



Dealing with river fragmentation in the UK

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River fragmentation

- Physical barriers increasingly recognised as major factors influencing migrations, population structures, spawning success and recruitment of freshwater organisms



Weirs (River Wharfe)
(source: HIFI)



Tidal barrages (River Idle)
(source: HIFI)



Sluices (River Trent)
(source: Trent Rivers Trust)

Situation in the UK

- EA “National Obstructions Database” lists >26,000 potential fish-migration barriers
- Information on 105 variables



Pumping stations
(Pauper's Drain) (source: HIFI)

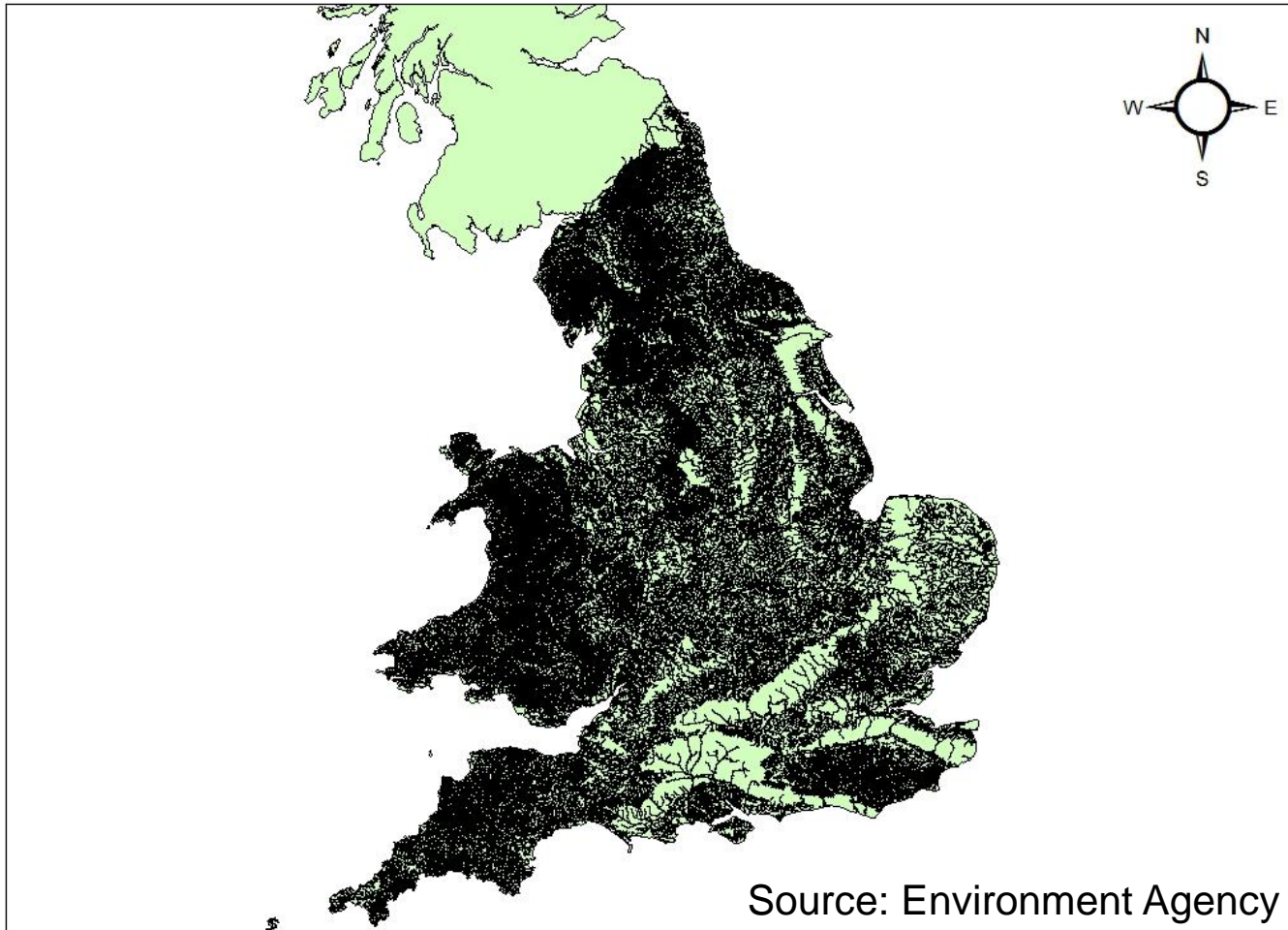


Lock gates (Stainforth & Keadby Canal) (source: HIFI)

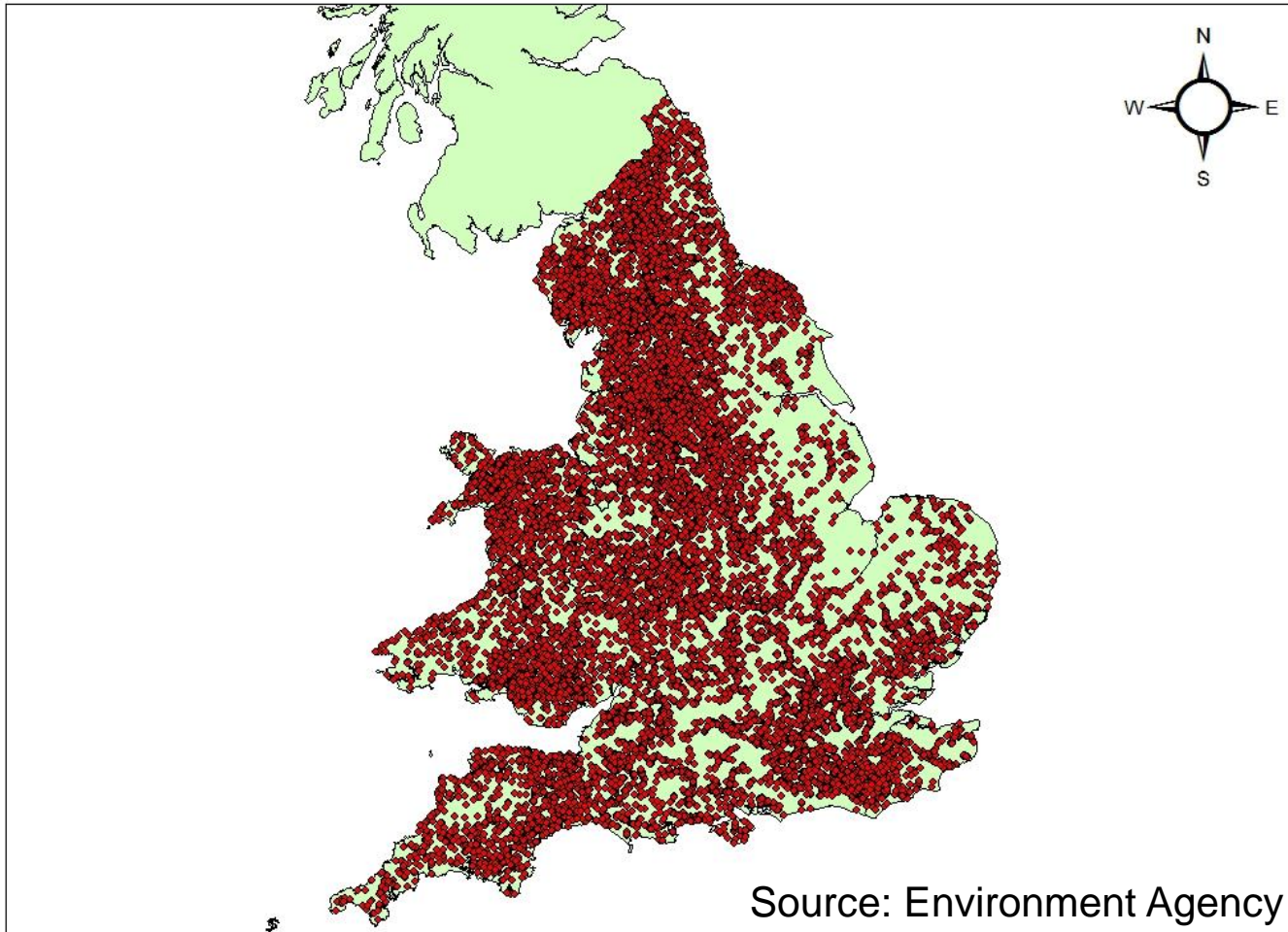


Pointing doors (Tetney Haven) (source: HIFI)

Situation in the UK



Situation in the UK



Situation in the UK

- Numerous barriers, limited resources
- EA “National Fish Pass Prioritisation Tool”
- SEPA and RFT prioritisation tool
- Local and national projects



Small weirs (River Foulness) (source: HIFI)



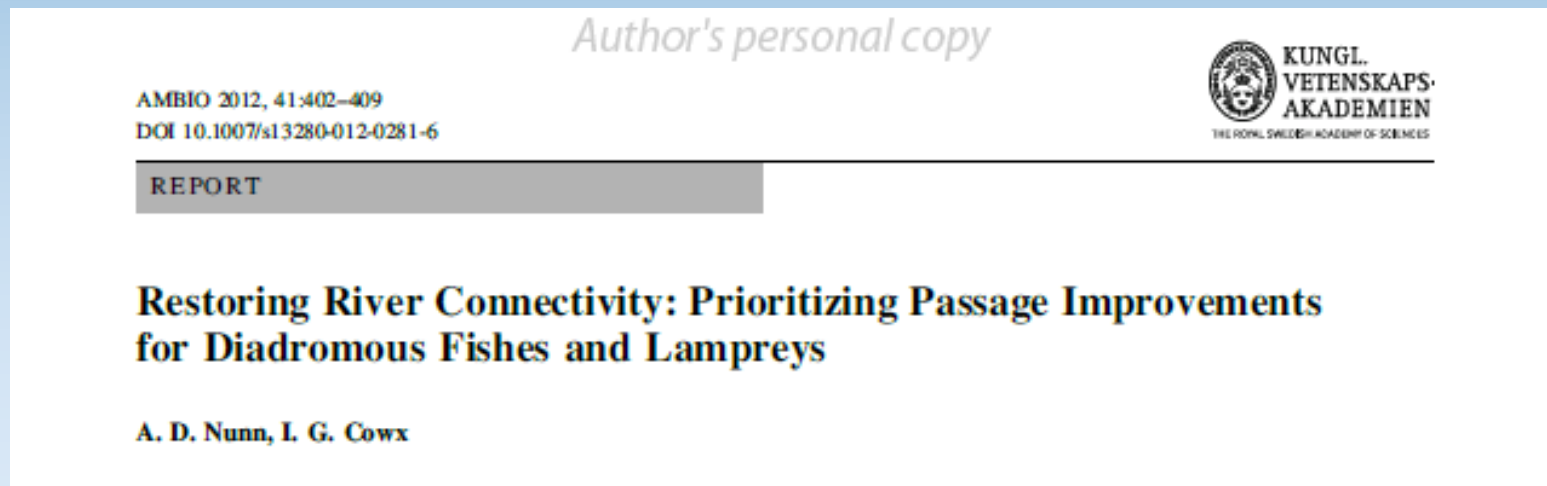
Moderate weirs (River Nidd) (source: HIFI)



Big weirs! (River Dearne) (source: HIFI)

Prioritising barriers

- Hull International Fisheries Institute (HIFI) developed simple method of rapidly assessing and prioritising barriers to migrations of diadromous fishes and lampreys for passage improvements



Prioritising barriers

- Developed using five parameters:
 - fish stock status
 - passage efficiency of fishes at individual structures
 - distance from tidal limit and passability of downstream barriers
 - quantity of habitat upstream of each structure
 - quality of habitat upstream of each structure

Prioritising barriers

- Output is the “Barrier score” (B):

$$B = F \times P \times A \times H_{qn} \times H_{ql}$$

where F is “Fish stock status”, P is “Passage efficiency”, A is “Likelihood of access”, H_{qn} is “Habitat quantity” and H_{ql} is “Habitat quality”. B ranges from 1 ($1 \times 1 \times 1 \times 1 \times 1$) to 3125 ($5 \times 5 \times 5 \times 5 \times 5$)

- Structures ranked according to B
- Barriers ranked as highest priority characterised by poor fish stocks upstream, low passage efficiency, easy passage from downstream, and large quantity and high quality of habitat upstream

Prioritising barriers

- 'Likelihood of access' accounts for passage efficiency downstream
- Possible to adjust class boundaries
- Applicable when multiple target species or river basins
- Can use expert judgement if no empirical data available
- Could adapt for potamodromous species
- Barriers ranked as highest priority not necessarily the most significant migration barriers

Prioritising barriers

Humber eel management issues: barriers and stocking

FINAL REPORT

A. D. Nunn, J. P. Harvey, R. A. A. Noble & I. G. Cowx

Identifying fish-passage solutions at tidal outfall structures

FINAL REPORT

A. D. Nunn, R. A. A. Noble & I. G. Cowx



Eel Management – the State of the Art

Prioritising eel-migration barriers for passage improvements

A.D. Nunn, J.P. Harvey, R.A.A. Noble and I.G. Cowx

River Trent – feasibility study into improving river connectivity through flap-gates

FINAL REPORT

A. D. Nunn, R. A. A. Noble, J. P. Harvey & I. G. Cowx

River Derwent barriers fish passage study: parts 1-3*

DRAFT REPORT

A. D. Nunn, M. A. Smith & I. G. Cowx

Weirs

- Barriers to fish migration into tributaries of Humber Estuary assessed and prioritised
- 67 barriers assessed, **11 identified as high priority for installation of eel passes**



Small weirs (River Foulness) (source: HIFI)

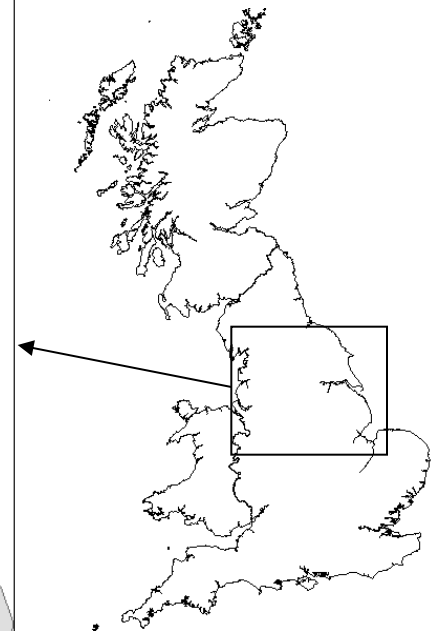
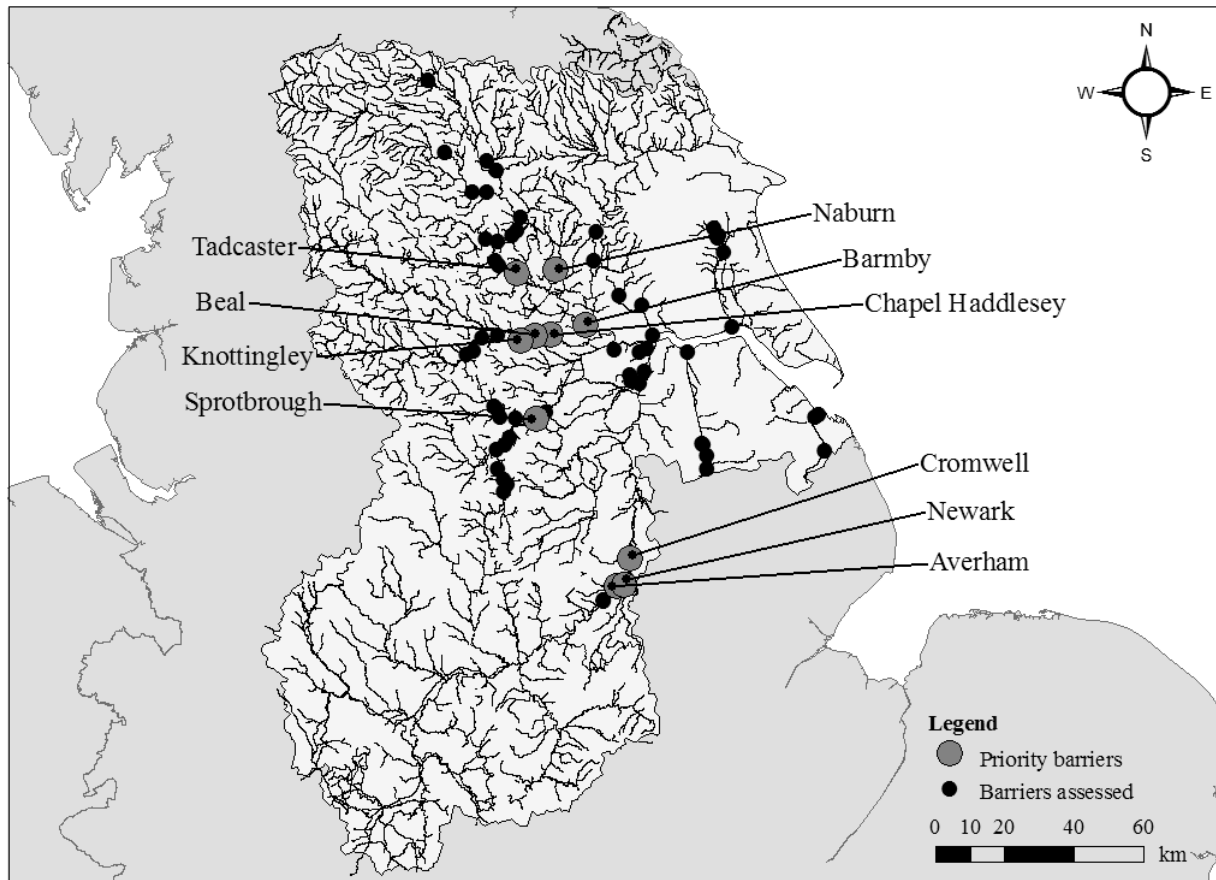


Moderate weirs (River Nidd) (source: HIFI)



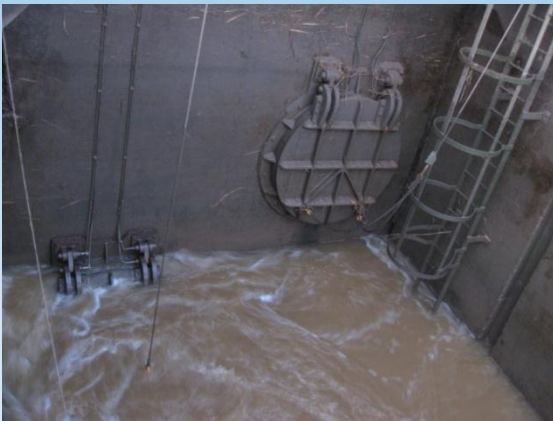
Big weirs! (River Dearne) (source: HIFI)

Weirs

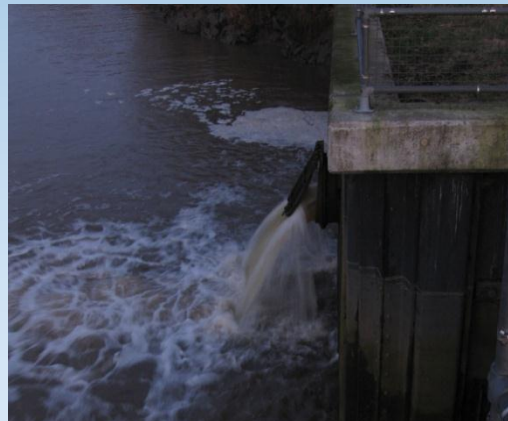


Flap-gates

- Barriers to fish migration into tributaries of tidal River Trent assessed and prioritised
- 129 barriers assessed, **eight prioritised for retrofitting 'fish-friendly' flap-gates**



Adlingfleet Drain (source: HIFI)

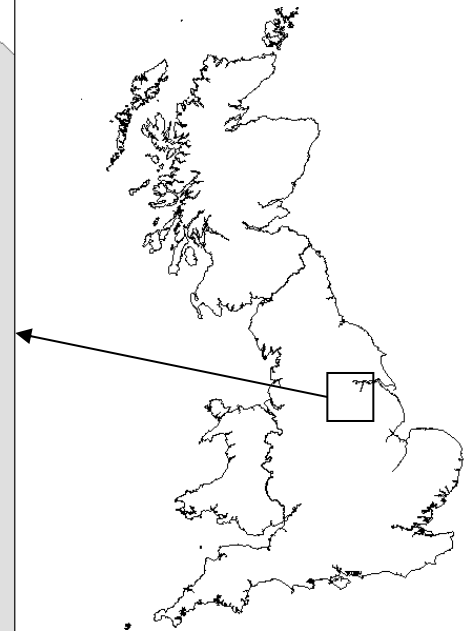
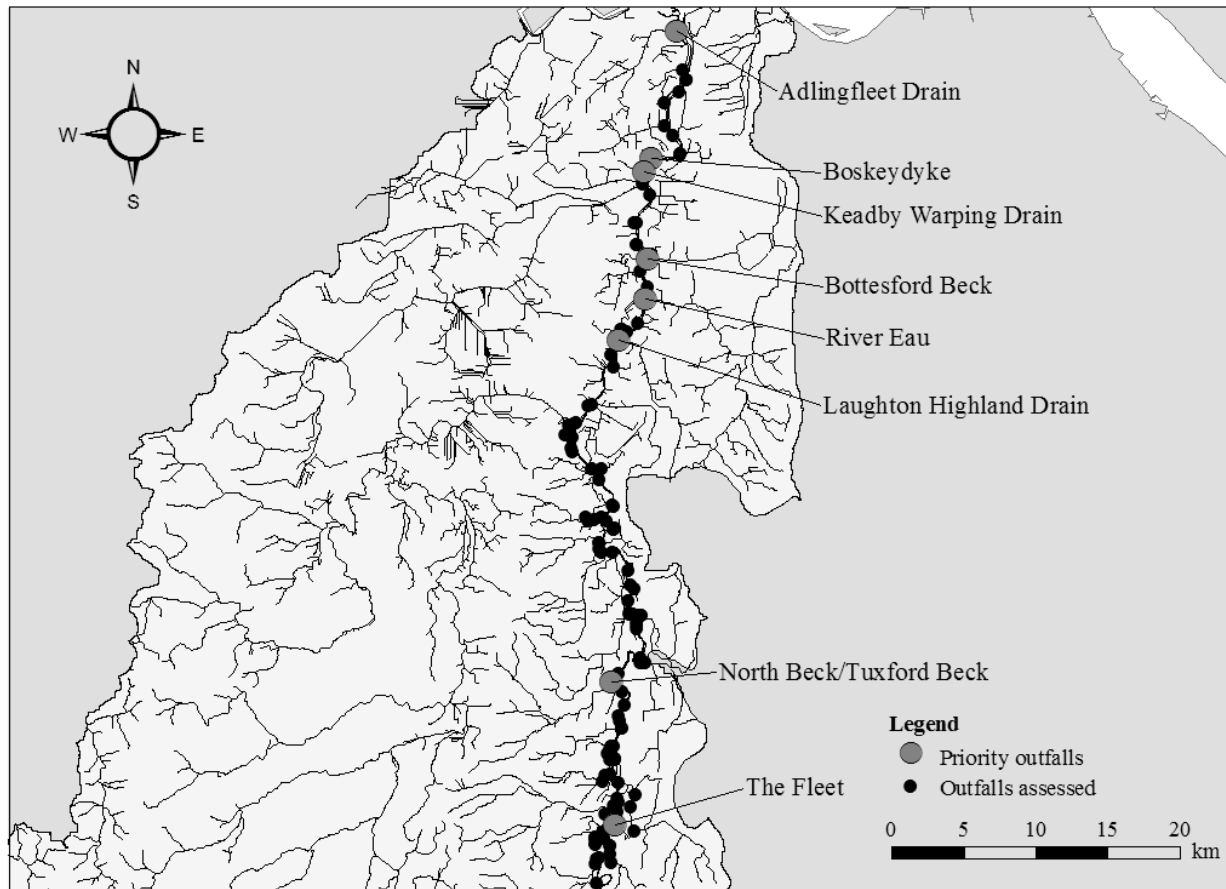


Jenny Hurn Drain
(source: HIFI)



Bottesford Beck (source: HIFI)

Flap-gates



Tidal sluices

- Barriers at tidal limit to fish migration into watercourses in England and Wales assessed and prioritised
- 1048 barriers assessed, **20 prioritised for passage improvements**



River Welland (source: HIFI)

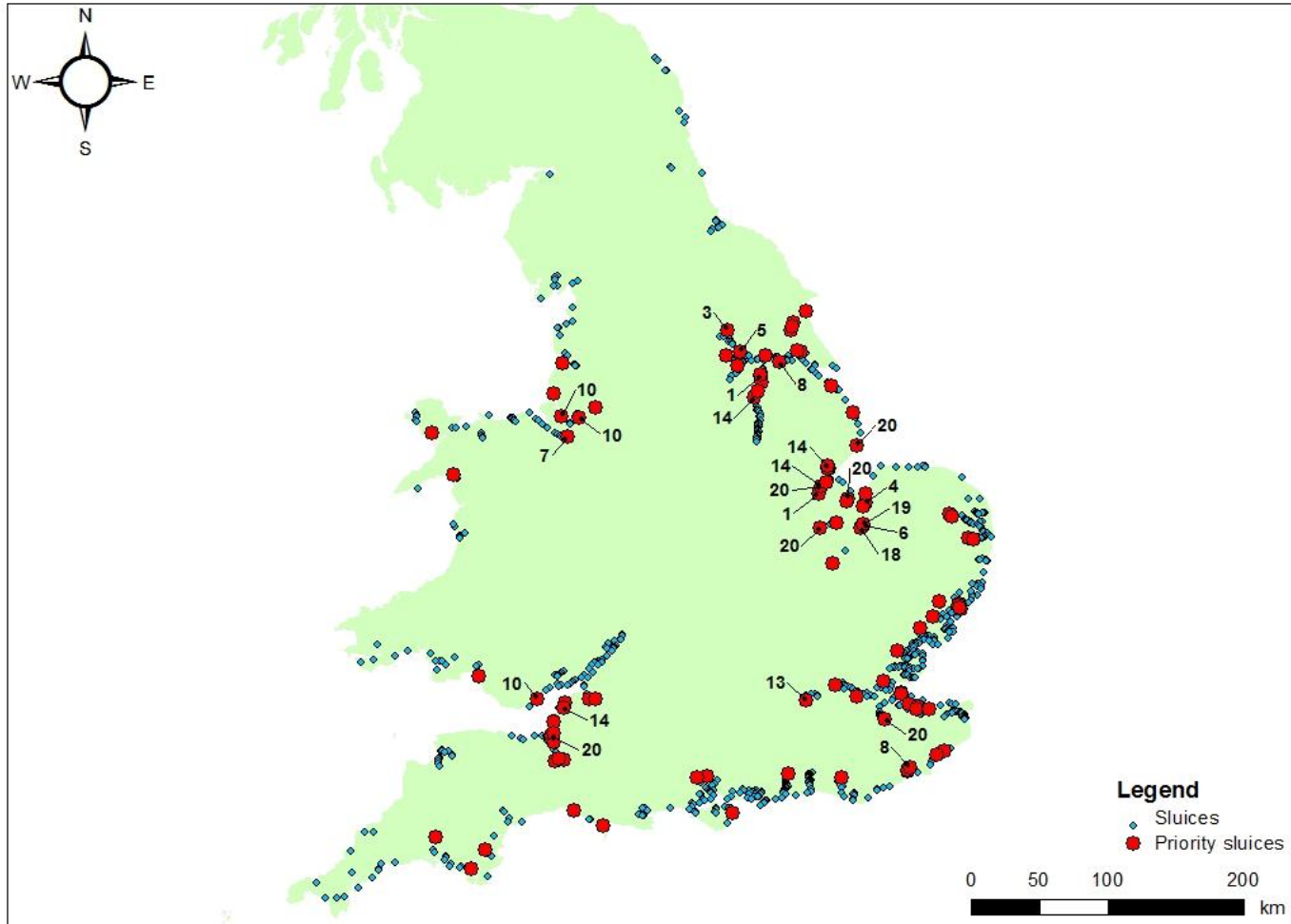


River Great Ouse
(source: HIFI)



River Nene (source: HIFI)

Tidal sluices



Options to improve passage



Barrier removal! (River Nidd)
(source: Environment Agency)



Fish passes (River Ure)
(source: HIFI)



Moveable weirs (River Rother)
(source: HIFI)



Elver passes (River Foulness)
(source: Environment Agency)



Rock chutes (River Rother)
(source: HIFI)



'Fish-friendly' flap-gates
(source: Stoneman's Engineering)

Situation in the UK

- EA/NRW – statutory responsibility for approving passes for migratory salmonids and eel (Salmon & Freshwater Fisheries Act 1975, Eels Regulations 2009)



Sea trout (River Esk)
(source: HIFI)



Salmon (River Ure)
(source: HIFI)



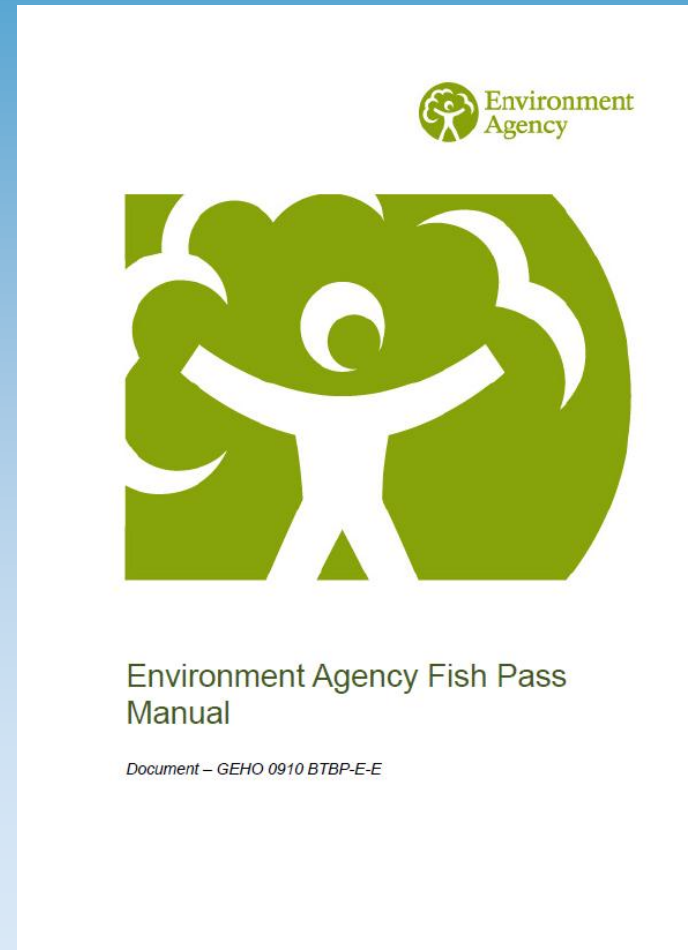
Eel (River Usk) (source: HIFI)

Situation in the UK

- Conservation duties (Environment Act 1995), responsibilities as developers (EC Directive 85/337)
- Consent under Land Drainage Act 1991 or Water Resources Act 1991
- Impoundment licence may be required (Water Resources Act)
- Planning permission may be required (Town & Country Planning Act 1990)

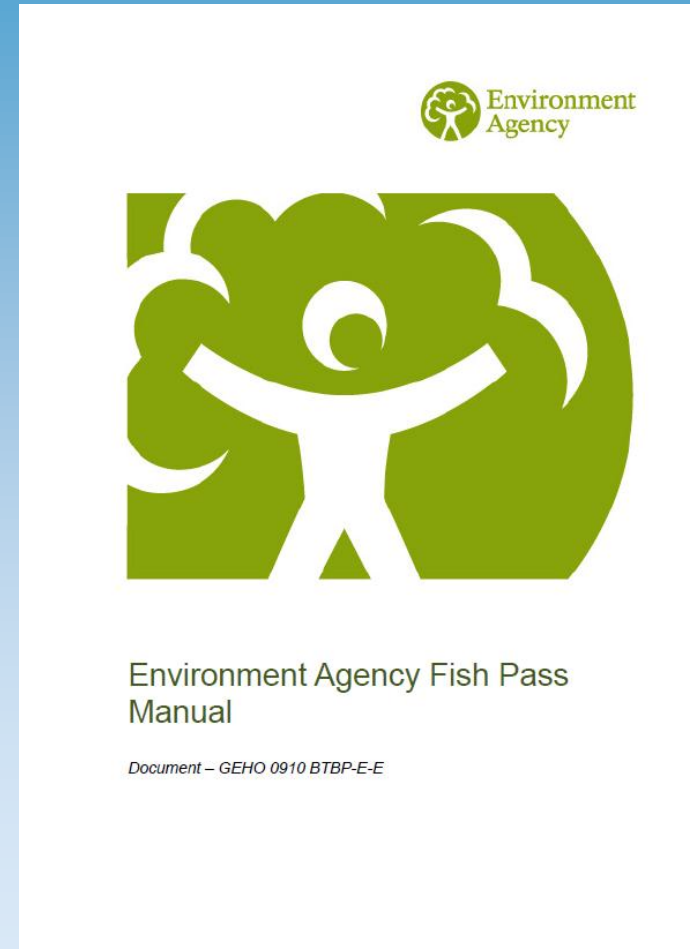
Situation in the UK

- Currently no central system or protocol for monitoring fish passes in UK
- “Environment Agency Fish Pass Manual: Guidance Notes on the Legislation, Selection and Approval of Fish Passes in England and Wales”



Situation in the UK

- Information to develop or audit proposals
- Statutory processes and requirements
- Assessing fish-passage requirements
- Pass types, evaluating performance, maintenance, operational changes



Situation in the UK

- Few data and highly variable efficiency
- Difficulty comparing performance of designs
- Inefficient use of tagging funding
- Standard definitions and experimental design



Fish passes (River Ure)
(source: HIFI)



Monitoring (Ewden Beck)
(source: HIFI)



Fish tagging (River Aire)
(source: HIFI)

Situation in the UK

- Developing European (CEN) standard for fish-pass monitoring: best practice for different methods and species
 - Definitions
 - Methods
 - Array/antennae positions
 - Capture, handling, tagging and release of fish
 - Timing/duration of investigations
 - Control/baseline studies
 - Sample sizes, statistics, data interpretation
 - Supplementary data

Conclusions

- Physical barriers recognised as major issue
- National Obstructions Database essential
- Need to prioritise barriers for passage improvements
- Pre- and post-rehabilitation monitoring required
- No central system or protocol for monitoring fish passes in UK
- Develop European (CEN) standard for fish-pass monitoring

**Thank you for your
attention!**