Timberline
Natural Resource Group

Carbon Optimization in a Mountain Pine Beetle Epidemic

Welches, Oregon
May 6, 2009

- MPB in BC
- Project Overview
- Patchworks
- CBM
- Case Study

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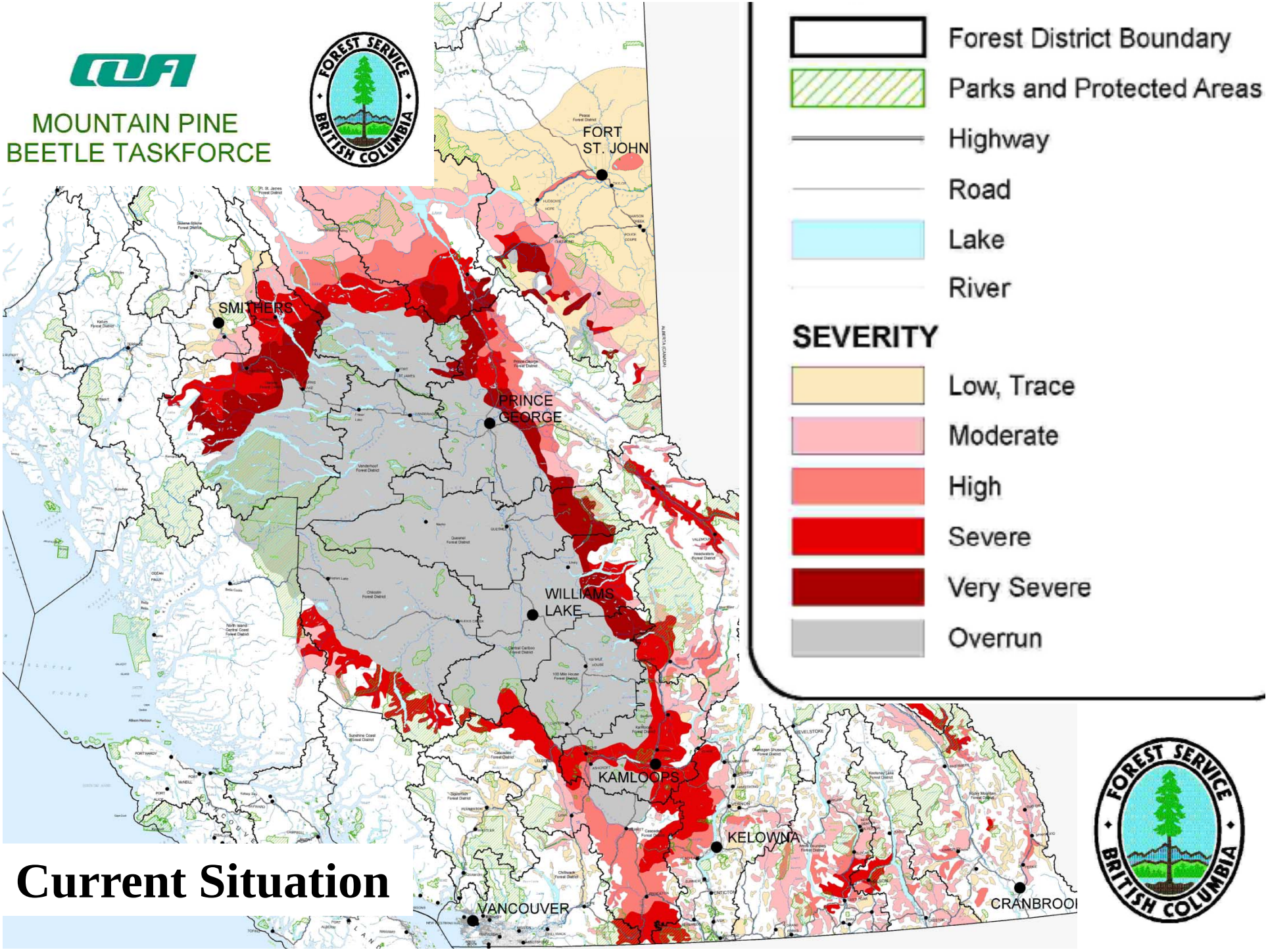
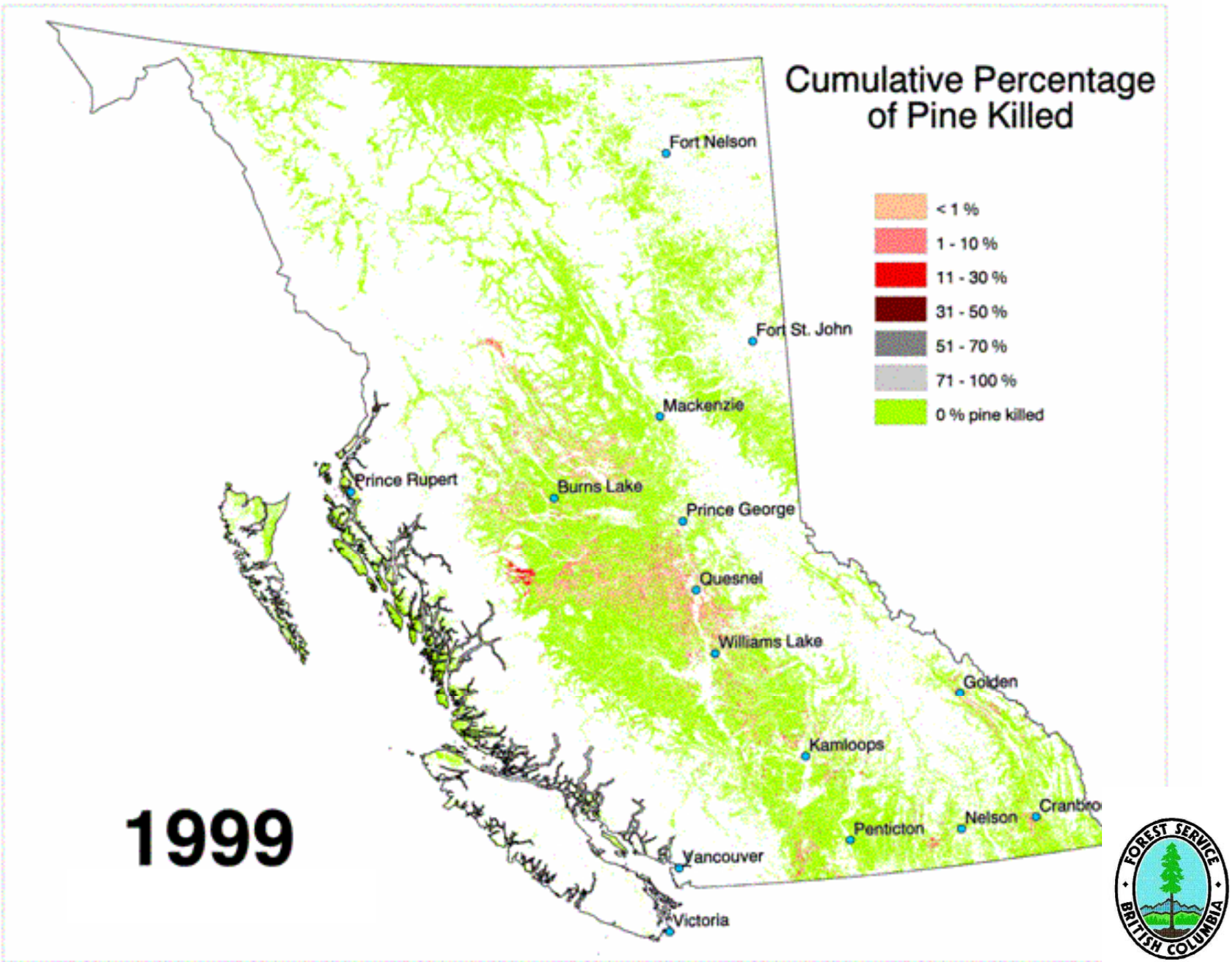
MOUNTAIN PINE
BEETLE TASKFORCE



Current Situation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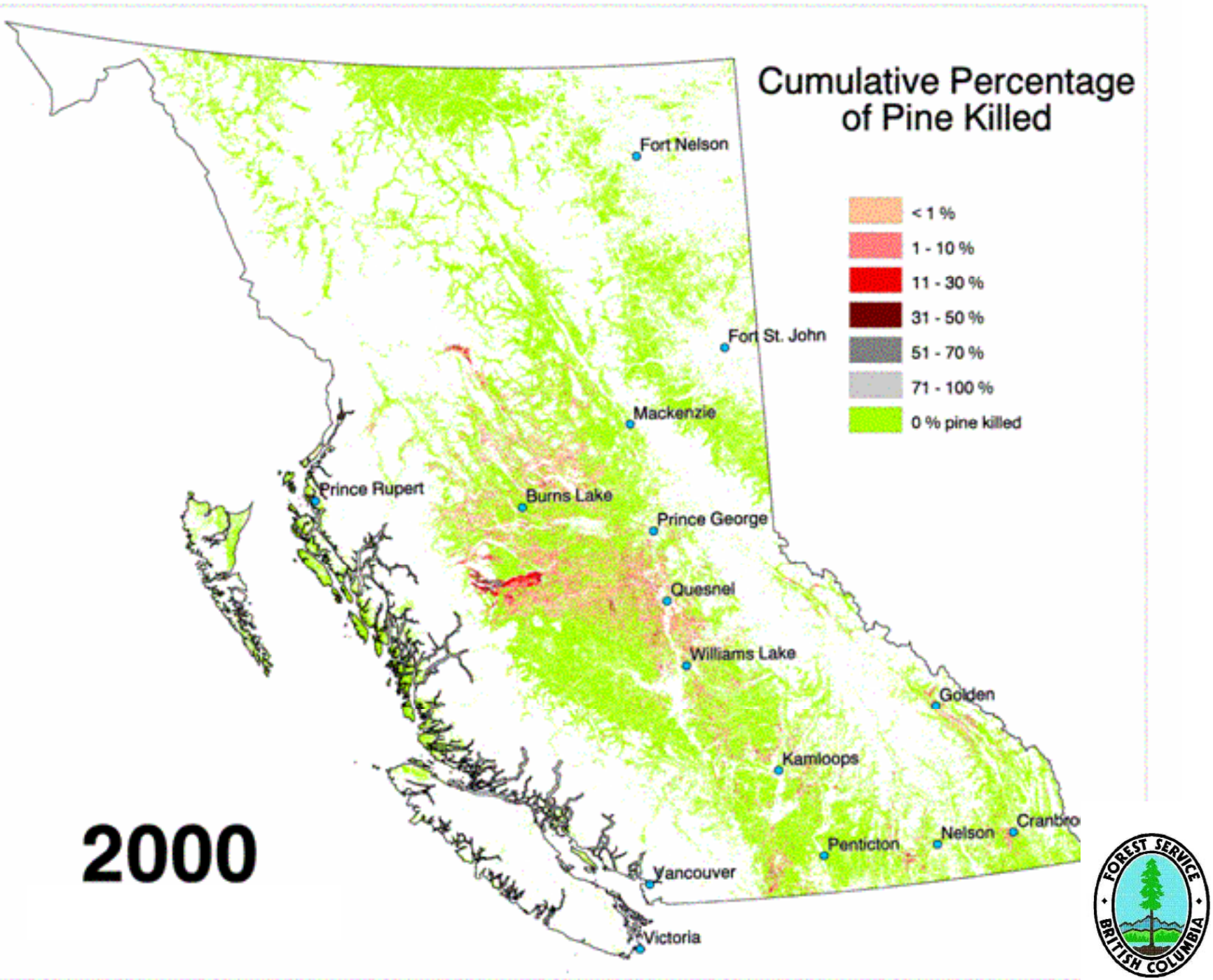
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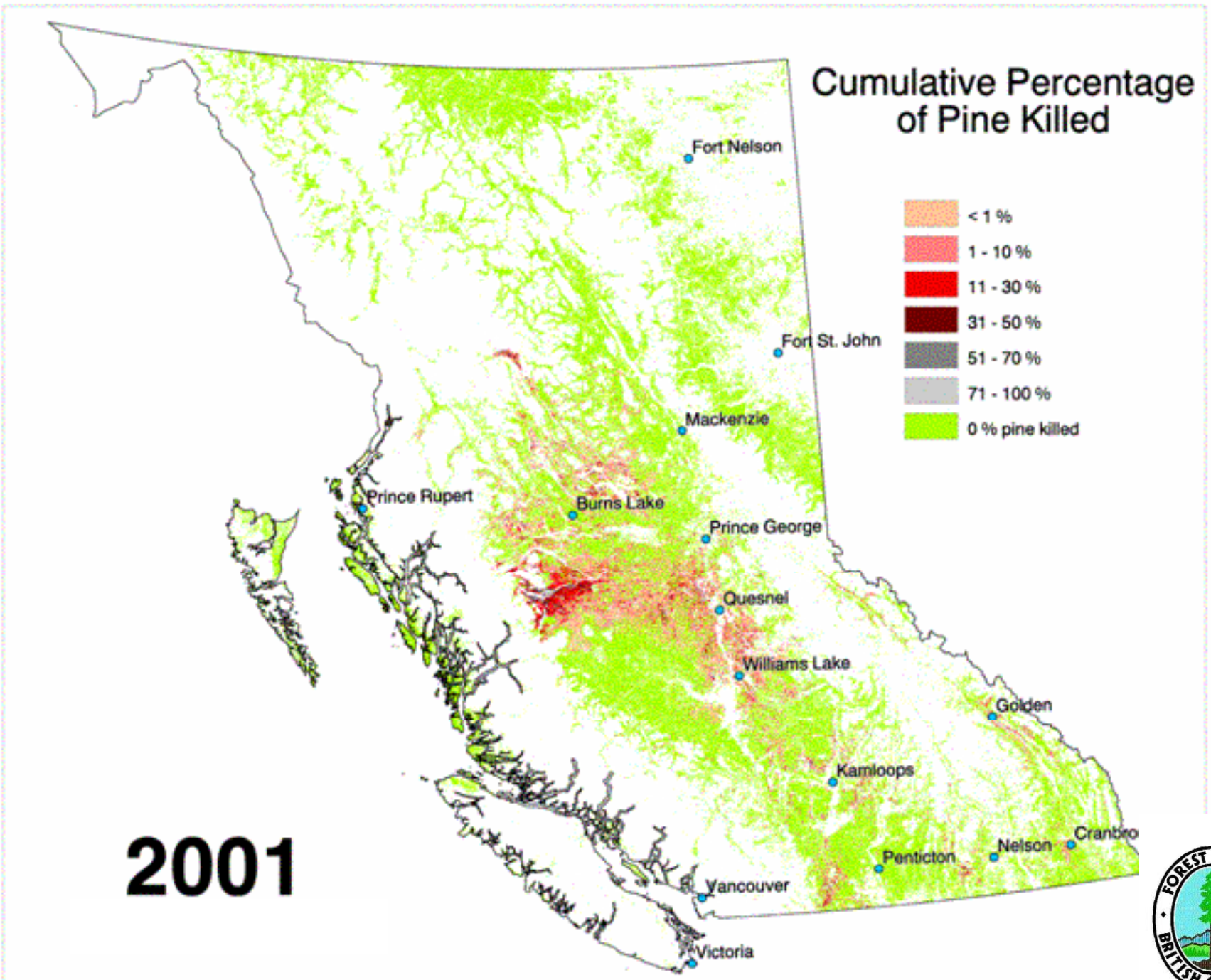
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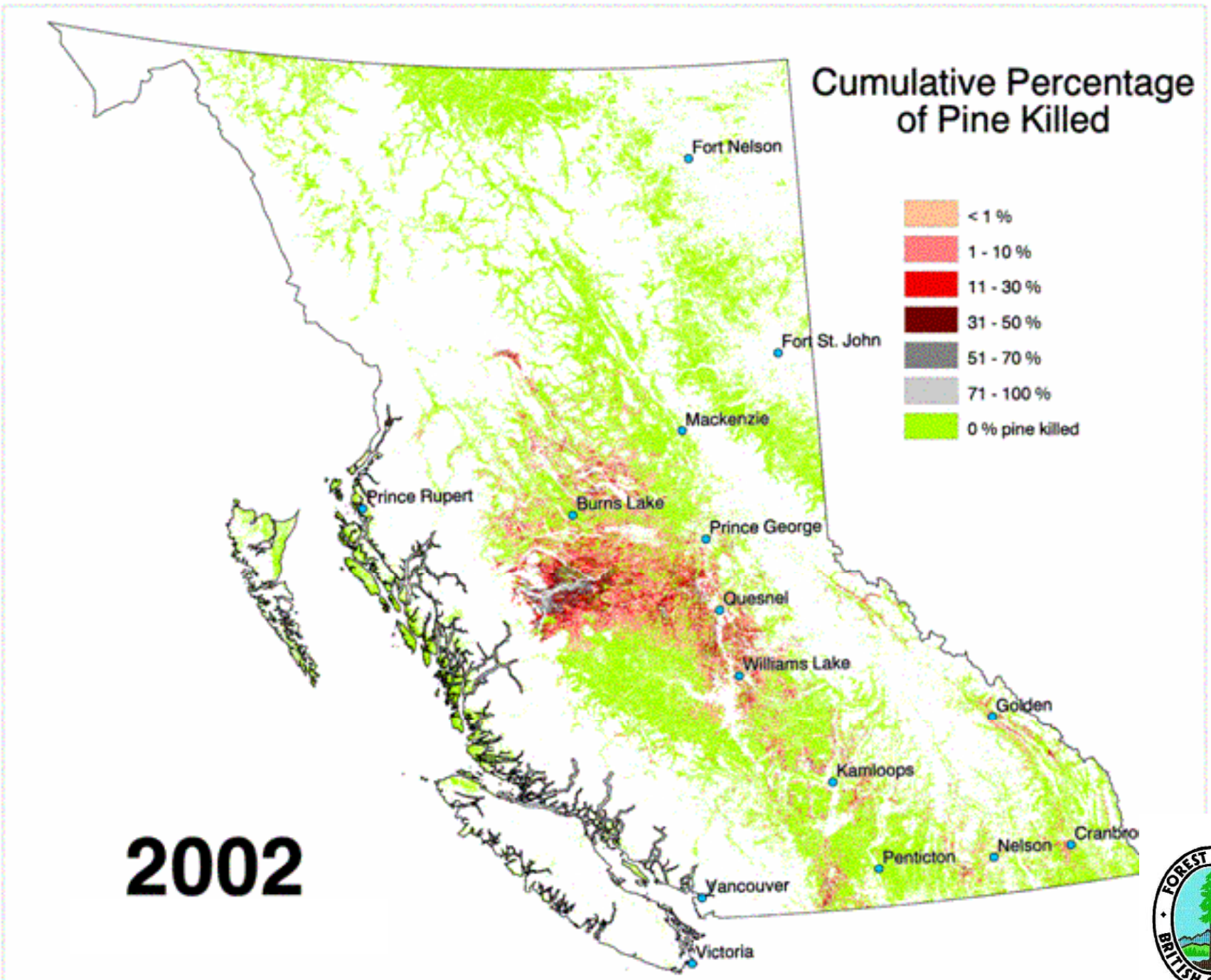
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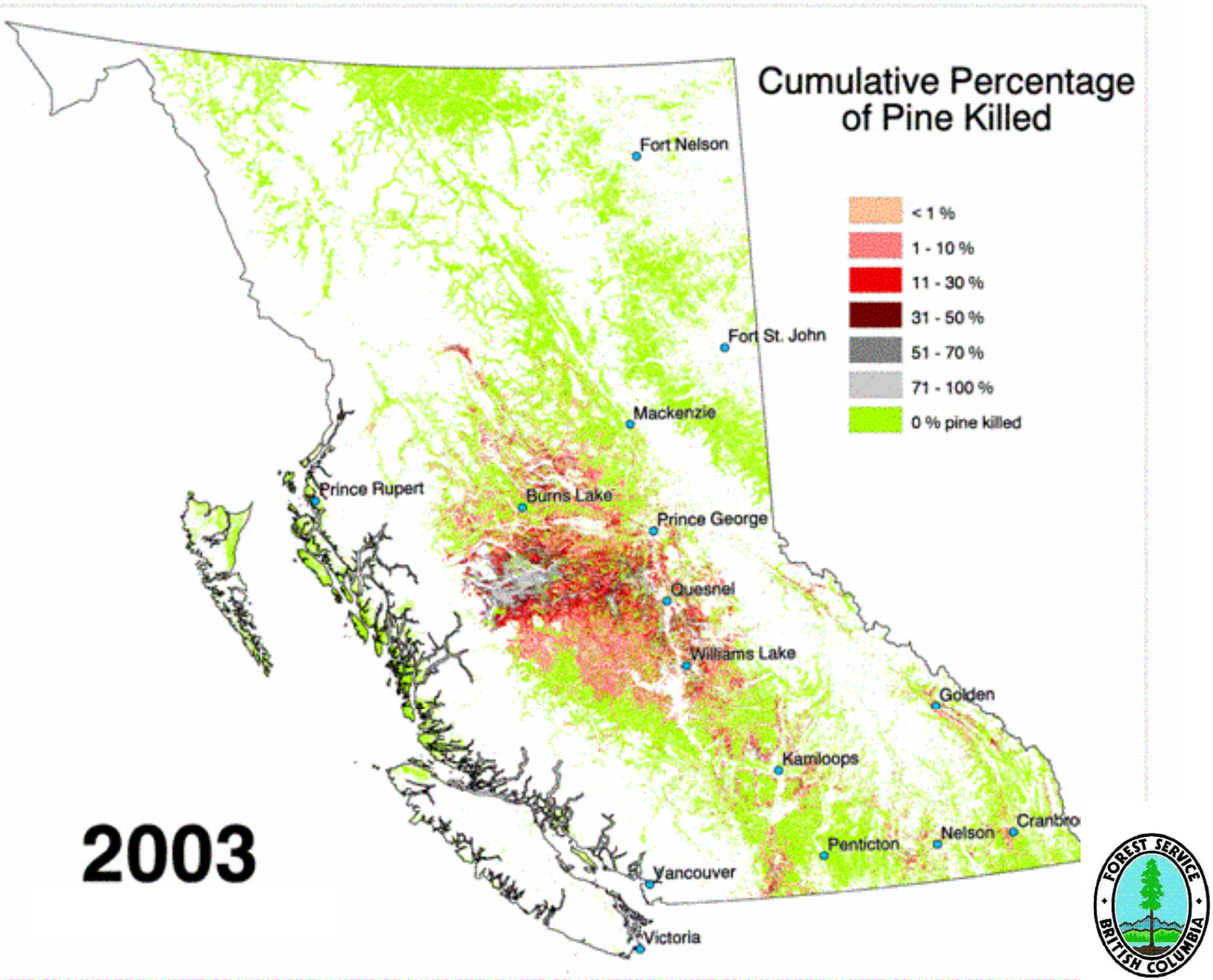
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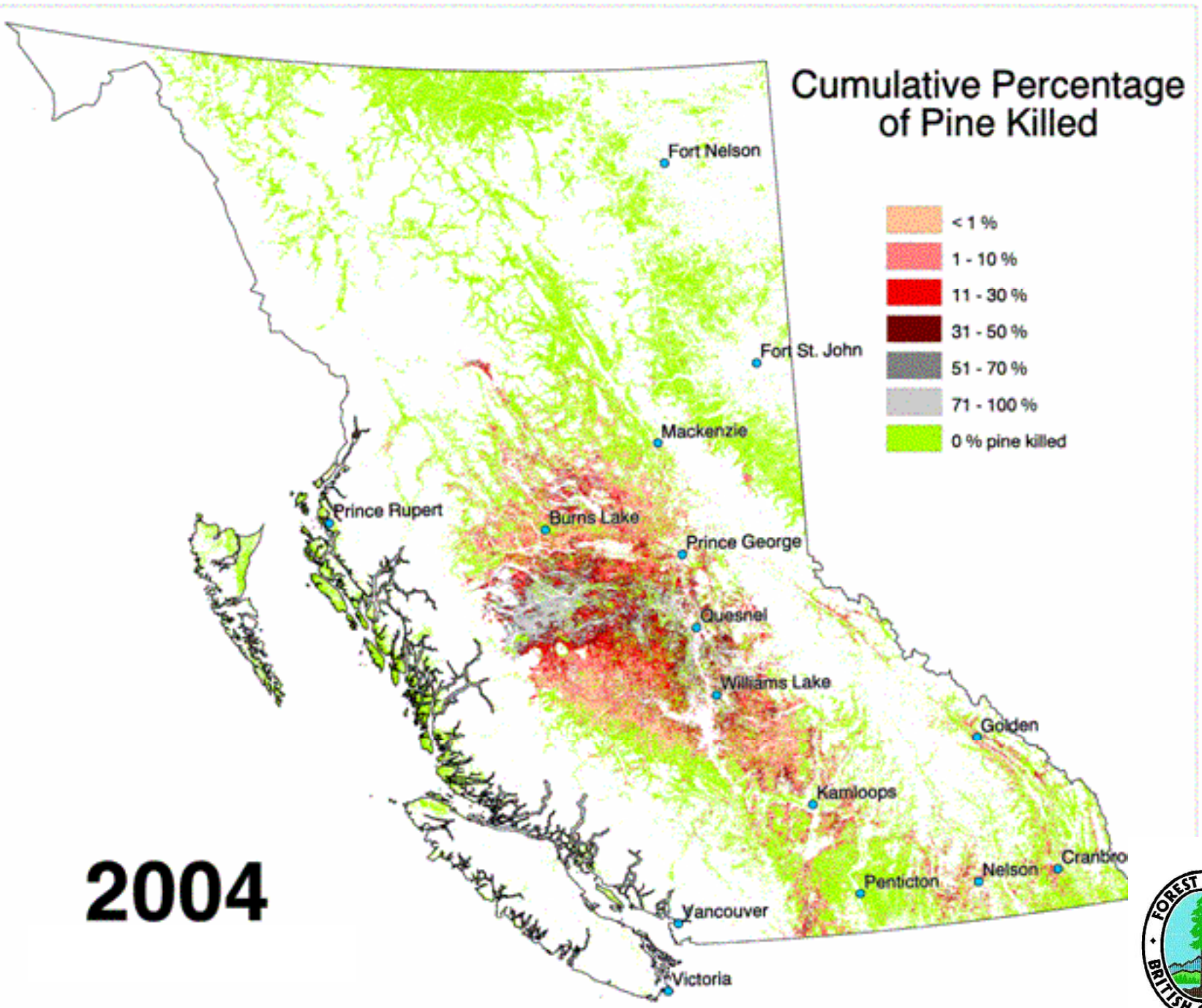
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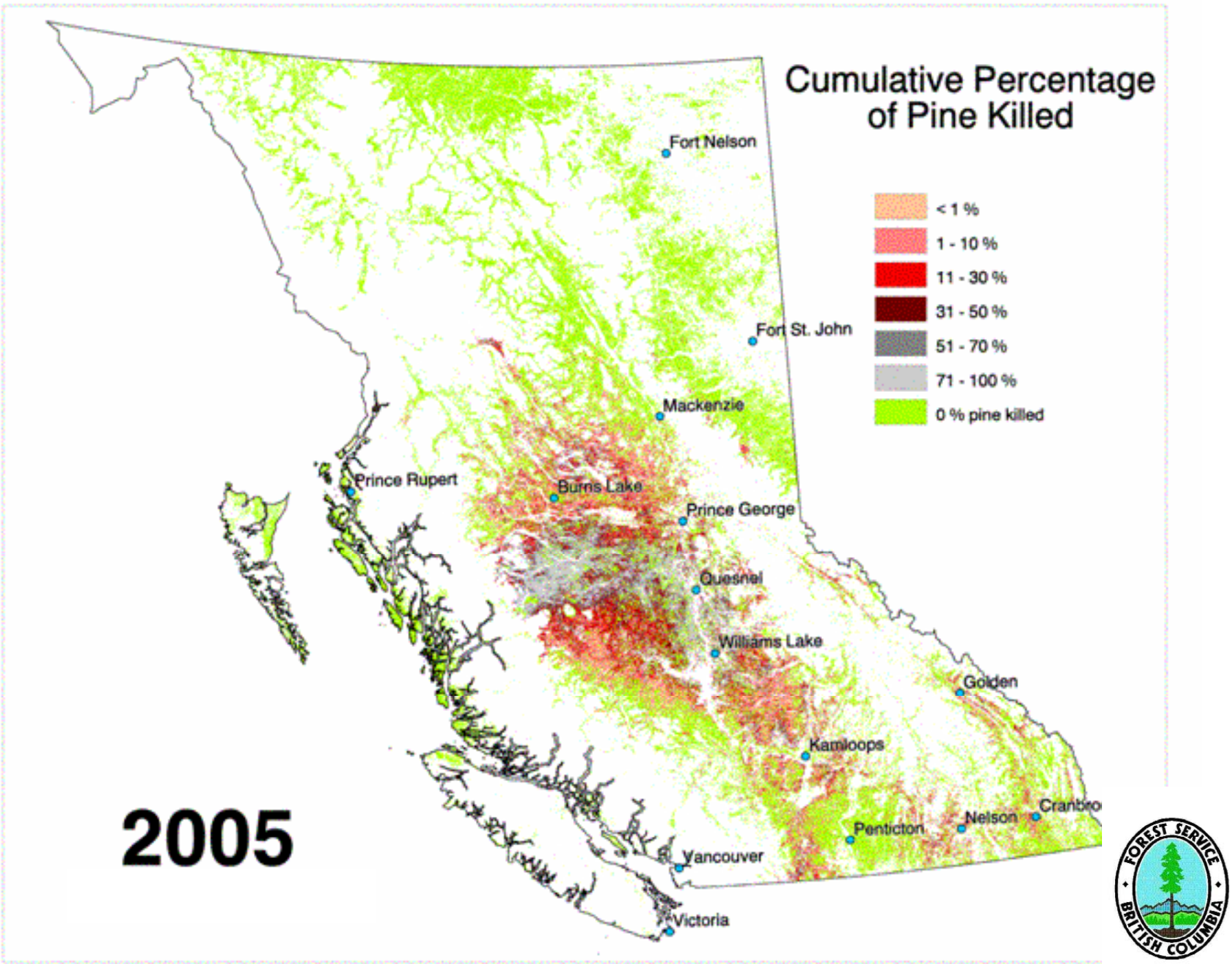
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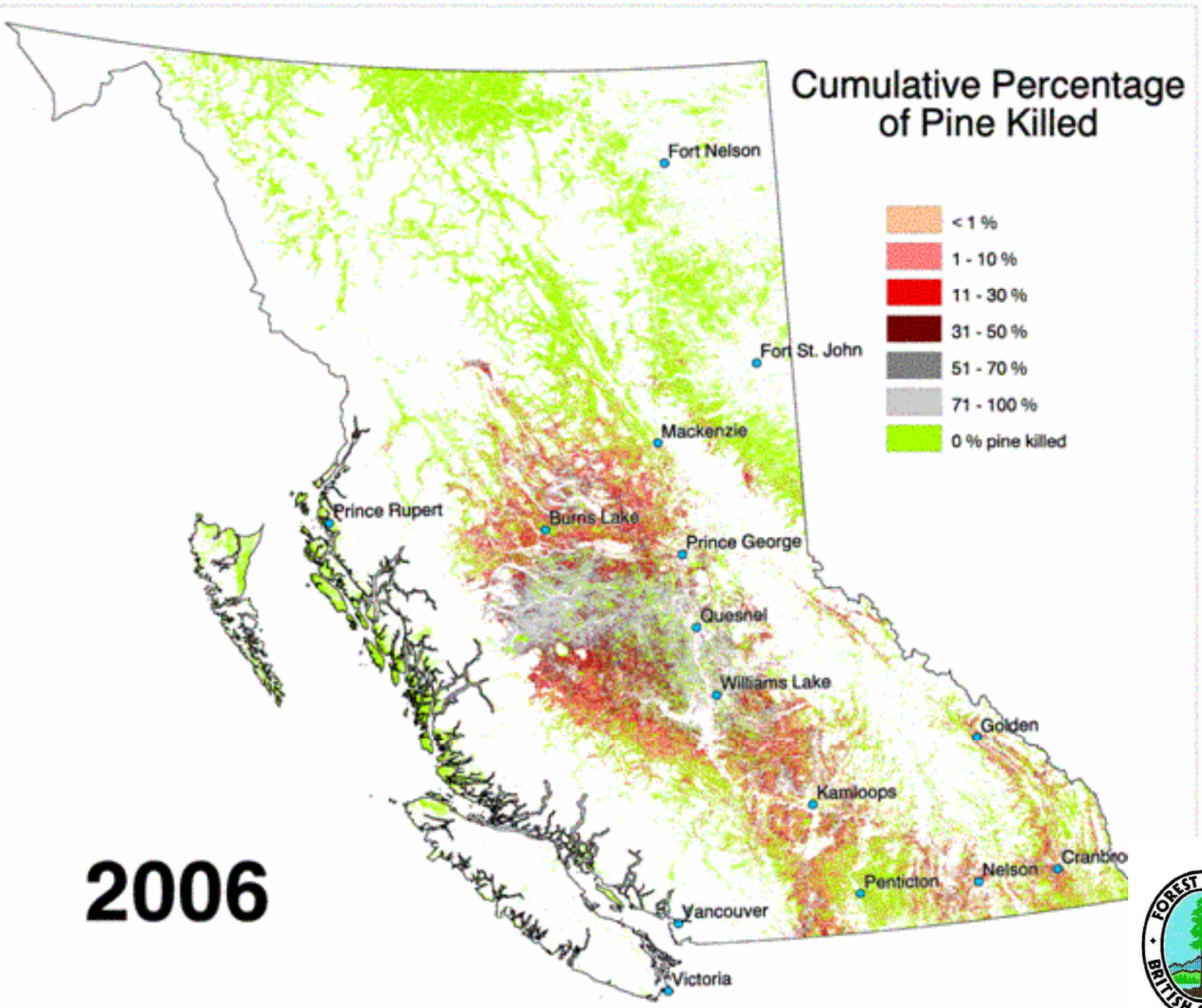
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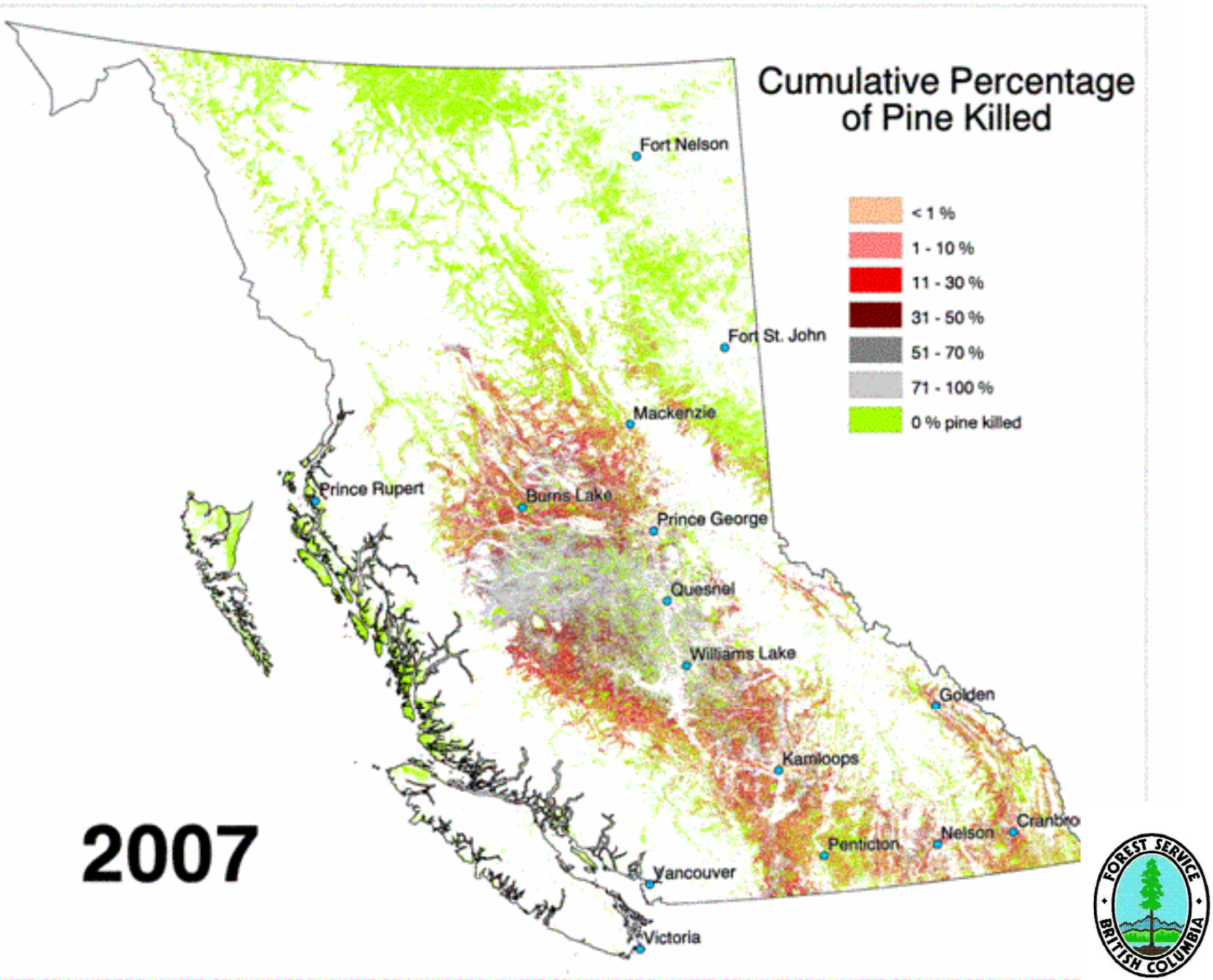
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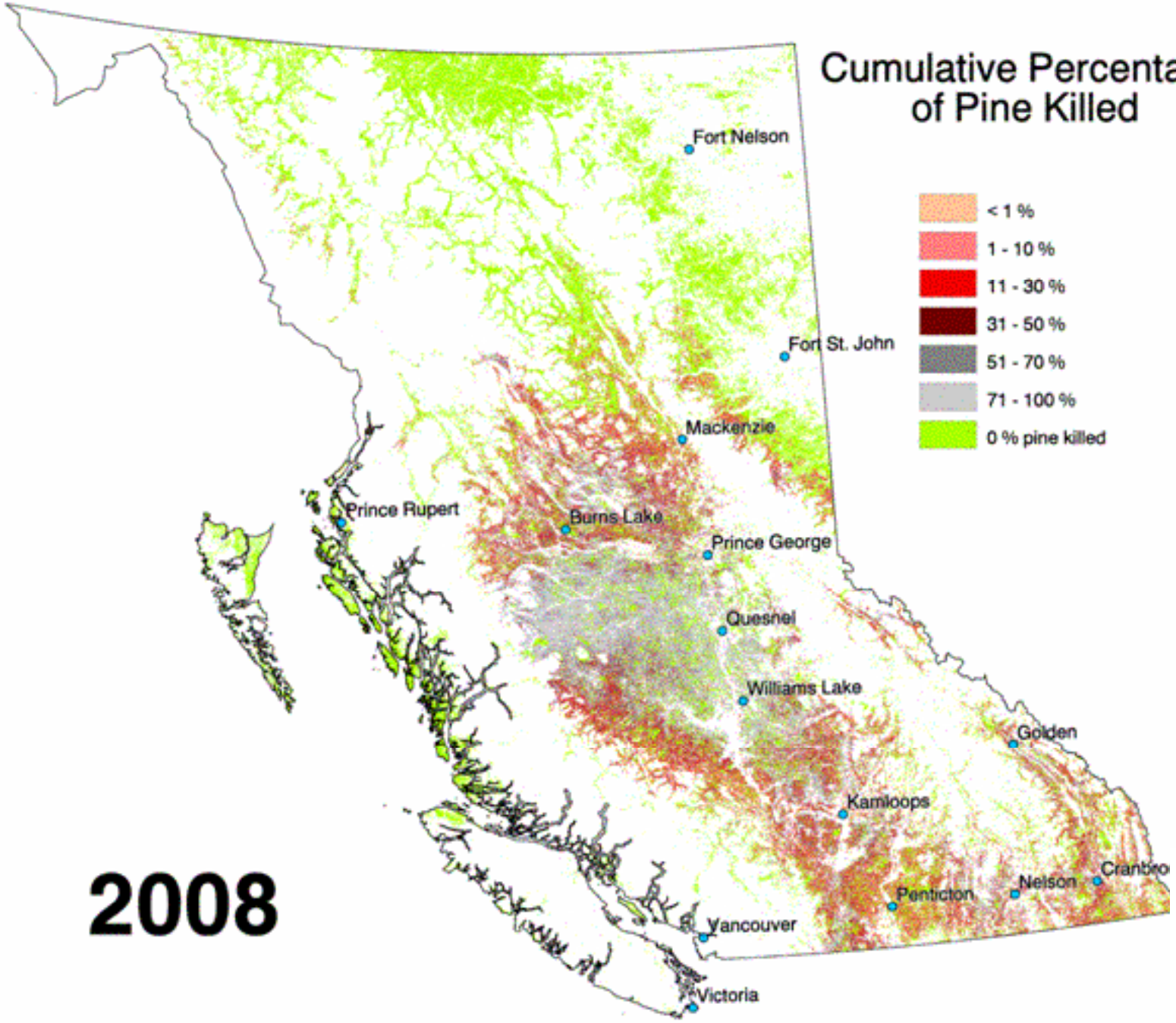
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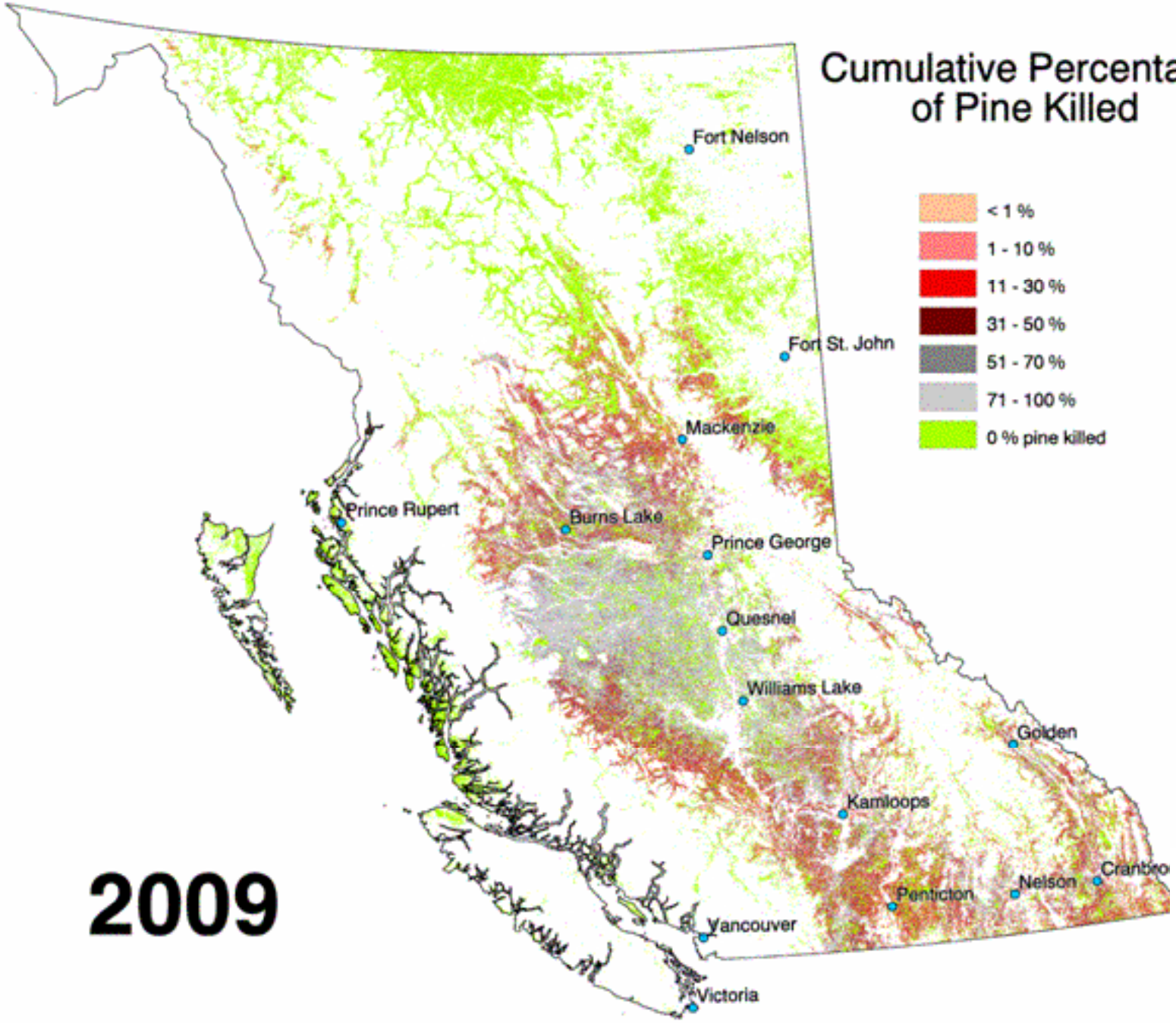
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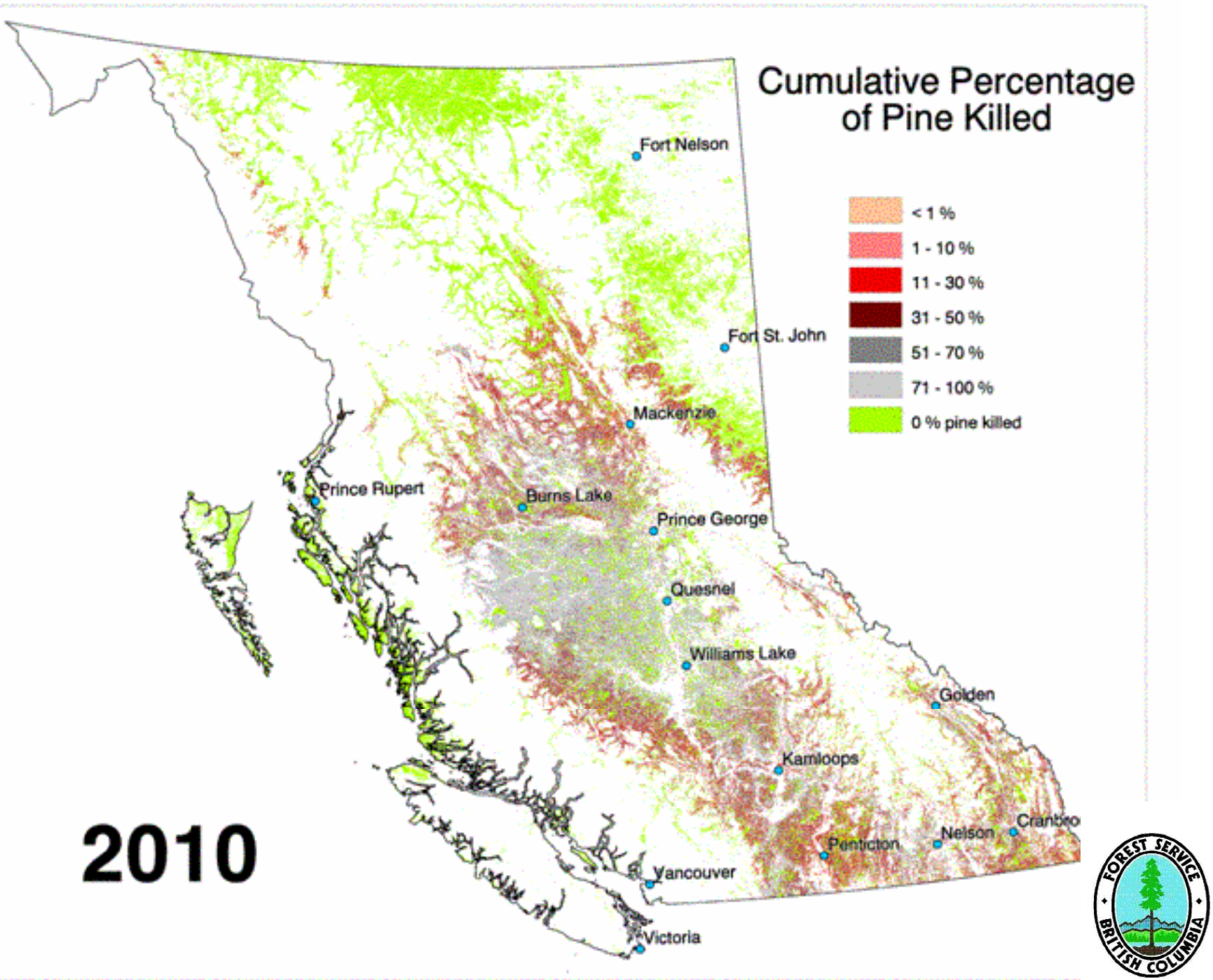
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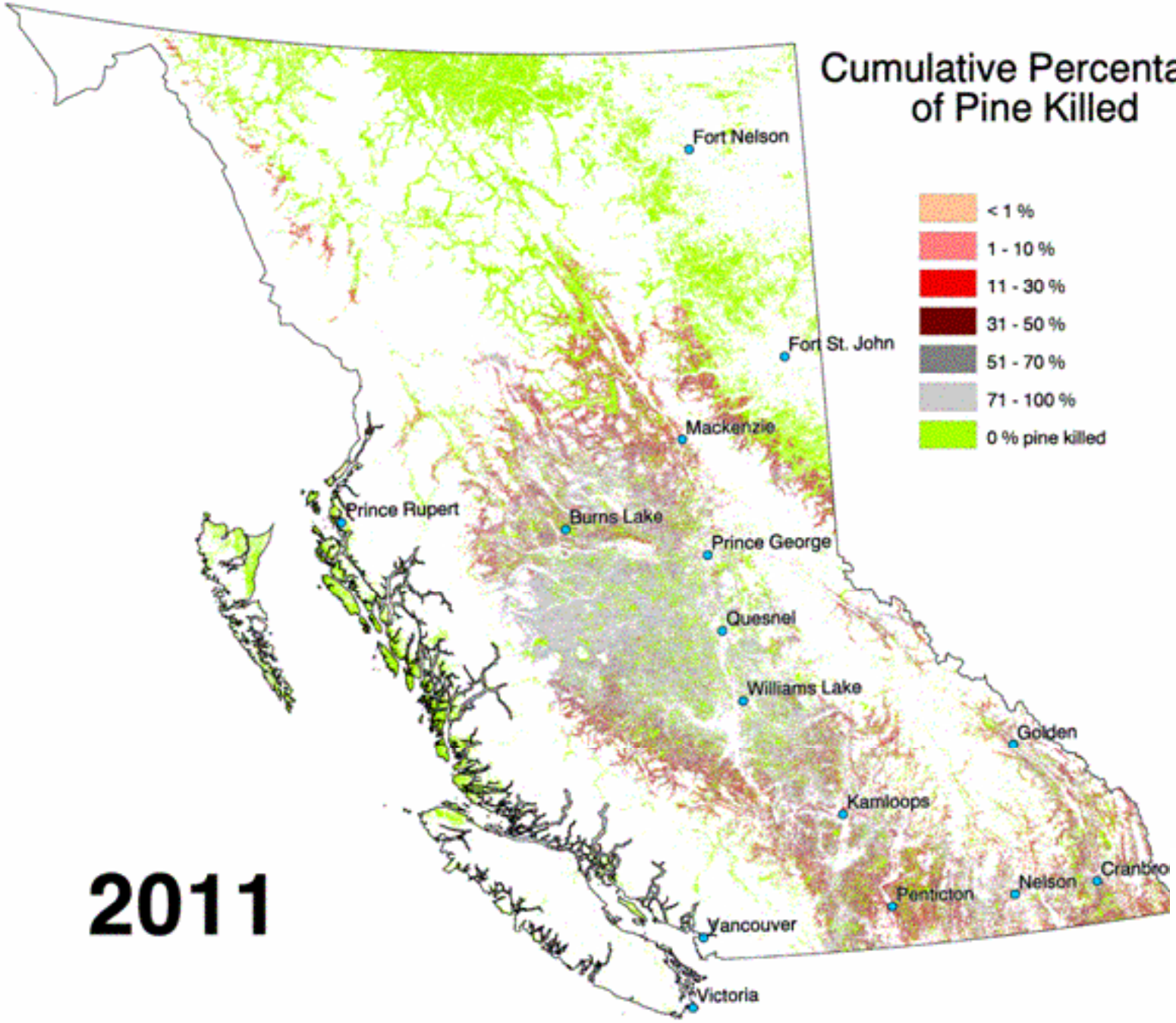
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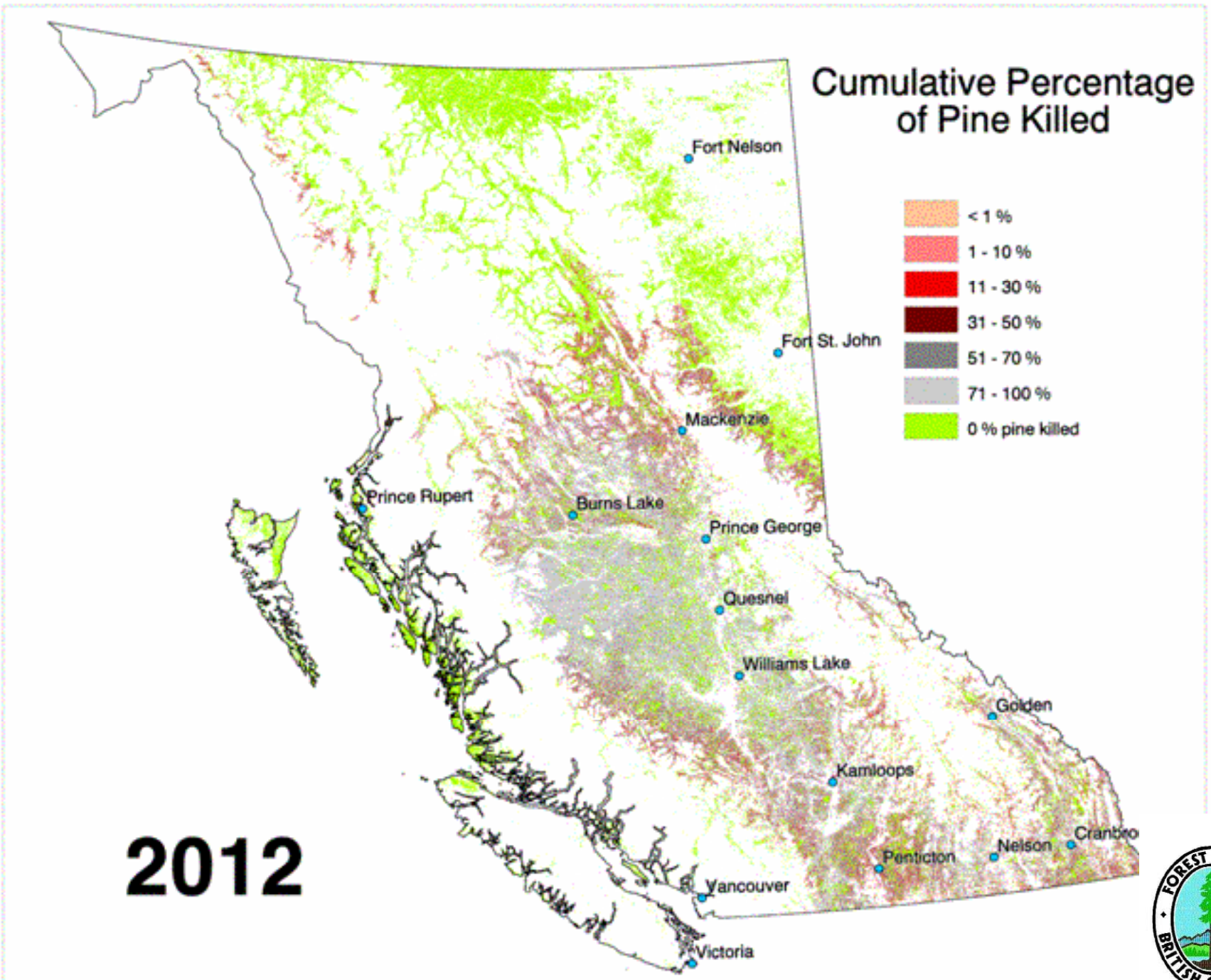
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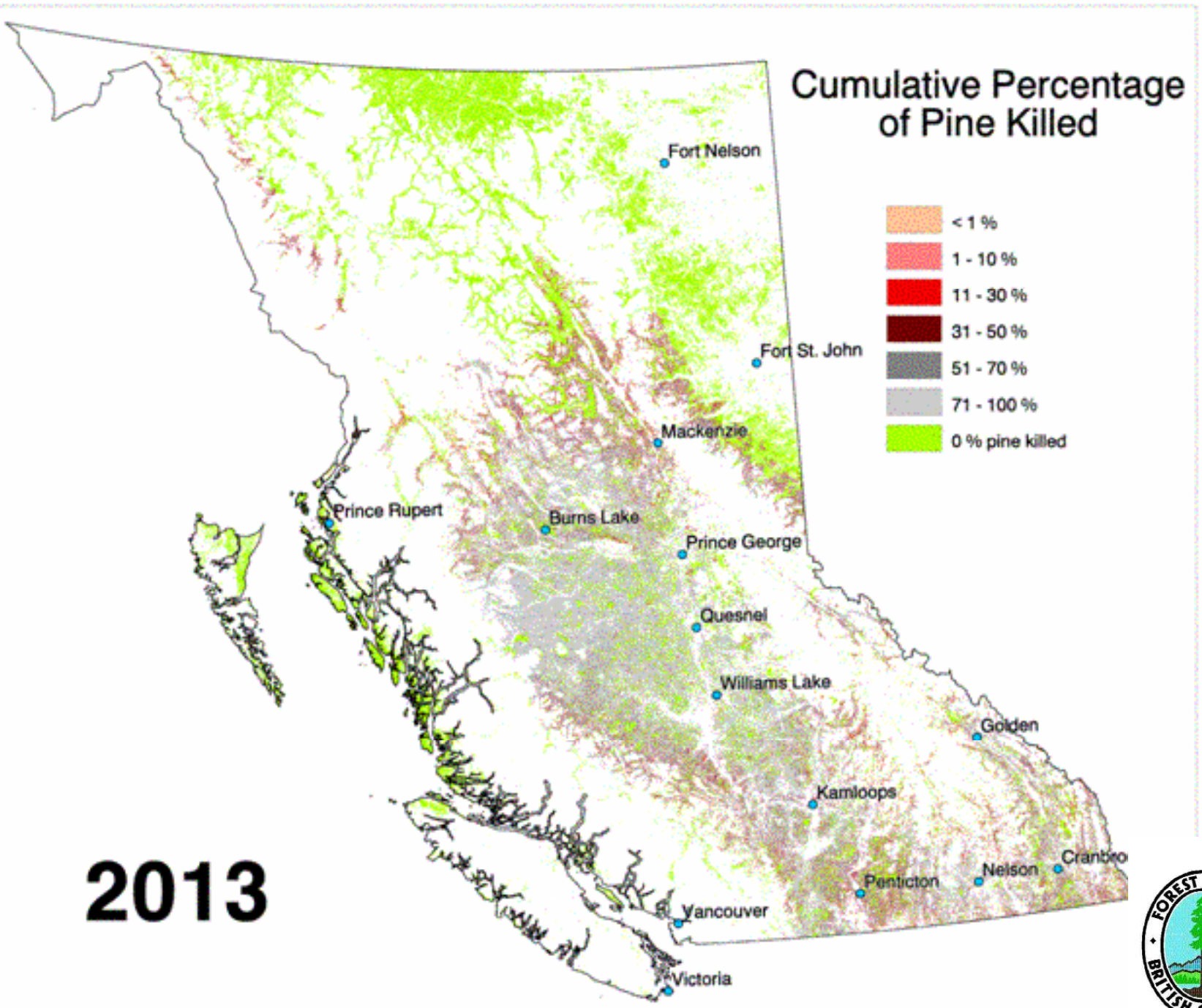
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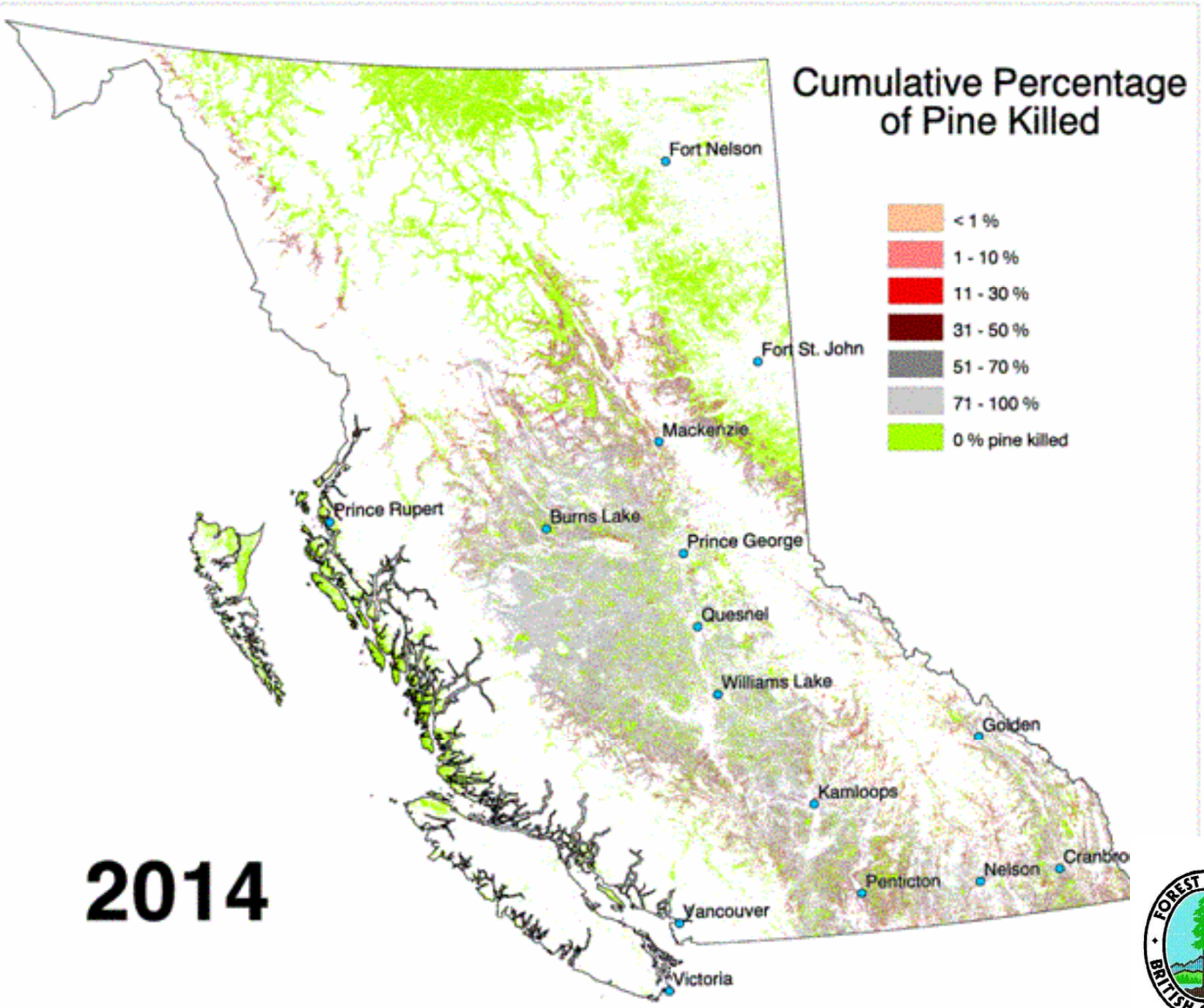
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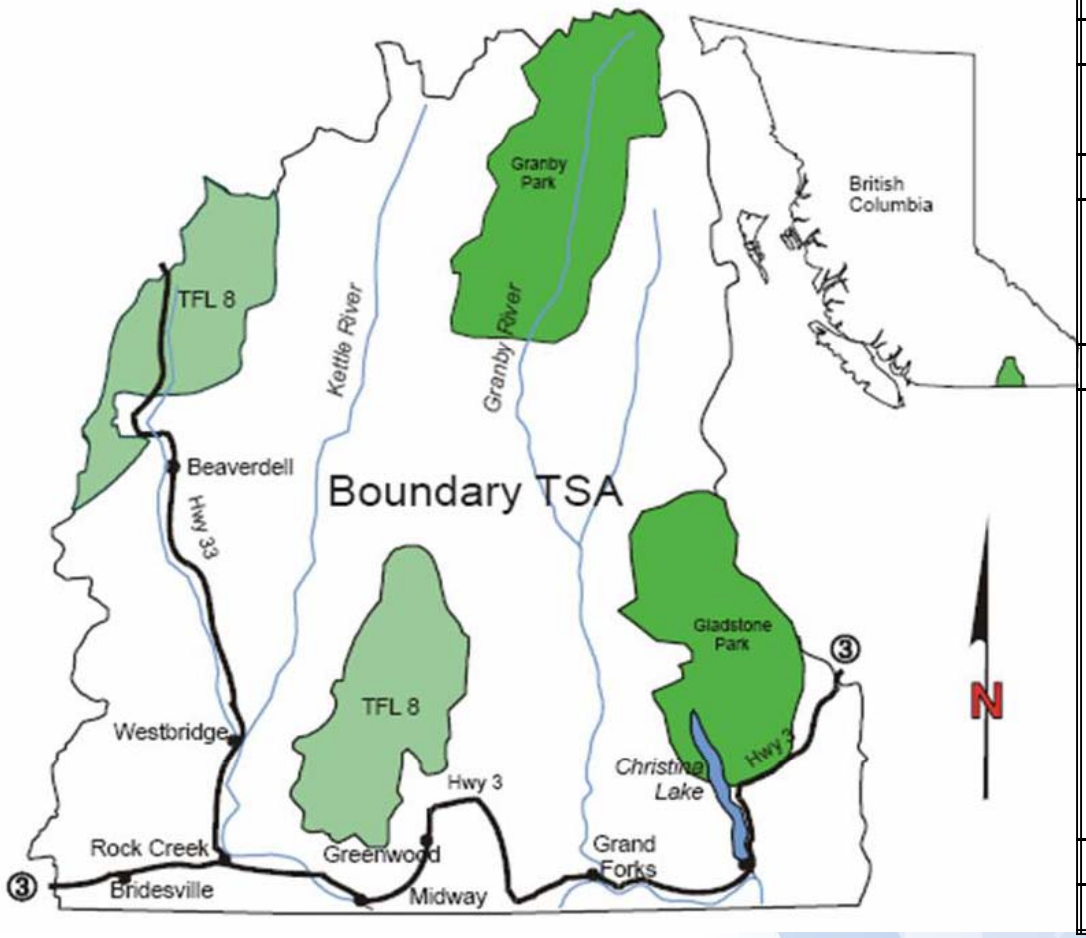
Case Study– Boundary TSA



Land Classification	Area (ha)
Boundary TSA Gross Area	**581,073**
Non-crown	63,798
Woodlots	20,067
Total TSA	**497,207**
Non-forest, Non-Productive	34,046
Non-Commercial	552
Existing Roads and Landings	5,191
Productive	**457,419**
Parks	68,908
Riparian	5,015
ESA's and Terrain	30,410
Low Timber Potential	22,059
Deciduous	2,143
Inoperable	29,686
Types	2,662
Consumptive Intakes	0
OGMA	19,521
Partial Netdowns	557
Total Productive Reductions	**180,405**
Timber Harvesting Landbase	**276,457**

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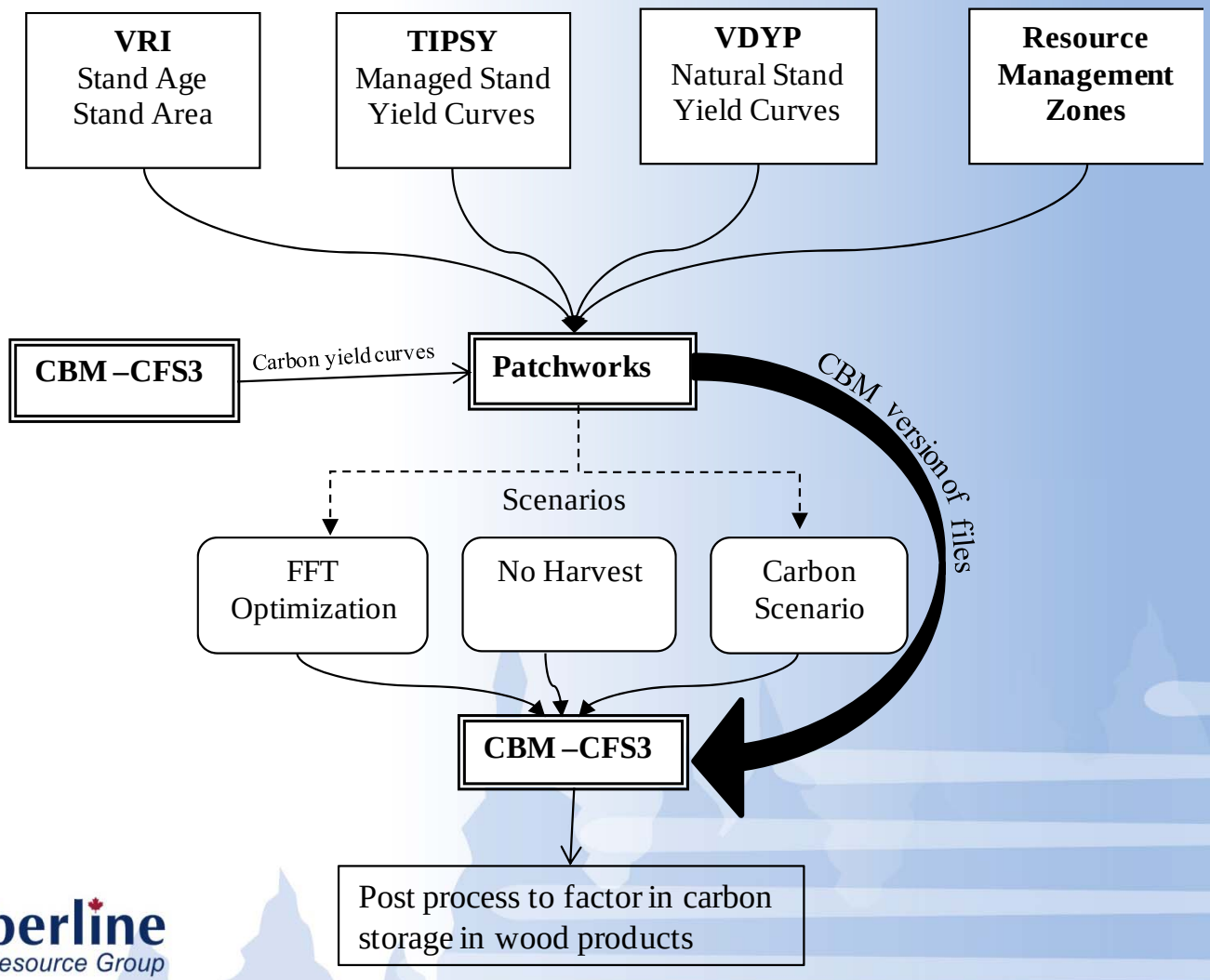
Carbon Optimization



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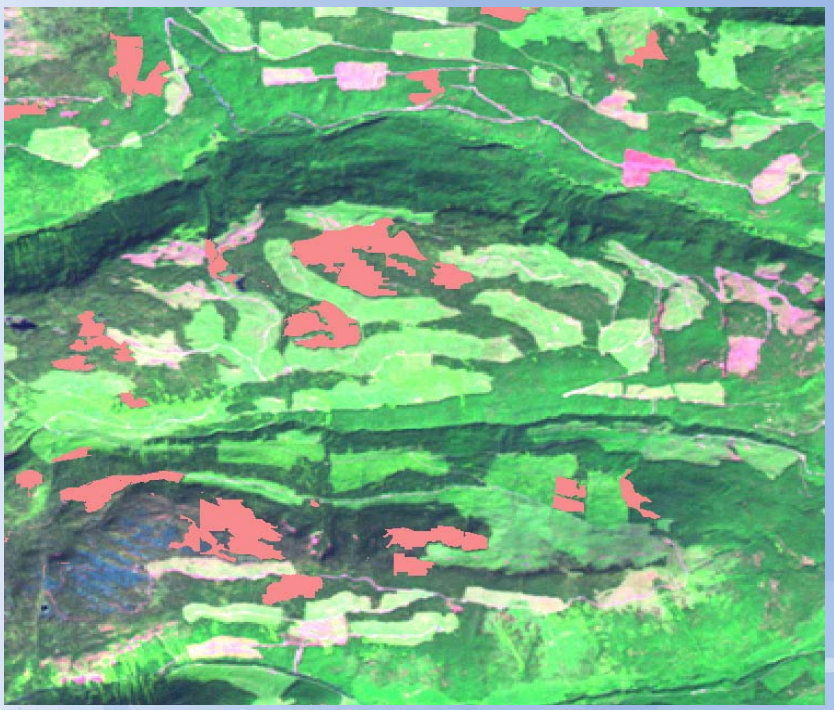
Patchworks Model

- An optimizer
- A multiple-objective model
- Seeks a solution that maximizes the total value of all constraints and objectives



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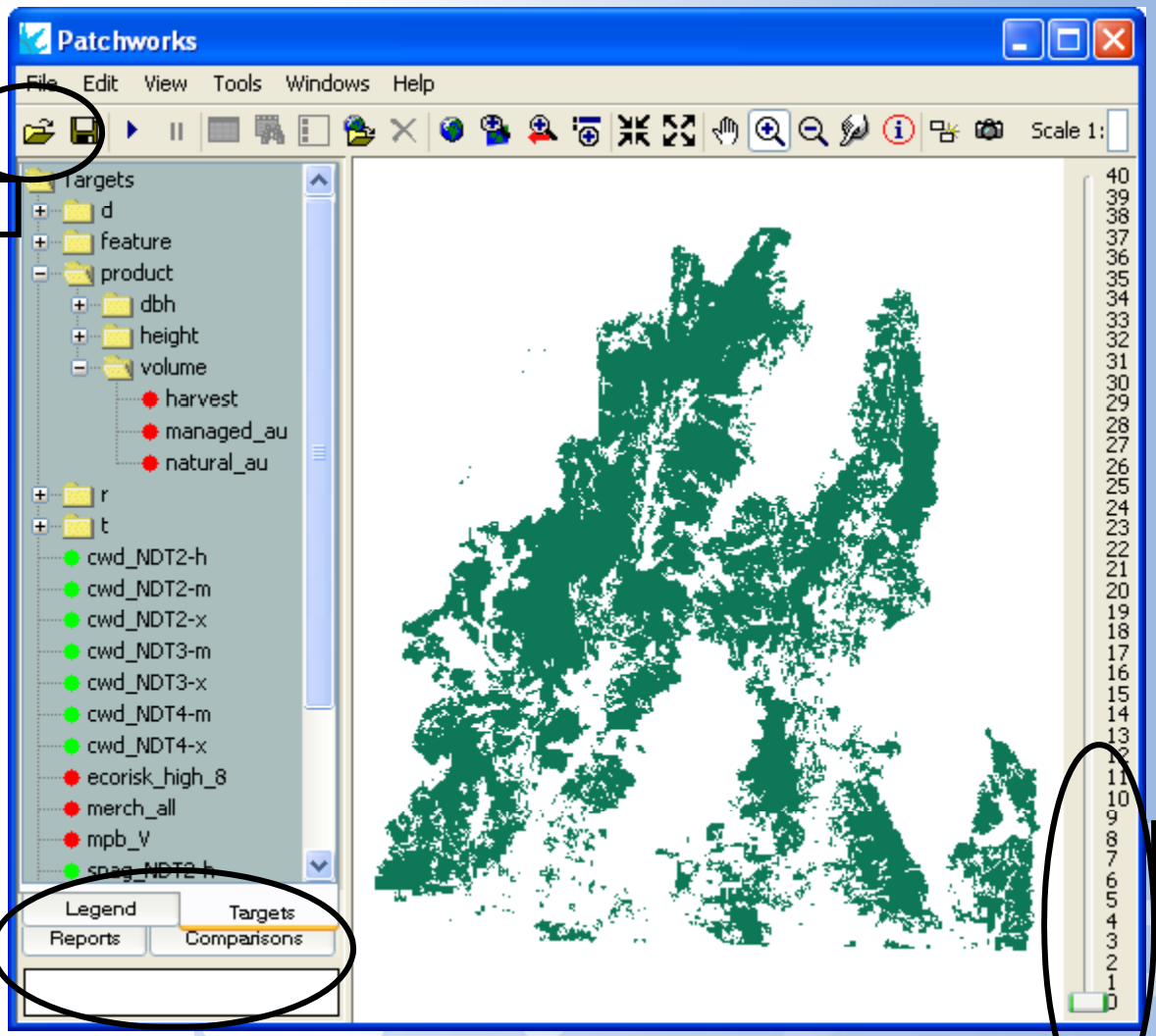
The *Patchworks* Main Window



Load and save Scenarios

View legend, target tab

Planning Horizon Slider Bar

Many point and click GIS-like functions

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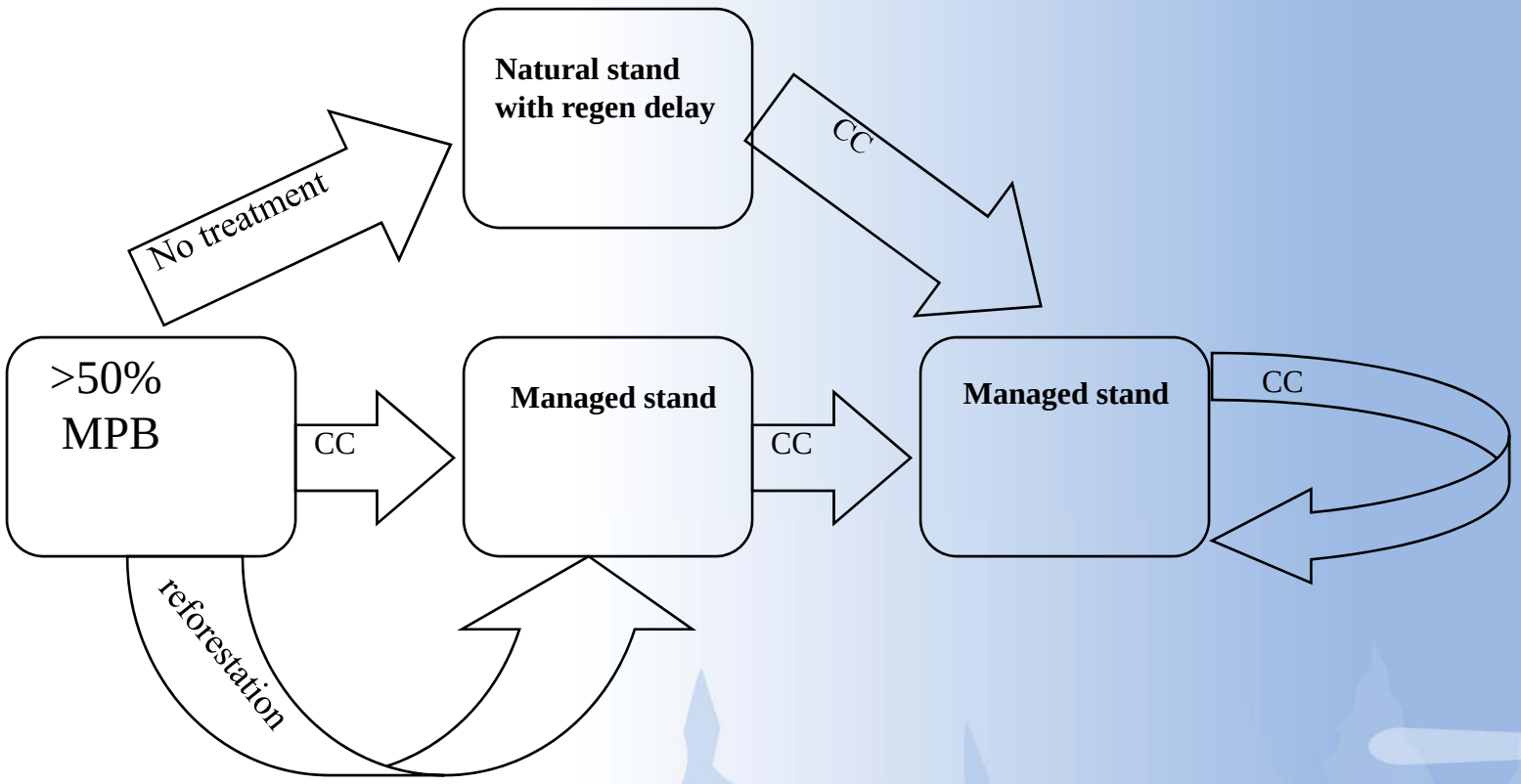
Multiple Paths- Reforestation



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Reforestation Assumptions

- Managed stand yield table
- Regeneration delay same as managed stands
- Costs: site survey, assessment and site prep of 300 $/ha + 1 $/seedling

BEC	Natural Regeneration Stocking (st/ha)	Target Stocking (st/ha)	FFT Planting Cost ($/ha)
ESSF	700	1,800	$1,400
ICH	800	1,800	$1,300
IDF	800	1,800	$1,300
MS	700	1,800	$1,400
SBPS	500	1,800	$1,600
SBS	800	1,800	$1,300

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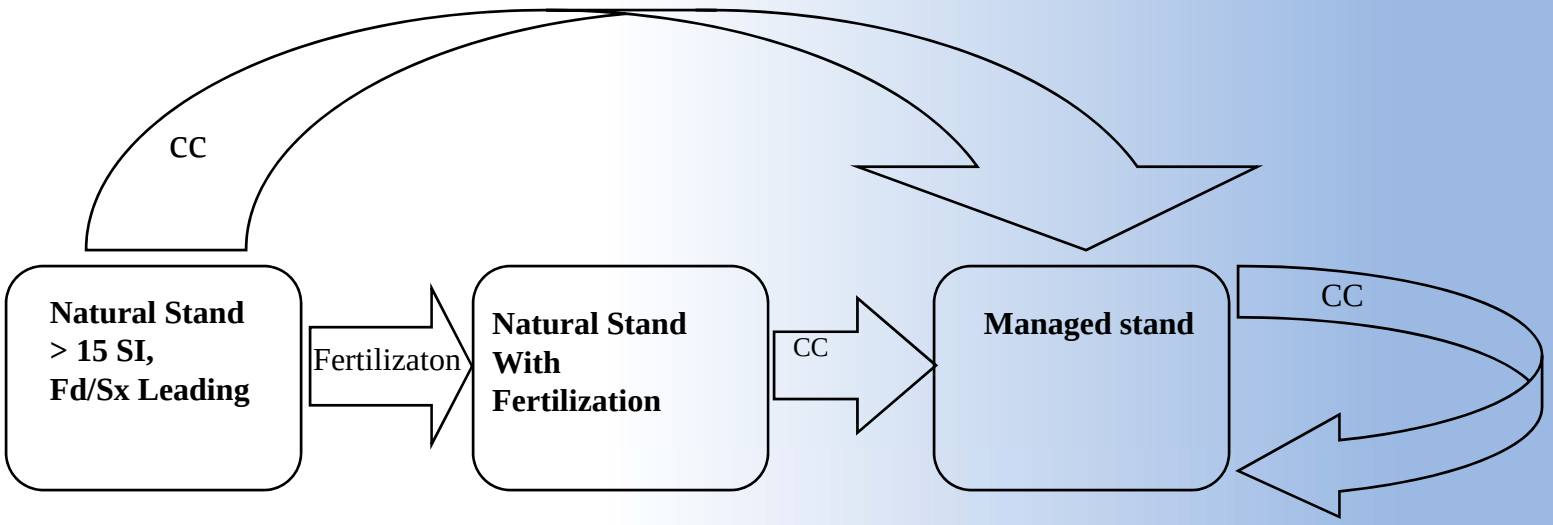
Multiple Paths- Fertilization



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Fertilization Assumptions

- 10 m³/ha response for Spruce
- 12 m³/ha response for Douglas fir
- Can't harvest for at least 10 years
- Costs: 450 $/ha
- All additional volume is assumed to be premium

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The CBM (CFS3) is a landscape level carbon accounting framework that simulates carbon dynamics of above-ground and below-ground forest biomass and DOM

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Carbon stock is the absolute quantity of carbon held within a pool at a specified time. This analysis reported on three pools:

- **Biomass =** the living mass from trees in a given area. This includes above-ground and below-ground tree components (stems, branches, leaves, and roots). Other woody vegetation; and mosses, lichens, and herbs are not included.

- **Dead organic matter (DOM) =** all the dead organic matter from trees in an ecosystem. Including standing dead trees, downed trees, coarse and fine woody debris, litter, and soil carbon.

- **Total ecosystem carbon stock =** is the sum of the biomass and DOM stocks.

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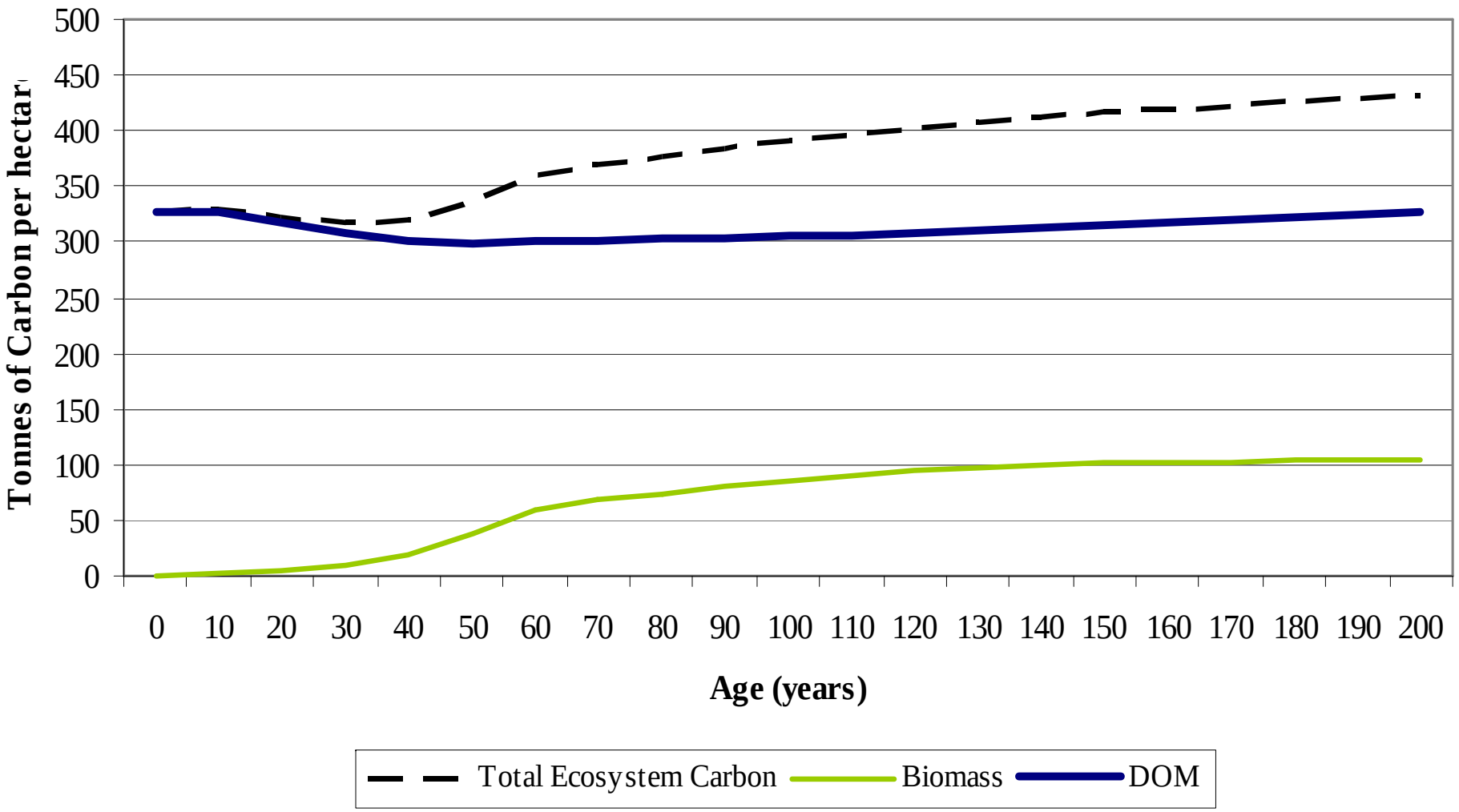
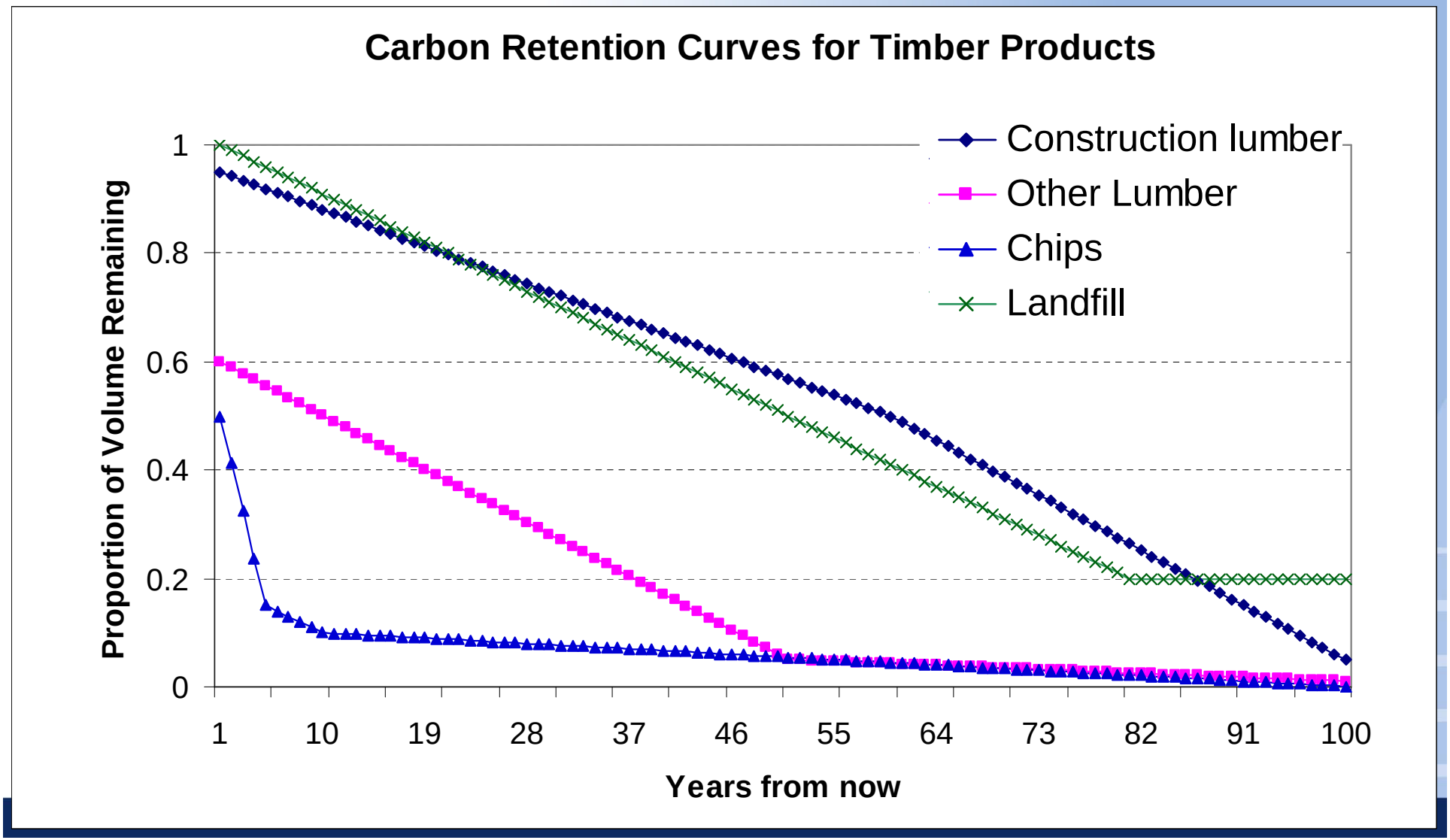
Carbon Curves



Storage in Wood Products



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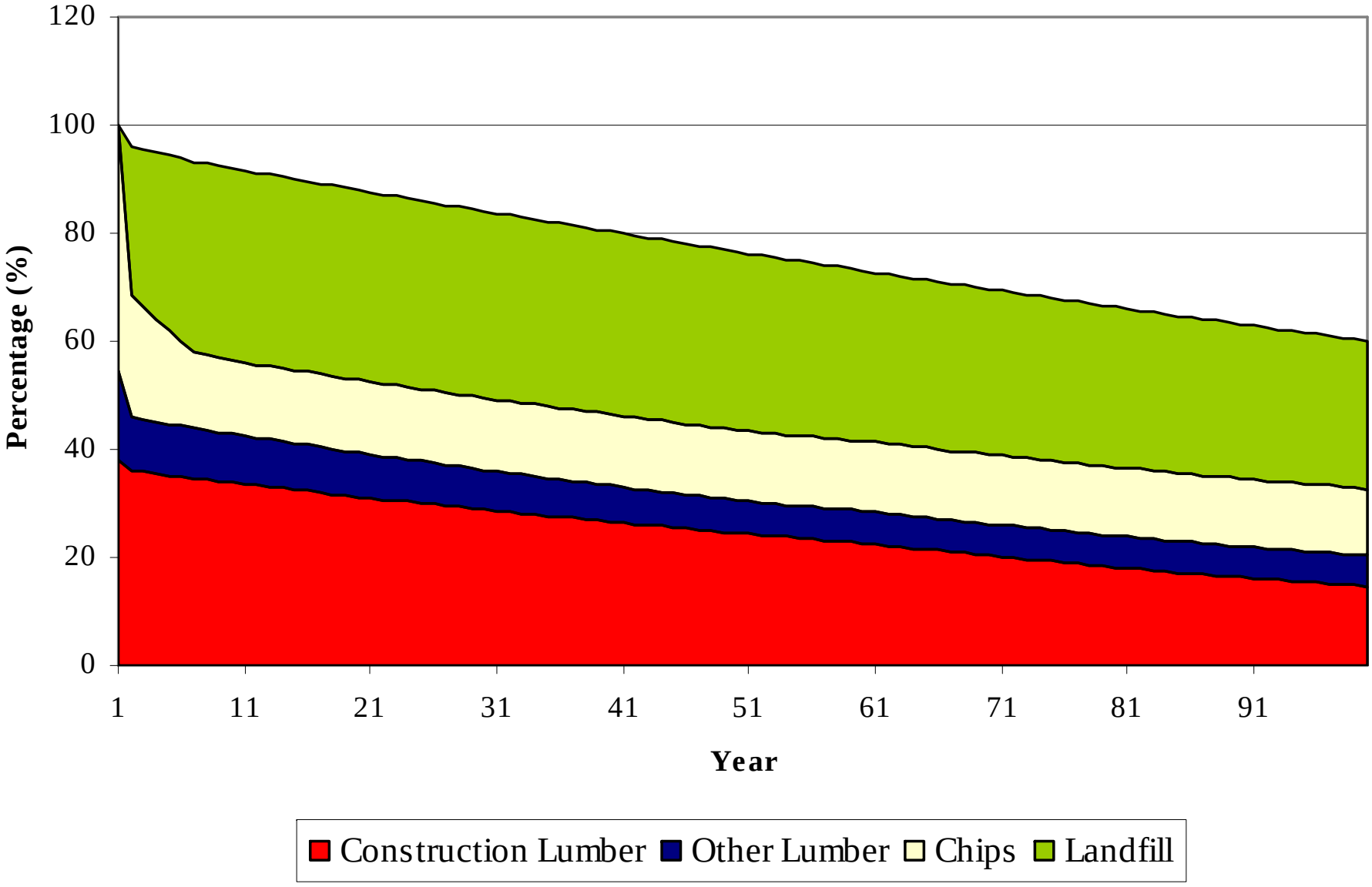
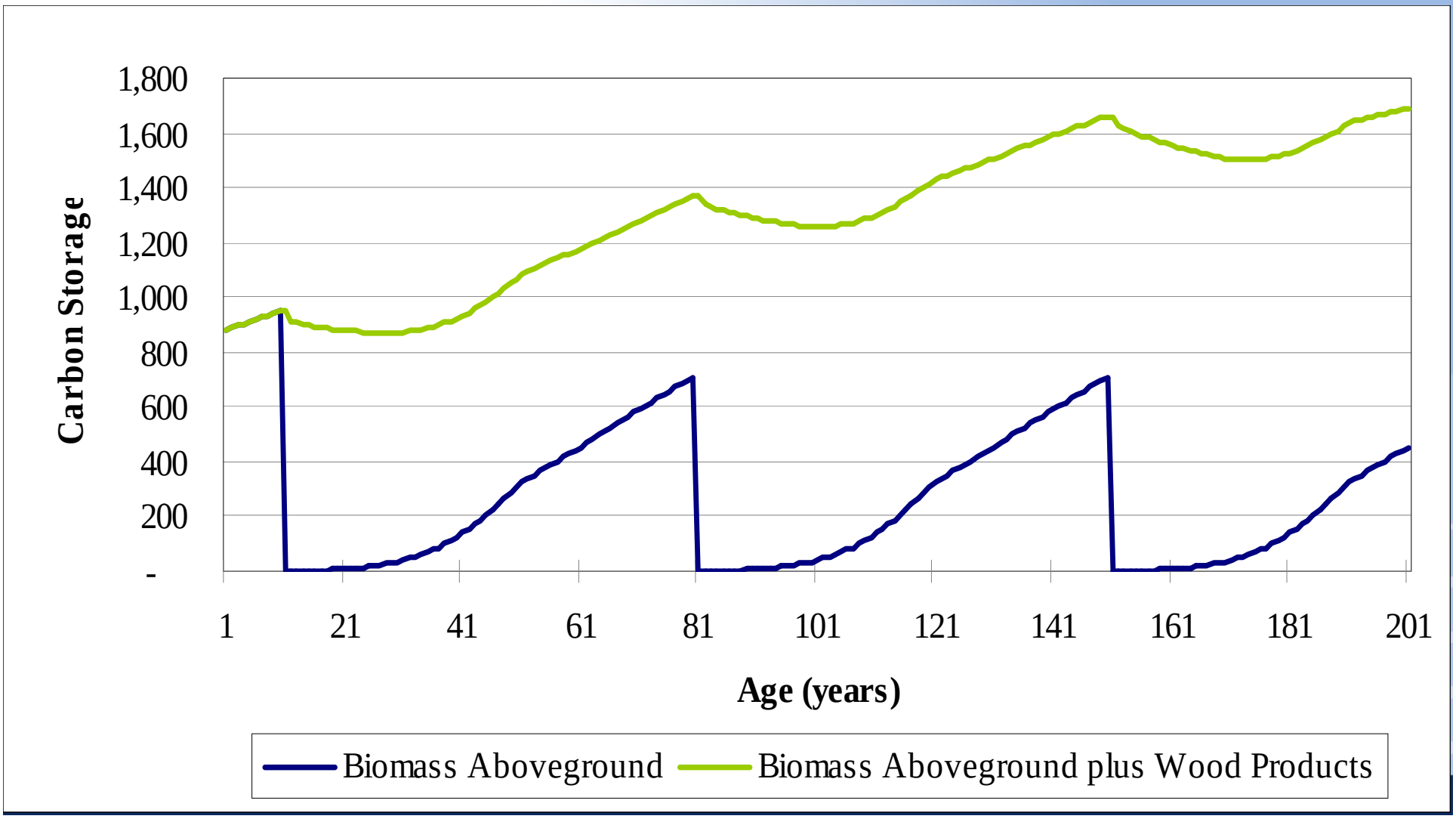
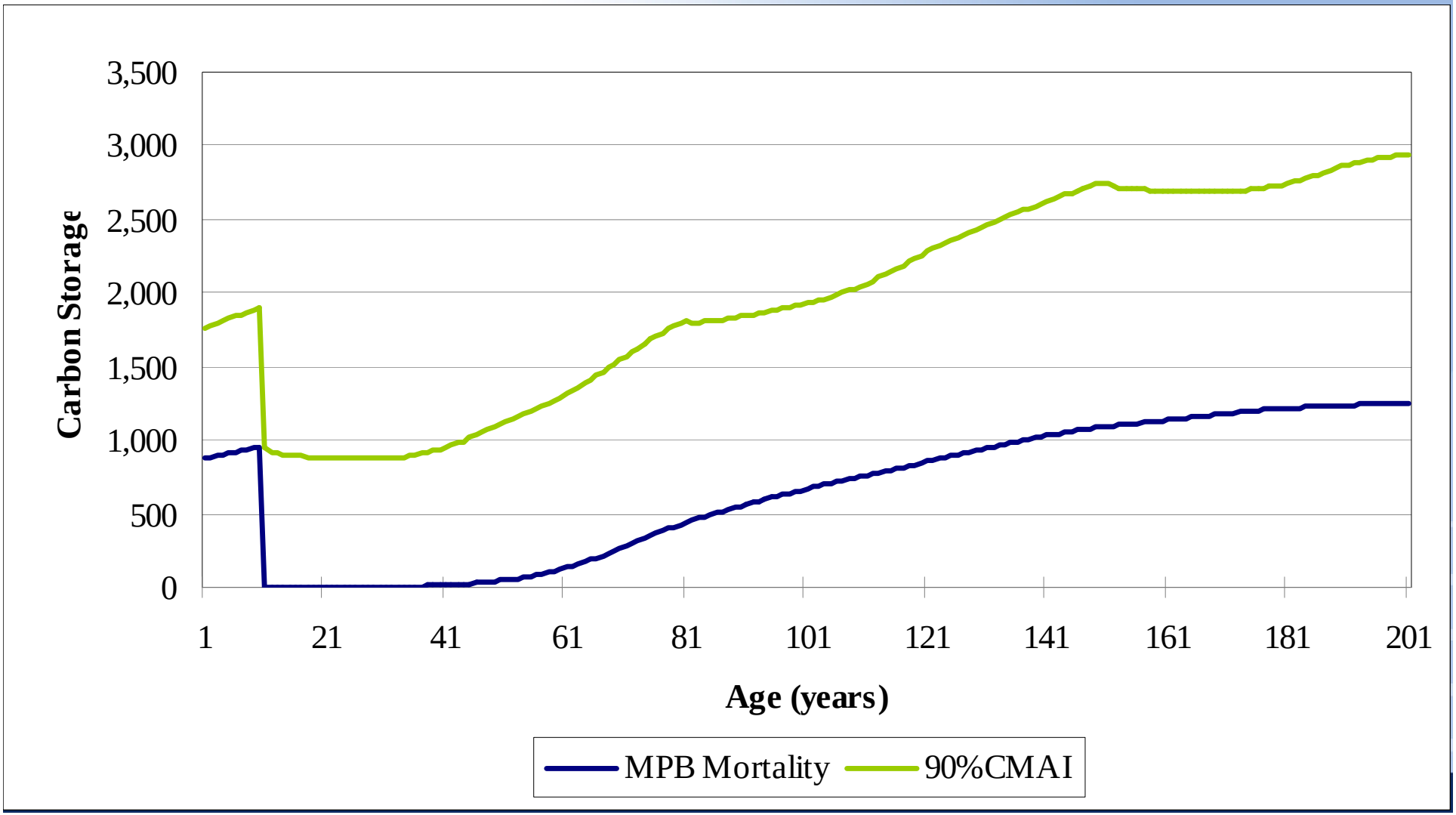


Storage Including Wood Products



MPB Stand- Harvest vs Mortality



Scenarios

1. No Harvest
2. Maximum Landbase Carbon
3. Maximum Total Carbon (landbase and forest products)
4. Optimum Management

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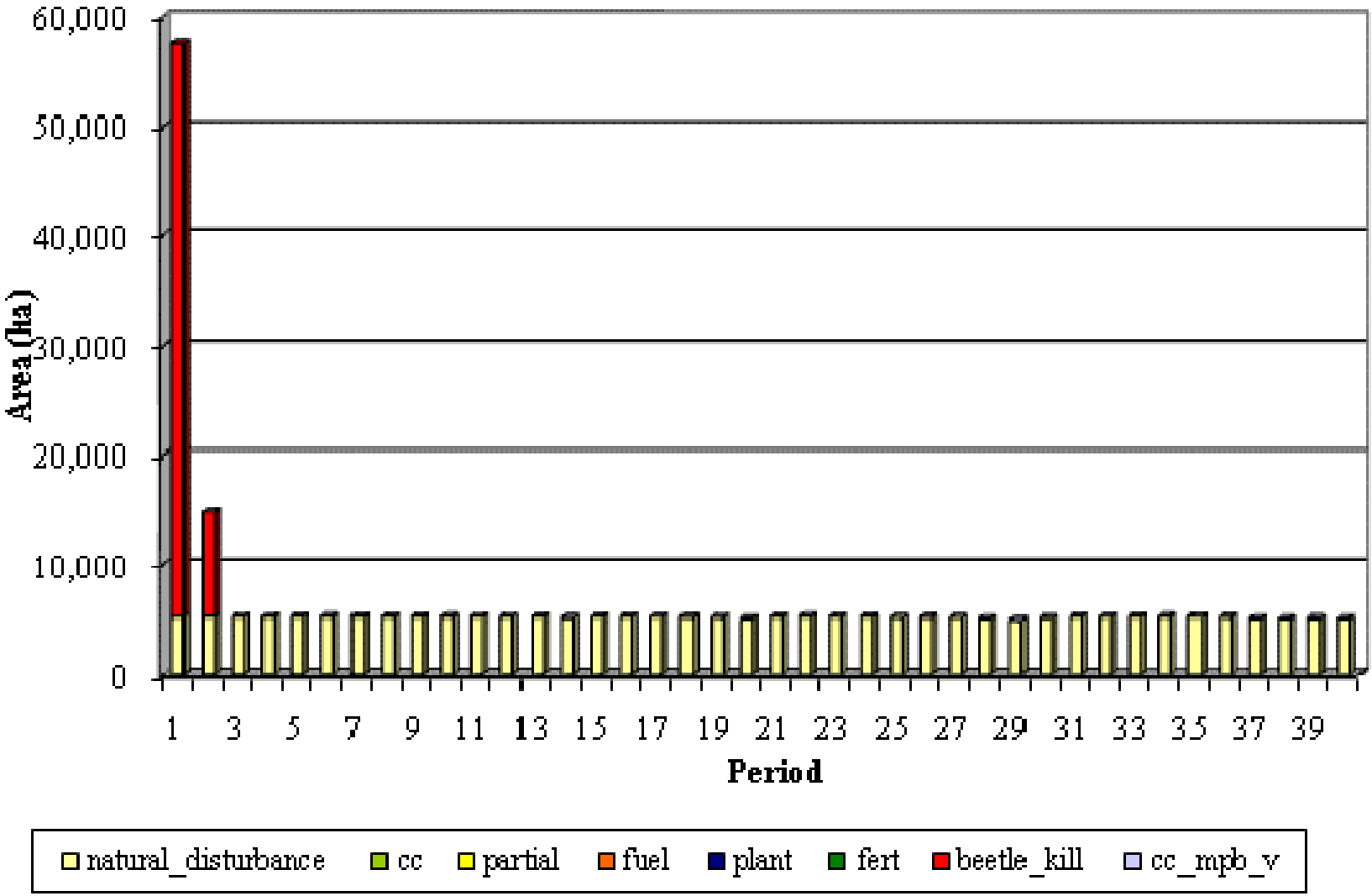
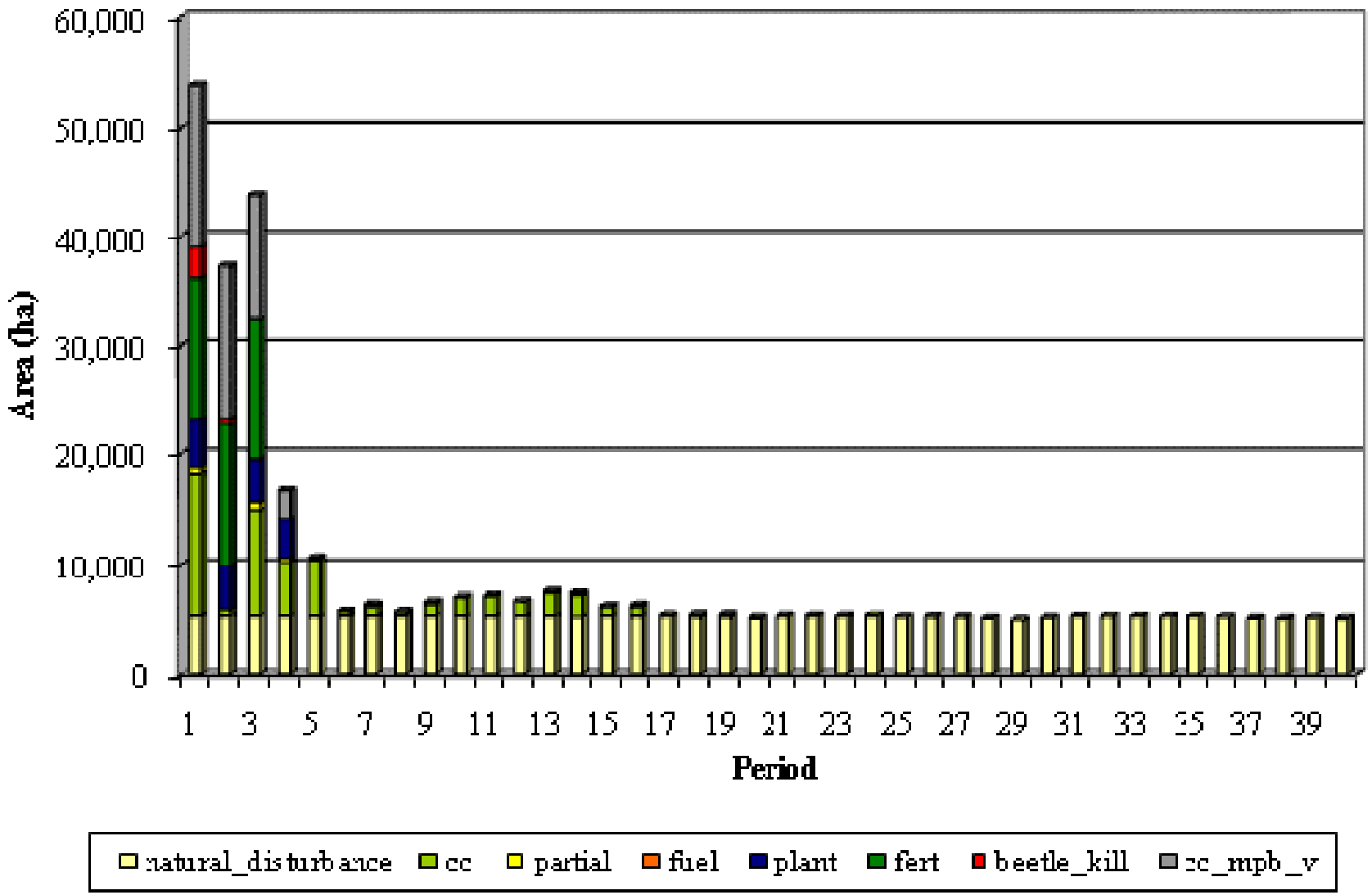
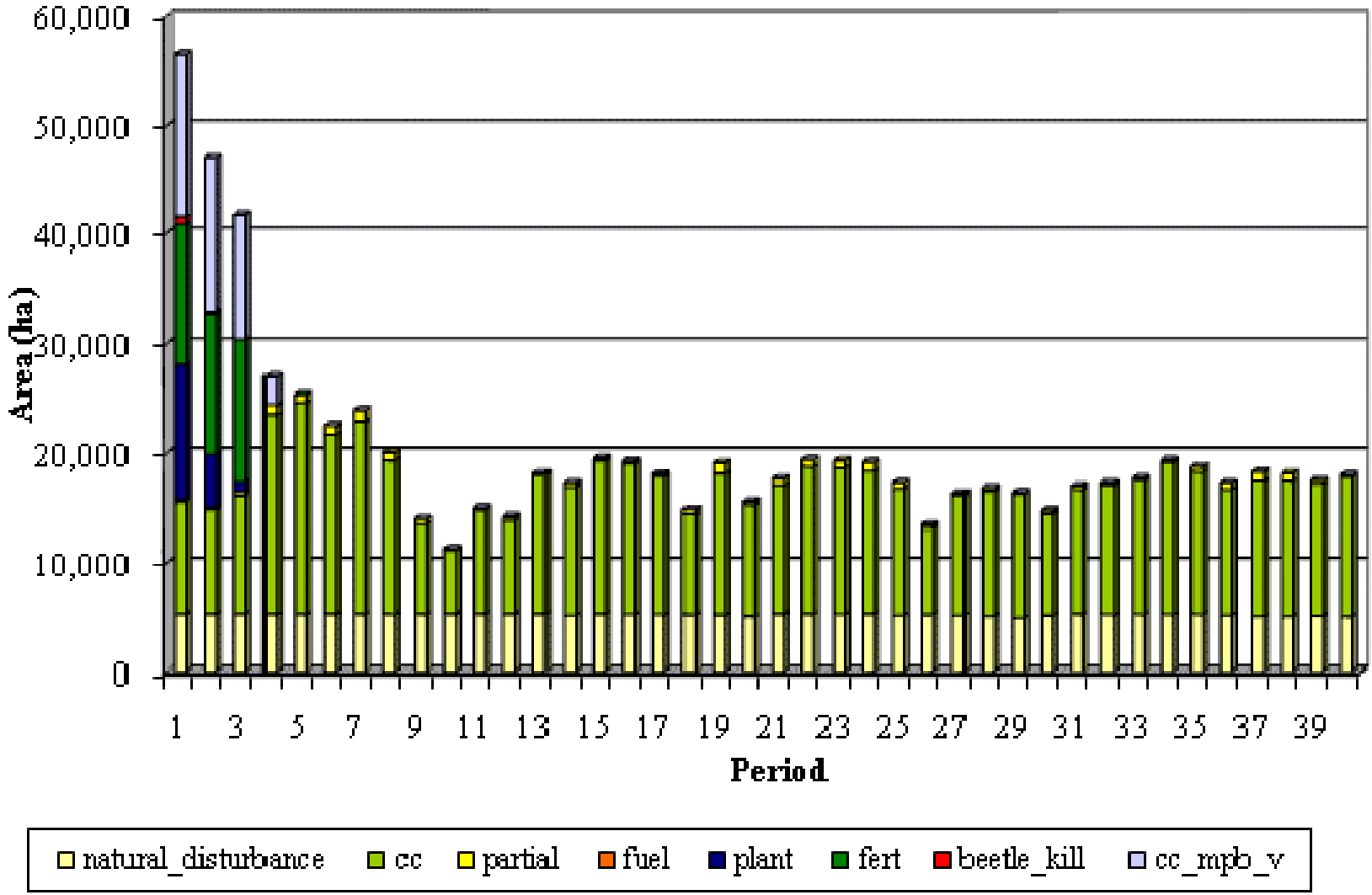
No Harvest


60,000
50,000
40,000
30,000
20,000
10,000
0
Area (ha)
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39
Period
natural_disturbance
cc
partial
fuel
plant
fert
beetle_kill
cc_mpb_v

Max Carbon Landbase



Max Carbon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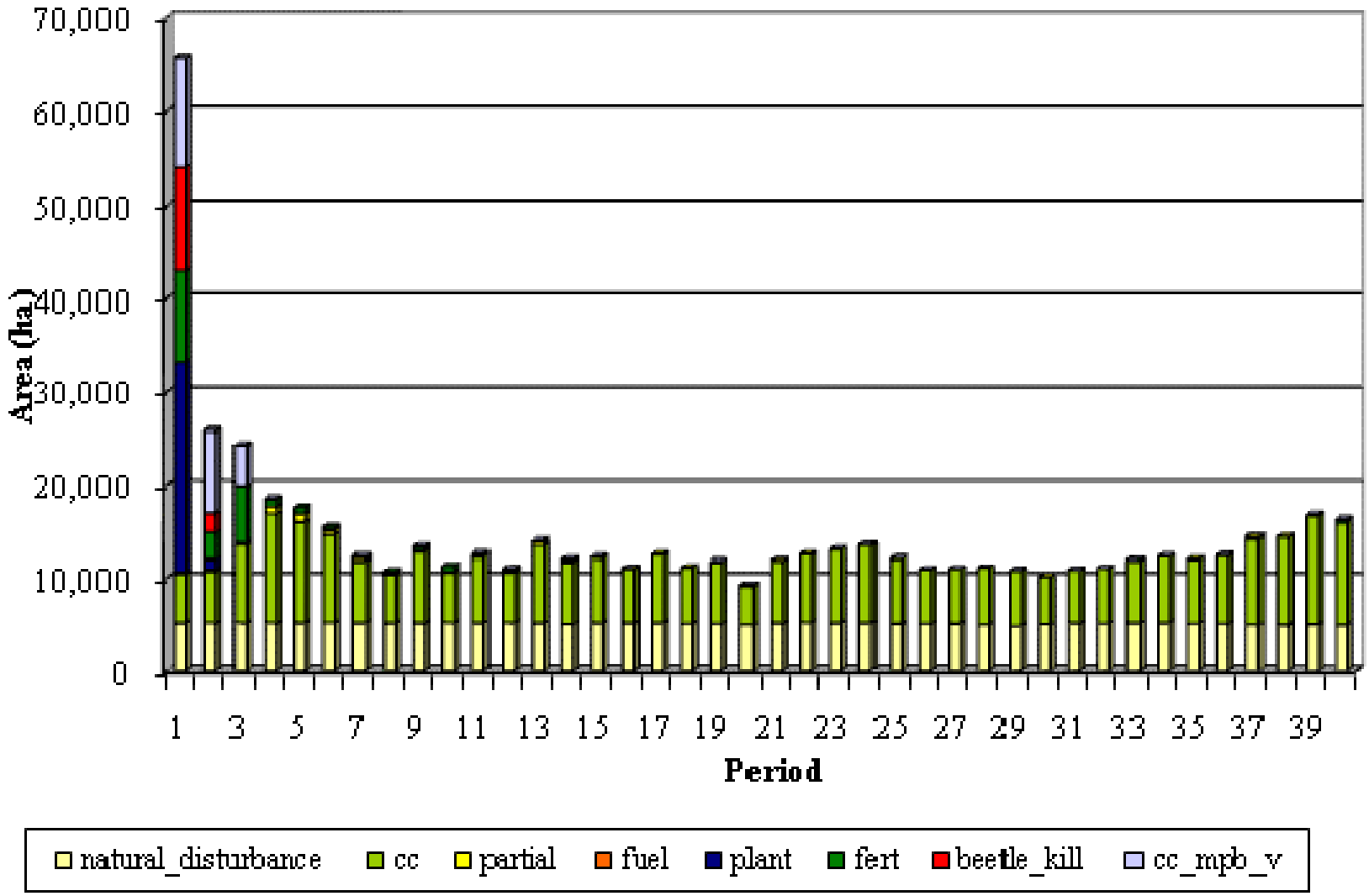
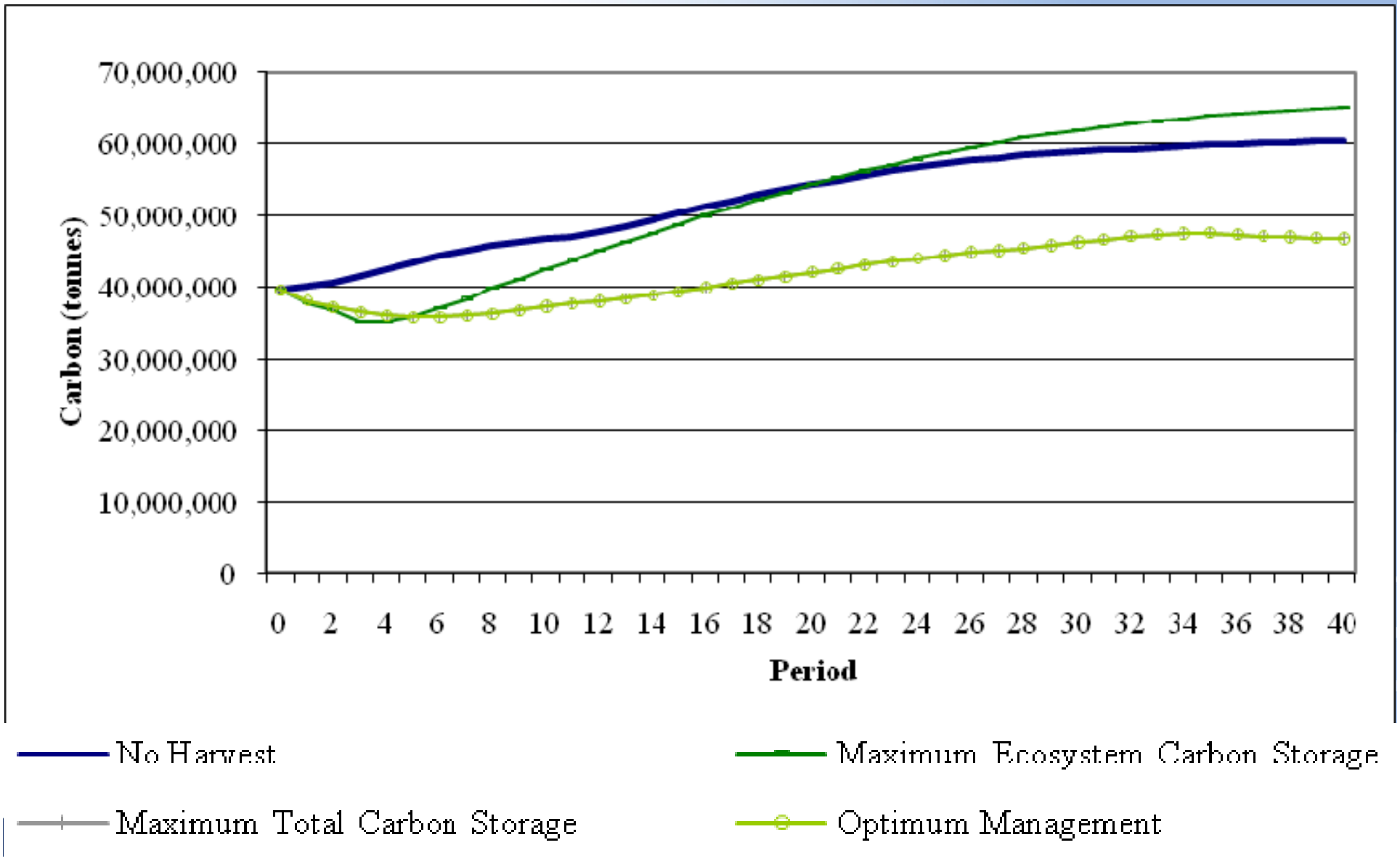
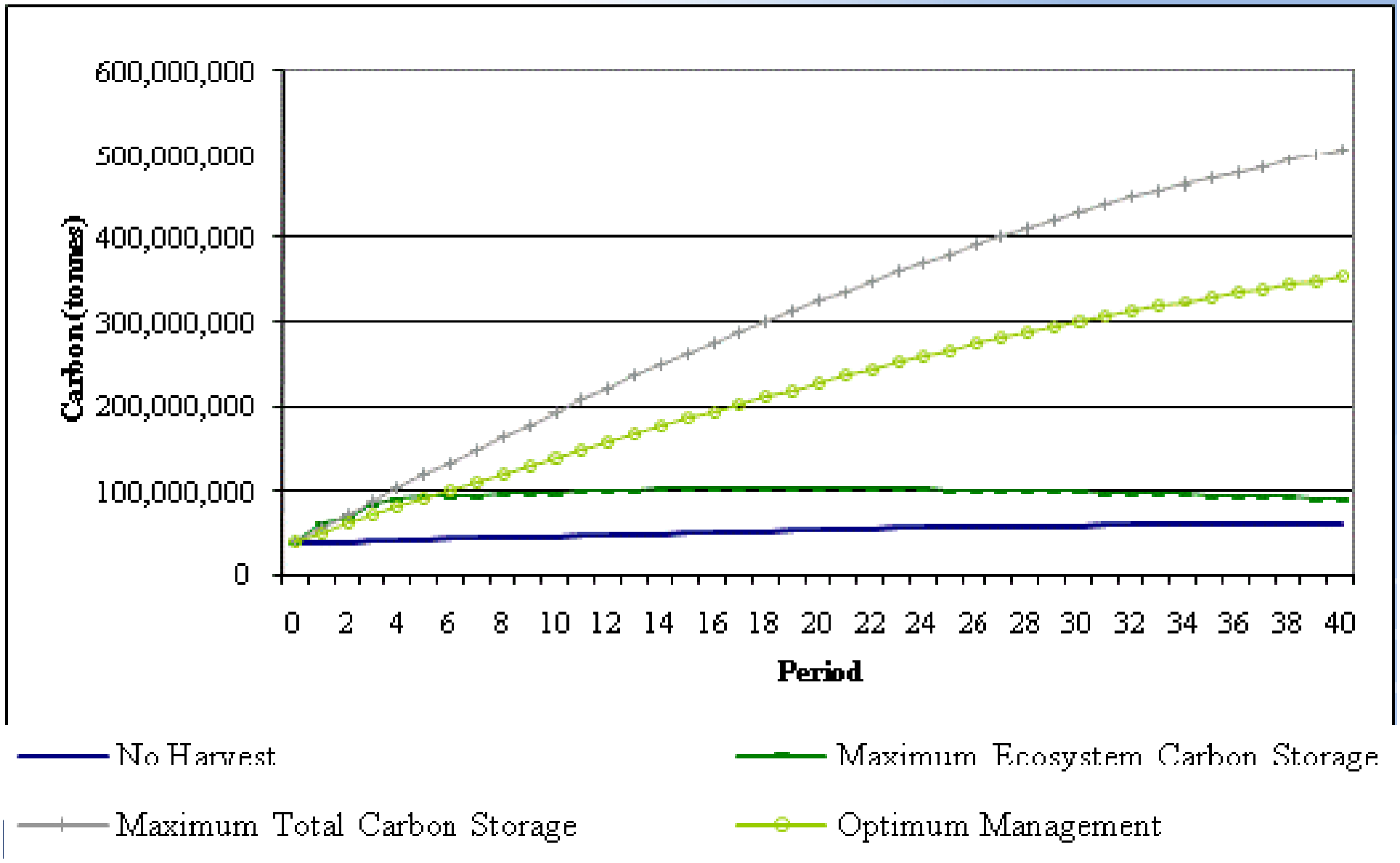
Optimum Management



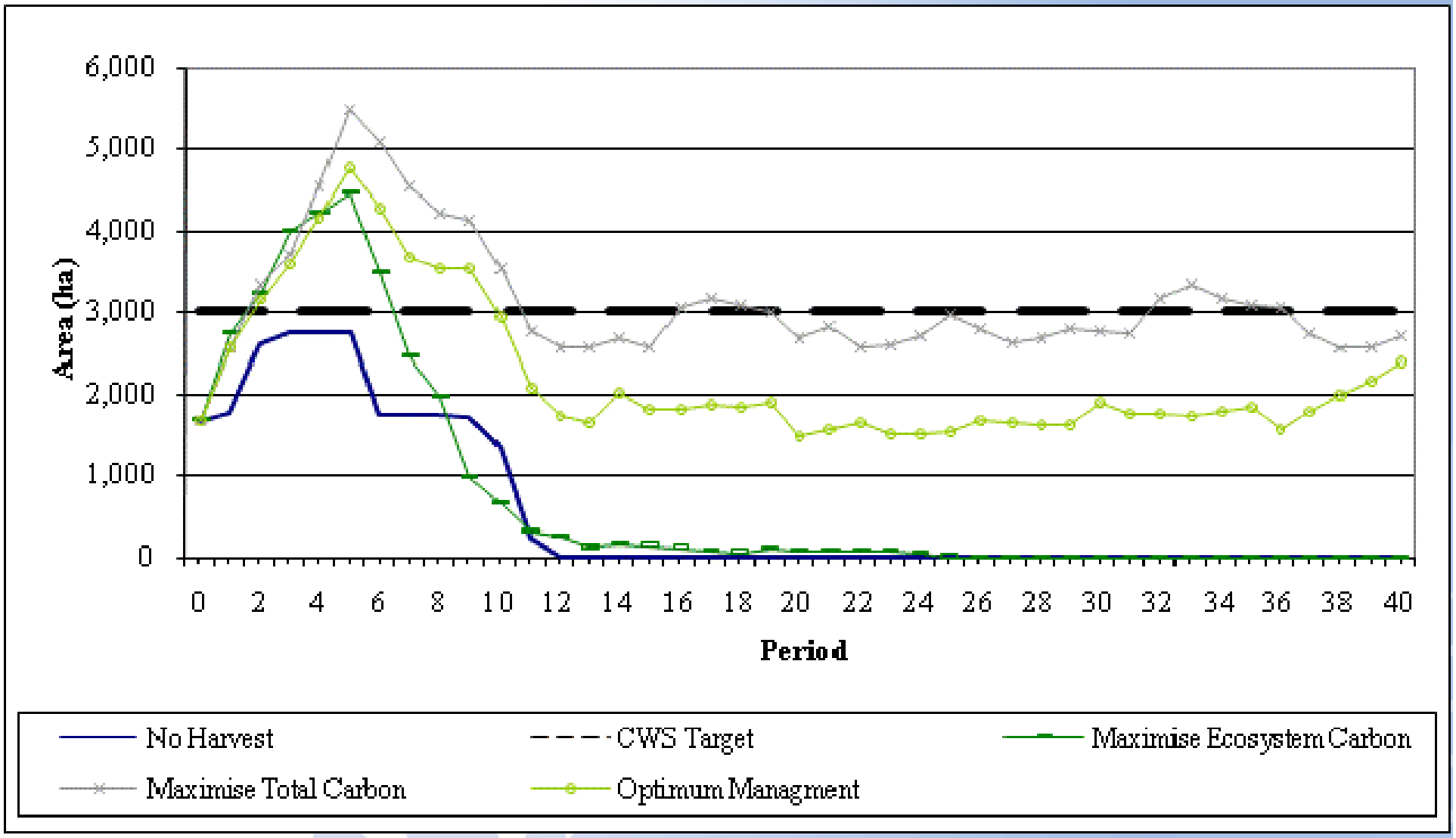
Carbon – Landbase



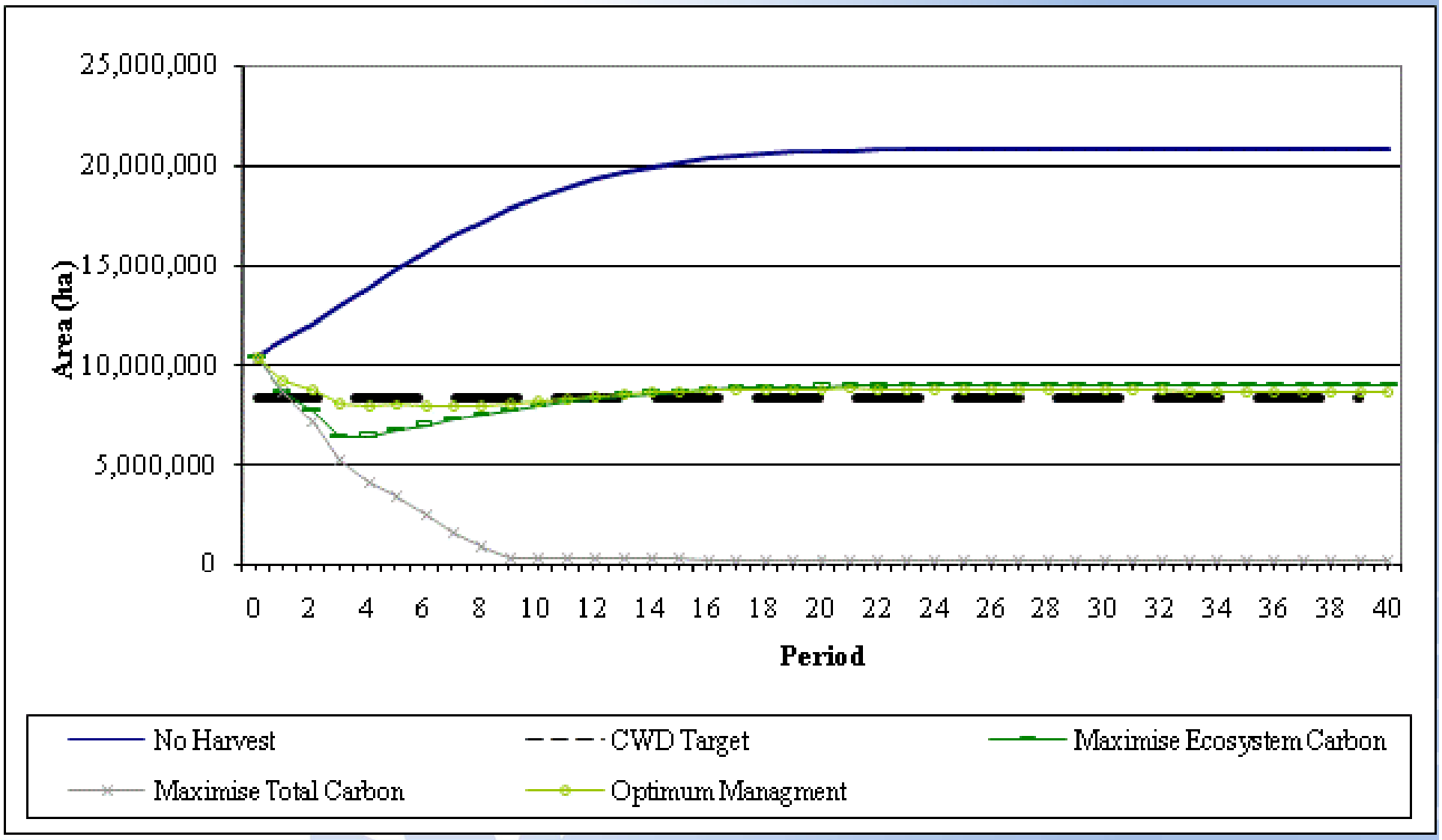
Carbon – Landbase and wood products



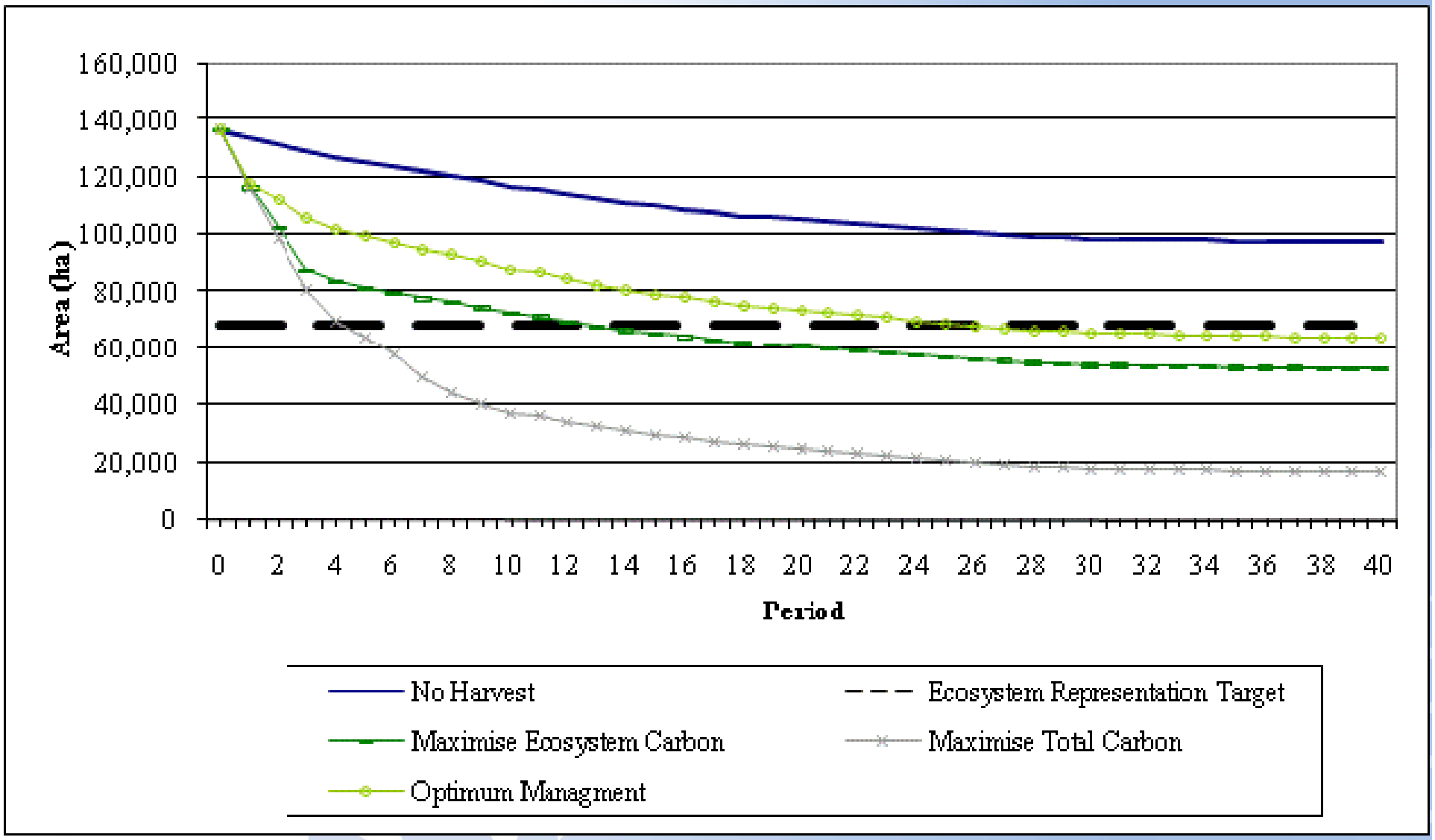
Community Watershed



Coarse Woody Debris



Ecosystem Representation



Take Home Message

- When considering wood products the best way to maximize carbon storage is to maximize the productive capacity of the landbase

- Silviculture activities that increase the volume (fertilization) or increase the productive capacity of the landbase (aggressive reforestation) are carbon positive

- Carbon management must be done in consideration of other environmental objectives otherwise resource managers run the risk of significantly compromising the other environmental objectives to benefit carbon storage

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Thank You

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