Vegetation Inventory and Mapping of Milo McIver State Park

Pacific Biodiversity Institute

Vegetation Inventory and Mapping of Milo McIver State Park

Hans M. Smith IV
hans@pacificbio.org

and

Peter H. Morrison
pm@pacificbio.org

June 2008

Pacific Biodiversity Institute
P.O. Box 298
Winthrop, Washington 98862
509-996-2490

Recommended Citation

Smith, H.M. IV, Morrison, P.H. 2008. Vegetation Inventory and Mapping of Milo McIver State Park. Pacific Biodiversity Institute, Winthrop, Washington. 68 p.

Acknowledgements

Sarah Schrock, Tobias Policha, and Stephanie Schroeder assisted with the field surveys for this project. Juliet Rhodes and Lin Kyan helped manage the large amount of data collected during these surveys. Photos were taken by Hans Smith and Sarah Schrock.

Project Funding

This project was completed under contract with the Oregon Parks and Recreation Department (Personal Services Contract #07-400).

Table of Contents

Executive Summary

Milo McIver State Park comprises almost 1000 acres of active river channel, old floodplain terraces, and upland slopes in the Clackamas River Valley near Estacada, OR.

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. Historic maps described the park area as being Douglas-fir dominated conifer forest before European settlement. Geological evidence and deduction from existing vegetation conditions suggests that vegetation communities in the park were more complex and that a mosaic of forested wetland communities dominated by deciduous trees also existed in historic times, much as they still do today. Active natural disturbance cycles from periodic landslides to annual flooding and long-term channel migration constantly impacted and changed the amount and distribution of historic vegetation communities, and these processes continue still. Historic and modern settlement and development in the area brought about large scale vegetation community changes in the park. All of the upland late successional forests were lost to logging and agricultural and grazing land development. Dam construction along the Clackamas River has altered historic hydrologic patterns and disturbance events, impacting the park's wetlands and riparian areas.

Current vegetation patterns depict the effects of the park's historic natural and human caused disturbances. Most of the park is forested with a patchy mosaic of young to mid-aged mixed conifer upland forests and mixed deciduous upland and wetland forests in varying conditions. A large portion of the park (nearly one third) is developed in the sense that the native forest communities have been removed and either park infrastructure and/or remnant fields have taken their place. The riparian river side communities of the park are mostly in poor to marginal condition due to development and exotic plant presence. The condition of communities outside of the river riparian areas varies widely. Areas nearest to developed sites, including the park's road system, tend to have the worst conditions while areas away from development tend to be in better condition. Some native vegetation community patches in excellent condition do exist within the park. Site conditions related to topographic variation seem to heavily influence vegetation community abundance and distribution.

Overall vascular plant diversity is relatively high in the park due to the abundance of variable habitat types and conditions. Exotic plant presence adds considerably to the amount of species diversity. 319 plant species were identified during field surveys, with 34% of identified plants being known exotics.

Infestations by Class A and B noxious weeds are abundant in some of the park's native vegetation communities. These infestations threaten to expand and diminish the ecological condition in more of the park in the near future. Infestations by false brome are the most severe for this suite of noxious plants. Himalayan blackberry and reed canarygrass also have severe infestations within the park.

A small population of tall bugbane (*Actaea elata* [*Cimicifuga elata*]) was located in the park near the fish hatchery. Much more potential habitat for tall bugbane exists within the park although no additional populations were encountered. Potential habitats for *Delphinium nuttallii ssp. ochroleucum*, *Lathyrus holochlorus*, and *Botrychium montanum* also occur within the park, but these species were not sighted.

Opportunities to restore native vegetation communities and control exotic and noxious weeds exist within the park. Control of the meadow hawkweed infestation near the model airplane field should be implemented immediately. Limiting and prohibiting development and other activities that would disturb native vegetation communities currently in excellent or good condition may help reduce the spread of exotic plants. Cutting, digging, and spraying exotic plant invasions in suitable areas may reduce and/or control some infestations, and following up treatments by aggressively planting native species is recommended. Certain infestations lending themselves to reasonably easy access along the park's road and trail system should be prioritized for control activities.

Study Area

Milo McIver State Park comprises almost 1000 acres of active river channel, old floodplain terraces, and upland slopes in the Clackamas River Valley near Estacada, OR. The park is completely surrounded by farmlands, residential development, and the Clackamas River. Park users enjoy hiking and equestrian use of the extensive network of trails, as well as camping, model airplane flying, swimming and rafting, and Frisbee golf within designated areas. The park possesses many large grassy fields suitable for various recreation activities.

Much of the Milo McIver State Park is forested with a mix of early to mid-successional upland conifer forests and broadleaf wetland/riparian forests. Topography within the park is diverse, with a mix of flat to gently sloping terraces, steep inter-terrace slopes, and large landslide deposits with undulating terrain. The substrate within the park ranges from silt loams to unconsolidated alluvial deposits and in a few places bedrock. Many small to midsize streams flow through the park in a general west to east direction and a vast array of swamps and vernal wetlands occur. Figure 1 illustrates the layout of Milo McIver State Park.

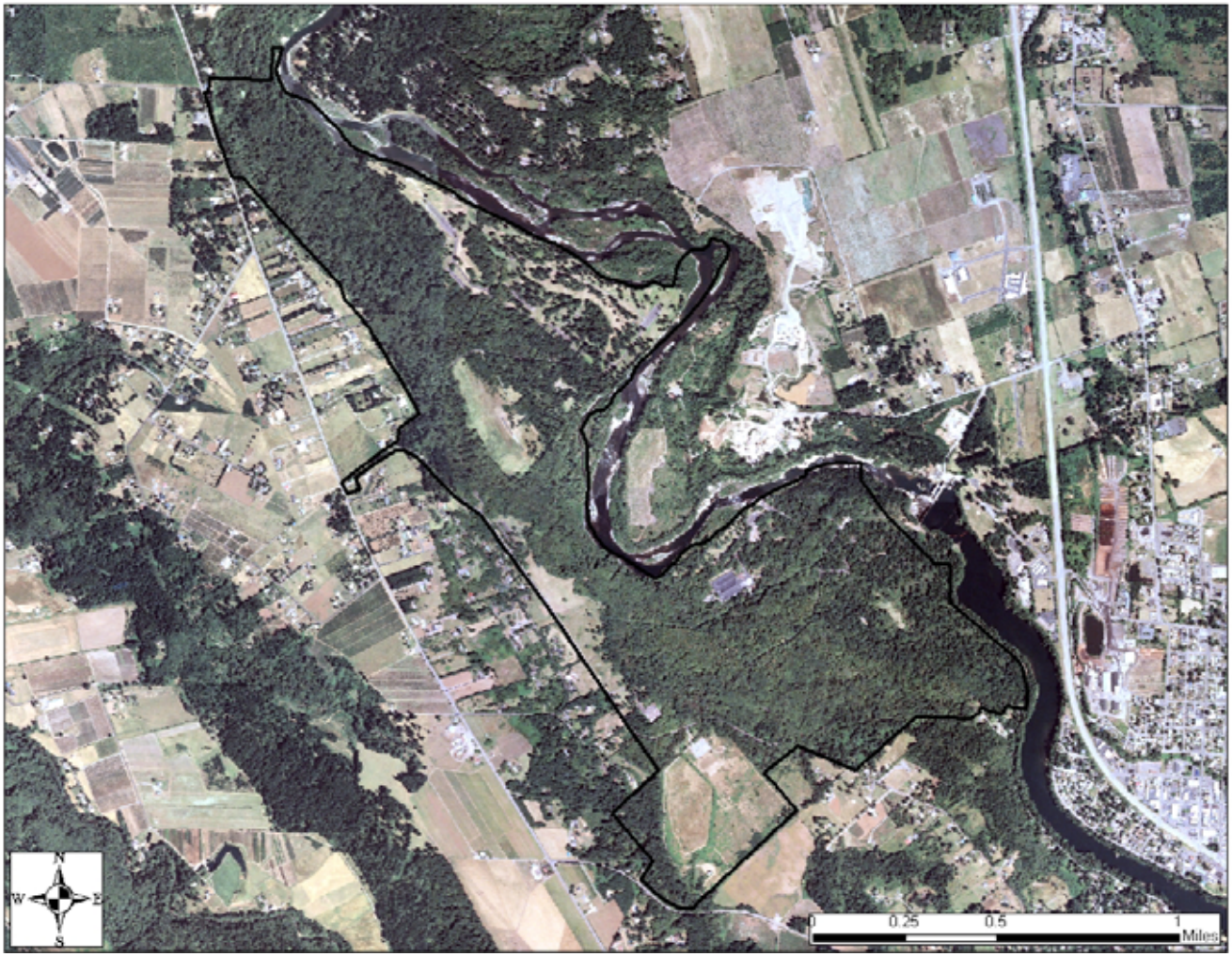

Figure 1. A map showing the boundaries of Milo McIver State Park overlaying a recent color aerial photograph.

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 polygon's 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 topographic (aspect, slope, elevation) and hydrologic information, and we map vegetation communities with significantly different understory composition as separate polygons. We also break vegetation communities into separate polygons when there are significant differences in alien plant composition, disturbance history or current human use.

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

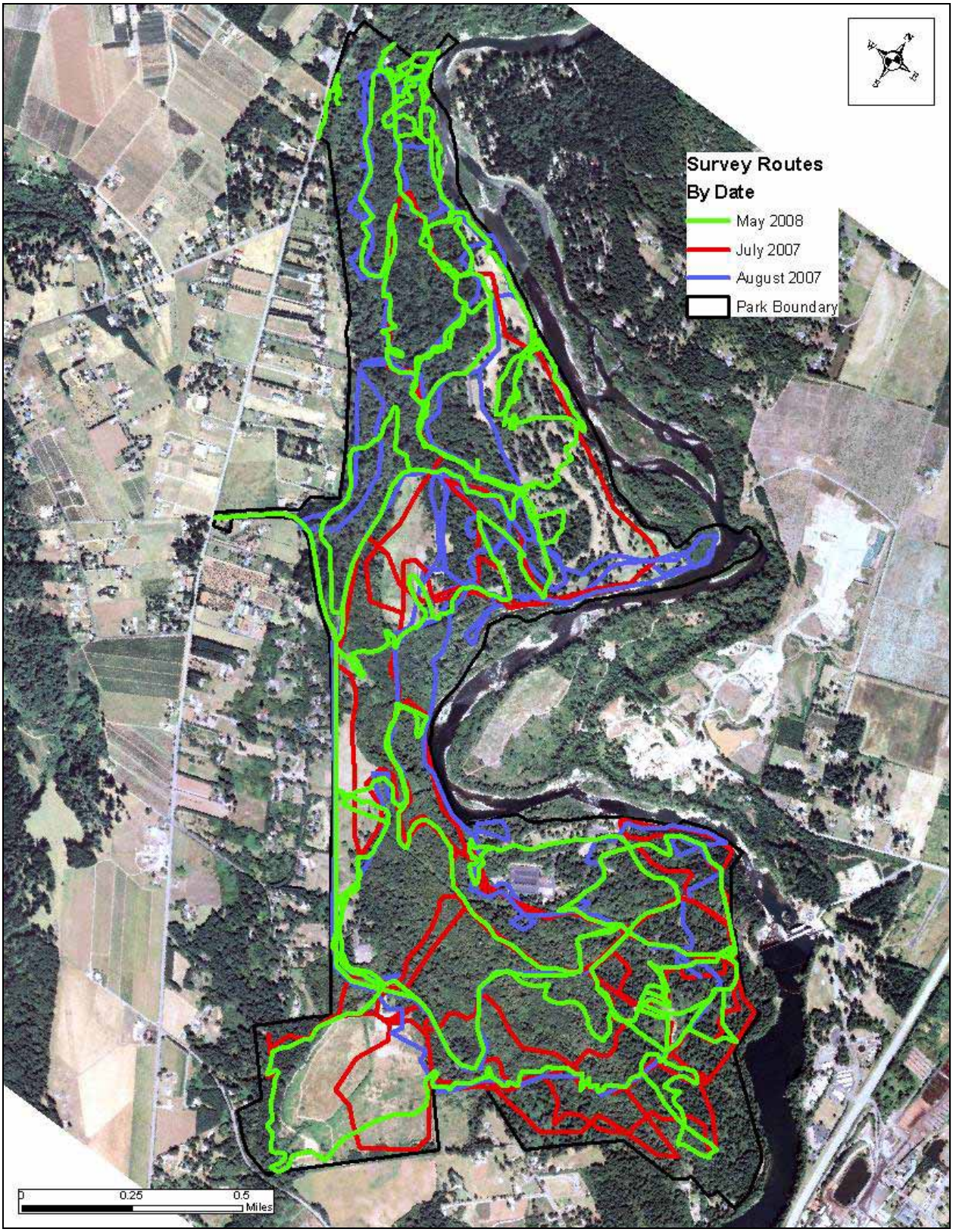

Figure 2. Field survey routes for July and August 2007 and May 2008.

Results

Historical Vegetation Patterns

According to Oregon Natural Heritage and Information Center's map of pre-settlement vegetation most of the area within and surrounding Milo McIver State Park was Douglas-fir dominated conifer forest (Tobalske, 2002). While accurate as a gross generalization, this map should be looked at as an over simplification of the actual diversity of vegetation communities that occurred historically in the project area.

Given the presence of the Clackamas River along the eastern boundary of the park, and the geological evidence of old river cobble, silt deposits, and general topographical features, it is obvious that riparian forests, probably dominated by deciduous trees, also occurred historically throughout many areas of the park. Using contemporary LIDAR imagery displayed as a shaded relief image, it is easy to see the old floodplain terraces which make up a good portion of the park's substrate (Figure 4). These terraces consist of unconsolidated alluvium that still harbors many wetlands and swamps with a deciduous forest overstory. It is reasonable to assume the active floodplains and wetlands on old floodplain terraces were not simply Douglas-fir forests and that their composition was similar to some of the mixed coniferous/deciduous wetland and riparian forests occurring in the park today.

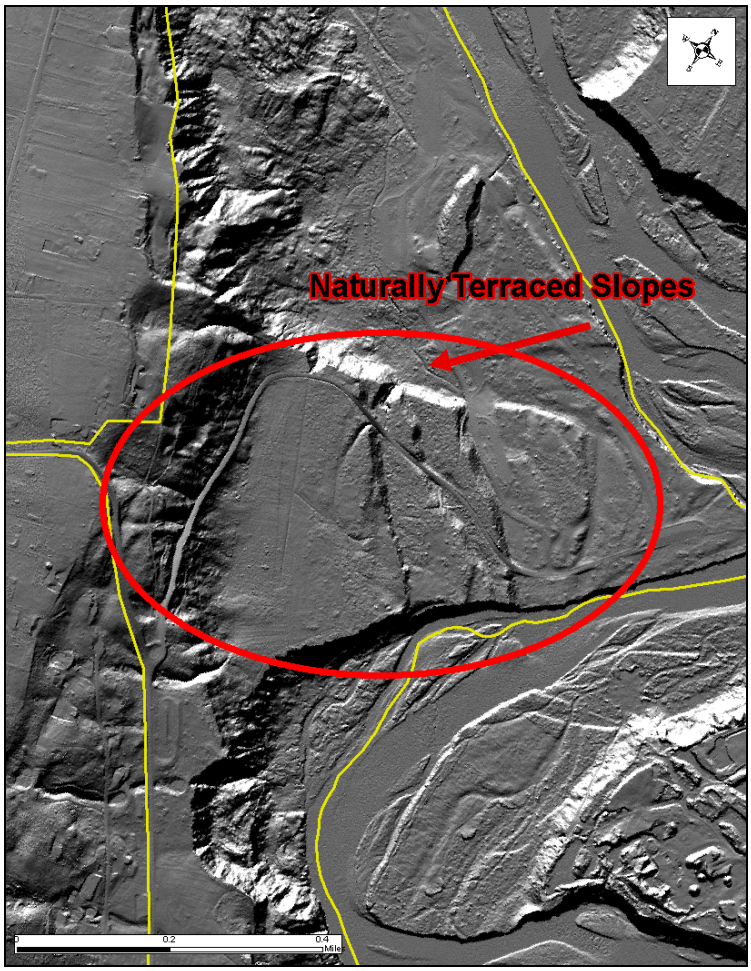

Figure 4. Example of the old floodplain terraces apparent in hillshaded LIDAR imagery. The area depicted includes the model airplane strip and surrounding field and two more minor terraces below.

The geological substrate within Milo McIver State Park is quite geomorphologicaly active given the mix of steep, unconsolidated bluffs above the deeply downcut valley bottom and the large, active river channel at the base. These topographic and substrate conditions lend themselves to active landslide activity and chronic slope erosion. There is ample evidence of many large-scale historic and more recent landslides in many areas of the park, and smaller, less apparent slope failure events are occurring frequently, which is probably consistent with historic conditions. Figure 5 uses the same contemporary LIDAR imagery to illustrate some of the large historic landslide features that occur in the park.

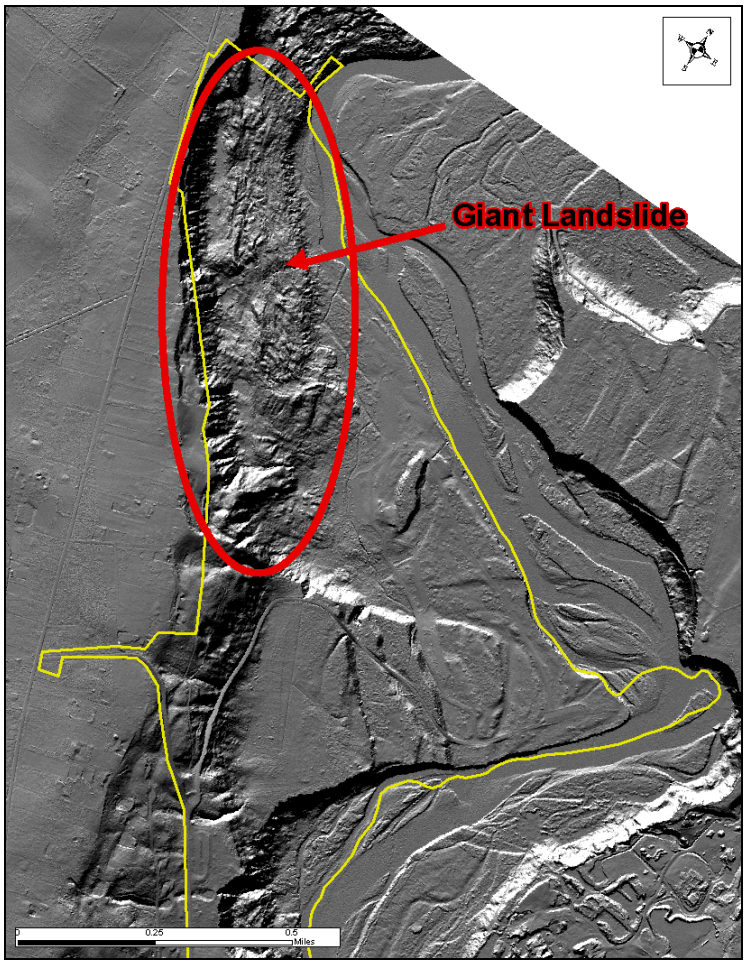

Figure 5. Example of a large historic landslide and landslide deposit in the northwest section of the park.

The meandering Clackamas River, the old floodplain terraces, landslide activity and old landslide deposits provided a diversity of disturbances and conditions within Milo McIver State Park that probably begot many large-scale vegetation changes between late successional upland conifer forests, deciduous forest swamps and wetlands, and young forests recolonizing after a large-scale disturbance. The nature of the landslide deposits and old floodplain terraces provide many opportunities for the formation of small wetland features that occur haphazardly throughout the upland park landscape. This mosaic of small wetland features probably occurred historically as well.

Apart from natural disturbance events, human activities have historically affected the vegetation communities within the park as well. Essentially all of the historic conifer forests were significantly altered in the park and the surrounding area by post-settlement logging and agricultural development. The old-growth forests were lost and replaced by young successional conifer and deciduous forest stands. Eventually some were subsequently replaced by weedy fields that had been used for agriculture and/or grazing. Figures 6 and 7 illustrate both an impressive remnant of the historic conifer forests that once occurred in the park and the evidence of human disturbance that altered the park's vegetation communities into a matrix of mostly mid-aged mixed conifer-deciduous forests.

Figure 6. A remnant giant Douglas-fir in the park.

Figure 7. An old Douglas-fir stump depicts the logging history in the park.

Along with logging and agricultural development, dam development along the Clackamas River has most certainly altered the historic flooding and channel migration patterns, which has probably changed many of the riparian communities in recent decades.

Current Vegetation Patterns and Conditions

Given the abundance of disturbance history and landscape change undergone by the vegetation communities in Milo McIver State Park, much of the park still possesses abundant native plant diversity and some exemplary regenerated native plant communities. While a large portion (about 1/3 of the area) of the park has been converted into recreational infrastructure which does not resemble historic vegetation conditions, many undeveloped areas maintain mostly native plant composition and are on a successional trajectory toward late-successional forest conditions which will probably more closely resemble historic conditions. The park still possesses floodplain shrublands and deciduous forests, old floodplain terrace mixed-conifer forests and deciduous forest wetlands, steep hillside mixed deciduous / conifer forests, and many small perennial and vernal wetlands of largely native species composition mixed in among the undulating topography of the old landslide deposits. Based on our analysis of aerial photography and subsequent field surveys, 170 vegetation community polygons were mapped and surveyed within the project area (Figure 8 and 9), and 200 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 viewed through the lense of predicted climax vegetation associations, these seemingly high amounts of vegetation community diversity become significantly reduced. Only 23 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 200 current vegetation descriptions down to 22 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 23 plant associations and 22 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 22 existing vegetation classes relate to the 23 published plant association classes.

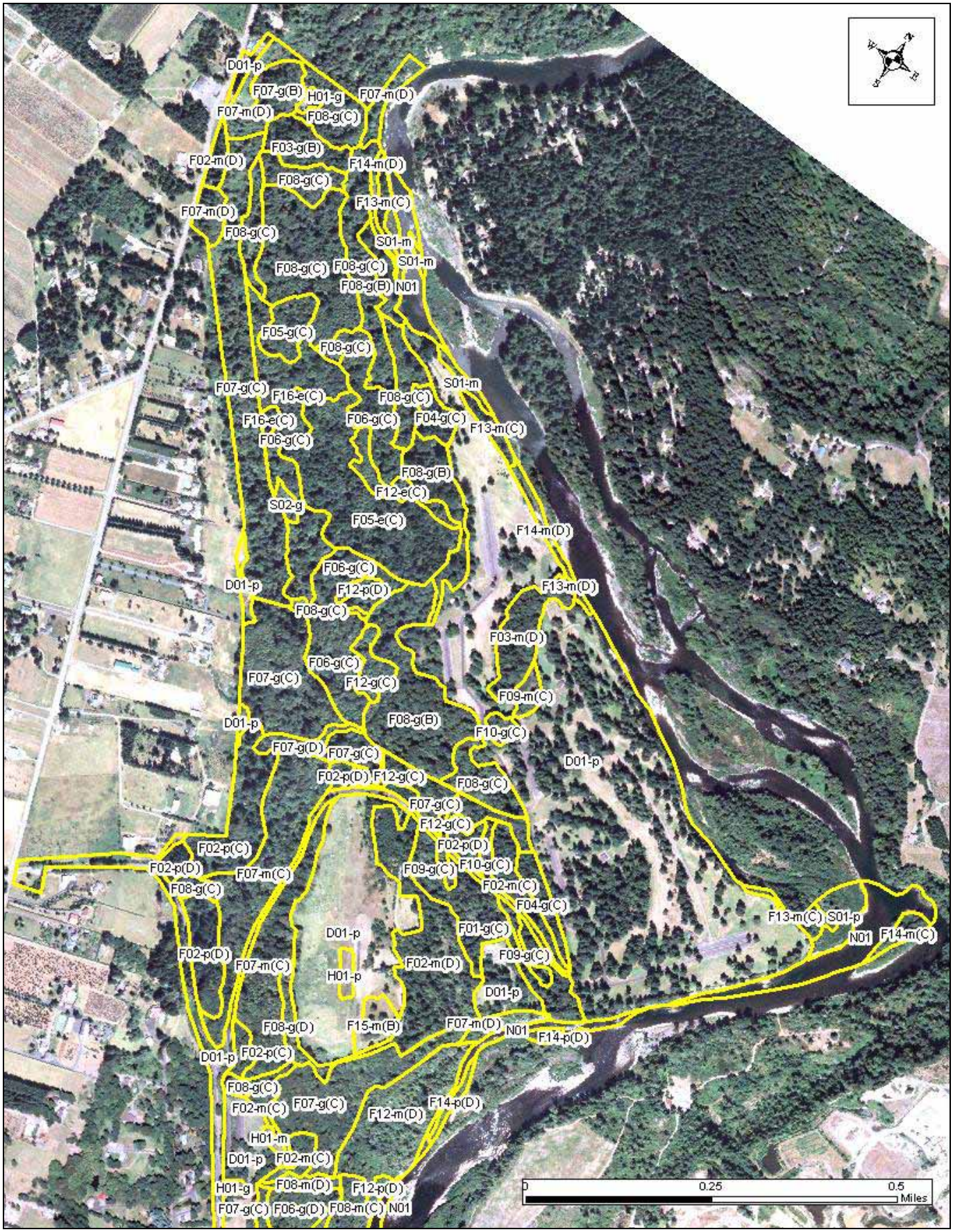

Figure 8. Map depicting the layout of the 170 digitized vegetation community polygons within the north section of the park.

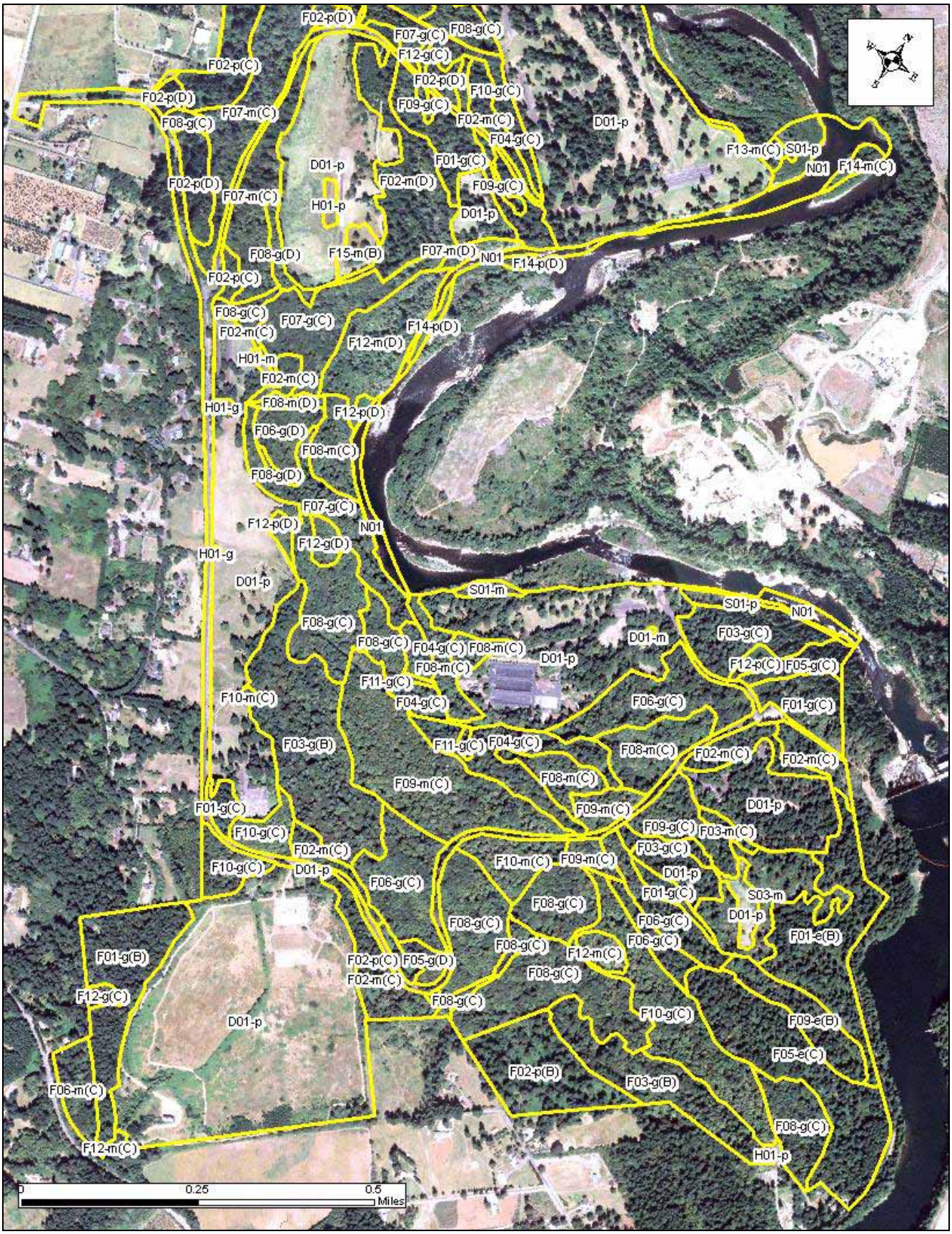

Figure 9. Map depicting the layout of the 170 digitized vegetation community polygons within the south section of the park.

Table 1. Table showing how the 22 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 Plant Association	Rank
F01	PSEMEN-(ACEMAC)/Mixed shrubs/POLMUN-Mixed herbs	PSEMEN/CORCOR-SYMALB/POLMUN (Kagan, 2004)	~G3S3
F02	PSEMEN-(Mixed trees)/Mixed shrubs-(RUBARM)/Mixed herbs-(BRASYL)	PSEMEN/CORCOR-SYMALB/POLMUN (Kagan, 2004)	~G3S3
F03	Mixed conifer-ACEMAC/CORCOR-(ACECIR)-Mixed shrubs/POLMUN-Mixed herbs	THUPLI-TSUHET/CORCOR/POLMUN (Kagan, 2004)	~G2S1
F04	THUPLI-ACEMAC-(PSEMEN)/ACECIR-Mixed shrubs/POLMUN-OXATRI	THUPLI-TSUHET/OXAORE (Kagan, 2004)	~G3S2
F05	Mixed conifer-(ACEMAC)/CORCOR-MAHNER-Mixed shrubs/POLMUN-Mixed herbs	THUPLI-TSUHET/MAHNER (Kagan, 2004)	~G3S1
F06	ACEMAC-(ALNRUB)-(Mixed conifer)/RUBSPE-(ACECIR)-mixed shrubs/URTDIO-(POLMUN)-mixed herbs	ACEMAC-PSEMEN/ACECIR/POLMUN (Kagan, 2004)	~G4S4
F07	ACEMAC-(ALNRUB)-(Mixed conifer)/CORCOR-mixed shrubs/POLMUN-mixed herbs	ACEMAC-PSEMEN/CORCOR/HYDTEN (Kagan, 2004)	~G2S2
		ACEMAC-ALNRUB/POLMUN-TELGRA (Kagan, 2004)	~G2G3
F08	Mixed deciduous-(THUPLI)/RUBSPE-ACECIR-mixed shrubs/wetland herbs	ACEMAC/URTDIO (Kagan, 2004)	~G4S4
		ACEMAC-PSEMEN/ACECIR/POLMUN (Kagan, 2004)	~G4S4
		ACEMAC-PSEMEN/CORCOR/HYDTEN (Kagan, 2004)	~G2S2
		ALNRUB/RUBSPE (Kagan, 2004)	~G5S4
		Hardwood/RUBSPE/HYDTEN (McCain/Christy, 2005)	~G3S3
		POPBAL-ALNRUB/SYMALB (Kagan, 2004)	~G3S3
		THUPLI-(ALNRUB)/RUBSPE/OXAORE (Kagan, 2004)	~G3S2
F09	FRALAT-(Mixed deciduous)/SYMALB-(ACECIR)/CAROBN-Mixed herbs	SYMALB/URTDIO-FRALAT/SAMRAC-CORCOR phase (McCain/Christy, 2005)	~G4S4
F10	FRALAT/SYMALB-(ACECIR)/CAROBN-Mixed herbs	FRALAT/CAROBN (McCain/Christy, 2005)	~G4S4
F11	THUPLI-ALNRUB/RUBSPE-(SAMRAC)/ATHFIL-TOLMEN	THUPLI-(ALNRUB)/RUBSPE/OXAORE (Kagan, 2004)	~G3S2
F12	ALNRUB/RUBSPE-(ACECIR)/URTDIO-Mixed herbs	ALNRUB/RUBSPE (Kagan, 2004)	~G5S4

OPRD Code	Existing Vegetation Community Class	Equivalent Plant Association	Rank
F13	POPBAL-(ALNRUB)/mixed shrub-(RUBARM)/PHAARU-Mixed herbs	POPBAL-ALNRUB/SYMALB (Kagan, 2004)	~G3S3
F14	ALNRUB/SALSIT-CORSER-(RUBARM)/weedy grasses-LOTCOR	ALNRUB/CORSER/westside forb (Kagan, 2004)	~GUSU
F15	QUEGAR/SYMALB/CAMQUA-FESARU	QUEGAR/SYMALB/POLMUN (Kagan, 2004)	~G1S1
F16	THUPLI/ATHFIL	THUPLI/ATHFIL (Kagan, 2004)	GUSU
S01	(POPBAL)/(SALSIT)-Mixed shrubs/weedy grasses	SALSIT (Kagan, 2004)	~G4S4
S02	SALSIT-CORSER-SPIDOU	CORSER-Salix spp. (Kagan, 2004)	~G3S3
S03	AMAALN-HOLDIS-Mixed shrubs/Mixed herbs	none	
H01	wetland herbaceous	LEMMIN (Kagan, 2004)	~G5S5
		JUNEFF (Kagan, 2004)	~G5S5
		TYPLAT (Kagan, 2004)	~G5S5
		OENSAR (Kagan, 2004)	~G4S4
D01	Developed / Disturbed	none	
N01	water	none	

Not all of the 22 existing vegetation communities or 23 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). 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 in a polygon.

OPRD Code	Existing Vegetation Community Class	Acres	Polygons	Percent of Area
F01	PSEMEN-(ACEMAC)/Mixed shrubs/POLMUN-Mixed herbs	48.95	6	5%
F02	PSEMEN-(Mixed trees)/Mixed shrubs-(RUBARM)/Mixed herbs-(BRASYL)	65.54	17	7%
F03	Mixed conifer-ACEMAC/CORCOR-(ACECIR)-Mixed shrubs/POLMUN-Mixed herbs	53.86	7	6%
F04	THUPLI-ACEMAC-(PSEMEN)/ACECIR-Mixed shrubs/POLMUN-OXATRI	17.27	5	2%
F05	Mixed conifer-(ACEMAC)/CORCOR-MAHNER-Mixed shrubs/POLMUN-Mixed herbs	44.32	5	5%
F06	ACEMAC-(ALNRUB)-(Mixed conifer)/RUBSPE-mixed shrubs/URTDIO-(POLMUN)-mixed herbs	38.53	6	4%

OPRD Code	Existing Vegetation Community Class	Acres	Polygons	Percent of Area
F07	**ACEMAC-(ALNRUB)-(Mixed conifer)/CORCOR-mixed shrubs/POLMUN-mixed herbs**	**105.41**	**17**	**11%**
F08	**Mixed deciduous-(THUPLI)/RUBSPE-ACECIR-mixed shrubs/wetland herbs**	**144.00**	**31**	**15%**
F09	FRALAT-(Mixed deciduous)/SYMALB-(ACECIR)/CAROBN-Mixed herbs	40.58	8	4%
F10	FRALAT/SYMALB-(ACECIR)/CAROBN-Mixed herbs	29.46	7	3%
F11	THUPLI-ALNRUB/RUBSPE-(SAMRAC)/ATHFIL-TOLMEN	0.63	2	0%
F12	ALNRUB/RUBSPE-(ACECIR)/URTDIO-Mixed herbs	23.47	14	2%
F13	POPBAL-(ALNRUB)/mixed shrub-(RUBARM)/PHAARU-Mixed herbs	3.77	4	0%
F14	ALNRUB/SALSIT-CORSER-(RUBARM)/weedy grasses-LOTCOR	4.97	5	1%
F15	QUEGAR/SYMALB/CAMQUA-FESARU	2.04	1	0%
F16	THUPLI/ATHFIL	0.55	2	0%
S01	(POPBAL)/(SALSIT)-Mixed shrubs/weedy grasses	7.03	6	1%
S03	SALSIT-CORSER-SPIDOU	0.64	1	0%
S04	AMEALN-HOLDIS-Mixed shrubs/Mixed herbs	9.38	1	1%
H01	wetland herbaceous	2.40	6	0%
N01	water	17.43	5	2%
D01	**Developed / Disturbed**	**308.19**	**14**	**32%**

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

Equivalent Published Plant Association	Acres	Polygons	Percent of Area
ACEMAC/URTDIO (Kagan, 2004)	16.76	3	2%
ACEMAC-ALNRUB/POLMUN-TELGRA (Kagan, 2004)	55.30	8	6%
ACEMAC-PSEMEN/ACECIR/POLMUN (Kagan, 2004)	80.79	10	8%
ACEMAC-PSEMEN/CORCOR/HYDTEN (Kagan, 2004)	69.99	12	7%
ALNRUB/CORSER/westside forb (Kagan, 2004)	4.97	5	1%
ALNRUB/RUBSPE (Kagan, 2004)	46.80	27	5%
CORSER-Salix spp. (Kagan, 2004)	0.64	1	0%
FRALAT/CAROBN (McCain/Christy, 2005)	29.46	7	3%

Equivalent Published Plant Association	Acres	Polygons	Percent of Area
Hardwood/RUBSPE/HYDTEN (McCain/Christy, 2005)	28.48	4	3%
JUNEFF (Kagan, 2004)	1.17	3	0%
LEMMIN (Kagan, 2004)	0.42	1	0%
POPBAL-ALNRUB/SYMALB (Kagan, 2004)	5.79	5	1%
PSEMEN/CORCOR-SYMALB/POLMUN (Kagan, 2004)	**114.49**	**23**	**12%**
QUEGAR/SYMALB/POLMUN (Kagan, 2004)	2.04	1	0%
SALSIT (Kagan, 2004)	7.03	6	1%
SYMALB/URTDIO-FRALAT/SAMRAC-CORCOR phase (McCain/Christy, 2005)	40.58	8	4%
THUPLI-(ALNRUB)/RUBSPE/OXAORE (Kagan, 2004)	11.90	5	1%
THUPLI/ATHFIL (Kagan, 2004)	0.55	2	0%
THUPLI-TSUHET/CORCOR/POLMUN (Kagan, 2004)	53.86	7	6%
THUPLI-TSUHET/MAHNER (Kagan, 2004)	44.32	5	5%
THUPLI-TSUHET/OXAORE (Kagan, 2004)	17.27	5	2%
TYPLAT (Kagan, 2004)	0.33	1	0%
none	335.48	21	35%

From these two tables it becomes apparent that a large portion of the park is disturbed and/or developed and no longer resembles a type of native plant community. It is also apparent that the ACEMAC-(ALNRUB)-(Mixed conifer)/CORCOR-mixed shrubs/POLMUN-mixed herbs and the Mixed deciduous-(THUPLI)/RUBSPE-ACECIR-mixed shrubs/wetland herbs forest communities, as well as the PSEMEN/CORCOR-SYMALB/POLMUN plant association are the dominant vegetation types in the park. The data expressed in these tables are spatially expressed in the following maps (Figures 10 – 15).

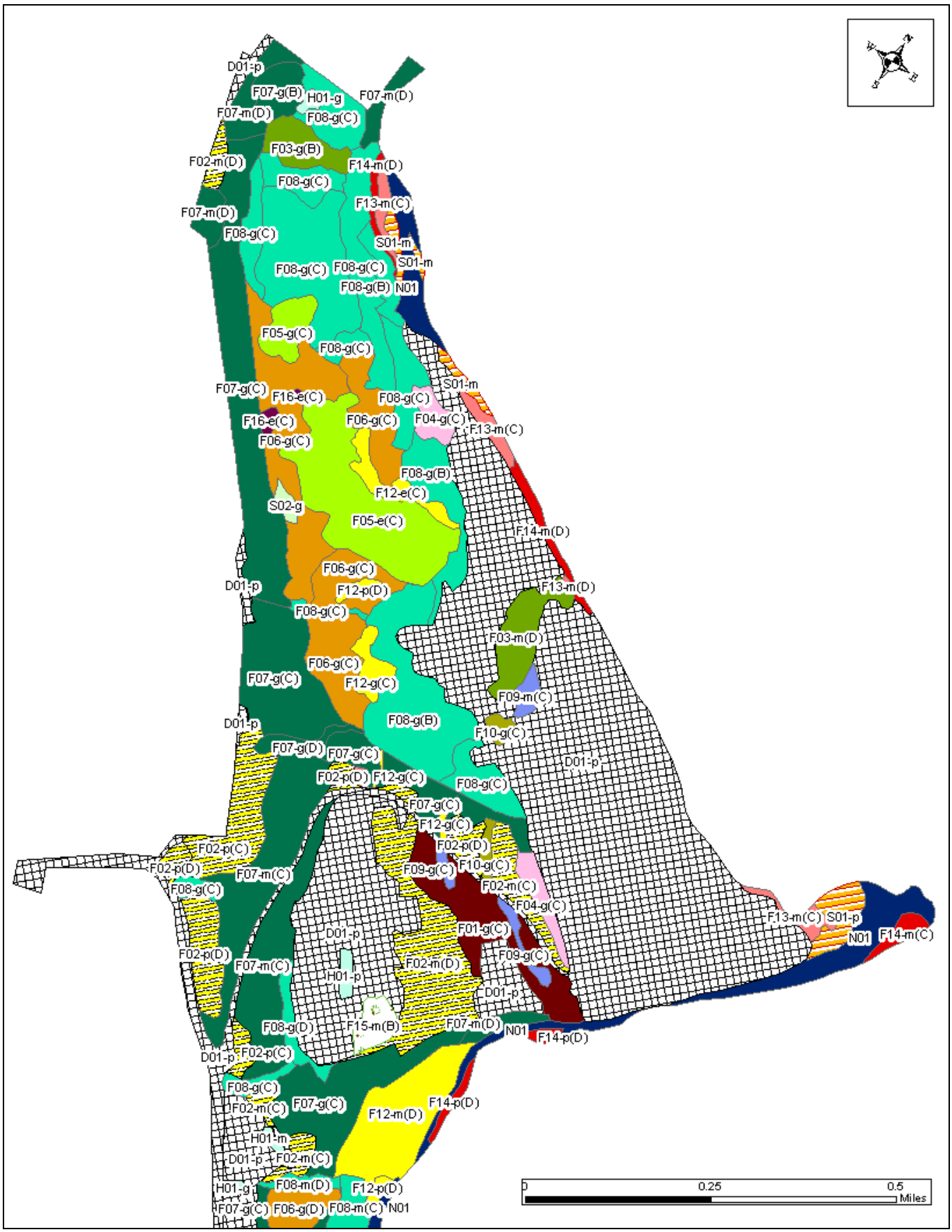

Figure 10. Map depicting the layout of the matrix existing vegetation community class for each polygon in the north section of the park.

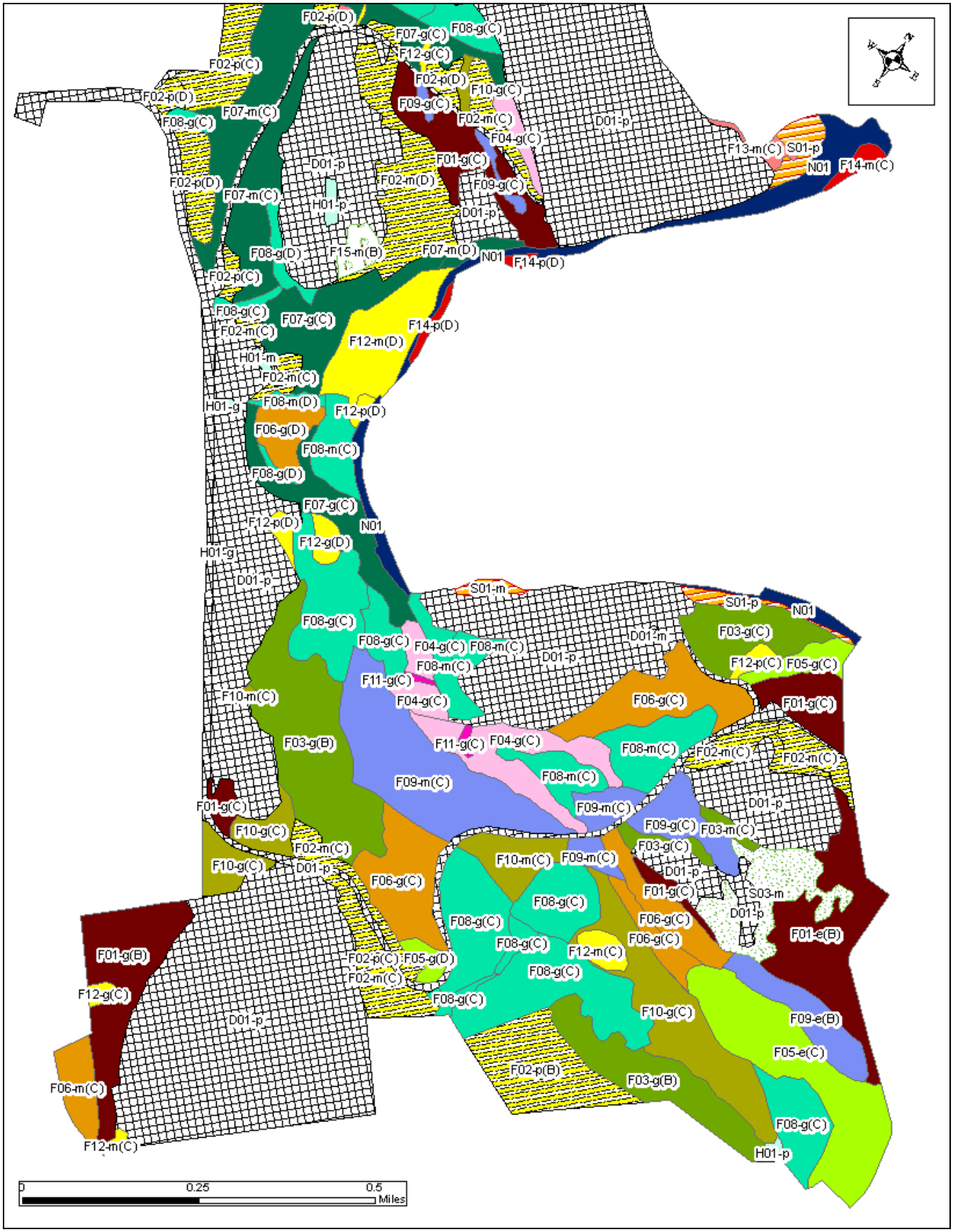

Figure 11. Map depicting the layout of the matrix existing vegetation community class for each polygon in the south section of the park.

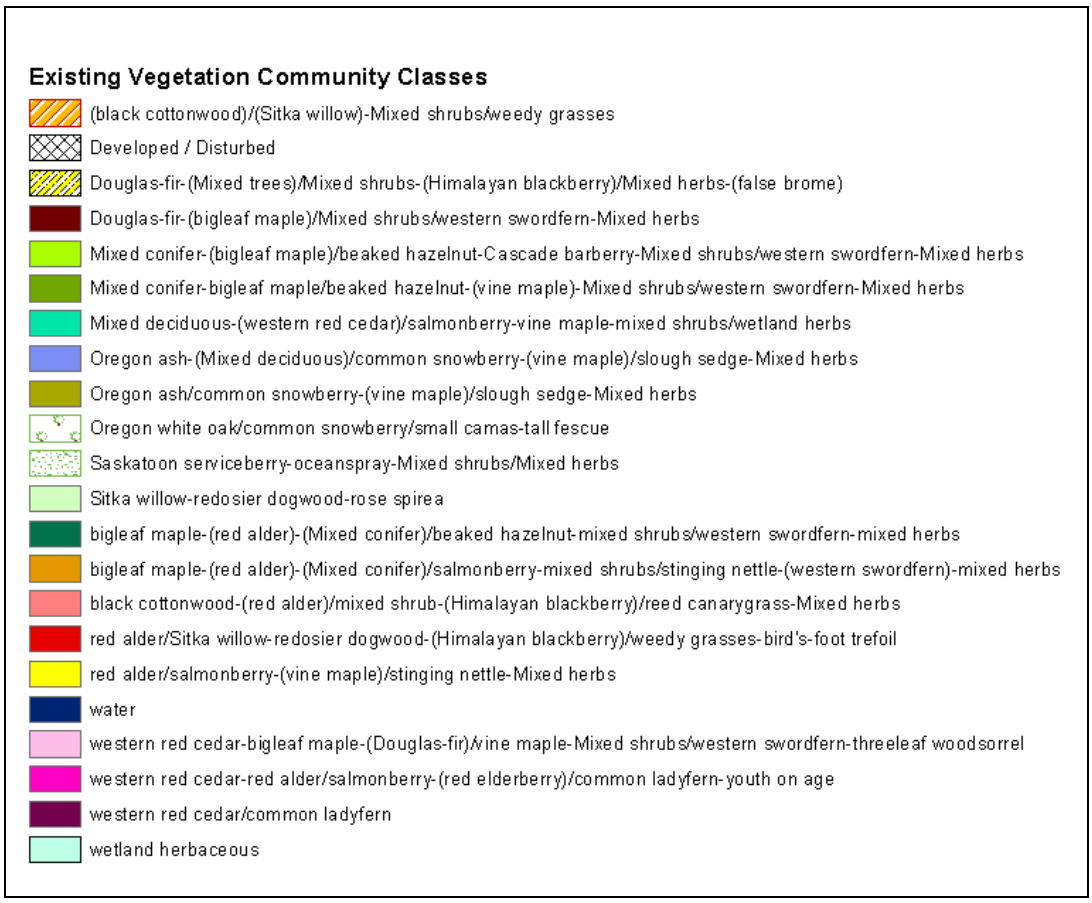

Figure 12. Color coded legend for Figures 10 and 11.

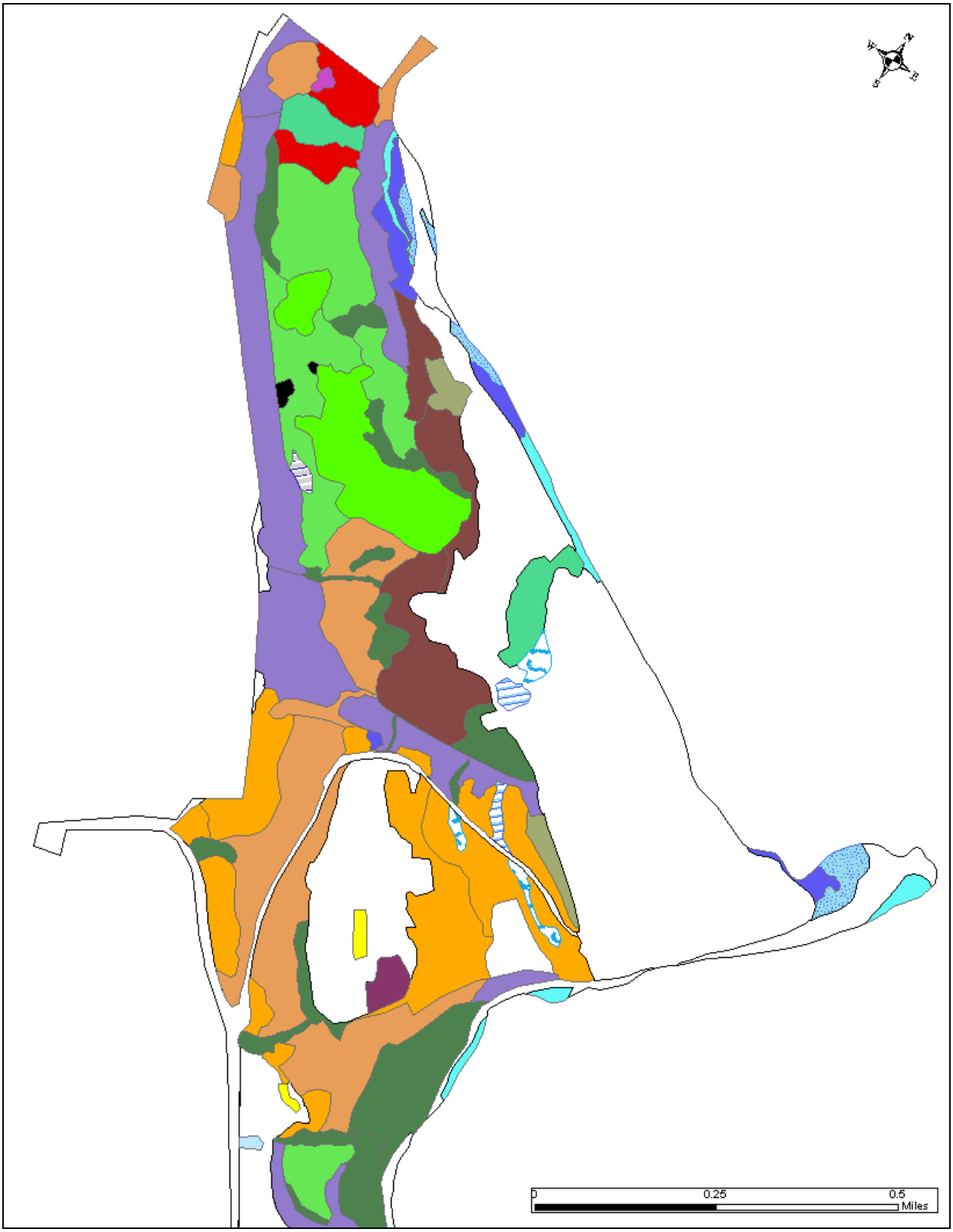

Figure 13. Map depicting layout of the matrix published plant association class for each polygon in the north section of the park.

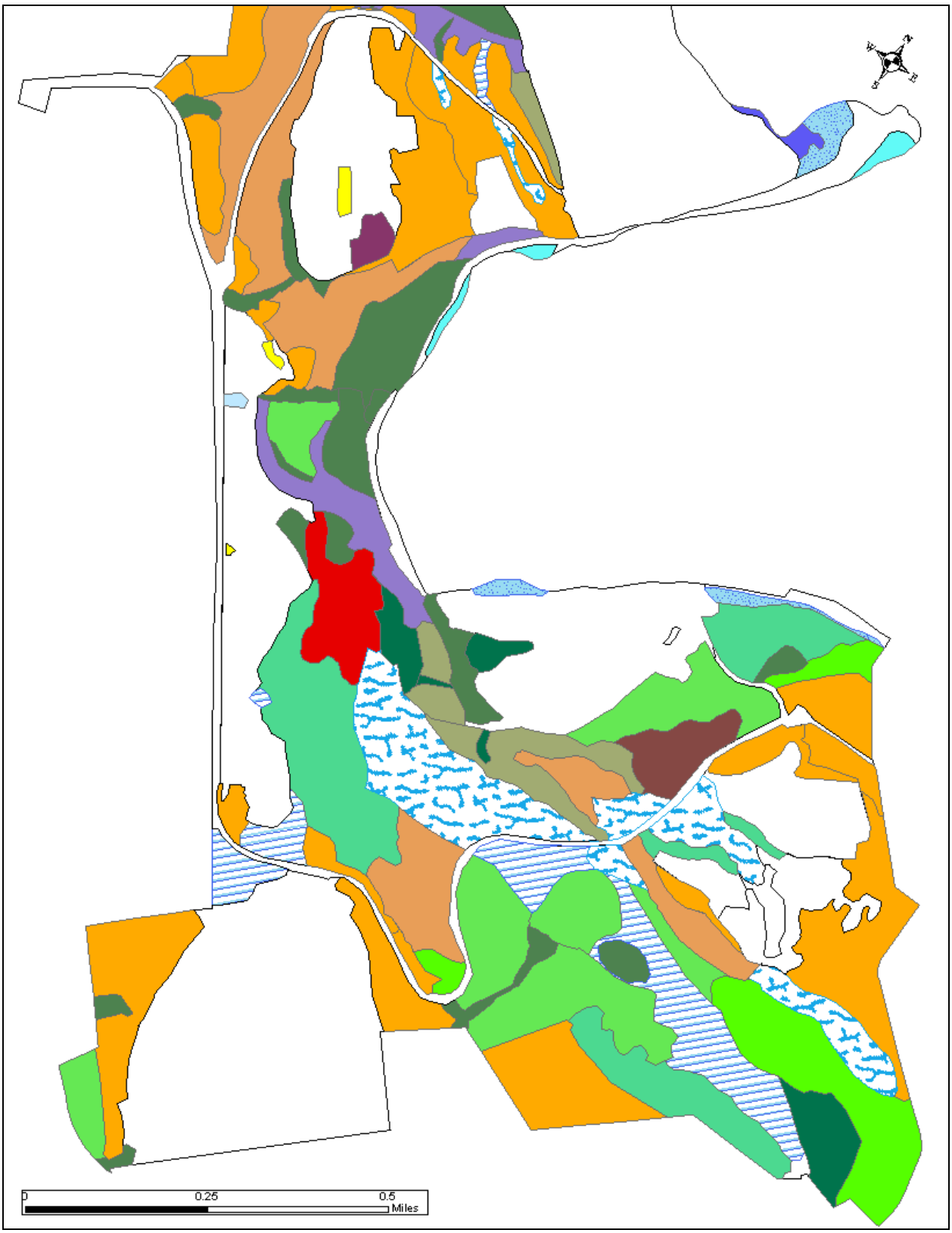

Figure 14. Map depicting layout of the matrix published plant association class for each polygon in the south section of the park.

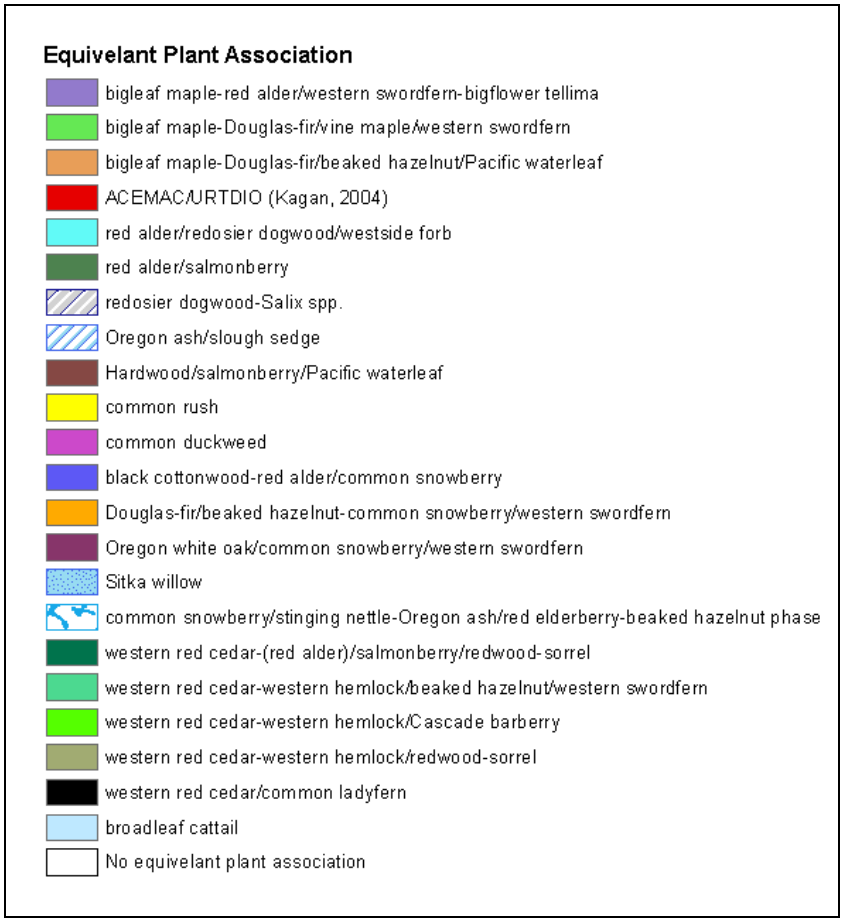

Figure 15. Color coded legend for Figures 13 and 14.

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 16 detail the abundance of each condition ranking in terms of overall condition of the matrix community.

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

Condition Class	Acres	Polygons	Percent of Area
Excellent	62.77	7	6%
Good	375.29	78	39%
Marginal	164.74	48	17%
Poor	40.17	19	4%
Not Assessed	325.48	18	34%

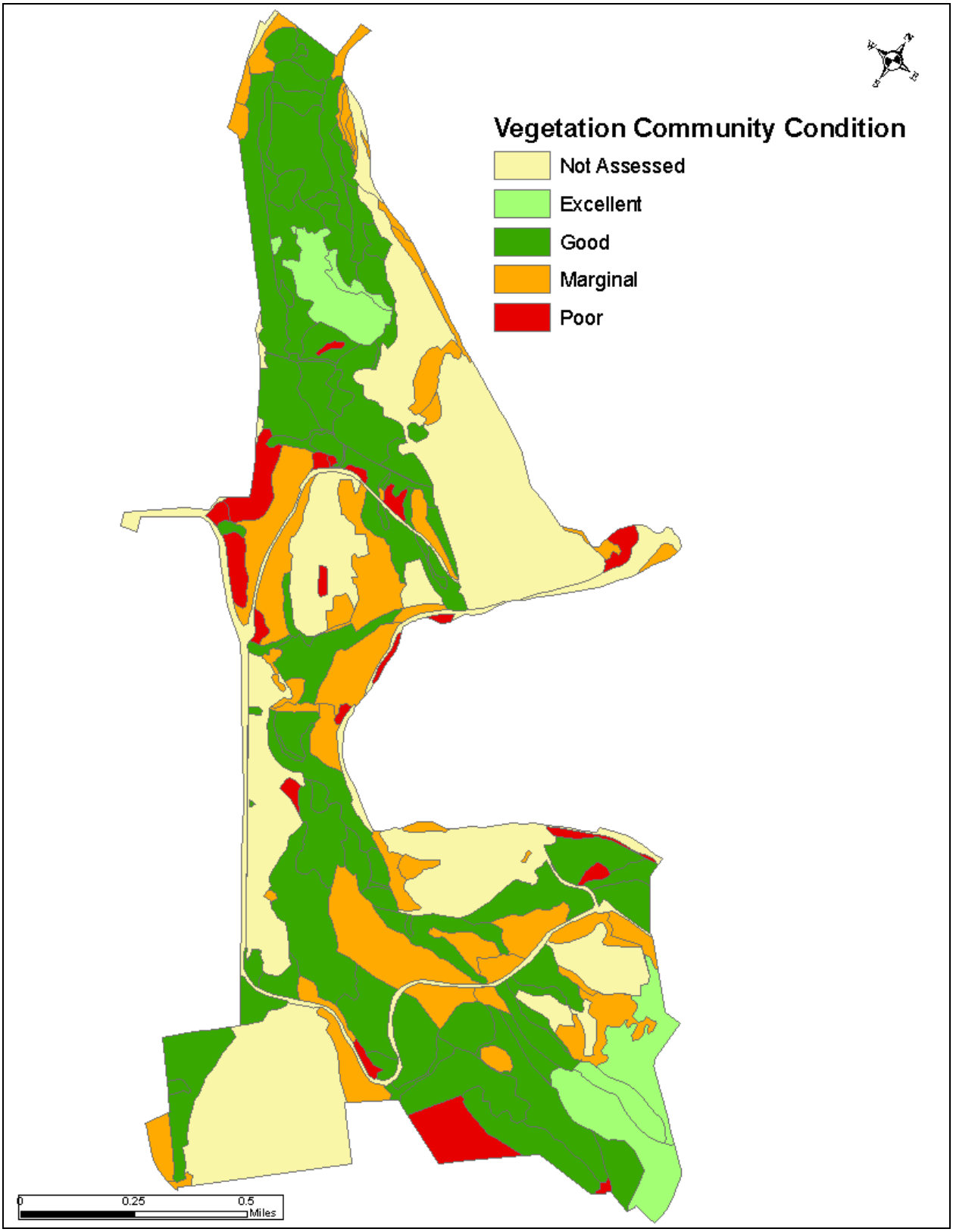

Figure 16. Map illustrating the overall polygon condition rankings.

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 17 illustrate the resulting distribution of suitability rankings by polygon. We have currently mapped the campground polygon in the south eastern portion of the park as suitability rank 2 because it contains patches of an S2 ranked forest community, but it is mostly developed, therefore may be best mapped as suitability rank 4.

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	477.65	112	49%
3	185.86	37	19%
4	287.50	16	30%
Water	17.43	78	2%

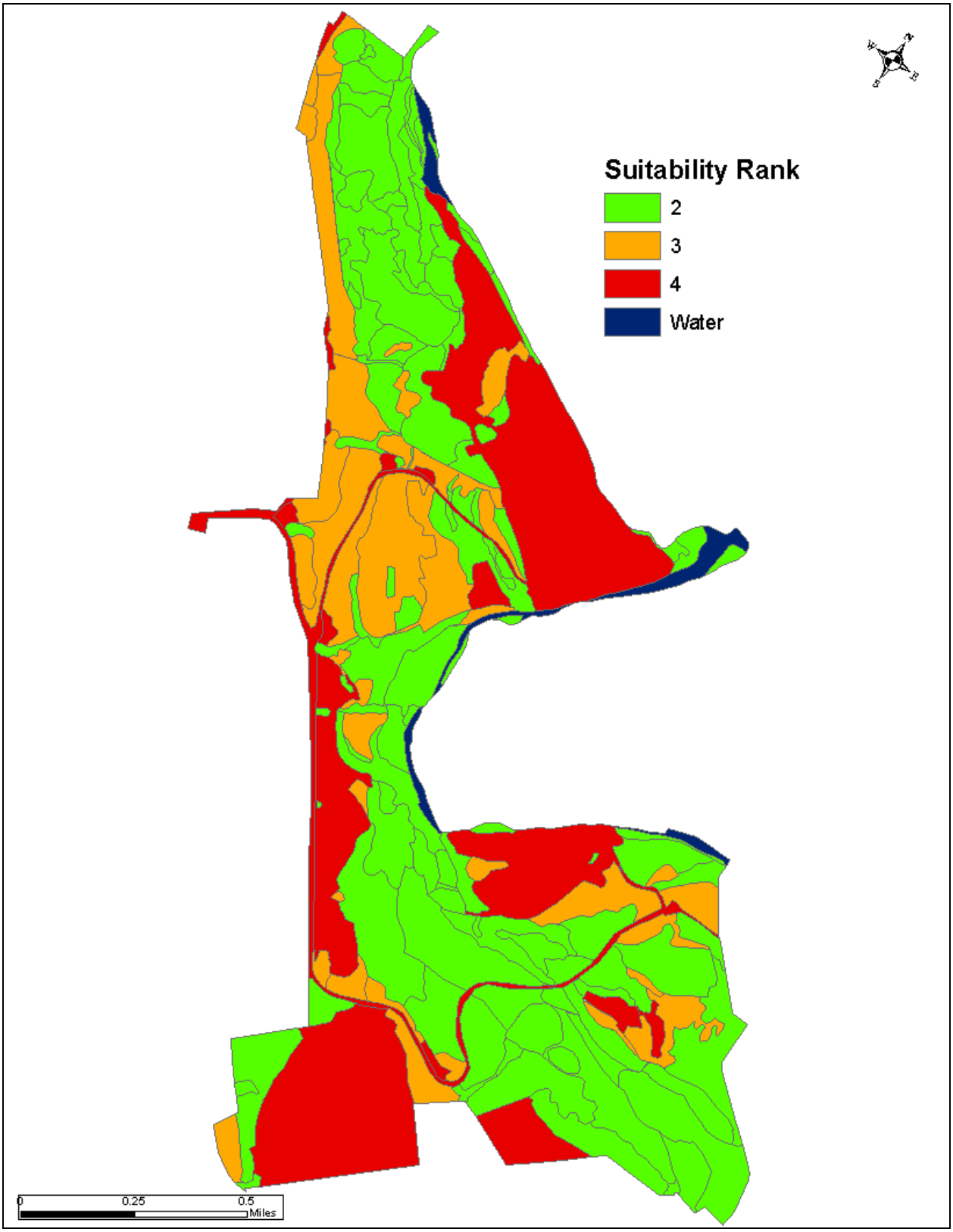

Figure 17. Map of the resulting plant community suitability ranks for each polygon.

The high percentage of suitability rank two reflects the abundance and large distribution of wetlands that exist within the park. Existing disturbed / developed areas make up the 30% of the park's area in suitability rank four.

Figure 18 illustrates the layout of polygons containing wetlands within the park.

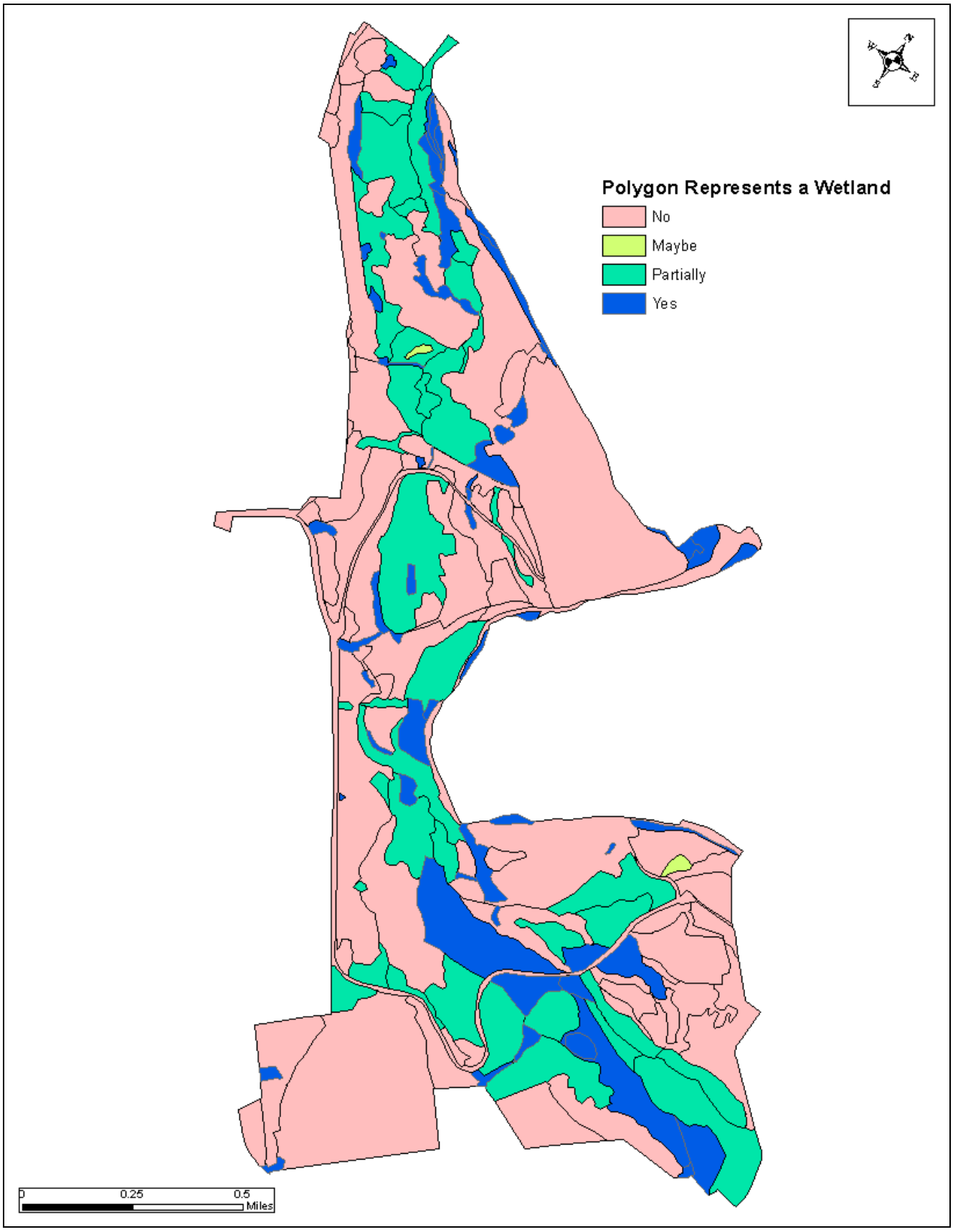

Figure 18. Layout of polygons containing wetlands within the park

Descriptions of Existing Vegetation Communities

F01: Douglas-fir-(bigleaf maple)/Mixed shrubs/western swordfern-Mixed herbs PSEMEN-(ACEMAC)/Mixed shrubs/POLMUN-Mixed herbs ~G3S3

This community is a variant of the PSEMEN/CORCOR-SYMALB/POLMUN plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This is an upland conifer forest plant association in which Douglas-fir is the dominant tree in the canopy, and is the only conifer tree in most cases. Shrub diversity is very high in this community with oceanspray, serviceberry, beaked hazelnut, vine maple, Indian plum, snowberry and Cascade barberry being common. Swordfern is the most common ground cover and native forb diversity is also high. While patches of this forest type are small within the park, they are mostly in good to excellent condition and should be protected from development.

F02: Douglas-fir-(Mixed trees)/Mixed shrubs-(Himalayan blackberry)/Mixed herbs-(false brome) PSEMEN-(Mixed trees)/Mixed shrubs-(RUBARM)/Mixed herbs-(BRASYL) ~G3S3

This community is a variant of the PSEMEN/CORCOR-SYMALB/POLMUN plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. Patches of this community have a forest canopy dominated by Douglas-fir, although the cohort age classes vary widely from polygon to polygon. Many other species of trees and/or shrubs and herbs may occur in this community type, but the exotic plant infestations that are bad to extreme are what separate this community from other conifer forest communities. In some polygons, Himalayan blackberry is a profuse understory plant, while in others false brome is profuse. Areas attributed as this community have been disturbed in recent times and exotic plants have become successfully established. These areas are good candidates for weed management and restoration activities.

F03: Mixed conifer-bigleaf maple/beaked hazelnut-(vine maple)-Mixed shrubs/western swordfern-Mixed herbs Mixed conifer-ACEMAC/CORCOR-(ACECIR)-Mixed shrubs/POLMUN-Mixed herbs ~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. A variety of conifers occur in this forest type, although Douglas-fir and western red cedar are the most common. Bigleaf maple is a consistent canopy component. The understory has a mix of native shrub species, but beaked hazelnut and vine maple are most common. Swordfern is the most common ground cover. Polygons attributed as this community are mostly in good condition, although one small polygon near the main campground has an infestation of evergreen clematis and another polygon in the middle of the Frisbee golf area actually has the golf course running through its interior.

F04: western red cedar-bigleaf maple-(Douglas-fir)/vine maple-Mixed shrubs/western swordfern-threeleaf woodsorrel THUPLI-ACEMAC-(PSEMEN)/ACECIR-Mixed shrubs/POLMUN-OXATRI ~G3S2

This community is a variant of the THUPLI-TSUHET/OXAORE plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. A variety of conifers occur in this forest type, although western red cedar is the most common. Bigleaf maple is a

consistent canopy component. While the understory has a consistent occurrence of vine maple, many other native shrubs may occur as well. Forests attributed as this community have a high amount of cover by swordfern and a common occurrence of threeleaf woodsorrel. Polygons of this community are in good condition. This is the community in which tall bugbane occurs in the park. This community seems to be mostly associated with the stable north facing hillsides between old floodplain benches.

F05: Mixed conifer-(bigleaf maple)/beaked hazelnut-Cascade barberry-Mixed shrubs/western swordfern-Mixed herbs
Mixed conifer-(ACEMAC)/CORCOR-MAHNER-Mixed shrubs/POLMUN-Mixed herbs ~G3S1

This community is a variant of the THUPLI-TSUHET/MAHNER plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community probably had a wider distribution in the park in historic times, but its occurrence has been limited by development and logging. Polygons attributed with this community type in the park are in good condition. This community is similar in composition and structure to other mixed conifer forests in the park, except for the higher constancy of occurrence of Cascade barberry.

F06: bigleaf maple-(red alder)-(Mixed conifer)/salmonberry-mixed shrubs/stinging nettle-(western swordfern)-mixed herbs
ACEMAC-(ALNRUB)-(Mixed conifer)/RUBSPE-mixed shrubs/URTDIO-(POLMUN)-mixed herbs ~G4S4

This community is a variant of the ACEMAC-PSEMEN/ACECIR/POLMUN plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community describes upland forests in the park in which deciduous cover is high but a mix of conifer species still occurs. Patches of this forest in the park tend to have more understory vegetation cover by species that prefer wetter sites than the other mixed conifer forests. Such species include salmonberry, vine maple, and stinging nettle. Patches of this forest type are mostly in good condition. They are young to mid-aged regenerating forests. This community description incorporates many areas that are borderline wetlands and/or have a repeating mosaic of wetland like conditions and vegetation within the polygon which are too difficult to map apart.

F07: bigleaf maple-(red alder)-(Mixed conifer)/beaked hazelnut-mixed shrubs/western swordfern-mixed herbs
ACEMAC-(ALNRUB)-(Mixed conifer)/CORCOR-mixed shrubs/POLMUN-mixed herbs ~G2G3

This community represents variants of the ACEMAC-PSEMEN/CORCOR/HYDTEN and ACEMAC-ALNRUB/POLMUN-TELGRA plant associations described by Kagan, 2004. The rarity rankings for forests attributed as this community are based on the rankings of these associations. The polygons attributed as a variant to ACEMAC-PSEMEN/CORCOR/HYDTEN occur on more gentle slopes than the variants of ACEMAC-ALNRUB/POLMUN-TELGRA. In both cases the overstory is similar to the ACEMAC-(ALNRUB)-(Mixed conifer)/RUBSPE-mixed shrubs/URTDIO-(POLMUN)-mixed herbs community, but the understory has less vegetation cover by species that prefer wetter sites than that community. The ACEMAC-ALNRUB/POLMUN-TELGRA variant occurs along some of the steepest slopes in the park, areas where landslides and slope erosion are common.

F08: Mixed deciduous-(western red cedar)/salmonberry-vine maple-mixed shrubs/wetland herbs

Mixed deciduous-(THUPLI)/RUBSPE-ACECIR-mixed shrubs/wetland herbs ~G5S4 ~G3S2 ~G4S4 ~G4S4 ~G3S3 ~G2S2 ~G3S3

This community represents variants of the following plant associations described by Kagan, 2004:

ALNRUB/RUBSPE
THUPLI-(ALNRUB)/RUBSPE/OXAORE
ACEMAC-PSEMEN/ACECIR/POLMUN
ACEMAC/URTDIO
POPBAL-ALNRUB/SYMALB
ACEMAC-PSEMEN/CORCOR/HYDTEN

Some polygons attributed as this community also represent the Hardwood/RUBSPE/HYDTEN plant association described by McCain and Christy, 2005. The rarity rankings for forests attributed as this community are based on the rankings of these associations.

This community description incorporates many of the forested plant communities in the park that are borderline wetlands and/or have a repeating mosaic of wetland like conditions and vegetation within the polygon which are too difficult to map apart. It is different from the ACEMAC-(ALNRUB)-(Mixed conifer)/RUBSPE-mixed shrubs/URTDIO-(POLMUN)-mixed herbs community in that only western red cedar is likely to occur, instead of a broader mix of conifers. A wider scope of broadleaf trees can occur within this community as opposed to the ALNRUB/RUBSPE-(ACECIR)/URTDIO-Mixed herbs community or the Oregon ash dominated wetland forests, although red alder and bigleaf maple are the most consistent. Shrub diversity can be high, but salmonberry is almost always present and vine maple is also quite common. Herbs associated with wetter forests to wetland obligate species like sweet parsley and skunk cabbage occur within these forest patches. Most polygons of this community are in good condition, however some patches of this community towards the middle of the park have large Himalayan blackberry infestations.

F09: Oregon ash-(Mixed deciduous)/common snowberry-(vine maple)/slough sedge-Mixed herbs

FRALAT-(Mixed deciduous)/SYMALB-(ACECIR)/CAROBN-Mixed herbs ~G4S4

This community is a variant of the SYMALB/URTDIO-FRALAT/SAMRAC-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 wetland forest type describes areas where Oregon ash is a canopy dominant, although other broadleaf trees occur in the canopy as well. Vine maple and snowberry are common shrub components, and slough sedge and stinging nettle are common in the herb layer. Patches of this community in the park range from excellent condition to marginal. Reed canarygrass and Himalayan blackberry are two exotic plants that have large infestations in this community type. Anywhere this community occurs near a road there are exotic species infestations.

F10: Oregon ash/common snowberry-(vine maple)/slough sedge-Mixed herbs

FRALAT/SYMALB-(ACECIR)/CAROBN-Mixed herbs ~G4S4

This community is a variant of the FRALAT/CAROBN plant association described by McCain and Christy, 2005. Its rarity ranking is based on the ranking of that association. It is very similar to the FRALAT-(Mixed deciduous)/SYMALB-(ACECIR)/CAROBN-Mixed herbs community except that Oregon ash forms a homogenous forest canopy without a major presence of other tree

species. The large patch of this community in the southeast section of the park is a very good example of this wetland type.

F11: western red cedar-red alder/salmonberry-(red elderberry)/common ladyfern-youth on age
THUPLI-ALNRUB/RUBSPE-(SAMRAC)/ATHFIL-TOLMEN ~G3S2

This community is a variant of the THUPLI-(ALNRUB)/RUBSPE/OXAORE plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community describes many of the small patch forested wetland communities occurring along intermittent streams throughout the park, especially on the less-slide prone slopes between the old floodplain terraces. Western red cedar and red alder both occur near the stream while salmonberry typically occurs along the stream edge. Ladyfern and youth on age are common directly on the stream bank. Patches of this community tend to be in good condition within the park.

F12: red alder/salmonberry-(vine maple)/stinging nettle-Mixed herbs
ALNRUB/RUBSPE-(ACECIR)/URTDIO-Mixed herbs ~G5S4

This community is a variant of the ALNRUB/RUBSPE plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community describes many of the forested wetland patches in the park where red alder is the dominant tree with little presence of other broadleaf species. It is a common small patch community in the wettest areas and intermittent stream sides of the old landslide deposit areas. The condition of this community varies widely from excellent to poor. Himalayan blackberry and reed canarygrass are the principal weeds invading this community type.

F13: black cottonwood-(red alder)/mixed shrub-(Himalayan blackberry)/reed canarygrass-Mixed herbs
POPBAL-(ALNRUB)/mixed shrub-(RUBARM)/PHAARU-Mixed herbs ~G3S3

This community is a variant of the POPBAL-ALNRUB/SYMALB plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community mostly occurs alongside the Clackamas River. It is a riparian forest community common on abandoned and secondary non-flooded river channels. Black cottonwood and red alder are common in the overstory while snowberry, Sitka willow, redosier dogwood, and salmonberry occur in the shrub layer. Invasions by Himalayan blackberry, reed canarygrass, and false brome are typically present in these riparian forest patches in the park.

F14: red alder/Sitka willow-redosier dogwood-(Himalayan blackberry)/weedy grasses-bird's-foot trefoil
ALNRUB/SALSIT-CORSER-(RUBARM)/weedy grasses-LOTCOR ~GUSU

This community is a variant of the ALNRUB/CORSER/Westside forb plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community occurs along the banks of the Clackamas River. It is partially inundated by flood waters when the river is high. Young red alder occurs in these areas with an understory of Sitka willow and redoiser dogwood and an herb layer that commonly contains bird’s-foot trefoil. Massive invasions by Himalayan blackberry and weedy grasses like reed canarygrass and false brome have greatly diminished the ecological condition of this riparian forest community in the park.

F15: Oregon white oak/common snowberry/small camas-tall fescue QUEGAR/SYMALB/CAMQUA-FESARU ~G1S1

This community is a variant of the QUEGAR/SYMALB/POLMUN plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. A small patch of this community occurs near the model airplane field. It is not clear whether this patch is a remnant of an oak woodland that was lost to development, but it does contain many oak woodland species such as snowberry, small camas, and Sierra pea. Much of the space between the widely dispersed oaks is filled with weedy grasses and herbs that have replaced whatever native vegetation may have historically occurred. This herbaceous community is referred to as the meadow herbaceous community and is not related to a recognized plant association. It consists of exotic herbs and grasses that have invaded the possible remnant Oregon white oak woodland. Meadow hawkweed is occurring in this community and needs to be controlled by park management right away. Further investigations into the origins of this oak woodland are recommended given this community's state sensitivity rank.

F16: western red cedar/common ladyfern THUPLI/ATHFIL GUSU

This community is a variant of the THUPLI/ATHFIL plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This community occurs as a small wetland patch among the old landslide deposits in the northwest section of the park. These wetland patches are in good condition and are characterized by the occurrence of mostly western red cedar and ladyfern alone on swampy fine silt. These patches provide good habitat conditions for mountain moonwort, although none was found during this project.

S01: (black cottonwood)/(Sitka willow)-Mixed shrubs/weedy grasses (POPBAL)/(SALSIT)-Mixed shrubs/weedy grasses ~G4S4

This community is a variant of the SALSIT plant association described by Kagan, 2004. Its rarity ranking is based on the ranking of that association. This is a riparian shrubland community that occurs along the banks of the Clackamas River. Young black cottonwoods occur within this community, but it is still considered a shrubland because the young trees are typically smaller than or equal to the height of the dominant native shrub layer which is mostly made up of Sitka willow. Massive invasions by Himalayan blackberry and weedy grasses like reed canarygrass and false brome have greatly diminished the ecological condition of this riparian forest community in the park.

S02: Sitka willow-redosier dogwood-rose spirea SALSIT-CORSER-SPIDOU ~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 native shrubland community occurs in one small wetland patch in the northwest section of the park. Himalayan blackberry has invaded a portion of this wetland. The community occurs in a bowl-like topographical feature located along the base of the large steep eroding slope in the northwestern section of the park.

S03: Saskatoon serviceberry-oceanspray-Mixed shrubs/Mixed herbs

This community is not related to a recognized plant association. Its occurrence is likely related to historic logging and settlement in the area during the pioneering era. Some old fruit trees occur within the patches of this community, mixed in with a highly diverse native and exotic shrub mix dominated by serviceberry and oceanspray. Himalayan blackberry and Scotch broom are common shrubby weeds. Weedy grasses are prevalent in the herbaceous layer.

H01: wetland herbaceous wetland herbaceous ~G5S5

This community represents variants of the following plant associations described by Kagan, 2004:

JUNEFF
LEMMIN
TYPLAT

The rarity rankings for forests attributed as this community are based on the rankings of these associations. Some of the polygons attributed as this community are also not related to a recognized plant association. The common rush wetland community occurs in the field near the model airplane strip and in a few places in the upper field where the off-leash dog park is located. This community possesses a variety of wetland herbs and sedges but is degraded by the presence of invasive weedy grasses. The lesser duckweed community occurs in a few stagnant ponds located in bowls similar to the steep hillside / landslide bowlshaped topographic feature that contains the SALSIT-CORSER-SPIDOU community. This community has wetland herbs like sweet parsley and pondweed occurring with a thick cover of lesser duckweed on the pond surface. Reed canarygrass and Himalayan blackberry occur in patches on the edges of the ponds. The common cattail community occurs in one small, seemingly manmade wetland near the off-leash dog park. Himalayan blackberry has a strong presence around the edges of this wetland. Lastly, the other wetland herbaceous types not affiliated with a recognized plant association are wetland areas dominated by reed canarygrass.

Vascular Plant Occurrence within the Project Area

319 species of vascular plants were identified within the project area during this project. This included 71 plant families with the Rosaceae, Poaceae, and Asteraceae families making up 32% of the species total. 34% of the total vascular plant diversity is exotic plants. See Appendix A for the full species list.

At-risk Plants within the Project Area

***Actaea elata* (Nutt.) Prantl - (*Cimicifuga elata* – Synonym) – tall bugbane - Ranunculaceae - ODA Candidate for Listing - G3S3**

We found a population of about ten individual plants of tall bugbane in three small groups in a secondary forest of THUPLI-ACEMAC-(PSEMEN)/ACECIR-Mixed shrubs/POLMUN-OXATRI that was in good condition. The plants occur in shady areas along the base of the slope of a large northeast facing hillside. Some of this population occurs very close to a hiking trail from where it is visible and easily accessed. This population has not been mapped before and is a new sighting of this species in Clackamas County.

Tall bugbane is typically associated with mature or old-growth stands of mesic coniferous forest, or mixed coniferous-deciduous forest, at elevations ranging from just above sea level to 3000 feet on the west side of the Cascades. Interestingly, the forest stand where tall bugbane occurs within the park is not composed of old-growth or mature trees, but more resembles a mid-aged conifer forest recovering from logging within the last 80 – 100 years. Figures 19 - 21 provide photos of the plants within the park. Figures 22 and 23 depict the location of the population within the park.

Figures 19 - 21. Photographs of tall bugbane within Milo McIver State Park.

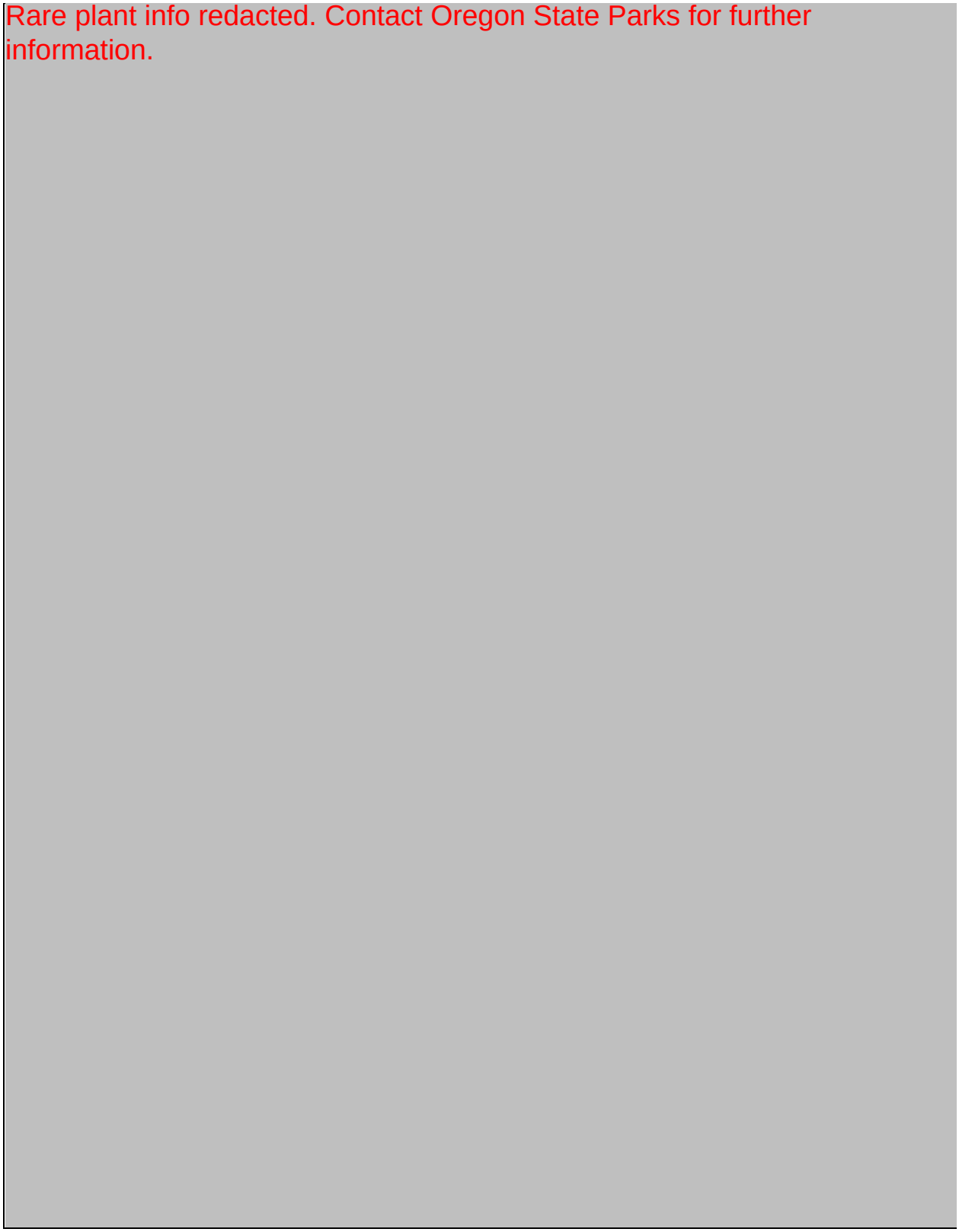

Figure 22. Location of tall bugbane within Milo McIver State Park.

Figure 23. Location of tall bugbane within Milo McIver State Park.

While no other populations of tall bugbane or other at-risk plants were found during this project, Milo McIver State Park does provide more potential habitat for this plant and three other at-risk species. Table 6 lists the three additional at-risk plants for which habitat potentially exists within the park. Figure 24 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
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
Botrychium montanum W.H. Wagner	mountain moonwort	Ophioglossaceae	Species of Concern		G3	S2

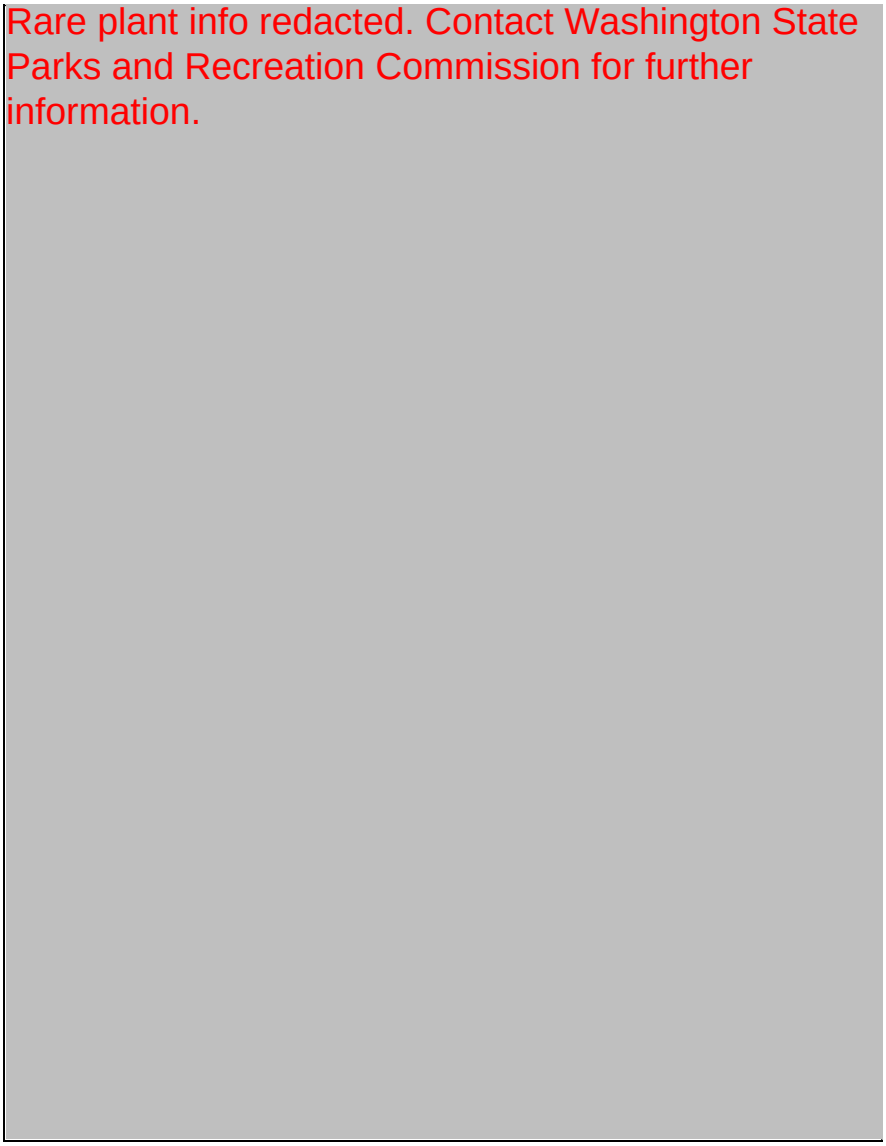

Figure 24. Locations of potential at-risk plant habitat with Milo McIver State Park.

***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 found along the Clackamas River. It is associated with undisturbed sites on dry bluffs, open ground, and moist lowland meadows. The open sloughing river bank in the north section of the park, and the woody/shrubby un-maintained edges of the park's fields and open recreation areas 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 park's fields and open recreation areas. Cutting by maintenance crews, spraying for weeds, and trampling by visitors are all active threats against the occurrence of thinleaf pea in the park.

***Botrychium montanum* W.H. Wagner**
The typical habitat for mountain moonwort is western red cedar swamps. It is thought to be dependent on the cedar through a mycorrhizal relationship. The plant seems to prefer damp soil sites with fertile mesic alluvium covered by dense duff and under deep shade. There are a few western red cedar swamps in the northwest section of the park, occurring among the undulating topography of the large old landslide deposits.

Invasive and Exotic Plants of Concern within the Project Area

Table 7 lists the Class A and B noxious plants encountered in the park during this project. There were a total of 16 Class B plants and 1 Class A plant identified.

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

Symbol	Scientific Name	Common name	Family	Class
BRSY	Brachypodium sylvaticum (Huds.) Beauv	false brome	Poaceae	B
CIAR4	Cirsium arvense (L.) Scop.	Canada thistle	Asteraceae	B
CIVU	Cirsium vulgare (Savi) Ten.	bull thistle	Asteraceae	B
CLVI6	Clematis vitalba L.	evergreen clematis	Ranunculaceae	B
CYSC4	Cytisus scoparius (L.) Link	Scotch broom	Fabaceae	B
EQTE	Equisetum telmateia Ehrh.	giant horsetail	Equisetaceae	B
HEHE	Hedera helix L.	English ivy	Araliaceae	B
HICA10	Hieracium caespitosum Dumort.	meadow hawkweed common St.	Asteraceae	A
HYPE	Hypericum perforatum L.	Johnswort	Clusiaceae	B
IRPS	Iris pseudacorus L.	paleyellow iris	Iridaceae	B
LIVU2	Linaria vulgaris P. Mill.	butter and eggs	Scrophulariaceae	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
ALPE4	Alliaria petiolata (Bieb.) Cavara & Grande	garlic mustard	Brassicaceae	B, T

The populations of some of the Class A and Class B noxious plants were mapped during this project. Figure 25 illustrates the location of the mapped infestations and populations.

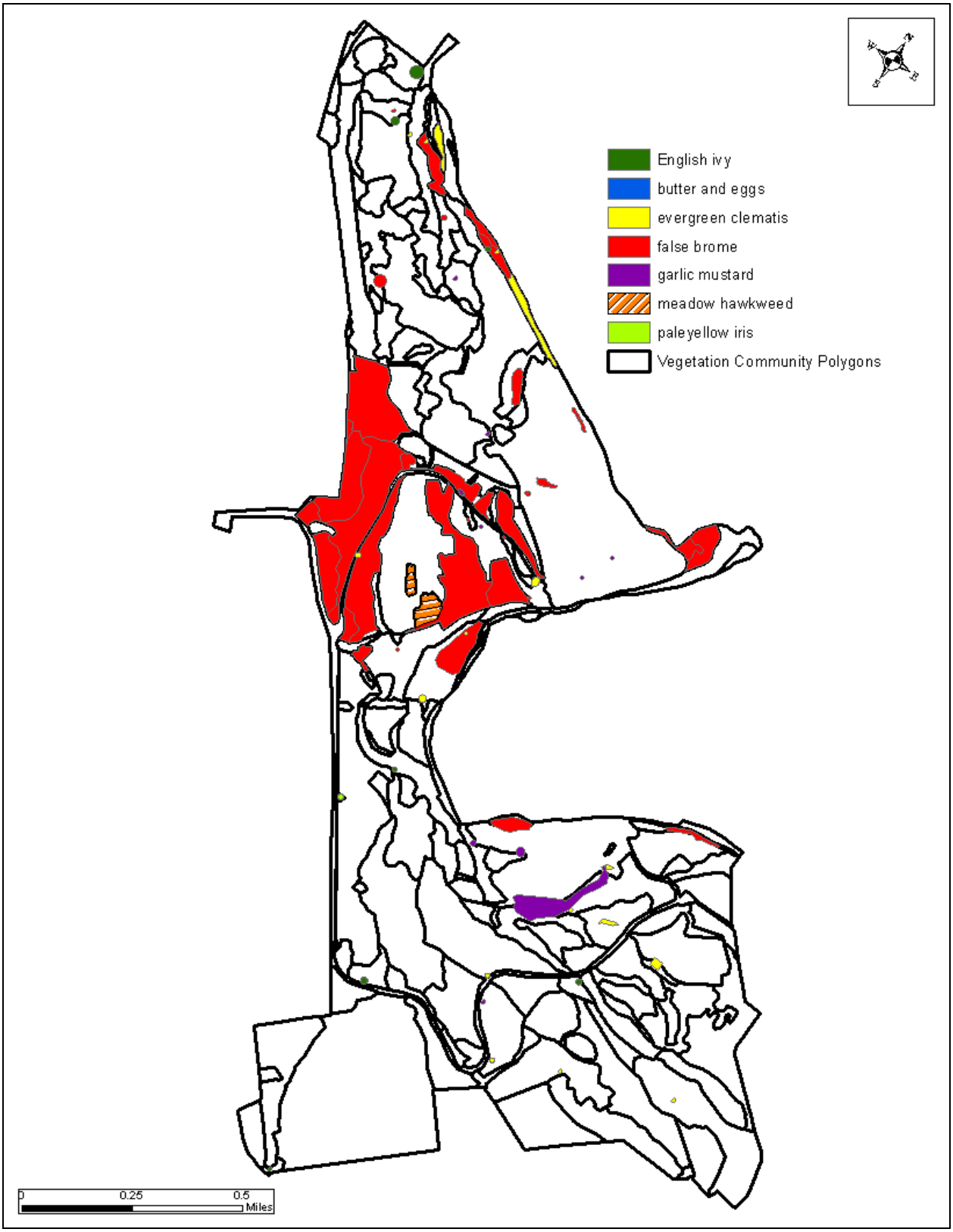

Figure 25. Location of noxious plants mapped with within the park.

While many forested communities within the park have a low cover of exotic species, there are some significant noxious and exotic plant infestations. The presence of Class A noxious weed meadow hawkweed near the model airplane field should be dealt with immediately. The plant is occurring in dense clumps in this area within the mapped polygon boundaries. Additional surveys for more hawkweed populations are suggested.

False brome is a forest understory invader that is the most extensively spread noxious weed in the park. Over 90 acres of the park are mapped as having significant false brome infestations. Many of the false brome sites are young to mid-aged disturbed Douglas-fir forest patches where understory vegetation is naturally sparse and false brome was able to take advantage of the lack of competition from other herbs and grasses. False brome also has significant infestations occurring in the active floodplain areas of the park where it has colonized forested cobblebars and abandoned river channels. Annual disturbances from flooding and river channel meandering may be assisting the spread false brome in these areas. False brome does seem to be establishing itself in some less disturbed forested areas. This species should be actively monitored for in non-infested areas and new populations should be controlled immediately.

Other exotic and noxious weeds are abundant throughout much of the park. There exist large infestations of reed canarygrass in many wetlands and riparian areas, and Himalayan blackberry is well established in many areas. Evergreen clematis and English ivy are not rampant in the park, but these two shade tolerant species threaten to displace native understory vegetation as well as kill overstory trees if not controlled. Figures 26 - 29 provide photos of some of the infestations encountered in the park. 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.

Figures 26 - 29. Photos of exotic plant invasions in the project area. Top left: Evergreen clematis covers a broken snag. Top right: False brome grows in an abandoned river channel under a canopy of black cottonwood and Oregon ash. Bottom left: A field of reed canarygrass in an Oregon ash wetland. Bottom right: Scotch broom and false brome create a new plant community in a shrubland along the Clackamas River.

Recommendations for Restoration and Vegetation Management

Opportunities exist within the park to conduct restoration and vegetation management activities that could benefit native species and vegetation communities. For the park's vegetation communities that are listed as being in excellent or good condition, we recommend prohibiting future human-caused disturbances like logging, increased recreational development, and transportation infrastructure development. Given the amount of exotic and noxious weed seed that now exists around these communities, it is likely that even small levels of canopy and/or soil disturbance will provide conditions for weed infestation. Monitoring these areas for new weed infestations is also important. New colonies of noxious and invasive plants are much easier to control and eradicate than large established populations

Directly managing certain noxious and exotic weed populations in some areas of the park may reduce and/or eliminate the occurrence of some species from some areas. A top priority should be to cover with weed cloth any and all population patches and individual meadow hawkweeds occurring near the model airplane field. This species tends to grow in dense clumps which lend themselves to being controlled by tarping.

Where large patches of Himalayan blackberry occur near to the park's road infrastructure, effort should be made to consistently cut back most of the above ground canes and plant these areas with sapling native shrubs like willows, redosier dogwood, and Indian plum, as well as with native trees. The intent here is to eventually shade out the blackberry with a native overstory. This approach can be successful in limited areas but is time and resource intensive.

Conducting control measures on the false brome infestations is recommended. Without control activities and vigilance, it is only a matter of time before this species is found throughout the park's trail system and within all the non-wetland forested communities. Consistently digging out small populations (and replanting with native grasses and shrubs) and cutting and spraying the larger populations are the recommended control techniques. The large patches of younger Douglas-fir forest with an understory principally made up of false brome would be high candidate sites for using cutting and spraying techniques to reduce the infestation.

Covering with weed tarp, and/or digging up patches of garlic mustard may be a successful way to eradicate this species from the park. Its presence is currently limited and consistent control efforts and monitoring of the known population occurrences is highly recommended.

Both evergreen clematis and English ivy are reaching the forest canopy in some areas of the park, but neither of these shade tolerant vines has a large foothold in the park's forests at this time. Consistently cutting vines off trees and shrubs in the mapped areas of these species occurrence and pulling suckers from the ground when feasible will help prevent the spread of these plants and protect the native trees from being overtaken.

English holly is a shade-tolerant species that is invading some of the forest stands in the park. Although it is not now classified as a noxious weed, it has the potential to significantly modify the understory of forests in Western Washington and Oregon. English holly can reach the size of a small tree, and it has become a common component of some state parks. While holly is not abundant at this time at Milo McIver, its scattered presence will increase with time without effective control measures. We recommend cutting the holly trees and saplings that are now present and painting the stumps with glyphosphate herbicide.

With all of these control measures, any time herbage or exotic species plant parts are removed from a site it is imperative that the removed debris not simply be transported to another section of the park. During our field work, we witnessed a debris pile along the main road to the fish hatchery containing an isolated infestation of garlic mustard. This population should be controlled and park management should develop a plan for how park staff can sensibly dispose of vegetation and debris containing exotic species.

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)

References

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Appendix A – Vascular Plant List for Milo McIver State Park

Count	Symbol	Scientific Name	Common name	Family	Alien	Class	Status
1	ABGR	Abies grandis (Dougl. ex D. Don) Lindl.	grand fir	Pinaceae			
2	ACCI	Acer circinatum Pursh	vine maple	Aceraceae			
3	ACGL	Acer glabrum Torr.	Rocky Mountain maple	Aceraceae			
4	ACMA3	Acer macrophyllum Pursh	bigleaf maple	Aceraceae			
5	ACMI2	Achillea millefolium L.	common yarrow	Asteraceae			
6	ACTR	Achlys triphylla (Sm.) DC.	sweet after death	Berberidaceae			
7	ACEL4	Actaea elata (Nutt.) Prantl	tall bugbane	Ranunculaceae			G3 C3
8	ADBI	Adenocaulon bicolor Hook.	American trailplant	Asteraceae			
9	ADAL	Adiantum aleuticum (Rupr.) Paris	Aleutian maidenhair	Pteridaceae			
10	AEPO	Aegopodium podagraria L.	bishop's goutweed	Apiaceae	Yes		
11	AGHE2	Agoseris heterophylla (Nutt.) Greene	annual agoseris	Asteraceae			
12	AGCA5	Agrostis capillaris L.	colonial bentgrass	Poaceae	Yes		
13	AGEX	Agrostis exarata Trin.	spike bentgrass	Poaceae			
14	AGGI2	Agrostis gigantea Roth	redtop	Poaceae	Yes		
15	AGHU	Agrostis humilis Vasey	alpine bentgrass	Poaceae			
16	AGPA8	Agrostis pallens Trin.	seashore bentgrass	Poaceae			
17	AICA	Aira caryophyllea L.	silver hairgrass	Poaceae	Yes		
18	ALPE4	Alliaria petiolata (Bieb.) Cavara & Grande	garlic mustard	Brassicaceae	Yes	B, T	
19	ALRU2	Alnus rubra Bong.	red alder	Betulaceae			
20	ALPR3	Alopecurus pratensis L.	meadow foxtail	Poaceae	Yes		
21	AMAL2	Amelanchier alnifolia (Nutt.) Nutt. ex M. Roemer	Saskatoon serviceberry	Rosaceae			
22	ANMA	Anaphalis margaritacea (L.) Benth.	western pearly everlasting	Asteraceae			
23	ANDE3	Anemone deltoidea Hook.	Columbian windflower	Ranunculaceae			
24	ANLY	Anemone lyallii Britt.	Little Mountain thimbleweed	Ranunculaceae			
25	ANGE2	Angelica genuflexa Nutt.	kneeling angelica	Apiaceae			
26	ANOD	Anthoxanthum odoratum L.	sweet vernalgrass	Poaceae	Yes		
27	APSP	Apera spica-venti (L.) Beauv.	loose silkybent	Poaceae	Yes		
28	APAN2	Apocynum androsaemifolium L.	spreading dogbane	Apocynaceae			
29	ARMI2	Arctium minus Bernh.	lesser burdock	Asteraceae	Yes		
30	ARAM2	Arnica amplexicaulis Nutt.	clasping arnica	Asteraceae			
31	ARDO3	Artemisia douglasiana Bess. ex Hook.	Douglas' sagewort	Asteraceae			
32	ARDIA	Aruncus dioicus (Walt.) Fern. var. acuminatus (Rydb.) Rydb. ex Hara	bride's feathers	Rosaceae			
33	ASCA2	Asarum caudatum Lindl.	British Columbia wildginger	Aristolochiaceae			
34	ASTR10	Asplenium trichomanes-ramosum L.	brightgreen spleenwort	Aspleniaceae			
35	ATFI	Athyrium filix-femina (L.) Roth	common ladyfern	Dryopteridaceae			
36	BAOR	Barbarea orthoceras Ledeb.	American yellowrocket	Brassicaceae			
37	BEPE2	Bellis perennis L.	lawndaisy	Asteraceae	Yes		
38	BICE	Bidens cernua L.	nodding beggartick	Asteraceae			
39	BIFR	Bidens frondosa L.	devil's beggartick	Asteraceae			
40	BLSP	Blechnum spicant (L.) Sm.	deer fern	Blechnaceae			

Count	Symbol	Scientific Name	Common name	Family	Alien	Class	Status
41	BOMA3	Boykinia major Gray	large boykinia	Saxifragaceae			
42	BRSY	Brachypodium sylvaticum (Huds.) Beauv	false brome	Poaceae	Yes	B	
43	BRNI	Brassica nigra (L.) W.D.J. Koch	black mustard	Brassicaceae	Yes		
44	BRAR5	Bromus arvensis L.	field brome	Poaceae	Yes		
45	BRRA2	Bromus racemosus L.	bald brome	Poaceae	Yes		
46	BRSI	Bromus sitchensis Trin.	Alaska brome	Poaceae			
47	BRVU	Bromus vulgaris (Hook.) Shear	Columbia brome	Poaceae			
48	CAOCO2	Calystegia polymorpha (Greene) Munz		Convolvulaceae			
49	CASE13	Calystegia sepium (L.) R. Br.	hedge false bindweed	Convolvulaceae	Yes		
50	CAQU2	Camassia quamash (Pursh) Greene	small camas	Liliaceae			
51	CASC7	Campanula scouleri Hook. ex A. DC.	pale bellflower	Campanulaceae			
52	CAAN5	Cardamine angulata Hook.	seaside bittercress	Brassicaceae			
53	CAOL	Cardamine oligosperma Nutt.	little western bittercress	Brassicaceae			
54	CAPE2	Cardamine penduliflora O.E. Schulz	Willamette Valley bittercress	Brassicaceae			
55	CAHE7	Carex hendersonii Bailey	Henderson's sedge	Cyperaceae			
56	CAIN17	Carex interrupta Boeckl.	greenfruit sedge	Cyperaceae			
57	CALE8	Carex lenticularis Michx.	lakeshore sedge	Cyperaceae			
58	CALE24	Carex leptopoda Mackenzie	taperfruit shortscale sedge	Cyperaceae			
59	CAOB3	Carex obnupta Bailey	slough sedge	Cyperaceae			
60	CAPE42	Carex pellita Muhl. ex Willd.	woolly sedge	Cyperaceae			
61	CAST5	Carex stipata Muhl. ex Willd.	owlfruit sedge	Cyperaceae			
62	CEMO	Centaurea montana L.	perennial cornflower	Asteraceae	Yes		
63	CEER5	Centaurium erythraea Rafn	European centaury	Gentianaceae	Yes		
64	CEDU2	Cerastium dubium (Bast.) Guépin	doubtful chickweed	Caryophyllaceae	Yes		
65	CEGL2	Cerastium glomeratum Thuill.	sticky chickweed	Caryophyllaceae	Yes		
66	CHAN9	Chamerion angustifolium (L.) Holub	fireweed	Onagraceae			
67	CIAL	Circaea alpina L.	small enchanter's nightshade	Onagraceae			
68	CIAR4	Cirsium arvense (L.) Scop.	Canada thistle	Asteraceae	Yes	B	
69	CIVU	Cirsium vulgare (Savi) Ten.	bull thistle	Asteraceae	Yes	B	
70	CLPEP	Claytonia perfoliata Donn ex Willd. ssp. perfoliata	miner's lettuce	Portulacaceae			
71	CLSI2	Claytonia sibirica L.	Siberian springbeauty	Portulacaceae			
72	CLLI2	Clematis ligusticifolia Nutt.	western white clematis	Ranunculaceae			
73	CLVI6	Clematis vitalba L.	evergreen clematis	Ranunculaceae	Yes	B	
74	CLDO2	Clinopodium douglasii (Benth.) Kuntze	yerba buena	Lamiaceae			
75	COHE2	Collomia heterophylla Dougl. ex Hook.	variableleaf collomia	Polemoniaceae			
76	COBO	Conyza *bonariensis* (L.) Cronq.	asthmaweed	Asteraceae	Yes		
77	COMA25	Corallorhiza maculata (Raf.) Raf.	summer coralroot	Orchidaceae			
78	CONU4	Cornus nuttallii Audubon ex Torr. & Gray	Pacific dogwood	Cornaceae			
79	COSE16	Cornus sericea L.	redosier dogwood	Cornaceae			
80	COSC4	Corydalis scouleri Hook.	Scouler's fumewort	Fumariaceae			
81	COCO6	Corylus cornuta Marsh.	beaked hazelnut	Betulaceae			
82	CRMO3	Crataegus monogyna Jacq.	oneseed hawthorn	Rosaceae	Yes		
83	CRSU16	Crataegus suksdorfii (Sarg.) Kruschke	Suksdorf's hawthorn	Rosaceae			
84	CRCA3	Crepis capillaris (L.) Wallr.	smooth hawksbeard	Asteraceae	Yes		

Count	Symbol	Scientific Name	Common name	Family	Alien	Class	Status
85	CRSE2	Crepis setosa Haller f.	bristly hawksbeard	Asteraceae	Yes		
86	CYEC	Cynosurus echinatus L.	bristly dogstail grass	Poaceae	Yes		
87	CYSC4	Cytisus scoparius (L.) Link	Scotch broom	Fabaceae	Yes	B	
88	DAGL	Dactylis glomerata L.	orchardgrass	Poaceae	Yes		
89	DACA6	Daucus carota L.	Queen Anne's lace	Apiaceae	Yes		
90	DELPH	Delphinium L.	larkspur	Ranunculaceae			
91	DEDA	Deschampsia danthonioides (Trin.) Munro	annual hairgrass	Poaceae			
92	DEEL	Deschampsia elongata (Hook.) Munro	slender hairgrass	Poaceae			
93	DIFO	Dicentra formosa (Haw.) Walp.	Pacific bleeding heart	Fumariaceae			
94	DIPU	Digitalis purpurea L.	purple foxglove	Scrophulariaceae	Yes		
95	DISA	Digitaria sanguinalis (L.) Scop.	hairy crabgrass	Poaceae			
96	DIFU2	Dipsacus fullonum L.	Fuller's teasel	Dipsacaceae	Yes		
97	DREX2	Dryopteris expansa (K. Presl) Fraser-Jenkins & Jermy	spreading woodfern	Dryopteridaceae			
98	DUAR3	Dulichium arundinaceum (L.) Britt.	threeway sedge	Cyperaceae			
99	ECCR	Echinochloa crus-galli (L.) Beauv.	barnyardgrass	Poaceae	Yes		
100	ELOV	Eleocharis ovata (Roth) Roemer & J.A. Schultes	ovate spikerush	Cyperaceae			
101	ELQU2	Eleocharis quinqueflora (F.X. Hartmann) Schwarz	fewflower spikerush	Cyperaceae			
102	ELGL	Elymus glaucus Buckl.	blue wildrye	Poaceae			
103	EPCI	Epilobium ciliatum Raf.	fringed willowherb	Onagraceae			
104	EQAR	Equisetum arvense L.	field horsetail	Equisetaceae			
105	EQHY	Equisetum hyemale L.	scouringrush horsetail	Equisetaceae			
106	EQTE	Equisetum telmateia Ehrh.	giant horsetail	Equisetaceae		B	
107	ERPH	Erigeron philadelphicus L.	Philadelphia fleabane	Asteraceae			
108	FEOC	Festuca occidentalis Hook.	western fescue	Poaceae			
109	FRVE	Fragaria vesca L.	woodland strawberry	Rosaceae			
110	FRVI	Fragaria virginiana Duchesne	Virginia strawberry	Rosaceae			
111	FRPU7	Frangula purshiana (DC.) Cooper	Cascara buckthorn	Rhamnaceae			
112	FRLA	Fraxinus latifolia Benth.	Oregon ash	Oleaceae			
113	GAAP2	Galium aparine L.	stickywilly	Rubiaceae			
114	GATR3	Galium triflorum Michx.	fragrant bedstraw	Rubiaceae			
115	GASH	Gaultheria shallon Pursh	salal	Ericaceae			
116	GEDI	Geranium dissectum L.	cutleaf geranium	Geraniaceae	Yes		
117	GELU	Geranium lucidum		Geraniaceae	Yes		
118	GEMO	Geranium molle L.	dovefoot geranium	Geraniaceae	Yes		
119	GERO	Geranium robertianum L.	Robert geranium	Geraniaceae	Yes		
120	GEMA4	Geum macrophyllum Willd.	largeleaf avens	Rosaceae			
121	GLHE2	Glechoma hederacea L.	ground ivy	Lamiaceae	Yes		
122	GLST	Glyceria striata (Lam.) A.S. Hitchc.	fowl mannagrass	Poaceae			
123	GNUL	Gnaphalium uliginosum L.	marsh cudweed	Asteraceae			
124	GOOB2	Goodyera oblongifolia Raf.	western rattlesnake plantain	Orchidaceae			
125	HEHE	Hedera helix L.	English ivy	Araliaceae	Yes	B	
126	HEMA80	Heracleum maximum Bartr.	common cowparsnip	Apiaceae			
127	HEMI7	Heuchera micrantha Dougl. ex Lindl.	crevice alumroot	Saxifragaceae			

Count	Symbol	Scientific Name	Common name	Family	Alien	Class	Status
128	HICA10	Hieracium caespitosum Dumort.	meadow hawkweed	Asteraceae	Yes	A	
129	HOLA	Holcus lanatus L.	common velvetgrass	Poaceae	Yes		
130	HODI	Holodiscus discolor (Pursh) Maxim.	oceanspray	Rosaceae			
131	HYTE	Hydrophyllum tenuipes Heller	Pacific waterleaf	Hydrophyllaceae			
132	HYAN2	Hypericum anagalloides Cham. & Schlecht.	tinker's penny	Clusiaceae			
133	HYPE	Hypericum perforatum L.	common St. Johnswort	Clusiaceae	Yes	B	
134	HYSC5	Hypericum scouleri Hook.	Scouler's St. Johnswort	Clusiaceae			
135	HYRA3	Hypochaeris radicata L.	hairy catsear	Asteraceae	Yes		
136	ILAQ80	Ilex aquifolium L.	English holly	Aquifoliaceae	Yes		
137	IMCA	Impatiens capensis Meerb.	jewelweed	Balsaminaceae			
138	IRPS	Iris pseudacorus L.	paleyellow iris	Iridaceae	Yes	B	
139	JUAC	Juncus acuminatus Michx.	tapertip rush	Juncaceae			
140	JUBU	Juncus bufonius L.	toad rush	Juncaceae			
141	JUCO5	Juncus covillei Piper	Coville's rush	Juncaceae			
142	JUEF	Juncus effusus L.	common rush	Juncaceae			
143	JUEN	Juncus ensifolius Wikstr.	swordleaf rush	Juncaceae			
144	JUNE	Juncus nevadensis S. Wats.	Sierra rush	Juncaceae			
145	JUTE	Juncus tenuis Willd.	poverty rush	Juncaceae			
146	LACO3	Lapsana communis L.	common nipplewort	Asteraceae	Yes		
147	LANE3	Lathyrus nevadensis S. Wats.	Sierra pea	Fabaceae			
148	LAPO3	Lathyrus polyphyllus Nutt.	leafy pea	Fabaceae			
149	LEOR	Leersia oryzoides (L.) Sw.	rice cutgrass	Poaceae			
150	LEMI3	Lemna minor L.	common duckweed	Lemnaceae			
151	LETAT	Leontodon taraxacoides (Vill.) Mérat ssp. taraxacoides	lesser hawkbit	Asteraceae	Yes		
152	LEVU	Leucanthemum vulgare Lam.	oxeye daisy	Asteraceae	Yes		
153	LICO	Lilium columbianum Leichtl. in Duchartre	Columbia lily	Liliaceae			
154	LIVU2	Linaria vulgaris P. Mill.	butter and eggs	Scrophulariaceae	Yes	B	
155	LIBO3	Linnaea borealis L.	twinflower	Caprifoliaceae			
156	LOAR5	Logfia arvensis (L.) Holub	field cottonrose	Asteraceae	Yes		
157	LOPE	Lolium perenne L.	perennial ryegrass	Poaceae	Yes		
158	LOCI3	Lonicera ciliosa (Pursh) Poir. ex DC.	orange honeysuckle	Caprifoliaceae			
159	LOCO6	Lotus corniculatus L.	bird's-foot trefoil	Fabaceae	Yes		
160	LOUNU	Lotus unifoliolatus (Hook.) Benth. var. unifoliolatus	American bird's-foot trefoil	Fabaceae			
161	LUPA	Ludwigia palustris (L.) Ell.	marsh seedbox	Onagraceae			
162	LUPO2	Lupinus polyphyllus Lindl.	bigleaf lupine	Fabaceae			
163	LUCO6	Luzula comosa E. Mey.	Pacific woodrush	Juncaceae			
164	LUPA4	Luzula parviflora (Ehrh.) Desv.	smallflowered woodrush	Juncaceae			
165	LYAM	Lycopus americanus Muhl. ex W. Bart.	American water horehound	Lamiaceae			
166	LYAM3	Lysichiton americanus Hultén & St. John	American skunkcabbage	Araceae			
167	MAGL2	Madia glomerata Hook.	mountain tarweed	Asteraceae			
168	MASA	Madia sativa Molina	coast tarweed	Asteraceae			
169	MAAQ2	Mahonia aquifolium (Pursh) Nutt.	hollyleaved barberry	Berberidaceae			
170	MANE2	Mahonia nervosa (Pursh) Nutt.	Cascade barberry	Berberidaceae			

Count	Symbol	Scientific Name	Common name	Family	Alien	Class	Status
171	MADI	Maianthemum dilatatum (Wood) A. Nels. & J.F. Macbr.	false lily of the valley	Liliaceae			
172	MARA7	Maianthemum racemosum (L.) Link	feathery false lily of the valley	Liliaceae			
173	MAST4	Maianthemum stellatum (L.) Link	starry false lily of the valley	Liliaceae			
174	MAFU	Malus fusca (Raf.) Schneid.	Oregon crabapple	Rosaceae			
175	MAPU	Malus pumila P. Mill.	paradise apple	Rosaceae	Yes		
176	MAOR3	Marah oreganus (Torr. ex S. Wats.) T.J. Howell	coastal manroot	Cucurbitaceae			
177	MADI6	Matricaria discoidea DC.	disc mayweed	Asteraceae	Yes		
178	MARE6	Matricaria recutita L.	German chamomile	Asteraceae	Yes		
179	MELU	Medicago lupulina L.	black medick	Fabaceae	Yes		
180	MESU	Melica subulata (Griseb.) Scribn.	Alaska oniongrass	Poaceae			
181	MEOF2	Melissa officinalis L.	common balm	Lamiaceae	Yes		
182	MEPI	Mentha ×piperita L. (pro sp.) [aquatica × spicata]	peppermint	Lamiaceae	Yes		
183	MEAR4	Mentha arvensis L.	wild mint	Lamiaceae			
184	MEPU	Mentha pulegium L.	pennyroyal	Lamiaceae	Yes		
185	MIGU	Mimulus guttatus DC.	seep monkeyflower	Scrophulariaceae			
186	MICA5	Mitella caulescens Nutt.	slightstemmed miterwort	Saxifragaceae			
187	MOMA3	Moehringia macrophylla (Hook.) Fenzl	largeleaf sandwort	Caryophyllaceae			
188	MOUN3	Monotropa uniflora L.	Indianpipe	Monotropaceae			
189	MOLI4	Montia linearis (Dougl. ex Hook.) Greene	narrowleaf minerslettuce	Portulacaceae			
190	MUME2	Muhlenbergia mexicana (L.) Trin.	Mexican muhly	Poaceae			
191	MYMU	Mycelis muralis (L.) Dumort.	wall-lettuce	Asteraceae	Yes		
192	MYDI	Myosotis discolor Pers.	changing forget-me-not	Boraginaceae	Yes		
193	MYLA	Myosotis laxa Lehm.	bay forget-me-not	Boraginaceae			
194	MYSC	Myosotis scorpioides L.	true forget-me-not	Boraginaceae	Yes		
195	NAIN2	Navarretia intertexta (Benth.) Hook.	needleleaf navarretia	Polemoniaceae			
196	NEPA	Nemophila parviflora Dougl. ex Benth.	smallflower nemophila	Hydrophyllaceae			
197	OECE	Oemleria cerasiformis (Torr. & Gray ex Hook. & Arn.) Landon	Indian plum	Rosaceae			
198	OESA	Oenanthe sarmentosa K. Presl ex DC.	water parsely	Apiaceae			
199	ORVU	Origanum vulgare L.	oregano	Lamiaceae	Yes		
200	OSBE	Osmorhiza berteroi DC.	sweetcicely	Apiaceae			
201	OXTR	Oxalis trilliifolia Hook.	threeleaf woodsorrel	Oxalidaceae			
202	PAVI3	Parentucellia viscosa (L.) Caruel	yellow glandweed	Scrophulariaceae	Yes		
203	PEFR5	Petasites frigidus (L.) Fries	arctic sweet coltsfoot	Asteraceae			
204	PHNE2	Phacelia nemoralis Greene	shade phacelia	Hydrophyllaceae			
205	PHAR3	Phalaris arundinacea L.	reed canarygrass	Poaceae	Yes		
206	PHLE4	Philadelphus lewisii Pursh	Lewis' mock orange	Hydrangeaceae			
207	PHPR3	Phleum pratense L.	timothy	Poaceae	Yes		
208	PHCA11	Physocarpus capitatus (Pursh) Kuntze	Pacific ninebark	Rosaceae			
209	PICO	Pinus contorta Dougl. ex Loud.	lodgepole pine	Pinaceae			
210	PIPO	Pinus ponderosa P.& C. Lawson	ponderosa pine	Pinaceae			
211	PLLA	Plantago lanceolata L.	narrowleaf plantain	Plantaginaceae	Yes		
212	PLMA2	Plantago major L.	common plantain	Plantaginaceae	Yes		

Count	Symbol	Scientific Name	Common name	Family	Alien	Class	Status
213	POCO	Poa compressa L.	Canada bluegrass	Poaceae	Yes		
214	POPR	Poa pratensis L.	Kentucky bluegrass	Poaceae	Yes		
215	POAV	Polygonum aviculare L.	prostrate knotweed	Polygonaceae	Yes		
216	POHY	Polygonum hydropiper L.	marshpepper knotweed	Polygonaceae	Yes		
217	POHY2	Polygonum hydropiperoides Michx.	swamp smartweed	Polygonaceae			
218	POPE3	Polygonum persicaria L.	spotted ladysthumb	Polygonaceae	Yes		
219	POGL8	Polypodium glycyrrhiza D.C. Eat.	licorice fern	Polypodiaceae			
220	POMU	Polystichum munitum (Kaulfuss) K. Presl	western swordfern	Dryopteridaceae			
221	POBAT	Populus balsamifera L. ssp. trichocarpa (Torr. & Gray ex Hook.) Brayshaw	black cottonwood	Salicaceae			
222	POGR9	Potentilla gracilis Dougl. ex Hook.	slender cinquefoil	Rosaceae			
223	PRHOO	Prosartes hookeri Torr. var. oregana (S. Wats.) Kartesz	Oregon drops of gold	Liliaceae			
224	PRVU	Prunella vulgaris L.	common selfheal	Lamiaceae	Yes		
225	PRAV	Prunus avium (L.) L.	sweet cherry	Rosaceae	Yes		
226	PRDO	Prunus domestica L.	European plum	Rosaceae	Yes		
227	PSME	Pseudotsuga menziesii (Mirbel) Franco	Douglas-fir	Pinaceae			
228	PTAQ	Pteridium aquilinum (L.) Kuhn	western brackenfern	Dennstaedtiaceae			
229	QUGA4	Quercus garryana Dougl. ex Hook.	Oregon white oak	Fagaceae			
230	RAAR3	Ranunculus arvensis L.	corn buttercup	Ranunculaceae	Yes		
231	RAFL2	Ranunculus flammula L.	greater creeping spearwort	Ranunculaceae			
232	RAOR3	Ranunculus orthorhynchus Hook.	straightbeak buttercup	Ranunculaceae			
233	RARE3	Ranunculus repens L.	creeping buttercup	Ranunculaceae	Yes		
234	RAUN	Ranunculus uncinatus D. Don ex G. Don	woodland buttercup	Ranunculaceae			
235	RIBR	Ribes bracteosum Dougl. ex Hook.	stink currant	Grossulariaceae			
236	RIDI	Ribes divaricatum Dougl.	spreading gooseberry	Grossulariaceae			
237	RILA	Ribes lacustre (Pers.) Poir.	prickly currant	Grossulariaceae			
238	ROPS	Robinia pseudoacacia L.	black locust	Fabaceae	Yes		
239	ROCU	Rorippa curvisiliqua (Hook.) Bess. ex Britt.	curvepod yellowcress	Brassicaceae			
240	ROEG	Rosa eglanteria L.	sweetbriar rose	Rosaceae	Yes		
241	ROGY	Rosa gymnocarpa Nutt.	dwarf rose	Rosaceae			
242	RONU	Rosa nutkana K. Presl	Nootka rose	Rosaceae			
243	RUAR9	Rubus armeniacus Focke	Himalayan blackberry	Rosaceae	Yes	B	
244	RULA	Rubus laciniatus Willd.	cutleaf blackberry	Rosaceae	Yes	B	
245	RULE	Rubus leucodermis Dougl. ex Torr. & Gray	whitebark raspberry	Rosaceae			
246	RUPA	Rubus parviflorus Nutt.	thimbleberry	Rosaceae			
247	RUSP	Rubus spectabilis Pursh	salmonberry	Rosaceae			
248	RUUR	Rubus ursinus Cham. & Schlecht.	California blackberry	Rosaceae			
249	RUAC3	Rumex acetosella L.	common sheep sorrel	Polygonaceae	Yes		
250	RUCR	Rumex crispus L.	curly dock	Polygonaceae	Yes		
251	RUOB	Rumex obtusifolius L.	bitter dock	Polygonaceae	Yes		
252	RUPH3	Rupertia physodes (Dougl. ex Hook.) J. Grimes	forest scurfpea	Fabaceae			
253	SAEX	Salix exigua Nutt.	narrowleaf willow	Salicaceae			
254	SALU	Salix lucida Muhl.	shining willow	Salicaceae			

Count	Symbol	Scientific Name	Common name	Family	Alien	Class	Status
255	SASI2	Salix sitchensis Sanson ex Bong.	Sitka willow	Salicaceae			
256	SARA2	Sambucus racemosa L.	red elderberry	Caprifoliaceae			
257	SAAN2	Sanguisorba occidentalis Nutt.		Rosaceae			
258	SAME7	Saxifraga mertensiana Bong.	wood saxifrage	Saxifragaceae			
259	SCPH	Schedonorus phoenix (Scop.) Holub	tall fescue	Poaceae	Yes		
260	SCMI2	Scirpus microcarpus J.& K. Presl	panicled bulrush	Cyperaceae			
261	SCAN2	Scleranthus annuus L.	German knotgrass	Caryophyllaceae	Yes		
262	SCLA2	Scutellaria lateriflora L.	blue skullcap	Lamiaceae			
263	SEDO	Selaginella douglasii (Hook. & Grev.) Spring	Douglas' spikemoss	Selaginellaceae			
264	SEJA	Senecio jacobaea L.	stinking willie	Asteraceae	Yes	B	
265	SEVU	Senecio vulgaris L.	old-man-in-the-Spring	Asteraceae	Yes		
266	SIID	Sisyrinchium idahoense Bickn.	Idaho blue-eyed grass	Iridaceae			
267	SODU	Solanum dulcamara L.	climbing nightshade	Solanaceae	Yes		
268	SONI	Solanum nigrum L.	black nightshade	Solanaceae	Yes		
269	SOCA6	Solidago canadensis L.	Canada goldenrod	Asteraceae			
270	SOOL	Sonchus oleraceus L.	common sowthistle	Asteraceae	Yes		
271	SOAU	Sorbus aucuparia L.	European mountain ash	Rosaceae	Yes		
272	SPEU	Sparganium eurycarpum Engelm. ex Gray	broadfruit bur-reed	Sparganiaceae			
273	SPVI	Spergularia villosa (Pers.) Camb.	hairy sandspurry	Caryophyllaceae	Yes		
274	SPBE2	Spiraea betulifolia Pallas	white spirea	Rosaceae			
275	SPDO	Spiraea douglasii Hook.	rose spirea	Rosaceae			
276	STCHC3	Stachys chamissonis Benth. var. cooleyae (Heller) G. Mulligan & D. Munro	coastal hedgenettle	Lamiaceae			
277	STLO2	Stellaria longipes Goldie	longstalk starwort	Caryophyllaceae			
278	STME2	Stellaria media (L.) Vill.	common chickweed	Caryophyllaceae	Yes		
279	SYAL	Symphoricarpos albus (L.) Blake	common snowberry	Caprifoliaceae			
280	SYSU4	Symphyotrichum subspicatum (Nees) Nesom	Douglas aster	Asteraceae			
281	SYRE	Synthyris reniformis (Dougl. ex Benth.) Benth.	snowqueen	Scrophulariaceae			
282	TAVU	Tanacetum vulgare L.	common tansy	Asteraceae	Yes		
283	TAOF	Taraxacum officinale G.H. Weber ex Wiggers	common dandelion	Asteraceae	Yes		
284	TABR2	Taxus brevifolia Nutt.	Pacific yew	Taxaceae			
285	TEGR2	Tellima grandiflora (Pursh) Dougl. ex Lindl.	bigflower tellima	Saxifragaceae			
286	THOC	Thalictrum occidentale Gray	western meadow-rue	Ranunculaceae			
287	THGR6	Thermopsis gracilis T.J. Howell	slender goldenbanner	Fabaceae			
288	THPL	Thuja plicata Donn ex D. Don	western red cedar	Cupressaceae			
289	TITR	Tiarella trifoliata L.	threeleaf foamflower	Saxifragaceae			
290	TOME	Tolmiea menziesii (Pursh) Torr. & Gray	youth on age	Saxifragaceae			
291	TOAR	Torilis arvensis (Huds.) Link	spreading hedgeparsley	Apiaceae	Yes		
292	TOPAP3	Torreyochloa pallida (Torr.) Church var. pauciflora (J. Presl) J.I. Davis	pale false mannagrass	Poaceae			
293	TODI	Toxicodendron diversilobum (Torr. & Gray) Greene	Pacific poison oak	Anacardiaceae			
294	TRDU	Tragopogon dubius Scop.	yellow salsify	Asteraceae	Yes		

Count	Symbol	Scientific Name	Common name	Family	Alien	Class	Status
295	TRBOL	Trientalis borealis Raf. ssp. latifolia (Hook.) Hultén	broadleaf starflower	Primulaceae			
296	TRDU2	Trifolium dubium Sibthorp	suckling clover	Fabaceae	Yes		
297	TRMI4	Trifolium microcephalum Pursh	smallhead clover	Fabaceae			
298	TRRE3	Trifolium repens L.	white clover	Fabaceae	Yes		
299	TROV2	Trillium ovatum Pursh	Pacific trillium	Liliaceae			
300	TRPE4	Triodanis perfoliata (L.) Nieuwl.	clasping Venus' looking-glass	Campanulaceae			
301	TSHE	Tsuga heterophylla (Raf.) Sarg.	western hemlock	Pinaceae			
302	URDI	Urtica dioica L.	stinging nettle	Urticaceae			
303	VAPA	Vaccinium parvifolium Sm.	red huckleberry	Ericaceae			
304	VASC2	Valeriana scouleri Rydb.	Scouler's valerian	Valerianaceae			
305	VAHE	Vancouveria hexandra (Hook.) Morr. & Dcne.	white insideout flower	Berberidaceae			
306	VECAC	Veratrum californicum Dur. var. caudatum (Heller) C.L. Hitchc.	Cascade false hellebore	Liliaceae			
307	VETH	Verbascum thapsus L.	common mullein	Scrophulariaceae	Yes		
308	VEAM2	Veronica americana Schwein. ex Benth.	American speedwell	Scrophulariaceae			
309	VEPE2	Veronica peregrina L.	neckweed	Scrophulariaceae	Yes		
310	VESC2	Veronica scutellata L.	skullcap speedwell	Scrophulariaceae			
311	VESE	Veronica serpyllifolia L. ssp. serpyllifolia	thymeleaf speedwell	Scrophulariaceae	Yes		
312	VICR	Vicia cracca L.	bird vetch	Fabaceae	Yes		
313	VIHI	Vicia hirsuta (L.) S.F. Gray	tiny vetch	Fabaceae	Yes		
314	VISA	Vicia sativa L.	garden vetch	Fabaceae	Yes		
315	VITE	Vicia tetrasperma (L.) Schreb.	lentil vetch	Fabaceae	Yes		
316	VIGL	Viola glabella Nutt.	pioneer violet	Violaceae			
317	VISE3	Viola sempervirens Greene	evergreen violet	Violaceae			
318	VUBR	Vulpia bromoides (L.) S.F. Gray	brome fescue	Poaceae	Yes		
319	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.