# Sensitivity of the clustering of harvest parameter in a spatial heuristic algorithm.

The spatial heuristic algorithm is a co-evolutionary cellular automata optimization heuristic developed by Heinonen and Pukkala (2007). The objective function of the model is to maximize the net benefit of achieving constraints related to harvest flow, landcover and spatial clustering of forest values. The first two are considered global constraints within the algorithm while the spatial clustering is a local constraint that leverages the cellular automata framework to incentivize the algorithm to select states similar to their neighbours.

In this test, we focus on the sensitivity of the clustering parameter harvestCluster which is bounded between 0 and 1. As harvestCluster increases it provides greater incentive for cells to choose states that are more like their neighbours. Specifically, the harvestCluster assesses the proportion of neighbours that are harvested each time period and incentivizes a cell to choose a state that results similar harvest scheduling.

### Methods

Initial forest was created as a random gaussian field age class distribution (100 x 100 raster each representing 1 ha cells). Planning horizon = 50 years in 5 year periods. White pixels are age =0 which are “cutblocks”.

A picture containing chart

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Harvest flow between 175000-185000 m3 per 5 years. Minimum harvest volume = 150 m3 per ha. Landcover constraint: 5% of the area to be > 140 years of age. Initial landscape has 8% of the area > 140 years. Through out the planning horizon growing stock > 50% of the initial amount of growing stock.

## Results

The spatial outcomes of the different parameterizations of the algorithm adjusting the harvestClusterWeight parameter and holding the remainder of the parameter’s constant. Panel graphs to be read: top left to bottom right= 5, 10, 15, 20, 25 and 30 years in the future.

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