This document is part of a collection of Ecological Integrity Assessments addressing 67 of Washington's 99 Ecological Systems. These documents were prepared by the Washington Natural Heritage Program with funding provided by the Washington Department of Fish and Wildlife.

Ecological Integrity Assessment: Willamette Valley Wet Prairie

Ecological Summary

The Willamette Valley Wet Prairie ecological system is a small patch, wet meadow system largely restricted to the Willamette Valley of Oregon and parts of western Washington. In Washington, this system was historically mostly found in the South Puget Sound area where it occurred in areas with seasonally high water tables (e.g., local depressions, swales and low gradient riparian areas) within the matrix of a fire-maintained prairie landscape. Given their location within a fire-maintained, open grassland landscape, these wet prairies experienced periodic fire, which is a distinguishing feature from similar wetland types elsewhere in western Washington and Oregon.

Within Washington, these wet prairies are found in two geographic areas: South Puget Sound and southwest Washington (i.e., Clark and Lewis County). The wet prairies of southwest Washington and the Willamette Valley of Oregon (hereafter referred to as 'Willamette Valley wet prairies') are often perched on clay-rich soils and historically covered large areas. The South Puget Sound wet prairies differ from Willamette Valley wet prairies in that they are associated with permeable glacial outwash and thus are restricted to swales and riparian areas where surface topography intersects local groundwater tables and in other areas with local aquitards. The aquitards are likely the result of overflow deposition or temporary impoundment of glacial melt-water (Easterly et al. 2005). Aquitards may have also formed from lahars or volcanic ash (Easterly et al. 2005). In addition to having different soil characteristics, the South Puget Sound wet prairies were much more localized than Willamette Valley wet prairies.

The wet prairies in the South Puget Sound have been drastically reduced in extent and remaining wet prairies are so altered that the original composition, diversity and structure of the vegetation are largely unknown (Easterly et al. 2005). However, the South Puget Sound wet prairies are thought to be floristically similar to the Willamette Valley, of which more natural remnants remain. Based on the composition of the Willamette Valley wet prairies, it is thought that the South Puget Sound Prairie wet prairies were dominated primarily by graminoids, especially *Deschampsia caespitosa*, *Camassia quamash*, *Carex densa*, and *Carex unilateralis*, and to a lesser degree by forbs (e.g., *Isoetes nuttallii*) or shrubs (e.g., *Rosa nutkana*). Chappell et al. (2004) compiled a list of species known from prairies in the Willamette Valley, Puget Trough and Georgia Basin ecoregion. This list has been maintained an updated by Alverson (2009b) and indicates which prairie-associated habitat type each

species occurred in, including oak woodland and savanna, herbaceous balds and rock outcrops, upland prairies, seasonal wet prairies, and vernal pools and seepages.

This system was productive and likely dynamic due to frequency of fire. Vegetation composition may have changed rapidly between fires. Without frequent fires, woody species associated with riparian areas would likely have encroached into and dominated narrow wet prairie swales along riparian corridors (Easterly et al. 2005). Areas supporting larger and wider wet prairies, such as in outwash channels and depressions, would have been more isolated from woody encroachment and would likely have persisted longer than narrow strips along wooded riparian areas (Easterly et al. 2005). The composition of woody species would likely have included many that are present today, but likely in different proportions. Relatively fire-tolerant trees like *Quercus garryana*, *Populus tremuloides* and probably *P. balsamifera* ssp. *trichocarpa*, would have likely been more abundant than the fire intolerant *Fraxinus latifolia*, which is presumed to have increased since European settlement (Easterly et al. 2005). Shrubby species likely included *Symphoricarpos albus*, *Crataegus douglasii*, *Rosa nutkana*, *R. pisocarpa*, *Oemleria cerasiformis*, *Amelanchier alnifolia*, *Spiraea douglasii* and *Salix* spp. In addition, until recently *Alnus sinuata* was apparently common around wetland edges in the Tacoma area, and may have been a component of these systems and *Pteridium aquilinum* may have been aggressive and had significant cover in some sites (Easterly et al. 2005).

Stressors

The stressors described below are those primarily associated with the loss of extent and degradation of the ecological integrity of existing occurrences. The stressors are the cause of the system shifting away from its natural range of variability. In other words, type, intensity, and duration of these stressors is what moves a system's ecological integrity rank away from the expected, natural condition (e.g. A rank) toward degraded integrity ranks (i.e. B, C, or D).

Wet prairies have been lost and/or degraded due to numerous anthropogenic land uses and activities. Due to their productive nature, many wet prairies were converted to agriculture use, others were overgrazed, and others experienced invasion of woody vegetation due to fire suppression. Many other sites have been altered by draining, roads, and groundwater withdrawal. Due to these impacts, wet prairies have been nearly extirpated in the South Puget Sound region. The hydrologic regime of remaining wet prairie sites has likely been altered by draining and/or recession of the water table (Easterly et al. 2005). Fire suppression, attenuation of salmon runs, and altered hydrology of the current landscape has likely had a profound influence on the ecological processes and dynamics, such as nutrient cycling and successional status, of remaining wet prairie sites (Easterly et al. 2005).

Conceptual Ecological Model

The general relationships among the key ecological attributes associated with natural range of variability of the Willamette Valley Wet Prairie system are presented in Figure 1.

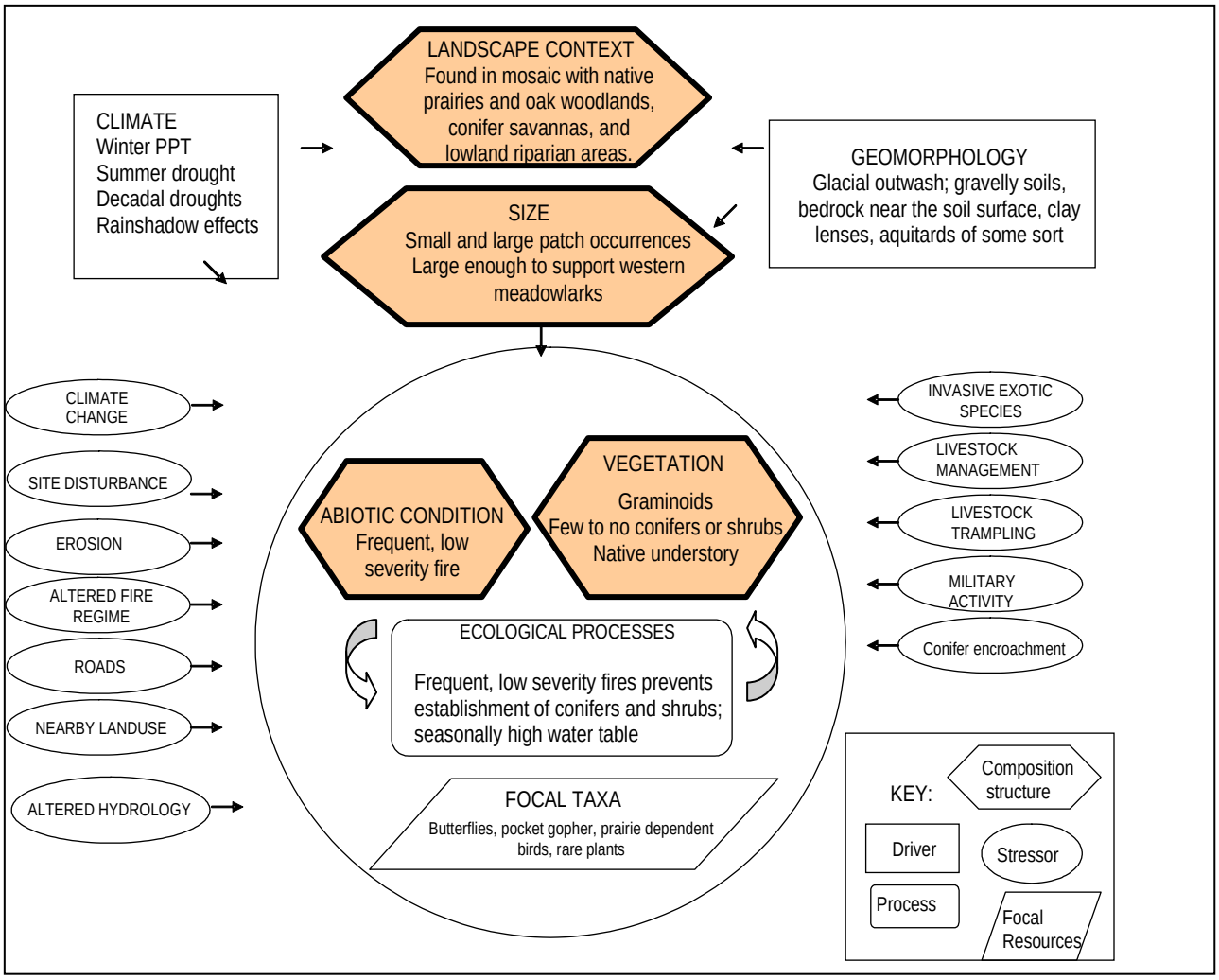

Figure 1. Generalized Conceptual Ecological Model for Willamette Valley Wet Prairie Ecological System.

Ecological Integrity Assessments

The assessment of ecological integrity can be done at three levels of intensity depending on the purpose and design of the data collection effort. The three-level approach is intended to provide increasing accuracy of ecological integrity assessment, recognizing that not all conservation and management decisions need equal levels of accuracy. The three-level approach also allows users to choose their assessment based in part on the level of classification that is available or targeted. If classification is limited to the level of forests vs. wetlands vs. grasslands, the use of remote sensing metrics may be sufficient. If very specific, fine-scale forest, wetland, and grassland types are the classification target then one has the flexibility to decide to use any of the three levels, depending on the need of the assessment. In other words, there is no presumption that a fine-level of classification requires a fine-level of ecological integrity assessment.

Because the purpose is the same for all three levels of assessment (to measure the status of ecological integrity of a site) it is important that the Level 1 assessment use the same kinds of metrics and major attributes as used at Levels 2 and 3. Level 1 assessments rely

almost entirely on Geographic Information Systems (GIS) and remote sensing data to obtain information about landscape integrity and the distribution and abundance of ecological types in the landscape or watershed. Level 2 assessments use relatively rapid field-based metrics that are a combination of qualitative and narrative-based rating with quantitative or semi-quantitative ratings. Field observations are required for many metrics, and observations will typically require professional expertise and judgment. Level 3 assessments require more rigorous, intensive field-based methods and metrics that provide higher-resolution information on the integrity of occurrences. They often use quantitative, plot-based protocols coupled with a sampling design to provide data for detailed metrics.

Although the three levels can be integrated into a monitoring framework, each level is developed as a stand-alone method for assessing ecological integrity. **When conducting an ecological integrity assessment, one need only complete a single level that is appropriate to the study at hand.** Typically only one level may be needed, desirable, or cost effective. But for this reason it is very important that each level provide a comparable approach to assessing integrity, else the ratings and ranks will not achieve comparable information if multiple levels are used.

Level 1 EIA

A generalized Level 1 EIA is provided in Rocchio and Crawford (2009). Please refer to that document for the list of metrics applicable to this ecological system. For the Level 1 Fire Condition Class metric, please use the metric ratings for that same metric found below in the Level 2 EIA.

Level 2 EIA

The following table displays the metrics chosen to measure most of the key ecological attributes in the conceptual ecological model above. The EIA is used to assess the ecological condition of an assessment area, which may be the same as the element occurrence or a subset of that occurrence based on abrupt changes in condition or on artificial boundaries such as management areas. **Unless otherwise noted, metric ratings apply to both Level 2 and Level 3 EIAs. The difference between the two is that a Level 3 EIA will use more intensive and precise methods to determine metric ratings.** To calculate ranks, each metric is ranked in the field according the ranking categories listed below. Then, the rank and point total for each metric is entered into the EIA Scorecard and multiplied by the weight factor associated with each metric resulting in a metric 'score'. Metric scores within a key ecological attribute are then summed to arrive at a score (or rank). These are then tallied in the same way to arrive at an overall ecological integrity score.

Table 1. Willamette Valley Wet Prairie Ecological Integrity Assessment Scorecard

Metric	Justification	Rank			
		A (5 pts.)	B (4 pts.)	C (3 pts.)	D (1 pts.)
Rank Factor: LANDSCAPE CONTEXT					
Key Ecological Attribute: *Buffer Effects*					
Buffer Length	The buffer can be important to biotic and abiotic aspects of the wetland as it provides connectivity and provides a 'filter' from exogenous threats.	Buffer is > 75 – 100% of occurrence perimeter.	Buffer is > 50 – 74% of occurrence perimeter.	Buffer is 25 – 49% of occurrence perimeter	Buffer is < 25% of occurrence perimeter.
Buffer Width		Average buffer width of occurrence is > 200 m, adjusted for slope.	Average buffer width is 100 – 199 m, after adjusting for slope.	Average buffer width is 50 – 99 m, after adjusting for slope.	Average buffer width is < 49 m, after adjusting for slope.
Buffer Condition		Abundant (>95%) cover native vegetation, little or no (<5%) cover of non-native plants, intact soils, AND little or no trash or refuse.	Substantial (75–95%) cover of native vegetation, low (5–25%) cover of non-native plants, intact or moderately disrupted soils; minor intensity of human visitation or recreation.	Moderate (25–50%) cover of non-native plants, moderate or extensive soil disruption; moderate intensity of human visitation or recreation.	Dominant (>50%) cover of non-native plants, barren ground, highly compacted or otherwise disrupted soils, moderate or greater intensity of human visitation or recreation, no buffer at all.
Key Ecological Attribute: *Landscape Structure*					

Connectivity	Intact areas have a continuous corridor of natural or semi-natural vegetation between shrub steppe areas	Intact: Embedded in 90-100% natural habitat; connectivity is expected to be high.	Variegated: Embedded in 60-90% natural or semi-habitat; habitat connectivity is generally high, but lower for species sensitive to habitat modification;	Fragmented: Embedded in 20-60% natural or semi-natural habitat; connectivity is generally low, but varies with mobility of species and arrangement on landscape.	Relictual: Embedded in < 20% natural or semi-natural habitat; connectivity is essentially absent
Landscape Condition Model Index	The intensity and types of land uses in the surrounding landscape can affect ecological integrity.	Landscape Condition Model Index >0.8		Landscape Condition Model Index 0.75 – 0.65	Landscape Condition Model Index < 0.65
Rank Factor: CONDITION					
Key Ecological Attribute: *Vegetation Composition*					
Relative Cover Native Plant Species	Native species in shrub and herbaceous layers; non-natives increase with human impacts.	Native species total cover >95% and dominate all physiognomic layers;	Native species total cover > 90%	Native species total cover 40 to 90%.	Native species total cover < 40%; nonnative species dominate.
Douglas-fir encroachment	The amount of encroachment by *Pseudotsuga menziesii* is an indication of the integrity of the fire regime (Chappell 2000; Chappell 2004).	*Pseudotsuga menziesii*, if present, consists of widely scattered large, old trees.	Douglas-fir at densities of <4 individuals/acre regardless of size.	Douglas-fir numerous as seedlings/saplings/small trees.	Douglas-fir numerous as seedlings/saplings/small trees and >25% cover.
Relative Cover of Native Increasers	Some stressors such as grazing can shift or homogenize native composition toward species tolerant of stressors. (i.e., Carex inops)	<10% cover	10-20% cover	20-50%	>50% cover
Shrub Cover	Shrub cover outside of NRV can indicate past disturbance such as grazing or fire suppression. *Symphoricarpos albus*, *Crataegus douglasii*, *Rosa nutkana*, *R. pisocarpa*, *Oemleria cerasiformis*, *Amelanchier alnifolia*, *Spiraea douglasii* and *Salix*	None or minimal cover (<1%).	Present and <10% cover.	<10-25%	>25%

Absolute Cover of Invasive Herbaceous Species	Invasive species can inflict a wide range of ecological impacts. Early detection is critical. Examples include *Phalaris arundinacea, Poa pratensis, Elymus repens.*	None or minimal (<1%) present.	Invasive species present, but sporadic (<5% cover).	Invasive species prevalent (5–30% absolute cover).	Invasive species abundant (>30% absolute cover).
Richness of Wet Prairie Associated Plant Species	The overall composition of native species can shift when exposed to stressors. This metric measures the presence of those species with strong fidelity to prairies. Refer to fidelity list below (Alverson 2009a; Chappell 2000).	>15 species with moderate or high fidelity toward wet prairies	10-15 species with moderate or high fidelity toward wet prairies	5-10 species with moderate or high fidelity toward wet prairies	<5 species with moderate or high fidelity toward wet prairies
Key Ecological Attribute: *Hydrology*					
Water Source	Anthropogenic sources of water can have detrimental effects on the hydrological regime	Source is natural or naturally lacks water in the growing season. No indication of direct artificial water sources	Source is mostly natural, but site directly receives occasional or small amounts of inflow from anthropogenic sources	Source is primarily urban runoff, direct irrigation, pumped water, artificially impounded water, or other artificial hydrology	Water flow has been substantially diminished by human activity
Hydroperiod	Alteration in hydrology or sediment loads or some onsite stressors can degrade channel stability (partially from Alverson 2009a)	Hydroperiod of the site is characterized by natural patterns of filling or inundation and drying or drawdown. Soils are generally saturated to the surface during the rainy season.	The filling or inundation patterns in the site are of greater magnitude (and greater or lesser duration than would be expected under natural conditions, but thereafter, the site is subject to natural drawdown or drying.	The filling or inundation patterns in the site are characterized by natural conditions, but thereafter are subject to more rapid or extreme drawdown or drying, as compared to more natural wetlands. OR filling or inundation patterns are of substantially lower magnitude or duration than expected under natural conditions, but thereafter, the site is subject to natural drawdown or drying.	Both the filling/inundation and drawdown/drying of the site deviate from natural conditions (either increased or decreased in magnitude and/or duration). Soils are either never saturated to the surface during the rainy season, or are completely inundated for more than 120 continuous hours (5 days) at least once in a five year period.

Hydrological Connectivity (non-riverine)	Floodwater should have access to the floodplain. Stressors resulting in entrenchment affect hydrological connectivity	Rising water in the site has unrestricted access to adjacent upland, without levees, excessively high banks, artificial barriers, or other obstructions to the lateral movement of flood flows.	Lateral excursion of rising waters is partially restricted by unnatural features, such as levees or excessively high banks, but < than 50% of the site is restricted by barriers to drainage. Restrictions may be intermittent along the site, or the restrictions may occur only along one bank or shore. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.	Lateral excursion of rising waters is partially restricted by unnatural features, such as levees or excessively high banks, and 50-90% of the site is restricted by barriers to drainage. Flood flows may exceed the obstructions, but drainage back to the wetland is incomplete due to impoundment.	All water stages in the site are contained within artificial banks, levees, sea walls, or comparable features, or greater than 90% of wetland is restricted by barriers to drainage. There is essentially no hydrologic connection to adjacent uplands.
Key Ecological Attribute: *Physicochemical*					
Soil Surface Condition	Soil disturbance can result in erosion thereby negatively affecting many ecological processes	Bare soil areas are limited to naturally caused disturbances such as flood deposition or game trails	Some bare soil due to human causes but the extent and impact is minimal. The depth of disturbance is limited to only a few inches and does not show evidence of ponding or channeling water.	Bare soil areas due to human causes are common. There may be pugging due to livestock resulting in several inches of soil disturbance. ORVs or other machinery may have left some shallow ruts.	Bare soil areas substantially & contribute to altered hydrology or other long-lasting impacts. Deep ruts from ORVs or machinery may be present, or livestock pugging and/or trails are widespread. Water will be channeled or ponded.
Water Quality	Excess nutrients, sediments, or other pollutant have an adverse affect on natural water quality	No evidence of degraded water quality. Water is clear; no strong green tint or sheen.	Some negative water quality indicators are present, but limited to small and localized areas. Water may have a minimal greenish tint or cloudiness, or sheen.	Negative indicators or wetland species that respond to high nutrient levels are common. Water may have a moderate greenish tint, sheen or other turbidity with common algae.	Widespread evidence of negative indicators. Algae mats may be extensive. Water may have a strong greenish tint, sheen or turbidity. Bottom difficult to see during due to surface algal mats and other vegetation blocking light to the bottom.
Rank Factor: SIZE					
Key Ecological Attribute: *Size*					
Relative Size	Indicates the proportion lost due to stressors such as complete fire suppression (conversion to a new system), development, roads, etc.	Site is at or minimally reduced from natural extent (>95% remains)	Occurrence is only modestly reduced from its original natural extent (80-95% remains)	Occurrence is substantially reduced from its original natural extent (50-80% remains)	Occurrence is severely reduced from its original natural extent (<50% remains)

Absolute Size	Absolute size may be important for buffering impacts originating in the surrounding landscape.	Very large (>300 ac/120 ha)	Large (100-300 ac/40-120 ha)	Moderate (10-100 ac/4-40 ha)	Small (<10 ac/4 ha)

Level 3 EIA
Level 3 metrics would include more quantitative measures of the metrics listed above. In addition, further consideration might be given to:

- Alverson (2009a) has suggested metrics for 1 m^2 quadrats.
- Nitrogen Enrichment (C:N)
- Phosphorous Enrichment (C:P)
- Soil Organic Carbon
- Soil Bulk Density
- Water Table Depth

Triggers or Management Assessment Points
Ecological triggers or conditions under which management activities need to be reassessed are shown in the table below. Since the Ecological Integrity rankings are based on hypothesized thresholds, they are used to indicate where triggers might occur. Specific details about how these triggers translate for each metric can be found by referencing the values or descriptions for the appropriate rank provided in the Tableabove.

Table 2. Triggers for Level 2 & 3 EIA

Key Ecological Attribute or Metric	Trigger	Action
Any metric (except Connectivity or LCM)	▪ C rank ▪ Shift from A to B rank ▪ negative trend within the B rating (Level 3)	Level 2 triggers: conduct Level 3 assessment; make appropriate short-term management changes to ensure no further degradation Level 3 triggers: make appropriate management adjustments to ensure no additional degradation occurs. Continue monitoring using Level 3.
Any Key Ecological Attribute	▪ any metric has a C rank ▪ > ½ of all metrics are ranked B ▪ negative trend within the B rating (Level 3)	Level 2 triggers: conduct Level 3 assessment; make appropriate short-term management changes to ensure no further degradation Level 3 triggers: make appropriate management adjustments to ensure no additional degradation occurs. Continue monitoring using Level 3.

Protocol for Integrating Metric Ranks
If desired, the user may wish to integrate the ratings of the individual metrics and produce an overall score for the three rank factor categories: (1) Landscape Context; (2) Condition; and (3) Size. These rank factor rankings can then be combined into an Overall Ecological Integrity Rank. This enables one to report scores or ranks from the various hierarchical scales of the assessment depending on which best meets the user's objectives. Please see Table 5 in Rocchio and Crawford (2009) for specifics about the protocol for integrating or 'rolling-up' metric ratings.

List of Native Species with Moderate and High Fidelity to Willamette Valley Wet Prairies (from Chappell et al. 2004 and Alverson 2009b)

SPECIES	FAMILY	COMMON NAME	Degree of fidelity to prairie habitats	Present in Georgia Basin	Present in Puget Trough	Present in Lower Columbia River	Present in Willamette Valley	Occurs in Wet Prairie	Occurs in Vernal Pools or Seeps
Agrostis exarata Trin. var. exarata	Poaceae	spike bentgrass	M	Y	?	Y	Y	Y	Y
Agrostis microphylla Steud.	Poaceae	awned spike bentgrass	H	Y	Y	Y	Y	Y	Y
Alopecurus carolinianus Walt.	Poaceae	Tufted Foxtail	H	Y	Y		Y		Y
Alopecurus geniculatus L. var. geniculatus	Poaceae	water foxtail	M	Y	Y	Y	Y	Y	Y
Alopecurus saccatus Vasey	Poaceae	Pacific foxtail	H	?	Y		Y		Y
Androsace filiformis Retz.	Primulaceae	slender rock-jasmine	H			Y	Y	Y	
Aristida oligantha Michaux	Poaceae	prairie threeawn	H				Y		Y
Asclepias fascicularis Duchesne	Asclepiadaceae	narrowleaf milkweed	H				Y	Y	Y
Beckmannia syzigachne (Steud.) Fernald	Poaceae	sloughgrass	H			Y	Y	Y	Y
Callitriche heterophylla Pursh ssp. bolanderi (Hegelm.) Calder & Taylor	Callitrichaceae	Bolander's water starwort	M	Y		Y	Y		Y
Callitriche marginata Torr.	Callitrichaceae	Winged Water-starwort	M	Y			Y		Y
Calochortus uniflorus Hook. & Arn.	Liliaceae	large flowered startulip	H				Y	Y	
Cardamine penduliflora O.E. Schulz	Brassicaceae	Willamette Valley bittercress	M			?	Y	Y	
Carex athrostachya Olney	Cyperaceae	slenderbeak sedge	M	Y	Y	Y	Y	Y	
Carex aurea Nuttall	Cyperaceae	golden fruited sedge	H	Y		Y	Y	Y	
Carex cusickii Mack. ex Piper & Beattie	Cyperaceae	Cusick's sedge	M	?	?	?	Y	Y	
Carex densa (L.H. Bailey) L.H. Bailey	Cyperaceae	dense sedge	H	?	Y	Y	Y	Y	Y
Carex feta L.H. Bailey	Cyperaceae	green sheathed sedge	M	Y	?	Y	Y	Y	
Carex scoparia Schkuhr ex Willd. var. scoparia	Cyperaceae	pointed broom sedge	M	Y		Y	Y	Y	
Carex unilateralis Mack.	Cyperaceae	one sided sedge	M	Y	Y	Y	Y	Y	Y
Centunculus minimus L.	Primulaceae	chaffweed	M	Y		Y	Y	Y	Y
Cicendia quadrangularis (Lam.) Griseb.	Gentianaceae	timwort	H				Y	Y	Y
Crassula aquatica (L.) P. Schoenl.	Crassulaceae	water pygmy weed	M	Y	Y	Y	Y		Y
Crassula connata (Ruiz & Pavón) Berger var. connata	Crassulaceae	Sand Pygmyweed	H	Y					Y
Cuscuta pentagona Engelm. var. pentagona	Cuscutaceae	field dodder	M	Y		?	Y	Y	Y

SPECIES	FAMILY	COMMON NAME	Degree of fidelity to prairie habitats	Present in Georgia Basin	Present in Puget Trough	Present in Lower Columbia River	Present in Willamette Valley	Occurs in Wet Prairie	Occurs in Vernal Pools or Seeps
Deschampsia cespitosa (L.) P. Beauv. s.l.	Poaceae	tufted hairgrass	M	Y	Y	Y	Y	Y	Y
Deschampsia danthonioides (Trin.) Munro	Poaceae	annual hairgrass	H	Y	Y	Y	Y	Y	Y
Downingia elegans (Douglas ex Lindl.) Torr. var. elegans	Campanulaceae	elegant downingia	H	?	Y	Y	Y	Y	Y
Downingia yina Applegate	Campanulaceae	Willamette downingia	H	?	Y	Y	Y	Y	Y
Eleocharis acicularis (L.) Roem. & Schult. var. acicularis	Cyperaceae	needle spikerush	M	?	Y	Y	Y	Y	Y
Eleocharis palustris (L.) Roem. & Schult. var. palustris	Cyperaceae	creeping spikerush	M	?	Y	Y	Y	Y	Y
Epilobium densiflorum (Lindl.) P.C. Hoch & P.H. Raven	Onagraceae	close flowered boisduvalia	H	Y	Y	Y	Y	Y	Y
Epilobium pygmaeum (Speg.) P.C. Hoch & P.H. Raven	Onagraceae	smooth willowherb	H			Y	Y		Y
Equisetum palustre L.	Equisetaceae	marsh horsetail	M				Y	Y	
Eryngium petiolatum Hook.	Apiaceae	coyotethistle	H			Y	Y	Y	Y
Gentiana sceptrum Griseb.	Gentianaceae	king's gentian	M	?		Y	Y	Y	
Glyceria occidentalis (Piper) J.C. Nelson	Poaceae	western mannagrass	M			Y	Y	Y	Y
Gnaphalium palustre Nuttall	Asteraceae	lowland cudweed	M	Y	Y	Y	Y	Y	Y
Gratiola ebracteata Benth.	Scrophulariaceae	bractless hedge hyssop	M	Y	Y	Y	Y	Y	Y
Helenium autumnale L. var. grandiflorum (Nutt). T.&G.	Asteraceae	autumn sneezeweed	M	Y	Y	Y	?	Y	
Juncus confusus Coville	Juncaceae	Colorado rush	H	?	?	?	Y	Y	
Juncus dudleyi Wieg.	Juncaceae	Dudley's rush	M				Y	Y	
Juncus hemiendytus F.J. Herm. var. hemiendytus	Juncaceae	dwarf rush	H			Y	Y		Y
Juncus nevadensis S. Watson var. nevadensis	Juncaceae	Sierra rush	H			Y	Y	Y	Y
Juncus occidentalis Wieg.	Juncaceae	prairie rush	M	Y	Y	Y	Y	Y	
Lepidium oxycarpum Torr. & Gray	Brassicaceae	Sharp-pod Pepper-grass	H	Y					Y
Limnanthes macounii Trel.	Limnanthaceae	Macoun's meadowfoam	H	Y					Y
Lotus formosissimus Greene	Fabaceae	bicolored lotus	H	Y	?	Y	Y	Y	Y
Lotus pinnatus Hook.	Fabaceae	bog lotus	H	Y	Y	Y	Y	Y	Y
Mentha canadensis L.	Lamiaceae	field mint	M	Y	?	Y	Y	Y	

SPECIES	FAMILY	COMMON NAME	Degree of fidelity to prairie habitats	Present in Georgia Basin	Present in Puget Trough	Present in Lower Columbia River	Present in Willamette Valley	Occurs in Wet Prairie	Occurs in Vernal Pools or Seeps
Mimulus douglasii (Benth.) A. Gray	Scrophulariaceae	Dougla's Monkeyflower	H				Y	Y	Y
Mimulus tricolor Hartw.	Scrophulariaceae	Tricolor Monkeyflower	H				Y		Y
Montia fontana L. var. tenerrima (Gray) Fern. & Wieg.	Portulacaceae	water chickweed	M	Y	Y	Y	Y	Y	Y
Montia linearis (Douglas ex Hook.) Greene	Portulacaceae	narrowleaf montia	M	Y	Y	Y	Y	Y	Y
Myosurus minimus L.	Ranunculaceae	least mousetail	H	Y	Y	Y	Y		Y
Navarretia leucocephala Benth. ssp. leucocephala	Polemoniaceae	white flowered navarretia	H				Y		Y
Navarretia squarrosa (Eschsch.) Hook. & Arn.	Polemoniaceae	skunkweed	M	Y	Y	Y	Y		Y
Navarretia willamettensis S.C. Spencer	Polemoniaceae	Willamette navarretia	H				Y		Y
Penstemon hesperius Peck	Scrophulariaceae	western penstemon	H			Y		Y	
Physostegia parviflora	Lamiaceae	western false dragonhead	M			Y		Y	
Plagiobothrys figuratus (Piper) I.M. Johnst. ssp. figuratus	Boraginaceae	fragrant popcorn flower	H	Y	Y	Y	Y	Y	Y
Plagiobothrys scouleri (Hook. & Arn.) I.M. Johnst. var. hispidulus (Greene) Dorn	Boraginaceae	sleeping popcornflower	M	?		Y	Y	Y	
Plagiobothrys scouleri (Hook. & Arn.) I.M. Johnst. var. scouleri	Boraginaceae	Scouler's popcorn flower	M	Y	Y	Y	Y	Y	Y
Plantago bigelovii Gray ssp. bigelovii	Plantaginaceae	coastal plantain	H	Y		Y		Y	Y
Polygonum bistortoides Pursh	Polygonaceae	western bistort	H	?	Y	Y	Y	Y	
Polygonum polygaloides ssp. confertiflorum	Polygonaceae	close flowered knotweed	H			Y	Y		Y
Potentilla rivalis Nuttall	Rosaceae	Brook Cinquefoil	H	Y	Y	Y		Y	
Psilocarphus elatior (A. Gray) A. Gray	Asteraceae	tall woollyheads	M	Y	Y	Y	Y	Y	Y
Psilocarphus oregonus Nuttall	Asteraceae	Oregon Woollyheads	M			Y	Y	Y	Y
Pyrrocoma racemosa (Nuttall) Torr. & A. Gray var. racemosa	Asteraceae	racemed goldenweed	H				Y	Y	
Ranunculus alismifolius Geyer ex Bentham var. alismifolius	Ranunculaceae	plantain leaved buttercup	H	Y	Y	Y	Y	Y	Y
Ranunculus lobbii (Hiern) A. Gray	Ranunculaceae	Lobb's water buttercup	H	Y	?		Y		Y
Ranunculus orthorhynchus Hook. var. orthorhynchus	Ranunculaceae	straightbeak buttercup	H	Y	Y	Y	Y	Y	

SPECIES	FAMILY	COMMON NAME	Degree of fidelity to prairie habitats	Present in Georgia Basin	Present in Puget Trough	Present in Lower Columbia River	Present in Willamette Valley	Occurs in Wet Prairie	Occurs in Vernal Pools or Seeps
Ranunculus orthorhynchus Hook. var. platyphyllus A. Gray	Ranunculaceae	broadleaved buttercup	H	Y		Y	Y	Y	
Rorippa curvisiliqua (Hook.) Bessey ex Britton	Brassicaceae	western yellowcress	M	Y	Y	Y	Y		Y
Rotala ramosior (L.) Koehne	Lythraceae	Toothcup	M		?	Y	Y		Y
Salix piperi Bebb	Salicaceae	Piper's willow	M	?	Y	Y	Y	Y	
Saxifraga oregana Howell var. oregana	Saxifragaceae	Oregon saxifrage	H	?	Y	Y	Y	Y	
Sclerolinon digynum (A. Gray) C.M. Rogers	Linaceae	northwestern yellowflax	H				Y	Y	Y
Sidalcea cusickii Piper	Malvaceae	Cusick's checkermallow	H				Y	Y	
Sidalcea nelsoniana Piper	Malvaceae	Nelson's Sidalcea	H			Y	Y	Y	
Stellaria longipes Goldie ssp. longipes	Caryophyllaceae	longstalk starwort	M	Y	Y	?		Y	
Thalictrum polycarpum (Torr.) S. Watson	Ranunculaceae	tall western meadowrue	M		?	?	Y	Y	
Trichostema oblongum Benth.	Lamiaceae	downy blue curls	H			Y	Y	Y	Y
Veronica peregrina L. var. xalapensis (Kunth) H. St. John & F.A. Warren	Scrophulariaceae	hairy purslane speedwell	M	Y	Y	?	Y	Y	Y
Veronica scutellata L.	Scrophulariaceae	marsh speedwell	M	?	Y	Y	Y	Y	Y
Viola langsdorfii (Regel.) Fisch.	Violaceae	Alaska violet	M	Y				Y	
Viola nephrophylla Greene	Violaceae	northern bog violet	M	Y				Y	

Supporting documents for the EIAs can be found at:
http://www1.dnr.wa.gov/nhp/refdesk/communities/eia.html

Documentation about Ecological Systems can be found at:
http://www1.dnr.wa.gov/nhp/refdesk/communities/ecol_systems.html

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