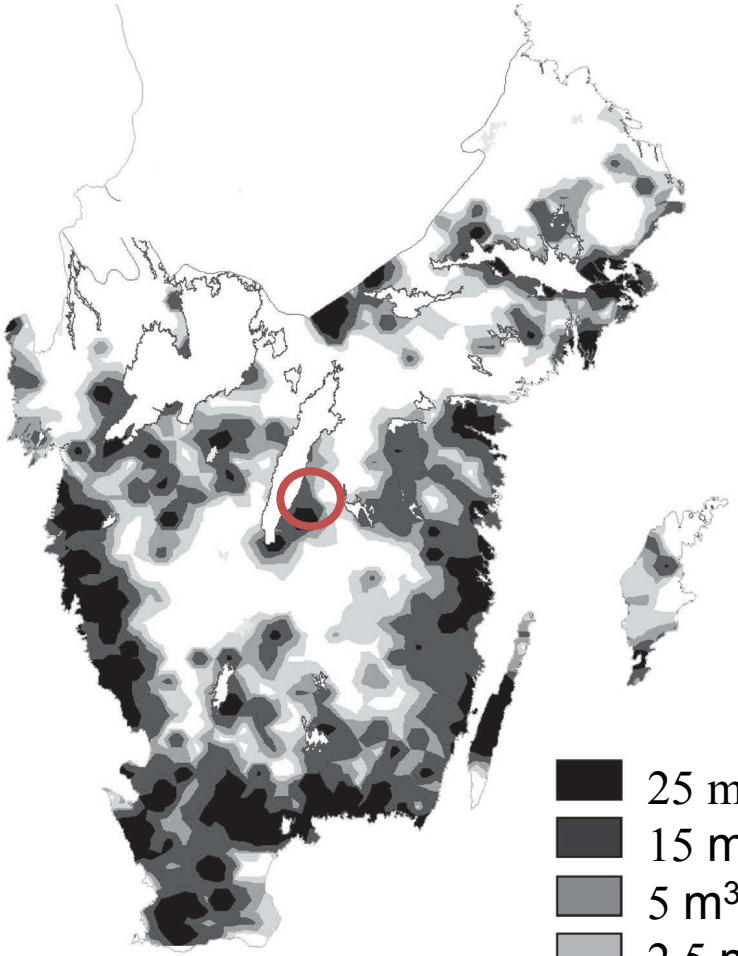
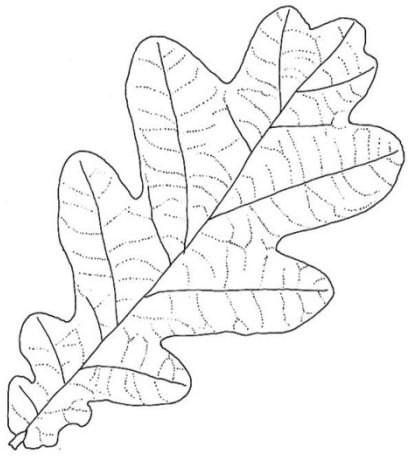
# Oak Oak Oak and Browser

Anna Monrad Jensen
Department of Forestry and Wood Technology
Linnaeus University

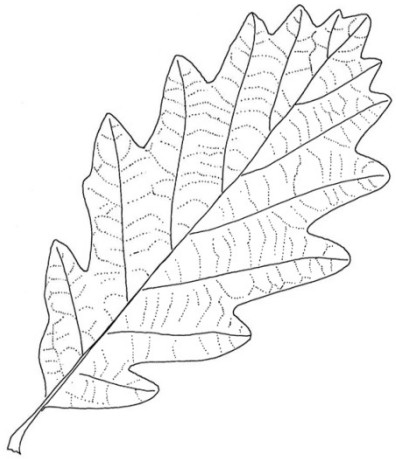
Email: Anna.Jensen@lnu.se
@AnnaMonrad



25 $m^3$ $ha^{-1}$
15 $m^3$ $ha^{-1}$
5 $m^3$ $ha^{-1}$
2.5 $m^3$ $ha^{-1}$
1 $m^3$ $ha^{-1}$
< 1 $m^3$ $ha^{-1}$



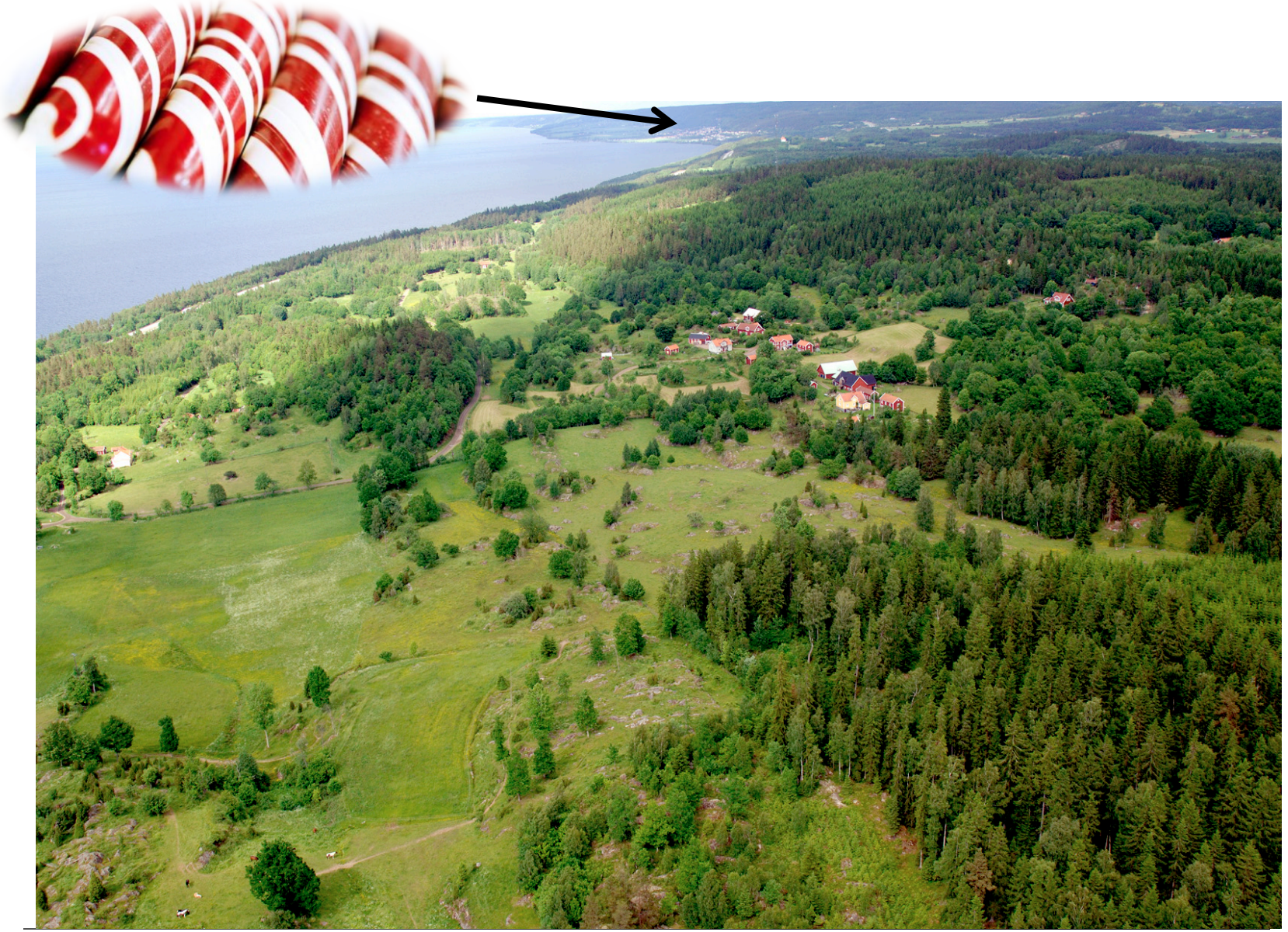
*Q. robur*



*Q. petraea*

Ref: M. Widén, Sveriges vildväxande träd och buska

Löf M, Brunet J, Filyushkina A, Lindbladh M, Skovsgaard JP, Felton A (2016) Management of oak forests: striking a balance between timber production, biodiversity and cultural services, International Journal of Biodiversity Science, Ecosystem Services & Management, 12:1-2, 59-73



Aspenäs, September 2007

# Typical oak forest

# A successful oak regeneration

- Plant material (seeding, planting, sprouting, advanced regeneration)
- Lots of light
- Interspecific competition
- Browsing pressure

# Regeneration: The First Pillar of Sustaining Oak Stocking

## Sources of Reproduction: New Oak Seedlings

**Shoot and root same age**

Carbon allocation:

To roots

Slow juvenile shoot growth

# Sources of Reproduction: Oak Sapling Sprouts

Root and shoot different ages due to
shoot dieback/ browsing and sprouting

# Sources of Reproduction: Oak Stump Sprouts

Sprouts arising from cut stems > 5 cm dbh

Fastest growing source of reproduction

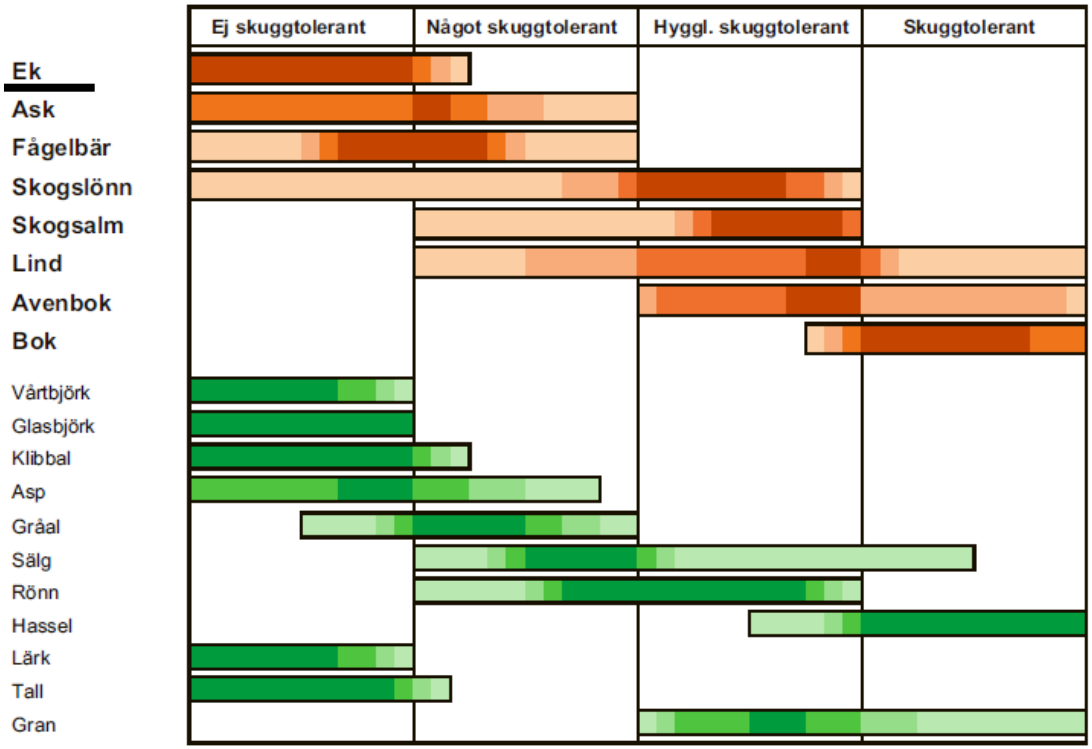
Stocking insufficient to maintain composition

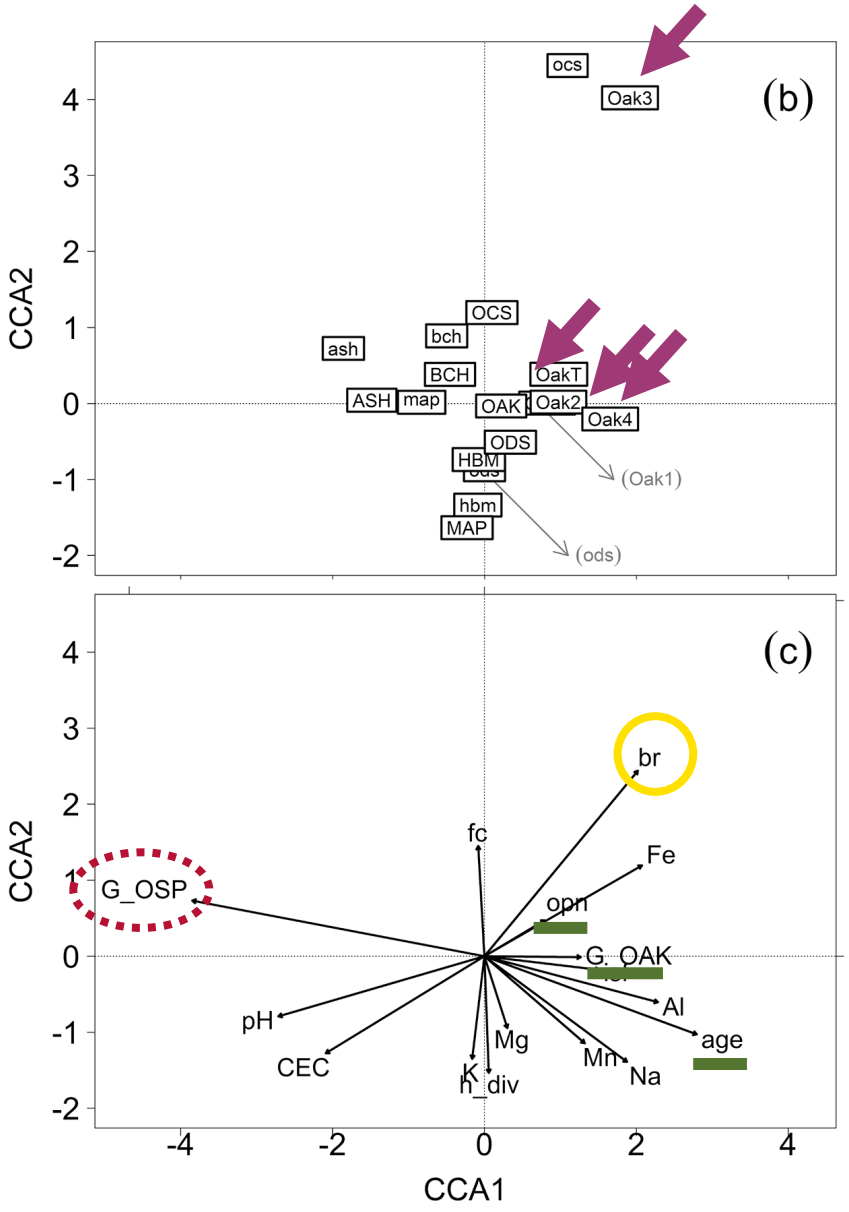
Sensitive to low light (competition)

Sensitive to browsing

# A successful oak regeneration

- Plant material (seeding, planting, sprouting, advanced regeneration)
- Lots of light
- Interspecific competition
- Browsing pressure






# Light, neighborhood and browsing

- Regeneration patterns differ depending on developmental stage (height)
- Increased oak regeneration can be expected with increasing light availability (opn, isf), stand age and basal area of oaks (G_OAK).
- Oak regeneration between 50 and 130 cm tall seem to be related to browsing (br)

Annighöfer P, Beckschäfer P, Vor T, Ammer C (2015) Regeneration Patterns of European Oak Species (*Quercus petraea* (Matt.) Liebl., *Quercus robur* L.) in Dependence of Environment and Neighborhood. PLoS ONE 10(8): e0134935. doi:10.1371/journal.pone.0134935

| | |
|---|---|
| An acorn | • Seed trees ↑<br>• Acorn size ↑<br>• Good or bad germination year |
| Oak 1<br>≤ 20 cm | • Overstory composition is important: oak over story basal area ↑<br>• Soil Fe content ↑ |
| Oak 2<br>20-50 cm | • Basel area for beech in the over story ↓<br>• Browsing ↗ |
| Oak 3<br>50-130 cm | • Browsing ↗ |
| Oak 4<br>> 130,<br>< 7 cm, dbh | • Light availability ↑ |

**Age or size of the oak seems to matter**
**– risk of being browsed**
**– within plant available recourses**

# A successful oak regeneration

- Plant material (seeding, planting, sprouting, advanced regeneration)
- Lots of light
- Interspecific competition
- Browsing pressure

# Solutions ?

## Avoid damage

- Fence
  - Individual trees
  - Group of trees
  - Permanent or temporary
- Repellent
- Use stand structures as a mean of avoiding damage
- Don´t plant oak

**Increased interspecific competition**
→ Increased operating cost
→ Reduced timber quality

**How?** We lack knowledge and practical experience

K. Schott, photo: F. Götmark

# Solutions ?

## Avoid damage

- Fence
  - Individual trees
  - Group of trees
  - Permanent or temporary
- Repellent
- Use stand structures as a means of avoiding damage
- Don´t plant oak

**Increased interspecific competition**
→ Increased operating cost
→ Reduced timber quality

**How?** We lack knowledge and practical experience

## When damage

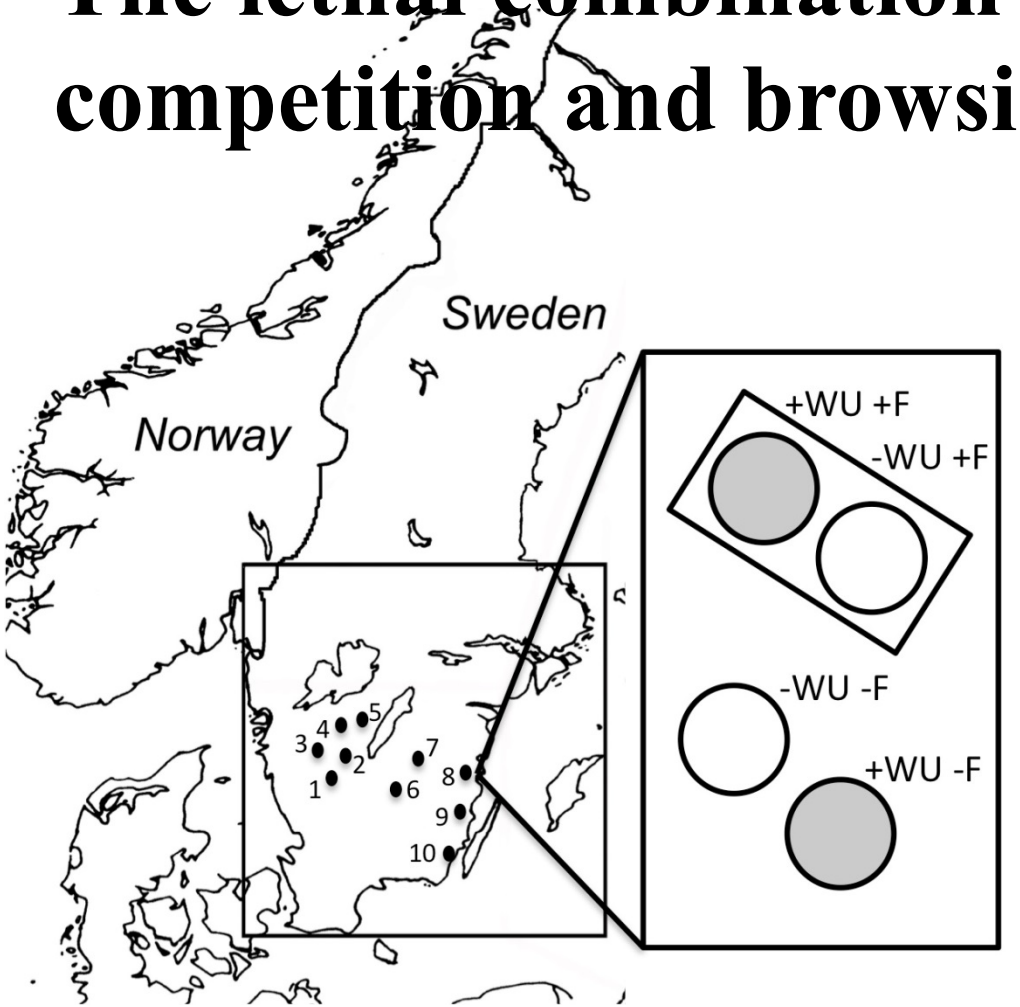
- Pruning
- Prolong regeneration
- Non-traditional forms of regeneration
- Use stand structures as a means of limiting browsing

Increased operating cost?
Reduced timber quality?

**How?** We lack knowledge and practical experience

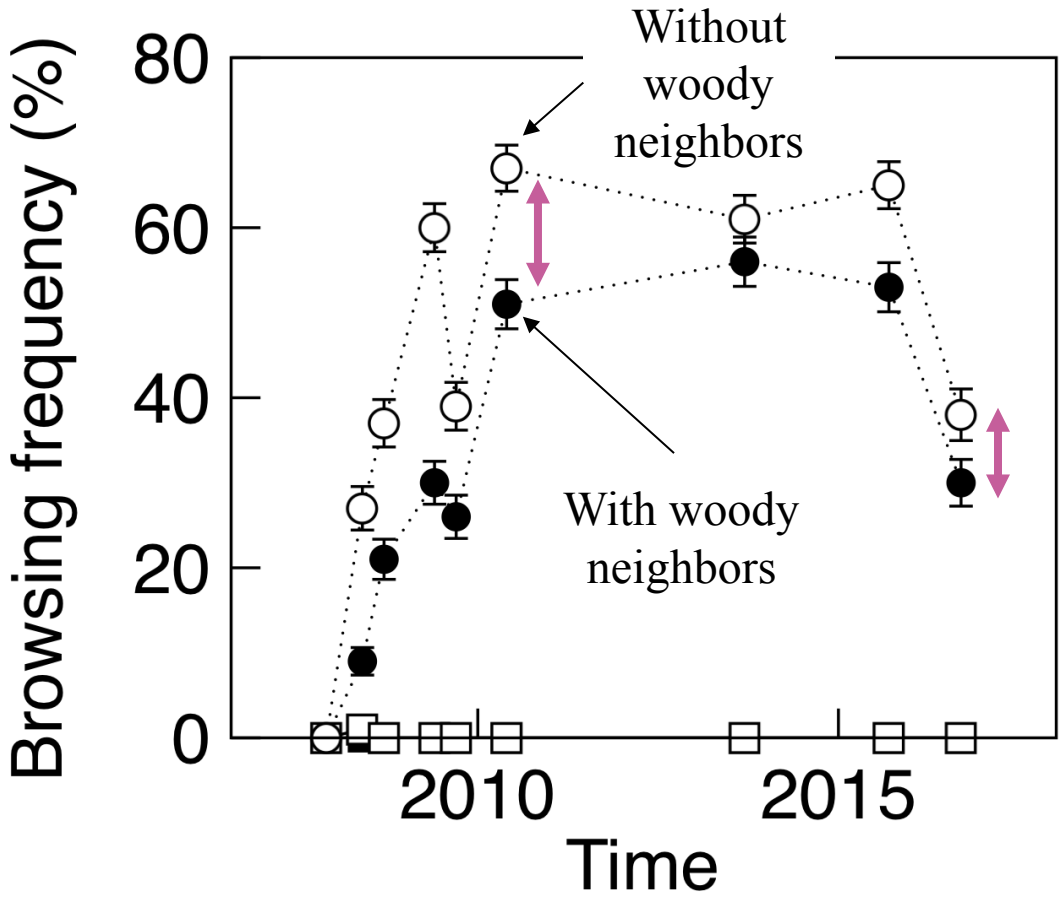
# Using stand structures as a means of limiting browsing

# The lethal combination of competition and browsing



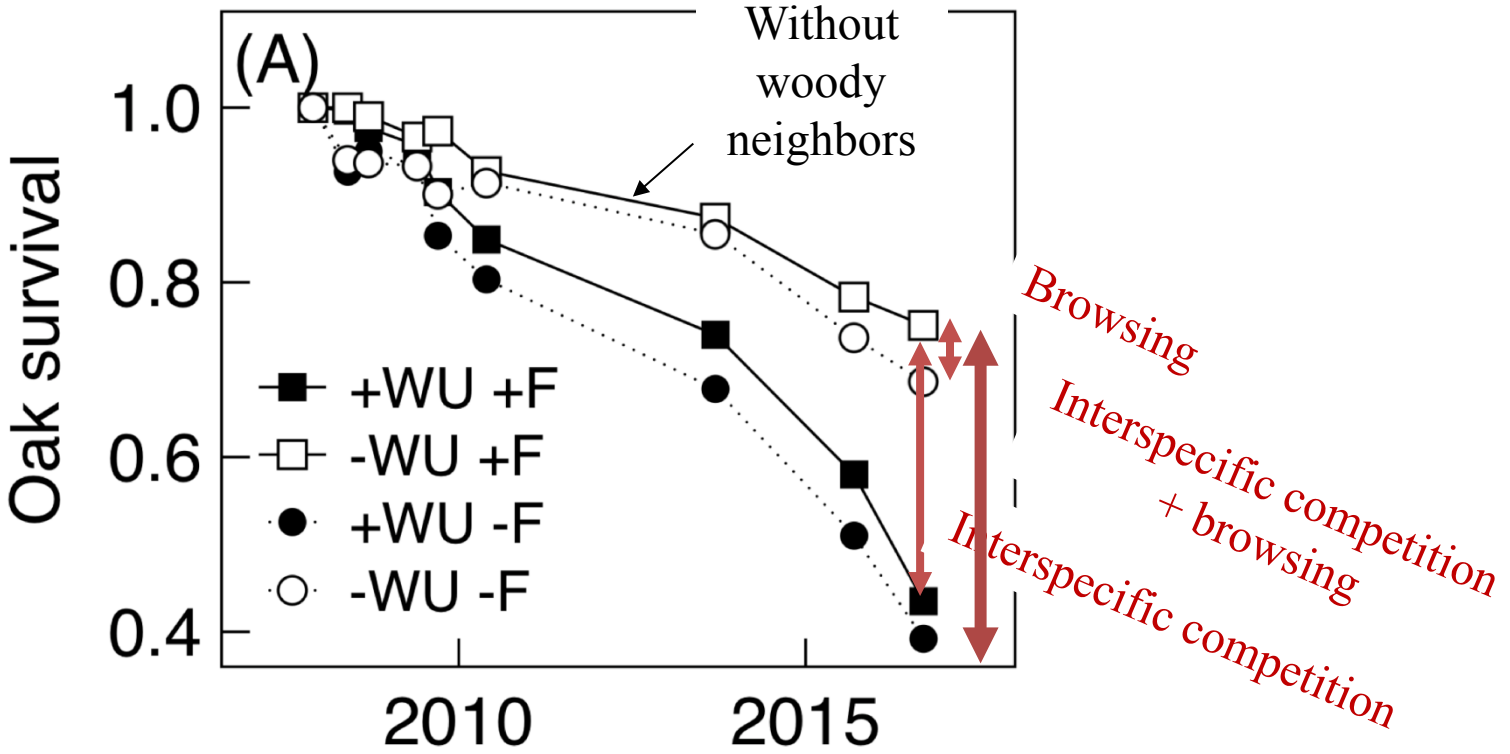
Anna M. Jensen AM, Persson M, Petersson L, Löf M, Felton A Shrubs protect oaks against ungulate browsing in temperate broadleaved forests of conservation interest: A long-term experiment *In prep.*

# Does woody understory vegetation reduce browsing?



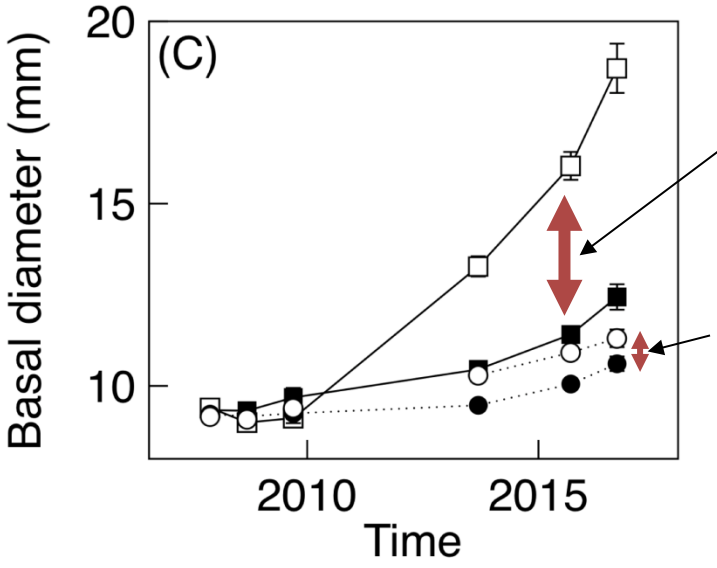

**Significant protection by neighboring vegetation**
**- between 5-30 percent unit**

# How are the oaks doing?



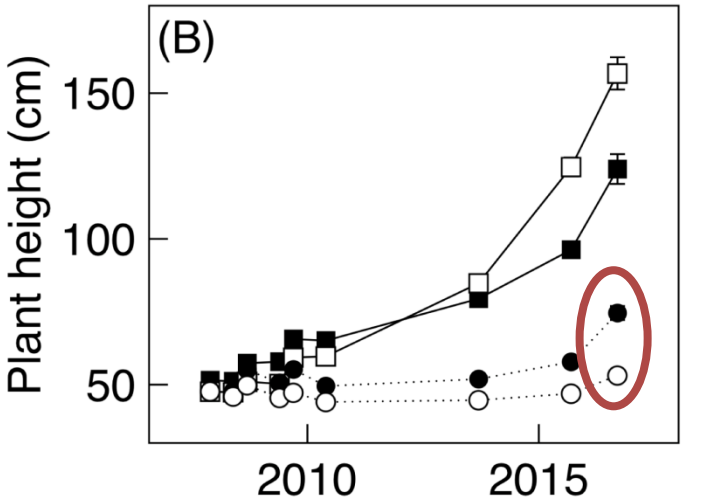

- **Browsing less important compared to competition.**
- **However, the combination of browsing and interspecific competition is a lethal combination for the oak**

# How are the oaks doing?

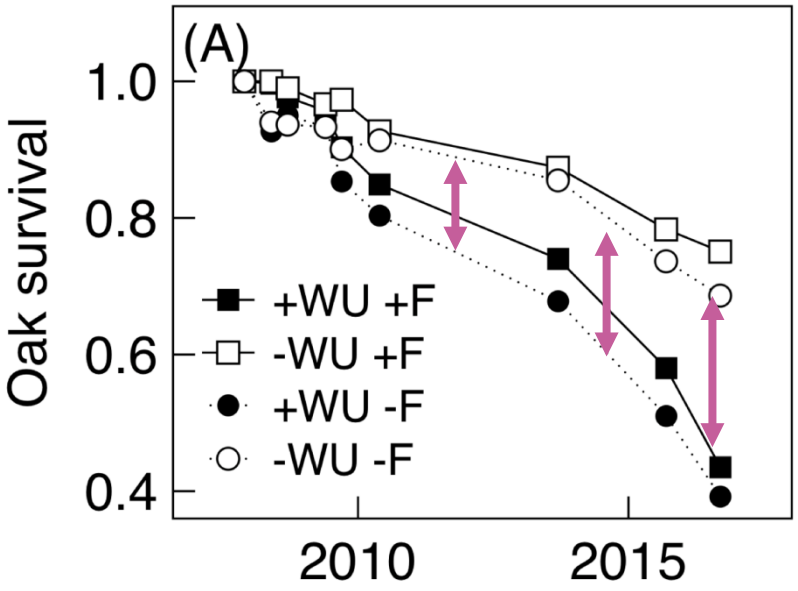



Growth loss due to interspecific competition.

Growth loss due to browsing.




- **Browsing less important compared to competition.**
- **The combination of browsing and interspecific competition is really bad.**

Can these oaks escape by growing tall?

# Is browsing really that bad?