



Constructed Wetland Framework and Hub

Nutrient neutrality catchment meeting

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01/08/2022



Overview

1. What are constructed wetlands?
2. Constructed Wetland Framework
3. Constructed Wetland Hub
4. Questions

What are constructed wetlands?

- Constructed or treatment wetlands are.... *"engineered systems designed to optimise processes found in natural environments and are therefore considered environmentally friendly and sustainable options for water treatment"*.

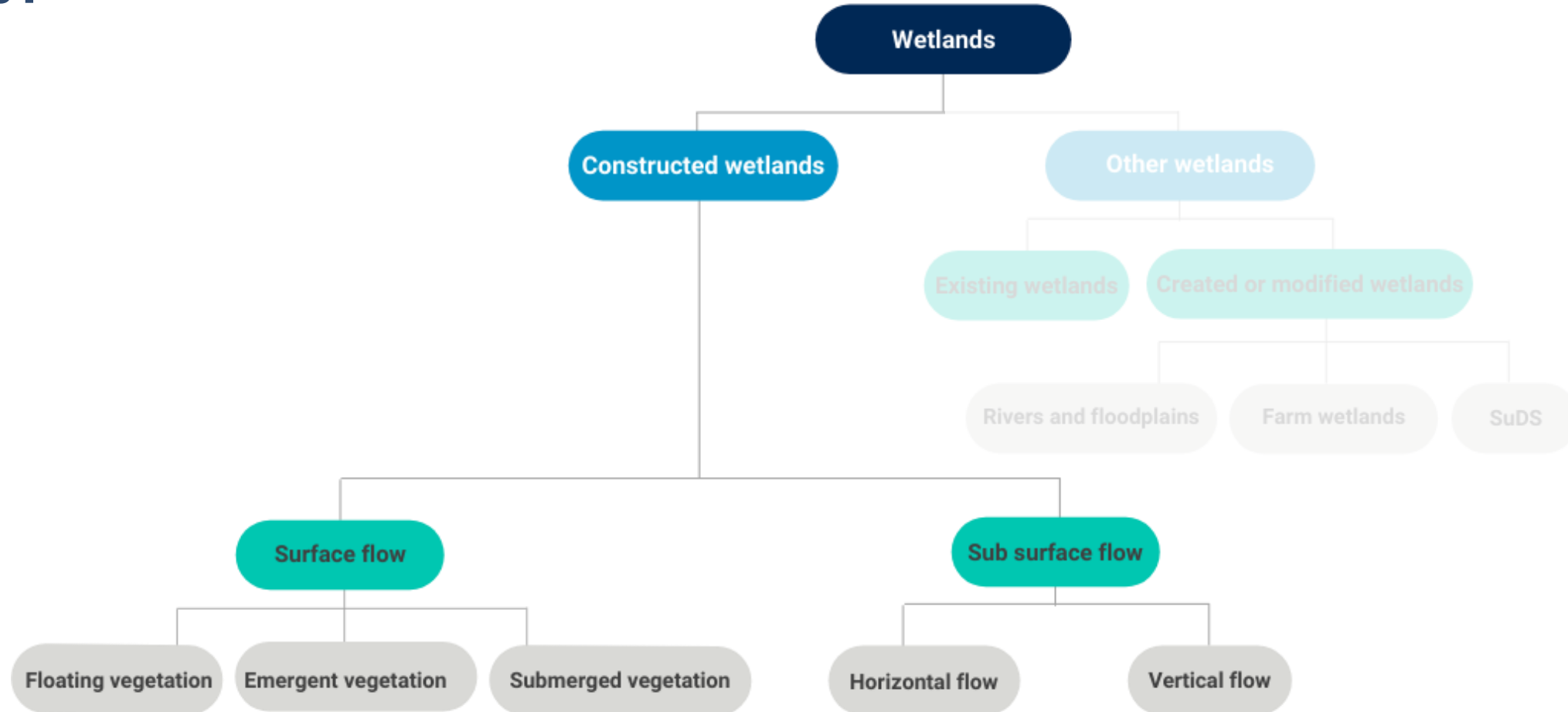
Dotro *et al.*, 2017.



What are constructed wetlands?

- Wastewater is treated through a complex range of processes which occur within the wetland including:
 - Sedimentation
 - Uptake of nutrients by plants
 - Reduction of pathogens through exposure to UV
- Constructed Wetlands range from simple vegetated pond-based systems up to complex, multi-stage systems treating concentrated point-source effluent
- Also known as Treatment Wetlands and Wetland Treatment Systems

Types of wetland





Constructed Wetland Framework

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Constructed Wetland Framework

- Framework Approach for Responding to Wetland Mitigation Proposals
- Written by The Rivers Trust and the Constructed Wetland Association for Natural England
- Describes a framework for the evaluation of Nutrient Neutrality mitigation-focussed constructed wetland applications by Natural England officers
- Will help to identify wetland proposals which are unreliable, unlikely to meet their objectives or are not appropriate due to a range of factors
- Will be used to structure detailed design guidance which will be released later this year

Key principles



1. Confidence in the design and maintenance

2. Flow

3. Characterisation of nutrient concentration

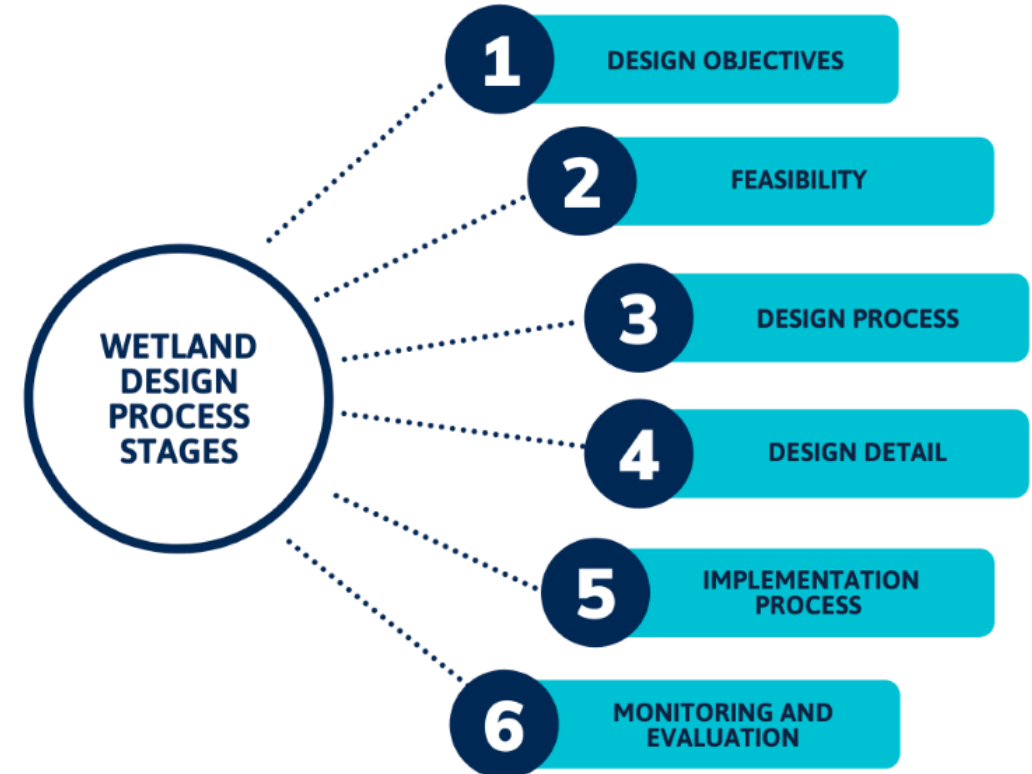
What doesn't the framework cover?

- Not all wetlands are constructed in response to nutrient reduction or the Habitat Regulations
- The rigorous assessment approach described by this Framework should not apply in those cases



Wetland design process

- Each stage of the process has a detailed section in the Framework
 - Example: Treatment Wetland Design Process
 - Introduction
 - Calculating nutrient removal and associated wetland area
 - Water
 - Hydrological control and management
 - Sediment loads and accumulation rates
 - Evaluation of the design process



Nutrient credit tables

- The matrices below summarise the percentage of calculated nutrient removal that any given wetland design should be credited

High confidence in design & maintenance

		Concentration		
		L	M	H
Flow	L	0%	20%	50%
	M	20%	50%	80%
	H	50%	80%	100%

Table 1.7a Percentage of calculated nutrient removal – high confidence design

Medium confidence in design & maintenance

		Concentration		
		L	M	H
Flow	L	0%	0%	20%
	M	0%	20%	50%
	H	20%	50%	80%

Table 1.7b Percentage of calculated nutrient removal – medium confidence design

Low confidence in design & maintenance

		Concentration		
		L	M	H
Flow	L	0%	0%	0%
	M	0%	0%	0%
	H	0%	0%	20%

Table 1.7c Percentage of calculated nutrient removal – low confidence design

Literature review

- Nitrogen and phosphorus
- Review of Stodmarsh Guidance & Cited Literature
- Review of wider literature and Treatment Wetland guidance

Questions raised regarding Treatment Wetland design

- Example question from the Framework:
- *Applicants often argue over our application of the 37% efficiency rate from the Land et al. review. Some will send literature papers claiming 90+% TN removal etc. Some standard wording about why we use this precautionary figure would be great.*
- Answer:
- *As explained in the review of the Land et al. study, it is not appropriate to apply the arbitrary 37% efficiency rate for TN (or 46% for TP) when designing wetlands. Rather than using precautionary efficiency rates, the precautionary approach should be to state that wetland designs must consider the hydraulic loading rate, retention time, inlet concentration and treatment area when assessing the efficiencies. . When using the P-k-C* design model (as described in the review of Kadlec & Wallace, 2009), treatment efficiencies of 90% are highly unlikely. This is because there is a logarithmic relationship between efficiency and treatment area and there are ever diminishing returns when trying to achieve a high efficiency by increasing area.*



Constructed Wetland Hub

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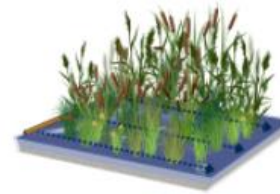
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Constructed Wetland Hub

The Rivers Trust and the Constructed Wetland Association



1 [Welcome to the Constructed Wetlands Hub](#)



2 What are constructed wetlands?



3 Constructing constructed wetlands



4 Designing for Nutrient Neutrality



5 Find a constructed wetland (Coming soon)



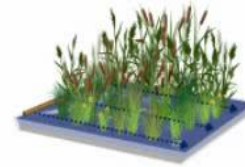
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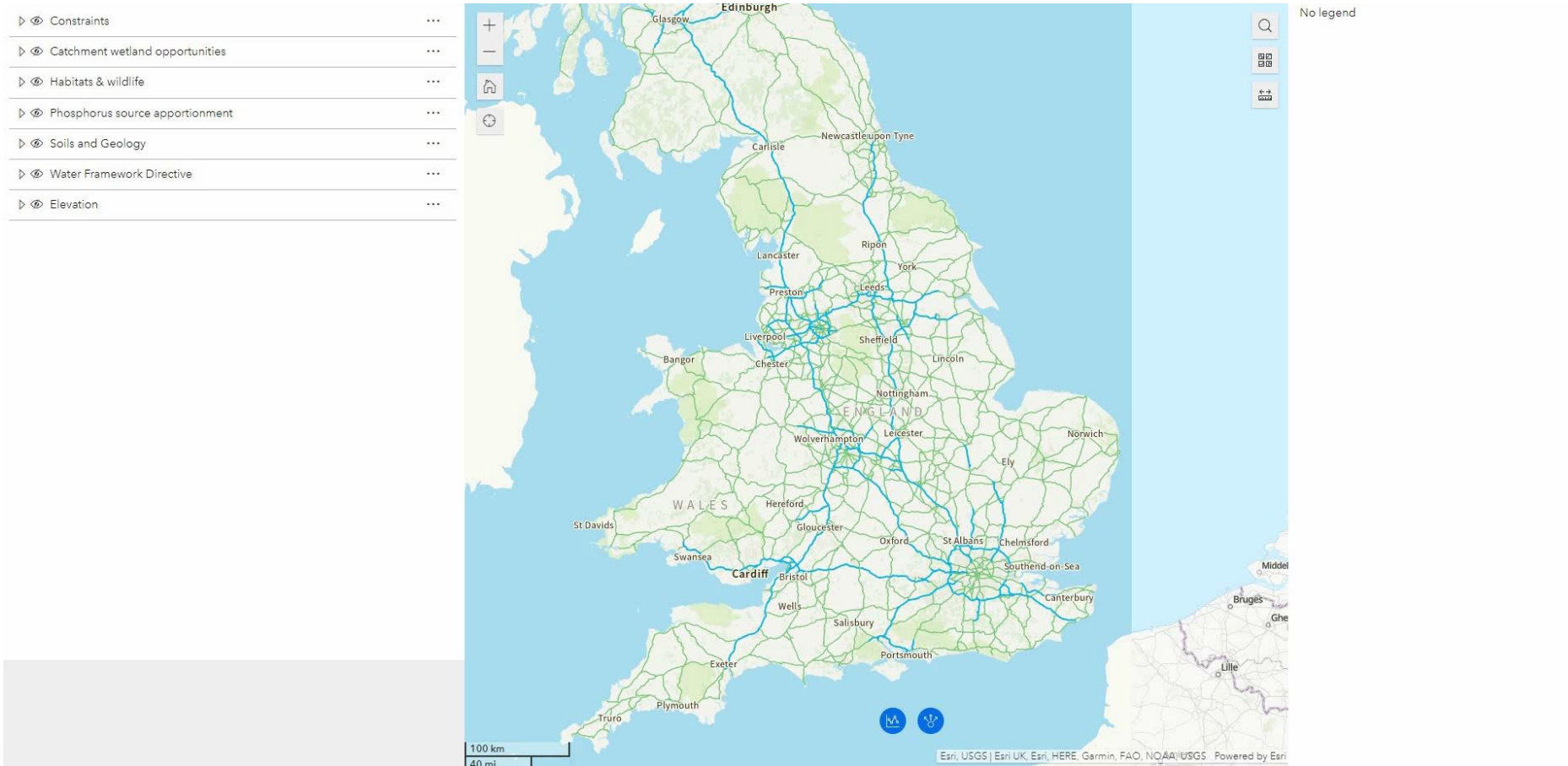
4 Designing for Nutrient Neutrality



5 Find a constructed wetland (Coming soon)



Constructed Wetland Hub - Data Explorer



Links & further reading

- Constructed Wetland Hub: <https://arcg.is/0DPuvH>
- Dotro, G., Langergraber, G., Molle, P., Nivala, J., Puigagut, J., Stein, O., & Von Sperling, M. (2017). Treatment wetlands (p. 172). IWA publishing.
- Kadlec, R.H. and Wallace, S. (2009). Treatment Wetlands. CRC Press. Boca Raton, FL, USA.
- Langergraber, G., Dotro, G., Nivala, J., Stein, O. R. and Rizzo, A. (2019). Wetland Technology: Practical information on the design and application of treatment wetlands. IWA publishing.
- Mackenzie, S.M. and McIlwraith, C.I. (2015). Constructed Farm Wetlands. WWT.



Thank you

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