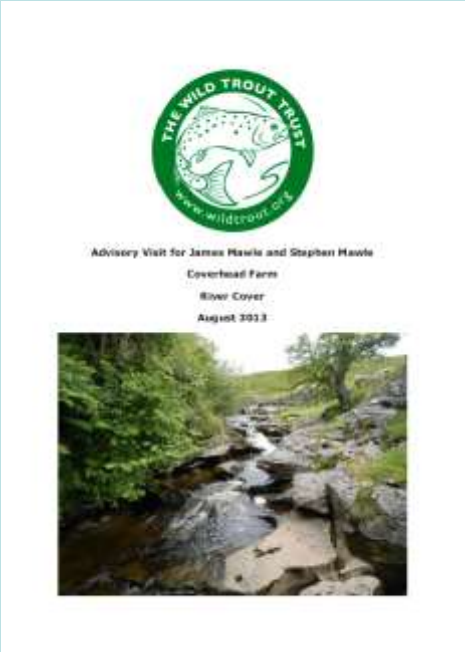
Renaturing upland vegetation and hydrology – excluding livestock grazing

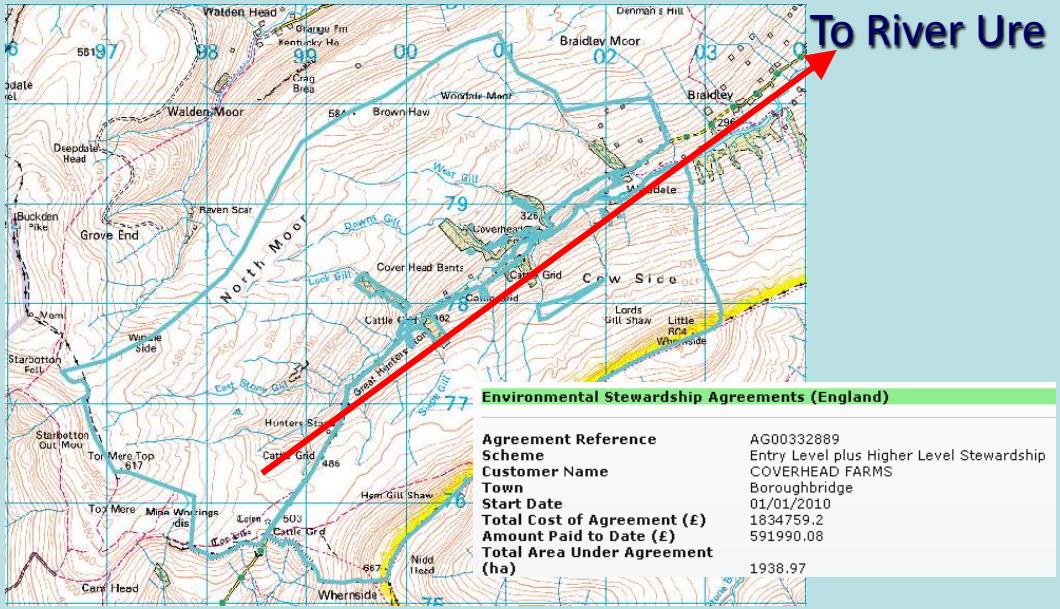
Mark Fisher & Richard Hart,
November 2013
Wildland Research Institute

River Cover – potential ecological improvements



Gareth Pedley, WTT

Coverhead Farm



Upper water catchment for River Cover

- Coverhead Farm is primarily a grouse moor
- Countryside Stewardship Scheme in 1999 - stock grazing decreased from 3000 ewes and 70 cattle, down to 350 ewes and 90 highland cattle. HLS followed on CSS
- 80-90% moorland grips now blocked
- moorland rejuvenating, with scrub and heathland regeneration creating habitat for a black grouse relocation program
- reduced stock density and grip blocking has attenuated peak river flows through better water storage on the moors
- river still impacted by sections of channel straightening, leading to bed scouring and bank erosion.

Long history of moorland grazing – bad for trout habitat

- significant lack of marginal trees and herbaceous vegetation along river's banks
- reduces availability of aerial and trailing cover along the river bank
- creates bank instability by reducing the diversity of root structure within the bank that would naturally protect
- reduces potential for creation and maintenance of deeper pools
- adult trout habitat needs deep water and aerial cover

simplified landscape -lack of trees and herbaceous vegetation from grazing

rocky outcrops restrict access to grazing livestock - diversity of shrubs and herbaceous vegetation

Where grazing stock is excluded along the river bank, there are numerous species of tree/shrub including willows, rowan, hazel, ash, alder, hawthorn, dog rose, along with ferns, meadow sweet, common knapweed and a wide range of other plants and grasses

Channel straightening ("cannalising") reduces salmonid spawning areas

•section of straightened channel showing the coarse boulder bed and lack of deeper water
•river channels were often moved or constrained (cannalised) to increase grazing areas

•straightening increases gradient and flow velocities, reducing sediment deposition, and retention of gravel and smaller cobble substrates required for salmonid spawning
•reduces pool formation around bends and thus habitat diversity
•prevents high flows from spilling out onto the floodplain to relieve extreme erosive forces
•shortens the length of river, leaving a channel dominated by large cobbles and boulders, and a lack of deep water

Recommendations from the Wild Trout Trust

Erect buffer fencing for stock exclusion

- fence along a naturally sinuous section, with much habitat diversity
    - deep and shallow sites downstream of existing well treed and vegetated areas, which form a seed and propagules bank
- don't fence where realignment is possible

Tree planting once buffer fencing installed

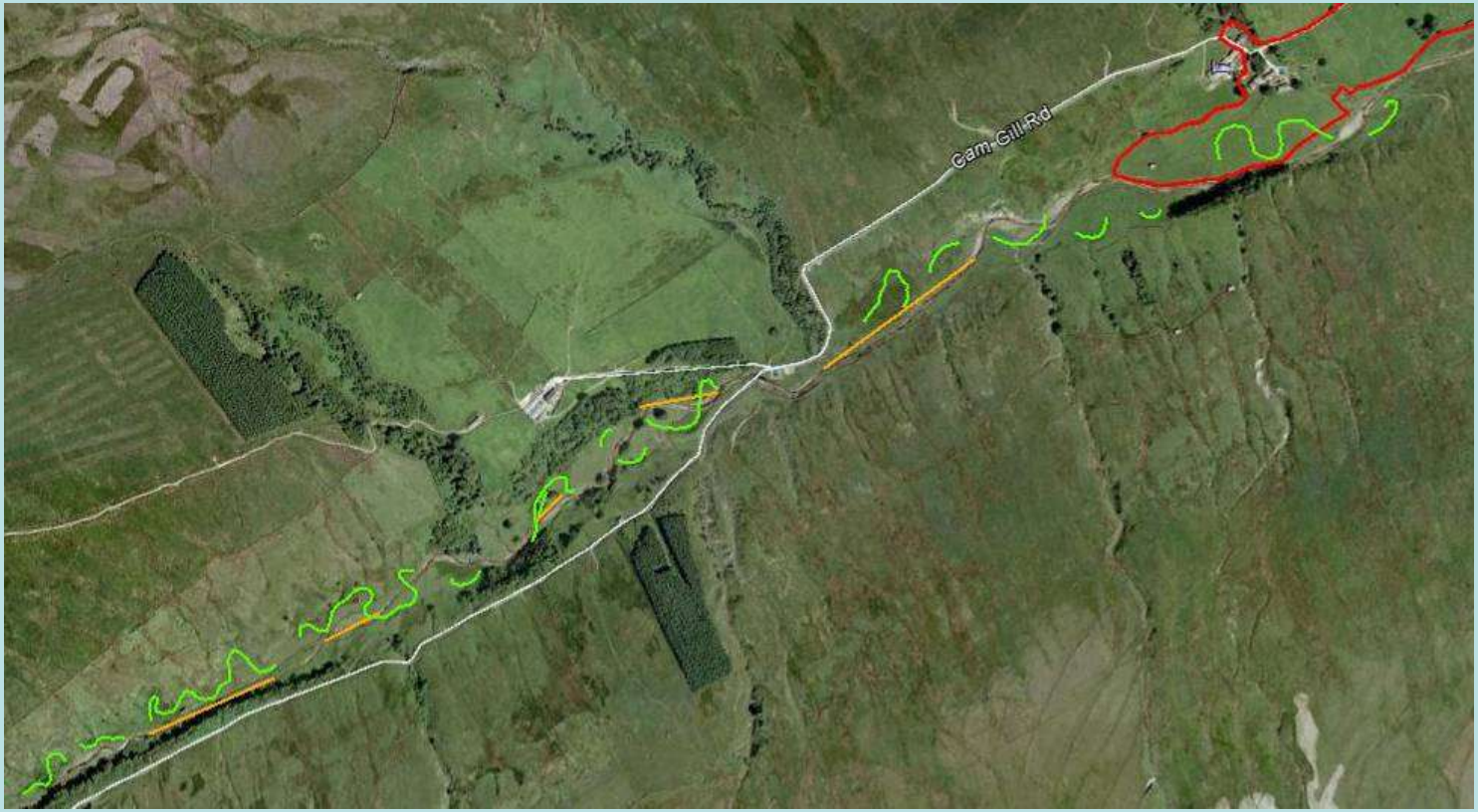
- plant in patches along the river bank and adjacent areas of the floodplain avoiding areas with potential for channel realignment
- targeted tree planting to provide important cover around the riffles and discrete pools that already exist
- redirect flows by planting discrete clusters on the waterline along straighter sections

Benefits of trees once established

- bankside trees provide shade, and low, trailing cover
- leaves provide a natural input of nutrients to the river, increasing productivity through additional food for detritivorous invertebrates that are eaten by other invertebrates and fish – TROPHIC CASCADE

Channel realignment – return the river to a natural, sinuous course

- realignment will reinstate natural erosional and depositional features, creation of pools and riffles
- simple trenching , berming, and vegetation banking could achieve gradual reinstatement



Natural course (light green) straightened channel (orange) farm boundary (red)

Vegetational renewal and hydrological improvements - examples of livestock exclusion in the uplands of Cumbria and Yorks

Livestock exclusions monitored by applications to the Planning Inspectorate to enfence areas in upland commons

Improving native diversity and hydrology, mitigating downstream erosion and flooding

Caldbeck Common (Burblethwaite, Charlton Gill, Roughton Gill), Cumbria - January 2008
Rishworth Moor Common, West Yorkshire - May 2008
Saddleback Common, Cumbria - July 2008
Mungrisdale Common, Cumbria - July 2008
Hartley Fell, Cumbria – March 2010
West Stonesdale Moor, Muker, North Yorkshire - February 2011
"conserve the common as gill woodland planting which would help reduce soil erosion and water run off downstream, resulting in the reduction of erosion/deposition and flood alleviation at the River Swale near Muker"
Bampton Common, Cumbria - February 2011
Brackenthwaite Fell, Cumbria March 2011
Skirwith Fell, Cumbria - September 2011
Langstrath & Coombe Fells, Cumbria June 2012

Protect woodland regeneration or planting

Milburn & Blencarn Commons, Cumbria – June 2005
Baugh Fell Common, Sedbergh, Cumbria – June 2006
Whernside Great Allotment, Cumbria – November 2007
Bowscale Common, Cumbria - July 2008
Ivelet Moor and Pasture, North Yorkshire- February 2011
Blencarn Fell Common and Kirkland Fell Common, Cumbria – Septemebr 2011
"the fences were necessary to protect three separate blocks of woodland (largely newly planted) from damage by grazing stock"
Skirwith Fell, Cumbria - September 2011
Glenridding Common, Cumbria – November 2011

Overgrazing

Westernhope Common, Durham – December 2009
Whelpside, Cumbria - August 2011
Abbotside Common, Richmondshire April 2011
Armboth Fell, Cumbria - August 2011
"exclude stock from a particularly degraded area of heathland and improve the condition of that part of the SSSI"
Blencarn Fell Common and Kirkland Fell Common, Cumbria – September 2011

Langstrath and Coombe Fells, Cumbria

The Planning Inspectorate

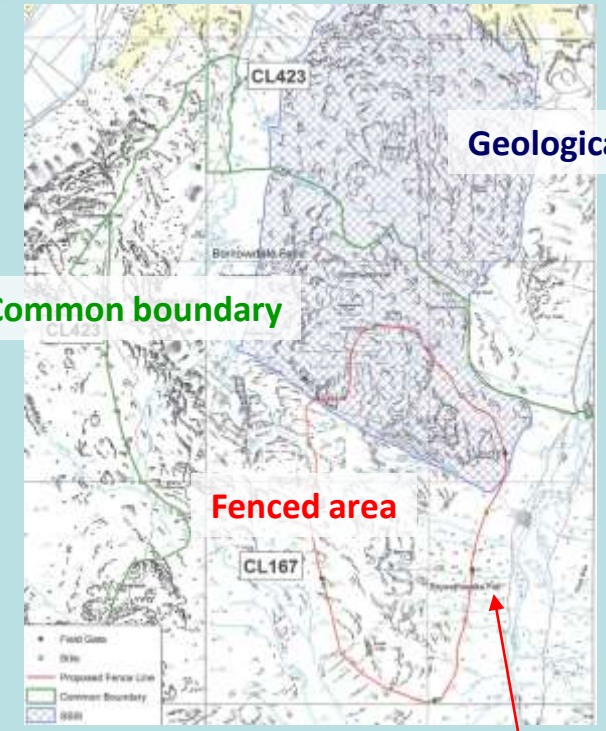
Application Decision

by Richard Holland

Appointed by the Secretary of State for Environment, Food and Rural Affairs

Decision date: 21 June 2012

Application Ref: COM 333
Langstrath and Coombe Fells, Cumbria
Register Unit No: CL 167
Commons Registration Authority: Cumbria County Council



- Common owned by National Trust
- seven grazing rights holders registered over the common
- HLS requires creation of areas of sparse woodland to enhance biodiversity
- fencing is to exclude sheep from 74ha so that new woodland is protected

Nature Conservation

14. The purpose of the fencing is to protect scattered newly planted trees and naturally regenerating trees from grazing stock. The primary reason for the tree planting is to prevent future soil erosion and downstream flooding by reducing the rate of water run-off into Borrowdale (a valley prone to flooding) and reducing the quantity of sediment reaching Bassenthwaite Lake. However, the applicant has advised that woodlands made of scattered trees also provide habitats for many different bird species along with food shelter and nesting materials. The trees will be a major contrast to the surrounding landscape, which will contribute to the biodiversity of the site.

- prevention of quick run off, reducing flooding further downstream
- creation of habitat for birds

Blea Rock with South Wall and Black Wall in background

Brackenthwaite Fell, Cumbria

The Planning Inspectorate

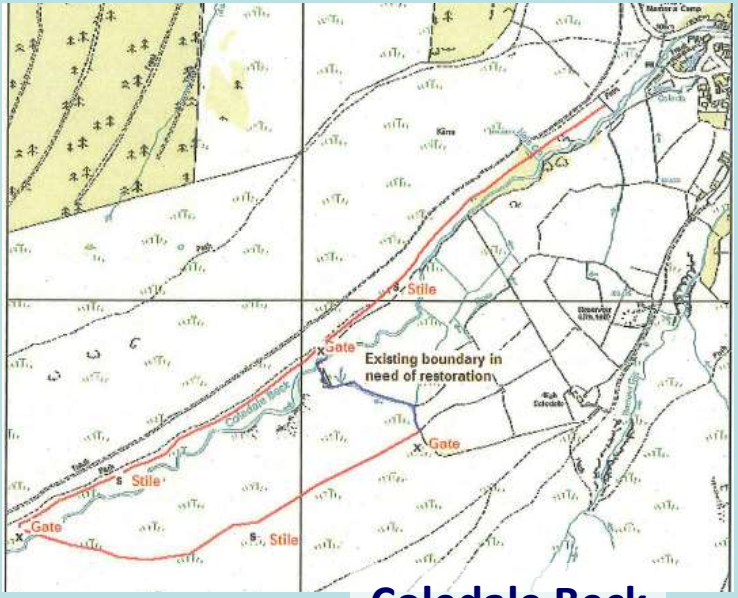
Application Decision

by Gina Warman

Appointed by the Secretary of State

Decision date: 10 March 2011

Application Ref: COM 187
Brackenthwaite Fell, Cumbria
Register Unit: No.CL 11
Registration Authority: Cumbria County Council



Coledale Beck

- National Trust owned common heavily grazed by sheep
- Coledale Beck severely eroded - several major landslips
- large amounts of sediment washed into Bassenthwaite Lake resulting in high levels of phosphates
- sediment risk map identified highest sediment supply risk rating for Coledale
- restoration of mire vegetation on the upper slopes and woodland regeneration on the lower slopes would help to reduce water run-off
- woodland restoration would increase diversity and provide habitat for breeding birds, merlin and ring ouzel

- **sheep excluded by fencing off 29ha**
- **4,000 trees - aspen, willow and alder - planted in drifts along two miles of the Beck**

University of Cumbria

Students helping to plant trees along the beck

Glenridding Common, Cumbria

The Planning Inspectorate

Application Decision

by Richard Holland

Appointed by the Secretary of State

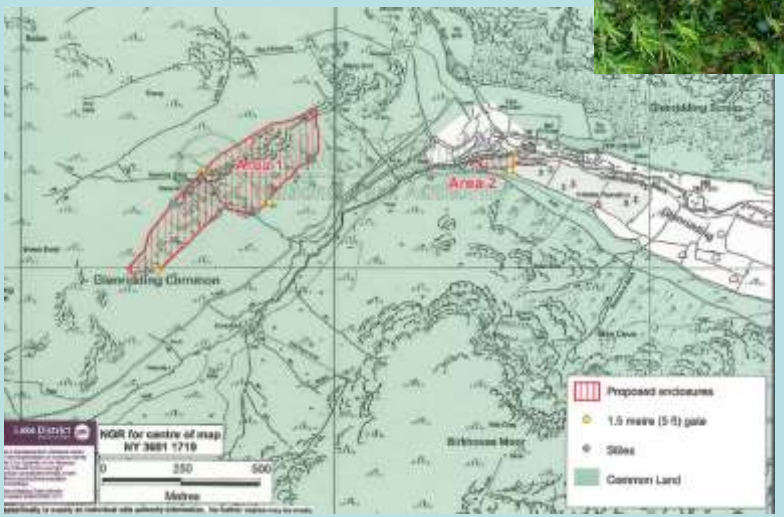
Decision date: 7 November 2011

Application Ref: COM 250

Glenridding Common, Cumbria

Register Unit: No. CL 101

Registration Authority: Cumbria County Council



- two graziers with registered rights on common owned by Lake District National Park
- one of the largest areas of juniper in the Lake District, dominated by bushes suffering dieback from old age
- juniper could be lost from the common as very few young vigorous bushes - regeneration often grazed off by sheep

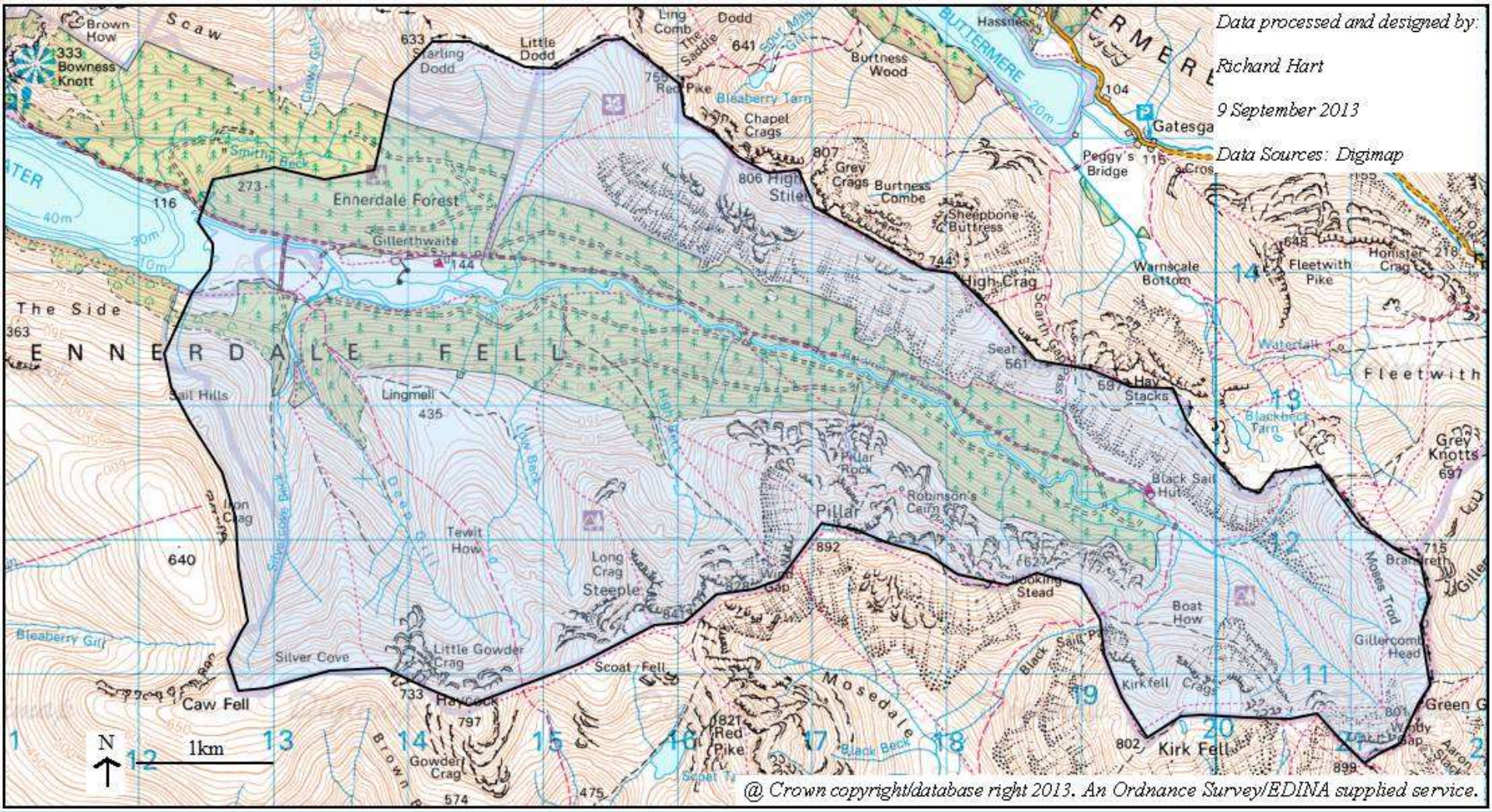
Area 1 – 14ha fenced off to exclude sheep so that juniper seedlings survive. Juniper also be planted with varying density

Area 2 – fenced off and planted with juniper and native woodland, extending a habitat corridor and improving connectivity of woodlands

Area 1 – juniper bushes suffering age-related dieback across the stand


The River Liza, Ennerdale

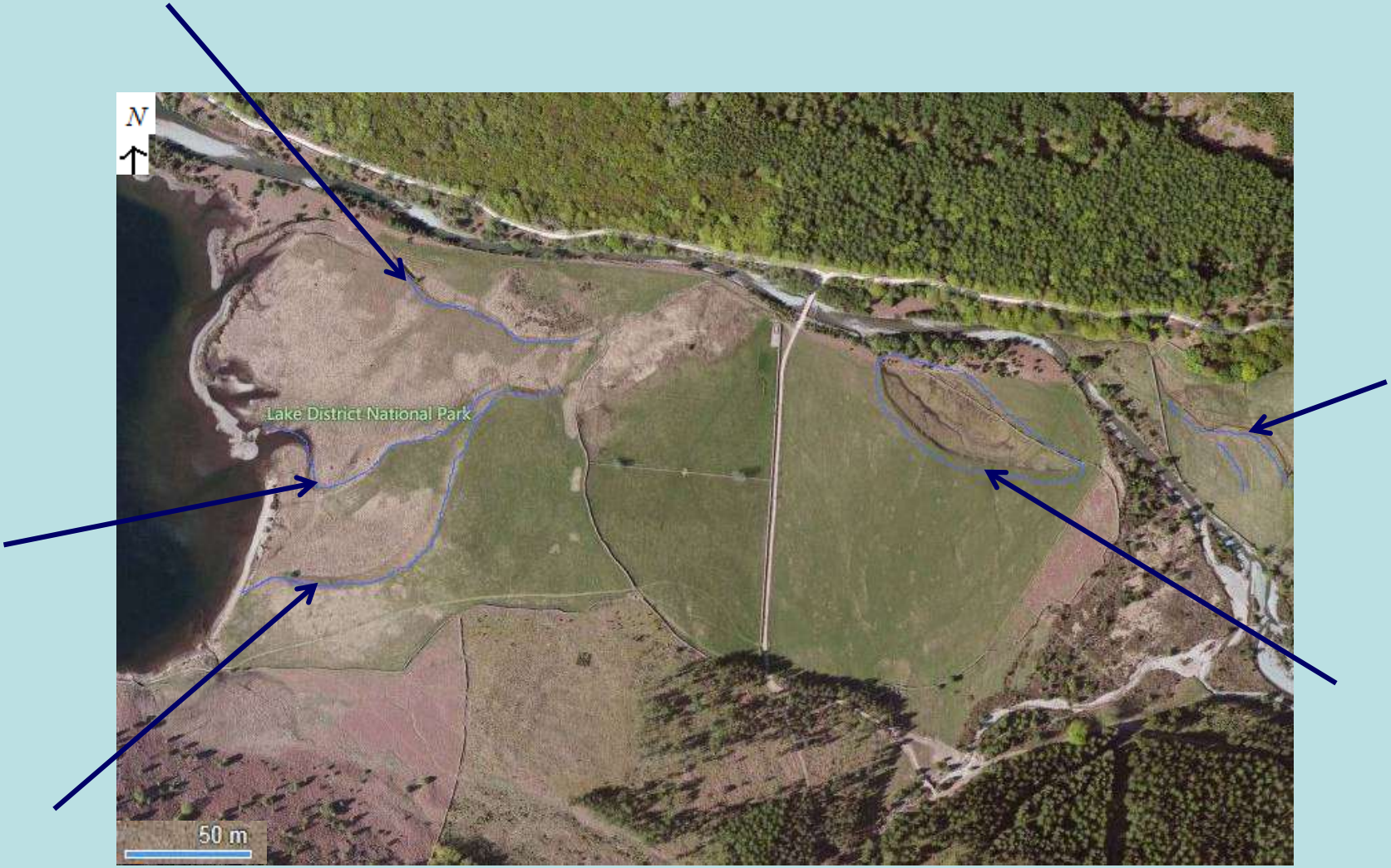
The River Liza



Channel Straightening

"...with the river channel often moved to the side of the valley to increase the size and continuity of grazing areas along the narrow valley bottom." (Wild Trout Trust, 2013)

Where?



Management

- Channel Realignment
- Non intervention management

Wandering Channel (left) is 1km from the straight channel (right). Note the wall on right side

Wild Ennerdale

The natural evolution of a wild valley

Forestry Commission England

"to allow the evolution of Ennerdale as a wild valley for the benefit of people, relying more on natural processes to shape its landscape and ecology"

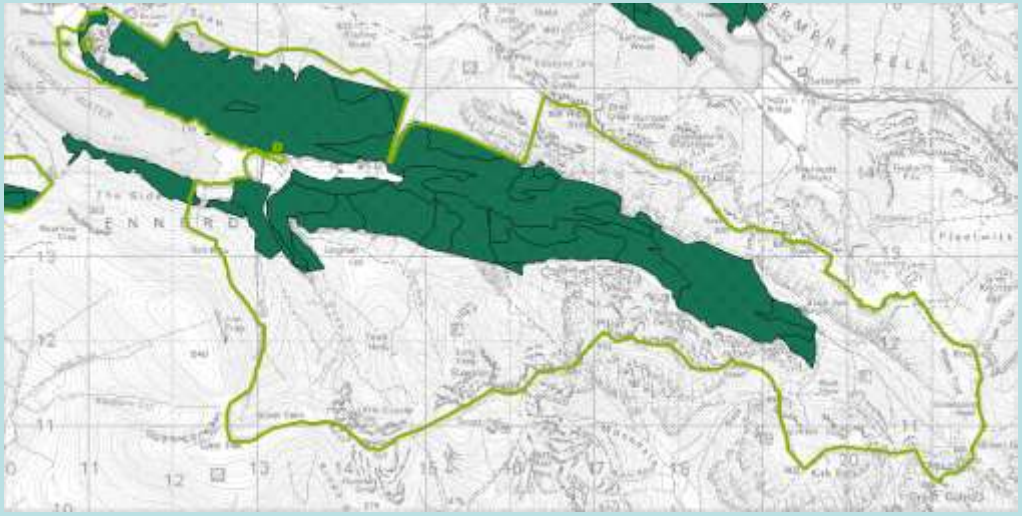
The eleven Guiding Principles are listed below.

- The sense of wildness experienced by people will be protected and enhanced;
- The valleys landscape and habitats will be given greater freedom to develop under natural processes, allowing robust and functioning ecosystems to develop on a landscape scale;

Wild Ennerdale Stewardship Plan

"greater freedom to develop under natural processes"

Ennerdale Forest – a Forestry Commission plantation



National Inventory of Woodland - all woodland

Deciduous (light green) ancient woodland (orange, brown)

- valley bottom filled with woodland that reaches someway up valley sides
- Ennerdale Forest is predominantly a non-native woodland of Sitka spruce and larch
- very little deciduous woodland
- two small areas of ancient woodland within FC boundary

Dynamic natural forces acting in the valley

River Liza – high energy

Roe deer (70-110) – Red deer arriving

Wind throw

Deer

The valley is thought to be home to around 80 to 100 Roe Deer and a mobile herd of up to 12 Red Deer that move between the western Lake District valleys. Roe deer are controlled by a Wildlife Ranger employed by the Forestry Commission. Annually around 20 Roe Deer are shot in the valley and this practice will continue for the foreseeable future in order to maintain numbers at a level where they do not dominant the opportunities for vegetation development at the landscape (whole valley) scale accepting that localised grazing may prevent woodland development in some areas.

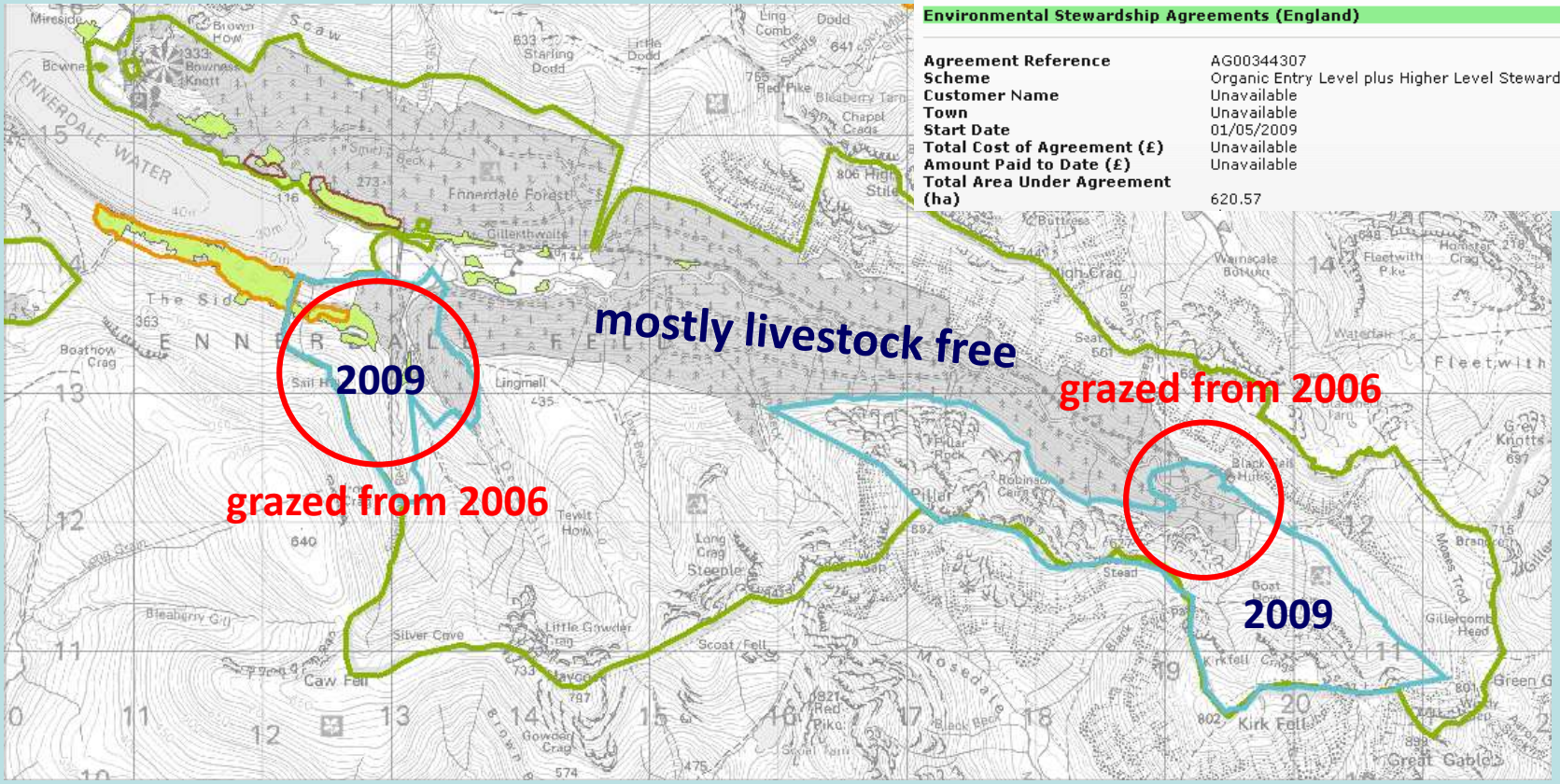
Why Cattle

- A key missing natural process

- Introduce cattle into the forest to restore a natural disturbance process.

No fossil evidence of aurochs in valley!

Grazing and agri-environment subsidy in Ennerdale Valley – Higher Level Stewardship in 2009



Environmental Stewardship Agreements (England)	
Agreement Reference	AG00344307
Scheme	Organic Entry Level plus Higher Level Stewardship
Customer Name	Unavailable
Town	Unavailable
Start Date	01/05/2009
Total Cost of Agreement (£)	Unavailable
Amount Paid to Date (£)	Unavailable
Total Area Under Agreement (ha)	620.57

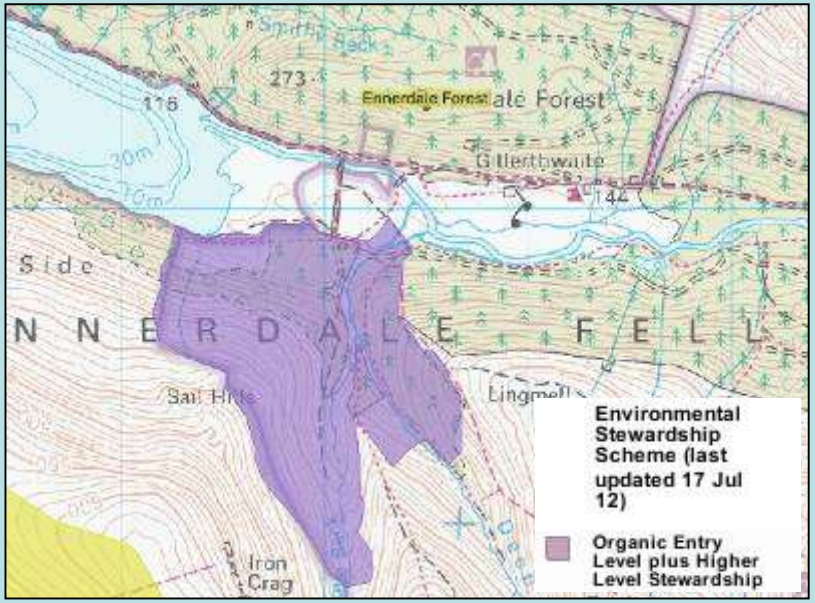
Cattle

The Wild Ennerdale Partners have introduced extensive grazing cattle into the valley in the form of two herds which roam around 300ha of forest (including areas covered by this plan), fell and valley bottom. The cattle are managed by tenant farmers who are responsible for their welfare. Both herds are all female and maintained at around 8 to 12 adult animals.

wild water forest mountains ennerdale

Silver Cove Grazing Area 140ha - 2006

Shaping the landscape naturally



UL18 - Cattle grazing on upland grassland and moorland

How have cattle affected tree regeneration in Silver Cove?

Felled areas in Silver Cove

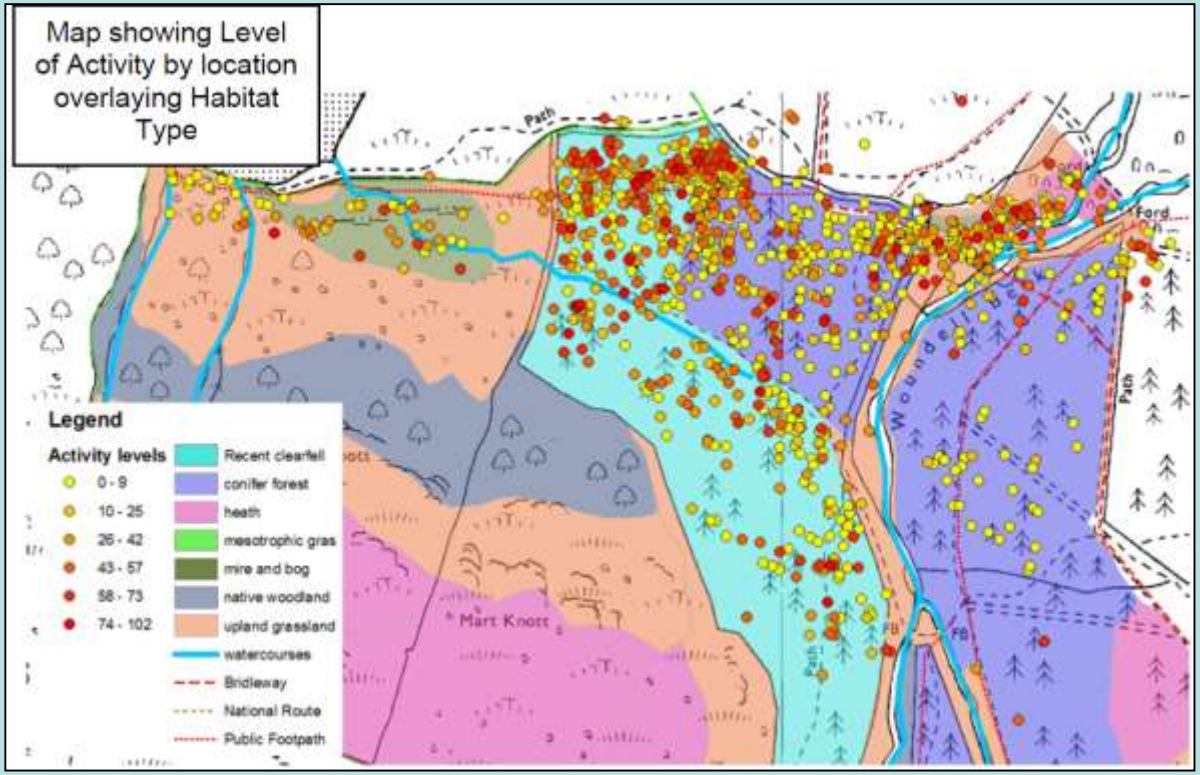
Regeneration on rocky slopes

Almost NO regeneration except in exclosures

Exclosures in Silver Cove – tree regeneration protected from grazing

Trampling by cattle not needed for tree establishment!

Radio-collar tracking cattle in Silver Cove and tree regeneration



Location tracking for two 3-day periods: Summer and Autumn

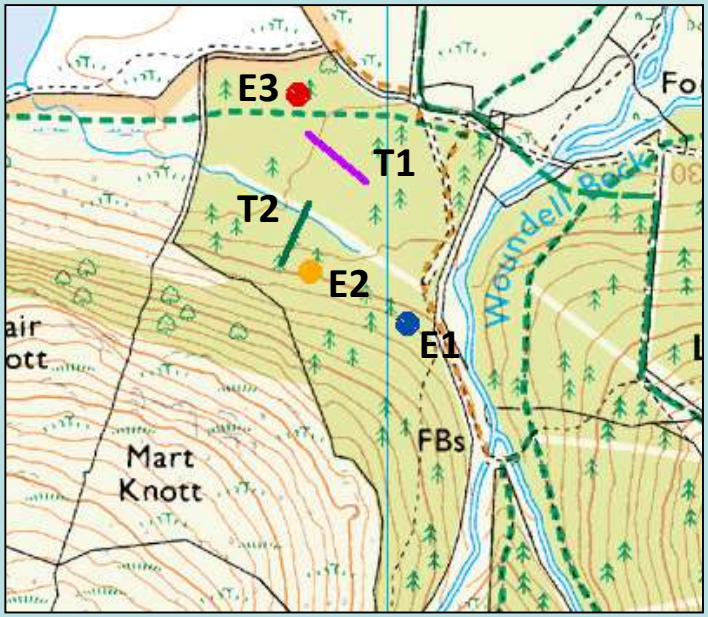
The greatest level of activity is on the **clear fell** where the cattle spend 40% of their time

Initial study in 2010 found the height of **native tree regeneration** outside of exclosures is related to **slope and accessibility**

- Cattle access upslope flat areas along easy routes with gradual incline, including existing footpaths (movement N to S)
- **Young trees on sharp inclines are not browsed** or **browsed less** (movement not E to W)

Effect of slope and exclusion in Silver Cove

Naomi Eleanor Matthews, 2012



- **Diversity** of tree species is affected by **slope** and by **exclosure** – Fig 1 (palatability is factor in the open)

- Average **height** of tree species affected by **slope** and **exclosure**

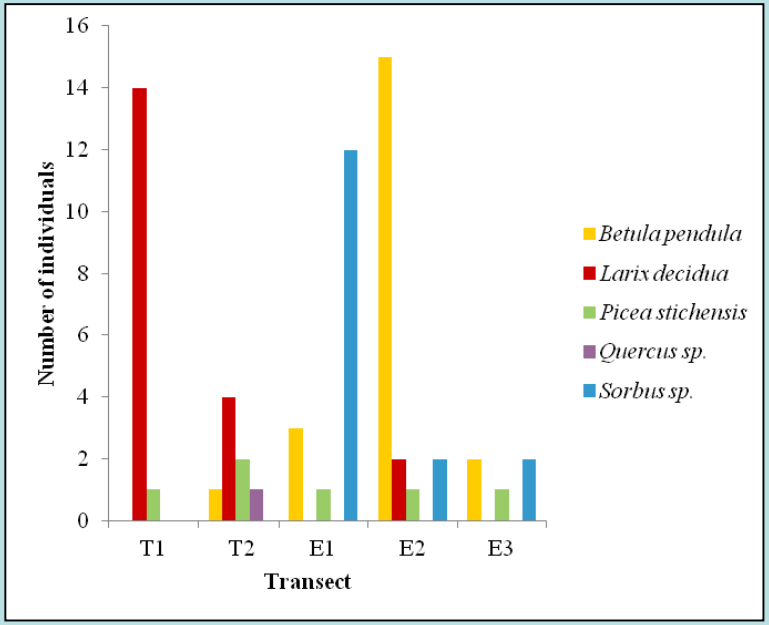


Fig. 1 Total number of tree seedlings found at each transect for each species

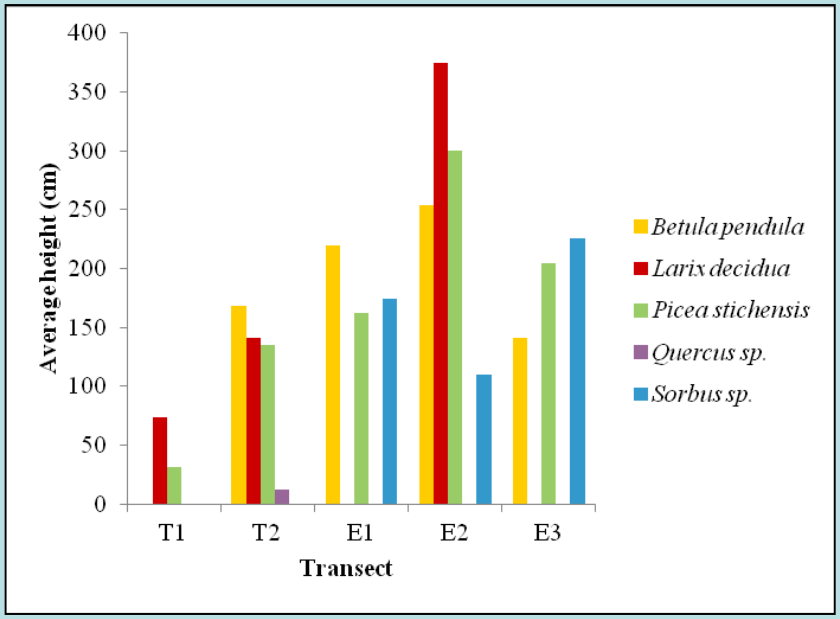


Fig. 2 Average height of tree seedling of each species at each transect

Lessons from cattle grazing in Silver Cove

In the **flat areas**:

- cattle producing a modified **plagio-climax** determined by **palatability**
- where protected through **exclosure**, native tree recruitment **does not need cattle trampling**

Cattle grazing will return the landscape back to the state before deforestation of conifers – this is not "rewilding"

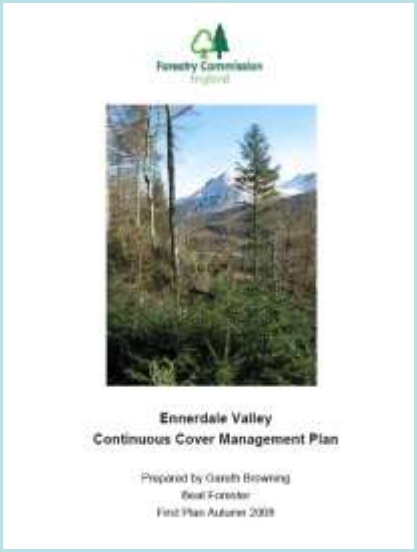
Effect of **slope**:

- modifies **cattle behaviour** through access restriction
- analogous to **exclosure** in species recruitment

Native trees will flourish on slopes – this is not wood pasture

If slope = fence, does fence = wolves?

Continuous Cover Forestry –regeneration without clearfelling

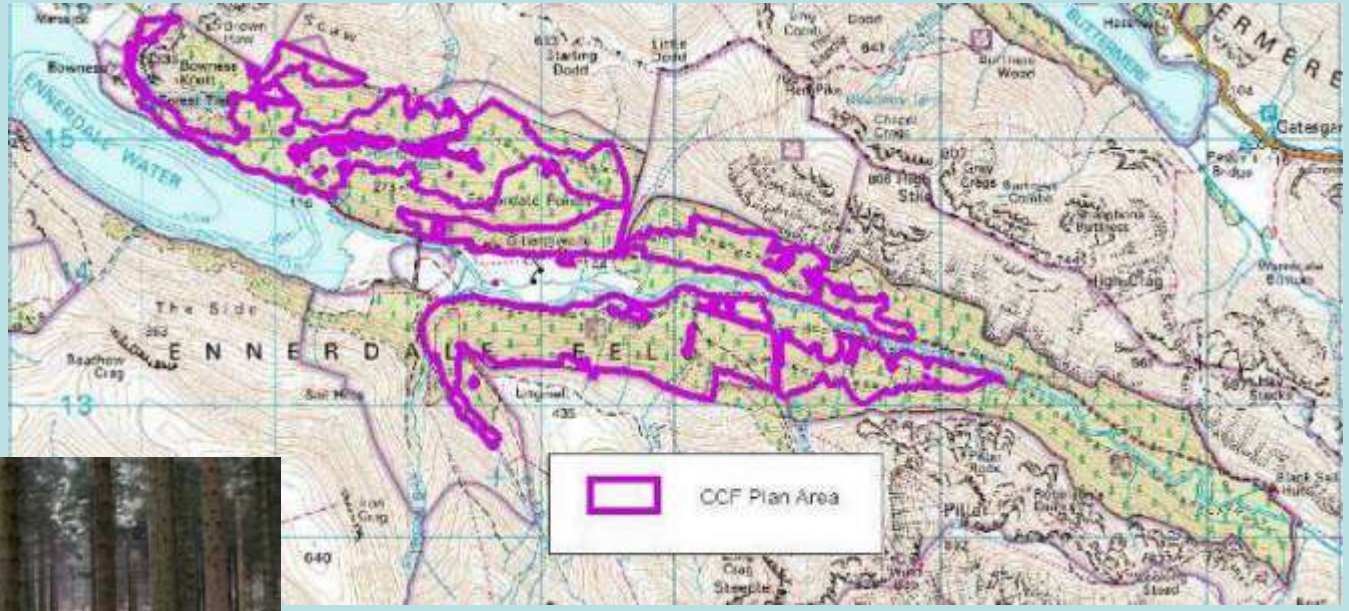


Ennerdale Valley Continuous Cover Management Plan 2008

Continuous Cover Management has been chosen as the principal method of managing the valleys forest as it is felt best suited to delivering the principals and actions listed above by:-

- Encouraging natural processes such as seeding, regeneration and windfall.
- Enable the dominance of spruce to be reduced.
- Allow a more open woodland structure to develop.
- Reduce the impact of mechanised operations by moving away from clear felling.
- Allow for the future expansion of areas of extensive grazing cattle.

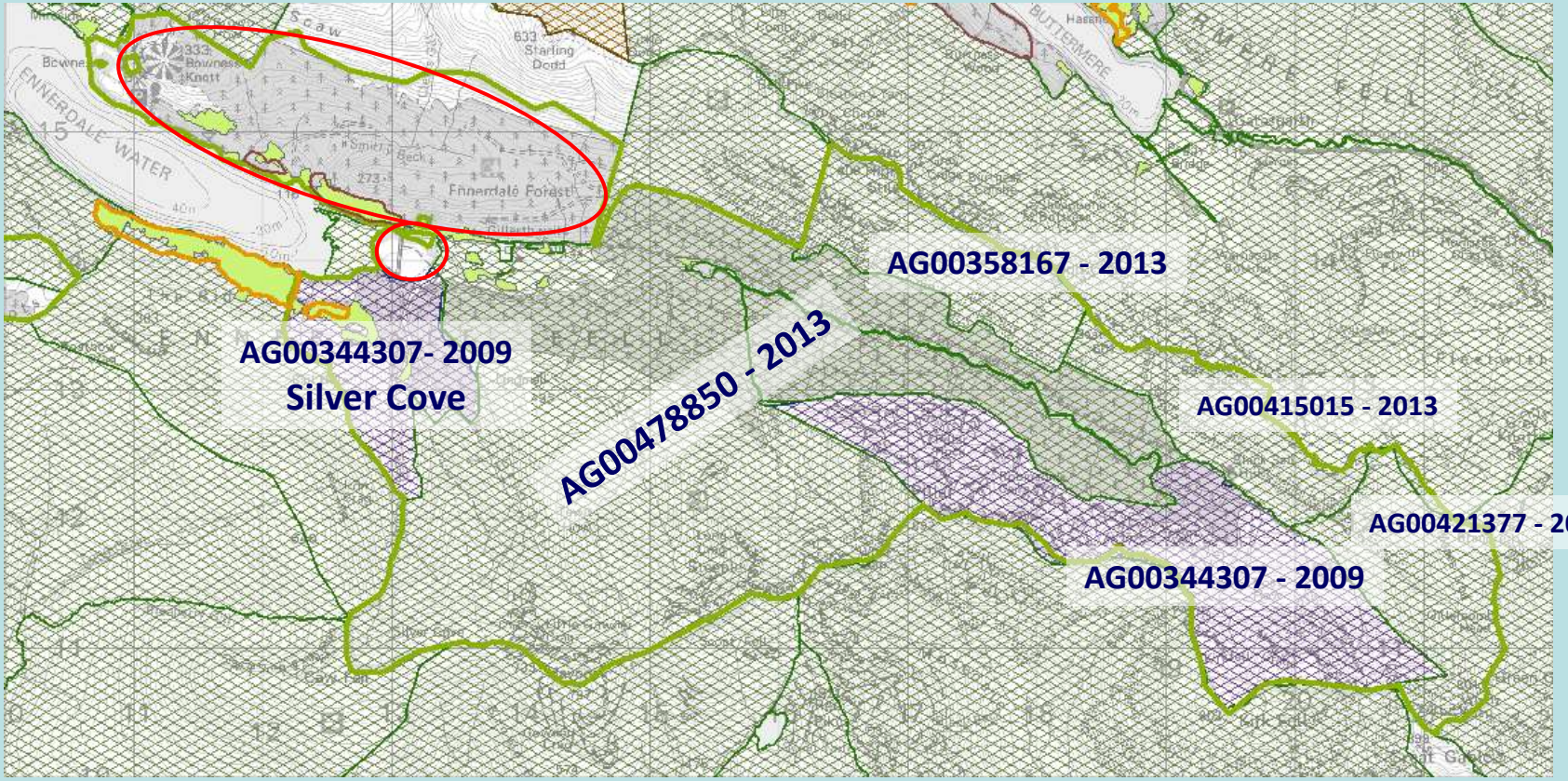
- Look to thin areas of maturing forest to provide more open habitats for future herbivore grazing.



Design Plan in 2006. It proposes the management of approximately 430ha of the valley's forests under Continuous Cover with up to as much as 280 ha of areas felled and allowed to regenerate being added in the future.

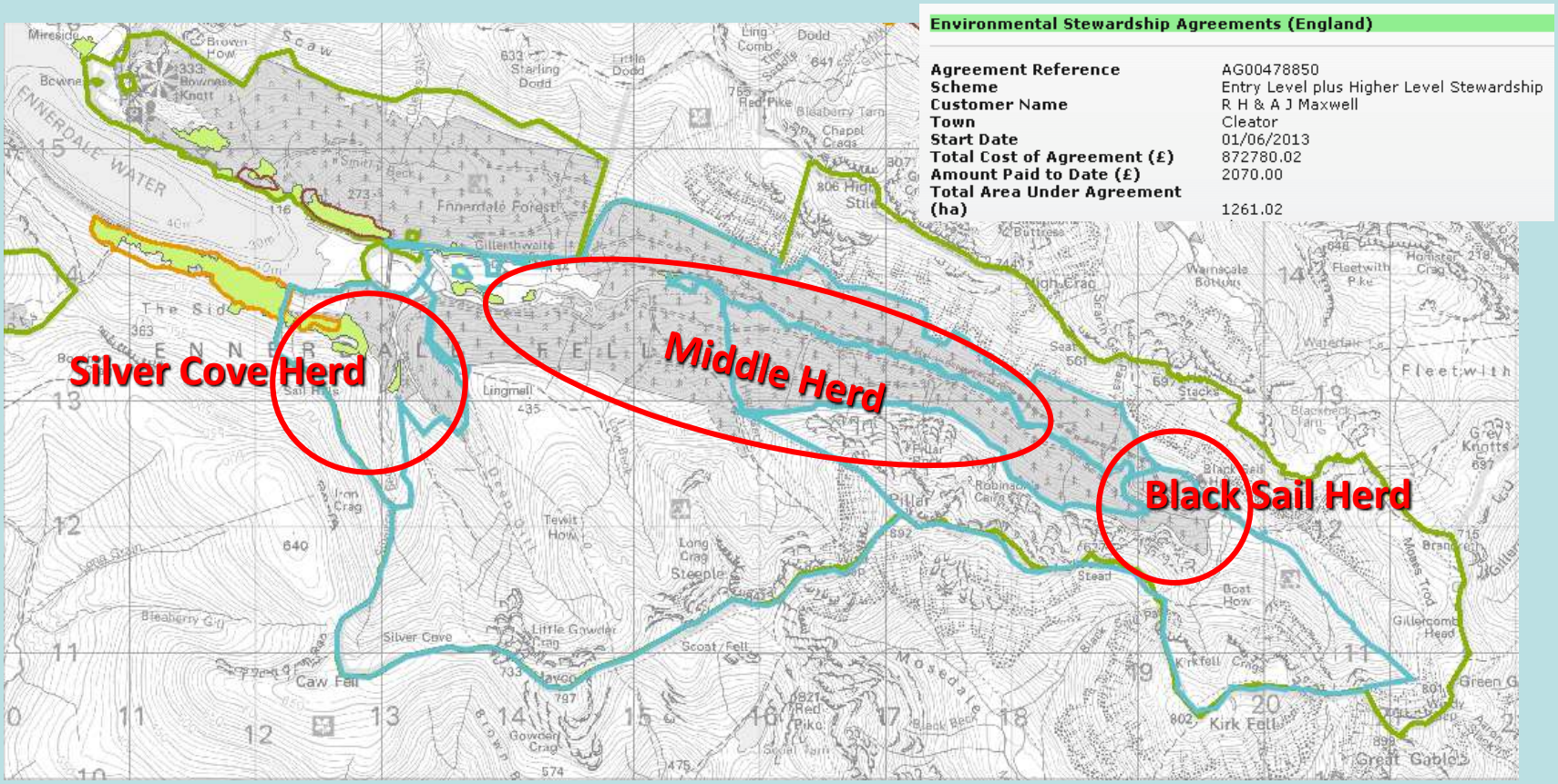
"The thinning of the forest under Lingmell is creating a more open and gappy structure which should promote regeneration and a more diverse mixed species forest"

Spread of agri-environment subsidy in Ennerdale Valley – Higher Level Stewardship in 2013



Only two areas of Forestry Commission land NOT covered by HLS!

Expansion of cattle grazing throughout the valley



- Species structure will be determined by natural regeneration. Understory thinning should favour non spruce species where they occur.

Evidence from Silver Cove is that natural regeneration will NOT occur with cattle

Hardknott Forest and the Duddon Valley woodland

- Hardknott forest is a 600 ha Forestry Commission conifer plantation in the upper Duddon valley
- planted in the 1930s and 1940s - now reaching the end of rotation (maturity)
- aim is to increase natural and recreational value through restoration into native oak and birch woodland
- opportunity to create the largest semi-natural woodland in the Lake District, linking Hardknott Forest with the existing a series of ancient oak woodlands that snake down the valley all the way to the coast!

Student volunteers work with Forestry Commission during natural regeneration at Hardknott

Cutting Sitka spruce regeneration

Cutting Sitka spruce amongst birch regeneration

- clear felling annually since the late 1990's has created a chronosequence of natural regeneration with ages of 0-13 years
- the management plan relies mainly on natural regeneration rather than planting, with some translocation of tree seedlings to areas of little regeneration
- work parties in dormant season clear regenerating Sitka spruce, plant juniper, and remove redundant fences (UoL, Park Lane College, Leeds, Leeds City College, Scottish Agricultural College, Scottish Rural University College)

Planting juniper

UoL hostel at Dale Head in Duddon valley

Grassguards Native Woodland – a linking woodland

- new Upland Oakwood planted by FC in 2005 to make the link between Hardknott Forest and the Duddon Valley ancient woodland **FOREST HABITAT NETWORKS**
- oak, rowan, birch, holly and juniper planted in five groups across landscape. Scattered holly, juniper and rowan in upper crags
- area enclosed by deer fencing to prevent browsing damage during woodland establishment

area clear felled in 2006

Effects of browsing by deer

- NO grazing by livestock
- HOWEVER population of roe deer in valley woodlands
- deer browsing monitored across target areas
- exclosures dotted around as controls

regeneration by 2010 – moorland as well as tree species

bilberry

heather

birch

Advanced natural regeneration at Hardknott Forest

clear felled 1998

2008

2010

Roe deer appear NOT to be a significant factor in natural regeneration!