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Swedish University of Agricultural Sciences

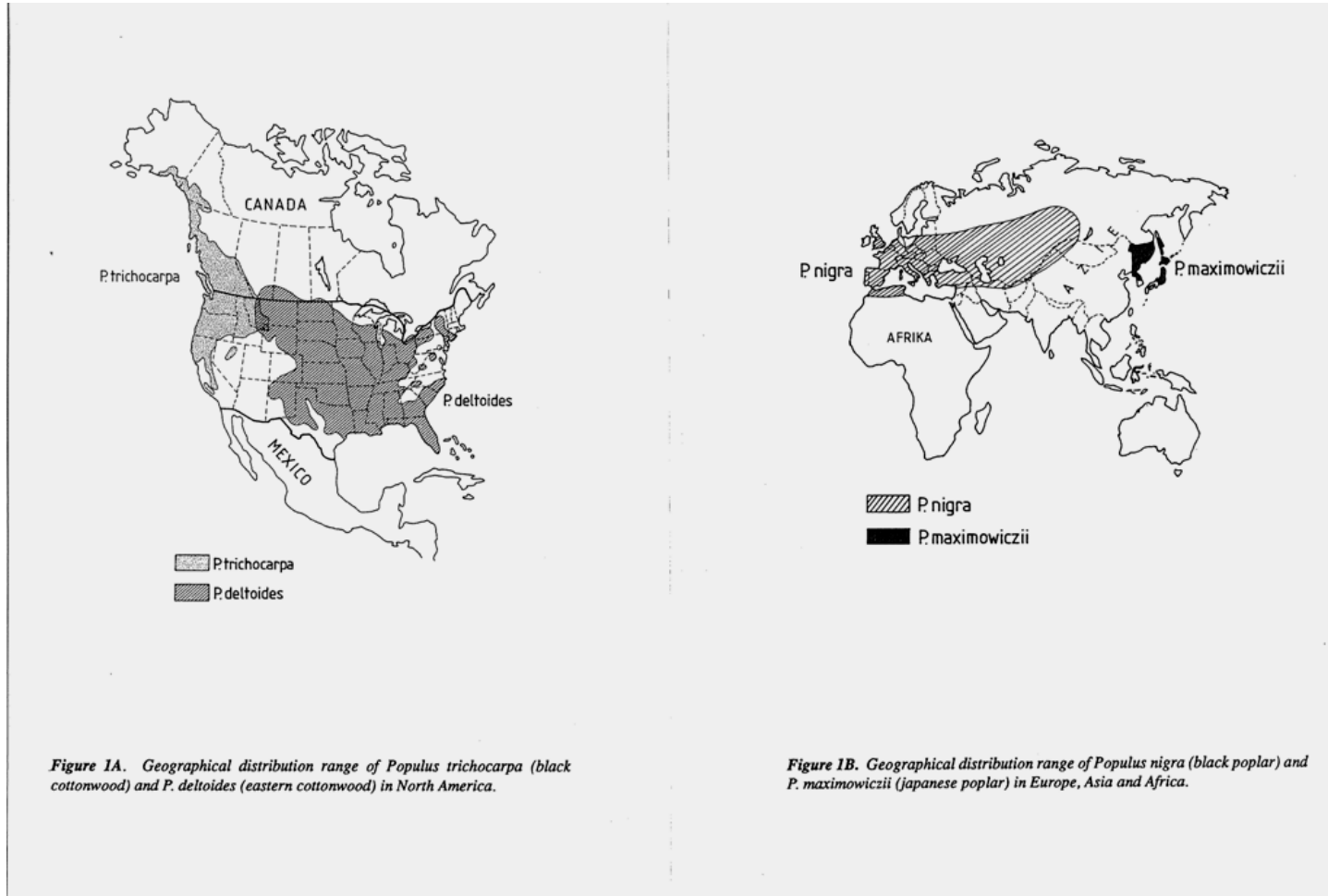
Department of Crop Production Ecology

# Poplars in Sweden

2015-01-21, SRC+ workshop at VPE.

Almir Karacic

# Some important poplar species



**Figure 1A.** Geographical distribution range of *Populus trichocarpa* (black cottonwood) and *P. deltoides* (eastern cottonwood) in North America.

**Figure 1B.** Geographical distribution range of *Populus nigra* (black poplar) and *P. maximowiczii* (japanese poplar) in Europe, Asia and Africa.

# Poplar - multiple use



# Main characteristics of poplar SRF in Sweden

- Few climate adapted clones (new material needed)
- Relatively high production (25-30 m<sup>3</sup> (ca 10 ton dm)/ha/yr)
- Used for bioenergy and pulpwood
- Rotations 13-18 yr, single-stem system
- Second rotation, coppice or single-stem??
- Harvested using equipment from conventional forestry
- Knowledge on plantations establishment and management not sufficient but increasing
- Animal browsing, fencing necessary??
- The economy of poplar enterprise??

# History

- Windbrakes, introduced in 18<sup>th</sup> century
  - Robusta and some other DxN hybrids
- Small production trial plots, 1930's – 1970's
  - DxN hybrids
- Poplar archives 1970's – 1990's
  - DxN, D, T, DxT etc.
- Commercial introduction of OP-42 (MxT), ca 1990
- Steenackers material, 1991
  - T, DxT
- Northern T and B, 1995-2015
  - PG, FN, Alaska,
- SLU, central Sweden adapted material, 1990's
  - T from Swedish, German and Finish archives crossed in Uppsala
- SLU, new material 2011-2014





Bruno Ilstedt and Lars Christersson, the pioneers of poplar research in Sweden





Clone trial with new clones of *Populus trichocarpa* bred at SLU in Uppsala

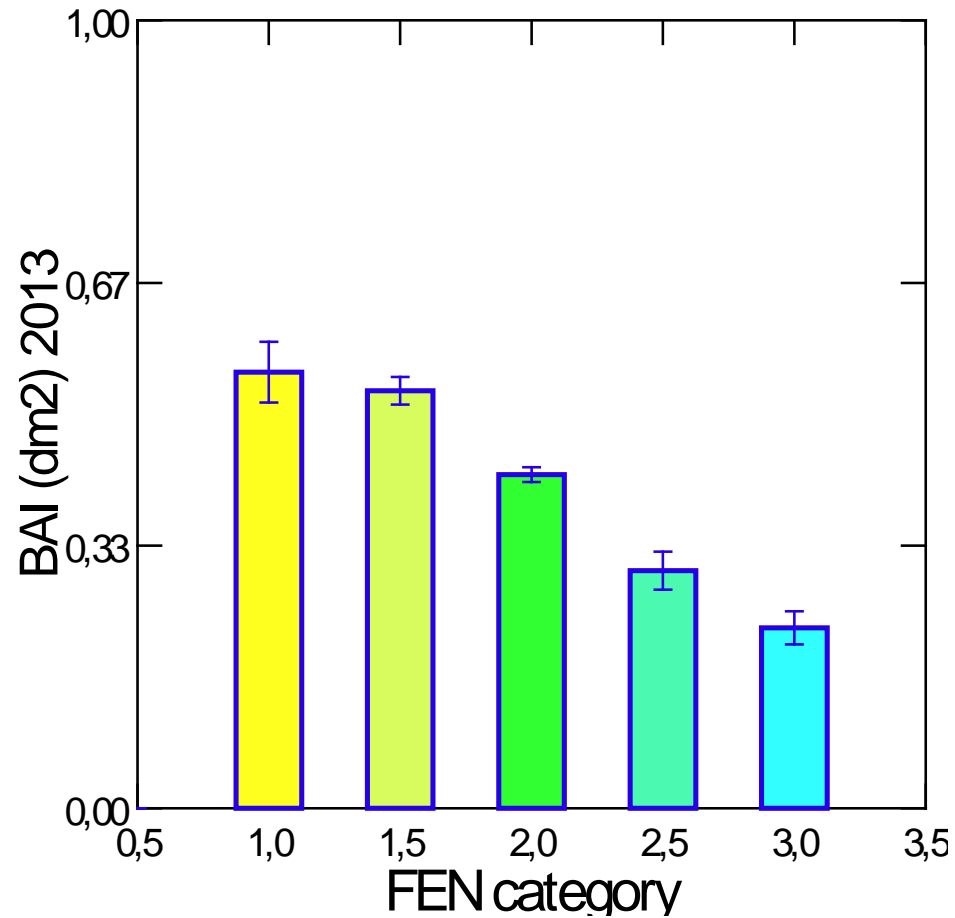




A 10-year old candidate clone that is considered for the deployment at the market by Swetree Technologies

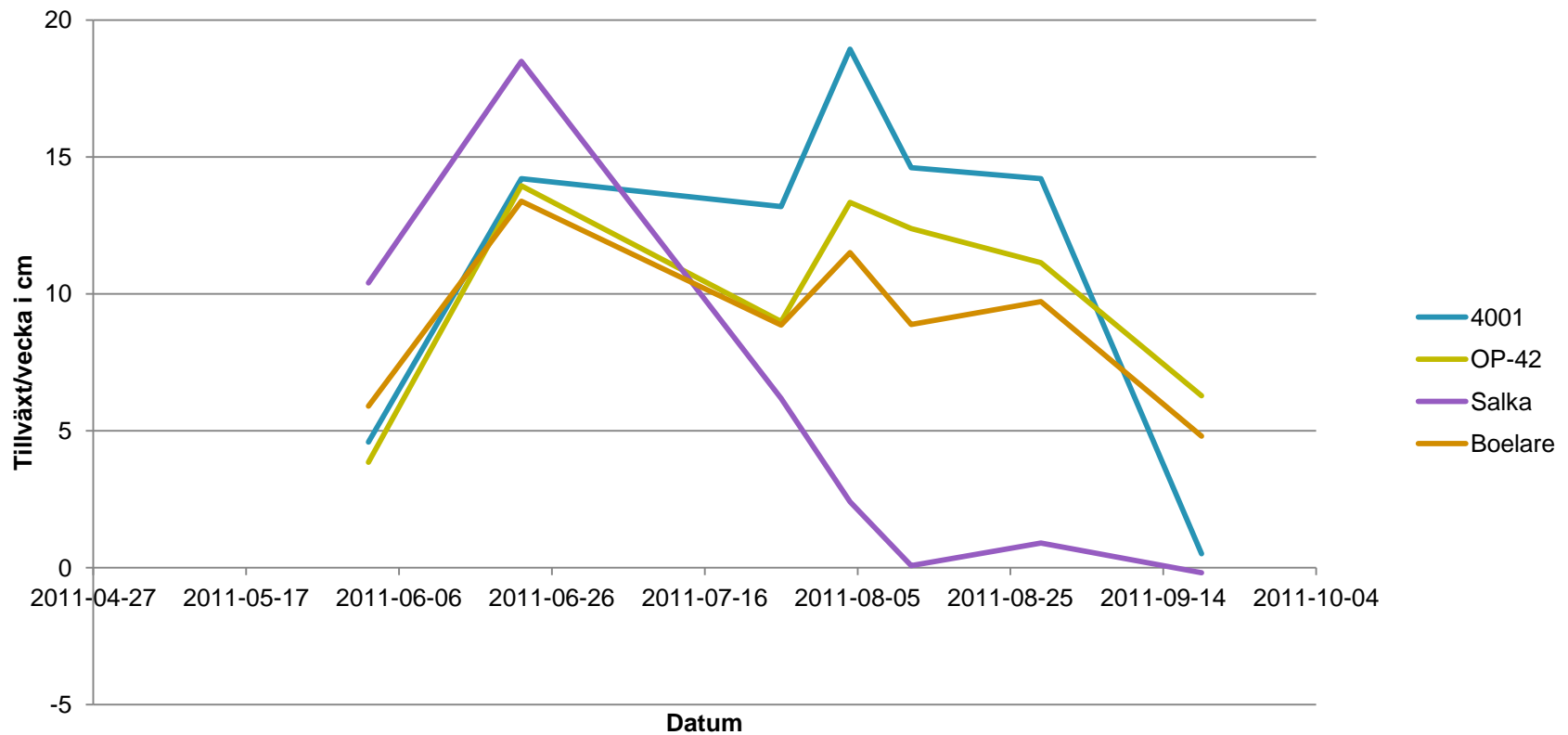


# New clones - phenology



# Poplar – growth rhythm and climate adaptation

## Tillväxtrytm

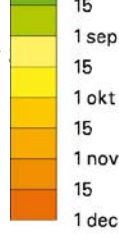




Clone screening, Halland, southern Sweden



# Svensk Trädgårds Zonkarta över



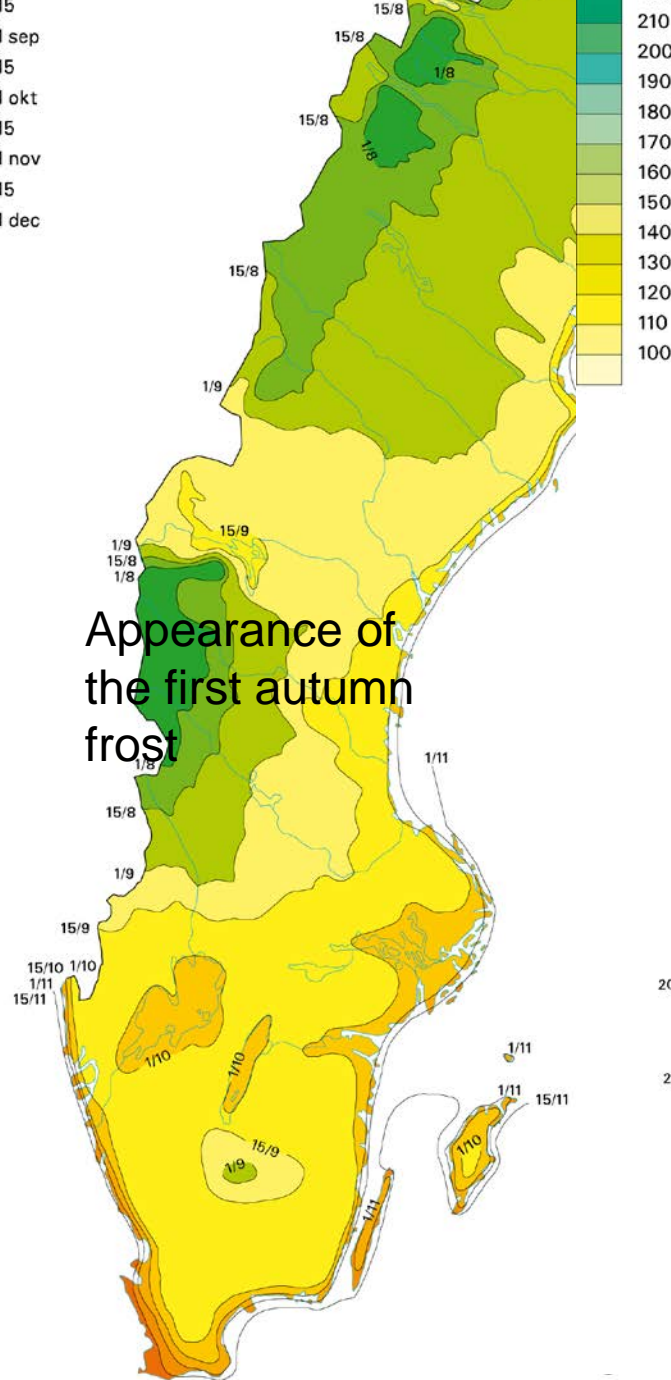
## Odlingszoner

- 1 Zon I
- 2 Zon II
- 3 Zon III
- 4 Zon IV
- 5 Zon V
- 6 Zon VI
- 7 Zon VII
- 8 Zon VIII
- Fjällregion

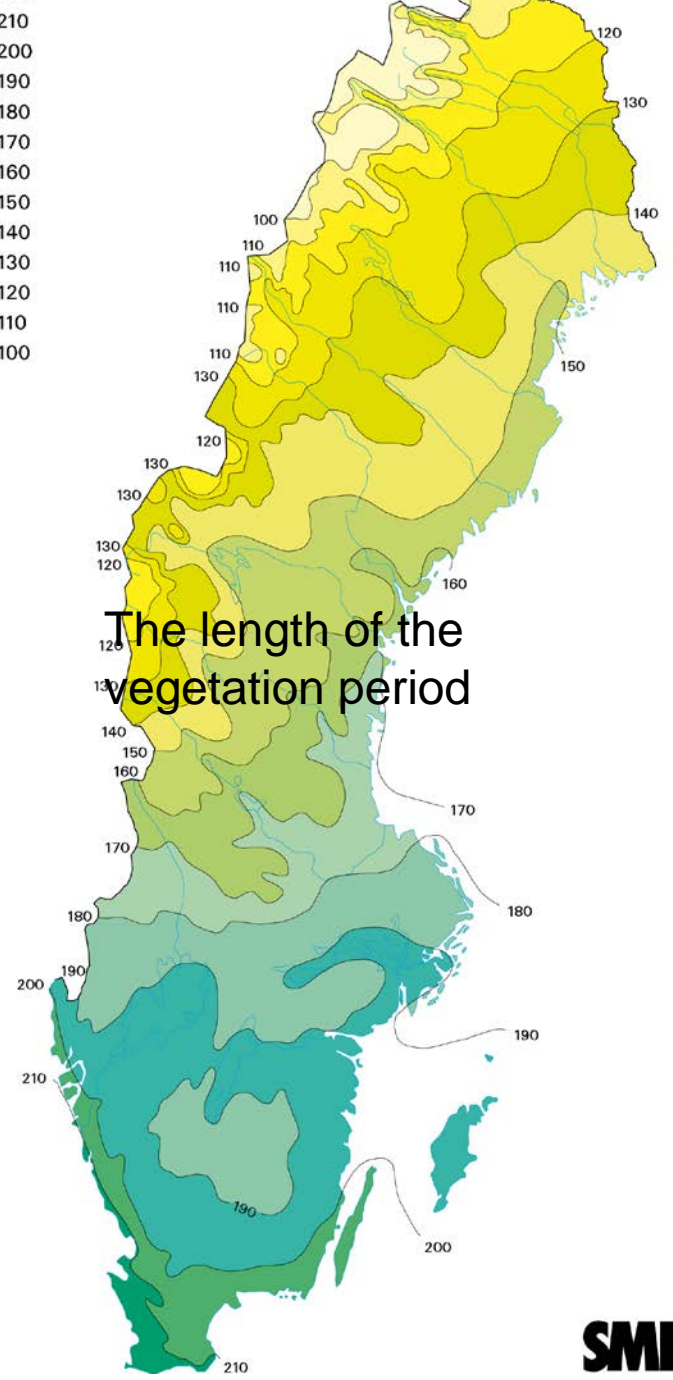


## Hardiness zones

## Appearance of the first autumn frost



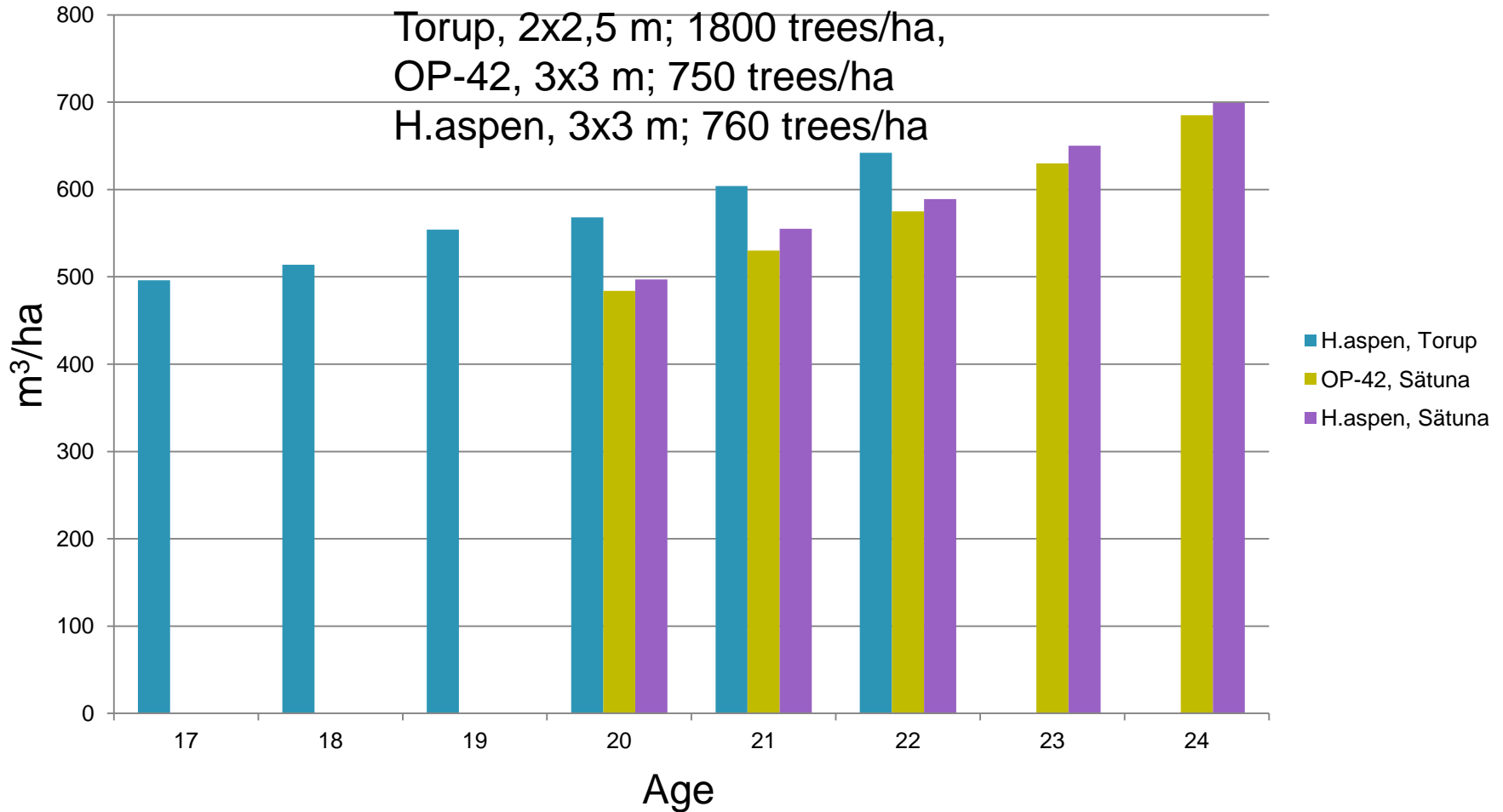
## The length of the vegetation period



- Age 18 years, rotation length 15-20 years
- Planting density 1100 st/ha,
- Thinning after 15 years down to 721 st/ha
- Mean DBH 25 cm
- Mean height 26 m
- Basal area 36m<sup>2</sup>/ha
- Standing volume 436 m<sup>3</sup>/ha, 416 m<sup>3</sup> pulpwood
- Total biomass 172 Mg/ha, 31 Mg tops and branches
- Annual production 9,5 (24,2 m<sup>3</sup>) Mg/ha/year

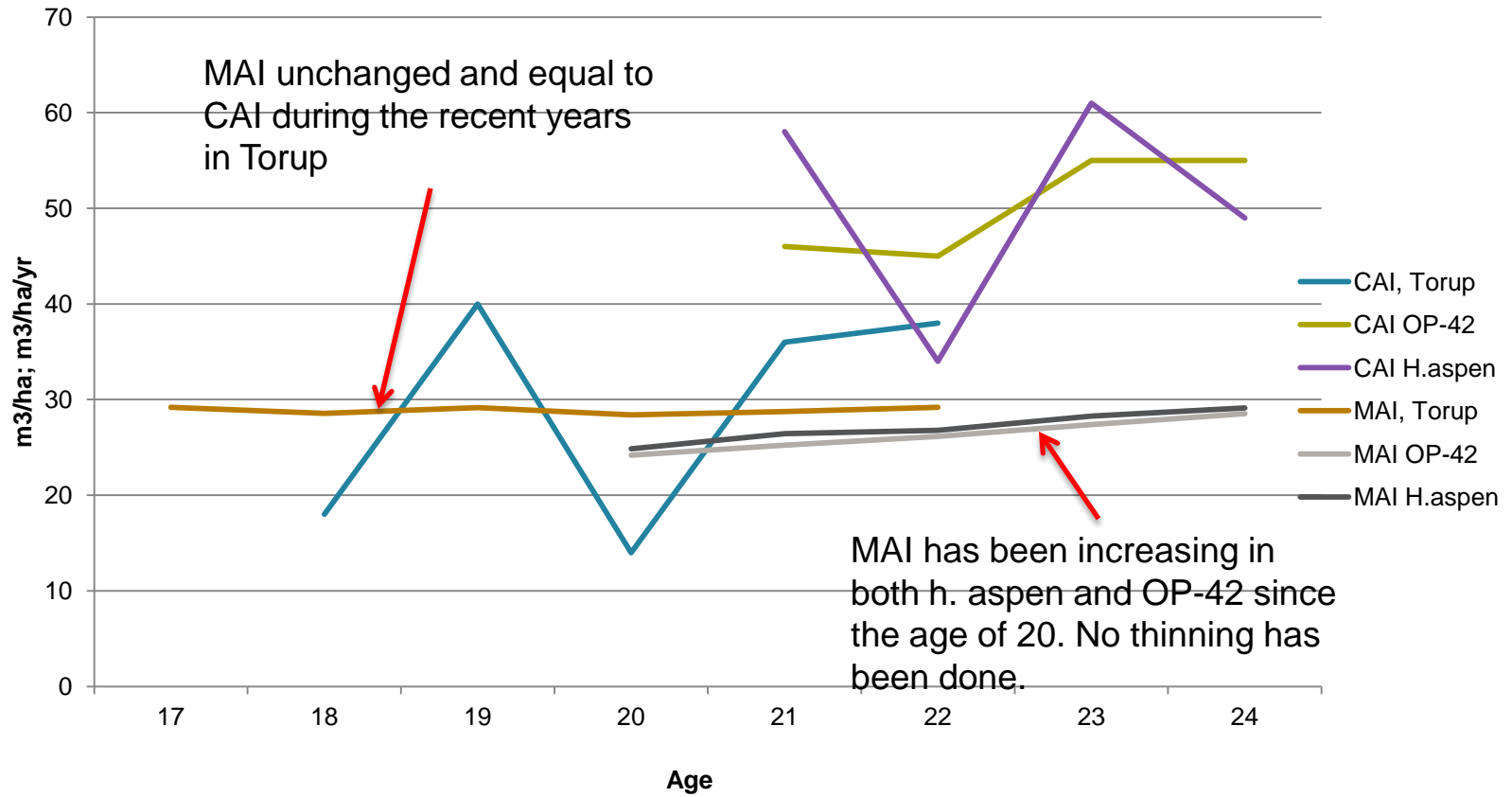
Plantation	Sångletorp	Rydsgård	PI 3	PI 4	Valsätra
Area (ha)	33	15	7,8	3,5	0,9
Age	14	13	17	18	22
Establishment costs /hektar	8210	10500	6600	7600	8022
Profit/ha	44504	20995	39932	69384	59895
Internal rate	14%	6%	12%	14%	11%
Internal rate with doubled establishment costs	8%	0%	7%	9%	7%

# Standing volume





# CAI and MAI





Planting poplar cuttings on a clear-cut forest site

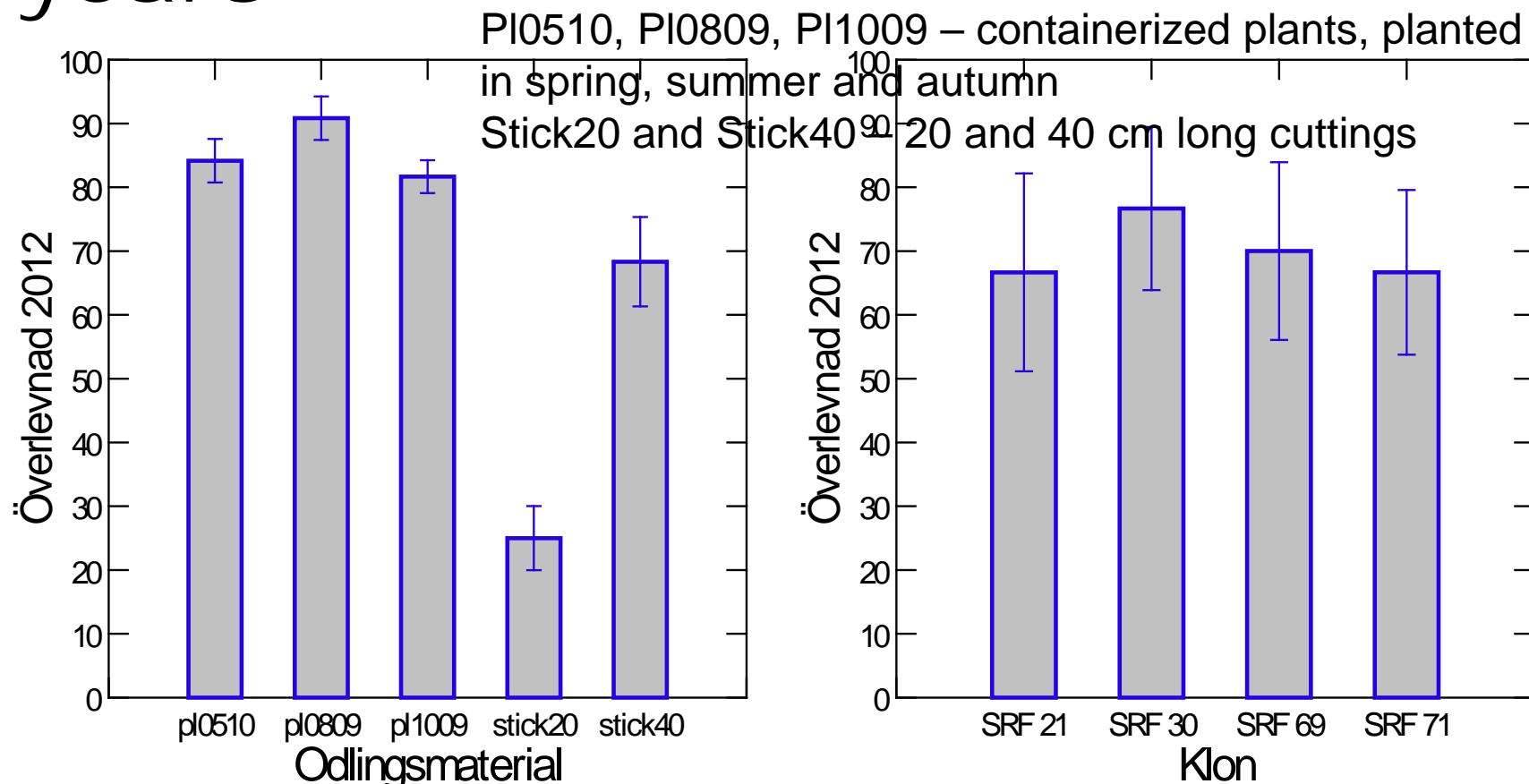




5 year later. The competition from ground vegetation and a coarse soils structure limit the availability of water and nutrients necessary for vigorous growth of poplars.



# Forestland – survival after 3 years





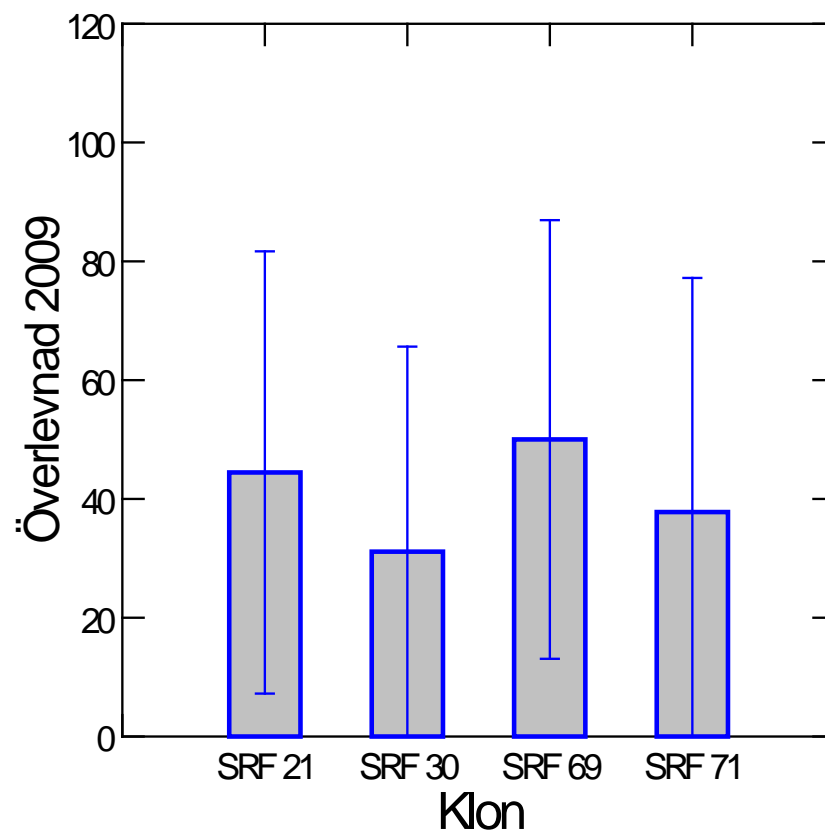
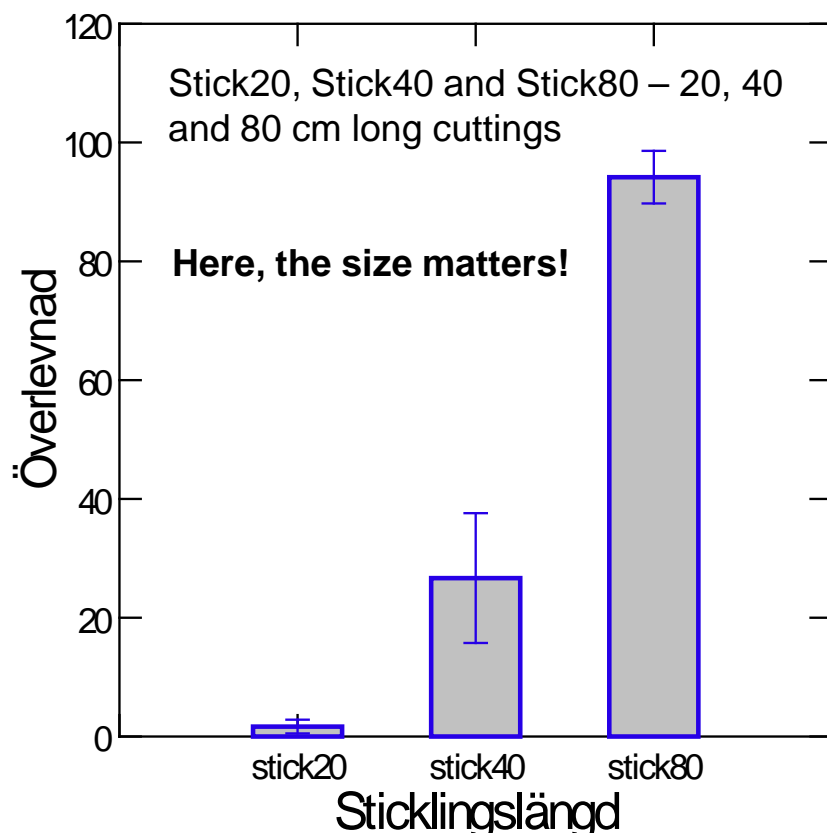
The weeds are abundant on organic soils. They represent tough competition to young poplar plants despite herbicide treatments. On such soils it is necessary to perform frequent mechanical cultivation during the establishment phase (2-3 years). This is still not a guarantee for the success of plantation establishment on this kind of soils.





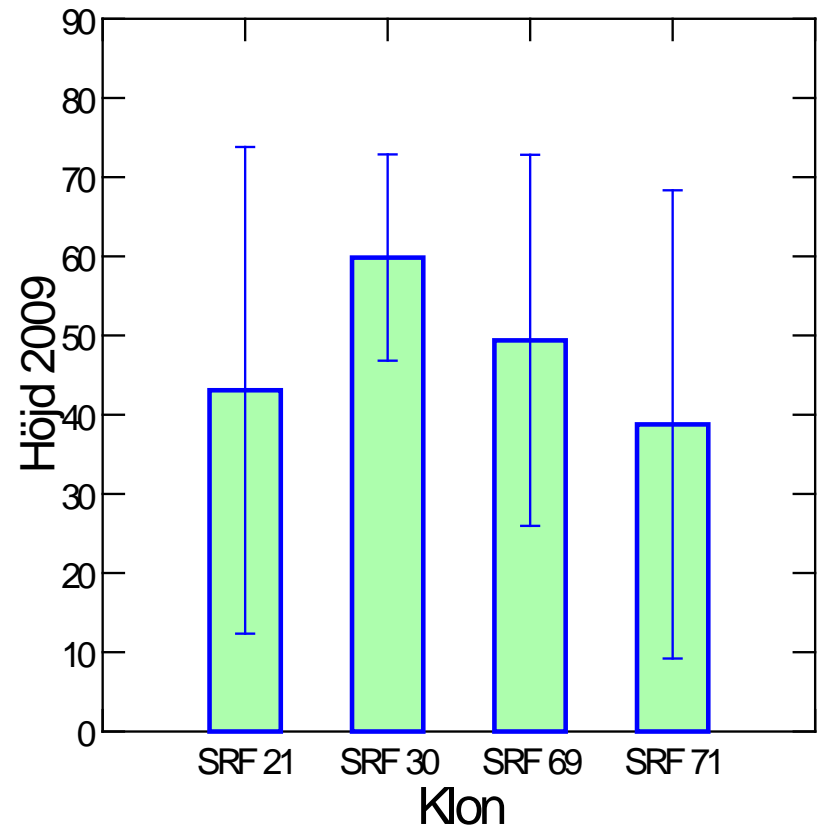
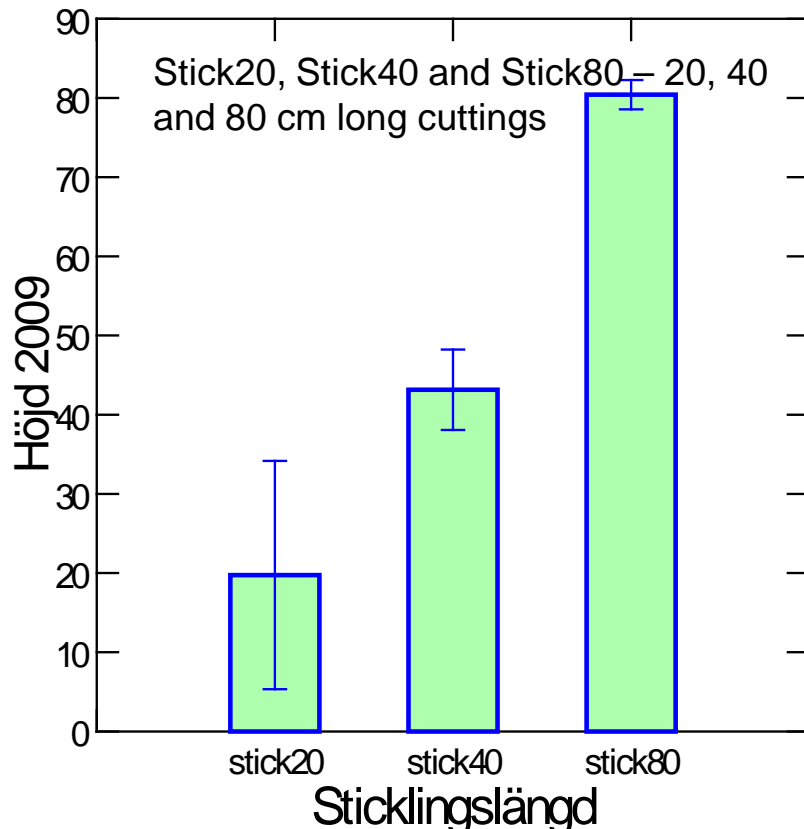
Proportion of organic material in the soils on this site is over 80%. All types of poplar plant material will have tough competition from weeds and be exposed to vole damage.

# Organic soils – survival in the first growing season





# Organic soil – growth in the first year





Establishing poplar using long poles on organic soils with high ground water level. The long poles can work only if the site is ditched or planting point mounded. Otherwise, oxygen-poor environment will result in dysfunctional fine-root system. The plant stands on water saturated soil but displays drought symptoms. It suffers from water and nutrient deficiency!





Cultivation of organic soils to reduced the weed competition and vole damage.





Testing the efficiency of various types of chemical repellents and mechanical protection against animal browsing. Planting poles early in the vegetation season is important for the successful establishment.



Poplar established in Tierp (60°N) using two year old unrooted poles. The soil is mounded at a planting point using excavator. No herbicides or other cultivation was applied. The first year growth is almost 2 m and the total height of the plant more than 3 m.



Large leaves already in the first growing season suggest that an extensive root system could develop to support the plant with large amount of water and nutrients.







Establishment on a commercial scale using bare-root plants and plastic mulch. This Swedish farmer has been establishing new plantations of poplars and hybrid aspens at a rate of ca 300 ha/year during several recent years. All plantations are established at approximately 3x3 m planting distance using a plastic cover 1 m wide. The application of plastic mulch is mechanized. The plastic cover is not perforated and appears to work well on clay soils.





Plastic mulch on a newly established poplar site