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Man and Fire in the Central North American Grassland 1535-1890: A Documentary Historical Geography

A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Geography

by

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The dissertation of Conrad Taylor Moore is approved, and it is acceptable in quality for publication on microfilm.

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PUBLICATIONS

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ABSTRACT OF THE DISSERTATION

Man and Fire in the Central North American Grassland

1535-1890: A Documentary Historical Geography

by

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Numerous scholars have raised questions and drawn conclusions concerning the causes and ecological effects of fires and their seasons of occurrence in the Central North American Grassland prior to permanent white settlement. These have consisted of either generalized discussions or more precise local analyses. None have examined the issues in detail for the entire region or attempted to point out geographical patterns pertaining to them.

In the present study these issues are considered in the light of information contained in historical documents. Over six hundred diaries, journals and memoirs left by whites who visited or resided in the area during the period 1535-1890 were examined. Four hundred and eighteen dated fires and burns were used for regionalization of the area on the basis of seasons of fire occurrence. Four distinct regions were delimited--Northeast, Northwest, Central, and Southern. Data per-

taining to Indian tribes and white occupational groups responsible for fires, the reasons for their occurrence, and effects on plants, animals and man were analyzed for each of the regions. Lightning was not considered as a significant causal factor since only one specific historical reference was recorded.

Previous investigators have stressed the importance of spring and fall fires, but the frequent occurrence of winter fires in the Southern Region and summer fires in the other three regions seems to have gone largely unrecognized. No attempts have been made to determine responsibility for fires started by members of the various Indian tribes residing in the area. Historical data indicate that the Sioux and Apache were responsible for fires well in excess of what would have been expectable in relation to tribal populations. Soldiers, tourists, explorers, and emigrants accounted for two-thirds of the cases in which white occupational groups were mentioned. Hunting, pasturage improvement, and accident have been regarded as the most important reasons for fires started by Indians. Present findings suggest that although hunting was of major significance, it was generally of lesser importance than grass fires set for signalling purposes or those related to warfare. Pasturage improvement and accident, as well as horse stealing, were secondary causes. Fires started by whites both accidentally and to improve pasturage conditions have been mentioned as important factors. While this is supported by early accounts, fires were also frequently set for communication and pleasure. More sophisticated recent studies of the effects of fire on vegetation are in general agreement with data contained in the historical record, but discrepancies are

significant with respect to effects on animals. Deaths of both native and domesticated animals appear to have occurred much more frequently than has been recently recognized. Little attention has been directed toward the problem of the effects of fire on man. Historical citations pertaining to human deaths and injuries, and insufficient forage for transportation animals accounted for forty percent of the cases mentioned. Other travel-related problems such as obstacles created by fire-felled trees, lack of fuel for cooking, and the obscuring of trails were also frequently cited.

Chapter I

INTRODUCTION

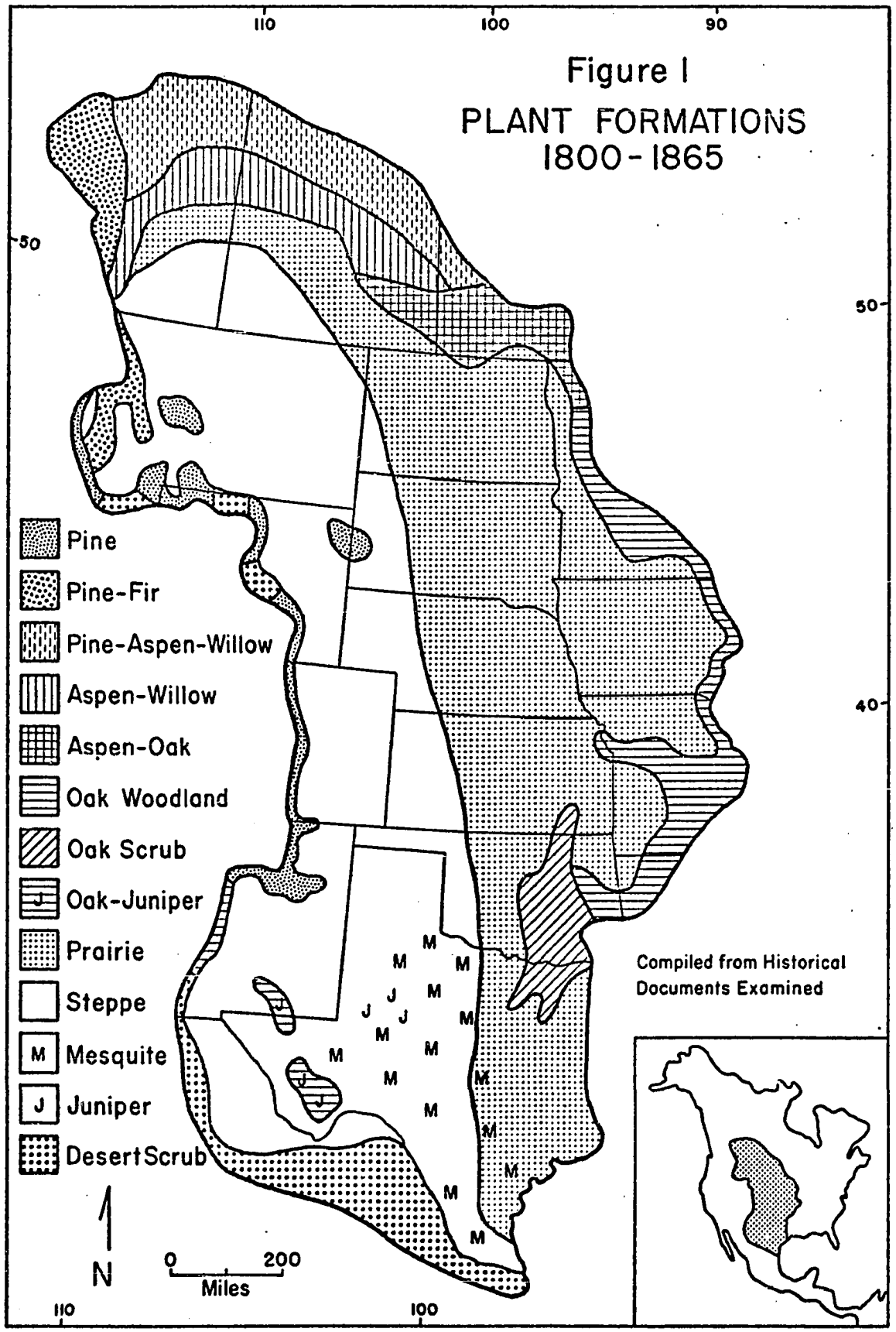
Probably in no other geographical region of the world have questions concerning the causes and ecological effects of fires generated more discussion than in the Central North American Grassland. Reasons for fires started by Indians and whites, the seasons in which fires occurred, and their effects on vegetation and animal life have been mentioned by numerous investigators. These studies have consisted of either generalized treatments for the region as a whole or more precise local analyses. None, however, have attempted to establish distinctive geographical patterns related to the occurrence of wildfires throughout the area.

In the present study an attempt has been made to re-examine some of these issues previously raised and to illustrate geographical patterns as precisely as possible from diaries, journals and memoirs written during the period 1535-1890. Research consisted of an examination of accounts left by fur trappers and traders, missionaries, military expeditions and government surveys, emigrants, early settlers, and tourists. Over six hundred of these were read. Many contained no pertinent information. The most complete and accurate data were left by fur trappers and traders and missionaries. These people were acquainted with the Indians on a first-hand basis and were usually quite aware of the biological environment and changes taking place within it. Members of military expeditions and government surveys were in many cases nearly equally well informed, frequently from Indian guides or scouts accompanying a party. Early settlers, emigrants and tourists were generally

the least well informed, although a few made exceptionally perceptive observations.

Historical references to the vegetation cover of the region, most of which were made during the first two-thirds of the nineteenth century, are nearly as fragmentary as they are numerous. However, there is general agreement on several geographical aspects. Early sources suggest a generally continuous grass cover, although few noted more than the transition from the taller grasses of the prairie to the short grasses of the steppe. Woodlands were usually quite open with grass occupying a greater area than the woody species. There was a consensus on extent of area covered by woodland formations, although observers varied considerably in the degree of species description recorded. In the context of common names, some mentioned dominant species and those of secondary importance. Others omitted the latter and made only scant reference to the former. Desertic vegetation was present in the southern and western periphery of the steppe, but areal extent was indefinitely indicated. Most description was couched in generalities such as "brush" and "cactus," although occasional reference was made to a few species.

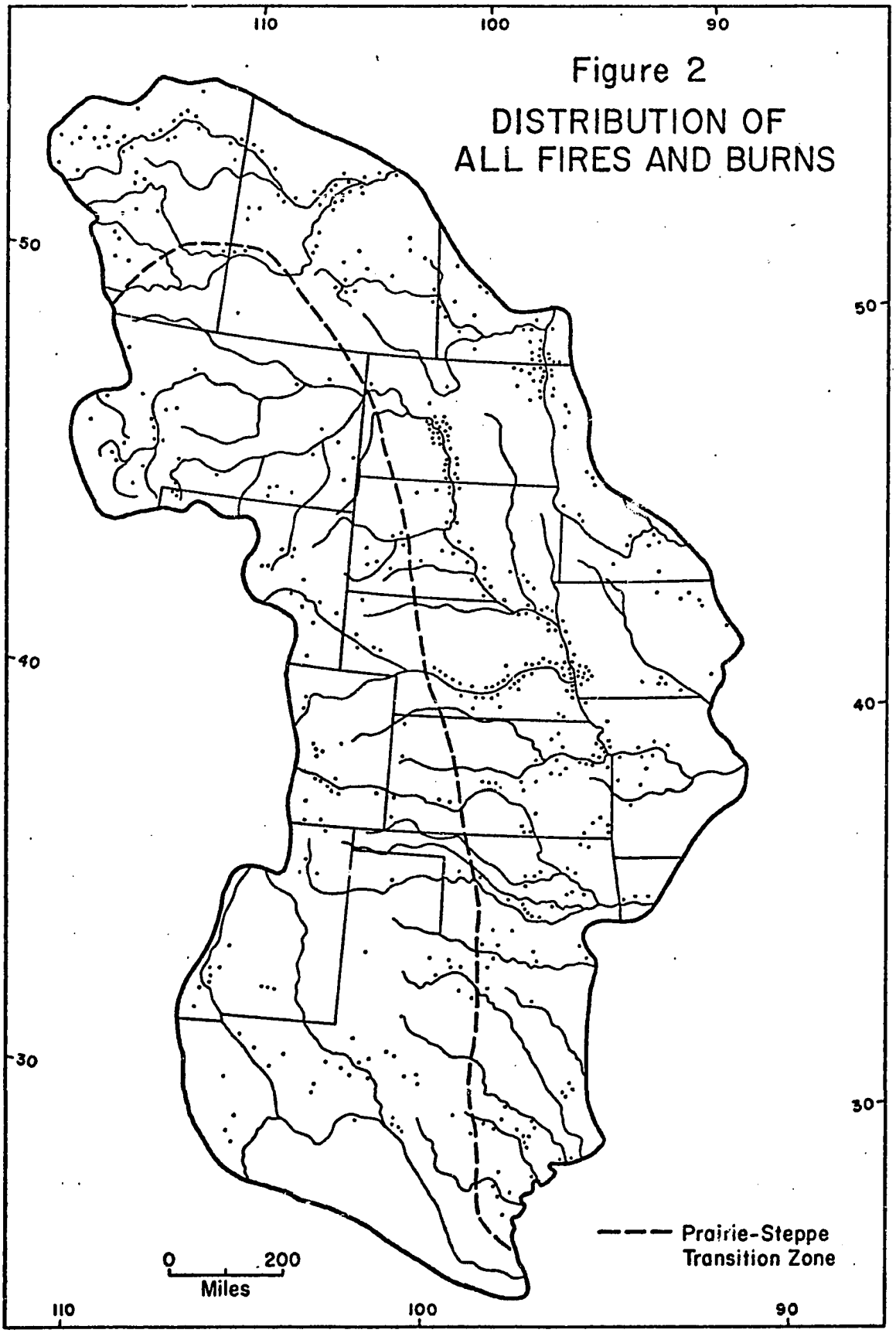
When considered collectively, the sources provide a basis for a generalized reconstruction of the vegetation prior to white settlement. Symbols for the various types of plant cover noted in historical documents were plotted on a base map. A vegetation map was then made in which boundaries were drawn delimiting the grassland region and the plant formations within it (Figure 1). The map is optimistic in the sense that it depicts the grassland at its maximum geographical extent. In the southern and central portions of the region, the extent of grass



cover or open woodland was greatest during the early part of the nineteenth century due to higher fire frequency. In the north, maximum fire frequency and the corresponding vegetational impact occurred during the mid-nineteenth century.

From 1535 to 1890, 333 observed fires and 178 burned-over areas were noted. In most cases, locations were given with fair accuracy. In some instances, however, estimates of location had to be made. With respect to extensive fires, location was based on the place where the fire was first observed or, in those cases where parties crossed extensive burned areas, the center of their transect.

All fires and burned-over areas were plotted on a large-scale map of the region. From this, two predominant distributional patterns emerged (Figure 2). First there was an obvious and unavoidable bias related to the spatial representation. The fires and burns were recorded by whites who, in most cases, traveled fairly specific routes throughout the region. This resulted in linear concentrations, particularly in river valleys. Whites also resided in certain locales in greater numbers and for longer periods of time than in others. This was reflected in nodal concentrations around trading and military posts and pioneer settlements. Secondly, fires occurred with much greater frequency to the east and north of the prairie-steppe transition zone than to the west and south of it. Only twenty-seven percent of the fires occurred within the latter area. This lends qualified support to statements made by two observers concerning the areal distribution of fires in the grassland. While traveling westward in the Arkansas Valley near the one hundredth meridian during August, 1825, Brown stated: "On Cow



Creek...the short grass commences and the short grass bounds the burnings of the prairies."[1] Washington Irving, in his digest of the journal of Captain B. Bonneville's expedition undertaken seven years later, made similar reference to the country west of the confluence of the North and South Platte.

> In these regions there is a fresh sweet growth of grass in the spring, but it is scanty and short and parches up in the course of the summer, so that there is none for the hunters to set fire to in the autumn. It is a common observation that "above the forks of the Platte the grass does not burn."[2]

Following the plotting of fires and burns, months and seasons of fire occurrence were tabulated. Dates were given in the historical documents for 333 observed fires. In addition, 85 of the 178 burned-over areas were mentioned as having been burned recently enough to justify assigning a month and season of fire occurrence. Dates of fire occurrence were noted adjacent to each of the 418 fires and recent burns on a large-scale map. Subsequent analysis indicated that there were four regions within the Central North American Grassland which were distinct from one another with respect to the months and seasons during which fires occurred within them. Boundary lines were then drawn on the basis of the continuity represented by the dated dots, and a map showing both the distribution of these fires and recent burns and the four seasonal fire regions was compiled (Figure 3).

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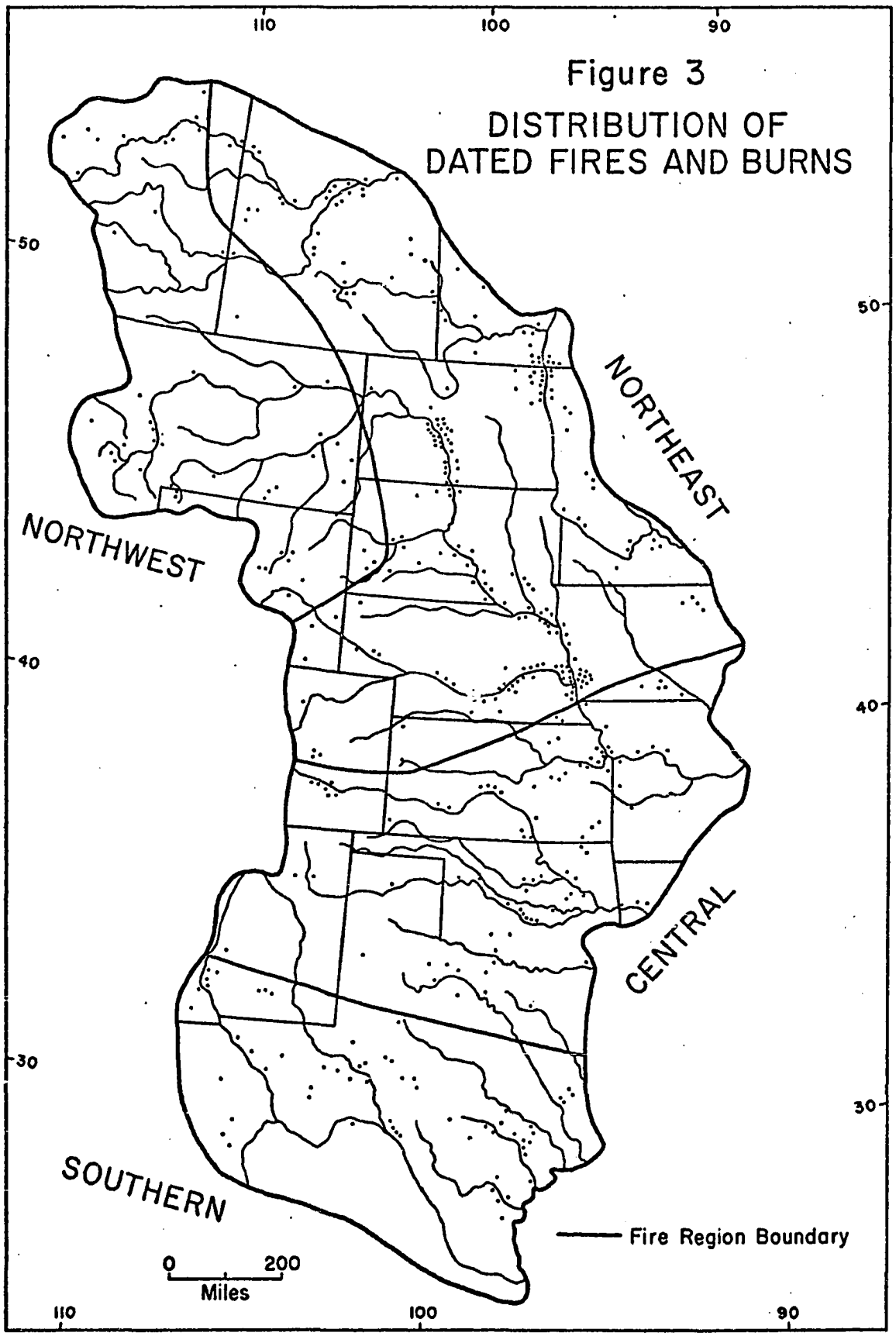
[1]J. C. Brown, "Field Notes of the United States Surveying Expedition, 1825-1827," Southwest on the Turquoise Trail, the First Diaries on the Road to Santa Fe (Denver: The Stewart Commission of Colorado College and the Denver Public Library, 1933), pp.120-121.

[2]W. Irving, The Adventures of Captain Bonneville U. S. A. in the Rocky Mountains and the Far West (Norman: University of Oklahoma Press, 1961), p.37.



Chapter II

THE NORTHEAST REGION

Two distinct burning periods were characteristic of the Northeast Region (Table 1). One occurred in spring, climaxing in May; the other extended from July through November, with a pronounced October maximum. June was conspicuously devoid of fires in marked contrast to May and July, although no explanation for this anomaly is apparent.

TABLE 1

SEASONS AND MONTHS OF FIRE OCCURRENCE

	Indian Fires	White Fires	Unascribed Fires	Total Fires	Percent
December 22-31	0	0	0	0	0.0
January	1	1	0	2	0.9
February	1	0	0	1	0.5
March 1-20	3	1	2	6	2.8
Winter	5	2	2	9	4.2
March 21-31	3	1	1	5	2.3
April	7	2	9	18	8.4
May	3	5	19	27	12.6
June 1-20	0	0	2	2	0.9
Spring	13	8	31	52	24.2
June 21-30	1	0	1	2	0.9
July	15	6	3	24	11.2
August	8	8	7	23	10.7
September 1-22	5	0	6	11	5.1
Summer	29	14	17	60	27.9
September 23-30	10	0	7	17	7.9
October	9	5	50	64	29.7
November	2	0	10	12	5.6
December 1-21	1	0	0	1	0.5
Fall	22	5	67	94	43.7
Year	69	29	117	215	100.0

Sources of Fires

Over 32 percent of all fires occurring within the region were

attributed to Indians. Whites were responsible for 13.5 percent. With the exception of a single lightning fire, the remainder were unascribed. While traveling through northwestern Kansas during the summer of 1884, Brock observed,

> I had thought up to this time that I knew what a Kansas storm was, but that evening I was shown that I had never been in one before. The lightning would strike the ground and set the grass on fire, then the rain would put it out.[3]

Twelve Indian tribes and nine occupational groups of whites were cited in reference to starting specific fires or engaging in grass-firing practices. The Sioux accounted for nearly half of the instances in which tribes were mentioned. Over two-thirds of the fires attributed to white groups were started by fur traders, explorers, tourists, and pioneer settlers. Although populations of both Indian tribes and white occupational groups fluctuated substantially during the period in which fire data were accumulated, it seems probable that responsibility for fires may have been out of proportion to the numbers present. Rough estimates have been made of Indian tribe populations in the late eighteenth and early nineteenth centuries.[4] Variation in responsibility for fires in comparison with populations is shown in Table 2. No comparable population data are available for white occupational groups, but it seems likely that variation between responsibility for fires and numbers of people in each category is considerable (Table 3).

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[3]G. W. Brock, "When Lightning Set the Grass on Fire," The Trail Drivers of Texas (Nashville, Tennessee: The Cokesbury Press, 1925), pp.224-225.

[4]R. H. Lowie, Indians of the Plains (Garden City, New York: The Natural History Press, 1954), pp.11-14.

TABLE 2

SOURCES OF INDIAN FIRES

Tribe	Population		Fires		Percentage
	Number	Percent	Number	Percent	Difference
Sioux	22,000	39.1	29	48.3	+9.2
Ojibwa	10,000	17.8	7	11.7	-6.1
Assiniboine	8,000	14.2	5	8.3	-5.9
Cree	4,000	7.2	5	8.3	+1.2
Cheyenne	3,500	6.2	2	3.3	-2.9
Arikara	2,600	4.6	3	5.0	+0.4
Hidatsa	2,100	3.7	1	1.7	-2.0
Illinois	2,000	3.6	3	5.0	+1.4
Mandan	1,600	2.8	1	1.7	-1.1
Oto	500	0.9	2	3.3	+2.4
Blackfoot	N/A*		1	1.7	N/A
Winnebago	N/A		1	1.7	N/A
Totals	56,300	100.0	60	100.0	-3.4

*Not applicable, tribes from outside areas.

TABLE 3

SOURCES OF WHITE FIRES

Group	Number of Fires
Fur traders	6
Explorers	5
Tourists	4
Settlers	4
Emigrants	3
Fur trappers	2
Soldiers	2
Missionary	1
Wagoner	1
Total	28

Disproportionately high figures seem to be associated with explorers and tourists as virtually all of the individuals in the former category and many of those in the latter kept diaries. Low figures probably occur among settlers, emigrants, fur trappers, and soldiers as many of these people were illiterate and relatively few among the literate population kept diaries.

Reasons for Fires Attributed to Indians

Eight reasons involving fifty-two cases were recorded for fires attributed to Indians (Table 4). Communication, warfare and hunting accounted for nearly two-thirds of these. Although specific tribes were mentioned only about half as often in this context, the Sioux maintained dominance. Almost half of all fires attributed to the Sioux were related to warfare. Within that category they accounted for over three-fourths of all instances in which tribes were noted.

TABLE 4

REASONS FOR FIRES ATTRIBUTED TO INDIANS

Tribe	Commun.	War.	Hunt.	Pastur. Improv.	Horse Steal.	Accid.	Divers. of Game	Pleas.	Totals
Sioux	4	7	1	0	2	1	0	1	16
Cree	1	0	0	0	1	1	1	0	4
Assiniboine	1	0	1	0	1	0	0	0	3
Illinois	0	0	3	0	0	0	0	0	3
Ojibwa	1	0	0	0	0	1	0	0	2
Arikara	0	2	0	0	0	0	0	0	2
Hidatsa	0	0	0	1	0	0	0	0	1
Cheyenne	0	0	0	0	1	0	0	0	1
Mandan	0	0	0	0	0	1	0	0	1
Blackfoot	1	0	0	0	0	0	0	0	1
Winnebago	1	0	0	0	0	0	0	0	1
Unspecified	4	2	4	5	0	1	1	0	17
Totals	13	11	9	6	5	5	2	1	52

Correlations between the reasons given and the seasons in which these fires occurred are shown in Table 5. Pasturage improvement accounted for half of the cases related to spring burning. Three-fourths of the summer fires resulted from communication, warfare and horse-stealing activities. Hunting was the main cause of fall fires, although other reasons were important as well.

TABLE 5

REASONS FOR THE SEASONAL OCCURRENCE OF INDIAN FIRES

Reason	Winter	Spring	Summer	Fall
Communication	1	2	4	2
Warfare	1	0	3	3
Hunting	0	0	0	5
Pasturage improvement	0	3	0	2
Horse stealing	0	1	2	1
Accident	0	0	1	3
Diversion of game	0	0	1	0
Pleasure	0	0	1	0
Totals	2	6	12	16

Communication.--Eleven observers discussed the practice of setting fire to the grass as a means of communication. In three cases this was discussed generally. The earliest reference was provided by la Potherie in the late seventeenth century.

> It is the custom of the peoples who inhabit this continent, that, when they go hunting in spring and autumn, they light fires on those prairies, so that they can ascertain each other's location. The fire becomes so strong especially when the wind rises, and when the nights are dark that it is visible forty leagues away.[5]

Keating, writing in reference to the prairies of eastern North Dakota during the early nineteenth century stated that fires were frequently started by the Indian "as a means of communicating intelligence with a view to give notice to his friends of his approach, or to warn them of the presence of an enemy."[6] However, Sullivan's statement, made while

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[5]C. C. L. la Potherie, "History of the Savage Peoples Who Are Allies of New France," The Indian Tribes of the Upper Mississippi Valley and Region of the Great Lakes (Cleveland, Ohio: The Arthur H. Clark Company, 1911), volume 1, p.366.

[6]W. H. Keating, Narrative of an Expedition to the Source of St. Peter's River, Lake Winnepeek, Lake of the Woods, &c. Performed in the Year 1823, by Order of the Honorable J. C. Calhoun, Secretary of War, under the Command of Stephen H. Long, U. S. T. E. (London: George B. Whittaker, 1825), volume 2, p.36.

crossing the plains of Saskatchewan in 1863, suggested to an even greater extent the degree to which the practice was engaged in by Indians.

> The most trivial signal of one Indian to another has often lost hundreds of acres of forest trees which might have brought wealth and comfort to the future settler, while it has brought starvation and misery to the Indian tribes themselves by spoiling their hunting grounds. The Indians, however, never taught by experience still use "signal fires" to the same extent as in former years, driving the animals from their retreats, and marring the fair face of nature for the future colonist.[7]

Ten references were made to observed signal fires. Six of these were attributed to war parties. The main reason given was to indicate the return of a party to its village. While traveling in southern Minnesota as a prisoner of the Santee Sioux, Father Hennepin recorded in May, 1680, that grass fires were set "to give notice to their people of their return."[8] In October, 1800, Henry reported from Park River Post in northeastern North Dakota that

> We perceive a thick smoke to the southwest at no great distance. Desmarais says it is the Sioux, who have killed the Indians that are gone to the hills, and on their way homeward set fire to the meadows. This is the custom with both Sioux and Saulteurs when they are out to war, and a party returns homeward.[9]

While camped near the Arikara villages during the spring of 1804,

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[7]United Kingdom, The Journals, Detailed Reports, and Observations Relative to the Exploration by Captain Palliser of that Portion of British North America, which in Latitude, Lies between the British Boundary Line and the Height of Land or Watershed of the Northern or Frozen Ocean Respectively, and in Longitude, between the Western Shore of Lake Superior and the Pacific Ocean, during the Years 1857, 1858, 1859, and 1860 (London: George E. Eyre and William Spottiswoode, 1863), p.89.

[8]L. Hennepin, A New Discovery of a Vast Country in America (Chicago: A. C. McClurg and Company, 1903), volume 1, p.248.

[9]E. Coues, New Light on the Early History of the Greater Northwest (New York: Francis P. Harper, 1897), volume 1, p.123.

Tabeau noted that the Sioux had lighted "great fires as signals of their return from battle victorious."[10] A similar reference was made by Luttig in February, 1813, at Fort Manuel on the Missouri River near the present boundary between North and South Dakota. "Passed a tranquil night, but saw some running fires, the signal of Indians after battle."[11] In one case a signal fire was set to prevent a surprise raid by the Ojibwa and Assiniboine on a Sioux village. The incident occurred in northeastern North Dakota during the fall prior to 1820. Tanner, accompanying the former group, reported:

> We had proceeded but a little distance, when one of the Assiniboines, who had turned back, purposely set fire to the prairie, and we now all turned back except the chief and one or two men.[12]

In another instance signal fires were set to warn members of one tribe of the presence of an enemy, thus supporting Keating's latter contention. Ross reported the attack of forty Ojibwa warriors on a band of less than twenty Sioux near the Cheyenne River in South Dakota during July, 1840.

> ...at the same moment three smokes were seen to rise as a signal to the Sioux camp, signifying what had happened; at the camp the signal was repeated to warn another at a still greater distance....The Sioux had set the plains on fire in various directions.[13]

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[10]A. H. Abel, Tabeau's Narrative of Loisel's Expedition to the Upper Missouri (Norman: University of Oklahoma Press, 1939), p.187.

[11]J. C. Luttig, Journal of a Fur-trading Expedition on the Upper Missouri, 1812-1813 (St. Louis: Missouri Historical Society, 1920), p.126.

[12]E. James, An Indian Captivity (1789-1822). John Tanner's Narrative (San Francisco: California State Library, 1940), p.154.

[13]A. Ross, The Red River Settlement: Its Rise, Progress, and Present State (Minneapolis: Ross and Haines, 1957), p.269.

Hind mentioned a case in which signal fires were set by a hunting party, although the reason was different from that given by la Potherie. The incident occurred in the Qu'Appelle Valley of southern Saskatchewan in July, 1858.

> This afternoon we saw three fires spring up between us and the Grand Coteau....In a few days we ascertained that the fire had been put out by Crees, to inform their friends that they had found buffalo.[14]

In his account of Perrot's journey to the plains of Minnesota in the spring of 1683, la Potherie stated that the Winnebago Indians accompanying the French agreed to set signal fires when they located members of other tribes further to the west.

> At the end of thirty days they [the French] descried fires, which were far away; and they also lighted fires by which the Puans knew that the French had established their posts.[15]

Two incidents were mentioned in which no reasons were given for the signal fires observed. To the west of the confluence of the Qu'Appelle and Assiniboine, Simpson reported in July, 1841, that "We observed some fires in the plains around us, while a solitary savage was seen firing signals."[16] In August, 1858, about forty miles southwest of the junction of the North and South Saskatchewan, Hind noted

> Once or twice "smokes," which, from their being soon answered in another quarter, we presumed to be signals, and might be

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[14]H. Y. Hind, Narrative of the Canadian Red River Exploring Expedition of 1857 and of the Assiniboine and Saskatchewan Exploring Expedition of 1858 (London: Longman, Green, Longman, and Roberts, 1860), volume 1, p.336.

[15]C. C. L. la Potherie, op. cit., volume 1, p.367.

[16]G. Simpson, Narrative of a Journey Round the World during the Years 1841 and 1842 (London: Henry Colburn, 1847), volume 1, p.68.

> raised by Blackfeet in the distant prairies, appeared on the west side of the river.[17]

Warfare.--Hostility was characteristic of relationships between most Indian groups in the Northeast Region. In 1818, Harmon provided a comparison which emphasized the importance of the pattern in the grassland.

> All the Indian tribes are frequently at war with each other; and at some times, two tribes will league together, against one tribe or more. Those who reside in the woody country, do not as frequently wage war against their neighbors, as those who live in the large plains. The latter, generally engage in war, either offensive or defensive, at the opening of every spring.[18]

Only one reference was made to the use of fire in warfare by the members of one Indian tribe against those of another. However, the prevalence of the practice as employed by Indians, particularly the Sioux, against whites suggests that it was probably frequently used in conflicts between Indian groups as well.

As an offensive device, fire was used to drive opposing groups from cover or to harass them. Six specific cases were mentioned in the literature. During his visit to the Omahas in the fall of 1820, James related:

> Two Omaha brothers had stolen a squaw from an individual of their nation, and were on their journey to seek a refuge in the Ponca village. But they had the misfortune, in a large prairie, to meet with a war-party of Sioux, their implacable enemies. They immediately concealed themselves in a deep ravine, which at the bottom was covered with dry reed grass. The Sioux surrounded this spot, and set fire to the windward

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[17]H. Y. Hind, op. cit., volume 1, p.394.

[18]D. W. Harmon, A Journal of Voyages and Travels in the Interior of North America (New York: A. S. Barnes and Company, 1903), p.306.

side of the reeds, in order to drive them out.[19]

While traveling through northwestern Minnesota during the summer of 1798, Thompson discussed the tactics employed by the Santee Sioux against his party.

> While they keep to the plains with their horses we are not a match for them; for we being foot men, they could get to the windward of us, and set fire to the grass; when we marched for the woods they would be there before us, dismount, and under cover fire on us.[20]

Luttig mentioned a vindictive act by the Arikara in November, 1812. "The three Rees which had camped with us last night went away displeased at not getting enough to eat and set the prairie around us afire..."[21] Bonner related an abortive incident involving an attack by members of the same tribe on a group of fur trappers during the late 1820's. "Evidently the savages had set fire to the grass all around, thinking to burn them out; but it had not reached them."[22] In late September, 1835, Murray was discouraged from hunting in northeastern Iowa, although he apparently never learned of the tribe responsible for the harassment.

> The Indians now set fire to the prairie and woods all around us, and the chance of good sport daily diminished. These malicious neighbors were determined to drive us from the district; they evidently watched our every motion; and whenever

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[19]E. James, An Account of an Expedition from Pittsburgh to the Rocky Mountains, Performed in the Years 1819, 1820; Under the Command of Major Stephen Long (Cleveland, Ohio: The Arthur H. Clark Company, 1905), volume 15, pp.38-39.

[20]R. Glover, David Thompson's Narrative (London: The Champlain Society, 1962), p.197.

[21]J. C. Luttig, op. cit., p.92.

[22]T. D. Bonner, The Life and Adventures of James P. Beckwourth, Mountaineer, Scout, and Pioneer, and Chief of the Crow Nation of Indians (Minneapolis: Ross and Haines, 1965), p.257.

> we entered a wood or grove to hunt, they were sure to set the grass on fire....The whole country around was so completely burnt up and devastated, that nothing remained for us but to resume our march towards the fort.[23]

Dodge received similar treatment of an even more persistent nature at the hands of the Sioux while hunting in the Loup River country of Nebraska during the 1860's. "We had no spot of comfort in our hunt, the wretches preceding us by day, driving away our game, and trying to burn us out every night..."[24] One entry suggested the possibility that grass fires may have been started to provide a smoke screen prior to an attack. While residing at Fort Clark in central North Dakota during early September, 1836, Chardon wrote:

> The prairies are all on fire, so that it is impossible to see the hills, on account of the thick smoke. No doubt the Yanktons are near at hand, as we expect an attack from them every day.[25]

As a defensive technique, fires were set to inhibit pursuit by eliminating feed for the horses of the pursuers and by obscuring the trails of those who were pursued. An example of the former as practiced by the Sioux, although unsuccessfully in this instance, was noted by Bandel as his detachment proceeded from Fort Laramie, Wyoming to Fort Pierre, South Dakota in the fall of 1855.

> The Indians kept well out of our way, but everywhere set fire

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[23]C. A. Murray, Travels in North America during the Years 1834, 1835, and 1836 (London: Richard Bentley, 1841), volume 2, pp.126-129.

[24]R. I. Dodge, Our Wild Indians: Thirty-three Years' Personal Experience among the Red Men of the Great West (New York: Archer House, 1959), p.458.

[25]A. H. Abel, F. A. Chardon's Journal at Fort Clark 1834-1839 (Pierre, South Dakota: Lawrence K. Fox, 1932), p.79.

> to the prairies in front of us, so that our horses and mules should not find anything to eat. However, there were places where the grass was not dry enough to burn well, so that we always managed to find a place to camp.[26]

The latter was discussed by Arese in reference to his Santee Sioux guide as they were traveling through southwestern Minnesota in August, 1837.

> ...towards noon the Indian set the prairie behind us on fire, --a fine idea; it wiped out our traces and also helped to retard the advance of anyone who coveted our horses.[27]

In one instance, fire was used to increase the speed of travel of prisoners of war. After capture by the Santee Sioux in May, 1680, Father Hennepin noted, "To hasten us, they sometimes set fire to the dry grass in the meadows through which we passed; so that our choice was march or burn."[28]

Hunting.--Nine observers discussed ways in which fire was used in the hunting of large game animals. Seven references pertained to buffalo. The degree of preference for the latter was noted by Catlin in 1832.

> The buffalo herds, which graze in almost countless numbers on these beautiful prairies, afford them an abundance of meat; and so much is it preferred to all other, that the deer, the elk, and the antelope sport upon the prairies in herds in the greatest security; as the Indians seldom kill them, unless they want their skins for a dress.[29]

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[26]E. Bandel, Frontier Life in the Army 1854-1861 (Glendale, California: The Arthur H. Clark Company, 1932), p.91.

[27]F. Arese, A Trip to the Prairies and in the Interior of North America, 1837-1838 (New York: The Harbor Press, 1934), p.110.

[28]L. Hennepin, op. cit., volume 1, p.248.

[29]G. Catlin, North American Indians (Edinburgh: John Grant, 1926), volume 1, p.27.

Furthermore, it was a widely recognized fact that the Plains Indians preferred the meat of the buffalo cow to that of the bull. In 1856, Ross commented on the importance of this element in relation to seasonal contrasts. "In the early part of the season [i.e. early summer] the bulls are fat and the cows lean; but in the autumn the case is the reverse, the bulls are lean and the cows fat."[30] The heavy emphasis on hunting during the fall and the use of fire to facilitate this activity may well have been a reflection of the preference for buffalo cows in addition to the need to acquire a food supply for the ensuing winter.

In the fall of 1679, Father Hennepin discussed the "fire surround" method employed by the Illinois in their buffalo hunts.

> When the savages discover a great number of these beasts together, they likewise assemble their whole tribe to encompass the bulls, and then set on fire the dry herbs about them, except in some places, which they leave free; and therein lay themselves in ambuscade. The bulls seeing the flame round about them, run away through those passages where they see no fire; and there fall into the hands of the savages, who by these means will kill sometimes above six score in a day.[31]

Later in the seventeenth century, Perrot described a variation of this method, also employed by the Illinois, which yielded even greater returns.

> They commence at once by setting fire to the dried herbage which is abundant in the prairies....That produces the same effect to the sight as four ranks of palisades, in which the buffaloes are enclosed. When the savages see that the animals are trying to get outside of it, in order to escape the fires which surround them on all sides (and this is the one thing in the world which they most fear), they run at them and compel

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[30] A. Ross, op. cit., p.262.

[31] L. Hennepin, op. cit., volume 1, p.147.

> them to re-enter the enclosure; and they avail themselves of this method to kill all the beasts. It is asserted that there are some villages which have secured as many as fifteen hundred buffaloes, and others more or fewer, according to the number of men in each and the size of the enclosure which they make in their hunting.[32]

During his residence with the Illinois in the 1720's, Charlevoix gave a more optimistic estimate of the degree of success attained by this method. "It is affirmed that no party ever returns from hunting without having killed fifteen hundred or two thousand beasts."[33] Carver's description in the 1760's of the method practiced during the fall hunt by the Santee Sioux is similar to Perrot's.

> The Indian method of hunting the buffalo is by forming a circle or square....Having taken their different stations, they set the grass, which at this time is rank and dry, on fire, and these animals, who are extremely fearful of that element, flying with precipitation before it, great numbers are hemmed in a small compass, and scarcely a single one escapes.[34]

In the 1820's, Schoolcraft discussed the fire surround with special reference to the impact of the introduction of firearms on the frequency of use of the method by tribes residing in the Upper Mississippi Valley.

> ...a great number of hunters disperse themselves around a large prairie where herds of buffalo happen to be feeding, and setting fire to the grass encompass them on all sides. The buffalo, having a great dread of fire, retire towards the center of the prairie as they see it approach, and here being pressed together

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[32]N. Perrot, "Memoir on the Manners, Customs, and Religion of the Savages of North America," The Indian Tribes of the Upper Mississippi Valley and Region of the Great Lakes (Cleveland, Ohio: The Arthur H. Clark Company, 1911), volume 1, pp.121-126.

[33]P. F. X. Charlevoix, Journal of a Voyage to North America (Chicago: The Caxton Club, 1923), volume 1, pp.188-189.

[34]J. Carver, Travels through the Interior Parts of North America in the Years 1766, 1767, 1768 (Minneapolis: Ross and Haines, 1956), pp.287-288.

> in great numbers, many are trampled under foot, and the Indians rushing in with their arrows and musketry, slaughter immense numbers in a short period....These practices are less common now than formerly, the introduction of fire arms among most of the tribes, putting it into the power of almost every individual to kill sufficient for the support of his family.[35]

The Assiniboine employed an entirely different method of using fire to facilitate the hunt--one in which only the smoke proceeding from fires set to grass or dung was used to drive buffalo to the wings leading into a pound. Henry described the procedure in the fall of 1808.

> Young men are usually sent out to collect and bring in the buffalo--a tedious task which requires great patience, for the herd must be started by slow degrees. This is done by setting fire to dung or grass. Three young men will bring in a herd of several hundred from a great distance. When the wind is aft it is most favorable, as they can then direct the buffalo with great ease. Having come in sight of the ranges, they generally drive the herd faster, until it begins to enter the ranges, where a swift-footed person has been stationed with a buffalo robe over his head, to imitate that animal....When he sees buffaloes approaching, he moves slowly towards the pound until they appear to follow him, then he sets off at full speed, imitating a buffalo as well as he can, with the herd after him.[36]

An even less direct method of using fire to facilitate the hunting of buffalo was the practice of burning over extensive tracts of grass so as to encourage herds to migrate to preferred locales which were left unburned. Dodge discussed this practice generally and related specifics concerning it which were given to him by an unnamed white hunter in the 1870's.

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[35]H. R. Schoolcraft, "Narrative Journal of Travels through the Northwestern Regions of the United States," Narrative Journal of Travels through the Northwestern Regions of the United States extending from Detroit through the Great Chain of American Lakes to the Sources of the Mississippi River in the Year 1820 (East Lansing: Michigan State College Press, 1953), p.185.

[36]E. Coues, op. cit., volume 2, p.519.

> The Indians burn portions of the prairie every fall, setting the fires so as to burn as vast an extent of country as possible, and yet preserve unburned a good section in the vicinity where they propose to make their hunt. The buffalo, finding nothing to eat on the burnt ground collect on that unburnt--reducing greatly the labor of the hunt.[37]

> If the game was not abundant, a few of the most sagacious hunters were sent out, who, taking advantage of winds or streams, set fire to the grass so as to denude the prairies, except within an area of fifteen or twenty miles contiguous to the camp.[38]

In one case deer and elk were mentioned as the object of fire drives. While camped in eastern Nebraska in 1833, John Irving stated:

> The annual fires...sweep over the whole face of the country during the autumn of every year....There will be no forest, as long as the Indians possess these regions; for every year, when the season of hunting arrives, they set fire to the long dry grass....The object of burning the grass is to drive the deer and elk, that are roving over the broad extent of prairie, into the small groves of timber scattered over the surface. Once enclosed within the thickets, they fall easy prey to the hunters.[39]

Preuss reported essentially the same practice while traveling through this area in the fall of 1842, although he gave no specifics concerning the animals involved.

> I find here many traces of previous prairie fires. Upon inquiry I heard that the Indians, when they are hungry and no longer have any food, will set the prairie on fire, with the wind. They then will lie in wait at the rivers for the game, which is naturally driven there.[40]

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[37]R. I. Dodge, The Hunting Grounds of the Great West (London: Chatto and Windus, 1877), p.29.

[38]R. I. Dodge, Our Wild Indians, p.288.

[39]J. T. Irving, Indian Sketches Taken During an Expedition to the Pawnee Tribe (Norman: University of Oklahoma Press, 1955), pp.53-54.

[40]C. Preuss, Exploring with Fremont (Norman: University of Oklahoma Press, 1958), p.74.

Pasturage Improvement.--Five observers commented on the practice of burning the grassland to improve pasturage conditions. This was done for the benefit of both large herbivores and Indian horse herds. In three cases reference was made to observed fires. In early March, 1805, Clark stated that the Hidatsa had set fire to the prairies near the Mandan villages "for an early crop of grass, as an inducement for the buffalo to feed on."[41] Late in the same month he added,

> The plains are on fire in view of the fort on both sides of the river. It is said to be common for the Indians to burn the plains near their villages every spring for the benefit of their horses.[42]

While descending the Missouri River in North Dakota during April, 1852, Kurz observed

> ...great numbers of prairie fires. At this season of the year Indians set the prairie on fire in order to remove the old, dried grass and provide room for the tender young regrowth. ...The only service the Indians render for the [buffalo] herds is to burn the dried grass every spring in order that the young crop will be more abundant.[43]

Others made general reference to the practice. In 1840, Father de Smet noted that the Indians residing in the Platte Valley set fire to the "prairies towards the end of autumn, in order to have better pasture at the return of spring..."[44] Two decades later, Domenech attributed

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[41]R. G. Thwaites, Original Journals of the Lewis and Clark Expedition 1804-1806 (New York: Dodd, Mead and Company, 1904), volume 1, p.269.

[42]Ibid., volume 1, p.279.

[43]J. N. B. Hewitt, Journal of Rudolph Friederich Kurz (Washington, D. C.: United States Government Printing Office, 1937), p.331.

[44]P. J. de Smet, Letters and Sketches with a Narrative of a Year's Residence among the Indian Tribes of the Rocky Mountains (Cleveland, Ohio: The Arthur H. Clark Company, 1906), volume 27, p.214.

the absence of trees in the Great Plains in part to "the habit the savages have of annually setting fire to the prairies, to obtain new grass."[45] In reference to the plains of southern Manitoba and Saskatchewan during the early 1880's, Macoun stated: "Indians in past time burnt the grass over wide areas every fall, so that the young and tender grass of the burnt districts might tempt the buffalo to migrate."[46] In one case, an entry served to illustrate the potential effectiveness of the practice. In mid-September, 1804, near the confluence of the White and Missouri rivers, Lewis stated:

> ...these vast plains had been lately burnt and the grass had sprung up and was about three inches high. Vast herds of buffalo, deer, elk, and antelope were seen feeding in every direction as far as the eye of the observer could reach.[47]

Horse Stealing.--Grass fires were apparently set both to provide cover in horse stealing raids and to stampede herds picketed at white encampments. The earliest reference suggesting the former was made by Henry while at Pembina Fort in northeastern North Dakota in April, 1803.

> The plains are on fire in every direction. We began to fear the Assiniboines and Crees might steal our horses; they have seemed honest thus far, but they are all horse-thieves.[48]

Chardon noted that a war party of Sioux had stolen several Mandan horses and set the prairies on fire to the north of Fort Clark in

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[45]E. Domenech, Seven Years' Residence in the Great American Deserts of North America (London: Longman, Green, Longman, and Roberts, 1860), volume 1, p.288.

[46]J. Macoun, Manitoba and the Great Northwest: The Field for Investment, the Home of the Emigrant (London: Thomas C. Jack, 1883), p.238.

[47]R. G. Thwaites, op. cit., volume 1, p.151.

[48]E. Coues, op. cit., volume 1, p.210.

November, 1836.[49] In July of the following year he observed "The smoke is so thick, that we cannot see as far as the hills; fine times for horse thieves."[50]

The stampeding of horses was mentioned in two accounts involving the Sioux and the Cheyenne. In reference to the former, Dodge observed,

> Setting fire to the grass in the vicinity of the camp is one of the Indian modes of annoying a party too strong for attack and too vigilant for a successful attempt at theft. Unless proper precautions are taken, horses are almost sure to be lost, for nothing frightens animals so thoroughly as fire.[51]

Sandoz related a specific incident which occurred near the confluence of the Platte and Loup rivers in July, 1870.

> Late one night a big prairie fire, perhaps started by Indians, came creeping down both sides of the river towards the camp. The weather was quiet and the grass thin, so it was easy to manage backfires set to burn off wide protective stretches around the camp. Perhaps the fire was planned to stampede the night herd. Years later old Cheyennes recalled that a party of Tall Bull's warriors had hung around the expedition, hoping to get some of their favorite horses back and some of the good cavalry stock.[52]

Accident.--Five references were made to fires started accidentally by Indians. The earliest was recorded by Thompson in 1796.

> The natives are frequently very careless in putting out the fires they make and a high wind kindles it among the pines which are always ready to catch fire; and they burn until stopped by a large swamp or lake; which makes many miles of the country very unsightly...[53]

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[49]A. H. Abel, Chardon's Journal, p.87.

[50]Ibid., p.122.

[51]R. I. Dodge, Hunting Grounds, pp.79-80.

[52]M. Sandoz, "Introduction," The Cheyenne Indians, Their History and Ways of Life (New York: Cooper Square, 1962), p.lx.

[53]R. Glover, op. cit., p.110.

Four specific cases were cited; two by Henry and two by Clark. In October, 1800, near Park River Post, Henry referred to a band of Ojibwa. "...they had seen no Sioux, contrary to our apprehension when we saw the smoke. It was themselves who had made it, by accident."[54] Two months later he reported from the same area:

> Indians came in from the camp below, and even from the upper part of Two Rivers, to inquire into the cause of the conflagration. They supposed that the Sioux had destroyed this fort, and set fire to the grass, as is their custom when they return from war....But the Crees came in with a few skins, and informed us that the fire had been lighted at their tents by accident.[55]

In August, 1804, Clark's party sighted a prairie fire near the present site of Onawa, Iowa. Several of the men traveled to the scene and found "that the fire arose from some trees which had been left burning by a small party of Sioux who had passed by that place several days earlier."[56] At the Mandan villages in late October of the same year he stated that "The prairie was set on fire (or caught by accident) by a young man of the Mandans..."[57] The degree of carelessness frequently responsible for these events was illustrated by Parkman in reference to an abandoned Arapaho camp near Greeley, Colorado in August, 1846.

> We passed close by a large deserted encampment of Arapahoes. There were about fifty fires still smouldering on the ground, and it was evident from numerous sign that the Indians must have left the place within two hours of our reaching it.[58]

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[54]E. Coues, op. cit., volume 1, p.132.

[55]Ibid., volume 1, p.158.

[56]R. G. Thwaites, op. cit., volume 1, pp.110-111.

[57]Ibid., volume 1, p.211.

[58]F. Parkman, Prairie and Rocky Mountain Life; or, the California and Oregon Trail (Columbus, Ohio: J. Miller, 1857), pp.350-351.

Diversion of game.--Two observers commented on the practice of setting grass fires to divert buffalo herds. Simpson reported a case of reprisal against the Hudson's Bay Company in 1832.

> The Company's establishments from this place [i.e. Fort Garry on the Red River] to the source of the Assiniboine have even been at times in a state of famine and several of our people have deserted in consequence....The plains Indians finding the coalition had taken place [between the Hudson's Bay Company and the Northwest Company] conceived that the sole object was as they express it "to render them pitiful," and by way of having revenge determined on starving the traders by keeping the buffalo off in summer and fall, which was easily effected by obstructing them at their usual passes to the northward, setting fire to the plains, etc.[59]

In July, 1858, near the headwaters of the Qu'Appelle, Hind stated in reference to the Plains Cree:

> One object in burning the prairie at this time was to turn the buffalo; they had crossed the [South] Saskatchewan in great numbers near the Elbow and were advancing towards us... by burning the prairie east of their course, they would be diverted to the south, and feed for a time on the Grand Coteau before they pursued their way to the Little Souris, in the country of the Sioux, south of the 49th parallel.[60]

Pleasure.--One case was cited in which two Santee Sioux were involved in setting fire to the prairie for the pleasure of seeing it burn. While camped in central Minnesota in August, 1837, Arese reported,

> I and my two guides reproached ourselves for having set fire to the prairie every night for our diversion and the enjoyment of a fine spectacle, because it might have attracted the attention and the curiosity of our enemies' war party....But that didn't happen...[61]

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[59]F. Merk, Fur Trade and Empire, George Simpson's Journal of 1824-25 (Cambridge, Massachusetts: The Belknap Press of Harvard University, 1968), p.180.

[60]H. Y. Hind, op. cit., volume 1, p.336.

[61]F. Arese, op. cit., pp.118-119.

Reasons for Fires Attributed to Whites

Six reasons were mentioned for fires attributed to whites (Table 6). Over three-fourths of the fires resulted from accident and communcation. No single occupational group was generally dominant with respect to responsibility, but fur traders, explorers, emigrants, and tourists accounted collectively for over 68 percent. Only in the category of fires set for communication was group dominance pronounced. Explorers and fur traders caused all of these.

TABLE 6

REASONS FOR FIRES ATTRIBUTED TO WHITES

Group	Accid.	Commun.	Pleas.	Pastur. Improv.	Malic. Destruc.	Insect Eradic.	Totals
Fur traders	0	3	1	1	0	0	5
Explorers	1	3	0	0	0	0	4
Emigrants	3	0	0	0	0	0	3
Tourists	2	0	1	0	0	0	3
Settlers	1	0	0	0	0	1	2
Soldiers	1	0	0	0	0	0	1
Missionary	1	0	0	0	0	0	1
Fur trappers	1	0	0	0	0	0	1
Wagoner	0	0	0	0	1	0	1
Unspecified	1	0	0	0	0	0	1
Totals	11	6	2	1	1	1	22

Those cases in which seasonal occurrence was given are shown in Table 7. No noteworthy correlations existed, except for signal fires set in the summer to attract Indians for purposes of trading or information gathering.

Accident.--All but one of the accidental cases involved campfires. In nine of the instances, human carelessness in managing them seems to have been the sole cause. One of these even resulted from abandonment, in spite of the widely recognized risks of doing so. In July, 1820,

TABLE 7

REASONS FOR THE SEASONAL OCCURRENCE OF WHITE FIRES

Reason	Winter	Spring	Summer	Fall
Accident	3	1	4	3
Communication	0	1	5	0
Pleasure	0	2	0	0
Pasturage improvement	0	1	0	0
Malicious destruction	1	0	0	0
Insect eradication	0	0	1	0
Totals	4	5	10	3

James wrote in reference to a campsite near Pike's Peak.

> We had travelled about three hours when we discovered a dense column of smoke rising from a deep ravine on the left hand. As we concluded this could be no other than the smoke of the encampment where we had left our blankets and provisions, we descended directly towards it. The fire had spread and burnt extensively among the leaves, dry grass, and small timber, and was now raging over an extent of several acres.[62]

In another case, however, there were extenuating environmental circumstances. While camped on an island in the Platte River during May, 1842, Sage reported that "a sudden gust of wind bore the sparks among the dry grass, and in an instant the whole island was one sheet of flame!"[63]

One incident was mentioned in which a backfire escaped control near the Mormon settlement of Kanesville (Council Bluffs), Iowa in October, 1846. Stout wrote:

> There was much fire out in the prairie today to the south and some, in order to save their hay, put fire in the grass

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[62]E. James, Long Expedition, volume 16, p.23.

[63]L. R. Hafen and A. W. Hafen, Rufus B. Sage, His Letters and Papers, 1836-1847, with an Annotated Reprint of His "Scenes in the Rocky Mountains and in Oregon, California, New Mexico, Texas, and the Grand Prairies (Glendale, California: The Arthur H. Clark Company, 1956), volume 2, p.27.

without any judgement and burnt up their own and others hay which would not have been injured but for themselves.[64]

Communication.--In 1823, Keating stated that fires were frequently set by whites in order to signal Indian groups.[65] In addition to la Potherie's statement noted previously, entries recorded in the journals of Clark and Luttig lend support to this contention. Clark mentioned three such instances. In August, 1804, near the junction of Floyd's River and the Missouri he stated that his party set fire to the prairie to bring in the Omaha and Sioux "if any were near, this being their usual signal."[66] Between the Vermillion and the James rivers, the practice was repeated twice shortly thereafter to attract the Sioux.[67] Two cases were cited by Luttig in July, 1812. In eastern Nebraska, to the north of the confluence of the Platte and Missouri rivers, he noted that "several of the hunters went out to make fires to give notice to the Indians of our approach."[68] Near the present boundary between North and South Dakota, he mentioned that "Messrs. Sanguinett and Bijou went out to make fires as we expected the Indians soon to meet..."[69]

Pleasure.--Two examples were cited in which prairie fires were started for pleasure or diversion. Maximilian recorded the following

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[64]J. Brooks, On the Mormon Frontier, the Diary of Hosea Stout, 1844-1861 (Salt Lake City: University of Utah Press, 1964), volume 1, p.206.

[65]W. H. Keating, op. cit., volume 2, p.36.

[66]R. G. Thwaites, op. cit., volume 1, p.111.

[67]Ibid., volume 1, pp.123 and 125.

[68]J. C. Luttig, op. cit., p.48.

[69]Ibid., p.54.

mildly abortive incident while his party was camped near the junction of the James and Missouri rivers in May, 1833.

> As soon as it was dark, the young men set fire to the dry grass of the prairie, to give us the pleasure of seeing how the fire spread, but the attempt did not succeed, because there was no wind.[70]

While at Fort Clark during the spring of 1839, Chardon depicted the sometime hum-drum existence of a fur trader and his attempt to liven up the day. "I set the men to clean around the fort....Having nothing else to do, I set fire to the prairies."[71]

Pasturage improvement.--While traveling through southern Saskatchewan during the summer of 1872, Grant discussed the problem of the increasing frequency of fires and cited improvement of pasturage conditions as a significant cause.

> Formerly, when the Hudson's Bay Company was the only power in this "Great Lone Land"....Each of its travelling parties carried a spade with which the piece of ground on which the fire was to be made was dug up, and as the party moved off, earth thrown on the embers extinguished them. But since miners, traders, tourists, and others have entered the country, there has been a very different state of affairs. Some of the spring traders set fire to the grass round their camps, that it may grow up the better and be fresh on their return in autumn...and the Indians and the Hudson's Bay parties seeing this, have become nearly as reckless.[72]

Malicious destruction.--Patterson commented on the destruction of pasturage as well as residences at Grand Island, Nebraska in 1859, by a prairie fire which had been maliciously set.

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[70]Maximilian, Travels in the Interior of North America (Cleveland, Ohio: The Arthur H. Clark Company, 1906), volume 22, p.281

[71]A. H. Abel, Chardon's Journal, p.187.

[72]G. M. Grant, Ocean to Ocean. Sanford Fleming's Expedition through Canada in 1872 (Toronto: James Campbell and Son, 1873), p.114.

> Some unprincipled scoundrel as ever went unhung, out of pure malicious mischief, with a full knowledge of the results that would follow his criminal act, in January, fired a patch of prairie grass, left as a winter pasture for their cattle, adjoining the town. Many of the inhabitants were away from the place at the time, and the flames spread with such rapidity before a raging wind, that nine houses, with all their contents, having taken fire from the thatched roofs, were crumbled to ashes before the devouring element. The miscreant who did this atrocious deed was a wagone .[73]

Eradication of insect pests.--In the summer of 1866, near Fort Kearny, Nebraska, Richardson noted that fire was used as a device for eliminating locusts, although the results seem dubious.

> In a column one hundred and fifty miles wide and about one hundred deep, they mysteriously appeared near Fort Kearny, and were sweeping southwest. Some farmers burn the prairies before them. This confounds the troublesome visitors; like human armies, finding their supplies cut off, they make forced marches.[74]

The Effects of Fire on Vegetation

Three general topics were discussed in the literature concerning the effects of fire on vegetation: (1) the relationship of recurrent fires to the formation of prairies in the east and the absence of trees in the west; (2) successional changes which developed in the presence or absence of fire and the relative resistance of certain species to repeated burning; and (3) the regrowth of grass following fire.

In the eastern portion of the Northeast Region, repeated burning was the sole reason given for prairie formation. Hind discussed the

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[73]E. H. N. Patterson, "Diary," Overland Routes to the Gold Fields, 1859, from Contemporary Diaries (Glendale, California: The Arthur H. Clark Company, 1942), p.120.

[74]A. D. Richardson, Beyond the Mississippi: From the Great River to the Great Ocean (Hartford, Connecticut: American Publishing Company, 1867), p.553.

process at length while traveling through southwestern Manitoba and southern Saskatchewan in the summer of 1858. In the valley of the Assiniboine he observed,

> Small "hummocks" of aspens and clumps of partially burnt willows, were the only remaining representatives of an extensive aspen forest which formerly covered the country....So great had been the change during twenty years, in the general aspect of this region, that our old hunter, who had undertaken to guide us in a straight line across the prairie...confessed that he did not "know the country" when within ten miles of the Assiniboine....He had not visited it for twenty years, and during that interval the timber, which formerly consisted of aspens and willows, had nearly all disappeared. The old man was correct; the face of the country had changed; the aspen forest had been burnt; and no vestige beyond the scattered hummocks and burnt willow clumps remained...75

Similar vegetational change was noted in the valley of the Qu'Appelle.

> An old Indian...born in this part of the country, told us that he remembered the time when the whole of the prairie through which we had passed since leaving Fort Ellice was one continuous forest, broken only by two or three narrow intervals of barren ground....A portion of the old forest alluded to by the Indian still exists....It consists of aspen of large growth and very thickly set.[76]

Norwood discussed the effect of annual fires in south-central Minnesota in 1847.

> I made an excursion of several miles into the country, and found the forest, over much of the tract traversed, destroyed by fire. Most of the trees had fallen to the ground, and in the course of two or three years, if the annual fires are kept up, the whole tract will be a prairie, and not a vestige of the forest which once occupied it will remain. A succession of fires are required to kill the trees, but after that is done, succeeding fires and wind soon bring them to the ground, and they disappear in a short time.[77]

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[75]H. Y. Hind, op. cit., volume 1, p.308.

[76]Ibid., volume 1, p.318.

[77]J. G. Norwood, "Description of the Geology of Middle and Western Minnesota," Report of a Geological Survey of Wisconsin, Iowa and Minnesota (Philadelphia: Lippincott, Grambo and Company, 1852), p.296.

In the more arid western section, the treeless character of the vegetation was variously attributed to low precipitation, high winds, sterile soil, and recurring fires. In reference to the Grand Coteau region of southern Saskatchewan, Hind concluded "From the character of its soil, and the aridity of its climate, the Grand Coteau is permanently sterile and unfit for the abode of civilised man."[78] Dodge regarded the first two elements as being of predominant importance.

> The treelessness of the high plains is caused by a lack of water and high winds...prairie fires which were formerly supposed to account for the treelessness of the plains, have really comparatively little to do with it. On the high prairie the grass is very short. When on fire, the blaze, from six to fifteen inches high, moves over the ground slower or faster depending on the wind, but not with vitality or heat enough to seriously injure a bush of a few inches in diameter. Yet the prairie is bare.[79]

Domenech, on the other hand, stressed the importance of high wind velocities and repeated burning.

> The absence of high trees is caused partly by the terrible winds that blow regularly at fixed periods in these regions, carrying along with them ruin and devastation; and partly by the habit the savages have of annually setting fire to the prairies.[80]

Recurrent fires alone were mentioned by three observers as the reason for the absence of trees on the mainland of the central portion of the Platte Valley. Near the eastern end of Grand Island, Ford stated in 1835:

> The fact that all these islands are covered with a thick and heavy growth of timber, is a conclusive proof that nothing but

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[78]H. Y. Hind, op. cit., volume 1, p.351.

[79]R. I. Dodge, op. cit., pp.29-31.

[80]E. Domenech, op. cit., volume 1, p.288.

> the annual fires, which sweep over these immense prairies prevents them from being timbered also. It is nonsense to suppose, as some have asserted, that timber cannot be made to grow on land like this. Prevent the fire from running over these prairies but for twenty years, and instead of millions and millions of acres of rich land without a stick of timber large enough for a riding switch, you would see one dense and beautiful forest of oak, hickory and ash, upon the highlands, and the majestic cottonwood and evergreen cedar upon the bottom lands, bordering on the great rivers.[81]

Six years later, de Smet concluded that "on account of the fires made in the autumn, the lofty vegetation is entirely confined to the islands that stud its surface."[82] In 1849, Stansbury reported with reference to the country west of Fort Kearny.

> From the fact that the islands in the river are, for the most part, covered with trees, the almost total absence of this feature in the landscape of the valley must be attributed, in part at least, to the fires which periodically sweep over the country in the autumn, destroying everything before them.[83]

Four Canadian observers discussed successional changes and the fire resistant properties of trees and shrubs. While traveling down the Red River Valley of southern Manitoba in 1798, Thompson stated:

> We journeyed on the west side of the river; the whole distance was meadowland, and no other woods than saplings of oak, ash and alder. From the many charred stumps of pines it was evident this side of the river was once a pine forest.[84]

Palliser noted the persistence of willows in the valley of the North

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[81]L. Ford, "A Summer Upon the Prairies," The Call of the Columbia (Denver: The Stewart Commission of Colorado College and the Denver Public Library, 1934), p.250.

[82]P. J. de Smet, op. cit., volume 27, p.221.

[83]H. Stansbury, Exploration and Survey of the Valley of the Great Salt Lake of Utah, including a Reconnaissance of a New Route through the Rocky Mountains (Philadelphia: Lippincott, Grambo and Company, 1852), p.32.

[84]R. Glover, op. cit., p.185.

Saskatchewan in 1858.

> ...the stunted willows still remained, after all other trees had been destroyed by fire....Where a scattered and stunted growth of willows is found, as a general rule, was ancient forest land, which when dug to a sufficient depth, still discloses numerous roots of destroyed timber.[85]

However, in the plains south of Battleford, Macoun discussed the process by which even these might be destroyed.

> The real cause of the absence of wood on every part of the region under consideration is undoubtedly prairie fires which sweep over almost every part of it year after year, destroying the seedling trees as long as there are any seeds left to germinate, and year by year killing the bushes until the capacity of the roots to send up shoots dies out, and then even willows cease to grow.[86]

The regenerative properties of aspen, unless burned at frequent intervals, was noted as well by Macoun.

> Aspen poplar (Populus tremuloides) may be called the characteristic tree of the plains. Wherever there is dry soil, not too sandy, outside of alluvium, there is aspen....I have noticed that the forest was only kept in check by the annual fires. Until the aspen roots had lost their vitality, they persisted in sending up crop after crop of stems ever increasing in number, until death by exhaustion took place and permanent prairie was formed.[87]

Hind observed the regeneration of both aspen-oak and aspen-willow formations in the valleys of the Little Saskatchewan in western Manitoba and the Qu'Appelle in southern Saskatchewan during the summer of 1858.

> Fires here as elsewhere have damaged the forest which once covered the country. Vast numbers of young oak and aspen are springing up in all directions on the prairie fringing the river near the trail.[88]

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[85]United Kingdom, op. cit., p.83.

[86]J. Macoun, op. cit., p.104.

[87]Ibid., p.315.

[88]H. Y. Hind, op. cit., volume 1, p.437.

> If a portion of prairie escapes fire for two or three years the result is seen in the growth of willows and aspen, first in patches, then in large areas, which in a short time become united and cover the country...[89]

Only cottonwood was mentioned by an American observer with respect to plant succession. In the mid-1870's, Dodge commented on this in reference to the valley of the North Platte in western Nebraska.

> As the settlements creep up the stream, and care is taken to prevent fires, the young trees spring up, and, as the growth of the cottonwood is extremely rapid, all the ground suited to their propagation is soon covered.[90]

Although numerous observers commented on the generally rapid and abundant regrowth of grass following burning, one case was mentioned in which it was severely impoverished. Macoun discussed the situation in southeastern Saskatchewan in 1880.

> Fire passes over the country every year, and, in 1879, in many places, burned the life so completely out of the roots of the various grasses which have a tendency to grow in clumps, that the following year, scarcely a blade was seen.[91]

The Effects of Fire on Native Animals

Buffalo, deer, elk, antelope, and wolves were mentioned in reference to the effects of fire on native fauna. Several observers discussed cases in which animals, particularly buffalo, were killed or blinded. Others discussed the impact of fires, smoke and burned grassland on the movement of herds.

In 1804, Harmon mentioned the prevalence of buffalo deaths due to

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[89] Ibid., volume 1, p.337.

[90] R. I. Dodge, Hunting Grounds, p.30.

[91] J. Macoun, op. cit., p.57.

prairie fires in southern Saskatchewan. "When the fire passes over the plains, which circumstance happens almost yearly...great numbers of buffaloes are destroyed..."[92] In late November of the same year, Henry provided a specific example of both deaths and blinding near Pembina Fort in northeastern North Dakota.

> The plains are burned in every direction and blind buffalo are seen every moment wandering about. The poor beasts have all the hair singed off; even the skin in many places is shriveled up and terribly burned, and their eyes are swollen and closed fast. It was really pitiful to see them staggering about, sometimes running afoul of a large stone, at other times tumbling downhill and falling into creeks not yet frozen over. In one spot we found a whole herd lying dead.[93]

Two other observers mentioned similar instances of death in the Platte Valley during the spring of 1850. In mid-May, just east of Fort Kearny, Kilgore observed "a great many buffalo and a great many of them are burned to death by the burning of the plains."[94] Later, about fifty miles west of the fort, he added "we see deer, wolves, and buffalo lying on the plains, burned to death."[95] In June, Langworthy speculated on an incident east of the confluence of the North and South Platte, although he did not observe it.

> A part of our company having been out upon the bluffs, report that they saw a thousand dead buffalo; they were lying in a deep valley surrounded by a steep bank....The most probable opinion is, that these animals lost their lives by the violence of a prairie fire, which is known to have passed along here towards the last of April. They were in the valley, which was

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[92]D. W. Harmon, op. cit., p.90.

[93]E. Coues, op. cit., volume 1, pp.253-254.

[94]J. R. Muench, The Kilgore Journal of an Overland Journey to California in the Year 1850 (New York: Hastings House, 1949), p.19.

[95]Ibid., p.20.

> covered with tall grass, in which it is probable they were surrounded by the fire and could not escape.[96]

The prevalence and behavior of blind buffalo on the plains of southern Canada was noted by Hind in 1858.

> Blind buffalo are frequently found accompanying herds, and sometimes they are met with alone. Their eyes have been destroyed by prairie fires; but their increased alertness enable them to guard against danger, and makes it more difficult to approach them in quiet weather than those possessing sight. The hunters think that blind buffalo frequently give the alarm when they are stealthily approaching a herd in undulating country.[97]

The influence of prairie fires and smoke on the departure of buffalo, elk and deer from grazing areas was mentioned in five diaries. Henry, in a continuing discussion of the impact of the fire accidentally started at the Cree camp in December, 1800, indicated that buffalo herds were absent from the general vicinity of Park River Post for a period of almost two weeks. On December 10th, he observed that "no bulls were to be seen, the fire having driven them away."[98] On the 22nd, he added: "The plains were covered with buffalo in every direction."[99] Two subsequent entries, however, suggested that perhaps as much as a month was required in some cases for buffalo to return to an area following a fire. On October 1, 1807, Henry reported that "Fire was all over the country."[100] On the 31st, he noted "Buffalo were in

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[96]F. Langworthy, Scenery of the Plains, Mountains and Mines (Princeton, New Jersey: Princeton University Press, 1932), p.34.

[97]H. Y. Hind, op. cit., volume 2, p.112.

[98]E. Coues, op. cit., volume 1, p.159.

[99]Ibid., volume 1, p.161.

[100]Ibid., volume 1, p.425.

abundance, although the plains were lately burned."[101] Similar observations in reference to elk and deer, as well as buffalo, were recorded in the diaries of Pike and Gale. In November, 1805, near Little Falls, Minnesota Pike stated:

> We went out and found that all the elk and buffalo had gone down the river, from those plains the day before--leaving the large roads to point out their course. This would not appear extraordinary, to persons acquainted with the nature of those animals--as the prairie had unluckily caught fire.[102]

Near the confluence of the Platte and Missouri in late September, 1819, Gale observed that "The grass is brown and dry and the hills on the north which are destitute of timber are on fire. Deer have become scarce."[103] That smoke alone was sufficient to drive buffalo away from grazing areas was noted by Hind in his comparison of the reactions of buffalo and horses to grass fires. "The buffalo are more wary, the smell of fire is often sufficient to drive them from pastures where they have been quietly feeding."[104] A case in point was mentioned by Chardon near Fort Clark in February, 1836.

> Two young Mandans came in from the hunter camp. They state that the west wind which had prevailed for several days--and drove the smoke of the villages to the east has chased all of the cattle [i.e. buffalo] out of the neighborhood.[105]

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[101] Ibid., volume 1, p.425.

[102] Z. M. Pike, "Journal of the Mississippi River Expedition," The Journals of Zebulon Montgomery Pike (Norman: University of Oklahoma Press, 1966), volume 1, p.56.

[103] R. L. Nichols, The Missouri Expedition of 1818-1820. The Journal of Surgeon John Gale with Related Documents (Norman: University of Oklahoma Press, 1969), pp.73-74.

[104] H. Y. Hind, op. cit., volume 2, p.117.

[105] A. H. Abel, Chardon's Journal, p.59.

The influence of burned-over tracts on the normal seasonal migrations of buffalo in western Canada was discussed at length by Hind in 1858.

> The ranges of the buffalo in the northwestern prairies are still maintained with great exactness, and old hunters, if the plains have not been burnt, can generally tell the direction in which the herds will be found at certain seasons of the year. If the plains have been extensively burned in the autumn, the search for the main herds during the following spring must depend on the course the fires have taken....As a general rule the Saskatchewan bands of buffalo go north during the autumn, and south during the summer. The Little Souris and the main river bands go north-west in summer and south-east in autumn....fires interfere with this systematic migration, but there are no other impediments which will divert the buffalo from their course....want of food alone is able to make them deviate from the course they have taken.[106]

The Effects of Fire on Domesticated Animals

Two types of results--one negative, the other positive--were mentioned with reference to the effects of fire on domesticated animals. Five observers discussed deaths of horses and cattle. One noted the preference of the former for the fresh regrowth on recently burned grasslands.

In 1804, Harmon stated that "great numbers of horses...are destroyed; for those animals when surrounded by fire, will stand perfectly still, until they are burned to death."[107] Hind explained the reason for this phenomenon with reference to Indian horses.

> During the fly season, smokes are made every night for the horses, and if this precaution is neglected, they will remind their masters of their want of care by surrounding the camp fire and standing with their heads in the smoke. It is this

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[106] H. Y. Hind, op. cit., volume 2, pp.107-109.

[107] D. W. Harmon, op. cit., p.90.

> habit of crowding around the smoke of a fire to avoid the torment of flies which makes Indian horses so difficult to drive from a prairie fire. Many are burned every year on account of their being unable to comprehend the danger which threatens them.[108]

A specific case was noted by Ferris while camped near the junction of the Platte and Missouri in March, 1830.

> ...we narrowly escaped losing our horses and baggage through the carelessness of one of our men, who kindled a fire and left it notwithstanding he had been repeatedly warned of the dangers of so doing....Two of our horses were less fortunate than their companions, for they were overtaken by the flames and completely singed, presenting an extremely ludicrous, but pitiable appearance. Is it not singular that these animals, not usually wanting in sagacity or courage, should when threatened by fire so quietly submit to their fate without making a single effort to escape?[109]

Other examples were mentioned by Ross in reference to the Red River Valley of southern Manitoba during the mid-nineteenth century in which "seventeen horses and numbers of horned cattle" were burned to death[110] and Allis in the Platte Valley in eastern Nebraska where "several horses" suffered the same fate in the fall of 1834.[111]

In July, 1880, Macoun discussed the positive effect of grass fires in southern Saskatchewan.

> On the prairie east of Long Lake, where the fire had not been, the grass was twice as long as where it had been burnt over; but the horses always went to the new grass, although quite

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[108] H. Y. Hind, op. cit., volume 2, p.117.

[109] W. A. Ferris, Life in the Rocky Mountains (Denver: The Old West Publishing Company, 1940), p.13.

[110] A. Ross, op. cit., p.14.

[111] S. Allis, "Forty Years among the Indians and on the Eastern Borders of Nebraska," Nebraska Historical Society Transactions and Reports, 2 (1887), p.137.

short in comparison to the other.[112]

The Effects of Fire on Man

Four fire-related human problems were discussed by nineteenth century observers: (1) deaths and injuries, (2) destruction of personal effects, (3) impediments to travel, and (4) liabilities for settlement. In one instance, however, prairie fires were regarded as being beneficial to initial settlement as they minimized the need for land clearance.

Deaths and injuries were mentioned in four diaries. Ross cited both second-hand information and personal observations in discussing this problem in relation to the Red River settlement during the first half of the nineteenth century.

> The natives frequently related that whole families have been overtaken by these irrestibile fires while travelling through the plains, and burnt to death. Indeed, we have seen a fatal instance of this kind ourselves, even on the colonized lands, and within three miles of the settlement. In this instance, three whites and two Indians lost their lives....The only chance for the traveller, unless some lake or river is at hand, is to burn the grass around him, and occupy the centre of the little clearing thus formed; in which case he will have only the smoke and ashes to contend with. At times, however, the fire advances with such fearful rapidity, as to baffle any attempt of this kind...[113]

Clark recorded the result of the previously cited fire which was started accidentally at the Mandan villages in October, 1804.

> The fire went with such velocity that it burnt to death a man and woman, who could not get to any place of safety. One man, a woman and child were much burnt and several narrowly escaped

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[112] J. Macoun, op. cit., p.287.

[113] A. Ross, op. cit., p.14.

the flame...[114]

The hazard posed by the tall grass in the bottomlands of the Platte was mentioned by Allis in reference to two specific cases during the fall of 1834, and others occurring later.

> I was awakened about 3 o'clock in the morning by the Indians hurrying to saddle up and leave camp, as the prairies were on fire....On that same trip another party encamped on the Platte bottoms; the fire surrounded them, and burned to death four Indians...I have several times been exposed to prairie fires, and sometimes had to fight to my utmost ability. I could relate many instances of great destruction of life and property among the traders and freighters from this cause.[115]

In reference to the Brulé Sioux of western Nebraska, Humfreville stated that "Many of this tribe were caught by prairie fires and burnt to the waist. It was for this reason the early French gave them this name."[116]

Loss of personal effects was mentioned by Sage in reference to the previously cited escaped campfire. "Robes, blankets, and all were almost entirely destroyed, notwithstanding our prompt efforts to save them."[117]

Insufficient pasturage for livestock, injury to the hooves of cattle, obstacles posed by fire-felled trees, and absence of fuel for cooking were cited as impediments to travel. Three observers commented on lack of forage. While traveling through southeastern Saskatchewan during May, 1805, Harmon observed that "As the fire had passed over the plains, this spring, it was with difficulty that we could find grass,

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[114]R. G. Thwaites, op. cit., volume 1, p.211.

[115]S. Allis, op. cit., p.137.

[116]J. L. Humfreville, Twenty Years among Our Hostile Indians (New York: Hunter and Company, 1903), p.160.

[117]L. R. Hafen and A. W. Hafen, op. cit., volume 2, p.27.

sufficient for the subsistence of our horses."[118] Stout displayed his irritation with an advance party of Mormons near the confluence of the Loup and Platte rivers in October, 1847. "Here we found the company with the ox-teams had burnt the prairie and almost entirely destroyed our feed."[119] In reference to the Platte Valley, Stansbury stated:

> On our return by this same route, in the fall of 1850, the country, for more than three hundred miles, had been completely devastated by these conflagrations, insomuch that our animals came near perishing for want of herbage.[120]

Injury to the hooves of cattle was mentioned by Palmer in June, 1859, to the west of Grand Island, Nebraska.

> We find our cattle growing lame, and most of the company are occupied in attempting to remedy the lameness. The prairie having been burnt, dry, sharp stubs of clotted grass remain, which are very hard, and wear and irritate the feet of the cattle. The foot becomes dry and feverish, and cracks in the opening of the hoof.[121]

Hind commented on the problem of travel through burned-over woodland in August, 1858, southwest of the junction of the North and South Saskatchewan.

> There are traces everywhere of a former fine aspen forest, with clumps of elm and ash; the dead trunks of these trees, eighteen inches in diameter, being frequently concealed by the undergrowth, offer a rude and stubborn obstacle to progress on foot through the tangled mass of vegetation which covers the rich flats.[122]

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[118] D. W. Harmon, op. cit., p.107.

[119] J. Brooks, op. cit., volume 1, p.286.

[120] H. Stansbury, op. cit., p.32.

[121] J. Palmer, Journal of Travels over the Rocky Mountains to the Mouth of the Columbia River; Made during the Years 1845 and 1846 (Cleveland, Ohio: The Arthur H. Clark Company, 1906), volume 30, p.49.

[122] H. Y. Hind, op. cit., volume 1, p.391.

Lack of fuel for cooking was mentioned by Ford while ascending the valley of the South Platte in northeastern Colorado during July, 1835.

> Fuel has been very scarce; indeed, for days together, not a stick could be procured, except from the islands in the river, or, now and then, a few scattering billets, left upon the main shore by the Indians.[123]

Two similar entries were made by Hind. The first was recorded near the Snake River in northwestern Minnesota in October, 1857; the other on the Qu'Appelle in July, 1858.

> The prairies here are altogether denuded of timber, so that this day we were compelled to carry our fuel for cooking purposes from Serpent River to the middle of the plain where we encamped for the night.[124]

> ...we were compelled to go supperless to bed...because we had neglected to take a supply [of wood] at the last aspen grove we passed, thinking that the bois de vache [i.e. buffalo dung] ...would be found in abundance, but the fires had burnt it also, and not even a fragment was to be procured. No tree or shrub, or even willow twig could be seen in any direction from our camp...[125]

Prairie fires were responsible for several problems related to early settlement in the region. In addition to the previously cited case of the destruction of dwellings at Grand Island, Henry discussed an incident which occurred at Pembina Fort in May, 1810.

> There was a tremendous gale of wind from the N.W., which kindled afresh the brushwood of yesterday; the fire spread in every direction; and was blown full upon the fort. Some sparks flew over the stockades and set fire to a heap of dry dung, which in an instant communicated to the stockades, and all was in a blaze. The flames were driven with violence upon our range of houses, and we were in imminent danger of losing all the property. But the Indians rendered great assistance in keeping the fire under control, carrying water,

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[123] L. Ford, op. cit., p.271.

[124] H. Y. Hind, op. cit., volume 1, p.257.

[125] Ibid., volume 1, p.338.

> etc., and after having suffered much by flame, smoke, and dust, we extinguished it.[126]

The destruction of hay supplies was mentioned twice. Near Kanesville in early October, 1846, Stout reported that "The prairie was on fire to the south today and burnt up some six or seven stacks of hay."[127] Two weeks later, he noted the incident mentioned previously.[128] Hayden commented on the problem of fire and timber resources needed for settlements in eastern Nebraska in 1871.

> Along the Missouri there is a good supply of timber, and a young growth of trees is continually aggressing upon the prairie portion. If not removed by the ax, or destroyed by fire, these hills and valleys will, in a few years, be clothed with a thick growth of valuable timber.[129]

Palliser commented similarly on the absence of timber from the valley of the main Saskatchewan in 1857, but went on to add that this was a benefit to initial cultivation of the land.

> The frequent fires which continually traverse the prairie have denuded the territory of large forest trees, indeed so much so as in some places to render their absence deplorable, and the result of these fires is that the agriculturalist may at once commence with his plough without any more preliminary labour.[130]

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[126]E. Coues, op. cit., volume 1, p.243.

[127]J. Brooks, op. cit., volume 1, p.204.

[128]Ibid., volume 1, p.277.

[129]F. V. Hayden, Final Report of the United States Geological Survey of Nebraska and Portions of the Adjacent Territories (Washington, D. C.: United States Government Printing Office, 1871), p.13.

[130]United Kingdom, op. cit., p.13.

Chapter III

THE NORTHWEST REGION

The Northwest Region had a very pronounced summer burning season with late spring and early fall being of secondary importance (Table 8). Eighty-six percent of the fires occurred during the four-month period June through September.

TABLE 8

SEASONS AND MONTHS OF FIRE OCCURRENCE

	Indian Fires	White Fires	Unascribed Fires	Total Fires	Percent
December 22-31	0	0	0	0	0.0
January	0	0	0	0	0.0
February	0	0	0	0	0.0
March 1-20	0	0	0	0	0.0
Winter	0	0	0	0	0.0
March 21-31	0	0	0	0	0.0
April	0	0	0	0	0.0
May	0	1	0	1	2.0
June 1-20	3	5	0	8	16.0
Spring	3	6	0	9	18.0
June 21-30	0	0	0	0	0.0
July	6	1	2	9	18.0
August	7	1	4	12	24.0
September 1-22	6	2	1	9	18.0
Summer	19	4	7	30	60.0
September 23-30	3	0	2	5	10.0
October	1	1	1	3	6.0
November	3	0	0	3	6.0
December 1-21	0	0	0	0	0.0
Fall	7	1	3	11	22.0
Year	29	11	10	50	100.0

Sources of Fires

Fifty-eight percent of the fires which occurred in the region were attributed to Indians. Whites were responsible for 22 percent. Seven

Indian tribes and five white occupational groups were mentioned in reference to starting fires or engaging in grass firing practices. The Blackfoot and Crow each accounted for over 31 percent of the cases in which tribes were named. Variation in responsibility for fires in comparison with populations is shown in Table 9.

TABLE 9

SOURCES OF INDIAN FIRES

Tribe	Population		Fires		Percentage Difference
	Number	Percent	Number	Percent	
Blackfoot	4,200	17.7	5	31.2	+13.5
Crow	4,000	16.9	5	31.2	+14.3
Blood	4,000	16.9	1	6.3	-10.6
Nez Percé	3,500	14.7	1	6.3	-8.4
Sioux	3,000	12.7	2	12.5	-0.2
Gros Ventre	3,000	12.7	1	6.3	-6.4
Flathead	2,000	8.4	1	6.3	-2.1
Totals	23,700	100.0	16	100.0	0.0

Almost half of the fires attributed to whites were started by explorers (Table 10). Comparatively few tourists visited the area.

TABLE 10

SOURCES OF WHITE FIRES

Group	Number of Fires
Explorers	4
Soldiers	2
Emigrants	1
Fur trappers	1
Tourists	1
Total	9

Reasons for Fires Attributed to Indians

Five reasons were given for fires attributed to Indians. Warfare and communication accounted for nearly 70 percent of the cases (Table

11).

TABLE 11

REASONS FOR FIRES ATTRIBUTED TO INDIANS

Tribe	War.	Commun.	Accid.	Hunt.	Improv. of Soil Fert.	Totals
Blackfoot	1	0	0	1	1	3
Crow	2	1	0	0	0	3
Sioux	1	0	1	0	0	2
Blood	1	0	0	0	0	1
Flathead	0	1	0	0	0	1
Gros Ventre	0	0	1	0	0	1
Unspecified	0	2	0	0	0	2
Totals	5	4	2	1	1	13

Correlations between the reasons for fires and the seasons in which they occurred are shown in Table 12. With a single exception, all fires started deliberately occurred during summer.

TABLE 12

REASONS FOR THE SEASONAL OCCURRENCE OF INDIAN FIRES

Reason	Winter	Spring	Summer	Fall
Warfare	0	1	4	0
Communication	0	0	3	0
Accident	0	1	0	1
Totals	0	2	7	1

Warfare.--The use of fire for offensive purposes in warfare was noted by two nineteenth century observers and for defensive reasons by four. Kit Carson recorded a Blackfoot attack on his party of trappers near the headwaters of the Missouri in the spring of 1835.

> They did everything they could to drive us from our place of concealment, finally setting fire to the brush. All the outer fringe of brush was consumed, but that under which we remained was not touched. I cannot account for our miraculous escape from the flames, unless it was the protecting hand of Providence. It could scarcely have been anything else, for the brush where we were concealed was dry and as easily burned as that which

had been consumed.[131]

In early September of the same year, Russell and several other trappers were attacked by about eighty Bloods on the Madison Fork.

> We lay silently about three hours when finding they could not arouse us to action by their long shots they commenced setting fire to the dry grass and rubbish with which we were surrounded; the wind blowing briskly from the south in a few moments the fire was convected into one circle of flame and smoke which united over our heads....Death seemed inevitable but we did not despair, but all hands began immediately to remove the rubbish around the encampment and setting fire to act against the flames that were hovering over our heads. This plan proved successful beyond our expectations. Scarce half an hour had elapsed when the fire had passed around us and driven our enemies from their position.[132]

Setting grass fires to impede the advance of an enemy was apparently a common practice among the Sioux and Crow. The degree to which the former used this technique is well illustrated by a directive sent from General Connor to his command while they were pursuing the Sioux in eastern Montana during July, 1865.

> The Indians will endeavor to impede your progress by burning the grass in your advance and stampeding your stock; the former you cannot prevent, but the latter you can by side-hobbling your horses.[133]

Subsequently, Captain Palmer noted that the Sioux had fired the grass in the Powder River valley for this purpose.[134] In his exploration of

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[131]M. Quaife, Kit Carson's Autobiography (Chicago: The Lakeside Press, 1935), pp.60-61.

[132]O. Russell, Journal of a Fur Trapper (Portland, Oregon: The Champoeg Press of Reed College, 1955), pp.30-31.

[133]P. E. Connor, "Letter to Lieutenant-Colonel Walker," Powder River Campaigns and Sawyers Expedition of 1865 (Glendale, California: The Arthur H. Clark Company, 1961), p.42.

[134]H. E. Palmer, "Account of the Connor Expedition," Powder River Campaigns and Sawyers Expedition of 1865 (Glendale, California: The Arthur H. Clark Company, 1961), p.116.

the valleys of the Bighorn and Little Bighorn in early September, 1859, Captain Raynolds met with extensive Crow burning.

> September 9th - Extensive fires have burned over much of this country, seriously injuring the grass, and as this seems to have been of recent occurrence, I imagine that it is the act of the Indians, who are thus seeking to impede our progress.
>
> September 10th - All the grass had been recently burned.
>
> September 11th - A large portion of the grass has just been burned over...[135]

Lieutenant Doane, while leading another military reconnaissance mission in northwestern Wyoming in August, 1870, also commented on this practice by the Crow. However, the reason given was to drive off game which might have been used for food by the soldiers.[136]

Communication.--While traveling through the valley of the Battle River in 1858, Captain Palliser commented on the extent to which signal fires were set.

> Unfortunately the Indians have a most disastrous habit of setting the prairie on fire for the most trivial and worse than useless reasons. If a war party returns, if a hunting party starts, even if a single individual wishes to signal his camp, the invariable method resorted to is "firing the prairie."[137]

Specific examples supporting Palliser's contention were recorded in three diaries. Near the site of the present town of Helena, Montana,

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[135]W. R. Raynolds, Report on the Exploration of the Yellowstone River (Washington, D. C.: United States Government Printing Office, 1868), pp.56-58.

[136]G. C. Doane, The Report of the So-called Yellowstone Expedition of 1870 (Washington, D. C.: United States Government Printing Office, 1871), p.6.

[137]United Kingdom, Papers Relative to the Exploration by Captain Palliser (London: George Edward Eyre and William Spottiswoode, 1859), p.30.

Lewis observed in July, 1805, that the grass in the valley had been set on fire by the Indians "to alarm the more distant natives...[138] A similar incident was reported by Clark a year later to the west of the confluence of the Stillwater and the Yellowstone.

> I observed a smoke rise to the south-southeast in the plains towards the termination of the Rocky Mountains....This smoke must be raised by the Crow Indians...as a signal for us, or other bands.[139]

The degree of recklessness to which Palliser was referring was, however, best illustrated by Ferris in August, 1833, while traveling through the Bitterroot Valley with a group of Flathead Indians who had accompanied his fur-trapping expedition.

> The Indians with us announced our arrival in this country by firing the prairies. The flames ran over the neighboring hills with great violence, sweeping all before them, above the surface of the ground...and filling the air with clouds of smoke.[140]

Accident.--In two cases, accident was given as the reason for grass fires. In October, 1810, in the valley of the North Saskatchewan, Henry reported: "We perceived the plains afire on the south side and were told it proceeded from the carelessness of the Fall [Gros Ventre] Indians when decamping."[141] While taking part in the Sioux campaign which culminated in the Custer disaster of June, 1876, Bradley wrote from his encampment on the Yellowstone:

> Today the Crows discovered a heavy smoke across and up the

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[138]R. G. Thwaites, op. cit., volume 2, p.252.

[139]Ibid., volume 5, p.273.

[140]W. A. Ferris, op. cit., p.215.

[141]E. Coues, op. cit., volume 2, p.656.

> river, apparently on O'Fallon Creek. It suggested a world of speculation, one of the theories being that a Sioux village had been attacked and destroyed either by Custer or Crook. It means more likely that the Sioux are moving in that direction and accidently set the grass on fire.[142]

However, four other observers mentioned that campfires were left burning by Indians when departing for another locale. Since four different tribes were named in this context, it would appear that there was a widespread potential for the occurrence of accidental fires throughout the region. While traveling in the Bitterroot Valley in July, 1806, Clark observed a Shoshone campfire which had been left burning along the trail.[143] Henry reported the same for a Sarsi encampment in early October, 1810. "We found still burning the fires of the Sarcees, who left the spot this morning--25 tents."[144] Two instances pertaining to the Blackfoot were recorded by Ferris in September and October, 1832, while traveling through the valleys of the Madison and Ruby rivers in southwestern Montana.[145] An abandoned Assiniboine encampment of about forty lodges was observed in the same state by Father de Smet to the west of Fort Union, Montana in August, 1840.[146]

Hunting.--A single symbolic reference was made to the use of smoke to drive buffalo to the ranges leading into a pound. While visiting a Blackfoot camp in August, 1833, Maximilian described the buffalo

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[142]J. H. Bradley, The March of the Montana Column, a Prelude to the Custer Disaster (Norman: University of Oklahoma Press, 1961), p.141.

[143]R. G. Thwaites, op. cit., volume 5, p.248.

[144]E. Coues, op. cit., volume 2, p.638.

[145]W. A. Ferris, op. cit., pp.167 and 176.

[146]P. J. de Smet, op. cit., volume 27, p.148.

dance.

> ...the women creep, crawling on all fours, and endeavor to imitate the manners of the buffalo cows. Several men represent buffalo bulls, and are at first driven back by the women; but then, as is the practice in this kind of hunting, a fire is kindled to the windward, and the women, or buffalo cows, as soon as they smell the smoke, retreat into the medicine lodge which concludes the festival.[147]

Improvement of soil fertility.--Maximilian wrote: "The Blackfeet, like most of the tribes of the upper Missouri, sow the seeds of the Nicotiana quadrivalvis having first burnt the place where they intend to grow it...[148]

Reasons for Fires Attributed to Whites

Four reasons were given for fires started by whites. Two-thirds of the cases were due to accident. Explorers were the most frequently named group, accounting for half of the accidental fires (Table 13).

TABLE 13

REASONS FOR FIRES ATTRIBUTED TO WHITES

Group	Accid.	Commun.	Pleasure	Warfare	Totals
Explorers	3	1	0	0	4
Soldiers	2	0	0	0	2
Emigrants	1	0	0	0	1
Tourists	0	0	1	0	1
Fur trappers	0	0	0	1	1
Totals	6	1	1	1	9

Instances in which seasonal occurrence was mentioned are shown in Table 14.

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[147]Maximilian, op. cit., volume 23, p.115.

[148]Ibid., volume 23, p.108.

TABLE 14

REASONS FOR THE SEASONAL OCCURRENCE OF WHITE FIRES

Reason	Winter	Spring	Summer	Fall
Accident	0	2	3	1
Communication	0	0	1	0
Pleasure	0	1	0	0
Totals	0	3	4	1

Accident.--Campfires were responsible for all recorded accidental grass fires, although the attendant circumstances varied. That such fires were a common occurrence, especially among the Forty-niners, is suggested in a statement made by Stansbury in July, 1849, while traveling along the emigrant trail in eastern Wyoming.

> The artemesia seemed today, to have taken complete possession of the country; and what little grass once grew along the road has been literally burned out by the passing emigrants.[149]

In some cases accidental fires were due entirely to negligence. Stuart reported such an instance in eastern Wyoming during October, 1812. One of the men left his campfire unattended while he went fishing in a nearby stream. Sparks from the campfire ignited the nearby grass, causing an extensive fire.[150] A similar example was noted by Hector in early September, 1858. The exploring party led by Captain Palliser had left a campfire unextinguished which resulted in a forest fire near the headwaters of the North Saskatchewan.[151] Wind was mentioned as an extenuating circumstance in two diaries. While camped near the confluence of the Milk and Missouri rivers in May, 1805, Lewis reported that

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[149]H. Stansbury, op. cit., p.59.

[150]K. A. Spaulding, On the Oregon Trail, Robert Stuart's Journey of Discovery (Norman: University of Oklahoma Press, 1953), p.114.

[151]United Kingdom, Journals, p.111.

a high wind swept embers into the adjacent grass with the result that the fire spread rapidly into the grass and woods before being contained by the men.[152] A similar example was noted by Bradley in early June, 1876, near the junction of the Yellowstone and Tongue rivers.

> In the evening we were treated to a high wind that roared grandly through the trees. It came up suddenly and for a time threatened a general conflagration, as it sent troops of burning coals hopping through the camp from the cook fires and deluged the tents with sparks.[153]

Communication.--Doane reported that a signal fire was set to locate a lost member of his party while they were near Yellowstone Lake in early September, 1870. "Messrs. Hauser and Langford ascended a high peak near camp and fired the woods in the hope of giving him a point of direction."[154]

Pleasure.--In June, 1863, Cheadle noted that one of the men in his expedition "set fire to the country" in the valley of the McLeod River in western Alberta for pleasure.[155]

Warfare.--Ross related an incident, based on eye-witness accounts, in which a party of fur-trappers led by Finan McDonald used fire against a band of Piegans who had taken refuge in a wood during a battle in 1823.

> It blew a strong gale of wind at the time and setting fire to the bush of dry and decayed wood it burnt with the rapidity of straw, and the devouring element laid the whole bush in ashes in a very short time...volleys of buckshot were poured

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[152]R. G. Thwaites, op. cit., volume 2, p.42.

[153]J. H. Bradley, op. cit., p.134.

[154]G. C. Doane, op. cit., p.23.

[155]W. B. Cheadle, Doctor Cheadle's Journal of a Trip Across Canada 1862-1863 (Ottawa: Graphic Publishers Limited, 1931), p.154.

into the bush to aid the fire in the work of destruction...[156]

The Effects of Fire on Vegetation

The formation of prairies in formerly wooded areas and post-fire successional patterns were noted by five Canadian observers. Most discussions suggest a general increase in fire frequency during the late eighteenth century and throughout most of the nineteenth century.

While passing through the Bow River Valley in 1800, Thompson observed that "The soil appears good along its whole extent, but for the most part it is bare of woods, and those that remain are fast diminishing by fire."[157] During his residence at Rocky Mountain House at the confluence of the Clearwater and North Saskatchewan in 1811, Henry stated that "Frequent fires have aided much in clearing away the wood and brush, so that we now have a grand view of the Rocky Mountains."[158] Later in the same year he added the following in reference to the country near the confluence of the White Earth and North Saskatchewan.

> This is the first meadow country seen along the Saskatchewan on the way down, and even this is due to the frequent fires that have ravaged the country and destroyed the wood, as is evident from the straggling stumps still to be seen. A soil covered with aspen and birch is in a few years converted by fire into beautiful meadowland; but where pine and willow grow, it requires a much longer time to alter the face of the country....Not many years ago all this country was thickly wooded, and scarcely a spot of prairie could be found; but the ravages of frequent fires have nearly destroyed the woods on the high ground. I have no doubt that, in a few years, the

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[156]A. Ross, The Fur Hunters of the Far West (Norman: University of Oklahoma Press, 1956), p.241.

[157]R. Glover, op. cit., p.144.

[158]E. Coues, op. cit., volume 2, p.680.

> country from Upper White Mud River downward will be a continuous plain.[159]

The continuing prevalence of vegetational change resulting from frequent burning was suggested by Palliser while traveling through eastern Alberta in 1858.

> Our course westward from Battle River continued through a soil of fine vegetable mould two feet deep upon a stratum of sand. This portion of country was no doubt formerly forest lands, but now converted into prairie by the frequent occurrence of fires which over-run the country.[160]

Two observations were recorded concerning regrowth on burned-over woodlands. In 1872, near the headwaters of the Athabasca River, Grant reported:

> A great part of the last half of this distance was through wood, some of it injured by fire, but most of it good...chiefly fir, but near Snaring River a growth of small pines has sprung up on burnt ground.[161]

In the Bow River Valley, Macoun observed in 1883: "Where the timber has been lately burnt off, pea-vine and vetch, with other tall-growing plants, grow so thick that it is extremely difficult to walk through them."[162]

The Effects of Fire on Native Animals

The influence of smoke and burned-over tracts on the movement of buffalo herds was noted by Henry. While observing a Blackfoot buffalo drive near the confluence of the Vermillion and North Saskatchewan

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[159] Ibid., volume 2, p.701.

[160] United Kingdom, Papers, p.30.

[161] G. M. Grant, op. cit., pp.235-236.

[162] J. Macoun, op. cit., p.261.

rivers in December, 1809, he commented on the adverse effect of the smoke proceeding from the Indian campfires.

> We were called early to see the buffalo, and instantly were on the lookout hill, whence we saw plenty indeed; but the wind was still unfavorable, and every herd that was brought near the ranks struck off in a wrong direction. We could plainly discern the young men driving whole herds from different directions, until they came within scent of the smoke, when they dispersed.[163]

In January, 1811, extensive burning of the prairies in east-central Alberta caused a famine among the Blackfoot.

> The Piegans...said that all the Slaves [Blackfoot] tribes had been starving. The plains being burned, buffalo are to be found only at a great distance beyond the Bow River, which has been the cause of their not coming in as usual.[164]

The Effects of Fire on Domesticated Animals

The preference of horses and mules for new regrowth on burned-over grasslands was observed by Mullan in September, 1853, near the confluence of the Little Blackfoot and Hellgate rivers in western Montana.

> In many places the valley has been burnt over, and the young green grass is growing abundantly. Our night's camp being near one of these spots, our animals duly appreciate the nutritious grass.[165]

The Effects of Fire on Man

In addition to the lack of game noted previously, four other human

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[163] E. Coues, op. cit., volume 2, p.577.

[164] Ibid., volume 2, p.671.

[165] J. Mullan, "Report of an Exploration from Fort Benton to the Muscle Shell River, and thence by the Southern Little Blackfoot River to the St. Mary's River," Report of Exploration of a Route for the Pacific Railroad--Governor Steven's Report to the Secretary of War (Washington, D. C.: United States Government Printing Office, 1854), p.315

problems related to grass fires were mentioned by nineteenth century observers: (1) risk of death or injury; (2) potential destruction of equipment; (3) hindrances to travel; and (4) inadvertent warnings to hostile Indians of the presence of whites.

The risk to human life posed by prairie fires was noted by Kane in a discussion of a massive fire near Fort Edmonton in September, 1846.

> We were apprehensive at one time of its crossing the river to the side on which the fort is situated, which must in that case have been destroyed. Our fears, too, for Mr. Rundell, whom we had left behind with the boys, were only relieved three days afterwards, when he arrived in safety. It appeared that he had noticed the fire at a long distance off, and immediately started for the nearest bend in the river, which with great exertions he reached in time, and succeeded in crossing. The mode resorted to by the Indians, when in the immediate vicinity of a fire, is to set fire to a long patch in front of them, which they follow up, and thus, depriving the fire in the rear of fuel, escape all but the smoke, which, however, nearly suffocates them.[166]

Hazards to both life and property were created when powder wagons were engulfed by flames from a grass fire. During General Connor's expedition against the Sioux in September, 1865, Palmer reported:

> Some careless soldiers fired the grass near our camp last night....At the starting of this fire the flames ran across camp toward two powder wagons. Volunteers from the General's headquarters camp, together with some soldiers, rushed through the fire to the powder wagons and dragged them to a place of safety; in doing so, they had to pass over burning grass.[167]

The travel-related problems of lack of sufficient forage for livestock and obstacles created by fire-felled trees were mentioned in three diaries. Maximilian noted that so much of the grass had been

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[166]P. Kane, Wanderings of an Artist among the Indians of North America (London: Longman, Brown, Longmans, and Roberts, 1859), p.138.

[167]H. E. Palmer, op. cit., p.114.

burned off by the Indians that there was not enough feed for the horses belonging to his party as they were traveling through the Missouri Valley in eastern Montana during September, 1833.[168] In some cases the obstructions created by fallen trees were so severe that they forced individuals to take another course, turn back, or even resort to another means of transportation. Thompson provided an example of the latter after departing from Fort Augustus on the North Saskatchewan in June, 1809.

> With two men and horses I went by land, but the woods had been lately burned, and the path could not be kept. I therefore sent a man with the horses back to Fort Augustus to Mr. Hughes, and embarked in the canoe.[169]

While passing through pine and aspen woodland near the confluence of the Pembina and North Saskatchewan in the fall of the following year he added:

> October 29th - ...the forests are so frequently burned and occasion so many windfalls, that the horses make very slow progress.
>
> November 2nd - ...burnt and fallen wood fatigued the horses...[170]

The danger presented by fallen logs concealed by tall grass was mentioned by Simpson in July, 1841, near Fort Edmonton.

> As the forests had been almost entirely destroyed by fire, the fallen timber, often concealed alike from horse and rider by the high grass, occasioned a good deal both of delay and danger.[171]

However, in certain instances repeated burning of formerly forested

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[168] Maximilian, op. cit., volume 23, p.162.

[169] R. Glover, op. cit., p.294.

[170] Ibid., pp.317-318.

[171] G. Simpson, op. cit., volume 1, p.107.

tracts eliminated these problems. While traveling down the valley of the Vermillion River in western Alberta during August, 1858, Hector observed that "The fire must have 'run' several times, as even the fallen trees have been burnt, which allowed us to pass along freely."[172]

An example of the risks incurred by soldiers or others who accidentally set fire to the grass while in hostile Indian territory was noted by Palmer during the Sioux campaign of 1865.

> The fire getting beyond our control, serves as a beacon light to the hostiles and gives great uneasiness to the guides, who fear that the Indians will be signaled thereby and may congregate in large numbers, too large for our little command.[173]

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[172]United Kingdom, Journals, p.103.

[173]H. E. Palmer, op. cit., p.114.

Chapter IV

THE CENTRAL REGION

Summer and fall were the high-fire seasons in the Central Region (Table 15). The intervening month of September was, rather inexplicably, a low-fire period. Spring burning was of distinctly secondary importance.

TABLE 15

SEASONS AND MONTHS OF FIRE OCCURRENCE

	Indian Fires	White Fires	Unascribed Fires	Total Fires	Percent
December 22-31	0	0	0	0	0.0
January	0	0	0	0	0.0
February	0	0	0	0	0.0
March 1-20	0	2	0	2	2.2
Winter	0	2	0	2	2.2
March 21-31	0	1	0	1	1.1
April	3	4	2	9	9.7
May	1	2	0	3	3.3
June 1-20	0	1	2	3	3.3
Spring	4	8	4	16	17.4
June 21-30	0	0	0	0	0.0
July	5	3	2	10	10.9
August	9	5	5	19	20.7
September 1-22	1	2	1	4	4.3
Summer	15	10	8	33	35.9
September 23-30	0	1	1	2	2.2
October	13	6	11	30	32.6
November	3	2	4	9	9.7
December 1-21	0	0	0	0	0.0
Fall	16	9	16	41	44.5
Year	35	29	28	92	100.0

Sources of Fires

Thirty-eight percent of the fires were ascribed to Indians. Over 31 percent were attributed to whites. Seven Indian tribes and seven

occupational groups of whites were mentioned in connection with responsibility for specific fires or grass firing practices. The Osage were the most frequently named tribe. Variation in responsibility for fires in comparison with populations is shown in Table 16.

TABLE 16

SOURCES OF INDIAN FIRES

Tribe	Population		Fires		Percentage Difference
	Number	Percent	Number	Percent	
Pawnee	7,000	33.0	2	13.3	-19.7
Osage	6,200	29.3	7	46.7	+17.4
Comanche	3,000	14.2	2	13.3	-0.9
Kiowa	2,000	9.4	1	6.7	-2.7
Kansas	1,800	8.5	1	6.7	-1.8
Wichita	900	4.2	1	6.7	+2.5
Waco	300	1.4	1	6.7	+5.3
Totals	21,200	100.0	15	100.0	0.0

Soldiers were mentioned more frequently than any other white group--in large part a reflection of their being involved in expeditions for which journals were kept (Table 17).

TABLE 17

SOURCES OF WHITE FIRES

Group	Number of Fires
Soldiers	7
Santa Fe traders	5
Emigrants	4
Tourists	4
Settlers	3
Cattle drovers	3
Explorers	2
Total	28

Reasons for Fires Attributed to Indians

Six reasons involving thirty-one references were recorded for

fires started by Indians (Table 18). Hunting and communication accounted for 55 percent of these. Although the Osage were mentioned more frequently than other tribes, the significance of this is minimal since over 70 percent of the cases were ascribed to "Indians" with no further elaboration as to the tribe involved.

TABLE 18

REASONS FOR FIRES ATTRIBUTED TO INDIANS

Tribe	Hunt.	Commun.	War.	Pastur. Improv.	Removal of Obstruc. Veg.	Accid.	Totals
Osage	0	2	1	0	0	1	4
Comanche	0	2	0	0	0	0	2
Kansas	0	0	1	0	0	0	1
Wichita	0	0	1	0	0	0	1
Waco	1	0	0	0	0	0	1
Unspecified	8	4	2	5	3	0	22
Totals	9	8	5	5	3	1	31

Correlations between reasons for fires and the seasons in which they occurred are indicated in Table 19. Communication was the main cause of summer fires. Hunting accounted for half of the fall fires.

TABLE 19

REASONS FOR THE SEASONAL OCCURRENCE OF INDIAN FIRES

Reason	Winter	Spring	Summer	Fall
Hunting	0	0	1	6
Communication	0	0	4	2
Warfare	0	2	0	2
Pasturage improvement	0	1	2	1
Removal of vegetation	0	0	0	1
Accident	0	1	0	0
Totals	0	4	7	12

Hunting.--Three methods of using fire to drive game during the hunting season were discussed in the literature. Some observers said that fires were set in the prairies to drive game to wooded areas.

Others stated the reverse. Probably both were correct. The issue may possibly relate to the extent to which the horse was used in hunting. For those tribes which preferred to do most of their hunting on foot, the former would have been the more advantageous situation. For the Plains Indians which, following the adoption of the horse, did most of their hunting on horseback, the latter would be more favorable. The third method involved the use of the "fire surround."

In reference to the first method, Burnett wrote of his recollections of the process in Missouri during the 1820's.

> They...found that it was far more difficult to hunt the deer in the prairie than in the timber; and they accordingly fired the prairies in the fall, so as to force the game into the timber for food.[174]

Similar observations were recorded by Wyeth in 1832 and Field in 1839; both in reference to eastern Kansas.

> ...we came to a large prairie...destitute of trees, and covered with tall, coarse grass. They are...rendered more arid by the Indian custom of setting fire to the high grass once or twice a year to start the game that has taken shelter there...[175]

> In the fall of the year the Indians set fire to the dry grass of the prairies....Their object is to drive the game to the edges of the creeks where they may be hunted with greater facility.[176]

Irving, in contrast, indicated during his tour of southeastern Kansas and eastern Oklahoma in the fall of 1832, that the Osage, who

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[174]P. H. Burnett, Recollections and Opinions of an Old Pioneer (New York: D. Appleton and Company, 1880), pp.21-22.

[175]J. B. Wyeth, Oregon; or a Short History of a Long Journey from the Atlantic Ocean to the Region of the Pacific by Land (Cleveland, Ohio: The Arthur H. Clark Company, 1905), volume 21, p.49.

[176]C. Porter and M. R. Porter, Matt Field on the Santa Fe Trail (Norman: University of Oklahoma Press, 1960), p.304.

hunted on horseback, fired the woodlands.

> ...columns of smoke hanging lazily in various directions on the horizon--kindled by Indians to drive the game to the prairies.
>
> Towards the end of our march we saw smoke along a woody glen about three or four miles off, made no doubt, by Indian hunters.[177]

The same pattern was noted with reference to the western part of the region. While ascending the Purgatoire Valley of southern Colorado in 1846, Edwards stated:

> Here are a great many dead cottonwood trees said to be killed by the Indians, who burn the thick undergrowth to start out the deer, elk, bear, turkeys, etc. in which the bottom is said to abound.[178]

Stevenson made the following observation for the mountainous woodland region of north-central New Mexico in 1879.

> Each autumn finds the Indians at their work of destruction. They set fire to the timber on the Mora, the Las Vegas, and the Santa Fe ranges that the game may be driven down into the canyons.[179]

The use of the"fire surround" was noted by Irving in central Oklahoma in the fall of 1832. "Ring fires--made by Indians on the prairies to drive game to a point."[180] An entry in Lieutenant Whipple's diary suggests the possibility that he may have encountered a similar situa-

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[177]J. F. McDermott, The Western Journals of Washington Irving (Norman: University of Oklahoma Press, 1944), pp.98 and 148.

[178]M. B. Edwards, "Journal," Marching with the Army of the West, 1846-1848 (Glendale, California: The Arthur H. Clark Company, 1936), p.147.

[179]J. J. Stevenson, Report upon Geological Examinations in Southern Colorado and Northern New Mexico, during the Years 1878 and 1879 (Washington, D. C.: United States Government Printing Office, 1881), p.387.

[180]J. F. McDermott, op. cit., p.138.

tion in the same area during August, 1853.

> One of the party...discovered two Indians setting fire to the prairie....Burning prairies have surrounded us today, and the smoke has been so dense as to nearly obscure the sun....Our visitors now said that they were not Kichais, but Huecos [Wacos], and that they were upon a hunting excursion.[181]

Communication.--The setting of grass fires for signalling purposes was noted by five observers. An illustration of the degree to which the Comanche engaged in this practice was indicated in a statement recorded by James in the summer of 1823. This concerned instructions he was given by a Comanche chief regarding the manner in which the latter's band could located when James returned to their territory in western Oklahoma. "And when you reach these mounds, he said, you will see the smoke from the grass that we will burn every day so that you may find us."[182] Tixier discussed a similar situation while traveling with a band of Osage through central Oklahoma in July, 1840. In reference to the chief of another Osage group which was to rendezvous with the one with which he was traveling, he stated: "As he wanted to join our troop to go to the Saline, he agreed with our men to set fire to the prairie when he would fold his lodges to set out for the Saline."[183] A few days later, Tixier's band fired the grass to signal that they were prepared to depart.

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[181]G. Foreman, A Pathfinder in the Southwest. The Journal of A. W. Whipple during his Exploration for a Railway Route from Fort Smith to Los Angeles in 1853-54 (Norman: University of Oklahoma Press, 1941), pp.61-64.

[182]T. James, Three Years among the Indians and Mexicans (New York: J. B. Lippincott Company, 1962), p.150.

[183]J. F. McDermott, Tixier's Travels on the Osage Prairies (Norman: University of Oklahoma Press, 1940), p.236.

> Towards nightfall, fire was set to the prairie to let the band of Ouanchinka-Lâgri know of the return of our warriors. A cool wind pushed forth the flames with great rapidity and when it was quite dark we saw a long trail of fire burning through the prairie with a crackling similar to that of crumpled dry brambles stirred by the wind.[184]

Subsequently, Tixier added that Ouanchinka-Lâgri's band reciprocated by firing the grass as had been planned.

> The fires of Ouanchinka-Lâgri announced that it was time to join him....After setting fire to the prairie he had waited for some time, and seeing that we did not come, he had gone farther on...[185]

Three incidents were reported by Captain Marcy during his travels across northern Texas in the mid-nineteenth century. In October, 1849, on the Double Mountain Fork of the Brazos, he stated: "We have seen several fresh Indian trails today, and they have been telegraphing with their signal-fires in several different directions."[186] A few days later, near the Clear Fork of the Brazos, he added: "We have seen signalling at several points today, showing that Indians are about us."[187] In August, 1854, while crossing the Llano Estacado he observed that "For two days past we have seen an extensive fire on the prairie to the southwest."[188] According to information subsequently communicated to him by friendly Comanche, the fire had been set by an Indian raiding

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[184]Ibid., p.236.

[185]Ibid., pp.239 and 259.

[186]G. Foreman, Marcy and the Gold Seekers. The Journal of Captain R. B. Marcy, with an Account of the Gold Rush over the Southern Route (Norman: University of Oklahoma Press, 1939), p.373.

[187]Ibid., p.377.

[188]R. B. Marcy, Thirty Years of Army Life on the Border (New York: Harper and Brothers, 1866), p.197.

party as a signal to another band of their departure for Chihuahua.[189] Cooper suggested that the Comanche may have been responsible for signal fires he observed in southwestern Oklahoma in July, 1858. "Three large smokes south and southwest, supposed to be on the Big Wichita, Texas... No other Indians are in that quarter."[190]

One observation was made which suggested that even in those areas where only sparse bunch grass was available, the setting of signal fires was practiced. In reference to northeastern New Mexico, Gregg stated in 1844, that smoke signals were "commonly raised by firing spots of dry grass."[191]

Warfare.--The use of fire as an offensive device in warfare was mentioned in three diaries. The earliest reference to the practice was made by Oñate in recording the fate of the Humaña party which had preceded him into south-central Kansas in the mid-1590's. The incident was related to him by Wichita Indians in 1601.

> We inquiring again regarding the country, they told us that in this region they had murdered the Spaniards, surrounding them with fire and burning them all, and that they had with them one who had escaped, injured by the fire.[192]

A similar incident was discussed two and a half centuries later by Lowe in reference to the Kansas Indians. His detachment was camped near

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[189]Ibid., p.197.

[190]G. Foreman, "A Journal Kept by Douglas Cooper of an Expedition by a Company of Chickasaw in the Quest of Comanche Indians," Chronicles of Oklahoma, 5 (1927), p.385.

[191]J. Gregg, Commerce of the Prairies. The Journal of a Santa Fe Trader (Dallas, Texas: The Southwest Press, 1933), p.414.

[192]D. J. Oñate, "True Account of the Expedition toward the East, 1601," Spanish Exploration in the Southwest, 1542-1706 (New York: Barnes and Noble, 1946), p.259.

Council Grove, Kansas in October, 1853.

> We had been very careful on account of the dense growth of grass and consequent danger of burning the camp. We had finished dinner, about two hours before sunset when, as if by one act, fire broke out in a circle all around us not more than a mile from camp. A stiff gale was blowing from the south, and when we noticed it the fire in the tall grass was roaring furiously and the flames leaping twenty feet high. Quickly we commenced firing outside of our camp, whipping out the fire next to it, thereby burning a circle around it. Every man used a gunny sack or saddle blanket and worked with desperate energy....Undoubtedly the Kaws had set the fire to burn us out, and while they did not quite succeed, if they had seen us they should have been fairly satisfied [i.e. blistered and burned hands, faces, etc.].[193]

Lowe's suspicions were confirmed in his own mind when he visited a near-by Kansas village the following day. "My appearance seemed to be quite a source of amusement for a lot of young bucks...doubtless the scoundrels who had set fire to the grass were before me."[194] Bandel mentioned a case in which a fire was set out of spite. While camped in southeastern Kansas during October, 1857, he reported:

> Indians are encamped on the river. They are Osage. Some of them were in camp this evening; and I suppose it was they also who set the prairie on fire across the river to spite us. Although the grass is still rather green, it burns lustily.[195]

The practice of burning over grass for defensive purposes was mentioned by Bradbury in 1810, and Maximilian in 1833, as each was ascending the Missouri near its confluence with the Platte River of Missouri during the month of April.

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[193]P. G. Lowe, Five Years a Dragoon ('49 to '54) and Other Adventures on the Plains (Kansas City, Missouri: The Franklin Hudson Publishing Company, 1906), pp.139-140.

[194]Ibid., p.142.

[195]E. Bandel, op. cit., p.204.

> ...we also saw other indications of war parties having been recently in the neighborhood, and observed in the night the reflection of immense fires, occasioned by burning the prairies. At this late season, the fires are not made by the hunters to facilitate their hunting, but by war parties; and more particularly when returning unsuccessful, or after a defeat, to prevent their enemies from retracing their steps.[196]

> In some places we saw smoke rising in the forest; in others the trees and the ground were burnt quite black. Such fires are sometimes caused by the Indians, in order to escape the pursuit of their enemies.[197]

Pasturage improvement.--Four observers mentioned pasturage improvement as a reason for Indian burning. While traveling through northwestern Arkansas in 1819, Nuttall commented twice on the benefits of burning off the cover of dead grass. In April, near Fort Smith, he stated:

> I took an agreeable walk into the adjoining prairie....The numerous rounded elevations which chequer this verdant plain, are so many partial attempts at shrubby and arborescent vegetation, which nature has repeatedly made, and which have only been subdued by the reiterated operation of annual burning, employed by the natives, for the purpose of...affording a tender pasturage for the game.[198]

In November, at a site about thirty miles east of the fort, he added:

> Among the more remarkable features of the autumnal season in this country, is the aspect of the atmosphere, which in all directions appears so filled with smoke, as often to render an object obscure at the distance of 100 yards. The southwest winds at this season are often remarkably hazy, but here the effect is greatly augmented by the burning of the surrounding prairies, annually practised by the savages and whites, for the benefit of the hunt, as the ground is thus cleared of a

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[196]J. Bradbury, Travels in the Interior of North America in the Years 1809, 1810, and 1811 (Cleveland, Ohio: The Arthur H. Clark Company, 1904), p.71.

[197]Maximilian, op. cit., volume 22, p.259.

[198]T. Nuttall, Journal of Travels into the Arkansas Territory, during the Year 1819 (Cleveland, Ohio: The Arthur H. Clark Company, 1905), pp.200-201.

> heavy crop of withered grass, prepared for an early vegetation in the succeeding spring, and also assisted in its growth by the stimulating effects of the alkaline ashes.[199]

With reference to prairie fires in central Oklahoma, Mollhausen stated in August, 1853, that "sometimes...they are intentionally kindled by the inhabitants of the steppes, who burn great tracts of the plains to favour the growth of young vigorous grass."[200] To the east of the Antelope Hills in Oklahoma, Whipple made the following entry two weeks later.

> Burnt prairies now surround us, accounting for the bright fires seen lately at night. This is probably the work of Indians to prepare fresh grass for the herds of buffalo that will be slaughtered on their return from the north.[201]

Indian horse herds also benefitted from the practice. In the early 1830's near Fort Leavenworth, Kansas, Catlin observed that many fires were started by the Indians "for the purpose of getting a fresh crop of grass, for the grazing of their horses..."202

Removal of obstructing vegetation.--Three observers indicated that fires were set for purposes of facilitating travel during the fall hunt or during seasonal migrations. In reference to the Arkansas Valley near Fort Smith, Nuttall stated that fires were started by the Indians "for the purpose of hunting with more facility..."[203] Burnett, writing

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[199]Ibid., pp.283-284.

[200]B. Mollhausen, Diary of a Journey from the Mississippi to the Pacific with a United States Government Exploring Expedition (London: Longman, Green, Longmans, and Roberts, 1858, volume 1, p.107.

[201]G. Foreman, Pathfinder, p.73.

[202]G. Catlin, op. cit., volume 2, p.19.

[203]T. Nuttall, op. cit., p.201.

again of Missouri in the 1820's, noted that grass was fired in woodland areas to eliminate fallen timber which might be an encumbrance at the time of the hunt.[204] Catlin mentioned during his visit at Fort Leavenworth that fires were set "for easier traveling during the next summer, when there will be no old grass to lie upon the prairies, entangling the feet of man and horse, as they are passing over them."[205]

Accident.--The only instance in which Indians may have been responsible for an accidental grass fire was mentioned by Tixier in reference to an Osage camp in southeastern Kansas in May, 1840.

> A column of white smoke arose at the horizon....A Canadian, André...told us that the column of smoke was produced by the burning of the tall grass which the campfire, beside which he and his companions [i.e. three Osage] spent the night, had set ablaze.[206]

However, abandoned but unextinguished Pawnee and Kiowa-Comanche campfires were noted by Gregg in central Kansas in the 1830's[207] and Marcy on the north fork of the Red River in February, 1854.[208]

Reasons for Fires Attributed to Whites

Seven reasons were mentioned for fires started by whites (Table 20). Over two-thirds were accidental. Soldiers and Santa Fe traders were responsible for 43 percent. All fires caused by the former group were due to accident.

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[204] P. H. Burnett, op. cit., p.21.

[205] G. Catlin, op. cit., volume 2, p.19.

[206] J. F. McDermott, Tixier's Travels, p.114.

[207] J. Gregg, op. cit., p.32.

[208] R. B. Marcy, op. cit., p.168.

TABLE 20

REASONS FOR FIRES ATTRIBUTED TO WHITES

Group	Accid.	Pleas.	Commun.	Pastur. Improv.	Land Clear.	Repel. Strang.	Malic. Destruc.	Totals
Soldiers	7	0	0	0	0	0	0	7
Traders	3	1	1	0	0	0	0	5
Emigrants	2	1	0	0	0	0	1	4
Tourists	2	2	0	0	0	0	0	4
Settlers	0	0	0	1	1	1	0	3
Drovers	3	0	0	0	0	0	0	3
Explorers	2	0	0	0	0	0	0	2
Totals	19	4	1	1	1	1	1	28

Instances in which the season of occurrence was mentioned are shown in Table 21. All fires recorded for summer were accidental.

TABLE 21

REASONS FOR THE SEASONAL OCCURRENCE OF WHITE FIRES

Reason	Winter	Spring	Summer	Fall
Accident	2	4	8	3
Pleasure	0	2	0	2
Communication	0	0	0	1
Malicious destruction	0	1	0	0
Totals	2	7	8	6

Accident.--Accidental grass fires were mentioned in sixteen diaries. All but one of these were campfire-related. In two cases extenuating environmental circumstances were recorded. For the remainder, negligence was the only explanation given. None were cited as having resulted from the abandonment of campfires, although several campsites were observed in that state.

While camped in southeastern Nebraska during October, 1833, John Irving stated that a gust of wind spread his fire into the adjacent prairie with devastating effect.

The sun had set upon a prairie still clothed in its natural

> garb of herbage. It rose upon a scene of desolation. Not a single weed--not a blade of grass, was left....In every direction, barrenness marked the track of the flames.[209]

Gibson recorded a similar incident in August, 1846, near the confluence of Timpas Creek and the Arkansas River in eastern Colorado.

> This evening the weather was windy...and a fire broke out in the brush, the lurid flames rising high, and the crackling of the dried brush alarming the prairie rabbits, almost the only tenants we saw in this poor and barren country.[210]

Campfires which had been abandoned while still burning or smouldering were noted in four diaries. Washington Irving observed "traces of the recent encampment of Captain Dean--one fire still smoking" to the west of Fort Gibson, Oklahoma in October, 1832.[211] In reference to a former encampment of Santa Fe traders near Council Grove, Kansas in June, 1837, Farnham noted that "their fires were still smouldering and smoking."[212] Near Bent's Fort, Colorado in November, 1846, Garrard stated that "we fixed ourselves in good time near to a heap of logs, which an improvident party of teamsters had collected, set on fire, and left to burn."[213] Abert referred to an advance party he had dispatched in central Kansas in February, 1847. "It was evident that the express I had sent on had encamped here last night; their fires were still

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[209]J. T. Irving, op. cit., pp.221-222.

[210]G. R. Gibson, Journal of a Soldier under Kearny and Doniphan, 1846-1847 (Glendale, California: The Arthur H. Clark Company, 1935), p.176.

[211]J. F. McDermott, Washington Irving, p.115.

[212]T. J. Farnham, Travels in the Great Western Prairies, the Anahuac and Rocky Mountains, and in the Oregon Territory (Cleveland, Ohio: The Arthur H. Clark Company, 1906), p.62.

[213]L. H. Garrard, Wah-to-Yah and the Taos Trail (Glendale, California: The Arthur H. Clark Company, 1938), p.130.

burning."[214]

A rather bizarre incident resulted in a prairie fire near Fort Worth in the spring of 1874. Lindsay recalled his attempt to shoot another member of his trail crew who was about to attack him and the results of the fiasco.

> ...the boys had previously extracted the bullets from my pistol, and I was shooting only wads, but I did not know it. The wads set his clothing afire and also the sage grass, and it took us several hours to put out the prairie fire.[215]

Pleasure.--Four observers cited cases in which fires were set for pleasure. Washington Irving recorded an abortive attempt at this sort of frivolity while camped in eastern Oklahoma in November, 1832. "Some of the men set the prairies on fire, but it is too damp to burn to any extent."[216] The casual attitude maintained by many in the pre-settlement period towards this practice is illustrated by statements made by Field in 1839. While traveling through the Arkansas Valley in central Kansas during October he noted that "We fired the prairie behind us, and the prairie is burning before us; so we are between two fires! Weather delightful--bathed in Walnut Creek."[217] Later in reference to the above incident, he added:

> In mere wantonness we fired the grass behind us when we left the opposite bank, and as the flames spread away in the distance

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[214]J. W. Abert, "Report of the Examination of New Mexico in the Years 1846-47," Notes of a Military Reconnaissance (Washington, D. C.: Wendell and Van Benthuysen, 1848), p.541.

[215]B. D. Lindsay, "One Trip up the Trail," The Trail Drivers of Texas (Nashville, Tennessee: The Cokesbury Press, 1925), p.1006.

[216]J. F. McDermott, Washington Irving, p.146.

[217]C. Porter and M. R. Porter, op. cit., p.57.

we hoped to enjoy an excitement similar to that which we had experienced in the night.[218]

Stout reported a case in south-central Iowa during April, 1846, in which he and some other Mormons started a prairie fire "which the wind drove furiously along as though it would devour everything before it, presenting a scene 'fearfully grand.'"[219] While camped about twenty miles east of the confluence of the Big Sandy and Arkansas rivers in May, 1847, Ruxton cited an instance in which fire was set to a large cottonwood tree which burned until it finally toppled over.[220]

Communication.--Although apparently in an entirely frivolous context, communication was the reason given by Field for a fire he started during October, 1843, in northeastern Kansas. "Saw a prairie set fire to in the distance and kindled one in answer."[221] There was no indication of the person or the purpose for which the fire was intended.

Pasturage improvement.--In the early nineteenth century, Nuttall mentioned that pioneer settlers in northwestern Arkansas set fires to improve pasturage conditions.[222]

Land clearance.--The use of fire for land clearance on pioneer farmsteads in southwestern Missouri was noted by Tixier in August, 1840. "More recent ones are still strewn about with trunks of trees

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[218]Ibid., p.306.

[219]J. Brooks, op. cit., volume 1, p.155.

[220]G. F. Ruxton, Wild Life in the Rocky Mountains (New York: The Macmillan Company, 1926), p.238.

[221]M. C. Field, Prairie and Mountain Sketches (Norman: University of Oklahoma Press, 1957), p.209.

[222]T. Nuttall, op. cit., p.284.

blackened by fire, among which corn and pumpkins are growing."[223]

Repelling strangers.--The setting of fires by squatters to repel inquisitive strangers was mentioned by Burks in 1871, as a common practice in Texas, Oklahoma and Kansas during the latter part of the nineteenth century.

> Many of the prairie fires were started by squatters on land who wanted to keep strangers away. They would plow a safety boundary around their stake and then set fire to the grass outside.[224]

Malicious destruction.--During the Colorado Gold Rush in the spring of 1859, one case was cited in which pasture relied on by the emigrants for livestock feed was consistently burned off to retard their advance. In April, near the Great Bend of the Arkansas, Wickersham reported:

> There is a horse train of ten or fifteen wagons, two days travel ahead of us, that burn off the grass every time they leave camp. The old grass was not burned last year, and the new coming up under the old makes fine feed, if they did not burn it off. I think if we overtake them we shall have a difficulty. A man who is mean enough to be guilty of such an act should be in a penitentiary.[225]

The Effects of Fire on Vegetation

The causes of the treeless character of the semi-arid western plains and the impact of fire on the various woodland formations present within the Central Region both received comment from observers.

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[223]J. F. McDermott, Tixier's Travels, p.275.

[224]A. Burks, "A Woman Trail Driver," The Trail Drivers of Texas (Nashville, Tennessee: The Cokesbury Press, 1925), p.302.

[225]H. F. Wickersham, "Letter to the Missouri Democrat," Overland Routes to the Gold Fields, 1859 from Contemporary Diaries (Glendale, California: The Arthur H. Clark Company, 1942), p.315.

Fire, drought, wind and soil conditions were all given as causes for the absence of trees in the western plains, although varying degrees of significance were assigned to each. In reference to western Kansas in 1846, Johnston attributed the situation solely to fire. "Keep fire away from it and in one hundred years it would be one of the richest portions of the continent."[226] In regard to the Llano Estacado, Lieutenant Whipple emphasized wind as the dominant factor.

> It seems that the prevalent southwest winds prevent the growth of trees upon the prairies. The nakedness of the Staked Plain is undoubtedly due, in part, to this cause. The want of water there and the annual fires may contribute to the result.[227]

A rebuttal of Whipple's contention was offered by Domenech in reference to the same region.

> It has long been thought that the south-western winds in those latitudes prevent the growth of all high vegetation, but the prolonged drought, the nature of the soil, and the habit that the Indians have of annually setting fire to the prairies, account much better for this aridity than the violence of the winds.[228]

The effect of fire on woodlands was discussed with respect to several eastern broadleaf trees and shrubs, the oak-dominated Cross Timbers, and juniper, mesquite and cottonwood formations. References to the relationship between fire and species of the broad-leaved woodland were mentioned in seven diaries. Most observers thought fire to be the principal cause of prairie formation in this region, although Brackenridge, in 1811, noted the resistance of the woods in central

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[226]A. R. Johnston, "Journal," Marching with the Army of the West, 1846-1848 (Glendale, California: The Arthur H. Clark Company, 1936), p.89.

[227]G. Foreman, Pathfinder, p.93.

[228]E. Domenech, op. cit., volume 1, p.150.

Missouri to burning.

> ...notwithstanding the ravages of fire, the marks of which are everywhere to be seen, the woods, principally hickory, ash, oak, and walnut formed a forest tolerably close.[229]

In reference to the woodlands near St. Louis in 1820, James observed that "Since their occupation by permanent inhabitants, the yearly ravages of the fire have been prevented, and a dense growth of oaks and elms has sprung up."[230] Flagg, visiting the same area sixteen years later, commented similarly.

> The face of the country is...clothed in a dense forest of black-jack oak, interspersed with thickets of the wild plum, the crab-apple, and the hazel. Thirty years ago, and this broad plain was a treeless, shrubless waste, without a solitary farmhouse to break the monotony. But the annual fires were stopped; a young forest sprang into existence; and delightful villas and country seats are now gleaming from the dark foliage in all directions.[231]

Gregg discussed prairie formation and woodland invasion processes in relation to fires in western Missouri and eastern Kansas in 1844.

> It is unquestionably the prairie conflagrations that keep down the woody growth....The occasional skirts or fringes which have escaped their rage, have been protected by the streams they border. Yet may not the time come when these vast plains will be covered with timber?...In fact we are now witnessing the encroachment of the timber upon the prairies wherever the devastating conflagrations have ceased their ravages.[232]

Johnston concluded the same for eastern Kansas two years later. "The

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[229]H. M. Brackenridge, Journal of a Voyage up the Missouri, 1811 (Cleveland, Ohio: The Arthur H. Clark Company, 1904), p.52.

[230]E. James, op. cit., volume 15, p.166.

[231]E. Flagg, The Far West: or a Tour Beyond the Mountains (Cleveland, Ohio: The Arthur H. Clark Company, 1906), volume 26, p.162.

[232]J. Gregg, op. cit., p.353.

country is well-watered, but the all-devouring element fire, prevents the rapid growth of timber."[233] Root suggested a geographical gradation of forest to prairie in western Missouri and eastern Kansas to illustrate the importance of fire in prairie formation in 1848.

> The traveler, soon after leaving St. Joseph's, westward sees the prairie in all stages of formation, from the dense forest to an entire prairie. This, with the dense forests of young timber eastward, where the white man has forbidden the practice of firing prairies, seems to be a convincing proof of the aforementioned mode of prairie formation.[234]

In 1859, Greeley stressed the importance of cultural features on the landscape in restricting the influence of prairie fires in Missouri. "A thick growth of young wood, now that the annual fires are somewhat checked by roads and cultivation, is coming forward under the full-grown oaks..."[235] He added more specific observations a few days later in eastern Kansas.

> I noted that these woody spurs, composed mainly of black oak and cottonwood...began to spread on every side wherever the annual fires were repelled from the adjacent prairie, whether by the interposition of a road or otherwise, and that the young trees that thus sprung up along the sides of the ravines and run out into the level prairie are quite often hickory, white ash, etc., even where none such are visible among the adjacent timber.[236]

In the Cross Timbers region of northern Texas and Oklahoma, Gregg emphasized the relative survival capacity of black-jack and post oak

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[233]A. R. Johnston, op. cit., p.79.

[234]R. Root, Journal of Travels from St. Joseph's to Oregon (Oakland, California: Biobooks, 1955), p.4.

[235]H. Greeley, An Overland Journey, from New York to San Francisco, in the Summer of 1859 (New York: C. M. Saxton, Barker and Company, 1860), p.15.

[236]Ibid., p.21.

and the morphological effect of repeated burning on these species.

> ...black-jack and post oak predominate, as these, and especially the former, seem only capable of withstanding the conflagrations to which they are exposed, and therefore abound along the prairie borders. The black-jack presents a blackened, scrubby appearance, with harsh rugged branches--partly on account of being so often scorched and crisped by the prairie fires....Most of the timber appears to be kept small by the continuous inroads of the burning 'prairies;' for, being killed almost annually it is constantly replaced by scions of undergrowth; so that it becomes more and more dense every reproduction. In some places, however, the oaks are of considerable size, and able to withstand the conflagrations.[237]

Kendall, in 1841, suggested the possible effects of fire on juniper in north-central Texas and noted the regrowth of seedlings.

> ...the whole surface below, was covered by dry cedars [i.e. junipers], apparently killed the previous year by fire... Shoots of young cedars, however, were springing up wherever they could find root-hold.[238]

The effect of prairie fires on mesquite was noted by Michler in 1849, near the confluence of the Clear and Double Mountain forks of the Brazos. "The whole country was well timbered with mesquite, but most of it had been killed by prairie fires."[239] Four observers commented on the effects of fires in relation to the general absence of cottonwood on the north side of the Arkansas in western Kansas and eastern Colorado. In July, 1846, Johnston and Edwards stated:

> There are no trees on the north side of the river and only a few on the south side, which the range of sand hills on that side have no doubt saved from the fire of the prairies.[240]

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[237] J. Gregg, op. cit., p.350.

[238] G. W. Kendall, Narrative of the Texan Santa Fe Expedition (Austin, Texas: The Steck Company, 1935), volume 1, p.175.

[239] N. H. Michler, "Report," Reports of the Secretary of War (Washington, D. C.: United States Government Printing Office, 1850), p.35.

[240] A. R. Johnston, op. cit., p.86.

> The few scattering groves of cottonwoods that appear on its banks are principally confined to the southern bank, which is protected by a line of sand hills which produce nothing to burn and serve as a protection to the bank. Some of the islands have timber on them.[241]

Similar observations were recorded by Gregg (1844) and Heap (1853).[242]

The Effects of Fire on Native Animals

Three references to the effects of fire on native animals were recorded in the literature. These involved behavioral characteristics in the face of different types of fire situations. Catlin, in the early 1830's, commented generally on the situation in the short grass region in the west.

> Over the elevated lands and prairie bluffs where the grass is thin and short, the fire slowly creeps with a feeble flame, which one can easily step over; where the wild animals often rest in their lairs until the flames almost burn their noses; when they will reluctantly rise, and leap over it, and trot off amongst the cinders, where the fire has passed and left the ground black as jet.[243]

He also observed the behavior of prairie chickens near Fort Leavenworth.

> ...seeing the prairies on fire several miles ahead of us, and the wind driving the fire gradually towards us, we found these poor birds driven before its long line, which seemed to extend from horizon to horizon....They generally flew half a mile or so, and lit down again in the grass, where they would sit until the fire was close upon them, and then they would rise again.[244]

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[241]M. B. Edwards, op. cit., p.138.

[242]J. Gregg, op. cit., p.30. L. R. Hafen and A. W. Hafen, Central Route to the Pacific, from the Valley of the Mississippi to California: Journal of E. F. Beale and Gwinn Harris Heap, from Missouri to California in 1853 (Glendale, California: The Arthur H. Clark Company, 1957), p.97.

[243]G. Catlin, op. cit., volume 2, p.19.

[244]Ibid., volume 2, p.18.

While traveling through the valley of the Canadian River in central Oklahoma in August, 1853, Mollhausen commented on the inter-relationship between grass fires, predatory birds, and small rodents.

> The fire advanced very slowly, and occasioned a short delay; the little rodentia could easily escape from it, but a troop of forked kites and brown falcons had nevertheless hastened hither, and circling sportively about in the black smoke, and watching their opportunity shot down, snatched their frightened prey from before the flames, and carried it off in their sharp claws.[245]

The Effects of Fire on Domesticated Animals

Two observers commented on deaths caused by fire. Catlin described the tendency of horses to freeze in panic before approaching flames in the bottomlands of the Arkansas and Missouri rivers.

> ...the dense column of smoke that is swept before the fire [alarms] the horse, which stops and stands terrified and immutable, till the burning grass which is wafted in the wind, falls about him, kindling up in a moment a thousand new fires, which are instantly wrapped in the swelling flood of smoke that is moving on like a black thunder-cloud.[246]

Mollhausen referred to cattle belonging to the Choctaw and Chickasaw who resided in eastern Oklahoma in 1853. "It is a matter of no infrequent occurrence that one of these fires proves the destruction...of the cattle..."[247]

The Effects of Fire on Man

Three effects of fire on man and human activities were recorded in historical diaries: (1) hazards to life; (2) destruction of personal

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[245]B. Mollhausen, op. cit., volume 1, p.112.

[246]G. Catlin, op. cit., volume 2, pp.19-20.

[247]B. Mollhausen, op. cit., volume 1, p.108.

effects and camp equipment; and (3) travel-related problems.

The possibility of people perishing in prairie fires varied regionally for, as Burton observed in 1862, fires in the short grass plains of the more arid western sections provided little in the way of a hazard to travelers whereas a similar situation in the tall grass prairies of the east could be extremely dangerous.[248] One place-name in western Missouri provided an example of the latter. Prado del Fuego, later translated to Fire Prairie by Anglos, derived its name from an incident which occurred during the latter half of the eighteenth century. Three or four Indians, of an unspecified tribe, were burned to death by a fire which occurred suddenly in the tall grass, trapping them before they were able to do anything to save themselves.[249] Normally, however, both Indians and experienced whites alike were able to survive by burning the grass in the area where they were located so as to clear a safety zone. Mollhausen discussed the method.

> The hunter, accustomed to be on his guard against all chances, when he sees the black clouds of smoke rolling over his head, as harbingers of the fiery tide, composedly kindles a new fire in the high grass before him, and having cleared of all combustible matter a spot large enough to ensure his safety, looks calmly from it on the threatened danger passing harmless by.[250]

Irving, however, related an incident which indicated the danger in which informed but inexperienced whites occasionally found themselves under

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[248] R. F. Burton, The City of the Saints and Across the Rocky Mountains to California (New York: Harper and Brothers, 1862), p.29.

[249] A. P. Nasatir, Before Lewis and Clark; Documents Illustrating the History of the Missouri 1785-1804 (St. Louis, Missouri: St. Louis Historical Documents Foundation, 1952), volume 1, p.125. E. James, op. cit., volume 14, pp.165-166.

[250] B. Mollhausen, op. cit., volume 1, p.110.

these circumstances.

> Mr. Bailey tells of his having nearly been overtaken last year by fire on the prairies--saw it approaching and was so confused that he was hardly able to make free and set the prairie on fire before him.[251]

A modified form of the above method of survival, utilizing favorable environmental conditions, was employed by Whipple while his expedition was proceeding westward through central Oklahoma in August, 1853.

> The train took refuge behind a watery ravine, where the grass was too green to burn freely. Taking advantage of a comparatively bare spot, the flames were fought, and a temporary opening made, through which the train passed to the black-burned prairie, which we traversed in safety.[252]

A more daring tactic was discussed by Carvalho in reference to Fremont's expedition as it was passing through central Kansas in October, 1853.

> At daylight our animals were all packed, the camp raised, and all the men in their saddles. Our only escape was through the blazing grass. We dashed into it, Colonel Fremont at the head. ...The distance we rode through the fire could not have been more than one hundred feet, the grass which ignites quickly, as quickly consumes, leaving only black ashes in the rear. We passed through the ordeal unscathed...[253]

The destruction of personal effects and camp equipment was reported by Kendall in an incident on the Wichita River in central Texas during August, 1841.

> ...the high grass had caught fire by accident, and that with such velocity had it spread that several of the wagons, and among them that of the commissioners, had been consumed. This wagon, contained, in addition to a large amount of cartridges, all the trunks and valuables of the mess to which I was

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[251] J. F. McDermott, Washington Irving, p.118.

[252] G. Foreman, Pathfinder, pp.67-68.

[253] S. N. Carvalho, Incidents of Travel and Adventure in the Far West with Colonel Fremont's Last Expedition (New York: Derby and Jackson, 1857), pp.60-61.

attached...[254]

Five travel-related problems resulting from prairie fires were mentioned by observers: (1) obscured trails; (2) injury to horses' hooves; (3) insufficient forage; (4) lack of fuel; and (5) absence of game. The problem of navigation across the prairies when trails had been obscured by fire was mentioned in three diaries. While traveling through eastern Kansas in July, 1822, Fowler stated: "We set out early to follow the Wagon Road, but here the prairie has been burned in the spring, and the grass so grown up that we cannot find it..."[255] A similar entry was recorded by Murray in August, 1835, to the north of the confluence of the Republican and Kansas rivers. "We reached an elevated district of tableland, which had been burned so close that I very often lost the track altogether for fifty yards."[256] Carvalho related a somewhat less perplexing situation which confronted Colonel Fremont and his Indian guide in central Kansas.

> To reach us he had to travel over many miles of country which had been on fire. The Indian trail which led to our camp from "Solomon's Fork" had become obliterated, rendering it difficult and arduous to follow; but the keen sense of the Indian directed him under all difficulties directly to the spot where he had left us.[257]

In November, 1832, Ellsworth commented on the injuries which occurred

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[254]G. W. Kendall, op. cit., volume 1, p.177.

[255]E. Coues, The Journal of Jacob Fowler (New York: Francis P. Harper, 1898), p.170.

[256]C. A. Murray, op. cit., volume 2, p.35.

[257]S. N. Carvalho, op. cit., p.58.

to the hooves of the horses belonging to his party as it was passing over recently burned prairie in eastern Oklahoma.

> The stubble left is very painful for the horses' feet--not only thatch, but small bushes are burnt even with the ground; and as soon as the horse presses his weight upon them, they too frequently run into the fray and make him lame.[258]

An example of the extreme problems which occasionally confronted travelers due to the destruction of forage was recorded by Williams during his journey across central and eastern Kansas in October, 1842. Near Council Grove he wrote: "The plains being burnt over by the Indians, my horses were almost starved."[259] At the Shawnee Mission on the Missouri state line he added:

> ...next morning I traded three of my horses for one, they being poor and almost starved to death, having travelled three hundred miles over the burnt plains, where there was but little grazing.[260]

A similar, although less severe situation was noted by Lieutenant Abert while traveling through southwestern and central Kansas during January and February, 1847.

> On account of the prairies having been burnt, our mules wandered off for five or six miles....Thus we were obliged to lose the best part of this day, on account of the inexcusable negligence of some preceding travellers...[261]

> The greatest inconvenience that we have suffered on this march

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[258]H. L. Ellsworth, Washington Irving on the Prairie or a Narrative of a Tour of the Southwest in the Year 1832 (New York: American Book Company, 1937), p.136.

[259]J. Williams, "Narrative of a Tour from the State of Indiana to the Oregon Territory, in the Years 1841-2," To the Rockies and Oregon 1839-1842 (Glendale, California: The Arthur H. Clark Company, 1955), p.281.

[260]Ibid., p.284.

[261]J. W. Abert, op. cit., p.527.

> has been caused by the negligence of others with regard to the campfires; which negligence having caused the destruction of the pasture grounds, our mules would wander off, and we frequently lost much of the day in catching them.[262]

Lack of fuel for cooking was noted by Burks in reference to cattle drives in the plains of Texas and Oklahoma during the latter part of the nineteenth century. "Fuel was very scarce because of these fires and the cook often had to go miles to get enough to cook a meal."[263] Tixier reported an absence of game in central Oklahoma during July, 1841. "The prairie fire had driven the bison away, and as we had not dried any meat a scarcity was beginning to be felt."[264]

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[262] Ibid., pp.533-534.

[263] A. Burks, op. cit., p.302.

[264] J. F. McDermott, Tixier's Travels, p.239.

Chapter V

THE SOUTHERN REGION

Although fires occurred on a year-around basis in the Southern Region, a pronounced winter maximum was followed by a spring burning period of secondary importance (Table 22). September was fire-free.

TABLE 22

SEASONS AND MONTHS OF FIRE OCCURRENCE

	Indian Fires	White Fires	Unascribed Fires	Total Fires	Percent
December 22-31	0	0	1	1	1.7
January	6	7	0	13	21.6
February	3	4	2	9	15.0
March 1-20	1	3	2	6	10.0
Winter	10	14	5	29	48.3
March 21-31	0	0	0	0	0.0
April	2	1	1	4	6.7
May	1	6	0	7	11.7
June 1-20	2	0	1	3	5.0
Spring	5	7	2	14	23.4
June 21-30	0	0	2	2	3.3
July	0	3	1	4	6.7
August	0	0	2	2	3.3
September 1-22	0	0	0	0	0.0
Summer	0	3	5	8	13.3
September 23-30	0	0	0	0	0.0
October	0	1	4	5	8.3
November	1	3	0	4	6.7
December 1-21	0	0	0	0	0.0
Fall	1	4	4	9	15.0
Year	16	28	16	60	100.0

Sources of Fires

Of the fires recorded, 27 percent were attributed to Indians and 47 percent to whites. Only the Apache and Comanche were assigned responsibility for specific fires or grass-firing practices. The

former accounted for over three-fourths of the instances cited. Variation in responsibility for fires in comparison with populations is shown in Table 23.

TABLE 23

SOURCES OF INDIAN FIRES

Tribe	Population		Fires		Percentage Difference
	Number	Percent	Number	Percent	
Comanche	3,000	60.0	2	22.2	-37.8
Apache	2,000	40.0	7	77.8	+37.8
Totals	5,000	100.0	9	100.0	0.0

Soldiers, tourists and emigrants were responsible for 73 percent of the fires caused by whites (Table 24).

TABLE 24

SOURCES OF WHITE FIRES

Group	Number of Fires
Soldiers	8
Tourists	6
Emigrants	5
Explorers	3
Settlers	2
Santa Fe traders	1
Missionaries	1
Total	26

Reasons for Fires Attributed to Indians

Five reasons involving twelve cases were given for fires attributed to Indians (Table 25). Warfare and communication accounted for three-fourths of these. The Apache were mentioned as the tribe responsible for over half of all cases and over three-fourths of those related to warfare and communication.

TABLE 25

REASONS FOR FIRES ATTRIBUTED TO INDIANS

Tribe	War.	Commun.	Hunt.	Pastur. Improv.	Insect Eradic.	Totals
Apache	4	3	0	0	0	7
Comanche	0	1	0	0	0	1
Unspecified	1	0	1	1	1	4
Totals	5	4	1	1	1	12

The only reasons mentioned for Indian burning in relation to seasons of the year were warfare and communication, with all instances occurring during winter and spring (Table 26).

TABLE 26

REASONS FOR THE SEASONAL OCCURRENCE OF INDIAN FIRES

Reason	Winter	Spring	Summer	Fall
Warfare	4	1	0	0
Communication	1	2	0	0
Totals	5	3	0	0

Warfare.--Two observers noted the use of fire as an offensive tactic in warfare. While traveling with a brigade of Mexican soldiers in northern Chihuahua during April, 1853, Froebel discussed harassment by the Apaches.

> The audacity which the Indians displayed during the march of so large a body of soldiers proves how difficult it is to restrain them. As soon as our encampment for the night was chosen, the cavalry had to ride in all directions in order to clear our neighborhood from them; but as soon a it became dark, the grass was on fire at some little distance all around us. Almost without exception, we had an illumination every night by the burning of the prairie. Fortunately, the grass in this region is neither thick or long, or we should have been often in danger, and, as it was, we were several times in great anxiety as to the safety

of our ammunition.[265]

Bennett recorded two attacks by the Mescalero Apache in the Sacramento Mountains of southern New Mexico during January, 1855.

> January 18th - At 11 o'clock at night, a dozen rifles cracked, and a score of arrows came flying into our camp. The dry grass was set on fire around us. Our horses stampeded, running in all directions. With a great deal of trouble we got them together. It remained quiet until morning.[266]

> January 26th - The Apache Indians tried to burn us out of camp last night. We saved ourselves by burning a circle around the camp.[267]

The use of fire for defensive purposes, in this case to inhibit the advance of the cavalry, was also suggested by Bennett in reference to the Mescalero on January 23rd. "The Indians have been burning the grass upon our route."[268] A similar reference was recorded by Gray near Fort Chadbourne in central Texas during the same month and year, although no tribe was mentioned.

> A war party, had a few days previously, passed along, and for many miles the fire was raging around us. As far as the eye could witness, all was ablaze, and at night appeared like a vast amphitheatre of illuminated cities...the object of the Indians is...to prevent immediate pursuers having forage for their animals.[269]

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[265]J. Froebel, Seven Years' Travel in Central America, Northern Mexico, and the Far West of the United States (London: Richard Bentley, 1859), pp.396-397.

[266]C. E. Brooks and F. D. Reeves, "James A. Bennett: A Dragoon in New Mexico, 1850-1856," New Mexico Historical Review 22 (1947), p.153.

[267]Ibid., p.154.

[268]Ibid., p.154.

[269]A. B. Gray, Survey of a Route on the 32nd Parallel for the Texas Western Railroad, 1854 (Los Angeles: The Westernlore Press, 1963), p.18.

Communication.--Grass fires set for purposes of communication were mentioned in four diaries. The earliest reference, pertaining to Apache groups in general, was recorded by Cordero in 1796, in his detailed description of the hunt.

> ...at dawn a piece of terrain is encircled, which frequently is five or six leagues in circumference. The sign to commence the chase, and consequently to close the circle, is given by smoke signals. There are men on horseback assigned to this project, which consists in setting fire to the grass and herbage of the whole circumference; and since for this purpose they are already placed ahead of time in their posts with torches ready which they make from dried bark or dried palmilla, it takes only a moment to see the whole circle flare up. At the same instant, the shouts and noise commence, the animals flee, they find no exit, and finally they fall into the hands of their astute adversaries.[270]

While traveling from San Antonio to Austin in May, 1841, Kendall observed grass fires set for signalling purposes by the Comanche.

> During the day, Small pointed to several large clouds of smoke rising at some distance ahead of us, and a little to the left of our route, remarking that they proceeded from Indian fires; but at the time we thought little of them.[271]

The following day he added:

> It was now also rendered evident that the alarm among our animals the previous night, was occasioned by Indians, and Matt Small's remark, that the smoke we had seen in the afternoon arose from the signal-fires of a party of savages, received direct confirmation.[272]

A brief entry, also suggesting a signal fire, was recorded by Bollaert near the confluence of the Nueces, Frio and Atascosa rivers in southern Texas during mid-June, 1844. "Saw a smoke rise up suddenly about

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[270]D. S. Matson and A. H. Schroeder, "Cordero's Description of the Apache--1796," New Mexico Historical Review, 32 (1957), pp.343-344.

[271]G. W. Kendall, op. cit., volume 1, pp.37-38.

[272]Ibid., volume 1, p.41.

south-southeast of us....I do not think it was a Comanche, but a Lipan fire."[273] Whiting reported an encounter with a Mescalero family near Fort Stockton, Texas in March, 1849.

> They said we were going wrong for Presidio, and the warrior pointed the course. We gave them a little tobacco, and they went on their way well pleased, but not before the old Indian had set the grass afire. This looked ominous and we proceeded cautiously, Smith, Howard, and the Delaware scouting in advance.[274]

A short time thereafter, Whiting's small detachment was surrounded by a band of about one hundred Mescalero warriors who had been alerted by the fire, but fortunately they were not hostilely disposed.[275]

Hunting.--The sole reference to the use of fire in hunting was recorded by Cabeza de Vaca while journeying across the plains of southern Texas in 1535.

> Those Indians...go about with a firebrand, setting fire to the plains and timber...to get lizards and similar things which they eat, to come out of the soil. In the same manner they kill deer, encircling them with fire, and they do it also to deprive the animals of pasture, compelling them to go for food where the Indians want.[276]

Pasturage improvement.--In addition to the previously cited statement concerning the fire observed near Fort Chadbourne, Gray also noted: "In burning the grass behind them, the object of the Indians is to accelerate the spring growth."[277]

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[273]W. E. Hollon and R. L. Butler, William Bollaert's Texas (Norman: University of Oklahoma Press, 1956), p.372.

[274]W. H. Whiting, "Journal," Exploring Southwestern Trails, 1846-1854 (Glendale, California: The Arthur H. Clark Company, 1938), p.270.

[275]Ibid., p.275.

[276]F. Bandelier, The Journey of Alvar Nuñez Cabeza de Vaca (Chicago: The Rio Grande Press, 1964), pp.92-93.

[277]A. B. Gray, op. cit., p.18.

Insect riddance.--De Vaca stated additionally that the Indians set fires "so as to drive off the mosquitoes."[278]

Accident.--Although no accidental fires were recorded in the Southern Region, the potential was clearly present. Amangual recorded the following observation in the Pecos Valley during November, 1808.

> At four o'clock the lieutenant and the party which had gone out to find the Indians returned and reported that they had found the village abandoned, with eight fires still burning, and he was certain the Indians were Comanches who were hunting in the region.[279]

Reasons for Fires Attributed to Whites

Five reasons were given for fires attributed to whites. Over half of the fires resulted from accidents and most of these were started by soldiers. Soldiers and tourists together were responsible for 57 percent of the total number (Table 27).

TABLE 27

REASONS FOR FIRES ATTRIBUTED TO WHITES

Group	Accid.	Commun.	Human Comf.	Pastur. Improv.	Reptile Eradic.	Totals
Soldiers	5	0	2	0	0	7
Tourists	2	2	1	0	0	5
Emigrants	3	0	0	0	0	3
Explorers	2	0	0	0	0	2
Settlers	0	0	0	2	0	2
Santa Fe traders	0	0	0	0	1	1
Missionaries	0	1	0	0	0	1
Totals	12	3	3	2	1	21

[278]F. Bandelier, op. cit., p.93.

[279]F. Amangual, "San Antonio to Santa Fe to San Elizario to San Antonio," Pedro Vial and the Roads to Santa Fe (Norman: University of Oklahoma Press, 1967), p.528.

Cases in which the season was indicated are shown in Table 28. All but one of the winter fires were accidental.

TABLE 28

REASONS FOR THE SEASONAL OCCURRENCE OF WHITE FIRES

Reason	Winter	Spring	Summer	Fall
Accident	6	2	2	2
Communication	0	3	0	0
Human comfort	0	0	0	3
Pasturage improvement	1	1	0	0
Reptile eradication	0	1	0	0
Totals	7	7	2	5

Accident.--Accidental fires were noted in ten diaries. Escaped campfires caused all but two of these. In four cases extenuating environmental circumstances were mentioned. No incidents were cited in which campfires were negligently abandoned with or without adverse effect, but in two cases they were deliberately abandoned as a tactical device.

Two incidents were recorded in February, 1847, in which wind conditions were primarily responsible for accidental grass fires. Both involved campfires. Near Encinillas, Chihuahua, Edwards noted: "The wind blowing tremendously, a fire was allowed to escape..."[280] While camped on the Jornada del Muerto of southern New Mexico, Susan Magoffin wrote:

> The wind blew high all the evening and the dust [was] considerable...the grass caught fire near to our baggage wagon....It is singular how rapidly it will spread in the dry grass. Before the alarm could be given yesterday, it spread several yards.[281]

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[280]M. B. Edwards, op. cit., p.257.

[281]S. S. Magoffin, Down the Santa Fe Trail and into Mexico (New Haven, Connecticut: Yale University Press, 1962), p.197.

Two observers mentioned that campfires were deliberately abandoned while burning in order to deceive hostile Indians as to the evening location of a white campsite. However, in neither case was there any further comment indicating if these resulted in grass fires. De Benavides discussed the hazards of travel for Spaniards in the region near the confluence of the Conchos and Rio Grande in 1630.

> [It] cannot be passed by less than twelve men with their horses, and very well ready with their weapons. Even in this manner, it is necessary to go with care, making a fire at nightfall at one place to lead them astray, and then to proceed beyond as far as possible.[282]

Whiting provided a case in point while traveling through the Davis Mountains in March, 1849, although the Mescaleros were only temporarily deceived.

> I determined to steal a march upon Gomez, for I had no doubt that he was moving his other bands....Our fires still burning, we issued from our camp without a sound...to the eastward above the hills of the pass rose the lurid glare of the gathering fires of the Apache....About eleven, on our left, a brilliant fire suddenly flashed into light from the summit of a lofty peak....We knew that our movement was discovered. The lurking spies about our camp had found that we had gone...[283]

In two cases controlled burning was adversely affected by high wind velocities. In reference to the previously cited fire near Encinillas, Edwards added that a backfire was attempted by the soldiers, but this escaped control and further endangered the supply wagons and munitions. The latter were finally protected when the cavalry cut off the tall grass with their sabers.[284] In January, 1854, Olmstead discussed

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[282]F. W. Hodge and C. F. Lummis, The Memorial of Fray Alonso de Benavides, 1630 (Albuquerque: Horn and Wallace, 1965), pp.12-13.

[283]W. H. Whiting, op. cit., pp.279-281.

[284]M. B. Edwards, op. cit., p.257.

an incident near New Braunfels, Texas, in which an attempt to burn a safety zone for a campfire went awry.

> ...the Doctor began to burn the grass off a small circle of the ground, that we might have a place to cook our supper upon, without danger of setting fire to the prairie at large. There was a strong southwest wind blowing; the grass had not been at all fed down, and was the thickest and heaviest we had anywhere seen, and perfectly dead and dry. Just as the fire was touched to the grass, there came an unusually violent gust, and in a moment it was burning furiously...[285]

Communication.--Reference to the setting of fires for signalling purposes was recorded in two diaries. While traveling through the country south of Austin during April, 1690, Father Massanet wrote:

> ...Captain Alonso de León and myself with fifteen men set out in a northerly direction for the San Marcos River, in order to try to find some Indians, burning fires day and night to see whether they should be answered by others.[286]

Two incidents were mentioned by Bollaert in May, 1844, to the east of San Antonio. "My party appears to be on the La Bahia trail, by a fire I saw on the prairie."[287] The following day he added: "I saw smokes of two fires--probably signals for me."[288]

Human comfort.--Three observers commented on the practice of firing patches of grass and other vegetation in order to obtain warmth during cool evenings. Each instance involved a crossing of the Jornada

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[285]F. L. Olmstead, A Journey through Texas; or, A Saddle-trip on the Southwestern Frontier (New York: Dix, Edwards and Company, 1857), p.216.

[286]D. Massanet, "Letter to Don Carlos de Siguenza, 1690," Spanish Exploration in the Southwest, 1542-1706 (New York: Barnes and Noble, 1946), p.372.

[287]W. E. Hollon and R. L. Butler, op. cit., p.344.

[288]Ibid., p.344.

del Muerto during the fall. In November, 1841, while a captive of the Mexican Army, Kendall made the following observation in reference to the Mexican soldiers and their camp followers.

> Being from a more southern and temperate climate, they suffered excessively from the cold, so much so that many of them were leading their horses and setting fire to every little tuft of palm or dry grass on either side of the road. Around these blazing tufts and scattered along the road for miles, were to be seen knots of half-frozen dragoons, mingled with a large number of women, who always follow the Mexican soldiery on a march....As tuft after tuft would fall away at the touch of fire, the wild group would hurry on to others, soon kindle them, and as they in turn would suddenly flash up, blaze for a few moments, and then as suddenly expire, away they would hie to the next.[289]

Kendall's speculation that the Mexicans set fire to warm themselves because of their low tolerance to cold weather is somewhat misleading, however. While traveling through the area with the U. S. Army in October, 1847, Ferguson reported:

> About ten o'clock the front guard set fire to some of the stalks of bear grass (a species of palm), which lit up the sky with a lurid glare. Some of us stopped and warmed [ourselves] by these transient fires.[290]

A similar notation was recorded by Froebel in October, 1852.

> On our way we set fire to the dry leaves of some yuccas, which burned with a high crackling flame, enclosing the whole stem, and affording us considerable warmth as we passed.[291]

Pasturage improvement.--Burning to improve pasturage conditions was noted in two diaries. In May, 1842, while traveling down the valley of the lower Brazos, Bollaert stated: "As night came on I saw a very

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[289]G. W. Kendall, op. cit., volume 2, pp.12-13.

[290]P. G. Ferguson, "Diary," Marching with the Army of the West, 1846-1848 (Glendale, California: The Arthur H. Clark Company, 1936), p.335.

[291]J. Froebel, op. cit., p.320.

large patch of prairie on fire....The prairies are generally set afire to burn weeds and old pasture, so as to make room for the new grass."[292] Olmstead made the following entry in March, 1854, near Goliad, Texas.

> We passed a man engaged in firing the prairie. He drew a handful of long, burning grass along the dry grass tops, at a run. Before the high gale it kindled furiously and in fifteen minutes had progressed a mile to leeward, jumping, with a flash, many feet at a time.[293]

Reptile eradication.--In the spring of 1855, Meriwether discussed a fire which was set near Las Cruces, New Mexico to rid an area of rattlesnakes.

> On this trip we encountered a very large number of rattlesnakes, and encamping one evening on the banks of the Rio Grande, we killed eleven of these reptiles on not more than an acre of land around our encampment. The next morning we...actually had to stop two or three times to let these reptiles get out of the road, for fear of having some of our horses and mules bitten. About ten o'clock that day the wind sprang up and blew directly to the river from the road, and as the dry grass and weeds covered the ground in this bend, I lighted a match and set fire to the grass in several places, which, it is hoped, destroyed many.[294]

The Effects of Fire on Vegetation

Four observers discussed the effects of fire on vegetation in the Southern Region. These concerned the treelessness of the plains of central Texas; the morphological impact of fires on live oaks and mesquite; and the occurrence of disjunct, generally even-aged populations of mesquite. Gray commented on the first of these in 1855.

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[292] W. E. Hollon and R. L. Butler, op. cit., pp.74-75.

[293] F. L. Olmstead, op. cit., p.261.

[294] D. Meriwether, My Life in the Mountains and on the Plains (Norman: University of Oklahoma Press, 1965), p.212.

> Much of the soil is good, and I question if the grass set on fire annually by the Indians...together with the "Northers," which sweep with such violence over the plains are not to a great degree causes of the total absence of timber.[295]

Olmstead commented on the suppressed growth of live-oaks near Austin in 1854.

> The live-oaks are often short, and even stunted in growth, lacking the rich vigor and full foliage of those further east. Occasionally a tree is met with which has escaped its share of injury from prairie burnings and northers, and has grown into a symmetrical and glorious beauty. But such are comparatively rare.[296]

A similar, although more perceptive observation, was made by Bartlett in reference to mesquite on the Edwards Plateau in 1850.

> Where the prairies are frequently burned over, the tree is reduced to a shrubby state, a great number of small branches proceeding from one root, which goes on developing and attains a great size, though the portion above ground may not be more than four or five feet high.[297]

Based on his own observations and second-hand information, Froebel discussed the relationship between fire and abnormal age groupings of the mesquite population in west Texas in 1853.

> One peculiarity is the repeated occurrence of dead mesquite trees, of considerable size, with the growth of young ones, --there being no intermediate stage of size or age. This probably has been caused by repeated prairie fires, which destroyed the old trees, and prevented the growth of fresh ones....At Chihuahua a man who had been a great deal into this locality told me that for a long period no Indians had lived there, during which it was covered with a thick mesquite wood. Subsequently, certain hordes came here, and with them the

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[295]A. B. Gray, op. cit., p.18.

[296]F. L. Olmstead, op. cit., p.130.

[297]J. R. Bartlett, Personal Narrative of Explorations and Incidents in Texas, New Mexico, California, Sonora, and Chihuahua, Connected with the United States and Mexican Boundary Commission during the Years 1850, '51, '52, and '53 (New York: D. Appleton and Company, 1854), volume 1, p.75.

> prairie fires began. In later times the advance of the whites into Texas has driven back the savages, and restrained their visits; and the prairie fires ceasing, trees and shrubs have again appeared. It is asserted that this process may be watched throughout West Texas...[298]

No information was found in the literature which served to substantiate or disprove the contention made by the man from Chihuahua.

The Effects of Fire on Native Animals

One rather general reference was made to the effects of fires on native animals. While traveling through the coastal prairies east of Corpus Christi in December, 1852, Bartlett observed:

> ...I looked with my telescope, when, to my surprise, I discovered the whole prairie towards the horizon alive with mustang....As we continued our journey other herds of mustangs were seen coming from the east....Large herds of deer and antelope were also perceived as we jogged along. In the afternoon we crossed a deep ravine...and just beyond this the great prairie was on fire.
>
> We had for hours noticed the huge volumes of smoke as they ascended from the plain, and attributed the flight of animals towards us, which we had seen during the day, to this fire.[299]

The Effects of Fire on Domesticated Animals

Olmstead noted the preference of cattle for fresh regrowth springing up on burned-over pastures in the Guadalupe Valley during February, 1854.

> ...the dreary, burnt prairies, from repulsive black, changed at once to vivid green, like that of young wheat....The herds all left the dry sedge, and flocked to the new pastures. The unburnt districts, covered with the thick mat of last year's growth, were a month behind.[300]

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[298] J. Froebel, op. cit., p.418.

[299] J. R. Bartlett, op. cit., volume 2, pp.524-525.

[300] F. L. Olmstead, op. cit., p.233.

The Effects of Fire on Man

Observers mentioned four types of human problems resulting from grass fires: (1) deaths or injuries; (2) destruction of equipment; (3) insufficient forage for livestock; and (4) inadvertent warning to hostile Indians of the presence of whites.

The first of these was discussed by Bollaert in reference to the tall grass prairies of southern Texas.

> Many distressing tales are told of travelers...being burnt by the prairie fires....The Indian plan, when surprised by a prairie fire, is to burn all the grass in their immediate vicinity, so as the fire sweeps over the ground...finding no combustible matter they may, although surrounded by fire, escape.[301]

Bartlett discussed a different method by which his expedition averted the danger posed by the fire cited previously.

> It stretched for miles in both directions, and was sweeping directly towards us. Whenever it reached a patch of high grass, volumes of smoke rose up, while the vivid flames leaped with greater rapidity over the plain. We rode up and down for some distance, but could find no opening through. At length a place was seen where the fire raged with less fury. Here the horsemen led the way; whereupon the teamsters put the whips to their animals, and uttering a loud whoop dashed through the flames.[302]

Destruction of arms, ammunition and other equipment was recorded by Bennett in March, 1852, while camped on the Rio Grande in southern New Mexico.

> Today the grass was as high as our heads and accidentally it got on fire. It came rushing on at a tremendous rate. We had merely time to save ourselves by running to the sandy beach of the river. All our provisions, saddles, arms, ammunition, and camp equipage were destroyed. It was an exciting time. Three hundred guns and several pistols, lying promiscuously on the

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[301] W. E. Hollon and R. L. Butler, op. cit., p.75.

[302] J. R. Bartlett, op. cit., volume 2, p.525.

> ground, discharged their deadly contents in all directions. No accidents, however, happened.[303]

Insufficient forage was mentioned by Froebel while passing through an extensive burned-over tract to the east of Van Horn, Texas in March, 1854.

> Over a wide tract, on mountain, valley and plain the grass had been burnt, so that our animals suffered greatly from want. Here and there only were some remains of the old grass, and in a few of the most favored spots the young grass was springing up. The burnt-over tract extended over hundreds of square miles.[304]

Whiting commented on the potential hazard created by fires started by whites while in hostile Indian territory. "These accidents are very dangerous...from the alarm they always give (by the smoke) to Indians..."[305]

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[303] C. E. Brooks and F. D. Reeves, op. cit., pp.86-87.

[304] J. Froebel, op. cit., p.463.

[305] W. H. Whiting, op. cit., p.320.

Chapter VI

REGIONAL SUMMARY

For the Central North American Grassland considered in its entirety, fall was the season in which the highest percentage of fires were recorded (Table 29). However, there was considerable variation in

TABLE 29

SEASONS AND MONTHS OF FIRE OCCURRENCE, IN PERCENT

	Northeast	Northwest	Central	Southern	All Regions
December 22-31	0.0	0.0	0.0	1.7	0.2
January	0.9	0.0	0.0	21.6	3.6
February	0.5	0.0	0.0	15.0	2.6
March 1-20	2.8	0.0	2.2	10.0	3.5
Winter	4.2	0.0	2.2	48.3	9.9
March 21-31	2.3	0.0	1.1	0.0	1.5
April	8.4	0.0	9.7	6.7	7.4
May	12.6	2.0	3.3	11.7	9.1
June 1-20	0.9	16.0	3.3	5.0	3.8
Spring	24.2	18.0	17.4	23.4	21.8
June 21-30	0.9	0.0	0.0	3.3	1.0
July	11.2	18.0	10.9	6.7	11.3
August	10.7	24.0	20.7	3.3	13.4
September 1-22	5.1	18.0	4.3	0.0	5.7
Summer	27.9	60.0	35.9	13.3	31.4
September 23-30	7.9	10.0	2.2	0.0	5.8
October	29.7	6.0	32.6	8.3	24.2
November	5.6	6.0	9.7	6.7	6.7
December 1-21	0.5	0.0	0.0	0.0	0.2
Fall	43.7	22.0	44.5	15.0	36.9

relative importance between the four regions. In the Northeast and Central regions over 40 percent of all fires occurred during this period. In the Northwest and Southern regions fall burning was of comparatively low significance. The degree of difference stands out even more markedly with respect to the high-fire month of October. In

the former regions, close to a third of all fires occurred during this month, whereas in the latter two, the figure was less than a tenth.

Summer ranked second in frequency of fire occurrence. The relative importance of summer burning was far greater in the Northwest Region than elsewhere, although only in the Southern Region was it of low significance. August was the high-fire month of the season in terms of average figures. In the Northwest and Central regions it was of primary importance by a substantial margin.

Slightly over a fifth of all fires occurred during spring. Percentage differences between regions were minimal on a seasonal basis, but pronounced with respect to the relative importance of particular months. In the Northeast and Southern regions half or more of all spring fires occurred during May. The same was true for the Central Region with respect to April. In the Northwest, almost 90 percent occurred during June.

Winter burning was of very low significance or entirely lacking in all but the Southern Region. Nearly half of all fires reported for that section occurred in winter. The degree of contrast was even more pronounced with respect to the high-fire months of January and February. The Southern Region accounted for almost eighty-eight percent of all fires recorded for the grassland during this two-month period.

For the monthly figures considered independently, two anomalies were apparent with respect to interseasonal periods. June was unexpectedly low in fire occurrence in the Northeast and Central regions. The same was true for September in the latter section. In the Southern Region, September was fire-free.

Sources of Fires

Over 35 percent of all fires recorded for the grassland were attributed to Indians. Twenty-three percent were ascribed to whites. One fire was caused by lightning. No sources were given for the remainder, although the majority of these were probably started by Indians as they were generally more numerous than whites and relied more heavily on grass-firing practices for their survival. Establishing the validity and relative importance of the evidence concerning the three sources mentioned is difficult. Lightning was mentioned by Catlin, Root, and de Smet within the context of general discussions concerning the causes of fires in the grassland, but no reference was made to specific instances.[306] Humfreville, in a discussion of the plains of western Kansas and Nebraska, stated that "Prairie fires were often caused by lightning."[307] However, as only one instance was found in the literature in which lightning was even suggested as the cause of a specific fire, it would seem that it was not generally regarded as important during the time period considered. Of the 97 fires attributed to whites, about two-thirds appear to have been based on accurate first-hand information. For the 149 fires attributed to Indians, however, only about twenty seem to be based on an equally sound foundation. In four instances, members of Indian tribes admitted having started fires. In approximately sixteen cases it appears that they were seen

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[306]G. Catlin, op. cit., volume 2, p.24. R. Root, op. cit., p.4. H. M. Chittenden and A. T. Richardson, Life, Letters and Travels of Father Pierre-Jean de Smet, S. J. 1801-1873 (New York: Francis P. Harper, 1905), volume 4, p.1383.

[307]J. L. Humfreville, op. cit., p.160.

doing so. The informational problem concerning Indian fires was largely a reflection of the fact that whites were rarely present when Indians set fire to the grass. Another problem was that of identification of the tribes responsible for specific fires or burning practices. Twenty-five tribes were mentioned in this context by early observers (Figure 4). However, there were numerous instances in which fires or the practice of firing the grass were simply attributed to "Indians" with no further elaboration as to which tribes might be involved. This is probably partly due to ignorance, but also the nomadic way of life of many tribes made it difficult to assign responsibility.

Eleven tribes were mentioned more than twice in connection with responsibility for specific fires or grass-firing practices. The Sioux accounted for 31 percent of the instances in which tribes were named. Ten other tribes were mentioned in 52 percent of the cases. Regional dominance in grass-firing activities was associated with the Sioux in the Northeast; the Blackfoot and Crow in the Northwest; the Osage in the Central; and the Apache in the Southern. Variation in responsibility for fires in comparison with populations is shown in Table 30.

Eleven white occupational groups were responsible for the occurrence of fires in the grassland (Table 31). Soldiers, tourists, explorers, and emigrants accounted for 67 percent of the cases. Pioneer settlers, fur traders and Santa Fe traders caused another 23 percent. In the Northeast and Northwest regions, explorers and fur traders started more fires than any other groups. In the Central and Southern regions, soldiers caused the greatest number of fires, but tourists, emigrants and Santa Fe traders also contributed heavily to the totals.

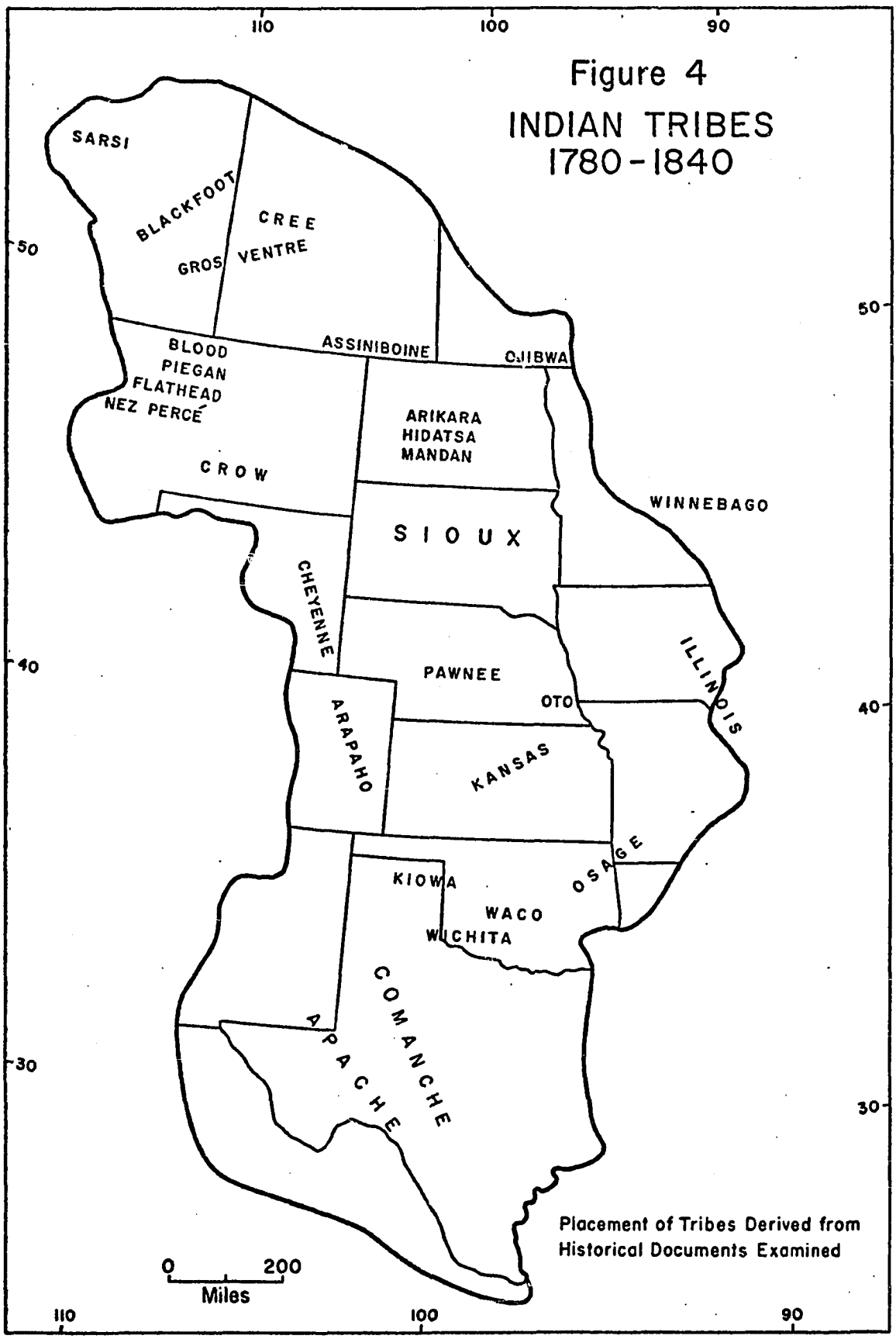

TABLE 30

SOURCES OF INDIAN FIRES

Tribe	Population Number	Population Percent	Fires Number	Fires Percent	Percentage Difference
Sioux	25,000	23.5	31	31.0	+7.5
Ojibwa	10,000	9.4	7	7.0	-2.4
Assiniboine	8,000	7.5	5	5.0	-2.5
Osage	6,200	5.8	7	7.0	+1.2
Comanche	6,000	5.7	4	4.0	-1.7
Blackfoot	4,200	3.9	6	6.0	+2.1
Cree	4,000	3.8	5	5.0	+1.2
Crow	4,000	3.8	5	5.0	+1.2
Arikara	2,600	2.4	3	3.0	+0.6
Illinois	2,000	1.9	3	3.0	+1.1
Apache	2,000	1.9	7	7.0	+5.1
Other	32,200	30.3	17	17.0	-13.3
Totals	106,200	100.0	100	100.0	0.0

TABLE 31

SOURCES OF WHITE FIRES

Group	Northeast	Northwest	Central	Southern	All Regions
Soldiers	2	2	7	8	19
Tourists	4	1	4	6	15
Explorers	5	4	2	3	14
Emigrants	3	1	4	5	13
Pioneer settlers	4	0	3	2	9
Fur traders	6	0	0	0	6
Santa Fe traders	0	0	5	1	6
Cattle drovers	0	0	3	0	3
Fur trappers	2	1	0	0	3
Missionaries	1	0	0	1	2
Wagoner	1	0	0	0	1
Totals	28	9	28	26	91

Reasons for Fires Attributed to Indians

Ten reasons were given for fires started by Indians, but only six of these were mentioned more than three times in the historical record (Table 32). For the entire grassland, 108 cases were recorded in which reasons were given. Communication, warfare and hunting accounted for

TABLE 32

REASONS FOR FIRES ATTRIBUTED TO INDIANS BY TRIBE

Tribe	Commun.	War.	Hunt.	Pastur. Improv.	Accid.	Horse Steal.	Other	Totals
Sioux	4	8	1	0	2	2	1	18
Apache	3	4	0	0	0	0	0	7
Blackfoot	1	1	1	0	0	0	1	4
Cree	1	0	0	0	1	1	1	4
Osage	2	1	0	0	1	0	0	4
Illinois	0	0	3	0	0	0	0	3
Assiniboine	1	0	1	0	0	1	0	3
Crow	1	2	0	0	0	0	0	3
Comanche	3	0	0	0	0	0	0	3
Other tribes*	3	5	1	1	3	1	0	14
Unspecified	10	5	13	11	1	0	5	45
Totals	29	26	20	12	8	5	8	108

*Two tribes named twice; ten tribes named once.

69 percent of these. Pasturage improvement, accident and horse stealing were the cause of another 23 percent. The Sioux were mentioned in 29 percent of the cases in which tribes were named in this context and the Apache in 11 percent. The Blackfoot, Cree and Osage accounted for about six percent each; and the Illinois, Assiniboine and Comanche for five percent. About one-third of all signal fires were started by the Sioux, Apache and Comanche. Almost half of the fires set for purposes of warfare were started by the Sioux and Apache. The Illinois was the only tribe mentioned more than once in relation to the use of fire in hunting.

Regional variation with respect to reasons for fires was negligible in some cases and pronounced in others (Table 33). Fires set for purposes of communication and warfare were the two most important causes in all but the Central Region where they ranked second and third. Hunting was the reason most frequently mentioned for fires started in

TABLE 33

REASONS FOR FIRES ATTRIBUTED TO INDIANS BY REGION

Reason	Northeast	Northwest	Central	Southern
Communication	13	4	8	4
Warfare	11	5	5	5
Hunting	9	1	9	1
Pasturage improv.	6	0	5	1
Accident	5	2	1	0
Horse stealing	5	0	0	0
Other	3	1	3	1
Totals	52	13	31	12

the Central Region and ranked third in importance in the Northeast. In the Northwest and Southern regions it appears to have been of very low importance. The same pattern prevailed for fires set to improve pasturage conditions. All but one of the accidental fires occurred in the two northern regions. Fires set to facilitate the stealing of horses were recorded only in the Northeast.

Seventy-four cases were recorded in which the season of occurrence was mentioned in connection with the major reasons given for fires started by Indians (Table 34). Similarities and differences between regions were largely a reflection of the reason considered and the predominant seasons of fire occurrence. Signal fires and those related to warfare occurred during all seasons, but were much more frequent in summer except in the Southern Region. Fires started to facilitate horse stealing may have followed the same general pattern. All but one of the cases in which fires were set for hunting purposes occurred during the fall. Burning to improve pasturage conditions seems to have been mainly a spring and fall phenomenon. The same may have been true for accidental fires.

TABLE 34

REASONS FOR THE SEASONAL OCCURRENCE OF INDIAN FIRES

	Northeast	Northwest	Central	Southern	All Regions
Winter					
Warfare	1	0	0	4	5
Communication	1	0	0	1	2
Spring					
Communication	2	0	0	2	4
Warfare	0	1	2	1	4
Pasturage improv.	3	0	1	0	4
Accident	0	1	1	0	2
Horse stealing	1	0	0	0	1
Summer					
Communication	4	3	4	0	11
Warfare	3	4	0	0	7
Pasturage improv.	0	0	2	0	2
Horse stealing	2	0	0	0	2
Hunting	0	0	1	0	1
Accident	1	0	0	0	1
Fall					
Hunting	5	0	6	0	11
Warfare	3	0	2	0	5
Communication	2	0	2	0	4
Accident	3	1	0	0	4
Pasturage improv.	2	0	1	0	3
Horse stealing	1	0	0	0	1

Reasons for Fires Attributed to Whites

Eleven reasons were given for fires started by whites, but only four of these were mentioned more than three times (Table 35). A total of seventy-nine cases were recorded. Sixty percent of all fires resulted from accident. Communication, pleasure and pasturage improvement accounted for an additional 28 percent. Percentages associated with the different groups were nearly identical to those given with reference to sources. Soldiers caused nearly a third of all accidental fires. Explorers set more signal fires than any other group and tourists were responsible for over half of the fires started for pleasure.

TABLE 35

REASONS FOR FIRES ATTRIBUTED TO WHITES BY OCCUPATION

Group	Accid.	Commun.	Pleasure	Pastur. Improv.	Other	Totals
Soldiers	15	0	0	0	2	17
Tourists	6	2	4	0	1	13
Explorers	8	4	0	0	0	12
Emigrants	9	0	1	0	1	11
Pioneer settlers	1	0	0	3	3	7
Santa Fe traders	3	1	1	0	1	6
Fur traders	0	3	1	1	0	5
Cattle drovers	3	0	0	0	0	3
Fur t appers	1	0	0	0	1	2
Missionaries	1	1	0	0	0	2
Wagoner	0	0	0	0	1	1
Totals	47	11	7	4	10	79

Three of the four cases in which grassland areas were burned to improve pasturage conditions were caused by pioneer settlers.

Distinct patterns of regional differentiation existed for three of the four major causes (Table 36). Accidental fires were dispropor-

TABLE 36

REASONS FOR FIRES ATTRIBUTED TO WHITES BY REGION

Reason	Northeast	Northwest	Central	Southern
Accident	10	6	19	12
Communication	5	1	1	3
Pleasure	2	1	4	0
Pasturage improv.	1	0	1	2
Other	2	1	3	4
Totals	20	9	28	21

tionately high in the Northwest and Central regions where they accounted for two-thirds of the totals. Forty percent of all accidental fires occurred in the latter section. Signalling was the second most important cause of fires in the Northeast and Southern regions. More fires were set for pleasure in the Central Region than in the other three

regions combined.

Aside from the over-all prevalence of accidental fires, two seasonal aspects of fire occurrence were apparent (Table 37). All but one of the signal fires were set in spring and summer. The only cases in which fires were started for pleasure occurred in spring and fall.

TABLE 37

REASONS FOR THE SEASONAL OCCURRENCE OF WHITE FIRES

	Northeast	Northwest	Central	Southern	All Regions
Winter					
Accident	3	0	2	6	11
Pasturage improv.	1	0	0	0	1
Spring					
Accident	1	2	4	2	9
Pleasure	2	1	2	0	5
Communication	0	0	0	3	3
Pasturage improv.	1	0	0	1	2
Summer					
Accident	4	3	8	2	17
Communication	5	1	0	0	6
Fall					
Accident	3	1	3	2	9
Pleasure	0	0	2	0	2
Communication	0	0	1	0	1

The Effects of Fire on Vegetation

In discussions of the effects of fire on vegetation, most of the commentary was related to trees and shrubs found within the grassland. Very little was recorded concerning the grass cover, except in relation to the invasion of woodland by prairie due to repeated burning and, in one instance, sparsity of regrowth following fire. Most of the observations centered on five issues: (1) the formation of prairies in the east or the invasion of these prairies by woody species following the

cessation of fires; (2) the widespread absence of trees in the west; (3) successional changes following the occurrence of fires; (4) the resistance of some species to repeated burning; and (5) the impact of repeated burning on the morphology of certain trees and shrubs.

In the Northeast and Northwest regions, recurrent fires were responsible for the extensive formation of prairies throughout most of the nineteenth century. In the eastern portion of the Central Region, the expansion of prairie had largely ceased by the 1850's due to the reduction in fire frequency attendant upon the encroachment of white settlement and the process was beginning to reverse itself. In the two northern regions, most statements concerned the widespread conversion of aspen forest to prairie although birch, willow and pine were also mentioned in this context. One observer made a distinction with regard to the latter two species, suggesting that a greater amount of time was required for the process to be completed. All observers, however, agreed that fire alone was responsible for the changes observed. In the Central Region, the relationship between recurrent fires and the extent of area covered by the oak-dominated broadleaf forest was discussed in several diaries. Although one observer noted the resistance of the woodland to conversion by repeated burning, all others stressed a direct correlation between fire frequency and the amount of woodland present.

Two situations were discussed with reference to the absence of trees in the semi-arid western sections of the Northeast, Central and Southern regions. One concerned the lack of riparian growth in extensive portions of the valleys of the Platte and Arkansas rivers. The

other involved the treelessness of the upland plains. With respect to the former, all observers were agreed that fire alone was responsible for the phenomenon. For the latter, recurrent fires and high-velocity winds were emphasized more frequently than aridity and soil conditions as explanations for the situation.

References to post-fire successional changes were recorded for all regions. In the Northeast, most observations pertained to the regrowth of aspen, willow and oak on lands where the frequency of fire occurrence had diminished. The regrowth of cottonwood in the North Platte Valley during the 1870's was also mentioned in this context. One observer noted that on an area of former pine forest in the Red River Valley the secondary growth consisted of oak, ash and alder. A similar observation was made in the Northwest in reference to pine regrowth on what was apparently an area of predominantly fir forest. In the Central Region, several observers noted that oak, elm, hickory, ash, cottonwood, and several shrubby species were invading following the cessation of fires. In north-central Texas, the regrowth of seedlings following the burning of a juniper woodland was noted. Mesquite invasion of grassland following a reduction in fire frequency during the mid-nineteenth century was recorded for the western portion of the Southern Region.

The high resistance of willows and aspen to repeated burning due to their capacity for resprouting was pointed out by two observers in the Northeast. In the Cross Timbers section of the Central Region, black-jack oak particularly and post oak secondarily were singled out as the species most resistant to the effects of recurrent fires. Al-

though one reference was made to large numbers of mesquite which were killed by fire, in another their resistance to destruction was emphasized.

Associated with discussions of resistance to fire damage were statements concerning the morphological changes which took place. Oaks capable of surviving repeated burning were dwarfed in the process. Mesquite not only exhibited this change, but it was observed that the root crown increased in size as well.

The Effects of Fire on Native Animals

Over twenty references were made to the effects of fire on native animals. Two-thirds of these pertained to the buffalo. Deer were mentioned three times. Single references were made to elk, antelope, wolves and three species of birds. Three-fourths of the observations involved two effects: (1) deaths and injuries and (2) the influence of grass fires and smoke on driving large herbivores away from grazing areas.

All references to deaths and injuries were recorded in the Northeast Region. Five of these, four involving specific cases, were made to buffalo killed in prairie fires. In one instance, deer and wolves were also mentioned. Large numbers of animals were affected in each of the incidents. The prevalence of blind buffalo on the northern plains was noted by one observer and a specific case was provided by another.

In the two northern regions, seven incidents were reported in which the proximity of grass fires or smoke caused large herbivores to abandon areas in which they were grazing. Deer and elk were each mentioned once. The remainder pertained to buffalo.

All other references concerned phenomena reported only once. Some of these were of a rather general nature. However, the influence of burned-over tracts of grassland on the routes taken by buffalo during their seasonal migrations noted in the Northeast, and the rather sophisticated observation recorded in the Central Region concerning the ecological relationship between grass fires, rodent populations and predatory birds were exceptions to this.

The Effects of Fire on Domesticated Animals

Deaths of horses trapped by prairie fires were noted by six observers, five of them in the Northeast Region. One observer blamed such fatal incidents on the animals having grown accustomed to fires kindled to protect them from horse flies. In two instances, deaths of cattle were also mentioned.

Three observers noted the preference of horses, mules and cattle for the new grass springing up on burned-over areas. One observation was recorded in the Southern Region; the others in the Northeast and Northwest.

The Effects of Fire on Man

Twelve problems resulting from fires were reported in the literature, but only six were mentioned more than twice. Human deaths and injuries, and insufficient forage for livestock used for transportation were most commonly cited. Each was mentioned nine times and together they accounted for 40 percent of all cases. Obstacles to travel created by fire-felled trees were noted in five instances and lack of fuel for cooking in four. Trails obscured by fire and destruction of per-

sonal effects also appear to have been major problems. The only significant regional pattern involved areas where fire-felled trees were obstacles to travel. All recorded incidents occurred in the two northern regions.

Chapter VII

CONCLUSION

Many of the subjects mentioned in early documents concerning fire in the Central North American Grassland have been discussed by scholars during the past three or four decades. In some cases recent conclusions are in close agreement with the evidence presented in the historical record. In others, however, the discrepancies are significant.

Two investigators have considered seasons of fire occurrence with reference to the time period dealt with in the present study. Jackson stressed the importance of dry, windy periods occurring particularly during early spring and fall and intermittently throughout the rest of the year with respect to high fire frequencies.[308] Komarek suggested a different seasonal emphasis for Indian grass-firing practices. "I feel...that the Indian who lived on the natural 'livestock'...probably did use summer fires."[309] The present study indicates that spring was an important season of fire occurrence throughout the grassland, although late spring rather than early spring burning was characteristic of the Northwest Region. Fall was the primary fire season in the Northeast and Central regions. With the exception of Komarek's statement, the importance of the summer fire season in the Northeast, Northwest and Central regions seems to have been largely unrecognized. The same is true for winter fires in the Southern Region.

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[308] A. S. Jackson, "Wildfires in the Great Plains Grasslands," Tall Timbers Fire Ecology Conference, Fourth Annual Proceedings, 1965, p.241.

[309] E. V. Komarek, "Fire Ecology--Grasslands and Man," Tall Timbers Fire Ecology Conference, Fourth Annual Proceedings, 1965, p.195.

Indian burning practices have been discussed in several publications. Fires started to facilitate hunting or improve pasturage conditions and those occurring accidentally have been mentioned more frequently than others. With reference to the occurrence of fires in the Great Plains, Stewart stated "Fire is reported most frequently used to aid hunting--to encircle, to rouse, to stampede..."[310] Lowie elaborated on the practice.

> Grass firing by itself implied hemming in the herd by setting fire on all sides except for the hunters' ambush, thus driving the buffalo to the only opening where they were promptly killed. This was a prairie technique reported for the Santee, Miami, and other Indian tribes of the Upper Mississippi country.[311]

He also noted that grass firing was used to drive buffalo into pounds where they were subsequently slaughtered.[312] In more recent articles, Anderson and Jackson have discussed the practice of burning grasslands so that the fresh regrowth would attract large herbivores.

> The Indian long ago discovered many uses of fire....He learned, for example...that the new, fresh herbage which appeared after fire would attract grazing animals in large numbers. Small wonder then that the prairie fire became a highly useful and widely used tool in his life and that the vegetation was subjected to far more burning than it had been before man appeared.[313]

> The nomadic Indian could hardly have been ignorant of the fact that the grass which followed burning held great attraction for buffaloes and wild mustangs.[314]

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[310] O. C. Stewart, "Why the Great Plains Are Treeless," Colorado Quarterly, 2 (1953), p.43.

[311] R. H. Lowie, op. cit., pp.15-16.

[312] Ibid., p.16.

[313] K. L. Anderson, "Fire Ecology--Some Kansas Prairie Forbs," Tall Timbers Fire Ecology Conference, Fourth Annual Proceedings, 1965, pp.157-158.

[314] A. S. Jackson, op. cit., p.242.

The importance of accidental fires was noted by Cooper and Stewart.

> Notwithstanding the popular misconception, American Indians were not cautious in using fires. They did not conscientiously put out campfires, nor unless their villages were threatened, did they try to keep fires from spreading.[315]

> American Indians did not extinguish their campfires often because they wished to have a chance to get fire easily if their "slow match" became extinguished. Also, Indians just left their fires because they did not recognize any real harm coming from igniting any vegetation that would burn.[316]

In other cases, fires set for signalling,[317] warfare,[318] insect riddance,[319] and pleasure[320] have received brief mention. It appears that the relative importance of reasons for fires started by Indians has been inadequately understood. Fires set for purposes of communication and warfare were mentioned more frequently than any other reasons in three of the four regions of the grassland. Only in the Central Region was hunting of predominant importance. The variation of the "fire surround" technique discussed by Lowie with reference to the tribes of the Upper Mississippi country was recorded only once in the historical literature. Setting fire to the vegetation on all sides so as to drive the animals to a central location seems to have been a more prevalent

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[315]C. F. Cooper, "The Ecology of Fire," Scientific American, 204 (1961), p.150.

[316]O. C. Stewart, "Barriers to Understanding the Influence of Use of Fires by Aborigines on Vegetation," Tall Timbers Fire Ecology Conference, Second Annual Proceedings, 1963, pp.120-121.

[317]K. L. Anderson, "Burning Flint Hills Bluestem Ranges," Tall Timbers Fire Ecology Conference, Third Annual Proceedings, 1964, p.89.

[318]O. C. Stewart, "Burning and Natural Vegetation in the United States," Geographical Review, 41 (1951), p.320.

[319]Ibid., p.320.

[320]O. C. Stewart, "Great Plains," p.43.

practice. Furthermore, observers indicated that the method was employed by tribes residing in the Central and Southern regions as well. The second technique mentioned by Lowie was recorded for only the two northern regions. Recent discussions of burning to improve pasturage conditions are in general agreement with the historical record, but as a cause of fires it seems to have been of secondary importance in the Northeast and Central regions, of slight importance in the Southern, and there is no record of the practice in the Northwest. Cooper's analysis of the importance of accidental fires seems to be entirely accurate, but Stewart's statement concerning lack of recognition of the harmful effects of fires seems highly questionable in light of the fact that Indians suffered in terms of loss of life, personal injury, loss of livestock, loss of feed for livestock, and absence of game as the result of fires--some of which were no doubt accidental. Insect riddance and pleasure were inconsequential as causes of fires.

Far less attention has been directed towards reasons for fires started by whites. Both Humphrey[321] and Jackson have stressed the importance of accidental fires, the latter suggesting that this was sufficiently important to have resulted in a significant increase in fire frequency during the latter half of the nineteenth century.

> Initial stages of settlement of the Great Plains may have been accompanied by an increase in occurrence of sweeping prairie fires. There were people traveling and camping in greater numbers. Many would-be settlers were in reality adrift and restless and had little proprietary interest in the land.[322]

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[321]R. R. Humphrey, "The Desert Grassland; a History of Vegetational Change and an Analysis of Causes," The Botanical Review, 24 (1958), p.244.

[322]A. S. Jackson, op. cit., p.243.

Anderson has suggested that the practice of setting fires to improve the quality of range grasses, may have diffused from the Indians to subsequent white settlers.

> ...it was not strange that the white settler soon learned from his Indian predecessors that grazing animals sought the new, fresh grass in burned-over areas in preference to that on unburned ones. Annual fire soon became a "necessity" in his livestock program on grassland ranges.[323]

Fires set for communication and pleasure have not been discussed in any detail by modern writers, although it appears that both were important secondary causes. With respect to the former, historical records provide sufficient evidence to suggest the possibility that diffusion from Indians to whites may have occurred in this instance as well.

A greater amount of research has been done on the relationship between fire and vegetation in the Central North American Grassland than for any other topic. In many cases historical information only lends support to the more sophisticated findings of recent scholars. Most botanists have long agreed with the conclusions drawn by early observers concerning the importance of fire in prairie formation. The issue of the absence of trees in the semi-arid steppe region has been subject to more controversy, but the prevalent viewpoint expressed in historical references tends to support a recent conclusion presented by Wells.

> The topographic control of vegetation patterns implied by the distribution of extensive grassy plains and scarp-restricted woodlands in the Central Plains region can be explained as a resultant of many interacting factors. However, wind-driven grass fires, whether ignited by lightning or by man, must be accorded a key position in the hierarchy. The wave-like motion

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[323]K. L. Anderson, "Bluestem Ranges," p.89.

> of a wind-swept grass fire across a flat or rolling plain would continue indefinitely until it was quenched by rain or checked by an abrupt break in topography. A bold, rocky, sparsely grassed escarpment would serve as a natural firebreak, harboring fire sensitive trees in safe sites...[324]

Many studies undertaken by modern botanists concerning plant succession and resistance of species to fire destruction are more advanced continuations of observations made by early travellers. Several illustrations of this are present in the literature. With regard to aspen invasion in central Alberta, Moss has stated:

> In some situations the aspen invades the grassland by extending its roots and forming suckers that establish there as trees. This tendency for aspen to invade and replace prairie vegetation has been reported for different parts of the parkland....Burning has doubtless been very effective in counteracting natural succession to woodland in the days of the Indian and buffalo as well as more recently. Where settlers have operated to prevent fires, the woodland has often extended at the expense of the prairie.[325]

A similar situation exists for Stallard's statement on the resistance of poplar and aspen to burning.

> [Populus grandidentata and P. tremuloides] propagate rapidly by shoots which spring from long horizontal roots, 1 to 5 inches beneath the surface. A 7- or 8-year old tree may often have produced 10 or more separate shoots which appear as individual trees grown from seeds. A number of these may be killed, at least the above ground portions, by rabbits or fire, yet sprouts will arise again from the underground system. Trees of either species, even at the age of 15 or 20 years, when killed by fire will produce sprouts in the same manner and reproduce the stage directly, but naturally several or repeated burnings will finally kill the underground propagules by starvation.[326]

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[324] P. V. Wells, "Postglacial Vegetational History of the Great Plains," Science, 167 (1970), p.1580.

[325] E. H. Moss, "The Vegetation of Alberta," The Botanical Review, 21 (1955), pp.517-518.

[326] H. Stallard, "Secondary Succession in the Climax Forest Formation of Northern Minnesota," Ecology, 10 (1929), pp.515-516.

Stallard also pointed out differences in the fire response of oaks present in the Northeast Region.

> ...Quercus macrocarpa, Q. coccinea and Q. rubra [are] each capable of enduring considerable burning without injury, or, if the parent trees have been severely fire-damaged, [are] capable of sprouting up from the stumps...Quercus alba is unable to regenerate in the field by sprouts; hence it cannot endure in places frequently burned.[327]

Daubenmire carried this one step further, concluding that bur oak was the most fire-resistant oak in the Northeast.[328] Bray observed with respect to juniper present on the Edwards Escarpment that "when cut or burned off it tends to occupy the ground most vigorously and to encroach upon the other species."[329] Box has noted from recent studies of the effect of fire on mesquite in grasslands not subject to heavy grazing that "Fires tend to kill only about 10% of the mature trees, but are somewhat more effective on those less than 0.5 inches in diameter."[330]

Comparatively little has been published on the effects of fire on animals. Most of that which has, has been of a relatively conservative nature. Komarek has made a rather extensive statement concerning the problem of deaths of grassland animals in general.

> Considering the many millions of acres burned every year in North America, Africa and Australia such deaths are unusual,

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[327] Ibid., pp.540-541.

[328] R. Daubenmire, "The 'Big Woods' of Minnesota: Its Structure, and Relation to Climate, Fire, and Soils," Ecological Monographs, 6 (1936), p.260.

[329] W. L. Bray, "The Ecological Relations of the Vegetation of Western Texas," Botanical Gazette, 32 (1901), p.214.

[330] T. W. Box, "Brush, Fire and West Texas Rangeland," Tall Timbers Fire Ecology Conference, Sixth Annual Proceedings, 1967, p.18.

> even rare. Somehow, mammals have the ability to sense the fire, smoke and the direction it travels. These animals do not panic and flee ahead of a wind driven fire, but they usually escape along the sides or flanks....My associates and I have observed Virginia deer (Odocoileus v. virginianus) quietly watching a fire at night while slowly moving away from the flames. My livestock (cattle and horses) show no fear of fire racing across a pasture....Horses, cattle and dogs have been seen warming themselves quite near moving flames....I have seen both cows and horses use the dense smoke of fires for protection from biting insects and for warmth on cool evenings.[331]

Earlier conclusions by Roe in his work on the buffalo are of essentially the same theme. "Fires...have been considered an active danger, although only two fatal historical cases have proved discoverable."[332] In reference to the issue of the blinding of buffalo caught in prairie fires, he stated:

> ...in all the not inconsiderable buffalo-reminiscence, travel-literature, or scientific generalization I have consulted, I have not found--but with one single exception...an allusion to buffalo blinded in this way.[333]

The findings of the present study are not in general agreement with these interpretations. Although Komarek's observations concerning animal behavior in the face of approaching flames or smoke are supported by statements in the historical record pertaining to native fauna, it appears that animal deaths were of significantly more frequent occurrence than either he or Roe have indicated. For buffalo, four fatal cases were recorded in the literature examined and another widely-

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[331]E. V. Komarek, "Fire and Animal Behavior," Tall Timbers Fire Ecology Conference, Annual Proceedings, 9 (1969), pp.170 and 188.

[332]F. G. Roe, The North American Buffalo. A Critical Study of the Species in Its Wild State (Toronto: University of Toronto Press, 1951), p.186.

[333]Ibid., p.159.

traveled observer stated that these incidents occurred "almost yearly." Eight similar instances were mentioned in reference to horses and cattle. The blinding of buffalo may also have occurred with greater frequency than Roe suggested. Several recent writers have commented on the attractiveness of fresh regrowth following burning for large herbivores. The evidence in the historical record is in perfect agreement with this.

In the 1956 symposium, Man's Role in Changing the Face of the Earth, Stewart asked that fire "be treated and studied as fully as other ecological factors" which are "measured, correlated, analyzed, and charted for each month and for many years." Malin and Anderson made similar appeals for greater precision in historical studies of fire and vegetation. In this study an attempt has been made to provide a first step toward obtaining and presenting the kinds of information all three considered essential to an increased understanding of the relationship of fire to the environment.

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