Remote sensing of growth dynamics of Sitka spruce plantation forests in upland Britain

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ForestSAFE objectives

- Meta-database
- Forest Parameter Estimates
- Combined estimates
- Forest Change Detection
- Habitat mapping
- Web based dissemination tool

Aims

- Demonstration of operational use of remote sensing
- Appropriate data
- Understandable models
- Operational uptake issues

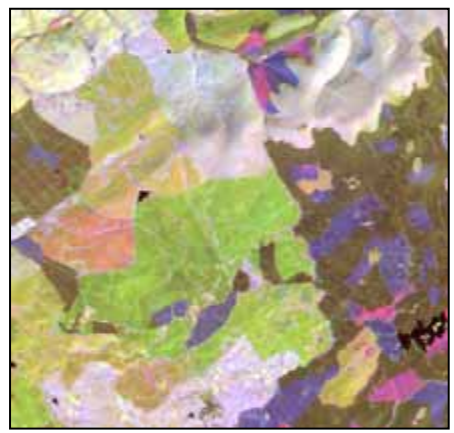
Monitoring Forest Change

1989

1995

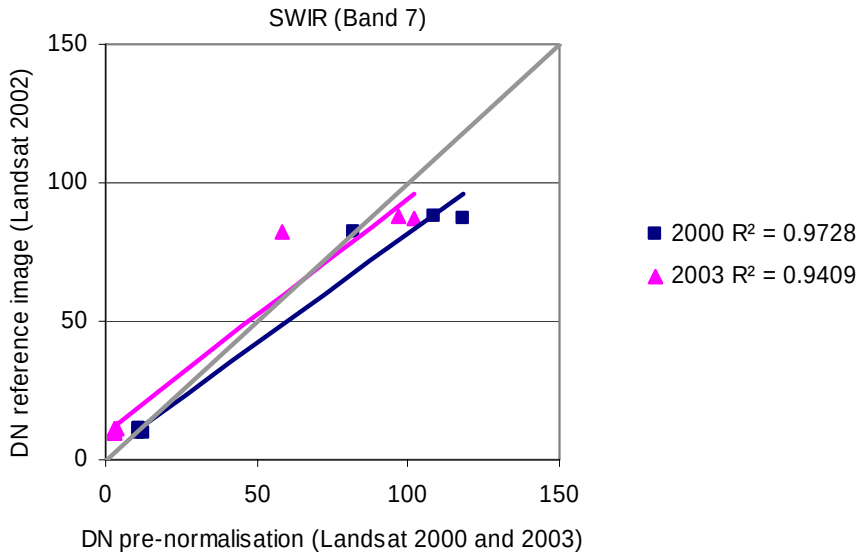
2001

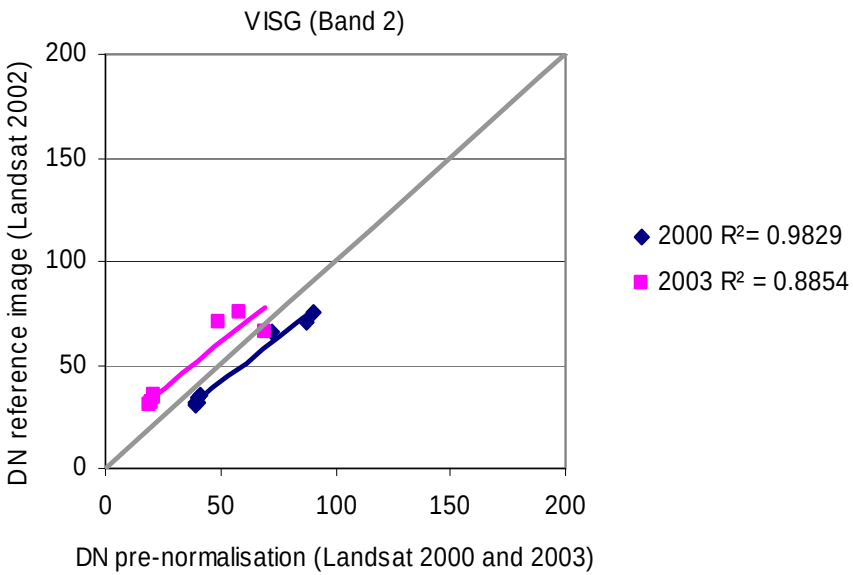
Change Image

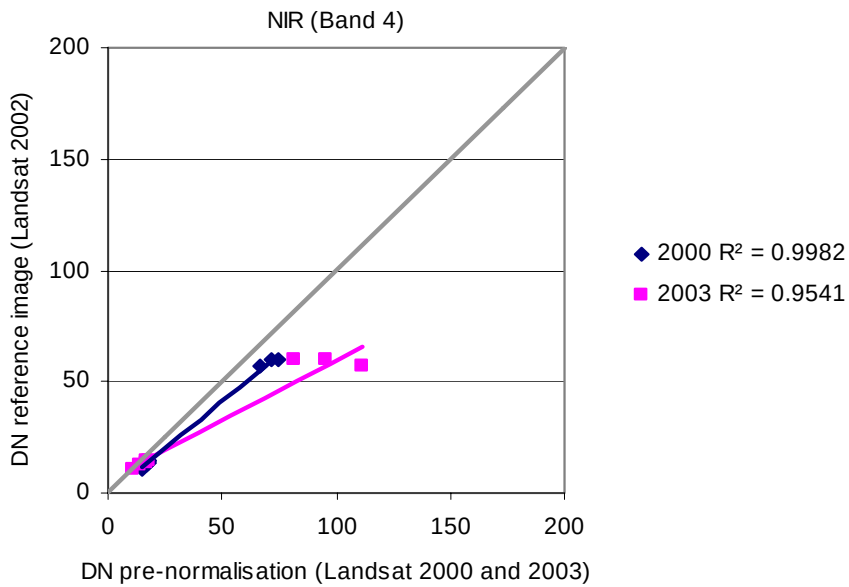


Product 3. Monitoring Forest Change

Radiometry

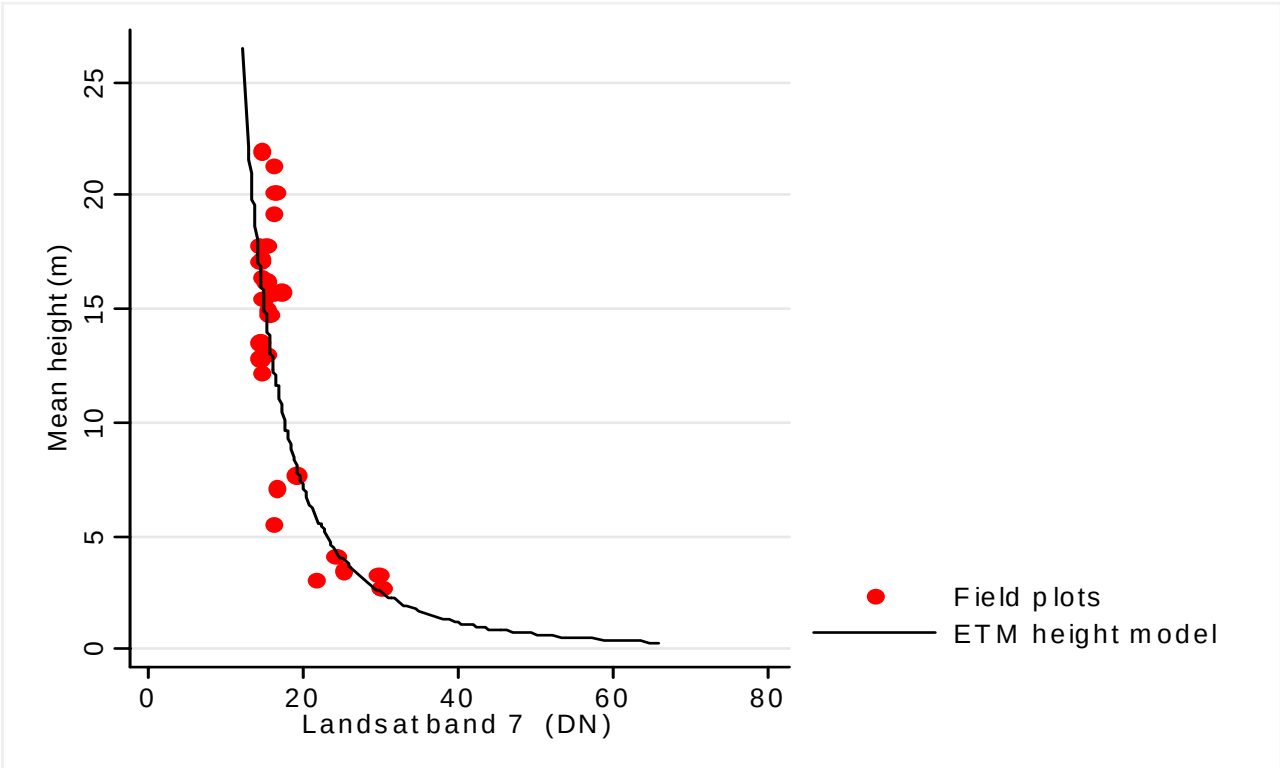

SWIR (Band 7)
DN reference image (Landsat 2002)
DN pre-normalisation (Landsat 2000 and 2003)
0
50
100
150
2000 R² = 0.9728
2003 R² = 0.9409


VISG (Band 2)
DN reference image (Landsat 2002)
DN pre-normalisation (Landsat 2000 and 2003)
0
50
100
150
200
2000 R²= 0.9829
2003 R² = 0.8854


NIR (Band 4)
DN reference image (Landsat 2002)
DN pre-normalisation (Landsat 2000 and 2003)
0
50
100
150
200
2000 R² = 0.9982
2003 R² = 0.9541

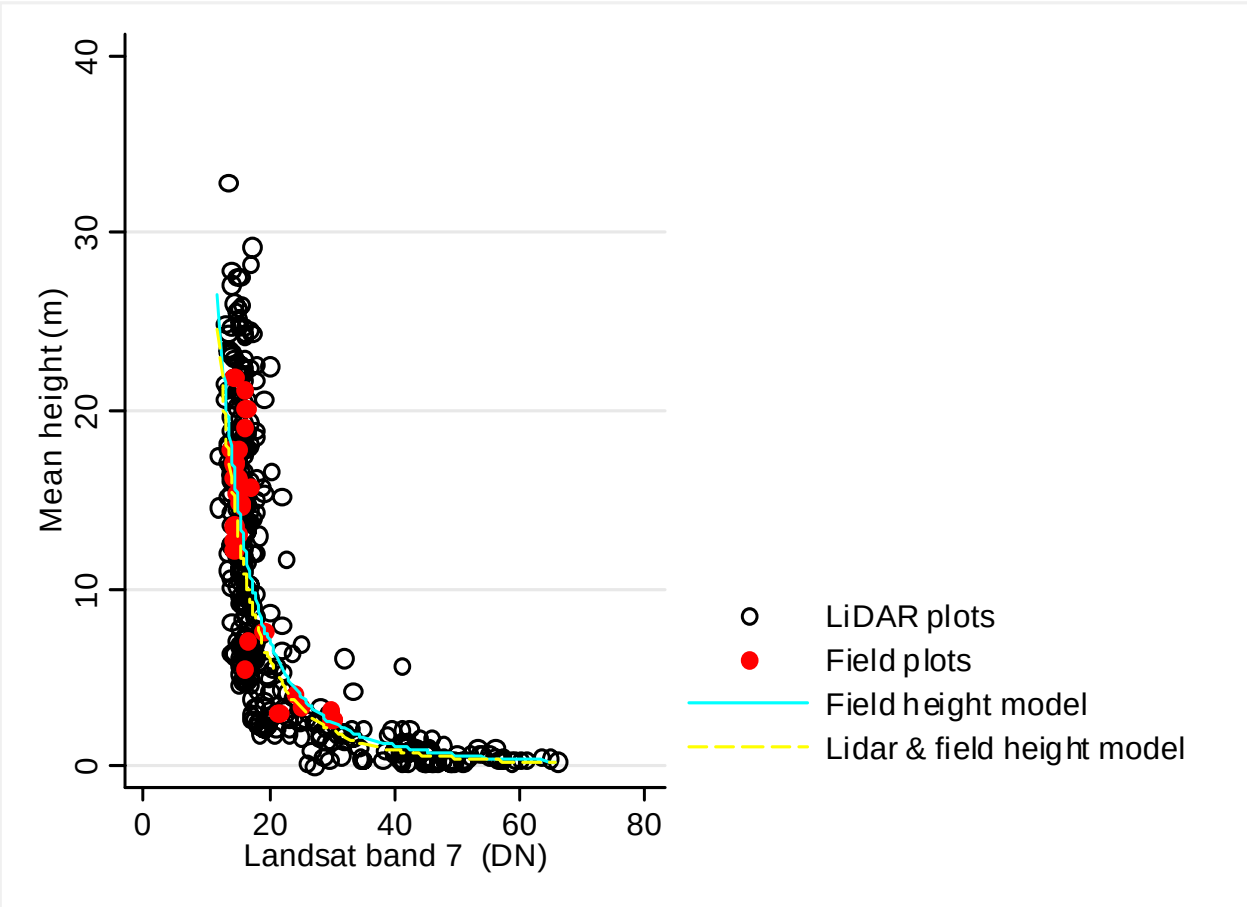
Height model

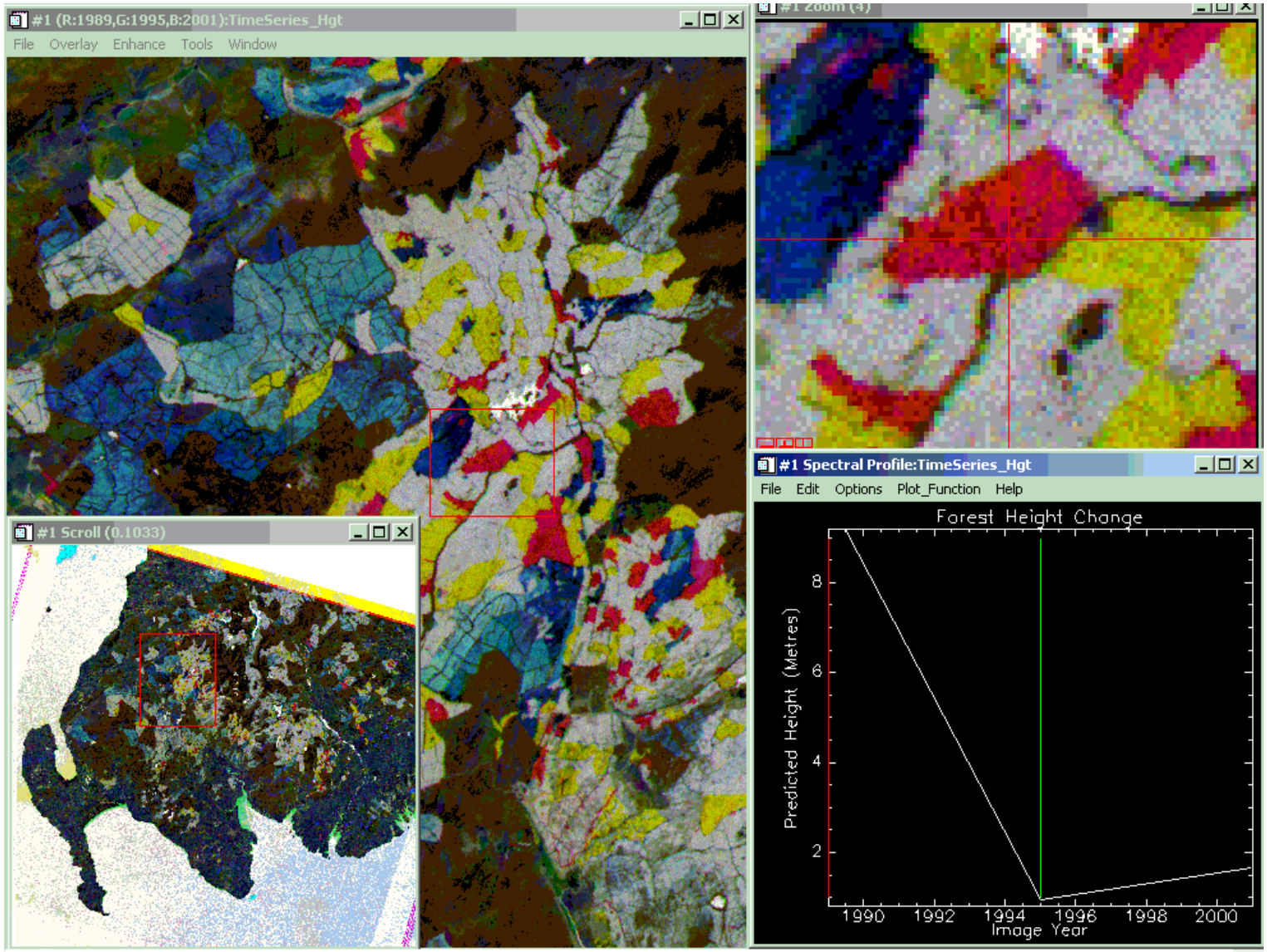
Model 1 (28 field plots) $R^2 = 0.80$



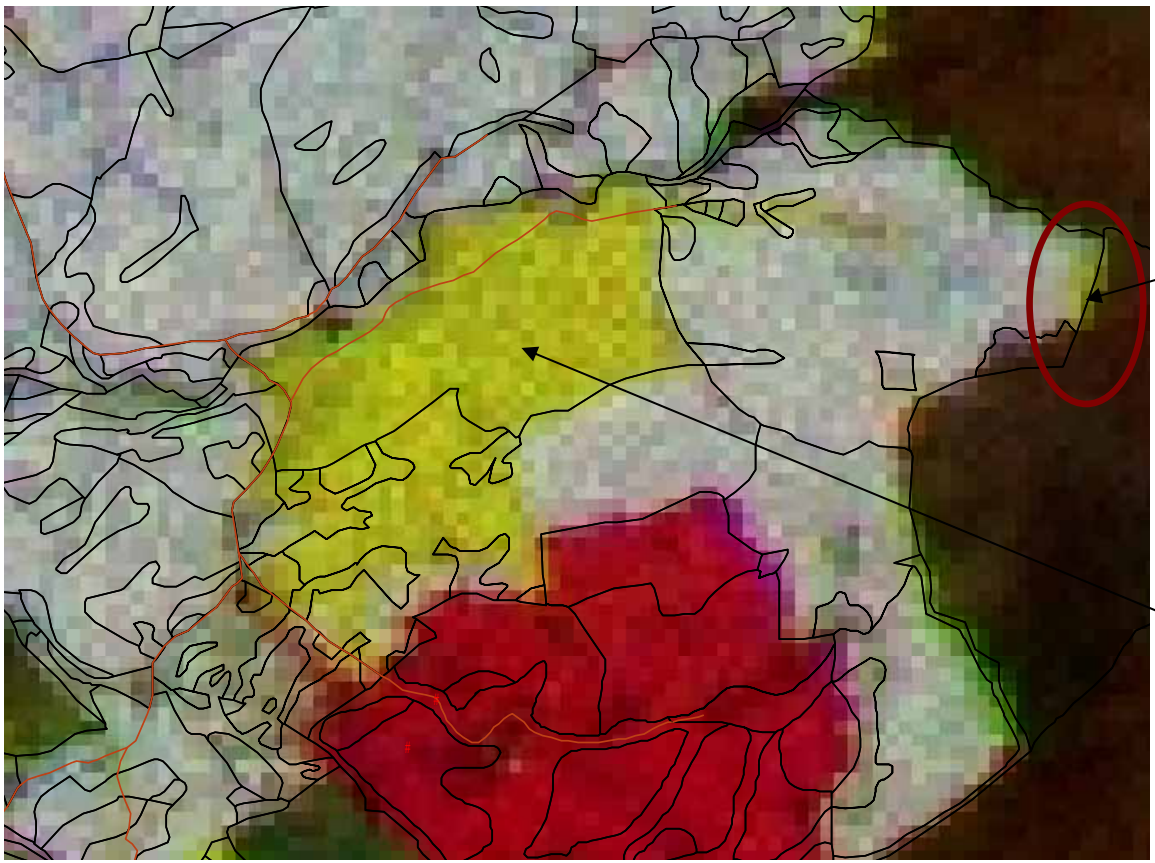
Field plots plus LiDAR extra plots

Models M1 n=28 R^2 = 0.80 : M2 n=438 R^2 = 0.80




#1 (R:1989,G:1995,B:2001):TimeSeries_Hgt
File Overlay Enhance Tools Window
#1 Scroll (0.1033)
#1 Spectral Profile:TimeSeries_Hgt
File Edit Options Plot_Function Help
Forest Height Change
Predicted Height (Metres)
2
4
6
8
1990
1992
1994
1996
1998
2000
Image Year

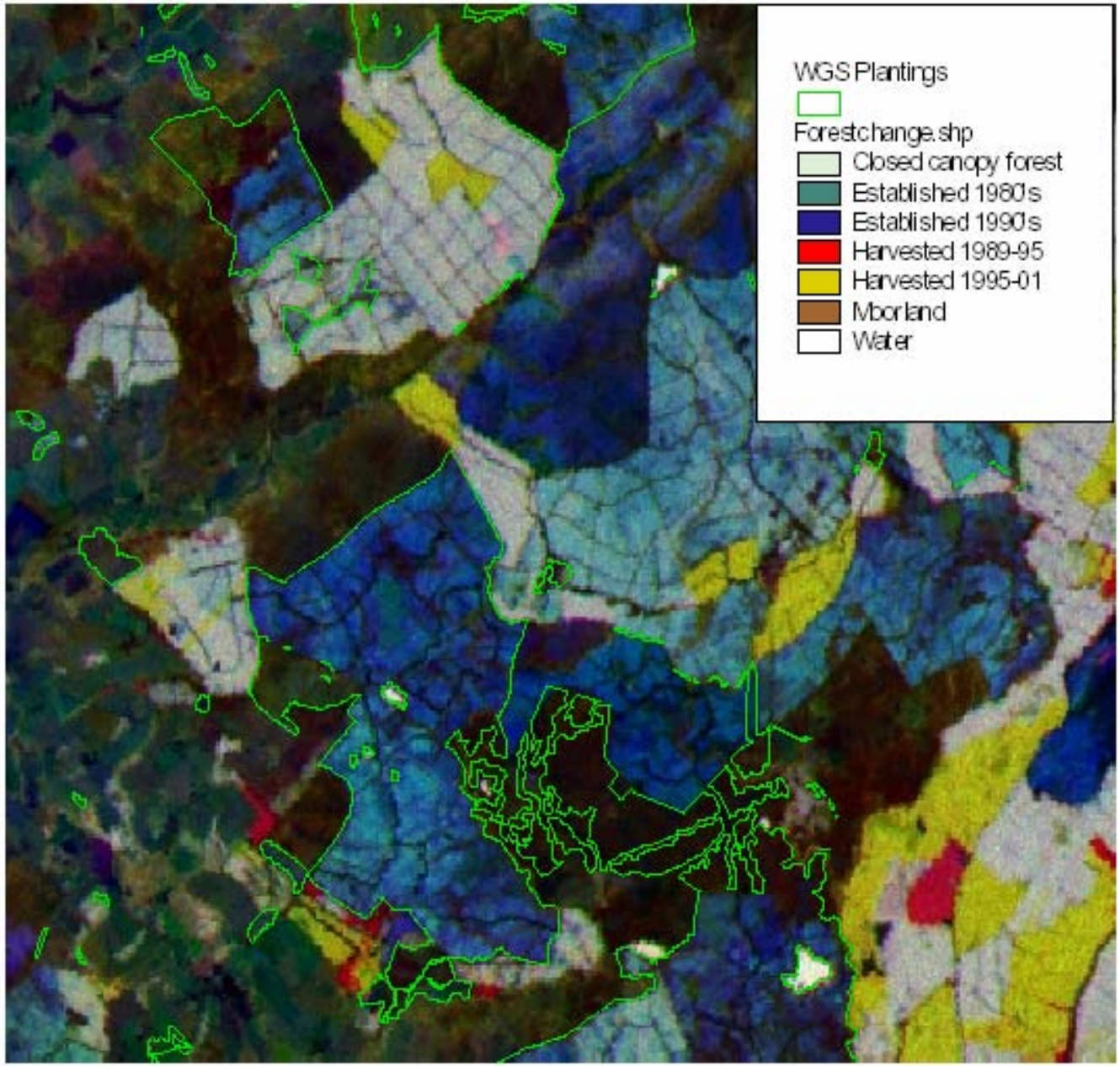
Monitoring Forest Change



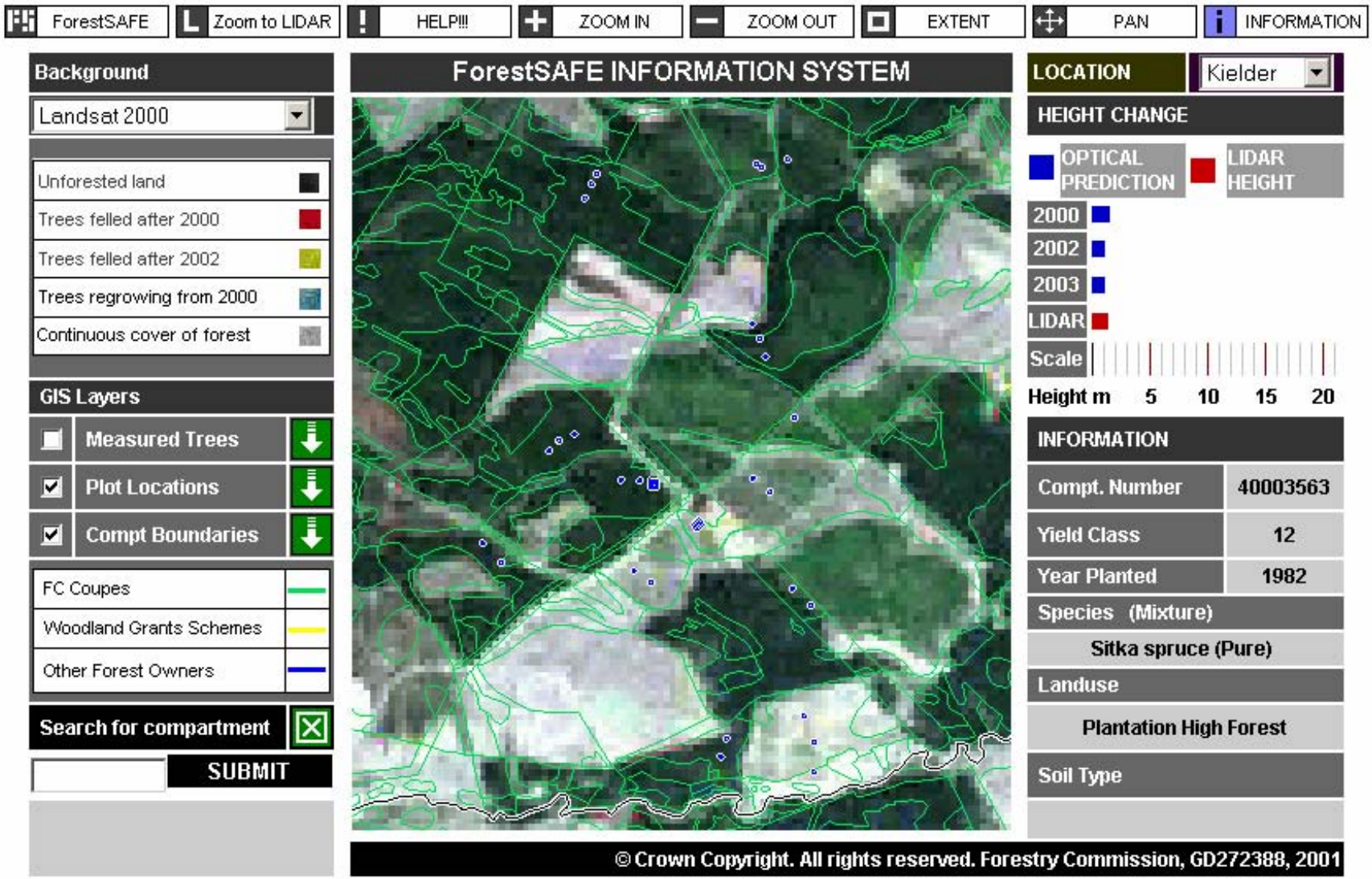
Windthrow

Forest Harvesting

Closed canopy 1989 -95 1995 -2001


WGS Plantings
Forestchange.shp
Closed canopy forest
Established 1980's
Established 1990's
Harvested 1989-95
Harvested 1995-01
Moorland
Water

On-line information system



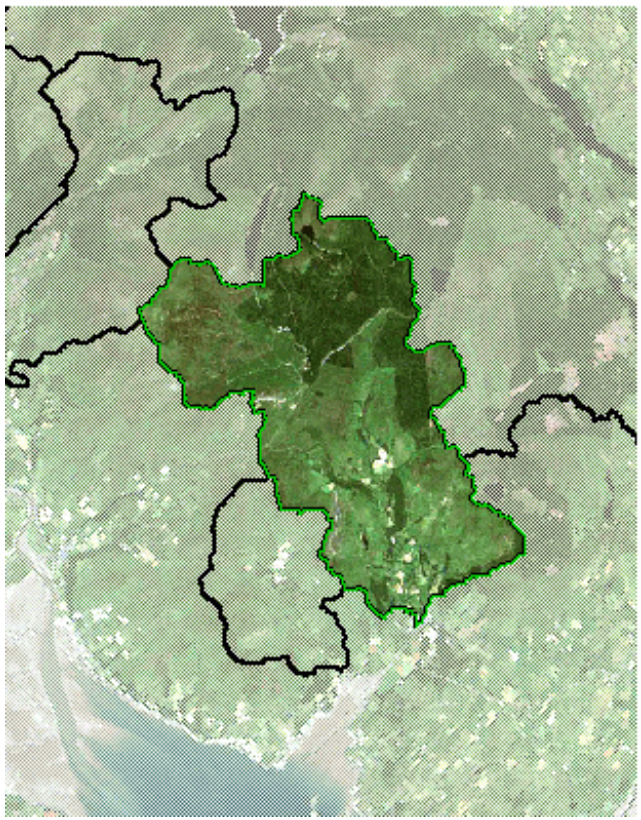
Areas of business use

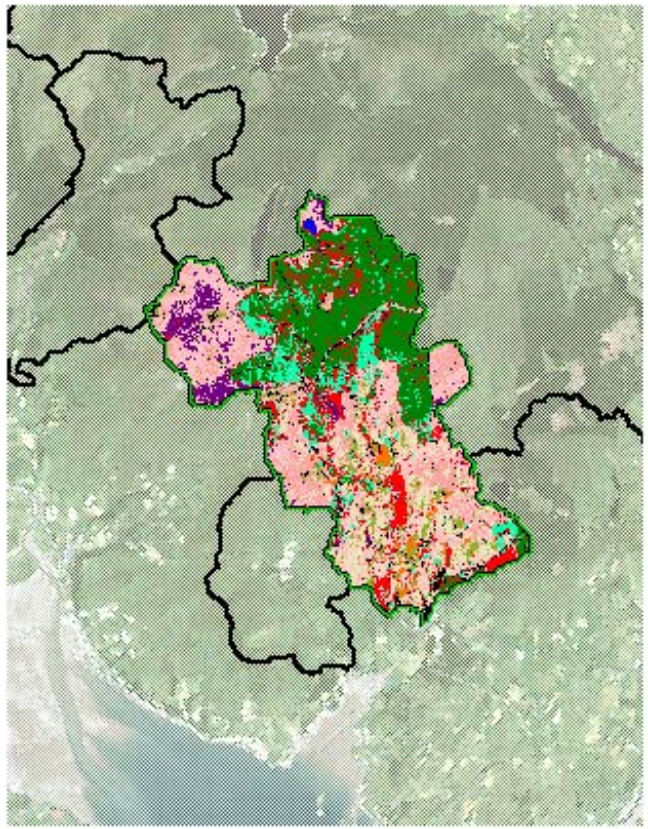
- Forest establishment monitoring
- Compliance checking e.g WGS
- Updating National Inventory of Woodland & Trees
- Forest harvesting monitoring

Summary

- Very few operational remote sensing applications
- Forest parameters more accurately mapped than field-based estimates?
- Accurate field survey => useful remote sensing predictions
- Not dependent only on Landsat imagery
- Products easily interpreted to give a rapid visual overview & quantitative structural information
- Methods work well for both private and state forests
- Effective for both first and second rotation forests

River basin management





Future development

- Expand to other species/mixtures
- Spin off products
  - Canopy closure maps
  - Input into river basin management plans
  - Wind/Snow damage assessments
- Evaluation with new sensors

ForestSAT 2005

31st May – 3rd June

focus on operational use of remote sensing

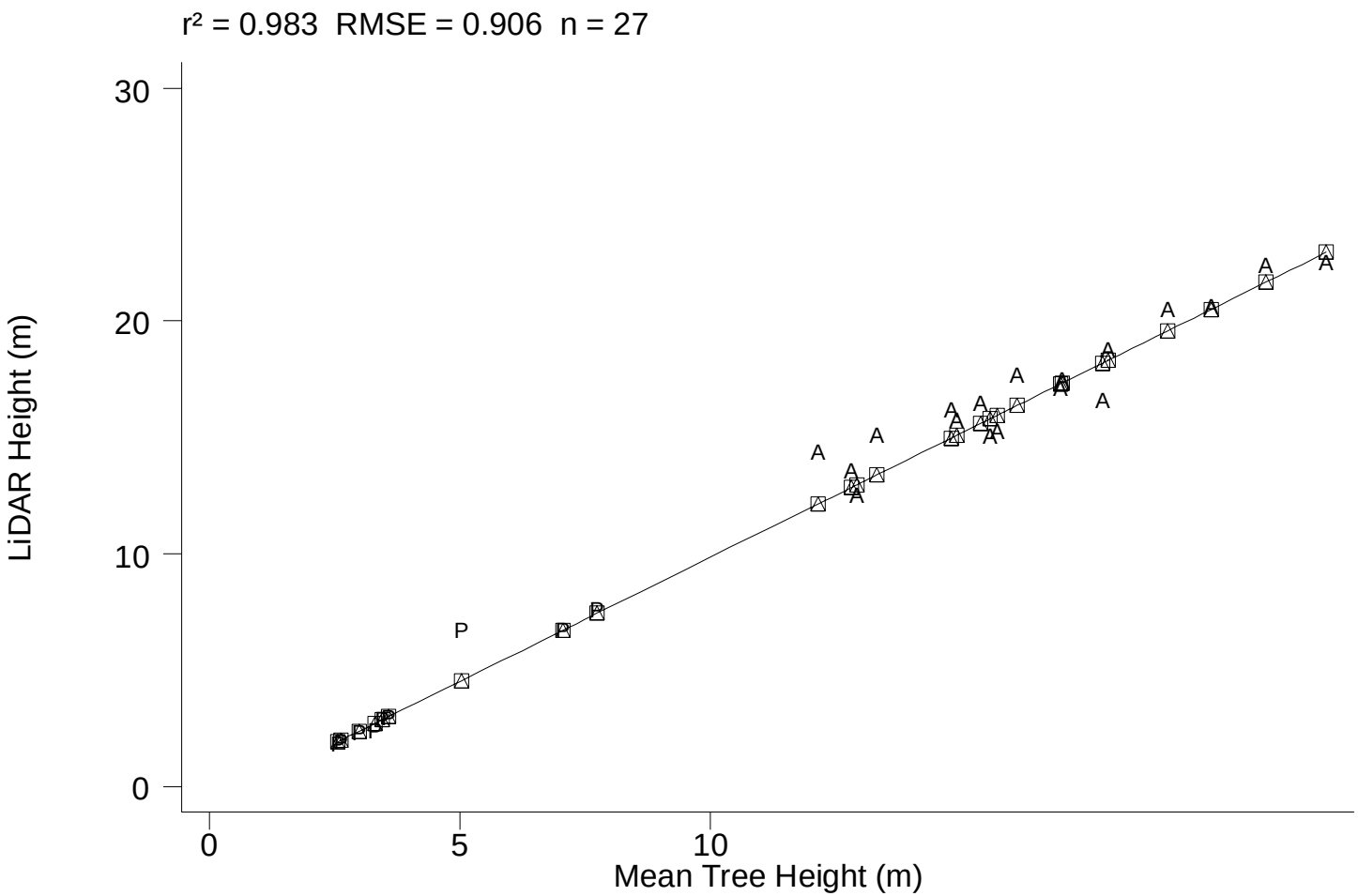
www.svo.se/forestsat2005

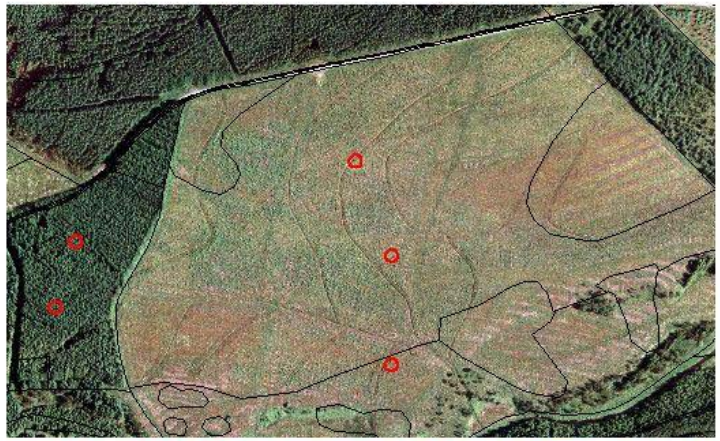
www.svo.se/forestsafe

BNSC BRITISH NATIONAL SPACE CENTRE

Forestry Commission

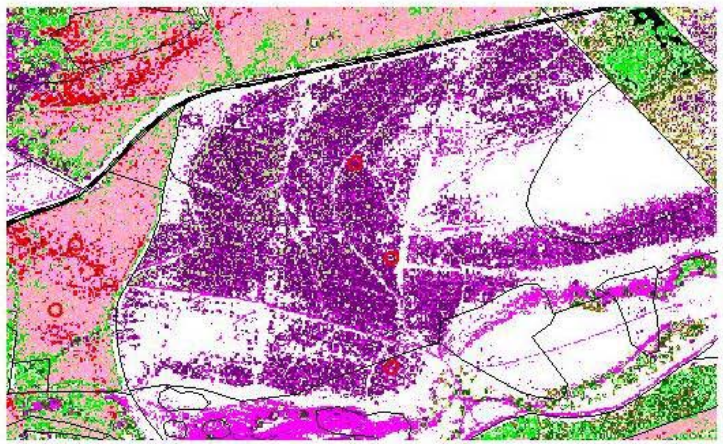
LiDAR height against mean stand height for Kielder test area





Sample Plots
Forest compartments
Forest roads
class A
Other Forest Roads

0 100 Meters



Lidar Height
0 - 0.49
0.5- 1.99
2 - 3.99
4 - 5.99
6 - 7.99
8 - 9.99
10 - 11.99
12 - 13.99
14 - 15.99
16 - 17.99
18 - 19.99
20 - 21.99
22 - 23.99
24 - 25.99
26 - 27.99
28 - 30
No Data

ETM 2002 Height Estimate
0 - 1.99
2 - 3.99
4 - 5.99
6 - 7.99
8 - 9.99
>10m (Canopy closure)
Cloud
No Data

www.geography.dur.ac.uk/ForestSAFE

www.sfcc.co.uk

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BNSC
BRITISH NATIONAL SPACE CENTRE

Life

Forestry Commission

FCC

The Scottish Fisheries Co-ordination Centre