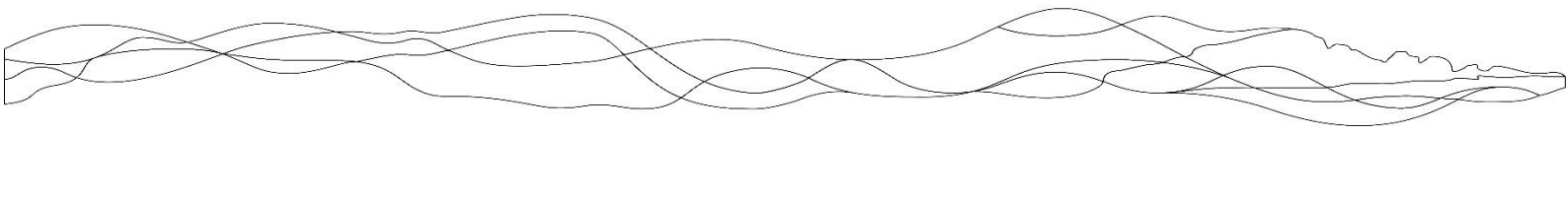
South Downs National Park Authority

Mapping of Ecosystem Services within the South Downs National Park using the EcoServ GIS Tool.

December 2016



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1. Introduction

Purpose of this study

1.1 Ecosystem Services are the benefits people and society get from the natural environment. There are four broad categories of Ecosystem Services, which are set out in table 1 and illustrated in figure 1.

Table 1: Four categories of Ecosystem Services

Regulating services	Services such as water purification, air quality, flood protection and climate regulation.
Provisioning services	Products we get from nature such as food, water and raw materials.
Supporting services	Functions that underpin all of the above, such as soil formation or nutrient cycling.
Cultural Services	'non-material' benefits such as health and well-being, recreation and inspiration.

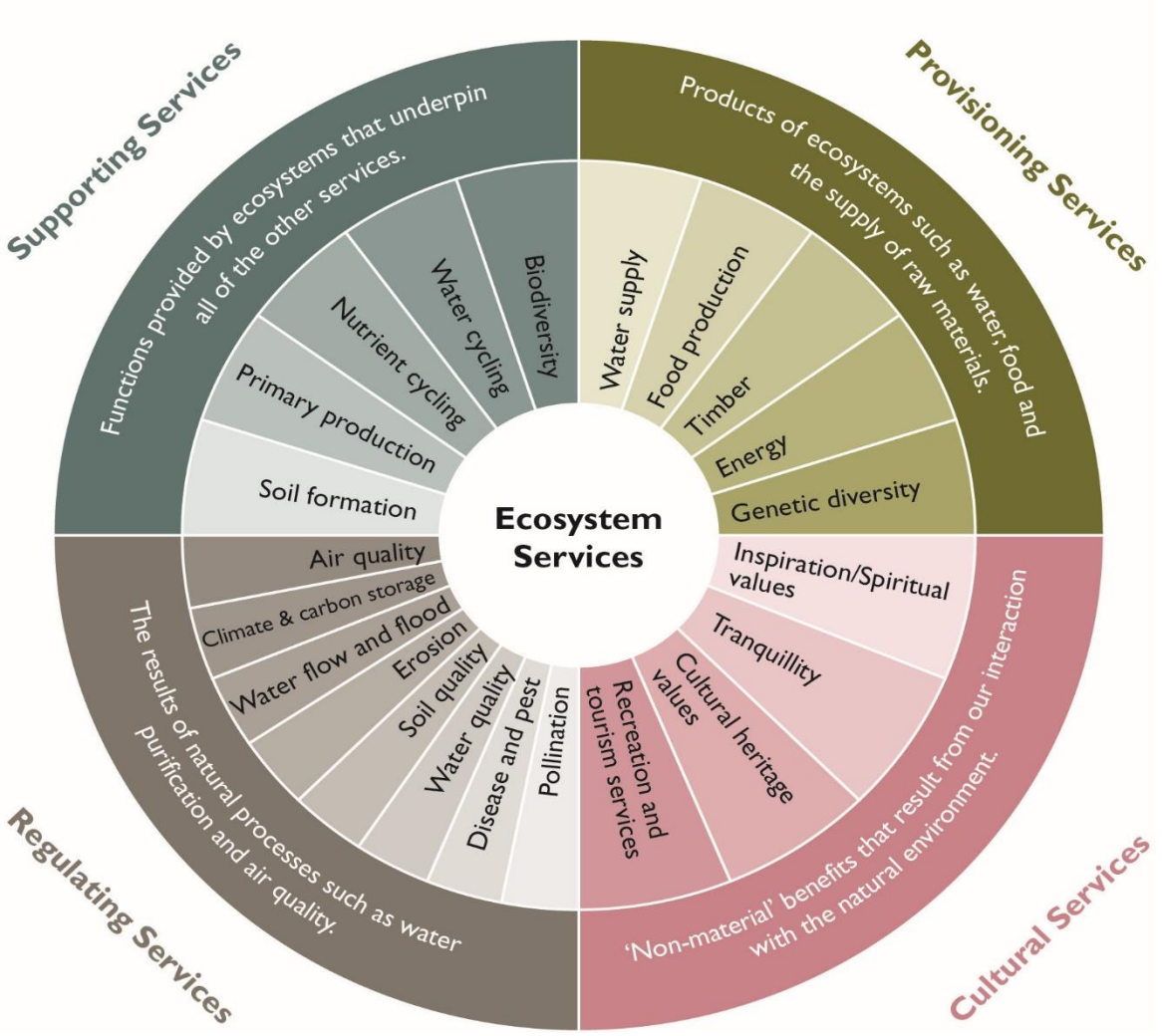


Figure 1: Ecosystem Services delivered in the South Downs National Park

1.2 To support the National Park Authority's work and the delivery of our statutory purposes we needed to develop a sound understanding of the Ecosystem Services provided by the National Park and the societal benefits that flow from them.

1.3 As a consequence the development of a GIS based tool (EcoServ GIS) has been undertaken to provide supporting evidence for our Local Plan and ensure our strategic policies can be better interpreted spatially. This GIS based tool enables us to map and understand the delivery of Ecosystem Services within the National Park in spatial terms. This evidential base supports us to:-

- Promote the conservation and sustainable use of the natural capital and assets of the National Park;
- Highlight areas where land-use change or trade-offs can present the best opportunities for delivering better public and environmental benefits;
- Identify constraints or negative impacts upon the natural assets of the National Park that are contrary to our policy goals and objectives;
- Support better community based planning and guide the development of spatial projects with our external partners;
- Consider different land-use change 'scenarios' that show the potential impacts of key drivers such as climate change.
- Enhance our ability to carry out multi-criteria analysis, support decision making and effectively target the delivery of our policies and objectives on the ground.

1.4 The EcoServ models and maps, along with the outputs of other GIS based tools help us to define priority areas, support decision making and help to target our resources most effectively. This also help us deliver the wider objectives of the Partnership Management Plan (PMP).

Background to this study

1.5 In terms of its plan making and policies, the South Downs National Park Authority (SDNPA) has sought to develop an integrated approach to managing land, water and the living resources of the National Park. It also seeks to promote their conservation and sustainable use, to ensure that these vital natural services are protected and enhanced now and for the future.

1.6 The concept of ecosystem services is fundamental to the delivery of our statutory purposes and duty. The SDNPA has sought to imbed this across all its work. As a new National Park we felt there was an opportunity to do this from the outset rather than as an afterthought. This is central to delivering the long term Vision for the National Park, which includes reference to understanding and valuing the natural goods and services provided by the National Park.

https://www.southdowns.gov.uk/national-park-authority/our-work/vision/

1.7 The consideration ecosystem services changes the traditional perception of the environment as a constraint to that of an asset which forms part of the growth agenda. However, such assets needs careful management and stewardship to ensure that the multiple benefits they provide to society are supported and protected.

2. Local Policy Context

South Downs Partnership Management Plan

2.1 The Partnership Management Plan (PMP) was published in 2013 and is a shared plan for the National Park area. It was developed with extensive involvement from a wide range of stakeholders and partner bodies. The development of the PMP was premised on the Ecosystem Approach. It recognises that the conservation and enhancement of this Natural Capital is fundamental to the pursuit of National Park Purposes. It seeks to highlight the important relationship between people, the landscape and the benefits nature provides for society. It also sets out the case for shared stewardship to ensure a sustainable future. For further details see Pages 2, 3 and 4 of the PMP, see link here:-

http://www.southdowns.gov.uk/wp-content/uploads/2015/01/SDNP Partnership-Management-Plan-2014-19.pdf

2.2 The policies within the PMP aim to cover the full range of Supporting, Regulating, Provisioning and Cultural services as defined in the National Ecosystem Assessment (NEA) 2011. For details of how the outcomes and polices contained within the PMP link to ecosystem services, please see the table below.

I:\Landscape_Character\Eco_systems_Services\EA Outcome 1c - Self-Assessment 2016\Ecosystem Approach Outcome 1c_Annex A_PMP Policy Matrix.xlsx

South Downs Local Plan

2.3 The emerging Local Plan for the South Downs National Park provides the overarching framework for evaluating all development proposals in the National Park. It has been developed based upon an Ecosystem approach from the outset.

2.4 It is an integrated plan and recognises the benefits and services we get from the natural environment. There is a strong read across from the PMP outcomes to the Local Plan, which includes a Core policy on protecting and enhancing Ecosystem Services. Work is also underway on formulating development requirements specifically related to Ecosystem Services for sites allocated for development in the plan. This allows us to fully consider these services and the full range of public benefits the environment provides in our decision making.

2.5 This approach allows the landscape to be valued for the variety of societal benefits it provides, rather than viewed just as a constraint to development. This provides opportunities for new environmental markets and for positive planning outcomes from sustainable development.

Why map Ecosystem Services?

2.6 The NPA took an early decision to adopt an ecosystem approach. To develop our evidence base we needed to map the Ecosystem Services provided by the National Park.

2.7 We considered a number of different approaches to doing this, including looking at a number of different GIS based tools and approaches. The tool needed to be able to be used at large spatial (landscape) scale and be able to be run with readily available datasets. It was considered that the EcoServ GIS tool was the 'best fit' in terms of meeting these requirements.

2.8 In terms of the Local Plan, developing a GIS based tool provides us with greater resolution and detail for the Policies Map. It also provides us with important context for major development sites and helps to inform decisions on allocations and strategic sites.

3. National Policy Context

National Planning Policy Framework (NPPF)

3.1 Paragraph 7 of the NPPF outlines that the planning system has an economic, social and environmental role in achieving sustainability.

3.2 Paragraph 17 set out the broad planning principles in plan and decision making. These encourage the delivery of multiple benefits from land use in both rural and urban areas including reference to ecosystem service functions such as flood mitigation, carbon storage and provisioning services such as food and fuel.

3.3 Paragraph 109 recognises that value and wider benefits of ecosystem services and requires that the planning system contribute to their enhancement and protection.

3.4 Paragraph 114 requires that Local Plans should take a strategic approach and plan positively for the creation, protection, enhancement and management of networks for biodiversity and green infrastructure.

3.5 Paragraph 117 also states that planning policies should contribute to the promotion of coherent ecological networks.

Defra White Paper 'The natural choice: Securing the value of nature (2011)'

3.6 Sets out that 30% of the ecosystem services provided by the natural environment are in decline. It also states that many of these essential societal benefits are not being properly valued or factored in to decision making. It highlights that the valuing of nature and ecosystem services are not a constraint on the economy – rather it can make it more resilient and sustainable through valuing the resources and the ecosystems that it relies upon.

National Ecosystem Assessment (2011)

3.7 The National Ecosystem Assessment (NEA) was the first UK wide attempt to assess the full range of benefits that nature provides. The assessment considered how they had been impacted historically, and how they may be affected by future changes. Key message from the NEA that are relevant to this plan are:-

- The natural world, its biodiversity and its ecosystems are critically important to our wellbeing and economic prosperity, but they are consistently undervalued in conventional economic analyses and decision making.
- Ecosystems and ecosystem services, and the ways people benefit from them, have changed markedly in the past 60 years, driven by changes in society.
- The UK's ecosystems are currently delivering services well, but others are in long-term decline. 30% of services are in decline.
- Population growth and climate change are likely to increase pressure on ecosystem services in the future.

- Actions taken and decisions made now will have consequences far into the future for ecosystem services and human wellbeing. It is important these consequences are understood and we make the best choices for present a future generations.

- We need to move to a more integrated approach to ecosystem management.

Biodiversity 2020: A strategy for England's wildlife and ecosystem services (2011)

3.8 This strategy set out some priority actions that seek to increase ecosystem resilience, and suggests we actively review our responses over time. Key to this is the need to establish *'more coherent and resilient ecological networks on land that safeguard ecosystem services for the benefits of wildlife and people'.*

3.9 It identified five components of an ecological network that are relevant to this work:-

- Core areas of high conservation value – rare or important habitats or area that are of high ecological value or deliver important ecosystem services.

- Corridors or stepping stones – provide a mosaic of habitats allowing species to move between core areas and supporting ecosystem service function.

- Restoration areas – creating new high value areas that restore habitats and ecosystem service functions.

- Buffer Zones – that protect core areas from adverse impacts in the wider environment.

- Sustainable use areas – areas of surrounding land that are managed in a sustainable and wildlife friendly way.

3.10 To achieve this the strategy recommends a spatially based approach and landscape scale action. The risk and opportunity assessment, which is annexed to this report, sets out these challenges as fully as possible. It also sets out an action plan for how we might seek to address the most significant effects, or make best use of new opportunities. This sets out our proposed adaptive responses.

4. Integrating Ecosystem Services into the formulation of the South Downs Local Plan

The 'Ecosystem Approach' – planning for multi-functional landscapes

4.1 The National Park Authority has applied the following principles to ensure we are taking an ecosystems based approach. These have been adapted from the National Ecosystem Assessment (2011) to meet the specific circumstances within the South Downs. They require that our plan making should:-

- Be based upon the public interest both inside and outside the plan area, including in particular, the opportunities for recreational activities and learning experiences and conserving the diverse, inspirational landscapes, breath-taking views and tranquillity.
- Delegate decision making to the most appropriate level, particularly for the communities with pride in their distinctive towns and villages
- Identify and assess adjacent effects at different scales, in particular taking into account, views, priority habitat connectivity, rare and internationally important species, river and water catchment issues and the associated flooding, water quality and supply issues.
- Understand the economic context and aim to reduce market distortion, particularly to enable farming to enhance the environment and continue to embrace new enterprise.
- Support the enhancement of Natural Capital, historic features and rich cultural heritage so it can be enjoyed by future generations
- Respect known environmental limits using best available evidence but develop flexible policies to respond to issues of uncertainty
- Operate at appropriate spatial and temporal timescales, linking in particular with partnership landscape-scale approaches, the National Character Area profiles and other local data and evidence
- Manage for the long-term, considering lagged effects
- Accept and manage change as inherent and inevitable, particularly considering recreation, housing, farming and land management as significant aspects of this change
- Deliver the National Park's two purposes as a priority and whilst doing so, the Authority duty using the Sandford Principle in case of conflict between purposes.
- Use a robust evidence base and apply the precautionary principle where the data or evidence is incomplete
- Maximise and maintain stakeholder engagement.

4.2 Subsequently, through our role as the local planning authority, we have sought to apply these principles to all of our work. This is an ongoing process and we are continuing to develop ways to enhance our capabilities and evidence base for the future.

4.3 The priority Ecosystem Services for provisioning, cultural, regulating and supporting services within the South Downs are set out in table 2.

Table 2: Priority Ecosystem Services for provisioning, cultural, regulating and supporting services within the South Downs

Supporting Services – Functions provided by ecosystems that underpin all of the other services	
Soil Formation	Soil is formed by the interaction between plants, micro-organisms and the underlying geology. We depend on healthy soils for growing food. Soils are slow to form but can be quickly degraded by poor land management, erosion and the impacts of weather and climate.
Primary Production	We rely greatly on processes such as photosynthesis where plant communities use solar energy to convert water and nutrient into biological growth, food and raw materials.
Nutrient Cycling	Plants, animals and micro-organisms are essential to the natural cycle of nutrients and help maintain soil and water quality. Increased levels of nutrients such as nitrates and phosphates from sewage and fertilisers can result in poor water quality.
Water Cycling	We rely on the natural environment and its functions to provide us with fresh water.
Biodiversity & Wildlife	Plants and animals drive many of the processes that result in a healthy ecosystem, and the benefits we get from it. The richness and diversity of species and habitats are vital to conserve as they support and underpin many of the processes we rely on to sustain our lives.
Provisioning Services - Products of ecosystems such as water, food, and the supply of raw materials	
Water supply	Clean water is essential for life. The chalk aquifers and river catchments of the South Downs provides drinking water for 1.2 Million people and we rely on the supply for all our commercial and domestic uses.
Food Production	Farmers in the South Downs produce food and other raw materials. The farmed environment of the South Downs is a major producer of cereals and wheat, oilseeds, sheep and cattle amongst other produce.
Timber	Woodland cover is around 24% of the total area of the National Park. Many estate woodlands in the central and western downs are under commercial management. There is great potential for bringing other areas of woodland into active management, through coppicing for example.
Energy	The South Downs has good conditions for a range of renewable energy, there is scope for developing resources such as wood fuel that also improve Landscape quality and Bio-diversity.
Genetic diversity	The Bio-diversity and seed bank within the National Park are a resource for the future. Local breeds of sheep and cattle help maintain important genetic diversity and contribute to both our cultural heritage and local distinctiveness.
Regulating Services - The results of natural processes such as water purification and air quality	
Air Quality regulation	Plants and trees are central to the cycle oxygen and carbon dioxide in the atmosphere, they have an important role to play in regulating levels of air pollution.
Climate regulation and carbon storage	Plants and trees have an influence on climate at both local and global scales. They absorb and store carbon from the atmosphere. The thin mineral soils on the chalk also have limited capacity to capture and store carbon.
Water flow and flood regulation	The water catchments, rivers and streams help regulate the flow of water and drainage of the land through storage and reducing run-off. If properly managed they can help reduce flooding at time of high

	rainfall, and sustain river flows and surface water levels during droughts.
Erosion regulation	The light, shallow soils on the chalk ridge and the sandy soils in the west weald are unstable and can be prone to erosion. Erosion is reduced by tree and vegetation cover. On farmed land the risk of erosion can be managed by taking care over cultivation, particularly on slopes.
Soil quality	Shallow, lime rich soils over chalk are free draining, which helps water infiltration and the recharge of the water aquifer. Soils are low in organic matter where they are under intensive cultivation.
Water quality	The soil structure and underlying chalk and greensand geology filters water and helps to regulate water quality in the underlying aquifer.
Disease and pest regulation	Natural processes such as predation and climatic conditions help to control the spread of disease and pests.
Pollination	The effective pollination of crops by Bees and other pollinators is vital to the life cycle of many plants. We rely on this 'natural service' for growing food crops as well as other plants and wildflowers.
Cultural Services – 'Non-material' benefits that result from our interaction with the natural environment	
Inspiration/Spiritual values	The South Downs is renowned for the beauty of its landscapes and its sense of place. They have provided inspiration for many famous artists and writers. They continue to provide people with the opportunity to understand and enjoy its special qualities. To escape, be inspired, and find spiritual renewal.
Tranquillity	The relative tranquillity is recognised as a special quality of the National Park. It provides a resource and a benefit that is greatly valued within such a busy and pressured region.
Cultural Heritage values	Human influence and settlement can be traced back many thousands of years to Mesolithic hunter gatherers and early agriculture. The National Park has a rich historic heritage in terms of its art, culture, ancient monuments and historic buildings. This has great social value, as well as an economic value.
Recreation and tourism services	Recreation and tourism is a significant feature of the area with an extensive network of access routes, popular beauty spots and visitor attractions. The area attracts 46 Million visitor trips per year and makes a significant contribution to the rural economy and the health and well-being visitors and residents alike.

The Spatial Portrait of the Local Plan

4.4 The emerging Local Plan includes a spatial portrait of the National Park, which introduces a new way of looking at the South Downs. It is based on the landscapes of the South Downs and includes five broad areas and four river corridors that share similar issues and challenges. The five broad areas are the Western Downs, the Western Weald, the Scarp Slope, the Dip Slope and the Coastal Plain, and the four river corridors that bisect the National Park are the Arun, Adur, Ouse and Cuckmere. The spatial portrait was informed by:

- The character of the different landscapes, as defined in the South Downs Integrated Landscape Assessment (SDILCA) and the historic patterns of development.
- The ecosystem services and special qualities of the National Park area;

- The drivers for change that strongly influence the National Park and the areas around it.

4.5 A broad spatial portrait was set out in the Preferred Options version of the plan. In order to facilitate the mapping of Ecosystem Services within the different areas of the National Park, the exact boundaries of the areas have been digitised. The EcoServ GIS data was then cut to match the broad spatial areas within the Local Plan.

4.6 The spatial portrait extend beyond the National Park and acknowledges the many interdependencies and connections that exist across its boundary. For example, the Coastal Plain extends far beyond the National Park to the South and cover the whole area down to the coast.

4.7 The version of the spatial portrait that will be included in the Pre-Submission plan is set out in figure 1. A summary of the priority Ecosystem Services for each broad spatial area is presented in chapter 2 of this report.

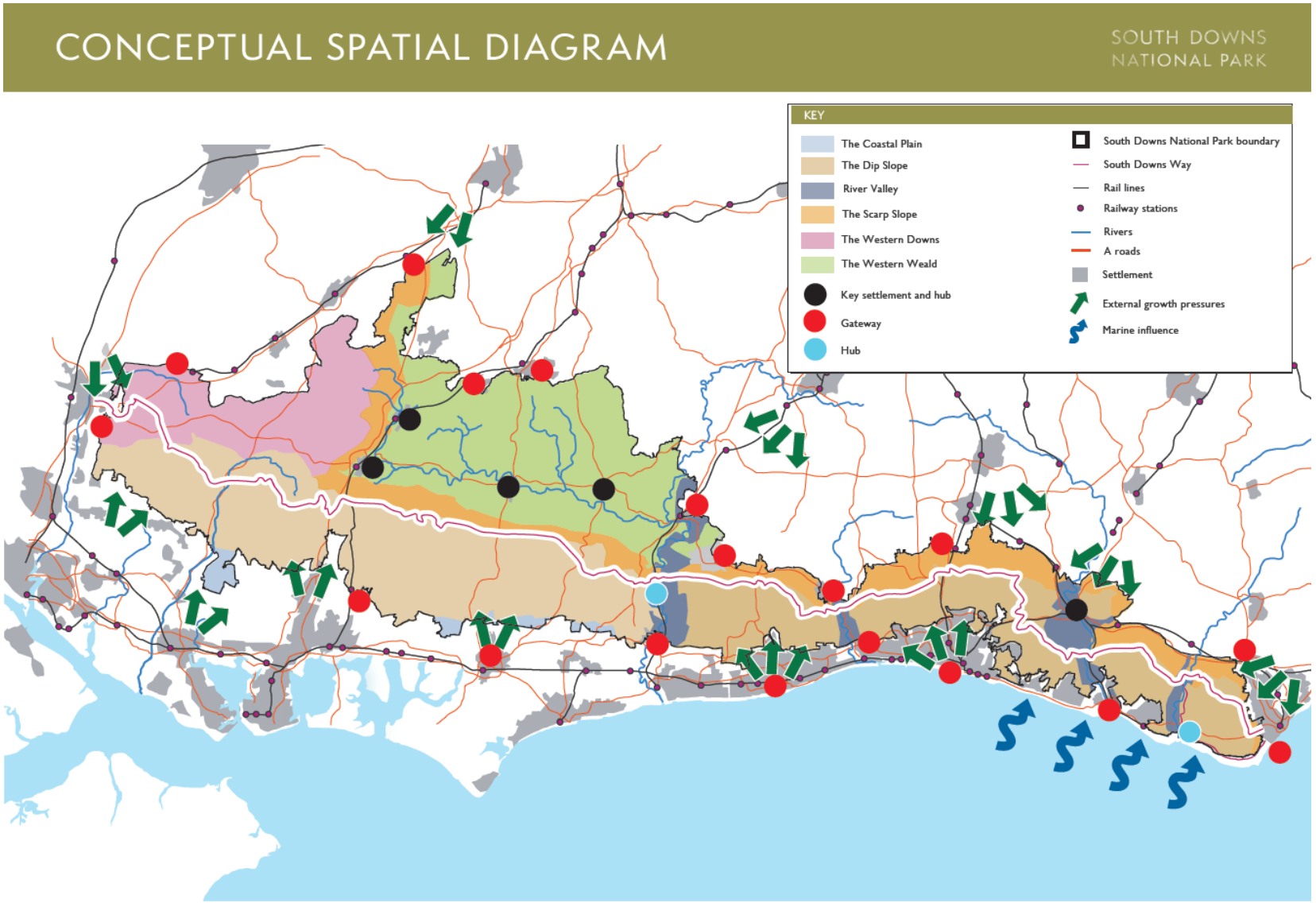


Figure 2: Spatial Portrait of the South Downs

5. Piloting EcoServ-GIS Toolkits

EcoServ-GIS Toolkit V2

5.1 In 2013 the Durham Wildlife Trust were in the early stages of developing the EcoServ-GIS tool. The intention was to help identify and map the multiple benefits provided by the natural environment. This earlier version of the tool mapped a broad range of Ecosystem Services function. Whilst it had been trialled locally in Durham the Trust were keen to test the applicability of the tool in other locations and over a larger spatial area.

5.2 As a consequence, the South Downs National Park was selected as a pilot area in 2014. We worked with the Sussex and Durham Wildlife Trusts to test and improve the tool. This version of the toolkit modelled the Ecosystem Services set out in table 3.

Table 3: Ecosystem Services modelled by EcoServ-GIS Toolkit V2

Cultural	Accessible nature, Aesthetics
Regulating	Carbon Storage, Local Climate Regulation, Air Purification, Water Purification, Noise Regulation, Pollination
Provisioning	Food, Timber
Supporting	The EcoServ Tool base map overlays a wide range of environmental datasets, including wildlife and habitat data. These represent the supporting services that underpin the delivery of the other ecosystem services.

5.3 Early versions of the output maps for the National Park were tested and considered by a range of external partners at a workshop event on the 20th January 2015. Comments and observations from this session were used to inform further development of the GIS tool and modelling.

Development of EcoServ GIS toolkit – Version 3.3

5.4 The latest version of the EcoServ-GIS tool (V3) was released in March of 2015. This is the version we are currently using for our evidence work. It has added additional models to the tool and adds some new features and functionality. We have run this version of the tool to produce output maps for ecosystem services at park-wide scale. The current range of Ecosystem Services functions are set out in table 4.

Table 4: Ecosystem Services modelled by EcoServ-GIS Toolkit – Version 3.3

Cultural	Accessible Nature, Education, Green Travel
Regulating	Carbon Storage, Local Climate Regulation, Air Purification, Water Purification, Noise Regulation, Pollination.
Provisioning	Food, Timber
Supporting	The EcoServ Tool base map overlays a wide range of environmental datasets, including wildlife and habitat data. These represent the supporting services that underpin the delivery of the other ecosystem services.

Outputs from the EcoServ GIS Tool and explanation of the map template

5.5 The tool makes use of a base map to generate its outputs. This base map overlays a wide range of environmental datasets, including soils, geology, wildlife and habitat data. From this the tool produces output maps that show:-

- **Ecosystem service capacity:** The performance and capability of the natural environment to produce Ecosystem derived goods and services.
- **Service demand areas:** Areas where there is societal demand (need) for a service and/or the need for ecological regulation
- **Service delivery or benefitting areas:** Where capacity and demand coincide, this represents 'benefiting areas' or areas where it may be necessary to protect or enhance a specific Ecosystem Service.
- **Management areas**: Highlights areas where there are gaps in provision occur, and where opportunities may exist to improve ecosystem service function.

Use of the EcoServ GIS Tool in local planning

5.6 The tool enables us to take an evidence-based approach and consider the multiple ecosystem derived benefits provided by the National Park. It can highlight important 'hot-spots' or areas that deliver multiple Eco System benefits. From this we can consider the potential impact of development proposals or land use change on these benefits. It can also identify where land use change may offer opportunities to improve or enhance ecosystem services.

Use of the GIS Tool at different spatial scale

5.7 Map outputs from the model can be generated and used at a range of different spatial scales. For the purpose of this report we have chosen to generate these maps at a park-wide scale and mapped across the broad areas and river corridors. This was considered the best approach to provide context of where Ecosystem Service benefits are being delivered across the National Park. Some of the models are better suited to being used at a strategic, or park wide scale. In some cases the modelling works better, and there is more relevance at a more local scale – such as at Parish or settlement level.

5.8 This means that some of the model output at a park wide scale may appear sparse in terms of data. In these cases it is often better to map and analyse the data at a far more localised scale. In order to highlight this within the output maps included within this report, a simple key has been included on the map template. The key gives an indication of

the range of uses that can be made of the data. It explains the most appropriate scales for which the data can be used. It also highlights if there are any limitations to the model in terms of usage or application at a certain scale.

Table 5: Ecosystem Service – Summary Table

Usage	Promotion & publicity Strategic/Conservation Planning Site Planning
Landscape	Urban Urban Fringe Rural Uplands
Scale	Site level (e.g to 1km²) Catchment (e.g to 100 km²) County/Region (e.g to 5,000 km²)
Model reliability	High Medium Low

Multi-functional mapping and Ecosystem Service 'Hot Spots'

5.9 The EcoServ GIS Tool has also been developed to map areas that deliver multi-functional benefits. This highlight 'hot-spots' in terms of ecosystem service delivery and allows us to understand where multiple benefits are being delivered within the landscape. This additional feature is helpful to highlight landscape areas or features that are of especially high value in terms of delivering ecosystem services – and where these functions might need to be protected or enhanced.

The EcoServ-GIS toolkit – output maps and scenarios

5.10 The EcoServ GIS tool generates fine scale maps that illustrate the societal requirements (need or demand) for Ecosystem Services. It also maps the capacity of the natural environment to maps each service area. The tool uses scientifically informed, standardised methods and widely available UK datasets. It also provides users with the facility to overlay these maps to see how the capacity and demands coincide spatially.

5.11 This serves to highlight areas that provide high levels of service delivery and should be conserved. These areas are shown by maps of the service flows and of identified management zones.

5.12 The maps can be utilised at a range of scales, from assisting in planning decisions at a local level, informing policies or helping to develop landscape scale projects. Its suitability, and limitations of use, at different spatial scales are summarised in table 6.

Table 6: Ecosystem Service – Summary Table

Ecosystem Service	Site Scale up to 1 Km²	Catchment Level to 100 Km²	Strategic Level to 5,000 Km²
Air Purification	Use with caution	Applicable use	Applicable use
Carbon Storage	Use with caution	Applicable use	Applicable use
Climate regulation	Applicable use	Applicable use	Applicable use
Noise regulation	Applicable use	Applicable use	Applicable use
Pollination	Use with caution	Applicable use	Use with caution
Water purification	Applicable use	Applicable use	Applicable use
Accessible nature	Applicable use	Applicable use	Applicable use
Education	Applicable use	Applicable use	Applicable use
Green Travel	Applicable use	Applicable use	Applicable use

5.13 The EcoServ GIS tool uses Ordnance Survey MasterMap and can be used with a wide range of other datasets. The tool kit has been produced using ArcGIS ModelBuilder and requires an advanced level license to run the models. The individual ecosystem service tools are independent of one another and they can be run alone or as part of a multi-functional assessment. The toolkit is more appropriate to use for mapping multiple services. Many of the services relate to urban or peri-urban areas, which makes it very well suited to application within the South Downs National Park area.

5.14 The EcoServ tool overlays various spatial datasets relating to landscape, land use, habitat type and socio-economic factors. It creates a 'Base map' from this data that is subsequently used by the other models to focus on individual ecosystem services. It uses widely available data inputs such as Digital Terrain Models (DTM) and green infrastructure surveys to ensure that the methods are transferable to different areas and regions. It also allows for areas to be re-assessed with new or updated data for improving output maps and scenario modelling.

5.15 The focus of the resulting map outputs so to locate where ecosystem services occur and highlight where relatively high capacity to deliver a service or a high demand for that service. It concentrates on spatial locations and does not seek to quantify the actual impact of each service. For example, it doesn't measure the specific ability of a habitat to regulate air quality in terms of amount of pollutant trapped per area of habitat. It grades the ability of that habitat to trap or diffuse pollutants from high to low. It then uses this to relate to the maps that predict societal demand (need) for that service.

5.16 A short summary of each service model is include in the following sections. For a more detailed explanation of each individual model in the tool kit and the datasets that are used it is necessary to refer to the toolkit handbook.

EcoServ GIS Version 3 - Handbook for the tool kit

5.17 A link to the EcoServ GIS tool handbook is included here. This provides far more detail on the function of the tool and how the individual models have been developed.

I:\Landscape_Character\Eco_systems_Services\mapping\EcoServ GIS\EcoServ_GIS V3.3 - User Guide.pdf

6. Summary of the priority Ecosystem Services within the broad spatial areas of the National Park

Spatial Area : Western Weald	
Provisioning Services	Food provision (National Importance) Mixed farming area producing significant amounts of cereals and arable crops. Important for livestock including sheep, pig and cattle. Pastoral and dairy on the heavier clay soils in low weald areas. Vineyards are also increasingly a feature on the south facing slopes.
	Timber provision (Regional Importance) Highest densities of ancient woodland in England. Timber mainly from commercial plantations on the larger estates. Potential for biomass through bringing woodland under management.
	Water availability (Regional Importance) Forms part of a sandstone aquifer which has an important role in maintaining springs and base flows into rivers. Also abstraction of surface water for public water supply, agricultural and commercial uses.
Regulating Services	Regulating water quality (Regional Importance) Groundwater is vulnerable to pollution from nitrates and pesticides. Good levels of baseflow help maintain the chemical and ecological status of groundwater and rivers.
	Regulating water flow (Regional Importance) Soils and underlying geology are permeable which allow groundwater levels to recharge. Drainage from streams and rivers within their associated catchments play a role in local flood management.
	Climate Regulation (Regional Importance) Woodland, wetlands and heathlands play an important role in carbon sequestration and storage. Low carbon content stored in the free draining, and sandy soils.
	Air Quality regulation (Regional/Local Importance) Trees are central to the cycle of oxygen and carbo dioxide in the atmosphere. They have an important role to play in regulating air pollution.
	Regulating soil erosion (Local Importance) Fertile and versatile soils though prone to compaction and erosion from wind and surface water run-off. Soil erosion can impact upon other essential ecosystem services such as soil and water quality and sustainable food production.
	Pollination (Regional Importance) Existing habitats such as heathlands and grasslands are important nectar sources for pollinating insects. Pollinators are important for supporting food production, especially for arable and fruit production.
Spatial Area : Western Weald	
Cultural Services	Sense of Place (National Importance) Extremely varied landscape character, prominent views form the greensand ridge. Extensive areas of lowland heath, historic

	commons and ancient woodland. Rural settlement pattern with an intimate and enclosed character. Many heritage assets and distinctive vernacular of local sandstone and carrstone. Numerous large houses and designed parklands. Hammer ponds associated with the areas industrial past.
	Tranquillity (National Importance) The highest levels of tranquillity are generally associated with the intimate rural landscape and the areas of heathland and ancient woodland.
	Recreation (National Importance) Areas offers a wide range of high quality opportunities for recreation and access, particularly associated with the woodland and heathland areas.
Supporting Services	Biodiversity (National Importance) Diverse range of habitats including ancient woodland, heathland, lowland acid grasslands and meadows that support an extensive range of species and ecosystem services.

Spatial Area : The Dip Slope	
Provisioning Services	Food provision (National Importance) This area is a major producer of cereals (wheat and barley) and meat principally from sheep, cattle and pigs. Dairy produce is focussed more in the valleys where there are deeper soils and it is less exposed. Large scale vineyards are increasingly a feature of the south facing slopes.
	Timber Provision (Regional Importance) Combined broadleaved and conifer woodland. Many woods are managed for game or wildlife conservation. Many of the large areas of estate woodland are managed for commercial forestry. Opportunities for improved woodland management for biomass, charcoal and other woodland products.
	Water Availability (Regional Importance) The chalk aquifers underlying the dip slope are the principle source of water for all of the settlements in and around the downs. They act as a storage reservoir, supplying water for drinking and for agricultural and commercial uses.
Regulating Services	Regulating water quality (Regional Importance) The chalk geology underling the dip slope act as a natural filtering system and helps to maintain the chemical and ecological status of water bodies in and around the dip slope.
	Regulating water flows (Regionally Important) The groundwater from the underlying chalk feed many of the rivers, streams and wetlands in the area. They also supply base flows to many spring fed streams that rise in the spring line villages and along the base of the scarp slopes.
	Regulating soils quality (Regionally Important) The thin soils on the gentle, south facing dip slopes are well drained and easily worked. They are quite productive and are mostly used for arable production. They are also important for aquifer recharge and aid water infiltration. Maintaining good structural condition and organic content is important for supporting sustainable food production.
	Regulating soil erosion (Locally Important)

	They are at risk from loss from wind and water erosion, particularly on sloping ground. They are also prone to drought which combined with regular cultivation can reduce their quality. Maintaining vegetative cover, low tillage on sloping ground or woodland cover helps prevent erosion.
	Climate regulation (Regionally Important) The thin chalk soils are under fairly intensive arable production. As a consequence they have limited capacity to store carbon. The woodland cover in this area plays an important role in climate regulation. Carbon sequestration and storage benefits can be delivered by enhanced woodland management.
	Air Quality regulation (Regional/Local Importance) Trees are central to the cycle of oxygen and carbon dioxide in the atmosphere. They have an important role to play in regulating air pollution.
	Pollination (Regionally Important) Existing habitats such as chalk and semi-natural grasslands are important nectar sources for pollinating insects. Pollinators are important for supporting food production.
Cultural Services	Sense of Place (Nationally Important) An elevated chalk ridge with open rolling aspect which offers expansive views and dramatic cliffs on the areas of undeveloped coastline. Distinctive dispersed downland settlement patterns with distinctive vernacular of flint walls and traditional buildings. The area has a rich cultural heritage of arts, music and rural traditions. A wealth of prehistoric and other heritage assets reflect the long history of human settlement and land use.
	Tranquillity (Nationally Important) The most tranquil areas are associated with the chalk ridge, dip slope and valleys away from the major settlements and roads. The dip slope has an open aspect with secluded downland coombes and dark night skies.
	Recreation (Nationally Important) The dip slope has an extensive network of paths, open access and promoted routes, including the South Downs Way. Access to the undeveloped 'heritage coast' area and iconic sea cliffs are also a feature of the area. This makes a major contribution to the health and well-being of locals and visitors alike.
Supporting Services	Biodiversity (Nationally Important) Diverse range of habitats including ancient woodland, chalk grasslands, wetlands and chalk cliffs support an extensive range of specialised plant and animal species. These in turn provide a range of associated ecosystem services.

Spatial Area : The Western Downs	
Provisioning Services	Food Provision (National Importance) Extensive areas of arable production and cereals and fodder crops for livestock (mostly maize, rape and kale). Improved pasture for sheep, beef and dairy cattle and pigs. Commercial watercress beds on the chalk streams and rivers. Fish farming on the Test and Itchen valleys.
	Timber Provision (Regional Importance) Combined broadleaved and conifer woodland. Many woods are under-utilised though some are managed for game, coppice or wildlife conservation. Opportunities for improved woodland management for biomass, charcoal and other woodland products.
	Water Availability (Regional Importance) The Chalk Rivers and streams in this area are among the finest in the world. Provide high quality water for domestic, agricultural and commercial uses. This includes paper mills, fish farms and water cress beds.
Regulating Services	Regulating water flow (Regional Importance) The Test and Itchen Rivers have small associated flood plains that flood naturally when groundwater levels are high. They are not engineered for flood control and flows are naturally by aquifer and surface water levels. Small seasonal tributaries such as winterbournes also have winter flows at times of high rainfall. Water flow and natural flood regulation benefit from woodland management.
	Regulating water quality (Regional Importance) Water filtering through the soils and bedrock of the western downs recharges the aquifer. This provides the principle sources of water. Summer flows to the chalk streams and headwaters also maintain good chemical an ecological status of the available water.
	Regulating soils quality The thin downland soils are productive and are mostly used for intensive arable production. They are important for aquifer recharge and aid water infiltration. Maintaining good structural condition and organic content is important for supporting sustainable food production.
	Regulating soil erosion They are at risk from loss from wind and water erosion, particularly on sloping ground. They are also prone to drought which combined with regular cultivation can reduce their quality. Maintaining vegetative cover, low tillage on sloping ground or woodland cover helps prevent erosion.
	Climate regulation The thin chalk soils are mostly in arable production and have limited capacity to store carbon. The woodland cover in the western downs play an important role in climate regulation. Carbon sequestration and storage benefits can be delivered by enhanced woodland management.
	Air Quality regulation (Regional/Local Importance) Trees are central to the cycle of oxygen and carbo dioxide in the atmosphere. They have an important role to play in regulating air pollution.

Cultural Services	Sense of Place Outstanding scenic beauty and landscape character with rolling hills, plateaux and hanging valleys, extensive views. Rick evidence of historic human occupation from Neolithic times, the Bronze and Iron ages. Rich in heritage assets, great country houses and parkland. The rivers Test and Itchen are internationally known for the quality of their fly fishing.
	Tranquillity The areas of highest tranquillity are associated with the downland areas away from the main roads and settlement areas. The narrow river valleys of the Test and Itchen also offer areas of tranquillity.
	Recreation There is a dense network of rights of way and promoted routes which are popular for informal recreation. The western downs themselves offer access to popular recreation sites which provide iconic and breath-taking views. The chalk streams and rivers in the western downs are important for their recreational and tourism value. They are also internationally important for their game fishing.
Supporting Services	Biodiversity The western downs has extensive areas of chalk grassland, ancient woodland, exceptional chalk rivers, chalk valleys and farmed areas that support rare arable flowers and farmland birds. These habitats support much of the biodiversity interest as well as supporting the delivery of other important ecosystem services.

Spatial Area : The Scarp Slope	
Provisioning Services	Food provision (National Importance) The scarp slopes are generally used for extensive sheep grazing, mainly for conservation. The remaining areas are generally wooded though some will be managed for game.
	Timber Provision (Locally Importance) To the East much of the scarp slope is open aspect and is not heavily wooded. Further West they are more wooded and either underutilised or they are managed for game or wildlife conservation. The steep scarp slopes make woodland management difficult and generally management for timber is small scale and localised.
	Water Availability (Regional Importance) The chalk aquifers underlying the scarp slope are the principle source of water for all of the settlements in and around the downs. They act as a storage reservoir, supplying water for drinking and for agricultural and commercial uses.
Regulating Services	Regulating water flows (Regional Importance) Areas of land under extensive management, permanent pasture or woodland are more stable and slow cross-land water flow. On steep slopes that or unstable and prone to erosion this helps limit damage from water run-off.
	Regulating water quality (Regional Importance) The chalk geology underling the scarp slope act as a natural filtering system and helps to maintain the chemical and ecological status of associated water bodies.
	Regulating water flow The groundwater from the underlying chalk feed many of the rivers, streams and wetlands in the area. They also supply base flows to many spring fed streams that rise in the spring line villages and along the base of the scarp slopes.
	Regulating soils quality Due to their steep aspect the scarp slopes are mainly uncultivated and more extensively managed. Soil under permanent pasture and woodland are less prone to erosion and this helps to retain soils and maintain moisture and nutrient levels. This helps make them more resilient to drought, compaction or other impacts.
	Regulating soil erosion The thin chalk soils are at risk from loss from erosion by run-off, particularly on the steep scarp slopes. This maintenance of vegetative cover, with semi-natural grassland, scrub and woodland cover helps prevent soil erosion.
	Climate regulation The thin chalk soils have a limited capacity to sequester and store carbon. The areas of woodland cover also play an important role in climate regulation. Carbon sequestration and storage benefits can be delivered by enhanced woodland management.
	Air Quality regulation (Regional/Local Importance) Trees are central to the cycle of oxygen and carbo dioxide in the atmosphere. They have an important role to play in regulating air pollution.
	Pollination (Regionally Important)

	Existing habitats such as chalk and semi-natural grasslands are important nectar sources for pollinating insects. Pollinators are important for supporting food production.
Cultural Services	Sense of Place There are open and extensive views from the top of the scarp slopes out across the Weald. The associated spring line villages are a distinctive feature with their vernacular of flint and malmstone buildings. To the west the majestic beech hangers are a distinctive feature.
	Tranquillity The majestic beech hangers are associated with tranquillity and dark night skies. The scarp slope largely lacks intrusive development and retains a sense of tranquillity and dark night skies.
	Recreation The South Downs Way National Trail runs along the crest of the scarp slope. There are a network of paths, bridleways and open access sites climbing up and across the scarp slope. It is a popular area for walking, horse riding and cycling.
Supporting Services	Biodiversity The areas of unimproved chalk grassland form an important and internationally rare habitat type. This supports many rare and specialised wildlife species. These habitats underpin many essential ecosystem services such as soil production and nutrient cycling.

Spatial Area : The Coastal Plain	
Provisioning Services	Food provision Highly fertile soils cover the river flood plains. This supports intensive arable farming and horticulture along with some dairy, beef and poultry farming.
	Timber provision This area is sparsely wooded with small and medium sized blocks of broadleaf woodland between the areas of farmland and urban settlement.
	Water availability The surrounding urban settlements are reliant on groundwater and surface water abstractions for public water supply. The small areas of the coastal plain within the National Park overly important chalk aquifers.
Regulating Services	Regulating water quality (Regional Importance) The areas to the south of the coastal plain are heavily urbanise and intensively farmed. The underlying chalk geology acts as a natural filtering system and helps to maintain the chemical and ecological status of water bodies.
	Regulating water flows (Locally Important) The groundwater from the underlying chalk feed many of the rivers, streams and wetlands in the area. They also supply base flows to many spring fed streams that rise in the spring line villages and along the base of the scarp slopes.
	Regulating soils quality (Locally Important) The free draining soils are fertile and protecting their quality is important for maintaining agricultural yields, water infiltration and aquifer recharge. Excess nutrients being washed from the soils can cause pollution of the underlying chalk aquifer.
	Regulating soil erosion (Locally Important) Enhanced risk of soil erosion, particularly on steep or moderately sloping ground. They are also prone to drought which combined with regular cultivation can reduce their quality. Maintaining vegetative cover, low tillage on sloping ground or woodland cover helps prevent erosion.
	Climate regulation (Locally Important) The thin chalk soils in these areas have limited capacity to store carbon. Small areas of broadleaf woodland play an important role in local climate regulation. Carbon sequestration and storage benefits can be delivered by enhanced woodland management.
	Air Quality regulation (Regional/Local Importance) Trees are central to the cycle of oxygen and carbon dioxide in the atmosphere. They have an important role to play in regulating air pollution. Small areas of woodland play a role in regulating local air quality.
	Pollination (Regional Importance) Existing habitats such as grasslands and urban gardens are important nectar sources for pollinating insects. Pollinators are important for supporting food production, especially for arable, horticulture and fruit production.
Cultural Services	Sense of Place (National Importance)

	The sense of place is achieved primarily from the views of the coast and out to sea. Some traditional villages and settlements with a local vernacular of timber framed buildings and flint.
	Tranquillity (National Importance) Tranquillity is associated with the small pockets of woodland and the remoter areas around the edge of the adjoining South Downs dip slope. These are valuable pockets of tranquillity given the heavily urbanised character of much of the adjoining coastal plain to the South.
	Recreation (National Importance) Areas offers a wide range of high quality opportunities for recreation and access, particularly associated with the woodland and access to adjoining downland areas from the urban settlements along the coast.
Supporting Services	Biodiversity (National Importance) The richness and diversity of habitats and species within the river valleys are vital as they support and underpin many of the ecosystem services we rely on to sustain our lives.

Spatial Area : Adur, Arun, Ouse and Cuckmere River Corridors	
Provisioning Services	Food provision Highly fertile soils cover the river flood plains, significant areas have been drained and converted to intensive agriculture. Extensive areas of brooks and flood plain grazing marshes remain such as the Lewes Wild Brooks and on the lower stretches of the River Arun at Amberley. These areas are mainly used for grazing sheep, dairy and beef cattle. They are also important areas for fisheries.
	Timber provision This area is sparsely wooded with small and medium sized blocks of broadleaf woodland between the areas of farmland and extensive urban settlement.
	Water availability The abstraction of surface water from the rivers such as the Arun and Ouse is important for water supply. Over-abstraction can cause low flows in the summer months which can result in pressures on water supply and threaten the natural resources and wildlife of the river valleys.
Regulating Services	Regulating water quality (Regional Importance) The rivers are a major source of water abstraction for domestic and commercial uses. They are also sensitive to diffuse pollution from agricultural activity, saline intrusion in coastal areas, urban and road related run-off and sewage leakage. They need good levels of base flow to maintain the chemical and ecological status of their waters.
	Regulating water flows (Regionally Important) The river valleys provide much needed flood storage capacity where more natural water flows are maintained. The River Arun has lost much of its flood storage capacity through land drainage and conversion for agriculture. Significant flooding risk also exists along the River Ouse and at Lewes, with tidal flooding more of a risk closer to the see at Newhaven. Estuaries such as the Cuckmere help to drain coastal areas and help flow surface water downstream and out to sea.
	Regulating soils quality (Regionally Important) The free draining soils are fertile and protecting their quality is important for good agricultural yields, preventing soil loss and maintaining water quality. Excess nutrients and sediments being washed into the rivers can cause pollution of result in poor chemical and ecological status of the rivers.
	Regulating soil erosion (Locally Important) The lighter, more fertile soils within the river valleys can be at risk of erosion where they are repeatedly cultivated or are on sloping land. Coastal flooding can also damage soils and cause erosion.
	Climate regulation (Locally Important) Small areas of broadleaf woodland play an important role in local climate regulation. Carbon sequestration and storage benefits can be delivered by improved soil management and new woodland planting along the river corridors.
	Air Quality regulation (Regional/Local Importance) Trees are central to the cycle of oxygen and carbon dioxide in the atmosphere. They have an important role to play in

	regulating air pollution. Small areas of woodland play a role in regulating local air quality.
	Pollination (Regional Importance) Existing habitats such as grasslands and urban gardens are important nectar sources for pollinating insects. Pollinators are important for supporting food production, especially for arable, horticulture and fruit production.
Cultural Services	Sense of Place (National Importance) The river valleys often have important historic settlement such as Arundel on the River Arun and Lewes on the River Ouse. This often reflects their value as places of early trade and commerce based on access by the river. The river valleys remain important transport and communication corridors through the chalk downs.
	Tranquillity (National Importance) The main areas of tranquillity are associated with the undeveloped sections of river corridor. There is also a sense of relative remoteness and wildness associated with the undeveloped heritage coast and Cuckmere Haven.
	Recreation (National Importance) The river valleys are valuable recreation resource for walking, fishing and water based recreation where access exists. Supporting Services
Supporting Services	Biodiversity (National Importance) The chalk streams and rivers are of international importance and are often designated for their high wildlife value, such as the Arun and Itchen. Their associated wetlands are often designated for their habitat and species interest, such as the Lewes Brooks SSSI. The rivers such as the Arun, Adur and Ouse, all support a range of fish populations. They are also important hatcheries for marine fish species. They rivers and their associated wetlands are of high value for biodiversity. Good water quality is key to maintaining these important habitats and the range of ecosystem services they provide.

APPENDIX 1

EcoServ Version 3: The Output maps

EcoServ maps have been produced for the following services:

- Accessible Nature
- Air Purification
- Carbon
- Local Climate
- Education
- Green Travel
- Noise
- Pollination
- Water Purification

For each service we have produced output maps covering four 'scenarios':

- **Capacity score**: Relative capacity to deliver the ecosystem service (regardless of demand)
- **Demand Score**: Relative demand for the ecosystem service
- **Ecosystem Service Benefitting Areas – Gaps and Prioritised**: categorised into
  - A1. Highest - Highest demand for a service and highest capacity to provide it
  - A2. High - High demand for a service and high capacity to provide it
  - A3. Intermediate - Intermediate demand for a service and intermediate capacity to provide it
  - A4. Low - Low demand for a service and low capacity to provide it
  - A5. Lowest - Lowest demand for a service and lowest capacity to provide it
  - B1. None: Highest Demand - Highest demand but no capacity
  - B2. None: High Demand - High demand but no capacity
  - B3. None: Int+Low Demand - Intermediate or low demand but no capacity
- **Ecosystem Service Benefitting Areas – management Zones**: categorised into
  - A1. Protect - Highest demand and highest capacity
  - A2. Protect / Maintain - High demand and high capacity
  - A3. Maintain - Highest demand and low or lowest capacity
  - A4. Improve - Intermediate demand and intermediate capacity
  - A5. Maintain / Improve - High or intermediate demand and low or lowest capacity
  - A6. Maintain / Assess - Low or lowest demand and low or lowest capacity
  - A7. Assess - Lowest demand and lowest capacity
  - A8. Change habitat type: Highest Demand - Highest demand but no capacity, in areas of greenspace

A9. Change habitat type: High Demand - High demand but no capacity, in areas of greenspace

B1. Create: Highest Demand - Highest demand but no capacity (no greenspace)

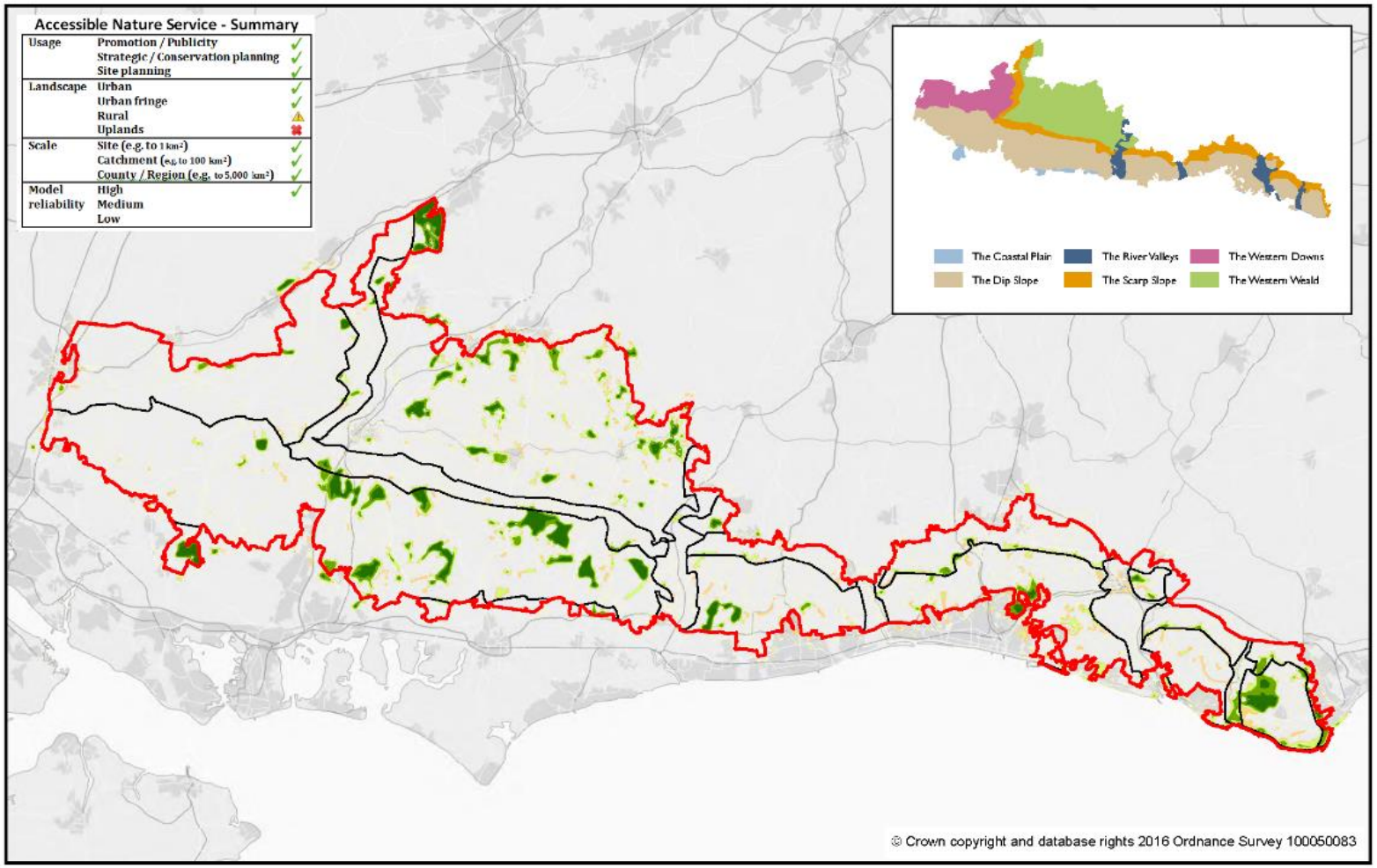
B2. Create: High Demand - High demand but no capacity (no greenspace)

B3. Create: Int+Low Demand - Intermediate or low demand and no capacity (no greenspace)

C1. Provide access: Highest Demand - Highest demand and access is restricted

C2. Provide access: High Demand - High demand and access is restricted

C3. Provide access: Int+Low Demand - Intermediate and low demand



EcoServ-GIS

Accessible Nature Capacity

SDNPA boundary
Broad Areas

Capacity Scores

80 - 100
60 - 80
40 - 60
20 - 40
1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Accessible Nature occurs where greenspace or semi-natural habitats give health and well being benefits to people through regular access for walking, cycling or jogging.

METHODS: Accessible Nature Capacity values per habitat are inferred from available literature. Values are estimates of "perceived naturalness" from public surveys, via photo interpretation. High values represent areas where habitats have a higher "perceived naturalness" score at both the site, and local, scale. Therefore larger continuous blocks of more natural habitat types will have higher scores than smaller isolated sites of the same habitat type. Default local search neighbourhood values are used, but can be modified by the user. (Default = 300 m)

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

DURHAM

LIVING LANDSCAPES

Scottish Wildlife Trust

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0 10 Kilometers

Date: 6/23/2016

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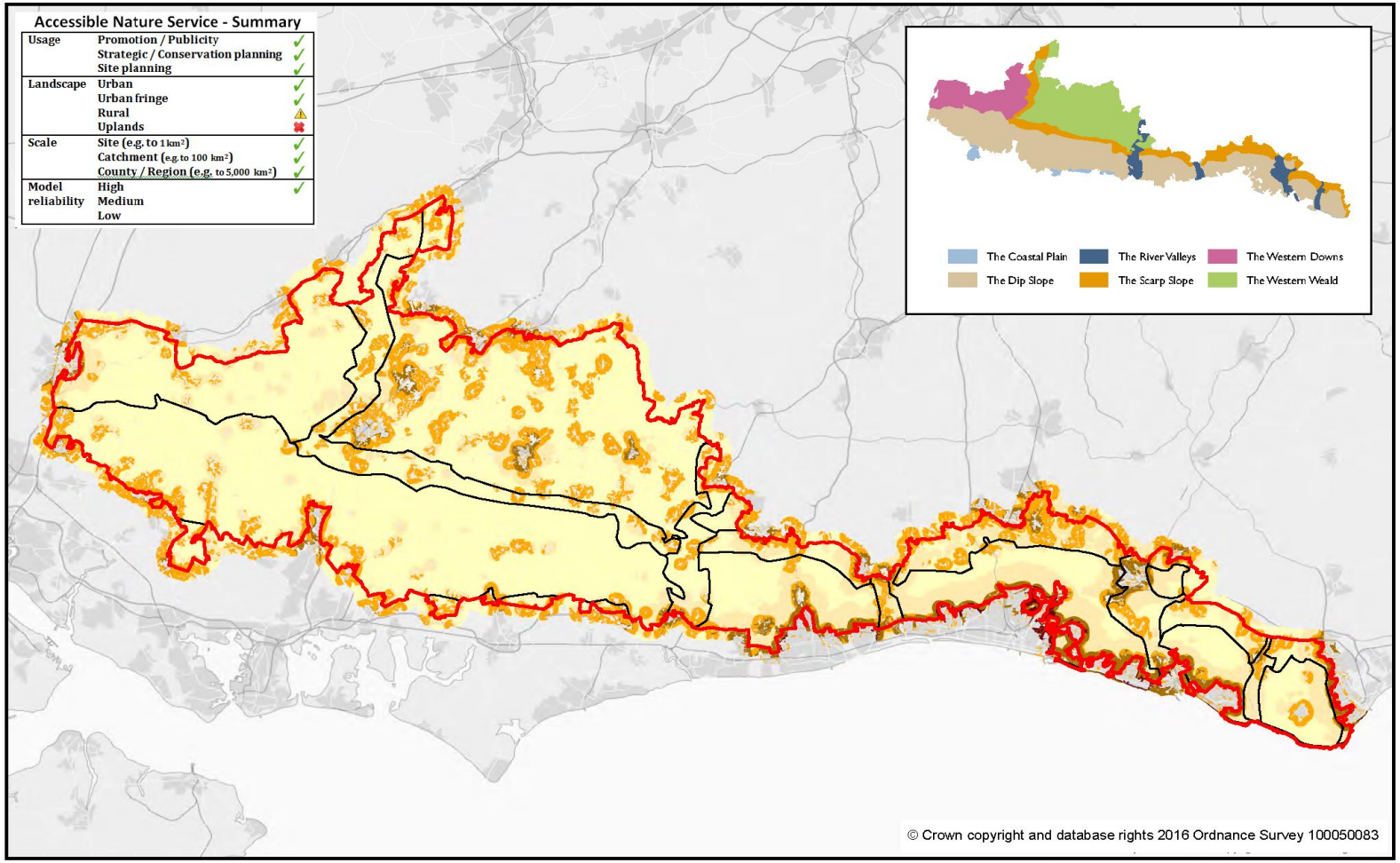

EcoServ-GIS

Accessible Nature Demand

SDNPA boundary

Broad Areas

Demand Scores

- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Accessible Nature occurs where greenspace or semi-natural habitats give health and well being benefits to people through regular access for walking, cycling or jogging.

Demand is mapped based on population size, health scores, greenspace size and accessibility. The Demand score is based on several combined indicators: population density, health scores and estimated visitation likelihood, based on greenspace size and distance. High values represent areas where there is a higher predicted benefit to those people likely to use each accessible nature site. Default local search neighbourhood values are used, but can be modified by the user. Local = 600 m, Landscape = 2400 m, Region = 12800 m. Greenspace size thresholds are applied: Local > 0.1 ha, Landscape > 10 ha, Region > 100 ha

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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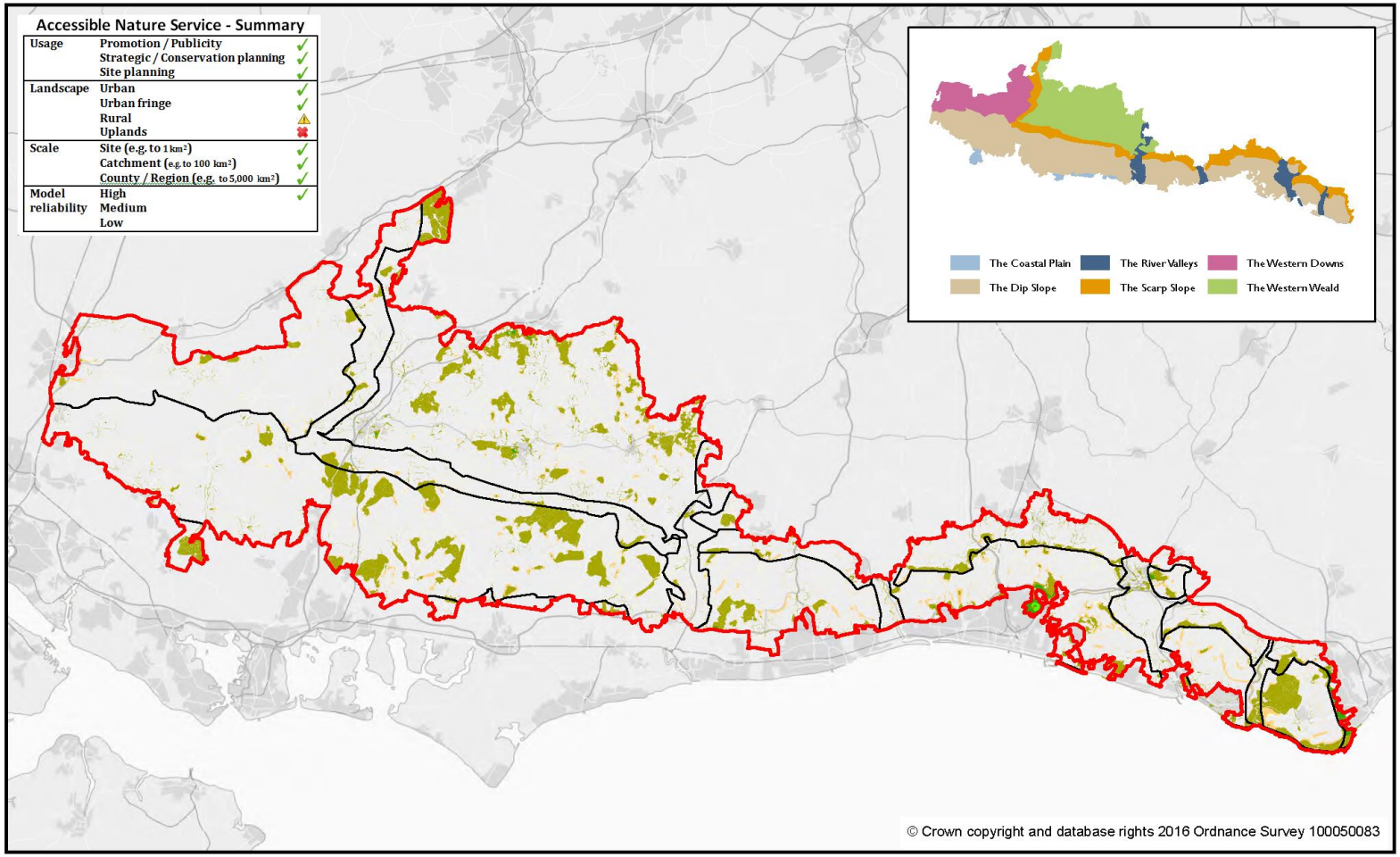


EcoServ-GIS

Accessible Nature Benefiting Areas

SDNPA boundary
Broad Areas

Benefits to people

A1. Highest
A2. High
A3. Intermediate
A4. Low
A5. Lowest

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

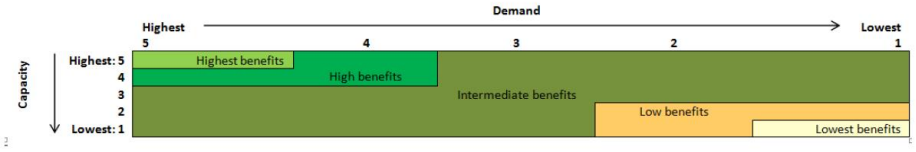
South Downs National Park Authority

Sussex Biodiversity Record Centre

Accessible Nature occurs where greenspace or semi-natural habitats give health and well being benefits to people through regular access for walking, cycling or jogging.

METHODS: Capacity and Demand quintiles are overlaid to estimate the levels of benefits that may be delivered to people by the habitats currently present. Not all categories are always present. White space indicates no data or no service benefits.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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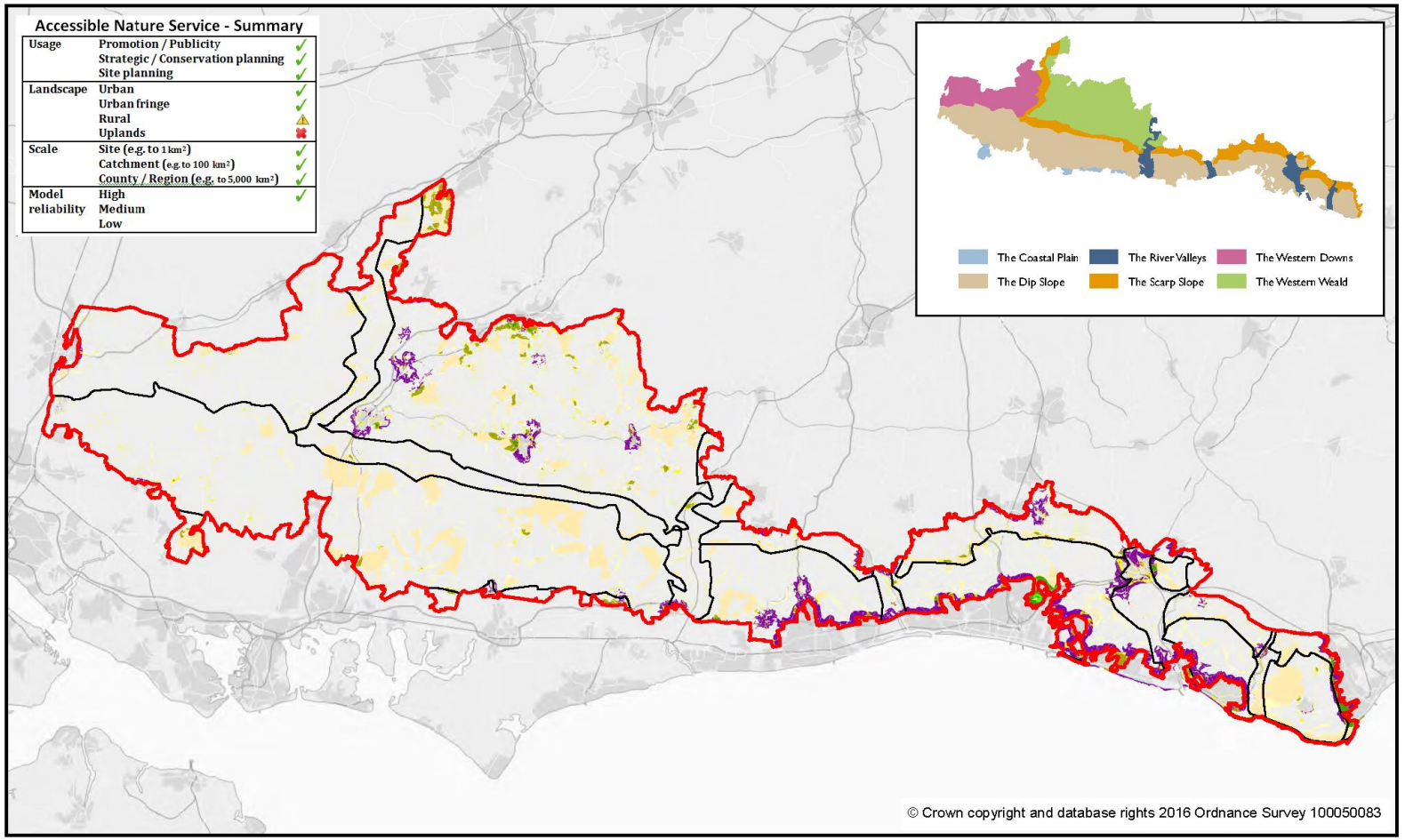


EcoServ-GIS

Accessible Nature Management Zones

SDNPA boundary
Broad Areas

Suggested Management

- A1. Protect
- A2. Protect / Maintain
- A3. Maintain
- A4. Improve
- A5. Maintain / Improve
- A6. Maintain / Assess
- A7. Assess
- A8. Change habitat type: Highest Demand
- A9. Change habitat type: High Demand
- B1. Create: Highest Demand
- B2. Create: High Demand
- C1. Provide access: Highest Demand
- C2. Provide access: High Demand

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

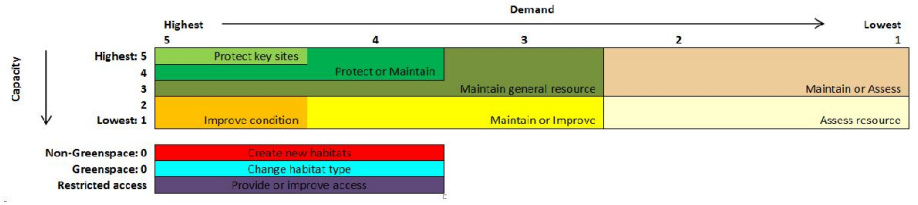
South Downs National Park Authority

Sussex Biodiversity Record Centre

Accessible Nature occurs where greenspace or semi-natural habitats give health and well being benefits to people through regular access for walking, cycling or jogging.

METHODS: Capacity and Demand quintiles are overlaid to estimate the management interventions that could maintain or increase the benefits delivered to people. Not all categories are always present.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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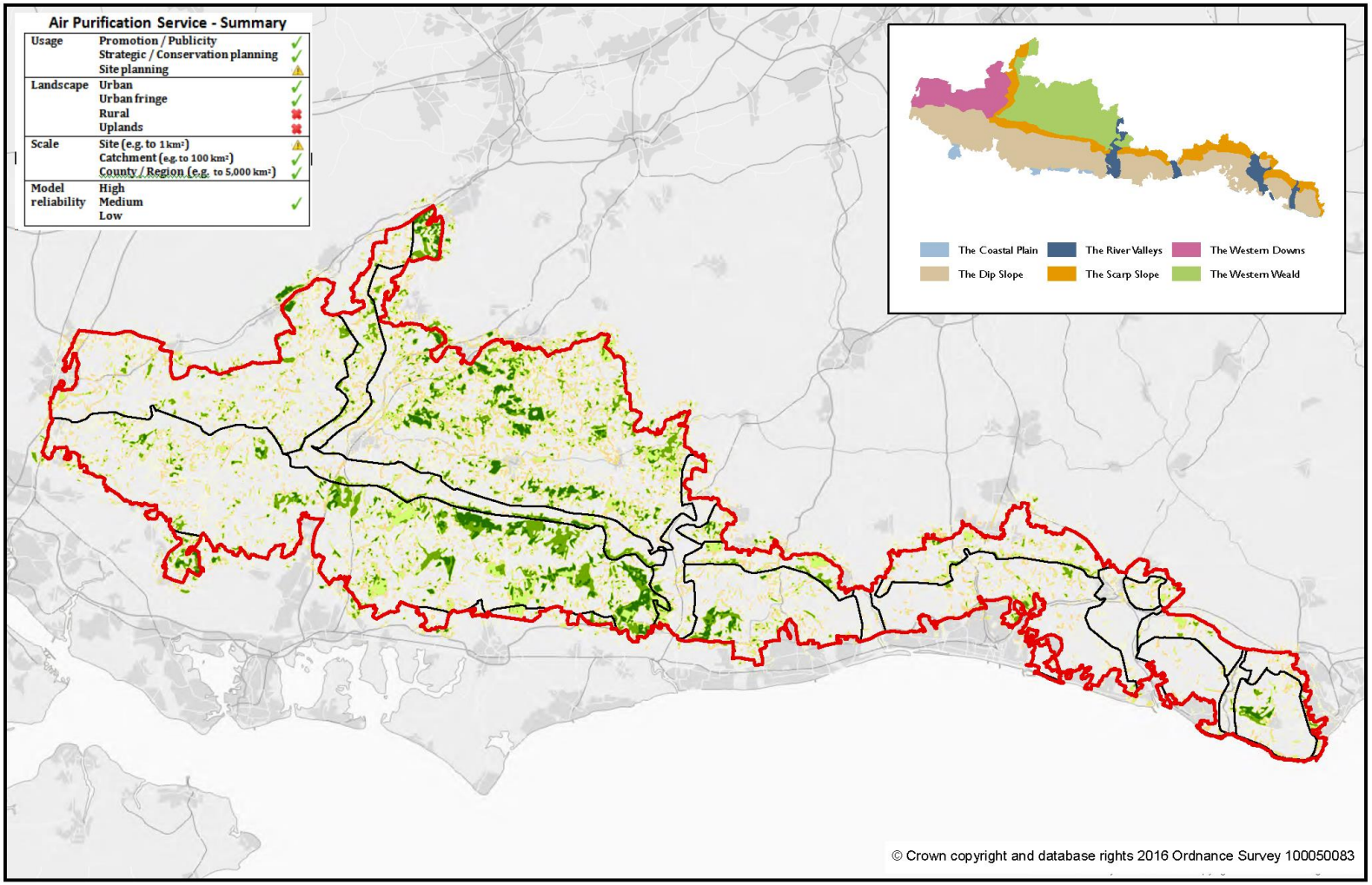

EcoServ-GIS

Air Purification Capacity

SDNPA boundary

Broad Areas

Capacity Scores

80 - 100
60 - 80
40 - 60
20 - 40
1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

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South Downs National Park Authority

Sussex Biodiversity Record Centre

Air Purification occurs where habitats help to intercept or absorb airborne pollutants produced from road traffic.

METHODS: Air Purification values per habitat are inferred from available literature. Values are estimates of potential Air Purification ability per habitat type. High values represent areas where habitats have a predicted higher capacity to intercept or absorb airborne pollutants. This is based on habitat type and structure. Habitat age and management are not included. Values are calculated within a local search neighbourhood (Default = 200 m). Habitat capacity is assumed to be cummulative, scores are summed within the neighbourhood. Both higher scoring habitats, and wider / larger areas of habitat lead to larger mapped capacity scores.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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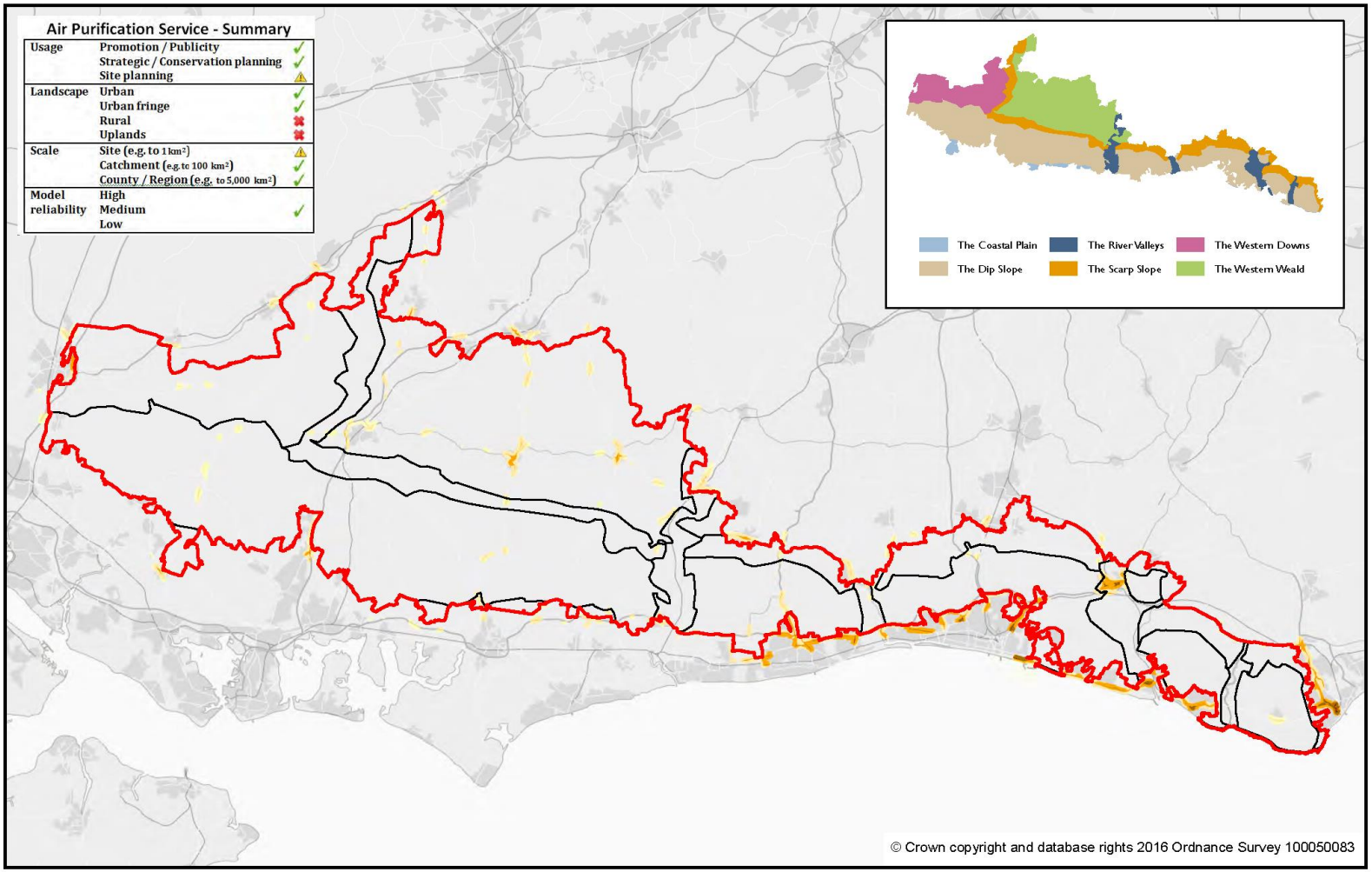

EcoServ-GIS

Air Purification Demand

SDNPA boundary

Broad Areas

Demand Scores

- Broad Areas
- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Air Purification occurs where habitats help to intercept or absorb airborne pollutants produced from road traffic.

METHODS: High values represent areas where there is a combination of higher population density, higher health deprivation scores and higher predicted air pollution levels based on proximity to roads. Threshold and search neighourhood values can be modified by the user. Default values are: Maximum air pollution occurence distance from roads = 400 m, Manmade surface cover = 400 m radius, Population density = 300 m, Health scores = 300 m

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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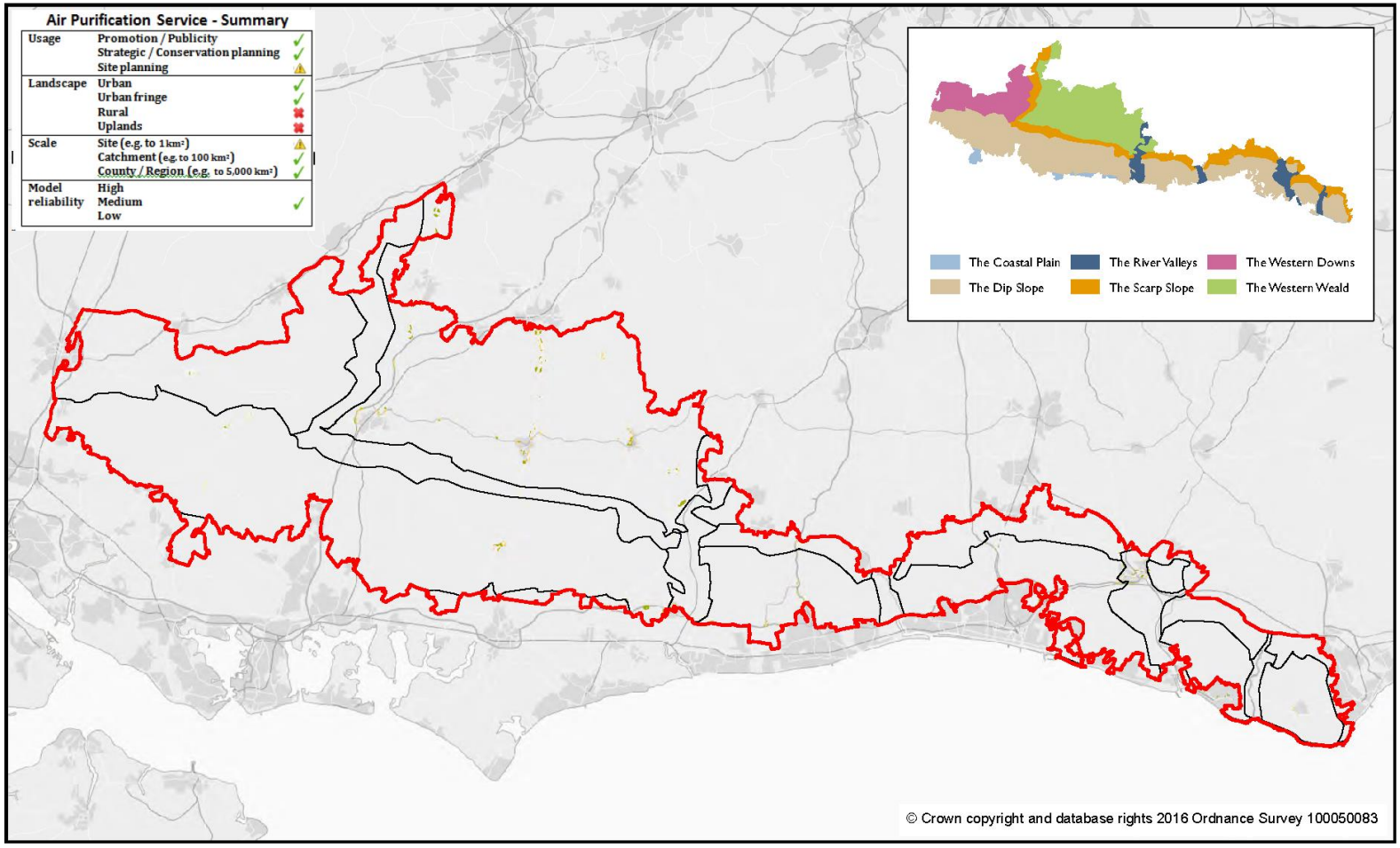


EcoServ-GIS

Air Purification Benefiting Areas

SDNPA boundary

Broad Areas

Benefits to people

- A1. Highest
- A2. High
- A3. Intermediate
- A4. Low
- A5. Lowest

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

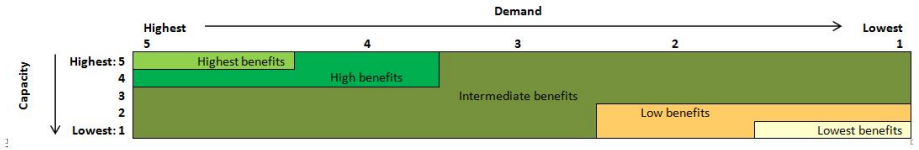
South Downs National Park Authority

Sussex Biodiversity Record Centre

Air Purification occurs where habitats help to intercept or absorb airborne pollutants produced from road traffic.

METHODS: Capacity and Demand quintiles are overlaid to estimate the levels of benefits that may be delivered to people by the habitats currently present. Not all categories are always present. White space indicates no data or no service benefits.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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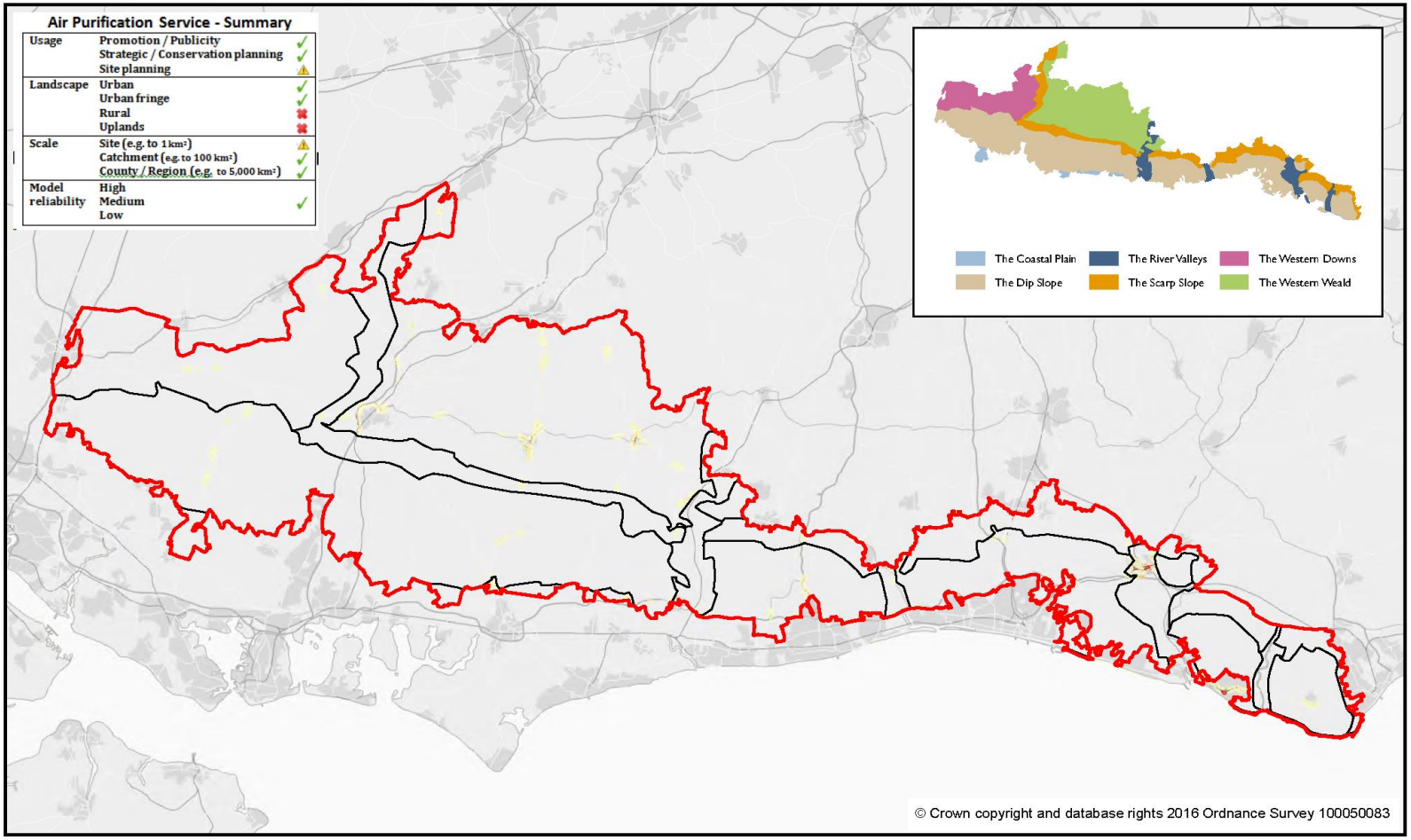


EcoServ-GIS

Air Purification Management Zones

SDNPA boundary

Broad Areas

Suggested Management

- Broad Areas
- A1. Protect
- A2. Protect / Maintain
- A3. Maintain
- A4. Improve
- A5. Maintain / Improve
- A6. Maintain / Assess
- A7. Assess
- A8. Change habitat type: Highest Demand
- A9. Change habitat type: High Demand
- B1. Create: Highest Demand
- B2. Create: High Demand

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildife Trust).

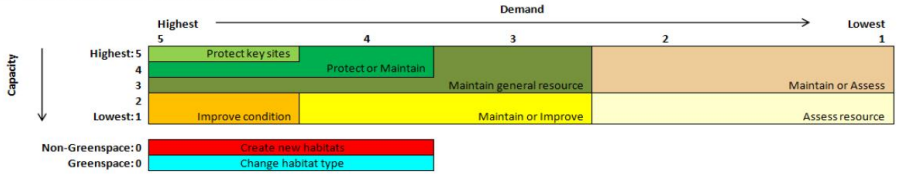
South Downs National Park Authority

Sussex Biodiversity Record Centre

Air Purification occurs where habitats help to intercept or absorb airborne pollutants produced from road traffic.

METHODS: Capacity and Demand quintiles are overlaid to estimate the management interventions that could maintain or increase the benefits delivered to people. Not all categories are always present.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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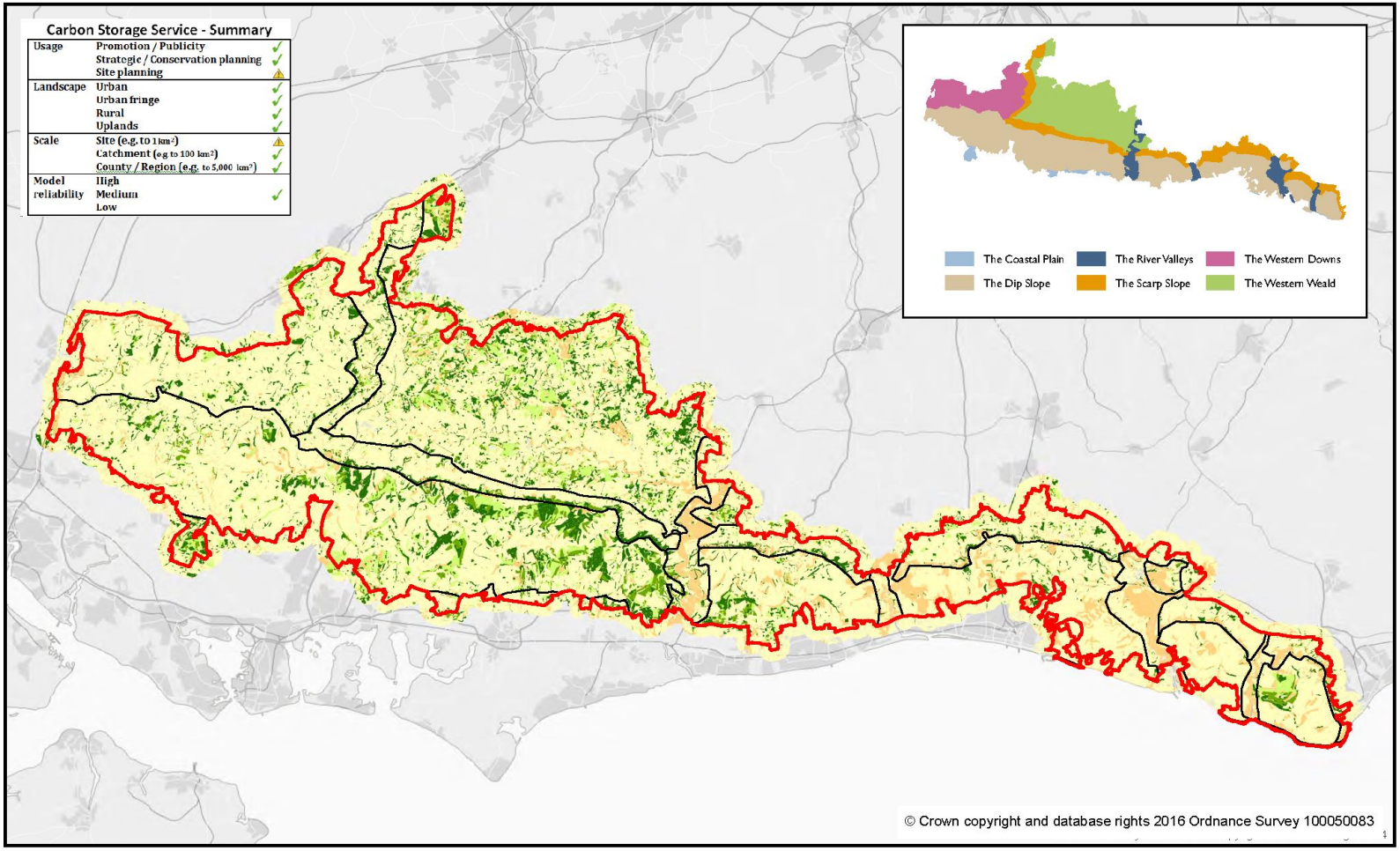

EcoServ-GIS

Carbon Storage Capacity

SDNPA boundary

Broad Areas

Capacity Scores

- Broad Areas
- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Carbon storage occurs in vegetation and soil.

METHOD: This toolkit maps the estimated amount of carbon stored in different ecosystem or habitat types. Carbon storage values are taken from available literature. Values are estimates of typical storage levels per habitat type. Soil type is assumed to be typical of the mapped habitat. Soil types are not separately mapped from soil data. Habitat age and management is not considered. High values represent high carbon storage levels per unit area. Carbon storage values are calculated from the data used within the attribute link table in the BaseMap models. Carbon storage values may link to mapped habitat types at different hierarchy levels (Phase 1 Habitat, Broad Habitat or Habitat Class)

LIMITATIONS: Care should be taken in map interpretation for certain habitats where it is known that certain soil types occur, such as deep peat, or where plantation woodlands or improved grasslands occur on deep peat. In such situations the capacity will reflect the current dominant habitat type. Running an alternative scenario analysis with such habitat restored or converted to blanket bog or marshy grassland would show the higher storage capacity in such habitats. EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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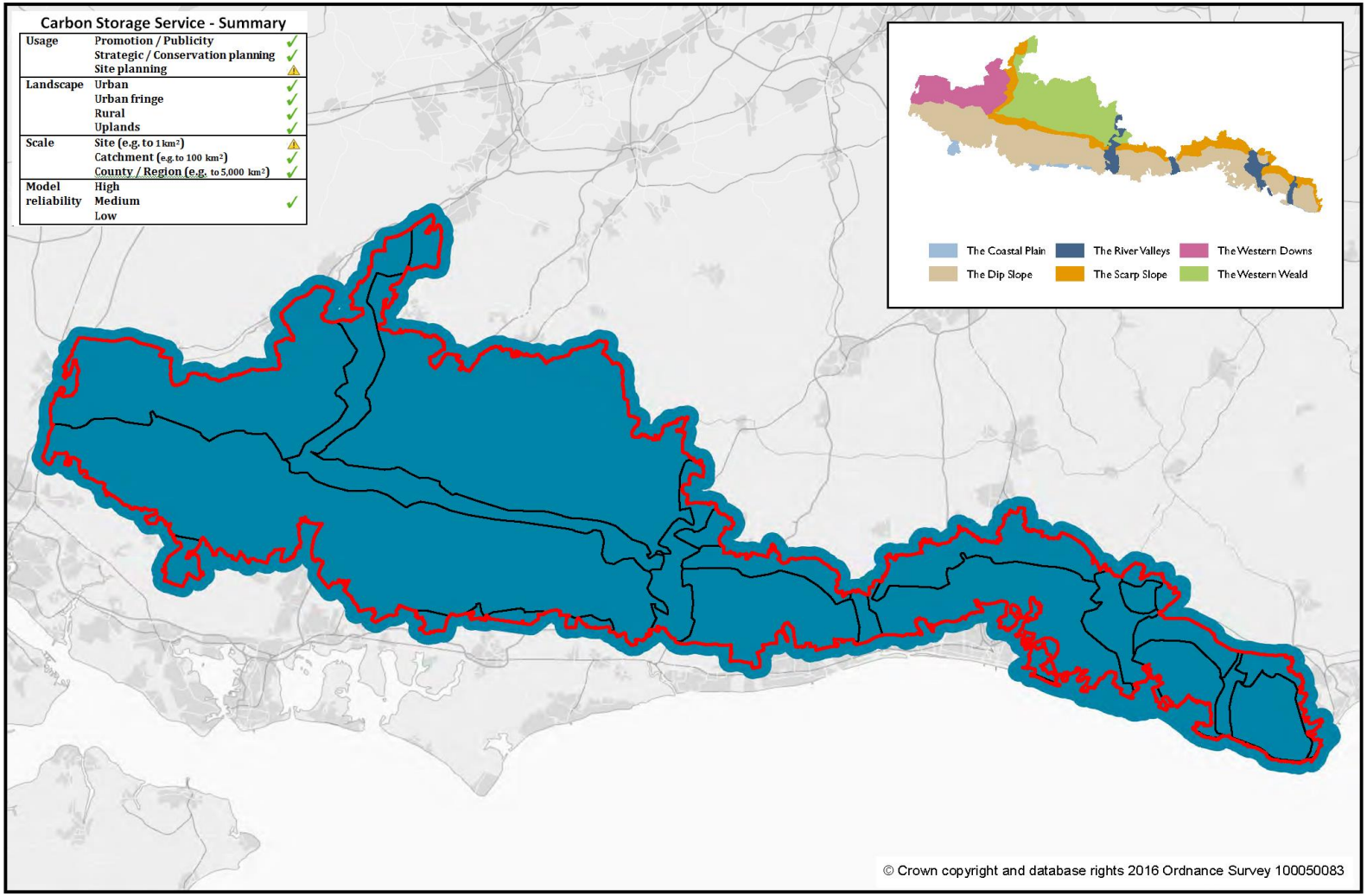

EcoServ-GIS

Carbon Storage Demand

SDNPA boundary

Broad Areas

Demand Scores

100

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Carbon storage occurs in vegetation and soil.

METHODS: This toolkit maps the estimated amount of carbon stored in different ecosystem or habitat types. Because the benefits of carbon storage are global, all areas are mapped as high demand.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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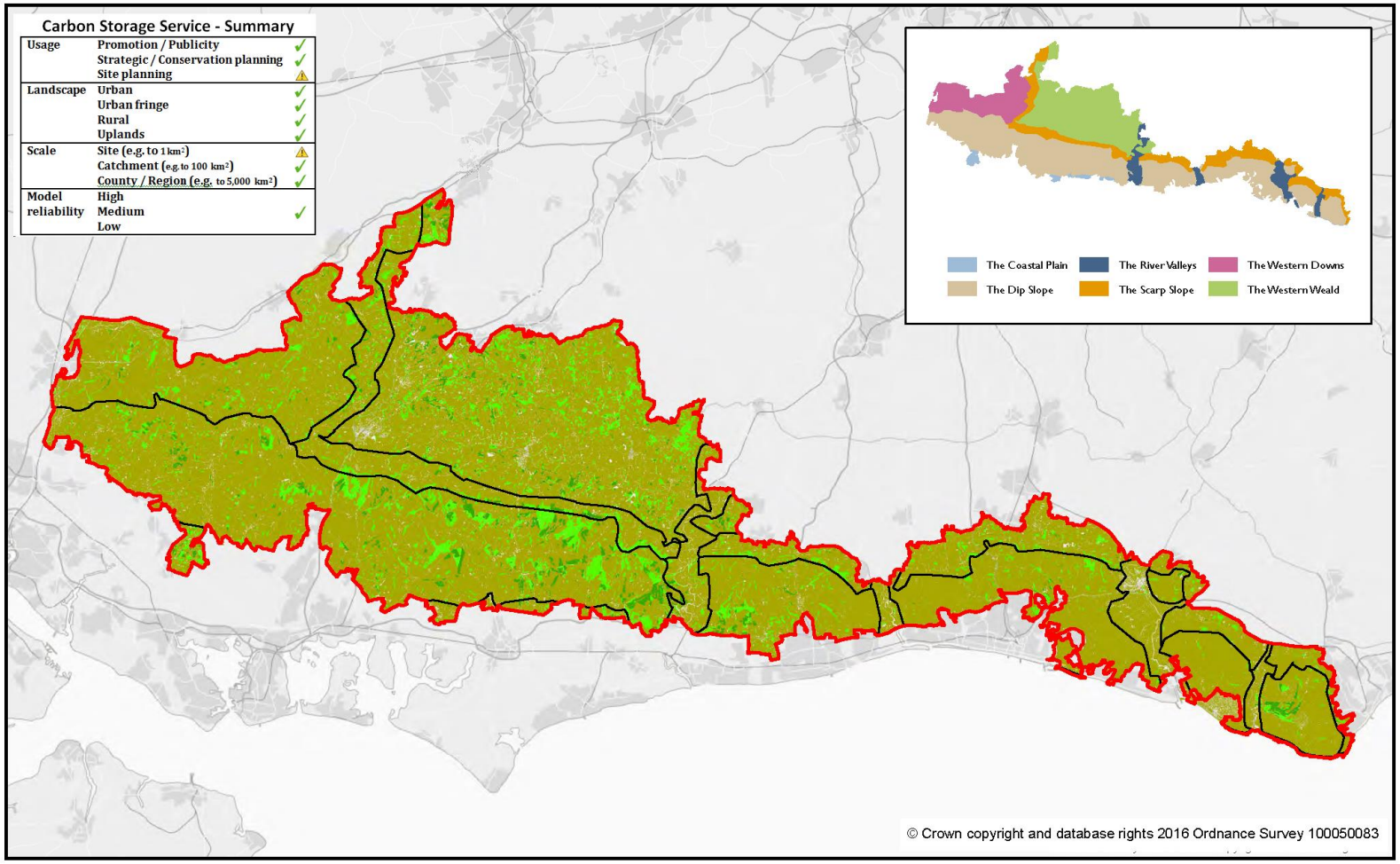


EcoServ-GIS

Carbon Storage Benefiting Areas

SDNPA boundary

Broad Areas

Benefits to people

- A1. Highest
- A2. High
- A3. Intermediate
- A4. Low
- A5. Lowest

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

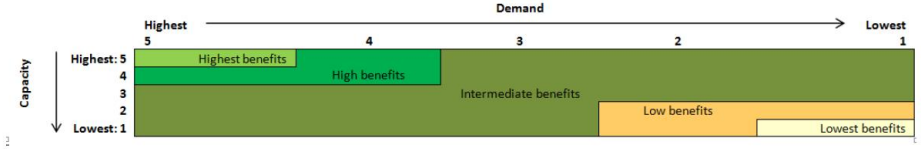
South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where people benefit from Carbon storage in Vegetation and Soil.

METHODS: Capacity and Demand quintiles are overlaid to estimate the levels of benefits that may be delivered to people by the habitats currently present. Not all categories are always present. White space indicates no data or no service benefits.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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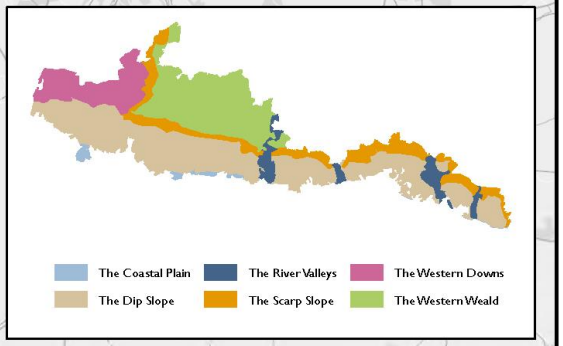
Carbon Storage Service - Summary

Usage	Promotion / Publicity	✓
	Strategic / Conservation planning	✓
	Site planning	⚠
Landscape	Urban	✓
	Urban fringe	✓
	Rural	✓
	Uplands	✓
Scale	Site (e.g. to 1 km²)	⚠
	Catchment (e.g. to 100 km²)	✓
	County / Region (e.g. to 5,000 km²)	✓
Model reliability	High	
	Medium	✓
	Low	



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EcoServ-GIS

Carbon Storage Management Zones

SDNPA boundary

Broad Areas

Suggested Management

- A1. Protect
- A2. Protect / Maintain
- A3. Maintain
- A4. Improve
- A5. Maintain / Improve
- A6. Maintain / Assess
- A7. Assess
- A8. Change habitat type: Highest Demand
- A9. Change habitat type: High Demand
- B1. Create: Highest Demand

The coloured graphic below the map illustrates how the capacity and demand maps are used to EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

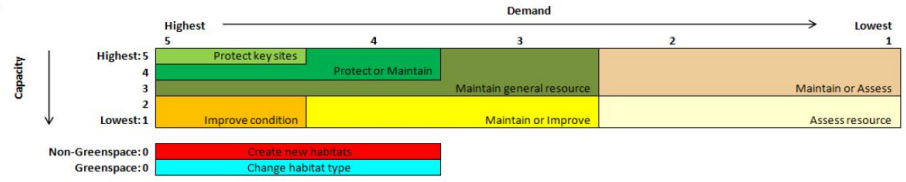
South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where people benefit from carbon storage in vegetation and soil.

METHODS: Capacity and Demand quintiles are overlaid to estimate the management interventions that could maintain or increase the benefits delivered to people. Not all categories are always present.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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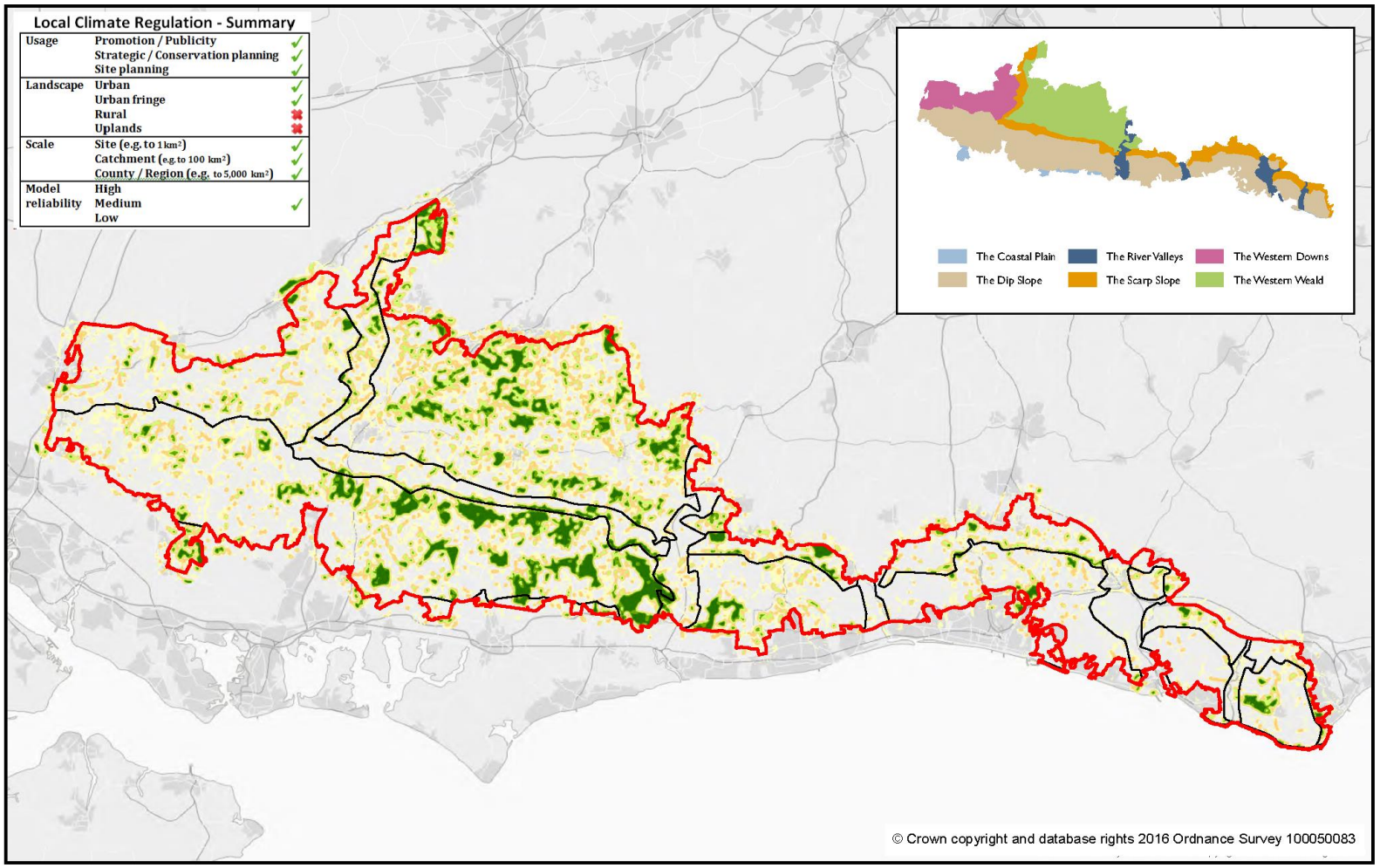

EcoServ-GIS

Local Climate Regulation Capacity

SDNPA boundary

Broad Areas

Capacity Scores

80 - 100

60 - 80

40 - 60

20 - 40

1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Local climate regulation reflects the ability of different ecosystems and habitats to absorb or intercept sunlight and reflected heat, controlling local temperatures & reducing the urban heat island effect

METHODS: Local climate regulation values per ecosystem / habitat are inferred from available literature. These are based on the area coverage of woodland habitats. Habitat age and management is not considered. Thresholds are applied to limit the area of mapped capacity. Defaults are applied, but can be varied with custom settings. Defaults: Local search distance = 200m

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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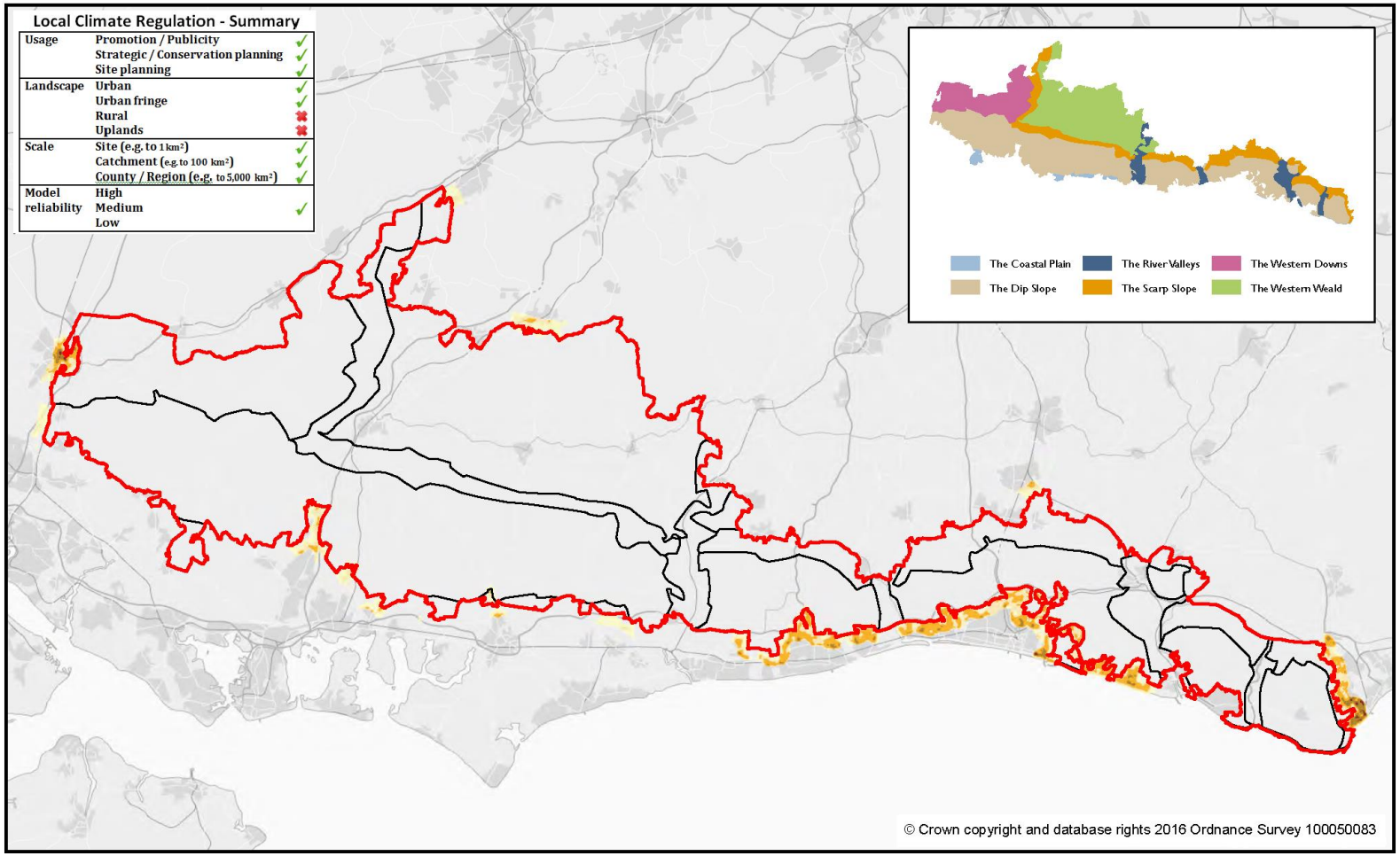

EcoServ-GIS

Local Climate Regulation Demand

SDNPA boundary
Broad Areas

Demand Scores

80 - 100
60 - 80
40 - 60
20 - 40
1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Local climate regulation reflects the ability of different ecosystems and habitats to absorb or intercept sunlight and reflected heat, controlling local temperatures & reducing the urban heat island effect

METHODS: Larger urban areas are assumed to have demand for Local Climate Regulation. Demand is mapped based on cover of man made surfaces, population density and the proportion of the local population potentially susceptible to heat waves (based on age). There is assumed to be no demand in non-urban areas or areas below the mapped population density thresholds. Thresholds are applied to limit the area of mapped Demand. Defaults are applied, but can be varied with custom settings. Local search distance (population size) = 200 m Local search distance (age risk score) = 200 m. Minimum population size (local scale) > 50 people. Urban areas with heat islands (> 1,000 ha). Local cover of man made surfaces = 200 m

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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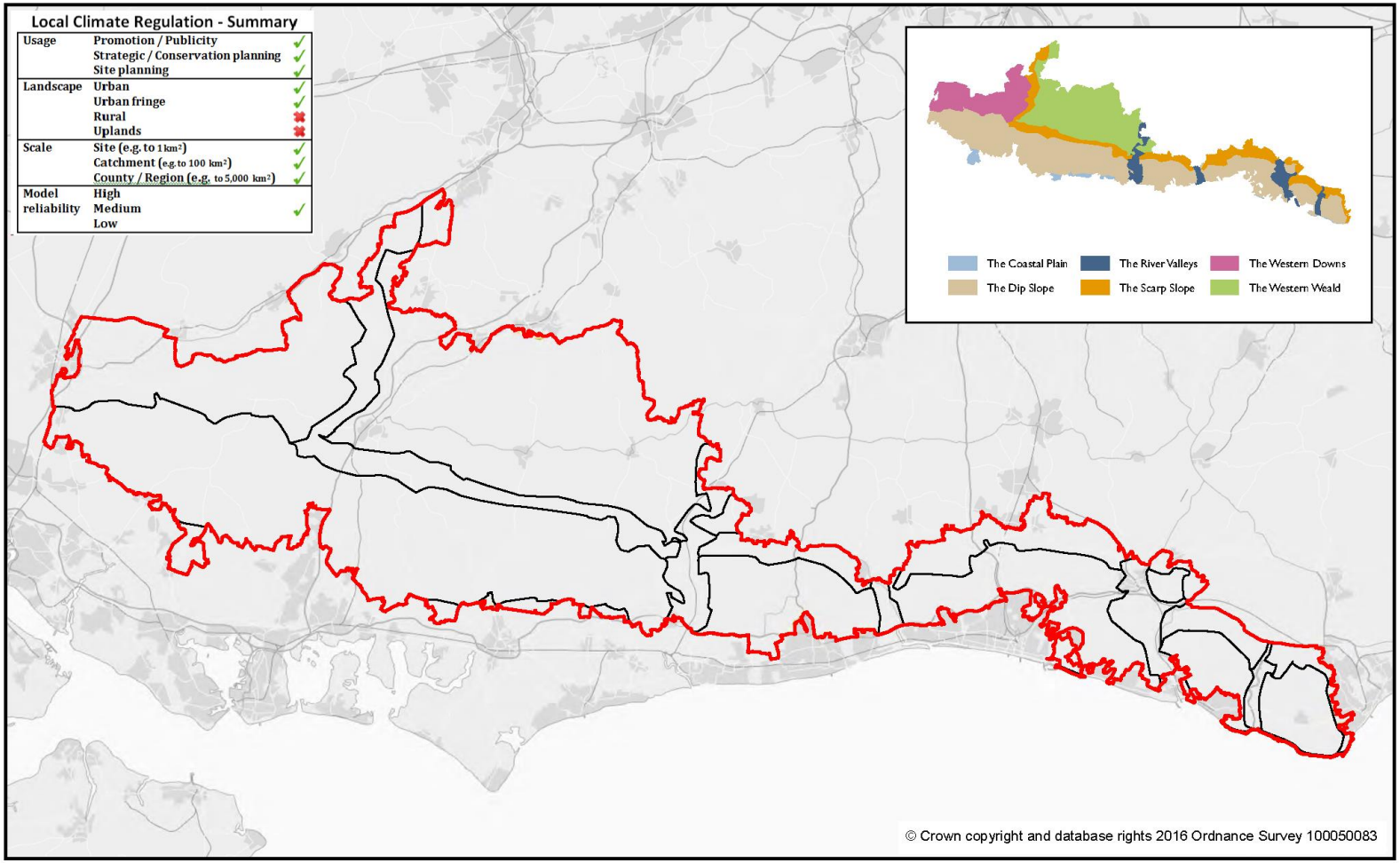

EcoServ-GIS

Local Climate Regulation Benefiting Areas

SDNPA boundary

Broad Areas

Benefits to people

- A1. Highest
- A2. High
- A3. Intermediate
- A4. Low
- A5. Lowest

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

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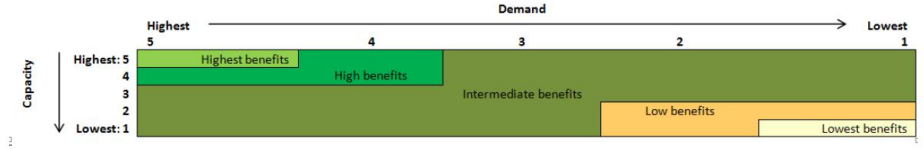

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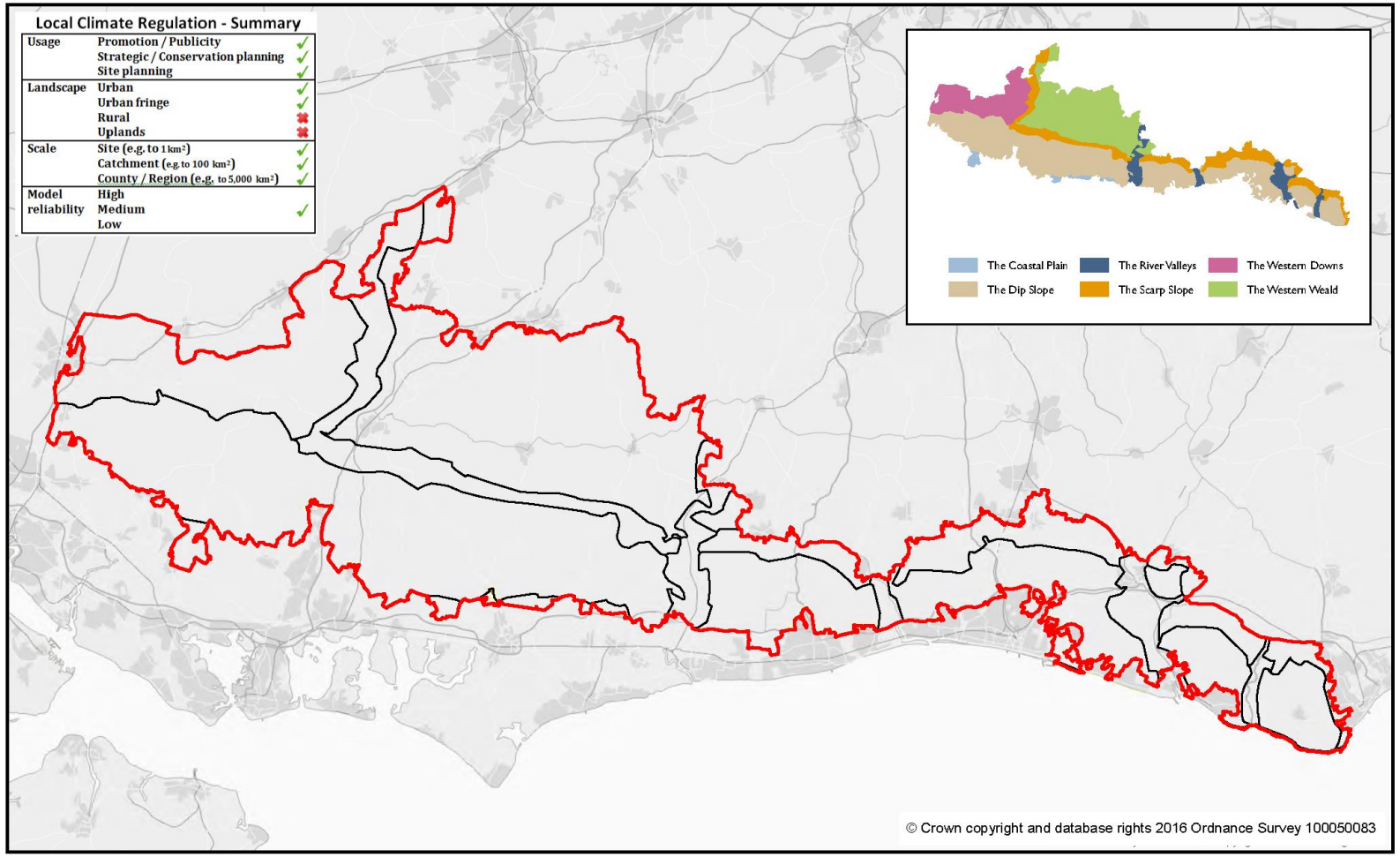

EcoServ-GIS

Local Climate Regulation Management Zones

SDNPA boundary

Broad Areas

Suggested Management

- A1. Protect
- A2. Protect / Maintain
- A3. Maintain
- A4. Improve
- A5. Maintain / Improve
- A6. Maintain / Assess
- A7. Assess
- A8. Change habitat type: Highest Demand
- A9. Change habitat type: High Demand
- B1. Create: Highest Demand
- B2. Create: High Demand

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Local climate regulation reflects the ability of different ecosystems and habitats to absorb or intercept sunlight and reflected heat, controlling local temperatures & reducing the urban heat island effect.

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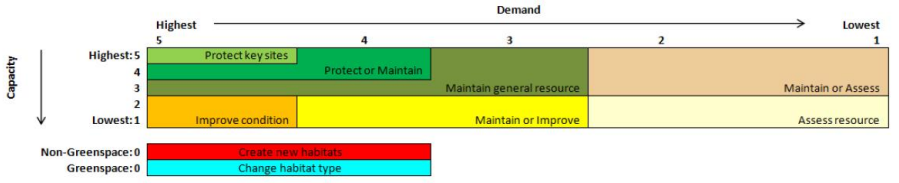

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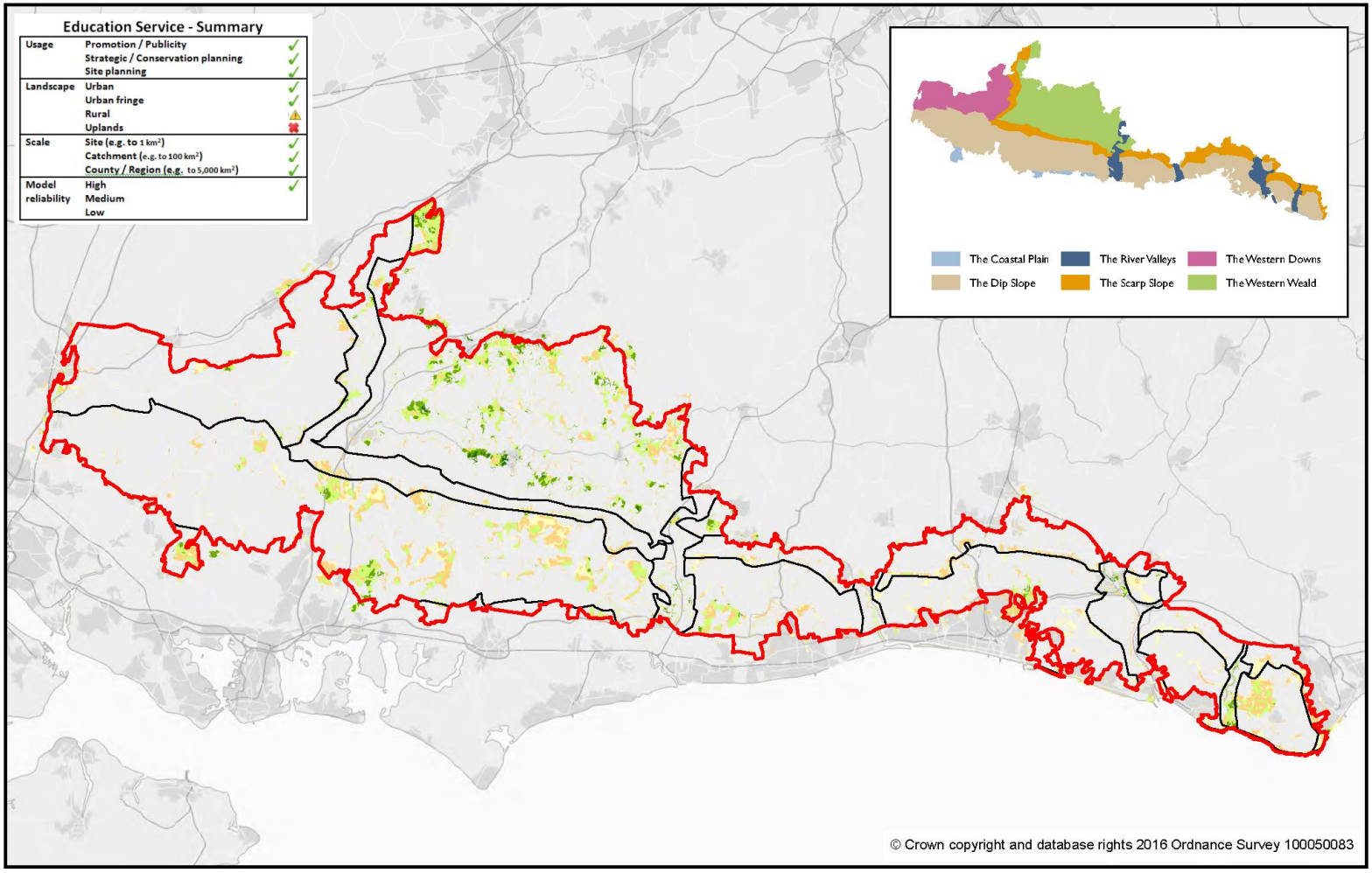

EcoServ-GIS

Education and Knowledge Capacity

SDNPA boundary
Broad Areas

Capacity Scores

- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Education and knowledge capacity is mapped by illustrating the number of broad habitat types that occur in a nearby local area (5 mins walk / 300 m)

METHODS: This map reflects the range of habitat types that are available in a local area for formal or informal study. Areas with a mix of habitats are assumed to offer opportunities for study, reflection and knowledge. The "unrestricted" capacity is shown, for areas which are likely to be accessed by the public. Thresholds are applied to limit the area of mapped capacity. Defaults are applied, but can be varied with custom settings. Local search distance = 300 m, Minimum education site size = 5,000 m (0.5 ha), Minimum number of Broad Habitats present = 2

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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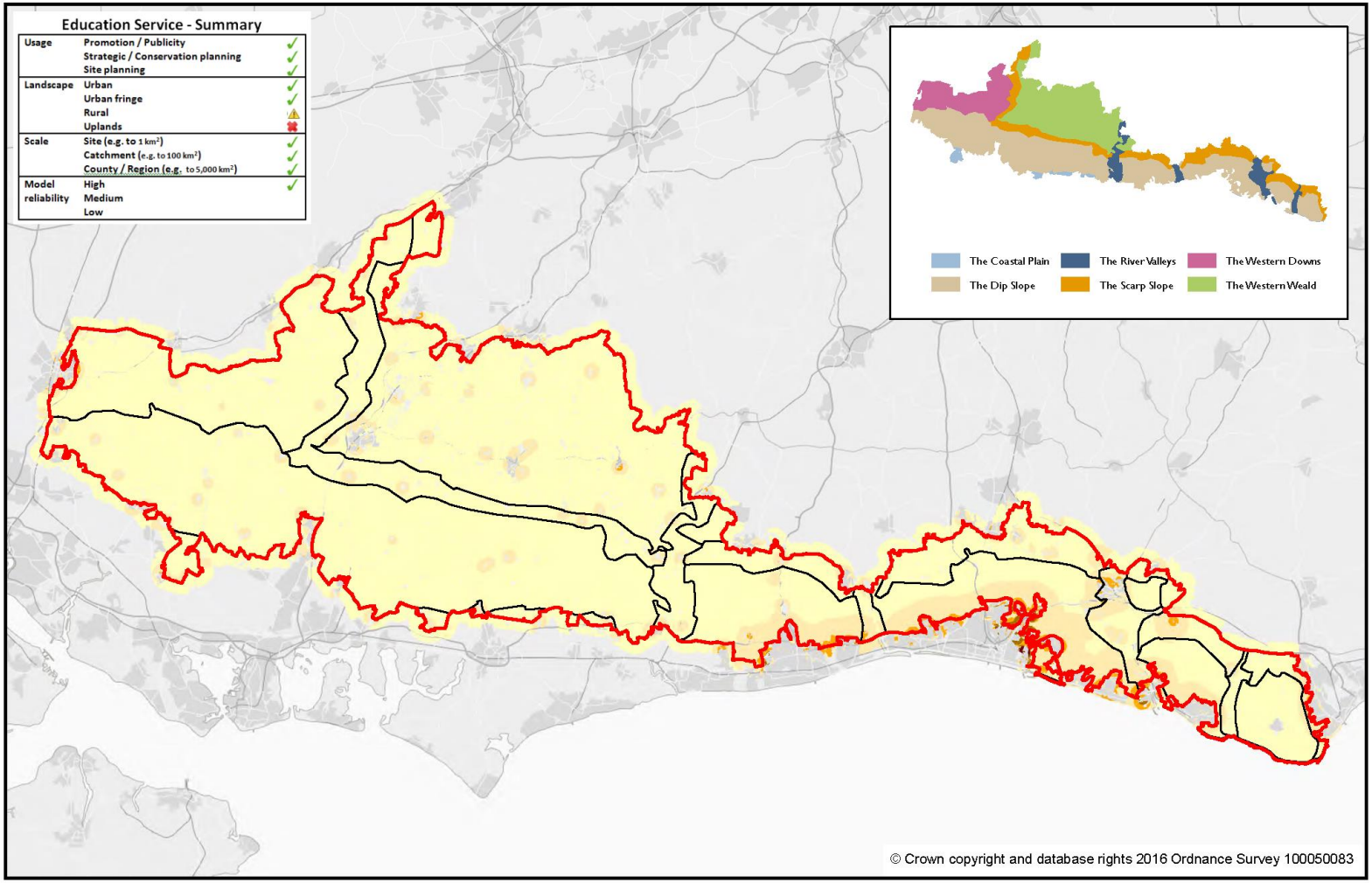

EcoServ-GIS

Education and Knowledge Demand

SDNPA boundary
Broad Areas

Demand Scores

- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Education and knowledge demand is mapped by combining two social indicators: the number of young people that live nearby, and the distance to nearby schools. Analysis examines greenspace sites at three spatial scales.

METHODS: Analysis defaults are: Young people <15yrs, Local scale: 600 m, Landscape scale: 3000 m. Region scale: 8000 m. Population thresholds are applied to remove areas of very sparse population. Defaults are: Local scale: > 50, Landscape scale: > 500, Region scale: > 1000

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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Date: 6/28/2016

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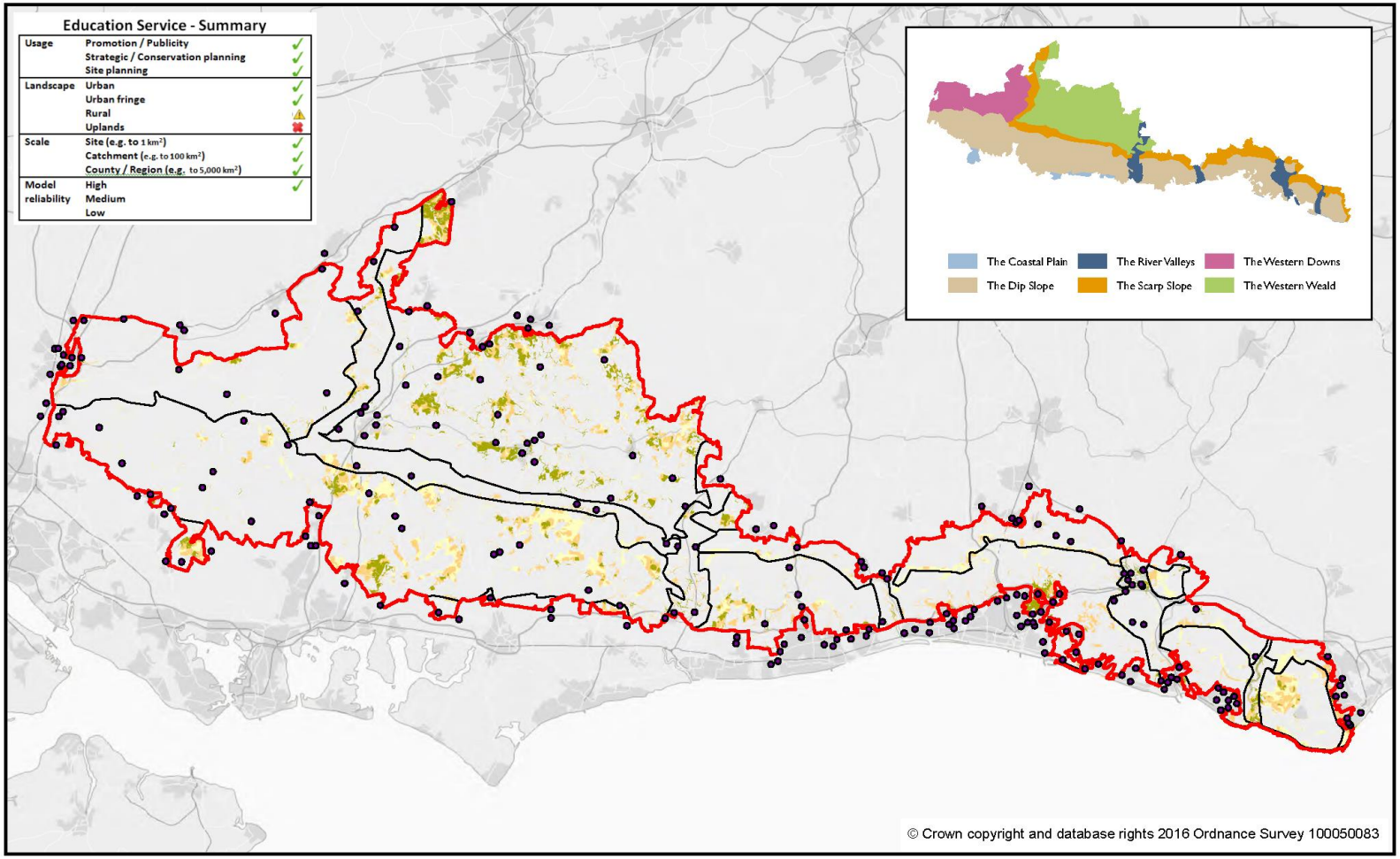
(at A3 paper size)



EcoServ-GIS

Education and Knowledge Benefiting Areas

OS Education Facilities
SDNPA boundary
Broad Areas

Benefits to people

- A1. Highest
- A2. High
- A3. Intermediate
- A4. Low
- A5. Lowest

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

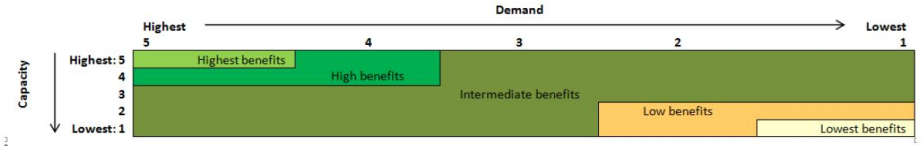
South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where young people can benefit from the education and knowledge opportunities of diverse semi-natural habitats.

METHODS: Capacity and Demand quintiles are overlaid to estimate the levels of benefits that may be delivered to people by the habitats currently present. Not all categories are always present. White space indicates no data or no service benefits.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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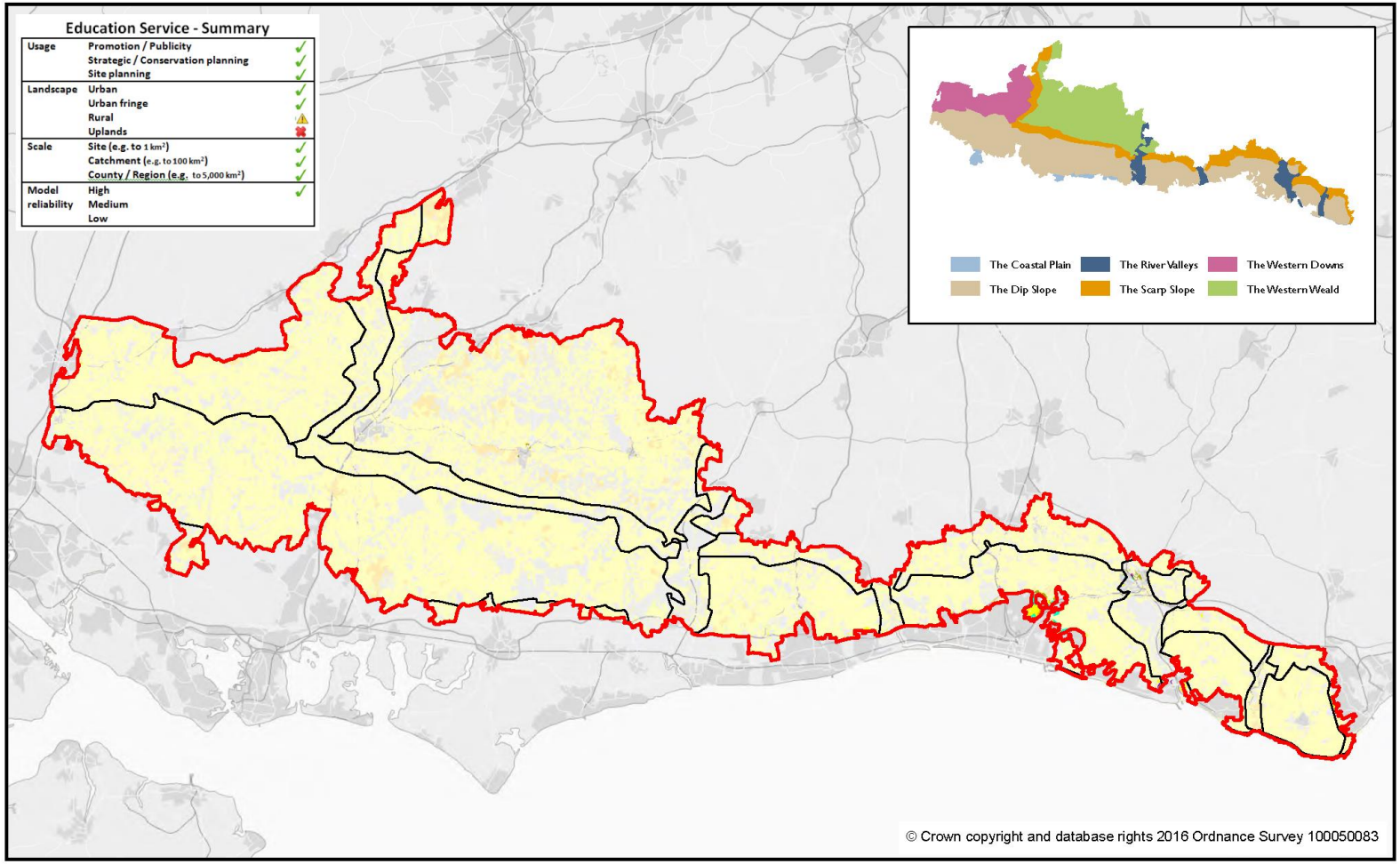

EcoServ-GIS

Education and Knowledge Management Zones

SDNPA boundary
Broad Areas

Suggested Management

- A1. Protect
- A2. Protect / Maintain
- A3. Maintain
- A4. Improve
- A5. Maintain / Improve
- A6. Maintain / Assess
- A7. Assess
- A8. Change habitat type: Highest Demand
- A9. Change habitat type: High Demand
- B1. Create: Highest Demand
- B2. Create: High Demand
- C1. Provide access: Highest Demand
- C2. Provide access: High Demand

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where young people can benefit from the education and knowledge opportunities of diverse semi-natural habitats.

METHODS: Capacity and Demand quintiles are overlaid to estimate the management interventions that could maintain or increase the benefits delivered to people. Not all categories are always present.

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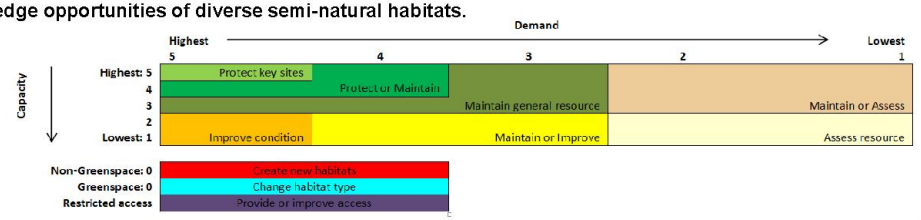

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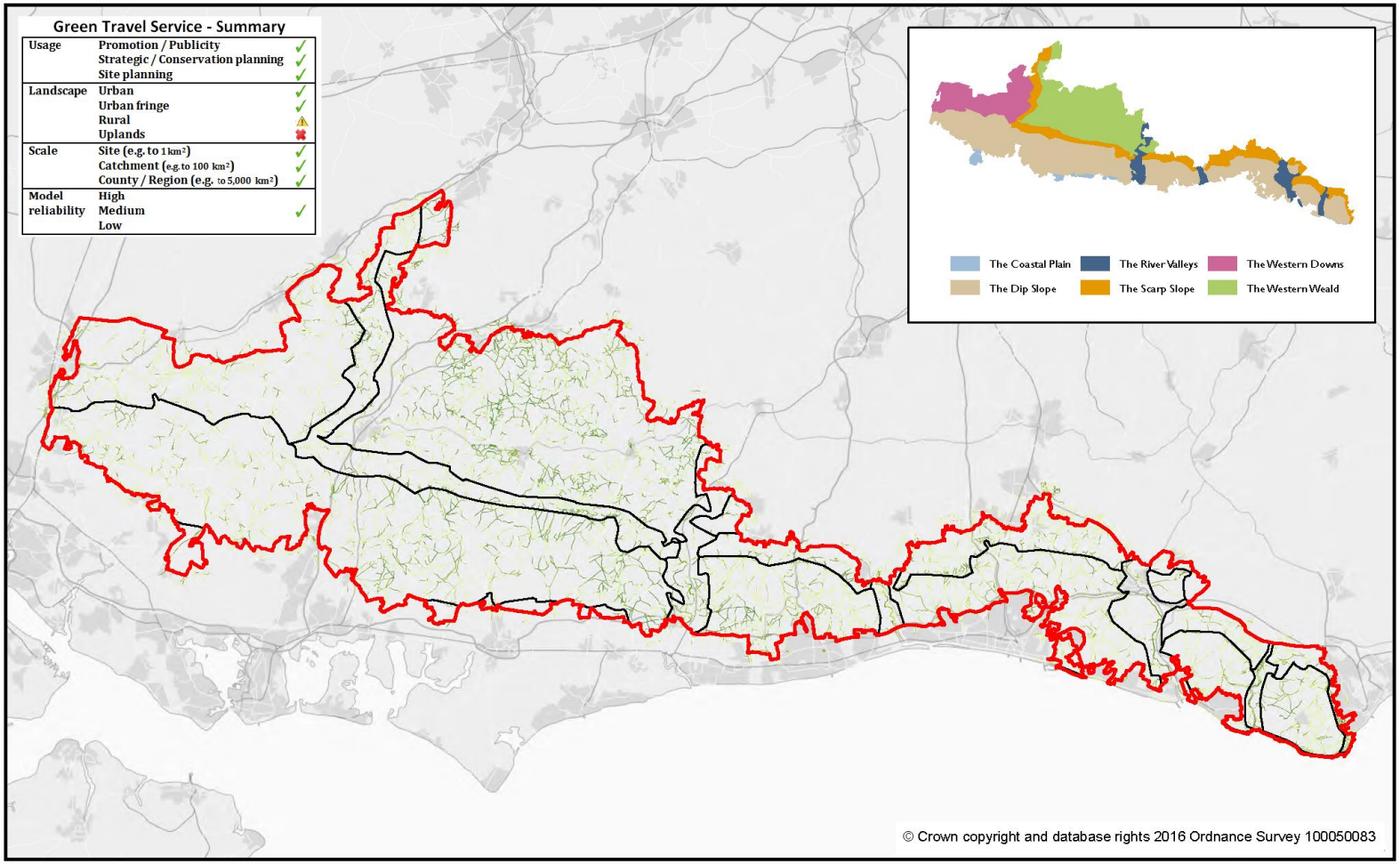

EcoServ-GIS

Green Travel Capacity

SDNPA boundary

Broad Areas

Capacity Scores

- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Green Travel routes are linear travel networks with a high cover of green infrastructure where people may benefit from a safer, calmer or more aesthetically pleasing travel route.

METHODS: This map reflects how "natural" habitat types are along linear travel networks. The model uses perceived naturalness scores.Routes are identified from Sustrans cycle routes, Public footpaths /Core paths and all pavements and paths mapped by OS MasterMap data. Informal footpaths and any paths not digitised within these data will not be idenified on the map. In rare cases paths and pavements will be mapped within private estates or industrial areas where no public access is permitted.Thresholds are applied to limit the area of mapped capacity. Defaults are applied, but can be varied with custom settings. Defaults are: Minimum linear route length = 2,000 m, Minimum area of travel route and buffer = 1,000 m (0.1 ha), Focal search distance for "local" scale mean naturalness score = 300 m.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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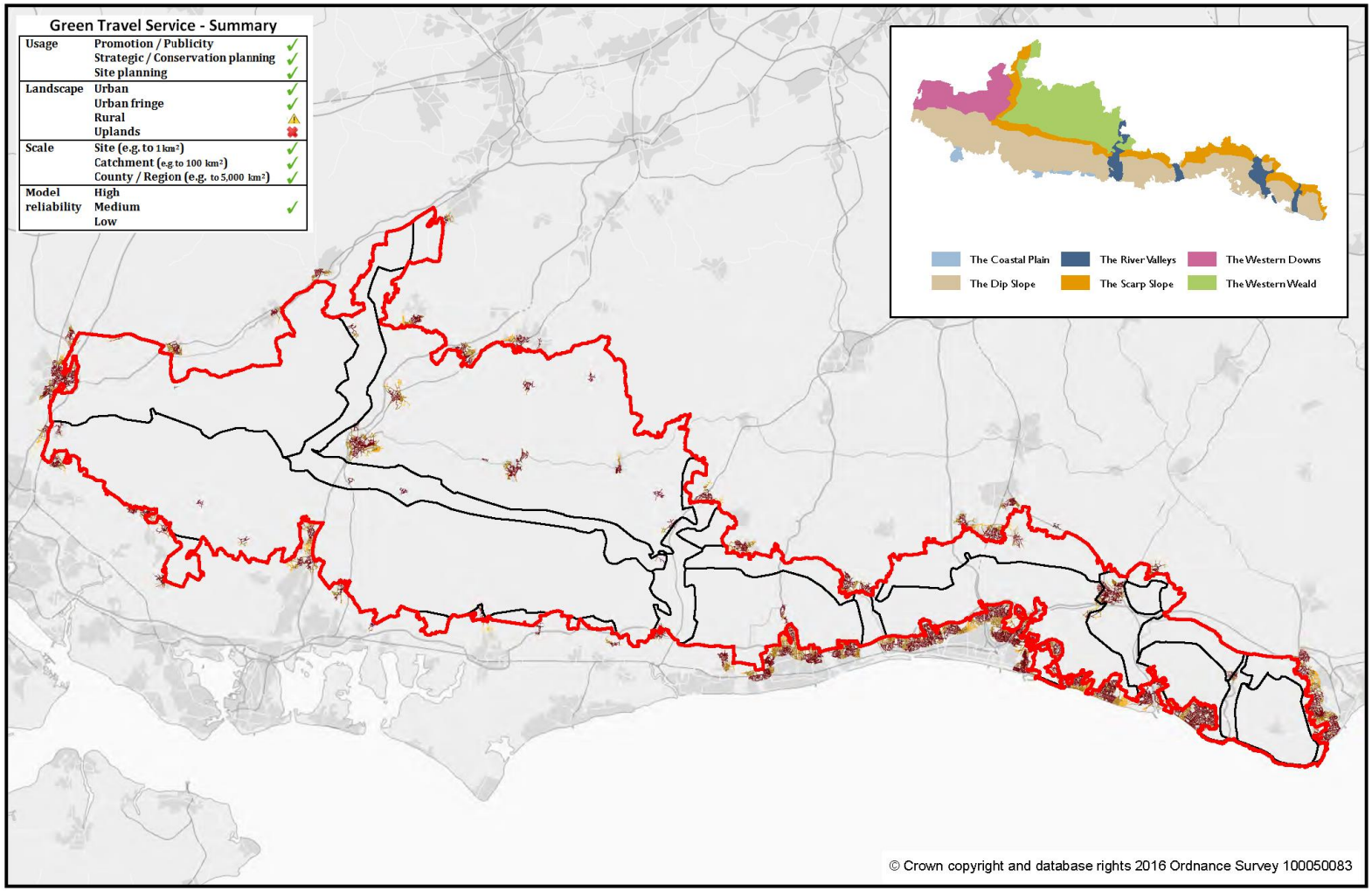

EcoServ-GIS

Green Travel Demand

SDNPA boundary
Broad Areas

Demand Scores

80 - 100
60 - 80
40 - 60
20 - 40
1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Green Travel routes are linear travel networks with a high cover of green infrastructure where people may benefit from a safer, calmer or more aesthetically pleasing travel route.

Demand for Green Travel routes is mapped using a least-cost analysis, along the linear travel network. Travel destinations used are rail stations, town centre locations and schools. The maximum travel distance used can be altered by users. The default maximum travel distance is 4,500 m.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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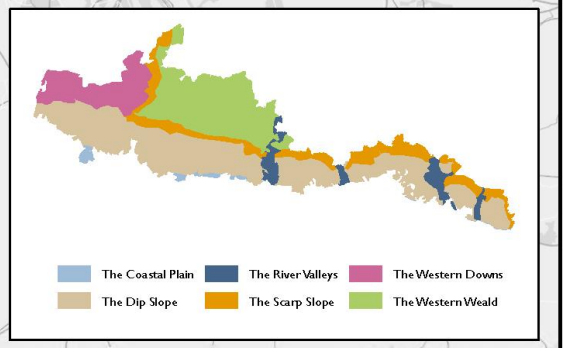
Green Travel Service - Summary

Usage	Promotion / Publicity	✓
	Strategic / Conservation planning	✓
	Site planning	✓
Landscape	Urban	✓
	Urban fringe	✓
	Rural	⚠
	Uplands	✖
Scale	Site (e.g. to 1 km²)	✓
	Catchment (e.g. to 100 km²)	✓
	County / Region (e.g. to 5,000 km²)	✓
Model reliability	High	
	Medium	✓
	Low	



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EcoServ-GIS

Green Travel Benefiting Areas

SDNPA boundary
Broad Areas

Benefits to people

- A1. Highest
- A2. High
- A3. Intermediate
- A4. Low
- A5. Lowest

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Green Travel routes are linear travel networks with a high cover of green infrastructure where people may benefit from a safer, calmer or more aesthetically pleasing travel route.

METHODS: Capacity and Demand quintiles are overlaid to estimate the levels of benefits that may be delivered to people by the habitats currently present. Not all categories are always present. White space indicates no data or no service benefits.

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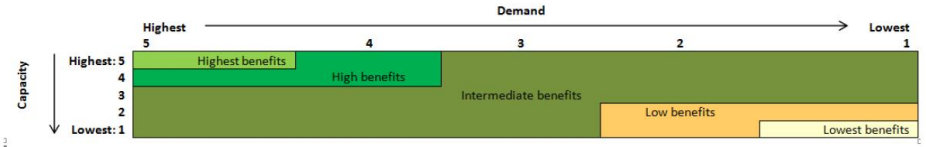

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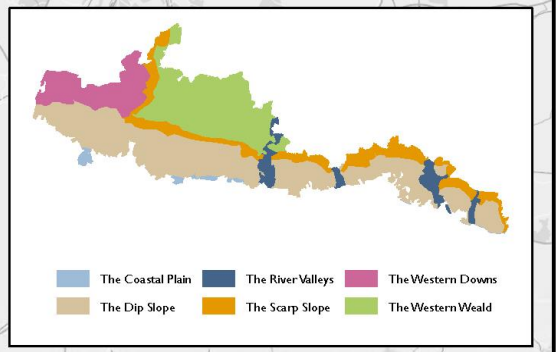
Green Travel Service - Summary

Usage	Promotion / Publicity	✓
	Strategic / Conservation planning	✓
	Site planning	✓
Landscape	Urban	✓
	Urban fringe	✓
	Rural	⚠
	Uplands	✖
Scale	Site (e.g. to 1 km²)	✓
	Catchment (e.g. to 100 km²)	✓
	County / Region (e.g. to 5,000 km²)	✓
Model reliability	High	
	Medium	✓
	Low	



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EcoServ-GIS

Green Travel Management Zones

SDNPA boundary
Broad Areas

Suggested Management

- A1. Protect
- A2. Protect / Maintain
- A3. Maintain
- A4. Improve
- A5. Maintain / Improve
- A6. Maintain / Assess
- A7. Assess
- A8. Change habitat type: Highest Demand
- A9. Change habitat type: High Demand
- B1. Create: Highest Demand
- B2. Create: High Demand

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

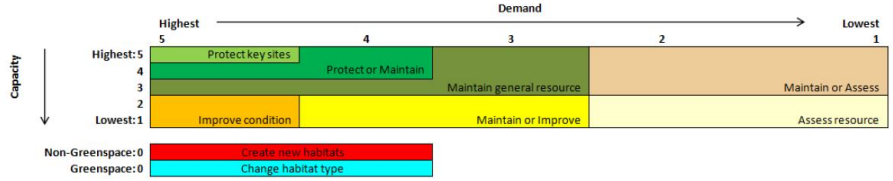
South Downs National Park Authority

Sussex Biodiversity Record Centre

Green Travel routes are linear travel networks with a high cover of green infrastructure where people may benefit from a safer, calmer or more aesthetically pleasing travel route.

METHODS: Capacity and Demand quintiles are overlaid to estimate the management interventions that could maintain or increase the benefits delivered to people. Not all categories are always present.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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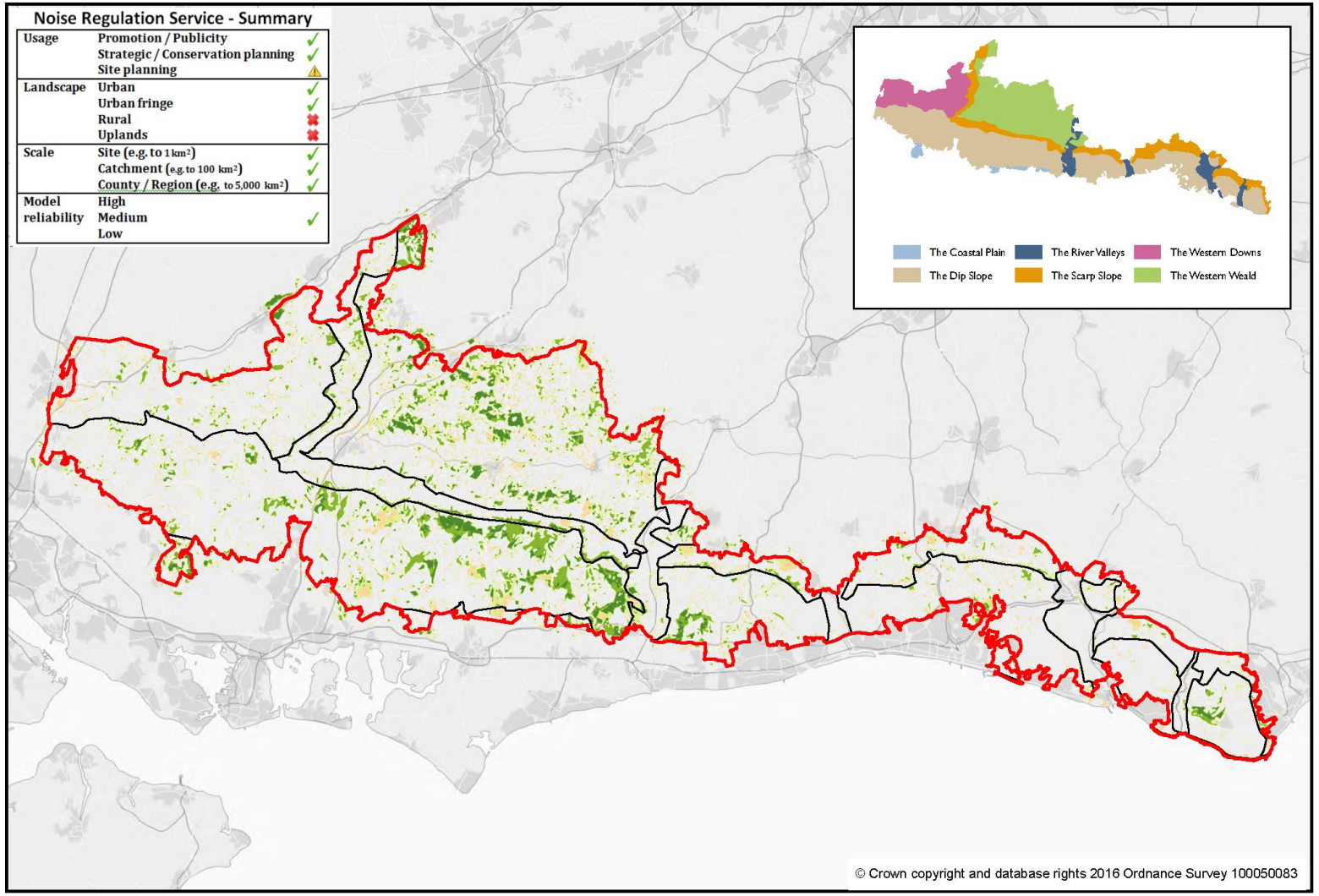

EcoServ-GIS

Noise Regulation Capacity

SDNPA boundary

Broad Areas

Capacity Scores

80 - 100

60 - 80

40 - 60

20 - 40

1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Noise regulation capacity reflects the ability of different ecosystems and habitats to absorb noise pollution.

METHODS: Noise regulation values per ecosystem / habitat are inferred from available literature. These are estimated typical values. Habitat age and management is not considered. Analysis is conducted at short and local scales to give capacity scores based on habitat type and patch size. Default short scale distance = 30 m. Default local scale distance = 100 m

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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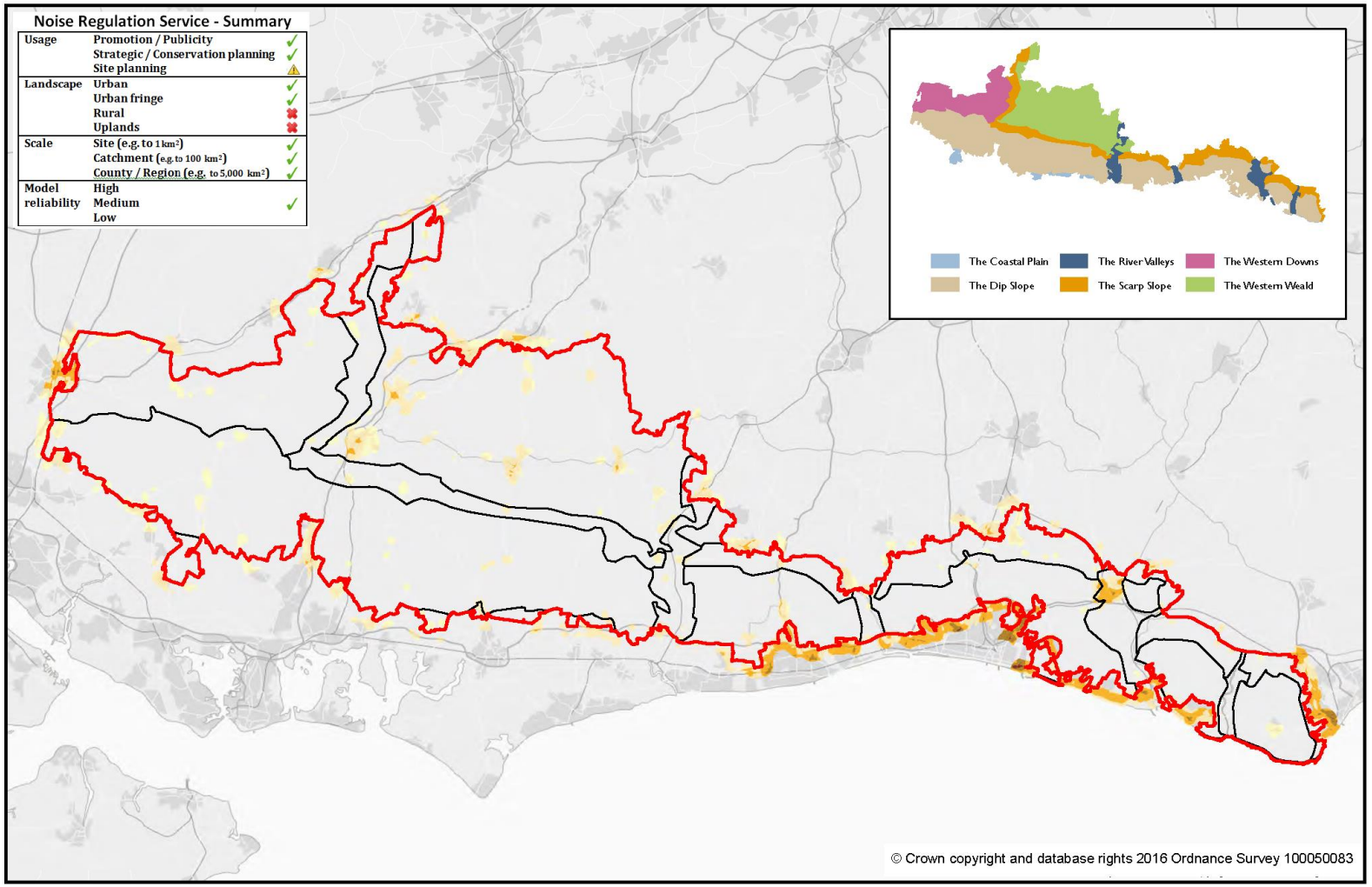

EcoServ-GIS

Noise Regulation Demand

SDNPA boundary

Broad Areas

Demand Scores

- 80 - 100
- 60 - 80
- 40 - 60
- 20 - 40
- 1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

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Sussex Biodiversity Record Centre

Noise regulation demand reflects the predicted need for noise regulation. This is based on modelled noise levels, population density and health data.

METHODS: Local search distance (population size) = 300 m, Minimum population size (local scale) = 50, Local search distance health scores = 300 m, Max noise distance from airports = 1500 m, Max noise distance from motorways = 800 m, Max noise distance from railways = 650 m, Max noise distance from A roads = 600 m, Max noise distance from B roads = 550 m. Thresholds are applied to limit the area of mapped Demand. Defaults are applied, but can be varied with custom settings.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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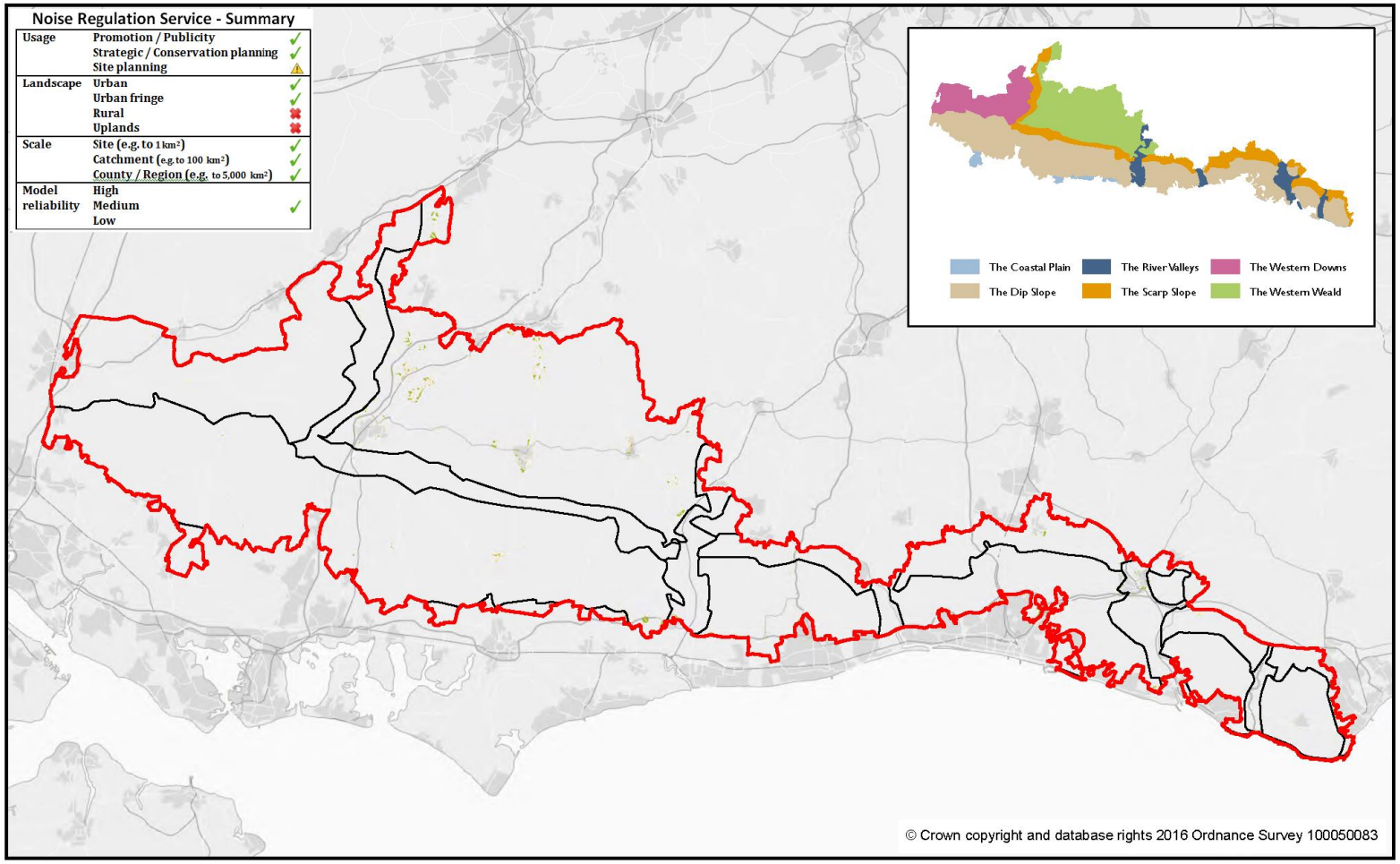


EcoServ-GIS

Noise Regulation Benefiting Areas

SDNPA boundary

Broad Areas

Benefits to people

- A1. Highest
- A2. High
- A3. Intermediate
- A4. Low
- A5. Lowest

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

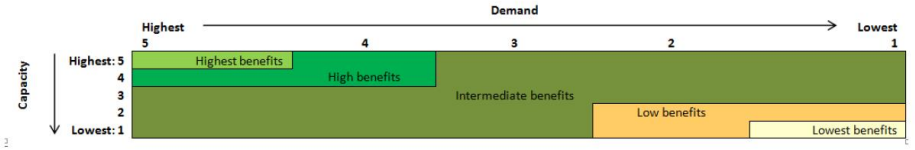
South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where people benefit from the noise reducing impact of semi-natural habitats and ecosystems

METHODS: Capacity and Demand quintiles are overlaid to estimate the levels of benefits that may be delivered to people by the habitats currently present. Not all categories are always present. White space indicates no data or no service benefits.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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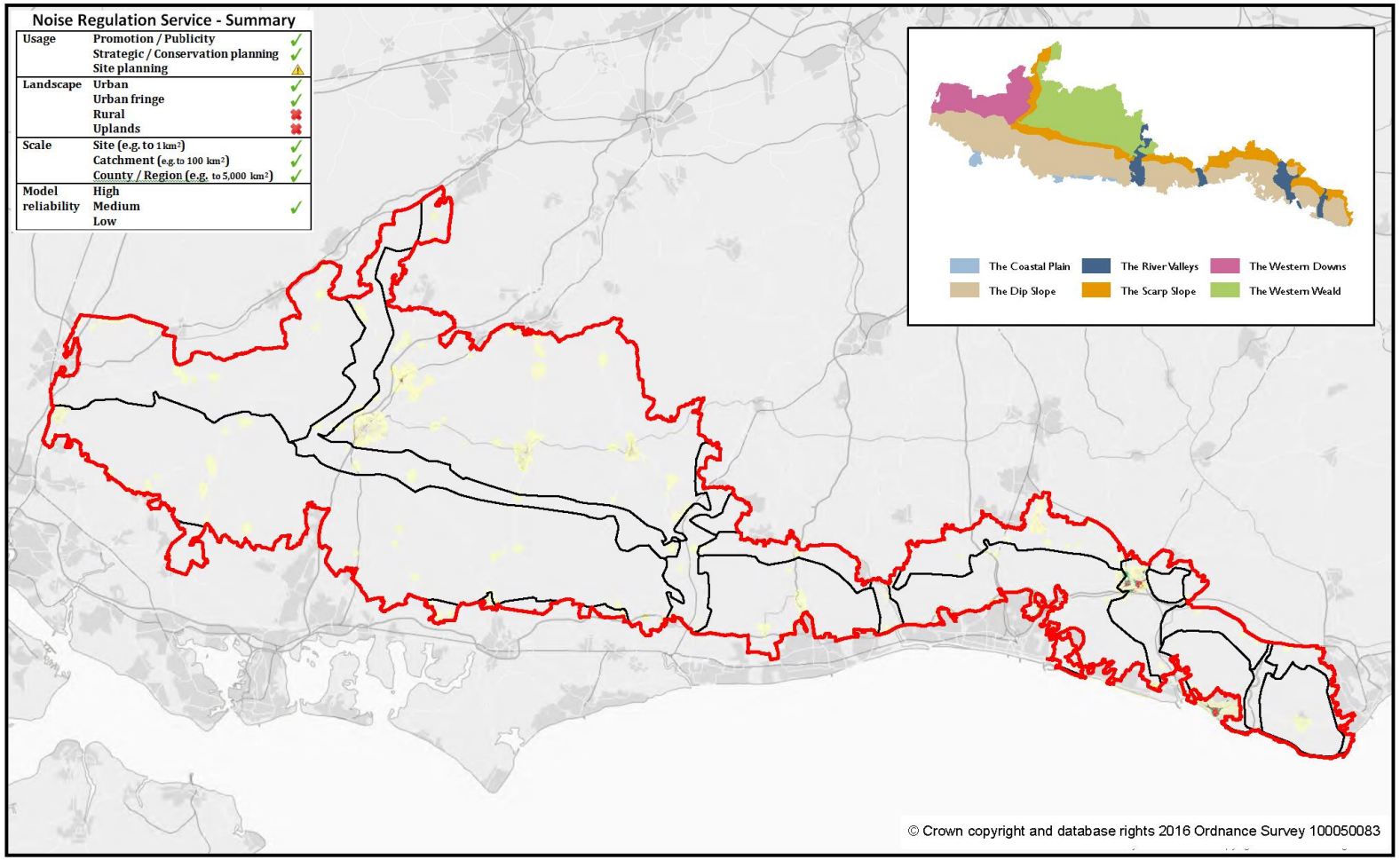
Noise Regulation Service - Summary

Usage	Promotion / Publicity	✓
	Strategic / Conservation planning	✓
	Site planning	⚠
Landscape	Urban	✓
	Urban fringe	✓
	Rural	✗
	Uplands	✗
Scale	Site (e.g. to 1 km²)	✓
	Catchment (e.g. to 100 km²)	✓
	County / Region (e.g. to 5,000 km²)	✓
Model reliability	High	
	Medium	✓
	Low	



EcoServ-GIS

Noise Regulation Management Zones

Suggested Management

- A1. Protect
- A2. Protect / Maintain
- A3. Maintain
- A4. Improve
- A5. Maintain / Improve
- A6. Maintain / Assess
- A7. Assess
- A8. Change habitat type: Highest Demand
- A9. Change habitat type: High Demand
- B1. Create: Highest Demand
- B2. Create: High Demand

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where people benefit from the noise reducing impact of semi-natural habitats and ecosystems.

METHODS: Capacity and Demand quintiles are overlaid to estimate the management interventions that could maintain or increase the benefits delivered to people. Not all categories are always present.

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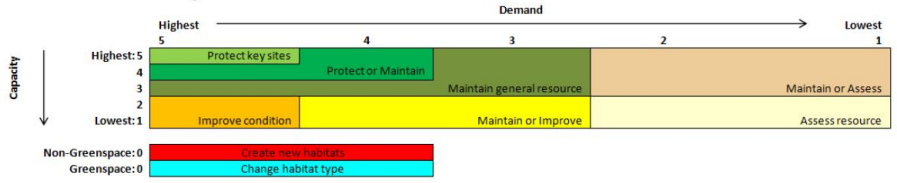

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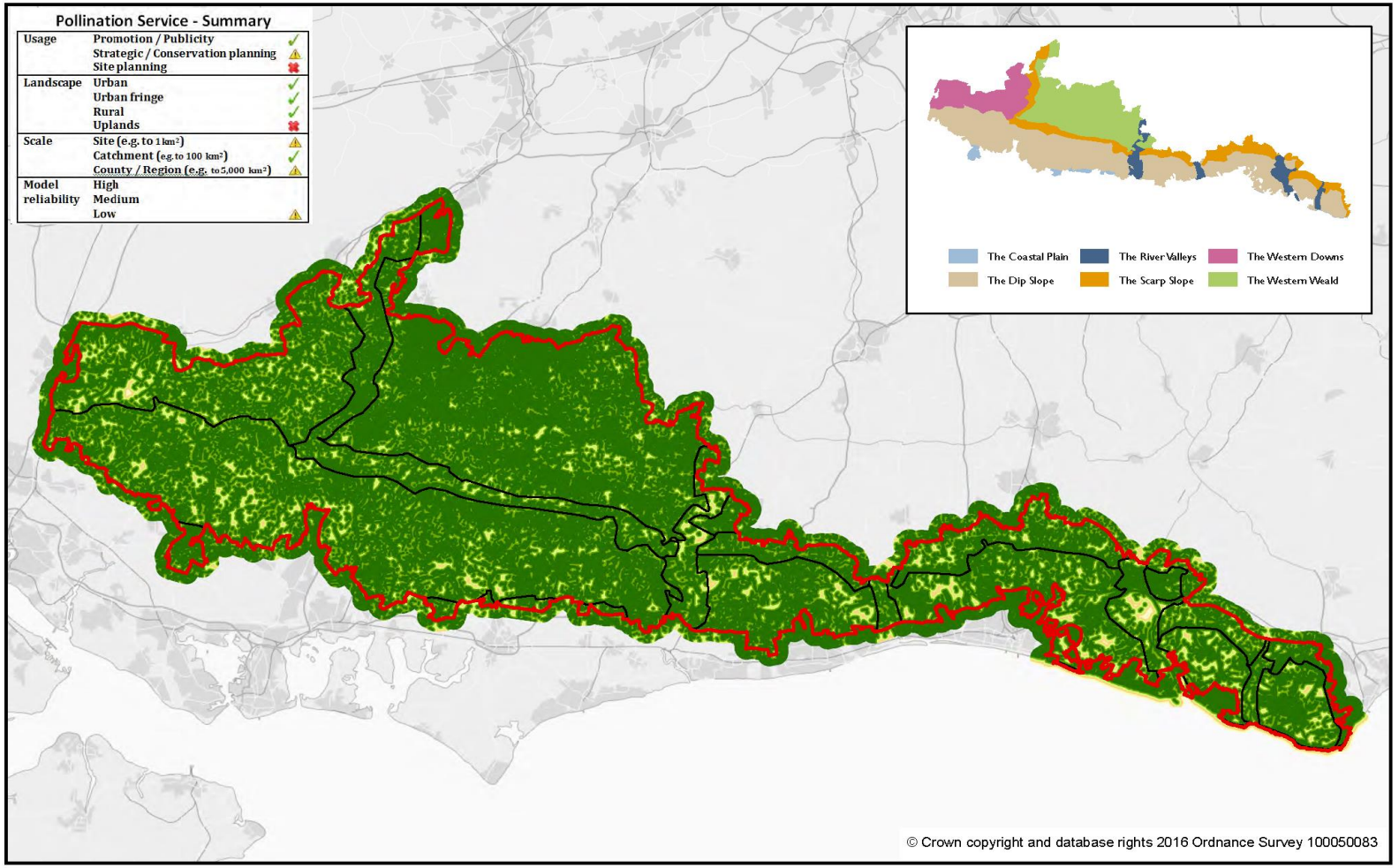

EcoServ-GIS

Pollination Capacity

SDNPA boundary

Broad Areas

Capacity Scores

80 - 100

60 - 80

40 - 60

20 - 40

1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

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Sussex Biodiversity Record Centre

Pollination capacity reflects the ability of different ecosystems to support wild pollinators, using an estimate of likely visitation by pollinators.

METHODS:Habitat types such as grassland and linear and edge habitats are identified that are likely to support wild pollinators. Distance from pollinator habitat is used to indicate the potential visitation likelihood by wild pollinators. A maximum travel distance of ~700 m is used within the mapping. Beyond this distance from a pollinator source habitat there is expected to be no capacity for pollination. Edge habitat is identified as 20 m into woodland habitats.

LIMITATIONS: The method used only considers habitat type and distance. No information on habitat area or habitat quality is included. The presence of any large areas of "unknown" or "unclassified" habitats in the BaseMap will have low capacity in this map. EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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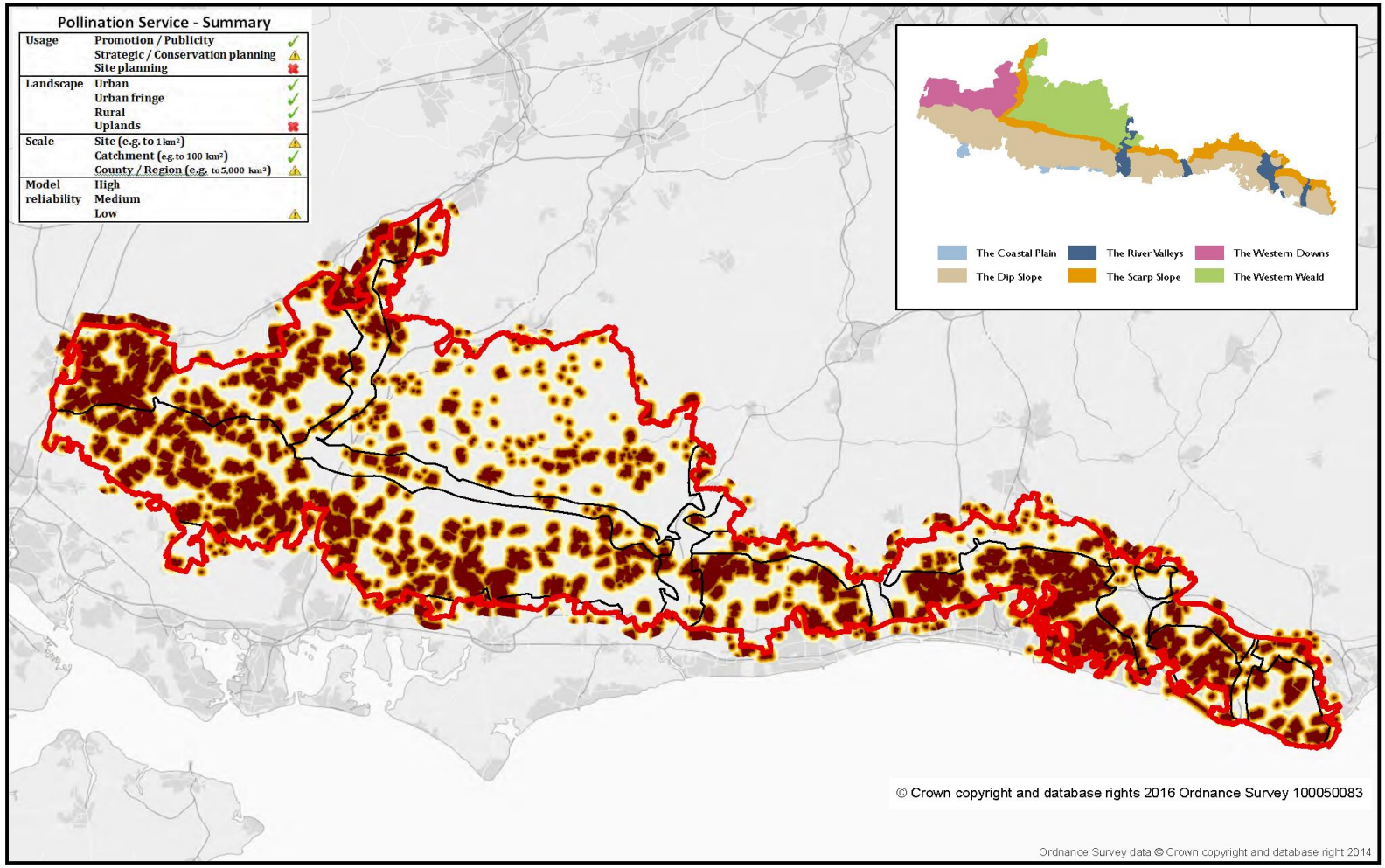

EcoServ-GIS

Pollination Demand

Study Area + 5Km

Broad Areas

Demand Scores

80 - 100

60 - 80

40 - 60

20 - 40

1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Pollination demand indicates areas of land that are expected to benefit from wild pollinators.

METHODS: Pollination demand is mapped from the locations of arable land, allotments and orchards.

LIMITATIONS: Often, depending on the input data used, arable land may be poorly mapped. Not all crops grown within areas of arable land will require pollination. If alternative data sources are available, they can be used to map the location of pollination demand. EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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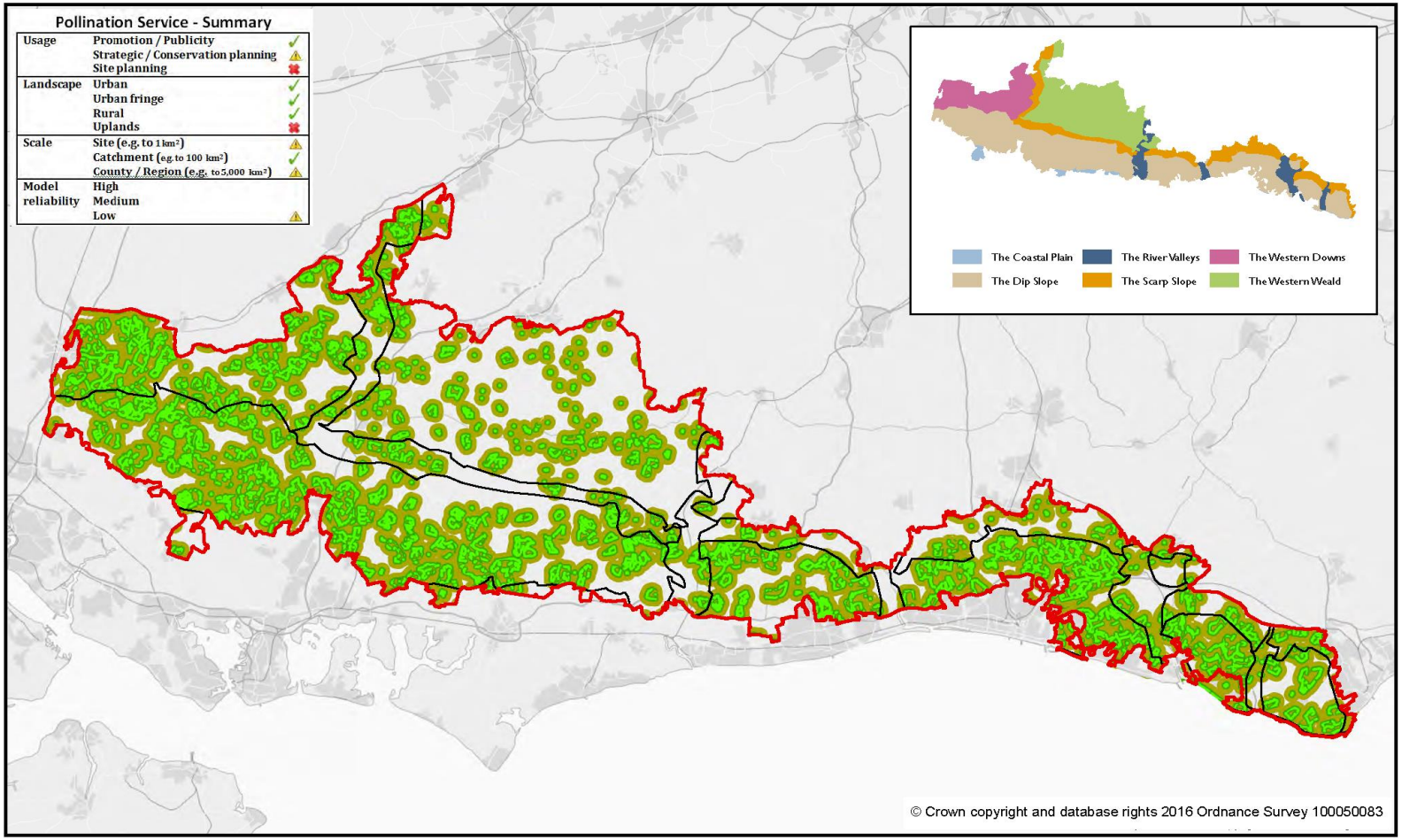


EcoServ-GIS

Pollination Benefiting Areas

Study Area + 5Km

Broad Areas

Benefits to people

- A1. Highest
- A2. High
- A3. Intermediate
- A4. Low
- A5. Lowest

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

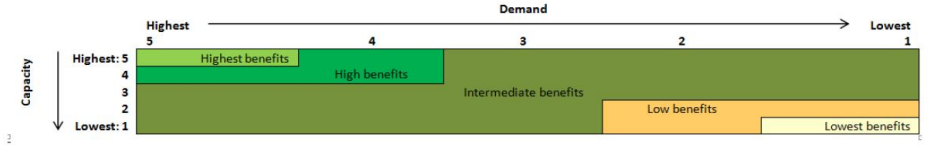
South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where crops in farmland, allotments or orchards are likely to benefit from wild pollinators from nearby semi-habitats.

METHODS: Capacity and Demand quintiles are overlaid to estimate the levels of benefits that may be delivered to people by the habitats currently present. Not all categories are always present. White space indicates no data or no service benefits.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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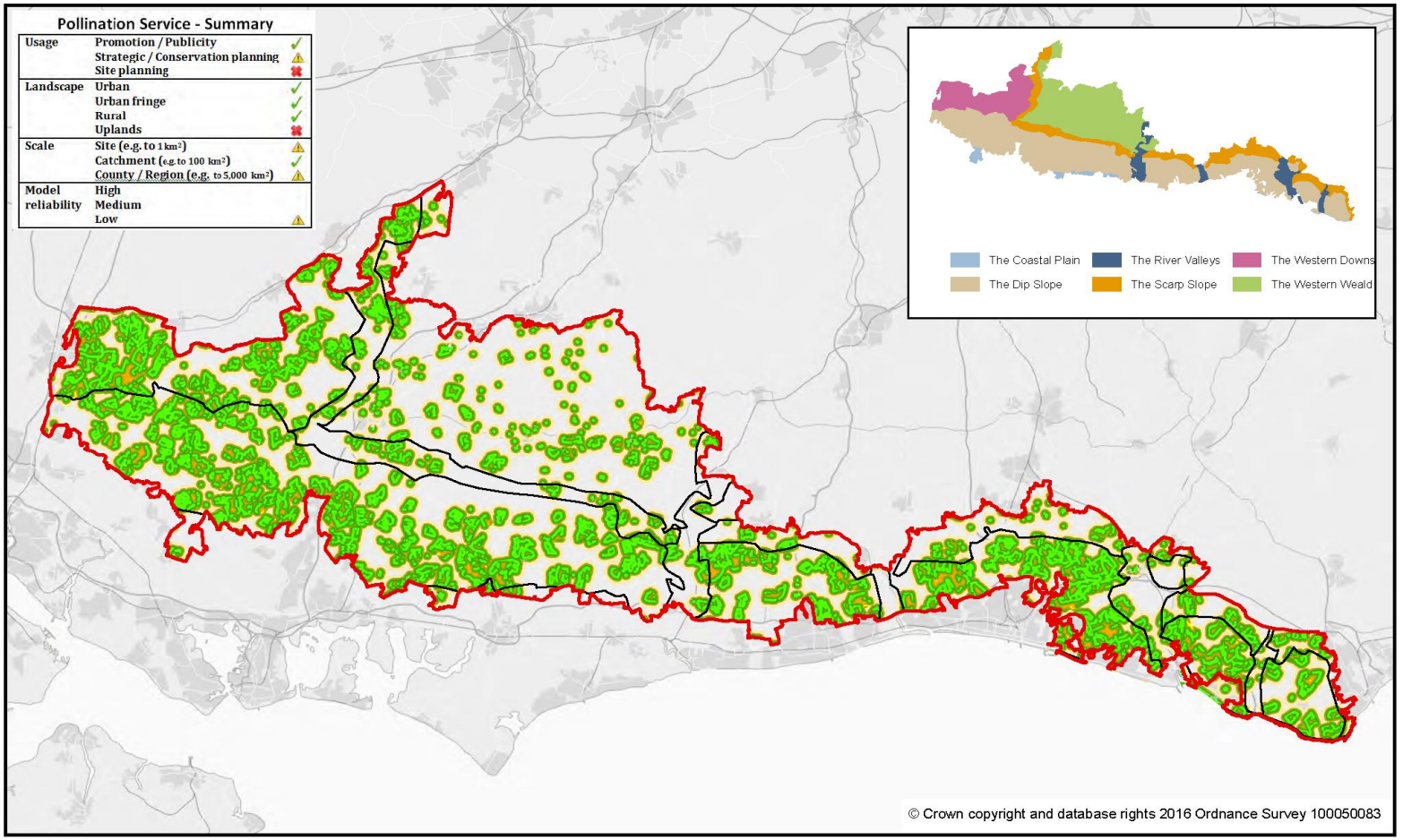

EcoServ-GIS

Pollination Management Zones

SDNPA boundary

Broad Areas

Suggested Management

- A1. Protect
- A2. Protect / Maintain
- A3. Maintain
- A4. Improve
- A5. Maintain / Improve
- A6. Maintain / Assess
- A7. Assess
- A8. Change habitat type: Highest Demand
- A9. Change habitat type: High Demand
- B1. Create: Highest Demand
- B2. Create: High Demand

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where crops in farmland, allotments or orchards are likely to benefit from wild pollinators from nearby semi-habitats.

METHODS: Capacity and Demand quintiles are overlaid to estimate the management interventions that could maintain or increase the benefits delivered to people. Not all categories are always present.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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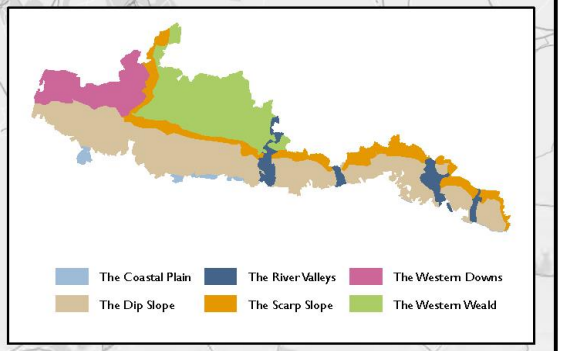
Water Purification Service - Summary

Usage	Promotion / Publicity	✓
	Strategic / Conservation planning	✓
	Site planning	✓
Landscape	Urban	⚠
	Urban fringe	✓
	Rural	✓
	Uplands	⚠
Scale	Site (e.g. to 1 km²)	✓
	Catchment (e.g. to 100 km²)	✓
	County / Region (e.g. to 5,000 km²)	✓
Model reliability	High	
	Medium	✓
	Low	



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EcoServ-GIS

Water Purification Capacity

SDNPA boundary

Broad Areas

Capacity Scores

80 - 100
60 - 80
40 - 60
20 - 40
1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where vegetation may help to purify water and reduce pollution impacts before reaching watercourses.

METHODS: Water Purification values per ecosystem are inferred from available literature, based on surface roughness and slope type. Habitat age and management is not considered.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

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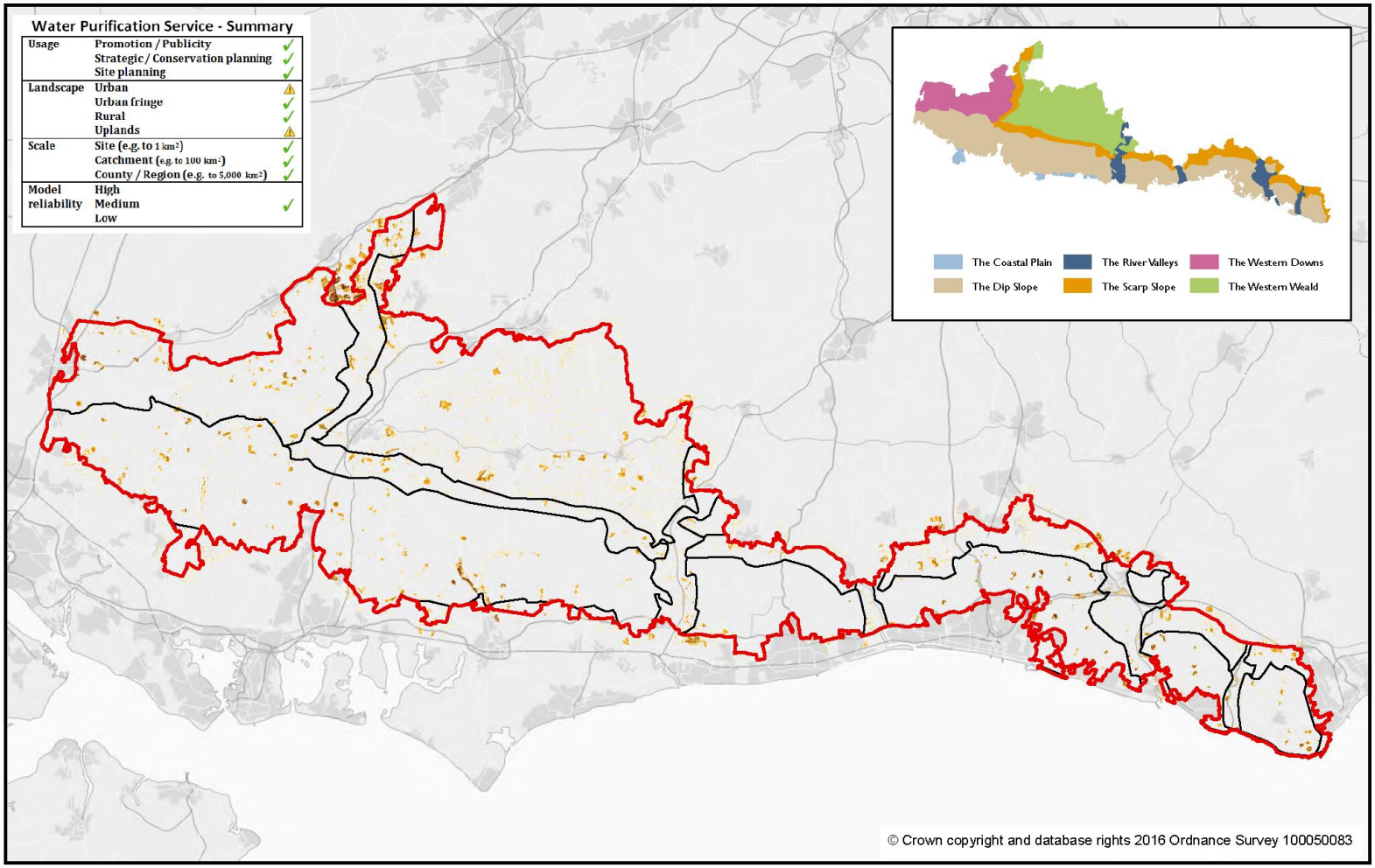

EcoServ-GIS

Water Purification Demand

SDNPA boundary

Broad Areas

Demand Scores

80 - 100

60 - 80

40 - 60

20 - 40

1 - 20

Scores are on a 1 to 100 scale, relative to values present within the Study Area. White space within the Study Area shows areas with no data or with no capacity

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas of land that may generate pollution risks to watercourses

METHODS: Demand is mapped based on a modified USLE equation, further adapted from a method presented in Sivertun and Prange (2003). Thresholds are applied to limit the area of mapped Demand. Defaults are applied, but can be varied with custom settings. Maximum risk distance from watercourses = 250 m. Potentially polluting land use types = Arable land, improved grassland, urban areas. Flow accumulation threshold used to identify streams, from which to map watersheds (catchments) = 20,000

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.

The Wildlife Trusts DURHAM

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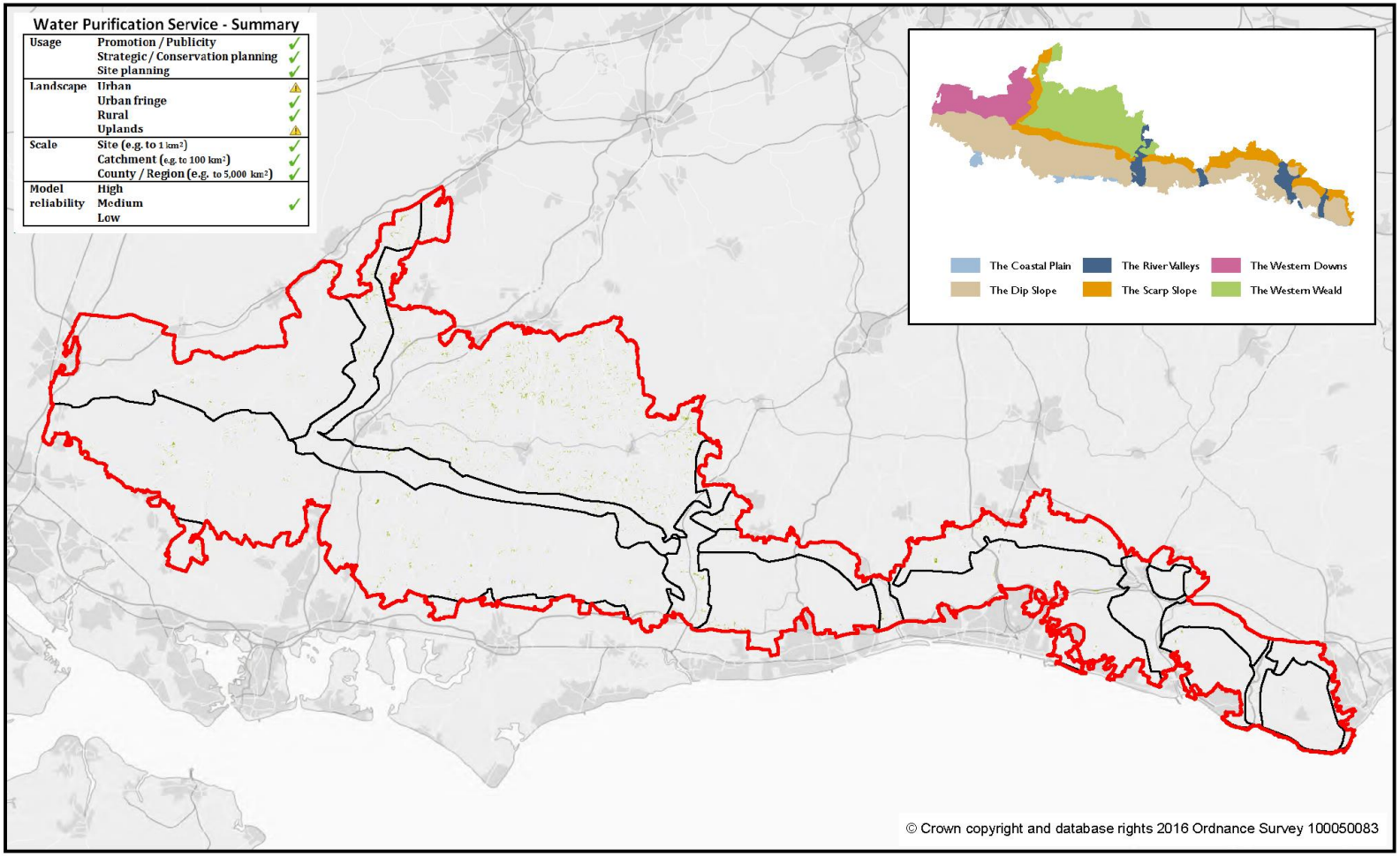


EcoServ-GIS

Water Purification Benefiting Areas

SDNPA boundary
Broad Areas

Benefits to people

A1. Highest
A2. High
A3. Intermediate
A4. Low
A5. Lowest

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

EcoServ-GIS models executed by Sussex Biodiversity Record Centre (hosted by Sussex Wildlife Trust).

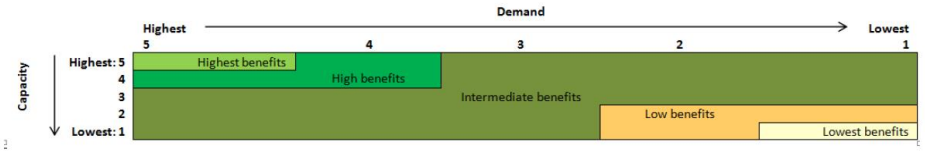
South Downs National Park Authority

Sussex Biodiversity Record Centre

Areas where people may be benefiting from the water purification effects of vegetation near streams

METHODS: Capacity and Demand quintiles are overlaid to estimate the levels of benefits that may be delivered to people by the habitats currently present. Not all categories are always present. White space indicates no data or no service benefits.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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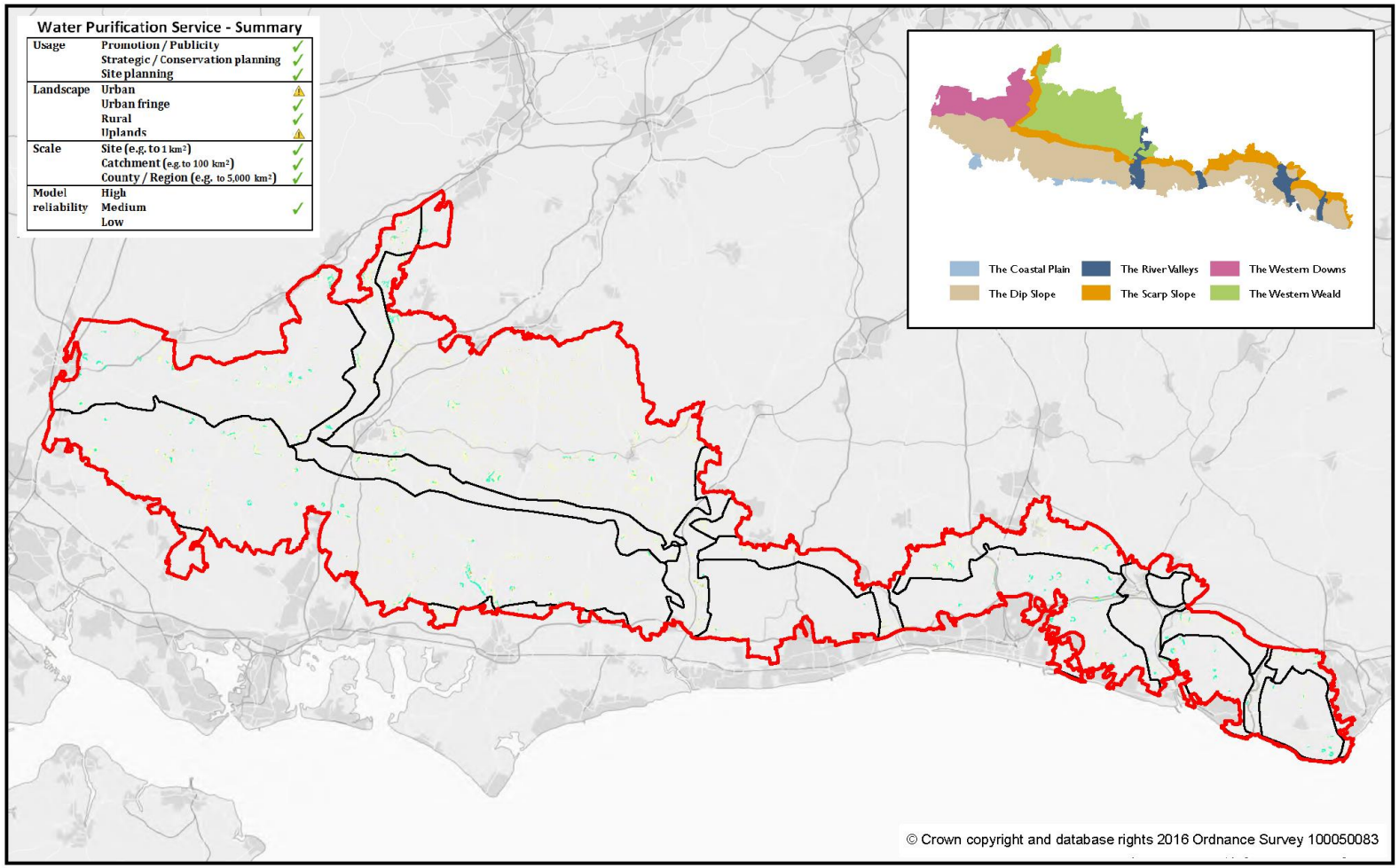

EcoServ-GIS

Water Purification Management Zones

SDNPA boundary

Broad Areas

Suggested Management

- A1. Protect
- A2. Protect / Maintain
- A3. Maintain
- A4. Improve
- A5. Maintain / Improve
- A6. Maintain / Assess
- A7. Assess
- A8. Change habitat type: Highest Demand
- A9. Change habitat type: High Demand
- B1. Create: Highest Demand
- B2. Create: High Demand

The coloured graphic below the map illustrates how the capacity and demand maps are used to create this classification.

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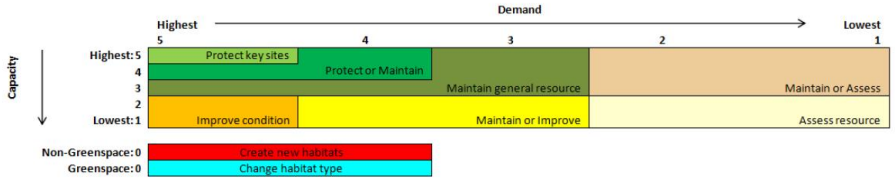
METHODS: Capacity and Demand quintiles are overlaid to estimate the management interventions that could maintain or increase the benefits delivered to people. Not all categories are always present.

LIMITATIONS: EcoServ-GIS relies on indicators to predict levels of capacity and demand. Results are relative to the study area and cannot be compared to other areas. Local knowledge must be used to interpret what the values mean in absolute terms.



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APPENDIX 2

Explanation of the Output from the Models

Accessible Nature Service Model

This highlights areas where people benefit from opportunities to experience and enjoy natural places and landscapes within their living, working, and commuting space. The capacity of the natural environment is mapped by identifying the public accessibility status of land and their level of perceived naturalness. The demand (need) for accessible nature is mapped on the number of people likely to travel to an area and their needs in terms of health benefits, based on the current index of Multiple Deprivation health scores.

Usage – Summary Table

Usage	**Promotion & publicity** **Strategic/Conservation Planning** **Site Planning**	**Yes** **Yes** **Use with caution**
Landscape	Urban Urban Fringe Rural Uplands	Yes Yes - -
Scale	Site level (e.g to 1km^2) Catchment (e.g to 100 km^2) County/Region (e.g to 5,000 km^2)	Yes Yes Yes
Model reliability	High Medium Low	Yes

Air Purification Service Model

Plants and trees are central to the cycle oxygen and carbon dioxide in the atmosphere, they have an important role to play in regulating levels of air pollution. Air purification occurs where habitats help to intercept and absorb airborne pollutants. In urban areas people benefit from green infrastructure and vegetation cover that helps to remove pollutants from vehicle emissions from the air.

The capacity to of the natural environment to provide this service is mapped by assigning scores to broad habitat types based on their ability to trap pollutants. The societal demand (need) for air purification is mapped by calculating population density. The regulatory demand is mapped by estimating traffic levels by road type.

Usage – Summary Table

Usage	Promotion & publicity Strategic/Conservation Planning Site Planning	Yes Yes Use with Caution
Landscape	Urban Urban Fringe Rural Uplands	Yes Yes - -
Scale	Site level (e.g to 1km²) Catchment (e.g to 100 km²) County/Region (e.g to 5,000 km²)	Use with Caution Yes
Model reliability	High Medium Low	Yes

Carbon Storage Service Model

This maps the storage of carbon in above and below ground biomass. The capacity is by assigning carbon storage values per mapped area. This maps typical storage values from peer reviewed papers for habitat types and within the top 30cm of soils. The demand (need) for carbon storage is considered to be a constant across the whole of the National Park as the benefits of carbon storage are universal and UK wide.

Usage – Summary Table

Usage	**Promotion & publicity** **Strategic/Conservation Planning** **Site Planning**	**Yes** **Yes** **Use with caution**
Landscape	Urban Urban Fringe Rural Uplands	Yes Yes Yes Yes
Scale	Site level (e.g to 1km²) Catchment (e.g to 100 km²) County/Region (e.g to 5,000 km²)	Use with caution Yes Yes
Model reliability	High Medium Low	Yes

Climate Regulation Service Model

This maps areas where the natural environment helps to mitigate the impact of the urban heat island effect due to the cooling impact of habitats and tree cover. The capacity of this service is mapped using the presence of types and configuration of green space in the local environment. The regulatory demand is mapped using the proportion of urban land cover. The societal demand for local climate regulation is mapped based upon population density and the vulnerability of the population to raised temperatures and heat waves based on age profile.

Usage – Summary Table

Usage	Promotion & publicity Strategic/Conservation Planning Site Planning	Yes Yes Yes
Landscape	Urban Urban Fringe Rural Uplands	Yes Yes - -
Scale	Site level (e.g to 1km²) Catchment (e.g to 100 km²) County/Region (e.g to 5,000 km²)	Yes Yes Yes
Model reliability	High Medium Low	Yes

Education Provision Service Model

This considers the opportunities for young students to develop skills and learn within the natural environment. The capacity of the environment to provide education opportunities is mapped by accessible areas and the variety or configuration of natural sites. Demand (need) is mapped based on population density, the distance to local and regional schools and the numbers of schools within driving distance.

Usage – Summary Table

Usage	Promotion & publicity Strategic/Conservation Planning Site Planning	Yes Yes Yes
Landscape	Urban Urban Fringe Rural Uplands	Yes Yes Use with caution -
Scale	Site level (e.g to 1km²) Catchment (e.g to 100 km²) County/Region (e.g to 5,000 km²)	Yes Yes Yes
Model reliability	High Medium Low	Yes

Green Travel Service Model

Green travel routes and access corridors occur in urban areas where there is a good network of habitats and green space. This can provide safe, traffic free routes, buffer areas from traffic based pollution and encourage different modes of travel. The capacity of the environment to provide green travel routes is mapped using perceived naturalness scores to habitats along different types of travel corridors. Societal demand (need) is mapped using key travel destinations or starting points. These include town centres, schools and train stations. Least cost modelling is used to determine which corridors are most connected to the key travel destinations.

Usage – Summary Table

Usage	**Promotion & publicity** **Strategic/Conservation Planning** **Site Planning**	**Yes** **Yes** **Yes**
Landscape	Urban Urban Fringe Rural Uplands	Yes Yes Use with caution -
Scale	Site level (e.g to 1km²) Catchment (e.g to 100 km²) County/Region (e.g to 5,000 km²)	Yes Yes Yes
Model reliability	High Medium Low	Yes

Noise Regulation Service Model

Explanation of the output maps from this model

Highlights areas where people benefit from the natural environments ability to diffuse and absorb traffic noise. The capacity is mapped by assigning a noise regulation score based on habitat types taking into account height, density permeability and year round cover. The demand (need) is mapped based on estimated noise volume levels and the societal impacts of noise pollution. These consider the proximity and distance from noise sources and considers key factors such as roads, railways and airports. The societal need is mapped based upon population density and Index of Multiple Deprivation health scores.

Usage – Summary Table

Usage	**Promotion & publicity** **Strategic/Conservation Planning** **Site Planning**	**Yes** **Yes** **Use with caution**
Landscape	Urban Urban Fringe Rural Uplands	Yes Yes - -
Scale	Site level (e.g to 1km²) Catchment (e.g to 100 km²) County/Region (e.g to 5,000 km²)	Yes Yes Yes
Model reliability	High Medium Low	Yes

Pollination Service Model

Explanation of the output maps from this model

The effective pollination of crops by Bees and other pollinators is vital to the life cycle of many plants. We rely on this 'natural service' for growing food crops as well as other plants and wildflowers. This model highlights the ability of areas to support wild pollinators and deliver pollination services.

The capacity of the natural environment to provide pollination services is based on the likelihood of pollinator visitation, based on the likely travel distance from pollinator habitat. The demand (need) is mapped by identifying allotments, orchards or areas of agricultural land which may benefit from insect pollinators.

Usage – Summary Table

Usage	**Promotion & publicity** **Strategic/Conservation Planning** **Site Planning**	**Yes** **Yes** **-**
Landscape	Urban Urban Fringe Rural Uplands	Yes Yes Yes -
Scale	Site level (e.g to 1km²) Catchment (e.g to 100 km²) County/Region (e.g to 5,000 km²)	Use with caution Yes Use with caution
Model reliability	High Medium Low	 Yes

Water Purification Service Model

Explanation of the output maps from this model

Areas where the natural environment and habitats provide benefits in terms of water purification effects near streams and water courses. Vegetation and woodland cover help trap sediment and slow water run-off in locations where pollutants are likely to be mobilised.

The capacity of the natural environment for water purification is mapped by calculating surface resistance based on land cover and slope gradient. The regulatory demand (need) is calculated on the basis of erosion risk and the proportion of the watershed covered by agricultural or urban land uses that can act as sources of pollution.

Usage – Summary Table

Usage	Promotion & publicity Strategic/Conservation Planning Site Planning	Yes Yes Yes
Landscape	Urban Urban Fringe Rural Uplands	Use with caution Yes Yes Use with caution
Scale	Site level (e.g to 1km²) Catchment (e.g to 100 km²) County/Region (e.g to 5,000 km²)	Use with caution Yes Yes
Model reliability	High Medium Low	 Yes

GLOSSARY AND EXPLANATION OF TERMS

Coherent: A plan or a set of ideas that is clear or carefully considered and each part connects or follows in a logical or natural way.

Ecosystem: A system, or a group of interconnected elements, formed by the interaction of a community of organisms with their environment.

Ecosystem Services: the benefits that people and society get from the natural environment.

Ecosystem Service Benefits: The wider environmental, cultural, economic or welfare benefits provided through Ecosystem Services.

Greenspace: An area of grass, trees or other vegetation set aside for recreation or other amenity purposes within a predominantly urban environment.

Green Infrastructure: A network of multi-functional green space, both rural and urban, which supports the natural and ecological processes and are integral to the health and quality of life of communities.

Hotspots: A small area with relatively high Ecosystem Service function or activity in comparison with its surroundings. Also relates to areas that deliver multiple functions within a landscape.

Landscape: An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors

Landscape Character: The distinct, recognisable and consistent pattern of elements in the landscape that makes it different from another (rather than better or worse)

Landscape-scale: A project or programme of work that delivers outcomes or activities across a large area and is based on a sound understanding of the character and function of that landscape. This also takes into account the natural and cultural elements of the landscape both old and new.

Natural Capital: The stock of natural resources, which includes geology, soils, air, water and living organisms. These are assets that provide people with a wide range of goods and services (see 'Ecosystem Services') which underpin our economy and society and which make human life possible.

Resilience: The ability to absorb, resist or recover from disturbances or damage from natural influences, human activities including climate change while continuing to provide ecosystem services.