Vegetation Inventory and Mapping of Bonnie Lure State Park

Pacific Biodiversity Institute

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Table of Contents

Executive Summary

Bonnie Lure State Park (84 acres) is the project area covered in this report.

Vegetation surveys took place during July and August 2007 and May 2008. This report summarizes the following findings from the surveys:

- Changes from historical vegetation patterns
- Distribution and condition of current vegetation patterns
- Occurrence of all vascular plant species within the project area
- Occurrence and distribution of at-risk plant species
- Occurrence and distribution of key exotic species
- Recommendations for restoration projects and managing key exotics

We conducted preliminary investigations into historical vegetation patterns for the project area but were generally unsuccessful in finding discreet maps or data that could be used to directly compare historical conditions from the contemporary. The park's upland forests most likely possessed classic low-elevation mixed conifer late-successional forests dominated by native conifers. These original forests were likely removed via post-European settlement logging and are currently replaced by secondary forests with similar overall species composition. The park's riparian and wetland areas were likely a fluctuating mosaic of black cottonowood gallery forests, alder / salmonberry stands, and primary, secondary and backwater channels and sloughs covered by native wetland plants. Eventual residential development within the last century around the park's exterior has worked to increase edge effects on the park's forest and created an ideal vector for exotic plant spread into the park's interior.

Current vegetation patterns reflect the region's recent history of logging and development. In the upland forests, old-growth trees have been replaced by younger regenerating forests, although understory conditions remain intact with mostly native plant occurence. Understory vegetation in the wetland and riparian areas has shifted away from native species cover to exotic plant dominance. Reed canarygrass and Himalayan blackberry now choke out the native shrub and herbaceous vegetation throughout most of the park, although a few small patches of non-weedy cottonwood gallery forest still exist.

Overall vascular plant diversity is relatively low in the park. 200 plant species were identified during field surveys, with 36% of identified plants being known exotics.

No at-risk plants were encountered in the park. Potential habitat for *Actaea elata* (*Cimicifuga elata*) and *Howellia aquatilis* does occur.

Opportunities to control Class B noxious weeds exist within the park, but due to the abudance of widespread distribution of reed canarygrass and Himalayan blackberry, successful restoration of native species composition in the wetlands and riparian areas is unlikely. Targeted recreational development accompanied by intensive native species planting may be a tool to reduce the range of reed canarygrass and Himalayan blackberry in some areas of the park.

Study Area

Bonnie Lure State Park is a small (84 acres), undeveloped park property occurring at the mouth of Eagle Creek where it intersects with the Clackamas River. The park has a few "fishermen" trails and old roads that allow easier access into the wilds of this park. There is one major unstable hill slope in the southeastern portion of the park that rises above flood influence. All other regions of the park are directly influenced by seasonal flooding. The parks substrate is made up of unconsolidated alluvium.

The park is surrounded by some residential development and a golf course, as well as the Clackamas River on its western boundary. Seemingly unmanaged riparian forest lands outside the park boundary provide continuity of the park's forested matrix into the greater landscape. Figure 1 illustrates the layout of Bonnie Lure State Park.

Figure 1. A map showing the boundaries of Bonnie Lure State Park overlaying a recent color aerial photograph.

Tasks and Methods

We performed our data mapping, data gathering, and data creation procedures in accordance with the guidelines and protocols stated in the Statement of Work section of Personal/Professional Services Contract #07-400. Appendix C contains the language used in the Statement of Work.

During the field survey portion of this project, more data was gathered on each vegetation polygon's current vegetation community composition than could be used in the resulting GIS data deliverables as stated by the Statement of Work. In order to retain the higher level of detailed data we collected on existing vegetation communities, we created additional items in the vegetation polygons attribute table which express our more detailed data while preserving the original attribute structure to meet the demands of the Statement of Work. These additional items and attributes are described in various places within this report and within the metadata associated with this report and the GIS data deliverables.

We created an initial vegetation map based on aerial photography and topographic information. We conducted fieldwork in the park during July and August 2007 and May 2008. Figure 2 illustrates our approximate survey routes. We produced a draft map report and geodatabase of our findings at the end of August, then revised the of mapping of vegetation communites based on further analysis of aerial photography, ASTER and Landsat TM satellite imagery and digital terrain products derived from LIDAR imagery in May 2008. This map was further refined through fieldwork conducted in May 2008. We revised the draft report to reflect the improved vegetation mapping and further fieldwork.

In some cases, vegetation polygon boundaries are very clear and distinct, due to abrupt and clearly visible breaks in vegetation community composition or structure. In these cases, we map the boundary along these clear and abrupt breaks. In many other cases, the vegetation communities may have similar canopy characteristics (visible in aerial photography) but the understory composition or structure may differ significantly from one area to another. We try to anticipate these differences of topographic (aspect, slope, elevation) and hydrologic information, and we map vegetation communities with significantly different understory composition as separate polygons. We also break vegetation communities into separate polygons when there are significant differences in alien plant composition, disturbance history or current human use.

Often, the breaks between vegetation polygons are not clearly visible in aerial photography and may not be readily apparent on the ground. Both overstory and understory vegetation can change gradually in composition and structure as one moves across the landscape. Frequently, we encounter gradual ecotones **(**transition areas between two adjacent ecological communities) that appear on the ground as a gradual blending of the two communities across a broad area. When these occur, we do our best to determine a polygon boundary that is the optimal break between the two vegetation communities. In reality, there is not an abrupt break, however, since this project called for the use of a polygonal representation of vegetation communities, we do our best to determine the best place to place polygon boundaries so that the polygons capture the significant differences in vegetation community composition, structure and human use.

Our assessment of historic vegetation included a review of existing historic vegetation maps (Tobalske 2002, Elliot 1914). We also inspected and reviewed a chronosequence of 9 Landsat MSS and TM satellite images taken between July 1972 and July 2001. In addition to this, we interpreted potential historic vegetation conditions based on elements still present in the contemporary landscape.

We relied on standard floras and field guides that cover the Pacific Northwest and adjacent areas for plant identification during this project (Cooke 1997, Hitchcock and Cronquist 1991, Hickman 1993, Pojar and MacKinnon 1994, Washington State Department of Natural Resources 1999, Washington State Department of Natural Resources 2008, Whitson et al 1992).

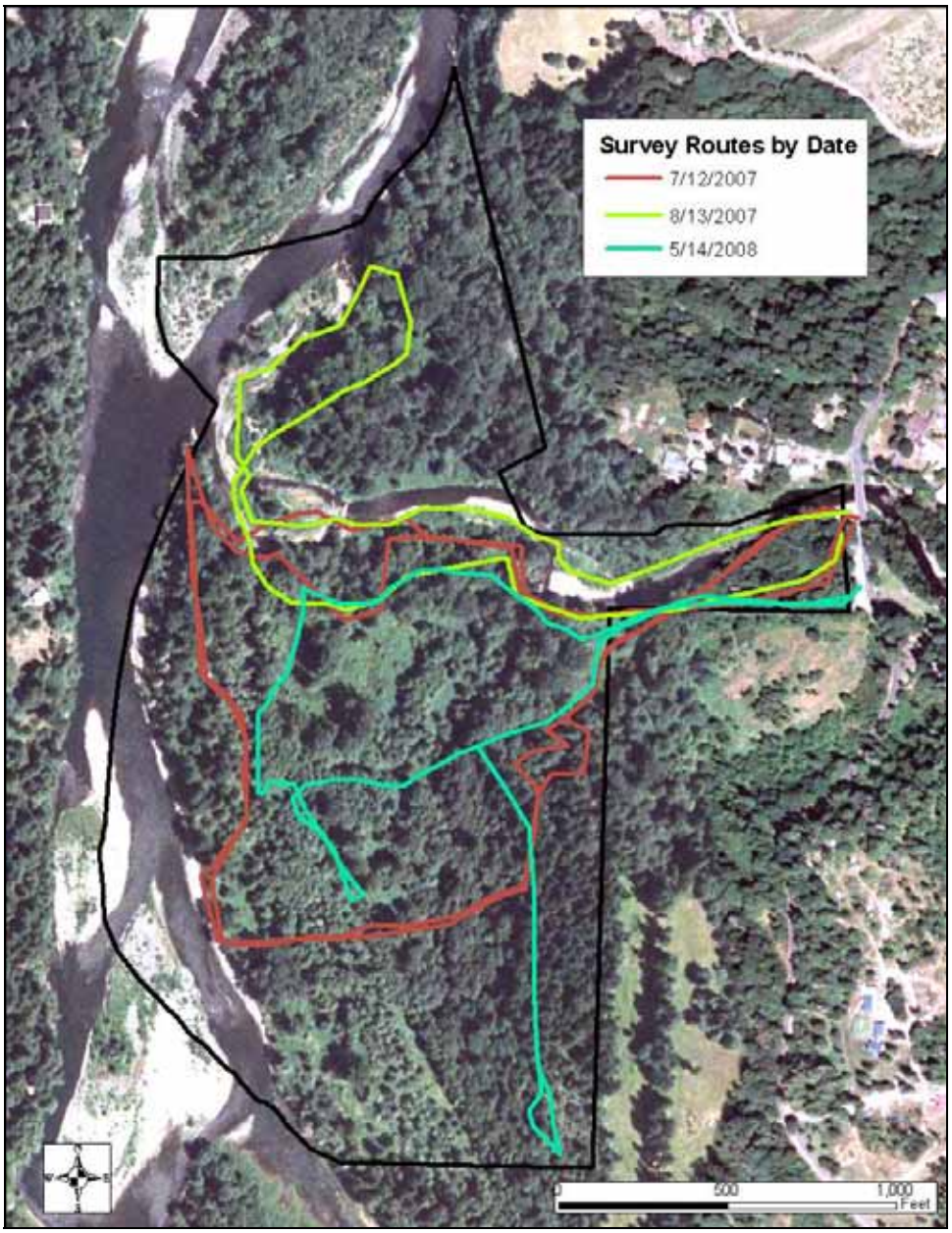

Figure 2. Field survey routes, July and August 2007 and May 2008.

Results

Historical Vegetation Patterns

Maps and data depicting historic vegetation patterns were too coarse for differentiation of the historical vegetation patterns within the park boundaries. One historic vegetation map created in 1936 (Tobalske, 2002) shows the entire park to be Douglas-fir forest. The 1914 forest cover map shows the entire park to be merchantable timber at the time that map was produced (Elliot 1914). Douglas-fir was probably significantly more common prior to logging in the 20th century, but much of this park probably consisted of forested wetlands, as it does today, given the low topography and the proximity to a major river and a major stream. Our review of a chronosequence of 9 Landsat satellite images supports this conclusion. There is little variation in spectral reflectance from 1972 to 2001, indicating that the dominant vegetation has not changed significantly in more than 30 years.

Judging from our field experience, it seems likely that most of the park contained forest types similar to what occur today, although in more mature phases and without the profuse infestations of exotic plants. The park's vegetation communities have been affected by a long natural history of flooding, river channel migration, and slope erosion. These processes are still on-going within the park and are helping to maintain the deciduous riparian forest communities that make up the matrix of the park. Historic logging and vegetation clearing for homesteading and agriculture have probably had substantial impacts on the native vegetation communities in the park. It is possible that more of the park's floodplain forests contained larger coniferous tree components than exist today, and that these components were lost due to historic logging and human activities.

Current Vegetation Patterns and Conditions

Bonnie Lure State Park is comprised mostly of riparian floodplain forests, streamside shrubland and herbaceous areas with a small section of upland forest along the southeastern side of the park. Influences of flooding and past human disturbances in the floodplain areas have created a mosaic of small patches of differing forest canopy types ranging from dominance by black cottonwood, to mixed conifer/deciduous stands, to purely alder dominated forests. Weed infestations in most of the floodplain areas have displaced native understory vegetation, although small patches of mostly native understory riparian vegetation do occur. Based on our analysis of aerial photography and subsequent field surveys, 26 vegetation community polygons were mapped and surveyed within the project area (Figure 3), and 34 different assortments of dominant vegetation composition were noted in our field data (there is often more than one vegetation community patch within a given polygon).

However, when looked at through the lense of predicted climax vegetation associations, the seemingly high amounts of vegetation community diversity do not endure. Only 10 equivalent published plant association classes were recorded for the park, and as required by the Statement of Work governing this project, we were able to effectively reduce the original 34 current vegetation descriptions down to 15 condensed vegetation types that adequately depict existing dominant species composition of the park's vegetation communities. The disparity between the complexity recorded in our field notes and the resulting simplification of the10 plant associations and 15 existing vegetation community classes can be reasoned by the fact that many of the same plants were described as dominant between each vegetation polygon, the descriptions just differ on what plant is most dominant from site to site. Table 1 depicts how the 15 existing vegetation classes relate to the 10 published plant association classes.

Figure 3. Map depicting the layout of the 26 digitized vegetation community polygons within the park.

Table 1. Table showing how the 15 Existing Vegetation Classes relate to the OPRD codes and the Published Equivalent Plant Associations (see Appendix B for definitions of conservation ranks).

OPRD Code	Existing Vegetation Community Class	Published Equivelant Plant Association	Rank
F01	ACEMAC-PSEMEN/HOLDIS-CORCOR/POLMUN-Mixed herbs	ACMA3-ALRU2/POMU-TEGR2 (Kagan, 2004)	~G2G3
F02	ACEMAC-QUEGAR/AMEALN-CORCOR-SYMALB/POLMUN-Mixed herbs	none	none
F03	ALNRUB/RUBARM-Mixed shrubs/PHAARU-URTDIO	ALNRUB/RUBSPE (Kagan, 2004)	~G5S4
F04	Mixed deciduous-Mixed conifer/Mixed shrubs-RUBARM/PHAARU-URTDIO	POPBAL-ACEMAC/SYMALB (Kagan, 2004)	~G3S3
F05	Mixed conifer-ACEMAC/ACECIR-CORCOR/POLMUN-Mixed herbs	ABIGRA-TSUHET/POLMUN (Kagan, 2004)	~G2S2
F06	Mixed conifer-POPBAL-ACEMAC/OEMCER-RUBSPE-SYMALB/POLMUN-Mixed herbs	ABIGRA-ACEMAC/SYMALB (Kagan, 2004)	~G3S2
F07	POPBAL-ALNRUB/RUBARM-Mixed shrubs/PHAARU-IMPCAP-URTDIO	POPBAL-ALNRUB/RUBSPE (Kagan, 2004)	~G2G3S2
F08	POPBAL-ACEMAC/CORCOR-ACECIR-SYMALB/URTDIO-Mixed herbs	POPBAL-ACEMAC/SYMALB (Kagan, 2004)	~G3S3
F09	PSEMEN-ACEMAC/ACECIR-SYMALB-MAHNER/POLMUN-Mixed herbs	ACEMAC-PSEMEN/ACECIR/POLMUN (Kagan, 2004)	~G4S4
S01	POPBAL/SALSIT/PHAARU-Mixed herbs	(SALMEL-SALSIT) Cobble Bar Shrubland (Crowe et al., 2004)	~G3G4
S02	SALSIT/Mixed herbs	(SALMEL-SALSIT) Cobble Bar Shrubland (Crowe et al., 2004)	~G3G4
H01	PHAARU-LUDPAL-POLPER	LUDPAL-POLHYD (McCain/Christy, 2005)	~G2S2
D01	PHAARU-Mixed herbs	none	none
D02	RUBARM	none	none
N01	water	none	none

Of course, not all of the 21 existing vegetation communities or 10 published plant association classes are equally common over the park's landscape. Summarizing the area of polygons containing identical existing vegetation classes as the dominant community type in the polygon yields insights as to the abundance of each vegetation community across the park's landscape (Table 2 – Note: This table does not include vegetation classes that are secondary types within the polygon, so it only contains the 15 dominant vegetation classes). Similarly, summarizing the area of polygons containing identical published plant association classes as the dominant association in the polygon is also revealing (Table 3).

Table 2. Table illustrating the amount of area and number of polygons each existing plant community class possesses as the dominant existing plant community.

OPRD Code	Existing Vegetation Community Class	Acres	Polygons	Percent of Area
F01	ACEMAC-PSEMEN/HOLDIS-CORCOR/POLMUN-Mixed herbs	5.72	1	7%
F02	ACEMAC-QUEGAR/AMEALN-CORCOR-SYMALB/POLMUN-Mixed herbs	0.97	1	1%
F03	ALNRUB/RUBARM-Mixed shrubs/PHAARU-URTDIO	4.55	1	5%
F04	Mixed deciduous-Mixed conifer/Mixed shrubs-RUBARM/PHAARU-URTDIO	6	2	7%
F05	Mixed conifer-ACEMAC/ACECIR-CORCOR/POLMUN-Mixed herbs	1.17	1	1%
F06	Mixed conifer-POPBAL-ACEMAC/OEMCER-RUBSPE-SYMALB/POLMUN-Mixed herbs	5.88	1	7%
F07	**POPBAL-ALNRUB/RUBARM-Mixed shrubs/PHAARU-IMPCAP-URTDIO**	20.03	3	24%
F08	POPBAL-ACEMAC/CORCOR-ACECIR-SYMALB/URTDIO-Mixed herbs	10.4	1	12%
F09	PSEMEN-ACEMAC/ACECIR-SYMALB-MAHNER/POLMUN-Mixed herbs	5.44	1	7%
H01	PHAARU-LUDPAL-POLPER	1.2	1	1%
N01	water	10.03	4	12%
S01	POPBAL/SALSIT/PHAARU-Mixed herbs	4.05	3	5%
S02	SALSIT/Mixed herbs	4.3	2	5%
D01	PHAARU-Mixed herbs	3.22	3	4%
D02	RUBARM	0.63	1	1%

Table 3. Table illustrating the summation of the amount of area and number of polygons each published plant association class possesses as the dominant plant association.

Published Plant Association	Acres	Polygons	Percent of Area
ABIGRA-ACEMAC/SYMALB (Kagan, 2004)	5.88	1	7%
ABIGRA-TSUHET/POLMUN (Kagan, 2004)	1.17	5	1%
ACEMAC-ALNRUB/POLMUN-TELGRA (Kagan, 2004)	5.72	1	7%
ACEMAC-PSEMEN/ACECIR/POLMUN (Kagan, 2004)	5.44	5	7%
ALNRUB/RUBSPE (Kagan, 2004)	4.55	1	5%
LUDPAL-POLHYD (McCain/Christy, 2005)	1.2	5	1%
POPBAL-ACEMAC/SYMALB (Kagan, 2004)	16.4	5	20%
POPBAL-ALNRUB/RUBSPE (Kagan, 2004)	20.03	1	24%
(SALMEL-SALSIT) Cobble Bar Shrubland (Crowe et al., 2004)	8.35	5	10%
none	14.85	1	18%

From these two tables (note the bold type) it becomes apparent that the POPBAL-ALNRUB/RUBARM-Mixed shrubs/PHAARU-IMPCAP-URTDIO and the POPBAL-ACEMAC/CORCOR-ACECIR-SYMALB/URTDIO-Mixed herbs forest communities, and the POPBAL-ACEMAC/SYMALB and the POPBAL-ALNRUB/RUBSPE plant associations are vastly more abundant across the park's landscape than the other vegetation classes. The data expressed in these tables are spatially expressed in the following maps (Figures 4 – 6).

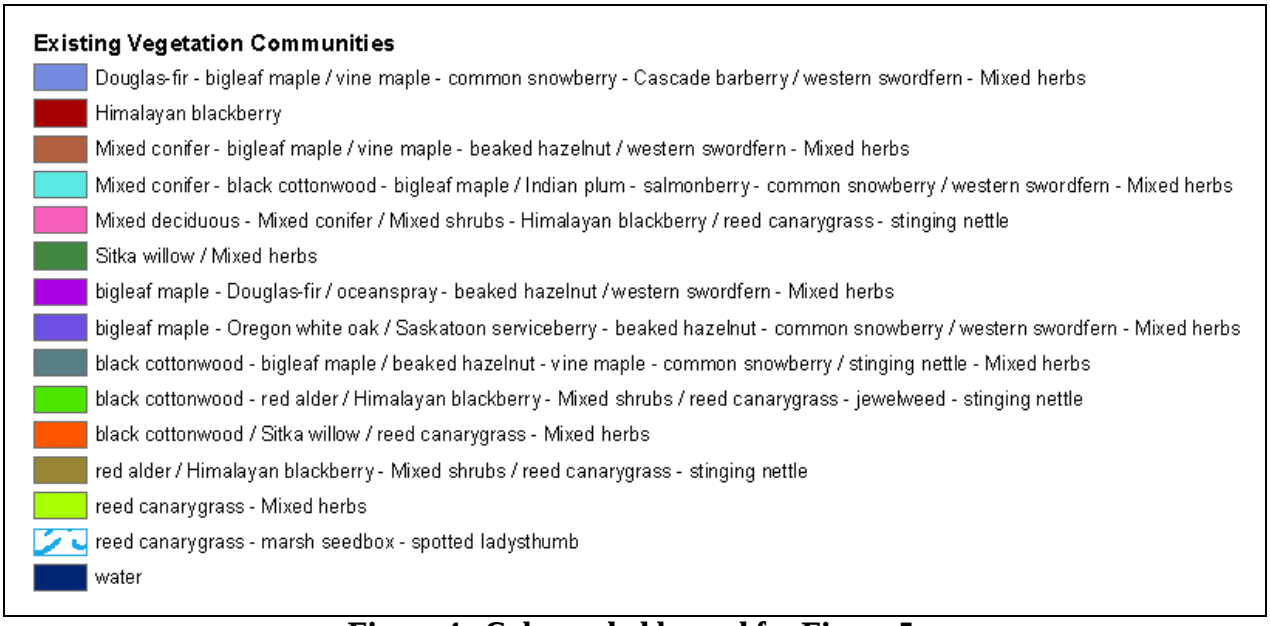

Figure 4. Color coded legend for Figure 5.

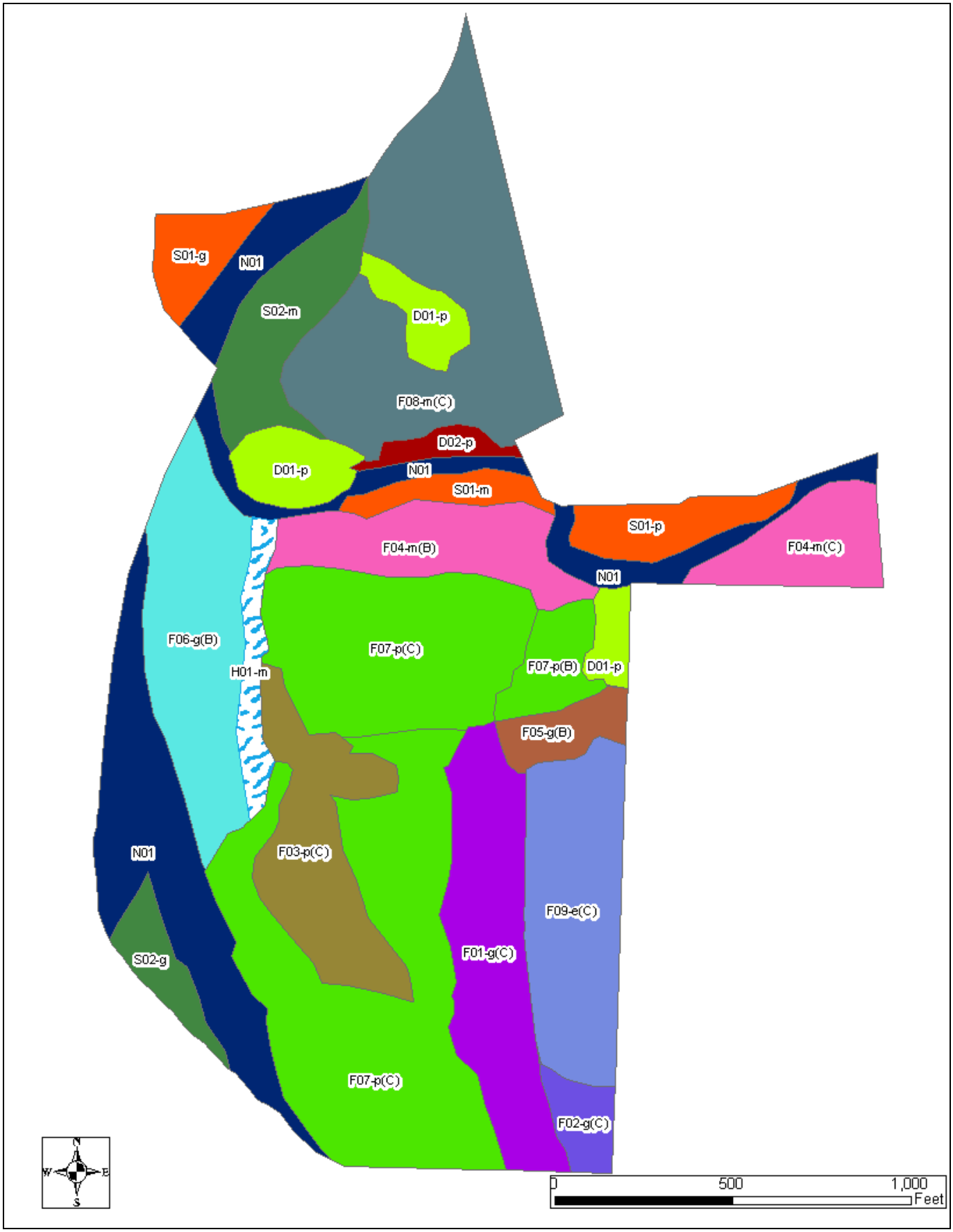

Figure 5. Map depicting the layout of the matrix existing vegetation community class for each polygon.

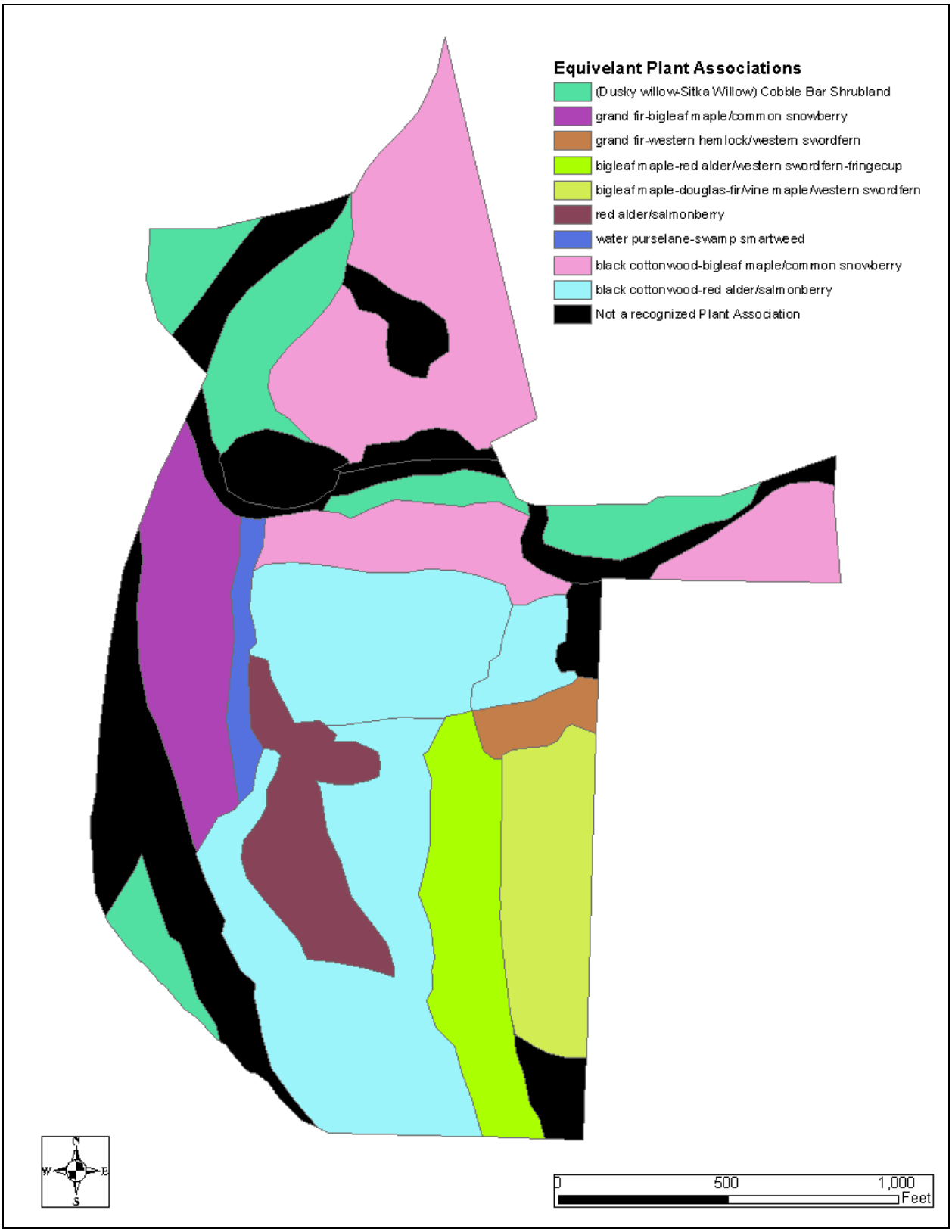

Figure 6. Map depicting layout of the matrix published plant association class for each polygon.

Apart from collecting data on vegetation community composition and plant association relationships, we also collected data on the overall condition of each polygon as it relates to the occurrence and abundance of exotic plants, vegetation disturbances, and naturally occurring native plant diversity. Table 4 and

Figure 7 detail the abundance of each condition ranking in terms of overall condition of the matrix community (most poor and marginal polygon rankings were due to high abundance of reed canarygrass and Himalayan blackberry).

Table 4. Table illustrating the amount of area and number of polygons for each condition class.

Condition Class	Acres	Polygons	Percent of Area
Excellent	5.44	1	7%
Good	16.27	6	19%
Marginal	21.71	6	26%
Poor	30.14	9	36%
No Assessed	10.03	4	12%

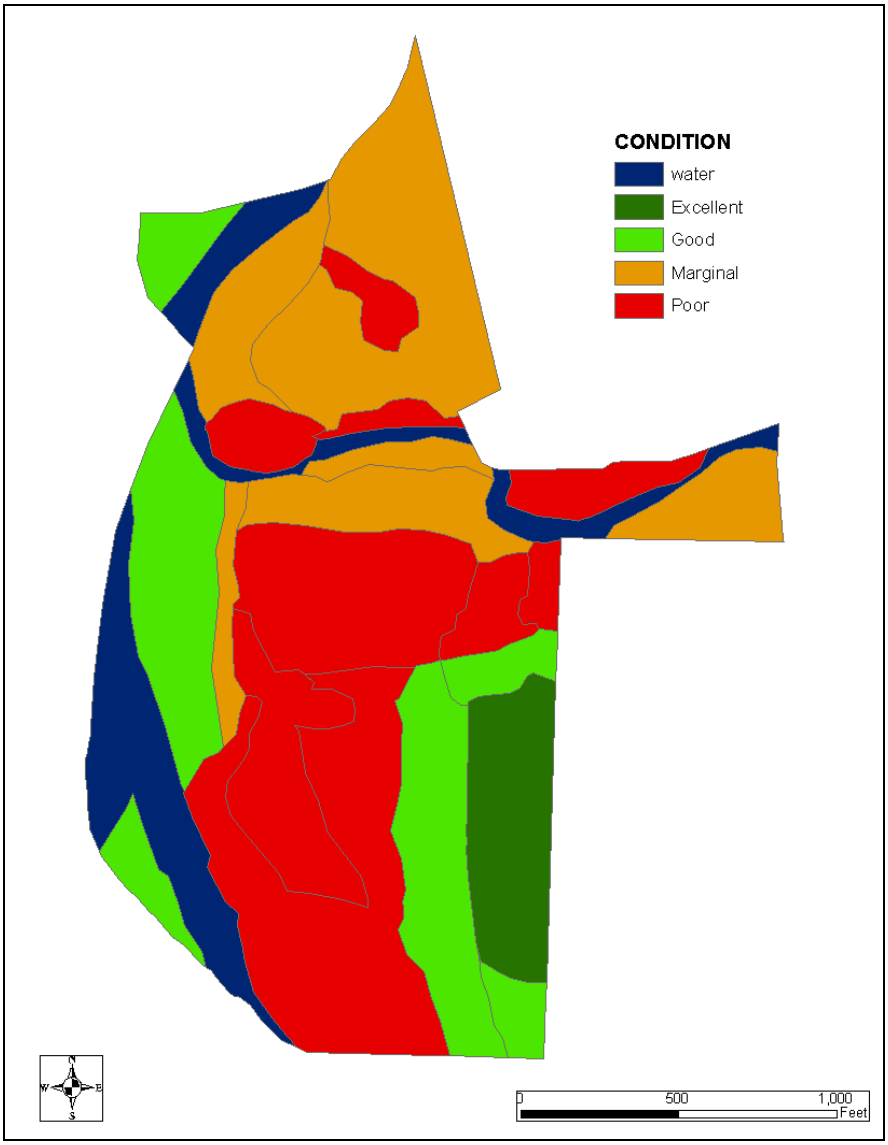

Figure 7. Map illustrating the overall polygon condition rankings.

Much of Bonnie Lure State Park is currently ranked as being in marginal to poor condition due to large-scale infestations of exotic plants. The best vegetation community conditions occur in the upland forest types or in areas so frequently inundated by swift water from the Clackamas River they are mostly exposed river cobble and/or sand.

Taking into account the overall polygon condition ranks, the presence of wetland communities, the associated conservation ranks of all communities attributed within a polygon, and the ageclass of forested and woodland polygons, we used the Plant Community Suitability Ratings reference matrices provided in the Statement of Work to produce suitability ratings for each polygon. Table 5 and Figure 8 illustrate the resulting distribution of suitability rankings by polygon. Although the two polygons on the southeastern boundary of the park show up as higher suitability for development than other polygons in the park, it is important to note that our surveys indicate this area to be in the best ecological condition of any area in the park.

Table 5. Table illustrating the amount of area and number of polygons for each plant community suitability rank.

Condition Class	Acres	Polygons	Percent of Area
2	77.18	24	92%
3	6.41	2	8%

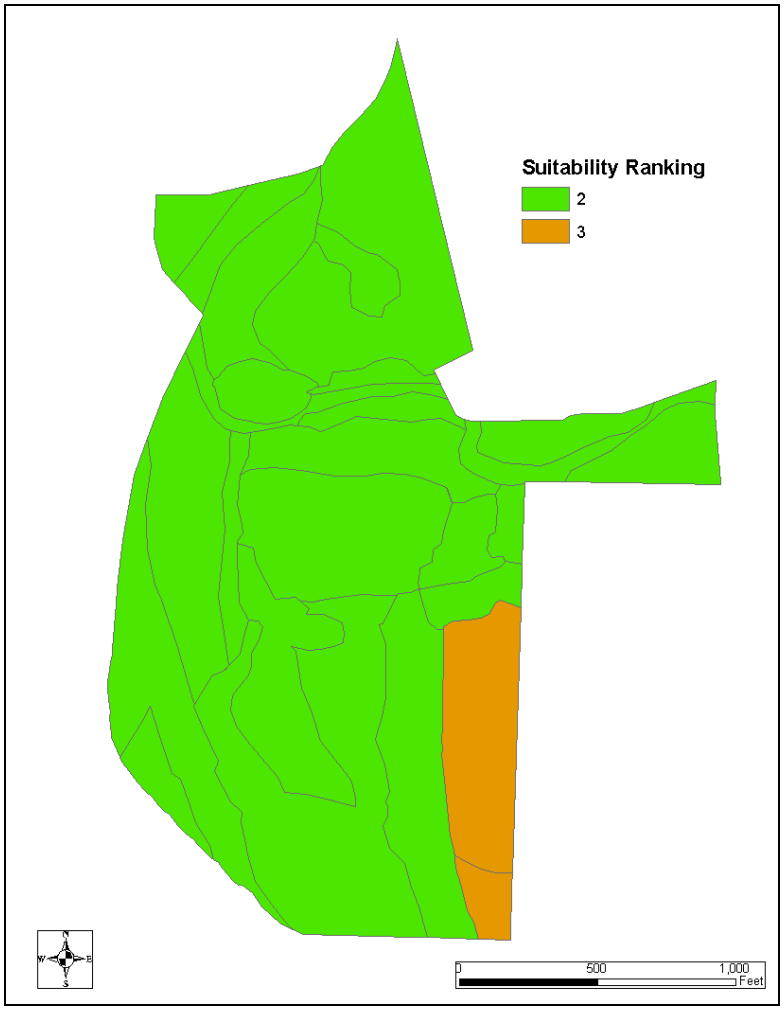

Figure 8. Map of the resulting plant community suitability ranks for each polygon.

Descriptions of Existing Vegetation Communities

F01: bigleaf maple - Douglas-fir / oceanspray - beaked hazelnut / western swordfern - Mixed herbs
ACEMAC-PSEMEN/HOLDIS-CORCOR/POLMUN-Mixed herbs ~G2G3

This community is a variant of the ACEMAC-ALNRUB/POLMUN-TELGRA plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. Only one polygon of this type was attributed in the southeast section of the park. Within this polygon there is a steep west facing slope with an unconsolidated substrate showing signs of chronic erosion and slope failure. The constant eroding of the slope helps to maintain a deciduous dominated forest canopy consisting mostly of bigleaf maple. Douglas-fir also occurs sporadically throughout the steep slope. Oceanspray and beaked hazelnut are the most frequent occurring shrubs, although many other shrub species occur including ninebark, Indian plum, and salmonberry. The herbaceous cover is mostly native species and is diverse and sporadic, with swordfern occurring most consistently throughout the polygon. This is a mid-aged forest that probably does not often evolve into a climax community due to the chronic slope failure events. The exotic species presence in this community is low although some small patches of weeds (Himalayan blackberry and reed canarygrass) do exist.

Within this community small patches of a PSEMEN-THUPLI-ACEMAC/ACECIR-CORCOR-MAHNER/POLMUN-Mixed herbs community exist. This community is a variant of the ACEMAC-PSEMEN/ACECIR/POLMUN plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community occurs as a smaller patch community along the steep hillslopes in the southeast section of the park where the ACEMAC-PSEMEN/HOLDIS-CORCOR/POLMUN-Mixed herbs community occurs. This community differs from the ACEMAC-PSEMEN/HOLDIS-CORCOR/POLMUN-Mixed herbs in that Douglas-fir and western red cedar are more prevelant in the upper canopy and Cascade barberry occurs with higher frequency. Patches of this community are mid-aged and are recolonizing old land slides. This community is in good to excellent condition.

F02: bigleaf maple - Oregon white oak / Saskatoon serviceberry - beaked hazelnut - common snowberry / western swordfern - Mixed herbs
ACEMAC-QUEGAR/AMEALN-CORCOR-SYMALB/POLMUN-Mixed herbs

This community has no adequate published plant association equivelant. It is in good condition in that it is composed mostly of native plants. The woodland canopy is a mix of Gary oak and bigleaf maple. The understory is a dense conglomeration of native shrubs including serviceberry, hazelnut, and common snowberry, which are most dominant. Due to the thick shrub cover, the herbaceous layer is not highly developed, but many native herbs occur along with a frequent occurrence of swordfern. The occurrence of a Gary oak woodland in this polygon is unique for the park, but it is not clear if this woodland is associated with historic oak woodlands in the area that no longer exist due to development, or if the oaks colinated the site after human caused disturbances like forest clearing for agriculture and golf courses created good habitat conditions.

F03: red alder / Himalayan blackberry - Mixed shrubs / reed canarygrass - stinging nettle

ALNRUB/RUBARM-Mixed shrubs/PHAARU-URTDIO ~G5S4

This community is a variant of the ALNRUB-RUBSPE plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community is in poor condition within the park, being dominated by reed canarygrass and Himalayan blackberry. It is a riparian forest community containing many weed covered sloughs and wet depressions. A few unofficial fisherman/game trails penetrate into this community's largest patch which occurs near the center of the park. Evergreen clematis and Japanese knotweed both occur within this patch. Some native shrubs do rise above the exotic plant cover, including salmonberry and redosier dogwood.

F04: Mixed deciduous - Mixed conifer / Mixed shrubs - Himalayan blackberry / reed canarygrass - stinging nettle

Mixed deciduous-Mixed conifer/Mixed shrubs-RUBARM/PHAARU-URTDIO ~G3S3

This community is a variant of the POPBAL-ACEMAC/SYMALB plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. While this community is in marginal to poor condition in the park due to infestations of Himalayan blackberry, reed canarygrass, and English ivy, it still has high native shrub diversity, including vinemaple, common snowberry, and salmonberry. In the infrequent places where exotic species cover is less abundant, native herbaceous cover does occur. The high diversity of trees in this community makes it a unique forest type. Black cottonwood, red alder, bigleaf maple, grand fir, and western redcedar share the upper canopy, although the cottonwood and maple are clearly more abundant than the other species. The most significant existing trail within the park travels through this community, as well as less significant fisherman trails. This is a riparian forest community and it contains some wet depressed areas.

F05: Mixed conifer - bigleaf maple / vine maple - beaked hazelnut / western swordfern - Mixed herbs

Mixed conifer-ACEMAC/ACECIR-CORCOR/POLMUN-Mixed herbs ~G2S2

This community is a variant of the ABIGRA-TSUHET/POLMUN plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community is in good condition and is not abundant within the park although it may have been historically more abundant in the surrounding landscape away from the riparian areas. Many species of conifer occur within this community, including Douglas-fir, western hemlock, western redcedar, and grand-fir. Bigleaf maple also has a frequent occurrence, most likely being related to the steep slope landslide events that have impacted part of this community. This community occurs on the north facing aspect of the same steep unconsolidated hillside that the ACEMAC-PSEMEN/HOLDIS-CORCOR/POLMUN-Mixed herbs community occurs on. Small patches of exotic plants occur within this community, probably due to the effects of landslide disturbance.

F06: Mixed conifer - black cottonwood - bigleaf maple / Indian plum - salmonberry - common snowberry / western swordfern - Mixed herbs
Mixed conifer-POPBAL-ACEMAC/OEMCER-RUBSPE-SYMALB/POLMUN-Mixed herbs ~G3S2

This community is a variant of the POPBAL-ACEMAC/SYMALB plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community is very similar in native species composition and micro-site topography to the Mixed deciduous-Mixed conifer/Mixed shrubs-RUBARM/PHAARU-URTDIO community, although it does not suffer from the extreme exotic species infestations that plague the other community. This is not to say that this community is without exotic species infestations however. This community occurs in a mosaic pattern with the ALNRUB/RUBARM-Mixed shrubs/PHAARU-URTDIO, which has a high percentage of weed cover that slightly penetrates the interior patch occurrences of Mixed conifer-POPBAL-ACEMAC/OEMCER-RUBSPE-SYMALB/POLMUN-Mixed herbs. The edges of this community abutting the Clackamas River and Eagle Creek also suffer from higher exotic species cover.

F07: black cottonwood - red alder / Himalayan blackberry - Mixed shrubs / reed canarygrass - jewelweed - stinging nettle
POPBAL-ALNRUB/RUBARM-Mixed shrubs/PHAARU-IMPCAP-URTDIO ~G2G3S2

This community is a variant of the POPBAL-ALNRUB/RUBSPE plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community comprises nearly 25% of the park's area making it the most dominant community type in Bonnie Lure State Park. Unfortunately this community has extreme exotic species infestation problems. Massive infestations of reed canarygrass and Himalayan blackberry dominate the understory of this community. This is a riparian forest community and it contains some weed dominated wet depressed areas and sloughs. Native shrub species common to black cottonwood riparian forests do occur in this community, but their distribution and abundance is marginalized by the exotic plant infestations.

One patch of CYTSCO/HYPPER-LEUVUL shrubland exists within the POPBAL-ALNRUB/RUBARM-Mixed shrubs/PHAARU-IMPCAP-URTDIO community. The CYTSCO/HYPPER-LEUVUL community has no adequate published plant association equivelant. It is an amalgamation of exotic shrubs and herbs that indicate a past disturbance occurred that removed the native vegetation. This community would be an opportune place for strategic recreational development that requires intensive vegetation removal such as campground and/or facilities development. A well used fisherman's trail passes through this community.

F08: black cottonwood - bigleaf maple / beaked hazelnut - vine maple - common snowberry / stinging nettle - Mixed herbs

POPBAL-ACEMAC/CORCOR-ACECIR-SYMALB/URTDIO-Mixed herbs ~G3S3

This community is a variant of the POPBAL-ACEMAC/SYMALB plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community occurs in the northern section of the park across Eagle Creek from the main body of the park. It is a riparian forest community where black cottonwood and bigleaf maple dominate the forest canopy. The understory has a strong native plant component, with a mix of native shrubs (hazelnut, vine maple, and common snowberry) and native herbs. Infestations of reed canarygrass and Himalayan blackberry occur sporadically throughout the community, and in some cases their abundance crowds out the native understory plants.

F09: Douglas-fir - bigleaf maple / vine maple - common snowberry - Cascade barberry / western swordfern - Mixed herbs

PSEMEN-ACEMAC/ACECIR-SYMALB-MAHNER/POLMUN-Mixed herbs ~G4S4

This community is a variant of the ACEMAC-PSEMEN/ACECIR/POLMUN plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This plant community is in excellent condition within the park, although it only occurs in one 5 ½ acre patch in the southeast section of the park. The forst stand is dominated by a single cohort of mid-aged Douglas-fir, with young bigleaf maples mixed into the forest canopy. The understory has high native shrub diversity, with vine maple, common snowberry, and Cascade barberry being the most abundant shrubs. Native herb cover is also high with abundant swordfern, vanilla leaf, inside-out flower, and Sierra pea.

S01: black cottonwood / Sitka willow / reed canarygrass - Mixed herbs

POPBAL/SALSIT/PHAARU-Mixed herbs ~G3G4

This community is a variant of the (SALMEL-SALSIT) Cobble Bar Shrubland plant association described by Crowe et al., 2004. Its rarity ranking is based on the ranking of that association. This community occurs on many of the riparian cobble bars along both rivers in the park. It is a shrubland community although small young black cottonwood saplings do occur (they are typically smaller than the surrounding shrub vegetation). Large infestations of canary reed grass and Himalayan blackberry are displacing and preventing the reestablishment of native vegetation in these cobble bar areas. Seasonal flooding from Eagle Creek and the Clackamas River is integral in maintaining the presence of this flooded shrubland alliance.

S02: Sitka willow / Mixed herbs

SALSIT/Mixed herbs ~G3G4

This community is a variant of the (SALMEL-SALSIT) Cobble Bar Shrubland plant association described by Crowe et al., 2004. Its rarity ranking is based on the ranking of that association. Like the POPBAL/SALSIT/PHAARU-Mixed herbs community, it occurs on the cobble and sand bars along the park's two rivers. This community, however, has less cottonwood and reed canarygrass present. Sitka willow forms the dominant woody cover and opportunistic herbs (many of them exotic species) grow in gaps where the willows don't occur (probably due to higher frequency flooding).

H01: reed canarygrass - marsh seedbox - spotted ladysthumb
PHAARU-LUDPAL-POLPER ~G2S2

This community is a variant of the LUDPAL-POLHYD plant association described by McCain/Christy, 2005. Its rarity ranking is based on the ranking of that association. This herbaceous wetland community occurs on the western side of the park. It occurs in a large backwater slough fed by flooding and the hyporehic flow from the Clackamas River and Eagle Creek. In late summer it drains into Eagle Creek. Reed canarygrass, marsh seedbox, and spotted ladysthumb make up the dominant herbaceous vegetation in this slough. This wetland is potential habitat for water howellia.

D01: reed canarygrass - Mixed herbs
PHAARU-Mixed herbs

This community has no adequate published plant association equivalent. It occurs as a thick two meter tall near monoculture of reed canarygrass with no to sparse tree and/or shrub cover. Some additional herbaceous species do occur with the reed canarygrass, namely jewelweed and stinging nettle.

Within this community a small patch of a variant of the SALSIT Shrubland plant association described by Crowe et al., 2004 exists. Its rarity ranking (~G4S4) is based on the ranking of that association. This is a wetland community which occurs in one small patch surrounded by the PHAARU-Mixed herbs community. It has a large infestation of reed canarygrass and is being overrun by Himalayan blackberry.

Vascular Plant Occurrence within the Project Area

200 species of vascular plants were identified within the project area during this project. This included 59 plant families, with the Rosaceae, Poaceae, and Asteraceae families making up 35% of the species total. 36% of the total vascular plant diversity is exotic plants. See Appendix A for the full species list.

At-risk Plants within the Project Area

No at-risk plant species were encountered during this project. Given the high levels of annual disturbance through flooding and the abundance of exotic species throughout much of the park, it is not likely that at-risk plants currently occur. That being said, some potential habitat for at-risk species exists within the park. Figure 9 depicts the locations of potential habitat for tall bugbane and water howellia in Bonnie Lure State Park.

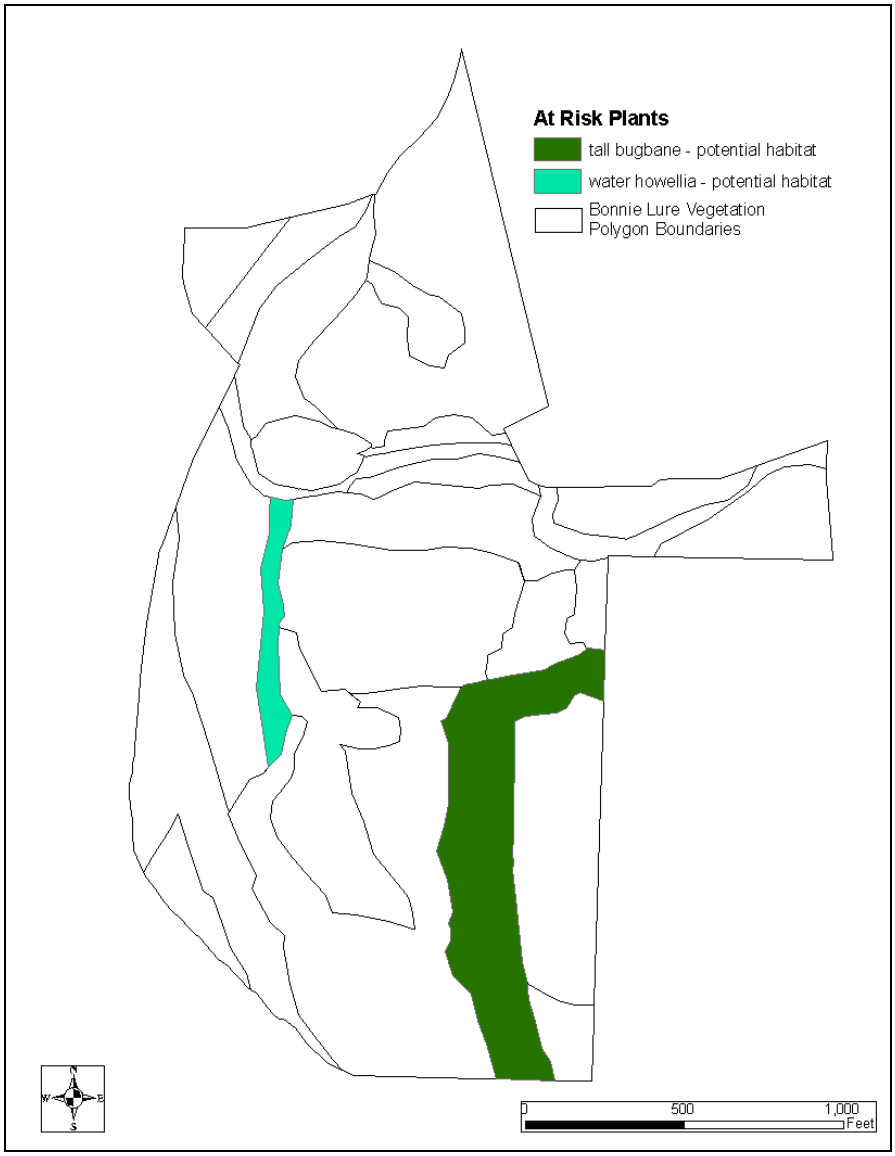

Figure 9. Locations of potential at-risk plant habitat in Bonnie Lure State Park.

***Actaea elata* (Nutt.) Prantl - tall bugbane – Ranunculaceae – status: G3 S3**
This plant is known to occur in upland westside forests with an abundant bigleaf maple component. While habitat of this nature is not abundant within the park, a few areas within the southeast region of the park possess adequate habitat for tall bugbane. We found it in a similar forest and topographic location at Milo McIvor State Park about 3 miles to the SSE. Figure 10 depicts the potential tall bugbane habitat within Bonnie Lure State Park.

Figure 10. Example of potential tall bugbane habitat within Bonnie Lure State Park.

***Howellia aquatilis* Gray - water howellia – Campanulaceae – status: G3 S1**
Howellia aquatilis occurs mostly in small ponds that retain water throughout the year. Ponds have soils rich in organic matter and frequently contain partially decomposed leaves, stems, and wood. Elevation range is known to be 10-2300 feet. The species seems to require exposure to air to germinate and inundation for growth in the spring. This restricts the species to the zone within wetlands that is seasonally inundated, but which dries out in late summer or early fall. Figure 11 depicts the potential water howellia habitat within Bonnie Lure State Park.

Figure 11. Example of potential water howellia habitat within Bonnie Lure State Park.

A query of the most current threatened and endangered plant spatial database maintained by the Oregon Natural Heritage Information Center returned no known sightings of any other at-risk plants in Bonnie Lure State Park (ONHIC, 2007).

Invasive and Exotic Plants of Concern within the Project Area

Table 6 lists the Class B noxious plants encountered in the park during this project. There were a total of twelve Class B plants and no Class A plants identified.

Table 6. Class B Noxious plants occurring in Bonnie Lure State Park.

Symbol	Scientific Name	Common name	Family	Class
BRSY	Brachypodium sylvaticum (Huds.) Beauv	false brome	Poaceae	B
CIAR4	Cirsium arvense (L.) Scop.	Canada thistle	Asteraceae	B
CIVU	Cirsium vulgare (Savi) Ten.	bull thistle	Asteraceae	B
CLVI6	Clematis vitalba L.	evergreen clematis	Ranunculaceae	B
CYSC4	Cytisus scoparius (L.) Link	Scotch broom	Fabaceae	B
ELRE4	Elymus repens (L.) Gould	quackgrass	Poaceae	B
EQTE	Equisetum telmateia Ehrh.	giant horsetail	Equisetaceae	B
HEHE	Hedera helix L.	English ivy	Araliaceae	B
HYPE	Hypericum perforatum L.	common St. Johnswort	Clusiaceae	B
LIVU2	Linaria vulgaris P. Mill.	butter and eggs	Scrophulariaceae	B
RUAR9	Rubus armeniacus Focke	Himalayan blackberry	Rosaceae	B
SEJA	Senecio jacobaea L.	stinking willie	Asteraceae	B

The occurrence and distribution of some Class B noxious plants were mapped during field surveys. Figure 12 illustrates the location of some noxious plant infestations. In some cases, polygons of one noxious weed overlap another weed. These overlaps can be examined in the GIS data and may not be apparent in this map. We also spotted what appeared to be *Cynoglossum officinale* (common hound's-tongue) in May 2008 growing on a sandbar on the north side of Eagle Creek. It was impossible to verify the plant because the creek was impossible to cross at that time and access was blocked on the north by private lands. We did not map this location as our identification was through binoculars and therefore inconclusive.

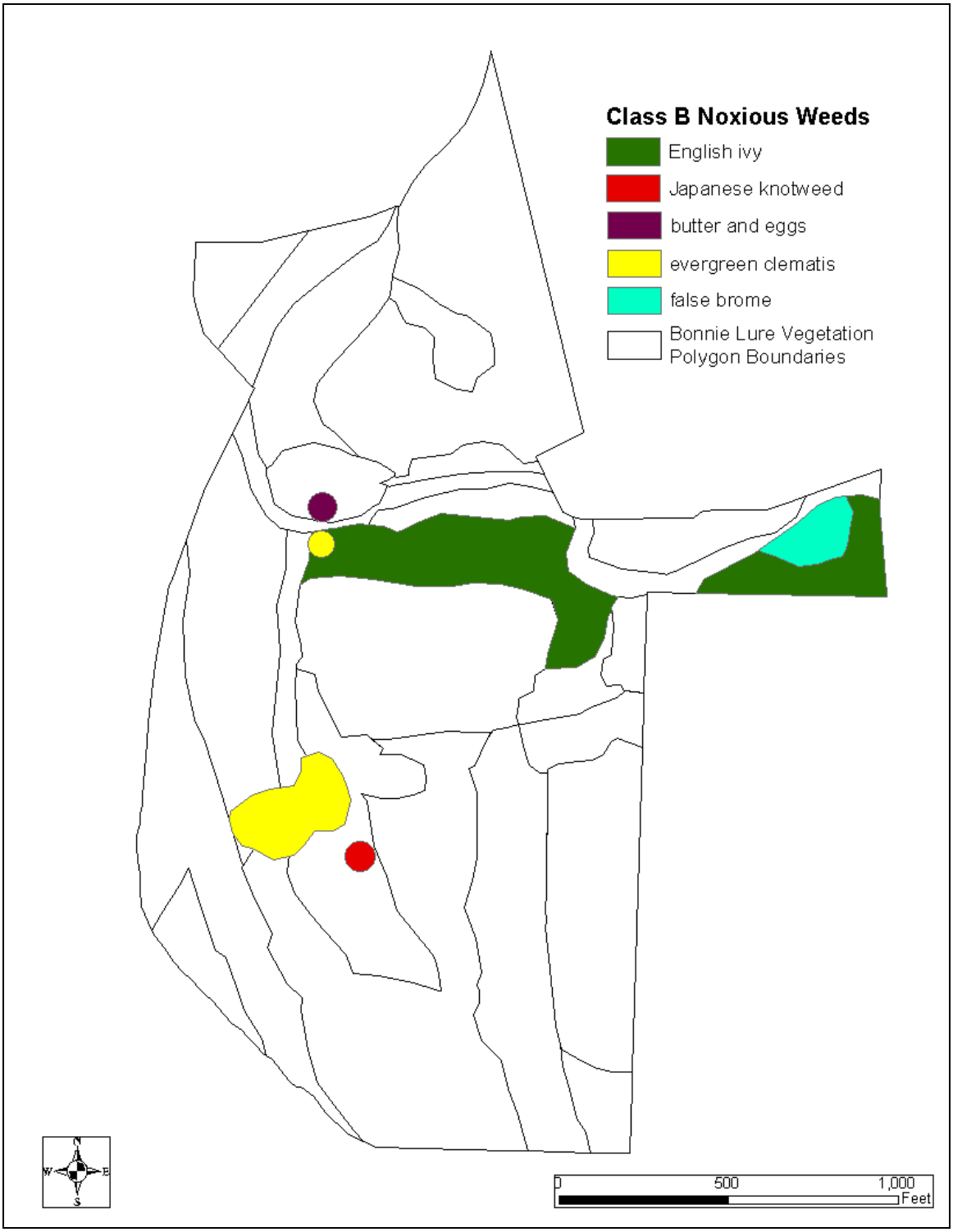

Figure 12. Location of noxious plants mapped with within the park.

Exotic and noxious weeds were abundant throughout much of the natural area. Massive infestations of reed canarygrass have displaced native understory vegetation in much of the park. Other exotic species are prolific in places, such as Himalayan blackberry and evergreen clematis. Figures 13 - 16 provide photos of some of the many extensive infestations encountered in the park.

Figures 13 - 16. Photos of exotic plant invasions in the project area. Top left: Himalayan blackberry along Eagle Creek. Top right: A sea of reed canarygrass. Bottom left: Scotch broom shrubland. Bottom right: Evergreen clematis in the trees and a sea of reed canarygrass below.

Recommendations for Restoration and Vegetation Management

As stated in the previous sections, the extent of non-native plant infestations within Bonnie Lure State Park is extreme. The sheer dominance of reed canarygrass and Himalayan blackberry in the forest understory and along the park's streams and river channels does not lend itself to easy restoration interventions.

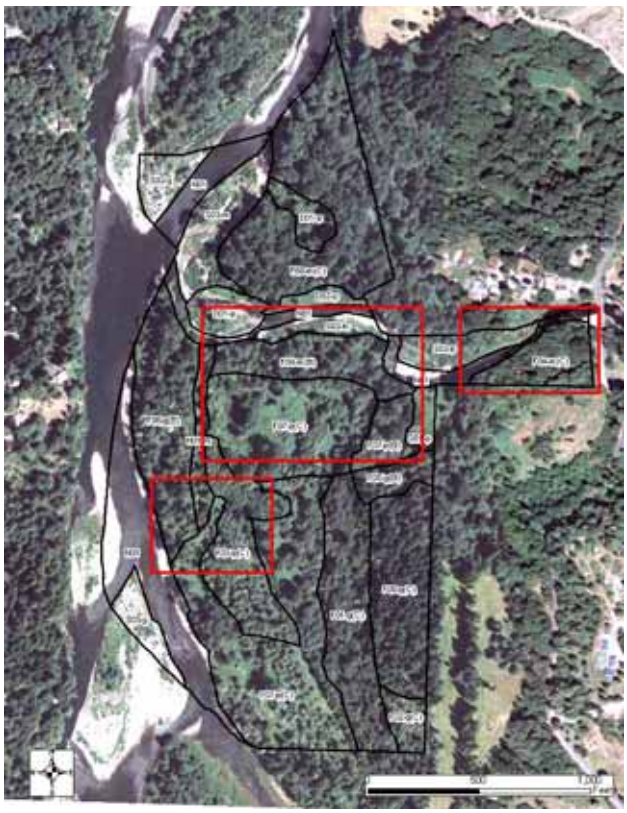

Figure 17. Areas of opportunity for Class B noxious species control.

That being said, opportunities do exist to control and/or diminish Class B noxious weed infestations in the park, and while these control activities may not restore native plant communities, they may help control the spread of these noxious weeds into other areas of the park and into the surrounding landscape. Figure 17 illustrates areas of priority for noxious weed control. Weeds we recommend to be targeted include evergreen clematis, English ivy, false brome, Japanese knotweed, and butter and eggs. Consult the noxious species occurrence maps for more information on which weeds to control in these areas. Since the ecological condition of the park is low and other alien plants are so pervasive, noxious weed control at this park should be a lower priority than other parks that have better ecological condition and where alien plants are less pervasive.

Additionally, if OSPRD decides to develop this park further, we recommend attempting to eliminate the large reed canarygrass fields and Scotch broom shrubland identified in blue in Figure 18 through replacement of the infested vegetation with flood-tolerant recreation facilities complemented by intensive planting of native vegetation cover on the periphery of the development. Removing the exotic vegetation and replacing it with more hardscape like campgrounds and/or structural facilities may be a positive way to improve recreation access in the park and reduce weed cover at the same time.

Figure 18. Areas of opportunity for future recreation development as a technique to decrease exotic plant infestations.

GIS Data Deliverables

Project GIS Data – Metadata

Survey_Routes_*Park_Name*
LINE_ID, Long, 14
DATE, String, 20 (date of site visit)
OBSERVER, String, 50
COMMENTS, String, 100

***Park_Name*_Vegetation_Polygons**
POLY_ID, String, 14
OPRD_CODE, String, 20
COMPLEX, Short (Value between 1 and 3, 1 = only one published plant association type ascribed to polygon, 2 = two published plant association types ascribed to polygon, 3 = three published plant association types ascribed to polygon)
FIELD_DATA, String, 100 = (6 letter plant code description of the matrix existing vegetation by growth form within the polygon [trees/shrubs/herbaceous])
ACRONYM, String, 50 (6 letter plant code description of the matrix existing vegetation class within the polygon)
SCI_NAME, String, 100 (Full scientific name of ACRONYM)
COM_NAME, String, 100 (Full common name of ACRONYM)
EQUIV, String, 50 (6 letter plant code of the equivalent published plant association with the authorities name and date)
ALLIANCE, String, 100
HABITAT, String, 100
AGECLASS, String, 4
RANK, Short, 2
CONDITION, String, 2
WEEDCOVR, String, 15
WETLAND, String, 4
FIELD_DATA2, String, 100 = (6 letter plant code description of unique smaller patches of existing vegetation by growth form within the polygon [trees/shrubs/herbaceous])
ACRONYM2, String, 50 (6 letter plant code description of unique smaller patches of existing vegetation community classes occurring in the polygon)
SCI_NAME2, String, 100 (Full scientific name of ACRONYM2)
COM_NAME2, String, 100 (Full common name of ACRONYM2)
EQUIV2, String, 50 (6 letter plant code of the equivalent published plant association with the authorities name and date)
ALLIANCE2, String, 200
HABITAT2, String, 200
AGECLASS2, String, 4
RANK2, Short, 2
CONDITION2, String, 2
WEEDCOVR2, String, 25
WETLAND2, String, 4
FIELD_DATA3, String, 100 = (6 letter plant code description of unique smaller patches of existing vegetation by growth form within the polygon [trees/shrubs/herbaceous])
ACRONYM3, String, 50 (6 letter plant code description of unique smaller patches of existing vegetation community classes occurring in the polygon)
SCI_NAME3, String, 100 (Full scientific name of ACRONYM3)
COM_NAME3, String, 100 (Full common name of ACRONYM3)

EQUIV3, String, 50 (6 letter plant code of the equivalent published plant association with the authorities name and date)
ALLIANCE3, String, 300
HABITAT3, String, 300
AGECLASS3, String, 4
RANK3, Short, 2
CONDITION3, String, 2
WEEDCOVR3, String, 35
WETLAND3, String, 4
SUITABL, String, 4
COMMENTS, String, 100

T_E_Plants_*Park_Name*
SIGHT, String, 10, (no = potential habitat only, yes = confirmed sighting in polygon)
SCI_NAME, String, 100
COM_NAME, String, 100
COMMENTS, String, 100
METHOD, String, 40 (method of localization of feature – i.e. GIS import, GPS, aerial photo interp/digitization, compass triangulation, traverse, azimuth and distance from a reference point)

SAMP_DATE, String, 20 (date of site visit)
PT_RELIAB, Short, 4 (reliability of point coordinates. Valid values 1,2,3,4,5. Value 1 – One foot or less, Value 2 – Three feet or less, Value 3 – Ten feet or less, Value 4 – 40 feet or less, Value 5 – more than 40 feet)

ClassB_Noxious_*Park_Name*
ODA_RATING, String, 4
CODE, String, 7 (6 letter plant code)
SCI_NAME, String, 100
COM_NAME, String, 100
COMMENTS, String, 100
METHOD, String, 40 (method of localization of feature – i.e. GIS import, GPS, aerial photo interp/digitization, compass triangulation, traverse, azimuth and distance)
SAMP_DATE, String, 20 (date of site visit)
PT_RELIAB, Short, 4 (reliability of point coordinates. Valid values 1,2,3,4. Value 1 – One foot or less, Value 2 – Three feet or less, Value 3 – Ten feet or less, Value 4 – 40 feet or less)

References

Christy, J. A. 2004. *Native Freshwater Wetland Plant communities of Northwestern Oregon.* Oregon Natural Heritage Information Center, Oregon State University: Corvallis, Oregon.

Cooke, S. S. 1997. *A Field Guide to the Common Wetland Plants of Western Washington and Northwestern Oregon*. Seattle Audubon Society: Seattle, Washington.

Elliot F.A. 1914. State Forestry Board map produced in 1914 by F.A. Elliot, State Forester. The original map was compiled by Theodore Rowland. The original map is presently archived at the OSU map library. Dave Stere, The Oregon Department of Forestry, had the map traced onto vellum overlays and then digitized by the State Service Center for GIS in August of 1993.

Hickman, J.C. editor. 1993. *The Jepson Manual: Higher Plants of California*. Univ. of California Press, Berkeley, CA. 1400 p.

Hitchcock, C. L., and A. Cronquist. 1991. *Flora of the Pacific Northwest: An Illustrated Manual.* University of Washington Press: Seattle, Washington. 730 p.

Kagan, J. S., J. A. Christy, M. P. Murray, J. A. Titus. 2004. *Classification of Native Vegetation of Oregon*. Oregon Natural Heritage Information Center, Oregon State University: Corvallis, Oregon.

Landsat MSS and TM satellite images ranging in date from 1972 to 2001. USGS, Souix Falls, ID.

McCain, C. 2004. Riparian Plant Communities of Northwest Oregon: Streamside Plant Communities. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Technical Paper R6-NR-ECOL-TP-10-04.

McCain, C., and J.A. Christy. 2005. *Field Guide to Riparian Plant Communities in Northwestern Oregon*. Technical Paper R6-NR-ECOL-TP-01-05. USDA Forest Service, Pacific Northwest Region, Portland, Oregon. 357 pp. + CD

Oregon Natural Heritage Information Center. 2007. Oregon rare, threatened, and endangered plants spatial database. Oregon Natural Heritage Information Center, Oregon State University, Portland, Oregon

Oregon Natural Heritage Information Center. 2007. *Rare, Threatened and Endangered Species of Oregon*. Oregon Natural Heritage Information Center, Oregon State University, Portland, Oregon. 100 pp.

Pojar, J. and A. MacKinnon. 1994. *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia and Alaska*. Lone Pine Publishing: British Columbia, Washington, and Alberta. 527 p.

Tobalske, C., (OR Natural heritage Program), 2002 Oregon Historic Vegetation vector digital data. http://www.oregon.gov/DAS/IRMD/GEO/sdlibrary.shtml

Washington State Department of Natural Resources. 1999. *Field Guide to Selected Rare Vascular Plants of Washington.* Washington Natural Heritage Program.

Washington State Department of Natural Resources. 2008. Rare Plants and Ecological Communities Information Available from the Washington Natural Heritage Program. Available online at http://www.dnr.wa.gov/nhp/refdesk/plants.html

Whitson, T. D., L. C. Burrill, S. A. Dewey, D. W. Cudney, B. E. Nelson, R. D. Lee, and R. Parker. 1992. *Weeds of the West*. The Western Society of Weed Science: Newark, California.

Appendix A – Vascular Plant List for Bonnie Lure State Park

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
1	ABGR	Abies grandis (Dougl. ex D. Don) Lindl.	grand fir	Pinaceae		
2	ACCI	Acer circinatum Pursh	vine maple	Aceraceae		
3	ACMA3	Acer macrophyllum Pursh	bigleaf maple	Aceraceae		
4	ACMI2	Achillea millefolium L.	common yarrow	Asteraceae		
5	ACTR	Achlys triphylla (Sm.) DC.	sweet after death	Berberidaceae		
6	ADBI	Adenocaulon bicolor Hook.	American trailplant	Asteraceae		
7	ADAL	Adiantum aleuticum (Rupr.) Paris	Aleutian maidenhair	Pteridaceae		
8	AGCA5	Agrostis capillaris L.	colonial bentgrass	Poaceae	Yes	
9	AGGI2	Agrostis gigantea Roth	redtop	Poaceae	Yes	
10	AGSC5	Agrostis scabra Willd.	rough bentgrass	Poaceae		
11	AICA	Aira caryophyllea L.	silver hairgrass	Poaceae	Yes	
12	ALRU2	Alnus rubra Bong.	red alder	Betulaceae		
13	AMAL2	Amelanchier alnifolia (Nutt.) Nutt. ex M. Roemer	Saskatoon serviceberry	Rosaceae		
14	ANMA	Anaphalis margaritacea (L.) Benth.	western pearly everlasting	Asteraceae		
15	ANDE3	Anemone deltoidea Hook.	Columbian windflower	Ranunculaceae		
16	ANOD	Anthoxanthum odoratum L.	sweet vernalgrass	Poaceae	Yes	
17	ARMI2	Arctium minus Bernh.	lesser burdock	Asteraceae	Yes	
18	ARDO3	Artemisia douglasiana Bess. ex Hook.	Douglas' sagewort	Asteraceae		
19	ATFI	Athyrium filix-femina (L.) Roth	common ladyfern	Dryopteridaceae		
20	BIFR	Bidens frondosa L.	devil's beggartick	Asteraceae		
21	BRSY	Brachypodium sylvaticum (Huds.) Beauv	false brome	Poaceae	Yes	B
22	BRPA3	Bromus pacificus Shear	Pacific brome	Poaceae		
23	BRVU	Bromus vulgaris (Hook.) Shear	Columbia brome	Poaceae		
24	CAST	Callitriche stagnalis Scop.	pond water-starwort	Callitrichaceae	Yes	
25	CASE13	Calystegia sepium (L.) R. Br.	hedge false bindweed	Convolvulaceae	Yes	
26	CABU2	Capsella bursa-pastoris (L.) Medik.	shepherd's purse	Brassicaceae	Yes	
27	CAOL	Cardamine oligosperma Nutt.	little western bittercress	Brassicaceae		
28	CAHE7	Carex hendersonii Bailey	Henderson's sedge	Cyperaceae		
29	CALE24	Carex leptopoda Mackenzie	taperfruit shortscale sedge	Cyperaceae		
30	CAOB3	Carex obnupta Bailey	slough sedge	Cyperaceae		
31	CAST5	Carex stipata Muhl. ex Willd.	owlfruit sedge	Cyperaceae		
32	CHAM	Chenopodium ambrosioides L.	Mexican tea	Chenopodiaceae	Yes	
33	COST19	Corallorhiza striata Lindl.	hooded coralroot	Orchidaceae		
34	CIIN	Cichorium intybus L.	chicory	Asteraceae	Yes	
35	CIAL	Circaea alpina L.	small enchanter's nightshade	Onagraceae		
36	CIAR4	Cirsium arvense (L.) Scop.	Canada thistle	Asteraceae	Yes	B
37	CIVU	Cirsium vulgare (Savi) Ten.	bull thistle	Asteraceae	Yes	B
38	CLSI2	Claytonia sibirica L.	Siberian springbeauty	Portulacaceae		
39	CLVI6	Clematis vitalba L.	evergreen clematis	Ranunculaceae	Yes	B
40	CLDO2	Clinopodium douglasii (Benth.) Kuntze	yerba buena	Lamiaceae		
41	COHE2	Collomia heterophylla Dougl. ex Hook.	variableleaf collomia	Polemoniaceae		
42	COBO	Conyza *bonariensis* (L.) Cronq.	asthmaweed	Asteraceae	Yes	

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
43	CONU4	Cornus nuttallii Audubon ex Torr. & Gray	Pacific dogwood	Cornaceae		
44	COSE16	Cornus sericea L.	redosier dogwood	Cornaceae		
45	COSC4	Corydalis scouleri Hook.	Scouler's fumewort	Fumariaceae		
46	COCO6	Corylus cornuta Marsh.	beaked hazelnut	Betulaceae		
47	CRSU16	Crataegus suksdorfii (Sarg.) Kruschke	Suksdorf's hawthorn	Rosaceae		
48	CRCA3	Crepis capillaris (L.) Wallr.	smooth hawksbeard	Asteraceae	Yes	
49	CRSE2	Crepis setosa Haller f.	bristly hawksbeard	Asteraceae	Yes	
50	CYSC4	Cytisus scoparius (L.) Link	Scotch broom	Fabaceae	Yes	B
51	DAGL	Dactylis glomerata L.	orchardgrass	Poaceae	Yes	
52	DACA6	Daucus carota L.	Queen Anne's lace	Apiaceae	Yes	
53	DIFO	Dicentra formosa (Haw.) Walp.	Pacific bleeding heart	Fumariaceae		
54	DIPU	Digitalis purpurea L.	purple foxglove	Scrophulariaceae	Yes	
55	DISA	Digitaria sanguinalis (L.) Scop.	hairy crabgrass	Poaceae		
56	DIFU2	Dipsacus fullonum L.	Fuller's teasel	Dipsacaceae	Yes	
57	ECCR	Echinochloa crus-galli (L.) Beauv.	barnyardgrass	Poaceae	Yes	
58	ELGL	Elymus glaucus Buckl.	blue wildrye	Poaceae		
59	ELRE4	Elymus repens (L.) Gould	quackgrass	Poaceae	Yes	B
60	EPCI	Epilobium ciliatum Raf.	fringed willowherb	Onagraceae		
61	EQAR	Equisetum arvense L.	field horsetail	Equisetaceae		
62	EQHY	Equisetum hyemale L.	scouringrush horsetail	Equisetaceae		
63	EQTE	Equisetum telmateia Ehrh.	giant horsetail	Equisetaceae		B
64	FESU	Festuca subulata Trin.	bearded fescue	Poaceae		
65	FRVE	Fragaria vesca L.	woodland strawberry	Rosaceae		
66	FRPU7	Frangula purshiana (DC.) Cooper	Cascara buckthorn	Rhamnaceae		
67	FRLA	Fraxinus latifolia Benth.	Oregon ash	Oleaceae		
68	GAAP2	Galium aparine L.	stickywilly	Rubiaceae		
69	GASH	Gaultheria shallon Pursh	salal	Ericaceae		
70	GADI2	Gayophytum diffusum Torr. & Gray	spreading groundsmoke	Onagraceae		
71	GERO	Geranium robertianum L.	Robert geranium	Geraniaceae	Yes	
72	GEMA4	Geum macrophyllum Willd.	largeleaf avens	Rosaceae		
73	GICA5	Gilia capitata Sims	bluehead gilia	Polemoniaceae		
74	GLHE2	Glechoma hederacea L.	ground ivy	Lamiaceae	Yes	
75	GLST	Glyceria striata (Lam.) A.S. Hitchc.	fowl mannagrass	Poaceae		
76	GNPA	Gnaphalium palustre Nutt.	western marsh cudweed	Asteraceae		
77	GNUL	Gnaphalium uliginosum L.	marsh cudweed	Asteraceae		
78	HEHE	Hedera helix L.	English ivy	Araliaceae	Yes	B
79	HEMA80	Heracleum maximum Bartr.	common cowparsnip	Apiaceae		
80	HIAL2	Hieracium albiflorum Hook.	white hawkweed	Asteraceae		
81	HOLA	Holcus lanatus L.	common velvetgrass	Poaceae	Yes	
82	HODI	Holodiscus discolor (Pursh) Maxim.	oceanspray	Rosaceae		
83	HYTE	Hydrophyllum tenuipes Heller	Pacific waterleaf	Hydrophyllaceae		
84	HYPE	Hypericum perforatum L.	common St. Johnswort	Clusiaceae	Yes	B
85	HYRA3	Hypochaeris radicata L.	hairy catsear	Asteraceae	Yes	
86	ILAQ80	Ilex aquifolium L.	English holly	Aquifoliaceae	Yes	
87	IMCA	Impatiens capensis Meerb.	jewelweed	Balsaminaceae		
88	JUBU	Juncus bufonius L.	toad rush	Juncaceae		

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
89	JUEF	Juncus effusus L.	common rush	Juncaceae		
90	JUTE	Juncus tenuis Willd.	poverty rush	Juncaceae		
91	LASE	Lactuca serriola L.	prickly lettuce	Asteraceae	Yes	
92	LACO3	Lapsana communis L.	common nipplewort	Asteraceae	Yes	
93	LANE3	Lathyrus nevadensis S. Wats.	Sierra pea	Fabaceae		
94	LETAT	Leontodon taraxacoides (Vill.) Mérat ssp. taraxacoides	lesser hawkbit	Asteraceae	Yes	
95	LEVI3	Lepidium virginicum L.	Virginia pepperweed	Brassicaceae		
96	LEVU	Leucanthemum vulgare Lam.	oxeye daisy	Asteraceae	Yes	
97	LIVU2	Linaria vulgaris P. Mill.	butter and eggs	Scrophulariaceae	Yes	B
98	LIBO3	Linnaea borealis L.	twinflower	Caprifoliaceae		
99	LOAR5	Logfia arvensis (L.) Holub	field cottonrose	Asteraceae	Yes	
100	LOCI3	Lonicera ciliosa (Pursh) Poir. ex DC.	orange honeysuckle	Caprifoliaceae		
101	LOCO6	Lotus corniculatus L.	bird's-foot trefoil	Fabaceae	Yes	
102	LUPA	Ludwigia palustris (L.) Ell.	marsh seedbox	Onagraceae		
103	LUMU2	Luzula multiflora (Ehrh.) Lej.	common woodrush	Juncaceae		
104	LUPA4	Luzula parviflora (Ehrh.) Desv.	smallflowered woodrush	Juncaceae		
105	LYCO	Lychnis coronaria (L.) Desr.	rose campion	Caryophyllaceae	Yes	
106	LYAM	Lycopus americanus Muhl. ex W. Bart.	American water horehound	Lamiaceae		
107	LYAM3	Lysichiton americanus Hultén & St. John	American skunkcabbage	Araceae		
108	LYNU	Lysimachia nummularia L.	creeping jenny	Primulaceae	Yes	
109	MASA	Madia sativa Molina	coast tarweed	Asteraceae		
110	MAAQ2	Mahonia aquifolium (Pursh) Nutt.	hollyleaved barberry	Berberidaceae		
111	MANE2	Mahonia nervosa (Pursh) Nutt.	Cascade barberry	Berberidaceae		
112	MARA7	Maianthemum racemosum (L.) Link	feathery false lily of the valley	Liliaceae		
113	MAST4	Maianthemum stellatum (L.) Link	starry false lily of the valley	Liliaceae		
114	MAPU	Malus pumila P. Mill.	paradise apple	Rosaceae	Yes	
115	MAOR3	Marah oreganus (Torr. ex S. Wats.) T.J. Howell	coastal manroot	Cucurbitaceae		
116	MADI6	Matricaria discoidea DC.	disc mayweed	Asteraceae	Yes	
117	MARE6	Matricaria recutita L.	German chamomile	Asteraceae	Yes	
118	MELU	Medicago lupulina L.	black medick	Fabaceae	Yes	
119	MIGU	Mimulus guttatus DC.	seep monkeyflower	Scrophulariaceae		
120	MOMA3	Moehringia macrophylla (Hook.) Fenzl	largeleaf sandwort	Caryophyllaceae		
121	MUME2	Muhlenbergia mexicana (L.) Trin.	Mexican muhly	Poaceae		
122	MYMU	Mycelis muralis (L.) Dumort.	wall-lettuce	Asteraceae	Yes	
123	MYLA	Myosotis laxa Lehm.	bay forget-me-not	Boraginaceae		
124	NEPA	Nemophila parviflora Dougl. ex Benth.	smallflower nemophila	Hydrophyllaceae		
125	OECE	Oemleria cerasiformis (Torr. & Gray ex Hook. & Arn.) Landon	Indian plum	Rosaceae		
126	OESA	Oenanthe sarmentosa K. Presl ex DC.	water parsely	Apiaceae		
127	OSBE	Osmorhiza berteroi DC.	sweetcicely	Apiaceae		
128	OXSU	Oxalis suksdorfii Trel.	Suksdorf woodsorrel	Oxalidaceae		
129	PESE5	Penstemon serrulatus Menzies ex Sm.	serrulate penstemon	Scrophulariaceae		
130	PEFR5	Petasites frigidus (L.) Fries	arctic sweet coltsfoot	Asteraceae		
131	PHNE2	Phacelia nemoralis Greene	shade phacelia	Hydrophyllaceae		
132	PHAR3	Phalaris arundinacea L.	reed canarygrass	Poaceae	Yes	

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
133	PHLE4	Philadelphus lewisii Pursh	Lewis' mock orange	Hydrangeaceae		
134	PHPR3	Phleum pratense L.	timothy	Poaceae	Yes	
135	PHCA11	Physocarpus capitatus (Pursh) Kuntze	Pacific ninebark	Rosaceae		
136	PLLA	Plantago lanceolata L.	narrowleaf plantain	Plantaginaceae	Yes	
137	PLMA2	Plantago major L.	common plantain	Plantaginaceae	Yes	
138	POPR	Poa pratensis L.	Kentucky bluegrass	Poaceae	Yes	
139	POAV	Polygonum aviculare L.	prostrate knotweed	Polygonaceae	Yes	
140	POPE3	Polygonum persicaria L.	spotted ladysthumb	Polygonaceae	Yes	
141	POGL8	Polypodium glycyrrhiza D.C. Eat.	licorice fern	Polypodiaceae		
142	POMU	Polystichum munitum (Kaulfuss) K. Presl	western swordfern	Dryopteridaceae		
143	POBAT	Populus balsamifera L. ssp. trichocarpa (Torr. & Gray ex Hook.) Brayshaw	black cottonwood	Salicaceae		
144	PRHOO	Prosartes hookeri Torr. var. oregana (S. Wats.) Kartesz	Oregon drops of gold	Liliaceae		
145	PRVU	Prunella vulgaris L.	common selfheal	Lamiaceae	Yes	
146	PRAV	Prunus avium (L.) L.	sweet cherry	Rosaceae	Yes	
147	PRLA5	Prunus laurocerasus L.	cherry laurel	Rosaceae	Yes	
148	PSME	Pseudotsuga menziesii (Mirbel) Franco	Douglas-fir	Pinaceae		
149	PTAQ	Pteridium aquilinum (L.) Kuhn	western brackenfern	Dennstaedtiaceae		
150	QUGA4	Quercus garryana Dougl. ex Hook.	Oregon white oak	Fagaceae		
151	RARE3	Ranunculus repens L.	creeping buttercup	Ranunculaceae	Yes	
152	RASA	Ranunculus sardous Crantz	hairy buttercup	Ranunculaceae	Yes	
153	ROCU	Rorippa curvisiliqua (Hook.) Bess. ex Britt.	curvepod yellowcress	Brassicaceae		
154	ROGY	Rosa gymnocarpa Nutt.	dwarf rose	Rosaceae		
155	RONU	Rosa nutkana K. Presl	Nootka rose	Rosaceae		
156	RUAR9	Rubus armeniacus Focke	Himalayan blackberry	Rosaceae	Yes	B
157	RULE	Rubus leucodermis Dougl. ex Torr. & Gray	whitebark raspberry	Rosaceae		
158	RUPA	Rubus parviflorus Nutt.	thimbleberry	Rosaceae		
159	RUSP	Rubus spectabilis Pursh	salmonberry	Rosaceae		
160	RUUR	Rubus ursinus Cham. & Schlecht.	California blackberry	Rosaceae		
161	RUCR	Rumex crispus L.	curly dock	Polygonaceae	Yes	
162	RUSA	Rumex salicifolius Weinm.	willow dock	Polygonaceae		
163	SAEX	Salix exigua Nutt.	narrowleaf willow	Salicaceae		
164	SALU	Salix lucida Muhl.	shining willow	Salicaceae		
165	SASI2	Salix sitchensis Sanson ex Bong.	Sitka willow	Salicaceae		
166	SARA2	Sambucus racemosa L.	red elderberry	Caprifoliaceae		
167	SCPH	Schedonorus phoenix (Scop.) Holub	tall fescue	Poaceae	Yes	
168	SCMI2	Scirpus microcarpus J.& K. Presl	panicled bulrush	Cyperaceae		
169	SEJA	Senecio jacobaea L.	stinking willie	Asteraceae	Yes	B
170	SEVU	Senecio vulgaris L.	old-man-in-the-Spring	Asteraceae	Yes	
171	SIVU	Silene vulgaris (Moench) Garcke	maidenstears	Caryophyllaceae	Yes	
172	SYRE	Synthyris reniformis (Dougl. ex Benth.) Benth.	snowqueen	Scrophulariaceae		
173	SODU	Solanum dulcamara L.	climbing nightshade	Solanaceae	Yes	
174	SOCA6	Solidago canadensis L.	Canada goldenrod	Asteraceae		
175	SOAR2	Sonchus arvensis L.	field sowthistle	Asteraceae	Yes	
176	SOAS	Sonchus asper (L.) Hill	spiny sowthistle	Asteraceae	Yes	

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
177	STCHC3	Stachys chamissonis Benth. var. cooleyae (Heller) G. Mulligan & D. Munro	coastal hedgenettle	Lamiaceae		
178	SYAL	Symphoricarpos albus (L.) Blake	common snowberry	Caprifoliaceae		
179	TAOF	Taraxacum officinale G.H. Weber ex Wiggers	common dandelion	Asteraceae	Yes	
180	TABR2	Taxus brevifolia Nutt.	Pacific yew	Taxaceae		
181	TEGR2	Tellima grandiflora (Pursh) Dougl. ex Lindl.	bigflower tellima	Saxifragaceae		
182	THOC	Thalictrum occidentale Gray	western meadow-rue	Ranunculaceae		
183	THPL	Thuja plicata Donn ex D. Don	western red cedar	Cupressaceae		
184	TOME	Tolmiea menziesii (Pursh) Torr. & Gray	youth on age	Saxifragaceae		
185	TOAR	Torilis arvensis (Huds.) Link	spreading hedgeparsley	Apiaceae	Yes	
186	TODI	Toxicodendron diversilobum (Torr. & Gray) Greene	Pacific poison oak	Anacardiaceae		
187	TRBOL	Trientalis borealis Raf. ssp. latifolia (Hook.) Hultén	broadleaf starflower	Primulaceae		
188	TRMI4	Trifolium microcephalum Pursh	smallhead clover	Fabaceae		
189	TRRE3	Trifolium repens L.	white clover	Fabaceae	Yes	
190	TROV2	Trillium ovatum Pursh	Pacific trillium	Liliaceae		
191	TSHE	Tsuga heterophylla (Raf.) Sarg.	western hemlock	Pinaceae		
192	URDI	Urtica dioica L.	stinging nettle	Urticaceae		
193	VAPA	Vaccinium parvifolium Sm.	red huckleberry	Ericaceae		
194	VAHE	Vancouveria hexandra (Hook.) Morr. & Dcne.	white insideout flower	Berberidaceae		
195	VEBL	Verbascum blattaria L.	moth mullein	Scrophulariaceae	Yes	
196	VETH	Verbascum thapsus L.	common mullein	Scrophulariaceae	Yes	
197	VEAM2	Veronica americana Schwein. ex Benth.	American speedwell	Scrophulariaceae		
198	VESE	Veronica serpyllifolia L. ssp. serpyllifolia	thymeleaf speedwell	Scrophulariaceae	Yes	
199	VISA	Vicia sativa L.	garden vetch	Fabaceae	Yes	
200	VIGL	Viola glabella Nutt.	pioneer violet	Violaceae		

Appendix B – Definitions of Vegetation Community Ranks

The following table defines the ranking system for plants and plant communities used by ONHIC (Kagan et al. 2004).

Code	Definition
G1	Critically imperiled throughout its range; extremely rare with five or fewer occurrences or very few remaining acres.
G2	Imperiled throughout its range; rare with six to 20 occurrences or few remaining acres.
G3	Either very rare and local throughout its range or found locally in a restricted range; uncommon with 21 to 100 occurrences.
G4	Apparently secure throughout its range, though it may be quite rare in some parts of its range, especially at the periphery; many occurrences.
G5	Demonstrably secure in its range, though it may be quite rare in some parts of its range, especially at the periphery; ineradicable under present conditions.
S1	Critically imperiled in Oregon; extremely rare with five or fewer occurrences or very few remaining acres.
S2	Imperiled in Oregon; rare with six to 20 occurrences or few remaining acres.
S3	Either very rare and local in Oregon or found locally in a restricted range; uncommon with 21 to 100 occurrences.
S4	Apparently secure in Oregon, though it may be quite rare in some parts; many occurrences.
S5	Demonstrably secure in Oregon, though it may be quite rare in some parts; ineradicable under present conditions.
U	Unknown
NA	Natural Heritage Rank not available
NR	Not Ranked

Appendix C – Work Scope Tasks and Criteria

Data Review

The Consultant shall review pertinent literature and other existing information as a basis for completing other tasks in this work scope. Pertinent literature will include, but is not limited to, the following sources:

1. The criteria sections of this work scope.

2. Existing published plant associations as a reference for identifying, delineating, naming, and describing the plant communities in the study area.

3. OPRD methodology for coding plant association and land cover polygons on presentation maps.

4. ONHIC (Oregon Natural Heritage Information Center) data on existing and historic vegetation in the study area.

5. National Wetland Inventory and/or Local Wetland Inventory mapping and any other available references that will assist in identifying and mapping wetlands in the study area.

6. ODA (Oregon Department of Agriculture) data and other available information on invasive exotic plant species within, or in the vicinity of, the study area that will assist in identifying and mapping exotic plants of particular concern.

7. ONHIC data and any other available information on at-risk plant species, including listed or candidate state or federal protected species, and/or species otherwise listed as rare by ONHIC. This shall include a review of the Natural Heritage Database for any known occurrences or historic sightings of rare species within, or in the vicinity of, the study area.

Aerial Photo Interpretation

The Consultant shall:

1. Review air photos and property boundary data provided by OPRD as a preliminary step in identifying and delineating plant association types and conditions.

2. Use the air photos provided by OPRD as base maps for the development of spatial data required by this work scope.

Field Mapping

The Consultant shall:

1. Make arrangements for access to the study area by coordinating with the appropriate park manager (see contacts section above).

2. Except in areas where OPRD has indicated that ground-truthing is not necessary, conduct site visits to each plant association polygon for the purposes described below :

    a. To verify and refine preliminary mapping and descriptions of plant association polygons;

b. To add map polygons for communities, which are not differentiable using aerial photography
alone.

c. To assess and document the characteristics of each plant association polygon using the criteria in this work scope;

d. To map at-risk plant species occurrences identified through data review or otherwise encountered during site visits to plant association polygons, and to map habitats that would likely support at-risk species (actual species occurrences shall be mapped using GPS technology, to the extent feasible);

e. To map wetlands identified through data review or aerial photo interpretation or otherwise encountered during site visits to plant association polygons (no formal determinations or delineations required);

f. To map invasive exotic plant species of particular concern identified through data review or otherwise encountered during site visits to plant association polygons.

If OPRD has not indicated any areas that do not need ground-truthing, the Consultant shall assume that ground truthing is necessary everywhere.

Note:
For mapping of wetlands, at-risk plant species, and invasive species of particular concern, the Consultant is not expected to search the ground for all such features that have not been identified through data review or air photo interpretation. Rather, the purpose is to map, as accurately as is feasible, such features that are encountered during site visits to plant association polygons, as well as those identified through data review or air photo interpretation.

The Consultant's draft findings may identify a need for more intensive survey for wetlands and at-risk plant species in specific areas where they are likely to occur and where they could be threatened by park uses. If such a situation arises, any additional work necessary may be negotiated and addressed in the form of a contract modification/amendment, at OPRD's discretion.

Criteria for Mapping and Characterizing Plant Communities, Conditions, and Other Land Cover Features

The Consultant shall:

1. Digitally map plant associations and their conditions in the study area using polygon coding and other mapping criteria developed by OPRD, discussed below. Mapping shall include native and non-native plant communities and other land cover features.

a) Plant communities shall be named and described according to their current and existing vegetation. Published classifications and associations shall only be used to name a community when the published description accurately describes the current species composition of the community – not the eventual or climax community. The standard naming conventions used by ONHIC and NatureServe shall be followed in creating a new plant association code. When plant communities are clearly very close to published associations, these similarities shall be noted for determination of conservation ranking (see 2.h., below). When

naming communities according to published plant associations, preference shall be given to use of the ONHIC names listed in "Classification of Native Vegetation of Oregon" (Kagan et al 2004). When a plant association is mapped as an early to mid-successional community, it may be appropriate to describe basic community origin and future trajectory in the text description for that community in the written report or in the comments field in the GIS tabular data. This might include indication of the likely climax association, when appropriate and feasible.

b) Upland plant association types as small as two acres shall be mapped as discrete polygons. Upland plant association types smaller than two acres shall be mapped at the discretion of the Consultant in cases where illustration as discrete polygons is important to the purpose of this work scope. Otherwise, these may be treated as inclusions in larger polygons and described as such in the written report. In cases where a habitat is made up of a complex mosaic of small (less than 2 acre), closely-related or inextricable communities, it may be necessary to name a plant community group - describing the component communities within the discussion of the larger group in the written report. Each park to be assessed under this work scope shall contain 10-25 distinct plant community-mapping types, or fewer. There may be more distinct plant communities than this identifiable on the ground, but for the purposes of master planning the communities will be aggregated for map and planning clarity. At the Consultant's discretion, more detail can be mapped as long as tabular data allows for aggregation into the coarser level needed for master planning. Following this later course of action might require the addition of an extra field to the tabular data.

c) All wetland plant communities and other surface water features that are identified through data review, aerial photo interpretation, or that are encountered during site visits (see note under "Field Mapping"), shall be mapped regardless of their size to the extent that such features can reasonably be illustrated separately from surrounding polygons. Use of GPS technology may be preferable in areas where the locations and/or boundaries of water features and wetlands are not evident in the aerial photography (especially in forested wetland situations).

2. Develop GIS data with attributes that characterize the native plant association polygons, and other land cover polygons, using the following fields as appropriate for each polygon:

a) OPRD mapping code for each plant association and land cover polygon (see section below "OPRD Mapping Codes").

b) Scientific name for each native plant association, using ONHIC / NatureServe classification format. No more than 3 species shall be used per canopy layer, unless there is a compelling reason for doing so. The reasons for citing more than 3 species per layer shall be detailed in the description of that community in the written report, and perhaps in the comments field of the GIS tabular data.

For example: Abies procera / Oxalis oregana

c) Common name for each native plant association, non-native plant community, or other land cover classification.

For example: noble fir / redwood sorrel

d) ONHIC / NatureServe acronym for each native plant association

For example: ABIPRO / OXAORE

e) Equivalent published association acronym, if applicable or discernable. Preference shall be given to ONHIC names.

In the example given above, this would be the same as the code assigned for item d: ABIPRO / OXAORE

f) NVCS (National Vegetation Classification System) alliance, following NVCS protocols

For example: Abies procera forest alliance

g) Habitat type for each native plant association, using the following land cover types (from the NVCS "Class"):

i. **Forest:** Trees with their crowns overlapping (generally forming 60-100% cover).
ii. **Woodland:** Open stands of trees with crowns not usually touching (generally forming 25-60% cover). Canopy tree cover may be less than 25% in cases where it exceeds shrub, dwarfshrub, herb, and nonvascular cover, respectively.
iii. **Shrubland:** Shrubs generally greater than 0.5 m tall with individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees generally less than 25% cover). Shrub cover may be less than 25% where it exceeds tree, dwarf-shrub, herb, and nonvascular cover, respectively. Vegetation dominated by woody vines is generally treated in this class.
iv. **Dwarf shrubland:** Low-growing shrubs usually under 0.5 m tall. Individuals or clumps overlapping to not touching (generally forming more than 25% cover, trees and tall shrubs generally less than 25% cover). Dwarfshrub cover may be less than 25% where it exceeds tree, shrub, herb, and nonvascular cover, respectively
v. **Herbaceous:** Herbs (graminoids, forbs, and ferns) dominant (generally forming at least 25% cover; trees, shrubs, and dwarf-shrubs generally with less than 25% cover). Herb cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and nonvascular cover, respectively.
vi. **Nonvascular:** Nonvascular cover (bryophytes, non-crustose lichens, and algae) dominant (generally forming at least 25% cover). Nonvascular cover may be less than 25% where it exceeds tree, shrub, dwarf-shrub, and herb cover, respectively.
vii. **Sparse vegetation:** Abiotic substrate features dominant. Vegetation is scattered to nearly absent and generally restricted to areas of concentrated resources (total vegetation cover is typically less than 25% and greater than 0%). Types within the Nonvascular and Sparse Vegetation Classes have not been well developed. Sparse Vegetation types are primarily based on substrate features, rather than vegetation. As more information is gathered, these types shall be increasingly defined by their vegetation characteristics.
viii. **Disturbed** *(not in NVCS classes)***:** sites with heavily impacted vegetation, resulting in significant bare ground or nearly complete dominance of early seral invasive species. Examples of this cover type include quarries, gravel piles, stockpiles, slash/debris piles, wide road shoulders/pullouts, cutbanks, and fill slopes, etc.
ix. **Developed** *(not in NVCS classes)***:** landscaped areas dominated by non-native vegetation or other built environments, including structures and infrastructure. Examples include lawns, gardens, buildings, parking lots, campgrounds, and picnic areas.

x. **Agriculture** *(not in NVCS classes)*: farmed fields, pastures, and recently abandoned farming ground that still retains an agricultural character.

h) Age class for each forest or woodland polygon: A = old (or if appropriate, the model expression of the NVCS plant community – as in the case of disturbance-adapted environments such as certain savannas, floodplains, etc), B = mature, C = mid-aged, D = young. See "OPRD Mapping Codes", subsection 4, below.

i) Global and State Ranks representing conservation status of each native association, based on ONHIC ranking criteria – e.g. "G3S2". In cases where plant communities have been aggregated into a larger polygon due to inextricable community mixtures or the presence of small inclusions, the highest conservation rank of any of the component communities shall be assigned to the composite polygon. Where no recorded conservation rank is available for a community, the contractor shall use best professional judgment to assign an approximate state rank. This code shall be preceded by the character "~". Where a plant community is similar but not identical to an ONHIC-listed association, that ranking can be used – but this code should also be preceded by "~".

For example, consider the following communities found in a park:

1. ABIPRO/OXAORE
2. ABIPRO/UVWXYZ
3. ABIPRO/OXAORE-UVWXYZ

The first community, ABIPRO/OXAORE, is ranked by ONHIC as G1S1. It would be recorded as such in the tabular data.

The second community, ABIPRO/UVWXYZ is unranked. Assume best professional judgment indicates that the community is somewhat rare, but not immediately imperiled. This would result in coding the community as "~S3".

The third community, ABIPRO/OXAORE-UVWXYZ is very similar to but not identical to that which received the ranking. In this case the ranking could be recorded as "~G1S1".

j) OPRD condition rating representing the condition of each plant association (using condition rating criteria below): e = excellent condition, g = good condition, m = marginal condition, p = poor condition (see "Criteria for Ranking...", below)

k) Percent cover of exotic species. Do not use relative covers.

For example, consider a Douglas-fir forest with an extremely dense understory of English ivy and false brome. The forest canopy might provide 70% cover, while the ivy and false brome covers 80% of the ground beneath the canopy. In this case, the percent cover of exotic species (English ivy and false brome) would be reported as 80%, not 53% (80/150).

l) Wetland polygon indicator, representing wetland plant association types and other surface water features (yes/no/maybe/partially field). Use "partially" only if a polygon is an unmappable mosaic of wetland and upland community types; otherwise probable wetlands (as indicated by their plant communities) are to be mapped regardless of size.

m) Plant community development suitability rating. See "Criteria for Assigning Plant Community Suitability Ratings", below.

n) Field for other comments that are pertinent to the purpose of this work scope.

Criteria for Ranking Plant Community Condition

1. The condition of each plant association delineated as a discrete polygon shall be rated using the codes below, which shall represent the following conditions:

Condition "e" (excellent): Pristine or near pristine native plant community. Exotic plants typically have a significant presence in the species composition over less than 10 percent of the polygon. These communities will have little or no evidence of trampling, disturbance, or human management. Late seral second growth forest stands may still potentially be in excellent condition. Forested stands that are recovering from logging within the last 30-50 years will generally be in marginal to good condition because of rutting, compaction, invasive species, or other human impact.

Condition "g" (good): Native plant community generally of good vigor and condition. Exotic plants typically have a significant presence in the species composition over 10 to 30 percent of the polygon. Natural or Human-caused damage may be evident.

Condition "m" (marginal): Native plant community substantially degraded by intrusion of exotic plants or disturbance. Exotic plants typically have a significant presence in the species composition over 30 to 70 percent of the polygon. Or, the native plant community is substantially and unnaturally lacking in plant diversity (such as in dense, single species and age, early to mid- successional forest, or plantation forest, etc.). Factors that degrade the community may include sources such as wind-throw, fire, logging, brush removal, vandalism, trampling, flood, disease, and landslides.

Condition "p" (poor): Native plant community highly degraded or replaced by exotic plants. Exotic plants typically have a significant presence in the species composition over more than 70 percent of the polygon. Factors that degrade the community may include sources such as wind-throw, fire, logging, brush removal, vandalism, trampling, flood, disease, and landslides.

Note:
Discretion must be used in rating the plant association conditions. The estimated percentage of polygon area where exotic plants appear to be significant should not be the deciding factor in isolation from other factors. In assessing how "significant" the exotic species presence is, the degree of threat from the exotic species to the dominant native species, as well as to the native species diversity, should be considered. The Consultant shall rate the plant association conditions in consultation with OPRD, and describe the rationale supporting the condition ratings for each plant association polygon in the written report.

2. Polygons that represent predominantly unvegetated areas (e.g., deep water, recently graded areas, paved or hard-scaped areas, buildings, etc.) shall not be ranked.

OPRD Mapping Codes

Plant community polygons shall be identified using OPRD's traditional mapping codes. These codes are assigned based on the concatenation of various site features:

1. **Land cover type prefix.**
    a. **"F"= forest**
    b. **"S"= shrub**

c. **"H"= herbaceous**
d. **"N"= non-vegetated**
e. **"V"= developed**
f. **"D"= disturbed.**
g. **"A"= agriculture**

2. **Sequential number of the community within the land cover type. There will likely be duplicates – i.e. more than one instance of a particular community in the study area.**

3. **Condition class, details above in "Criteria for Ranking Conditions of Plant Associations".**

4. **Age class (for forested communities only).**
   "A"= old. This age class is characteristic of oldgrowth forest, with many trees being over 150 years old. Vegetation is usually close to climax composition.

   "B"= mature. This age class corresponds to an age at which communities of this overstory species typically near climax understory species composition.

   "C"= mid-aged. This age class is still successionally transitional, sharing characteristics of mature and young stands.

   "D"= young. This age class generally still shows significant signs of the disturbance that killed the previous forest stand. Trees are typically small and young. The canopy layer is typically even-aged.

Examples:

1. **The third forested community described in the report might be a 35 year-old Douglas-fir/sword fern stand in poor condition. This would be coded as "F03-p(C)". For the purposes of calibration, a young Douglas fir stand would probably be 0-25 years old and a mature stand would be approximately 60-150 years old.**

2. **A native upland prairie in marginal condition that is the 5th described herbaceous community in the report would be coded as "H05-m"**

Criteria for Assigning Plant Community Suitability Ratings

Plant community suitability ratings shall be used to determine the appropriate locations for development, conservation, or restoration in the park, along with ratings of other factors including known occurrences of sensitive species, habitat, hazards, and cultural resources.

Ratings are numeric and range from 1 to 4, based on the matrices below:

For Non-Forested Habitats

	Special Designation*	Condition E	Condition G	Condition M	Condition P
Special designation*	1	1	1	1	1

Conservation rank S1	1	2	2	2	3
Conservation rank S2	1	2	2	3	3
Conservation rank S3	1	2	2	3	4
Conservation rank NA, S4,or S5	1	3	3	3	4
Developed or agricultural	1	4	4	4	4
(Containing) Definite wetland plant communities	1	2	2	2	2
(Containing) Possible wetland plant communities	1	2 if S1,S2,S3 3 if NA,S4,S5	2 if S1,S2,S3 3 if NA,S4,S5	3	3

For Forested Habitats (including woodlands)

	Special Designation*	**Condition E**	**Condition G**	**Condition M**	**Condition P**
Special designation*	1	1	1	1	1
Conservation rank S1	1	2 if age A,B,C 3 if age D	2 if age A,B,C 3 if age D	2 if age A,B 3 if age C,D	3
Conservation rank S2	1	2 if age A,B,C 3 if age D	2 if age A,B,C 3 if age D	2 if age A,B 3 if age C,D	3
Conservation rank S3	1	2 if age A,B 3 if age C,D	2 if age A,B 3 if age C,D	2 if age A 3 if age B,C,D	4
Conservation rank NA, S4, or S5	1	2 if age A,B 3 if age C,D	2 if age A 3 if age B,C,D	3	4
Developed	1	4	4	4	4
(Containing) Definite wetland plant communities	1	2	2	2	2
(Containing) Possible wetland plant communities	1	2 if S1,S2,S3 3 if NA,S4,S5	2 if S1,S2,S3 3 if NA,S4,S5	3	3

** for the purposes of this matrix, "special designation" means that the polygon is part of a conservation area such as a Natural Heritage Conservation Area, a Research Natural Area, an Area of Critical Environmental Concern, a designated Wilderness, a conservation easement, or a Habitat Conservation Plan.*

Criteria for Mapping At-Risk Plant Species

1. The Consultant shall map known occurrences of at-risk plant species in the study area in an acceptable GIS format (see section below on final mapping products).

    a. Mapping of at-risk species shall include both occurrences identified in research of existing information, and any new occurrences found during site visits. (See note under "Field Mapping.")

    b. All at-risk plant species occurrences identified in the study area shall be mapped, regardless of the size of the site. For the purposes of this assessment, at-risk is defined as all species that are either

1. Species that are currently listed, proposed for listing, or candidates for listing as endangered or threatened under the federal or state Endangered Species Acts.

2. Federal (US Fish and Wildlife) species of concern.

3. Species that are not in either of the preceding categories, but which are listed by ONHIC (lists 1-4).

    c. In cases where sites of identified at-risk species are not readily and accurately mappable using aerial photography, use of GPS technology or informal surveying may be necessary to assure accurate site location information. Informal surveying may be done with a compass and string box (or other system of measurement of distance) from photo-identifiable points, or sites may be mapped using triangulation. If a string box is used, the string shall be removed from the site after the measurements are completed.

2. The Consultant shall digitally map areas that provide potential habitat for federally and/or state listed or candidate plant species

    a. All areas where state or federally listed or candidate plant species have potential to occur shall be mapped, regardless of polygon size.

    b. Areas providing habitat for other at-risk species such as those listed by ONHIC (but not by the state or federal ESAs) may be mapped at the discretion of the Consultant.

Criteria for Mapping Invasive Exotic Plant Species of Particular Concern

The Consultant shall digitally map invasive exotic plant species of particular concern that are identified within, or in the immediate vicinity of, the study area.

1. For the purposes of this project, OPRD considers all ODA "A" and "T" list species, as well as all "B"list species ***<u>except</u>*** the following to be of particular concern:

    a. Scotch broom — *Cytisus scoparius*
    b. St. John's wort — *Hypericum perforatum*
    c. Himalayan blackberry — *Rubus discolor/ armeniacus/ procerus*
    d. Evergreen blackberry — *Rubus laciniatus*
    e. Canada thistle — *Cirsium arvense*
    f. Bull thistle — *Cirsium vulgare*
    g. Tansy ragwort — *Senecio jacobea*

    The excluded B-list species are widespread and firmly established in western Oregon. Their mapping is required only if they form large enough populations to be mapped as distinct plant communities, or if the populations are isolated enough to be significant (because, for example, they are manageable in size and/or are of high treatment priority from an ecological viewpoint). Determination of significant isolation shall be based on the Consultant's best professional judgment.

2. The mapping shall include all identified occurrences of exotic plants of particular concern, regardless of the size of the occurrence.

3. Mapping of exotic plants of concern shall include occurrences identified from review of available existing data as well as occurrences located during site visits. (See note under "Field Mapping.")

4. In cases where sites of identified exotic plants of concern are not readily and accurately mappable using aerial photography, the use of GPS technology or informal surveying may be necessary to assure accurate site location information. Informal surveying may be done with a compass and string box (or other system of measurement of distance) from photo-identifiable points, or sites may be mapped using triangulation. If a string box is used, the string shall be removed from the site after the measurements are completed.