

# EUGENE CITY COUNCIL

## AGENDA ITEM SUMMARY



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Public Hearing: A Special Ordinance Granting an Exemption to the Application of Section 6.200 of the Eugene Code, 1971 (Ordinance to Renew Five-Year Exception to Application for Controlled Ecological Burning)

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Meeting Date: May 16, 2011  
Department: Public Works  
[www.eugene-or.gov](http://www.eugene-or.gov)

Agenda Item Number: 2  
Staff Contact: Trevor Taylor  
Contact Telephone Number: 541-682-4888

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### ISSUE STATEMENT

The purpose of this public hearing is to provide an opportunity for public input regarding a proposed ordinance that would provide an exception to the application of Eugene Code 6.200 (open burning) for prescribed burning by the U.S. Bureau of Land Management (BLM), The Nature Conservancy (TNC), and City of Eugene for wetland vegetation protection, management, and restoration for a period of five years. The council is scheduled to take action on the proposed ordinance on June 13, 2011.

### BACKGROUND

#### Council Action History

In 1986 and 1987, the City Council approved exceptions to the application of Eugene Code 6.200 to permit The Nature Conservancy to conduct controlled ecological burns in the Willow Creek Natural Area. Due to the recurring nature of these requests, in September 1990, the City Council approved a five-year exception for the Willow Creek Natural Area by Ordinance No. 19715. In May 1995, the Council approved a second five-year exception for several sites within the West Eugene Wetlands Plan area by Ordinance No. 20014. In June 2001, the council approved a third five-year exception for several sites within the West Eugene Wetlands Plan area by Ordinance No. 20231. Again, in June 2006, the council approved another five-year exception by Ordinance No. 20370.

The purpose of these controlled burns is to maintain native prairie vegetation and to control invasive vegetation in the native prairie sites. To date, The Nature Conservancy has conducted burns in 1986, 1987, 1991, 1994, 1996, 1997, 1998, 1999, 2001, 2005, 2007, 2008, and 2009, within the area covered by the exceptions. In addition, controlled burns were conducted on BLM lands in 1996, 1998, 2000, 2005, and 2009, and on City of Eugene land in 2002, 2007, and 2008, within the area covered by the exceptions.

#### Policy Issues

The two primary policy areas are (1) maintaining and improving air quality in the Metro Area, and (2) protecting, maintaining and managing wetlands designated for restoration and protection in the West Eugene Wetlands Plan and the associated rare plant and animal species. A key policy issue is the proposed expansion of areas allowed to be burned, and any potential air quality impacts or community perceptions of potential problems from these prescribed burns, contrasted with past City efforts to curtail commercial grass seed field burning in the southern Willamette Valley. The City lobbied to exempt

ecological burns from state regulations curtailing commercial grass seed field burning for the purposes of improving habitat and providing fire fighting training opportunities. Both of these goals are met in this ordinance.

### **Other Background Information**

See attached Memorandum dated April 29, 2011.

### **Timing**

The appropriate season for conducting controlled ecological burns in wetland areas is late summer and early fall. Since the previously approved exception to the open burning ordinance expired on December 31, 2010, no ecological burning can be conducted within City limits until this exception is approved. Therefore, staff recommends immediate action on the ordinance, so that it will become effective prior to the upcoming burning season.

### **COUNCIL OPTIONS**

1. Accept public testimony and take action on the item at the June 13, 2011, council meeting.
2. Accept public testimony, direct staff to make modifications to the proposed ordinance, and take action on the revised ordinance at the June 27, 2011, council meeting.

### **CITY MANAGER'S RECOMMENDATION**

The City Manager recommends that the council take action on the proposed ordinance at the June 13, 2011, meeting.

### **SUGGESTED MOTION**

None; this is a public hearing only. Action on the proposed ordinance is scheduled for June 13, 2011.

### **ATTACHMENTS**

- A. Proposed ordinance
- B. Exhibit A: map of potential burn sites within current city limits and outside of city limits but within UGB
- C. Memorandum from Staff, dated May 6, 2011
- D. "Use of Controlled Ecological Burns in Willamette Valley Native Prairies, Ed Alverson, May 2011
- E. Copy of Eugene Code 6.200 Outdoor Burning

### **FOR MORE INFORMATION**

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ORDINANCE NO. \_\_\_\_\_

**A SPECIAL ORDINANCE GRANTING AN EXEMPTION TO THE APPLICATION  
OF SECTION 6.200 OF THE EUGENE CODE, 1971.**

**The City Council of the City of Eugene finds as follows:**

**A.** Section 6.200 of the Eugene Code, 1971, (EC), proscribes the practice of open burning within the City of Eugene with specified exceptions to this ban. This ordinance is a component of local measures designed to assure compliance with federal ambient air quality standards.

**B.** Maintenance and enhancement of air quality is critical to the health and welfare of metropolitan area residents, the area's ability to attract new businesses, and the avoidance of sanctions for noncompliance.

**C.** The Eugene-Springfield Metropolitan Area General Plan (the Metro Plan) adopted and acknowledged in 1982, identifies the West Eugene Industrial Area as a major growth area for the City.

**D.** The West Eugene Wetlands Plan (the Plan) was adopted by the City Council on May 20, 1992, by Ordinance No. 19853 as a refinement to the Metro Plan. The Plan was amended by the City Council by Ordinance Nos. 19867, 20002, 20119, 20126, 20147, 20171, 20200, 20201, 20208, and 20259 during the years 1992 to 2002. The Plan sets forth policies for preserving significant wetlands in West Eugene, allowing development of lower quality wetlands, and establishing a system for mitigation of filled wetlands. The Plan also includes goals and policies for protecting and expanding populations and habitats of rare, threatened or endangered plants, including Bradshaw's lomatium (*Lomatium bradshawii*), Willamette Valley daisy (*Erigeron decumbens* var. *decumbens*), and white-top aster (*Aster curtus*), and policies for protecting and managing the native Willamette Valley wet prairie plant community. In addition, the Plan contains policies for managing the preserved wetlands in public ownership.

**E.** Experimental burns conducted in 1986, 1987, and 1991 in the Willow Creek natural area within wetland habitat containing the above-mentioned plant species have resulted in expansion of populations of those plants in the areas burned. Controlled burns in 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2004, 2005, 2006, 2007, 2008, 2009 and 2010 on several sites have also been beneficial for managing wetland habitat and maintaining and improving wet prairie habitat.

**F.** Management of these wetlands and preservation of native plant species and native plant communities requires controlled open burning of vegetation for scientific purposes and to foster growth of wetlands species in the areas noted on the map attached as Exhibit A hereto and incorporated herein by reference. This burning of vegetation in these areas will help restore them to their historical condition and replicate the indigenous environment for the plants.

**G.** Some wetland sites owned by the City, Bureau of Land Management, and The Nature Conservancy that are currently outside of the Eugene City limits and/or the urban growth boundary also need controlled open burning for the purpose of managing wet prairie habitat and

protecting rare plant species. Some of these areas may be annexed to the City within the period from 2011 to 2015.

**H.** A limited and special exception to the open burning ban in EC 6.200 is necessary for the purposes outlined above. This limited exception is based upon the high costs and limited practicability of alternative vegetation management and control methods, the limited nature of the expected burns, air pollution control strategies that will be employed to prevent significant degradation of air quality, the special recognition given to this area and habitat in the comprehensive planning documents, the City's direct responsibility under those plans for preservation of the natural resources in this area, and the general public benefit derived from the preservation of this habitat. This limited exception is unique and should not serve as precedent for future exceptions for other purposes or signal any relaxation of the City's commitment to preservation of air quality.

**I.** Exceptions to the open burning ban for the management of wetlands in the West Eugene Wetlands Plan area have been previously granted by the City Council by Ordinance No. 19403 enacted August 13, 1986, Ordinance No. 19493 enacted July 27, 1987, Ordinance No. 19634 enacted September 11, 1989, Ordinance No. 19715 enacted September 12, 1990, Ordinance No. 19983 enacted September 12, 1994, Ordinance No. 20014 enacted May 22, 1995, Ordinance No. 20231 enacted June 25, 2001, and Ordinance No. 20370 enacted June 26, 2006. An exception is again necessary to ensure the continued proper and effective management of this valuable natural resource area.

**NOW, THEREFORE,**

**THE CITY OF EUGENE DOES ORDAIN AS FOLLOWS:**

**Section 1.** The findings set forth above are adopted.

**Section 2.** The City shall continue to use its outdoor burning ordinance as one method for maintaining and improving air quality of the metropolitan area.

**Section 3.** An exception to the application of EC 6.200 is given to the Bureau of Land Management, Eugene Public Works Department, and The Nature Conservancy to conduct periodic "wetland management" controlled open burning of vegetation for scientific purposes and to foster growth of wetlands plant species in the areas noted on the map attached as Exhibit A hereto and incorporated herein by reference, providing the following conditions are met:

- a. Prior to commencement of any burn, the Bureau of Land Management, Eugene Public Works Department, or The Nature Conservancy shall give notice to the Eugene Fire Marshal and the Lane Regional Air Protection Agency and shall obtain the approval of those agencies to conduct the burn in the time, place, and manner proposed.
- b. No more than 250 acres of open burning shall be conducted within any one calendar year.
- c. Environmental protection and fire suppression strategies, personnel, and equipment (including wind direction, moisture regime, and fire fighting equipment) shall be

approved in advance by the Eugene Fire Marshal and Lane Regional Air Protection Agency. The Bureau of Land Management, Eugene Public Works Department, and The Nature Conservancy shall comply with all conditions imposed by those agencies.

- d. Burning shall only occur when wind and weather conditions are such that air quality impacts are minimized and safety can be maintained.
- e. Burns shall occur periodically only in the time period between the effective date of this Ordinance and December 31, 2015.
- f. The Bureau of Land Management, Eugene Public Works Department, and The Nature Conservancy assume responsibility for providing all equipment and personnel associated with the burn and for complying with all applicable federal, state and local laws.

**Section 4.** In the event the areas are annexed to the City prior to December 31, 2015, an exception to the application of EC 6.200 is given to the Bureau of Land Management, Eugene Public Works Department, and The Nature Conservancy to conduct periodic "wetland management" controlled open burning of vegetation for scientific purposes and to foster growth of wetlands plant species in any of the "Ecological Burn Site" areas shown on the map attached as Exhibit A hereto and incorporated herein by reference, following annexation of those sites to the City of Eugene, providing the following conditions are met:

- a. Prior to commencement of any burn, the Bureau of Land Management, Eugene Public Works Department or The Nature Conservancy shall give notice to the Eugene Fire Marshal and the Lane Regional Air Protection Agency and shall obtain the approval of those agencies to conduct the burn in the time, place and manner proposed.
- b. No more than 75 acres of open burning shall be conducted within any one calendar year.
- c. Environmental protection and fire suppression strategies, personnel and equipment (including wind direction, moisture regime, and fire fighting equipment) shall be approved in advance by the Eugene Fire Marshal and Lane Regional Air Protection Agency. The Bureau of Land Management, Eugene Public Works Department, and The Nature Conservancy shall comply with all conditions imposed by those agencies.
- d. Burning shall only occur when wind and weather conditions are such that air quality impacts are minimized and safety can be maintained.
- e. Burns shall occur periodically only in the time period between the effective date of this Ordinance and December 31, 2015.
- f. The Bureau of Land Management, Eugene Public Works Department, and The Nature Conservancy assume responsibility for providing all equipment and personnel associated with the burn and for complying with all applicable federal, state and local laws.

laws.

**Passed by the City Council this**

**13<sup>th</sup> day of June 2011.**

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**City Recorder**

**Approved by the Mayor this**

**\_\_\_\_\_ day of June 2011.**

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**Mayor**

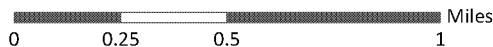
# Exhibit A

Ecological Burn Sites - 2011-2015

Within City Limits and/or Urban Growth Boundary (UGB)



NOTE:  
In most cases the actual area burned will be smaller than the area indicated.



March 30, 2011



# MEMORANDUM

City of Eugene  
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Eugene, Oregon 97402  
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[www.eugene-or.gov/parks](http://www.eugene-or.gov/parks)

**Date:** May 6, 2011

**To:** Mayor Piercy and City Council

**From:** Trevor Taylor, Natural Areas Restoration Supervisor, 682-4888

**Subject:** Exception to Open Burning Ordinance for Controlled Ecological Burns in West Eugene

## 1. Introduction

Controlled ecological burns represent the use of fire, an important natural process, under carefully managed conditions and circumstances. Controlled ecological burns have been conducted in West Eugene, under a City Council exemption from the prohibition of open burning, since 1986. The purpose of this memo is to provide specific information regarding the proposed application of ecological burns in West Eugene over the next five years. Background information regarding the justification and need for ecological burning is provided in the attached paper, "Use of Controlled Ecological Burns in Willamette Valley Native Prairies," by Ed Alverson of The Nature Conservancy.

## 2. Description of acreage and locations to be burned

Over the next five years, agencies responsible for managing protected wetland sites in west Eugene propose controlled ecological burns on a maximum of 250 acres within the City limits annually, and a maximum of 75 acres outside City limits but within the urban growth boundary annually. Ordinance Exhibit A shows the areas that are proposed for ecological burning within the next five years.

## 3. Description of Potential impacts to Adjacent Properties

Potential impacts to adjacent properties would depend upon the location of the property relative to the prevailing wind direction at the time of the burn. Controlled burns in West Eugene would be conducted only under conditions where the prevailing wind is coming from the north or northeast. Thus, impacts to properties to the north or northeast of the burn site would generally be negligible, as smoke is dispersed to the south and southwest. Burns would also be conducted under atmospheric conditions that result in optimal lifting and dispersion of smoke. The smoke column would be visible overhead from properties within a half mile downwind of the burn sites. Some slight ash fall might also be experienced (most ash fall would be within 500 feet downwind of the burn site). Note also that the areas downwind from the burn sites are currently developed at typical rural residential densities, so the number of residents or property owners that might be affected is relatively low.

Special precautions will be taken for burns at sites that are adjacent to manufacturing facilities where smoke is a special concern. A number of the burn sites are adjacent to existing



manufacturing facilities, and any burns done on those sites would accommodate any concerns regarding potential smoke impacts for potentially affected facilities. Burns would only be conducted with prevailing winds that carry the smoke away from these facilities, and at a time when the manufacturing process is not in operation and air intake systems are not turned on.

#### **4. Reasons for When, How Often, and Where Burning Will Occur**

Controlled ecological burns will be conducted in the late summer or early fall. This is the time of year that the herbaceous vegetation is dormant and is not damaged by fire. Burns will occur only on days when the weather conditions (temperature, relative humidity, and wind speed) provide the proper window to conduct a safe burn. Generally controlled ecological burns are conducted after the first fall rains have reduced regional fire hazards somewhat but fine fuels such as grasses are still brown and dormant.

Research to date indicates that the optimal burn frequency for meeting site ecological goals is once every three to six years. Thus, most of the sites will only be burned once during the next five year period.

The areas selected for ecological burning include the highest quality native prairie remnants under protective management. These are typically the sites that will benefit most from burning. Many of these prairie sites contain endangered plant species which have also been shown to benefit from such burns.

#### **5. Description of Burning Procedures**

Controlled ecological burns will be conducted by trained personnel from the U.S. Bureau of Land Management (BLM), The Nature Conservancy, City of Eugene Fire Department, trained Parks and Open Space Division staff, contract crews, and other partner fire protection agencies (e.g., Oregon Department of Forestry). The BLM has been involved with Willamette Valley controlled ecological burning since 1988. Agencies for whom the BLM has provided controlled ecological burning services include The Nature Conservancy, U.S. Army Corps of Engineers (Fern Ridge and Dorena reservoirs and adjacent lands), US Fish and Wildlife Service (Finley National Wildlife Refuge), City of Eugene and Lane County. The Nature Conservancy and City of Eugene's Parks and Open Space Division began providing trained staff for controlled burns in west Eugene in 2004. Beginning in 2008, the City of Eugene Fire Department (EFD) began serving as the lead agency for burns on City-owned land. This allows EFD the additional benefit of using controlled burns as valuable wild land fire fighter training opportunities for staff.

The State of Oregon has delegated to the Lane Regional Air Pollution Authority (LRAPA) the authority for management of air quality within the Eugene-Springfield area. In order to conduct controlled ecological burns, partners must submit a permit application to LRAPA that includes all of the planned burn sites for the next year. LRAPA reviews the application and issues a special permit. In addition, both LRAPA and the Oregon Department of Agriculture are involved in determining whether burning can be conducted on a given day and site, based on the impact that expected weather conditions will have on smoke dispersal.

Controlled ecological burns are conducted only under the authority of an approved burn plan (as described above), which identifies specific parameters under which the burn may be accomplished.

Elements of the plan include:

- i. The identification of the resource/ecological fire objectives.
- ii. The prescription "window" under which the burn can be accomplished, which includes temperature, relative humidity, wind speed and direction and the conditions of the fuel to be consumed.
- iii. A communications plan.
- iv. A notification plan (for emergency services and interagency information).
- v. An ignition and holding plan, which defines specifically how the area will be ignited and what resources will be used to suppress the fire along the perimeter.
- vi. An equipment and staffing plan which defines specifically the amount of staff that will be needed, the amount and type of equipment that will be used in the ignition and holding actions.
- vii. A contingency plan, identifying the amount and type of resources that will be on site, in addition to ignition and holding resources, in event an escapement occurs.

Prior to ignition, all required permits will be obtained and all jurisdictional interagency fire departments will be notified of the proposed burn. Immediately after the burn, aggressive mop-up is implemented to extinguish all smoldering embers, and if necessary, an infrared scan of the area will occur to detect any latent heat.

All of the personnel that are utilized on the ecological burns have received extensive training in the use and application of fire in wild land and urban interface situations. In addition, ecological burns provide agencies with a unique controlled opportunity to train staff in wildland fire fighting techniques and to become familiar with fire fighting equipment operation.

In all cases a fire break is established around a planned burn. This may consist of an existing road, trail, or a mowed line which will be used as a holding line with proper water/foam support. The ecological burn area is evaluated well in advance to ascertain the location of the fire lines, holding areas, water sources and values at risk. A thorough safety briefing for all participants is conducted prior to ignition. By conducting the briefing, all personnel are informed of the sequence of events that will occur as the burn progresses and radio frequencies are verified. All weather parameters that are required by the appropriate agencies are verified. This is accomplished by launching helium balloons to verify transport wind direction and by obtaining the meteorological conditions at the site. The weather conditions are documented each fifteen minutes throughout the duration of the burn. In the event traffic control is required professional, certified flaggers will be used, required ODOT permits will be obtained and proper signing per OSHA regulations will be instituted. The Burn Boss has access to a cellular phone at the burn site and numerous interagency radio frequencies are at the discretion of the Burn Boss to use.

Lookouts are posted downwind to keep the Burn Boss apprised of any abnormalities. In most cases a qualified EMT is on site to assist with medical situations.

## **6. Description of Public Notice and Outreach**

Public notification for the Council's public hearing on this item will include a hearing notice describing the ordinance title and meeting information.

For previous controlled ecological burns at Willow Creek, TNC staff have notified nearby residents by distributing fliers door-to-door on the day before the scheduled burn. This practice will continue at Willow Creek. BLM staff will notify nearby businesses in person or by phone prior to burning on BLM lands. For burns on City land, notification is provided to all properties around the burn area in advance of a burn, providing residents the option of having staff contact them during the morning prior to a burn. All public notices will comply with LRAPA notice requirements.

## **7. Controlled ecological burns and recent state legislation**

Controlled ecological burns are exempted from recent state legislation curtailing grass seed farm open burning. The City lobbied for this exemption in order to provide both an important tool for protecting and restoring biological diversity in wetland prairies, and to provide opportunities for training fire staff in wildland fire fighting techniques. Both of these goals are met by the City's controlled ecological burning program.

## **8. Costs and Who Pays for Burning**

Costs of burning are paid by either the land owning agency or agency providing the burn crews. The fee for obtaining the burn permit from the Lane Regional Air Pollution Authority (LRAPA) is paid on a rotating basis by the Bureau of Land Management, U.S. Army Corps of Engineers, City of Eugene, Friends of Buford Park and Mt. Pisgah or The Nature Conservancy. These organizations pool all of their native prairie ecological burns under a single LRAPA permit.

BLM crews serve as the lead agency for burns on federal lands. The Nature Conservancy uses its own trained staff along with contract crews to provide burn resources at the Willow Creek Preserve. The Eugene Fire Department provides lead support with trained Parks and Open Space Division staff on City burns. However, all of these organizations, along with other partner agencies such as the Oregon Department of Forestry, have historically collaborated, volunteering support for each other to ensure adequate resources are available at each ecological burn, regardless of who owns the land.

## **9. Conclusions**

This pending proposal for authorization to conduct controlled ecological burns follows the course of past requests that have been authorized by the Eugene City Council. We believe the proposed burning can be accomplished with a minimal impact to adjacent property owners and the general public.

# USE OF CONTROLLED ECOLOGICAL BURNS IN WILLAMETTE VALLEY NATIVE PRAIRIES

Edward R. Alverson  
The Nature Conservancy  
May 2011

Controlled ecological burning involves the controlled use of fire as a management tool in natural areas. Scientists have been using controlled burns throughout the Willamette Valley to meet natural area conservation objectives and habitat restoration goals. The purpose of this paper is to provide historical background and ecological information to better understand why controlled ecological burns are considered to be so essential to natural area management in the Willamette Valley.

## **1. Natural History and Role of Fire in the Willamette Valley**

The first explorers and settlers who arrived in the Willamette Valley in the early 1800's described the Willamette Valley as supporting extensive areas of prairie and oak savanna. Land surveys conducted by the General Land Office of the US Government in the 1850's documented that about 1 million acres of the Willamette Valley were prairie lands at that time (Christy and Alverson, in press). These native prairie and oak habitats have been greatly reduced in extent due to agriculture, grazing of domestic livestock, residential and urban development, and expansion of forest vegetation into former prairies. Only small remnants of high quality native prairie and savanna are known to currently exist in the Willamette Valley at present. The exact number of remaining acres has not been documented, but the reduction from the original extent has been estimated to be close to 98%.

The exact details of how the prairies and savannas originally became established are uncertain. The prairies may have become established during a time when the climate was warmer and drier than today (Hansen 1942, Walsh et al. 2010). At present, the climate of the Willamette Valley is sufficiently cool and moist to support forest vegetation on most sites in the absence of disturbance, but prairie or savanna may have been the "climax" vegetation at an earlier time when the climate was warmer and drier than today.

However, there is some evidence that the extensive prairies and savannas were maintained, if not actually created, by fires set by Native Americans. Studies documenting pollen deposits in the Willamette Valley since the end of the ice age has shown a positive correlation between increases in grass pollen and increases in charcoal contained in the sediments at certain times in the past (Walsh et al. 2010). This suggests the possibility that prairies and savannas may have been created or maintained by human-set fires, since the incidence of lightning-caused fires in the Willamette Valley is generally low. More studies are needed to provide greater understanding of how prairies and savannas came to dominate the Willamette Valley in prehistoric times, but many researchers today believe that fire played a significant role.

The Kalapuya Indians had abundant motivation to use fire in the landscape (Boyd, 1999).

Because of the falls on the Willamette River at Oregon City, the Willamette was not a major salmon stream, and the Kalapuya did not utilize salmon to the extent that tribes along the Columbia River did. Instead, the Kalapuya hunted game such as deer and elk, and gathered food plants from the native flora. The prairies provided the majority of their food plants, including camas (*Camassia* spp.) bulbs, yampah (*Perideridia* spp.) roots, and tarweed (*Madia* spp.) seeds. Though they were not farmers in the conventional sense, they used fire to maintain habitats for valued food plants just as a farmer tills and plants a field to produce a crop. In addition, they may have found fire useful in hunting game, by attracting animals to browse on the fresh green growth that emerges soon after a fire. During the millennia that the Kalapuya people (presumably) subjected the Willamette Valley to fires, a diverse flora and fauna evolved that had appropriate adaptations to avoid, withstand, or even become dependent on fire to maintain suitable habitats. In some cases, these were animal and plant species occurring nowhere else in the world except the Willamette Valley.

Thus it was a "natural" landscape shaped (most likely) by human-set fires that the first explorers and settlers encountered in the early 1800's (Habeck 1961, Johannessen et al. 1970, Towle 1974). Morris (1934), Johannessen (1971) and Boyd (1986) document this practice through reviews of the early explorers and missionaries journals (David Douglas-1826, John Work-1834, C. Wilkes-1845, B. Hines-1881, etc.). These records report that fires were set annually in late summer and early fall, and covered extensive portions of the Willamette Valley. The main difficulty with the historic record is that it does not clearly describe how often presettlement fires returned to any given location, and that is a pertinent question that cannot necessarily be determined from the historical record (Whitlock and Knox, 2002).

Drastic population declines resulting from introduced diseases, and ultimately, the removal of the Kalapuya Indians to the Grand Ronde Reservation halted wide scale burning in the Willamette Valley in the 1830's and 1840's. Without fire, wet prairies that have been left undisturbed have in many cases gradually changed into ash forests, while the drier prairies and savannas have succeeded to oak woodlands and maple and Douglas-fir forests.

## **2. Fire Effects**

Having established that fires likely were a significant feature of the presettlement landscape, scientists began developing hypotheses regarding the specific roles that fire plays in maintaining prairie habitats. Historical analyses of vegetation change at individual sites led to the development of a number of hypotheses, including:

- 1) Fires occurring at frequent intervals maintained open prairie habitats and prevented colonization of trees and shrubs on sites where they would be able to occur if fire was excluded;
- 2) Many herbaceous prairie species possess tolerance or even adaptation to fire as a frequent influence; and
- 3) Some non-native plant species, particularly those coming from regions where fires do not occur, are negatively affected by fire.

Thus, implementing controlled ecological burns could potentially reduce cover of invading woody plants, enhance the populations of native plant species, and help reduce the abundance of some undesirable non-native plants.

Experience with controlled burning in native prairies began in the 1970's at Finley National Wildlife Refuge, and continued in the 1980's on land at Fern Ridge Reservoir owned by the US Army Corps of Engineers, and at The Nature Conservancy's Willow Creek Natural Area. Ten controlled burns, typically covering 10 to 50 acres, have been conducted in the wet prairie habitats at Willow Creek, in 1986, 1987, 1991, 1994, 1996, 1998, 2001, 2005, 2007, and 2009. Over the past 15 years, additional controlled burns have occurred on BLM lands in 1996, 1998, 2000, 2005, and 2009, and on City of Eugene land in 2002, 2007, and 2008. In general, the results of the burns have supported the hypotheses listed above. Typically, new green growth begins to sprout within two weeks after the burn; species such as tufted hairgrass, the dominant native grass in wet prairies, grow more vigorously through the fall and winter than in unburned areas. The following year, and often the following two years, see increases in the flowering and seed production of many native prairie plants.

With increased flowering and seed production, the fire adapted species may gradually increase in population size. For example, a study of the State and Federal listed endangered Bradshaw's lomatium (*Lomatium bradshawii*) found that within two years of a fire the populations showed an increase in density of vegetative and reproductive plants (Pendergrass et al., 1999). At Willow Creek, monitoring data consistently show native species that were used as food plants by Kalapuya people such as camas (*Camassia quamash*), wild onion (*Allium amplexans*), and yampah (*Perideridia* spp.) increase in abundance in the year following woody vegetation removal or controlled burns (Jancaitis 2001). This is consistent with research at Fern Ridge Reservoir where camas (*Camassia quamash*), and tarweed (*Madia glomerata*), two species used by Kalapuya people, increased in abundance after repeated burning (Taylor 1999, Pendergrass 1995).

From 2001 to 2007, The Nature Conservancy collected data for an experiment designed to compare the response of wet prairie species to burning and mowing. Burn and mow treatments were implemented twice through the duration of the study, in 2001 and 2005. For both, burn and mow treatments, more "desirable" species responses (increases in a native species or decreases in non-native species) were recorded. However, 15 species showed a desirable treatment response from burning, while only 8 species showed a desirable treatment response from mowing. The higher level of desirable responses from the burn treatments suggests that fire is a critical management tool in wet prairie, at least in higher quality native remnants (Nuckols et al., in press).

While late summer mowing is a useful management treatment for holding back vegetative succession, we have observed stronger effects of fire on woody vegetation than from mowing. While most woody plants (except for conifers) readily sprout after mowing or burning, we have observed that controlled ecological burns are successful in killing a small percentage of trees and shrubs outright. After repeated controlled burns, tree stumps become sufficiently damaged that a

percentage are completely consumed by fire, resulting in an end to additional sprout production. In the last few years at Willow Creek, manual removal of woody plants has been implemented in conjunction with controlled burns, to help speed progress toward achieving site management goals.

Burning also appears to reduce the use of prairie habitats by meadow voles, which are small rodents that eat vegetation. During peak years of vole abundance (such as in 2001 and 2005), they can have substantial negative impacts on native prairie communities because of their herbivory (grazing) of native prairie plants.

We still have much to learn about fire effects in Willamette Valley prairies. The response of prairie species to management treatments such as fire or mowing are complex and may vary from year to year depending upon a variety of environmental factors, from fire behavior to precipitation patterns. As we continue to implement controlled burns, long term monitoring and data collection efforts will be a key to helping us improve our prairie management strategies as well as refine our restoration priorities.

### **3. Benefits and Potential Drawbacks to Controlled Ecological Burns**

Reviewing the landscape history of the Willamette Valley provides the perspective that fire has been an important component of the "natural" ecosystem for thousands of years, and monitoring data for recent controlled burns supports the idea that many native prairie plants benefit from such fires. One of the reasons herbaceous prairie plants benefit from fire is because the fires that burn in these prairies are of low intensity and are of short duration. During a low intensity controlled burn, the dried leaf litter is consumed, but the meristems (growing points) of the plants are left unharmed, protected in the crown of the plant or buried underground. The precise reasons for the benefits of fire are not fully understood, but a variety of mechanisms have been proposed. For some species, seeds may lie dormant in the soil until the heat from a fire breaks the seed coat and stimulates germination. The burning of leaf litter that occurs during a fire releases nutrients and makes them available to plants when they otherwise would not be, providing a sort of fertilizer effect. When the leaf litter is burned, the bare soil that is left behind may be a better microenvironment for germination of seeds of native prairie plants, due to increased light and better contact with the soil. Other biological functions, such as soil microbial activity, may also be stimulated by fire.

Of course, fires can have negative effects as well. Most animals are able to move out of the way of typical prairie fires, and we have observed only a minor amount of vertebrate wildlife mortality (small numbers of dead garter snakes) in previous controlled burns in West Eugene. Invertebrates, especially those that are present in the leaf litter, may be more subject to mortality by controlled burns, but their populations can usually persist if some areas of habitat are always left unburned. Because of this possibility, The Nature Conservancy burns more no more than 1/3 of the habitat of the endangered Fender's blue butterfly at Willow Creek in any one year.

Controlled ecological burns will always need to be treated with caution because of the potential for fire to spread beyond the burn unit. Safety is always the paramount consideration, and it is

incumbent upon the burn boss to ensure that a controlled burn is conducted under appropriate conditions. Fire managers use computer models to predict fire behavior given certain site conditions, and under specific weather conditions. These models are used to determine the appropriate range of temperatures, humidity, and wind speed under which a burn can be safely conducted. For each controlled burn, a burn plan is prepared that states the conditions under which the controlled burn can be safely carried out, and if those conditions are not met, the burn is postponed until a later date. The burn plan also specifies the crew and equipment needed, and the pattern by which ignition will occur. Safety is also bolstered by providing appropriate fire breaks that are mowed or plowed around the burn unit to help contain the fire within the desired area

The main drawback of controlled ecological burns from the point of the general public is the smoke that is generated. While a controlled burn may resemble a grass field burn, the amount of smoke produced by a controlled burn in a native prairie is much less than a burn of an equal area of grass seed field. This is because the amount of fuel present in a grass seed field is 2 to 4 times greater per unit area than in a native prairie. Controlled burns in Eugene are only conducted when the prevailing wind blows the smoke away from the populated urban areas, and under atmospheric conditions that provide for the most efficient dispersal of smoke. Weather conditions are monitored continuously during a burn to ensure prevailing winds remain appropriate during the entire ignition period. Similarly, burn units are typically smaller than grass seed fields which mean that the actual length of time during which the burns occur is quite short and the amount of fuel burned during an event is generally less than typical grass seed field burns.

#### **4. Alternatives to Controlled Ecological Burns**

A number of alternatives to controlled ecological burning have been proposed, but none appear to provide all of the ecological benefits of fire. Mowing can inhibit the growth of woody plants and maintain the open prairie aspect. Mowing also may improve habitat for some of the rare prairie species, if it is done at the proper time of year. For example, the Bradshaw's lomatium population in Amazon Park has greatly increased in size over the past 15 years since the first mowing has been delayed until the plants have finished growth and the seeds have matured. At the plant community level, as noted above, mowing was found to provide ecological benefits in wet prairie, but not as extensive as the benefits of controlled burns.

However, mowing large acreages can be expensive, and wet prairies typically have a very irregular surface with numerous divots, hummocks, and ant mounds that make equipment operation difficult. Mowing may promote the growth of invasive non-native grasses such as tall fescue (*Festuca arundinacea*). Mowing also does not provide the nutrient cycling benefits or microhabitats suitable for seedling germination that fire provides.

Manual labor can be used to remove woody plants that have invaded prairie habitats. In fact, at Willow Creek we have determined that manual removal is necessary to achieve our management goals because the ash and pear trees are too well established to be removed by fires occurring on a 2 to 5 year interval. Removal of woody plants also reduces the amount of fuel that the fire



could consume, and reduces the smoke that is produced by controlled burns. However, once the woody plants are removed, fire plays a useful role by killing back any seedlings or stump sprouts that may emerge.

Using heavy equipment to remove woody plants is an undesirable option in native prairie remnants, because the soil disturbance would damage existing vegetation and likely allow invasive non-native species to increase. Using manual labor to remove woody vegetation causes less damage to the existing herbaceous cover, but is generally more expensive.

It may be possible to use tractor-mounted propane torches to achieve some of the ecological benefits of controlled burns in sites that are especially smoke-sensitive. However, the same problems with negotiating the divots, hummocks, and ant mounds mentioned above under mowing are pertinent here.

## **5. Summary and Conclusions**

The Willamette Valley has an interesting history of interactions between human populations and the natural landscape, of which fire was a significant component. Controlled ecological burning is viewed by scientists and land managers as an important tool for ensuring that this natural legacy is passed on to future generations. Some type of active management of these native prairie sites is necessary to maintain open habitat conditions and keep out woody plants, and fire is the most natural means to achieve these ends. Without controlled burning, we will find it to be both more difficult and more expensive to maintain remaining high quality native prairie sites. Although controlled burns may result in some localized, short term inconveniences to the public, our experience as land managers indicates that the overall benefits, both to the general public and to the natural habitats, outweigh the inconveniences involved.

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## **6.200 Outdoor Burning.**

- (1) No person shall kindle, maintain or allow to be maintained, an outdoor fire, bonfire, rubbish fire or garbage fire; nor shall any person kindle, maintain or allow to be maintained a fire for the purpose of burning grass, hay or straw, tree limbs and trimmings; nor shall any person maintain or allow to be maintained a fire for land clearing operations, or commercial burning; nor shall any person kindle, maintain or allow to be maintained any other type of open burning with the following exceptions:
  - (a) Outdoor recreation fire used for cooking with the fire in a fireplace, barbecue set, or an outdoor fire used for cooking only.
  - (b) Recreation fire in an approved campsite in fire pits provided.
  - (c) Fires set and maintained for fire fighting training or training fire protection personnel.
  - (d) In cases of fire hazard that cannot in the judgment of the fire marshal be removed or disposed of in any other practical manner, a fire may be allowed by written permit only. Said permit is to be issued by the fire marshal.
- (2) No person shall accumulate or suffer or allow to accumulate material which in the judgment of the fire marshal constitute a fire hazard. Any such accumulation is a nuisance and subject to abatement as provided in this Code.