

AVIAN HABITATS OF THE OLYMPIC PENINSULA
Meadow Communities
(Draft 2008)
Fred Sharpe

as we passed through little open glades or prairies.....glimpses of the mountains could be seenthe birds chatted in the morning and all seemed peaceful and happy...

James Wickersham Shelton Prairies 1890

Introduction

When we think of the Olympics, we envision ancient forests and titanic trees. Indeed, there are few places on earth that can rival the biomass of our old-growth forests. The Olympics, however, are also a land of open spaces. In the simplest terms, these open habitats are places where the forest does not hold sway. The factors preventing tree growth are as diverse – and as beautiful – as the meadows that arise. These places have many faces – prairies, meadows, tundra, muskegs, fens, savannas, swards, balds, bogs, bluffs and barrens. They range from high to low and wet to dry. Open habitats embrace the cactus patches of Sequim to the Quinault’s hillsides bogs, which are the wettest sites in the contiguous United States (over 15 feet of rain). Open communities occupy sandy flats of Dungeness Spit to the high rocky barrens of Elk Mountain. These non-forested sites also include a panoply of mid elevation sites including rocky balds, cliff faces, and avalanche shoots.

Land of extremes

The ecology of Olympics’ open spaces is complex and counter-intuitive. Here climate and cordillera collide to create an ecologically abrupt landscape. Shifts in rainfall, steepness, elevation, and biomass are among the most extreme in North American continent. Our peninsula is both land of hyper-maritime and the extra dry. We are a land of ragged mountains surrounded by rolling glacial planes and marine beaches. This environmental diversity produces a broad range of conditions over which plant and wildlife communities develop.

The beauty of meadowlands can be readily appreciated. However, the origins of meadows can be difficult to decipher. On a given meadow, there are typically multiple stressors or disturbance that stymie tree growth. These are places where trees fall on hard times. These are places where the land plays hardball to create hardpan and hard rocks. Meadowlands are also intimately intertwined with human history. There is evidence that the fires of native

peoples may have helped maintain lowland communities for thousands of years (citations).

In this complex landscape, it can be difficult to generalize about Olympic habitats. Plant communities shift in time and space as they respond to perpetual cycles of climate change. Over twelve hundred varieties of plants grace the Olympic Peninsula (Buckingham et al. 1995) creating a seemingly endless habitat array. The tension between forest and prairie is a zero sum game; one's loss is the other's gain. The Olympics are a land of strange bedfellows. Cactus grows a stones throw from Sitka Spruce. Sunny patches of chaparral perch above steamy groves of ancient cedar. Despite this bewildering complexity one thing is certain; our current climatic regime favors tree growth. Without disturbance--such as native fires--trees have encroached on most Olympic meadowlands.

Uniqueness

Although often modest in size – each meadow has its own unique story. They can be read like a detective novel with a cast of characters that include Little Ice Ages and Medieval drought. Suspects also include skeletal soils, the browsing of elk, and fires of ancient peoples. The Olympic Peninsula is a counter-intuitive landscape. This land best understood by the exceptions that prove the rule. This was not lost on the first biological expedition to traverse these mountains. In 1890 the O'Neil expedition wrote:

All rules that held good to us in other lands, failed us here...

Soil moisture

Soil water – either too wet or too dry – is often a key to understanding open spaces. The substrates on which Olympic soils form are diverse. The handy work of rivers and ice bequeathed the Peninsula a thick bed of rocky leavings. Our lowlands--the Olympic esplanade-- is a riot of tills, eskers, drumlins, gravel bars, moraines, terraces, sands, clays, loess and rock outcrops. This substrate diversity of substrate plays havoc with soil moisture, creating pools in one place while desiccating another. Excessive rain in the west promotes camas meadows and cranberry bogs, while the rainshadow in the northeast promote savanna and grasslands. It is curiously, meadows often appear along Olympic rivers where gravel bars put moisture at a premium. Rich Fonda has show that gravel bars nearest the river can be the driest, for they lack organics and are exposed to full sun.

Disturbance

Disturbance is also a huge factor in opening up forests. Spasms of nature—drought, flood, wind, avalanche, fire and snow—can lay the forest low. Although forests are quick to reclaim their own, there are many places where the Olympic jungle does not hold sway. Open habitats may be born from a river at flood stage or an avalanche tumbling from Olympic heights. In the west western Peninsula, it is often hurricane force winds that break the forest's back. In the dryer eastern peninsula, great fires have swept the land (Henderson).

History

For lowland prairies, life began when the glaciers left. However, rock outcrops that emerged above the icy advance have far more ancient origins (Buckingham et al 1995). Disjunct and endemic plants reflect a refuge of great antiquity—perhaps stretching back more than a million years. The Olympic rainshadow is presumably as ancient as the mountains themselves. Climate evidence suggests that after each major glacial episode, our regional climate has become steadily drier. This increasing climatic aridity has fostered the development of the world's Mediterranean zones (Axelrod 1973). Plants with adaptation to drought and fire have become more prevalent (Dallam). With the most recent retreat of glacial ice (about 12,000 years ago) a particularly intense period dry and warm conditions prevailed. Known as the altithermal, this was a golden age of prairies (Peterson et al 1983). Pollen evidence indicates these open communities persisted until about 4,000 ago until there was a gradual cooling and moistening of the climate. As forests of cedar and hemlock spread, it has been suggested by Ugolini and Schlichte that human cultures became the new keeper. By diligently setting fire to land, first peoples enhanced habitat for game and favored the growth of useful plants (Norton 1979).

Native Fire

Here the land also speaks of Indians who fire-tended open spaces. To know these wild places is to decipher how these Native fires interacted with sites of environmental stress (Wray and Anderson 2003). Through the use of fire, Indians deepened natural perturbation to curtail encroachment of trees and shrubs. Instead of towering forests, first peoples tended fields of camas and cranberry bogs. Instead of impenetrable thickets, elk and deer were enticed to fatten on swards of luxuriant grass.

Europeans

When explorers first sailed along the outer coast, most were largely unaware of the peninsula's open habitats. These mariners needed masts for their tall ships; they had an eye for great trees. The Olympics with their towering forests did not disappoint. When Spanish explorer Perez sailed these shores in 1775, he recorded mountains and great forests. At Cape Flattery in 1778 Captain

James Cook noted the land was “well covered in wood”. The following year, John Meares sailed the outer coast and noted “immense forests covered the whole of it within our sight down to the very beach”. He called this land “the perfect forest”. It was not until Captain Vancouver, and his naturalist Archibald Menzies, sailed into Olympic rainshadow in 1792 did our meadows become known to the wider world. The wrote:

“the forests did not conceal the whole face of the country in one uninterrupted wilderness”, but rather “open spaces chequered the valleys in many directions”.

Except for a few diligent observers, Europeans failed to recognize this fire mediated link between Natives and open lands.

Unlike early mariners who sailed past, settlers made this land their home. Olympic forests, however, are massive and imposing. Shaded understories were not to liking of old world farmers. Cultivators desired open spaces; their writ was to plant, herd, and tend. They eschewed the naturally bounty for the tended crops and the husbandry of old world animals. Natural openings were coveted, for they provided light to receive the plow, seed and hoof. Land claim were overwhelming filed open spaces. John Muir noted in 1888:

On every meadow or opening of any kind, someone would be found keeping cattle, hemp vines, raising hops, vegetables, and patches of grain.

Harry Fisher of the O’Neil expedition noted in 1890:

There are some small patches of ground bare of trees called prairies, these have all been taken....

Understandably, these habitats became the nucleus of towns such as Forks, Sequim, Chehalis, and Oakville. Although prairies made desirable home sites, they were often cruel places to farm. Tree growth was stymied for good reason; droughty, gravelly soils put the cultivator to the test. The diaries of early settlers reflect their tribulations. On Humtulips Prairie in 1890, Harry Fisher noted:

The soil was considered no good for farming being of a hard gravelly nature.

On the plains of the Nisqually, Eddy Higgins noted similar trials:

The most diligent cultivation failed to make the gravelly soil of the plains produce profitable crops

Near the coast, the wet climate was also problematic. James Swan noted:

The humidity of the climate is extreme, consequently the cereals do not ripen, nor has it been possible to cure hay.

On the Quillayute Prairie, Leslie Smith wrote:

In the early days people tramped over many miles of difficult pack trail or voyaged around Cape Flattery in small sailboats and paddled up the rivers in canoes to settle on this prairie land that need no clearing. Although dark, mellow, and very fertile in outward appearance, the Quillayute is deceptive. Good crops of oats were grown at first, but during recent years all attempts to farm this soil have led to disappointment

The misfortune of the meadows is a sad chapter in Olympic landscape ecology. Indians were displaced. Settlers were deceived. Fires were snuffed. Native birds and plants were diminished. The vanquishing of native fire is not without irony. Nancy Turner notes that the landscapes so appreciated by early colonists were created by the very fires that settlers feared and vanquished.

Today, many lowland meadows are only memories. Although the song of the meadowlark is gone, the final chapter of this lost biome is still to be written. With awareness and diligence, bluebirds and camas may once again flash across our prairies. Small reservoirs of rich prairie diversity remain. Awareness and dedication are now required to save prairies. Pulling weeds, planting natives, and canvassing neighbors is the new front of meadow salvation.

PRAIRIES and GARRY OAK SAVANNAS

where the sunshine may enter.....

John Muir

General Introduction

When one hears the word prairie, they often think of the amber grasslands of the American Midwest. Although more modest in extent, the prairies of the Olympic Peninsula share many features with those of the American heartland (especially those of the "Prairie Peninsula" found in Illinois, Iowa, Minnesota and Manitoba). Both areas were born of ice along the terminus of Canadian glaciers and both experienced a golden age that commenced soon after ice retreated (about 10,000 years ago). Fire and drought are also important factors in keeping the forest at bay both on both our local prairies and those of midde-

America. Despite this kinship, there are important differences; we possess dry summers and wet winters, while the American heartland has considerable moisture during the growing season. Instead of deciduous trees, we possess drought resistant conifers the surround and often invade our meadowlands. In reality, the true affinities of our local grasslands lie to south. The prairies of the Willamette Valley-Puget Trough-Georgia Basin Ecoregion represent the northern extension of grassland biome that is more numerous to the south along the California coast (Anderson 2005).

As noted above, the history of Olympic prairies began thousands of years ago during the age of ice. During the Pleistocene, glaciers moved through the region and left their calling card of pulverized rock and sand. Pollen studies reveals that many meadows developed on these deposits on the heels of retreating ice about 12,000 years ago (Barnosky 1982, Hansen 1981). The golden age of prairies lasted from about until about 5,000 years ago. At this time, a gradual cooling and moistening of the climate tipped the climate in favor of the forests.

However, as Native tribes became more sedentary and sophisticated prairies were given a new lease on life. There is evidence that fire began to be used as a tool to maintain open landscapes. These "fire-enhanced" habitats provided a host of resources including food plants, game animals and plant fiber for clothing and baskets. For thousands of years, natives diligently used fire to keep the forest at bay. These burning practices many have been especially important on the Olympic Peninsula, where our relatively moist climate permits robust coniferous growth.

Environmental stress is also a major factor in the production of meadowlands. These stony deposits found on Olympic Prairies can have difficulty retaining moisture and nutrients, and can favor drought resistant flowers and grass. Our mountains cast a small, but intense rainshadow which exacerbates our Mediterranean-type climate. In these areas of low rainfall, droughty soils, and desiccating winds are also major factors in prairie formation. These habitats often slope toward the south, where sun's light shine more brightly. The domain of our rainshadow extends well beyond the peninsula's shores. Its arid envelops stretches across Juan de Fuca Strait to the Gulf and San Juans Island. The Olympics also team up with the mountains on Vancouver to aridify the Inside Passage and Desolation Sound. Prairie ecosystems are also found in wetter southern reaches of the Olympic Peninsula, such as around Shelton, Pierce County, and Chehalis River corridor.

For thousands of years, a collusion of geology, climate, rainshadow and Native fire allowed grasslands to flourish. However, the arrival of Europeans ushered in the of prairie degradation. Meadows made highly prized home sites amidst the forest shadows. The plow, hoof, and tread all took their toll. Diseases ravaged the Native stewards and their tending fires were soon vanquished. Many prairies now only exist as memories. The Washington Natural Heritage

Program has estimates that less than 5% of the original prairies remain west of the Cascades. More native birds have disappeared from Olympic prairies than any other habitat.

All is not lost, for our remnant prairies harbor beautiful and distinctive biotas. Locally a blaze of wildflowers can still be found including purple camas, death camas, California buttercup, prickly pear cactus, chocolate lily, western buttercup, white chickweed, wild onion, and larkspur. Among the panoply of native grasses are fescues, bromes, junegrass, and wildrye. From the prairies edge, a wave of shrubs make their bid for the light including hazel, oceanspray, snowberry and the precious scent of Nootka rose. The quintessential broadleaf trees of the savanna lands are Garry Oak and the smooth-barked madrone. Behind the shrubs looms the forest of Douglas fir, although lodgepole pine and Rocky Mountain juniper may also be present. Ponderosa pine is also present on the south sound prairies.

In the rainshadow habitats of the San Juans, prairies and rock outcrops often intertwine in a mosaic-like fashion. However, on the Olympic Peninsula prairies and outcrops typically found in separate domains. On the peninsula, prairies are found on relatively low lying deposits of glacial sediments, usually within a few hundred feet of sea level. In contrast, the province of rock is in more mountainous terrain, usually above three hundred feet elevation.

The bluffs along Puget Sound's shorelines often support prairie plants as they are steep and erode easily, making establishment of trees difficult. High winds along shorelines also topple trees while the salt spray can "burn" the foliage of trees and shrubs. Once these "hanging prairies" are established, a thick sod layer of lichens, mosses, and grasses may also prevent the roots of conifers seedlings from reaching mineral soil. Sandspits similarly can harbor many wildflowers and often intergrade into upland prairie communities (see strand section).

The Cultural Aspect of Prairies

As noted above, the meadows of the Olympic Peninsula have cultural significance as well. These open spaces are closely associated with to the burning practices of native peoples. Over the last several millennia, Native cultures of western North American used fire as a management tool. Through a careful processes of burning, seed scattering, tilling, pruning, and harvesting, natives maintained prairie habitats for hundreds--perhaps thousands of years (Anderson 2005). Deliberate burning increased the diversity and abundance of foodstuffs including tubers, greens, seeds and acorns.

Fire may also have been used as a form of integrated pest management to control insects and diseases that could harm wild foods (Anderson 2005). The vigorous growth of regenerating shrubs enhanced the quality and quantity of material used for basketry, cordage, fishing weirs, traps, clothing, and weapons.

These supple young stems or “withes” are long, strait, and typically lack blemishes, insect damage and lateral branches. Hazel stems were a favored species for basketry materials, and both Natives and Steller’s jays coveted the tasty nuts. Oceanspray was also known as ironwood, and its fire regenerated withes made superior arrow shafts.

It has also been noted by Kat Anderson that burning practices of Native peoples locally promoted plant complexity, increased biodiversity, and maintained certain vegetation types that otherwise would have undergone successional change. Prairie plants not only tolerate fire, but may also require periodic burning to complete their life cycle or to maintain dominance (Anderson 2005). Fire also reduced accumulation of thatch, leaves, twigs and other aging plant parts that could reduce plant vigor. A reduction in debris also is said to have facilitated the collection of acorns from the ground.

Fire was also used to manage deer and elk herds in a primitive form of animal husbandry. At Whidbey Island Vancouver notes

In these beautiful pastures... the deer were seen playing about in great numbers. The grass of an excellent quality, grew to the height of three feet...

Instead of barbed wire, natives used habitat enhancements and enticements to increase game production. As noted by David Douglas

These fir groves were found necessary by the Indians to induce deer and other game to stay in the valley. These groves were undisturbed by fire....

The re-growth of grasses following fires is more palatable and nutritious for grazing animals, thereby increased the yield of meat. Patch burning could also modified the spatial distribution of shrubs and trees for hiding cover, thereby facilitating the ease of the hunt. Instead of barbed wire, natives increasing habitat quality to entice grazing animals to frequent certain areas. At Nisqually prairie in 1847, Joes Clark wrote:

Everywhere in this part of the country the prairies open wide, covered with a low grass of a most nutritious kind, which remains good throughout the year. In September there are slight rains, at which time the grass commences a luxuriant growth, and in October and November there is an abundance of green grass, which remains until the ensuing summer. About June it is ripe, and drying without being ripe, it is like our hay in New England...

Perhaps most spectacularly, fire was used capture game in a tactic know as the circle hunt. In this cooperative venture, tribes such as the Kalapuya in the

Willamette set fires around herds of deer. The flames would assist in driving and concentrating quarry in a common center, where the bowman could make an easy kill. The hunt was conducted after the fawns had been weaned and the animals had been fattened on acorns (Boyd 1999).

In 1774 the Spanish explorer Juan Perez was returning to New Spain [Mexico] from the Queen Charlotte Islands. As he sailed past the Olympic coast, he noted in the ships log the haze from fires shrouded the coast. Although the origin of these fires is not known, Perez's words presage many subsequent observations of fire, natives, and open landscapes.

Nearly two decade elapsed before the next Europeans sailed these waters. In 1792, George Vancouver sailed into the Strait of Juan de Fuca and observed

“As we advanced the country seemed gradually to improve in beauty. The cleared spots were numerous and of larger size”.

Anchoring at Discovery Bay, he sauntered ashore to explore Protection Island and wrote

The summit of the island presents nearly a horizontal surface, interspersed with some inequalities of ground, which produced a beautiful variety, on an extensive lawn covered with luxuriant grass, and diversified with an abundance of flowers. To the northwest was a coppice of pine trees and shrubs of various sorts, that seem as if it had been planted for the sole purpose of protecting from northwest winds this delightful meadow.

Vancouver puzzled over the formation of the prairies and observed

...the clear places may have been indebted, for the removal of their timber and underwood to manual labor. Their general appearance furnished the opinion, and their situation on the most pleasant and commanding eminences, protected from the forest on every side, except that which would precluded a few of the sea, seemed to encourage the idea...

In 1849, James Douglas described Victoria as a range of planes nearly six miles square...a perfect Eden. In his travels in Willamette Valley and the plains of the Nisqually Wilkes penned:

The whole country is sprinkled with oaks, so regularly dispersed as to have the appearance of a continued orchard. Lupines and kamass flowers all seeming in the utmost order as if man had been ever watchful of its beauty and cultivation

Similarly Cooper in 1860 noted:

Their most striking feature is the abruptness of the forest which surround them giving them the appearance of land which have been cleared for and cultivated for hundreds of years

As more Europeans arrived, they made direct observations of native burning. On Whidbey Island in 1852, Colonel Ebby noted;

A great deal of smoke is to be seen on the other side which I suppose is caused by the Indians burning the woods.

At Nisqually, Dr Tolmie recorded fires over a period of successive years:

Fire has today consumed all the herbage on the plain for an extent of several miles 7 July 1833

The weather is warm and we are surrounded by a thick smoke owing to fire being up to the field behind us 6 September 1834

The country around us is all on fire and the smoke is so great.... 14 Aug 1835

We have not the sun from the smoke, the wind is from the northeast 19 Sept 1836

To the south, explorers made similar observations in the oak savannas of the Willamette Valley. In the 1820's David Douglas wrote:

Country undulating; soil rich, light, with beautiful solitary oaks and pines interspersed through it...but being all burned. Camped on the side of a low woody stream in the center of a small plain – which, like the whole of land, had been burned. The fire drove toward the grove; then quickly closing ranks, made a clean sweep of the country....As the shades of night deepened, long lines of flame and smoke could be seen retreating before the breeze across the hills and valleys.

Cooper in 1860 also noted

The Indians, in order to preserve their open grounds for game, and the production of their important root, the camas, soon found the advantage of burning....

In 1877 George Gibbs wrote:

The kamas season is in May and June, and then as well as in the fall, when the sunflowers are dug, the prairies are dotted over with squaws, each armed with a sharp digging stick and a basket

In the northern sector of the Olympic Rainshadow at Victoria, an anonymous newspaper article in 1849 writes

Miles of ground were burnt and smoky, and miles were still burning. The Indians burn the country in order to [promote]...the roots which they eat.

The fire runs along at great pace, and it is the custom here if your are caught to gallop right through; the grass being short, the flame is very little, and your are through in a second

Natives deliberately burned prairies and the encroaching woodlands after the summer harvest to increase the abundance of certain foods and to aid in their collection. With the increased sunlight, prairie and forest edges produced an envious selection of botanical foods including acorns, camas bulbs, tiger lilies, hazelnuts, bracken fern, onions, mustard, tarweed, blackberries, elderberries, gooseberries, wild carrot, and clover. The ash from these fires may have maintained the fertility of the soil by reducing the soils acidity and increasing the availability of nutrients such as phosphorus, calcium and potassium. The gathering activities with digging sticks may have tilled and aerated the earth, further improving its quality. Small bulbs were returned to the soil, thus insuring the annual harvest. Natives tending activities may have selected for plants traits adapted to human perturbation such as asexual fragmentation of small bulbs (Anderson 2005). Similar to the manner in which families would possess rights to fish a particular stretch of river, there is evidence that prairie plots were also owned, inherited, weeded, fertilized and replanted. Natives may also have aided in the northward dispersal of oak and other prairie plants by transported them as food and seed stock.

Perhaps the most coveted fire-enhanced food plant was the camas. Its attractive purple blossoms grow over a wide range of conditions from sodden bogs at Quinault to the gravelly prairies of Kia Tia. On the Kitsap Peninsula at Village Point, Vancouver observed a seasonal camp

This station did not appear to have been preferred for the purposes of fishing, as we saw few of the people so employed; nearly the whole of the inhabitants belonging to the village, which consisted of about eighty or a hundred men, woman, and children, were busily engaged like swine, rooting up this beautiful verdant meadow in quest of a species of wild

onion and two other roots. They all seemed to gather them with much avidity, and to preserve them with great care....

Vancouver was not aware that these harvest activities were annual events, and that they perpetuated these “beautiful verdant meadows”.

A menagerie of insects could also be found including ants and the larvae of yellow jackets (Anderson 2005). Grasshoppers were easily collected with singed wings, and their toasted bodies made tasty fare. Even well seasoned travelers were taken by the bounty of our meadows. In 1888, John Muir visited the prairies of southern Puget Sound and wrote

 Berries grow in lavish abundance, enough for man and beast, with thousands of tons to spare. The woods are full of theses, especially about the boarders of meadows where the sunshine may enter. Nowhere in the north does nature set a more bountiful table....

Similarly, on Whidbey Island in 1792, George Vancouver noted that

 the verdure of these beautiful pastures included grass of excellent quality....gooseberries, currants, raspberries, and strawberries were to be found in many places.....and appeared to grow very luxuriantly...onions were to be got almost everywhere...

This botanical smorgasbord provided vital sources of carbohydrate, plant protein and vitamins.. Fires reduced excessive brush, thus permitting and allowed for more efficient gathering by natives. Wild honey was found in association with open communities. Deer and elk were attracted to these prairies, and fire could be used as a tool to herd the mammals into an ambush. Smaller mammals could also be more readily be procured among the smoke and flame..

When fire sweeps the prairie, it scorches and kills invading shrubs and conifers. However, prairie plants possess adaptations permitting them to survive – and thrive – amidst the fire. Both berry producing shrubs and lilies have the capacity to regenerate from underground rhizomes or buried storage organs (Turner 1999). Most of the species whose growth and productivity are increased following landscape burning are early successional species requiring clearings or open canopies for optimum growth (Turner 1999).

Garry oak is a classical fire adapted tree. The oak’s thick furrowed bark shield its cambial tissues from the heat of fire, and scorched individuals respond by sending up suckers to produce new stands. Acorns also find fertile conditions on ash beds as competition for light and soil nutrients is reduced. Acorns have relatively large food reserves, thus permit them to send down a deep tap root to find moisture (Agee 1993). Acorns and other seeds that are liberated onto the ash beds, may be obscured from predators and the sterilized

soil may reduce the chance of mold. Sites that have recently been fired may be less likely to burn the following year, and thus give the seedlings a better chance to reach the more fire resistant sapling stage (Agee 1993).

Native were not wanton with fire. Rather fire was diligently applied in a manner to achieve specific objectives in certain habitats. As noted by Kat Anderson, the use of fire entailed a number of considerations, such as seasonality, frequency, and the aerial extent of the burn.

Native Peoples: the combustion conjurers

Native tribes of the Olympic Peninsula were experts at taming and harnessing fire. With simple materials of the land, they could make flames spring to life. With fire they cooked food, made tools, and changed ecosystems. In the 1850's James Swan noted their ability to light fire under impossible circumstances....

The Indians would always and invariably kindle a fire whenever we would stop for half an hour either to wait for someone to come up or while waiting for the tide. They are the most expert people to build fires in wet weather I every met with. I was one night obliged to camp out in a heavy rain, being unable to cross the Bay [Willapa] on account of the wind blowing violently. I saw no possible means of procuring a fire. We were at a place were there were no large trees, and all the drift-wood was saturated with water; but the Indians soon had a blaze, which they kindled in this manner: There was plenty of the dry, dead stalks of the wild or cow-parsnip lying about. These stalks are hollow, with a dry substance inside that burns like tinder; and no matter how much it may rain, the inside of the stalks is always dry. The Indians had used this material, and after once starting a blaze, soon managed to have a roaring fire.

Most fires of Pacific coast tribes were made with the use of hand drills. This involved the use of a slender wooden shaft that was placed into a hole in a stationary board called a hearth. With a rapid rubbing of the hands the shaft created sufficient friction to induce smoldering. By gently blowing – or by wafting with a fan made of tail feathers – a glowing ember sprang to life. This ignited tinder such as fine cedar strips, grasses, or the punky material obtained from hollowed trees. Tinder could be kept dry on the wettest of nights by placing tinder inside a clam shell. The shell was then sealed with pitch, keeping it dry on the wettest of canoe rides.

During James Swan's many years among Washington's coastal tribe, he documented their ignition ingenuity. They could forge a piece of iron with no greater heat than an ordinary fire. Using a large stone for an anvil they fashioned into knives, tools, and weapons. Flames were used to herd game by

setting fire to prairie. At night fire was taken into canoes to spotlight birds. Once the game was captured, fire was used to cook, smoke, boil or steam. Herbs, tinctures and berries were also cured with diligent application of fire.

At Copalis beach, Swan the local inhabitants always kept a welcoming fire burning. Here razor clams could be dug, and roasted over the glowing embers of sprucewood. Similarly, on the Kitsap Peninsula, Vancouver noted that smoke house fires were kept constantly burning to cure clams, mussels, and fish.

Canoes, the SUV's of native tribes, were fashioned with fire. Cedar trees were felled with the assistance of fire. By meticulously building fires along the length of the log, their massive canoes took shape. The steam from hot rocks would turn boards into bentwood boxes. Heavy ropes for towing whales were made by steaming the roots of spruce in ashes. rendered them extremely tough and pliable. Swan also noted that fire was used as an implement of war:

They then prepared great torches of dried pitch-wood and made then into fagots. These were tied on the ends of poles to set [thy enemies] houses on fire...

Fire also had medicinal uses:

The dried inner bark of white-pine was applied to moistened skin and set afire to relieve skin afflictions. The practice seemed to be common among all the coast tribes in the vicinity, and it is rare to see an adult who has not scars produced by its means.

Fire was also used to taint the skin, thereby permitting increasing the proficiency of handling implements. A burning moxas of dried pitch was applied to the wrist and back of the hand, thus creating a callous or scar. This was reputed to keep the bow string from hurting the hand and provide steadiness of aim. Boys being boys, fire handling was also applied to the body for showman ship.

I have seen schoolboys sit down of and evening by the fire and amuse themselves in this manner, holding out their hands with the burning pitch stinging the flesh, and showing their bravery by the amount of pain they could bear.

Perhaps the greatest legacy of Native fires was the creation of wide-open spaces. Although fading, this signature of past native fires is still written our landscapes. How did it come to pass that the embers of native fire were extinguished?

The Vanquishing of Pyro-culture

There were many factors that brought about the end of native burning. Epidemics associated with European diseases were probably the single greatest cause. In some areas it has been estimated that more than 85% of the population was vanquished by disease. As these pathogens swept the land, tribes and their cultural knowledge – including fire tending – rapidly vanish.

On the Olympic Peninsula, the first and most deadly pathogens arrived with Spanish in 1775. When captain Vancouver arrived 15 years later, his journal entries tell of a sad legacy in burial sites, depopulated villages, and small pox scars on survivors:

This deplorable disease is not only common....but is very fatal amongst them, as its indelible marks were seen on many.

There are reason to believe [this region] has been infinitely more populous...the part of the coast we that we had now reached being nearly destitute of inhabitants....

In our different excursions, particularly those in the neighborhood of Port Discovery, the skull, limbs, ribs, and backbones, or some other vestige of the human body were found in many places....and scattered about the beach in great numbers. Similar relicts were also frequently met with during our survey in the boats. I was informed by the officers, that in their several perambulations, the like appearances had presented themselves so repeatedly, and in such abundance, as to produce the idea that the environs of Port Discovery were a general cemetery for the whole of the surrounding country.

Vancouver was also under the impression that interior areas had been abandoned, and natives were now centered in coastal sites near areas of white commerce. On their way to the mouth of the Columbia River in 1805, Lewis and Clark made similar observations. They noted an abandoned Indian village, a “desolate site” they procured a load of boards for their own shelters. At Willapa Bay in the 1850’s, James Swan similar saw the signs of a great tribulation among the tribes:

The relics of old lodges, canoes, heaps of shells, and other remains, give evidence that at some period that there must have been a large body of Indians around Shoalwater Bay. The deserted villages are to be met with all over the coast portion of the Territory.....There is not disputing the fact that an immense mortality has occurred among these people, and that they are reduced to a mere handful.

Rumor of abandoned Native camps also found far up the Queet River by fisher in 1890. He noted the "decayed racks upon which the Indians had dried their fish".

With the disappearance of native communities, so to fire disappeared from the land. Perhaps the greatest impact has been the surge of shrubs and trees onto meadow communities. This was evident to Vancouver who astutely observed plant succession around abandoned villages at Port Discovery and wrote:

The habitations had now fallen into decay...as well as a small surrounding space that appeared to have been formerly occupied, were overrun with weeds....

Not many years since each of these vacant places might have been allotted to the habitation of different societies....and on the site of their extermination, nothing but the smaller shrubs and plants have been able to rear their head.

By the time John Cooper arrived to the south sound prairies in 1860, he saw the rapid changing prairie landscape.

From various facts observed, I conclude that they are the remains of much more extensive prairies, which, within a comparative recent period, occupied all the lower and dryer parts of the valleys, and the forests have been gradually spreading over in their downward progress from the mountains. On some prairies near Vancouver and Nisqually, where this burning has been prevented for twenty years past, young spruces are found to be growing up rapidly, and Indians have told me when they can remember when some other prairies were much larger than at present.

In addition to extinguishing fire, there are a myriad of other European influences that degrade prairie habitat. The importation of livestock onto to prairies also resulted in a rapid degradation of these communities. Pigs are particularly destructive to camas bed, as they are root through the soil to uncover the bulbs. On Whidbey Island Mrs. Ebby writes:

We have but a few hogs yet; but in another year we expect to have more. They can do well on kummus. There are quantities of it here on this island, and it is excellent for both Indians and hogs.

The loss of functioning prairies in the south sound region was noted by Dr. Tolmie in 1841. The importation of over 16,000 cattle, sheep, and horses by

the Puget Sound Agriculture Company caused considerable consternation among the Indians.

“The difficulty of Indian management at Nisqually had been greatly enhanced by the introduction sheep and cattle in large numbers on the plains. The Indians themselves, owners of horses and considerably dependent on roots of native growth for subsistence, and found the innovation so much for the worse that discontent was often exhibited”.

An agent for the Puget Sound Agricultural Company, Eddy Higgins also noted the degradation of Nisqually prairies and wrote:

...the nutritious blue bunch grass was plowed up or killed out by to close pasturing, and followed the cattle into the things of the past. The most diligent cultivation failed to make the gravelly soil of the plains produce profitable crops; fields again turned into pastures which produced a scant growth much inferior to the original blue bunch grass, which waved in the breeze like the great fields of ripening grain.

Certain species of plants appear to be adapted to both burning and digging to complete their life cycle (Anderson 2005).

The plowing and heavy livestock pressure on native grasses decreased the amount of fine fuels. Thus the ability of prairies to sustain low-intensity fires may have also been decreased. This produce a feedback loop, whereby Douglas fir could invade, and further suppress fire by the shading of native grasses. Intense grazing and rooting by hogs can expose mineral soils, facilitating the advance of weeds and conifers onto native plant communities.

Although grazing degrades herbaceous communities, it can in some cases, preserve open character of oak and grasslands. By replacing fire as a disturbance agent, grazing can keep invading trees and shrubs at bay.

On the south sound prairies Douglas-fir competes with ponderosa pine, and suppresses production of the pine highly flammable needles. Garry Oak was also highly prized by shipbuilders, as its wood is strong, dense and resistant to decay. The wood was particularly sought after for frames and knees, and its use in furniture and other artifices contributed to its decline in western Washington.

Most Europeans who beheld Native fires found them to be unsettling. Homes, barns, fences, livestock, and crops were not compatible with flames that flashed across the August prairies. Instead, settlers brought old-world disturbances to keep the undergrowth at bay. This included the ax, saw, plough, and the ruminant's incisors. With the advent of new agricultural practices, Europeans implored the Natives to cease burning. The fires at Victoria were

“very alarming” and unwelcome (Turner 1999) and on Whidbey Island noted by Bill Penn:

“the white men didn’t like [Indians] setting fires to the prairies”

Hal George, a Native American also notes: (Powell 2002)

We weren’t allowed to burn it anymore. There were already farms on the Quillayute Prairie...they had plowed some of the prairie and fenced some of it.”.

At Victoria in 1857 Colquhoun Grant attempted various techniques to halt the burning

I have endeavored...to check these fires by giving neither potlatch or employment to any Indians so long as a fire was blazing in sight of my house.

At Whidbey Island, Richard White summarized the European perspective

When the whites arrived, they regarded the prairies as wild. They dammed the bracken fern making plowing difficult, cursed the painful sting of the nettle, and praised the camas as pig food.

The vanquishing of native fire is not without irony. It has been noted by Nancy Turner that the landscapes so appreciated by early explorers and colonists were created by the very fires they feared and disliked.

Most Europeans remained in the dark as to why Natives set the prairie a blaze. However all humans – both old world and new – marveled at the prairie’s beauty. Humans have a deep connection to savanna habitats. Part of our evolutionary history played out on the African Plains and other open habitats. It has been suggested by Gordon Orians that we are innately drawn to features of landscape that aided in our survival. Known as Prospect-Refuge Theory, Orians suggests certain landscape features helped hunter-gatherers survive. These included habitats that offers optimal surveillance (prospect) and protection (refuge). In particular, hills and outcrops provided superior spots to scan for trading or warring parties. These natural ramparts provided outlooks for game and signal fires, and could be more readily defended from nare-do-wells. Presumably we are allured to the striking shape of savanna trees, as they permitted escape from ground dwelling predators. The spreading limbs of savanna trees also tend to yield more bountiful nut and fruit crops. Presumably we also appreciate vivid wildflower displays, for in past human environments, this was correlated with a rich harvest of berries, seeds, and bulbs.

Regardless of the features that attract us to open ecosystems, modern humans have loved the prairies to death. To this day, intensive development continues on prairie environments. The natural processes that historically sustained prairies have been banished from the land. Obviously fire cannot be returned to suburbanized landscapes. However, there is much that can be done to protect these ecological--and culturally significant--sites. Become aware of biotic diversity in your own neighborhood and endeavor to protect the small patches that remain. Support sensible legislation that protects critical habitat and farmland. Join organizations such as the Washington Native Plant Society, The Audubon Society, and The Nature Conservancy that work to restore prairie ecosystems.

Birds

Life in open country habitats requires specialized adaptations. Subdued coloration and counter shading permit blending with the subtle prairie hues. Ground nests that are often concealed in a tuft of grass (sparrows), shallow depression (larks), or by building a small "beaver mound" over the nest (meadowlark). Behavioral tactics include the distraction displays of spotted sandpiper and killdeers to lure enemies away. The burrowing owl may also dissuade predators by mimicking the sound of a rattlesnake to dissuade predators. Short egg incubation also reduces the exposure time to predators, and young are mobile soon after hatching. The scarcity of perches require open country birds to be resourceful, and thus they will hunt while hovering (kestrel), sing on the wing (larks) or ground (meadowlarks) (Altman et al 2001).

Prairies and meadows are often the first places to feel the touch of spring. Here rufous-sided hummingbirds make their debut to sip the swelling blossoms of red-flowering currant. Horned larks and bluebirds are among the first migrants to visit during the February gales. As the spring progress, there are many resources that can be found here. The bed-rock that often lies just below the surface creates seeps and vernal pools providing bathing and preening sites for robins, juncos, and kinglets. Glacial erratics scattered over the prairies provide hunting perches for raptors, drumming posts for blue grouse, and singing stations for meadowlarks. Shrubs provide cover and a panoply of berries for robins, waxwings, and solitaires. Herbs and grasses are utilized by savannah sparrows, white-crowned sparrows, and American goldfinches. On the barren gravelly knolls, nighthawks lay a pair of camouflaged eggs. The oak's gnarled limbs are favored stopover foraging sites for migrant yellow-rumped warblers and Townsend's solitaires and provide additional hunting perches for flycatchers and kestrels. Where limbs break from the trunk of oaks, cavities are created which are used by owls, flickers, chickadees, or Townsend's big-eared bats. The heavily furrowed bark of oak may support rich lichen communities and provides foraging sites for nuthatches and creepers. Garry oak forests often

occur as a fringe habitat between fir woodlands and grasslands providing habitat for edge specialists such as house wrens and chipping sparrows. California quail call from the thickets while mountain quail can be found locally in the dense brush of the south Sound prairies. In migration and winter northern shrikes hunt in these habitats and hang their prey from thorns of nootka rose. Open country vagrants such as the Western Kingbird, Lapland Longspur and the rare Say's Phoebe are predisposed to visit these open habitats during their seasonal wanderings, In winter or migration these communities may be visited by various flocking species including American Pipit, Snow Bunting, Lapland Longspur, Western Meadowlark, killdeer, mew and glaucous-winged gulls.'

Conservation

Grasslands, savanna, and fir parklands were once pervasive west of the Cascades. During the last century and a half, however, they have largely vanished. Like the Indians who went before, Europeans coveted these open communities. These new stewards found meadows to be both beautiful and useful for homes, villages, and ranches. Sadly however, Europeans remained largely ignorant of the ecological processes that sustained open communities. Today they have been overrun by agricultural lands, managed forests, shopping centers, housing developments, highways, industrial parks, churches, golf courses, and vacant lots. Most prairies now occur as isolated patches dying a slow death.

The European love affair with the prairie has greatly impacted native bird communities. More species of birds have disappeared from open habitats on the Olympic peninsula than all other habitat types combined. Open country birds that have disappeared or been diminished from the lowlands of the Olympic Peninsula include the Northern Harrier, Short-eared Owl, Burrowing owl, Purple Martin, Lewis' Woodpecker, Western Bluebird, Vesper Sparrow, Chipping Sparrow, Western Meadowlark, , and Streaked Horned Larks. There is also evidence that small populations of Yellow-breasted Chats, Lazuli Buntings, Nashville Warblers, White-breasted Nuthatch and Western Kingbirds inhabited the prairie regions of southern Puget Sound, but most soon vanished after EuroAmerican arrival (5). Most of these birds had relatively small, isolated populations at this latitude, making them particularly susceptible to human disturbance. In addition to habitat loss, introduced European Starlings and House Sparrows have been implicated in the decline of some of these birds, as they pose stiff competition for food resources and the dwindling supply of nest snags. Some native species have increased dramatically with conversion to agricultural activities including the Brewer's Blackbird, Brown-headed Cowbird, Red-winged Blackbird and American Goldfinch.

Conversion of prairie to hayfields can continue to provide habitat for a few species such as meadowlarks and savannah sparrows. However when the

hay thresher begins working the fields in late June, these sites can become ecological traps for ground nesting birds. Fire suppression has permitted Douglas fir, snowberry, and nootka rose to encroach on prairies unchecked for more a century. More than 50% of former prairie in the south Puget Sound are is now Douglas fir forest. The heavy buildup of fuels over the last century now creates high intensity fires which can destroy oaks. Over- grazing and trampling by livestock has degraded many natural prairies beyond recognition and off-road vehicles can further impact these habitats. Once the native bunchgrass community is disturbed, introduced sod-forming grasses spread rapidly by rhizomes and quickly out-compete natives. Scotch broom is a particularly aggressive non-native invader of these sites and quickly smothers native plants under its evergreen canopy. As with other legumes, broom has the ability to fix atmospheric nitrogen and thus provides elevated nutrient levels permitting cheat grass, cat's ear and battalions of other aggressive weeds to more easily invade the prairies. Scotch broom is resistant to fire and establishes such a large seed bank in the soil that new plants continue to sprout years after it has been removed. Weeds are problematic in that they can readily become established and preempt resources, and are less likely to be grazed or attacked by insects or pathogens, and thus have a competitive advantage (Walker and del Moral 2003). Weeds are often wind pollinated or self-fertilized and thus don't require pollinators or can rely on generalist pollinators. For many savannas and natural grasslands, the only reminders of this former biome are the names --Sequim Prairie, Elk Prairie-- and a few remnant oaks along borders housing developments.

