Green Infrastructure Framework

Evidence & Analysis Appendices

a co-operative council

Telford & Wrekin COUNCIL

Appendix 1: Stakeholders in the Telford & Wrekin Green Infrastructure Framework

External organisations:

BESST (Business Environmental Support Scheme for Telford)

CABE space (part of Design Council)

Community Safety (West Mercia Police)

English Heritage

Environment Agency

Greenwoods Trust

Homes and Communities Agency

Ironbridge Gorge Museums Trust

Local media

Marches Local Enterprise Partnership

Natural England

Severn Gorge Countryside Trust

Shropshire Chamber of Commerce

Shropshire Council

Shropshire Wildlife Trust

Small Woods Association

South Staffordshire Council

South Telford Rights of Way Partnership

Sport England

Stafford Borough Council

Telford & Wrekin Council

Cabinet lead

Cabinet Members

Development Plans Steering Group

Telford & Wrekin Council Officers (directly involved with project)

Community Engagement, Equalities & Action Team

Corporate Finance Manager

Development Management Service Delivery Manager

Economic & Regeneration Team Leaders (Borough Towns)

Estates & Investments Manager

Green infrastructure Project Board Members

Highways & Transport Service Delivery Manager

Parks and Open Space Manager

Partnership & Performance Manager

Strategic Housing & Development Plans Service Delivery Manager

Town and Parish Council & Rural Specialist

Telford & Wrekin Council Officers (not directly involved with project)

Capital & Facilities Manager

Highways & Transport Service Delivery Manager

Leisure Facilities & Services Service Delivery Manager

Other

Telford & Wrekin Community Volunteer Service

Telford & Wrekin Parish Councils

Telford & Wrekin general public

Telford & Wrekin Local Strategic Partnership

Telford & Wrekin PCT/NHS

Telford &Wrekin user groups (e.g. friends of)

TWS (Telford & Wrekin Services) Contractors

Wrekin Housing Trust

Appendix 2: Typology Factsheets

Agricultural Land

Distinguishing Features

- Usually associated with food production (growing of crops and the rearing of animals)
- Often compromised of one single crop which is grown and cultivated annually, there may be rotation of crops leading to distinct annual variations
- Land may be under environmental stewardship schemes which ensure effective environmental management of agricultural land. This can include organic practices and wildlife sensitive farming
- Some environmental stewardship schemes promote public access, therefore access and recreation functions may be present on site
- Mainly consists of fields, which may include scattered trees and hedgerows
- The appearance of agricultural land will change seasonally, from bare ground post harvesting and ploughing, to fully grown crops. Appearance may also change if different crops are grown

OWNERSHIP: Predominantly private or landowner leased

ACCESS: Limited public access some public rights of way

LANDSCAPE PATTERN: Variable size, shape and form; can be undulating or level. Predominantly rectangular with strong landscape pattern

MANAGEMENT: Intensive with seasonal variations. Fields may be managed in a rotational manner whereby a field is left fallow for one year

MISC: Occasional trees, hedgerows bare ground and hay bales

Allotments & Community Gardens

Distinguishing Features

- Usually associated with the cultivation of fruit and vegetables on a small scale
- Sites are made up of several smaller parcels of land which are individually managed but overseen by a committee of allotment holders and/or the local authority
- Individual allotment plots will have a different range of vegetation and some plots will have a wider species range than others
- Community gardens are sites that are managed by the local community
- Sites have value as a recreational resource, and as a space for learning about nature and food production
- Sites or individual parcels of land within sites will change in appearance seasonally. The site composition may change as ownership changes or a change of flora is introduced

OWNERSHIP: Predominantly council owned, plots are leased to individuals who manage the land within a set of guidelines

ACCESS: Limited to those with permission or keys to the site

LANDSCAPE PATTERN: Sites vary in size and shape but are usually split into a series of square plots, strong landscape pattern

MANAGEMENT: Each allotment is individually managed and management practices will vary, though overall site management will be overseen by a committee of allotment holders and/or the local authority

MISC: Occasional trees and hedgerows at the external boundaries of sites

Cemeteries, Churchyards & Burial Grounds

Distinguishing Features

- Areas which act as a resting place for the dead and quiet contemplation for the living
- Often attached to religious grounds and buildings or specifically designed space for burials near to urban areas
- Usually grassland with scattered trees, shrubs and flowers, cut flowers may be laid. Sites have maintained footpaths and benches
- Limited change over time, extra graves may be added but overall composition of the green infrastructure of the site is unlikely to change

OWNERSHIP: Usually council owned or on private church grounds

ACCESS: Publicly accessible though may be closed at night

LANDSCAPE PATTERN: Large expanses of grassland with rows of headstones creating structure. There are also likely to be clear boundaries to the site

MANAGEMENT: Intensive, grass is kept short and a formal feel is maintained

Incidental Green Space

Distinguishing Features

- Areas which have been left over after planning, and areas that have been left intentionally such as village greens or space used as a buffer for example roadside verges
- This type usually consists of mown grass
- Can be large or small parcels of land
- The intention of incidental green space is usually aesthetic but sometimes these areas can look tired and monotonous due to lack of aftercare or inappropriate design
- Ranges from land which is well maintained to areas which are not managed

OWNERSHIP: Usually council owned

ACCESS: Usually publicly accessible though areas such as verges may not be thought of as publicly accessible space

LANDSCAPE PATTERN: Predominantly grassland and wildflowers, occasional trees

MANAGEMENT: Grass is mown/maintained alongside main roads.

Grassland, Heathland, Moorland, Scrubland

Distinguishing Features

- Grasslands are areas where the dominant type of vegetation is grasses
- Heathlands and moorlands are areas associated with acidic ground where the dominant type of vegetation is low growing woody species
- Scrubland areas often occur on previously developed land, where pioneer species thrive
- Land of this type is quite varied, it often has a more “natural” wild appearance,
- Land of this type, particularly scrubland, is sometimes classed as “derelict” by local authorities. However it is a functioning piece of green infrastructure, even scrubland is land that is undergoing natural succession
- Many of the pitmounds of Telford & Wrekin are dominated by this type
- The appearance of this type will change as management is carried out, particularly if this involves burning

OWNERSHIP: Varied, both private and public ownership

ACCESS: Varied, mainly depending on ownership of the site

LANDSCAPE PATTERN: Rugged, usually has a more natural appearance

MANAGEMENT: Grassland will be mowed whereas heathland and moorland is likely to undergo controlled burning. Management techniques will differ; some sites may be heavily managed e.g. public grassland, whereas others may be left to natural succession e.g. brownfield land

MISC: A site could be designated for its function as a habitat for wildlife, e.g. as a Local Nature Reserve etc. Brownfield land is often under pressure from development

Green Roofs

Distinguishing Features

- Green roofs are roofs that are either partially or completely covered in vegetation, they can be found on buildings, shed and garages
- Their popularity is growing in the UK, as an effective method of adapting to climate change and controlling and reducing energy use within buildings
- Vegetation ranges from sedums, plants, perennials, grasses, to trees and shrubs depending on the strength of the roof
- Green roofs are unlikely to change overtime due to the limiting nature of their location, there may be seasonal variations in appearance

OWNERSHIP: Green roofs are owned by the owner of the building, therefore there is varied private and public ownership

ACCESS: Varied, depends on strength of roof and ownership

LANDSCAPE PATTERN: Can change the skyline of a town/city, will have a larger impact if several roofs are located close together

MANAGEMENT: Dependent on the type of vegetation used, can be intensive (more accessible „park like" roofs involving grass, shrub and tree maintenance) or extensive (relatively self sustaining sedums and mosses)

MISC: Green roofs are often associated with photovoltaic panels, as locating these on green roofs boosts their productivity.

Institutional Grounds

Distinguishing Features

- Spaces found surrounding public or private commercial, industrial and retail buildings. For example offices, schools, shops, factories, hospitals and residential care homes
- Usually consists of grassed landscape, scattered shrubs and trees with potential ornamental plants and flowers
- Aims to provide attractive landscape “buffer” space around buildings
- Institutional grounds are subject to limited change over time, except seasonal variations

OWNERSHIP: Varied between public buildings and private companies/businesses

ACCESS: Most publicly owned land has public access during the daytime; grounds of some public buildings are always accessible. Privately owned institutional grounds tend to have lower levels of public access

LANDSCAPE PATTERN: Formal landscapes, often have a manicured and formal feel

MANAGEMENT: Relatively intensive management regime, could include regular cutting of grass and pruning of trees to achieve a sculptured look

MISC: This type of land may be at risk from development/expansion of existing buildings, particularly school fields

Not Green Infrastructure

Distinguishing Features

- Everything that is man-made and not green space, such as buildings, roofs, roads, footpaths, town squares, and car parks
- Varies in size from garden sheds to large expanses such as car parks
- It does not provide any of the green infrastructure functions
- Buildings with green roofs do not count as not green infrastructure

OWNERSHIP: Mixture of public and private

ACCESS: Dependent on ownership and type e.g. road, pubic building, private home

LANDSCAPE PATTERN: Common materials are concrete, brick, tarmac and plaster

MANAGEMENT: Needs little maintenance or management

Orchards

Distinguishing Features

- Parcels of land where fruit growing trees dominate the vegetation type
- Where these are publicly owned there is usually a strong community focus
- Includes orchards where fruit is grown and sold for commercial gain
- Limited change in appearance of site except where trees are felled

OWNERSHIP: Either private (usually for commercial gain) or community owned (for public benefit, often attached to a public park)

ACCESS: Dependent on ownership, limited to those with permission or keys to the site

LANDSCAPE PATTERN: Strong, lined avenues of trees, usually with clear borders to site

MANAGEMENT: Harvesting of fruit in autumn, grass under trees will be regularly mown

Outdoor Sports Facilities

Distinguishing Features

- All green land used for sports, it does not include Astroturf or other artificial pitches
- Examples include golf courses, football pitches and grass running tracks
- Sites usually contain large expanses of grass with border trees, shrubs and flowers
- Predominantly used for public recreation and physical activity
- Limited chance for change as need to maintain primary purpose of outdoor sports provision

OWNERSHIP: Either publicly owned or private clubs where members pay a subscription to join

ACCESS: Usually have to pay to access and at limited times according to classes etc.

LANDSCAPE PATTERN: Varied – depending on type of outdoor sports facility, usually grassland

MANAGEMENT: Intensive, grass will be kept short for sports. Border trees and shrubs may have more relaxed maintenance but will have to maintain “neat” appearance

Parks, Public Gardens & Recreation Grounds

Distinguishing Features

- The primary use of parks, public gardens & recreation grounds is informal recreation
- Sites can vary in structure and composition, from large grassed areas, to lakes, trees, and formal planting beds
- Some parks and gardens will contain infrastructure provision such as roads, play equipment, cafes and visitor centres
- This type is identifiable by its distinct boundaries, i.e. it is clear whether you are within the park or not
- The appearance of this type may change over time as the usage of the park changes, different areas of a park may have very different seasonal appearances too, i.e. a nature garden may have a "wilder" seasonal appearance than a formalised grass field which rarely changes

OWNERSHIP: Usually publically owned

ACCESS: Often controlled access, times may be limited and there may be a charge to enter

LANDSCAPE PATTERN: Distinctive and varied dependent on nature of park

MANAGEMENT: May vary within sites, and certainly varies between sites. Sites may be intensively managed to maintain a manicured look or left to a more "natural" feel

MISC: Parks often have friends of groups who contribute to the management, education, promotion and decision making guiding the future of the park

Private Domestic Gardens

Distinguishing Features

- Sites vary widely in size, from a small back yard to large fields
- Composition and management depends upon the enthusiasm, age, and knowledge of the owner, therefore quality of composition and management varies
- Private domestic gardens could contain a variety of; trees, shrubs, grass, flower beds, fruit and vegetables
- Many gardens contain areas of decking/paving/sheds/patio – these are impervious surfaces and are not classed as part of the green infrastructure.
- Private domestic gardens may change in composition as ownership of the dwelling changes. Also as the age of the owner, and their enthusiasm or knowledge varies, management of the site may increase, reduce or stop

OWNERSHIP: Usually attached to a private dwelling and thus in private ownership

ACCESS: Limited to those who own or are invited by the owner

LANDSCAPE PATTERN: Collectively gardens in residential areas will form a strong landscape pattern

MANAGEMENT: Dependent on the enthusiasm/age/knowledge of owner, usually controlled planting and maintenance

MISC: Private domestic gardens often make up a significant part of the green fabric of urban areas

Street Trees

Distinguishing Features

- Street trees are trees planted in the public realm, usually alongside roads and in town squares
- Vary from small street trees in residential areas, to large grand trees in town centre squares, though trees of any size can be found in any area
- Includes all species of tree
- Appearance may change due to felling/pruning and occasionally due to vandalism

OWNERSHIP: Usually publicly owned. Can be privately owned if on private land

ACCESS: Dependent on ownership, normally publicly accessible

LANDSCAPE PATTERN: Provide character through varied species choice and can enhance Quality of Place

MANAGEMENT: Publicly owned trees will be managed by the local authority and will be regularly pruned

MISC: Usually located on the pavement edge in tree pits, requires reasonably wide pavements. Urban planters and other green “street furniture” is also classified as this type

Water Bodies

Distinguishing Features

- Small or large expanses of open non moving water
- Includes lakes, ponds, reservoirs and harbours
- Water bodies can be actively used e.g. for water sports or for aesthetical quality in a development
- Unlikely to change over time, with no seasonal variation. Potential for expansion/extension of existing water bodies

OWNERSHIP: Mixture of private and public

ACCESS: Dependent on ownership, often accessible with prior notification of landowner

LANDSCAPE PATTERN: Water bodies are usually a dominant feature of the landscape or site

MANAGEMENT: Can be managed to promote wildlife in an area. Management may include draining or dredging. Water quality may be monitored and could influence future management

Water Courses

Distinguishing Features

- Small or large areas of moving water, includes natural and man-made channels
- Includes rivers, streams, and canals
- Includes bankside areas, unless these are definable as a separate type within the typology
- Natural water courses are likely to change over time as the banks erode and the course of the river changes. Man made changes such a dam creation and flow alterations will lead to aesthetic changes

OWNERSHIP: Mixture of public and private ownership

ACCESS: Dependent on ownership, often accessible with prior notification of landowner

LANDSCAPE PATTERN: Water courses usually divide land and are sometimes used as boundaries for sites

MANAGEMENT: Management may include draining or dredging. Water quality may be monitored and could influence future management. Management may include bank erosion protection

MISC: Close links between this type and areas designated for controlled flooding

Wetlands

Distinguishing Features

- Wetlands are areas of land where the soil is saturated with water, some or all of the time
- Land of this type has expanses of water, wet habitats, including fen, marsh, bog and wet flush vegetation
- Vegetation in these areas has to be adapted to deal with high water levels
- May have a “wild” appearance
- Unlikely to change in appearance except potential for drying out in instances of extreme heat/drought

OWNERSHIP: Usually publicly owned

ACCESS: Often publicly accessible on boardwalks or viewing platforms

ANDSCAPE PATTERN: Loose, often sporadic patches of water/marsh

MANAGEMENT: Usually a “hands off” approach is taken with wetlands where the land is managed for nature conservation

MISC: Often designated as a protected habitat for wildlife

Woodlands

Distinguishing Features

- A woodland is a parcel of land where there are more than just scattered trees – trees are the dominant vegetation type
- There are many different types of woodland, coniferous, non coniferous, ancient, semi natural etc. All are included in this type
- Woodlands vary in size, density, age, ownership, and species composition
- Sites may be commercially managed for timber production or maintained as woodland for public recreation or as a habitat
- Appearance will change in commercial woodlands as trees are felled and re-planted. In other woodlands the changes will mainly be seasonal and occasional coppicing and thinning

OWNERSHIP: Commercial woodlands are predominantly privately owned, public woodlands usually exist for public benefit or as a wildlife habitat

ACCESS: Dependent on ownership, access is usually allowed in public woodlands

LANDSCAPE PATTERN: Strong, trees dominate the area and form a definite structure

MANAGEMENT: If managed commercially, will be intensive rotation of yields, publicly owned woodlands may be managed more for biodiversity or public recreation

MISC: This type often occurs on regenerated pitmounds

Appendix 3: Typology Maps

Agricultural Land

Legend

Agricultural Land

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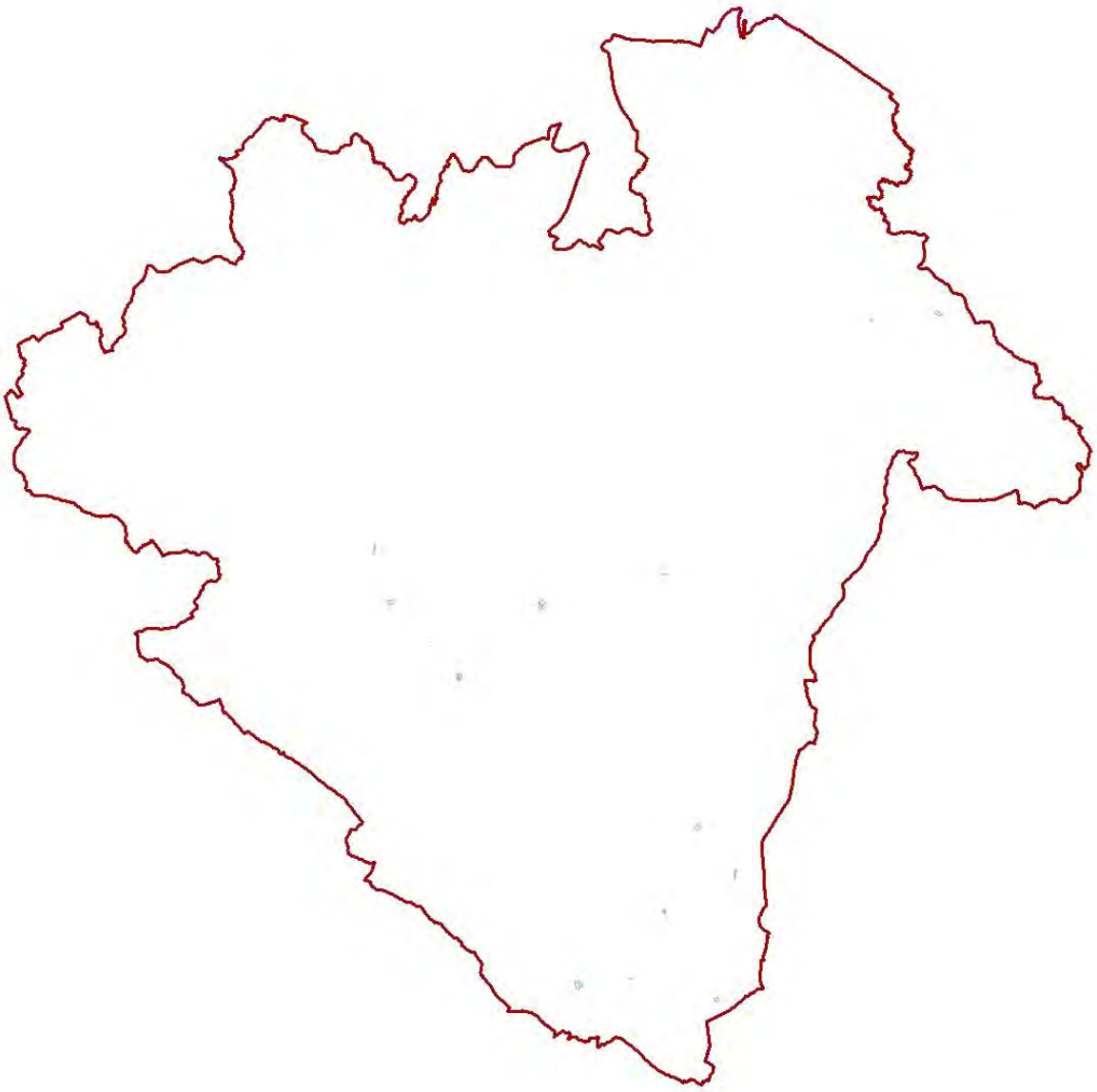
Allotments & Community Gardens



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Allotments & Community Gardens

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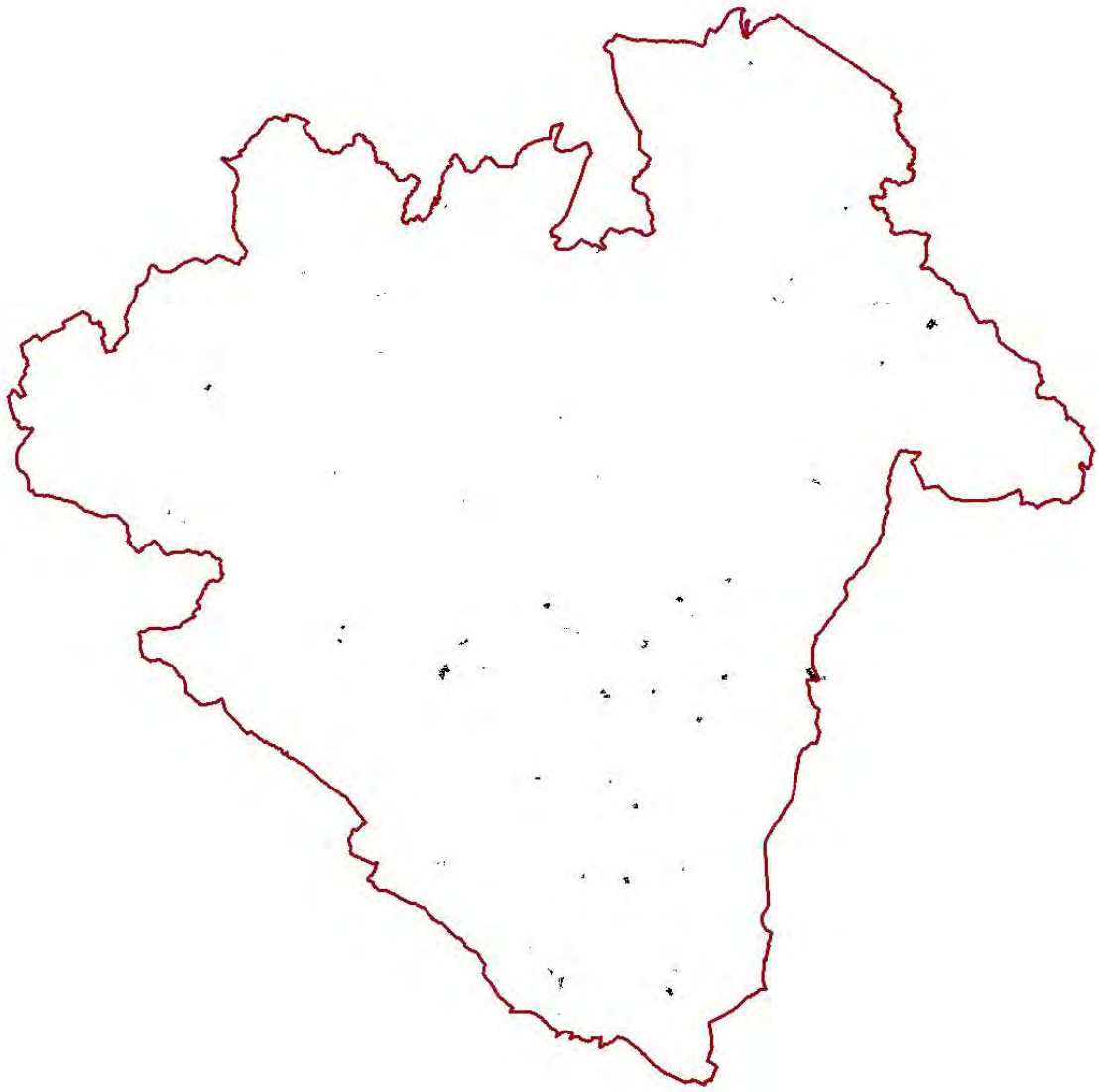
Cemeteries, Churchyards & Burial Grounds



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Cemeteries, Churchyards & Burial Grounds

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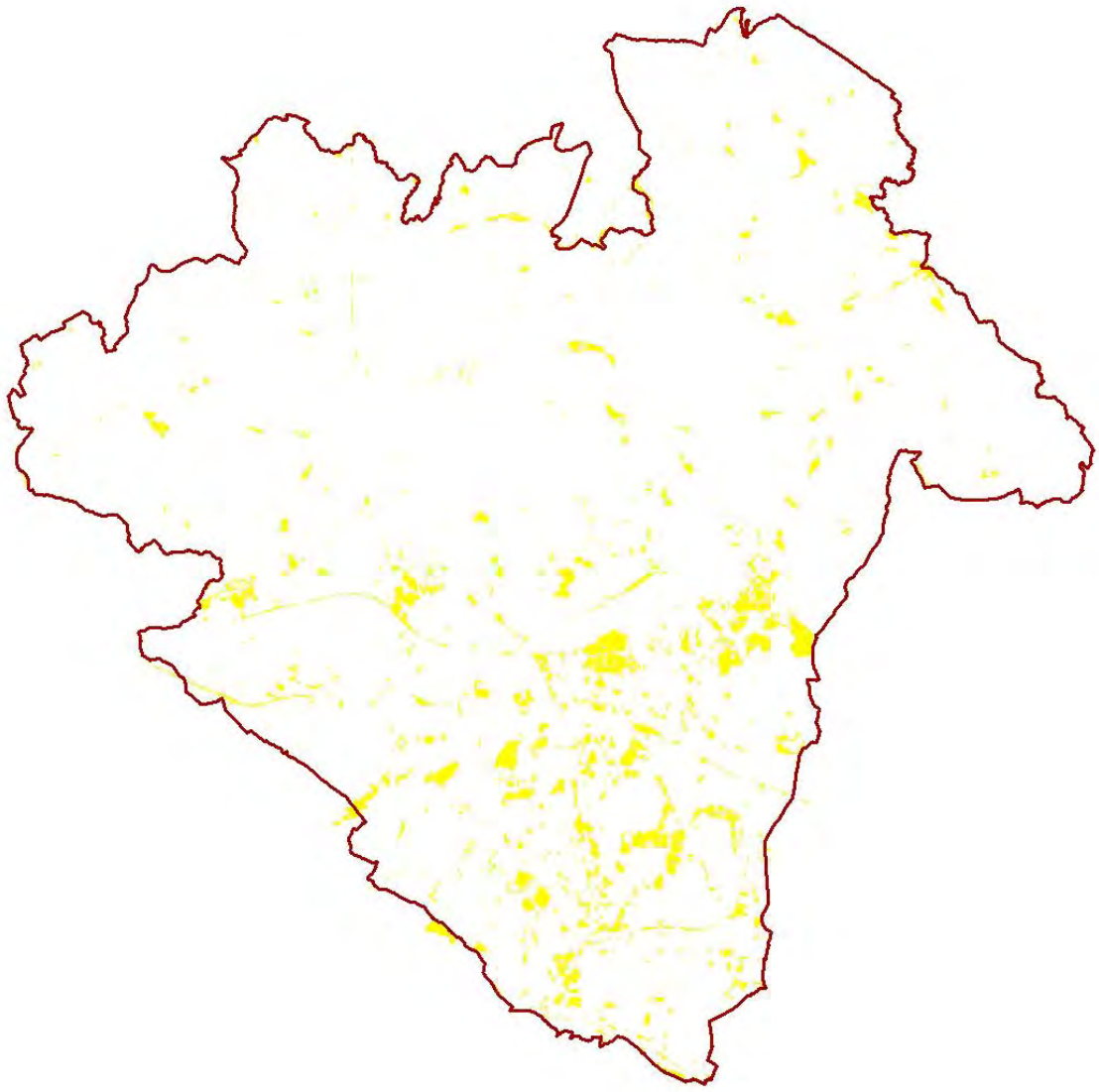
Grassland, Heathland, Moorland, Scrubland



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Grassland, Heathland, Moorland & Scrubland

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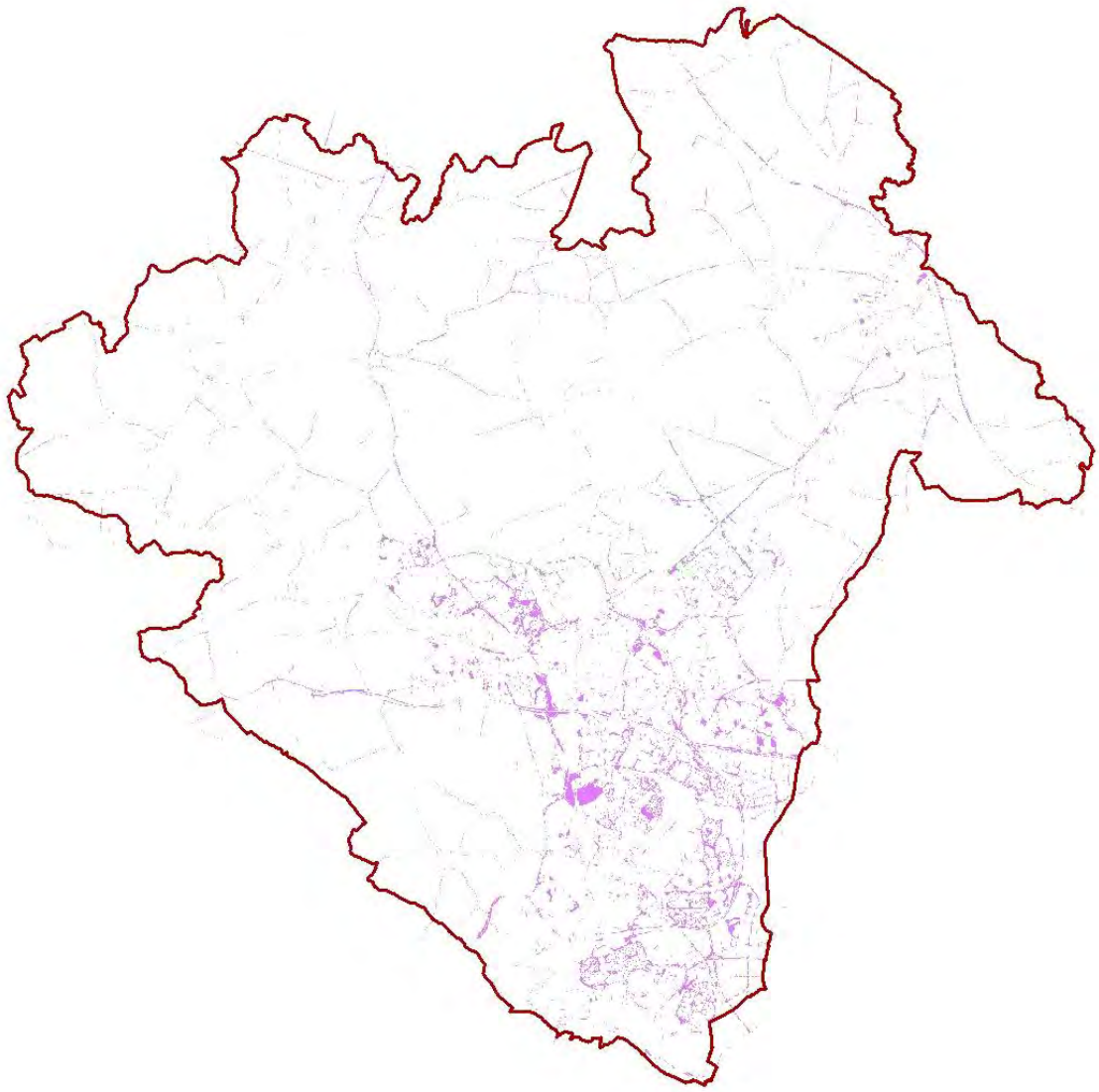
Incidental Green Space



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Incidental Green Space

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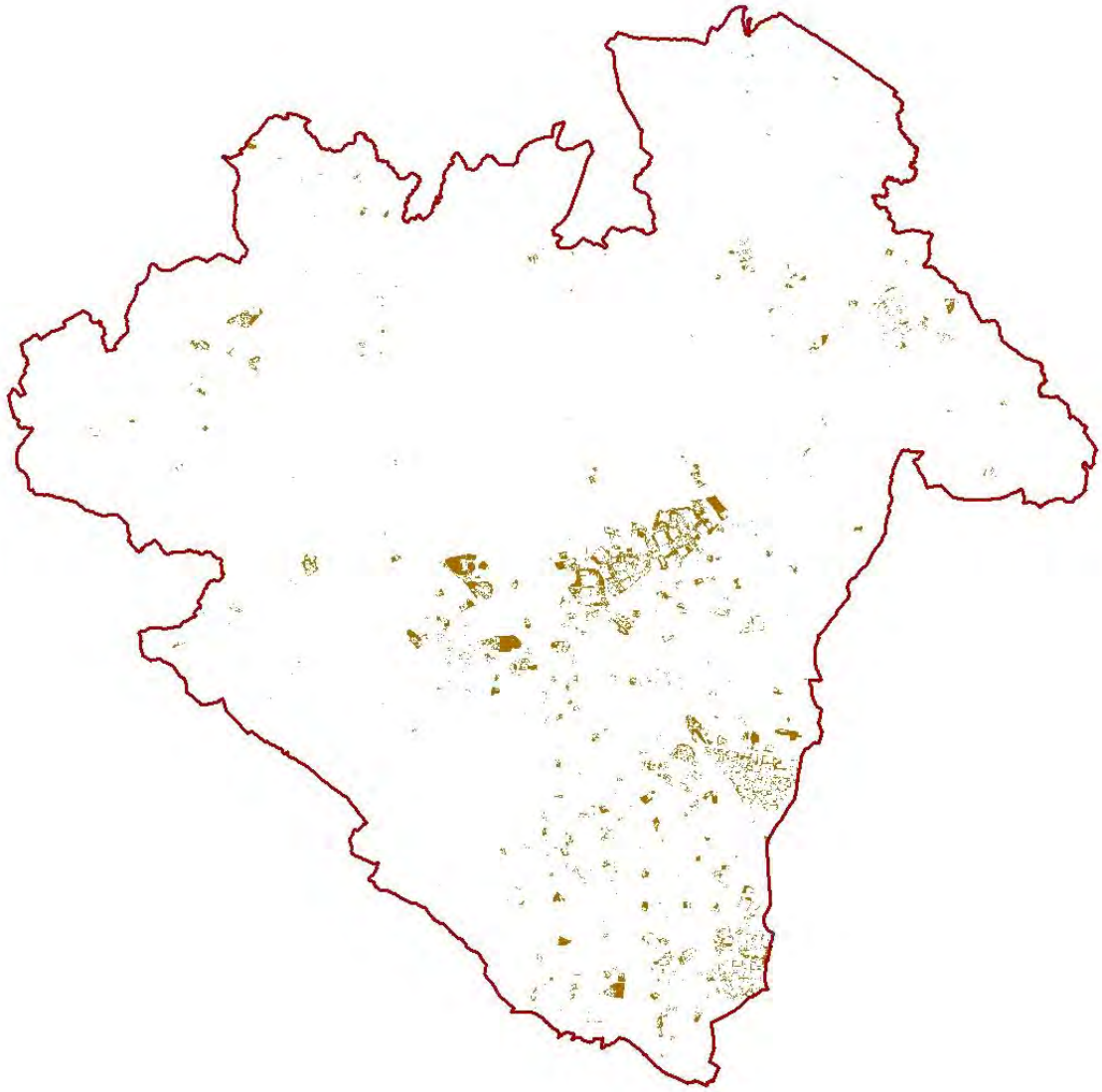
Institutional Grounds



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Institutional Grounds

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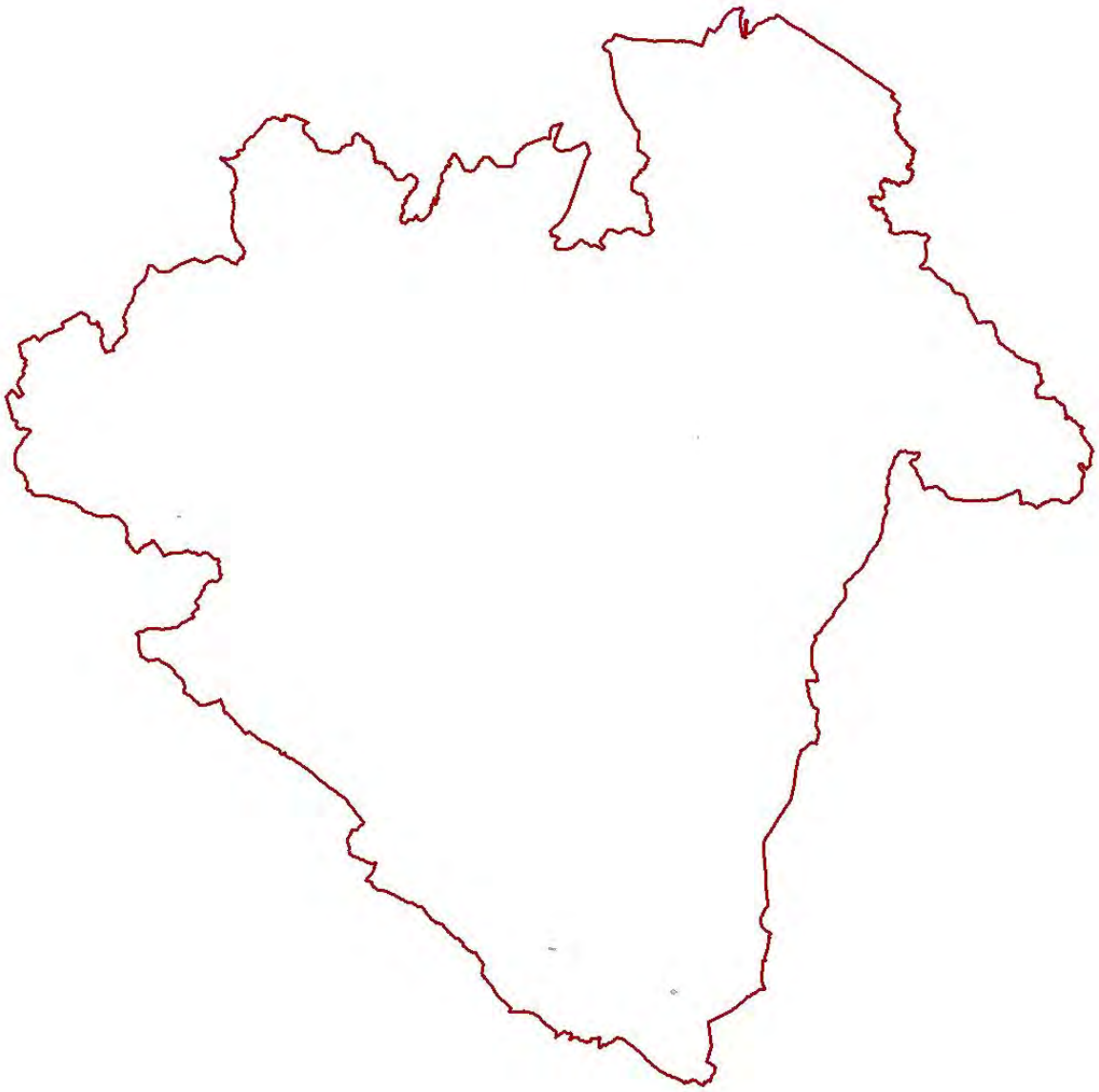
Orchards



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Orchards

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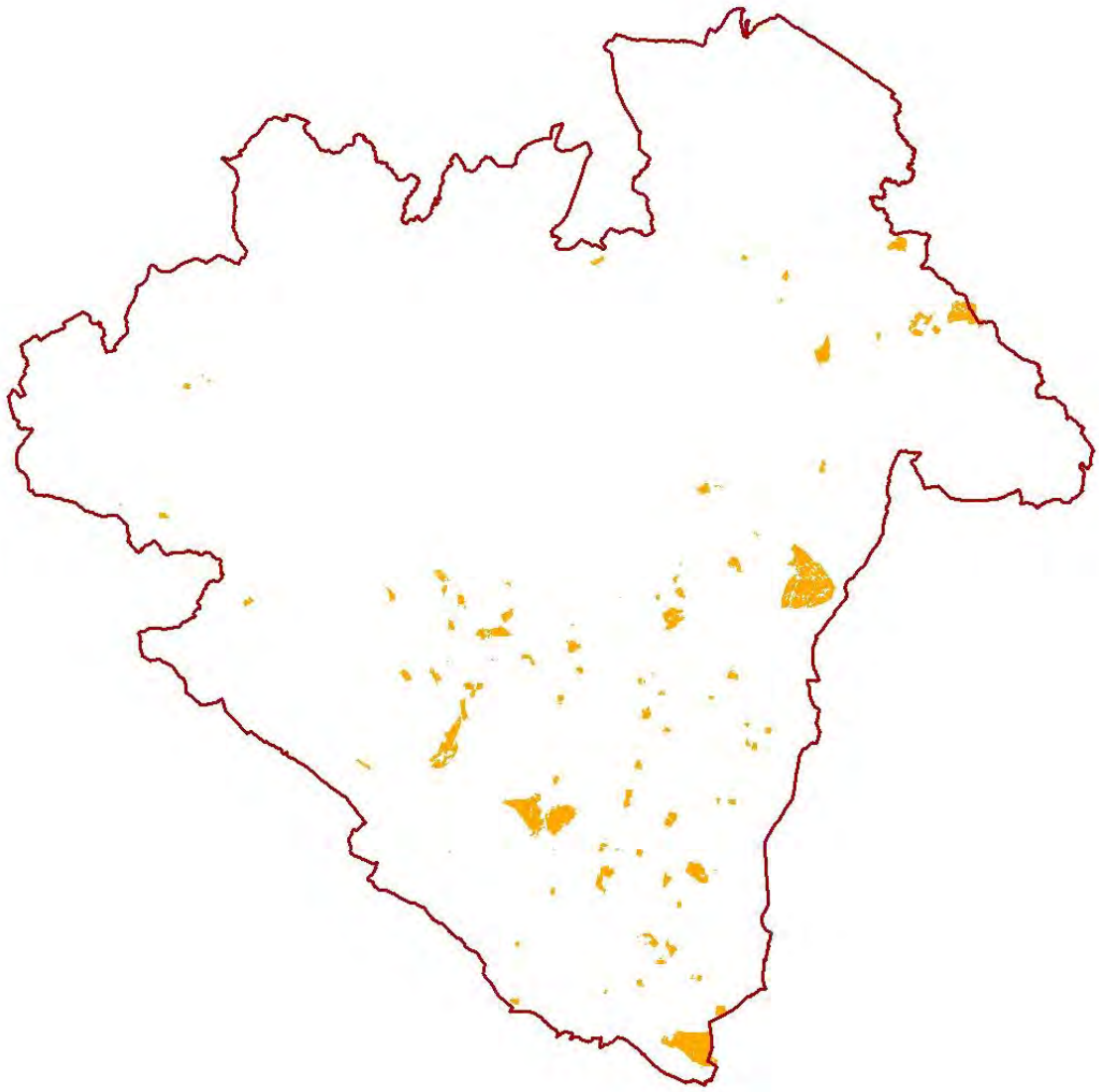
Outdoor Sports Facilities



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Outdoor Sports Facilities

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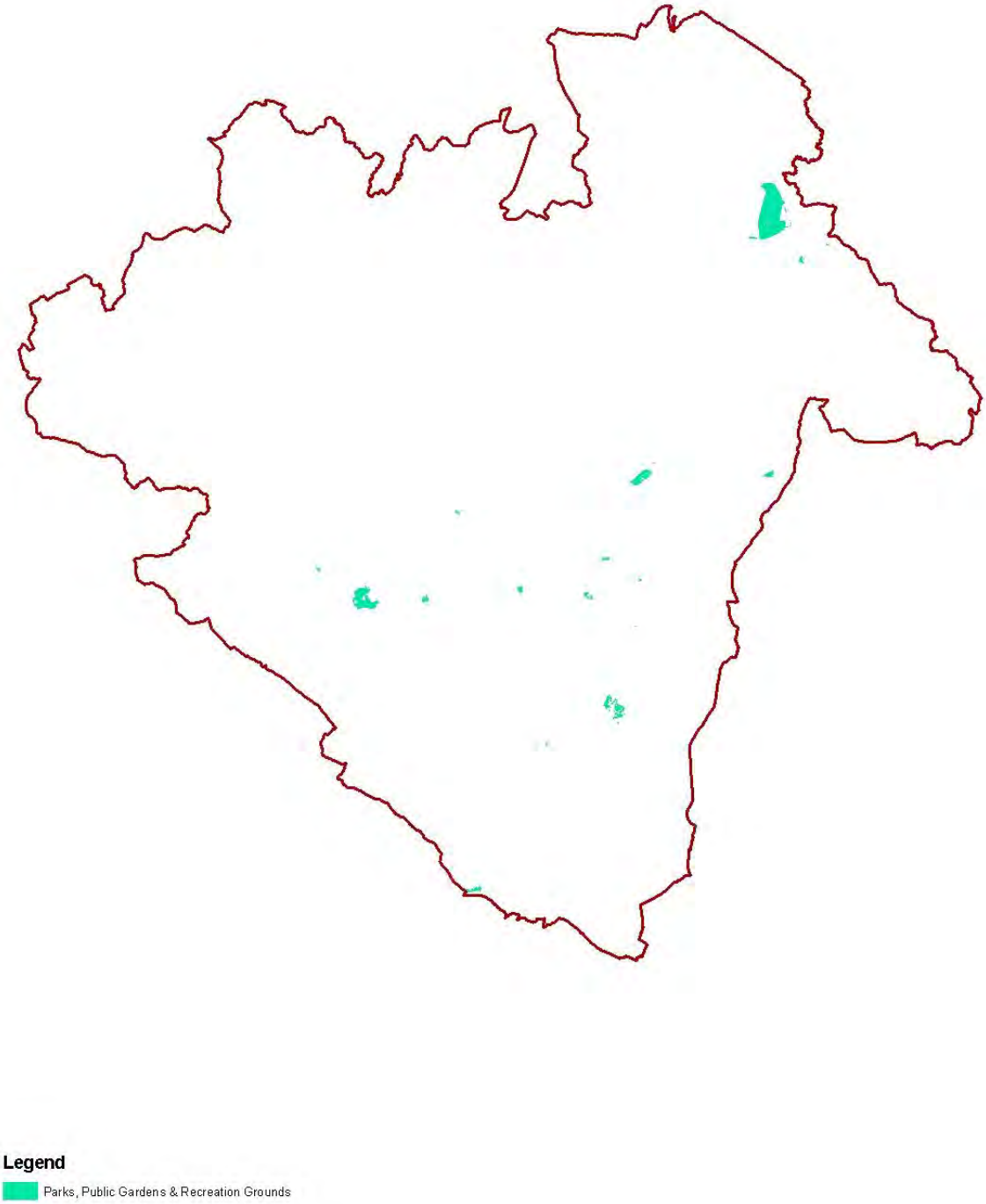
Parks, Public Gardens and Recreation Grounds



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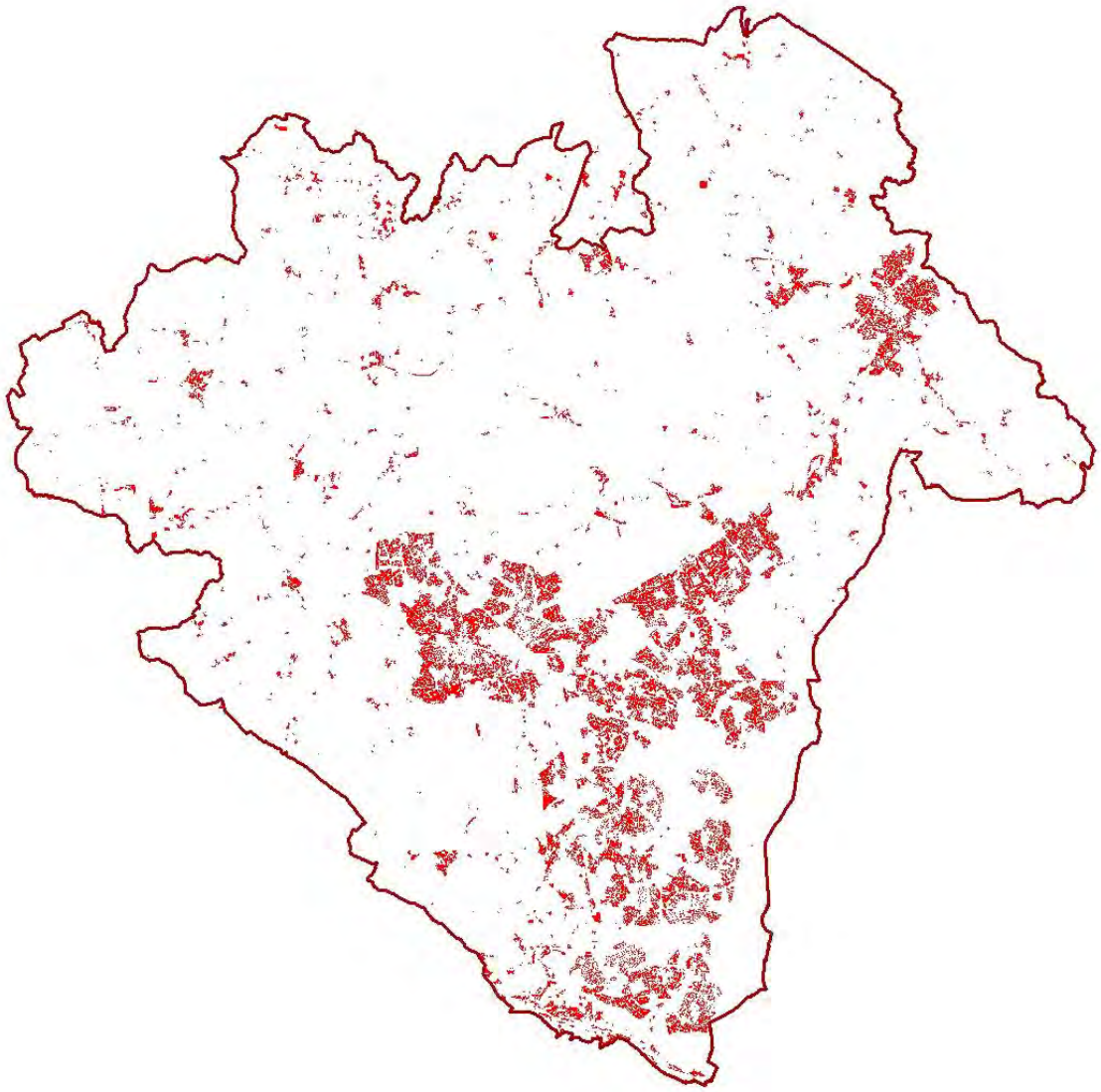
Private Domestic Gardens



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Private Domestic Gardens

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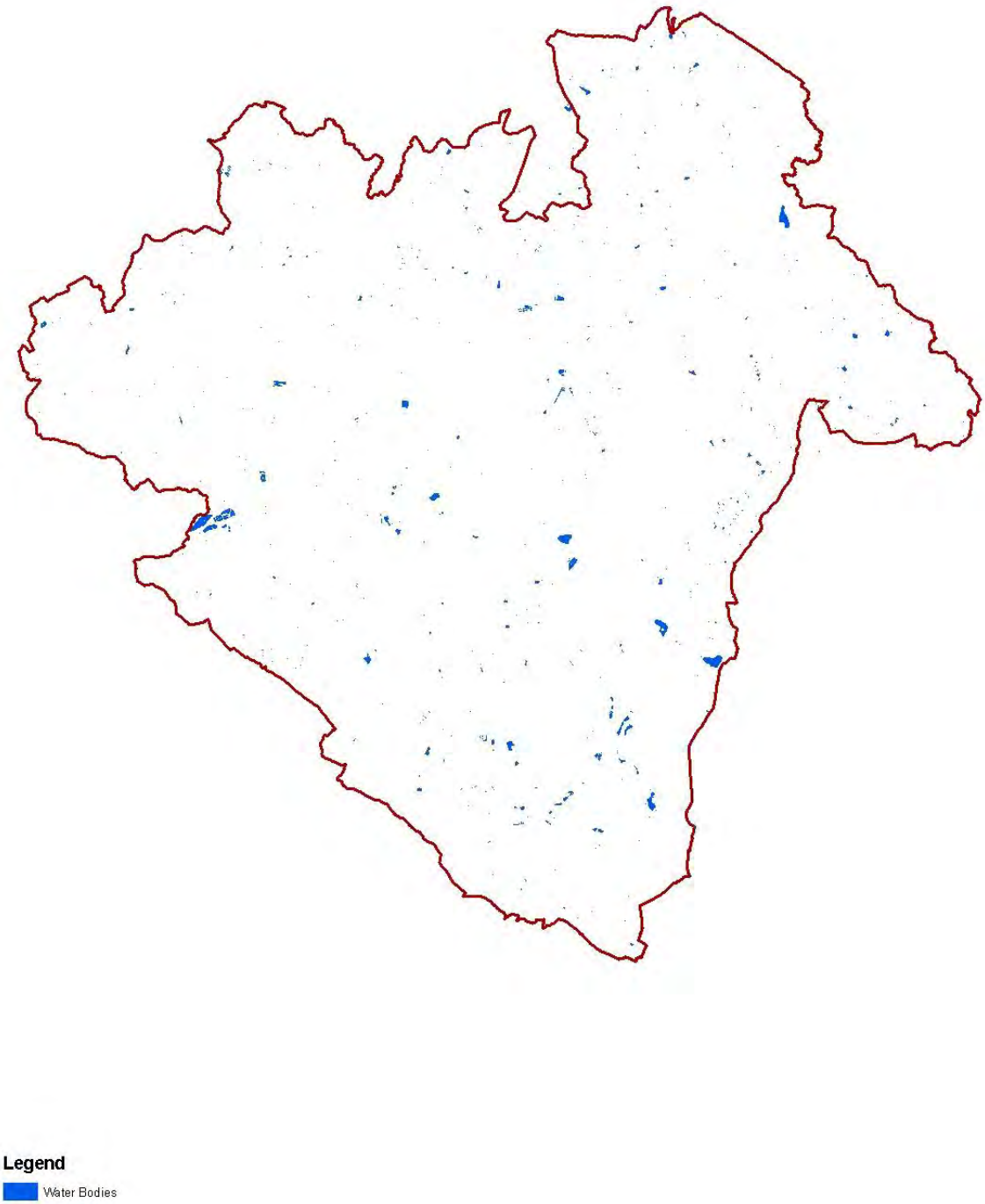
Water Bodies



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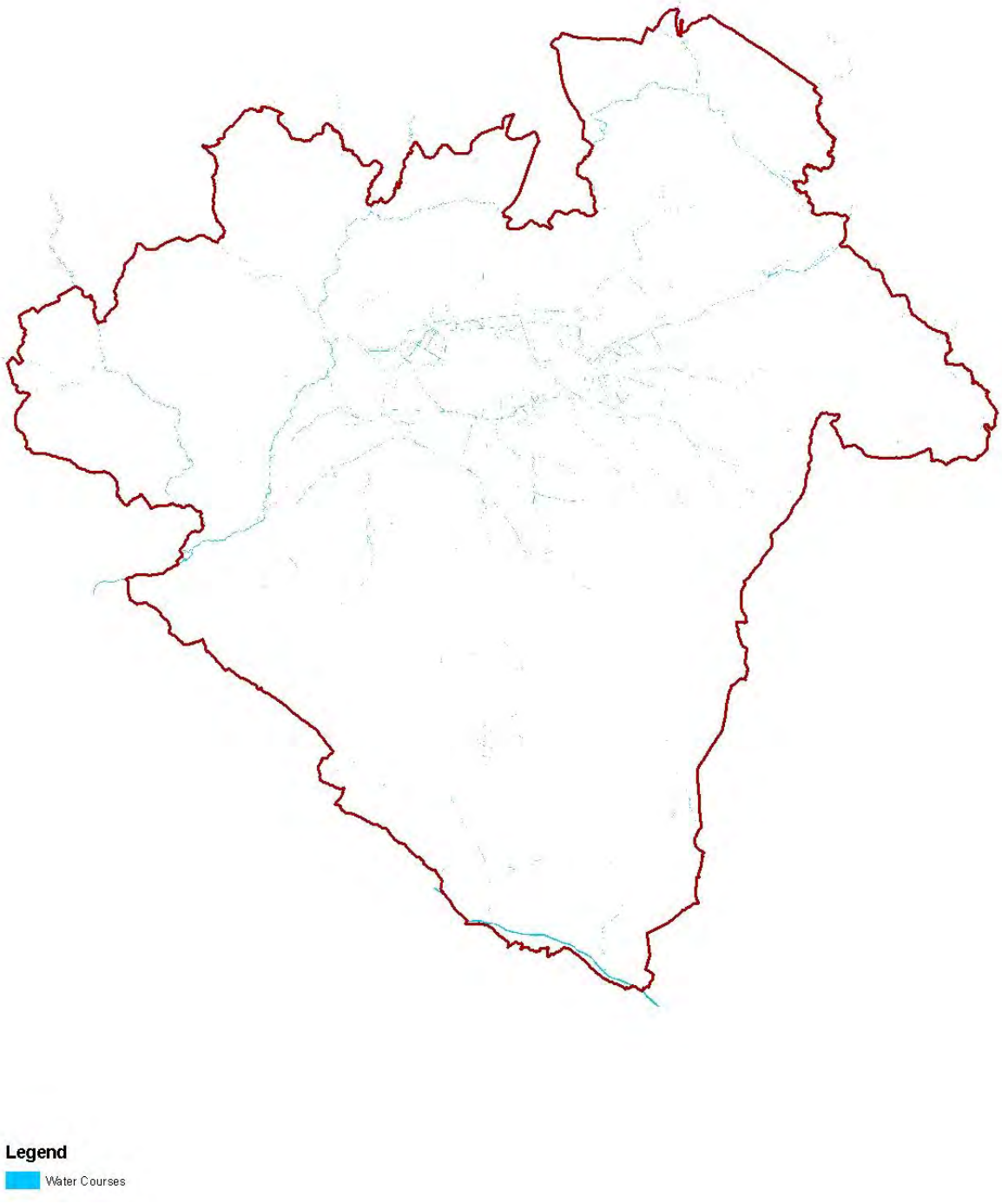
Water Courses



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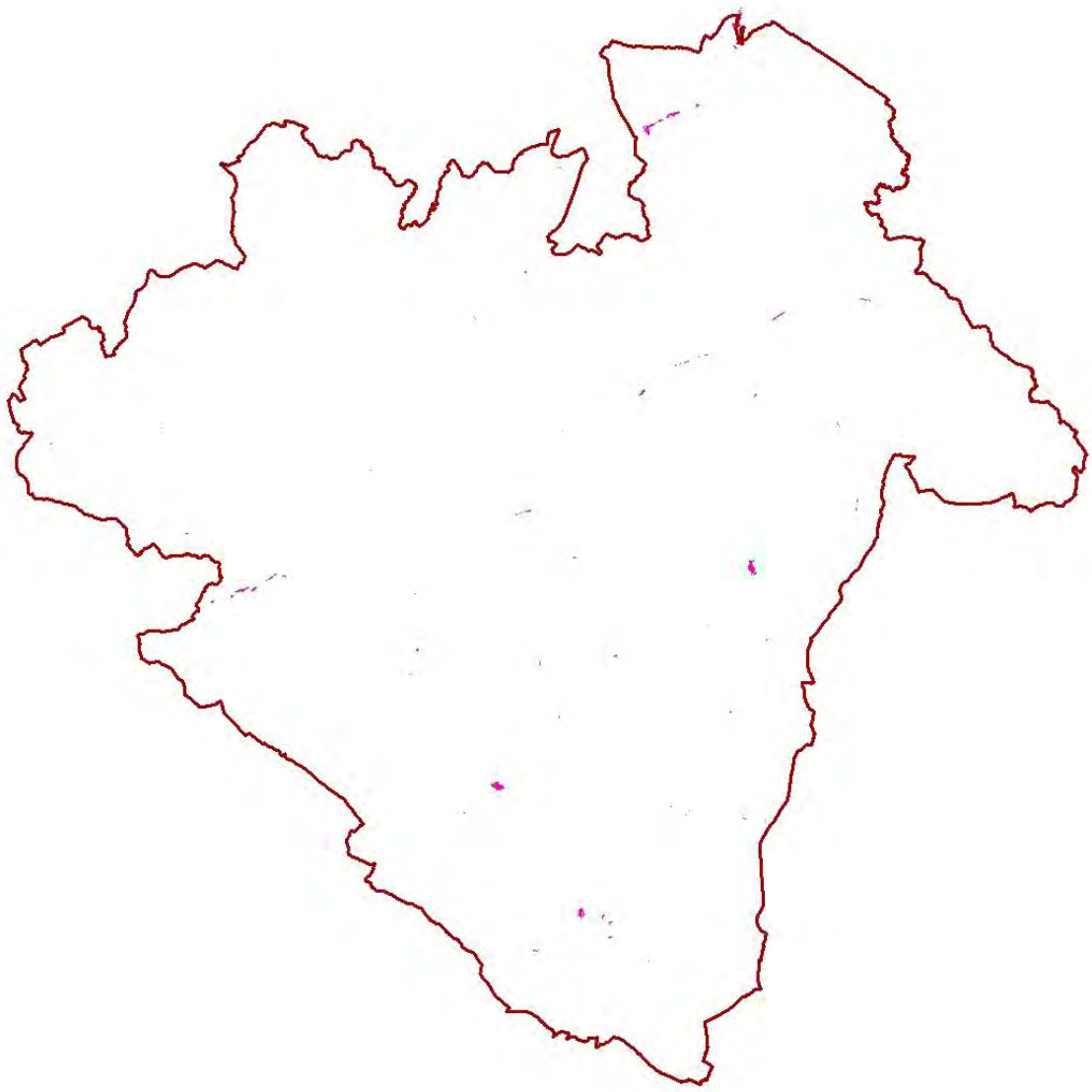
Wetland



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Wetland

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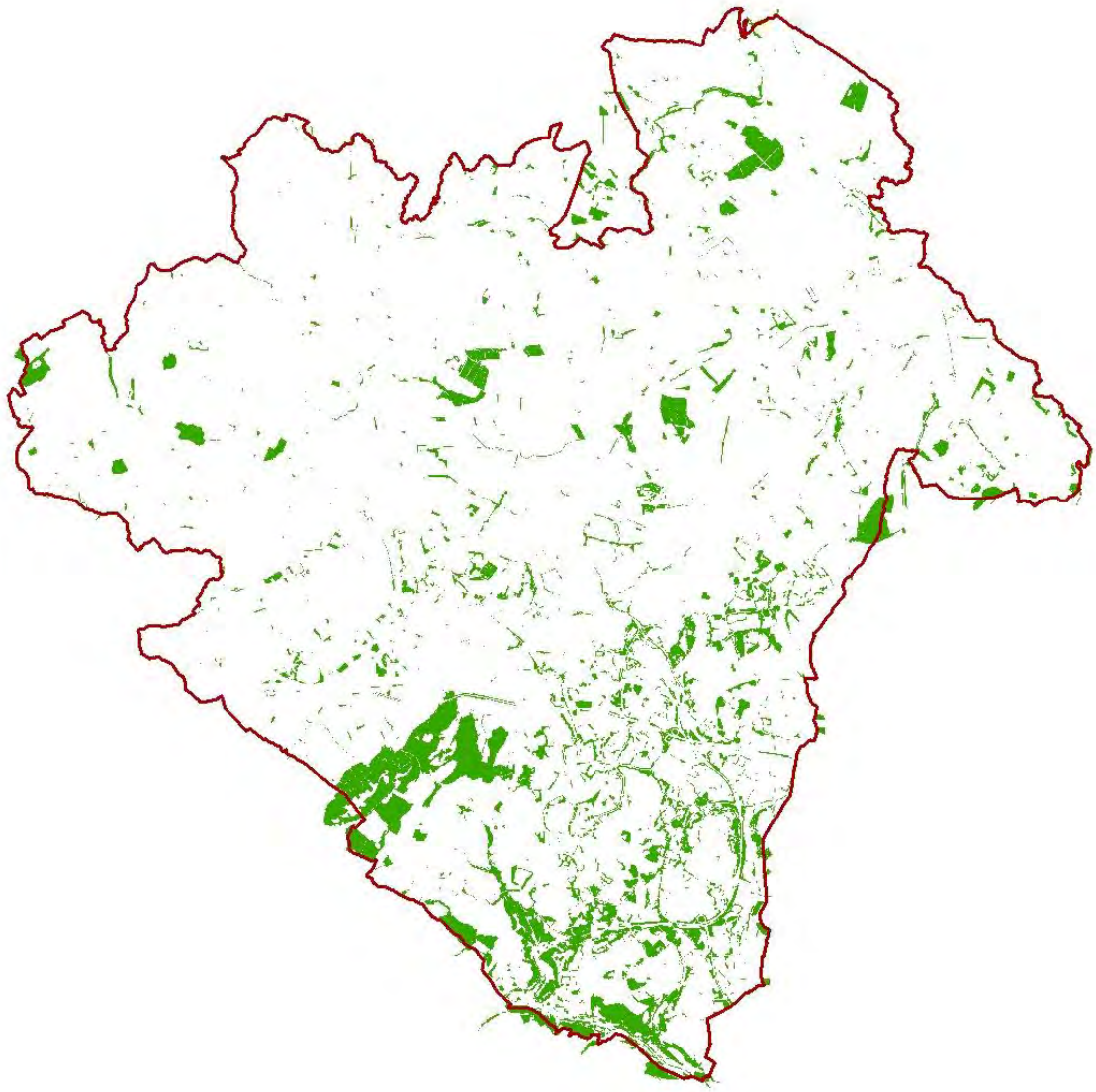
Woodland



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Woodland

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Appendix 4: Function Thresholds

The following tables take each function in turn and show under what circumstances each type of green infrastructure would be providing the function in question.

Does each type below perform: **AESTHETIC**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	A	
Allotments & Community Gardens	A	
Cemeteries, Churchyards & Burial Grounds	A	
Incidental Green Space	A	
Grassland, Heathland, Moorland, Scrubland	A	
Green Roofs	A	
Institutional Grounds	A	
Orchards	A	
Outdoor Sports Facilities	A	
Parks, Public Gardens & Recreation Grounds	A	
Private Domestic Gardens	A	
Street Trees	A	
Water Bodies	A	
Water Courses	A	
Wetlands	A	
Woodlands	A	

Does each type below perform: **ACCESSIBLE WATER STORAGE**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	N	
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	N	
Green Roofs	N	
Institutional Grounds	N	
Orchards	N	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	N	
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	A	
Water Courses	A	
Wetlands	S	Where open water on aerial photos
Woodlands	N	

Does each type below perform: **BIOFUELS PRODUCTION**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	where Energy Crops (Natural England data)
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	N	
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	N	
Green Roofs	N	
Institutional Grounds	N	
Orchards	N	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	N	
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	A	

Does each type below perform: **BURIAL SPACE**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	A	
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	N	
Green Roofs	N	
Institutional Grounds	N	
Orchards	N	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	N	
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	N	

Does each type below perform: **CARBON STORAGE**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	S	If significant tree cover
Incidental Green Space	S	If significant tree cover
Grassland, Heathland, Moorland, Scrubland	S	Peat soil/ significant tree cover
Green Roofs	S	If significant tree cover
Institutional Grounds	S	If significant tree cover
Orchards	A	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	S	If significant tree cover
Private Domestic Gardens	S	If significant tree cover
Street Trees	A	
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	A	

Does each type below perform: **CORRIDOR FOR WILDLIFE**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Allotments & Community Gardens	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Cemeteries, Churchyards & Burial Grounds	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Incidental Green Space	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Grassland, Heathland, Moorland, Scrubland	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Green Roofs	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Institutional Grounds	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Orchards	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Outdoor Sports Facilities	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Parks, Public Gardens & Recreation Grounds	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Private Domestic Gardens	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Street Trees	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Water Bodies	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Water Courses	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Wetlands	S	Buffer of 10m around and including habitats (if intersects by > 10%)
Woodlands	S	Buffer of 10m around and including habitats (if intersects by > 10%)

Does each type below perform: **CULTURAL ASSET**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	A	
Incidental Green Space	S	If Village Green
Grassland, Heathland, Moorland, Scrubland	N	
Green Roofs	S	As part of A3/A4 use class
Institutional Grounds	S	When part of museum grounds/church
Orchards	A	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	A	
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	N	

Does each type below perform: **EVAPORATIVE COOLING**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	A	
Allotments & Community Gardens	A	
Cemeteries, Churchyards & Burial Grounds	A	
Incidental Green Space	A	
Grassland, Heathland, Moorland, Scrubland	A	
Green Roofs	A	
Institutional Grounds	A	
Orchards	A	
Outdoor Sports Facilities	A	
Parks, Public Gardens & Recreation Grounds	A	
Private Domestic Gardens	A	
Street Trees	A	
Water Bodies	A	
Water Courses	A	
Wetlands	A	
Woodlands	A	

Does each type below perform: **FLOW REDUCTION THROUGH SURFACE ROUGHNESS**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	N	
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	S	If slope < 5^0
Green Roofs	N	
Institutional Grounds	N	
Orchards	S	If rough ground / dense ground cover and slope < 5^0
Outdoor Sports Facilities	S	If rough ground / dense ground cover and slope < 5^0
Parks, Public Gardens & Recreation Grounds	N	
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	N	
Water Courses	N	
Wetlands	S	If slope < 5^0
Woodlands	S	If slope < 5^0

Does each type below perform: **FOOD PRODUCTION**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	A	
Allotments & Community Gardens	A	
Cemeteries, Churchyards & Burial Grounds	N	
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	N	
Green Roofs	S	If food producing plants
Institutional Grounds	N	
Orchards	A	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	N	
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	S	If fishing licence
Water Courses	S	If fishing licence
Wetlands	N	
Woodlands	N	

Does each type below perform: **GREEN TRAVEL ROUTE**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	Within 2m of B roads, PROW, Sustrans
Allotments & Community Gardens	S	Within 2m of B roads, PROW, Sustrans
Cemeteries, Churchyards & Burial Grounds	S	Within 2m of B roads, PROW, Sustrans
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	S	Within 2m of B roads, PROW, Sustrans
Green Roofs	N	
Institutional Grounds	N	
Orchards	S	Within 2m of B roads, PROW, Sustrans
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	S	Within 2m of B roads, PROW, Sustrans
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	S	Within 2m of B roads, PROW, Sustrans
Water Courses	S	Within 2m of B roads, PROW, Sustrans
Wetlands	S	Within 2m of B roads, PROW, Sustrans
Woodlands	S	Within 2m of B roads, PROW, Sustrans

Does each type below perform: **GROUND STABILISATION**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	S	Areas prone to erosion - steep slopes > 16^0, flood plains
Incidental Green Space	S	Areas prone to erosion - steep slopes > 16^0, flood plains
Grassland, Heathland, Moorland, Scrubland	S	Areas prone to erosion - steep slopes > 16^0, flood plains
Green Roofs	N	
Institutional Grounds	S	Areas prone to erosion - steep slopes >16^0, flood plains
Orchards	S	Areas prone to erosion - steep slopes >16^0, flood plains
Outdoor Sports Facilities	S	Areas prone to erosion - steep slopes >16^0, flood plains
Parks, Public Gardens & Recreation Grounds	S	Areas prone to erosion - steep slopes >16^0, flood plains
Private Domestic Gardens	S	Areas prone to erosion - steep slopes >16^0, flood plains
Street Trees	S	Areas prone to erosion - steep slopes >16^0, flood plains
Water Bodies	N	
Water Courses	N	
Wetlands	S	Areas prone to erosion - steep slopes >16^0, flood plains
Woodlands	S	Areas prone to erosion - steep slopes >16^0, flood plains

Does each type below perform: **HABITAT FOR WILDLIFE**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	Environmental Stewardship Schemes
Allotments & Community Gardens	S	Designated sites, sensitive management, eco features
Cemeteries, Churchyards & Burial Grounds	S	Designated sites, sensitive management, eco features
Incidental Green Space	S	Designated sites, sensitive management, eco features. Where conservation verge - identified by mgt (grass grade (6-9) less frequent cut
Grassland, Heathland, Moorland, Scrubland	A	
Green Roofs	A	
Institutional Grounds	S	Designated sites, sensitive management, eco features
Orchards	A	
Outdoor Sports Facilities	S	Designated sites, sensitive management, eco features
Parks, Public Gardens & Recreation Grounds	S	Designated sites, sensitive management, eco features
Private Domestic Gardens	S	Designated sites, sensitive management, eco features
Street Trees	A	
Water Bodies	A	
Water Courses	A	
Wetlands	A	
Woodlands	A	

Does each type below perform: **HERITAGE**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchard, ancient trees/woodlands
Allotments & Community Gardens	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Cemeteries, Churchyards & Burial Grounds	A	
Incidental Green Space	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Grassland, Heathland, Moorland, Scrubland	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Green Roofs	N	
Institutional Grounds	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Orchards	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Outdoor Sports Facilities	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Parks, Public Gardens & Recreation Grounds	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Private Domestic Gardens	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Street Trees	S	If within conservation area/TPO
Water Bodies	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Water Courses	S	Designated WHS, conservation area or Canal
Wetlands	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands
Woodlands	S	Designated WHS, conservation area, scheduled monuments, historic park/garden, orchards, ancient trees/woodlands

Does each type below perform: **INACCESSIBLE WATER STORAGE**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	High porosity soil or SUDS present and not colliery spoil
Allotments & Community Gardens	S	High porosity soil or SUDS present and not colliery spoil
Cemeteries, Churchyards & Burial Grounds	S	High porosity soil or SUDS present and not colliery spoil
Incidental Green Space	S	High porosity soil or SUDS present and not colliery spoil
Grassland, Heathland, Moorland, Scrubland	S	High porosity soil or SUDS present and not colliery spoil
Green Roofs	S	If trees present
Institutional Grounds	S	High porosity soil or SUDS present and not colliery spoil
Orchards	A	
Outdoor Sports Facilities	S	High porosity soil or SUDS present and not colliery spoil
Parks, Public Gardens & Recreation Grounds	S	High porosity soil or SUDS present and not colliery spoil
Private Domestic Gardens	S	High porosity soil or SUDS present and not colliery spoil
Street Trees	S	High porosity soil or SUDS present and not colliery spoil
Water Bodies	N	
Water Courses	N	
Wetlands	A	
Woodlands	A	

Does each type below perform: **LEARNING**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	Farm open days, learning farms (e.g. Hoo/Harper)
Allotments & Community Gardens	S	If ranger/ educations skills group
Cemeteries, Churchyards & Burial Grounds	N	
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	S	If visitor centre
Green Roofs	S	If designed accordingly
Institutional Grounds	S	Grounds of educational establishments
Orchards	N	
Outdoor Sports Facilities	S	Grounds of educational establishments
Parks, Public Gardens & Recreation Grounds	S	If visitor centre
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	N	
Water Courses	N	
Wetlands	S	If visitor centre / grounds of educational establishment
Woodlands	S	If visitor centre / grounds of educational establishment / where used for forest schools

Does each type below perform: **NOISE ABSORPTION**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	S	If significant tree cover & close to road/rail
Incidental Green Space	S	If significant tree cover & close to road/rail
Grassland, Heathland, Moorland, Scrubland	S	If significant tree cover & close to road/rail
Green Roofs	S	If significant tree cover & close to road/rail
Institutional Grounds	S	If significant tree cover & close to road/rail
Orchards	S	If within 250m of road/rail
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	S	If significant tree cover & close to road/rail
Private Domestic Gardens	S	If significant tree cover & close to road/rail
Street Trees	S	If within 250m of road/rail
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	S	If within 250m of road/rail

Does each type below perform: **POLLUTANT REMOVAL FROM SOIL/WATER**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	If SUDS / High levels of vegetation
Allotments & Community Gardens	S	If SUDS / High levels of vegetation
Cemeteries, Churchyards & Burial Grounds	S	If SUDS / High levels of vegetation
Incidental Green Space	S	If SUDS / High levels of vegetation
Grassland, Heathland, Moorland, Scrubland	S	If SUDS / High levels of vegetation
Green Roofs	A	
Institutional Grounds	S	If SUDS / High levels of vegetation
Orchards	A	
Outdoor Sports Facilities	S	If SUDS / High levels of vegetation
Parks, Public Gardens & Recreation Grounds	S	If SUDS / High levels of vegetation
Private Domestic Gardens	S	If SUDS / High levels of vegetation
Street Trees	A	
Water Bodies	S	If SUDS / High levels of vegetation
Water Courses	S	If SUDS / High levels of vegetation
Wetlands	A	
Woodlands	A	

Does each type below perform: **PRIVATE RECREATION**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	N	
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	N	
Green Roofs	S	If no public access
Institutional Grounds	N	
Orchards	S	If no public access
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	N	
Private Domestic Gardens	A	
Street Trees	N	
Water Bodies	S	If no public access
Water Courses	N	
Wetlands	N	
Woodlands	S	If no public access

Does each type below perform: **PUBLIC RECREATION**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	S	If publicly accessible
Cemeteries, Churchyards & Burial Grounds	A	
Incidental Green Space	S	If suitable size, and publicly accessible
Grassland, Heathland, Moorland, Scrubland	S	If publicly accessible
Green Roofs	S	If publicly accessible
Institutional Grounds	S	If publicly accessible
Orchards	S	If publicly accessible
Outdoor Sports Facilities	A	
Parks, Public Gardens & Recreation Grounds	A	
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	S	If publicly accessible
Water Courses	S	If publicly accessible
Wetlands	S	If publicly accessible
Woodlands	S	If publicly accessible

Does each type below perform: **PUBLIC RECREATION WITH RESTRICTIONS**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	If PROW/ farm open days
Allotments & Community Gardens	S	Unless publicly accessible
Cemeteries, Churchyards & Burial Grounds	N	
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	N	
Green Roofs	N	
Institutional Grounds	N	
Orchards	S	If entrance fee/restricted access
Outdoor Sports Facilities	A	
Parks, Public Gardens & Recreation Grounds	S	If entrance fee/restricted access
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	S	If entrance fee/restricted access
Water Courses	N	
Wetlands	N	
Woodlands	S	If entrance fee/restricted access

Does each type below perform: **SHADING FROM THE SUN**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	If trees/hedges present
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	S	If significant tree cover
Incidental Green Space	S	If significant tree cover
Grassland, Heathland, Moorland, Scrubland	S	If significant tree cover
Green Roofs	S	If includes trees
Institutional Grounds	S	If significant tree cover
Orchards	A	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	S	If significant tree cover
Private Domestic Gardens	S	If significant tree cover
Street Trees	A	
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodland	A	

Does each type below perform: **TIMBER PRODUCTION**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	N	
Incidental Green Space	N	
Grassland, Heathland, Moorland, Scrubland	N	
Green Roofs	N	
Institutional Grounds	N	
Orchards	N	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	N	
Private Domestic Gardens	N	
Street Trees	N	
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	A	

Does each type below perform: **TRAPPING AIR POLLUTANTS**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	S	If significant tree cover
Incidental Green Space	S	If significant tree cover
Grassland, Heathland, Moorland, Scrubland	S	If significant tree cover
Green Roofs	S	If significant tree cover
Institutional Grounds	S	If significant tree cover
Orchards	A	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	S	If significant tree cover
Private Domestic Gardens	S	If significant tree cover
Street Trees	A	
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	A	

Does each type below perform: **WATER CONVEYANCE**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	SUDS / Open air drain (MM Anno)
Allotments & Community Gardens	S	SUDS / Open air drain (MM Anno)
Cemeteries, Churchyards & Burial Grounds	S	SUDS / Open air drain (MM Anno)
Incidental Green Space	S	SUDS / Open air drain (MM Anno)
Grassland, Heathland, Moorland, Scrubland	S	SUDS / Open air drain (MM Anno)
Green Roofs	N	
Institutional Grounds	S	SUDS / Open air drain (MM Anno)
Orchards	S	SUDS / Open air drain (MM Anno)
Outdoor Sports Facilities	S	SUDS / Open air drain (MM Anno)
Parks, Public Gardens & Recreation Grounds	S	SUDS / Open air drain (MM Anno)
Private Domestic Gardens	S	SUDS / Open air drain (MM Anno)
Street Trees	N	
Water Bodies	S	SUDS / Open air drain (MM Anno)
Water Courses	A	
Wetlands	S	SUDS / Open air drain (MM Anno)
Woodlands	S	SUDS / Open air drain (MM Anno)

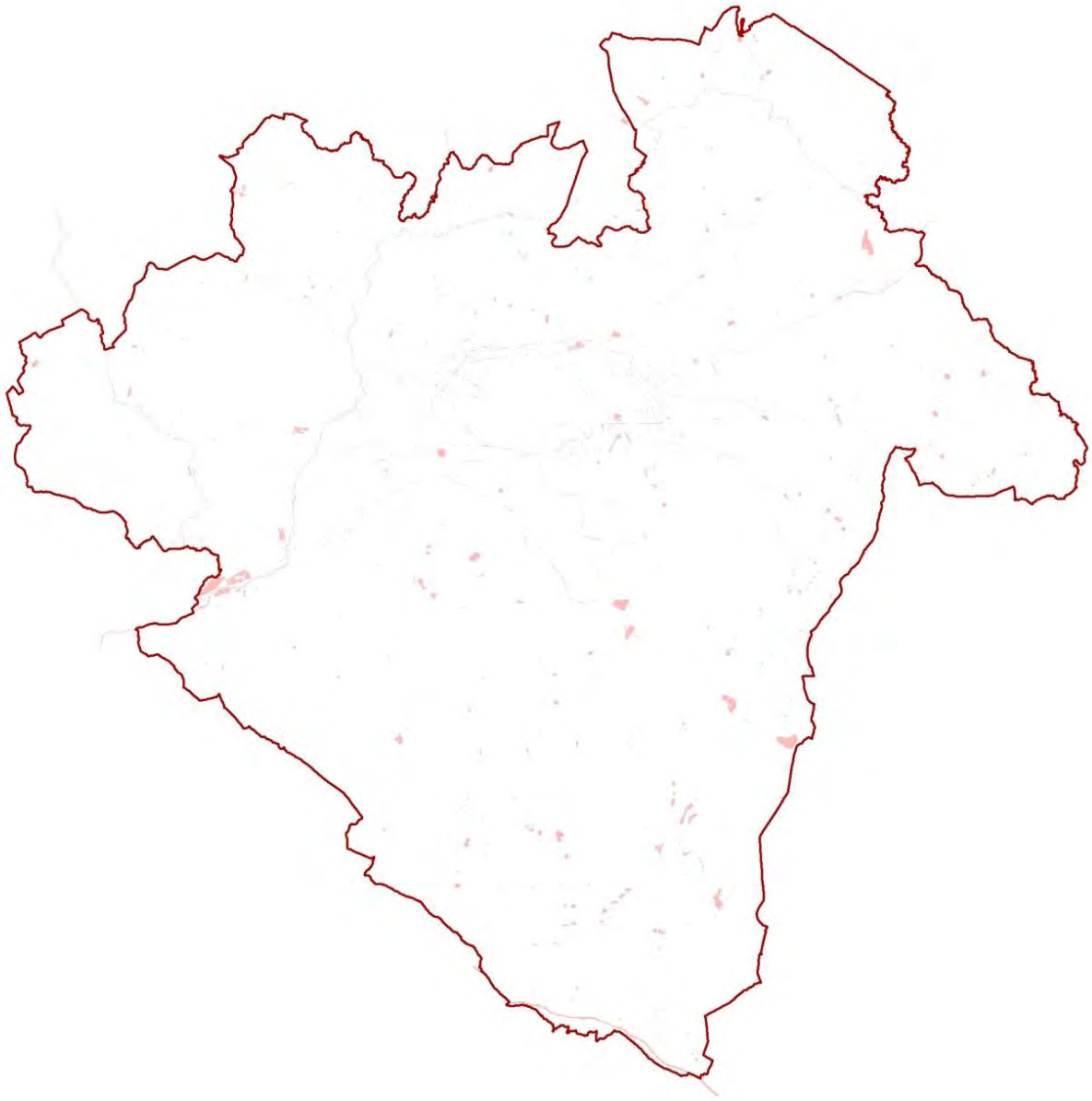
Does each type below perform: **WATER INFILTRATION**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	S	High porosity soils / large trees
Allotments & Community Gardens	S	High porosity soils / large trees
Cemeteries, Churchyards & Burial Grounds	S	High porosity soils / large trees
Incidental Green Space	S	High porosity soils / large trees
Grassland, Heathland, Moorland, Scrubland	S	High porosity soils / large trees
Green Roofs	N	
Institutional Grounds	S	High porosity soils / large trees
Orchards	S	High porosity soils / large trees
Outdoor Sports Facilities	S	High porosity soils / large trees
Parks, Public Gardens & Recreation Grounds	S	High porosity soils / large trees
Private Domestic Gardens	S	High porosity soils / large trees
Street Trees	S	High porosity soils / large trees
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	S	High porosity soils / large trees

Does each type below perform: **WATER INTERCEPTION**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	S	If significant tree cover
Incidental Green Space	S	If significant tree cover
Grassland, Heathland, Moorland, Scrubland	N	
Green Roofs	N	
Institutional Grounds	S	If significant tree cover
Orchards	S	If significant tree cover
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	N	
Private Domestic Gardens	S	If significant tree cover
Street Trees	S	If significant tree cover
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	A	

Does each type below perform: **WIND SHELTER**	**Always (A), Sometimes (S), Never (N)**	**If Sometimes, under what circumstances is it performed – a threshold**
Agricultural Land	N	
Allotments & Community Gardens	N	
Cemeteries, Churchyards & Burial Grounds	S	If significant tree cover
Incidental Green Space	S	If significant tree cover
Grassland, Heathland, Moorland, Scrubland	S	If significant tree cover
Green Roofs	S	If trees present
Institutional Grounds	S	If significant tree cover
Orchards	A	
Outdoor Sports Facilities	N	
Parks, Public Gardens & Recreation Grounds	S	If significant tree cover
Private Domestic Gardens	S	If significant tree cover
Street Trees	A	
Water Bodies	N	
Water Courses	N	
Wetlands	N	
Woodlands	A	

Appendix 5: Function Maps

Accessible Water Storage Function



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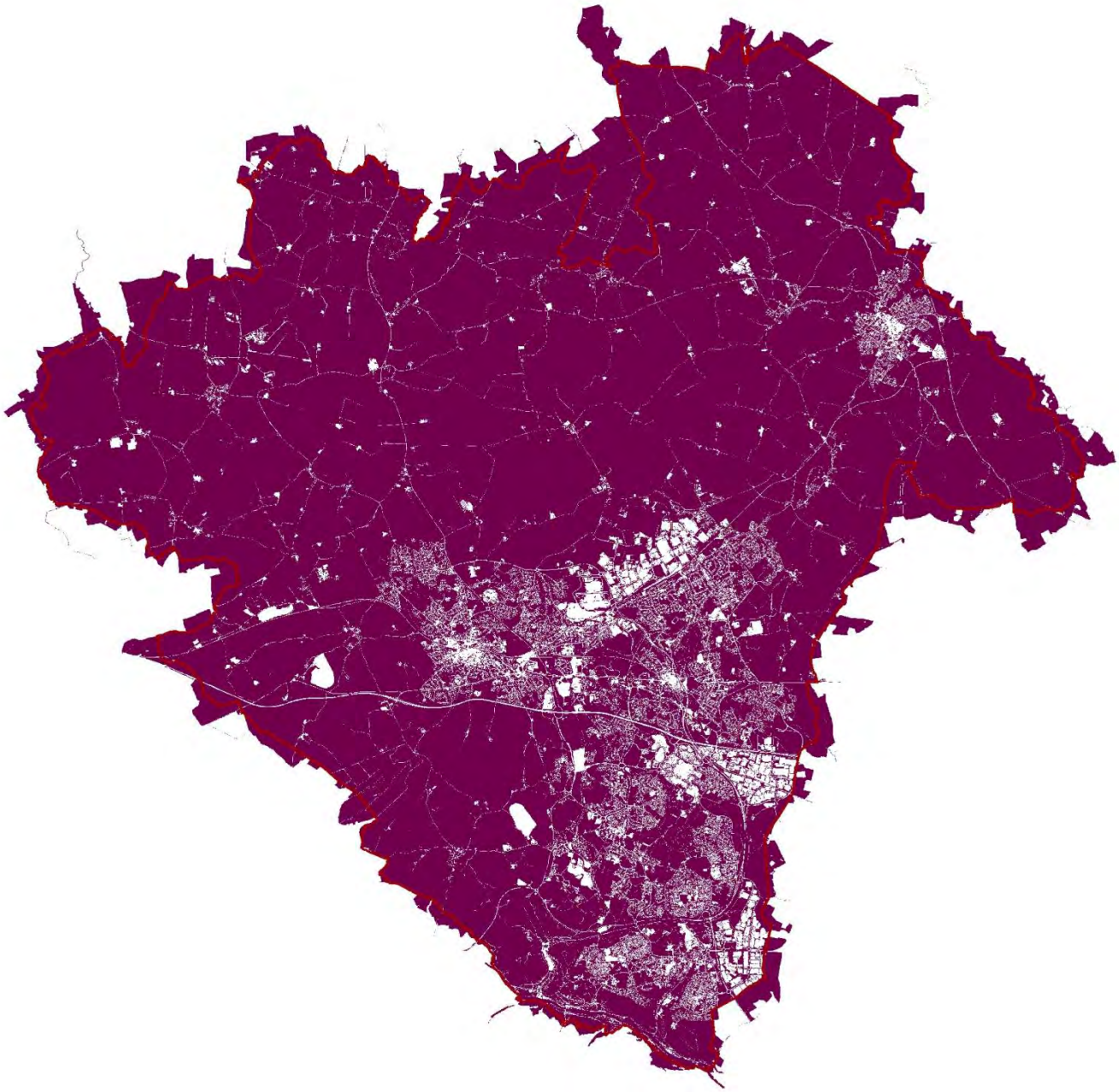
Aesthetic Function



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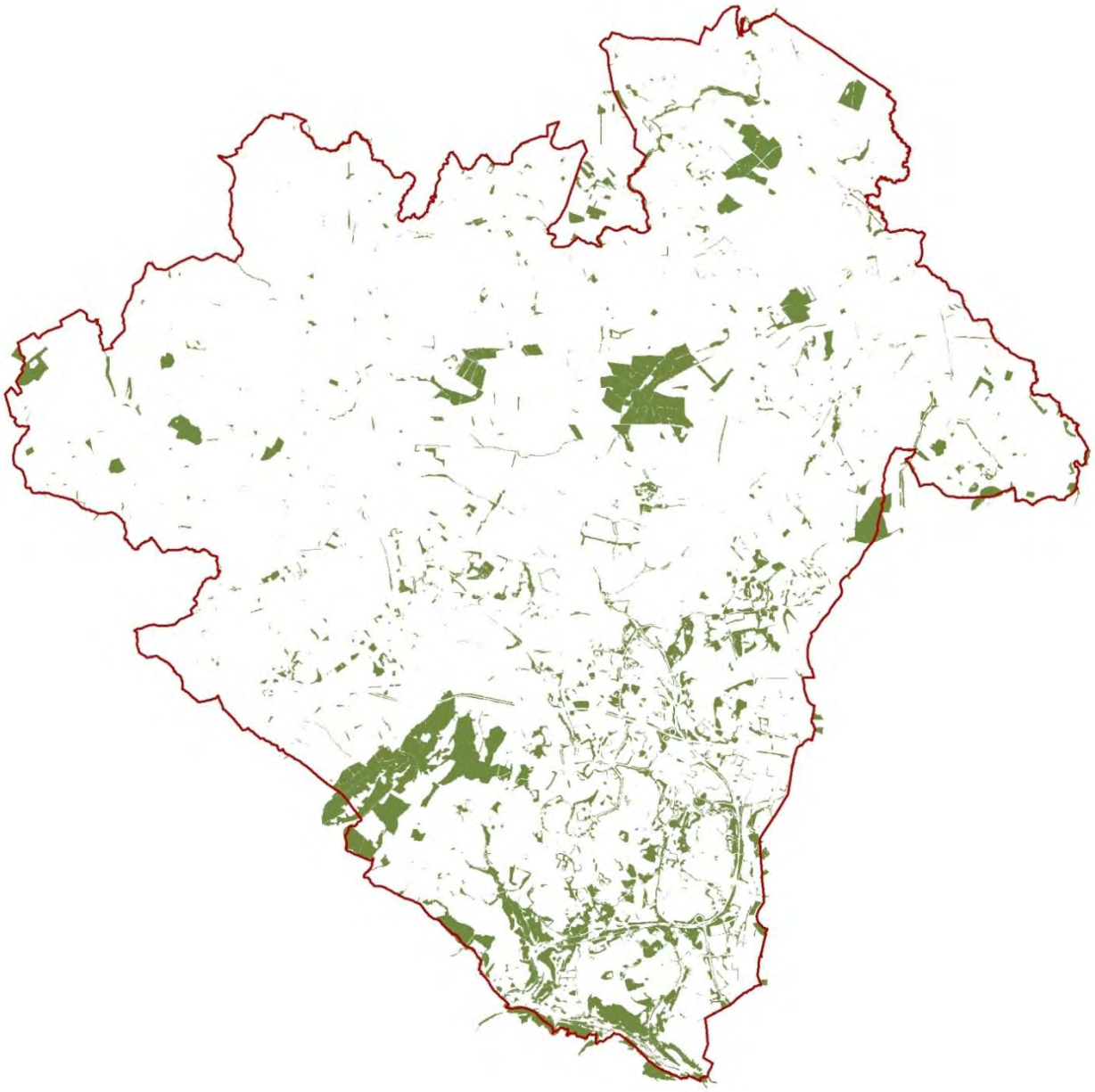
Biofuels Production Function



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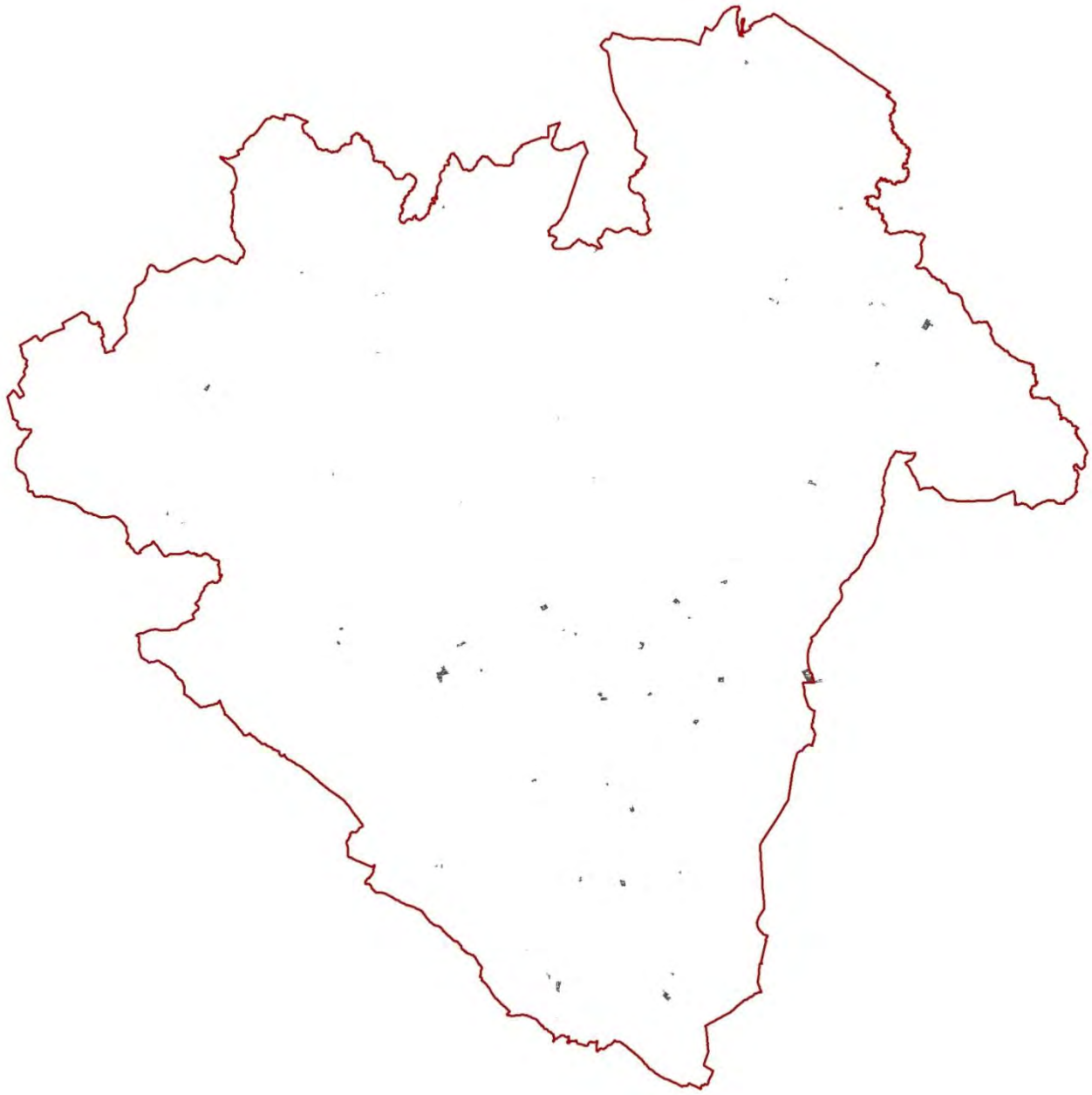
Burial Space Function



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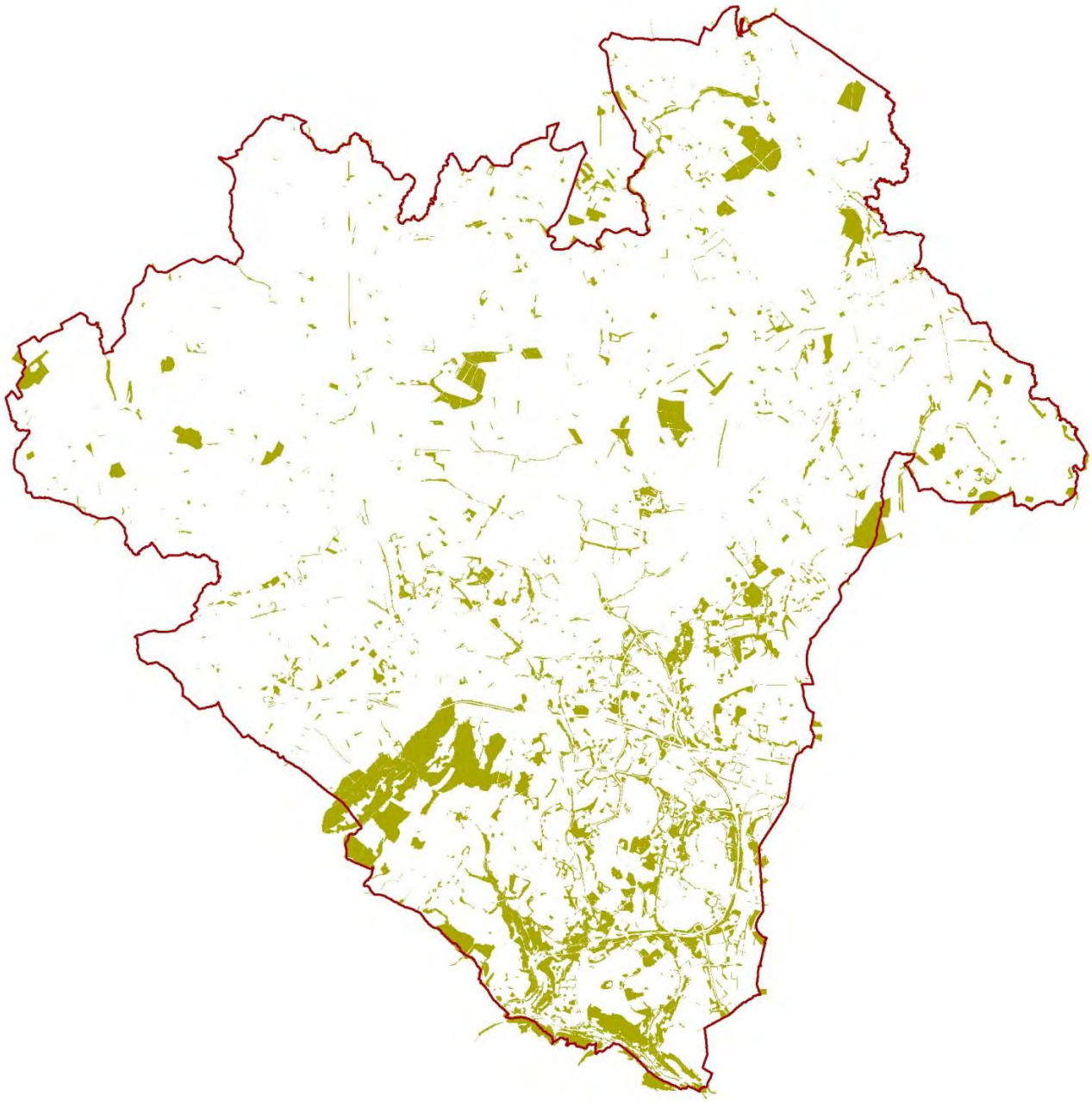
Carbon Storage Function



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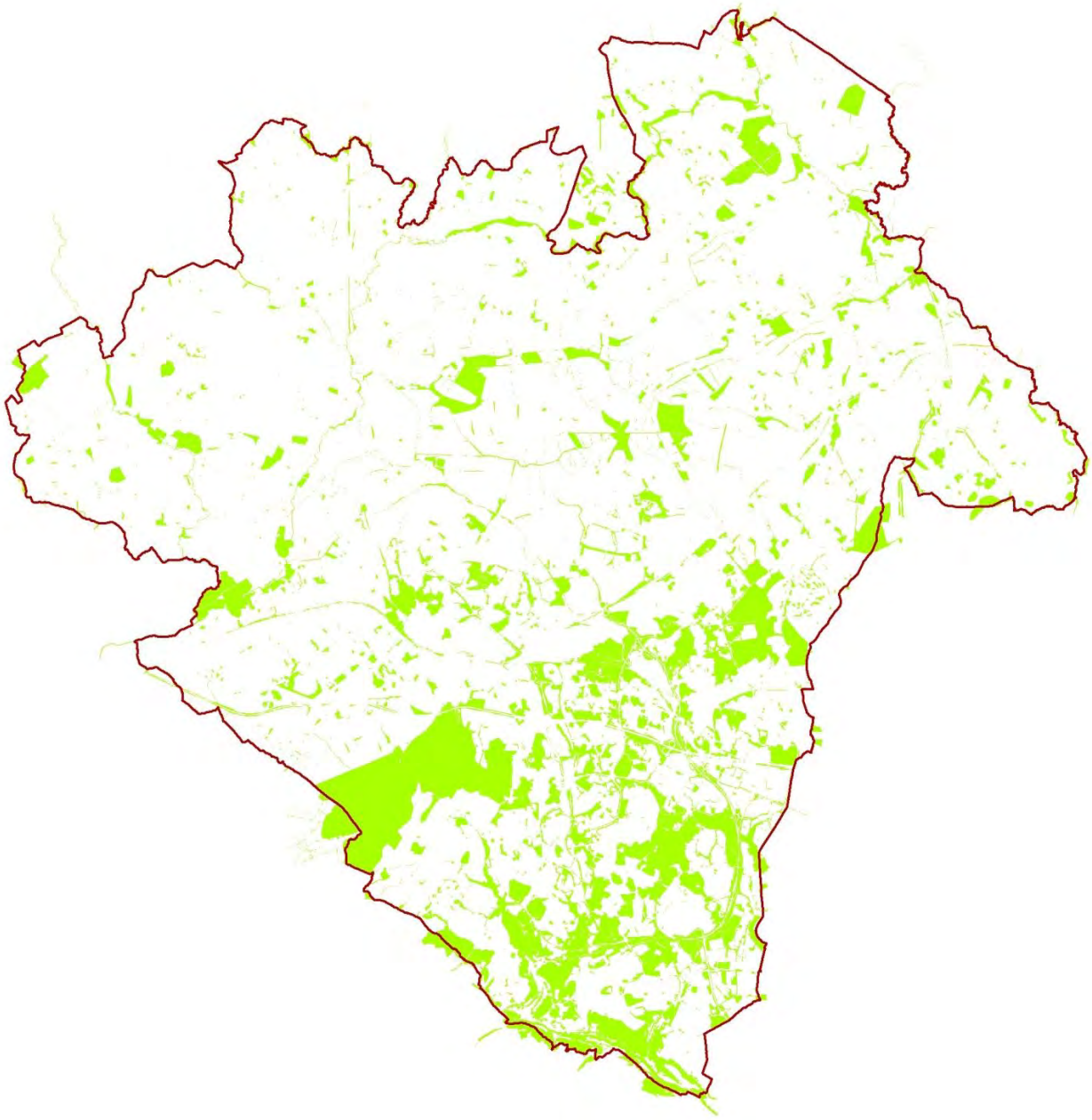
Corridor for Wildlife Function



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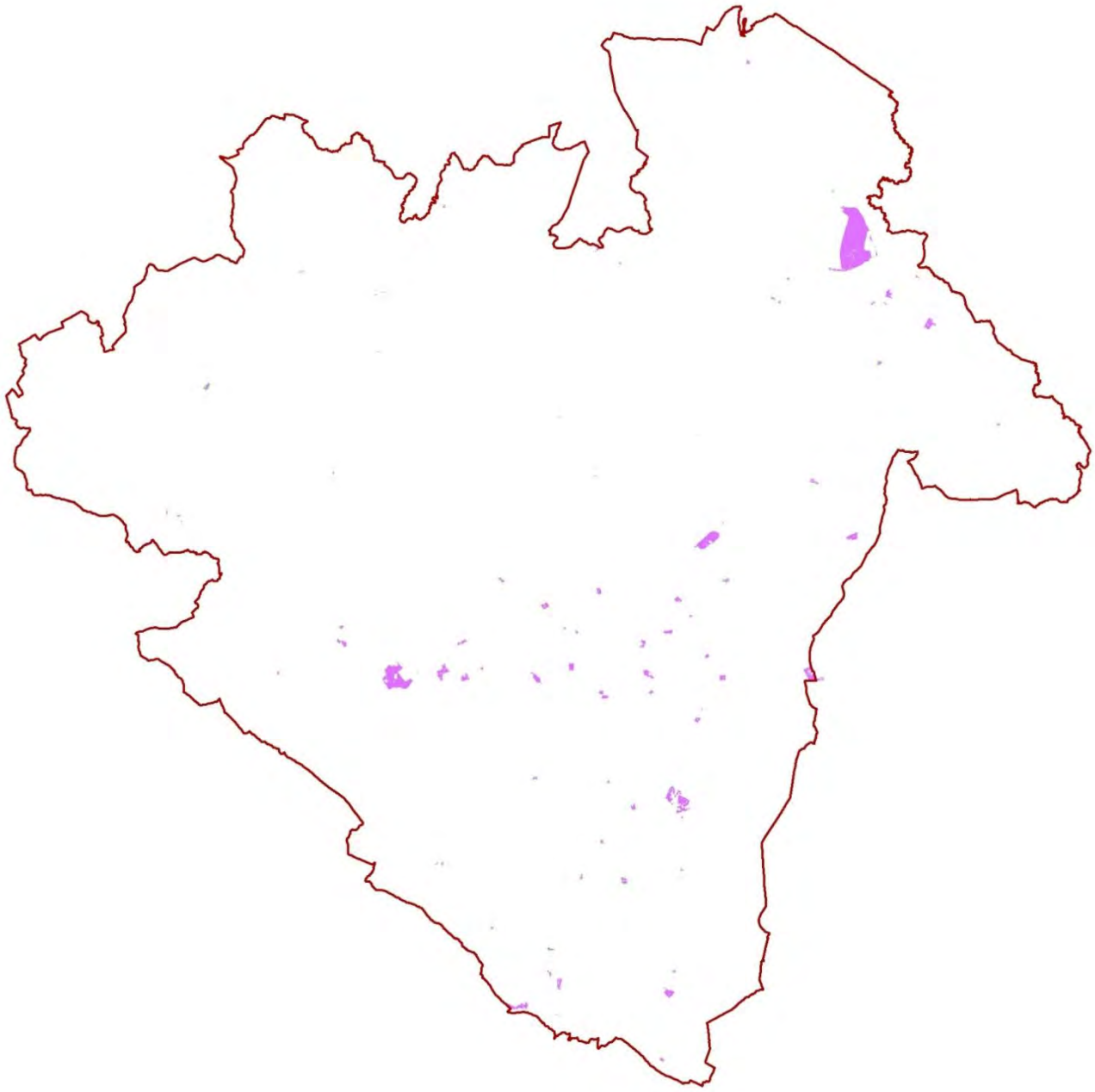
Cultural Asset Function



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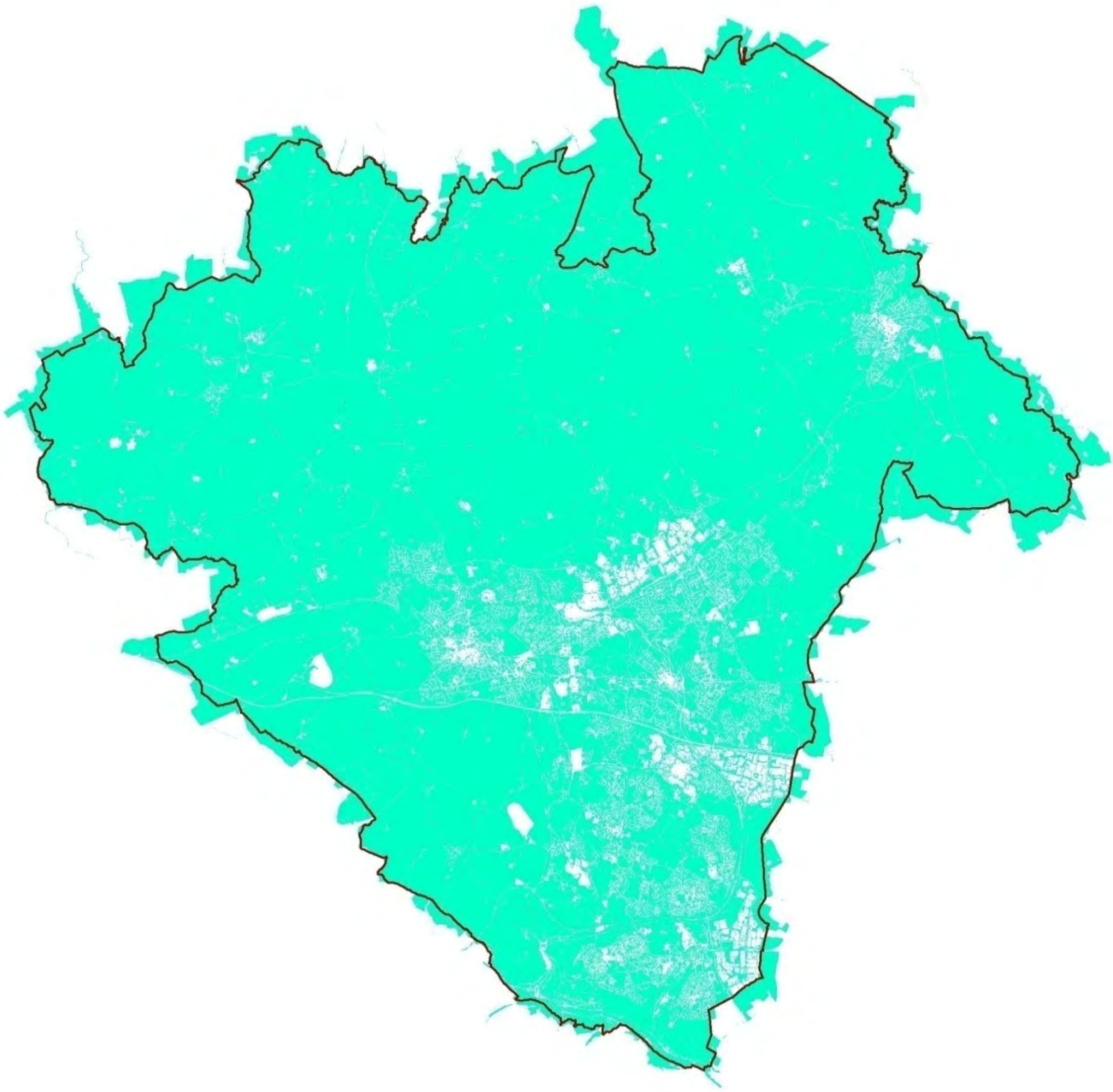
Evaporative Cooling Function



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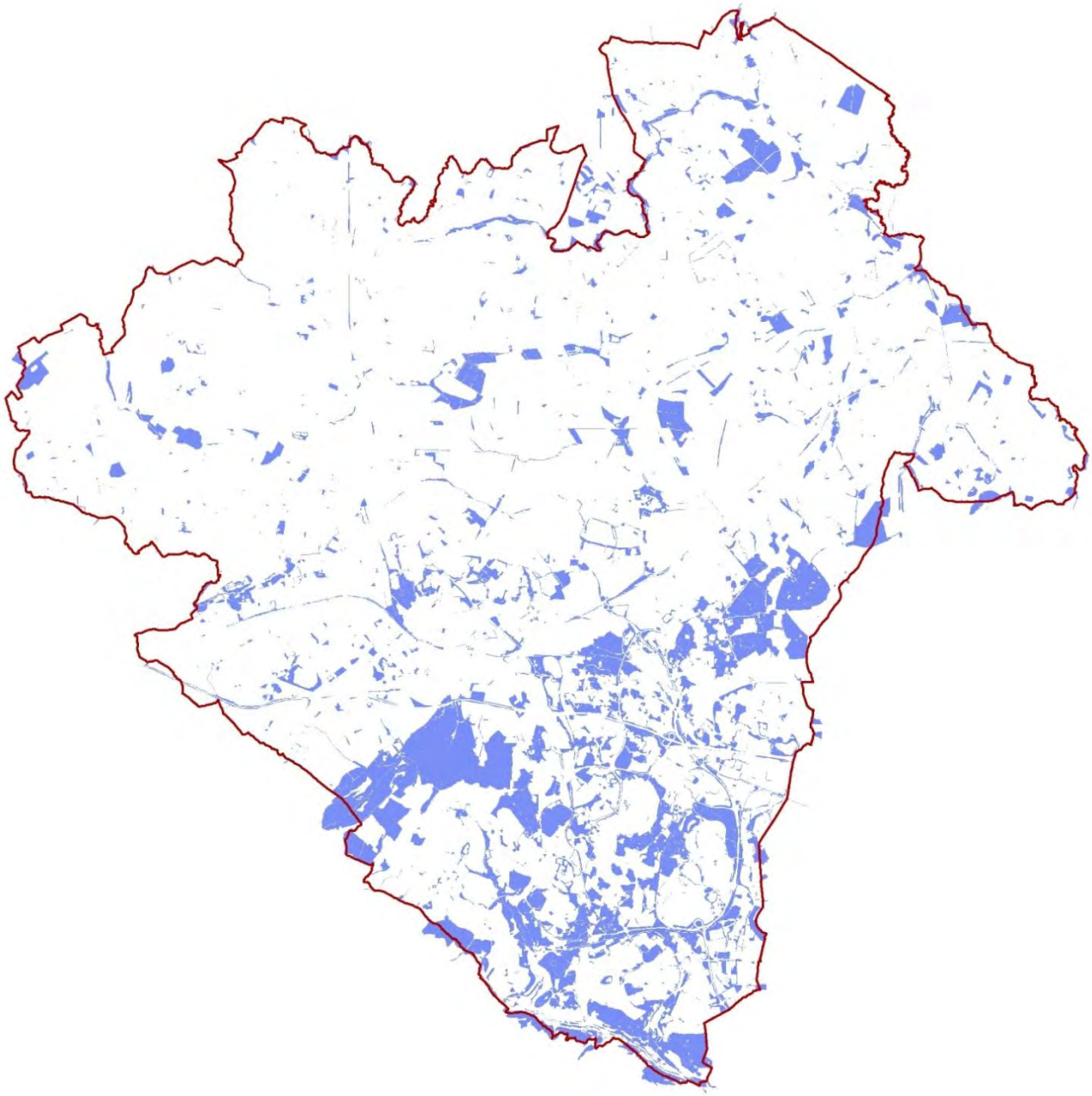
Flow Reduction through Surface Roughness Function



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Food Production Function

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Green Travel Route Function

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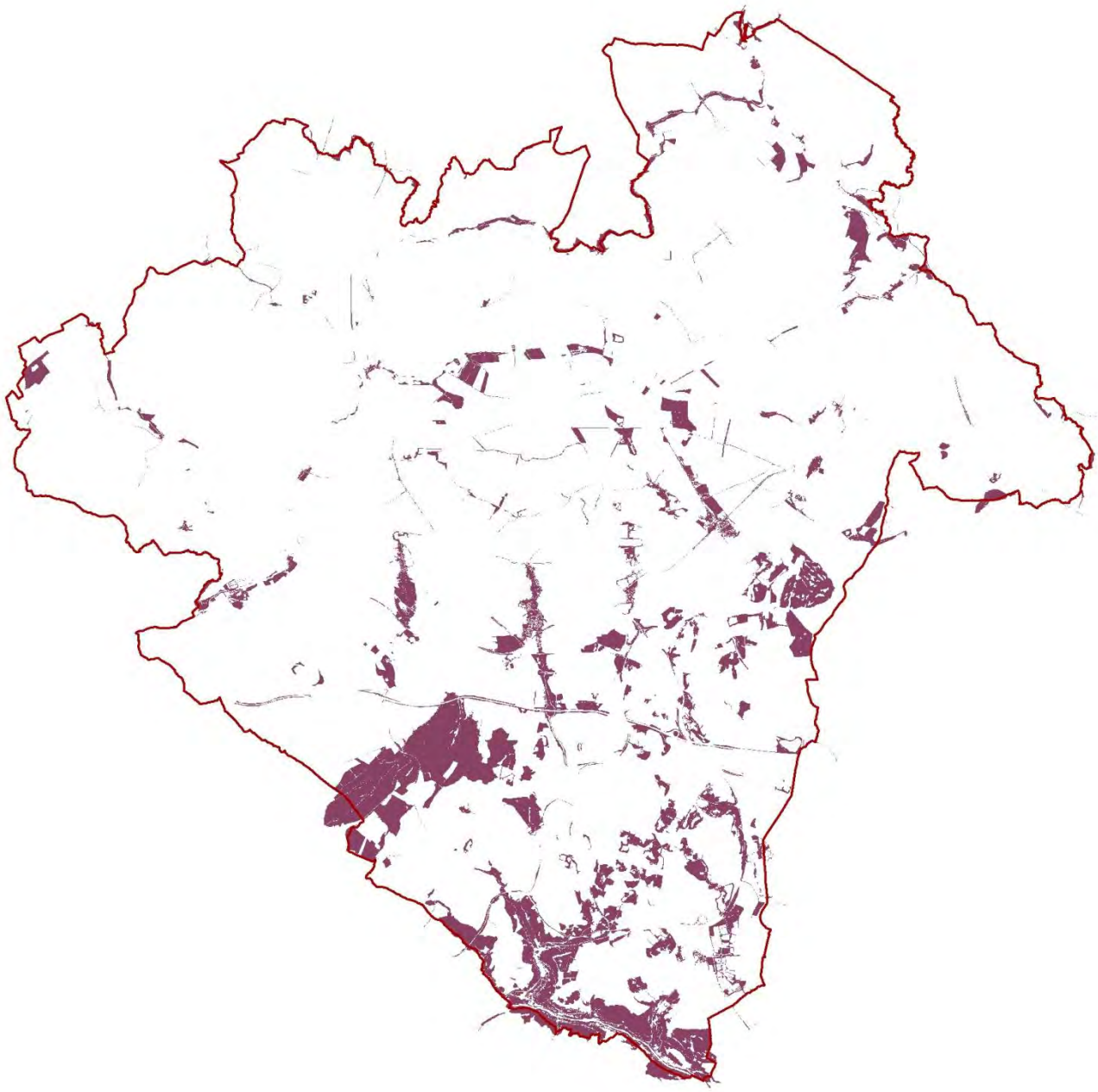
Ground Stabilisation Function



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Habitat for Wildlife Function

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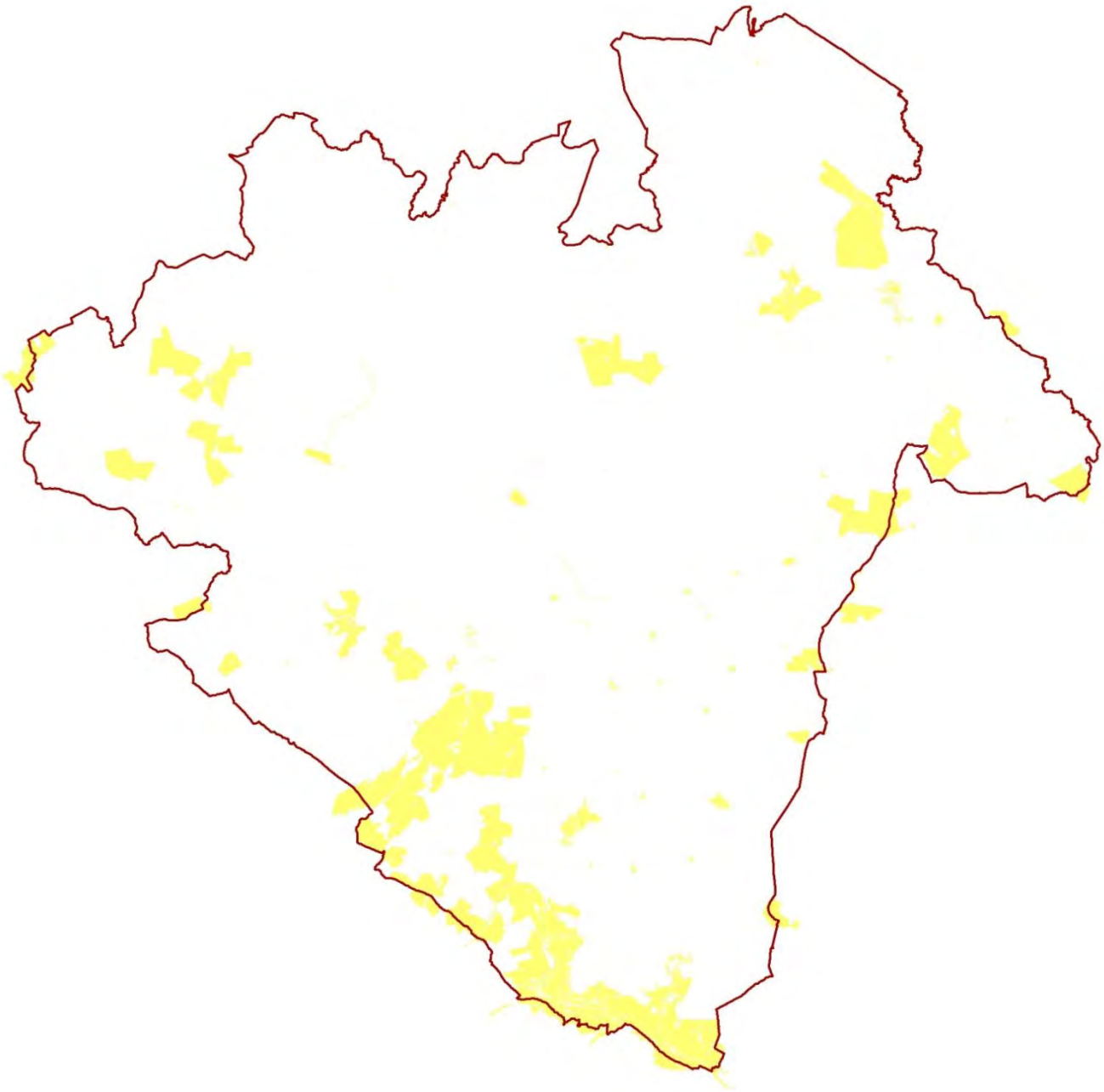
Heritage Function



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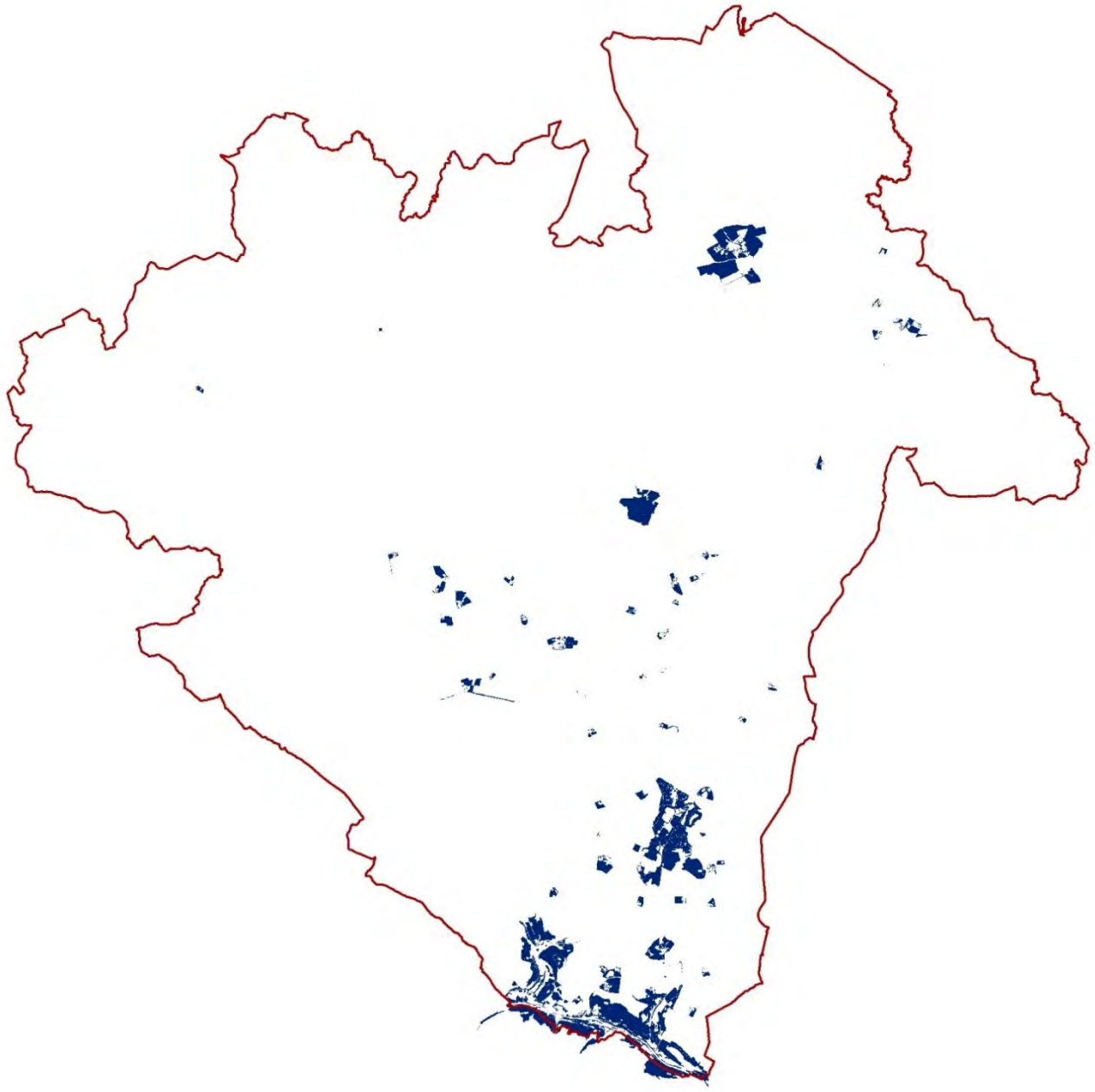
Learning Function



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Noise Absorption Function

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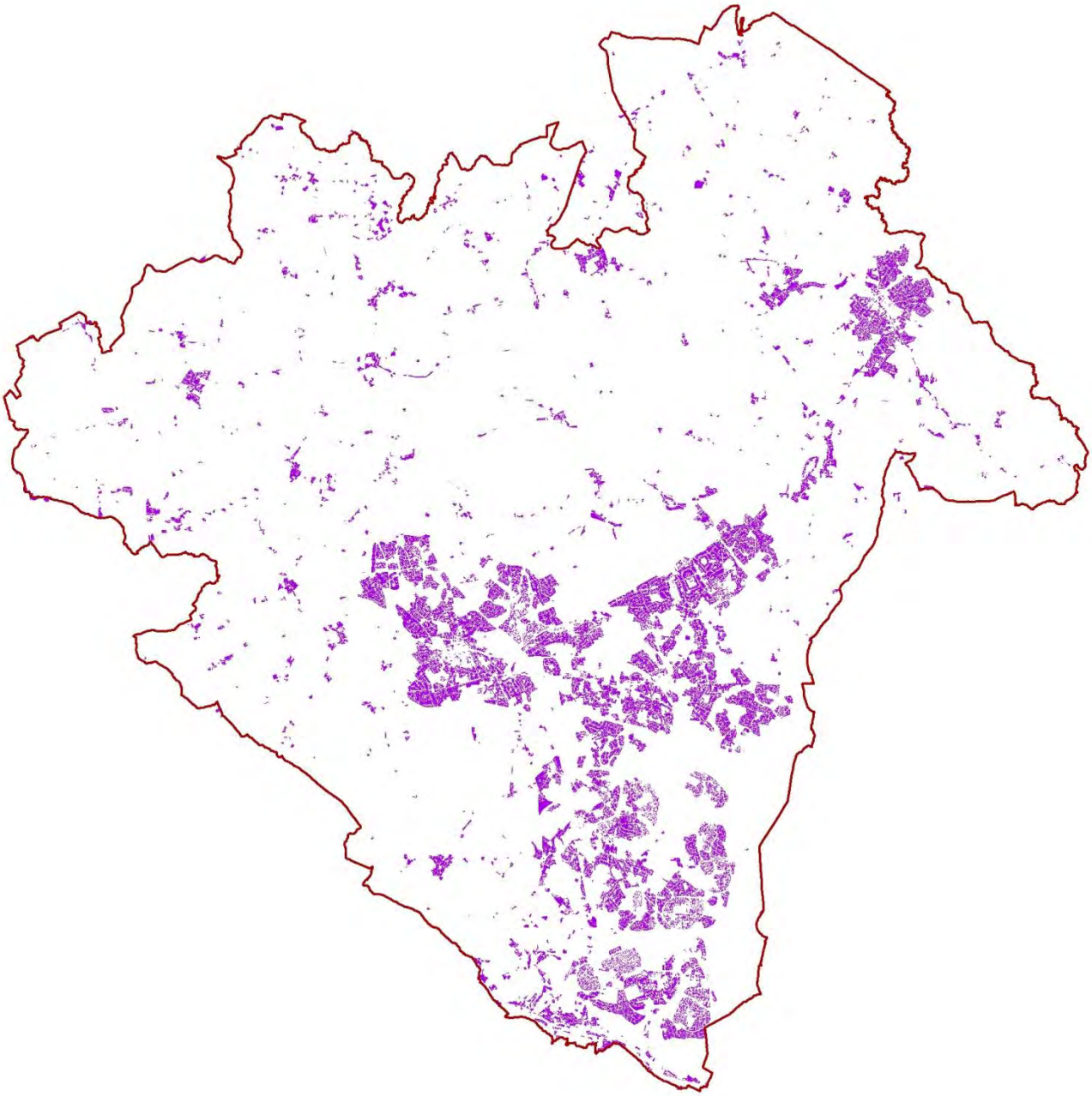
Private Recreation Function



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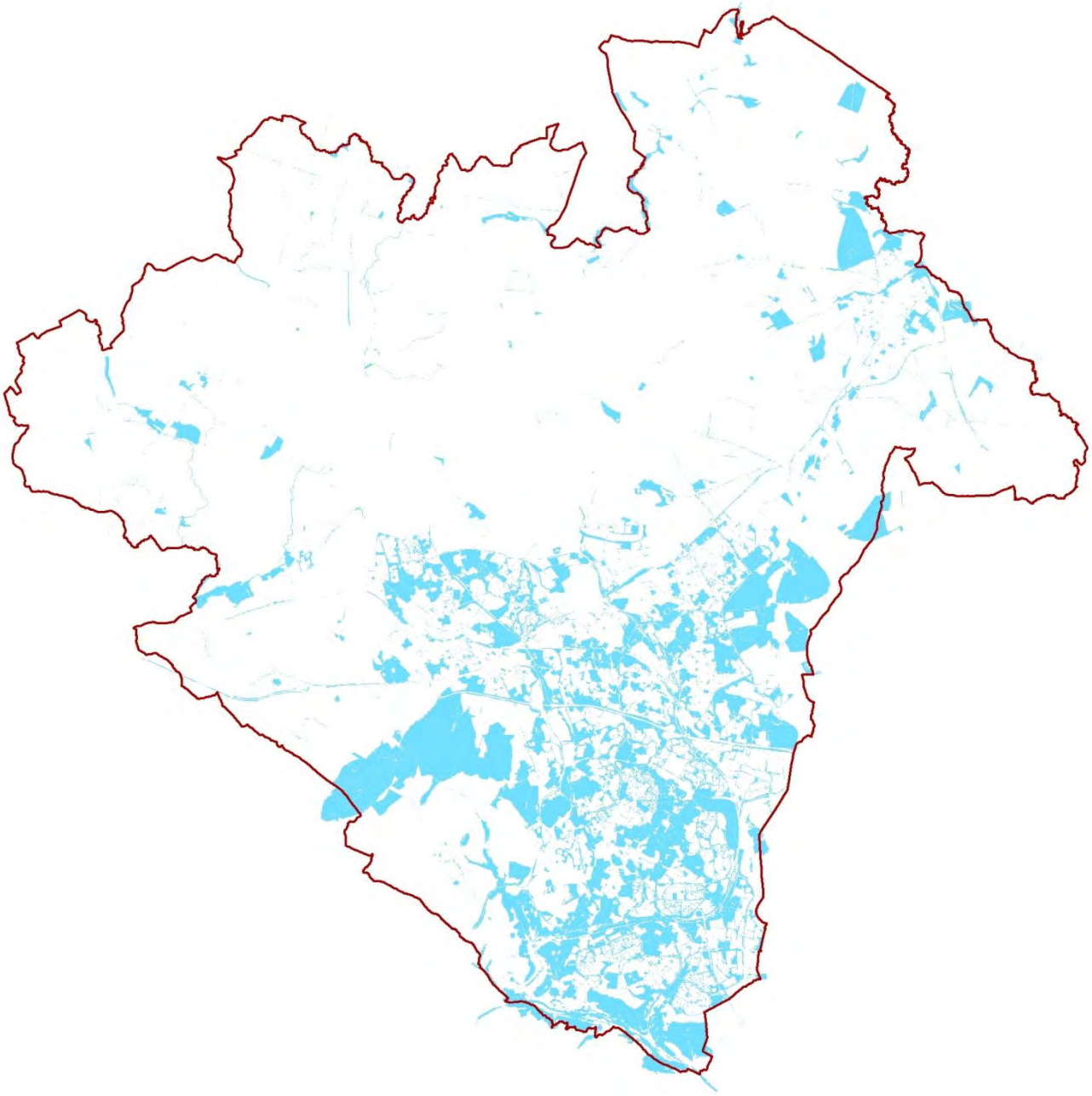
Public Recreation Function



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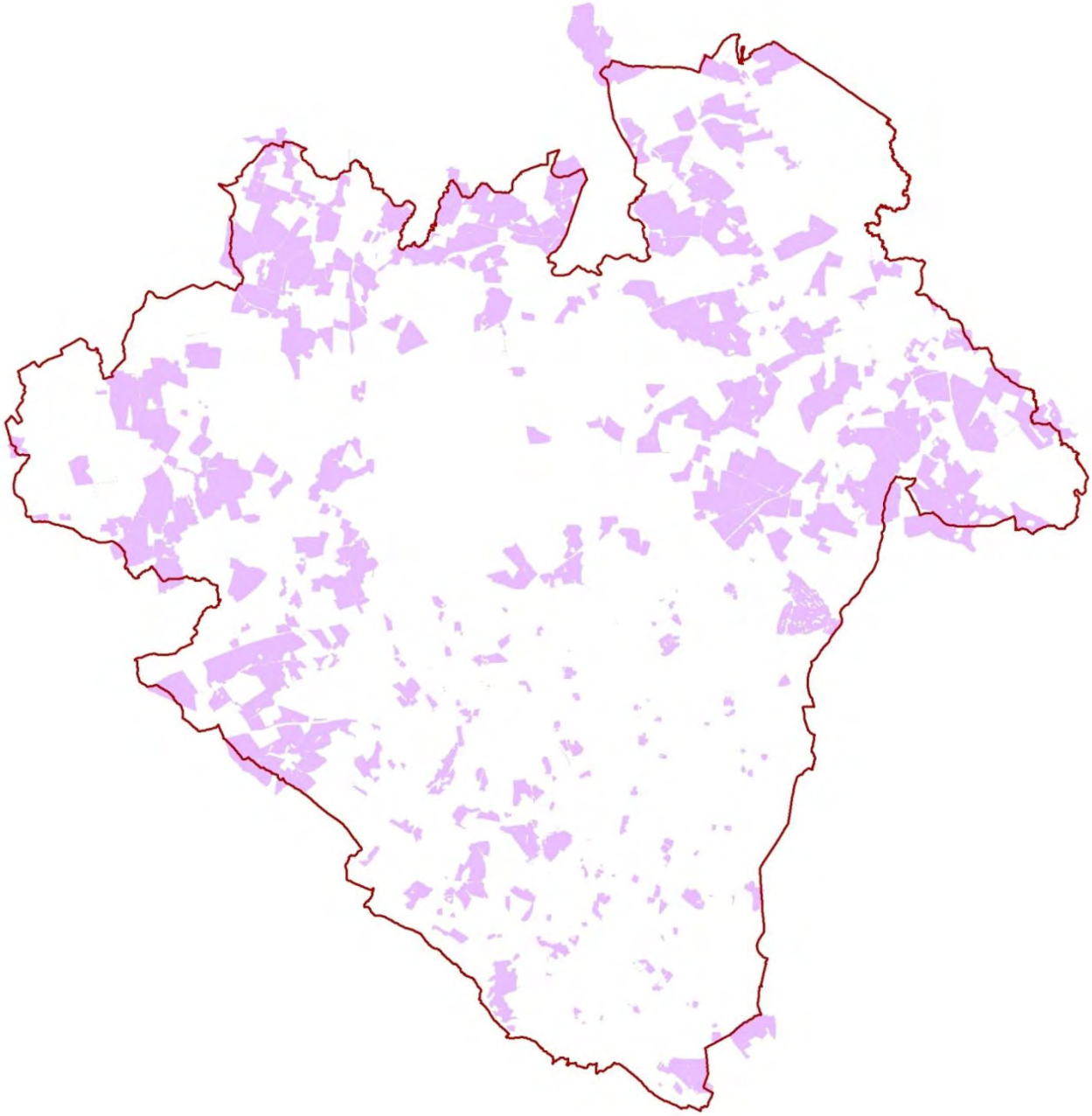
Public Recreation with Restrictions Function



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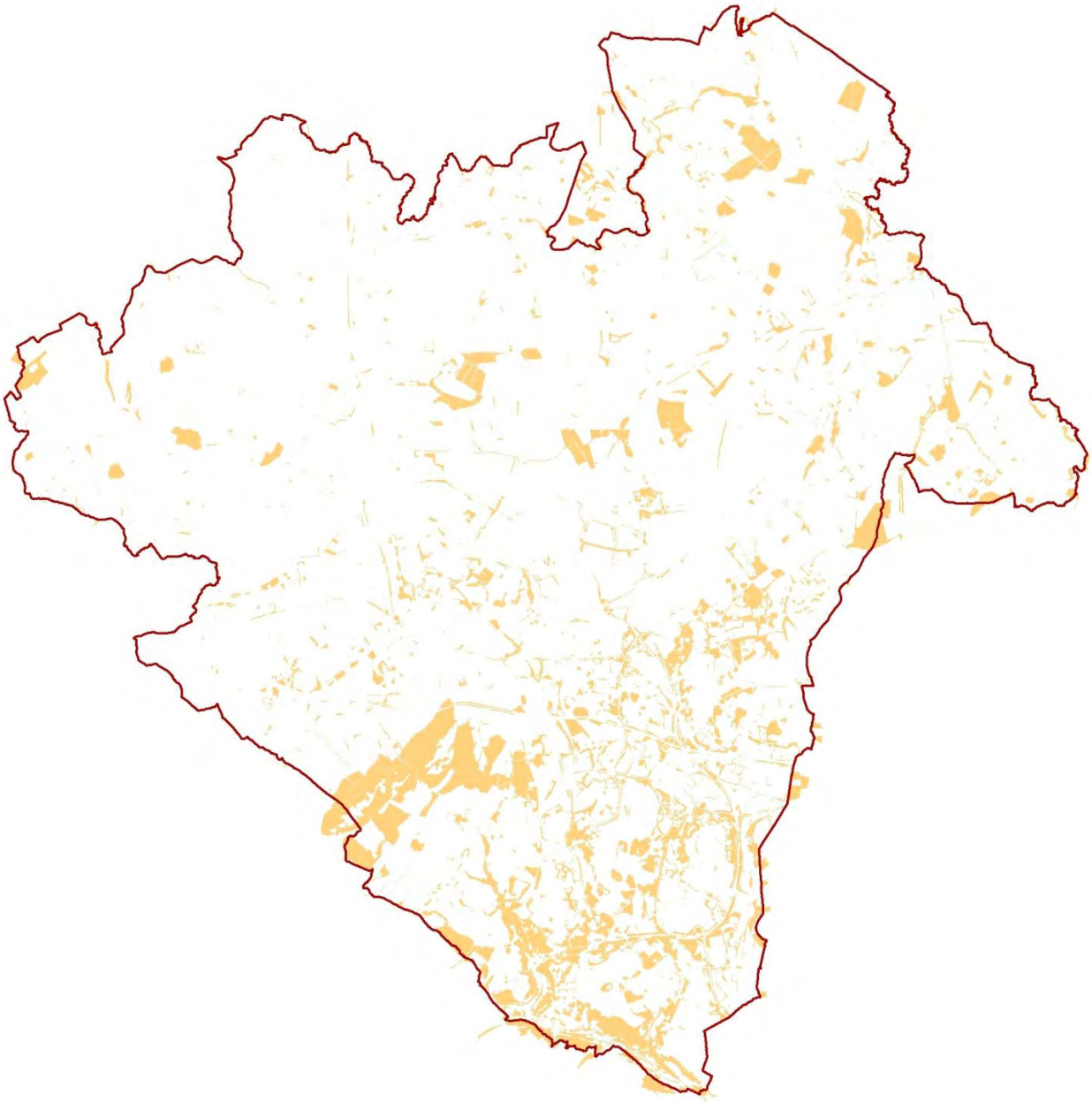
Shading from the Sun Function



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Timber Production Function

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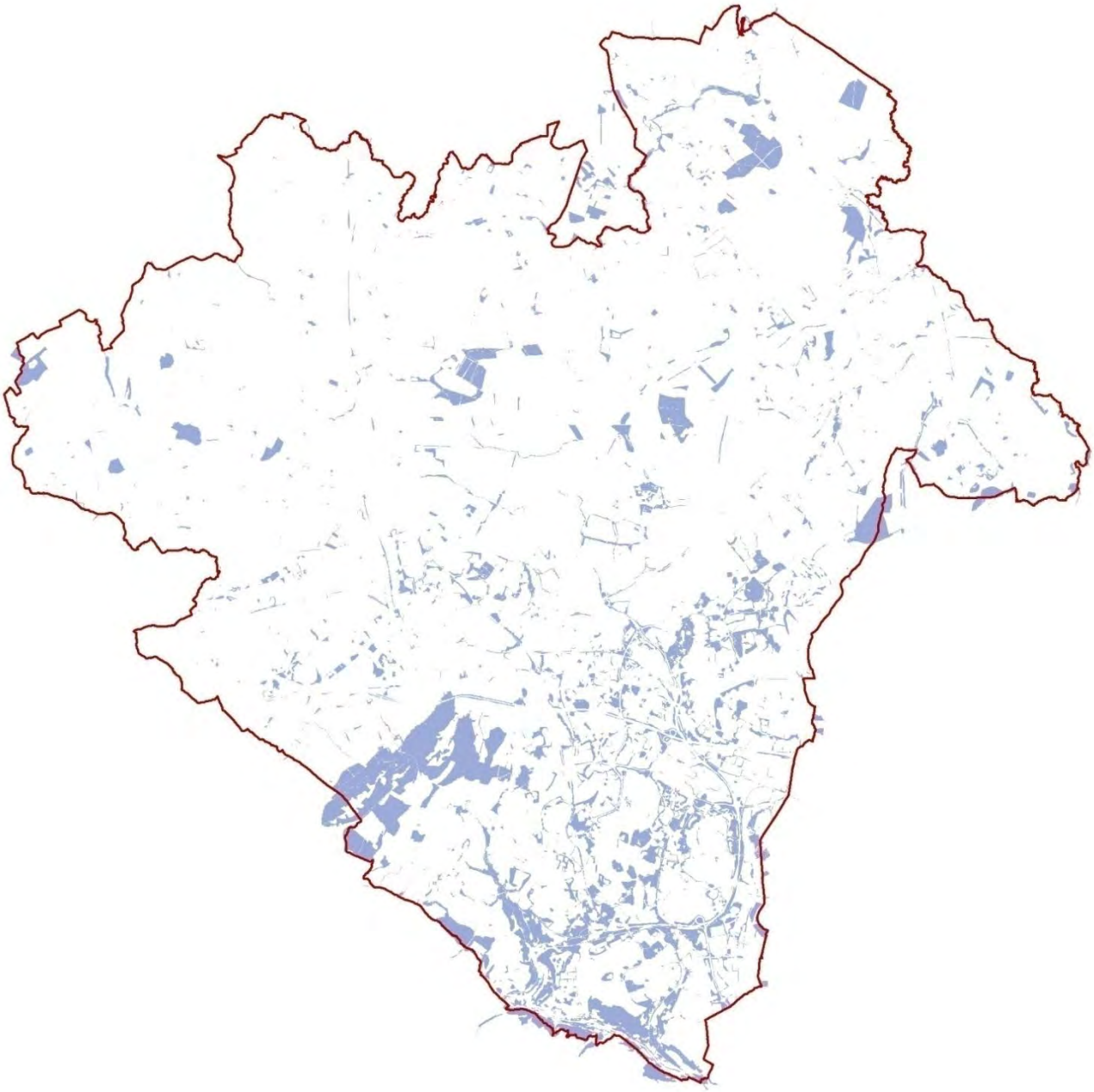
Trapping Air Pollutants Function



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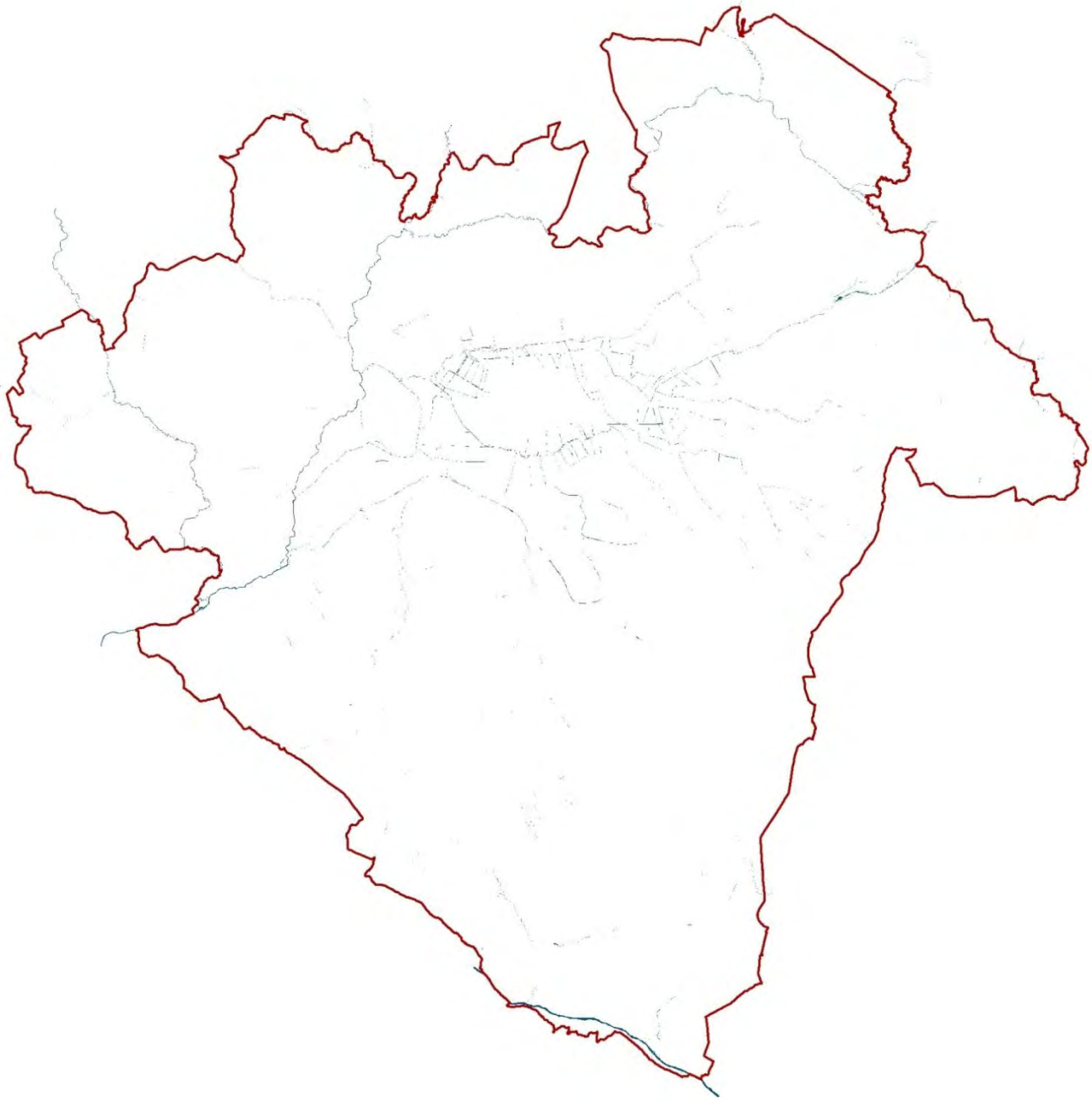
Water Conveyance Function



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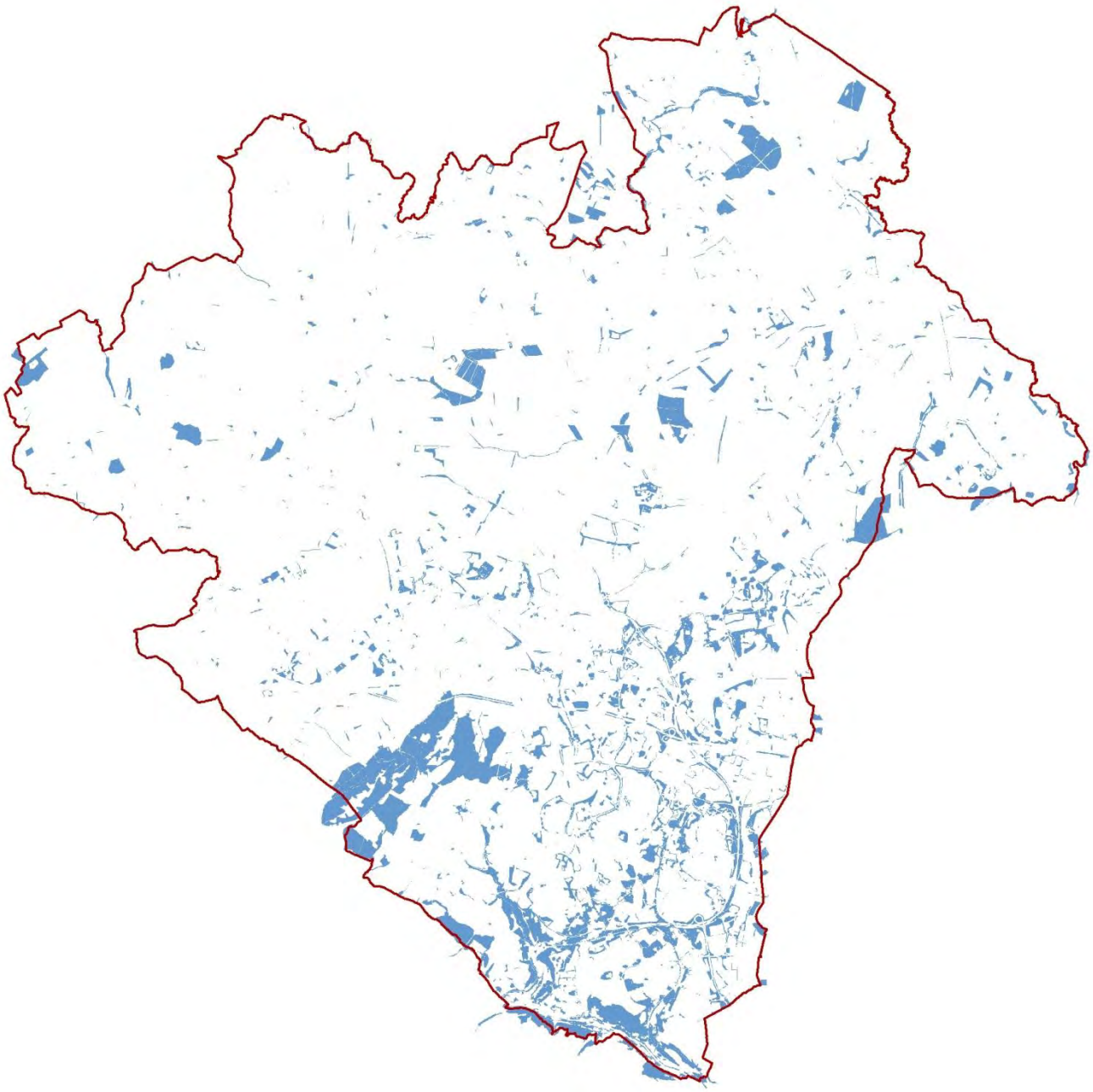
Water Interception Function



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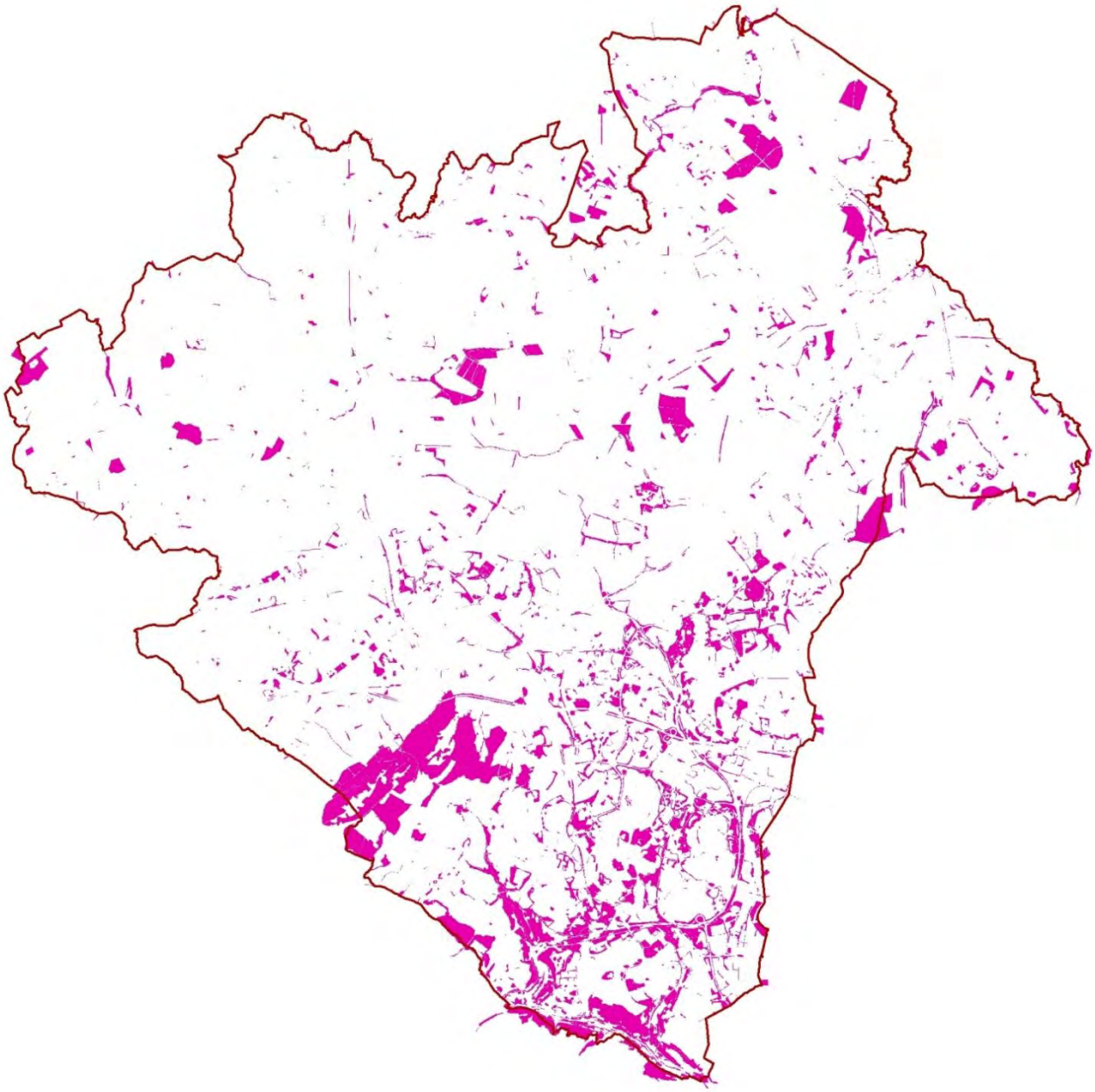
Wind Shelter Function



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Appendix 6: Quality Assessment of Data Behind Each Function Map

Aesthetic

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework
Date of data	2011
Quality of data used	High
Confidence in final map	Medium • All green infrastructure was presumed to perform the aesthetic function. It is accepted that in reality not all areas of green infrastructure will perform the aesthetic function. However, defining when green infrastructure does perform the aesthetic function is difficult. This is an area of work which will be highlighted in the areas for action

Accessible Water Storage

Datasets used	Telford & Wrekin Council: Aerial photography
Date of data	2010
Quality of data used	High
Confidence in final map	High

Biofuels Production

Datasets used	Natural England: Energy Crops
Date of data	2011
Quality of data used	High
Confidence in final map	High

Burial Space

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework
Date of data	2011
Quality of data used	High
Confidence in final map	High

Carbon Storage

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework
Date of data	2011
Quality of data used	Medium
Confidence in final map	Medium • No data collected for the mapping of peat and other carbon rich soils. • No data collected to show where significant tree cover on types Incidental Green Space, Institutional Grounds and Private Domestic Gardens

Corridor for Wildlife

Datasets used	Natural England: Environmental Stewardship Schemes and Countryside Stewardship Schemes Telford & Wrekin Council: Local Nature Reserves Telford & Wrekin Council: SSSI Telford & Wrekin Council: AONB Telford & Wrekin Council: Land management (grass cuts)
Date of data	2011
Quality of data used	High
Confidence in final map	High

Cultural Asset

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework Telford & Wrekin Council: Village green
Date of data	2011
Quality of data used	High
Confidence in final map	Medium • No data collected to show where green infrastructure is within museum grounds • No data collected to show where A3/A4 land use class

Evaporative Cooling

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework
Date of data	2011
Quality of data used	High
Confidence in final map	High

Flow Reduction through Surface Roughness

Datasets used	LIDAR (Light Detection And Ranging) slope data
Date of data	2011
Quality of data used	High
Confidence in final map	High

Food Production

Datasets used	Telford & Wrekin Council: Fishing licences Natural England: Agricultural Land Classification
Date of data	2011

Quality of data used	High
Confidence in final map	High

Green Travel Route

Datasets used	Ordnance Survey: Open data A road, B road, motorways Telford & Wrekin Council: Public Rights of Way Network Sustrans: National and Regional routes
Date of data	2011
Quality of data used	High
Confidence in final map	High

Ground Stabilisation

Datasets used	LIDAR (Light Detection And Ranging) slope data Environment Agency: Flood Zones
Date of data	2011
Quality of data used	High
Confidence in final map	High

Habitat for Wildlife

Datasets used	Natural England: Environmental Stewardship Schemes and Countryside Stewardship Schemes Telford & Wrekin Council: Local Nature Reserves Telford & Wrekin Council: SSSI Telford & Wrekin Council: AONB Telford & Wrekin Council: Land management (grass cuts)
Date of data	2011
Quality of data used	High
Confidence in final map	High

Heritage

Datasets used	Telford & Wrekin Council: World Heritage Site Telford & Wrekin Council: Conservation Area Telford & Wrekin Council: Scheduled Ancient Monuments English Heritage: Historic Parks and Gardens Telford & Wrekin Council: Ancient woodland, Trees Natural England: Traditional Orchards
Date of data	2000
Quality of data used	High
Confidence in final map	High

Inaccessible Water Storage

Datasets used	Not mapped
Date of data	N/A
Quality of data used	Not mapped – Low
Confidence in final map	Not mapped – Low • No data collected for soil type • No data for SUDS locations

Learning

Datasets used	Telford & Wrekin Council: Hoo Farm Boundary Telford & Wrekin Council: Harper Adams Boundary Telford & Wrekin Council: Schools
Date of data	2011
Quality of data used	Medium
Confidence in final map	Medium • No data collected on visitor centre location • No data collected on ranger/skills groups

Noise Absorption

Datasets used	Ordnance Survey: Mastermap Railway lines, A roads, B Roads
Date of data	2011
Quality of data used	Medium
Confidence in final map	Medium • No data collected to show where significant tree cover on types Grassland, Heathland, Moorland, Scrubland, Incidental Green Space, Institutional Grounds and Private Domestic Gardens

Pollutant Removal from Soil/Water

Datasets used	Not mapped
Date of data	N/A
Quality of data used	Not mapped – Low
Confidence in final map	Not mapped – Low • No data collected to show where SUDS located • No data collected to show levels of vegetation coverage

Recreation – Private

Datasets used	Telford & Wrekin Council: Council Ownership
Date of data	2011
Quality of data used	High
Confidence in final map	High

Recreation – Public

Datasets used	Telford & Wrekin Council: Public rights of Way Network Telford & Wrekin Council: Open Spaces Sustrans: National and Regional Routes Telford & Wrekin Council: Green Network Designation

Date of data	2011
Quality of data used	High
Confidence in final map	High

Recreation – Public with Restrictions

Datasets used	Telford & Wrekin Council: Public rights of Way Network
Date of data	2011
Quality of data used	Medium
Confidence in final map	Medium • No data collected on where entrance fees/restricted access apply for Allotments & Community Gardens, Orchards, Parks, Public Gardens & Recreation Grounds, Water Bodies and Woodlands

Shading from the Sun

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework Telford & Wrekin Council: Hedges
Date of data	2011
Quality of data used	High
Confidence in final map	Medium • No data collected to show where significant tree cover on types Grassland, Heathland, Moorland, Scrubland, Incidental Green Space, Institutional Grounds and Private Domestic Gardens

Timber Production

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework Telford & Wrekin Council: Hedges
Date of data	2011

Quality of data used	High
Confidence in final map	High

Trapping Air Pollutants

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework
Date of data	2011
Quality of data used	High
Confidence in final map	Medium • No data collected to show where significant tree cover on types Grassland, Heathland, Moorland, Scrubland, Incidental Green Space, Institutional Grounds and Private Domestic Gardens

Water Conveyance

Datasets used	Ordnance Survey: Mastermap –where open air drain
Date of data	2011
Quality of data used	High
Confidence in final map	Medium • No data collected to show where SUDS located

Water Infiltration

Datasets used	Not mapped
Date of data	N/A
Quality of data used	Not mapped – Low
Confidence in final map	Not mapped – Low • No data collected to show where high porosity soils located • No data to show where large trees located

Water Interception

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework
Date of data	2011
Quality of data used	High
Confidence in final map	Medium • No data collected to show where significant tree cover on types Grassland, Heathland, Moorland, Scrubland, Incidental Green Space, Institutional Grounds and Private Domestic Gardens

Wind Shelter

Datasets used	Green Infrastructure Typology dataset: Telford & Wrekin Green Infrastructure Framework
Date of data	2011
Quality of data used	High
Confidence in final map	Medium • No data collected to show where significant tree cover on types Grassland, Heathland, Moorland, Scrubland, Incidental Green Space, Institutional Grounds and Private Domestic Gardens

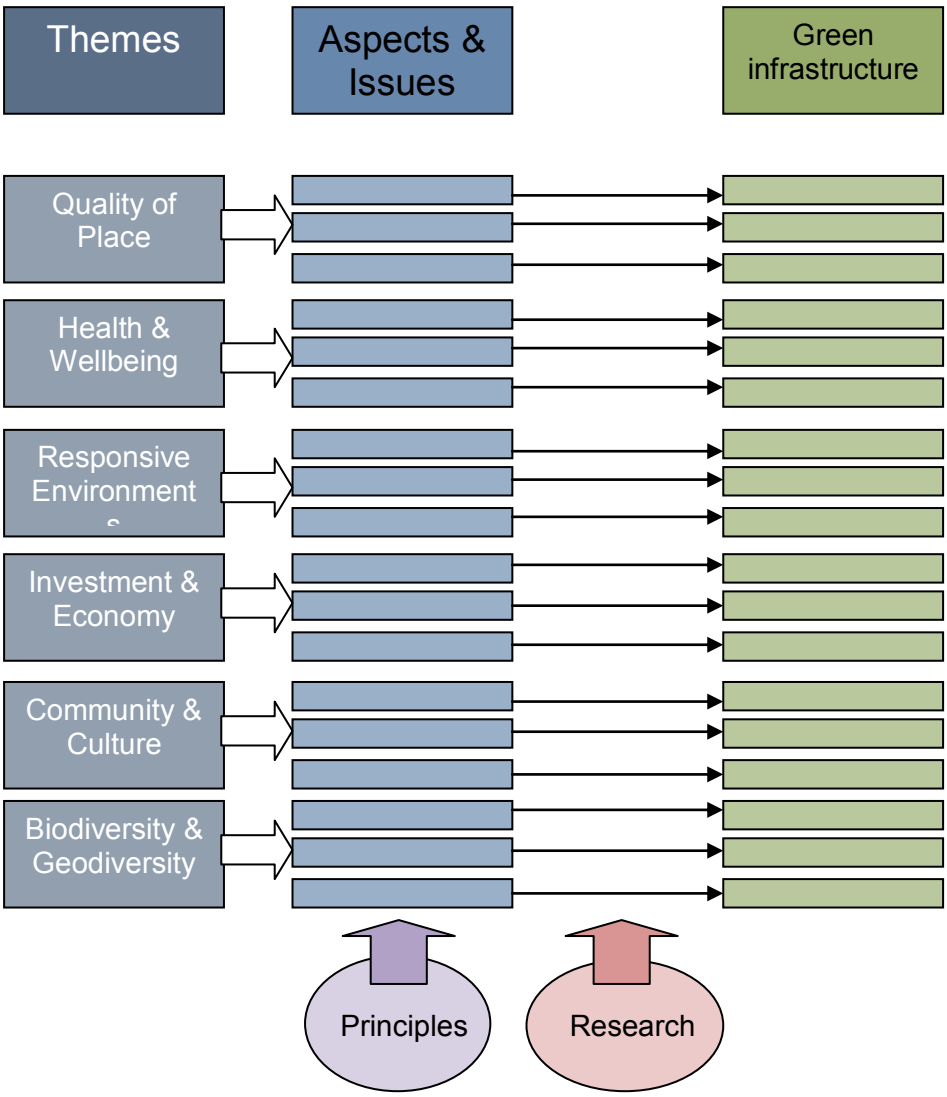
Appendix 7: Principles

The vision of a successful place (and successful green infrastructure) has been organised around the following 6 themes:

- Quality of Place
- Health & Wellbeing
- Responsive Environments
- Investment & Economy
- Community & Culture
- Biodiversity & Geodiversity

Each theme has been broken down into the components which make up each of those themes (these are called aspects).

Figure 1 How the Themes, aspects and issues are related



This section explains the ***principles*** which have been used to identify issues which are related to each aspect. The source of those principles is sustainability.

Sustainability

The vision for the borough of Telford & Wrekin is to be a successful place. A successful place is a sustainable place, i.e. it is a place which is shaped by the concept and philosophy of sustainability and the application of sustainable principles. Since green infrastructure is an integral part of a place the Green Infrastructure Framework is shaped and directed by the same concept, philosophy and principles

which determine the overall quality of a place.

The concept and philosophy of Sustainability is:

- Establishing and sustaining a balance between social well being, economic vitality and viability and protecting the environment
- Achieving and sustaining a balance in such a way that it not only preserves human life but enables the ability of future generations to enjoy the same or a greater quality of life as current generations.

Sustainable Principles

Sustainable principles are based upon :

- Achieving and sustaining social, economic and environmental needs
- Achieving and sustaining social, economic and environmental needs in ways which achieves a balance across all three i.e. the pursuit of one is not conducted at the expense or detriment of the other two.

For the purposes of the Green Infrastructure Framework the terms „social sustainability", „economic sustainability" and „environmental sustainability" are defined as the way in which those themes can be sustained ***and*** the way in which they can be sustained in balance with each other.

The following sustainable principles are based upon the DEFRA Guiding principles for sustainable development[1]. „*The goal of living within environmental limits and a just society will be achieved by means of a sustainable economy, good governance, and sound science*."

[1] DERFA (2011) Guiding principles for sustainable development

The Five Shared Principles

Living Within Environmental Limits

Respecting the limits of the planet‟s environment, resources and biodiversity – to improve and safeguard our environment and ensure that the natural resources needed for life are unimpaired and remain so for future generations.

Ensuring a Strong, Healthy and Just Society

Meeting the diverse needs of all people in existing and future communities, promoting personal health and wellbeing, social cohesion and inclusion, and creating equal opportunity for all.

Achieving a Sustainable Economy

Building a strong, stable and sustainable economy which provides prosperity and opportunities for all, and are pursued in ways which are not to the detriment of environmental and social needs

Using Sound Science Responsibly

Ensuring that actions are undertaken on the basis of a sound scientific, technical and ecological basis as well as public attitudes and values.

Promoting Good Governance

Actively promoting effective, participative systems of governance in all levels of society – engaging people‟s creativity, energy, and diversity.

Appendix 8: Evidence and Justification behind Key Issues from Quality of Place

Providing for People

Telford & Wrekin contains a wide variety of green infrastructure and this is evident from the typology and function mapping. There are correspondingly high variations in the ability of the public to access green infrastructure. The rural area for example contains a predominance of agricultural land, the vast majority of which is in private ownership with little or no public access. Telford on the other hand is a planned town with large amounts of green infrastructure intended to be available for public use. The reality is that not all of Telford‟s green infrastructure will be as publicly accessible as it first appears. There may be physical barriers to accessing much of this land, such as ground conditions, overgrown vegetation, flooding and drainage problems, or access may be restricted, particularly if the land is in private ownership.

Character

Some areas of the borough lack a unique or identifiable identity or character. Telford Town Centre is a particular example of such an area – Telford & Wrekin council‟s Central Telford Area Action Plan identifies that amongst the issues facing the town centre are the limited mixture of uses and activities, the lack of a social and cultural heart, barriers to safe and attractive pedestrian and cyclist movement and a physical townscape lacking in distinctiveness. The same kinds of issues may apply to many areas of the borough, particularly where development during the New Town era was progressed rapidly and at low cost with little acknowledgement of the local context.

The borough contains a number of sites which have been designated for their natural or historic value. These include conservation areas, local nature reserves and wildlife sites as well as major national or international designations such as the Shropshire Hills Area of Outstanding Natural Beauty which covers the Wrekin hill and the Ironbridge Gorge World Heritage Site. These designated areas are not immune from

development – there were 120 planning applications received for development within the World Heritage Site in 2010 alone, but the key issue is to ensure that development that is permitted respects and reflects the visual qualities of the designated area.

Connections & Circulation

Green infrastructure between residential and employment areas tends to contain major highways which act as a significant barrier for people to travel between the two areas without the use of a car. This is particularly evident throughout the eastern side of Telford where large concentrations of employment at Halesfield, Hortonwood and Stafford Park are separated from residential areas by the A442 Eastern Primary road.

Whilst there are broader initiatives and incentives to encourage people to use sustainable modes of transport (e.g. walking, cycling and public transport) as an alternative to the car, there is currently very little emphasis of using green infrastructure to facilitate the use of these alternatives.

Building Uses & Building Types

Telford & Wrekin has projected levels of housing development of 26,500 new homes up to 2026, with the vast majority – 25,000 – to be accommodated within Telford[2]. Although these are figures from the regional strategy which is scheduled to be abolished with the enactment of the Localism Bill, the figures are based upon the most robust and up to date evidence of housing need and supply currently available. Much of the development land in Telford is based on former New Town land.

In April 2005 The Economist recognised that nature provides cities with services which can be valued, priced, and marketed[3]. Median dwelling prices in Telford &

[2] West Midlands Regional Spatial Strategy Phase 2 Revision and Panel Report -
[3] „Urban Green Infrastructure: Capturing Ecosystem Value", rudi.net, accesses 28/10/11: Urban Green Infrastructure: Capturing Ecosystem Value | RUDI - Resource for Urban Design Information

Wrekin have been consistently lower than the West Midlands in the period 1996 to 2006[4], so green infrastructure has a vital role to play in raising the value of development in the borough.

Public Realm

The Central Telford Area Action Plan notes that The current function and design of space between buildings in the Central Telford area and particularly in the Town Centre is dominated by serving the needs of motor vehicles, this can separate areas and does not promote social interaction.

[4] Nevin Leather Associates. (2008) Telford & Wrekin Strategic Housing Market Assessment

Appendix 9: Evidence and Justification behind Key Issues from Health & Wellbeing

General

Barriers to Improving Health

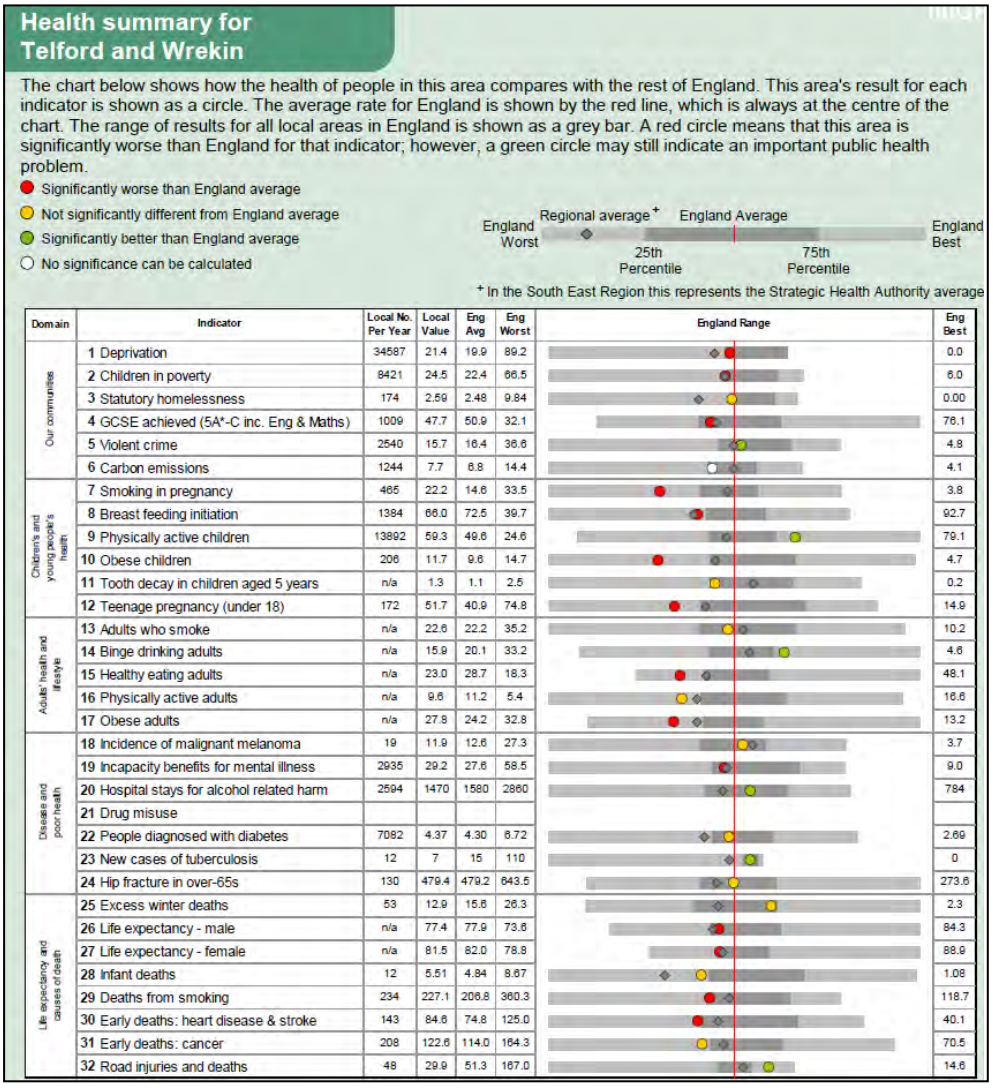
One of the key ways to improve health is to increase people‟s physical activity. Telford was designed as a new town in the 1960‟s and 1970‟s, the design of the town is based on the American “Radburn” design. The Radburn concept was a "Town for the Motor Age"[5], it is very focused on movement around the town by car. Therefore within urban Telford the promotion on active lifestyles meets with more challenges than other areas.

Joint Strategic Needs Assessment

Each local authority and PCT must undertake a Joint Strategic Needs Assessment (JSNA) for their area. JSNA identifies current and future health issues of the local population. In Telford & Wrekin these issues reflect the national health issues affecting the UK. In general, the health of people in Telford & Wrekin is generally poorer than the average for England with the borough performing statistically worse across 14 of the 32 health indicators, see Figure 2.

[5] http://www.radburn.org/geninfo/history.html

Figure 2 Health Summary for Telford & Wrekin[6]



Health summary for Telford and Wrekin

The chart below shows how the health of people in this area compares with the rest of England. This area's result for each indicator is shown as a circle. The average rate for England is shown by the red line, which is always at the centre of the chart. The range of results for all local areas in England is shown as a grey bar. A red circle means that this area is significantly worse than England for that indicator; however, a green circle may still indicate an important public health problem.

- Significantly worse than England average
- Not significantly different from England average
- Significantly better than England average
- No significance can be calculated

England Worst | Regional average + | England Average | England Best | 25th Percentile | 75th Percentile

+ In the South East Region this represents the Strategic Health Authority average

Domain		Indicator	Local No. Per Year	Local Value	Eng Avg	Eng Worst	England Range	Eng Best
Our communities	1	Deprivation	34587	21.4	19.9	89.2		0.0
	2	Children in poverty	8421	24.5	22.4	66.5		6.0
	3	Statutory homelessness	174	2.59	2.48	9.84		0.00
	4	GCSE achieved (5A*-C inc. Eng & Maths)	1009	47.7	50.9	32.1		76.1
	5	Violent crime	2540	15.7	16.4	36.6		4.8
	6	Carbon emissions	1244	7.7	6.8	14.4		4.1
Children's and young people's health	7	Smoking in pregnancy	465	22.2	14.6	33.5		3.8
	8	Breast feeding initiation	1384	66.0	72.5	39.7		92.7
	9	Physically active children	13892	59.3	49.6	24.6		79.1
	10	Obese children	206	11.7	9.6	14.7		4.7
	11	Tooth decay in children aged 5 years	n/a	1.3	1.1	2.5		0.2
	12	Teenage pregnancy (under 18)	172	51.7	40.9	74.8		14.9
Adults' health and lifestyle	13	Adults who smoke	n/a	22.6	22.2	35.2		10.2
	14	Binge drinking adults	n/a	15.9	20.1	33.2		4.6
	15	Healthy eating adults	n/a	23.0	28.7	18.3		48.1
	16	Physically active adults	n/a	9.6	11.2	5.4		16.6
	17	Obese adults	n/a	27.8	24.2	32.8		13.2
Disease and poor health	18	Incidence of malignant melanoma	19	11.9	12.6	27.3		3.7
	19	Incapacity benefits for mental illness	2935	29.2	27.6	58.5		9.0
	20	Hospital stays for alcohol related harm	2594	1470	1580	2860		784
	21	Drug misuse						
	22	People diagnosed with diabetes	7082	4.37	4.30	6.72		2.69
	23	New cases of tuberculosis	12	7	15	110		0
	24	Hip fracture in over-65s	130	479.4	479.2	643.6		273.6
Life expectancy and causes of death	25	Excess winter deaths	53	12.9	15.6	26.3		2.3
	26	Life expectancy - male	n/a	77.4	77.9	73.6		84.3
	27	Life expectancy - female	n/a	81.5	82.0	78.8		88.9
	28	Infant deaths	12	5.51	4.84	8.67		1.08
	29	Deaths from smoking	234	227.1	206.8	360.3		118.7
	30	Early deaths: heart disease & stroke	143	84.6	74.8	125.0		40.1
	31	Early deaths: cancer	208	122.6	114.0	164.3		70.5
	32	Road injuries and deaths	48	29.9	51.3	167.0		14.6

Physical Health & Wellbeing

Obesity

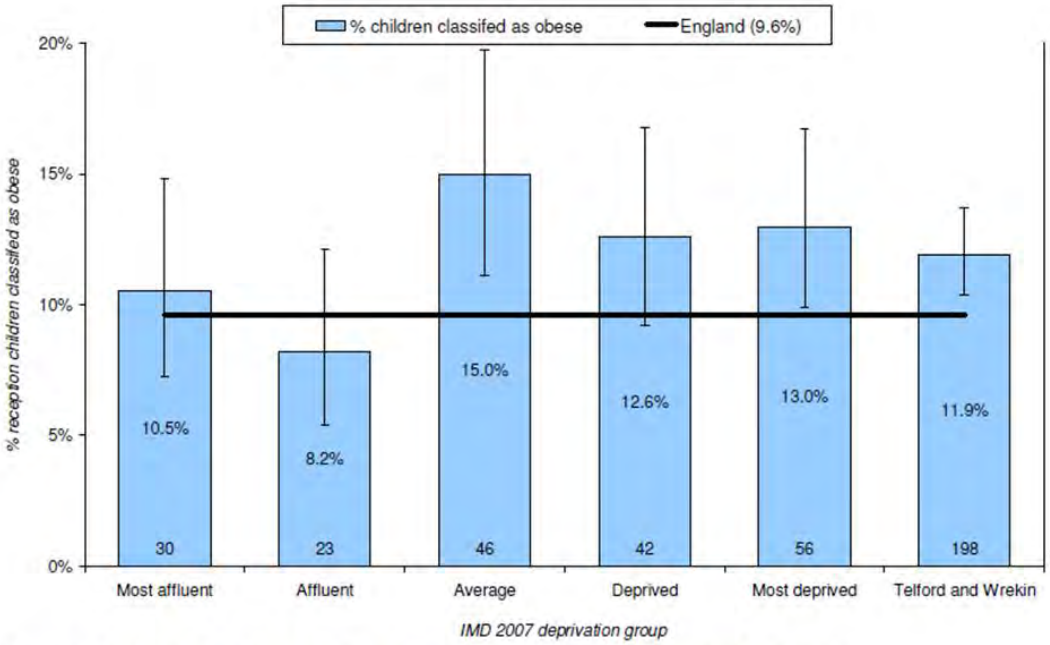
In the UK, over half of women and about two thirds of men are either overweight or obese[7]. Though there are inherent uncertainties in quantifying the link between obesity and associated disease, it is estimated that it costs at least £½ billion a year in treatment costs to the NHS, and possibly in excess of £2 billion to the wider economy[8]. Estimates for the annual costs to the NHS as a result of physical inactivity

[6] http://www.apho.org.uk/resource/view.aspx?RID=71297
[7] http://info.cancerresearchuk.org/healthyliving/obesityandweight/
[8] National Audit Office (2001) Tackling obesity in England: Report by the comptroller and auditor general HC220. http://www.nao.org.uk/publications/0001/tackling_obesity_in_england.aspx

are between £1 billion and £1.8 billion. The costs of lost productivity to the wider economy have been estimated at around £5.5 billion from sickness absence and £1 billion from premature death of people of working age[9]. Taken together, these costs total approximately £8.3 billion every year[10]. It is clear that tackling the obesity epidemic has financial benefits.

Obesity is regarded a key issue locally in Telford & Wrekin. In Reception year (4-5 years olds) the prevalence of obesity is 11.9%, this is statistically significantly worse than the national average for England (9.6%), see Figure 3. In Reception year the prevalence of overweight children is 18.2%, statistically significantly worse than the national average for England (13.0%). The prevalence of obesity and overweight symptoms in older children and adults is also higher than the national average for all age ranges.

Figure 3 Prevalence of obesity in reception year by deprivation group



The numbers shown in the base of the bars indicate the actual number of children classified as obese

Source: National Child Measurement Programme, West Midlands Public Health Observatory, http://www.communities.gov.uk/communities/neighbourhoodrenewal/deprivation/deprivation07/

[9] Allender, S. *et al*. (2007) The burden of physical activity-related ill health in the UK, *Journal of Epidemiology and Community Health* 61. p344–348; Ossa D. & Hutton J. (2002) The economic burden of physical inactivity in England. London: MEDTAP International

[10] Department of Health (2009) Be Active, Be Healthy: A Plan for Getting the Nation Moving http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_094358

High levels of obesity can lead to many associated health issues such as problems with joints and bones, high blood pressure, heart failure, increased risk of insulin resistance and type 2 diabetes. These issues have a financial impact, it is estimated that the cost to the borough of adult obesity is in the region of £42million per year[11]. Many of these diseases could easily be prevented by people leading more active lifestyles. Provision of locally accessible green infrastructure can promote healthier lifestyles as people are provided with the facilities they need to become more active day to day.

Cardiovascular Diseases

In Telford & Wrekin premature mortality rates (deaths under 75 years) from all circulatory diseases (heart disease, stroke and other related diseases) for all persons are statistically significantly worse than national average position for England.

Approximately 148 people in Telford & Wrekin (102 men and 46 women) die from circulatory disease before the age of 75 every year; 59% of these deaths are from coronary heart disease (66 men [45%] and 21 women [14%]), 20% are from stroke (19 men and 12 women)[12]. Table 1 shows the years of life lost from premature deaths; circulatory disease accounts for 36% of all deaths and nearly a quarter of years of life lost.

[11] CordisBright Consulting (2009) JSNA Deep Dive: Child and Adult Obesity http://www.telford.nhs.uk/Documents/docs_common/Publications%20and%20Policies/Publications/Joint%20Stategic%20Needs%20Assessment/03%20JSNA%20Deep%20Dive%20and%20HCNA%20Reports/14%20JSNA%202009%20-%20Obesity%20Deep%20Dive.pdf

[12] http://www.telford.nhs.uk/Documents/docs_common/About%20The%20PCT/Board%20Papers/2009/October/Agenda%20Item%2011.2%20Joint%20Strategic%20Needs%20Assessment%20(JSNA).pdf

Table 1 Deaths and years of life lost contributing to reduced life expectancy years of life lost[13]

	Annual average no. of deaths	% of total deaths	Years of Life Lost (Under 75 years)	
			Number	% of total
All Telford and Wrekin Deaths	**1,301**	**100%**	**7,527**	**100%**
All Cancers	373	29%	2,476	33%
Circulatory Diseases	465	36%	1,724	23%
Accidental deaths	26	2%	759	10%
Suicides and undetermined deaths	14	1%	384	5%

The JSNA highlights that besides tackling cancer, reducing coronary heart disease will have the greatest impact on improving life expectancy in the borough. Tackling obesity, which increases the risk of developing cardiovascular disease, is a key part of improving life expectancies. As stated previously provision of green infrastructure can support active lifestyles, and act as a preventative measure against disease.

Mental Health & Wellbeing

The World Health Organisation projects that depression will be the second largest single course of ill health by 2020[14]. However, there is little accessible data about mental health locally.

"There is no health without mental health"[15] is a new strategy recently released by the government. The document states that "the cost of mental health problems to the economy in England has recently been estimated at a massive £105 billion, and treatment costs are expected to double in the next 20 years"[15]. In 2005, 27.7 million anti-depressant prescriptions were written in England, at a cost of £338 million to public health service[16]

[13] Compendium of Clinical and Health Indicators / Clinical and Health Outcomes Knowledge Base (www.nchod.nhs.uk). The Information Centre for health and social care. © Crown Copyright
[14] http://www.who.int/mental_health/management/depression/definition/en/
[15] Department for Health (2011) No Health without Mental Health http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_124058.pdf
[16] Mind (2007) Ecotherapy: The Green Agenda for Mental Health http://www.mind.org.uk/assets/0000/2138/ecotherapy_report.pdf

Almost half of all adults will experience at least one episode of depression during their lifetime[17]. However, mental health issues are often complex and not openly discussed. Measures to improve mental health should be taken, even if locally specific statistics are not readily available as national research shows that 1 in 4 people will experience some kind of mental health problem in the course of a year[18].

Food & Nutrition

Another way of improving general health is to improve people‟s diets, this however requires (among other things) education. Healthy eating can be promoted through the use of allotments & community gardens, encouraging people to learn about where food comes from and how it is grown. Telford & Wrekin Council currently provide three allotment sites throughout the borough: Brookside, Randlay and Wellington. In addition, there are seven association managed sites within the borough located in: Admaston, Leegomery, Madeley, Sutton Hill, Newport, Stirchley and Woodside. As part of the Allotments Strategy for the borough a survey was carried out where 88% of respondents said there was a need for more allotments in their area.

Inequality

There is a strong association between deprivation and poor health in Telford & Wrekin. The areas with the highest levels of deprivation also have the highest numbers of people reporting poor health. 21.4% of the population live within the 20% most deprived areas in England[19]. As displayed previously in Figure 4 the prevalence of childhood obesity amongst 4-5 year olds is significantly higher than the national average in the most deprived quintiles.

[17] Andrews, Poulton & Skoog (2005) Lifetime risk of depression: restricted to a minority or waiting for most? British Journal of Psychiatry 187: 495–496.
[18] Office for National Statistics (2001) Psychiatric Morbidity Report http://www.statistics.gov.uk/statbase/Product.asp?vlnk=8258&More=N
[19] Indices of multiple Deprivation Data

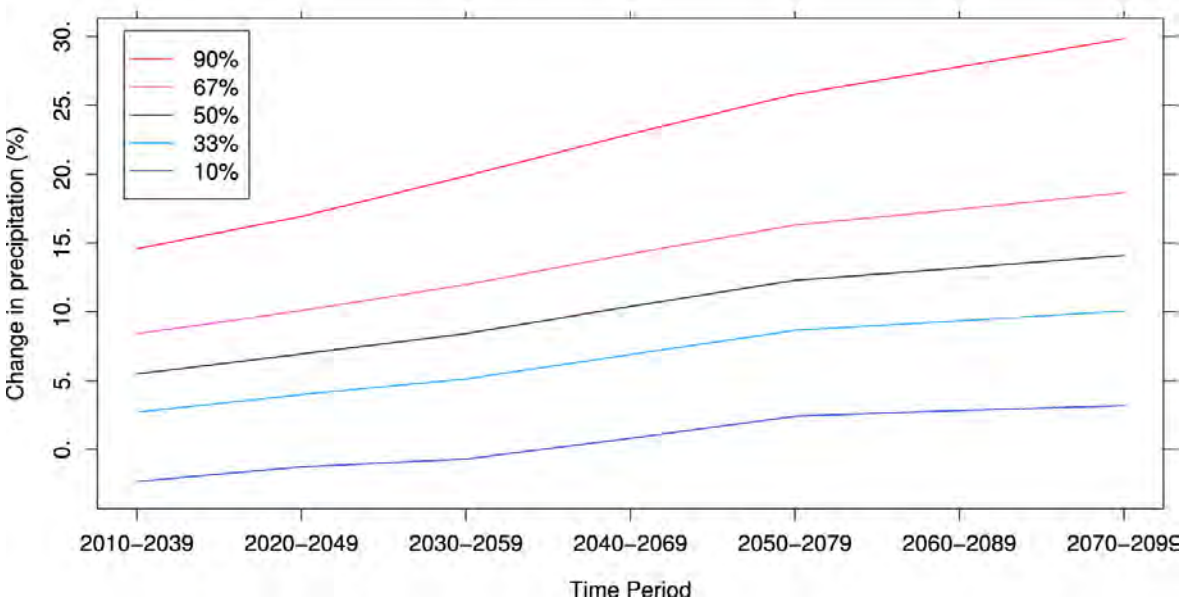
Appendix 10: Evidence and Justification behind Key Issues from Responsive Environments

Water Management

Decrease in net annual rainfall, yet an increase in heavy rain events, Warmer, wetter winters, Increase in flash flooding events and Increase in frequency of storm events

The UKCIP projections show an overall decrease in net annual rainfall, however during winter there is projected to be an increase in mean precipitation (See Figure 7, Figure 8 & Figure 9) and in storm events.

Figure 4 Change in winter mean precipitation (Low emissions scenario)[20]



[20] The graph shows varying probability levels (the relative degree to which each possible climate outcome is supported by the evidence available, taking into account current understanding of climate science and observations, as generated by the UKCP09 methodology.)

Figure 5 Change in winter mean precipitation (Medium emissions scenario)[20]

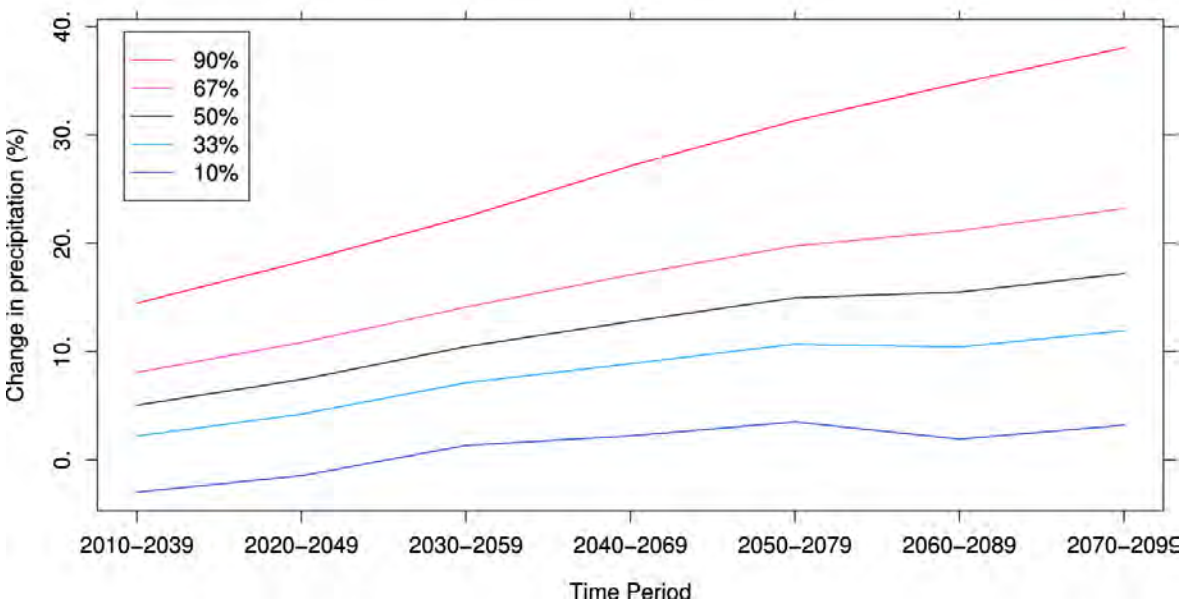
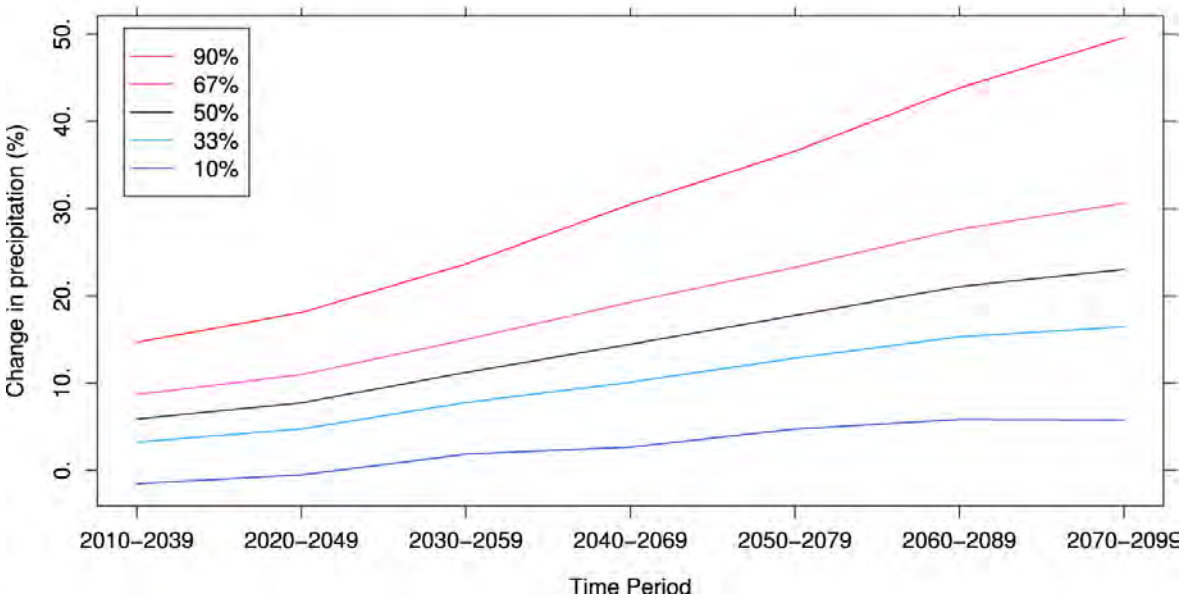


Figure 6 Change in winter mean precipitation (High emissions scenario)[20]



The Telford & Wrekin a Level 1 Strategic Flood Risk Assessment[21] (SFRA) provides information on the probability of flooding; taking into account different types of flooding and future climate change scenarios. The increase in winter rainfall (identified by UKCIP and the SFRA), could lead to increased risk of river flooding. River flooding can have severe social, economic and environmental impacts. For

[21] Halcrow Group Ltd. (2007) Telford & Wrekin Level 1 Strategic Flood Risk Assessment http://www.telford.gov.uk/info/1004/planning_policy/387/development_and_flood_risk/2

example damaging local infrastructure, causing disease and homelessness in local residents and destroying valuable habitats for wildlife.

Aside from river flooding increased winter rainfall could also lead to more surface water flooding. Higher precipitation levels at certain times of year will increase pressure on surface water drainage systems. In particular this will affect urban areas where impermeable surfaces dominate; this reduces infiltration of water into the ground and leads to localised flooding.

Land

A further impact of increased rainfall is an increased risk of subsidence and a greater risk of soil erosion and ground instability. Telford & Wrekin already has several areas of land instability, concentrated in the South of the borough including the Ironbridge Gorge, but also in other parts of the borough where mineshafts are present.

In the Ironbridge Gorge previous industrial activity has altered the landscape considerably. The underground geological structure of the Ironbridge Gorge and the effects of mining in the area have caused gradual land slipping for many years[22]. Landslips in the Gorge area over the last couple of centuries have seen the loss of a number of homes. Since 2001 Telford & Wrekin Council has spent more than £16 million on the land instability issue[22].

Temperature

Warmer, drier summers and increase in frequency and duration of heatwaves

The UK Climate Projections show potential future climate based on modelling work carried out by the UK Climate Impacts Programme (UKCIP). Figure 7, Figure 8 & Figure 9 show the projected change in annual mean temperature for the low,

[22] Land instability in the gorge – info pack 2010 http://www.telford.gov.uk/download/downloads/id/1395/land_instability_in_the_ironbridge_gorge_information_packk

medium and high emissions scenarios for the West Midlands. At all emissions scenarios the temperature across the region is increasing.

Figure 7 Change in annual mean temperature (Low emissions scenario)[23]

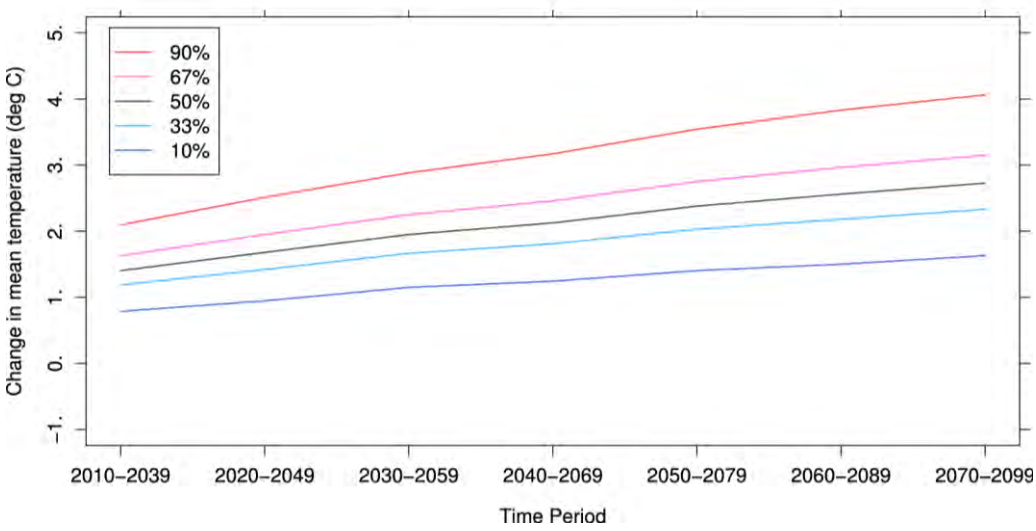
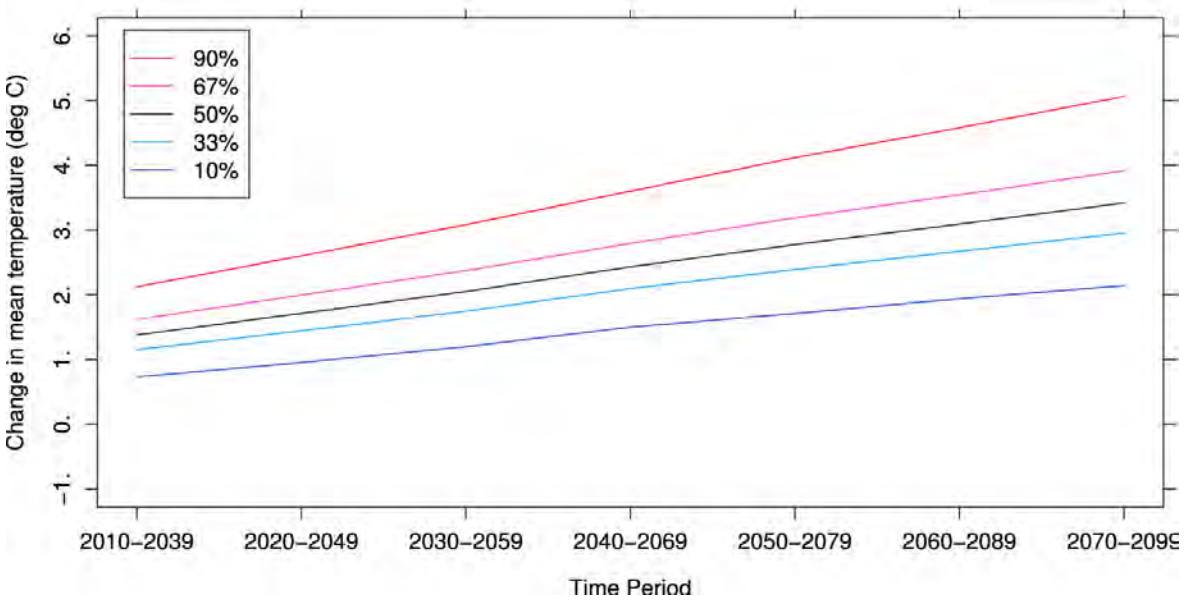
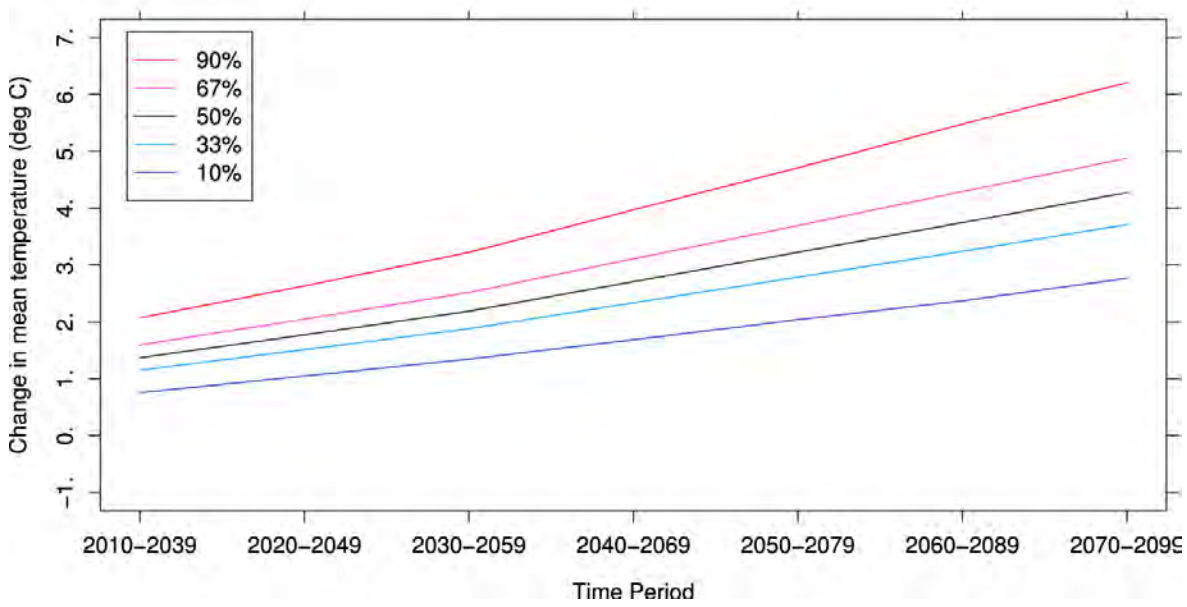


Figure 8 Change in annual mean temperature (Medium emissions scenario)[23]



[23] The graph shows varying probability levels (the relative degree to which each possible climate outcome is supported by the evidence available, taking into account current understanding of climate science and observations, as generated by the UKCP09 methodology.)

Figure 9 Change in annual mean temperature (High emissions scenario)[23]



Increased temperatures and frequency of extreme heat events can have several negative impacts. The Heatwave Plan for England[24] highlights the potential negative impact on public health of increased temperatures: patients suffering from heat cramps, heat rash, heat exhaustion and increased mortality. An initial evaluation by the Health Protection Agency estimates that there were approximately 300 excess summer deaths following the heatwave in 2009 between 30 June and 2 July[24].

Certain sections of the population are more vulnerable to heat stress than others; the Heatwave Plan for England identifies the elderly, the very young and those with chronic or severe illness as particularly at risk.

Energy

The Stern Review[25] states that climate change is the greatest and widest-ranging market failure ever seen. Stern found that failure to tackle climate change could result in economic costs of up to 20% of GDP per year, now and forever. In

[24] Department of Health (2011) Heatwave Plan for England: Protecting health and reducing harm from extreme heat and heatwaves http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_127235.pdf

[25] Stern (2006) The economics of climate change http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/stern_review_report.htm

comparison, the costs of effectively tackling climate change could be limited to only 1% of GDP per year. It makes clear financial sense to tackle climate change.

It is arguable that adapting and altering current systems to tackle climate change can bring economic opportunities:
"The shift to a low-carbon economy will also bring huge opportunities. Markets for low-carbon technologies will be worth at least £500bn, and perhaps much more, by 2050 if the world acts on the scale required."[26]

The UK has committed to a target of producing 15% of its energy demands from renewable energy sources by 2020. To aid this the government has introduced the Renewable Heat Incentive(RHI), the RHI will help accelerate deployment of renewable energy production by providing a financial incentive to install renewable heating in place of fossil fuels. This includes the use of biomass. Using biomass through the RHI could lead to economic benefits, reduced carbon emissions and a more sustainable way of managing green infrastructure.

[26] http://www.direct.gov.uk/en/NI1/Newsroom/DG_064854

Appendix 11: Evidence and Justification behind Key Issues from Investment & Economy

Transport

Telford has come to be known as one of the UK"s most „car-friendly" towns[27] and this is reflected the town"s connections to the Motorway network via the M54 and the major trunk road of the A442 which runs through the town.

Despite this, Telford & Wrekin has lower than the national and regional average for car ownership. This can affect resident"s access to work and services if they do not have access to a car. Meaning that they must rely on public transport. However, the local bus service is considered to be poor[28]. Many of Telford"s New Town estates were designed with the potential for „busways" to run through their middle[29]. In reality these busways were never built. The routes that these would have taken are now large areas of green space within the middle of these estates and the buses have to travel around the longer circular rounds surrounding the estates, thus increasing the time and costs of running bus services. Recent regeneration work, particularly at Woodside and Sutton Hill, has seen some through routes reconnected through the centres of these estates, which have increased the potential to run more cost effective public transport in these areas.

Telford & Wrekin Local Transport Plan 3 identifies a need for more sustainable forms of transport, particularly in regard to walking, cycling and rail transport. Similarly, the Shrewsbury and Newport Canal Trust have a desire to restore the entire route of the canal which runs east-west across the rural area of the borough and close to the northern edge of Telford. Much of this route is now unrecognisable as a canal as it has become part of the wider agricultural land or overgrown with vegetation.

[27] Virgin Money survey of the 65 biggest cities and towns, 2008-2011
[28] Ispira Consulting on behalf of Telford & Wrekin Economic Development Board (2011) Telford & Wrekin Local Economic Assessment
[29] John Madin Design Group on behalf of Telford Development Corporation (1968) Telford Development Proposals

Regeneration of the canal as a green travel route would encourage more sustainable travel.

Employment & Industry

As Telford New Town developed in the 1960s/1970s, the local economy became focused on manufacturing and service sectors. Large new industrial estates were planned and built at Halesfield, Stafford Park and Hortonwood. These new estates provided industrial buildings set within open areas of green space and contrasted strongly with the heavy industry that preceded them. Despite the new development and investment in the area, the recession of the early 1980s saw the unemployment rate rise to 22.4% amongst men and 16% amongst women[30].

Since then, the economy of Telford has diversified and is now concentrated on the manufacturing, polymers, advanced engineering, construction, retail and tourism sectors. Manufacturing is decreasing at a slightly slower rate than other parts of the UK and the service sector is growing, particularly in property and business services[31]. The recent economic downturn has affected Telford & Wrekin, with the unemployment rate at around 8.5% in September 2010[32]. The predominant economic sectors in the borough are now business and professional services, wholesale and retail, engineering, health and social work[33].

Telford has a number of large „campus" industrial sites. These are large sites, which may be many hectares in size, that are occupied by a single employer. Currently, in many cases only part of the site has be developed for industrial use and it is usually less that half of the site area. The remainder of the site usually comprises of large expanses of green space in the form of formally maintained grassland interspersed with planted trees and shrubs. The primary reason for these large expanses of land is to provide room for the future expansion of the industrial building within it, however

[30] De Soissons, M. (1991) Telford: The Making of Shropshire's New Town
[31] One Telford: http://www.investintelford.co.uk/about-telford/economy
[32] BCRS (2011) Recent Economic Trends: Shropshire, Telford & Wrekin
[33] Office of National Statistics (2007) Annual Business Inquiry

it also has the added benefit of providing an attractive setting for the employer, investors and employees.

Examples of campus sites in Telford include Maxell in Apley, Epson in Hortonwood, Ricoh in Priorslee and Denso in Hadley Park. Some of these industries have already expanded and developed in to their campus land. Across all of the campus sites in the borough there remain significant areas of expansion land left over. There has been a gradual decrease in the number of campus sites in the borough as some have been developed for wider uses. Examples of this include the former Mitutoyo factory site in Hadley Park which has been developed for a number of smaller industrial units and the former Celestica site in Priorslee which has now been demolished and is due to be redeveloped for a mixture of housing and employment.

Planning & Land

There is a significant amount of undeveloped land that was intended for housing, employment and other types of development in the New Town era. This land is currently green infrastructure.

Much of this land has planning permission to be developed under powers given by the New Towns Act 1981. In recent years the appropriateness of the sites identified for development in this way has come into question. Telford is no longer a New Town, its needs have changed and so has the planning framework within which developments must be considered. Until now there has been no assessment of the functions this land could be performing in its current state.

The council"s Annual Monitoring Report 2010 identifies that there is 227 hectares of land with planning approval for employment development, and 524 hectares of land with approval for residential development.

The development of these sites presents both a challenge and an opportunity for appropriate green infrastructure provision in the borough, particularly so given their size. It could be beneficial in many of these cases to encourage temporary use of

these sites as a green infrastructure resource, for example, using a site as a temporary allotments site or as a tree nursery.

One of the attractions of Telford New Town was its lower density of development set within expanses of green space. However, some of Telford‟s older industrial and residential estates are now beginning to show their age, some are semi-derelict and are not providing a positive environment with which to attract investors.

Population & Housing

The population of the UK is growing[34], in Telford and Wrekin the population is forecast to increase to 206,600 people by 2026 – up from 167,200 in 2008. An increase of 39,400 people or 23.6%. The increase in population will lead to increased demand for housing. The West Midlands Regional housing target for Telford & Wrekin was 26,500 homes by 2026. During this period the population will „age‟ as the increase in the older population will be relatively greater than for other age groups[35], this will result in an increased demand for certain local services.

Tourism

Tourism and the heritage economy are vital to the economic wellbeing of Telford & Wrekin. Ironbridge Gorge World Heritage Site is the most significant tourist attraction in the borough. The Ironbridge Gorge museums are also the 16th most visited attraction in England, having seen a 1% increase in visitor numbers from 566,967 in 2009 to 567,510 in 2010[36]. Similarly, Telford International Centre is in the top ten

[34] Office of National Statistics (2011) Statistical bulletin: Annual Mid Year Population Estimates 2010 http://www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-uk--england-and-wales--scotland-and-northern-ireland/mid-2010-population-estimates/annual-mid-year-population-estimates--2010.pdf

[35] Telford & Wrekin PCT (2009) Joint Strategic Needs Assessment http://www.telford.nhs.uk/About-the-PCT/PublicationsBoard-Papers/Publications/

[36] Visit England (2010) Survey of paid attractions http://www.visitengland.org/insight-statistics/major-tourism-surveys/attractions/Annual_Survey/index.aspx

event venues in the UK with over half a million visitors each year[37]. It has recently expanded to 15,000m^2, making it the 5th largest facility of its type in the UK[38].

According to the Department for Culture, Media and Sport (DCMS), the UK tourism industry accounts for £90 billion direct spend each year[39]. In 2005 the tourism industry was estimated to be worth £104 million to Telford & Wrekin, the same year 1.5 million tourists visited the area[37]. The tourism industry is estimated to support 3,629 jobs in Telford & Wrekin[40].

There is projected to be 5% year on year growth in England‟s visitor economy over the decade 2010 to 2020[41]. Rural attractions in Telford & Wrekin include the Wrekin Hill and the Newport and Shrewsbury Canal (including the Longdon-on-Tern Aqueduct).

The West Midlands Visitor Economy Strategy suggests that “a competitive edge can be created in the tourism market by adding value through exploitation of the strong leisure brands in the region that convey world-class culture”[42]. The Cultural Strategy goes further by stating that the Ironbridge Gorge World Heritage Site would be key to this offer, and so would wider links with the heritage attractions and the wider countryside throughout Shropshire.

The Local Economic Assessment recognises that the borough‟s tourism assets are not always connected together to realise their full potential, as is the case with many of the borough‟s other economic sectors[43].

[37] Shropshire Council and Telford & Wrekin (2009) Evolution, Revolution & Innovation: A Cultural Strategy for Shropshire and Telford & Wrekin 2009 – 2014 http://www.telford.gov.uk/site/scripts/download_info.aspx?downloadID=434&fileID=1585
[38] Ispira Consulting on behalf of Telford & Wrekin Economic Development Board (2011) Telford & Wrekin Local Economic Assessment
[39] DCMS (2011) Government Tourism Policy
[40] „Tourism Futures: Support for the Shropshire and Telford and Wrekin Visitor Economy‟, paper to Shropshire Council Cabinet meeting, May 2010
[41] Visit England (2011) A Strategic Framework for Tourism 2010 - 2020
[42] Advantage West Midlands (2008) West Midlands Visitor Economy Strategy
[43] Ispira Consulting on behalf of Telford & Wrekin Economic Development Board (2011) Telford & Wrekin Local Economic Assessment

The Olympic Games in 2012 is highly likely to increase visitor numbers in the UK. Whilst Telford & Wrekin does not contain any Olympic venues, it is anticipated that it will benefit from events connected to the Cultural Olympiad, particularly given the close proximity of Much Wenlock where the modern Olympic movement is considered to have begun.

Education

The Local Economic Assessment[43] identifies that heritage industries such as the Ironbridge Gorge Museums Trust and the Telford Steam Railway find it hard to recruit workers with traditional skills. It also suggests that there may be an opportunity for a joint initiative between the council, local training providers and museums/historic visitor attractions to create a centre of excellence for heritage skills.

Appendix 12: Evidence and Justification behind Key Issues from Community & Culture

People

Demography

Reflecting Telford‟s former New Town status, the population of the town is young. The proportion of the population under 25 is around 32.9%, which is above the regional average (31.8%)[44]. By 2026, 10,300 of the population is projected to be aged over 65, representing an increase of 45%, whilst the amount of people aged 85 and over will have increased by 112%, from 2,500 to 5,300[44]. This ageing population will create different demands for the use and provision of green infrastructure within Telford as there is an increasing trend for older people who need to stay fit, active and involved in society.

Currently, 84% of the population of the borough live in urban Telford, though this is only 28% of the land area of the borough[45]. The countryside is under increasing pressure from development. People often prefer to live in rural or semi-rural environments due to a perception that this will offer a more tranquil and authentic way of life[46], but also there is limited space left within the urban boundary to accommodate new development.

The Cultural Strategy identifies that a stronger „green‟ conscience is emerging as people become more aware of the impact of climate change and the need to protect the environment. It suggests that there is scope to embrace this as part of the cultural agenda; by raising awareness, increasing understanding and appreciation of the environmental agenda, celebrating and using the green environment through countryside, parks, cultural programmes and education, supporting conservation

[44] West Midlands Regional Observatory (2008) West Midlands Regional Economic Assessment Telford & Wrekin
[45] Shropshire Council and Telford & Wrekin (2009) Evolution, Revolution & Innovation: A Cultural Strategy for Shropshire and Telford & Wrekin 2009 – 2014
[46] DCMS (2011) Government Tourism Policy

where people live („In My Back Yard") and reducing the environmental impact of culture[49].

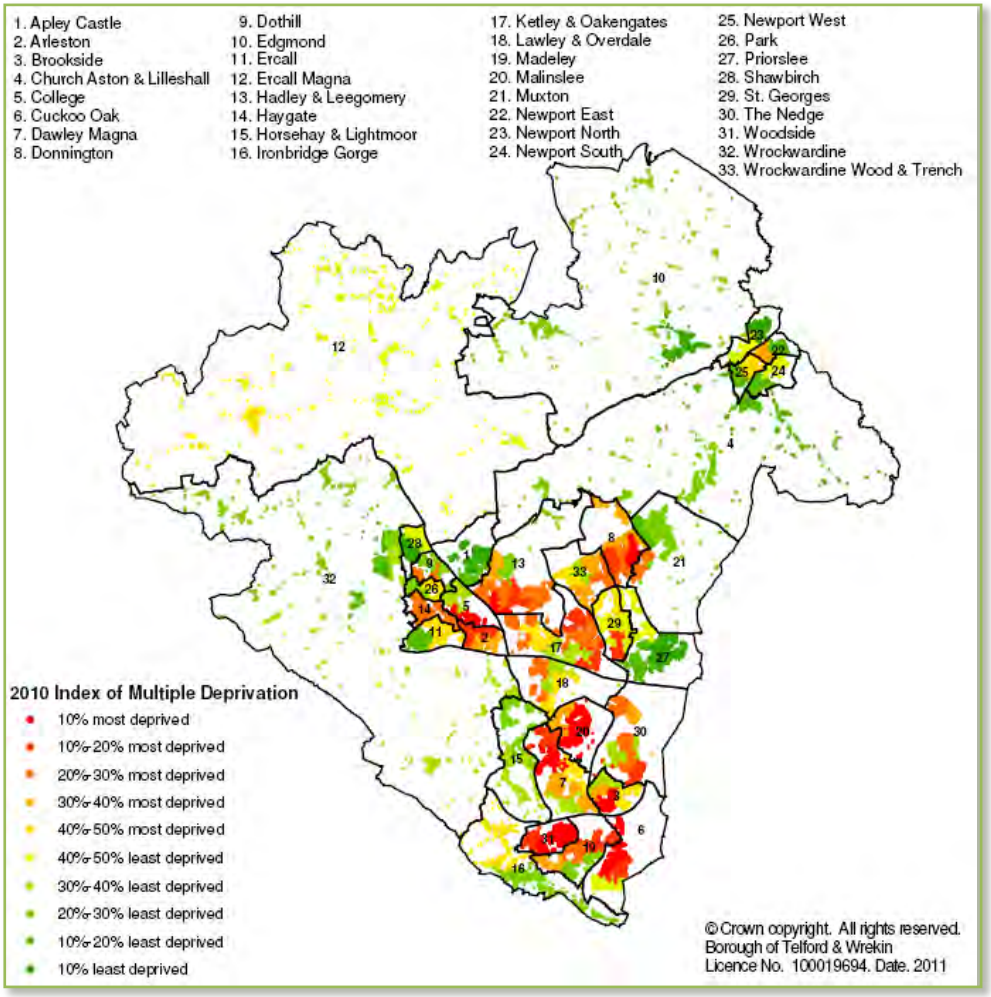
Deprivation

Deprivation is mixed across the borough, and its prevalence is increasing. The Index of Multiple Deprivation (IMD) 2010 identifies Telford & Wrekin as within the top 30% most deprived areas regionally and in the top 40% nationally. Out of 108 Super Output Areas in the borough, 14 are in the top 10% most deprived nationally and a further 12 are in the top 20%. This places 38,600 people (a quarter of the borough's total population) in the 20% most deprived areas of the country[47].

There are concentrations of deprivation in Arleston, Brookside, College, Cuckoo Oak, Dawley Magna, Donnington, Hadley & Leegomery, Ketley & Oakengates, Madeley, Malinslee, St Georges, The Nedge and Woodside. These concentrations are shown in Figure 10 below.

[47] Telford & Wrekin Council (2011) Telford & Wrekin Indices of Deprivation 2010

Figure 10 Areas of deprivation in Telford & Wrekin[48]



As Figure 10 shows, Telford & Wrekin also has a large number of areas with low deprivation. 15 Super Output Areas are in the 20% least deprived nationally. These areas are clustered in and around Newport and Wellington and at the edge of the urban boundary. The total population living in such areas is 23,300, or 14% of the borough‟s population. Substantially less than the number of people living the most deprived areas.

History, Heritage & Knowledge

When Telford new town was developed many new people relocated to the borough, partly attracted by the green nature of the area. Many green infrastructure related

[48] Telford & Wrekin Council (2011) Indices of Deprivation Report

initiatives from this era are well known by local people. Such initiatives include the „Forest City" concept and the Green Network, both of which have become deeply rooted in the consciousness of the town.

The Shropshire and Telford & Wrekin Cultural Strategy underlines the importance of green infrastructure in Telford; "People enjoy the more urban shopping and leisure experiences afforded by Telford, but also appreciate its greenery, which includes a network of hedgerows, canals, meadows, some 400 acres of ancient semi-natural woodland and other open spaces, including the 170-acre Telford Town Park. Together, these aspects create a natural landscape which, at the time of Telford's development in 1968, was unique to new town planning, achieved international recognition and pioneered the way forward for new towns elsewhere"[49]

The culture of Newport and the rural area is deeply intertwined with its economic base of agriculture and food production. Newport and the rural area are much more traditional when compared to Telford. Agriculture and Food have been the traditional industries here for many centuries. This is reflected in Newport which is an historic market town and it continues to hold a weekly indoor market and the annual Newport agricultural show.

The Ironbridge World Heritage site is the key heritage asset of the borough. The green infrastructure surrounding Ironbridge is key to the character of the heritage of the area.

Arts & Entertainment

There are several festivals and events held in Telford & Wrekin annually. One of the most famous is the Ironbridge World Heritage Festival which celebrates the designated site. The World Heritage Site also has a year long calendar of special events, exhibitions and activities, some of which take place within the green infrastructure of the area.

[49] Shropshire Council and Telford & Wrekin (2009) Evolution, Revolution & Innovation: A Cultural Strategy for Shropshire and Telford & Wrekin 2009 – 2014

Other areas of green infrastructure play host to art and cultural exhibitions. A product of the New Town, Telford Town Park is now well established as a cultural gem at the heart of the town. It attracts over 1 million visits a year[50]. The Telford Town Park Strategic Framework highlights opportunities for the future of the park, these include:

- develop a cultural heritage trail with interpretation as part of the wider park interpretation strategy;
- explore opportunities to develop Stirchley chimney as an industrial heritage feature attraction in its own right;
- develop wider cultural heritage links between the Town Park, Telford and Ironbridge.

Sports & Leisure

As part of the Building Schools for the Future programme Telford & Wrekin is developing a number of Sports and Learning Communities. These developments concentrate education, health, sport and leisure facilities for local people on to one site[51]. The council owns and runs nine leisure centres which include the Madeley Court Outdoor Ski and Snowboard Centre and Horsehay Golf Centre There are a number of sports clubs in the borough, including Lilleshall National Sports Centre abuts the edge of the borough. These facilities are open for the community to use and many community sports groups are connected with them. Telford & Wrekin has a rights of way network that contains over 900 individual routes, totalling over 360 kilometres of path[52].

BMX is growing in popularity nationally. There are highly regarded local teams but facilities are considered to be poor[51].

[50] Shropshire Council and Telford & Wrekin (2009) Evolution, Revolution & Innovation: A Cultural Strategy for Shropshire and Telford & Wrekin 2009 – 2014
[51] Ispira Consulting on behalf of Telford & Wrekin Economic Development Board (2011) Telford & Wrekin Local Economic Assessment
[52] PMP on behalf of Telford & Wrekin Council (2008) Open Space, Sport and Recreation Facilities Study

The Cultural Strategy recognises that there are individuals and groups in society who are less likely to attend or participate in cultural activities. Amongst the reasons why this might be the case are perceptions that public spaces and public transport may be unsafe (particularly in the evenings)[50].

"Consultation conducted by Play England in 2008 found that parks and green spaces are very important to children and young people – these are where the great majority of children say they play and want to play. This is true for some older children and young people locally who want opportunities to socialise in safe open environments without being pushed towards structured youth provision"[53].

[53] Play England (2008) 11 Million

Appendix 13: Evidence and Justification behind Key Issues from Biodiversity & Geodiversity

Designated Sites

There are some species and habitats present in Telford and Wrekin which are nationally and locally important, and which need to be protected and managed appropriately to survive and flourish. The borough and the surrounding areas contain a range of sites that are internationally, nationally and locally designated for their biodiversity value: including national and Local Nature Reserves, sites of special scientific interest, ancient woodland, wildlife sites, and strategic wildlife corridors. These areas require specific management to ensure that they maintain their quality and value, some have already been designated and are therefore offered higher protection, others are still not classified. The majority of LNR‟s and wildlife sites in the borough are located in the urban area and may suffer from the effects of development, lack of appropriate management and visitor pressures.

Designated Landscapes

Similarly to designated sites designated landscapes often have public access, this can lead to potential conflicts between people, recreation and wildlife. This needs to be carefully managed so that the quality and ecological value of the site does not deteriorate over time. One of the main ways to manage pressure is to have an up to date and relevant management plan. Not all sites in the borough have this. Updating management plans is seen as a priority, with recent guidance and policy recommending that important sites are protected and restored so that they continue to be of value in the long term. The government has set targets within the England Biodiversity Strategy for bringing sites into favourable conservation management

Protected & Priority Species & Habitats

The Shropshire Biodiversity Partnership has indicated actions that are needed to protect and enhance this resource via the Shropshire Biodiversity Action Plan. Conserving biodiversity is a major challenge. We need to balance the needs of the natural environment with those of agriculture, the need for development such as for housing and people's quality of life. In Telford and Wrekin there are a number of species being lost or in decline. Telford needs to enhance existing biodiversity assets and restore biodiversity that has previously been lost to development and other pressures. The protection and enhancement of the existing green infrastructure is important to conserve natural assets, protect local distinctiveness and minimise habitat fragmentation.

Local authorities are required by European and National Legislation and policies to protect and conserve wildlife including flora and fauna, and their habitats. The Natural Environment and Rural Communities Act 2006 (Sec 40), requires local authorities to have regard to biodiversity conservation in carrying out their functions - referred to as their “Biodiversity Duty” and states that they should use Local Biodiversity Action Plans (LBAP).

The Dingy Skipper is an example of a UK Priority BAP species, which requires habitat on urban brown-field and post-industrial sites. The Telford & Wrekin area was identified as a regional stronghold for the Dingy Skipper by the Butterfly Conservation organisation in 1997. However, key sites for this species are threatened by development or natural succession.

Research and information available varies between species and habitats, with some groups better documented than others. Species records are collected by volunteer recording groups and the level of survey effort and accuracy varies. Habitats in the borough have only been broadly classified. Lack of data for an area could mean that species/habitats have been lost or there may be just a lack of survey effort. There is a lack of baseline ecological data and on-going monitoring; this adversely affects the accurate assessment of the extent of species/habitat loss. For example, research

suggests that Water Voles have disappeared from 95% of their former territories nationally, due to habitat loss and unsympathetic management[54].

Ecological Networks

Threats to biodiversity in Telford and Wrekin include demand for development, which can result in habitat loss and fragmentation. Many of Telford and Wrekin‟s biodiversity hotspots are on brownfield land, such as pitmounds. The current planning system aims to locate 60% of development on brownfield sites[55], however, the biodiversity quality of the brownfield sites must be assessed to ensure no negative effects on biodiversity. However, if carried out sensitively development can provide opportunities for improvements to biodiversity, through creation, enhancement and appropriate management of habitats.

Agricultural intensification and changes in agricultural, woodland and forestry management practices can impact on local habitat and species. Water abstraction, drainage or inappropriate river management can also cause habitat loss and degradation. For example the Weald Moors provide an important habitat for birds. Lapwings and other wading birds need wet grassland areas because they provide nesting habitat and abundant insect food for adult birds and their chicks. Improved drainage of these areas and historic conversion of grassland to arable production created a serious problem for lapwings and other birds, which rely on this habitat.

In 2010, the independent review of England‟s wildlife sites and ecological network, chaired by Professor Sir John Lawton, concluded unequivocally that England‟s collection of wildlife areas is fragmented and does not represent a coherent and resilient ecological network capable of responding to the challenges of climate change and other pressures. The review called for „a step-change in nature conservation [...] a new, restorative approach which rebuilds nature and creates a more resilient natural environment for the benefit of wildlife and ourselves‟.

[54] Whitchurch Community Water Vole Project http://www.woodlanereserve.co.uk/watervoles.htm
[55] DCLG (2011) PPS3: Housing (update)

The Making Space for Nature review of terrestrial wildlife sites argued that we must:

- improve the quality of current wildlife sites by better habitat management;
- increase the size of existing wildlife sites;
- enhance connections between sites, either through physical corridors or through „stepping stones";
- create new sites; and
- reduce the pressure on wildlife by improving the wider environment.

Within the borough there is a high public demand for declaration of Local Nature Reserves, the following LNR proposals have recently been approved by cabinet:

- Southern extension to the existing Granville Local Nature Reserve
- Madebrook and Stirchley Dingle Local Nature Reserve

The following proposals are currently being considered and have not yet been fully consulted on or approved by cabinet:

- Southern extension to the existing Town Park Local Nature Reserve
- Madeley Pitmounds Local Nature Reserve
- Dothill Local Nature Reserve, Wellington

People & Nature

There is a strong group of volunteers present in the borough who help with, data collection , maintenance and management of the some designated sites. Groups such as "friends of" and the Green Gym are indispensible for helping protect sites within the borough. There is scope to expand these groups, particularly as part of the "big society".

Whilst volunteers are priceless, due to the reliance on amateur recorders and volunteers there is a danger of a lack of coherent and consistent data collection and management for protected sites. There is a need for greater data sharing and further green education.

Resilient Ecosystems

The benefits we get from nature are often described as „ecosystem services". Natural resources (such as food, timber and water) and functioning natural systems (such as healthy, fertile soils; clean water and air; and a regulated climate) are vital support services for our wellbeing and security, and are themselves sustained by biodiversity. Biodiversity & Geodiversity have inherent economic value, the TEEB project[56] concluded that degradation of the natural world was costing the global economy £1.3-3.2 billion per year. At a national scale Caroline Spelman MP is quoted as saying that bees alone are worth £440 billion a year to the UK economy[57]. Although biodiversity does not often have an obvious economic value, it provides a variety of ecosystem services without which life could not be sustained. Taking account of all the economic and non-economic benefits we get from these services enables decision-makers to exercise judgement about how we use our environment. Such an approach is often called an „ecosystems approach". The importance of managing ecosystems in a more integrated fashion, to achieve a wider range of services and benefits needs to be recognised by decision makers. This means, for example, linking goals on wildlife, water, soil and landscape, and working at a scale that respects natural systems and the natural features supporting such systems. An integrated approach to managing the natural environment, particularly at the landscape scale, should be promoted.

The Green Infrastructure Framework recognises that it is not just designated sites that are important to biodiversity, other types of Green Infrastructure present in the borough supply a biodiversity function through the provision of a habitat or corridor for wildlife.

Climate change is probably the greatest threat to the worlds ecosystems. As the climate changes, species will be displaced by higher temperatures and a different

[56] TEEB (2010) The Economics of Ecosystems and Biodiversity: Mainstreaming the economics of nature: A synthesis of the approach, conclusions and recommendations of TEEB http://www.teebweb.org/LinkClick.aspx?fileticket=bYhDohL_TuM%3d&tabid=1278&mid=2357
[57] http://www.bbc.co.uk/news/science-environment-11642538

climatic environment. It is projected that most species will seek to move Northwards and upwards. The movement of species will need to be monitored and managed to ensure the transition of species is not at the expense of another species.