



An Application of the Process Restoration Philosophy on a Scottish Upland River.

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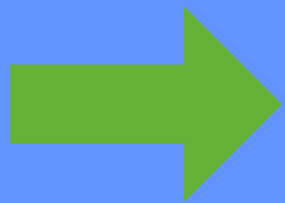
**University
of Glasgow**

PROCESS RESTORATION

- **Over-arching philosophy:** restore catchment-scale river processes as much as possible
 - Operate at largest feasible spatial scales
 - Aim to restore process rather than specific local-scale design
 - Think at longer temporal scales – not ‘quick fix’ approach
 - More sustainable approach – let the river do the work!
- **HOWEVER**, typically constraints to full application:
 - Development and land-use pressures
 - Fragmented land-ownership and management
 - Lack of catchment scale management plans
 - Inappropriate management timescales
 - Lack of knowledge and perception

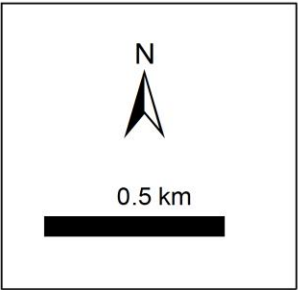
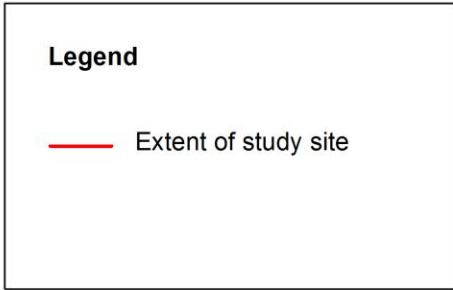
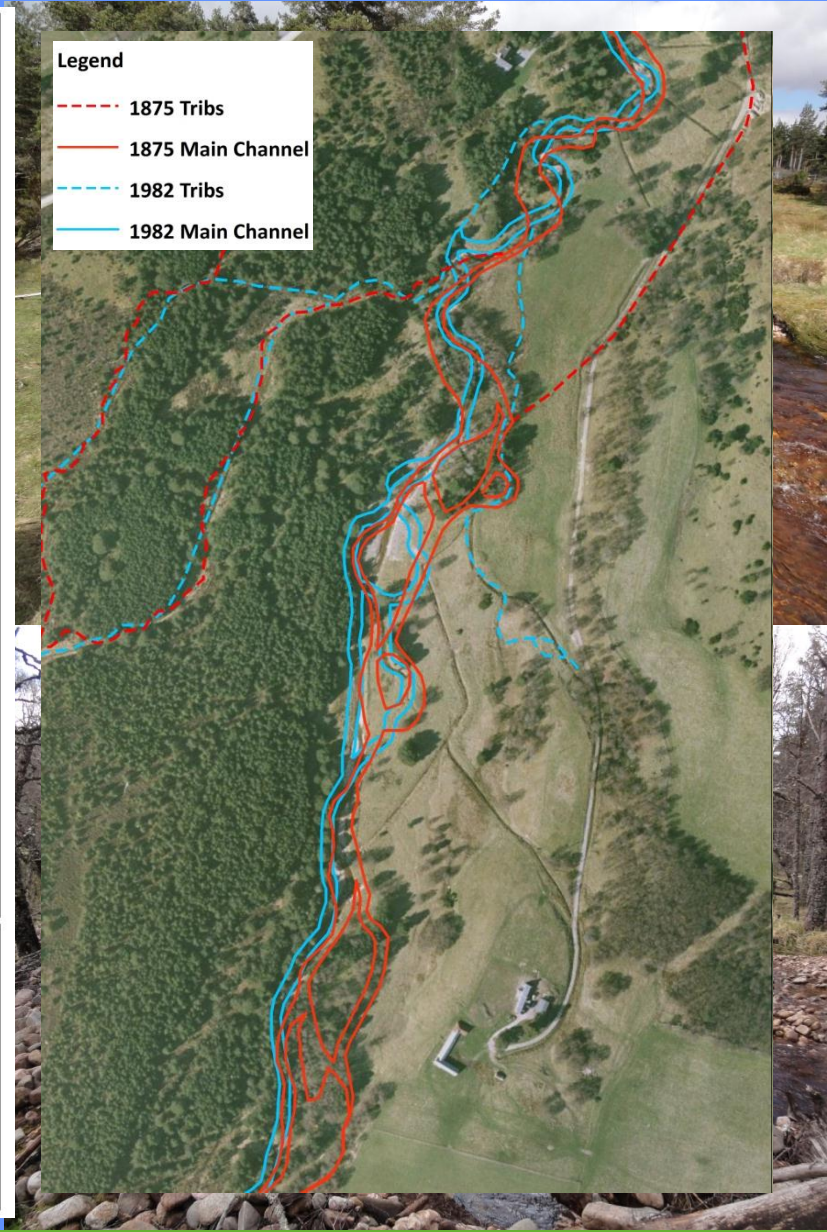
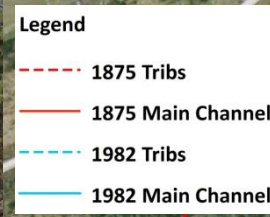
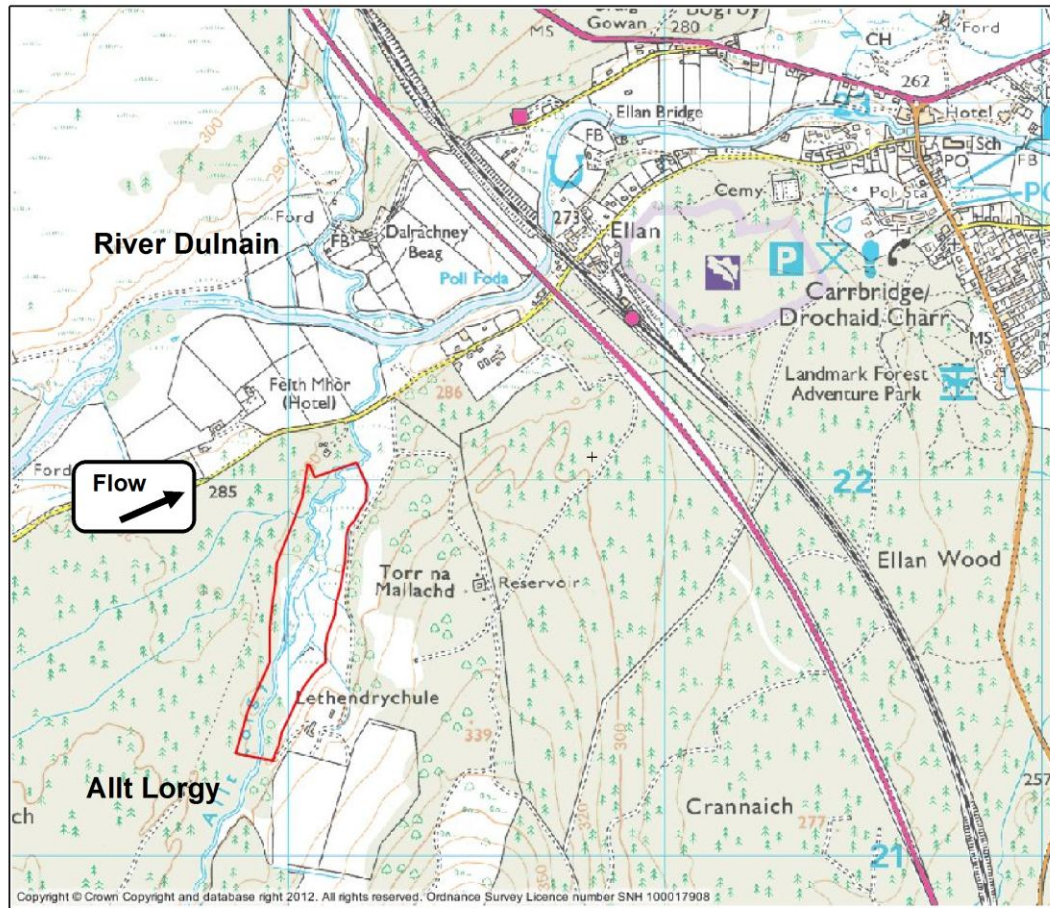
Allt Lorgy Restoration

- Very simple land-ownership of area
- Very little infrastructure 'at risk'
- Regulators (SEPA and SNH) very supportive of process restoration philosophy
- Open-minded client!

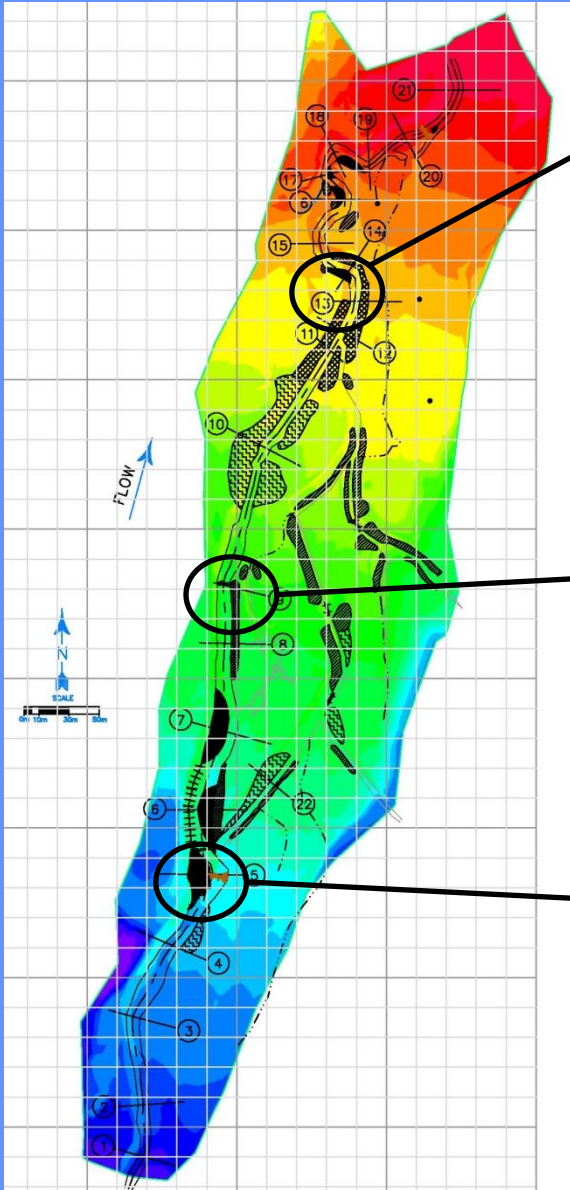


'EVERYTHING ON THE TABLE!'

Allt Lorgy, near Carrbridge, Cairngorm National Park



Engineering Impacts of the Allt Lorgy



Allt Lorgy Process Restoration, Sept 2013

Assessment of geomorphic process

- Important to understand ‘geomorphic process regime’ of system in order to ensure that ‘assisted recovery’ is feasible
 - Detailed fluvial audit, sediment budget and 2D hydrodynamic modelling undertaken on the Allt Lorgy
 - Revealed dynamic sediment transport regime
 - indicators of moderate bedload transport rates
 - evidence of dynamic geomorphic activity
 - high hydraulic forces
- Appropriate site where the reduction of constraints on fluvial process will yield natural recovery

Restoration objectives and actions

Restoration objectives:

- increased connectivity with floodplain
- increased within-channel sediment storage
- greater lateral geomorphic process
- initiation of natural channel morphological recovery

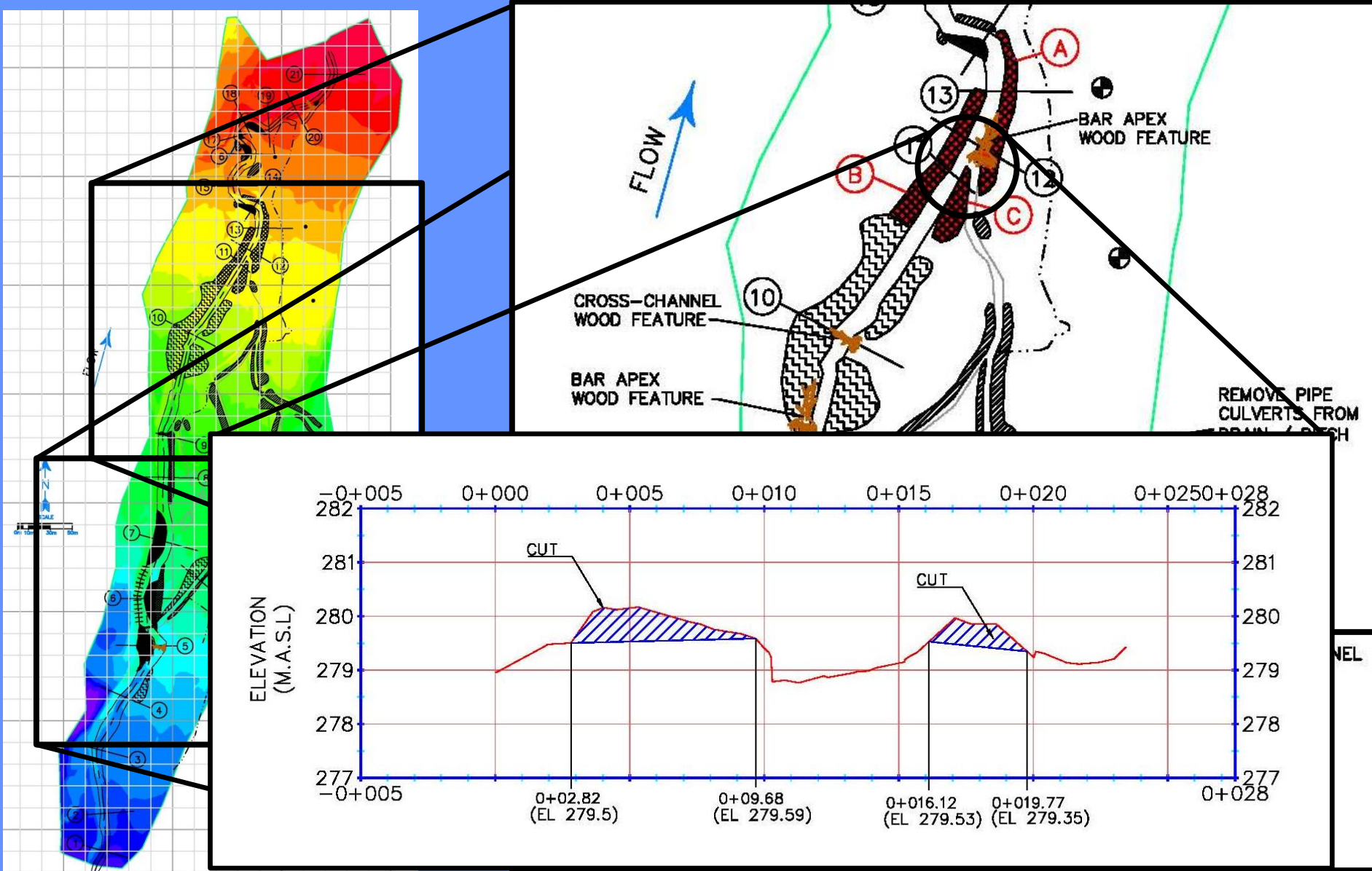
Restoration actions:

- reduction/ removal of embankments
- gravel augmentation
- removal of large boulder placements
- large wood placement

Fundamentally, remove constraints to geomorphic function:

- allow the channel to naturally recover
- avoid the need for complex and uncertain designs
- restoration NOT re-engineering!

Restoration 'design'



Iterative Design Modelling

Existing conditions
model detail



Design conditions
model detail

Restoration Implementation

- Embankment removal
- Large wood placement
- Gravel augmentation

Post-implementation flood

Construction completed on 22nd Sept, 2012
Greater than 'bank-full' flood event on 12th Oct.

- Mid-site large wood feature
- Upper site large wood complex

Pre- and Post- Restoration implementation



Allt Lorgy Process Restoration, Sept 2013

Pre- and Post- Restoration implementation



Allt Lorgy Process Restoration, Sept 2013

Pre- and Post- Restoration implementation



Allt Lorgy Process Restoration, Sept 2013

Pre- and Post- Restoration implementation



Allt Lorgy Process Restoration, Sept 2013

Pre- and Post- Restoration implementation



Allt Lorgy Process Restoration, Sept 2013

Conclusions

- Near unique example of a full application of ‘process restoration’
- ‘Design’ as built not end product but beginning of trajectory of natural recovery – ongoing monitoring
- Allt Lorgy provides valuable case study for this approach and the methodologies applied
- Emphasis of importance of assessing geomorphic condition of site/ system in detail

Cringletie Realignment, Eddleston Water, Tweed Catchment

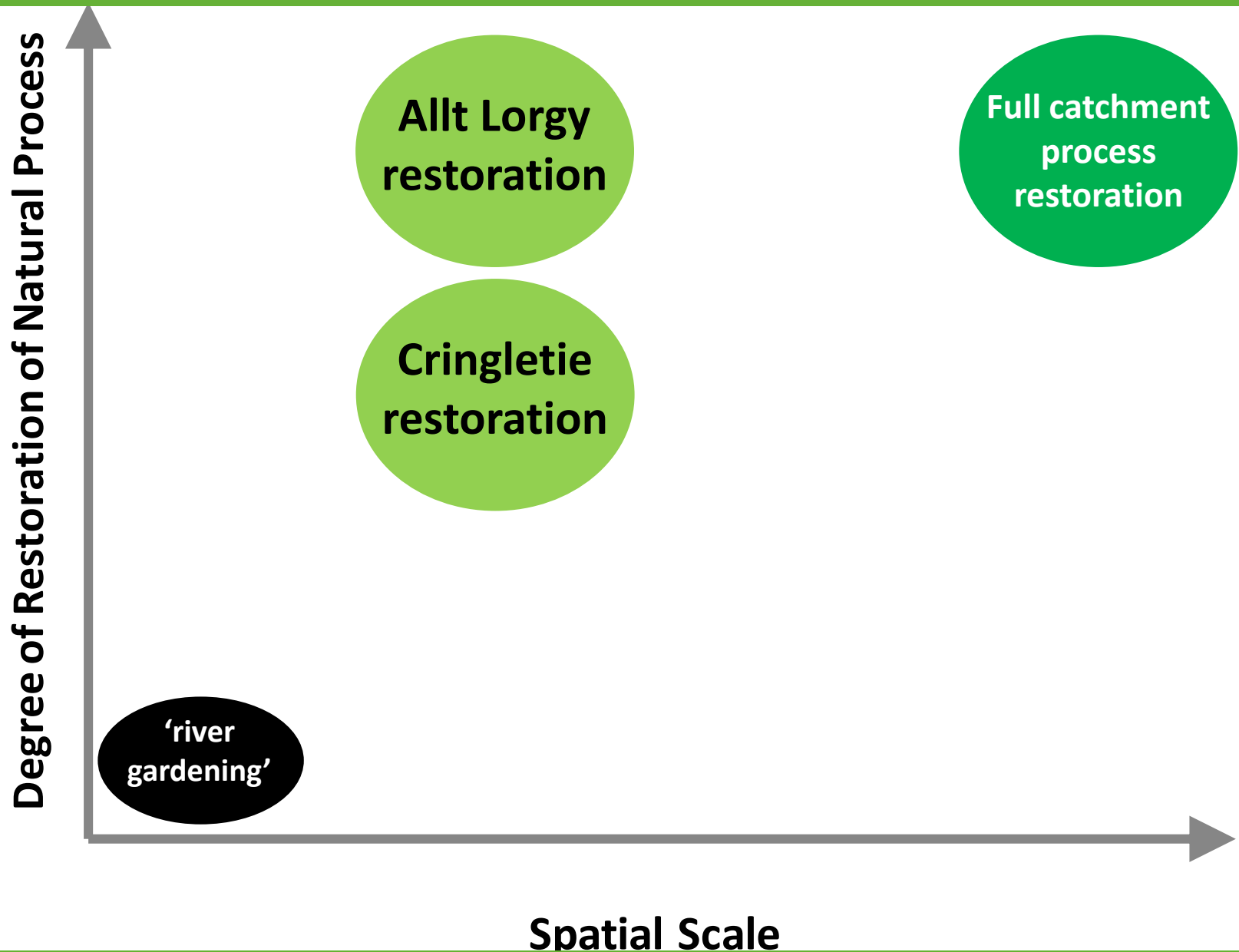


Allt Lorgy Process Restoration, Sept 2013

Conclusions

- Near unique example of a full application of ‘process restoration’
- ‘Design’ as built not end product but beginning of trajectory of natural recovery – ongoing monitoring
- Allt Lorgy provides valuable case study for this approach and the methodologies applied
- Emphasis of importance of assessing geomorphic condition of site/ system in detail
- To fully apply the approach, multiple ‘treatments’ prioritised at the catchment scale

'Domain of the process restoration continuum'



Acknowledgements



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