ENVIRONMENTAL ASSESSMENT

WILDLAND FIRE MANAGEMENT PLAN

HANFORD REACH NATIONAL MONUMENT/ SADDLE MOUNTAIN NATIONAL WILDLIFE REFUGE

APRIL, 2001

ENVIRONMENTAL ASSESSMENT FOR FIRE MANAGEMENT PRACTICES ON THE HANFORD REACH NATIONAL MONUMENT/SADDLE MOUNTAIN NATIONAL WILDLIFE REFUGE

Fitzner-Eberhardt Arid Lands Ecology Reserve Unit
Benton County, Washington

Saddle Mountain National Wildlife Refuge Unit
Grant County, Washington

Wahluke Slope Unit
Franklin, Adams Counties, Washington

April, 2001

United States Department of the Interior
Fish and Wildlife Service
Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge

U.S. DEPARTMENT OF INTERIOR
U.S. FISH AND WILDLIFE SERVICE
ENVIRONMENTAL ASSESSMENT

for

WILDLAND FIRE MANAGEMENT PLAN
HANFORD REACH NATIONAL MONUMENT/SADDLE MOUNTAIN NATIONAL WILDLIFE REFUGE

WASHINGTON

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PURPOSE AND NEED

Numerous wildland fires occur annually on lands in and surrounding the Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge (monument/refuge) (See Figure 1). Many of these fires are human-caused resulting from vehicle ignitions from roads and highways, unattended campfires, burning of adjacent agricultural lands and irrigation ditches, and arson. Fires of natural origin (lightning caused) also occur on lands within and adjacent to the monument/refuge. The U.S. Fish and Wildlife Service is responsible for appropriate suppression and management of wildland fires occurring on monument/refuge lands.

Prior to alteration of the shrub-steppe of eastern Washington in the late1800's/early 1900's, big sagebrush/bluebunch wheatgrass was the dominant vegetation type within the and over much of the Columbia Basin (Daubenmire, 1970). The natural fire regime was small, high-intensity fires with a long fire-return interval.

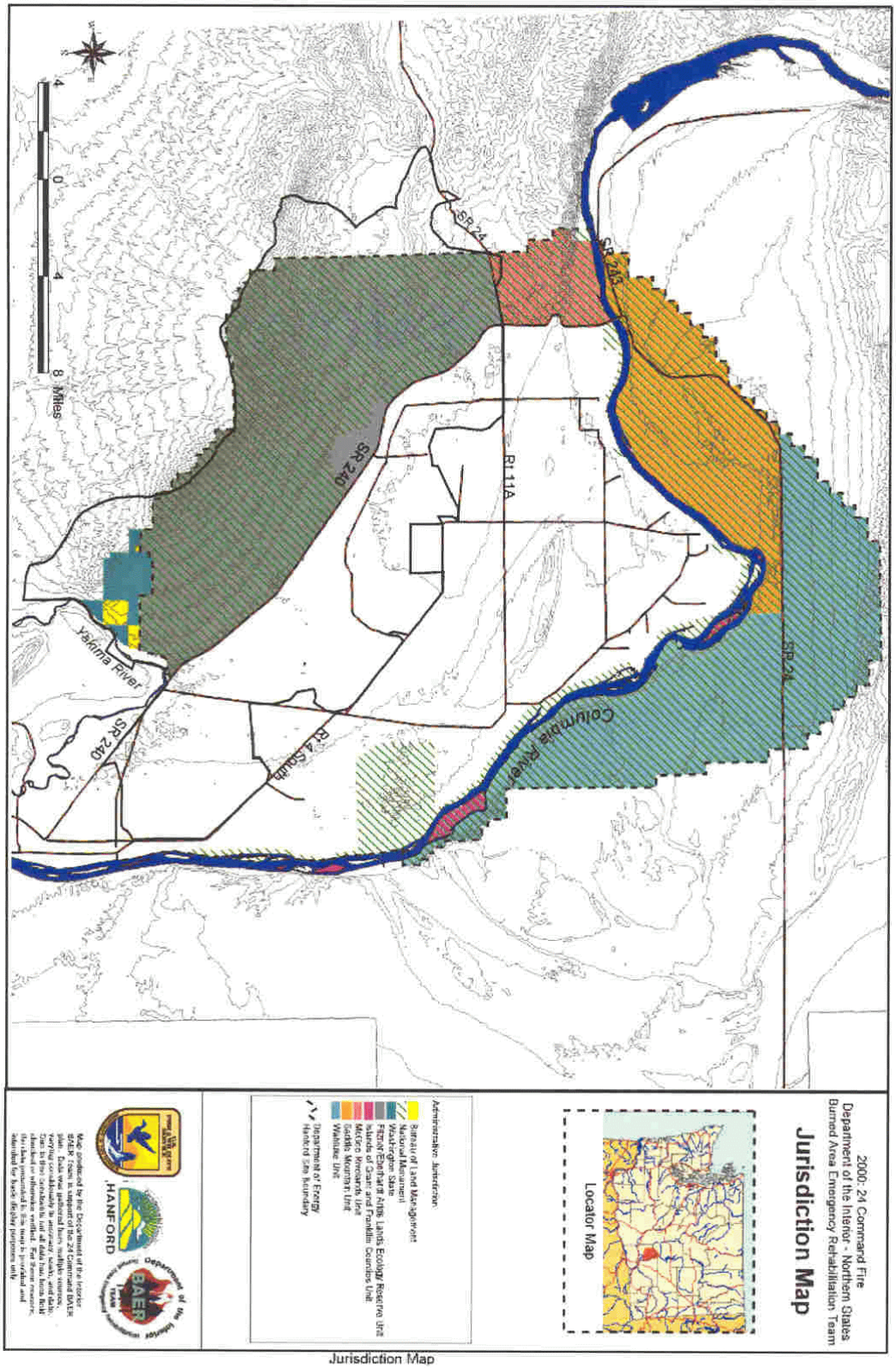
Since the early 1900's, fire suppression, land use practices, and exotic species invasion have altered plant community structure and composition, changed historic landscapes, and altered the fire regime by contributing to artificially high fuel loads. The contemporary fire regime is large, high intensity fires with a shorter fire return interval. This regime is causing declines in fire-intolerant sagebrush stands and increases in exotic species, primarily cheatgrass and tumbleweed. Once exotic species are established, it is unlikely that native vegetation communities will return without extensive restoration. The invasion of non-native plants represents a threat to the integrity of the monument and the preservation of it's unique biodiversity through loss of native vegetation, loss of wildlife habitat, and alteration of historic landscapes.

There is a need to reestablish the natural fire regime of the monument/refuge, and to use prescribed fire and other management tools to reduce hazardous fuels accumulation, maintain fire breaks, eliminate exotic vegetation, restore native communities, improve wildlife habitat, and restore and maintain the historic landscape. The purpose of the Fire Management Plan is to provide for the perpetuation of natural conditions and processes within the monument/refuge, while managing wildland fire to protect life, property, and cultural resources. The Plan will guide fire management procedures to ensure that fire management practices are appropriate, current, and environmentally sound.

FWS policy requires that each refuge complete a Comprehensive Conservation Plan (CCP) to direct overall refuge program activities, and a Fire Management Plan to direct specific fire program activities. The monument/refuge will initiate a CCP once funding is appropriated. This Fire Management Plan precedes the CCP because fire management is necessary under emergency situations, and is an essential management tool to reduce hazards associated with unplanned fire events.

The Wildland Fire Management Handbook (USFWS 2000) further defines the FWS goal of wildland fire management to achieve resource objectives through preventing human-caused wildland fires, minimizing negative impacts on resources from all wildland fires, and using prescribed fire to benefit natural and cultural resources while minimizing risk to employees, visitors, neighbors and property.

Figure 1. Hanford Reach National Monument Jurisdiction Map



ALTERNATIVES

The following alternatives were analyzed for this environmental assessment. All of the alternatives have certain features in common. Under each alternative, appropriate suppression response would be taken on all wildland fires, including human- and lightning-caused ignitions. Low impact wildland fire suppression tactics (e.g. cold-trailing, using water, using natural and manmade barriers, avoiding surface disturbance and high-intensity burning in sensitive areas) will be used to the fullest extent possible. Surface disturbing actions associated with full suppression could include the use of water, foam retardant, building fire line with hand crews, and use of equipment (fire engines, etc). The use of ground disturbing equipment, such as dozers and graders, within the monument/refuge must be approved by the Project Leader or Designee on a fire-by-fire basis. Fire breaks would be maintained through mechanical manipulation along corridors with historic human-caused ignitions. Fire management activities will be planned and conducted with interdisciplinary teams in accordance with the laws, regulations and policies governing the protection of sensitive and threatened and endangered plant and animals, and cultural resources.
For alternatives using mechanical treatment, associated actions could include removing brush, constructing and maintaining fire line, and cutting and stacking fuels.

For the alternatives with prescribed fire, all activities would be conducted under Federal and State air quality requirements and best management practices. Prescribed fires, ignited by qualified fire personnel, would be used to accomplish management objectives in the Saddle Mountain Unit under prescribed conditions identified in approved prescribed burn plans. Prescribed burn plans would address timing and fire intensity to minimize impacts to sensitive biological and cultural resources, smoke management, timely notification of public officials and citizens, and contingency planning. Prescribed fires would be designed to create mosaic burn patterns (with only 40-70% of acreage within the fire perimeter actually burned). All prescribed fires would be monitored and be available as research projects. Mechanical preparations would be used as appropriate to prevent prescribed fires from escaping control lines. Mechanical preparations could include the use of chainsaws and hand crews to create fire-line, stack downed fuels for ignition during burning windows, and other actions as appropriate. Fire-line would be rehabilitated as needed to prevent soil erosion and exotic species invasion.

Prior to any fire program activities occurring under the Fire Management Plan, an Inter-Service Threatened and Endangered Species Act, Section 7 documentation will be completed by the FWS Ecological Services Division.

ALTERNATIVE A: FULL SUPPRESSION, MECHANICAL TREATMENT, PRESCRIBED FIRE ON SADDLE MOUNTAIN UNIT ONLY (NO ACTION)

Under the "No Action Alternative", all wildland fires would be suppressed, mechanical treatment could be used, and prescribed fires would be conducted on the Saddle Mountain Unit only. An Environmental Assessment/Finding of No Significant Impact was completed for these actions in 1992 and is on file at the monument/refuge headquarters.

ALTERNATIVE B: FULL SUPPRESSION, MECHANICAL TREATMENT, PRESCRIBED FIRE ON ALL MONUMENT/REFUGE UNITS (PROPOSED ACTION)

All wildland fires on the monument/refuge would be suppressed, and prescribed fires would be used as appropriate on all Units of the monument/refuge.

ALTERNATIVE C: FULL SUPPRESSION, MECHANICAL TREATMENT, NO PRESCRIBED FIRE

Under this alternative, all fires on the monument/refuge would be suppressed. Prescribed fire would not be

used. Mechanical manipulation would be used to redistribute fuels and remove hazard fuel accumulations and invasive species.

ALTERNATIVE D: FULL SUPPRESSION, NO PRESCRIBED FIRE, NO MECHANICAL TREATMENT
Under this alternative, all fires on the monument/refuge would be suppressed. Prescribed fire and mechanical manipulation would not be used.

ALTERNATIVES CONSIDERED BUT FOUND TO BE INFEASIBLE

No Suppression
Under this alternative all ignitions would be allowed to burn on the monument/refuge. This alternative was found to be infeasible due to unacceptable risk to human life and property, and potential for significant socioeconomic impacts on neighboring rural communities, agriculture and rangelands.

While fire has played an integral role in the history of the shrub-steppe environment, the region's historical fire regime has been greatly altered from socio-political and economic factors. Wildland fires on the Monument/Refuge have increased from historical levels. Coupled with the arrival of invasive species and noxious weeds, this has weakened the natural recovery processes of the shrub steppe ecosystem from disturbance events such as fire. Repeated and/or catastrophic fires would degrade the objects of antiquity for which the Monument/Refuge was established. The FWS would be out of compliance with the FWS policy and the directives of Proclamation 7319, Establishment of the Hanford Reach National Monument.

Wildland Fire Use Program
Under this alternative, unintentional ignitions would be managed in predetermined areas for resource benefits, if all prescription criteria were met. This alternative was found to be infeasible due to staff limitations, valuable natural and cultural resources, and high values at risk on neighboring lands.

Mechanical Treatment of Fuels Only
Under this alternative, hazard fuel buildups would be removed or manipulated strictly by mechanical means to the extent practicable. This alternative was found to be infeasible because of associated exorbitant costs and high potential to result in substantial damage to biological and cultural resources from mechanical equipment.

AFFECTED ENVIRONMENT

GENERAL DESCRIPTION

The Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge includes approximately 195,000 acres sprawling across four counties of south central Washington. The land forms a large C-shaped region, bisected by the Hanford Reach of the Columbia River. All of the land is owned by the Department of Energy and is part of the 360,000 acre Hanford Site. The Hanford Site was established by the US Government in 1943 as a national security area for the production of weapons-grade plutonium and purification facilities. For more than 40 years, the primary mission at Hanford was associated with the production of nuclear materials for national defense. However, large tracts of land were used as protective buffer zones for safety and security purposes and remained undisturbed. These buffer zones preserved a biological and cultural resource setting unique in the Columbia Basin region.

The 195,000-acre Hanford Reach National Monument was established by Presidential Proclamation in June, 2000, to protect the nation's only remaining free-flowing stretch of the Columbia River and the largest remnant of the shrub-steppe ecosystem once blanketing the Columbia River Basin. The U.S. Fish and Wildlife Service and the Department of Energy are joint stewards of the monument. The Proclamation directs the DOE and FWS to protect and conserve the area's native plant communities, specifically recognizing the nationally significant scientific values provided by the area's biologically diverse shrub-steppe ecosystem.

The monument/refuge is located within the planning framework of DOE's Hanford Comprehensive Land-Use Plan (CLUP) and Environmental Impact Statement (EIS), 9/99. The CLUP and subsequent DOE/FWS Memorandum of Agreement and Permit establish the project area as an overlay unit of the National Wildlife Refuge System under FWS management. Pending completion of a Comprehensive Conservation Plan, the FWS formally adopted DOE's CLUP and EIS by Record of Decision, 1999.

FWS-administered lands of the Monument are divided up into four major management units.

The Fitzner-Eberhardt Arid Lands Ecology (ALE) Reserve is a 120 mi 2 (312 km 2) tract of land in the southwestern portion of the Hanford Site. It is designated the Rattlesnake Hills Research Natural Area as a result of a federal interagency cooperative agreement (PNL 1993). The ALE Reserve constitutes the single largest tract in the federal Research Natural Area system for Oregon and Washington (Franklin *et al*. 1972, Rickard 1972), and is one of the few remaining large tracts of shrub-steppe vegetation in Washington that retains a predominant pre-European settlement character (PNL 1993). This area is closed to the public and is maintained for scientific purposes.

The Saddle Mountain Unit of the Monument has been managed by the U.S. Fish and Wildlife Service since 1971 under a 30-day revocable use permit with DOE. This unit is a 50 mi 2 (130 km 2) tract of land located north-northwest of the river and generally south and east of state Highway 24. The Bureau of Reclamation's South Columbia Basin Irrigation District maintains an irrigation return canal that created and sustains the Saddle Mountain Lakes. This area has been closed to public access since the 1940's. Currently, access is available to approved research activities and special uses through the FWS monument headquarters.

The Wahluke Unit of the Monument is a 87 mi 2 (225 km 2) tract of land located north and east of both the Columbia River and the Saddle Mountain NWR. It is bisected by Highway 24. The Bureau of Reclamation's South Columbia Basin Irrigation District maintains several irrigation canals throughout the

area. The WB-10 ponds was created and is sustained from irrigation runoff. The Wahluke Unit is open to the public year-round for day use only.

The Columbia River Islands Unit of the Monument is a group of islands within the Columbia River. Seven islands total 320 acres (829 km 2). The islands are seasonally open for limited public use.

PHYSICAL RESOURCES

Climate

The Monument is located within the driest and hottest portion of the Columbia Basin. An almost 50 year record of climate data is available for the central portion of Hanford (Hoitink and Burk 1994). Average weather conditions described here are based on that location and are taken from Cushing (1995). Still, it is important to remember that differences in the topography of the Hanford Site contribute to ecologically significant changes in some aspects of climate, particularly annual mean temperature and precipitation (Cushing 1995). For example, although the average annual precipitation for central portion of Hanford is 6.3 in (16 cm), on the crest of Rattlesnake Mountain annual precipitation can reach up to 13.8 in (35 cm) (Downs et al. 1993). Most precipitation occurs during the winter, with more than half the amount occurring from November through February. Snowfall accounts for about 38% of all precipitation from December through February. Average monthly temperatures range from a low of 30ºF (-0.9 ºC) in January to a high of 76ºF (24.6 ºC) in July. Prevailing wind directions are generally from the northwest in all months of the year, but southwesterly winds also regularly occur. Monthly average wind speeds are lowest during the winter months and highest during the summer.

Physiography

The Monument lies in the heart of the Pasco Basin. Columbia River Basalt, a result of lava flows occurring roughly between 17 and 2 million years ago, underlies the Monument. Several basalt ridges traverse the Monument and provide much of its topographic relief. A stretch of the Columbia River (the Hanford Reach) runs through the Monument and forms part of its southern and southwestern boundary. The Columbia River Plain constitutes the majority of the Monument and is both its lowest (about 360 ft [110 m] along the river) and most arid region.

Prominent natural features of the ALE Reserve Unit of the Monument include the ridge top and mostly north-facing slope of Rattlesnake Mountain, portions of the Rattlesnake Hills, Dry Creek Valley, Cold Creek Valley, and the east end of Yakima Ridge. Two streams, Snively Creek and Dry Creek, and a number of cold springs occur within the ALE Reserve (DOE-RL 1996). Elevations across the ALE Reserve range from about 500 ft (150 m) in the Cold Creek Valley to 3450 ft (1050 m) on top of Rattlesnake Mountain.

Prominent natural features within the Saddle Mountain Unit of the Monument include a portion of the Wahluke Slope, the western end of the White Bluffs geologic formation, the slopes and crest of the Saddle Mountains, and a portion of the Hanford Reach of the Columbia River. The refuge contains several lakes and wetlands created and sustained by raised water tables associated with irrigation drainage and runoff.

Prominent natural features found within the Wahluke Unit of the Monument include: a portion of the Wahluke Slope, the eastern end of the White Bluffs geologic formation, large dune fields above the White Bluffs, the Saddle Mountains (which rise to over 2000 ft [610 m] within the monument/refuge, and several lakes and wetlands created and sustained by raised water tables associated with irrigation drainage and runoff.

FUELS

The fuel types in the shrub-steppe region is typically grass and shrub. The fuel is generally herbaceous plants that are dormant, or are nearly dormant. Occasionally, litter and dead-down stemwood from the open shrub overstory contributes to the fire intensity. Fires in this fuel type are surface fires that move rapidly through the cured grass and associated material. Rarely, brush becomes the primary carrier of fire spread; however, brush requires moderate winds, greater than 8 mph at the mid-flame height, for fire to spread from crown to crown.

FIRE ECOLOGY

Most fires in the area occur during the summer months with the majority of ignitions in June, July, August, and September. Although precipitation free months are rare, these months are generally hot and dry. There are an average of 65 days of 90 º F or above during the summer, and the average precipitation during these months is only 0.3 inches per month.

While fire has played an integral role in the history of the shrub-steppe environment, the region's historical fire regime has been greatly altered from socio-political and economic factors. Couple with the arrival of invasive species and noxious weeds, this has weakened the natural recovery processes of the shrub steppe ecosystem from disturbance events such as fire. The Fire Effects Information Service describes the autecology of the major species in the shrub-steppe. Sagebrush does not tolerate fire, while the grasses are fire-tolerant. Because the grasses offer the available to carry a fire and because the native grasses are either short in height (Sandberg's bluegrass) or clumpy (bluebunch wheatgrass), the pre-settlement fires were probably small. Thus, the fire regime for the pre-settlement era was probably small, high intensity fires with a long fire return interval (50-100 years). Sagebrush is a fire intolerant species, and historical densities were typical only 15-25% of the vegetative cover in sagebrush shrub-steppe communities. Small, infrequent fires maintained bunch grass openings within the shrub-steppe, providing for both shrub and grassland communities.

After the 1900's, human activities interrupted the natural fire interval and patterns of burning. Agricultural development and livestock grazing reduced the light fuels that would normally carry a fire. Livestock grazing also had the effect of suppressing native bunch grasses and allowing sagebrush densities to increase. Beginning until 1906 through the present, fire suppression efforts have resulted in increased sagebrush stand density. This allows for hotter, more destructive fires, due to the closer proximity of each individual plant, which allows fires to spread within the shrub canopy.

Rangeland improvements also brought in a variety of non-native grasses, either as purposeful introductions to provide forage enhancement, or as accidental introductions within seed/pasture mixes. Plants such as cheat grass, tumbleweed, and other annual plants altered native plant community structure. The discontinuous fuel that native bunch grasses provided were invaded by thick, continuous fuels that would carry fires over large areas. Cheatgrass also cures into dry fuel earlier in the fire season than native grasses providing a longer fire season. High mortality of perennial grasses may occur if fire burns in cured litter of annual grasses while perennials are still actively growing. The invasion of cheatgrass has changed the community appearance and altered the fire regime because of an abundance of available and continuous fuel. Natural succession has been altered by cheatgrass such that burned areas do not recover to their former community structure following fire.

The fire frequency has increased due to an increase in human caused ignitions, and the fire size has increased due to changes in fuel structure. The contemporary fire regime is large, high intensity fires with a shorter fire return interval. This has led to a decrease in the fire intolerant sagebrush and a commensurate increase in exotic species, primarily cheatgrass and tumbleweed.

Four different fuel types are currently recognized in the monument/refuge.

1) Native grasslands are characterized by dry, open, grassy areas, with individual grass clumps providing a discontinuous natural fuels. Native, perennial grasses and forbs are found throughout this community. Perennial grasses and forbs tend to have long, fibrous root structures that can access moisture throughout the soil profile. Thus, native vegetation in this area remains green during the first half of the fire season, curing out during the late summer, July, and August. Fires during late summer can burn within these areas. Perennial grasses may suffer high mortality if fires fueled by cured annual grasses burn perennial species during their active growing season. Fires during late summer can burn within perennial grassland areas. Occasionally, depending upon wind conditions, surface fires can move rapidly through the cured grass and associated materials.

2) Shrub-steppe areas are grasslands that retain a component of shrub as an overstory. Wyoming big sagebrush is the most common, dominant shrub, but there are also communities of three-tip sagebrush, bitterbrush, black greasewood, spiny hopsage, gray and green rabbit brush. Generally, the shrubs burn with greater intensity than the grasses, and produce longer flame lengths. Sagebrush has volatile, flammable chemicals associated with it's foliage. In some areas, the shrubs can burn with such intensity that they permanently destroy the understory plants and create hydrophobic conditions on the soil surface.

3) Riparian and riverine bottoms are occupied by willow dominated communities. Because of their proximity to water, riparian and riverine habitats tend to have a high density of shrubs and trees, and a greater amount of vertical structure. Native and non-native grasses are found in the understory throughout the community. Vegetation in this area remains green during the majority of the fire season, but as the grasses cure the understory becomes more flammable. Dried grasses, and shrubs can provide ladder fuels that burn into the riparian tree canopy and can kill overstory trees. Occasionally, aquatic vegetation can build up such that open water habitat becomes limited. These situations may require fire to reduce such build ups.

4) Non-native plant communities are dominated by invasive species such as cheatgrass, tumbleweed, and other exotic plants. Cheatgrass germinates in late fall and winter, and cures earlier than native grasses, usually by late June. As the cheatgrass cures it becomes an available abundant and available fuel. Often fires start within the cheatgrass and spread to other adjacent communities. Subsequently, other plants are exposed to burning earlier in the fire season than they historically would have been. This weakens native plants, because they are burned during the peak of their growing cycle, and can allow cheatgrass to spread further into native plant communities. This reduces biodiversity and accelerates the fire cycle.

VEGETATION

The Monument is located within the Columbia Basin Ecoregion (DOE-RL 1996: Appendix C), an area that historically included over 14.8 million acres (6 million ha) of steppe and shrub-steppe vegetation across most of central and southeastern Washington State (Franklin and Dyrness 1973) as well as portions of north-central Oregon. native, pre-settlement vegetation consisted primarily of shrubs, perennial bunchgrass, a variety of forbs and a living soil crust composed of lichens, moss and algae. The State of Washington has designated shrub-steppe communities as a priority habitat because of their significance to a number of wildlife species and the scarcity of this habitat type (WDFW 1996). In addition, the U.S. Department of the Interior (DOI) has identified native shrub and grassland steppe in Washington and Oregon as an endangered ecosystem (DOI 1995).

Native Grassland and Shrub-steppe

A number of different plant association zones occur as climatic climaxes (*i.e*., the plant association or community expected to occur in typical sites in the absence of disturbance) throughout the Columbia Basin Ecoregion. The largest and driest of these zones (about 8.2 million acres [3.3 million ha]) is the big sagebrush (*Artemisia tridentata*) / bluebunch wheatgrass (*Pseudoroegneria spicata* [=*Agropyron spicatum*]) association. This association occupies the center of the Columbia Basin Ecoregion, which includes the Hanford Site. In general, the big sagebrush / bluebunch wheatgrass association is characterized by four layers of vegetation: an overstory layer composed mostly of big sagebrush up to two meters tall, a tall understory layer of bluebunch wheatgrass, a short understory dominated by Sandberg's bluegrass (*Poa sandbergii* [included within *Poa secunda*]), and a layer of algae, lichens and mosses on the soil surface (i.e., the microbiotic crust). The microbiotic crust is a critical component of native grasslands and shrub-steppe communities. This diminutive community of mosses, lichens, liverworts, algae, and bacteria stabilizes the soils and fills the interstitial space between bunchgrass clumps. Perennial forbs are a minor constituent of the tall understory layer, whereas most annual forbs occur in the short understory layer. Other shrubs that may be present include rabbitbrush (*Chrysothamnus* spp.), bitterbrush (*Purshia tridentata*), spiny hopsage (*Grayia spinosa*), and three-tip sagebrush (*Artemisia tripartita*). Additional locally abundant bunchgrasses include needle-and-thread (*Stipa comata*), Indian ricegrass (*Oryzopsis hymenoides*), Cusick's bluegrass (*Poa cusickii* [included within *Poa secunda*]) and Idaho fescue (*Festuca idahoensis*). Other associations, such as big sagebrush / Idaho fescue, bluebunch wheatgrass / Sandberg's bluegrass, and bluebunch wheatgrass / Idaho fescue can occur as topographic climaxes on moister sites within the big sagebrush / bluebunch wheatgrass association. Certain edaphic (soil-related) plant associations also are of ecological importance within the ecoregion. On deep soils dominated by gravel, sand, or strongly weathered volcanic ash, needle-and-thread and/or Indian ricegrass replaces bluebunch wheatgrass as the dominant grass in several associations. The dominant shrub in these associations can be either big or three-tip sagebrush or bitterbrush. On stony soils or extremely shallow soils over bedrock (lithosols), various species of buckwheat (*Eriogonum*) and/or stiff sage (*Artemisia rigida*) dominate the shrub layer and Sandberg's bluegrass dominates the understory. As the hottest, driest, and lowest elevation part of the ecoregion, the Hanford Site also possesses a series of three plant associations found on reasonably deep, loamy (but dry) soils. These are the big sagebrush / Sandberg's bluegrass, spiny hopsage / Sandberg's bluegrass, and winterfat (*Atoides* [=*Eurotia*] *lanata*) / Sandberg's bluegrass associations. Each of these associations is characterized by the lack of large, perennial bunchgrasses (Sandberg's bluegrass is relatively small) and low overall plant diversity.

Riparian areas

Riparian vegetation of the Monument is limited to portions of the Columbia River shoreline, islands and sloughs, a few natural desert springs, and ponds, lakes, and wetlands created by irrigation run off. In a dry, cold-desert environment, riparian areas are extremely valuable. Because of their direct association with water, plant diversity and structure is increased, consequently, the value of these communities as wildlife habitat is very high. Although these areas are small in acreage, riparian zones are a very important component of the Monument. These sites are important because the lush riparian habitat sharply contrasts with the surrounding dry shrub-steppe and provides trees and larger shrubs not available elsewhere on the Monument. Riparian areas are characterized by diverse shrubs and trees that include a substantial component of, or dominance by willow (S*alix*) species. Other trees include black cottonwood (*Populus trichocarpa*), black locust (*Robinia pseudo-acacia*), and quaking aspen (*P. tremuloides)*. Shrubs include several willow species (*Salix* spp.), mock-orange (*Philadelphus lewsii*), golden currant (*Ribes aureum*), Wood's rose (*Rosa woodsii*), blue elderberry (*Sambucus ceruleus*), chokecherry (*Prunus virginiana*), sumac (*Rhus glabra*), and red-osier dogwood (*Cornus stolonifera*) and western virginbower (*Clematis ligusticifolia)*. Watercress (*Rorripa nasturtium-aquaticum*), stinging nettle (*Urtica dioica*), water

speedwell (*Veronica anagallis-aquatica*), rushes (*Juncus* spp.), bulrush (*Scirpus* spp.), and spike rush (*Eleocharis* spp.) are common herbaceous species. The "artificial" wetland areas have a larger component of non-native species such as Russian olive (*Elaeagnus angustfolia*), and tamarisk (*Tamarix parviflora*), but also support native willows (common cattail (*Typhus* sp.) and black cottonwoood.

Disturbed Vegetation/Invasive species

Prior to alteration of the shrub-steppe of eastern Washington in the 1800's, big sagebrush/bluebunch wheatgrass was the dominant vegetation type over much of the Columbia Basin (Daubenmire 1970). Although the Monument area has documented large, relatively undisturbed shrub-steppe plant communities as described above, many previously disturbed areas have altered vegetative communities. One of the primary significant changes to the vegetative communities is the invasion of non-native plant species. Once introduced, these species can proliferate because of the lack of natural predators or because they can out-compete native plant species in disturbed habitats. Moreover, some species are aggressive enough to be successful in invading even intact native plant communities. Disturbed areas of the Monument units usually are dominated by cheatgrass and other exotic species cover with or without big sagebrush. Cheatgrass is a particularly competitive plant that favors disturbed areas, and has several characteristics that enhance its ability to establish and persist, including the ability to germinate in the spring or fall, high seed production, greater germinability than native grasses, and tolerance to grazing. Within several areas the native vegetation has likely been permanently replaced by cheatgrass and other non-native plants, particularly in areas where historic disturbances were the most intense (especially on historically farmed and grazed locations). Vegetation within these areas have highly variable shrub cover, high cover of cheatgrass, frequently a significant cover of Sandberg's bluegrass, and usually a low cover of microbiotic crust. It is unlikely that native bunchgrasses will become established without extensive restoration. Additionally, noxious weeds, and other aggressive non-native plants tend to invade, and become established more readily within previously disturbed habitats. The invasion of non-native plants represents a threat to the integrity of the Monument, and the preservation of it's unique biodiversity.

Rare Plants

A total of 127 populations of 30 rare plant taxa have been documented to occur on the Hanford Site. A majority of these populations and taxa occur on the Monument. In addition, 3 taxa (two species and one variety) had not previously been described and are considered "new" to science; *Eriogonum codium* (Umtanum Ridge desert buckwheat) - a Federal Candidate Species for Threatened and Endangered listing, *Lesqurella tuplashensis* (White Bluffs bladder-pod), and *Astragalus comjunctus* var. *rickardii.* (Rattlesnake mountain milk-vetch). Many of these populations of plants are endemic to the area, several were not previously known from Washington State, or otherwise of botanical interest and potentially of conservation and management concern. Little is known about the ecology, requirements or population dynamics of these species. Fire may be one of the greatest threats to many of these plants, mortality of Umtanum Ridge desert buckwheat was documented following a 1997 fire. There are no federally listed plants on the monument/refuge.

FISH AND WILDLIFE

The diversity of habitats across the Monument support a diverse assemblage of wildlife species. The shrub-steppe ecosystem supports an unusually high diversity of native plant and animal species, including significant breeding populations of nearly all steppe and shrub-steppe dependent wildlife. Mature sagebrush/bunch grass and riparian areas are of particular importance for wildlife. The sagebrush is either a food source or provides nesting, resting, thermal and escape cover for a wide variety of species. Other value for wildlife includes the thick canopy which protects under story vegetation (forbs) that can be a valuable food source for wildlife. Riparian areas provide structure and diversity critical for nesting, resting

thermal and escape cover, as well as abundant water. Numerous wildlife species depend upon the Monument's intact ecosystems; 43 species of fish, including threatened and endangered salmon and trout; 40 mammals; 246 birds; 4 amphibians; 11 reptiles and over 1500 invertebrates have been documented on the Monument.

Fish

The monument/refuge includes the Hanford Reach; the nation's last, non-tidal, free-flowing segment of the Columbia River. Forty three species of fish have been documented as occurring in the Hanford Reach. Salmonids are of particular interest, large numbers of fall chinook salmon *(Onchorynchus tshawytscha*) spawn in the Hanford Reach, Upper Columbia River Spring Chinook (*Onchorynchus tshawytscha*), listed as a federally threatened species, also uses the Hanford Reach for migration, as well as both the Middle Columbia River Steelhead (*Onchorynchus mykiss*) and Upper Columbia River Steelhead (*Onchorynchus mykiss*) both of which are federally threatened species. Beach seine catches from April-June in the Hanford Reach are dominated by subyearling fall chinook salmon (USGS, unpublished data). Other numerically important species during this time are redside shiners, carp, largescale suckers, northern pikeminnow, and peamouth. Mountain whitefish are common in the Hanford Reach and support a recreational fishery. Centrarchids and percids are more common in McNary Reservoir, although smallmouth bass are also abundant in the Hanford Reach. Tench, threespine sticklebacks, and mountain whitefish are rarely captured in Hanford beach seining activities (Ward, 2001). The ponds and lakes created by irrigation run-off also have populations of introduced fishes such as carp, bass, sunfish, and panfish. Riparian vegetation and backwater sloughs are very important for fisheries habitat. Shoreline vegetation provides shade, moderates temperatures in shallow water and provides shelter and substrate for invertebrate populations all of which are critical for sustaining fish populations. Occasionally, vegetation may become dense and limit open water habitat.

Wildlife

Shrub-steppe obligates/Species of Management Concern

The Proclamation establishing the monument directs the FWS to manage the monument to protect all of the species associated with the shrub-steppe ecosystem. A primary objective of the FWS is to ensure that the area is operated and managed for the protection and preservation of the native shrub-steppe habitat and its associated wildlife species. Wildlife species that are dependent on sagebrush and are considered shrub-steppe obligates in the Columbia Basin Ecoregion include: Ferruginous hawk (*Buteo regalis*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), sage sparrow (*Amphispiza belli*), Brewer's sparrow (*Spizella breweri*), sage thrasher (*Oreoscoptes montanus*), greater sage grouse (*Centrocercus urophasianus*), long-billed curlew (*Numenius americanus*), sagebrush vole (*Lagurus curtatus*), Merriam's shrew (*Sorex merriami*), pygmy rabbit (*Brachylagus idahoensis*), Washington ground squirrel (*Spermophilus washingtoni*), black tailed jack-rabbit (*Lepus californicus*), sagebrush lizard (*Sceloporus graciosus*) and striped whipsnake (*Masticophis taeniatus*). Management to maintain and enhance habitat for these species is and will be a priority throughout the monument/refuge. Little is known about the habitat needs of many of these species, so that protection and preservation of intact areas is paramount.

Mammals

The most abundant mammal of shrub-steppe habitat of the Monument is the Great Basin pocket mouse (*Perognathus parvus*). The deer mouse (*Peromyscus maniculatus*), western harvest mouse (*Reithrodontomys megalotis*), northern grasshopper mouse (*Onychomys leucogaster*), bushytail woodrat (*Neotoma cinerea*), and northern pocket gopher (*Thomomys talpoides*) are other common small mammals using habitats on the ALE Reserve. Least chipmunks (*Eutamius minimus*) are found in the upper

elevations of Rattlesnake Mountain, and sagebrush voles are relatively common above 1,000 feet (305 m) elevation in sagebrush habitat.

Porcupines (*Erethizon dorsatum*) are typically restricted to riparian areas where they feed on the bark of small limbs and tree branches. Black-tailed jackrabbits (*Lepus californicus*) are usually common in mature sagebrush habitat. White-tailed jackrabbits *(L. townsendi*) occur in sagebrush/bunchgrass habitats, generally at higher elevations than black-tailed jackrabbits. The populations of both species are cyclical and are currently at low levels throughout the Columbia Basin.

Large mammals found on the ALE Reserve include the occasional cougar *(Felis concolor*), bobcat (*Felis rufus*), and badger (*Taxidea taxus*). These species are present throughout the Hanford Site in low numbers. A resident Elk (*Cervus elaphus*) herd uses the ALE site portion of the National Monument. Mule deer (*Odocoileus hemionus*) densities on the ALE Reserve and along the Columbia River are the highest among Hanford habitats. Coyotes (*Canis latrans*) are the most abundant large carnivore on the Monument.

The lack of sufficient roost habitat probably limits the density and diversity of bats on the Monument. Bats may be more common in areas adjacent to the Columbia River and in riparian zones around desert springs and lakes created by irrigation return. Studies in the general Hanford vicinity have documented the presence of pallid bat (*Antrozous pallidus*), silver-haired bat (*Lasionycteris noctivangans*), and western small-footed myotis (*Myotis ciliolabrum*). The extent to which these species use the Monument is not known.

Birds

Approximately 238 species of birds have been documented on or near the Monument, 36 of which are common and 40 are accidental visitors. The Monument provides habitat for year-round residents, migratory species that breed on the site, winter residents, and migrants that are passing through to or from breeding grounds.

Mature sagebrush stands are perhaps the most important habitat on the National Monument because large blocks of sagebrush in good condition are a dwindling resource in the Columbia Basin Ecoregion. Horned lark (*Eremophila alpestris*) and meadowlark (*Sturnella neglecta*) are the most abundant breeding birds in the sagebrush/bunchgrass habitats. Brewer's sparrow is more common in the three-tip sagebrush communities at higher elevations. The Brewer's sparrow and sage sparrow are sagebrush obligates and require sagebrush stands for nesting. Other species closely tied to sagebrush occurrence include loggerhead shrike and sage thrashers. Loggerhead shrikes are commonly observed in dense sagebrush stands of the Monument.

The large expanses of bunchgrass habitat on the Monument provide hunting, nesting, and resting areas a number of bird species. Native bunchgrass habitat is used for foraging by a variety of raptors including Swainson's hawk (*Buteo swainsoni*), golden eagles (*Aquila chrysaetos*), prairie falcons (*Falco mexicanus*), short-eared owls (*Asio flammeus*), and red-tailed hawks (*Buteo jamaicensis*), among others. Meadowlarks, horned lark, and grasshopper sparrow (*Ammodramus savannarum*) are some of the ground-nesting birds that are commonly found in bunchgrass habitat on the ALE Reserve. Burrowing owls (*Athene cunicularia*) and Swainson's hawks also have been documented nesting and feeding in bunchgrass habitat.

Riparian habitat is a scarce but important resource for birds on the National Monument. The sharp contrast with the adjacent shrub-steppe habitat, the presence of trees, and the abundant cover make these

areas focal points for predator and prey. Although the total area occupied by riparian habitat is small, the avian diversity is higher than the surrounding shrub-steppe. Riparian habitats are used by neotropical migrants such as, the western wood pewee (*Contopus sordidulus*), Say's phoebe (*Sayornis saya*), western kingbird (*Tyrannus verticalis*), and resident downy woodpeckers (*Picoides pubescens*), and northern flickers (*Colaptes auratus*). Trees are rare on the Monument landscape and therefore provide an important resource for a number of birds. Raptors will perch, hunt from, or nest in trees in the riparian zone, or they may be attracted by the presence of prey species. The barn owl (*Tyto alba*), long-eared owl (*Asio otus*), great-horned owl (*Bubo virginianus*), red-tailed hawk, sharp-shinned hawk (*Accipiter striatus*), American kestrel (*Falco sparverius*), and Swainson's hawk regularly use riparian zones. Chuckar (*Alectoris chukar*), California quail (*Callipepla californica*), and mourning dove (*Zenaida macroura*) find abundant cover from predators in the riparian zones. Red-winged (*Ageliaus phoeniceus*) and Yellow-headed blackbirds (*Xanthocephalus xanthocephalus*) breed along watercourses. Songbirds documented using the Monument riparian zones include the ruby-crowned kinglet (*Regulus calendula*) and golden-crowned kinglet (*R. satrapa*), warbling vireo (*Vireo gilvus*), orange-crowned warbler (*Vermivora celata*), yellow-rumped warbler (*Dendroica coronata*), MacGillivray's warbler (*Oporornis tolmiei*), and Wilson's warbler (*Wilsonia pusilla*), among others. In the winter, riparian zones are used by dark-eyed junco (*Junco hyemalis*), white-crowned sparrow (*Zonotrichia leucophrys*), American robin (*Turdus migratorius*), Townsend's solitaire (*Myadestes townsendi*), and other species (LaFramboise and LaFramboise 1998).

Riverine habitat along the Hanford Reach is used extensively by Mallards (*Anas platyrhynchos*), Canada geese (*Branta canadensis*) and other waterfowl for wintering, and the island habitats for nesting. Great Blue herons (*Ardea herodias*), Great Egrets (*Ardea alba*), Black-crowned night-herons (*Nycticorax nycticorax*), and other water-related birds have also been noted using the river corridor and islands. Double crested cormorants (*Phalacrocorax auritus*), American white pelicans (*Pelecanus erythrorhynchos*), several species of gulls and terns also use these areas.

Amphibians and Reptiles

Limited surveys recently documented a number of common amphibians and reptiles on the Monument. Species recorded on the include the Great Basin spadefoot toad *(Scaphiopus intermontanus*), Woodhouse's toad (*Bufo woodhousei*), Tiger salamander (*Ambystoma tigrinum*), Pacific treefrog (*Hyla regilla*), Painted turtle (*Chrysemys picta*), short-horned lizard (*Phynosoma douglassi*), sagebrush lizard (*Sceloporus graciosus*), side-bloched lizard (*Uta stansburiana*), racer (*Coluber constrictor*), gopher snake (*Pituophis melanoleucus*), common garter snake (*Thamnophis sirtalis*), western terristrial garter snake (*Thamnophis elegans*) night snake (*Hypsiglena torquata*), striped whipsnake and western rattlesnake (*Crotalus viridis*). Bullfrog (*Rana catesbeiana*), an introduced exotic species, were also documented on the Monument.

Invertebrates

The diversity of insect life on the Monument is very high; over 1500 species have been documented. Darkling beetles (family *Tenebrionidae*) are some of the more conspicuous ground-dwelling insects on the Hanford Site, including the Monument. These beetles play an important role in the nutrient cycling in shrub-steppe communities and are prey for a variety of mammals. Darkling beetles are generally more abundant in warmer and drier locations and in areas dominated by native vegetation, and thus may be a good indicator of change in shrub-steppe habitats.

The ALE Reserve is particularly rich in butterflies and moths; 46 butterfly species and 107 moth taxa have been identified. Umtanum Ridge, Rattlesnake Ridge, and the shorelines of the Columbia River appear to support a wide variety of butterflies, including several rare species. An alkaline spring on Umtanum Ridge supports an endemic snail not known from any other location. Most insects are associated with specific

microhabitats or host plants, are short-lived, and travel only short distances during their life. Unlike birds and mammals that may colonize an area if suitable habitat develops, the ability of insects to re-invade sites is minimal. Preservation of the variety of habitats available throughout the Monument is therefore particularly important for invertebrate conservation.

AIR QUALITY

The monument/refuge is located within a Class II air quality area as specified by the Clean Air Act. Air quality in the monument/refuge is well within federal and state standards for criteria pollutants, except that short-term particulate concentrations occasionally exceed the 24-hour standard for particulate matter. Dust storms can create serious visibility problems on highways and other roads within the monument/refuge. Winds capable of moving sand-sized particles occur approximately 40 days per year. An average of eight dust storms a year that decrease visibility to below 10 km (6.2 mi) occur at the Hanford Meteorology Station (U.S. Department of Energy, 1998). Dust storms occur most frequently from March through May and also in September. Wind-blown dust, or "rural fugitive dust" is generally exempt from U.S. Environmental Protection Agency (EPA) regulations.

Outdoor burning permits are issued by the Washington State Department of Ecology in Franklin and Grant counties, and by the Benton Clean Air Authority in Benton County.

WATER RESOURCES

Primary natural surface water features within the monument/refuge include the Hanford Reach of the Columbia River and Snively and Rattlesnake springs; two major spring systems with short stream segments located on the ALE. The Snively and Rattlesnake spring systems provide important aquatic and riparian habitats in an otherwise arid landscape. A number of intermittent natural springs and streams originate on the flanks of Rattlesnake and Saddle Mountains.

Several irrigation canals, part of the Bureau of Reclamation's Columbia Basin Irrigation Project, form artificial lakes (Saddle Mountain lakes), ponds (WB-10 ponds) and associated wetland areas in the Saddle Mountain and Wahluke Units.

The Columbia River within the Hanford Site is unique within the post-dam Columbia River system in the United States. As opposed to the rest of the river system which is a series of slack-water reservoirs formed by dams; here, the river runs freely through an approximately 51-mile segment extending from the upper end of McNary Dam Reservoir to Priest Rapids Dam. Although overall flow volume and corresponding water levels are controlled by upstream dams, the Reach itself remains essentially free-flowing. As such, it contains significant riparian habitat, islands, riffles, gravel bars, oxbow ponds, and backwater sloughs, which are otherwise rare within the Columbia River system (USFWS 1980, NPS 1994). These once common habitats now provide remnant habitat for aquatic organisms, including salmon that were widespread before the remainder of the Columbia River system was converted to reservoir or slack-water habitat. There are no perennial streams originating from the monument/refuge that feed the Columbia River.

SOILS

Located within the Columbia River Plain, the monument/refuge is underlaid with Columbia River Basalt, a result of lava flows occurring roughly between 17 and 2 million years ago. Massive flood events (The Missoula Floods) occurred periodically towards the end of the Pleistocene epoch; until roughly 12,000 years ago.

Soils on the monument/refuge vary from wind-carried sand and sandy loam to silt, with 15 types in all described (Hajek 1966). The silt loam soils tend to be found on the slopes and higher elevation areas, whereas sandier soils are found at the lower elevations of the Columbia River Plain. Large, active dune fields occur on both sides of the river.

Throughout much of the monument/refuge, a living crust covers some or all of the soil between plants (Nash, 1996a.b). The soil crust - referred to as microbiotic, cryptobiotic, or cryptogamic - is composed of algae, fungi, lichens, and mosses. Microbiotic soil crusts are especially well developed in relatively undisturbed areas of the monument/refuge. Although the ecological role of the microbiotic crust is not completely understood, it is thought to play an important role in ecosystem functioning. Microbiotic crusts can stabilize the soil, thus reducing wind and water erosion (Metting 1991; Johansen 1993; Eldridge and Greene 1994). Some crust organisms contribute nitrogen (Harper and Pendleton 1993) and organic carbon (Johansen et al.1993) to the soil. Some researchers have found an increase in the infiltration of precipitation into the soil with microbiotic soil crusts (Brotherson and Rushforth, 1983). Intact crusts can also enhance native seedling establishment in arid ecosystems (St. Clair et al. 1984), and may discourage invasion by non-native species such as cheatgrass.

Erosion is a major concern on the monument/refuge where disturbance has occurred along roadbeds, powerline corridors, and severely burned areas. High-intensity fires that remove the shrub, herbaceous and microbiotic crust cover from the soil can experience substantial soil loss through wind erosion and spring melt events.

CULTURAL RESOURCES

The monument/refuge contains extensive, well-preserved archaeological deposits left by more than 10,000 years of human activity. This area retains traditional cultural significance to members of the Yakama, Umatilla, Nez Perce, and Colville Tribes, and the Wanapum People. Their ancestors resided on the land and used its resources and their past and present culture is tied closely with the landscape. Numerous archaeological sites have been recorded within the monument/refuge, with documentation secured at the Pacific Northwest National Laboratory and FWS monument/refuge headquarters.

Euro-Americans first visited the region with the Lewis and Clark expedition, followed by fur trappers, military units, miners, and settlers. By 1880, cattle ranches and farms were established on lands currently within the monument/refuge. The federal government acquired 1,517 square km (586 square miles) for the Hanford Engineer Works in 1943, evacuating all citizens and razing most structures. Still, historic sites have been documented throughout the monument/refuge, including the White Bluffs log cabin and ferry landing, natural gas exploration wells, mine tailings, remnants of homesteads and agricultural structures, and historic trash scatters. More recent historic sites on the monument/refuge include structures and facilities associated with Cold War activities.

RECREATION RESOURCES

Located with one-half day's drive of more than four million people, the monument/refuge provides locally and regionally significant semi-primitive opportunities for fishing, hunting, wildlife observation, photography, environmental education, and motorized and non-motorized boating. Visitors may access over 57,000 acres located on the Wahluke Unit, and over 50 miles of river along the free-flowing Hanford Reach of the Columbia River. The scenery, wildlife, and seasonal opportunities for solitude contribute to the high quality of the experience in this area. Current visitor facilities consist of access roads, parking areas and primitive boat launches in the Wahluke Unit.

Anglers from throughout the Pacific Northwest visit the Hanford Reach for the smallmouth bass, sturgeon, steelhead, and fall chinook salmon sport fisheries. The largest remaining wild fall chinook salmon spawning area in the Pacific Northwest; an internationally significant resource; is found within the Hanford Reach. The heaviest recreation use period on the monument/refuge occurs in September and October during the fall chinook runs.

The Hanford Reach offers excellent opportunities for waterfowl hunting during the fall and winter months. The Wahluke Unit is locally popular for upland bird and deer hunting.

The Hanford Reach and Wahluke Unit offer some of the best opportunities for wildlife observation in eastern Washington State. Bald eagles, common loons, white pelicans, terns, gulls, great blue and night-crowned herons, mule and white tailed deer, coyotes, porcupines and beavers are commonly observed. Outstanding opportunities for birding are available on the Wahluke Unit, especially during spring's influx of migratory song-birds. Recreationists are drawn by the showy wildflower displays throughout the monument/refuge each spring.

The Hanford Reach was found suitable for Recreational River designation under the Wild and Scenic Rivers Act (Hanford Reach of the Columbia River Conservation Study and EIS, 1994). This river segment is under interim protection status through Public Law (PL) 100-605, as amended by Section 404 of PL104-333. Interim protection is administered by the FWS.

VISUAL RESOURCES

The landscape setting within the monument/refuge is characterized by broad basins and flat plateaus interspersed with ridges, providing wide, open vistas throughout much of the area. The majority of the area is undeveloped, although the presence of roads and highways, fences, small buildings, power lines, and irrigation canals are visible in much of the area. Outstanding scenic resources include Rattlesnake Mountain, the Saddle Mountain range, the Columbia River, the White Bluffs geologic formation, sand dunes, and the unbroken expanses of shrub-steppe vegetation communities. Shrub-steppe vegetation communities constitute the region's historic landscape, and the monument/refuge provides excellent examples of the landscape witnessed by post-European explorers Lewis and Clark. Shrub-steppe vegetation communities are characterized by overstories consisting of sagebrush, bitterbrush, black greasewood, spiny hopsage, and rabbit brush, interspersed by perennial bunchgrasses and forbs. Spectacular wildflower displays are evident throughout the area each spring. Portions of the monument/refuge that have incurred surface disturbance are dominated by non-native plant communities such as cheatgrass, knapweed, thistle and skeletonweed. These monotypic plant communities appear markedly different from the historic landscape, and are undesirable from a visual resource perspective.

CONSEQUENCES OF THE PROPOSED AND ALTERNATIVE ACTIONS

The following Critical Elements of the Human Environment have been considered and would not be affected by the proposed action: Environmental Justice; Farm Lands (Prime or Unique); Floodplain; Native American Religious Concerns; Native American Trust Assets, Wastes, Hazardous or Solid; and designated Wilderness.

Under any alternative, there are no adverse effects to Threatened and Endangered Species anticipated.

Full suppression of all wildland fires would occur under all alternatives. Impacts associated with full suppression would vary with the different fuel loads associated with each alternative.

FUELS

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)

Implementing this alternative would allow for operations at the monument/refuge to continue status quo, including the continuation of prescribed fires on the Saddle Mountain Unit. Hazardous fuels would continue to accumulate, leading to an increased potential of large, high-intensity wildland fires. Control capabilities may be compromised or exceeded, and suppression expenses increased. The potential of threat to life and property would rise. Ecological degradation that would both eliminate shrubs and increase non-native plants would continue.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/Refuge Units (Proposed Action)

Implementing this alternative would allow the use of the combination of mechanical fuel manipulation and prescribed burning. Using these management tools would reduce fuels and minimize large, potentially catastrophic fires. Prescribed fires do provide short-term risk of escape in areas where fuel loads are high.

Alternative C: Full Suppression, Mechanical Treatment, No Prescribed Fire

Implementing this alternative would allow for mechanical treatment of fuels, but no prescribed fires. Mechanical manipulation would allow stacking, piling and re-arrangement of fuels on the landscape. This would reduce the ability of fires to spread, but the remaining large piles could create pockets of high intensity fires. Mechanical treatments would not be possible in many areas due to sensitive cultural and natural resources that would be affected by heavy equipment. Hazardous fuels would continue to accumulate, leading to an increased potential of large, high-intensity wildland fires. Control capabilities may be compromised or exceeded, and suppression expenses increased. The potential of threat to life and property would rise. This could lead to large destructive fires in biologically and culturally sensitive areas.

Alternative D: Full Suppression, No Mechanical Treatment, No Prescribed fire

Implementing this alternative would allow wildland fires to be suppressed, but would eliminate the use of either mechanical treatment or prescribed fire. Hazardous fuels would continue to accumulate, leading to an increased potential of large, high-intensity wildland fires. Control capabilities may be compromised or exceeded, and suppression expenses increased. The potential of threat to life and property would rise. Ecological degradation that would both eliminate shrubs and increase non-native plants would continue.

VEGETATION

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)

Under the No Action alternative all wildland fires will be suppresses and vegetation could be mechanically manipulated and prescribed fire used on the Saddle Mountain Unit.

Effects of fire on vegetation are directly related to the type of vegetation and the fire behavior exhibited by the fire. Fire intensity, temperature, flame length, duration, time of day, and season influence fire impact. Fire might kill or damage individual plants but many plants would survive through various fire adaptations. Invasive species often increase following disturbance and out-compete native plants. The presence of non-native invasive plants has altered the ability of many plant communities to progress through a natural succession process following disturbance such as fire.

High-intensity fires cause high mortality of overstory shrubs, and can potentially increase mortality and

significantly reduce the abundance and diversity of native plants. Additionally, native seed banks can potentially be destroyed by high intensity fires. This type of disturbance can make native habitat vulnerable to invasion by cheatgrass and other non-native plants. Cheatgrass can out compete native plants because of it's rapid seed dispersal, it's ability to germinate in the early winter before native plants, and because it is well adapted to repeated high intensity fires. Natural re-vegetation of burned areas has been altered with the invasion of cheatgrass. Normal succession of plant communities in areas dominated by cheat grass does not occur. This can cause permanent changes to the plant community and to ecosystem function.

Even in predominantly native plant communities, it may take many growing seasons for the plant structure and diversity to recover following a high intensity fire. Native grasses take a minimum of 3-5 years and may take as long as 10 years to recover to their pre-fire structure, depending on soil types. Shrubs may take at least 10-15 years and perhaps as long as 50 years to recover their size and structure, depending on soil types. If shrub recovery is left up to natural succession, without rehabilitation efforts, shrubs may take centuries to re-invade over large fire areas. Sagebrush, for example, only reproduces by seed following fire and seeds from reproductive plants do not fall far from the parent plant. Seeds can spread small distances by wind. Little is known about how fire effects microbiotic crust species, and how long it might take to re-establish the crust layer following fire.

Suppressing all wildland fires would benefit native vegetative communities by decreasing the acreage of the fire. Minimizing wildland fire acres burned will protect fire intolerant species of shrubs and allow their development. Sagebrush will be allowed to grow into an overstory plant in areas where repeated fires have eliminated the shrub component of the vegetative community. Mechanical treatments could be conducted to install fire breaks and prevent fires in the Saddle Mountain Unit. Preventing fires will help to restore the natural fire regime to the area by extending the amount of time between fires.

Prescribed fires could be used to prevent destructive wildland fires by reducing fuels in native communities during seasons of the year when burns would be low intensity. Also, prescribed fire could be used in areas to prepare them for restoration of native vegetation.

This Alternative provides limited ability to address accumulation of fuels, and may lead to catastrophic, destructive fires. Mechanical methods could be used to address some of the fuel concerns, but only on the Saddle Mountain Unit. Higher intensity fires would invariably occur due to increased fuel loads in all other areas.

Suppression activities may result in direct destruction of vegetation from firelines, helispot construction and other activities. These activities would impact cryptogamic layers through compaction and unearthing of these diminutive soil associated communities. Suppression activities will also have localized effects on plants, through compaction and unearthing. All disturbed areas have the potential for introduction and establishment of non-native plants. Because of this potential, the impacts from suppression activities could be more wide spread than localized, if areas are not rehabilitated following fire fighting activities.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/Refuge Units (Proposed Action)

Under this alternative, suppression would be conducted on wildland fires, vegetation could be mechanically manipulated and prescribed fire could be used on all areas of the monument/refuge. This alternative would expand the ability to manage fire for many purposes including; reestablishment of the natural fire regime, reduction of hazardous fuels accumulation, maintenance of fire breaks, management of exotic vegetation,

restoration of native communities, and improvements to wildlife habitat. Implementing a combination of suppression, controlled fire, and mechanical methods will allow for the greatest flexibility in vegetation and habitat management.

Effects of fire on vegetation are directly related to the type of vegetation and the fire behavior exhibited by the fire. Fire intensity, temperature, flame length, duration, time of day, and season influence fire impact. Fire might kill or damage individual plants but many plants would survive through various fire adaptations. Invasive species often increase following disturbance and out-compete native plants. The presence of non-native invasive plants has altered the ability of many plant communities to progress through a natural succession process following disturbance such as fire.

High-intensity fires cause high mortality of overstory shrubs, and can potentially increase mortality and significantly reduce the abundance and diversity of native plants. Additionally, native seed banks can potentially be destroyed by high intensity fires. This type of disturbance can make native habitat vulnerable to invasion by cheatgrass and other non-native plants. Cheatgrass can out compete native plants because of it's rapid seed dispersal, it's ability to germinate in the early winter before native plants, and because it is well adapted to repeated high intensity fires. Natural re-vegetation of burned areas has been altered with the invasion of cheatgrass. Normal succession of plant communities in areas dominated by cheat grass does not occur. This can cause permanent changes to the plant community and to ecosystem function.

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Prescribed burns would prevent catastrophic damage to fire tolerant species and would reduce fuel accumulations that could contribute to large and potentially dangerous conflagrations. This would help prevent native vegetation mortality associated with large, uncontrolled wildland fires. Additionally, fire

could be used as a tool to reduce populations of non-native, invasive plants, and to prepare areas for restoration to native vegetation.

Prescribed burns, especially for hazard fuel reduction projects, are often conducted during the season best suited to fire control efforts. Burning during these times of year can increase mortality rate of some plant species that are not fire adapted. Thus hazard fuel burning, in some instances, can reduce the biological diversity of an area. However, fuel reduction may limit the mortality to sensitive species that may be at greater risk if fuels remained heavy and contributed to larger more destructive fires.

Preburn preparation of a prescribed burn project might include manual manipulation of fuels prior to ignition. Mechanical manipulation could be used prior to a prescribed burn situation to pile/stack fuels and limit the impacts from prescribed burns. This manipulation might include line preparation using hand tools, wet line, or foam techniques, and the movement of downed fuels to nearby areas where they might be safely ignited. Manual manipulation may include the use of heavy equipment (dozers, front end loaders, etc.), but this use would be limited to non-sensitive sites. Individual burn plans would describe the techniques to be used under different situations.

Alternative C: Full Suppression, Mechanical Treatment, No Prescribed Fire
Under this alternative, suppression and mechanical manipulation would be combined to limit wildland fire and re-distribute fuels. Vegetation would be mechanically treated by piling/stacking to reduce fuel loads. This alternative requires a large investment in labor costs, and would be extremely expensive over the entire Monument. Some vegetation that would benefit from occasionally burning, such as wetland vegetation, or open grasslands would not be exposed to fire, and would therefore be ecologically stressed. Biologically and culturally sensitive areas may not be well managed, because mechanical treatments may not be possible in those areas. This would leave sensitive areas with heavy fuel loads and would expose them to intense fires. Activities associated with suppression operations would be similar to Alternative A.

Alternative D: Full Suppression, No Mechanical Treatment, No prescribed fire
Under this alternative, wildland fires and unpredictable ignitions would continue to occur. Vegetation would continue to be exposed to repeated burning, potentially during the growing season, in many areas. This would limit the regeneration of shrub habitat over large areas, and could negatively affect native plant communities. The inability to address un-natural accumulation of fuels, such as non-native plants, would create areas of high fuels leading to catastrophic, destructive fires. High intensity fires cause high mortality of overstory shrubs, and can potentially increase mortality and significantly reduce the abundance and diversity of native plants. High intensity fires can cause crown mortality, stem mortality, and root mortality. Additionally, native seed banks can potentially be destroyed by high intensity fires. This type of disturbance can make native habitat vulnerable to invasion by cheatgrass and other non-native plants. Cheatgrass can out compete native plants because of it's rapid seed dispersal, it's ability to germinate in the early winter before native plants, and because it is well adapted to repeated high intensity fires. Natural re-vegetation of burned areas has been altered with the invasion of cheatgrass. Normal succession of plant communities in areas dominated by cheat grass does not occur. This can cause permanent changes to the plant community and to ecosystem function. Under this alternative, it is expected that large, wildland fires would continue to repeatedly burn the Monument area, and that ecosystem values would be reduced or lost. Activities associated with suppression operations would be similar to Alternative A.

WILDLIFE
Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)

Wildlife populations would be influenced directly and indirectly by the impacts on associated vegetative communities. Direct effects refer to mortality or disturbance that results in flushing, displacement, harassment or mortality of the animal. Indirect effects refer to modification of habitat and/or effects to prey species. The ability of wildlife to survive a fire depends upon the season, uniformity (or patchiness), severity and intensity of the burn, and the size and duration of the fire, as well as the animal's mobility and habitat use patterns.

Full Suppression of all wildland fires would limit direct effects to wildlife minimizing acres burned.

Indirect effects, the effects associated with changes to habitat must be considered with respect to the analysis of vegetation impacts. Referring to the vegetation section above, under this alternative, shrub-steppe dependant wildlife (see Affected Environment) would benefit from suppression actions that would retain shrub communities on the landscape. Sagebrush is either a food source or provides nesting, resting, thermal and escape cover for a wide variety of species. Other value for wildlife includes the thick canopy which protects understory forbs that can be a valuable food source for wildlife. Minimizing acres burned would help retain vegetation structure, native plant communities and continue to limit the spread of native non-native invasive plants.

There is potential for inadvertent wildlife habitat destruction during suppression activities (e.g., fireline construction). However, the benefit of attempting to protect or prevent larger fires may mitigate the smaller localized habitat alterations needed for suppression efforts. Attempting to keep wildland fires small in size will more closely mimic the historical fire regime.

Limited prescribed fire would benefit habitat on the Saddle Mountain Unit. Habitat could be protected from large, high intensity, high severity burns through the use of mechanical fuels reduction and the use of prescribed fire. Applying prescribed fires allows for greater flexibility in planning for, locating, and avoiding disturbance to wildlife populations. Habitat impacts would be determined by prescribed burn timing, location, conditions, and patterns. This would reduce impacts from unplanned ignitions in these areas.

On the areas of the Monument where there would be no prescribed fire, the increased fuel loads and increased probability of intense wildland fires may lead to increased direct impacts on wildlife and potential fire-caused mortalities. Severe impacts to habitat in areas of high fuel accumulations would also lead to indirect effects on wildlife populations. The displacement of individuals, followed by decreases in productivity, and reduced populations could result from large scale wildland fires. The elimination of shrub-steppe obligate species over large areas could occur with the wide scale elimination of shrub cover. Riparian wildlife would be affected by intense burns in riparian zones, because the structure would no longer be there to support nesting, hiding, roosting, or escape cover. Riparian vegetation also provides shade, temperature moderation, and hiding cover for fish. Removal of this cover could have negative impacts on fish. Alternatively, letting vegetation become too dense in shallow water areas also may cause adverse impacts on fish populations in several areas. Aged, decadent, or even non-native streamside vegetation would continue to alter the structure of riparian zones at alarming rates.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/Refuge Units (Proposed Action)

This alternative would allow greater flexibility in planning for, locating, and avoiding disturbance to wildlife populations. The ability of wildlife to survive a fire depends upon the season, uniformity (or patchiness), severity and intensity of the burn, and the size and duration of the fire, as wells as, the animals

mobility, and habitat use patterns. Because burns could be well planned, direct impacts to wildlife could be avoided. Indirect or habitat impacts would be determined by prescribed burn timing, location, conditions, and patterns. In general, all burns would be planned to improve habitat areas for wildlife. Thus, both direct and indirect impacts would be minimized. Considering the large size of the refuge, and the modest proposed prescribed fire program, any impacts to wildlife would be minimal and temporary. No long-term changes in population are anticipated. Using prescribed burning on the Monument would help to protect habitat conditions from large, catastrophic fires that could have long-term, negative effects on wildlife populations.

As in Alternative A, suppression efforts would benefit shrub-steppe obligates by re-establishing a longer fire regime (time between fires) and allowing the development of a shrub overstory in areas where that component of the vegetation has been eliminated through repeated fires. Suppression will also protect riparian areas, and native plant communities. Applying fire in small, controlled burns will allow a mosaic of habitats to develop, and will serve to more closely mimic the historical fire regime.

Mechanically treating excessive fuels, such as non-native plants, will reduce impacts from both prescribed fires and wildland fire. Fuels reduction will promoted less intense burns and will protect wildlife from direct effects of fire, and will reduce the indirect effects on wildlife habitat.

Proper planning and management of prescribed fires would aid in the reduction of ash and other contaminants that might be washed into streams, thereby minimizing impact to fish species. Timing of prescribed burning would be coordinated to minimize impacts on spawning times for fish species, and also to minimize ground cover loss and the resultant surface washing that may produce contaminates in water resources.

Impacts to the mammals and birds on the federal and state species of concern list should be temporary in nature and minor in intensity. Fire is a natural process and local wildlife evolved in the presence of fire. Mosaic burn patterns will provide refuge for small mammals and will ensure that forage for bat and bird species remains intact.

Alternative C: Full Suppression, Mechanical Treatment, No Prescribed Fire

As in Alternative A and B, suppression efforts on wildland fires would benefit shrub-steppe obligates by re-establishing a longer fire regime (time between fires) and allowing the development of a shrub overstory in areas where that component of the vegetation has been eliminated through repeated fires. Suppression will also protect riparian areas, and native plant communities. However, the inability to apply prescribed fires in a controlled manner would prevent the use of fire to promote ecological function, or to reduce fuels. This would lead to fuel build up (see Vegetation Assessment, Alternative C) and would make large, destructive fires more likely. Consequently wildlife would experience greater negative direct and indirect effects from this alternative.

Mechanical treatments could redistribute fuels away from important wildlife habitat areas, and could be piled or stacked. The exception would be in highly sensitive areas where mechanical treatments could not be used. Mechanical treatments could be timed so that they would not impact animals during important stages of their life cycle (i.e., nesting). These stacks and piles may create an undesirable habitat condition. Stacks and piles may provide un-natural habitat for predators, such as skunks, magpies, etc. which could negatively impact resident wildlife.

Alternative D: Full Suppression, No Mechanical Treatment, No prescribed fire

As in Alternative A, B, and C, suppression efforts would benefit shrub-steppe obligates by re-establishing a longer fire regime (time between fires) and allowing the development of a shrub overstory in areas where that component of the vegetation has been eliminated through repeated fires. Suppression will also protect riparian areas, and native plant communities. However, the inability to apply prescribed fires in a controlled manner would prevent the use of fire to promote ecological function, or to reduce fuels. This would increase fuel loads and increase the probability of intense wildland fires, which would lead to increased direct impacts on wildlife and potential fire-caused mortalities. Severe impacts to habitat which would occur in areas of high fuel accumulations would also lead to indirect effects on wildlife populations. The displacement of individuals, followed by decreases in productivity, and reduced populations could result from large scale wildland fires. The elimination of shrub-steppe obligate species over large areas could occur with the wide scale elimination of shrub cover. The conversion of native grassland areas to cheatgrass dominated zones severely impacts the structure and function of the habitat for native wildlife species. For example, native grassland nesting birds have decreased nesting densities in cheatgrass. Cheatgrass also does not produce the same seed crop as native wheat grasses and other bunchgrasses. Small mammals depend on heavy, nutritious sees for survival, particularly over winter, and cheatgrass seeds do not have the same nutrients as native grass seeds. Cheatgrass areas continually have lower abundance and diversity of wildlife species than other native grass, and shrub-steppe communities. Riparian wildlife would be affected by intense burns in riparian zones, because the structure would no longer be there to support nesting, hiding, roosting, or escape cover. Riparian vegetation also provides shade, temperature moderation, and hiding cover for fish. Removal of this cover could have negative impacts on fish. Under this alternative, it is expected that large, wildland fires would continue to repeatedly burn the monument/refuge, and that ecosystem values would be reduced or lost. Wildlife populations would be reduced across the area.

AIR QUALITY

The effect of smoke from wildland fires will be similar in all alternatives. The amount of smoke and dispersion cannot be controlled in wildland fire situations. Full suppression of all wildland fires should limit smoke emissions by limiting acres burned.

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)

Local air quality would be adversely affected for short periods of time during prescribed burns in the Saddle Mountain Unit from smoke and particulate matter and post-fire, wind-driven particulate matter. The type and amount of emissions would vary greatly dependent upon fuel moisture, fire intensity and other physical characteristics of the environment. The potential for large, high intensity fires which are difficult to suppress would continue to increase in the monument/refuge outside of the Saddle Mountain Unit, along with increased potential for severe episodes of air pollution and impacts to visibility. With catastrophic fire, decreased air quality effects would occur in the short term, through smoke, and in the long term, from wind-driven particulate matter.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/Refuge Units (Proposed Action)

Local air quality would be adversely affected for short periods of time during prescribed burns through smoke and particulate matter and post-fire, wind-driven particulate matter. Increases in particulate matter would be short-term and localized. The effect of particulate matter and visibility on local communities and commercial establishments would be lessened through the proper use of smoke management and public notification. The controlled nature of prescribed burns makes their effect on air quality significantly less severe than from catastrophic wildland fires. The potential for large, high intensity fires which are difficult

to suppress should decrease in the monument/refuge, along with decreased potential for severe episodes of air pollution and impacts to visibility.

Alternative C: Full Suppression, Expanded Mechanical Treatment, No Prescribed Fire
The potential for large, high intensity fires which are difficult to suppress would continue to increase in the monument/refuge along with increased potential for episodes of air pollution and impacts to visibility. Mechanical treatments could be used to redistribute fuels away from roads and thus reduce episodes of decreased visibility from high-intensity fires along travel corridors.

Alternative D: Full Suppression, No Mechanical Treatment, No Prescribed Fire
The potential for large, high intensity fires which are difficult to suppress would continue to increase in the monument/refuge, along with increased potential for episodes of air pollution and impacts to visibility. Decreased air quality effects would be both short term, through smoke, and long term, through wind-driven particulate matter.

WATER RESOURCES
Under all alternatives, full suppression of all wildland fires would maintain the soil's protective cover of vegetation, litter, and microbiotic crust cover; thus benefitting water resources by reducing overland soil erosion.

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)
Water resources adjacent to the Saddle Mountain Unit would benefit from reduced heavy fuel accumulation through prescribed fire. Reduced fuels lessens the potential for catastrophic fire and subsequent overland soil erosion.

The potential for high-intensity fires outside of the Saddle Mountain Unit would continue to increase due to accumulated fuels resulting from suppression actions. The potential for significant impacts to water resources on the Wahluke and ALE Units through erosion would increase following high-intensity fires and resultant removal of the soil's protective cover of vegetation, litter, and cryptogamic crust.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/Refuge Units (Proposed Action)
Because of the controlled area, timing, and intensity of prescribed burning, water resources should incur little or no long-or short-term changes within the prescribed burn areas. Rehabilitation would minimize erosive effects from fireline construction and other ground disturbing activities. Moderate intensity burns have been shown to aid in increasing grass and forb growth, which would reduce surface runoff. Erosion resulting from this alternative should approximate natural erosion levels.

Alternative C: Full Suppression, Mechanical Treatment, No Prescribed Fire
Implementation of this alternative would increase the potential for high-intensity fires throughout the monument/refuge due to accumulated fuels resulting from suppression actions. Mechanical treatments would be used to limit the intensity of wildland fires and redistribute fuels, but the overall effectiveness of this method is uncertain due to high costs and constraints in sensitive areas. Biologically and culturally sensitive areas may not receive mechanical treatments, leaving these areas with heavy fuel loads and greater potential for catastrophic fires. The potential for significant impacts to water resources through erosion would increase following high-intensity fires and resultant removal of the soil's protective cover of vegetation, litter, and cyrptogamic crust.

Alternative D: Full Suppression, No Mechanical Treatment, No prescribed fire
Implementation of this alternative would increase the potential for high-intensity fires throughout the monument/refuge due to accumulated fuels resulting from suppression actions. The potential for significant impacts to water resources through erosion would increase following high-intensity fires and resultant removal of the soil's protective cover of vegetation, litter, and cyrptogamic crust.

SOILS

Under all alternatives, full suppression of all wildland fires should reduce burned acreage in the short term. The soil's protective cover of vegetation, litter, and cryptogamic crust would be maintained; thus benefitting soil resources by reducing erosion. Suppression activities would have some localized impacts to protective cryptogamic crust through compaction and unearthing.

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)
Long-term impacts of this alternative, with increased potential for catastrophic fire outside the Saddle Mountain Unit, would have overall adverse impacts to soils. Diurnal temperature regimes would be altered from effects of catastrophic fire due to loss of shading and insulating cover. Fire suppression activities could severely impact soils during episodes of catastrophic fire. Some erosive effects would result from the construction of firelines and other ground disturbing activities. Soils stripped of vegetative cover are likely to suffer severe erosion during windstorms and spring melt run-off events.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/Refuge Units (Proposed Action)
Because of the controlled area, timing, and intensity of prescribed burning throughout the management area, impacts to soils should be reduced compared to Alternative A. Erosive effects from fireline construction and mechanical treatment may be mitigated with careful planning. Through prescribed burning, fire intensity is lower and designed to burn in mosaic patterns, which prevents soils from sheet erosion and has the effect of increasing interception of precipitation.

Alternative C: Full Suppression, Mechanical Treatment, No Prescribed Fire
Suppression and mechanical treatment would be combined to limit wildland fire and fuel loading. Vegetation would be mechanically treated by piling/stacking to reduce fuel loads, redistribute fuel and limit the intensity of wildland fires, but the overall effectiveness of this method is uncertain due to high costs and constraints in sensitive areas. In these areas, diurnal temperature regimes would be altered from effects of catastrophic fire due to loss of shading and insulating cover. Fire suppression activities could severely impact soils during episodes of catastrophic fire. Some erosive effects would result from constructing firelines and other ground disturbing activities. Soils stripped of vegetative cover could suffer severe erosion during windstorms and spring melt run-off events.

Alternative D: Full Suppression, No Mechanical Treatment, No prescribed fire
Long-term impacts of this alternative, with increased potential for catastrophic fire, would have adverse impacts to soils. Diurnal temperature regimes would be altered from effects of catastrophic fire due to loss of shading and insulating cover. Fire suppression activities might severely impact soils during episodes of catastrophic fire. Some erosive effects would result from fireline construction and other ground disturbing activities. Soils stripped of vegetative cover could suffer severe erosion during windstorms and spring melt run-off events.

CULTURAL RESOURCES

Cultural resources would be protected under all alternatives through the use of low impact wildland fire suppression tactics (e.g. cold-trailing, using water, using natural and manmade barriers, avoiding surface disturbance and high-intensity burning in sensitive areas). Cultural resources would be protected under all alternatives using prescribed fire by designing fire intensity and use of mechanical treatment to minimize impacts.

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)
Outside of the Saddle Mountain Unit, potential for damage to cultural resources from fire would increase in the long-term. Because of increased potential for catastrophic fire, there would be an increased possibility that previously unrecorded cultural resources could be damaged or destroyed as a result of fire suppression activities and heat damage.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/Refuge Units (Proposed Action)
With the scheduled nature of burning under this alternative, there would be an ability to plan for, locate, and avoid the disturbance of cultural resources due to either ignition or fire control activities. Dangerous fuel buildups near known resources would be reduced. Cultural features, structures, and other resources would receive increased protection by reducing fuels and fire intensity by conducting controlled burns in appropriate areas.

Alternative C: Full Suppression, Mechanical Treatment, No Prescribed Fire
The potential for damage to cultural resources from fire would increase in the long-term due to the increased potential for catastrophic fire. There would be an increased possibility of destruction of previously unrecorded cultural resources as a result of fire suppression activities, and through heat damage. Culturally sensitive areas may not receive mechanical treatments, leaving these areas with heavy fuel loads and greater potential for catastrophic fires.

Alternative D: Full Suppression, No Prescribed Fire, No Mechanical Treatment
The potential for damage to cultural resources from fire would increase in the long-term due to the increased potential for catastrophic fire. There would be an increased possibility of destruction of previously unrecorded cultural resources as a result of fire suppression activities and through heat damage.

RECREATION RESOURCES
Under all alternatives, full suppression of wildland fires would benefit recreation resources by preventing shrub-steppe habitats from burning, thus retaining the historic landscape and maintaining wildlife populations through habitat protection.

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)
Prescribed fire would benefit recreation resources indirectly through beneficial impacts to Saddle Mountain wildlife habitat. Outside of the Saddle Mountain Unit, the potential for negative impacts to recreation resources from fire would increase in the long-term due to the increased potential for catastrophic fire. Essential habitat for wildlife could be lost, or removed for several decades following a large fire. Wildlife habitat loss would likely result in declining wildlife populations and related outdoor recreation opportunities such as hunting, wildlife observation and photography would be reduced.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/Refuge

Units (Proposed Action)
Prescribed fire would benefit recreation resources indirectly through beneficial impacts to wildlife habitat throughout the monument/refuge. This alternative would allow greater flexibility in protecting wildlife habitat and wildlife populations, with consequent benefits to related outdoor recreation opportunities such as hunting, wildlife observation and photography.

Alternative C: Full Suppression, No Prescribed Fire
The potential for damage to recreation resources from fire would increase in the long-term due to the increased potential for catastrophic fire. Essential wildlife habitat could be lost, or removed for several decades following a large fire. Wildlife habitat loss would likely result in declining wildlife populations and related outdoor recreation opportunities such as hunting, wildlife observation and photography would be reduced.

Alternative D: Full Suppression, No Mechanical Treatment, No prescribed fire
The potential for damage to recreation resources from fire would increase in the long-term due to the increased potential for catastrophic fire. Essential wildlife habitat could be lost, or removed for several decades following a large fire. Wildlife habitat loss would likely result in declining wildlife populations and related outdoor recreation opportunities such as hunting, wildlife observation and photography would be reduced.

VISUAL RESOURCES
Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)
Under this alternative, prescribed fires would occur on Saddle Mountain Unit only. Prescribed fires would have short-term impacts to visual resources such as blackened ground, vegetation removal, and air-borne particulate matter. These impacts would be reduced as vegetation is reestablished in the relatively small burned area. Visual resources in other areas of the monument/refuge could be drastically impacted through the greater potential for large, high-intensity fires. Opportunities to control impacts to sensitive visual resources are limited with catastrophic fires. These types of high-intensity fires result in both short-term and long-term impacts to visual resources. Short term effects could include reduced visibility from smoke, post-fire wind erosion causing dust storms, and a short-term black appearance to the landscape. Long-term visual impacts could occur through exotic species invasion and alteration of historic shrub-steppe vegetation communities of burned areas.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/Refuge Units (Proposed Action)
Through the use of prescribed burns, areas with sensitive visual resources could be protected from fire throughout the monument/refuge. Short-term visual effects would consist of scorching of foliage, blackened earth, and airborne particulate matter. Carefully planned prescribed fires would be beneficial to the historic landscape by more closely mimicking the historical fire regime.

The reduced risk of catastrophic fire would in turn reduce the potential of long-term visual resource impacts resulting from soil loss and exotic species invasion.

Alternative C: Full Suppression, Expanded Mechanical Treatment, No Prescribed Fire
Mechanical manipulation would allow stacking, piling and re-arrangement of fuels on the land scape to reduce the ability of fire ignitions to spread, but large piles and stacks would remain. These fuel stacks would be out of character with the historic landscape.

Alternative D: Full Suppression, No Mechanical Treatment, No prescribed fire
Visual resources in other areas of the monument/refuge could be drastically impacted through the greater potential for large, high-intensity fires. Opportunities to control impacts to sensitive visual resources are limited with catastrophic fires. These types of high-intensity fires result in both short-term and long-term impacts to visual resources. Short term effects could include reduced visibility from smoke, post-fire wind erosion causing dust storms, and a short-term black appearance to the landscape. Long-term visual impacts could occur through exotic species invasion and alteration of historic shrub-steppe vegetation communities of burned areas.

SAFETY

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)
Both wildland and prescribed fires can affect public safety because of smoke. Smoke can obscure visibility affecting transportation. Additionally, smoke can impact people with respiratory problems. Usually, prescribed fires are smaller than wildland fires and generate decreased amounts of smoke. Furthermore, smoke management guidelines require management ignitions to occur when smoke dispersion is favorable.

Prescribed burns generally occur under conditions that promote firefighter safety. Because prescribed fires often prevent, or at least reduce the size and intensity of, wildland fires, prescribed fire diminishes firefighter exposure to the dangers of subsequent wildland fires.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/refuge/Refuge Units (Proposed Action)
This alternative would have the same general impact as Alternative A, but B is more desirable than A because both firefighter and public safety are enhanced by increased prescribed burning.

Alternative C: Full Suppression, No Prescribed Fire
This alternative eliminates the exposure of both firefighters and the public to prescribed burning conditions. Although prescribed burning occurs under managed conditions, firefighters are exposed to the hazards of fire during the operation. Since smoke from wildland fires impacts both public transportation and public health, this alternative would diminish the smoke effects if the mechanical treatment is effective.

Alternative D: Full Suppression, No Mechanical Treatment, No prescribed fire
Similar to alternative C, this alternative eliminates the exposure of both firefighters and the public to prescribed burning conditions. However, the smoke from wildland fires that impacts both public transportation and public health would increase the smoke effects from this alternative.

OVERALL PROGRAM RISK

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)

Prescribed fire is used to meet two general objectives: hazard fuel reduction and resource management. The exclusion of prescribed fire on 90% of monument/refuge lands results in limitations on meeting these general objectives on a majority of the Monument/refuge property. The uneven application of prescribed fire techniques on large sections of the Monument/refuge will lead to public misunderstanding of the different strategies on different portions of the landscape. Failure to address hazardous fuel accumulations on a large segment of the landscape could promote an initiating fire to spread into fragile habitat.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/refuge/Refuge Units (Proposed Action)

As stated above, prescribed fire is used to meet two general objectives: hazard fuel reduction and resource management. Burning hazardous fuels under controlled conditions emulate the natural process as well as is cost effective. Similarly, using fire for resource management emulates a natural process. The uniform approach to hazard fuel reduction minimizes the risk for fires to spread onto the Monument/refuge interior.

Alternative C: Full Suppression, No Prescribed Fire

Reliance on both mechanical and chemical treatments can cause damage to the landscape as equipment is used on fragile soils and has environmental consequences as chemicals are introduced into the environment. Because these processes are both labor intensive and costly, the potential for failure to complete a treatment is high. The resultant accumulation of fuel may promote an unwanted fire to spread onto Monument/refuge land.

Alternative D: Full Suppression, No Mechanical Treatment, No prescribed fire

This ecosystem generates hazardous fuels annually. Failure to remove these hazards may allow an initiating fire to easily spread onto any part of the Monument/refuge landscape. The resultant wildland fires will be larger, increasing the likelihood that a point will experience a shorter fire free interval, and change the biological diversity as fire intolerant species are removed.

CUMULATIVE IMPACTS

Alternative A: Full Suppression, Mechanical treatment, Prescribed Fire on Saddle Mountain Unit Only (No Action)

Implementing this alternative would have both positive and negative impacts on Monument/refuge resources. Suppression would benefit the predominantly native communities, by creating a longer fire return interval that more closely resembles the historic fire regime. This would benefit monument/refuge/refuge management projects aimed at restoration of the native plants and ecosystem structure. This would also benefit monument/refuge/refuge objectives for preservation of historic, cultural, visual, aesthetic and recreation resources. Suppression activities would result in localized adverse resource impacts from firelines and other activities. But these impacts would be potentially mitigated by preventing fire over large areas, and rehabilitating areas damaged through suppression efforts.

Mechanical treatments could be used to maintain fire breaks to prevent fire, and to reduce fuel loads in localized areas. These treatments augment efforts of the monument/refuge/refuge management to control non-native, invasive species and to reduce build up of vegetation along road ways and in public use areas, such as parking lots. The negative impact from this on monument/refuge/refuge operations is that it requires a large amount of labor and expense. Personnel would have to invest large amounts of time to

mechanically treat fuels, or be taken off other tasks to conduct fuel reduction operations.

In the Saddle Mountain Unit only, prescribed fire could be used to reduce hazardous fuels accumulation, maintain fire breaks, eliminate exotic vegetation, restore native communities, improve wildlife habitat, and restore and maintain the historic landscape. Across the rest of the monument/refuge, particularly areas affected by non-native, invasive plant species, suppression combined with the lack of prescribed fire would create a gradual and unnatural increase in fuel accumulations leading to increased potential of wildland fires of greater size and intensities than would occur under natural fire regimes. The potential for inadvertent wildlife habitat destruction could occur from large catastrophic fires and fire suppression activities. Repeated large fires will continue to reduce the native plant cover, increase non-native plant communities, decrease the biodiversity of the site and cause degradation of the intact ecosystems represented on the monument/refuge. This alternative would increase the potential for severe episodes of air pollution due to accumulated fuels, especially given that wildland fires often occur simultaneously region-wide. The potential for large, high intensity fires further contributes to vegetation and land impacts with associated runoff to hydrologic resources, again with simultaneous fires region-wide increasing the magnitude of the effect. There would be an increased possibility of destruction of existing and previously unrecorded cultural resources. Risk to historic structures increases as the chance for a catastrophic fire increases. The occurrence of catastrophic fires resulting from high fuel loadings poses a threat to the safety of both firefighters and the public. The potential of threat to life and property rises. As fire hazards increase due to the continuing buildup of fuels, the magnitude of the suppression effort would rise as would associated suppression costs. This alternative would limit the monument/refuge manager in the ability to protect the objects of antiquity for which the monument/refuge was established.

Alternative B: Full Suppression, Mechanical treatment, Prescribed Fire on All Monument/refuge/Refuge Units (Proposed Action)

No adverse cumulative impacts would be expected from the Proposed Action alternative. Suppression efforts would be employed to limit damage to resources from unplanned wildland fire. Suppression would benefit the predominantly native communities, by creating a longer fire return interval that more closely resembles the historic fire regime. This would benefit monument/refuge management projects aimed at restoration of the native plants and ecosystem structure. This would also benefit monument/refuge objectives for preservation of historic and cultural resources, and visual, aesthetic and recreation resources. Suppression activities would result in localized adverse resource impacts from firelines, helispot construction and other activities. But these impacts would be potentially mitigated by preventing fire over large areas, and rehabilitating areas damaged through suppression efforts.

Mechanical treatments could be applied throughout the monument/refuge as in Alternative A, Cumulative Impacts. The use of mechanical treatments to prepare prescribed fire areas would expand to include the entire monument/refuge. Mechanical fuels reduction would augment other monument/refuge programs for vegetation management, including non-native and invasive plant species control. Mechanical preparations could also enhance monument/refuge restoration programs.

Expanded prescribed fire would give the monument/refuge managers the greatest flexibility to reestablish the natural fire regime of the monument/refuge/refuge, to reduce hazardous fuels accumulation, maintain fire breaks, eliminate exotic vegetation, restore native communities, improve wildlife habitat, and restore and maintain the historic landscape. Fire could be used to reduce un-wanted vegetation, and to improve native vegetative communities, when necessary. As stated above, prescribed burns could be planned to have little impact on biological resources, cultural resources, visual and recreation resources. These practices will reduce the chance of a large, destructive wildland fire causing widespread resource damage.

The historical fire regime could begin to be re-established with smaller, low intensity prescribed fires. Monument/refuge management activities such as vegetation control, wildlife habitat improvement and restoration would be enhanced through the ability to use prescribed fire.

Local air quality would be affected for short periods of time during prescribed burns, with air quality returning to normal following the completion of burning. Effects of smoke from prescribed fires throughout the basin may be mitigated with careful planning. Particulate matter would be the primary pollutant with localized effects. The controlled nature of these burns would make the effect on air quality much less severe than from catastrophic wildland fires. Similarly, impacts to water quality from surface runoff would be reduced when compared to the other alternatives. There should be little or no long- or short- term changes in soils within the prescribed burn areas. Some erosive effects would result from the construction of firelines and other ground disturbing activities. There is a potential safety problem from prescribed fires that might cross control lines, but back-up resources would be notified and available for continency response.

This alternative would allow the monument/refuge managers the greatest flexibility in protection of the objects of antiquity for which the monument/refuge was established. Management actions could be designed to meet established monument/refuge planning goals (when established), and to meet the following fire management goals; reduce hazardous fuels accumulation, maintain fire breaks, eliminate exotic vegetation, restore native communities, improve wildlife habitat, and restore and maintain the historic landscape.

Alternative C: Full Suppression, Mechanical Treatment, No Prescribed Fire
Under this alternative some cumulative impacts would be negative, particularly with respect to the ability to reduce hazardous fuels using mechanical treatments without prescribed fire.
Suppression would have similar cumulative effects as above in Alternatives A and B.

Mechanical treatments would be expanded to reduce hazardous fuels across the entire monument/refuge.

Mechanical treatments could be used to maintain fire breaks to prevent fire, and to reduce fuel loads in localized areas. The sheer size and nature of the monument/refuge makes fuel reduction over large areas difficult. The negative impact from this on monument/refuge/refuge operations is that it requires a large amount of labor and expense. Personnel would have to invest large amounts of time to mechanically treat fuels, or be taken off other tasks to conduct fuel reduction operations.
Fuels would most likely continue to build in many areas, and could lead to large fires.

Elimination of prescribed fire would allow build-up of excessive hazardous fuel loadings, encourage accumulation of vegetative debris, and would preclude improving plant vigor and rejuvenation and restoration of vegetative stands. Prescribed fire could not be used to simulate the ecological effects of natural fire, to reduce hazard fuels, to control non-native and invasive vegetation, or to prepare areas for restoration. Larger more destructive wildland fires would likely occur. The potential for inadvertent wildlife habitat destruction could occur from large catastrophic fires and fire suppression activities. Repeated large fires will continue to reduce the native plant cover, increase non-native plant communities, decrease the biodiversity of the site and cause degradation of the intact ecosystems represented on the monument/refuge.

This alternative would increase the potential for severe episodes of air pollution due to accumulated fuels, especially given that wildland fires often occur simultaneously region-wide. The potential for large, high

intensity fires further contributes to vegetation and land impacts with associated runoff to hydrologic resources, again with simultaneous fires region-wide increasing the magnitude of the effect. There would be an increased possibility of damage and/or destruction of existing and previously unrecorded cultural resources. Risk to historic buildings increases as the chance for a catastrophic fire increases. The occurrence of catastrophic fires resulting from high fuel loadings poses a threat to the safety of both firefighters and the public. The potential of threat to life and property rises. As fire hazards increase due to the continuing buildup of fuels, the magnitude of the suppression effort would rise as would associated suppression costs. This alternative would limit the monument/refuge manager in the ability to protect the objects of antiquity for which the monument/refuge was established.

Alternative D: Full Suppression, No Mechanical Treatment, No prescribed fire
Under this alternative wildland fires would be suppressed, but no mechanical or prescribed fire would be used. Elimination of mechanical treatments and prescribed fire would allow build-up of excessive hazardous fuel loadings, encourage accumulation of vegetative debris, and would preclude improving plant vigor and rejuvenation and restoration of vegetative stands. Prescribed fire could not be used to simulate the ecological effects of natural fire, to reduce hazard fuels, to control non-native and invasive vegetation, or to prepare areas for restoration. Larger more destructive wildland fires would likely occur. The potential for inadvertent wildlife habitat destruction could occur from large catastrophic fires and associated fire suppression activities. Repeated large fires will continue to reduce the native plant cover, increase non-native plant communities, decrease the biodiversity of the site and cause degradation of the intact ecosystems represented on the monument/refuge.

This alternative would increase the potential for severe episodes of air pollution due to accumulated fuels, especially given that wildland fires often occur simultaneously region-wide. The potential for large, high intensity fires further contributes to vegetation and land impacts with associated runoff to hydrologic resources, again with simultaneous fires region-wide increasing the magnitude of the effect. There would be an increased possibility of damage and/or destruction of existing and previously unrecorded cultural resources. Risk to historic buildings increases as the chance for a catastrophic fire increases. The occurrence of catastrophic fires resulting from high fuel loadings poses a threat to the safety of both firefighters and the public. The potential of threat to life and property rises. As fire hazards increase due to the continuing buildup of fuels, the magnitude of the suppression effort would rise as would associated suppression costs. This alternative would limit the monument/refuge manager in the ability to protect the objects of antiquity for which the monument/refuge was established.

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