

Effects of intensified forestry on the landscape-scale extinction risk of deadwood dependent species



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Intensive forestry and the conservation of forest biodiversity

Binkley CS. 1997. *Preserving nature through intensive plantation management*. Forestry Chronicle 73: 553-558.

Can an intensification of forestry in parts of the landscape be used to facilitate the conservation of biodiversity elsewhere?

Zoning approaches

The TRIAD - Seymour and Hunter (1992)

1. Wood production zones (= intensive plantation forestry)
2. Ecosystem management zones (= ecological forest management)
3. Conservation zones (= set-asides)

Examples of real-world applications:

- Maine, USA
- NW New Brunswick, Can.
- British Columbia, Can. (Kelowna)
- Quebec, Can. (Mauricie)
 - 20% intensive forestry
 - 69% ecosystem management
 - 11% set-asides



Simulation study:

General approach

- **Model landscape:**
 - 3600 forest stands of 5 ha
 - 40% Norway spruce stands
- **Model species:**
 - 5 virtual insect species
 - All dependent on Norway spruce dead wood < 10 years and > 10 cm in diameter
- Metapopulation model (incidence function model) to simulate colonization-extinction dynamics in forest stands
- Response: landscape-scale probability of extinction

Model species

Sensitive species: All 5 model species have a ~50% extinction risk over 250 yrs given the current management regime (95% conventional forestry and 5% set-asides)



Species	u	x	y	1/ α	Dead wood exposition
“Normal” (average) sp.	0.53	0.5	96.5	0.5	All
Long-distance disperser	0.51	0.21	850	2	All
Short-distance disperser	0.56	1	6.8	0.1	All
Sun-exposure specialist	0.39	0.5	6.3	0.5	Sun-exposed
Closed forest specialist	0.51	0.5	88	0.5	Shaded

Simulated landscape dynamics

- Start at -100 yrs; 0.95% of the forest harvested every year from 100 yrs ago until today
- Aggregation of unmanaged forest in the landscape
- Three possible types of management from today (year 0) and 250 yrs forward:
 - Free development (= setting aside)
 - Conventional forestry (FSC standards)
 - Intensive plantation forestry (no Norway spruce dead wood)
- Intensive plantation forestry implemented gradually as stands are harvested
- In conventionally managed forest: amount of dead wood predicted as a function of stand age following Ranius *et al.* (2003; Forest Ecol. Manag.)



Three sets of scenarios (from now and 250 yrs into the future)

Proportion of intensive plantation forestry varies in all scenario sets from 0 to 50%

Scenario set 1: No compensation for loss of dead wood due to intensive plantation forestry

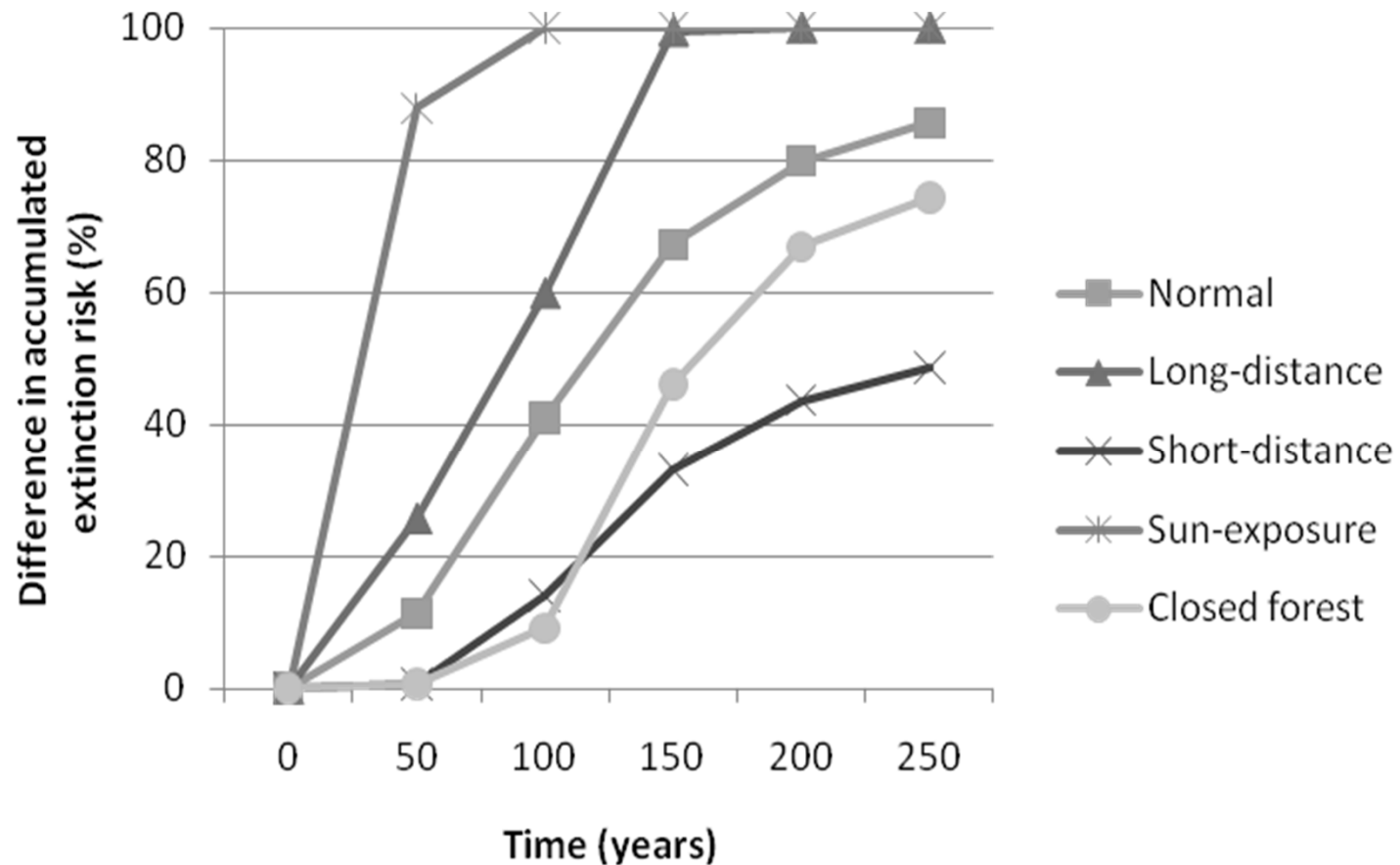
Scenario set 2: Compensation through leaving more dead wood in managed stands

Scenario set 3: Compensation through setting aside more stands for free development

→ *Scenario sets 2 & 3: landscape-scale amount of dead wood remains the same no matter proportion of intensive plantation forestry*

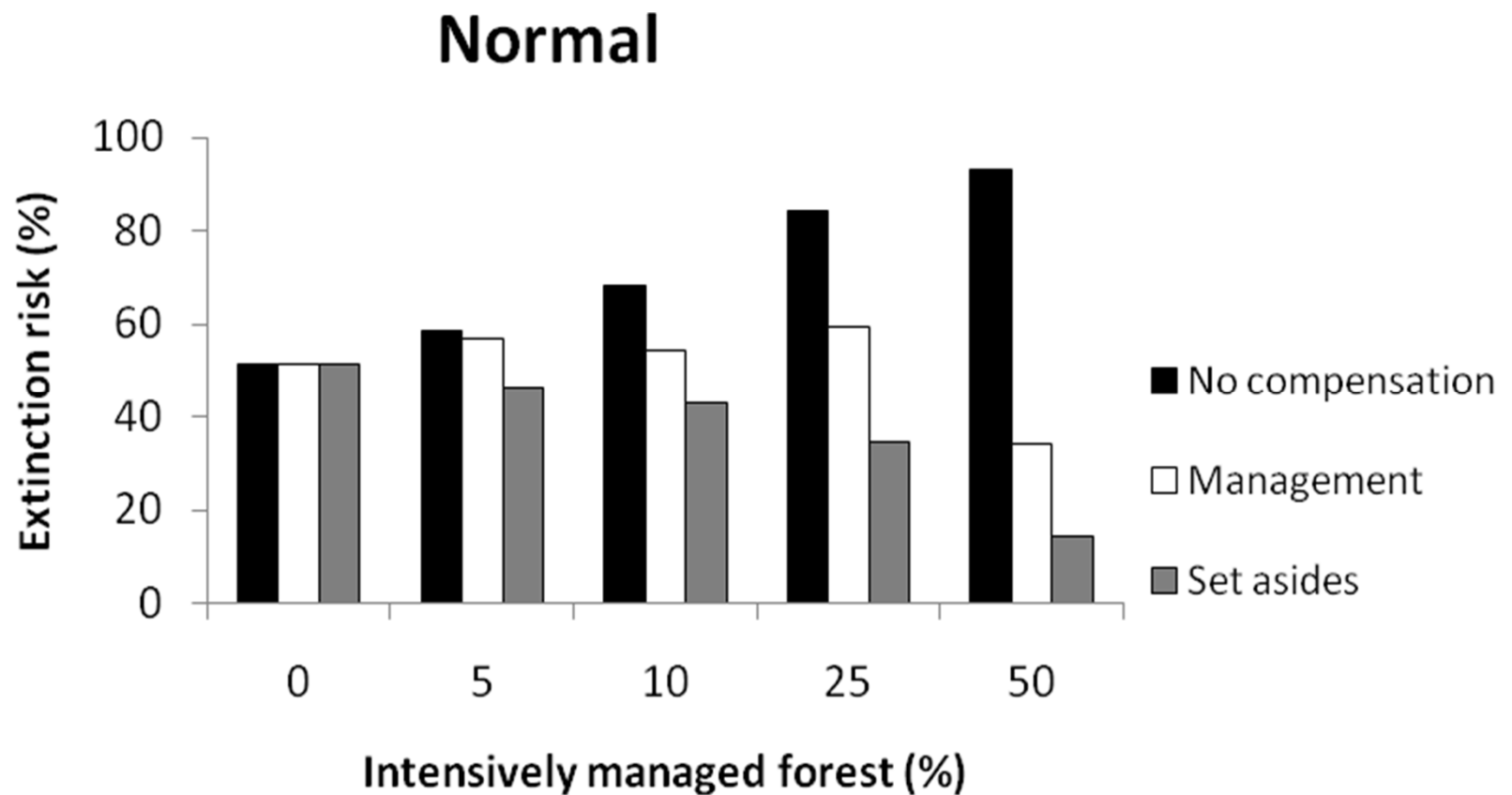
Results

Effects of 50% intensive plantation forestry;
no compensation (scenario set 1)

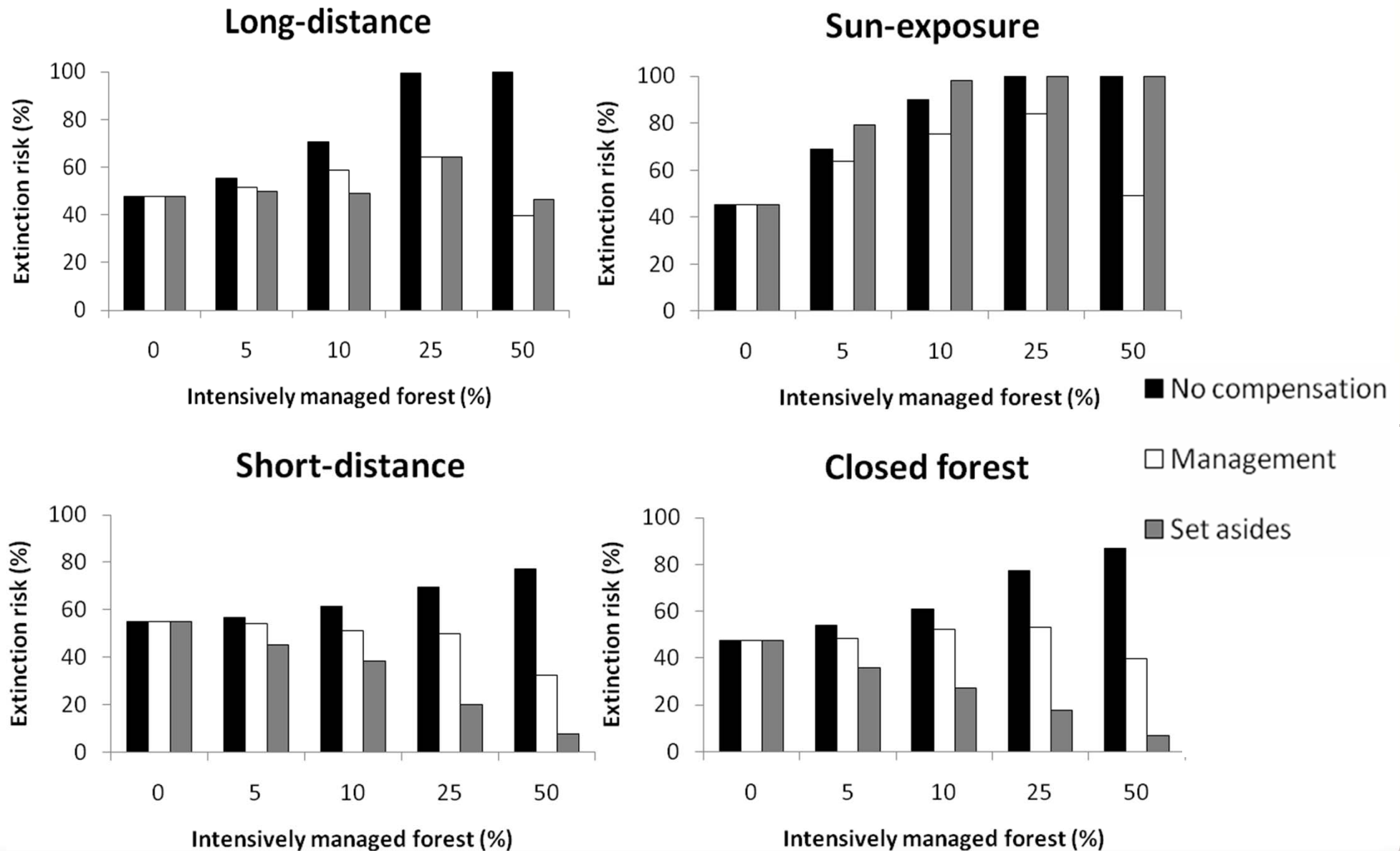


Results (cont.)

Effect of increasing % of intensive plantation forestry;
Normal species, 250 yrs



Results (cont.)



Proportion of intensive plantation forestry (%)	Change in harvestable wood volume (%)		
	No compensation	Compensation through management	Compensation through set-asides
0	0	0	0
5	+5	+4.7	+2.9
10	+10	+9.5	+5.7
25	+25	+23.7	+14.3
50	+50	+47.3	+28.6

Conclusions

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- Local decreases in biodiversity in individual stands, but increased landscape-scale biodiversity?
- However, some species (here the sun exposure specialist) seem not to benefit from compensation through set-asides

Thank you for your attention!



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