

Appendix 1: Data

Appendix 1 contains the origins and descriptions for the data layers collated for this project summarised in Table 1. In addition, the Appendix illustrates the requirement for a wide range of environmental data required in such a project and acknowledges the contributions of the organisation how provided them.

Table 1: Data collated for this project

General	Organisation/Source
5km Landis climatic datasets	NSRI
50m resolution Digital Terrain Model	CEH
1:50,000 river network coverage	CEH
Soil map for Moorhouse	CEH
Soil map of the Eden at 250m resolution	NSRI
Soil map of the Eden at 50m resolution	NSRI
Soil map of the Lossie at 250m resolution	Macaulay
Soil map of the Tern at 250m resolution	NSRI
Soil map of the Tern at 50m resolution	NSRI
Land Cover Map 2000	CEH
Landscape Character Assessment	Staffs County Council
Landscape Character Assessment	Shrops County Council
Biomass production	
Agricultural Land Classification	Defra
Flood Risk	Environment Agency/ CEH
Land Capability for Agriculture	Macaulay
Land capability for Forestry	Macaulay
Environmental interaction	
Flood plain position	Environment Agency/CEH
Metals in soil	NSRI
Soil contamination	Macaulay
Soil water quality	NRFA/CEH
Gauging stations	NRFA/CEH
Biological habitat and gene reserve	
Countryside 2000 data	CEH
Landscape value and character areas	County Councils
BAP species records	Biological Records Centre/CEH
Areas of Outstanding Natural Beauty	MAGIC
Common Land	MAGIC
Countryside Agency Regions	MAGIC
Countryside Character Areas	MAGIC
Environmentally Sensitive Areas	MAGIC
Forestry Commission Conservancy Boundaries	Forestry Commission
National Parks	MAGIC
Nitrate Vulnerable Zones	DEFRA
Nitrate Sensitive Areas	MAGIC
Ancient Woodlands	English Nature
Sites of Special Scientific Interest	English Nature
Physical medium	
Infrastructure and urban areas	Bartholomew
Potential Land for Housing in Scotland	Macaulay
Urban Settlements	ODPM
Geology (various)	BGS
Cultural heritage	
250 grid indicating known archaeological sites	English Heritage & OS Mastermap

No National Parks in Tern catchment and no Nitrate Sensitive Areas in the Eden catchment

MAGIC**Agricultural Land Classification - Provisional (England)**

Name	Agricultural Land Classification - Provisional (England)
Map Topic(s)	Land Classifications
Abbrev Name	ALC
Theme	Agricultural land classified into five grades. Grade one is best quality and grade five is poorest quality. A number of consistent criteria used for assessment which include climate (temperature, rainfall, aspect, exposure, frost risk), site (gradient, micro-relief, flood risk) and soil (depth, structure, texture, chemicals, stoniness).
Labelling Convention	One number code uniquely identifying ALC Grade
Definition	One number code uniquely identifying ALC Grade
Domain of Use	England
Owner	DEFRA
Version	1.0
Version Date	10/01/2002
Parent	Not Applicable
Child	Not Applicable
Responsible Authority	DEFRA
Frequency of Supply	Never
Source	Raster Digital mapping
Scale	1:250,000
Data Capture Process	Head down digitising
Quality	Digitised from the published 1:250,000 maps which was in turn compiled from the published 1 inch to 1 mile maps. Digitised without reference to underlying O.S.
Positional Accuracy	Estimated as +/- 0.1mm from source document; based on visual comparison with published maps which are only accurate to nearest 80ha.
Precision	Data captured with co-ordinate precision of 1 metre
Measurement	Spatial (from extent of feature)
Unit of Measure	Hectares
Dimension	Area
Other Information	

2001 Urban Settlements (England)

Name	2001 Urban Settlements (England)
Map Topic(s)	Land Classifications
Abbrev Name	
Theme	ODPM's 2001 Urban Settlement data cover England and Wales corresponding to the 2001 Census data. Urban settlements were defined as areas of built up land with an associated population of 1,000 and a minimum area of 20 hectares. Settlements separated by less than 200metres were linked. The settlements were extracted from the Ordnance Survey 1: 10,000 scale maps, as at 1st April 2001
Labelling Convention	Unique code of single letter and five digits for each urban area
Definition	Unique code of single letter and five digits for each urban area
Domain of Use	England
Owner	The Office of the Deputy Prime Minister (ODPM) for Urban Areas, Office for National Statistics (ONS) for population data
Version	
Version Date	01/04/2001
Parent	Not Applicable
Child	Not Applicable
Responsible Authority	The Office of the Deputy Prime Minister (ODPM)
Frequency of Supply	Decennially
Source	
Scale	1:10,000
Data Capture Process	Heads down digitising
Quality	Checked against OS 1:10,000 scale mapping
Positional Accuracy	Positional accuracy estimated as +/- 0.1mm from source document; based on visual comparison with plots
Precision	Data captured with co-ordinate precision of 1 metre
Measurement	Spatial (from extent of feature)
Unit of Measure	Hectares
Dimension	Area
Other Information	

Areas of Outstanding Natural Beauty (England)

Name	Areas of Outstanding Natural Beauty (England)
Map Topic(s)	Rural Designations - Statutory
Abbrev Name	AONB
Theme	AONBs are designated areas where protection is afforded to protect and manage the areas for visitors and local residents
Labelling Convention	Numerical code identifying each individual AONB
Definition	Numerical code identifying each individual AONB
Domain of Use	England
Owner	Countryside Agency
Version	
Version Date	05/05/2005
Parent	Not Applicable
Child	Not Applicable
Responsible Authority	Countryside Agency
Frequency of Supply	Unknown
Source	Mixed scale pape
Scale	Mixed small, medium and/or large scales
Data Capture Process	Heads-up digitising
Quality	This dataset is
Positional Accuracy	Estimated as +/-
Precision	Data captured with co-ordinate precision of 1 metre
Measurement	Statutory
Unit of Measure	Square kilometres
Dimension	Area
Other Information	

Common Land (England)

Name	Common Land (England)
Map Topic(s)	Rural Designations - Statutory
Abbrev Name	
Theme	Common Land is land over which individuals other than the owners have 'rights of common'. The 'rights of common' entitle persons possessing such rights to use a range of products and characteristics of the land. The rights may include grazing of stock, collecting of timber or taking of fish. These rights have been handed down through nine or more centuries. This data has been provided with the agreement of the Department for Environment, Food and Rural Affairs (DEFRA). You will be aware that the dataset is intended to be indicative and not definitive and that available records held in local authority Registers have been digitised at a resolution of 1:50 000 and are dated c.1993. Every effort was made to ensure the Common Land and Village Green boundary digital dataset was accurate. Due to limited resources it is impractical to investigate and correct errors in the dataset. DEFRA cannot accept any responsibility for the accuracy of the data or any liability resulting from their use. Common land boundaries will be updated through the project to produce maps of Open Countryside.
Labelling Convention	Up to 6 figure unique reference code
Definition	Up to 6 figure unique reference code
Domain of Use	England
Owner	DEFRA
Version	
Version Date	01/10/1993
Parent	Not Applicable
Child	Not Applicable
Responsible Authority	DEFRA
Frequency of Supply	To be confirmed
Source	Large scale digitising
Scale	1 : 50 000
Data Capture Process	Digitising by county creating polygons for common land
Quality	An algorithm was written to assist in data checking. The program compares the listing of digitised commons against the listing of commons from the superfile database
Positional Accuracy	+ / - 1mm from source maps
Precision	50 m on the ground
Measurement	Registered area of common. Minimum mapping unit often greater than 4 hectares
Unit of Measure	Hectares
Dimension	Area

Other Information <http://www.countryside.gov.uk/access/mapping>

Countryside Agency Regions (England)

Name	Countryside Agency Regions (England)
Map Topic(s)	Administrative Areas
Abbrev Name	
Theme	Countryside Agency Administrative Regions
Labelling Convention	Two letter code uniquely identifying each administrative region
Definition	Two letter code uniquely identifying each administrative region
Domain of Use	England
Owner	Countryside Agency
Version	1.0
Version Date	12/03/2002
Parent	OS Boundary-Line
Child	N/A
Responsible Authority	Countryside Agency
Frequency of Supply	Annually
Source	OS Boundary-Line
Scale	1:10,000 generalised to 50 metres
Data Capture Process	Dissolving of county / unitary components
Quality	OS Boundary-Line
Positional Accuracy	Unknown
Precision	Unknown
Measurement	Spatial (from extent of feature)
Unit of Measure	Square kilometres
Dimension	Area
Other Information	

Countryside Character Areas (England)

Name	Countryside Character Areas (England)
Map Topic(s)	Joint Character Areas
Abbrev Name	
Theme	Countryside Character Areas provide a context to local planning, action and development. There are 159 areas that are unique in terms of a combination of physiographic, land use, historical and cultural attributes
Labelling Convention	Numerical code uniquely identifying each Countryside Character Area
Definition	Numerical code uniquely identifying each Countryside Character Area
Domain of Use	England
Owner	Countryside Agency
Version	1.0
Version Date	05/05/2005
Parent	Natural Areas
Child	Not Applicable
Responsible Authority	Countryside Agency (digital copy from FRCA)
Frequency of Supply	Unknown
Source	Joint character
Scale	1:200,000
Data Capture Process	Digitising polygons from Joint Character Map, using existing polygon data from Natural Areas dat
Quality	Quality checked
Positional Accuracy	Boundaries repre
Precision	not relevant
Measurement	Spatial (from extent of feature)
Unit of Measure	Square kilometres
Dimension	Area
Other Information	

Environmentally Sensitive Areas (England)

Name	Environmentally Sensitive Areas (England)
Map Topic(s)	Rural Designations - Statutory
Abbrev Name	ESA
Theme	Environmentally Sensitive Areas are one of a range of agri-environment schemes operating under the England Rural Development Programme. Incentives are offered to farmers to adopt agricultural practices which will safeguard and enhance parts of the country of particularly high landscape, wildlife or historic value.
Labelling Convention	Two letter code uniquely identifying the ESA
Definition	Two letter code uniquely identifying the ESA
Domain of Use	England
Owner	DEFRA
Version	1.0
Version Date	20/12/2001
Parent	Not Applicable
Child	ESA Agreements ESA Tiers
Responsible Authority	DEFRA
Frequency of Supply	Not known
Source	Large scale raster digital mapping
Scale	1:10,000
Data Capture Process	Head up digitising
Quality	Boundaries of features traced from 1:10,000 scale Ordnance Survey raster mapping; quality control against published paper mapping
Positional Accuracy	Positional accuracy estimated as +/- 0.1mm from source document; based on visual comparison with plots
Precision	Data captured with co-ordinate precision of 1 metre
Measurement	Spatial (from extent of feature)
Unit of Measure	Hectares
Dimension	Area
Other Information	

Forestry Commission Conservancy Boundaries (England)

Name	Forestry Commission Conservancy Boundaries (England)
Map Topic(s)	Administrative Areas
Abbrev Name	
Theme	Forestry Commission Administrative Regions
Labelling Convention	Two letter code uniquely identifying each Forestry Commission conservancy
Definition	Two letter code uniquely identifying each Forestry Commission conservancy
Domain of Use	England
Owner	Forestry Commission
Version	1.0
Version Date	22/05/2002
Parent	OS Boundary-Line
Child	N/A
Responsible Authority	Forestry Commission
Frequency of Supply	As required
Source	OS Boundary-Line
Scale	1:10,000 generalised to 50 metres
Data Capture Process	Dissolving of county / unitary components
Quality	OS Boundary-Line
Positional Accuracy	Unknown
Precision	Unknown
Measurement	Spatial (from extent of feature)
Unit of Measure	Square kilometres
Dimension	Area
Other Information	

National Parks (England)

Name	National Parks (England)
Map Topic(s)	Rural Designations - Statutory
Abbrev Name	
Theme	National Parks are run by National Park Authorities for the purpose of conserving and enhancing the natural beauty, wildlife and cultural heritage and to provide opportunities for the understanding and enjoyment of the Park by the public.
Labelling Convention	One number code uniquely identifying each National Park
Definition	One number code uniquely identifying each National Park
Domain of Use	England
Owner	Countryside Agency
Version	
Version Date	01/03/2005
Parent	Not Applicable
Child	Not Applicable
Responsible Authority	Countryside Agency (DEFRA digitization)
Frequency of Supply	Unknown
Source	Mixed scale paper mapping
Scale	Mixed small, medium and/or large scales
Data Capture Process	Heads-up digitising
Quality	The New Forest National Park has been verified against the Designated Boundary. All other National Parks in this data set are improved interpretations of the Designated Boundaries, completed using Ordnance Surver Land-Line 2001 as base mapping. These boundaries will be the subject of further refinement over the course of the next 6 to 12 months.
Positional Accuracy	Estimated as +/- 0.5mm from source document
Precision	Data captured with co-ordinate precision of 1 metre
Measurement	Statutory
Unit of Measure	Square kilometres
Dimension	Area
Other Information	

Nitrate Sensitive Areas (England)

Name	Nitrate Sensitive Areas (England)
Map Topic(s)	Rural Designations - Statutory
Abbrev Name	NSA
Theme	NSAs are carefully selected areas covering groundwater sources used to supply drinking water. In these areas incentives were offered to farmers to undertake significant changes in agricultural practices to reduce nitrate leaching, thereby helping stabilise or reduce nitrate levels. There are 32 NSAs in England. Note this scheme is now closed to new applicants.
Labelling Convention	Two letter code uniquely identifying the NSA
Definition	Two letter code uniquely identifying the NSA
Domain of Use	England
Owner	DEFRA
Version	1.0
Version Date	10/01/2002
Parent	Not Applicable
Child	Not Applicable
Responsible Authority	DEFRA
Frequency of Supply	Never
Source	Raster Digital mapping
Scale	1:10,000
Data Capture Process	Head up digitising
Quality	Boundaries of features traced from 1:10,000 scale Ordnance Survey raster mapping; quality control against published paper mapping.
Positional Accuracy	Estimated as +/- 0.1mm from source document; based on visual comparison with published maps
Precision	Data captured with co-ordinate precision of 1 metre
Measurement	Spatial (from extent of feature)
Unit of Measure	Hectares
Dimension	Area
Other Information	

Nitrate Vulnerable Zones (England)

Name	Nitrate Vulnerable Zones (England)
Map Topic(s)	Rural Designations - Statutory
Abbrev Name	NVZ
Theme	NVZs were set up under Council Directive 91/676/EEC and have been established in areas where nitrate from agricultural land is causing pollution of the water environment. In these zones Action Programmes of compulsory measures apply. These measures include a requirement for farmers to limit their applications of livestock manures and, in some circumstances, to observe closed periods for the application of organic manure to agricultural land. Action Programme measures apply to all land within designated NVZs from 19th December 2002. Around 55% of England is now included within a Nitrate Vulnerable Zone.
Labelling Convention	One figure reference code identifying Nitrate Vulnerable Zone
Definition	One figure reference code identifying Nitrate Vulnerable Zone
Domain of Use	England
Owner	DEFRA
Version	
Version Date	09/01/2003
Parent	Not applicable
Child	Not applicable
Responsible Authority	DEFRA
Frequency of Supply	Irregular - in line with requirements to meet EC legislation
Source	NVZ Methodology Report (DEFRA)
Scale	1:2500
Data Capture Process	Cloning of OS landline data, heads up digitising
Quality	OS 1:2500 landline features cloned following rules in Methodology Report, 25% check on total length of line.
Positional Accuracy	Accuracy is that of OS landline where boundary has been cloned i.e.relative accuracy is +-1.2m at 1:2500 scale over a length of 200m
Precision	Data captured with co-ordinate precision of sub 1 metre
Measurement	Not applicable
Unit of Measure	Not applicable
Dimension	Not applicable
Other Information	

Urban Settlements (ODPM)

ODPM's 2001 Urban Settlement data cover England and Wales corresponding to the 2001 Census data. Urban settlements were defined as areas of built up land with an associated population of 1,000 and a minimum area of 20 hectares. Settlements separated by less than 200metres were linked. The settlements were extracted from the Ordnance Survey 1: 10,000 scale maps, as at 1st April 2001.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=1&x=5&y=7

Agricultural Land Classification (DEFRA)

Agricultural land classified into five grades. Grade one is best quality and grade five is poorest quality. A number of consistent criteria used for assessment which include climate (temperature, rainfall, aspect, exposure, frost risk), site (gradient, micro-relief, flood risk) and soil (depth, structure, texture, chemicals, stoniness).

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=2&x=6&y=5

Areas of Outstanding Natural Beauty (DEFRA)

AONBs are designated areas where protection is afforded to protect and manage the areas for visitors and local residents.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=4&x=11&y=7

Common Land (DEFRA)

This dataset contains parcels of land designated as Registered Common Land under the Countryside and Rights of Way Act 2000. It was created under the Countryside Rights Of Way Act (2000) and the Registered Common Land (RCL) data was digitised from DNF Landline by the contractors Geodata on behalf of The Countryside Agency.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=205

Countryside Agency Regions (DEFRA)

This dataset contains the administrative regions of the Countryside Agency.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=9&x=15&y=5

Countryside Character Areas (DEFRA)

Countryside Character Areas provide a context to local planning, action and development. There are 159 areas that are unique in terms of a combination of physiographic, land use, historical and cultural attributes.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=10&x=3&y=8

Environmentally Sensitive Areas (DEFRA)

Environmentally Sensitive Areas are one of a range of agri-environment schemes operating under the England Rural Development Programme. Incentives are offered to farmers to adopt agricultural practices which will safeguard and enhance parts of the country of particularly high landscape, wildlife or historic value. The boundaries of features were traced from 1:10,000 scale Ordnance Survey raster mapping and quality controlled against published paper mapping.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=23&x=13&y=13

Forestry Commission Conservancy Boundaries (Forestry Commission)

Forestry Commission Administrative Regions.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=24&x=16&y=2

National Parks (DEFRA)

National Parks are run by National Park Authorities for the purpose of conserving and enhancing the natural beauty, wildlife and cultural heritage and to provide opportunities for the understanding and enjoyment of the Park by the public.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=41&x=8&y=8

Nitrate Sensitive Areas (DEFRA)

NSAs are carefully selected areas covering groundwater sources used to supply drinking water. In these areas incentives were offered to farmers to undertake significant changes in agricultural practices to reduce nitrate leaching, thereby helping stabilise or reduce nitrate levels. There are 32 NSAs in England. Note this scheme is now closed to new applicants.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=45&x=6&y=3

Nitrate Vulnerable Zones (DEFRA)

NVZs were set up under Council Directive 91/676/EEC and have been established in areas where nitrate from agricultural land is causing pollution of the water environment. In these zones Action Programmes of compulsory measures apply. These measures include a requirement for farmers to limit their applications of livestock manures and, in some circumstances, to observe closed periods for the application of organic manure to agricultural land. Action Programme measures apply to all land within designated NVZs from 19th December 2002. Around 55% of England is now included within a Nitrate Vulnerable Zone.

Source: www.magic.gov.uk/datadoc/metadata.asp?dataset=46&x=20&y=7

English Nature

Ancient Woodlands (English Nature)

This inventory identifies over 22,000 ancient woodland sites in England, including ancient woodland, ancient semi-natural woodland and ancient replanted woodland. Ancient woodland is identified using presence or absence of woods from old maps, information about the wood's name, shape, internal boundaries, location relative to other features, ground survey, and aerial photography. The information recorded about each wood and stored on the Inventory Database includes its grid reference, its area in hectares, how much is semi-natural or replanted, whether any of the wood has been cleared (since 1920 approx), public ownership details where known, and any conservation status. Prior to the digitisation of the boundaries, only paper maps depicting each ancient wood at the 1:50,000 scale were available.

Source: www.english-nature.org.uk/pubs/gis/gis_register.asp

(or viewed online via www.magic.gov.uk/datadoc/metadata.asp?dataset=3&x=4&y=7)

A variety of publications regarding ancient woodlands are available from English Nature's Enquiries Service or

www.english-nature.org.uk/pubs/publication/pub_search.asp:

- Reid CM (1997) *Guidelines for Identifying ancient woodland. English Nature booklet*
- Reid CM (1997) *Local Authorities and the protection and management of ancient woodland. English Nature Research Report No.250.*
- Reid CM (1999) *Help notes for Planning consultation on ancient woodland. English Nature booklet*
- Reid CM, Iles VH & Isaacs J (March 1999) *The ancient woodland inventory database and digital boundary project, An update of recent developments. English Nature Research Report No.313.*
- Spencer, J W & Kirby, K J (1992) *An inventory of ancient woodland for England and Wales. Biological Conservation, 62, 77-93. (Background to how the data were collected)*

Sites of Special Scientific Interest (English Nature)

A Site of Special Scientific Interest (SSSI) is the land notified as an SSSI under the Wildlife and Countryside Act (1981), as amended. SSSIs notified under the 1949 Act only are not included in the Data set.

Source: www.english-nature.org.uk/pubs/gis/gis_register.asp

Environment Agency

Flood Risk (Environment Agency)

The data supplied comes from a ground breaking project called Risk Assessment for Strategic Planners (RASP). This is an R&D project and the version 5 output provides an assessment of likelihood of flooding taking into account the location, type and condition of flood defences. A number of products are used in the derivation of the flood probabilities provided. They include an assessment of flows and the extent to which water will reach from flood modelling of rivers and the sea. Ground levels used come from the newly available Digital Terrain Model produced by Intermap. All of the products used are the best available for use for national modelling as confirmed by industry experts. However, they all have inherent limitations with respect to accuracy of outputs, particularly at a local level.

HR Wallingford/University of Bristol (2004), Risk Assessment for Flood and Coastal Defence for Strategic Planning (RASP), Environment Agency R&D Technical Report W5B-030/TR
Available online: <http://publications.environment-agency.gov.uk/epages/eapublications.storefront/43e77d8800caa856273fc0a8029606de/Product/View/SCHO0305BIQM&2DE&2DE>.

County Councils

Landscape Character Assessment

LCA involves the map based identification of the elements which contribute to the intrinsic character of a landscape and then collecting information on their condition and distribution by means of a field-based survey. This process divides an area into a number of units called Landscape Description Units (LDU's) within which the landscape will display a broadly similar character.

Source: Shropshire County Council & Staffordshire County Council

www.countryside.gov.uk/LAR/Landscape/CC/index.asp

British Geological Survey (BGS)

DIGMAP

DiGMAPGB-50 product providing 1:50 000 scale geological map data. The data is separated into four themes: Solid (bedrock) geology, Drift (superficial or Quaternary) deposits, Artificial ground, and Mass Movement deposits. Each polygon is labelled with a geological attribute indicating the geological unit (lithostratigraphy) and its composition (lithology). The data is available under licence to external users but more information can be found at www.bgs.ac.uk/products/digitalmaps/digmapgb.html.

Centre for Ecology and Hydrology (CEH)

Land Cover (250m degraded)

LCM2000 is a vector database, for use within a GIS system. It is registered to the British National Grid (also known as Ordnance Survey grid references). It shows areas of land as 'parcels' or polygons. Each parcel has attached to it a list of values or attributes, covering such topics as land cover class, parcel area, length of boundary, processing history, knowledge-based correction and identification of the original satellite scene. Data is available under licence but further information is available at www.ceh.ac.uk/sections/seo/lcm2000_home.html.

Robinson, P., Fisher, P., & Smith, G. (2005) Evaluating object-based data quality attributes in the Land Cover Map 2000 of the United Kingdom. Photogrammetric Engineering and Remote Sensing, 71, 269-276.

Heritage

Identifying archaeological features

In order to identify the presence of archaeological features within the three study catchments data sets from statutory agencies – English Heritage for the Upper Eden and Tern and Historic Scotland for the Lossie - and the Ordnance Survey have been used.

Ancient monuments data for the Lossie catchment were obtained from Historic Scotland as spatial data files in which monuments are recorded as polygon features. These were imported directly into the GIS. Associated attribute data includes reference id, region and district codes, category type, grid reference, display parameters and a name (e.g. "Elgin Castle", "Quarrywood, henge 260m N of Oakwood Motel", "Elgin Cathedral").

Scheduled monuments data for the Upper Eden and Tern catchments were obtained from English Heritage as spreadsheet files in which monuments are located using grid references. Whilst the majority of monuments are located with a single grid reference and were loaded into the GIS as point features, some monuments have multiple locations and were loaded into the GIS as line features. Other attributes supplied with the scheduled monuments data include a unique monument id, county, district and parish and a brief description (e.g. "Prehistoric hut circle settlement, associated field system and a medieval shieling", "Romano-British farmstead and a length of Roman Road", "Pendragon Castle") which could be used to broadly date the monument. Table 1 summarises the number of scheduled and ancient monuments within the study catchments.

Table 1: Summary of scheduled and ancient monuments within the Lossie, Upper Eden and Tern catchments.

Catchment	Point features	Line features	Polygon features	Source
Lossie	-	-	18	Historic Scotland
Upper Eden	172	12	-	English Heritage
Tern	52	1	-	English Heritage

Additionally, heritage and antiquity features within the catchments have been identified using spatial data available from the Ordnance Survey (OS). These MasterMap data are designed for

general purpose mapping with the data captured from a variety of sources and scales. Area, annotation (map text), boundary, point, map symbol and line features are available and each feature has a range of attributes which allow the MasterMap data to be mapped in a variety of different ways. The Theme attribute contains information on the nature or usage of features including whether the feature is a site or construction of historic interest and has been used to identify the distribution of heritage and antiquity features within the catchments (Table 2). Annotation features have an attribute which specifies the font to be used to display the map text. As with paper OS maps, different fonts are used to identify whether the heritage and antiquity feature is Roman or non-Roman. Similarly, the date of battle sites is also given. This information could be used to give an approximate age to some of the heritage and antiquity features. It should be noted that in the version of the MasterMap data obtained for use with this project the Heritage and Antiquity theme is not complete, so some heritage and antiquity features within the study catchments may not be identified. This should be rectified in later versions of the MasterMap data.

Table 2: Summary of heritage and antiquity features within the Lossie, Upper Eden and Tern catchments identified using OS MasterMap data.

Catchment	Feature type					
	Area	Annotation	Boundary	Point	Symbol	Line
Lossie	6	53	-	9	1	12
Upper Eden	0	299	0	39	9	7
Tern	23	191	0	11	4	46

To identify the distribution of archaeological features within each of the study catchments the scheduled and ancient monuments and heritage and antiquity features were overlain with the base 250 × 250 m resolution grid for each catchment (see Figures 1a-1c). Results of this analysis are presented in Table 3 and show surprisingly little overlap between the available data sets. Therefore, to ensure that as many archaeological features as possible are identified within the study catchments information on scheduled and ancient monuments and heritage and antiquity features should be combined.

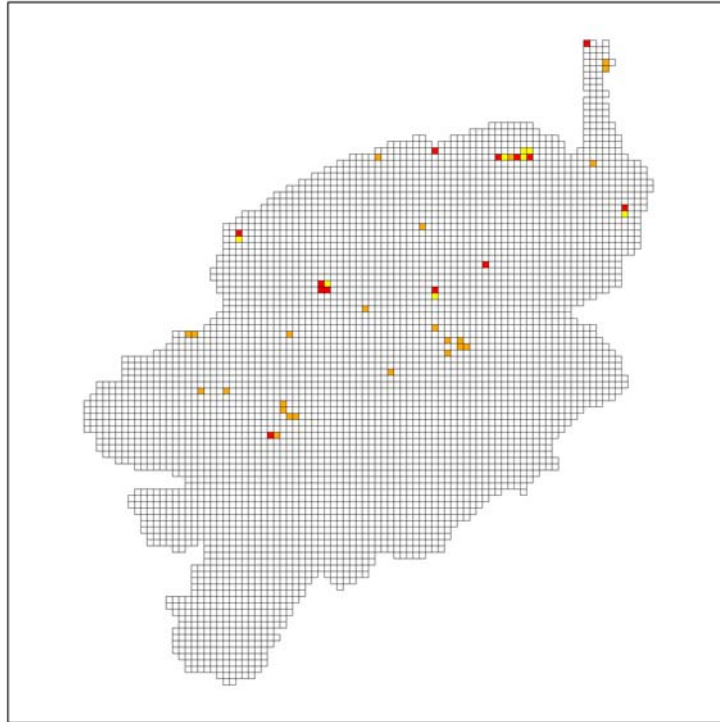


Figure 1a: Distribution of ancient monuments in the Lossie catchment where yellow indicates the presence of a ancient monument within a 250 × 250 m pixel, orange a heritage and antiquity feature and red both.

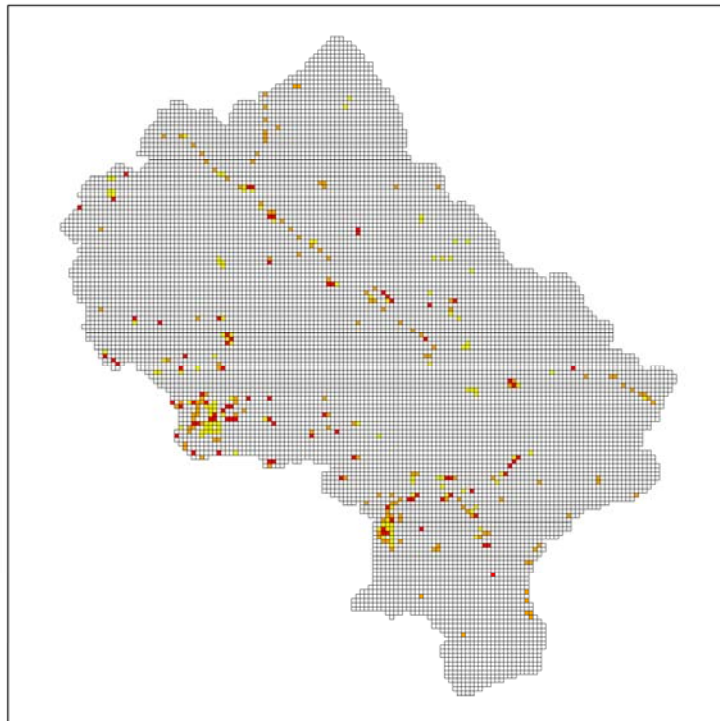


Figure 1b: Distribution of scheduled monuments in the Upper Eden catchment where yellow indicates the presence of a scheduled monument within a 250 × 250 m pixel, orange a heritage and antiquity feature and red both.

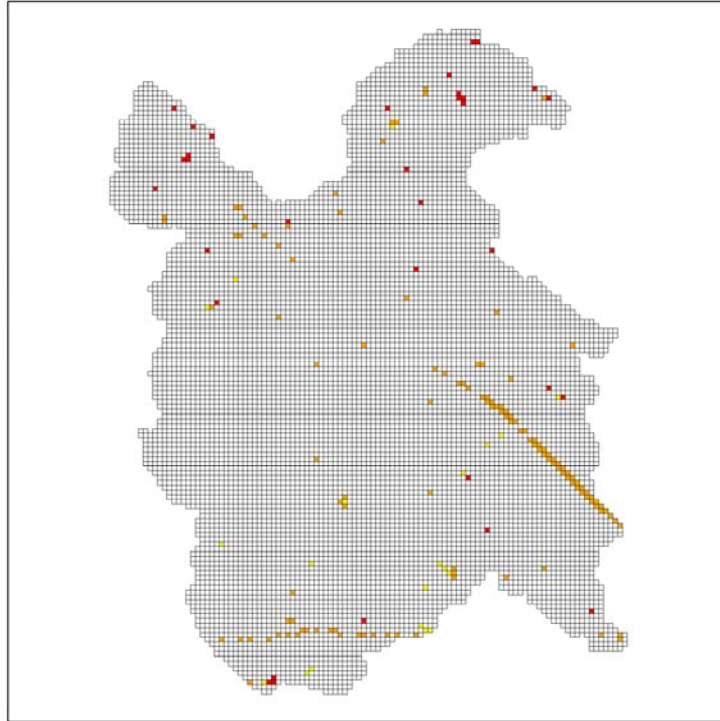


Figure 1c: Distribution of heritage features in the Tern catchment where yellow indicates the presence of a scheduled monument within a 250 × 250 m pixel, orange a heritage and antiquity feature and red both.

Table 3: Summary of distribution of scheduled and ancient monuments and heritage and antiquity features within the three study catchments.

Catchment	Total number of 250 × 250 m pixels	Number of 250 × 250 m pixels		
		Scheduled and ancient monuments	Heritage and antiquity features	Both
Lossie	4567	21	37	13
Upper Eden	11110	202	234	85
Tern	9707	53	155	33