Kent Habitat Survey 2012

Land cover change analysis 1961 - 2008

Table of Contents

1 Introduction

1.1 Background

The land cover analysis has been used to monitor the Kent countryside resource since the 1960's. The 2008 land cover dataset is derived from the detailed habitat survey, which is based on aerial photograph interpretation and field survey. It takes a broad look at the nature of the land surface and changes over the past decades.
The land cover data set is made up of a coarse grid of 1 hectare cells, where the centre point reflects the land cover. Older data sets in the same coarse format were also derived from detailed source data, based on aerial photograph interpretation and field survey. The grid data format is especially suitable for direct comparisons between different periods, although detail is lost through the coarseness of the grid.
Classifications of land cover have evolved over time and forced a more generic approach to establish change between different periods. A much simplified classification distinguishes 11 land cover categories, further grouped into six broad categories.

This report describes the methodology for comparing land cover data over time and presents results in the form of maps, tables and charts. Discussion covers trends rather than details of types and locations of change. The results for Kent include Medway Unitary Authority unless otherwise stated.

In the strictest sense land cover represents the '*observed (bio)physical cover on the earth's surface' (Food and Agricultural Organisation),* while land use describes the: '*arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it*. Definition of land use in this way establishes a direct link between land cover and the actions of people in their environment (FAO, 2000).

The current land cover classification used in Kent contains classes that are 'pure' land cover (e.g. grassland, rock) and others that are land use classes in the strictest sense (e.g. agriculture, urban, orchard). One reason for this mixed classification is the ultimate purpose of this data set: to inform planning decisions and policy development. Another reason is the historic use of this classification in Kent, providing us with the opportunity to carry out change analysis while being confident that we are comparing like for like.

National initiatives such as *LUCS* and *NLUD* also include both land use and land cover in the same classification (National Land Use Database: Land Use and Land Cover Classification, ODPM, 2006)

1.2 History of Land Cover Change Analysis in Kent

A number of land cover and land use surveys have been carried out in the past, some which cover Kent specifically. Table 1-1 lists the most relevant surveys for the current project.

The oldest survey by Sir Dudley Stamp was an inventory of land use completely focused on rural areas, whereas more recent surveys include all land covers. The most compatible data sets are listed in bold in the table and are used in the land cover change analysis for this report.

Table 1 Land surveys in Kent

Year	Reference	Source	Name of survey	Coverage	In change analysis
1937-1948	Sir Dudley Stamp	Field survey	First Land Utilisation Survey of Britain	national: rural only	
1961	Alice Coleman	Field survey	Second Land Utilisation Survey of Britain	national	Yes
1972	McCrae	API and field survey	Based on Land Utilisation surveys	regional	
1984	Kent County Council	API	Surface Cover Survey of Kent	regional	
1990	Kent County Council	API and field survey	Land cover Change in Kent 1961 - 1972 - 1990	regional	Yes
2000	CEH Countryside survey 2000	Satellite image interpretation	Land cover map 2000	national	
2003	Kent County Council	API and field survey	Kent Land cover survey 1999	regional	Yes
2005	MAFF (later DEFRA)	API	National Land Use Database (NLUD) in OS MasterMap Address Layer 2 data	national	
2007	CEH Countryside survey 2007	Satellite image interpretation	Update of Land cover map 2000	national	
2012	Kent County Council	API and field survey	Kent Land cover survey 2008	regional	Yes

1.3 Key Objectives

The key objectives for developing land cover data are:

- To quantify the gross changes in land cover between 1961 to 2008, for particular target areas of Kent and for Kent as a whole.
- To identify the most significant types of land cover change
- To identify where such changes have taken place in order to inform future policy, strategies and countryside management.

1.4 Environmental conditions

1.4.1 **Geology**

Geologically Kent forms part of the north eastern Wealden anticline, an elongated, dome-shaped area of uplift with its axis aligned from west to east. In more recent geological time the rocks have been stripped off from the centre of the anticline, exposing the oldest rocks (near the Kent-Sussex border). Successive inward-facing escarpments formed by more resistant rock are separated by vales developed on weaker strata. The North Downs escarpment, for example, is separated from the High Weald escarpment by the Vale of Holmsdale, the Greensand Ridge and the Low Weald. The three principal rivers of Kent, the Darent, Medway and Great Stour cut through the chalk of the North Downs and enter the sea on the North Kent coast where the most recent geological strata are located (Landscape and Nature Conservation Guidelines 1993).

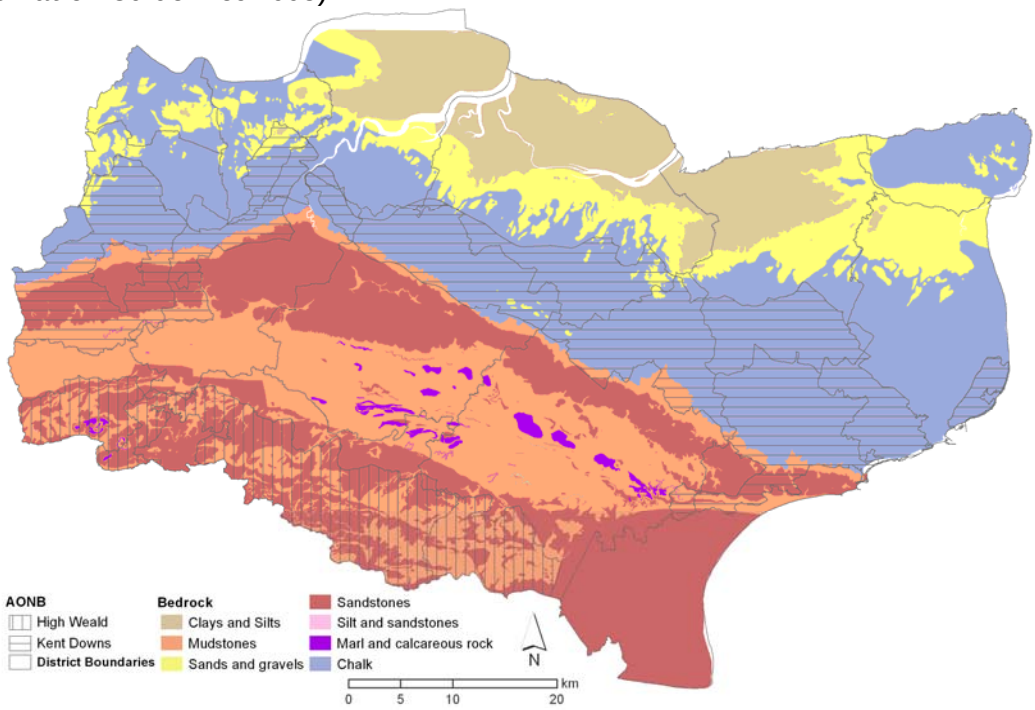


Figure 1-1 Map of Kent bedrock

1.4.2 Soils

Kent's soils follow the broad geological pattern first identified by John Boys in 1798. Four distinct zones are recognised that still form the basis of present soil distribution. In the centre the chalk of the North Downs contains the calcareous soils and some brown earths. The Low and High Weald are identified by partially water-logged stagno-gley soils. Along Kent's coast alluvial soils are found in clays and silts. This is a general description of the distribution Kent's soils, and variations in these broad soil types do occur.

1.4.3 Climate

Kent has a temperate climate, warm in summer, cold in winter and relatively dry by British standards. The wettest areas are located on the North Downs and High Weald, with an average annual rainfall range of between 750-850 mm. The driest area is along the length of Kent's north coast with an average annual rainfall of <600 mm. In between these higher areas the average annual rainfall range varies from 600-749 mm, with a general rule that inland areas are wetter than coastal ones.

1.4.4 Vegetation

Kent has a rich and varied vegetational diversity which, in simple terms, reflects the underlying geology (see Figure 1.1 for bedrock extents). As a county, Kent is best known for its calcicolous flora. However, where the chalk is overlain by clay with flints the soils tend to be more acid and the vegetation reflects this. Underlying the chalk is the fertile Gault Clay which is heavily cultivated. The few remaining woodlands on the Gault Clay contain a rich variety of plants.

Further south the Hythe Beds, known as Kentish ragstone, form another inward facing scarp slope. In the centre of Kent the Weald Clay is exposed and heavily cultivated, with very little of the original flora remaining. The oldest exposed rocks, the Tunbridge Wells Sands, are acid and support infertile soils. This lack of fertility means there is less pressure from agriculture and so the area has maintained a greater density of trees, woodland, and permanent pastures than elsewhere in Kent. In south-east Kent, Romney Marsh is formed from recent alluvial deposits. The southern area, around Dungeness, hosts the greatest expanse of shingle in Europe.

At Sandwich Bay, the sand dunes are some of the richest areas botanically in Kent and are of international importance. Finally, the three main rivers, the Darent, Medway and Great Stour have played a major part in landform evolution of the county and their flood plains still, in part, provide significant corridors of semi-natural vegetation, despite pressures for quarrying, particularly of gravels.

1.4.5 History and settlement pattern

At the time of the Domesday Book in 1086, it could be said there remained wild landscape in Kent. Across the Weald the extensive forest of Andred was still essentially primeval woodland and the population probably no more than 40 - 50,000 compared to 1.73 million today (Kent and Medway combined, 2011 Census). The system of land tenure and inheritance that was unique to the county encouraged a more dispersed settlement pattern, which is still apparent today.

The vast increase in population has meant clearance of woodland, reclamation of heath and drainage of marsh in order to create more land for agriculture, more land for building and a denser network of communications links. In the past, manual labour and use of horses meant that the most practical approach was to work with the character and qualities of the land rather than against it. In modern times, tools and technology make it easier to work against natural attributes and the scope for change is enormous.

1.4.6 Landscape character

The combination of geology, soil, climate, vegetation, and human activity, has resulted in the formation of distinctive areas within Kent. These Natural Character Areas (Figure 1-2) are useful in describing the natural landscape of the county

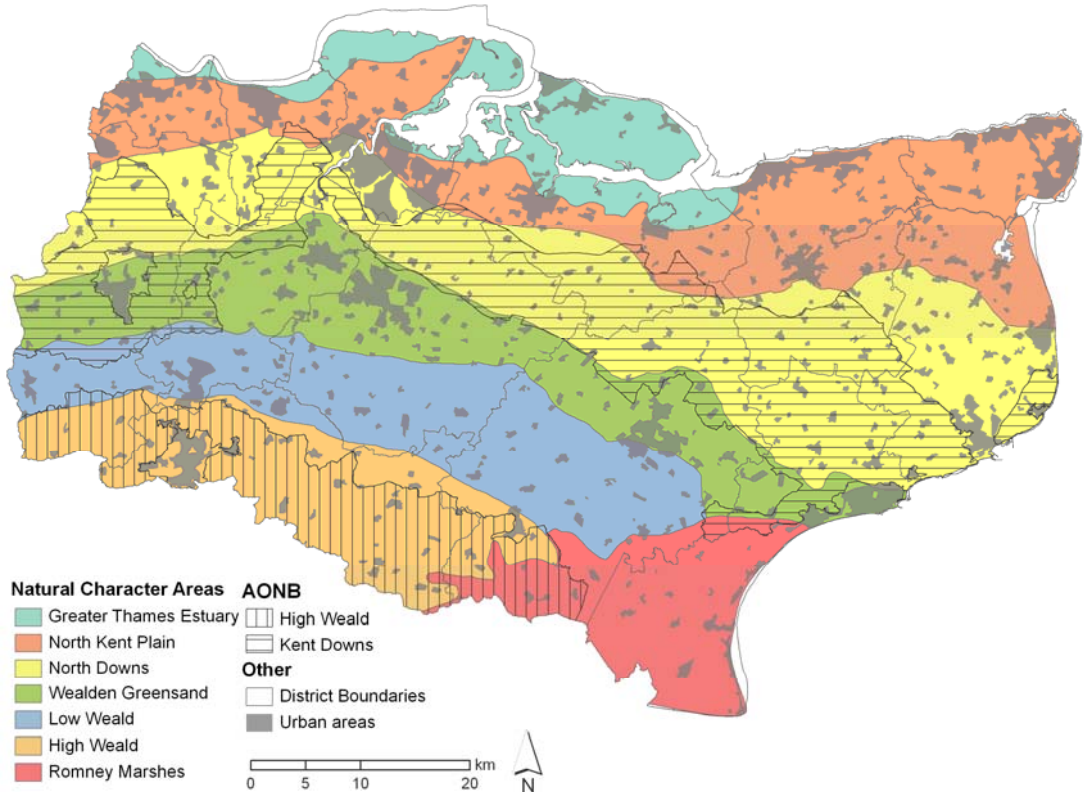


Figure 1-2 Map of Kent showing Natural Character Areas and Areas of Outstanding Natural Beauty

2 Methodology

2.1 Creating the land cover data set

Aerial photograph interpretation of 2008 aerial photography formed the basis of the Kent Habitat Survey 2012, which created a detailed inventory of all habitats and land uses, with special emphasis on natural and semi-natural habitats. The 2012 Kent habitat survey data forms the basis for the 2008 land cover data. Historically the land cover data set is named after the actual year in which the aerial photographs were flown. For the 2012 Kent habitat survey this is 2008. Previous detailed habitat surveys were carried out in 1995 and 2003 (based on photography of 1990 and 1999), but due to differences in methodology and geometry direct comparison of the habitat data was complicated.
The land cover data 2008 is derived from the habitat data using the same methods as in 1990 and 1999, thus enabling direct comparisons.

The Kent 2012 habitat data are classified using the Integrated Habitat System of classification (IHS, see Kent Habitat Survey 2012 Report, 2013). Each habitat class is correlated with a land cover class (Table 2).

Table 2 Land cover classes with corresponding IHS codes

Value	Land cover	IHS Code
1	Arable	CR0
3	Grassland	GA*, GC*, GI*, GN*, GM*
4	Grassland with scrub	Grassland habitat with matrix SC*
5	Orchard	CR31, CR312, CR313, CR33
6	Traditional orchards	FT*
7	Hops	CR311
8	Heathland	HE*
26	Scrub	BRZ, LF1, LF11*, OV3, WB2*
27	Urban	UR0, Grassland habitat with management GL1, GL12, LT4 (in urban areas), UA3*, UA4*
28	Roads	LF27* with Management UL2*
29	Railways	LF271 with Management UL1
30	Active mineral sites	RE2, RE21, RE22, RE24, RE2Z
34	Freshwater	AR0, AR4, AR42, AS0, AS3, AS31
35	Freshwater marsh	EM1*, EM2*, EM31, EM312, EM3Z, EM4, EM422, EM4Z
36	Saltwater	AR41, AR5, AS6*
37	Saltwater marsh	LS2, LS3*, LS34, LS35, LS37
38	Intertidal sand and mud	LS41
39	Intertidal shingle	LS5, LS6, LSZ
40	Intertidal rock	LR*
41	Sand	SS0, SS1*, SS4
42	Shingle	SS3, SS31, SS31*, SS3Z
43	Rock	RE1*, SR1*, SR2, SR23
44	Other landuse	LF271 with Management UL3
51	Broadleaved woodland	LF1Z, LF21, WB3*
52	Coniferous woodland	WCZ
53	Mixed woodland	WB1

* = All sub-classes applicable to that IHS category

In some cases the management together with the habitat code distinguished a land cover class. For example, roads and railways are both coded 'LF271', therefore to distinguish railways, the management code 'UL1' must also be taken into account to arrive at the correct land cover class. The IHS class 'Path and trackway' is distinguished by management 'UL3' on the same habitat code 'LF271'. This category does not fit any of the land cover classes and was not recorded separately in surveys before 1999, therefore it is classed as 'Other land use'.

The land cover codes were incorporated into the Kent Habitat Survey geodatabase so that every polygon was assigned a land cover class. A grid of 100x100m raster cells was used to display and analyse the land cover.

The data set was created as follows:

1. Create centre points for 100x100m grid cells (based on land cover grids of previous periods to ensure correct alignment). See Figure 2-1.
2. Aerial photo interpretation for Kent Habitat Survey 2012. See Figure 2-2.
3. Assign land cover classification to centre points based on habitat polygons, through spatial join with habitat data. Figure 2-3
4. Convert centre point data with land cover classes to land cover raster format with 100x100m cells. Figure 2-4.

The resulting raster is a coarse representation of the nature of the land surface and management practices.

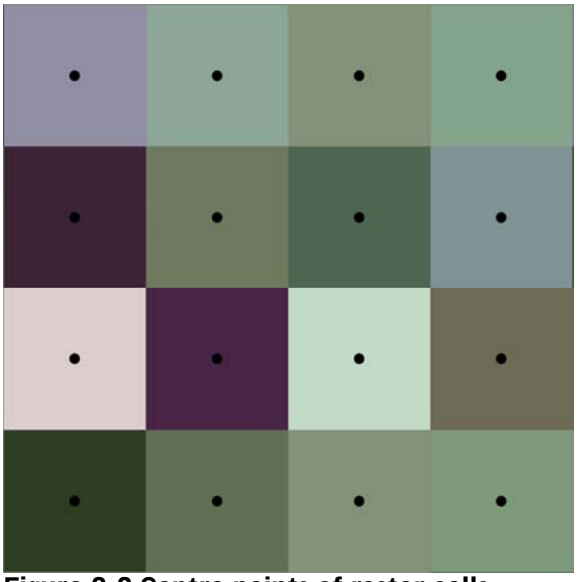


Figure 2-2 Centre points of raster cells

Figure 2-1 Aerial photograph of 2008 used in the habitat survey

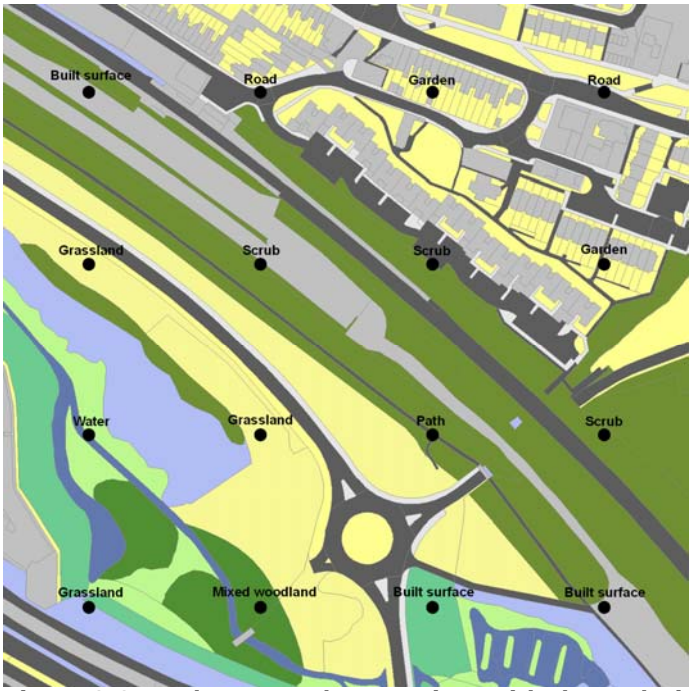


Figure 2-3 Land cover codes correlate with the underlying habitat

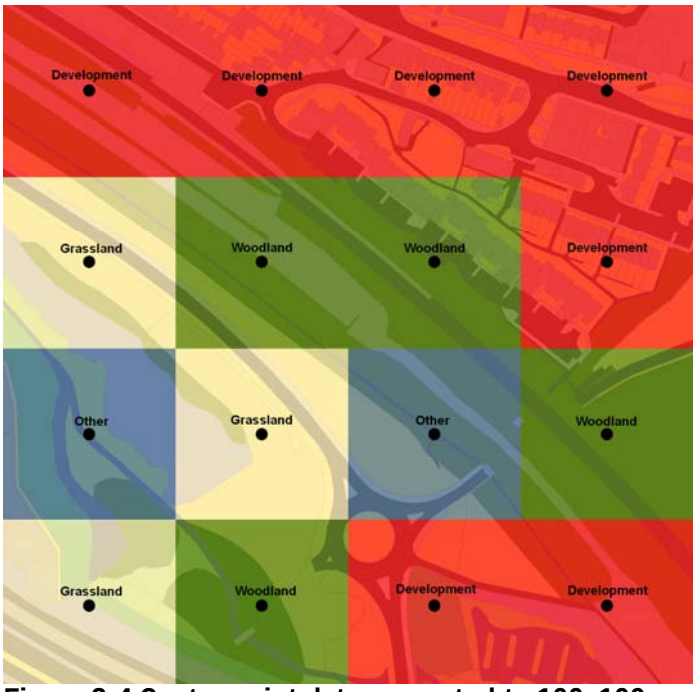


Figure 2-4 Centre point data converted to 100x100m raster format

2.2 Land cover classification

The detailed land cover classification distinguishes 26 classes, grouped into 11 categories and finally summarised in six broad categories. Table 3 lists the classes and groupings.
The land cover analysis in this report mainly focuses on the 11 categories in comparisons with previous data sets as the detailed versions would give a false impression of detail and accuracy.

Table 3 26 Land cover classes make up 11 categories and 6 broad categories

Land cover Broad Category	Land cover Category		Land cover Class
1 Arable	1 Arable	1	Arable
2 Grassland	2 Grassland	3	Grassland
		8	Heathland
	3 Grassland & scrub	4	Grassland with scrub
3 Orchard & Hop	4 Orchard & Hop	5	Orchard
		6	Traditional orchards
		7	Hops
4 Woodland	5 Scrub	26	Scrub
	6 Woodland	51	Broadleaved woodland
		52	Coniferous woodland
		53	Mixed woodland
5 Development	7 Urban	27	Urban
		29	Railways
		30	Active mineral sites
	8 Roads	28	Roads
6 Other	9 Wetland	34	Freshwater
		35	Freshwater marsh
	10 Coastal	36	Saltwater
		37	Saltwater marsh
		38	Intertidal sand and mud
		39	Intertidal shingle
		40	Intertidal rock
		41	Sand
		42	Shingle
	20 Miscellaneous	43	Rock
		44	Other landuse

Available data from previous land cover assessments are: 1961, 1972, 1990 and 1999, all providing raster data of 11 land cover categories. As part of the land cover assessment in 1999, the older survey data were reclassified to enable direct comparison with the 1999 data. Source classifications changed over time, for example in 1990 the aerial photograph interpretation of the habitats was based on Phase 1 classification and this was translated to land cover classes afterwards. In 2003 and 2012 the aerial photograph interpretation was based on IHS classification and these survey data were also correlated with land cover classes. These correlations meant that habitat data from each period could be systematically translated to land cover data in GIS.

Table 4 shows the adjustment of some classes in past surveys to correlate more closely with the 1999 survey. All classes historically used in Kent are listed in Table 5. The current land cover employs the same classification established in 1999 enabling change analysis.

Table 4 Reclassified classes in pre-1999 land cover data

Original Land cover	Re-classed Land cover		
	1961	1972	1990
Unclassified	Other landuse	Other landuse	Other landuse
Arable - out of production			Arable
Young managed woodland	Coniferous woodland	Coniferous woodland	Coniferous woodland
Young managed coppice			Broadleaved woodland
Parkland	Grassland	Grassland	Grassland
Not available	Other landuse	Other landuse	Other landuse

Table 5 Land cover classes in use from 1961 to 2008

Land cover Broad Category	No.	Land cover	1961	1972	1990	1999	2008
	0	Unclassified	●	●	●		
1 Arable	1	Arable	●	●	●	●	●
	2	Arable - out of production			●		
2 Grassland	3	Grassland	●	●	●	●	●
	4	Grassland with scrub		●	●	●	●
3 Orchard & Hop	5	Orchard			●	●	●
	6	Traditional orchards			●	●	●
	7	Hops			●	●	●
2 Grassland	8	Heathland				●	●
4 Woodland	24	Young managed woodland	●	●	●		
	25	Young woodland coppice			●		
	26	Scrub	●	●	●	●	●
5 Development	27	Urban	●	●	●	●	●
	28	Roads	●	●	●	●	●
	29	Railways	●	●	●	●	●
	30	Active mineral sites	●	●	●	●	●
	31	Tips and waste disposal sites	●	●	●		
	32	Caravans	●	●	●		
2 Grassland	33	Parkland	●	●	●		
6 Miscellaneous	34	Freshwater	●	●	●	●	●
	35	Freshwater marsh	●	●	●	●	●
	36	Saltwater	●	●	●	●	●
	37	Saltwater marsh	●	●	●	●	●
	38	Intertidal sand and mud	●	●	●	●	●
	39	Intertidal shingle	●	●		●	●
	40	Intertidal rock	●	●	●	●	●
	41	Sand	●	●	●	●	●
	42	Shingle	●	●	●	●	●
	43	Rock	●	●	●	●	●
	44	Other landuse				●	●
	45	Not available	●	●	●		
3 Orchard and hop	50	Orchard and hops	●	●	●		
4 Woodland	51	Broadleaved woodland	●	●	●	●	●
	52	Coniferous woodland	●	●	●	●	●
	53	Mixed woodland	●	●	●	●	●

As the current land cover is derived from a habitat survey based on the IHS classification also used in 1999, no changes were made to the land cover classes with one exception. 'Parkland' has been recorded, but not consistently over the years. In past surveys 'Parkland' was reclassified as grassland, irrespective of the actual habitat. In the current data, the parkland management code is completely ignored and the land cover solely based on the habitat code. In 94% this happens to be grassland, with the remaining 6% divided by woodland, scrub and bracken.
The IHS habitat class 'Path and trackway' is generally not considered to be a road and therefore was assigned to the class 'Other landuse' (in category 'Miscellaneous', broad category 'Other'). Many path and track ways that were distinguished in the habitat survey are not surfaced, some can be quite overgrown or can be classed as grassland. This is another example where management, rather than the habitat determines the classification.

Detailed land cover classes were derived for the current data set, with comparison totals for older dates grouped to category and broad category level. Summaries of total area in each class for the Districts and Medway UA were derived by overlaying the land cover grid with the district boundary grid using the zonal statistics tool in ArcGIS Spatial Analyst. The tool produces a table of total category area in each district. At boundaries between districts the cell that has its centre point within the district counted for that district.
Summaries at county level include Medway UA and are considered gross totals, without positional or attribute corrections as discussed in the next section.

2.3 Error assessment

2.3.1 Position

The basis for the 2003 and 2012 habitat surveys was the Ordnance Survey (OS) detailed land information (Landline and Master Map respectively). The OS carried out major accuracy work over the past decade, resulting in positional changes in the baseline data used in the habitat surveys.

Consequently the OS Master Map 2010 base data used for the 2012 habitat survey no longer aligned exactly with the base data of 2003. In severe cases the shift amounted to more than 7 metres, although generally the difference remained less than 2 metres. The positional differences were not a systematic shift over the entire county, therefore a fix could not be applied.

The result of this positional shift is a change in land cover where the centre point of the grid cell happens to intersect with the 'moved' polygon. This is not real change, but rather 'digitisation' change. Digitisation change is not easily quantified, but it is believed that at county scale this error can be ignored.

2.3.2 Attributes

The land cover data is a coarse dataset, where the value is arbitrarily determined by the habitat that happens to coincide with the centre point of the 1 hectare grid cell. This is not necessarily the dominant habitat in that one hectare. If the centre point happens to fall on a tiny pond in a large arable field, then the value for that hectare is 'water', not arable. The reverse may happen for polygons larger than 1ha, that are of such a shape that the centre point of the 1 hectare pixels does not

touch them, hence excluding the polygon from the resulting land cover (for example roads).

In the strictest sense this means a wrong classification is attributed. However, the method has been applied systematically in the GIS and at county-scale the totals of each class will have evened out this issue.

2.4 Change analysis

The land cover change analysis compares land cover data for each grid cell for the 5 periods considered: 1961-1972-1990-1999-2008. In ArcGIS (ESRI) Spatial Analyst extension a 'COMBINE' command used with two periods produces a new raster, with a new set of values representing all possible combinations of land cover categories of the two source rasters. It also provides the number of raster cells for each value, i.e. the total area in hectares (each cell = 100x100m).

The standard way of presenting and analysing the results is through cross-tabulation of the areas in each category. A cross-table shows clearly areas that are unchanged and areas that have changed to and from other classes between two periods (see description of cross-tabulation in Appendix A).

Considering positional errors discussed in the previous section, the resulting apparent change influences the totals derived here. To counter such false change a filter is applied to the combined grids of each combination of periods. The filter checks for each 1ha cell whether its value represents a change, if it does, then the values of the surrounding 8 cells are checked. If 4 or more contiguous cells of those 8 are also changed, then the central cell is considered changed as well and its value adjusted accordingly. Contiguous areas of change are confidently considered to represent real change. Equally if less than 4 contiguous cells show change then the land cover in the central cell is assumed to have remained unchanged and the value is corrected accordingly.

As a result the change analysed through the filtered method differs from the gross change recorded by summarising totals for the county in each class. The filtered change results are presented in the cross-tables in Appendix A, while the unfiltered totals are shown in tables in the next sections.

3 Land cover change in Kent

3.1 Overview of land cover change

This section describes the distribution and extent of gross land cover changes that have occurred since 1961. Results of broad category are given in maps and charts in the following sections, highlighting the most notable changes. Tables showing total area and percentage of Kent are presented at the start of each section, followed by maps displaying both increase and decrease in the broad category. The comparisons show broad categories only, with detailed figures of land cover categories available in the cross-tabulations in Appendix A. A summary of the key findings is presented at the end of this chapter.

The map in Figure 3-1 displays the extent of broad categories. In 2008 the habitat survey extended to the Mean Low Water Mark, to include a large portion of salt marsh and intertidal rock and sediment. In previous years these areas were (partially) excluded from underlying surveys, therefore in the filtered change analysis based on combined grids these areas are largely absent. Total areas are given in hectares (ha) and percentages (%) of the total area of Kent, based on the extent of the surveyed area. In 2008 the extent covered 389,032ha. The land cover summary for 2008 in Table 6 shows gross totals as derived from the raster dataset. Appendix B gives the details by District.

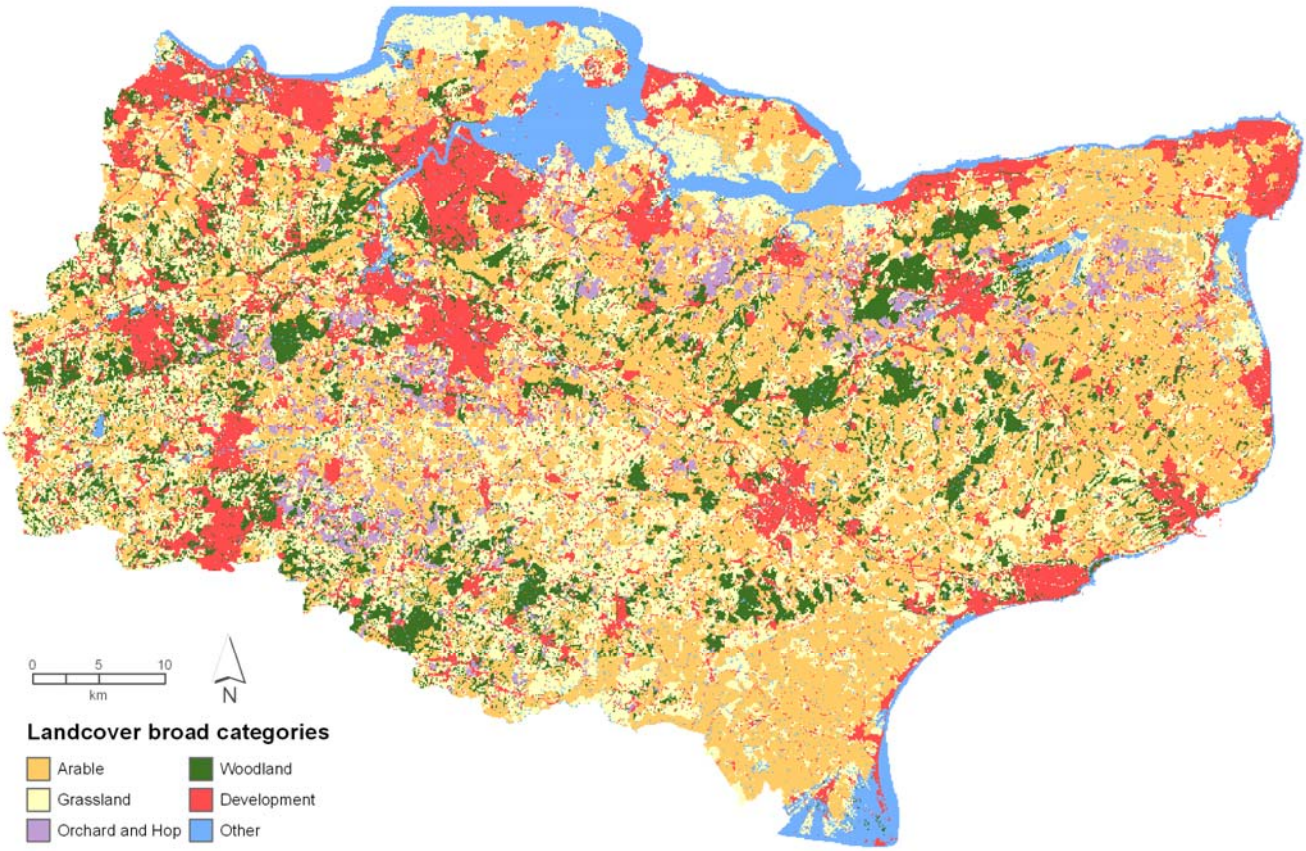


Figure 3-1 Kent land cover 2008 showing broad categories

Table 6 Total area of land cover classes in 2008

Land cover Broad Category	Total area (ha)	Land cover Category	Total area (ha)		Land cover class (2008)	Total area (ha)
1 Arable	127,272	**1 Arable**	127,272	1	Arable	127,272
2 Grassland	107,569	**2 Grassland**	81,562	3	Grassland	81,496
				8	Heathland	66
		3 Grassland & scrub	26,007	4	Grassland with scrub	26,007
3 Orchard & Hop	11,666	**4 Orchard & Hop**	11,666	5	Orchard	9,527
				6	Traditional orchards	1,676
				7	Hops	463
4 Woodland	48,043	**5 Scrub**	3,971	26	Scrub	3,971
		6 Woodland	44,072	51	Broadleaved woodland	37,247
				52	Coniferous woodland	3,373
				53	Mixed woodland	3,452
5 Development	67,332	**7 Urban**	53,654	27	Urban	51,898
				29	Railways	770
				30	Active mineral sites	986
		8 Roads	13,678	28	Roads	13,678
6 Other	27,150	**9 Wetland**	4,836	34	Freshwater	3,942
				35	Freshwater marsh	894
		10 Coastal	19,851	36	Saltwater	5,378
				37	Saltwater marsh	1,445
				38	Intertidal sand and mud	9,294
				39	Intertidal shingle	449
				40	Intertidal rock	733
				41	Sand	424
				42	Shingle	2,128
		20 Miscellaneous	2,463	43	Rock	216
				44	Other landuse	2,247

Figure 3-2 gives an overview of change, based on the coverage of each broad category in each period. Land covered by 'Development' has noticeably increased from nearly 11% in 1961 to over 17% in 2008, a total increase of 62% of the 1961 resource (Figure 3-3). The 'Orchards and hop' category has suffered the most dramatic decline, with more than two-thirds of the resource lost since 1961. The extent of land covered by arable and grassland has changed very little, hovering around 60%, with the balance of arable and grassland generally shifting according to the state of the agricultural economy.

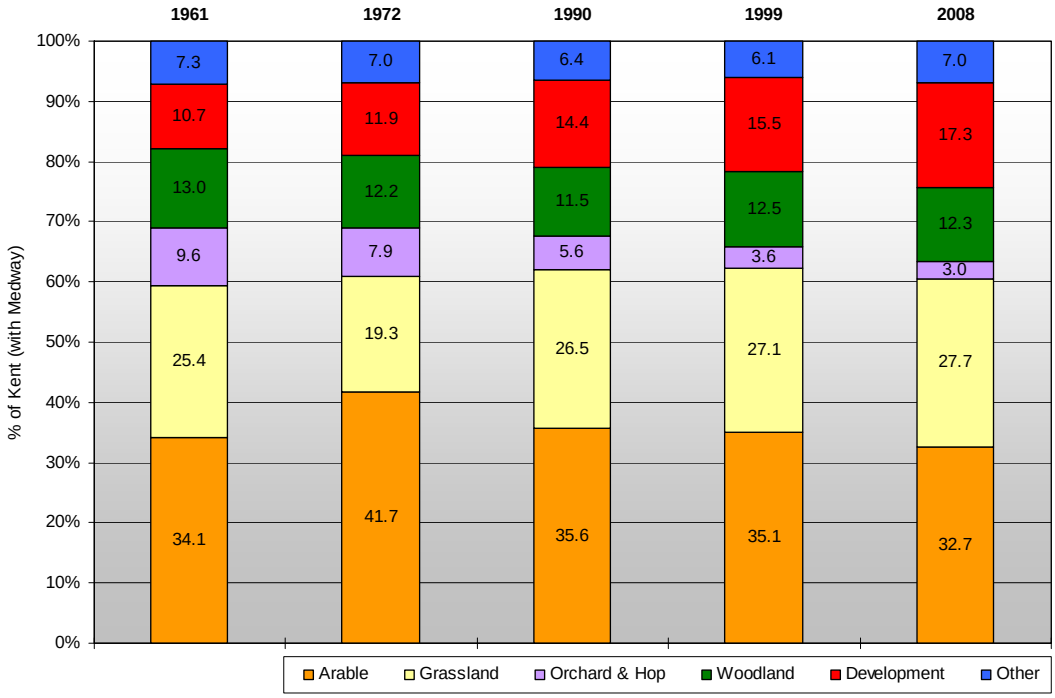


Figure 3-2 Change based on percentage of Kent by broad category

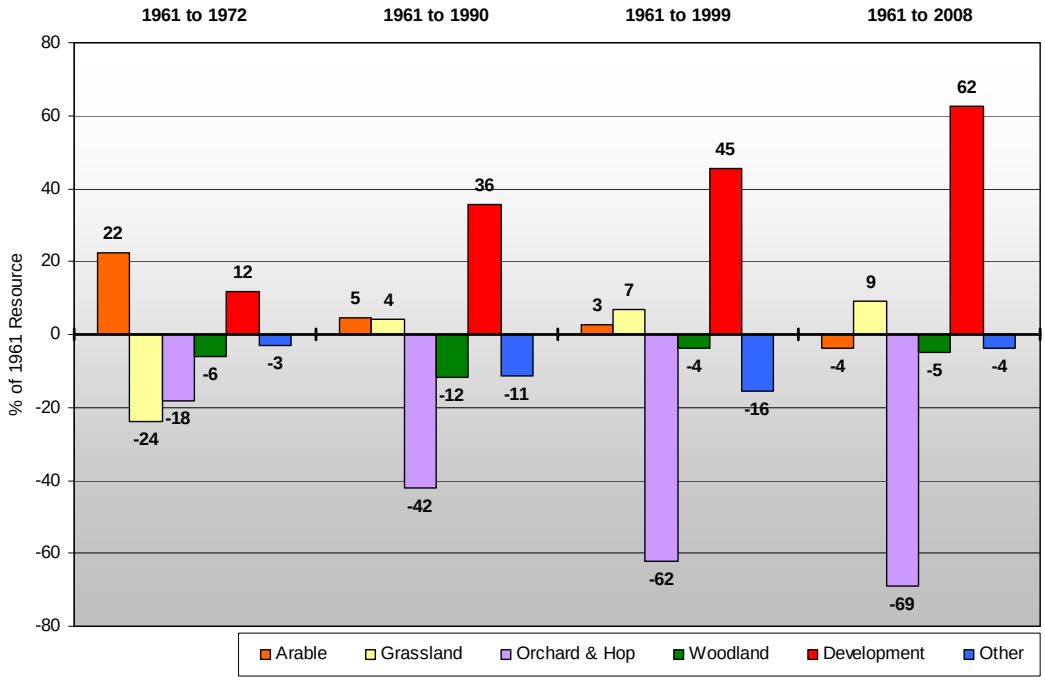


Figure 3-3 Change in broad categories as percentage of 1961 resource

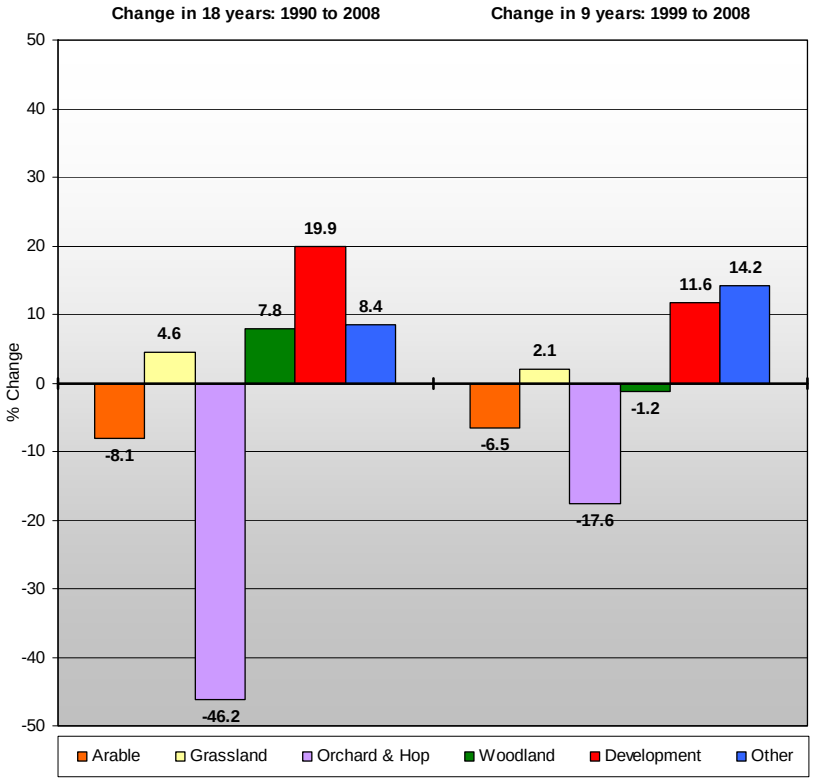


Figure 3-4 Change in the past 20 years by broad category

Figures 3-5 to 7 show land cover change in broad categories, based on the filtered change analysis. The change from arable to grassland and vice versa is displayed separately in green to indicate that this change is largely due to changes reflecting the state of the agricultural economy and generally does not represent 'real' or permanent change.
The real change in purple generally reflects irreversible change, for example from grassland to urban and roads, or orchards and hop to arable.

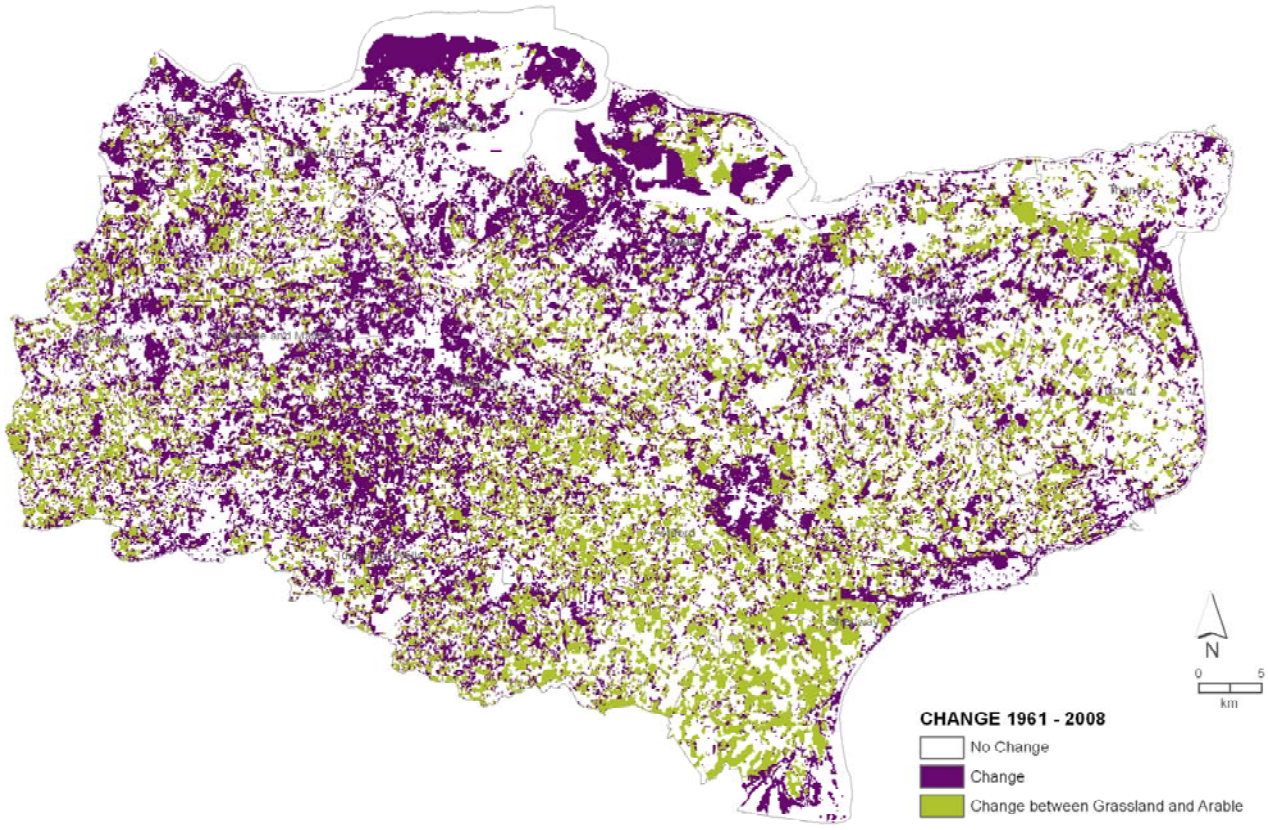


Figure 3-5 Filtered change in land cover since 1961

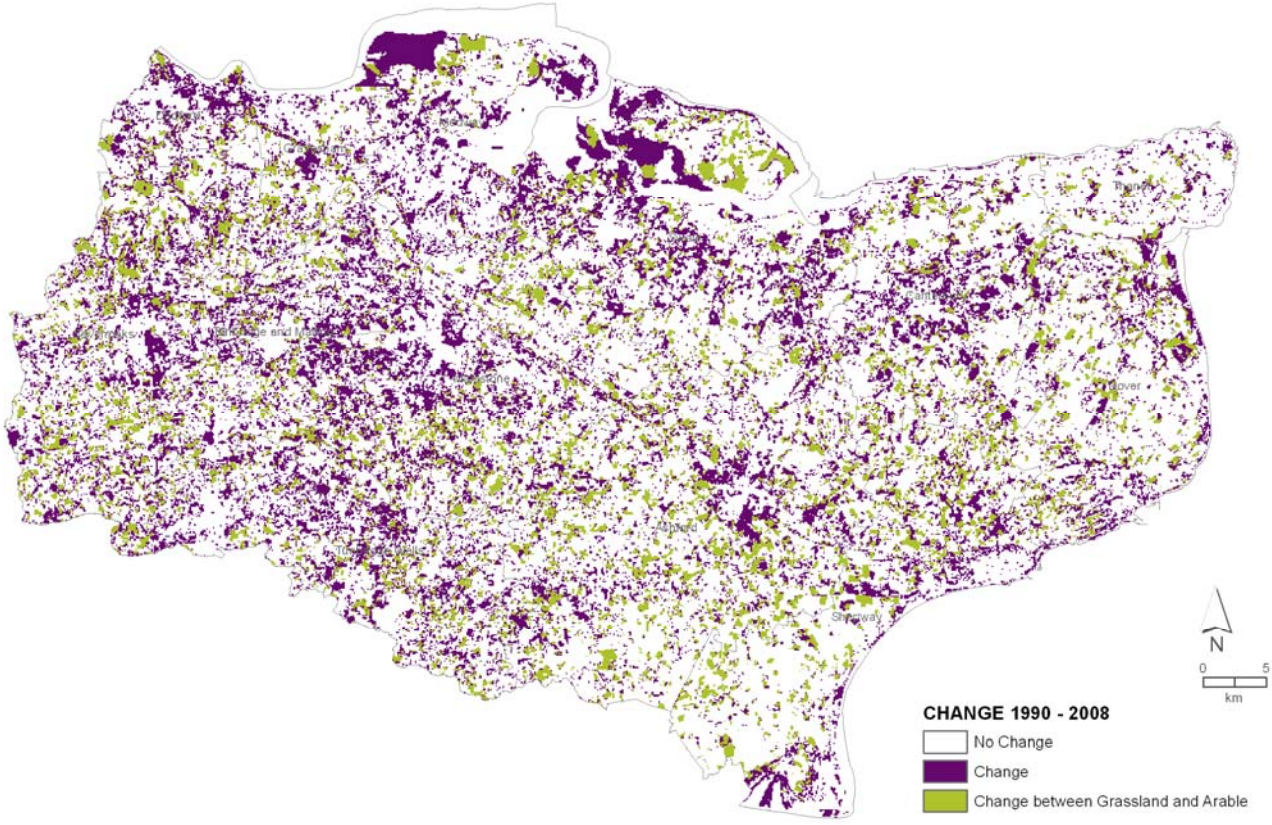


Figure 3-6 Filtered change in land cover since 1990

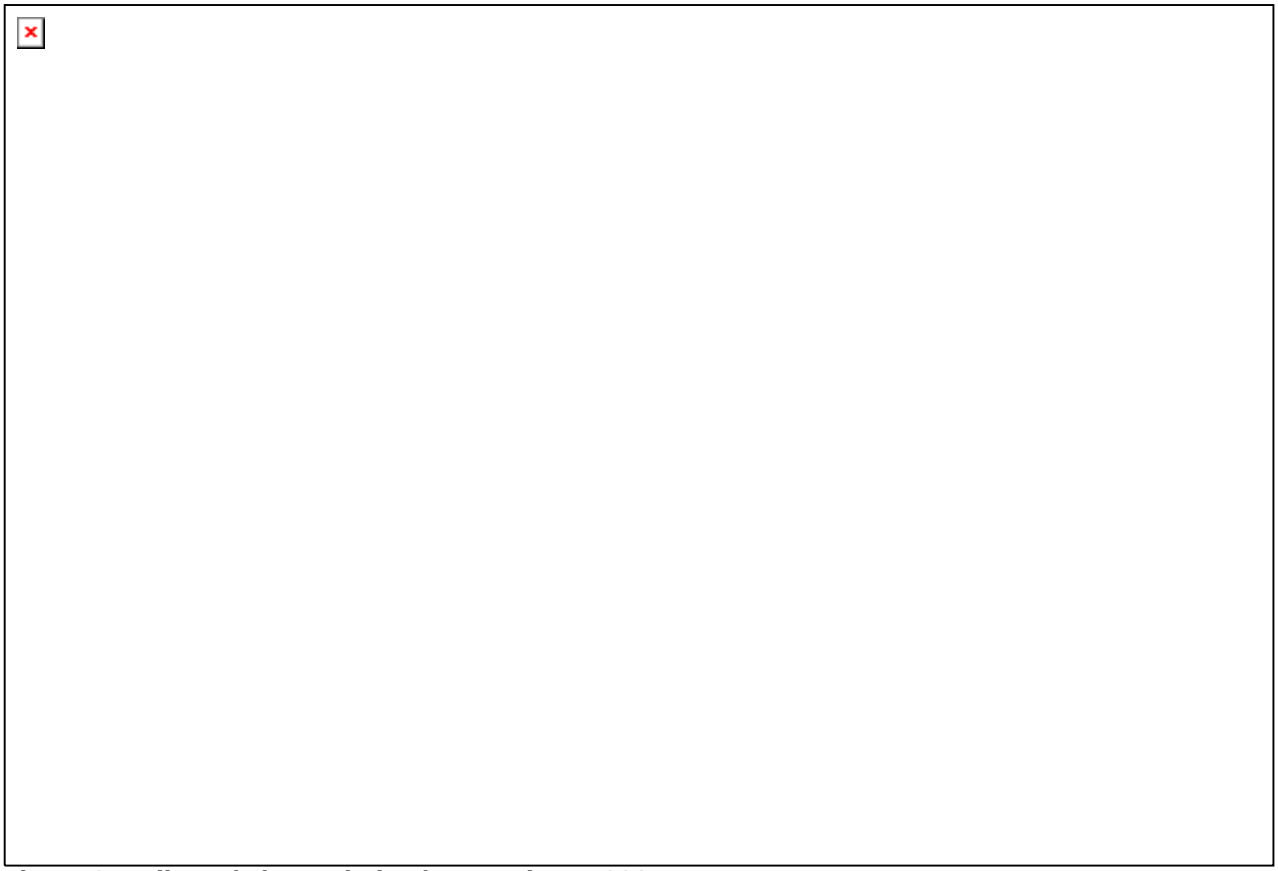


Figure 3-7 Filtered change in land cover since 1999

The following sections show the filtered change results in more detail by category. Each section starts with a map showing the current extent of the broad land cover category (for example Figure 3-8). Following are 3 maps showing filtered change from 1961, 1990 and 1999 to the present day respectively. With each map is a bar chart displaying the detail of which categories changed and by how much, as well as which categories contributed to increases and decreases. These bar charts are based on cross tabulations in Appendix A.

For example in Figure 3-9 Change in Arable 1961 – 2008 shows a total decrease of 53,477ha, and by 2008 a total increase of 51,471ha. The net result is a 2006ha decrease in arable. The map shows where the Arable resource has decreased, in purple and where it has increased, in green. Where Arable land has decreased, the land cover was changed to other categories as shown on the left in the bar chart with Figure 3-9.

The bar chart shows which categories benefited from the decrease (most notably Grassland with more than 70%). Where Arable increased, other categories were changed to Arable, thus contributing to the increase. This is shown on the right in the bar chart. Again almost two-thirds of that change can be attributed to grassland. A similar trend is noted in the grassland changes of section 3.3 where most of the change is to and from Arable.

Nearly a third of the total area changed to Arable was derived from a reduction in Orchards and Hop. Section 3.4 shows a total net loss of orchards of 24,439ha since 1961. 3538ha of orchards were newly established, the majority of which are intensive orchards.

3.2 Arable

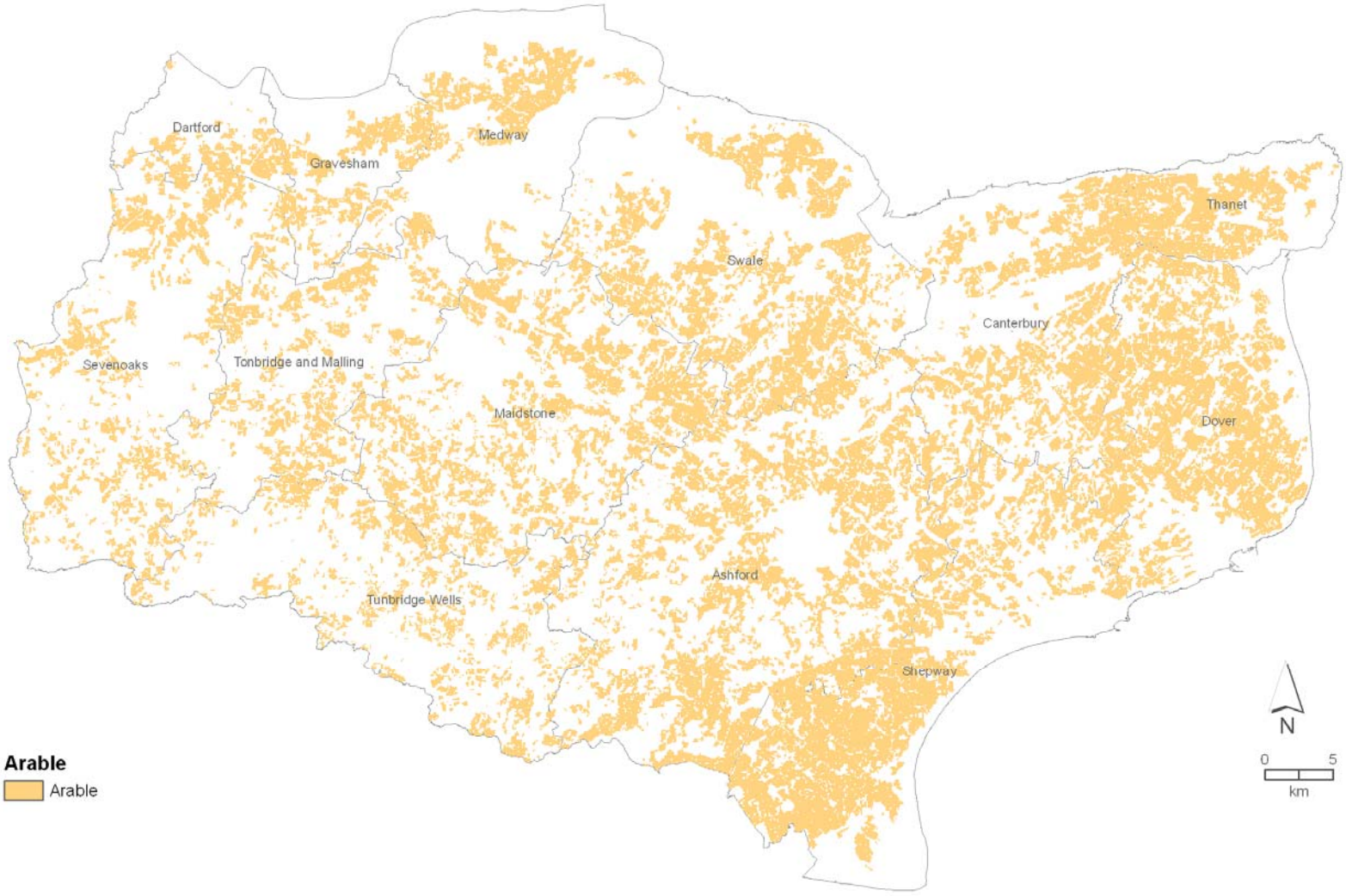


Figure 3-8 Extent of Arable land cover in 2008

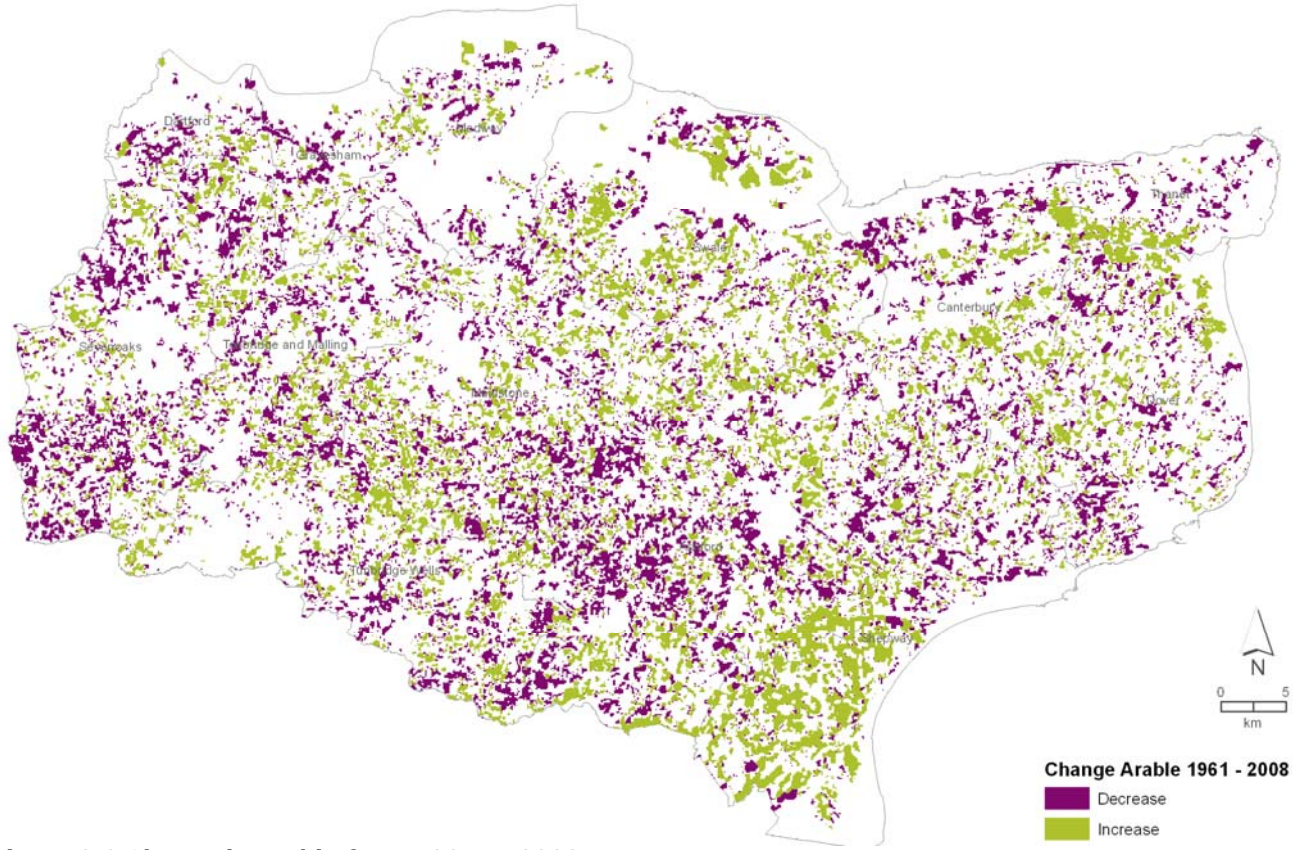
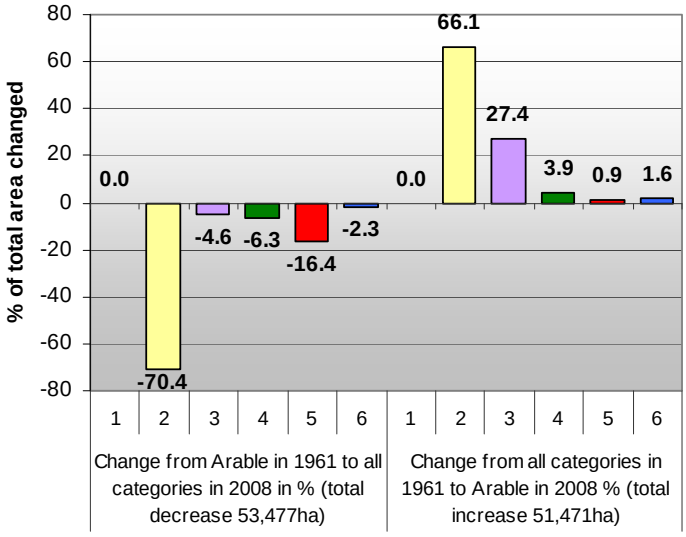


Figure 3-9 Change in Arable from 1961 to 2008



Net change Arable: 2,006ha decrease

The total decrease (purple on map above) is 53,477ha, 70% of which was converted to Grassland, with the remaining area converted to Orchard and hops (4.6%), Woodland (6.3%), Development (16.4%) and Other (2.3%).

The total increase in Arable during this period (in green on map above) is 51,471ha. The bulk of this increase came at the expense of Grassland (66.1%) and Orchard and Hop (27.4%), with minor changes from the other categories.

Landcover broad categories

1 Arable	4 Woodland
2 Grassland	5 Development
3 Orchard and Hop	6 Other

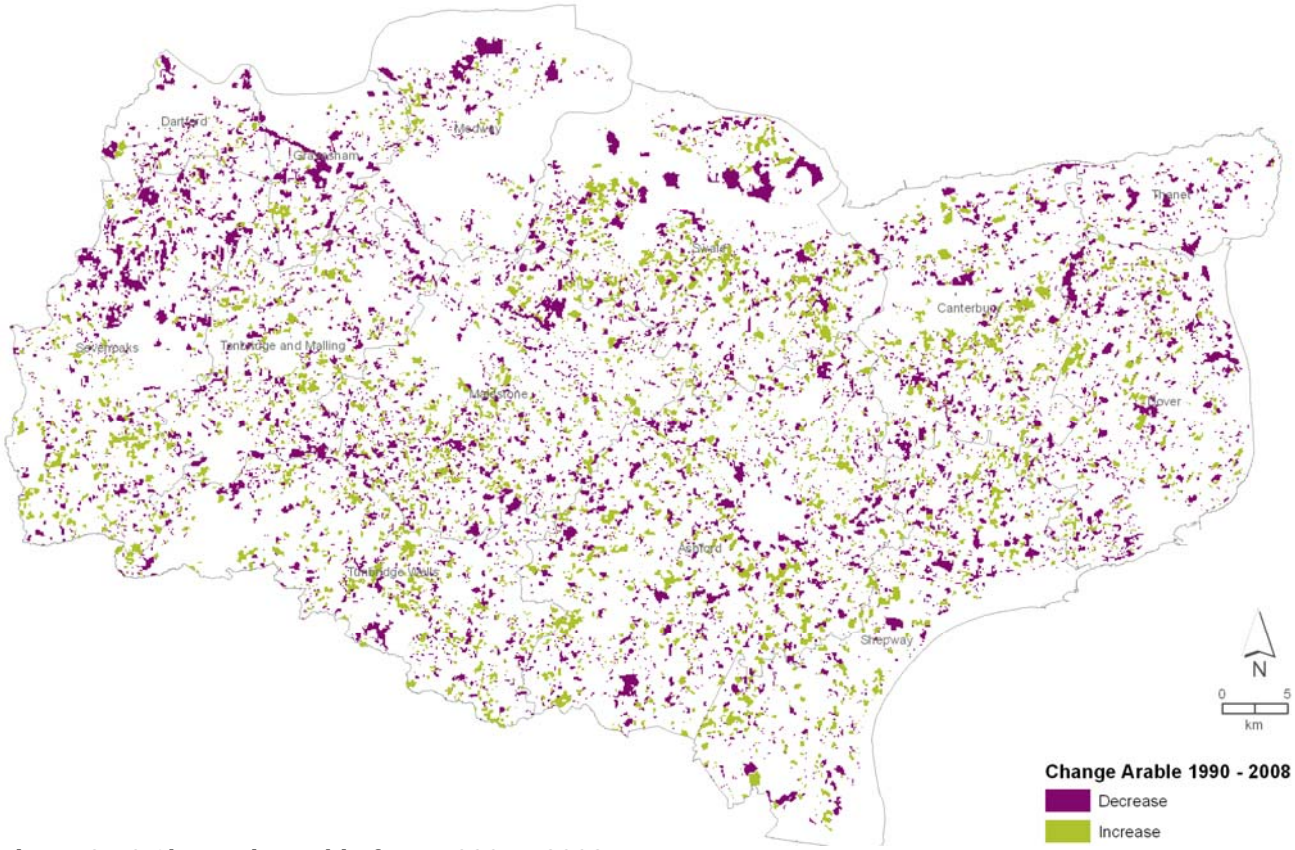
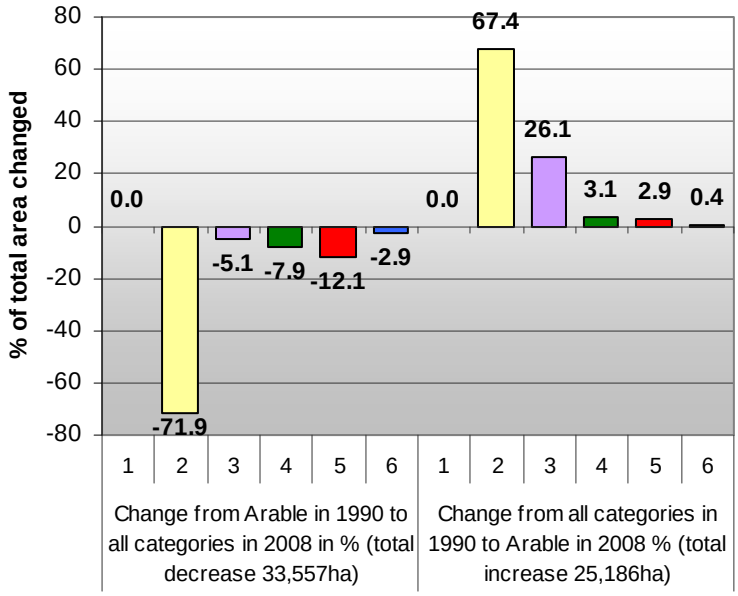


Figure 3-10 Change in Arable from 1990 to 2008



Net change Arable: 8,371ha decrease

Total decrease (purple on map above) is 33,557ha, nearly 72% of which was converted to Grassland, with the remaining area converted to Orchard and hops (5.1%), Woodland (7.9%), Development (12.1%) and Other (2.9%).

Total increase in Arable during this period (in green on map above) is 25,186ha. The bulk of this increase came at the expense of Grassland (67.4%) and Orchard and Hop (26.1%), with minor changes from the other categories.

Landcover broad categories

1 Arable	4 Woodland
2 Grassland	5 Development
3 Orchard and Hop	6 Other

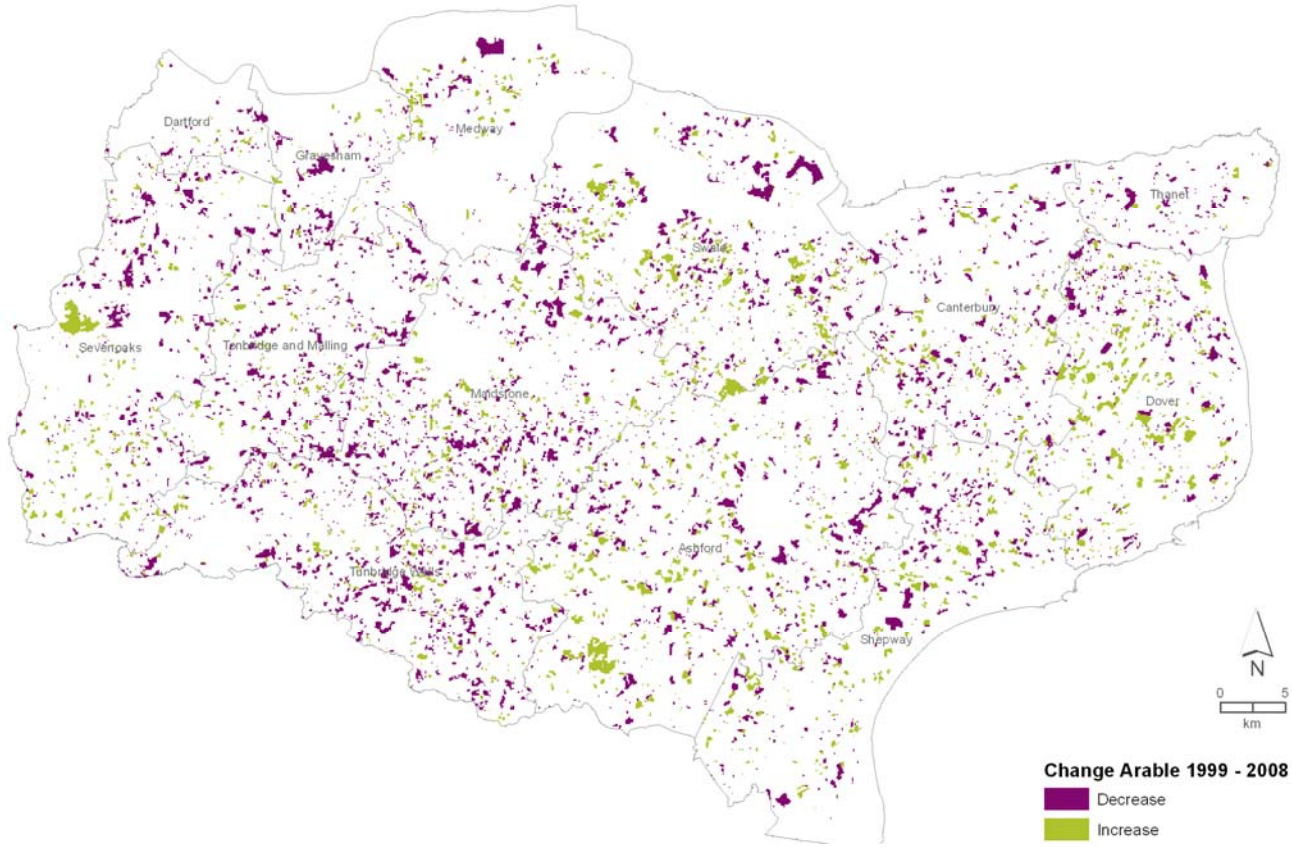
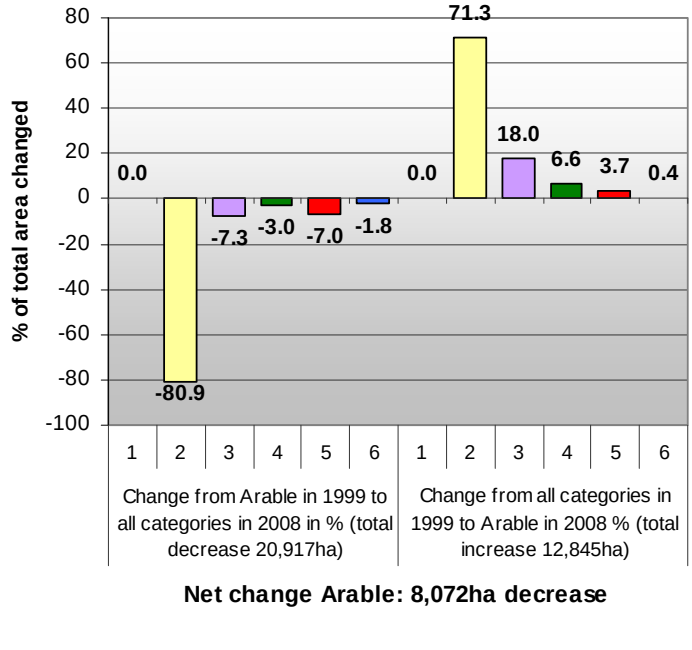


Figure 3-11 Change in Arable from 1999 to 2008



Net change Arable: 8,072ha decrease

The total decrease in Arable land cover (purple on map above) is 20,917ha, more than 80% of which was converted to Grassland, with 7.3% converted to Orchard and hops (5.1%), 3.0% to Woodland, 7.0% to Development and 1.8% to Other.

Total increase in Arable during this period (in green on map above) is 12,845ha. The bulk of this increase came at the expense of Grassland (71.3%) and Orchard and Hop (18.0%), with minor contributions from the other categories.

Landcover broad categories

1 Arable	4 Woodland
2 Grassland	5 Development
3 Orchard and Hop	6 Other

3.3 Grassland

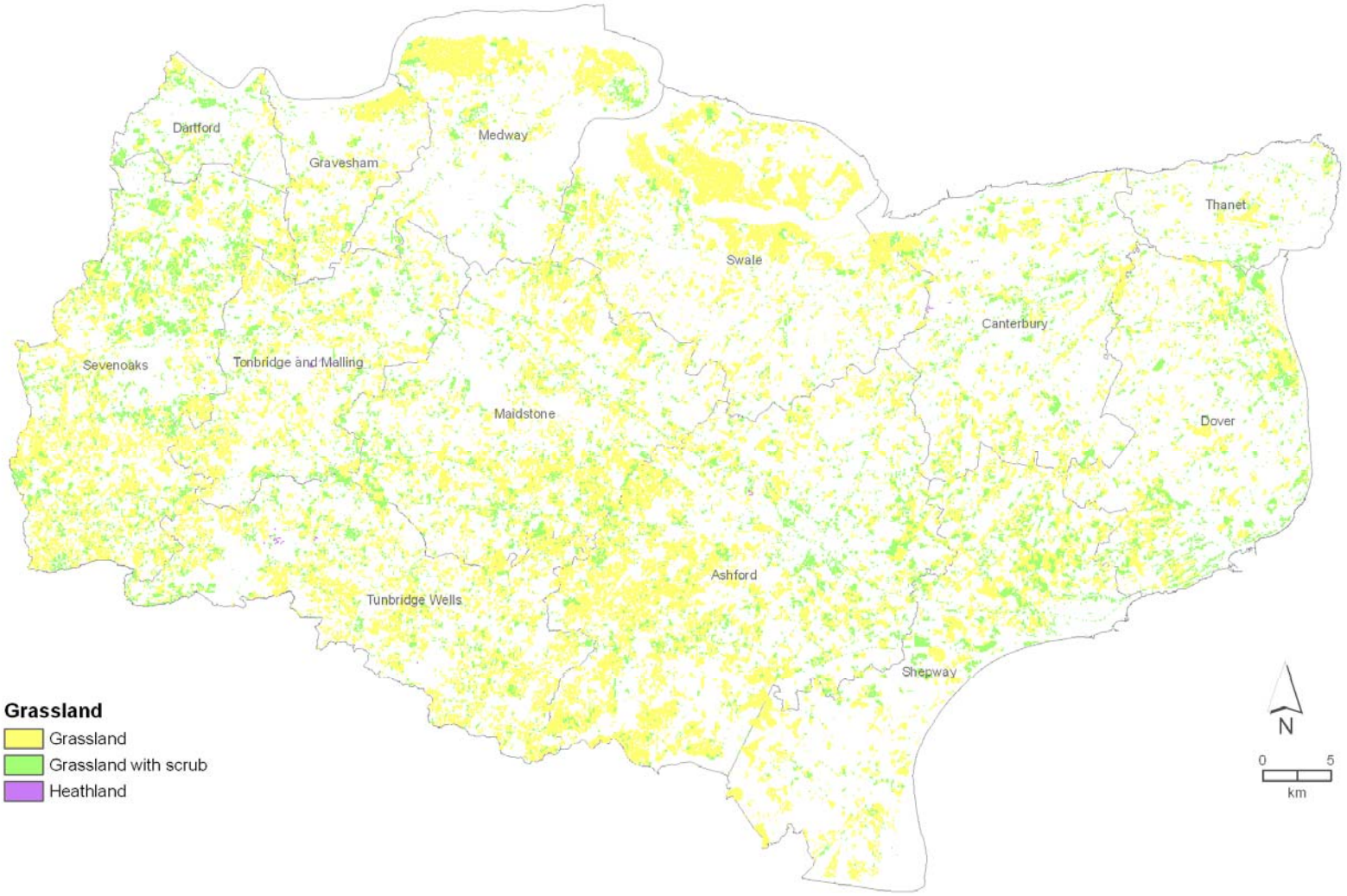
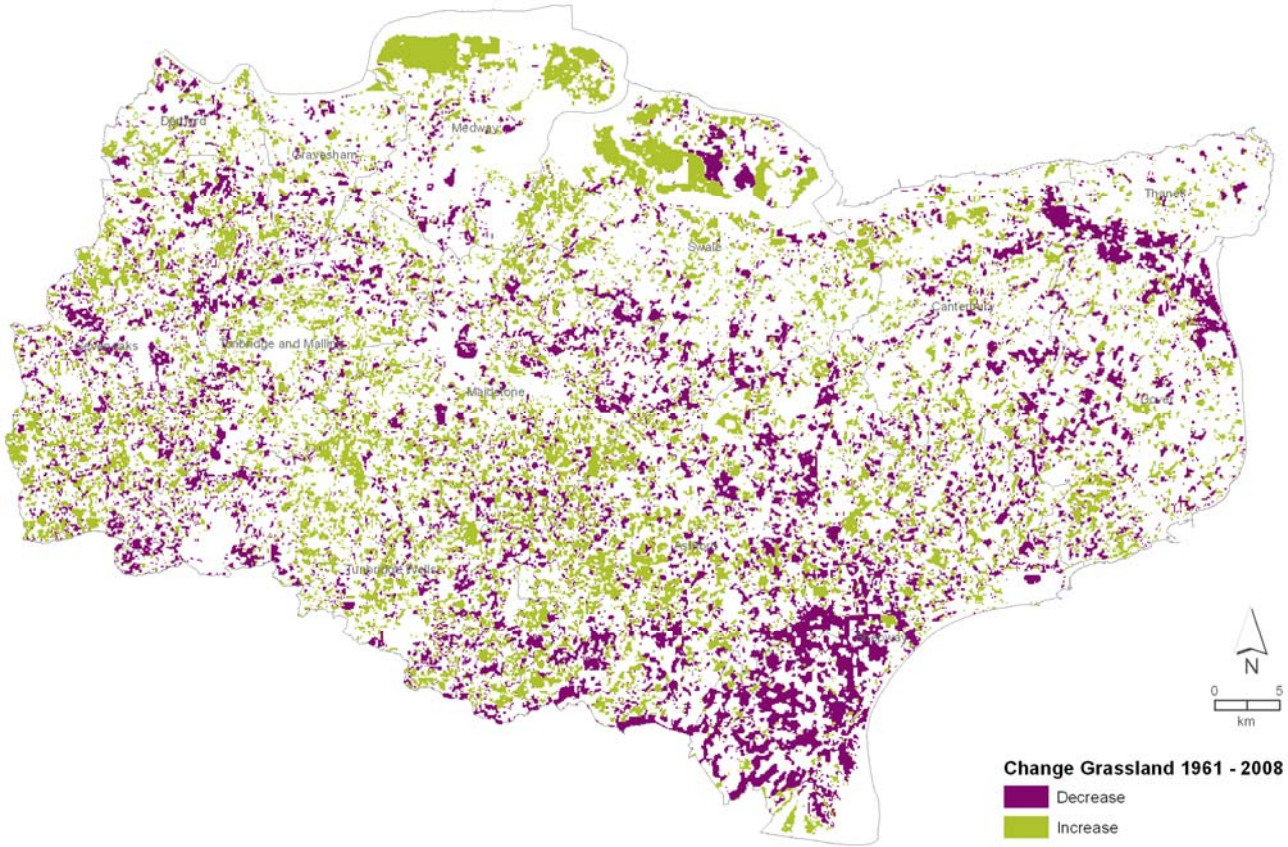
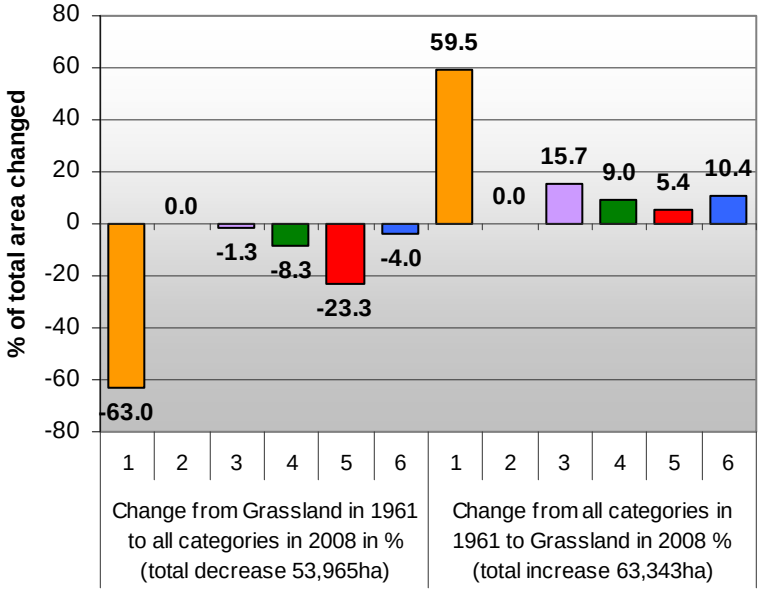


Figure 3-12 Extent of Grassland land cover in 2008





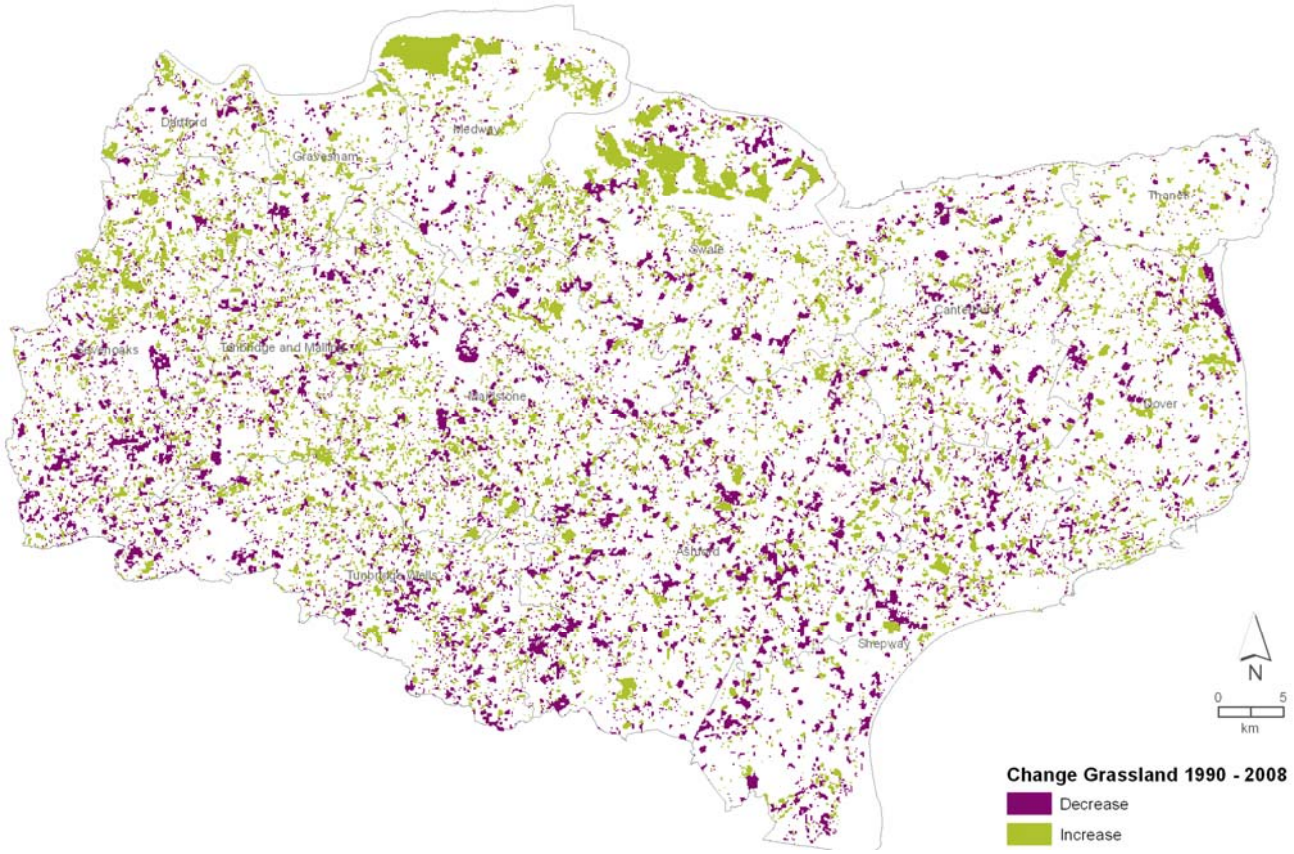
Net change Grassland: 9,378ha increase

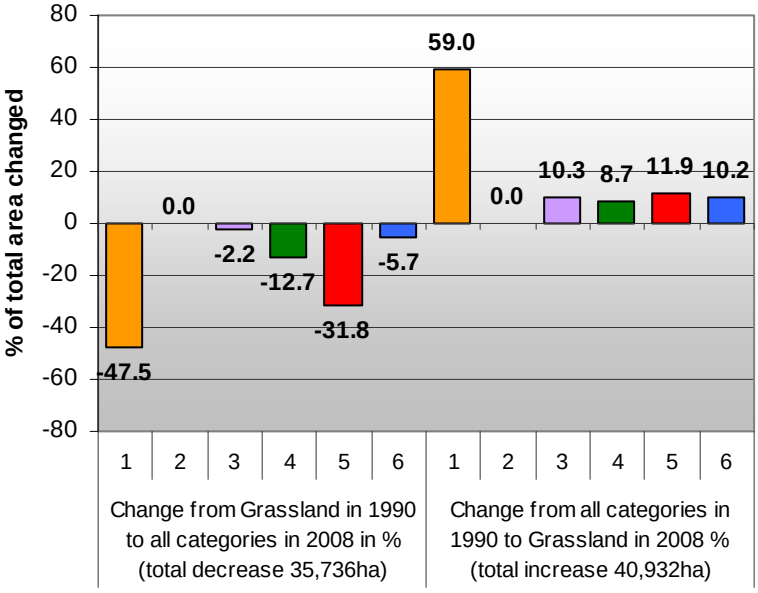
The total decrease in Grassland land cover (purple on map above) is 53,965ha, 63% of which was converted to Arable, with the next largest loss to Development (23.3%).

The total increase in Grassland during this period (in green on map above) is 63,343ha. The bulk of this increase came at the expense of Arable (59.5%) and Orchard and Hop (15.7%), with minor contributions from the other categories.

Landcover broad categories

- 1 Arable
- 2 Grassland
- 3 Orchard and Hop
- 4 Woodland
- 5 Development
- 6 Other





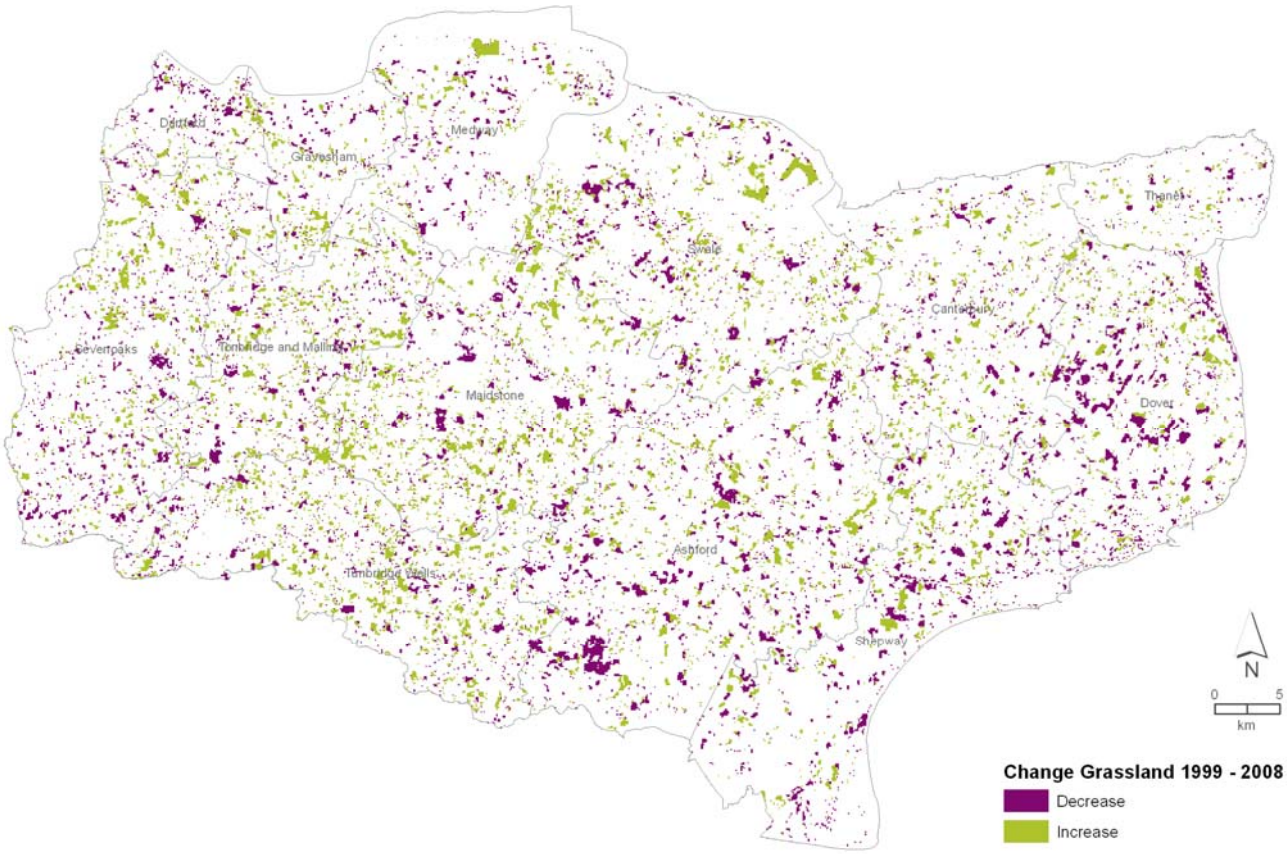
Net change Grassland: 5,196ha increase

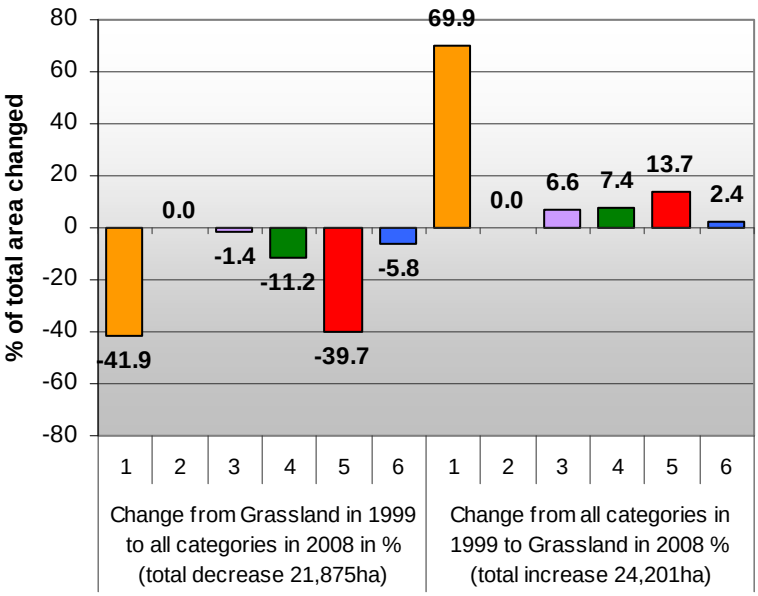
The total decrease in Grassland land cover (purple on map above) is 35,736ha, 47.5% of which was converted to Arable, with the next largest losses to Development (31.8%) and Woodland (12.7%), partly due to scrubbing over of grassland.

The total increase in Grassland during this period (in green on map above) is 40,932ha. The bulk of this increase came at the expense of Arable (59.0%), Orchard and Hop (10.3%) and Development (11.7%). The latter could be explained through positional and attribute changes as discussed in Section 2.3.

Landcover broad categories

1 Arable
2 Grassland
3 Orchard and Hop
4 Woodland
5 Development
6 Other





Net change Grassland: 2,326ha increase

The total decrease in Grassland land cover (purple on map above) is 21,875ha, 41.9% of which was converted to Arable, with the next largest losses to Development (39.7%) and Woodland (11.2%), partly due to scrubbing over of grassland.

The total increase in Grassland during this period (in green on map above) is 24,201ha. The bulk of this increase came at the expense of Arable (69.9%) and Development (13.7%). The latter could be explained through positional and attribute changes as discussed in Section 2.3.

Landcover broad categories

1 Arable
2 Grassland
3 Orchard and Hop
4 Woodland
5 Development
6 Other

3.4 Orchard and Hops

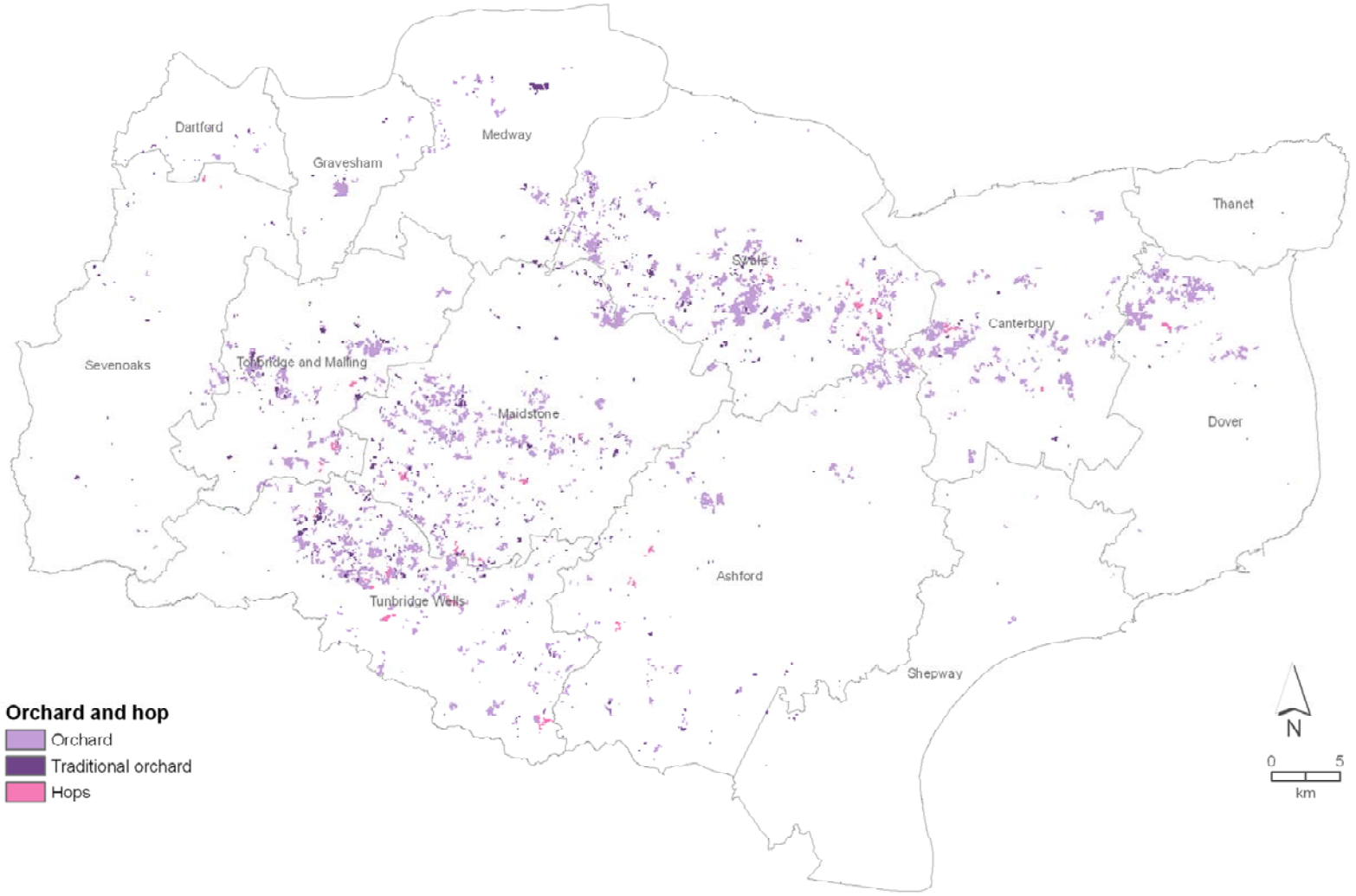
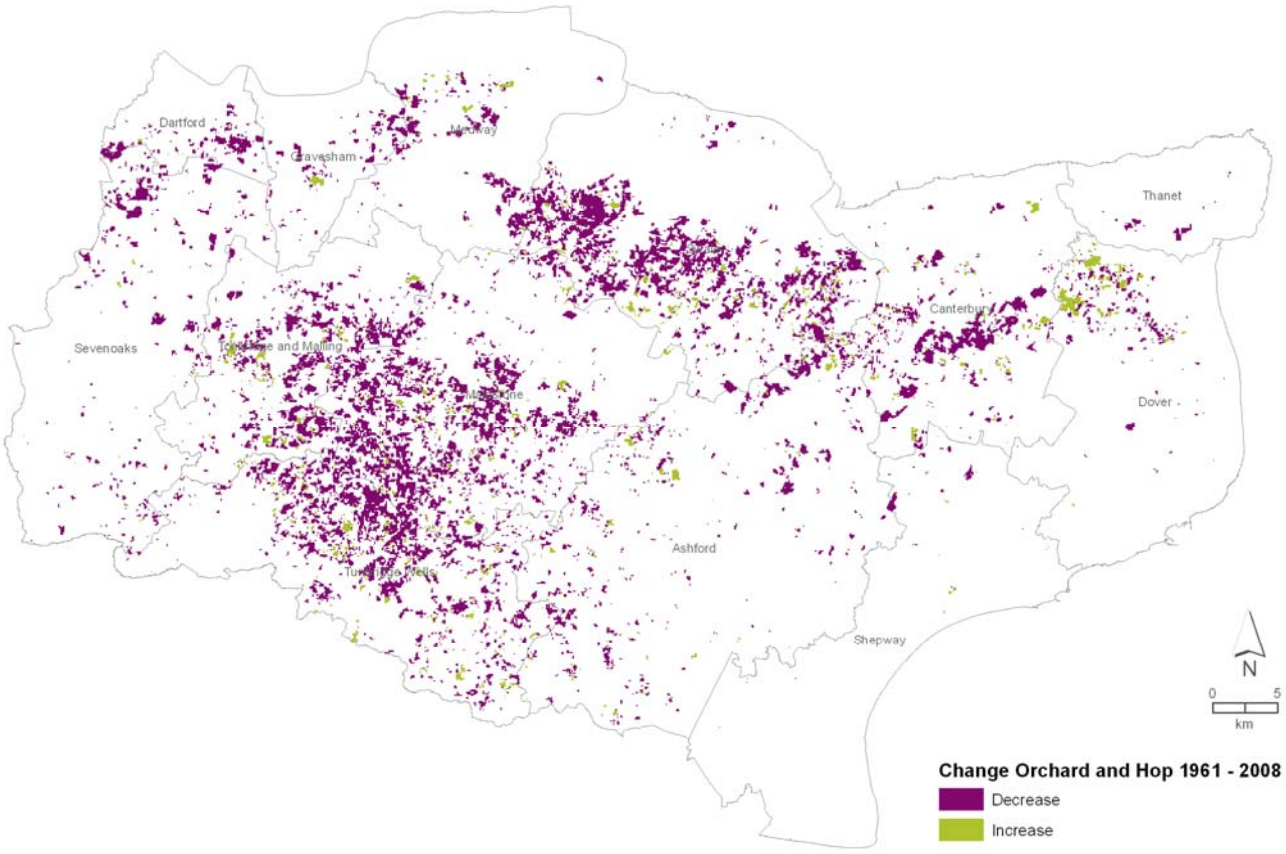
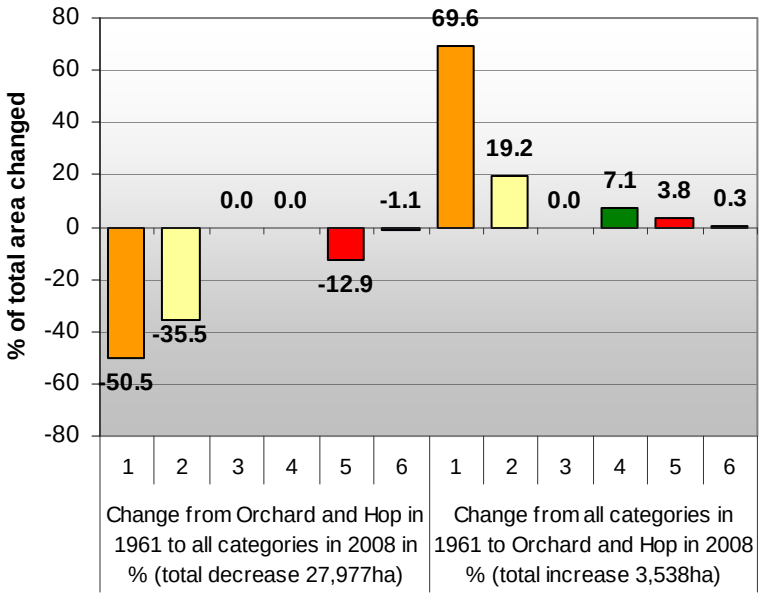


Figure 3-13 Extent of Orchard and hop land cover in 2008





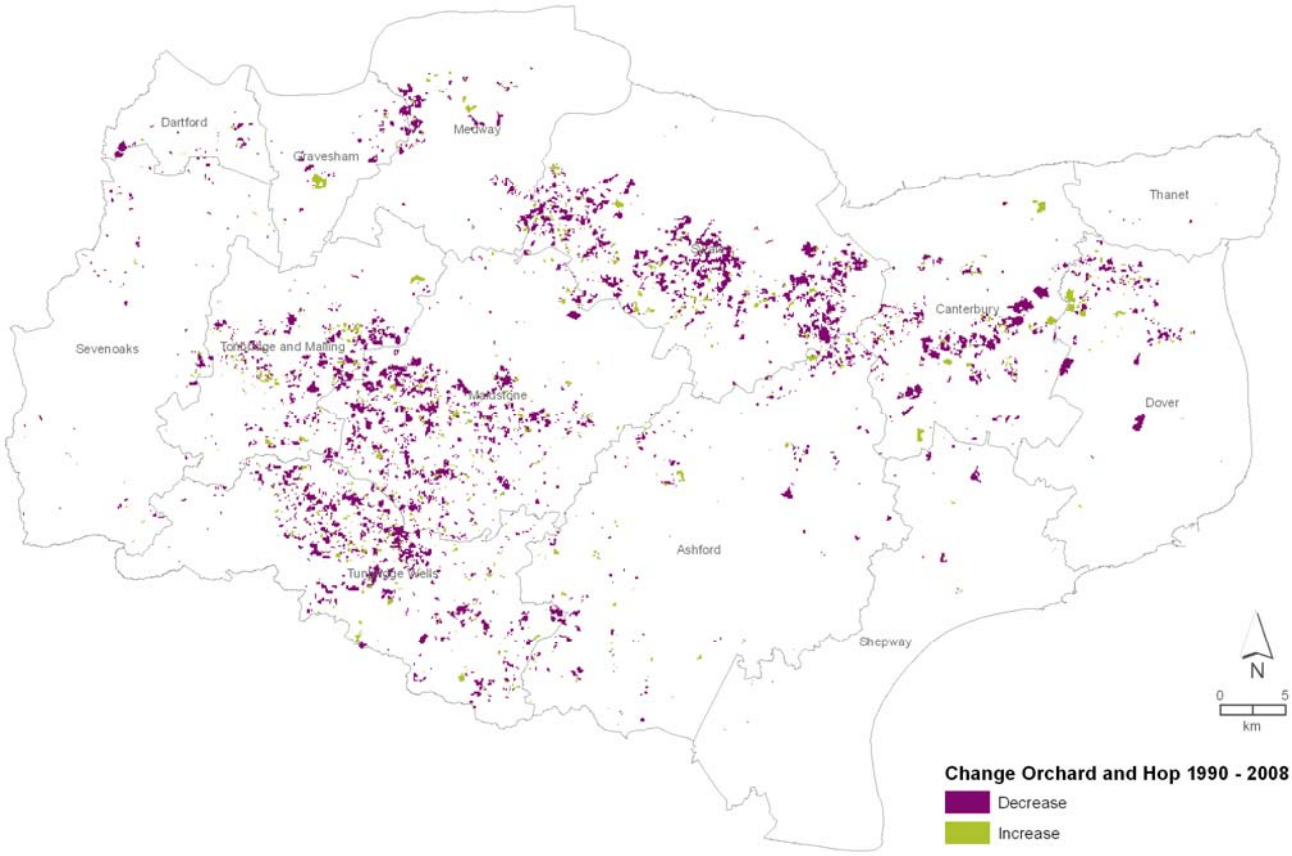
Net change Orchard and Hop: 24,439ha decrease

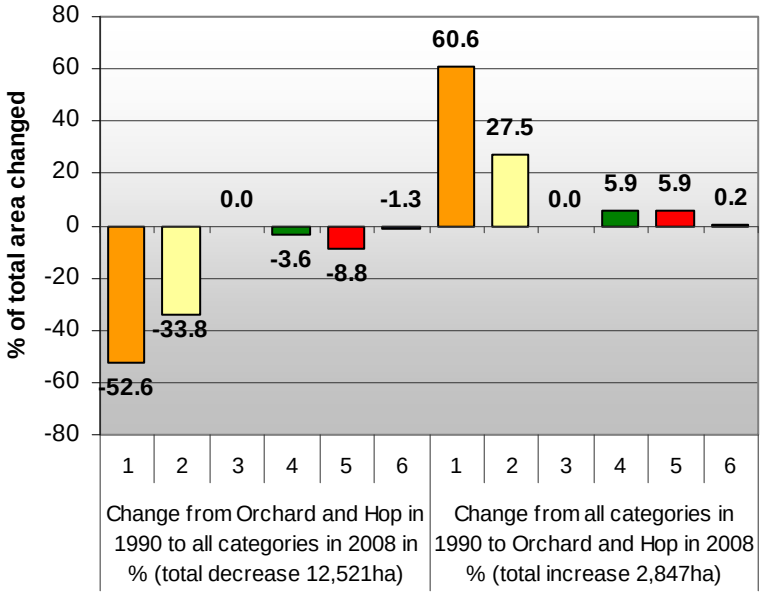
The total decrease in Orchard and hop land cover (purple on map above) is 27,977ha, 50.5% of which was converted to Arable, 35.5% to Grassland, and12.9% to Development.

The total increase in Orchard and hop during this period (in green on map above) is 3,538ha. The bulk of this increase came at the expense of Arable (69.9%) and Grassland (19.2%). These areas are primarily newly established intensively managed orchards.

Landcover broad categories

1 Arable
2 Grassland
3 Orchard and Hop
4 Woodland
5 Development
6 Other





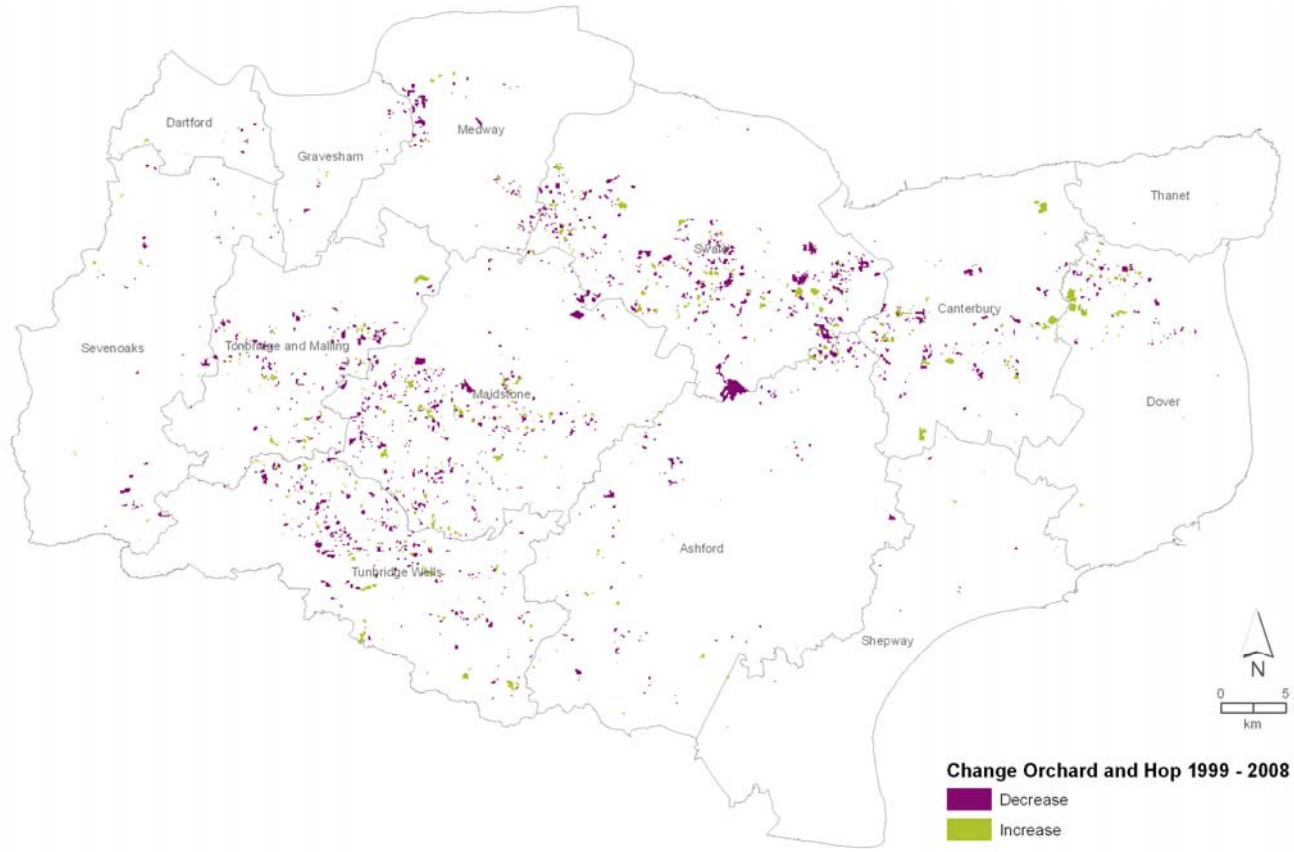
Net change Orchard and Hop: 9,674ha decrease

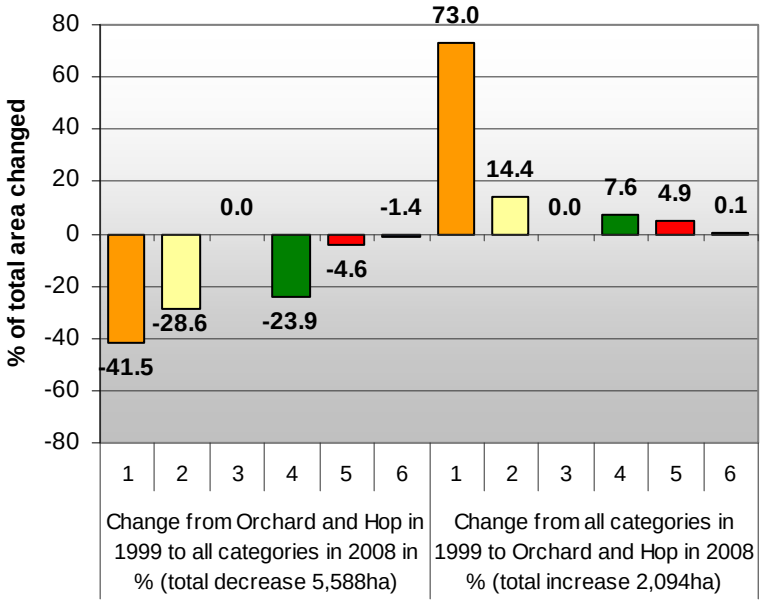
The total decrease in Orchard and hop land cover (purple on map above) is 12,521ha, 52.6% of which was converted to Arable, 33.8% to Grassland, and 8.8% to Development.

The total increase in Orchard and hop during this period (in green on map above) is 2,847ha. The bulk of this increase came at the expense of Arable (60.6%) and Grassland (27.5%). These areas of increase are primarily newly established intensively managed orchards.

Landcover broad categories

- 1 Arable
- 2 Grassland
- 3 Orchard and Hop
- 4 Woodland
- 5 Development
- 6 Other





Net change Orchard and Hop: 3,494ha decrease

The total decrease in Orchard and hop land cover (purple on map above) is 5,588ha, 41.5% of which was converted to Arable, 28.6% to Grassland, and 23.9% to Woodland.

The total increase in Orchard and hop during this period (in green on map above) is 2,094ha. The bulk of this increase came at the expense of Arable (73.0%) and Grassland (14.4%), with minor contributions from Woodland (7.6%) and Development (4.9%). These areas of increase are primarily newly established intensively managed orchards. Changes from Development could be due to positional issues as discussed in Section 2.3.

Landcover broad categories

1 Arable
2 Grassland
3 Orchard and Hop
4 Woodland
5 Development
6 Other

3.5 Woodland

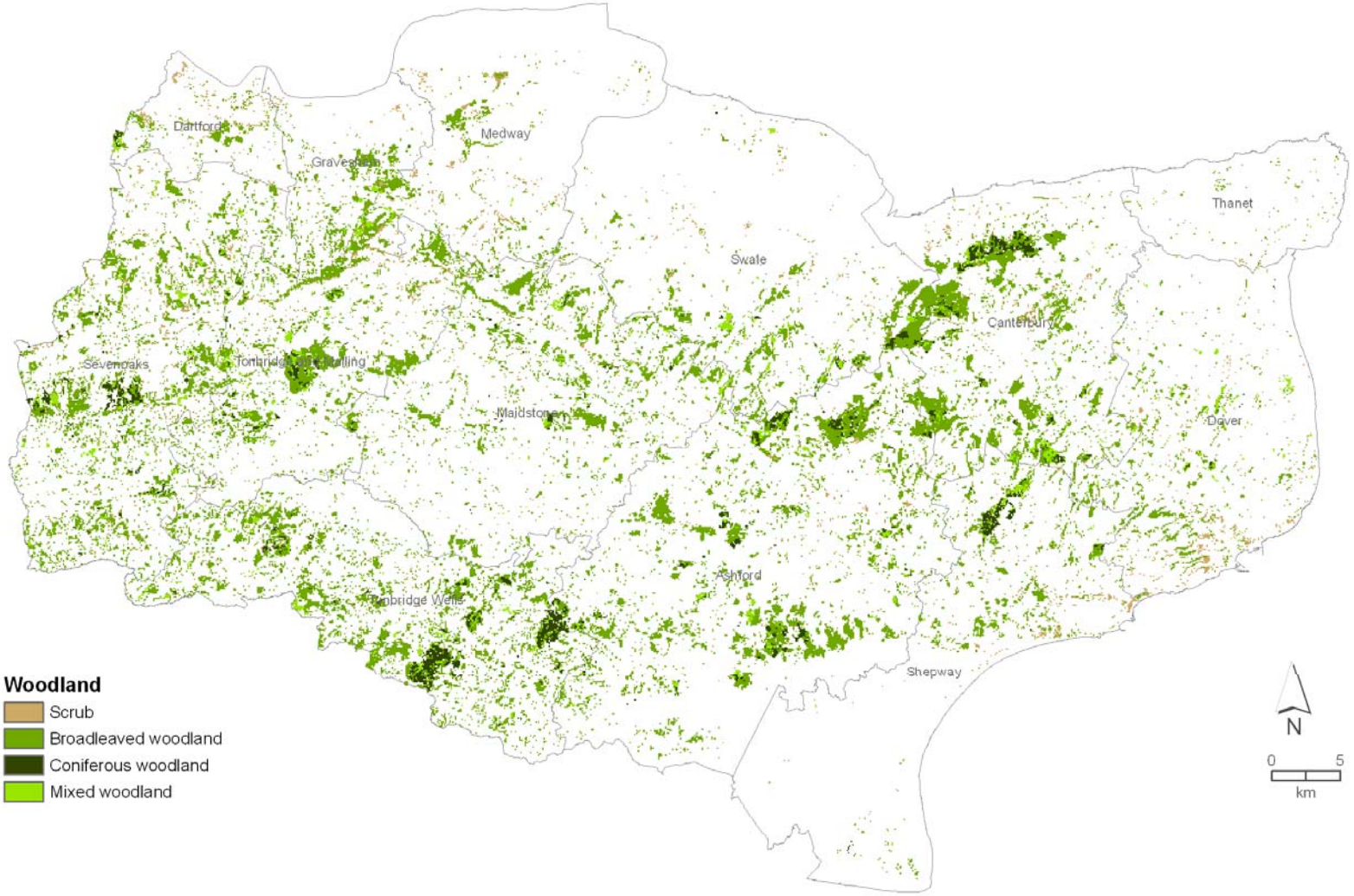
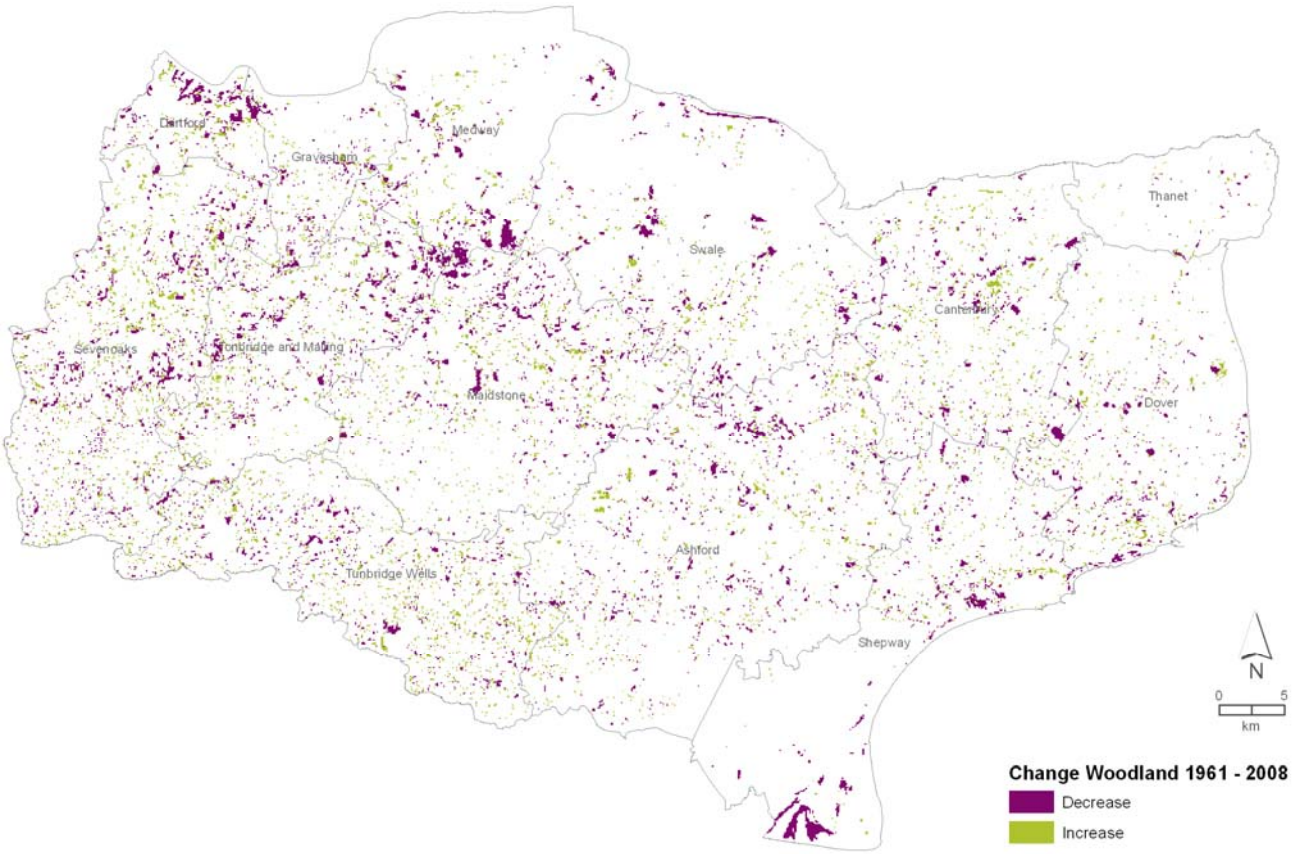
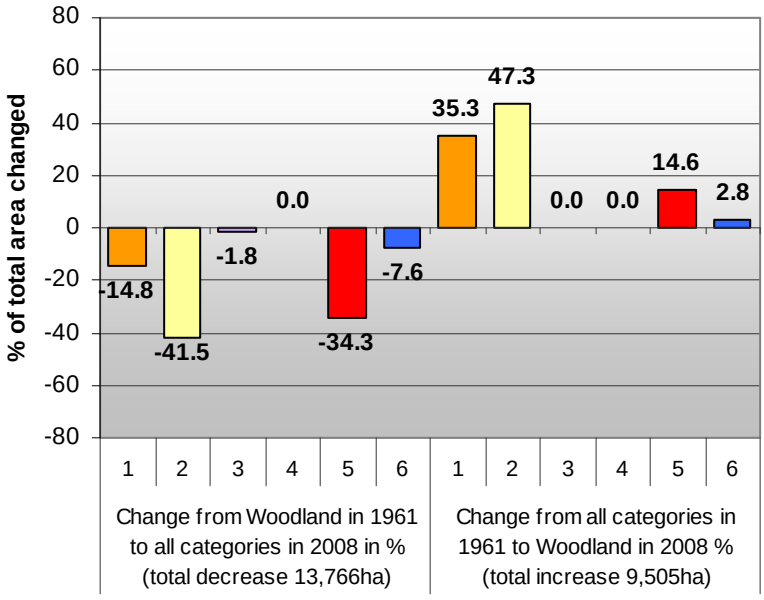


Figure 3-14 Extent of Woodland land cover in 2008





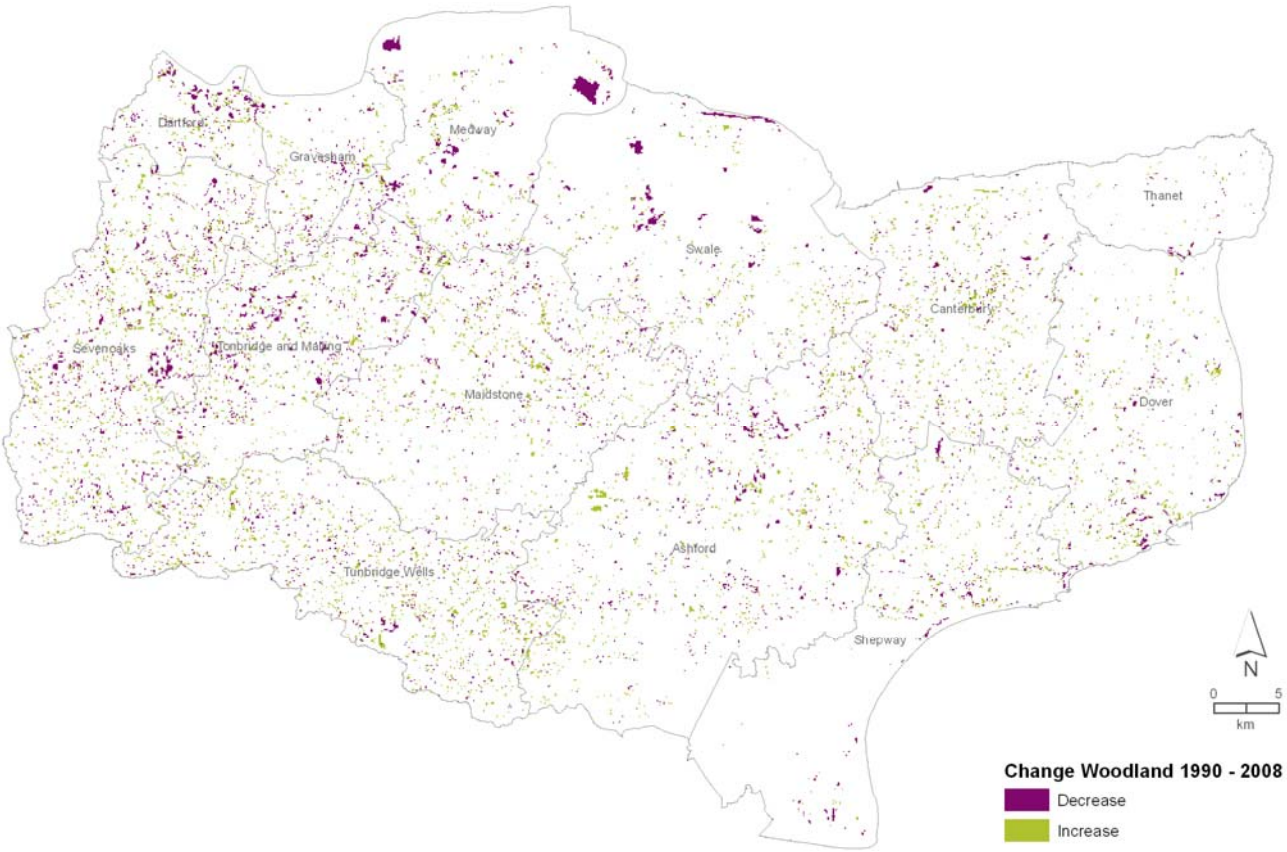
Net change Woodland: 4,261ha decrease

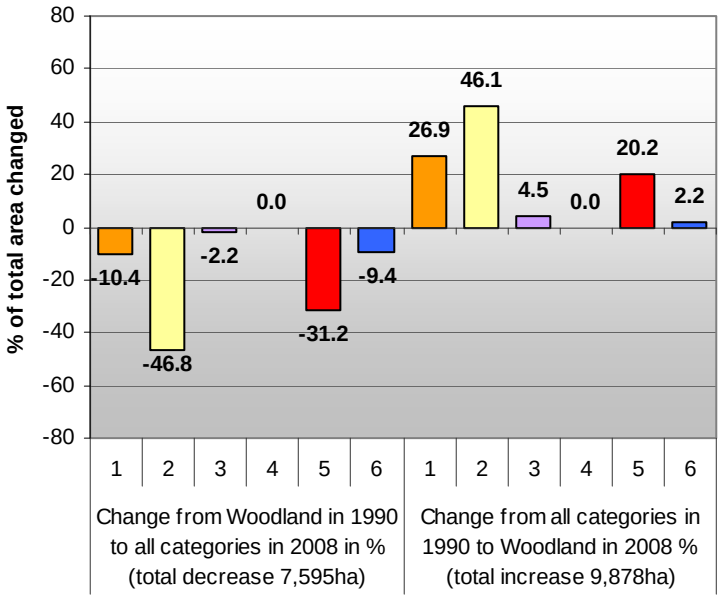
The total decrease in Woodland land cover (purple on map above) is 13,766ha, 41.5% of which was converted to Grassland, 34.3% lost to Development and 41.5% to Grassland.

The total increase in Woodland during this period (in green on map above) is 9,505ha. The bulk of this increase came at the expense of Grassland (47.3%), Arable (35.3%) and Development (14.6%). Some of the change is due to scrubbing over of grasslands and to newly planted areas of woodland or plantation. Changes from Development to Woodland could be due to issues discussed in Section 2.3.

Landcover broad categories

- 1 Arable
- 2 Grassland
- 3 Orchard and Hop
- 4 Woodland
- 5 Development
- 6 Other





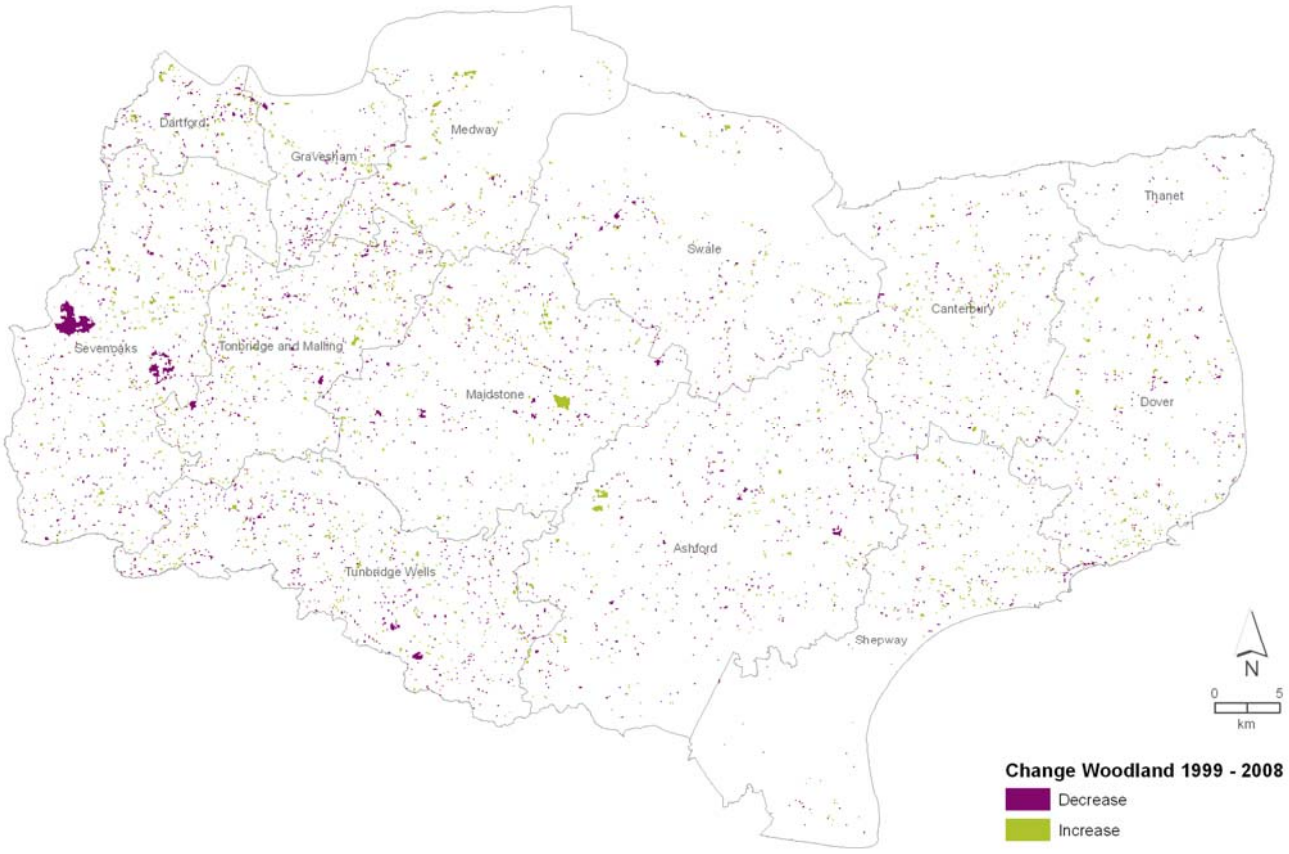
Net change Woodland: 2,283ha increase

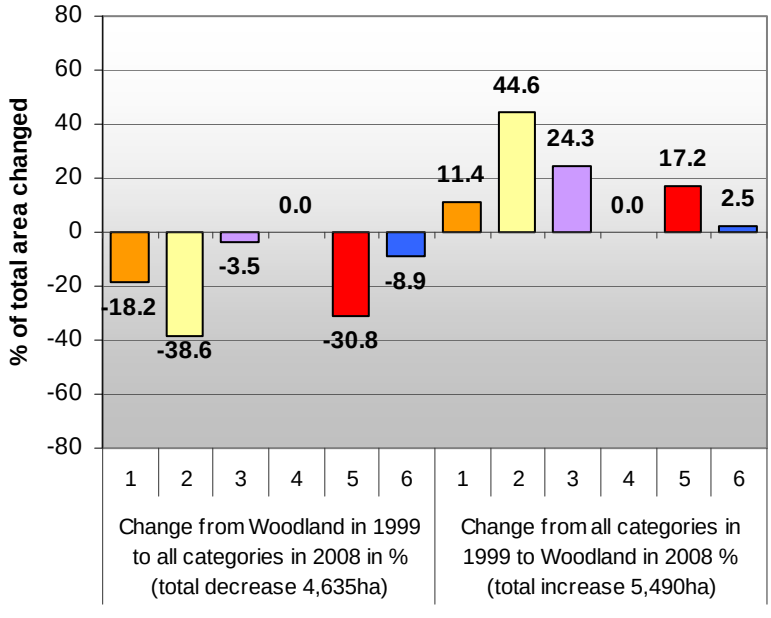
The total decrease in Woodland land cover (purple on map above) is 7,595ha, 46.8% of which was converted to Grassland, 31.2% lost to Development and 10.4% to Arable.

The total increase in Woodland during this period (in green on map above) is 9,878ha. The bulk of this increase came at the expense of Grassland (46.1%), Arable (26.9%) and Development (20.2%). Some of the change is due to scrubbing over of grasslands and to newly planted areas of woodland or plantation. Changes from Development to Woodland could be due to issues discussed in Section 2.3.

Landcover broad categories

1 Arable	4 Woodland
2 Grassland	5 Development
3 Orchard and Hop	6 Other





Net change Woodland: 855ha increase

The total decrease in Woodland land cover (purple on map above) is 4,635ha, 38.6% of which was converted to Grassland, 30.8% lost to Development and 18.2% to Arable.

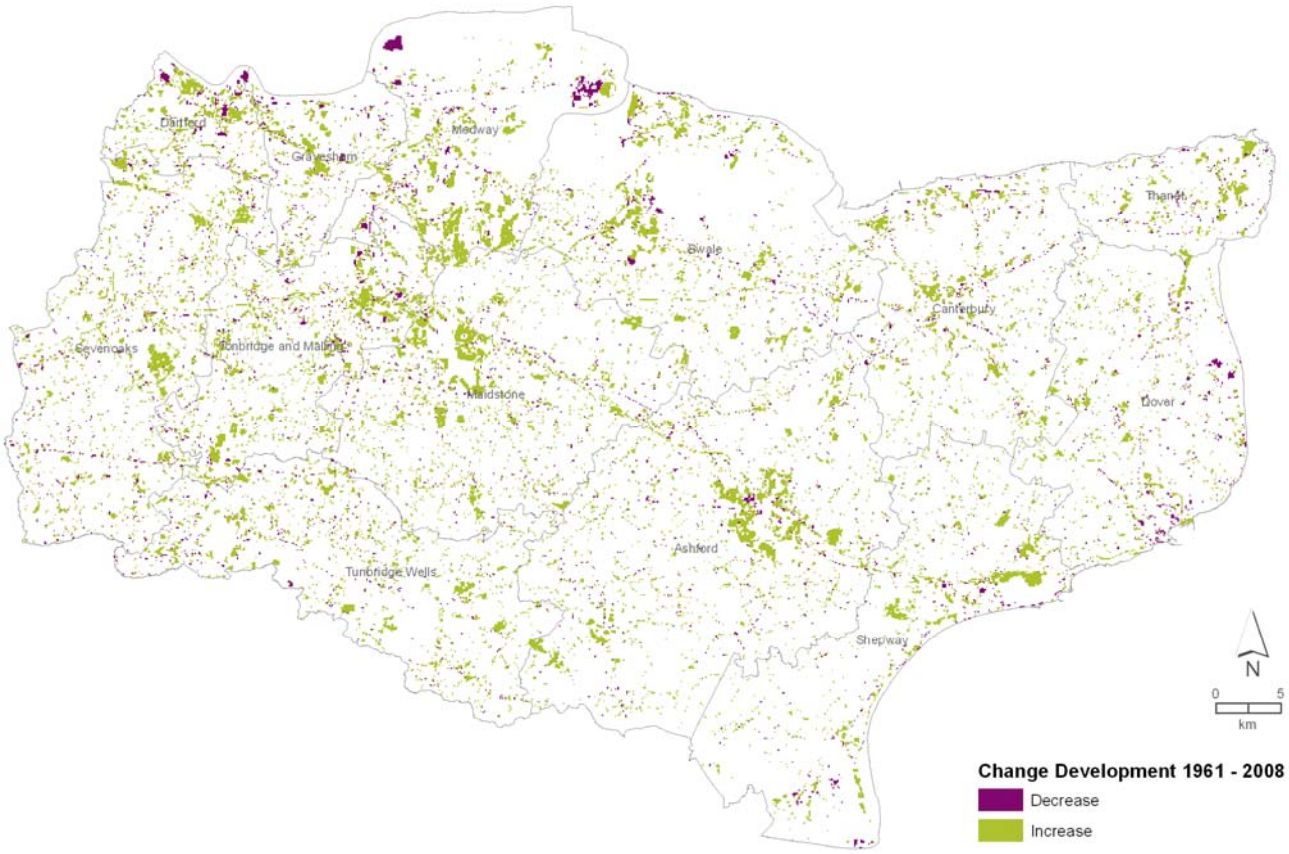
The total increase in Woodland during this period (in green on map above) is 5,490ha. The bulk of this increase came at the expense of Grassland (44.6%), Orchard and Hop (24.3%) and Development (17.2%). Some of the change is due to scrubbing over of grasslands and to newly planted areas of woodland or plantation. Changes from Development to Woodland could be due to issues discussed in Section 2.3.

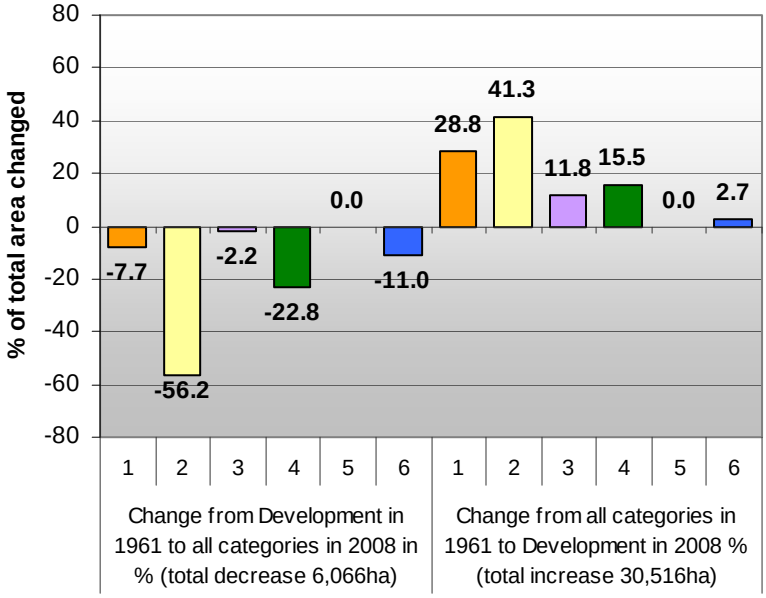
Landcover broad categories

- 1 Arable
- 2 Grassland
- 3 Orchard and Hop
- 4 Woodland
- 5 Development
- 6 Other

3.6 Development

Figure 3-15 Extent of Development land cover in 2008





Net change Development: 24,450ha increase

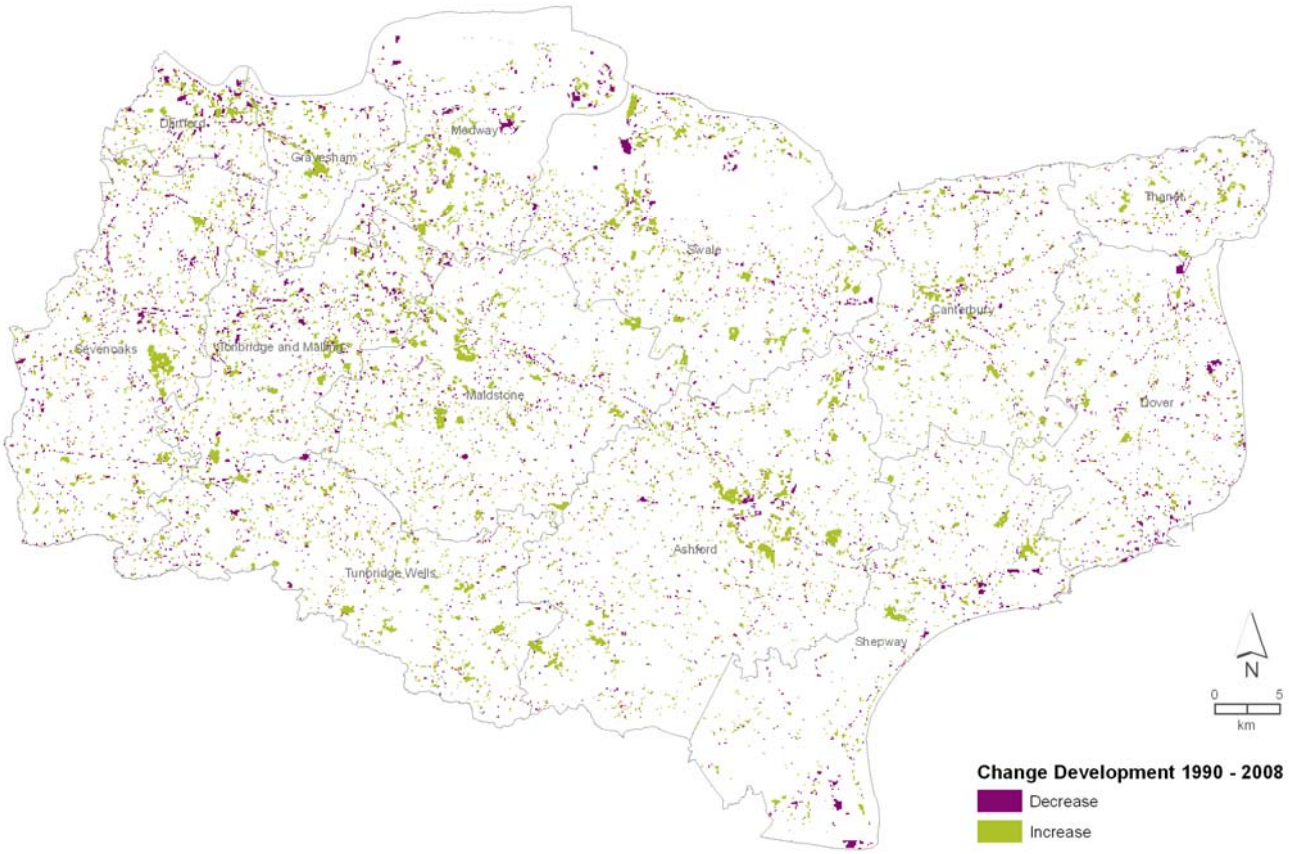
The total decrease in Development land cover (purple on map above) is 6,066ha, 56.2% of which was converted to Grassland, 22.8% lost to Woodland and 11% to Other.

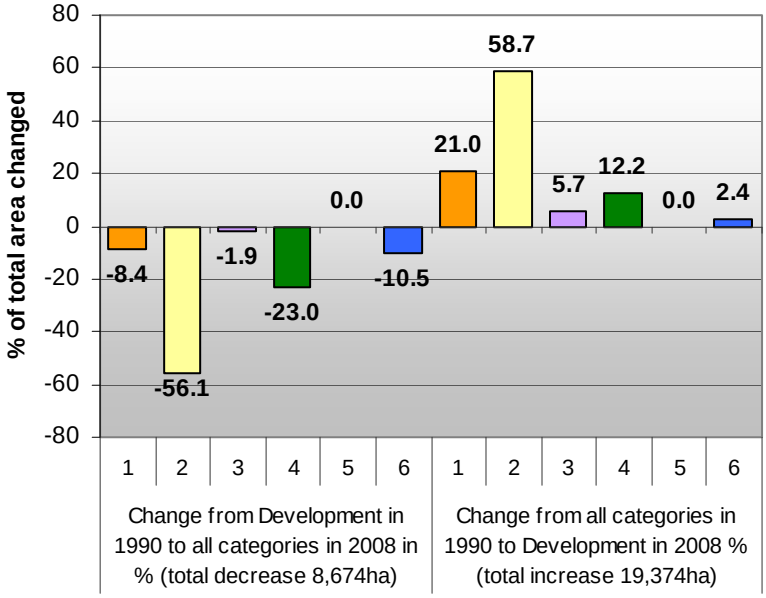
The total increase in Development during this period (in green on map above) is 30,516ha. The bulk of this increase came at the expense of Grassland (41.3%), Arable (28.8%), Woodland (15.5%) and Orchard and Hop (11.8%).

Changes from Development to Grassland, Arable and Woodland could be due to classification and/or positioning issues.

Landcover broad categories

1 Arable
2 Grassland
3 Orchard and Hop
4 Woodland
5 Development
6 Other





Net change Development: 10,700ha increase

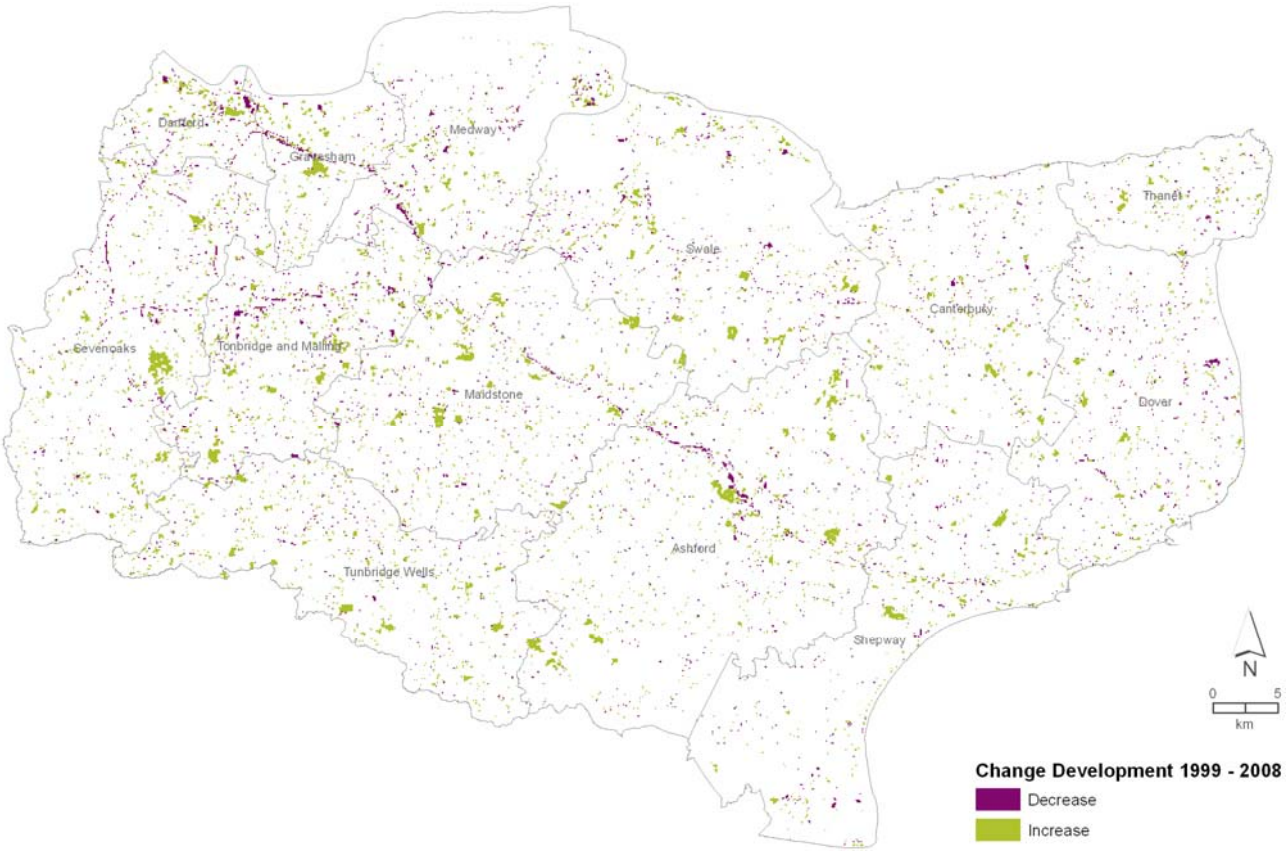
The total decrease in Development land cover (purple on map above) is 8,674ha, 56.1% of which was converted to Grassland, 23% lost to Woodland and 10.5% to Other.

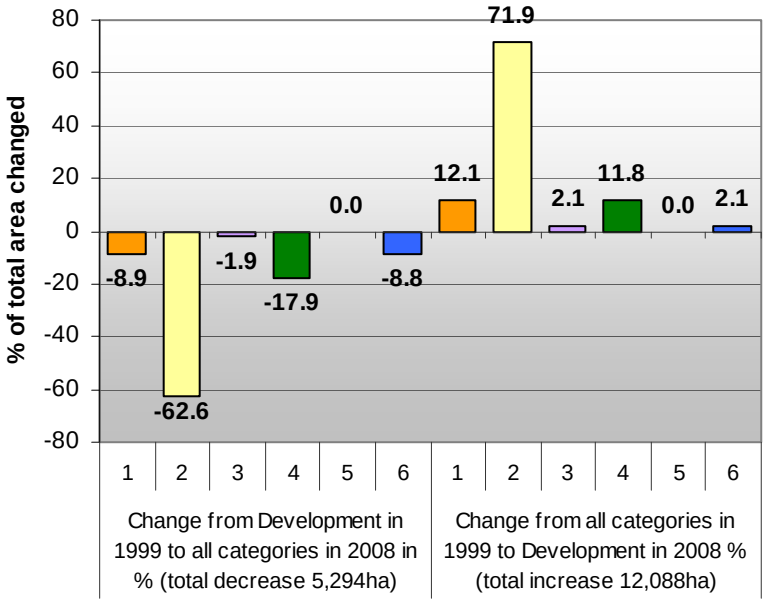
The total increase in Development during this period (in green on map above) is 19,374ha. The bulk of this increase came at the expense of Grassland (58.7%), Arable (21%), Woodland (12.2%) and Orchard and Hop (5.7%).

Changes from Development to Grassland, Arable and Woodland could be due to classification and/or positioning issues.

Landcover broad categories

- 1 Arable
- 2 Grassland
- 3 Orchard and Hop
- 4 Woodland
- 5 Development
- 6 Other





Net change Development: 6,794ha increase

The total decrease in Development land cover (purple on map above) is 5,294ha, 62.6% of which was converted to Grassland, 17.9% lost to Woodland and 8.9% to Arable.

The total increase in Development during this period (in green on map above) is 12,088ha. The bulk of this increase came at the expense of Grassland (71.9%), Arable (12.1%) and Woodland (11.8%).

Changes from Development to Grassland, Arable and Woodland could be due to classification and/or positioning issues.

Landcover broad categories

1 Arable
2 Grassland
3 Orchard and Hop
4 Woodland
5 Development
6 Other

3.7 Other

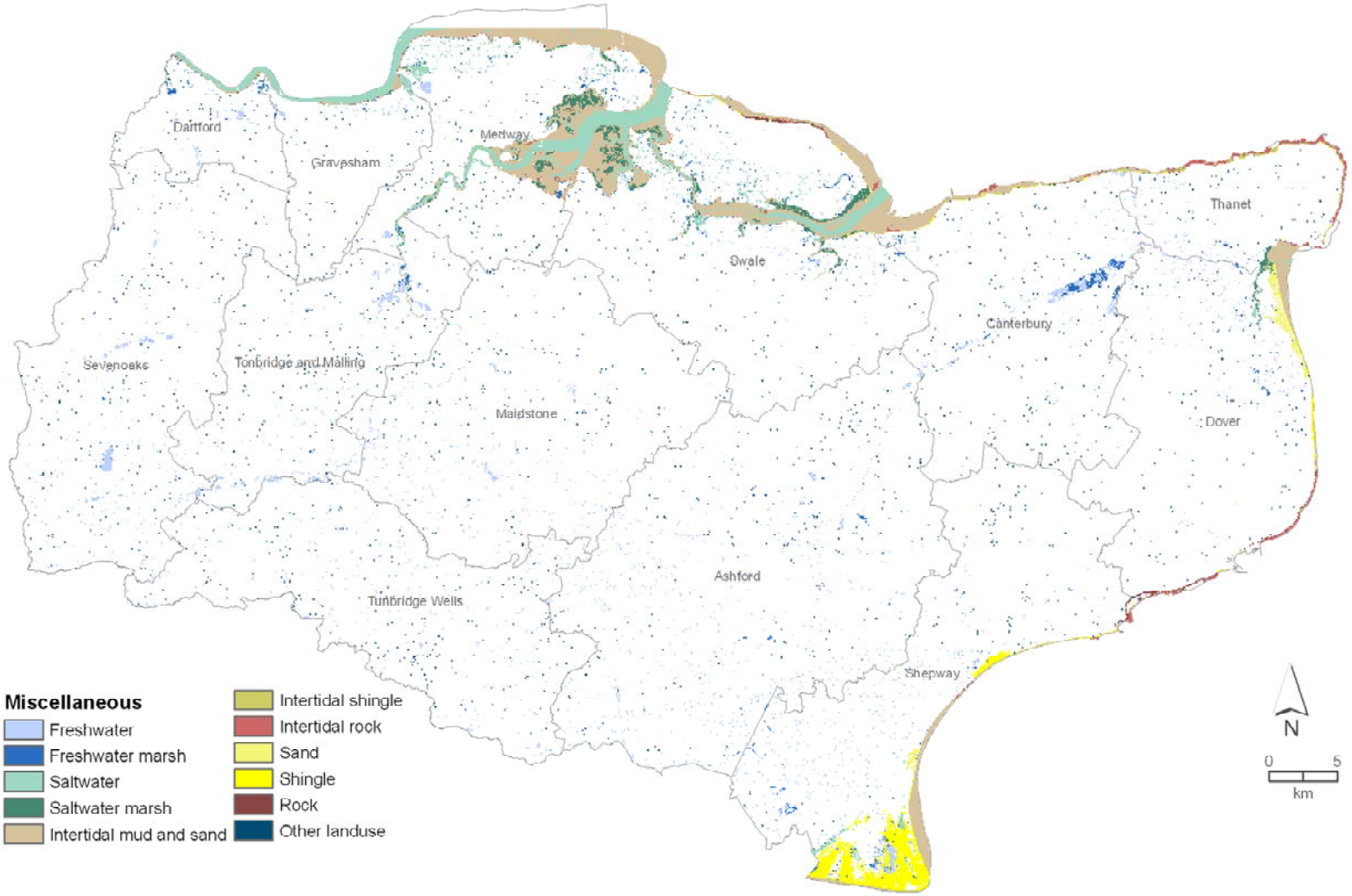
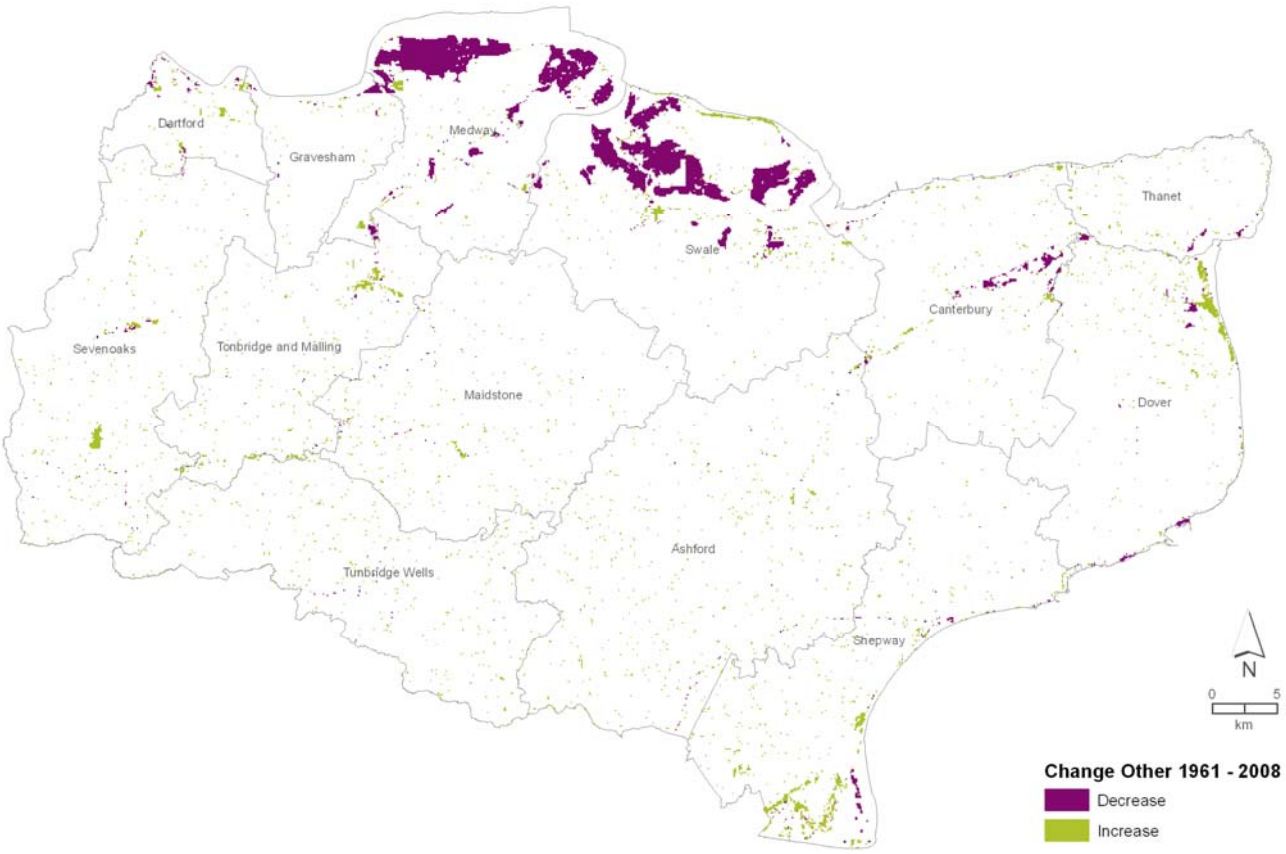
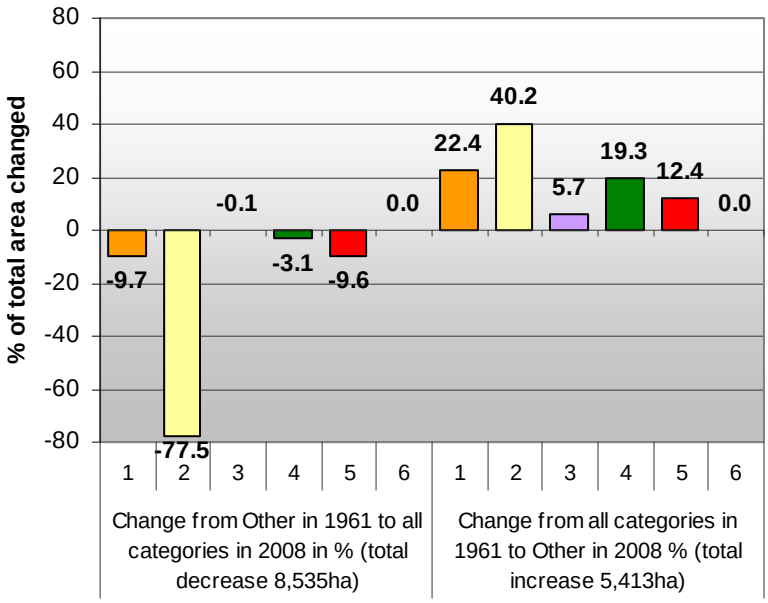


Figure 3-16 Extent of Other land cover in 2008





Net change Other: 3,122ha decrease

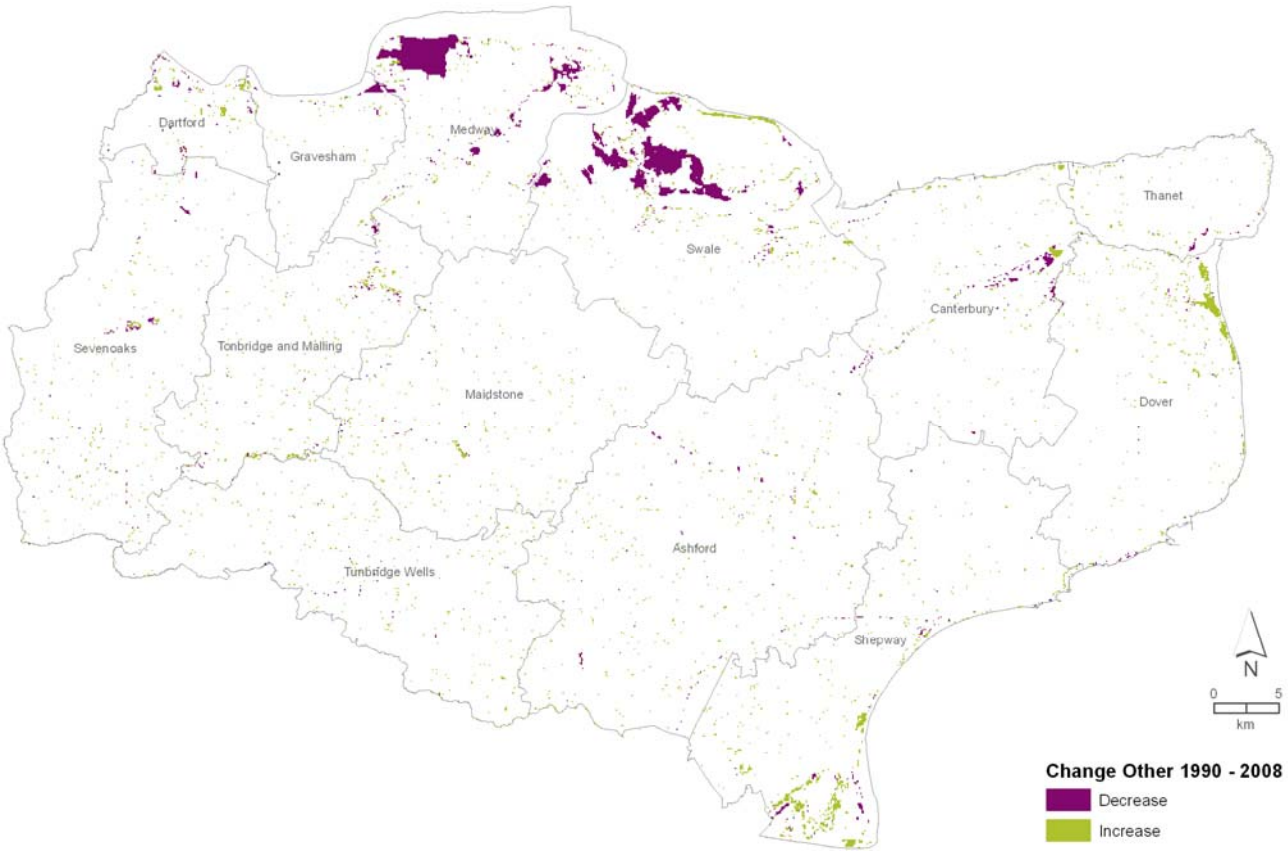
The total decrease in Other land cover (purple on map above) is 8,535ha, 77.5% of which was converted to Grassland, 9.7% lost to Arable and 9.6% to Development. Conversion to Grassland mostly concerns areas Halstow Marshes, Isle of Grain and Isle of Sheppey, where areas were previously classed as Wetland.

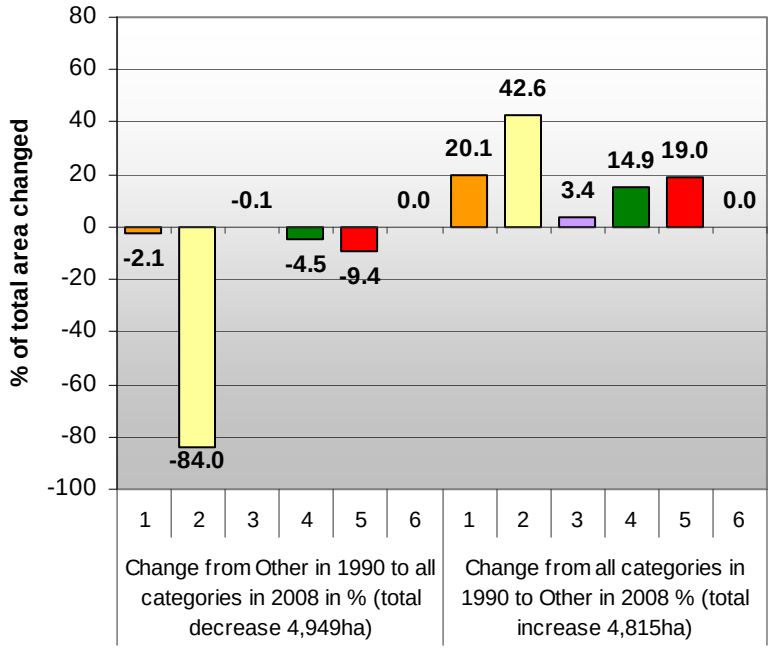
The total increase in Other during this period (in green on map above) is 5,413ha. The bulk of this increase came at the expense of Grassland (40.2%), Arable (22.4%) and Woodland (19.3%).

Conversion from Development to Other are caused by classification differences or by conversion of mineral and waste sites to Other land use.

Landcover broad categories

1 Arable
2 Grassland
3 Orchard and Hop
4 Woodland
5 Development
6 Other





Net change Other: 134ha decrease

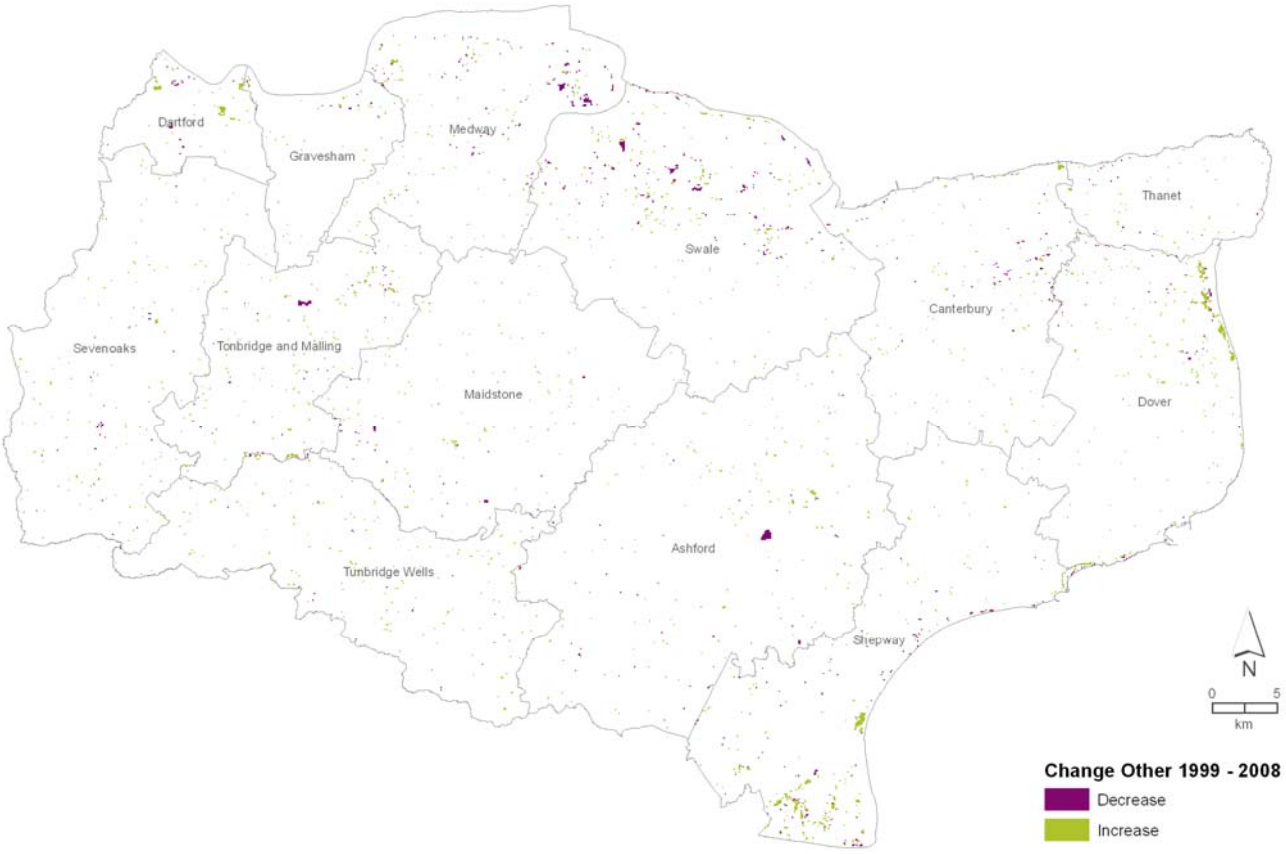
The total decrease in Other land cover (purple on map above) is 4,949ha, 84% of which was converted to Arable, 9.4% lost to Development and 4.5% to Woodland. Conversion to Grassland mostly concerns areas of Halstow Marshes and Isle of Sheppey, which were previously classed as Wetland.

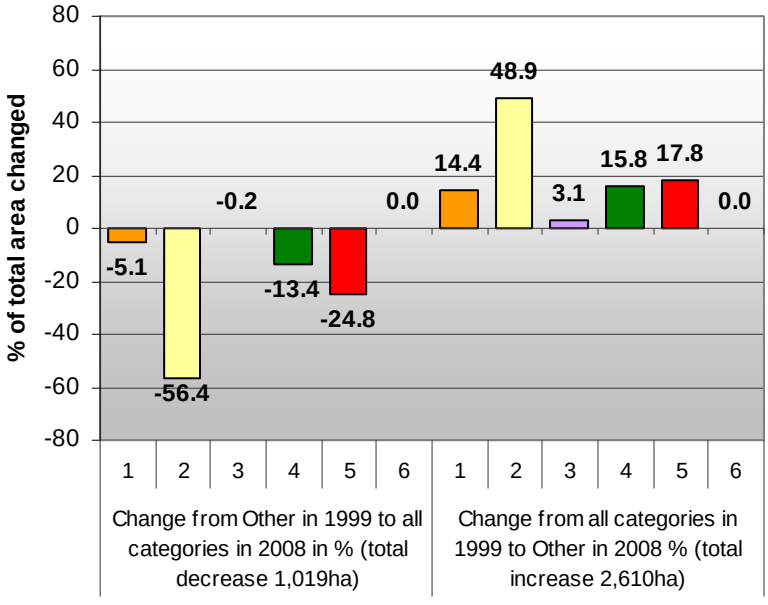
The total increase in Other during this period (in green on map above) is 4,815ha. The bulk of this increase came at the expense of Arable (42.6%), Grassland (20.1%) and Development (19.0%).

Conversions from Development to Other are caused by classification differences or by conversion of mineral and waste sites to Other land use.

Landcover broad categories

1 Arable
2 Grassland
3 Orchard and Hop
4 Woodland
5 Development
6 Other





Net change Other: 1,591ha increase

The total decrease in Other land cover (purple on map above) is 1,019ha, 56.4% of which was converted to Arable, 24.8% lost to Development and 13.4% to Woodland.

The total increase in Other during this period (in green on map above) is 2,610ha. The bulk of this increase came at the expense of Arable (40.9%), Development (17.8%) and Woodland (15.8%).

Conversions from Development to Other are caused by classification differences or by conversion of mineral and waste sites to Other land use.

Landcover broad categories

- 1 Arable
- 2 Grassland
- 3 Orchard and Hop
- 4 Woodland
- 5 Development
- 6 Other

3.8 Key findings

3.8.1 Arable and grassland combined remain stable

The combined area in the arable and grassland categories has remained remarkably stable at around 60% of the county since 1961. A decline of slightly less than 2% since 1990 was recorded. Fluctuations occur between the two categories, largely due to fluctuations in the state of the agricultural economy.

3.8.2 Loss in Orchard and Hop category

The total decrease of Orchard and Hop category by 69% since 1961 is based on the gross change of total areas. The detailed filtered change analysis confirmed a real loss of 65 % of the 1961 resource. The detailed figure also shows that there were also new areas of orchards established during this period. These consist primarily of newly established intensively managed orchards. The overall decrease in this category consists largely of loss of traditional orchards and hop fields.

3.8.3 Woodland remains largely stable

An overall decrease of Woodland since 1961 is noted, with some localised increases at the expense of arable and grassland cover. Since 1990 a net increase in Woodland area occurred, largely due to conifer plantations and planted (young) woodlands (for instance along the channel tunnel rain link and other transport verges previously classed as grassland).

3.8.4 Increase in Development to 17.3%

As expected 'Development' (urban, roads, rail, and mineral sites) is covering ever greater areas of Kent. Since 1961 a 62% increase is noted in this category. The total resource in 1961 was slightly underestimated with the exclusion of minor roads from the analysis (see 1990 Land cover change report). From 1961 to 1990 'Urban parks and playing fields' were not recorded consistently, with some recorded as grassland and some as urban, thus slightly underestimating the total 'Development' resource in those years. At the same token 'Parkland' (although inconsistently recorded) was covered in the 'Development' category in 1961 and 1990, whereas in 1999 and 2008 Parkland was recorded as its constituent habitats. This affected a total of 3,176ha in 2008 which were left out of the Development category.

The current value of 17.3% Development within Kent is one of the highest in England. Pressure on transportation links and housing to accommodate population and economical growth all contribute to the increase. Population increased from 1.2 million in 1961 to 1.73 million in 2011, a 44% increase on the 1961 resource.

3.8.5 Other remains largely unchanged

This category is less likely to develop a clear trend of increase or decrease. During earlier surveys before 1999 the intertidal zone was excluded, and areas of salt marsh, intertidal sand, mud, rock and shingle were under-recorded. The current

survey has covered these areas in detail as a large proportion of this resource is considered to be of great value for conservation and biodiversity.

Due to the different extent in surveys the filtered change analysis only covers the common extent between two periods. So, in comparison with the older data, the areas below the high water mark are excluded, whereas the gross changes, which look at county totals only, cover the wider extent of each survey (388,878 ha in 1961 and 1972, 388,435 ha in 1999 and 389,032 ha in 2008). As a result 2008 shows an overall increase in area in this category compared to previous years.

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National data available:
http://data.gov.uk/data/search?q=national+land+use+database&ext_bbox=-0.00%2C50.81%2C1.50%2C51.56&page=3

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APPENDIX A Cross tabulation for filtered change analysis

Table 7 Cross tabulation of land cover change from 1961 to 2008

				2008 Land cover (ha)												
		Broad land cover		Arable	Grassland		Orchard	Woodland		Development		Other				
	Broad land cover		Land cover	Arable	Grassland	Grassland with scrub	Orchard & hops	Scrub	Woodland	Urban	Roads	Wetland	Coastal	Misc	Category Total	Broad Category Total 1961
1961 Land cover (ha)	Arable	1	Arable	80,241	30,348	7,324	2,463	539	2,815	6,369	2,408	759	96	356	133,718	**133,718**
	Grassland	2	Grassland	34,022	33,709	11,064	679	980	3,520	10,581	2,007	1,229	600	347	98,738	
		3	Grassland with scrub	0	0	0	0	0	0	0	0	0	0	0	0	**98,738**
	Orchard	4	Orchard & hop	14,126	7,654	2,278	8,278	228	952	2,825	783	167	3	141	37,435	**37,435**
	Woodland	5	Scrub	558	1,366	1,279	74	686	2,011	1,532	353	204	303	121	8,487	
		6	Woodland	1,474	2,168	904	178	524	32,806	2,152	683	189	4	224	41,306	**49,793**
	Development	7	Urban	424	1,723	1,570	124	377	928	30,893	3,077	240	199	210	39,765	
		8	Roads	43	81	36	10	18	62	133	509	5	7	9	913	**40,678**
	Other	9	Wetland	773	5,663	421	10	65	142	336	56	910	521	30	8,927	
		10	Coastal	50	364	149	0	17	37	385	36	215	17,493	44	18,790	
		20	Misc	1	8	7	0	2	3	8	2	0	52	75	158	**27,875**
		Category Total		131,712	83,084	25,032	11,816	3,436	43,276	55,214	9,914	3,918	19,278	1,557	388,237	
		Broad Category Total 2008		**131,712**	**108,116**		**11,816**	**46,712**		**65,128**		**24,753**				

The result of the filtered change analysis is presented as a cross-tabulation, with the totals of the older data (1961 in the above table) in rows and the later date (2008) in columns.

For example, grid cells from 1961 in category Arable have changed to 5 other broad categories (in row):

- In 1961 133,718 ha was arable

- By 2008, 53,477 ha had changed: 37,672 ha to Grassland, 2,463 ha to Orchards and Hop, 3,354 ha to Woodland, etc

In 2008 a total of 131,712 ha was arable, this total contained an unchanged (since 1961) portion of 80,241 ha, and a contribution of a total of 51,471 ha from all other broad categories (in column Arable, all values, apart from the grey cell, summed). The total loss of arable can be calculated as (Total Arable 2008) 131,712 – Total Arable 1961) 133,718 = -2,006 ha.

The cross tabulations above and below give details of the filtered change analysis, comparing 1961, 1990 and 1999 with 2008.
As discussed previously these filtered change totals are different from the gross totals of the land cover grids. Filtering removes apparent change, i.e. where just 1 grid cell has recorded change, but the majority of surrounding cells have remained unchanged.

Table 8 Cross tabulation of land cover change from 1990 to 2008

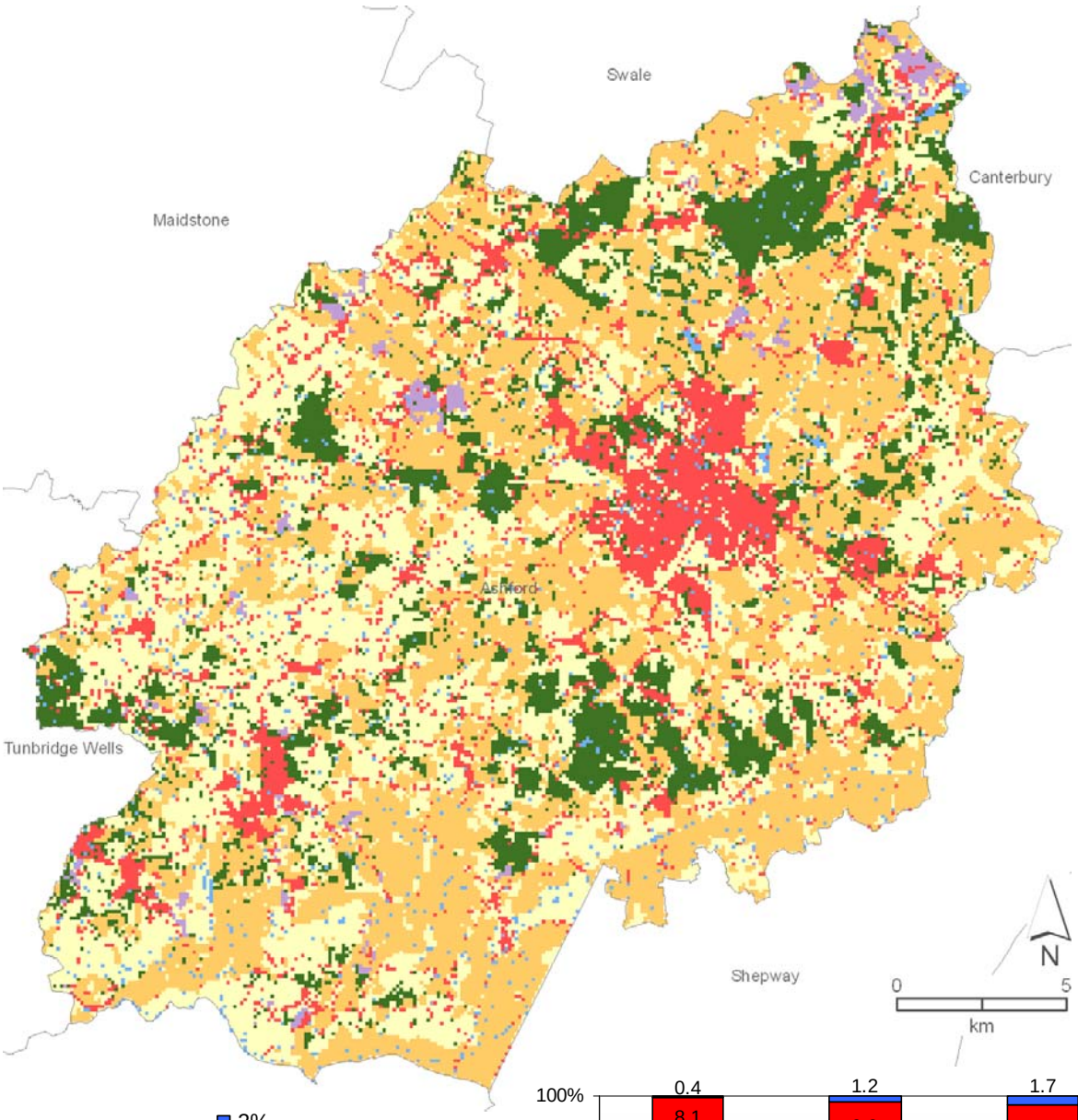
				2008 Land cover (ha)												
		Broad Land cover		Arable	Grassland		Orchard	Woodland		Development		Other				
	Broad Land cover		Land cover	Arable	Grassland	Grassland with scrub	Orchard & hops	Scrub	Woodland	Urban	Roads	Wetland	Coastal	Misc	Category Total	Broad Category Total 1990
1990 Land cover (ha)	Arable	1	Arable	107,493	18,813	5,317	1,725	418	2,241	3,155	919	594	100	275	141,050	**141,050**
	Grassland	2	Grassland	16,924	52,400	13,298	753	752	3,357	9,981	1,038	844	599	353	100,299	
		3	Grassland with scrub	56	528	1,137	29	238	209	299	48	86	147	23	2,800	**103,099**
	Orchard	4	Orchard & hops	6,583	3,417	813	9,019	87	466	912	185	69	3	92	21,646	**21,646**
	Woodland	5	Scrub	95	562	906	38	688	752	777	108	131	129	83	4,269	
		6	Woodland	694	1,400	684	129	619	34,002	1,207	279	158	5	210	39,387	**43,656**
	Development	7	Urban	560	2,439	2,068	144	430	1,241	38,543	1,754	310	280	263	48,032	
		8	Roads	172	223	135	24	74	250	336	4,812	13	8	40	6,087	**54,119**
	Other	9	Wetland	61	3,515	335	5	40	123	145	27	1,460	583	13	6,307	
		10	Coastal	14	185	89	0	11	30	272	10	109	17,373	43	18,136	
		20	Misc	27	14	17	0	2	15	9	3	13	51	74	225	**24,668**
		Category Total		132,679	83,496	24,799	11,866	3,359	42,686	55,636	9,183	3,787	19,278	1,469	388,238	
		Broad Category Total 2008		**132,679**	**108,295**		**11,866**	**46,045**		**64,819**		**24,534**				

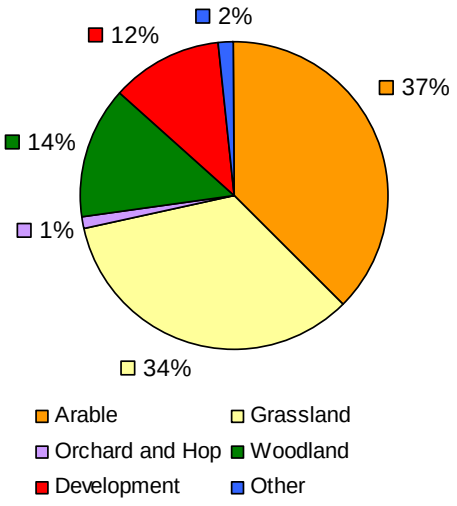
Table 9 Cross tabulation of land cover change from 1999 to 2008

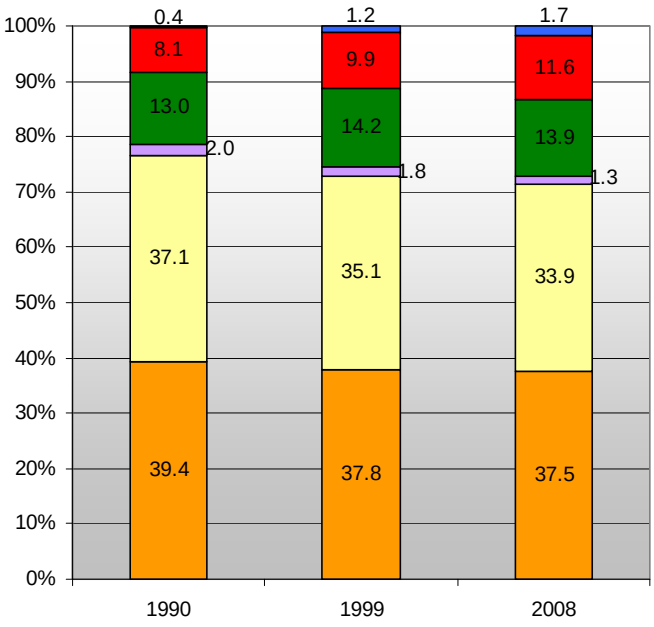
				2008 Land cover (ha)												
		Broad Land cover		Arable	Grassland		Orchard	Woodland		Development		Other				
	Broad Land cover		Land cover	Arable	Grassland	Grassland with scrub	Orchard & hops	Scrub	Woodland	Urban	Roads	Wetland	Coastal	Misc	Category Total	Broad Category Total 1999
1999 Land cover (ha)	Arable	1	Arable	120,697	14,024	2,899	1,528	121	507	1,002	461	146	27	202	141,614	**141,614**
	Grassland	2	Grassland	8,556	60,711	9,099	232	310	804	5,350	712	274	386	276	86,710	
		3	Grassland with scrub	604	3,945	9,793	69	760	573	2,248	380	146	52	143	18,713	**105,423**
	Orchard	4	Orchard & hop	2,318	1,262	338	9,748	21	141	170	86	16	0	65	14,165	**14,165**
	Woodland	5	Scrub	34	109	232	37	1,267	504	249	75	15	5	60	2,587	
		6	Woodland	811	890	560	123	475	39,874	689	413	72	12	249	44,168	**46,755**
	Development	7	Urban	306	1,717	1,232	79	195	427	45,648	1,634	94	56	253	51,641	
		8	Roads	164	228	135	24	75	248	338	4,946	12	7	42	6,219	**57,860**
	Other	9	Wetland	52	291	186	2	32	100	82	17	2,857	654	4	4,277	
		10	Coastal	0	63	19	0	1	3	61	9	58	17,225	14	17,453	
		20	Misc	0	13	3	0	1	0	76	8	0	23	119	243	**21,973**
		Category Total		133,542	83,253	24,496	11,842	3,258	43,181	55,913	8,741	3,690	18,447	1,427	387,790	
		Broad Category Total 2008		**133,542**	**107,749**		**11,842**	**46,439**		**64,654**		**23,564**				

APPENDIX B Land cover summary by district

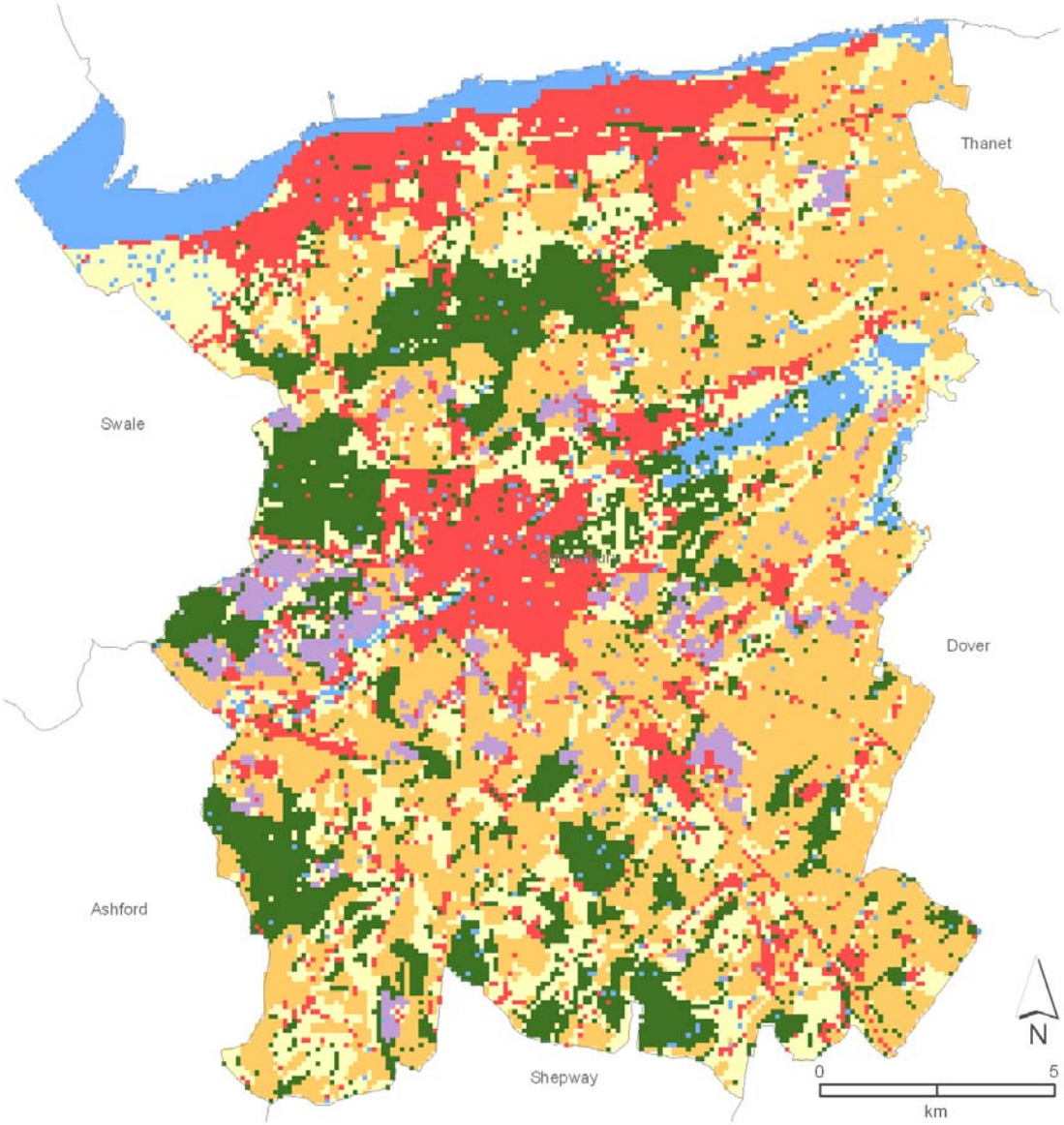
B.1 Land cover 2008 Ashford

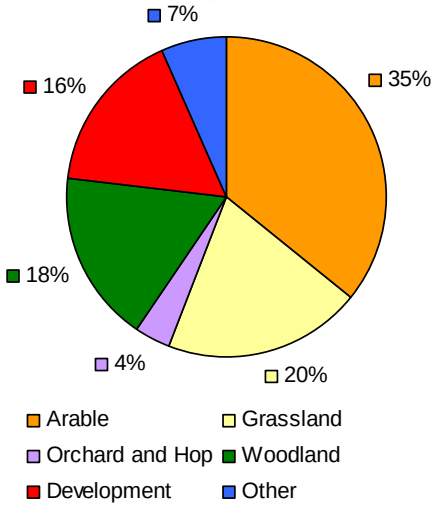


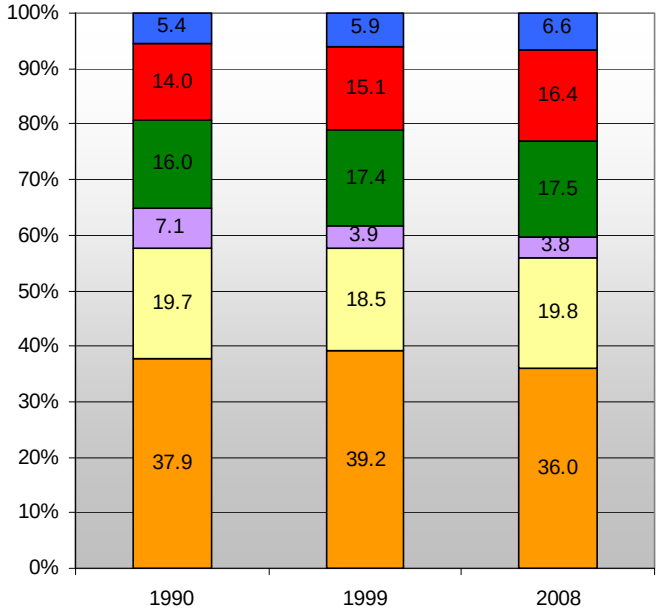




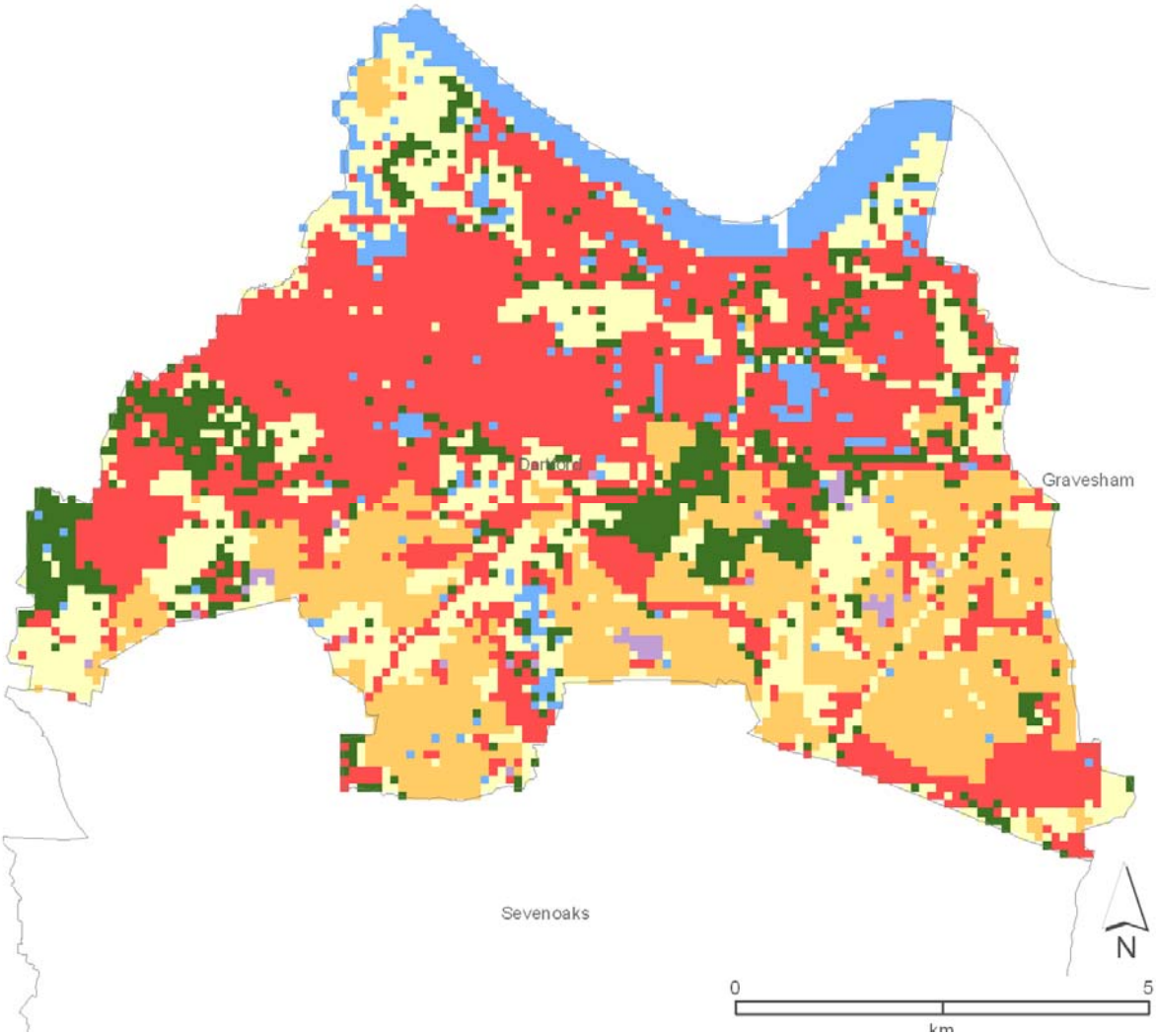
B.2 Land cover 2008 Canterbury

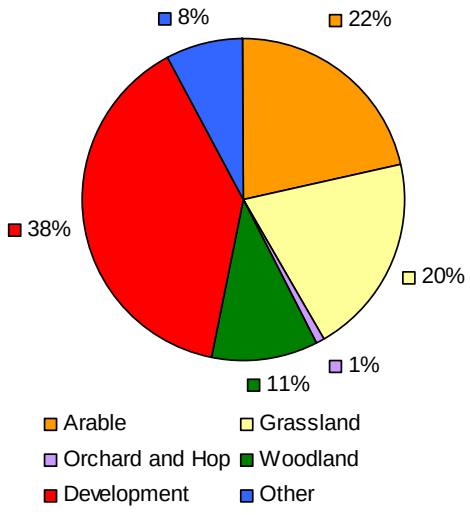


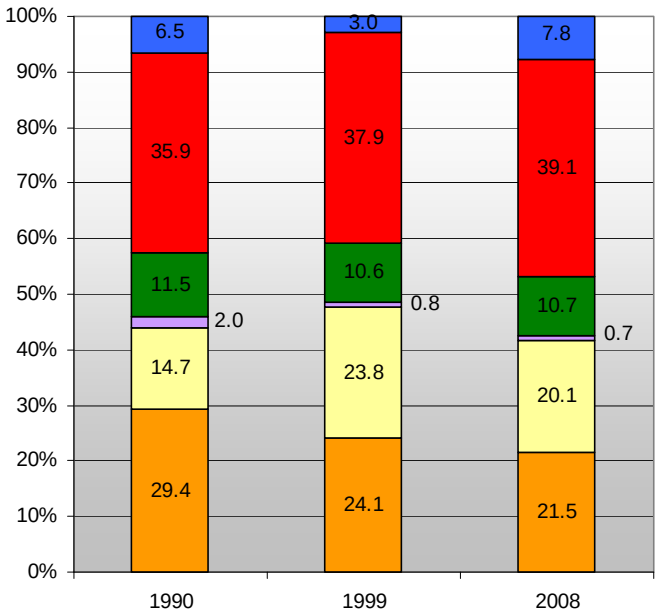




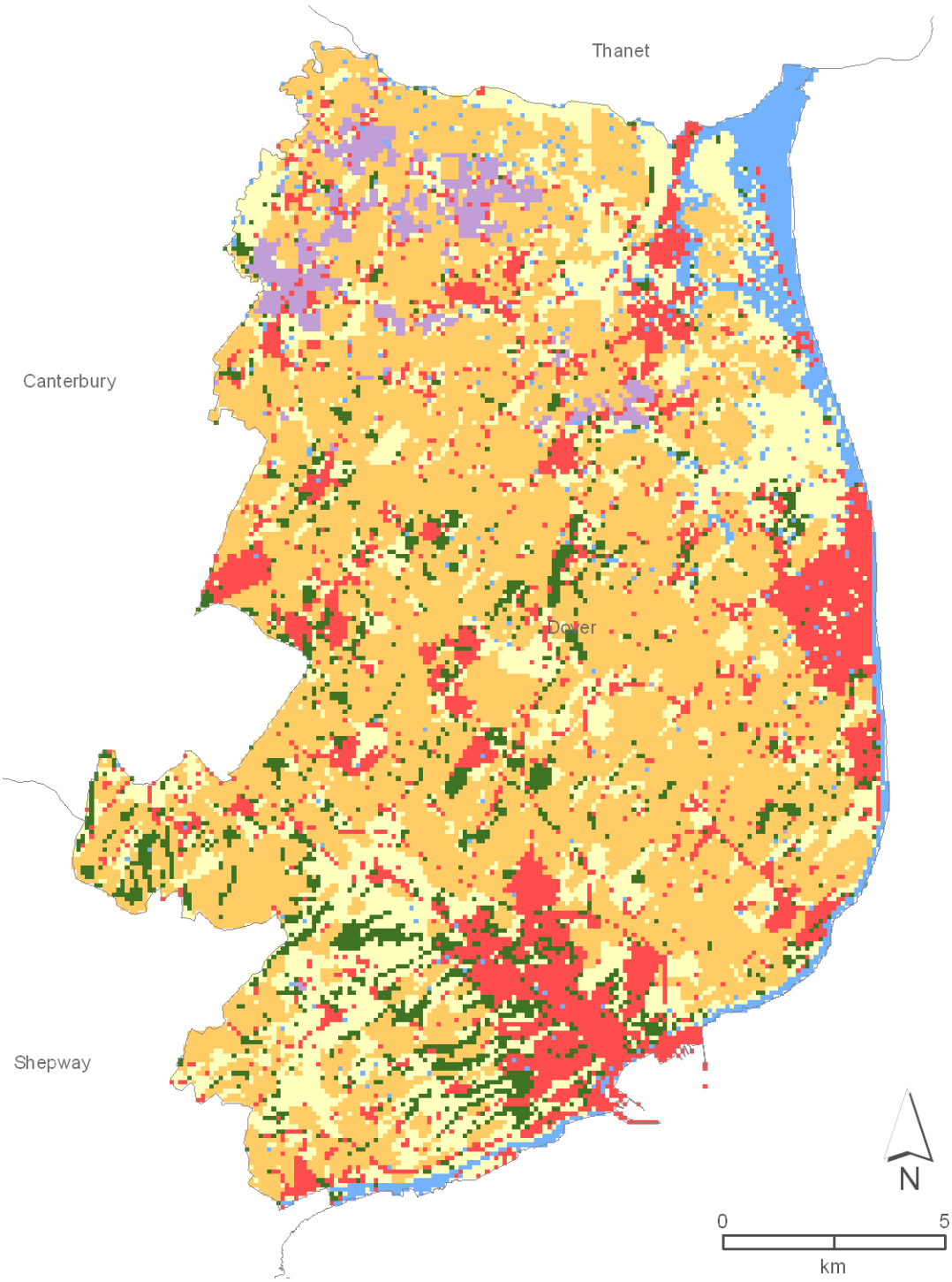
Land cover 2008 Dartford

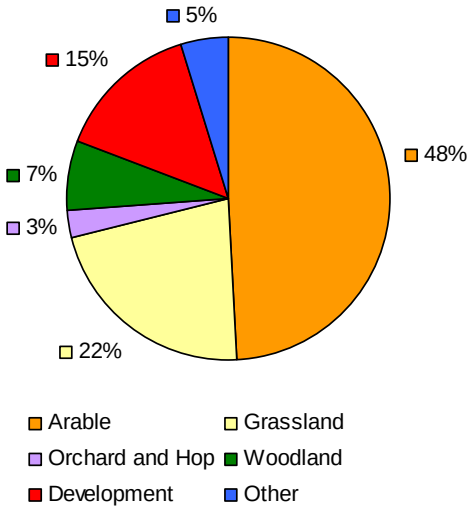


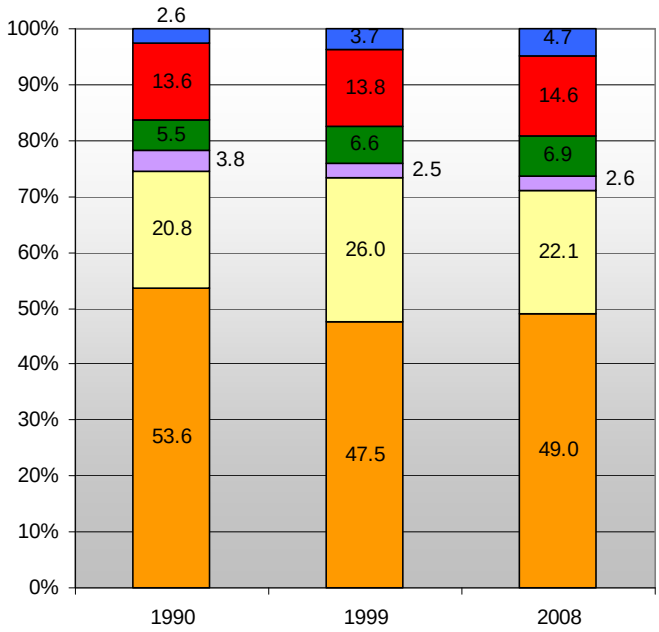




B.3 Land cover 2008 Dover




5%
15%
48%
7%
3%
22%
Arable
Grassland
Orchard and Hop
Woodland
Development
Other


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2.6
13.6
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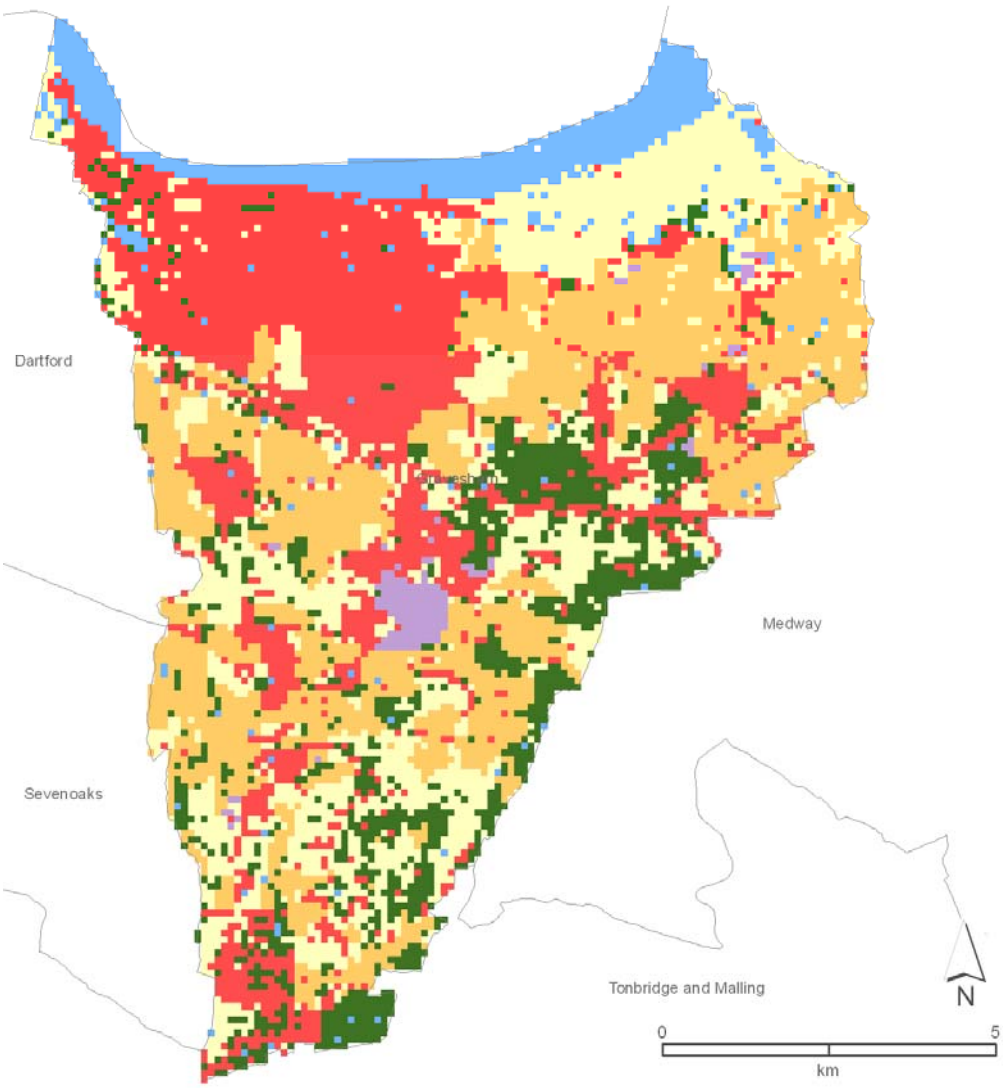
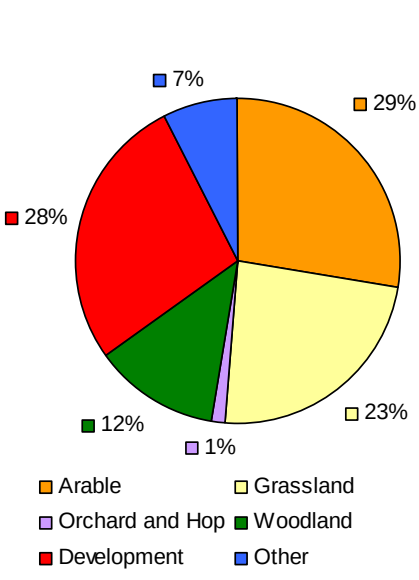
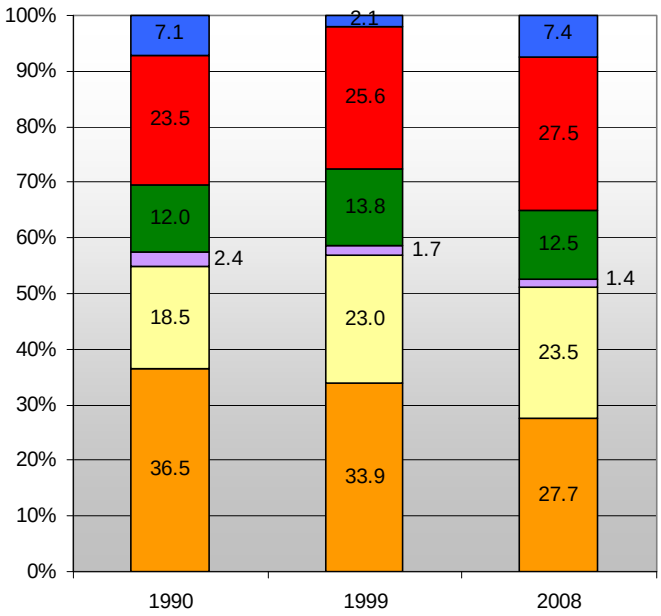
3.8
20.8
53.6
3.7
13.8
6.6
2.5
26.0
47.5
4.7
14.6
6.9
2.6
22.1
49.0
1990
1999
2008

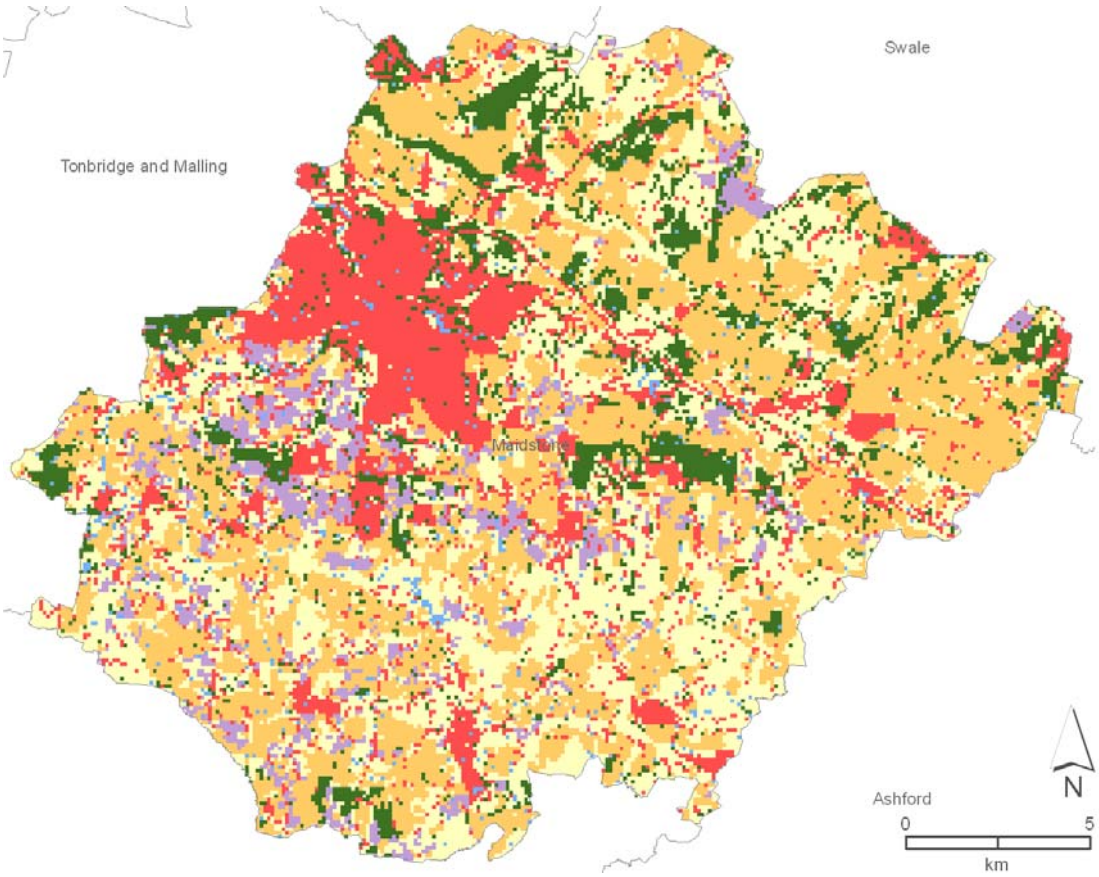
B.4 Land cover 2008 Gravesham

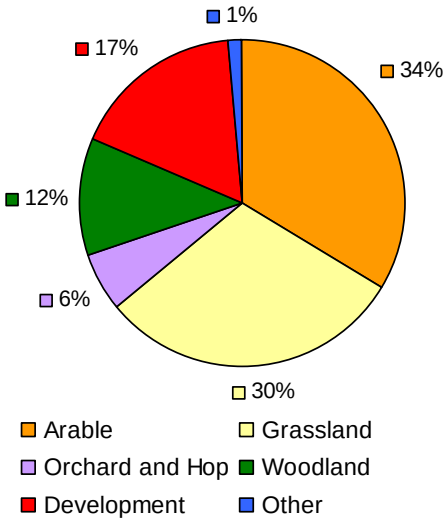


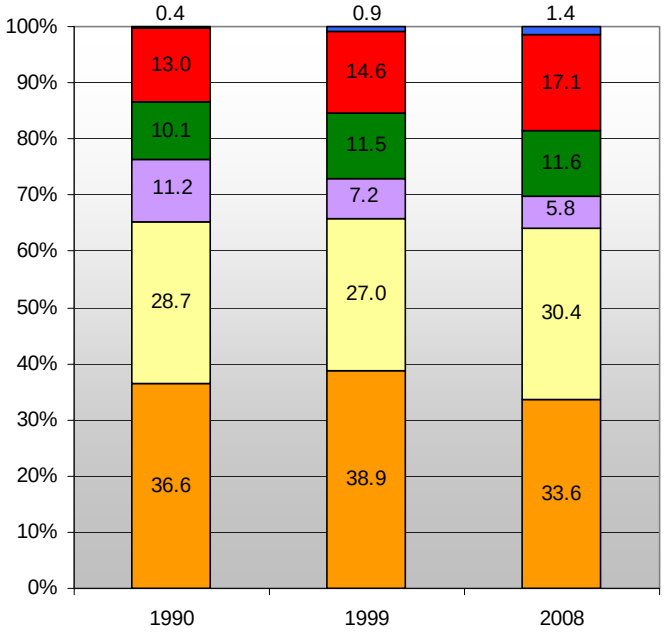




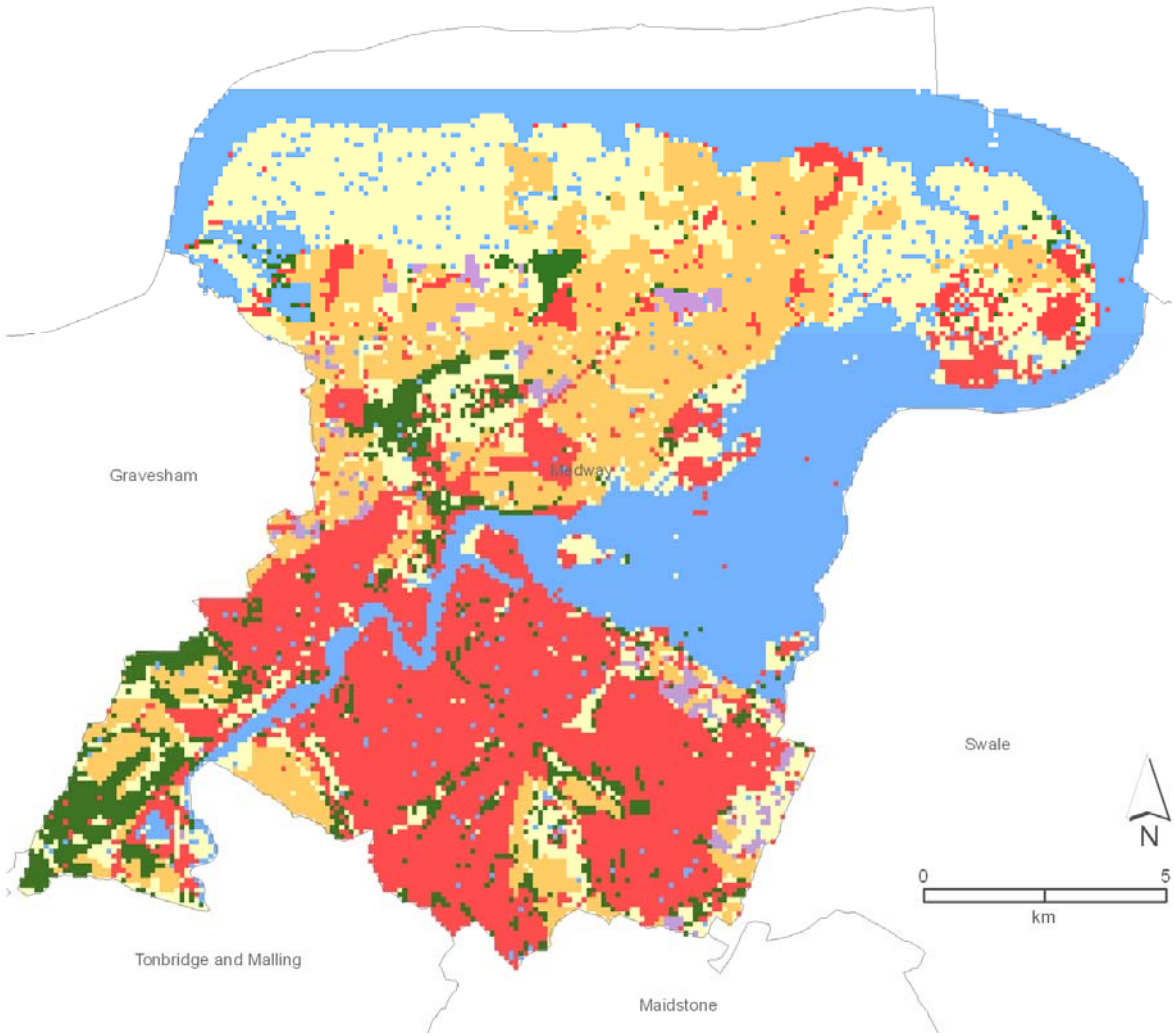
B.5 Land cover 2008 Maidstone

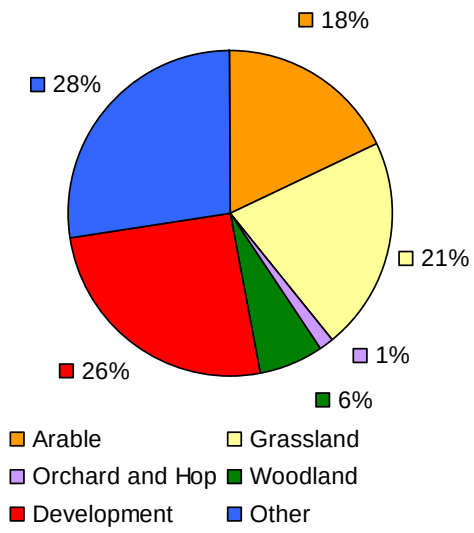


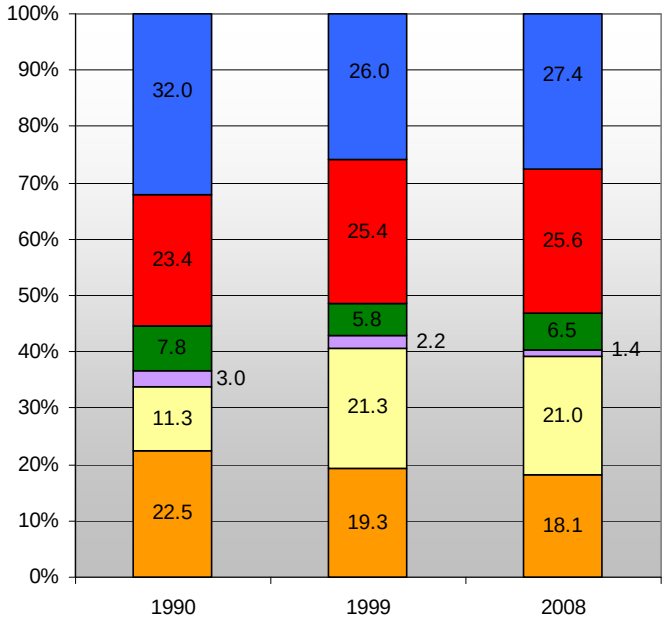




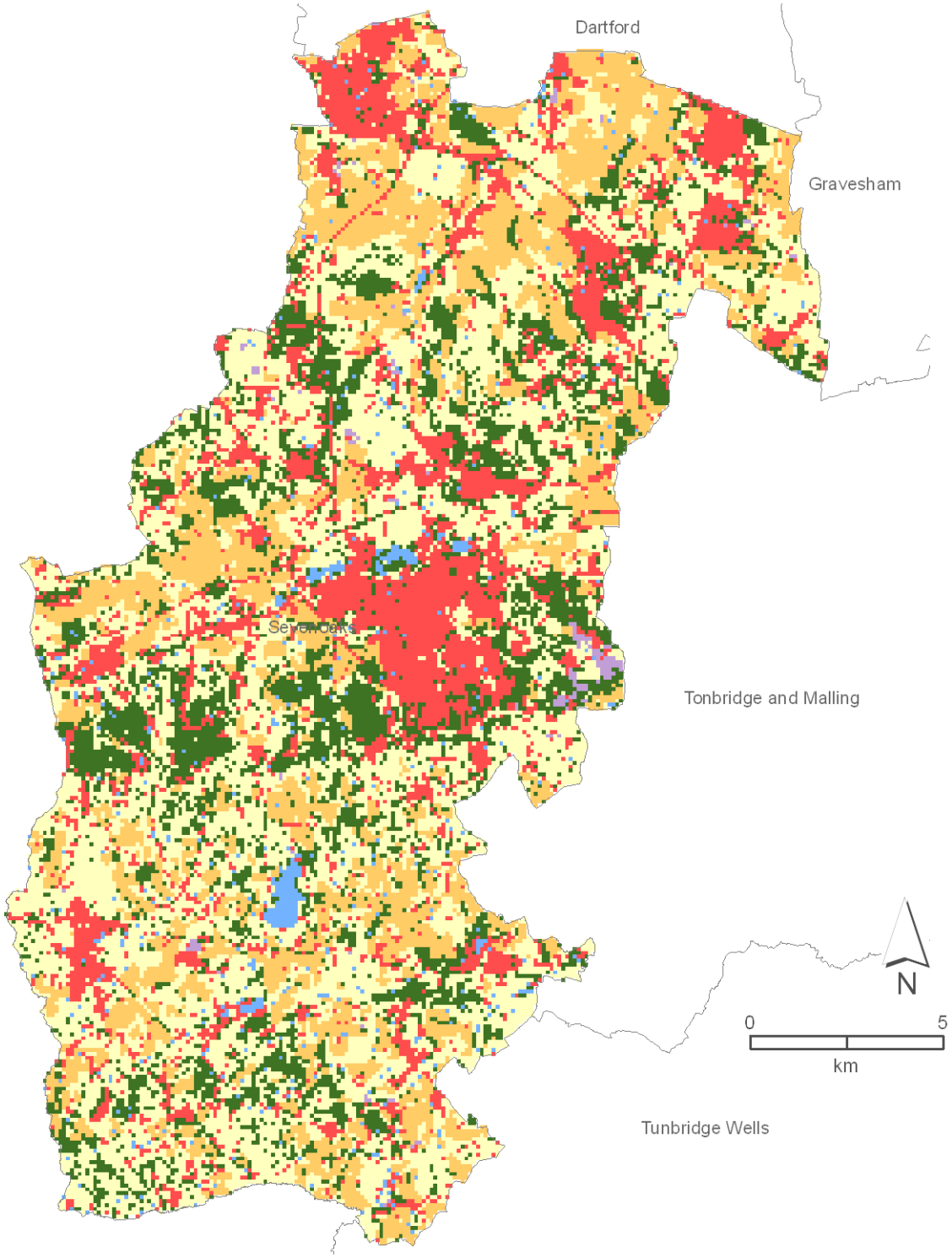
B.6 Land cover 2008 Medway

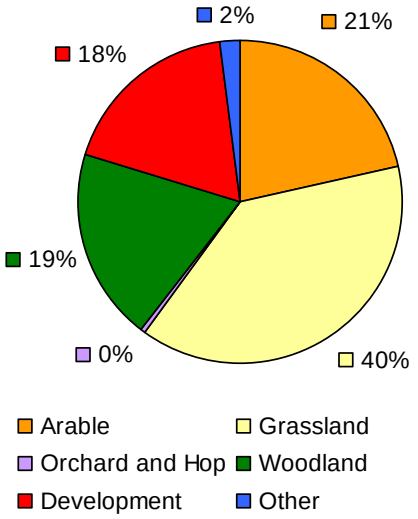


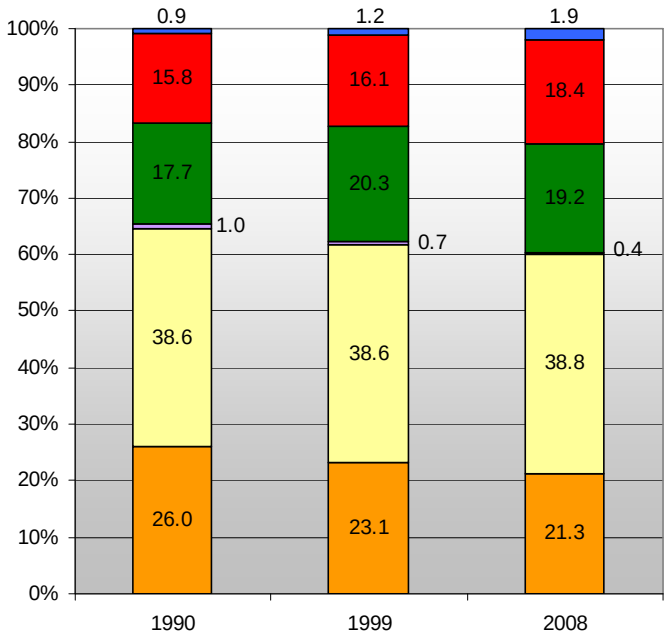




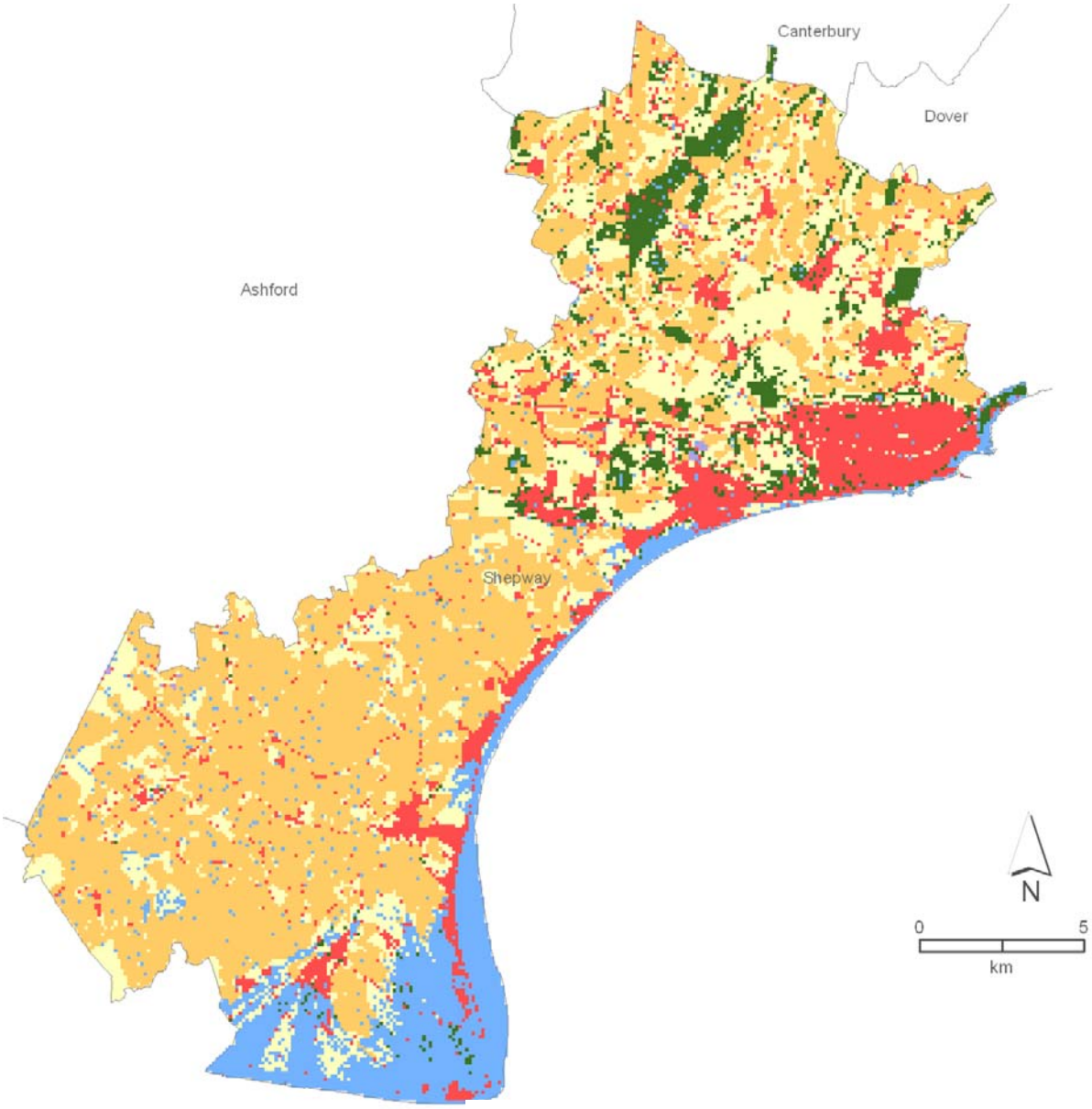
B.7 Land cover 2008 Sevenoaks

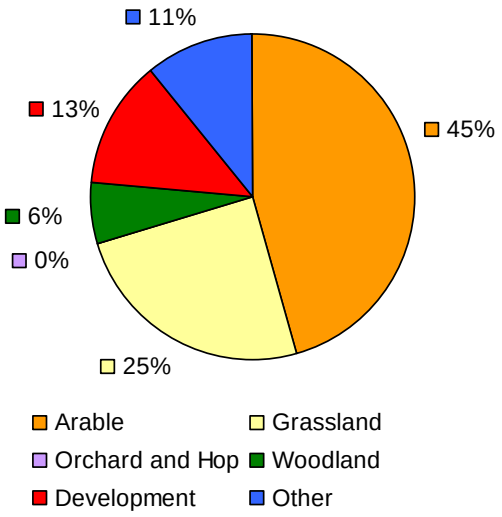


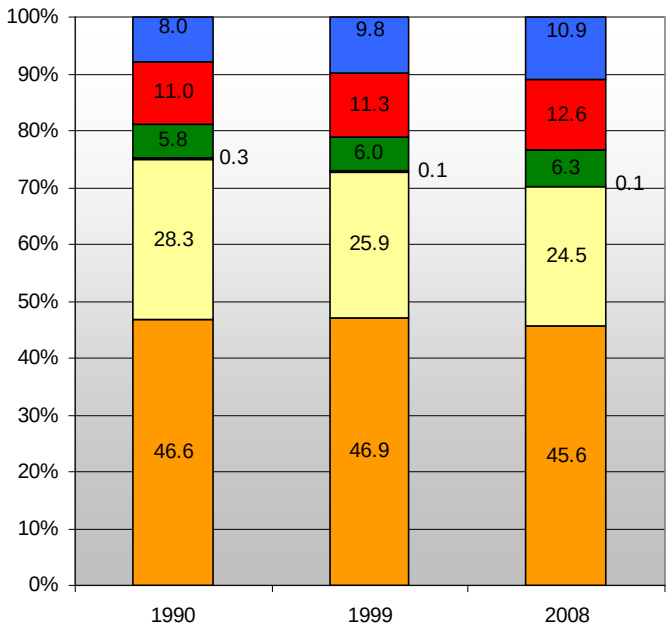

2%
21%
18%
19%
0%
40%
Arable
Grassland
Orchard and Hop
Woodland
Development
Other


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.9
1.2
1.9
15.8
16.1
18.4
17.7
20.3
19.2
1.0
0.7
0.4
38.6
38.6
38.8
26.0
23.1
21.3
1990
1999
2008

B.8 Land cover 2008 Shepway

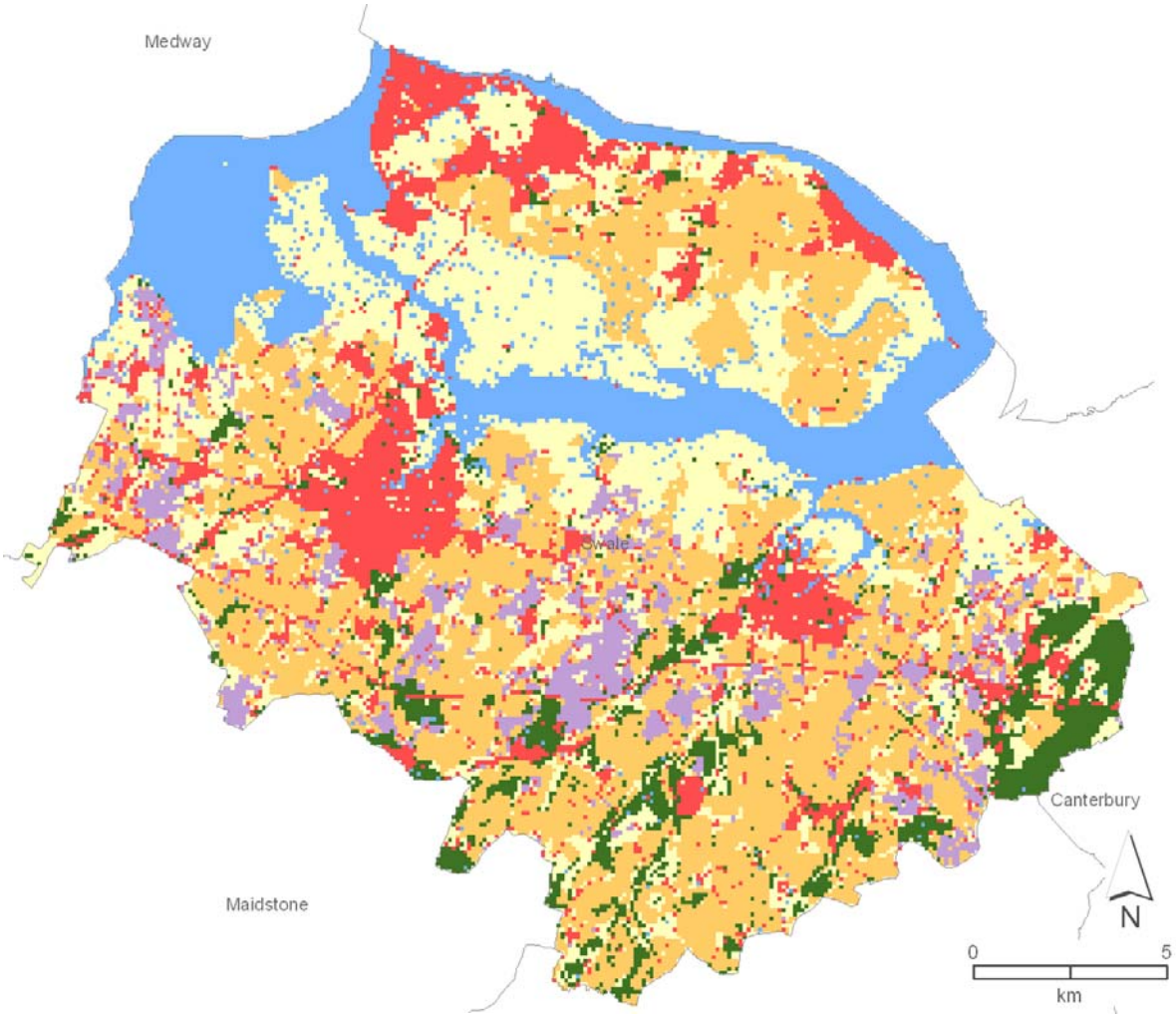


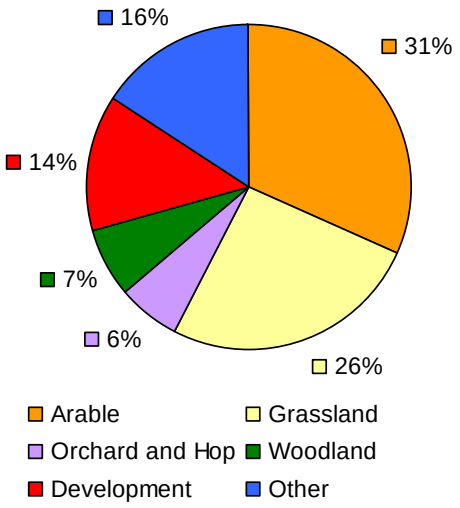


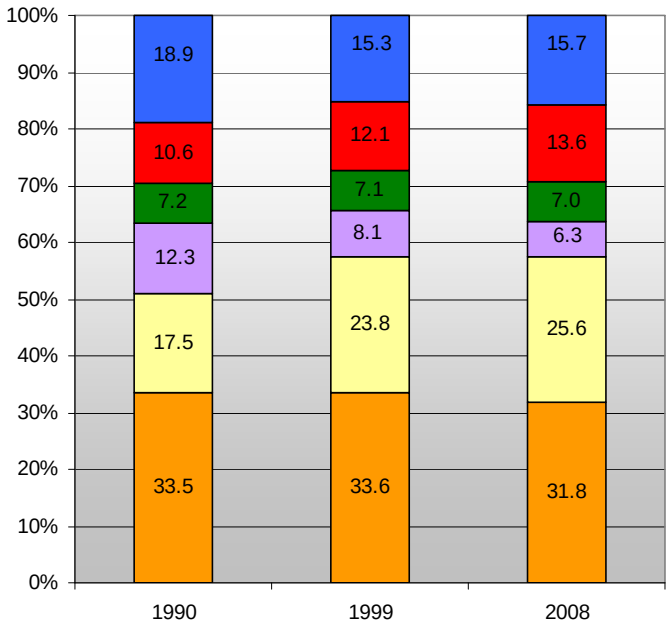


Land cover change in Kent 1961 - 20

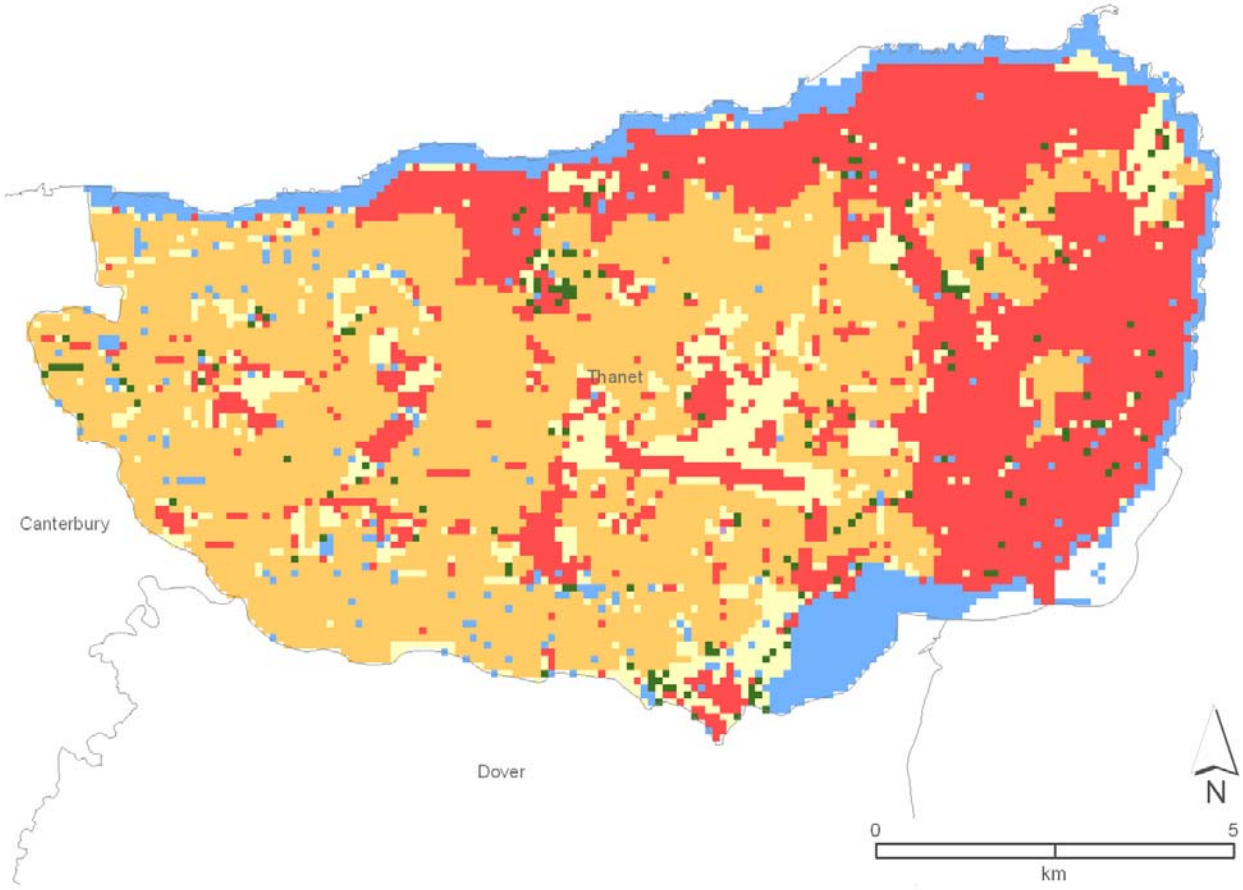
B.9 Land cover 2008 Swale

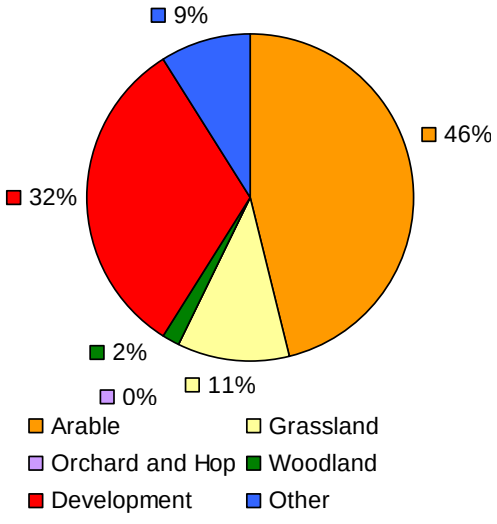


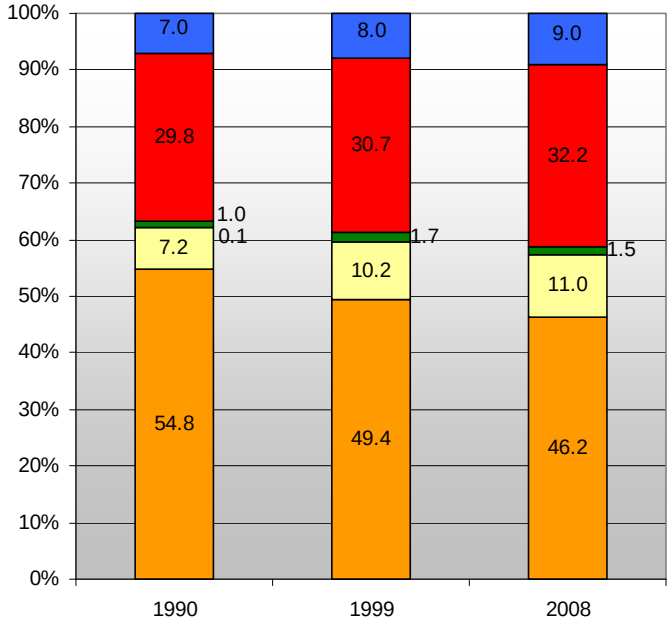




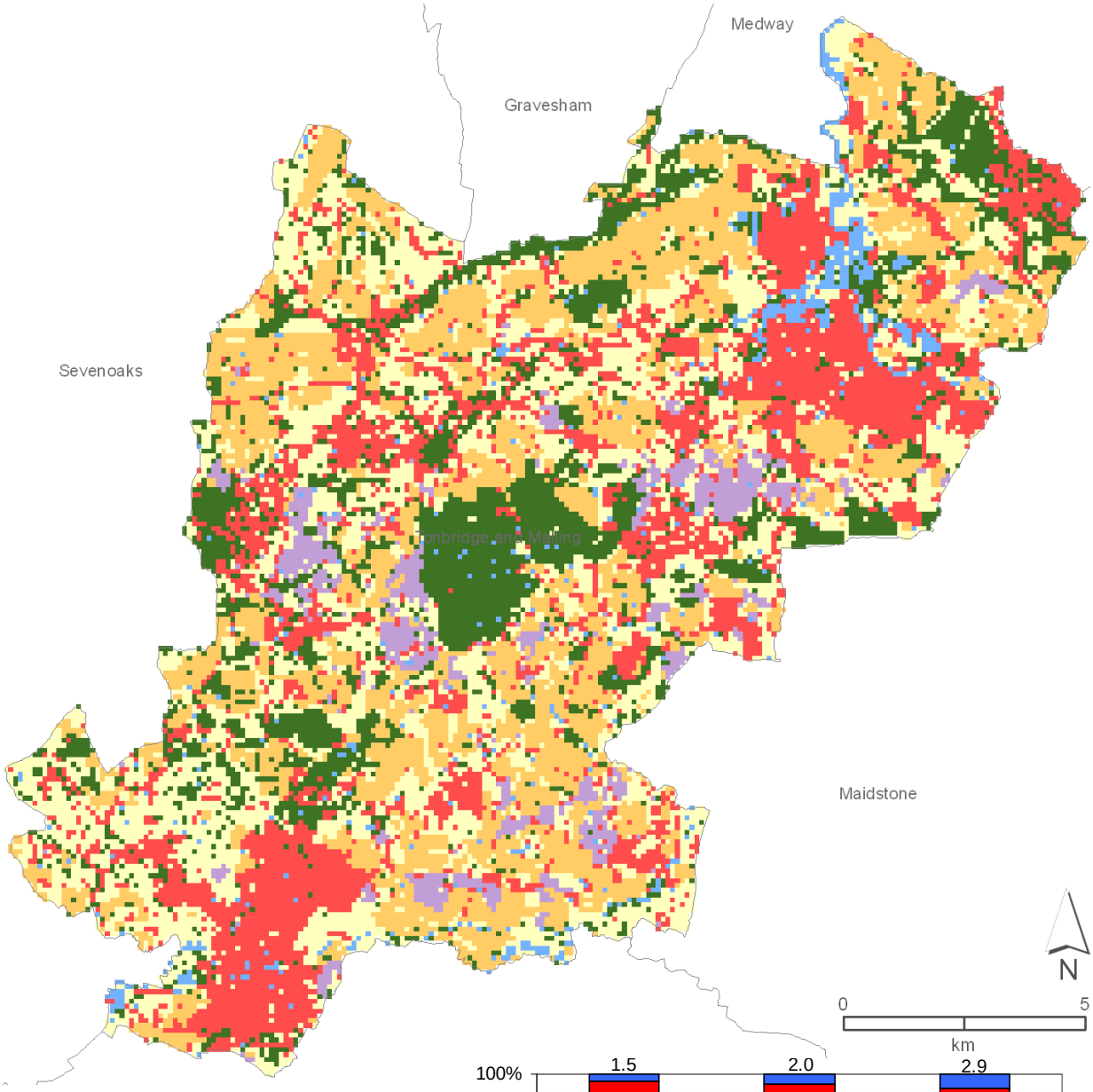
B.10 Land cover 2008 Thanet

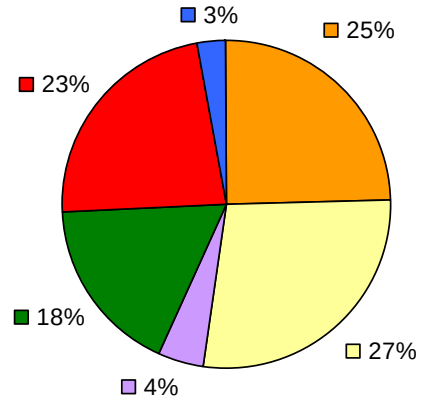


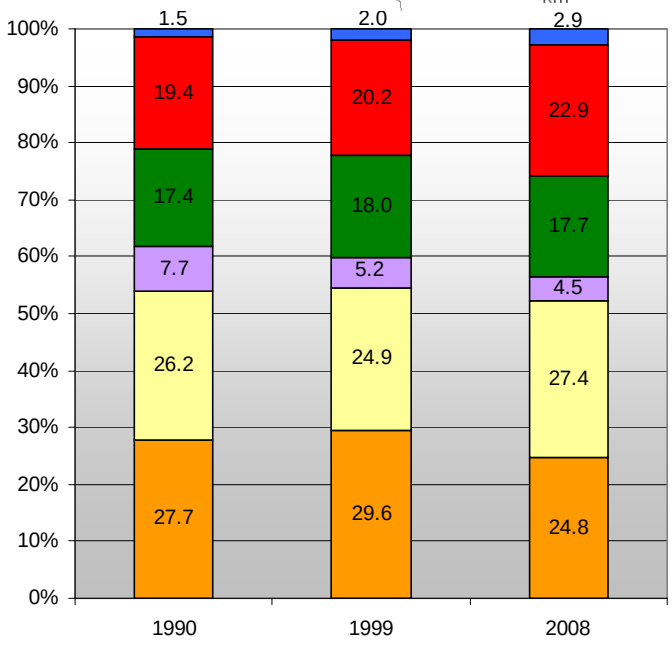




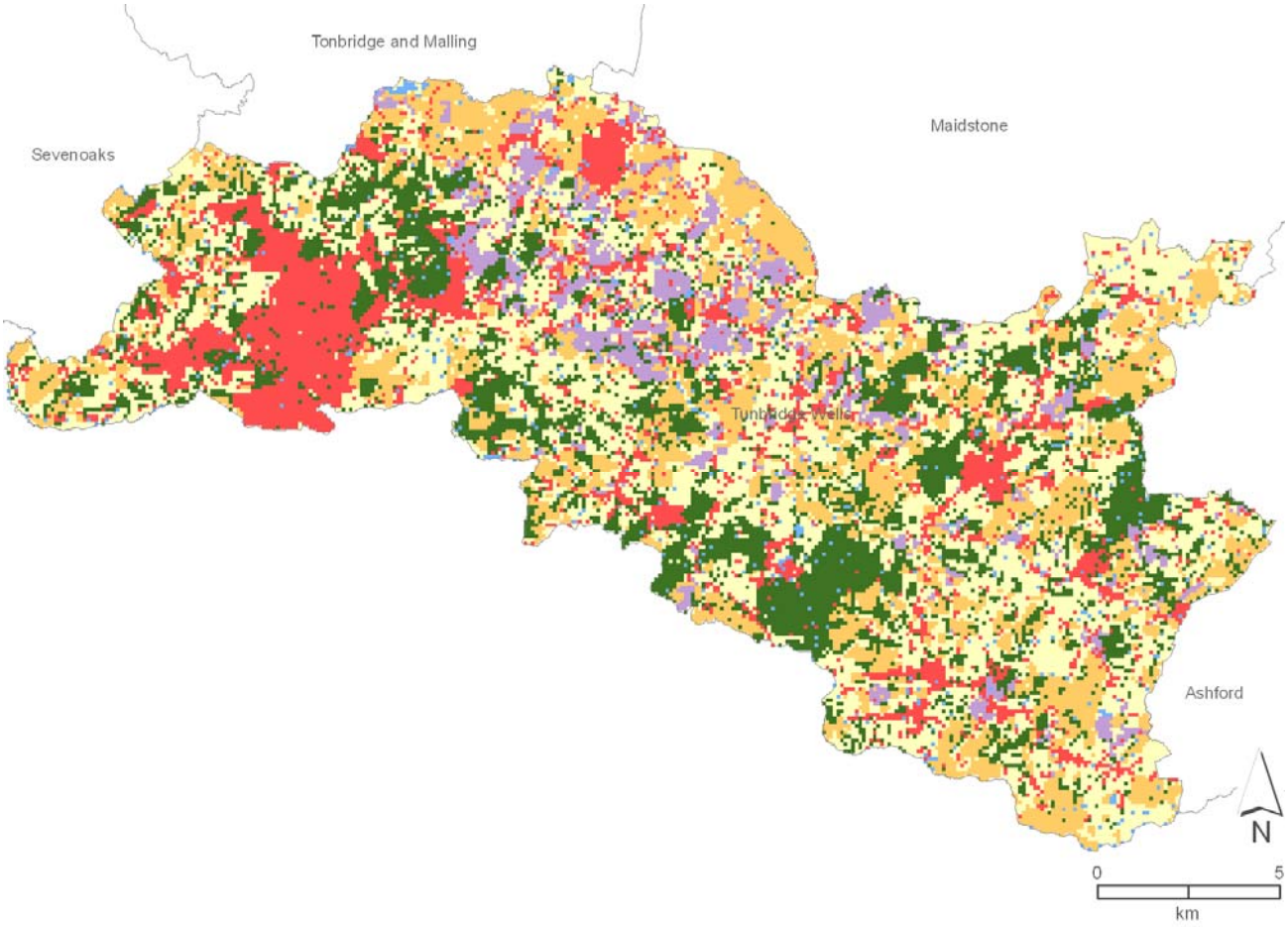
B.11 Land cover 2008 Tonbridge and Malling

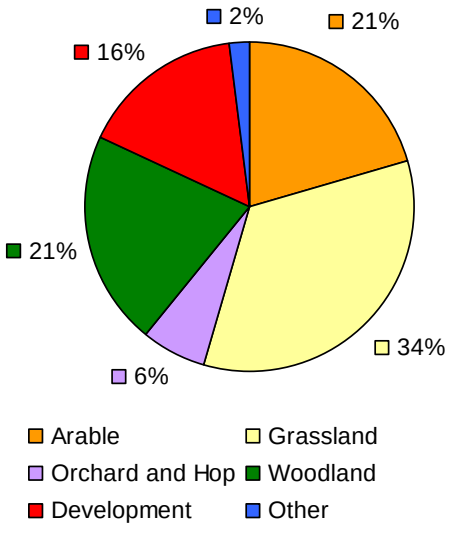


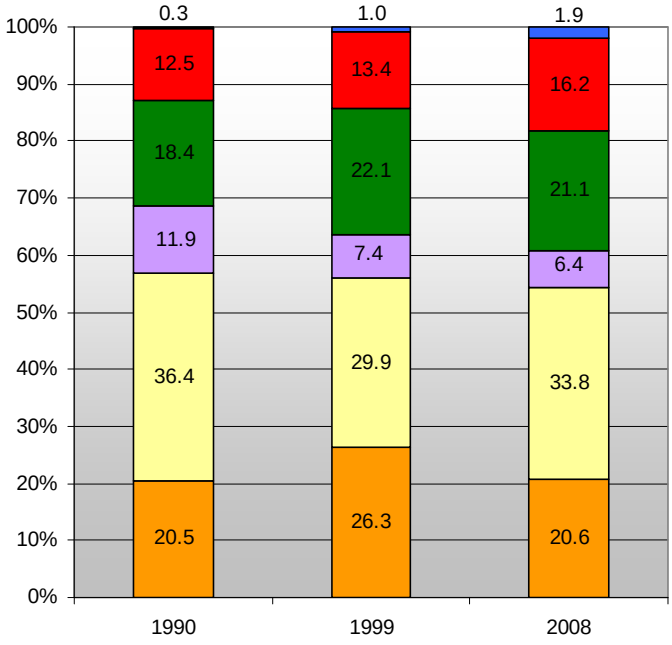




B.12 Land cover 2008 Tunbridge Wells







This report is part of the ARCH project, with analyses and results based on findings in the Kent Habitat Survey 2012.

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