Water Resource Benefits of Working With Natural Processes

GIS Dataset User Guide

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Environment Agency

1.1 Introduction

This document is a user guide to accompany the suite of Working With Natural Processes (WWNP) and potential recharge area GIS datasets produced as part of the Water Resource Benefits of Working With Natural Processes Environment Agency project.

More detailed documentation of methodology and technical assumptions in producing these datasets are provided within the project technical report (2020[1]).

1.2 Working With Natural Processes Features

A set of water resource beneficial measures for WWNP has been developed based on a literature review, site visits, conceptualisations by groundwater specialists, hydrogeological, soils and a range of spatial data. They have been derived by combining locations where it is advantageous to work with natural processes (as initially defined by the Environment Agency's Evidence Directory[2]), and areas where promotion of such measures are likely to benefit the recharge of aquifers of varying importance. The underlying data include key physical properties of the national groundwater vulnerability map, such as depth and cover of drift and presence of primary, secondary or perched aquifer types. Combined with a soils classification focused on soil drainage, and avoiding the enhancement of recharge where pollution could create dis-benefits (such as within Source Protection Zone 1/1c or in the vicinity of landfill sites), the new measures represent a screening dataset for locating a range of nature based solutions that could enhance water resources. The following measures are available as spatial datasets, and have all been attributed with specific hydrogeological and soil based properties which can be used to identify and screen recharge in an advantageous location, and identify multiple benefits.

The measures help signpost where the water resource benefits of WWNP might be most advantageous based on detailed national datasets, but can be considerably improved through catchment walkovers, local knowledge and engaging with landowners to identify genuine opportunities for land use change.

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1 Water Resource Benefits of Working With Natural Processes Technical Report 2020, accessible at: https://consult.environment-agency.gov.uk/water-resources/water-resources-priority-catchments/

2 https://www.gov.uk/government/publications/working-with-natural-processes-to-reduce-flood-risk

- Runoff Attenuation Feature (WWNP_RAF)
  - *These include small area measures to intercept or divert water onto the floodplain and are most beneficial where the soils are permeable and there is underlying aquifer. Strategies could involve large woody barriers, gully blocking, bunds and small-scale floodplain reconnection measures.*
- Mid/Upper-Catchment Storage (WWNP_CS)
  - *These include more expansive areas than runoff attenuation features where storage and attenuation of hillslope flow pathways are most beneficial over permeable soils and underlying aquifers. Strategies could involve large woody barriers, riparian planting and small/medium-scale river restoration measures.*
- Mid/Upper-Catchment Riparian Zone (WWNP_RZ)
  - *These include measures to intercept or attenuate minor watercourse corridors above the floodplain, particularly where the soils are permeable and there is underlying aquifer. Strategies could involve large woody barriers, riparian planting, rewilding and small/medium-scale river restoration measures.*
- Lower Catchment Floodplain Reconnection (WWNP_FROP)
  - *These include measures to intercept or divert water onto the floodplain in areas deemed at a national-scale to have a lower watercourse connectivity and associated flood risk and are most beneficial where the soils are permeable and there is underlying aquifer. Elevated groundwater levels within the lower catchment may seasonally reduce recharge capabilities. Strategies could involve large woody barriers, floodplain reconnection, wetland and storage area development and medium-scale river restoration measures.*
- Lower Catchment Floodplain Zone (WWNP_FZ)
  - *These include more expansive areas than floodplain reconnection measures within the wider floodplain and may be of seasonal benefit where sited over underlying aquifers. Elevated groundwater levels within the lower catchment may seasonally reduce recharge capabilities. Strategies could involve floodplain planting, wetland development and medium/large-scale river restoration measures.*
- Slowly Permeable Soils (WWNP_SPS)
  - *These include areas of impeded soil permeability and superficial till cover where land cover management strategies may include improving soils, de-compacting, crop cover and type management and planting of less dense woodland such as shelterbelts or wood pasture to increase infiltration rates. High density woodland should be avoided.*
- Arable & Grassland Land Cover Management (WWNP_LCM)
  - *These include more expansive areas than slowly permeable soils defining areas of arable or grassland where land cover management strategies may include de-compacting, crop cover and type management and planting of less dense woodland such as shelterbelts or wood pasture to increase infiltration rates. High density woodland should be avoided.*

1.3 Feature Attribution and Recommendations

Each WWNP feature has been attributed with its dominant soil drainage class (***Soil_Perm***), superficial recharge (***SF_Re***) and bedrock recharge (***BR_Re***) potential classes. The maximum potential recharge (***Max_Re***) documents the highest recharge class between both the superficial and bedrock classes. These attributes can be used to screen WWNP measures and identify areas which may benefit from enhanced aquifer recharge providing the soil permeability is suitable to the WWNP measure.

The recharge potential classes provided do not take into account groundwater levels. It is important to note that elevated groundwater levels (potentially only seasonally) may limit the recharge potential of any WWNP measure and is an important consideration together with local knowledge. Users should always be aware of communities at risk in the vicinity of proposed measures, especially if historical flooding stems from groundwater.

A range of additional attributes provide further context to the WWNP features within their immediate vicinity.

Attribution of the agricultural land classification grade (***ALC_Grade***) provides further context and constraints to screen WWNP measures on.

Attribution of the proximity to source protection zones (***SPZ***) (having already excluded SPZ1/1c) are important considerations to identify when proposing WWNP which may influence groundwater water quality. Expert hydrogeological advice should be sought within these zones and Environment Agency guidance[3] followed.

Attribution of proximity to Sites of Special Scientific Interest (***SSSI***), Groundwater Dependent Terrestrial Ecosystems (***GWDTE***) and Special Areas of Conservation (***SAC***) may highlight multiple benefit opportunities although expert ecological advice should be sought to identify any impacts proposed WWNP measures may have on the locally specific ecosystem and its function.

1.4 Wider Recharge Area (WRA) Layers

Recognising that the delineated WWNP potential measures may be supplemented by additional features based on more local knowledge, a wider recharge area layer has been defined across the Area of Interest to understand wider recharge potential. As before, the dominant soil drainage class (***Soil_Perm***), superficial recharge (***SF_Re***) and bedrock recharge (***BR_Re***) potential classes can be used to identify areas which may benefit from enhanced aquifer recharge. The maximum potential recharge (***Max_Re***) documents the highest recharge class between both the superficial and bedrock classes.

The recharge potential classes provided do not take into account groundwater levels. It is important to note that elevated groundwater levels (potentially only seasonally) may limit the recharge potential of any WWNP measure and is an important consideration together with local knowledge. Users should always be aware of communities at risk in the vicinity of proposed measures, especially if historical flooding stems from groundwater.

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3 https://www.gov.uk/government/publications/protect-groundwater-and-prevent-groundwater-pollution/protect-groundwater-and-prevent-groundwater-pollution

1.5 Example Figures

The figures below provide an example of WWNP features with their 'fill' defining their type and their 'outline' defining their maximum recharge potential.

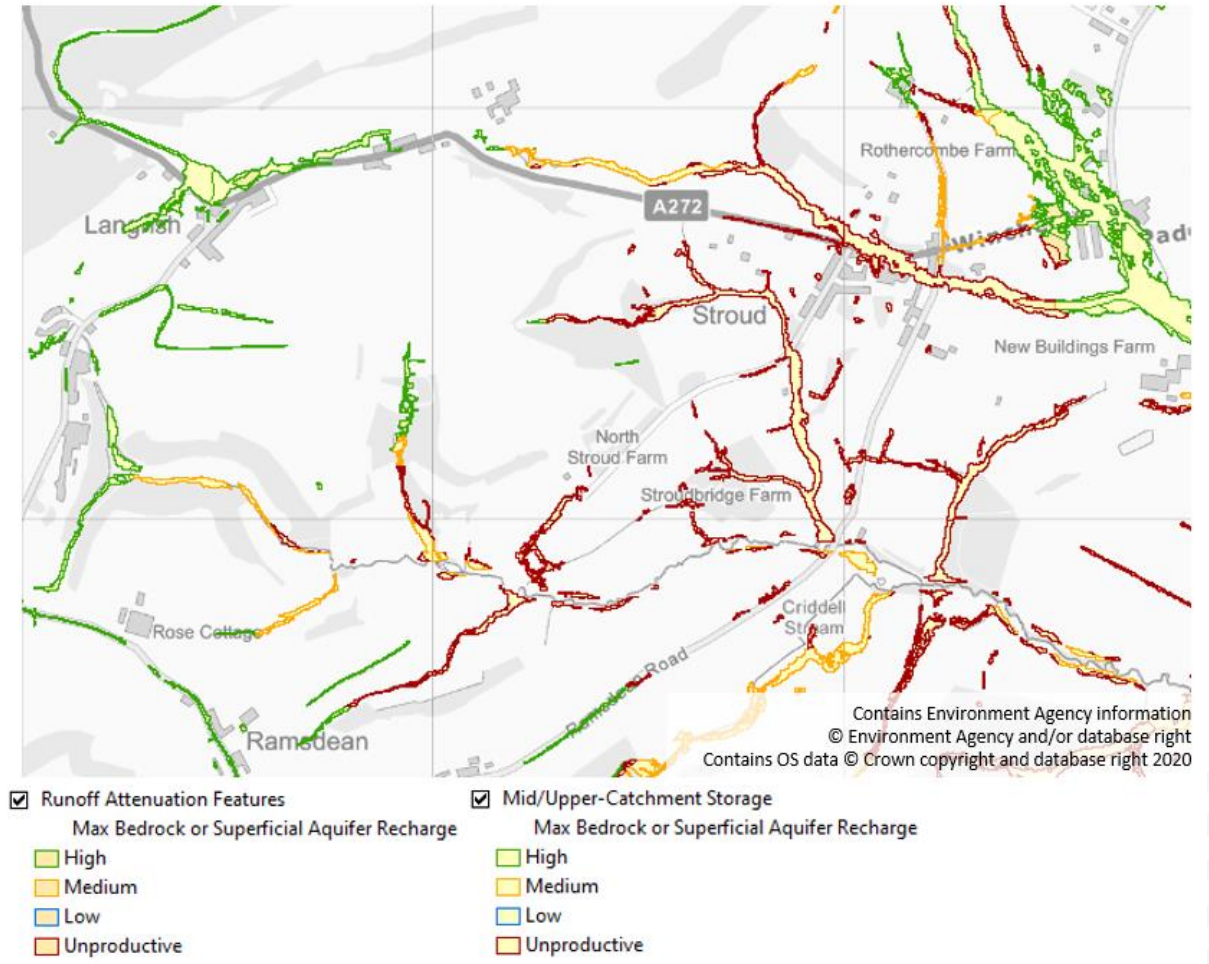

Figure 1-1: Runoff attenuation features and Mid/Upper-Catchment Storage Maximum Aquifer Recharge Potential

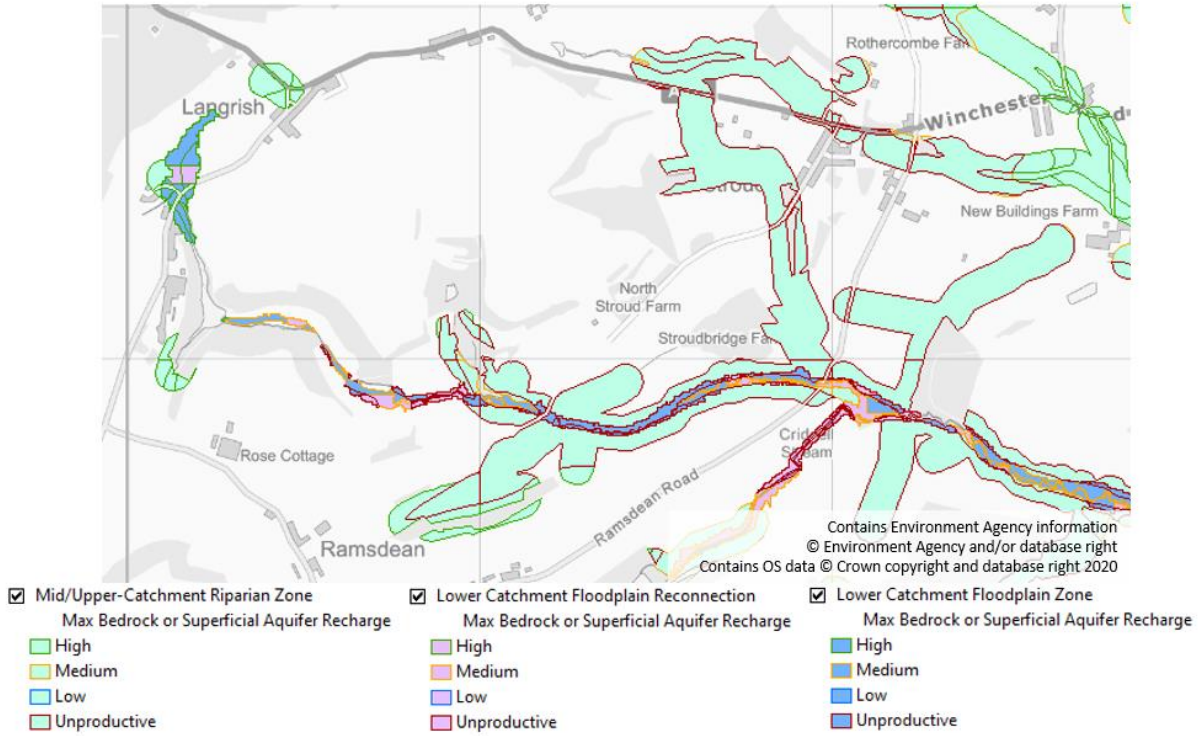

Figure 1-2: Mid/Upper-Catchment Riparian Zone, Lower Catchment Floodplain Reconnection and Lower Catchment Floodplain Zone Features Maximum Aquifer Recharge Potential

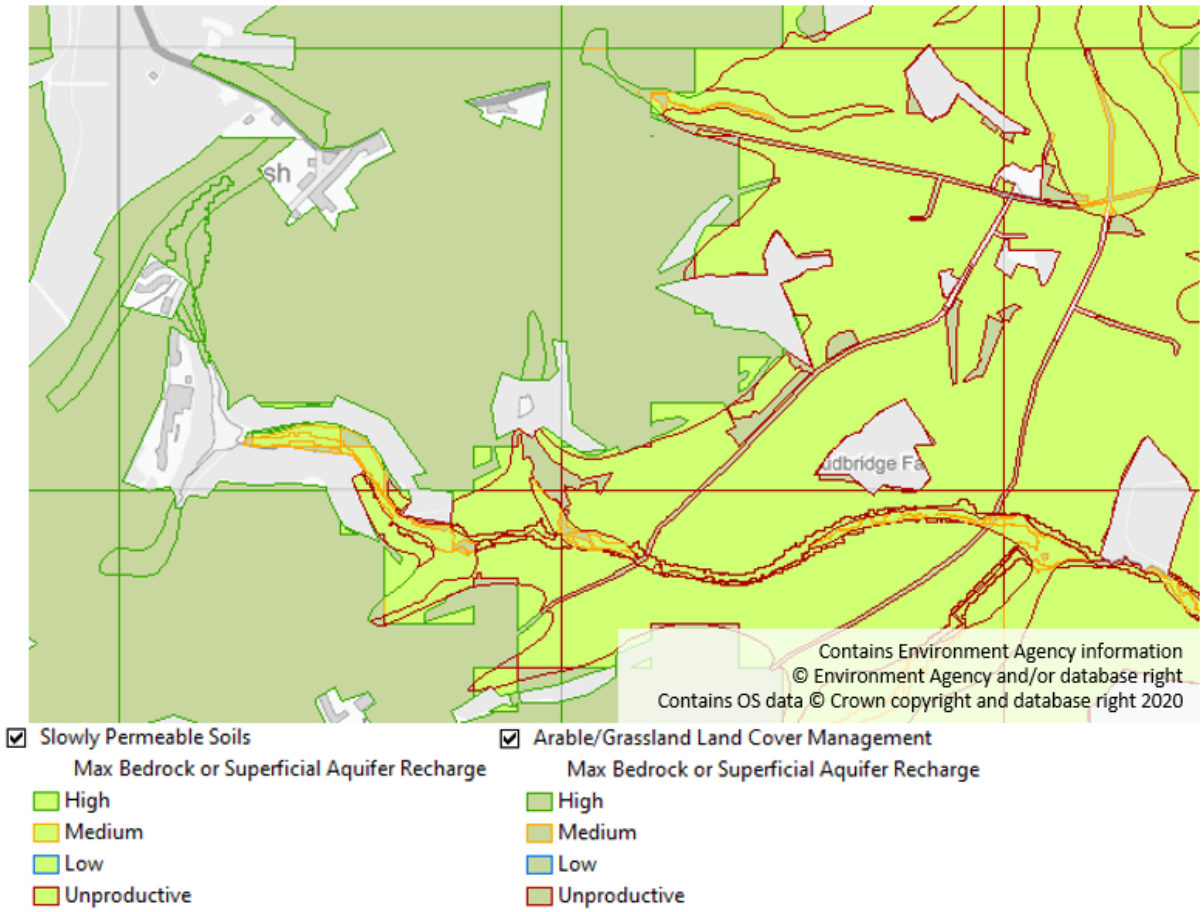

Figure 1-3: Slowly Permeable Soils and Arable/Grassland Land Cover Management Features Maximum Aquifer Recharge Potential

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