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**NATIVE VEGETATION OF THE SOUTH PUGET SOUND
PRAIRIE LANDSCAPE**

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Abstract

Vegetation of the South Puget Prairie Landscape has undergone dramatic changes since European settlement, primarily due to suppression of fires, invasion of non-native species, and land conversion. Major existing land cover includes conifer forests, conifer savannas, oak woodlands, grasslands (prairies), forested and non-forested wetlands, agricultural crops, and developed areas. This paper will describe the composition and successional status of native prairies, oak woodlands, conifer savannas, and riparian deciduous forested wetlands.

Native prairies, found on glacial outwash soils, are represented by the Idaho fescue-white-topped aster community type. This community type is characterized by a group of native forbs which distinguish it from superficially similar community types located on shallow bedrock soils elsewhere in the Puget Trough. Given a conifer seed source and time without fire, all South Sound prairies appear to be capable of succeeding to dominance by Douglas fir and/or lodgepole pine. Many non-native species have invaded these prairies and in most cases radically altered their composition and/or structure.

Four oak woodland plant community types are represented in the South Sound: Oregon white oak/long-stolon sedge-camas, Oregon white oak/common snowberry/long-stolon sedge, Oregon white oak-Douglas fir/snowberry/swordfern, and Oregon white oak/snowberry/moist forb. The first of these is an open woodland that is most similar in composition to pre-settlement oak savannas. The non-native shrub, Scot's broom, readily invades the understory of this community type. Oak-Douglas fir/snowberry/swordfern and oak/snowberry/sedge communities are a result of succession in the absence of fire on sites that were once primarily occupied by prairies or oak savannas. They were probably of minor importance in the pre-European landscape. The oak/snowberry/moist forb community is a transitional type between wetlands and upland prairies, generally has a dense shrub layer, and is functionally a part of riparian systems.

Conifer savannas are a result of patchy tree establishment and survival on prairies. Understory composition is largely similar to prairies. Douglas fir is the most common savanna tree, lodgepole pine (shore pine) is found in scattered localities, especially in Mason County, and ponderosa pine is limited to a small area of Pierce County. The relative fire resistance of these tree species provides clues to the successional status, pre-settlement abundance, and restoration priorities for different types of savannas. All savannas are expected to succeed toward conifer forest in the absence of fire or management.

Riparian deciduous forested wetlands in the prairie landscape are generally dominated by Oregon ash, sometimes with black cottonwood co-dominant. Typical understory dominants include common snowberry, red-osier dogwood, and Pacific ninebark.

The dynamic nature of these communities and the prominence of non-native invader species makes them a management and restoration challenge. The species composition, successional status, and environment of these existing plant communities can be used to set realistic restoration targets.

INTRODUCTION AND METHODS

The South Puget Sound prairie landscape consists of a mosaic of different types of vegetation. Prior to Euro-American settlement, the area was defined by a mosaic of grasslands, oak and conifer savannas, and various types of wetlands (Lang 1961). The area occupied by native grasslands and oak woodlands with a native understory has been dramatically reduced due to multiple influences: altered fire regimes, invasion of non-native species, grazing, and urban and agricultural conversion (Giles 1970, Agee 1993, Clampitt 1993, Crawford and Hall this volume). Major existing land cover within this landscape includes grasslands (prairies), conifer forests, conifer savannas, oak woodlands, wooded and non-wooded wetlands, agriculture, and developed areas.

Remaining native prairie and oak vegetation has taken on added significance due to its current rarity and the many species associated with the unique prairie landscapes that have declined. Native-dominated examples of these

vegetation types in intact landscapes are most likely to be useful in stemming the decline of species of concern. In

addition, smaller fragments of native vegetation can be useful as reference sites for future restoration or research and may benefit some species of concern. A systematic description of prairie-associated native vegetation of the South Puget Sound area has not previously been published, but selected studies have focused on particular sites with specific objectives (Lang 1961, Giles 1970, del Moral and Deardorff 1976, Kertis 1986, Clampitt 1993).

Even the best remaining examples of many of these vegetation types have probably undergone considerable change since pre-settlement times, and in pre-settlement times this landscape was strongly culturally influenced (Norton 1979). For these reasons, I have focused on defining existing native vegetation types and describing their successional status, rather than on attempting to describe what the “natural” vegetation is (Sprugel 1991). Nevertheless, existing knowledge of what general types of

vegetation were present in the pre-settlement landscape is essential to understanding trends and current vegetation.

This paper will describe the species composition, environmental features, non-native invader species, and successional status (dynamics) of native-dominated prairies, oak woodlands, conifer savannas, wooded wetlands and riparian areas, and conifer forests. Plant community types, based on existing vegetation, are defined for native-dominated grasslands and oak woodlands. Vegetation descriptions are based primarily on plot data and field observations. Data were collected on 400-500 m² circular plots located subjectively to represent a sampled stand of vegetation. Data were analyzed with numerical clustering and ordination methods (detrended correspondence analysis) and plots were classified after interpretation of the analyses in light of environmental features, disturbance, and succession.

GRASSLANDS

Grasslands, often referred to as prairies, were the dominant landscape feature on the glacial outwash soils prior to Euro-American settlement (Lang 1961). The majority of remaining prairie is actually dominated or co-dominated by non-native species (Crawford and Hall this volume). Even in the best-condition remaining communities, non-native species are present with high frequency. The few remaining tracts of prairie dominated by native species are dominated by Idaho fescue (*Festuca idahoensis* var. *roemerii*) and mosses (especially *Rhacomitrium canescens*), with a diverse and somewhat variable assemblage of native herbaceous species prominent. Despite the apparent variability in species composition, these grasslands are unique compositionally when compared with grasslands in other areas of the Pacific Northwest and, from a statewide or regional perspective, the remaining native-dominated

prairies represent a single plant community type that is held together by a number of distinctive species (Chappell et al. 1996), the Idaho fescue-White-top aster community.

Idaho Fescue-White-top Aster Community:

This grassland community is dominated by Idaho fescue, generally occupying 30-70 percent cover. A variety of native and non-native herbaceous species are common (Table 1). Common camas (*Camassia quamash*) is present with high constancy and contributes considerable cover, especially when in bloom during late April and May. Other native species that are usually present include the graminoids long-stolon sedge (*Carex inops*), California danthonia (*Danthonia californica*), and field woodrush (*Luzula multiflora*); and the forbs woolly sunflower (*Eriophyllum lanatum*), houndstongue hawkweed (*Hieracium cynoglossoides*), white-top aster (*Aster curtus*), cutleaf microseris (*Microseris laciniata*), broadpetal strawberry (*Fragaria virginiana* var. *playpetala*), spikelike goldenrod (*Solidago spathulata*), early blue violet (*Viola adunca*), prairie lupine (*Lupinus lepidus*), western buttercup (*Ranunculus occidentalis*), yarrow (*Achillea millefolium*), meadow death-camas (*Zygadenus venenosus*), slender cinquefoil (*Potentilla gracilis*), pomocelery lomatium (*Lomatium utriculatum*) and Henderson's shooting star (*Dodecatheon hendersonii*). Brackenfern (*Pteridium aquilinum*) is also frequent and sometimes co-dominates, for example, on the top of individual Mima mounds. The showy Puget balsamroot (*Balsamorhiza deltoidea*) is found on a few prairies in abundance, but is absent from the majority of sites. Native shrubs are absent or present in low abundance, with widely scattered serviceberry (*Amelanchier alnifolia*) or black hawthorn (*Crataegus douglasii*) or occasional patches of the dwarf shrub, kinnikinnick (*Arctostaphylos uva-ursi*), found on many prairies.

Non-native invader species with high constancy are the shrub Scotch broom (*Cytisus scoparius*); the perennial grasses colonial bentgrass (*Agrostis tenuis*), common velvetgrass (*Holcus lanatus*), and Kentucky bluegrass (*Poa pratensis*); the perennial forbs hairy catsear (*Hypochaeris radicata*), common St. Johns-wort (*Hypericum perforatum*), buckhorn plantain (*Plantago lanceolata*), and oxeye-daisy (*Chrysanthemum leucanthemum*); and the annual forbs sheep sorrel (*Rumex acetosella*) and teesdalia (*Teesdalia nudicaulis*).

This community is distinguished from superficially similar Idaho fescue communities elsewhere in western Washington by a suite of character species which occur commonly in the Idaho fescue-white-top aster community but are absent or rare in the other community types (Chappell et al. 1996). These diagnostic South Sound prairie species are houndstongue hawkweed, cutleaf microseris, spikelike goldenrod, slender cinquefoil, white-top aster, and prairie lupine. Conversely, field chickweed (*Cerastium arvense*), blue wildrye (*Elymus glaucus*), and onions (*Allium* spp.) are largely absent from the South Sound prairies. These other community types also occur primarily in the northern Puget Lowland on shallow bedrock soils. The Idaho fescue grassland at Bald Hill, Thurston County, has more in common, both compositionally and environmentally, with the bedrock

types of the northern Puget Lowland than with the South Sound prairies.

The Idaho fescue-White-top aster community type is limited to gravelly glacial outwash parent materials of the southern Puget Sound area. Remaining examples are all located on Spanaway or Spanaway-Nisqually complex soil series. These sites are flat or nearly so, or are located on Mima mounds topography. Similar communities formerly occurred also on Carstairs and Nisqually soil series, and possibly on some sites now occupied by the Everett soil series.

This community type is susceptible to invasion by native conifer species, especially Douglas fir (Lang 1961, Giles 1970). Given a conifer seed source and adequate time without fire (or other disturbance to remove invading conifers), all South Sound prairies may succeed to forested conditions. Conifer savannas are often an intermediate stage in succession between prairies and forests. Conifer establishment may be tied to years of greater summer moisture than usual (Agee and Dunwiddie 1984) and could be enhanced by grazing or other ground disturbances (Reed and Sugihara 1987, Agee 1987).

Portions of this vegetation type have been variously described by Lang (1961), Giles (1970), del Moral and Deardorff (1976), and Clampitt (1993).

Table 1. Percent constancy and mean relative cover of common species in native prairie and oak woodland communities of South Puget Sound. n= number of plots.

	Idaho fescue- White-top aster (n=14)		Garry oak/Long-stolon sedge-Camas (n=12)		Garry oak/Snowberry/ Long-stolon sedge (n=16)		Garry oak-Douglas fir/ Snowberry/Swordfern (n=8)		Garry oak/Snowberry/ Moist forb (n=19)	
	% Constancy	% Cover	% Constancy	% Cover	% Constancy	% Cover	% Constancy	% Cover	% Constancy	% Cover
Trees										
Cascara buckthorn			10	1	11	1	50	1	37	
Domestic sweet cherry					6	3	38	5		
Douglas fir	29	1	40	2	50	7	75	31	16	
Garry oak			100	53	100	61	100	71	100	

Oregon ash			20	1	28	6	50	4	53
Western crabapple					6	3	13	1	16
Shrubs									
Baldhip rose					6	1	63	2	16
Black hawthorn	14	1			6	1	13	38	11
Blackcap					6	1	50	1	26
California hazelnut			10	1	11	2	75	13	21
Common snowberry	7	1	70	6	100	34	100	32	100
Creeping snowberry			10	13	6	3	25	3	
Indian plum			50	1	56	9	88	13	94
Kinnikinnick	7	1	30	6					
Nootka rose	7	1					13	3	16
Oceanspray			20	3	17	1	38	15	32
Orange honeysuckle			10	1	33	9	63	6	42
Oval-leaf viburnum					6	8	25	3	16
Scot's broom	57	4	70	11	83	9	25	2	5
Serviceberry	21	1	60	3	83	7	88	10	89
Tall oregongrape			80	5	72	9	100	3	74
Trailing blackberry			10	1	39	4	100	9	47
Herbs									
Alaska oniongrass			10	3	11	2	75	2	5
Bigleaf sandwort					11	2	38	10	16
Blue wildrye			60	13	67	7	13	1	21
Bluebells-of-Scotland	29	1	10	3					
Brackenfern	64	5			11	9	13	1	16
Broadleaf starflower							25	1	11
Broadpetal strawberry	64	4	20	3	11	1			
Buckhorn plantain	64	2	80	2	11	1			
California danthonia	79	2	50	3					
Catchweed bedstraw			60	3	50	2	38	3	47
Chocolate lily	21	1	40	1	11	1	13	3	

Colonial bentgrass									
Common camas	86	6	60	5					
Common St.-Johns wort	79	1	80	4	89	3	38	1	21
Common vetch			50	5	22	2			5
Common velvetgrass	64	2	10	3	6	3			
Cutleaf microseris	71	1	40	2					
Early blue violet	64	4	70	1	11	1			
Enchanter's nightshade							13	3	21
Field woodrush	71	1	60	2					
Hairy catsear	93	9	60	2	28	1			
Henderson's shooting star	50	1							
Houndstongue hawkweed	86	4	20	2					
Idaho fescue	100	45	60	6	22	1			
Kentucky bluegrass	57	2	100	22	89	15	25	2	37
Licorice fern			20	1	11	1	63	1	42
Long-stolon sedge	93	2	100	22	83	12	75	1	26
Meadow death-camas	57	1	40	1					
Mountain sweet-cicely			20	1	6	1	38	1	42
Nuttall's peavine			10	3	56	4			11
Orchardgrass	14	1	20	25	6	1	13	1	26
Oregon manroot			10	8	6	13	13	3	16
Oxeye-daisy	50	3	10	1	6	1	13	1	
Pacific sanicle			50	3			13	3	21
Pomo-celery lomatium	43	1	20	4					
Prairie junegrass	29	2	10	1					
Prairie lupine	64	2							
Puget balsamroot	21	3	10	13					
Red fescue			20	22					
Selfheal	64	1	30	1			13	1	
Sheep sorrel	71	1	50	1	17	1			
Siberian minerslettuce							25	3	42
Silver hairgrass	29	1	20	1	6	1			
Slender cinquefoil	57	2	10	3					
Small-flowered trillium									26
Smallflower nemophila			10	1			25	1	32
Spikelike goldenrod	64	2							
Sweet vernalgrass	71	4							
Starry false solomons seal					6	1	25	10	37
Swordfern			20	1	17	1	100	7	53
Tall oatgrass	21	6	20	6	44	4			16
Teesdalia	71	1	50	1	22	1			

Western buttercup	64	2	60	2	11	1		
White-top aster	71	4	40	1				
Woods strawberry	7	3	20	3	6	3	25	3
Woolly sunflower	93	2	20	6				
Yarrow	64	1	70	4	28	1		
Yerba buena			10	1	11	6	38	1

OAK WOODLANDS

Four oak woodland community types dominated by native species are defined for the South Puget Sound prairie landscape. A fifth community type also occurs infrequently near the edges of the area, the Garry oak/Oval-leaf viburnum-Poison-oak community (Chappell et al. *in prep.*). The descriptions below and the accompanying plot data (Table 1) apply only to the southern Puget Sound area, although these four community types occur elsewhere in the Puget

Lowland. Historical evidence indicates that the oak woodlands of the Pacific Northwest, and this area in particular, have changed dramatically since Euro-American settlement (Thilenius 1968, Kertis 1986, Reed and Sugihara 1987, Agee 1993, Easterly 1996).

The following key to the native oak woodland community types can be used for identification of stands in the field. Refer to the descriptions below to verify your identification.

Table 1 Key to the native oak woodland community types.

1a Scot's broom > 25% cover.....	Oregon white oak/Scotch broom
1b Scot's broom < 25% cover.....	2b
2a Oval-leaf viburnum + Poison-oak > 10% cover	Oregon white oak/Oval-leaf viburnum-Poison-oak
2b Oval-leaf viburnum + Poison-oak < 10% cover	3a
3a Common snowberry > 10% cover	4a
3b Common snowberry < 10% cover	6a
4a Swordfern + Enchanter's nightshade + Siberian minerslettuce + Starry false solomons seal > 1% cover.....	5a
4b Above species total < 1% cover.....	Oregon white oak/Snowberry/Long-stolon sedge
5a Riparian or wetland transition site, Oregon ash often >10%, Enchanter's nightshade or Siberian minerslettuce often > Swordfern	Garry oak/Snowberry/Moist forb
5b Not a riparian or wetland site, Douglas fir > 10% cover or stumps evident, Hazelnut usually present, Swordfern > 1% cover	Oregon white oak-Douglas fir/Snowberry/Swordfern
6a Long-solon sedge or Blue wildrye > 10% cover and Common camas or western buttercup present.....	Oregon white oak/Long-stolon sedge-Camas
6b Long-stolon sedge and Blue wildrye < 10% cover or Common camas and western buttercup absent.....	7a
7a Swordfern + Enchanter's nightshade + Siberian minerslettuce + Starry false solomons seal > 1% cover	8a
7b Above species total < 1% cover.....	Undescribed non-native-dominated community
8a Riparian or wetland transition site, Oregon ash often >10%, Enchanter's nightshade or Siberian minerslettuce often > Swordfern	Oregon white oak/Snowberry/Moist forb

Oregon white oak/Long-stolon sedge-Camas Community Type:

This community is typically an open woodland dominated by Garry oak (*Quercus garryana*) with a graminoid-dominated understory. Douglas fir or Oregon ash (*Fraxinus latifolia*) are occasionally present in small amounts. The shrub layer is sparse in the best condition examples, but may occupy up to about 20% cover. The major shrub species are Scot s broom, tall Oregon grape (*Mahonia aquifolium*), common snowberry (*Symphoricarpos albus*), and serviceberry.

The understory is typically dominated by a mixture of long-stolon sedge and Kentucky bluegrass. Although Kentucky bluegrass is a non-native, we delineated this community type to represent the best of what remains of oak woodlands with a grassy understory, which were once a major landscape type. Orchardgrass (*Dactylis glomerata*), another non-native species, blue wildrye (*Elymus glaucus*), Idaho fescue, or red fescue (*Festuca rubra*) occasionally co-dominate also.

Many of the same herb species commonly found in the prairies are also present here and these species are used to help distinguish this community from the Garry oak/Snowberry/Long-stolon sedge community. Common camas is very frequent and may be abundant in spring. Its constancy is underestimated by our plots because some plots were

sampled after camas was dormant for the season. Other common native forbs include early blue violet, western buttercup, yarrow, catchweed bedstraw (*Galium aparine*), and chocolate lily (*Fritillaria lanceolata*). A large diversity of other native forbs associated with xeric conditions may be found. Non-native herbs are similar to those found in South Sound prairies. The non-native species common vetch (*Vicia sativa*) and tall oatgrass (*Arrhenatherum elatius*) are more frequent here than in other native communities of the South Sound.

In the South Sound area, this community type is located primarily on the gravelly glacial outwash of the Spanaway soil series. It is also known to occur on the Everett soil series (also glacial outwash) and on south- to west-facing slopes with rock outcrops at Bald Hill, Thurston County. It occurs as patches in a grassland matrix or as a transition between prairies and other oak woodland or forest types.

This community type is the most closely related to the oak savannas that once covered large areas of the South Sound landscape. For this reason, it is of high conservation concern. These savannas, which were grasslands with scattered large oak trees (tree cover perhaps 5-20%), are now basically extinct. The Garry oak/Long-stolon sedge-Camas community type probably differs from pre-settlement oak savannas in the following ways: (1) greater canopy

cover and density of oaks (woodlands as opposed to savannas), (2) smaller oak trees on average, (3) less cover of Idaho fescue, (4) more cover of shrubs, non-native species, long-stolon sedge and other species that tend to fare better with some shade. When Idaho fescue occurs, it appears to be mostly confined to sunny microsites, whereas long-stolon sedge tends to dominate shady microsites, for example, under the oak canopy. This observation is consistent with those of Lang (1961), Giles (1970), and Pavlick (1983).

Non-native species, especially Scot's broom, are a major threat to the continued existence of this community type. Scot's broom dominates the understory of the majority of sites that were formerly this community type, creating the widespread Garry oak/Scot's broom community type. Remaining examples of the Garry oak/Long-stolon sedge-Camas community are now rare and usually small in extent.

This community type is closely allied to the Garry oak/Snowberry/Long-stolon sedge community type, but is distinguished by an understory dominated by graminoids, as opposed to shrubs, and the presence of "prairie" forbs like camas and western buttercup. There appears to be a successional trajectory in the absence of fire, at least on many sites, from Garry oak/Long-stolon sedge-Camas to Garry oak/Snowberry/Long-stolon sedge that involves an increase in common snowberry and other shrubs and a decrease in grassland-associated species. Douglas fir may also invade this community and dramatically alter its composition. The Garry oak/Long-stolon sedge-Camas community was

called Garry oak/Long-stolon sedge-western buttercup in a previous presentation (Chappell et al. 1996).

Similar, but not identical, communities have been described from southwestern British Columbia (Roemer 1972). The abundance of California brome (*Bromus carinatus*) in B.C. is a distinct difference from the South Sound community type.

Oregon white oak/Snowberry/Long-stolon sedge Community:

The canopy is dominated by Garry oak and is semi-open to closed. Douglas fir is usually present in relatively small amounts, but may occasionally co-dominate. Oregon ash is occasionally prominent. The understory is dominated by common snowberry. Other important shrubs include Scot's broom, serviceberry, tall Oregon grape, Indian plum (*Oemleria cerasiformis*), and orange honeysuckle (*Lonicera ciliosa*). The herb layer is sparse to moderate in prominence and is typified by long-stolon sedge, Kentucky bluegrass, and blue wildrye. Nuttall's peavine (*Lathyrus nevadensis*) is frequent. Forbs typical of prairies, swordfern (*Polystichum munitum*), and moist-site forbs are largely absent.

This community type is found primarily on the Spanaway soil series. It may also occur on the Everett or Nisqually soil series. These sites appear to be environmentally similar to those occupied by the Garry oak/Long-stolon sedge-Camas community. The type occurs as patches in a conifer forest or prairie matrix, and as a transitional zone between prairies and conifer forests.

This community type is uncommon, mainly due to the invasion of non-native species and residential conversion of oak woodlands, but is well represented where oak woodlands still remain. It appears to be largely the result of (1) shrub increase in the understory of woodlands that formerly had understories dominated by graminoids (Kertis 1986), i.e. similar to the Oregon white oak/Long-stolon sedge-Camas community type, and (2) invasion of oaks onto former prairies. Douglas fir invasion and growth on sites with this community type likely leads to conversion to another community type, the Garry oak-Douglas fir/Snowberry/Swordfern community.

The Oregon white oak/Snowberry/Long-stolon sedge community type was probably of minor significance in the pre-settlement landscape. However, the continued dominance of native species is noteworthy and the reintroduction of fire into this community type has high potential to return the understory to a graminoid-dominated state. A recently burned site that I observed at Fort Lewis attests to this likelihood, with white-top aster and other prairie species prominent on a formerly snowberry-dominated site.

The Garry oak/Snowberry/Long-stolon sedge community type has been described at Oak Patch, Mason County, under a slightly different name (Kertis 1986). Somewhat similar communities have been described from British Columbia (Roemer 1972) and the Willamette Valley (Thilenius 1968).

Oregon white oak-Douglas fir/Snowberry/Swordfern Community Type:

The canopy of this community type is generally closed and is dominated by Garry oak and, to a lesser degree, Douglas fir. Cascara (*Rhamnus purshiana*), Oregon ash, and sweet cherry (*Prunus avium*), a non-native species, are moderately frequent, mainly in the lower canopy layers. Douglas fir may be absent if it was selectively removed by logging, a not-uncommon occurrence. The understory is dominated primarily by common snowberry, and secondarily by Indian plum, hazelnut (*Corylus cornuta*), or oceanspray (*Holodiscus discolor*). Other frequent understory species are swordfern, Alaska oniongrass (*Melica subulata*), baldhip rose (*Rosa gymnocarpa*), orange honeysuckle, tall Oregongrape, licorice fern (*Polypodium glycyrrhiza*), and long-stolon sedge. Although present with only moderate frequency, when they are present bigleaf sandwort (*Arenaria macrophylla*) and starry false Solomons seal (*Smilacina stellata*) contribute about 10% cover. Swordfern is a constant indicator species for the type, and hazelnut is another excellent indicator.

This community type occurs primarily on the Spanaway soil series, and secondarily on the Everett soil series. It may also occur on the McKenna and Nisqually soil series. It occurs primarily on flat topography but also less frequently on gently to moderately steep slopes, especially south- to west-facing aspects. Most of these sites appear similar to those occupied by the Garry oak/Snowberry/Long-stolon sedge community type, from which they have likely succeeded with Douglas fir invasion and growth in the absence of fire. The presence of swordfern and other conifer forest species suggests that

soil properties and understory microenvironments have likely been altered by the increasing importance of Douglas fir in the canopy (see Ugolini and Schlichte 1973). A significant minority of these sites, however, may represent naturally somewhat more moist sites transitional between pre-settlement forests and prairies.

This community type is relatively common in the landscape as a transition zone between prairies and conifer forests, and between pure oak woodlands and conifer forests. It may also occur as patches in a conifer forest matrix or as a transition between riparian ash communities and prairies. Riparian oak communities with abundant Douglas fir have similarities to both the Garry oak-Douglas fir/Snowberry/Swordfern community type and the Garry oak/Snowberry/Moist forb community type.

The Garry oak-Douglas fir/Snowberry/Swordfern community type was probably present, but to a degree much less than today, in the pre-settlement landscape. Douglas fir is likely to increase over time in most stands and result in conversion of these communities to Douglas fir forests (Agee 1993). Therefore, judicious removal of Douglas fir from this community type prior to their complete dominance is recommended to maintain an oak woodland.

A somewhat similar community, but with less Douglas fir, has been described from the Willamette Valley (Thilenius 1968).

Oregon white oak/Snowberry/Moist forb Community Type:

This closed-canopy community is dominated by Garry oak and occasionally co-dominated by Oregon ash. Oregon ash has relatively high constancy. Douglas fir may be present or absent, and is occasionally co-dominant. Grand fir (*Abies grandis*) has been noted in the understory at one site. The understory is dominated by a relatively dense shrub layer, primarily common snowberry, and secondarily Indian plum and serviceberry. Tall Oregon grape, orange honeysuckle, and trailing blackberry are frequent. Swordfern or one or more moist-site forb species are always present and, together with the riparian or wetland setting, indicative of the type. These moist-site forbs include enchanter's nightshade (*Circea alpina*), smallflower nemophila (*Nemophila parviflora*), Siberian minerslettuce (*Montia siberica*), starry false Solomons seal, small-flowered trillium (*Trilium parviflorum*), and pioneer violet (*Viola glabella*). Catchweed bedstraw is also common.

This community type is documented to occur on soils mapped as Spanaway and McKenna soil series. It occurs only as a riparian community (i.e. riverine associated) or surrounding wetlands, and is usually transitional from riverine or impounded wetlands to prairies or more xeric oak woodland communities. Soil moisture availability is probably higher here than in any other oak woodland community.

The Garry oak/Snowberry/Moist forb community type has probably changed less in its character than other oak woodland types since Euro-American settlement. However, early references to stinging nettle (*Urtica dioica*)

dominating riparian understories in the area (Perdue this volume) would seem to contradict with the current situation. This community type is relatively uncommon in the landscape, in part because of development and degradation of oak woodlands. It probably was never very widespread because of its limited environmental setting. This community type is significant as one of the primary habitats for the state sensitive small-flowered trillium.

The prominence of Oregon ash in the subcanopy of many of these communities suggests the possibility of succession on these sites toward dominance by ash. Ash appears to be capable of regenerating in the understory of these moist oak woodlands and is typically dominant in adjacent wetlands. Himalayan blackberry is a non-native invader that can result in the displacement of native understory and should be removed whenever possible.

CONIFER SAVANNAS

Savannas dominated by conifers are a vegetation type that is relatively common in the prairie landscape, but the majority of savannas, like the prairies, have been degraded by grazing, other disturbances, and the invasion of non-native species. By savanna, I am referring to grasslands with a scattered tree layer with tree canopy cover of less than 25% (Agee 1993). Douglas fir is the major savanna tree in the existing landscape. Lodgepole pine (*Pinus contorta* var. *contorta*) and ponderosa pine (*Pinus ponderosa*) also form savannas in the South Sound area.

Savannas are closely similar to prairies in species composition and environment

(see Idaho fescue-White-top aster community type), but with the addition of a scattered tree layer. Understory species that increase in shady conditions, e.g. long-stolon sedge, are more abundant in savannas than in prairies, and a few forest species occasionally make their way into savannas.

Savannas are a result of patchy tree establishment and survival on prairies. The relative fire resistance of the tree species provides important clues to the successional status and pre-settlement importance of the various types of savannas. Douglas fir savannas were probably always a component of the South Sound landscape. Douglas fir is moderately fire resistant and its resistance increases with increasing tree age. Douglas fir's ability to survive fire contributes to its prominence in savannas. However, the tendency of Douglas fir savannas to become forests over time in the absence of fire and to contribute seed rain to adjacent grasslands makes management for savannas a problematic and, in many cases, undesirable objective.

Lodgepole pine has relatively low fire resistance due to its thin bark and shallow rooting habit (Agee 1993). For this reason, lodgepole pine savanna is probably a very unstable community that is transitional from a prairie to a conifer forest. It will likely either succeed to forest or return to a prairie condition via a fire. This is in contrast to Douglas fir, which could survive fire and remain in a savanna condition. There is only one known lodgepole pine savanna in the South Sound and a few other very degraded examples. However, lodgepole pine savanna was probably

relatively rare in the pre-settlement landscape.

Ponderosa pine is the most fire resistant of the conifers that form savannas. Ponderosa pine savannas were probably maintained by frequent fires (Agee 1993). Most pre-settlement ponderosa pine savannas have now been converted to Douglas fir-ponderosa pine forests by the invasion and growth of Douglas fir. Existing ponderosa pine savannas are primarily a result of relatively recent invasion of pine onto prairies (Foster this volume) and are mostly dominated by non-native species.

My observations indicate that, in addition to Spanaway soils, many sites currently classified as Everett soil series formerly supported Douglas fir savannas in pre-settlement times. Now these sites support Douglas fir or lodgepole pine forest.

CONIFER FORESTS

Vast areas of former prairie and savanna are now occupied by conifer forests, dominated primarily by Douglas fir and secondarily by lodgepole pine. Understories in these forests are somewhat variable. Many forests that developed relatively recently, within the last 60 years for example, often have poorly developed understories with low percent cover of a few, mainly herbaceous, species. Non-natives, especially wall lettuce (*Lactuca muralis*), may be prominent in these developing understories.

Forests that invaded 60-125 years ago, typically have better developed understory vegetation. Three of the

most common community types on former prairies or savannas are: Douglas

fir/hazelnut/swordfern, Douglas fir/salal(-evergreen huckleberry), and lodgepole pine-Douglas fir/salal (Chappell et al. *in prep.*) Bigleaf maple (*Acer macrophyllum*) is a common subcanopy tree in the first community listed. Common understory dominants or co-dominants include hazelnut, salal, swordfern, low Oregon grape (*Mahonia nervosa*), trailing blackberry, oceanspray, and brackenfern. These invasion forests occur primarily on Spanaway and Everett soil series.

WOODED WETLANDS

Riverine wetlands in the prairie landscape are dominated primarily by deciduous broadleaf trees. Impounded wetlands are more diverse in physiognomy and may be dominated by deciduous trees, shrubs, or herbaceous vegetation. Although existing data is limited, this section will discuss wetlands dominated by trees within the prairie landscape. Kunze (1994) describes native shrub- and herb-dominated impounded wetlands of the Puget Lowland.

The dominant tree in riparian and other wetlands is Oregon ash. Black cottonwood (*Populus balsamifera ssp. trichocarpa*) is commonly a co-dominant species in riparian environments. Quaking aspen (*Populus tremuloides*) is occasionally important, mostly in impounded wetlands. Bigleaf maple is occasionally found in riparian situations, particularly if conifer-dominated forest is adjacent. A few, generally large, Garry oaks infrequently occur in these wetlands also. Red alder

(*Alnus rubra*), so abundant in forested landscapes of western Washington, is largely absent from the prairie landscape, except for along the major rivers, Chehalis and Nisqually, in areas where conifers are, or were, abundant.

Understory vegetation and environmental characteristics of the wooded wetlands have not been thoroughly documented, but a number of community types have been observed. Dominant native species include common snowberry, red-osier dogwood (*Cornus sericea*), Pacific ninebark (*Physocarpus capitatus*), and slough sedge (*Carex obnupta*). Black hawthorn, a very tall shrub, may occur along edges or where the upper canopy is not too dense. Non-native species may invade these understories, most commonly reed canarygrass (*Phalaris arundinacea*) and climbing nightshade (*Solanum dulcamara*). Reed canarygrass is prominent only where tree canopy density is not too high, whereas climbing nightshade may occur under dense canopies.

CONCLUSIONS

The vegetation types described are very dynamic, due primarily to the strong influence of fire in their development and maintenance. Each of the plant communities has the potential to develop into another different community or has developed from another previously, or both. Research is needed to verify and expand upon the hypothesized successional sequences.

Some species of concern are associated only with specific plant communities. For example, small-flowered trillium occurs primarily in the Garry

oak/Snowberry/Moist forb community type and in Oregon ash wetlands. Our current knowledge of many invertebrates and non-vascular plants is very incomplete: there may be other species with community-specific needs that we are currently unaware of.

Restoration and management of the prairie landscape and its vegetation will require a knowledge of the vegetation, its relationship to the environment and disturbance, and its dynamics. The framework of vegetation types presented here can be used as a basis for restoration or management. Realistic restoration targets can be set with the help of this community-specific information.

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