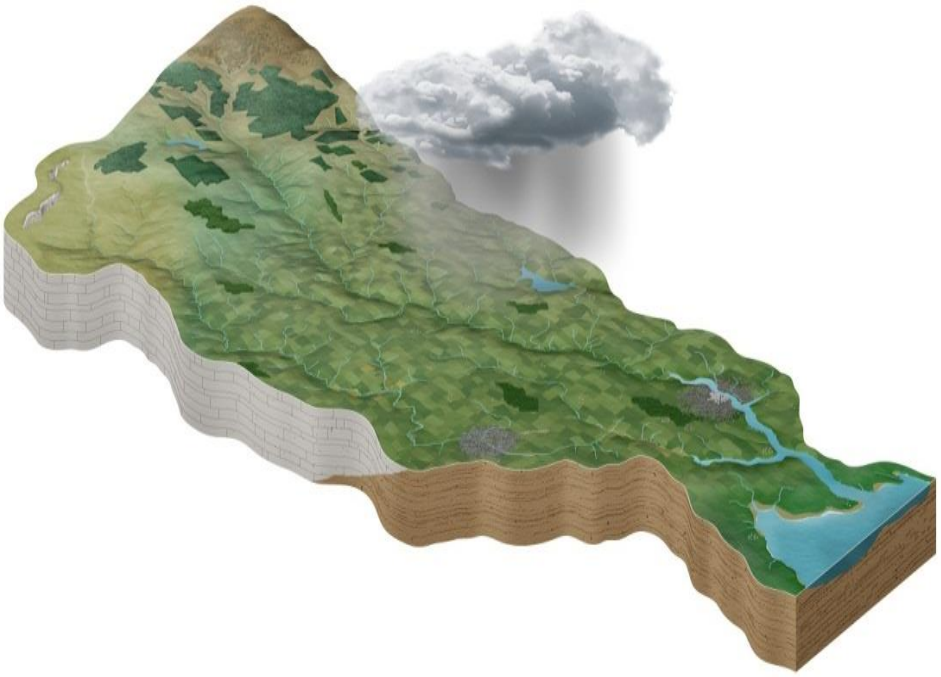
Report series:

Impacts of pressures on water quality

HYDROMORPHOLOGY



Catchment Science & Management Unit

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Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Preface

This document is part of a report series that summarises the evidence on each of the main significant pressures that impact on water quality. The series currently includes reports on the following key pressures:

- Agriculture
- Urban waste water
- Hydromorphology
- Forestry
- Domestic waste water
- Industry
- Drained peat

This report series is complemented by a sister series of 46 catchment reports which describe the water quality, risk, pressures and other relevant data for each waterbody in each catchment. All reports are available on www.catchments.ie.

An online interactive mapping system, where the most up to date data can be viewed, is available at EPA Maps.

Data can be downloaded from the EPA geoportal site at https://gis.epa.ie/GetData.

Impacts of hydromorphology pressures on water quality

What is hydromorphology?

The hydromorphology of a waterbody describes its physical characteristics in terms of the movement of water flows and levels ('hydro'), and the structure and form of the bed, banks and riparian zones and how they function within the surrounding landscape ('morphology'). Good hydromorphological conditions are required to create and maintain diverse aquatic habitat for invertebrates, fish and plants, which in turn support healthy aquatic ecosystems and good ecological status.

Hydromorphological condition is assessed in surface water bodies. Human activities that impact on the hydromorphological condition of waters, for example channelisation and straightening of rivers, installation of weirs or other instream barriers, culverting or otherwise installing hard engineering works, and removal of natural features such as sand and gravel banks and riparian vegetation, are known as hydromorphology pressures (Figure 1).

Figure 1: Good hydromorphological condition (left), with a diversity of habitat conditions in the channel and a healthy riparian zone, and unsatisfactory hydromorphological condition (right) where the channel has been straightened and deepened, the riparian vegetation from the banks has been stripped and left bare.

Hydromorphology as a pressure

Changes to the hydromorphology ranks as the second most significant pressure in surface water bodies. Activities that impact on the hydromorphological condition have been identified as significant pressures in just under one-third of all river waterbodies considered '*At Risk*' of not achieving their environmental objective (Table 1 and Figure 1). This is based on the most recent characterisation assessment using data up to 2021.

Table 1: Number of 'At risk' waterbodies with significant hydromorphology pressures

Waterbody Type	No. Waterbodies	No. At Risk waterbodies	No. Waterbodies with HYMO identified as a significant pressure	% At Risk waterbodies (with HYMO identified as a significant pressure)
River	3192	1337	428	32
Lake	812	142	15	11
Transitional	196	60	5	8
Coastal	112	16	0	0
Groundwater	514	94	0	0
Total	**4826**	**1649**	**448**	**27%**

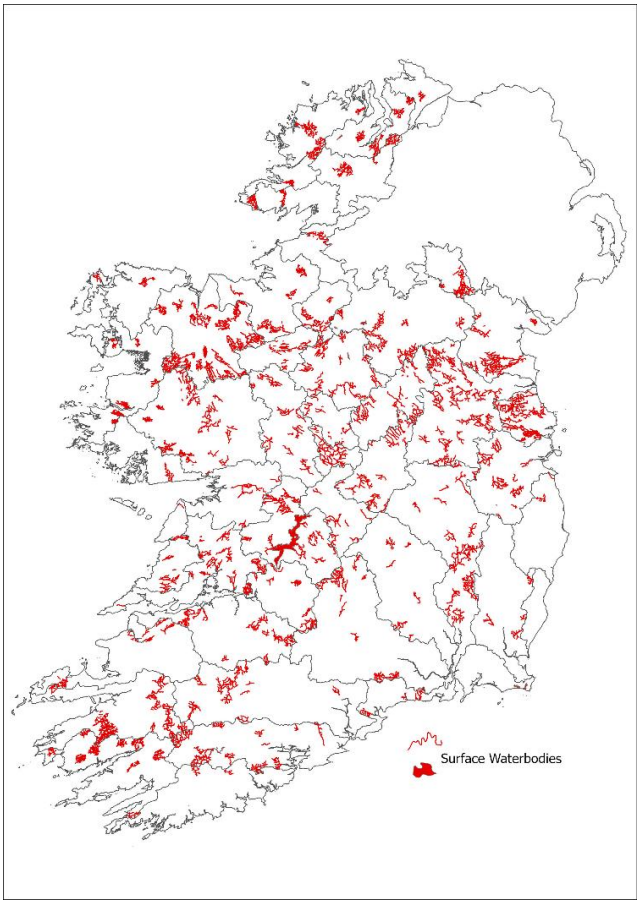

Figure 2: Surface water bodies where activities impacting on the hydromorphological condition are a significant pressure (August 2023).

The different types of hydromorphological pressures identified and their relative importance are presented in Table 2. Channelisation is the dominant hydromorphological pressure type, which includes in-channel works as part of drainage and channel maintenance schemes. This is often associated with land drainage activities where landholders develop in field and field edge drains which are connected to main channels. In-channel structures that block the flow of water and sediment, such as dams, barriers, locks and weirs are also an issue. Activities causing hydromorphological pressures may be carried out for multiple purposes, for example drainage of lands for agriculture, forestry or extraction of peat; water abstractions; flood protection; and development in urban areas.

Table 2: Numbers of waterbodies impacted by different types of hydromorphology pressures. Note there may be more than one hydromorphological pressure type impacting a waterbody.

Hydromorphology pressure type	Rivers	Lake	Transitional	Coastal	Total
Channelisation	286	3	0	0	**289**
Land drainage	70	5	0	0	**75**
Dams, barriers, locks, weirs	54	8	3	0	**65**
Embankments	29	2	2	0	**31**
Riverbank erosion	27	0	0	0	**27**
Overgrazing	14	0	0	0	**14**
Culverts	4	0	0	0	**4**

Impacts of hydromorphology pressures

Hydromorphology pressures alter the natural functioning of a water body such as its ability to move and store water through the system; to generate, move and store sediment; and to create and maintain a variety of features such as pools and riffles in rivers; all of which in turn create diverse habitat. Impacts from in-channel works like dredging, drainage, straightening, widening and deepening rivers alter the natural flow, sediment transport regime and diversity of habitat. Bank erosion can add excess fine sediment and other pollutants to watercourses, while removal of riparian vegetation can reduce shade, increase water temperatures and reduce sources of food for aquatic species. Barriers can not only impede the transport of water and sediment but also impact the movement of fish. These kinds of changes to the habitat conditions can impact on the condition of the invertebrates, plants and fish, which are a fundamental indicator of good ecological status.

Changes in hydromorphology pressures over time

Overall, the number of *At Risk* waterbodies with significant hydromorphology pressures has increased from 342 in 2015 to 448 in 2021 (Figure 3). However, the development of new assessment tools and an improved understanding of hydromorphological pressures over this period is also a contributing factor. The output from these tools were used in the 2021 assessment, alongside biological data, siltation levels and hydromorphological status where available. Additional data such as aerial imagery and local knowledge provided by the LAWPRO, local authorities and Inland Fisheries Ireland were also used.

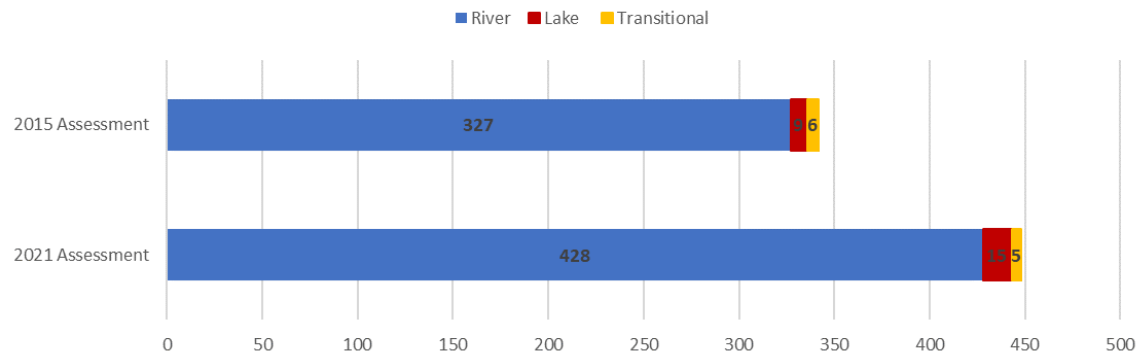

Figure 3: Change in number of waterbodies impacted by hydromorphology pressures between 2015 and 2021 across all surface water body types

What is being done?

Although the 3rd cycle river basin management plan 2018-2021 has been delayed, a number of measures were highlighted in the draft plan or are already being implemented.

It is recognised that there is a need for a comprehensive, integrated, statutory control regime to manage activities impacting on the hydromorphological condition of the water environment, as well as a prioritised programme of restoration for impacted waters. Inland Fisheries Ireland is leading on a major barriers programme to assess and mitigate significant barriers to fish passage, and a roadmap has been developed to improve fish passage in the Lower River Shannon. New legislation was enacted in 2022 to control abstractions and associated impoundments and relevant regulations are being developed.

Further work is needed to try to better understand the relationships between hydromorphology pressures and ecological status, in particular in relation to eflows to support the new abstractions licensing regime. Several EPA funded research projects will have been completed before or during the

third cycle and may inform future hydromorphology policy. These include a project to inform the development of standards for the regulation of activities impacting on hydromorphological condition (HymoGuide); and WaterFutureS which aims to assess hydromorphological and ecological responses to climate, land-use and demographic change, and consider implications for measures under different climate change scenarios.

Where a waterbody's hydromorphological characteristics have been heavily modified by engineering works for the purposes of one or more specified uses in the public interest, the Minister may designate them as heavily modified waterbodies (HMWBs), subject to a number of conditions. The specified uses include power generation, water supply, flood defences, arterial drainage, navigation, and urban environments. A technical review of HMWBs was completed by the EPA in 2022 and is being used by the Department of Housing, Local Government and Heritage (DHLGH) to inform potential future HMWB designations. Once designated, waterbodies must achieve an objective of Good Ecological Potential rather than Good Ecological Status, which recognises the extent of the modification. The methodology to assess the Ecological Potential of waterbodies is under review.

Find out more

Water bodies where hydromorphology pressures are significant can be viewed at www.catchments.ie.

A link to further information on the national Barriers programme which is being led by Inland Fisheries Ireland is available at https://www.fisheriesireland.ie/what-we-do/research/national-barriers-programme

Further information on HMWBs is available at: https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/designation-of-heavily-modified-waterbodies-for-the-third-river-basin-management-plan.php.