UPLAND PLANT ASSOCIATIONS OF THE PUGET TROUGH ECOREGION, WASHINGTON

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INTRODUCTION

The purpose of the this document is to inform the reader about the characteristics of native-dominated plant associations that occur on upland, as opposed to wetland or riparian floodplain, sites in the Puget Trough ecoregion. Vegetation in the Puget Trough ecoregion has not been comprehensively described in the past, unlike adjacent ecoregions with large federal land holdings. The Washington Natural Heritage Program has been collecting and analyzing vegetation plot data from the ecoregion for the last 14 years. These data contribute to the development of an existing vegetation classification to fill this gap in our knowledge of biodiversity in the state. The fact sheets, key, and association tables are a means of communicating this information to a broader audience.

This classification of plant associations uses standards of the International Classification of Ecological Communities and the National Vegetation Classification (Federal Geographic Data Committee 1997, Grossman et al. 1998, Jennings et al. 2003). These “plant associations” differ from “plant associations” as described on surrounding National Forests in that they refer to existing vegetation rather than potential vegetation. As such, in the lexicon of Pacific Northwest potential natural vegetation literature (*e.g.,* Franklin and Dyrness 1973), many of them would be called “plant community types.” The classification is based primarily on floristics and physiognomy, and secondarily on environmental factors (including natural disturbance regimes).

The fact sheets are intended for use only within or immediately adjacent to the Puget Trough ecoregion (Washington Department of Natural Resources 2003). The ecoregion is illustrated by shading on plot location maps within the individual fact sheets. The Puget Trough is generally characterized by a relatively dry, warm climate in comparison to adjacent areas of

western Washington, and low elevations (mostly below 1000 feet, maximum 2400 feet). It includes the far northern end of what is sometimes considered a separate ecoregion located mostly in Oregon, the Willamette Valley. A distinctive climatic area, the Olympic Mountains rainshadow, is frequently referred to in the text. It includes San Juan County, far western Whatcom and Skagit counties (Lummi, Fidalgo, Cypress, and Guemes islands), central and northern Island County, far northeastern Jefferson County (Quimper and Miller peninsulas), and eastern Clallam County (Sequim to Port Angeles).

Associations in the text are named by dominant and diagnostic plant species. Dashes in the names separate species that are in the same physiognomic layer (trees, shrubs, herbs); slashes in the names separate species in different physiognomic layers; parentheses around a species name indicate that the taxon occurs with less than 60 to 80% constancy in the association. In the association names and in the vegetation composition tables, parentheses around 2 species but not the genus, e.g. *Symphoricarpos (albus, hesperius)*, implies that either one or both of the two species occur in any particular plot or occurrence. The order of species within a layer typically indicates decreasing levels of dominance. Species names used in the association names may be those of dominant species and/or diagnostic species; at least one dominant species appears in every association name. The presence of a species in the name of an association does not imply that the species is always found in every occurrence of that association, but rather that it does occur in most of them. Nomenclature follows Kartesz (2003). Synonyms, using Hitchcock and Cronquist (1973) nomenclature, are included where a Hitchcock and Cronquist name differs from that used by Kartesz (2003).

A key is included to assist the reader in identifying the plant association. The association tables (found on the web at http://www.dnr.wa.gov/nhp/refdesk/communities/html/assoc_tables.html) display nearly complete vegetation composition data summarized by plant association.

METHODS

Stands of relatively homogeneous vegetation were sampled during inventory efforts that focused on locating remnant

communities that had been little disturbed by past timber harvest and that were dominated in all physiognomic layers by native species. Thus the sampling was biased toward those environments that had been least disturbed by post-Western settlement anthropogenic influences. Some data from natural-regeneration young forests more disturbed by timber harvest were collected in those geographic areas where little in the way of undisturbed forest stands remain, especially on Fort Lewis in Pierce and Thurston counties. A total of 945 plots were sampled, mostly during the period 1992-2004. Wetlands and riparian floodplains were not targeted as part of this work. For freshwater wetland plant associations, see Kunze (1994).

Data were collected from circular plots located non-randomly to represent the stand, that is, a relatively homogeneous area of vegetation present on a topographically relatively homogeneous site. Most plots were approximately 400 m^2, though for some herbaceous vegetation, plots were as small as 42 m^2. On each plot, all vascular plant species were identified and placed in percent crown cover classes (<1%, 1-5%, 6-10%, 11-15%, 16-25%, 26-35%, 36-45%, 46-55%, 56-65%, 66-75%, 76-85%, 86-95%, 96-100%). Early on, some plots were collected using 25% cover class intervals for those classes above 25% cover. Tree canopy layering was noted and one or more tree cores were collected to ascertain dominant stand age class(es). Evidence of disturbance was noted.

Aspect, slope, slope position, microtopography, and landform were recorded on each plot. Geographic location of each plot was recorded in a geographic information system. Shallow soil pits, usually 10-30 inches deep, were dug on each Fort Lewis plot (92 total), with the objective of verifying or refuting the soil map designation for the plot and recording obvious surficial texture and color characteristics.

Vegetation data was analyzed using TWINSPAN, a divisive hierarchical classification technique, and detrended correspondence analysis (DCA), an ordination method. The analysis process was iterative and adaptive, with the goal of understanding relatively consistent patterns in the data, and relating them where possible to environmental variables, disturbance regimes, or successional relationships. Analyses were run with all species included and with native disturbance-associated increaser species and exotic species removed. Correlations

between environmental variables and DCA ordination axes were examined.

Conservation status of the plant associations referred to in the fact sheets as **global/state status** follows NatureServe terminology. The primary factors for assessing status are: total number of occurrences of the association and total acreage occupied by the association. Secondary factors include geographic range over which the community occurs, threats, long-term trends, degree of environmental specificity, and ecological integrity of the occurrences. The conservation status ranks are as follows (G ranks refer to global ranks, S ranks refer to state ranks):

G1 Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer occurrences), very steep declines, or other factors.

G2 Imperiled—At high risk of extinction due to very restricted range, very few occurrences (often 20 or fewer), steep declines, or other factors.

G3 Vulnerable—At moderate risk of extinction due to a restricted range, relatively few occurrences (often 80 or fewer), recent and widespread declines, or other factors.

G4 Apparently Secure—Some cause for long-term concern due to declines or other factors.

G5 Demostrably Secure—Common; widespread and abundant.

G#G# Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank.

GNR Unranked—Global rank not yet assessed.

GH Presumed Eliminated— Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration.

? Inexact Numeric Rank—e.g., G2?

Q Questionable taxonomy—Taxonomic distinctiveness of this entity at the current level is questionable.

The **distribution** section in the fact sheet describes the range of the type in Washington and globally. The maps that appear with each fact sheet illustrate only the locations of plots where data were collected for the plant association. They do not illustrate the entire range of the type in the Puget Trough.

The **environment** section of each fact sheet includes data collected on the plot itself and data from geographic information systems (GIS). Mean annual precipitation data referred to is modeled from the 1960 to 1990 period. Most of the soils information was not verified on plots in the field, but was pulled from the Department of Natural Resources GIS (which refers to county soil surveys) based on the plot location. Therefore, a degree of uncertainty exists with regard to soils descriptions. In some cases, these mapped soil series were not what would be ecologically expected based on the vegetation and such series were not used to describe the environment for the association. Apparent relative nutrient status of the soil was derived from an examination of vegetation indicators and their abundance in the association (Klinka et al. 1989, Green and Klinka 1994). The data reported in the environment summary tables at the end of the environment section refers primarily to the plots that were sampled. Slope positions are abbreviated in the table such that the word slope does not appear, e.g. mid = mid-slope. A short slope is less than 100 vertical feet. Slope positions or soil series underlined in the summary tables are those that are most frequent for the association.

The **ID tips** (identification tips) section gives a quick overview of distinguishing characteristics for the association. For the most common and widespread forest alliance, those forests that have abundant Douglas-fir and greater than 10% cover or dominant tree regeneration of western hemlock or western redcedar, the tree layer is not referred to in the ID tips section.

In the **vegetation** section, the range and characteristic expression of vegetation physiognomy (structure) is described using categories (mostly formations) defined by the International Classification of Ecological Communities (Grossman et al. 1998). These include forest (generally >60% crown cover of trees, tree crowns touching), woodland (generally 25-60% crown cover of trees, tree crowns not touching for the most part), herbaceous vegetation with a sparse tree layer (10-25%

crown cover of trees over a grass-forb-dominated vegetation, referred to in the text as savanna), and herbaceous vegetation (herbaceous vegetation dominates, tree crown cover typically <10%). The terms “present,” “prominent,” “co-dominant,” and “dominant” are often used to describe the vegetation composition. “Present” means present on the sample plot but less than about 5% crown cover. “Prominent” means about 5% to 15% crown cover. “Co-dominant” means that species shares dominance in overstory or understory layer with other species and usually has about 10% to 50% crown cover. “Dominant” means that the species is the sole dominant in overstory or understory and usually has crown cover of greater than 25%. “Dominant tree regeneration” refers to the tree species that is most abundant in the <5 inch diameter size class (understory trees) and that has at least 25 individuals per acre of this size. “Crown cover” refers to the percent of the sample plot covered by the total vertical projection of the crown of all above-ground stems of a species or physiognomic layer. In other words, spaces between branches or leaves connected to the same individual stem of a plant are counted toward the cover for that species.

The **classification notes** section in each fact sheet is intended to clarify how the association as here defined relates to others that have been described in the past, especially in Washington state. In addition, if the name of the association as presented here differs from that used by NatureServe (www.natureserve.org/explorer), then the differences and relationships are described. If the NatureServe 2005 name is identical, then no mention is made of NatureServe as a reference. In classification notes, names for associations or plant community types are abbreviated using 4-letter codes for genus and species.

The **biodiversity notes** section is only included if there are rare or otherwise remarkable species that are known to use the association in the Puget Trough. The **vegetation composition table** includes partial listings of plant species that help to characterize the association or distinguish it from similar ones, and includes all abundant species.