

# EcoCo Life Project

## Practical application of models, maps and matrices

**LIFE Platform meeting on Ecosystem Services**

**WORKING GROUP 3**

**Applying ES in decision making**

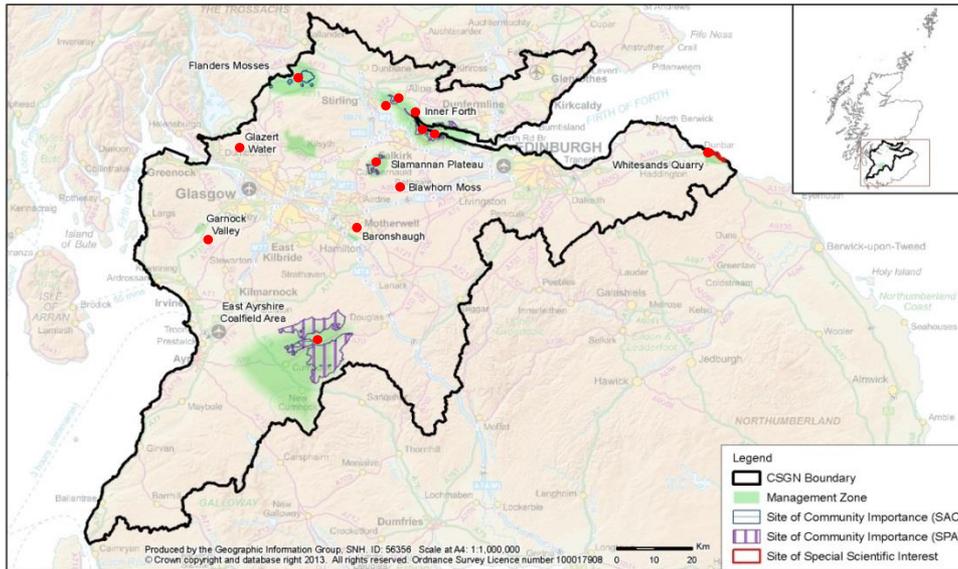
**11 May 2017**

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EcoCo Project Manager, Scottish Natural Heritage



# “Implementation of integrated habitat networks to improve **E**cological **C**oherence across the Central Scotland Green Network”



- 12 management zones (mainly post industrial) ; identified using the “**E**cological **C**oherence Protocol”
- 4 broad habitat types; peatland, wetlands, freshwater and open mosaic habitats

## Ecological Coherence elements:

- Patch size
- Connectivity; structural and functional (networks)
- Biological diversity
- Ecological functionality
- Presence of endangered, rare or endemic species

**And provide benefits to people through provision of ecosystem services**

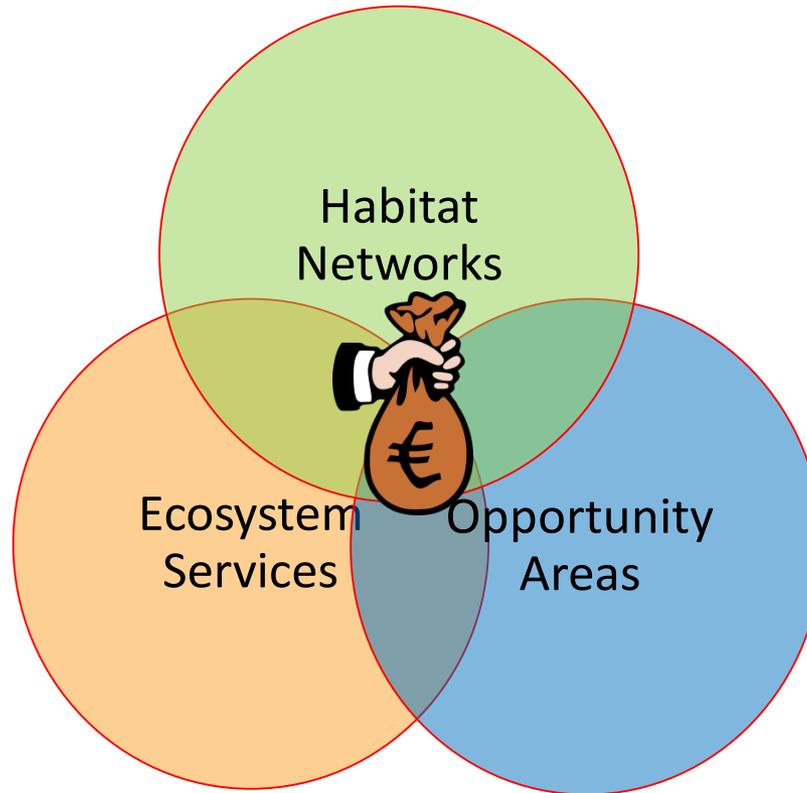


# Ecological Coherence Protocol

The best places to work for people and wildlife



- Accessible nature
- Education
- Green travel
- Carbon storage
- Local climate regulation
- Air purification
- Noise regulation
- Water purification
- Pollination



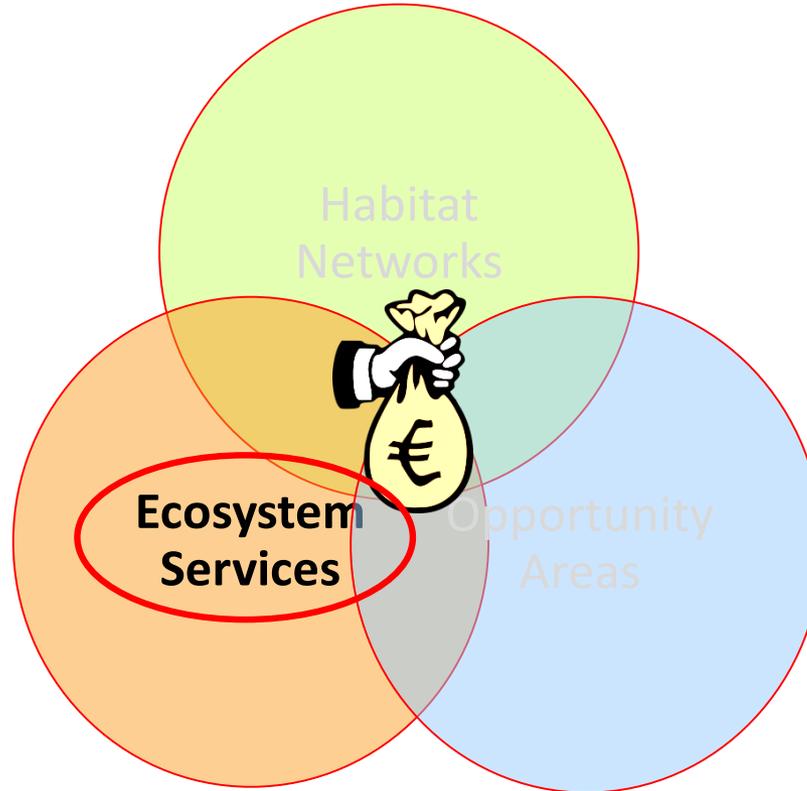
- Identification of source areas
- Least-cost connectivity analysis to map networks
- Low, medium and high dispersal distances

- Locations where an action is feasible
- Parameters include elevation, slope, land-use, land unit size, proximity to water courses, water levels ...



The best places to work  
**for people** and wildlife

- Accessible nature
- Education
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- Pollination



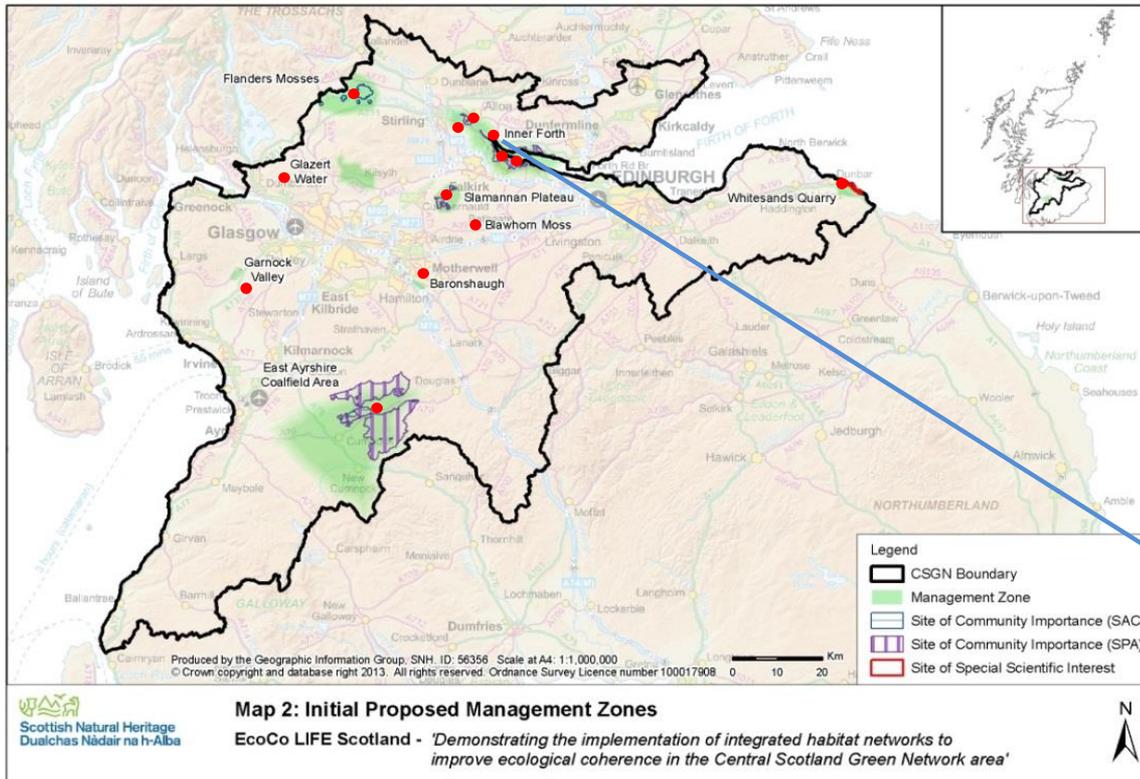
- Identification of source areas
- Least-cost connectivity analysis to map networks
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- Parameters include elevation, slope, land-use, land unit size, proximity to water courses, water levels ...

# An example...



Joining up nature across central Scotland



Black Devon Wetlands



# Lowlands Wetlands creation Black Devon wetlands, Clackmannanshire; RSPB



Joining up nature across central Scotland

http://ing06/maps/geoview/index.html

geo.View 3.2

File Edit View Favorites Tools Help

Suggested Sites Web Slice Gallery

Report a bug | Spatial Data Directory | Help

Enter place or postcode or grid ref Search Default search

OS Base OS Grey OS Simple

Layer List

Find a layer at least 4 characters

Popular layers Other data External data Favourites

- Protected Areas
  - Biogenetic Reserves
  - Biosphere Reserves
  - Community Marine Conservation Areas
  - Country Parks
  - Environmentally Sensitive Areas
  - European Diploma Areas
  - Geoparks
  - Gardens and Designed Landscapes
  - GCR Sites
  - Local Nature Reserves
  - Marine Consultation Areas
  - National Nature Reserves
  - National Parks
  - National Scenic Areas
  - Nature Conservation MPAs
  - Ramsar Sites
  - Regional Parks
  - Special Areas of Conservation
  - Special Protection Areas
  - Sites of Special Scientific Interest
  - Voluntary Marine Reserves
  - World Heritage Sites - Natural

Basemap transparency  
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North Doll

100%

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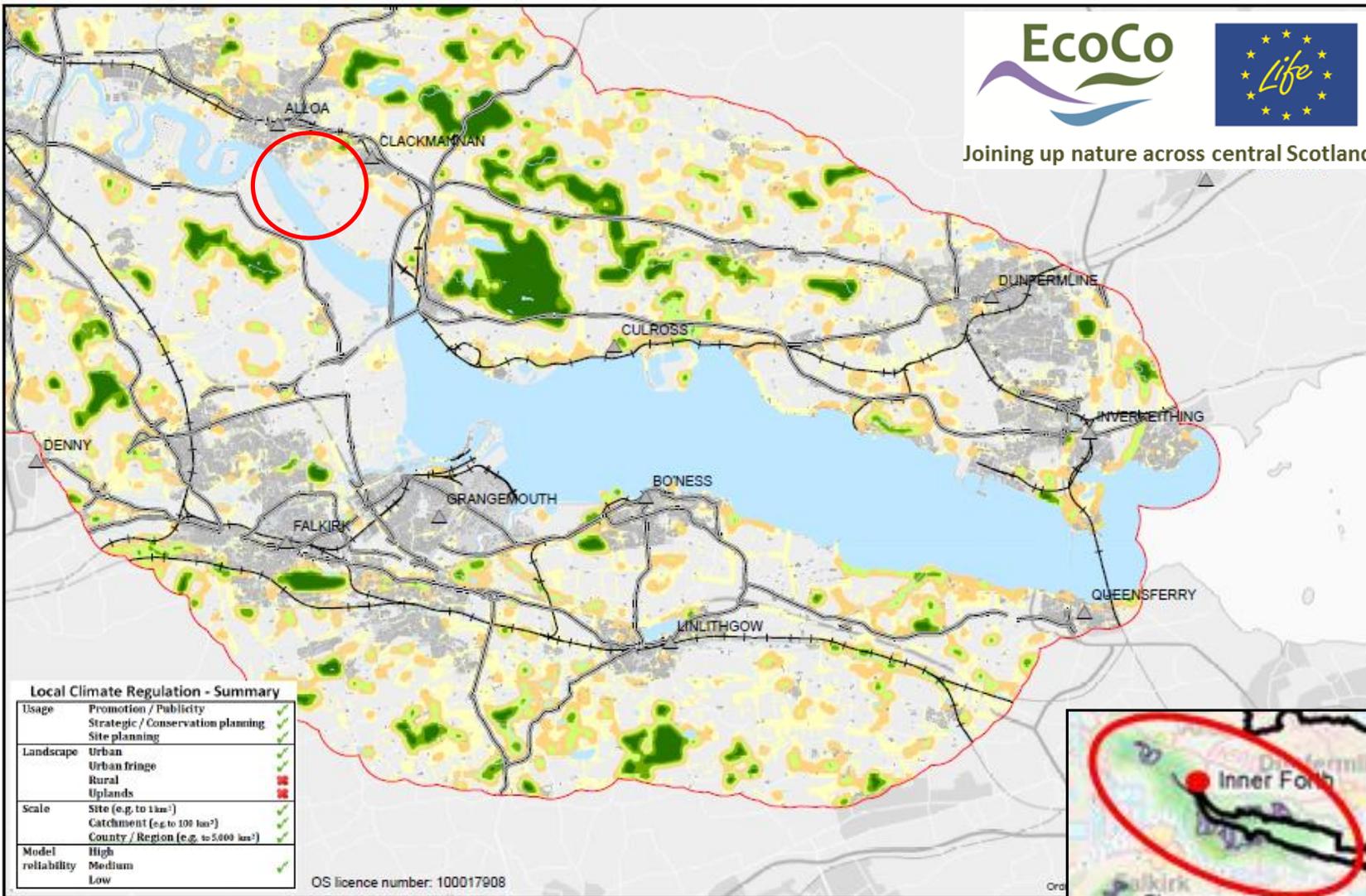
# Ecosystem Services



Joining up nature across central Scotland

Service	Environmental capacity indicators	Regulatory demand and societal needs indicators
<b>Accessible nature</b>	Site accessibility, perceived naturalness	Health, Index of Multiple Deprivation, likelihood of use
<b>Education</b>	Site accessibility, habitat diversity	Number of young people, education, Index of Multiple Deprivation, distance from schools
<b>Green travel</b>	Perceived naturalness, access routes	Cost distance from origin and destination travel locations.
<b>Carbon storage</b>	Carbon content per habitat	All assumed to have demand
<b>Local climate regulation</b>	Cover of woodland	Urban areas and domestic houses. Population at risk from heat events.
<b>Air purification</b>	Purification score per habitat	Road type, sealed surfaces, population, health Index of Multiple Deprivation.
<b>Noise regulation</b>	Regulation score per habitat	Predicted noise levels (cumulative), population, health Index of Multiple Deprivation
<b>Water purification</b>	Roughness score, slope angle	Soil erosion risk, pollution risk, distance to water courses.
<b>Pollination</b>	Pollinator visitation likelihood	Distance to arable, orchards and allotments.





Local Climate Regulation Capacity

1 to 100 Values

Location  
InnerForth\_SE1

Controlling local temperatures & reducing the urban heat island effect

Local climate regulation reflects the ability of different ecosystems and habitats to absorb or intercept sunlight and reflected heat.

Map Methods and Limitations

EcoServ-GIS relies on indicators to predict where ecosystem services occur. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

**Local Climate Regulation - Summary**

Usage	Promotion / Publicity	✓
	Strategic / Conservation planning	✓
	Site planning	✓
Landscape	Urban	✓
	Urban fringe	✓
	Rural	✗
	Uplands	✗
Scale	Site (e.g. to 1km <sup>2</sup> )	✓
	Catchment (e.g. to 100 km <sup>2</sup> )	✓
	County / Region (e.g. to 5000 km <sup>2</sup> )	✓
Model reliability	High	✓
	Medium	✓
	Low	✓

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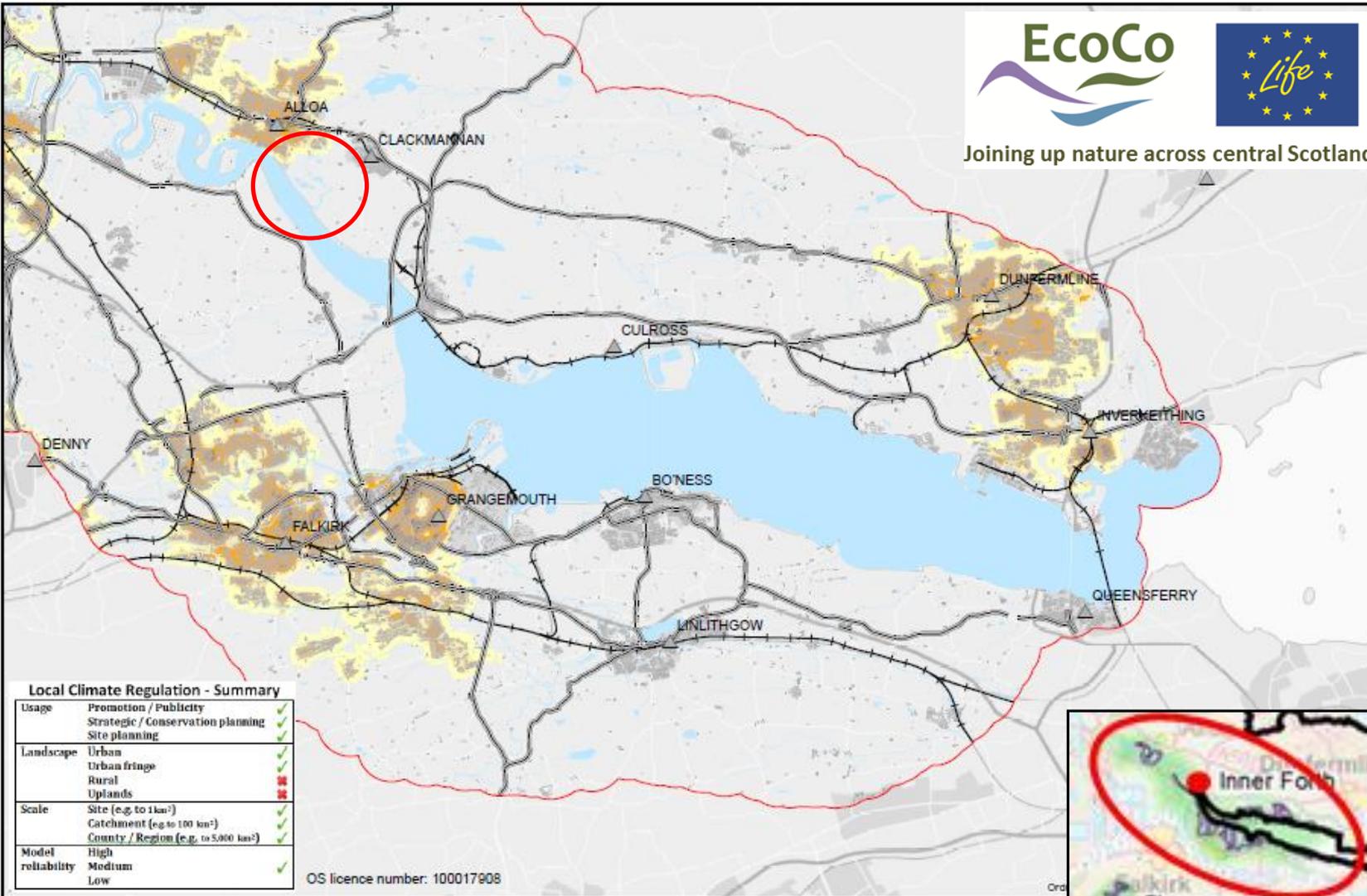
- 80 - 100
  - 60 - 80
  - 40 - 60
  - 20 - 40
  - 1 - 20
- White or Grey space within the Study Area shows areas with no data, or with no capacity.
- Scores are on a 1 to 100 scale, relative to values present within the Study Area

Thresholds are applied to limit the area of mapped capacity. Defaults are applied, but can be varied with custom settings.

Defaults: Local search distance = 200m

Local climate regulation values per ecosystem / habitat are inferred from available literature. These are based on the area coverage of woodland habitats. Habitat age and management is not considered.





Local Climate Regulation Demand

1 to 100 Values

Location  
InnerForth\_SE1

Controlling local temperatures & reducing the urban heat island effect

Local climate regulation reflects the ability of different ecosystems and habitats to absorb or intercept sunlight and reflected heat.

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Landscape	Urban	✓
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	Rural	✗
	Uplands	✗
Scale	Site (e.g. to 1km <sup>2</sup> )	✓
	Catchment (e.g. to 100 km <sup>2</sup> )	✓
	County / Region (e.g. to 5,000 km <sup>2</sup> )	✓
Model reliability	High	✓
	Medium	✓
	Low	✓

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- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

White or Grey space within the Study Area shows areas with no data, or with no service

Scores are on a 1 to 100 scale, relative to values present within the Study Area

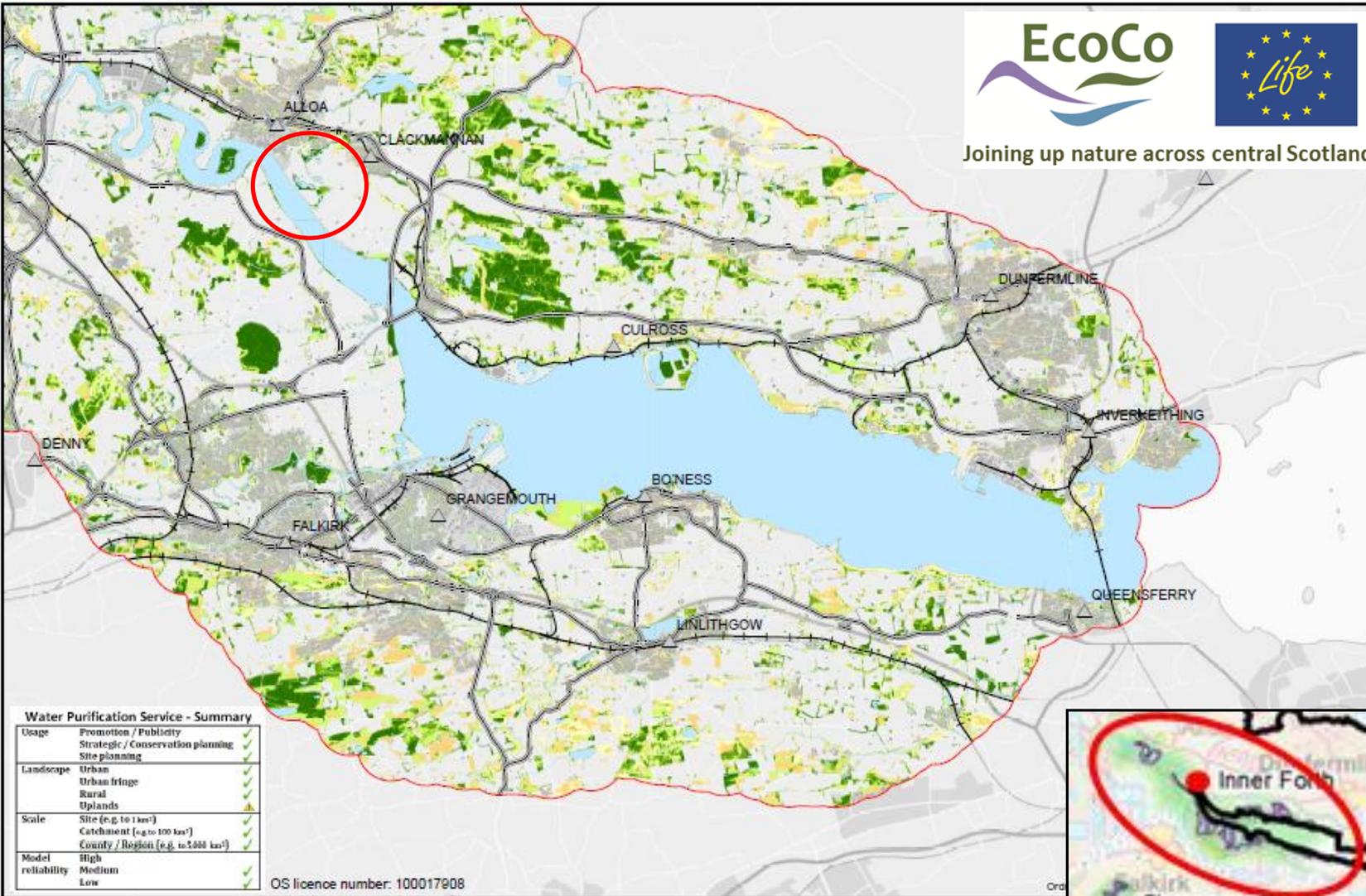
Thresholds are applied to limit the area of mapped Demand. Defaults are applied, but can be varied with custom settings.

Local search distance (population size) = 200 m  
 Local search distance (age risk score) = 200 m  
 Minimum population size (local scale) > 50 people  
 Urban areas with heat islands (> 1,000 ha)  
 Local cover of man made surfaces = 200 m

Larger urban areas are assumed to have demand for Local Climate Regulation. Demand is mapped based on cover of man made surfaces, population density and the proportion of the local population potentially susceptible to heat waves (based on age).

There is assumed to be no demand in non-urban areas or areas below the mapped population density thresholds.





**Water Purification Capacity**

1 - 100

**Location**  
InnerForth\_SE1

Areas where vegetation may help to purify water and reduce pollution impacts before reaching watercourses

**Map Methods and Limitations**

EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

**ES2 Water Purification Toolbox**



**Water Purification Service - Summary**

Usage	Promotion / Publicity Strategic / Conservation planning Site planning	✓✓✓
Landscape	Urban Urban fringe Rural Uplands	✓✓✓
Scale	Site (e.g. to 1km <sup>2</sup> ) Catchment (e.g. to 100 km <sup>2</sup> ) County / Region (e.g. to 5,000 km <sup>2</sup> )	✓✓✓
Model reliability	High Medium Low	✓✓✓

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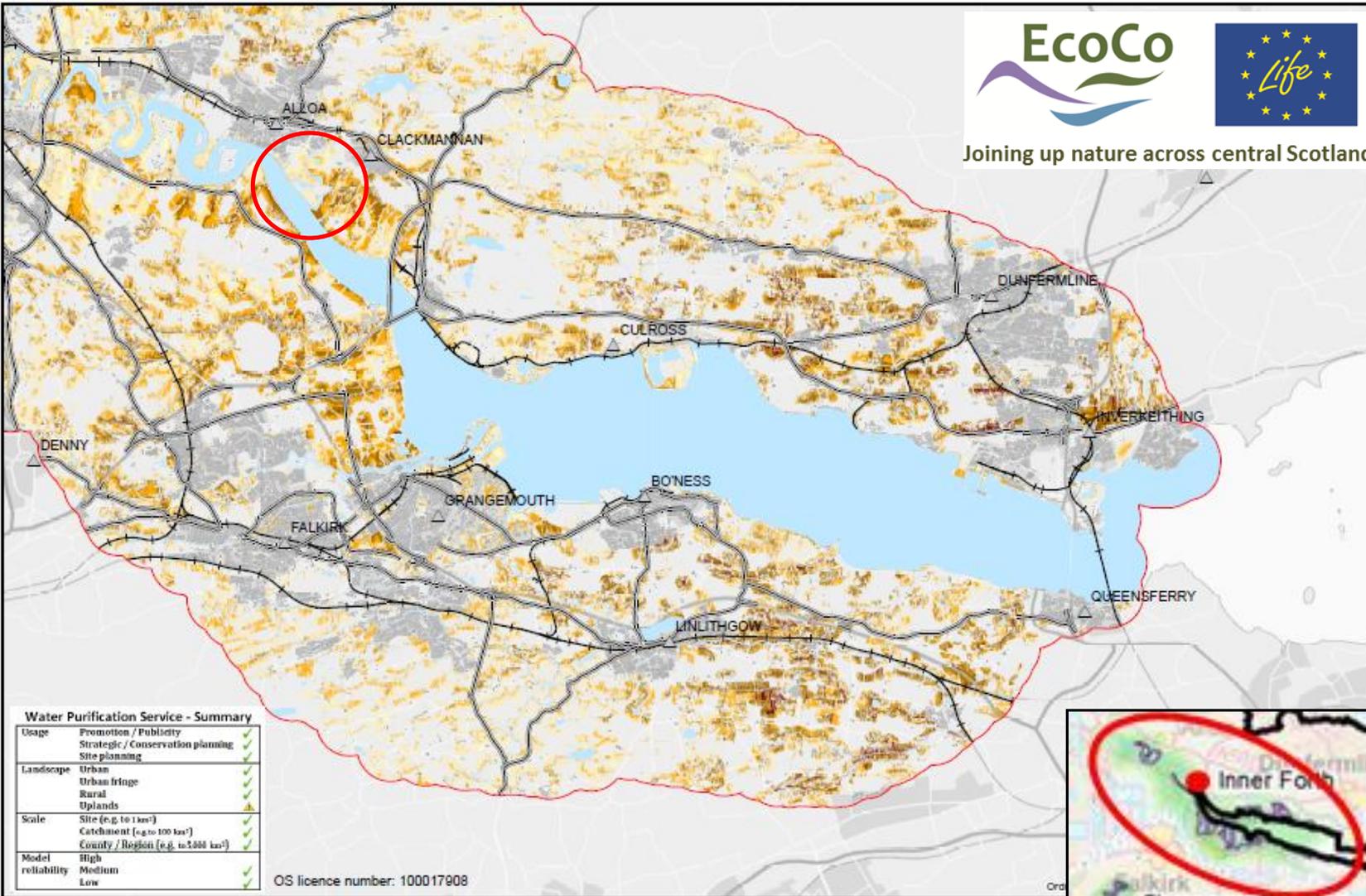
- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

White or grey space within the Study Area shows areas with no data or with no capacity

**Water Purification Capacity Methods**

Water Purification values per ecosystem are inferred from available literature, based on surface roughness and slope type. Habitat age and management is not considered.





Water Purification Demand

1 to 100 Values

Location  
InnerForth\_SE1

Areas of land that may generate pollution risks to watercourses

Map Methods and Limitations

EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

ES2 Water Purification Toolbox

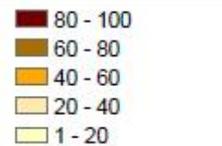


Model the riparian zone of surface water courses and wetland buffers

Water Purification Service - Summary

Usage	Promotion / Publicity Strategic / Conservation planning Site planning	✓✓✓
Landscape	Urban Urban fringe Rural Uplands	✓✓✓
Scale	Site (e.g. to 1km <sup>2</sup> ) Catchment (e.g. to 100 km <sup>2</sup> ) County / Region (e.g. to 1000 km <sup>2</sup> )	✓✓✓
Model reliability	High Medium Low	✓✓✓

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White or grey space within the Study Area shows areas with no data or with no demand

Water Purification Demand Methods

Demand is mapped based on a modified USLE equation, further adapted from a method presented in Sivertun and Prange (2003).

Thresholds are applied to limit the area of mapped Demand. Defaults are applied, but can be varied with custom settings.

Water Purification Demand Methods

Maximum risk distance from watercourses = 250 m  
Potentially polluting land use types = Arable land, improved grasslands, urban areas  
Flow accumulation threshold used to identify streams, from which to map watersheds (catchments) = 20,000



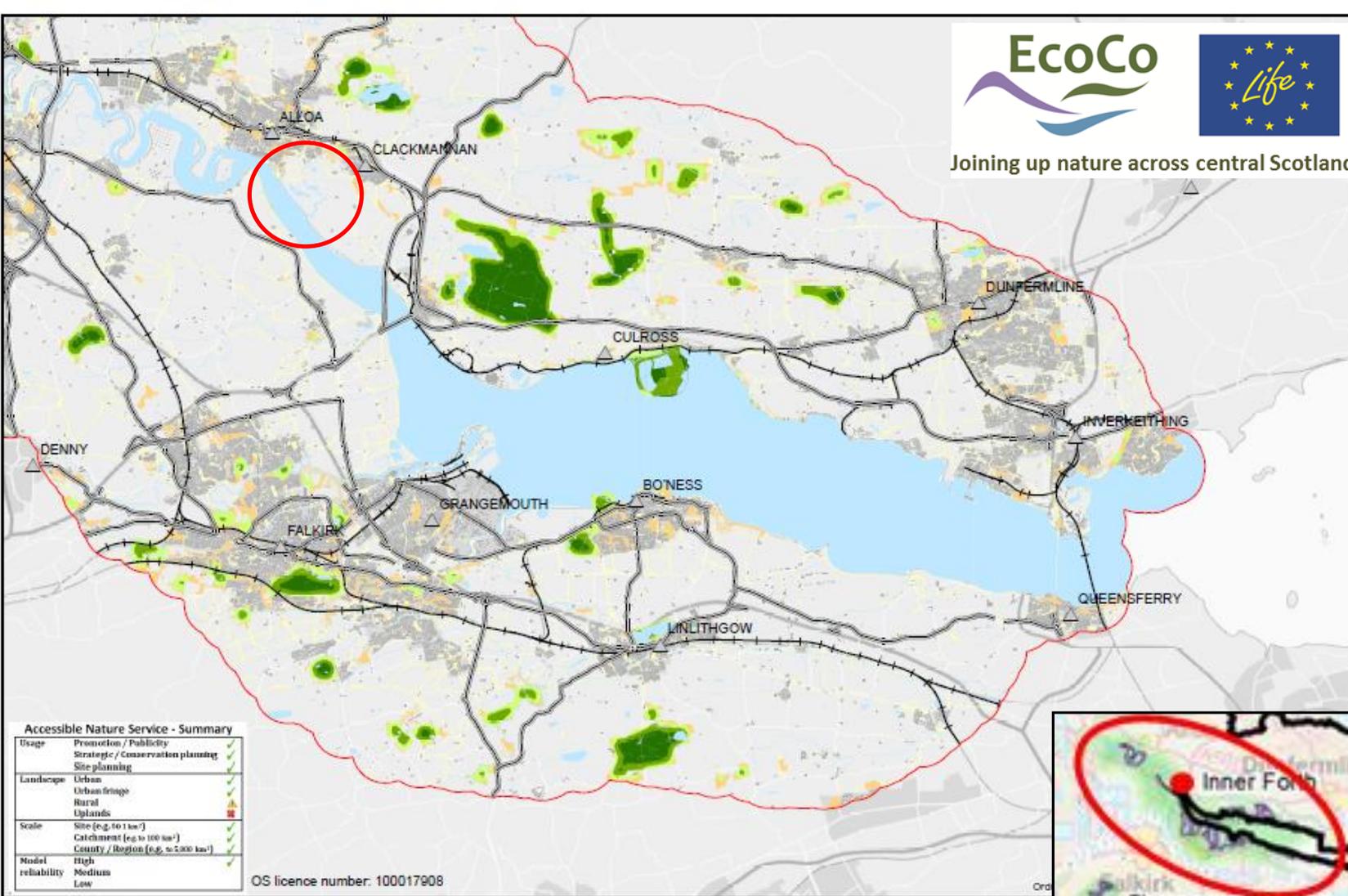
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Date: 02/09/2015



Study Area Buffer





Accessible Nature Capacity

1 - 100

Location

InnerForth\_SE1

Accessible Nature occurs where greenspace or semi-natural habitats give health and well being benefits to people through regular access for walking, cycling or jogging.

Map Methods and Limitations

EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

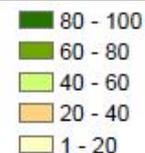
ES1\_Accessible Nature Footpath



Accessible Nature Service - Summary

Usage	Promotion / Publicity Strategic / Conservation planning	
	Site planning	
Landscape	Urban	
	Urban fringe	
	Rural Uplands	
Scale	Site (e.g. 50 1 km <sup>2</sup> )	
	Catchment (e.g. 100 km <sup>2</sup> )	
	County / Region (e.g. 5,000 km <sup>2</sup> )	
Model reliability	High	
	Medium	
	Low	

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White or grey space within the Study Area shows areas with no data or with no capacity

Accessible Nature Capacity values per habitat are inferred from available literature. Values are estimates of "perceived naturalness" from public surveys, via photo interpretation.

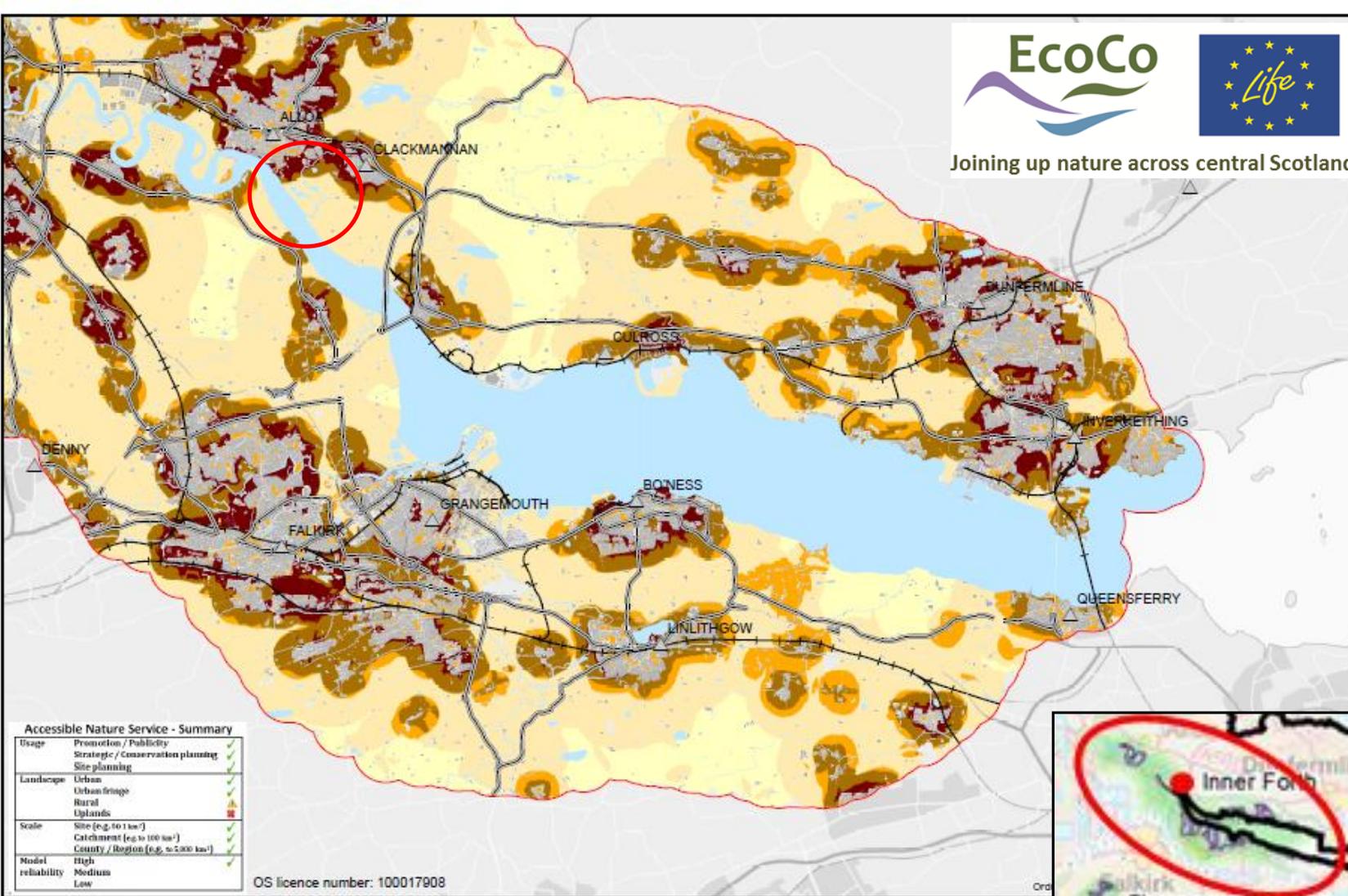
Accessible Nature Capacity Methods

High values represent areas where habitats have a higher "perceived naturalness" score at both the site, and local, scale. Therefore larger continuous blocks of more natural habitat types will have higher scores than smaller isolated sites of the same habitat type.

Accessible Nature Capacity Methods

Default local search neighbourhood values are used, but can be modified by the user. (Default = 300 m)





Accessible Nature Demand

1 - 100

Location

InnerForth\_SE1

Accessible Nature occurs where greenspace or semi-natural habitats give health and well-being benefits to people through regular access for walking, cycling or jogging.

Demand is mapped based on population size, health scores, greenspace size and accessibility.

Map Methods and Limitations

EcoServ-GIS relies on indicators to predict levels of capacity and demand.

Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



ES1\_Accessible Nature Footprint



Accessible Nature Service - Summary

Usage	Promotion / Publicity Strategic / Conservation planning Site planning	
Landscape	Urban Urban fringe Rural Uplands	
Scale	Site (e.g. 50 1 km <sup>2</sup> ) Catchment (e.g. 100 km <sup>2</sup> ) County / Region (e.g. 5,000 km <sup>2</sup> )	
Model reliability	High Medium Low	

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- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

White or grey space within the Study Area shows areas with no data or with no demand

Accessible Nature Demand Methods

High values represent areas where there is a higher predicted benefit to those people likely to use each accessible nature site.

Accessible Nature Demand Methods

The Demand score is based on several combined indicators: population density, health scores and estimated visitation likelihood, based on greenspace size and distance.

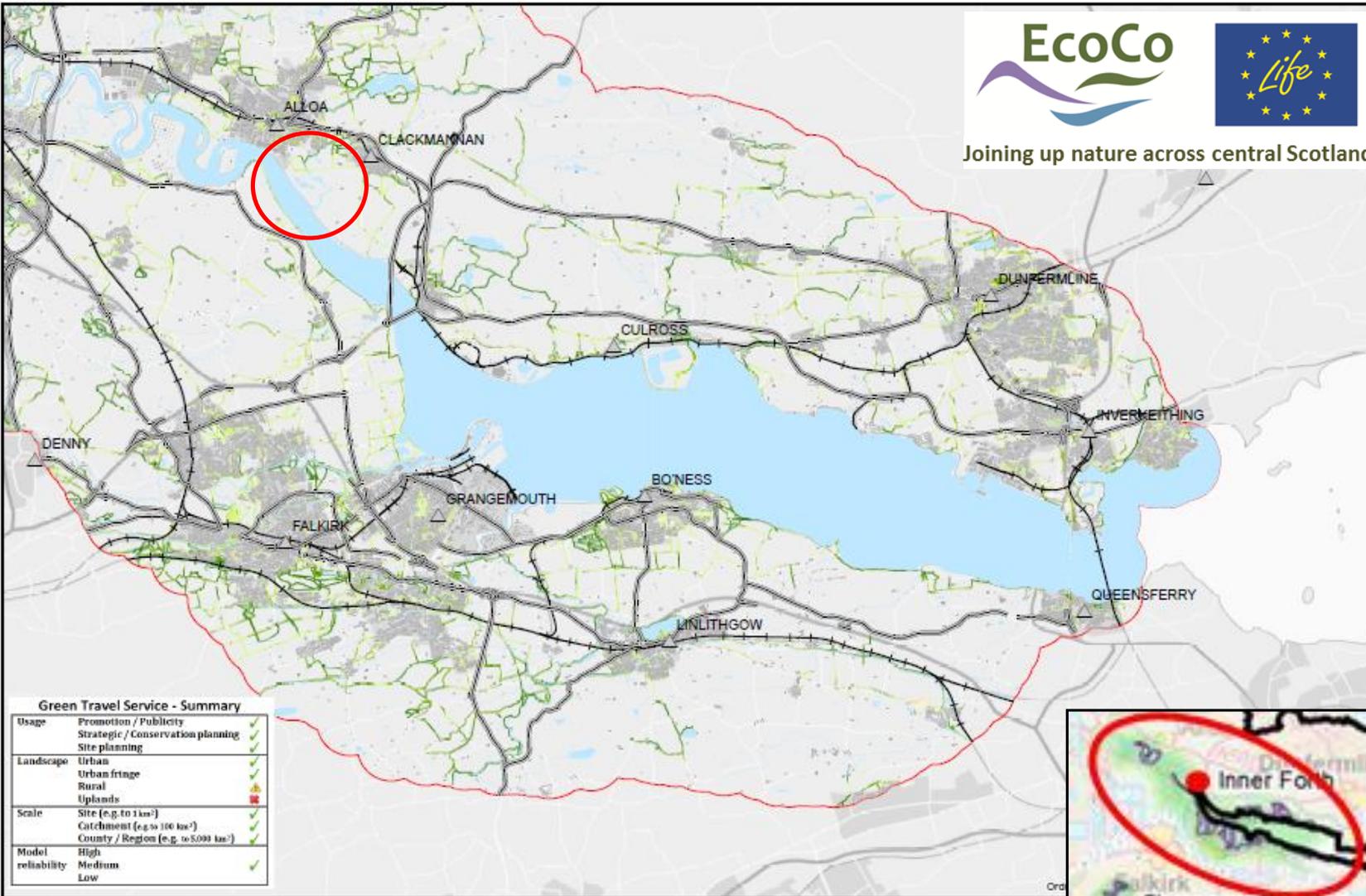
Accessible Nature Demand Methods

Default local search neighbourhood values are used, but can be modified by the user.

Local = 600 m  
Landscape = 2400 m  
Region = 12800 m

Greenspace size thresholds are applied:

Local > 0.1 ha  
Landscape > 10 ha  
Region > 100 ha



Green Travel Capacity

1 to 100 Values

Location

InnerForth\_SE1

Green Travel routes are linear travel networks with a high cover of green infrastructure where people may benefit from a safer, calmer or more aesthetically pleasing travel route

Map Methods and Limitations

EcoServ-GIS relies on indicators to predict where ecosystem services occur. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

EcoServ-GIS Green Travel Analysis Interface



**Green Travel Service - Summary**

Usage	Promotion / Publicity	✓
	Strategic / Conservation planning	✓
	Site planning	✓
Landscape	Urban	✓
	Urban fringe	✓
	Rural	✓
	Uplands	✗
Scale	Site (e.g. to 1 km <sup>2</sup> )	✓
	Catchment (e.g. to 100 km <sup>2</sup> )	✓
	County / Region (e.g. to 5,000 km <sup>2</sup> )	✓
Model reliability	High	✓
	Medium	✓
	Low	✓

- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

White or Grey space within the Study Area shows areas with no data, or with no capacity.

**Limitations and Method Notes**

Routes are identified from Sustrans cycle routes, Public footpaths / Core paths and all pavements and paths mapped by OS MasterMap data. Informal footpaths and any paths not digitised within these data will not be identified on the map. In rare cases paths and pavements will be mapped within private estates or industrial areas where no public access is permitted.

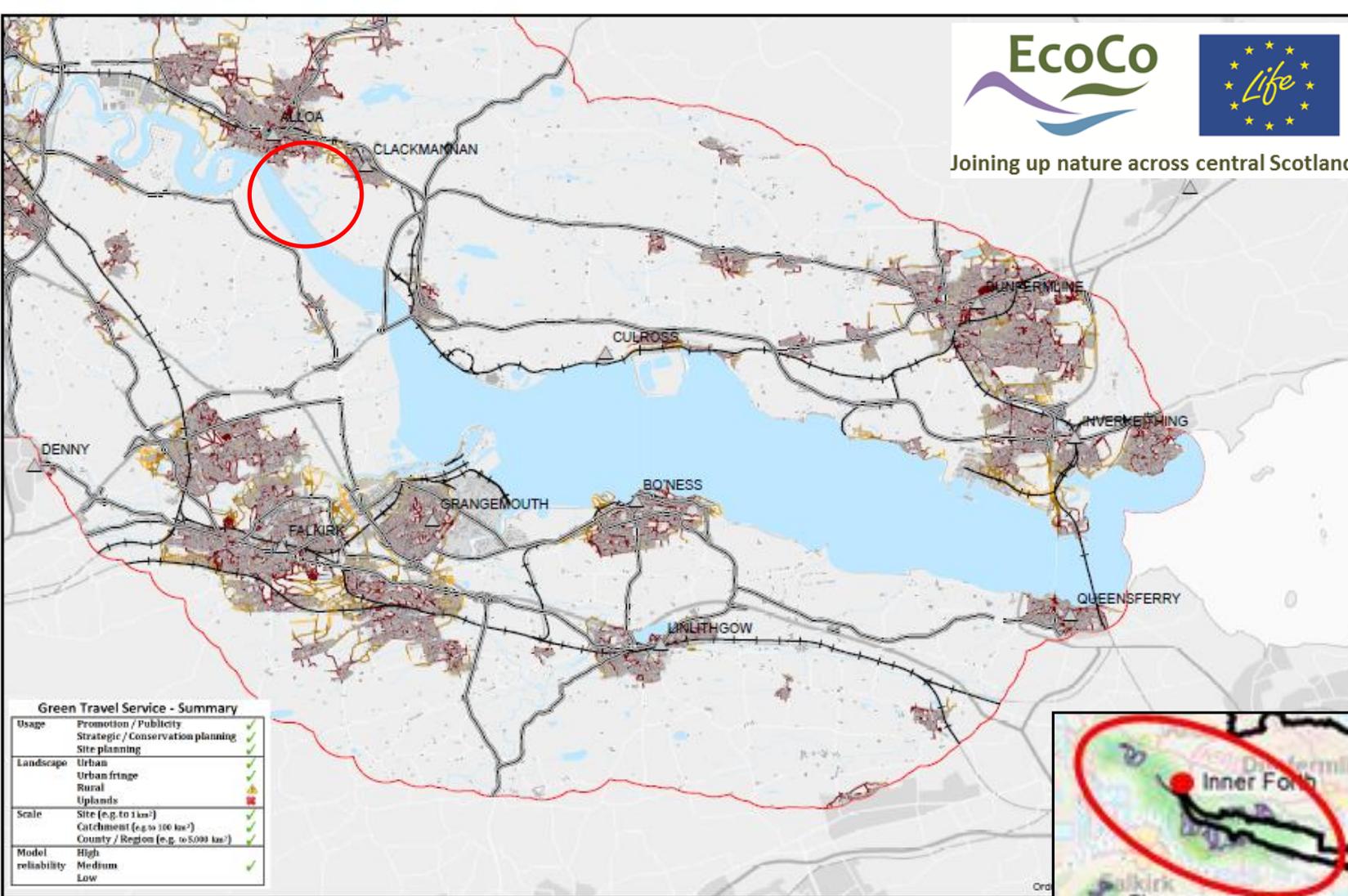
Thresholds are applied to limit the area of mapped capacity. Defaults are applied, but can be varied with custom settings. Defaults are:

Minimum linear route length = 2,000 m  
 Minimum area of travel route and buffer = 1,000 m (0.1 ha)  
 Focal search distance for "local" scale mean naturalness score = 300 m

This map reflects how "natural" habitat types are along linear travel networks. The model uses perceived naturalness scores.



### Joining up nature across central Scotland



**Green Travel Demand**

**1 to 100 Values**

**Location**  
InnerForth\_SE1

Green Travel routes are linear travel networks with a high cover of green infrastructure where people may benefit from a safer, calmer or more aesthetically pleasing travel route

**Map Methods and Limitations**

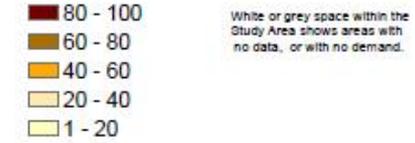
EcoServ-GIS relies on indicators to predict where ecosystem services occur. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

*EcoServ-GIS Green Travel Analysis Interface*



**Green Travel Service - Summary**

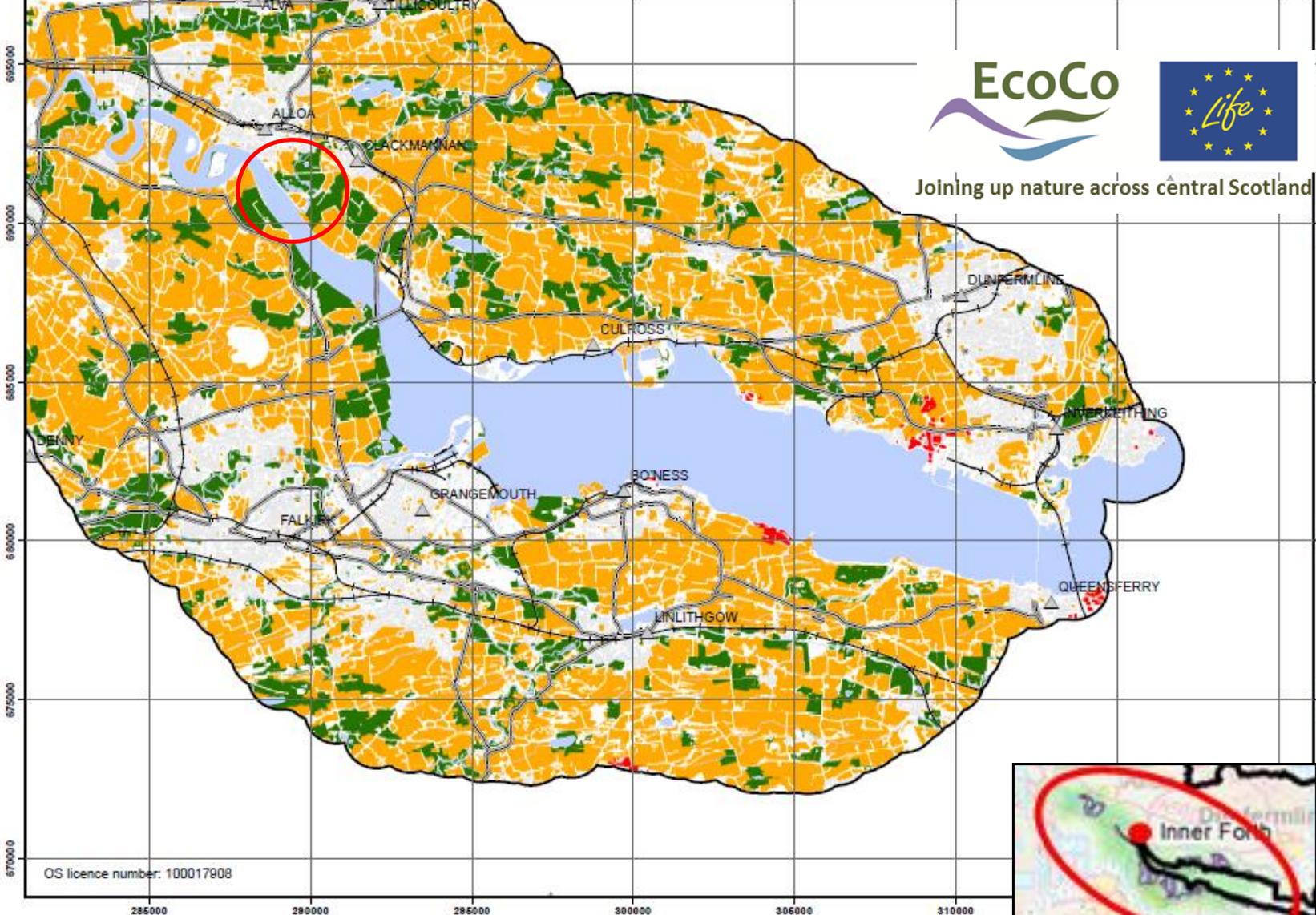
Usage	Promotion / Publicity	✓
	Strategic / Conservation planning	✓
	Site planning	✓
Landscape	Urban	✓
	Urban fringe	✓
	Rural	✓
	Uplands	✗
Scale	Site (e.g. to 1 km <sup>2</sup> )	✓
	Catchment (e.g. to 100 km <sup>2</sup> )	✓
	County / Region (e.g. to 5,000 km <sup>2</sup> )	✓
Model reliability	High	✓
	Medium	✓
	Low	✓



Demand for Green Travel routes is mapped using a least-cost analysis, along the linear travel network. Travel destinations used are rail stations, town centre locations and schools.  
The maximum travel distance used can be altered by users.  
The default maximum travel distance is 4,500 m.



Joining up nature across central Scotland



Opportunity Areas

(b1.1a) Lowland wetland creation

Total score:  
All opportunity areas  
(without ecosystem services score)

Location:  
InnerForth\_SE1

Ecological Coherence Protocol Score:  
The value provided to ecological coherence in the landscape, or potential value that future created habitat could provide. Score is classified into three equal interval classes. Scores are relative to the landscape. The variables used to calculate the score may vary between landscapes. Variables include: patch area, network presence and type, proximity to similar habitat, and ecosystem service delivery or potential.

Ecological Coherence Protocol Score

- 3 high
- 2 medium
- 1 low

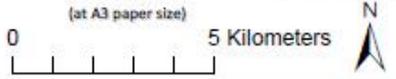


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Joining up nature across central Scotland



Ecological Networks

All Habitat Networks

Location:  
InnerForth\_SE1

This map is illustrative, as many networks overlap in spatial occurrence and the map is therefore influenced by the drawing order of the different habitat types. Each network type is shown in full in separate maps.

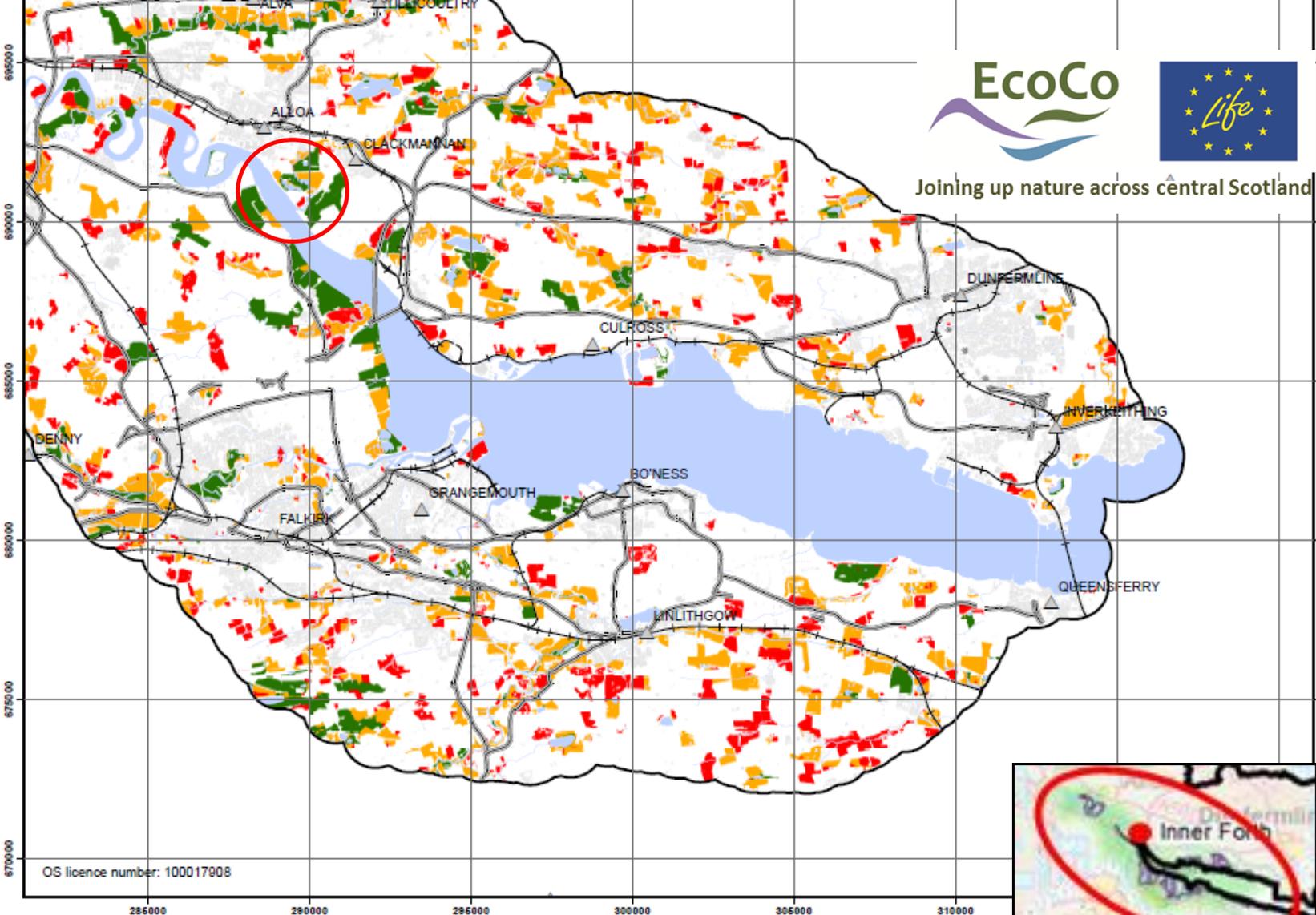
- Ponds network (all)
- Heathland networks (all)
- Lowland wetland networks (all)
- Mires networks (all)
- Grassland networks (all)
- Woodland networks (all)



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Joining up nature across central Scotland



Opportunity Areas

(b1.1b) Lowland wetlands Creation

Total score:  
Opportunity areas  
within networks  
(without ecosystem  
services score)

Location:  
InnerForth\_SE1

Ecological Coherence Protocol Score:  
The value provided to ecological  
coherence in the landscape, or potential  
value that future created habitat could  
provide. Score is classified into three  
equal interval classes. Scores are relative  
to the landscape. The variables used to  
calculate the score may vary between  
landscapes. Variables include: patch  
area, network presence and type,  
proximity to similar habitat, and  
ecosystem service delivery or potential.

Ecological Coherence  
Protocol Score

- 3 high
- 2 medium
- 1 low



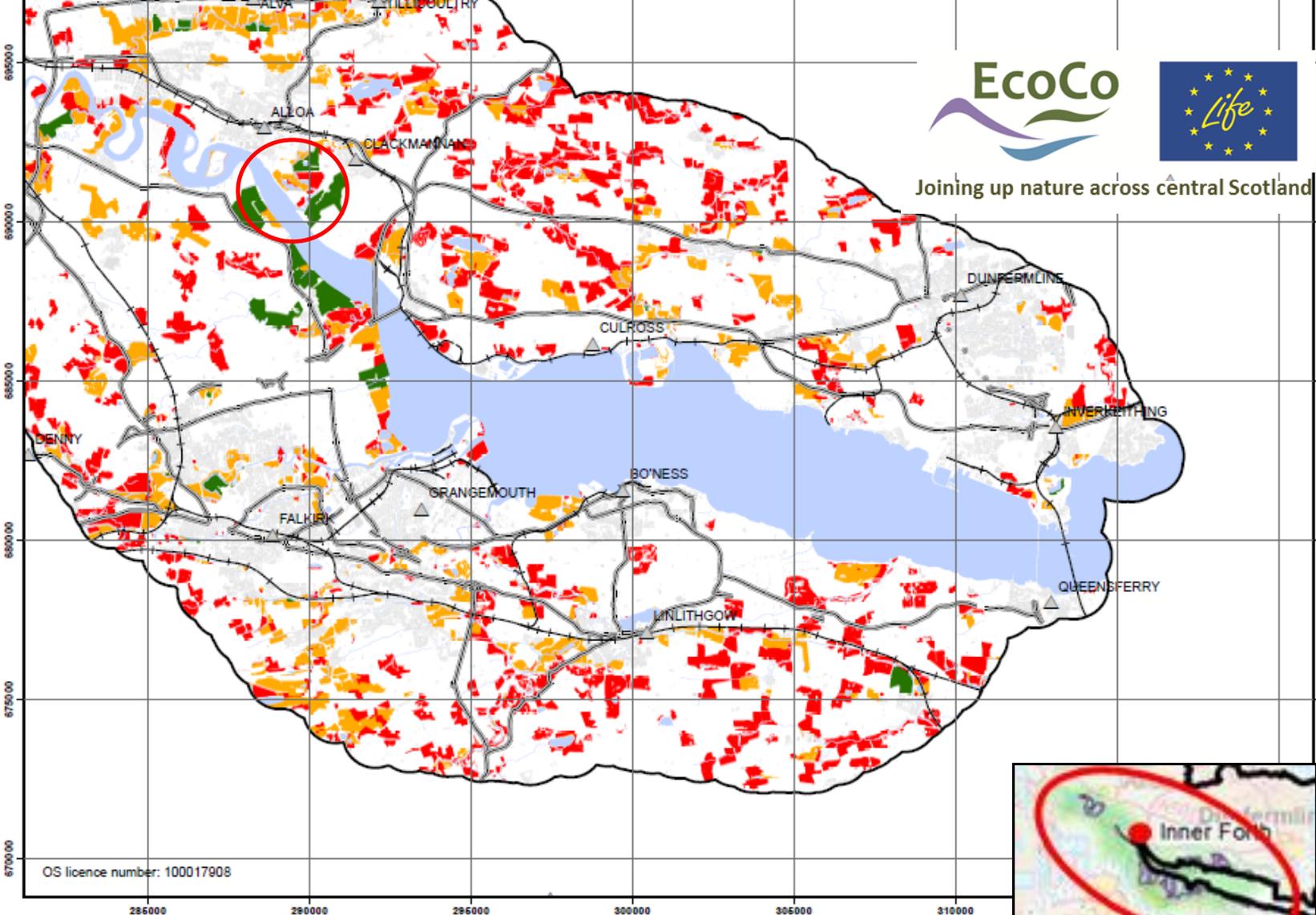
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(at A3 paper size)





Opportunity Areas

(b1.1c) Lowland wetlands creation

Total score:  
Opportunity areas  
within networks  
with ecosystem  
services score

Location:  
InnerForth\_SE1

Ecological Coherence Protocol Score:  
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Ecological Coherence Protocol Score

- 3 high
- 2 medium
- 1 low

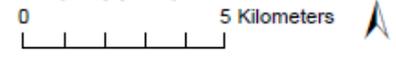


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(at A3 paper size)

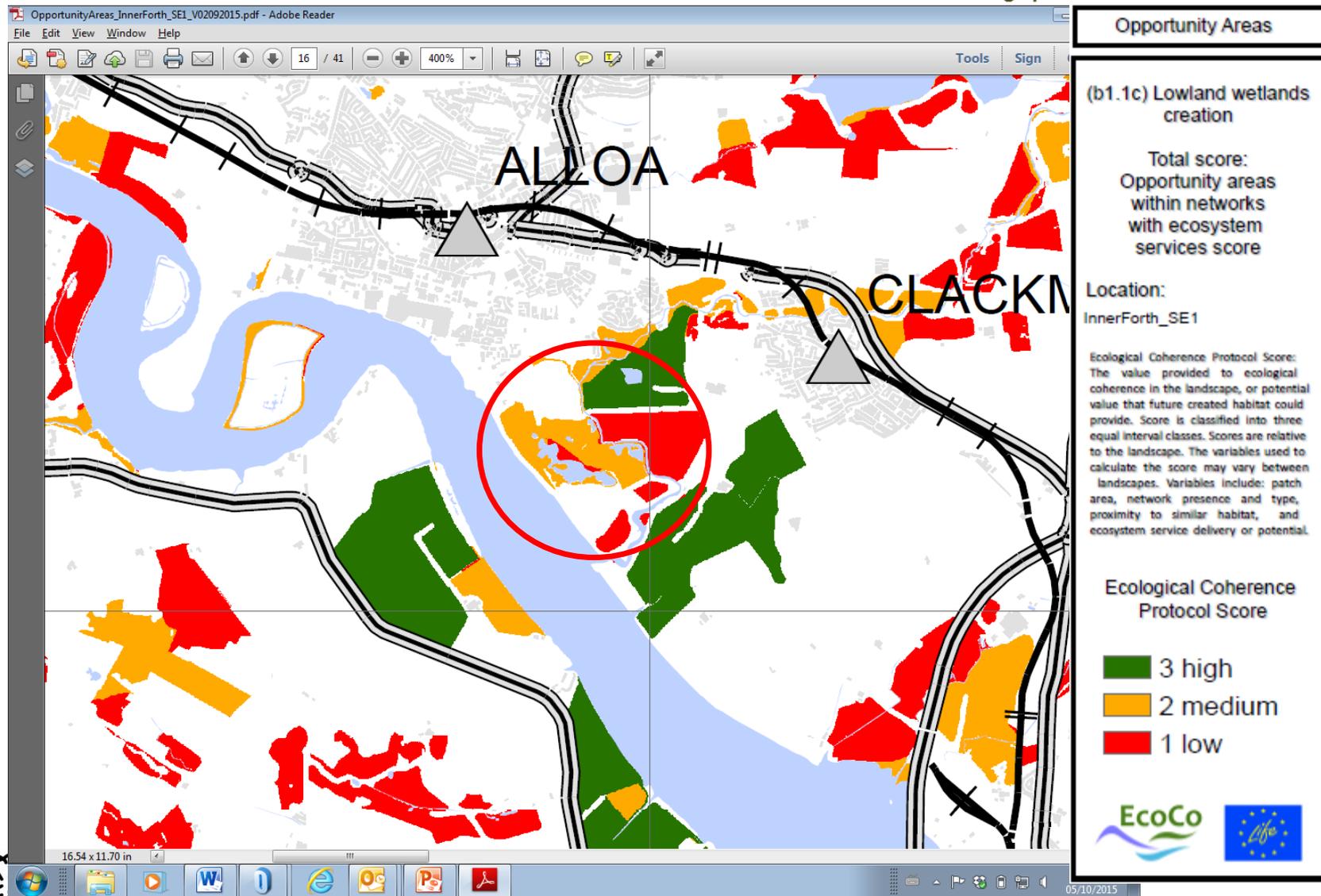


# Lowlands Wetlands creation

## Black Devon wetlands, Clackmannanshire; RSPB



Joining up nature across central Scotland



# Policy influence...

The project is working to influence the adoption more widely of its novel approach to consider strategic sub-nationally and nationally at “landscape scale” prioritisation of conservation efforts in Scotland. National and organisational drivers that incorporate ES explicitly within them include;

- Central to two of [Scotland's National Outcomes](#)
- Scottish Biodiversity Strategy [Routemap 2020](#),
- [Scottish Natural Heritage \(SNH\) Corporate Plan 2016-18](#)
- [Land Use Strategy for Scotland 2016-21](#).
- [Protected areas for nature review \(Scotland\) 2014](#)

**So more about policy implementation than influence, but able to show how policy might be implemented...**

# Governance and Engagement...

- EcoCo led by the national agency (Scottish Natural Heritage) and sponsored directly from the Scottish government and so has a high profile.
- [Scotland's Natural Capital Asset Index](#) (EUNIS –based); “A *configuration, over time and space, of natural resources and ecological processes, that contributes through its existence and/or in some combination, to human welfare.*” led by the natural capital group (governance structure of the Scottish Biodiversity Strategy)
- Engagement is maintained formally through formal reporting and less formal means through site visits and presentations.
- EcoCo and its experience necessarily falls into line with this emerging change trend in policy direction.



# ES in the planning cycle...

- The system is based on a system **designed for planners** to provide strategic indications of where developments to mitigate adverse environmental impacts and positive interventions are best suited
- Dialogue and engagement with “**green infrastructure**” type initiatives for the adoption of ES valuation. We have some case study examples where the base ES evaluation tool used by EcoCoLife has been used in **spatial planning scenarios** with development planners.
- EcoCo focuses on the **Central Scotland Green Network** which is a national development stated in the **National Development Plan**. Locally delivers on policies related to; health, housing, travel, disadvantaged communities, and greenspace ...

# ES in the planning process...



# Monitoring success...

- Establishing confidence in implementing an approach that is **reliable, trusted and verifiable** – we are still learning
- **Standardised** approach (there are many approaches)
- Establishing **what success should look like** ... determining what matters most (or hoping for the best from other targeted outcomes)
- SNH as the EcoCoLife Coordinating Beneficiary is in the process of developing with others “**Scotland’s Natural Capital Index**” and includes the experience of EcoCoLife. The index is “**a function of ecosystem area and ecosystem quality**”. It uses as far as possible existing UK National Ecosystem Assessment habitats and includes 100 indicators **based on the Common International Classification of Ecosystem Services (CICES)**. It is expected that the index will be adopted more widely as a subject of the Scottish government’s targets for SNH.

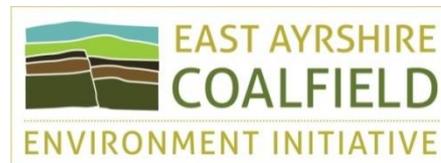


# Barriers to policy implementation...

- Adapting the **ES terminology** i.e. people “get” that nature provides benefits for us, but can we use their **jargon and metrics**?
- At policy level where the **ES concept fits well** with departmental objectives and responsibilities (e.g. **environment and natural resources** mainly) there is a natural fit, can be **awkward with others** like transport, health, economy, economy ... the ecologists *do* try!
- Establishing **meaningful weights and values**; the need for interdisciplinary cooperation.
- Mainstreaming, underpinning, overriding, cross-cutting, target setting ... dealing with the **politics of policy hierarchy** and national+ agendas

## References and thanks to;

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- Central Scotland Green Network [www.centuralscotlandgreennetwork.org](http://www.centuralscotlandgreennetwork.org)
- EcoServ-GIS; Jonathan Winn [jwinn@scottishwildlifetrust.org.uk](mailto:jwinn@scottishwildlifetrust.org.uk)
- EcoCo Partners;





Joining up nature across central Scotland

Thanks for listening

