CHAPTER IX

HAS THE SYSTEM BEEN AT EQUILIBRIUM BETWEEN 1800 AND 1990?

PART 2: EARLY HISTORICAL ACCOUNTS

INTRODUCTION

As discussed in Chapter 2 (above), Murie (1940), Gruell (1973), and Houston (1982) used selected quotes from historical journals to support their contention that thousands of elk had always inhabited the Greater Yellowstone Ecosystem. Murie (1940:1-8), Gruell (1973:10), and Houston (1982:23) also accused earlier park biologists such as Skinner (1927) and Rush (1932) of "incomplete reviews of the literature and the use of select negative information." To avoid any selection bias, I conducted a continuous-time analysis (Rusco 1976) of those same journals. The picture which emerges when one looks at the continuous record of these early explorations sheds new light on the early historical abundance of ungulates in the Yellowstone area.

For example, Houston (1982:205) cited two passages from DeLacy's 1863 journal (DeLacy 1876) of a trip through Yellowstone and Jackson Hole as support for his contention that thousands of elk always inhabited the Greater Yellowstone Ecosystem. What Houston failed to mention is that DeLacy and his party of 25-40 gold seekers spent 27 days in the area, yet he only reported elk on the two occasions Houston cited. Moreover, DeLacy's party killed only five ungulates during their entire 27-day journey through the Yellowstone area even though they were on constant lookout for game (i.e., food). Thus, I suggest that Murie, Gruell, and Houston's selective use of information also biased their analyses.

To overcome any problems of bias, I systematically recorded all observations of ungulates and other large mammals found in 20 first-person historical accounts of exploration in the Yellowstone area from 1835 to 1876. I then tabulated those data in the following three ways.

(1) Game seen. I listed the observer, the date of his trip, the length of his trip within the Greater Yellowstone Ecosystem, the size of the party, and the number of occasions on which the explorers actually saw large game animals. If they reported seeing one animal, that was recorded as a single observation, and if they reported seeing more than one animal together at one time, that was also recorded as a single observation. If an explorer reported killing one or more animals of a particular species at one time, that was recorded as one sighting of that animal. I also included the number of references made by early explorers to abundant game where the species were not identified.

(2) Game sign encountered or referenced. I listed the number of occasions on which specific animal sign, usually tracks, was seen or referenced. For instance, if explorers said they were going deer hunting, that was recorded as a single reference to deer. If they said they were going deer and elk hunting, that was recorded as a single reference to each of those species. Included in these counts are any references to hearing specific animals, such as wolves howling or mountain lions screaming, as well as references to Native American artifacts. For example, Osborne Russell (1965) who met several Native Americans on Yellowstone's northern range noted those people had specific animal skins. Each of those observations was recorded as a single reference to that species. I also listed the number of occasions on which Native Americans were seen or their sign, tracks, trails, and the like were referenced. In addition, I included the number of references made by each party to a lack of food or lack of game. Acts such as shooting a horse for food were each considered a single reference to a food shortage.

(3) Game shot. I listed the number of ungulates which each explorer reported as having killed within the Greater Yellowstone Ecosystem. In nearly every instance, those people recorded the exact number of animals which they killed. However, Osborne Russell (1965)

on one occasion noted that his party killed "some" bison. Since there is no way to tell what "some" actually means, in summation I counted that reference as two bison. The reader is free to make his or her own judgment on this treatment as that reference is clearly indicated in my tabulation. Henderson (1870) repeatedly reported that "several" animals of this or that species were killed. I included his observations in my tables, but I omitted them from my summary calculations because Henderson (1870) appears to have exaggerated what he saw (see below).

The tables summarizing these three data sets are presented in this chapter, and to facilitate their use, I also prepared short synopses of each exploration or journal. These are presented below and contain references to the lack of game and to ungulates other than elk. Since Murie (1940:1-8), Gruell (1973:53-57), and Houston (1982:204-211) already have cited all the references to elk in these journals, that material was not repeated here, though some references to elk are discussed. However, all references to elk are included in my tabular summaries.

RESULTS AND DISCUSSION

Journal Synopses in Chronological Order

Osborne Russell

Osborne Russell (1965) made five trips through the Greater Yellowstone area during 1835-1839 (Haines 1977:48). On his first visit in 1835 (Haines 1977: Plate 3), he crossed from Pierre's Hole into Jackson Hole, went up the Gros Ventre River to the headwaters of the Wind River, and crossed over to the North and South Forks of the Shoshone or Stinking Water River before he descended the Lamar River into what is today Yellowstone Park. Russell then traversed the northern range, crossed to the Gallatin River, and then went over the divide to the Madison River. During this 61-day period, Russell only reported killing two ungulates. Though he traveled through what are

today the summer ranges of several elk herds, Russell only reported seeing elk on a single occasion. Instead, he reported "thousands of Mountain Sheep" (p. 21), "near us on either hand the large bands of Mountain Sheep" (p. 22), and "for an eye could scarcely be cast in any direction around above or below without seeing the fat sheep gazing at us" (p. 25).

In 1836, Russell (1965:42-46 and Plate 5) traveled up the Green River, crossed over to the Gros Ventre, and followed that river into Jackson Hole. Russell then traveled up Pacific Creek to the headwaters of the Yellowstone River, down to Yellowstone Lake, and over to Lamar Valley. He then traversed the northern range before he descended the Yellowstone River north of the present park boundary. Though he traveled through the present summer ranges of several of today's elk herds, Russell only reported seeing one elk. He did report killing an elk north of Yellowstone Lake, where he observed "tall pines forming shady retreats for numerous elk and deer during the heat of the day" (p. 44). Though numerous elk and bison are found in that same area today, deer are rare.

In 1837, Russell (1965:61-68 and Plate 7) ascended the Green River to the Hoback divide, followed the Hoback River into Jackson Hole, went up Pacific Creek, down the Yellowstone River to Yellowstone Lake, over to the headwaters of the Shoshone and Clark Fork Rivers, into Lamar Valley, down to Hellroaring Creek, up that creek, and over the divide into the Boulder River drainage. During the 56 days that he was in the greater Yellowstone area, Russell reported his party killed "some" bison (in Jackson Hole), three elk, one deer, and two bighorn sheep. Russell again reported large bands of bighorn sheep.

In 1838, Russell (1965:91, Plate 7) traveled up the Wind River to the Gros Ventre drainage and down into Jackson Hole before crossing over to Pierre's Hole. He reported "the whole company were starving" and that they killed but a single deer.

In 1839, Russell (1965:97-107 and Plate 9) crossed from the Greys River into Jackson Hole, went up the Snake River to Shoshone Lake, over the divide into the Firehole, crossed over to Hayden Valley, went on to the Lamar, again traversed the northern range, went up the Gardiner River, and then crossed over to Yellowstone Lake, where he and his party were attacked by Blackfeet Indians. During this 68-day trip, Russell reported elk only around Yellowstone Lake. Though he traveled through the Firehole where elk and bison are now common, he reported neither. Instead, along the Firehole he observed "vast numbers of Black Tailed [mule] Deer" (p. 99). Today, few deer are found in that area.

Presently there are 2,000-3,000 bison in Yellowstone Park (Meagher 1973, 1976, 1985, 1989a, 1989b). That species is also believed to be "naturally regulated," and today's bison population is thought to represent the natural condition of the park. However, on all of his trips through the Yellowstone area, Osborne Russell never reported any bison in the park, though he saw and killed bison in Jackson Hole. Moreover, while in the park during 1839, his comrades "started for the plains to kill some Buffalo Cows," implying that none were available in Yellowstone. Russell pointed out that this was a "dangerous" undertaking because Blackfeet Indians were on the plains. It is doubtful his companions would have braved that hazard if bison were to be found in the park.

Though Russell saw elk on several occasions, he also observed large herds of bighorn sheep and mule deer. Since he never commented on the relative abundance of the various ungulates in the Yellowstone area, it is difficult to determine which species was most abundant. However, based on the species he saw or did not report seeing in specific areas, it is clear that elk were not the dominant ungulate they are today. Over the 5-year period from 1835 to 1839, Russell spent 234 days in the Greater Yellowstone area; yet, he and his party reported killing only 16 plus ungulates, of which eight were elk. Of course, we

do not know if Russell recorded all of the ungulates which were killed. Nonetheless, these figures would suggest that ungulates were not as abundant then as they are today.

William Raynolds

Captain Raynolds (1868), Corps of Topographic Engineers, made an extensive trip through the West in 1859-60. He spent the winter of 1859 on Wyoming's upper Platte River. In May 1860, he traveled up the Wind River Valley, crossed the divide, and was on the headwater of the Gros Ventre River by May 31. From there, he traveled down the Gros Ventre into Jackson Hole, across Teton Pass into Pierres Hole, and down the Teton River. He then crossed to the Henrys Fork River, went up that river to Henrys Lake, crossed the divide, and descended through the Madison Valley (Haines 1977:88).

Raynolds was guided by Jim Bridger, who was to lead him into and through what is now Yellowstone Park. However, deep snow prevented them from entering that region; instead, they crossed Jackson Hole and traveled to the west of the park as described above. Although they reported an abundance of game in the Wind River Valley, they reported seeing or killing little game on the rest of their trip. They did kill three deer in the Gros Ventre but did not report seeing any elk until they were just south of Henrys Lake. Raynolds sent hunters out from the main party, but despite this effort, at one point after killing a bear, he reported that was "thus our first taste of fresh meat for nearly a week" (p. 97).

Walter DeLacy

DeLacy (1876, Haines 1977:64-67) and his party of prospectors entered Jackson Hole from the south along the Snake River in 1863. They then followed up the Snake River through Jackson Hole to Yellowstone's Shoshone Lake, crossed to the Firehole, went down that river to the Madison, crossed to the Gallatin, and then went down the Gallatin River

(Haines 1977:66). On the headwaters of the Gallatin, DeLacy (1876:121) "encountered many bands of elk" and killed three elk. However, these were the only elk which he reported seeing despite the fact that he traveled through several areas where, today, several thousand elk summer. In general, DeLacy observed that game was very scarce.

While in Jackson Hole, DeLacy (1876:107) noted, "as usual, some men went out to hunt, and others to prospect, but brought in neither gold or game. Up to this time, and for a long time after, we saw nothing larger than rabbits." Though they hunted throughout Jackson Hole, they saw no wild ungulates. Today several thousand elk and a few hundred moose summer in the same area traversed by DeLacy. Those elk and moose populations are now thought to represent "natural" conditions (Martinka 1965, 1969; Houston 1968; National Park Service 1986; Boyce 1989). Yet if elk and moose had "always" inhabited the area, it is hard to imagine that those animals would not have been observed or killed by DeLacy's party since as many as 40 men searched the countryside each day during their 27-day trip through the Greater Yellowstone area.

Later, DeLacy (1876:114, 116) remarked "we killed two deer this evening, which was the first large game shot on the trip" and "we camped . . . and prospected and hunted for the rest of the day, but without success." He did see signs of "wood buffalo" near Shoshone Lake, but he never actually saw any bison. DeLacy's observations also provide evidence that his party did not scare all the game out of sight by their mere presence. When DeLacy finally encountered game on the Gallatin, he (p. 121) observed that the elk "would stand within thirty yards of us without fear."

Bart Henderson, 1867

Henderson (1867, Haines 1977:76-80) and his small party of prospectors traveled up the Snake River through Jackson Hole in 1867. They went up Pacific Creek, crossed the divide, went down the Yellowstone River to Yellowstone Lake, and traversed that lake's east

shore before they continued down the Yellowstone River and out of today's park (Haines 1977:78). Though they too passed through the summer ranges of several present-day elk herds, they made no reports of game until they neared the northern range. There, Henderson (1867:46) reported "elk, deer and antelope in abundance." This was in early September. Today, elk usually do not move to the winter range that early. At the time of Henderson's visit, there were only "4 inches" of fresh snow on Mt. Washburn, so it is doubtful if an early, heavy snow drove the animals onto the winter range. Henderson (1867:45) noted that in early September elk were everywhere on the northern range between Tower Creek and the Gardiner River. This was not reported by any other early visitors to Yellowstone; in fact, the opposite is true. As discussed below, Henderson may not have been a credible observer.

Cook-Folsom-Peterson Expedition

Cook (et al. 1965, Haines 1977:91-101) and his two companions set off to "discover" Yellowstone's wonders in September 1869. They traveled up the Yellowstone River and then went up the Lamar River. From there, they crossed over to the Yellowstone River near the falls, followed the river up to Yellowstone Lake, traveled along the lake's west shore, crossed the divide into the Firehole drainage, went down the Firehole River to the Madison, and left via the Madison River (Haines 1977:93). They "saw the tracks of elk, deer and sheep in great abundance, and for several miles were scarcely out of sight of antelope" on the northern winter range below the Gardiner River (Cook et al. 1965:19).

Cook et al. (1965:27) heard "elk whistling in every direction" on the Lamar Valley's northern winter range. In crossing the Mirror Plateau, Cook et al. (1965:28) "saw a great many deer today and, judging from their tracks, elk are also very abundant." Today, that same area is the major summering area for Yellowstone's northern herd (Houston 1982), but few deer are now found there. On a trip over that portion

of the summer range in 1983, I saw an uncountable number of elk tracks and thousands of elk, yet I observed no deer and only saw eight sets of deer tracks.

Unlike Osborne Russell (1965), Cook et al. (1965) reported seeing no game along the west shore of Yellowstone Lake. In the Firehole, Cook et al. (1965:44) observed that "no animals -- not even a track--[were] anywhere to be seen," where, 30 years before, Osborne Russell (1965:99) had reported "vast numbers of Black Tailed [mule] Deer." Cook et al. (1965:44) did observe a single bison skeleton in one of the Firehole's hot springs which, had "probably fallen in accidentally and been boiled down to soup."

Bart Henderson, 1870

Henderson (1870, Haines 1977:78-83) made a second trip through the Yellowstone area in 1870. Henderson traveled up the Yellowstone River to Gardiner where he turned east and crossed Hellroaring Creek, Buffalo Creek, Slough Creek, Soda Butte Creek, and the headwaters of the Clarks Fork River. His group then turned to the southwest, descended Soda Butte Creek to the Lamar River and followed that river down to the Yellowstone River near Tower. There they turned back to the southeast, ascended Specimen Ridge, crossed the Mirror Plateau, and traversed the headwaters of the Lamar River. Reversing direction again, they descended the Lamar Valley to Slough Creek where they turned to the north and ascended that creek to the divide before going down the Boulder River drainage (Haines 1977:78).

Henderson reported seeing and killing more game in Yellowstone than any other early explorer. In fact, he reported seeing and killing more elk, bison, deer, and bears, most probably grizzlies, than nearly all the explorers before or after him. Henderson reported finding "thousands of buffalo quietly grazing . . . thousands of bear, elk, buffalo, and deer . . . several hundred elk near camp . . . thousands of antelope . . . while deer are more plentiful [on the Mirror Plateau]

than we have seen on our trip . . . thousands of elk and deer . . . elk and sheep plenty, bear everywhere . . . [and] Mountains covered with sheep."

He also reported having "27 bearskins" in camp most of which, judging from the text, were grizzlies, and that his "camp was attacked by wolves." In addition, he reported seeing moose on the northern range and implied that they were abundant. If he, in fact, killed 20 or more grizzlies, that would represent over 10% of the current grizzly bear population in the entire Greater Yellowstone Ecosystem (Knight and Eberhardt 1984, 1985, 1987). Furthermore, there is no evidence that wolves ever "attacked" a camp similar to Henderson's anywhere in North America (U.S. Fish and Wildlife Service 1987). In addition, Houston (1982:131) stated there were no verified observations of moose on the northern range until 1913 or in Jackson Hole until 1910 (Houston 1968).

This all suggests that Henderson exaggerated or invented some of his diary entries. His entry of July 24 sheds some light on his observational abilities and his truthfulness. On that day, he traveled through the Upper Lamar Valley and reported that area contained "thousands of hot or boiling springs." Today, there are fewer than 50 hot springs in the Lamar Valley including lower Cache Creek (Webb Springs)(Bryan 1979). Moreover, this small thermal area never contained "thousands" of hot springs and certainly did not when Henderson visited that area in 1870 (Bryan 1979). There is little doubt Henderson's diary entry on this point represents a gross exaggeration. However, there is no way to judge the accuracy of his other entries except by comparison with journals left by other early explorers.

Of the 100 or so other first-person historical accounts from 1780 to 1860 which I have read, none reported that game was abundant in any mountainous area throughout the northern Rockies and southern Canada. Based on these lines of evidence, I would discard this entire diary. I leave the reader to judge the validity of Henderson's 1870 diary for

him or herself. I have included it here and in Tables 52-54 to insure a thorough analysis of all historic source material, but I did not include it in my summations.

Washburn Expedition

Washburn led a 19-man party of exploration through Yellowstone Park in August-September 1870 (Haines 1977:105-134). Langford (1972), Doane (1875), and Gillette (1870) left daily journal accounts of that trip. They traveled up the Yellowstone River, entered the present park near Gardiner, crossed the northern range, went over Mt. Washburn, followed the Yellowstone River to Yellowstone Lake, went around the east and south sides of the lake to West Thumb, crossed the divide into the Firehole, went down the Firehole, and exited via the Madison River (Haines 1977:110).

Though this group spent nearly 30 days in the Yellowstone area shortly after Henderson's 1870 trip, in contrast to Henderson, Washburn's party only reported killing one elk, one deer, two antelope, and one bighorn sheep. Moreover, unlike Henderson, they did not report an abundance of game or "thousands of animals." In fact, Washburn's group ran short of food in the park. "The country through which we have passed for the past five days is like that facetiously described by Bridger as being so . . . barren of resources, that even the crows flying over it were obliged to carry along with them supplies of provisions" (Langford 1972:80).

On the southern side of Yellowstone Lake, Everts became separated from the group. After searching unsuccessfully for several days, the group left Everts to his fate because they were running short of food and could not remain any longer. Langford (1972:98) said "It is a source of great regret to us all that we must leave this place and abandon the search for Mr. Everts; but our provisions are rapidly diminishing, and force of circumstances obliges us to move forward." Upon returning to civilization, Langford (1972:120) noted that "At the

onset of this journey I tipped the beam of scales at a little over one hundred and ninety (190) pounds, and to-day I weigh but one hundred and fifty-five pounds, a loss of thirty-five (35) pounds," which, in part, can be attributed to the short rations he and his party subsisted on while in Yellowstone Park.

Doane (1875:22) observed that on one occasion "our party kept up such a racket of yelling and firing as to drive off all the game for miles ahead." Along the Firehole, Doane (1875:28) noted "numerous fresh signs of buffalo" but added that those animals had been "driven out by the noise of our hasty intrusion." However on at least two other occasions, Gillette (1870:5, 10) noted that hunters were sent ahead of the main party. Moreover, from reading the three accounts of this expedition, it is clear that the party often split into small groups who walked or rode away from the main line of march. Furthermore, when Doane (1875:14) encountered "a large flock of mountain sheep" at close quarters he noted that those animals were "very tame." Thus, it is doubtful whether the activities of the group scared all of the game out of the country.

Barlow and Heap Expedition

Captains Barlow and Heap (1872, Haines 1977:142-140) traveled up the Yellowstone River into Yellowstone Park. Following the Gardiner River, they reached Mammoth Hot Springs, crossed Blacktail Plateau to Tower Falls, went over Mt. Washburn to Yellowstone Falls, and then followed up the Yellowstone River to the lake. There, they backtracked to Hayden Valley and traveled west up Alum Creek, went down Nez Perce Creek, and ascended the Firehole River. They then crossed over to Shoshone Lake, went over the divide to West Thumb, southward to Mt. Sheridan, Mt. Hancock, and along Big Game Ridge to the headwaters of the Yellowstone River. From there, they traveled down the east shore of Yellowstone Lake and the Yellowstone River until they neared Hayden Valley. There, they turned east, went over Mirror Plateau, and

descended the Lamar Valley to Tower where they retraced their route out of the park (Haines 1977:145).

Though Barlow and Heap often sent hunters ahead of the main party or traveled in small groups, they saw little game on their 41-day trip through Yellowstone. Barlow and Heap reported that their party only killed one elk and two deer. At one point (p. 37) they noted their "provisions were just exhausted, but the arrival at this point of fresh supplies [from Bozeman, MT] . . . relieved . . . [their] anxiety in that respect." This occurred just after they had traversed the headwaters of the Snake River and Big Game Ridge. In that area, they said (p. 36) "signs of game abound, among which were found tracks of grizzly and the black bear [Ursus americanus], mountain sheep, elk, and deer." However, the only animals which they reported actually seeing were "a large grizzly bear and cub." If game were as abundant as the above passage suggests, why did they not see more animals? And why did they not kill any, especially since they were short on provisions and that area was not normally visited by hunters?

As noted above, Barlow and Heap reported numerous tracks of deer and bighorn sheep near or on Big Game Ridge. Today, though a large segment of the Jackson Hole elk herd summers there, deer are rare and bighorns do not now use that area (Croft and Ellison 1960, Gruell 1973, Croft 1974, Boyce 1989). On a 1983 trip along the headwaters of the Snake River and over Big Game Ridge, I saw several hundred elk but only two mule deer. Elk tracks were everywhere, but deer tracks were, by comparison, almost non-existent.

When Barlow and Heap (1872:40) crossed Yellowstone's Mirror Plateau they reported that "several elk and deer [were] seen just in advance of [their] train." As noted above, today large numbers of elk summer on Mirror Plateau, but few deer now use that area.

Hayden Survey

Hayden (1872) and his party of scientists made extensive trips through Yellowstone Park in 1871 under the auspices of the U.S. Geological Survey. They ascended the Yellowstone River to Yellowstone Lake. They explored the Firehole, all around Yellowstone Lake, including Big Game Ridge, as well as the headwaters of the Snake and Yellowstone Rivers. From there they traveled along the east shore of Yellowstone Lake, ascended Pelican Creek, crossed the Mirror Plateau, descended through the Lamar Valley to the Yellowstone River, and then followed that river out of the park (Haines 1977:190).

From Hayden's (1872) account it is clear that his party frequently split into small groups to explore all corners of the park. He also had several hunters out looking for game. Yet he only reported killing one mule deer and he did not report that he or any members of his party actually saw any elk or other game except the deer which was killed. At one point, his party ran low on provisions, and he sent men out (150 km) to get additional supplies (p. 131).

While camped south of Yellowstone Lake Hayden (1872:131) noted "Our hunters returned, after diligent search for two and a half days, with only a black-tailed deer, which, though poor, was a most important addition to our larder." Hayden added that tracks of elk and deer were seen everywhere but that those animals had retreated to the mountains "to escape the swarms of flies in the lowlands." From there, Hayden's party proceeded to climb several mountains and traversed the headwaters of the Snake and Yellowstone Rivers including Big Game Ridge. Though they went through the very country Hayden claimed the game had retreated to, they did not report seeing any animals. Small groups of men climbed several mountains over 3,300m where today summering elk are common, yet in 1871, they did not report seeing any animals. Later, Hayden also crossed over the Mirror Plateau without reporting any game.

While we can never know whether Hayden did not see any game or

just failed to record it, other passages in his report suggest ungulates were less abundant than they are today. Along many of the park's thermal features and especially in the Firehole, Hayden reported "luxuriant growth[s] of vegetation." Today, elk and bison crop those areas so closely that Hayden's earlier description is no longer appropriate. Hayden (1872:76) did claim that Yellowstone had "a good supply of game of all kinds, [to] fully satisfy the wants of the traveler and render this valley one of the most attractive places of resort for invalids or pleasure seekers in America," but as noted above, his subsequent entries do not support this assertion. It appears Hayden may have included his reference to abundant game to promote tourism in Yellowstone. It must be remembered that Hayden and others used this report to lobby for the creation of Yellowstone National Park (Haines 1977).

Frank Bradley

Bradley (1873) was a geologist with the U.S. Geological Survey when he visited the Yellowstone area in 1872. He and his party entered the park via the Madison River and then ascended the Firehole where they camped for an extended length of time. From there, Bradley and a few members of his party made a side trip over to Yellowstone Falls, Yellowstone Lake, and back. Breaking camp in the Firehole, Bradley proceeded to Lewis and Shoshone Lakes, climbed Mt. Sheridan, traversed the headwaters of the Snake River, ascended Big Game Ridge, dropped down into Jackson Hole, and followed the Snake River out of that valley (Haines 1977:190).

Though he was in the Yellowstone area for 45 days, Bradley reported seeing elk only once. He did mention that he employed a hunter (p. 243) but he did not report that any ungulates were killed. At one point he commented on the lack of game (p. 244), but later on Big Game Ridge, he said (p. 254) "the numerous game-trails give evidence that it is frequented by deer and elk."

Sidford Hamp

Sidford Hamp was a member of Hayden's 1872 (Haines 1977:177-191) expedition to Yellowstone (Brayer 1942). Hayden's U.S. Geological Survey that year consisted of two parties which explored different regions of the park. The party to which Hamp was assigned as a general assistant entered Yellowstone via the Madison and then traveled up the Firehole. From there they crossed over to Yellowstone Falls before they moved down to Mammoth Hot Springs and out of the park (Haines 1977:190).

Though Hamp spent over 2 weeks in the park, his only report of game was an antelope his party shot along the Madison River. Again, there is no way to determine whether he did not see any other game or just failed to record those observations. However, a careful reading of his entire journal suggests that he did not record any game in Yellowstone because he did not see any. Prior to entering the park and after leaving, Hamp recorded instances where ungulates were sighted or killed. Moreover, while in the park, he listed birds and other small game which he or others killed for food. This would suggest that Hamp would have recorded any ungulates which were seen or shot, especially since he was only 17 years old and had journeyed from England, at the invitation of his uncle, William Blackmore, on this trip of adventure to the "far west."

William Blackmore

William Blackmore (1872) was a member of Hayden's 1872 (Haines 1977:177-191) expedition to Yellowstone and the uncle of Sidford Hamp (see above). However unlike his nephew, Blackmore traveled with the U.S. Geological Survey party actually led by Dr. Hayden. That group left Bozeman, MT, traveled east over Bozeman Pass, and descended to the Yellowstone River which they followed upstream into Yellowstone Park. After stopping at Mammoth Hot Springs, they traversed the northern range, crossed the Lamar Valley, and traveled up Soda Butte Creek until they reached the mining area around Cooke City, MT. From there, they

visited the headwaters of the Clarks Fork of Yellowstone River and Rosebud Creek before they returned to the Lamar Valley. They then crossed over Mt. Washburn, went to Yellowstone Falls, on to the lake, over to the Firehole and left the park via the Madison River after they spent a day exploring the upper Firehole.

From the text, it is clear that Blackmore, Hayden, and others often traveled in small groups away from the main party. They also had at least four hunters with them who frequently left the main party in search of game. Near Yellowstone Lake, Blackmore (1872:Diary 7, pp. 21-22) reported that two of the hunters killed 6 elk, one mule deer, and one bear and added that "the hunters had been unusually successful." At another point in his journal, Blackmore (1872:Diary 7, p. 35) noted that from July 19, when the party left Bozeman, to August 10, the group's four hunters had killed a total of 13 antelope, 8 elk, 4 bear, and 2 mule deer. Blackmore (1872:Diary 6, p. 72) also reported "elk horns in abundance" on the northern range east of Mammoth. Next to Henderson (1870) (see above), Blackmore reported that his party killed and saw more game in Yellowstone Park than other early explorers.

Jones Expedition

Captain William Jones (1875), Corps of Engineers, led a large party through Yellowstone in 1873. Jones entered the park from the east after ascending the North Fork of the Shoshone River. From Yellowstone Lake, Jones descended the Yellowstone River, crossed over Mirror Plateau, and then traveled down the Lamar and Yellowstone River Valleys to Mammoth Hot Springs. From Mammoth, they retraced their route to Tower, crossed over Mt. Washburn, went up Hayden Valley, descended Nez Perce Creek to the Firehole, ascended the Firehole, crossed over to West Thumb, traveled along the south shore of Yellowstone Lake, and followed the Upper Yellowstone River to its headwaters before crossing over to the Wind River drainage (Haines 1977:202).

For most of the trip, Jones' party was short on food and reported

seeing or killing little game. At one point, Jones sent to Ft. Ellis (Bozeman, MT) for additional provisions. At another point, Jones and his men were forced by "pangs of hunger" to eat fish from Yellowstone Lake which contained parasitic worms (p. 35). Moreover, Jones had Native American guides and hunters who were forced to eat "these wormy fish all along." Jones also crossed the Mirror Plateau, today the main summering area for the northern Yellowstone herd, without reporting any game, though he was short of food at the time.

At two points in his journal (p. 21 and p. 39), Jones remarked that his large party made so much noise, while on the march, all the game "took the alarm in time to get out of sight." While this may have been true, it must also be remembered that Jones split his party into several smaller groups or individuals; and at those times, they neither reported seeing or killing more game. The only time Jones reported seeing or killing several elk was when he neared the headwaters of the Yellowstone River and Two Ocean Pass. In that area, Jones (1875:39) recorded where "A magnificent elk crossed the valley in advance of us, and in plain sight to-day." However he added that all the members of his party were too rain-drenched and cold "to make any attempt to get him." He then noted that this was "the first instance of the escape of anything (except bear) that came in sight of" his party.

Earl of Dunraven

Dunraven (1967) traveled through Yellowstone during late summer and early fall of 1874. He was on a sporting/hunting trip and was primarily interested in killing game animals, especially elk. He and his small party of fellow hunters followed the Yellowstone River up to Mammoth Hot Springs. From there, they crossed the northern range to Tower, ascended Mt. Washburn, and visited Yellowstone Falls and Canyon before going through Hayden Valley into the Firehole. After touring the Upper and Lower Geyser Basins, Dunraven retraced his route exiting the park as he had entered. Before he entered the park and after he left,

Dunraven hunted in the mountains around Bottler's ranch north of the park (Haines 1977:190).

While Dunraven reported killing more game than most other early travelers to the Yellowstone area, the majority of the animals he saw or killed were outside the park. Dunraven reported killing five elk north of the park and only two within. Throughout his trip, Dunraven (1967:229) observed that he and his party "were constantly on the look-out for game." In Yellowstone Park, he (pp. 253-254) noted "not a single fresh track, and nothing whatever eatable to be seen . . . I soon made up my mind that there was no game then in the country." Later he (p. 336) added "we had counted upon getting plenty of game, deer and elk, all through the trip, and had arranged the commissariat accordingly. But we had grievously miscalculated either our own skill or the resources of the country, for not an atom of fresh meat had we tasted for days." Dunraven considered his trip and especially his time in Yellowstone Park to have been less than successful in producing the game animals he sought.

William Ludlow

Captain Ludlow (1876), Chief Engineer, Department of Dakota, and a party of 21 made a 15-day trip through Yellowstone Park in 1875. They followed almost the same route used by Dunraven the previous year, but they included a trip to Yellowstone Lake. As they neared Tower on their return trip, Ludlow (p. 30) reported seeing two deer and added that those deer were "the only game animals we encountered in the park." Ludlow (1876:36) complained that though Yellowstone was still secluded "Hunters have for years devoted themselves to the slaughter of the game, until within the limits of the park it is hardly to be found." He added that "people on the spot" had told him 1,500-2,000 elk had been killed "within a radius of fifteen miles of the Mammoth Hot Springs" last winter. Grinell in his accompanying zoological report (Ludlow 1876:59-92) put that number at "not less than 3,000 elk." Ludlow

(1876:37) suggested that hunting in the park should be banned.

William Strong

General Strong (1968) was part of a party of VIP's who toured Yellowstone in 1875. The group included General Belknap, Secretary of War; General Marcy, Inspector General of the Army; and General Forsyth among others. Strong's party followed almost the same route used by Ludlow (see above) except that on the way back to Mammoth, Jack Baronette led Strong on a hunting trip through the mountains west of Mt. Washburn. Strong reported seeing and killing more game than Ludlow though most were deer, not elk. Strong's journal is extremely detailed and contains information on the numbers of fish caught and birds killed. Thus, it is probably fair to assume that when he failed to record any game, there was none.

Strong (1968:81) noted General Marcy "hunted very hard, sometimes riding miles away from the trail, working almost indefatigably, early and late, to kill an elk or deer; but this is the most barren country for game at this season of the year I have ever seen, and nothing has been killed by the party but grouse." Strong made this comment about that part of Yellowstone Park around the falls, Hayden Valley, and Firehole where today, thousands of elk and bison summer. At another point, Strong (pp. 86-87) wrote "I started out in advance of the party, with my orderly, in hope of killing deer, and traveled along the foot-hills, hunting the valley to the south of the Madison thoroughly, but saw no game or fresh signs."

Based on secondhand accounts, Strong (p. 47) claimed great bands of elk and "no end to mountain sheep and deer" were still to be found on Mirror Plateau and the headwaters of the Yellowstone River south of the lake. Also based on secondhand sources, he reported (p. 105) "over four thousand [elk] were killed last winter by professional hunters in the Mammoth Springs Basin alone" and added "Mountain sheep and deer have been hunted and killed in the same manner [during winter] for their

hides." Strong recommended that hunting should be prohibited in the park.

Strong claimed that Yellowstone once abounded with game, but that market hunters had decimated the herds in recent (1870-1875) years. Strong (p. 104) stated "In 1870, when Lieutenant Doane first entered the Yellowstone Basin, it was without doubt a country unsurpassed on this continent for big game. Large herds of elk, mountain sheep, the black and white-tail deer, and the grizzly, cinnamon, and black bears were numerous." However, as has been previously noted, Doane did not, in fact, report such an abundance of game in Yellowstone (see above). Moreover, no one beside Strong ever claimed that large numbers of white-tailed deer inhabited Yellowstone (see Chapter 6 above).

Doane Expedition

Lieutenant Doane (1876) and a small party of men (Server 1876-77) traversed the Yellowstone Ecosystem during the winter of 1876-77. They entered the park via the Yellowstone River, traveled up to Mammoth Hot Springs, around to Tower, went over Mt. Washburn, rejoined the Yellowstone River, and ascended to Yellowstone Lake. There, they assembled a boat which they had horse-packed to that point. They loaded most of their equipment onto the boat which they sailed to the southwest corner of the lake while the stock followed along the west shore. From there, they dragged the boat over the divide into the Heart Lake drainage which they descended to the Snake River. They then floated down the Snake River, crossed Jackson Lake, found the Snake River outlet, and then descended that river through Jackson Hole and the Snake River Canyon. During this trip, their horses were led along the river banks or lake shores through snow 0.3-0.6m deep and with temperatures as low as -30°C.

Despite weather conditions which should have forced game animals down to what are today wintering areas, Doane's party reported killing only three deer and two elk on their entire 64-day trip. Moreover, the

group ran short on provisions. When they killed a deer in Jackson Hole, Doane (1876:24) wrote that "it was the first game we had killed for a long time and came in the nick of time." Doane (1876:21-22) attributed the lack of game, in part, to the "little depth of snow" which had "allowed the game to run high on the mountains." Yet when he reached the Greys River, the lowest point near the end of his trip, he reported that "the snow was knee deep on level ground and crusted so that the leader on the trail had to break through at every footstep." Today, similar snow and weather conditions would drive game down along many points on his route.

Twice in Jackson Hole, Doane (1876:25-26) reported that his party saw large herds of elk but were unable to kill any. In one instance, Doane noted that two members of his party "followed a herd of elk til dark but did not get one." Doane (1876:26) reported "game is scarce and shy." He also reported that due, in part, to short rations, his body weight dropped from 190 pounds down to 126 pounds and that the "others were similarly reduced."

Near Yellowstone's Hayden Valley, Doane (1876:10-11) reported seeing a herd "of at least two thousand elk." He also mentioned (p. 16) "driving out a large herd of elk" near Heart Lake. While near Mammoth, he reported (p. 9) "thousands of [shed] Elk horns" and noted that shed elk antlers were common at "many such places in the park, where these animals have gone for centuries to drop their horns in early winter." Of the journals reviewed here, this is only the second report of shed elk antlers on Yellowstone's northern range which, of course, implies that at least some bull elk wintered there.

Tabular Summaries

Table 52 summarizes the sight observations left by Yellowstone explorers. Some 19 expeditions, travelling for 765 days through the Greater Yellowstone Ecosystem, reported seeing elk on only 42 occasions.

Table 52. Historical evidence relating to the distribution and abundance of ungulates in the Greater Yellowstone Ecosystem from 1835 to 1876: Part I. Number of occasions on which large animals were reported to actually have been seen by early explorers. To make this large table more readable, dashes are used instead of zero's for species which were not reported.

Observer[1]	Date	Length of trip (days)	Size of party	Number of occasions on which animals were observed											Number of references to abundant game without denoting species
				Elk	Bison	Deer	Antelope	Bighorn sheep	Moose	Wolf	Mountain lion	Grizzly bear	Black bear	Bear[2]	
1. Osborne Russell															
a.	7/2 - 8/31/1835	61	Varied, usually	1	-	-	-	4	-	-	-	-	-	-	1
b.	7/26 - 8/28/1836	34	3-4, but	1	-	-	-	-	-	-	-	-	-	-	1
c.	7/26 - 9/19/1837	56	some groups	2	1	1	-	2	-	-	-	2	-	-	-
d.	7/21 - 8/4/1838	15	contained up	-	-	1	-	-	-	-	-	-	-	-	-
e.	6/29 - 9/4/1839	68	to 60 people	3	1	3	-	1	-	-	-	-	-	-	-
Subtotal	1835 - 1839	234		7	2	5	-	7	-	-	-	2	-	-	2
2. William Raynolds	5/31 - 6/25/1860	26	32+	1	1	3	1	-	-	-	-	-	-	1	-
3. Walter DeLacy	8/23 - 9/18/1863	27	13-40	2	-	1	-	-	-	-	-	-	-	1	-
4. Bart Henderson	8/25 - 9/6/1867	13	4	4	-	2	3	-	-	-	-	-	-	1	-
5. Cook-Folsom-Peterson Expedition	9/12 - 10/3/1869	22	3	1	-	1	2	-	-	-	-	-	-	-	-
6. Bart Henderson	6/6/ - 8/12/1870	68	5	13	11	8	2	3	1	1	-	1	-	14	4
7. Washburn Expedition															
a. Langford	8/24 - 9/21/1870	29	19	-	-	-	1	-	-	-	-	2	1	-	-
b. Doane	8/24 - 9/21/1870	29	19	2	-	-	2	1	-	-	-	1	-	1	-
c. Gillette	8/24 - 9/27/1870	35	19(3)	1	-	1	1	-	-	-	-	-	-	-	1
8. Barlow and Heap Expedition	7/20 - 8/29/1871	41	17	3	-	3	1	-	-	-	-	1	-	-	-
9. Hayden Survey	7/20 - 8/27/1871	39	40	-	-	1	-	-	-	-	-	-	-	-	2
10. Frank Bradley	8/12 - 10/5/1872	55	12	1	-	1	2	-	-	-	-	-	-	-	1
11. Sidford Hamp	8/13 - 8/29/1872	17	8-35	-	-	-	1	-	-	-	-	-	-	-	-
12. Willian Blackmore	7/29 - 9/17/1872	21	20-30	5	-	2	6	1	-	-	-	-	-	2	-
13. Jones Expedition	7/26 - 9/7/1873	44	45	3	-	1	-	-	-	-	-	-	-	2	1
14. Earl of Dunraven	Summer 1874	30	7												
a. North of Park				3	-	2	3	7	-	-	-	3	-	-	-
b. In Park				3	-	-	7	-	-	-	-	-	-	-	-
15. William Ludlow	8/12 - 8/27/1875	15	22	-	-	1	-	-	-	-	-	-	-	-	-
16. William Strong	7/29 - 8/11/1875	14	35	3	-	4	-	-	-	-	-	2	-	-	-
17. Doane Expedition	10/13 - 12/15/1876	64	6-8												
a. Doane				4	-	2	-	-	-	-	-	1	-	-	1
b. Server				3	-	1	-	-	-	-	-	-	-	1	-
Total[3]	1835 - 1876	765	Varied	42	3	30	30	16	zero	zero	zero	11	1	9	8

1. See Table 53 for citations.
2. Species was not reported in the original journals.
3. Not including Henderson's 1870 trip because he appears to have exaggerated what he saw, see text; nor duplicate sightings made by the Washburn (7) and Doane (16) Expeditions.

This is an average of only one elk observation per party in 18 days. The fact that a number of these parties broke up into small groups and spread out to hunt makes this observation rate all the more meager. Deer and pronghorn were reported to have been seen about three-fourths as often as elk, while bighorn sheep were seen about one-third as often. Bison were seen on three occassion and no moose, wolves, or mountain lions were seen.

Table 53 summarizes the reports of animal sign. The magnitudes of these reports are similar to those of animal sightings. Thus, elk sign was reported on 44 occasions compared with the 42 on which elk were seen. Parallel values for deer are 32 and 30, bighorn sheep 19 and 16, bison 3 and 9, and antelope 3 and 30. The frequency of reported elk sign was about the same as the sighting frequency, one per 18 party days. Other game sign, as well as that of elk, was seen infrequently. Of the 19 parties, 13 commented on the scarcity of game or the lack of food and those reports outnumber elk sightings or elk kills.

Table 54 summarizes the actual numbers of game reported killed. Here again, the magnitudes of the reports are remarkably similar to the observation incidents and sign encounters; 36 elk, 3 bison, 27 deer, 17 pronghorn, and 8 bighorns were shot. No moose, wolves, or lions were killed. The number of party days per elk killed was 21, or 3 weeks.

JUDGING VALIDITY OF THE REPORTS

Murie (1940), Gruell (1973), and Houston (1982) made little attempt to judge the validity of Yellowstone's historic source materials. Forman and Russell (1983) asked "If we read something written today, do we automatically believe it? If we read something written a long time ago . . . do we believe it?" They noted that "Too often the answer to the last questions is 'yes', simply because information is scarce and the statement is old." Historians have developed standard source-evaluation techniques which appear useful for

Table 53. Historical evidence relating to the distribution and abundance of ungulates in the Greater Yellowstone Ecosystem from 1835 to 1876: Part II. Number of occasions on which animal sign was reported to have been seen, heard, or referenced, by early explorers including Native American artifacts. To make this large table more readable, dashes are used instead of zero's for species which were not reported.

Observer	Number of occasions on which animal sign was seen, heard, or referenced, including Native American artifacts											Number of occasions on which Native Americans were seen or sign observed/ referenced		Number of references to lack of game or lack of food	Reference
	Elk	Bison	Deer	Antelope	Bighorn sheep	Moose	Wolf	Mountain lion	Grizzly bear	Black bear	Bear[1]	Seen	Sign		
1. Osborne Russell															
a.	3	1	2	-	5	-	-	1	-	-	-	2	1	-	Russell 1965:18-29
b.	2	-	1	-	-	-	1	-	-	-	-	1	-	-	Russell 1965:42-46
c.	1	-	-	-	2	-	-	-	-	-	-	1	2	-	Russell 1965:61-68
d.	-	-	-	-	-	-	-	-	-	-	-	-	-	1	Russell 1965:91
e.	2	-	1	-	1	-	-	-	-	-	-	2	-	1	Russell 1965:97-107
Subtotal	8	1	4	-	8	-	1	1	-	-	-	6	3	2	Russell 1965, Haines 1977:48-53
2. William Raynolds	-	-	-	-	-	-	-	-	-	-	-	2	7	3	Raynolds 1868, Haines 1977:86-89
3. Walter DeLacy	-	1	-	-	-	-	-	-	-	-	-	-	5	2	DeLacy 1876, Haines 1977:64-67
4. Bart Henderson	-	-	-	-	-	-	-	-	-	-	2	1	1	-	Henderson 1867, Haines 1977:91-101
5. Cook-Folsom-Peterson Expedition	3	1	1	-	1	-	1	1	-	-	-	3	2	2	Cook et al 1965, Haines 1977:91-101
6. Bart Henderson	3	3	2	-	1	1	-	-	-	-	4	2	2	-	Henderson 1870, Haines 1977:78-83
7. Washburn Expedition															
a. Langford	3	-	1	1	1	-	-	5	1	-	3	-	8	8	Langford 1972, Haines 1977:105-134
b. Doane	3	1	-	-	2	-	-	5	-	-	2	-	7	1	Doane 1875
c. Gillette	1	1	1	1	-	-	-	-	-	-	1	-	2	-	Gillette 1870
8. Barlow and Heap Expedition	2	1	2	-	1	-	-	1	1	1	-	-	4	1	Barlow and Heap 1872, Haines 1977:142-151
9. Hayden Survey	2	-	-	-	-	-	-	-	-	-	-	-	-	1	Hayden 1872, Haines 1977:149-191
10. Frank Bradley	3	-	2	-	-	-	-	-	-	-	-	-	-	1	Bradley 1873
11. Sidford Hamp	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Brayer 1942, Haines 1977:177-191
12. William Blackmore	7	3	4	2	1	-	-	1	-	-	6	-	6	-	Blackmore 1872
13. Jones Expedition	3	-	1	-	2	-	-	-	-	-	-	-	2	8	Jones 1875, Haines 1977:201-203
14. Earl of Dunraven															
a. North of Park	3	1	7	-	3	3	-	-	-	-	4	-	-	2	Dunraven 1967
b. In Park	1	-	3	-	2	-	-	-	-	-	-	1	2	5	
15. William Ludlow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Ludlow 1876
16. William Strong	6	-	7	-	2	1	-	-	4	-	-	-	-	6	Strong 1968
17. Doane Expedition															
a. Doane	3	-	-	-	1	2	1	3	-	-	2	-	-	6	Doane 1876
b. Server	1	-	-	-	-	-	-	1	-	-	-	-	-	3	Server 1876-77
Total[2]	44	9	32	3	19	5	3	12	6	1	17	13	40	45	

1. Species was not given in the original journals.
2. Not including Henderson's 1870 trip because he appears to have exaggerated what he saw, see text; nor duplicate sightings made by the Washburn (7) and Doane (16) Expeditions.

Table 54. Historical evidence relating to the distribution and abundance of ungulates in the Greater Yellowstone Ecosystem from 1835 to 1876: Part III. Number of ungulates and other large animals reported to have been killed by early explorers. To make this large table more readable, dashes are used instead of zero's for species which were not reported.

	Number of ungulates and other large animals killed										
Observer[1]	Elk	Bison	Deer	Antelope	Bighorn sheep	Moose	Wolf	Mountain lion	Grizzly bear	Black bear	Bear[2]
1. Osborne Russell											
a.	1	-	-	-	1	-	-	-	-	-	-
b.	1	-	-	-	-	-	-	-	-	-	-
c.	3	"some"	1	-	2	-	-	-	-	-	-
d.	-	-	1	-	-	-	-	-	-	-	-
e.	3	1	1	-	1	-	-	-	-	-	-
Subtotal	8	"some"	3	-	4	-	-	-	-	-	-
2. William Raynolds	-	-	5	1	-	-	-	-	-	-	1
3. Walter DeLacy	3	-	2	-	-	-	-	-	-	-	1
4. Bart Henderson	1	-	-	1	-	-	-	-	-	-	-
5. Cook-Folsom-Peterson Expedition	1	-	-	1	-	-	-	-	-	-	-
6. Bart Henderson	14+ Several	5+ Several	8+ Several	4	-	-	-	-	1	-	18[3]
7. Washburn Expedition											
a. Langford	-	-	1	-	-	-	-	-	-	-	-
b. Doane	-	-	-	2	1	-	-	-	-	-	-
c. Gillette	1	-	1	1	-	-	-	-	-	-	-
8. Barlow and Heap Expedition	-	-	2	-	-	-	-	-	-	-	-
9. Hayden Survey	-	-	1	-	-	-	-	-	-	-	-
10. Frank Bradley	-	-	-	-	-	-	-	-	-	-	-
11. Sidford Hamp	-	-	-	1	-	-	-	-	-	-	-
12. William Blackmore	7	-	1	4	-	-	-	-	-	-	4
13. Jones Expedition	4	-	1	-	-	-	-	-	-	-	3
14. Earl of Dunraven											
a. North of Park	5	-	-	2	3	-	-	-	1	-	-
b. In Park	2	-	-	5	-	-	-	-	-	-	-
15. William Ludlow	-	-	-	-	-	-	-	-	-	-	-
16. William Strong	1	-	7	-	-	-	-	-	2	-	-
17. Doane Expedition											
a. Doane	2	-	3	-	-	-	-	-	-	-	-
b. Server	-	-	1	-	-	-	-	-	-	-	-
Total[4]	36	3	27	17	8	zero	zero	zero	3	zero	9

1. See Table 53 for citations.
2. Species was not given in the original journals.
3. 18 Bear and 1 grizzly by actual count, later he refers to having 27 bearskins, implying that number were killed.
4. Not including Henderson's 1870 trip because he appears to have exaggerated what he killed, see text; nor duplicate sightings made by the Washburn (7) and Doane (16) Expeditions.

gauging the validity of historical statements regarding the 1835-1876 distribution and abundance of ungulates in the Greater Yellowstone Ecosystem (Rusco 1976, Price 1980, Forman and Russell 1983, Black-Rogers 1986). These include (1) first or secondhand observations and the credibility of the observer, (2) purpose or possible bias of the statements, (3) the author's knowledge of the subject, (4) semantics, and (5) context of the statement including negative information.

(1) First or secondhand observations. Did the author of a statement personally make the observation reported, or was it learned second- or third-hand? Was it written at the time of the event or was it written long after the fact based solely on memory? Was the observer credible? And do his statements appear to be within reason?

All of the historical accounts found in Tables 52-54 appear to have been written by the observer at the time of the event. However, several do contain some secondhand information relating to the early abundance of elk and other ungulates. Accounts of extensive winter hunting of elk in Yellowstone Park during the 1870s (Strong 1875; Ludlow 1876; Norris 1877, 1878, 1880a, 1880b, 1881) have been quoted to support the contention that elk always wintered on the northern range (Houston 1982:10). However, these reports must be viewed with caution because none of those observers resided in the park during winter (Haines 1977). Furthermore, those reports may also have been motivated by political considerations (see below). Because of these considerations, second-hand reports that "thousands" of elk were killed in the park during winter must be viewed with skepticism.

Of the 20 historical accounts reviewed in Tables 52-54, only Henderson's 1870 diary suggests that he was not a credible observer. Based on the evidence presented above, it appears Henderson was prone to exaggeration. Accordingly, I did not include his 1870 observations in my summations. I suspect that his reports of large numbers of ungulates on the northern range in early fall of 1867 may also be

inaccurate. However, since there is nothing in that journal which can be independently verified or checked as there is in his 1870 diary, I have not discarded his 1867 account, though I personally do not put much store in either of Henderson's journals.

(2) Purpose or possible bias of the statement. "Did the author of the statement have a special interest or bias which may have colored the statement?" (Forman and Russell 1983). Or did the author color his entire journal?

During the late 1870s, the military was lobbying Congress to have Yellowstone Park transferred to its jurisdiction; so, Captain Ludlow (1876) and General Strong (1875) may have wanted to imply that the civilian administration was incapable of protecting the park (Hampton 1971, Haines 1977). At the same time, Superintendent Norris (1877, 1878, 1880a, 1880b, 1881) was using his reports to secure additional appropriations from Congress to protect and improve the park (Haines 1977). Thus, both sides would have had reason to exaggerate the early abundance of game in the park and the amount of poaching which supposedly occurred. It should be remembered that the military eventually was given control over Yellowstone and that the National Park Service was not created until 1916 (Hampton 1971, Haines 1977). Many early accounts of the great abundance of elk and other ungulates in the park appear to be more akin to motherhood statements than fact. They certainly are not supported by the analyses presented in Tables 52-54.

There is another source of bias in all of these journals which is much more difficult to address. The procedures which were used to compile Tables 52 and 53 assume that animals were recorded in relation to their historic numbers. This may or may not be an appropriate assumption. Rare animals or highly prized game animals such as elk, grizzlies, or bighorn sheep may have been recorded more often than more common species such as deer and antelope. At the time most of these journals were written, elk had been extirpated from most of the West.

Dunraven (1967) came to Yellowstone, in part, specifically to hunt elk. On seeing his first elk in Yellowstone, General Strong (1968:67) said "I would have given everything I possessed to have cut him [bull elk] down handsomely . . . it was the first elk I have ever fired at."

I suspect that the observations compiled in Tables 52 and 53 are biased in favor of elk. This may even be true for the number of ungulates reported killed in Table 54. People have a tendency to more frequently write down events which are of importance or interest to them (Rusco 1976). Thus, I suspect that a higher proportion of elk sightings, sign, and kills were recorded by early visitors to Yellowstone than were similar data on deer and antelope, because elk were more important to them than were the smaller ungulates.

(3) Author's knowledge of the subject. Though few of the early explorers to Yellowstone had any formal zoological training (Haines 1977), I assume that most of them could tell the various ungulate species apart on sight. However, it would be more difficult to distinguish between their sign. For instance, could they tell deer tracks from bighorn sheep tracks? Or black bear from grizzly tracks? Or wolf, coyote (Canis latrans), and mountain lion tracks apart? There simply is no way to tell. It would even be more difficult to positively identify animal calls, such as the howls of wolves and coyotes or the screams of mountain lions. Thus, the observations recorded in Tables 52 (actual sightings) and 54 (dead animals) are more reliable than those based on other information (Table 53).

(4) Semantics. Accounts of Native Americans "starving" are common in many historical journals. This term seems relatively clear-cut especially as it is applied to situations today. However, Black-Rogers (1986) demonstrated where that term, when used in the context of the day, had several different meanings including literal, technical, metaphorical, and ritual whose usage was governed by a host of circumstances. Most of the time when Native Americans said they were

starving, that was technically not the case but was said to invoke sympathy and to obtain free food or gifts from European fur traders.

In the context of the current discussion, what does it mean when early observers removed from each other in time and space used such terms as "abundant game," "whole country swarming with game," "large herds" or "thousands of animals"? When Doane (1876) said he saw "2,000 elk," did he count them? What did Osborne Russell (1965) actually see when he reported "vast herds of Blacktail Deer?" Do reports of "abundant" animals of this species or that species mean that those populations, ipso facto, were similar to today's?

I submit that these questions cannot be answered by any analysis of the documents themselves, but that other types of data must be utilized if we are to gauge the meaning of these early statements. For instance, Murie (1940), Gruell (1973), and Houston (1982) cited early statements on the great abundance of elk and other ungulates in Yellowstone to support their assertion that 12-15,000 elk always wintered on the northern range while a similar number of elk wintered in Jackson Hole. However, my analysis of early photographs (see Chapter 8 above) clearly indicates that the woody vegetation on the northern range exhibited no signs of elk use from approximately 1800 to the 1880s. Whatever accounts of "abundant" game mean in early written source materials, they do not signify that large numbers of elk wintered in the park or that those ungulates were resource limited.

(5) Negative information and the context of early statements. Skinner (1927), Rush (1932), and other early park biologists noted that most early explorers of Yellowstone actually reported seeing very little game. Did the fact that they reported little game mean they actually saw few animals, or that they simply did not bother to write down a description of all the animals which were seen? Is negative information data? Murie (1940:2) stated that "negative evidence must yield to positive evidence because failure to report game does not disprove its

abundance." Gruell (1973:10) added that "the failure to mention sightings of elk in early reports was not in itself positive evidence that they were not plentiful in the mountains."

While positive statements about a subject are preferable to silence, I submit that negative information can be just as important. I also maintain that what people do not say is, at times, even more important than what they do say. For instance, negative information avoids the problems of exaggerations, semantics, and misleading statements discussed above (Price 1980).

There are two ways to check the validity of the negative information contained in Yellowstone's historic source material. First, if the observers recorded wildlife sightings or kills before entering and after leaving Yellowstone, but not while they were in that area, this strongly suggests they were careful observers whose lack of record really means they saw little game in the park. As discussed above, Raynolds' (1868) and Hamp's (Brayer 1942) journals exhibit this pattern as does Osborne Russell's (1965) since he reported more game outside Yellowstone. Most of the other's journals do not lend themselves to this type of analysis because they often began and ended their trips in areas heavily impacted by the advancing tide of civilization.

Second, the majority of early journals exhibit the same general pattern. That their writers were removed in time and space, yet reported similar ungulate sighting or kill rates, would imply that it was a valid pattern and not an aberrant occurrence. For instance, 13 of 19 early journals reported a lack of game or a shortage of food while they were in Yellowstone (Table 53). Moreover, instances of food shortages outnumber reported elk sightings or kills.

WHY DID EARLY EXPLORERS SEE SO LITTLE GAME?

Murie (1940), Gruell (1973), and Houston (1982) claimed that early explorers to Yellowstone saw little game for several reasons. (1) Their

large, noisy parties chased all the game out of the country or drove the animals into hiding, in advance of their passing. (2) "Game in summer was largely at higher elevations away from the traveled route." People traveling through winter ranges in summer would not be expected to see game. (3) Hunting in the park, which was legal at the time, drove game away from established trails and scenic attractions. (4) It was more difficult to see and kill game in the heavily wooded mountains than on the plains where reports of abundant game are more common than in Yellowstone.

As noted above, Doane (1875:22, 28), Jones (1875:21, 39), and other early visitors to Yellowstone suggested that their large, noisy parties scared off all of the game before it could be seen. While this was no doubt true to some degree, I do not believe it can be cited as a major reason so little game was seen or killed in Yellowstone (Tables 52 and 54). For instance, as previously noted, most large parties split into smaller groups to explore the park and several sent out hunters ahead of their line of march. Most of those smaller groups were no more successful at seeing or killing game than were the larger parties. As already noted, Hayden (1872:131) commented that at one point in the park, his hunters searched diligently for two and one-half days, yet killed only one mule deer.

The argument that early explorers saw little game in Yellowstone because all the animals summered at higher elevations away from the traveled routes is based on the assumption that elk always summered there to secure better forage and to avoid insects. This assumption appears to be without merit. When Grand Teton Park was expanded to its present size (Righter 1982), no elk summered on the valley floor. Since that time, a summering elk herd of 2,000-4,000 animals has built up in that area (Martinka 1965, 1969; National Park Service 1986; Boyce 1989; G. Roby, pers. commun. 1987; B. Smith, pers. commun. 1988). A summer elk herd has also become established on the National Elk Refuge at an

even lower elevation in Jackson Hole (B. Smith, pers. commun. 1988; and pers. obs.). That herd would have continued to grow except the Wyoming Game and Fish Department and National Elk Refuge set special hunting seasons to eliminate those animals because they did not want elk summering on the winter range (G. Roby, pers. commun. 1987; B. Smith, pers. commun. 1988).

Summering elk herds have also become established on Yellowstone's northern winter range. Several hundred elk now summer on Mt. Everts, Brunsen Peak, and around Mammoth (F. Singer, pers. commun. 1989; and pers. obs.). In Montana, summering elk herds have become established on several winter ranges owned by the Montana Department of Fish, Wildlife and Parks. Those herds also would have expanded beyond their present numbers, except that Montana set special hunting seasons to eliminate them because the state too does not want elk summering on their winter ranges such as the Sun River Game Range (Montana Department of Fish, Wildlife and Parks, pers. commun. 1985; and pers. obs.). Furthermore, even Yellowstone's bison now spend much of their summer on the northern winter range (pers. obs.).

In addition, elk do not "need" to forage at higher elevations to meet their nutritional requirements. Lewis and Clark (1893), Maximilian (1966), and other early explorers repeatedly saw and killed large numbers of elk on the plains. In the hottest, driest part of Washington State's Columbia Basin, a resident elk herd not only increased at near the theoretical maximum rate of increase for that species, but bulls in that herd grew huge record-book antlers indicative of excellent nutritional conditions (Rickard et al. 1977; Urness 1985; McCorquodale et al. 1986, 1988, 1989a, 1989b; McCorquodale 1987a, 1987b; Petron 1987). This herd inhabits a grass-sagebrush range with no tree cover except for a few limited riparian areas (pers. obs.). If elk can summer there, they surely could summer on any winter range in the Greater Yellowstone Ecosystem.

Moreover, mule deer which summer in Yellowstone Park near Slough Creek campground, winter approximately 60 km to the north and migrate up and over the Absaroka Mountains to summer on Yellowstone's northern winter range (Youmans et al. 1982). In addition, as discussed above, several small parties of early explorers climbed various mountains in Yellowstone without reportedly seeing any game. Early parties also reported seeing relatively little game on Yellowstone's Mirror Plateau which today is one of the major summering areas for the northern elk herd. Thus, not only is there no physiological "need" for elk to summer at higher elevations, but early explorers often failed to find elk on Yellowstone's highlands.

Murie (1940), Gruell (1973), Houston (1982), and Haines (1977:200) also suggested that early visitors to Yellowstone saw little game because hunting in the park drove the animals away from the most traveled routes. First, since relatively few game animals were actually killed by early visitors to Yellowstone (Table 54), it appears doubtful that this had a major influence on ungulate distribution or abundance, though it cannot be discounted. DeLacy (1876) and Cook et al. (1965) were some of the first Europeans to enter Yellowstone, yet they did not report seeing or killing any more game than later parties. During the 1860s, visitors to Yellowstone reported seeing or killing an average of 0.087 elk per party day, while during the 1870s parties reported seeing or killing an average of 0.138 elk per party day. From 1835 to 1869, visitors killed an average of 0.040 elk per party day, while between 1870 and 1877, they shot an average of 0.062 elk per party day or an increase of 54% over the earlier period. Clearly, early explorers to Yellowstone did not report more game than later groups as would be expected if hunting drove out or killed most of the animals.

Finally, it has also been postulated that early explorers reported more game on the plains than in Yellowstone Park or other mountainous areas because game was easier to see and kill where there was no forest

cover. Murie (1940:3) suggested that few animals would be seen in Yellowstone's dense forests. While ungulates certainly are more visible in the open than in forests, three lines of evidence suggest that this was probably a minor consideration.

First, the plains are not flat. When hunting antelope in eastern Montana or other treeless areas, I have always been amazed at how large herds (20-60) of those animals can disappear from sight so quickly and completely. Undulating topography often makes it difficult to see ungulates in treeless areas. Second, in the mountains most ungulates feed in openings (Houston 1982) where they can often be easily seen from opposing hillsides or mountain tops, especially using binoculars or telescopes which were available to early explorers.

Third, my repeat photographs, as well as those compiled by Houston (1982) and Gruell (1980a, 1983) clearly show that forests in the Greater Yellowstone area and throughout the northern Rockies have closed or grown up since the late 1800s due to human suppression of forest fires. In reviewing those early photographs (see Figs. 15, 16, 18, 19, 26, 27, and 28), one is struck by how open the country was when Yellowstone was first explored. Thus, animals hidden from view by dense forests, are a greater consideration today than in the past.

CONCLUSIONS

The estimated number of ungulates in the Greater Yellowstone Ecosystem during the summer of 1989 and their relative abundances are presented in Table 55. Elk make up nearly 80% of the total, mule deer constituted 9%, bison 4%, bighorn sheep 4%, moose 4%, and antelope 1%. While estimated population sizes may vary, my 1989 estimated relative abundance of elk and other ungulates is consistent with other data for Yellowstone's northern range and Jackson Hole (Table 56). If we use the 1989 relative abundance of ungulates as the expected, for they are thought by some authors to represent near "natural" conditions (Houston

Table 55. Estimated number of ungulates in the Greater Yellowstone Ecosystem, summer 1989.

Area	Estimated number of ungulates (percentage of total in parentheses)*						
	Elk	Bison	Deer	Antelope	Bighorn	Moose	Total
Yellowstone National Park including Gallatin, Firehole, Sand Creek, and Northern herds	26,000 (80%)	2,200 (7%)	3,000 (9%)	500 (2%)	500 (2%)	300 (1%)	32,500
Clark's Fork of the Yellowstone	3,000 (72%)	0 ---	400 (10%)	0 ---	600 (14%)	150 (4%)	4,150
North Fork of Shoshone	3,000 (65%)	0 ---	900 (19%)	0 ---	650 (14%)	100 (2%)	4,650
South Fork of Shoshone	2,000 (63%)	0 ---	800 (25%)	0 ---	300 (9%)	100 (3%)	3,200
Jackson Hole including Hoback	20,000 (85%)	150 (1%)	1,200 (5%)	100 (1%)	300 (1%)	1,800 (8%)	23,500
Totals	54,000 (79%)	2,350 (4%)	6,300 (9%)	600 (1%)	2,370 (4%)	2,450 (4%)	68,050

* Data adapted from Singer (1989) and personal communications with Wyoming Department of Game and Fish; Montana Department of Fish, Wildlife, and Parks; and Yellowstone National Park.

Table 56. The relative abundance of ungulates in the Greater Yellowstone Ecosystem. Species percentage of total numbers or total historic observations.

Data set	Species percentage of total					
	Elk	Bison	Deer	Antelope	Bighorn	Moose
Population Estimates						
1. Northern range 1978 counts (Houston 1982)	86	2	8	1	3	1
2. Jackson Hole 1974-1984 average winter estimates[1]	83	1	6	0	2	8
3. Greater Yellowstone Ecosystem 1989 summer estimates[2]	79	4	9	1	4	4
Historical Observations[3]						
4. Sightings	35	2	25	25	13	0
5. Sign	39	8	29	3	17	4
6. Animals killed	40	3	30	19	9	0
Subtotals	38	5	27	15	13	2

1. Wyoming Department of Game and Fish; antelope summer but do not winter in Jackson Hole.
2. From Table 55.
3. From Tables 52, 53, and 54.

1982, Despain et al. 1986, Boyce 1989), a chi-square test shows the total historical observations to be significantly different from today's mix of ungulate species; $X^2 = 679.08$, $p < .001$. Based on historical observations (Tables 52-54), deer, bighorn sheep, and antelope were a larger proportion of the ungulate community then, while elk were a smaller proportion. As previously noted, large numbers of mule deer and bighorn sheep were reported by early explorers in areas where they do not occur today or are now present in only very low numbers.

Despite the difficulties of dealing objectively with historic materials, continuous-time analyses of Yellowstone's early historic documents support the following general conclusions relating to the 1835-1876 distribution and abundance of ungulates throughout the Greater Yellowstone Ecosystem.

1. Bison were rare in Yellowstone suggesting that today's 2,000-3,000 bison do not represent the "natural" or "pristine" condition of the park.

2. Moose were extremely rare or absent and did not inhabit areas where they are common today suggesting that present moose populations do not represent "natural" conditions.

3. In relation to elk, mule deer and bighorn sheep constituted a larger proportion of the total ungulate community when Yellowstone was first explored than is the case today.

4. None of the early explorers saw or killed any wolves or mountain lions in the Yellowstone area. Very few explorers even reported seeing wolf or mountain lion tracks or hearing them vocalize. This suggests that ungulates were not historically abundant in and around Yellowstone Park. Reports of abundant ungulates on the plains are invariably accompanied by observations of large numbers of predators, mainly wolves (Lewis and Clark 1893, Maximilian 1966).

5. Elk and other ungulates were not abundant throughout the Greater Yellowstone Area during the period of early historical records.

Few animals were seen or killed and their sign was not observed very often. From 1835 to 1876, 19 different parties spent a total of 765 days in the Yellowstone area, yet they only reported killing 91 ungulates or an average of 8.4 days per kill per party day. Historical sources provide no evidence that thousands of resource-limited elk inhabited Yellowstone.