Opportunities and constraints of close-to-nature sylviculture as an adaptation strategy to climate change

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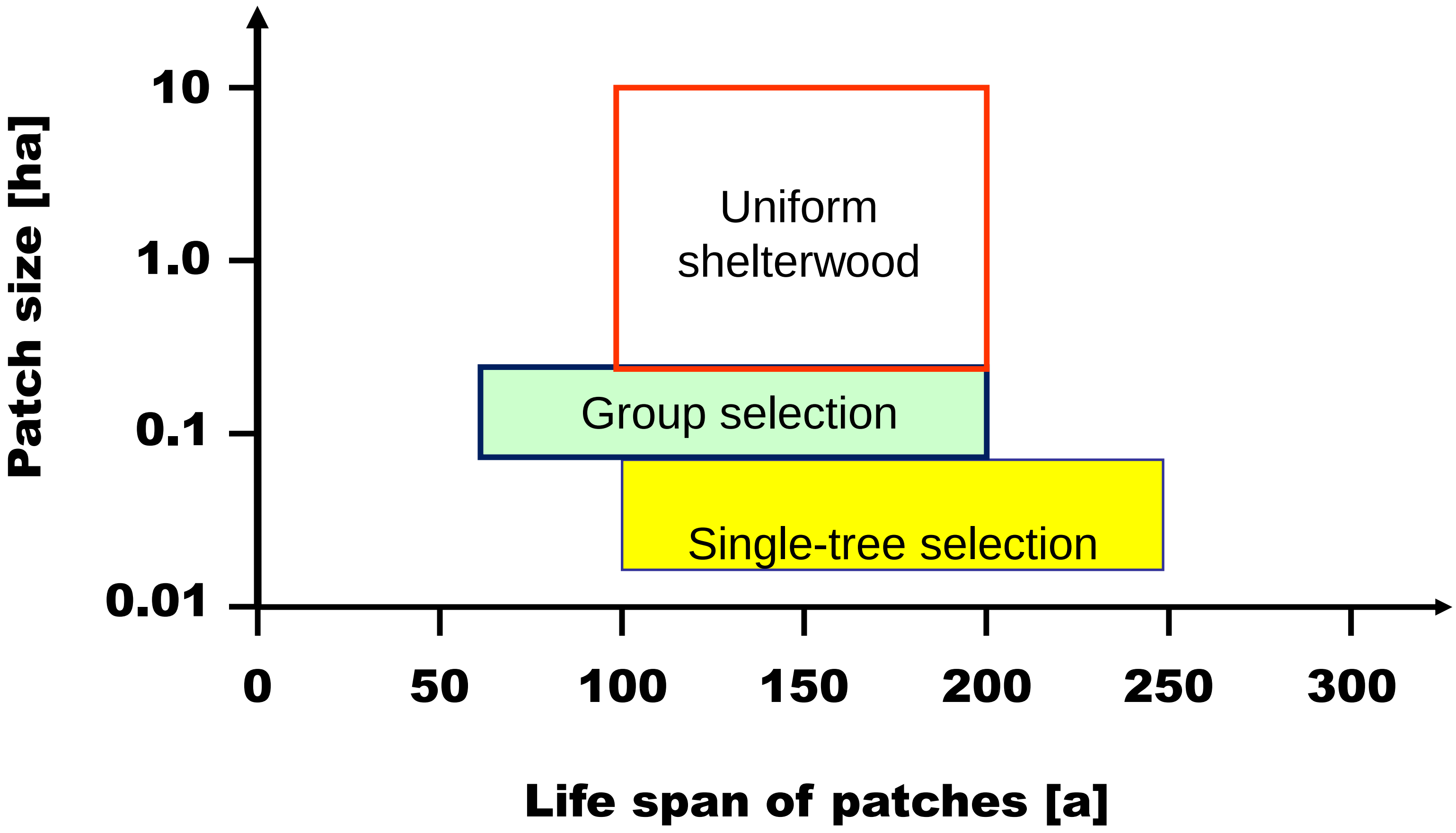
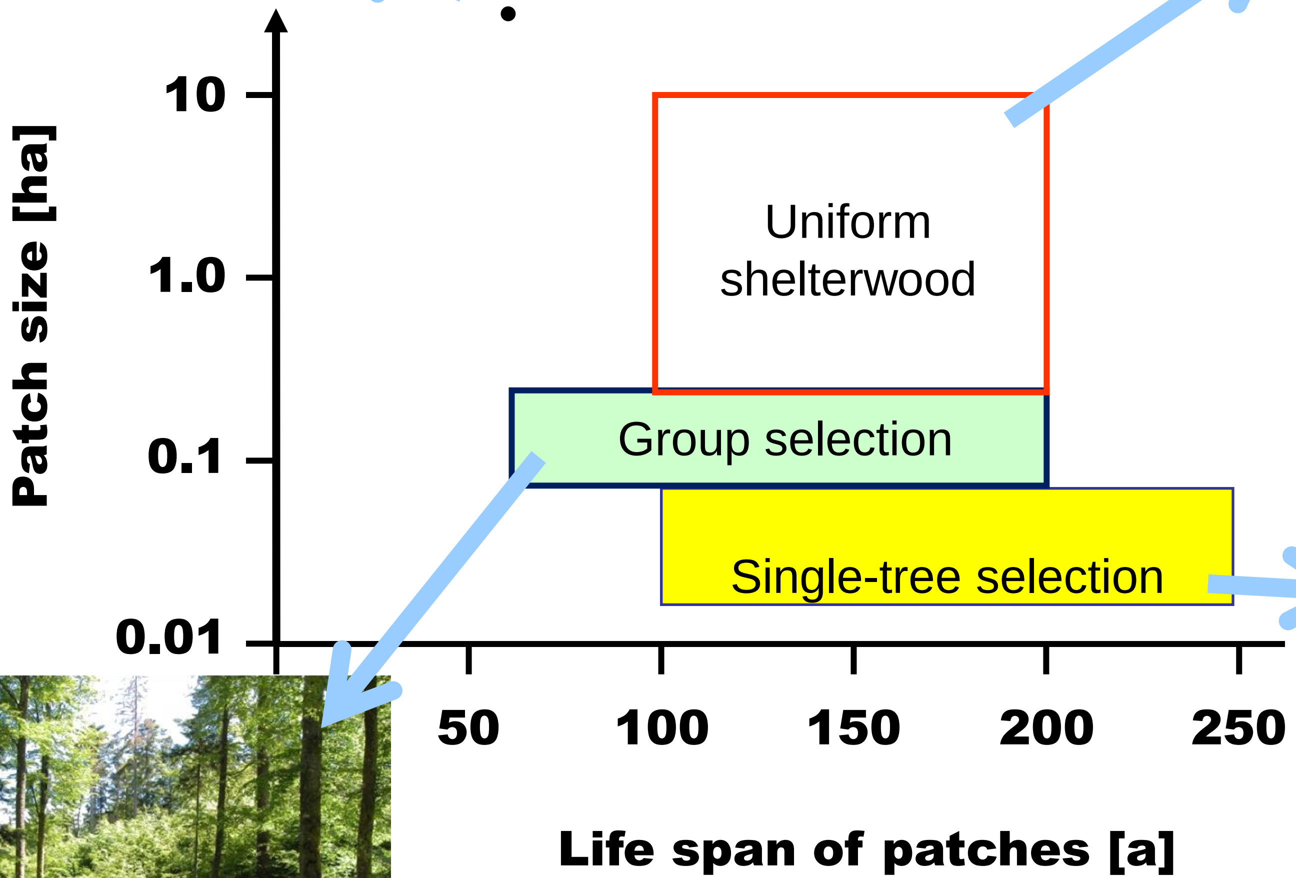
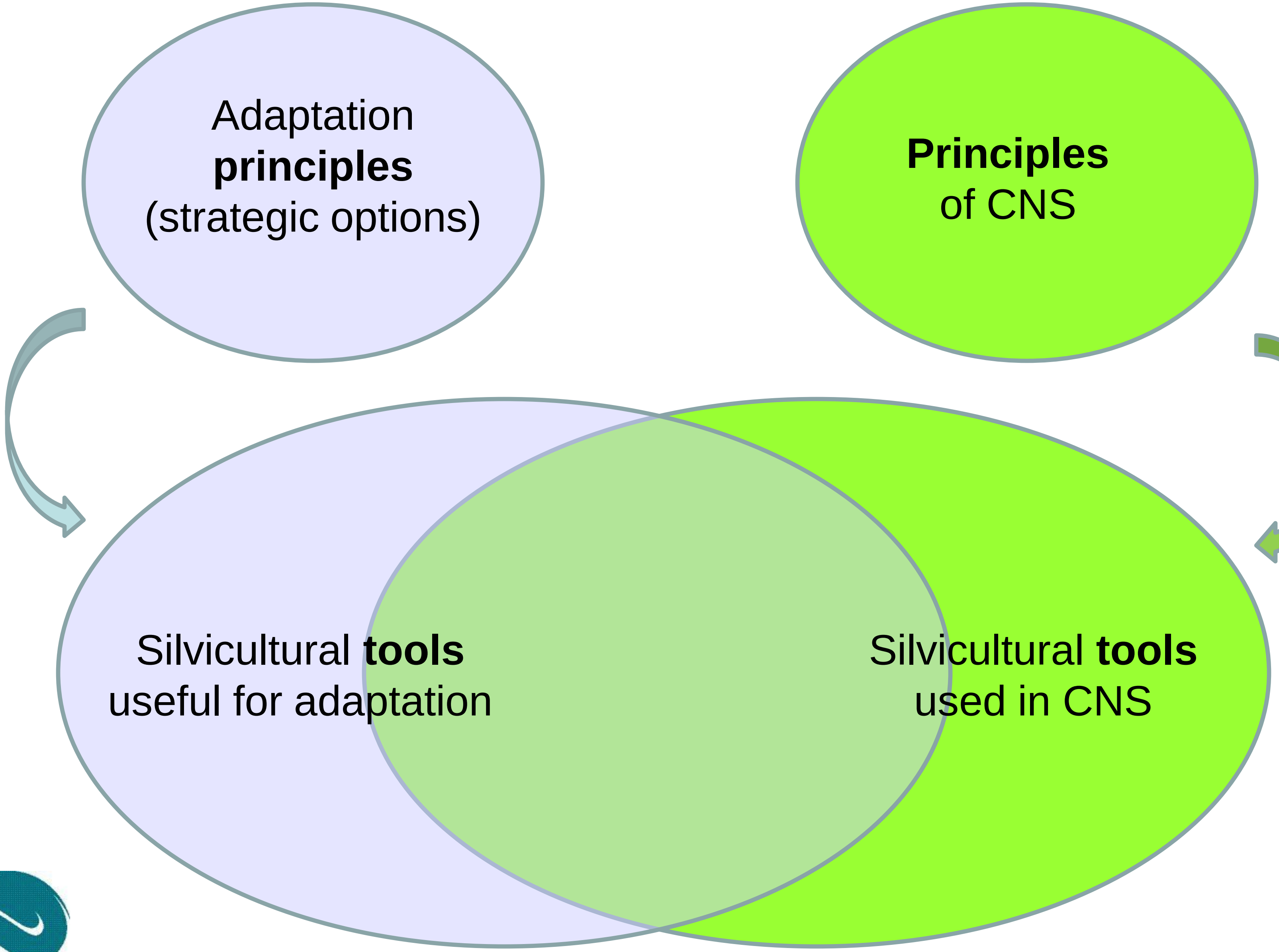
3 CNS types: size and life span of patches



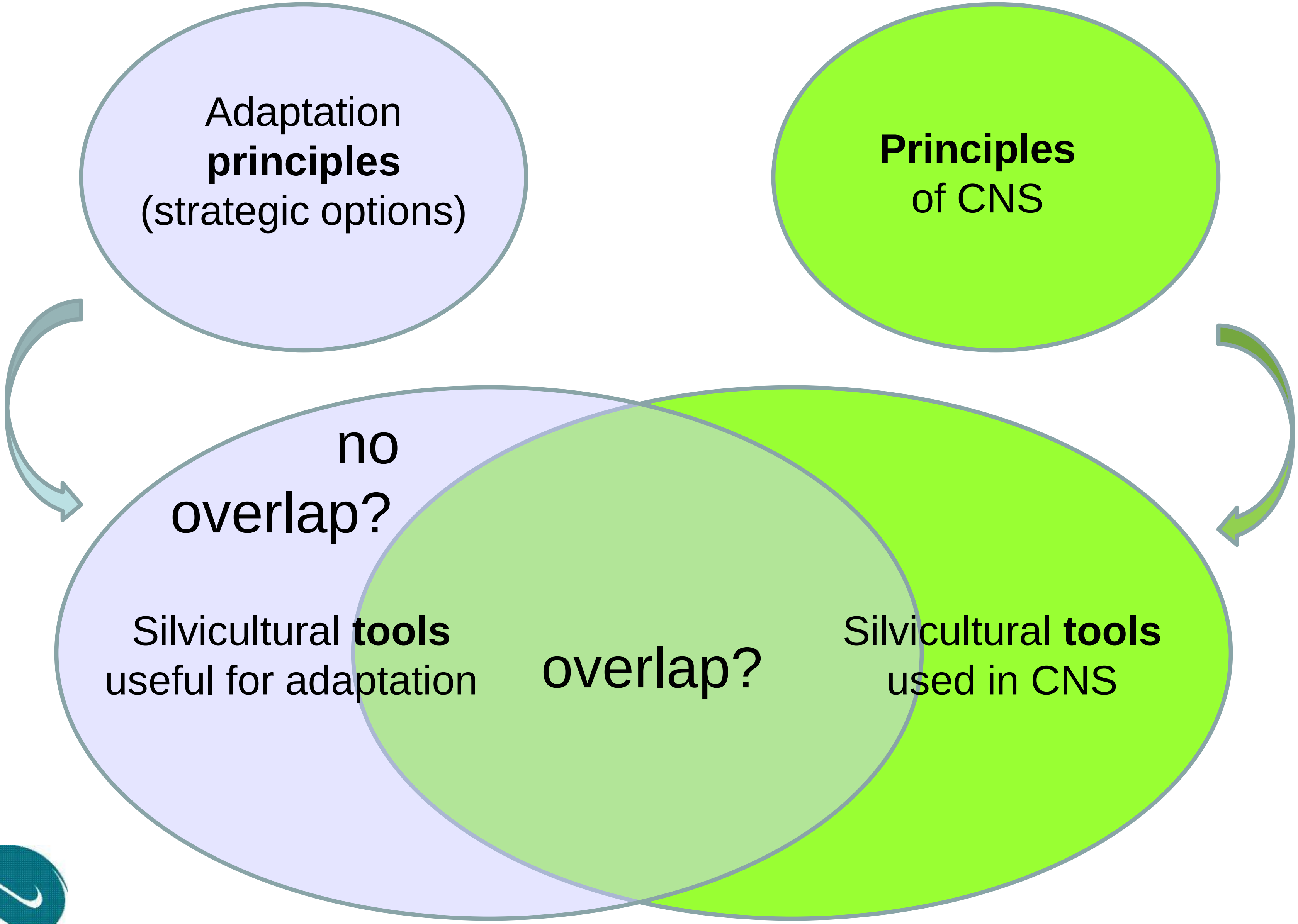
s: size and life span of



Approach


Adaptation **principles** (strategic options)
Principles of CNS
Silvicultural **tools** useful for adaptation
Silvicultural **tools** used in CNS

Approach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(strategic options)
Principles
of CNS
no
overlap?
Silvicultural tools
useful for adaptation
overlap?
Silvicultural tools
used in CNS

CNS principles

- promotion of the **natural or site-adapted tree species composition**, often based on the assumed potential natural vegetation
- promotion of **mixed** forests
- promotion of **diverse** vertical and horizontal stand **structures**
- promotion of **natural regeneration**
- silvicultural practices focus on **individual** trees
- **no clear-cutting**

Importance of the principles varies among CNS types

Adaptation principles

= strategic options for increasing the adaptive capacity* of forests, and avoid/reduce loss of ecosystem services

1. Increase tree species richness
2. Increase structural diversity
3. Maintain & increase genetic variation within tree species
4. Increase resistance of individual trees to biotic and abiotic stress
5. Replace high-risk stands
6. Keep growing stocks low
7. Provide a forest microclimate

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Example:
Justification of … increased species richness

1. Disturbance or stress are less likely to affect all trees (higher resistance)
2. Species-rich stands are more resilient after disturbance (faster recovery)
3. Increased redundancy of ecological functioning
4. Increase of future management options

Seven adaptation principles

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Silvicultural tools to implement the adaptation principles

- Single-tree selection cutting (incl. conversion cuts)
- Diverse regeneration cuts
- Long regeneration periods
- Maintenance of seed trees
- Natural regeneration
- Artificial regeneration
- Mixing provenances of the same species
- Tending
- Thinning
- Reducing impact of felling operations
- Reduced rotation length
- Control of ungulates

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→ No new tools – but new importance of existing tools
→ Which tools are applied in CNS?

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Which *adaptation principles* are in agreement with CNS, which ones not, which ones partly?

Principle	Single-tree selection	Group selection	Uniform shelterwood
Increase tree species richness	☹	☺	😐
Increase structural diversity	☺	☺	☹
Maintain & increase genetic variation within tree species	😐	☺	😐
Increase individual resistance to biotic and abiotic stressors	☺	😐	😐
Replace high-risk stands	☹	☺	😐
Keep growing stocks low	😐	😐	☺
Provide a forest microclimate	☺	☺	☺

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Keep growing stocks low	😐	😐	☺
Provide a forest microclimate	☺	☺	☺

→ Small gaps hinder the establishment of light-demanding species, no planting

→ Patch cuts are avoided

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Keep growing stocks low	😐	😐	☺
Provide a forest microclimate	☺	☺	☺

→ Match depends on CNS type

→ Smallest agreement in traditional single-tree selection, highest in group selection

Opportunities and constraints of CNS

- Highly motivated practicioners
- CNS includes many elements facilitating adaptation to climate change
- … but no CNS type is a general remedy to cope with it
- More flexibility in implementation

Conclusions

- Several CC adaptation principles are implemented in CNS
- CNS has deficiencies in the adaptation principles
  - Increase tree species richness
  - Maintain and increase genetic variation
  - Replace high-risk stands
- CNS should make increased use of
  - a large variation in cutting layouts to promote tree species richness
  - non-native species and non-local provenances