Creation Research Society Quarterly 2019 55:235–245.

Mammoth Trapping in the Yukon:

A review of Northern Tutchone oral history evidence supporting the survival of Woolly Mammoths in the Yukon Territory within the past 1,000 years

Martin Johnson*

Abstract

This paper is a multi-disciplinary review of the Northern Tutchone oral history concerning encounters with Woolly Mammoths in their traditions. A comparison is made with similar traditions of other North American indigenous people, and this is reviewed against evidence for the existence and hunting of woolly mammoth in North America. The Ice Age geology and archaeology of the Yukon Territory is considered, coupled with wider oral histories of the other indigenous peoples who use Athapascan languages. This locates the Northern Tutchone in Yukon Territory only within the past 1,000 years. The Northern Tutchone legends are shown to contain credible descriptions of encounters with woolly mammoth, which implies the relatively recent survival of these animals in the Yukon. A discussion of the history of woolly mammoth and other Ice Age fauna in the Yukon concludes with an examination of some major finds of animal remains, and the problems of radiocarbon dating in this context. It is argued that the wide disparity between radiocarbon dating of Ice Age fauna and flora found in the Yukon and the multi-disciplinary evidence supporting the oral history of the Northern Tutchone casts doubt on the reliability of radiocarbon dating in this context. Dates between 600 and 1,000 years ago are proposed for the events behind the Northern Tutchone mammoth legends.

Introduction

In the heart of Yukon territory, about 180 km from Whitehorse along the Klondike highway is the small town of Carmacks, for most of its history little more than a trading post on the Yukon river, and for several decades a supply point for firewood to the steamboats on the Yukon river (Fig. 1).

The "First Nation" (indigenous) people for whom central Yukon is home are the Northern Tutchone, who speak one of the Athapascan group of lan-

* Martin Johnson, martin.w.johnson@ntlworld.com
Accepted for publication December 14, 2018

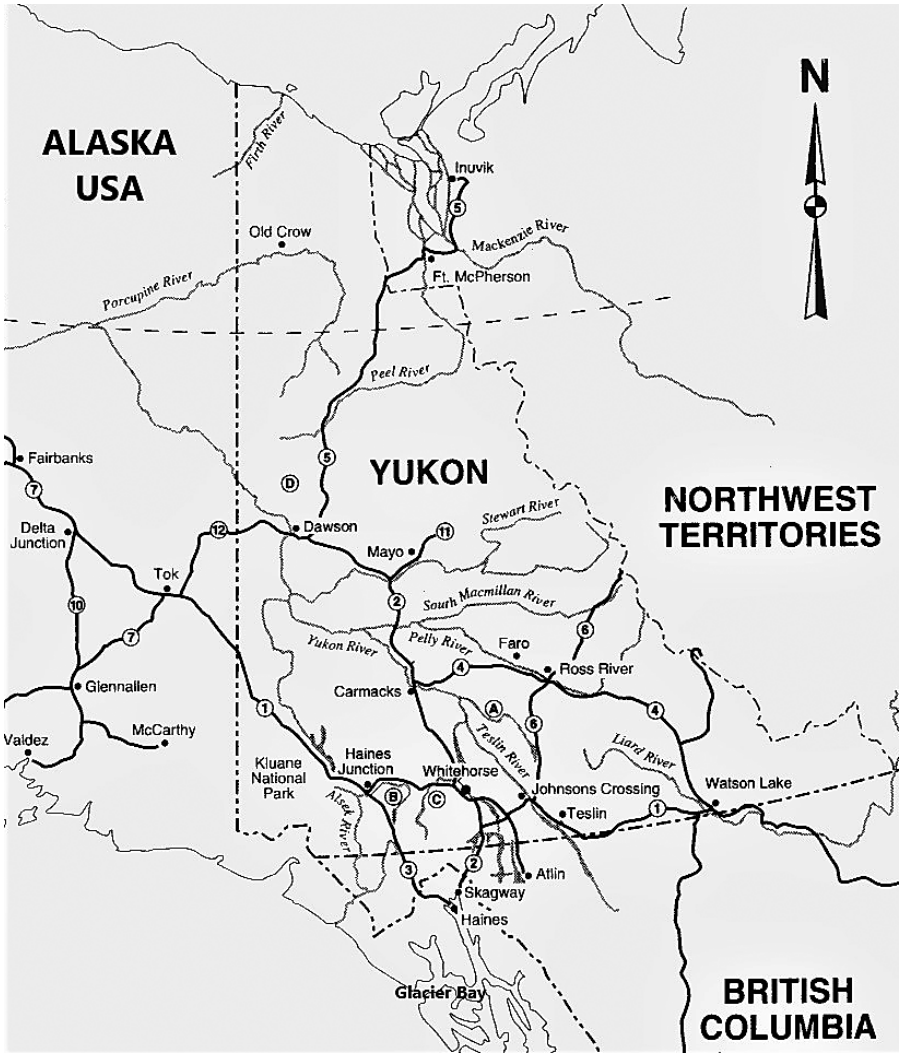

Figure 1. Map of Yukon Territory

guages (McClellan 2007). They have a visitor centre beside the highway in Carmacks with many exhibits showing their history and culture. Their traditions are based on the historical memories of their people, some of which are on display (Fig. 2). They have recorded three different accounts of how their ancestors encountered, were killed by, and in turn killed mammoths. The most startling exhibit is a model of a Mammoth trap, built according to the specifications handed down to Elder Wilfred Charlie:

> The snare or trigger is a line made of babiche (i.e. cord made of hide or sinew) crocheted together. This is strung among some trees, which have been cut part way through. When the mammoth comes through the trees, the line pulls all the trees down on him. Clubs were used to kill the mammoth then… One time, when people snared a mammoth, its foot was thumping on the ground while he was pinned under the trees. People made him turn his foot over. If the foot points down, it means that people are going to die. When the foot points the other way, it means that people are going to live. (Charlie 1986)

The notice under the model says:

> The legend of how Northern Tutchone snared and killed mammoths was first recorded here in Carmacks. During the end of the existence of this huge animal it seems to have become a threat to humans.
>
> The Northern Tutchone devised this elaborate snare system to rid the land of their most feared predator. People dressed up in their best clothing in case they died in the fight with the mammoth. If the mammoth died with his feet up it meant good luck.
>
> The last mammoths were not eaten since the Northern Tutchone did not eat any animal that ate humans. The bones of the last mammoth that was killed in the Frenchman Valley are reported to be still there but have not been found yet.

The legends give the following specific details, which are important in trying to evaluate the veracity of the reported encounters with mammoths:

1. The mammoth trap is a type of snare and deadfall combination.
2. The mammoths so trapped were killed with clubs.
3. The mammoths attacked the homes of the people.
4. The mammoths were believed to be man-eaters, and therefore were not killed for food.
5. The killing of mammoths was regarded as an important event, to be done while wearing the best clothes, because of the risk of being killed by the mammoth.
6. The climate when this was happening was becoming very cold, so that the Northern Tutchone were constructing their homes out of brushwood and pouring water over the outside, where it froze and gave them strong walls of ice (which

defended them during attacks by mammoths).

7. The posture of the mammoth when it died had mystical importance ("luck"—a life or death matter—depended on whether a mammoth's foot was pointing upwards or downwards).

Questions

To confront this graphic evidence of people encountering a creature supposedly extinct "at the end of the last Ice Age," we must consider two main questions:

1. To what extent can these mammoth legends of the Northern Tutchone be validated?
2. If they can be, when did these events take place?

Figure 2. Mammoth Trap model, Carmacks, Yukon Canada

Yukon Valley—Background

The Yukon River rises in the mountains of British Columbia, flowing 3,190 km north and west through the Yukon Territory into Alaska, emptying into the Bering Sea. The current population of Yukon Territory is around 35,000, some 25,000 of whom live in Whitehorse. The remaining 482,000 km^2 of the territory outside Whitehorse is very sparsely populated, and (except for the Gold Rush years) always has been. From around the start of the 17th century, Yukon natives were trading in European goods with Russians and British traders who came either from the west, along the Yukon River, or from the east, traders of the North West company, and later the Hudson's Bay company. To the south, trade was handled via the Tlingit people of the Alaskan coast. In the late 19th century, gold was discovered in the alluvial gravel beds near where the Klondike River joins the Yukon at Dawson City. In general terms, directly above the bedrock is the alluvial gravel where gold is found. This is covered by a surface layer of "muck" (i.e. various unconsolidated silts with ice and other material which can be up to 20 meters thick in the Klondike area).

Figure 3 illustrates the range of layers of unconsolidated material which may be found. You will see from this that mammal bones are found in silt layers above the gravel, and that there are likely to be many pieces of ice within the silt, as well as the larger sections of ice running upwards through several layers. The mammal bones uncovered are typically described as fossils, although they have not been permineralized (turned into stone, the normal definition of a fossil), and traces of DNA may be found within them (Willersley et al 2014). This is all usually found in a zone of permafrost, which poses two main challenges to miners, first that the permafrost has to be thawed to reach the gravel where the gold may be found, and second that the process of separating the gravel to find gold requires large volumes of water, which can only be done during the summer months when the rivers are not frozen.

Scores of square kilometers of valley bottom land near Dawson City have been mined down to bedrock, leaving vast areas of washed gravel tailings. This has resulted in the discovery within the "muck" of animal remains in prolific quantities. Some 80% of all remains are those of the now-extinct Steppe Bison, while the best-known are Woolly Mammoths. In addition, discoveries include Mastodon, Horse, Lion, Scimitar Cat, Giant Ground Sloth, Giant Beaver, Western Camel, Giant Camel, Elk, Caribou, and Peccary. Some animals have been found partly preserved by the permafrost, showing they were frozen very soon after death, but they have usually been disarticulated, that is, torn apart before being deposited. The dates attributed to the remains found generally range from 300,000 BP (Before Present) to about 10,000 BP, though separate evidence has been found of

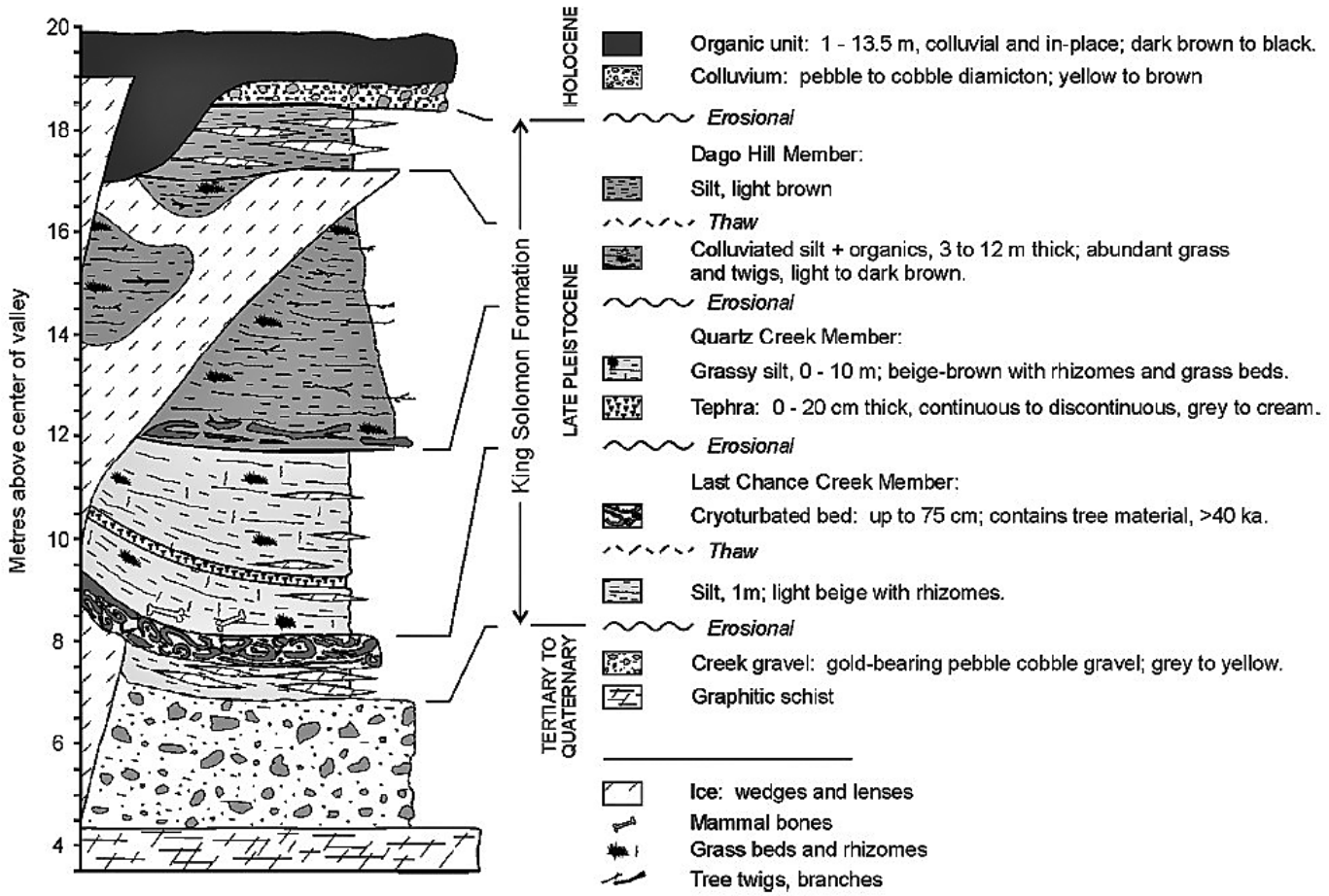

Figure 3. Representative section of Klondike Muck, (Kotler and Burn. 2011).

Steppe Bison surviving as recently as 400 years ago (Harington 1996). Most writers describe the main extinction of these "Ice Age Mammals," including mammoths and steppe bison as happening about 10,000 BP (Harington 2003).

The conventional explanation of these remains involves a series of Ice Ages over 300,000 years or more, with intervening warm periods. The quantity of mammoth remains found indicate there was once a very large number of them in the Yukon region. Giant Ground sloths and peccaries are among the creatures found that are known to require a much warmer climate than has been seen in this region in historic times (the area currently has a Subarctic climate). The sea levels of the Bering and neighbouring Chukchi Seas have been found to be as much as 120 meters lower than today (Sancetta et al. 1985; Keigwin et al. 2006), creating a sub-continent-sized area of dry land connecting Siberia and Alaska known as Beringia, which provided a route for people and animals to travel between Asia and North America. Sea levels are believed to have risen following the melting of ice at the end of the Ice Age.

While most of central and northern Yukon was never glaciated, the regions to the south and over the mountains to British Columbia and southern Alaska were. There were some large glacial lakes. Glacial Lake Champagne (Gilbert and Desloges, 2005), filling many valleys in southern Yukon, is estimated to have covered a few thousands km^2, and was around 200m deep. It has left several residual lakes, including Lake Kluane (408 km^2) and Lake Kusawa (142 km^2), where evidence has been found for several level changes. The later Neo-Glacial Lake Alsek was at maximum extent 100 km long and 200 m deep (Clague and Rampton 1982). There is evidence for "catastrophic outflows," and three successively smaller versions of this lake (Hefner 2008). Some more recent glacial lakes have suddenly emptied causing floods as recently as the 19th century AD (Cruikshank 1981). Such flood events can be triggered by melting

glaciers, landslides, and earthquakes, all of which are common in the region (Brideau et al 2004).

There has been a lot of volcanic activity in the wider region, and the volcano Mt Churchill (Alaska) last erupted about 1,100–1,200 BP with a force far greater than Mt St Helens (erupted 1980 AD), ejecting some 30 times as much material (est. 50km^3). It covered a large area of the southern and central Yukon with ash, with ash layers now found between 3 and 10 cm, and would have probably made this area uninhabitable for many years (West 2007).

In general, there is clear evidence in the Yukon for the existence of large numbers of mammoths, and of early human habitation contemporary with these Ice Age mammals. It will be shown that it is unlikely that the Northern Tutchone are connected with these archaeological discoveries.

Oral History

The oral traditions of the various Indigenous peoples of Alaska, Yukon and Northwest Territories have been closely studied for the best part of a century (Cruikshank 1981), in common with similar studies across the whole of North America (Sinha and Sinha 1968). Initially, researchers were sceptical that the oral histories (including songs and stories) could contain much information that could be assigned to dateable events, but by the 1970s, this had changed. Archaeologists had confirmed stories from the Paiute and Hopi dated to events in the 12th century AD, while a Tlingit (Alaska) story locating a village built around 1400 AD (Cruikshank 1981 p. 83), beneath a glacier for most of the past three centuries, was confirmed in the 1950s. It has been found that several Athapascan-speaking tribes outside the Yukon have maintained legends of a massive volcanic eruption that have been traced to Mt Churchill, over 1100 BP (Fast 2008). This is the remotest dateable event so far identified in their oral traditions.

Traditions have been proved very accurate when it comes to cataloguing and describing wildlife and plants of all kinds, and how to make snares and traps to capture creatures like the Caribou. There is also much information about the movements of glaciers, and the filling and emptying of glacial lakes. Beyond that, stories move into the realm of myth (in the opinion of the anthropologists researching oral traditions). This includes the creation of the earth, and the great flood which destroyed everything but a few survivors and some animals. The difficulty with many of the legends is matching them to a modern chronology. For example, there are vivid stories of a year with "two winters joined together," which researchers first understood was in the late 19th century, then realised that "grandfather's time" could actually mean "grandfather's grandfather's time," pointing to the early 19th century AD, and probably therefore 1816 AD, known in western circles as "the year with no summer" [attributed to the effects of the eruption of Mt Tambora, Indonesia, in April 1815 (Decker and Decker 1989)]. Traditions also set the last hunting of (now-extinct) bison in the eastern Yukon around then, about 200 years ago (Cruikshank 1981).

As far as the Tutchone are concerned, the fact that they have no tradition of a major volcanic eruption indicates they were not present at the time of the latest Mt Churchill eruption, and it has also been suggested that much of their present territory was in any event under water then (Fast 2008). This means that their mammoth legends presumably belong to a time within the last 1,000 years. The reference to "Frenchman's Valley" (about 20km northeast of Carmacks) as a place where bones of a killed mammoth may be found sets the context for that event firmly in central Yukon. While no-one has found these bones, the paleontologist C. R. Harington in 1967 followed up a legend told him by a Gwitchin elder in Old Crow of "monsters" in the Whitestone River area and found the remains of a female mammoth (Harington 2008). The story was that a "monster" had broken out of a lakebed near the Upper Porcupine River, trudged up that river and died under a bank on the Whitestone River, a tributary of the Porcupine River. Harington speculated that the legend had been a result of a flash flood into the Porcupine River farther south cutting back the edge of the lake (and thus exposing the bones he found). Harington radiocarbon dated these remains to 30,000 BP, and his rationalisation seems an attempt to harmonise an apparently impossible narrative (in his view) with the historical reality. The alternative could be that someone saw an exhausted mammoth in a lake perhaps washed down in a sudden local flood which rose up out of the mud as it reached shallow water near the lake's edge and then walked away and died. Harington's discovery of mammoth bones in the area might then be pure coincidence.

The Northern Tutchone are only one of several indigenous North American peoples with legends of encounters with elephant-like creatures (Strong 1934). Some authorities attribute the creatures variously as mastodons or mammoths, both mammals of the order Proboscidea which includes elephants. It is not possible to use the legends to differentiate one type from another. All are very large, have tusks and trunks, and leave circular footprints, traits which feature in the descriptions. Mammoths were the most prolific of these creatures as so far known from remains discovered, and certainly the dominant Proboscidean species in the Yukon territory. Strong (1934) identified credible legends from the Abenaki, (other) Algonquians, Naskapi, Alabama, Koasati, Penobscot, Ohio, Ojibwa, Iroquois, Micmac, Chitimacha and Atakapa tribes, ranging from Louisiana to Nova Scotia. He mentioned

also tribal legends from Bering Straits and Alaskan Eskimo (Inuit) which he discounts. He does not mention any Yukon tribes.

Most of these other legends lack the sharp detail found in the Northern Tutchone legends, though hunting with arrows and traps is described. One interesting detail is that

> the Alabama and Koasati Indians of the Southeast insist on translating man-eater (Atipa tcobá) as "elephant" (Strong 1934).

Mammoth hunting

One aspect of the legends we can test easily involves methods of hunting mammoths. There is a lot of evidence for mammoths being hunted by people, and this takes the form of such things as spear heads found in mammoth remains, the scars made by spears on mammoth bones, and other marks showing mammoths were butchered for food. It has also been observed that mammoths which fell into pits were unable to escape making pit traps feasible as they have been with elephant hunting in Asia and Africa. Agam and Barkai (2018) discuss several possible methods for hunting mammoths, using elephant-hunting methods for comparison. Known methods include using spears, axes, pitfalls, traps, arrows, fire, and dogs.

The mammoth encounters with the Northern Tutchone happen in the context of very cold weather, when the tree and log snare described would be easy to make, while digging pits would not be feasible.

There is no reasonable doubt that mammoths and mastodons were hunted by people, using methods like those described by the Northern Tutchone. The differences in detail (e.g. using clubs rather than spears, the deadfall trap) show that it is an independent narrative, not deriving from the other North American legends.

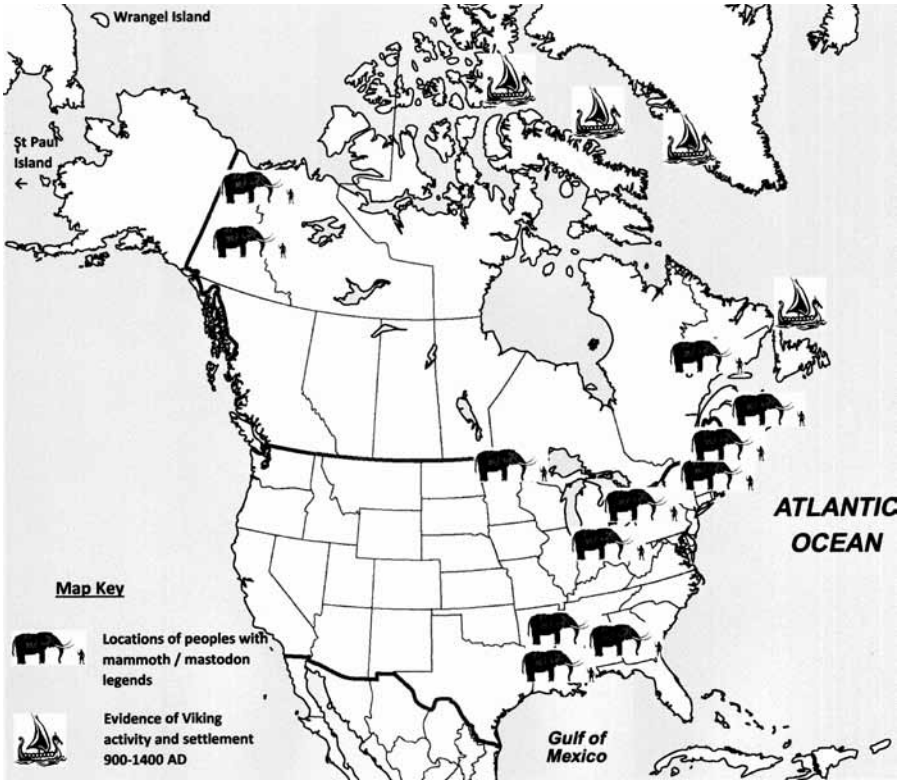

Figure 4. Map showing locations of the First-nation peoples reporting encounters with Mammoths or Mastodons, and northerly sites of known Viking activity during the Medieval Warm Period.

Figure 4 shows that most of the available legends originate with peoples in eastern USA and Canada, or in the southeast near the coast of the Gulf of Mexico. The Northern Tutchone legends come from an area that is well separated from most of the others, by both the Great Plains and the Rocky Mountains. The other legends also usually relate to encounters with no more than one or two mammoths/mastodons at most, whereas archaeological remains around the world evidence the destruction of large herds virtually simultaneously (Oard 2004). If these legends are rooted in fact, then most can only relate to encounters with sparse survivors of earlier events which wiped out the vast majority.

Man-eating Mammoths?

A serious problem to confront is the detail that at least one of the mammoths in the Northern Tutchone legends ate people. Mammoths are one of the few extinct creatures where preserved examples have been found with stomach contents that can be examined. The creatures were undoubtedly herbivores, just like the surviving varieties of elephants today. As they share so many features with mammoths, it is reasonable to explore elephant behaviour, and what is found that while normally elephants are herbivores, they sometimes attack houses and people and, very occasionally, eat them (Handwerk 2005, Hay 2015, Zelman 2011).

These aggressive behaviours by elephants are attributed to stresses caused by competition for land by people, food and water supplies being threatened, and hunting. It is thus easy to see how some mammoths could have turned to this kind of behaviour as a result of either being hunted or food shortages or both. Four of the peoples with mammoth legends elsewhere mention man-eating (Strong 1934).

Advancing Ice and Climate Change

The legends indicate that these events occurred at a time of increasing cold. So cold that you could pour water over the outside of your hut and it would freeze before it reached the ground, making walls strong enough to resist attacks by mammoths. For this you need two things, an outside air temperature below, say -10^0 C, and a supply of (unfrozen) water nearby—such as could be provided by a river like the Yukon before its surface froze solid, which nowadays normally happens after mid-November and until May (The process would have been like the formation of glaze ice: with an air temperature well below 0^oC, and the (brushwood) surface of the shelter at air temperature, water would freeze on contact. Repeated applications of water would thicken the ice coating rapidly). -10^0 C is within the present range of temperatures in the Yukon Valley in November. At present, the climate is becoming warmer in this region, therefore we need to identify a time when the climate was becoming colder.

The most recent period when a warmer climate turned to a colder climate across the whole Northern Hemisphere is in the 14th century AD. In the four or five hundred years before then, the climate in northern Canada and Greenland was distinctly warmer than today, as demonstrated by the range of Viking settlements and artefacts discovered from this era (Fig. 4). This suggests that the (currently Arctic) climate of Western Greenland was possibly cool temperate. The remains of hundreds of Viking-era farms with temperate-climate livestock along 450 km of the Greenland coast strongly indicate conditions very different to now (Wahlgren 1986). The beginning of the Medieval Warm Period appears to have coincided with the arrival of the Tutchone in the Yukon area. Today the climate of the Yukon is warmer than Western Greenland, so this is likely to have been the case then. The Medieval Warm Period was followed by "The Little Ice Age," between around 1300 and 1870 AD, during which time glaciers in Alaska advanced, driving the Tlingits out of their Glacier Bay homeland (Bohrer 2016, Cruikshank 1981).

The mammoth legends must be more than 300 years old. The oral traditions do not assign them to any "grandfathers," as was the case with bison hunting. There is no credible evidence for the survival of mammoths anywhere in the wider Yukon River region from the 17th century AD onwards, when trading contacts with Russian and British traders began.

Some Conclusions

We have seen that the oral tradition of Northern Tutchone about hunting mammoths should be regarded as credible because:

- Mammoths were undoubtedly hunted by people.
- The Northern Tutchone describe viable methods for hunting mammoths.
- The aggressive behaviour of mammoths (attacking homes and people, eating people) all falls within the known behaviours of stressed elephants, while the man-eating claim is strong authentication.
- The parallel with traditions about hunting the Steppe Bison, once thought to be long extinct, is a reminder of the possibility that "newer" mammoth remains may yet be found.
- The corroboration by several other parallel North American Indigenous traditions of encounters with mammoth-like animals.

The Time of the Mammoth Encounters

In summary, these legends cannot be much more than 1,000 years old, because the Tutchone were not resident in the Yukon before then. Neither can they be less than 300 years old, because the oral tradition does not assign them such a recent date, nor is there any evidence from the trading connections that this was happening then. The cooling climate evidenced within the stories suggests a possible date at the onset of the Little Ice Age, therefore 6–700 years ago. This takes us to the main area of difficulty, current views on the timing of the extinction of the mammoths.

When Did the Mammoths Finally Die Out?

Archaeological evidence for mammoths being hunted by people suggests this was happening about 13,000 BP (Gill et al. 2009, Haile et al. 2009). Could the oral history have been accurately maintained as long as this? And how did they die in such vast numbers? Any search will reveal a bewildering array of theories for what caused the extinction of the mammoths. In recent years these have included: advancing forests, invasive grass species, a meteorite impact in Greenland, melting ice blocks, human "germs," climate change, a comet explosion, over-hunting, disease, and a catastrophic weather event (Results of a Bing search engine query: "What wiped out the Mammoths?," 23 December 2018). Michael Oard has argued for dust-storms as the main killer of the Siberian mammoths, while acknowledging that end-of-Ice Age flooding could explain the mass

deaths in other regions. He presents the argument that they increased in number rapidly after the (Genesis) Flood, from 2,300 to 1,800 BC during the advance of the Ice Age, with extinction beginning around 1,800 BC near the end of the Ice Age, and ending in 1,600 BC (Oard 2006).

Isolated groups of mammoths have been found which have been radiocarbon dated to 5,600 BP on St Paul's Island, Alaska, and 3,700 BP on Wrangel Island, off the coast of Siberia, some 5–7,000 years later than the conventional extinction date (Vartanyan et al 2008., Graham et al 2016). This is strong evidence for the possibility of groups of Ice Age megafauna including the mammoths surviving long after the majority of their species have died out, but even if we suppose similar dates could apply in the Yukon, there is still a gap of 3–5,000 years to bridge, or perhaps 2,500 years following Michael Oard's chronology. Could small groups of mammoths have survived this long? The Northern Tutchone legends describe not just small groups but very small groups (usually lone animals).

The longer the survival period, the greater numbers you would expect to find—even one thousand years in good circumstances could be enough time to produce more large herds. The legends therefore lead us to conclude there was a relatively short survival period for these mammoths; otherwise they should have been found in large herds like that better-known North American Ice-Age survivor, the American Bison.

Radiocarbon Dating Issues

The main basis for the dates cited for the remains of mammoths and other creatures found in the Yukon area is radiocarbon dating. The problem with this is that it is not as precise as is often supposed, and where it can be checked against known historical dates is regularly shown to overstate the age of samples (as will be demonstrated below).

As the preservation of these remains has depended in every case on swift burial and freezing, the inconsistency is obvious. Studies of outburst floods, sudden releases of impounded water and sediment found in glacial lakes, show they have been known to produce layers of sediment matching or exceeding the total thickness of the Yukon and Alaskan "muck" deposits, complete also with the graded layers in a single event (Carrivick et al 2007). The concentration of mammal remains in these deposits, usually in a single layer of silt, implies just one mass destruction, caused by a single flood event (Figs. 3, 5). Therefore, many of these remains with widely differing radiocarbon dates must have died at the same time

Stevens Village Alaska is some 600 km downriver from Dawson City. Figure 5 illustrates the nature of the problem. You can see (on the left) some 13 meters of deposits above the alluvium, with dates suggesting it took some 4,000 years or more to deposit this. You find rabbits both near the top and bottom of the sequence, while elk are located both below and in the middle of the bison. The combination of elk, bison, mammoth, and horse all occur in one layer, with bison both above and below as well. It is easy to picture this as the result of a single large outburst flood, resulting from the breaching of one of the great glacial lakes in Southern Yukon, and then you could picture the rabbits, some caught grazing in the open and some diving into their burrows when the flood comes. Those in the open would float near the surface. The elk, close kin to moose could have been divided between those swimming—diving even, as is known for moose, trapped by the sediments under water, while those caught grazing on land would be mixed in with the other grazing animals. As the bison comprised some 80% of all grazing animal remains, their sheer numbers would have their bodies surrounding the other creatures. So what about the 4,000 year spread indicated by (calibrated) radiocarbon dating?

Radiocarbon Dating problems

A recent re-evaluation of human remains in the UK caused the adjustment (reduction) of radiocarbon dates by almost 200 years on bones of people who died in the winter of 873–874 AD. The spread was in the range of +6 – +17% on this relatively recent set of samples. This revision was forced by the inconsistency between the radiocarbon findings and the well-dated historical event concerned (Jarman et al 2017). (Johnson (2018) has argued that a main factor in this discrepancy is the Viking fish-based diet!). Another study of material about 7–800 years older, samples of mortar used in buildings in Pompeii and Herculaneum (destroyed by volcanic eruption 79 AD, samples from buildings constructed during previous 200 years) gave radiocarbon dates ranging from 2,400–5,800 BP. This is an error range from around +10% up to +290%. (Lindroos et al 2007). These two reports are unusual for presenting the full range of uncalibrated radiocarbon dates. More usually, the dates supplied are calibrated. Calibration means adjustment by removing the more extreme dates and subjecting the remainder to a statistical analysis, a method which can produce very flawed results, as these cases show.

Baumgardner (2005) has presented considerable evidence for the extreme unreliability of radiocarbon dating of the more distant past. He suggests that older radiocarbon dates may massively overstate the true age of the samples tested.

Conclusions

The Northern Tutchone legends of encounters with mammoths, and their trapping of them, are credible accounts of events, counter-intuitively reinforced

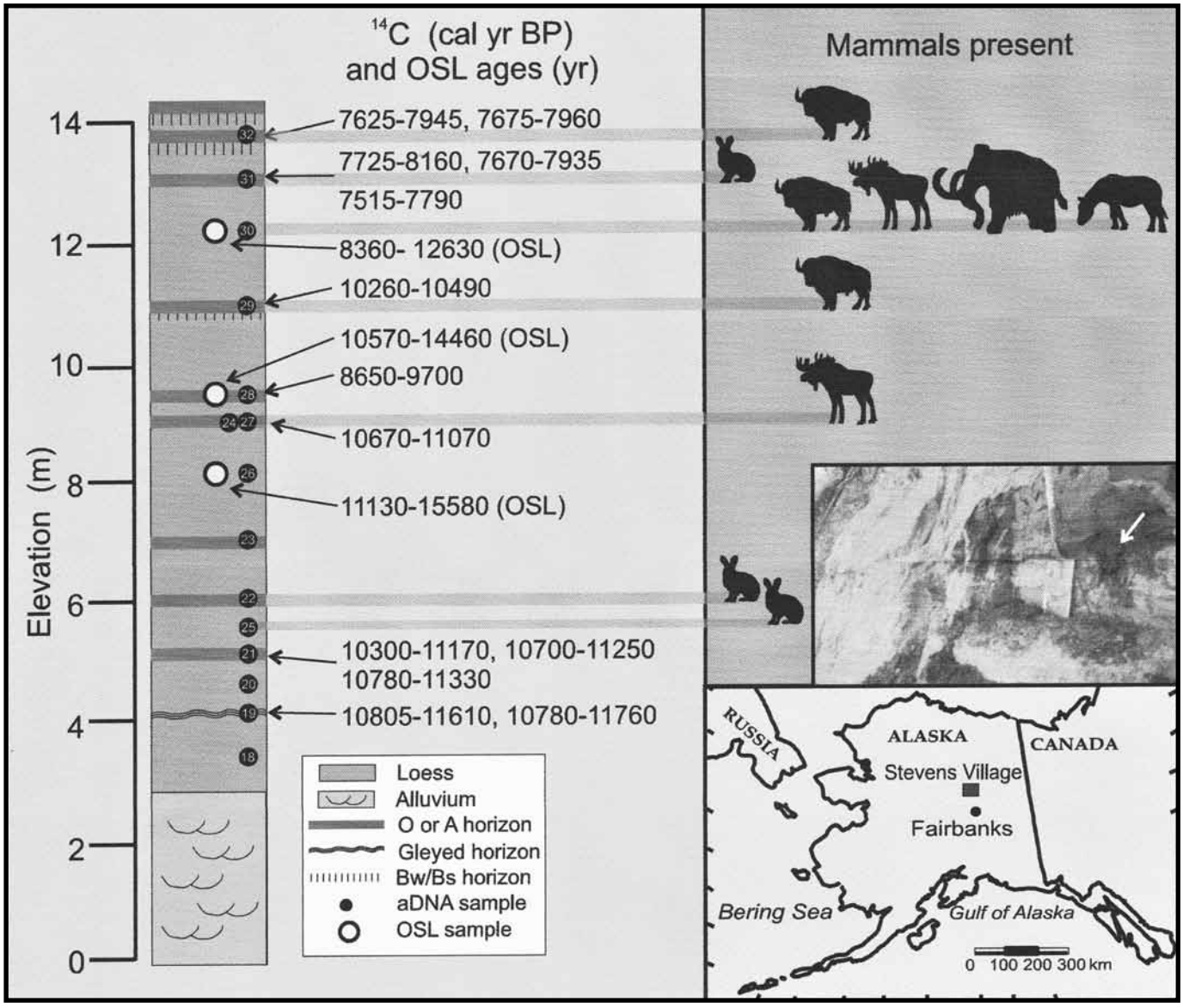

Figure 5. Stratigraphic profile of Stevens Village site, by James Haile et al (2009).

by the aggressive behaviour of the mammoths.

The probable sequence of events is that mammoths together with a wide range of other animals crossed Beringia before and during the early Ice Age, spreading from Asia into and throughout the Americas. They flourished in the warmer climate of Beringia away from the main glaciated regions, until rising sea levels destroyed their main habitat. Herds survived in the Yukon region before one or more glacial lake breaches triggered massive outburst floods, wiping out those animals living on the valley floor. The flood waters tore the animals to pieces and deposited them mixed up with silt, ice and vegetation on top of the gravel beds. A few animals further up the valley sides escaped, and survived for possibly some hundreds of years, in a progressively deteriorating climate, before encountering the newly arrived Tutchone people, who killed off the last stragglers. As the end of the Ice Age was not a sudden or precise event, the main Yukon Territory flood destruction could

easily have been as recent as 2,000 BP or later.

Dating the Northern Tutchone legends can be done by combining estimates of the possible decline in accuracy of oral history over time, noting their probable arrival in area about 1,000 years ago, and historic change from a warmer to a colder climate. The14th century AD offers a very reasonable date for the final legends, with the others possibly dating from a few hundred years previously. The main alternative, that the legends relate to a timespan of around 10,000 years is simply not credible.

If the oral history of the Northern Tutchone is valid, then the radiocarbon dating of the remains in the Klondike muck cannot be. Of these two attempts to date history, one is based on:

1. Geological evidence of the Mt Churchill eruption, of which the Tutchone traditions show no sign.
2. Several separate examples of North American indigenous traditions being validated in recent years, with dates going back at least 1,000 years (including Mt Churchill).
3. The wholly credible (and counter-intuitive) nature of the northern Tutchone mammoth legends.

The other is based on a dating method that has been demonstrated to be inaccurate, and sometimes extremely inaccurate, when it has been tested. If the Northern Tutchone mammoth legends are accepted as valid, then it implies a much more recent date for the end of the "last" Ice Age, than (say) 10,000 BP, and the subsequent destruction of the mammoths among a wide range of other mostly now-extinct fauna.

If we accept the possibility of the late survival of herds of Woolly Mammoth in the Yukon, beyond, say, those in Siberia and Northern Europe, to as recently as 2,000 BP, then the Northern Tutchone legends make sense. The time scale proposed by Michael Oard fits better with the evidence from the Northern Tutchone legends, but needs further adjustment to allow for later survival of woolly mammoths in the Yukon region.

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