

# Catchment management of Irish rivers and the role of hydromorphology

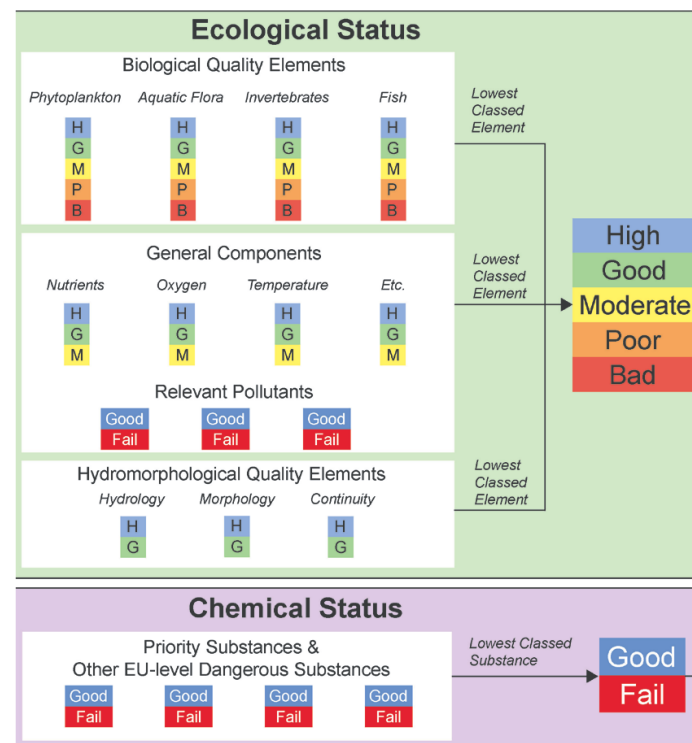
CIEEM Irish Conference 2019: Wading into Water

*28<sup>th</sup> February 2019*

Emma Quinlan  
EPA Catchments Unit

# Water Framework Directive

- Most important piece of water legislation to-date
  - Protect, enhance, restore, prevent deterioration
  - Ensure sustainable use of resources
  - Achieve compliance with the requirements for designated protected areas
- River Basin Planning cycle – every 6 years
- All water bodies to achieve **Good** ecological status by 2015
- Huge investment made but no overall improvement – new approach needed!



# WFD: 1<sup>st</sup> cycle to 2<sup>nd</sup> cycle changes

- 1 national river basin district, 2 international districts
- Plans developed by DHPLG, supported by EPA
- Promoting an Integrated Catchment Management approach
- Focus on public and community engagement and involvement
- EPA Catchments Unit established in 2014
- New governance model for implementation

**Tier 1: Policy & oversight**  
Water Policy Advisory Committee



**Tier 2: Technical  
implementation, networking &  
reporting**  
EPA

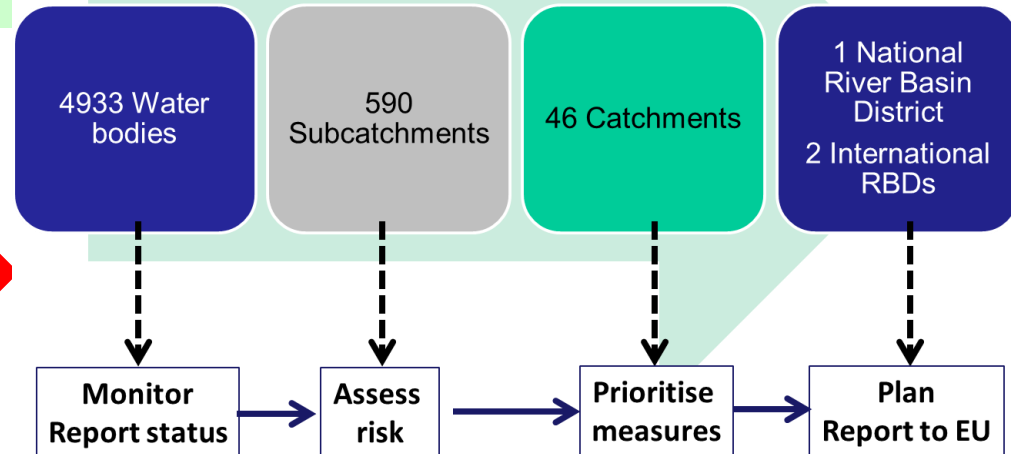
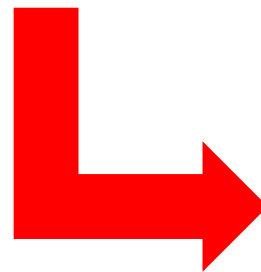
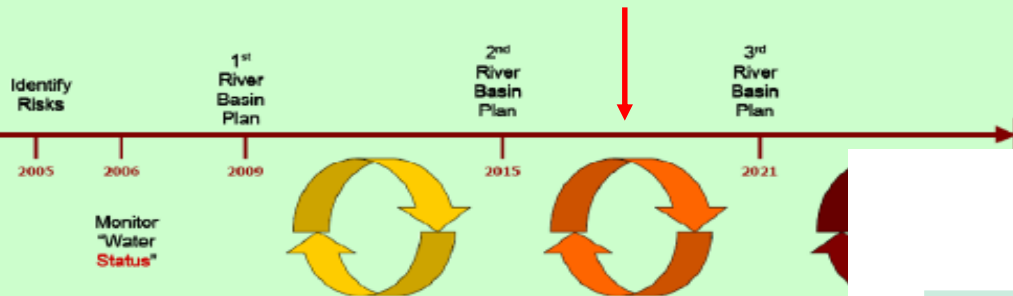


**Tier 3: Public participation &  
regional implementation**  
Local Authority Waters  
Programme, Agricultural  
Sustainability Support and  
Advisory Programme & Local  
Authorities

# Water Framework Directive

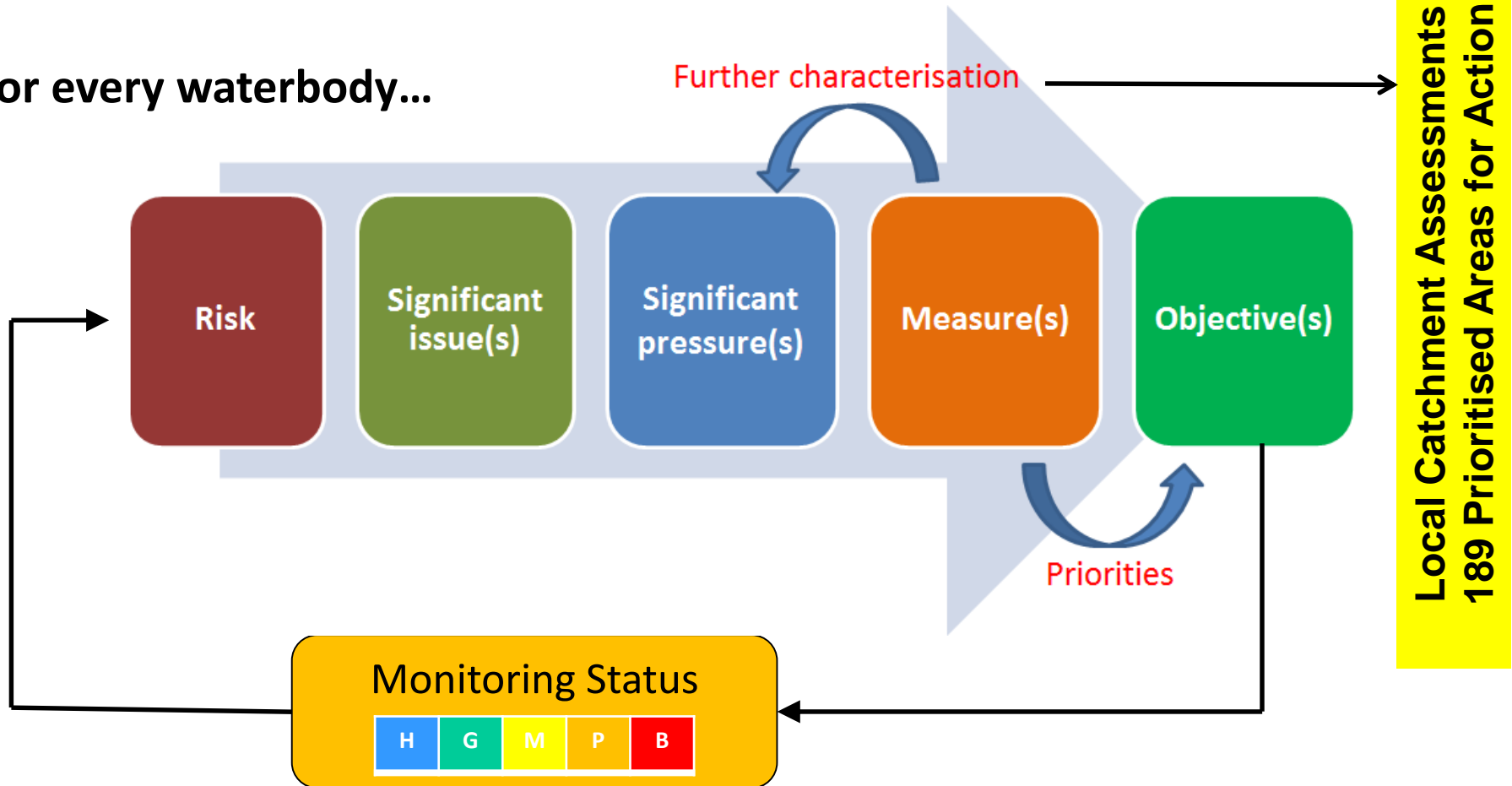
## Water Framework Directive - River Basin Planning Cycles

**River Basin Management Plan (2018-2021) published**



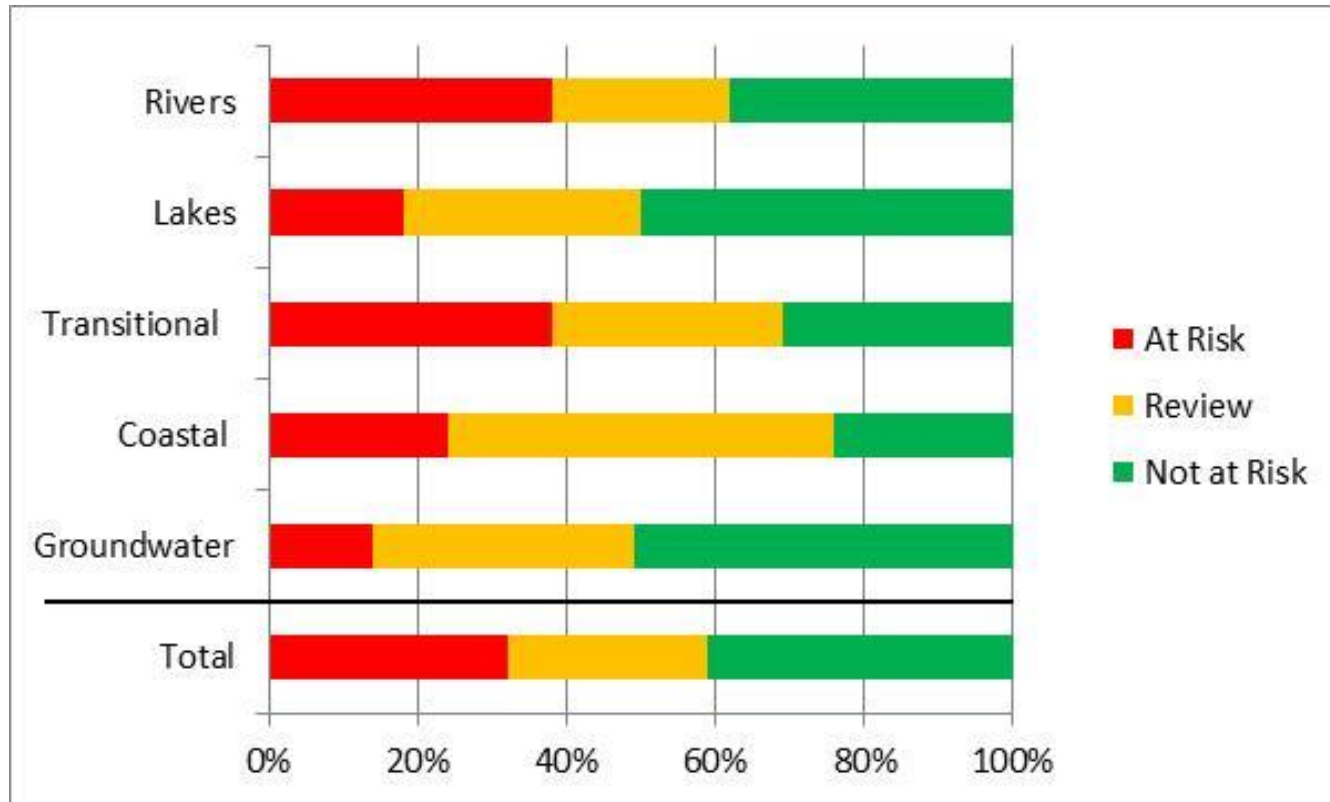
# Characterisation approach - evidence based

For every waterbody...



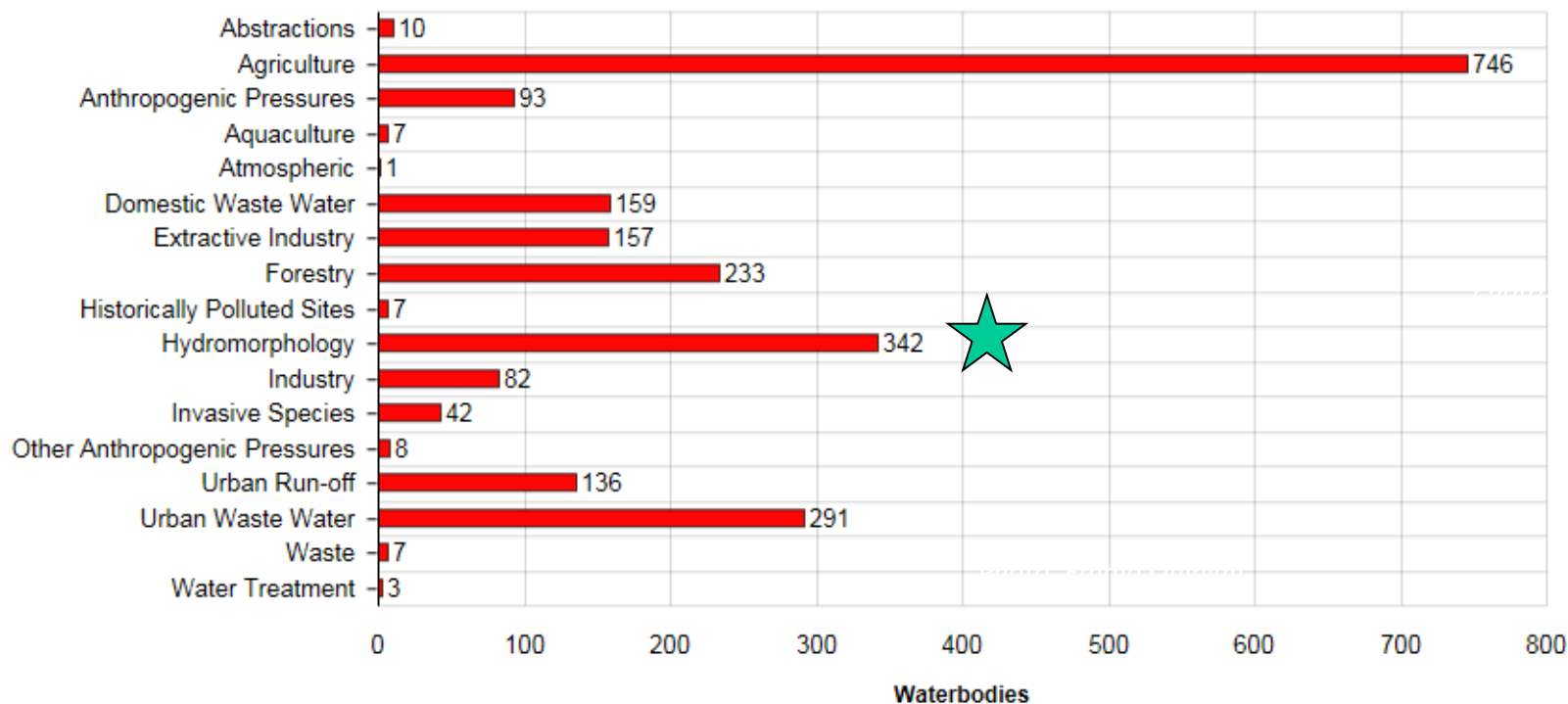
Aiming for *'The right measure in the right place'*

# Risk assessment outcomes



Approximately one third of all waterbodies are **At Risk** of not achieving WFD objectives and need additional action

# Risk assessment outcomes: Significant pressures





# Actions and outcomes

Principal Actions		Expected Outcomes	
1	Existing regulations, which (i) provide for EIA to mitigate the impact of planned land-use changes on waters and (ii) reduced the exempted-development threshold for drainage of wetlands from 20 ha. to 0.1 ha., will continue to contribute to protecting surface waters from deterioration.	255	Urban waste-water treatment projects progressed
2	The EPA will <u>improve assessment methods</u> and knowledge of the physical condition of surface waters through a number of actions, including the development of a Morphological-Quality Index for Irish rivers and enhanced use of GIS for assessing lakes, transitional waters and coastal waters.	€73m	Invested to reduce water leakage by 61million m <sup>3</sup> per annum. Reduce leakage from 45% - 38%
3	The EPA, with the support of other agencies, will develop the necessary evidence base for <u>establishing the link</u> between physical integrity of water bodies and ecological status. The EPA will also define appropriate <u>environmental supporting conditions</u> with regard to hydromorphology.	30	Sustainability advisors in place to deliver the Agricultural Sustainability Support and Advisory Programme
4	IFI will lead a multi-stakeholder programme that will collect and collate data to support the development of an <u>inventory of barriers to fish migration</u> nationally.	43	Technical personnel deployed to regionally-based Local Authorities Water Support and Advisory Teams
5	<u>Mitigation measures incorporated in the OPW drainage maintenance programme</u> will be applied for all such works.	23,000	Farmers will receive sustainability advice under the Dairy Sustainability Initiative and the Agricultural Sustainability Support and Advisory Programme
6	The Minister for Housing, Planning and Local Government will establish a Steering Group to review and make recommendations on <u>improving fish passage</u> throughout the Shannon catchment within the period of this Plan.	4,000	Inspections under the National Inspection Plan for Domestic Waste Water Treatment Systems
7	A series of 4 <u>EPA research projects</u> related to hydromorphology (SILTFLUX, COSAINT, DETECT and RECONNECT) will be completed, and their outputs will be used to inform future actions to mitigate the impact of hydromorphological impacts.	3,000+	Water abstractions registered and an authorisation system implemented
			Guidance for planning authorities on physical planning and the Water Framework Directive
		726	Water bodies to achieve general water quality improvements
		152	Water bodies to experience improved water quality status





# EPA National Hydromorphology Workplan

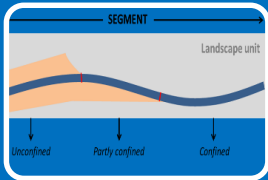
Steps	2017	2018	2019	2020	2021
1. Improve knowledge of hydromorphology-ecology relationships					
2. Develop assessment tools					
<b>3. Assess hydromorphological condition</b>					
4. Review heavily modified designations					
5. Develop key indicators and agree a monitoring programme					
6. Identify appropriate measures					
7. Develop and agree a prioritised restoration programme					
8. Develop environmental quality standards					
9. Adapt tools for assessing impacts of proposed developments					

EPA  
Focus



Develop in 2<sup>nd</sup> cycle, implement in 3<sup>rd</sup> cycle

# Assessment of Hydromorphological Pressures on Rivers: Morphological Quality Index (MQI)



Step 1: Reach Identification / Typology

Most technically challenging



Step 2: Data Capture/ Digitising

Most resource demanding

Morphological Quality class	MQI score
High	$0.85 \leq \text{MQI} \leq 1$
Good	$0.7 \leq \text{MQI} < 0.85$
Moderate	$0.5 \leq \text{MQI} < 0.7$
Poor	$0.3 \leq \text{MQI} < 0.5$
Bad	$0 \leq \text{MQI} < 0.3$

Step 3: Calculating Indicators and Condition Assessment Score

Requires most expert input

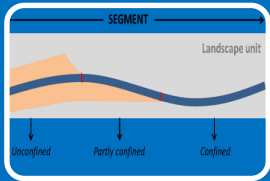


Step 4: Engagement and Decision Support

Stakeholder engagement



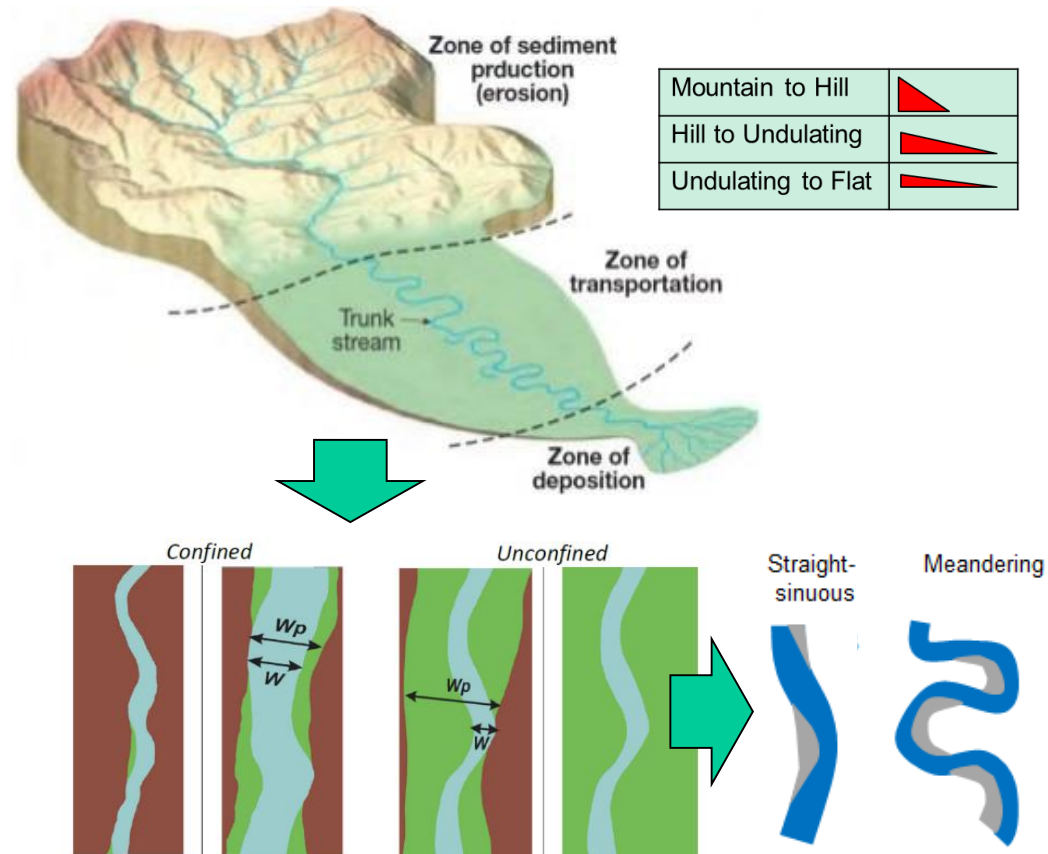
***National overview of morphological condition, 60,000km of river channel***



## Step 1: Reach Identification / Typology

Most technically challenging

- River Reaches are categorised by their landscape setting, floodplain interactions, and channel pattern.
- Process automation ongoing.
- Outputs support river-type specific measures – *right measure in the right place*.





## Step 2: Data Capture/ Digitising

Most resource  
demanding

- Identification of natural features.....
  - E.g. riparian vegetation, floodplain features
- and hydromorphological pressures
  - E.g. weirs, dams, bridges, modification, drainage schemes, permeable surfaces
- With support of:
  - current remote sensing imagery;
  - present day and historical mapping;
  - extracting data and;
  - manual digitising (where necessary)

### Farmbridge crossing a river:



#### Morphological Quality

High

Good

Moderate

Poor

Bad

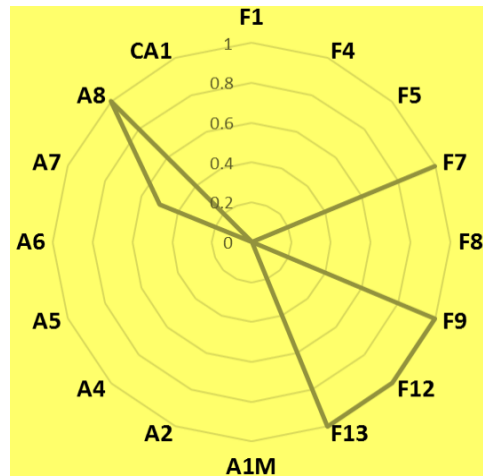
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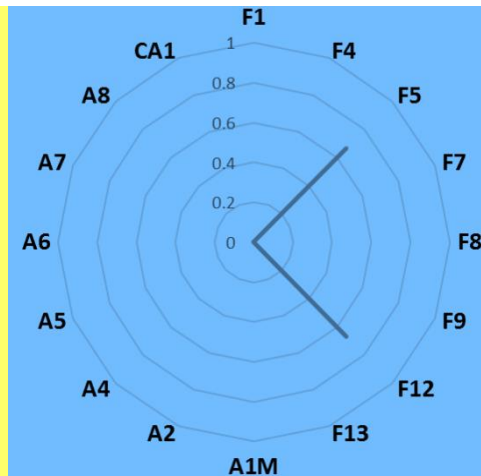
Functionality  
Artificiality  
Channel Addjustment



Channelised reach, MQI= 0.6



Natural reach, MQI= 0.95



Morphological Quality class	MQI score
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→ automation in progress - condition assessment completed nationally by end of 2019.

[illegible]

# Lake and TraC Hydromorphology

## Lakes:

- Lake Morphological Impact Assessment Tool (**MImAS**) since 2007
- GIS, remote sensing and groundtruthing over last 3 years for **224** lakes
- **19 pressure metrics** relating to the water levels, shoreline, structures and land use
- Development of further metrics of lake hydromorphology in 2019 to support WFD



Photo: W. Trodd

## Transitional and Coastal:

- Hydromorphological Quality Index (**HQI**; developed in-house)
- In line with European guidance on assessing the hydromorphological features of transitional and coastal waters (EN 16503:2014)
- 13 metrics
  - 4 GIS based
    - e.g. shoreline alterations, barriers, geology
  - 9 from monitoring data
    - e.g. changes to salinity, tidal/wave regime, river flows



# Summary

- Adopting integrated catchment management approach – multi-disciplined, collaborative, evidence based.
- Prioritising resources and ensuring measures and environmental objectives are scientifically robust and achievable.
- WFD is cyclical so work is ongoing - work for third cycle (2021-2027) is already underway!
- Major focus on hydromorphology - improved hydromorphological tools in combination with the proposed monitoring programme will support the River Basin Management Plan's priorities and principle actions.
- Gaps still need to be addressed! There is a need to better understand the linkages between hydromorphology and ecology in all Member States.



catchments.ie

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Science

Learn +

Maps

Data

Newsletter



## Welcome to Catchments.ie - Water from source to sea.

catchments.ie shares science and stories about Ireland's water catchments, and people's connections to their water.

For water, a catchment is simply defined as an area of land around a river, lake or other body of water.

Living in a catchment that has healthy water can help a community to have a better quality of life.

A healthy water catchment provides high-quality drinking water and supports livelihoods such as agriculture, recreational angling and water sports. It also supports local ecosystems so plants, animals, fish and insects that depend on having healthy water can thrive and flourish.

This website is a collaboration between the Department of Housing, Planning and Local Government, the Environmental Protection Agency, and the Local Authorities.

### Get involved

Make your local catchment work for you



First name



Surname



Email



County



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Public information:

***[www.catchments.ie](http://www.catchments.ie)***



Find out more



Explore



WFD Risk



Water Quality



Catchment Stories



Environmental Pressures



Programmes of Measures

Find Water Feature

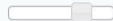
#### Explore map layers



Stories



A Catchment Story at this location, bringing science and policy to life.



Catchments



A catchment is an area where water is collected by the natural landscape and flows from source through river, lakes and

#### Map legend

Stories



Story



River Trust

Catchments



***River AI, Athlone***

See also EPA Geoportal for data and maps: <https://gis.epa.ie>



# Additional information

Issue 9: Winter 2018 Online Edition: ISSN 2009-8928 Print Edition: ISSN 2009-891X

## Catchments Newsletter

Integrated Catchment Management: sharing science and stories



**Plans and pressures: how characterisation helps us act as custodians of our catchments**



**Inside this issue**

- Waters and Communities – news from around the country
- Understanding our catchments: Water Framework Directive Characterisation
- Telling stories with data
- Groundwater characterisation: The River Basin Management Plan, 2018-2021
- The Local Authority Waters Programme Catchment Assessment Team
- Local Catchment Assessments: the next step in characterising our catchments
- Significant Pressures: selected summaries

*The Bredagh River, Donegal - photos from Inishowen Rivers Trust*

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Issue 1: October 2015 Online Edition: ISSN 2009-8928 Print Edition: ISSN 2009-891X

**Catchments Newsletter**  
Integrated Catchment Management: sharing science and stories

Issue 2: March 2016 Online Edition: ISSN 2009-8928 Print Edition: ISSN 2009-891X

**Catchments Newsletter**  
Integrated Catchment Management: sharing science and stories

Issue 3: June 2016 Online Edition: ISSN 2009-8928 Print Edition: ISSN 2009-891X

**Catchments Newsletter**  
Integrated Catchment Management: sharing science and stories

Issue 4: Winter 2016 Online Edition: ISSN 2009-8928 Print Edition: ISSN 2009-891X

**Catchments Newsletter**  
Integrated Catchment Management: sharing science and stories

Issue 5: Spring 2017 Online Edition: ISSN 2009-8928 Print Edition: ISSN 2009-891X

**Catchments Newsletter**  
Integrated Catchment Management: sharing science and stories

Issue 6: Autumn 2017 Online Edition: ISSN 2009-8928 Print Edition: ISSN 2009-891X

**Catchments Newsletter**  
Integrated Catchment Management: sharing science and stories

Issue 7: Winter 2017 Online Edition: ISSN 2009-8928 Print Edition: ISSN 2009-891X

**Catchments Newsletter**  
Integrated Catchment Management: sharing science and stories

Issue 8: Spring 2018 Online Edition: ISSN 2009-8928 Print Edition: ISSN 2009-891X

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**Waters & communities**

**Ireland's freshwaters: a world of wonder and discovery awaits you...**

**THE STORY OF THE SUIR**  
from Devil's Bit, to By Hook or by Crook...

**PLIGHT OF THE PEARLS**  
Young Scientists win with study of Pearl Mussels in the River Allow

**Waters & communities**

**Integrated Catchment Management – research we have to make it happen**

**How you can help bridge gaps**

**Reduced Drug Residues**  
Managing freshwater and the pressures on our water resources

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[More](#)

[www.catchment.ie](http://www.catchment.ie)

[hello@catchments.ie](mailto:hello@catchments.ie)

# Thank you



# Irish MQI Indicators

Indicator Code	Indicator Name
F1	Longitudinal continuity in sediment and wood flux
F3	Hillslope-river corridor connectivity
F4	Processes of bank retreat
F5	Presence of a potentially erodible corridor
F7	Planform pattern
F8	Presence of typical fluvial landforms in the floodplain
F9	Variability of the cross section
F12	Width of functional vegetation
F13	Linear extension of functional vegetation
A1 <sub>M</sub>	Upstream alteration of flows
A1 <sub>H</sub>	Upstream alteration of flows (Hydro-component)
A2	Upstream alteration of sediment discharges
A4	Alteration of sediment discharge in the reach
A5	Crossing structures
A6	Bank protection
A7	Artificial levees
A8	Artificial changes of the river course
CA1	Adjustments in channel pattern
CA2	Adjustments in channel width

**Functionality**

**Artificiality**

**Channel adjustment**

BODY TYPE	HYDROMORPHOLOGICAL QUALITY ELEMENTS	
<b>Rivers</b>	Hydrological regime	<ul style="list-style-type: none"> <li>• quantity and dynamics of water flow</li> <li>• connection to groundwater bodies</li> </ul>
	River continuity	<ul style="list-style-type: none"> <li>• longitudinal and lateral connectivity</li> </ul>
	Morphological conditions	<ul style="list-style-type: none"> <li>• river depth and width variation</li> <li>• structure and substrate of the river bed</li> <li>• structure of the riparian zone</li> </ul>
<b>Lakes</b>	Hydrological regime	<ul style="list-style-type: none"> <li>• quantity and dynamics of water flow</li> <li>• residence time</li> <li>• connection to the groundwater body</li> </ul>
	Morphological conditions	<ul style="list-style-type: none"> <li>• lake depth variation</li> <li>• quantity, structure and substrate of the lake bed</li> <li>• structure of the lake shore</li> </ul>
<b>Transitional waters</b>	Morphological conditions	<ul style="list-style-type: none"> <li>• depth variation</li> <li>• quantity, structure and substrate of the bed</li> <li>• structure of the intertidal zone</li> </ul>
	Tidal regime	<ul style="list-style-type: none"> <li>• freshwater flow</li> <li>• wave exposure</li> </ul>
<b>Coastal waters</b>	Morphological conditions	<ul style="list-style-type: none"> <li>• depth variation</li> <li>• structure and substrate of the coastal bed</li> <li>• structure of the intertidal zone</li> </ul>
	Tidal regime	<ul style="list-style-type: none"> <li>• direction of dominant currents</li> <li>• wave exposure</li> </ul>