A Spatio-Temporal Modelling Framework for Informing Recovery Planning for Northern Spotted Owl

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Introduction

We have developed a general landscape-level spatio-temporal modelling framework for analyzing resource management and habitat and population problems of the Northern Spotted Owl (*Strix occidentalis caurina*; SPOW), an endangered species in B.C.

The framework includes six integrated spatially explicit modelling components implemented in SELES.

The framework concurrently integrates information about both ecological processes and predicted consequences of forest management activities. It includes methods for:

- trading-off costs and benefits of both economic (e.g., timber supply) and ecological values (e.g., SPOW population response);
- identifying critical habitat;
- designing habitat management options to meet current and future recovery goals.

Photo Credit: Jared Hobbs

Timber Supply Analysis

Assesses harvest flows using a spatially explicit timber supply model (STSM) developed in SELES.

The forest is developed according to growth and yield assumptions used in each management unit (TSA, TFL).

Harvesting rules and constraints are defined spatially and sustainable harvest flows (m^3/year) are estimated for the landbase.

A base scenario is verified to align with TSR results (e.g., FSSIM).

Trade-Off Analysis

This helps decision-makers to identify options with optimal tradeoffs between economic and ecological impacts over time.

Harvest flows are the primary indicator of economic status.

Habitat supply, territory supply, population response are indicators of SPOW status.

Indicators are expressed as the % change from a reference scenario; this enables relative comparisons.

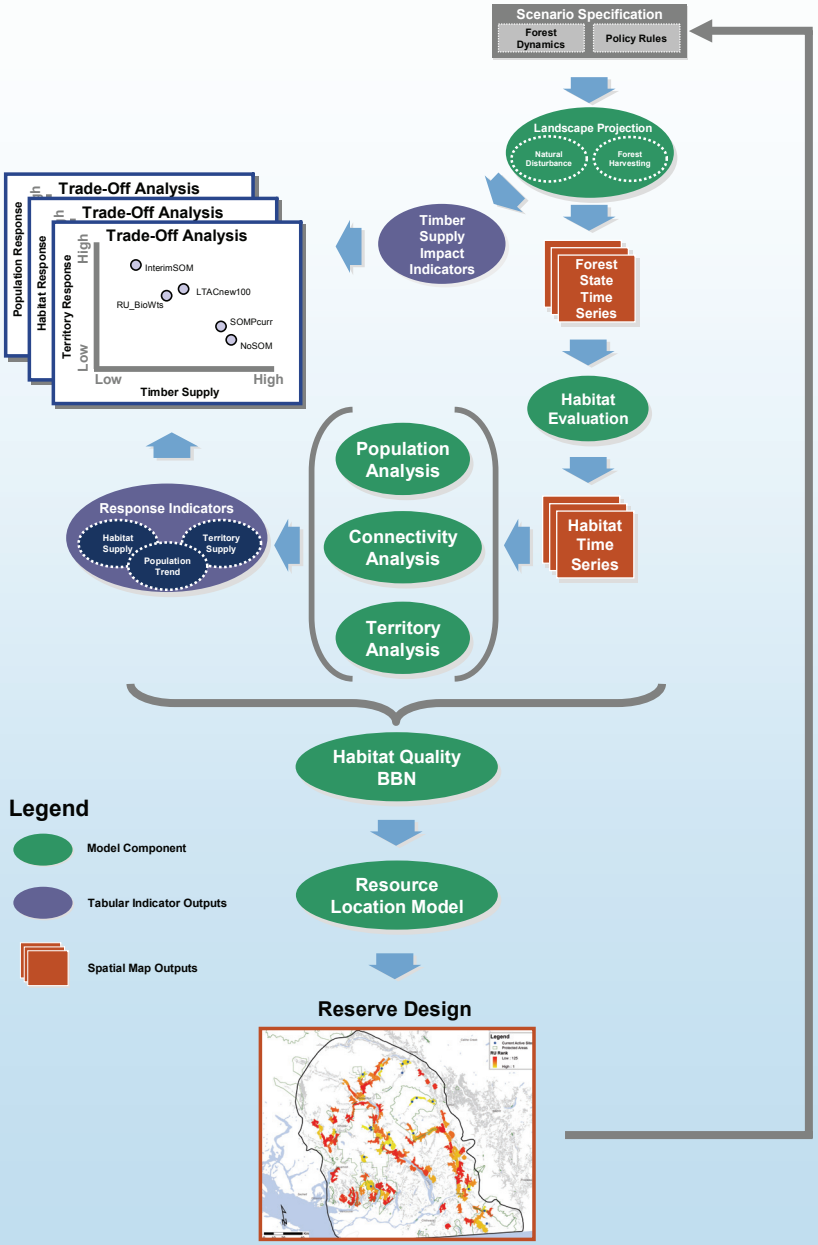
Both short and long-term effects are evaluated.

Reserve Design

Using a habitat quality Bayesian Belief Network (BBN) and a resource location model, potential habitat reserves are identified and ranked based on:

- biological, ecological, and policy-based criteria;
- current and future habitat quality assessed at site, territory and population scales.

Currently suitable and restorable habitat is efficiently allocated to meet short and long-term management goals (e.g., recovery) .



Landscape Projection

The landscape dynamics component combines:

- a spatially explicit timber supply model;
- a stand-replacing natural disturbance model.

Scenarios are defined to represent forest management policy.

Sustainable harvest flows are estimated (i.e. timber supply analysis).

Spatial time-series of forest state indicators (e.g., stand age, height, species, structure) are projected.

Habitat Evaluation

A site-scale habitat classification model for identifying foraging, nesting and movement habitat.

Inputs are the projected spatial time-series of forest state conditions.

Habitat is classified based on biophysical variables representing the influences of climate, topography, vegetation structure and composition.

Population Analysis

A spatially explicit stage-based demography model for testing ecological hypotheses about possible causal factors of population decline.

The model provides estimates of the likelihood that a modelled population could recover to selected target population sizes, and/or persist for long time periods under alternative management scenarios.

Connectivity Analysis

Structural connectivity is assessed using spatially defined landscape graphs.

This is used to identify movement corridors, centres of well connected habitat (current and future), and to assess connectedness and proximity of SPOW territories and management areas.

Territory Analysis

A spatial model for delineating locations of potential territories.

It is used to identify areas where the spatial configuration of habitat meets criteria for supporting a breeding site and territory.

It provides a territory-scale definition of suitable habitat.

For More Information

Sutherland, G.D., D.T. O'Brien, S.A. Fall, F.L. Waterhouse, A.S. Harestad, J. B. Buchanan, 2006. A Framework to Support Landscape Analyses of Habitat Supply and Effects on Populations of Forest-Dwelling Species. BC MOFR Technical Report, *In press.*

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