A model of the post-fire recruitment of *Picea mariana* and *Pinus banksiana* as a function of salvage timing and intensity

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Fire and the Boreal forest

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***Picea mariana* (black spruce) (Semi serotinous)**

***Pinus banksiana* (jack pine) (Fully serotinous)**

- Possess aerial seedbanks

Salvage

- The harvesting of charred trees following fire
- Recuperates economic losses associated with fire
- Intensive and extensive
- Typically applied in the first autumn and winter post-fire to avoid degradation due to wood-boring insects, stain fungi, wood-decay fungi, and checking

Negative effects

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2. Negative effects of removal of wood on dead-wood-dependent species

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3. Changes in hydrologic regime

4. Altered soil characteristics

5. Road network expansion

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•A seedling density of ~1/m^2 or greater considered adequate to fully re-stock stands (Greene *et al.* 2002)

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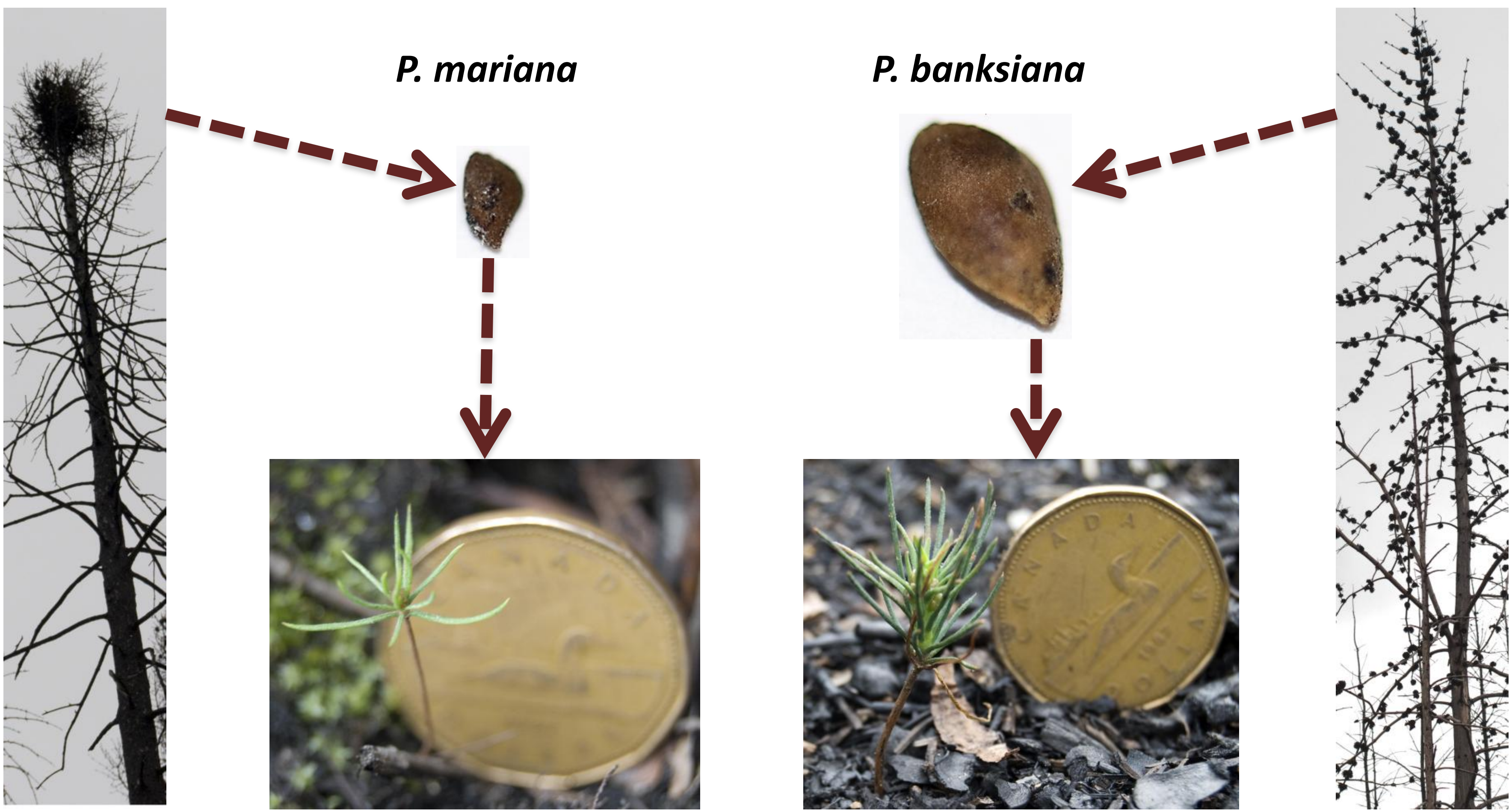
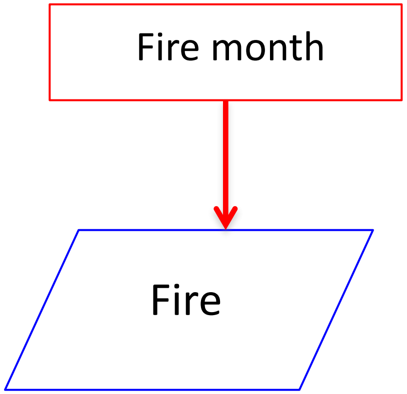
4. Model the effect of distributing salvaged seed.

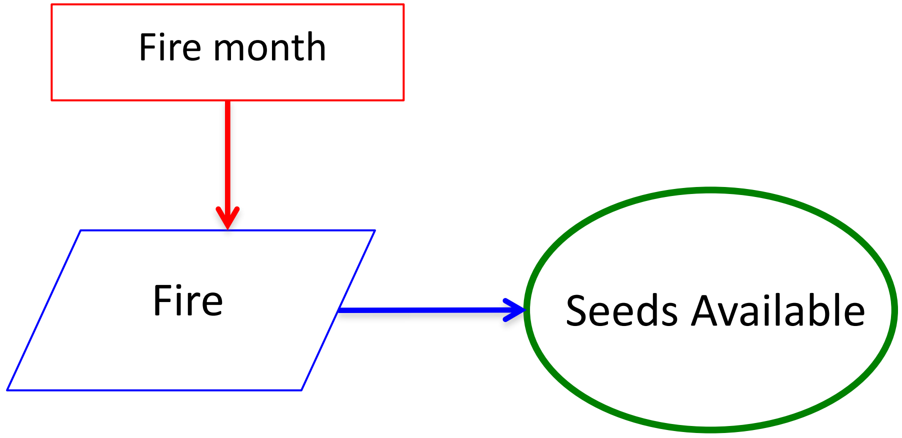
General approach

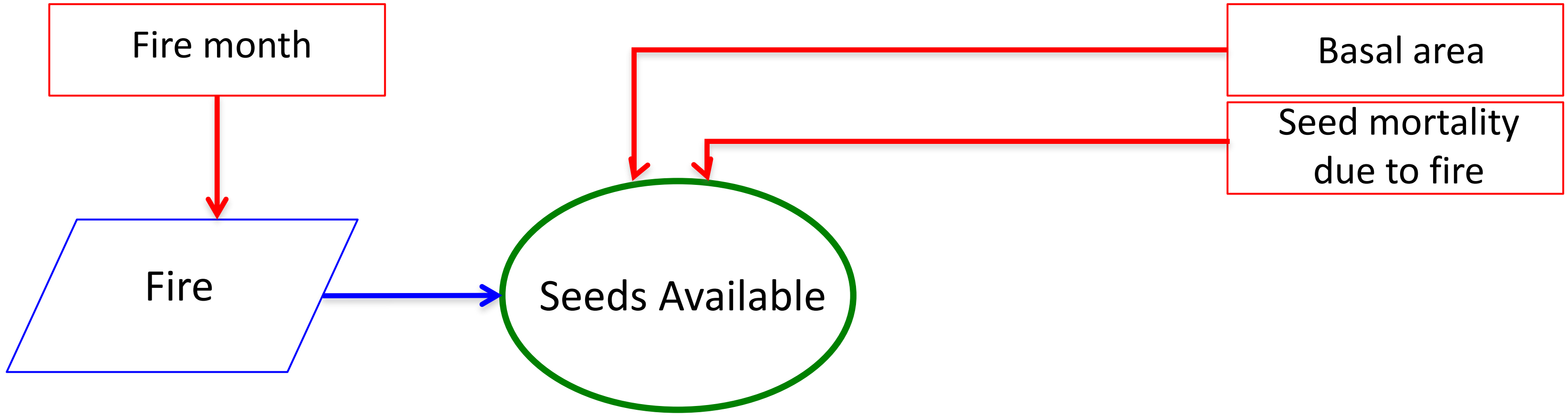
- Developed using the modeling software STELLA

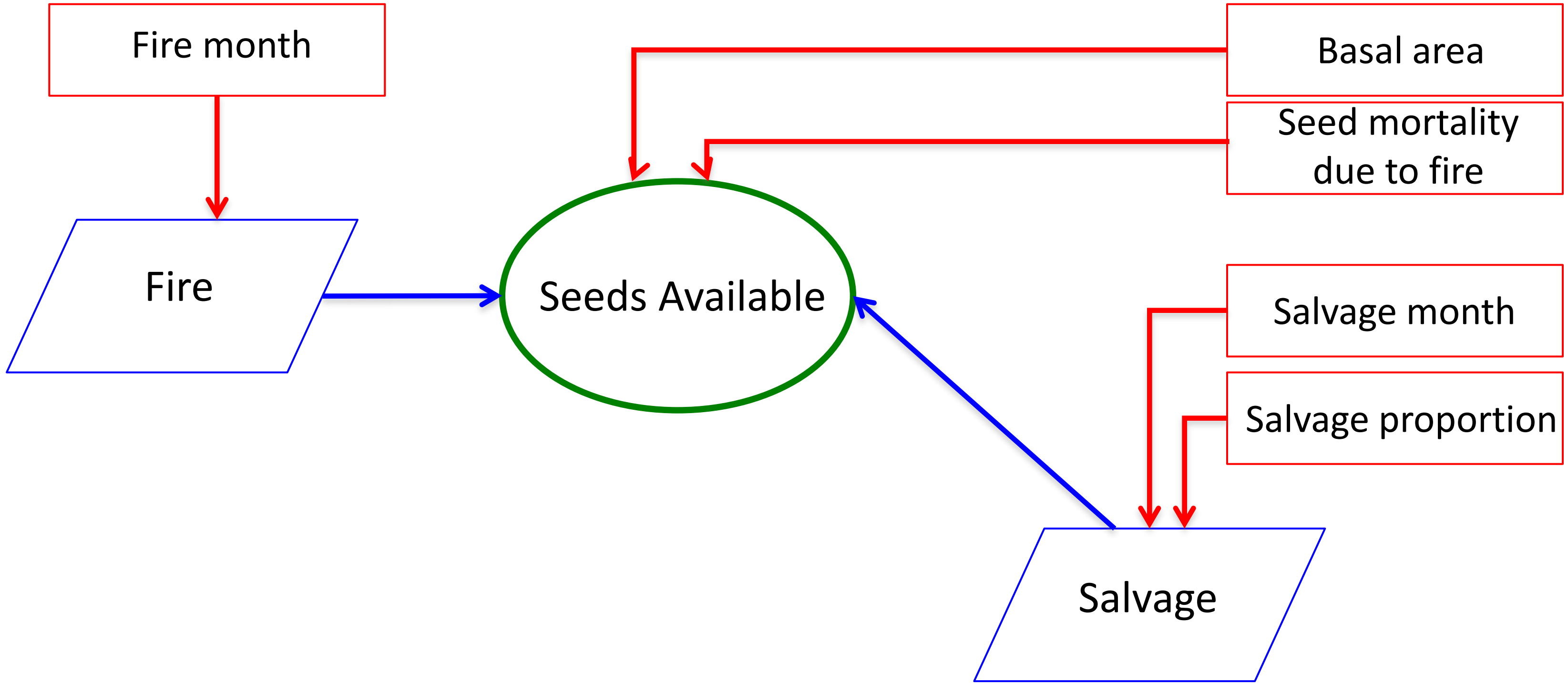
- Simulation period: 72 months (6 years)

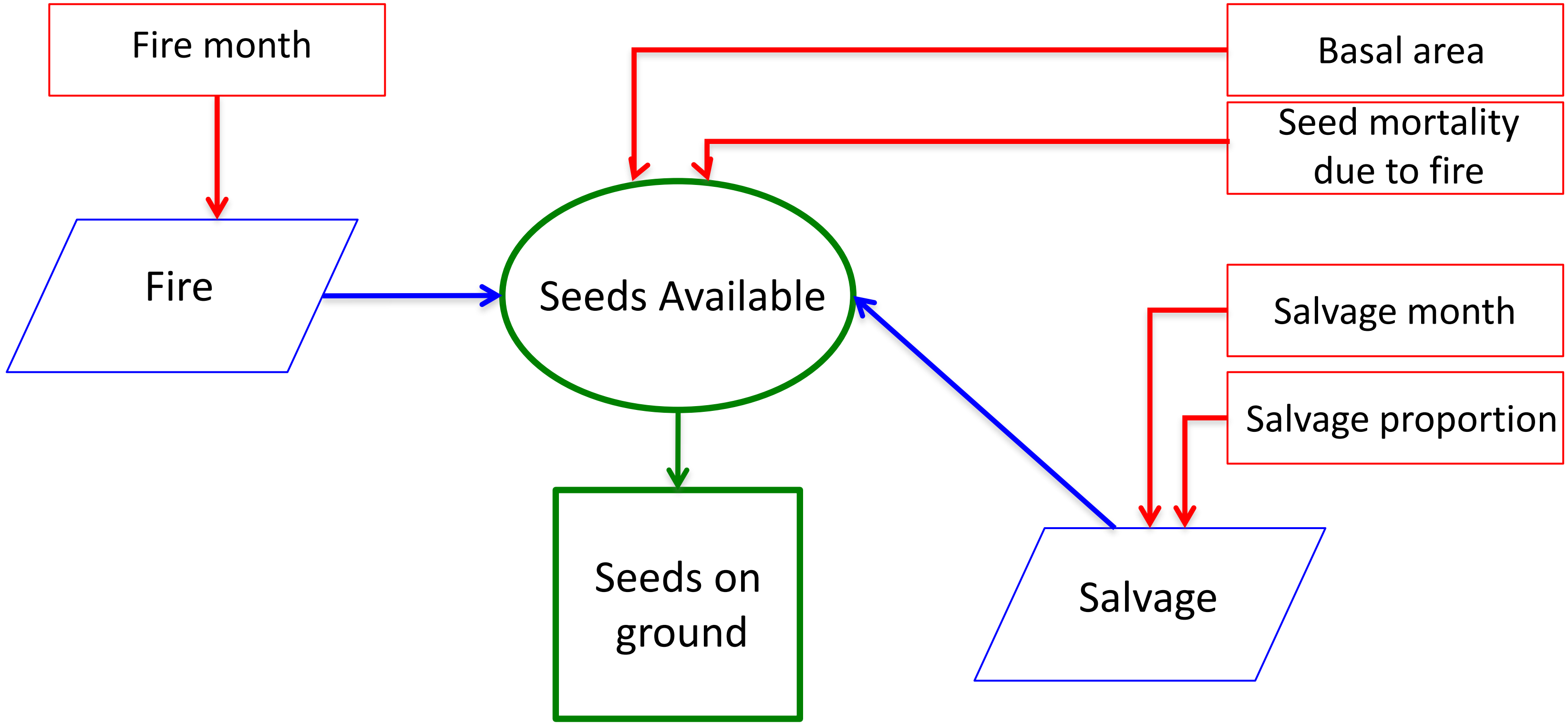


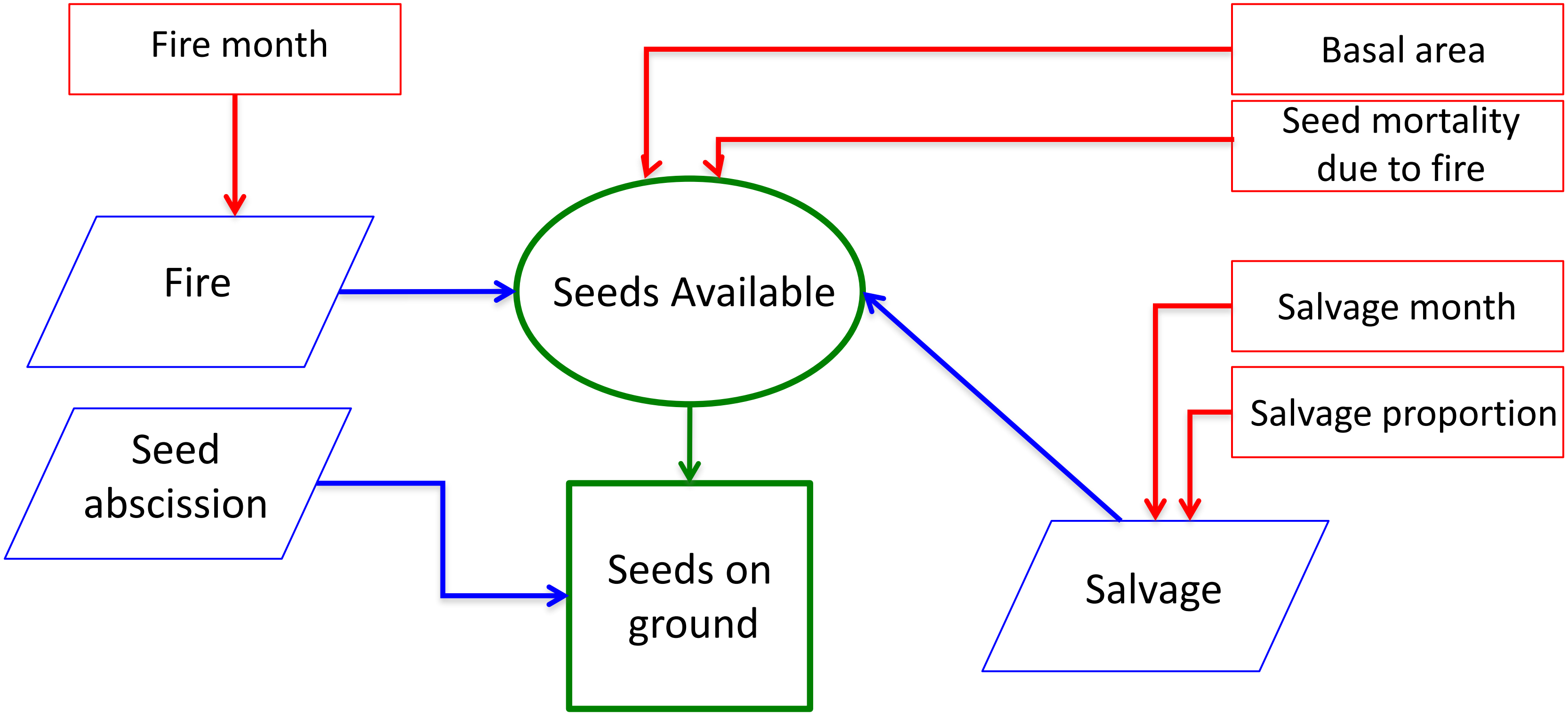

Fire month
Fire


Fire month
Fire
Seeds Available

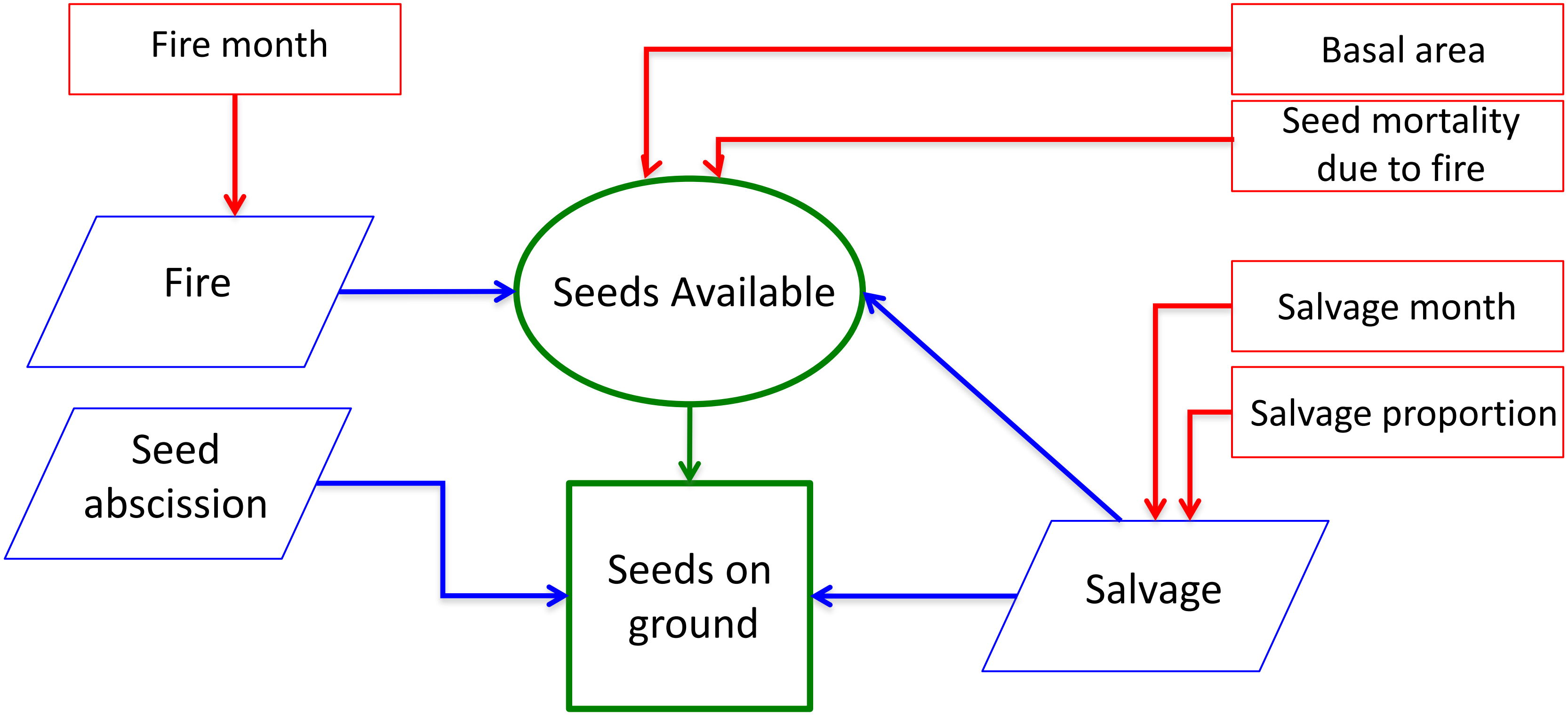

Fire month
Basal area
Seed mortality due to fire
Fire
Seeds Available


Fire month
Basal area
Seed mortality due to fire
Fire
Seeds Available
Salvage month
Salvage proportion
Salvage


Fire month
Basal area
Seed mortality due to fire
Fire
Seeds Available
Salvage month
Salvage proportion
Seeds on ground
Salvage



Fire month
Basal area
Seed mortality due to fire
Fire
Seeds Available
Salvage month
Salvage proportion
Seed abscission
Seeds on ground
Salvage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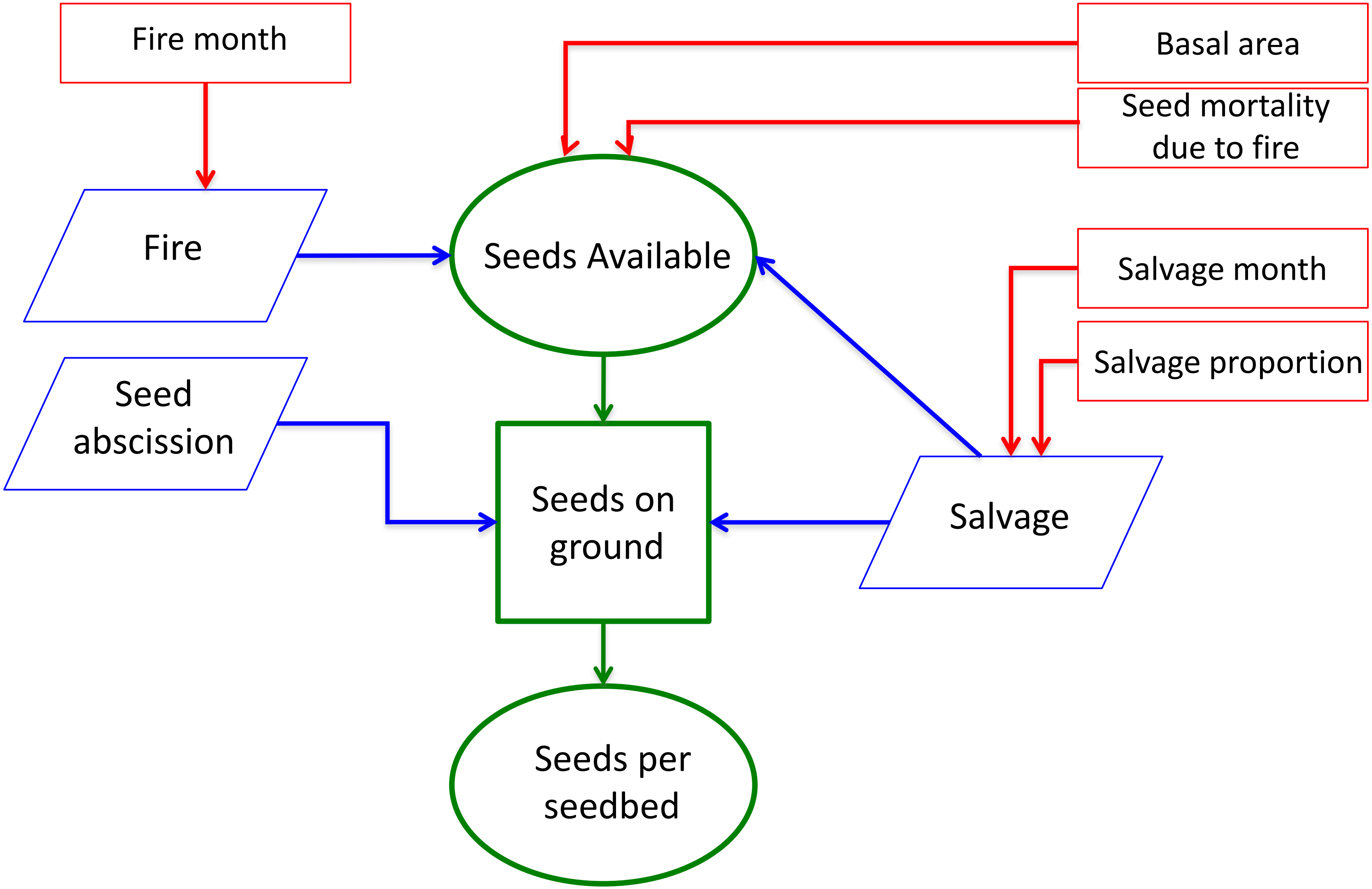
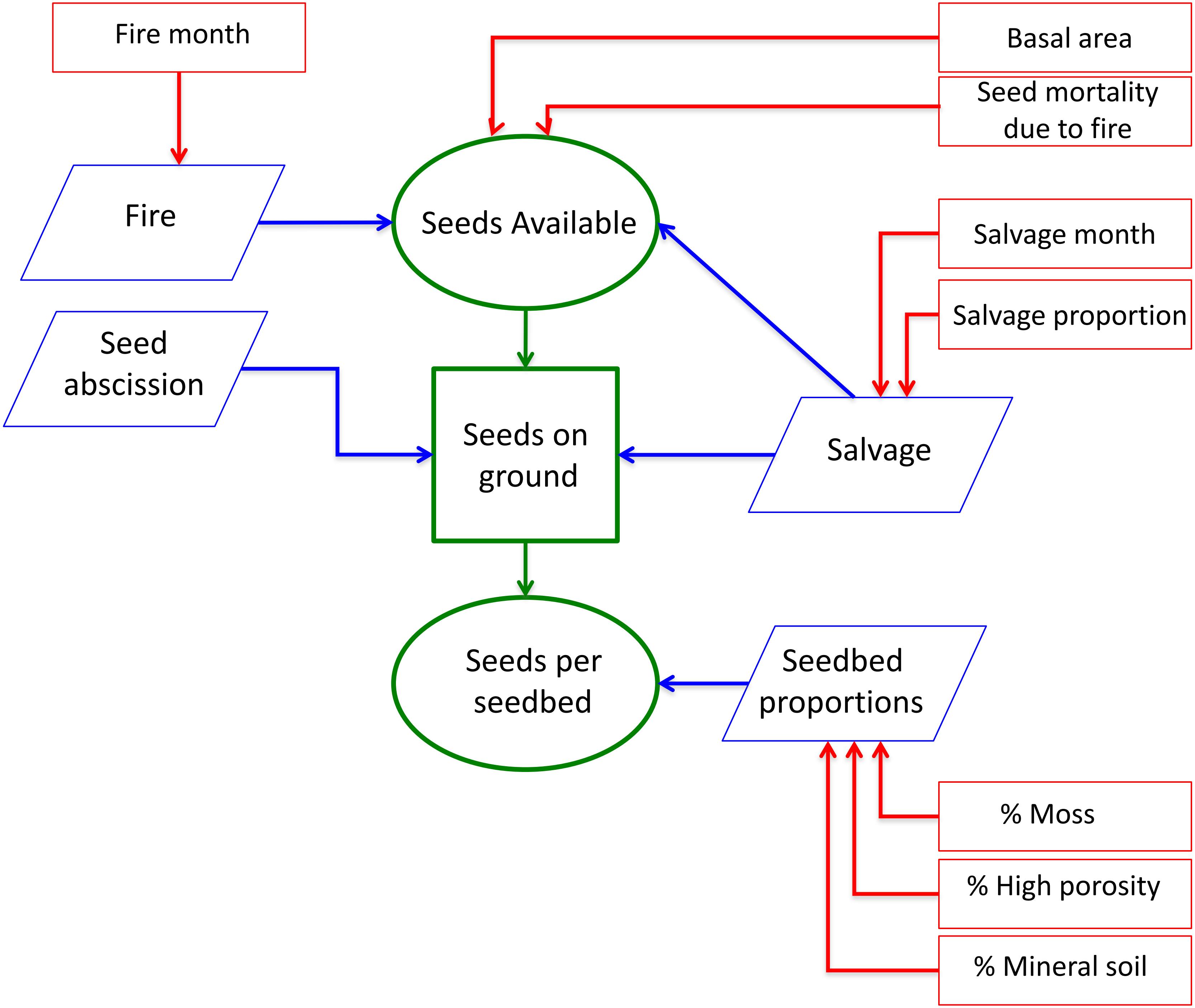

Fire month
Basal area
Seed mortality due to fire
Fire
Seeds Available
Salvage month
Salvage proportion
Seed abscission
Seeds on ground
Salvage
Seeds per seedbed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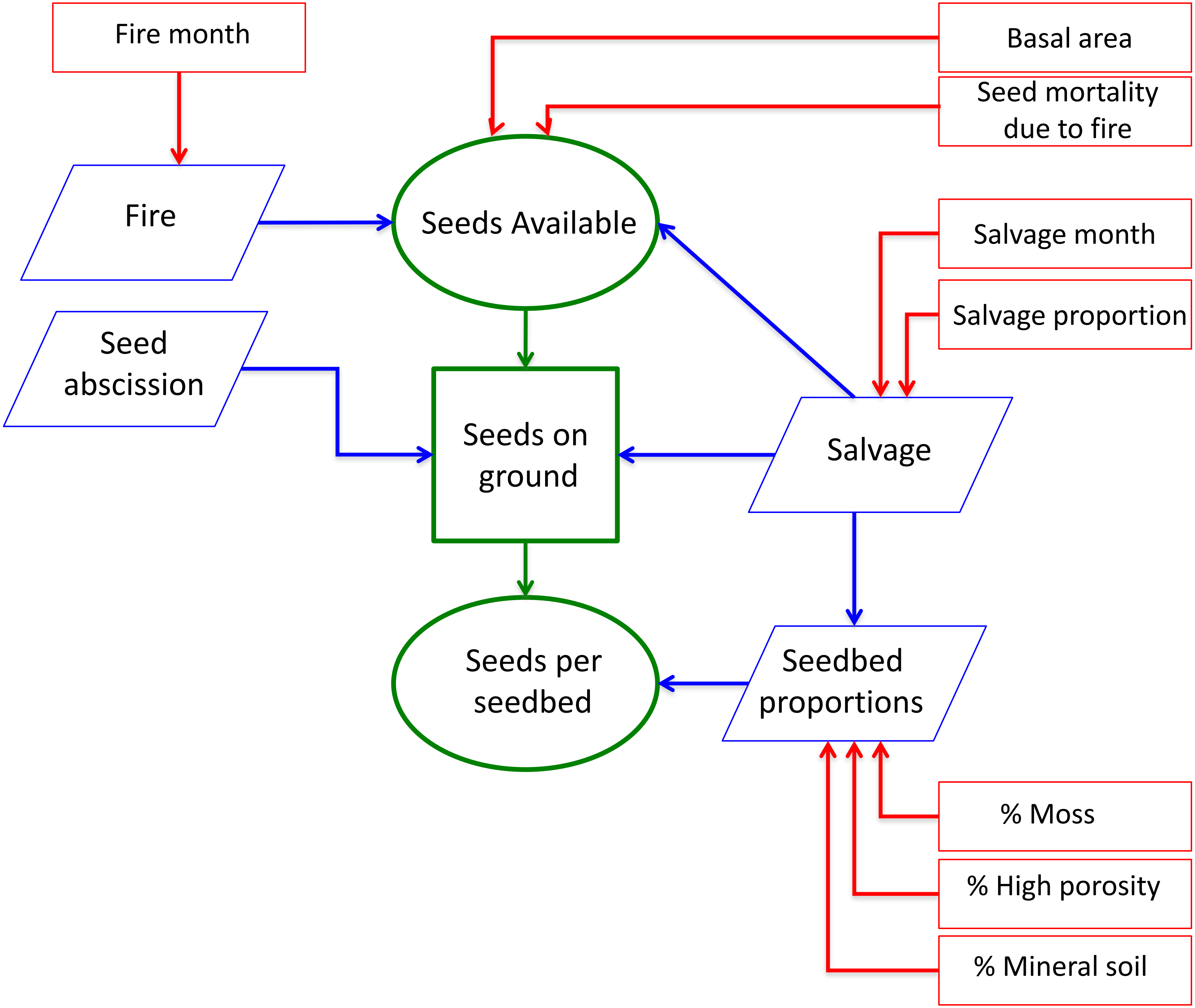
Salvage
Seeds per seedbed
Seedbed proportions
% Moss
% High porosity
% Mineral soil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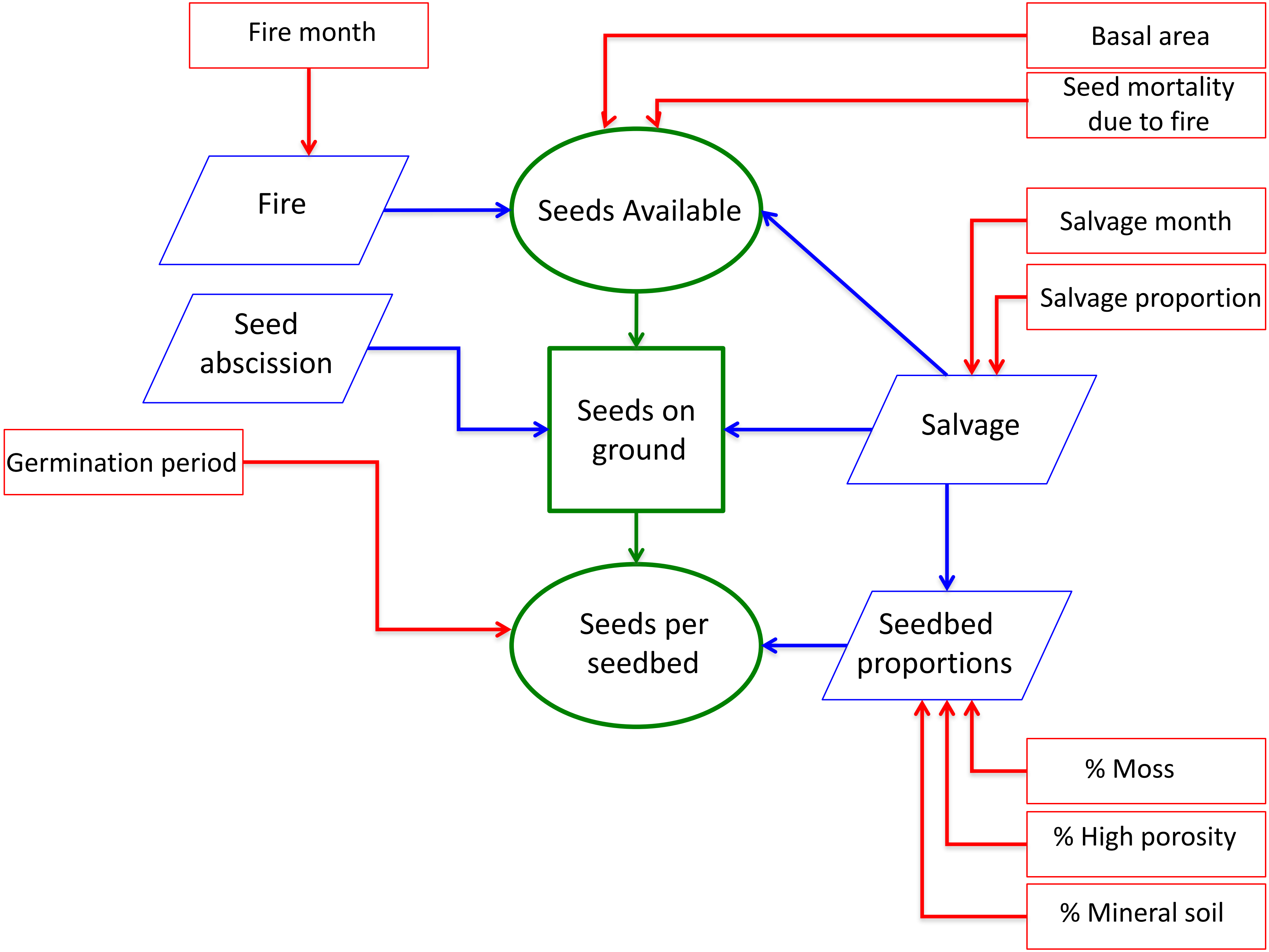

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Germination period
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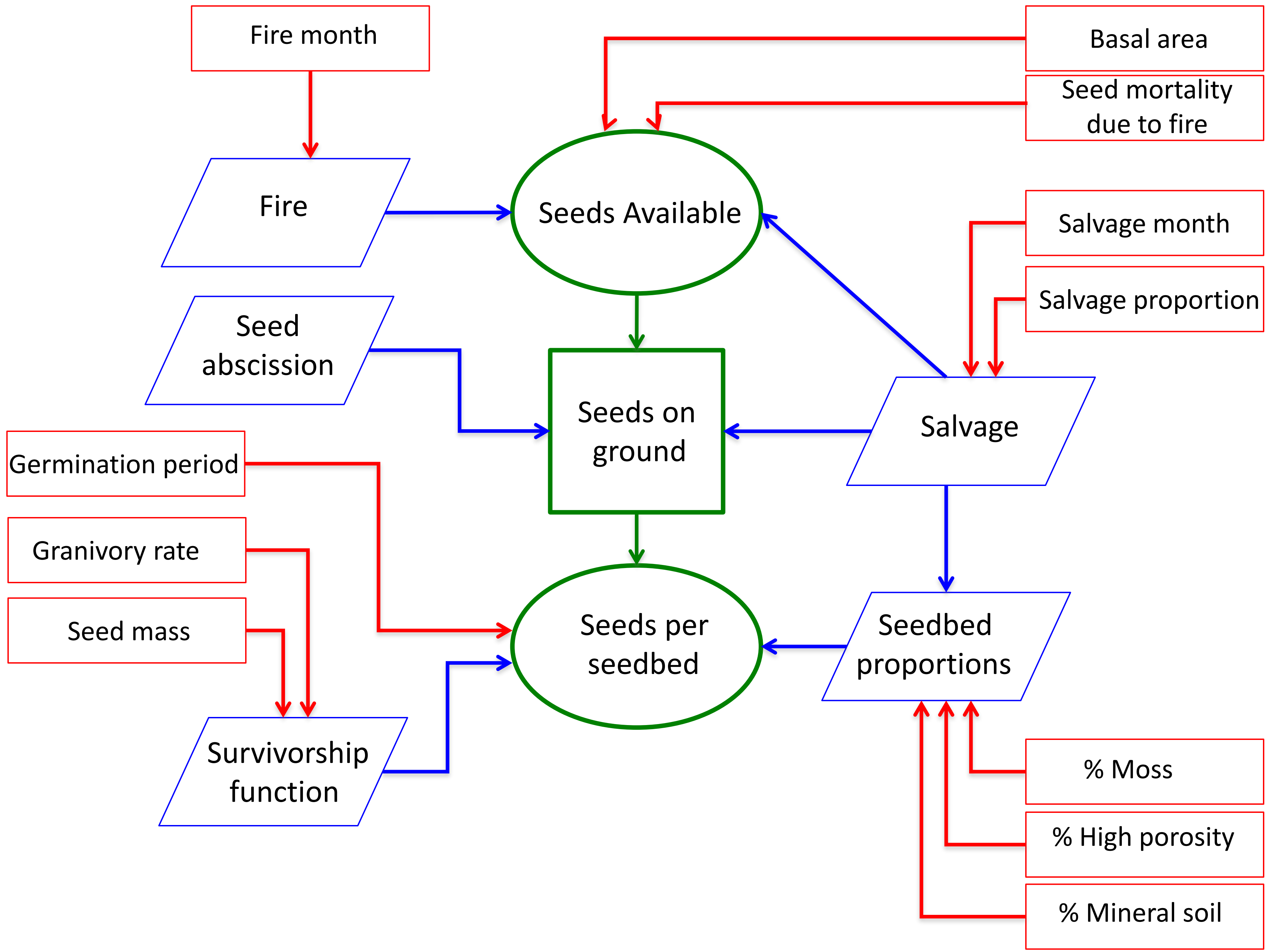
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Seed abscission
Seeds on ground
Salvage
Germination period
Granivory rate
Seed mass
Seeds per seedbed
Seedbed proportions
Survivorship function
% Moss
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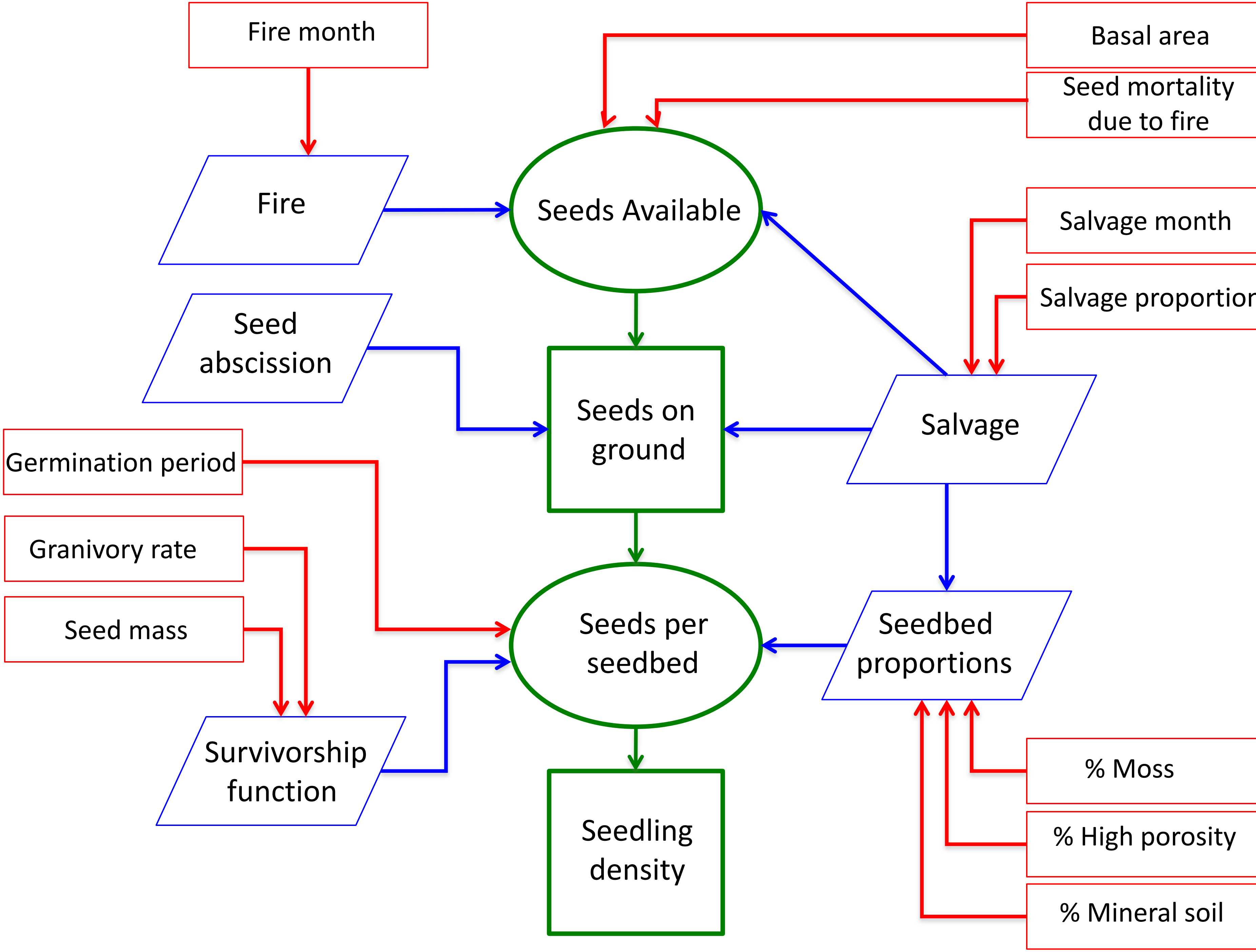
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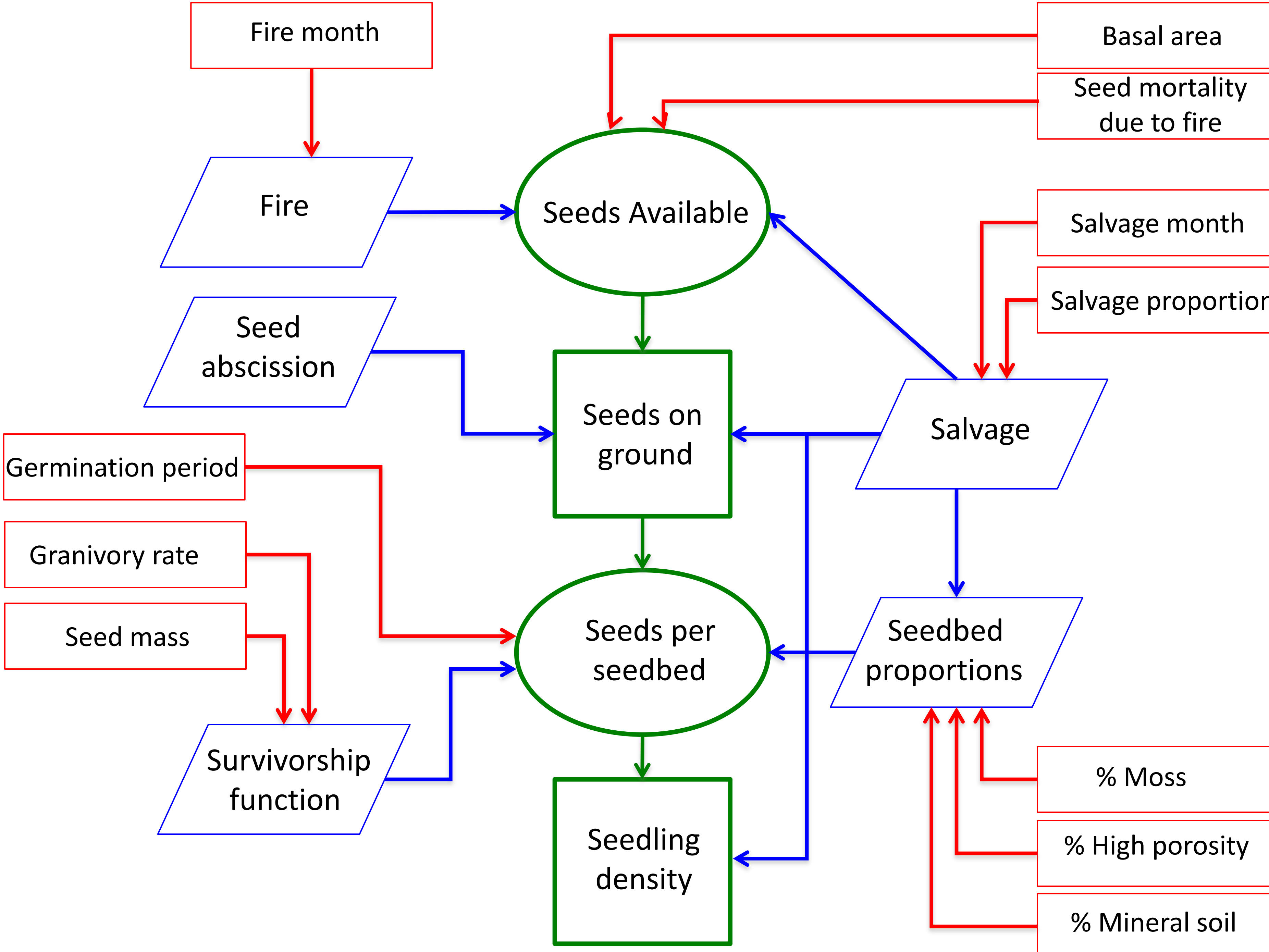
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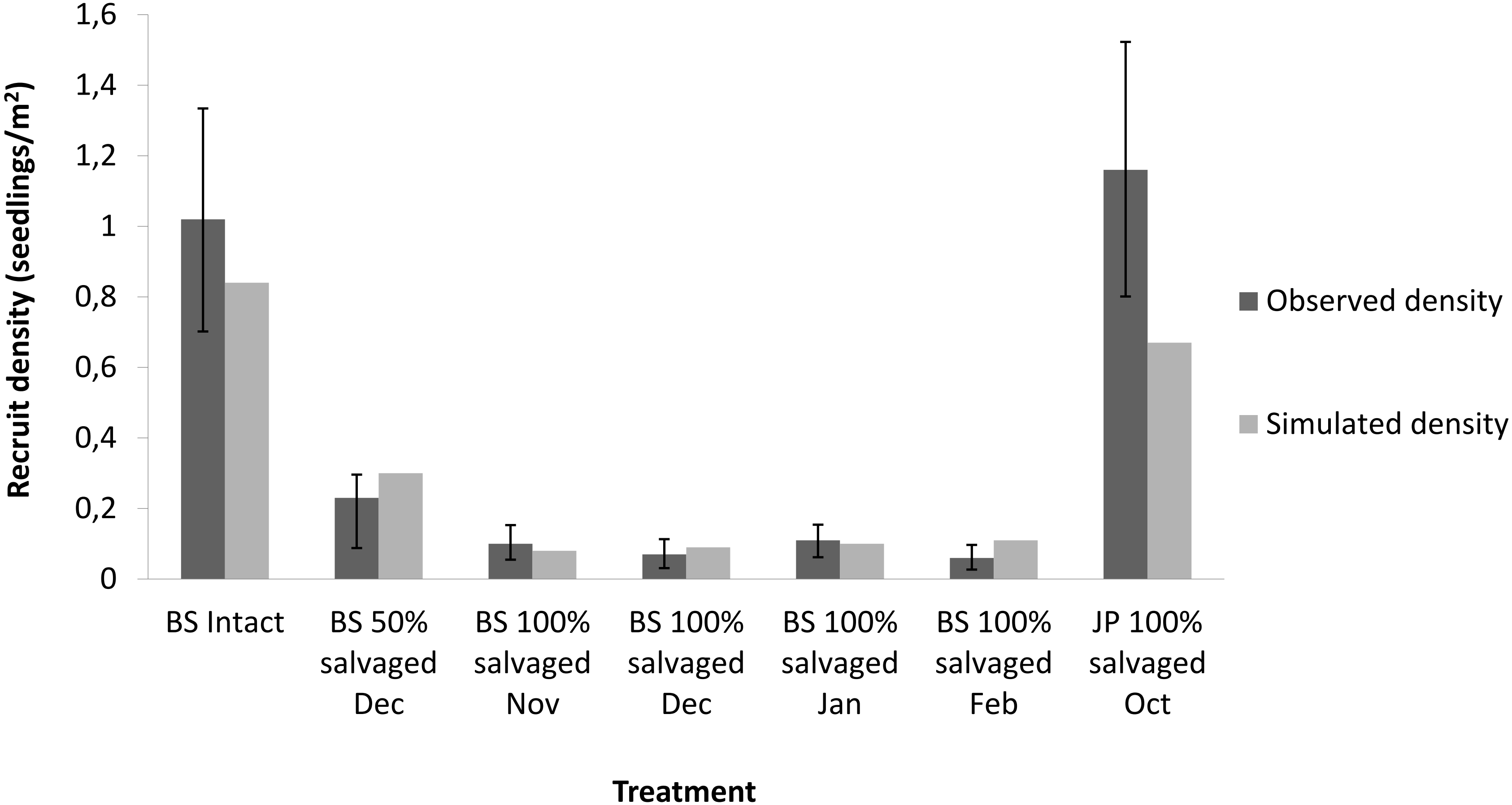
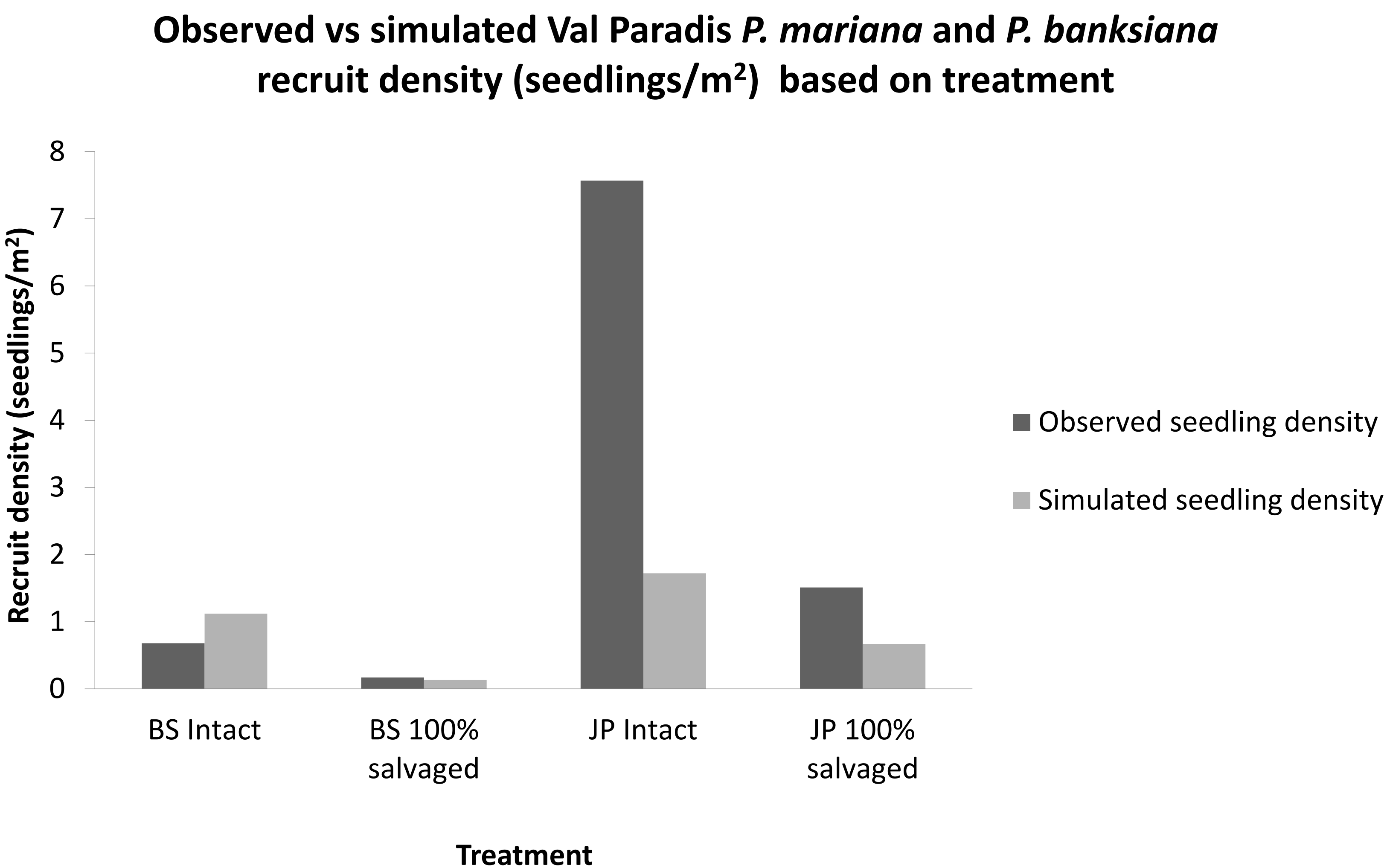
Model validation

Lebel-sur-Quevillion fire

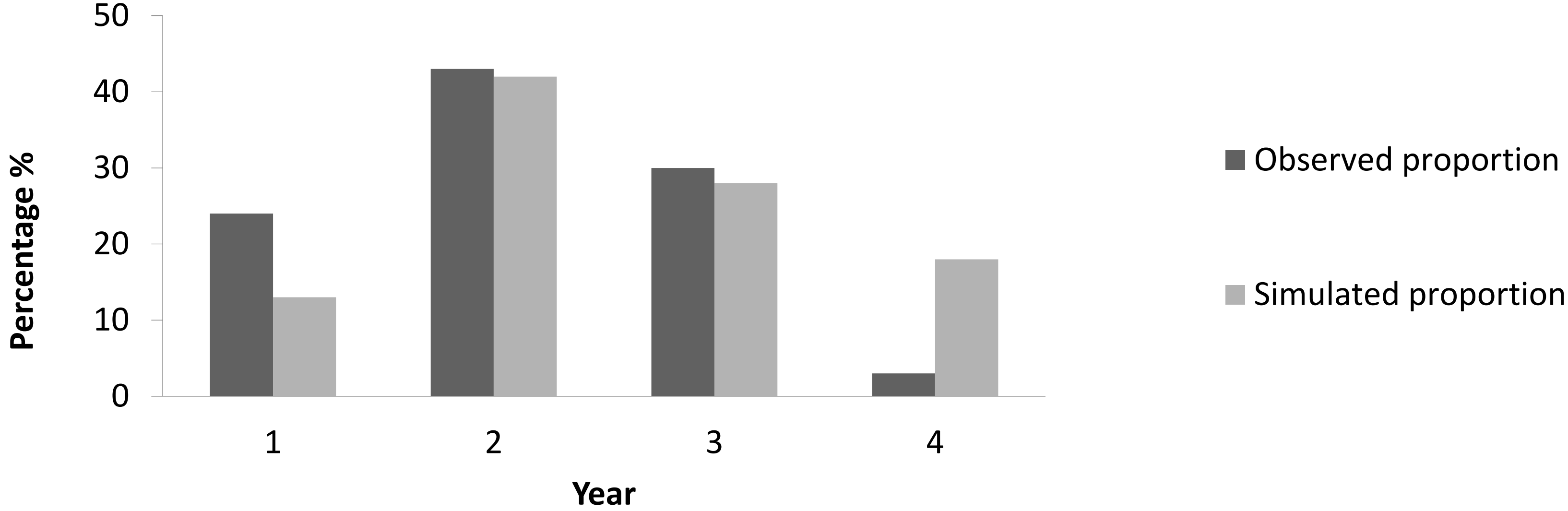
Observed vs simulated Lebel-sur-Quevillion *P. mariana* and *P. banksiana* recruit density (seedlings/m²) based on treatment



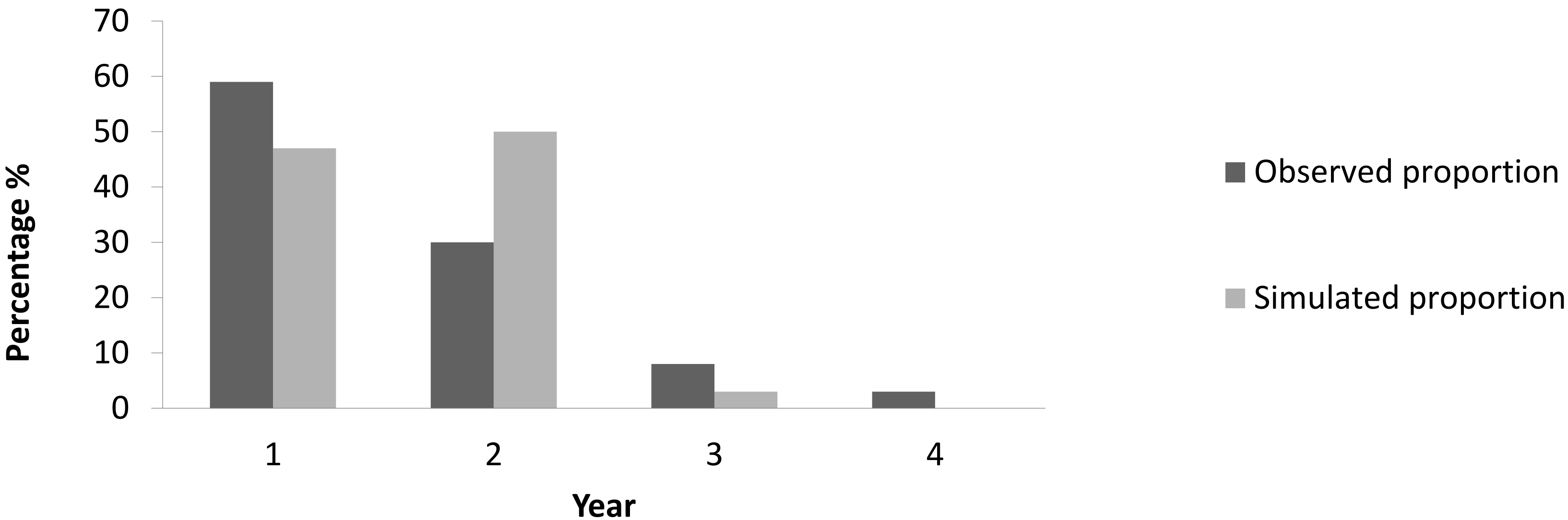
Val Paradis fire (Greene *et al.* 2006, 2004)



P. mariana age structure Val Paradis (simulated vs observed)

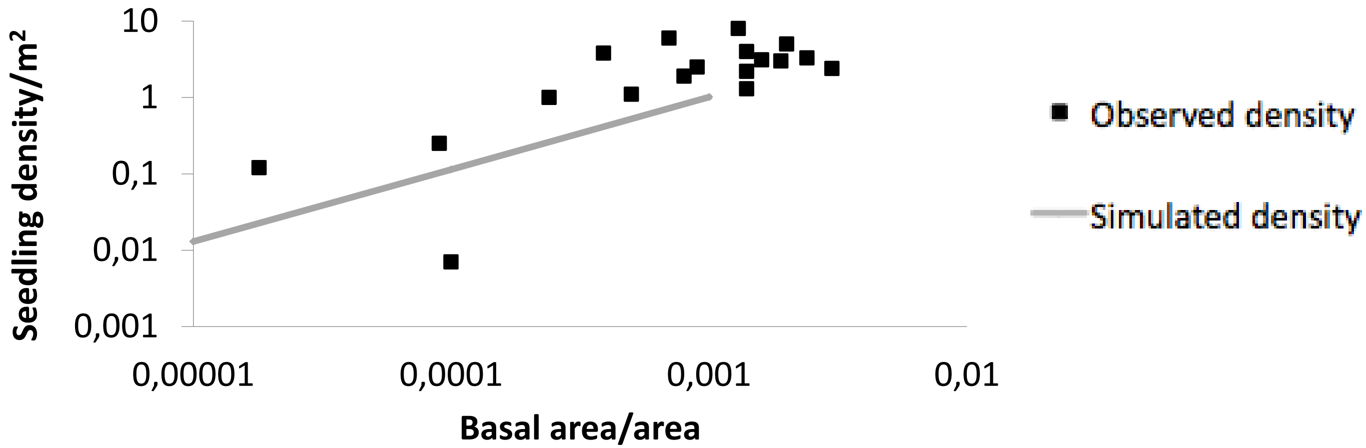


P. banksiana age structure Val Paradis (simulated vs observed)

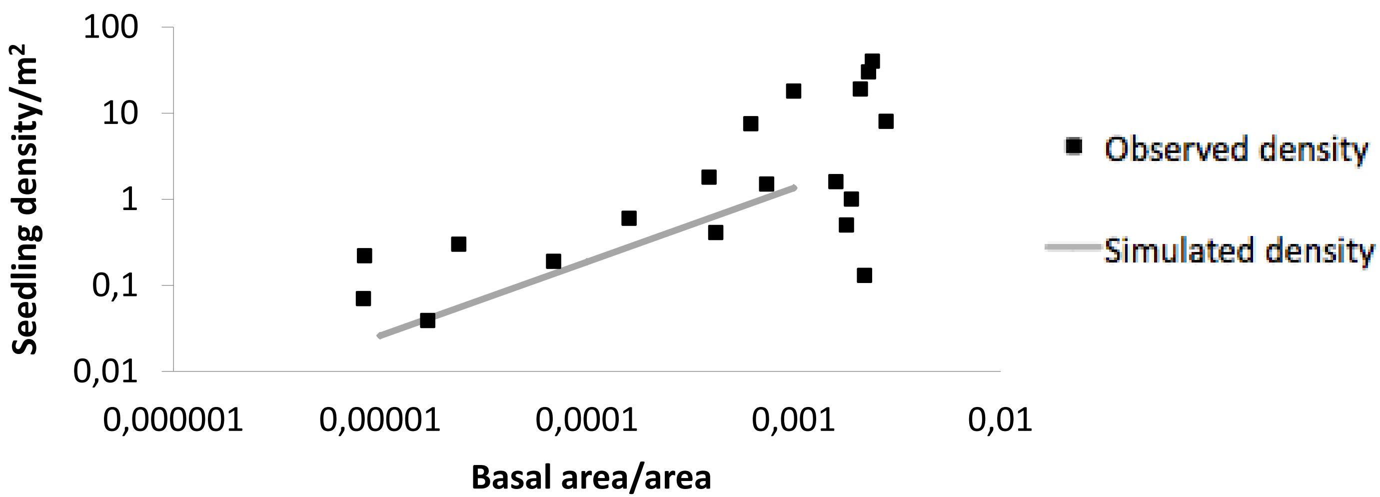


Saskatchewan fire (Greene and Johnson 1999)

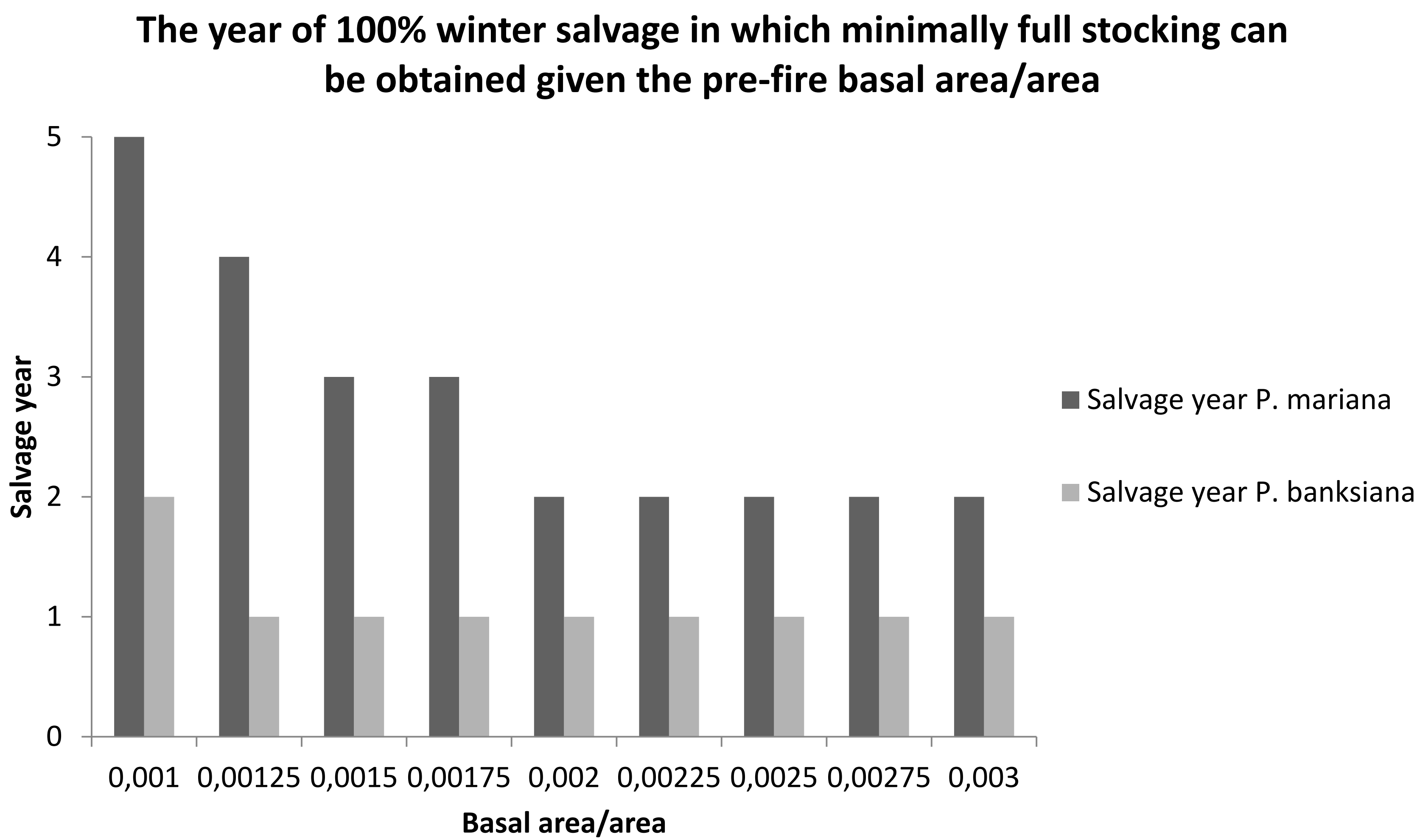
Observed vs simulated *P. mariana* recruit densities per m²



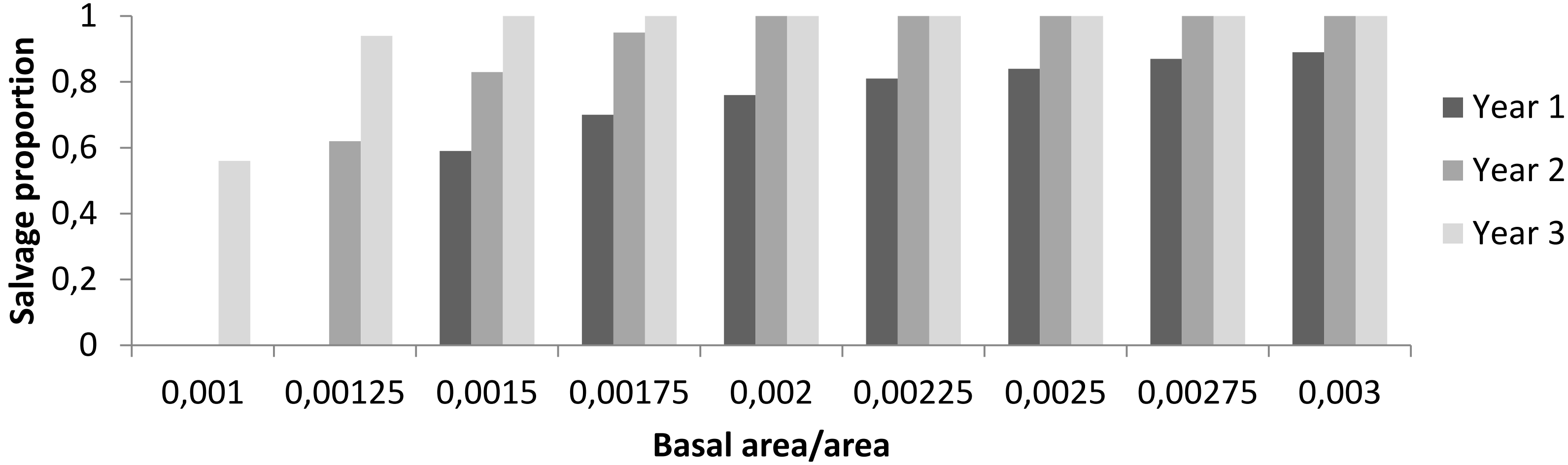
Observed vs simulated *P. banksiana* recruit densities per m²



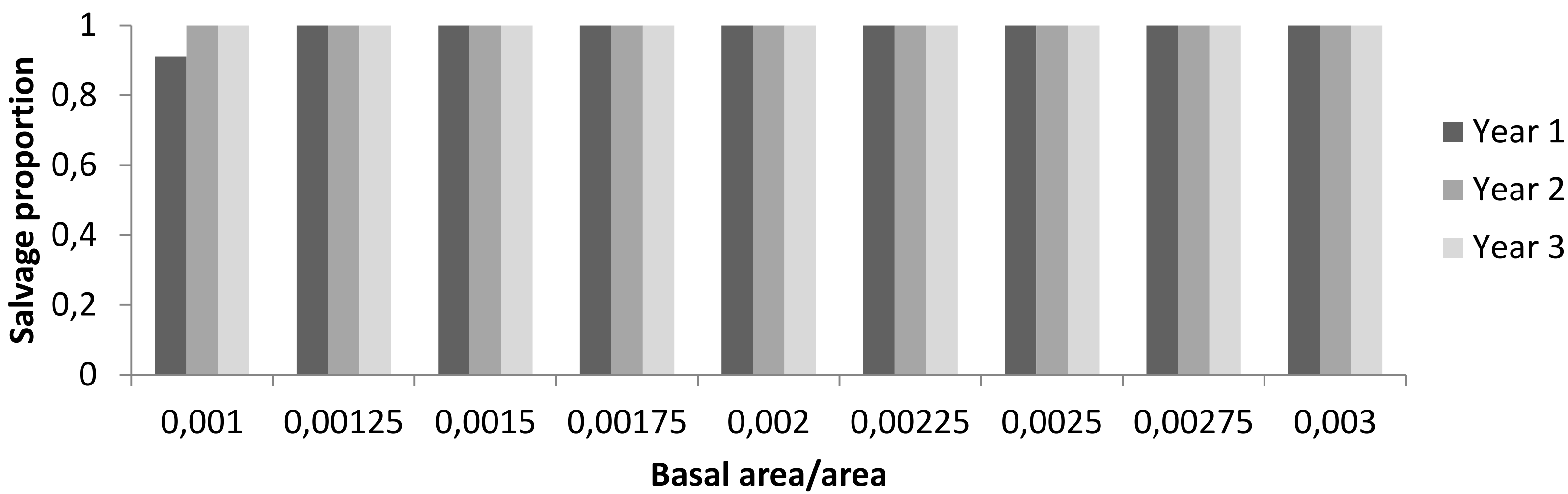
Exploratory simulations



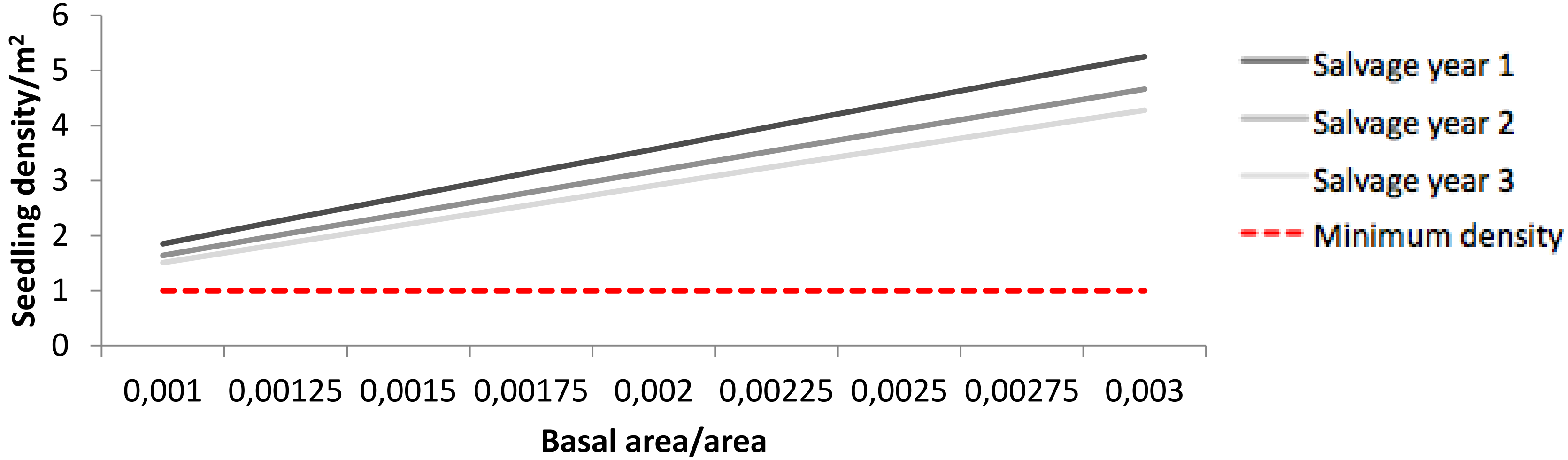
Maximum salvage proportion per year for *P. mariana* to achieve 1 seedling/m² vs the pre-fire basal area/area



Maximum salvage proportion per year for *P. banksiana* to achieve 1 seedling/m² vs the pre-fire basal area/area



P. mariana seedling densities vs year with distribution of salvaged seeds (75%) and 100% salvage



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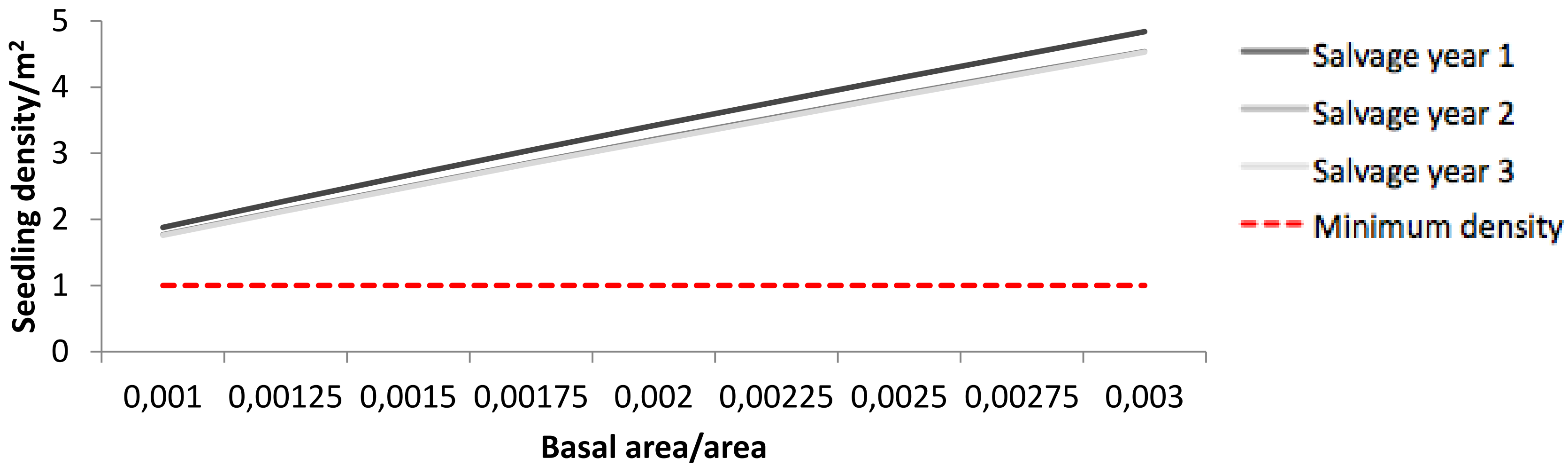

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- Distribution of salvaged seeds presents a promising alternative to planting, as does partial or delayed salvage

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- Wood affected by checking, stain fungi, and insect damage can still be used for pulp

Environment and Economy, a delicate balance

- Most pyrophilous insects and fire-associated woodpeckers are abundant for only 2-3 years following fire (St-Germain and Greene 2009)

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3. Delay salvage until the second or third winter, to be used for pulp only. Satisfy saw-log demand using traditional harvest methods

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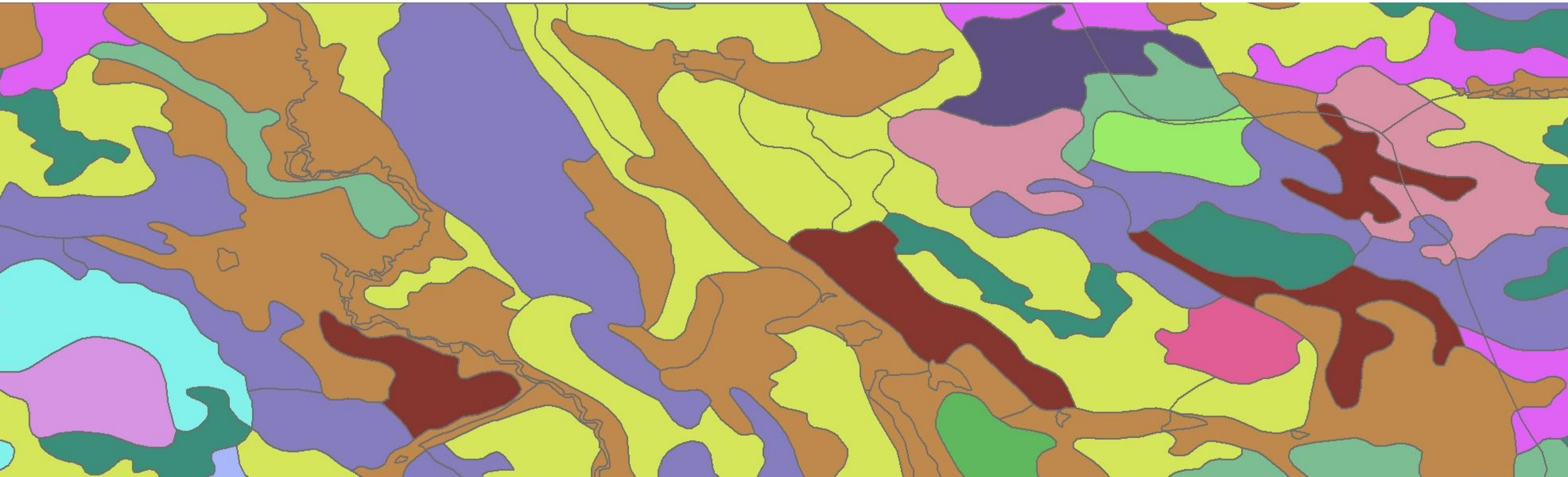
- Translate model results onto forest inventory maps



Merci!