Why there are so few forest fires in Finland?

EWWF Wildfire conference, 20-21.Nov, 2019, Cardiff

Henrik Lindberg, Häme University of Applied Sciences

Forest fires have became a growing issue in many arts of world

- And Finland has gradually gained increasing interest as a forested country with surprisingly few forest fires (or rather a surprisingly small area)
- Which was highlighted when…

The New York Times

By Patrick Kingsley, Nov. 18, 2018

Trump Says California Can Learn From Finland on Fires. Is He Right?

“President Trump has repeatedly blamed California’s forest management for the huge wildfires burning there, one of which has left at least 76 dead and become the most destructive in state history.”

“You look at other countries where they do it differently and it’s a whole different story,” Mr. Trump said at a news conference in Paradise, Calif., on Saturday. “I was with the president of Finland and he said: ‘We have a much different — we’re a forest nation.’ He called it a forest nation, and they spent a lot of time on raking and cleaning and doing things. And they don’t have any problem.”

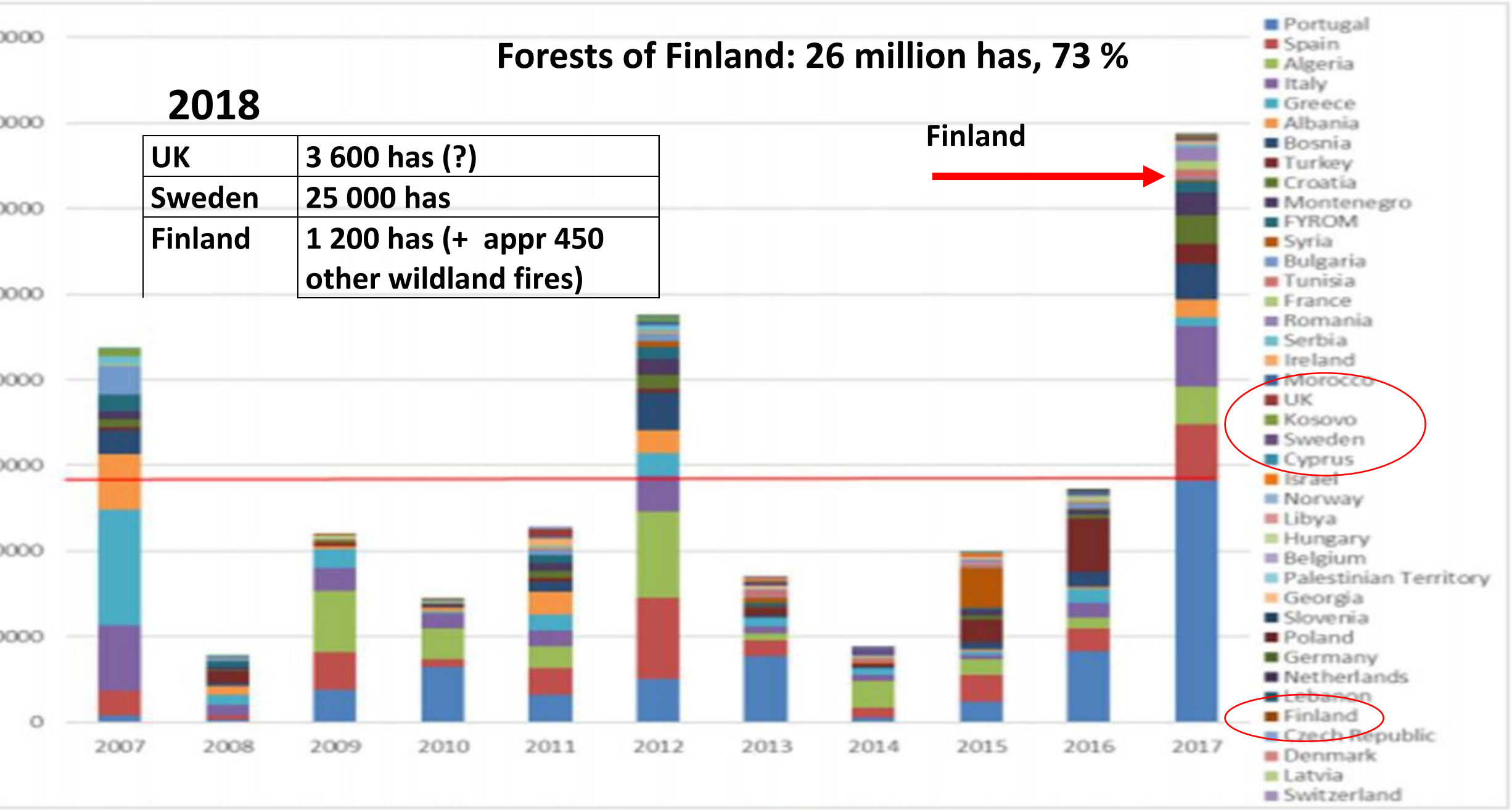
“The secret to the Finns’ forest management system lies instead in its early warning system, aerial surveillance system and network of forest roads, said Professor Henrik Lindberg, a forest fires researcher at the Häme University of Applied Sciences, a college in southern Finland”

- Of course it is unreasonable, unnecessary and unfair to compare areas that differ completely (climate, vegetation, demographics)

Forests of Finland: 26 million has, 73 %

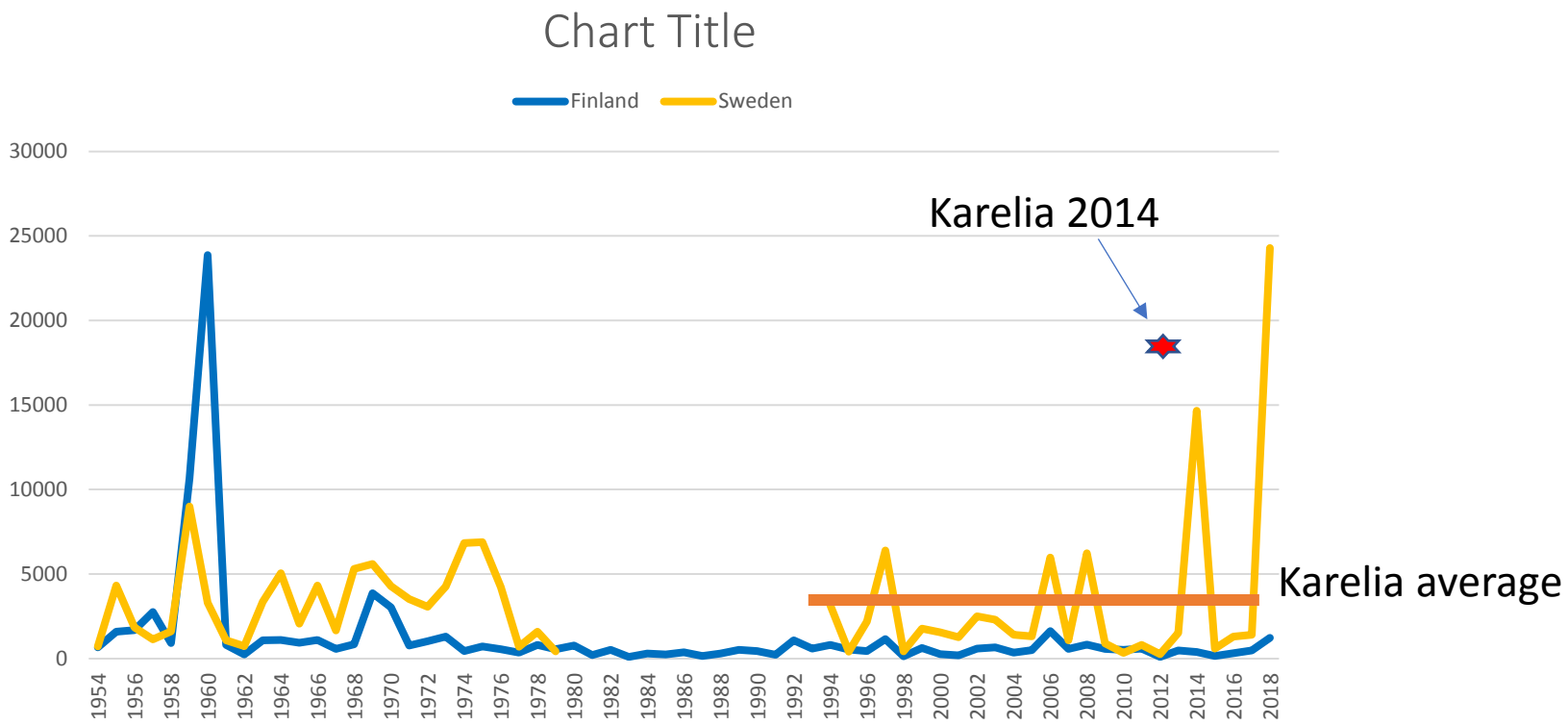
2018

UK	3 600 has (?)
Sweden	25 000 has
Finland	1 200 has (+ appr 450 other wildland fires)



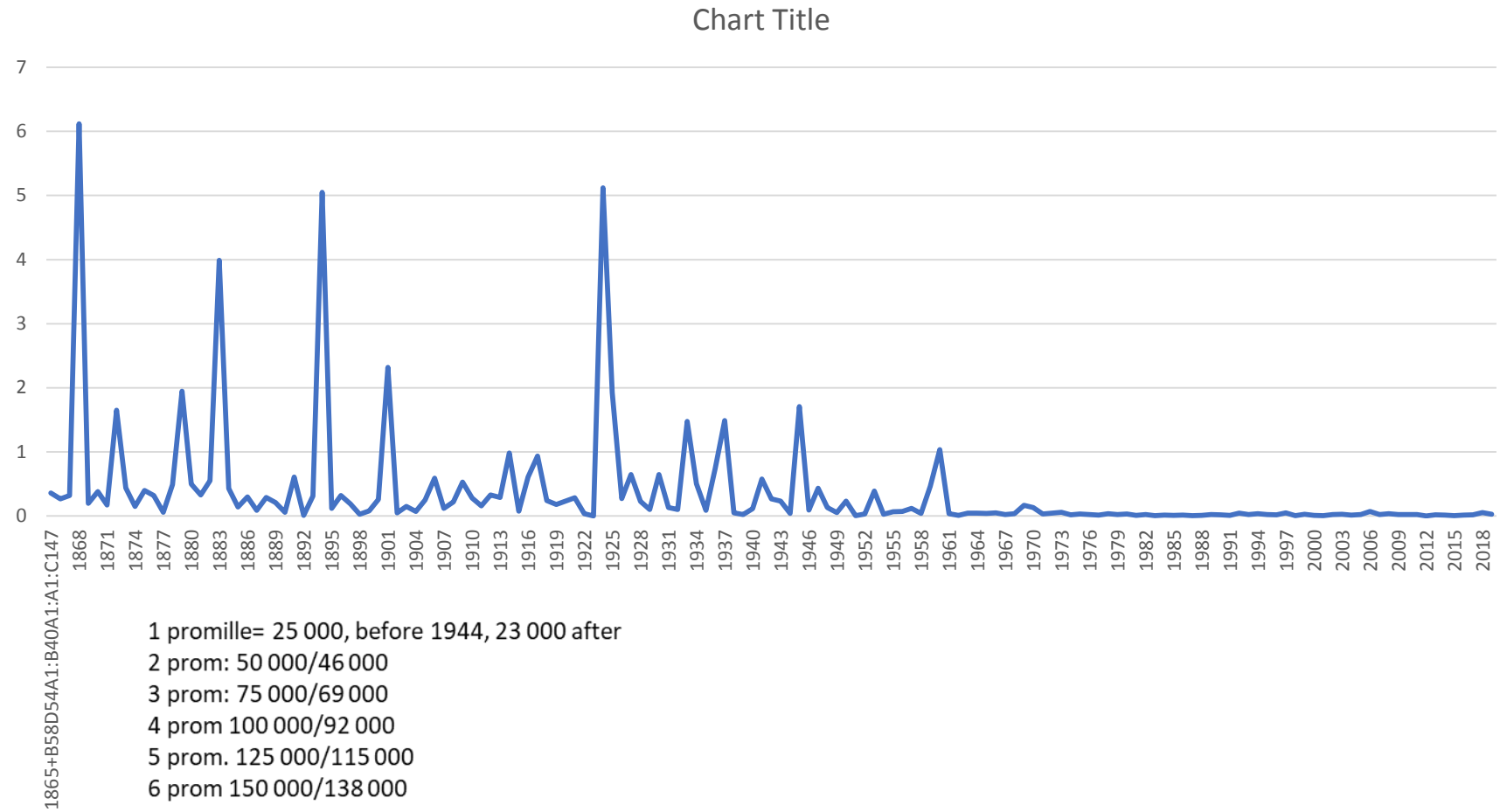
ure 164. Overview of total burnt area across Europe and the Middle East for the last 11 years. Countries are ordered by size of total burnt area over this period. Note that the burnt area mapped for Portugal in 2017

Forest fires in Sweden and Finland (+Karelian average), annual area, ha:s



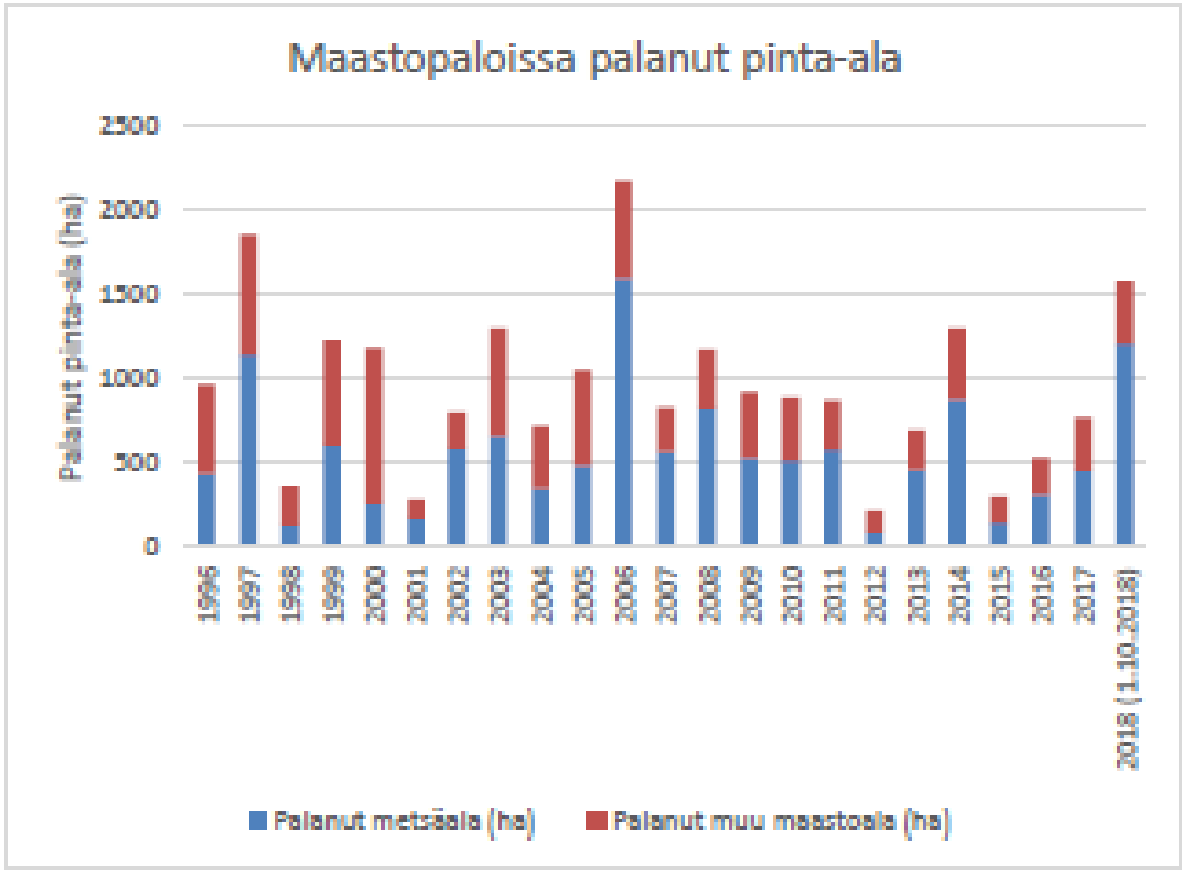
Source. Finnish statistical yearbook, Swedish Rescue service

An estimate of annual burned area in Forest fires related to total forested area in Finland, promilles



1 promille= 25 000, before 1944, 23 000 after
2 prom: 50 000/46 000
3 prom: 75 000/69 000
4 prom 100 000/92 000
5 prom. 125 000/115 000
6 prom 150 000/138 000

Forest fires=blue, other wildland fires= red



2019: forest fires 620 hectares, other wildland fires 320 hectares

In recent years

- **Surface fires** **abt 90 %**
- **Crown fires** **< 1 %**
- **Ground fires** **abt 10 %**

Average fire size:
0,4 hectares

Summary: lots of small, low-intensity, surface fires that do not escalate in to large fires

Reasons: Fire suppression + forest management actions

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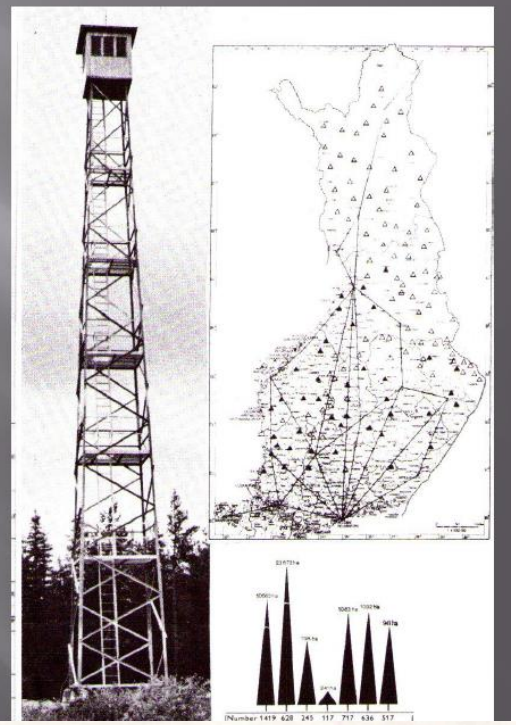
- Fi

Fire tower network 1950-60`s, 161 towers



Citizen warnings

OULUN LÄÄNISSÄ ON VOIMASSA

METSÄPALOVAROITUS

jonka johdosta avotulen pito on

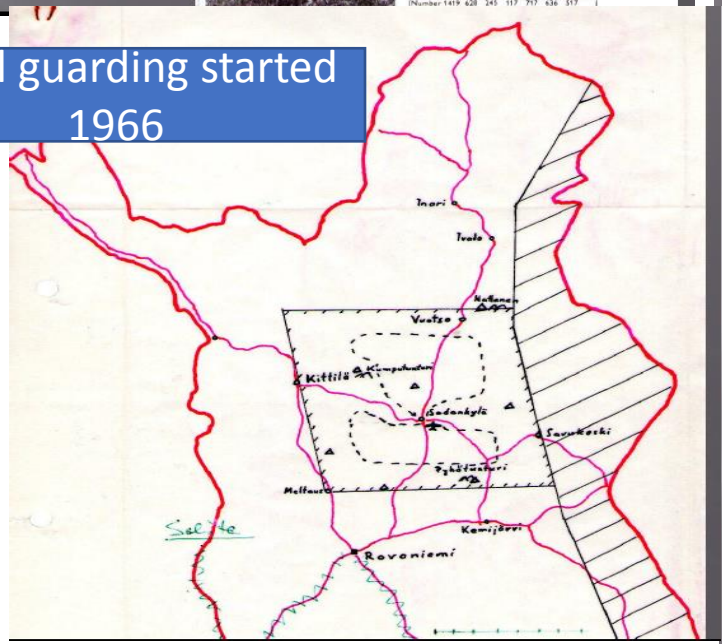
ANKARASTI KIELLETTY.

Oulun läänin palo- ja pelastustarkastajan puolesta valvontakoneen päällikkö .....

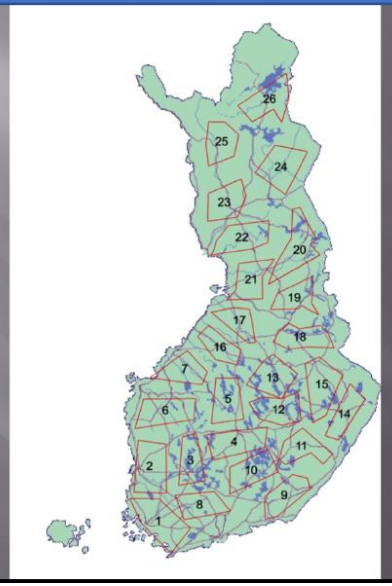
Oulussa ...../..... .....

Pyydämme palauttamaan tämän kapulan ensi tilassa osoitteeseen:

Aerial guarding started 1966



Aerial guarding routes 2010

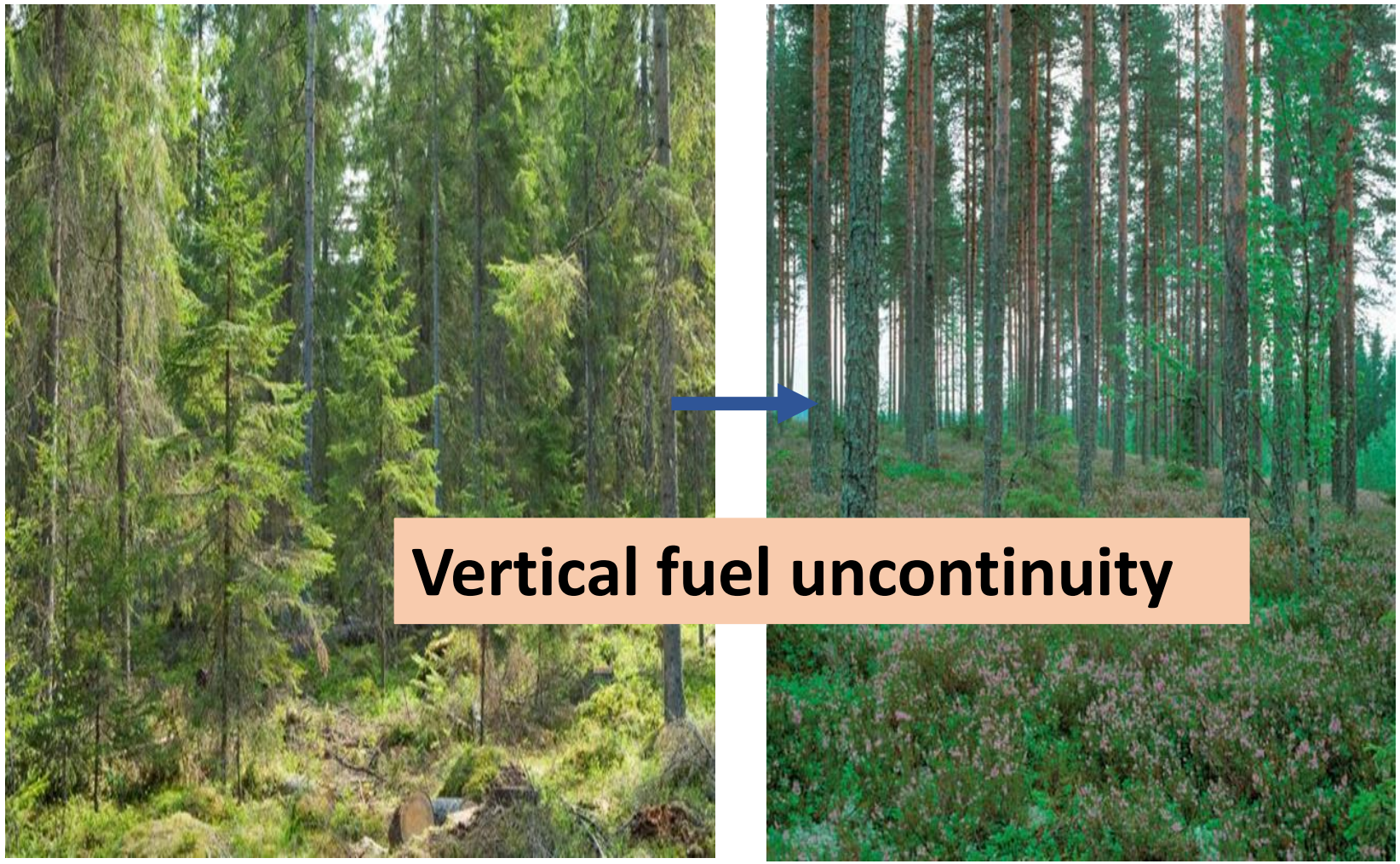


Forestry driven silvicultural actions in stand level have changed the forest structure of Finnish forests thoroughly, especially after WWII

- transferring uneven-aged forests to even aged forests
- Introducing clear-cuts and artificial regeneration as main regeneration method
- Affecting tree species distribution
- Reducing fuel load with continuous thinnings
- Reducing fuel load by harvesting logging residuals (slash) from cuttings for energy use


Natural forest
Luonnollinen metsän kehityskulku
50
100
150
vuotta
Natural
disturbance
Even-aged, managed forest
Talousmetsän kehityskulku
Retention trees
hakkuu
vesakon torjunta
harvennus
harvennushakkuut
päätehakkuu
maan muokkaus
Tendering of
young stands
thinnings
Final cutting+soil
preparation+regenaration
Jari Kostet 1986

Changes in tree species composition and stand structure



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Thinnings in forests and logging slash harvesting for bioenergy reduce fuel load

Important: these actions are part of normal forest management and economically profitable for land-owners. This (combined with technological development) made them a common practice and eventually decreased the fuel load in forests

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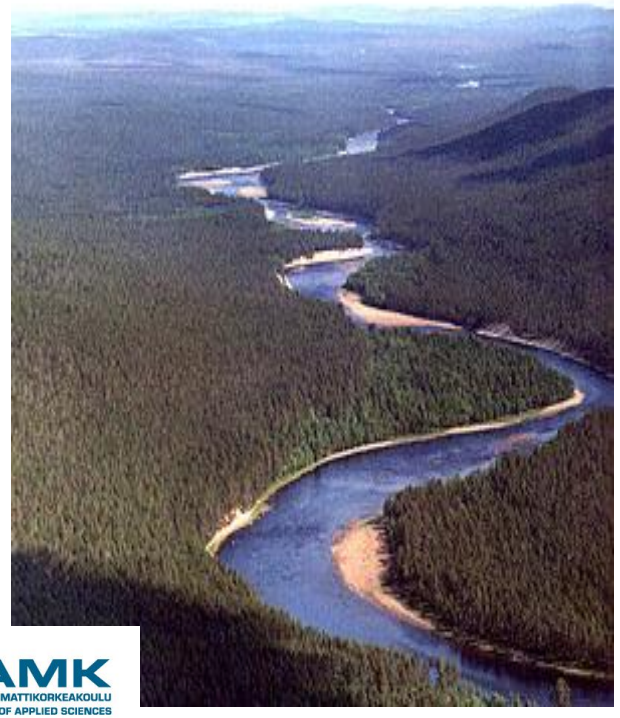
In landscape level recent forest management combined with high portion of small-scale private forest owners (40 – 50 ha/average), has led to fragmented forest-structure. Small compartments in Finnish conditions effectively prevent forest fire spreading. Small forest owners form Forestry Owners Associations in order to form economically more reasonable units which motivate and help them in mainteinance and silvicultural actions

Horizontal fuel uncontinuity



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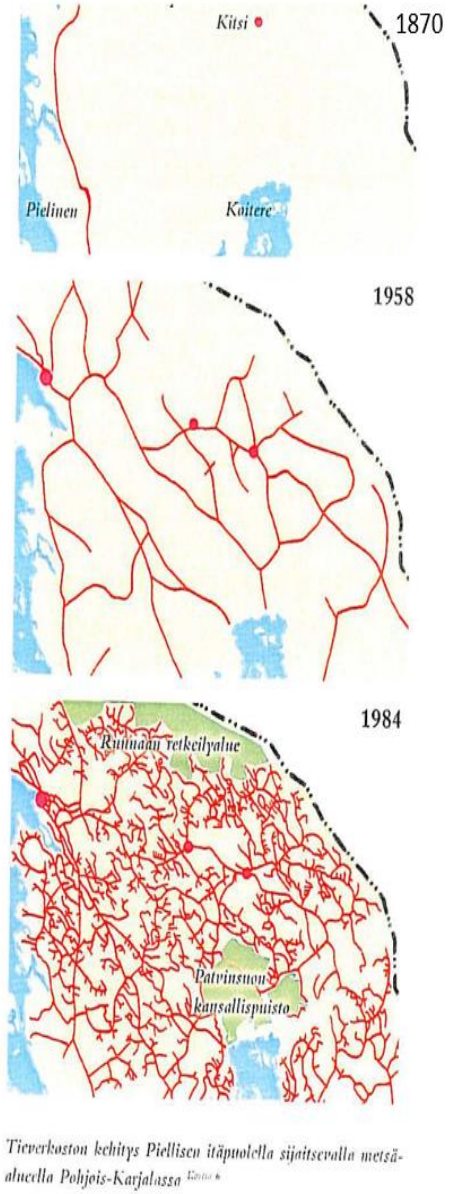
Dense forest road network makes forestry actions possible and increases the accessibility in forests, - especially fire trucks - and function as fire breaks, significantly helping fire suppression. The construction of forest road network improves national infrastructure and has been subsidized by state.



Tieverkoston kehitys Pielisen itäpuolella sijaitsevalla metsäalueella Pohjois-Karjalassa

Björn 2000

In Finland the post-WWII forestry management policies have created a forest structure that has led to decreasing fuel loads in forests. Active management has played a key role, yet the original intention was to increase forest growth, yield and value. Forest advising for land owners proved essential. The actions e,g presented in Northern America have happened as a sideporuduct.

Table 1
Principles of fire resistance for dry forests (adapted from Agee, 2002 and Hessburg and Agee, 2003)

Principle	Effect	Advantage	Concerns
Reduce surface fuels	Reduces potential flame length	Control easier; less torching[a]	Surface disturbance less with fire than other techniques
Increase height to live crown	Requires longer flame length to begin torching	Less torching	Opens understory; may allow surface wind to increase
Decrease crown density	Makes tree-to-tree crown fire less probable	Reduces crown fire potential	Surface wind may increase and surface fuels may be drier
Keep big trees of resistant species	Less mortality for same fire intensity	Generally restores historic structure	Less economical; may keep trees at risk of insect attack

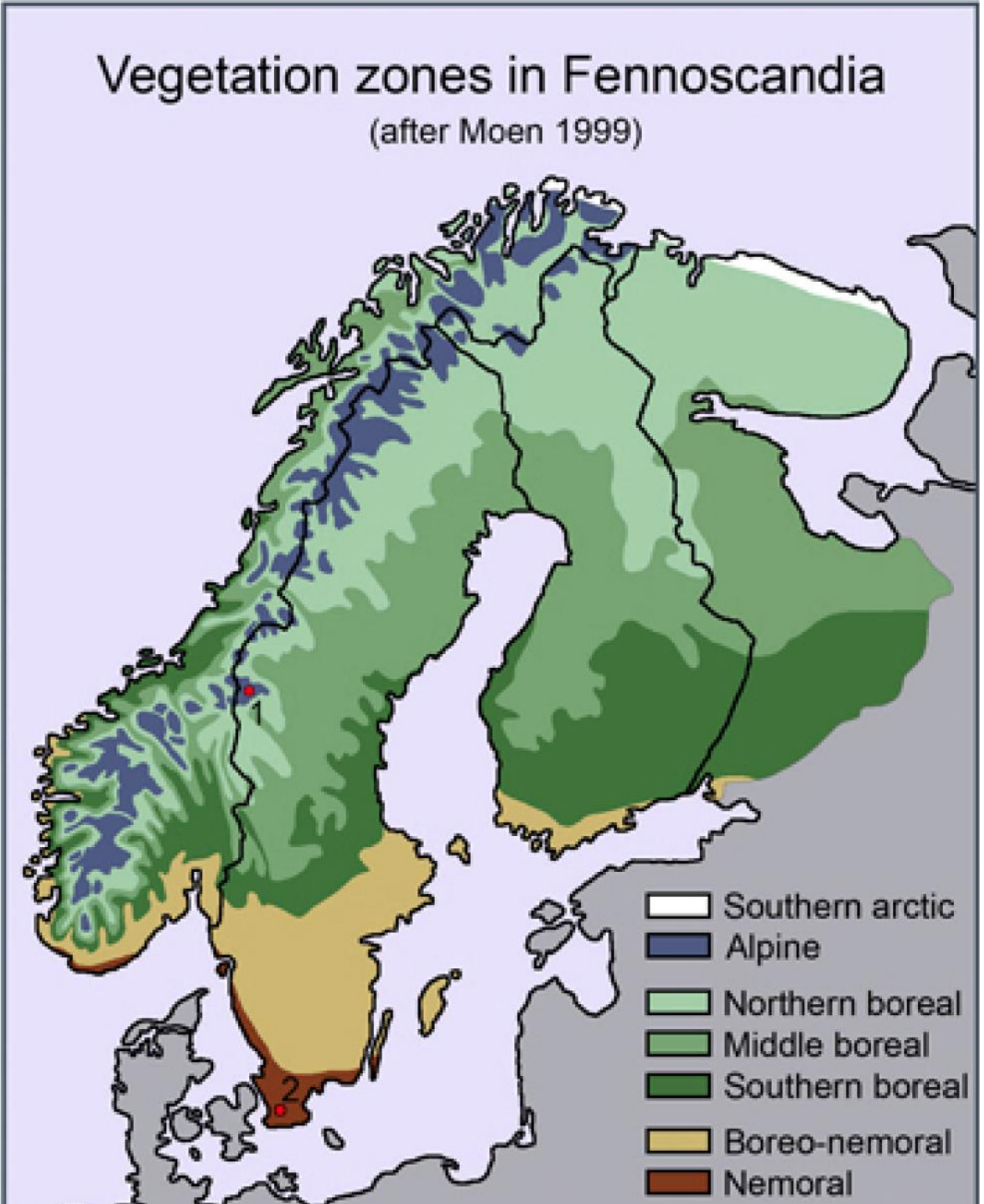
[a] Torching is the initiation of crown fire.

Agee, J. K. & Skinner, C. N. 2005. Basic principles of forest fuel management For. Ecol. Manage. 211: 83-96

Summary- why there are so few (or rather so small area)

- Effective early warning system and aerial surveillence
- Rescue service organisation suitable for catching fires quickly..
- … made possible by a dense forest road network
- (unintentional) effective fuel reduction and fuel management as a byproduct of silvicultural guidelines and forest management


Thank You!
Kiitos!

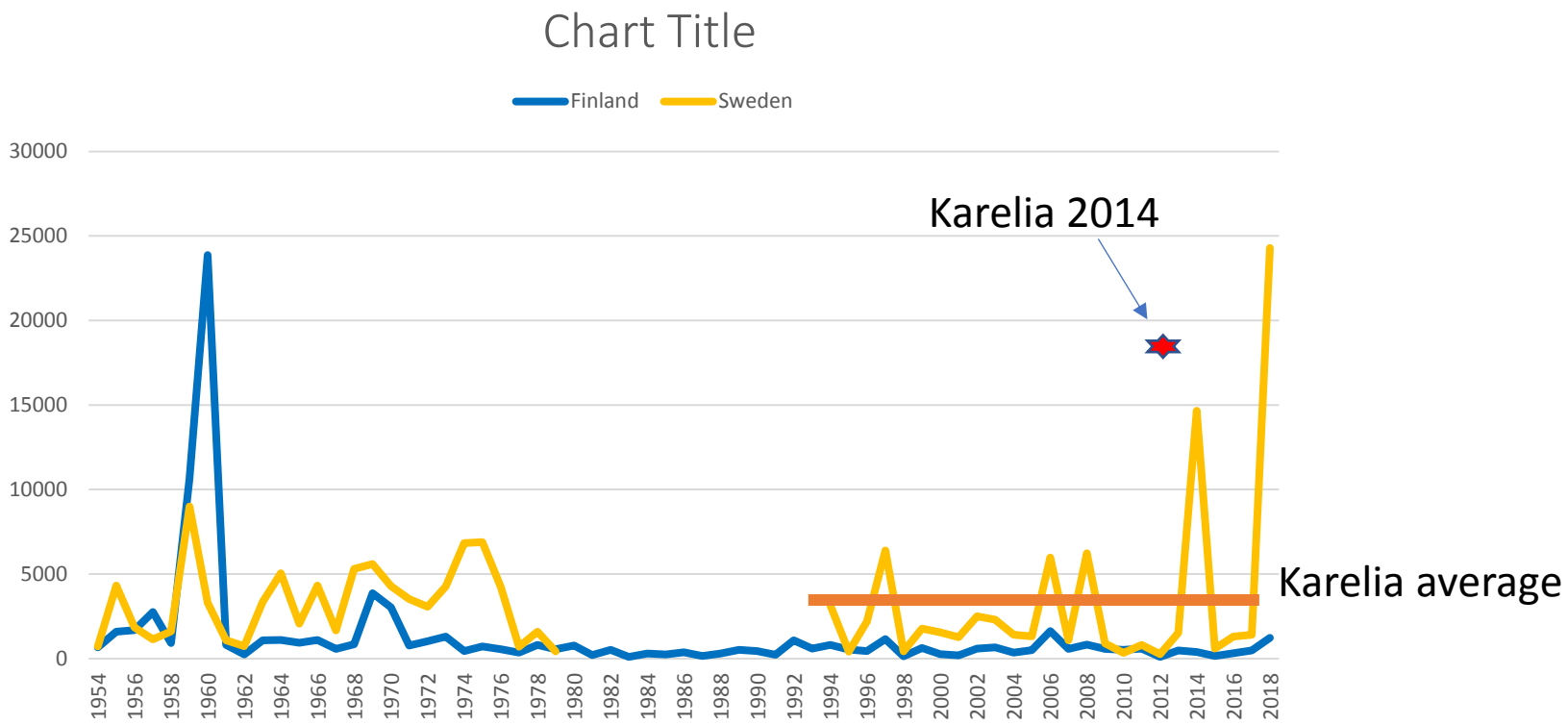


Bonus:if time!

Sweden, Finland, Karelian republic - about the same size – little less than 20 milj hectares (Norway excluded)

How about the neighbours?

Forest fires in Sweden and Finland (+Karelian average), annual area, ha:s



Source. Finnish statistical yearbook, Swedish Rescue service

Average annual burned area (1994-2018), has

Finland	534
Sweden	3 359
Karelia	2 500 – 3 000

Large wildfires in Finland and Sweden

Finland

- 1959 Isojoki-Honkajoki noin 1 700 ha
- 1960 Tuntsa noin 120 000 ha (siitä Suomen puolella noin 15-20 000 ha)
- 1969 Rantsila noin 600 ha
- 1969 Tyrnävä-Muhos noin 1300 ha
- 1972 Inari noin 200 ha
- 1970 Kalajoki noin 1 600 ha
- 1970 Liminka noin 500 ha
- 1992 Lieksa noin 150 ha
- 1997 Laihia noin 150 ha
- 1997 Tammela noin 250 ha
- 1999 Kangasala noin 110 ha
- (2006 Sodankylä, ampuma-alue n 130 ha)

Noin=about

Sweden

1992 Gotland 1000 ha
1994 Trollhättan 400 ha
1997 Östersund 1000 ha
1997 Ånge 400 ha
1997 Sollefteå 450 ha
1999 Tyresta 450 ha
2003 Skellefteå 210 ha
2006 Bodträskfors 1 900 ha
2006 Muddus 300 ha
2006 Lainio 400 ha
2008 Vännebo 800 ha
2008 Nordanstig 1200 ha
2014 Sala/Västmanland 14 000 ha
2018 4 fires with combined area of abt 20 000 has, (two largest fires 8 500 ha each)

Finland-Sweden

- In Sweden the general trend is decreasing like in Finland, but the scale is different
- In ”easy” fire years Finland and Sweden are close, but…
- In Sweden part of fires seldom but frequently develop in to major fires which have practically disappeared in Finland
- In Sweden the variety between different years (weather conditions) still shows, in Finland it has been cleaned away
- In Sweden in recent years there is an escalating trend of forest fires, even megafires
- This does not show in Finland

Why?

- Human behaviour, mentality, society +- same
- Climate+-same
- Ignition source and probability +- same
- Fuels
  - Ground fuels: especially lichen/bryophyte ratio
  - Stand level– landscape level differences (silvicultural policies, compartment size, tree species)

- Fire suppresion:differences: the organisation of rescue service and fire fighting
- Similar society, +- similar early warning system + aerial patrolling
- Some differences in silviculture: denser stands, more spruce-dominated forests in Sweden
- Forest road network: accessebility, fire breaks, increases human activities in forest
- Topography
- Luck?

Finland-Sweden

- In Finland the fires are ”caught” and limited earlier and more securely than in Sweden – which keeps them small and prevents major fires
  - Density of forest road network: in Finland 300-400 m:s to nearest road (in Northern Finland a bit more), in Sweden and especiallý in central and northern Sweden significantly higher
  - Compartment size (e.g in Finland average size of final cutting area 1-1.5 ha, in Sweden 3-4 ha and even larger in central and in Northern Sweden)
  - Silvicultural policies (denser stands, spruce dominated → increases crown fire risk)
  - ” The Finnish partly voluntarely-based organised (with many small and medium size local fire brigades in villages) probably suits better for wildfire suppression than Swedish permant-based rescue service


Thank You!
Kiitos!