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Inventory and Risk Assessment of Historic Caribou and Sheep Fences in the NWT

Climate Change Preparedness in the North
Program Project 2017-06

**Cultural Places Program
Culture and Heritage Division
Department of Education, Culture and Employment
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Introduction

Wooden caribou and sheep fences are typically long linear log structures built by past hunters to amass and lead animals to kill sites. Archaeological fence sites are important records of the communal hunting strategies used by the Indigenous peoples of the North. Fence locations also illuminate the historical ecology of caribou and sheep populations in the NWT as they were built to intercept animals along major migration routes or other areas of key habitat. With warmer air temperatures and changes to precipitation patterns leading to longer and more intense wildfire seasons in the boreal forest, surface archaeological features made from wood will be increasingly at risk of destruction from forest fires. In response to this increased risk, the Cultural Places Program (CPP) is making efforts to create detailed records of known fences using unmanned aerial vehicles (UAV), standard archaeological survey methods, and dendrochronological (tree ring dating) techniques. This process was successfully implemented at a caribou fence in the Mackenzie Mountains in 2016.

The NWT Archaeological Sites Database contains records for 19 wood fence sites including 8 fences in the Mackenzie Mountains and 11 fences located along the latitudinal tree line (Figure 1). Most of these sites were recorded more than 30 years ago, and their current conditions are unknown. In order to prioritize mitigation efforts for fences at risk of impact from forest fires, we have compiled information on the most recent observed conditions of these fence sites, as well as information on the history of forest fires in the vicinities of the fences. The goal of this project is to combine this information to identify the most significant and well-preserved fences that are at greatest risk from forest fires.

Methodology

Archaeological Site Data

We created the inventory of wood game fences by searching the NWT Archaeological Sites Database. We compiled information on the observed conditions of the fences from final archaeology permit reports and field notes on file at the Prince of Wales Northern Heritage Centre.

Forest Fire History

We obtained the forest fire history information from the Forest Management Division's (ENR) Fire History layer (accessed from the GNWT's Spatial Data Warehouse). The data used in our analysis includes forest fire perimeter outlines from 1965 to 2016. The description of this layer indicates that the perimeter outlines include un-burnt islands and small internal lakes. The overall data accuracy should be assumed to be 1:250,000. Omission and accuracy errors are expected to be most prevalent for the earlier portions of the dataset (i.e. 1965-1975).

For each fence in the inventory, we calculated the straight-line distance to the nearest forest fire, the number of forest fires within 100 km of the fence, and the frequency of forest fires within 100 km of the fence. The frequency was calculated by dividing the number of fires within 100 km of a fence by 51 years (the number of years in the dataset).



Figure 1: Map showing recorded caribou and sheep fences in the NWT and forest fire history from 1965-2016. Map created by Julie Buysse and Kaylee Woldum, CPP.

Results

Table 1 presents the most recent observed conditions of the 19 caribou fences in the inventory. Relatively recent condition reports (i.e. since 2007) are only available for four fences; most of the fences have not been inspected in 30-40 years.

Table 2 presents the forest fire data compiled for each fence. None of the 19 fences in the inventory, which were all recorded after 1965, have been impacted by a forest fire that is recorded in the 1965-2016 fire history dataset, but 5 fences are located less than 10 km from a forest fire. Only one fence – NeRn-1 – is more than 100 km from the nearest forest fire. The frequency of forest fires within 100 km of a fence is greater than 1/year for five fences. The greatest frequency is 5.4 forest fires/year (within 100 km of JcNi-3).

Table 1: Inventory of wood caribou and sheep fences in the NWT.

Fence	Year First Recorded	Year(s) Revisited	Description	Most Recent Observed Condition
JiNc-3	1977		This fence is located near the shore of Firedrake Lake. It was described by an informant as being several kilometres long, and consisting of “small wood remnants.” It was not inspected by an archaeologist.	1977: Not observed.
McRa-9	1979	2018	This fence is located on Caribou Point (Great Bear Lake). It runs from the shore of McTavish Arm north to a small inland lake (a distance of approximately 3 km). This fence was mapped by GPS and photographed in 2018.	2018: Most fence rails have fallen to the ground but a near-continuous fence line is visible over a distance of approximately 2 km. Sections of the fence associated with wet, low-lying terrain have largely rotted away.
MdPq-2	1979		This fence is located on Fault River, near the head of Hornby Bay (Great Bear Lake). It consists of approximately 500 m of fence line. The fence crosses a small creek.	In 1979, parts of the fence were on the verge of total disintegration, but the fence was generally traceable along its length.
MdPs-30	1979		This fence is located near Cosmo Creek on Caribou Point. It consists of several segments totaling about 250 m of fence.	In 1979, the fence was weathered and disintegrating. Remnants were only present in areas of exposed sand and rock, but the fence was generally traceable along its length.
MePq-1	1979		This fence is located on upper Bunn Creek, near the head of Hornby Bay. It consists of two wings (500-600 m long) leading to corral-like structure.	In 1979, fence rails that had not fallen to the ground were in good condition. The fence was generally traceable along its length
MePq-7	1979		This fence is located on inner Hornby Bay. It consists of a 600-700 m long line of fence.	In 1979, the fence was highly deteriorated and was difficult to trace along most of its length
MePr-4	1979		This fence is located on lower Bunn Creek, near the head of Hornby Bay. It consists of three segments of fence totaling approximately 700 m	In 1979, the fence had mostly collapsed. It was generally traceable along its length but there were numerous gaps in the structure where the fence had

Fence	Year First Recorded	Year(s) Revisited	Description	Most Recent Observed Condition
			in length.	likely rotted away.
MePr-9	1979		This fence is located on middle Bunn Creek, near the head of Hornby Bay. It is a 600 m long drift fence.	In 1979, the fence was in an advanced state of deterioration. It was generally traceable along its length but had been totally lost in some areas.
ZAVR-030	1985		This fence is 1.5-2 km long caribou fence located on Caribou point, consisting of two wings leading to a corral. It was reported by a pilot; it has never been inspected by an archaeologist.	1985: Report indicates that continuous fence lines were visible.
NeRn-1	1993		This fence is a 2 km long drift fence, located near the Horton river.	1993: Not reported but assumed to be intact at time of recording.
NfRt-1	1987		This fence is located on Sadene Lake and consists of two wings that converge to an oval-shaped corral.	1989: Condition reported as stable. No further details available.
KgRu-1	1975	2017	The fence sits on a level bench above the Raven Throat's River, and consists of approximately 1 km of fallen timber fencing. This fence was mapped by GPS and photographed in 2017.	2017: The fence has collapsed but a continuous fence line is visible and well-preserved.
KhRt-1	1975		This site is a possible moose fence associated with a mineral lick.	In 1975, the fence was considered to be not well preserved and obscured by deadfall. It was not possible to trace a coherent fence line.
KjRt-1	1986		This site is a possible sheep fence associated with a mineral lick, located on the Moosehorn River.	In 1986, there was no evidence of a continuous fence line. Scattered fallen timbers were noted, but it was unclear if they were part of a fence.
KkRx-1	1983		This site is a sheep fence associated with a mineral lick, located on Sheep Fence Mountain. An attempt to relocate it in 2005 was unsuccessful.	In 1983, most of this fence had been destroyed by rock slides. No remnants were visible from the air in 2005, indicating that it might now be completely destroyed.
KjRx-1	2009	2010 2016	This site consists of three sections of fencing that	2009: The fence is largely collapsed but a continuous fence

Fence	Year First Recorded	Year(s) Revisited	Description	Most Recent Observed Condition
		2017	together total >800 m in length. It is associated with a mineral lick. A high resolution map and orthophoto has been created for this fence using an UAV, and the fence has been dated through dendrochronological analysis.	line is visible and well-preserved.
LeRu-3	1989		This feature consists of a spruce pole sheep fence. It is located on the west side of the Carcajou River on the western slope of a north-south trending ridge.	In 1989 this fence had collapsed and was overgrown with birch shrubs, but the fence line was still visible.
LfRw-1	1989	2007	This site is a well-preserved boulder and pole sheep fence, located on a ridge near Katherine Creek. The fence lies perpendicular to the long axis of the ridge. A prominent sheep trail runs the length of the ridge. The fence was mapped by GPS in 2007.	2007: Wood snare poles collapsed but well-preserved.
ZAVR-013	1990		This site is described as a large sheep fence with an associated trail located on Gayna Creek at the north end of Gayna Lake. It is visible from the air. This site was observed by a helicopter pilot. It has not been investigated by an archaeologist.	1990: Partially destroyed by a landslide.

Table 2: Wood fences and forest fire history.

Fence	Distance to Nearest Forest Fire (km)	Number of Forest Fires Within 100 km of Fence	Frequency of Forest Fires Within 100 km of the Fence (# of fires/year)	Years of Forest Fires Within 100 km of Fence
JiNc-3	23.1	124	5.4	1967, 1969, 1970, 1971, 1972, 1973, 1976, 1980, 1981, 1982, 1984, 1985, 1986, 1989, 1991, 1992, 1993, 1994, 1997, 1998, 2001, 2004, 2005, 2007, 2008, 2010, 2013, 2014, and 2015
McRa-9	24.5	19	0.37	1974, 1975, 1976, 1979, 1988, 1989, 1991, 1992, 1996, and 2012
MdPq-2	8.5	15	0.29	1968, 1975, 1982, 1989, 1991, 1992, 2000, 2007, and 2014
MdPs-30	28.1	15	0.29	1968, 1975, 1982, 1989, 1991, 1992, 2000, 2007, and 2014
MePq-1	17.9	13	0.25	1968, 1975, 1982, 1989, 1991, 1992, 2000, 2007, and 2014
MePq-7	13.1	14	0.27	1968, 1975, 1982, 1989, 1991, 1992, 2000, 2007, and 2014
MePr-4	16.0	14	0.27	1968, 1975, 1982, 1989, 1991, 1992, 2000, 2007, and 2014
MePr-9	16.6	14	0.27	1968, 1975, 1982, 1989, 1991, 1992, 2000, 2007, and 2014
ZAVR-030	29.3	12	0.24	1968, 1975, 1982, 1991, 1992, 2000, 2007, and 2014
NeRn-1	105.8	0	0	
NfRt-1	59.1	13	0.25	1979, 1986, 1987, 1988, 1989, and 2012
KgRu-1	40.9	35	0.69	1969, 1972, 1982, 1983, 1986, 1988, 1993, 1994, 1995, 1998, 2000, 2010, and 2015
KhRt-1	16.2	54	1.06	1966, 1968, 1972, 1975, 1977, 1979, 1982, 1983, 1986, 1988, 1989, 1991,

Fence	Distance to Nearest Forest Fire (km)	Number of Forest Fires Within 100 km of Fence	Frequency of Forest Fires Within 100 km of the Fence (# of fires/year)	Years of Forest Fires Within 100 km of Fence
				1993, 1994, 1995, 1998, 2000, 2012, and 2015
KjRt-1	8.2	87	1.71	1966, 1968, 1969, 1971, 1972, 1973, 1974, 1975, 1977, 1980, 1982, 1983, 1986, 1989, 1993, 1994, 1995, 1996, 1998, 2000, 2001, 2004, 2005, 2006, 2010, 2011, 2012, 2013, 2014, 2015, and 2016
KkRx-1	7.0	15	0.29	1972, 1994, 1996, 1998, 2000, 2004, 2010, 2012, and 2015
KjRx-1	65.3	16	0.31	1972, 1983, 1994, 1996, 1998, 2000, 2004, 2010, 2012, and 2015
LeRu-3	5.2	127	2.49	1965, 1968, 1969, 1971, 1972, 1973, 1975, 1976, 1977, 1981, 1982, 1983, 1984, 1987, 1989, 1993, 1994, 1995, 1996, 1998, 2001, 2003, 2004, 2005, 2006, 2007, 2008, 2010, 2011, 2012, 2014, 2015, and 2016
LfRw-1	7.6	111	2.18	1965, 1968, 1969, 1971, 1972, 1973, 1975, 1976, 1977, 1981, 1982, 1983, 1984, 1987, 1989, 1993, 1994, 1995, 1996, 1998, 2001, 2003, 2004, 2005, 2006, 2007, 2008, 2010, 2011, 2012, 2014, 2015, and 2016
ZAVR-013	62.2	13	0.25	1967, 1971, 1974, 1976, 1977, 1980, 1982, 1983, 1987, 1994, 1995, 1998, 1999, 2003, 2004, 2007, 2011, 2012, and 2014



Figure 2: Example of caribou fence (KjRx-1) in the Mackenzie Mountains. Photo: Tom Andrews.

Discussion and Conclusion

A common feature of all of the caribou fences in the inventory is that the surviving elements typically consist of very dry wood. We expect that they would be completely destroyed by a forest fire if one occurred in close proximity to a fence. The data presented in Table 2 provide a coarse filter for the relative risk of the fences to forest fires based on fire history data. Combining these data with the condition information in Table 1 offers some clues on what fences to target for detailed recording efforts in order to mitigate the risk of destruction by forest fire. KjRt-1, LfRw-1, and LeRu-3 stand out in that they have all had forest fires approach within 10 km, and have a frequency of forest fires within 100 km of greater than 1/year; however, the most recent observation of KjRt-1 indicates that a coherent fence was difficult to trace at this site, so it may not be worth investing in detailed data recording of this fence. JiNc-3 presents a similar situation. The frequency of forest fires within 100 km of this fence is very high at 5.4/year, but we have very little information on whether or not any of the fence remains.

In terms of further work, the approach to risk assessment used in this report could be refined by accounting for the size of fires near to the fences. Many of the forest fires closest to the fences are small in area. Another useful measure of risk may be to calculate the area burned within 100 km of each fence. More specific information about the characteristics of landscape associated with each fence may also enhance risk assessments. For example, LfRw-1 is located just above the tree line, which may lower

the risk of it being impacted by a fire, and many of the fences along the latitudinal tree line may be in areas of more patchy forest cover.

The Cultural Places Program will continue its work to update condition assessments for the fences that have not been inspected for several decades, and create detailed records of the most significant and well-preserved fences that are at greatest risk from forest fires.

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Acknowledgments

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