Forest Research

# *Slowing the Flow at Pickering: Helping to Reduce Flood Risk*

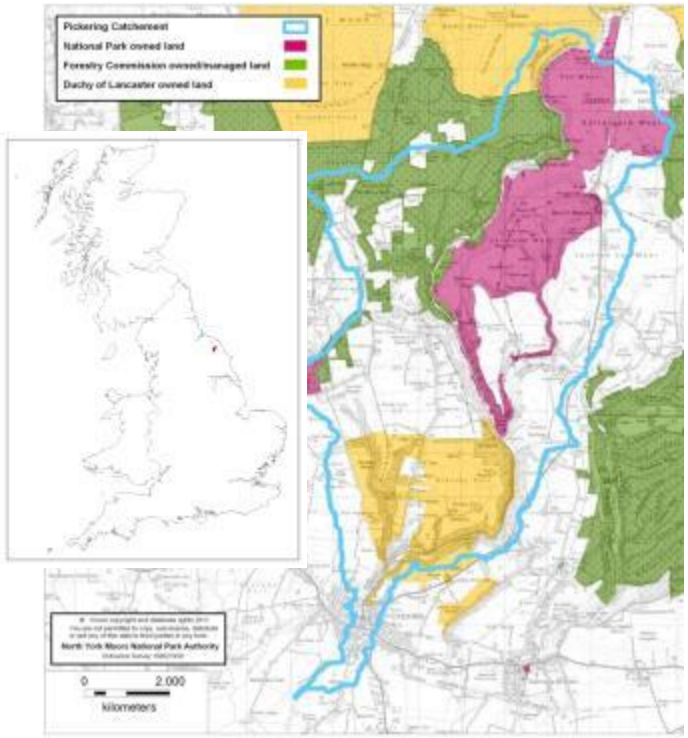
*Huw Thomas*

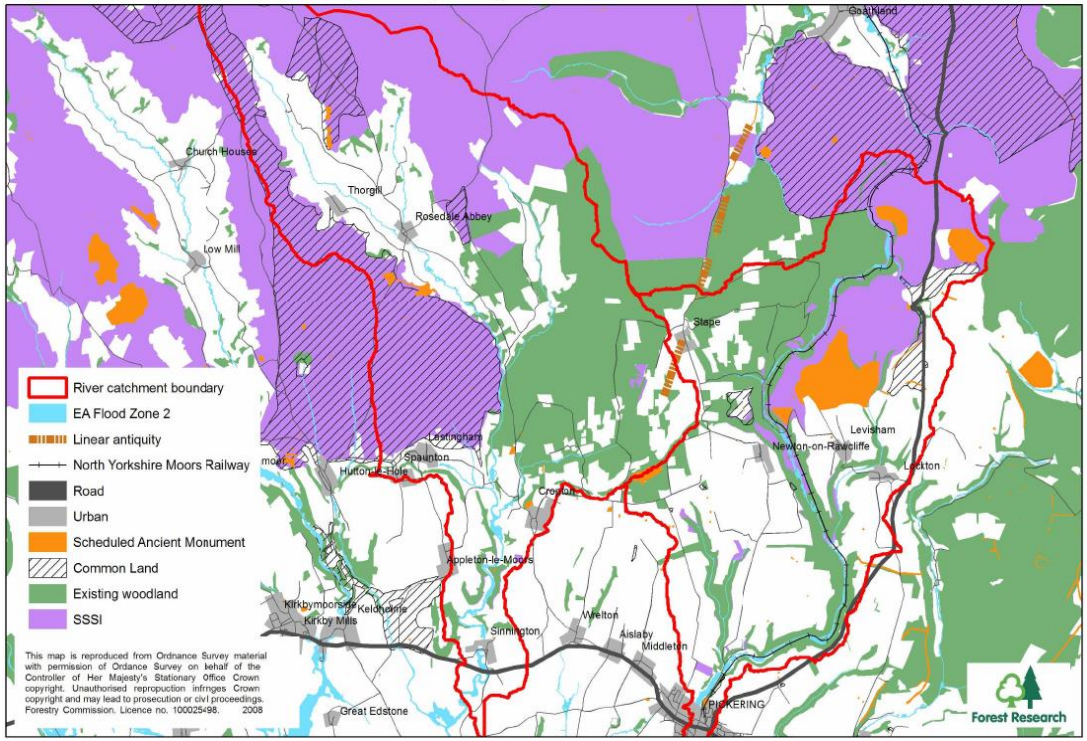
*Centre for Ecosystems, Society and Biosecurity*

*Partnership project: Forestry Commission, Environment Agency, Defra, NYMNPA, Natural England, Ryedale District Council, North Yorkshire CC, NYMR, Pickering Town Council, Sinnington Parish Council, Durham University*

# Background

**Aim:** To demonstrate how the **integrated** application of a range of land management practices can help reduce flood risk at Pickering (protect from 1 in 25 year event), as well as deliver wider **multiple benefits** for local communities.



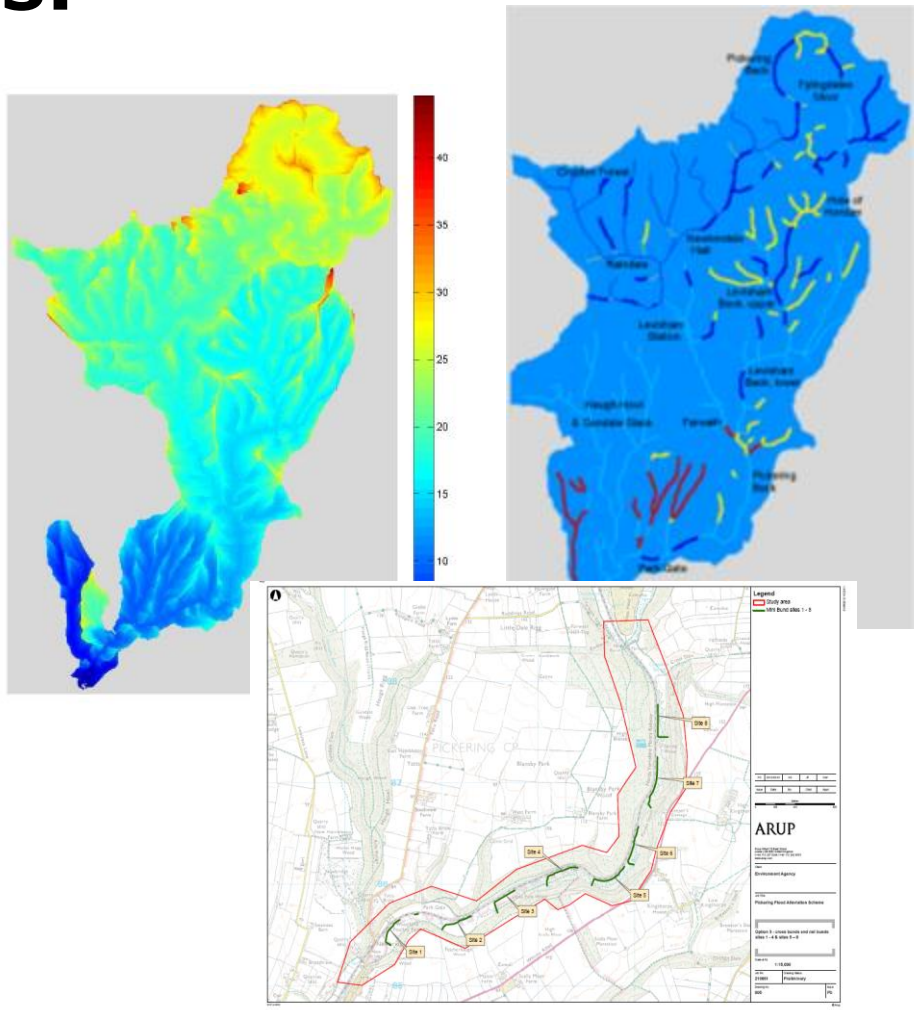



# Demonstration of 7 measures, funded by partners:

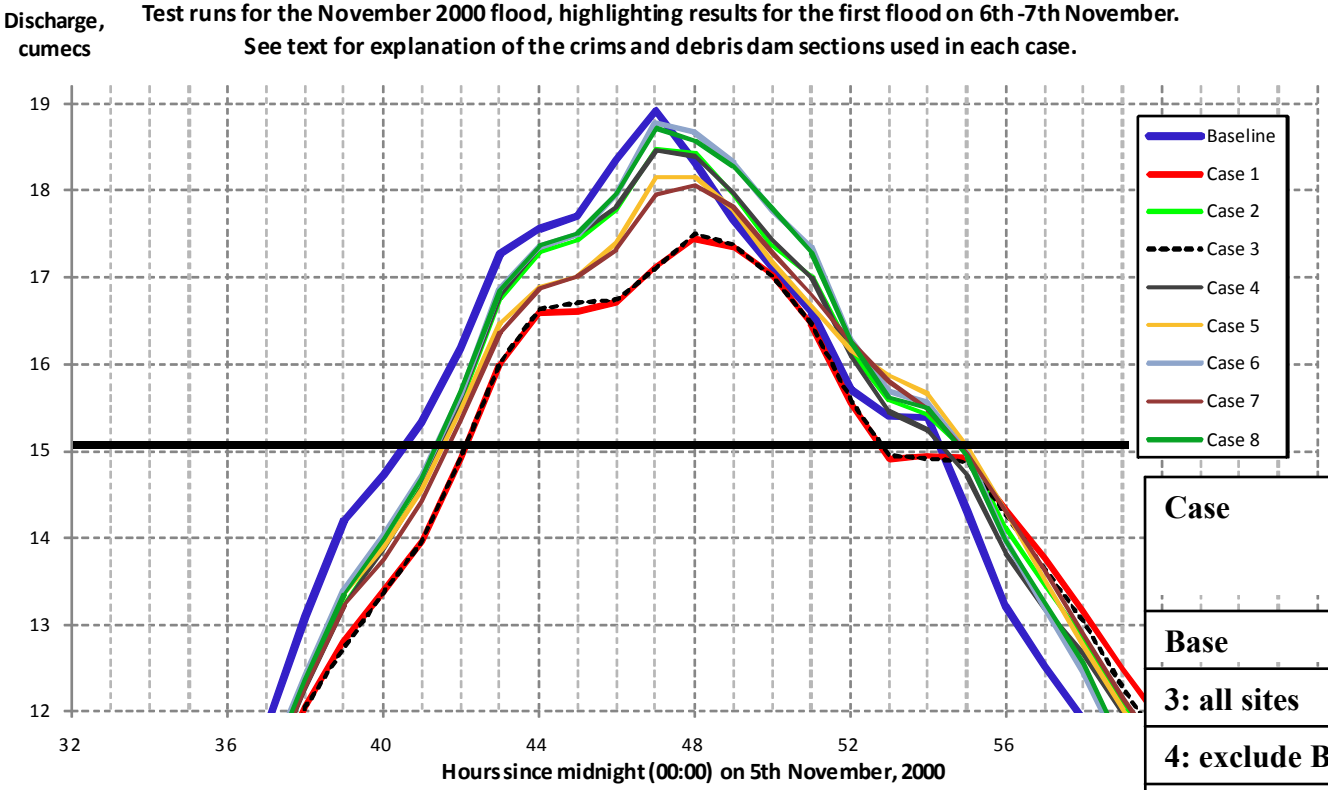
- Construction of low-level, earthen, flood storage bund (underway)
- Planted 25 ha riparian woodland
- Planted 25 ha farm woodland
- Constructed 175 Large Woody Debris dams
- Implemented sustainable forest drainage systems and reviewed felling plans
- Installed 130 heather bale check dams in moorland drains plus no-burn buffer zones
- Implemented a range of CSFDI measures

# Models used to optimise design and location of measures:

- Simplified, coupled, hydrological-hydraulic model developed by Durham University guided siting of woodland planting and LWD dams
- Use of 1d-2d ESTRY-TUFLOW hydraulic model and LiDAR data by ARUP to evaluate and optimise bund design and location



# Predicting impact of woodland measures on 1 in 25 yr flood:




| Case | Peak discharge, cumecs | Flood reduction 000s $m^3$ |
|---|---|---|
| Base | 18.9 | - |
| 3: all sites | 17.5 | 37 |
| 4: exclude Beck | 18.5 | 5 |
| 7: 100 lwd dams | 18.1 | 15 |

Planting 50 ha of riparian woodland and installing 100 LWD dams could reduce 1 in 25 year peak by 4% (21% of margin)

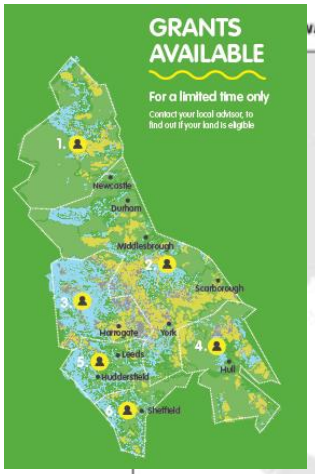
# Measures helping to hold back flood waters during flood events

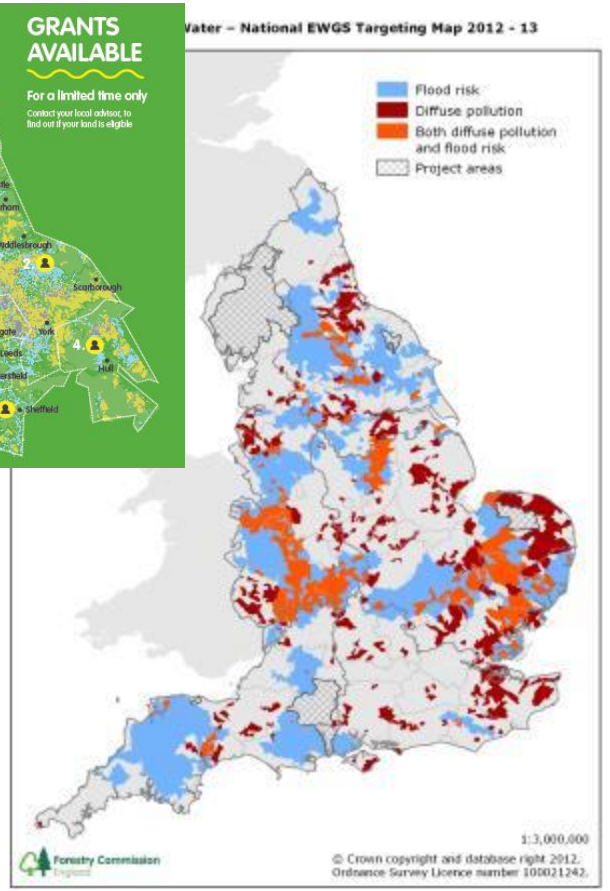
# Evaluating woodland services: indicative ecosystem service present values (£k at 2013 prices)

| | Low (£k) | Central (£k) | High (£k) |
|---|---|---|---|
| Habitat creation | £76 | £135 | £172 |
| Flood regulation | £105 | £190 | £275 |
| Climate regulation | £265 | £801 | £1,561 |
| Erosion Regulation | £0 | £3 | £6 |
| Education and knowledge | £0 | £1 | £6 |
| Community development | £0 | £17 | £64 |
| Agricultural production | -£136 | -£106 | -£17 |
| Forestry Costs | -£231 | -£174 | -£117 |
| **Net Present Value** | **£79** | **£866** | **£1,949** |

# Additional payment for woodland creation to deliver water benefits:

- English Woodland Grant Scheme offered an extra £2,000/ha;
- Applied to priority target catchments in England;
- Focus on addressing diffuse pollution and flood risk
- ~1,000 ha delivered in 2012-13 with another 1,200 ha under consideration.



# Conclusions

- Woodland creation can help to reduce flood risk and diffuse pollution, as well as provide benefits for carbon sequestration, biodiversity, landscape, recreation and timber
- Value of public benefits greatly outweighs cost but opposite is often the case for private landowners
- Enhanced rates of grant have helped to promote woodland creation for water but barriers still exist
- To be most effective, woodland creation needs to be carefully targeted - role for opportunity mapping
- Need long-term vision, plan and can do attitude!
- Need to continue with developing more targeted and integrated grant payments to secure service provision.