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Prioritising research and development gap opportunities for river woodlands

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River woodlands (RW): Trees, woodlands and forests, either natural or planted, around the bank and alongside a natural body of freshwater (especially a stream or river but also including lochs).

Key takeaway messages

- Restoring river woodlands (RW) is an important and growing priority, as they play a crucial role in maintaining healthy rivers and offer numerous benefits that address both the biodiversity and climate crises. However, more evidence is needed to fully understand the benefits and maximise impacts across multiple sectors and Scotland's environment.
- We reviewed 60 specific knowledge gaps to determine where more evidence is needed for RW implementation.
- We consulted 115 experts and stakeholders to identify and prioritise these RW knowledge gaps and research needs.
- While RW are widely recognised for their benefits, challenges such as funding, policy hurdles, and constraints in landowner engagement make it difficult to turn knowledge into action.
- There is strong evidence for RW benefits in areas like improving water quality, enhancing biodiversity, protecting soil, and supporting wildlife. However, stakeholders need better access to this knowledge and practical guidance.
- There is limited scientific evidence on key areas like RW placement for managing low river flows, selecting drought-resistant tree species, understanding greenhouse gas interactions, and assessing attitudes toward RW restoration. Figure 1 a) shows stakeholders priorities according to levels of evidence of reviewed gaps and b) shows some overall pathways for resolving evidence needs.
- More research is needed on how RW function over time and across different landscapes, including monitoring their long-term effects.
- Instead of focusing solely on new research, efforts should also prioritise applying existing knowledge, improving funding options, encouraging collaboration, and creating better tools for RW management.

Background and research goals

RW play a crucial role in protecting river ecosystems, for example by reducing flooding, storing carbon, filtering pollution, and benefiting local communities. However, nearly 55% of surveyed riverbanks in Scotland show poor RW health. This highlights a need for RW restoration. While RW initiatives like Riverwoods are gaining traction, scaling them up remains challenging.

In 2022, Riverwoods conducted a review of existing research on RW benefits, identifying 60 key knowledge gaps (Ogilvy *et al.*, 2022). However, that review did not consider the perspectives of different stakeholders such as policymakers, landowners, businesses,

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and conservation groups. Our project builds on that work by updating the scientific review and incorporating stakeholder priorities.

Many policies support RW restoration, including the Scottish Biodiversity Strategy, Forestry policies, and the National Adaptation Plan. However, more work is needed to turn knowledge into practical guidance for policymakers, businesses, conservation groups, and other stakeholders.

This project aimed to:

- **Review existing research** to assess the strength of evidence on RW benefits and identify remaining knowledge gaps.
- **Engage stakeholders** (academics, policymakers, businesses, and environmental groups) to determine research priorities and practical needs for RW restoration.
- **Find solutions** to address these gaps and support investment in RW projects.

How the research was conducted

- We reviewed global scientific studies from 2014-2024, analysing research on key RW benefits and stakeholder-identified gaps.
- We engaged over 115 stakeholders through surveys, workshops, interviews, focus groups, and a consultation to gather their insights.
- We combined scientific evidence with stakeholder priorities to highlight areas that need urgent attention.

Main findings

- Our research mostly confirmed the 2022 findings on RW knowledge gaps and strength of evidence, but also downgraded (to moderate) eight cases where previously strong evidence classification was countered by multiple specific gaps which remain unaddressed for topics considered important to RW implementation in Scotland.
- Stakeholders generally support RW restoration but want better access to knowledge, funding, and practical tools.
- Rather than focusing on single issues, stakeholders prefer an integrated approach that combines evidence across multiple benefits. They want tools that address RW overall impact, rather than isolated studies on specific benefits.
- Research is particularly weak in key areas like RW placement for water management, drought-resistant tree species, carbon storage, and public attitudes toward RW restoration.
- Strong scientific evidence supports RW benefits for clean water, soil health, biodiversity, and wildlife protection, but there is a need for better knowledge-sharing and guidance.
- More studies should explore RW management, tree placement, and long-term monitoring to measure their effectiveness.
- Practical challenges – such as limited funding, lack of collaboration, and inconsistent data – may be bigger barriers to RW implementation than gaps in scientific knowledge.

Key recommendations

- **Improve Policies for RW** – Align RW targets with national policies (e.g., biodiversity, climate resilience, and water management) to ensure long-term support and funding.
- **Expand Funding Options** – Develop financial models like carbon markets and green investment strategies to attract private sector support.
- **Strengthen Research & Tools** – Improve monitoring methods, develop tools to optimise RW placement, and support interdisciplinary studies on RW management.
- **Enhance Monitoring Efforts** – Establish long-term monitoring programs using advanced techniques like citizen science, environmental DNA (eDNA), and water sensors.
- **Encourage Collaboration & Knowledge Sharing** – Create national guidance resources, improve coordination across sectors, and promote RW benefits through initiatives like Riverwoods.

By addressing these issues, we can enhance RW restoration efforts, improve river health, and maximise environmental and societal benefits across Scotland.

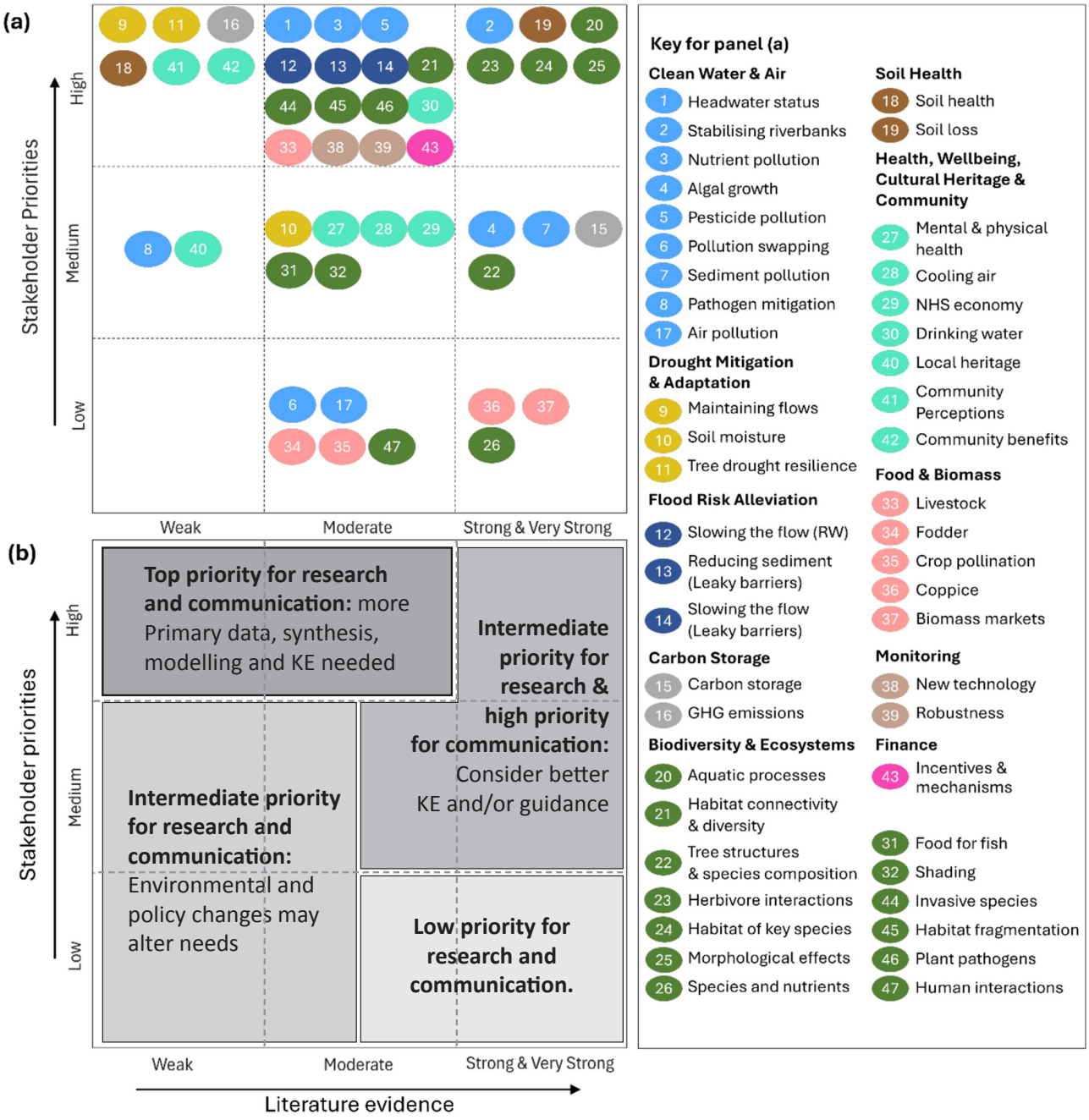

Figure 1: Overview of Stakeholder Priorities and Supporting Evidence. (a) The 47 identified gaps, categorised by benefit themes, as discussed with stakeholders. (b) Recommended priority areas for action based on overall stakeholder input Note: KE = Knowledge Exchange. The matrix positions are based on a review of the specific gaps (x-axis) and the full stakeholder engagement process (y-axis). For identification of the specific number gaps (1-47) above, see the summary text in Table 3 and details in Tables 5-12 of the main report.

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