

# Making Natural Flood Management at the Landscape Scale a Reality: An Investigation of the Barriers and Spatial Disconnection between NFM Investments and Beneficiaries


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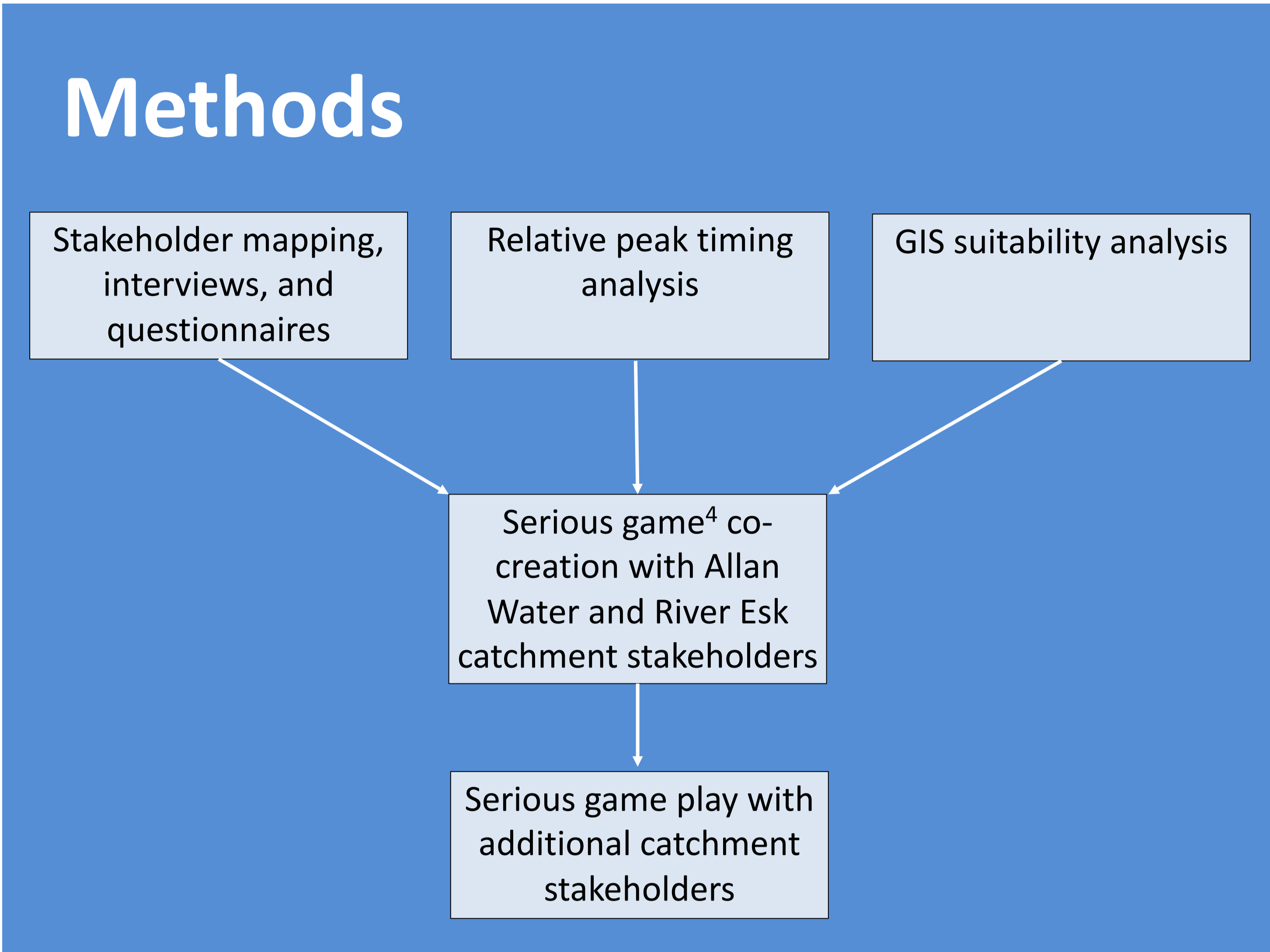
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## Introduction

- Nature-Based Solutions (NBS) are practices that use natural processes to achieve environmental, social, or economic goals.<sup>1</sup>
- Under the “umbrella”<sup>1</sup> of NBS, Natural Flood Management (NFM) aims to use natural processes to manage flood risk.<sup>3</sup>
- NFM is difficult to implement at scale due to a variety of technical and political “barriers.”<sup>7</sup>
- I am investigating the ways in which upstream and downstream communities can cooperate to reduce flood risk and overcome these barriers.

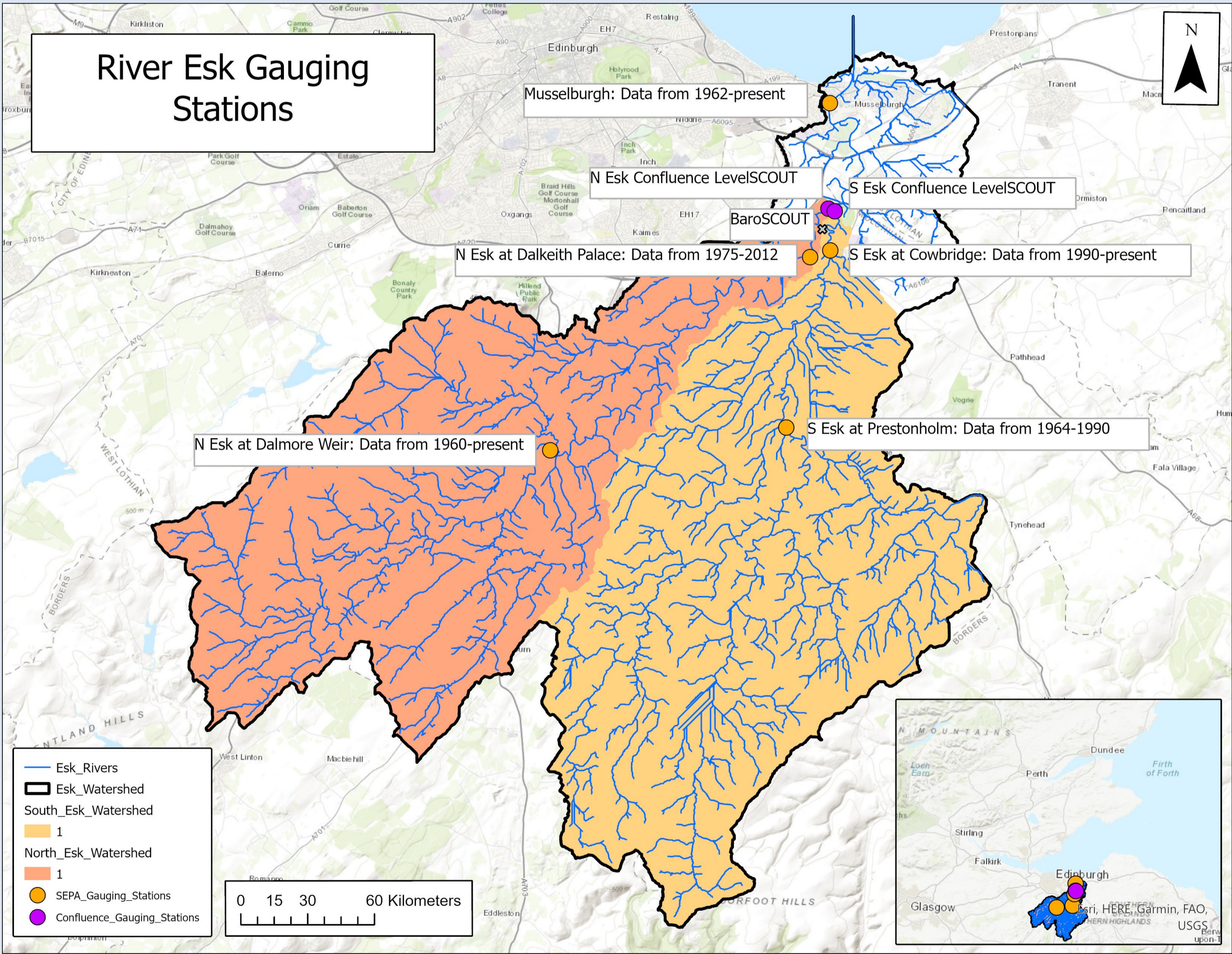


*Riparian tree planting is one example of NFM.*



## Progress

- 11 scoping interviews with stakeholders showed interest in NFM paired with the need to fulfil other responsibilities.
- 57 questionnaires completed by Allan Water and River Esk catchment residents showed varying levels of concern about flood risk.
- Project focus narrowed from "Nature-Based Solutions" in general to "Natural Flood Management" in particular.
- Stilling wells installed to measure water levels at the River North Esk-River South Esk confluence.<sup>2</sup>



**River Esk Gauging Stations**

Musselburgh: Data from 1962-present

N Esk Confluence LevelSCOUT

S Esk Confluence LevelSCOUT

BaroSCOUT

N Esk at Dalkeith Palace: Data from 1975-2012

S Esk at Cowbridge: Data from 1990-present

N Esk at Dalmore Weir: Data from 1960-present

S Esk at Prestonholm: Data from 1964-1990

Legend: Esk\_Rivers, Esk\_Watershed, South\_Esk\_Watershed, North\_Esk\_Watershed, SEPA\_Gauging\_Stations, Confluence\_Gauging\_Stations

Scale: 0 15 30 60 Kilometers

Inset map: Scotland, showing the location of the River Esk catchment area.

## Overcoming Barriers to NFM: The Game

Policy challenges, funding gaps, differing perceptions, land availability, and knowledge gaps make it difficult to implement NFM at scale.<sup>5, 6, 7</sup> Often, overcoming these barriers requires convincing someone (landowners, government officials, floodplain residents) to change their behaviour.

**Can you overcome the barriers to NFM?**

1. Pick a Mission card
2. Pick a Results card
3. Complete the mission by the end of the poster session

*Opting in/out: Put on a safety pin to join the game. Anyone wearing a pin is also playing! If someone is not wearing a pin, they are not able to help with your mission.*

## Next Steps

- Additional stakeholder mapping exercises, interviews, and workshops.
- Serious game co-creation with stakeholders.
- Measure water levels on the Allan Water-River Knaik and North Esk-South Esk confluences to investigate which tributary peaks first.

## References

<sup>1</sup>Cohen-Shacham, E. et al. (eds) (2016) Nature-based solutions to address global societal challenges. IUCN International Union for Conservation of Nature. Available at: <https://doi.org/10.2305/IUCN.CH.2016.13.en>.

<sup>2</sup>Edina Digimap (2023) Digimap. Available at: <https://digimap.edina.ac.uk/> (Accessed: 30 September 2023).

<sup>3</sup>Forbes, H., Ball, K. and McLay, F. (2015) 'Natural Flood Management Handbook'. Scottish Environment Protection Agency. Available at: <https://www.sepa.org.uk/media/163560/sepanatural-flood-management-handbook1.pdf>.

<sup>4</sup>Harteveld, C. (2011). 'Triadic Game Design'. Available at: <https://link.springer.com/book/10.1007/978-1-84996-157-8>

<sup>5</sup>Holstead, K. (2014) Natural flood management from the farmer's perspective: criteria that affect uptake. Available at: <https://onlinelibrary.wiley.com/doi/ful/10.1111/jfr3.12129> (Accessed: 19 September 2023).

<sup>6</sup>Kabisch, N. et al. (2016) 'Nature-based solutions to climate change mitigation and adaptation in urban areas: perspectives on indicators, knowledge gaps, barriers, and opportunities for action', Ecology and Society, 21(2). Available at: <https://doi.org/10.5751/ES-08373-210239>.

<sup>7</sup>Wingfield, T. et al. (2021) 'Barriers to mainstream adoption of catchment-wide natural flood management: a transdisciplinary problem-framing study of delivery practice', Hydrology and Earth System Sciences, 25(12), pp. 6239–6259. Available at: <https://doi.org/10.5194/hess-25-6239-2021>.

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