UK CLIMATE RISK

FRESHWATER HABITATS BRIEFING

Findings from the third UK Climate Change Risk Assessment (CCRA3) Evidence Report 2021

FRESHWATER HABITATS

This briefing summarises how freshwater habitats have been assessed in the latest UK Climate Change Risk Assessment (CCRA) Technical Report, and what types of action to adapt to climate change risks and opportunities would be beneficial in the next five years.

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The full assessment looks at risks and opportunities for the UK under two climate change scenarios, corresponding to approximately a 2°C or a 4°C rise in global temperature by 2100. It answers three questions, for 61 different risks or opportunities using available published evidence and analysis:

1. What is the current and future level of risk or opportunity?

2. Is the risk or opportunity being managed, taking account of government action and other adaptation?

3. Are there benefits of further adaptation action in the next five years, over and above what is already planned?

The main findings from the full assessment related to freshwater habitats are summarised below, together with the adaptation actions that would be beneficial over the next five years. Each risk or opportunity has an identifier code linked to the full analysis, which is available in the CCRA3 Technical Report.

Readers are encouraged to use these briefings to locate the parts of the Technical Report of most relevance to them.

Alternatively, if you would like a summary of the analysis by UK nation, please go to the national summary documents:

• **England** • **Northern Ireland** • **Scotland** • **Wales**

This briefing is aimed primarily at the UK Government, the governments of Scotland and Wales, the Northern Ireland Assembly and their respective departments and agencies responsible for freshwater habitats. However, it should also be of interest to a wider audience.

Key messages

- Higher water temperatures, reduced water availability and changing river flows due to drier summers and wetter winters, could increase the degradation of freshwater habitats, and compromise the viability of some freshwater species.
- The negative consequences on native freshwater species from a greater number of pests, pathogens and invasive non-native species (INNS) on native UK freshwater species could increase, in large part due to warmer, wetter winters.
- There may be opportunities from the arrival of other new species through enhanced biodiversity, although evidence on this is limited at present.

Risks, opportunities, and benefits of further action

More action needed

Further investigation

Sustain current action

Maintain a watching brief

Average UK wide scores

N11. Risks to freshwater species and habitats from changing climatic conditions and extreme events, including higher water temperatures, flooding, water scarcity and phenological shifts

N12. Risks to freshwater species and habitats from pests, pathogens and invasive species

N13. Opportunities to freshwater species and habitats from new species colonisations

1. Risks to freshwater species and habitats from changing climatic conditions (N11)

Freshwater habitats and species are particularly vulnerable to reduced water availability and higher water temperatures due to climate change.

These risks could lead to aquatic species exceeding their thermal tolerance or causing detrimental habitat changes, which can cause loss of sensitive species, and changes in phenology and species composition.

For example, rising water temperatures in Windermere, England's largest lake, are associated with a shift towards earlier perch spawning. However, changes in perch spawning have not kept pace with similar shifts in seasonal plankton food resources, with detectable effects on fish development.

Droughts have also had notable impacts on UK chalk streams, including reductions in invertebrate abundance and species turnover in plant communities, which transitioned from non-aquatic to wetland and classic aquatic plants as flows resumed.

Higher temperatures can also directly or indirectly increase the possibility of water quality problems, for example through reduced oxygen levels, increasing the rates of biological and chemical processes, especially algal growth rates and nutrients. Impacts on water quality and algal bloom growth can also be caused by, for example, the heating of water for power station cooling, although recent research suggests this impact could be minimal.

The magnitude of current and future risks to freshwater habitats and species is judged to be medium by the 2050s across the UK. This increases to high magnitude for the 2080s under a 4°C warming scenario.

Beneficial actions in the next five years include:

- **A clear mechanism that accounts for the consequences of higher water temperatures and drying up of water bodies in meeting Water Framework Directive targets.**
- **Investigation into and development of a framework that measures the scale and effectiveness of climate impacts on freshwater ecosystems under different warming levels.**
- **Continued development of adaptation measures that enhance habitat and ecological resilience, such as weir removal and assisted natural recovery.**
- **The forthcoming replacement of policies to support landowners to provide public goods from their land could include specific measures to protect and adapt freshwater habitats and species. To be effective these supporting arrangements need to factor in climate change adaptation directly.**

Further details on this risk: Natural Environment and Assets Technical Chapter, risk N11

2. Risks to freshwater species and habitats from pests, pathogens, INNS (N12)

New and emerging pests, pathogens and invasive species have been identified as important risks due to their negative impact on biodiversity.

While climate change is just one factor affecting the arrival and possibly establishment of INNS, it is possible that some currently non-invasive, non-native species in the UK could become invasive with climate change.

Impacts on freshwater ecosystems from climate change include changes in the distribution and spread of various diseases and INNS, changes in the rate at which invaders competitively displace native species, and greater competition for food with native species. There is also increasing evidence to show how climate change could affect freshwater species and there are indications that the number of INNS is likely to increase in future.

Over 130 INNS are currently present in freshwater in the UK, including topmouth gudgeon, water primrose, variable-leaved watermilfoil, ruddy duck, American bullfrog and floating pennywort. The current and future risk is assessed as medium for Northern Ireland, Scotland and Wales, and high for England, due to the greater likely increase in the number of pests, pathogens and INNS.

Beneficial actions in the next five years include:

- **The costs of dealing with established pests, pathogens and INNS are considerably higher than the costs of biosecurity measures to prevent them becoming established, so continued action in prevention, monitoring, surveillance and early response is required.**
- **Other possible adaptation options include enhancing biosecurity measures, monitoring and enforcing of legislation, banning or restricting the possession, sale and release of other species, support for further research aimed at developing effective eradication methods, and contingency planning and rapid response for early invasion.**
- **In isolated cases, there could be a case for moving vulnerable species away from areas where INNS are present. The creation of isolated sanctuaries or 'ark sites' have been accepted for the white-clawed crayfish, which is under threat from introduced crayfish.**

Further details on this risk: Natural Environment and Assets Technical Chapter, risk N12

Later this century more of the rain in summer will come from **short lived high intensity showers.**

3. Opportunities to freshwater species and habitats from new species colonisations (N13)

The arrival of new species in the UK as the climate changes has the potential to enhance species richness and contribute to community adaptation to climate change.

Examples include crustaceans arriving from south-east Europe that serve as prey for fish and mussels and provide habitat to other species.

Some freshwater species that are already present in the UK could also benefit, for example fish such as bream, pike and perch, which tolerate a range of temperatures and seem to be responding positively to warming.

The expansion of native species ranges toward the poles may also bring similar benefits. However, the opportunities from climate change are assessed as low, both currently and in the future, as there is low evidence of these opportunities to date and climate change is likely to a play smaller part in the benefits of colonisation compared to other factors.

Beneficial actions in the next five years include:

- **Many of the adaptation actions that are taken to combat the risk to freshwater species (see risk N11) will facilitate species realising any opportunities associated with climate change.**
- **Additional consideration of actions to encourage the survival and population growth of arriving new or iconic species could present further opportunities.**

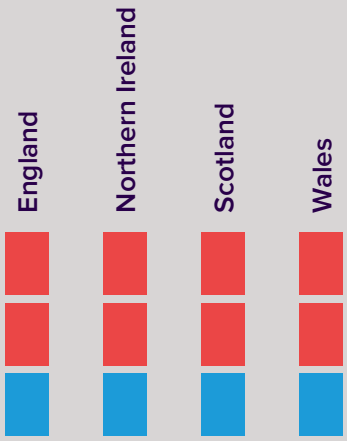
Further details on this opportunity: Natural Environment and Assets Technical Chapter, opportunity N13

The chance of **extreme maximum daily temperatures** will increase.

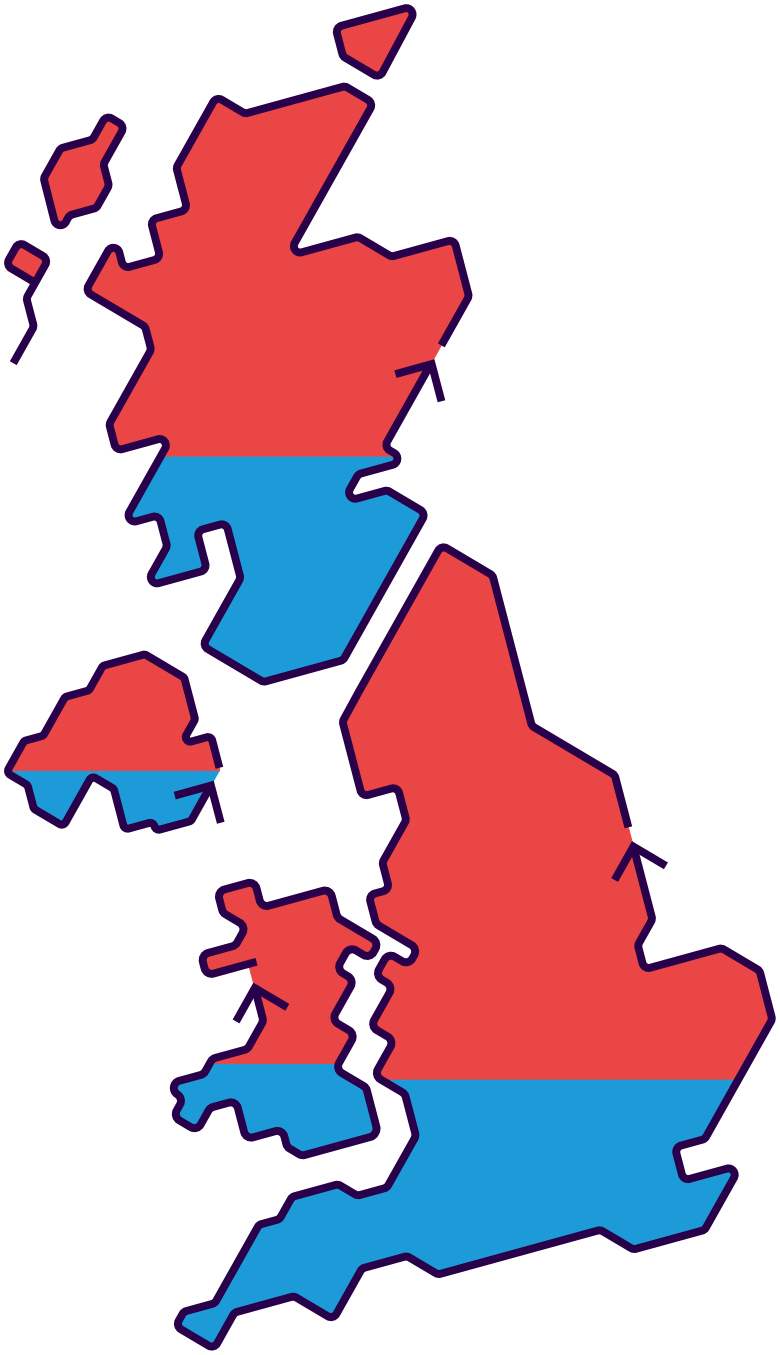
Variations across the UK

Key

- More action needed
- Further investigation
- Sustain current action
- Maintain a watching brief



Risk or opportunity	England	Northern Ireland	Scotland	Wales
Risks to freshwater species and habitats from changing climatic conditions and extreme events, including higher water temperatures, flooding, water scarcity and phenological shifts **(N11)**	●	●	●	●
Risks to freshwater species and habitats from pests, pathogens and invasive species **(N12)**	●	●	●	●
Opportunities to freshwater species and habitats from new species colonisations **(N13)**	●	●	●	●



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Background

The UK Government is required by the UK Climate Change Act 2008 to assess the risks and opportunities from climate change to the UK every five years and respond to the risks via a National Adaptation Programme, covering England. The devolved administrations also publish their own adaptation programmes in response to the risk assessment.

For this third UK Climate Change Risk Assessment, the Government's independent advisers on climate change, the Climate Change Committee (CCC), have been asked to prepare an independent risk assessment setting out the latest evidence on the risks and opportunities to the UK.

Over 450 people from more than 130 organisations have contributed to preparing the assessment. The risks have been assessed using the latest climate projections for the UK which were updated in 2018 by the Met Office. These briefings summarise some of the key topics that are assessed through the Technical Report, to enable readers to understand the key messages and where to find more detail.

Where to find more detail

Each risk or opportunity in this briefing has an identifier code linked to the full analysis, which is available in the CCRA3 Technical Report. Readers are encouraged to use these briefings to locate the parts of the Technical Report of most relevance to them.

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