Scotland's National Ecological Network: progress and practicalities

March 11th 2020, Edinburgh Centre for Carbon Innovation

Workshop Report

Co-organisers: Chloe Bellamy (Forest Research), Alison Hester (James Hutton Institute), Marc Metzger (University of Edinburgh)

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Background

This report summarises the contents and outputs from workshop 'Scotland's National Ecological Network: progress and practicalities', held on the 11th March 2020 at the Edinburgh Centre for Carbon Innovation. This event was led by Chloe Bellamy (Forest Research), Alison Hester (The James Hutton Institute) and Marc Metzger (The University of Edinburgh), in collaboration with ESCom Scotland.

Scotland's Programme for Government 2019-2020 and Biodiversity Routemap to 2020 set out ambitious targets to address climate and biodiversity emergencies, including the development of regional land use plans and strategies. A critical part of this process involves understanding and taking action to ensure delivery of the biggest climate change, biodiversity and other benefits from our land management decisions. Embedded in this approach to more sustainable land use is the need to take stock of progress towards regional and national ecological networks to increase resilience into the future.

Following on from the Nature Connections workshop (March 2017) and Nature Connections parliamentary roundtable (June 2019), we organised this workshop to provide a forum for people working in this important subject across Scotland to meet, update and exchange new information and ideas between policy, practice and research on how we can progress towards the creation of regional and national ecological networks in Scotland[1].

Summary

The workshop brought together around 40 researchers, planners, policy makers, land manager and conservation professionals (Covid19 reduced attendees from a registration list of 80, all of whom receive this report and pdfs of the presentations). The latest 'on the ground' activities and emerging research were presented, with opportunities for discussion and identification of critical gaps and research-into-action needs going forward.

The presentations highlighted new developments since the 2017 workshop in terms of the research and tools available to support NEN implementation, and the variety of new and successful examples of ecological networks in practice across Scotland. The discussion sessions were arranged in two steps. The first one, following the practitioner presentations, focused on four types of perceived barriers to NEN progress: data gaps, evidence gaps, policy and knowledge exchange. When asked to identify which of these presented the biggest barrier(s), the highest proportion of votes (88%) was allocated to policy - a lack of incentives and regulation to encourage action on the ground. During discussion session two,

[1] Scottish Environment LINK (2017) defines a national ecological network as "a strategic, practical and long-term approach to enhancing Scotland's natural environment which is directly linked to increasing the social and economic prosperity and sustainability of its rural and urban communities. The NEN will operate at a national scale but be built of action across Scotland from the local to regional scale."

informed by the second set of presentations by researchers, the voting about the most important barriers changed as follows: 'knowledge exchange across sectors, projects and locations' received more votes (67%) than policy (57%), evidence (29%), data (14%) or 'other' issues (14%) (users could select more than one barrier type).

The discussions also generated many ideas for how to better encourage and facilitate progress. For example, it was suggested that current changes to agricultural and environmental policies under Brexit, and new environmental obligations such as Scotland's 2045 net-zero commitments, provide an exciting 'window of opportunity'. It was agreed that the development and use of clear terminology and fresh communication approaches should be a major priority if we are to encourage the political buy-in and public awareness required to enact change. We need to reframe the concept of an NEN to ensure that it is seen as an opportunity to tackle the ecological crisis, rather than a mechanism for restricting or preventing development. Ideas to take this forward included working with film makers and artists to develop engaging visualisations, stories and 'place-based' examples that showcase the wide benefits that an NEN could provide.

Workshop programme

To allow maximum exposure and learning, the day was structured as a lively exchange of flash talks, supplemented with discussion, interactive activities and an hour of networking opportunities over lunch.

9:45 – 10:15	ARRIVAL & COFFEE
10:15 – 10:30	Welcome
10:30 – 11:00	Keynote speaker: Jo Pike, Scottish Wildlife Trust, "Towards transformative change"
11:00 – 12:00	Practitioner & policy flash talks

Zoe Clelland	RSPB	Inner Forth Habitat Network
Diarmid Hearns	The National Trust for Scotland	A national Ecological Network: connecting ambition, regulation and funding
Donya Davidson	Scottish Wildlife Trust	Edinburgh's Thriving Green Spaces
Alan Bell	Loch Lomond & The Trossachs National Park Authority	Landscape Scale Ecological Networks
Andy Tharme	Scottish Borders Council	A Scottish Borders perspective
Jeremy Roberts	Cairngorms Connect	Cairngorms Connect
Scot Mathiesan	SEPA	River Woods: Evidence of Benefits
Neville Makan	SNH	CSGN Habitat Network 2020 Opportunity Map
Max Hislop	GCV Green Network Partnership	A Strategic Habitat Network for the Glasgow City Region
Deryck Irving	Central Scotland Green Network Trust	A Central Scotland Green Network Blueprint

12:00 – 12:15	Questions for speakers

12:15 – 13:15 LUNCH & posters

13:15 – 14:00 Group exercise 1 – breakout groups

14:00 – 14:30 Science flash talks

Darren Moseley	Forest Research	Developing ecological network methodologies to identify opportunities for policy makers and practitioners
Katrina Brown	James Hutton Institute	Generating actionable knowledge across land management boundaries
Alessandro Gimona	The James Hutton Institute	Work relevant to ecological networks
Kirsty Park	University of Stirling	Woodland Creation & Ecological Networks (WrEN project)
Ruth Mitchell	James Hutton Institute	The consequences of tree diseases for connectivity

14:30 – 14:45 Questions for speakers

14:45 – 15:00 TEA BREAK

15:00 – 15:50 Group exercise 2 – breakout groups

15:50 – 16:00 Wrap up

Social media

During the event, participants were encouraged to use Twitter to share their updates on the workshop and their thoughts using #NatEcoNet @ESComScot.

Talk structure

To facilitate comparisons and learning across talks we asked presenters to structure their presentations around three questions.

Policy & practice

1. What work are you doing now on ecological networks? (2 slides)
2. What evidence, data or tools do you *use* to make decisions related to ecological connectivity? (1 slide)
3. GAPS: What evidence, data or tools *would help you* make decisions related to ecological connectivity? (1 slide)

Research

1. What work are you doing now on ecological networks? (2 slides)
2. What policy or practice needs is your research addressing? (1 slide)
3. GAPS: What new research would support a National Ecological Network? (1 slide)

Presenters were asked to email brief answers to these questions before the event. From the compiled responses, the workshop leads identified four broad themes regarding barriers to progress, that were common to people's responses across science, policy and practice:

- **Data gaps** - quality, accessibility and availability
- **Evidence gaps** - knowledge and understanding to underpin action on the ground
- **Knowledge exchange** - across sectors, projects and locations
- **Policy** - incentives and regulation to encourage action on the ground.

The answers were also used to create a word cloud (Fig 1) to highlight common issues and topics emerging from the presenters' responses (after removing words belonging to the workshop title).

Figure 1. Word Cloud of responses to the questions posed to presenters.

Breakout groups

The four types of barriers to progress identified provided the focus for the breakout groups and discussion sessions. During these group exercises, participants first added named post-it notes to each of the four topic area stations, outlining needs not being met currently under that topic area. They were then asked to go to the topic area they believed was of highest priority for discussion. This format was the same for both breakouts, i.e. number one breakout after the practitioner talks and before the science flash talks; and number two breakout after the science talks, building on the information shared during the first breakout using information learned from the science presentations.

Four facilitators led the discussions, one at each of the four topic stations: Darren Moseley (FR), Scot Mathiesan (SEPA), Ruth Mitchell (JHI) and Kirsty Park (University of Stirling).

Some of the main barriers and opportunities identified and discussed by each group are presented below:

1. **Data gaps**

- Better consistency and coverage of data collection and classification are needed (e.g. some projects use UKHab versus EUNIS habitat classifications; some data are patchy or out of date e.g. Phase 1 survey data).

- Data accessibility: there should be wider use of an open platform for data sharing and access (e.g. via Scotland's Environment Web) – many datasets are prohibitively costly.

- Better data on habitat condition and monitoring are needed to evaluate success of actions on the ground.

- Additional data required e.g. trees outside of woodlands; land ownership; habitats such as mosaics.

- Citizen science data – a great resource that could be made more widely available and used.

- Wider implementation and testing of machine learning to automatically identify habitat types, land use and cover over time.

- Better use of natural experiments to fill evidence and data gaps, e.g. species dispersal distances; temporal connectivity; value of regenerative grazing systems.

2. Evidence gaps

- A better understanding of the types of benefits that regional and National Ecological Networks provide, e.g. biodiversity and ecosystem services; the trade-offs between these benefits; and potential disbenefits, e.g. spread of invasive non-native species, pests and diseases.

- What does success look like? How can we gauge the impact of policy on outcomes?

- Prioritisation – which actions should we take for which benefits?

- Barriers include data availability and access (see above) and cultural barriers to partnership working.

- Collaboration and knowledge exchange for gathering and dissemination of data: we need case studies that cover a strategic network approach alongside practical delivery. We can learn from other sectors (e.g. health sector) and via better collaboration. We should also better consider how we reframe evidence for different audiences.

3. Knowledge exchange

- Better within and between sector knowledge exchange, collaboration and communication needs to be encouraged and supported to improve awareness of activities and progress, e.g. sharing best practice examples and practical, place-based case studies. This may be aided by a better understanding of less tangible modes of

exchange (e.g. cultural development of institutional processes) and could be facilitated more by partnerships and landscape scale projects.

- We need to break out of our 'bubble' and engage a more diverse set of people and organisations. In particular, better engagement with Scottish Government, farmers, local authorities, communities and businesses is required. How do we engage better with the general public about this issue – simple messaging and more engaging mechanisms such as via story-telling, visualisations, interactive/online tools, and the arts? Some community groups are less engaged and more underrepresented than others, e.g. green infrastructure provision favouring more affluent urban areas. We can learn from some good examples, e.g. Scottish Wildlife Trust's approach to engaging the investment community.

- A clearer vision of what the NEN is trying to achieve and non-technical, more consistent and engaging terminology are required.

4. Policy

- Spatial scale: the NEN needs to be clearly expressed at the national scale with a clear, top-down policy commitment and a strategic national spatial framework to support land use strategies, ecological/habitat network delivery and biodiversity protection at regional to national scales. These need to be underpinned by a well-defined vision – what are we trying to achieve?

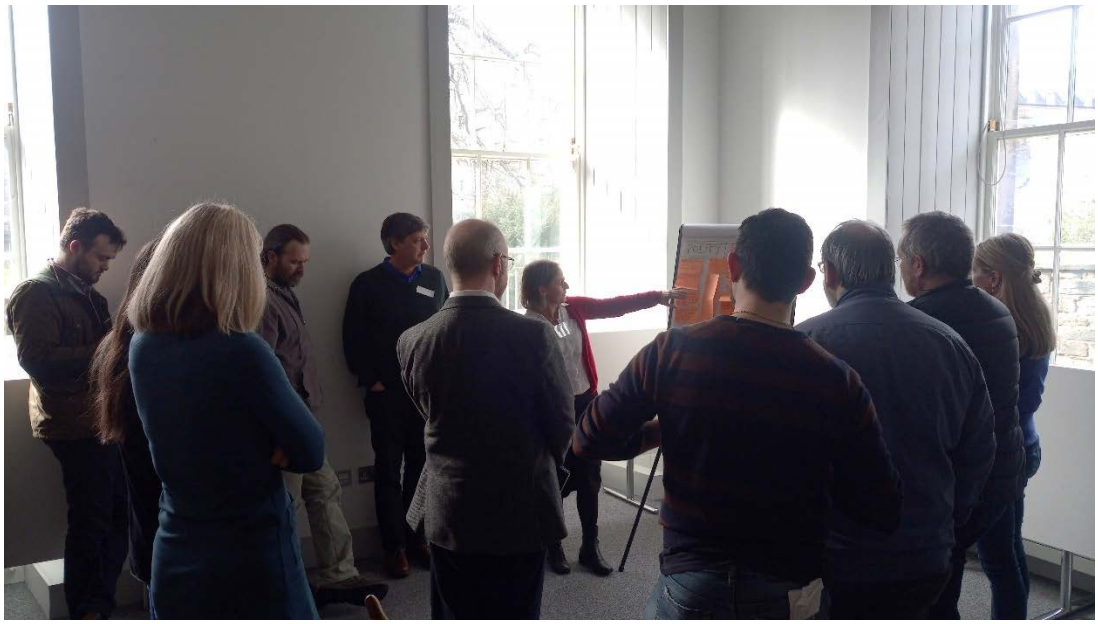
- Fresh incentives and funding approaches: less conventional approaches to funding networks could be investigated, e.g. investing in environmental based businesses; encouraging businesses to invest in natural capital; public goods funding could be expanded beyond traditional land use sectors. More incentives for ecological farming practices and to encourage collaboration between land managers are needed. Developers should be obligated/awarded for delivering habitat quality and connectivity gain, e.g. via the Biodiversity Net Gain metric.

- Some guidelines and policies may need to be reviewed and updated; they need to be more widely adhered to by organisations other than conservation agencies (e.g. Scottish Biodiversity Duty; Species Control Agreements for invasive non-native species).

- Rural versus urban land use policy: there is perhaps less ‘policy control’ in rural areas, but perhaps a greater need for incentives in urban areas where there are more people and greater competition for land.

- We need to overcome misinterpretation of the topic/term (NEN) and to use more consistent terminology (e.g. green, habitat or ecological networks?) to ensure buy in.

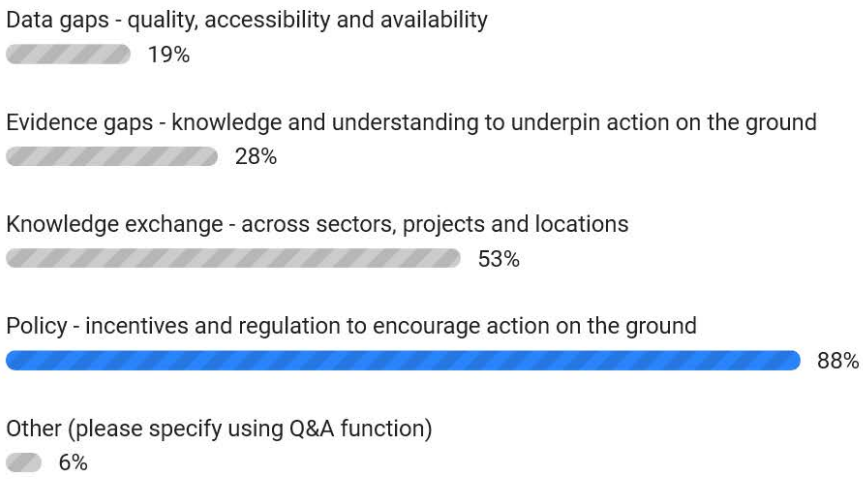
- Policy tensions and integration across policy areas – some policies are pitted against each other e.g. rural economy versus biodiversity, causing resource/budget competition and land use conflicts. We need a coordinated approach across all policy areas and to build understanding - without truly integrating biodiversity policies, the ecological crisis cannot be addressed effectively.



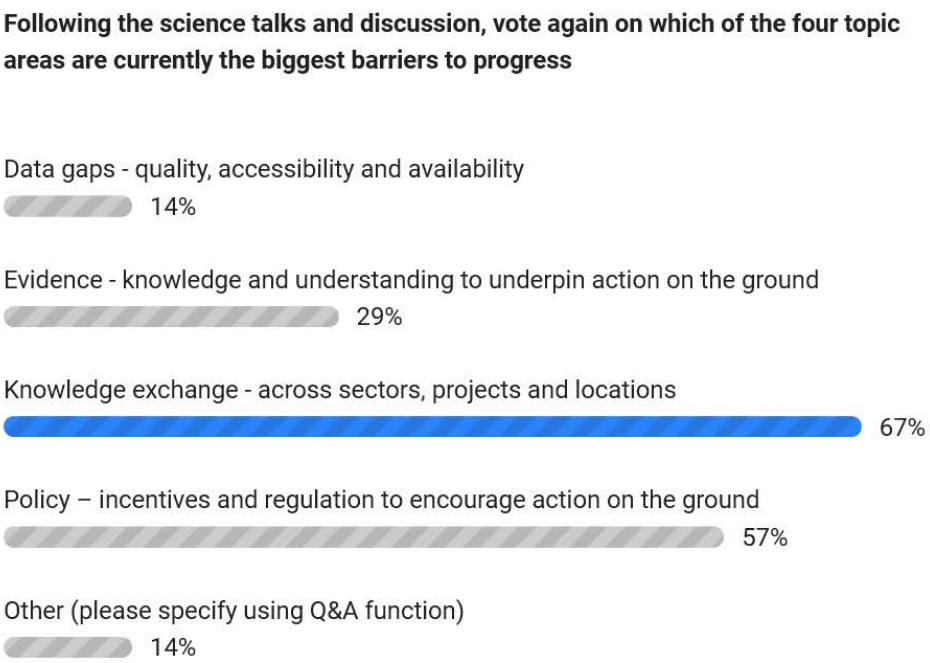
Online poll

To further engage participants and collect analytical data on their thoughts and priorities, an online poll was created using the tool Sli.do. The poll questions posed during the group exercises are shown below, alongside the responses:

1. Out of the four general topic areas, which do you think are currently the biggest barriers to progress? (Beginning of group exercise 1)



2. Following the science talks and discussion, vote again on which of the four topic areas are currently the biggest barriers to progress? (Beginning of group exercise 2)



3. What would you most like to see happen next to help progress in this area of ecological connectivity and networks (free text answers)? (End of group exercise 2)

- Policy-maker engagement
- A new appreciation that without the integration of biodiversity thinking across land use sectors - i.e. without a NEN or equivalent - we will never succeed in reversing species abundance and range declines, the loss and degradation of habitats and the successful implementation of nature-based solutions to the climate emergency.
- Would be lovely if “competing” approaches to things can come together.
- An ability to communicate core message effectively to different audiences, tailoring ’story’ as appropriate.
- Funding to work with film makers/artists to capture some of the personal stories and place-based connections that will resonate with people, and show the magic of biodiversity and healthy ecosystems.
- Conversion of the science into opportunity maps, supported by scenario visualisations for SH engagement and a steer by SG for all land management incentives to follow the opportunities
- Bringing different individual activities together more formally to (a) scale up and join up different areas for bigger impact; and (b) share methods and data. And learn from each other about pathways to success.
- A working group to define the meaning of NEN and identify ways it could be translated and communicated to different audiences. 2. More communication between NEN stakeholders to share knowledge and support working towards common aims (ie promotion and implementation of NEN)
- Discussion around how to reframe the concept so there is greater buy in from policy, public and business. Discussion around how to better tell the story of why we need an NEN.
- More funding opportunities to develop the NEN and policy to help implement it.
- Demonstration projects showing concept to implementation through a series of stories and engaging graphics.
- A shared understanding that an ecological network is about much more than just physical connectivity – it’s is about habitat quality, habitat extent, buffer zones, stepping stones and should have protected areas as a 'backbone'.
- A new way of funding land management that is based on public/ecological benefits, not farm production.
- More socio-economic research to demonstrate the societal benefits of better networks
- Buy in from policy makers and politicians that NENs are a way of tackling biodiversity crisis... and not just a threat to development.
- Agreement on the methodology for identifying and communicating NEN. Rebranding for relaunch.
- More work to help civic society and more specifically some key business sectors understand why a NEN is needed and how it can deliver benefits and help them.
- The agreement of a dominant, consistent approach to gathering data and a centralised system for the sharing and access of that data.

- Translate evidence base into a policy proposal for NPF4 and for CAP replacement - areas of land, required land uses, and how different types of owners can be incorporated.
- Story sharing - visualisations, communicating positive messages, links to social and economic benefits.
- A way to share resources and find out more about different projects/partners with the aim of building new collaborations.
- A more, national joined up approach with better policy buy in and funding!
- A national framework to connect initiatives.

Concluding reflections from the organisers

The workshop polls highlighted the fact that 'knowledge exchange across sectors, projects and locations' is considered a major barrier to progress regarding NEN. This result underlines the need for these types of networking and knowledge exchange events and highlights the important role that communities of practice, such as ESCom Scotland, can play in encouraging and facilitating discussion and collaboration between research, policy and practice.

The workshop was considered a success and, despite the Covid-related reduction in numbers actually attending on the day, the presentations and discussions demonstrated: (a) what fantastic work is going on across Scotland, addressing a diverse set of questions and challenges which are all important for the progress towards creating ecological networks in and between both urban and rural areas; and (b) exciting new research findings that are coming out and helping to inform action on the ground. It also brought into sharp focus those major challenges that are still holding back progress in this area, with some constructive suggestions on ways forward and actions needed.

This is an important subject and one that our three organisations will continue to take forward. Please browse the presentation slides in the appendix to this report well as this report, have a look at the additional Resources shared by some of the participants (next page) and feel free to contact individuals or organisations represented at this workshop if you want to follow up on any of their work.

Resources

All presentations are available as Appendix to this report.

Participants were encouraged to share links to relevant projects and helpful resources. These are shown below.

Forest Research

- BioCoRe webpage: An interactive/adaptable landscape ecology approach for targeting restoration
- Glasgow and Clyde Valley integrated habitat networks research page and report

RSPB

- Further information and downloads relating to the Inner Forth Futures partnership and Inner Forth Habitat Network and Ecological Coherence Practitioners Guide.
- The document produced by the Landscape Scale Working Group of the Scottish Biodiversity Strategy available on request.
- Please contact Kate Fuller or Zoe Clelland with any questions about the process.

Scottish Wildlife Trust

- Edinburgh's Thriving Green Spaces Information Briefing
- The Ecological Coherence Protocol Practitioners Guide

University of Stirling & Forest Research

- The Woodland Creation & Ecological Networks - WrEN project webpage

Appendix – slide of all the presentations at the workshop

Pg 17	Alison Hester Chloe Bellamy	James Hutton Institute Forest Research	Welcome
Pg 25	Jo Pike	Scottish Wildlife Trust	Keynote: Towards transformative change
Practitioner & policy flash talks			
Pg 53	Zoe Clelland	RSPB	Inner Forth Habitat Network
Pg 58	Diarmid Hearns	The National Trust for Scotland	A national Ecological Network: connecting ambition, regulation and funding
Pg 63	Donya Davidson	Scottish Wildlife Trust	Edinburgh's Thriving Green Spaces
Pg 69	Alan Bell	Loch Lomond & The Trossachs National Park Authority	Landscape Scale Ecological Networks
Pg 74	Andy Tharme	Scottish Borders Council	A Scottish Borders perspective
Pg 79	Jeremy Roberts	Cairngorms Connect	Cairngorms Connect
Pg 84	Scot Mathiesan	SEPA	River Woods: Evidence of Benefits
Pg 89	Neville Makan	SNH	CSGN Habitat Network 2020 Opportunity Map
Pg 93	Max Hislop	GCV Green Network Partnership	A Strategic Habitat Network for the Glasgow City Region
Pg 99	Deryck Irving	Central Scotland Green Network Trust	A Central Scotland Green Network Blueprint
Science flash talks			
Pg 106	Darren Moseley	Forest Research	Developing ecological network methodologies to identify opportunities for policy makers and practitioners
Pg 111	Katrina Brown	James Hutton Institute	Generating actionable knowledge across land management boundaries
Pg 116	Alessandro Gimona	The James Hutton Institute	Work relevant to ecological networks
Pg 122	Kirsty Park	University of Stirling	**W**oodland C**r**eation & **E**cological **N**etworks (**WrEN** project)
Pg 129	Ruth Mitchell	James Hutton Institute	The consequences of tree diseases for connectivity

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Edinburgh Centre for Carbon Innovation, High School Yards, Edinburgh EH1 1LZ

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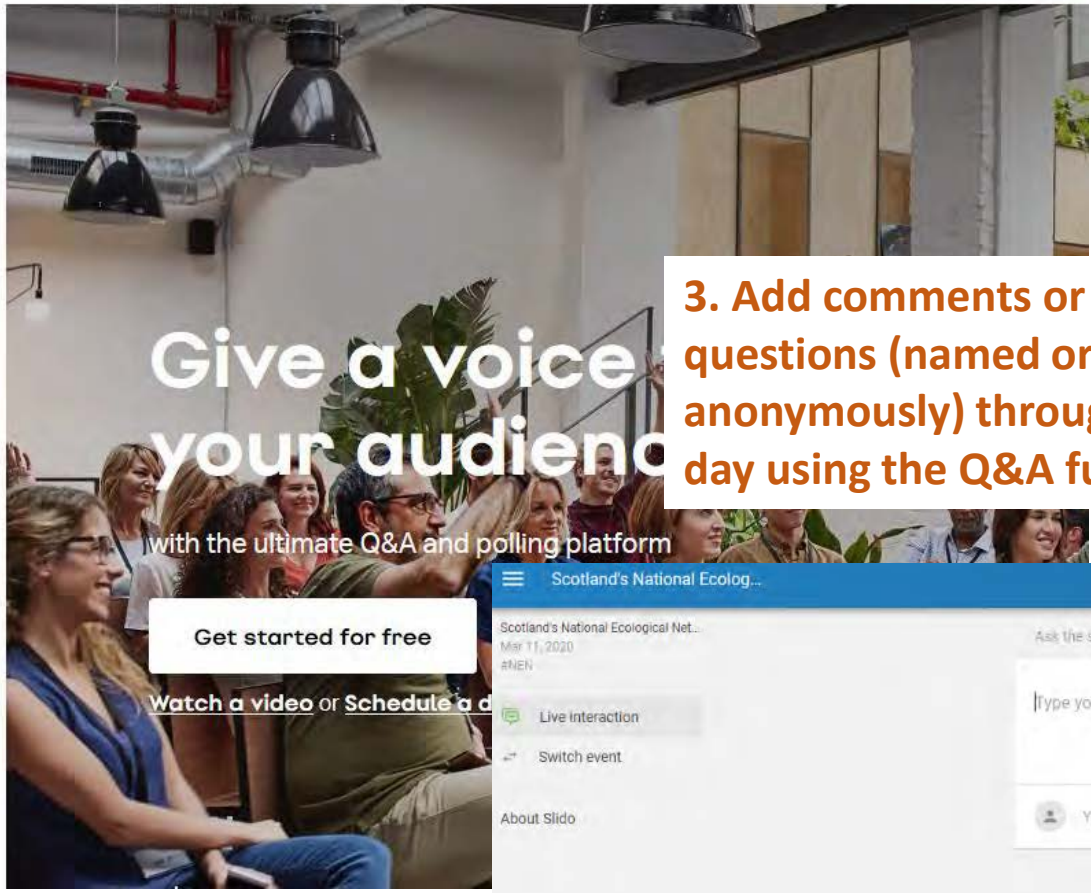
10:15 – 10:30	Welcome
10:30 – 11:00	Keynote speaker: Jo Pike, Scottish Wildlife Trust
11:00 – 12:00	Practitioner & policy flash talks (x12)
12:00 – 12:15	Questions for speakers
12:15 – 13:15	LUNCH & posters
13:15 – 14:00	Group exercise 1
14:00 – 14:30	Science flash talks (x5)
14:30 – 14:45	Questions for speakers
14:45 – 15:00	TEA BREAK
15:00 – 15:50	Group exercise 2
15:50 – 16:00	Wrap up

Questions? www.sli.do/ #NEN

Twitter: @EScomScot #NatEcoNet

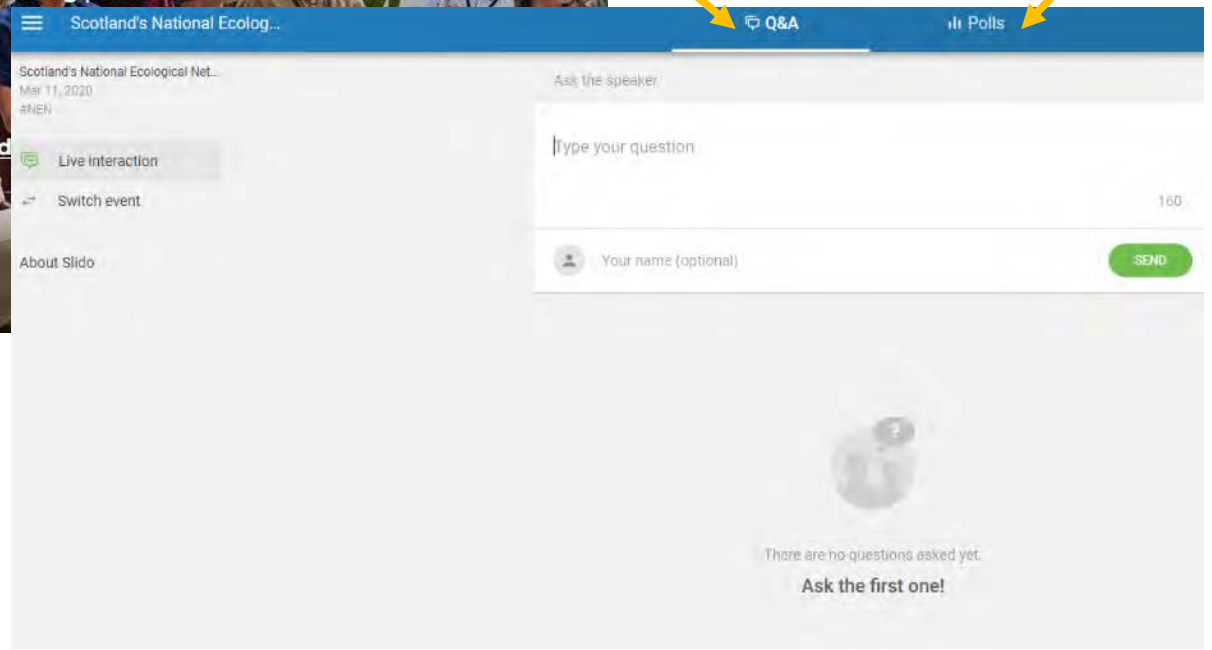
1. On a smartphone or computer*, go to www.sli.do/

2. Type ‘NEN’ in event code



3. Add comments or ask questions (named or anonymously) throughout day using the Q&A function

4. Poll function to be used during group exercises…



*Please come and see me to use shared tablet/laptop

Scotland's National Ecological Network: progress and practicalities, March 11th 2020

Policy & practice – flash talk speakers		
Zoe	Clelland	RSPB
Diarmid	Hearns	The National Trust for Scotland
Donya	Davidson	Scottish Wildlife Trust
Alan	Bell	Loch Lomond & The Trossachs National Park Authority
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Kirsty	Park	University of Stirling
Ruth	Mitchell	The James Hutton Institute

Questions? www.sli.do/ #NEN

Twitter: @ESComScot #NatEcoNet

Policy & practice

1. What work are you doing now on ecological networks?
2. What evidence, data or tools do you use to make decisions related to ecological connectivity?
3. What evidence, data or tools would help you make decisions related to ecological connectivity?

Science

1. What work are you doing now on ecological networks?
2. What policy or practice needs is your research addressing?
3. What new research would support a National Ecological Network?

Questions? www.sli.do/ #NEN

Twitter: @ESComScot #NatEcoNet

Barriers to progress - four themes identified

Data gaps - quality, accessibility and availability

Evidence gaps - knowledge and understanding to underpin action on the ground

Knowledge exchange - across sectors, projects and locations

Policy - incentives and regulation to encourage action on the ground

Questions? www.sli.do/ #NEN

Twitter: @EScomScot #NatEcoNet

Scotland's National Ecological Network: progress and practicalities, March 11th 2020

Group exercise 1 – identifying gaps (13:15 – 14:00)

1. Go to www.sli.do on your phones, enter event code **#NEN** and participate in the poll (5 minutes)

Out of the four general topic areas, which do you think are currently the biggest barriers to progress?

- Data gaps - quality, accessibility and availability
- Evidence gaps - knowledge and understanding to underpin action on the ground
- Knowledge exchange - across sectors, projects and locations
- Policy - incentives and regulation to encourage action on the ground

2. Add named post it notes to each topic area station outlining needs not being met currently under that topic area (15 minutes)

3. Go to your highest priority topic area station for discussion (20 minutes)

Twitter: @ESComScot #NatEcoNet

Scotland's National Ecological Network: progress and practicalities, March 11th 2020

Group exercise 2 – plugging the gaps (15:00 – 15:50)

1. Go to the topic area station of highest interest/priority and discuss, in light of the science presentations, where you think current work is addressing the gaps identified (15 minutes)
2. Plenary feedback (3 minutes from each station)
3. Go to www.sli.do **#NEN** and participate in the second poll (5 minutes) and free text question (5 minutes)

   a. Following the science talks and discussion, vote again on which of the four topic areas are currently the biggest barriers to progress?
   - Data gaps - quality, accessibility and availability
   - Evidence gaps - knowledge and understanding to underpin action on the ground
   - Knowledge exchange - across sectors, projects and locations
   - Policy - incentives and regulation to encourage action on the ground

   b. What would you most like to see happen next to help progress in this area of ecological connectivity and networks?

Twitter: @ESComScot #NatEcoNet

Scotland's National Ecological Network: progress and practicalities, March 11th 2020

Image credit: Burton et al (2019). Landscape Ecology, 34(7), 1693-1713.

Thank you!

The James Hutton Institute

THE UNIVERSITY of EDINBURGH

Forest Research

escom Ecosystem Services Community Scotland

Want to run an event with ESCom Scotland?

Get in touch!

escom.scot@yahoo.com

Twitter: @ESComScot

#NatEcoNet

Towards transformative change

Jo Pike, Chief Executive
Scottish Wildlife Trust

Scotland's National Ecological Network:
Progress and Practicalities
11 March2020

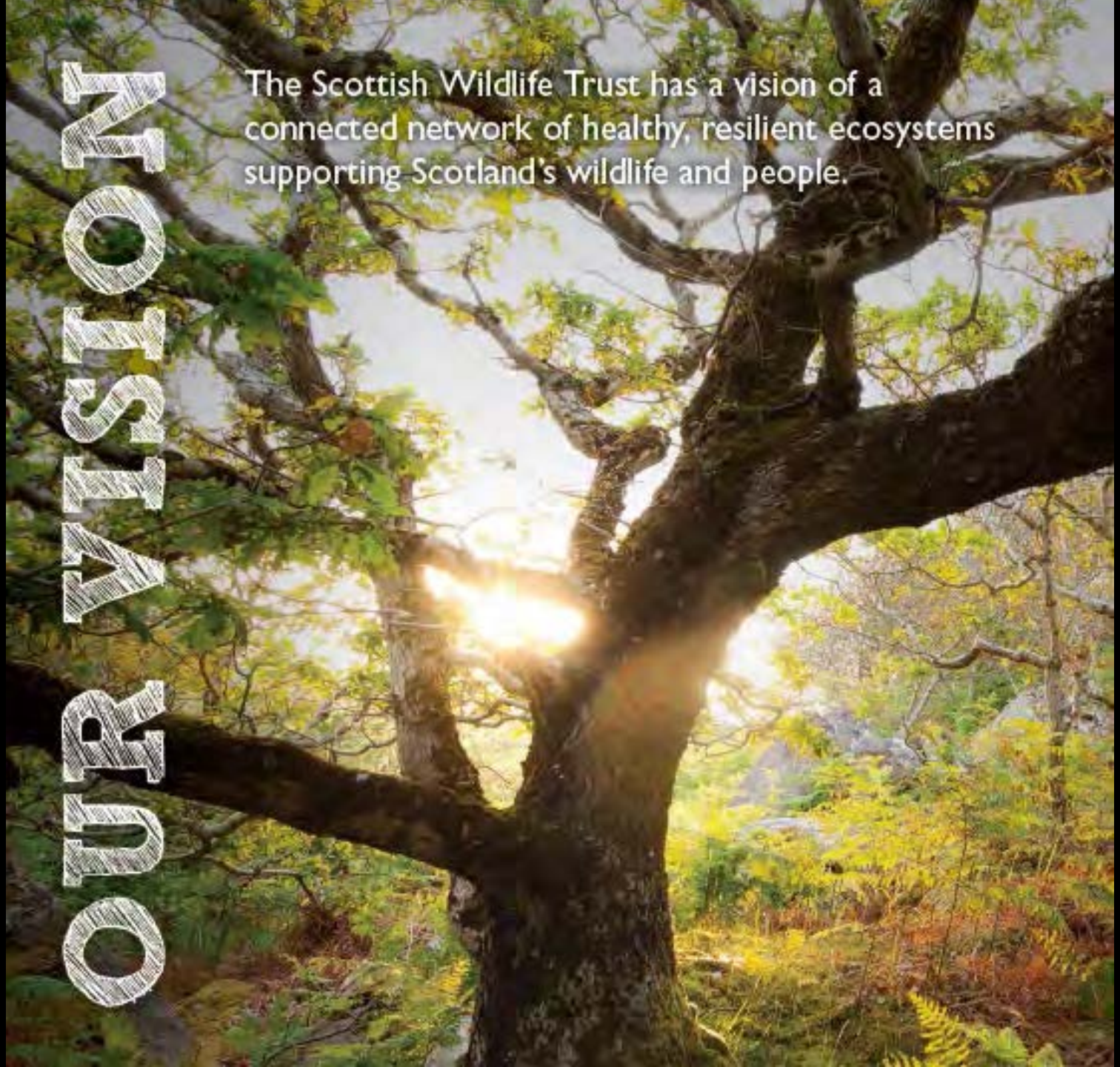
@ScotWildlife


“Protecting and enhancing our stock of natural capital…is fundamental to a healthy and resilient economy”
Nicola Sturgeon, First Minister
@ScotWildlife

Scottish Wildlife Trust

Why a National Ecological Network?

@ScotWildlife


OUR VISION
The Scottish Wildlife Trust has a vision of a connected network of healthy, resilient ecosystems supporting Scotland's wildlife and people.

Scottish Wildlife Trust

OUR GOALS

HEALTHY ECOSYSTEMS | **PROTECTED PLACES** | **THRIVING SPECIES** | **A SCOTLAND THAT VALUES & BENEFITS FROM NATURE**

...AND HOW WE ACHIEVE THEM

CHAMPION
the ecological, moral, social and economic reasons to protect and restore nature

DEMONSTRATE
best practice in practical conservation and the creation of Living Landscapes and Living Seas

INSPIRE
people to experience, learn about and care for wildlife and wild places

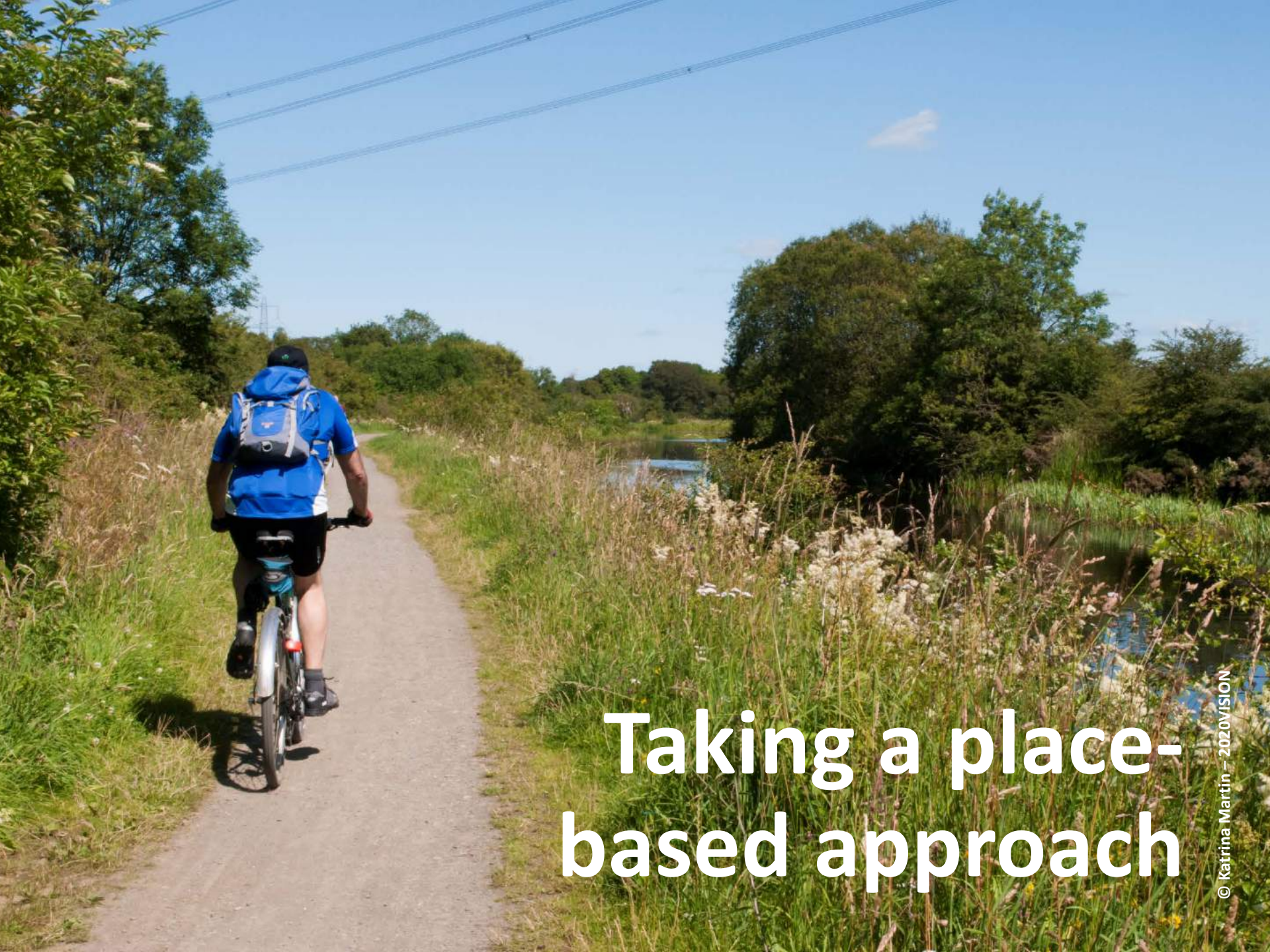
OUR STRONG FOUNDATIONS

Valued and motivated **PEOPLE**

Sufficient and sustainably managed **RESOURCES**

Sound knowledge and **EVIDENCE**

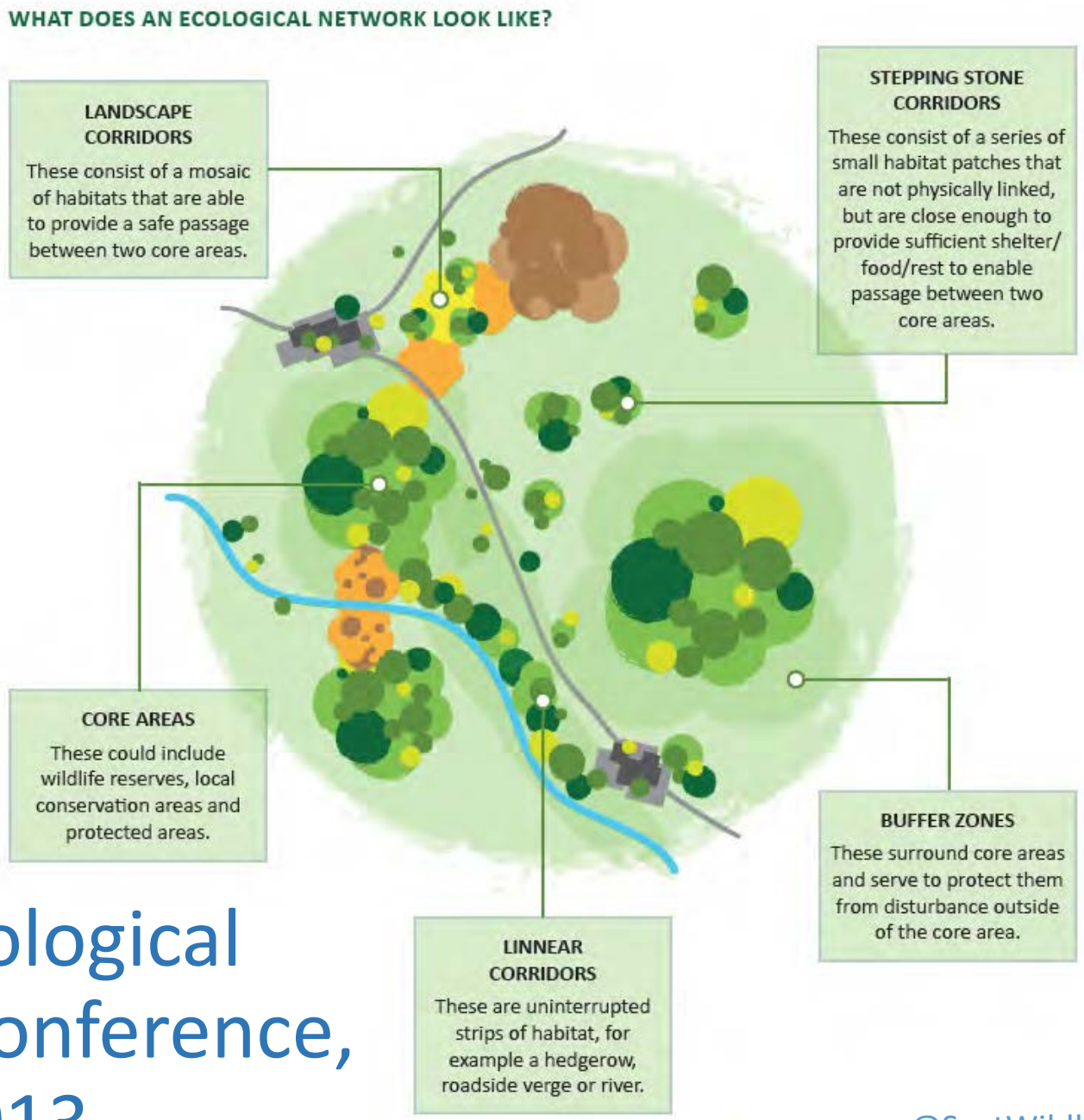

Tackling the twin emergencies of climate change and biodiversity loss
©Tim Allot



Taking a place-based approach

Scottish Wildlife Trust

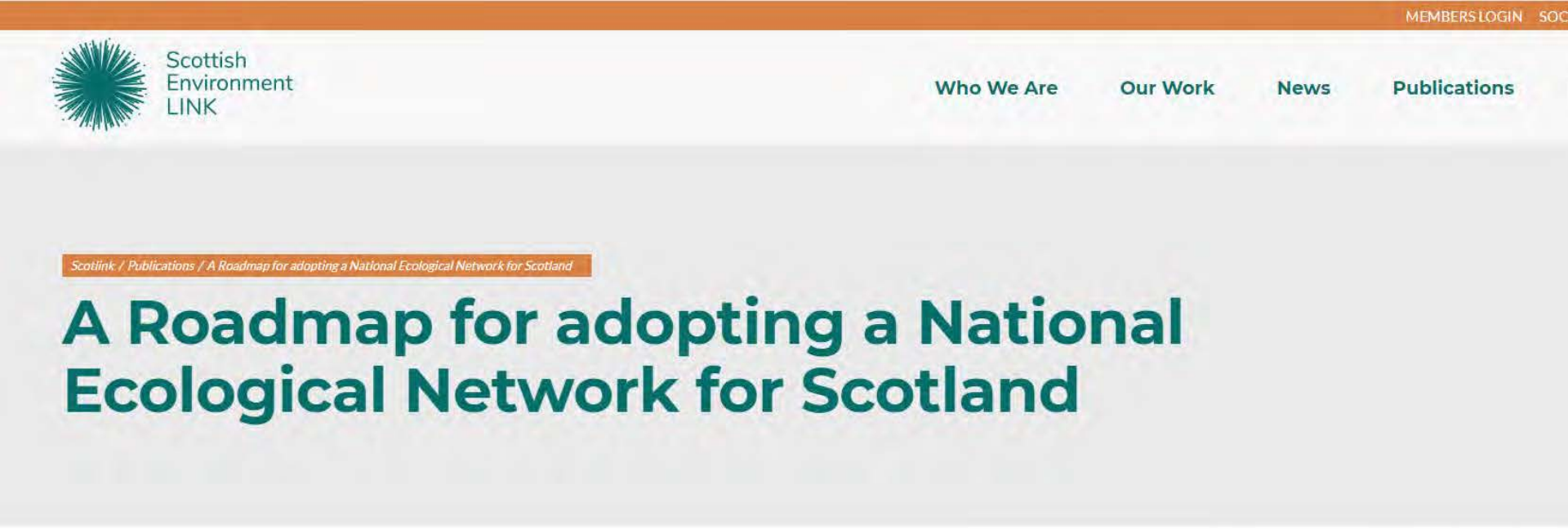
Steps on a journey…



National Ecological Networks Conference, February 2013

@ScotWildlife


"We mustn't build up a massive debt of natural capital as we've already done with financial capital"
Alan Seatter, Deputy Director-General for the Environment, European Commission
"A National Ecological Network could help Scotland deliver its international biodiversity commitments"
Dr Jane Smart, Global Director, IUCN Biodiversity Conservation Group



Work with Scottish Environment LINK

Scottish Wildlife Trust

"At its simplest level, an NEN is a national vision to create a rich network of natural habitats across Scotland and a commitment to deliver that. Promoting an overarching ambition for restoring and reconnecting nature and a spatial vision of where and what could be achieved, would give us all a common purpose and show where best to target collective action and investment. Applying strategic planning to our green and blue infrastructure, as we do with built infrastructure, would catalyse the necessary step change in level of action."

Landscape-Scale Conservation Working Group of the Scottish Biodiversity Strategy

Advocacy on natural infrastructure

PART B:
Sector Summaries

On this basis it is recommended that:

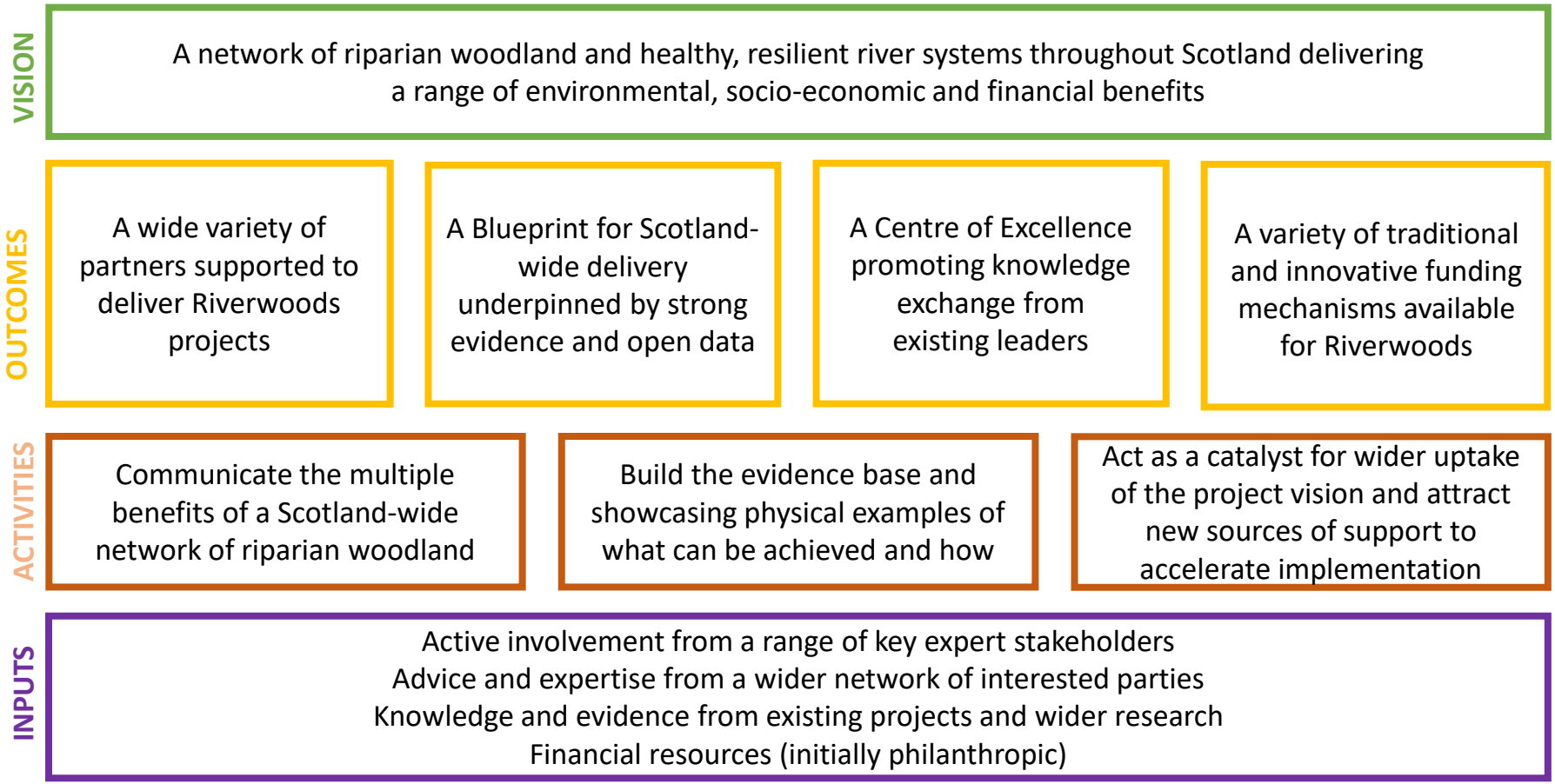
23. By 2021 a body should be given the responsibility by the Scottish Government to provide independent, long term, evidence-based advice to Scottish Ministers on investment decisions for the social, economic and natural infrastructure needs and priorities required to deliver an inclusive net zero carbon economy.

Scottish Wildlife Trust

A physical expression of the National Ecological Network…


Riverwoods: scaling up for transformative change
@ScotWildlife

RIVERWOODS: A bottom-up approach to a Scotland-wide vision



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Tool designed by the Cambridge Conservation Initiative for assessing conservation projects against the Sustainable Development Goals.

10 of the 17 SDG Goals are delivered through Riverwoods

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Scottish Wildlife Trust
Harbourside House
110 Commercial Street
Edinburgh, EH6 6NF

Scale: 1:2,763,795

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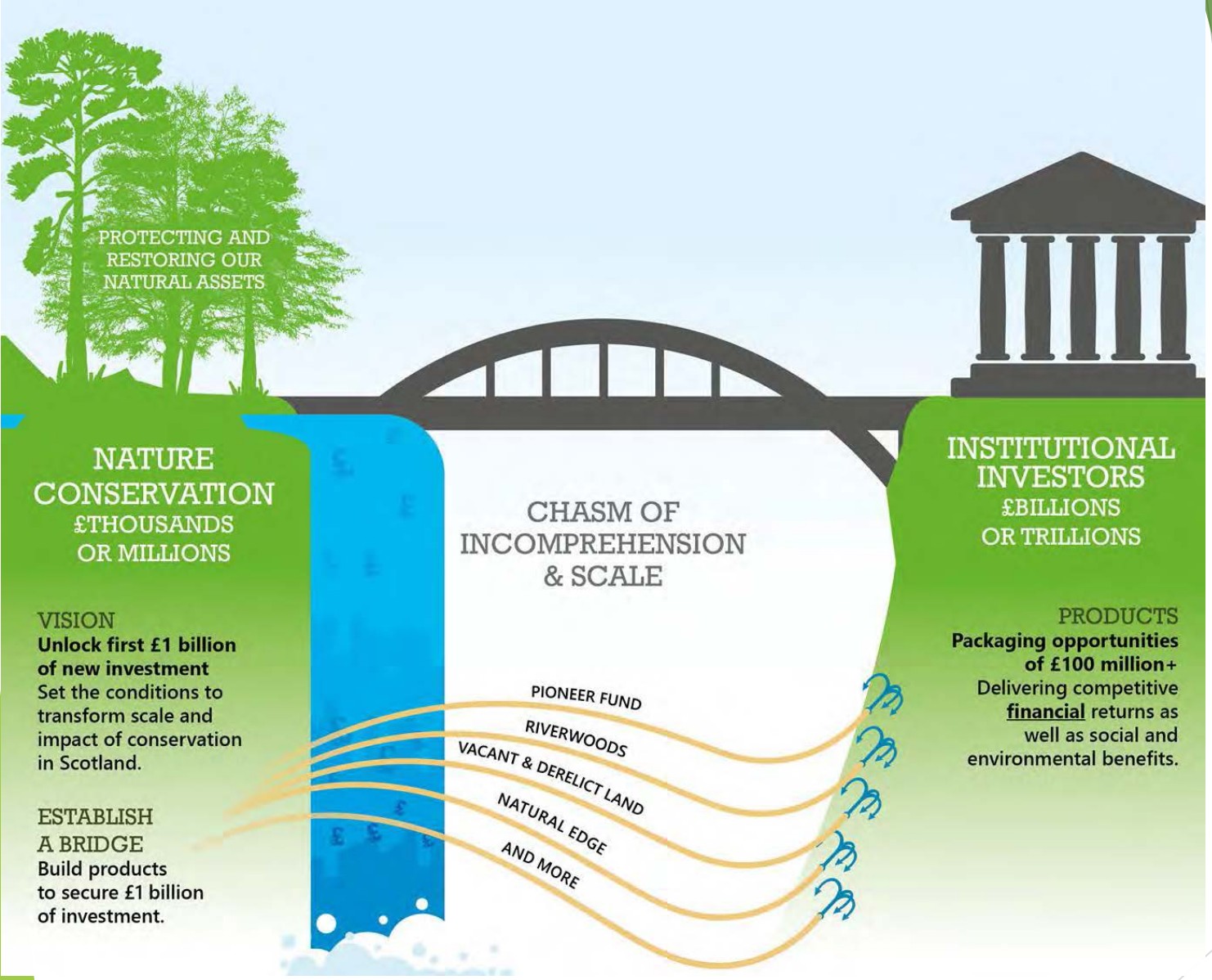
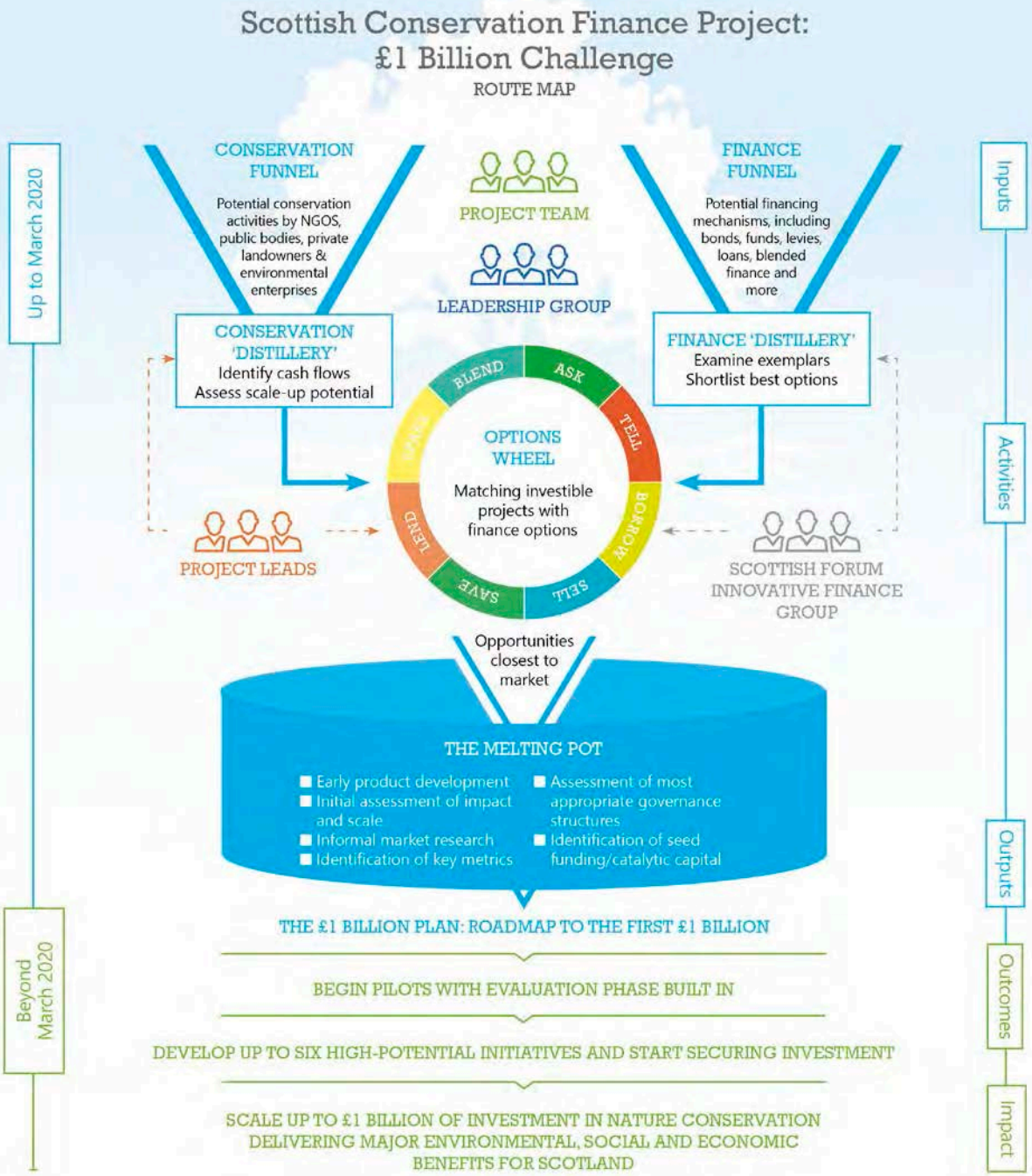
£1 Billion Challenge

The Scottish Conservation Finance Project

SEPA
Scottish Environment Protection Agency

Scottish Wildlife Trust


PROTECTING AND RESTORING OUR NATURAL ASSETS
NATURE CONSERVATION
£THOUSANDS OR MILLIONS
VISION
Unlock first £1 billion of new investment
Set the conditions to transform scale and impact of conservation in Scotland.
ESTABLISH A BRIDGE
Build products to secure £1 billion of investment.
CHASM OF INCOMPREHENSION & SCALE
PIONEER FUND
RIVERWOODS
VACANT & DERELICT LAND
NATURAL EDGE
AND MORE
INSTITUTIONAL INVESTORS
£BILLIONS OR TRILLIONS
PRODUCTS
Packaging opportunities of £100 million+
Delivering competitive financial returns as well as social and environmental benefits.


Scottish Conservation Finance Project:
£1 Billion Challenge
ROUTE MAP
Up to March 2020
CONSERVATION FUNNEL
Potential conservation activities by NGOS, public bodies, private landowners & environmental enterprises
PROJECT TEAM
LEADERSHIP GROUP
FINANCE FUNNEL
Potential financing mechanisms, including bonds, funds, levies, loans, blended finance and more
CONSERVATION 'DISTILLERY'
Identify cash flows
Assess scale-up potential
FINANCE 'DISTILLERY'
Examine exemplars
Shortlist best options
OPTIONS WHEEL
Matching investible projects with finance options
ASK
TELL
BORROW
SELL
SAVE
LEND
SAVE
BLEND
PROJECT LEADS
SCOTTISH FORUM INNOVATIVE FINANCE GROUP
Opportunities closest to market
THE MELTING POT
Early product development
Initial assessment of impact and scale
Informal market research
Identification of key metrics
Assessment of most appropriate governance structures
Identification of seed funding/catalytic capital
THE £1 BILLION PLAN: ROADMAP TO THE FIRST £1 BILLION
BEGIN PILOTS WITH EVALUATION PHASE BUILT IN
DEVELOP UP TO SIX HIGH-POTENTIAL INITIATIVES AND START SECURING INVESTMENT
SCALE UP TO £1 BILLION OF INVESTMENT IN NATURE CONSERVATION DELIVERING MAJOR ENVIRONMENTAL, SOCIAL AND ECONOMIC BENEFITS FOR SCOTLAND
Beyond March 2020
Inputs
Activities
Outputs
Outcomes
Impact

The Route Map will be published imminently… Watch this space!

SEPA
Scottish Environment Protection Agency

Scottish Wildlife Trust

Benefits of being part of Riverwoods

- Opportunity to help shape a transformative project
- Opportunity to showcase existing activities as part of a wider narrative
- Opportunity to access potential new knowledge, new partners and new sources of funding
- Opportunity to demonstrate leadership and achieve more through collaborative working
- Momentum for to respond to the Climate Emergency and Biodiversity Crisis
- **Please let us know if you'd like to be part of an upcoming High-level Science Workshop. Date TBC.**

Scottish Wildlife Trust

Recap on a few NEN-related knowledge gaps…

Scottish Wildlife Trust

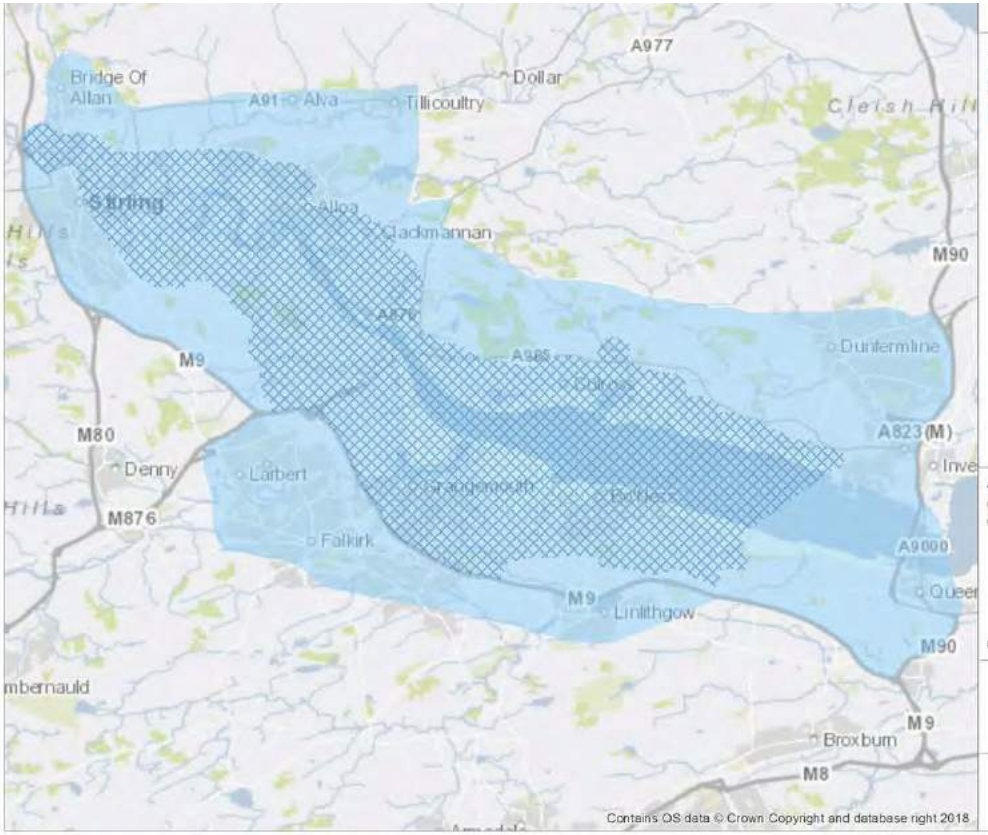
A few questions

- What is the extent to which networks facilitate the spread of **non-native invasive species?**
- With regards to the work that is already being done, how can we learn from that and improve on that?
- What would it look like if we were to increase Scotland's natural capital by 10%, 30%, 50%?


Thank you
© Katrina Martin – 2020VISION

Inner Forth Habitat Network

Zoe Clelland – Area Manager, RSPB Scotland



Legend:

- Inner Forth Area (core project area)
- Inner Forth Wider Engagement Area

Acknowledgements & notes:

Created by: RSPB

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N

Map scale = 1:179,671

Date printed: 14/03/2019

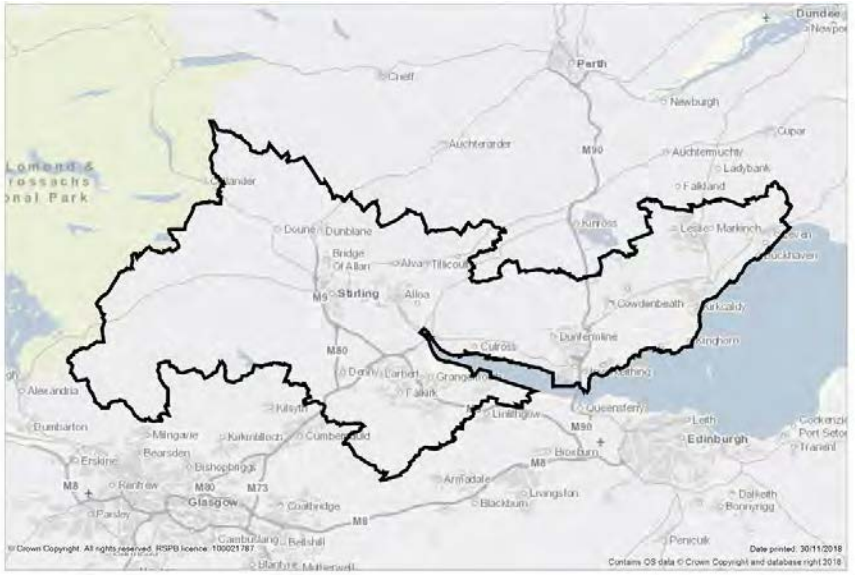
0 2 4 8 Km

rspb giving nature a home

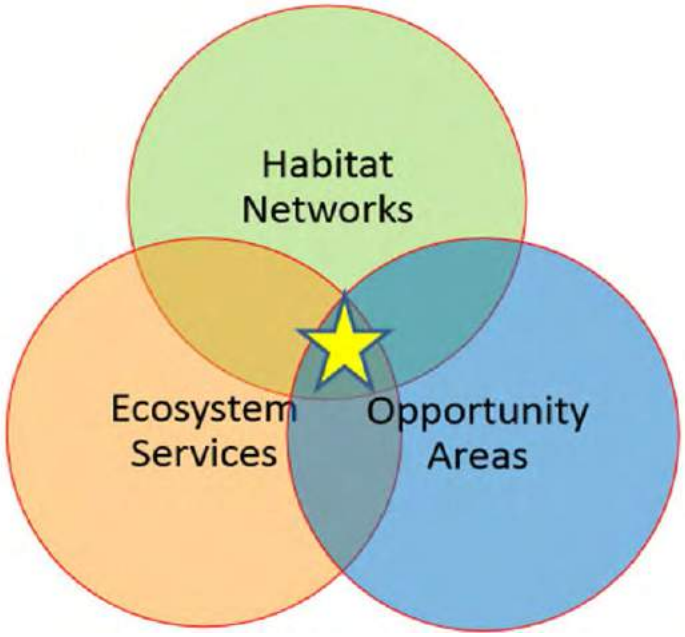
Joining up nature across central Scotland

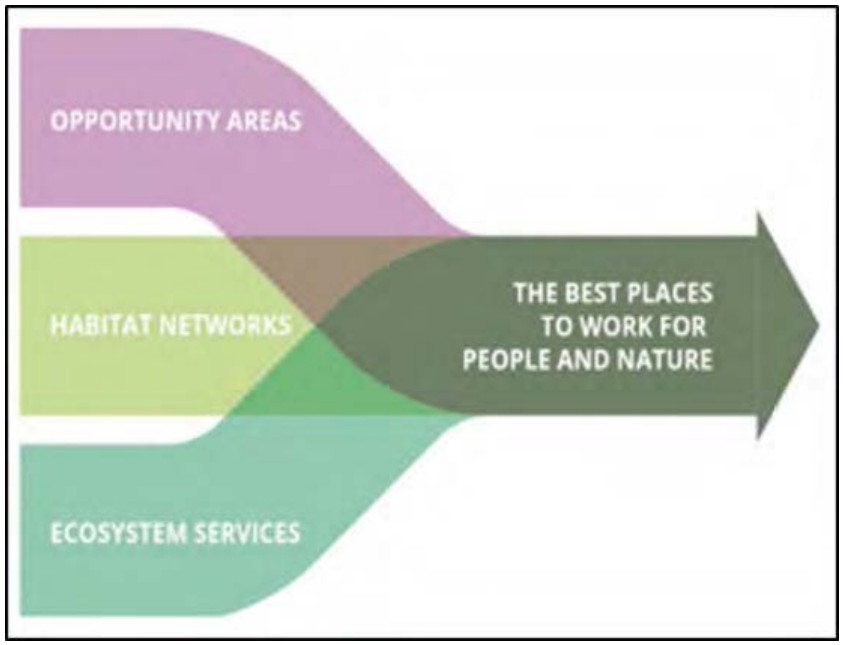
Network mapping

- Co-design workshops
- Local knowledge
- Aspirational



Using the ecological coherence protocol





Woodland

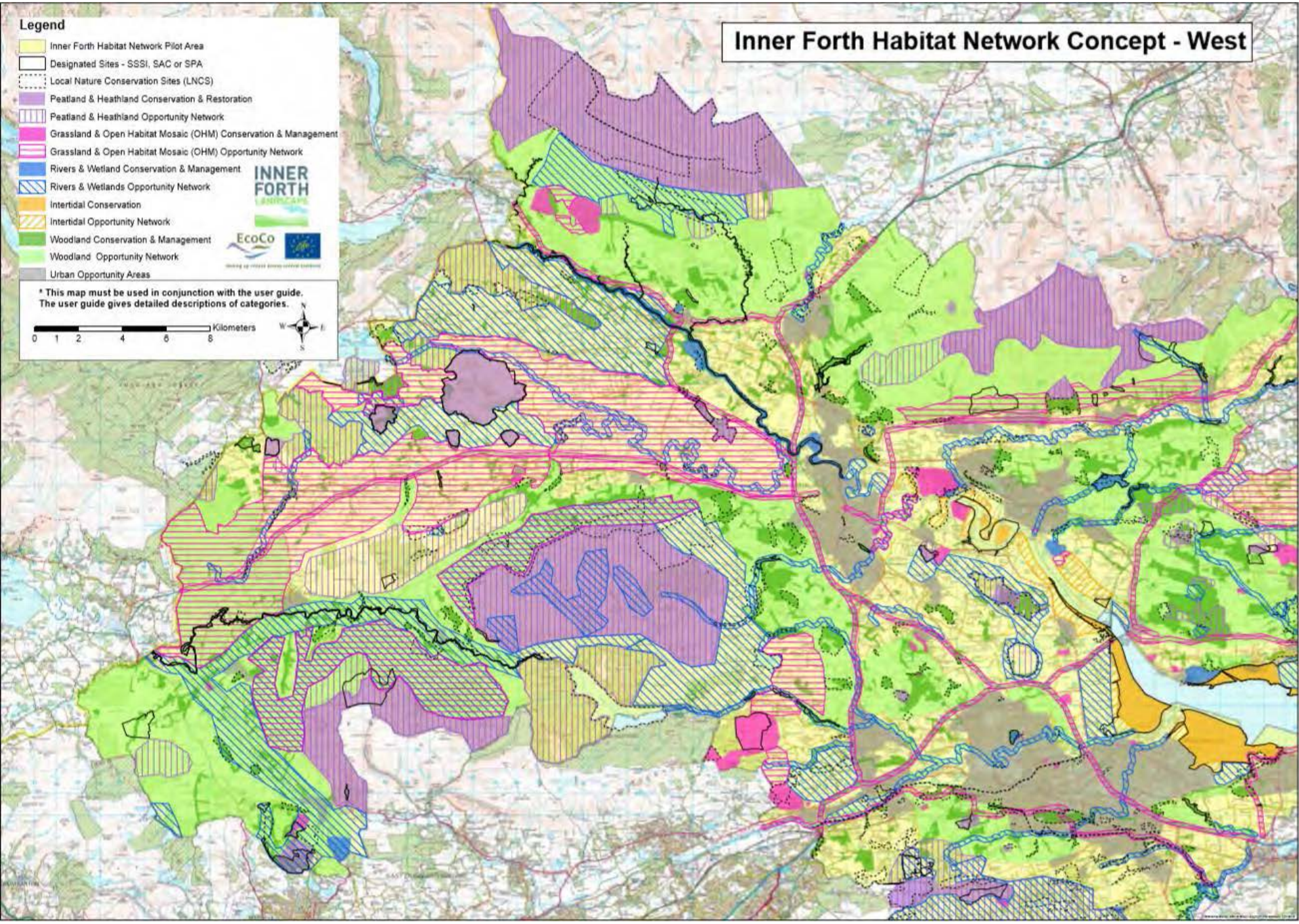
Hedgerow & street trees

Grassland & Open Mosaic Habitat

Peatland & Heathland

Rivers & Wetland

Intertidal


Inner Forth Habitat Network Concept - West
Legend
Inner Forth Habitat Network Pilot Area
Designated Sites - SSSI, SAC or SPA
Local Nature Conservation Sites (LNCS)
Peatland & Heathland Conservation & Restoration
Peatland & Heathland Opportunity Network
Grassland & Open Habitat Mosaic (OHM) Conservation & Management
Grassland & Open Habitat Mosaic (OHM) Opportunity Network
Rivers & Wetland Conservation & Management
Rivers & Wetlands Opportunity Network
Intertidal Conservation
Intertidal Opportunity Network
Woodland Conservation & Management
Woodland Opportunity Network
Urban Opportunity Areas
INNER FORTH LANDSCAPE
EcoCo
* This map must be used in conjunction with the user guide.
The user guide gives detailed descriptions of categories.
Kilometers
0 1 2 4 6 8
N
W
E
S

A Call to Action

- Projects & funders
- Planning
- Land use

Inner Forth Key Habitat Action Plan[6]	Intertidal				
Objective: Conservation of existing habitat to benefit people and nature	*Places where the conservation of existing intertidal habitat is the priority for the coherence of the habitat network.*				
Action	Barriers to action			Priority location	Constraints and/or opportunities
	£	*	^		
Ensure no net loss of habitat as a result of development.	N	Y	Y	All areas	Requires up front delivery of mitigation or compensation habitat.
Ensure water management infrastructure, eg sluices, is functioning to support habitat.	Y	N	N	• Black Devon Wetlands (C) • Kinneil Lagoons (F) • Skinflats Pools (F)	
Plan signage, screening, viewing structures and interpretation to encourage people to enjoy the wildlife responsibly, without disturbing birds using the habitat.	Y	N	Y	• Cambus Pools (C) • Skinflats Pools (F) • Kinneil Lagoons (F) • Valleyfield Ash Lagoons (Ff) • Blackness to Bo'ness footpath (F)	
Control invasive non-native species, such as *Spartina anglica*, to ensure it does not spread across habitat.	Y	N	N	All areas	Lack of resources to monitor and control. Potential for spartina to reduce erosion of tidal areas.
Manage vegetation so it does not overshadow or encroach on habitat.	Y	N	N	• Kinneil Lagoons (F) • Black Devon Wetlands (C) • Longannet/ Valleyfield Ash Lagoons (Ff) • Bothkennar lagoons (F)	
Survey and ensure protection of tern colonies.	Y	Y	N	• Grangemouth Docks (F)	Access permissions required.

[6] **Key to acronyms:** C – Clackmannanshire; F – Falkirk; Ff – Fife; F&L- ??????; FGS – Forestry Grant Scheme; GI - Green Infrastructure; INNS - Invasive Non-Native Species; LDP - Local Development Plan; LLTNP - Loch Lomond and Trossachs National Park; LTFP - Long Term Forest Plans; NFM - Natural Flood Management; PAWS - Planted Ancient Woodland Sites; RBMP – River Basin Management Plan; S – Stirling; SAC - Special Area for Conservation; SPP - Scottish Planning Policy; SSSI - Site of Special Scientific Interest; SUDS - Sustainable Drainage System; UKBAP – UK Biodiversity Action Plan; VDL - Vacant and Derelict Land; WEF - Water Environment Fund; WIAT – Woods In and Around Towns
Core barriers to action: £- resource &/funding limitations; *- Consenting /permissions /technical issues; ^ Lack of public or policy drivers.

NATIONAL TRUST *for* SCOTLAND

A National Ecological Network: connecting ambition, regulation and funding

Current activity - ambition

Climate Change (Scotland) Act 2009, Section 57 Duty to produce a land use strategy

(1)The Scottish Ministers must, no later than 31 March 2011, lay a land use strategy before the Scottish Parliament.

(2)The strategy must, in particular, set out—

(a)the Scottish Ministers' objectives in relation to sustainable land use;

(b)their proposals and policies for meeting those objectives; and

(c)the timescales over which those proposals and policies are expected to take effect.

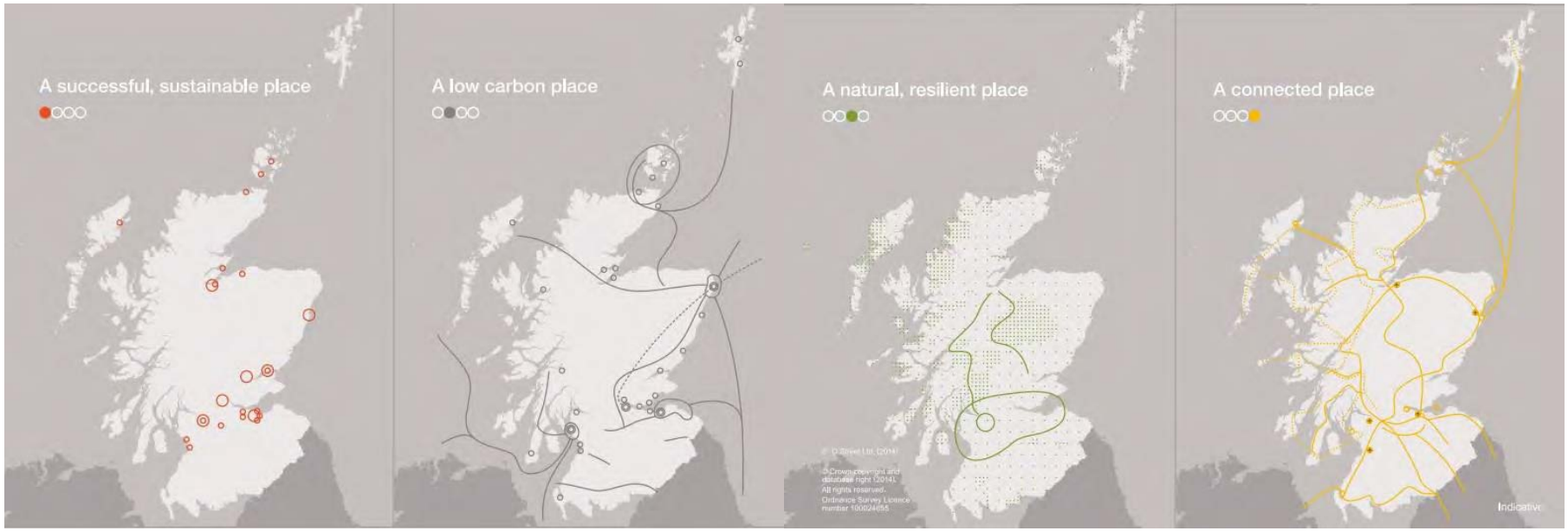
National Planning Framework 3 (2014)

“We will implement the Scottish Biodiversity Strategy, including completing the suite of protected places and improving their connectivity through a national ecological network centred on these sites.”

Current activity (and inactivity)

Getting the best from our land: A Land Use Strategy for Scotland 2016-2021

"Although the Scottish Government is clear that the planning system is a delivery mechanism for the second Land Use Strategy, the alignment between the Land Use Strategy and planning is not always well understood."



What makes the difference?

Scope – what is to be delivered and where?

Solution – how the outcome is to be delivered, considering available technologies and best practice?

Delivery – which organisation(s) is best placed to deliver

Implementation – how the proposal is to be delivered, for example will it be an initial pilot, phased implementation or a 'big bang' approach?

Funding – what is an indicative cost and how will it be funded?

Opportunities?

Ambition:

National Planning Framework 4? – opportunity for a national ecological network to be raised to the status of a National Development

Regulation:

Sustainable Development Goals? – Target 15.9 “By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts”

Land reform? – new emphasis on the best use of land, rather than simply ownership; new impetus for the Land Use Strategy; right to buy to meet local sustainable development ambitions

Funding

Replacement of the Common Agricultural Policy? - £4.6 billion to Scottish farmers and crofters from 2015-2020

Edinburgh's Thriving Green Spaces

Donya Davidson

Project Development Officer: Ecologist

ddavidson@scottishwildlifetrust.org.uk

Scotland's National Ecological Network Event

11th of March 2020

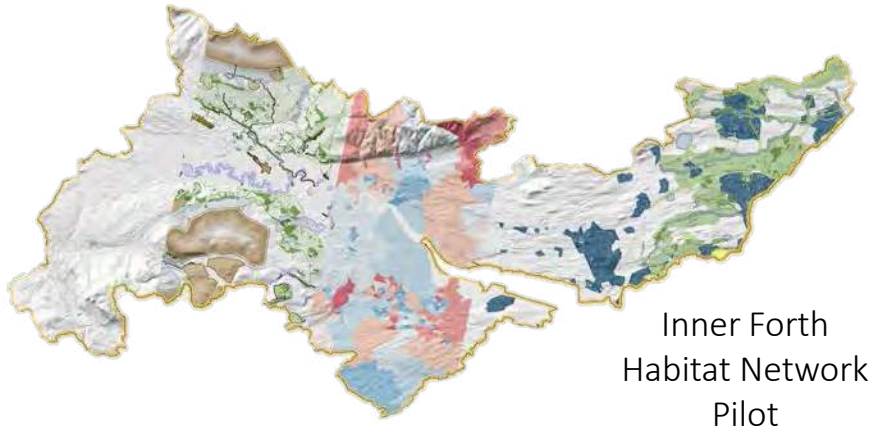
EDINBVRGH
THE CITY OF EDINBURGH COUNCIL

Scottish Wildlife Trust

What work are we doing now on ecological networks?

We are creating an **Ecological Coherence Plan (ECP)** for Edinburgh using the **Ecological Coherence Protocol (EcoCo Protocol)**

Identify the best places in Edinburgh to **maximise ecological, ecosystem service and socio-economic benefits.**



Inner Forth Habitat Network Pilot

Royal Botanic Garden Edinburgh

SEPA Scottish Environment Protection Agency

CSGN Central Scotland Green Network

rspb

Scottish Natural Heritage Dualchas Nàdair na h-Alba nature.scot

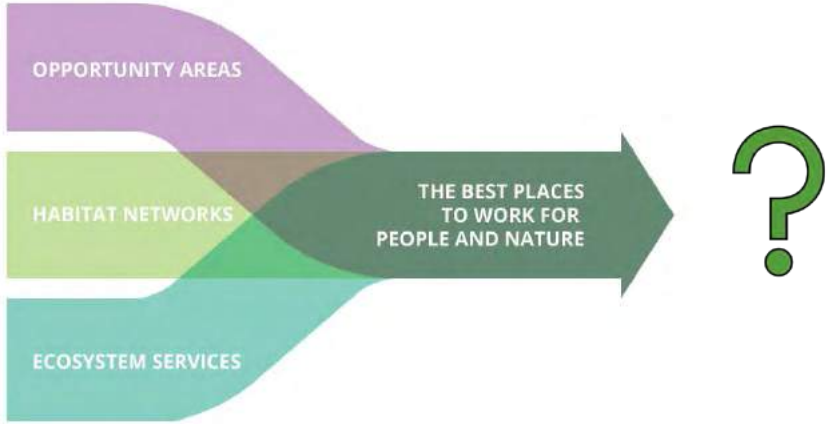
THE UNIVERSITY of EDINBURGH

Edinburgh Shoreline

EDINBURGH & LOTHIANS GREENSPACE TRUST

Scottish Environment LINK

IUCN Urban Alliance



What work are we doing now on ecological networks?

Habitat Networks

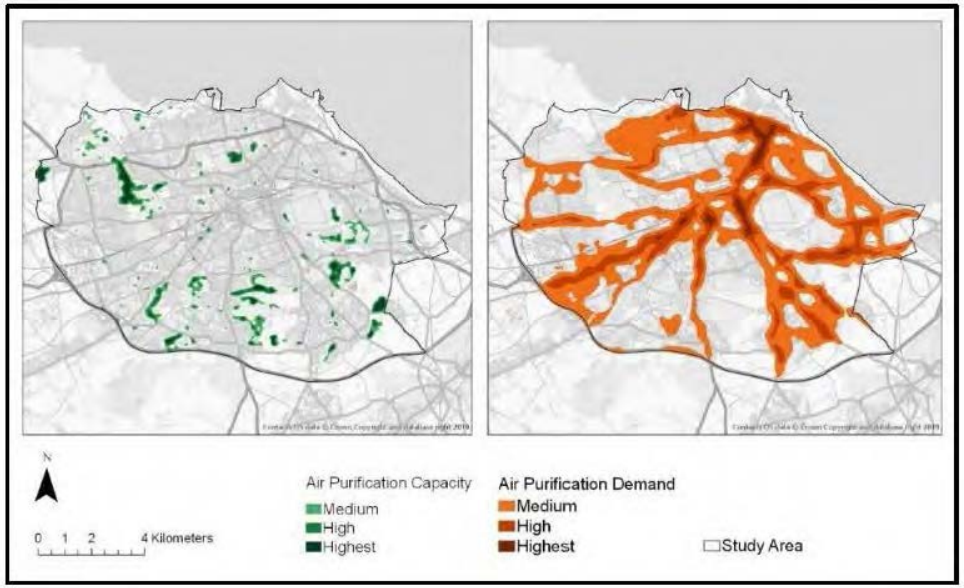
Collecting data to map **key habitats** within Edinburgh

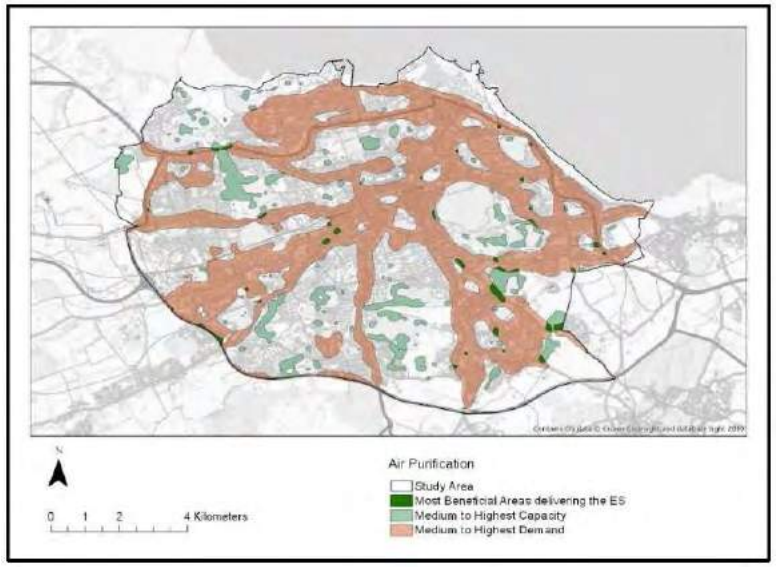
Workshop 1: Using stakeholders to identify opportunities for **habitat network development**

Ecosystem services

Mapping **provision and demand of key ecosystem services** in Edinburgh

Workshop 2: Using stakeholders to identify opportunities to **increase ecosystem services in areas of demand**





What evidence, data or tools do we currently use to make decisions related to ecological connectivity?

TWIC

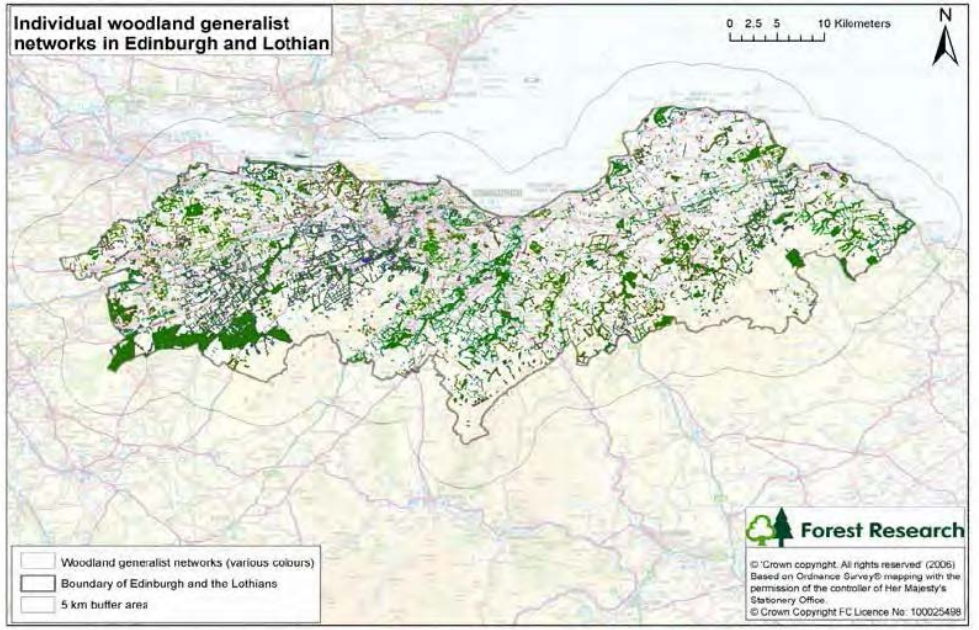


Figure 8. Networks for specialists of high quality broadleaved and mixed woodland combined with other broadleaved specialists and woodland generalists in the region of Edinburgh and the Lothians.

"There is an emphasis on the importance of collaborative work across different types of habitat types and **increasing connectivity between the habitats.**"

edinburgh LIVING LANDSCAPE

EDINBURGH SHORELINE

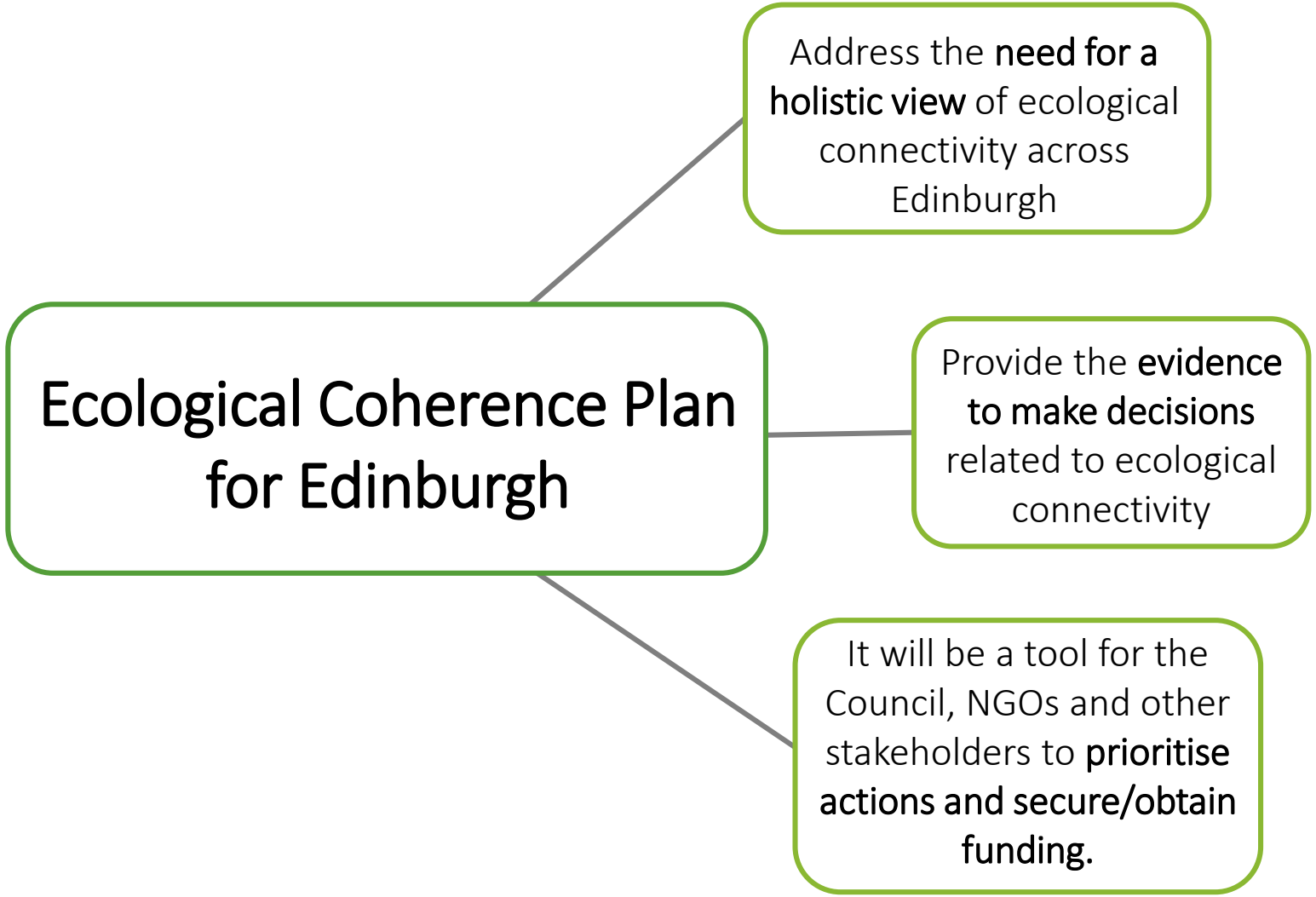
From summer 2019 we will be delivering The Wild Line: large scale habitat creation for pollinators, rocky shore invertebrates and seabirds along the Edinburgh coast.

GAPS: What evidence, data or tools would help us make decisions related to ecological connectivity?

Gaps: Limited data on ecological connectivity in Edinburgh

- E.g. Forest habitat network and Cramond foreshore.

What about other habitats and ecosystem services across Edinburgh?



Thank you

General info regarding the Edinburgh's Thriving Green Spaces Project can be found here:

https://www.edinburgh.gov.uk/parks-greenspaces/thriving-green-spaces-project/1

(official website coming soon)

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THE CITY OF EDINBURGH COUNCIL

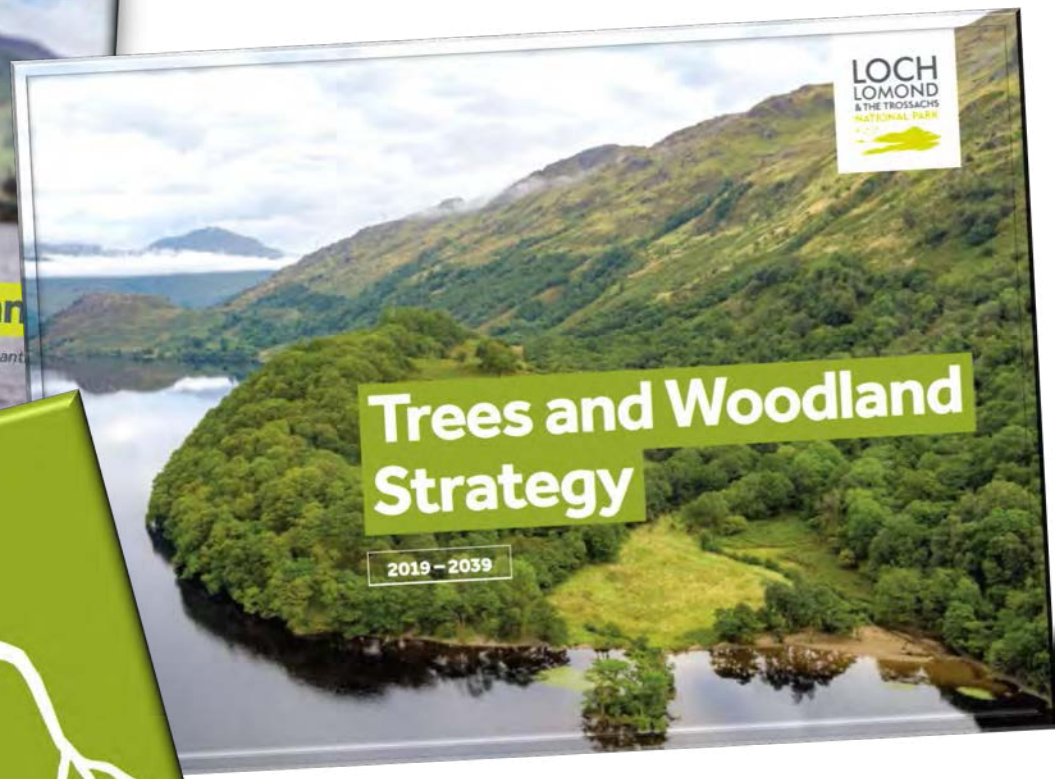
Scottish Wildlife Trust

Landscape Scale Ecological Networks

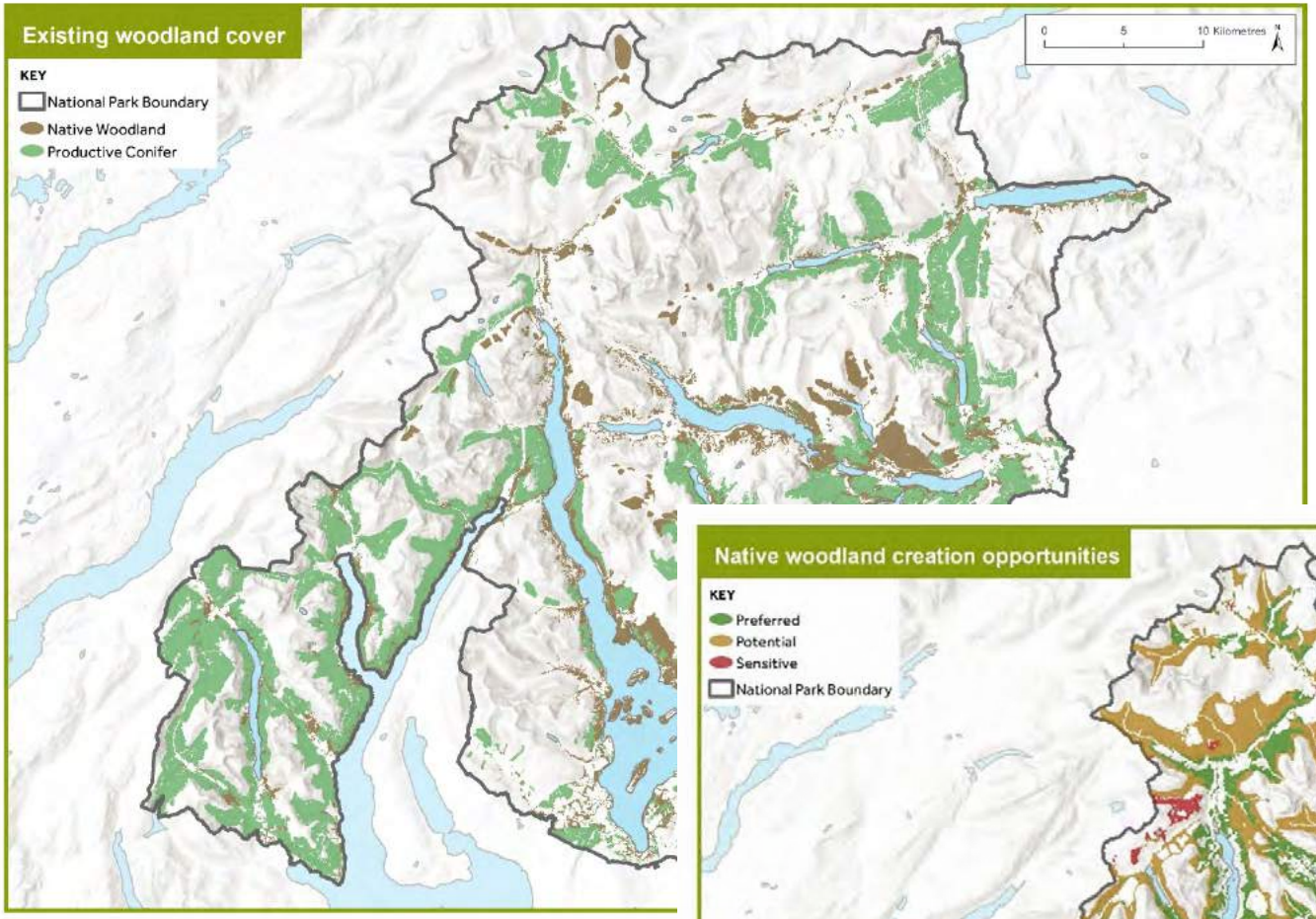
LOCH LOMOND & THE TROSSACHS NATIONAL PARK

Alan Bell
Landscape and Ecology Manager

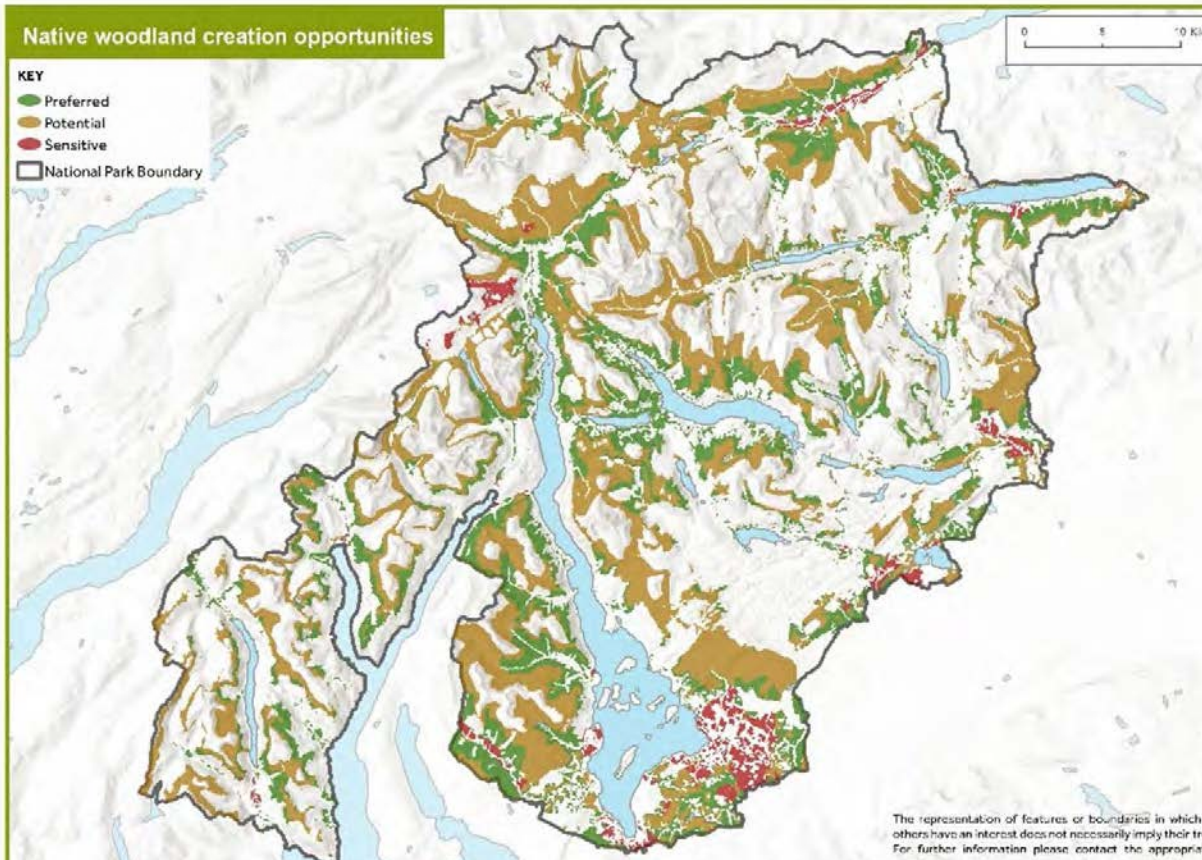
Setting the Strategic Direction



Wild PARK

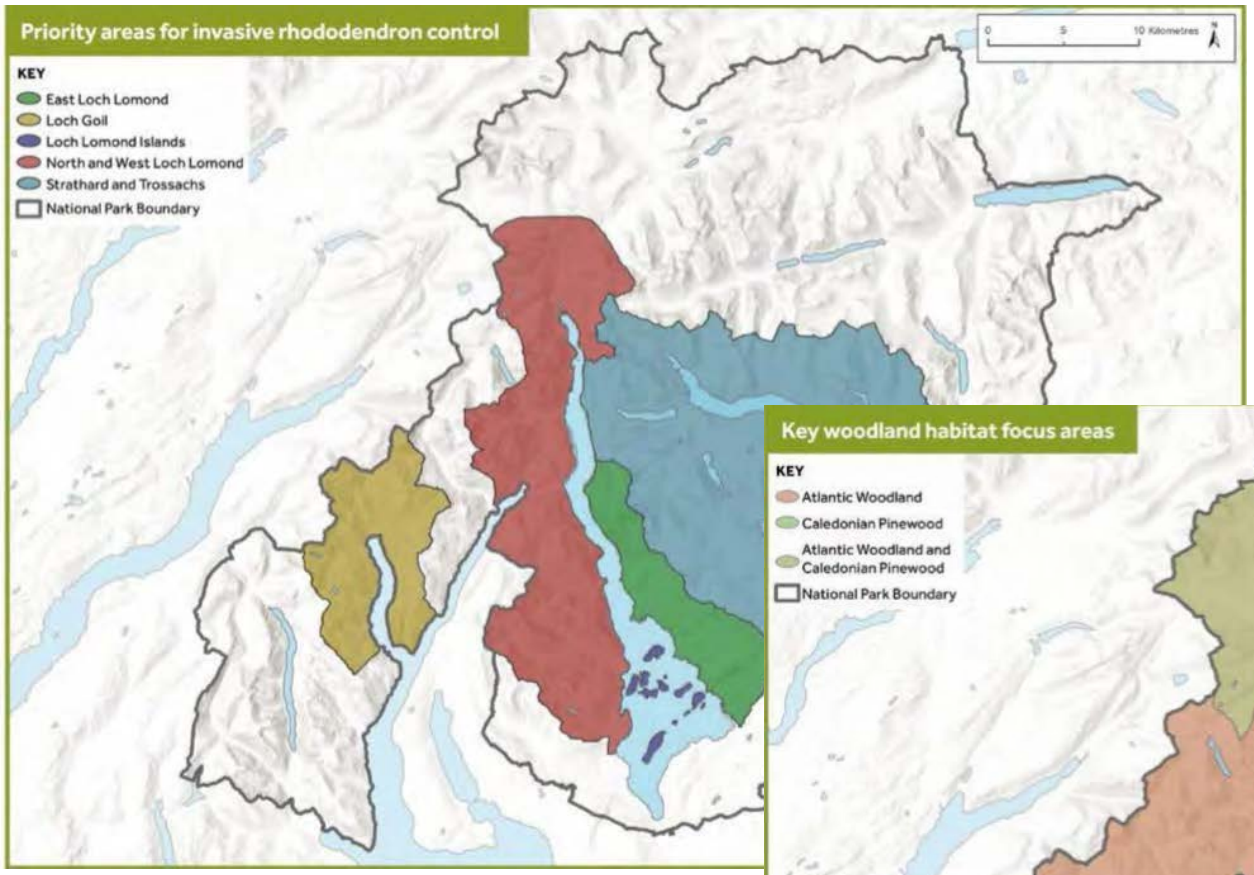


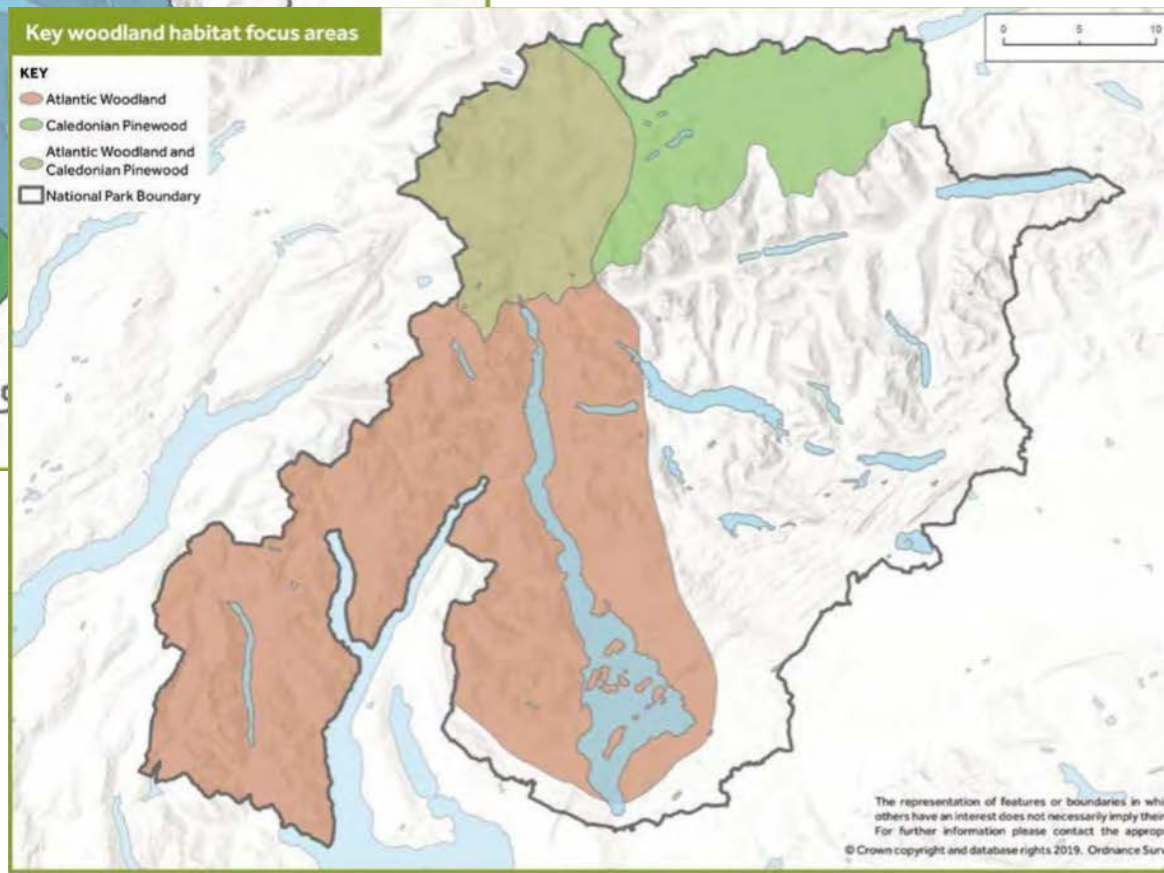
LOCH LOMOND & THE TROSSACHS NATIONAL PARK



Increasing Native Woodland Connectivity

Improving Native woodland quality



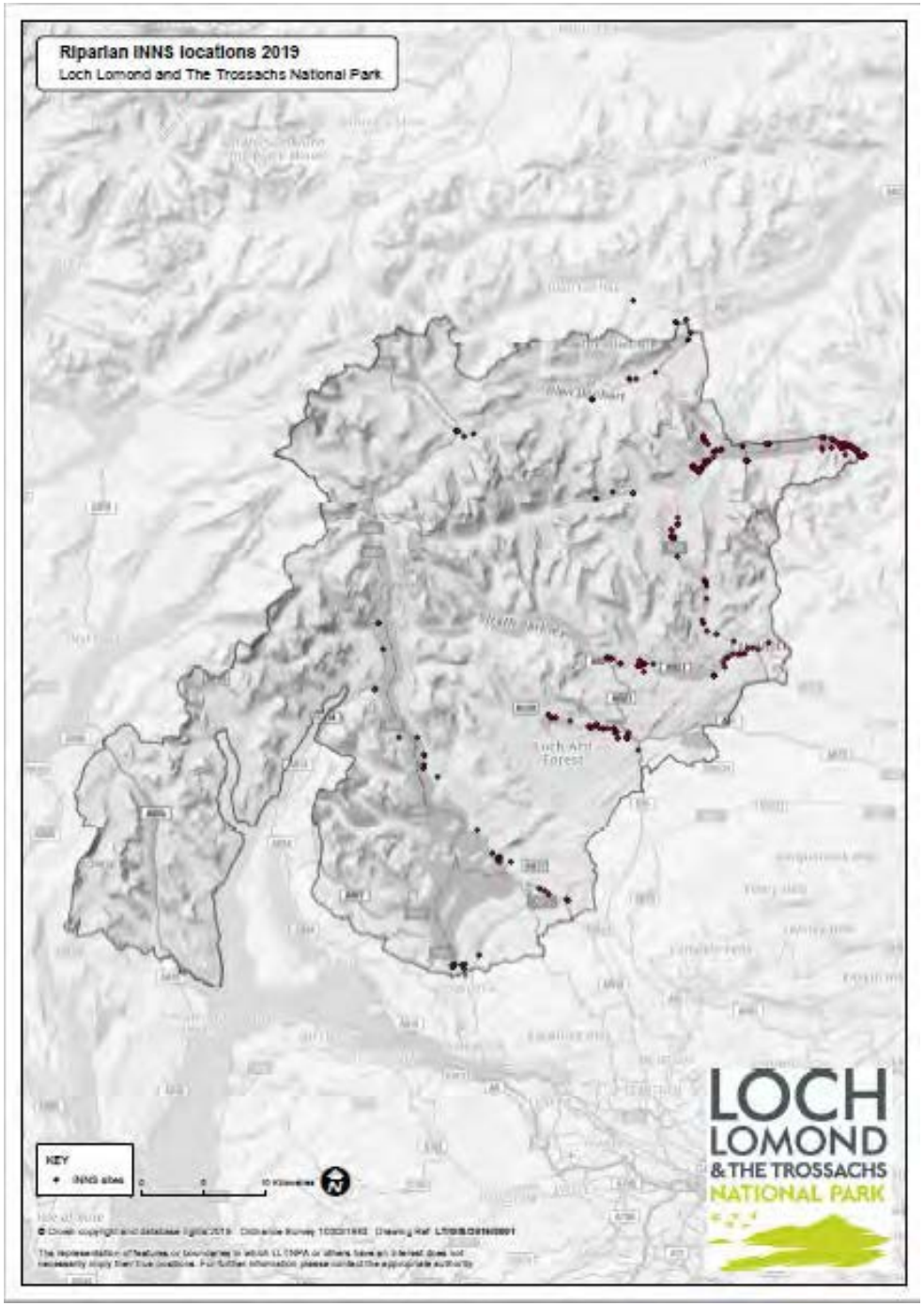


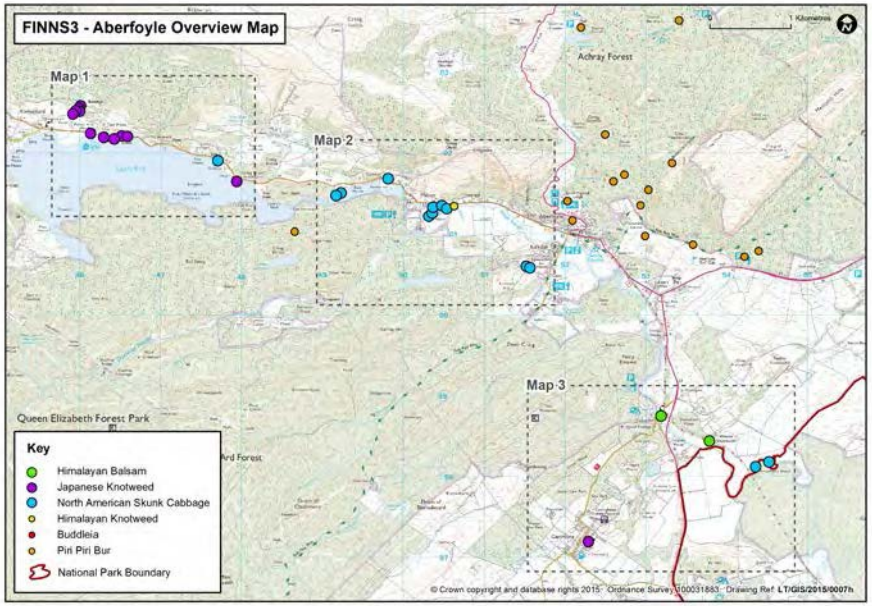
Invasive Rhoddies

Atlantic Woodland
Caledonian Pinewood

Riparian INNS Control

- in prioritised catchments





Scotland's National Ecological Network: progress and practicalities

A Scottish Borders perspective

ECCI, Edinburgh

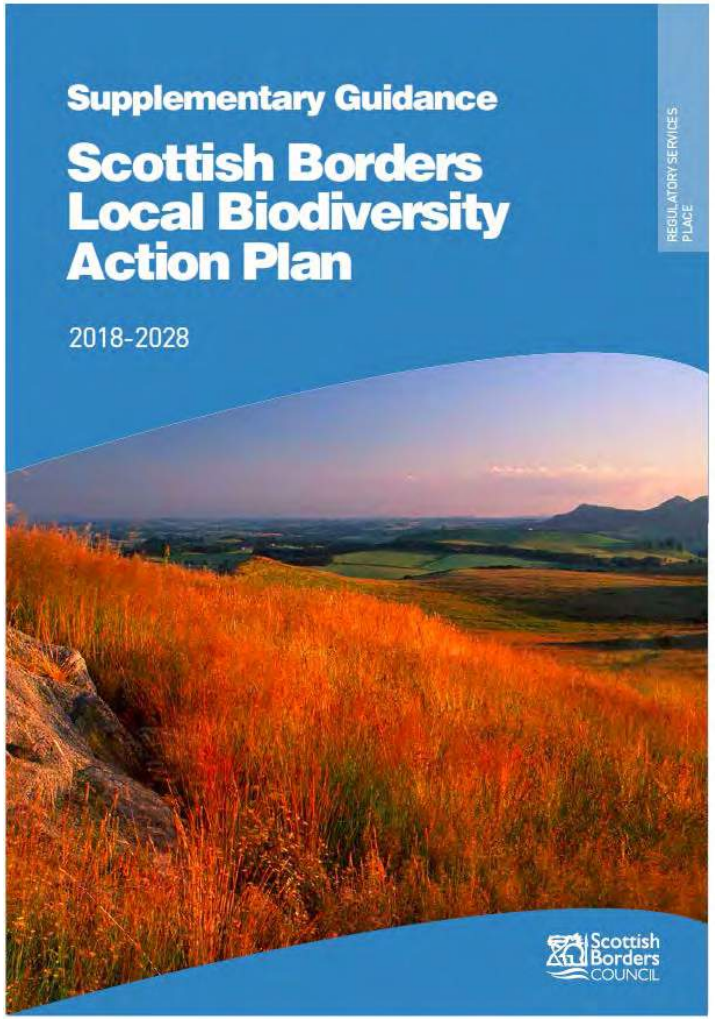
11th March 2020

Andy Tharme

Scottish Borders Council

atharme@scotborders.gov.uk

Current work on ecological networks



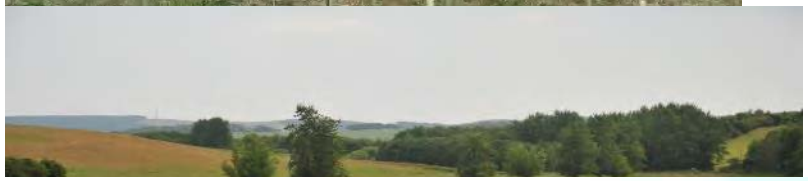
ıent Plan policy *EP3 Local Biodiversity*

set implementation projects

native & riparian woodland for NFM

eeding waders

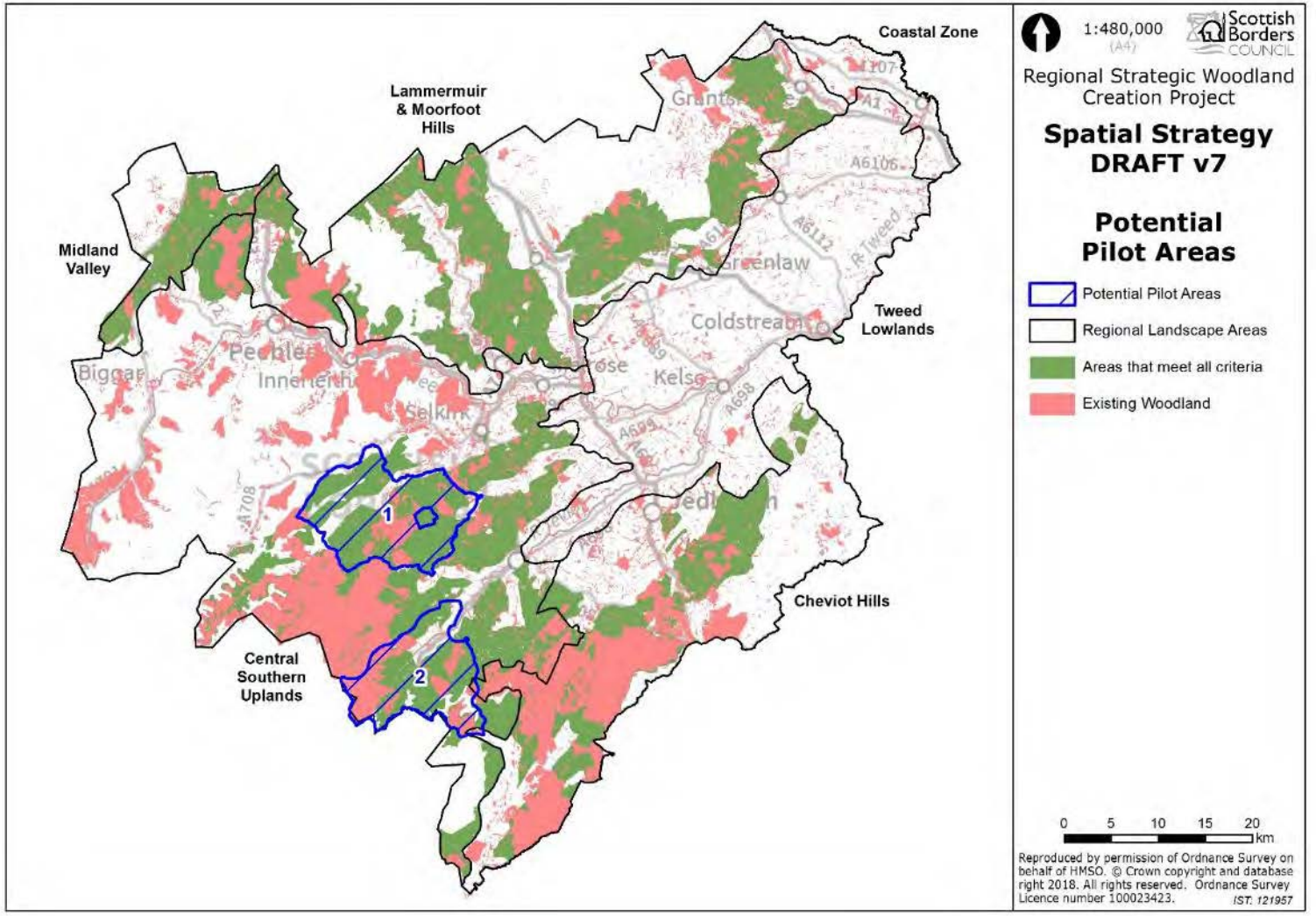
Compensatory Replanting Scheme



atharme@scotborders.gov.uk

Current work on ecological networks

Regional Strategic Woodland Creation pilot project



LDP Policy EP13: Trees, woodlands and hedgerows

Scottish Forestry
Coilltearachd na h-Alba

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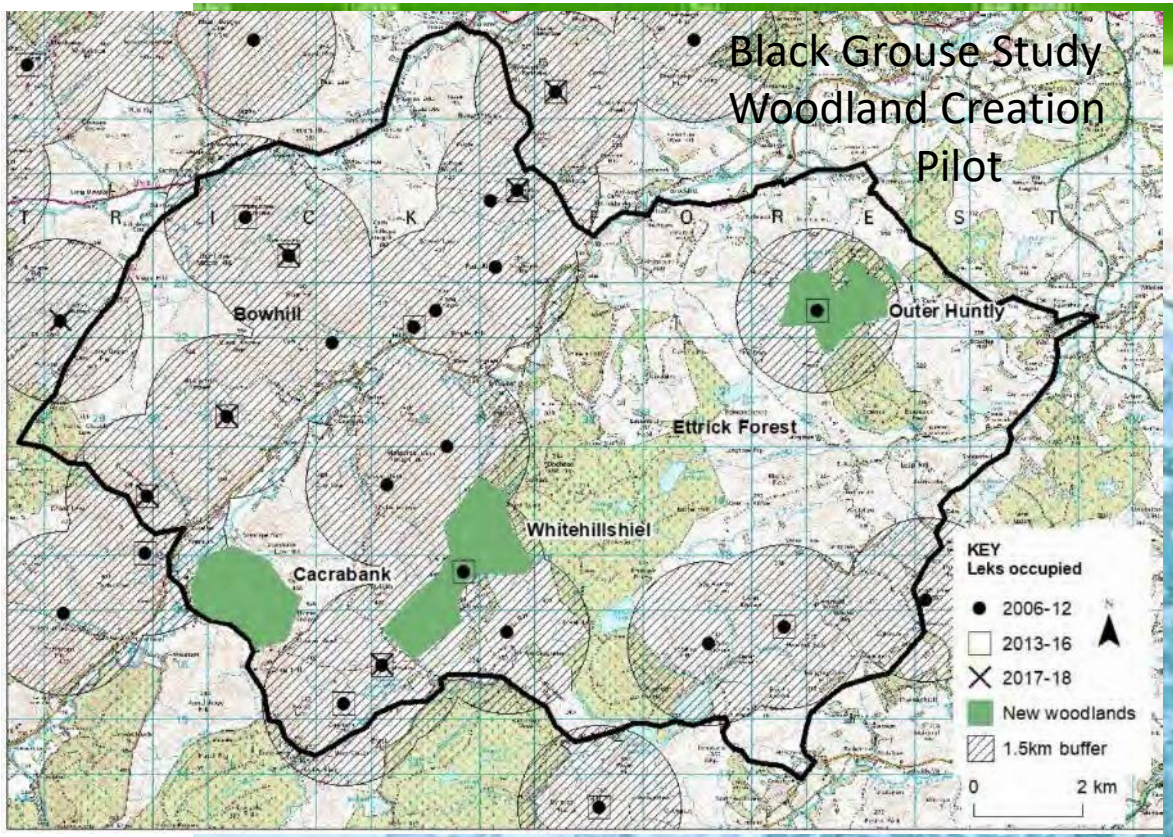
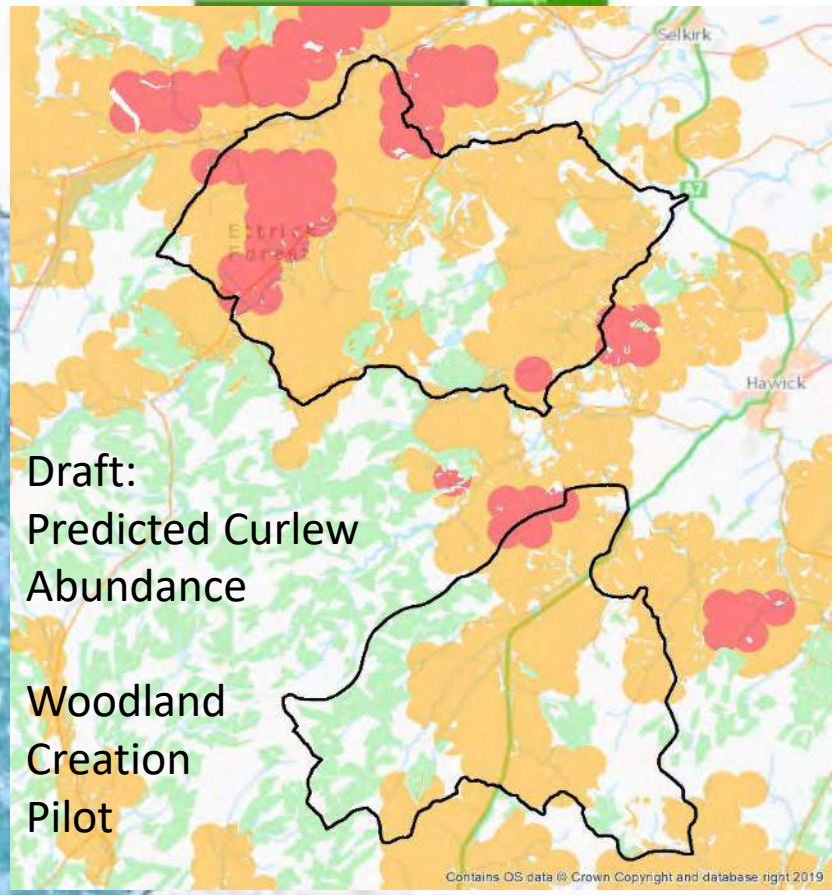
What evidence, data or tools are used





Scottish Forestry
Coilltearachd na h-Alba

TWEED FORUM

SOC

BTO Scotland

atharme@scotborders.gov.uk

GAPS: What evidence, data or tools would help

- National tool of habitat network for SBL priority habitats

(Regional priorities for LBAP delivery)

- Development of a national LUS tool to identify where Natural Capital and delivery of ecosystem services can be maintained or enhanced (LBAP/ LUS delivery)

- A national tool to identify strategic core areas and habitat corridors for open habitat species e.g. black grouse, breeding waders and butterflies (Woodland Strategy –LUS/Integrated Land Use)

atharme@scotborders.gov.uk

The biggest habitat restoration project in Britain – 600 sqkm

Cairngorms Connect

Wildland

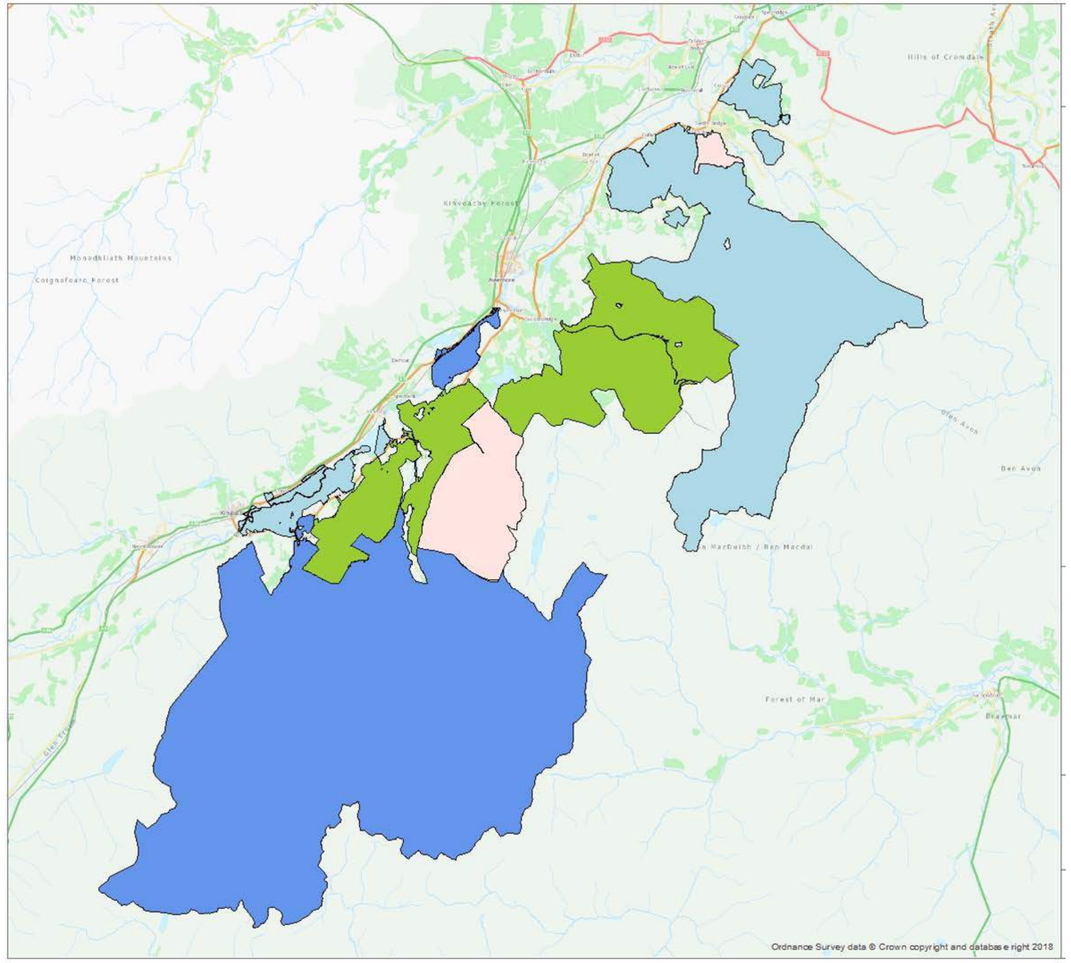
rspb giving nature a home

Forestry and Land Scotland
Coilltearachd agus Fearann Alba

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
nature.scot

CAIRNGORMS NATIONAL PARK AUTHORITY
ÙGHDARRAS PÀIRC NÀISEANTA A' MHONAIDH RUAIDH

ENDANGERED LANDSCAPES PROGRAMME

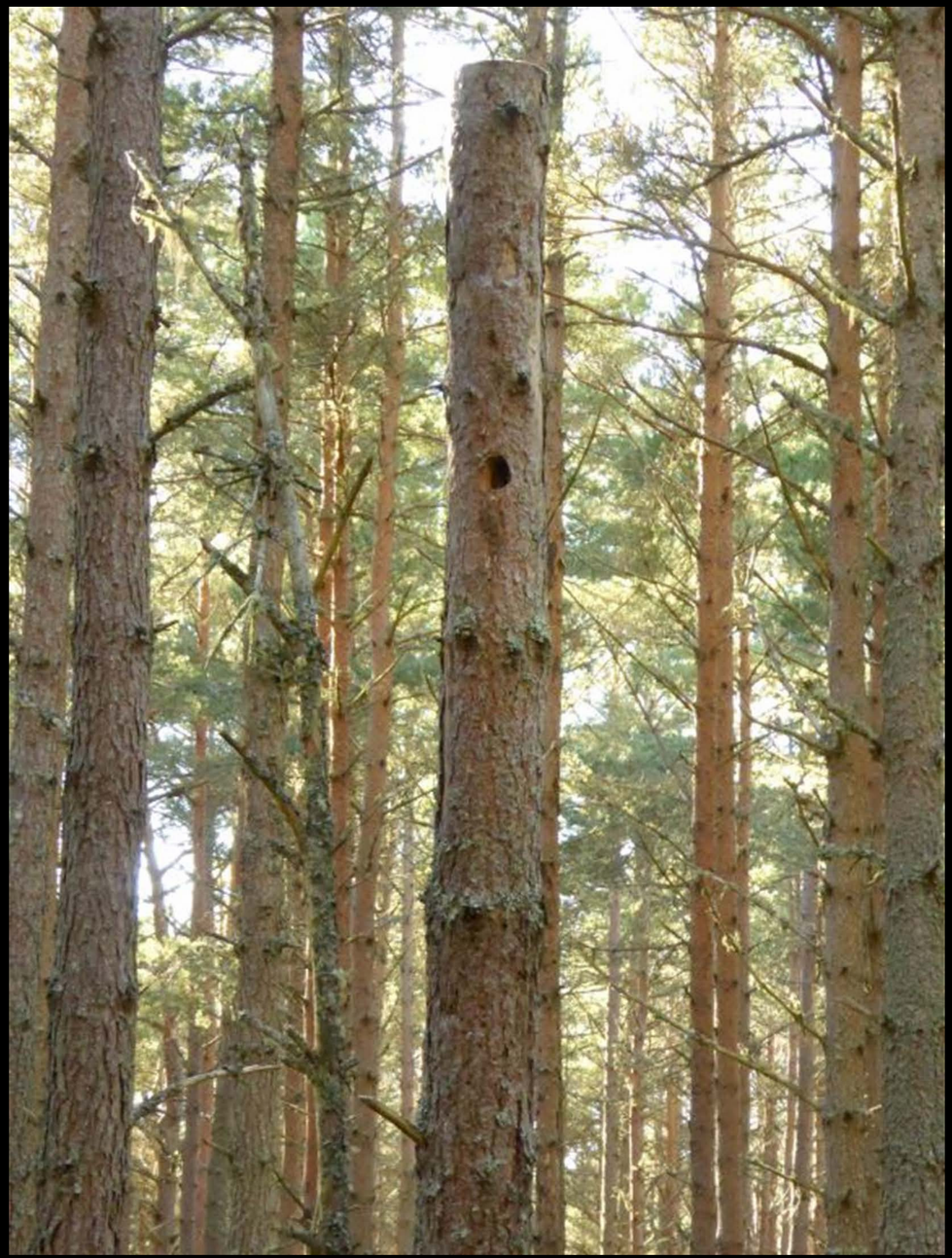


Current action on ecological networks - extending

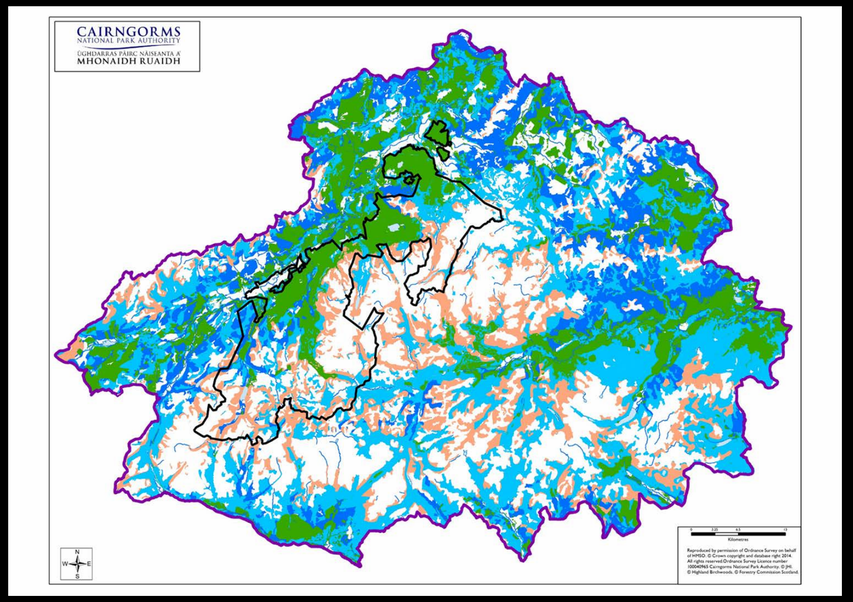
1. Restoring and extending native woodlands to their natural limit.
2. Restoring peatlands
3. Restoring hydrological processes and floodplains

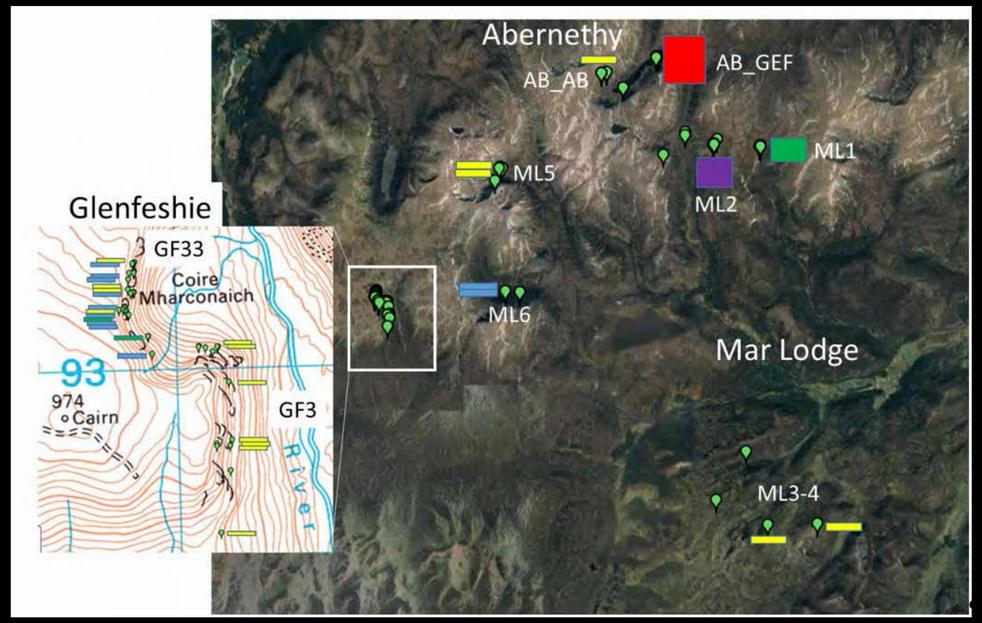
Current action on ecological networks – improving quality

7,800 ha of plantation

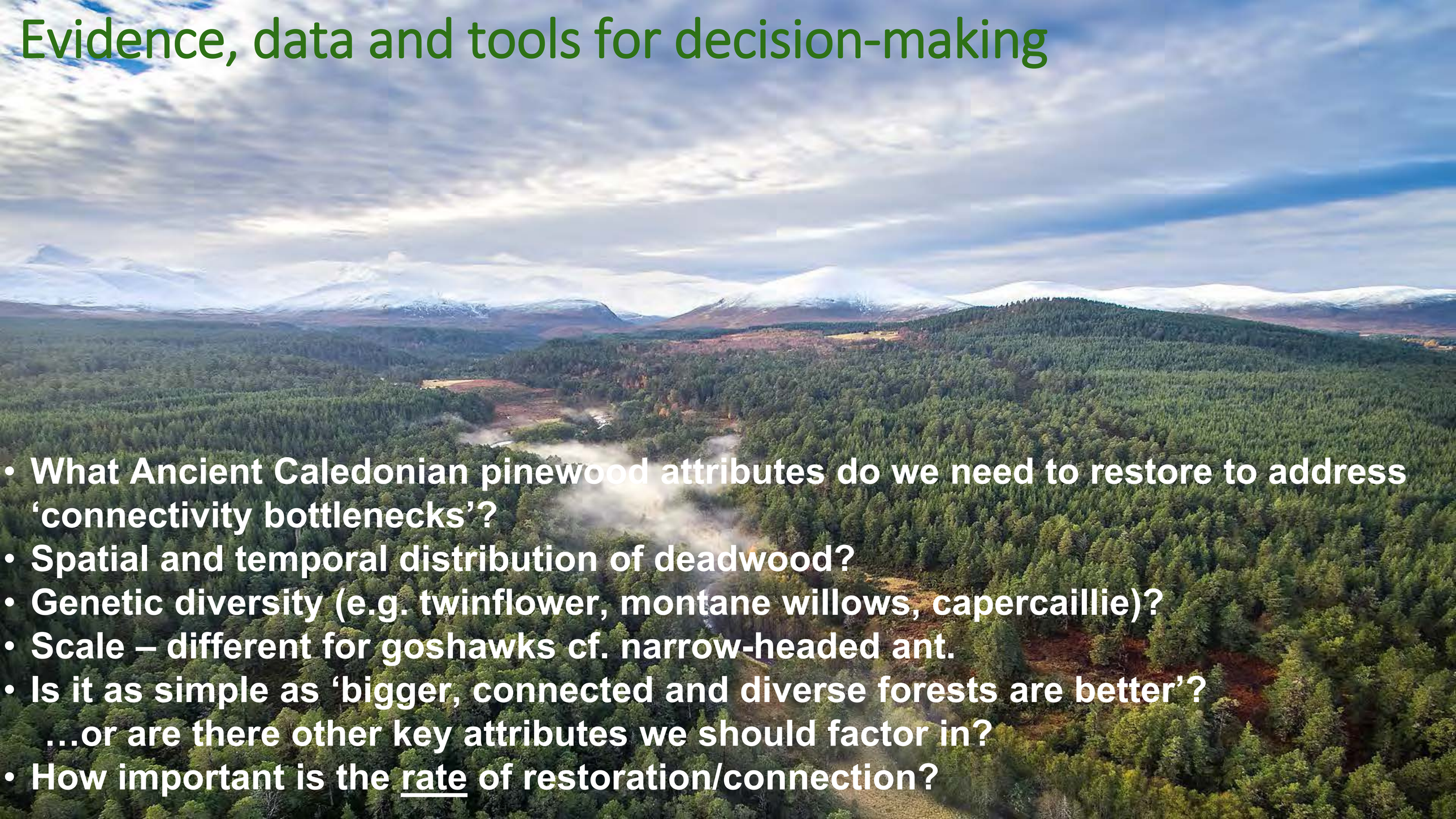


Evidence, data and tools for decision-making





Evidence, data and tools for decision-making



- What Ancient Caledonian pinewood attributes do we need to restore to address ‘connectivity bottlenecks’?
- Spatial and temporal distribution of deadwood?
- Genetic diversity (e.g. twinflower, montane willows, capercaillie)?
- Scale – different for goshawks cf. narrow-headed ant.
- Is it as simple as ‘bigger, connected and diverse forests are better’?
  …or are there other key attributes we should factor in?
- How important is the rate of restoration/connection?

Scottish Wildlife Trust

River Woods

Evidence of benefits

Tanya Ogilvy & Nicola Melville-
SEPA

River Woods Technical Group

Forest Research, JHI, BugLife, Scottish Forestry, Tweed Forum, SNH

SEPA
Scottish Environment Protection Agency
Buidheann Dion Àrainneachd na h-Alba

River Woods benefits

Healthy resilient river ecosystem
More biodiverse more food for fish

Shelter for livestock
Retaining soil
Retaining and slowing flood water

Bank stability
Recreation & active travel
Managing flooding

Cooling for fish
Slowing the flow

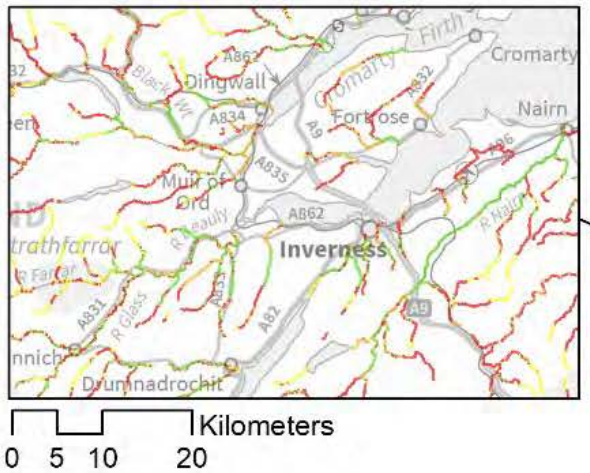
Improving water quality

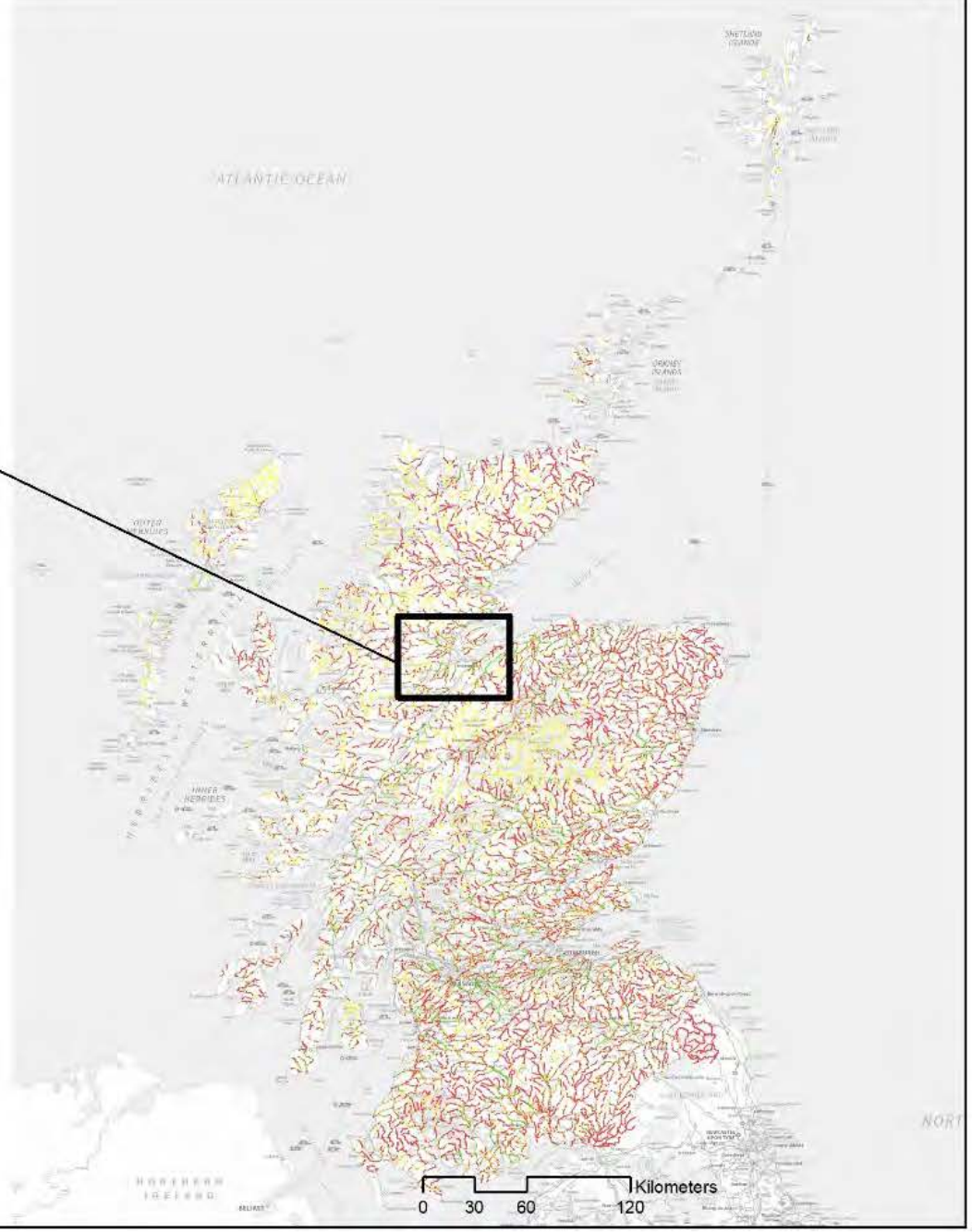
Storing carbon
Removing CO^2 from air

Beneficial insects
Reducing pests
Improving soil structure

SEPA
Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba

RIPARIAN VEGETATION IN SCOTLAND





Riparian Vegetation Quality

- 0 - No Data
- 1.1 - Good
- 1.2 - Other Habitat
- 2 - Moderate
- 3 - Poor

N

Evidence

Benefit	Evidence	Quantified	Tools
Carbon store and CO^2removal	Strong	Yes – international Scottish evidence - in progress	Woodland carbon code – carbon calculators
Cooling for fish	Strong	Yes	Models for targeting and local design (Marine Scotland)
Biodiversity	Strong	Yes – invertebrates & fish	
Bank erosion & stability	Strong	Yes - international	
Slowing the flow (small floods at local scale)	Medium	Yes – modelled, relatively small benefit, location dependent to de-sychronise flood peak	JULES model for floodplain woodlands
Beneficial insects	Medium	Yes – for beetles	
Buffers - retaining and improving soil	Medium	Yes - mixed quantified evidence for sediments, nutrients & pesticides	Woodlands for water – species mix and density Tool for buffer width
Human health	Medium	No – primarily for woodlands and green space in general	

More evidence needed

- Changes in carbon stocks over time for new river woods
- Improved design information for cooling and buffers
- More observed data to improve validity of models for benefits
- Human health benefits specific to river woods
- Business sector specific info

“Scotland’s National Ecological Network: progress and practicalities”
ESCom Event 11 March 2020

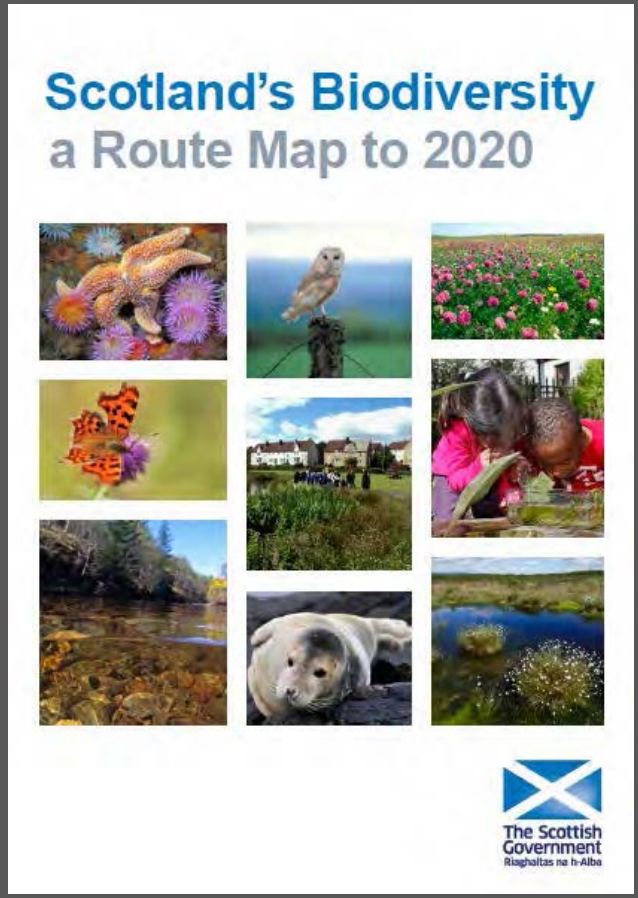
CSGN Habitat Network 2020 Opportunity Map

Big Step 5 – Sustainable management of land and freshwater

Priority Project 10: Improving ecological connection

Planned work

Develop a national ecological network to enable characterisation of the nature of Scotland, and to help with the identification of priority areas for action on habitat restoration, creation and protection.



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Neville Makan
SNH Projects and Partnerships

“Scotland’s National Ecological Network: progress and practicalities”
ESCom Event 11 March 2020

CSGN Habitat Network 2020 Opportunity Map

Central Scotland Green Network

A national development within the National Planning Framework –
By 2050, Central Scotland has been transformed into a place where the environment adds value to the economy and where people’s lives are enriched by its quality.

Delivery Plan 2025: Priorities for Delivery; Habitat Network workstream

Outcome to 2050 - An integrated habitat network across the CSGN with wildlife corridors joining up important sites and habitats.

Outcome to 2025 - The priority areas for habitat network restoration and development have been mapped, and we have a system to measure change in place.

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“Scotland’s National Ecological Network: progress and practicalities”
ESCom Event 11 March 2020

CSGN Habitat Network 2020 Opportunity Map

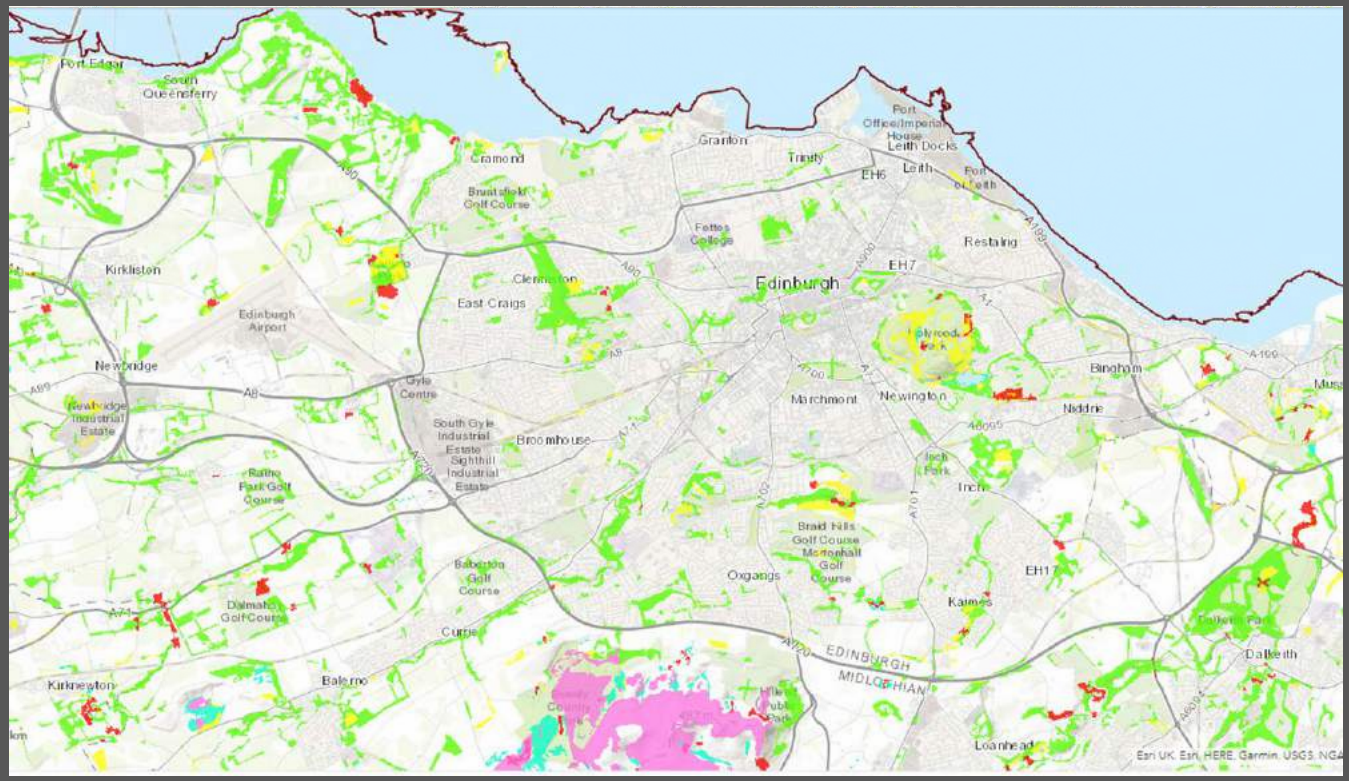
Four habitat layers:

Woodland (broadleaved, yew and mixed)

Grassland (neutral)

Wetland (fen, marsh and swamp)

Bog & Heath (heather dominated)



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“Scotland’s National Ecological Network: progress and practicalities”
ESCom Event 11 March 2020

CSGN Habitat Network 2020 Opportunity Map

FURTHER RESEARCH –

- **Develop and promote guidance**: principles, priorities, spatial information, measuring success, communications, sharing best practice..
- **Key delivery mechanisms**: contribution of key sectors, national infrastructure, regional plans and strategies, targeting of funding, landscape scale partnerships..
- **New policies and practice**: management objectives for protected areas, future support for land managers post 2021, marine environment, role of green infrastructure – linking urban and rural..

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
nature.scot

Neville Makan - SNH Projects and Partnerships
neville.makan@nature.scot
0131 316 2649

Green Network
The Blueprint Making the Connections

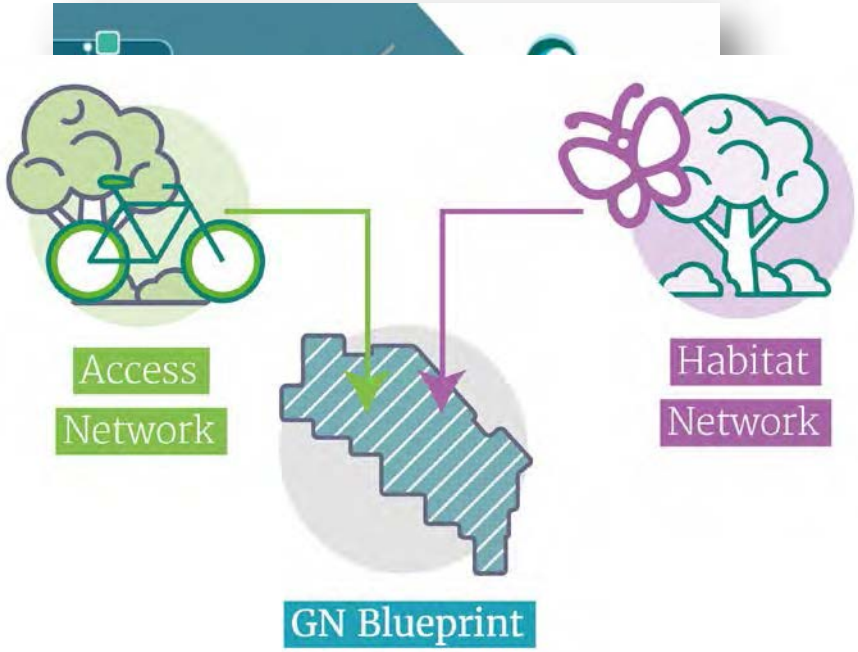
gcv green network

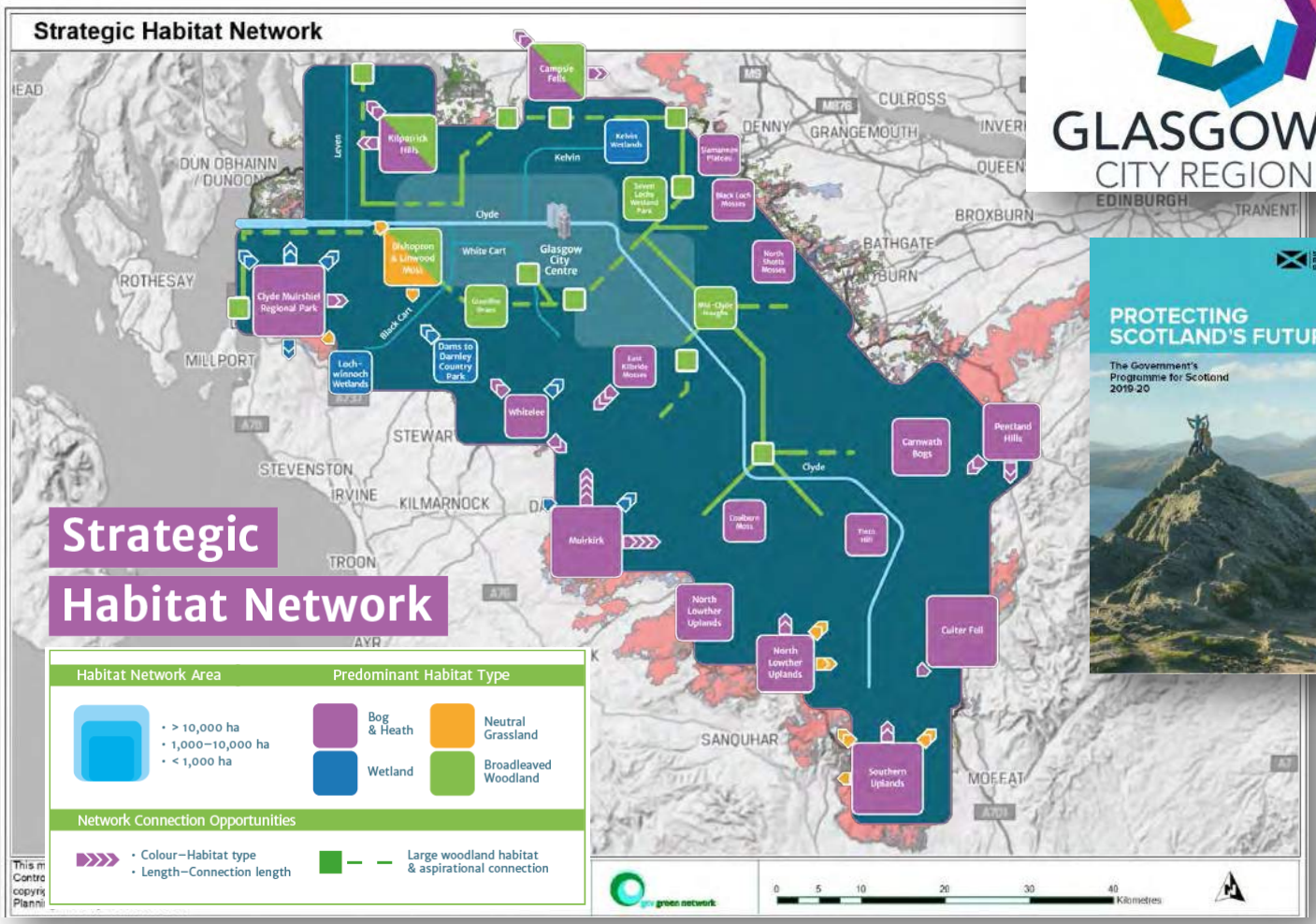
A Strategic Habitat Network for the Glasgow City Region

Max Hislop - Programme Manager, GCV Green Network Partnership

Green Network

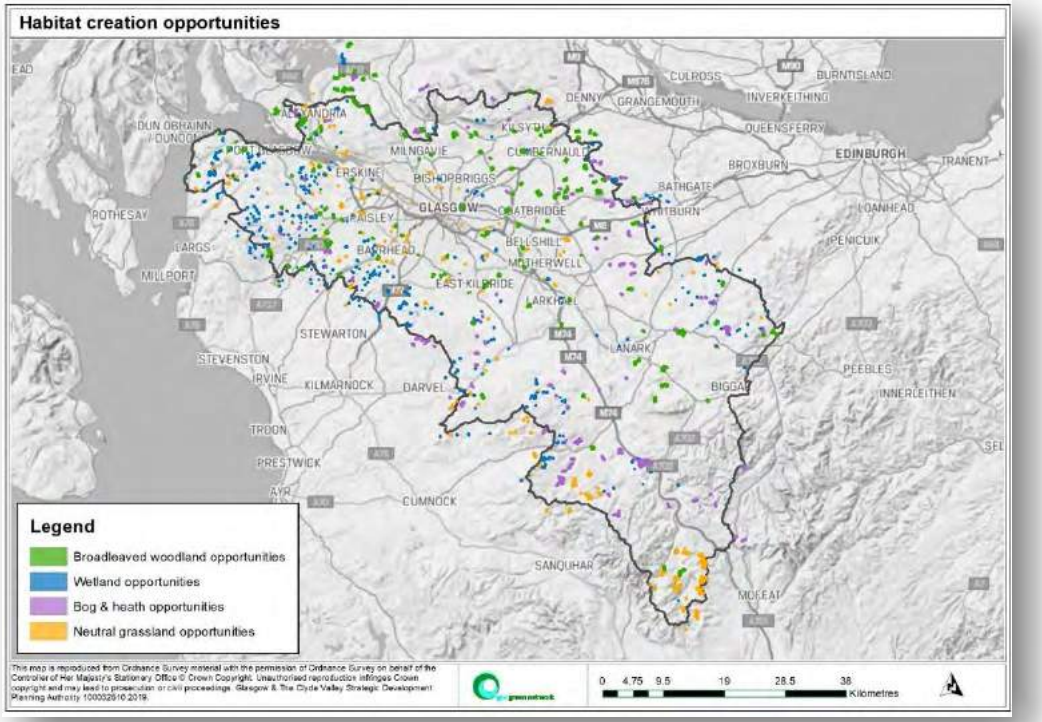
The Blueprint Making the Connections



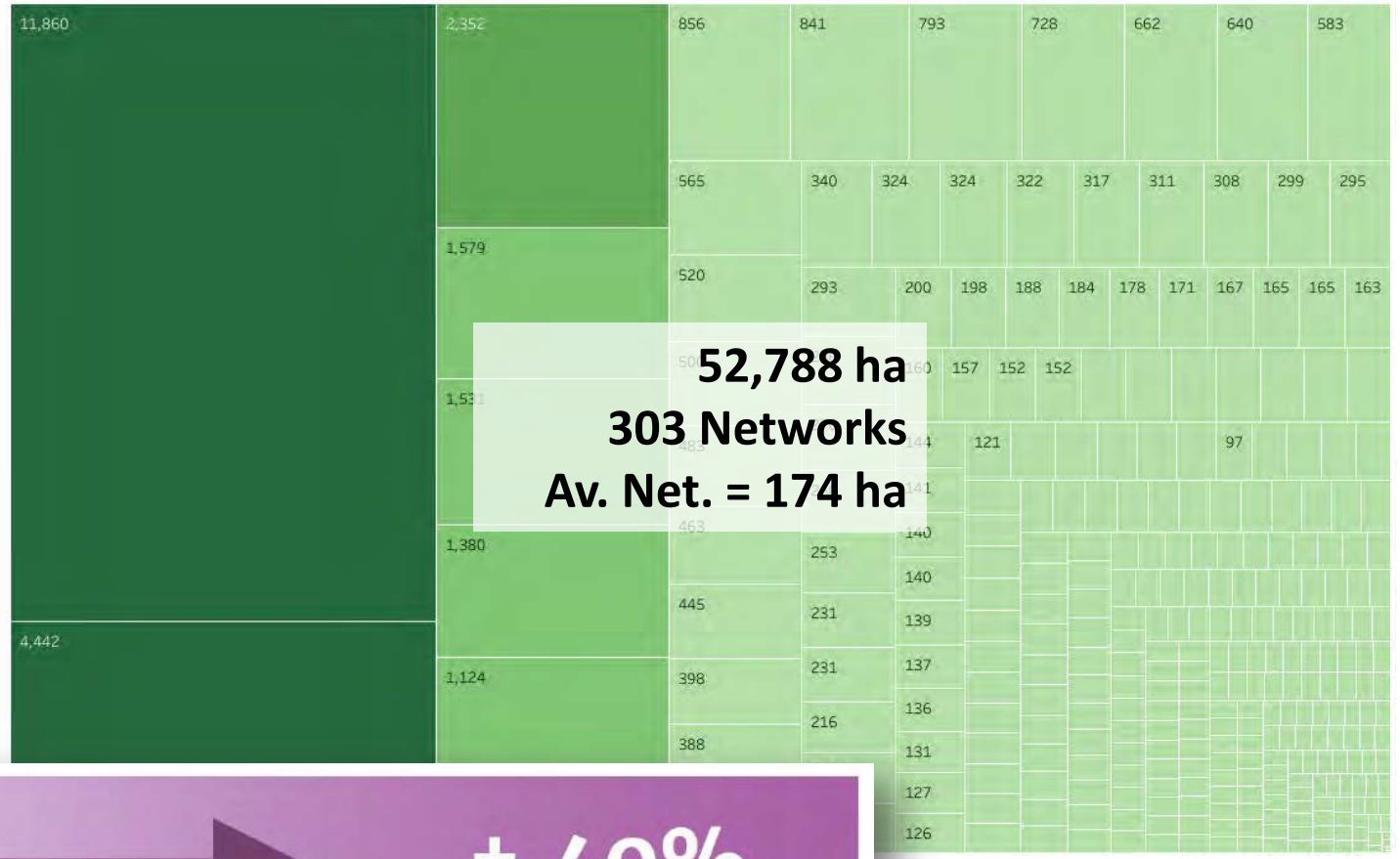


GLASGOW CITY REGION

800 connection opportunities

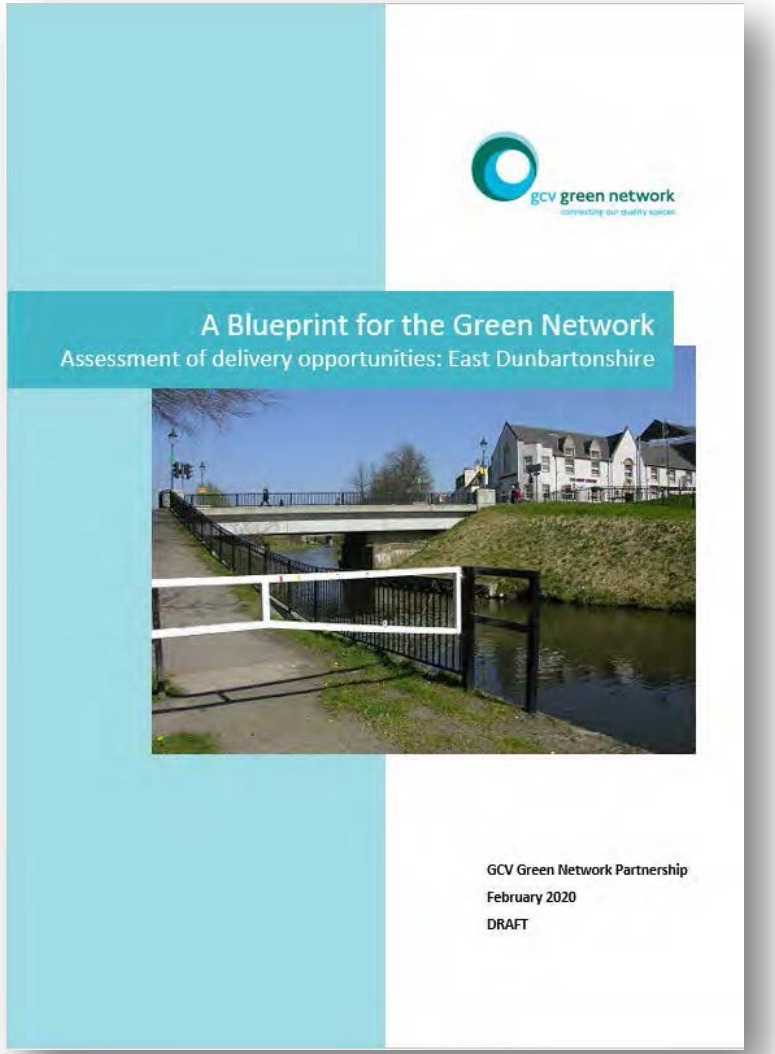


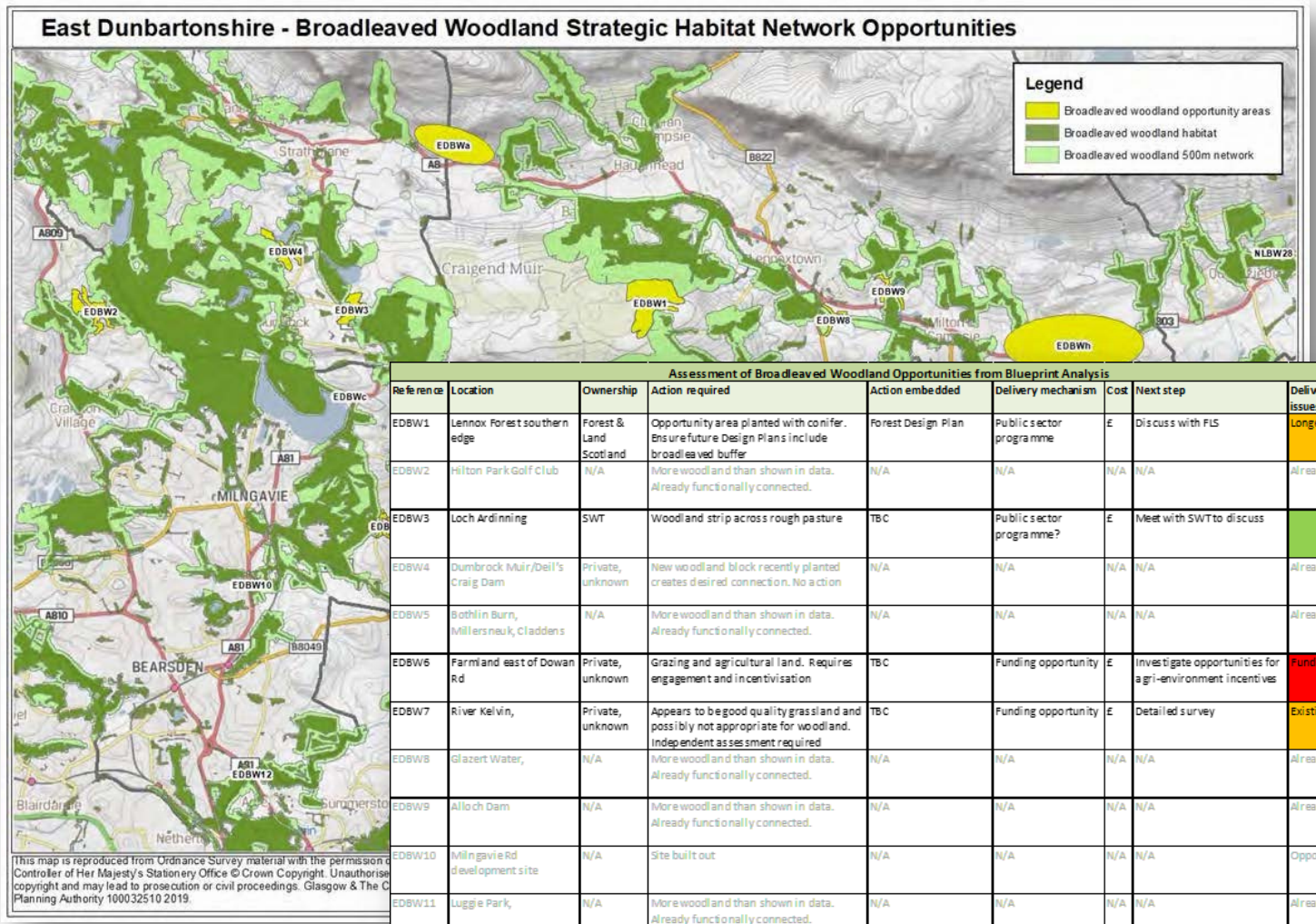
Current Woodland Networks



+ 1% more habitat **delivers** **+ 40%** larger networks

Current Work: Blueprint ‘Assessment Reports’





Assessment of Broadleaved Woodland Opportunities from Blueprint Analysis

Reference	Location	Ownership	Action required	Action embedded	Delivery mechanism	Cost	Next step	Deliverability & issues
EDBW1	Lennox Forest southern edge	Forest & Land Scotland	Opportunity area planted with conifer. Ensure future Design Plans include broadleaved buffer	Forest Design Plan	Public sector programme	£	Discuss with FLS	Longer term
EDBW2	Hilton Park Golf Club	N/A	More woodland than shown in data. Already functionally connected.	N/A	N/A	N/A	N/A	Already connected
EDBW3	Loch Ardinning	SWT	Woodland strip across rough pasture	TBC	Public sector programme?	£	Meet with SWT to discuss	
EDBW4	Dumbrock Muir/Deil's Craig Dam	Private, unknown	New woodland block recently planted creates desired connection. No action	N/A	N/A	N/A	N/A	Already connected
EDBW5	Bothlin Burn, Millersneuk, Claddens	N/A	More woodland than shown in data. Already functionally connected.	N/A	N/A	N/A	N/A	Already connected
EDBW6	Farmland east of Dowan Rd	Private, unknown	Grazing and agricultural land. Requires engagement and incentivisation	TBC	Funding opportunity	£	Investigate opportunities for agri-environment incentives	Funding
EDBW7	River Kelvin,	Private, unknown	Appears to be good quality grassland and possibly not appropriate for woodland. Independent assessment required	TBC	Funding opportunity	£	Detailed survey	Existing habitat
EDBW8	Glazert Water,	N/A	More woodland than shown in data. Already functionally connected.	N/A	N/A	N/A	N/A	Already connected
EDBW9	Alloch Dam	N/A	More woodland than shown in data. Already functionally connected.	N/A	N/A	N/A	N/A	Already connected
EDBW10	Milngavie Rd development site	N/A	Site built out	N/A	N/A	N/A	N/A	Opportunity lost
EDBW11	Luggie Park,	N/A	More woodland than shown in data. Already functionally connected.	N/A	N/A	N/A	N/A	Already connected
EDBW12	River Kelvin,	N/A	More woodland than shown in data. Already functionally connected.	N/A	N/A	N/A	N/A	Already connected

Lessons learned so far…

The 'Blueprint' (Strategic Habitat Network):

- Has received high-level buy-in
  - good communication/presentation & timing
- Identified opportunities are based on 'least input/highest returns'
  - for a NEN a different method to identify opportunities is required

Modelling Data:

- Some data problems emerged when sense checking
  - we used the best data available - but it's not consistent
- Need a mechanism to gather new data and include in model re-runs
  - e.g. development sites & LNCS reviews

Green Network

The Blueprint Making the Connections

gcv green network

Thank You

max.hislop@gcvgreennetwork.gov.uk

@Max_GCVGNP

www.gcvgreennetwork.gov.uk/what-we-do/our-blueprint

A Central Scotland Green Network Blueprint

11 March 2020

Central Scotland Green Network Trust

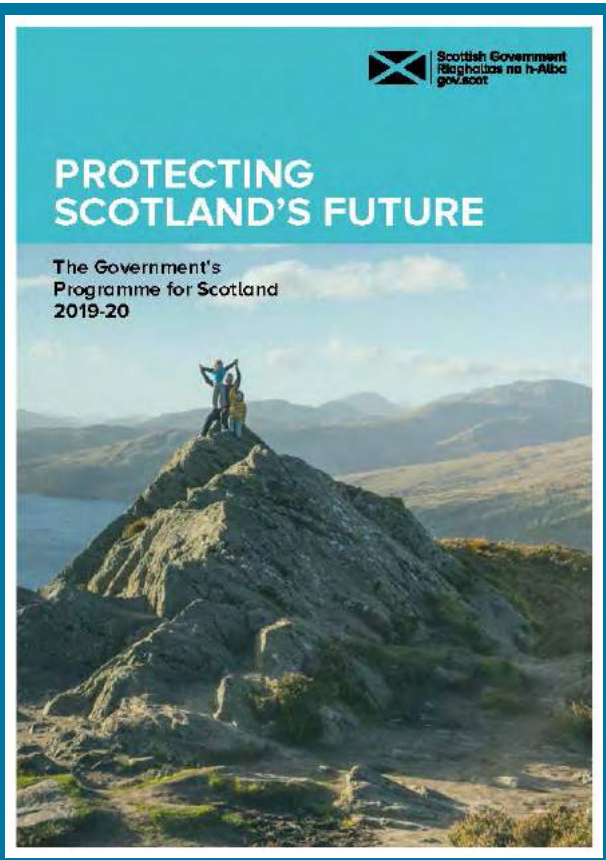
19 LAs; 3.8M people

Central Scotland Green Network Trust

By 2050, Central Scotland has been transformed into a place where the environment adds value to the economy and where people's lives are enriched by its quality

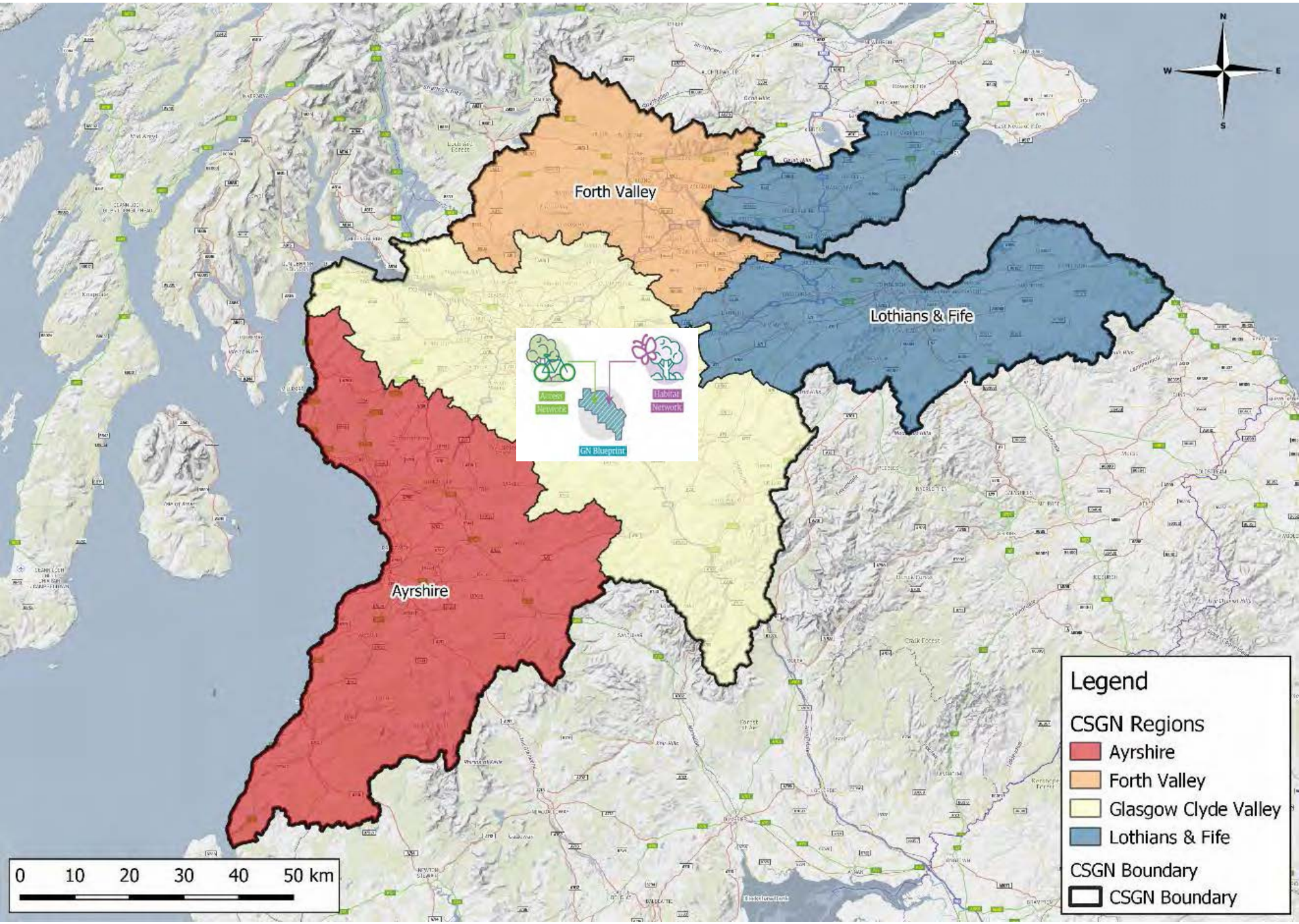
The Central Scotland Green Network

Developing a CSGN Blueprint



Protecting Scotland's Future
The Government's Programme for Scotland 2019-20

'We will publish a blueprint for the network, providing a targeted map that identifies the best opportunities for greenspace projects that will deliver the biggest climate change and biodiversity benefits to communities across the central belt'.


Forth Valley
Lothians & Fife
Ayrshire
Access Network
Habitat Network
GN Blueprint
N
W
E
S
0 10 20 30 40 50 km
Legend
CSGN Regions
Ayrshire
Forth Valley
Glasgow Clyde Valley
Lothians & Fife
CSGN Boundary
CSGN Boundary

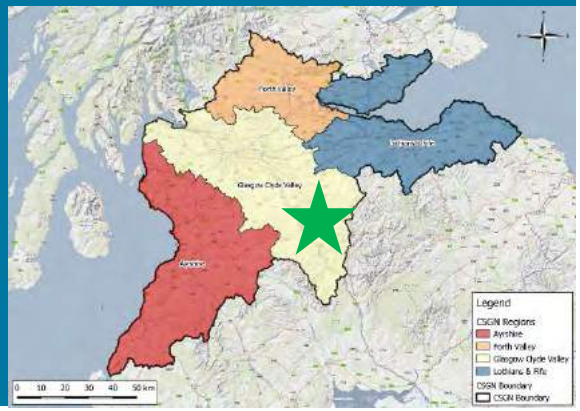
Components – Glasgow and Clyde Valley

Central Scotland Green Network Trust

- Supporting GCV GNP's implementation work

  +

- SEPA spatial modelling of river catchment and flood risk management
- Scottish Water modelling of potential for flood attenuation action

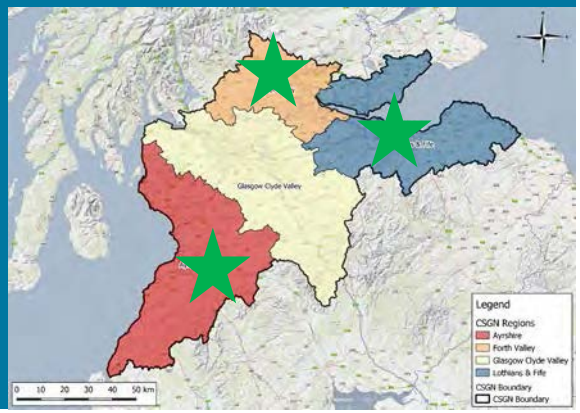


Components

– Ayrshire; Lothians and Fife; Forth Valley

Central Scotland Green Network Trust

- SNH Biocore modelling
- ‘Climate layer’
- Existing strategic and spatial priorities for active travel and green network



Timescale for development

- Aligned with National Planning Framework 4 development
- Local groups and data collation April 2020
- Substantially complete Autumn 2020

Forest Research

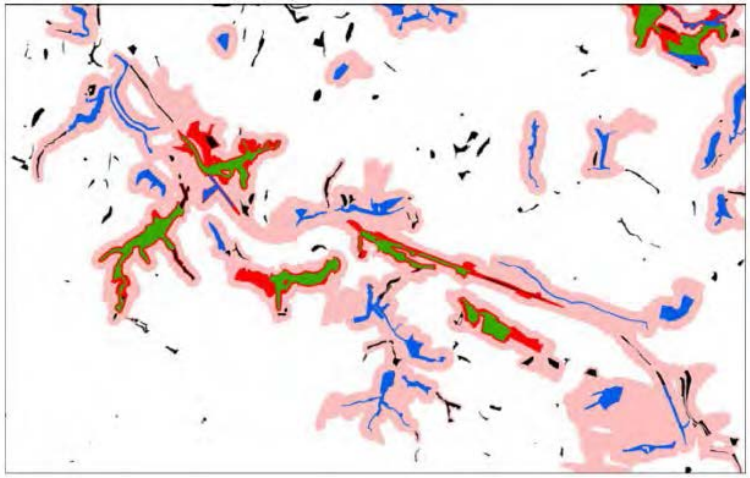
Developing ecological network methodologies to identify opportunities for policy makers and practitioners

Darren Moseley

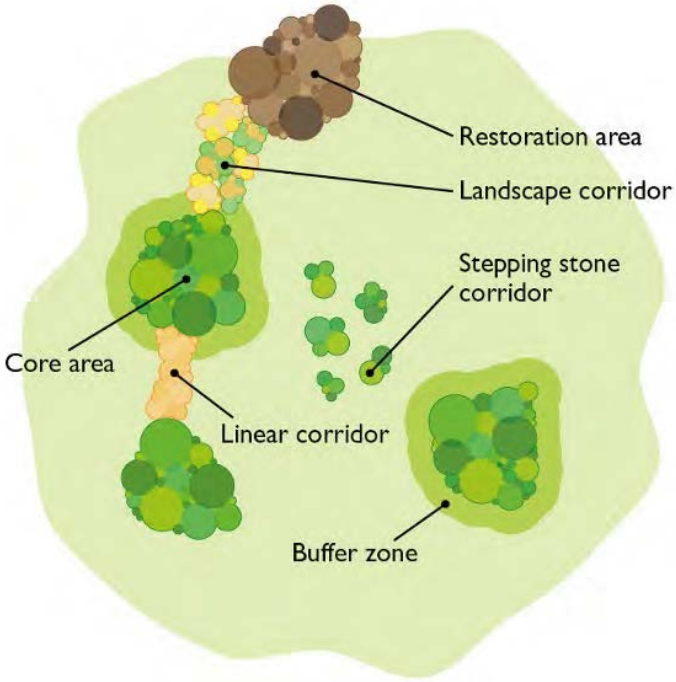
Andrew Rattey

Chloe Bellamy

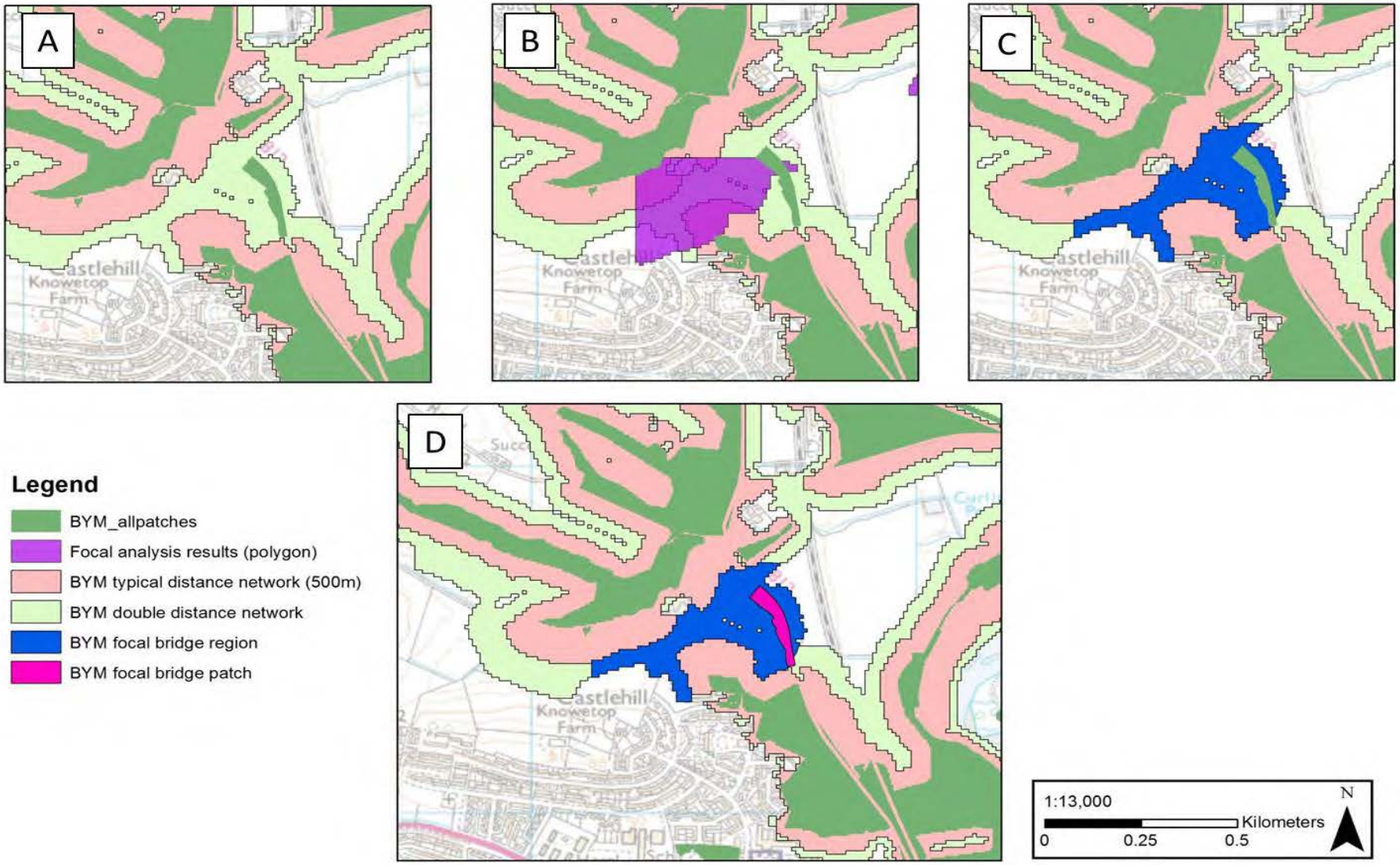
Work on ecological networks



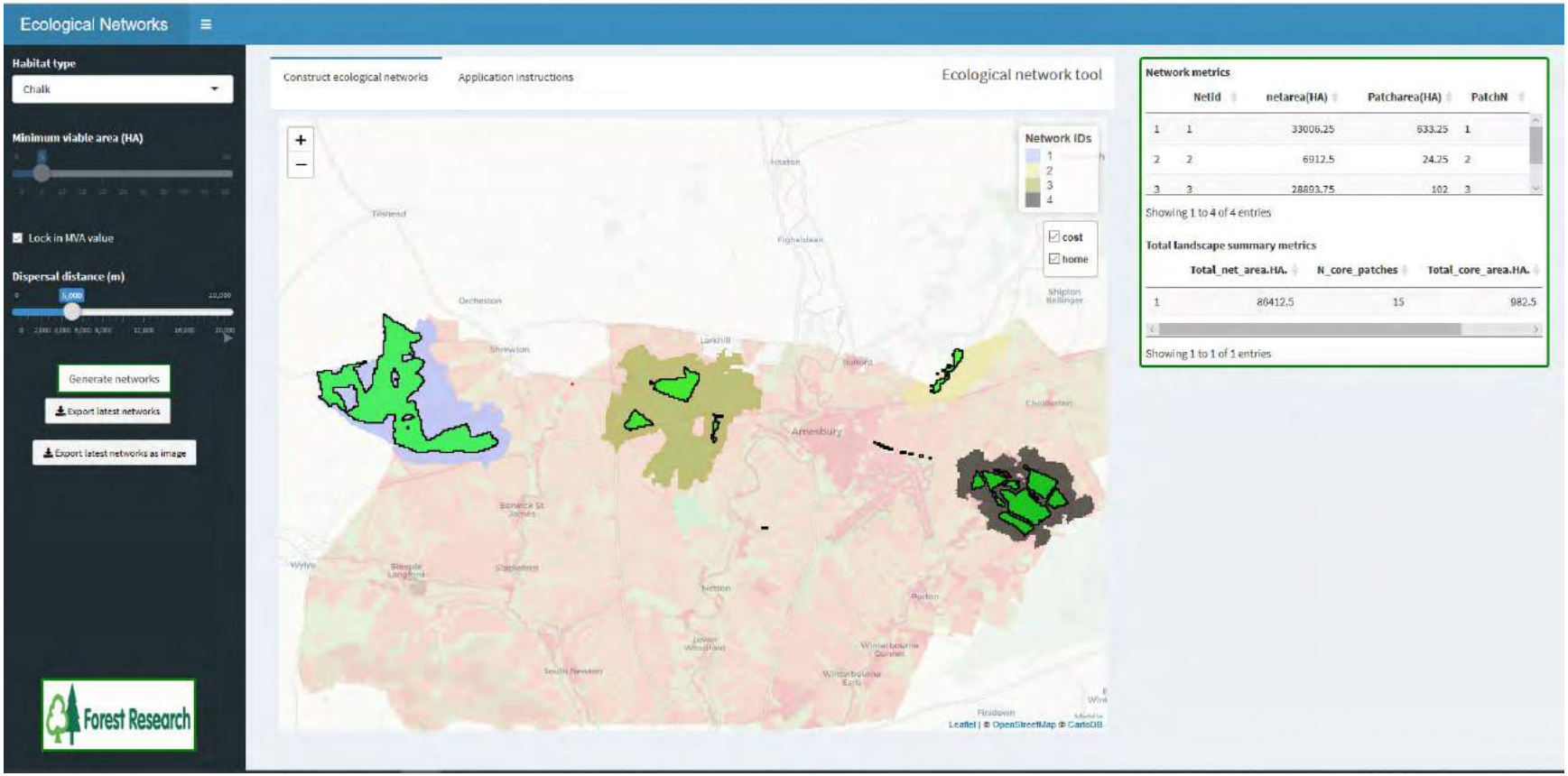
Least-cost network approach



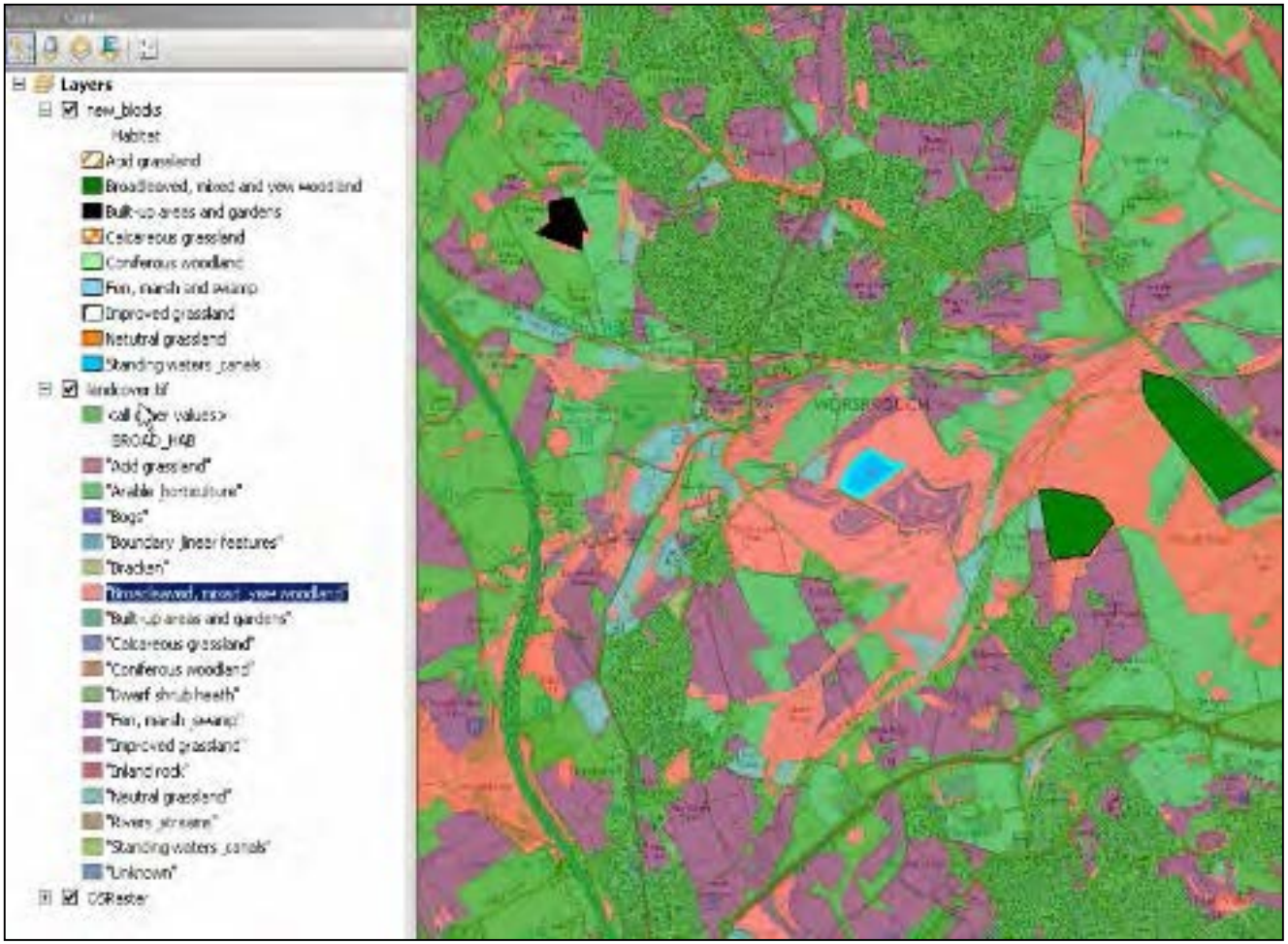
Work on ecological networks

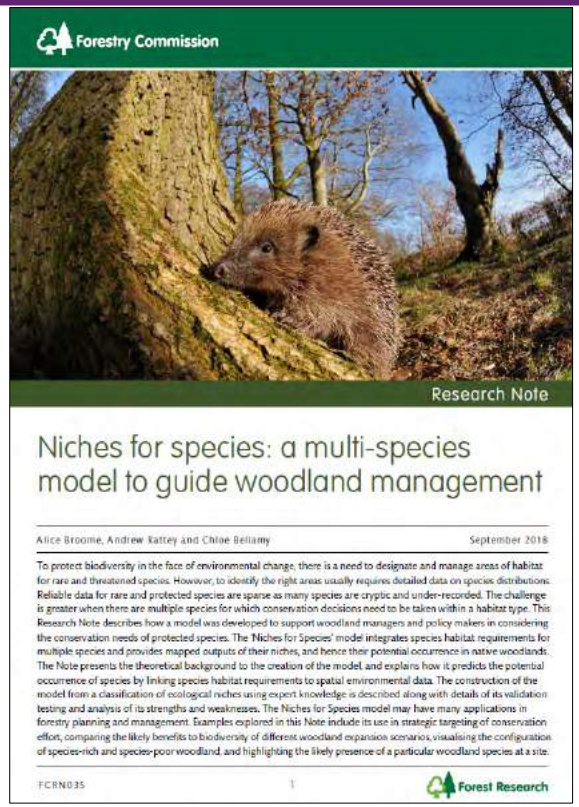


Policy & practice needs



Research gaps





Generating actionable knowledge across land management boundaries

Katrina Myrvang Brown

The James Hutton Institute

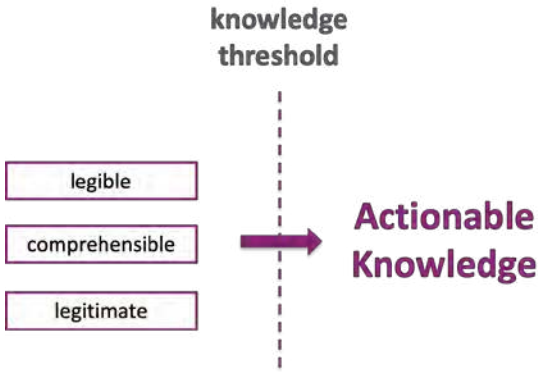
katrina.brown@hutton.ac.uk

Learning from the Scottish Capercaillie Group

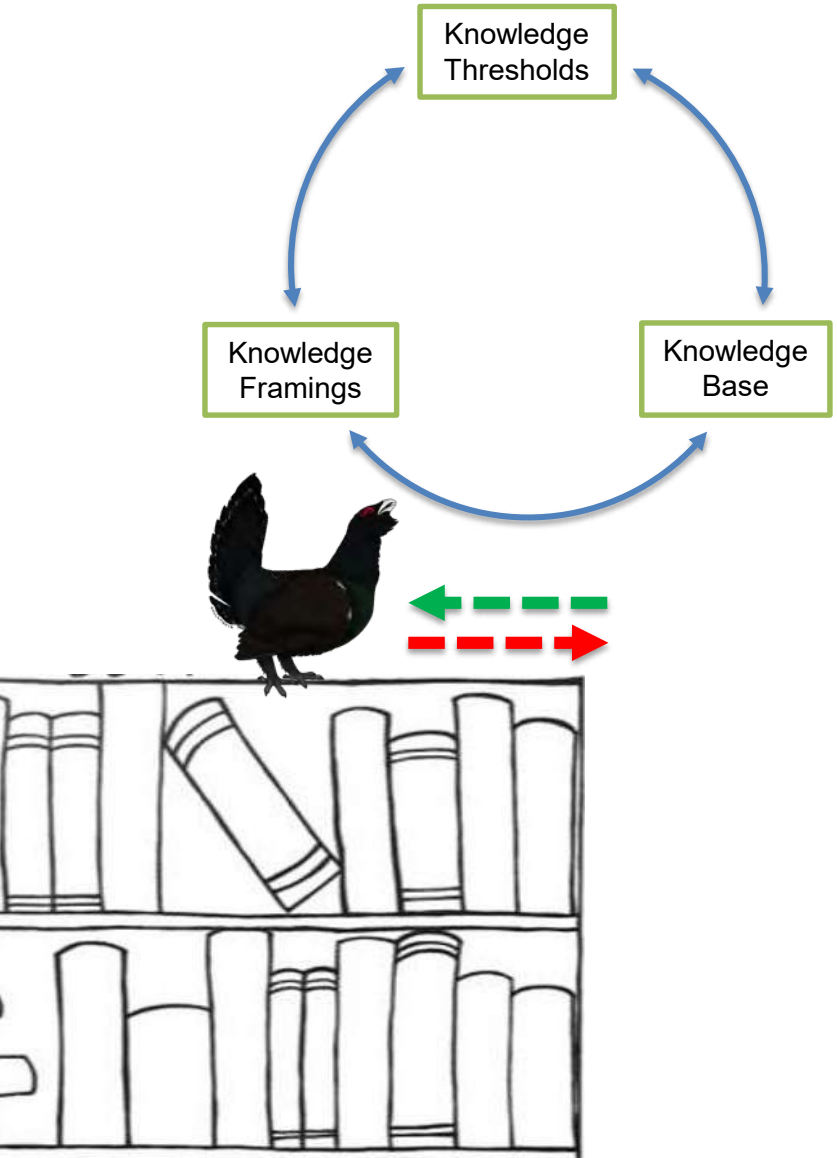
The James Hutton Institute

Example of a forum for exchange of knowledge and experience across land management boundaries

- How is actionable knowledge shared, translated & co-produced amongst the group?
- What makes knowledge actionable in this context?



Making knowledge actionable on the shelf of extinction



Developing **response-ability**: the mutual capacity to respond

Policy & practice needs being addressed

- **Policy needs**
  - Biodiversity strategies: both broad & species-specific e.g.
    - Natura 2000
    - Scottish Biodiversity Strategy
    - The Capercaillie Framework
  - Rural development policy
    - e.g. SRDP 'Capercaillie' Package
- **Practical needs**
  - Land can only be managed across ecologically meaningful scales if management can be co-ordinated
  - Therefore, a wide range of land managers need to be able to communicate and ideally collaborate with each other
    - need for meaningful exchange on a number of levels
    - from latest international scientific evidence to personal constraints

New research that would support a National Ecological Network

Identifying and understanding mechanisms (formal and informal) through which land management practices and cultures can and do change towards embracing ecological network thinking

What is it about particular individuals, narratives, relationships, forms of knowledge or formative experiences that provides the grounds for - and sew the seeds of - openness to change?

(also involves deepening understanding of how and why such change is resisted)

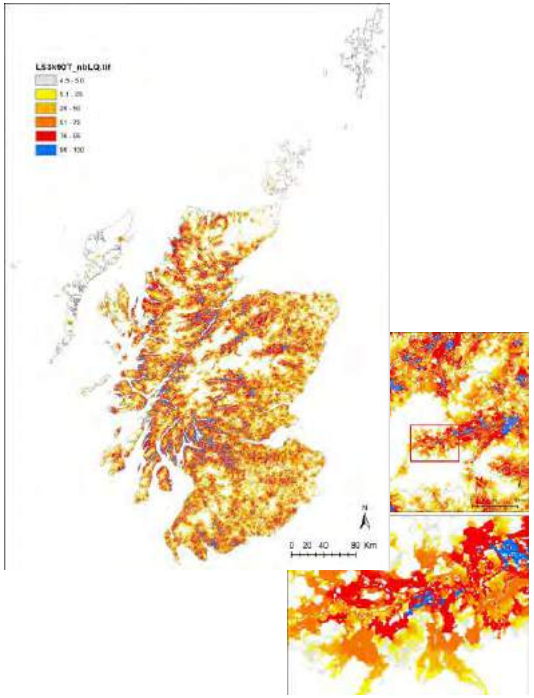
Work relevant to ecological networks

Alessandro Gimona, Marie Castellazzi, Andrea Baggio

The James Hutton Institute

Current relevant work

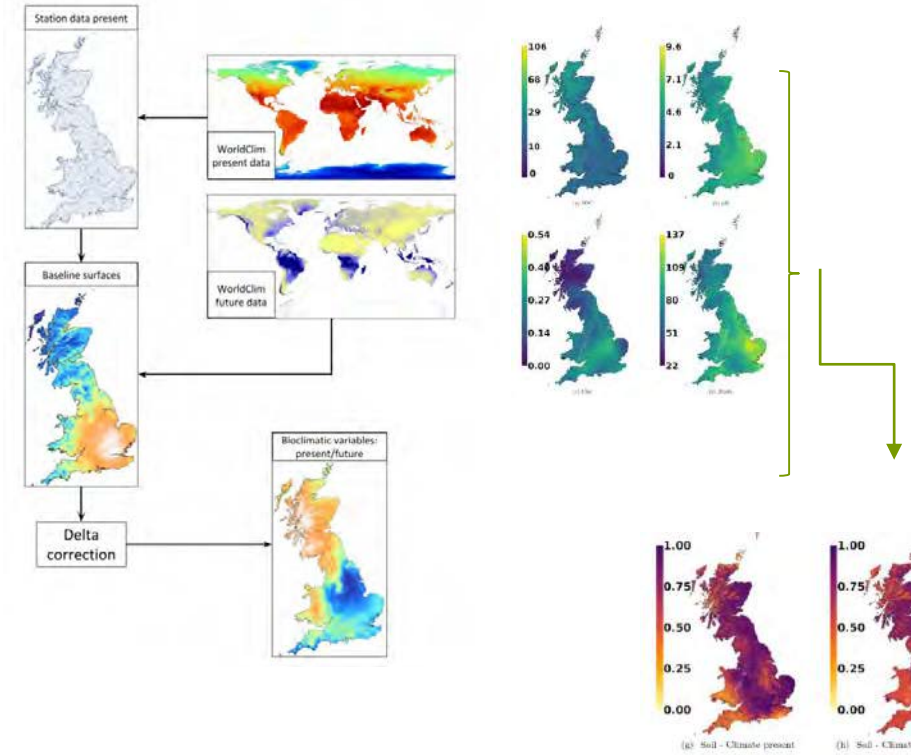
1) New tool to estimate (woodland) connectivity
based on simulated individual movements



Index of connectivity, BL woodlands

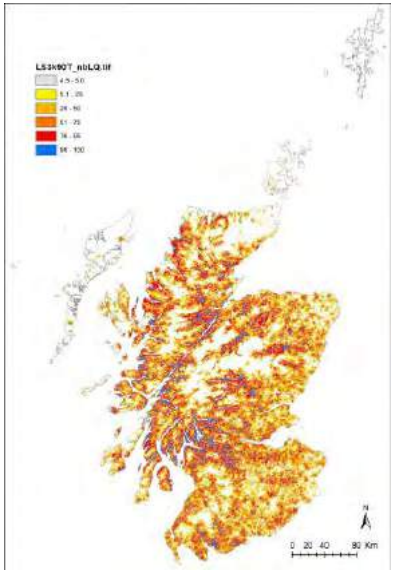
2) High res. range shift models for native tree spp.

Climate (bias corrected) + Soil (100 m)

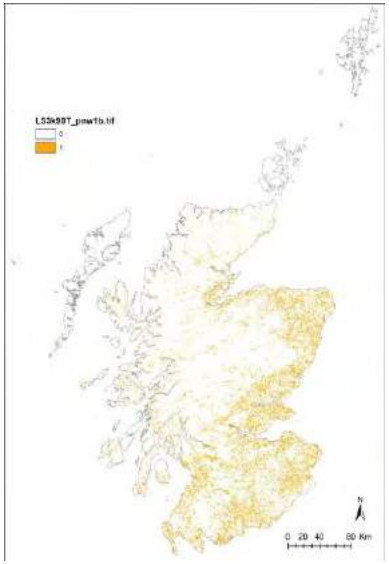


Present and future distribution

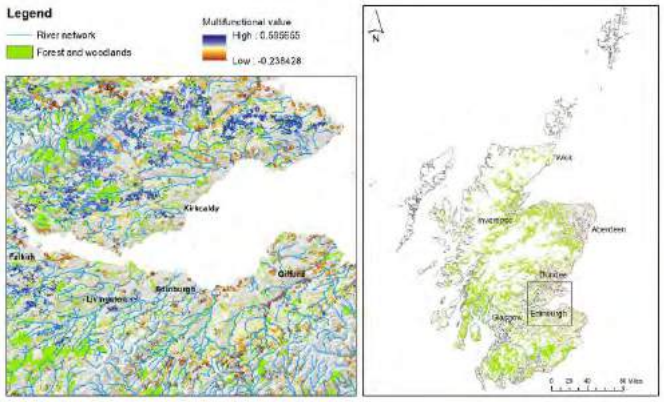
Locating where to put stepping stones



Traffic of individuals



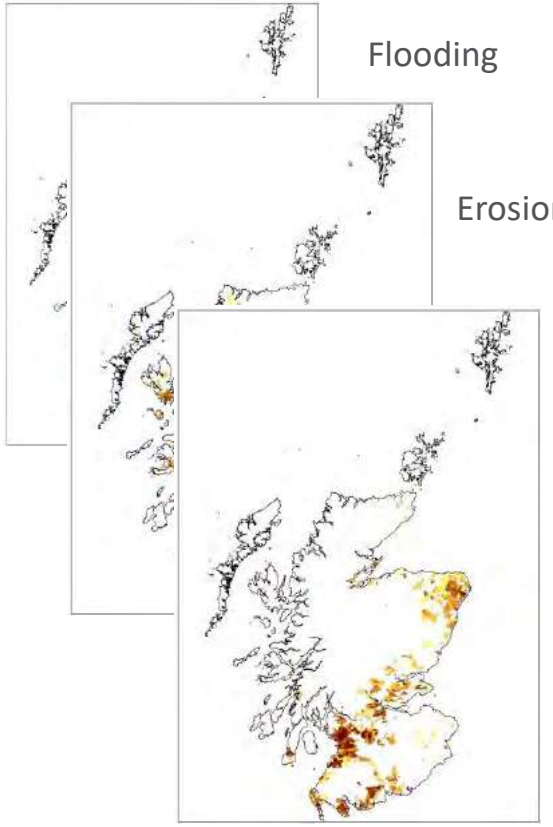
Best areas for stepping stones



Connectivity & other benefits

Multiple benefits from woodlands

Priority areas for alleviation of:



Flooding

Erosion

Diffuse Pollution

Etc..

What policy or practice needs is this research addressing?

Biodiversity strategy;
Land use strategy;
Climate policy (net zero)

What new research would support a National Ecological Network ?

- Tracking/estimating actual dispersal and movements through the matrix in a variety of landscapes;
- How is dispersal dependent from patch area?
- Range shifts of target species
- **Dynamic landscapes: land use change and climate change interact!**
- Land manager's attitudes to dispersal corridors

The James Hutton Institute

Thanks to the Scottish Government (RESAS) for financial support

Contact: Alessandro.gimona@hutton.ac.uk

Athena SWAN Bronze Award

We are a Living Wage Employer

Scottish Government
Riaghaltas na h-Alba
gov.scot

Woodland C**r**eation & **E**cological **N**etworks (**WrEN** project)

Web: www.wren-project.com

Twitter: @WrENproject

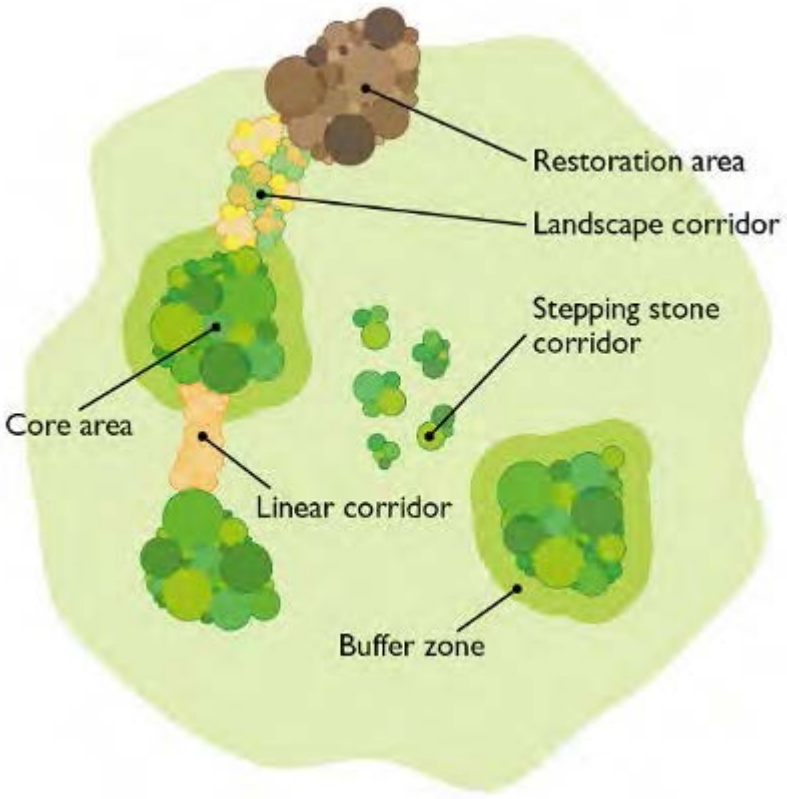
Forest Research

UNIVERSITY of STIRLING

NATURAL ENGLAND

Ecological restoration following habitat loss

- Building & enhancing "ecological networks" – conservation policy to tackle habitat fragmentation
- Sound scientific principles but limited empirical evidence for prioritisation



Ecological networks; Making Space for Nature 2010

The spatial scale challenge

- Experimentation is fundamental to inform conservation, but rare and challenging over large spatio-temporal scales.

- Challenge 1: spatial scale.
  - Experimental control/replication *vs*. ecological realism.

Ecological realism

Control & replication

The temporal scale challenge

- Experimentation is fundamental to inform conservation, but rare and challenging over large spatio-temporal scales.

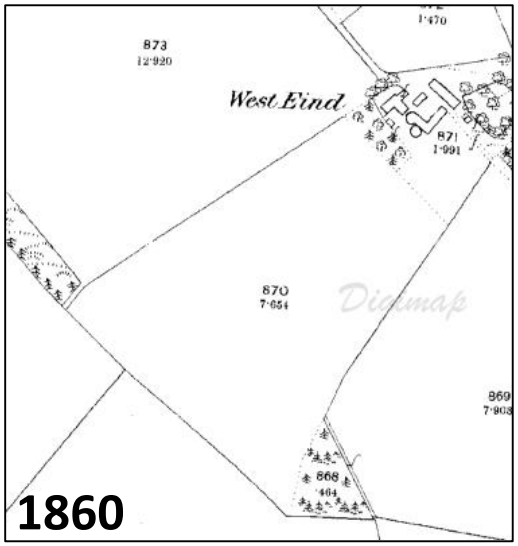
- Challenge 2: temporal scale
  - Slow habitat development (e.g. woodlands).
  - Time lag in biodiversity response/colonisation.

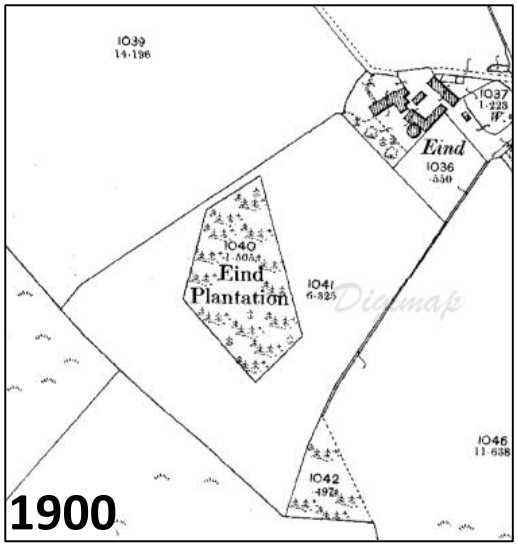
Habitat development & biodiversity response

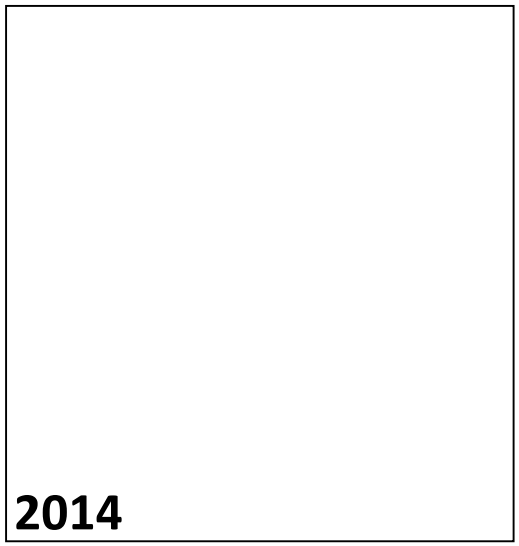
What is WrEN?

www.wren-project.com
@WrENproject

- Research project using a 'natural experiment' approach to assess the effects of **past** landscape change on **current** biodiversity to inform **future** conservation actions.
  - Historic maps used to identify woodland patches created in the past 150 years.
  - Woodlands systematically selected to reflect variation in key local (e.g. patch size) and landscape-level (e.g. surrounding woodland amount) attributes.
  - Woodlands surveyed for a range of woodland-dependent species.







Time

What have we achieved so far?

www.wren-project.com
@WrENproject

130 woodland sites surveyed

2000+ species have colonised woodland creation sites so far, including specialists

How to prioritise alternative actions to maximise benefits?

Taxa-specific

Life-history traits (mobility, habitat specificity) e.g. connectivity for woodland specialist moths

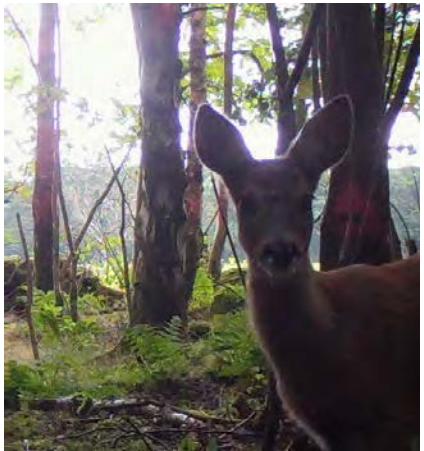
Ongoing work

www.wren-project.com
@WrENproject

- Synthesis analyses to identify synergies and trade-offs across taxa
- Soil properties & fauna (PhD studentship)
- Effects of woodland restoration on ecosystem processes (e.g. tree regeneration, herbivory)






The consequences of tree diseases for connectivity

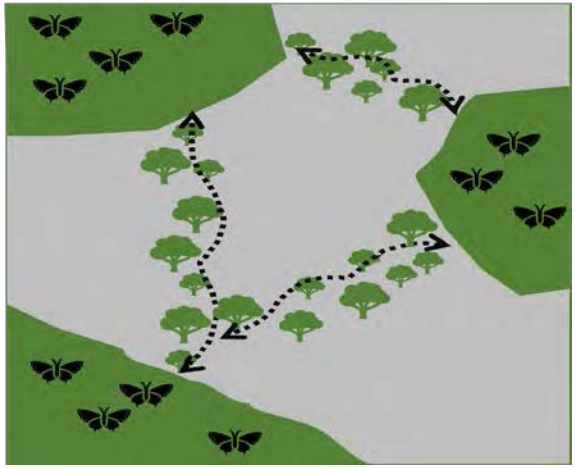
Ruth Mitchell and Fiona Plenderleith

Scotland's National Ecological Network: progress and practicalities 11th March 2020

Tree diseases & connectivity

- Trees outside woodlands facilitate dispersal between woodlands
- Ash trees are common outside woodlands in the UK
- Threatened by ash dieback

- 4.4 million ash trees next to the UK road and rail network
- Losses outside of woodlands are high due to preventative felling along linear features for health and safety



Ash dieback and associated management

Data analysis and results

Inputs
real ecological data

Species traits
- Demography
- Dispersal
- Genetics

Landscape features
- Habitat type
- Breeding patches

RangeShifter

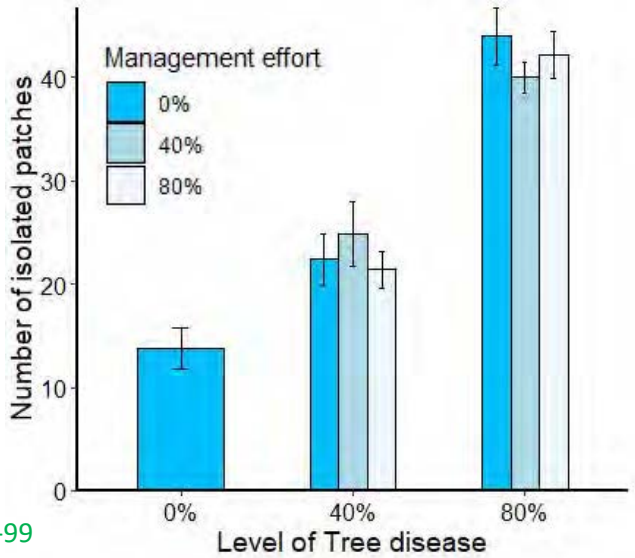
Model repeated for different scenarios of tree loss

Level of tree disease:
0%, 40% or 80%

Management response:
Removal of roadside ash trees within a 100m radius of 0, 40 or 80% of infected tree cells

Outputs
Long-term predictions

- Population genetics
- Population dynamics



Removing 60% of road side trees decreases the number of successful dispersers by up to 17% Henry et al 2017 Ecological Informatics, 42, 90-99

Policy or practice needs

The James Hutton Institute

The problem: Tree loss along roads and railways is high due to health and safety precautions

Unknown impact: Quantify the impact of tree loss on connectivity and dispersal

Mitigation: Explore mitigation options for tree planting to minimise impact on connectivity and health and safety concerns

GAPS: identify trade-offs of an increase in connectivity

The James Hutton Institute

Pros	Cons
Increase in one habitat	Decrease in the habitat converted
Increase dispersal of 'desirable' species	Increase in dispersal of pests, pathogens and non-native species
Increase resilience (some aspects)	Decreased resilience (some aspects)
Some ecosystem services increase	Some ecosystem services decreased

Thank you