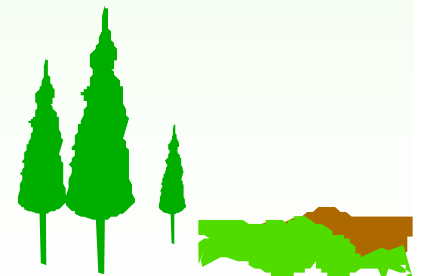


# Cuttings versus seedlings – not only a matter of genetics

Mats Hannerz  
SkogForsk  
Uppsala, Sweden

SKOG  
FORSK



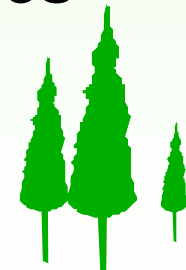
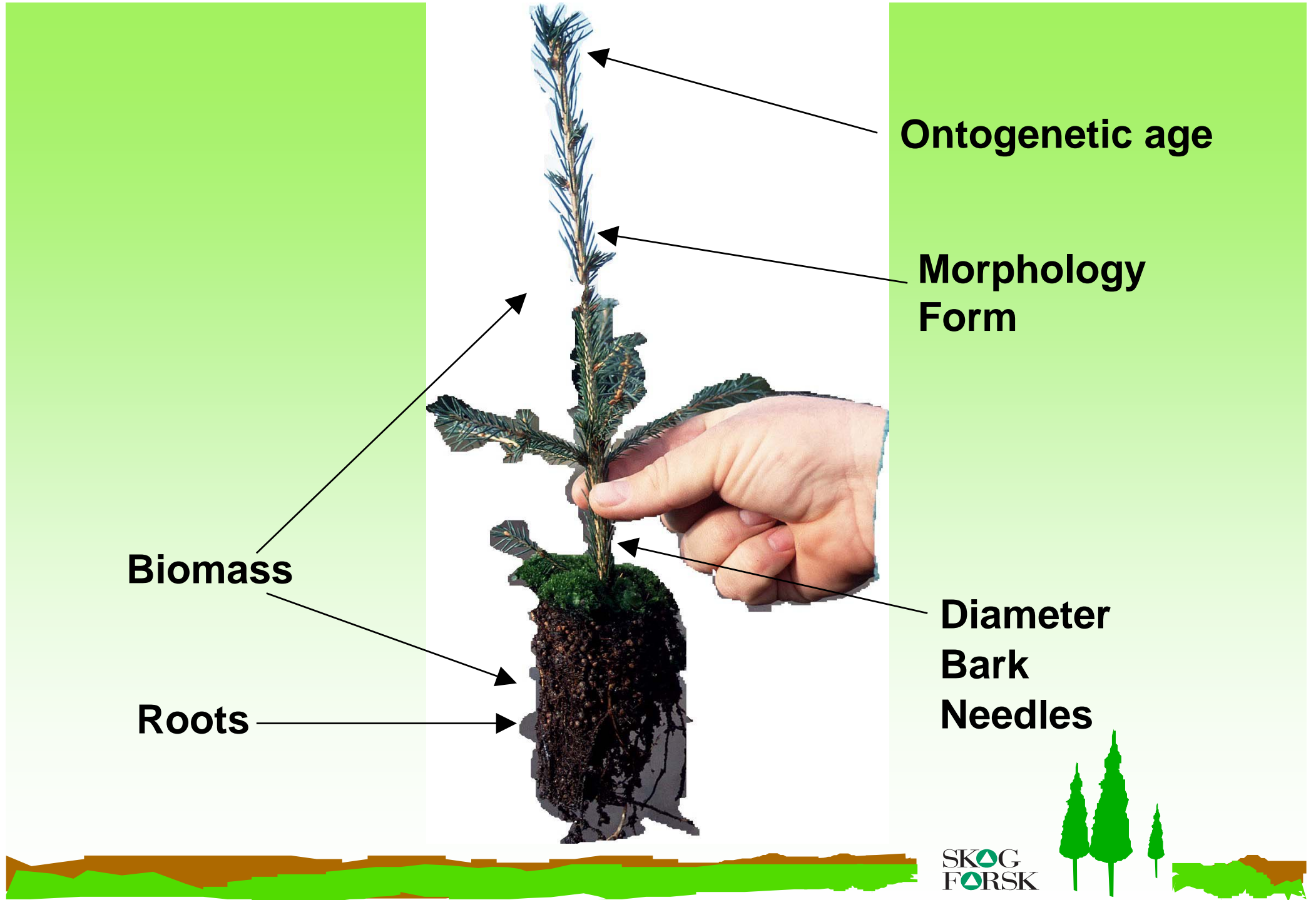
**Biomass**

**Roots**

**Ontogenetic age**

**Morphology  
Form**

**Diameter  
Bark  
Needles**



- ◆ **Form**
- ◆ **Growth**
- ◆ **Survival**
- ◆ **Frost damage**
- ◆ **Resistance to pine weevil**
- ◆ **Stability**



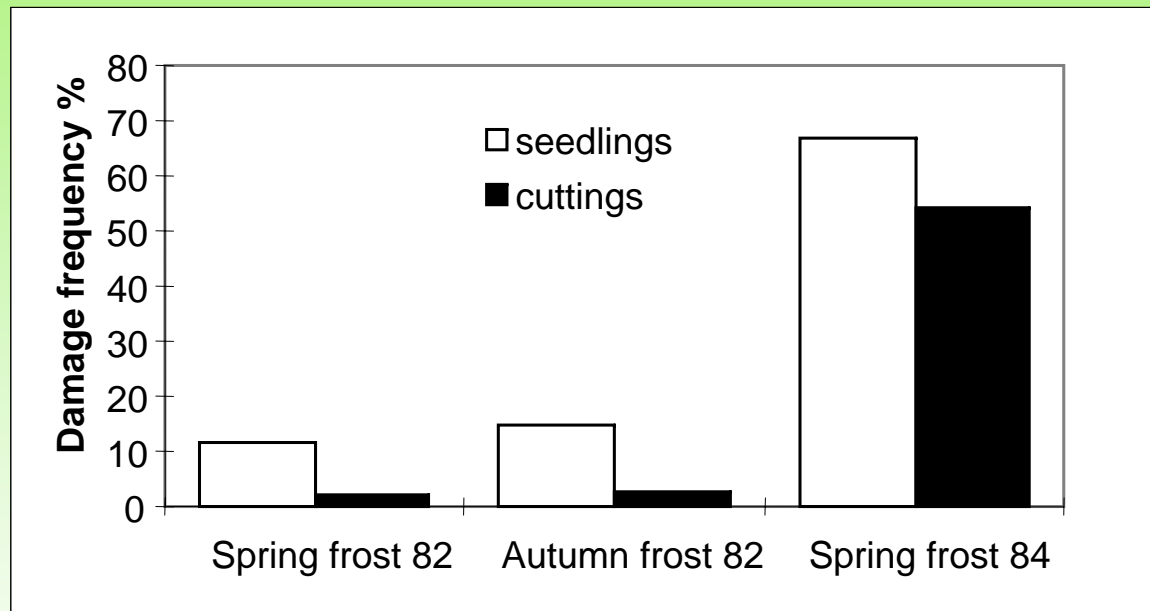
# Superior growth

- ◆ **Gemmel, Örlander & Högberg, 1991\***:  
Same seed source -> cuttings and seedlings  
20 sites in southern Sweden  
After 8 years: + 15% taller, higher survival
- ◆ **Hannerz & Wilhelmsson, 1998\*\***:  
After 14 years: + 6% taller
- ◆ **Roulund, Wellendorff & Werner, 1985\*\*\***:  
*After 13 years: + 18% taller*
- ◆ **Karlsson et al., 2001\*\*\*\***:  
*Effect varies between vegetative cycles.*

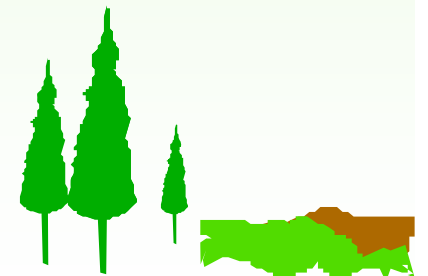
\*Silva Genetica. \*\*Forestry, \*\*\* Forest Tree Improvement, \*\*\*\* Can J For Res



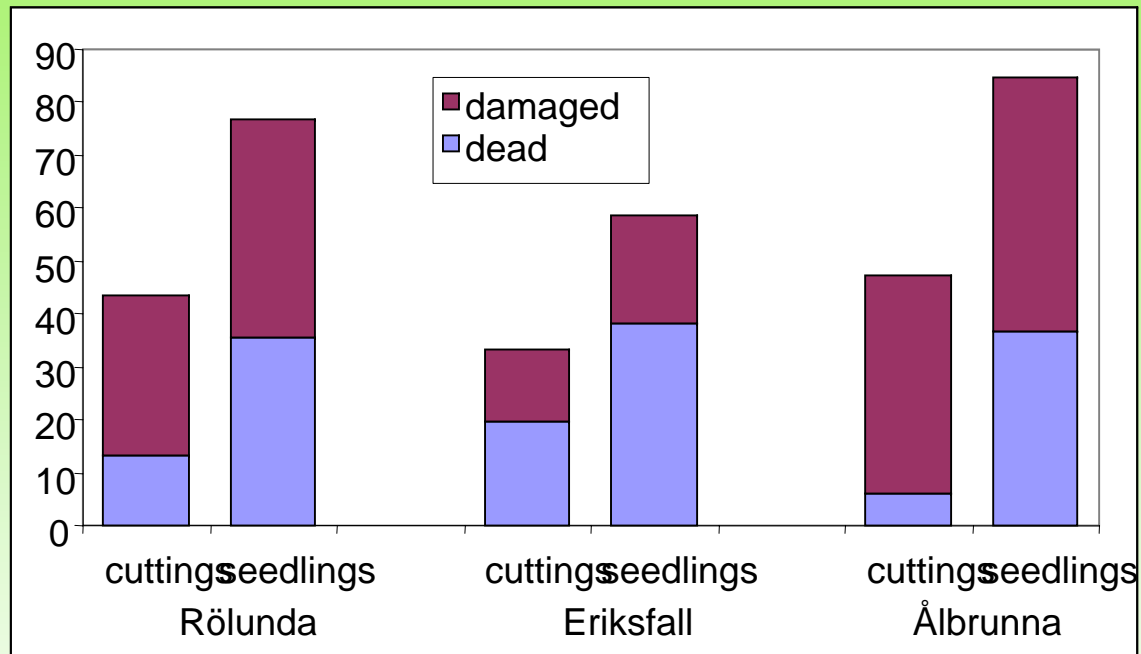
# Less frost injury



*Hannerz & Wilhelmsson, 1998, Forestry*



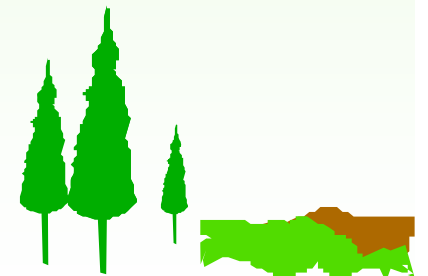
# ...and winter damage



**Cuttings = selected clones**  
**Seedlings = provenances**

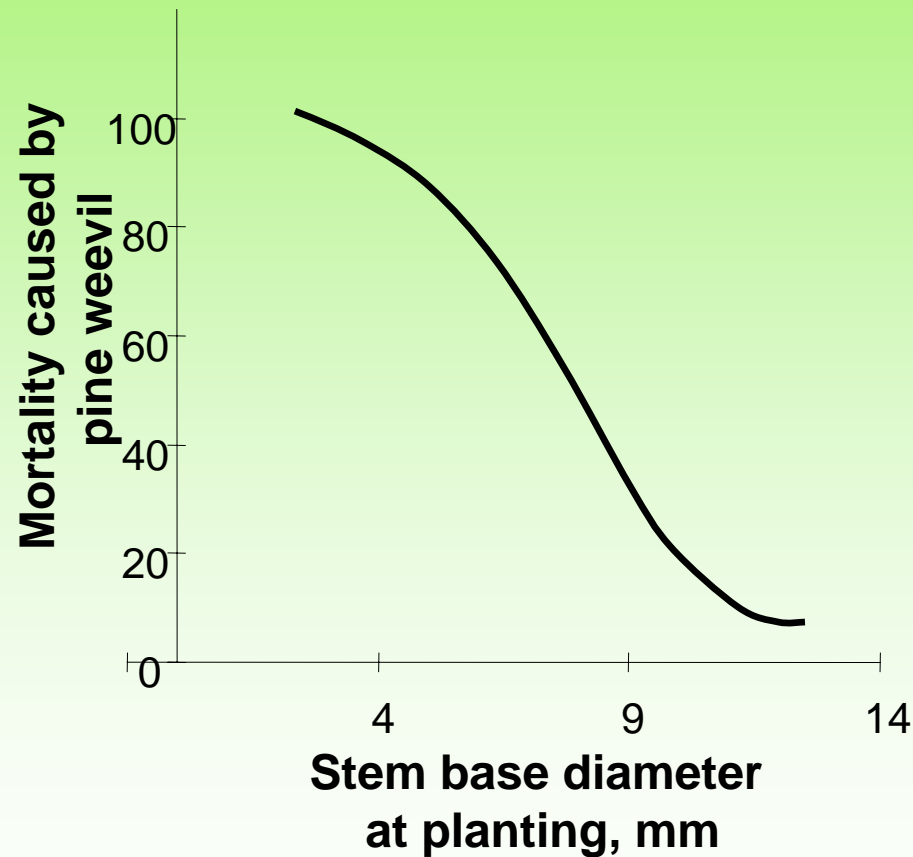
*Hannerz, 1994. SkogForsk, Report No. 6*

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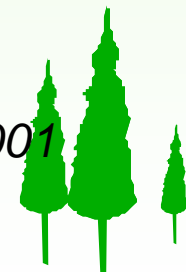


# Pine weevil damage

## ◆ Damage is size dependent



*Modified from Thorsén, Mattsson & Weslien, Scand J For Res, 2001*



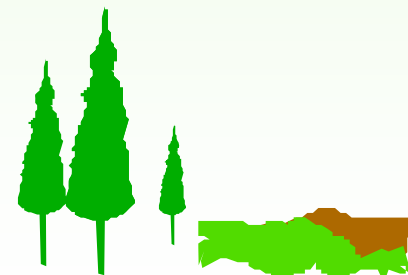
# Less pine weevil damage

Hannerz, Thorsén, Mattsson, Weslien, 2002\*:

- ◆ 2-year-old containerised cuttings and seedlings
- ◆ "Same size" compared (4 mm diameter)
- ◆ Different seed sources (Vitebsk vs Maglehem)
- ◆ Five sites in southern Sweden
- ◆ Compared survival, growth, pine weevil attacks the first 5 years

\* *Forest Ecology and Management*

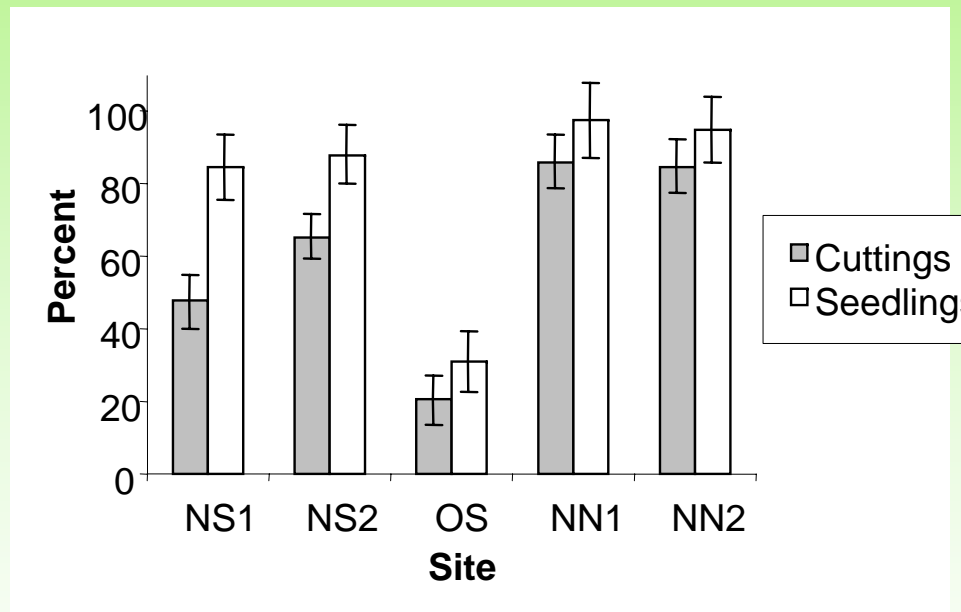
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# Less pine weevil damage

## ◆ Percent attacked by pine weevil the first year



Sites:

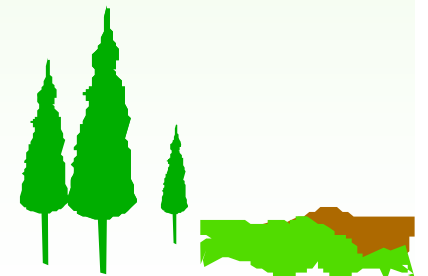
NS=New clearcut, scarified

OS=Old clearcut, scarified

NN=New clearcut, not scarified

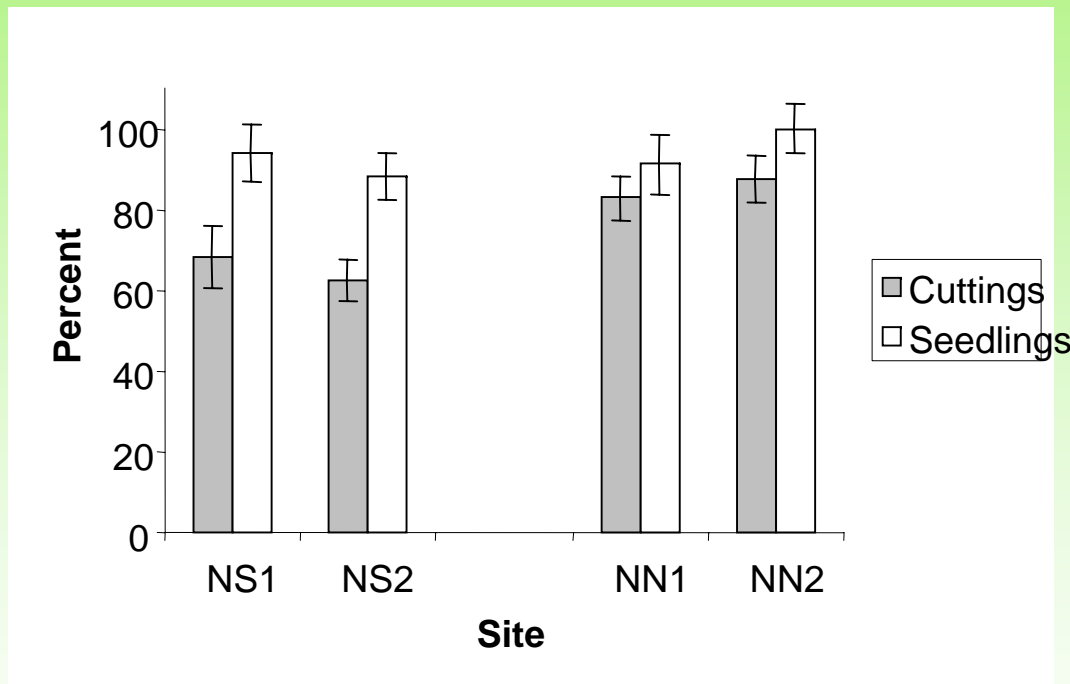
*Hannerz, Thorsén, Mattsson, Weslien, 2002, For Ecol Manage*

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# Less pine weevil damage

## ◆ Attacked seedlings that were girdled



Sites:

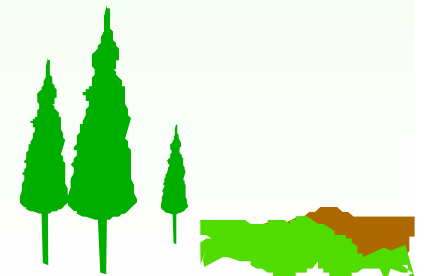
NS=New clearcut, scarified

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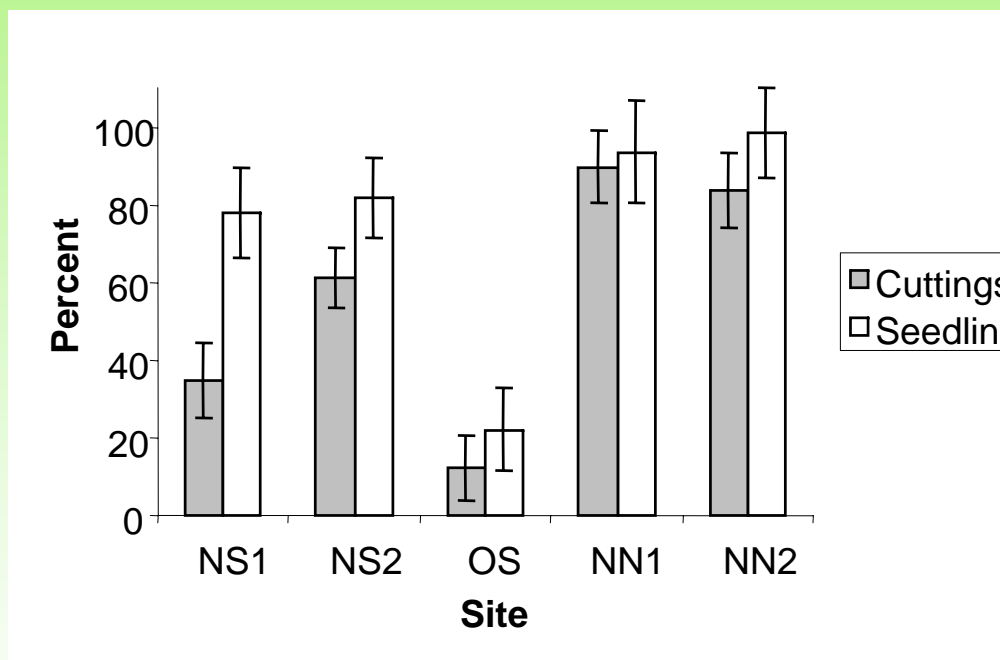
*Hannerz, Thorsén, Mattsson, Weslien, 2002, For Ecol Manage*

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# Less pine weevil damage

## ◆ Percent killed by pine weevil after 5 years



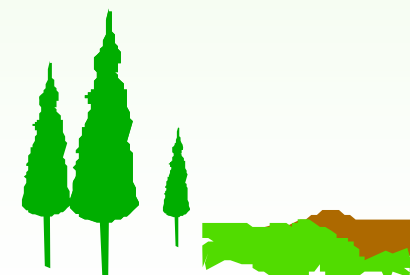
Sites:

NS=New clearcut, scarified

OS=Old clearcut, scarified

NN=New clearcut, not scarified

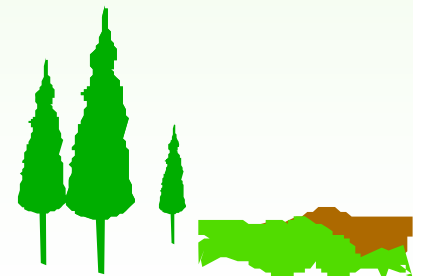
*Hannerz, Thorsén, Mattsson, Weslien, 2002, For Ecol Manage*



# Less pine weevil damage

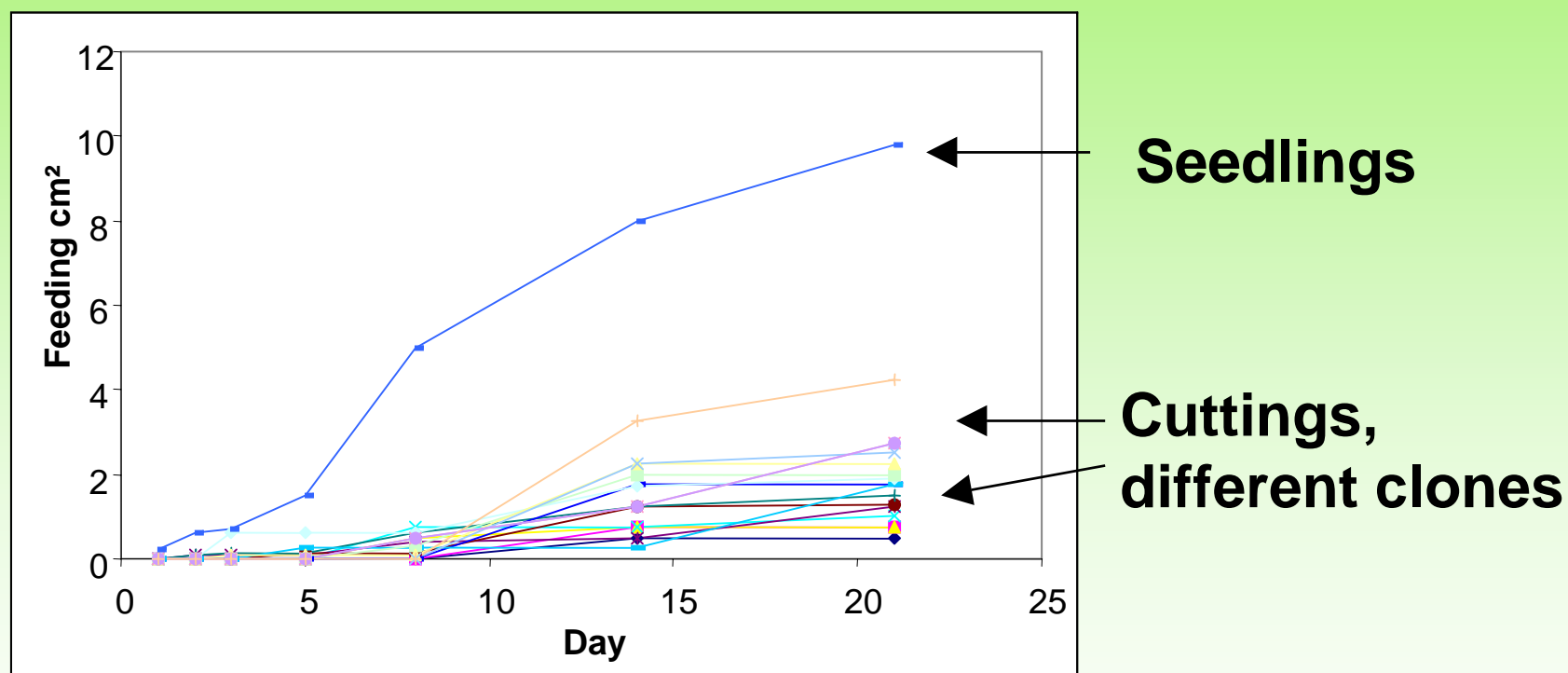
**Göran Nordlander et al., SLU, Uppsala:**

- ◆ Laboratory experiments
- ◆ Different clones
- ◆ Relatively old clones
- ◆ More or less needles at the stem base
- ◆ Preliminary results

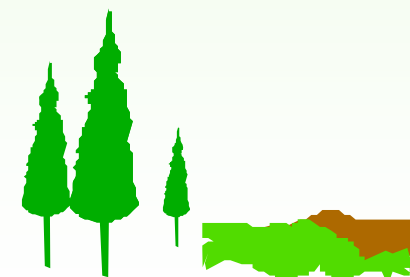


# Less pine weevil damage

## ◆ Cumulative feeding over 21 days



*Nordlander et al., unpublished*

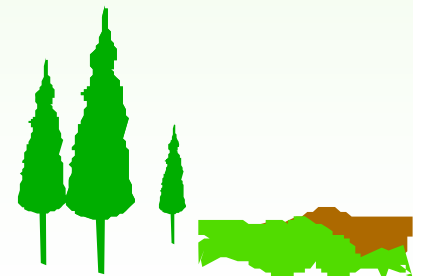


# Less pine weevil damage

- ◆ Same number of visits on seedlings and cuttings – but no feeding on the cuttings
- ◆ Tendency to less feeding on clones with dense needles at the stem base

*Nordlander et al., unpublished*

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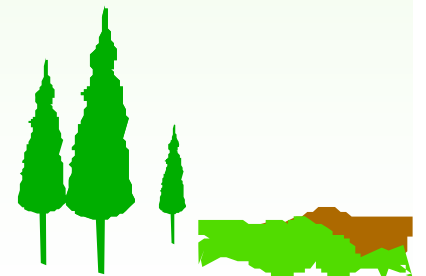
# Less pine weevil damage

**Jan Weslien, SkogForsk:**

- ◆ Same material as Nordlander
- ◆ Field experiment
- ◆ Attacked 1st season:  
Seedlings 58%  
Cuttings 12%

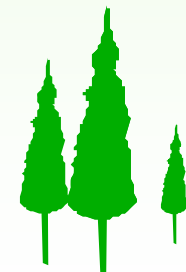
*Weslien, unpublished*

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*Photo: Jan Weslien*





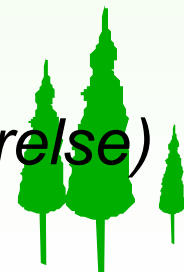
# Root stability

- ◆ Reports from field of lower stability in cuttings

**Controlled experiments\* show:**

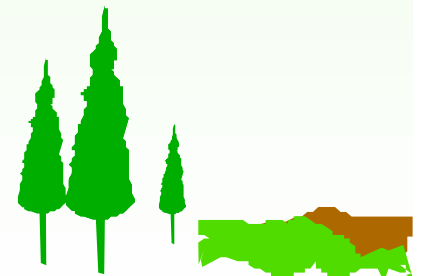
- ◆ Same number of roots
- ◆ Equal vertical and horizontal distribution
- ◆ No root deformation
- ◆ Higher root area / stem diameter

*\* Hannerz & Lindström, 1998 (SkogForsk, Redogörelse)*



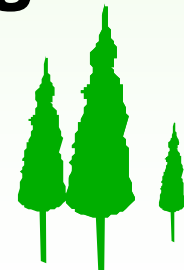
# Conclusions: Cuttings...

- ◆ ...usually establish quicker and grow better initially
- ◆ ...sustain frost damage better
- ◆ ...are less attacked by pine weevils
- ◆ ...have an initially different root system  
– but differences disappear



# ...but questions remain

- ◆ **Why less frost damaged?  
(role of ontogenetic aging?)**
- ◆ **Why do pine weevils avoid cuttings?  
(bark structure, chemical composition,  
genetic variation?)**
- ◆ **How to exploit the qualities of cuttings?**



**Thank you  
for your attention**



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