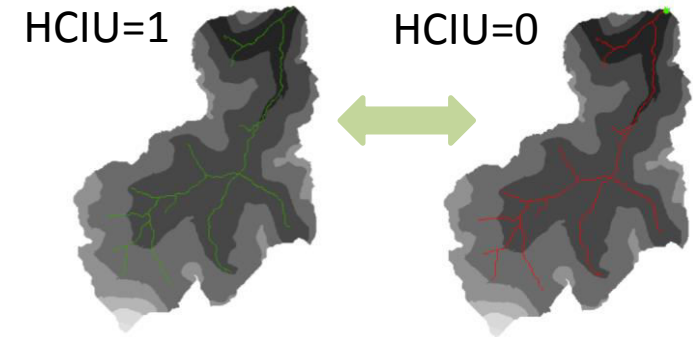
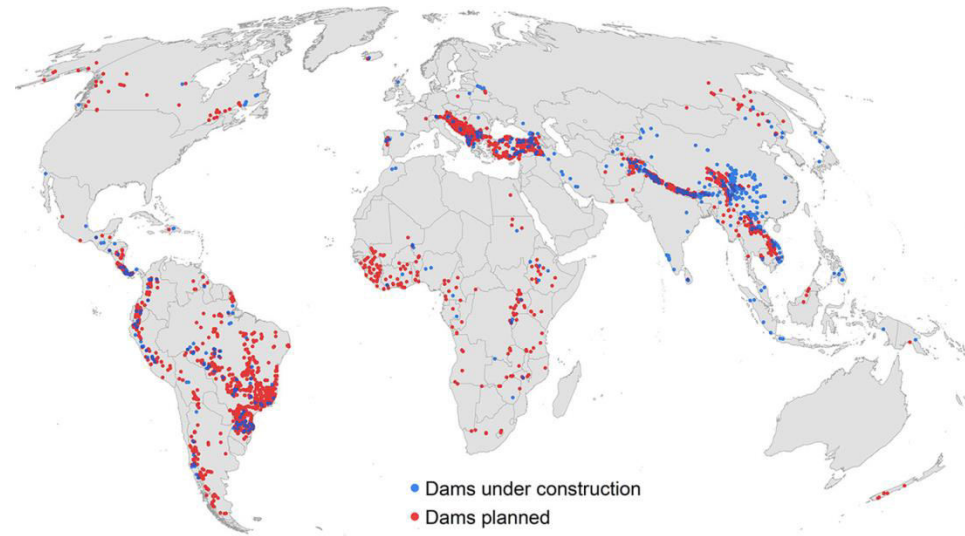
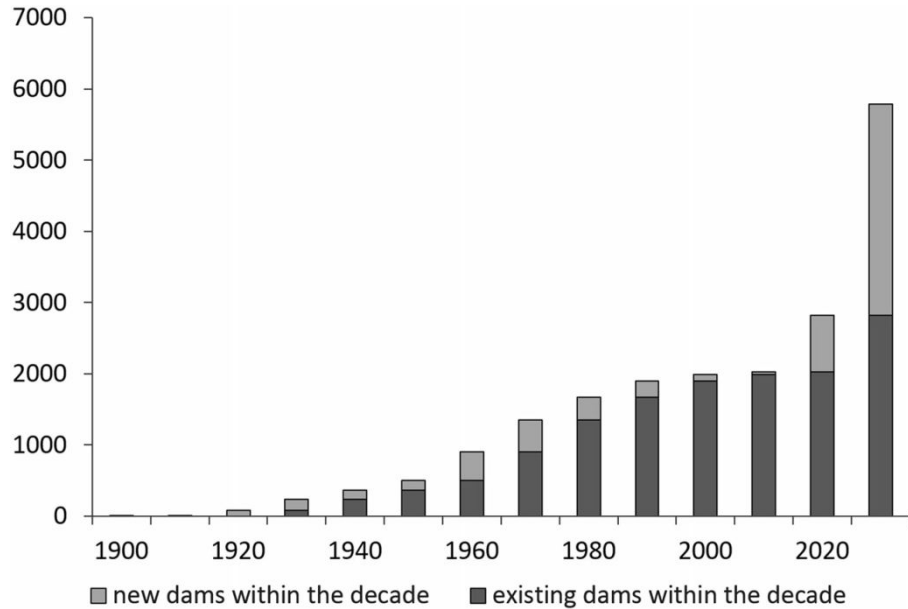


Potential impacts of hydropower regulation on salmonid habitats using connectivity metrics



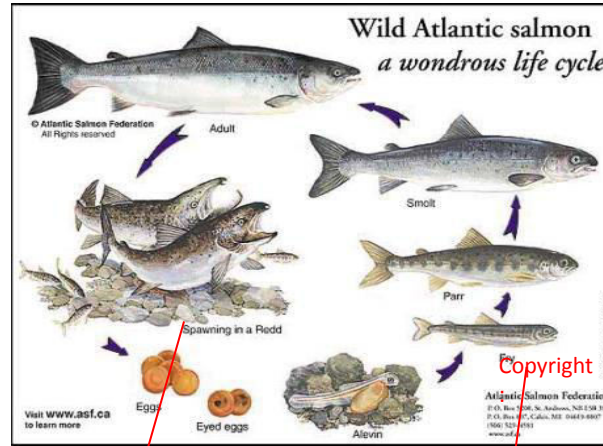
Bas Buddendorf, Josie Geris, Iain Malcolm, Mark Wilkinson, Chris Soulsby

Introduction

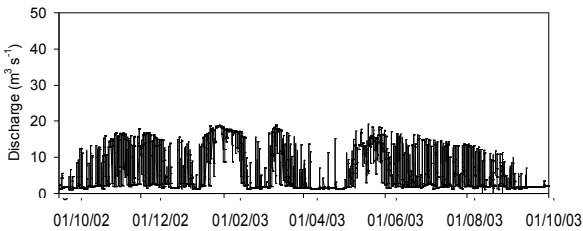


Zarfl et al., 2015. *Aquatic Sciences*.

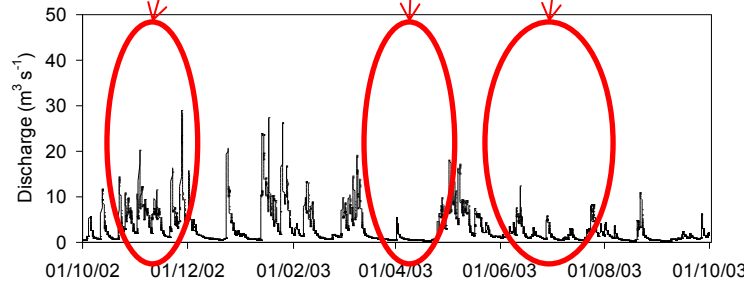
Introduction



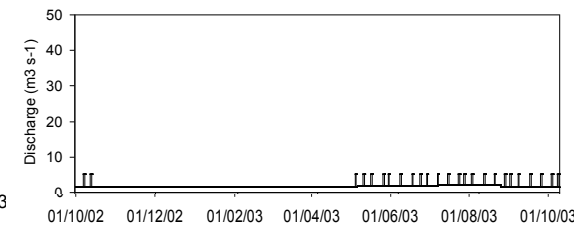
Hydropower dam



Unregulated



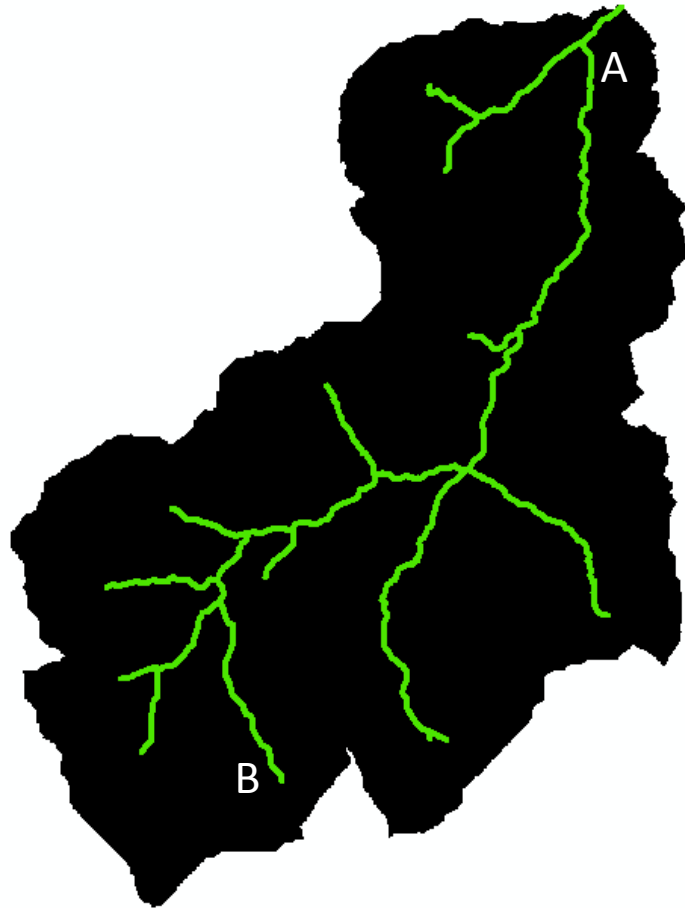
Reservoir



Jackson et al., 2007. *River Res & App.*

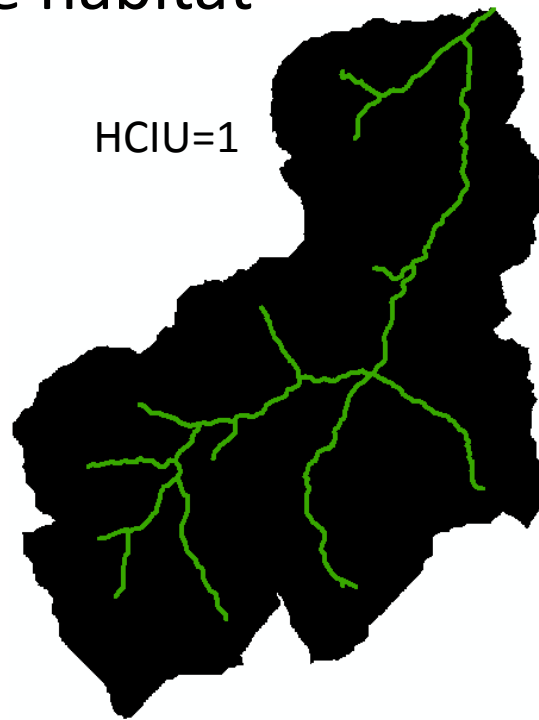
Introduction

- Spatial connectivity:
 - Ability to travel from point A to point B

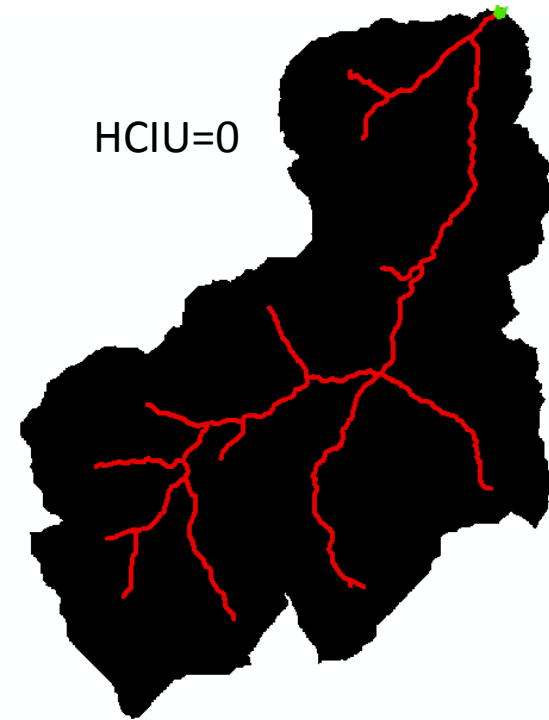


Introduction

- Habitat Connectivity Index for Upstream passability (HCIU, McKay et al., 2013)
- Global index for connectivity and a measure for upstream available habitat



versus



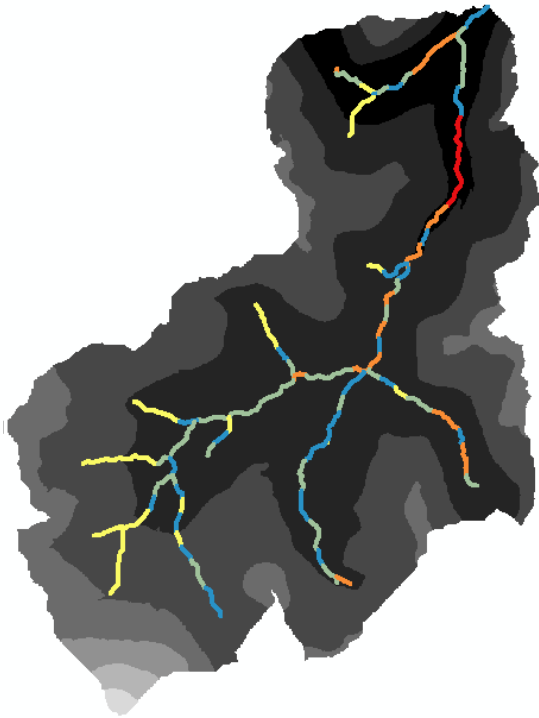
Research Questions

- How is upstream connectivity affected by hydropower constructions?
- How do hydropower constructions influence sustainability of salmonid habitat?
- Do we have tools for site selection to optimise hydropower generation and habitat maintenance?

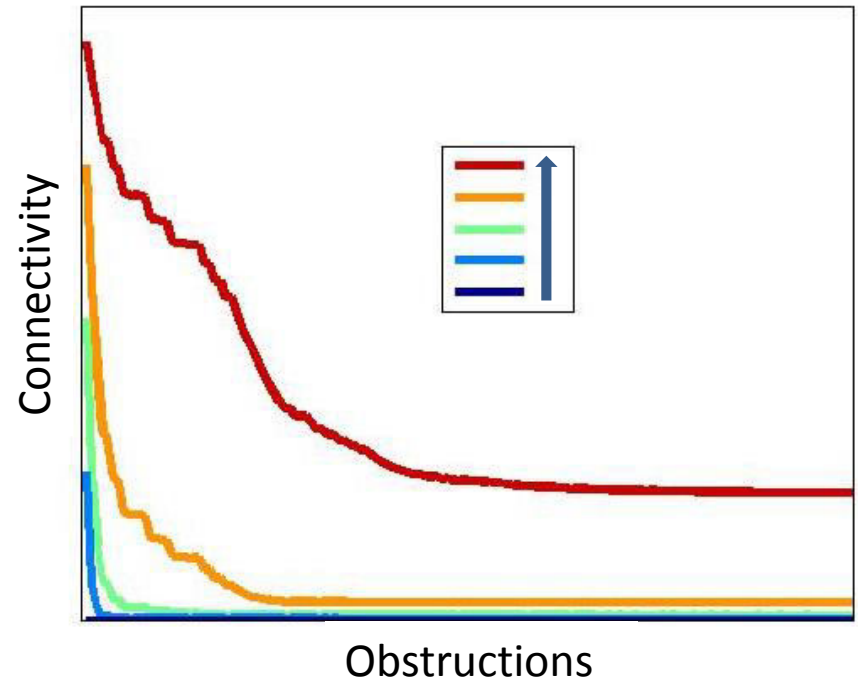
Methods

- Theoretical study of a typical Scottish upland river
- Use GIS based classification scheme to understand connectivity

Reach classification (S. Addy, *PhD thesis*)



Impact of obstructions on river connectivity for different scenarios

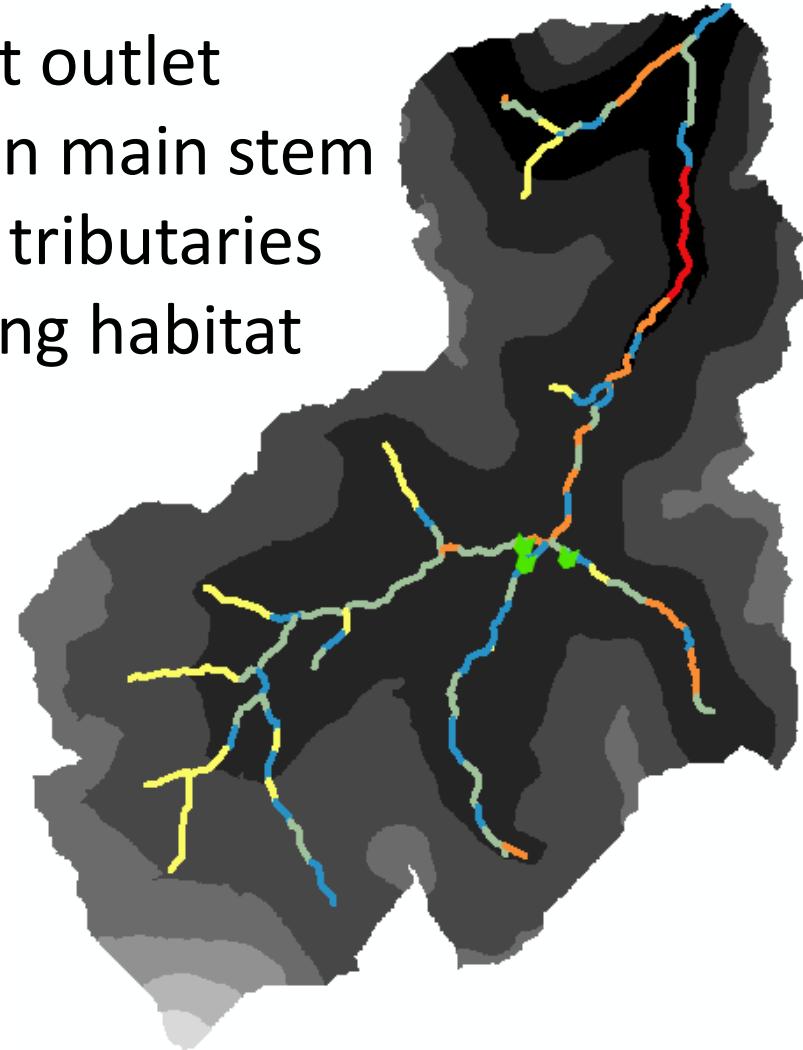
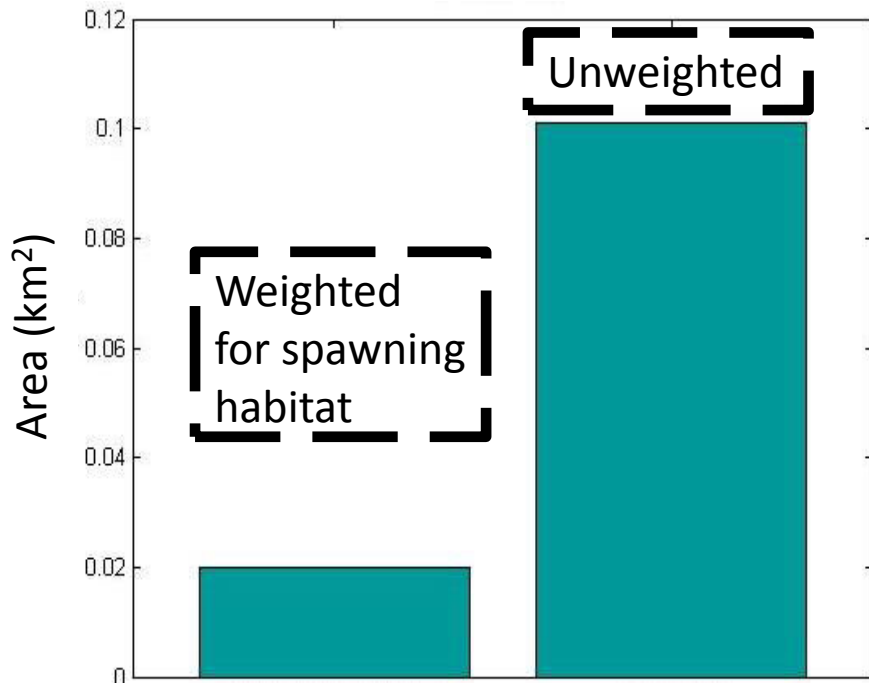


Methods

Three impact scenarios versus natural situation:

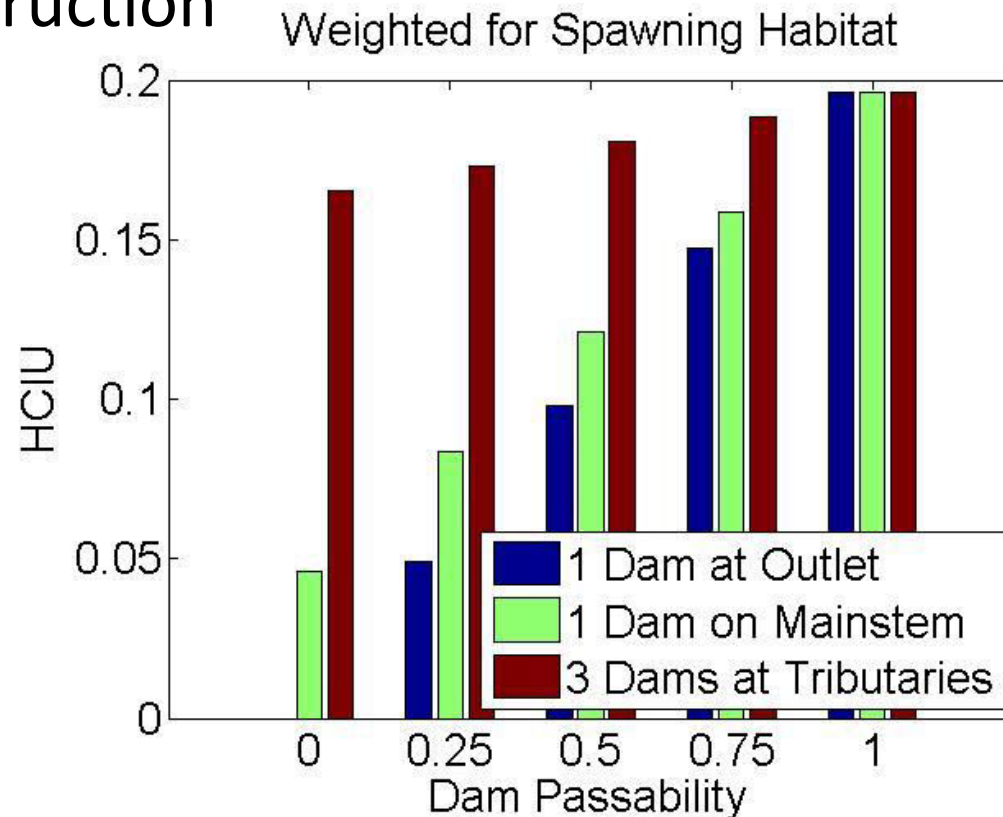
1. One hydropower construction at outlet
2. One hydropower construction on main stem
3. 3 Hydropower constructions on tributaries

Apply a weighting factor for spawning habitat



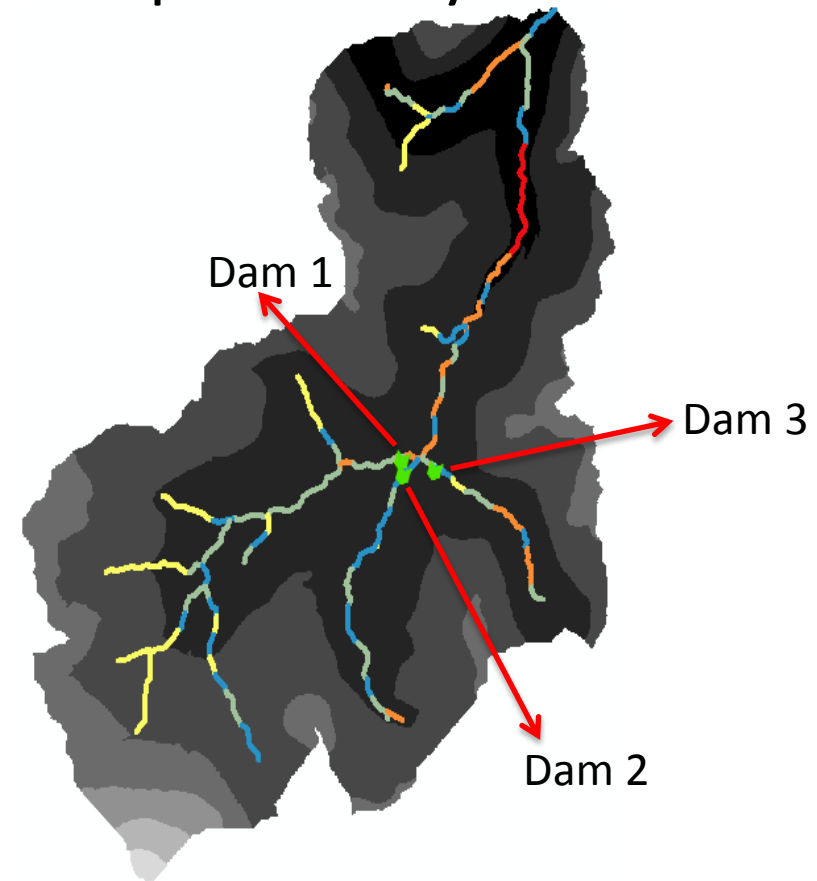
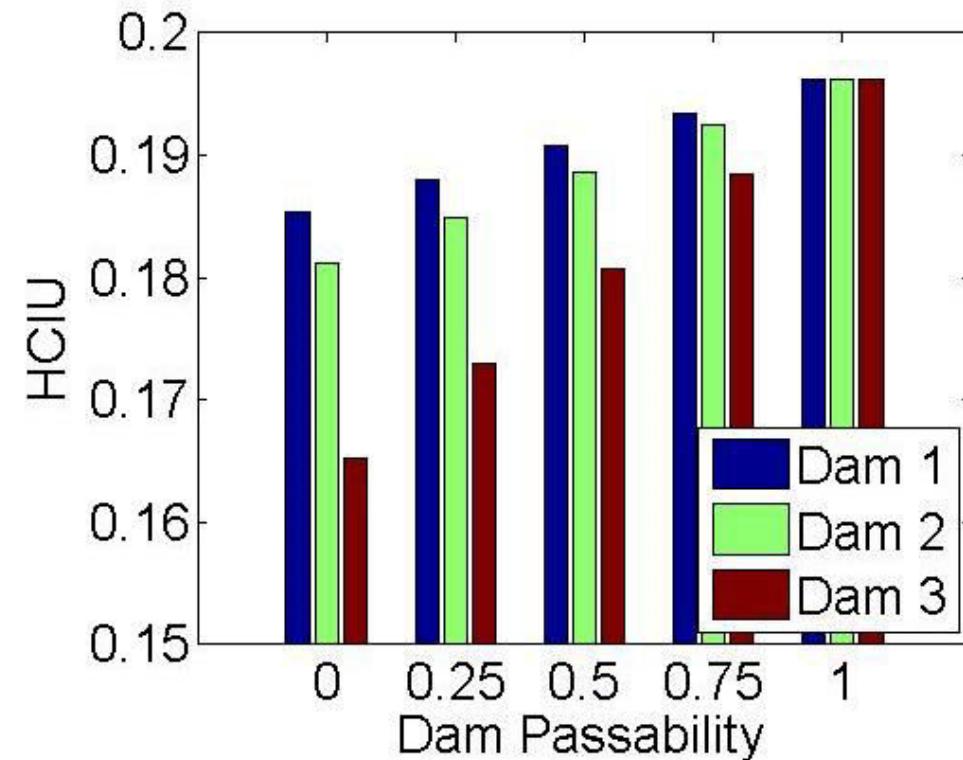
Results

- Impact on connectivity depends on location
- In this situation multiple smaller hydropower constructions may potentially have a lower impact than a single larger hydropower construction



Results

- There is a clear relationship between habitat and connectivity
- Losing less but more suitable habitat potentially has a disproportionately large impact



Further work

- No hydrological/hydraulic/biological data
- In-stream spatial distribution of habitat types may have different relationships with connectivity (Kim and Lapointe, 2011), as well as discharge
- Currently only small scale has been considered, trends may differ at larger scales (Mahlum et al., 2014)
- Apply and ground-truth approach in the larger Lyon and Tay catchments

Summary and take-home messages

- Preliminary results show that, in the case of weighting for spawning habitat:
 1. Location, number and size of hydropower construction(s) is important
 2. Multiple small hydropower constructions could potentially have a lower impact than a single large construction
 3. There may be different implications for different habitat types
- A better understanding of impacts on connectivity can help to inform sustainable management of hydroschemes

Thanks

Questions?

