CASE STUDY

Restoring Indian-Set Fires to Prairie Ecosystems on the Olympic Peninsula

by Jacilee Wray and M. Kat Anderson

Native American land management practices maintained the economic and ecological viability of Olympic Coast prairies.

If ecological restoration is defined as returning ecosystems to the condition in which they existed before non-indigenous settlement, then we argue that with certain ecosystems—such as the prairies on the Olympic Peninsula—their condition is not an entirely natural one. Such prairies are not only edaphically and climatically determined but may also have been greatly affected by indigenous burning. Prairie ecosystems with their rich biodiversity are disappearing throughout much of the Pacific Northwest, and specifically on the Olympic Peninsula, because they are being overgrown by conifers and shrubs (Figure 1). Research findings of anthropologists, ecologists, soil scientists, and palynologists point to the cessation of Native American burning as one of the major factors connected with the decline of prairies throughout the West (Sugihara and Reed 1987, Bicknell and others 1989, 1992, Leopold and Boyd 1999).

This article explores the importance of Pacific Northwest prairie ecosystems to biocultural diversity conservation, details their creation and maintenance through natural *and* cultural processes, and makes a case for their restoration in Olympic National Park and the surrounding region of the Olympic Peninsula using Native American traditional ecological knowledge and practices.

Animals and Plants of the Olympic Prairies and Their Uses

Prairies in the Pacific Northwest are composed of diverse assemblages of grasses, ferns, sedges, rushes, and herbaceous perennials. Many of these prairies are biodiversity hotspots—containing a species-rich flora and fauna that is unique from that of the surrounding forests and shrublands (Stromberg and others 2001). The prairies are significant foraging grounds for Roosevelt elk, deer, and black bears, and they form important habitat for various butterfly species that use the unique plant life as larval and nectar food plants. They are also important to Native American tribes that have hunted and gathered a myriad of resources in these ecosystems for hundreds, if not thousands, of years.

While the indigenous people did not cultivate domesticated crops, they did practice land management techniques including burning, pruning, and tillage in order to augment plant and animal populations (Stern 1934, Schlichte and Ugolini 1973, Norton 1979). Burning fertilized the prairies and destroyed invasive species, creating habitat for the animal and plant species that provided some of the key nutrients of life. Some form of ownership, based on the tending of plants, probably existed for these prairies. According to anthropologist Wayne Suttles, the best camas and fern beds were owned by extended families, and ownership and plant tending seem to be related (Suttles 1951). In the Quinault area, "each family had an occupancy right in a great prairie, such as O'took Prairie or Quileute {*sic*} Prairie. The family burned over its part of the prairie in the spring so the dead ferns would be destroyed, giving way to camas. Generally no outsider would trespass unless he received permis-

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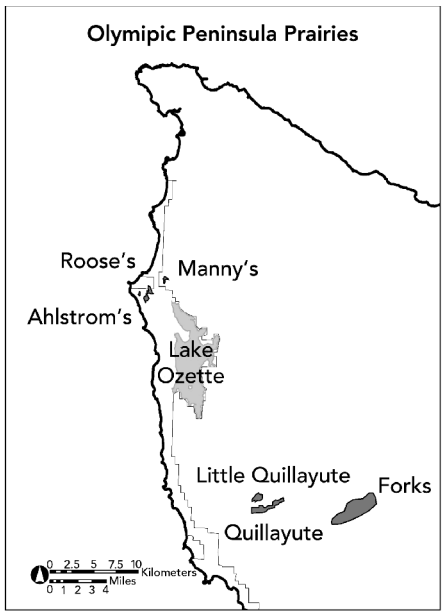

Figure 1. Map showing the general locations of prairies on the Olympic Peninsula of Washington. *Courtesy of Roger Hoffman, Olympic National Park*

sion from the family which 'owned' the site" (Singh 1966, pp. 25-26).

Prairies are also the storehouse for plant and animal species important to Native American economies for basketry materials, clothing, foods, household items, tools, and medicines. In the Ozette prairies of Olympic National Park and Tsoo Yess Prairie on the Makah Reservation at Neah Bay, bog cranberries (*Vaccinium oxycoccos* var. *intermedium*) still bloom every spring. Traditionally, the berries were eaten fresh, and in later times they were canned, and used for making jam, jellies, and pies (Gill 1984). The Makah recall past and present gathering, trade, and preparation of bog cranberries:

> {My dad, Charles Claplanhoo,} said that a lot of cranberries were traded. The really nice cranberries were traded with the people down towards Westport. There was a trade route that you can go on and they would trade for silk berries, cranberries and wild mountain berries. There was a lot of wild mountain berries. There were a lot of cranberries. There was so much that they used to press them into bricks about the size of your hand. And that's the way that they were dried and kept. They were all compact and ready to travel. (Claplanhoo 2002)

Labrador tea (*Ledum groenlandicum*), also known as Indian or cranberry tea, grows in association with cranberries. Continuing an ancient custom, the Makah gather and steep the leaves and drink the resulting tea as a refreshing beverage (Gill 1984):

> Cranberry tea—that's good. We used it, especially if we were sick and couldn't eat, we would drink a lot of that tea. So it wasn't only used like drinking coffee every day. It was also used for a medicine. If you can't eat—drink the tea. Keep drinking—even if it's just a little bit until your appetite came back. So that's how I know it. But I always drank it if I was thirsty because all of the old people always had some. They just had it in a jar right there. If you wanted some they would just add some more, just keep adding to the tea that they had on there to make it stronger. So I was more or less brought up with that tea where these kids don't use it as much as I did. All of the old people always had it. (Johnson 2002)

The prairies on the Olympic Peninsula contain large stands of bracken fern in the drier areas. The rhizomes were dug and roasted in ashes, peeled and the starchy center eaten (Gunther 1973). According to Albert Reagan, the Quileute and Hoh "dug the roots of these ferns, pounded them to a pulp, dried the pulp, mixed it into a sort of dough and baked bread from it, which they claim was pretty good bread" (Reagan 1934, pp. 56-57).

Another prairie plant that was highly valued for its edible underground swollen stem was camas (*Camassia quamash*). The bulbs were dug with digging sticks, cooked in earth ovens, and relished by many tribes including the Klallam, Lummi, Makah, Quileute, Quinault, and the Skokomish (Gunther 1973). Camas is still gathered today.

The Makah harvested the leaves of basket sedge (*Carex obnupta*) from the wetter parts of Ozette prairie and other open sites for the horizontal strands in basketry (Gill 1984). Contemporary weavers still gather this plant.

The Quileute ate the fruits of snakeberry (*Maianthemum dilatatum*), another prairie plant. The Makah chewed the plant's roots and swallowed the juice to correct sterility. Many tribes used yellow avens (*Geum macrophyllum*), which is found in prairies and open forests, for medicinal purposes. The Quileute applied the leaves to boils, while the Quinault smashed the leaves and rubbed them on open cuts. The Makah, Quinault, and Klallam mashed the plant of sweet-scented bedstraw (*Galium triflorum*) and rubbed it on their hair to make it grow (Densmore 1939, Gunther 1973).

The ecotone areas surrounding prairies also contain rich resources, such as western crab apples (*Pyrus fusca*). The apples were gathered by many tribes and eaten. The crab apple bark has many medicinal properties and was taken internally for ulcers, the heart, and as a blood purifier (Gill 1984). Salal (*Gaultheria shallon*), one of the most significant edible berry plants to tribes on the Olympic Peninsula, grows profusely in the open areas surrounding the prairies, bearing much greater quantities of fruit than in the dense coniferous forests. The berries were eaten raw and also dried for future use. Presently, the Makah eat the fruit fresh and use them in pies and jellies (Gill 1984).

Originally, these fertile prairies supported herds of Roosevelt elk (*Cervus elaphus*) (Figure 2). The Makah and other tribes hunted elk on the prairies. The Quinault and Quileute used every part of the elk, including the meat, fat, hide, antlers, and bone (Singh 1966). In 1889, Reverend Myron Eells published uses of elk among the Twana, Chemakum, and Klallam Indians: "The flesh serves for food; the skins for robes, shield-shirts, and when dressed, for strings and clothes; of the horns they make chisels, wedges, and paint" (Eells 1996, p. 25).

Figure 2. A herd of Roosevelt elk (*Cervus elaphus*), one of the many game species that forage on the Indian-burned prairies. *Photo courtesy of Olympic National Park*

Evidence of Indian Burning

According to palynologists and climatologists, the prairies of the Olympic Peninsula were initially glaciated during the last Ice Age and became deglaciated between 20,000 and 13,000 years ago (Bach and Conca 2002). Humans arrived on the Olympic Peninsula at least 10,000 years ago (Wray 1997). Carbon-14 dating indicates that earliest human habitation in proximity to the Ozette prairies took place 3,460 ± 60 years ago at what is now an archaeological site near the mouth of the Ozette River (Wessen 2003). The ancestors of today's tribes—the Makah, Quileute, and Klallam—widely and intensively inhabited the northern Olympic Peninsula. Most of their permanent settlements were along the riverways with important seasonal gathering and hunting sites located in nearby prairies.

During a cooling trend 3,000 to 4,000 years ago (Whitlock pers. comm.), coniferous trees became established and Native Americans likely began burning the prairies to manage them for the continuation of the prairie species. There are at least four major reasons why Native Americans burned to create specific ecological effects: 1) increase the abundance, densities, and diversity of plants used as food, medicines, and household items; 2) increase numbers of desirable plant parts per plant—for example, increase cranberry production on cranberry plants; 3) increase forage for deer (*Odocoileus hemionus*) and elk; and 4) keep surrounding trees from encroaching the prairies.

The diaries, books, and reports of early settlers, Indian agents, and biologists provide ample evidence for Indian-set fires. For example, in the 1920s and early 1930s, George Neville Jones conducted a survey of the plants of the Olympic Peninsula (Jones 1936). As part of his work, Jones spoke with early settlers and reported the following: "In several places on the Olympic Peninsula these outwash plains appear as areas of small, dry, sparsely timbered or timberless gravelly 'prairies,' which constitute the nearest approach to a grassland formation to be found near sea level on the Peninsula….These prairies, according to the testimony of old residents, were formerly much more extensive than they are at the present time….As a cause of these prairies it is said that the Indians prevented the growth of trees by burning the ground over annually, thus preserving their open grounds for game and for production of their food plant, the camas" (Jones 1936, p. 35).

Mr. Pullen, who homesteaded on the Quillayute Prairie around 1880, said that the Quileute "used to burn both {the Quillayute and Little} prairies so they could get the little bulbs at the bottom like onions. They would come up after the burn" (Pullen 1980, p. 6).

Albert Reagan, who lived among the Quileute at the turn of the century, wrote that the "burning of {the bracken} fern {*Pteridium aquilinum* var. *pubescens*} year by year was what kept up the prairies…. {T}he Indians burned the ferns for the purpose of clearing out the prairies so they could shoot deer and elk when they came to feed on the young fern fronds" (Reagan 1934, p. 56).

Early and contemporary anthropologists have also documented the burning of prairies on the Olympic Peninsula. For example, anthropologist Ram Raj Prasad Singh, while he does not mention which of the Olympic Peninsula groups burned the prairies or how often, noted their tendency to set fires:

> The Indians who dug roots in prairies burned over such sites in order to give useful roots a chance to grow instead of weeds and ferns. They took precautions not to burn the surrounding trees and bushes, and burned the prairie section by section. Their methods of fire control were so effective that in the Olympic Peninsula, except for a small area of forest near Little Prairie, none of the forest surrounding a prairie shows any sign of fire. (Singh 1966, p. 29)

In 1978, Hal George, who was both Quileute and Makah, told anthropologist Jay Powell that Little Prairie was burned every fall to encourage further growth (Powell 2002). Quileute tribal member Sara Hines remembered why they no longer burned in her interview with Powell: "There were already farms in Sat'ayaqw (Quillayute Prairie) and on the way up there. They had plowed up some of the prairie and fenced some of it. We

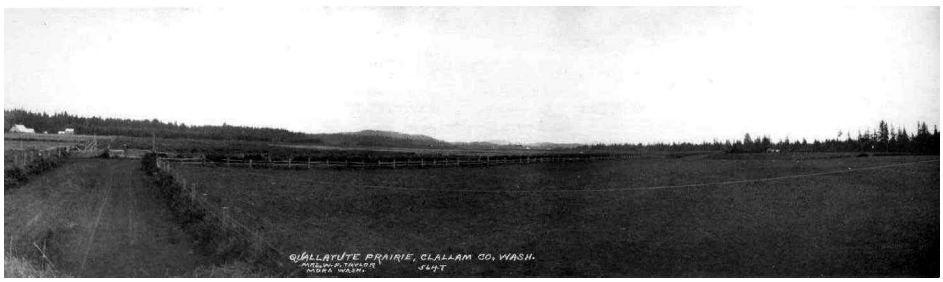

Figure 3. Quallayute Prairie was fenced and plowed after European settlement. *Photo by Fanny Taylor, Mora, Washington*

weren't allowed to burn it anymore" (in Powell 2002, p. 52). Bill Penn told Powell that "the whitemen didn't like them setting fires in the prairies. Later he saw them {the Quileute} burning part of Sat'ayaqw (Quillayute Prairie), but they only burned a small area, burned when the grass was damp and it didn't make a big fire" (in Powell 2002, p. 22).

Powell found that Quileute use of fire in maintaining the prairies "is inarguable," although the details of traditional burning strategies are not clear (Powell 2002). For instance, Ram Raj Singh mentions that a particular Quileute "family burned over its part of the prairie in the spring so that dead ferns would be destroyed, giving way to camas" (p. 25). However, Hal George remembered that in the 1890s the prairies were burned in late September or early fall. By then, families had already foraged for roots and berries and the grasses were dry (Powell 2002). It may be that the two sources are referring to different types of prairies, one managed for camas and the other managed for fern. The Ozette prairies may not have contained any camas because the Makah traded with the Quinault and Quileute for camas (Swan 1870, Curtis 1913).

Preliminary Findings from a New Ethnobiological Study in Olympic National Park

In 2002, Kat Anderson began a study to document the historic land use patterns within the Ozette prairies of Olympic National Park. The Ozette prairies, known as Ahlstrom and Roose Prairies, are being encroached upon by western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), and Sitka spruce (*Picea sitchensis*). To date, about 40 percent of the prairies are gone. A complementary study of the Ozette prairies suggests that fire-scarred stumps and soil that contains abundant charcoal fragments are evidence that the prairies were much larger and that fire has removed the forest cover within the margins of the Ozette prairies (Bach and Conca 2002).

This ethnobiological study involves an exhaustive literature search, coupled with ethnographic interviews with elders of the Makah Tribe and non-Indian longtime residents of the Olympic Peninsula in an attempt to reconstruct the harvesting patterns and fire management practices within and surrounding the Ozette prairies. Additionally, information on the details of former burning regimes (for example, season, frequency, extent, purpose, ignition pattern) will be recorded, if available.

The indigenous people who resided in this area of the Olympic Peninsula were ancestors of the Quileute and Makah tribes of today. The Ozette Reservation, bordering the Ozette prairies, was set aside in 1893 for the 64 residents living there (Wray 1997). Mandatory schooling at Neah Bay resulted in the remaining families moving to the Makah Reservation at Neah Bay in 1903. The Ozette prairies ceased to be a major, active plant gathering site after that time. Today the Ozette Reservation is held in trust for the Makah Tribe, although no one resides on the reservation.

Interviews conducted with Makah tribal members today reveal much knowledge of burning of prairies—but this memory is largely confined to Tsoo Yess Prairie, which is on the Makah Reservation and is easily accessible and still visited by families each fall for the harvest of cranberries and Labrador tea.

In one of the many interviews Anderson conducted with Makah tribal members, Greg Colfax revealed how he learned about burning of the cranberry bogs in Tsoo Yess Prairie from his dad Lloyd Colfax:

> My dad mentioned that it was something that he knew would go on. Either yearly or whenever was necessary the cranberry bogs were burned. When the cranberry bogs would get so overgrown then the folks knew that it was time to do it. And so it was generally in autumn I think when it happened. It was just at the time when you had your long spells of like summer weather in September and October. And it was the perfect time to do it because you match it to the wind and you match it to upcoming rains. So there was really quite an art to it. There was one man here whose name was Hillary Irving or Zab Irving. And I believe that he was the man who used to go out there and burn it. During the time when it was being taken care of, I have a friend of mine whose name is Ernie Cheeka. And he could remember going out into the prairie and coming out within a couple of hours with gallon buckets of cranberries. (Colfax 2003)

Descendents of pioneer families also recall that prairies on the Olympic Peninsula, including those near Ozette, were regularly burned. Bob Bowlby, who was born in 1926 and has lived on the Olympic Peninsula all his life, recalls those days:

> Dad {William Henderson Bowlby} and my stepdad {Clyde Maneval} also told me of the Indians burning the prairies. And it was just a well-known fact to everybody. The closest was Beaver Prairie, then Shuwah, then Forks Prairie, then Quillayute Prairie, then

> Little Prairie. And that's the ones on that end, the eastern part. And then there was what we called Ahlstrom's Prairie up past Ozette Lake and Roose's Prairie, which would be hooked on to Ahlstrom's Prairie. They always waited until the prairies were very dry and so it would be probably a hot day in August when they set the fires. They would burn them once every year. And if you wanted to dig down in Forks Prairie, or any of the prairies you can find black soil down to below even the plow line or at least that deep that the Indians caused by burning their prairies year after year. And they probably did it for centuries. The object was to burn everything that was there and keep the trees off of the prairie and around the edges so that the woods wouldn't creep in on the elk pasture. And of course that would be the purpose of burning the prairie in the first place, so the animals could have some grass to eat. (Bowlby 2003)

The prairies were customarily maintained by traditional burning until homesteaders claimed the west-end prairies of the Olympic Peninsula at the turn of the twentieth century. Lars Ahlstrom and Peter Roose, for example, made the Ozette prairies their home in 1902. Both Ahlstrom and Roose kept livestock and farmed the prairies. In an attempt to improve the grazing on the prairies and increase palatable grasses and forbs, Ahlstrom continued to burn the prairie that was "burned over by the Indians before his arrival" (Anonymous 1946).

Through the assemblage, integration, and interpretation of information from the historic literature and interviews, such as those sampled above and many others not included in this article, the cultural resource staff at Olympic National Park will identify the specific biotic resources within the Ozette, Tsoo Yess, and other prairies that were likely influenced by former indigenous management practices during pre-European settlement. This information will be very important for the future restoration and management of the prairies in Olympic National Park.

Restoring and Managing the Ozette Prairies Today

The National Park Service (NPS) has been interested in the history and ethnography of the Ozette prairies since the prairies were added to the park in 1953. Over the years the park staff has attempted various management techniques from small-scale brushing and sapling removal to allowing the prairies to be reclaimed by trees and salal—the latter management option being currently the case.

The 2001 NPS Management Policies state that each park's Fire Management Plan will respond to natural and cultural resource objectives and that decisions about fire management actions can be responsive to resource benefits, if they are based on sound scientific research (National Park Service 2001, 4.5). Olympic National Park's goals are to insure professional management of natural and cultural resources as integrated systems (Olympic National Park 1996) and the park recognizes that fire can be used "as a management tool in maintaining prairies traditionally used by Native Americans" (Olympic National Park 2003).

As a result of these policies, managers at Olympic National Park need data about the historic fire regime of the prairies in order to make decisions about how to replicate the processes and recurring conditions that characterize this prairie ecosystem. There is, however, a predominant reluctance on the part of park managers, fire ecologists, and park scientists to mimic the detail of past structure, function, or composition created by humans, or to build such "a set of desired conditions" for fear that they will stem from a highly inferred, and perhaps false, range of variability. Instead plant ecologists and resource managers seek to ensure that natural forces (lightning fire, hydrologic function, nutrient cycles) will continue to operate in the landscape and these processes will determine the fire regime and ecosystem structure (Graber 1995).

We recognize that determining and mimicking indigenous land management practices, such as reinstating fires that simulate indigenous burning, are complex, especially given the fact that indigenous people no longer burn the prairies and the details of their management practices are passed down almost solely through oral tradition. Nonetheless, we believe that interdisciplinary teams, who will be conducting soil, bog-core, and vegetation analyses, will be able to reconstruct the objectives and the details of indigenous land management of the Ozette prairies, and that this work will demonstrate that there was a "human disturbance regime" that can be replicated. Such information when combined with ethnographic studies can then be used in developing modeling approaches and ecological field experiments to investigate the probable environmental impacts from those practices at different scales of biological organization. In turn the outcomes of these experiments can be used to write National Park Service prescribed burning and other restoration management prescriptions.

This type of work will be important not only for retaining cultural knowledge, but for conserving and restoring plant and animal species—many of which are threatened by a loss of habitat. Such is the case for the Makah copper butterfly (*Lycaena mariposa*) at Olympic National Park. It appears that given its food preferences and biology, the Makah copper prefers open areas with particularly warm microclimates. Its main source of nectar, the swamp gentian (*Gentiana douglasiana*), also requires very sunny, open conditions. Thus, the "succession of hemlock and cedar" is a great threat to these species (Pyle and Pyle 2000). In order to keep the Ozette habitat open for these species to thrive, park managers are considering reviving the ancient system of fire management developed by the Makah and other Olympic Peninsula tribes to maintain the prairies.

Conclusions

We contend that given the length of time Native Americans have lived near the prairies of the Olympic Peninsula (at least 3,000 years), the extensive evidence for indigenous burning in this vegetation type, and the fact that genetic changes in plant species can occur rapidly through selection

pressures, indigenous people in all probability have altered the "natural" fire regimes and have had substantial ecological and genetic effects on this plant community. It is likely that Native Americans altered prairies by expanding the burning season, shortening the fire return interval, and by encouraging the composition, abundance, densities, and quality of species, that suited specific cultural objectives.

Failure to learn the details of and simulate these practices could quite possibly mean the loss of the Ozette prairies and their diverse resources. With the implementation of studies that work to integrate disciplines and involve combining cultural and natural scientific knowledge, park managers and ecologists can gain the most accurate and comprehensive knowledge for making more informed decisions about the future restoration and management of the Ozette and other prairies. Reinstating past burning practices used by Native Americans for specific purposes could become important for rejuvenating prairie ecosystems at the population and community scale.

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