

**PEOPLE AND WILDLIFE IN
NORTHERN NORTH AMERICA:
ESSAYS IN HONOR OF R. DALE GUTHRIE**

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WOOD BISON IN LATE HOLOCENE ALASKA AND ADJACENT CANADA: PALEONTOLOGICAL, ARCHAEOLOGICAL AND HISTORICAL RECORDS

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INTRODUCTION

Bison originated in Eurasia, dispersing to North America by the Bering Isthmus several hundred thousand years ago, possibly during a transition from Irvingtonian to Rancholebrean fauna (Harington 1984). Large-horned forms similar to steppe bison (*Bison priscus* McDonald 1981, Guthrie 1990; *Bison bison priscus*; van Zyll de Jong 1986) prevailed until near the end of the Pleistocene when a number of large Pleistocene mammals became extinct or shifted their ranges southward. Large-horned bison in Siberia, Alaska and northwestern Canada evolved into modern, small-horned bison during the late Pleistocene and early Holocene, culminating in the wood bison (*B. b. athabascae*). Bison were abundant on the Alaskan landscape during most of the last 100,000 years (Guthrie 1968; 1990), and wood bison were the last subspecies to occupy Alaska and adjacent regions (Skinner and Kaisen 1947; Harington 1977; van Zyll de Jong 1986).

Bison have long been thought to have been a major food resource for humans in Beringia and elsewhere. Evidence from archaeological sites in Alaska and a large body of archaeological evidence demonstrates late Pleistocene and early Holocene associations of hunting implements with bison remains (cf. Guthrie 1980; Powers et al. 1983; Frison 1991, 1996; Yesner 1994; Loy and Dixon 1998; Brink, this volume; Kooyman, this volume). However, with few exceptions (Gordon and Savage 1973; Holmes and Bacon 1982; West 1982; Guthrie 1990; Gates et al. 1992), ethnographers, archaeologists and biologists have given little consideration to the possibility that bison played a role in the late Holocene subsistence system of Athabascan people in interior Alaska and adjacent parts of northwestern Canada. On the basis of paleontological and zooarchaeological evidence, Skinner and Kaisen (1947), Holmes and Bacon (1982), Guthrie (1990), and others have suggested that northern bison populations disappeared shortly before the arrival of Euro-Americans. Van Zyll de Jong (1986) referred to the "prehistoric" range of wood bison as extending "north

and west into Alaska and the Yukon," noting that "the exact boundaries of the historical distributional range of *B. b. athabascae* cannot be determined at present on the basis of the available information." He also described the occurrence of small-horned bison similar to wood bison in eastern Siberia during the Holocene.

In this study we review new and existing paleontological and archaeological data and oral accounts from Native elders in Alaska and Canada, focusing on the late Holocene history and human use of wood bison in Alaska, Yukon and the western Northwest Territories (N.T.). These data include oral narratives provided by Athabascan elders in several interior Alaskan villages, similar accounts obtained from First Nation elders in Yukon (Lotenberg 1996) and N.T., and radiocarbon dates from bison remains collected at various locations throughout the study area (Figure 1). We also explore cultural and ecological factors that may have caused the demise of bison in part of their original range in Alaska and Canada. In the course of our discussions with Athabascan elders we were also provided with information regarding the occurrence of muskoxen (*Ovibos moschatus*) prior to their extirpation. Information pertaining to muskoxen is included where it clarifies issues pertaining to the late Holocene range of wood bison and muskoxen.

WOOD BISON ECOLOGY AND BEHAVIOR

Wood bison are adapted to boreal regions, having a highly efficient digestive system and an ability to forage on a variety of common grasses and sedges found in meadows and early successional habitats (Reynolds and Hawley 1987; Reynolds et al. 1978; Larter and Gates 1991). They are highly mobile, use a variety of open and forested habitats, and maximize seasonal foraging efficiency by selecting habitats where crude protein is most available (Larter and Gates 1991). Bison are adapted to low temperatures (Fuller 1962; Peters and Slen 1964; Christopherson et al. 1978, 1979) and snow conditions typical of northern latitudes (Larter and Gates 1991; Carbyn et al. 1993). Unlike caribou,

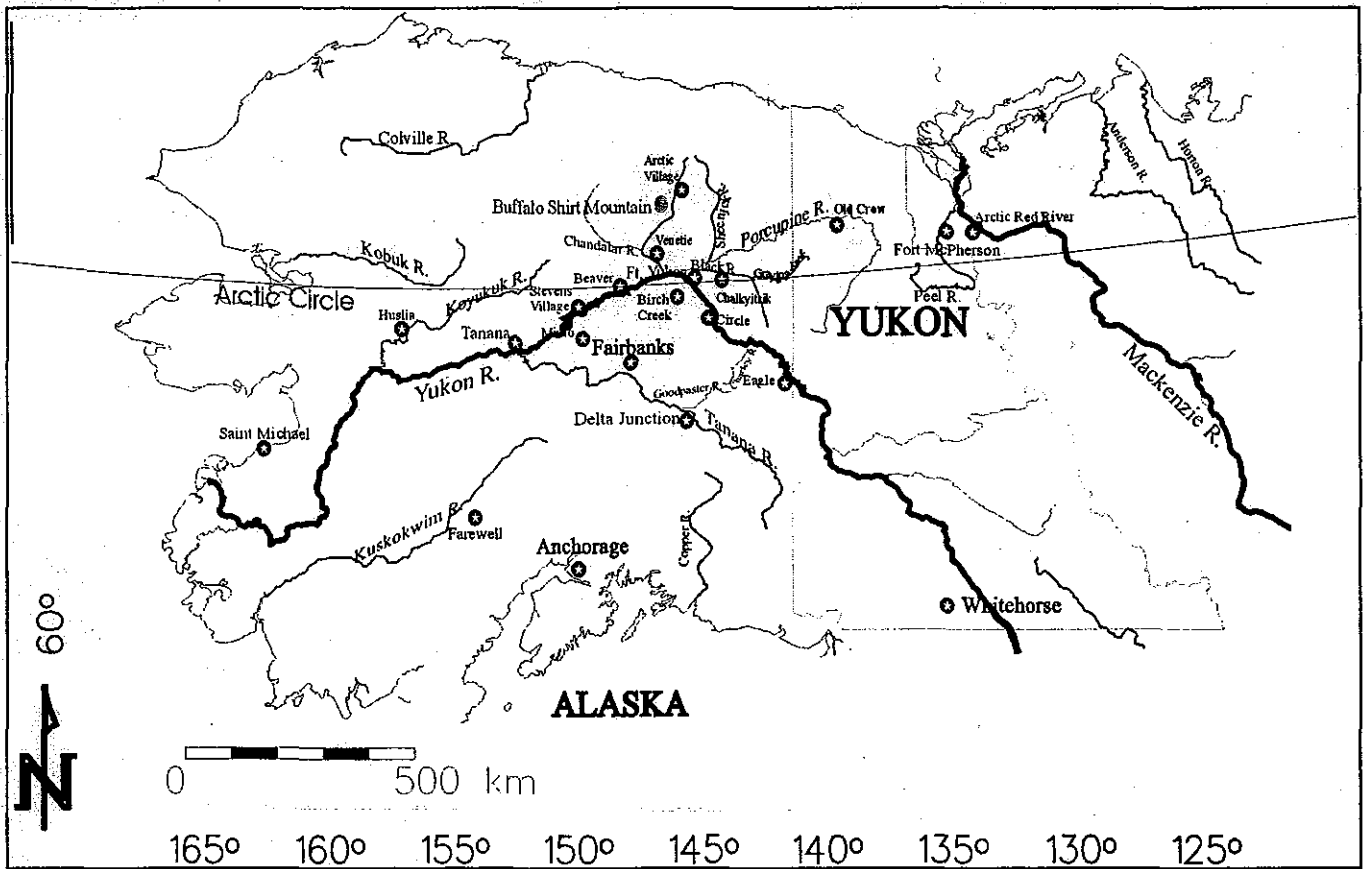


Figure 1. Map of study area showing major geographic features and locations mentioned in the text.

which crater snow with their hooves, bison expose forage by sweeping aside snow with their heads (Guthrie 1990).

The social behavior of wood bison is adapted to northern forests where forage occurs in scattered meadows separated by woodlands. Wood bison are gregarious animals that exist in several types of groups during the course of the year, although group size is generally smaller than among plains bison (*B. b. bison*) (Komers et al 1993). Cows, calves and yearlings are usually found in matriarchal groups ranging up to a few dozen animals or so. Maternity groups consisting of cows with young calves also occur. Mature bulls seldom form groups of more than a few animals, and solitary bulls are common (Komers et al 1992). Male wood bison show a linear, age-related, dominance hierarchy similar to that observed in plains bison (Komers et al 1994). Wood bison occur in small, mixed herds during the rut, apparently as an adjustment to resource availability in forested terrain (Melton et al. 1989; Komers et al 1993), but adult bulls generally remain separate during other seasons (Reynolds et al. 1978). Adult female and yearling bison occur in larger groups and have larger home ranges than do adult male bison (Larter and Gates 1994).

Soper (1941) estimates a total population of 168,000 wood bison in North America in 1800. However, the fate of wood bison was similar to that of plains bison. By the end of 19th century they had nearly vanished as a result of over-

exploitation following the fur trade and westward expansion of European settlement (Gates et al. 1992). Subsequent conservation efforts improved their status in Canada (Reynolds and Gates 1991). There are currently about 2800 disease-free wood bison in six, free-ranging herds, and an additional 700 in captive herds in Canada. Prior to population declines during the 19th century, wood and plains bison occupied different habitats. During winter their movements may have overlapped in a limited area along the southern edge of wood bison range, but different migratory patterns suggest they did not share a common range during the breeding season. Differing habitat preferences and seasonal behavior maintained reproductive isolation (van Zyll de Jong 1986).

The evolutionary history of the North American bison is described in detail elsewhere (Skinner and Kaisen 1947; Harington 1977; van Zyll de Jong 1986, 1993; McDonald 1981; Guthrie 1990). These studies are in general agreement regarding the pattern of evolutionary divergence and geographic discontinuities lead to the existence of two morphologically distinct bison types during the Holocene. Modern forms evolved relatively recently, resulting in minor genetic, morphological and behavioral differences between subspecies. Studies of bison systematics show primarily clinal variation among contiguous populations, with a phenotypic discontinuity between boreal (*B. b. athabascae*) and plains (*B. b. bison*) populations supporting the

designation of only two late Holocene subspecies in North America (van Zyll de Jong 1986, 1993).

A typological approach to systematics during the late 1800s and early 1900s led to a bewildering array of species designations within the genus *Bison* (Guthrie 1980; van Zyll de Jong 1986). Subsequent recognition of the clinal variation in certain characteristics, and the relatively labile nature of social organs such as horn cores (Guthrie 1966, 1990), resulted in a trend toward synonymy in bison taxonomy (Skinner and Kaisen 1947; Guthrie 1980; van Zyll de Jong 1986).

The evolution of northern bison reflects the clinal variation and gradual reduction in body and horn size that has occurred in *Bison* over time (Guthrie 1990). Steppe bison evolved into an intermediate form, *B.b. occidentalis*, during the late Pleistocene-Holocene transition, which in turn gave rise to *B.b. athabasca* (van Zyll de Jong 1986). It is clear that wood bison are the most recent northern variant of *B. bison*, just as plains bison are the most recent southern variant. It is also known that wood bison were the last type of bison to inhabit Alaska and northwestern Canada, and were once widely distributed in this region (Skinner and Kaisen 1947; Harington 1977; Guthrie 1980; van Zyll de Jong 1986; 1993).

Wood bison are recognized as a subspecies based on morphology (Figure 2), blood characteristics and DNA. Geist (1991) suggested the subspecific status is not warranted and that observed differences are environmentally induced. However, morphological studies of plains bison and wood bison show differences in cranial and skeletal characteristics (van Zyll de Jong 1986), as well as in the anterior slope of the hump, location of the highest point on the hump, angle of the hump, cape variegation and demarcation, upper front leg hair, frontal display hair, ventral neck mane and beard, indicating that phenotypic differences are genetically controlled (van Zyll de Jong et al. 1995).

There are similarities as well as differences in mtDNA, genomic DNA (Bork et al. 1991; Strobeck et al. 1993), and erythrocyte antigens and blood proteins in plains bison and wood bison (Zamora 1983; Peden and Kraay 1979). Wilson and Strobeck (1999) investigated variability in 11 microsatellite loci of genomic DNA in 11 North American bison herds. Genetic distances between wood bison and plains bison subpopulations were usually larger than those within either subspecies, indicating that wood bison continue to function as genetic entities separate from plains bison, despite the introduction of plains bison into wood bison range in the 1920s (van Zyll de Jong et al. 1995). Strobeck et al. (1993) compared sequence divergence in a section of D-loop in the mtDNA of a small number of wood and plains bison and found that differences between the two subspecies are approximately the same or less than within plains bison.

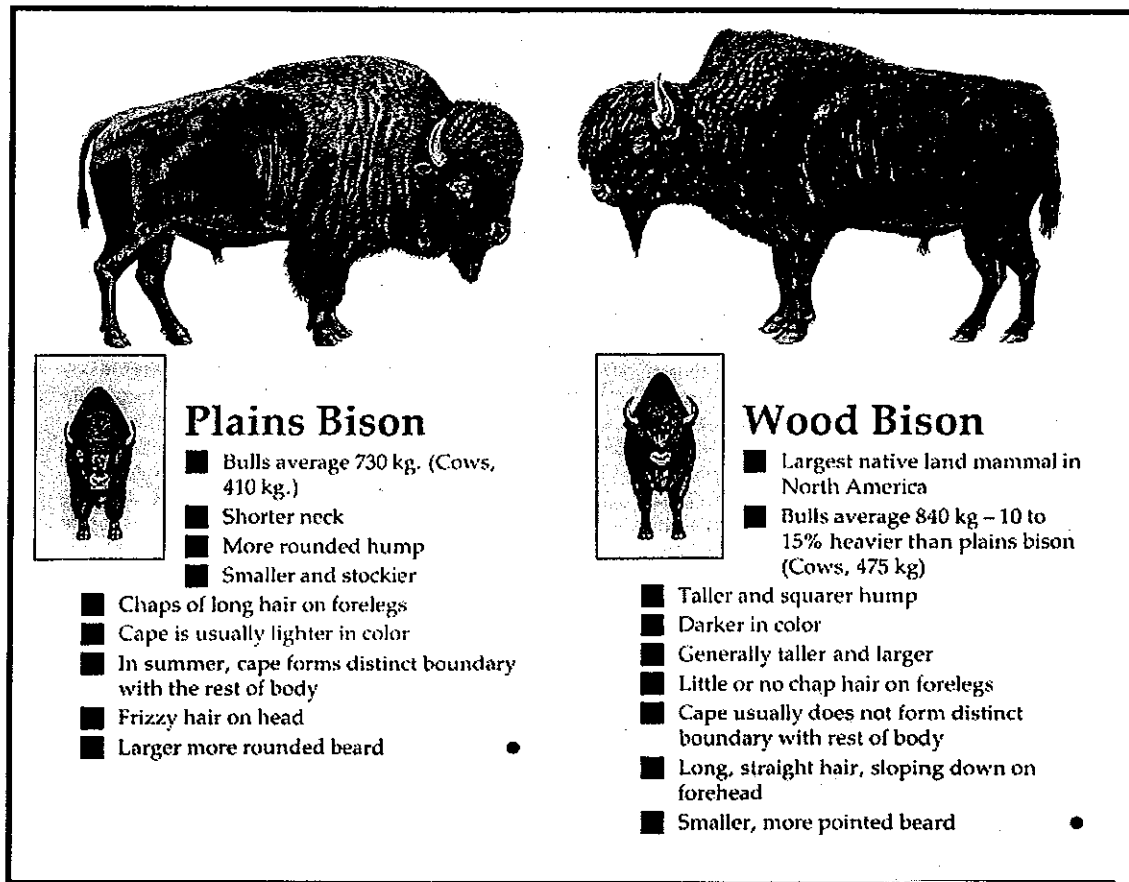


Figure 2. A comparison of the morphological characteristics of plains bison and wood bison. Reproduced with permission of Environment Canada, Elk Island National Park.

The rate of sequence divergence in mtDNA is on the order of 1% to 2% per million years (Wilson et al. 1985). These findings are consistent with the view that wood bison and plains bison existed as reproductively isolated populations during the last 5-10,000 years, a relatively short time in evolutionary terms, and probably also reflect some introgression of plains bison mtDNA into remnant wood bison populations during the 1920s (Van Zyll de Jong et al. 1995).

PROCEDURES

We first became aware of the existence of traditional knowledge about late Holocene bison in Alaska in the fall of 1991, when a resident of Fort Yukon informed the senior author that his mother had told stories describing how bison had once lived in the area around Fort Yukon. This prompted efforts to determine whether historic information might be present in the oral traditions of other Athabascan people in the region. We subsequently learned that elders in several villages in interior Alaska could recount credible and substantive stories about both the presence and the hunting of bison. We interviewed Athabascan elders in nine interior Alaska communities including Fort Yukon, Birch Creek, Beaver, Chalkyitsik, Venetie, Arctic Village, Minto, Nenana and Tanana (Figure 1) between November 1991 and July 2000. In June 1998, residents of several communities in northern Yukon and NT traveled to Alaska to attend the Sixth Biannual Gwich'in "Giikhii" Gathering at Fort Yukon, where two residents of Arctic Red River, NT contributed information regarding the occurrence of bison within recent times near that community. Individuals providing information in this study are identified in connection with their accounts, which are detailed below. Most informants ranged in age from 60 to over 90 years.

Oral accounts were summarized in writing following each interview based on notes taken during the conversation. Interviews were generally conducted in English, but in some cases in *Gwich'in* with the aid of a translator. Photographs of wood bison and muskoxen were used to help confirm the identity of the animal in question. Individuals were specifically asked to identify the animals represented and to provide, if possible, Athabascan or English names for them. Efforts were made to collect information about the abundance and spatial and temporal distribution of bison, their physical and behavioral characteristics, other details relating to their occurrence and how they were hunted and used, and if and where bison remains had been found.

Several accounts were substantiated and elaborated on through second and third discussions with elders. In subsequent discussions we reviewed and clarified details, particularly if there appeared to be confusion about the literal or interpretive meaning of an account (see Burch 1975). Information from two informants was independently reviewed and verified by researchers not directly involved in the study. William Schneider, a long time associate of Moses Cruikshank, and Curator of Oral History at the University of Alaska Fairbanks (UAF), conducted additional interviews with Mr. Cruikshank, independently confirming our results in the process. Historic accounts provided by Reverend

David Salmon were compiled and reviewed by UAF anthropologist Thomas O'Brien who, in 1994, began a long-term collaborative project to record Rev. Salmon's life history (e.g. genealogy, land use, historic travel narratives), and to collect narratives pertaining to a variety of other ethnographic and historic topics (O'Brien 1997). O'Brien conducted a line-by-line review with Rev. Salmon to evaluate with him the accuracy of accounts recorded previously by Stephenson.

We recognize the potential for bias in oral accounts, just as there is a bias in written and other documentary sources. We also recognize their utility for historical reconstruction and value in understanding natural history (cf. Garraghan 1940; Dundes 1965; Cruikshank 1981; Vansina 1986; Burch 1991; Beaudry 1994; Stevenson 1996; Wenzel 1999). We find no reason to discount or dismiss the following accounts pertaining to the late Holocene occurrence of bison in Alaska. While individual narratives vary in level of detail, they provide a relatively robust set of historical data with which to reevaluate the biogeography of wood bison and some aspects of late Holocene Athabascan subsistence, economy and ecology.

The emergence of oral accounts describing the presence of bison in recent times led to a more detailed examination of archaeological, paleontological and previously collected ethnohistorical data. We also obtained radiocarbon dates from bison skeletal material recovered from the Yukon Flats and other parts of Alaska and Canada, dating those remains that, based on morphology and preservation, appeared to represent Holocene specimens. In addition, we worked with other investigators to compile new and existing radiometric data for late Pleistocene and Holocene bison discoveries (Table 1). We relied on published literature and skeletal measurements to distinguish specimens of male and female bison where possible. In 1993 Gerlach and Mills conducted a 10 day archaeological survey in the vicinity of Smoke Creek, approximately 45 km southwest of Arctic Village, Alaska to search for evidence of bison hunting in the form of kill-, drive- or jump-sites. The survey occurred near "Buffalo Mountain" (Figure 1), a place name reported by T.E. Taylor in 1956 (Orth 1971). This survey was brief and logistically constrained, and no positive evidence was found (Mills 1993).

ATHABASCAN ORAL NARRATIVES ABOUT LATE HOLOCENE BISON ON THE YUKON FLATS AND IN OTHER AREAS OF INTERIOR ALASKA

Athabascan elders residing in the upper Yukon and Tanana River drainages in interior Alaska provided oral accounts referring specifically to late Holocene bison. Consistent oral narratives provided by multiple elders indicate bison were present and were hunted in parts of interior Alaska within the last few hundred years. There are a number of persistent themes in the oral narratives that provide insight into the late Holocene distribution, human use, and disappearance of wood bison in Alaska. Although the narratives are substantive by current historical and ethnographic standards, there is little doubt that more detailed information would have been available to earlier ethnographers.

The accounts indicate that wood bison were widely distributed in the upper Yukon drainage, and apparently in the Tanana drainage as well, until late in the Holocene. Specific areas referred to as being inhabited by bison include the flats along the Yukon River from the vicinity of Beaver east to the lower Chandalar, Porcupine and Black River drainages in the vicinity of Fort Yukon, the Hodzana River drainage northwest of Beaver, the Grayling Fork area in the upper reaches of the Black River, and the flats adjacent to the Tanana River.

Discussions with several elders in Alaska also revealed an awareness of the fact that bison were still hunted in the Mackenzie River-Lake Athabasca region in Canada many years after significant populations had disappeared from the upper Yukon basin in Alaska. This knowledge is based on accounts from relatives who, on at least a few occasions, traveled to and from this region via the Porcupine River in connection with the fur trade during the late 1800s and early 1900s (McKenna 1965).

Oral narratives provided by thirteen Athabascan elders in the Yukon Flats communities of Beaver, Birch Creek, Chalkyitsik, Fort Yukon, and Venetie, and two elders from the communities of Minto and Nenana (Figure 1) indicate bison were sufficiently abundant to be a resource of some importance as recently as 200 to 300 years ago. One elder stated that a group of bison was seen near Eagle in 1916 or 1917, and two others report that small herds were sighted near Circle and Fort Yukon during the same period. Two elders describe instances in which single bison were killed in Alaska in the early 1900s. A few elders reported observations of tracks or other signs of bison in northeastern Alaska during the mid 1900s.

Details in these accounts are consistent with existing knowledge of bison ecology, morphology and behavior. Informants characterize the animals as being of unusually large size with small horns, a large hump, a large head, short legs, long hair and a long tail. These features are typical for wood bison (Figure 2), whose hump is especially prominent and whose tail is substantially longer than that of other ungulates present in Alaska during the Holocene (Guthrie 1990, van Zyll de Jong 1993). The elders further distinguish between bison and muskoxen, and include information that agrees with paleontological, archaeological and other historical evidence regarding their Holocene distribution (Lent 1998).¹

Bison are said to provide high quality food and raw materials. Hides were tanned and used to make robes, pillows, and clothing, and sewing thread was made from bison hair. Bison were hunted with bow and arrow, spears, dogs, and with snowshoes to gain advantage in deep snow, and possibly with drives. The accounts obtained indicate that resident populations of wood bison declined or disappeared from Alaska by the early or mid 1800s, with the occurrence of small numbers in the eastern interior as late as the early 1900's.

Several elders were familiar with one or more *Gwich'in* terms for bison. Some informants indicated that one

Gwich'in name for bison is *Dachantèe aak'ii*, which they translate as "cow in the forest." Another provided the name *Dachantèe qwaak'ii*, indicating it had a similar meaning. One informant described how the above terms were applied to either bison or muskoxen, and were always accompanied by a hand sign that identified the species being referred to.

These terms appear to be the most well known *Gwich'in* terms for bison; the first translates as "muskox among timber" and the second "the hefty one among timber" (J. Kari, pers. comm.). The *Gwich'in* term for muskoxen is *aak'ii*, which appears to originate from the verb theme "to be hefty, meaty" and is literally "the one that is hefty" (J. Kari, pers. comm.). Another *Gwich'in* name for bison is said to be *Ch'itthay dighan*, which describes a large, humped animal or "humped game" (R. Mueller, pers. comm.), or "humped meat" (J. Kari, pers. comm.). A similar term, *Ch'atthai daghan choo*, was provided by another elder (O'Brien pers. comm.). One elder provided the name *Nan'aak'ii choo*, indicating it meant simply, "big animal." *Nan'aak'ii choo* translates as "big hefty one on the land" (J. Kari, pers. comm.).

Gwich'in terms for bison appear to be a lexical innovation perhaps coined at a time when the animal was already scarce, and after a more ancient term had become obsolete. The term for bison is not as widely distributed in northern Athabascan languages, and is not as ancient as, for example, terms for moose or caribou, which are cognate terms. The apparently limited contemporary linguistic terminology related to bison in Alaska may reflect the fact that wood bison have been absent from the region, and culturally obsolete, for some time. (J. Kari, pers. comm.).

Different linguists transcribe and gloss *Gwich'in* Athabascan words in different ways. For example, one may transcribe bison as "*Dachantèe aak'ii*", another as "*Dachantèe akii*." The observed variation may reflect lexical, phonemic, dialectical, geographic, or idiosyncratic differences. We are unable to clarify all linguistic issues, but simply present them here as they have been interpreted for us.

Oral Narratives about the Upper Yukon Basin

Mrs. Annie James of Fort Yukon recognized a picture of bison and said that her mother, grandfather, and other "old-timers" told stories about bison in the Fort Yukon area, and in the upper Mackenzie River area in Canada. These elders described how bison were hunted in the upper Yukon area in Alaska during the "skin-clothes days," and were aware of the fact that bison still occurred and were hunted to the east in Canada after they had disappeared from the Fort Yukon area.

Mrs. James said she was told there were once "lots" of bison in the Fort Yukon area, that they were hunted with bows and arrows and spears, that the meat was sometimes dried, and that some "old-timers" thought the meat was tough. Mrs. James mentioned a number of other elders who should have information about the history of bison in the region, indicating that her knowledge of bison was not unusual. Among these knowledgeable elders was her brother, the Reverend David Salmon of Chalkyitsik.

Rev. Salmon is acknowledged for his extensive and detailed knowledge of *Gwich'in* Athabascan history and traditions. He recounted bison stories that were related to him by his father, mother, maternal father-in-law, and additional stories based upon accounts provided by his paternal grandfather and other elders. Prior to their disappearance, bison were an important source of food for the *Gwich'in* on the Yukon Flats. Rev. Salmon emphasized that "they lived on it," especially before moose (*Alces alces*) became more common, adding that mosquitoes did not bother bison because of their long hair.¹ Bison were said to be a "good animal," providing valuable food and material for people. In discussing the history of bison in the region, Rev. Salmon often commented that the Yukon Flats "is their country...they belong to it."

According to stories passed on to Rev. Salmon, the bison that lived in this area had a large hump. During the 1970s his grandson found the skeleton of a bison in a cutbank along the Black River, about 20 miles west of Chalkyitsik (Figure 1). The remains were brought to Chalkyitsik where people noted the long spines on the cervical and thoracic vertebrae. Rev. Salmon pointed out that this was consistent with the large hump described in *Gwich'in* oral narratives. We obtained a radiocarbon date of 1730±60 BP for this specimen (Table 1, Map No. 37). Rev. Salmon has often found bison horns and other skeletal remains on the Yukon Flats, and observes that many of the bones have a "fresh" appearance and appear to be of recent origin. The Grayling River flats in the upper Black River drainage was one area known as bison country. Rev. Salmon mentioned that a bison skull had been found there and that his father found a frozen bison head along the Black River upstream from Chalkyitsik in 1926. It was recovered from permafrost and looked "fresh." Both horn sheaths were attached, and Rev. Salmon described it as being a small-horned bison.

According to Rev. Salmon, *Gwich'in* names for bison include *Dachantèe aak'ii* which he translated as, "cow in the forest", and *Ch'athaii daghan choo*, which he translated as "large animal with a hump." He indicates these terms could be applied to either muskoxen or bison, emphasizing that only bison occurred on the Yukon Flats. Rev. Salmon explained that these two animals were distinguished in conversation on basis of the distinctive shape of their horns, and clarified any ambiguity regarding the name *Dachantèe aak'ii*. He describes the characteristic downswept horns which "cover the head" of a muskoxen, contrasting them with the upwardly curving horns of bison. When referring to muskoxen the speaker would typically place an open palmed right hand above the ear, move it gently downward over the ear and then out and up in an arc, indicating the downswept curve and upturned end of the horn. When referring to wood bison a hunter would extend and slightly curve the first and second fingers, placing them against the upper temple, indicating the outward and upward curve of wood bison horns. The phrase "*Dachantèe aak'ii viji viki' noiinjik*" means "cow in the forest with the horn that sweeps downward to protect the head." In contrast, the phrase "*Dachantèe aak'ii viji neekwaii gwanlii*" means "cow in the forest with two short horns turning upward." Rev. Salmon stated that even during the early 1900's hunters discussing

bison or muskoxen would qualify the term with hand sign, adding that *Gwich'in* people in a large region extending from Fort McPherson to Fort Yukon commonly used the term *Dachantèe aak'ii*, accompanied by hand sign, to denote wood bison. It is interesting that this hand sign for bison is identical to that used in the traditional hand sign language of Plains Indians, as well as other indigenous peoples in North America (T. O'Brien, pers. comm.).¹

Rev. Salmon believes that Athabascan stories about bison hunting refer to a time no longer than 300-500 years ago, in part because he doubts that stories of this nature could persist for a longer period of time. Moreover, he indicates that bison were still being hunted at the time that moose first became known to the *Gwich'in*. Rev. Salmon said the first moose (*Alces alces*) was seen near Birch Creek about 400 years ago. People were initially afraid, but as moose became more common, they began to rely on them for food (Salmon, n.d.). McKennan (1965) describes a similar oral tradition among the Chandalar *Gwich'in* regarding the historic occurrence of moose in the vicinity of Arctic Village. Paleontological and archaeological evidence suggests that moose were present in Interior Alaska throughout the Holocene, but may have been locally absent or rare for extended periods in certain areas (Yesner 1989).

Rev. Salmon clearly distinguished bison from muskoxen and notes that bison bones are commonly found on the Yukon Flats, where the remains of muskoxen are unknown. He indicates that while oral tradition describes how wood bison were once common on the Yukon Flats, there is no such tradition regarding muskoxen, stating "...all they had was wood bison down this way." Rev. Salmon states that muskoxen were once an important resource for people to the northeast in the upper Porcupine-Peel river region, and describes hunting techniques used to take muskoxen with bow and arrow, and with muzzle loaders after they became available during the mid 1800s. Rev. Salmon also refers to a story originating with the *Dihaii Gwich'in* describing how muskoxen were sometimes killed by being driven over a cliff in the upper Chandalar River country. He indicates this technique may have also been used somewhere north of the Porcupine River, north and east of the Yukon Flats, in the "Old Crow country."

Athabascan people relied extensively on their highly developed archery to take bison and other animals. Rev. Salmon describes hunting strategies and archery technology that were effective in harvesting large game animals such as moose and grizzly bears (*Ursus arctos*), and believes they would have been adequate for bison hunting as well (O'Brien 1997). Hunters used finely crafted "self-bows" made from selected birch wood, along with a wide array of arrow types designed for specific purposes. Archery tackle was designed for long range shooting, with the draw weight of bows used by Athabascan men estimated to have ranged from 60 to 80 pounds (O'Brien pers. comm.). Arrows used to kill large game animals were generally tipped with one of a variety of broadheads made from bone or antler (O'Brien 1997).

Rev. Salmon states that archery training was extensive and

thorough, and was intended to produce highly competent archers with years of experience, knowing that the survival of people from one generation to the next depended heavily on their skill. Hunting strategies were adapted to environmental conditions and to the behavior of animals, and often involved the efforts and expertise of several hunters. For example, during winter animals were driven into deep snowdrifts, where hunters using large hunting snowshoes could shoot at close range. Big game animals were often killed as they crossed rivers or lakes in spring and summer (O'Brien 1997).

Rev. Salmon describes a special arrowhead used to kill large animals which includes a detachable head that was serrated and barbed in such a way that it worked its way through tissue as the animal moved (O'Brien 1997). The hunter had only to penetrate the hide with this arrowhead in order to kill an animal. Although Rev. Salmon believes snares could have been used to take bison, just as they were used to take moose and caribou (*Rangifer tarandus*), he is unaware of specific stories describing their use, stating instead that the bow and arrow was the most effective weapon for this species.

Based on his knowledge of the skill and purpose of earlier generations of hunters, Rev. Salmon believes that hunting played a role in the disappearance of wood bison from the Yukon Flats, emphasizing the ease with which Athabascan archers killed moose, bears and other large game. Stressing the cyclic pattern of human populations increase and subsequent decline to very low levels due to shortages of big game and other resources, Rev. Salmon described how during hard times people hunted intensively, and may have "hunted out" bison (Salmon/O'Brien, taped interview, June 3, 1997; see also Campbell 1978; Mishler 1995). He points out that "mountain people" were generally "wiped out" during periods of starvation, but that a small number of people would typically survive along the Yukon River where salmon and other fish provided a more reliable supply of food. Human populations would subsequently increase and disperse from these areas. Rev. Salmon further said that the more open nature of the terrain in the past would have made bison vulnerable to hunters, and also believes that intensive hunting might have caused the last bison to leave the country and go to the "Canadian side."

Rev. Salmon recalled stories told to him by his maternal grandfather, John Chitleii (1840-1923), a noted hunter from Old Crow, Yukon (O'Brien 1997), regarding the disappearance of bison in the region. These accounts described the occurrence of bison in the country lying between Old Crow and Arctic Red River, NT, including the Peel River area, during a time when habitat was more open than at present. Bison were once hunted in this area but populations eventually declined, first in the western portion of this range and later to the east as well. Rev. Salmon said the stories told by John Chitleii indicated that bison disappeared from the region east of Old Crow after they had disappeared from the Yukon Flats.

Rev. Salmon and other elders emphasize geographical and temporal differences between oral traditions relating to bison in Canada, some of which were obtained during periodic

long-distance trading forays in the mid 19th century. Rev. Salmon is aware that bison occurred in the area near Lake Athabasca in Canada during the mid 19th century, after they had largely disappeared from the Yukon Flats, based on information passed on by his father, William Salmon, reflecting the experiences of his paternal grandfather, King Salmon. During the period from approximately 1850-1868 King Salmon made several journeys into Canada via the Porcupine and Mackenzie Rivers in connection with the Hudson Bay Company. He traveled as far as Lake Athabasca and the Wabasca River, a tributary of the Peace River (Salmon n.d.).

Mr. Moses Cruikshank of Beaver said there were many *Gwich'in* stories describing how bison inhabited the Yukon Flats in the old days when, "big herds" of these animals occurred in the area. Large numbers of bison were sometimes killed in the fall when much of the meat was dried and "used all winter long." A story attributed to Chief Christianⁱⁱⁱ relates to "a mountain up in the Sheenjek River country" called "Buffalo Shirt Mountain." Mr. Cruikshank said "a large herd of bison came through and covered the mountain like a shirt" at this location. Bison were hunted there for several years, and were guided by fences down on the flats and driven over a cliff. Mr. Cruikshank said many bison were killed during this period. He noted that the taking of large numbers of bison by people at "Buffalo Mountain" occurred sometime before Chief Christian was born, and before firearms were generally available. Rev. Salmon estimates that Chief Christian was born about 1855 and was 93 years old when he died (T. O'Brien, pers. comm.). Campisi (1993) indicates Chief Christian was born in Arctic Village in 1866. Mr. Cruikshank said bison lingered in the area for a few years, but eventually disappeared. He remembered the "old-timers" saying there were two types of bison, one living on the flats and the other in the mountains, and that one was larger than the other. He thought the "mountain buffalo" were larger, but was not certain about this point. Mr. Cruikshank further states that a strong bow was required to kill bison, and that bison hunting was sometimes dangerous.

Mary Sam was born in 1914 and lived in the Black River area near Chalkyitsik until 1947. She presently lives in Beaver, Alaska. Mrs. Sam recalls that when she was about nine years old her grandparents, Mariah and Henry Gwats'oo, told stories originating from her great-grandfather that described how bison were once abundant in the Black River country. Mrs. Sam believes that her great-grandfather might have seen bison in that area. She was told these animals had small horns, a big hump, short legs, long hair, and were hunted with bow and arrow. They were said to have been a major source of food, were a "counterpart" (literal translation from *Gwich'in*) to moose in the diet, and were valued for their high quality meat.

With regard to the disappearance of wood bison, Mrs. Sam said that "maybe they ate it up," suggesting that hunting might have contributed to the disappearance of bison in the Black River area. She remembers her grandfather saying that moose were also likely to become scarce in the future because there would be more people in the area. She also

described how on one occasion her grandparents pointed to another young girl, saying, "...When this young girl grows up, and her children grow up, then the bison will come back." She recalled a story about a hunter who returned to a village in the area near Beaver after unexpectedly encountering a bison north of the Yukon River, describing how "his eyes were really big." Although her grandparents had told her the *Gwich'in* name for wood bison, she could not recall it. Mary Sam clearly differentiated muskoxen from bison, noting that a muskox had recently been seen near Arctic Village or Venetie. Muskoxen were reintroduced to northern Alaska in 1969-70 and have expanded their range in recent years, with some males dispersing south of the Brooks Range (Reynolds 1998).

Ms. Ann Fisher describes how her mother, the late Charlotte Adams of Beaver, often talked about the former occurrence of bison in the Hodzana River area northwest of Beaver. These accounts originated from Charlotte's father, "Old Adam" who, with his family, lived and traveled in the Hodzana drainage (Cruikshank 1986). He often talked about seeing bison in this area when he was a young man, later referring to them as "white mans moose." Old Adam hunted with bow and arrow and spears in the early days and is said to be one of the last people to have killed a bear with a spear. The inscription at his gravesite indicates he was born in 1848 and died in 1944, at the age of 96. This account indicates that resident bison populations existed in the vicinity of Beaver during or after the mid-1800s.

Mrs. Virginia Titus provided stories regarding the presence of bison in interior Alaska that were conveyed to her by her father and grandfather. Her family originally lived in the Koyukon Athabascan community of Tanana. However, her father spent most of his life in Fort Yukon and travelled extensively between the two communities. Her father heard many stories about bison and their value to people in the "skin clothes days," when animal skins were the only materials available for clothing. She was told that bison were once common and widespread in Alaska, although they were found mostly at low elevation and were scarce in the mountains. The flats in the Tanana and Yukon drainages were said to support bison in the early days. According to Mrs. Titus, bison were second only to moose as a source of food, and were an important source of material for clothing and shelter as well. Bison had a "big head," and the hides were tanned with the hair on to make warm robes and clothing. The hair was soft, and bison hides were preferred for clothing because they did not cause allergic reactions in people.^{iv}

Mrs. Titus said these stories described the presence of bison in the 1700s and into the early 1800s, as well as earlier. Her grandfather said bison were hunted with bow and arrow, with spears, with the aid of snowshoes in winter, and with the aid of dogs. Mrs. Titus said the dogs used by people in the early days were larger than the sled dogs generally used today. She adds that there was more snow in the early days, noting this may have increased the vulnerability of bison to hunters. She indicated that the disappearance of bison in this region was due to hunting, stating "...they were easy to kill, that's why they are not here," Mrs. Titus recalled the name

for bison as "*nan' aak'ii choo*," which she translated as "big animal."^v Mrs. Titus stressed that stories relating to bison were not recorded earlier because of the generally poor communication between interior Alaska Natives and early settlers, missionaries and explorers.

Mr. Elliot Johnson, age 96, of Fort Yukon, also states that bison once lived on the Yukon Flats and were hunted in the early days. He had heard other "old-timers" talk about the former occurrence and use of bison on the Yukon Flats, specifically mentioning Chief Christian and Chief Robert, two prominent leaders in the Fort Yukon area during the late 1800s and early 1900s (T. O'Brien, pers. comm.). In addition to being an important source of food, bison provided raw materials, with hides making good blankets and pillows and the hair being used to make thread for sewing. Bison hides were left outside for a time to rid them of "bugs" before using them because they harbored parasites.^{vi} According to Mr. Johnson, the decline of bison populations was followed by a period of food scarcity, which continued into the 1900's when he was a young man. He indicates that people referred to this period with the phrase "no buffalo, no power." Big game was extremely scarce in the Fort Yukon area during this period, which was characterized by social instability and extensive movements in search of bison and other game. Mrs. Johnson states that he saw four bison along the Porcupine River a few miles from Fort Yukon on one occasion in the early 1900s. He describes them as having black, upward curving horns, long hair, and being about five feet high at the shoulder. He did not shoot these animals because it was the first time he had seen "buffalo", and later he returned to the site with other people in an unsuccessful effort to relocate them. Mr. Johnson also recounts a story told by his father-in-law, Frank Alexander, relating to an animal that he encountered as he was travelling from Tanana to Fort Yukon. He shot the animal with his rifle, thinking it was a moose, but on approaching it found it had a long tail and was actually a bison.

The late Julia Tritt of Venetie recounted stories told by her grandfather and other elders about how "buffalo" were hunted on the Yukon Flats. She referred to bison as the "big animal," stating that elders often remarked on the animals' "big head," long tail and large size. She said hunters often found their large round tracks in the snow. They were said to be fairly easy to hunt and to kill with bow and arrow or spears, and dogs were also used to help bring them down. Bison were sometimes caught in, and often ruined, snares set for moose or caribou. These snares were often not strong enough to hold them. She said bison were "good eating" and provided high quality food for people. Sewing thread was made by plaiting together several of the longest hairs, and a single bison hair was used to suture cuts on people. Mrs. Tritt said bison hides were hard to tan compared to those of other animals, and were sometimes only partially tanned and used to cover the floor in a dwelling. She said that bison eventually disappeared or left the country. Mrs. Tritt indicated these accounts pertained to the early 1800s and earlier.

Mr. Earl Erick of Venetie recalls stories told by his grandmother, the late Myra Roberts of Venetie. As a young

woman, Mrs. Roberts lived at White Eye, located about 20 miles northeast of Beaver along the Yukon River. Her grandfather, father, and mother, described how small numbers of bison still roamed the flats adjacent to the Yukon River near White Eye in the recent past, with populations extending to the east at least as far as the area around the lower Chandalar River, the Porcupine River and Fort Yukon. Mrs. Roberts said these animals had small horns. Mr. Erick said Mrs. Roberts indicated that people in her grandfather's generation knew others who had seen bison in this area, and believes the stories about bison pertain to a period ending about 200 years ago.

Other elders in the Fort Yukon area also know that bison inhabited the area in the past, but provided fewer details about them or their relationship to people. Mr. Steven Henry of Chalkyitsik knew of their former presence, and states that bison were once abundant on the Yukon Flats. Based on stories told by his father, Paul Henry, Steven Henry believes that bison disappeared about 200 years ago. Mr. Richard James of Birch Creek said his grandfather, Birch Creek Jimmy, told him that bison once lived on the Yukon Flats and were a source of food for people in the area. Birch Creek Jimmy died in 1979 at the age of 111. Prior to his death in 1997, Mr. Steven Peter of Arctic Village (then residing in Fort Yukon) stated that bison lived on the Yukon Flats and were called *Dachan aak'ii*. He was also aware that bison existed to the east in Canada in more recent times. One of their characteristics was that they were difficult for wolves (*Canis lupus*) to kill. Mr. Peter said bison were known to kill wolves by kicking them. Mr. Daniel Flitt of Fort Yukon also said bison were once abundant on the Yukon Flats.

Oral Narratives from the Tanana Drainage

Mr. Peter John of Minto recognized an illustration of bison and noted that the animal had once lived in the Minto area. He stated that long ago "we used to hunt that animal," and described a place on the Chatanika River, near Minto, where old bones are often found. The remains of Pleistocene fauna, including bison, have been recovered from the Chatanika River and are deposited in the University of Alaska Museum (Gerlach lab notes, June 19, 1997).

Mr. Howard Luke, originally from Nenana and now residing near Fairbanks (see Luke 1998), stated that as a young boy he was told that bison once occurred "on the Fort Yukon side." He describes how people traveled from the Tanana drainage up the Goodpaster River and into the Yukon drainage in the early days, probably by way of the Charley River. He said these animals were wood bison and existed well before the introduction of plains bison to Alaska (Luke 1998). Plains bison were introduced near Delta Junction, Alaska, in 1928 (Dubois and Stephenson 1998). Although he did not know exactly how long ago bison were present, he was clear about the identity of the animal and certain that they once lived in the Fort Yukon area. Mr. Luke is not aware of stories regarding the occurrence of bison in the Tanana drainage. Mrs. Catherine Attla of Huslia, Alaska was present during the discussion with Howard Luke, and states that she too is unaware of any oral tradition regarding bison in the Koyukuk River area near Huslia.

Other 20th Century Oral and Documentary Accounts from Alaska

In addition to the accounts describing the presence of wood bison 200 years ago and earlier, a few accounts suggest that a few bison occurred in the upper Yukon area in the early 1900s. Mr. Bill Goebel, a resident of Eagle, relates an account provided to him in 1992 by his aunt, the late Sarah Malcolm of Eagle, shortly before her death at the age of 87. Mrs. Malcolm was a Han Athabascan who spent her life in Eagle. She stated that several bison were seen near Eagle in 1916 or 1917, when she was 11 or 12 years old. The bison became entangled in, and broke, snares set for moose or caribou. She said people were afraid of the animals because of their large size. Mr. Goebel questioned her closely as to the identity of these animals, but Mrs. Malcolm was certain they were "buffalo," and that this was the only time they were seen near Eagle in recent times. Lotenberg (1996) notes that a Vuntut *Gwich'in* First Nation Elder said there was a place near Eagle called Buffalo Hill.

Mr. William Joseph of Chalkyitsik, originally from the village of Circle, recalls a story told by his grandfather, Zias Joseph, who spent his life in the Circle area. Zias Joseph described how he once saw a group of 5-7 bison on the hills near Circle as they traveled through the area. Zias Joseph died in the 1930's when he was about 60 years old, suggesting these bison were observed in the late 1800s or early 1900s.

Mary Sam recalled an incident that occurred in 1922, when she was 8 years old, when her grandfather was hunting moose during winter near the south end of Ohtig Lake, about 6 miles south of Chalkyitsik. He killed a moose, and after returning to their camp near Chalkyitsik, described how he had found large, round tracks of a big animal he had never seen before. He thought a bison, an animal he said previously occurred in the area, made the tracks.

Mr. Joe Herbert of Chalkyitsik describes a similar incident that occurred in January 1941, when his family was living at Shuman House, on the Porcupine River about 25 miles north of Ohtig Lake. His grandfather (also named Joe Herbert) found large, round tracks of what he thought was a bison, and droppings in large mushy piles he described as looking like "cow patties" a short distance north of Shuman House. Drag marks showed that the animal's chest touched the snow, which was no more than 20 inches deep. They returned to the area the following day but the tracks had been largely obscured by drifting snow during the night. The droppings described are characteristic of bison, which unlike muskoxen or moose, do not produce fecal pellets.

Virginia Titus recalls that her father, Robert Albert, described to her how he and his adopted father, Pretty Albert, encountered a bison near Tanana, probably in the winter of 1918. This occurred when they were on their trapline and when her father, who was born in 1904, was fourteen years old. Her father remembered being scared when they encountered a large animal in the brush. His father shot the animal with a lever-action rifle, the first cartridge rifle they had obtained. The animal was a large