

# Changing landscape : Predation, humans and their activities

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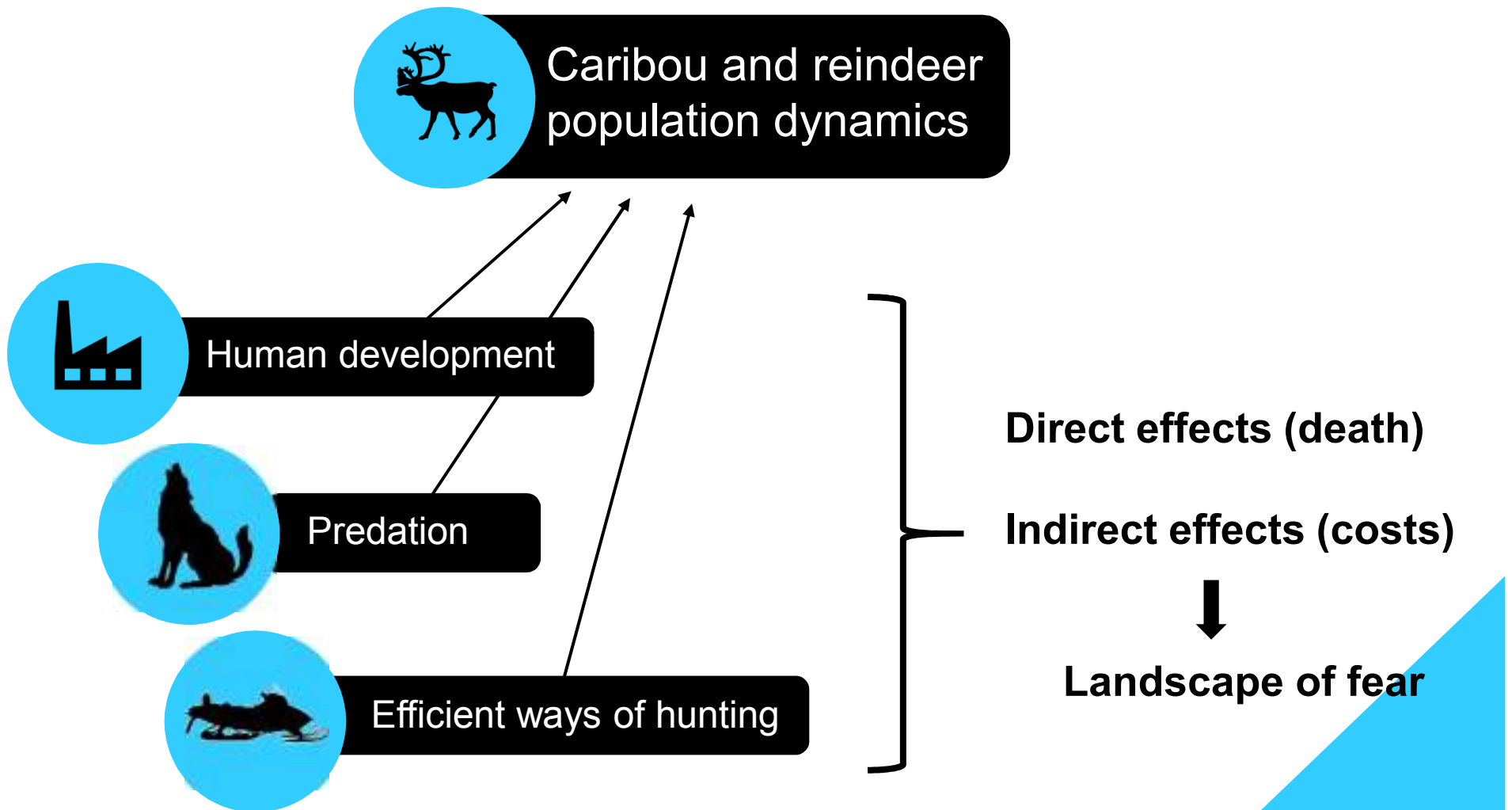
CENTRE D'ÉTUDES NORDIQUES  
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# PAST, CURRENT AND FUTURE KNOWLEDGE ON THREATS FOR HERDS RECOVERY

- I) What do we know about the impacts of predation, humans and their activities on caribou and reindeer populations ?
- II) How can we plan herd recovery : what we need to do and challenges.



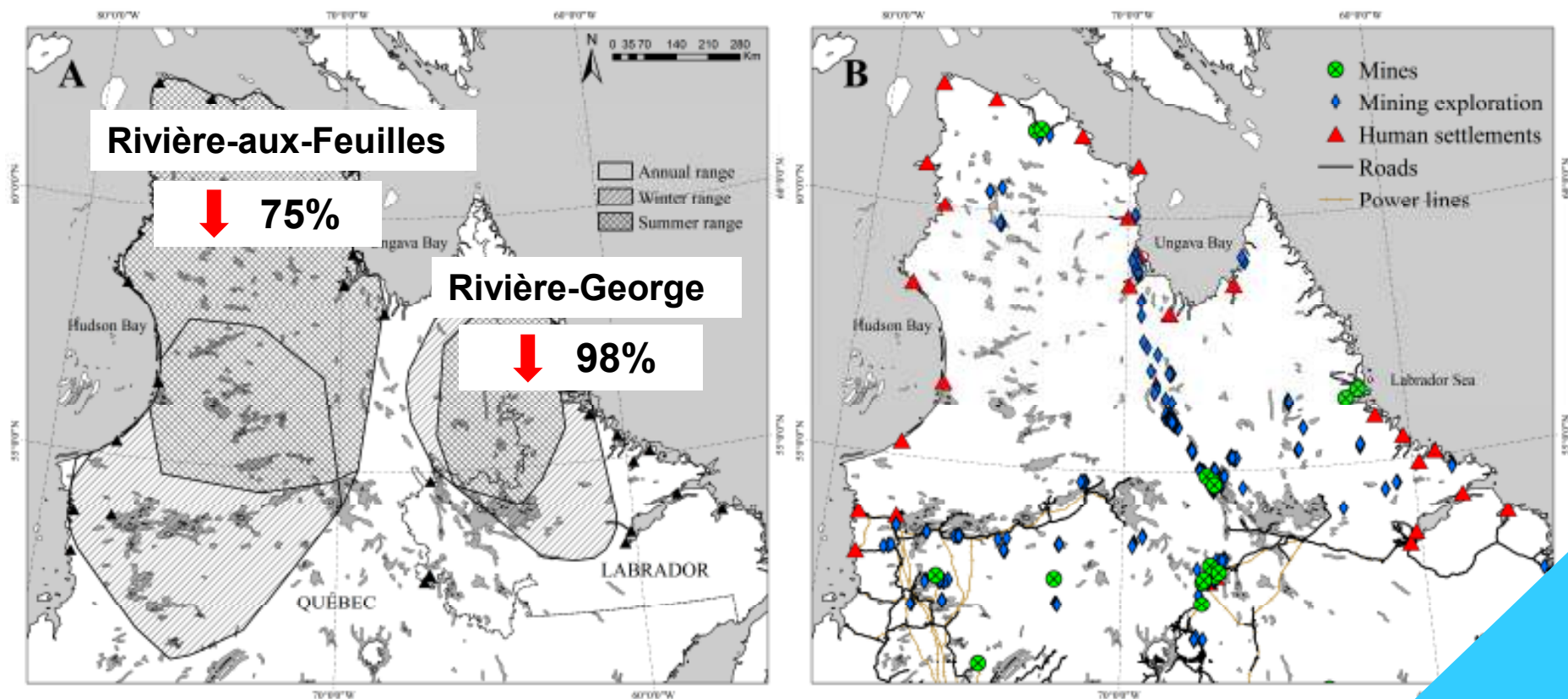
# I) THREATS FOR CARIBOU AND REINDEER RECOVERY : PREDATION, HUMANS AND THEIR ACTIVITIES



(Vors and Boyce 2009, Festa-Bianchet et al 2011)

# I) THREATS FOR CARIBOU AND REINDEER RECOVERY

Some context on the eastern migratory caribou in northern Québec and Labrador



(Plante et al 2018, *under revision*)

# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



## Human development

### 1) Increased movement rate near disturbances



Northern Québec and Labrador :  
Caribou moving 2x faster when crossing a road

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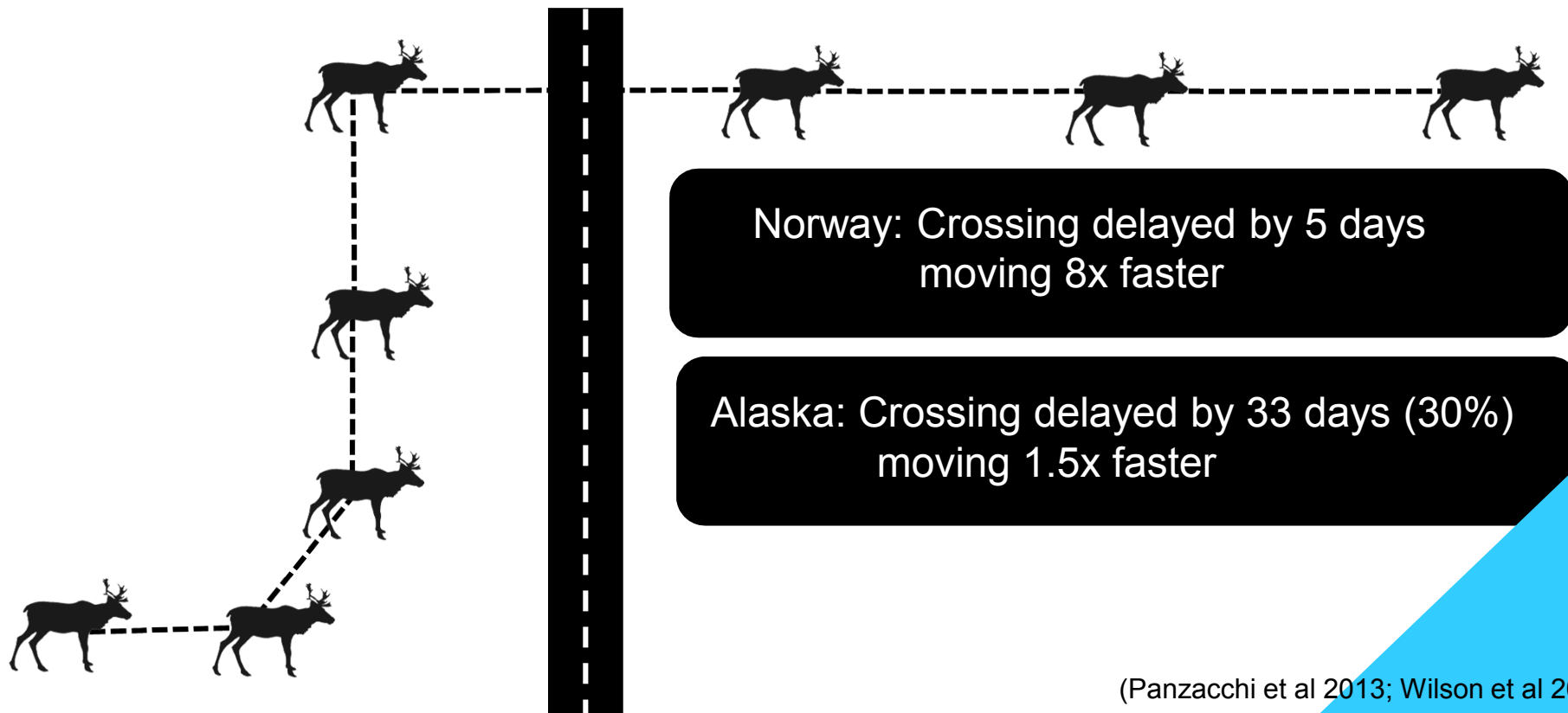
(Plante et al 2018, *under revision*)

# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



## Human development

### 1) Increased movement rate near disturbances



(Panzacchi et al 2013; Wilson et al 2016)



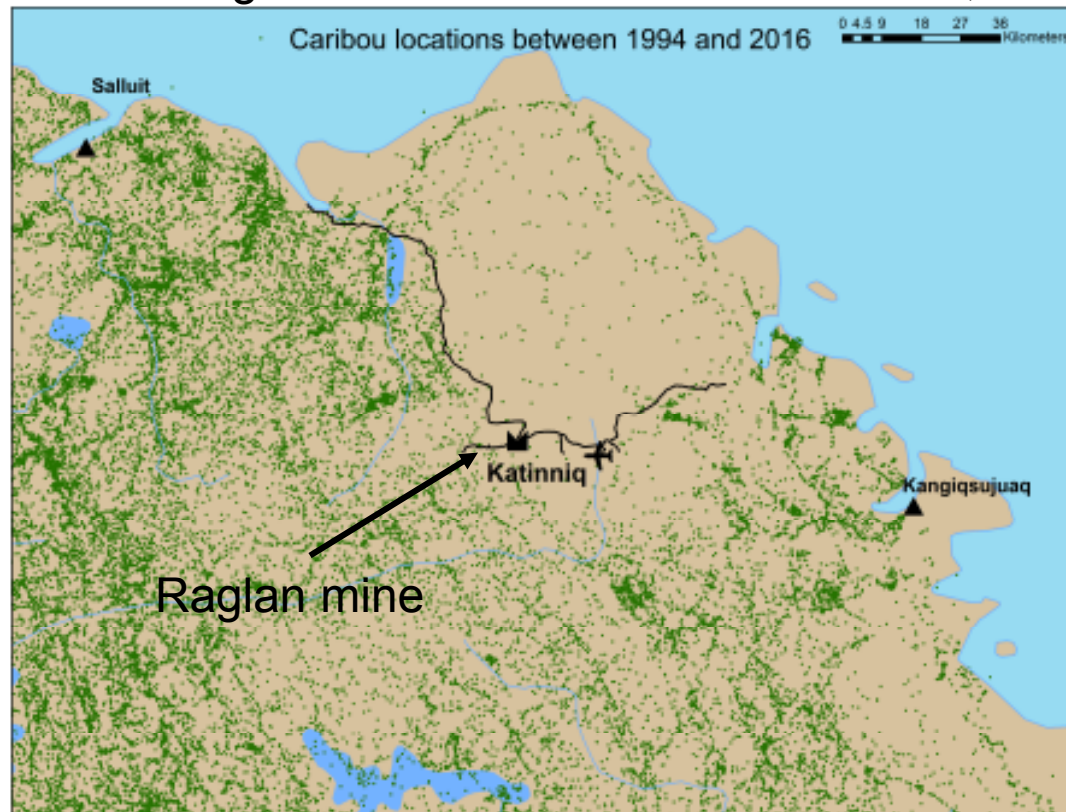
# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



## Human development

### 2) Failure to cross linear features

Summer range of the Rivière-aux-Feuilles herd, Québec



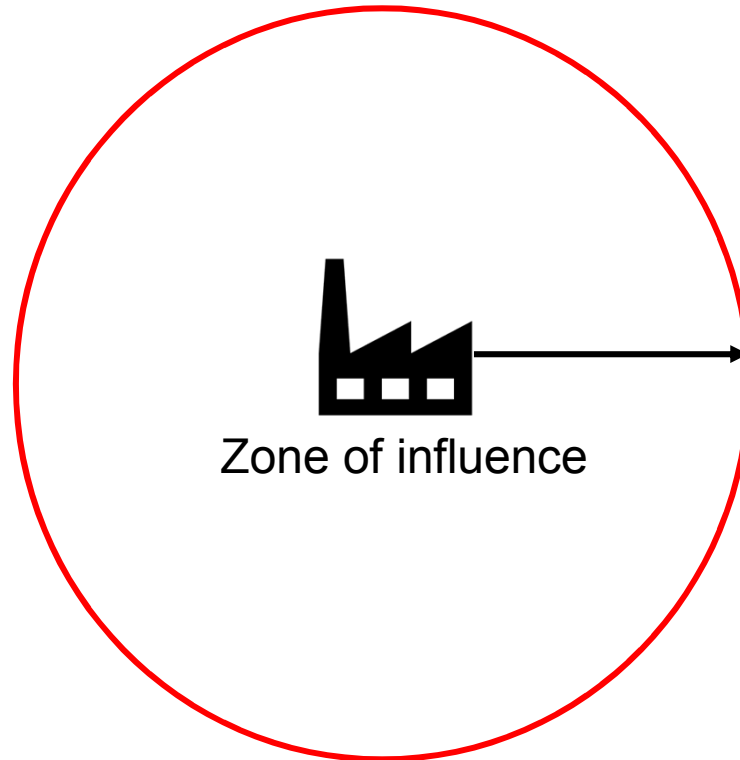
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# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



Human development

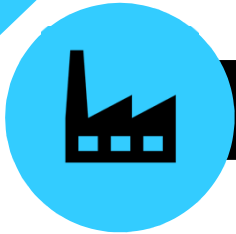
3) Avoidance of disturbed areas



(Anttonen et al 2011; Cameron et al 1992; Boulanger et al 2012; Haskell et al 2006; Helle et al 1993, 2012; Johnson et al 2014; Nellemann et al 2001, 2010; Plante et al 2018, *under revision*; Vistnes et al 2008)



# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



## Human development

### 3) Avoidance of disturbed areas

Disturbance type	ZOI in QC and LAB	ZOI elsewhere
Mines	19-21 km	11-14
Mining exploration	3-21 km	0-1.5 km (gold digging)
Low use features (wells, seismic lines)	N/A	6-11 km

(Anttonen et al 2011; Cameron et al 1992; Boulanger et al 2012; Haskell et al 2006; Helle et al 1993, 2012; Johnson et al 2014; Nellemann et al 2001, 2010; Plante et al 2018, *under revision*; Vistnes et al 2008)

# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



Human development

## 4) Cumulative effects

Cumulative habitat loss for caribou of the RAF and RG herds in Québec and Labrador



Period	Cumulative area lost	Cumulative high-quality habitat lost
Summer	0.1% - 2.0%	0.0% - 2.6%
Winter	0.0% - 6.7%	0.0% - 7.3%

# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



Efficient ways of hunting



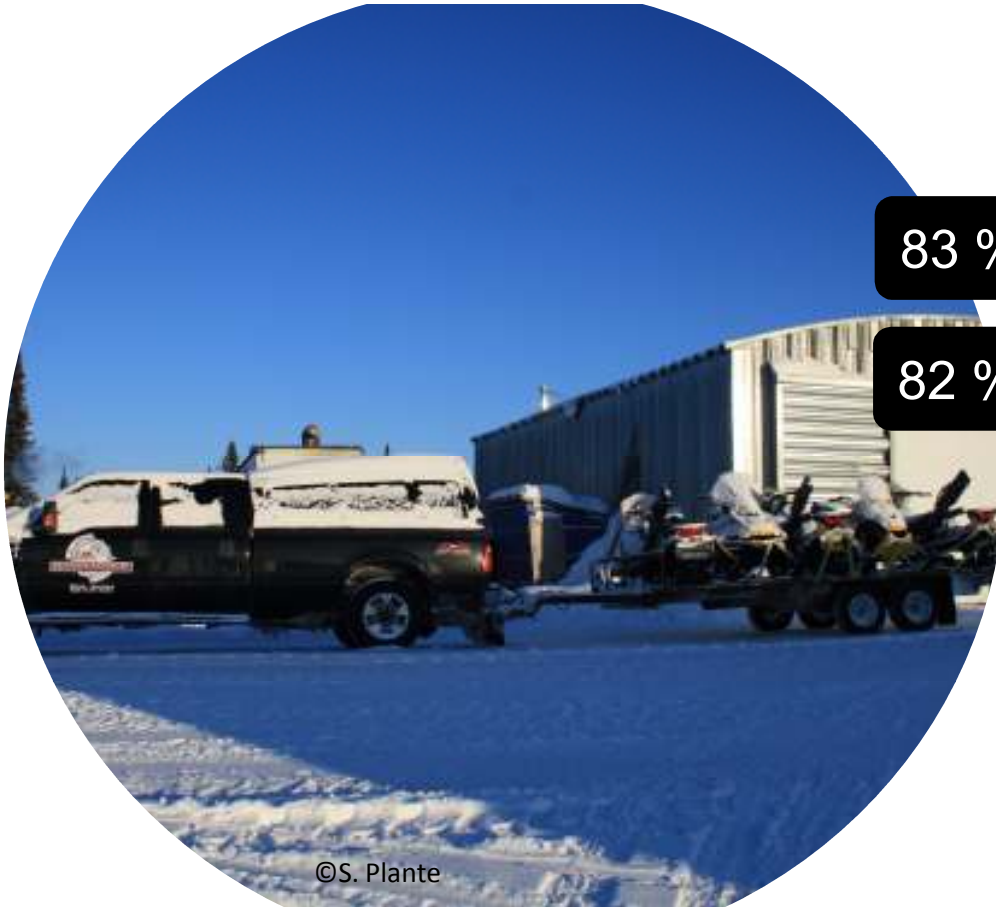
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# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



## Efficient ways of hunting

### 1) Increased access to hunting grounds



83 % of harvest < 10 km of a road

82 % of harvest < 60 km of a camp

# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



## Efficient ways of hunting

2) Decrease tolerance toward disturbances during hunting

Disturbance	ZOI without hunting	ZOI with sport hunting
Roads	0-3 km	0-15 km
Villages	0-4 km	2-18 km

Period	Cumulative area lost	Cumulative high-quality habitat lost
Summer	0.1% - 2.0%	0.0% - 2.6%
Winter	0.0% - 6.7%	0.0% - 7.3%

# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



Modifications in predator-prey interactions



©BBC Earth

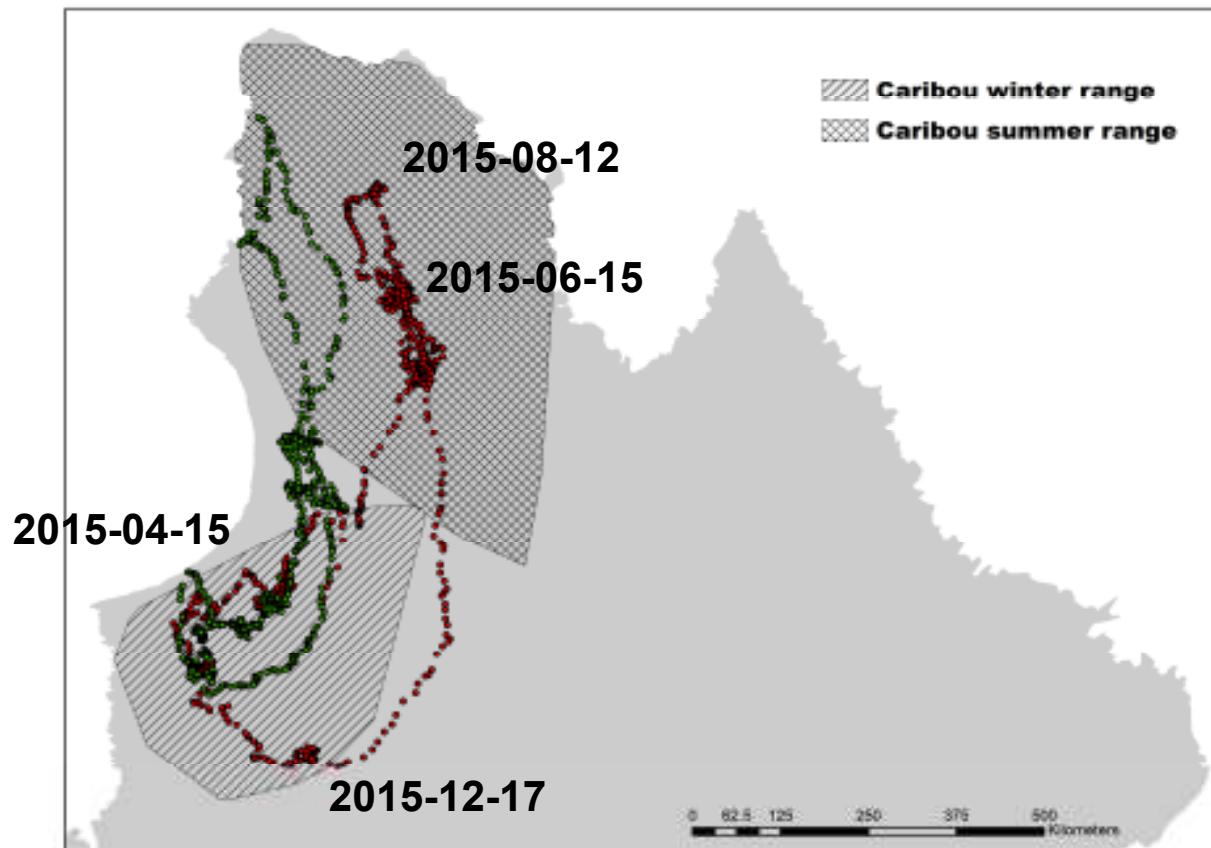


# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



## Modifications in predator-prey interactions

### 1) Migratory wolves



(Cluff et al 2002; Hansen et al 2013; Walton et al 2001; Rogers et al, unpublished work)

# I) THREATS FOR CARIBOU AND REINDEER RECOVERY



Modifications in predator-prey interactions

2) Interaction with human disturbance and activity

Use of linear features by hunting  
wolves



©C. Gale – Caribou Monitoring Unit

Avoidance of lakes during sport hunting



©S. Plante

(DeMars et al 2018; Newton et al 2017; Plante et al 2017)

## II) PLANNING CARIBOU AND REINDEER RECOVERY



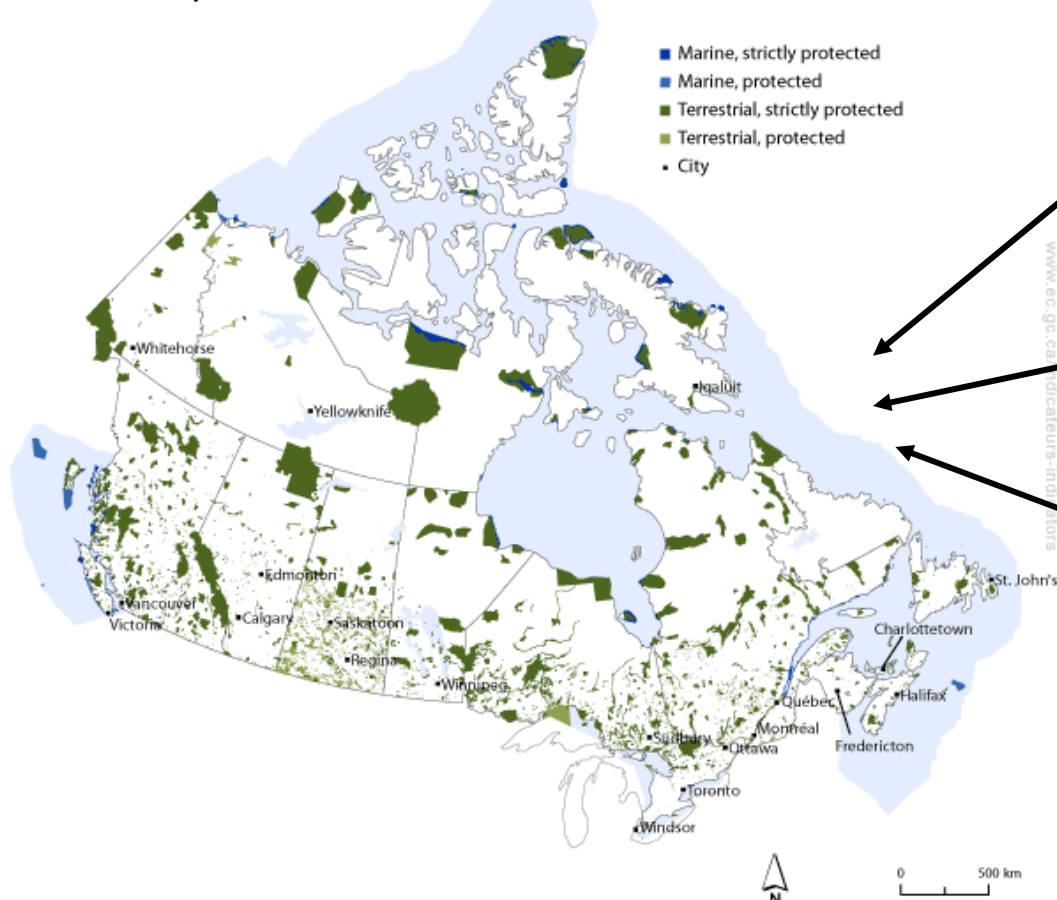
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## II) PLANNING CARIBOU AND REINDEER RECOVERY



### Ensure habitat integrity

#### 1) Protect sensitive areas for caribou



Conflict with existing or future activities

Large ranges

Tracking changes in use ?

(Newton et al 2013; Taillon et al 2012)

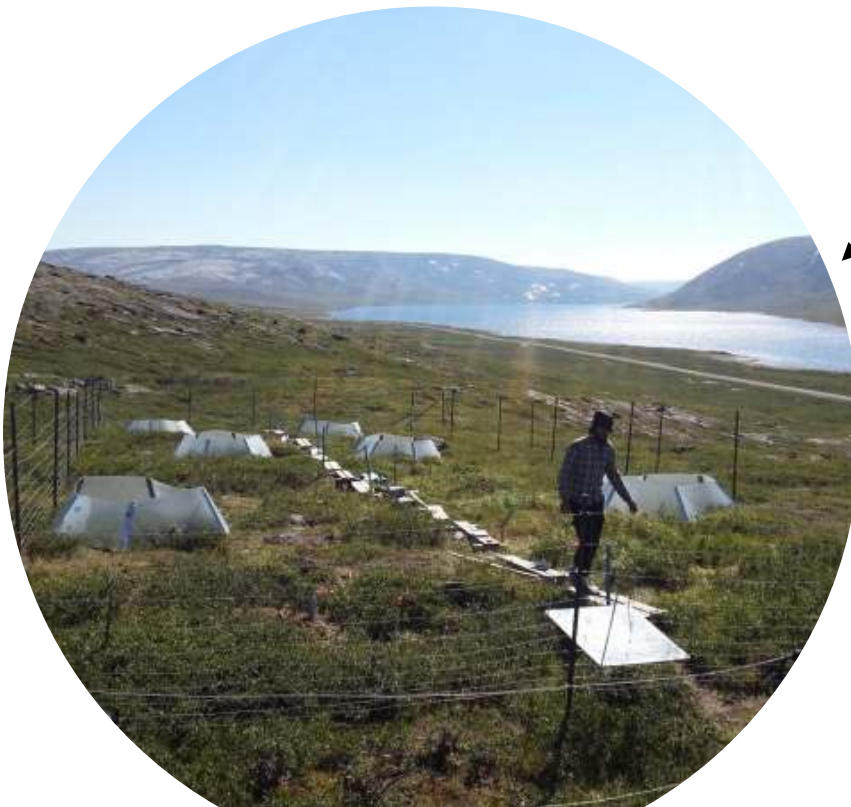


## II) PLANNING CARIBOU AND REINDEER RECOVERY



Ensure habitat integrity

2) Monitoring and simulating the impact of climate change on caribou landscape



Climate warming

Increased nutrients

Increased snow cover

Browsing pressure

(Morrissette-Boileau et al 2018)

## II) PLANNING CARIBOU AND REINDEER RECOVERY



Ensure habitat integrity

3) Identify critical habitat for caribou



Boreal caribou

**Vital  
rates**



Barren-ground/migratory caribou

- i) Forage abundance and quality
- ii) Avoidance of predators
- iii) Avoidance of insects

**Selection  
or use**



## II) PLANNING CARIBOU AND REINDEER RECOVERY



Ensure habitat integrity

3) Identify critical habitat for caribou

- i) no avoidance  $\neq$  no effect
- ii) Maladaptive habitat selection  $\rightarrow$  negative correlation between selection and fitness



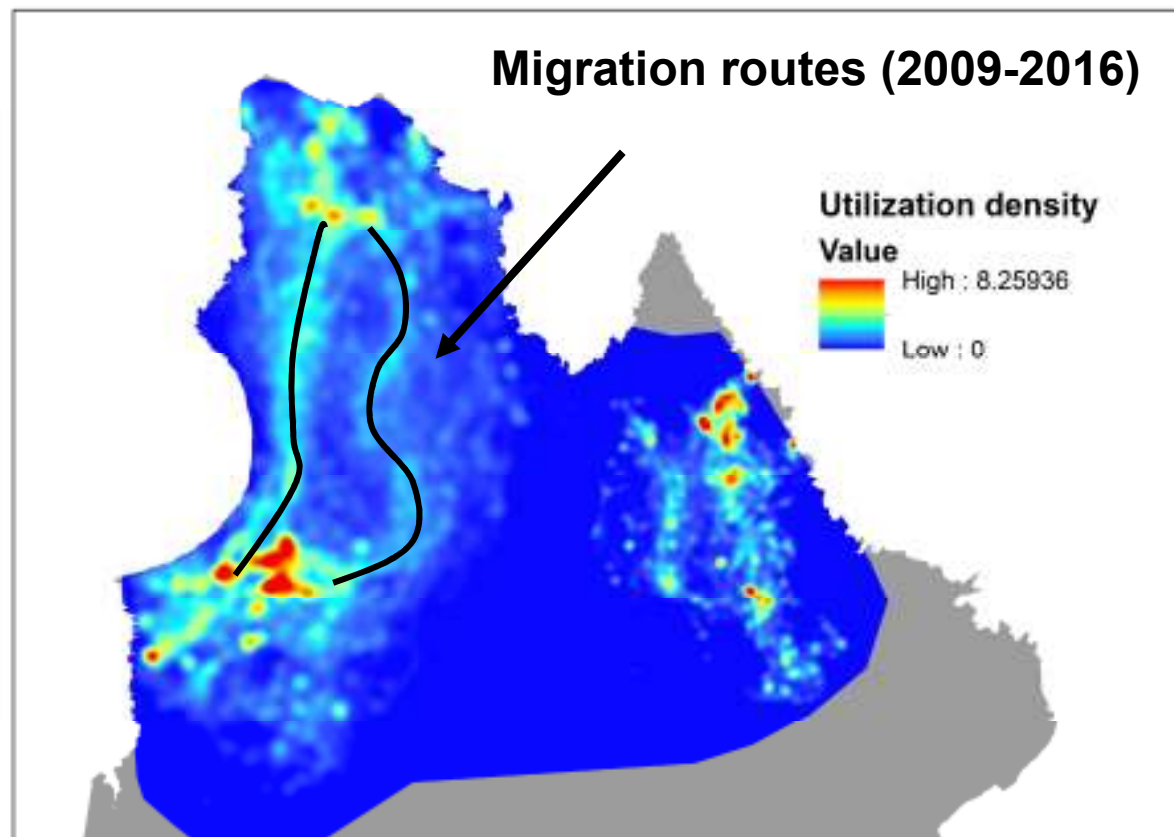
Verifying fitness-habitat selection relationship

## II) PLANNING CARIBOU AND REINDEER RECOVERY



Ensure connectivity and limit human development

1) Monitoring caribou range use and disturbance effects



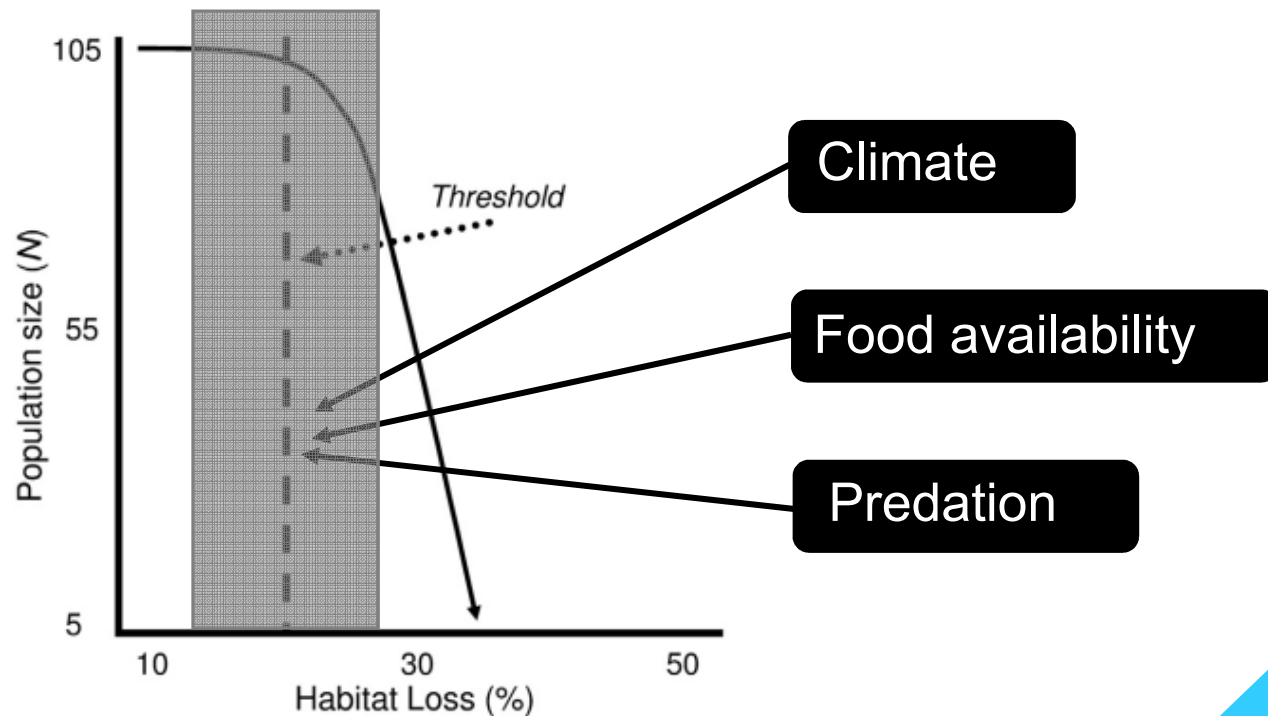
(Colman et al 2017,

## II) PLANNING CARIBOU AND REINDEER RECOVERY



Ensure connectivity and limit human development

### 2) Identifying thresholds for regulating development



(Johnson 2013)

## II) PLANNING CARIBOU AND REINDEER RECOVERY



Ensure sustainable harvest

1) Model scenario with various hunting modalities

Scenario

Business as usual

Males only

50% reduction

No harvest

Predicted trend in  
population size

Torngat mountain caribou



(Bélanger et al *under review*)

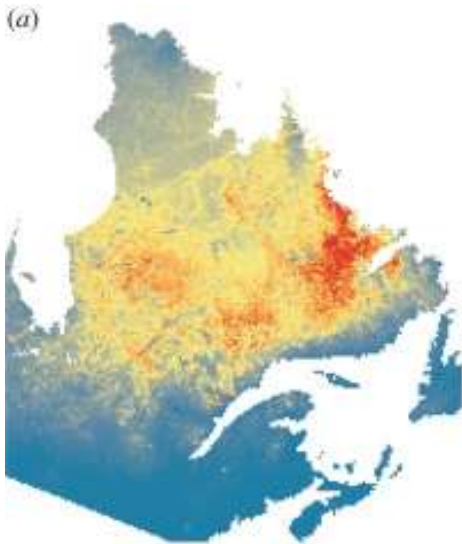
## II) PLANNING CARIBOU AND REINDEER RECOVERY



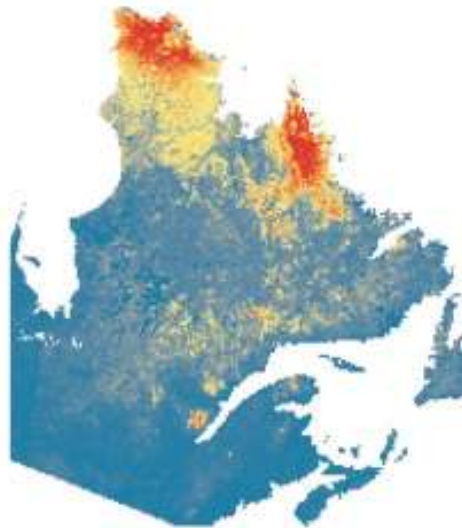
Limit impacts on predator-prey interactions

### 1) Landscape of fear

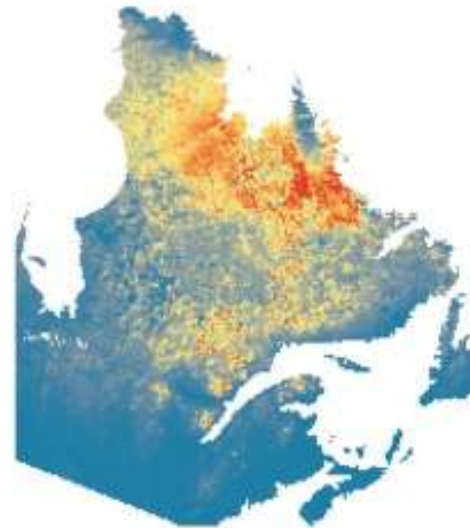
Predation risk



Food availability



Disturbance risk



## II) PLANNING CARIBOU AND REINDEER RECOVERY



Limit cumulative impacts

- i) Multiple causes, one ultimate result is population decline
- ii) Landscape level planning





# ACKNOWLEDGEMENTS

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