Kern Ewing
Center for Urban Horticulture
University of Washington
3501 NE 41st Street
Seattle, Washington 98195

MANAGEMENT AND RESTORATION OF PUGET SOUND PRAIRIES AND OAK WOODLANDS

Kern Ewing

Abstract

The prairies and oak woodlands of the South Puget Sound region are the result of glacial history and the subsequent soils which were created, regional climate, topography and human history. The ongoing loss of these systems has to do with many of the same things. After glacial retreat, open grassland and mixed forbs and grasses may have been maintained first by harsh conditions, then by natural fires, and finally by fires set by native people to ensure a continuing supply of food from these systems. Today prairies and oak woodlands are being eliminated by encroachment of Douglas fir because of cultural practices which favor the suppression of fires.The flat outwash plains which make up the landscape provide easy building sites for development of housing and commercial sites to accommodate a burgeoning population attracted to the Puget Sound region by The climate and natural features. The existence of prairies and oak woodlands as well as the threats to their future existence all have to do with the complex mix of geological and ecological processes, culture, climate and economics of the Northwest.

Prairie and oak woodland vegetation represents northern and western extensions of grassland steppe which exists to the east and grassland and woodlands which exist to the south. As the systems themselves are threatened, individual plant species such as Aster curtus, Castilleja levisecta and others are also put at risk. Wildlife associated with the systems are endangered as a result of habitat loss; open lands are habitat for unique species (e.g., Puget Blue, Mardon Skipper, etc.) in a region dominated by massive closed canopy forests. Prairies and woodlands represent not only important habitats and communities, but are stunning visual counterpoints to the forests and mountains; they have drawn people to their edges since they were first found. From early natives to contemporary society, people have settled, hunted, and travelled through these open systems because of their unique characteristics of openness, productivity, and difference from the surrounding country.

Strategies to preserve or improve these habitats are going to have to be well-conceived to be effective; the causes of their decline and loss have been complex. At one level, control of or influence on management strategies employed on the land will need to be secured. It is obvious that there will be a great deal of control in some areas and little others. The next necessary steps will be tactical: learning how to control invasive species, how to establish individual native plants, how to combine species into stable communities. Successful management will require an understanding of when native communities are resistant to damage and when they are vulnerable, and of which activities can be supported and which result in unacceptable levels of damage. Recreating communities also means understanding how to produce a supply of plants, with a genetic amplitude which makes communities resilient. It also means knowing how and when to install plants, and what to do when confronted with varying degrees of success and failure. Long-term management of restored or protected communities will require knowledge of when and how to intervene. Intervention may include the use of fire, water, shading, grazing, chemical control, the removal of disturbance, or the addition of compatible elements to the ecosystem. Common knowledge often combines with trial and error to achieve desired effects in restoration projects. Informed trial an error can be much more efficient, and a knowledge of mechanisms which is gained by scientific inquiry is important in this respect. In restoration and conservation, as in few other fields, practical ways of doing things must be found, but the complexity and dynamic nature of natural systems requires and understanding of basic biological and ecological processes.

Introduction

The prairies and oak woodlands of the South Puget Sound region are the result of glacial history and the subsequent soils which were created, regional climate, topography and human history (Lang 1961, Giles 1970, Barnosky 1983, Kertis 1986). The ongoing loss of these systems has to do with many of the same things. After glacial retreat, open grassland and mixed forbs and grasses may have been maintained first by harsh conditions, then by natural fires, and finally by fires set by native people to ensure a continuing supply of food from these systems (Norton 1979). Today prairies and oak woodlands are being eliminated by encroachment of Douglas fir because of cultural practices which favor the suppression of fires (Del Moral and Deardorff 1976). The flat outwash plains which make up the landscape provide easy building sites for development of housing and commercial sites to accommodate a burgeoning population attracted to the Puget Sound region by the climate and natural features and by the economy. The existence of prairies and oak woodlands, as well as the threats to their future existence, all has to do with the complex mix of geological and ecological processes, culture, climate and economics of the Northwest.

Prairie and oak woodland vegetation represents northern and western extensions of grassland steppe which exists to the east and grassland and woodlands which exist to the south. As the systems themselves are threatened, individual plant species such as *Aster curtus, Castilleja levisecta* and others are also put at risk (Clampitt 1993). Wildlife associated with the systems are endangered as a result of habitat loss; open lands are habitat for unique species (e.g., butterflies such as the Puget Blue, Mardon Skipper, etc.) in a region dominated by massive closed canopy forests. Prairies and woodlands represent not only important habitats and communities, but are stunning visual counterpoints to the forests and mountains; they have drawn people to their edges since they were first found. From early natives to contemporary society, people have settled, hunted, and travelled through these open systems because of their unique characteristics of openness, productivity, and difference from the surrounding country.

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Ecological Functions of Puget Sound Prairies and Oak Woodlands

A common way of determining the value of ecosystems is to assess their ecological functioning. This procedure has been performed most often for wetlands, and has evolved as a result of the need for comparing the functioning of wetlands which are to be damaged or lost by human activities with those which are to be created or restored in their place (Marble 1992). Though wetlands are unique systems combining aquatic and terrestrial biota, terrestrial systems are capable of performing most of the same functions, and some of them are performed better in uplands (such as flood abatement by forested ecosystems). Table 1 contains a list of commonly cited ecosystem functions, and next to each function is a qualitative evaluation of how prairie/woodlands might perform the function as compared to Douglas fir forest.

Table 1. Score of prairie-woodlands ecosystems on a commonly used set of functional attributes for evaluating ecosystem function (+ and - indicate high or low ability to perform each particular function, compared to a Douglas Fir forest).

ECOSYSTEM FUNCTION	PRAIRIE/WOODLANDS
PRODUCTIVITY	-
LANDSCAPE STABILIZATION	-
HYDROLOGIC CONTROL	-
WATER QUALITY	-
STRUCTURAL COMPLEXITY	+
ECOSYSTEM BIODIVERSITY	+
WILDLIFE HABITAT	+
SELF-SUSTAINING	-

A. <u>Comparison of functional attributes:</u>

This comparison is between prairie/woodlands and the system which appears would replace it, Douglas fir forest. A similar comparison could be made between prairie/woodlands and an urbanized matrix.

Productivity -

The productivity of prairie/woodlands is low, primarily because of the moisture stress induced by the extremely well-drained soil, and also because of the nutrient availability in the coarse-textured soils. This favors stress-tolerators, which give the system part of its unique character.

Landscape stabilization -

This environment presents a low opportunity for erosion.

Hydrologic control -

The hydrologic interaction between precipitation and ground or surface water is probably controlled more by soil texture than by plant community. The outwash plain must act as an aquifer in any case. Development would probably change its behavior; a Douglas fir forest might not have nearly the effect.

Water quality -

The water quality effect of the prairie/woodland is probably achieved more by keeping the area out of development rather than having a cleansing effect (removal of sediment, nutrients, toxicants).

Structural complexity +

The prairie alone has little structural complexity, but combined with surrounding forest or with the ecotonal oak woodlands, much landscape complexity is produced. On a landscape scale, the region is enriched. At a local scale, new habitats and beneficial combinations of habitats are produced.

Ecosystem biodiversity +

Because of the diminishing nature of the prairie/woodlands system, threatened species, endemics and range extensions find an important regional expression here.

Wildlife habitat +

Open canopy systems in juxtaposition with forests provide beneficial combinations of cover, travel corridors, grazing and browse.

Self-sustaining -

The prairie/woodland systems may have existed after glaciation but may have retreated farther to the south as climate and conditions became more mesic. Some anthropogenic causation has definitely occurred.

B. Basis for functions performed well

1. Uniqueness

In an area dominated by massive, closed canopy forest, open canopy systems are unique and house and produce plants and animals which are less common in the region.

2. Wildlife habitat

Some animals which are either quite rare or are rare this far north or west are supported by the combination of a maritime climate and a droughty soil environment.

3. Structural complexity of landscapes with prairie/woodland elements

Grasslands adjacent to forests provide the grassland habitat, the ecotone habitat, the forest habitat, and a synergism which results from all three being juxtaposed. Because they cover a substantial geographic area, there are significant corridors and a large edge habitat.

C. Human values

1. Production of needed food and materials for native people.

Historical data has shown that the prairie/woodland system was valued for its production of food and of material for tools, clothing, etc.

2. Openness in the middle of a closed forest

There has always been and certainly is now a psychological need among people to break the oppressing monotony of the looming dark forest. People have sought and valued oak woodlands at the edge of the prairie as both a respite from the ominous nature of the forest and the harshness of the plain.

Restoration

Conservation of systems has an important place in protecting them. Restoration augments conservation by producing ecotonal or transitional environments as well as successional facsimilies of prairie and woodland

A. <u>Making Plants Grow</u>

Germination

The first step in growing native plants is determining best collection times for viable seed; germination requirements.

Production

Important elements of production are : matching phenology of plants to nursery regimes, learning requirements of storage and transportation, learning how to produce many plants, and what size to produce.

Installation

Proper installation requires determination of the best form of plant to use (seeds, sets, bare root, balled and burlapped), soil amendment or depauperization, water requirements, time of year.

Maintenance and Monitoring

After care requirements (water, weeding, replanting) and how long to perform such activities may be the single most important way to improve restoration success.

B. <u>Establishing Communities</u>

Establishing co-dominant species and developing strategies for getting sub-dominants or rarer spp. to come in will result in the complex natural communities which are desired.

C. <u>Managing Invasives</u>

Options for invasive management include: burning, herbicide, plowing, grazing, manual removal, and development of management plans.

Future of Prairies/Oak Woodlands

A. <u>Confounding Conditions</u>

Fragmentation

Remaining intact parcels become smaller and smaller, with fewer species and special microhabitats to support them.

Isolation

Distance between remaining populations of species becomes greater, genetically isolating them and subjecting them to potential inbreeding depression, lack of pollinators or dispsersers, etc.

Disturbance

The presence of people increases disturbance of some kinds: trampling, plowing, grazing.

Limits to Burning

Traditional burning is now limited by property value considerations and by air quality regulations.

Innoculation Pressure from Non-Natives

The sheer volume of introduced invasive plants, and the massive acreage now infested by them, means that the innoculation pressure on any remaining native parcels is great and unremitting.

Urban Climate

Urban climates have a heat island effect, induce different precipitation patterns and amounts, and are also subjected to pollution impacts.

Development

Development removes habitat directly, and also has an indirect effect on fragmentation, disturbance, isolation, pollution, etc.

B. <u>Desirable Goals Attainable?</u>

Native Biodiversity — Yes

Plants can be collected, grown, managed and sustained.

Protection of Rare Spp. — Yes

Threatened species are being grown *ex-situ* and reintroduced, and thrive. Habitat loss is a more serious threat.

Wildlife Habitat — Yes

Habitat destruction is probably the most severe form of habitat loss. Habitat restoration can be achieved if land is put into a program before its habitat values are completely diminished.

Vegetation Structure — Yes

Vegetation structural complexity can be maintained by keeping prairies and woodlands open.

Natural Communities — Partial

Plant communities can be developed by planting major components of communities; rare species may be more difficult to sustain; weeds are a problem.

Control of Invasives — Partial

Invasives are present, will continue to be, and will continue to require management. It is not likely that an invasive-fre environment can be sustained in the midst of so much "invasive-friendly" disturbance.

Self-Sustaining Not Likely

Because of the modification of the traditional buffers, sources of regeneration, fire regimes and weed presence, it is not likely that native prairie/woodland systems will sustain themselves without some energy subsidy, management, etc.

Conclusion

In summary, we possess a substantial amount of information and skills which will allow us to deal with the problem of stabilizing and perhaps even reversing the loss of prairies, oak woodlands, and all the plant, animal and other components of the ecosystems. These systems must now, however, be viewed in the context of modified landscapes which impart their own dynamic to the sustainability of natural systems (Forman and Godron 1986). The modification of the landscape setting may mean that for certain functions, perpetual human intervention will be necessary. The converse of this point is that if continual management is not going to be available, we may be have to make decisions about how much and what parts of the ecosystems that we want to provide subsidies to. For example, we may be able to produce self-sustaining systems that are composed of 70-80% native species, and which require only occasional maintenance. But in terms of important ecological functions such as the provision of wildlife habitat or the protection of threatened plant species, this degree of fidelity to "nativeness" may be quite adequate.

Literature Cited

Barnosky, C.W. 1983. Late-quaternary vegetational and climatic history of southwestern Washington. Unpubl. Ph.D. thesis, University of Washington.

Clampitt, C.A. 1993. Effects of human disturbances on prairies and the regional endemic *Aster curtus* in western Washington. Northwest Science 67:163-169

del Moral, R. and D.C. Deardorff. 1976. Vegetation of the Mima Mounds, Washington State. Ecology 57:520-530.

Forman, R.T.T. and M. Godron. 1986. Landscape Ecology. John Wiley and Sons, New York, 619 p.

Giles, L.J. 1970. The ecology of the mounds on Mima Prairie with special reference to Douglas fir invasion. Unpubl. M.S. Thesis. University of Washington.

Kertis, J. 1986. Vegetation dynamics and disturbance history of Oak Patch Natural Area Preserve, Mason County, Washington. Unpubl. M.S. Thesis, University of Washington.

Lang, F.A. 1979. A study of vegetation change on the gravelly prairies of Pierce and Thurston Counties, western Washington. Unpubl. M.S. thesis, University of Washington.

Marble, A.D. 1992. A Guide to Wetland Functional Design. Lewis Publishers, Ann Arbor, Michigan, 222 p.

Norton, H.H. 1979. The association

between anthropogenic
and important western Washington.
Northwest Anthropological
Research Notes 13:175-200.