

# Bipole III Transmission Line Project- Caribou



## Outline

- Introduction to caribou in Manitoba
- Background and Status of Barren Ground and Coastal Caribou
- Boreal Woodland Caribou
  - Conservation Status
  - Manitoba Hydro Threat Assessment
  - Approach to Studies
- Evaluation of Alternative Routes
- Assessment of Evaluation Ranges
- Cumulative Effects
- Wabowden Re-Route
- Summary of Predicted Effects
- Conclusions

## Caribou in Manitoba

- Three types of caribou in the Project Study Area:
  - Boreal Woodland Caribou (*Rangifer tarandus caribou*) – Forest Dwelling Ecotype
  - Coastal Caribou (*Rangifer tarandus caribou*) – Forest-Tundra Ecotype
  - Barren-Ground Caribou (*Rangifer tarandus groenlandicus*) – Migratory
- Barren Ground and Coastal Caribou are not listed
- Boreal Woodland Caribou are “Threatened” (SARA & MESA)

## Barren-Ground Caribou

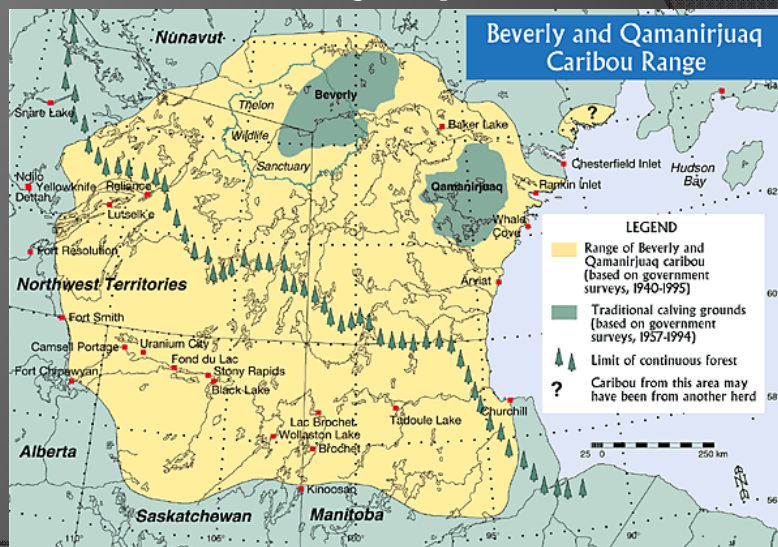


Photo Credit: Robert Mulders, Govt. of the NWT

# Barren-Ground Caribou

- Northern portion of the Project Study Area includes habitat that is occasionally occupied by barren-ground caribou
- Potential effects of the Project on barren-ground caribou were evaluated based on historical range data, government documents, Beverly and Qamanirjuaq Caribou Management Board reports and ATK

## Barren Ground Caribou Ranges: Qamanirjuaq Caribou



# Qamanirjuaq Caribou

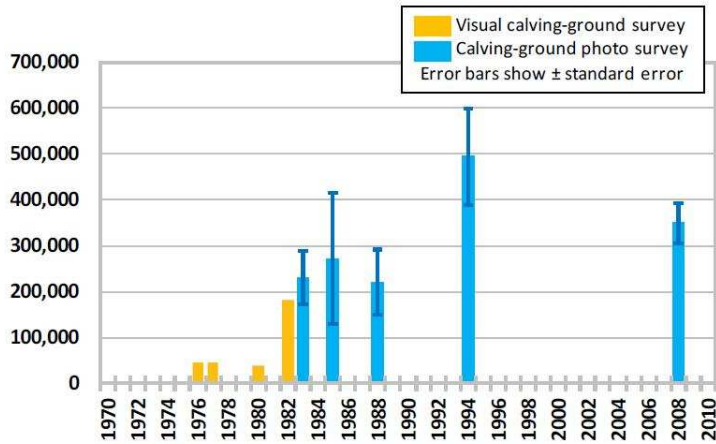


Figure 17. Qamanirjuaq Caribou Herd population estimates.  
 For years where no standard error is shown, none was calculated for the survey.  
 Source: based on data from Campbell et al. (2010)

# Migratory Caribou Ranges: Trends

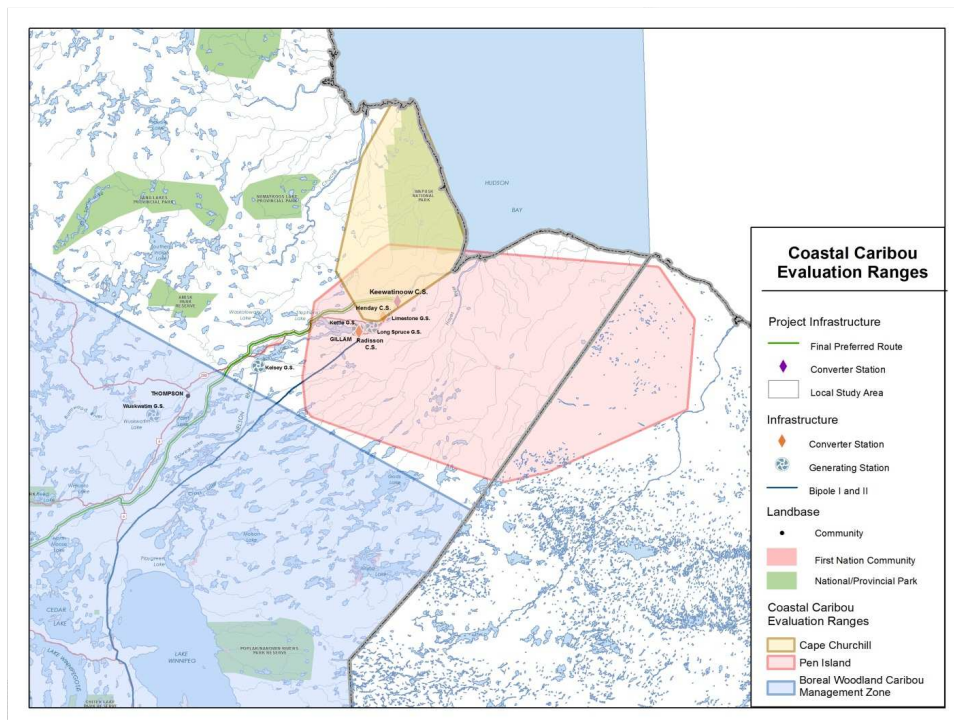
A. Gunn, D. Russell and J. Eamer 2010





# Coastal Caribou

- Potential Effects of the Project on Coastal Caribou were evaluated through:
  - Collaring and telemetry;
  - Review of Historical Data, Government Documents;
  - Cumulative Effects Assessment; and
  - Review of ATK.



## Cape Churchill

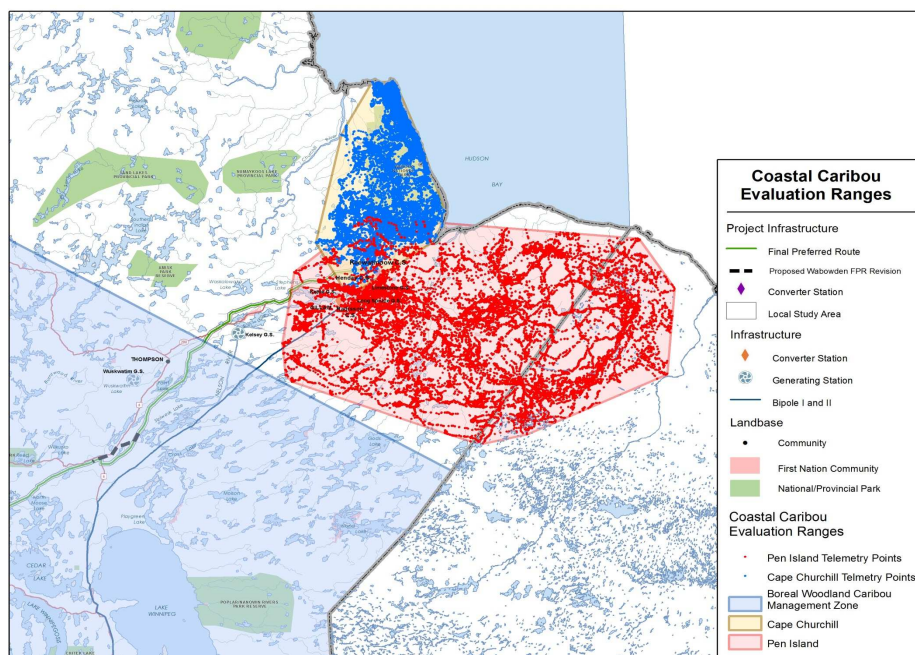
- | Year | Population Estimate |
|------|---------------------|
| 1965 | 58                  |
| 1980 | 300                 |
| 1988 | 2,000               |
| 1997 | 3,000               |
| 2012 | 3,000 +             |
- Trend considered to be stable

## Pen Islands

- Identified in the 1970's as a discrete caribou population
  - Calving in proximity to the Pen Islands
- | Year | Population Estimates |
|------|----------------------|
| 1979 | 2,300                |
| 1986 | 4,700                |
| 1994 | 11,000               |
| 2010 | Lower                |
- Less caribou on coast during calving period with evidence of inland range use during summer

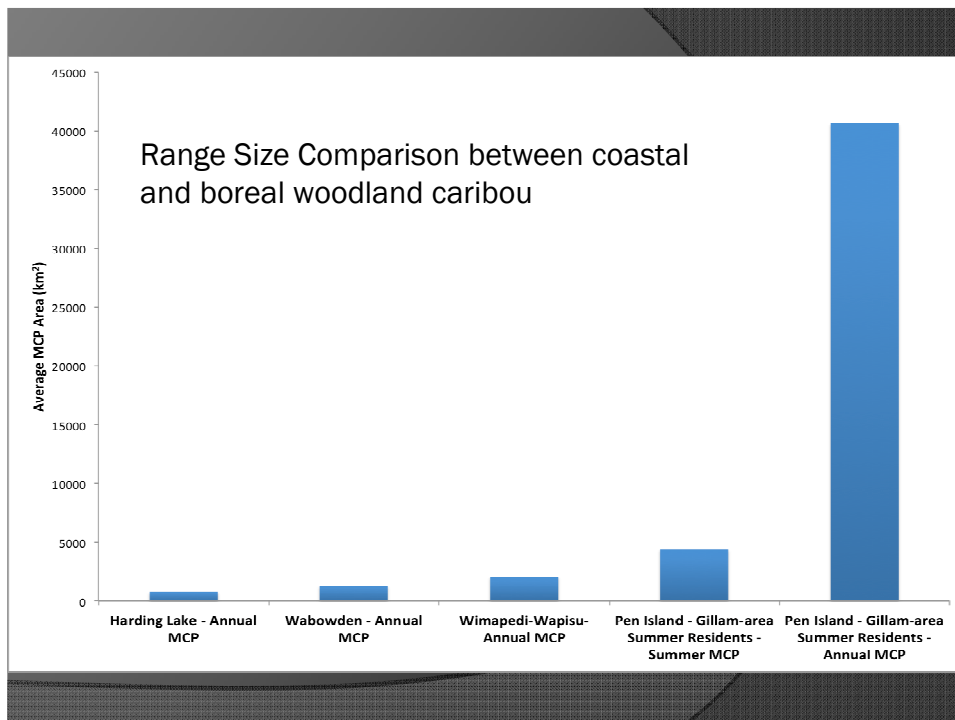
# Coastal Caribou Collaring

- Northern Resource Management Boards, Manitoba Conservation and Manitoba Hydro (year)
  - Cape Churchill 10 female caribou
  - Pen Islands 22 female caribou



## Pen Island Caribou – Gillam Area

- Cape Churchill more defined range
- 8 of 22 Pen Islands caribou illustrated summer use near Gillam – supports observations of Abraham 2012
- Much larger home ranges than BWC
- Movements are variable from year to year





## Aboriginal Traditional Knowledge

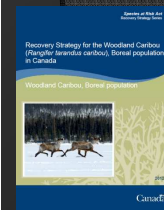
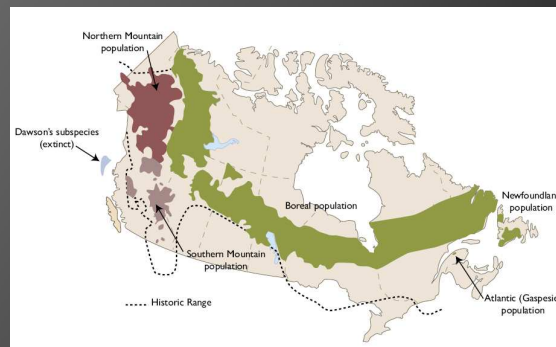
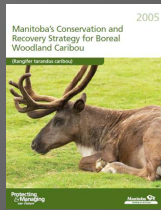
- ◉ Aboriginal Traditional Knowledge materials, including literature, data and maps were incorporated and considered in the environmental effects assessment process
  - ATK descriptions of caribou locations and movement were consistent with information provide through collar data

## Boreal Woodland Caribou



## Boreal Woodland Caribou Conservation Status

- SARA (2002) and MESA (2006) – Threatened
- National Recovery Strategy 2012
- Manitoba's Conservation and Recovery Strategy for Boreal Woodland Caribou (being updated)
- Action Plans for Boreal Woodland Caribou Ranges in Manitoba (being reviewed)



## Boreal Woodland Caribou Management in Manitoba

- Manitoba's Strategy identifies a shared responsibility for the conservation of boreal woodland caribou in Manitoba.
- Manitoba Hydro shares this responsibility and participates on three regional caribou committees.

## Manitoba Hydro Process for Evaluating Threats to Boreal Caribou

- Threat Assessment Process – A formal process following Environment Canada’s Threat Assessment Guidelines for Species At Risk (Environment Canada 2007). Included workshops and site visits.
- Participants: Stan Boutin, Jim Schaefer, Shane Mahoney, Jim Rettie, Gerry Racey, Art Rodgers and Doug Schindler
- Expert workshop (2007) to assess the potential threats to boreal woodland caribou from transmission line construction/operation and identify approaches in site selection and environmental assessment (SSEA), long-term monitoring, and research.

## Manitoba Hydro Process for Evaluating Caribou –outcome

Threat Assessment Categories	Overall Level of Concern	Monitoring – Mitigation
Forage Loss and Degradation	Low	Routing, vegetation management i.e., Lichens
Range Fragmentation	Intuitively low, gaps include unknown effects of linear development and access	Telemetry studies assessing movement patterns across various ROWs
Predation	Medium to High	Telemetry studies, female mortality, population dynamics, disturbance regime assessments, wolf collaring
Pathogens	Unknown	Monitor deer presence/absence via aerial surveys and trail cameras, investigate incidence of <i>P. tenuis</i> in western Manitoba
Direct Mortality from Humans (i.e. hunting)	Unknown	BWC protected, MESA, Supporting stewardship, MH participation in regional caribou committees

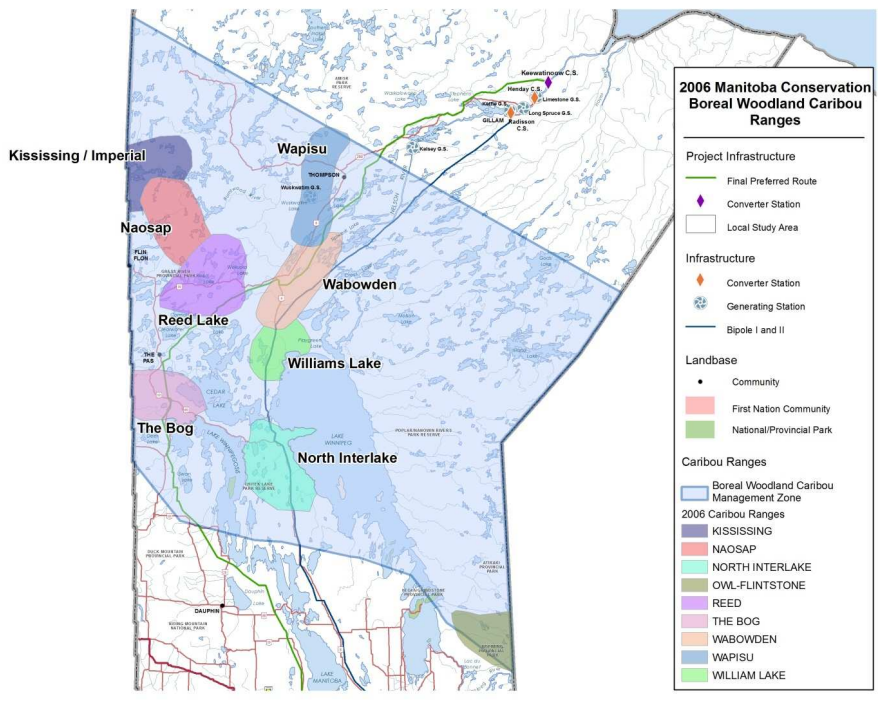
## Expert Workshop Key Recommendations

- Most issues related to construction and operation can be mitigated through routing to avoid majority of boreal woodland caribou ranges;
- Conduct pre-project radio-collaring and monitoring to identify critical local range components (calving and winter use areas) for avoidance;
- Initiate monitoring on local populations to determine effects of disturbance on predation rates, movements and range occupation.

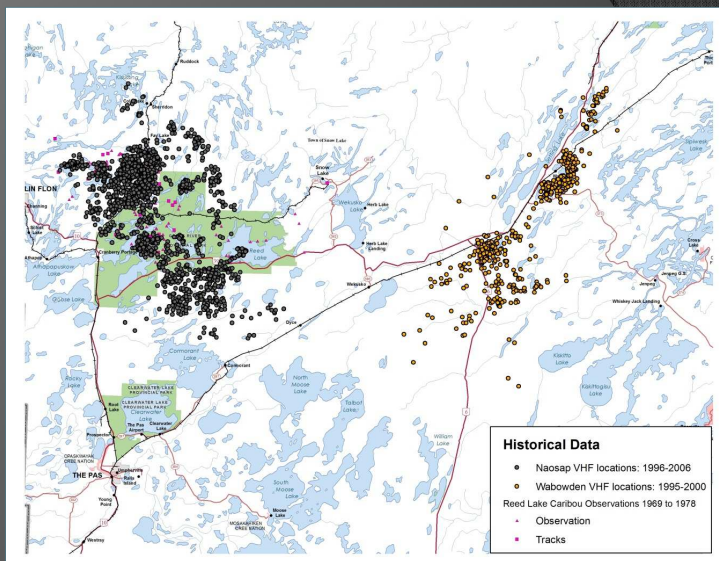
## Major Pre-construction Monitoring Activities / Methods Recommended by Expert Group (Part 1)

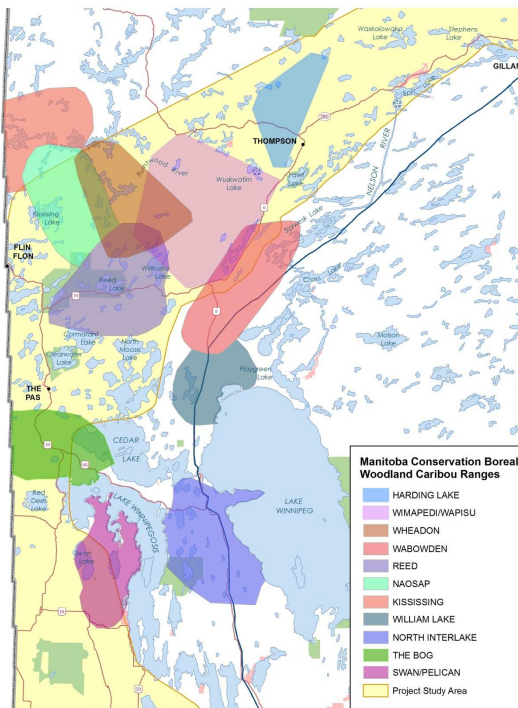
- Assessment of historical and known provincial distributions;
- Pre-project radio-collaring / telemetry studies to identify ranges and calving and winter use areas;
- Aerial surveys to detect other caribou groups;
- Refine provincial ranges to yield evaluation ranges;
- Assessment of habitat selection; Preliminary modelling of calving and winter habitat;
- Mitigate majority of effect through routing.





## Historical caribou research data





## Boreal Woodland Caribou Ranges and Bipole III study area

## Pre-project collaring / telemetry studies

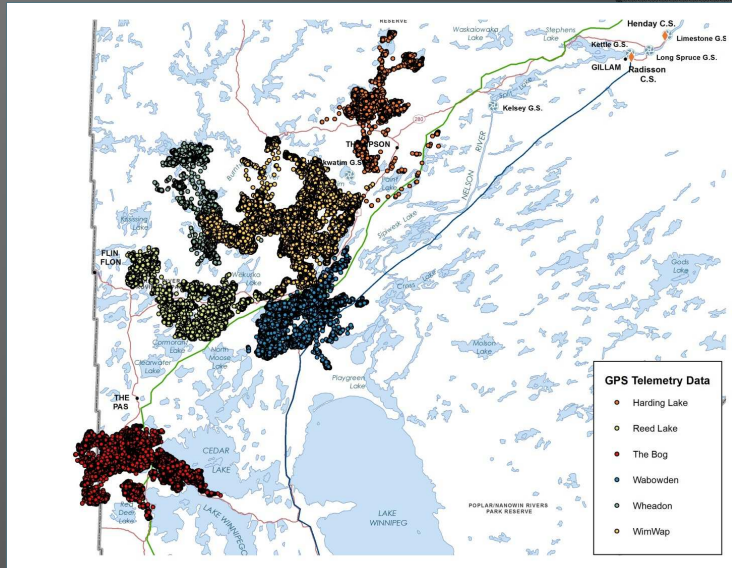
Manitoba Hydro conducted intensive research to assist in evaluating the potential effects as identified in the Bipole III EIS

Caribou collar deployments from 2007-2011

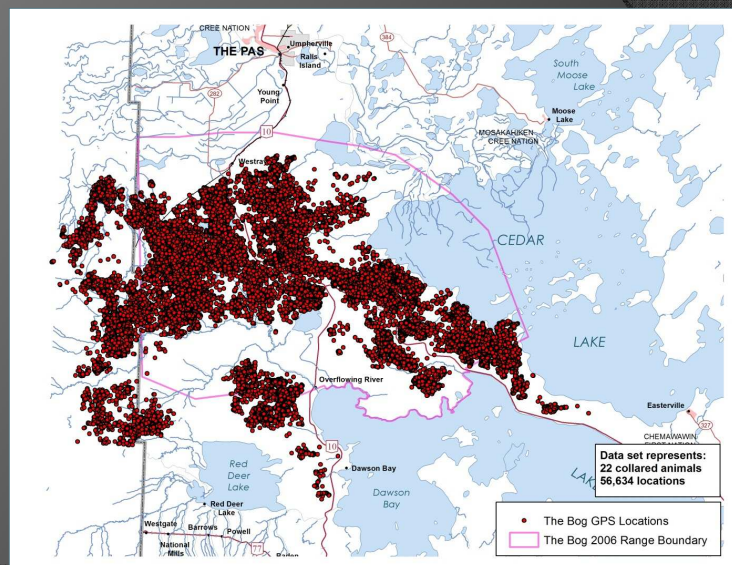
Evaluation Range	Deployment Years			
	2007	2009	2010	2011
Reed Lake		3	3	5
The Bog		6	16	8
Wabowden		10	10	5
Wheadon			20	8
Wimapedi-Wapisu	8	14	19	8
<b>Total</b>	<b>8</b>	<b>33</b>	<b>68</b>	<b>34</b>



# Telemetry study data

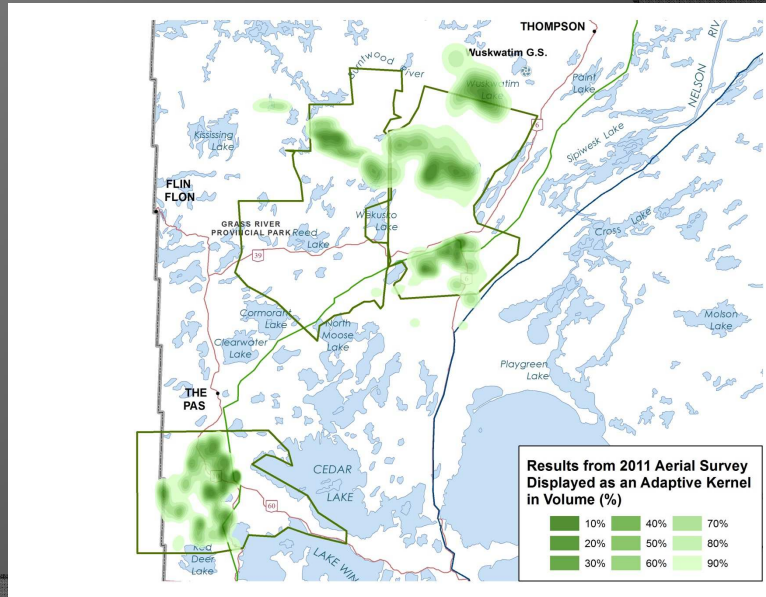


# The Bog telemetry study data



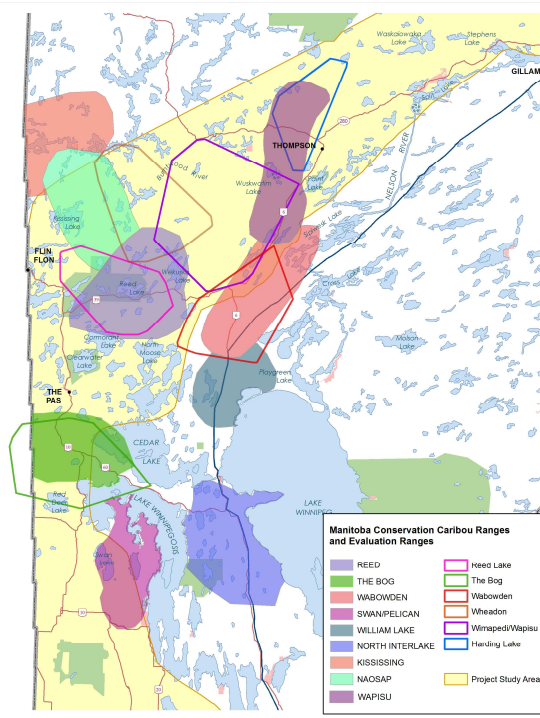


# Multi species aerial surveys



Provincial Ranges

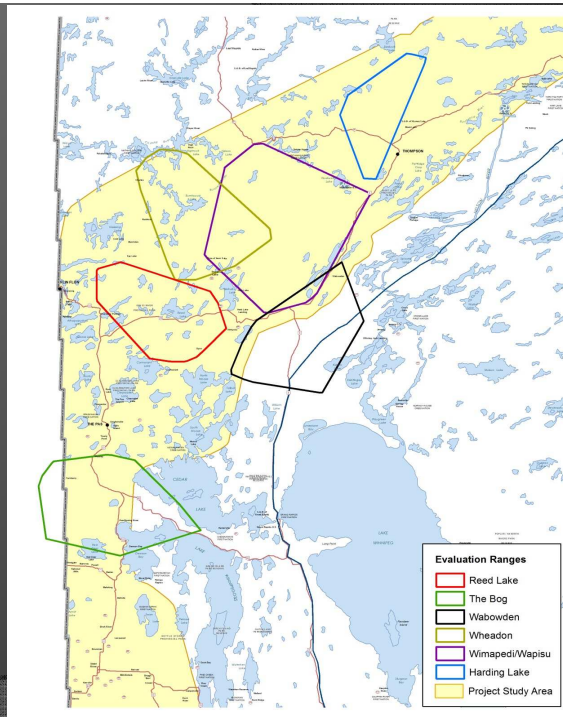
Study Evaluation Ranges





Study Area

Study  
Evaluation  
Ranges

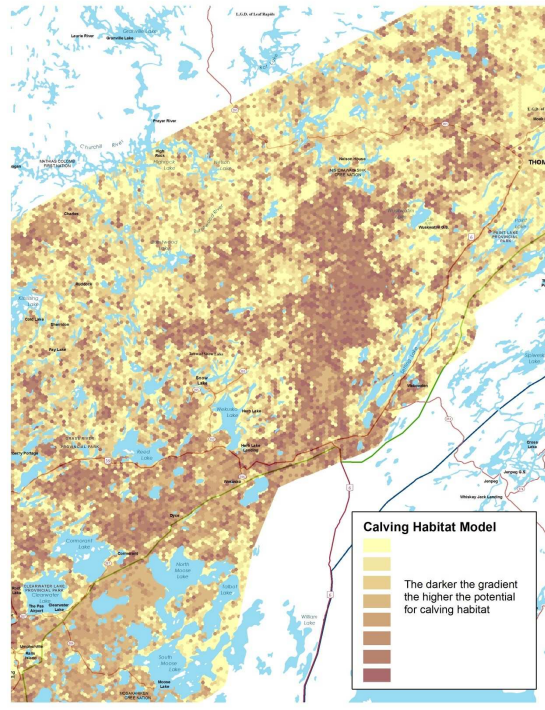


## Preliminary Modelling

- Models for the entire study area based on data from all study animals and habitat.
  - Identification of potential calving habitat
  - Identification of potential core winter range

## Calving Habitat

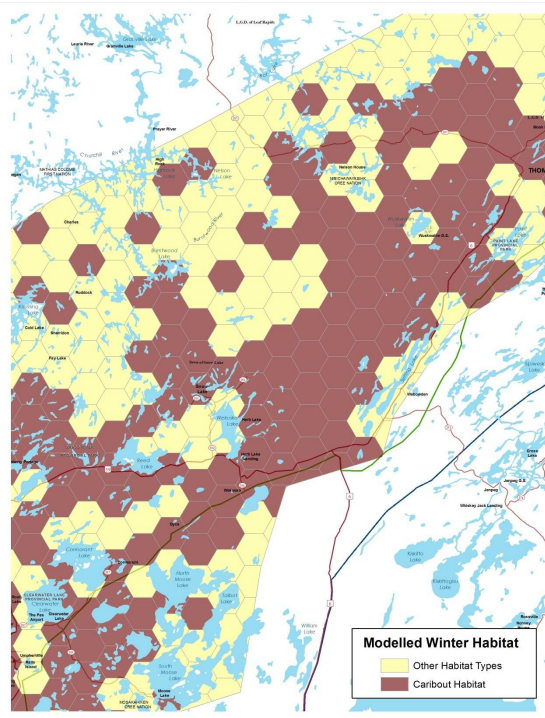
Large scale potential calving model for the Project Study Area



## Potential Core Winter Areas

Large scale potential winter use areas for the Project Study Area

- Purpose to avoid fragmenting winter core habitat for evaluating alternate

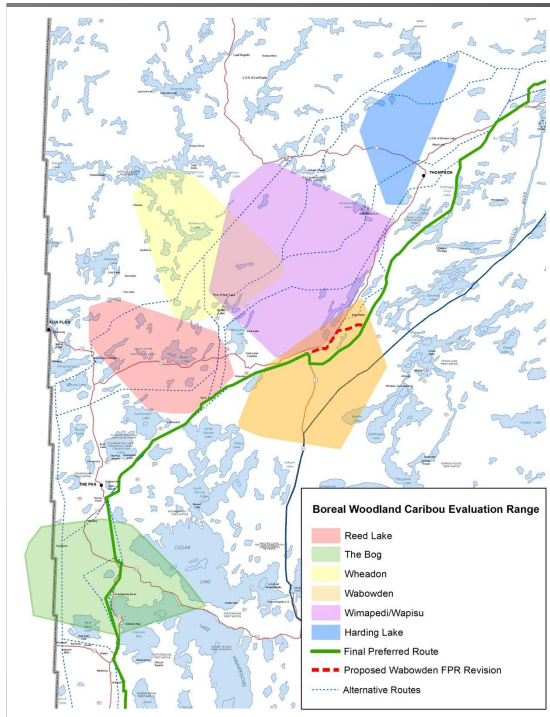












Outcome of the Route Selection Process

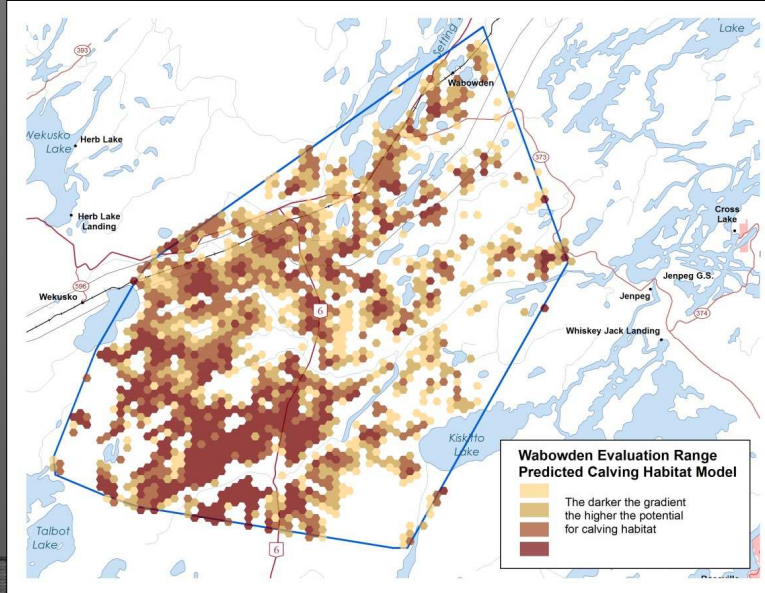
Next step: Assessment of FPR

## Recommendations of Expert Group (Part 2)

- Assessment of historical and known distributions;
- Pre-project radio-collaring / telemetry studies to identify key ranges and calving and winter use areas;
- Aerial surveys to detect un-collared caribou groups;
- Update to provincial ranges (evaluation ranges);
- Assessment of habitat selection; Preliminary modelling of calving and winter range use
- Mitigate majority of effect through routing;
- Assessment of habitat selection; Final modeling with resource selection functions (RSFs)
- Use existing data to examine effect of transmission line ROWs on caribou behaviour;
- Conduct long-term monitoring of recruitment and mortality in affected and control ranges (radio-telemetry studies, aerial surveys, and subsequent analyses).

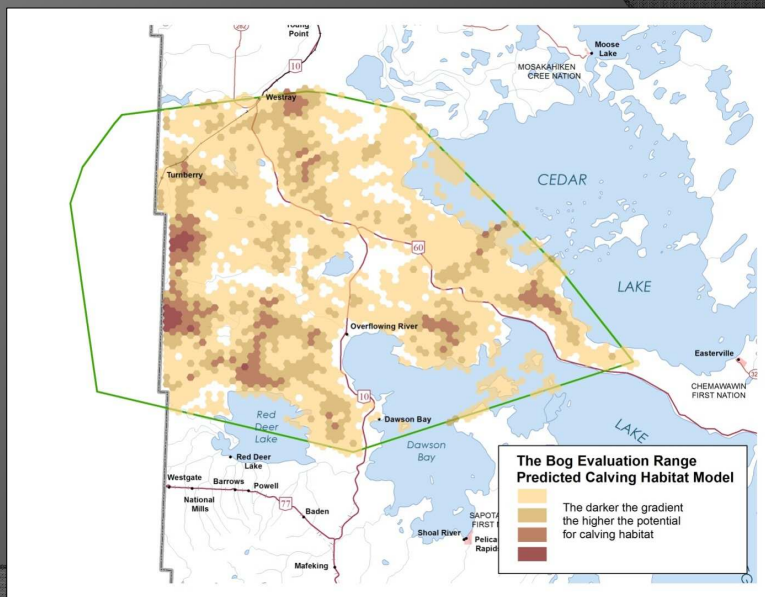
# RSF Modelling

Fine-tuned calving model for Wabowden evaluation range



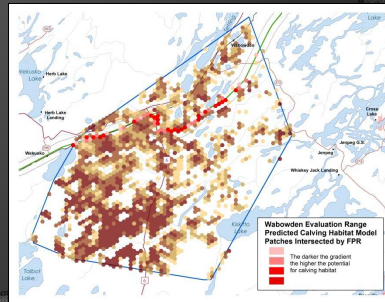
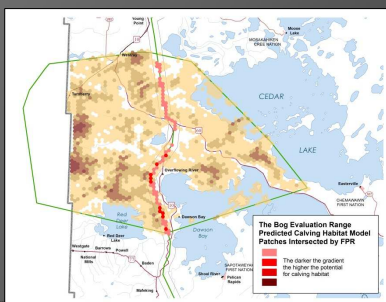
# RSF Modelling

Fine-tuned calving model for The Bog evaluation range



## Results of Modelling

Evaluation range	Total Area (km <sup>2</sup> )	Total Number of Calving Hexes Identified	Area of Calving Hexes (km <sup>2</sup> )	Evaluation Range Identified as Calving Habitat (%)	Number of Calving Hexes Intersected by FPR	Area of Calving Hexes intersected by FPR (km <sup>2</sup> )	Total Area of Calving Hexes Intersected by FPR (%)
The Bog	5,707	2,043	4,086	71.59	61	122	2.99
Wabowden	5,928	1,518	3,036	51.21	52	104	3.43
Revised Wab Route	5,928	1,518	3,036	51.21	46	92	3.03



## Winter RSF Modeling

- Wabowden
  - Little or no habitat preference in winter within the evaluation range area.
- The Bog
  - General tendency for animals to be closer to major roads and select wetland habitat.
- Winter habitat selection is expected to be at a coarser scale than the evaluation range.



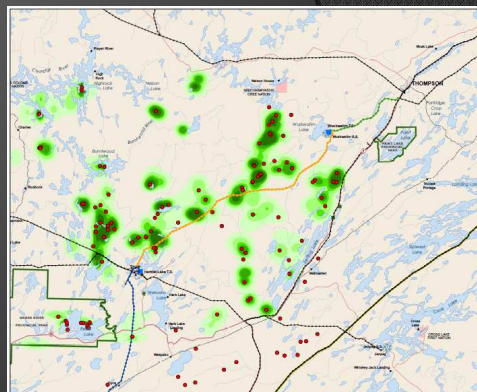
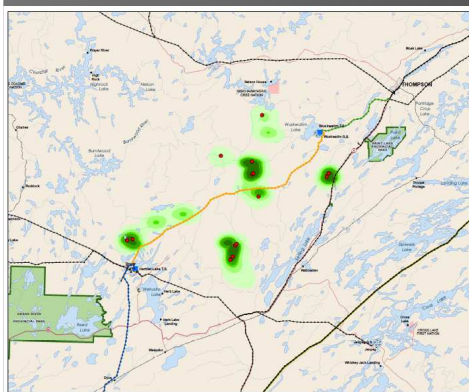
## Manitoba Hydro Process for Evaluating Caribou

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## Wuskwatim Case Study: Summer Pre and Post

Pre-construction

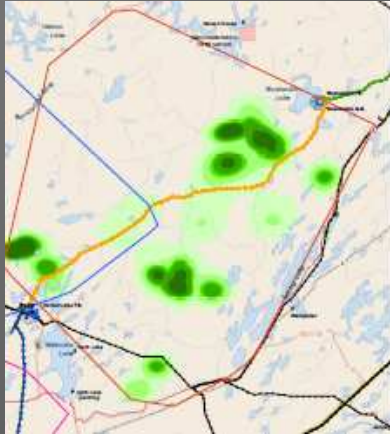
Post-Construction





## Wuskwatim Case Study: Winter Pre and Post

Pre-construction



Post-Construction

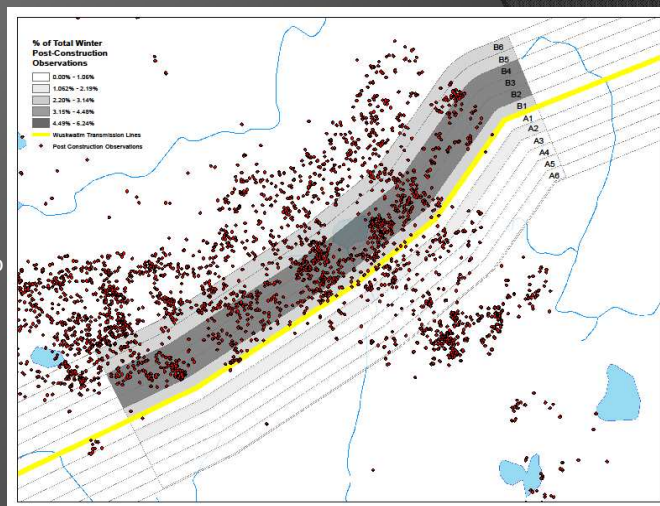


## Linear Feature Effects Analysis

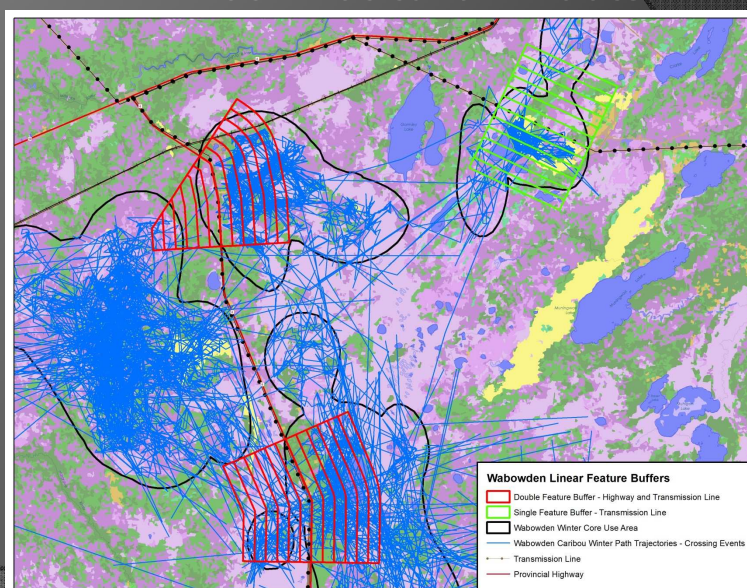
- Used point and path trajectory data
  - Wuskwatim Transmission Line Case Study;
  - Highways, double features, transmission lines;
  - Mean number of animals/km<sup>2</sup>, mean crossing speed, number of crossing, number of locational fixes/ km<sup>2</sup>

# Linear Feature Effects

**Example from the Wuskwatim Case Study:**  
Point density analysis for winter post-construction caribou locations in relation to the Wuskwatim Transmission Line



# Linear Feature Effects



## Results of Linear Features Effects

- Preliminary results support literature regarding effects of linear features
  - High variance in all measure variables
  - Measure parameters increase with distance to linear features (1 to 2 km)
  - Animals avoid spending long amounts of time adjust to features
  - Results confounded by major differences in habitat on each side of feature

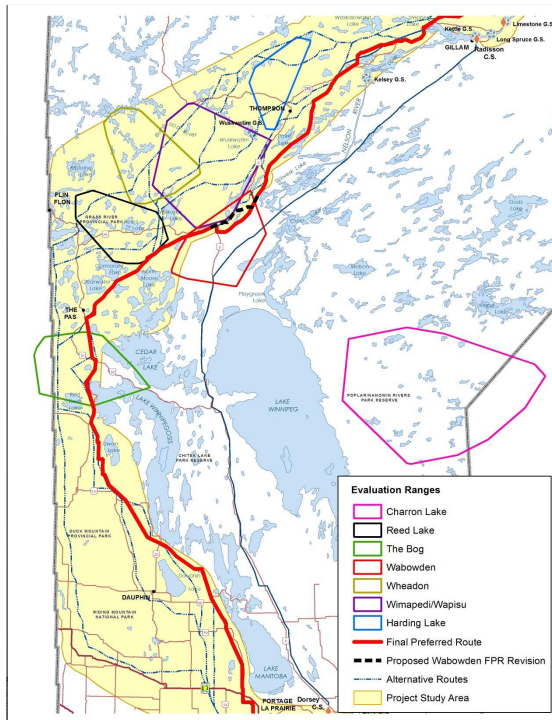
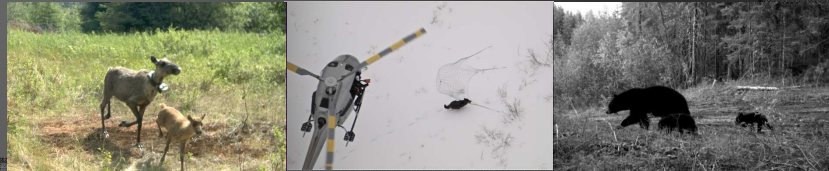
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# Increased Predation

- Effects of human disturbance on caribou populations
  - Focused studies on collared caribou included recruitment and mortality;
  - Comparison among evaluation ranges.



Recruitment and mortality study ranges



## Survival and Recruitment

- Long term objectives: Understand the effects of disturbance on populations.
- Adult survival (minimum sample 20)
- Recruitment (surveys)
- Population growth (Lambda)



## Annual Survival

Evaluation Range	2010	2011	Pooled 2010-11
Charron Lake	1.00 (1.00 - 1.00)	0.84 (0.68 - 1.00)	0.88 (0.76 - 1.00)
Harding Lake	0.91 (0.75 - 1.00)	0.80 (0.63 - 1.00)	0.85 (0.72 - 1.00)
Reed Lake	1.00 (1.00 - 1.00)	0.78 (0.56 - 1.00)	0.88 (0.73 - 1.00)
The Bog	0.94 (0.84 - 1.00)	0.77 (0.59 - 0.99)	0.85 (0.75 - 0.98)
Wabowden	0.94 (0.83 - 1.00)	0.78 (0.59 - 1.00)	0.87 (0.75 - 1.00)
Wheadon	0.88 (0.74 - 1.00)	0.94 (0.84 - 1.00)	0.91 (0.82 - 1.00)
Wimapedi-Wapisu	1.00 (1.00 - 1.00)	0.80 (0.64 - 1.00)	0.90 (0.82 - 1.00)
Other Locations in Canada			
Alberta	0.88 (averaged across 6 ranges)		
Saskatchewan	0.84 (averaged across 6 ranges)		

## Annual Recruitment

Based on aerial surveys, expressed as number of calves per cow

Evaluation Range	Sept 2010	Winter 2010-2011	Sept 2011	Winter 2011-2012
Charron lake	No data	No data	0.24	No data
Harding Lake	0.00	No data	0.13	No data
The Bog	0.13	0.10	0.06	0.07
Wabowden	0.00	0.00	0.13	0.08
Wheadon	0.00	No data	0.15	0.00
Wimapedi-Wapisu	0.00	0.03	0.29	0.07
Overall	0.03	0.05	0.16	0.07
Other Locations in Canada				
Alberta	0.17 (averaged across 6 ranges)			
Saskatchewan	0.28 (averaged across 6 ranges, 3 years)			
NW Ontario (Berens 2011)	0.05			

## Annual Rates of Increase

Caribou evaluation range annual growth rates (Lambda) based on survival and recruitment estimates

Evaluation Range	Lambda 2010	Lambda 2011
Charron Lake	No data	0.94 (0.75-1.13)
Harding Lake	0.91 (0.77-1.05)	0.86 (0.65-1.05)
The Bog	1.00 (0.88-1.12)	0.79 (0.61-0.98)
Wabowden	0.94 (0.84-1.03)	0.83 (0.62-1.05)
Wheadon	0.88 (0.74-1.02)	1.01 (0.88-1.13)
Wimapedi-Wapisu	1.00 (1.00-1.00)	0.92 (0.72-1.11)
Other Locations in Canada		
Alberta	0.96 – 1.01 (6 ranges)	
Saskatchewan	0.95 (averaged across 6 ranges, 3 years)	

## Notes:

- Adult survival is expected to be relatively high and stable across years and populations.
- Recruitment is expected to be more variable year to year (consistent with large herbivores) .
- 2012 National Recovery Strategy for Boreal Woodland Caribou:
  - Recommends measuring population trends over five years to confirm trend.

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## Brainworm – *P. tenuis*

- Recognize potential for *P. tenuis* in caribou.
- Very few deer observed during aerial surveys or on trail cameras
- Habitat limiting for deer north of Red Deer Lake
- FPR parallels existing linear corridors in caribou range
- No reports from MCWS of Brainworm in moose or caribou in western Manitoba

## Evaluation of the FPR

- Methods used to evaluate the effect of the Project on caribou included:
  - Development of RSF – modelled effects on habitat;
  - Analysis of effects of linear development on fragmentation (do caribou cross the road?);
  - Disturbance effects on population growth;
  - Predation as a result of linear development;
  - Parasites; and
  - Wabowden re-route resulting in reduced potential impact.



## Cumulative Effects - Boreal Woodland Caribou

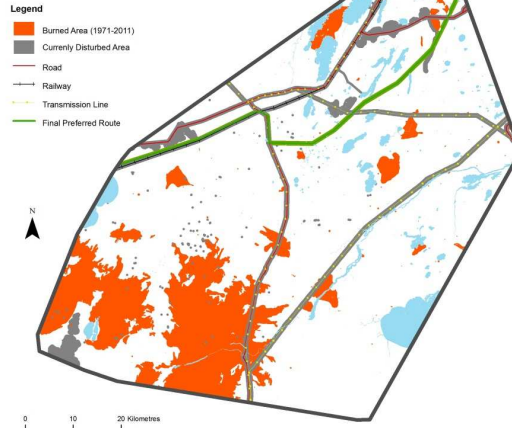
- ◉ National Recovery Strategy addresses Sustainability using thresholds of disturbance
- ◉ 65% of the landscape undisturbed
- ◉ 35% threshold of disturbance
  - > 35% = ? Self sustaining ?

## Cumulative Effects – Boreal Woodland Caribou

- ◉ Current and future disturbance regimes were assessed against the 65% threshold;
- ◉ Fire disturbance within MCPs;
- ◉ Current and future forestry development;
- ◉ Current and future mining development;
- ◉ Current and future linear development, includes roads, winter roads, trails, and transmission.

# Cumulative Effects

## Current Disturbance Across Wabowden Evaluation Range

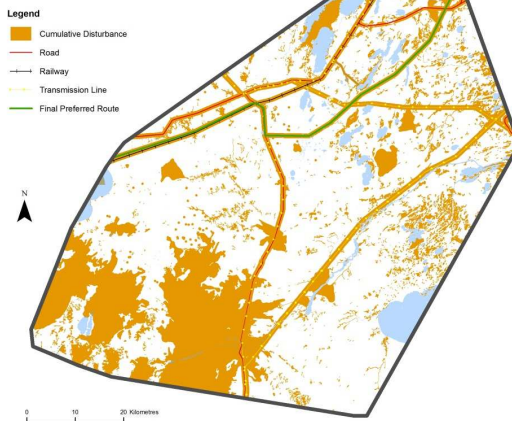


Wabowden		
Evaluation Range Attributes	Evaluation Range Area Total*	5,589 km <sup>2</sup>
	Population Size**	200 - 225
	Current Habitat Disturbance	1,432 km <sup>2</sup>
Determination of Habitat Amount	Evaluation Range Area*	5,589 km <sup>2</sup> (100%)
	Current Habitat Disturbance	1,432 km <sup>2</sup> (26%)
	Available Undisturbed Habitat	4,157 km <sup>2</sup> (74%)

\*Evaluation range area excludes water  
 \*\*Population size values for the Wabowden evaluation range were used from the Manitoba Conservation 2005 Caribou Strategy

# Cumulative Effects

## Cumulative Disturbance Across Wabowden Evaluation Range



Wabowden		
Evaluation Range Attributes	Evaluation Range Area Total*	5,589 km <sup>2</sup>
	Population Size**	200 - 225
	Current Habitat Disturbance	1,432 km <sup>2</sup>
Determination of Habitat Amount	Evaluation Range Area*	5,589 km <sup>2</sup> (100%)
	Total Cumulative Disturbance	1,481 km <sup>2</sup> (27%)
	Total Available Undisturbed Habitat	4,108 km <sup>2</sup> (73%)

\*Evaluation range area excludes water  
 \*\*Population size values for the Wabowden evaluation range were used from the Manitoba Conservation 2005 Caribou Strategy

## Current Disturbance

	Reed Lake Range (%)	The Bog Range (%)	Wabowden Range (%)
Total Linear Features Buffer - no overlap	8.97	5.62	6.95
Harvested Forest <40 yrs 500m Buffer	7.45	4.99	1.54
FPR Net Area (all other buffer overlap removed)	0.04	0.86	1.10
Natural Disturbance - Fire<40yrs Gross	32.01	3.33	16.96
Total Disturbance - water and overlap removed	42.48	14.68	25.61

## Future Disturbance

	Reed Lake Range (%)	The Bog Range (%)	Wabowden Range (%)
<b>Total Current Disturbance</b>	42.48	14.68	25.61
BPIII Infrastructure - net area*	0.04	0.86	1.10
Total Future Disturbance	1.39	1.75	0.88
Total Cumulative Disturbance	43.88	16.43	26.49
Land Coming Online in 5 yrs 2017 (LCCEB Land Age 35 - 40)*	0.43	0.24	0.10
Total Cumulative Disturbance (including restored land)	43.45	16.19	26.39

## Evaluation of the FPR

### ○ Results of Cumulative Effects Analysis

Current and Cumulative Disturbance Levels across Evaluation Ranges

Evaluation Ranges	Current Disturbance within Evaluation Range	Cumulative Disturbance within Evaluation Range	Total Disturbance Increase
Reed Lake	42.5%	43.9%	1.40%
The Bog	14.7%	16.4%	1.75%
Wabowden	25.6%	26.49%	0.88%

## Evaluation of the FPR

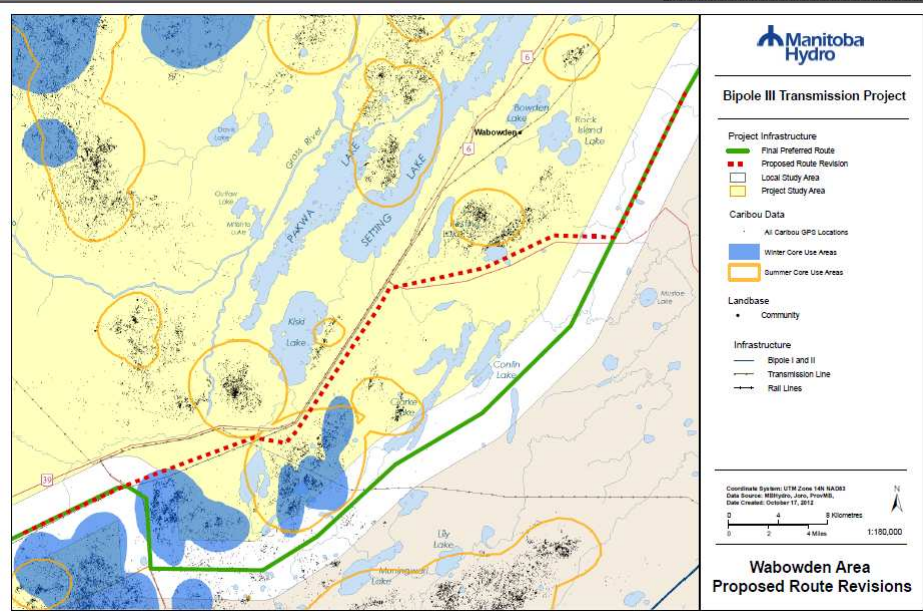
Rates of increase (lambda): Caribou evaluation range annual growth rates (expressed as Lambda) based on survival and recruitment estimates and total current disturbance calculated per range

Evaluation Ranges	Lambda 2010	Lambda 2011	Total Current Disturbance (%)
Charron Lake	No data	0.94	24.78
Harding Lake	0.91	0.86	39.47
The Bog	1.00	0.79	14.68
Wabowden	0.94	0.83	25.61
Wheadon	0.88	1.01	27.86
Wimapedi-Wapisu	1.00	0.92	23.42



Total length of FPR intersect (km) within each evaluation range that parallels existing linear features (MCP)

Evaluation range	Total Length of Evaluation Range FPR Intersect	% of FPR Paralleling Existing Linear Features
The Bog	84.23	63.03
Wabowden	94.16	41.63
Reed Lake	8.86	85.78
Wabowden Re-Route	85.3	88.39
<b>Total</b>	<b>187.25</b>	<b>53.35</b>





## Revised Wabowden Route

	FPR	Revised Route
Length of new linear disturbance created	49 km	0 km
Total length of ROW	58 km	47 km
Mitigation needs	Access control – PTH 6 Habitat retention in ROW Reduces uncertainty regarding mitigation for original FPR	Little mitigation required Follows disturbed areas (373)

## Conclusions – Boreal Woodland Caribou

- Pre project monitoring assisted route selection that mitigated the majority of potential effects on regional boreal woodland caribou populations.
  - FPR avoided the majority of important un-fragmented caribou range in the BPIII Project Study Area.
  - The FPR mainly parallels existing infrastructure
  - Little calving habitat and core winter range is disturbed.
  - FPR on fringe of Reed Lake and Wabowden ranges

## Threat Summary - Boreal Woodland Caribou

Threat Assessment Categories	Overall Level of Concern	Conclusions (Monitoring – Mitigation)
Forage Loss and Degradation	Low	Net effect (500 m buffer) – Wabowden = 1.1% Reed = 0.04%; The Bog = 0.86%
Range Fragmentation	Intuitively low, gaps include unknown effects of linear development and access	Results of linear effects illustrate high variance. Affected by habitat and only relevant in the Bog and Wabowden; Routing avoids core areas and follows existing linear development in Wabowden, Reed and The Bog;

## Threat Summary - Boreal Woodland Caribou

Threat Assessment Categories	Overall Level of Concern	Conclusions (Monitoring – Mitigation)
Predation	Medium to High	Mortality rates of adult females consistent with stable populations. Currently, high calf mortality yields low Lambda rates. Predation rates not expected to increase given minimal habitat loss.
Pathogens	Unknown	Not a concern.
Direct Mortality from Humans (i.e. hunting)	Unknown	BWC protected, MESA, Supporting stewardship.

## Conclusions – Barren-ground and Coastal Caribou

- Very occasional occurrence
- Project footprint very small proportion of home ranges.
- Cumulative effects considered for Pen Islands caribou near Gillam

Evaluation Ranges	Current Disturbance within Evaluation Range	Cumulative Disturbance within Evaluation Range	Total Disturbance Increase
Cape Churchill	25.6%	25.6%	0.04%
Pen Island	27.5%	29.1%	1.6%





Questions