



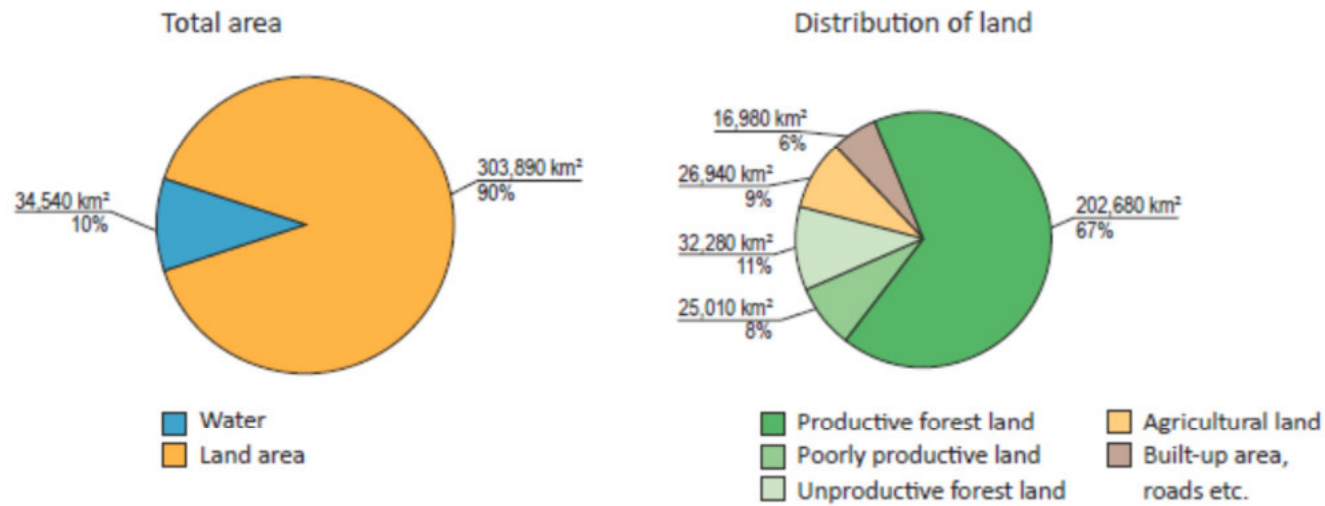
CAFF 2018; Session “Biodiversity, cultural heritage and land-use planning”

Impacts of reindeer management and forestry on biodiversity of northern forests

Sirpa Rasmus, Minna Turunen (Arctic Centre, University of Lapland)

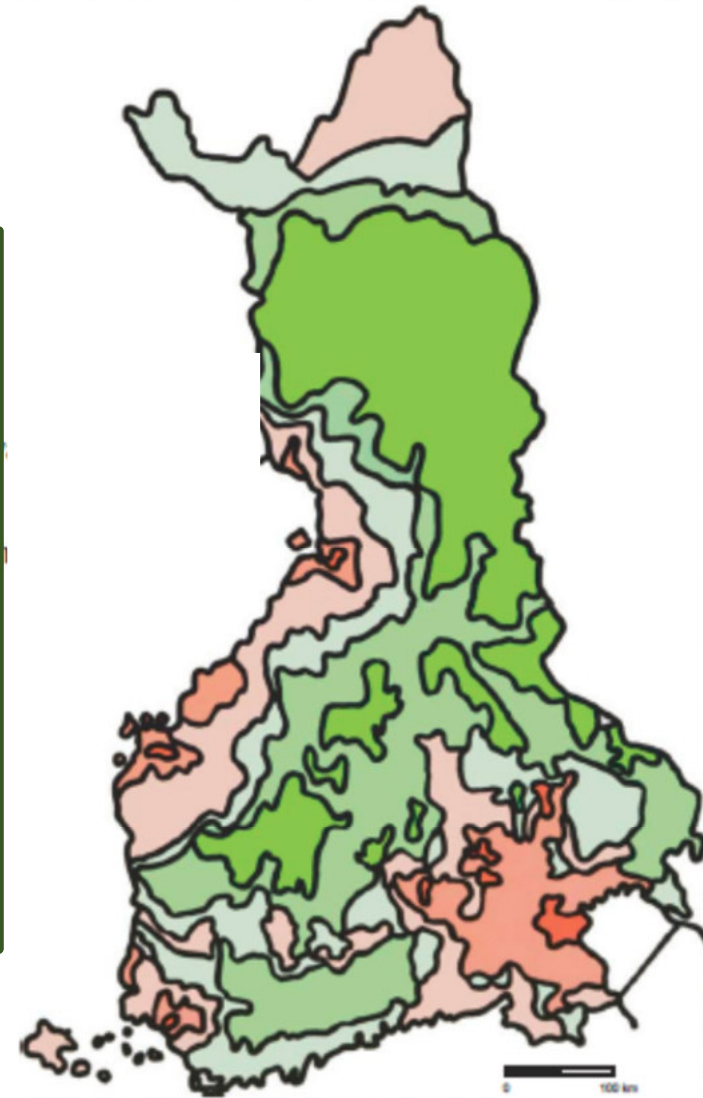
FINNISH FORESTS IN 1850

FINLAND – A LAND OF FORESTS

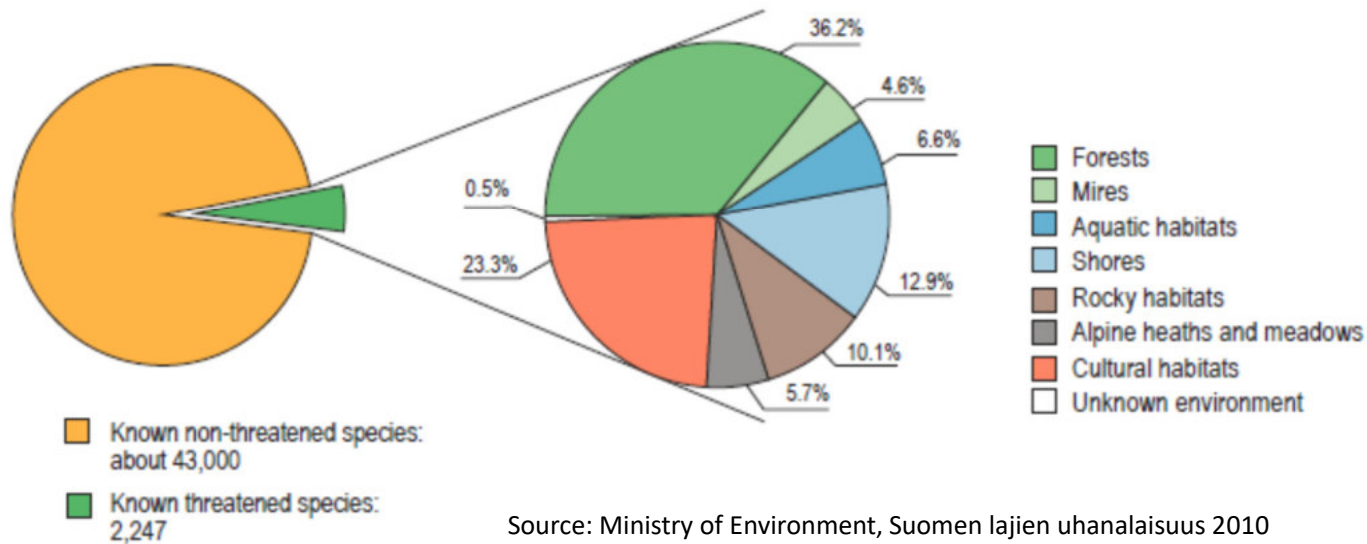


Source: National Forest Inventory; forest.fi

• Source: C.W. Gyldeń, 1850.



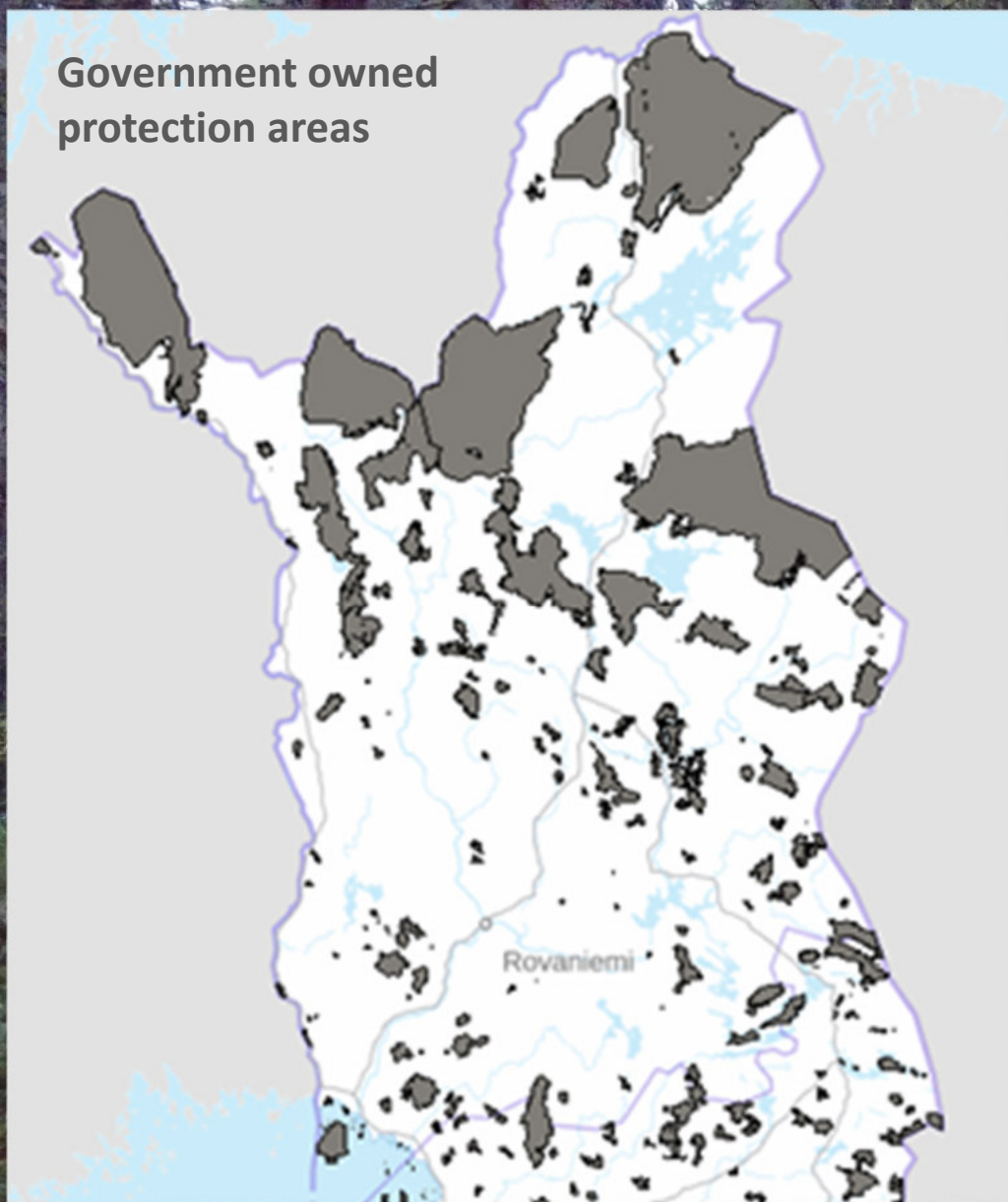
HABITATS AND AMOUNTS OF THREATENED SPECIES IN FINLAND



Source: Ministry of Environment, Suomen lajien uhanalaisuus 2010

- 50 000 animal, plant and fungal species
- Of these, 20 000 live in forests
- ... and 2250 are threatened
- 1/3 of threatened species in Finland are forest species

Government owned
protection areas



Our research questions

- 1) How does reindeer grazing affect the forest biodiversity in this area?
 - 2) How does forest management affect the forests biodiversity in this area?
 - 3) How to reconcile reindeer management and forestry in the same regions to maintain biodiversity of forests and gain benefit for both of the livelihoods?
- Literature review; findings of recent and on-going projects.

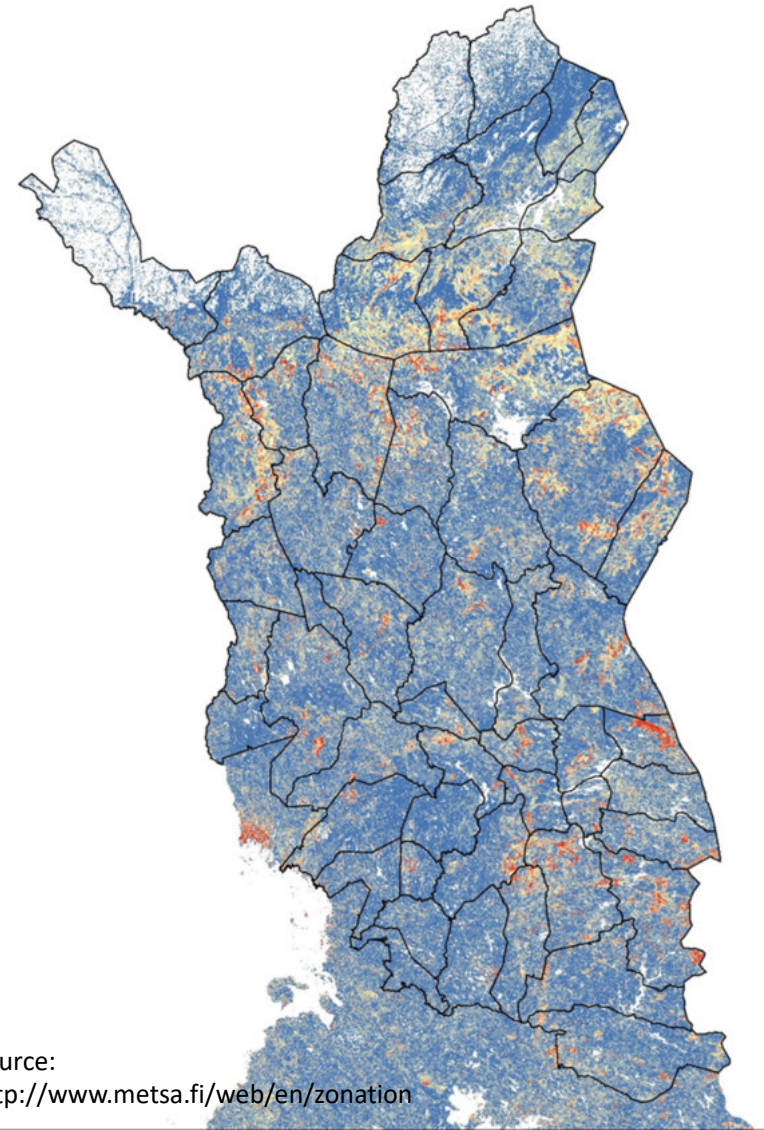
Forest biodiversity

- Species richness determined by the structure and age of a forest stand
 - Old natural forest is significantly richer in species than an old commercial forest
 - The number of species is highest immediately after a strong disturbance
- Natural disturbances maintain and renew:
 - wind-throws
 - damages due to heavy snow-loads
 - small-scale mortality due to insects and fungi
 - forest fires (rare, frequency even 350y)
- Especially valuable:
 - Old spruce forests
 - Forests close to small water bodies
 - Preserved continuum of dead and decaying wood



Biodiversity of northern forests

- Generally lower than in the southern forests
- Forests are barren, number of species lower.
- Lower number of vascular plant species
- Higher number of lichens and mosses



Source:
<http://www.metsa.fi/web/en/zonation>

Impacts of forestry on biodiversity

- Multi-aged forest cover -> fragmented patches of rather homogeneous, young forest stands
- Significance of natural disturbances like forest fires and storms has decreased
- Forest with little amount of old trees and dead wood
- Especially intensive forest management with clear cuts affected the environment after the decades following the II world war.



Photo: Ulla Huusko



Photo: Skogsstyrelsen



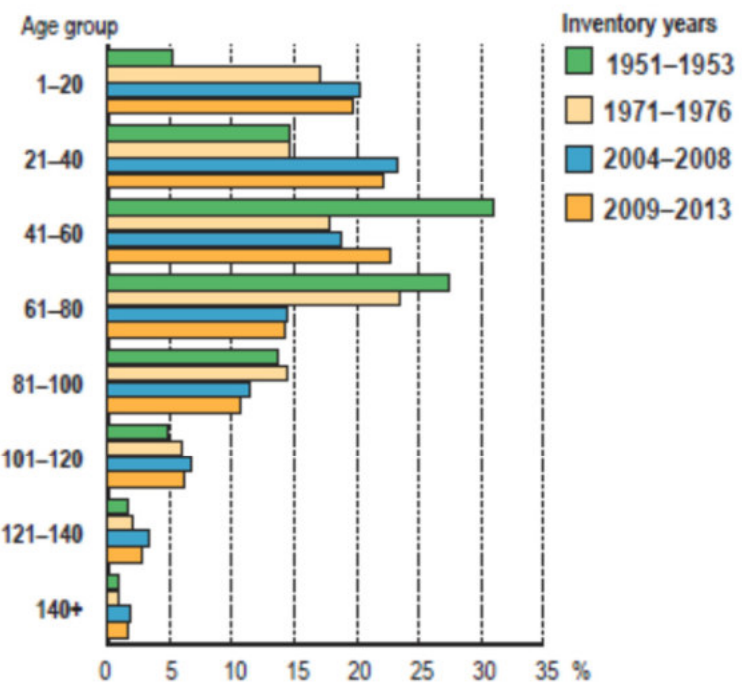
Photo: Jouko Kumpula



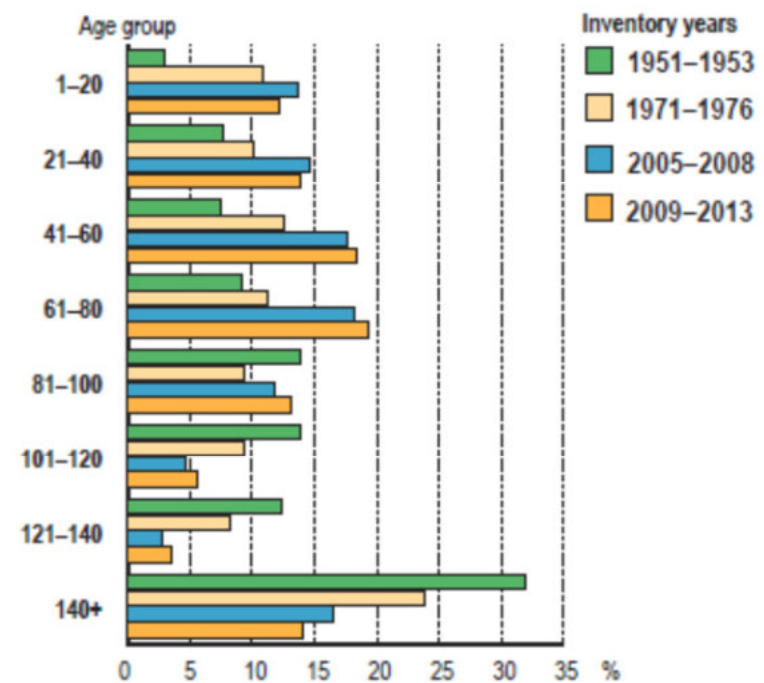
Source: Reindeer Herders' Association

CHANGES IN THE AGE STRUCTURE OF FORESTS IN 1951–2013

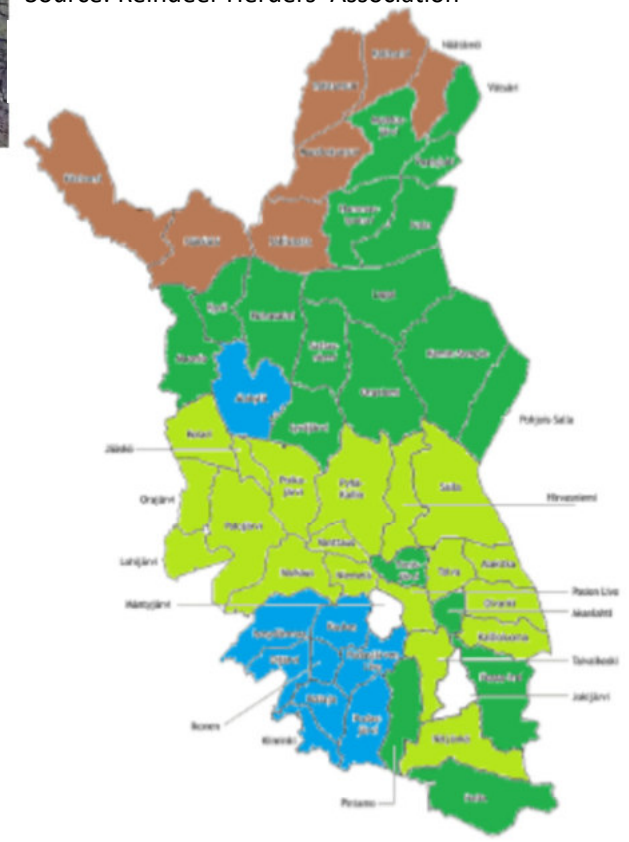
Southern Finland



Northern Finland



Source: National Forest Inventory; forest.fi



Spring:

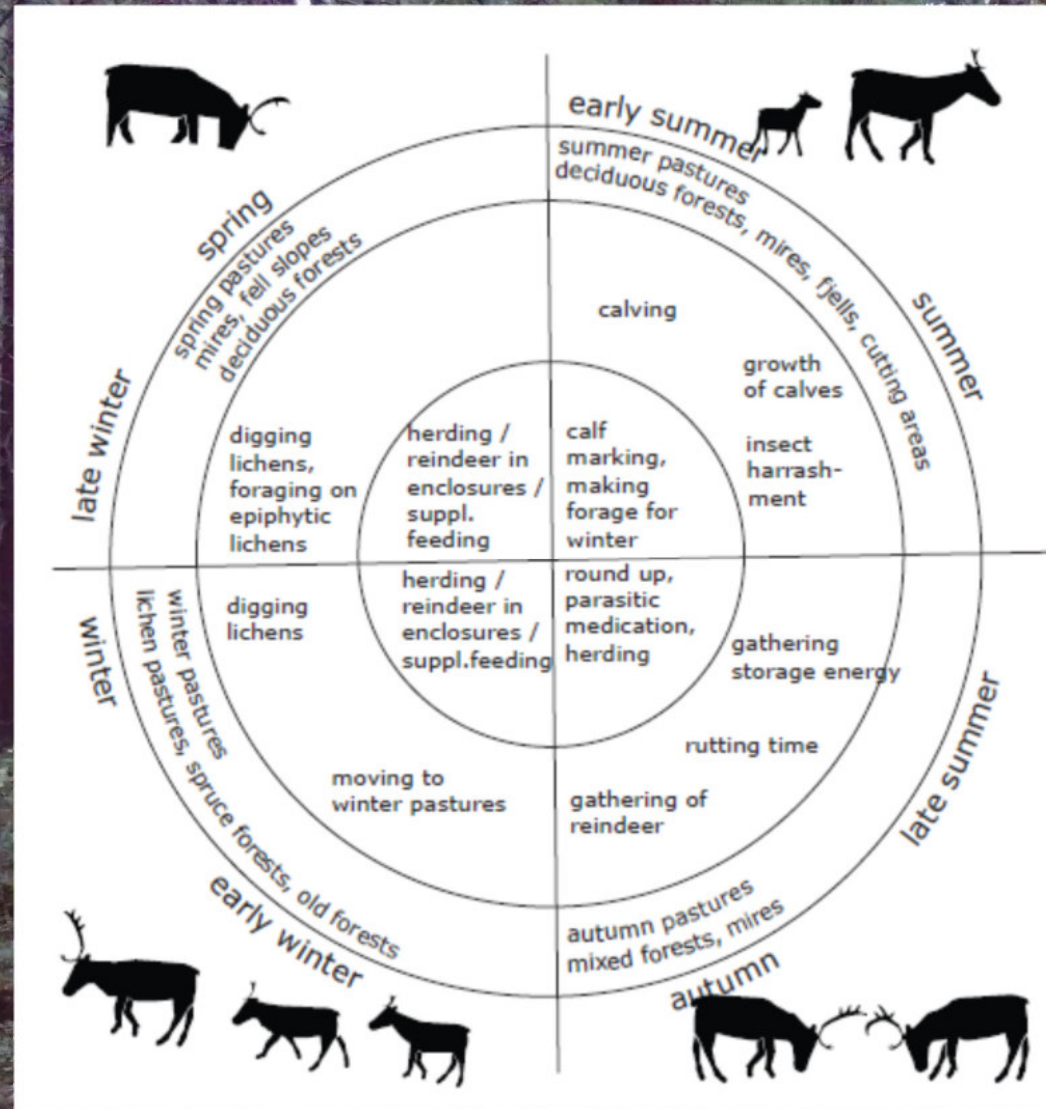
Grazing on green plants in the snow-free patches and bogs

Winter:

Pastures in coniferous forests:
-Ground lichens (*Cladonia spp.*)
-Shrubs (*Empetrum nigrum*, *Calluna vulgaris*, *Vaccinium vitis-idaea*)
-Graminoids
Later winter also arboreal lichen:
-*Alectoria spp.*
-*Bryoria spp.*
-*Usnea spp.*

Autumn:

Grazing on green plants and mushroom, e.g.:
-*Boletus spp.*
-*Leccinum spp.*
-*Suillus spp.*
-*Russula spp.*
-*Lactarius spp.*



Summer

Pastures: bogs, grass dominated biotopes, river banks, open fjells, snow beds
Tens-hundreds of species foraged (grasses, leaves), e.g.:
-*Vaccinium myrtillus*
-*V. uliginosum*
-*Deschampsia flexuosa*
-*Poa alpina*
-*Festuca ovina*
-*Epilobium angustifolium*
-*Hierachium*
-*Melampyrum spp*
-*Luzula pilosa*
-*Geranium sylvaticum*
-*Filipendula ulmaria*
-*Rumex spp.*
-*Alchemilla spp.*
-*Carex spp.*
-*Comarum palustre*
-*Menyanthes trifoliata*
-*Equisetum fluviatile*
-*Eriophorum vaginatum*
-*Trichophorum cespitosum*
-*Angelica archangelica*
-*Sorbus aucuparia*

Impacts of reindeer grazing on biodiversity

- Grazing increases richness and diversity of vegetation and invertebrate assemblages
- Depends greatly on site type, most clear in lichen-dominated sites
- Also in other type sites through feeding on dominant species and enhancing growth of others
- Moderate grazing better than light or heavy grazing
- Berry crops decrease if reindeer foraging is prevented?

Helle & Aspi 1983, Suominen & Olofsson 2000, Berg et al. 2008, Berg 2010,

Kivinen et al. 2010, Kumpula et al. 2014



About legislation and practises

- First restrictions to reindeer herding in 1916 (grazing and reindeer number limitations), to decrease the effects on forests and forest regeneration.
- Forestry and biodiversity
 - Habitats important for biological diversity of forests are conserved (Forest act 1996).
 - Recent regulation gives forest owners more choices what comes to cuttings, site preparations preparations etc. (Regulation 1234/2010)
- Regulation of forest management: In 21 northernmost districts “land should not be used in a way detrimental to herding” (Reindeer herding act 1990).
- Finnish forest agency Metsähallitus is obligated to negotiate with herding districts about the forest management within the RMA (RHA 1990)
- Metsähallitus consolidates these two livelihoods through
 - agreement with Reindeer Herders’ Association
 - annual consultations with herding districts
 - internal guidance for environment protection

Promotion of biodiversity in commercial forests

- Conserving old spruce forests
- Removal of spruce from herb-rich forests
- Retention of dead and decaying trees during felling
- Increased green-tree retention on regeneration areas
- Methods mimicking natural disturbances and natural development of forests provide more habitats:
 - Different kinds and sizes of forest cuttings
 - Creating multi-aged, multi-layered forests.
 - Creating and maintaining natural structural variability and diversity of habitats
- Mimicking natural fire dynamics through controlled burning
- Clear-cut can partly mimic the effect of forest fire
- Restoration of drained mires to their natural state

Kauhanen et al. 2008, <https://smy.fi/en/forest-fi/forest-facts/biodiversity/>

Needs of reindeer herding?

- REGENERATION CUTTING: avoiding clear-cuts; harvesting during the snow season; harvesting of logging waste
- IMPROVEMENT CUTTING: Strong thinning; early enough
- SOIL PREPARATION: Using of light methods; not treating the lichen rich places; avoidance of harrowing and ploughing
- DITCHING: Incline and building routes over ditches to make moving of calves easier
- BURNING: Controlled burning, but not in lichen rich forests
- FOREST ROADS: Avoidance of building roads
- FERTILIZING: Avoidance of fertilizing

Juha Järvenpää, Metsäkeskus 2018, interview summary, 29 professionals interviewed



Promoting of biodiversity through reindeer grazing

- Maintaining moderate grazing pressure
- Pasture rotation – avoiding heavy grazing
- Supplementary winter feeding can be a part of the solution (or a part of the problem)



Effects of supplementary feeding

- Forest and enclosure feeding means nutrient rich environment and heavy grazing pressure
- Introduction of new species
- Effects on species composition



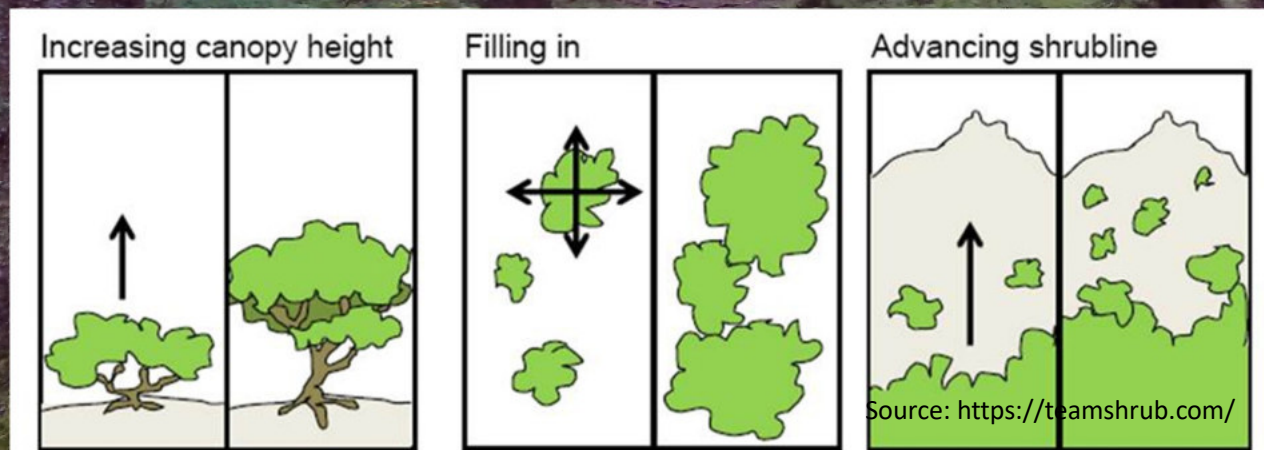
Emerging issues I

- Significance of certifications programmes
 - 90 % of commercial forests have been PEFC certified, 6% have been FSC certified
 - Certification criteria are stricter than decrees or legislation -> in practice, certification determines the standards.
 - Improving the status of forest biodiversity – e.g. demands to leave a certain amount of retention trees unfelled during regeneration felling.
 - Conditions regarding consulting and negotiation with local communities
- Significance of private owners

<https://www.pefc.org/>; <https://ic.fsc.org/en>

Emerging issues – climate change

- Warming climate will promote the forest growth and forestry?
- Need for diverse winter pasture areas for reindeer is increasing, as warming climate increases the risk of icy snow formation?
- Need for supplementary feeding increases
- Shrubification - Grazing can keep tundra and the forests more open?
- What does it mean for reindeer herding, if needs for bioenergy and bio products will intensify or change the forest management?



Conclusions

- Forestry and reindeer herding continue being important players in the northern Finland
- Importance of tourism is growing
- ... and conserving biodiversity
- ... and climate change mitigation
- Need to look for synergies and mutual benefits
- Land use planning and consolidation of different livelihoods is getting more significant.



Thank you!

Further information: <http://www.reign.no/>



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For the North – For the World



ulapland.fi

References

- Berg, A., Östlund, L., Moen, J., Olofsson, J. 2008. A century of logging and forestry in a reindeer herding area in northern Sweden. *Forest Ecology and Management* 256(5):1009-1020.
- Berg, A. 2010. Reindeer herding and modern forestry – The historical impacts on forests of two main land users in Northern Sweden. PhD Thesis. Swedish University of Agricultural Sciences SLU.
- Bernes, C., K. Bråthen, B. Forbes, J. Speed, and J. Moen. 2015. What are the impacts of reindeer/caribou (*Rangifer Tarandus L.*) on arctic and alpine vegetation? A systematic review. *Environmental Evidence* 4(1): 1–26.
- Helle, T. & Aspi, J. 1983. Effects of winter grazing by reindeer on vegetation. *Oikos* 40: 337-343.
- Helle T., L. Kajala, A. Niva, and M. Särkelä. 1998. Effect of reindeer grazing on the structure of mountain birch forests In: Effect of reindeer on forest and fjell environments (Finnish Forest Research Institute Research Papers 678), ed. M. Hyppönen, T. Penttilä, and H. Poikajärvi, 132-141.
- Kauhanen, H., Kuuluvainen, T., Ylisirniö, A.-L., Huhta, E. 2008. Pohjoiset havumetsät – tutkimustuloksia ekologiseen metsänhoitoon. Metsäntutkimuslaitos.
- Kivinen, S., Moen, J., Berg, A., Eriksson, Å. 2010. Effects of modern forest management on winter grazing resources for reindeer in Sweden. *Ambio* 39 (4), 269-278
- Kumpula J., M. Kurkilahti, T. Helle, and A. Colpaert. 2014. Both reindeer management and several other land use factors explain the reduction in ground lichens (*Cladonia* spp.) in pastures grazed by semi-domesticated reindeer in Finland. *Regional Environmental Change* 14(2): 541-559.
- Suominen & Olofsson 2000 Impacts of semi-domesticated reindeer on structure of tundra and forest communities in Fennoscandia: a review. *Annales Zoologici Fennici* 37(4): 233-249
- Turunen, Minna & Vuojala-Magga, Terhi, 2011. Poron ravinto ja talvinen lisäruokinta muuttuvassa ilmastossa. Rovaniemi, Lapin yliopisto, Arktinen keskus. 56 s.