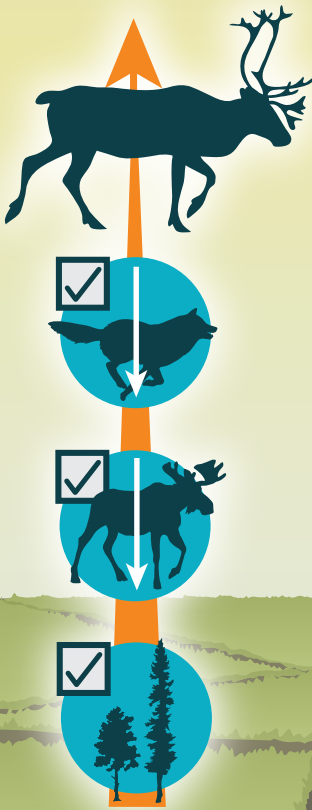




WHEN IS CARIBOU HABITAT RECOVERED?

LINKING MONITORING INDICATORS TO MECHANISMS OF POPULATION DECLINE



Habitat recovery is a core objective for conserving boreal caribou and other species threatened by habitat loss. Yet, determining when a species' habitat is sufficiently recovered can be difficult.

Researchers recently proposed a series of indicators linked to known mechanisms of decline in caribou populations, creating a framework that ensures habitat recovery leads to caribou population recovery.

Currently, the amount of disturbance in a range is the core measure of caribou habitat recovery. However, a simple focus on disturbances levels may not capture the complexity of caribou habitat recovery,

This study creates a **continuous series of indicators to reveal trends towards caribou habitat recovery** in a region, with each indicator associated with a mechanism that causes caribou decline.

The suggested approach focuses on two primary types of disturbances, and linked these disturbances to two primary mechanisms of caribou population decline:

DISTURBANCES

POLYGONAL



Harvest blocks, fires, and well pads

LINEAR



Legacy linear features

MECHANISMS

DISTURBANCE MEDIATED APPARENT COMPETITION



Disturbances transform mature, conifer-dominated forests into younger stands rich in leafy browse. These areas, **increase moose and deer numbers who feed on the leafy forage, which in turn draw predators.**

ALTERED PREDATOR BEHAVIOUR



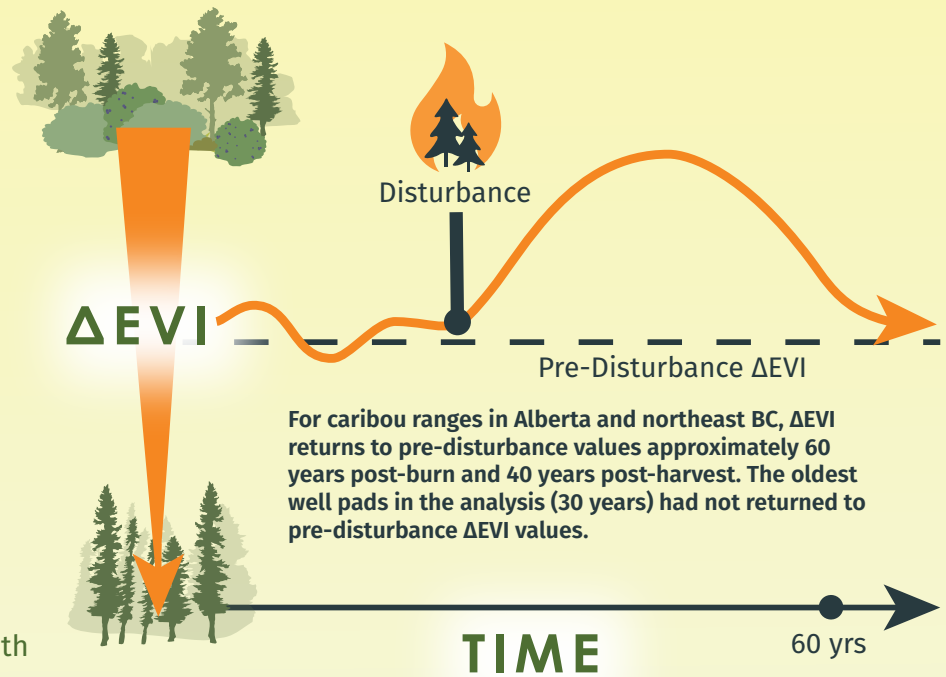
Increased linear disturbance **increases wolf access** to previously inaccessible caribou habitat and increases movement speed and efficiency.

DISTURBANCE MEDIATED APPARENT COMPETITION

Populations of deer and moose, and their predators, should decline as forage production decreases. Thus, an indicator of habitat recovery for caribou is when forage production for apparent competitors returns to pre-disturbance levels.

Using remote sensing, this index can be assessed by the yearly change in the **Enhanced Vegetation Index (ΔEVI)**, which effectively captures changes in browse vegetation and has been positively linked to moose and deer densities.

By estimating when ΔEVI returns to pre-disturbance levels, habitat recovery time can be predicted at both the site and range scales.



ALTERED PREDATOR BEHAVIOUR

Indicators of linear disturbance habitat recovery should measure predator use and movement speed. Recovery is reached once these indicator values match those found in mature forests.

This study proposes two main indicators of altered predator movement:

MEASUREMENTS OF BOTH ΔEVI AND VEGETATION HEIGHT CAN BE MADE USING REMOTE SENSING AND SATELLITE IMAGERY.



INDICATOR 1)

When vegetation reaches an average height of 0.5m, wolf speed declines sharply.



INDICATOR 2)

Average vegetation height is greater than 4.0m, wolf speed matches their speed in a mature forest.

Slower predators should result in fewer caribou kills. For wolves, fewer kills may result in larger territories and decreased wolf densities.

KEY IMPLICATIONS:

This recovery continuum offers practical indicators that show current habitat conditions and help predict recovery timelines. While most indicators are not yet proven to support self-sustaining caribou populations, they complement the federal recovery strategy by adding multiple lines of evidence to guide conservation decisions. Although monitoring may seem costly, it provides valuable, ongoing feedback on restoration effectiveness and represents a minor expense compared to the investment required for large-scale habitat restoration.



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Reference: DeMars et al., 2023. When is habitat recovered? Understanding the mechanisms of population decline to evaluate habitat recovery for boreal caribou. Conservation Science and Practice.