The nature management of esker forests and other xeric sun-lit forest habitats

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NATURA 2000

The ecological value and importance to biodiversity

- They differ from normal upland forests
- The more they differ the more unique and more valuable they are to biodiversity
- They host species that are adapted to open, extreme, heaty circumstances where normal upland vegetation is not dominant, typical are certain key species with diverse companion species pool with complicated symbiontic relationships
- Not only eskers, we can define widely ”barren forested nature types” similar characteristic with barren, xeric forests in general
- ”substitutional habitats”, road banks, small airfields, sand- and gravel excavating areas, military exercise areas + other ruderate areas
- Lan[illegible]e issues

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Especially army exercise areas have shown to been imortant

Puolustusvoimat ja biodiversiteetti

Sotilaallisen toiminnan vaikutukset luontoarvoihin

Characteristics

- The amount of radiation: light, openness
- thin (or absent) raw humus layer, open mineral soil
- These must be so significant that they affect the competion conditions, so that the species adapted to these habitats can survive

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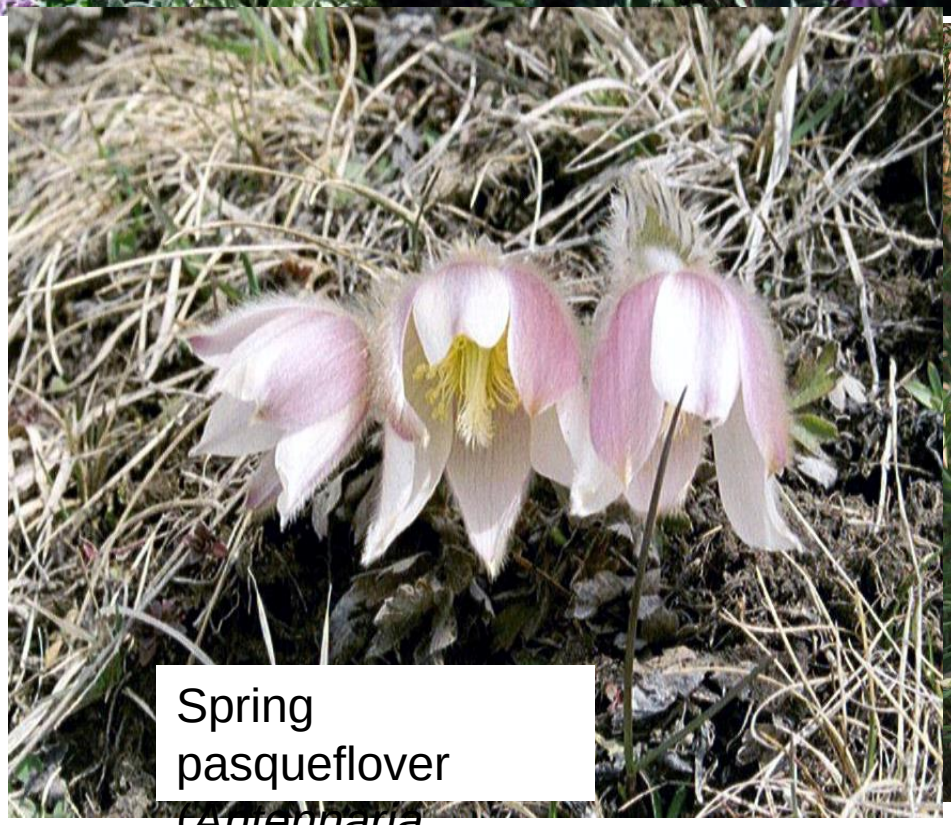
Such as

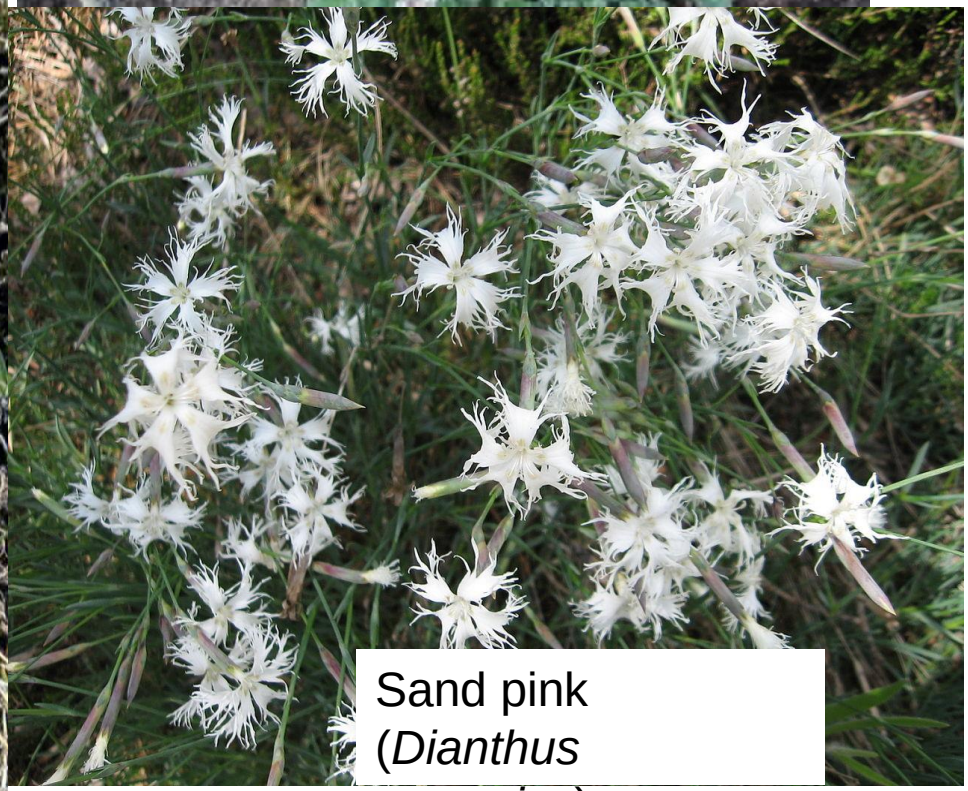
- Plant species are often relics from cooler and drier weather periods, later they survived in e.g esker forests where fires have created a somewhat similar extreme habitats

Wild thyme(*Thymys serpyllum)* with 10-20 dependant species

Catsfoot (*Antennaria dioica*)



Spring pasqueflower (*Anemonna*



Sand pink (*Dianthus arenarius*)

Classic example

Large blue (*Glaucopsyche arion*), CR

Parasitic wasps (*Ichneumonidae)*

Larvas food plant

Wild thyme (*Thymys serpyllum*), NT

Myrmica sabuleti

Larva parasitical in ant-nests

The ecological background – why do we have sun-lit habitats

Soil+topography+exposition+disturbance dynamics= sun-lit habitat

- Coarse, water permeable, nutrient poor soil
- Exposition to south-western direction
- Open stand structure
- Narrow humus layer

- Earlier the open stand structure was caused by frequent forest fires, maintained the characterstics
- Forest grazing
- Selective cuttings

The development

- Esker forests, sun-lit habitats and xeric forests have decreased significantly
- Or rather they have changed, transformed to become normal-forest (similar than e.g some cultural biotopes, herb-rich forests, fertilized lakes)
- Overgrowth, fertilization, or rather ”freshification”
- This weakens the opportunities of species of sun-lit habitats

	Esker forests	Forest fire areas
Red-listed species	196, 10.4 %	23, 1.2 %
Endangered species	113, 13.8 %	10, 1.2 %

From: *The 2010 Red List of Finnish Species, % refer to all endangered forest species*

EU Habitats directive species, abt 10 can be considered fire-benefitters

Habitat	Esker forests, primary			Esker forests, secondary			Dry forests, primary			Dry forests, secondary			Forest fire areas, primary			Forest fire areas, secondary		
Conservation status Species group	CR, EN VU	RE NT DD	TOT	CR EN VU	RE NT DD	TO T	CR EN VU	RE NT DD	TO T	CR EN VU	RE NT DD	TO T	CR EN VU	RE NT DD	TO T	CR EN VU	RE NT DD	TO T
Vascular plants/*Tracheobionta*	6	3	9		1	1								1	1			
Gilled mushrooms/*Agaricales*		1	1				1	2	3									
Aphylloporales							2		2		7	7	2		2	2		2
Parasitic microfungi/*Pucciniomycetes*	1		1	1		1												
Sac fungi/*Ascomycota*							1	1	2				2		2			
Lichens/*Lichenes*																	2	2
Birds/*Aves*										2		2						
Spiders/*Arachnida*								1	1		4	4						
Crickets etc/Orthoptera	2		2															
Bugs/*Heteroptera*	1	1	2					1	1				1		1		2	2
Aphids etc/ Homoptera	19	11	30	4	2	6	3	2	5									
Net-wingers/*Neuroptera*								1	1		1	1						
Thrips/*Thysanoptera*		2	2															
Butterflies and moths/*Lepidoptera*	49	22	71	25	14	39	2	1	3		1	1				2	2	4
Mosquitos etc/*Nematocera*													1		1	2	7	9
Flies/*Brachycera*		3	3	1	3	4				1		1						
Twisted-wing parasites/*Strepsiptera*		2	2															
Sawflies/*Symphyta*	1		1				1		1									
Parasitic wasps/*Parasitica*	1	2	3													2		2
Stinging wasps/*Aculeata*	21	23	44	11	8	19		1	1							2		2
Beetles/*Coleoptera*	6	6	12	2	1	3					1	1	4	8	12	6	1	7
Total	107	76	183	44	29	73	10	10	20	3	14	17	10	9	19	16	14	30

Habitat	Esker forests	Xeric heath forests	Barren heath forests
Conservation status, Southern Finland	EN	NT	CR
Conservation status, Northern Finland	NT	NT	CR
Conservation status, Finland,	VU	VU	CR

From: *Assessment of threatened habitat types in Finland* (2008)

Causes

- The absence of forest fires, fire suppression- no fire (50-150 years ago)
- Silviculture- the former open stands were transformed to relatively dense, shady even-aged stands (70 years ago)
- Aerial nitrogen deposit
- The end of forest grazing

Result

- Soil+topography+exposition cannot maintain sun-lit habitats when natural disturbance do not ”manage” the biotopes
- Radiation, light and heat decrease
- Raw humus layer accumulates, soil becomes more moist and less extreme in e.g moisture and temerature behaviour
- Lichens are substituted by mosses
- The original vegetation is oututcompeted by general upland vegetation which affects companion species

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Numbers (Finland)

- Nature type originally maybe 700 000 hehtaaria (esker-forests) + xeric forests
- In Finnish N2000 abt 36 000 ha (5%)
- Protected by Conservation act 11 800 ha 1,6%
- Managed maybe 100-200 ha:s, 0,001%, small areas, and the management is essential
- So the management need is urgent

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- **More important than conservation status is management**
- Need to priorize

How manage?

- The openness and radiation should increase (if needed)
- Mineral soil should be revealed, humus layer should be affected
- Biomass should be removed

- And rather at same time so that there is a clear change in competition characteristics – so after management they should differ from normal upland forests

Management methods: Burning

- ***”impowerishment burning”***
  - At best: Raw humus layer decreases, mineral soil is revealed+ biomass is removed + radiation increases: can be considered the best and most natural-like management method
  - Burning goal: humus layer should be burned properly, burn deeply
  - With burning you also gain other ecological benefits of controlled burning
  - Logging residues (if a lot) should be removed before burning


Rather like this
Kuva:Keijo Mattila


…k
Than this
Kuva: SYKE/Harri Tukia


Kuva: SMk/Timo Vesanto


Kuva: SMk/Timo Vesanto


Kuva: SMk/Seppo Repo

Challenge

-do the areas burn well enough, do we achieve what we want , is raw humus dry enough?

FMC : 10-20%

FMC :50-200%

So it can happen that:

- Humus layer is thinned only a bit
- Mineral soil is not revealed and humus layer does not decrease
- Ash fertlization effect may happen and the nutrient budget improves – totally opposite effect what wanted

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- And unwanted plants might benefit from burning
- Especially on areas that are moss-dominated and raw humus is thick the use of burning is problematic – but this is a general problem because of the gap to last fire is long in most cases

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Kuva: SMk/Seppo
Repo

- So the burning should be done in dry enough circumstances and estimate if the humus layes is dry enough
- And in general learn to predict and estimate burning depth and burning result
- So the burning can cause even negative results
- The choosing of right place and time is essential

Challenge 1

- Burning in practice:
  - Differs from normal
  - Steep slope
  - small fuel load, the aim is to burn moss/lichens + humus+ shrubs
  - Often lack of natural extinguishing water
  - these kinds burnings are still in some kind of experimental stage but their imoprtance is increasing

Challenge 3

- Water impact: nature protection vs environmental protection
  - Ground water areas
  - The humus layer is considered important in infiltrating process … but it is just that which should be decreased
  - Different opinions

The problem with PAH-compunds

- In forest fires and in prescribed burnings carsinogenic **Polycyclic aromatic hydrocarbons** (PAH:s) are produced
- The research knowledge is scarce but according to ***precautionary principle*** it can be interpreted that burnings might cause the increase of PAH-compounds in groundwaters

Questions

- Are sun-lit habitats an important issue in other countries?
- Do you manage/plan to manage them?
- How do you manage?
- What do you think of ”substitutional habitats”- unnatural but important for species

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Alternatives for burning

Management cuttings

- Often essential but usually not enough alone
- Im general the radiation should increase significantly
- The logging residues should be collected and removed from area (if possible)

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Kuva: UPM/Juha-Matti Valonen

Affecting the soil

- Soil should be revealed
- By machines or manually
- Different opinions

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Kuva:UPM/Juha-Matti
Valonen


Kuva:UPM/Juha-Matti Valonen


Kuva: UPM/Juha-Matti
Valonen

The management chain of sun-lit habitats

- **1.Choosing the area -important**
- Is it dry enough, are the topography, soil and exposition suitable.? Can you achieve something with management or is it too fresh already?. Are there observations of sun-lit habitat vegetation, can they re-colonize the area.?
- **2. Increasing radiation by cuttings**
- Cutting to e.g 300-500 stems/ha, if necessary clearing the understorey
- **3. Removing biomass**
- Logging residues should be removed
- **4. Reducing raw humus and revealing mineral soil**
- Burning or sufficient mechanival scarification. The more the better.
- **(5. Re-introducing species)**
- **6. Monitoring and estimating future actions**
- Clearing understorey (maybe every 10-20 years)
- Burning or scarification according need – maybe after 30-50 years)


Kuva: SMk/Timo Vesanto