

Water and forests in developing countries

SIWI seminar on
“Water and the forest – experience and knowledge
among Swedish forest-actors”

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How similar or different is the forest and water relation between South and North?

- For the **hydrologist** – understanding the water balance and having standard research approaches
- For the **forest historian or soil scientist** looking at the forest management development as a driver for water and other ecosystem services
- For the **forest manager** – having perceptions from education and policy
- For the **Agriculturalist** needing the water downstream
- For **local people** needing the water in the well in the dry season
- For the **carbon payment scheme**

How to focus in this comparison?

- 1) The situation is hydrologically and socially incompatible between Sweden and most developing regions in the South.
- 2) In forest hydrology we tend to work with "northern" methods and in environments and land uses that afford to have own empirical research. Have this confused the paradigms and policy for Southern forest-water relations?
- 3) The development of forest land-use is the driver of impact on water. Are there parallels between how forests have developed in Sweden and how they will develop in the South?

1) Large tracts of Boreal regions like Sweden and Finland are special in being humid and having low population

- In this sense being similar to the Amazon?



- But not like large parts of Sub-Saharan Africa being either humid or semi-arid but in both cases with increasingly dense populations



2) Is the perceptions of forests and of forest hydrology from the North setting the paradigm for forest – water relations in the South?

Sponge effect

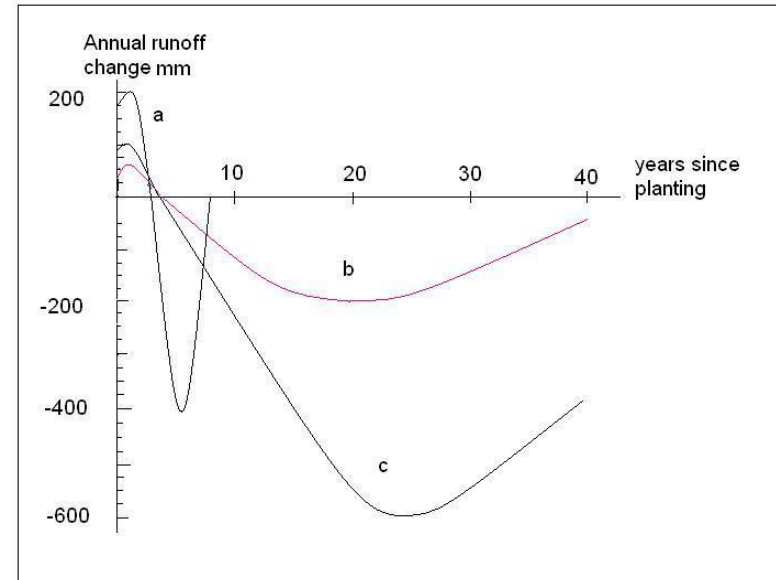
- Trees improve soil and infiltration
- Groundwater instead of fast surface runoff
- More water in wells in dry season and less flooding after rains

Trade-off theory

- Trees transpire more water than they contribute to more groundwater
- Increasing problem with increasing lack and competition of water

The empirical evidence for trade-off is strong globally

- Groundwater and streamflow increases during a short time after clearing
- But the water use by the trees is very much larger as the forest grows.
- In general true for both humid and semi-arid regions



But how strong is the emperical base for the tropics and for Sub-Saharan Africa

The latest global review state:

- Carbon offset schemes in the tropics are questionable
- Forest planting likely to severely reduce or even eliminate streamflow

Jackson et al. In Science 2005

- *None of the 504 observations from the 26 sites used occurred within ten degrees of the Equator.*
- *Only two occurred within twenty degrees.*
- *These were all on natural grassland and not on degraded land where trees might improve infiltrability*

How did it come to this?

Do we emphasis forest, when it is about the trees?

- (Northern) hydrologists and foresters work with forests



While in In Africa tree densities vary:

- 350 m ha of open and fragmented forests
- 514 m ha of other wooded lands, including savannah and agroforests
- 277 m ha of closed forest
- 8 m ha forest plantations

(FAO, 2010)

And yes, forest plantations use more water



- Old growth forests are a mix of species and old and young individuals and gaps,
- while the new forest plantations are monocultures of fast growing species.
- It is not only Eucalypts that use a lot of water – also indigenous pioneer species in secondary forest use as much water (Fritzsche et al., 2006)

But the situation in developing regions is that trees integrates in other land-uses in various densities



Can we reconcile the debate of **either** co-benefits or trade-offs by forests and trees by use of an *optimum tree cover theory*?

There is for each landscape (climate and tree species mix) an optimum tree density for balancing groundwater recharge with tree water use.

As a first example, shown for traditional agroforestry parklands in Burkina Faso with up to 20 % crown cover

(Ilstedt et al. under review)

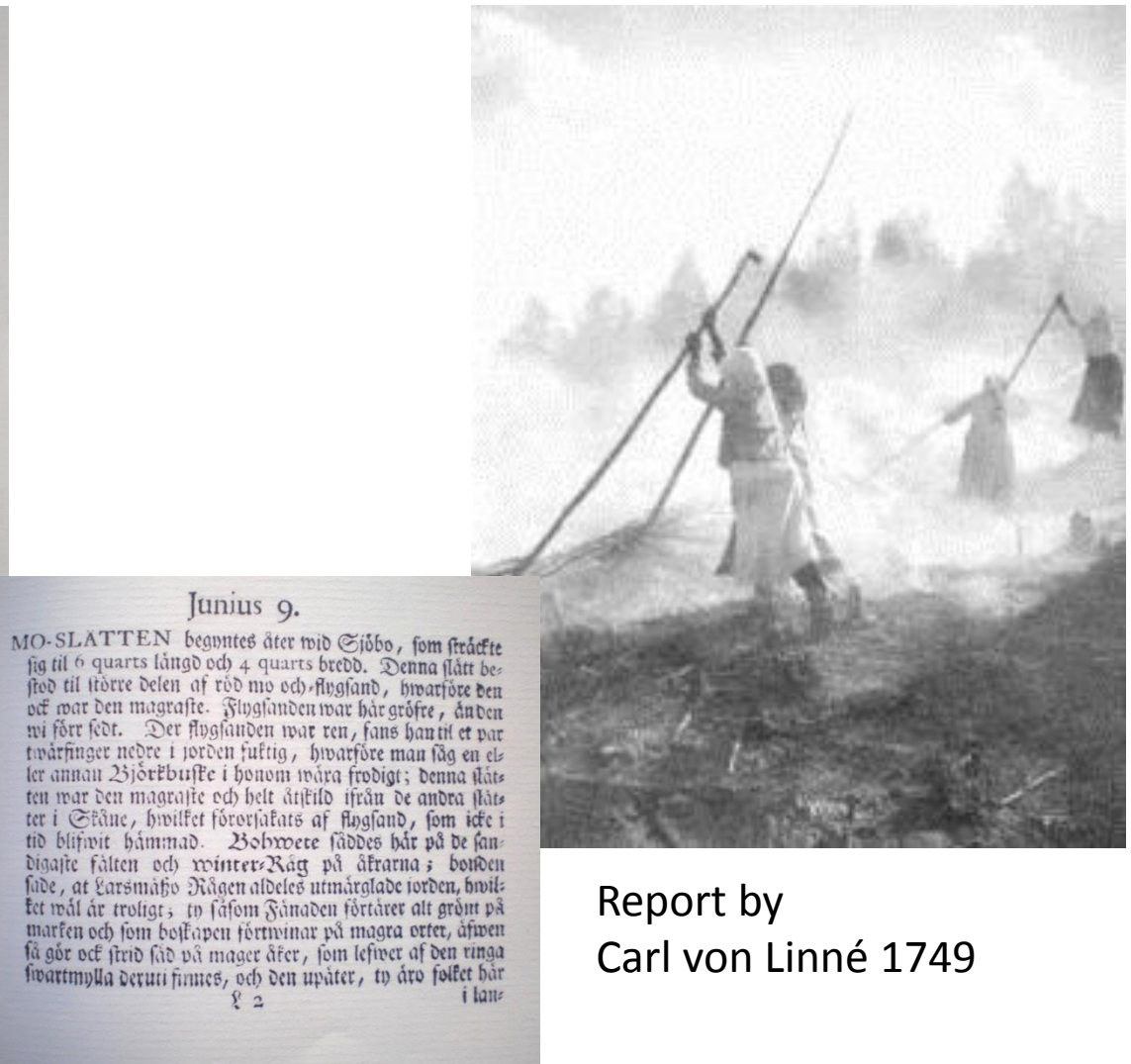
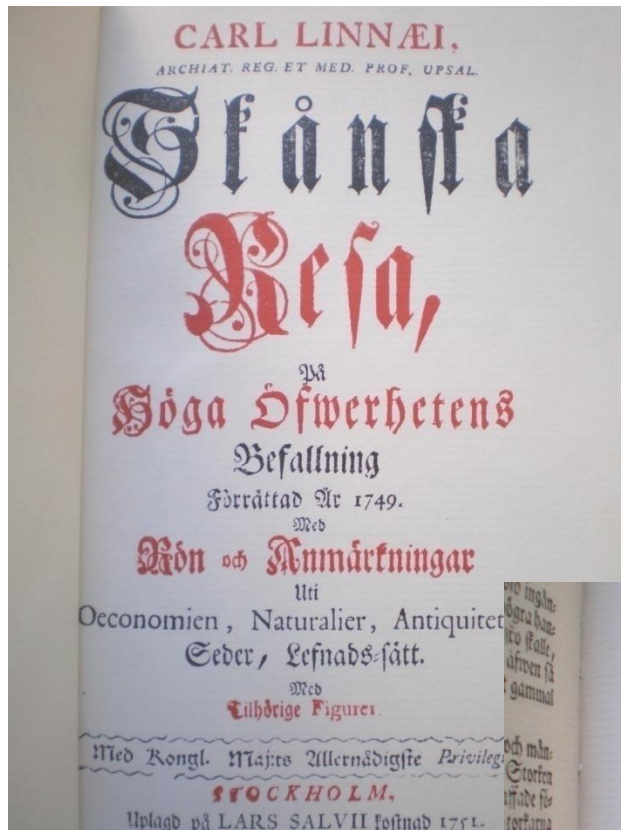
The forests that have been investigated in the South are the ones that have been part of a weak market economy



Will there be increasing interest to understand complex landscapes with growing economies and integration of land-use therein?

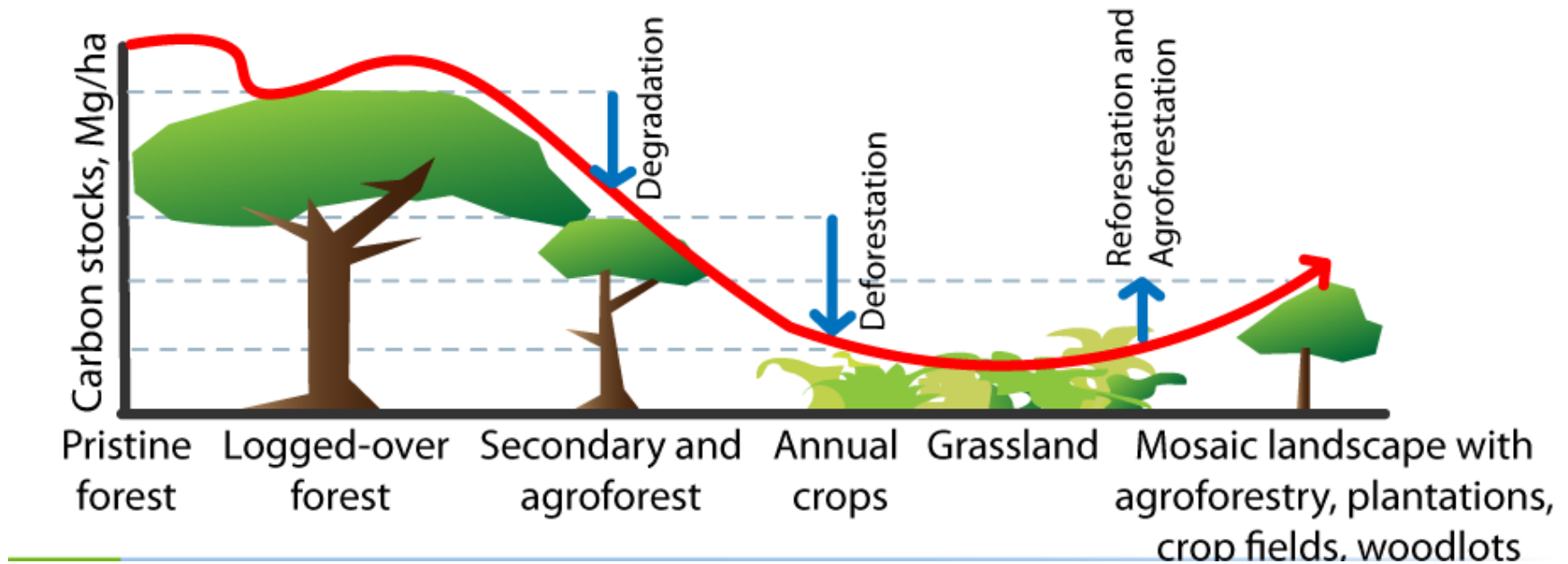


3) Is that what happened in Sweden? And can we learn from history?



Report by
Carl von Linné 1749

Forest cover or tree density is well correlated with economic development



Forest cover in province of Halland 1650 – 1920 (Carl Malmström, 1939)

C:a 1650

C:a 1700

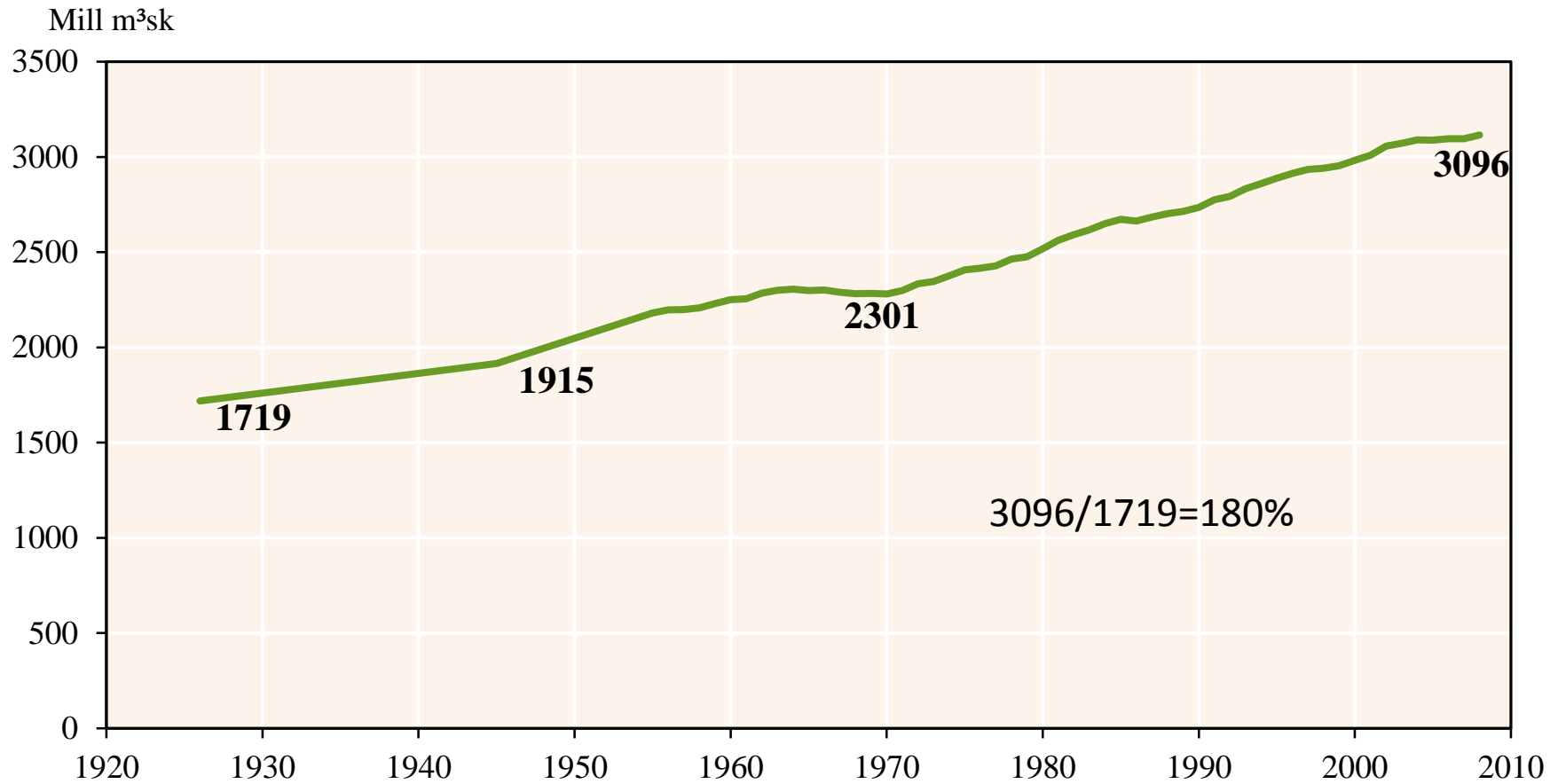
C:a 1850

C:a 1920



grazing broadleaved forest coniferous forest
& agriculture

Total growing stock, National Forest Inventory



Various drivers for forest restoration in Sweden:

Industrialisation / urbanisation (leaving abandoned agricultural and grazing land)

1 milj Swedish immigrants to USA

Abolishing of grazing in forest land

Lack of timber in logged over forests combined with **increasing demand i Europe**

National forest legislation and forest inventory since 1923,

Large volume of governemental sponsored long term research and forest technical education

Cooperative cooperation between farmer forest owners



Certainly changes in trees' roles in changing land-use will have an effect on water but:



- Do we have a clear policy on the role of forests and trees in the South?
- Is it based on empirical science?
- Is the trajectory of importance and values of Swedish forests – and its related planning and understanding a major experience to share?