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Changes in the South Puget Prairie Landscape

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Abstract:

This paper assesses the change in coverage of prairie vegetation as estimated by current occupancy of grasslands on mapped grassland soils. Southern Puget Sound prairies occur on gravelly, well-drained soils or on other soils derived from materials with low water holding capacity. These prairie soils are shallow, sandy to gravelly loam soils collectively referred to as the Spanaway series with inclusions of Nisqually and Carstairs soils. The assessment area contains approximately 1,497,600 acres. Within that, 149,360 acres are mapped as grassland soils. The Washington Natural Heritage Program maps occurrences of native prairie on 12582 acres of the assessment area representing 8% of the historical grassland area. Currently native prairie species dominate only 2993 acres or 3% of the grassland soils. The general reduction of southern Puget Prairies to approximately 10% of its former abundance appears to be a proportional loss across all size classes of prairie sites. Immediate conservation action of Puget prairies is critical for all the remaining native grasslands since they will serve as the cores for future conservation.

Introduction

All landscapes reflect their history and the processes that formed them. A historical view of a landscape will provide a context to see desired futures and a clue for management. This paper provides a historical broadscale assessment of general grassland types in the Puget Lowland landscape. More detailed analysis of species composition and fine-scale structure are described elsewhere in this symposium.

A Vision Of The Past

Many of the biological components of the original prairie landscape arrived during a warm/drier climatic period (the Hypsithermal) than of today. Since that time, approximately 4,000 years ago, high frequency/low intensity fires (many of aboriginal origin), and periodic soil drought combined to maintain a bunchgrass-dominated vegetation complex. This grassland vegetation existed under a

climatic regime that would otherwise support forest vegetation (Hansen 1947).

The southern Puget Sound prairies occur on gravelly, well-drained soils or on other soils derived from materials with low water holding capacity. These prairie soils are shallow, sandy to gravelly loam soils collectively referred to as the Spanaway series with inclusions of Nisqually and Carstairs soils. These soils typically have a thin layer (2.5 cm) of well-decomposed organic material on the surface (Clampitt, 1984). The A1 horizon (0-14 inches) is a strongly acidic, gravelly sandy loam with high organic content. The soil becomes less acidic with depth until it consists of large stones in a matrix of sand and gravel below 18 inches (Lang 1961). These soil types are low in productivity and very prone to drought.

Prairie soils primarily exist in five counties: Grays Harbor, Thurston, Lewis, Mason and Pierce. Grays Harbor county has Spanaway and Carstairs soils; Lewis county has Spanaway and Nisqually soils; Mason county has Carstairs; Pierce has Spanaway, Nisqually, and Spana soils; Thurston county has Spanaway, Nisqually, Spanaway/Nisqually, and Spana soils.

Peter (1996) speculated that prairies were part of the presettlement landscape on Shelton and Everett Soils in Mason County.

We assume that soils that developed and retain grassland characteristics currently better indicate the minimum area for grassland in the study area. If these soil types did support presettlement prairies, it only magnifies the conclusions of rate and magnitude of change presented in this paper.

Evaluation of a landscape needs information on four aspects of the component of concern: 1) the portion of the whole area

occupied, 2) the number of patches, 3) the size and distribution of patches, and 4) the spatial distribution of patches.

- Summing the total acreage covered by grassland soils and expressing it as a ratio of non-grassland soils provides the most generalized view of the past Puget Prairie landscape. The area of assessment contains approximately 1,497,600 acres. Within that, 149,360 acres are mapped as grassland soils. That indicates a minimum ratio of non-grassland to grassland vegetation as 9:1.
- Two hundred thirty-three prairie soil sites are mapped in the assessment area. A prairie soil site is a contiguous cluster of prairie soil polygons. Grassland soil sites have an average size of 641 acres (standard deviation=4746 acres).
- These historical grassland sites appear over a wide range of sizes:

Table 1. Size frequency distribution of historic prairie soil sites

Size class in acres	Number of sites
1-10	45
11-100	117
101-500	41
501-1000	12
1001-5000	12
5001-10000	5
>10000	1

There may have been much more prairie if Peter's (1996) speculation is correct that Everett soils supported savannas. Savannas and woodlands with vegetation that did not develop grassland soil characteristics or

grasslands too ephemeral to develop a grassland soil may have separated prairies. This vegetation could have been a mixture of fire-adapted shrubs and scattered trees, somewhat reminiscent of chaparral vegetation. Although few fire-adapted shrubs are in the Puget lowlands, oak (*Quercus* sp.), chinkapin (*Castenopsis* sp.), manzanita (*Arctostaphylos* spp.), buckthorn (*Ceanothus* spp.), serviceberry (*Amelanchier* sp.) are all members of fire shrublands in the northern Rocky Mountains and southern Oregon and California. If extensive, these areas would have provided corridors for more prairies or other non-forest species between individual grasslands.

Today’s View

Current grassland cover in the assessment area was estimated by two measures: 1) the distribution of grasslands that have a dominance of native prairie species as mapped by the Washington Natural Heritage Program (WANHP), and 2) air photography interpretation and field reconnaissance of 92298 acres of the assessment area by Hall.

Grasslands, without reference to composition as native or alien species dominated occupy 20306 acres or 22% of 92297 acres of the assessment area (Hall 1995). Of those grasslands, field reconnaissance revealed that "intact prairies" occupy only 2993 acres or 3% of that part of the assessment area. Estimates of grassland condition on Ft Lewis (77,500 acres in northeast corner of the assessment area) concluded 40% of 11500 acres of mapped grasslands were WANHP native prairie sites. A total of 2130 acres (17%) of Fort Lewis grasslands met Hall’s criteria as “intact prairie”.

WANHP maps occurrences of native prairie (generally over 25% native prairie species) on 12582 acres of the assessment area. That represents 8% of the historical grassland area as measured by prairie soil sites.(Crawford, 1994). Hall (1995) estimated causes of prairie loss as urban development (33% of grassland sites assessed), forest invasion or conversion (32%) and agricultural uses (30%).

The non-grassland to grassland ratio for the whole assessment area is 118:1. These native prairie sites occupy 29 sites and average 433 acres (standard deviation=1519 acres). These grassland sites appear over a wide range of sizes:

Table 2. Size frequency distribution of current prairie sites

Size Class (acres)	Number of Sites
1-10	9
11-100	10
101-500	7
501-1000	1
1001-5000	1
5001-10000	1
>10000	0

The graph in Figure 1 compares the relative difference in number of grassland soils and existing native grasslands.

A visual inspection of the pattern of prairie soils overlane with pattern of WANHP prairies reveals that grasslands have apparently shrunk proportionally across the landscape. Although not statistically tested, large grasslands are much smaller, many of the small grasslands have disappeared, and distance among prairies has increased from the pattern represented by grassland soils.

The general reduction of southern Puget prairie to approximately 10% of its former abundance appears to be a proportional loss across size classes. In other words, the size class distribution has not changed much from the original distribution indicated by grassland soil sites. The magnitude of change has been approximately the same in all size classes.

Gaining A Future Vision

The southern Puget Lowland landscape has changed dramatically over the past 150 years. The prairie or grassland-savanna vegetation that covered a tenth of the original landscape has been reduced by 90%. The size distribution of grasslands resembling the presettlement prairies is similar to that of prairies as measured by grassland soil types.

Our 1994-1995 assessments are a snapshot of a rate of change in Puget Prairie landscape. Since Hall's 1995 assessment of 'intact prairies', we are aware of significant prairie losses and degradation through increased training on Ft. Lewis and urban development. Consequently, total reduction of prairies may be in the 95% or more range. Efforts at restoration apparently are not keeping up with the alarming rate of conversion and degradation of native prairies.

Conservation of biodiversity associated with these prairies within this highly altered landscape must by necessity focus on its components, occurrences of species and communities, rather than restoration of larger scale processes. Careful design of conservation sites surrounding all remaining occurrences of Puget prairies will ensure

their highest probability of survival into the future at the site level. Restoration of natural processes at the scale of a site will eventually lead to opportunities to rehabilitate landscape processes among the remaining prairie sites that support the targets of conservation.

Immediate conservation action of Puget prairies is critical for all the remaining WANHP grasslands since they will serve as the cores that contain native species composition and community structure. Collectively these sites retain the landscape distribution that will provide a template to allow landscape function to emerge in the long run. Investments in rehabilitation are needed in the non-native grasslands to help increase the landscape structure nearer the potential indicated by soils. Conversion of agriculture or forest site will be costly but will be necessary if landscape functions of prairie species metapopulation dynamics are to be restored.

Acknowledgments

We would like to thank Betty Stephens for her GIS assistance and Chris Chappell for reviews.

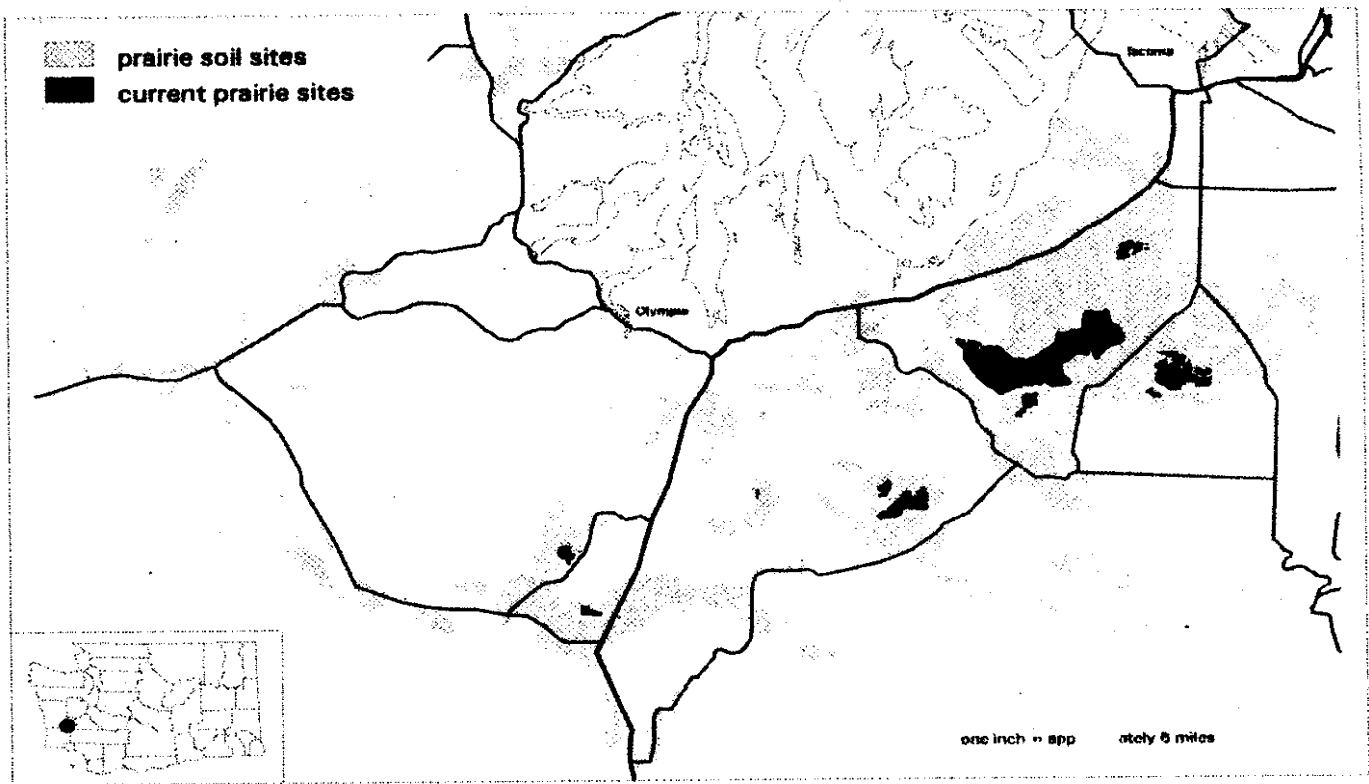


Fig. 1. Spatial distribution of remnant prairies and prairie soils in the South Puget Sound region.

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