Intermingled allotted, tribal, and deeded tracts constrain fire management options and operations. The Tribe holds the Big Horn Mountains as a cultural reserve and does not permit logging in those lands.

3.2 Status of Adjacent Lands

The Reservation is comprised of and surrounded by public and private lands of diverse jurisdictions. Adjoining lands' fire protection is administered by Yellowstone County, Carbon County, Treasure County, Big Horn County, Montana and Sheridan County, Wyoming; the Bureau of Indian Affairs for the Northern Cheyenne Reservation; the Bureau of Land Management (BLM); the Forest Service (USFS) Custer National Forest; the National Park Service (NPS) Bighorn Canyon National Recreation Area and Little Bighorn Battlefield; State of Montana trust lands; and private landowners. Cooperative agreements for fire suppression exist with many of these agencies; however, their management plans are each unique. Certain high-elevation lands within the Custer National Forest are Research Natural Areas and Wilderness Study Areas eligible for federal Wilderness designation, but they do not adjoin the Reservation.

3.3 Air Resources

Air quality is of critical importance to inhabitant comfort, human health, scenic vistas, and preservation of natural systems. Many elements of the environment are sensitive to air pollution. These elements, including vegetation, visibility, water quality, wildlife, historic and prehistoric objects and structures, are referred to as air quality related values (AQRV).

The Northern Cheyenne Reservation downwind from the Crow Reservation is a designated Class I area under the Clean Air Act Prevention of Significant Deterioration program. Class I designation mandates the most protective requirements for protection of air quality related values (AQRV) from adverse impacts of air pollutants.

National and Montana Ambient Air Quality Standards are legally enforceable standards to protect human health. Air quality monitoring shows Big Horn County (including the Crow Reservation) in "attainment" of MAAQS standards for measured air pollutants; the nearest area of nonattainment is Billings (MDEQ, 2009). In the county, the criteria pollutants that exceeded air quality index (AQI) healthy standards at any time 2002-07 included PM_{10} (particulate matter) and SO_2 (sulfur dioxide) (EPA 2009).

Air monitoring programs at Crow Fire and Aviation measure only weather and qualitative visibility. Opportunities exist to share other agencies' collection of different parameters of air quality including particulates, dioxides, ozone, and acid deposition. While the Crow Reservation remains one of the less polluted air regions in the United States, its air quality depends on large-scale nearby industrial development (power plants and refineries) and national wildfire activity, as well as on local point sources such as industrial farming.

3.4 Water Resources

The Crow Reservation has three mountain ranges that collect winter snowmelt, which then funnels through the prairie in irrigated valleys. Annual precipitation reaches 30" in the heights of the Wolf Mountains, but is only 4" in the cold deserts west of Bighorn Canyon. Pryor Creek, the Bighorn River (which is called the Wind River in most of Wyoming), and the Little Bighorn River flow dependably year-round; other streams include Lodge Grass Creek, Sage Creek, Rotten Grass Creek, Soap Creek and Rosebud Creek. Reservoirs include 500' deep Bighorn Lake on the Bighorn River above Yellowtail Dam, Willow Creek Reservoir on

Lodge Grass Creek above Lodge Grass, and the 4-H Pond in the Wolf Mountains. Assessment and monitoring stations are operated by the Montana Department of Environmental Quality on the Bighorn and Little Bighorn Rivers (MDEQ, 2009). Both the Bighorn and the Little Bighorn valleys hold irrigation districts and ditches developed in the first decade of the 1900's.

There are approximately 1,243 miles of perennial and 9,646 miles of intermittent streams on the Reservation. Fire season in August matches the driest time of year, when many other streams hold only pockets of water. The porous limestone-based Pryor Mountains, for example, hold no surface water at all other than a small mudhole called Crater Lake. Stock tanks and ephemeral creeks are the only available water across scores of miles of the central Reservation.

Water quality on the Reservation is impacted by agricultural chemicals, feedlots and erosion; however the water remains in general less polluted by human activity than in hard-rock mining areas of Montana. Seeps in prairie farm ground are often alkalized by years of plowing.

3.5 Soils

The Bighorn Mountains hold varied geological strata. The Pryor Mountains are derived of limestones, while the eastern two-thirds of the Reservation rest on the Eagle sandstone.

Surfaces range from deep topsoils to fantastically shaped badlands. Certain soils have more trouble revegetating after disturbance than others do, depending on their local climate as well as their composition: saline, shallow, or steep soils exist across the landscape. Very little unplowed grassland prairie remains on the Reservation. Soils that have received their share of human manipulation (other than restoration) typically have higher sodium absorption ratios (SARs), salinity, and erosion potential.

Many small mines have come and gone on the Reservation; for years, the Tribe operated an Abandoned Mine Lands reclamation program mainly for small coal mines. The Pryor Mountains saw uranium exploration in the 1950's. Small oil fields were first developed near Soap Creek and Lodge Grass in the 1920's.

The Reservation is one of the great coal reserves of the United States. The Westmoreland Sarpy Creek mine is on ceded lands (with tribal mineral rights) at the northeast corner of the Reservation. As of 2009, a multi-billion dollar coal-to-liquids refinery in the Wolf Mountains is being planned.

3.6 Vegetation

Grasslands, shrublands, forests, riparian areas, and barren lands all have specific plant communities on the Reservation (Crow Natural, 2002).

The most important exotic plant in prairie areas is cheatgrass (*Bromus tectorum*), a highly fire-adapted annual grass. Exotics have entered successions in all zones; for example, riparian corridors once dominated by cottonwood are now full of Russian olive trees.

Noxious weed distribution has been best documented in travel and riparian corridors such as river and creek valleys (Montana Digital Atlas, 2009), but many mountain areas disturbed by logging have infestations. Noxious weeds vary by location on the Crow Reservation. In the Wolf Mountains, spotted knapweed, Canada thistle, common mullein, Dalmatian toadflax, sulfur cinquefoil, houndstongue, and field bindweed are present. In the East Pryors, some Canada thistle, houndstongue, and spotted knapweed exist. In the West Pryors, spotted knapweed, leafy spurge, Canada thistle, and

houndstongue have been located. Except for houndstongue and leafy spurge, the other noxious weeds are typically first found along roads in the forested areas. Houndstongue is generally moved by livestock and wildlife and will typically first be found along trails, at gates, and at areas where animals congregate or rub themselves. Leafy spurge can be moved by birds and can first be found under trees or along fences, etc. where birds frequently rest.

Harvesting of timber and the disturbances involved open those areas up to infestations of noxious weeds like Canada thistle, common mullein Dalmatian toadflax, spotted knapweed, and others. These disturbed areas (haul roads, landings, skid trails) need to be monitored for the introduction and invasion of noxious weeds for at least three years after the completion of activities. Livestock operators hauling weed infested hay is another problem that is causing the spread of noxious weeds. Operators should be using certified weed free hay.

Currently, most of the noxious weed control in the forested areas is being done by herbicide applications. Herbicides include Tordon 22K, 2,4-D, and Telar or Escort. Biological control of Dalmatian toadflax by *Mecinus janthinus* and spotted knapweed by *Cyphocleonus achates* and *Larinus minutus* is also being done at sites acceptable to the biocontrol agents.

Preventing the spread of noxious weeds is the most cost-effective means of control. Power washing vehicles and equipment, especially the undercarriage, before they move to a new location is important to reducing the movement of weed seeds and plant parts. Also, equipment and vehicles should not be driven through patches of noxious weeds, or even over individual plants-- nor should logs be dragged or skidded through these areas. Noxious weed seeds and plant parts are hauled for miles to many new sites if these precautions are not taken.

Agency monitoring of species distribution consists of a 2008 continuous forest inventory analysis and FIREMON baseline plots in forest and range lands across the Reservation.

For a neighborhood as little populated as the backcountry of the reservation, disturbance to prehistoric vegetation has been high. Relatively little untilled prairie exists on the Reservation. Much of zone 1 has been tilled historically: in 1920, prairie areas of the Reservation comprised the largest wheat farm in the world, Campbell Farming Corporation. Mountain areas with relatively poor access have less disturbed biota, but most areas where it is easy to travel have seen the advent of non-native vegetation.

Ecological Distribution in the Wolf Mountains (this and following vegetation sections come verbatim from Environmental Assessment (2008), ed. Taylor).

The timber in the Wolf Mountains is almost exclusively ponderosa pine, yet there is considerable variability between the stands. The moist north slopes support ponderosa pine/chokecherry and ponderosa pine/snowberry habitat types. The often-lush understory is a mix of serviceberry, hawthorn, mountain maple, and thimbleberry along with chokeberry and snowberry. The North Slope forest is typically even-aged, consisting of a patchwork of stands that originated in the wake of several large wildfires around 1910. Douglas-fir and Engelmann spruce are present but rare, and do not appear to regenerate well enough to increase their representation. The majority of these stands were logged in some fashion during the past 60 years.

On the opposite side of the ridge, south slopes support a mix of grassland and semi-open ponderosa pine/bunchgrass forest. Yet here too, fire has played a critical role in shaping the character of these stands. In the past, repeated light burns maintained a network of patchy,

multi-storied stands consisting of a few large trees intermingled with a number of smaller trees. In the absence of wildfire, those small trees are attaining commercial size, and pine seedlings are slowly encroaching on neighboring grasslands. The obvious differences in understory vegetation translate to substantial differences in productivity. The north slopes are, of course, the more productive of the two types. The south slope forest is much more fragmented, consisting of patches usually less than 50 acres.

The driest margins of the forest support scattered stands of Rocky Mountain juniper. These areas include exposed, dry ridges, steep south faces, and gravelly toe slopes. Here, widely fluctuating daytime temperature combined with lack of moisture during the growing season create severe growing conditions. At the opposite end of the spectrum, aspen, cottonwood, ash, and boxelder stands are mostly confined to stream bottoms and moist draws.

Since the times of the large fires, periodic smaller fires, selective logging, prescribed fire and occasional mountain pine beetle outbreaks have all influenced the structure of the present day forest. During the mid 1980's, a major pine beetle infestation killed patches of pine sawtimber throughout the Wolf Mountains, leaving conspicuous gaps in the canopy. Hardest hit were stands in the Corral and Cache Creek drainages.

Ecological Distribution in the Pryor Mountains

The Pryor Mountains support a diverse pattern of forest cover types, zoned in an elevational distribution. The major conifer species are lodgepole pine, Douglas-fir, ponderosa pine, and limber pine. Engelmann spruce and subalpine fir, confined to wetter areas, are present in small amounts, although subalpine fir is successfully regenerating under lodgepole pine. The woodland portion consists of a cottonwood dominated stream bottom forest and widely scattered, sometimes extensive, upland aspen groves. In the riparian forest, green ash and box elder are common associates. In the Pryors, aspen is intermingled with mountain grasslands and lodgepole pine stands.

The limber pine type, found along the dry margin of the forest, is the most widespread elevationally. It ranges widely, from dry foothill locations (4,800 ft) along the grassland fringe to the steep, south and west facing upper slopes (6,600 ft) of the larger drainages. By comparison, the less extensive ponderosa pine forest (4,800- 5,800 ft) is restricted to lower elevations. Generally, ponderosa pine grows on sites too warm and dry for Douglas-fir. It grows in denser stands on cool exposures and in more open, park-like stands on warm exposures. Most notable are the steep, bunchgrass dominated, southwest slopes of Pryor Canyon, which are covered with short and limby ponderosa pine.

On the adjacent north slopes, ponderosa pine graduates upslope to a Douglas-fir forest. This type, which accounts for roughly 30 percent of Pryor Mountain forestland, forms extensive stands of dense timber on most major north and east-facing slopes. The understory is shrub-dominated and ranges from a mix of snowberry and white spirea at mid elevations to buffaloberry upslope. On the steeper slopes, limestone outcrops form prominent horizontal bands of rock.

The cold and moist lodgepole pine-dominated subalpine forest is restricted to the nearly level benches of the higher plateau (6,500-7,100 ft). Engelmann spruce, Douglas-fir, and subalpine fir are present in small amounts. Spruce is usually confined to wet stringers and Douglas-fir to drier pockets. On all but the driest sites, subalpine fir is the climax species. The two most common habitat types are subalpine

fir/grouse whortleberry and subalpine fir/dwarf huckleberry. The undergrowth is dominated by arnica, elk sedge, western meadowrue, and pine grass.

The current dominance of dense, even-aged lodgepole pine arises from intense fires around 1900. By now, many of these stands have stagnated and deadfall is accumulating. As tree vigor declines, resistance (largely a matter of toxin production) to mountain pine beetle drops off. Dwarf mistletoe is a major damaging agent in the lodgepole pine stands. Witches brooms often form on infected branches. Top kill is common. Stem cankers or swellings sometimes result from stem infections by dwarf mistletoe. Height and diameter growth reductions can be significant. Tree form is often affected as well. Bark beetles sometimes attack trees weakened by dwarf mistletoe infections. In all likelihood, the fire and rebirth cycle will continue when another round of intense, stand-replacing fires destroys the existing forest. The current pattern of fire followed by thick lodgepole stands (regenerating from serotinous cones triggered by heat) will repeat itself once again.

Ecological Distribution in the Bighorn Mountains

The Bighorn Mountains, sacred to the Crow people, rise from the east side of the Bighorn River opposite the Pryor Mountains, and climb to over 9,000 feet at the Wyoming border. Several major canyons dissect the Bighorns, limiting access in many areas to the relatively flat ridge tops. The dry, exposed, south and west facing slopes are mostly barren or sparsely timbered with occasional patches of limber pine, Rocky Mountain juniper, or hardy ponderosa pine. The north and east slopes, dropping steeply into the canyons, support thick stands of trees. The composition of the forest changes with increasing elevation, ranging from ponderosa pine, Douglas-fir, and lodgepole pine on the lower slopes, to a mix of subalpine fir, Engelmann spruce, and whitebark pine at the higher elevations. The stream bottoms are spruce dominated with cottonwoods at lower elevations. Stands of aspen are often located around boggy or seasonally wet areas. Other woodland species include Rocky Mountain maple, green ash, boxelder, and chokecherry.

Bark beetles, defoliators, and root rots are endemic in the Bighorn Mountains. Mortality ebbs and flows, but seems to be increasing currently. Because the forestlands have been designated a cultural and recreational reserve, they have not been inventoried for mortality causes or potential sales. The occurrence and cause of mortality are anecdotal and not based on verifiable data.

3.7 Fauna

From review of published information and discussions with Crow Tribal members, it is estimated that 79 species of mammals, 260 species of birds, 5 species of amphibians, 14 species of reptiles, and 19 species of fish are found on the Crow Reservation at some time during the year (Wildlife: Resources, 2002). Most of these species are non-game wildlife.

Big game species include pronghorn antelope, elk, white-tailed and mule deer, buffalo, and black bear. Small game animals include white-tailed jackrabbit, snowshoe hare and mountain cottontail. The coyote is the primary predator on the reservation, but bobcats and mountain lions are also present. Fur bearers on the reservation include: Beaver, muskrat, lynx, bobcat, black bear, raccoon, red fox, coyote, badger, striped skunk, western spotted skunk, mink, ermine, and long-tailed weasel.

Raptorial birds are common throughout the area. American kestrels, marsh hawks and red-tailed hawks are rather common and nest reservation. Both bald and golden eagles occur on the Crow Reservation. Bald eagles generally are found most frequently along the Bighorn River. Both

species nest on the reservation. Prairie falcons are uncommon but probably nest on the reservation. Upland game birds include Merriam's turkey, mourning dove, blue grouse, ruffled grouse, sharptailed grouse, chukar partridge, ring-necked pheasant, and gray partridge.

On March 5, 2010, the greater sage grouse (*Centrocercus urophasianus*) was warranted protection under the Endangered Species Act. However, the U.S. Fish and Wildlife Service has determined that proposing the species for protection is precluded by the need to take action on other species facing more immediate and severe extinction threats. As a result, the greater sage-grouse is placed on the list of species that are candidates for Endangered Species Act Protection. The greater sage grouse are native to the sagebrush steppe of western North America, and their distribution closely follows that of sagebrush, primarily big sagebrush. Distribution of greater sage grouse in Montana includes the Crow Reservation.

On June 29, 2010 the U.S. Fish and Wildlife Service reinstated a proposal to list the mountain plover (*Charadrius montanus*) as a threatened species under the Endangered Species Act. The mountain plover is a small bird (17.5 cm, 7 in.) about the size of a killdeer. It is light brown above with a lighter colored breast, but lacks the contrasting dark breast-belt common to many other plovers. During the breeding season it has a white forehead and a dark line between the beak and eye, which contrasts with the dark crown (USFWS 2002). Mountain plover breeding habitat includes short-grass prairie and shrub-steppe landscapes; dryland, cultivated farms; and prairie dog towns. Plovers usually nest on sites where vegetation is sparse or absent, conditions that can be created by herbivores, including domestic livestock and prairie dogs (USFWS 2002). They breed in the western Great Plains and Rocky Mountain States from the Canadian border to northern Mexico and are also known to breed on the Crow Reservation.

The Crow Indian Reservation has habitat that historically supported three other federally listed species, including the black-footed ferret, grizzly bear, and whooping crane (Crow Tribe 2002).

Of those three, the black-footed ferret (*Mustela nigripes*) is the only endangered species under the Endangered Species Act thought to be on the reservation. The black-footed ferret is an extreme specialist, depending on the prairie dogs (*Cynomys* spp.) of North American grasslands for food and using prairie dog burrows for shelter. Last documented sighting was in 1949 (J. Gust, BIA Rocky Mountain Regional Biologist, personal communication, May 2010).

The Montana Natural Heritage Program lists as sensitive species on the Reservation the bald eagle, burrowing owl, mountain plover, long-billed curlew, and grey wolf. Six species of concern (SOC) that could potentially occur are the Merriam's and Preble's shrews, western hog-nosed snake, milksnake, spiny softshell turtle, and sauger fish.

The three sensitive bird species above all use shortgrass, mixed-grass and scrub prairie communities for breeding and nesting. They rely on the cover and openness of flat grasslands to rear their young. The continued loss of grassland habitat remains one of the greatest threats to these species' future.

The reservation is home to a wide variety of other wildlife. Reservation species common to the mountain ranges and prairie of south central Montana include mule deer, white-tailed deer, black bears, elk, coyotes, mountain lions, bighorn sheep, bobcats, pronghorn antelope, foxes, porcupines, rabbits and prairie dogs, and other small mammal species.

There are numerous species of resident and migratory birds on the reservation. Game birds such as rough, sharptail and spruce grouse, turkeys, and pheasants are present. Waterfowl species include Canada geese, mallards, redheads, American widgeons and lesser scaup. There are many species of shorebirds present, such as herons, rails, and a variety of smaller species. There are many species of songbirds and woodpeckers throughout the reservation. A variety of raptors are commonly seen, such as golden eagles, bald eagles, goshawks, kestrels, red-tailed hawks, Northern harriers, ferruginous hawks, great grey owls, great horned owls and screech owls.

3.8 Cultural Resources

The Crow Reservation harbors extensive archeological resources, from cultures and passersby at least 10,000 years ago, up through fascinating, often-unprotected historical sites. The Tribe, the Bureau of Indian Affairs, and amateur enthusiasts have developed databases of cultural sites, viewed and described with different perspectives by each.

(The following discussion of cultural resources comes verbatim from Environmental Assessment (2008), ed. Taylor). Cultural resources on the Crow Reservation encompass a wide variety of tangible and intangible resources that not only include the standard definitions of archaeological and historical sites, but also sites and areas of broader cultural importance. Many of the prehistoric sites are important not only for their scientific value, but for their traditional cultural and historic value. Some rock art sites, and some stone features (cairns and medicine wheels) continue to have religious and cultural value.

Known archaeological site types on the reservation include stone feature sites such as stone circles, cairns and rock alignments, as well as surface artifact concentrations (lithic scatters), buried camps, bison kills, and caves/rock shelters which contain evidence of habitation and rock art.

Sites dating to the historic period include a variety of buildings and structures. Most post-date the establishment of the reservation. These include residences and other commercial properties, as well as structures and facilities associated with the farming, ranching and mining activities. Nineteenth century battle sites also occur on the reservation. These include not only the well-known military battles, such as the Little Bighorn Battlefield and the Rosebud Battlefield, but also lesser-known sites of intertribal battles, such as East Pryor Creek and Grapevine Dome.

Water, mineral, plant and animal resources are important to the Crow both culturally and spiritually. While these resources are tangible, they are often considered intangible cultural resources because they have no obvious manmade modifications, and their importance may not be readily apparent to outsiders.

Many Crow traditional religious practices are personal and private. Rural tracts on the reservation can offer the seclusion needed to perform some ceremonies. Sites related to these practices can sometimes be identified by their physical remains. They include larger structures, such as Sundance lodges, as well as small personal sites, such as fasting structures and sweat lodges. Many cultural sites are not formally recorded because they leave little or no tangible evidence, and because knowledgeable tribal members do not discuss these sites out of respect for the sites and their practitioners. Consequently, many cultural and religious sites remain confidential.

Pryor Mountains and Bighorn Canyon– Cultural Significances

Located on the western side of the Crow Reservation, the Pryor Mountains rise to 8,800 feet in elevation. Because the Pryor Mountains offered a variety of plant and animal resources that could be exploited throughout the year, a wide range of archaeological and historical sites occur in these, both on and off the Crow Reservation. Prominent in both the Pryor and Bighorn Mountains are deposits of chert that offered a high quality stone material source. The steep limestone walls of many canyons also contain rock shelters and caves, many of which show evidence of human use. Extensive archaeological surveys completed on U.S. Forest Service, National Park Service and Bureau of Land Management as well as Bureau of Indian Affairs lands have documented hundreds of sites in the Pryors (Nabakov et al, 1994, Loendorf 1974). Surveys on nearby Crow lands have also documented similar densities of sites (Good and Loendorf 1974, Good 1975). Recent archaeological surveys on the Crow Reservation have been less expansive and have been restricted to small projects related to timber harvest, range improvements, roads and mineral exploration. The sites known to occur on the reservation side of the Pryors include lithic scatters, cairns, stone circle sites, bison kills, caves and rock art sites. The majority of the recorded archaeological sites occur along the major drainages in the Pryors, near springs, and in the open upland areas.

Recorded historic sites have included timber and wood frame structures, commonly related to early ranching activity. The Indian Conservation Corps (ICC) constructed some of these structures in the 1930's.

The Pryor Mountains are also culturally and spiritually important to the Crow Tribe. While minor timber cutting has been allowed, the Tribe has sought to protect the area by limiting access to non-tribal members. The tangible evidence of this importance can be seen in the numerous stone fasting (vision quest) structures, which are known to occur on both East Pryor Mountain and Big Pryor Mountain. The most notable of these are on Castle Rocks, a formation located above Pryor Gap. This formation includes both historic and contemporary vision quest sites. The revival of the Sundance occurred in the town of Pryor and many Sundance participants continue to use the Pryors for fasting.

Pryor Gap itself is important, not only as an early travel route, but also for its association with Arrow Rock and the home of the "Little People", who figure prominently in Crow beliefs. Local people continue to view the area as a prime hunting area, and use the area to gather plants and cut tepee poles.

Bighorn Mountains – Cultural Significances

The Bighorn Mountains are prominent on the Crow Reservation and rise to over 9,000 feet in elevation. Like the Pryors, the Bighorn Mountains offered the same variety of plant, animal and mineral resources in both prehistoric and historic times, and the archaeological sites in the area reflect this diversity. Archaeological surveys conducted in Bighorn Canyon prior to its flooding attest to the intense use of the canyon floor as evidenced by the numerous camps and rock shelters (Husted 1969). The Bighorn Reservoir has inundated most of these sites. The steep and eroded limestone walls of the canyons in the Bighorns contain caves and rock shelters, many of which show evidence of habitation and contain rock art. Numerous mountain springs also offered prime locations for prehistoric camps.

The Crow Tribe has restricted the development of the Bighorn Mountains, and few archaeological surveys have been conducted. The surveys that have been completed have been limited to small scale range developments, minor road improvements and fire-related

impact studies. Archaeological sites recorded in the Bighorns include lithic scatters, open camps, rock shelters, bison kill sites, rock art sites, cairns and stone circle sites. Garvin Basin, which is located between the Bighorn Mountains, and Bighorn Canyon, has been shown to contain many prehistoric sites that are in a remarkable state of preservation (Keller 2005). This is largely because of the restricted access imposed by the Tribe as well as the physical difficulty in reaching the area.

Historic sites include log and frame structures related to early ranching activity in the area. Because the Bighorns were isolated, numerous seasonal cow camps were constructed in the mountains and in Garvin Basin. Private ranchers who held leases in the area erected some structures, and the ICC erected some.

Like the Pryor Mountains, the Bighorn Mountains are historically, culturally and spiritually important to the Crow Tribe. It is for this reason that the Tribe has chosen to limit development and restrict access to the area. Tangible evidence of the spiritual importance can be seen in the numerous fasting (vision quest) sites that occur along the exposed upland ridges overlooking Bighorn Canyon. Many areas in the Bighorns have been used historically for fasting and continue to be used by current tribal members. The prehistoric and historic spiritual importance of the Bighorns can also be seen in the construction of medicine wheels, the most notable of which is the Bighorn Medicine Wheel located in the Bighorns south of the reservation in Wyoming. The Fort Smith Medicine Wheel is located on the reservation along the Bighorn River, just north of the mountains, and other medicine wheels have been reported in the Bighorns, but not formally recorded.

The presence of abundant plant and animal resources in the Bighorn Mountains contributes to the importance the area holds for the Crow Tribe. Numerous prehistoric bison jumps and kill sites are known to exist, in the area, particularly in the vicinity of Grapevine and Dryhead Creeks. The placement of the Crow buffalo herd in the Bighorns demonstrates the significance of this animal and the value the Tribe continues to place on the area. Many tribal members hunt and gather plants in the Bighorns. Due to the relatively high elevations and cooler temperatures, the mountains are often used for family summer camps. The tribe has also constructed a summer youth camp in Black Canyon, which is often used by tribal programs for meetings and retreats.

Wolf Mountains – Cultural Significances

The Wolf Mountains form the divide between the Little Bighorn and Rosebud Creek drainages. With elevations of over 5,000 feet, they are not as spectacular as the Pryor or Bighorn Mountains. Geologically, the Wolf Mountains are younger and do not contain dolomite and limestone deposits, or associated cherts. Consequently, the Wolfs do not have steep eroded canyons, cave and rock shelter sites are relatively rare, and chert is not the dominant stone tool material found in prehistoric camps. Instead, sandstones, shales and coal are the dominant deposits. The sandstones may contain small rock shelters, and they offer a surface for rock art. As a result of natural coal burns, some baked shale formed into deposits of porcellanite, material used for prehistoric stone tools. Like the Pryors and Bighorns, the Wolf Mountains were important prehistorically and continue to be important for the variety of plant and animal resources offered in the area.

Unlike the Pryors and Bighorns, which are largely tribally owned and protected, land ownership in the Wolf Mountains is mixed, with allotted and private lands dominating. As a result of this ownership pattern, more access roads exist in the area. More development has also occurred. A number of cultural resources

surveys have been conducted, mostly for timber surveys and sales in the central part of the mountains, and for coal mines in the southern portions. Archaeological sites include lithic scatters, cairns, stone circle sites, bison kills, and rock art sites.

Historic sites include buildings and structures relating to early ranching activity. A well known historic site east of the Crow Reservation is the late 1800's Rosebud Battlefield, which was listed on the National Register of Historic places in 2008. Massacre Hill, which is the location of a Crow-Atsina battle, is also located in the area.

The cultural and spiritual importance of the Wolf Mountains is seen through tangible manmade rock structures representing fasting sites. Historic Crow figures known to have fasted in the Wolf Mountains include Frank Bethune, Long Hair and Wraps Up His Tail (McCleary 2005). The area continues to be used by contemporary Crows for fasting and for Sundances. Sundance structures and fasting sites are known to occur in the vicinity of Wolf Mountain Lookout.

Plant gathering and animal harvesting continue to be important in the Wolfs. Deer and black bear are common in the area, and many drainages contain abundant berry bushes. Medicinal substances such as bear-root and white clay are also collected in the Wolf Mountains.

3.9 Social and Economic Values

The Crow Reservation has unique demographics that encompass varied communities with varied values. The Agency's mandate is to protect the resources of Tribal members. Because the Reservation is a traditional land base for families of all backgrounds, many communities that use Reservation lands place high value on outdoor activities and recreation.

Many Reservation residents earn their living ranching or in work for Tribal or federal government agencies. Work at for-profit businesses on the Reservation is limited to a handful of private businesses. Nearby communities offer further employment but are off-Reservation. Education and employment successes are insufficient to maintain a comfortable standard of living for many inhabitants of the Reservation.

The Natural Resources Department of the Crow Tribe patrols backcountry and Tribal lands of the Reservation. Access to certain Tribal lands is limited to Tribal members and to others with Tribally-issued permits.

In 2007 the median household income on the Reservation was $27,044, 64% of the Montana median household income of $42,425 (US Census, 2009). Short-term temporary-hire firefighting either through the Bureau of Indian Affairs, or intermittently since 1992 through the Crow Tribe, has been a tradition for three or four generations of many families on the Reservation.

IV. ENVIRONMENTAL CONSEQUENCES

This section is the scientific and analytic basis for comparison of the alternatives described in Section III. It describes the probable consequences of each alternative on selected environmental resources. The discussion is organized by effects on resources, with each alternative's potential impacts considered on that resource.

In general, a fire's effects on an area are manifold, but depend strongly on specific fire behavior influenced by that area's fire regime, available fuels, and weather. In other words, the Alternatives remain general descriptions for wide variations in ranges of specific effects of fire. This discussion is limited to those consequences that can be clearly predicted as differing by choice of Alternative Action.

4.1 Introduction

To summarize the following section, the fire-related virtues of Alternative A, full suppression, include reducing total acres burned. Negative fire effects to ecosystems and personal and tribal property are minimized. These negative effects include destruction of built property and of economic resources such as homes, grass and timber. Alternative A limits a further list of detrimental consequences such as invasive and exotic plant infestations, smoke, and disturbance of cultural areas. However, depending on fuel types and fire regimes, Alternative A's unplanned fires will eventually result in an average of more severe fires than will the other alternatives, especially in ponderosa pines and in grasslands.

Alternatives A and C eliminate an existing and prospering fuels management program in the preferred Alternative, Alternative B, which encompasses plans to eventually use prescribed fire to mimic pre-settlement fire regimes in most of the forest management compartments across the Reservation. In 2009 the fuels program has treated more than its annual acres objective for six years. Fires burning next to or in treated areas demonstrate moderate intensities, which will eventually become commensurate with pre-settlement fires in those fuel types. The Agency's 2008 Forest Management Plan includes hazard fuels reduction projects in the Bighorns, as well as the Pryors and the Wolfs. Fuels reduction impacts are a major benefit of the preferred Alternative.

Alternative C, fires managed for resource benefit without use of prescribed fire, strikes a middle ground in the duration and cumulative impact of fires' environmental effects. Fires managed for resource benefit mimic the pre-settlement roles of fire in an ecosystem. Due to accumulation of fuels from sixty years of fire suppression, fires that burn with a modified suppression strategy often burn hot: they have negative effects from high fire intensities.

All fires have an ecological place on the Crow Reservation, but all also cause some unavoidable adverse effects: some short-term diminishment of environmental quality. For example, fire's radical alteration of wildlife habitat is often eventually balanced by a long-term contribution to habitat diversification. Impairment of air quality, including elevated concentration of fine particulates and decreased visibility, follows fires over large areas during unfavorable weather.

Overall, other factors than the Alternative chosen will play a great role in determining landscape-level ecological dynamics. Species diversity may continue to decrease on the Reservation not because of any fire management choices, but due to combinations of the effects of climate change and of increased human activity that alters the landscape, regardless of the alternative selected.

4.2 Status of Adjacent Lands

Several Federal land management agencies with lands bordering the Crow Reservation have adopted fire management objectives that share with the BIA mostly common standards for the administration and operation of prescribed fire programs, including the BLM, NPS, and USFS. Also, private landowners on and next to the Reservation conduct spring burning and other "controlled burns" in a culturally-familiar application of prescribed fire principles, with goals of soils enhancement, removal of dead vegetative cover, disease reduction, and/or insect control, as well as diminishment of future fire danger.

4.3 Air Quality

Wildland fires' primary air pollutant is particulate matter (PM_{10}), which along with other chemicals in smoke can worsen breathing ability for people with pre-existing health conditions. In the short-term for Alternatives B and C, lack of immediate complete suppression, air quality could deteriorate short-term due to two factors. First, under specific constraints and closely managed parameters, a wildland fire would be permitted to burn, creating smoke over a longer time period. Managers closely monitor the mixing height and dispersal of smoke as part of their prescribed burn operations. Secondly, a fire in an area that has not burned in a long time will have heavy fuel loadings, resulting in more burning material and more smoke. This second factor will be reduced as a natural frequent low-intensity fire cycle resumes in ponderosa pine forests, such as the Wolf Mountains.

The primary area of impact will be downwind (to the east) of the Crow Reservation, in the communities of Busby and Lame Deer on the Northern Cheyenne Reservation, a Class I area under the Clean Air Act. Under the Clean Air Act , a Class I area receives the highest level of protection, where degradation of air quality by man's activities is strictly regulated. Yet under the Clean Air Act, smoke from a naturally-caused wildland fire is not considered a man-caused activity.

Smoke impacts will occur more often under Alternatives B and C but will be less intense in Alternative B, as more intense unplanned fires will exist in Alternatives A and C. Smoke effects of Alternative B are also mitigated by allowing prescribed burning only during weather periods with good ventilation. Since perceived smoke effects on human health vary with concentration/intensity more than with seasonal duration, Alternative B will cause the least discord.

Increased smoke may affect visibility in the Class I area. Fortunately, eastern Montana's vigorous winds assure good mixing during most of the fire season. Additionally, when weather favors a wildland fire on the Crow Reservation, it is likely that local fire will be part of a Western U.S. fire bust, to which the smoke contribution from the Crow Reservation would be marginally important.

Decision not to suppress the fire could result in a larger active fire front, which would take longer to suppress following the development of weather conditions unfavorable for smoke dispersal. Weather forecasts and availability of suppression resources will be continuously monitored during all fires. The BIA will mitigate smoke impacts by taking appropriate control actions to suppress a fire, if human health and safety are threatened or if serious visibility impairment occurs. The BIA can consult with the Montana Department of Environmental Quality to determine whether smoke dispersal conditions and air quality conditions are adequate to allow fires to continue to burn.

4.4 Water Resources

Regardless of the Alternative selected, fire management planning requires best available practice to minimize impact to any locale's water resources. Prescribed burn plans, for example, require exclusion of fire from riparian areas, where fire would severely affect a water resource with ash and erosion, or reduce diversity in riparian plant communities.

Suppression operations of Alternative A and C are required to keep all fire chemicals out of streams and lakes. However, in practice, retardant drops under time pressure can degrade water resources, as can use of firefighting foam sprayed on vegetation by engine crews. As written, all Alternatives give equal emphasis to rehabilitation efforts to prevent post-fire deterioration of water quality, such as using berms.

Again, use of prescribed fire allows the maximum opportunity to fashion management for multiple objectives including maintenance of water quality. Prescribed fires can be implemented in a manner to reduce potential erosion, by burning at lower intensities on erodible areas. They are also proposed in part in order to reduce more intense unplanned fires.

4.5 Soils

Soils with less biomass are more vulnerable to erosion. Fire converts biomasses to ash and smoke, but fires of different intensities have very different effects on soils. Unplanned high-severity fires can sterilize soils by killing soil biota and microbiota. Intense fires also cause chemical and physical changes in soils that promote erosion. Burn prescriptions are written to avoid unduly heating soils, but even high-intensity surface fire can have less effect on soils than do slow burns. Hydrophobicity from glazing of soil surfaces occurs mostly from more intense fires, but baking soils deeply results more from smoldering fires in duff (or in peat, which on the Reservation is only found in small areas in the Big Horns).

Alternatives 1 and 3 will have more intense heating of soil surfaces due to more unplanned fires. Alternative 2 brings the most fire to the landscape, in a planned way. Prescribed burns of Alternative 2 can mitigate soil and vegetation baking by scraping duff away from tree stems as part of pre-burn treatment.

4.6 Vegetation

Fire has long been one of the most important influences shaping plant communities of the Reservation. The frequency with which a given area burned depended on local frequency of ignitions, plant community types, topography and microclimate. Fire as a physical process has several ecological functions:

- Maintenance of plant vigor and productivity
- Reduction of woody fuel accumulations
- Maintenance or creation of early successional stages
- An increase in plant community diversity
- An increase in forage availability and nutritional quality.

Crow Reservation plant communities all developed in landscapes frequently affected by fire. Suppression activity that removes the influences of fire on these communities alters them over time to become less diverse, as certain species, once kept out by fire, replace other more fire-adapted natives.

Native prairie and grassland plants have adapted many different strategies to survive fire. Some, such as rabbit brushes, resprout after a fire, while others such as big sagebrush must reestablish by seed following a fire. Grasses, bulbs, and large-rooted plants regrow from

underground parts after fire. Rhizomatous grasses such as western wheatgrass, and shrubs which can resprout from lateral roots, may increase in dominance in communities following fire. Other species are adapted to take advantage of reduced post-fire competition. Seeds may be stored in the soil for years and only germinate following a fire, or when seeds carried to the burned area find more favorable conditions for germination. Since fire usually sets back succession and creates openings, burned areas have a potential for noxious weed invasion.

In many prairie areas following fire, cheatgrass dominates areas formerly dominated by sagebrush and perennial bunch grasses. Areas with healthy perennial bunch grasses and forbs before a fire can sometimes recover without cheatgrass dominance. Spring prescribed burning when cheatgrass has germinated, before native grasses have come up, is one of the more effective treatments to reduce cheatgrass.

Alternative A: The effects of Alternative A on vegetation would continue as they have for the past 50 years of active fire suppression throughout the Reservation. The primary impact is the partial loss of fire's dynamic influence of reshaping the otherwise static nature of these communities. However, impacts of non-native and invasive species vary.. In general, human-caused disturbance results in a temporarily less diverse vegetative community, generally less valuable as a habitat for wildlife overall. Periodic fires create a diverse mix of areas dominated by grasses and forbs as well as different aged stands of sagebrush and other shrubs. Another impact of continued fire suppression is the expansion of certain plant communities beyond their current range: shrubby ponderosa pine has colonized many Crow country hillsides that were barren of timber in historical photographs.

Actual post-fire plant community succession is dependent upon four primary factors including:

- pre-fire plant community species composition
- fire intensity and its effect on the existing plant community
- post-fire environmental conditions including precipitation
- the availability of seeds, rhizomes or other propagules to revegetate burned areas.

Post-fire succession follows differing pathways depending on inputs of these four factors.

The preceding discussion of fire effects on the plant communities of the Crow Reservation applies to implementation of all Alternatives. Wildland fires will occur regardless of which alternative is selected. Alternative A's policy of a full suppression effort would continue to be applied to areas near homes and development (wildland urban-interface or WUI areas). These more densely inhabited areas are along highways, railroad, or riparian corridor.

Mountain and foothill areas include the quaking aspen communities on the Reservation. Since aspen stands usually depend upon fire to regenerate, Alternatives A and C could result in a decline in aspen over the long-term. Alternative B, due to its use of prescribed fire, should not allow fire management to diminish aspen stand regeneration.

Implementation of Alternative B will result in more burned acreage within foothill and mountain forested areas than has burnt within the past 50 years or more. The increase in use of fire for resource benefit is generally appropriate for the vegetation resource because it seeks to replicate pre-settlement conditions of no suppression, with heightened species distribution and diversity. The extent of the potential burned area increase is difficult to

quantify, since the number and location of wildland fire starts is unknown, and the intensity and extent of spread depends upon the specific area and weather conditions. However, Reservation fire history suggests that over the long term the total acreage burned in remote mountainous areas would increase compared to Alternative A. The acreage increase would be actively managed to generally correspond with pre-settlement patterns of fire spread.

Alternative B would permit fire to resume its role in the ponderosa pine ecosystem of the Wolf Mountains. Over the long-term, fuel levels and fire intensity would decline as natural ignitions and prescribed burns produce a mosaic of patches dominated by early successional forbs and grasses, and areas dominated by widely spaced large ponderosa pines. Prescribed burns in the Wolf Mountains in the 1990's demonstrate success at slowly restoring pre-settlement species composition in pine-forested areas that receive multiple treatments, including maintenance burns. The spatial arrangements of these mosaics vary over time; they are influenced by successional development and by periodic wild fires. After several decades of a stable application of Alternative B, total burned acreage would remain less than prehistoric totals, due to the necessity to suppress unwanted fire, but mechanical treatment would take up some of that difference. Overall, biological diversity would increase.

The spread of noxious and exotic plants is most likely to be enhanced by wildland fire disturbance in those areas with weeds already present, which includes the travel corridors of the Wolf and Pryor Mountains and most of fire management zone 1.

As of 2009, FIREMON baseline monitoring plots are prepared before any planned fire across the Reservation. The plots record species and biomass.

4.7 Fauna

The forest and range environments are fire-dependent ecosystems, which have evolved in association with fire, and will lose their character, vigor, and faunal and floral diversity if fire is excluded. Wildland fires impact wildlife both positively and negatively through changes in the availability of food and cover. The extent of these changes is dependent upon the same type of factors influencing fires' effects on vegetation. Direct effects of fire, while they do occur, are usually of short duration. Since wildland fires occur as a result of random events it is not possible to predict the specific effects on individual species. However, native plants and animals both have coexisted with wildland fires in southeast Montana for many years.

The benefits and detriments to the habitats and relative frequency of fire are subject of disagreement. Fire management actions are divided into two categories: planned and unplanned wildfires. Both can have cumulative effects on the ecosystems on the Crow Reservation and the species that depend on it. Prescribed fires are planned events with specific objectives; however, changes and variation in conditions at the site can change the actual outcome. Wildfires are less predictable and unplanned, and they have the most significant effect on individual species.

Alternative B, which includes use of prescribed fire, results in less severe fires with correspondingly lessened effects on wildlife. More acres are treated in Alternative B, covering more habitat area, but the number of acres burned in any of the Alternatives is less than the prehistoric average, due to continued fire suppression.

To the extent that wildfires alter vegetation communities by favoring early seral stage grasses and forbs (less mature communities

ecologically), species which benefit from early seral stages of plants find enhanced habitat after fire. These are grazers, grass eaters, and consumers of saplings rather than those that live among mature trees or climax communities. Species which require food or cover from older growth trees and shrubs, such as sagebrush obligates (greater sage grouse, for example), have a decrease in available habitat from increased acres burned.

The Crow Tribe through its Natural Resources Departments has inherent sovereign authority over wildlife management on the Reservation. A priority will be to work with the Crow Tribal Fish and Wildlife Department and the BIA Environmental Services to incorporate wildlife habitat information needed to set prescribed fire plans and wildlife suppression priorities related to resources:

1. Develop criteria for managing fuels and other risks to wildlife habitat.
2. Identify critical wildlife habitats and prioritize on the basis of risk of loss to wildfire.
3. Develop appropriate actions on a site by site basis.

Overall, one of the goals is to maintain a diversity of wildlife and their natural habitats and provide protection and habitat for endangered species. But the highest priorities are human life, community protection, and resource considerations. Thus, prior knowledge of Tribal and/or Federal important wildlife habitat is necessary if consideration is to be given in light of higher priorities.

4.8 Cultural Resources

Unplanned fires of Alternatives 1 and 3 often burn more severely than prescribed fires do. The benefit to cultural resources of severe fire effects includes exposing more sites for prospective data collection and analysis. Patterns of human use can become apparent that were hidden by vegetation or soil cover. The negatives of fire include the physical cracking and spalling of artifacts, diminishing their relevance for analysis.

In general, archeological resources suffer from increased fire activity, as well as from less careful suppression activity. Heat of more intense fire may alter the chemical composition of stone artifact material types. Loss of ground vegetation cover exposes cultural properties and encourages risk of looting. Also, with loss of vegetation, cultural properties are at increased risk of erosion.

An impact of either fire or of suppression may be the diminishment of plants that are used for ceremonial, medicinal or subsistence purposes.

Under each Alternative, mitigation for cultural resource protection includes consultation for all fire projects and incidents with the Tribal Historic Preservation office (THPO), and survey by BIA Regional Office archaeology staff. Sites and areas identified with archeological resources receive protection from fire in incident and management objectives.

4.9 Social and Economic Values

Many members of the Crow Tribe benefit of fire-related employment. The Administratively Determined, Emergency Firefighter (AD/EFF) program typically employs 150 to 200 people on a short-term as-needed basis during an average fire season. In past years the majority of employment opportunities were in the form of Type II crews dispatched throughout the United States. Increasingly since 2006, local use of AD/EFF provides employment opportunities in support of prescribed fire and other fuels projects, as well as in initial attack and extended attack fires. Revenue from this type of employment averages approximately $1 million

to $1.5 million annually depending on the severity of the fire season.

Although Alternative A requires suppression of all fires, Alternatives A and C provide less employment than does Alternative B, with its broader range of management options for a more diverse spectrum of fires to manage.

V. List of Preparers

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APPENDIX C

Resolution

United States Department of the Interior
BUREAU OF INDIAN AFFAIRS
Crow Indian Agency
Box 69
Crow Agency, Montana 59022

IN REPLY REFER TO:
Fire and Aviation
(406) 638-2247

October 4, 2010

Chairman Cedric Black Eagle
Crow Tribe of Indians
PO Box 400
Crow Agency, MT 59022

Dear Chairman Black Eagle,

The Bureau of Indian Affairs is required to update the Fire Management Plan. The previous plan expired on June 30, 2009, since we've been operating on an approved extension while the current plan is being developed. The Fire and Aviation Management Section has completed the new plan with consultation with the Crow Tribal Executive and Legislative Branches. Before the plan can become final and be implemented, a Joint Resolution is needed in support of the Fire Management Plan.

If you should have any questions, please call Bryce Rogers, Assistant Fire Manager at Crow Indian Agency. You can reach him at 638-22471, or you can call me at 638-2672.

Sincerely,

Frank E. Merchant
Acting Superintendent