Vegetation Inventory and Mapping of Molalla River State Park

Pacific Biodiversity Institute

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Table of Contents

Executive Summary

Molalla River State Park is a 567 acre park comprised mostly of old agricultural lands and riparian gallery forests and active floodplain communities.

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. Compared to pre-European conditions, the park has lost much of its upland native forested habitat, although, much of the native riparian hardwood forests remain in place. Based on an analysis of an old black and white aerial photograph of the park, it is evident that the native riparian hardwood forests, associated shrublands and the herbaceous wetland habitats occurring in the floodplain have been constantly disturbed and rearranged due to flooding and primary channel meandering. Intensive logging and agricultural development and more recent residential and infrastructure development have directly and indirectly impacted many of the historic vegetation communities in the park.

Current vegetation patterns reflect the history of human-caused and natural disturbances. While native riparian gallery forests still remain intact through much of the park's floodplain areas, extreme infestations of exotic plants, introduced through agriculture and development inside and outside the park, dominate under the forest canopy. Weeds such as reed canarygrass, Himalayan blackberry, and Japanese knotweed have taken advantage of the flooding cycle and human disturbances to create impenetrable weed thickets in what were once beautiful riparian forests and shrublands. Much of the upland areas of the park faired no better during the settlement era when they were converted to agricultural use. Later, recreational infrastructure and transmission line corridors impacted the park landscape. All these disturbances have given exotic plants major advantages over native species. Fortunately, a few significant areas of good condition upland and riparian forest do remain within the park.

Overall vascular plant diversity is relatively high in the park due to exotic plant presence and the multitude of disturbance habitats weeds have to choose from. 268 plant species were identified during field surveys, with 43% of identified plants being known exotics.

No at-risk plants were encountered in the park. Potential habitat for *Howellia aquatilis*, *Actaea elata* (*Cimicifuga elata*), *Delphinium nuttallii ssp. ochroleucum*, *Lathyrus holochlorus*, and *Utricularia minor* does occur, although the potential habitat areas are marginal.

Opportunities to control exotic and noxious weeds are limited within the park given the overwhelming abundance of existing infestations and the difficulty of accessing much of the park's landscape.

Study Area

Molalla River State Park is a 567 acre park comprised mostly of old agricultural lands and riparian gallery forests. The park's substrate is mostly made up of deep Willamette Silt with river cobble occurring along the main river channel. Seasonal flooding from both the Willamette and Molalla Rivers has major influence on the park's distribution of plant communities. The park is surrounded by agricultural fields, some residential development, and the Willamette River along the northern boundary. A large power line corridor exists within the northwestern and southern section of the park. Figure 1 illustrates the layout of Molalla River State Park.

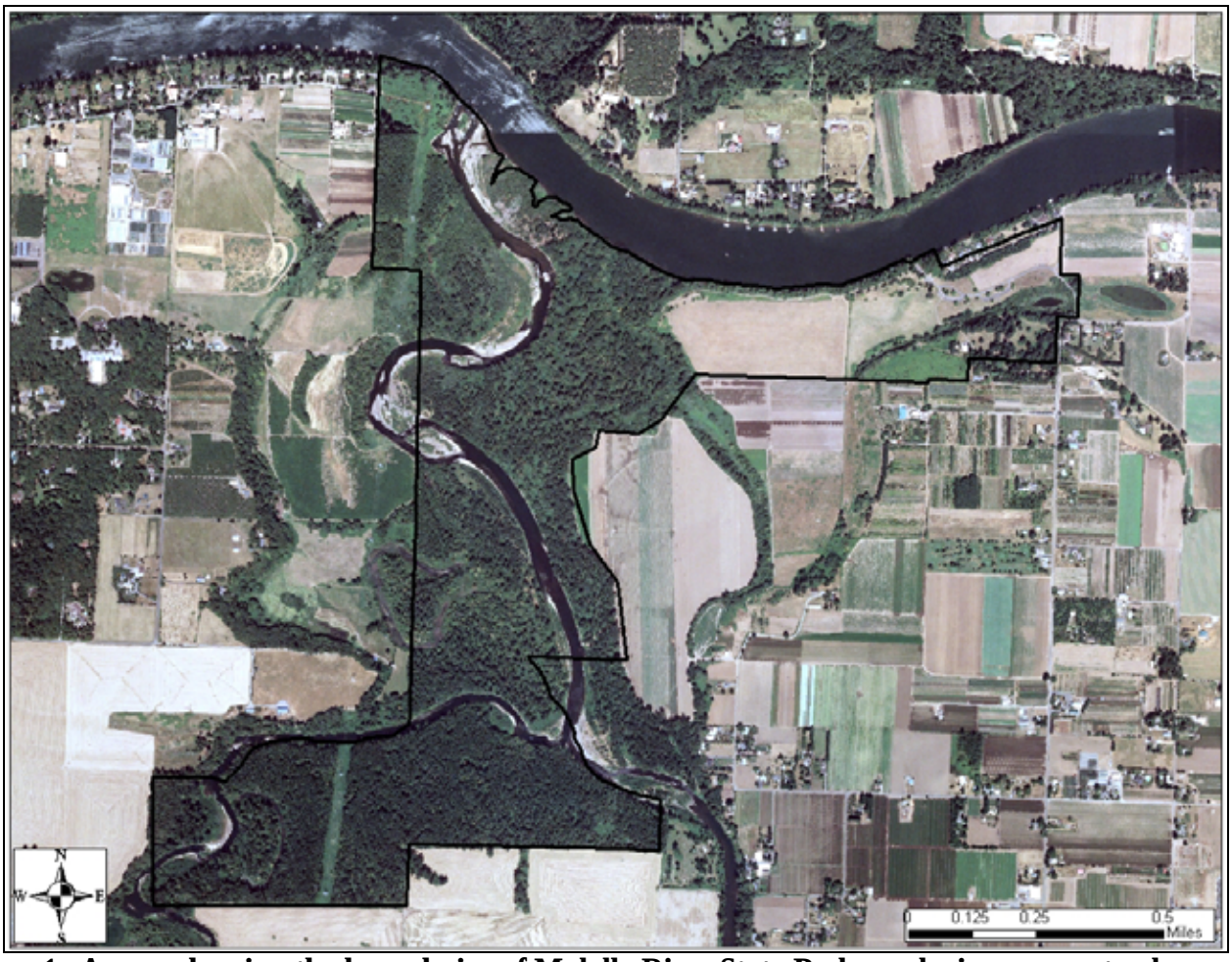

Figure 1. A map showing the boundaries of Molalla River State Park overlaying a recent color aerial photograph.

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 communities 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 topography (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 location to place polygon boundaries so 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).

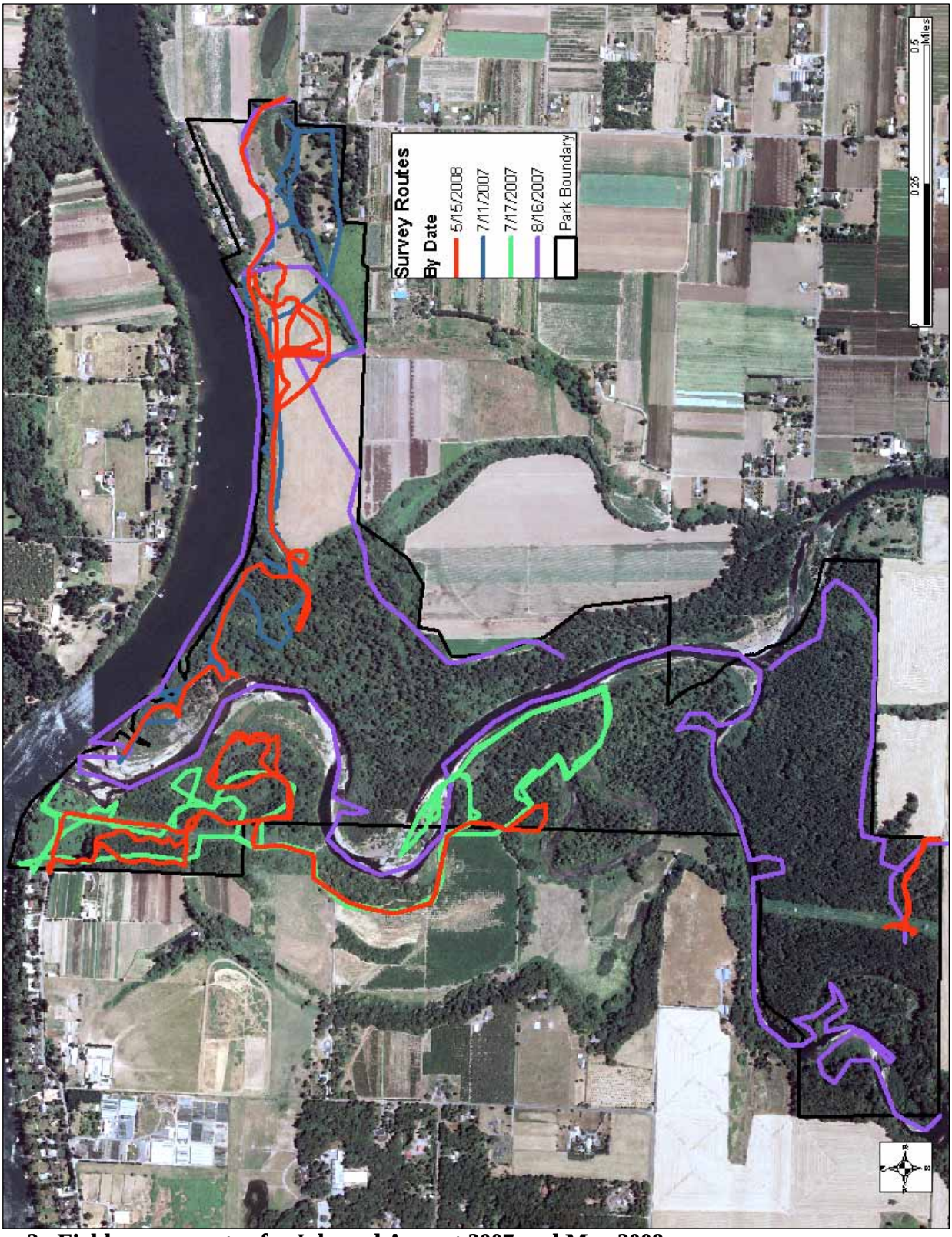

Figure 2. Field survey routes for July and August 2007 and May 2008.

Results

Historical Vegetation Patterns

The vegetation communities in the lower portion of the Molalla River have had a complex history of natural and human influences affecting their distribution and condition. Figure 3 displays a map of suspected pre-European settlement vegetation types in the park and surrounding areas. Many different vegetation and habitat types existed within this limited area, giving testament to the diverse influences of disturbances such as flooding from the Willamette River, the Molalla River, the Pudding River, and burning by aboriginal fire and natural fires. The park has always had a significant riparian wetland component and was probably dominated by deciduous riparian forests with smaller inclusions of herbaceous and shrub-dominated wetlands in substrate depressions left over from river channel migration.

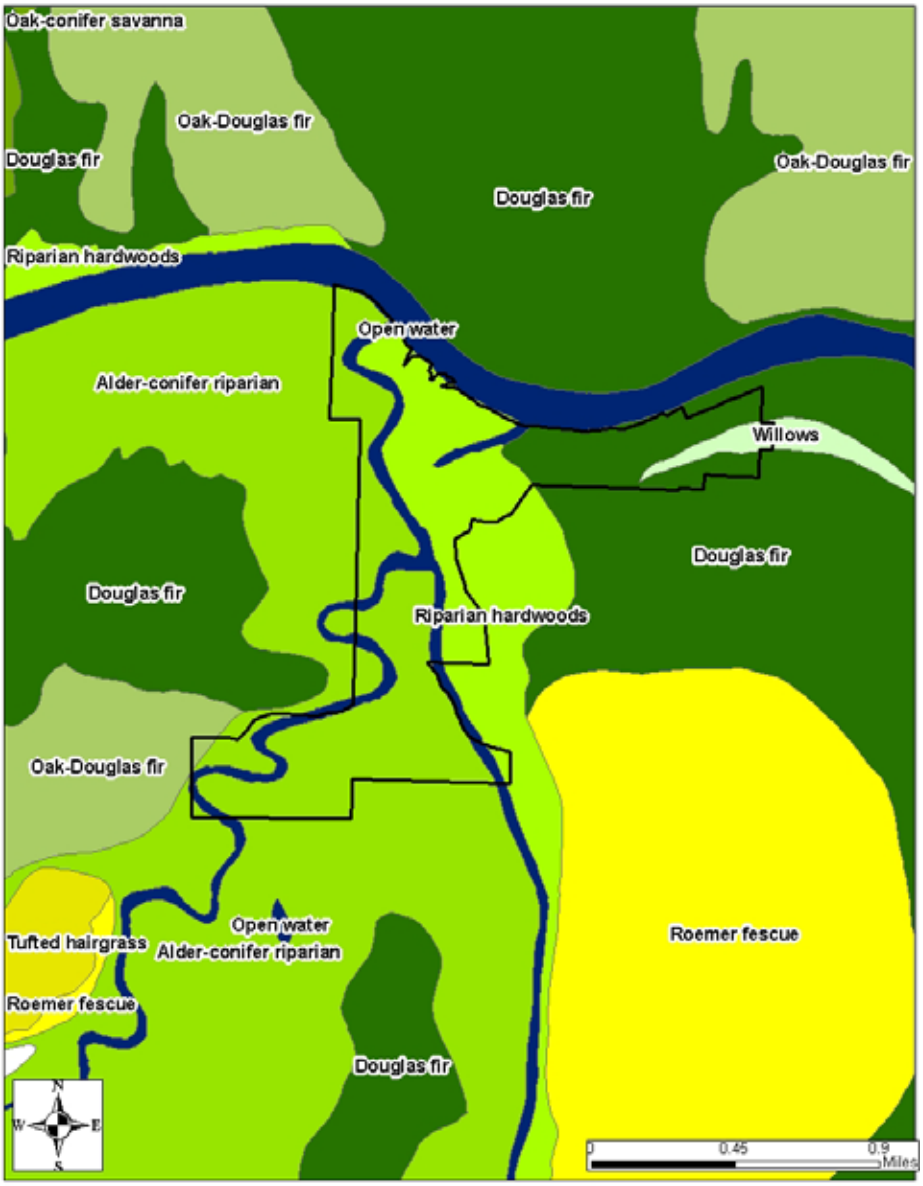

Figure 3. Pre-settlement vegetation in the Molalla River State Park area according to a GIS data layer created by Tobalske, 2002.

Interestingly, the Douglas-fir forests depicted in the map no longer occur due to agricultural development. However, the willow wetlands shown in the northeast portion of the park still exist. Given this map, it is probable that historic vegetation patterns were more diverse than what exists today, and various habitat types associated with conifer forests once existed in the park.

A black-and-white aerial photograph of the park area from 1956 was located in the Canby City Library. In this photo, it is apparent that logging and agricultural development had already impacted much of the surrounding areas of the park, and some limited areas within the park as well. Using GIS, the 1956 courses of the Molalla and Pudding Rivers were digitized and compared to current conditions. Figure 4 exhibits the 1956 photo and the subsequent digitized river courses.

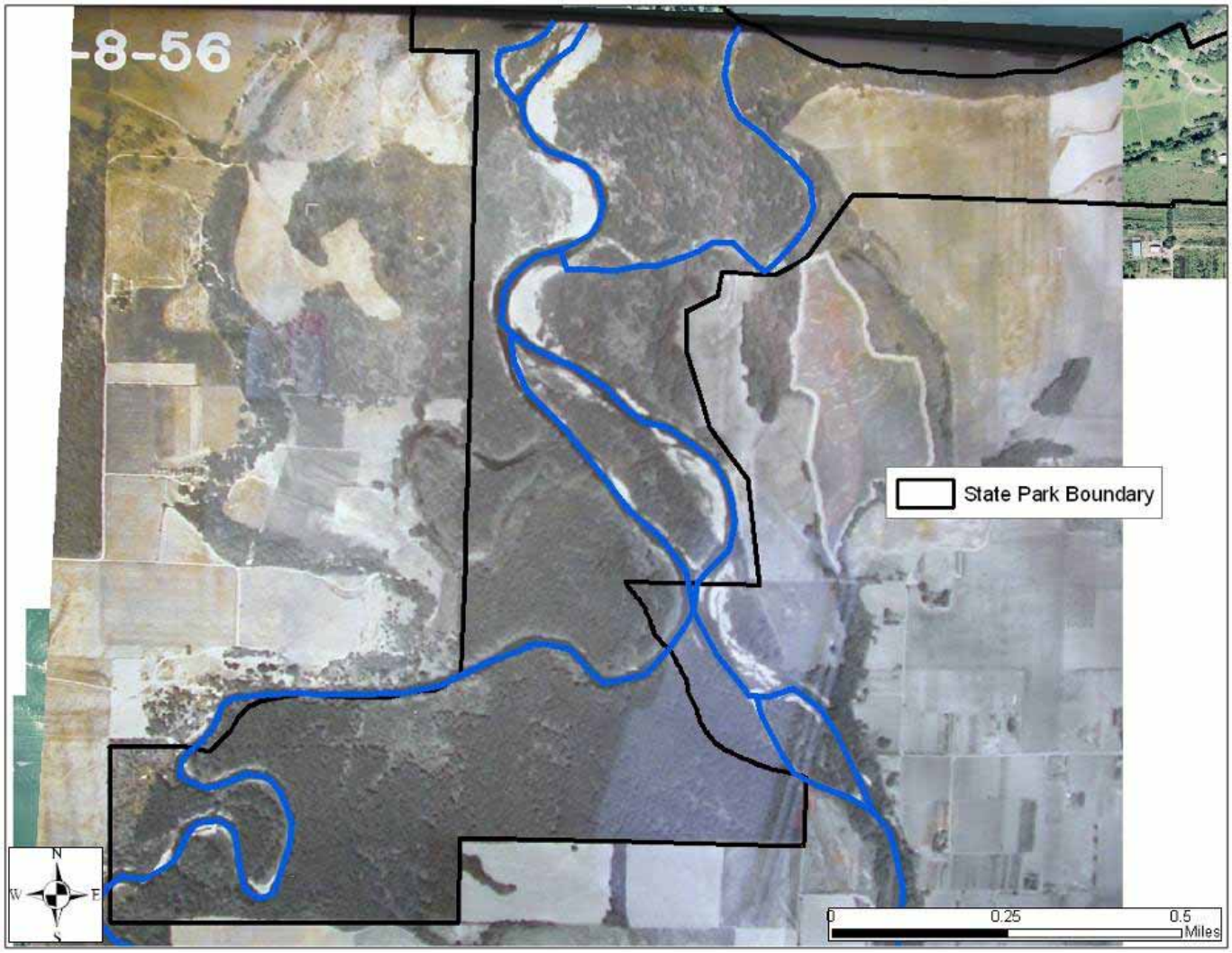

Figure 4. Location of the 1956 main river channels (blue lines) overlaid on a historic 1956 black-and-white aerial photograph.

Comparing the 1956 river courses to recent imagery of the park reveals that the primary channels of these rivers changed greatly over time (Figures 5 - 7). The river channel migration observed in this sequence of photos indicates that at least one large flood occurred during the last 50 years and that low-lying vegetation communities were significantly disturbed by the flood(s).

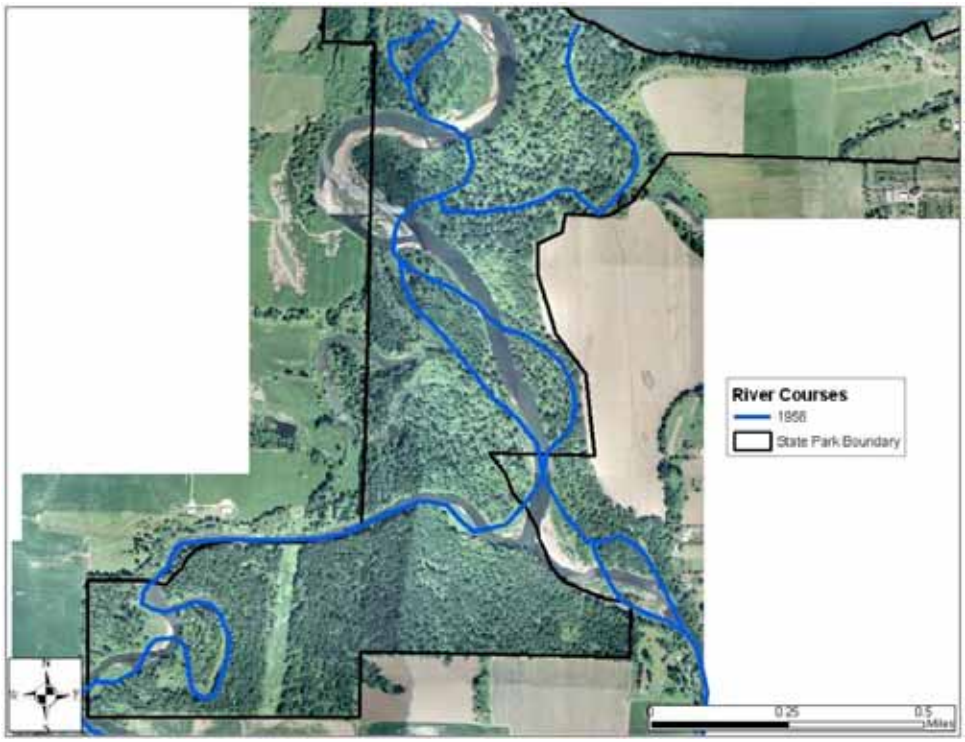

Figure 5. The digitized 1956 river channel GIS layer (blue line) overlaid on a recent high-resolution color aerial photograph of the park.

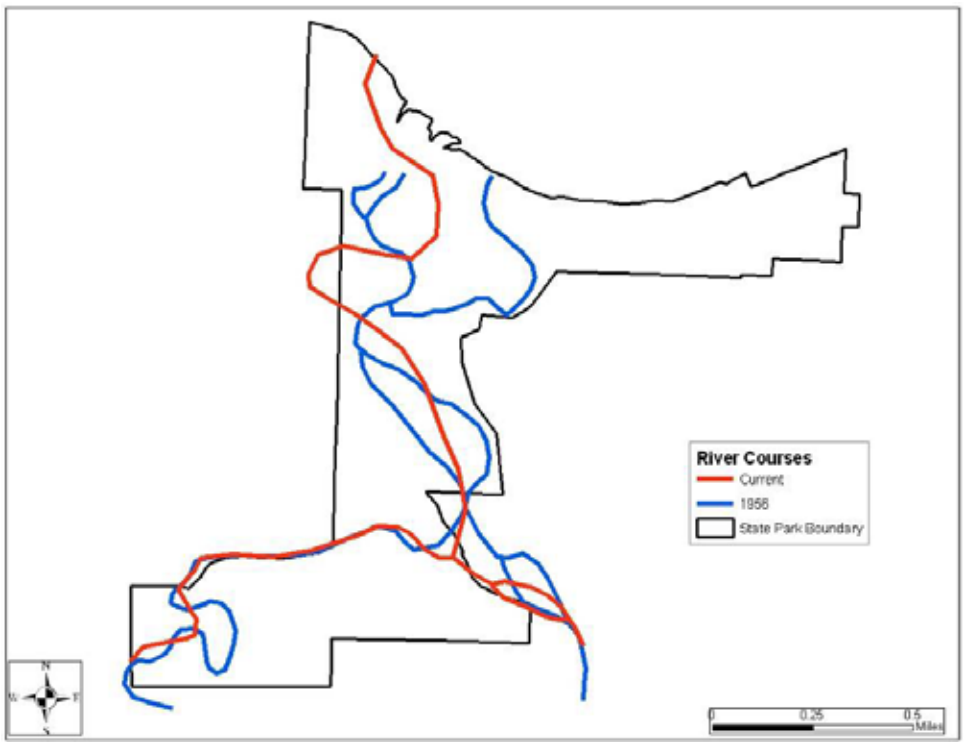

Figure 6. A comparison of the 1956 river channel GIS layer with a digitized version of the current main river channels.

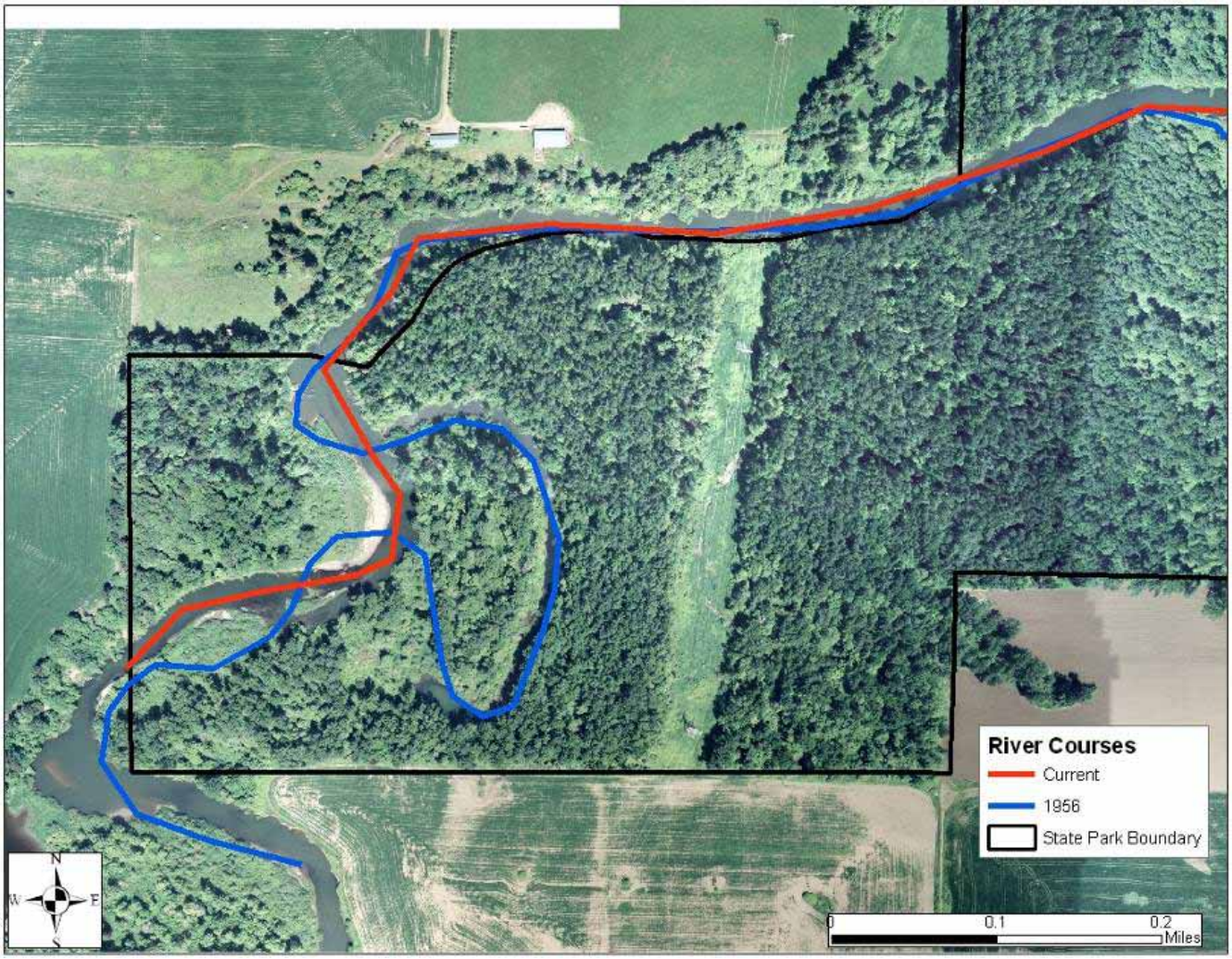

Figure 7. A close up look at the historic river channel layer overlaid a current color aerial photograph of the southwest corner of the park. Note how the 1956 river course fits perfectly within the now abandoned ox-bow apparent in the recent imagery.

Current Vegetation Patterns and Conditions

The historic cycles of flooding and channel migration have greatly influenced the current natural vegetation patterns and conditions within Molalla River State Park. Our analysis of a chronosequence of Landsat satellite images reveals that the river channels have migrated repeatedly and significantly during the period between 1972 and 2001. For the most part, a large portion of the park consists of riparian floodplain forests, shrublands, off channel herbaceous wetlands, and cobble/sand bars. The other significant portion of the park outside of the riparian zone is highly disturbed and developed by human land uses such as an electrical transmission line, agriculture, and recreational areas. Weedy exotics, including noxious weed species, have taken advantage of the high levels of disturbance (both natural and human caused) affecting this park. It is unfortunate that the majority of the park is in marginal to poor ecological condition due to exotic species infestations. However, some native vegetation communities in good ecological condition do exist in the park.

Based on our analysis of aerial photography and subsequent field surveys, 76 vegetation community polygons were mapped and surveyed within the park (Figure 8), and 80 different assortments of dominant vegetation composition were noted in our field data (there can be more than one vegetation community patch within a given polygon).

When looked at through the lens of predicted climax vegetation associations, the seemingly high amounts of vegetation community diversity become significantly reduced. Only 17 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 80 current vegetation descriptions down to 20 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 the 17 plant associations and 20 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 20 existing vegetation classes relate to the 17 published plant association classes.

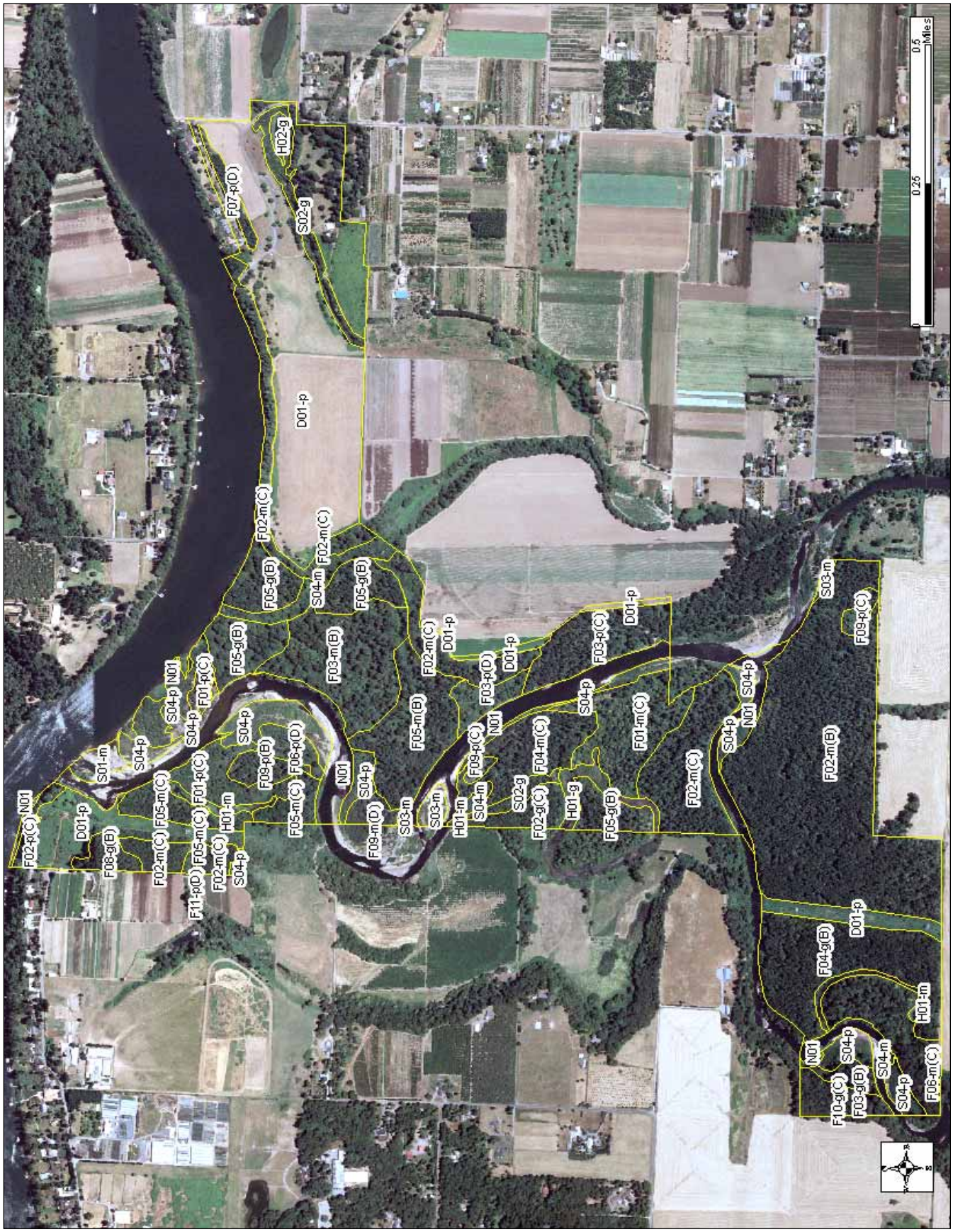

Figure 8. Map depicting the layout of the 76 digitized vegetation community polygons within the park.

Table 1. Table showing how the 20 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	Equivalent	Rank
F01	POPBAL/SALLUC-(CORSER)/PHAARU-URTDIO	POPBAL/CORSER/IMPCAP (McCain/Christy, 2005)	~G2S2
F02	POPBAL-(FRALAT)-ACEMAC/ACECIR-SYMALB-Mixed shrubs/Mixed herbs	SYMALB/URTDIO-(ACEMAC-POPBAL)/CORCOR phase (McCain/Christy, 2005)	~G3S3
F03	POPBAL-(FRALAT)-ACEMAC/CORSER-(RUBSPE)-Mixed shrubs/Mixed herbs-(PHAARU)	Hardwood/RUBSPE/HYDTEN (McCain/Christy, 2005)	~G3S3
F04	POPBAL-FRALAT/ACECIR-SYMALB-Mixed shrubs/Mixed herbs-(PHAARU)	(POPBAL-FRALAT)/RUBSPE-SYMALB (McCain/Christy, 2005)	~G4S4
F05	POPBAL-FRALAT/CORSER-(RUBSPE)-Mixed shrubs/Mixed herbs-(PHAARU)	(POPBAL-FRALAT)/RUBSPE-SYMALB (McCain/Christy, 2005)	~G4S4
F06	POPBAL-FRALAT/SALLUC-Mixed shrubs/PHAARU	POPBAL/CORSER/IMPCAP (McCain/Christy, 2005)	~G2S2
F07	PSEMEN/RUBARM		
F08	PSEMEN-ABIGRA-THUPLI/ACECIR-SAMRAC/POLMUN-URTDIO	ABIGRA-TSUHET/POLMUN (Kagan, 2004)	~G2S2
F09	POPBAL/weedy understory	POPBAL/CORSER/IMPCAP (McCain/Christy, 2005)	~G1S1
F10	ACEMAC-THUPLI/CORCOR-SAMRAC/POLMUN-URTDIO	THUPLI-TSUHET/CORCOR/POLMUN (Kagan, 2004)	~G2S1
F11	FRALAT/(CORSER)/PHAARU-URTDIO	FRALAT/CARLEP-URTDIO (McCain/Christy, 2005)	~G4S4
S01	SALLUC-SALEXI/PHAARU-Mixed herbs	SALLUC/SALxFLU (Kagan, 2004)	~G3S3
S02	CORSER-(SALSIT)/IMPCAP-wetland herbs	CORSER-Salix spp. (Kagan, 2004)	G3S3
S03	(POPBAL)/SALLUCL-SALEXI/PHAARU-Mixed herbs	SALLUC/SALxFLU (Kagan, 2004)	~G3S3
S04	SALLUC-(CORSER)-(SALSIT)/PHAARU	SALLUC/URTDIO (McCain/Christy, 2005)	~G2S2
S05	SPIDOU	SPIDOU (McCain/Christy, 2005)	G5S4
H01	SPAEUR-LUDPAL-POLPER-LEEORY	LUDPAL-POLHYD (McCain/Christy, 2005)	G2S2
H02	NUPLUTP	NUPPOL (McCain/Christy, 2005)	G5S5
H03	LEEORY-ERAHYP-LINDUB	ERAHYP-GNAPAL (McCain/Christy, 2005)	~G2S1
D01	Developed / Disturbed		
N01	water		

Not all of the 20 existing vegetation communities or 17 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 20 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 type.

OPRD Code	Existing Vegetation Community Class	Acres	Polygons	Percent of Area
F01	POPBAL/SALLUCL-(CORSER)/PHAARU-URTDIO	27.63	3	5%
F02	POPBAL-(FRALAT)-ACEMAC/ACECIR-SYMALB-Mixed shrubs/Mixed herbs	140.14	9	25%
F03	POPBAL-(FRALAT)-ACEMAC/CORSER-(RUBSPE)-Mixed shrubs/Mixed herbs-(PHAARU)	45.25	4	8%
F04	POPBAL-FRALAT/ACECIR-SYMALB-Mixed shrubs/Mixed herbs-(PHAARU)	41.9	2	7%
F05	POPBAL-FRALAT/CORSER-(RUBSPE)-Mixed shrubs/Mixed herbs-(PHAARU)	57.19	8	10%
F06	POPBAL-FRALAT/SALLUC-Mixed shrubs/PHAARU	18.21	2	3%
F07	PSEMEN/RUBARM	2.76	1	0%
F08	PSEMEN-ABIGRA-THUPLI/ACECIR-SAMRAC/POLMUN-URTDIO	3.41	1	1%
F09	POPBAL/weedy understory	9.51	4	2%
F10	ACEMAC-THUPLI/CORCOR-SAMRAC/POLMUN-URTDIO	5.64	1	1%
F11	FRALAT/(CORSER)/PHAARU-URTDIO	1.22	2	0%
S01	SALLUCL-SALEXI/PHAARU-Mixed herbs	3.03	1	1%
S02	CORSER-(SALSIT)/IMPCAP-wetland herbs	8.52	2	2%
S03	(POPBAL)/SALLUCL-SALEXI/PHAARU-Mixed herbs	2.89	3	1%
S04	SALLUCL-(CORSER)-(SALSIT)/PHAARU	38.19	14	7%
H01	SPAEUR-LUDPAL-POLPER-LEEORY	8.55	4	2%
H02	NUPLUTP	1.38	1	0%
H03	LEEORY-ERAHYP-LINDUB	0.1	1	0%
N01	water	43.67	7	8%
D01	Developed / Disturbed	107.98	6	19%

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

Equivalent Published Plant Association	Acres	Polygons	Percent of Area
(POPBAL-FRALAT)/RUBSPE-SYMALB (McCain/Christy, 2005)	99.09	10	17%
ABIGRA-TSUHET/POLMUN (Kagan, 2004)	3.41	1	1%
CORSER-Salix spp. (Kagan, 2004)	8.52	2	2%
ERAHYP-GNAPAL (McCain/Christy, 2005)	0.1	1	0%
FRALAT/CARLEP-URTDIO (McCain/Christy, 2005)	1.22	2	0%
Hardwood/RUBSPE/HYDTEN (McCain/Christy, 2005)	45.25	4	8%
LUDPAL-POLHYD (McCain/Christy, 2005)	8.55	4	2%
NUPPOL (McCain/Christy, 2005)	1.38	1	0%
POPBAL/CORSER/IMPCAP (McCain/Christy, 2005)	55.35	9	10%
SALLUCL/SALxFLU (Kagan, 2004)	5.92	4	1%
SALLUCL/URTDIO (McCain/Christy, 2005)	38.19	14	7%
SYMALB/URTDIO-(ACEMAC-POPBAL)/CORCOR phase (McCain/Christy, 2005)	140.14	9	25%
THUPLI-TSUHET/CORCOR/POLMUN (Kagan, 2004)	5.64	1	1%
No published equivalent	154.41	14	27%

From these two tables, it becomes apparent that the POPBAL-(FRALAT)-ACEMAC/ACECIR-SYMALB-Mixed shrubs/Mixed herbs forest community, the SYMALB/URTDIO-(ACEMAC-POPBAL)/CORCOR phase and (POPBAL-FRALAT)/RUBSPE-SYMALB plant associations and developed / disturbed areas are much more abundant across the park's landscape than the other vegetation classes. The data expressed in these tables is spatially expressed in the following maps (Figures 9 – 11).

Figure 9. Map depicting the layout of the matrix existing vegetation community class for each polygon.

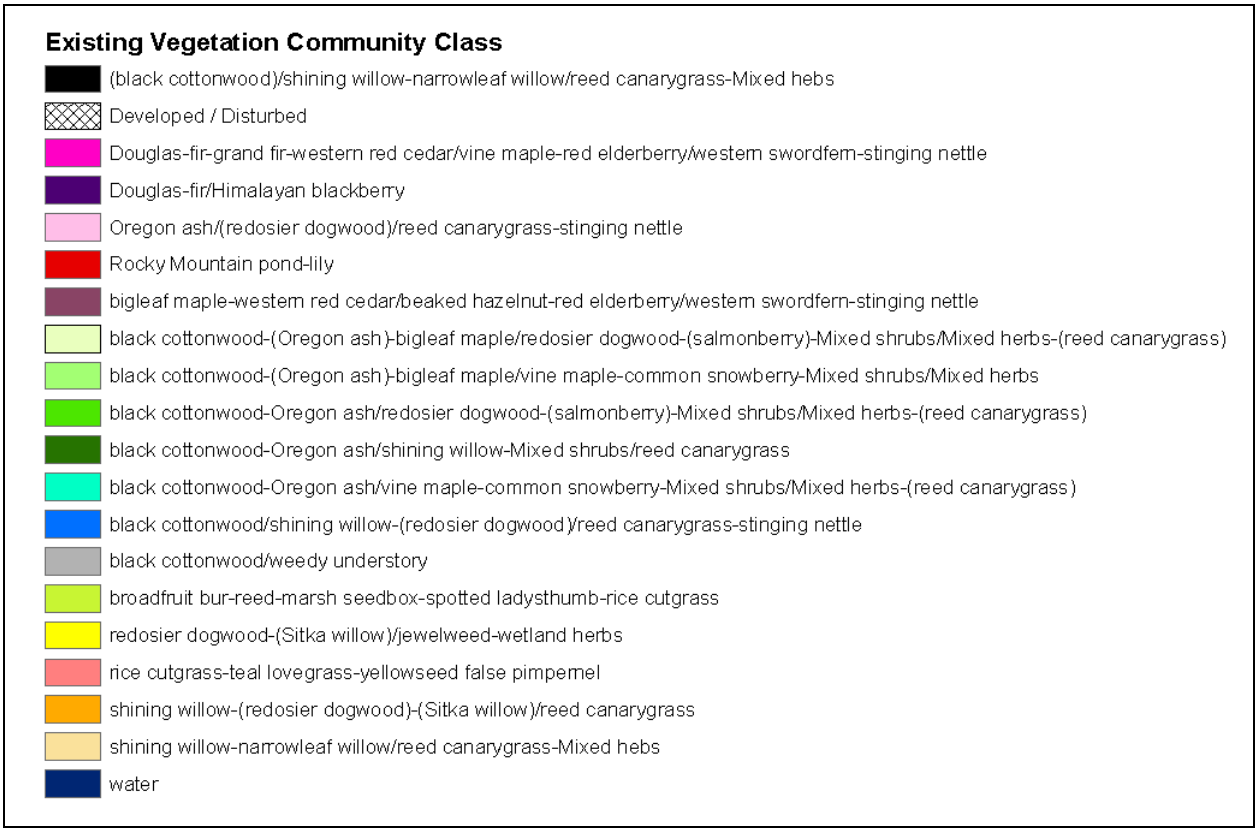

Figure 10. Color coded legend for Figure 9.

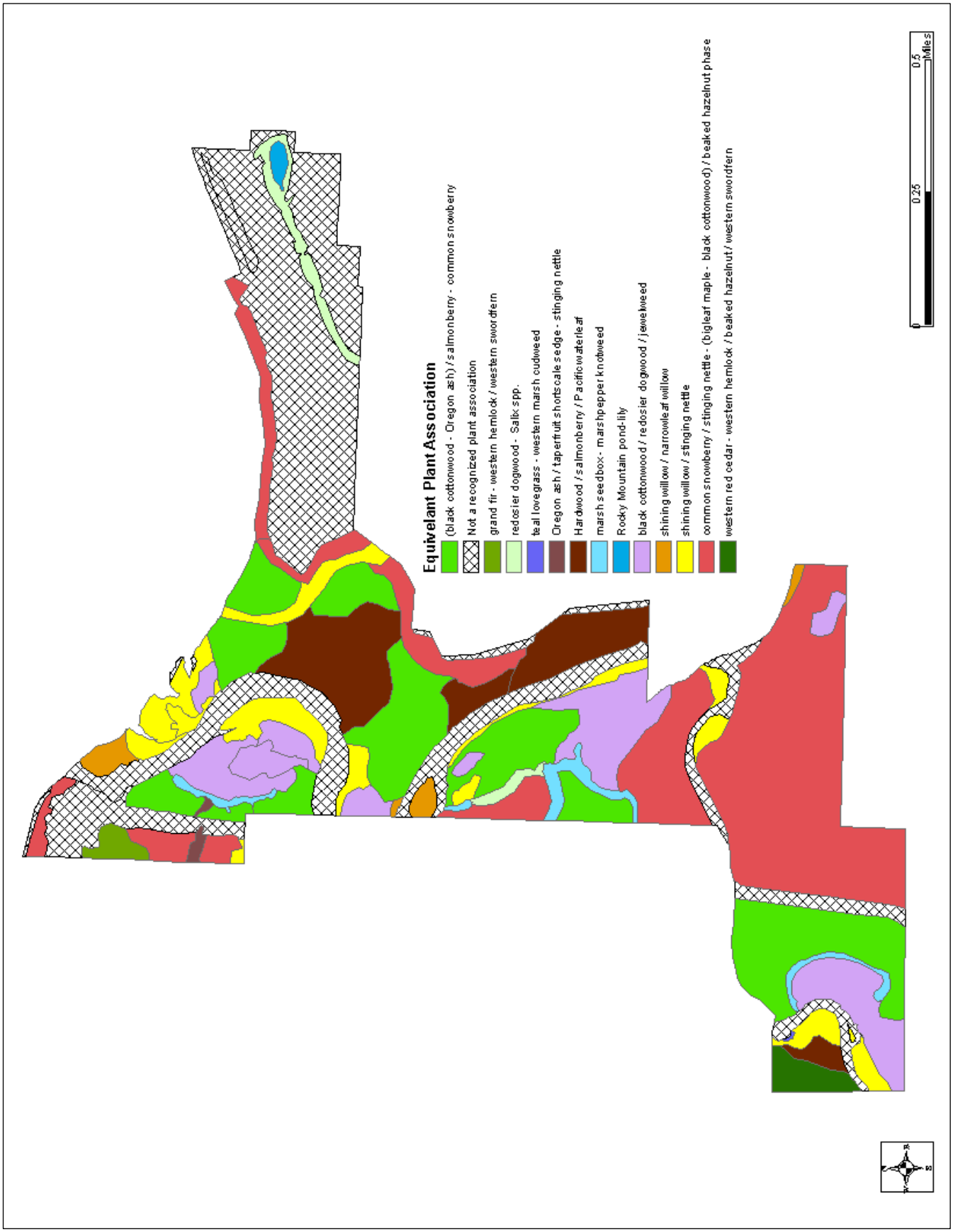

Figure 11. Map depicting layout of the matrix published plant association class for each polygon.

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. The following Table 4 and Figure 12 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).

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

Condition Class	Acres	Polygons	Percent of Area
Good	86.91	14	15%
Marginal	251.7	27	44%
Poor	184.89	28	33%
Water	43.67	7	8%

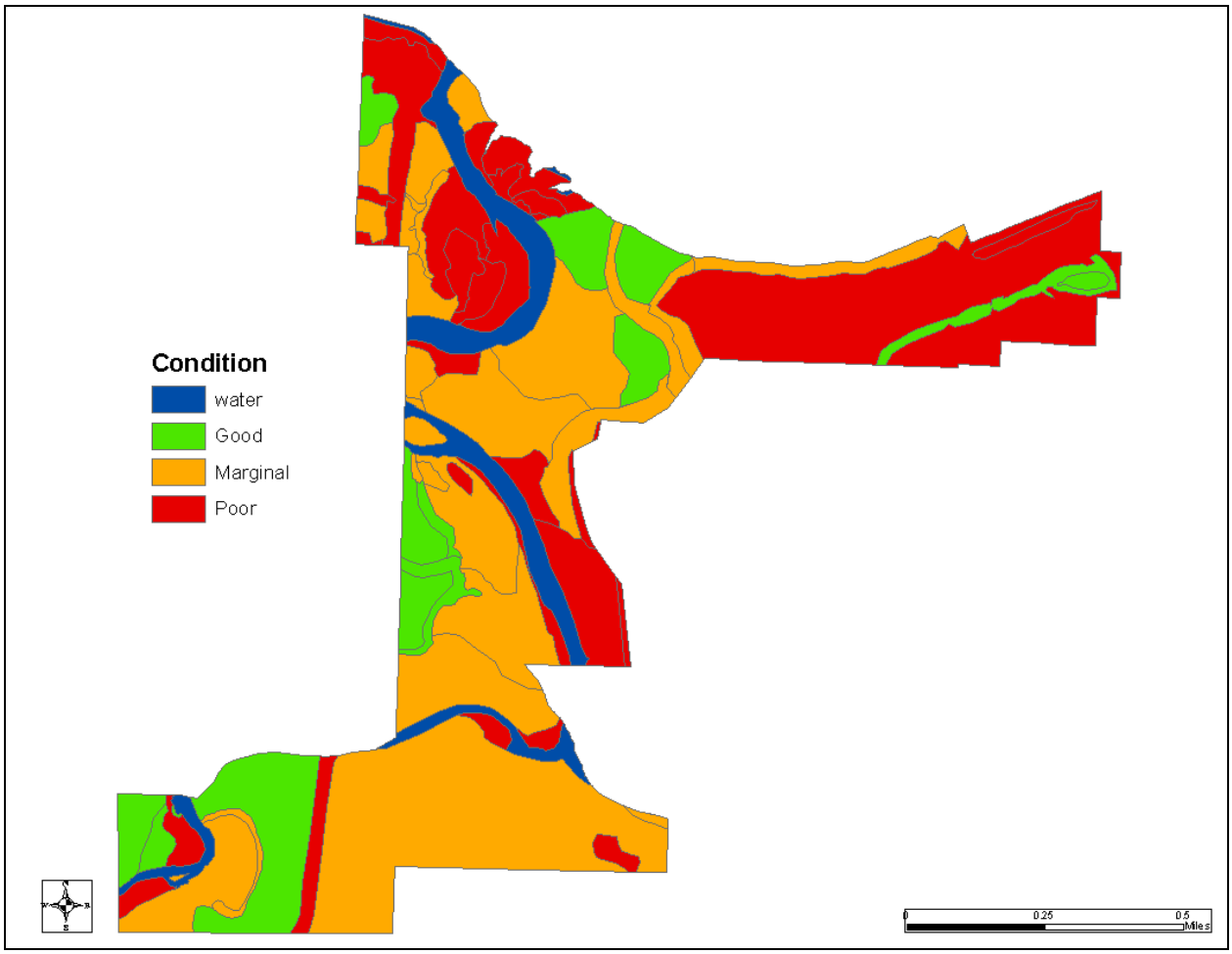

Figure 12. Map illustrating the overall polygon condition rankings.

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 age class 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. The following Table 5 and Figure 13 illustrate the resulting distribution of suitability rankings by polygon.

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

Plant Community Suitability Rank	Acres	Polygons	Percent of Area
2	396.8	59	70%
3	13.43	2	2%
4	113.27	8	20%
water	43.67	7	8%

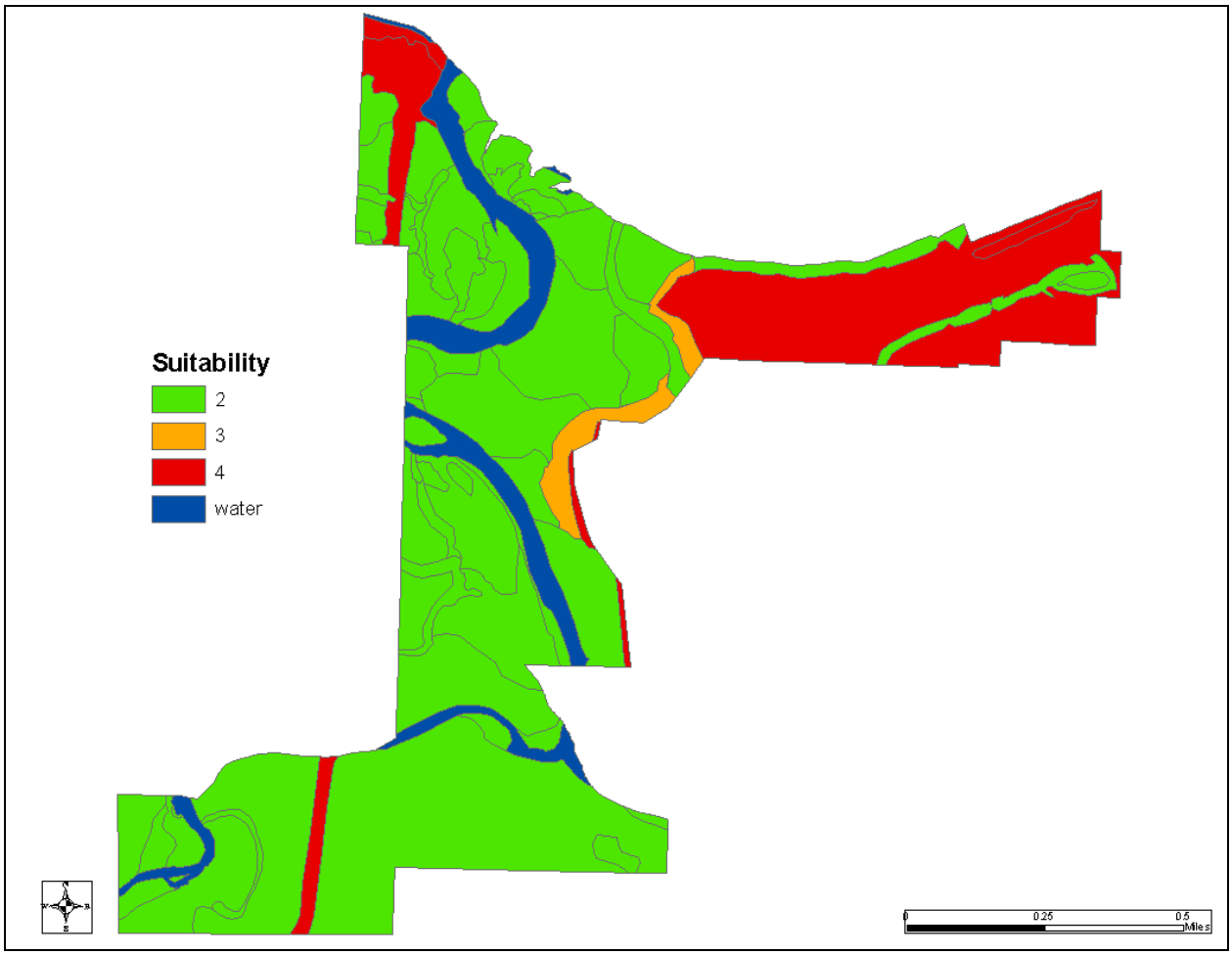

Figure 13. Map of the resulting plant community suitability ranks for each polygon.

The high percentage of suitability rank two reflects that most of the park is in the riparian zone of influence and is considered wholly or partially wetland. The disturbed / developed areas make up the 20% of the park's area in suitability rank four.

Figure 14 illustrates the layout of polygons containing wetlands within the park.

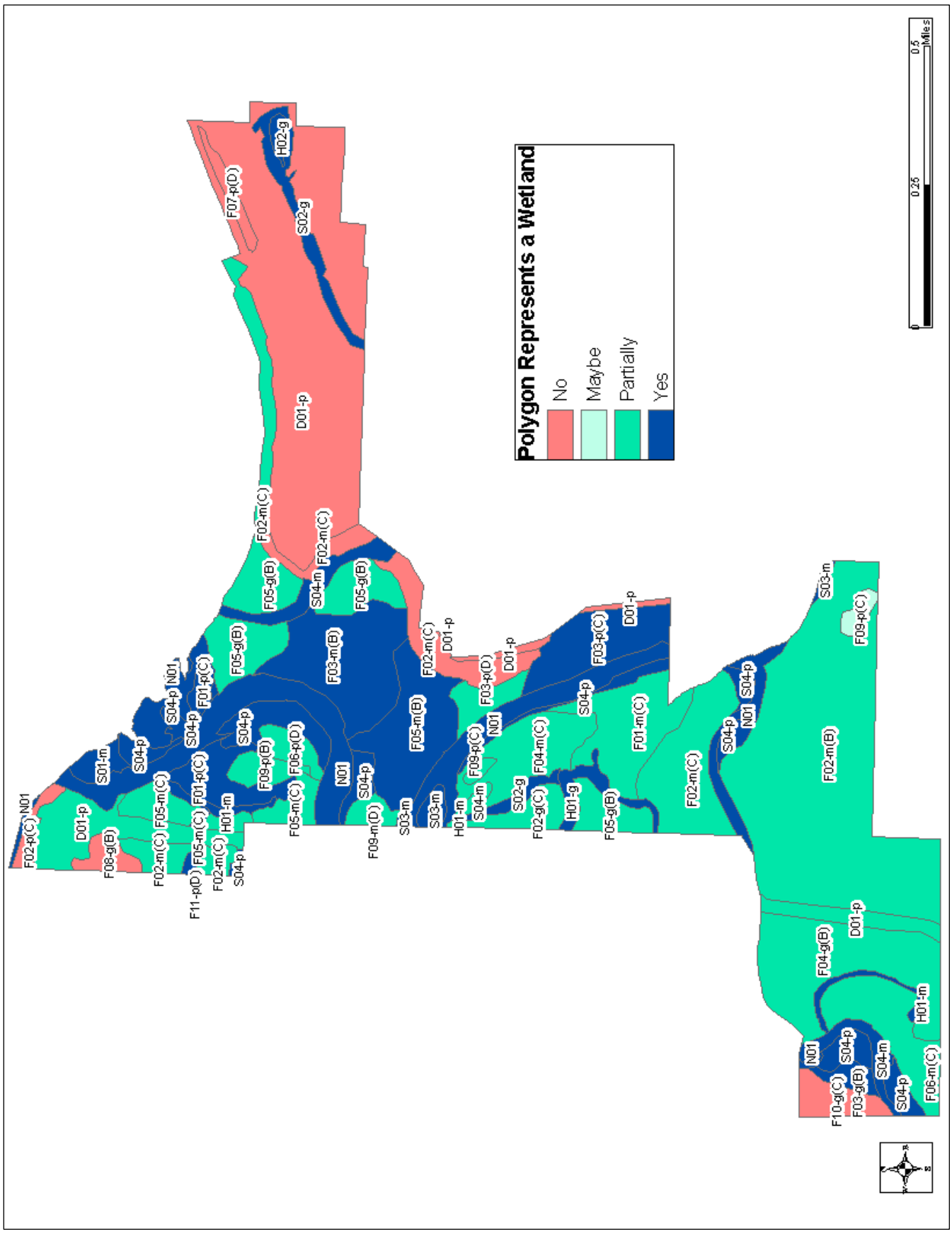

Figure 14. Layout of polygons containing wetlands within the park

Descriptions of Existing Vegetation Communities

F01: black cottonwood/shining willow-(redosier dogwood)/reed canarygrass-stinging nettle
POPBAL/SALLUC-(CORSER)/PHAARU-URTDIO ~G2S2

This community is a variant of the POPBAL/CORSER/IMPCAP plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. This is a riparian forest community with an overstory of black cottonwood. Shining willow creates a second overstory in this community as it grows from shrub to tree height. Redosier dogwood occurs sporadically throughout the community, sometimes forming dense thickets. This community is always in marginal to poor condition because the dominant understory vegetation is thick reed canarygrass with some stinging nettle mixed in. Patches of Himalayan blackberry are also common in this community. This community is a common smaller patch community occurring as a mosaic within polygons of other types of riparian floodplain forest.

F02: black cottonwood-(Oregon ash)-bigleaf maple/vine maple-common snowberry-Mixed shrubs/Mixed herbs
POPBAL-(FRALAT)-ACEMAC/ACECIR-SYMALB-Mixed shrubs/Mixed herbs ~G3S3

This community is a variant of the SYMALB/URTDIO-(ACEMAC-POPBAL)/CORCOR phase of the forested SYMALB/URTDIO group of plant associations described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. This is a riparian forest community with an overstory of black cottonwood mixed with bigleaf maple and occasionally Oregon ash. This was most likely the dominant historical forest community in the floodplain areas of the park pre-European settlement. It is still the most abundant forested vegetation community in the park today, although it has been degraded by exotic species infestations in the forest understory. Its current condition runs from good to marginal in the park, with some areas having large expanses of only native species occurrence. Some of the polygons attributed as this community in the park tend to be some of the oldest forests in the park. Reed canarygrass, English ivy, and Himalayan blackberry are the most common exotic species invading this community.

Where this community occurs along the Willamette River in the northeast section of the park, large patches of ACEMAC-ALNRUB/CORCOR-HEDHEL/Mixed herbs forest occur intermixed as well. This community is a variant of the ACEMAC-ALNRUB/POLMUN-TELGRA plant association described by Kagan, 2004. Its rarity ranking (~G2G3) is based on the ranking of that association. This community occurs where there are steep slopes along the south bank of the Willamette River in the east side of the park. Erosion and slope failure help to maintain the deciduous tree cover of this community. Massive infestations of English ivy plague this community, and non-designated trails impact understory vegetation in places.

F03: black cottonwood-(Oregon ash)-bigleaf maple/redosier dogwood-(salmonberry)-Mixed shrubs/Mixed herbs-(reed canarygrass)
POPBAL-(FRALAT)-ACEMAC/CORSER-(RUBSPE)-Mixed shrubs/Mixed herbs-(PHAARU) ~G3S3

This community is a variant of the Hardwood/RUBSPE/HYDTEN plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. This is a riparian forest community with an overstory of black cottonwood mixed with bigleaf maple and occasionally Oregon ash. It is similar to the POPBAL-(FRALAT)-ACEMAC/ACECIR-SYMALB-Mixed shrubs/Mixed herbs community in overall species composition except that redosier dogwood and salmonberry tend to be much more prevalent than common snowberry. The exotic weed infestations also tend to be worse in this community with condition rankings between marginal and poor (one polygon has a good ranking). As with most of the riparian forest types occurring in the park, this community repeatedly mosaics with the POPBAL-(FRALAT)-ACEMAC/ACECIR-SYMALB-Mixed shrubs/Mixed herbs community in such a way that they can be difficult to map apart.

F04: black cottonwood-Oregon ash/vine maple-common snowberry-Mixed shrubs/Mixed herbs-(reed canarygrass) POPBAL-FRALAT/ACECIR-SYMALB-Mixed shrubs/Mixed herbs-(PHAARU) ~G4S4

This community is a variant of the (POPBAL-FRALAT)/RUBSPE-SYMALB plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. This is a riparian forest community with an overstory of black cottonwood mixed with Oregon ash. It is compositionally similar to the POPBAL-(FRALAT)-ACEMAC/ACECIR-SYMALB-Mixed shrubs/Mixed herbs community except for the perceivable absence of bigleaf maple in the overstory. As with most of the riparian forest types occurring in the park, this community repeatedly mosaics with cottonwood riparian forest types in such a way that they can be difficult to map apart. It suffers from extreme infestations of exotic species except for in the southwest corner of the park where exotic presence is not as high as in other areas of the park probably because the forest there is older and has not been fragmented by logging or extreme flood events.

F05: black cottonwood-Oregon ash/redosier dogwood-(salmonberry)-Mixed shrubs/Mixed herbs-(reed canarygrass) POPBAL-FRALAT/CORSER-(RUBSPE)-Mixed shrubs/Mixed herbs-(PHAARU) ~G4S4

This community is a variant of the (POPBAL-FRALAT)/RUBSPE-SYMALB plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. This is a riparian forest community with an overstory of black cottonwood mixed with Oregon ash. It is compositionally similar to the POPBAL-(FRALAT)-ACEMAC/CORSER-(RUBSPE)-Mixed shrubs/Mixed herbs-(PHAARU) community except for the perceivable absence of bigleaf maple in the overstory. As with most of the riparian forest types occurring in the park, this community repeatedly mosaics with cottonwood riparian forest types in such a way that they can be difficult to map apart. While it is suffers from some extreme exotic species infestations, its condition ranks from good to marginal. The interior patch conditions of POPBAL-FRALAT/CORSER-(RUBSPE)-Mixed shrubs/Mixed herbs-(PHAARU) on the east side of the Molalla River provide excellent examples of this community in good ecological condition. The main trail access to the mouth of the Molalla River passes through this community in this area.

Within this community near where it occurs near the Willamette River, there is a small patch inclusion of the FRALAT/SALSIT-RUBSPE/IMPCAP shrubland community. This community is a variant of the FRALAT/ACECIR/HYDTEN-URTDIO plant association described by McCain

and Christy, 2005. Its rarity ranking (~G3S2) is based on the ranking of that association. It is typified by the occurrence of Oregon ash as the only overstory tree. It is a small patch community that occurs in a wet depression in the north section of the park along the Willamette River. It occurs within a matrix of good condition floodplain forest dominated by black cottonwood. Native wetland shrubs, mainly Sitka willow and salmonberry, provide a thick shrub cover with jewelweed as the dominant herbaceous cover, although other herbs such as Pacific waterleaf and stinging nettle also occur.

F06: black cottonwood-Oregon ash/shining willow-Mixed shrubs/reed canarygrass POPBAL-FRALAT/SALLUC-Mixed shrubs/PHAARU ~G2S2

This community is a variant of the POPBAL/CORSER/IMPCA plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. This is a riparian forest community with an overstory of black cottonwood mixed with Oregon ash. Shining willow creates a second overstory in this community as it grows from shrub to tree height. Exotic species infestations are abundant in this community, although native shrub diversity tends to be high as well. Redosier dogwood is the other most abundant native shrub. This community is always in marginal to poor condition because the dominant understory vegetation is thick reed canarygrass. Patches of Himalayan blackberry are also common in this community.

F07: Douglas-fir/Himalayan blackberry PSEMEN/RUBARM

This community has no adequate published plant association equivalent. It represents a small young Douglas-fir forest patch surrounded by development in the northeast section of the park. Himalayan blackberry is profuse in the understory.

F08: Douglas-fir-grand fir-western red cedar/vine maple-red elderberry/western swordfern-stinging nettle PSEMEN-ABIGRA-THUPLI/ACECIR-SAMRAC/POLMUN-URTDIO ~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 occurs in one 3.5 acre patch in the far northwest section of the park. Exotic plant infestations are profuse along the disturbed boundaries of this patch, and parts of the interior have been affected by the set up of a paintball course. The conifer trees in this patch are mature. It is probably the best existing example in the park of what the upland Douglas-fir forests were like pre-European settlement.

F09: black cottonwood/weedy understory POPBAL/weedy understory ~G1S1

This community is a variant of the POPBAL/CORSER/IMPCA plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. This community represents black cottonwood dominated forest or woodland areas where the understory is so overrun by exotic plants that understory native species are almost non-existent. In terms of the gradient between low weed cover to high weed cover, patches of this community are in the extreme high weed cover category.

F10: bigleaf maple-western red cedar/beaked hazelnut-red elderberry/western swordfern-stinging nettle ACEMAC-THUPLI/CORCOR-SAMRAC/POLMUN-URTDIO ~G2S1

This community is a variant of the THUPLI-TSUHET/CORCOR/POLMUN plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community occurs in one 5.6 acre forest patch in the extreme southwest corner of the park. The forest canopy is dominated by bigleaf maple and western red cedar and the understory possesses a large diversity of native shrubs and herbs. It occurs on a steep hillslope with an east-southeast aspect. It is in good condition and exemplifies the type of conifer forest community that was probably once more widespread in the area. While exotic plant invasion is currently limited to the patch edges, this community is in danger of being overrun by exotic plants without concentrated human intervention.

F11: Oregon ash/(redosier dogwood)/reed canarygrass-stinging nettle FRALAT/(CORSER)/PHAARU-URTDIO ~G4S4

This community is a variant of the FRALAT/CARLEP-URTDIO plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. It is typified by the occurrence of Oregon ash as the only overstory tree. It is a small patch community that occurs in wet depressions within the matrix of floodplain forests dominated by black cottonwood. Some native wetland shrubs, mainly redosier dogwood, occur in patches of this community. The herbaceous layer is overrun by thick fields of reed canarygrass mixed with stinging nettle. Paleyellow iris is a Class B exotic plant occurring in some patches of this community.

S01: shining willow-narrowleaf willow/reed canarygrass-Mixed herbs SALLUC-SALEXI/PHAARU-Mixed herbs ~G3S3

This community is a variant of the SALLUC/SALxFLU plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community occurs directly adjacent to the active river channel of the Molalla River near and at the mouth of the Molalla River. It is a sand/gravel bar shrubland community that experiences frequent flooding which maintains the cover of riparian willows. Many exotic herbs and grasses are well established within and on the periphery of this shrubland community. Mexican tea is one exotic herb that is especially profuse.

S02: redosier dogwood-(Sitka willow)/jewelweed-wetland herbs CORSER-(SALSIT)/IMPCAP-wetland herbs G3S3

This community is a variant of the CORSER-Salix spp. plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This shrubland community occurs in wet soils around the small ponds located in the northeast section of the park. Redosier dogwood and Sitka willows are the main wetland shrubs. Invasions by Himalayan blackberry are taking place within this community. Development, trails, and off-trail access to the ponds in this area frequently disrupt the native vegetation cover of this community and have probably fragmented it considerably from historical conditions.

Within the shrubland complex dominated by CORSER-(SALSIT)/IMPCAP-wetland herbs, smaller patches of the SPIDOU shrubland community also occur. This community is described by McCain and Christy, 2005 and has a rarity ranking of G5S4. This wetland community only occurs on the silty swampy soils surrounding the larger NUPLUTP pond in the northeast section of the

park. It mosaics with the CORSER-(SALSIT)/IMPCAP-wetland herbs community in this area. Exotic plant presence is typically low in the patches of this community.

One occurrence of the CORSER-(SALSIT)/IMPCAP-wetland herbs community exists within the Molalla River riparian floodplain complex in the western portion of the park. This community occurs along a perennially flooded backwater slough and is in good condition in this area. The SPAEUR-LUDPAL-POLPER-LEEORY herbaceous wetland community occurs as a smaller patch community within the willow – dogwood shrubland community in this area.

S03: (black cottonwood)/shining willow-narrowleaf willow/reed canarygrass-Mixed herbs (POPBAL)/SALLUCL-SALEXI/PHAARU-Mixed herbs ~G3S3

This community is a variant of the SALLUC/SALxFLU plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community occurs on cobble and sand bars directly adjacent to the active river channel of the Molalla River. It is a shrubland community although small young black cottonwood saplings do occur (they are typically smaller than the surrounding shrub vegetation). Besides the black cottonwood saplings, this community is very similar in composition and condition to the SALLUC-SALEXI/PHAARU-Mixed herbs community.

Herbaceous cobble/sand bars lacking shrub cover also occur mixed in with this community. The Herbaceous cobble/sand community describes the cobble and sandbars along the Molalla River and at its mouth that are frequently covered by the rivers during high water events. Sparse herb cover of mostly exotic annual species occurs in these areas.

S04: shining willow-(redosier dogwood)-(Sitka willow)/reed canarygrass SALLUC-(CORSER)-(SALSIT)/PHAARU ~G2S2

This community is a variant of the SALLUC/URTDIO plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. This community occurs on cobble and sand bars directly adjacent to the active river channel of the Molalla River and progresses away from the cobble and sandbars grading into the black cottonwood dominated riparian forests. It is a shrubland community dominated by shining willow, with thickets of redosier dogwood and Sitka willow present in places. In many places, the shining willow component of this community has grown to tree height and creates a forest-like overstory under which the other shrubs and thick seas of reed canarygrass occur. This community is in poor to marginal condition throughout the park due to the invasion of reed canarygrass and large infestations of Himalayan blackberry and Japanese knotweed.

H01: broadfruit bur-reed-marsh seedbox-spotted ladysthumb-rice cutgrass SPAEUR-LUDPAL-POLPER-LEEORY ~G2S2

This community is a variant of the LUDPAL-POLHYD plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. This community occurs in the large backwater sloughs and silty old abandoned river channels of the Molalla River. Seasonal flooding and hyporheic flow inputs help maintain this wetland community. Exotic plant invasions are occurring in many of the patches of this community throughout the park. Barnyard grass, paleyellow iris, and parrot feather watermilfoil are some exotic invaders that are displacing native vegetation in this community.

Within the largest off-channel slough on the western side of the Molalla River, in the southern part of the park, the AZOFIL herbaceous wetland community occurs in the deeper water sections of the slough. It is a smaller patch community within the matrix of SPAEUR-LUDPAL-POLPER-LEEORY herbaceous wetland community. The rarity ranking of this community is G4S4 and it is described by McCain and Christy, 2005. It occurs where water flow is deepest and stagnate at most low-flow river stages. Azolla filiculoides is the dominant vegetation cover in this community.

H02: Rocky Mountain pond-lily NUPLUTP G5S5

This wetland community is described by McCain and Christy, 2005. The large pond in the northeast region of the park is the only place where this wetland type occurs in the park. Floating pondweed also occurs mixed in with the pond-lily. The wetland seems to be free of exotic plants.

H03: rice cutgrass-teal lovegrass-yellowseed false pimpernel LEEORY-ERAHYP-LINDUB ~G2S1

This community is a variant of the ERAHYP-GNAPAL plant association described by McCain and Christy, 2005. This community was found to occur along a flat silt covered bank of the Molalla River in the southwest corner of the park, where seasonal inundation by slower moving river flows occur. Herbaceous and graminoid diversity is high in this community, with many native and exotic herbs and grasses present.

Vascular Plant Occurrence within the Project Area

268 species of vascular plants were identified within the project area during this project. This included 57 plant families with the Rosaceae, Poaceae, and Asteraceae families making up 35% of the species total. 43% 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 disturbance through flooding and development, 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. Table 6 lists the five at-risk plants for which habitat potentially exists within the park. Figure 15 depicts the locations of potential habitat for the at-risk plants within the park.

Table 6. List of at-risk plants which have habitat occurring within the park.

Scientific Name	Common name	Family	Federal Status	ODA Status	Global Rank	State Rank
Howellia aquatilis Gray	water howellia	Campanulaceae	Listed threatened	Listed threatened	G3	S1
Actaea elata (Nutt.) Prantl	tall bugbane	Ranunculaceae		Candidate for Listing	G3	S3
Delphinium nuttallii Gray *ssp. ochroleucum* (Nutt.) Warnock	upland larkspur	Ranunculaceae	Species of Concern	Listed endangered	G4T2	S2
Lathyrus holochlorus (Piper) C.L. Hitchc.	thinleaf pea	Fabaceae	Species of Concern		G2	S2
Utricularia minor L.	lesser bladderwort	Lentibulariaceae			G5	S2

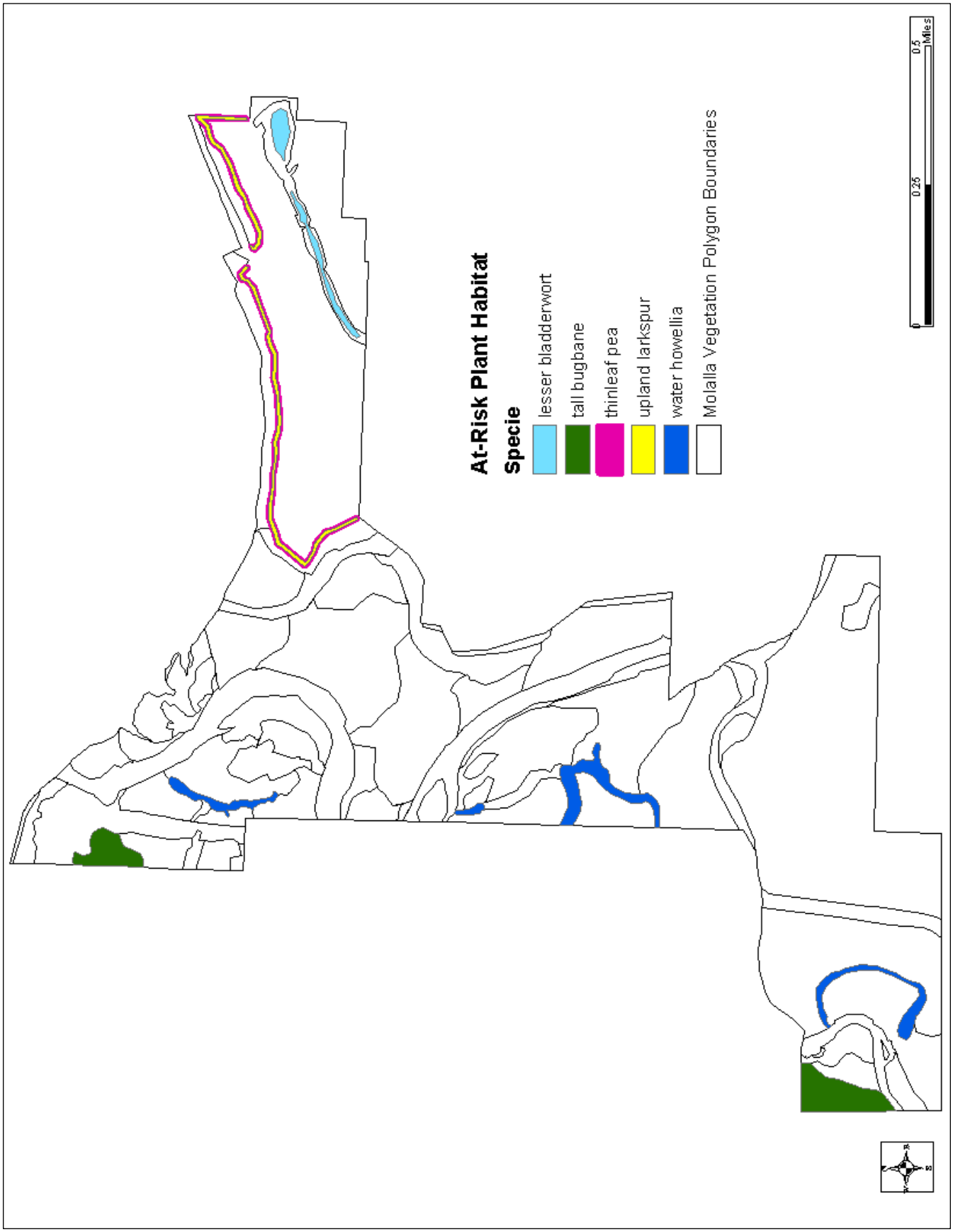

Figure 15. At-risk plant habitat in Molalla River State Park. (note – upland larkspur and thinleaf pea potential habitats overlap eachother in the northeast section of the park – yellow/pink lines)

***Howellia aquatilis* Gray**
Water howellia is not known to occur in the park, and no new populations were encountered during the 2007-2008 surveys. It is thought to be extirpated from Oregon. However, some of the park's floodplain wetlands do contain habitat potentially suitable for water howellia. *Howellia aquatilis* occurs mostly in small ponds that retain water throughout the year. These 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 seasonally inundated zones within wetlands which dry out in late summer or early fall. Figure 16 depicts the potential water howellia habitat within Molalla River State Park.

Figure 16. Photo of a floodplain wetland with habitat potentially suitable for water howellia.

***Actaea elata* (Nutt.) Prantl**
Tall bugbane is not known to occur in the park, and no new populations were encountered during the 2007-2008 surveys. However, a few patches of upland forest exist within Molalla River State Park that offer suitable potential habitat for tall bugbane. This plant is known to occur in westside forests with an abundant bigleaf maple component. Herbivory by native ungulates seems to be a significant threat to existing populations across its range.

***Delphinium nuttallii* Gray *ssp. ochroleucum* (Nutt.) Warnock**
This species is also known as *Delphinium leucophaeum*. It is not known to occur in the park, and no new populations were encountered during the 2007-2008 surveys. However, we did encounter some dead and dried out *Delphinium spp.* material during our 2007 surveys, but we were not able to identify the specimen to species. Upland larkspur occurs throughout Clackamas County and is associated with undisturbed sites on dry bluffs, open ground, and moist lowland meadows. The woody/shrubby un-

maintained edges of the large agriculture and developed fields in the northeast section of the park are likely places to find upland larkspur. Cutting by maintenance crews, spraying for weeds, and trampling by visitors are all active threats against the occurrence of upland larkspur in the park.

***Lathyrus holochlorus* (Piper) C.L. Hitchc.**

Thinleaf pea is not known to occur in the park, and no new populations were encountered during the 2007-2008 surveys. This species would occur on sites similar to upland larkspur within the park, that is the woody/shrubby un-maintained edges of the large agriculture and developed fields in the northeast section of the park. Cutting by maintenance crews, spraying for weeds, and trampling by visitors are all active threats against the occurrence of thinleaf pea in the park.

***Utricularia minor* L.**

Although not observed during the 2007-2008 surveys, the open water wetlands in the northeast corner of the park may provide potential habitat for lesser bladderwort. This species has not been encountered in this area before. Figure 17 depicts the potential lesser bladderwort habitat within Molalla River State Park.

Figure 17. Photo of wetland that may provide adequate habitat for lesser bladderwort in Molalla River State Park.

Invasive and Exotic Plants of Concern within the Project Area

Table 7 lists the Class B noxious plants encountered in the park during this project. There were a total of 16 Class B plants and no Class A plants identified.

Table 7. Class B noxious plants occurring within the park.

Symbol	Scientific Name	Common name	Family	Class
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
COMA2	Conium maculatum L.	poison hemlock	Apiaceae	B
COAR4	Convolvulus arvensis L.	field bindweed	Convolvulaceae	B
CYSC4	Cytisus scoparius (L.) Link	Scotch broom	Fabaceae	B
ELRE4	Elymus repens (L.) Gould	quackgrass	Poaceae	B
HEHE	Hedera helix L.	English ivy	Araliaceae	B
HYPE	Hypericum perforatum L.	common St. Johnswort	Clusiaceae	B
IRPS	Iris pseudacorus L.	paleyellow iris	Iridaceae	B
LIVU2	Linaria vulgaris P. Mill.	butter and eggs	Scrophulariaceae	B
POCU6	Polygonum cuspidatum Sieb. & Zucc.	Japanese knotweed	Polygonaceae	B
RUAR9	Rubus armeniacus Focke	Himalayan blackberry	Rosaceae	B
RULA	Rubus laciniatus Willd.	cutleaf blackberry	Rosaceae	B
SEJA	Senecio jacobaea L.	stinking willie	Asteraceae	B
LYSA2	Lythrum salicaria L.	purple loosestrife	Lythraceae	B, T

The occurrence and distribution of some Class B noxious plants were mapped during field surveys. Figure 18 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.

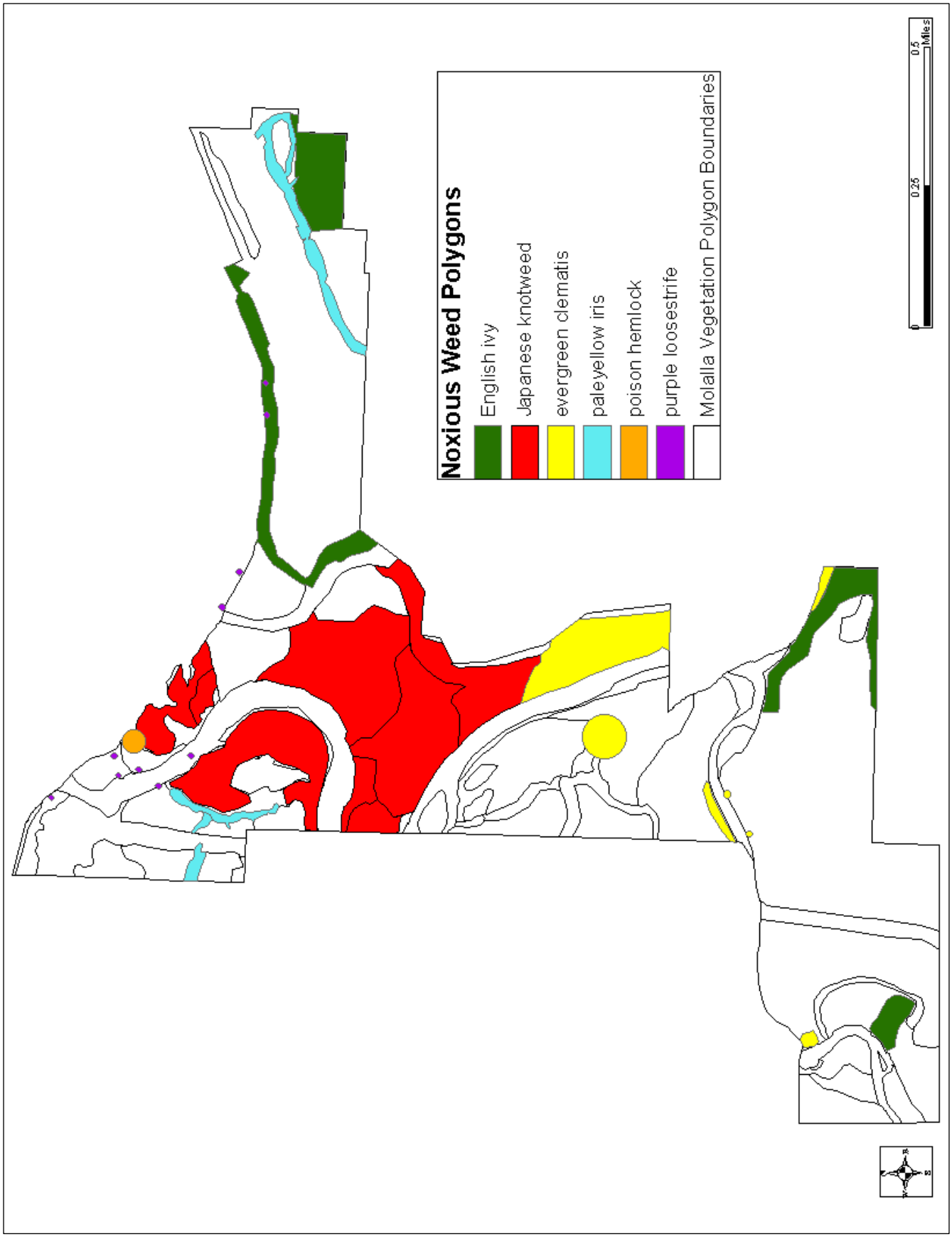

Figure 18. Location of noxious plants mapped with within the park.

Exotic and noxious weeds were abundant throughout much of the park. Massive infestations of reed canarygrass, Himalayan blackberry, Japanese knotweed, evergreen clematis, and English ivy threaten to displace native understory vegetation as well as kill overstory trees. Other exotic species like purple loosestrife and paleyellow iris are abundant in wetlands and along the banks of the Molalla River. Figures 19 - 22 provide photos of some of the infestations encountered in the park.

Figures 19 - 22. Photos of exotic plant invasions in the project area. Top left: Himalayan blackberry along the Molalla River. Top right: Reed canarygrass and Himalayan blackberry grows over a field surveyor's head. Bottom left: Japanese knotweed forest. Bottom right: A sea of reed canarygrass in the shining willow shrubland.

Recommendations for Restoration and Vegetation Management

As stated in the previous sections, the extent of non-native plant infestations within Molalla River State Park is extreme. The sheer dominance of reed canarygrass, Himalayan blackberry, Japanese knotweed, and English ivy within large expanses of the park do not lend themselves to easy restoration interventions. We do not recommend that restoration work be prioritized within the park. Much of the park is difficult to access and there is a high probability that episodic flooding will continue to affect many of the vegetation communities and create good conditions for continual exotic plant invasion. Attempts to control or diminish the cover of one exotic species would most likely just provide an advantage for the establishment of another exotic species.

In polygons where vegetation community condition is attributed as good, the absence of recent vegetation disturbances has probably not given exotic invaders a chance to colonize. We recommend that any future development and/or vegetation management activities that would disturb the native vegetation in these areas be avoided.

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 occuring 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)

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Appendix A – Vascular Plant List for Molalla River 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	ACPL	Acer platanoides L.	Norway maple	Aceraceae	yes	
5	ACMI2	Achillea millefolium L.	common yarrow	Asteraceae		
6	ACRU2	Actaea rubra (Ait.) Willd.	red baneberry	Ranunculaceae		
7	ADAL	Adiantum aleuticum (Rupr.) Paris	Aleutian maidenhair	Pteridaceae		
8	AGCA5	Agrostis capillaris L.	colonial bentgrass	Poaceae	yes	
9	AGEX	Agrostis exarata Trin.	spike bentgrass	Poaceae		
10	AGGI2	Agrostis gigantea Roth	redtop	Poaceae	yes	
11	AICA	Aira caryophyllea L.	silver hairgrass	Poaceae	yes	
12	ALPL	Alisma plantago-aquatica L.	European water plantain	Alismataceae	yes	
13	ALAM2	Allium amplectens Hook.	narrowleaf onion	Liliaceae		
14	ALRU2	Alnus rubra Bong.	red alder	Betulaceae		
15	AMPO2	Amaranthus powellii S. Wats.	Powell's amaranth	Amaranthaceae		
16	AMAL2	Amelanchier alnifolia (Nutt.) Nutt. ex M. Roemer	Saskatoon serviceberry	Rosaceae		
17	ANAR	Anagallis arvensis L.	scarlet pimpernel	Primulaceae	yes	
18	ANMA	Anaphalis margaritacea (L.) Benth.	western pearly everlasting	Asteraceae		
19	ANOD	Anthoxanthum odoratum L.	sweet vernalgrass	Poaceae	yes	
20	APAN2	Apocynum androsaemifolium L.	spreading dogbane	Apocynaceae		
21	ARME	Arbutus menziesii Pursh	Pacific madrone	Ericaceae		
22	ARMI2	Arctium minus Bernh.	lesser burdock	Asteraceae	yes	
23	ARDO3	Artemisia douglasiana Bess. ex Hook.	Douglas' sagewort	Asteraceae		
24	ASCA2	Asarum caudatum Lindl.	British Columbia wildginger	Aristolochiaceae		
25	ATFI	Athyrium filix-femina (L.) Roth	common ladyfern	Dryopteridaceae		
26	AVFA	Avena fatua L.	wild oat	Poaceae	yes	
27	AZFI	Azolla filiculoides Lam.	Pacific mosquitofern	Azollaceae		
28	BAOR	Barbarea orthoceras Ledeb.	American yellowrocket	Brassicaceae		
29	BEPE2	Bellis perennis L.	lawndaisy	Asteraceae	yes	
30	BICE	Bidens cernua L.	nodding beggartick	Asteraceae		
31	BIFR	Bidens frondosa L.	devil's beggartick	Asteraceae		
32	BRNI	Brassica nigra (L.) W.D.J. Koch	black mustard	Brassicaceae	yes	
33	BRPA3	Bromus pacificus Shear	Pacific brome	Poaceae		
34	BRRA2	Bromus racemosus L.	bald brome	Poaceae	yes	
35	BRVU	Bromus vulgaris (Hook.) Shear	Columbia brome	Poaceae		
36	CASE13	Calystegia sepium (L.) R. Br.	hedge false bindweed	Convolvulaceae	yes	
37	CAQU2	Camassia quamash (Pursh) Greene	small camas	Liliaceae		
38	CAMO32	Canadanthus modestus (Lindl.) Nesom	giant mountain aster	Asteraceae		
39	CABU2	Capsella bursa-pastoris (L.) Medik.	shepherd's purse	Brassicaceae	yes	
40	CALE8	Carex lenticularis Michx.	lakeshore sedge	Cyperaceae		
41	CALE24	Carex leptopoda Mackenzie	taperfruit shortscale sedge	Cyperaceae		
42	CAOB3	Carex obnupta Bailey	slough sedge	Cyperaceae		
43	CASC11	Carex scoparia Schkuhr ex Willd.	broom sedge	Cyperaceae		
44	CAST5	Carex stipata Muhl. ex Willd.	owlfruit sedge	Cyperaceae		
45	CEER5	Centaurium erythraea Rafn	European centaury	Gentianaceae	yes	
46	CEGL2	Cerastium glomeratum Thuill.	sticky chickweed	Caryophyllaceae	yes	

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
47	CHMA15	Chamaesyce maculata (L.) Small	spotted sandmat	Euphorbiaceae	yes	
48	CHAN9	Chamerion angustifolium (L.) Holub	fireweed	Onagraceae		
49	CHAL7	Chenopodium album L.	lambsquarters	Chenopodiaceae	yes	
50	CHAM	Chenopodium ambrosioides L.	Mexican tea	Chenopodiaceae	yes	
51	CIIN	Cichorium intybus L.	chicory	Asteraceae	yes	
52	CIAR4	Cirsium arvense (L.) Scop.	Canada thistle	Asteraceae	yes	B
53	CIVU	Cirsium vulgare (Savi) Ten.	bull thistle	Asteraceae	yes	B
54	CLSI2	Claytonia sibirica L.	Siberian springbeauty	Portulacaceae		
55	CLVI6	Clematis vitalba L.	evergreen clematis	Ranunculaceae	yes	B
56	COGR4	Collomia grandiflora Dougl. ex Lindl.	grand collomia	Polemoniaceae		
57	COMA2	Conium maculatum L.	poison hemlock	Apiaceae	yes	B
58	COAR4	Convolvulus arvensis L.	field bindweed	Convolvulaceae	yes	B
59	COBO	Conyza *bonariensis* (L.) Cronq.	asthmaweed	Asteraceae	yes	
60	CONU4	Cornus nuttallii Audubon ex Torr. & Gray	Pacific dogwood	Cornaceae		
61	COSE16	Cornus sericea L.	redosier dogwood	Cornaceae		
62	COAV	Corylus avellana	filburt hazelnut	Betulaceae	yes	
63	COCO6	Corylus cornuta Marsh.	beaked hazelnut	Betulaceae		
64		Cotoneaster	cotoneaster	Rosaceae	yes	
65	CRMO3	Crataegus monogyna Jacq.	oneseed hawthorn	Rosaceae	yes	
66	CRSU16	Crataegus suksdorfii (Sarg.) Kruschke	Suksdorf's hawthorn	Rosaceae		
67	CRCA3	Crepis capillaris (L.) Wallr.	smooth hawksbeard	Asteraceae	yes	
68	CUCAB	Cuscuta californica Hook. & Arn. var. breviflora Engelm.	chaparral dodder	Cuscutaceae		
69	CYDA	Cynodon dactylon (L.) Pers.	Bermudagrass	Poaceae	yes	
70	CYST	Cyperus strigosus L.	strawcolored flatsedge	Cyperaceae		
71	CYSC4	Cytisus scoparius (L.) Link	Scotch broom	Fabaceae	yes	B
72	DAGL	Dactylis glomerata L.	orchardgrass	Poaceae	yes	
73	DAST	Datura stramonium L.	jimsonweed	Solanaceae	yes	
74	DACA6	Daucus carota L.	Queen Anne's lace	Apiaceae	yes	
75	DELPH	Delphinium L.	larkspur	Ranunculaceae		
76	DIPU	Digitalis purpurea L.	purple foxglove	Scrophulariaceae	yes	
77	DISA	Digitaria sanguinalis (L.) Scop.	hairy crabgrass	Poaceae		
78	DIFU2	Dipsacus fullonum L.	Fuller's teasel	Dipsacaceae	yes	
79	ECCR	Echinochloa crus-galli (L.) Beauv.	barnyardgrass	Poaceae	yes	
80	ELOV	Eleocharis ovata (Roth) Roemer & J.A. Schultes	ovate spikerush	Cyperaceae		
81	ELPA3	Eleocharis palustris (L.) Roemer & J.A. Schultes	common spikerush	Cyperaceae		
82	ELGL	Elymus glaucus Buckl.	blue wildrye	Poaceae		
83	ELRE4	Elymus repens (L.) Gould	quackgrass	Poaceae	yes	B
84	EPCI	Epilobium ciliatum Raf.	fringed willowherb	Onagraceae		
85	EPGL	Epilobium glaberrimum Barbey	glaucus willowherb	Onagraceae		
86	EQAR	Equisetum arvense L.	field horsetail	Equisetaceae		
87	ERHY	Eragrostis hypnoides (Lam.) B.S.P.	teal lovegrass	Poaceae		
88	ERPE	Eragrostis pectinacea (Michx.) Nees ex Steud.	tufted lovegrass	Poaceae		
89	ERPH	Erigeron philadelphicus L.	Philadelphia fleabane	Asteraceae		
90	ERLA6	Eriophyllum lanatum (Pursh) Forbes	common woolly sunflower	Asteraceae		
91	ERCI6	Erodium cicutarium (L.) L'Hér. ex Ait.	redstem stork's bill	Geraniaceae	yes	
92	FRVE	Fragaria vesca L.	woodland strawberry	Rosaceae		
93	FRPU7	Frangula purshiana (DC.) Cooper	Cascara buckthorn	Rhamnaceae		

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
94	FRLA	Fraxinus latifolia Benth.	Oregon ash	Oleaceae		
95	GAAP2	Galium aparine L.	stickywilly	Rubiaceae		
96	GATR3	Galium triflorum Michx.	fragrant bedstraw	Rubiaceae		
97	GEDI	Geranium dissectum L.	cutleaf geranium	Geraniaceae	yes	
98	GELU	Geranium lucidum		Geraniaceae	yes	
99	GEMO	Geranium molle L.	dovefoot geranium	Geraniaceae	yes	
100	GEMA4	Geum macrophyllum Willd.	largeleaf avens	Rosaceae		
101	GICA5	Gilia capitata Sims	bluehead gilia	Polemoniaceae		
102	GLST	Glyceria striata (Lam.) A.S. Hitchc.	fowl mannagrass	Poaceae		
103	GNPA	Gnaphalium palustre Nutt.	western marsh cudweed	Asteraceae		
104	GNUL	Gnaphalium uliginosum L.	marsh cudweed	Asteraceae		
105	HEHE	Hedera helix L.	English ivy	Araliaceae	yes	B
106	HOLA	Holcus lanatus L.	common velvetgrass	Poaceae	yes	
107	HODI	Holodiscus discolor (Pursh) Maxim.	oceanspray	Rosaceae		
108	HYRA	Hydrocotyle ranunculoides L. f.	floating marshpennywort	Apiaceae		
109	HYTE	Hydrophyllum tenuipes Heller	Pacific waterleaf	Hydrophyllaceae		
110	HYPE	Hypericum perforatum L.	common St. Johnswort	Clusiaceae	yes	B
111	HYRA3	Hypochaeris radicata L.	hairy catsear	Asteraceae	yes	
112	ILAQ80	Ilex aquifolium L.	English holly	Aquifoliaceae	yes	
113	IMCA	Impatiens capensis Meerb.	jewelweed	Balsaminaceae		
114	IRPS	Iris pseudacorus L.	paleyellow iris	Iridaceae	yes	B
115	JUGLA	Juglans L.	walnut	Juglandaceae	yes	
116	JUAC	Juncus acuminatus Michx.	tapertip rush	Juncaceae		
117	JUBU	Juncus bufonius L.	toad rush	Juncaceae		
118	JUEF	Juncus effusus L.	common rush	Juncaceae		
119	JUEN	Juncus ensifolius Wikstr.	swordleaf rush	Juncaceae		
120	JUNE	Juncus nevadensis S. Wats.	Sierra rush	Juncaceae		
121	JUTE	Juncus tenuis Willd.	poverty rush	Juncaceae		
122	KIEL	Kickxia elatine (L.) Dumort.	sharpleaf cancerwort	Scrophulariaceae	yes	
123	LASE	Lactuca serriola L.	prickly lettuce	Asteraceae	yes	
124	LACO3	Lapsana communis L.	common nipplewort	Asteraceae	yes	
125	LATO	Lathyrus torreyi Gray	Torrey's pea	Fabaceae		
126	LEOR	Leersia oryzoides (L.) Sw.	rice cutgrass	Poaceae		
127	LEMI3	Lemna minor L.	common duckweed	Lemnaceae		
128	LETAT	Leontodon taraxacoides (Vill.) Mérat ssp. taraxacoides	lesser hawkbit	Asteraceae	yes	
129	LEVI3	Lepidium virginicum L.	Virginia pepperweed	Brassicaceae		
130	LEVU	Leucanthemum vulgare Lam.	oxeye daisy	Asteraceae	yes	
131	LIVU2	Linaria vulgaris P. Mill.	butter and eggs	Scrophulariaceae	yes	B
132	LIDU	Lindernia dubia (L.) Pennell	yellowseed false pimpernel	Scrophulariaceae		
133	LOAR5	Logfia arvensis (L.) Holub	field cottonrose	Asteraceae	yes	
134	LOCO6	Lotus corniculatus L.	bird's-foot trefoil	Fabaceae	yes	
135	LOUNU	Lotus unifoliolatus (Hook.) Benth. var. unifoliolatus	American bird's-foot trefoil	Fabaceae		
136	LUPA	Ludwigia palustris (L.) Ell.	marsh seedbox	Onagraceae		
137	LUPE5	Ludwigia peploides (Kunth) Raven	floating primrose-willow	Onagraceae	yes	
138	LUPA4	Luzula parviflora (Ehrh.) Desv.	smallflowered woodrush	Juncaceae		
139	LYAM	Lycopus americanus Muhl. ex W. Bart.	American water horehound	Lamiaceae		
140	LYNU	Lysimachia nummularia L.	creeping jenny	Primulaceae	yes	
141	LYSA2	Lythrum salicaria L.	purple loosestrife	Lythraceae	yes	B, T

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
142	MACA2	Machaeranthera canescens (Pursh) Gray	hoary tansyaster	Asteraceae		
143	MASA	Madia sativa Molina	coast tarweed	Asteraceae		
144	MAAQ2	Mahonia aquifolium (Pursh) Nutt.	hollyleaved barberry	Berberidaceae		
145	MADI	Maianthemum dilatatum (Wood) A. Nels. & J.F. Macbr.	false lily of the valley	Liliaceae		
146	MARA7	Maianthemum racemosum (L.) Link	feathery false lily of the valley	Liliaceae		
147	MAST4	Maianthemum stellatum (L.) Link	starry false lily of the valley	Liliaceae		
148	MAPU	Malus pumila P. Mill.	paradise apple	Rosaceae	yes	
149	MAOR3	Marah oreganus (Torr. ex S. Wats.) T.J. Howell	coastal manroot	Cucurbitaceae		
150	MARE6	Matricaria recutita L.	German chamomile	Asteraceae	yes	
151	MEOF	Melilotus officinalis (L.) Lam.	yellow sweetclover	Fabaceae	yes	
152	MEAR4	Mentha arvensis L.	wild mint	Lamiaceae		
153	MIGU	Mimulus guttatus DC.	seep monkeyflower	Scrophulariaceae		
154	MOVE	Mollugo verticillata L.	green carpetweed	Molluginaceae		
155	MYMU	Mycelis muralis (L.) Dumort.	wall-lettuce	Asteraceae	yes	
156	MYLA	Myosotis laxa Lehm.	bay forget-me-not	Boraginaceae		
157	MYAQ2	Myriophyllum aquaticum (Vell.) Verdc.	parrot feather watermilfoil	Haloragaceae	yes	
158	NAIN2	Navarretia intertexta (Benth.) Hook.	needleleaf navarretia	Polemoniaceae		
159	NASQ	Navarretia squarrosa (Eschsch.) Hook. & Arn.	skunkbush	Polemoniaceae		
160	NIAC	Nicotiana acuminata (Graham) Hook.	manyflower tobacco	Solanaceae		
161	NULUP	Nuphar lutea (L.) Sm. ssp. polysepala (Engelm.) E.O. Beal	Rocky Mountain pond-lily	Nymphaeaceae		
162	NYOD	Nymphaea odorata Ait.	American white waterlily	Nymphaeaceae		
163	OECE	Oemleria cerasiformis (Torr. & Gray ex Hook. & Arn.) Landon	Indian plum	Rosaceae		
164	OESA	Oenanthe sarmentosa K. Presl ex DC.	water parsely	Apiaceae		
165	OEBI	Oenothera biennis L.	common evening-primrose	Onagraceae	yes	
166	OSBE	Osmorhiza berteroi DC.	sweetcicely	Apiaceae		
167	OXSU	Oxalis suksdorfii Trel.	Suksdorf woodsorrel	Oxalidaceae		
168	PACA6	Panicum capillare L.	witchgrass	Poaceae		
169	PAVI3	Parentucellia viscosa (L.) Caruel	yellow glandweed	Scrophulariaceae	yes	
170	PHNE2	Phacelia nemoralis Greene	shade phacelia	Hydrophyllaceae		
171	PHAR3	Phalaris arundinacea L.	reed canarygrass	Poaceae	yes	
172	PHAR4	Phleum arenarium L.	sand timothy	Poaceae	yes	
173	PHPR3	Phleum pratense L.	timothy	Poaceae	yes	
174	PHCA11	Physocarpus capitatus (Pursh) Kuntze	Pacific ninebark	Rosaceae		
175	PICO	Pinus contorta Dougl. ex Loud.	lodgepole pine	Pinaceae		
176	PLLA	Plantago lanceolata L.	narrowleaf plantain	Plantaginaceae	yes	
177	PLMA2	Plantago major L.	common plantain	Plantaginaceae	yes	
178	POPR	Poa pratensis L.	Kentucky bluegrass	Poaceae	yes	
179	POAV	Polygonum aviculare L.	prostrate knotweed	Polygonaceae	yes	
180	POCU6	Polygonum cuspidatum Sieb. & Zucc.	Japanese knotweed	Polygonaceae	yes	B
181	POHY	Polygonum hydropiper L.	marshpepper knotweed	Polygonaceae	yes	
182	POHY2	Polygonum hydropiperoides Michx.	swamp smartweed	Polygonaceae		
183	POPE3	Polygonum persicaria L.	spotted ladysthumb	Polygonaceae	yes	
184	POGL8	Polypodium glycyrrhiza D.C. Eat.	licorice fern	Polypodiaceae		
185	POMU	Polystichum munitum (Kaulfuss) K. Presl	western swordfern	Dryopteridaceae		
186	POBAT	Populus balsamifera L. ssp. trichocarpa (Torr. & Gray ex Hook.) Brayshaw	black cottonwood	Salicaceae		

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
187	PONA4	Potamogeton natans L.	floating pondweed	Potamogetonaceae		
188	PRHOO	Prosartes hookeri Torr. var. oregana (S. Wats.) Kartesz	Oregon drops of gold	Liliaceae		
189	PRVU	Prunella vulgaris L.	common selfheal	Lamiaceae	yes	
190	PRAV	Prunus avium (L.) L.	sweet cherry	Rosaceae	yes	
191	PRLA5	Prunus laurocerasus L.	cherry laurel	Rosaceae	yes	
192	PSCAT	Pseudognaphalium canescens (DC.) W.A. Weber ssp. thermale (E. Nels.) Kartesz	Wright's cudweed	Asteraceae		
193	PSME	Pseudotsuga menziesii (Mirbel) Franco	Douglas-fir	Pinaceae		
194	PTAQ	Pteridium aquilinum (L.) Kuhn	western brackenfern	Dennstaedtiaceae		
195	PYCO	Pyrus communis L.	common pear	Rosaceae	yes	
196	QUGA4	Quercus garryana Dougl. ex Hook.	Oregon white oak	Fagaceae		
197	RARE3	Ranunculus repens L.	creeping buttercup	Ranunculaceae	yes	
198	RIDI	Ribes divaricatum Dougl.	spreading gooseberry	Grossulariaceae		
199	ROPS	Robinia pseudoacacia L.	black locust	Fabaceae	yes	
200	ROCU	Rorippa curvisiliqua (Hook.) Bess. ex Britt.	curvepod yellowcress	Brassicaceae		
201	ROPA2	Rorippa palustris (L.) Bess.	bog yellowcress	Brassicaceae		
202	RONU	Rosa nutkana K. Presl	Nootka rose	Rosaceae		
203	RUAR9	Rubus armeniacus Focke	Himalayan blackberry	Rosaceae	yes	B
204	RULA	Rubus laciniatus Willd.	cutleaf blackberry	Rosaceae	yes	B
205	RUPA	Rubus parviflorus Nutt.	thimbleberry	Rosaceae		
206	RUSP	Rubus spectabilis Pursh	salmonberry	Rosaceae		
207	RUUR	Rubus ursinus Cham. & Schlecht.	California blackberry	Rosaceae		
208	RUAC3	Rumex acetosella L.	common sheep sorrel	Polygonaceae	yes	
209	RUCR	Rumex crispus L.	curly dock	Polygonaceae	yes	
210	RUOB	Rumex obtusifolius L.	bitter dock	Polygonaceae	yes	
211	RUSA	Rumex salicifolius Weinm.	willow dock	Polygonaceae		
212	SALA2	Sagittaria latifolia Willd.	broadleaf arrowhead	Alismataceae		
213	SAEX	Salix exigua Nutt.	narrowleaf willow	Salicaceae		
214	SALU	Salix lucida Muhl.	shining willow	Salicaceae		
215	SASI2	Salix sitchensis Sanson ex Bong.	Sitka willow	Salicaceae		
216	SARA2	Sambucus racemosa L.	red elderberry	Caprifoliaceae		
217	SAOF4	Saponaria officinalis L.	bouncingbet	Caryophyllaceae	yes	
218	SCPH	Schedonorus phoenix (Scop.) Holub	tall fescue	Poaceae	yes	
219	SCTA2	Schoenoplectus tabernaemontani (K.C. Gmel.) Palla	softstem bulrush	Cyperaceae		
220	SCMI2	Scirpus microcarpus J.& K. Presl	panicled bulrush	Cyperaceae		
221	SCAN2	Scleranthus annuus L.	German knotgrass	Caryophyllaceae	yes	
222	SCLA	Scrophularia lanceolata Pursh	lanceleaf figwort	Scrophulariaceae		
223	SCLA2	Scutellaria lateriflora L.	blue skullcap	Lamiaceae		
224	SEJA	Senecio jacobaea L.	stinking willie	Asteraceae	yes	B
225	SEVU	Senecio vulgaris L.	old-man-in-the-Spring	Asteraceae	yes	
226	SINO	Silene noctiflora L.	nightflowering silene	Caryophyllaceae	yes	
227	SODU	Solanum dulcamara L.	climbing nightshade	Solanaceae	yes	
228	SONI	Solanum nigrum L.	black nightshade	Solanaceae	yes	
229	SOAR2	Sonchus arvensis L.	field sowthistle	Asteraceae	yes	
230	SOOL	Sonchus oleraceus L.	common sowthistle	Asteraceae	yes	
231	SOSC2	Sorbus scopulina Greene	Greene's mountain ash	Rosaceae		
232	SPEU	Sparganium eurycarpum Engelm. ex Gray	broadfruit bur-reed	Sparganiaceae		
233	SPDO	Spiraea douglasii Hook.	rose spirea	Rosaceae		

Count	Symbol	Scientific Name	Common name	Family	Alien	Class
234	STCHC3	Stachys chamissonis Benth. var. cooleyae (Heller) G. Mulligan & D. Munro	coastal hedgenettle	Lamiaceae		
235	STME2	Stellaria media (L.) Vill.	common chickweed	Caryophyllaceae	yes	
236	SYAL	Symphoricarpos albus (L.) Blake	common snowberry	Caprifoliaceae		
237	SYOC	Symphoricarpos occidentalis Hook.	western snowberry	Caprifoliaceae		
238	SYSU4	Symphyotrichum subspicatum (Nees) Nesom	Douglas aster	Asteraceae		
239	TAVU	Tanacetum vulgare L.	common tansy	Asteraceae	yes	
240	TAOF	Taraxacum officinale G.H. Weber ex Wiggers	common dandelion	Asteraceae	yes	
241	TABR2	Taxus brevifolia Nutt.	Pacific yew	Taxaceae		
242	TEGR2	Tellima grandiflora (Pursh) Dougl. ex Lindl.	bigflower tellima	Saxifragaceae		
243	THOC	Thalictrum occidentale Gray	western meadow-rue	Ranunculaceae		
244	THPL	Thuja plicata Donn ex D. Don	western red cedar	Cupressaceae		
245	TITR	Tiarella trifoliata L.	threeleaf foamflower	Saxifragaceae		
246	TOME	Tolmiea menziesii (Pursh) Torr. & Gray	youth on age	Saxifragaceae		
247	TODI	Toxicodendron diversilobum (Torr. & Gray) Greene	Pacific poison oak	Anacardiaceae		
248	TRDU2	Trifolium dubium Sibthorp	suckling clover	Fabaceae	yes	
249	TRMI4	Trifolium microcephalum Pursh	smallhead clover	Fabaceae		
250	TRPR2	Trifolium pratense L.	red clover	Fabaceae	yes	
251	TRRE3	Trifolium repens L.	white clover	Fabaceae	yes	
252	TROV2	Trillium ovatum Pursh	Pacific trillium	Liliaceae		
253	TRPE4	Triodanis perfoliata (L.) Nieuwl.	clasping Venus' looking-glass	Campanulaceae		
254	ULMUS	Ulmus L.	elm	Ulmaceae	yes	
255	URDI	Urtica dioica L.	stinging nettle	Urticaceae		
256	VAHE	Vancouveria hexandra (Hook.) Morr. & Dcne.	white insideout flower	Berberidaceae		
257	VEBL	Verbascum blattaria L.	moth mullein	Scrophulariaceae	yes	
258	VETH	Verbascum thapsus L.	common mullein	Scrophulariaceae	yes	
259	VEAM2	Veronica americana Schwein. ex Benth.	American speedwell	Scrophulariaceae		
260	VESE	Veronica serpyllifolia L. ssp. serpyllifolia	thymeleaf speedwell	Scrophulariaceae	yes	
261	VISA	Vicia sativa L.	garden vetch	Fabaceae	yes	
262	VITE	Vicia tetrasperma (L.) Schreb.	lentil vetch	Fabaceae	yes	
263	VIMA	Vinca major L.	bigleaf periwinkle	Apocynaceae	yes	
264	VIGL	Viola glabella Nutt.	pioneer violet	Violaceae		
265	VIOD	Viola odorata L.	sweet violet	Violaceae	yes	
266	VIRI	Vitis riparia Michx.	riverbank grape	Vitaceae	yes	
267	VUBR	Vulpia bromoides (L.) S.F. Gray	brome fescue	Poaceae	yes	
268	XAST	Xanthium strumarium L.	rough cockleburr	Asteraceae		

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 ***except*** 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.