

Is pruning an effective tool for mitigating subsidence damage?

Dr Martin Dobson

Hello, my name is Martin Dobson and I am an

Arbiculturist  
Arborealist  
Arborologist  
Arbiculturist  
Arboriculturist



Hello, my name is Martin Dobson and I am a

Tree consultant





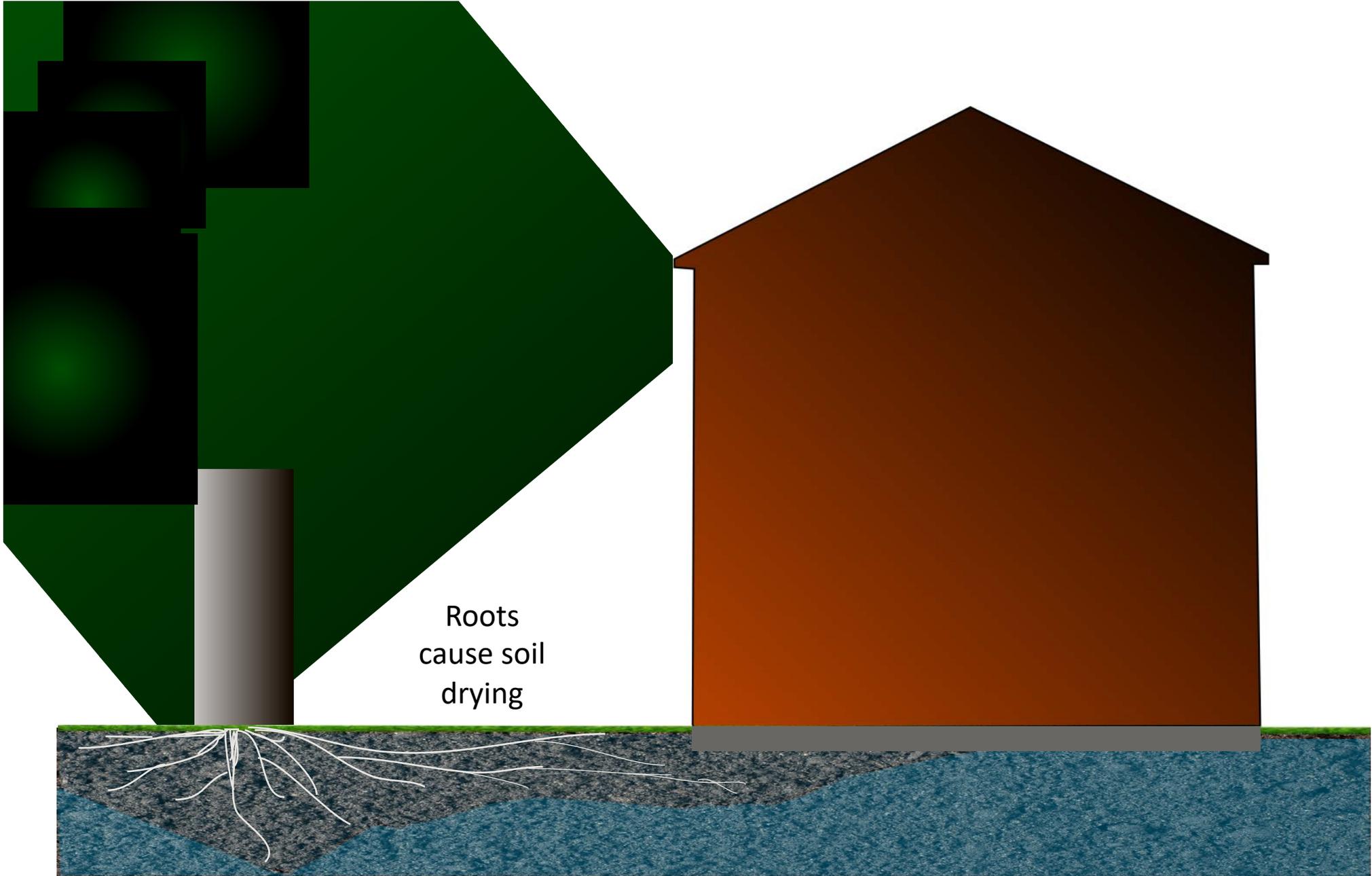
As a tree consultant I have spent the last 22 years writing a lot of reports on clay shrinkage subsidence damage caused by trees



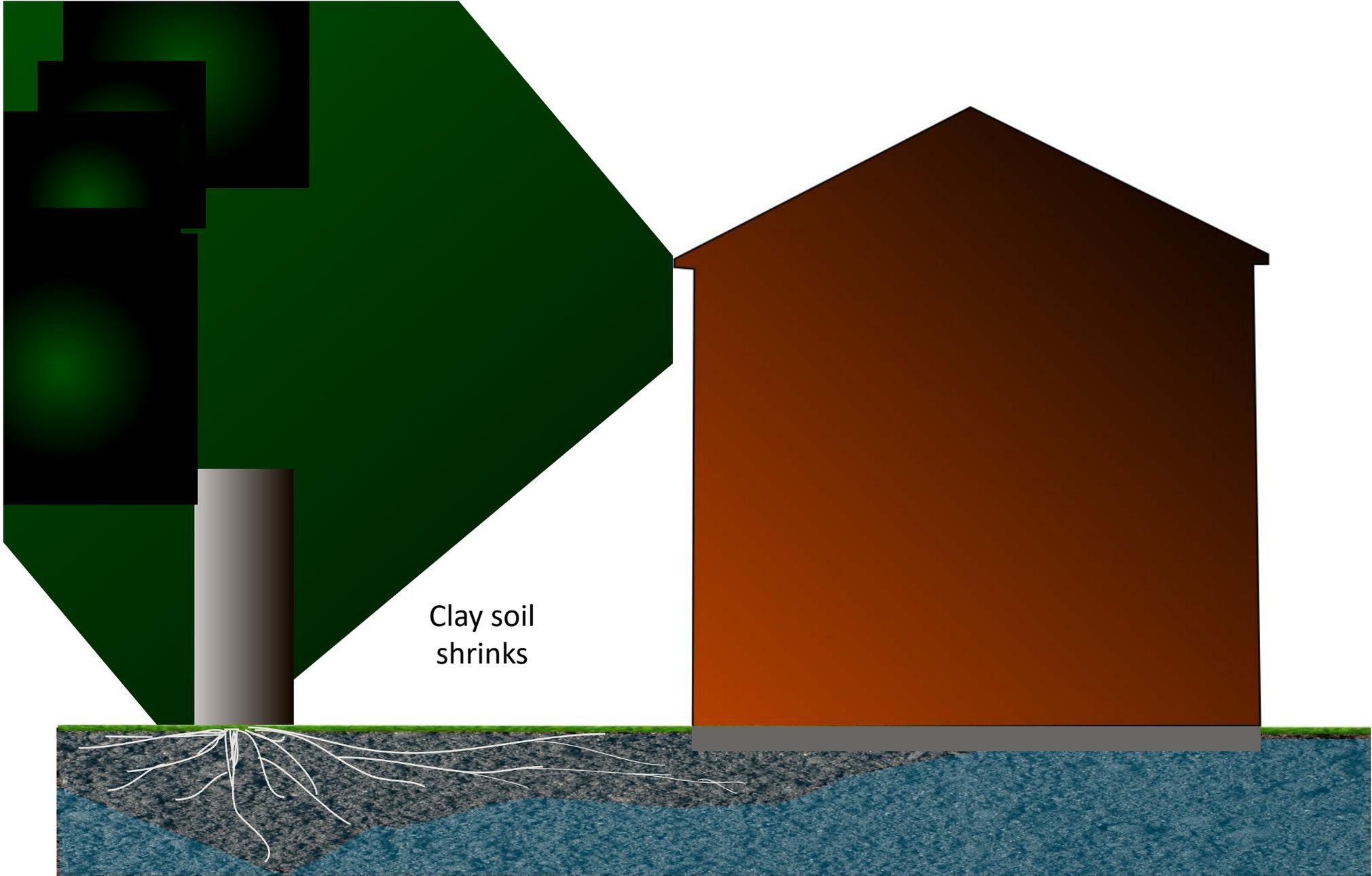
Sometimes  
damage is  
slight



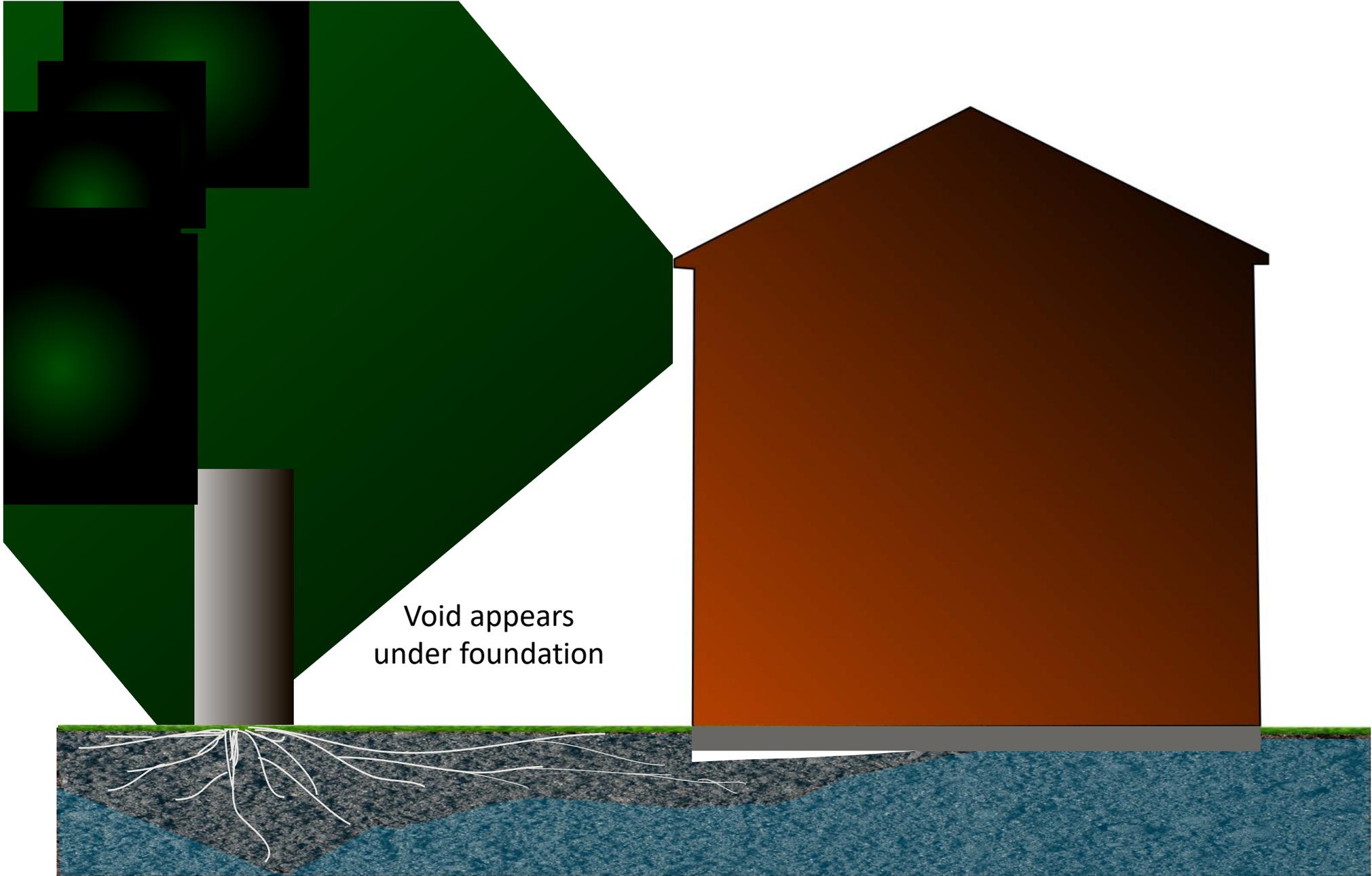
At other  
times it can  
be severe and  
of structural  
significance



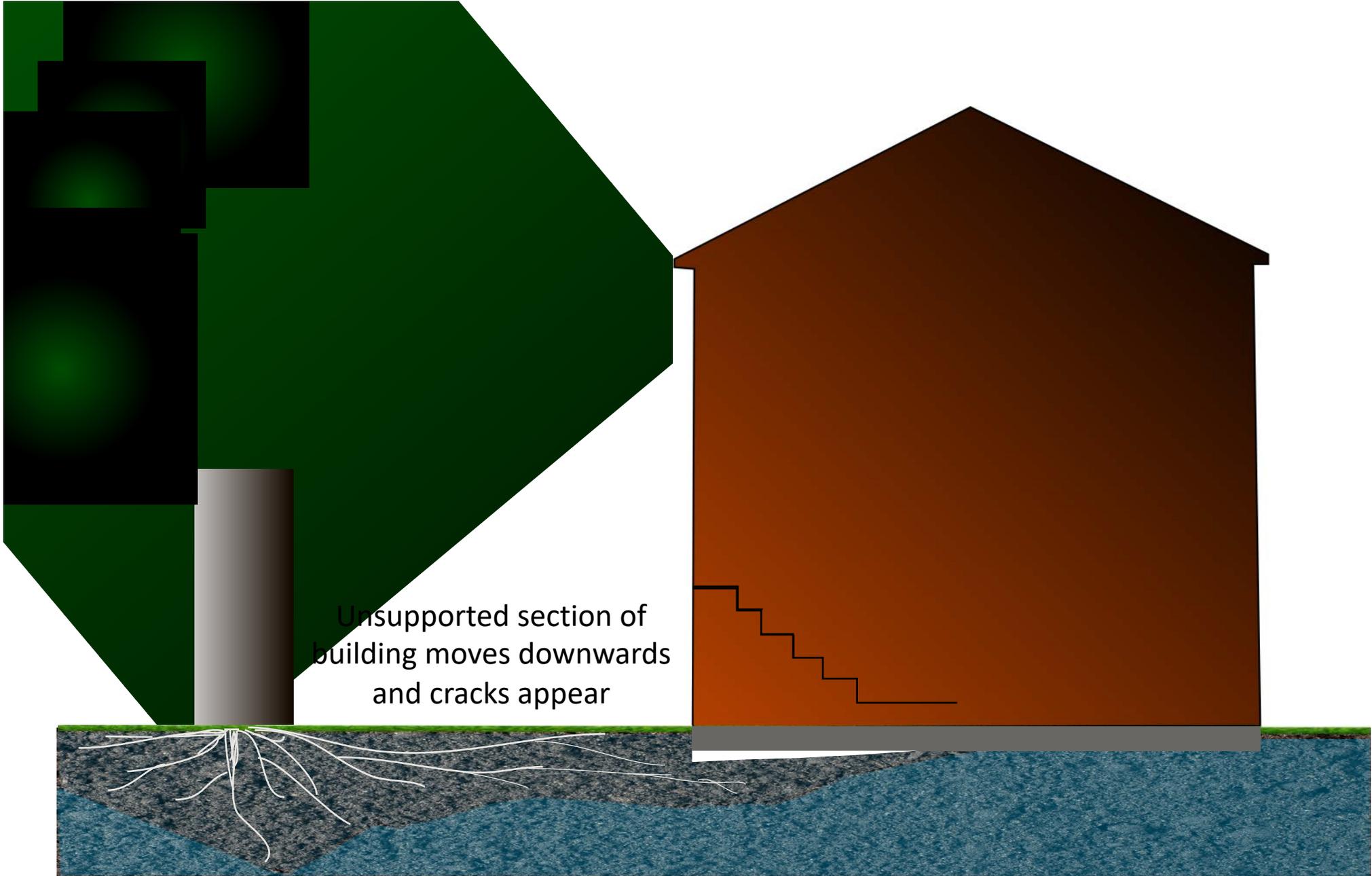
Roots  
cause soil  
drying



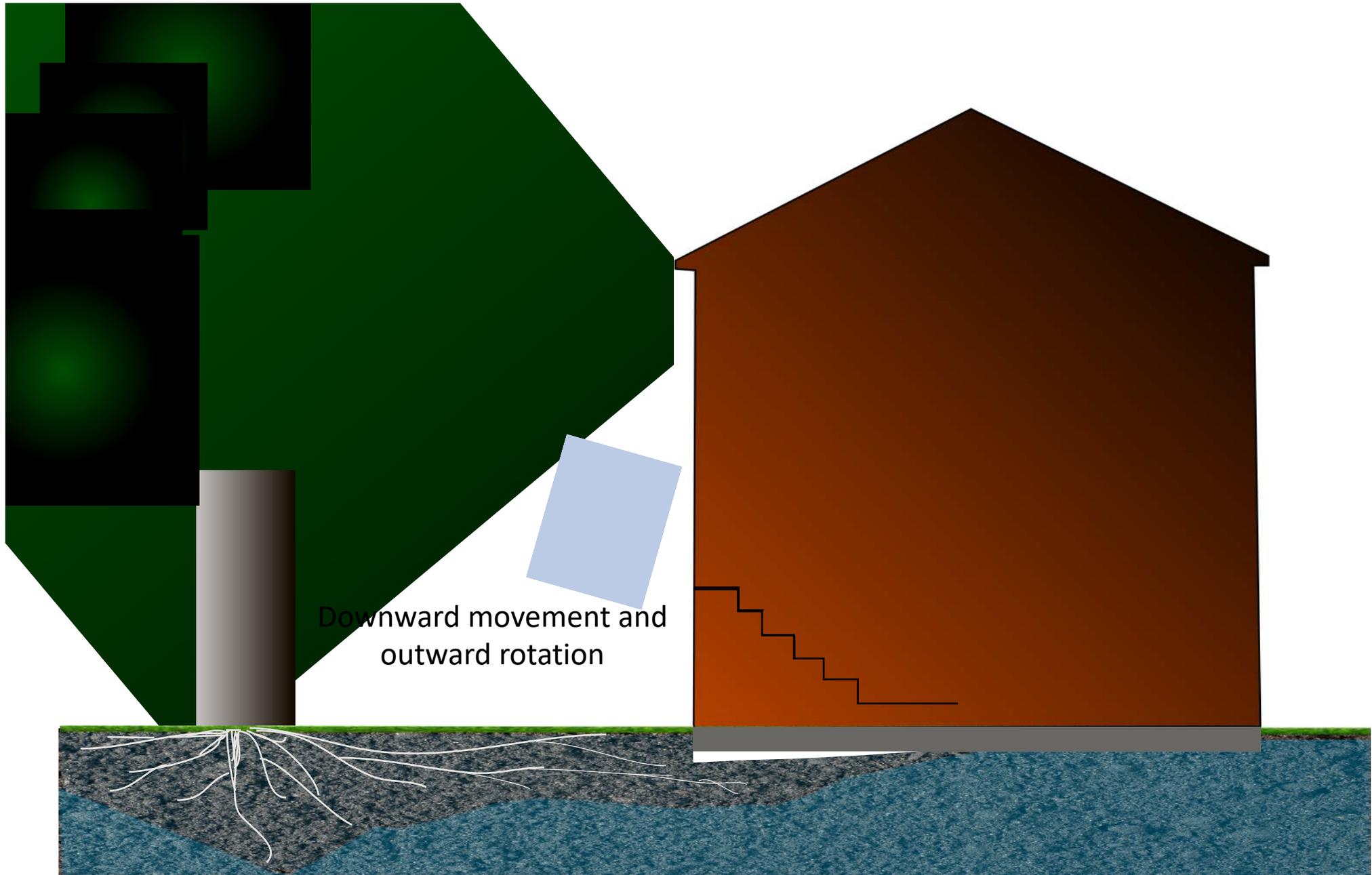
Clay soil  
shrinks



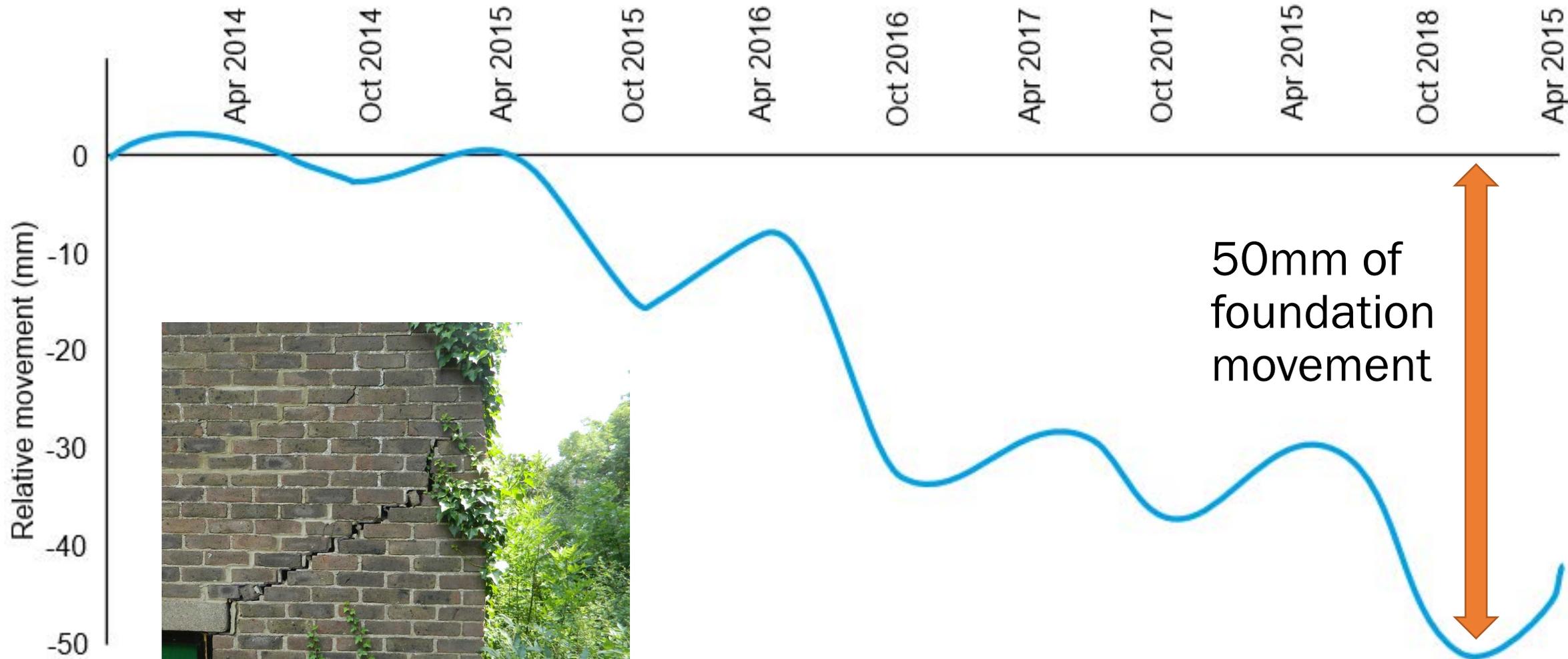
Void appears  
under foundation



Unsupported section of building moves downwards and cracks appear

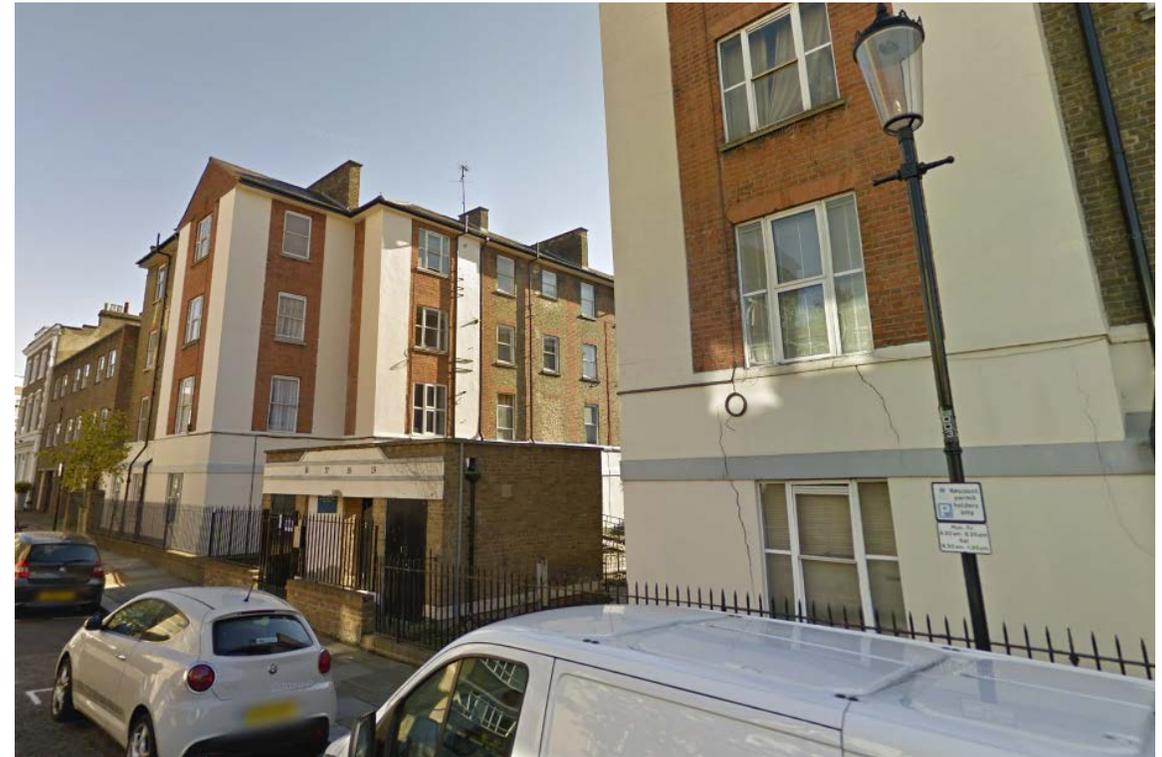


Downward movement and outward rotation



If it can be demonstrated that a tree is the material cause of damage, then the usual way of preventing ongoing subsidence is to remove the offending tree(s).

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However, where the tree is regarded as being important crown reduction may be considered as an alternative to minimize water uptake and limit foundation movements



But, is it effective?



# Tree-related subsidence: Pruning is not the answer

In 2005 we heard  
from Dealga  
O'Callaghan and  
Oisín Kelly that  
'Pruning is not the  
answer'

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## Tree-related subsidence: Pruning is not the answer

*Received (in revised form): 8th April, 2005*

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### **Oisín Kelly** BSc, MIBiol, MAE

is a senior practice consultant at OCA UK Ltd based at its Colchester office where he is Head of Technical Services company-wide. He holds an honours baccalaureate degree in forestry from the University of Aberdeen. He is a Member of the Institute of Biology and a Chartered Biologist, a practising Associate of the Academy of Experts and a Law Society Accredited & Checked Expert Witness. Mr Kelly has 12 years' experience in public sector arboriculture in various London boroughs and has considerable experience in the area of tree-related subsidence. He has given evidence in numerous civil cases in England.

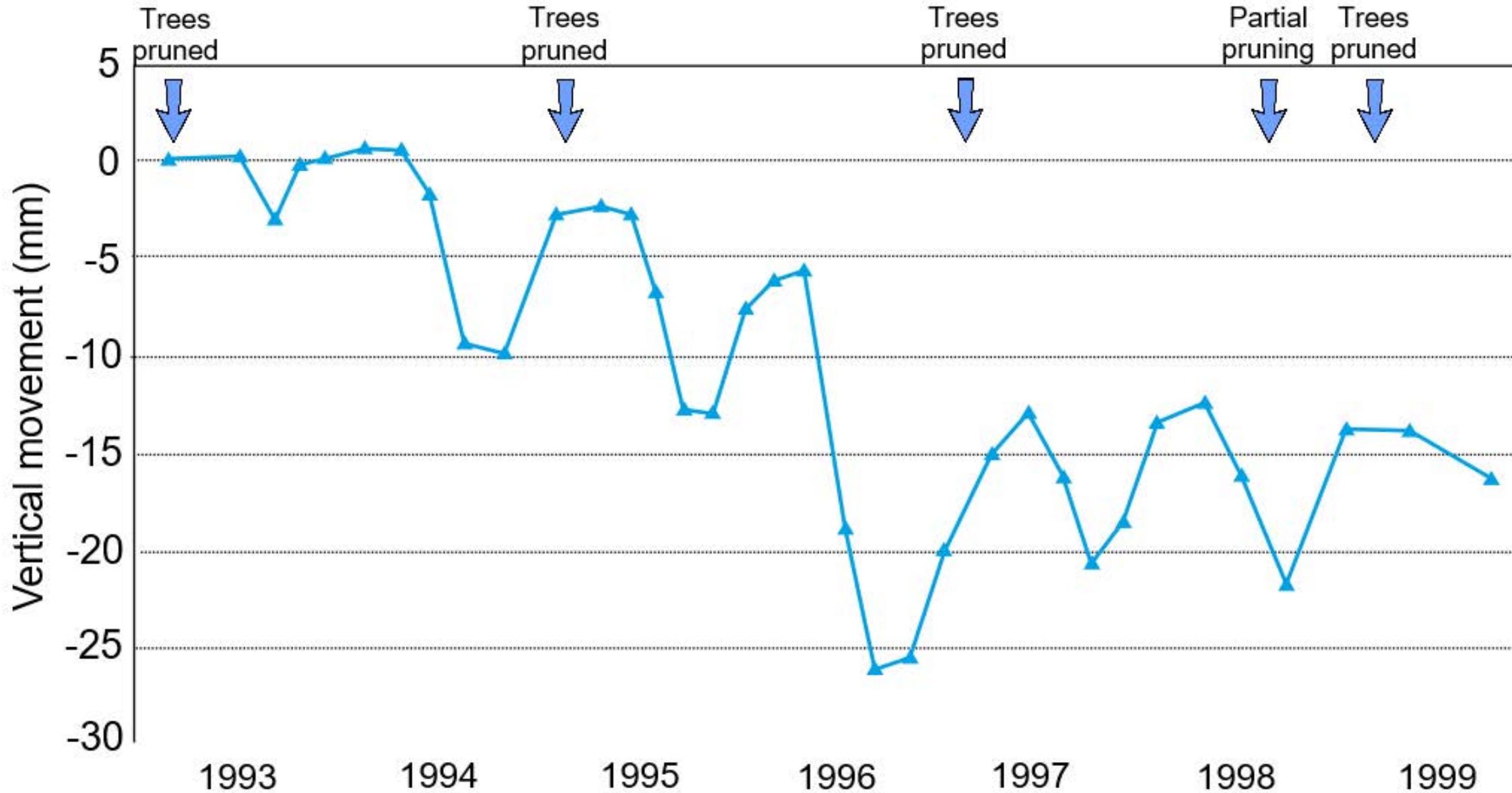
### **Abstract**

Building subsidence is a major problem in the UK and has been for many years. Most subsidence problems are tree-related and the cost to the insurance sector runs into hundreds of millions of pounds a year. Subsidence damage ranges from minor cracking to significant structural damage and trees are sometimes viewed negatively because of their role in subsidence damage. There are over 150 million urban trees in Britain and a significant majority of these are legally protected by tree preservation orders or by virtue of the fact that they are in conservation areas. There has been simplistic and erroneous advice available for a number of years that is based on a false premise that pruning offers a means to control tree water use sufficiently to provide a remedy for tree-related subsidence. This paper presents a factual account of the biology involved in how trees use water, together with the results of recent research into the subject, that cogently dispose of the false premise that has dominated the subject since the 1970s. A simple 'model tree' is presented in the context of clay soils, climate, building guidelines, the housing stock and management options. Recent case law in this area is placed in the context of the legal framework surrounding the issue and the effect of tree removals on the nation's urban tree population is discussed.



One piece of evidence used to reach this conclusion was a study by BRE in the Queen's Park Estate

# Queens Park



Suggested that even very heavy pruning was not effective in mitigating subsidence



# **CONTROLLING WATER USE OF TREES TO ALLEVIATE SUBSIDENCE RISK**

*Horticulture LINK project 212*

**Final report – May 2004**



**UNIVERSITY OF  
CAMBRIDGE**

# Cherry 1999

8 m tall



Non-pruned

30% crown reduction



Crown-reduced

# Plane 2000 and 2003

20 m tall

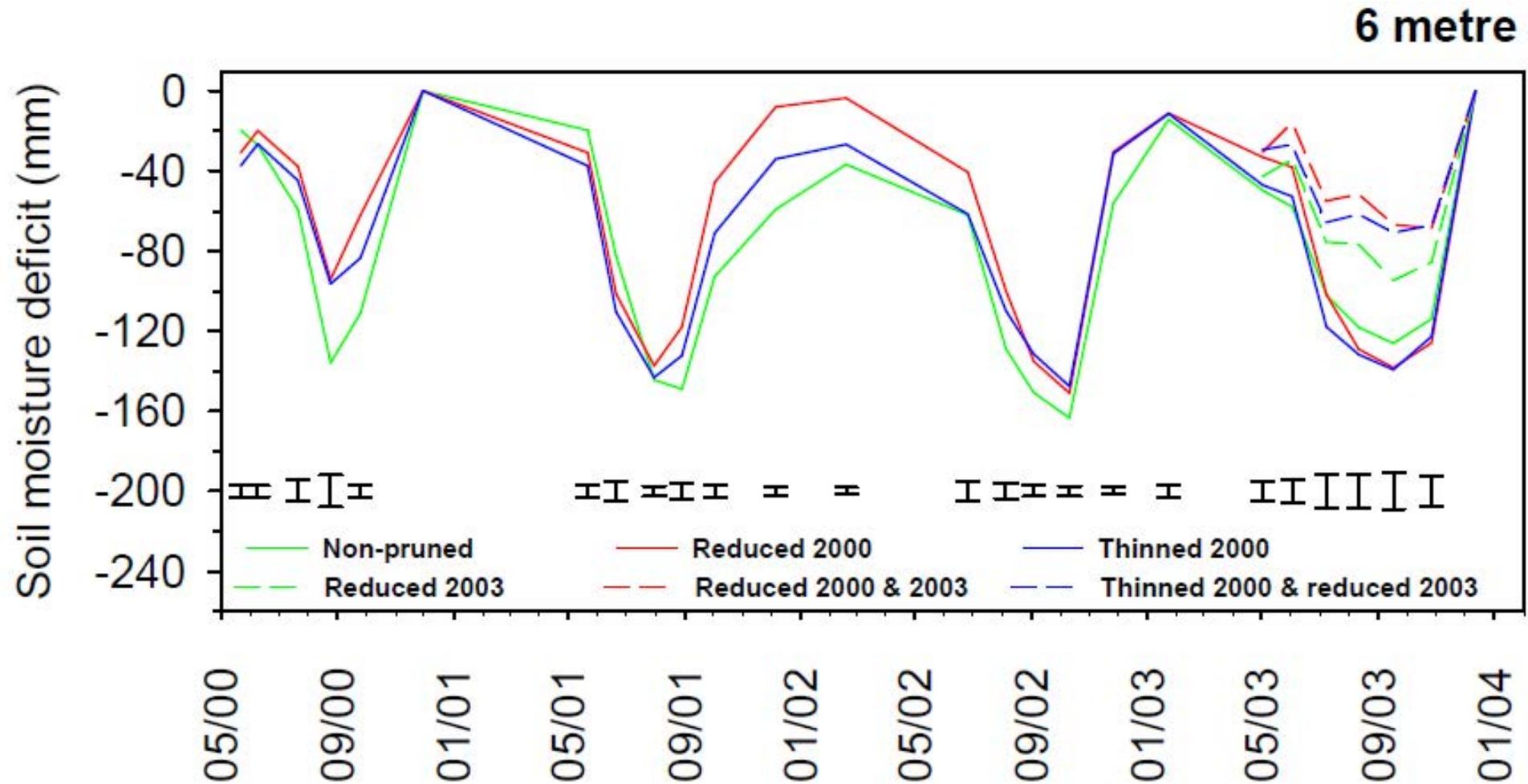


30% crown reduction  
(72% crown volume reduction)



60% height reduction  
(90% crown volume reduction)





30% crown reduction (72% crown volume) had about 17% benefit in reducing soil drying  
 60% height reduction (90% crown volume) had about 33% benefit in reducing soil drying  
 Effects generally lost after two years



PG Biddle:  
Plane tree,  
light pruning

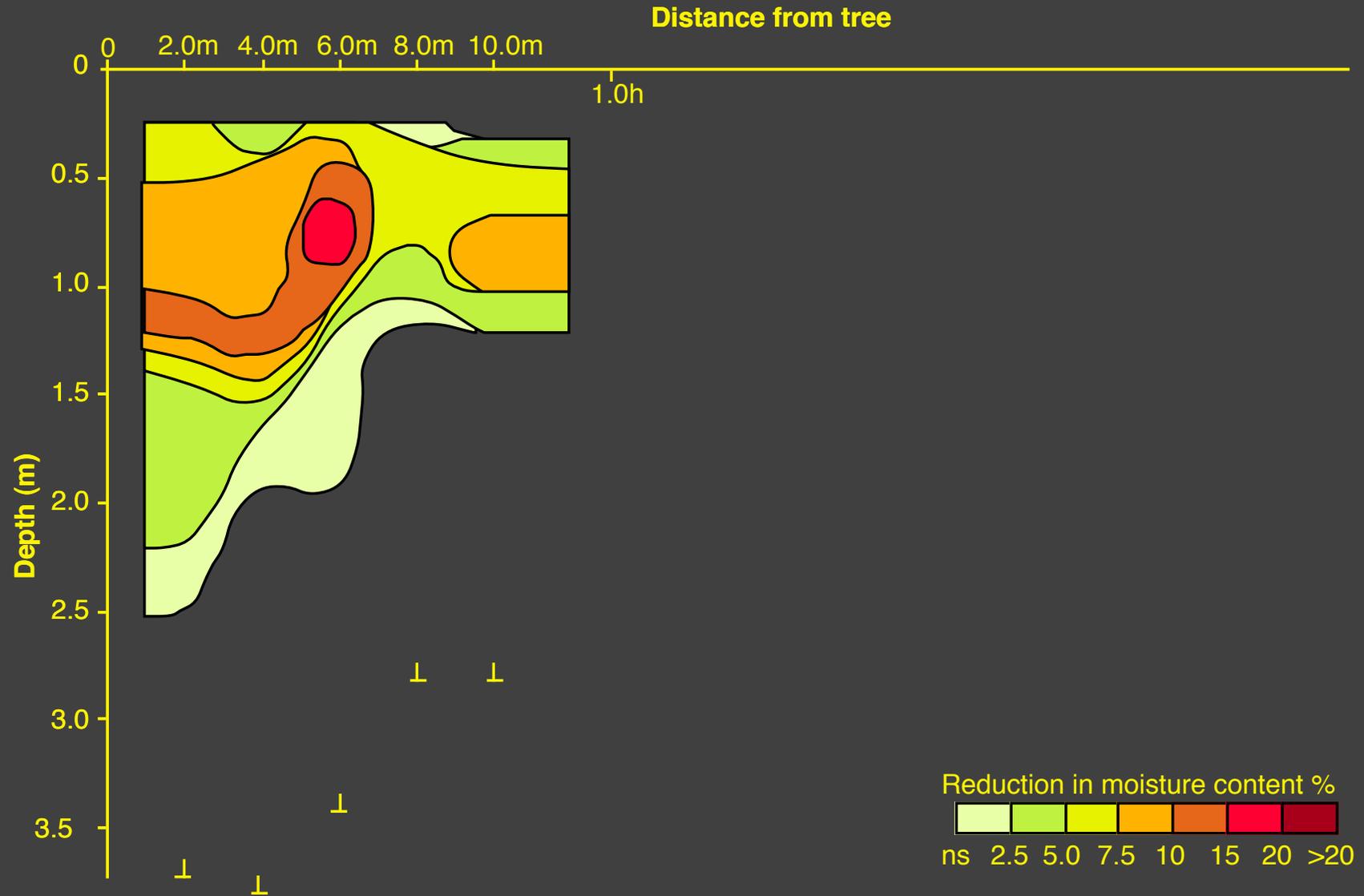


Plane tree,  
moderate  
pruning

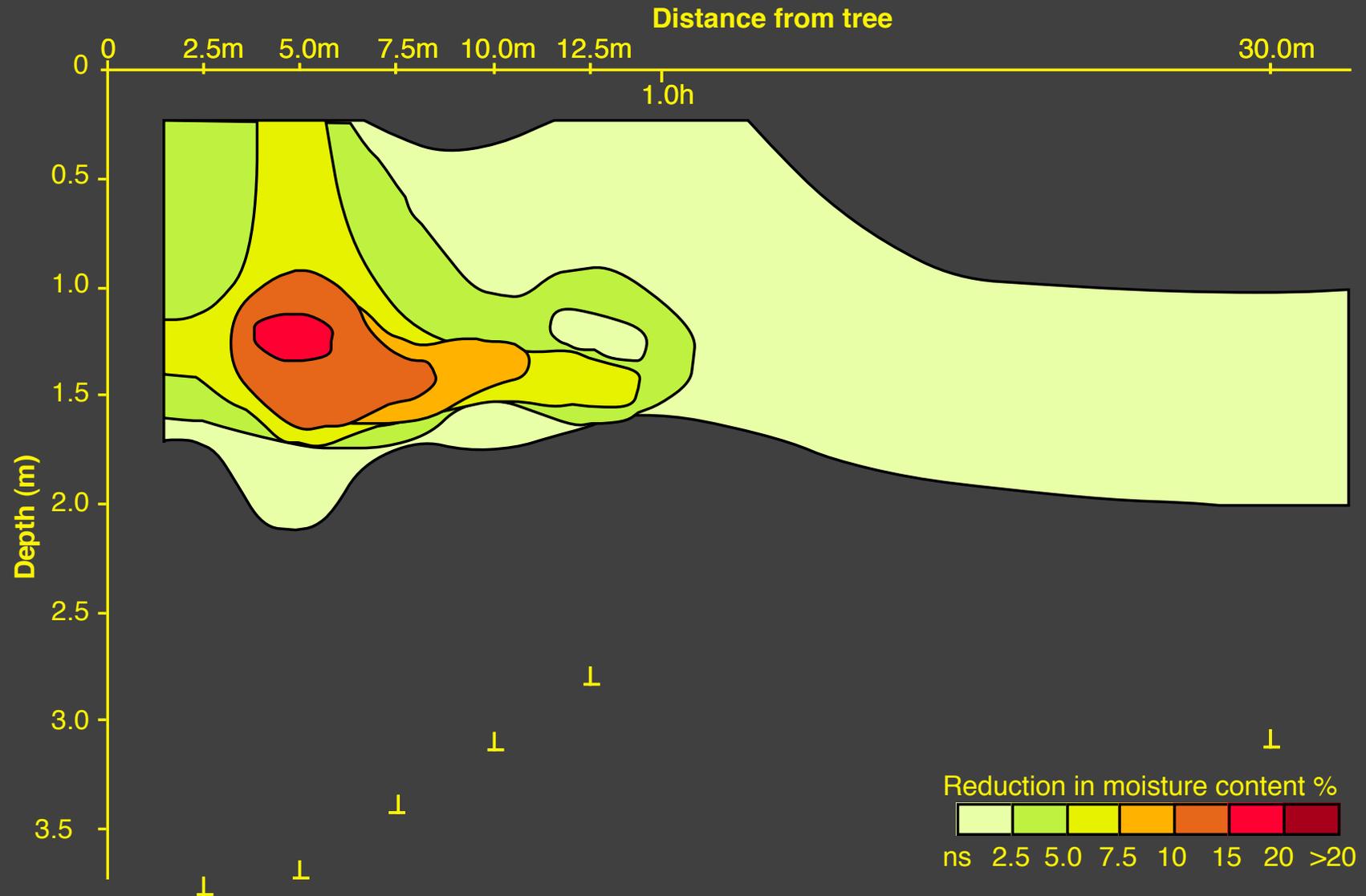


Plane tree,  
heavy pruning

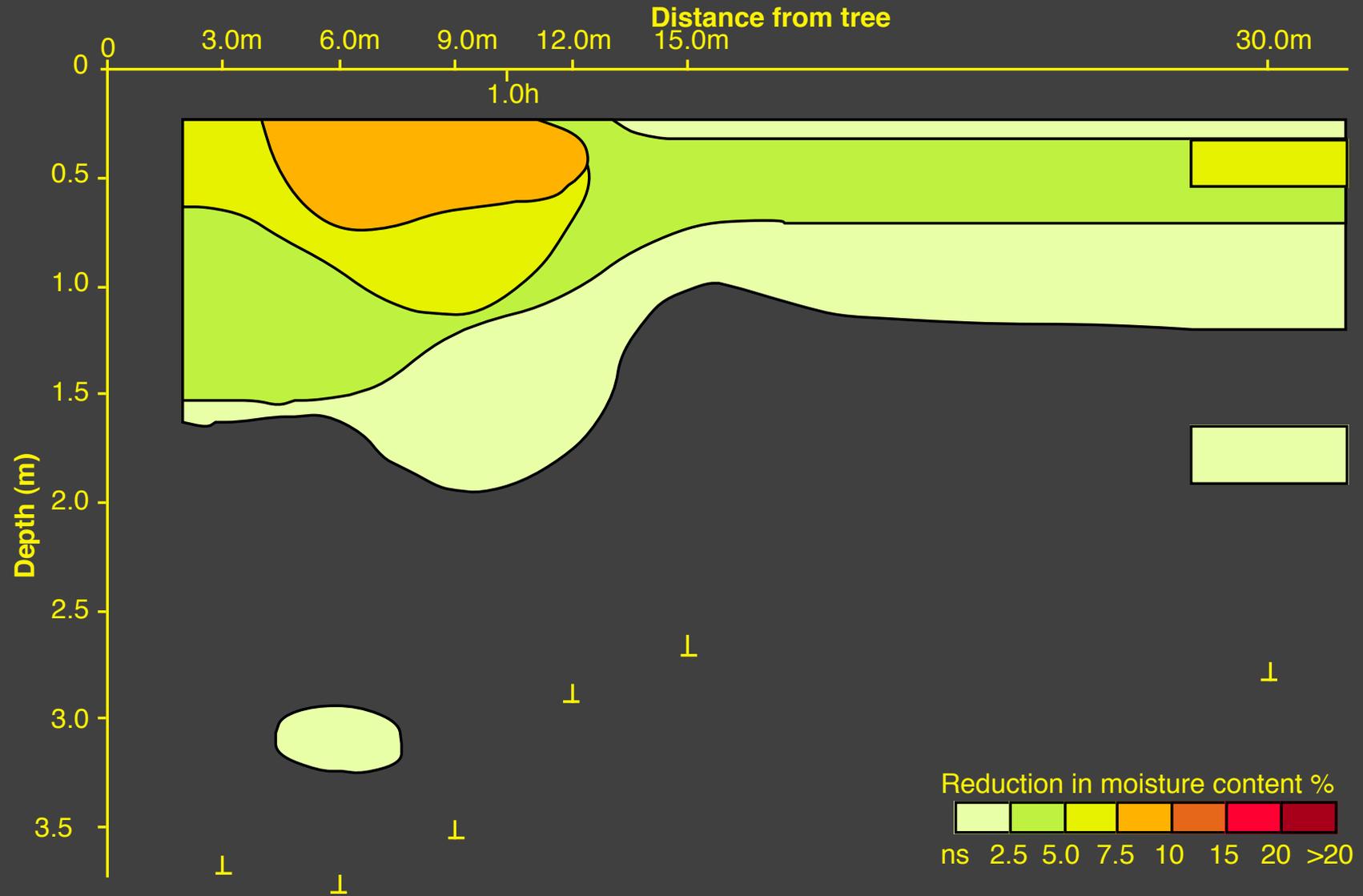
# Plane tree, Control (29/9/84)



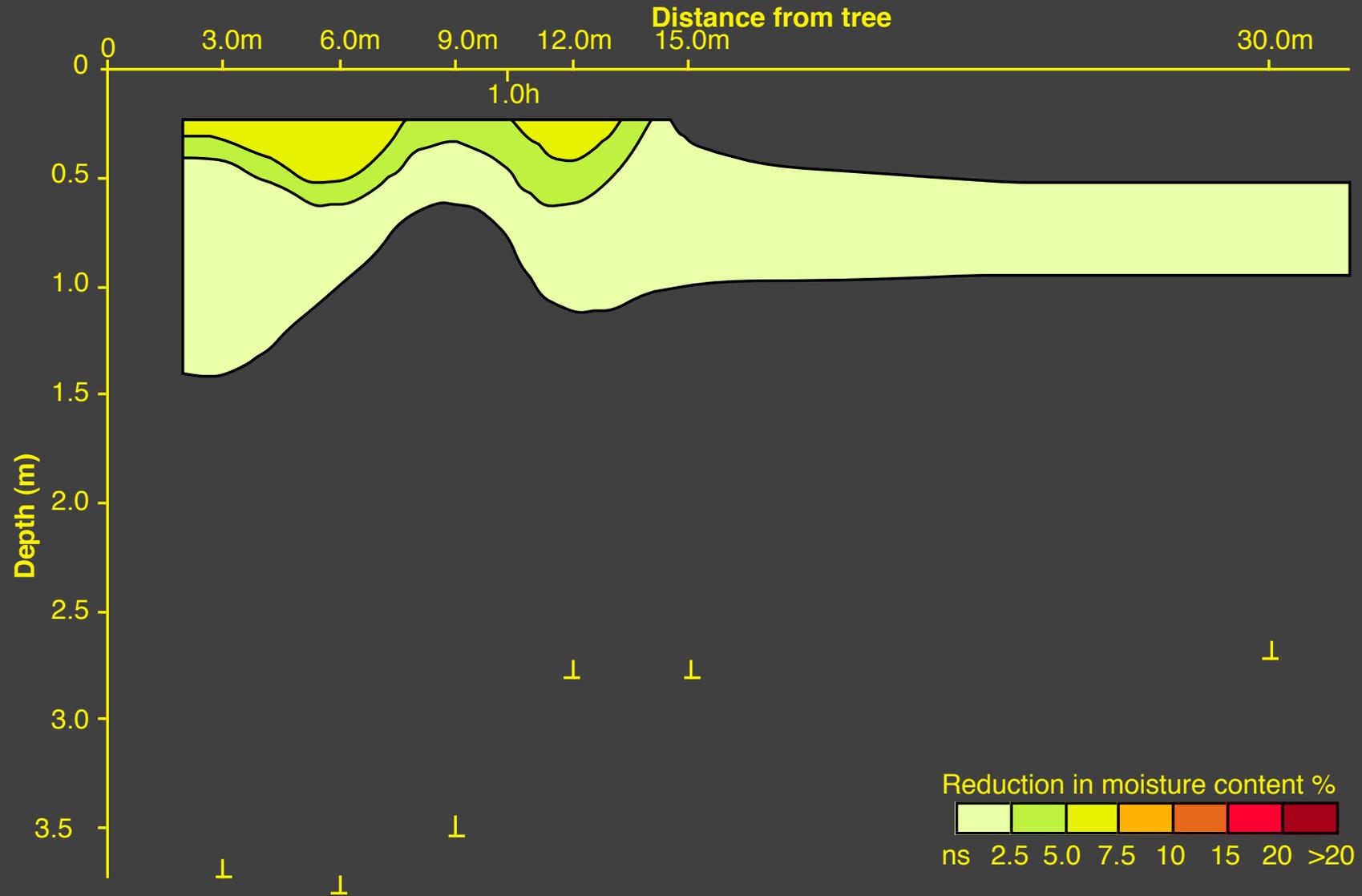
# Plane tree, light pruning (29/9/84)



# Plane tree, moderate pruning (29/9/84)



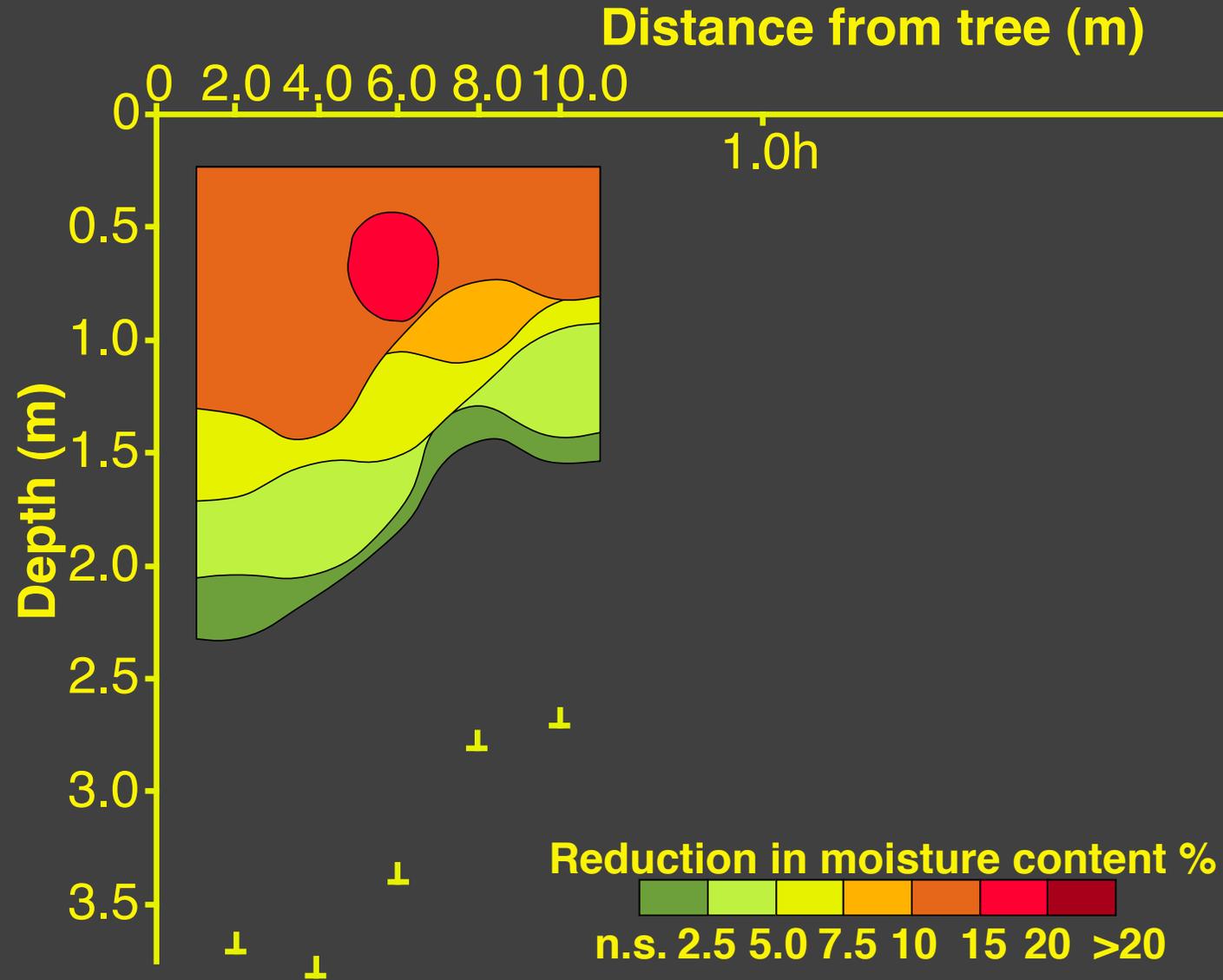
# Plane tree, heavy pruning (29/9/84)



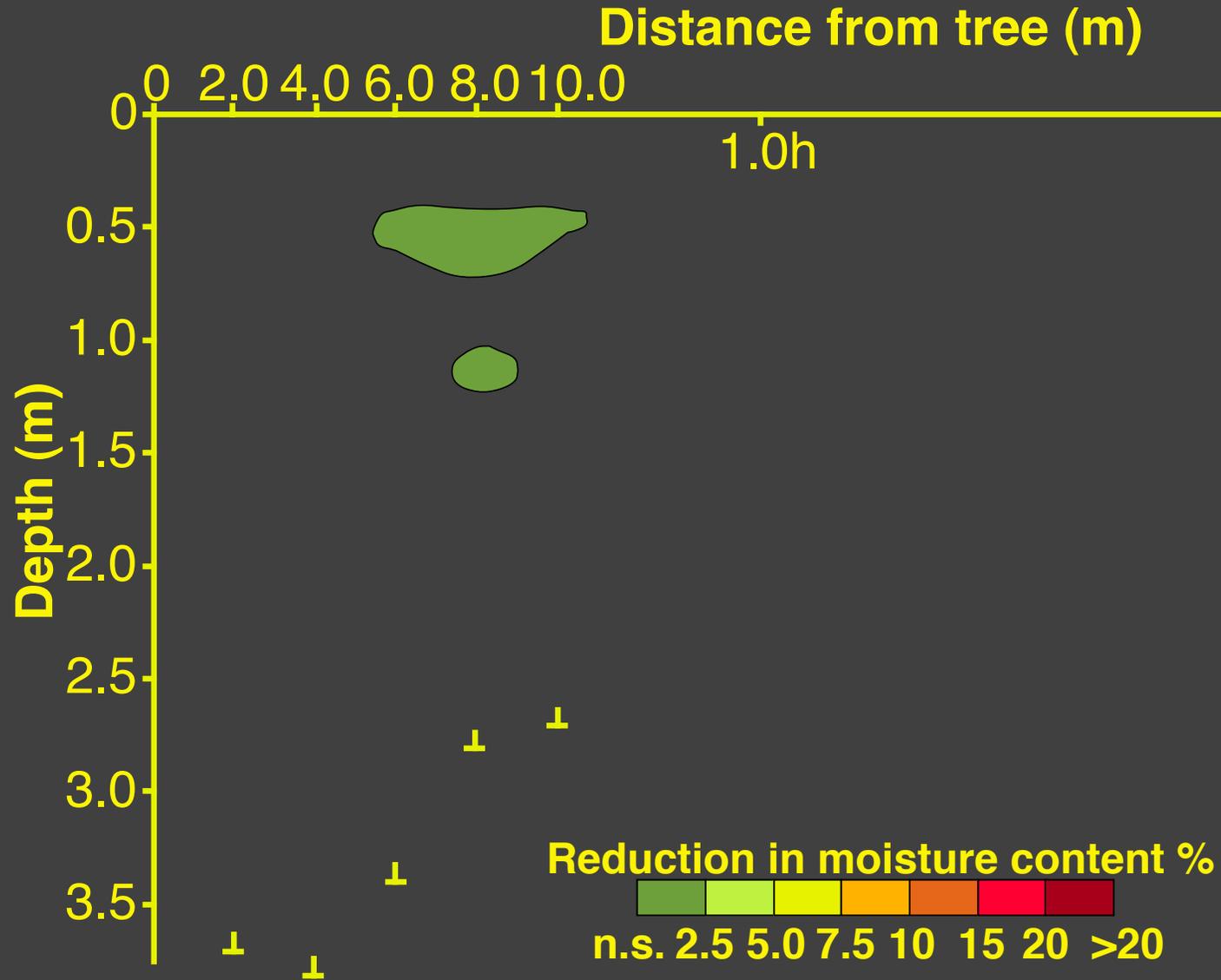


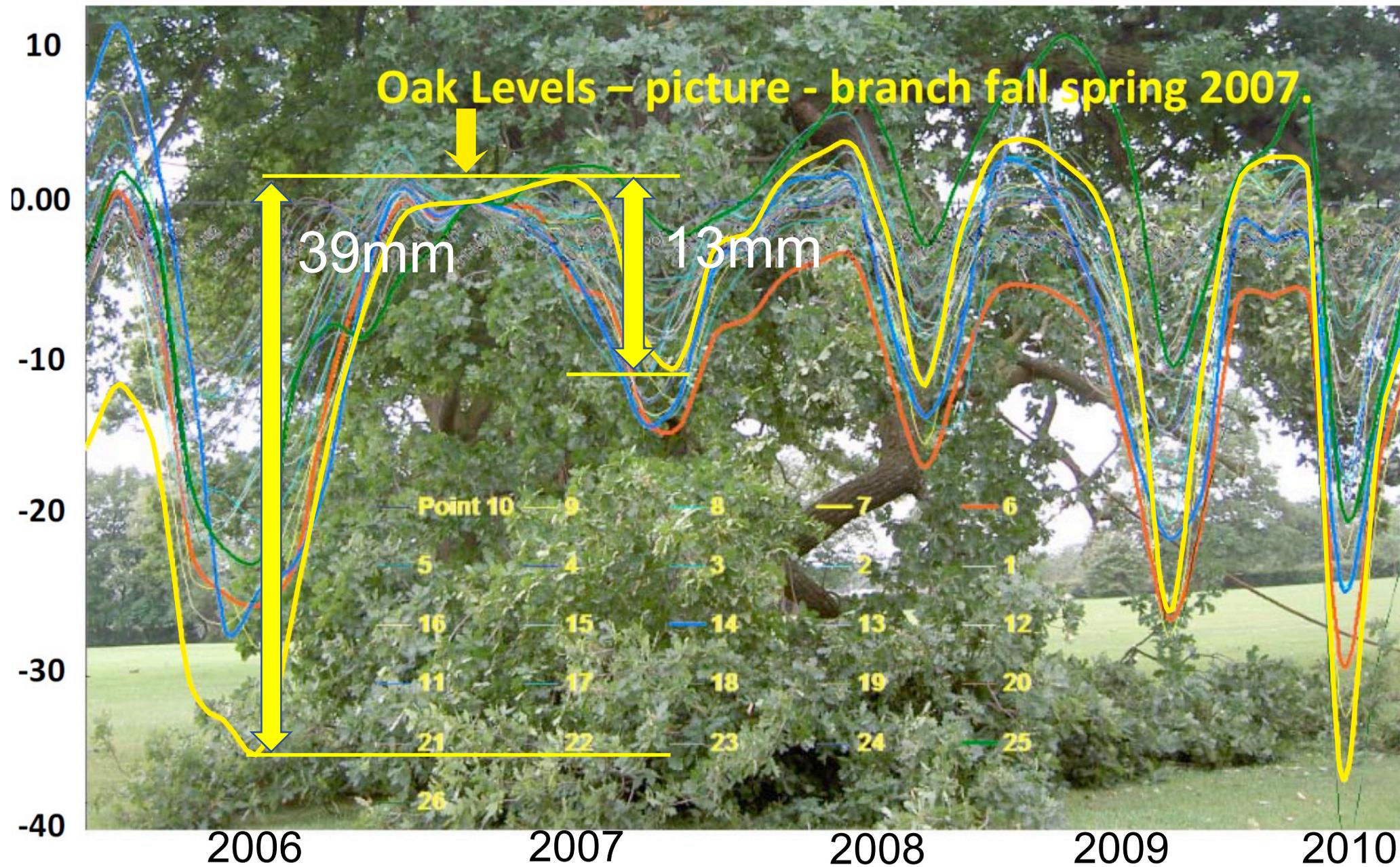
Plane tree,  
after pollarding

# Plane tree, prior to pollarding (4/10/89)

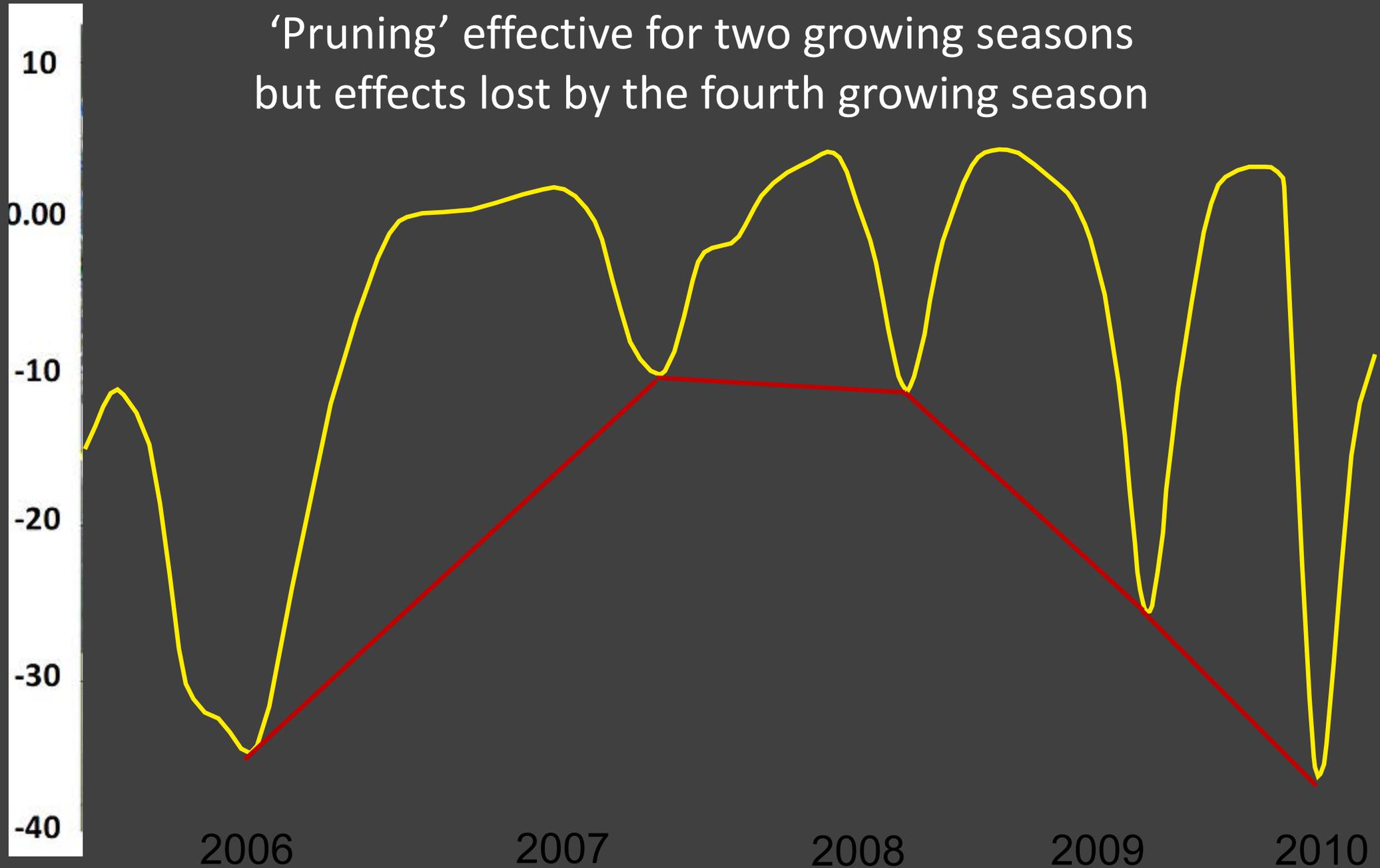


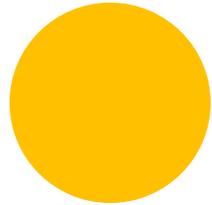
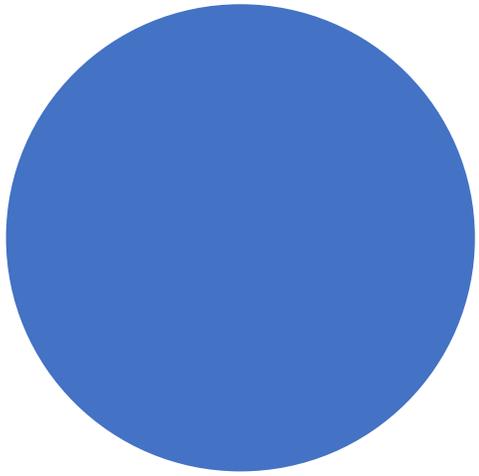
# Plane tree, after pollarding (21/9/94)





'Pruning' effective for two growing seasons  
but effects lost by the fourth growing season





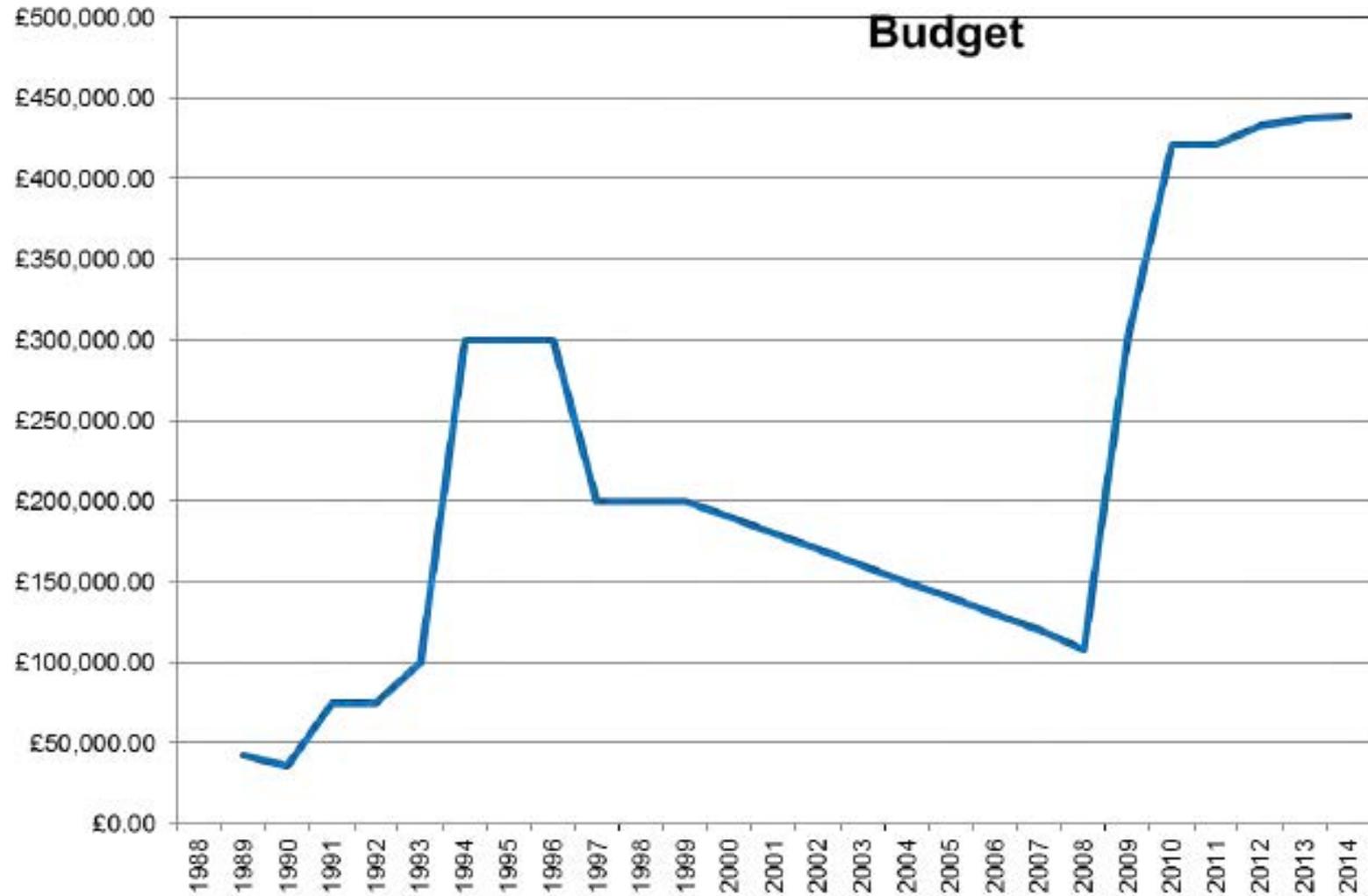
**Brief summary:** to decrease soil drying by a tree pruning has to be very substantial and be repeated every two years.

But it is important to make a distinction between:

Pruning to minimise risk of future damage

Pruning to mitigate actual damage

# Camden's experience of tree management



Time Period	No. of Claims	Cost of Claims
2002-2007	503	£4.6m
2008-2013	224	£2.5m

Regular management can reduce the cost of claims but cannot eliminate them.



**A Risk Limitation Strategy  
for Tree Root Claims**  
*3rd Edition - Revised May 2008*

## **The London Tree Officers Association**

### **A Risk Limitation Strategy for Tree Root Claims**

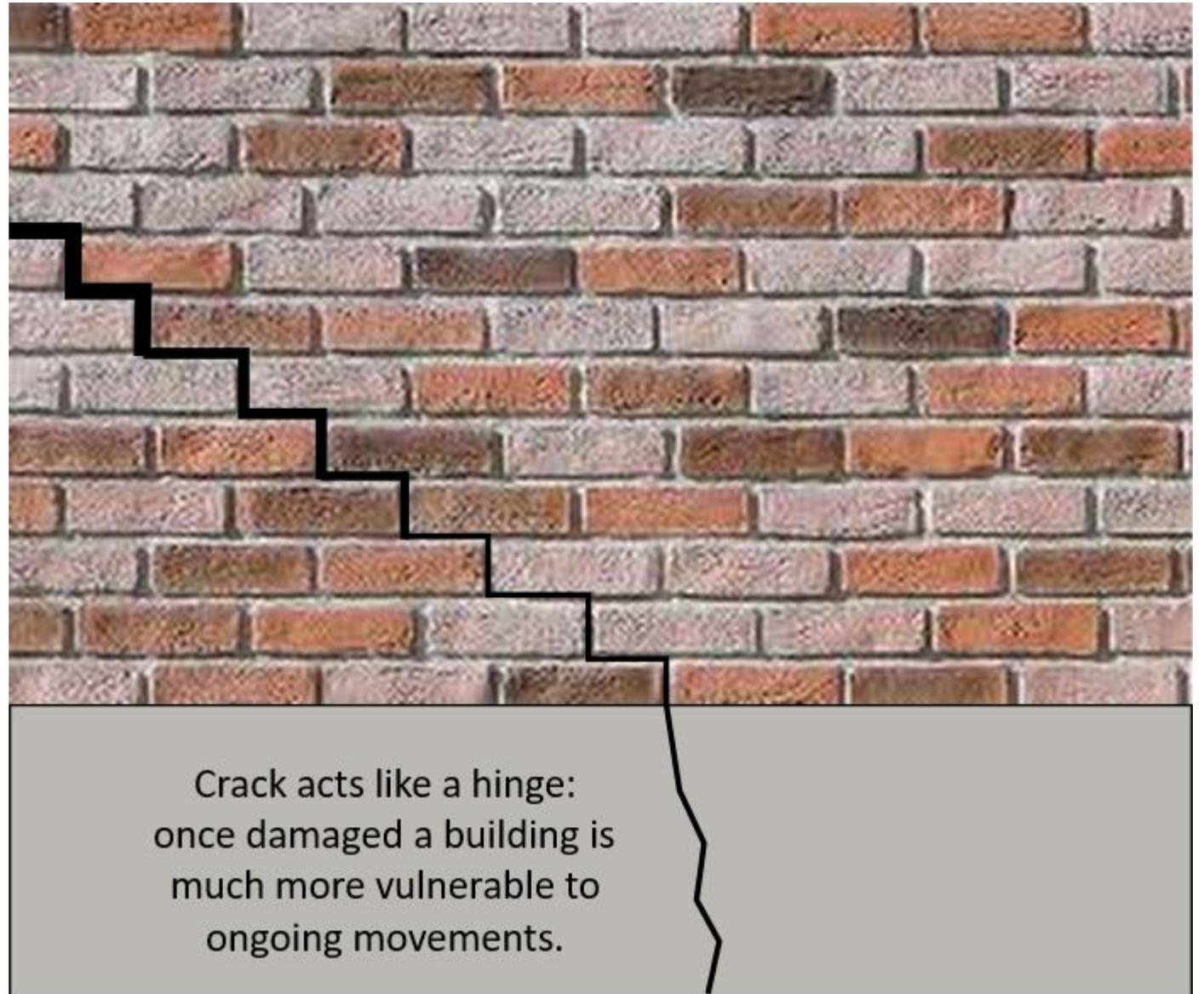
A survey of London Boroughs in 2007 indicated that boroughs which undertake cyclical pruning can expect to reduce their annual cost on subsidence claims by 18.5%.

Two boroughs which did not have a cyclical maintenance programme had to remove 70 trees per borough in five years due to subsidence against an average of 31 for the other boroughs that participated in the survey.

So, cyclical pruning can have some benefits in reducing the incidence of subsidence damage and is best targeted at 'high risk' areas, i.e. areas where historically there have been high numbers of subsidence events.



But after a tree has caused subsidence pruning is much less effective in mitigating crack damage as a building will have lost its structural rigidity.

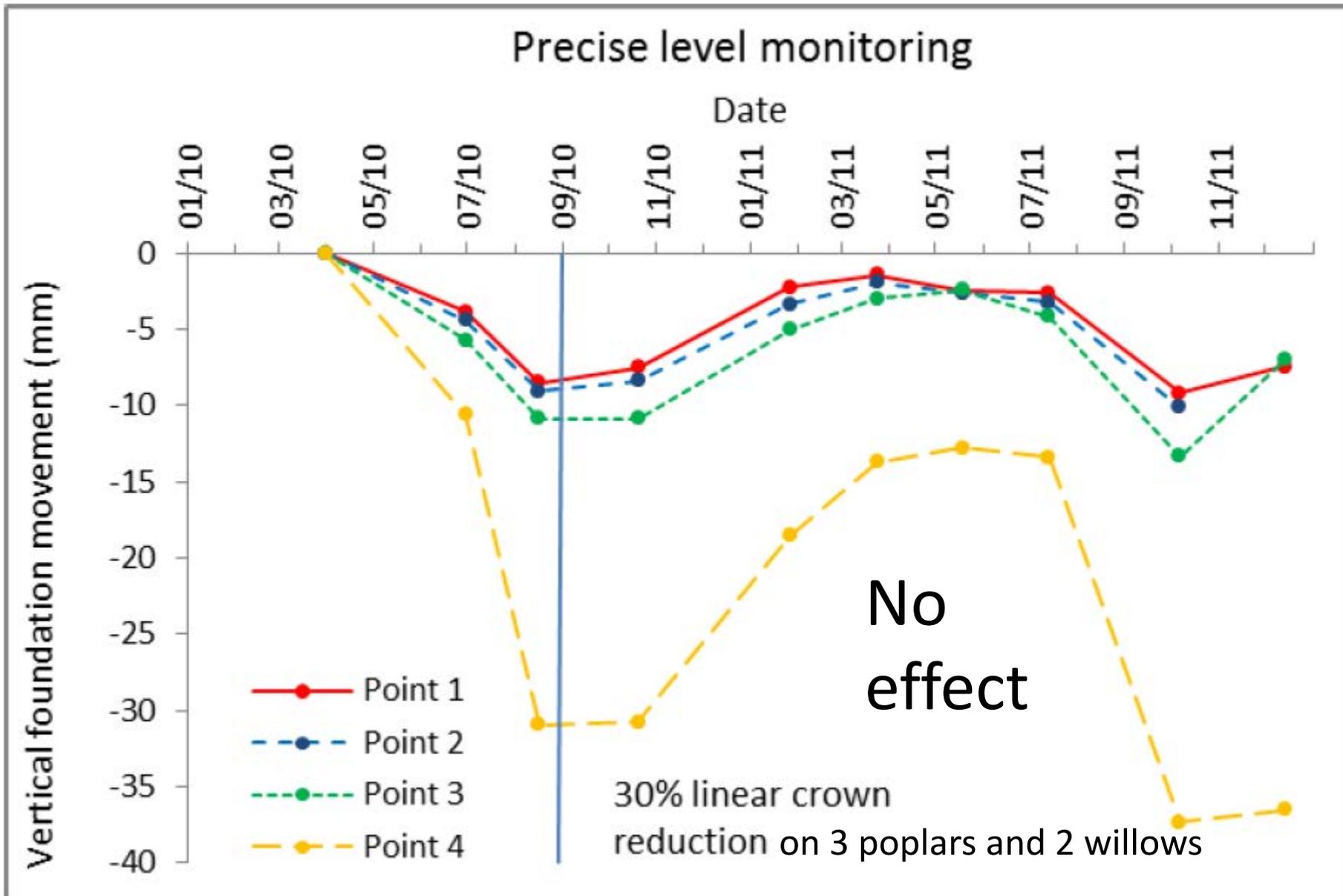


‘Pilot study to determine the feasibility of using existing claims data to determine the impact of tree pruning on subsidence incidents on swelling clay soils.’

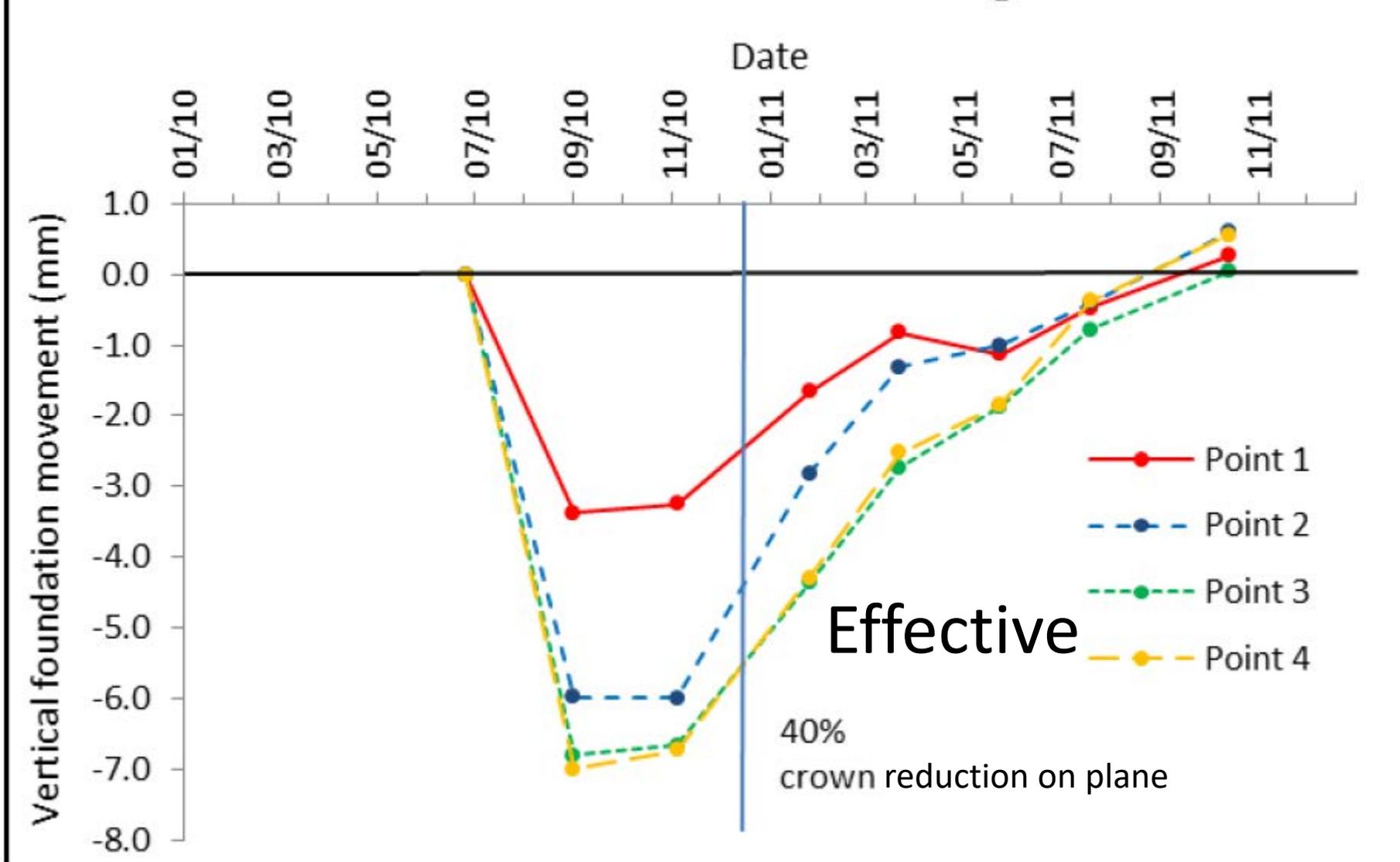
# Dr NA Hipps and Prof CJ Atkinson 2014

Trees prior to crown reduction (left), after reduction (right).



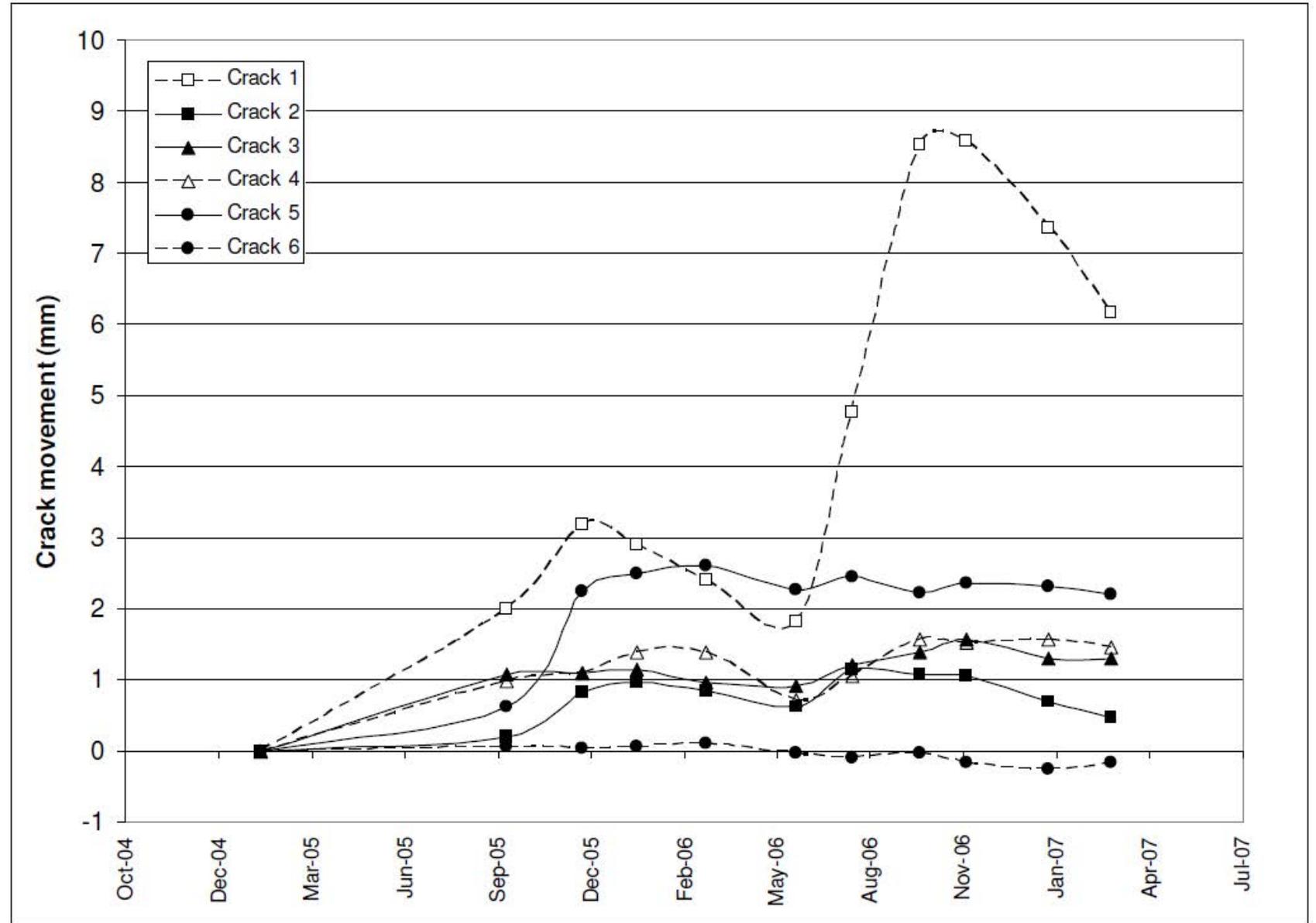


# Precise level monitoring



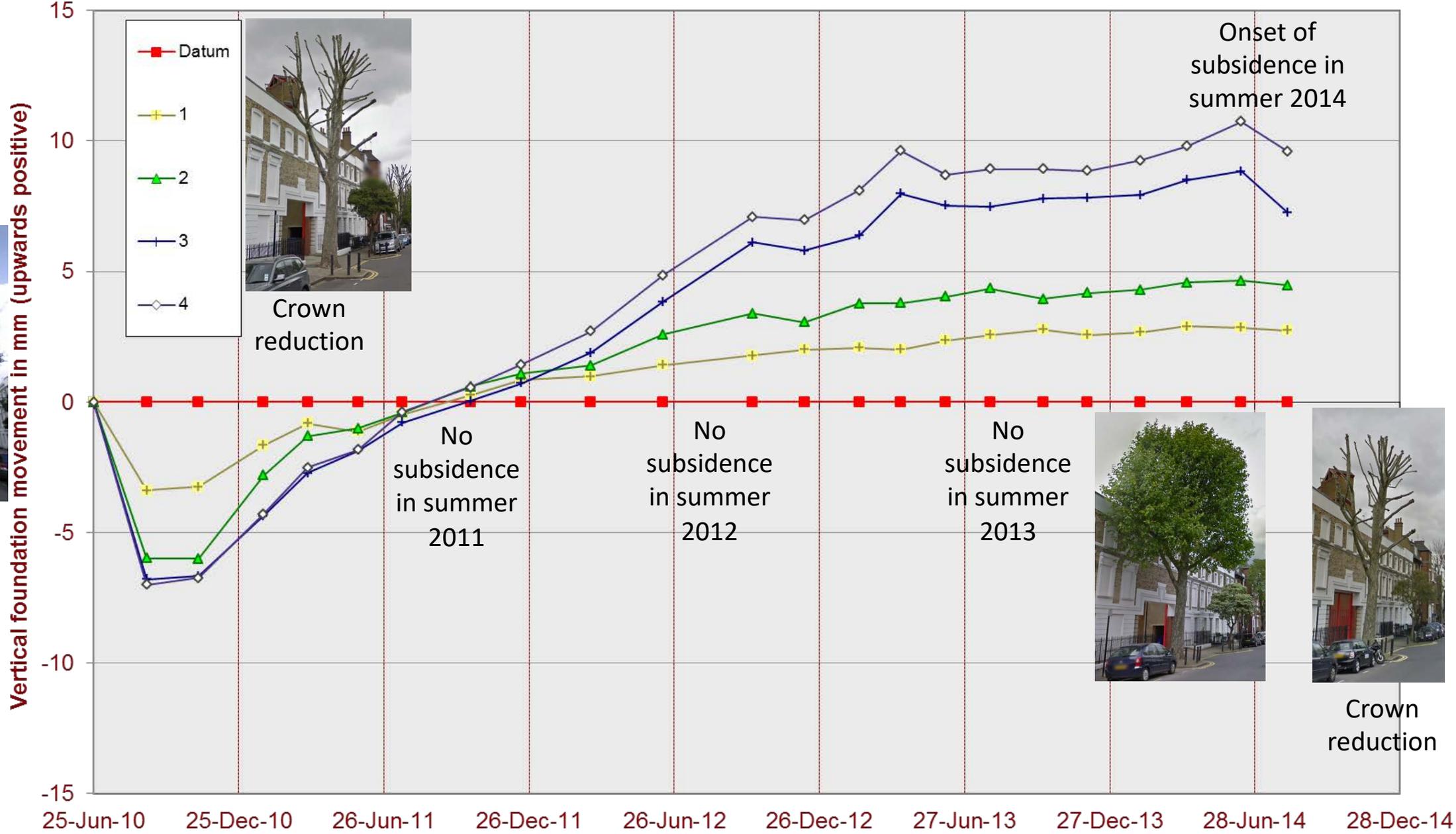


Re-occurrence  
of crack  
damage which  
had started in  
summer 2003



# Precise level monitoring - Front Elevation

Repairs completed in 2008 and cracking re-appeared Sep 2009



Crown reduction

April 2019



# Conclusions

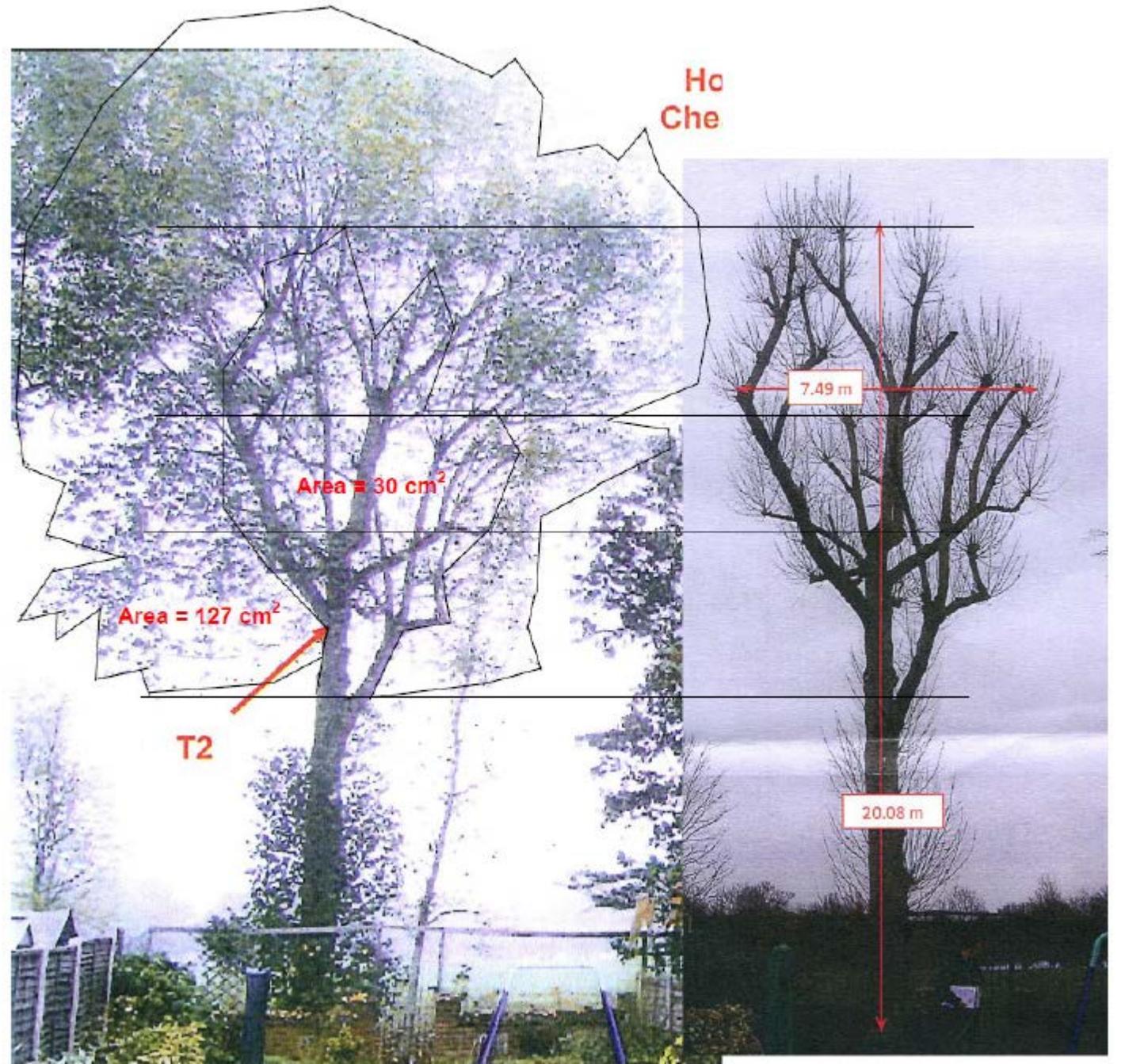


1. Nine cases were studied
2. In three cases pruning eliminated foundation movement
3. In four cases pruning reduced foundation movement
4. In two cases pruning had no effect



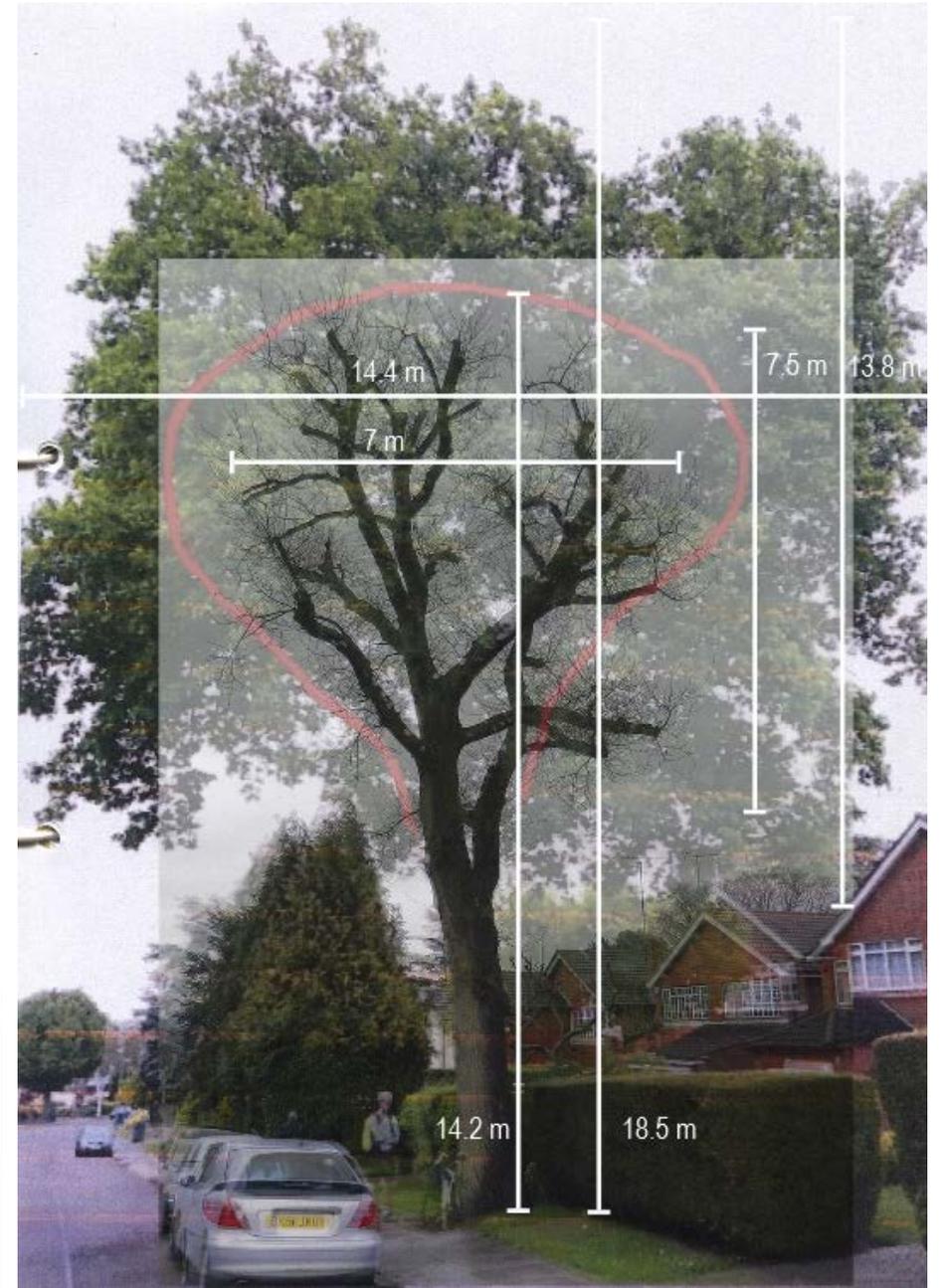
## Mrs Robbins v London Borough of Bexley.

Poplar tree 31m from rear of damaged building reduced in height from 26m to 20m and crown width reduced from 17m to 7.5m (approx. 73% crown volume reduction) and building movement was reduced by 82%.



18.5 m tall oak 10 m away from property  
 $D/H = 0.54$





Crown volume before reduction 1468m<sup>3</sup>

Crown volume immediately after reduction 200m<sup>3</sup>

Equivalent to 86% crown volume reduction

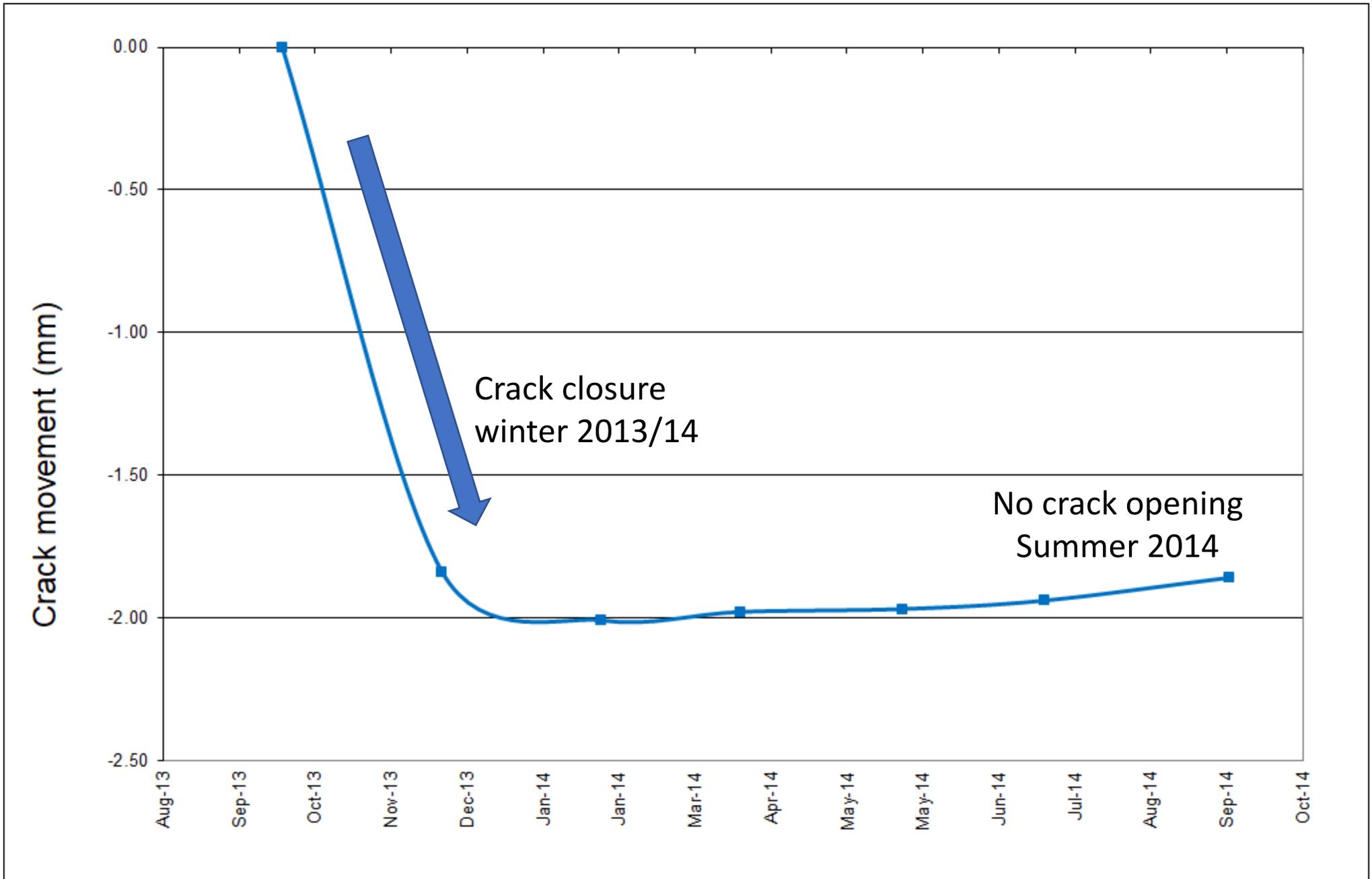
Crown width reduction 51%

Crown height reduction 46%

Equivalent to 48.5% linear crown reduction

Crown volume at the end of 2015 after 1 yr regrowth 273m<sup>3</sup>

Equivalent to 36.5% increase in crown volume





May 2019  
(Streetview)

Plane tree 25 m tall and 18 m away



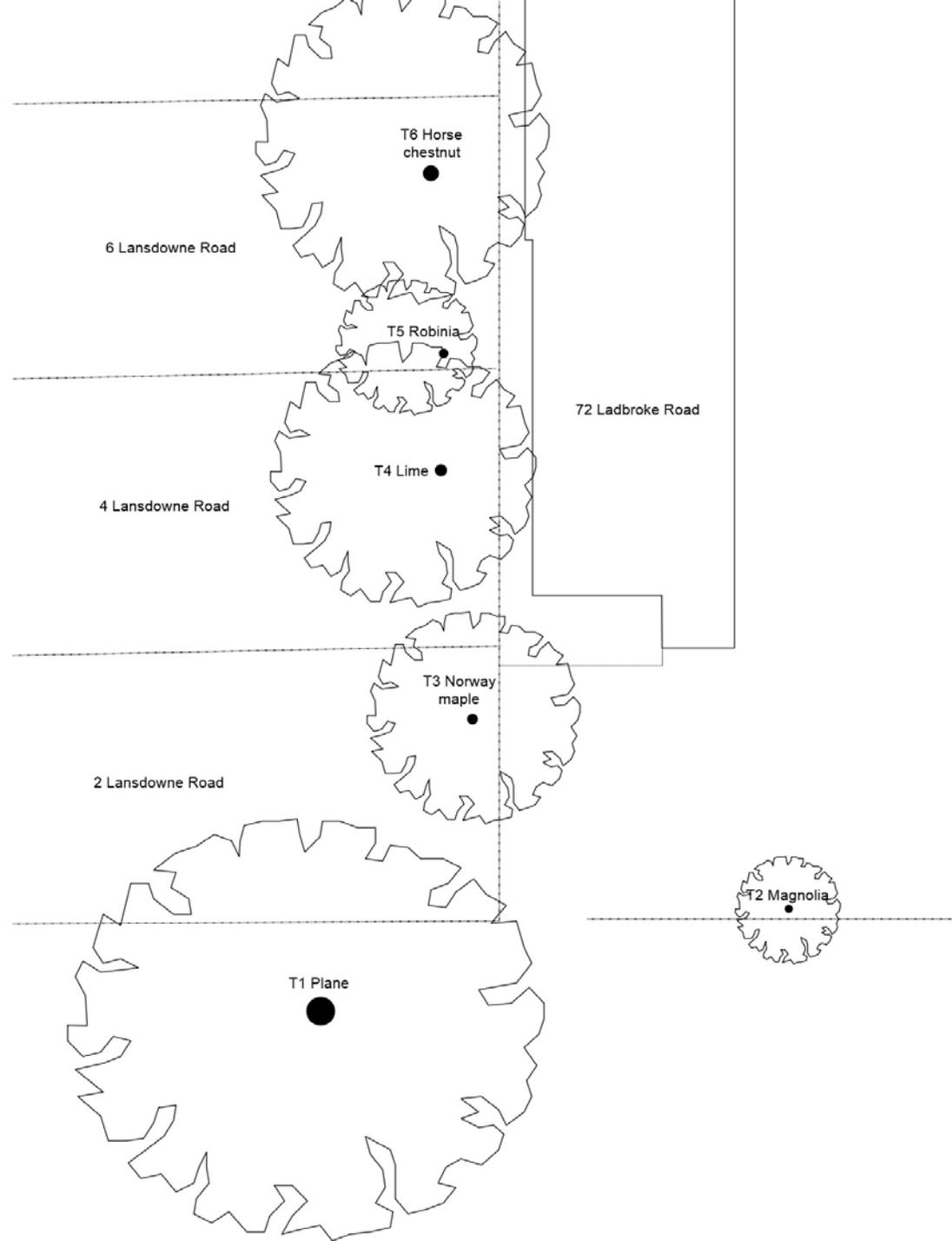


Photo taken 6/4/15

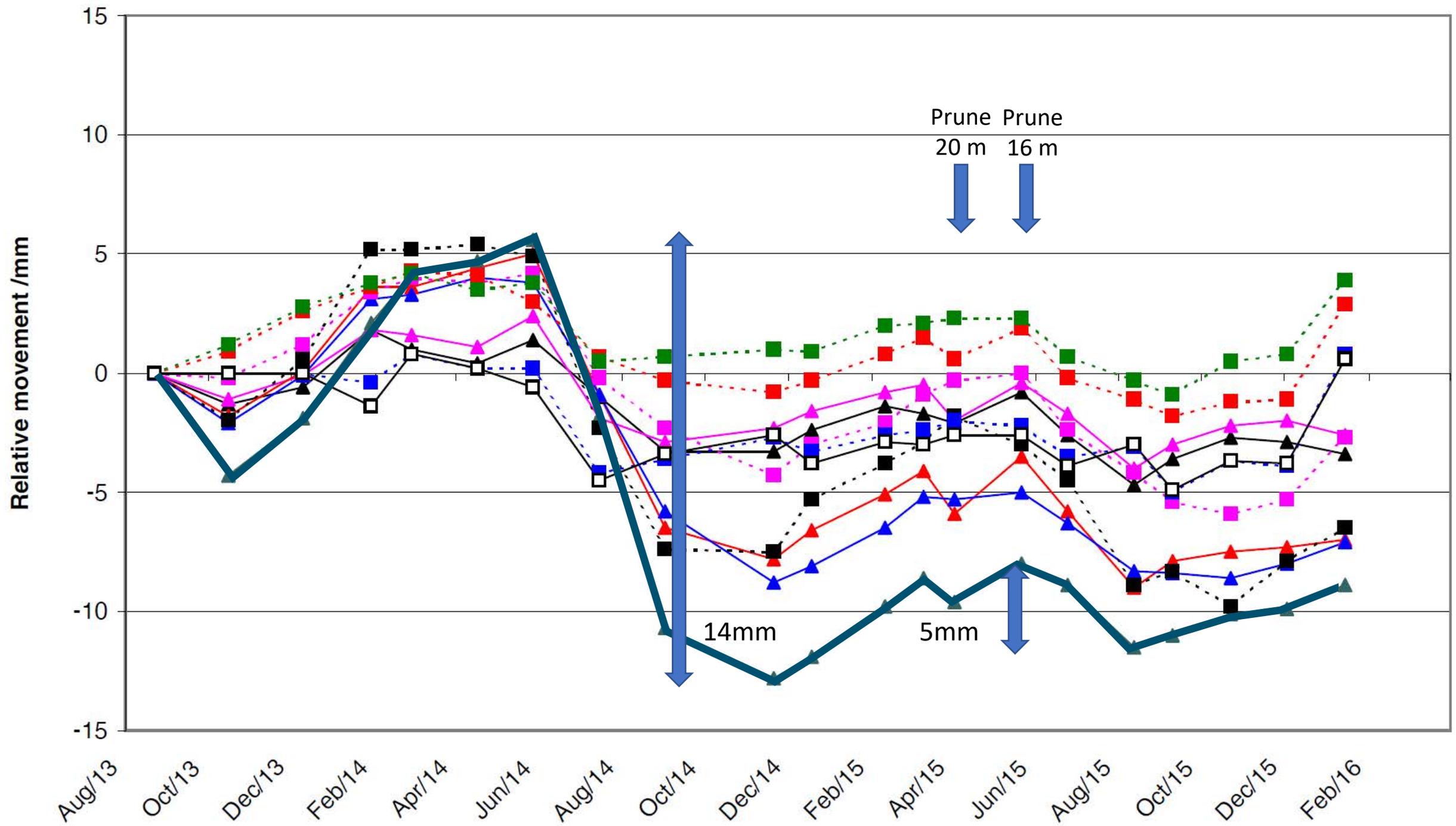


Photo taken 5/5/15



Photo taken 3/7/15

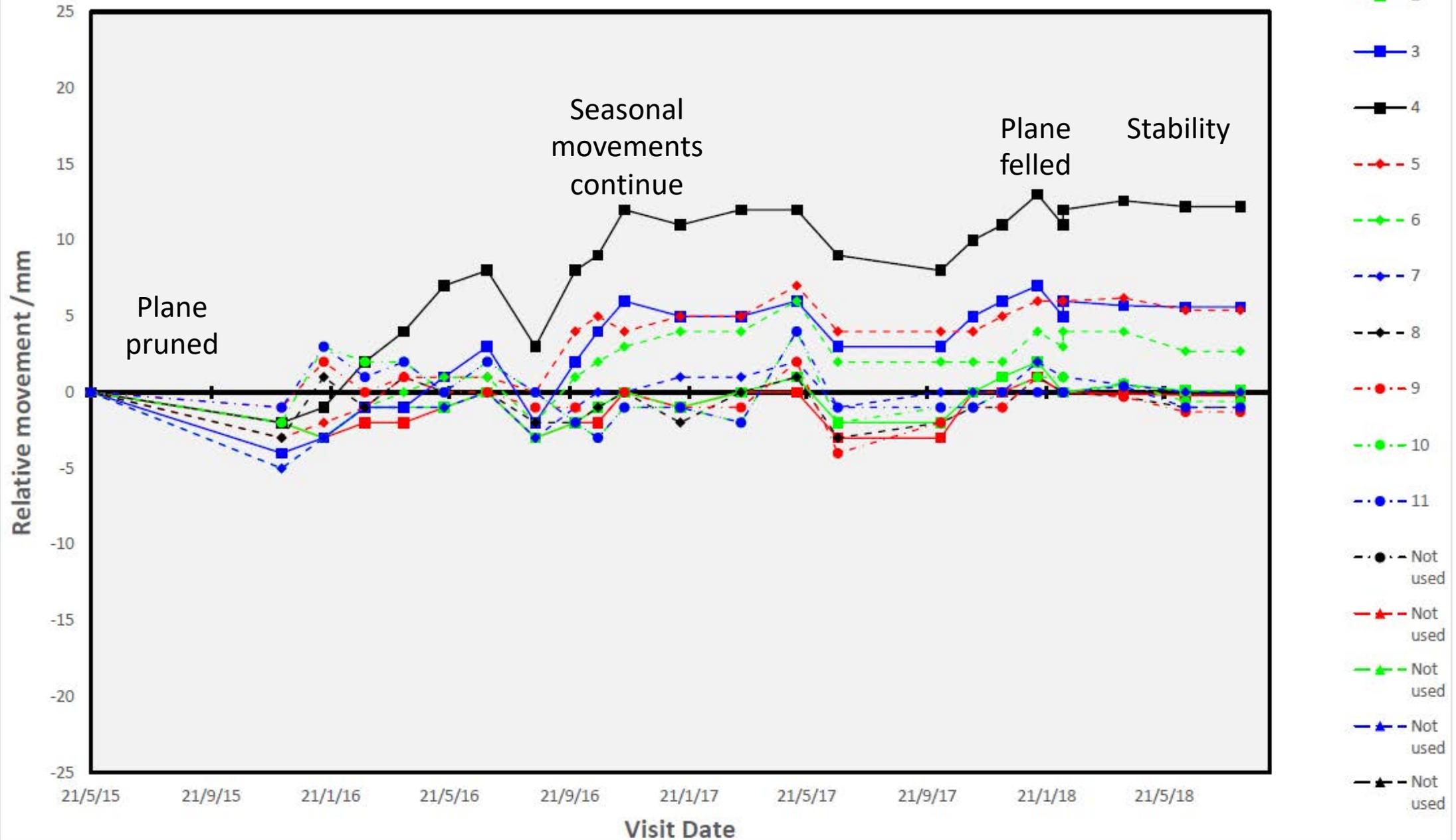




Photograph taken on  
11<sup>th</sup> November 2017



Level Monitoring - Movement relative to datum against Date







**Table 1****Current Claim - Tree Details & Recommendations**

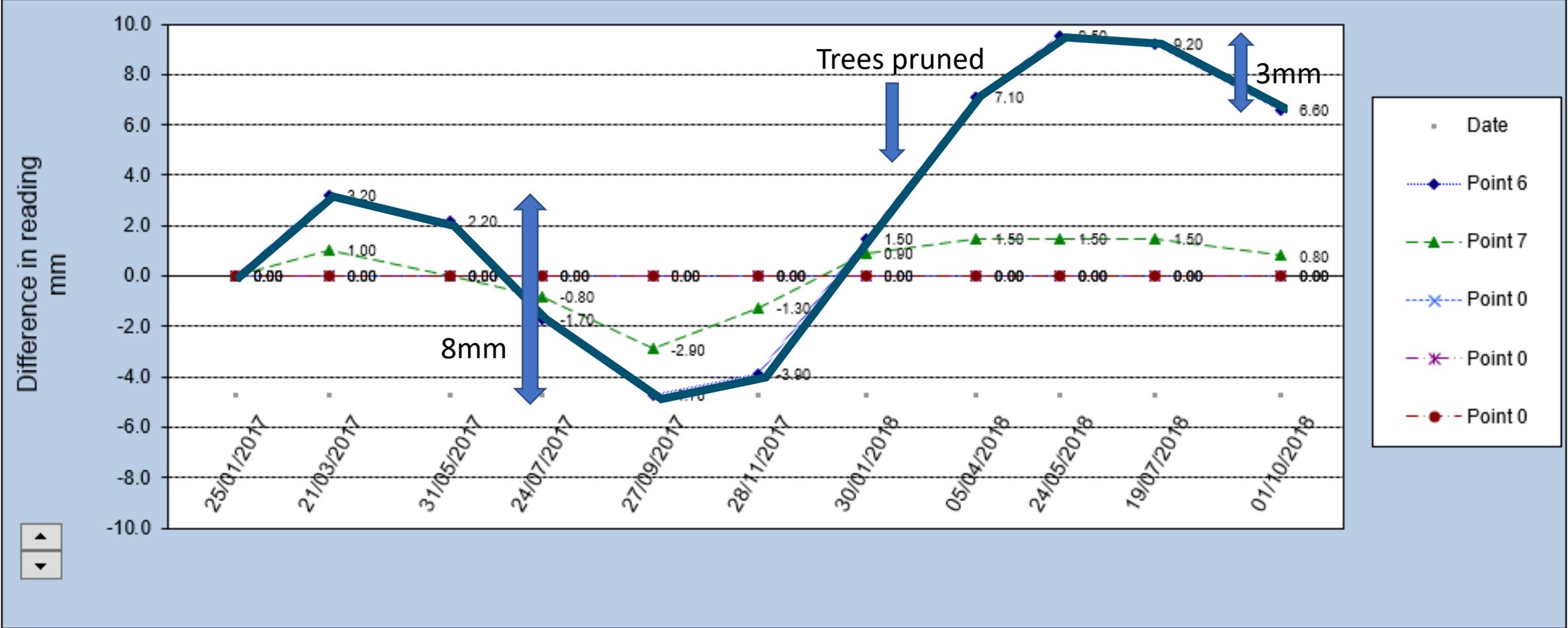
Tree No.	Species	Ht (m)	Dia (cm)	Crown Spread (m)	Dist. to building (m)	Age Classification	Ownership
T1	Cypress	9.6	35*	5.0-6.0	3.0	Younger than property	Policy Holder
Management history		Limited recent management.					
Recommendation		Remove to ground level					
G1	Lime x 4	13.0-15.0	M/S Av45*	20.0 linear	7.3.10.5	Older than property	Policy Holder
Management history		No evidence of significant recent management					
Recommendation		Remove 2no central trees to ground level and remove any re growth from the stumps as it appears. The remaining 2no outer trees should be reduced (pollarded) at 9.0m with re growth removed triennially.					

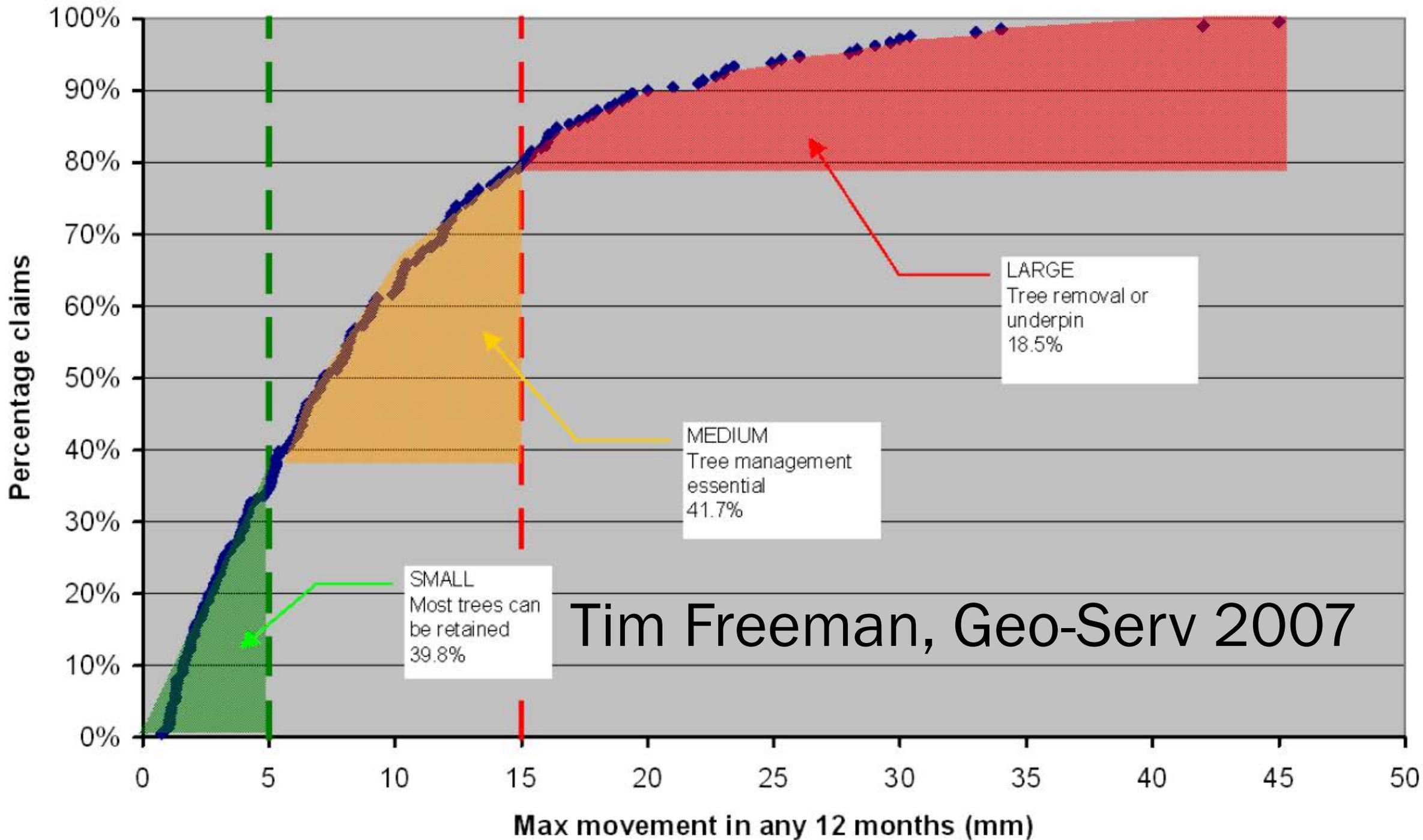
Ms: multi-stemmed

\* Estimated value



2





Tim Freeman, Geo-Serv 2007

# Conclusions:



Pruning can be used as a reasonable way of minimising risk and preventing first instance of subsidence: (30% linear crown reduction every two years).



Once subsidence damage has occurred pruning is not a consistently reliable means of mitigation.



However, if pruning rather than felling is desirable then 40 – 50% linear crown reduction is required.

Avoiding  
liability:

## Berent v Family Mosaic Housing and London Borough of Islington (May 2011)





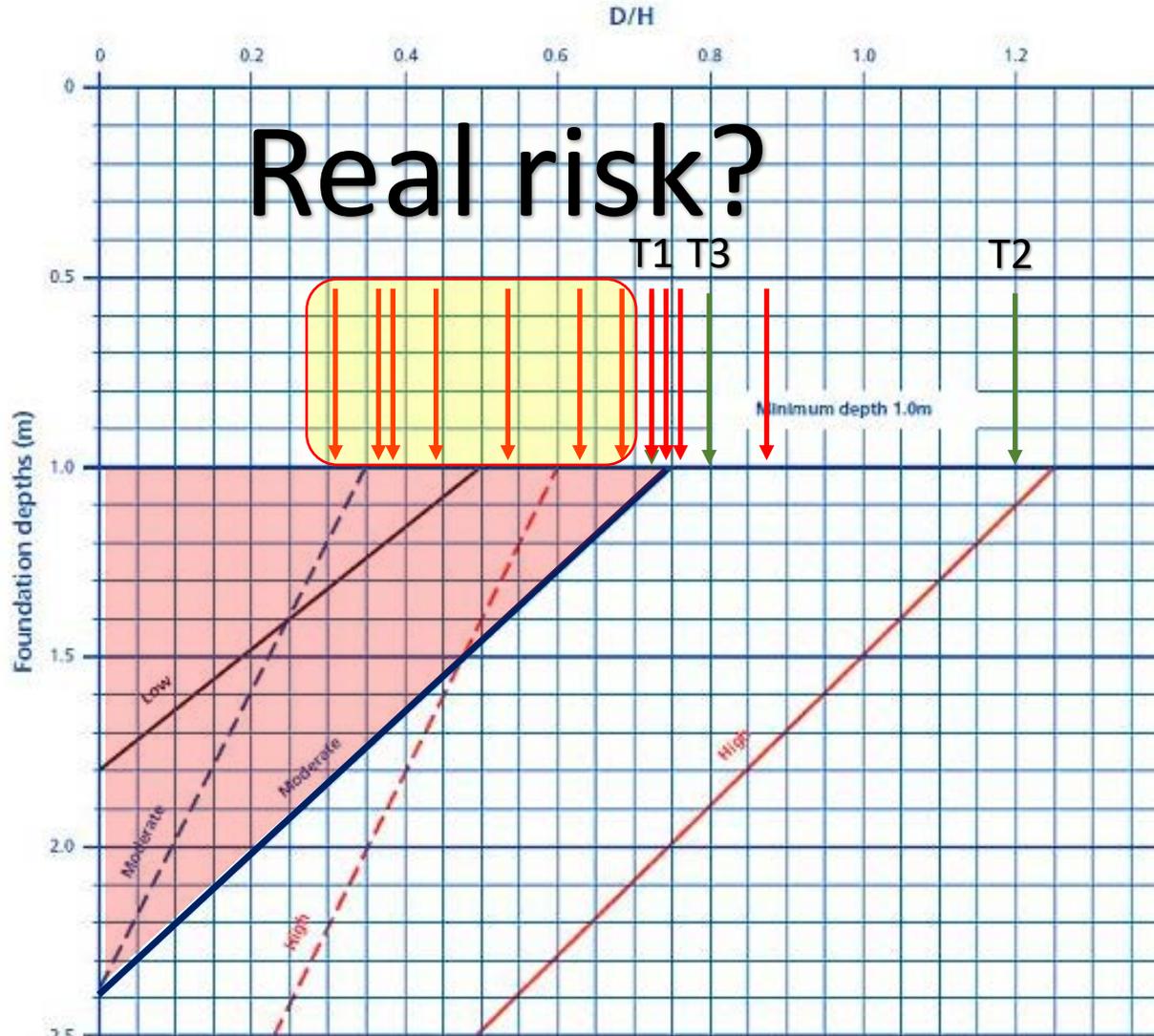
His Honour Judge David Wilcox:  
*‘The local authority I am satisfied had followed a prudent regime of tree management by pruning’.*

*‘There is no evidence to suggest that the council were uncooperative or were possessed of information that made a possible risk of damage a real risk.  
(Upheld at appeal).*

In the light of Berent what constitutes a real risk?



Chart 1 Soils with HIGH volume change potential: Modified Plasticity Index 40% or greater  
(see Design clause D5(b))



Tree number	Ownership	Location	H – height (m)	D – distance (m)	D/H
T1	Plane – Mosaic housing	Front left	17	12.2	0.72
T2	Plane – Islington	Front left	10	12.0	1.20
T3	Plane – Islington	Front right	15	12.0	0.80

# Patichis v L.B. Enfield

(Nov 2016)

The Judge considered that the tree was not in a subsidence 'hot-spot' despite the council having received 17 other claims within a 2 mile radius:

*'The Tree was no more of a risk than any of the other Norway maple trees in the Defendant's borough that were situated up to 6 meters away from pre-war housing stock built on London clay'.*



Norway maple

# Patichis v L.B. Enfield

(Nov 2016)

In regards to pruning to control the risk the judge held that

*'the risk of damage is such that it would be reasonable to do something about it, if something reasonable could be done'.*

Both experts agreed that the industry standard 30% linear reduction would have had no effect on subsidence risk.



Gurdwara  
v RBKC

Claim No: E20CL002  
(May 2019)



Indian bean  
tree

Turkish  
hazel

# Gurdwara v RBKC

(May 2019)

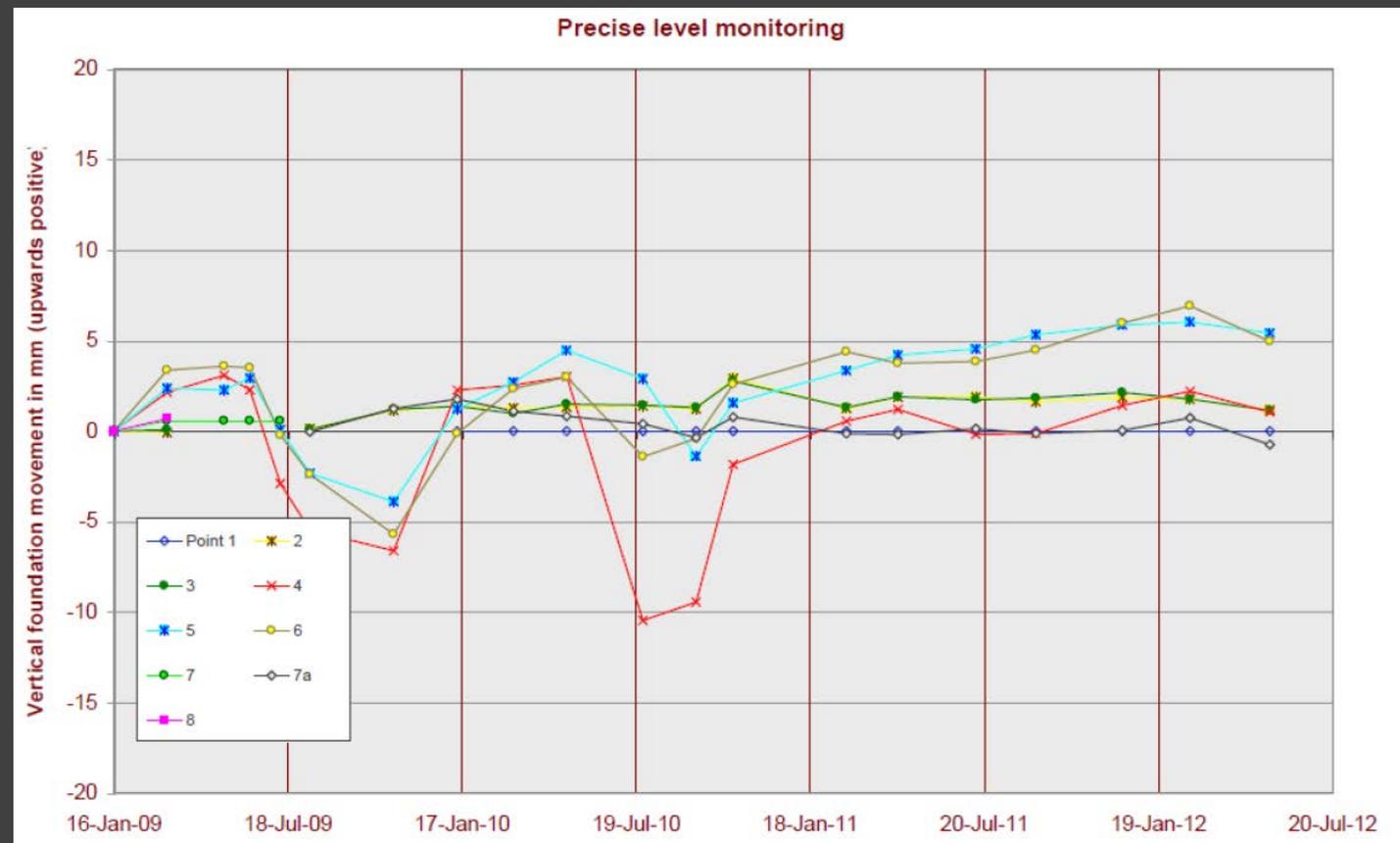
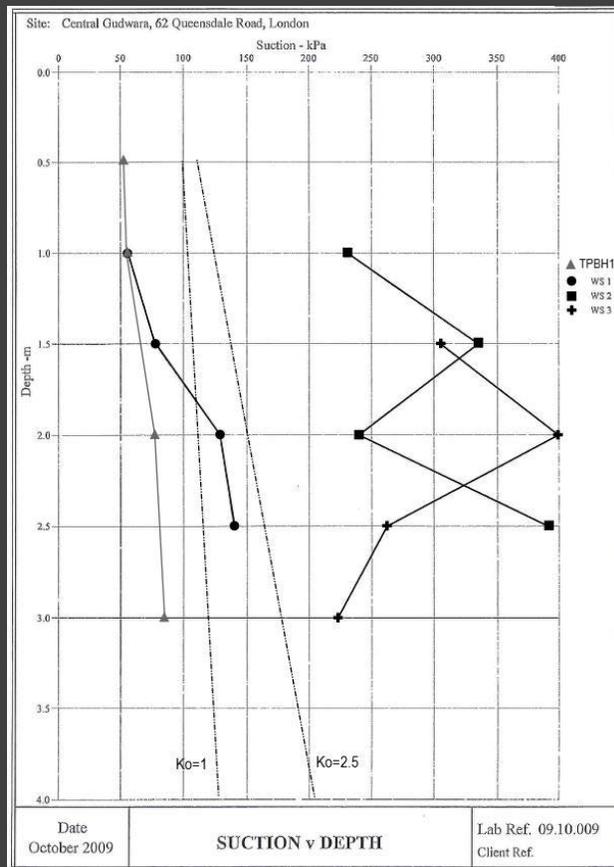
Substantial voids and loose fill below steps



# Gurdwara v RBKC

(May 2019)

Soil tests indicated significant desiccation and cyclical subsidence at the front of the steps



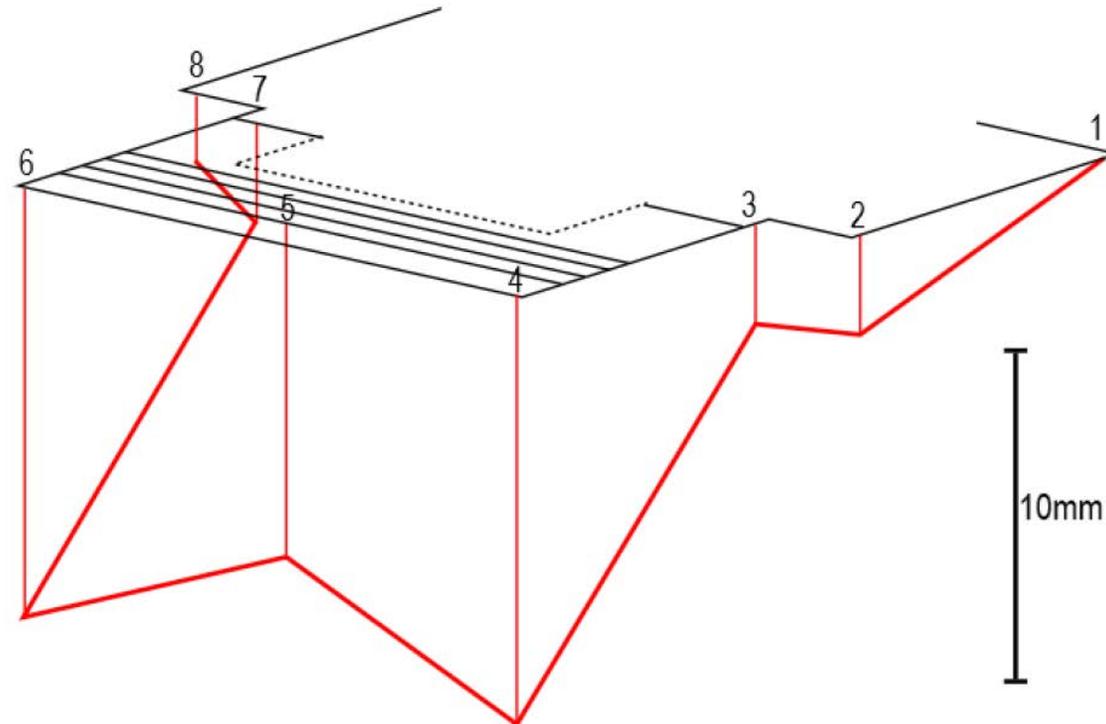
# Gurdwara v RBKC

(May 2019)

Direction of movement was down towards the front of the steps

**Figure 8.** Isometric sketch showing amplitude of subsidence movements at each monitoring marker.

The greatest movements were at the front closest to the trees.



Judgement on  
Gurdwara v RBKC  
Claim No:  
E20CL002  
(May 2019)



1. The material cause of damage was settlement rather subsidence;
2. Council records indicated 12 other subsidence cases within 500 m;
3. Judge ruled that only eight could be considered valid and the area thus did not qualify as a 'hot spot';
4. Indian bean tree and Turkish hazel no track record for causing subsidence;
5. Damage was not foreseeable to the Defendant.

# Judgement on Gurdwara v RBKC Claim No: E20CL002

(May 2019)

## Implications:

1. Claimant needs to demonstrate species is a frequent cause of damage
2. Claimant needs to demonstrate damage was in a known 'hot spot'

So, plant trees that have no track record of subsidence

Ginkgo



Liriodendron



Nothofagus



Kalopanax



Metasequoia



Paulonia

