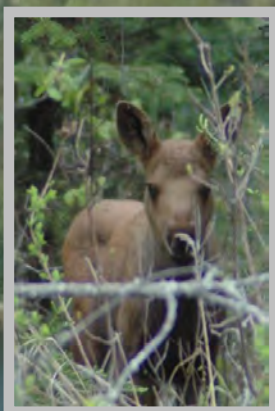


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**Science and Information
in support of
Ontario's Forest
Management Guides
For Landscapes
Science Package – Series B
Results: Landscape
Guide Region 4W**



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Elkie, P., M. Gluck, J. Elliott, G. Hooper, R. Kushneriuk, Rempel, K. Ride, A. Smiegielski, 2019. **Science and Information in support of Ontario's Forest Management Guides for Landscapes: Science Package - Series B: Results: Landscape Guide Region 4W**. Ontario Ministry of Natural Resources and Forestry, Crown Forests and Lands Policy Branch.

The various linked objects and embedded objects are highlighted in blue with context specific descriptions and underlined text.

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1 Overview

This document includes simulation results and tools for target setting and forest management planning that have been submitted and presented to the Forest Management Guide for Landscapes development team and is intended for use by forest management planning teams when considering direction from the Forest Management Guide(s) for Landscapes (hereafter called landscape guides).

The simulated ranges of natural variation (SRNV) are science based ecological estimates of landscape potential with no anthropogenic influence. As part of the landscape guide project, SRNV's were estimated for numerous forest composition and species-specific habitat indicators. The SRNV for a given indicator is generally expressed as the amount (i.e., usually area based) and distribution (i.e., relative landscape pattern).

SRNV for a series of landscape level indicators (i.e., forest composition and habitats) were estimated for the entire area where forest management planning occurs in Ontario. These SRNV's were estimated using stochastic landscape level simulation models. Briefly, these models attempt to emulate landscape level disturbances (i.e., fire, insect and weather events), succession and post disturbance transitions. The stochastic nature of the models (i.e., random fire starts from simulated lightning strikes) means that each time a simulation is completed the result will be unique. The simulation models were run between 10 to 60 times depending on the eco-region in the province. In each eco-region, simulations were run long enough to remove the existing anthropogenic footprint. The area based SRNV are expressed and characterized using box and whisker plots. The plots include a minimum (bottom whisker), maximum (top whisker), the median value, and a box representing the range between the 25th to 75th percentiles. The current value of the indicator is plotted on the box and whisker diagram illustrating the current state of that indicator.

Refer to “**Science and Information in support of Ontario's Forest Management Guides for Landscapes: Science Package – Series A: Simulations, Rationale and Inputs**” for explanations of models, simulations, rationale and inputs.

2 Simulation Results

Simulation results are organized by landscape guide regions (**Figure 1**).

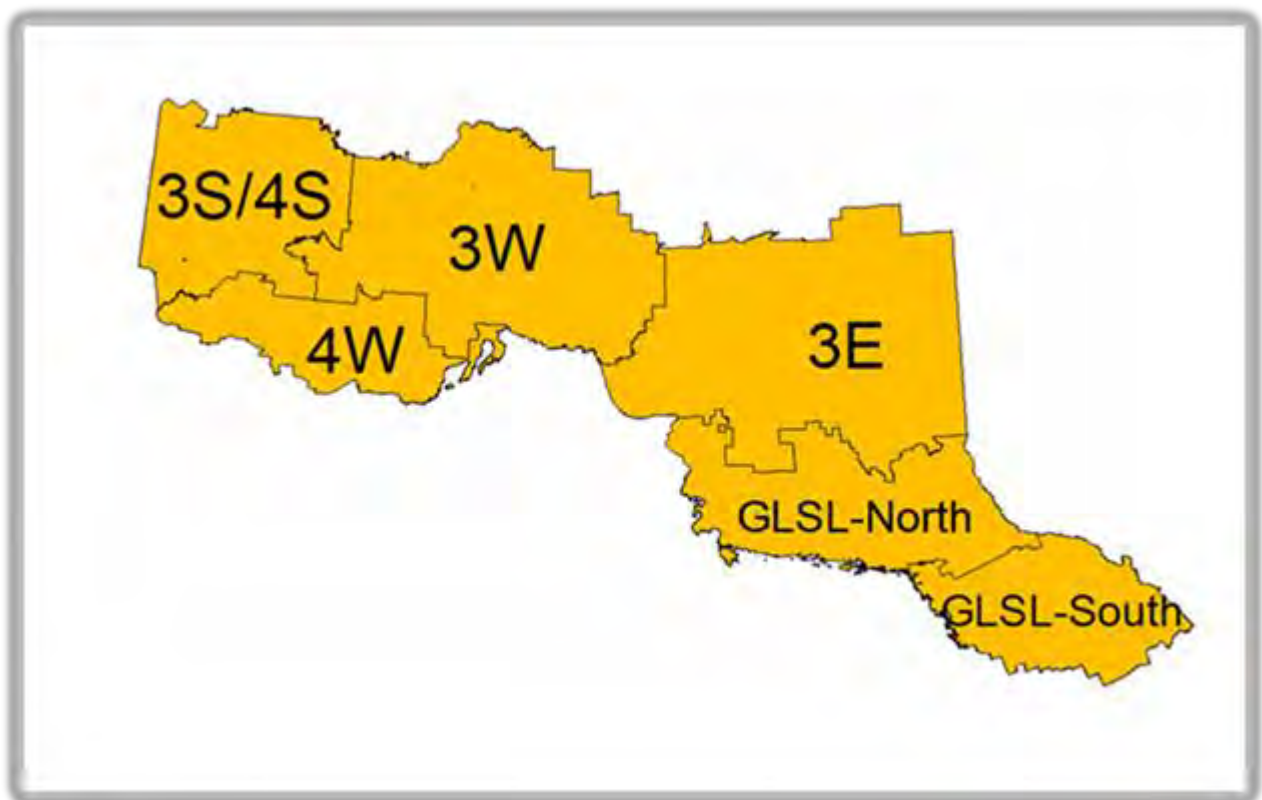


Figure 1 Landscape guide regions. Landscape guide regions approximate ecoregions but are snapped to 2006 forest management unit boundaries. GLSL-North includes eco-region 4E and GLSL-South includes eco-region 5E.

2.1 Special considerations for Landscape Guide Region 4W

Landscape Guide Region 4W is a transition between Boreal and Great Lakes St. Lawrence Forest Regions. However, at the time of running these simulations, BFOLDS was limited to stand replacing fires only (i.e., no surface fires) and no insect disturbances. Surface fires are a significant ecological process required to regenerate red and white pine. Fortunately, as described in the Boreal landscape guide, examination of alternative information sources for natural disturbance and landscape patterns allow us to reconcile estimates of the amount of red and white pine in 4W. Used as milestones in landscape guide appendices, the historic survey work is the best estimate of the natural amounts red and white pine in 4W (examples **Figure 2** and **Figure 3**).

It should be noted that mixing BFOLDS based SRNV and historic-survey derived milestones is a compatible method for direction setting. Red and white pine are included as part of the mature and older upland conifer landscape class indicator. As described in the Boreal landscape guide, forest management planning teams should use professional judgment when applying forest composition guidelines and take into account the contribution of red and white pine forest units to the mature and older upland conifer landscape class.

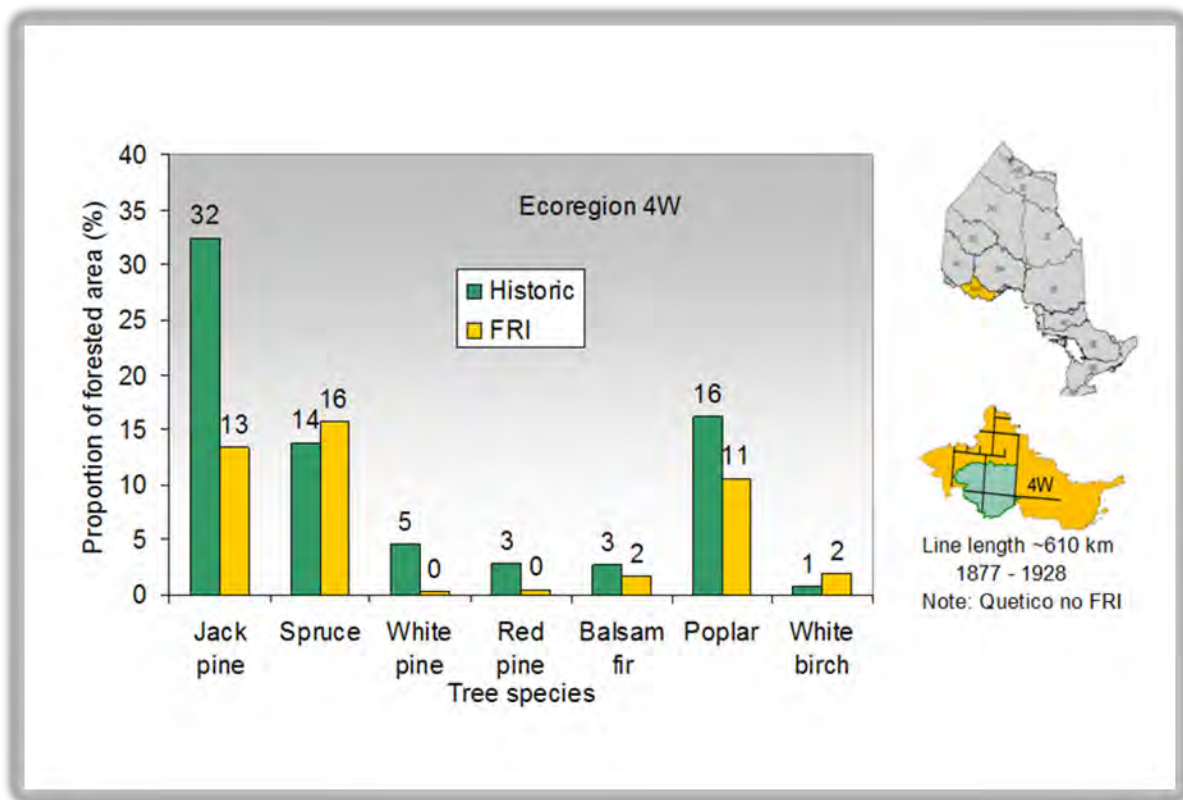


Figure 2 The proportion of forested area in jack pine, spruce, white pine, red pine, balsam fir, poplar and white birch as pure stands ($\geq 90\%$ of species) in ecoregion 4W from historic survey notes (circa. 1870-1910) compared to current forest resource inventory (FRI).

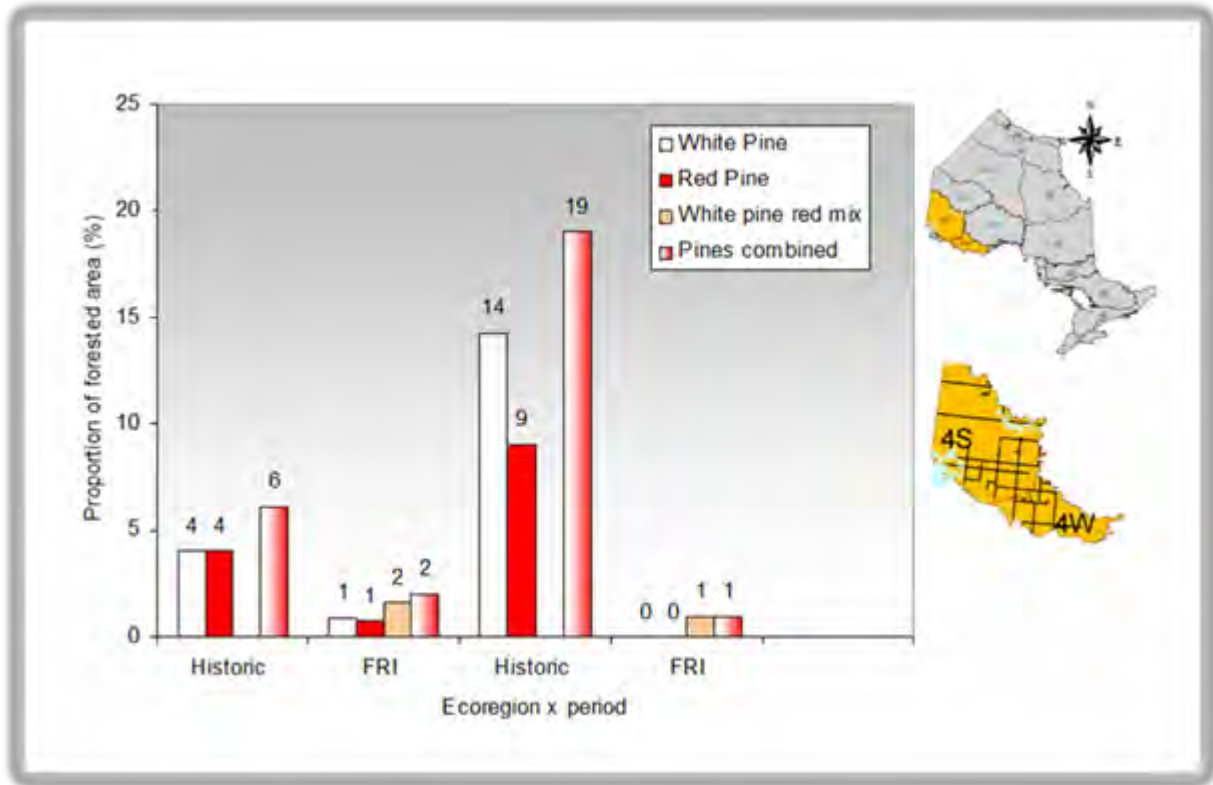


Figure 3 The proportion of forested area in stands dominated with red and or white pine in ecoregion 4W from historic survey notes (circa. 1870-1910) compared to current forest resource inventory (FRI).

2.2 Simulation surfaces

2.2.1 Example animation simulation

The attached example includes a 100-year BFOLDS simulation in Landscape Guide Region 4W. Many simulations were used in estimating the simulated range(s) of natural variation and the example is for illustrative purposes.

Example Simulation Animation

2.2.2 Disturbance return interval surfaces

We created surfaces depicting the mean stand replacing disturbance return interval. The main disturbance type that caused stand replacement was crown fires. In the GLSL forest, surface fire, wind and spruce budworm mortality also caused occasional stand replacement (see Elkie *et al.* 2013 for a full explanation of disturbance types simulated). These surfaces were created by estimating the time, during the simulation measurement sampling period (i.e., 400-500 years GLSL North, 900-1000 years GLSL South and 100-200 years all boreal regions), that a given tessellated polygon (GLSL) or pixel (Boreal) was below the age of 20.

Crown Fire Return Interval Surface

2.2.3 Forest unit occurrence surfaces

In the boreal landscape guide regions, we created surfaces depicting the mean number of times a forest unit occupied a pixel. These surfaces provide an estimate of both relative occurrence and distribution of each **forest unit**.

Forest Unit	Description
Bfdom	Balsam fir dominated
Bwdom	White birch dominated
Conmx	Conifer mixedwood
Hrdmx	Hardwood mixedwood
Hrdom	Hardwood dominated
Pjdom	Jack pine dominated
Pjmx1	Jack pine mixed conifer
Podom	Poplar dominated
Sbdom	Black spruce dominated
Sbmx1	Black spruce mixed

2.3 Prescriptive Indicators

We estimated area-based simulation ranges of natural variation (SRNV) for each prescriptive indicator and pattern based SRNV for several prescriptive indicators.

Forest unit by development stage and landscape classes

Old growth and Mature and old

Conifer

Young forest

2.4 Evaluative Indicators

We also estimated area based SRNV for each evaluative indicator.

Indicator results

Lynx

Northern Flying Squirrel

Snowshoe hare

Boreal songbirds

Marten

Model descriptions

Lynx description

NFS description

Hare description

Songbirds description

Marten description – marten analyst

Marten 2 models