

Caribou in Nunavut

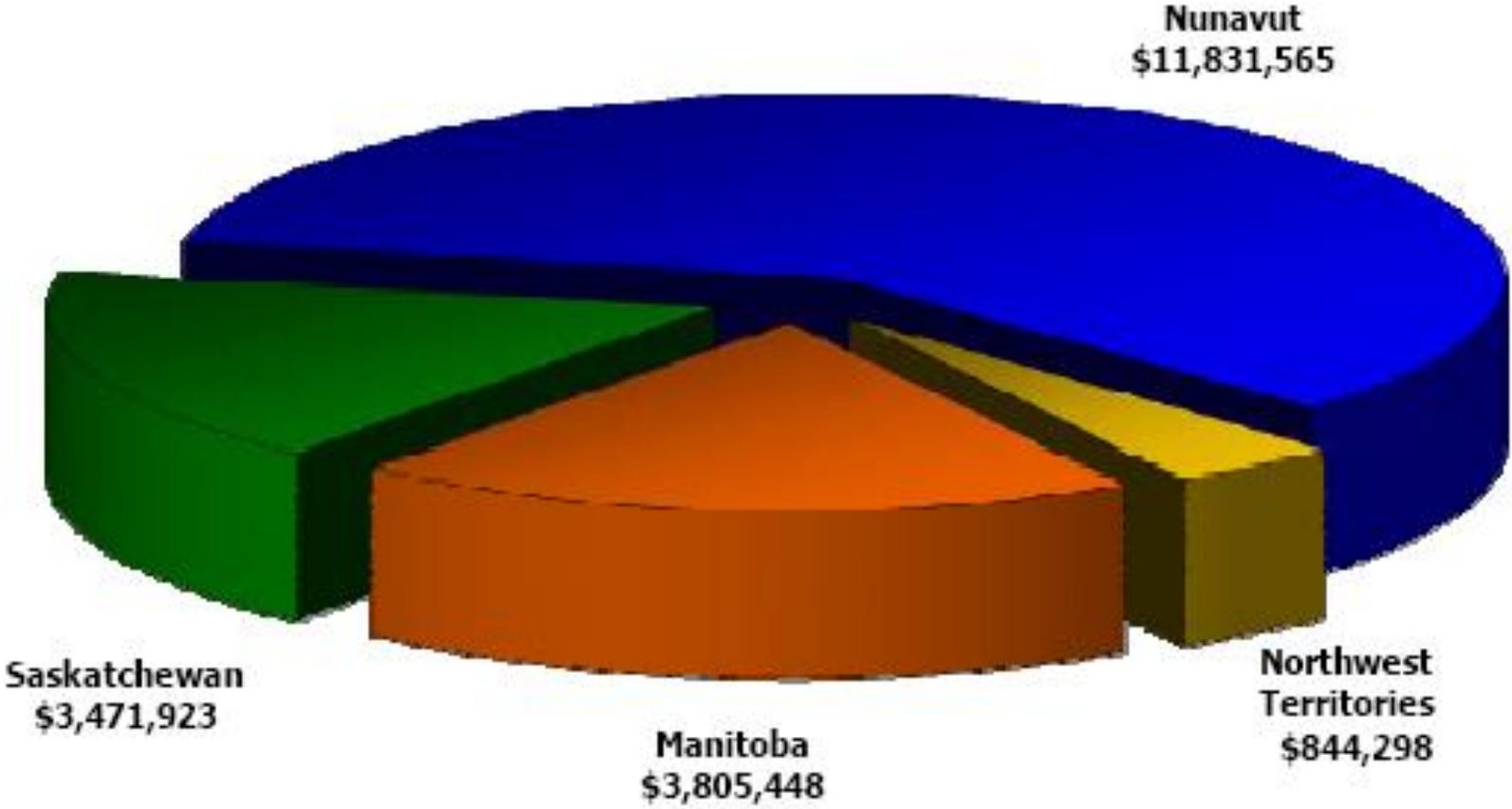
- There are an estimated 19 populations and/ or subpopulations of caribou either wholly or partially within the Nunavut settlement area.
- Eight (8) of these populations and/or subpopulations are mainland migratory (MM), and tundra wintering (TW) caribou.
 1. Bluenose East (MM)
 2. Dolphin and Union (TW)
 3. Bathurst (MM)
 4. Beverly (MM)
 5. Ahiak (TW)
 6. Qamanirjuaq (MM)
 7. Lorillard (TW)
 8. Wager Bay (TW)
- The annual core calving areas of all of these subpopulations are either entirely or mostly within the Nunavut settlement area.



Shared Management

- The annual ranges of 5 of the 8 subpopulations are shared with other jurisdictions.
 - Bluenose East – NWT, & Nunavut
 - Bathurst – NWT, Saskatchewan, & Nunavut
 - Beverly –NWT, Saskatchewan, & Nunavut
 - Ahiak – NWT, Saskatchewan, & Nunavut
 - Qamanirjuaq – NWT, Saskatchewan, Manitoba, & Nunavut
- Caribou management in Nunavut is shared with Regional Wildlife Boards and community HTOs.
- Nunavut has an obligation to involve other jurisdictions in caribou management.

The Value of Caribou



Caribou Ecotypes

- Of the mainland herds there are two main ecotypes:
 1. Mainland Migratory (MM)
 2. Tundra Wintering (TW)
- Characteristics of Mainland Migratory Caribou:
 - They display the most extensive migratory behaviour
 - They are generally sexually segregated throughout the year except during the rut and fall migratory periods.
 - They migrate across tundra range in spring, returning south to the forested areas in early to late fall.
 - Their extensive seasonal movements make them less able to adapt to disturbance effects.
 - Calving grounds and spring migratory corridors are more defined and predictable.
- Characteristics of Tundra Wintering Caribou:
 - They display less extensive migratory behaviour.
 - They generally display less sexual segregation throughout the year.
 - They rarely migrate to treeline, spending the entire year within tundra habitats.
 - Their less extensive seasonal movements may allow for a greater degree of adaptation to disturbance effects.
 - Calving grounds and spring migratory corridors are less defined and predictable.

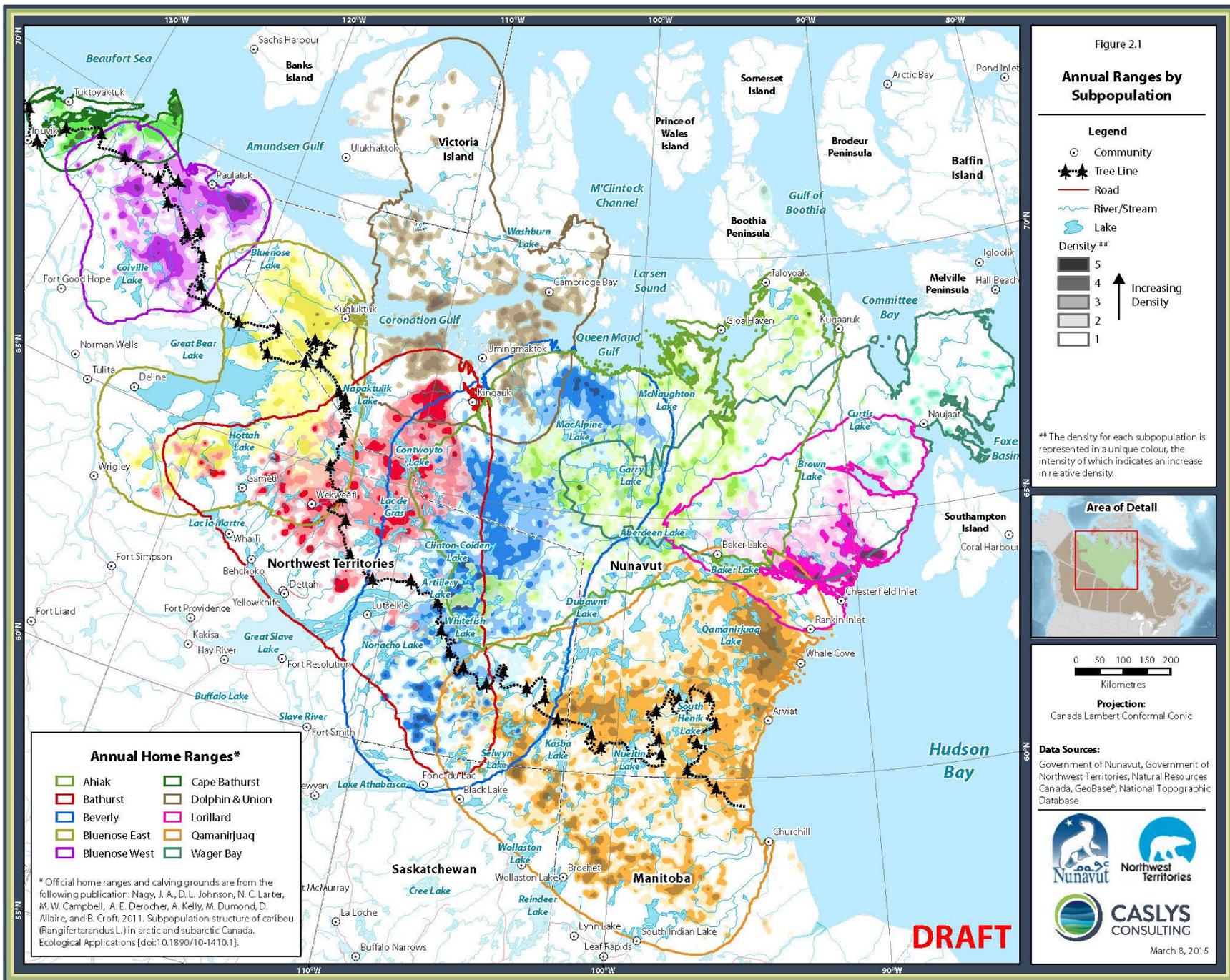


Figure 2.1
Annual Ranges by Subpopulation

Legend

- ⊙ Community
- ▲▲▲ Tree Line
- Road
- ~ River/Stream
- ☪ Lake

Density **

5
4
3
2
1

↑ Increasing Density

** The density for each subpopulation is represented in a unique colour, the intensity of which indicates an increase in relative density.



0 50 100 150 200
 Kilometres

Projection:
 Canada Lambert Conformal Conic

Data Sources:
 Government of Nunavut, Government of Northwest Territories, Natural Resources Canada, GeoBase®, National Topographic Database

CASLYS CONSULTING
 March 8, 2015

Annual Home Ranges*

Ahiak	Cape Bathurst
Bathurst	Dolphin & Union
Beverly	Lorillard
Bluenose East	Qamanirjuaq
Bluenose West	Wager Bay

* Official home ranges and calving grounds are from the following publication: Nagy, J. A., D. L. Johnson, N. C. Larter, M. W. Campbell, A. E. Derocher, A. Kelly, M. Dumond, D. Allaire, and B. Croft. 2011. Subpopulation structure of caribou (*Rangifer tarandus* L.) in arctic and subarctic Canada. Ecological Applications [doi:10.1890/10-1410.1].

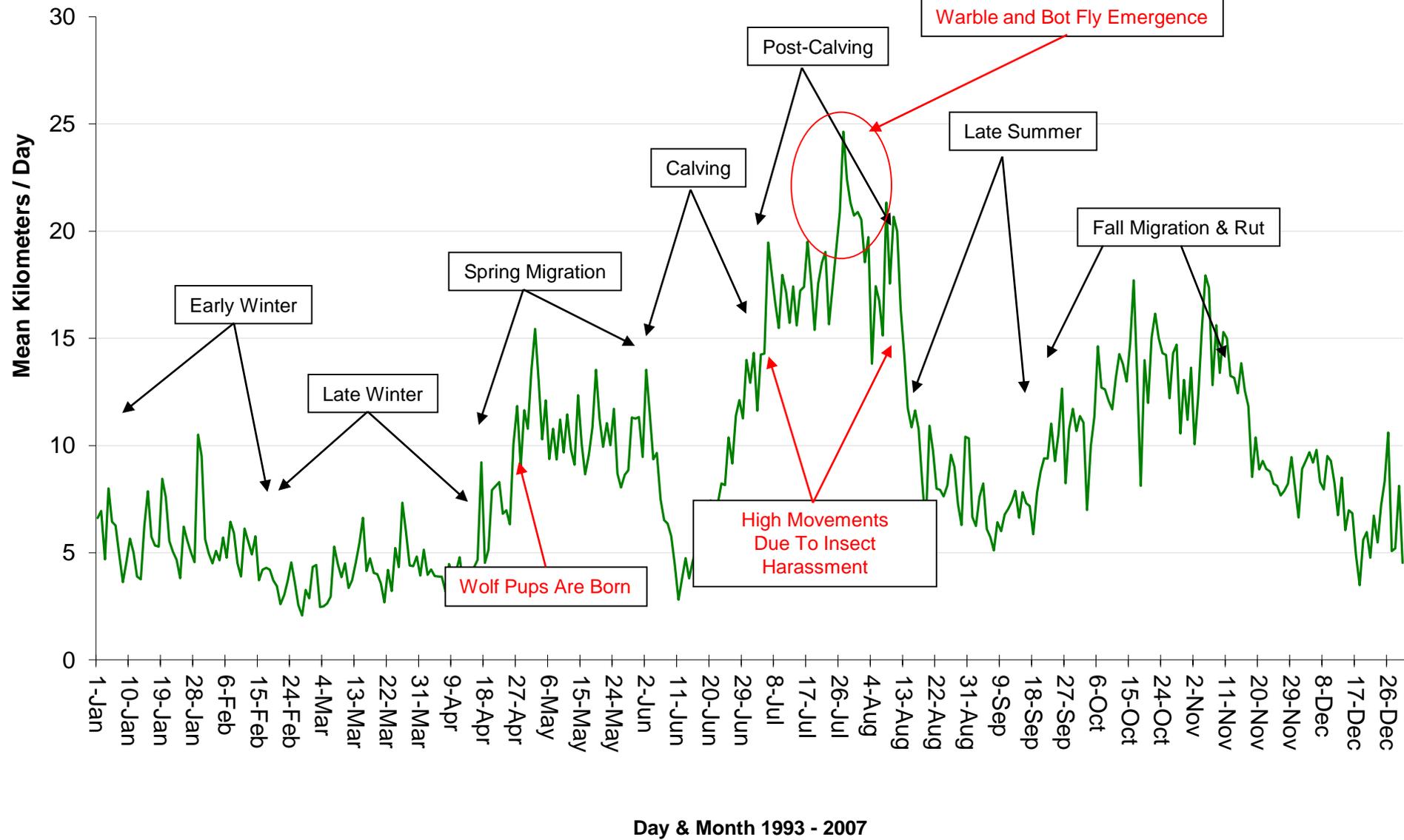
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Seasonal Range

- Based on collar derived caribou movement rates, we can identify at least 9 distinct seasons of importance to caribou.
 1. Calving
 2. Post-Calving
 3. Summer
 4. Late Summer
 5. Fall Migration – Pre-breeding
 6. Rut
 7. Fall Migration – Post-breeding
 8. Winter
 9. Spring Migration



Qamanirjuaq Caribou Movements (Km / Day)



HERD	SEASON								
	Calving	Post-calving	Summer	Late Summer	Fall migration, pre-breeding	Rut/Breeding	Fall migration, post-breeding	Winter	Spring migration
Bluenose East (8 th)	May 28 - Jun 20	Jun 21 - Jul 3	Jul 4 - Aug 12	Aug 13 - Sep 6	Sep 7 - Oct 11	Oct 12 - Nov 4	Nov 5 - Dec 25	Dec 26 - Apr 9	Apr 10 - May 27
Bathurst (9 th)	Jun 2 - 16	Jun 17 - 28	Jun 29 - Aug 17	Aug 18 - Sep 6	Sep 7 - Oct 16	Oct 17 - 31	Nov 1 - 30	Dec 1 - Apr 19	Apr 20 - Jun 1
Dolphin and Union (10 th)	May 29 - Jun 23	Jun 24 - Jul 3	Jul 4 - Aug 2	Aug 3 - 22	Aug 23 - Oct 12	Oct 13 - Nov 7	Nov 8 - 30	Dec 1 - Apr 24	Apr 25 - May 28
Lorillard (11 th)	May 29 - Jun 25	Jun 26 - Jul 13	Jul 14 - Aug 12	Aug 13 - Sep 21	Sep 22 - Oct 22	Oct 23 - Nov 8	Nov 9 - Dec 15	Dec 16 - Apr 4	Apr 5 - May 28
Wager Bay (12 th)	May 30 - Jun 25	Jun 26 - Jul 12	Jul 13 - Aug 12	Aug 13 - Sep 21	Sep 22 - Oct 22	Oct 23 - Nov 8	Nov 9 - Dec 15	Dec 16 - Mar 31	Apr 1 - May 29
Beverly (13 th)	Jun 6 - 19	Jun 20 - Jul 8	Jul 9 - Aug 12	Aug 13 - Sep 11	Sep 12 - Oct 20	Oct 21 - Nov 3	Nov 4 - Dec 15	Dec 16 - Apr 9	Apr 10 - Jun 5
Qamanirjuaq (16 th)	Jun 9 - 22	Jun 23 - Jul 3	Jul 4 - Aug 22	Aug 23 - Sep 16	Sep 17 - Oct 18	Oct 19 - Nov 6	Nov 7 - Dec 15	Dec 16 - Apr 14	Apr 15 - Jun 8
Ahiak (19 th)	Jun 13 - 25	Jun 26 - Jul 12	Jul 13 - Aug 12	Aug 13 - Sep 21	Sep 22 - Oct 22	Oct 23 - Nov 8	Nov 9 - Dec 15	Dec 16 - Apr 5	Apr 6 - Jun 12

Calving

Late May – Early June

- **Characteristics:**

- Spatially the most concentrated and predictable seasonal range with the lowest daily movement rates.
- Predominantly occupied by breeding and non-breeding females and newborn calves.
- Spatial extents are exclusively within tundra habitats offering limited cover to visual and/or audible disturbance.
- Characterized by low densities of predators and little to no human harvest.
- Commonly areas with few foraging opportunities but adjacent to areas that will offer foraging opportunities.

- **Sensitivities:**

- Vulnerability to all disturbance effects are at their greatest throughout this period.
- Energy demands reach a peak throughout this period while forage opportunities remain low.
- Flight responses to any form of visual and/or sound disturbance is at its greatest during this period.
- Susceptibility to the disruption of the cow/calf bond is at a peak throughout this period.
- The high densities of cows and calves within a small geographic area warn of the high potential for disturbance related spatial and population level impacts during this period.

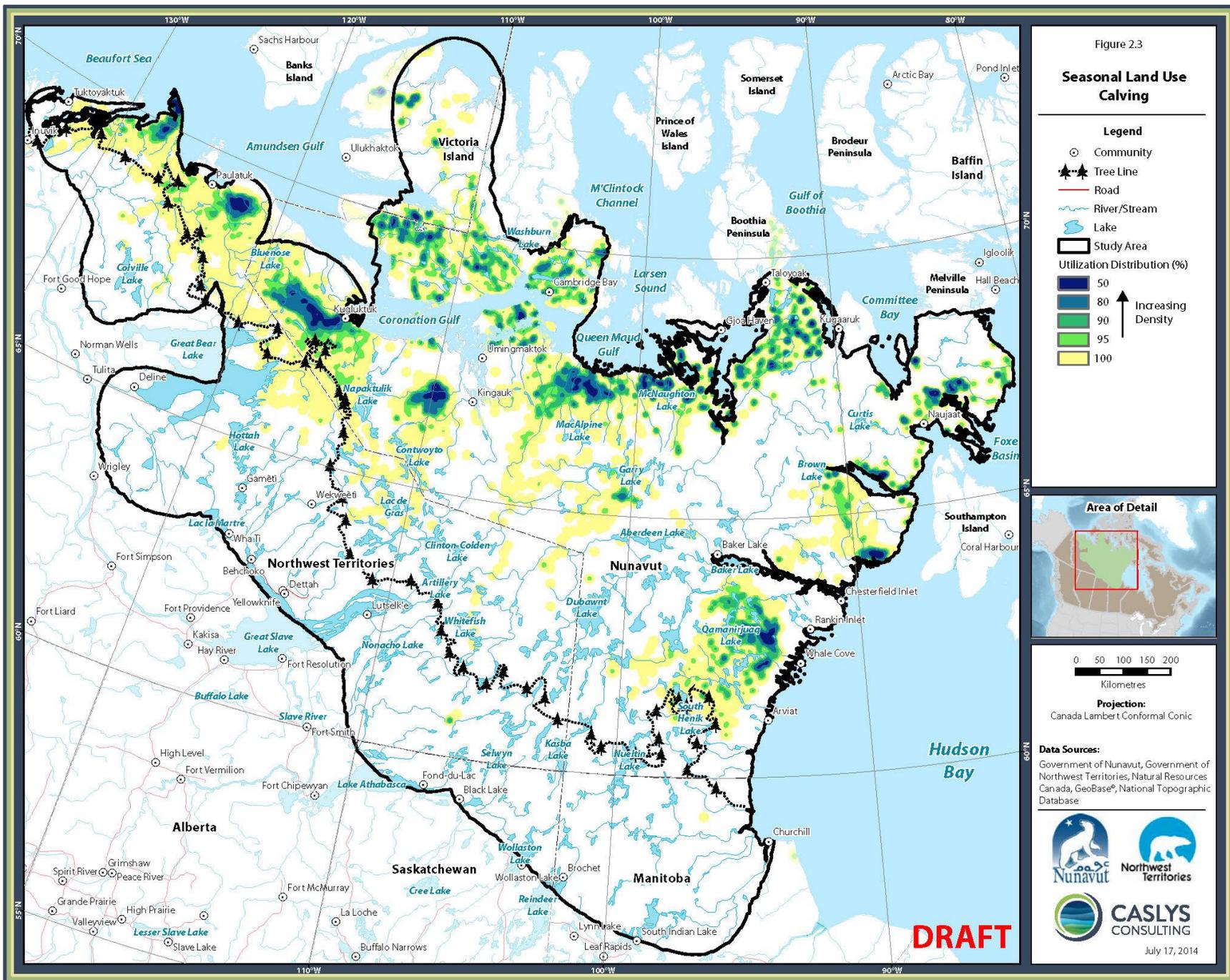


Figure 2.3

Seasonal Land Use Calving

Legend

- ⊙ Community
 - *** Tree Line
 - Road
 - ~ River/Stream
 - ☪ Lake
 - ▭ Study Area
 - Utilization Distribution (%)
 - 50
 - 80
 - 90
 - 95
 - 100
- ↑ Increasing Density

Area of Detail



Projection:

Canada Lambert Conformal Conic

Data Sources:

Government of Nunavut, Government of Northwest Territories, Natural Resources Canada, GeoBase®, National Topographic Database



July 17, 2014

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Post-Calving and Early Summer

Late June - mid-August

- **Characteristics:**

- A time of year when the energy demands on cows nursing calves are extremely high.
- Calf survival depends on intact cow-calf bonds and continuous milk production.
- Generally occurs within and directly adjacent to calving grounds.
- Primarily cow/calf and yearling groups moving together in search of high quality forage to sustain milk production and build fat reserves.
- More extensive than calving grounds but similarly used in a temporally and spatially predictive manner.
- Biting insect emergence begins and increases through the later half of this period.
- The most extensive daily movement rates occur during the later half of this period.

- **Sensitivities:**

- Biting insects can significantly increase energy expenditures impacting forage intake and milk production.
- There are high energetic costs associated with the displacement of caribou from insect avoidance habitat.
- Displacement of cow-calf pairs into marginal habitats will reduce energy intake and in turn milk production.
- Susceptibility to calf abandonment throughout this period.
- Environmental stressors are generally low early in this period allowing for extensive foraging.
- Mechanized transport, aircraft, roads and their effects on increasing disturbance and human harvesting are of the greatest concern within these areas.
- General disruption of foraging behaviour of cow-calf groups will negatively effect cow health and calf survival.

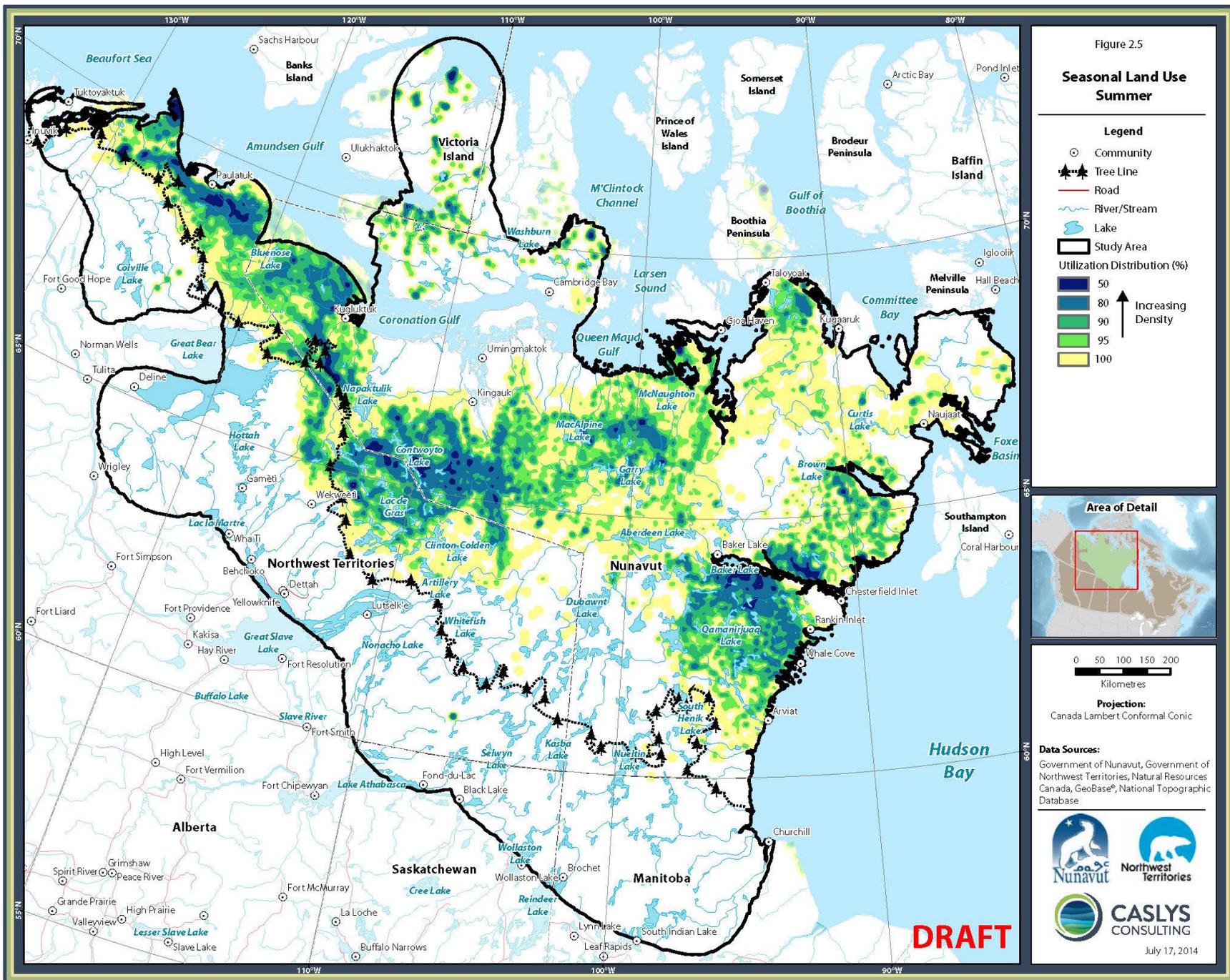


Figure 2.5

**Seasonal Land Use
Summer**

Legend

- ⊙ Community
 - ▲▲▲ Tree Line
 - Road
 - ~ River/Stream
 - ☪ Lake
 - ▭ Study Area
 - Utilization Distribution (%)
 - 50
 - 80
 - 90
 - 95
 - 100
- ↑ Increasing Density

Area of Detail



Projection:

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Late Summer

Mid August – Mid September

- **Characteristics:**

- Biting insects steadily decline during this period.
- Forage intake is maximized during this period, while forage quality declines.
- A time of year when environmental stressors are low, allowing caribou to focus on forage intake and the storage of excess energy as fat.
- Geographically extensive though foraging caribou are often selecting for small patch's of higher quality forage.
- Uninterrupted foraging during this period is critical to reproductive success and overwinter survival.
- Movement rates are generally low during this period.

- **Sensitivities:**

- High sensitivity to forage disruption with the potential to strongly impact energy uptake and fat production.
- Low movement rates make caribou on their late summer range particularly susceptible to roads and their characteristic of increasing hunting pressure and general disturbance.
- When disturbed forage patches can take considerable time and energy to re-locate.
- Cumulative effects, particularly centered around roads, aerial disturbance, harvesting pressure and predation, are of the greatest concern during this period.

Fall Migration & the Rut

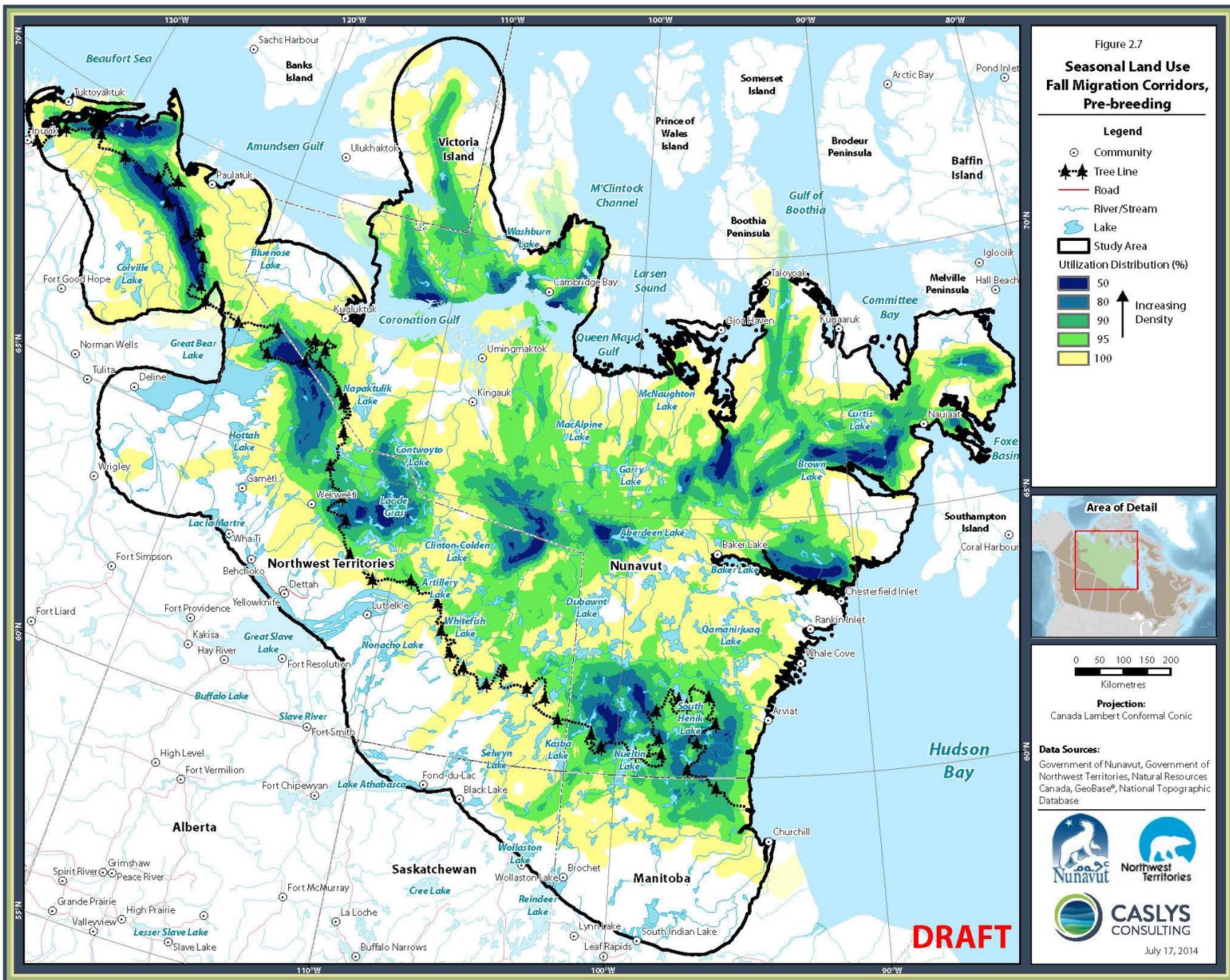
Mid September - Mid December

- **Characteristics:**

- A time of year when breeding occurs.
- All ages and sexes come together.
- Generally occurs in the vicinity of the treeline for MM herds.
- Primarily cow/calf groups migrate from the tundra environment into the forested environment (MM) or into the more southerly extents of their annual range (TW).
- Cow-calf groups join up with mature and young bulls generally in the vicinity of the treeline (MM).
- Though geographically extensive, caribou generally utilize these areas in a predictable manner.

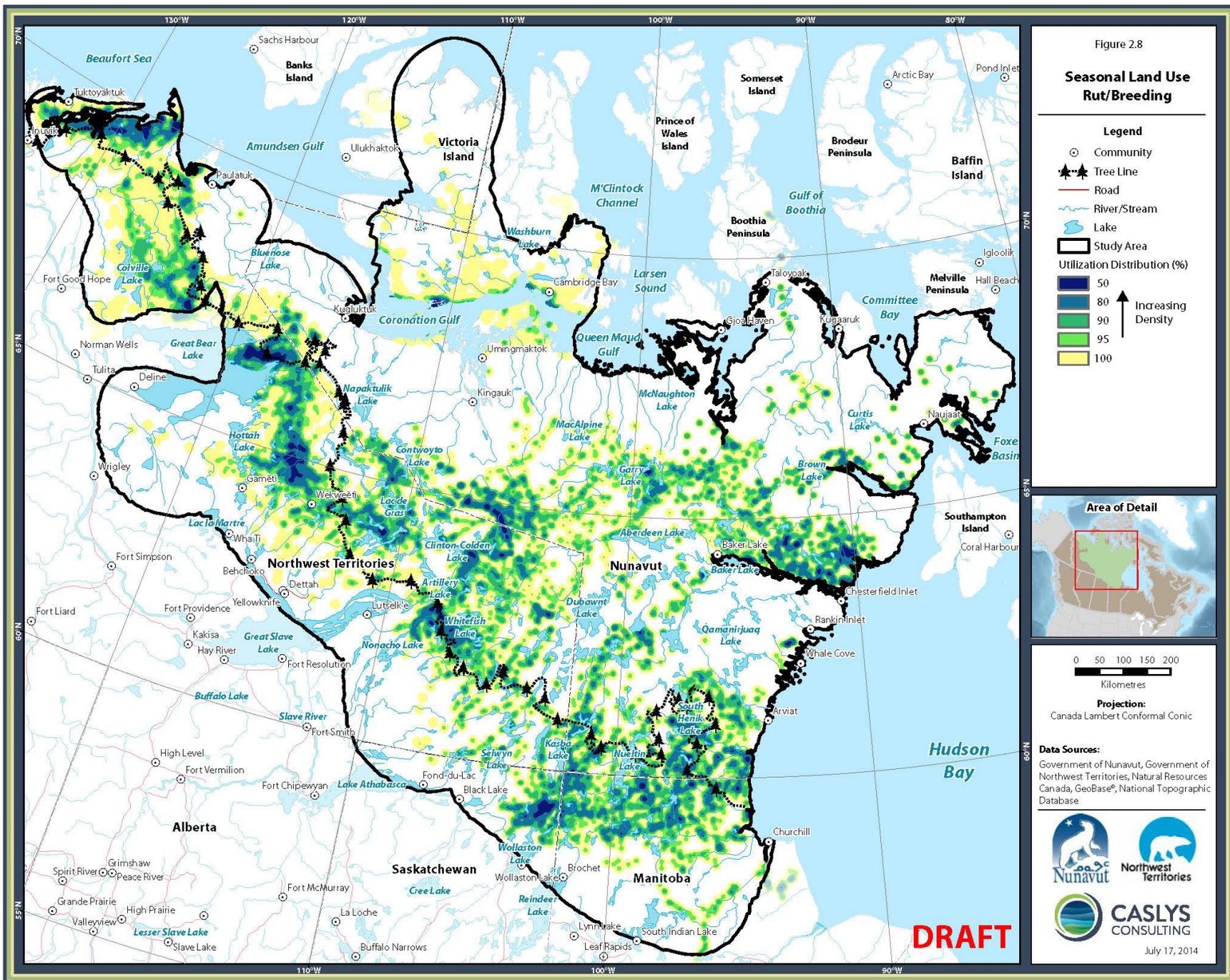
- **Sensitivities:**

- Migration and breeding are energetically demanding primarily to mature bulls.
- Disruption of the breeding process will increase energy demands and impact breeding success.
- Occurs just prior to the winter season when the amount stored energy will directly effect overwinter survival/productivity.
- These ranges are generally extensive.
- Obstruction and/or diversion of pre-rut migrating caribou can substantially disrupt the breeding process.
- Cumulative effects as they apply to the disruption of migrating caribou and the breeding process are of the greatest concern within these seasonal ranges.



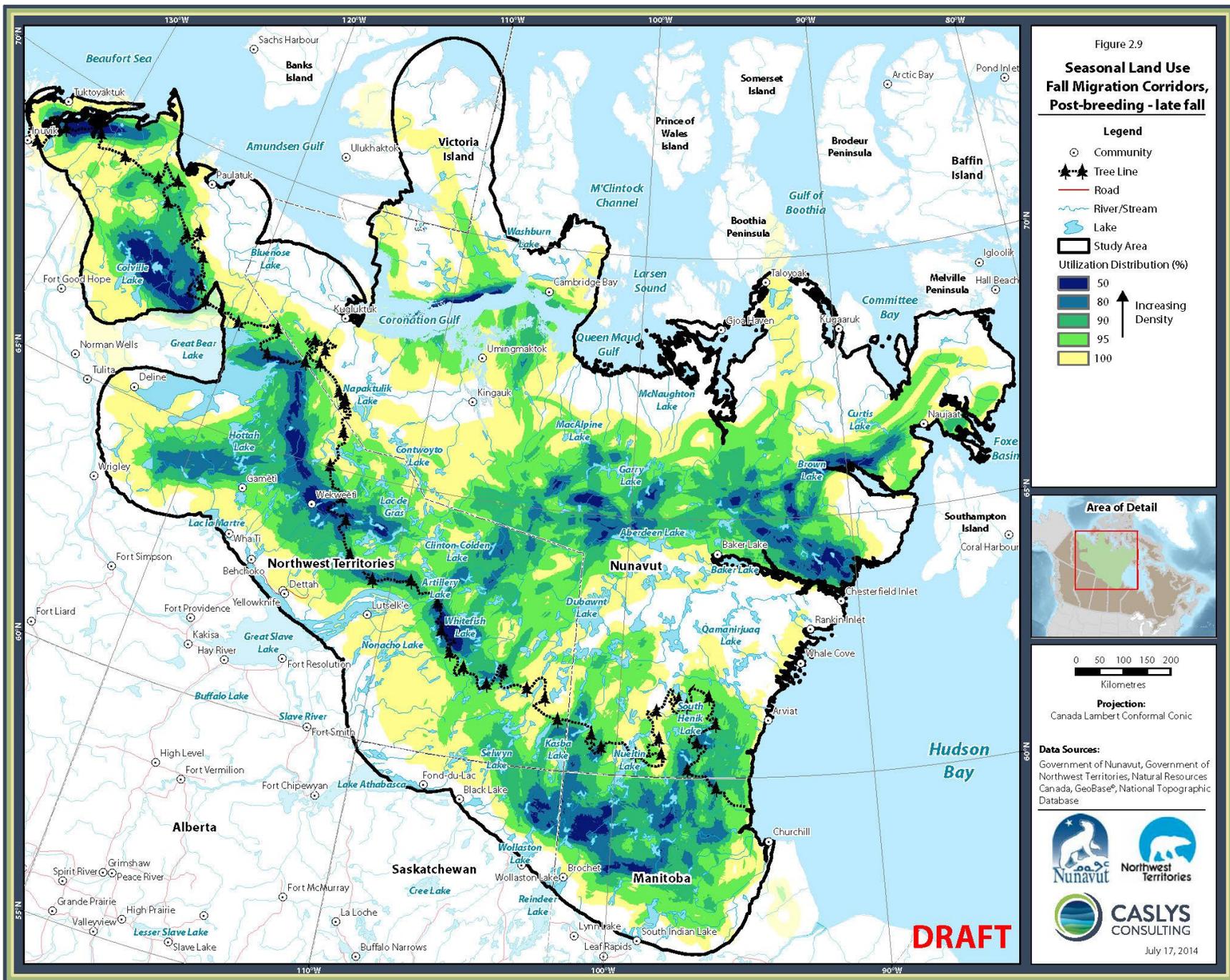
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Winter Range

Mid December – Mid April

- **Characteristics:**

- A time of year when energetic stressors are at their greatest.
- Forage quality, quantity, and accessibility can be highly variable from year to year, but is generally low.
- Generally occurs within the treeline for MM herds.
- Movement is generally low though can vary with levels of predation, harvesting and snow conditions.
- Spatial use of winter range is highly dependant on fire history, weather, roads, and harvesting pressure.
- The most geographically extensive range.

- **Sensitivities:**

- Caribou are particularly susceptible to roads and associated harvesting pressure.
- Snow thickness, icing, forest fires and harvesting pressure can heavily impact caribou condition and survival.
- Severe winters can push caribou past stored energy thresholds reducing overall survival and/or productivity.
- Late winter yarding behaviour can concentrate caribou into small areas. Disturbing caribou within these areas can reduce survival.
- Cumulative effects, particularly centered around roads and associated harvesting pressure and disturbance are of the greatest concern.

Spring Migration

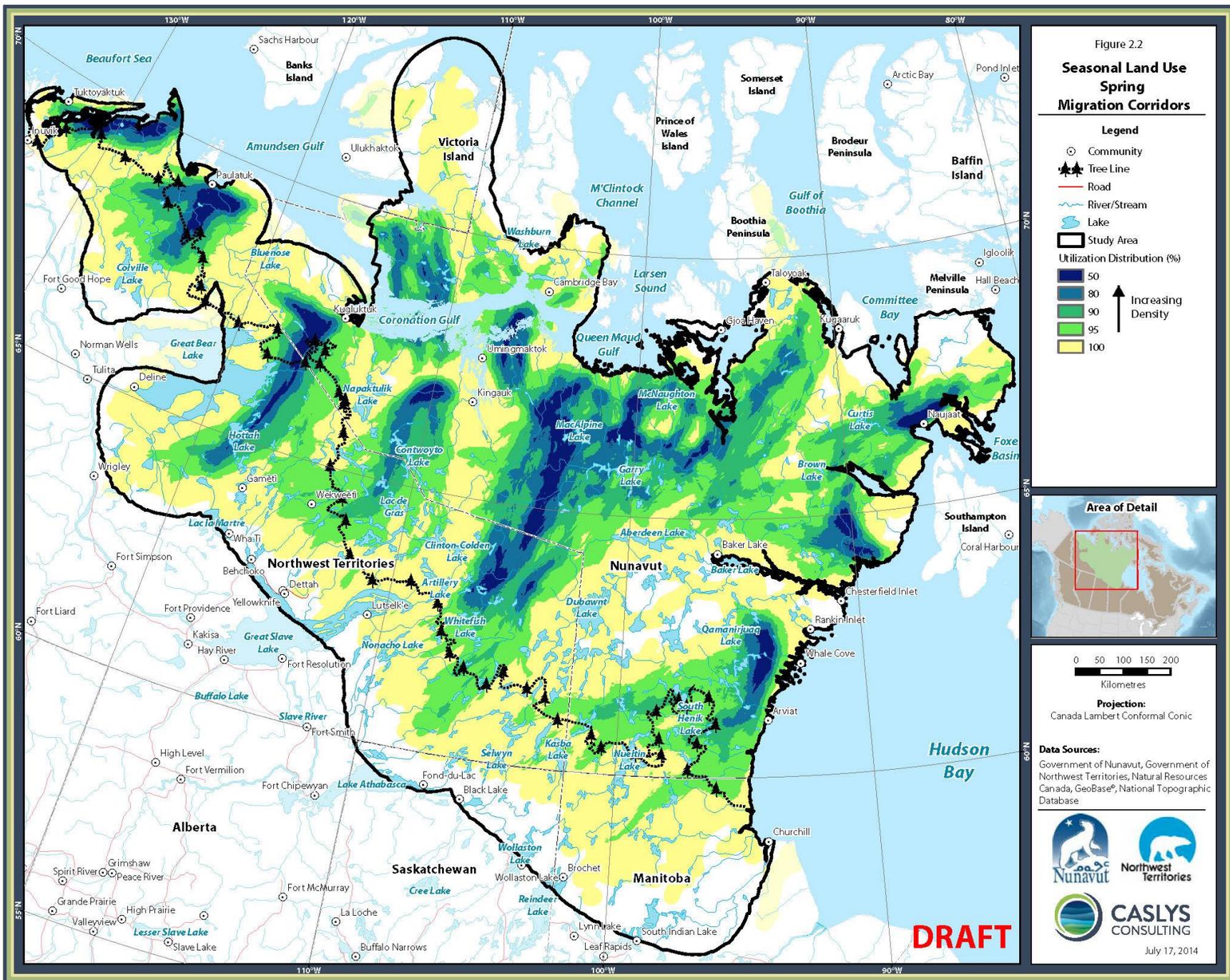
Mid April – Late May

- **Characteristics:**

- Begins following wolf denning and pupping, restricting a packs ability to follow migrating caribou.
- A time of year characterized by declining energy reserves and increasing energetic demands for parturient cows.
- Forage quality and accessibility along migratory corridors is generally very low.
- Primarily cow/calf and yearling groups migrate from winter grounds to calving grounds.
- Migratory corridors are generally linear and used annually in a spatially predictable manner.
- Daily movement rates are high during this period, often covering hundreds of km.

- **Sensitivities:**

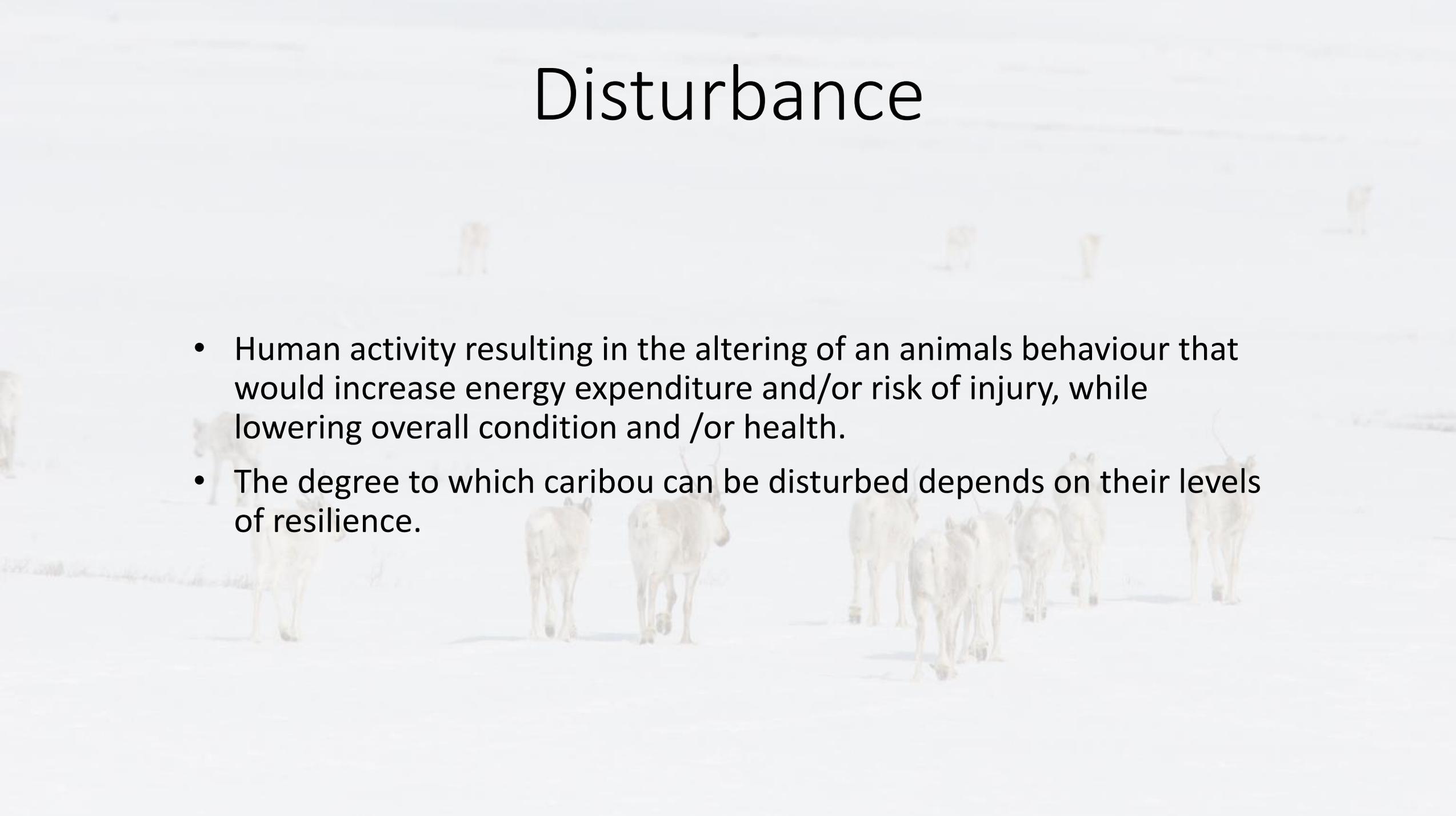
- Disruption and/or diversion of migrating caribou can have serious energetic consequences.
- High susceptibility to predation during this period.
- Diversion of spring migrating caribou could delay arrival times onto calving grounds leading to calving outside of these areas and corresponding increases in predation, and reduced calving success.
- Disturbance of migrating caribou can modify spring migratory corridors and calving extents.
- Linear features, obstructions, and/or disturbance during migration can disrupt and/or divert caribou.



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Disturbance

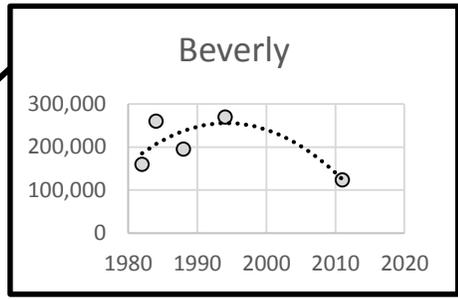
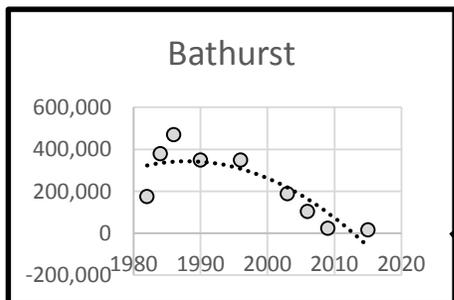
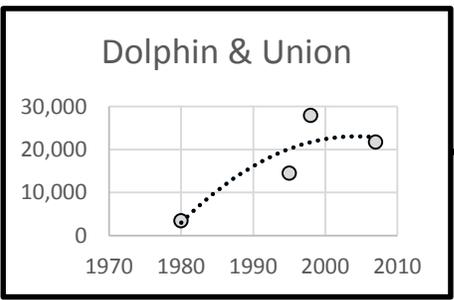
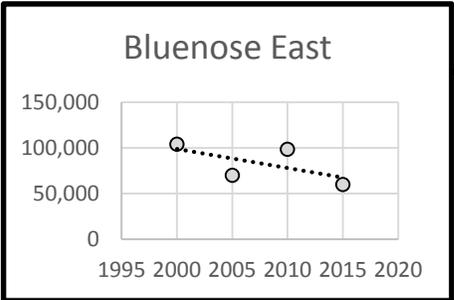
A herd of caribou is shown in a snowy, open landscape. The animals are scattered across the frame, with some in the foreground and others in the distance. The background is a vast, flat, snow-covered plain under a bright sky.

- Human activity resulting in the altering of an animals behaviour that would increase energy expenditure and/or risk of injury, while lowering overall condition and /or health.
- The degree to which caribou can be disturbed depends on their levels of resilience.

Resilience and its Application to Caribou Vulnerability

- An Added Complication

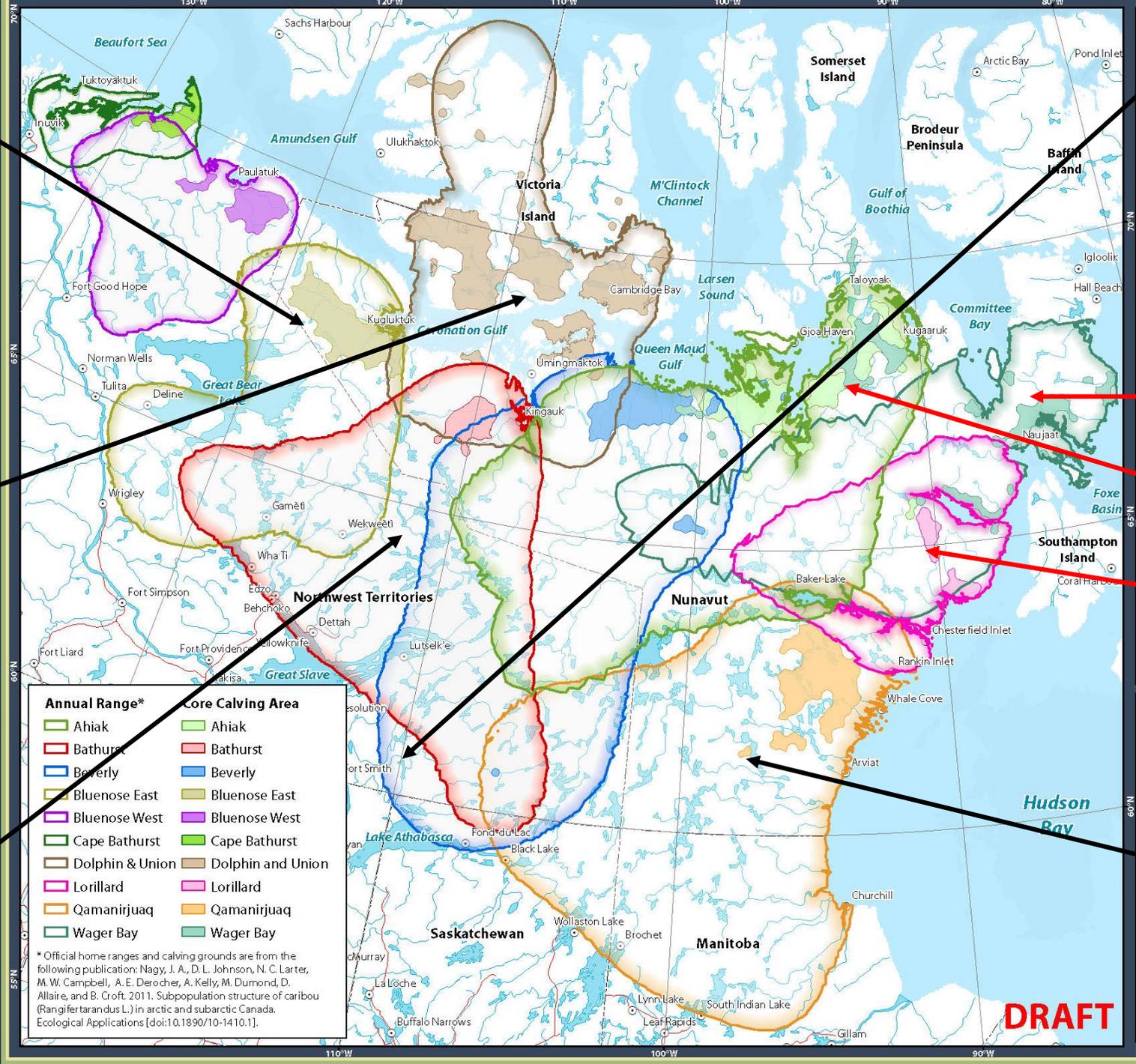
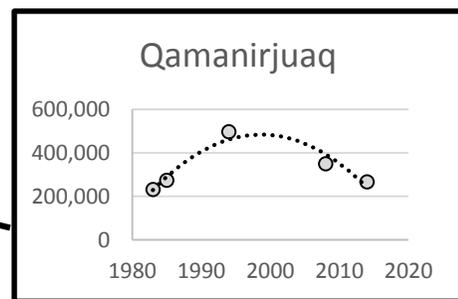
- Resilience describes the ability of caribou to cope with stress.
- Resilience decreases with decreasing population size as does its magnitude with the depth of decline.
- Resilience is directly proportional to vulnerability to inputs like disturbance and/or habitat modification.
- Highly Resilient animals are healthy and productive and better able to cope with environmental stress.



Wager Bay ??

Ahiak ??

Lorillard ??



Annual Range*	Core Calving Area
Ahiak	Ahiak
Bathurst	Bathurst
Beverly	Beverly
Bluenose East	Bluenose East
Bluenose West	Bluenose West
Cape Bathurst	Cape Bathurst
Dolphin & Union	Dolphin and Union
Lorillard	Lorillard
Qamanirjuaq	Qamanirjuaq
Wager Bay	Wager Bay

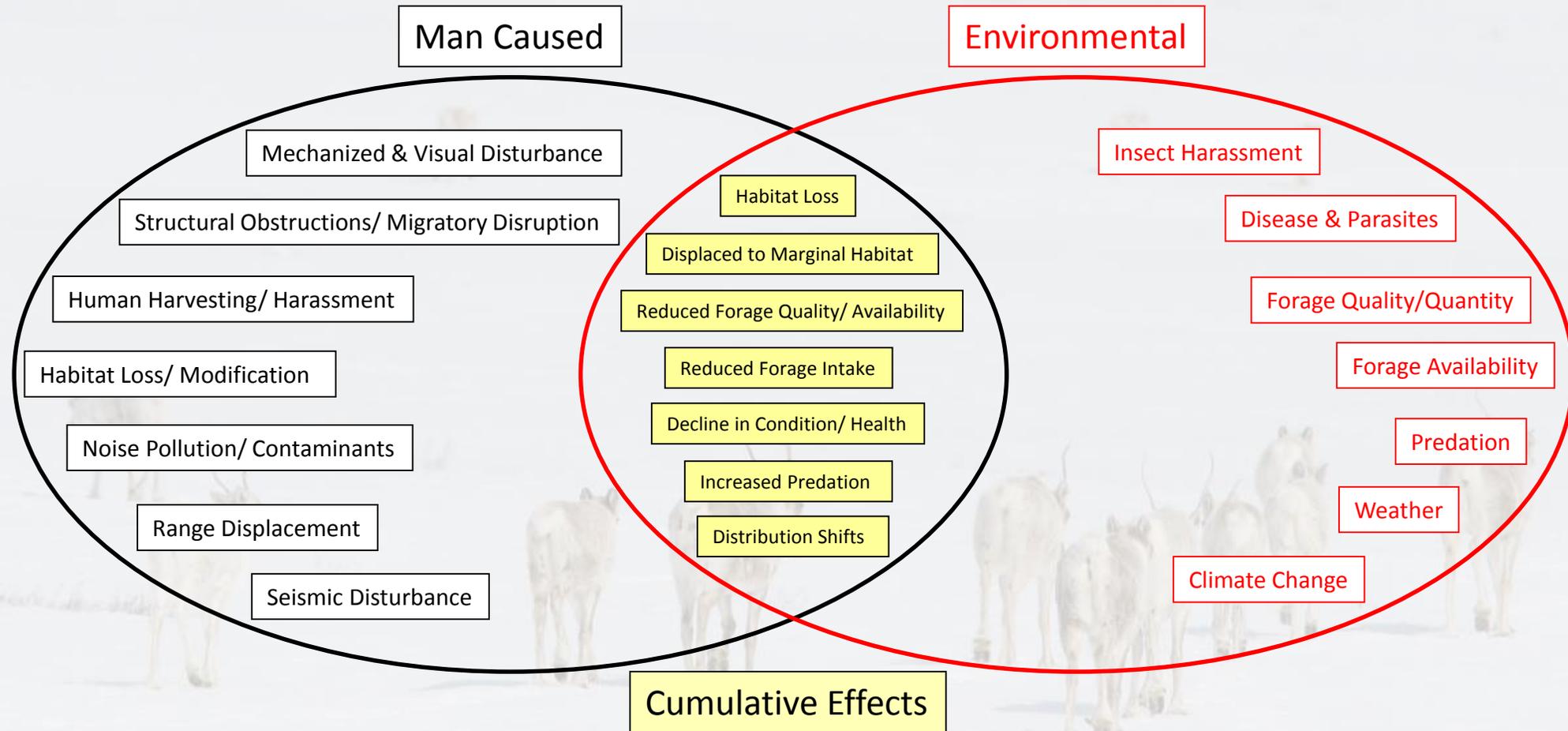
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Why Manage Disturbance on Caribou Range?

- To respect cultural values and traditional practices.
- To maximize subsistence harvesting opportunities.
- To maximize commercial harvesting opportunities.
- To respect subsistence harvesting within other jurisdictions.
- To maintain healthy, abundant caribou populations over the long term.

- Caribou herd productivity and health are impacted by many types of disturbance.
- To maximize caribou herd productivity we have to acknowledge all disturbance factors on the range but only have control over disturbances caused by man.

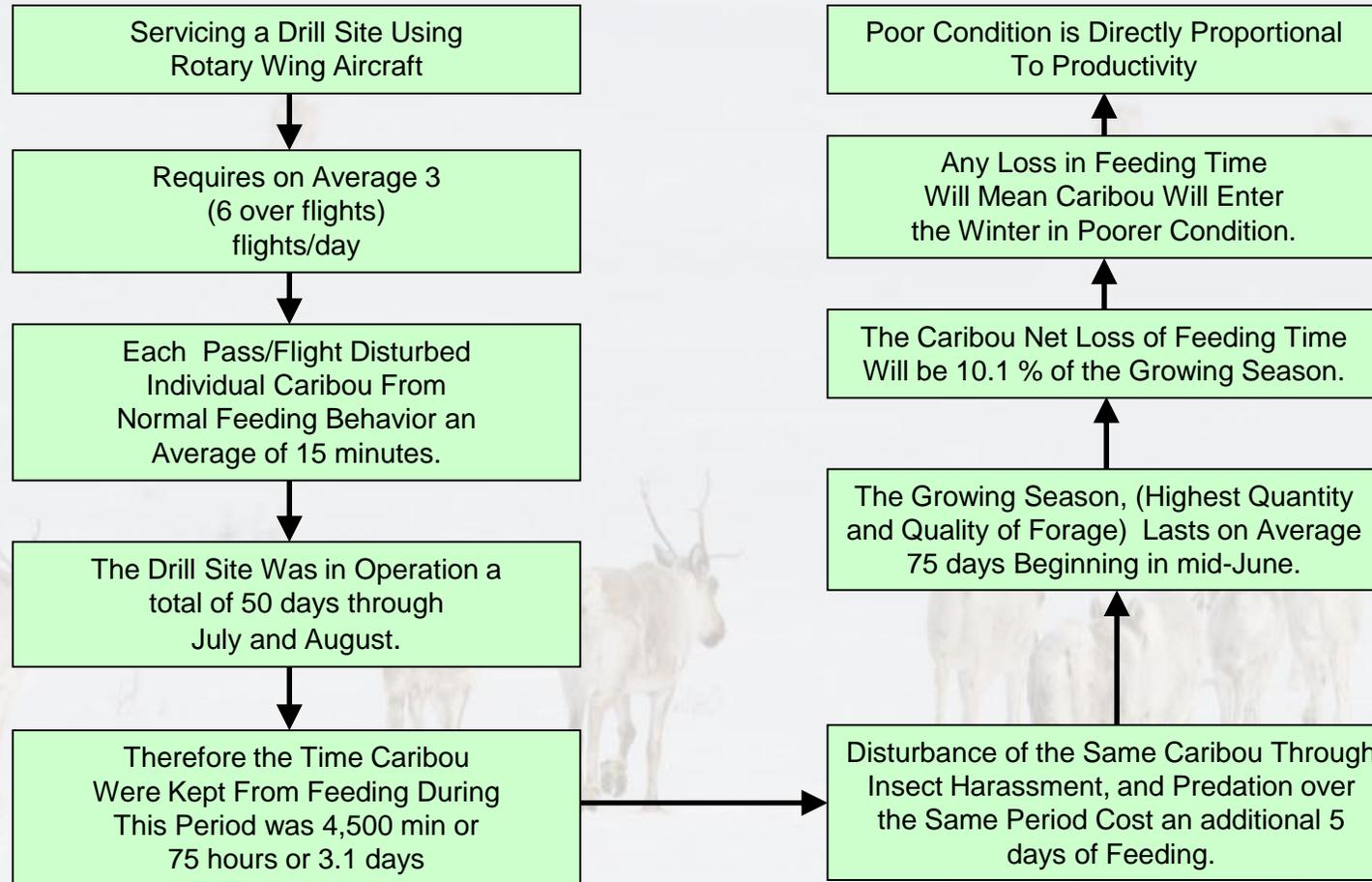


- The only way we can foster recovery of a population is to remove and/or mitigate the disturbances we have control over.

Cumulative Effects

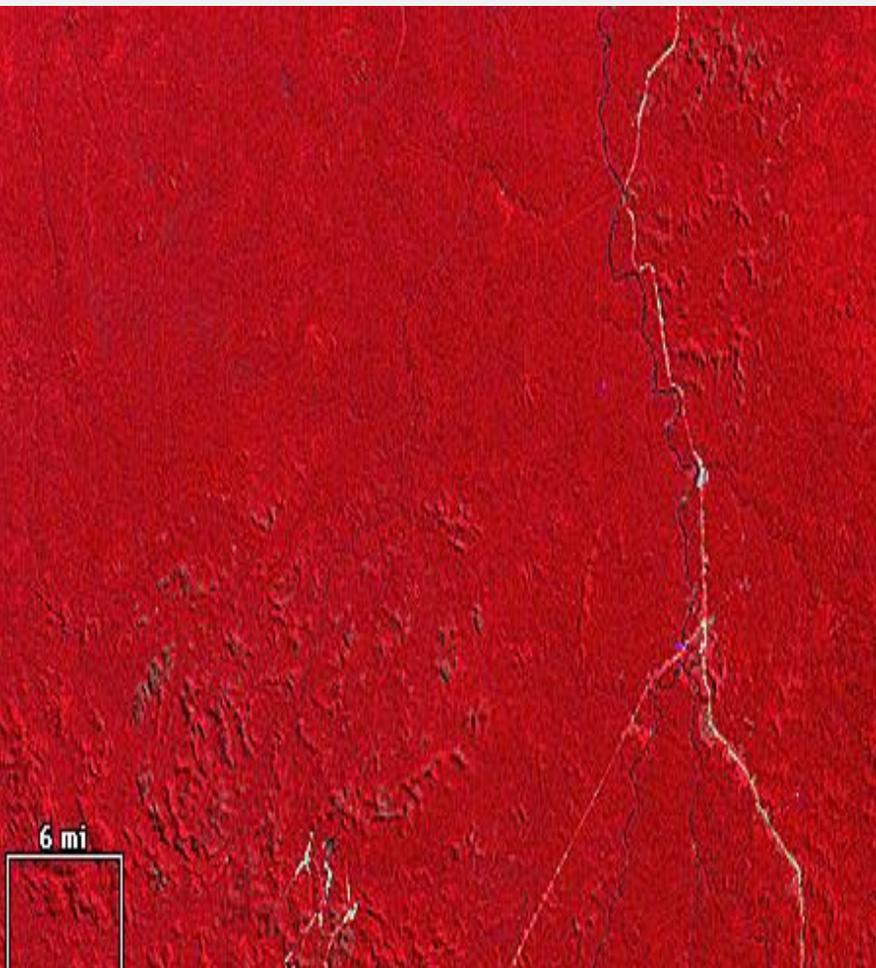
- Are a number of disturbances/Stressors that when combined have an amplified effect.
- Stress is known to negatively impact the health and life span of mammals.
- The only treatment for stress in wildlife is to remove the possible stressors.
- The only stressors we have control over are those caused by man.
- All forms of disturbance will cause stress in caribou either directly and/or indirectly through environmental modification.

Measuring Disturbance

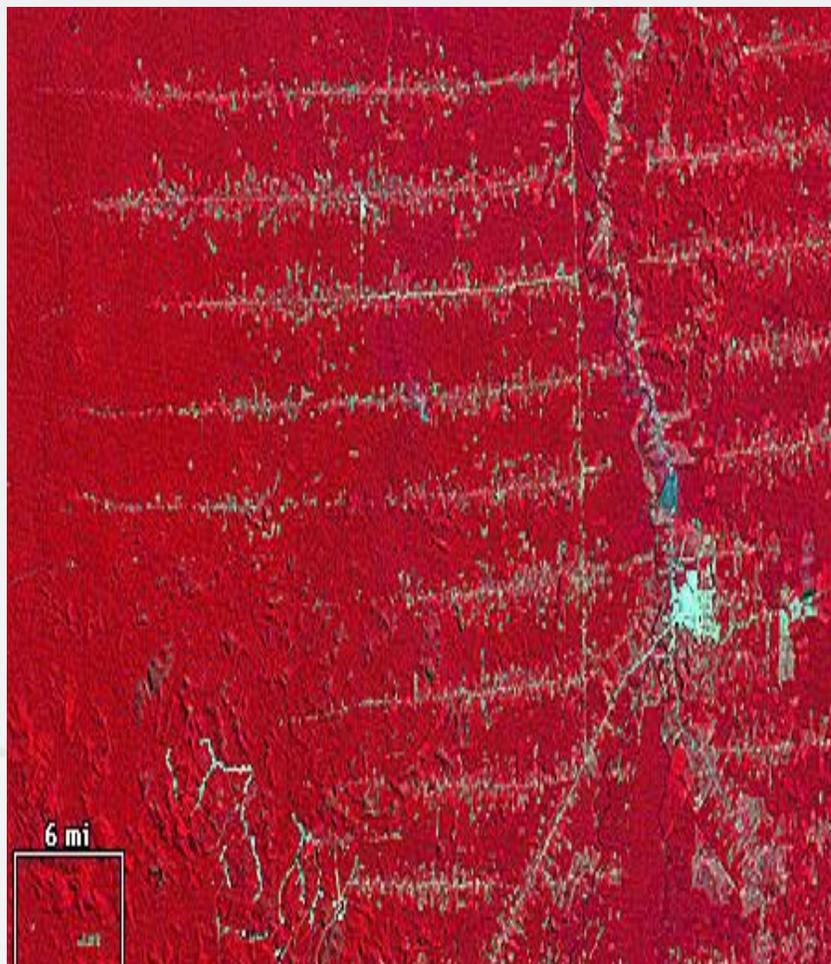


Cumulative Effects

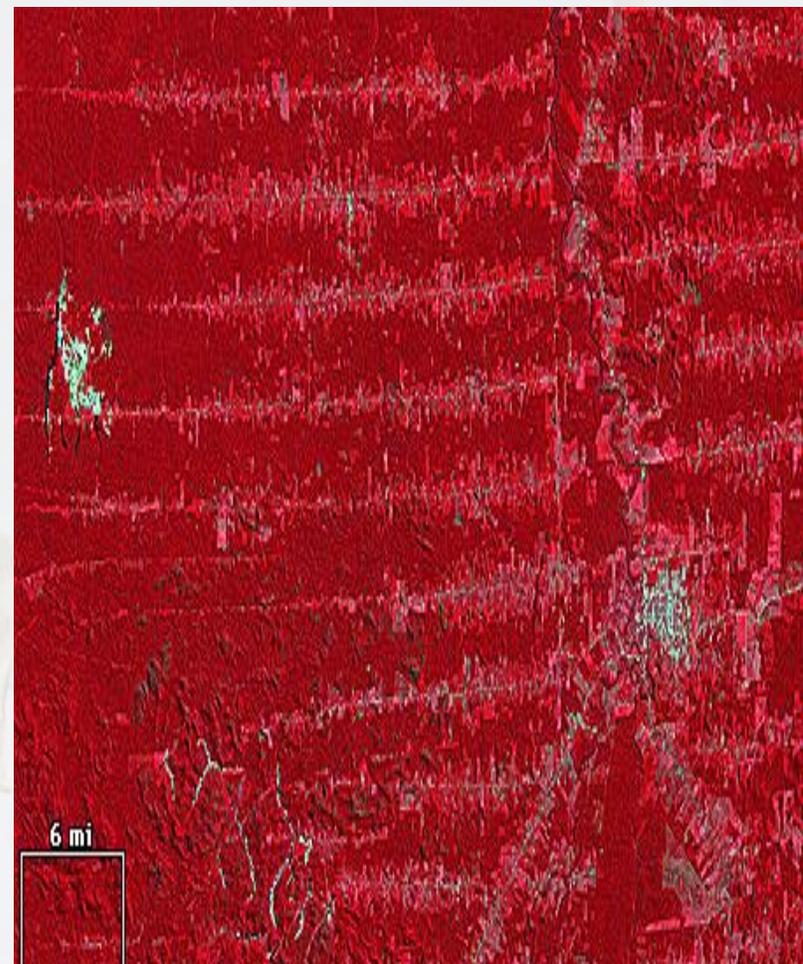
1975



1982



1996



Protected Areas vs Protection Measures

- **Protected Areas:**
 - Protected areas exclude industrial development and associated infrastructure within sensitive seasonal habitat.
 - The effectiveness of protected areas on removing negative disturbance effects on caribou is **100 %**.
 - Cost of research and enforcement is low, well within the capacities of regulatory agencies in Nunavut.
- **Protection measures:**
 - Allow industrial development and associated infrastructure within sensitive habitats then attempt to minimize associated disturbance.
 - Protection measures cannot stop all disturbance effects so there will always be a negative impact on caribou, the degree to which will be dependant on the development and seasonal sensitivities.
 - The effectiveness of protection measures on reducing negative effects of development is largely unknown, especially regarding mining in calving grounds.
 - Cost of research and enforcement is high, well beyond the capacities of regulatory agencies in Nunavut.

The Reality of Protection Measures

- Protection measures generally utilize a series of recommendations designed to reduce encounters with caribou and/or reduce disturbance to caribou.
- The fundamental flaw with this approach is that the infrastructure, activities, and habitat modification caused by development, will still negatively impact caribou.
- The tools used by industry to assess potential wildlife encounters/disturbance often cause disturbance themselves.
- Infrastructure and associated habitat modification can evoke an avoidance response even during operational shutdowns.
- Protection measures utilized for aircraft are only as effective as the weather is predictable often requiring operation well below threshold altitudes for days or weeks at a time.
- Protection measures require effective enforcement to insure compliance.
- In Nunavut there are no organizations either individually or combined with the financial and/or human resources necessary to effectively monitor compliance to protection measures.
- We currently are data deficient on the effectiveness of protection measures. Many of these measures could be ineffective and offer little to no protection to caribou.

Summary

- Many of Nunavut's caribou subpopulations/populations are a shared responsibility. How we manage caribou in Nunavut will impact subsistence harvesters from other jurisdictions.
- All mainland barren-ground caribou populations are either in steep decline or unknown, suggesting low resilience and high vulnerability.
- Sensitivities of caribou to disturbance varies throughout their annual cycle and is strongly correlated to their resilience and/or vulnerability.
- Commercial development on caribou range will cause disturbance that will negatively impact caribou health, abundance and spatial distribution.
- Of the many disturbance events caribou can be exposed to, we can only have influence over those caused by man.
- Complete protection of seasonally sensitive caribou range is 100% effective, requiring few resources to monitor and enforce.
- All agencies with the responsibility to monitor protection measure compliance across Nunavut lack the financial and human resources necessary to ensure compliance.
- Effectiveness of protection measures is largely assumed. Due to data deficiencies there is considerable debate over the effectiveness of any protection measures proposed for seasonal range, particularly calving and post calving.
- The resource is simply too important to utilize trial and error as a means of protecting caribou.