




Valuing and managing veteran trees

An advanced course for trainers
by the VETree project



Biskops Arnö, Sweden Photo: Vikki Bengtsson




VETree project





Bertiz, Spain Photo: Ola Bengtsson

Introduction to course

- This course is to prepare you for delivering the one day basic level course 'Valuing and managing veteran trees'
- You will do this using the material we have already prepared
- This course will present some more advanced information and ideas but it is not simply an advanced course

Introduction to course

- Plan for the three days
- Comfort information
- Health and Safety
- Overnight accommodation
- Time keeping
- Questions?
- Course outline






Photo: Vikki Bengtsson, Sweden

Introduction to day 1






Photo: Helen Read, Norway

- 10:00 - 11:00 Introduction, definition of a veteran tree
- 11:00 - 11:30 - Coffee/tea break
- 11:30 - 12:55 - Aging process, biodiversity, cultural and historical values of veteran trees
- 12:55 - 14:00 - Lunch
- 14:00 - 16:00 - Field session (incl. coffee/tea break)
- 16:00 - 17:00 - Introduction to managing veteran trees, roots and natural processes
- *Optional evening field excursion*

Introductions

- Who are you?
- Where do you work?
- What do you do?
- What experience do you have of veteran trees
- What are your expectations of this course?




Photo: Helen Read, Romania

What was the point of that?

- Why do an icebreaker?
- Why ask participants to introduce each other?
- Any other icebreakers that people have used?



Photo: Helen Read

By the end of this course you will be able to:

- Give a definition of a veteran tree
- Explain the biological principles relating to old trees:
 - (a) Root systems
 - (b) Why trees can live so long
 - (c) Natural processes
 - (d) Habitat development

By the end of this course you will be able to (cont....)

- Undertake a survey of a veteran tree
- Prepare a simple management plan for a veteran tree
- Assess if a population of trees is sustainable

Definition of a veteran tree?

Objectives:

- List the characteristics of a veteran tree
- To give a definition of a veteran tree
- Explain why age and size are not always reliable methods of characterising a veteran tree

Old trees are among the things that bind us to one another and to our past



Windsor Great Park, England

Photo: Vikki Bengtsson

Defining a veteran tree

- What are veteran trees?
- How can you recognise them?
- Age, size, species and condition



Kvilleken, Sweden

Photo: Vikki Bengtsson

Exercise 1: Make a list of veteran tree characteristics



Photo: Helen Read, Urkiola, Spain

Some pictures to help you



Photo: Brian Cleckner, Ashtead Common, UK

Photo: Vikki Bengtsson, Fontainebleau, France

Photo: Helen Read, Spain

Why can trees live so long?




Illustration by Neville Fay (2002) after Raimbault (1995) and Lonsdale, (1999)

Why does retrenchment occur?

Height at peak maturity is determined by the tree's capacity to supply water to the top of its crown.

Depends on:

- Water supply and demand (soil, climate)
- Hydraulic efficiency of the sapwood (species, part of tree)

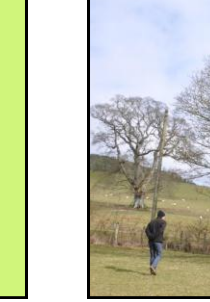


Photo: Ola Bengtsson, Landeryd, Sweden

Retrenchment follows maturity

Combination of physiological & biomechanical processes

- Narrower sapwood increments
- Increased hydraulic resistance
- Smaller crown, less sugar, less root growth
- Less capacity to absorb water
- Branches break more easily

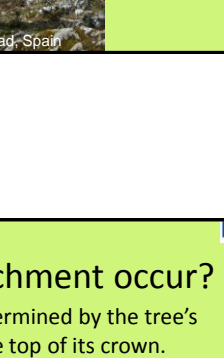


Photo: Vikki Bengtsson, Ashtead Common, England



Photo: Vikki Bengtsson, Bodfach Park, Wales

Loss of apical dominance

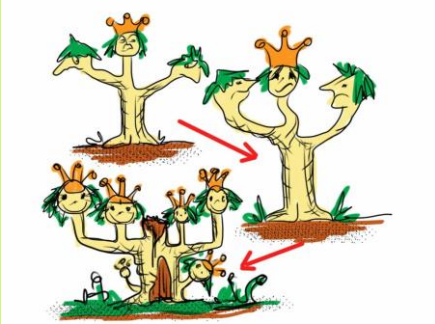


Illustration: Claus Mattheck

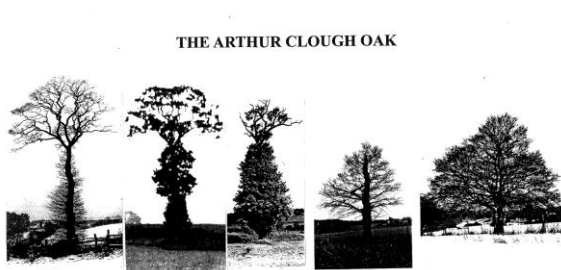
The King has lost his head



Photo: Vikki Bengtsson, Romania

Tree Time!

THE ARTHUR CLOUGH OAK



1910 1920s c. 1950 1981 2009

Photos compiled by Philip Stewart, Oxfordshire, England

Indefinite growth

- Can produce new shoots, roots, wood and bark throughout their lives
- There is no theoretical limit to a tree's capacity to produce new tissues



Photo: Vikki Bengtsson, Hatfield Forest

Indefinite growth




Photo: Vikki Bengtsson, Tortworth Chestnut, England

- They can theoretically live forever unlike most animals

Why such variation in life length?

- Most trees eventually die due to changes and factors that accumulate with age
- Progressive narrowing of new growth increments round the large dead core




Photo: Vikki Bengtsson, Hatfield Forest

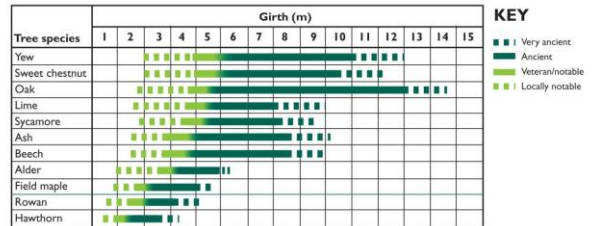
Why such variation in life length?

- Wood type (heart wood vs durable ripe wood)
- Damage that the tree is unable to repair
- Evolutionary lifestyle 'choice'
- Human intervention!!!



Photo: Vikki Bengtsson, Braemar, Scotland

How different species vary in girth: Handout



Coffee time



Photo: Helen Read

Re group.....

- This next session is about valuing veteran trees....

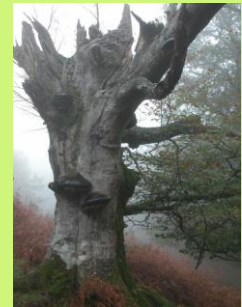


Photo: Helen Read

Veteran trees and wildlife

- Why are veteran trees important for wildlife?
- Fungi and their fundamental role
- Examples of wildlife associated with veteran trees
- Importance/status of the wildlife
- Wildlife habitat requirements (and what we can do to help)

Veteran trees are living ecosystems

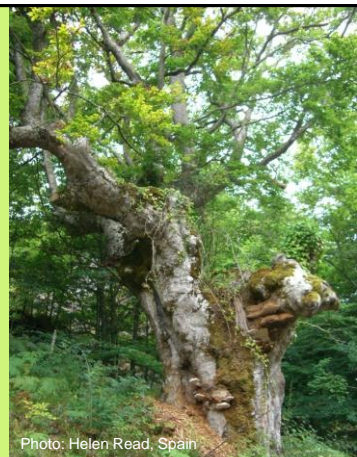


Photo: Helen Read, Spain

Tree form/history is important

- Open grown
- Pollards
- Damaged trees
- Age
- Hollowing
- Cultural landscapes



Photo: Vikki Bengtsson, ash pollards, Sweden

Decay process and fungi

- Decay = decomposition
- Nutrient cycling
- Natural process
- Complex process
 - Fungi, microbes and invertebrates
- Wood = energy source
- Wood transformed




Photo: Vikki Bengtsson, Gripsholm, Sweden

Nutrient cycling



Photo: Vikki Bengtsson, *Laetiporus sulphureus*,



Photo: Vikki Bengtsson, Ashted Common, England

Not all decay is the same

- Different fungi, different trees, different conditions
- Brown-rot
 - cellulose first, lignin intact
- White-rot
 - Lignin broken down preferentially
 - or
 - Lignin and cellulose broken down simultaneously




Photo: Brian Cleckner, England

Fungi – the unknown world?

- Can live in the tree and never fruit
- Co-evolved
- Water and air crucial factors affecting fungal growth
- Much more to learn!
- More on this later



Photo: Vikki Bengtsson, *Fistulina hepatica*

Exercise 2: Recognising habitats


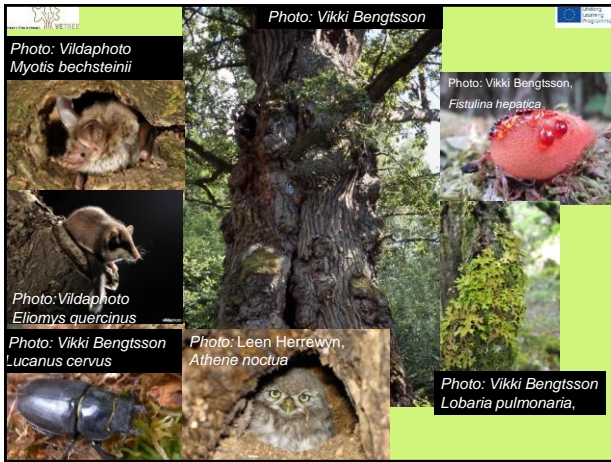


Illustration: Neville Fay



Why is decay important?

- Different types and stages of decay attract different species
- Succession of species
- Competition between species
- Very many species

Illustration by Per Axell after Stokland et al. (2012)

Invertebrates

- HUGE number and variety!
- Annual life cycle
- Many specialists

Photo: Henk-Jan de Jong,
Ctesias serra (cobweb beetle) larva

- Larva and adult - different requirements
- Many rare!

Photo: Roger Key,
Helophilus pendulus

Rare & threatened species

- 11% of European saproxylic beetles are threatened (IUCN)
- Most threatened species community in Europe

Photo: Roger Key

Photo: Roger Key

Limoniscus violaceus adult and larva

Conservation - problems

- Species cannot survive indefinitely in a single tree
- Large populations of old trees required
- Variety of niches required
- Tree population may have an age gap

Think about future generations of veteran trees

Photo: Helen Read, Spain

Creating habitat!

Illustration: Per Axell
Photos: Vikki Bengtsson, Roger Key, Ola Bengtsson

Where there are no 'future' veteran trees to close the generation gap it may be desirable to create some!

Ideal scenario

- Plenty of veteran trees, relatively close together
- Good age structure in tree population
- Flowering bushes and plants
- Sunny, sheltered open spaces
- Decaying wood in all shapes, sizes and locations!




Photo: Vikki Bengtsson, Sweden

Conclusion

- Diverse and species-rich communities
- Rare and specialised
- Fungi crucial
- Natural processes vital
- Sustainable populations of trees essential




Photo: Vikki Bengtsson, Romania

Heritage & cultural value of veteran trees



Photo: Helen Read

Cultural importance of veteran trees

- Historic link to person or event
- Illustrate past uses for tree products
- Illustrate past land use or cultural landscape
- Part of a designed landscape e.g. avenues
- Tree rings - historical records of past events



Photo: Helen Read

Cultural importance of veteran trees

- Important for research
- Educational resource
- May have been integrated into a designed landscape and pre-date it
- Trees can have stories or traditions associated
- Trees can be a special or rare clone/species/sort

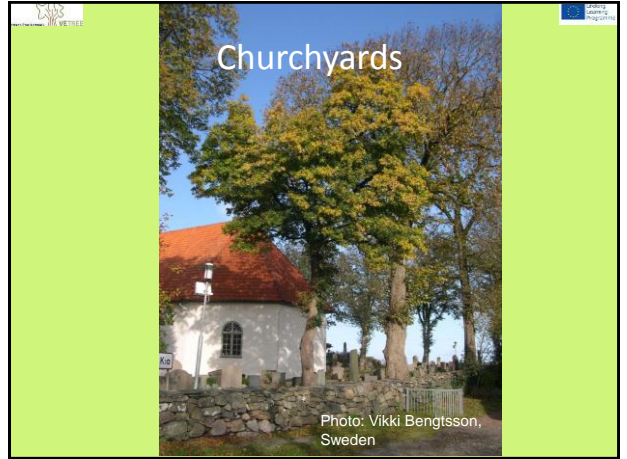


Photo: Vikki Bengtsson



Photo: Vikki Bengtsson, Sweden

Avenues



Aesthetic importance of veteran trees

- Inspire people
- Encourage creativity
- Provide an air of stability
- Incorporated into formal designed landscapes to give an air of antiquity
- Some people think they are ugly – encourages debate!

Photo: Helen Read

Other values

- Landscape values
- Ecosystem services such as shade...
- Important gene pool (e.g. more variation, helpful for disease resistance, climate change etc)

Photo: Vikki Bengtsson, Epping Forest

Exercise 3: Description of a veteran tree

- Work in small groups try to produce a description of a veteran tree that encompasses all the aspects we have talked about (biological, cultural, aesthetic) – max 20 words!

Photo: Helen Read

What is a veteran tree in Sweden?

- a tree more than 1m dbh
- 40 cm if hollowing in the trunk
- or
- very old (200 years for spruce, pine, oak and beech, 140 years for all other tree species).




Photo: Vikki Bengtsson, Hallstad Ångar, Sweden

What is a veteran tree in the UK?

- A tree that has passed beyond maturity and is old, or aged in comparison with other trees of the same species
- A tree that is of interest biologically, culturally or aesthetically because of its great age, size or condition.



Photo: Helen Read

Exercise 4: Outdoors

- Clipboards
- Pens
- Field forms
- Boots/waterproofs
- Water




Photo: Helen Read

Field form

Veteran Tree Habitat Assessment Practical Exercise Field Form

NAME: _____

DATE: _____ Tick the boxes

SITE: _____

SURVEY: _____

TREE AND HABITAT DETAILS

4. NUMBER OF TREES RECORDED

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

5. TREE SPECIES

Ash Birch Hawthorn Holly Horse Chestnut Hornbeam Lime Oak Maple Sycamore Willow Yew Other species _____

6. TRUNK GIRTH AT 1.3m ABOVE GROUND LEVEL

100-120 cm 120-140 cm 140-160 cm 160-180 cm 180-200 cm 200-220 cm 220-240 cm 240-260 cm 260-280 cm 280-300 cm 300-320 cm 320-340 cm 340-360 cm 360-380 cm 380-400 cm 400-420 cm 420-440 cm 440-460 cm 460-480 cm 480-500 cm 500-520 cm 520-540 cm 540-560 cm 560-580 cm 580-600 cm 600-620 cm 620-640 cm 640-660 cm 660-680 cm 680-700 cm 700-720 cm 720-740 cm 740-760 cm 760-780 cm 780-800 cm 800-820 cm 820-840 cm 840-860 cm 860-880 cm 880-900 cm 900-920 cm 920-940 cm 940-960 cm 960-980 cm 980-1000 cm 1000-1020 cm 1020-1040 cm 1040-1060 cm 1060-1080 cm 1080-1100 cm 1100-1120 cm 1120-1140 cm 1140-1160 cm 1160-1180 cm 1180-1200 cm 1200-1220 cm 1220-1240 cm 1240-1260 cm 1260-1280 cm 1280-1300 cm 1300-1320 cm 1320-1340 cm 1340-1360 cm 1360-1380 cm 1380-1400 cm 1400-1420 cm 1420-1440 cm 1440-1460 cm 1460-1480 cm 1480-1500 cm 1500-1520 cm 1520-1540 cm 1540-1560 cm 1560-1580 cm 1580-1600 cm 1600-1620 cm 1620-1640 cm 1640-1660 cm 1660-1680 cm 1680-1700 cm 1700-1720 cm 1720-1740 cm 1740-1760 cm 1760-1780 cm 1780-1800 cm 1800-1820 cm 1820-1840 cm 1840-1860 cm 1860-1880 cm 1880-1900 cm 1900-1920 cm 1920-1940 cm 1940-1960 cm 1960-1980 cm 1980-2000 cm 2000-2020 cm 2020-2040 cm 2040-2060 cm 2060-2080 cm 2080-2100 cm 2100-2120 cm 2120-2140 cm 2140-2160 cm 2160-2180 cm 2180-2200 cm 2200-2220 cm 2220-2240 cm 2240-2260 cm 2260-2280 cm 2280-2300 cm 2300-2320 cm 2320-2340 cm 2340-2360 cm 2360-2380 cm 2380-2400 cm 2400-2420 cm 2420-2440 cm 2440-2460 cm 2460-2480 cm 2480-2500 cm 2500-2520 cm 2520-2540 cm 2540-2560 cm 2560-2580 cm 2580-2600 cm 2600-2620 cm 2620-2640 cm 2640-2660 cm 2660-2680 cm 2680-2700 cm 2700-2720 cm 2720-2740 cm 2740-2760 cm 2760-2780 cm 2780-2800 cm 2800-2820 cm 2820-2840 cm 2840-2860 cm 2860-2880 cm 2880-2900 cm 2900-2920 cm 2920-2940 cm 2940-2960 cm 2960-2980 cm 2980-3000 cm 3000-3020 cm 3020-3040 cm 3040-3060 cm 3060-3080 cm 3080-3100 cm 3100-3120 cm 3120-3140 cm 3140-3160 cm 3160-3180 cm 3180-3200 cm 3200-3220 cm 3220-3240 cm 3240-3260 cm 3260-3280 cm 3280-3300 cm 3300-3320 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7. TRUNK SHAPE

Straight Slightly curved Curved Stumpy

8. STANDING DEAD WOOD

None Very little Little Medium A lot

9. OVERSHAD

None Little Medium A lot

10. HOLLOW TRUNK

Does the trunk have holes?

No Yes (1-3) 4-6 7-9 10-12 13-15 16-18 19-21 22-24 25-27 28-30 31-33 34-36 37-39 40-42 43-45 46-48 49-51 52-54 55-57 58-60 61-63 64-66 67-69 70-72 73-75 76-78 79-81 82-84 85-87 88-90 91-93 94-96 97-99 100

11. HOW WOULD YOU DESCRIBE THE QUALITY OF THE HABITAT IN THIS TREE?

Very high High Medium Low None

12. ARE THERE ANY IMPORTANT BACKLOGGED ISSUES ASSOCIATED WITH THE TREE? (e.g. please list them)

13. WHAT LANDSCAPE VALUE WOULD YOU GIVE THIS TREE?

Very high High Medium Low None

14. WHAT FACTORS, IF ANY, PUT A CURRENT THREAT TO THE TREE?

15. HOW WOULD YOU RATE THESE THREATS?

Very high High Medium Low None

16. How would you describe the quality of the habitat in this tree?

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68. How would you describe the quality of the habitat in this tree?

69. How would you describe the quality of the habitat in this tree?

70. How

Managing veteran trees

Objectives:

- Describe at least three natural strategies that trees have to respond to damage
- Describe how and where roots grow and why they are important

Exercise 5: Roots

- True/false session




Photo: Helen Read

Trees need space!



Photo: Vikki Bengtsson, Suffolk, England

Root protection area

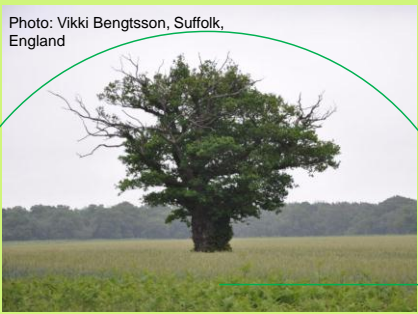


Photo: Vikki Bengtsson, Suffolk, England


15 x diameter of the trunk or 5m beyond the crown-spread - whichever is the greater!

Trees and natural processes



Photo: Vikki Bengtsson, Windsor, England

Browsers or Natural Disasters?



Photos: Vikki Bengtsson, Luminita Holban; Sweden, Spain, Romania

Exercise 6:
Browsers or Natural Disasters?

- What strategies do trees have for coping with being eaten?
- What strategies do trees have for regenerating?
- What strategies do trees have for coping with losing limbs?

Natural strategies



Photo: Vikki Bengtsson, Sweden

Photo: Vikki Bengtsson, England

Natural processes




Photo: Tom Joye

Photo: Helen Read

Summary of Day 1

- Easy to recognise, harder to define?
- Wide range of values and benefits
- Roots of crucial importance, often forgotten
- Evolutionary adaptation should help guide management!




Photo: Vikki Bengtsson, Sweden

Well done everyone for getting through day 1!

- Update on practical arrangements for the evening
- Start time for tomorrow
- Before you go..... take the handout which has an exercise for everyone to do overnight

Day 2

- 09:00 – 10:00 – Introduction to teaching techniques
- 10.00 – 10.30 – Management of veteran trees
- 10.30 – 11.00 – Coffee/tea break
- 10.30 – 12.30 – Cont. management of veteran trees
- 12.30 – 13.30 – Lunch
- 13.30 – 17.00 – Management planning in practice (field session)
- 19.00 – 20.30 – Managing veteran trees and risk and a general discussion session




Photo: Helen Read

What did you learn yesterday?

- What made the biggest impression on you?
- What information was new?
- Is there anything that is not clear?
- Any aspect that needs more explanation?
- Where do you need more depth of information to be able to teach others?

Teaching techniques

Objectives:

- Describe three models relating to learning theory
- Be able to rank the retention rates of different teaching methods



Photo: Helen Read

Exercise 7

- Learning styles – what are you?
- Activist
- Reflector
- Theorist
- Pragmatist



Photo: Helen Read

Ripples model Phil Race (1993)

Adult learning model (intersecting like ripples on a pond!)

- Wanting/needing
- Doing
- Digestion
- Feedback



Competence ladder

	Level 4: Unconscious competence	
	Level 3: Conscious competence	
	Level 2: Conscious incompetence	
	Level 1: Unconscious incompetence	

Exercise 8

Teaching methods and retention rates



Photo: Helen Read

The learning pyramid

Lecture 5%
Reading 10%
Audio/visual 20%
Demonstration 30%
Discussion group 50%
Practice by doing 75%
Teaching others 90%

Learning styles

- Why did we do this?




Photo: Helen Read

Phew!

- That's enough about learning styles
- Let's move on to more tree management!




Photo: Helen Read

Veteran tree management

Objectives:

- Decide where and when management is appropriate for old trees and their surroundings
- To be able to give guidelines for the appropriate management of old trees

Exercise 9

Why manage veteran trees?

What happens if you don't?




Photo: Helen Read

Tree management

- What are the problems for our veteran trees?
- When is management appropriate?
- What management is appropriate?
- How do you decide what to do?




Photo: Brian Cleckner, Hampstead Heath, England



Photo: Tom Joye

Overall aim: No avoidable loss of veteran trees

Where are they today?

Photo: Vikki Bengtsson, Ekolsund avenue, Sweden



What are the problems for veteran trees?




Photo: Vikki Bengtsson, England

Consequences of past management

Felling or other inappropriate management



Photo: Vikki Bengtsson, Sweden



Photo: Szarpanyos Arpad, Romania

Poor management in urban environments




Photo: Tom Joye, Belgium

Tree diseases, climate change & pollution




Photo: Vikki Bengtsson, ash with *Chalara fraxinea*, Sweden

Site problems

Age gaps e.g. lots of old trees but no young




Photo: Vikki Bengtsson, Sweden

Heavy shade by surrounding trees




Photo: Vikki Bengtsson, England

Why are veteran trees different?

Photo: Vikki Bengtsson, veteran oak, Sweden



- Reduced vigour
- Risk of failure
- Decay
- Retrenchment
- Sensitive to change
- Competitively weaker
- But.. may exhibit more natural survival strategies

Why do anything at all?



Photo: Brian Cleckner, Windsor

Natural processes may be enough?

Things to consider: Surroundings



Photo: Tom Joye, sweet chestnut in beech plantation, Belgium

Does the land around the tree need management?

Things to consider: Site issues



Photo: Vikki Bengtsson, Spain

Management history
Risk of loss of the trees

Things to consider: Tree issues



Photo: Vikki Bengtsson, Sweden

Tree species, location, weather conditions
Response to past management
Associated rare & threatened species

Management Planning

- What needs to be done?
- What techniques to use?
- Long term planning vital



Photo: Vikki Bengtsson, hazel pollards in shade, Sweden

Clearance of competition

- Film** A video delivered by the VETree project



Halo clearance for veteran trees




Photo: Vikki Bengtsson

Managing the land around the tree

- Film** A video delivered by the VETREE project



The importance of the land around a veteran tree

Exercise 10: What is the ideal management for these trees?




Photo: Vikki Bengtsson, Västergötland, Sweden

Photo: Vikki Bengtsson, Östergötland, Sweden

Pruning techniques film

- Film** A video delivered by the VETREE project



Techniques for crown reducing a veteran tree

Exercise 11: Pruning techniques

- 1) How might thinking about trees natural responses help guide pruning on old trees?
- 2) What may be the consequences of pruning old trees too hard?
- 3) What factors would you use to decide if you should prune a tree or leave it alone?

Remember future generations of trees are crucial for long term viability

Photo: Chris Knapman, Scotland



Exercise 12

Management planning in practice

- Critically evaluating the management needs of an old tree
- Drawing up a work programme



Photo: Helen Read

Lunch & travel to the site

Field exercise -
TAKE WITH YOU:

- Clip board
- Pencil/pen
- Binoculars
- Forms to fill in
-



Photo: Helen Read

More management techniques & issues

- Some specialist techniques
- Management in relation to risk
- Questions and discussion
- Management of decaying wood habitats

Propping

- To stop branches falling and breaking the tree apart
- To stop tree from falling over
- Is it necessary (i.e. will the tree prop itself?)
- Replacing props can be dangerous!



Photo: Helen Read

Cable bracing

- Invasive/non invasive method of linking branches of a tree together, often combined with light pruning, to attempt to stop a tree falling apart

May be appropriate:

- For feature trees or those with special values
- Where the only other option would be heavy pruning which would compromise the tree's viability
- Especially where safety of people is of concern

Cable bracing (& propping)

For:

- Can protect people and property in the event of failure.
- Can reduce the need for severe pruning

Unknown

- Does it work?

Against:

- Can be expensive (but variable)
- Seen as inappropriate in some situations?
- Special training, experience & insurance required.
- Needs regular inspection/maintenance
- The whole tree could fail, even if failure of part of the tree is prevented

Common sense guide to risk

- **Film** A video delivered by the VETree project



Common sense risk management of veteran trees

Summary Day 2

- Different learning styles & retention rates!
- Land management around tree first priority
- Pruning – must be justified and appropriate
- Variety of techniques
- Still much to learn!




Photo: Helen Read

Q & A session - management



Photo: Vikki Bengtsson., Sweden

Values of the tree and management

- How does the biodiversity value have an impact on management?
- How does the aesthetic or cultural values of a tree have an impact on management?
- How does risk have an impact on management?

Dead wood management

- **Film** A video delivered by the VETree project



Creation of decaying wood habitats

Day 3

- 09:00 – 10:15 – More about teaching adults
- 10.15-10.45 - Foundation course content
- 10.45 – 12.30 – Tree species & management (including coffee break)
- 12.30 – 13.00 – Fungi, decay & trees
- 13.00 – 13.45 – Lunch
- 13:45 – 14.30 – Populations
- 14.30 – 14.50 – Tea break
- 14.50 – 15.10 – Protection, grants, legislation
- 15.10-15.30 – Planning, evaluation



Photo: Helen Read

Recap on previous day



Photo: Helen Read

Skills & techniques for teaching adults & foundation course

Objectives:

- List techniques that can be used when courses include people with challenging behaviours
- Become familiar with foundation course content



Photo: Helen Read

Exercise 13

- The alternative expert
- The dominant person
- The persistent talker
- The quiet as a mouse

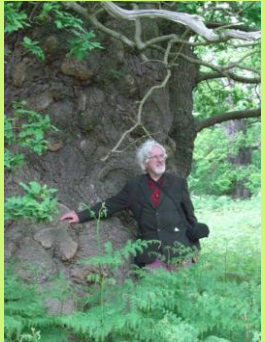


Photo: Helen Read

Dealing with difficult delegate behaviour

- The delegate is not difficult, it is their behaviour and your response
- Acknowledge the wants and needs of the delegate
- Don't get annoyed (easier said than done sometimes!)
- Is the behaviour adversely affecting the group?
- 'Eyes and pause'
- Avoid empty threats
- Ultimately the group is more important than the individual
- Another option is to do nothing..... think about the group

Running your foundation course

Valuing and managing veteran trees

A training day produced by the VETree project



Biskops Arnö, Sweden Photo: Vikki Bengtsson

Practicalities of running a course

- Facilities at the venue
- The outdoor session (having suitable trees)
- Advance preparation
- Contingency planning for bad weather
- First aid/risk assessments
- Adequate advance information to the delegates

What we will provide for the course

- The presentations, exercises etc. on a memory stick and on the website
- Mentoring system
- www.vetree.eu
- www.facebook.com/VeteranTreeNetwork

Tackling some more difficult subjects

Objectives:

- To gain an understanding of how different tree species respond to management
- Consolidate understanding of the role of fungi in tree decay
- Assess if a population of veteran trees is sustainable
- Opportunity to have a go at a short teaching session

How do different tree species respond to tree work?

- In order to look at this we need to revisit some tree physiology....



Photo: Brian Cleckner

Sapwood & Heartwood

Sapwood

- Living tissue
- High moisture content
- (passively) defended against loss of function & activity of fungi
- If injured can form an active defence



© David Lonsdale 2005

Heartwood & Ripewood

Heartwood

- Dead central wood of species where living sapwood has a finite and pre-determined lifespan

Durable heartwood

- Heartwood containing protective substances (e.g. Oak)

Ripewood

- Older central wood of tree species where sapwood gradually ages without being converted to heartwood (e.g. Beech)



Photo: Helen Read

Heartwood, sapwood & ripewood

Heartwood (durable in some species)

Sapwood (has active defences)

Ripewood (non durable)

Comparison between tree species with a true heartwood (left) and with a ripewood core (right)

© David Lonsdale 2005

Ring porous vs diffuse porous

Two types of wood structure in broadleaved trees

Ring porous:
Each annual increment has two distinct bands (in cross section). Early wood with wide water conducting cells and latewood with narrow ones (e.g. *Q. robur* & *Q. petraea*)

Diffuse porous:
The diameters of the water conducting cells decrease gradually from the spring-wood to the late-wood autumn in each annual increment (e.g. Beech)

Shoot formation

Dormant buds

- An axillary bud which doesn't develop into a shoot until after the second season following its formation. Buds may persist throughout the life of a tree, only develop if stimulated to do so

Adventitious shoots

- Shoots that develop neither from terminal nor axillary buds

Epicormic shoots
Shoots initiated on mature woody stems
Can be from **dormant buds** or **adventitious**

Interaction of decay fungi and tree

White rot fungi:

- Break down the lignin in early stages → wood loses stiffness
- Tree with reduced stiffness sways more in the wind → stimulating adaptive growth so good mechanical integrity even in advanced decay

Brown rot fungi:

- Break down the cellulose → wood becomes brittle
- Brittle trees don't sway → less opportunity to put on adaptive growth

Exercise 14

- How do different species of tree respond to management work?

Photo: Brian Cleckner

Coffee break

Photo: Vikki Bengtsson

Fungi & decay in trees

- Woody plants and decay fungi have co-existed for hundreds of millions of years
- An evolutionary race!



Photo: Helen read

Fungi 'life styles'

- Saprotrophic
- Parasitic
- Mycorrhizal

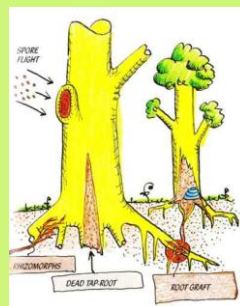
Mycelium →
Fruiting body →
Spores →
Next generation



Photo: Brian Cleckner

Entry of fungi into trees

- Bark is a good barrier
- Exposed wood may allow entry
- Many minor entry points e.g. broken twigs
- Big entry points from large wounds/breaks
- Also stress, disease or insect attack



From Weber & Mattheck 2003

Latent fungi

- Most are endophytes
- Occur sparsely in intact, living sapwood
- May get into the tree via seed
- Only cause decay/disease if the wood is exposed to aeration



Photo: Brian Cleckner

What enables fungi to grow in trees?

- In sapwood spaces are filled with water or gases low in oxygen
- Most fungi cannot grow in these conditions
- Exposure → drying → fungal growth
- Dry zones become dysfunctional



Photo: Helen Read

What happens when a tree is cut?

- Inrush of air into the water conducting cells
- Loss of tension so conduction cells contract (like a cut elastic band)
- Fungal spores and bacteria get sucked in
- Transpirational pull drops & water is withdrawn from the damaged region



Photo: Helen Read

The tree's response to dysfunction

- CODIT (Compartmentalisation Of Dysfunction In Trees): passively and actively restricts drying and decay

PASSIVE:

- High moisture-content in sapwood
- Durable heartwood in some species
- "Safety valves" between conducting cells
- Anatomical boundaries between cells types (e.g. latewood, earlywood, rays)

ACTIVE

- Reaction zones in pre-existing wood
- Barrier zone protects wood formed after the decay-initiating injury




Photo: Brian Cleckner

Other barriers seen in trees

- Where different fungi species or individuals meet = sharp black lines in cross-section or pseudosclerotial plates, produced by the fungi




Photo: David Lonsdale

Do old trees benefit from fungal decay?

- Wood breakdown releases nutrients/minerals which the tree can re-absorb
- Adventitious/aerial roots feed on decaying wood
- Aerial roots may prise apart weak forks contributing to tree failure
- Essential part of the nutrient cycling



Photo: Brian Cleckner

Exercise 15

- Fungi and trees




Photo: Helen Read

Fungi in trees

- Trees co-exist with fungi
- Many fungi are not detrimental to trees
- Fungi release nutrients
- Tree growth can keep up with fungal decay
- Stressed & weakened trees are less able to defend themselves
- Large wounds cause larger areas of dysfunction




Photo: Helen Read

Lunch




Photo: Helen Read

Populations of veteran trees

- Small sites, few trees
- Isolated & fragmented
- Loss greater than regeneration?
- Age gaps
- Extinction debt – loss of species



Photo: Vikki Bengtsson

Populations of veteran trees

- 1-2% of our veteran trees remaining?
- 0.5 – 2.0% mortality per year
- Mortality may be greater in overgrown sites
- Generation gaps
- Delivery time!



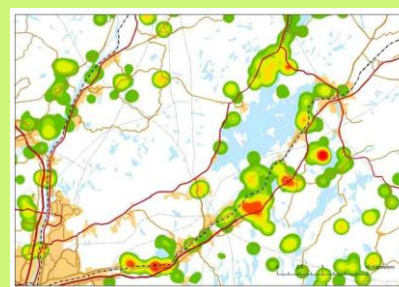
Photo: Vikki Bengtsson

Exercise 16

- How do you define a 'site'?
- How many trees do you need for a sustainable population?
- How many new trees do you need to get one veteran?

What makes a site sustainable?

- Geography
- Biology
- Chronology
- Ownership
- Species
- Regeneration
- Mortality
- Growth rates
- Succession



Map: Vikki Bengtsson

Mortality scenario

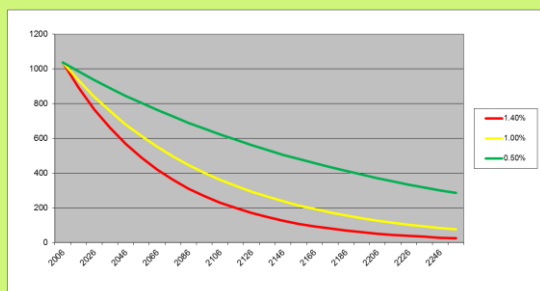
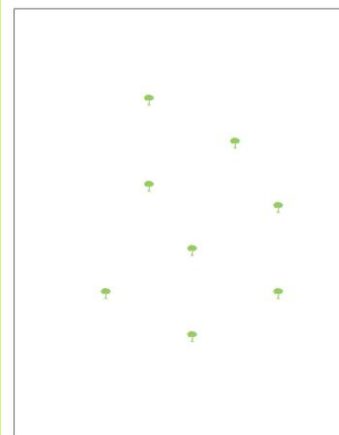


Figure: Vikki Bengtsson

Figures:
Vikki Bengtsson



Threshold values?

- Oak & hermit beetle
- At least 50 individuals & 20 sites (20 trees?)
- 57 – 280 ha & 160 hollow oaks
- 2.8 hollow oaks/ha
- Sustainable mortality rate?
- Sustainable regeneration rate?




Photo: Vikki Bengtsson

Tea break!



Photo: Helen Read

Protection for our old trees

- Old, oak wooden ship - sunk on its maiden voyage!
- Cherished today as a national monument & rightly so



Photo: Peter Isotala



Photo: Vikki Bengtsson - Sweden

BUT

- Living ancient trees – older than the ship should be equally cherished!

Legislation & Grants

- Many different laws deal with trees
- What you can/cannot do depends on the designation of the area and/or the tree



Photo: Brian Cleckner

Protected areas/designations

- TPO
- Urban conservation area
- SSSI
- Natura 2000 (SAC/SPA)
- Scheduled Ancient monument
- National Park
- Woodland
- Protected species (especially bats)
- Health and Safety



Photo: Brian Cleckner

TPOs & urban conservation areas




Photo: Brian Cleckner

Occupier's Liability Act

- Roots or branches which extend into a neighbouring property and cause problems may be removed



Photo: Brian Cleckner

Protected areas

- Protection depends on the designation of the area
- Variations between sites so 'Potentially Damaging Operations' (PDOs) & management objectives need to be checked to see what is and is not permitted



Photo: Helen Read

The role of statutory agencies

- Regulatory authorities
 - Give advice
 - Impose action/restrictions
 - Prosecution
- Are also grant giving through Agri-environment schemes



Photo: Helen Read

Scheduled Ancient Monuments, Historic Parks & Churchyards



Photo: Brian Cleckner

Protection for woodland trees

- Felling licences
- UKWAS



Photo: Brian Cleckner

Protected species

- Species protection legislation and Natura 2000
- Animals:
 - Forbidden to kill, injure, catch or collect in any other way, wild living individuals. It is also forbidden to take away the eggs, roe, larvae or nests of these species.
- Plants:
 - Forbidden to pick, dig up or in any other way damage wild, living individuals.
- In relation to Natura2000-species, it is also forbidden to destroy breeding or resting sites.

Grants

- Agri Environment schemes
- Woodland Grant Schemes



Photo: Brian Cleckner

Photo: Vikki Bengtsson, Windsor, England



Questions?

What will you do now?

Draw up an action plan for what you will do now in order to run your own course




Photo: Helen Read

Veteran trees - conclusions

- Biodiversity
- Ageing process and natural processes very important
- Veteran trees need space
- Plan any management very carefully
- Plan for the future
- Protect for the future



Photo: Helen Read, Spain

Further information



Veteran Tree Network 

- www.vetree.eu
- www.ancient-tree-forum.org.uk
- Join us on Facebook and Twitter




Please fill in your evaluation forms!



Photo: Vikki Bengtsson, Olaneku, Spain