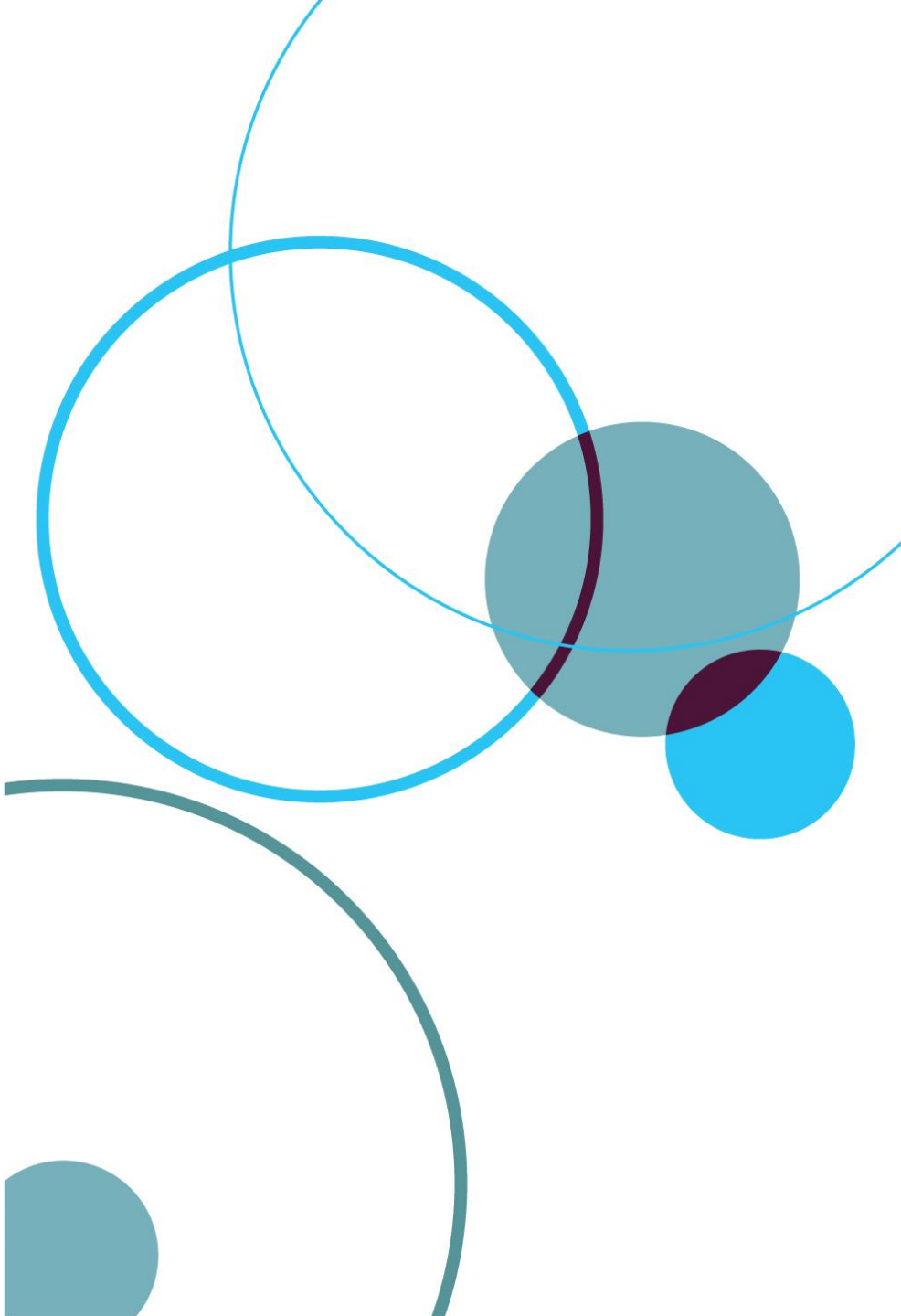
: vivideconomics

Cranfield Water

A valuation of the natural capital of the Cam and Ely-Ouse catchment

Final report prepared for WWF-UK – Appendix 2

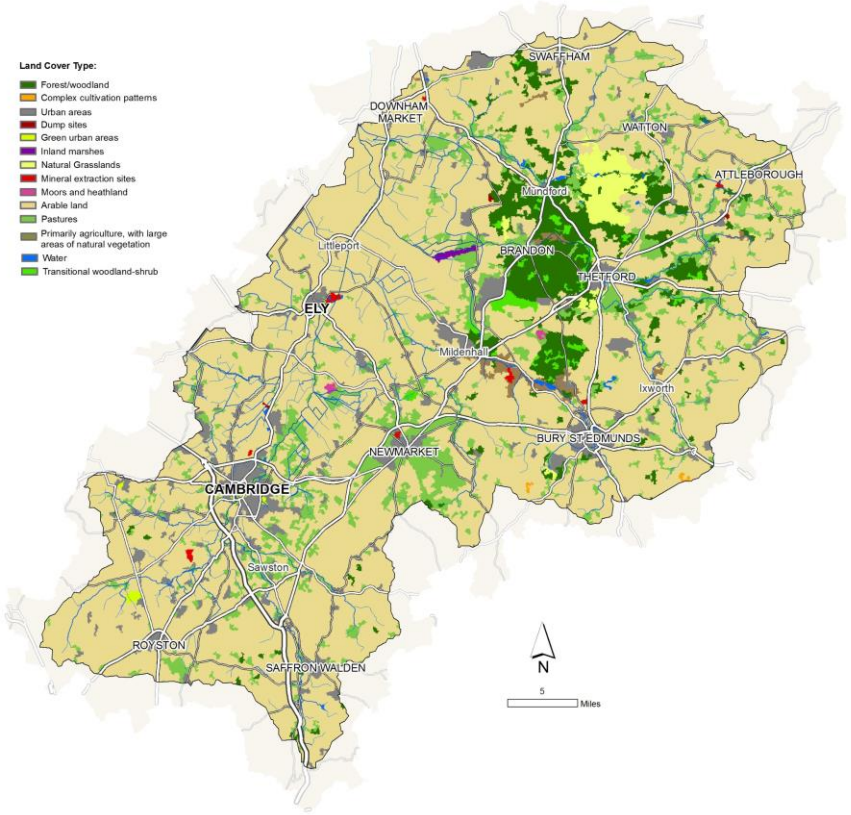
August 2017

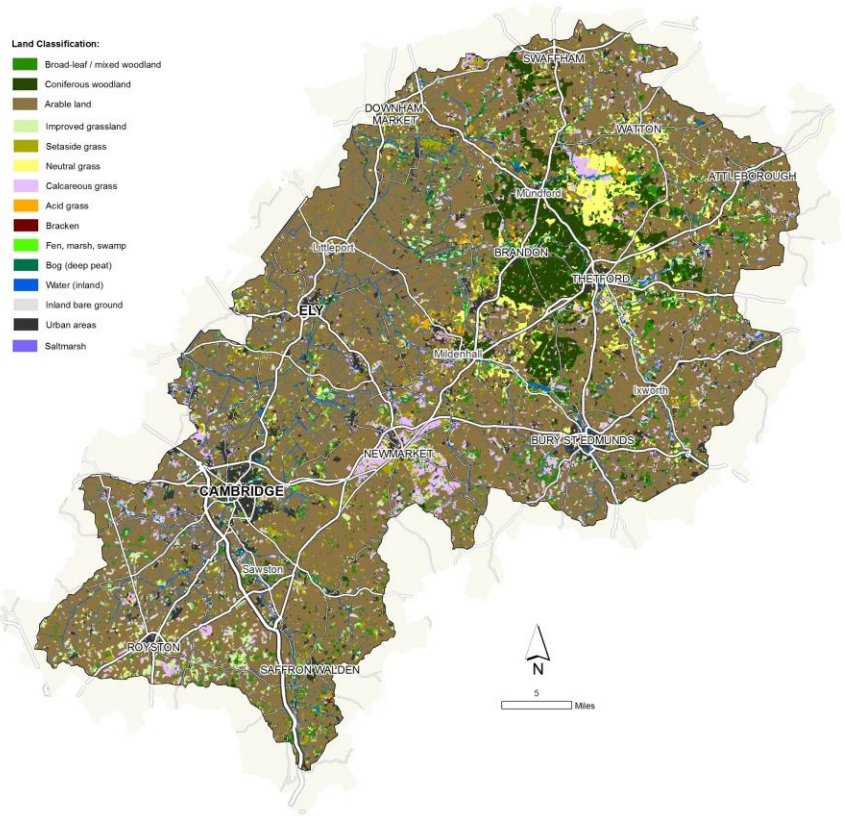


Appendix 2: Maps and Data Tables

1. Maps of catchment activity, natural capital assets and ecosystem services
2. Data tables supporting valuation and soilscapes scenario

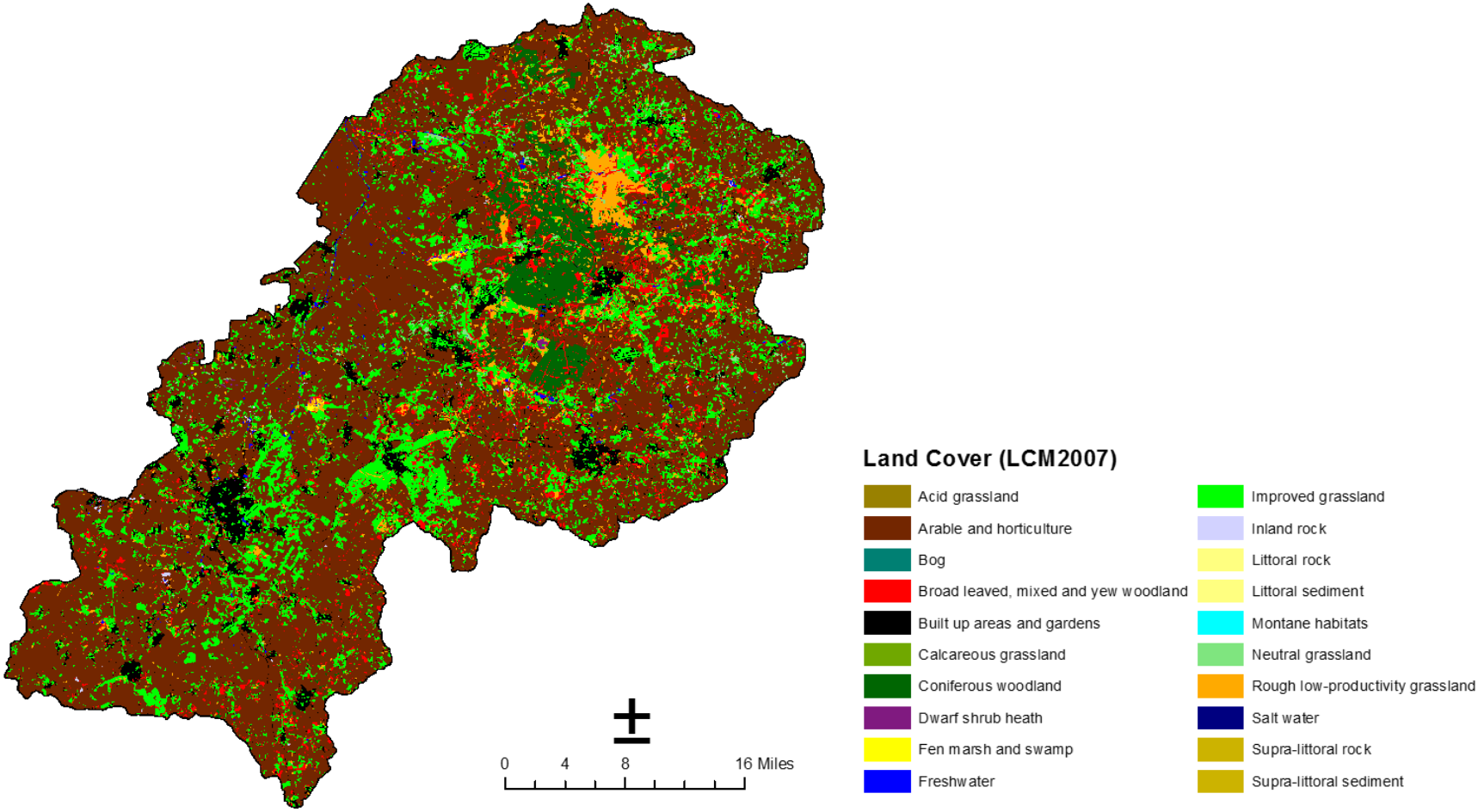
Land cover in CamEO (1)





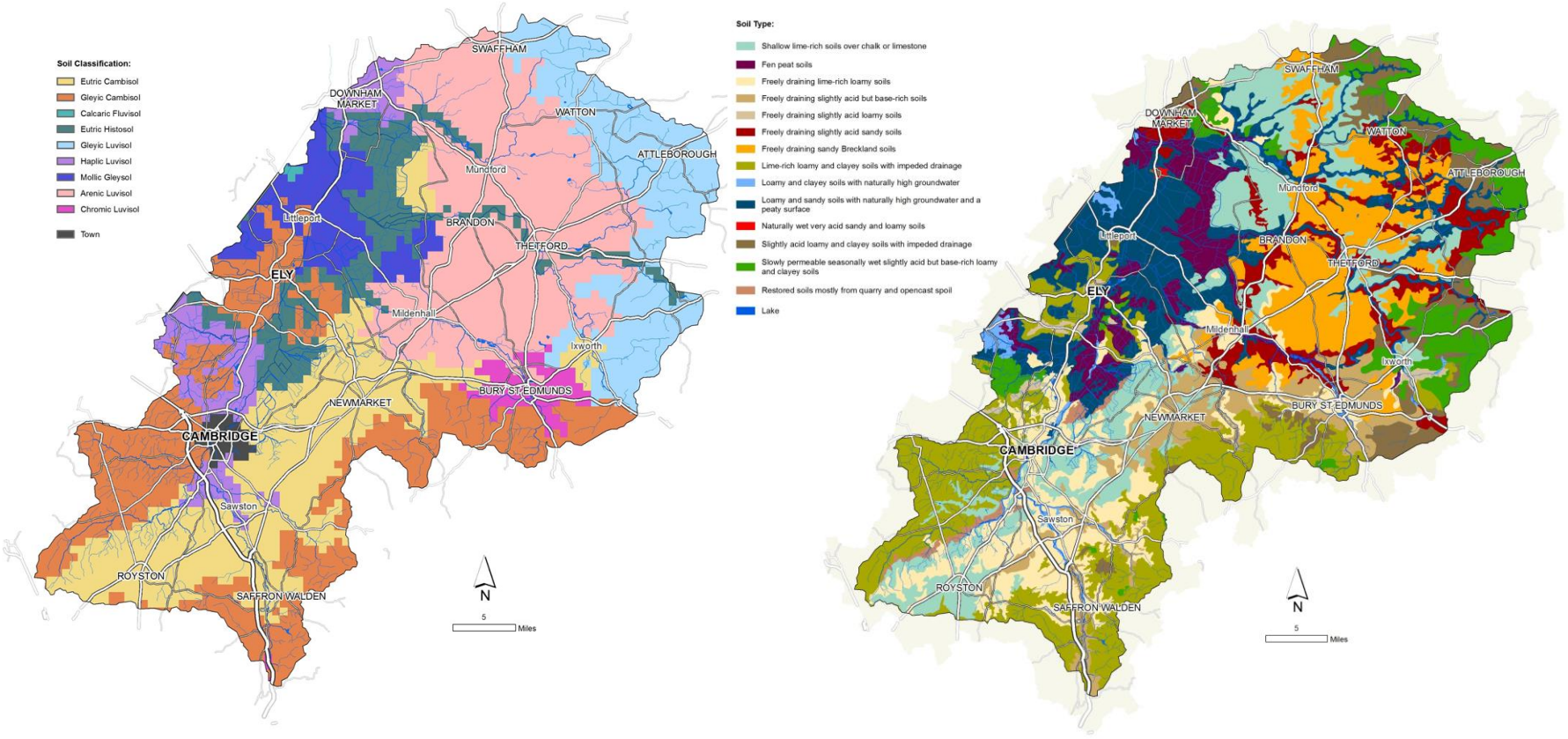
Source: The Rivers Trust

Land cover in CamEO (2)



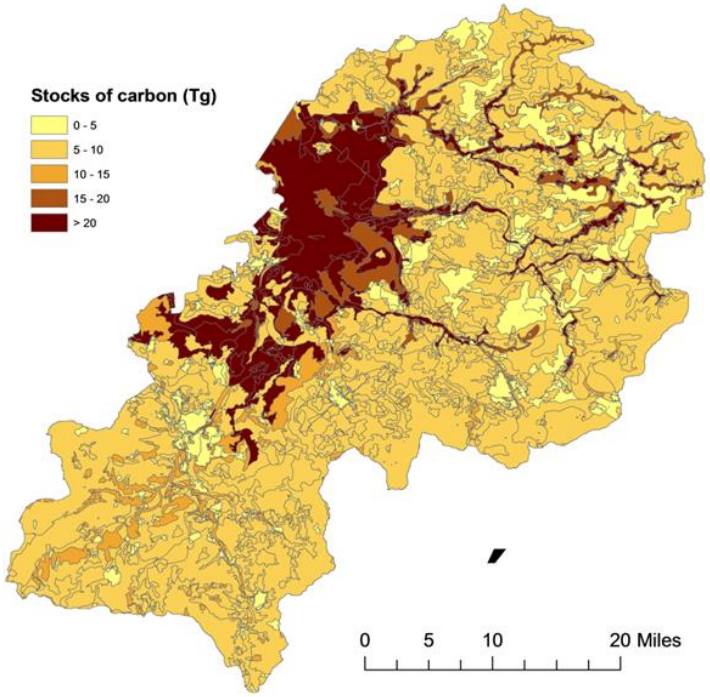
Source: Cranfield University

Soil resources in CamEO (1)



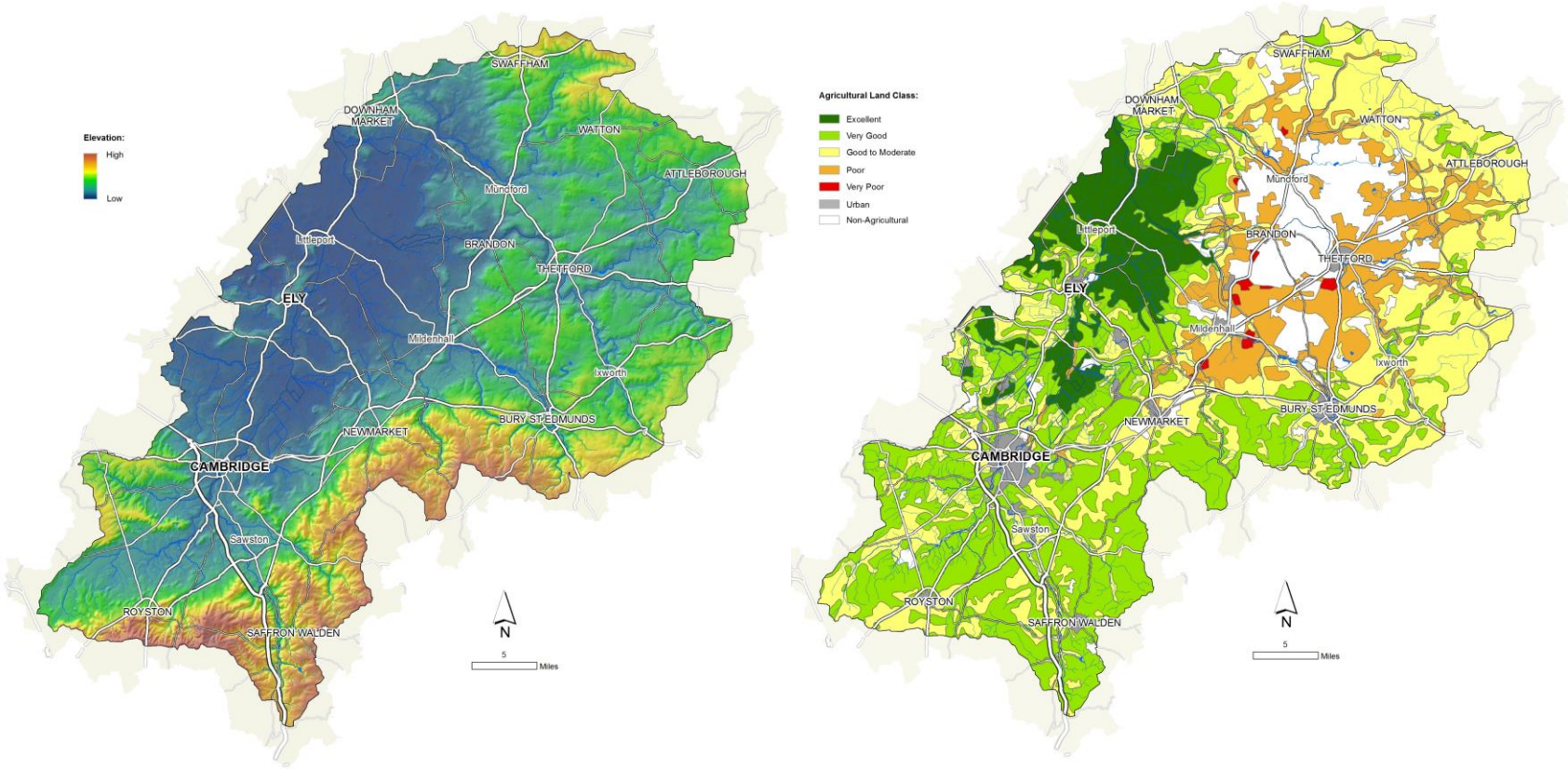
Source: The Rivers Trust

Soil resources in CamEO (2)



Source: Cranfield University

Land quality in CamEO (1)



Source: The Rivers Trust

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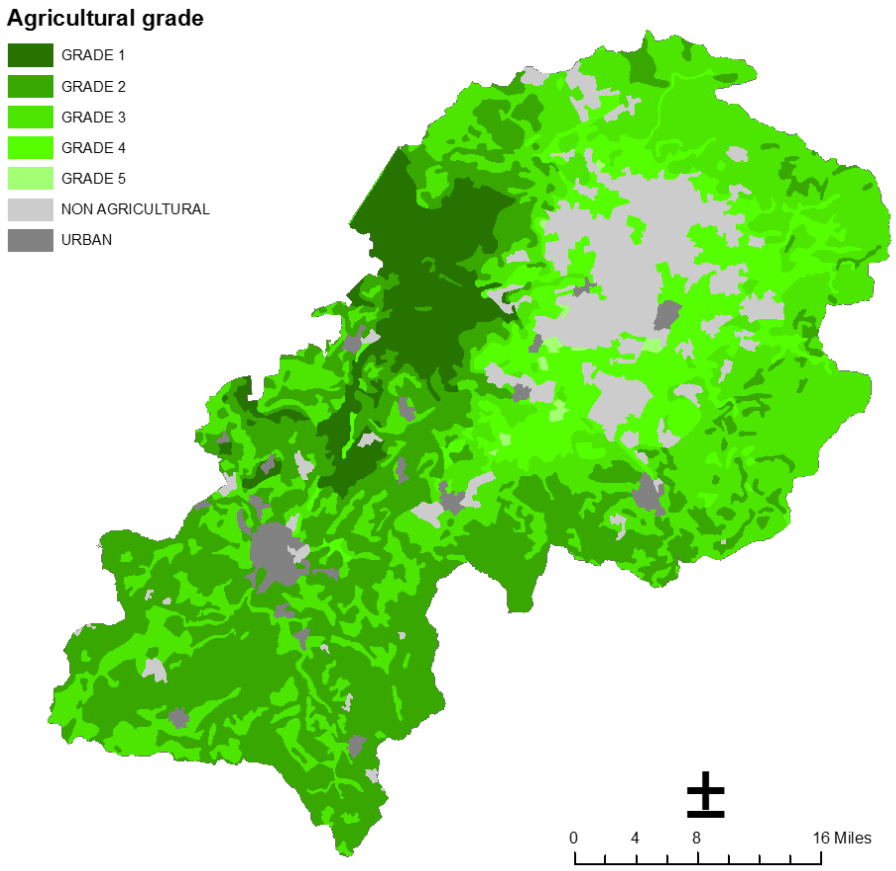
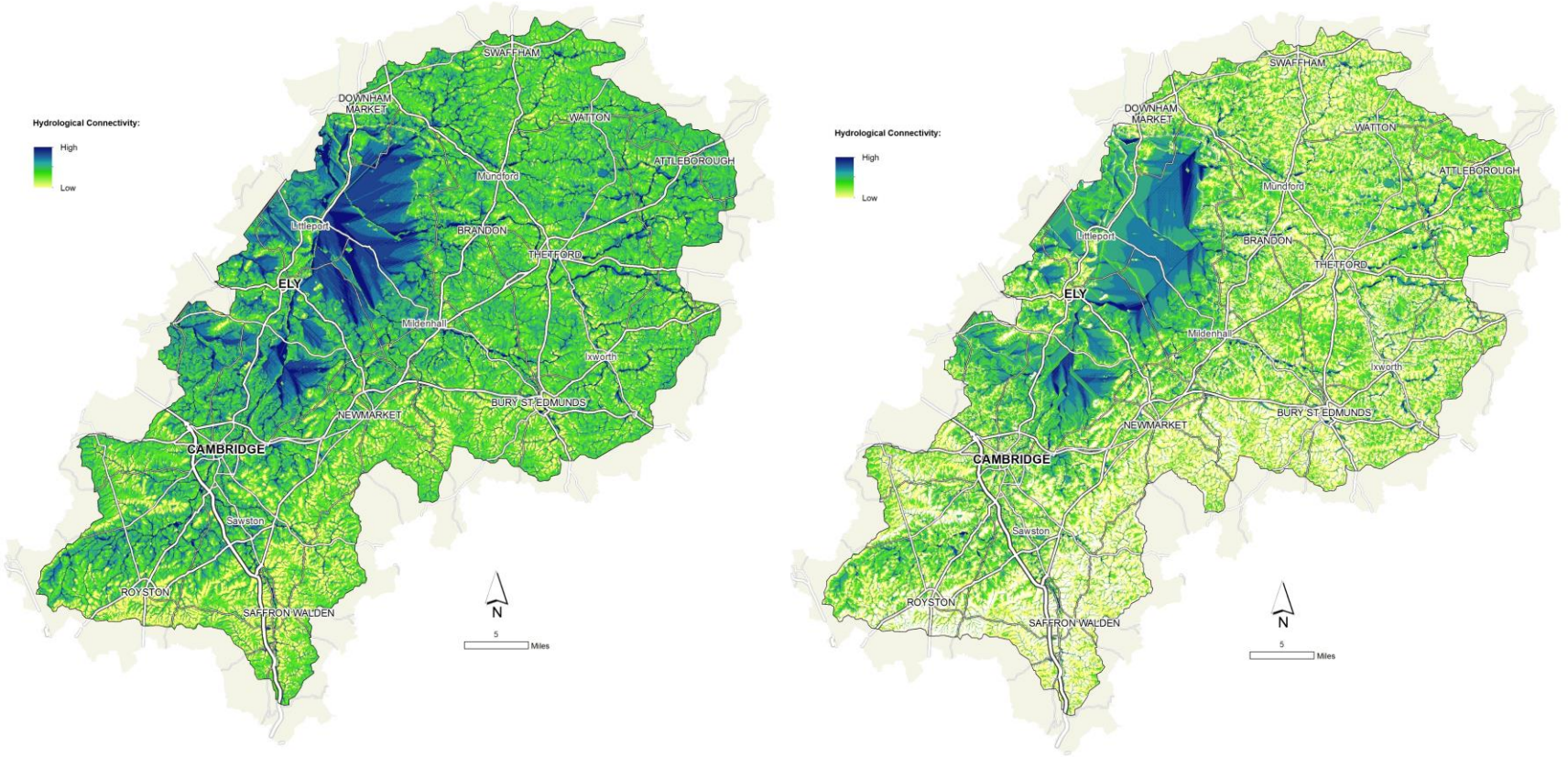


Source: Cranfield University

Water system characteristics in CamEO (1)



Source: The Rivers Trust

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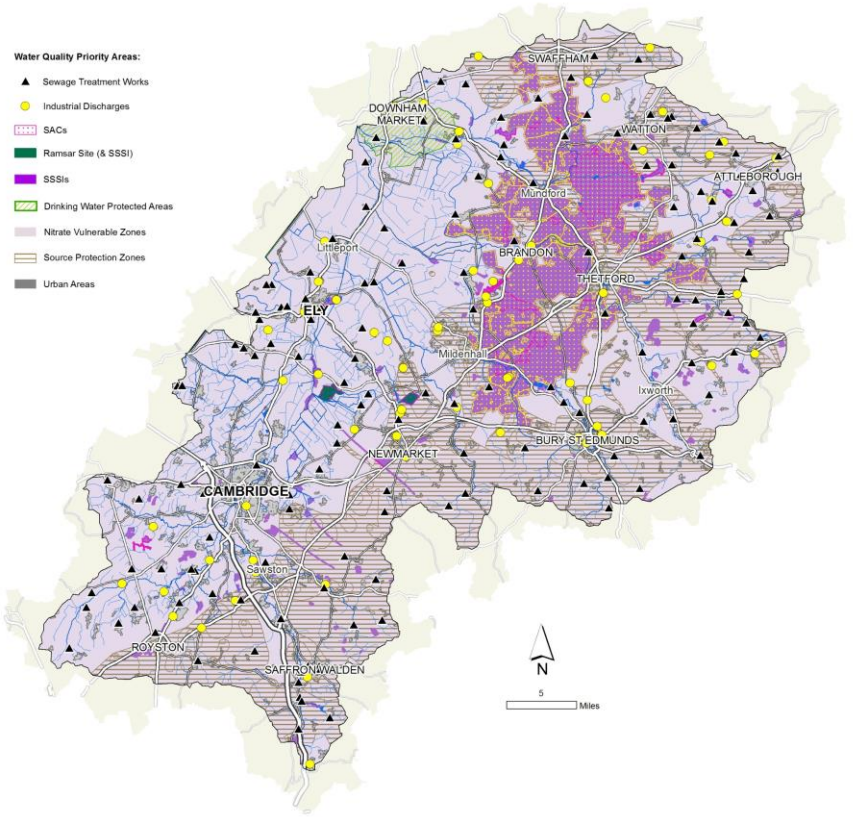
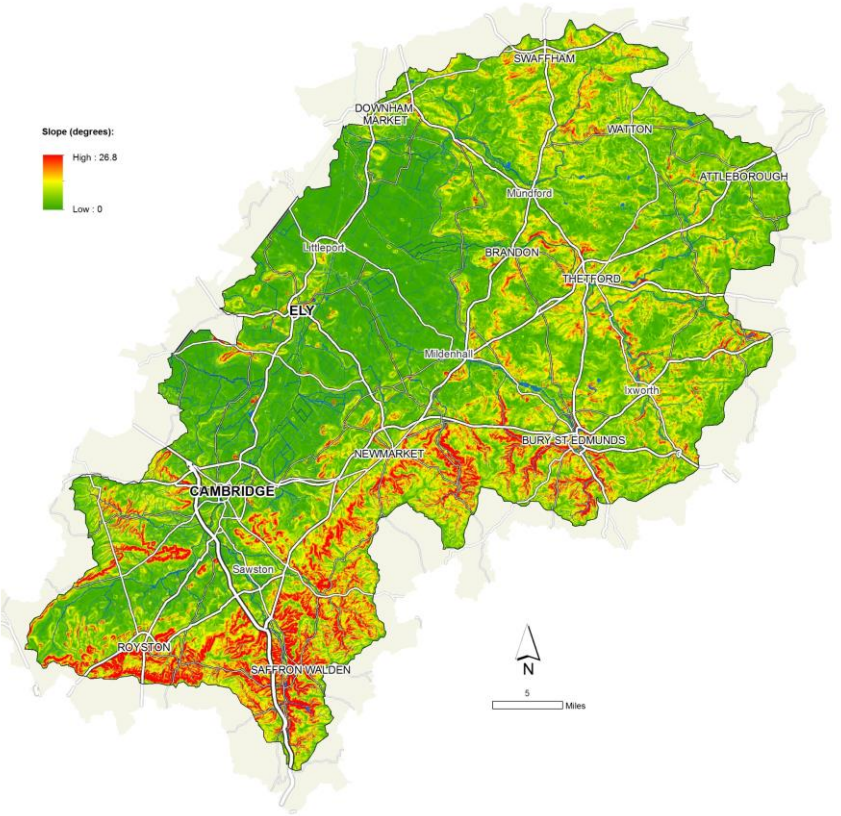
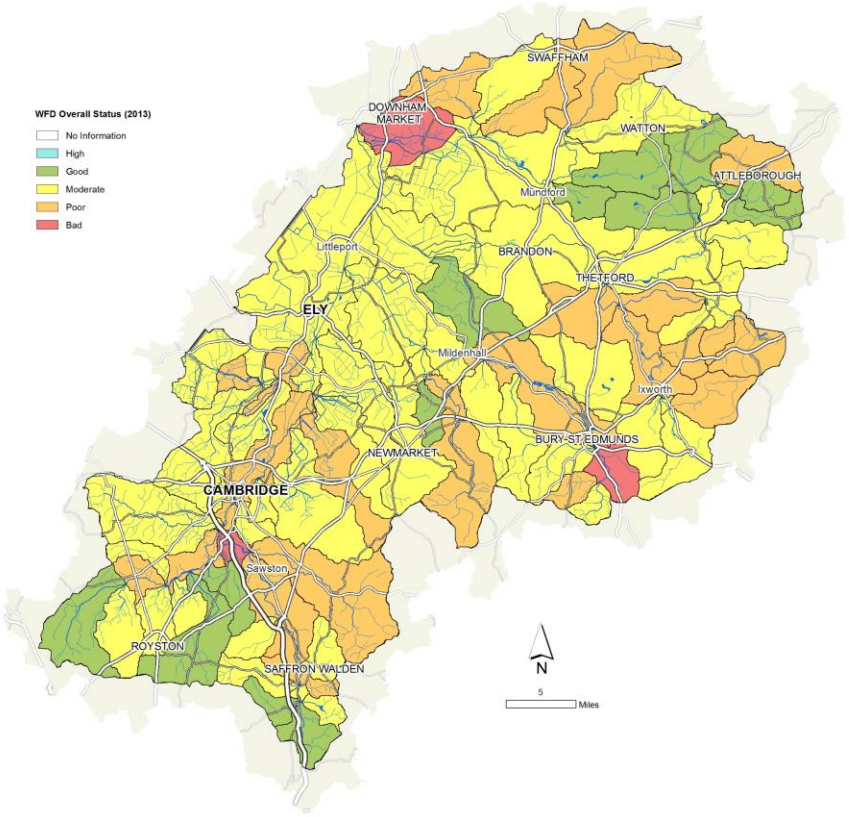
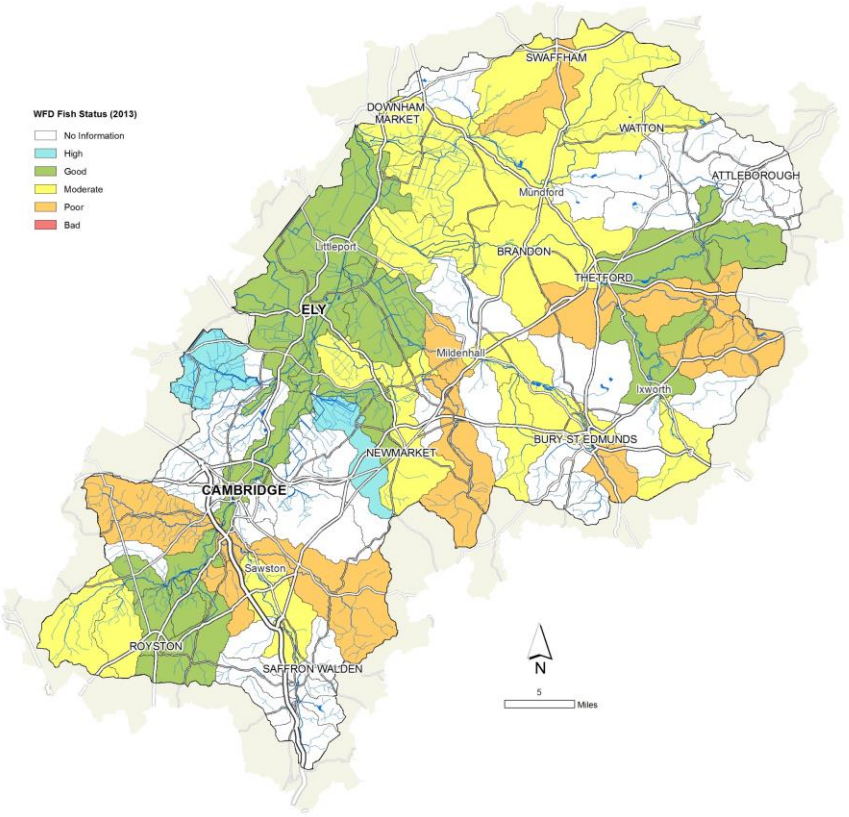




Source: The Rivers Trust

Water quality in CamEO (1)





Source: The Rivers Trust

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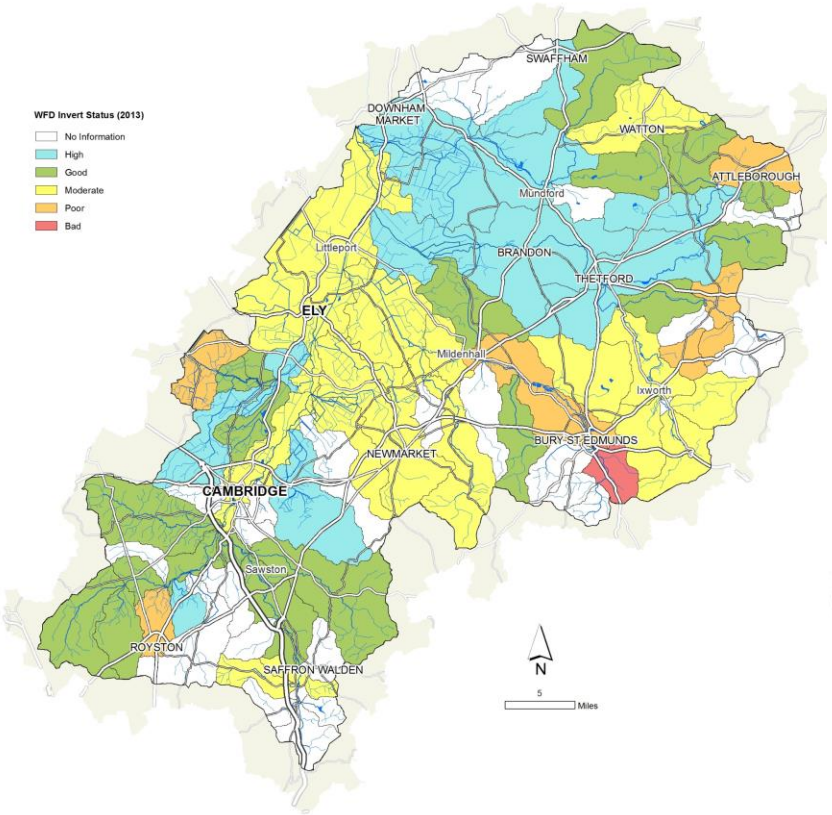
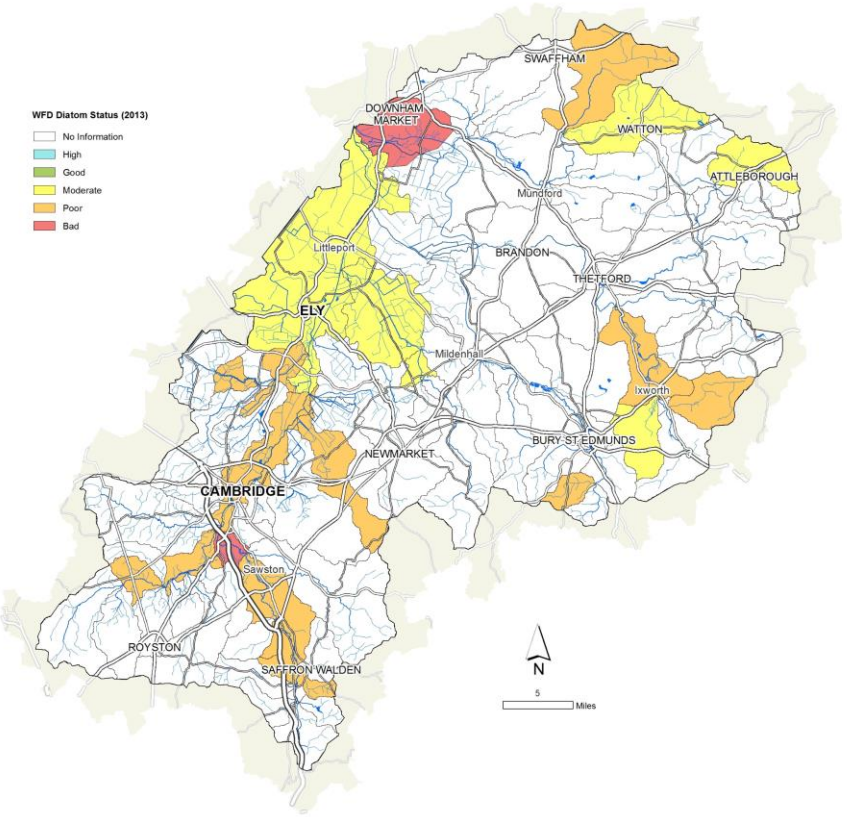
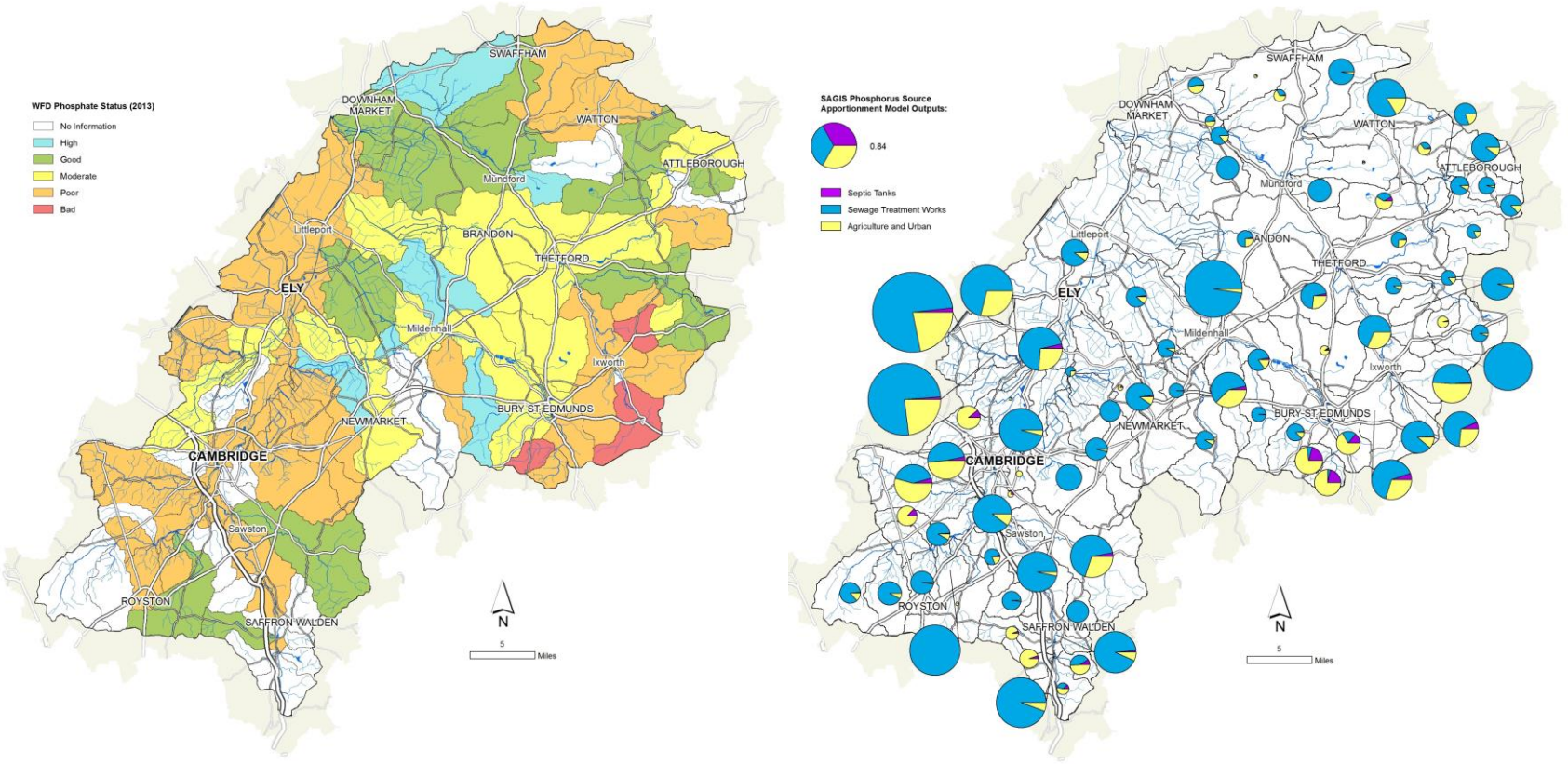




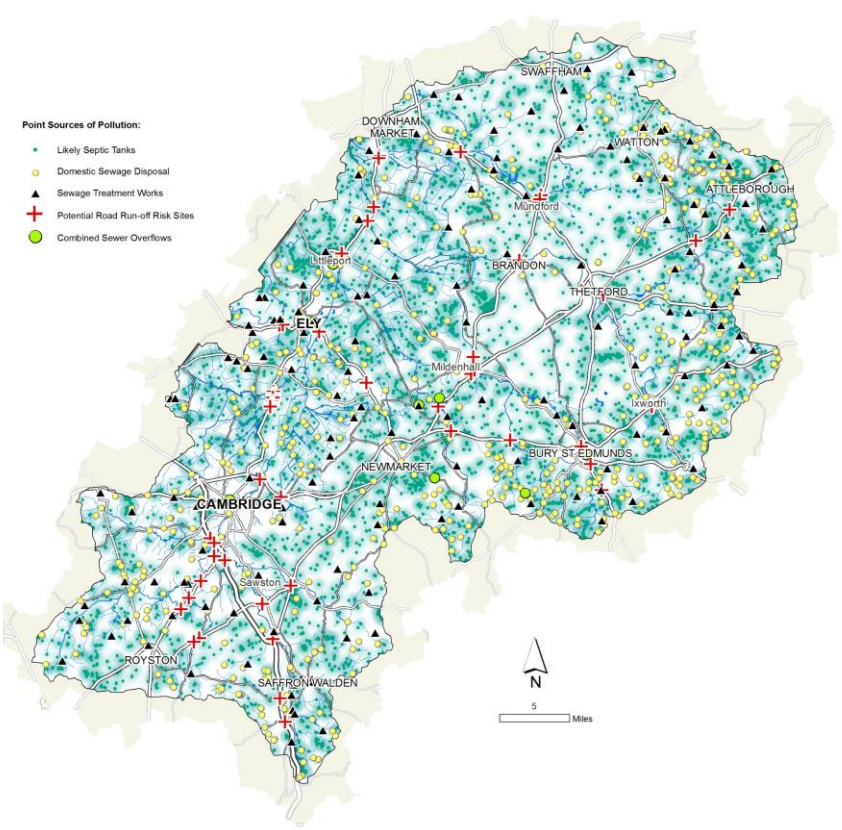
Source: The Rivers Trust

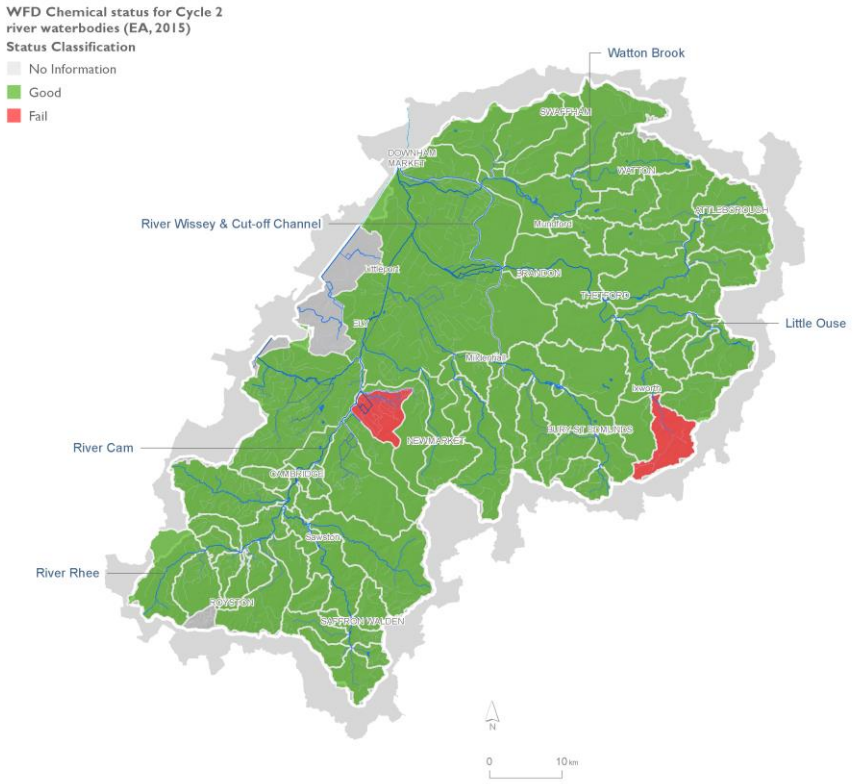
Water quality in CamEO (3)



Source: The Rivers Trust

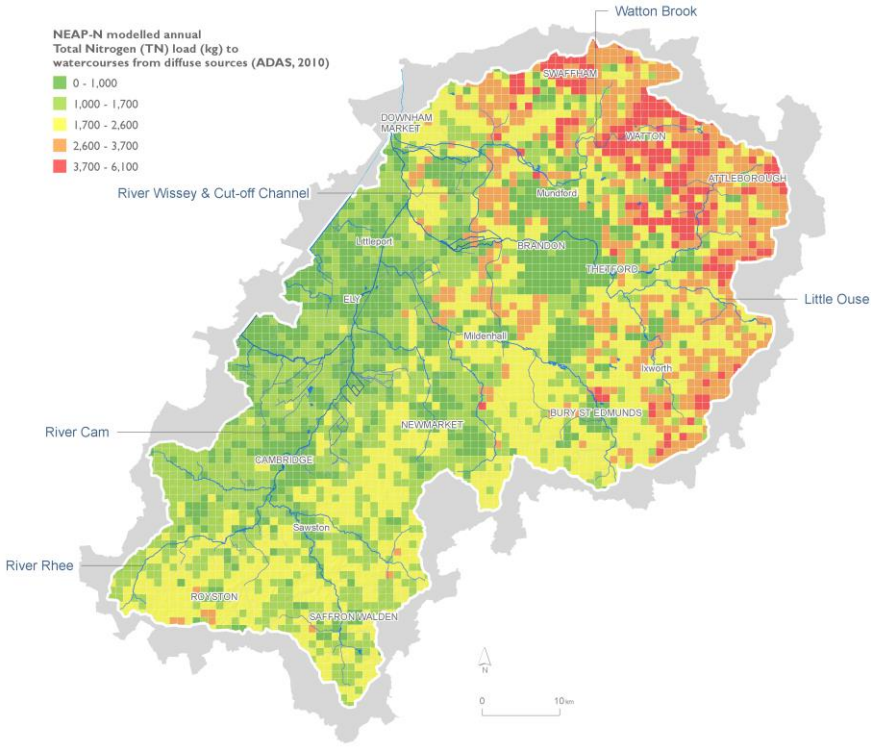
Water quality in CamEO (4)

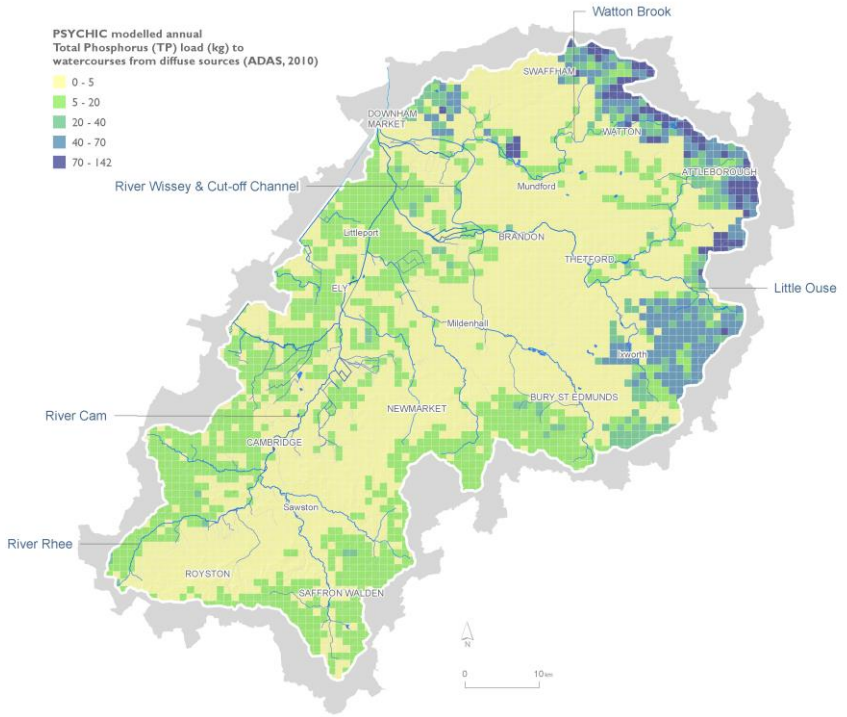




Source: The Rivers Trust

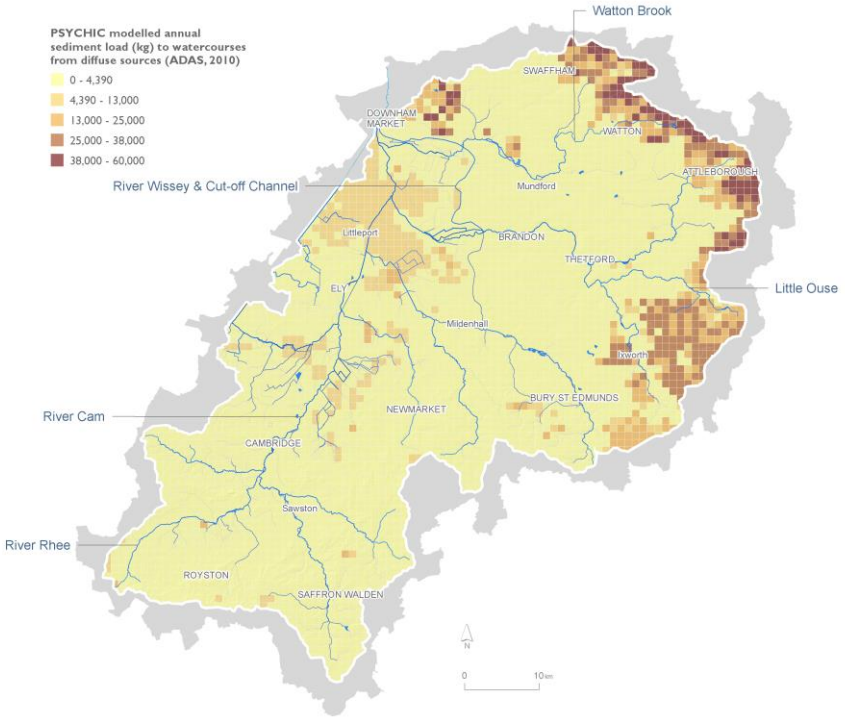
Water quality in CamEO (5)

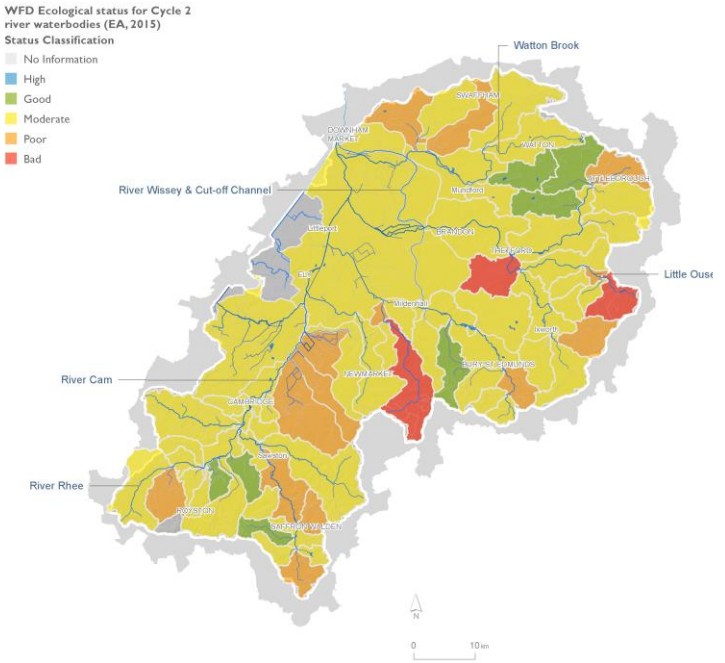




Source: The Rivers Trust

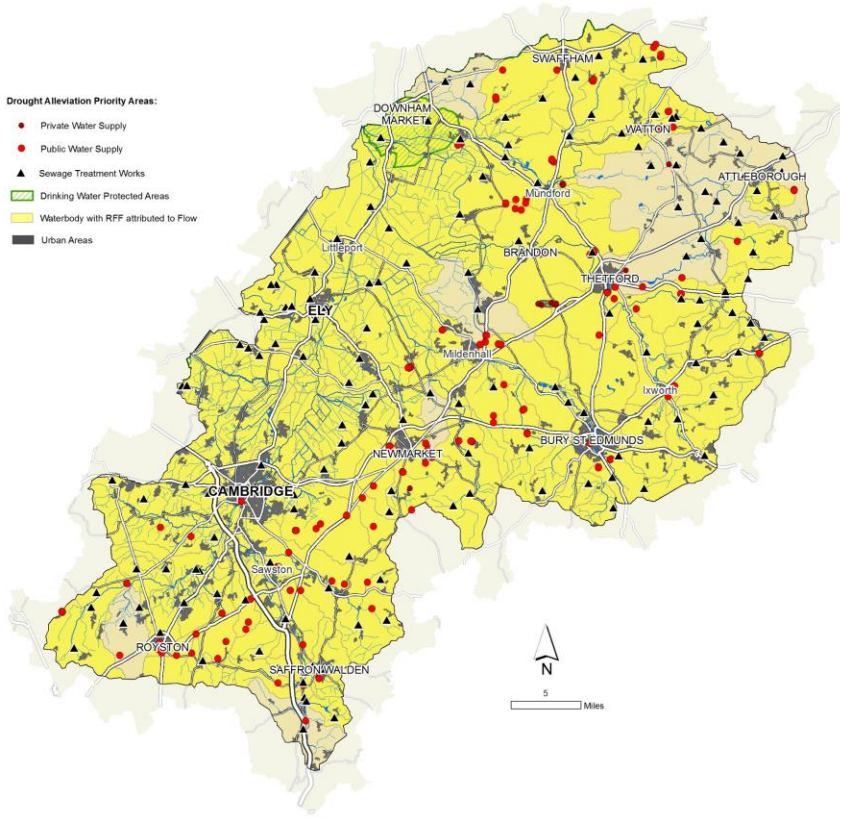
Water quality in CamEO (6)

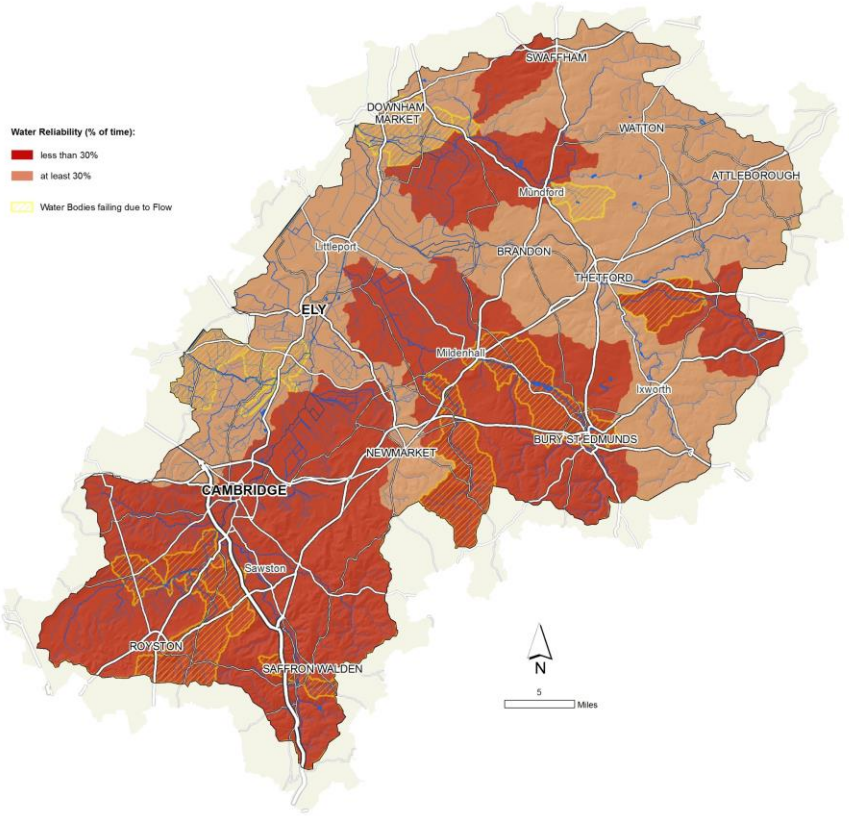




Source: The Rivers Trust

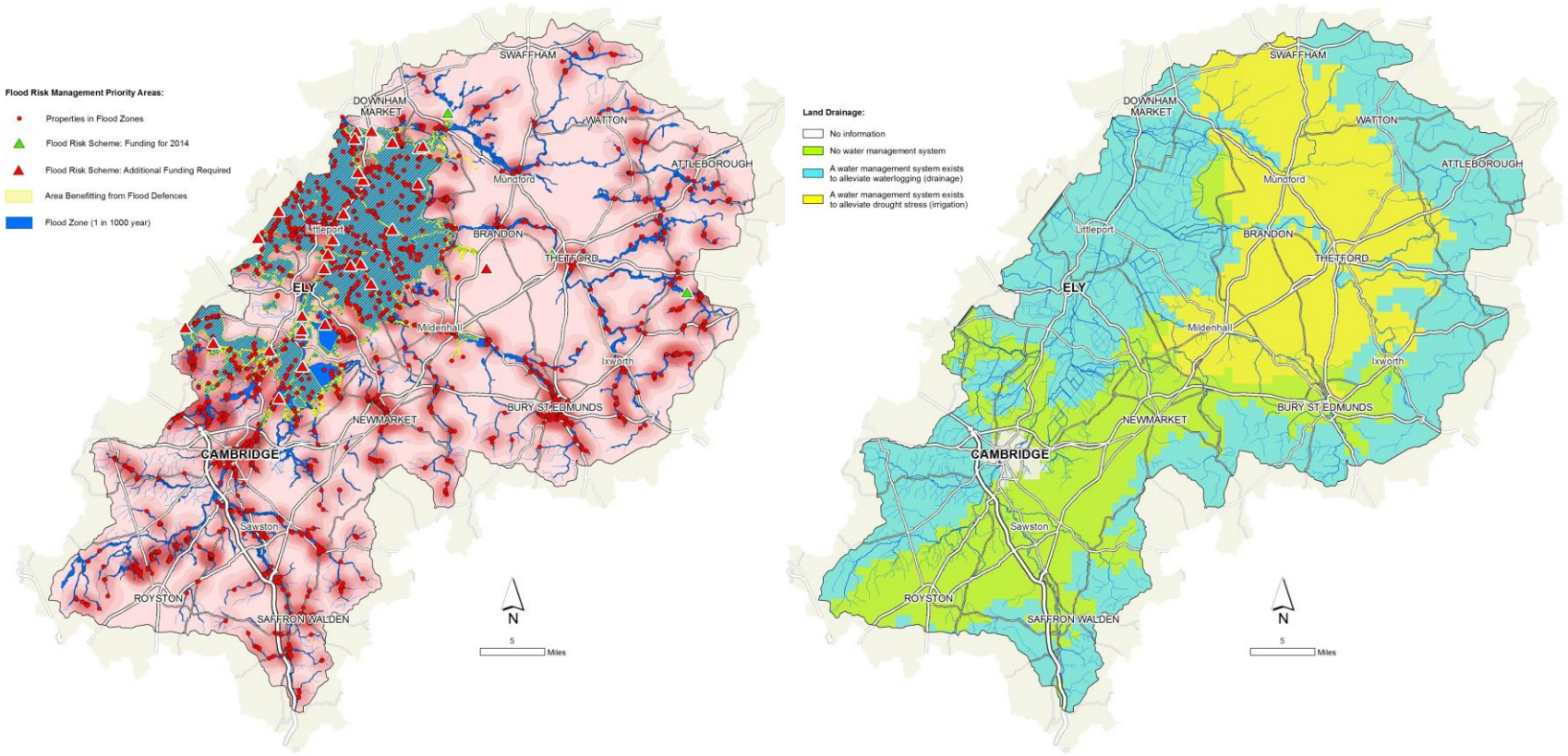
Water flow in CamEO





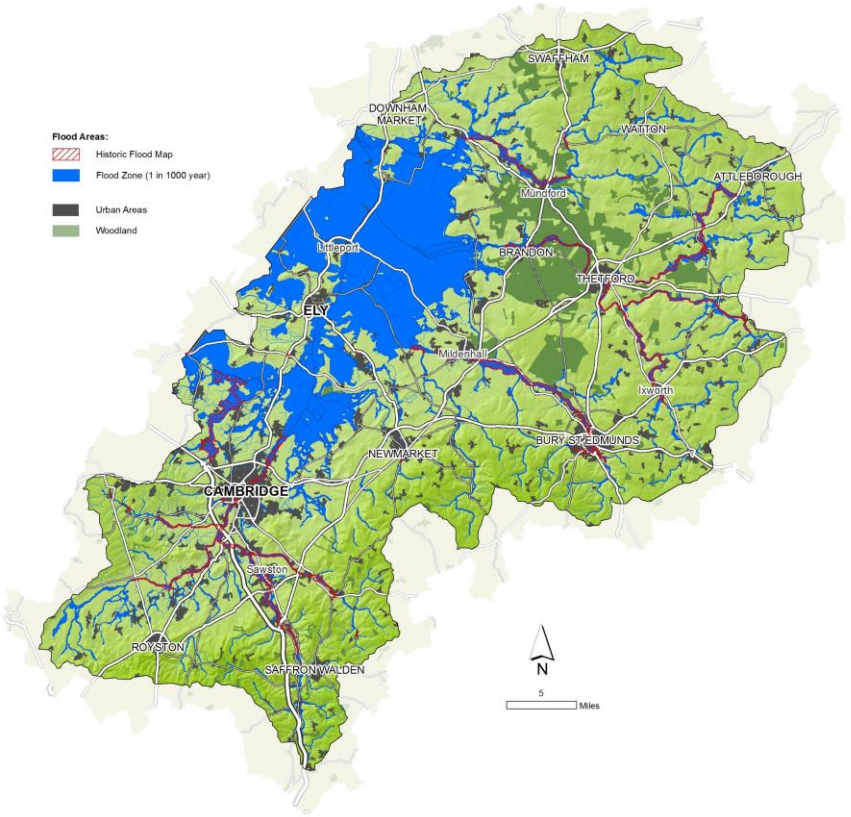
Source: The Rivers Trust

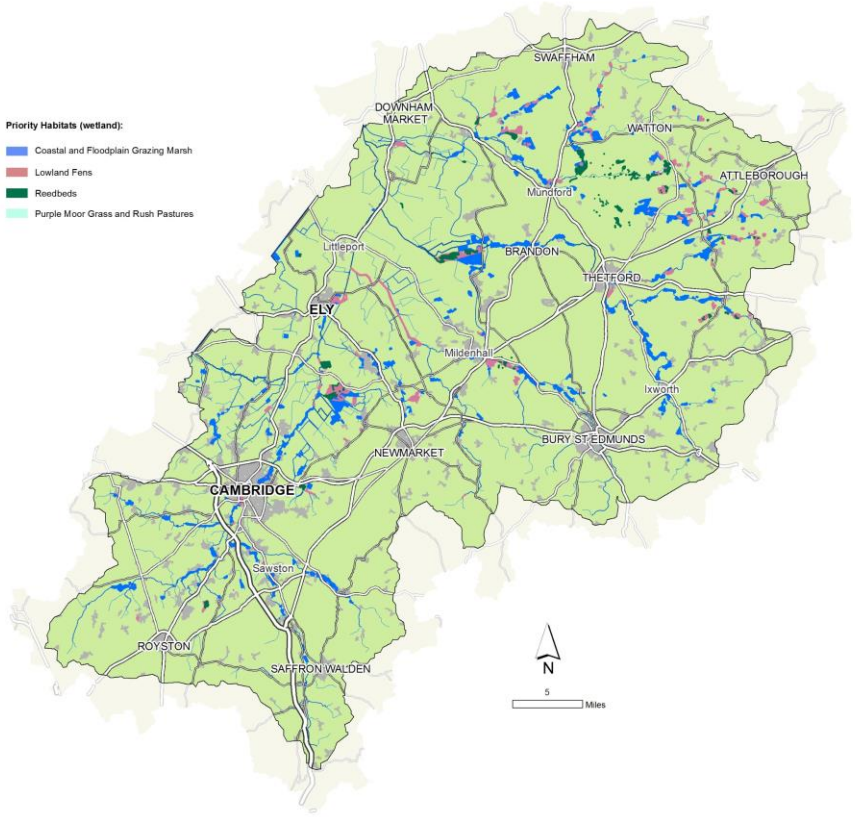
Flood risk in CamEO (1)



Source: The Rivers Trust

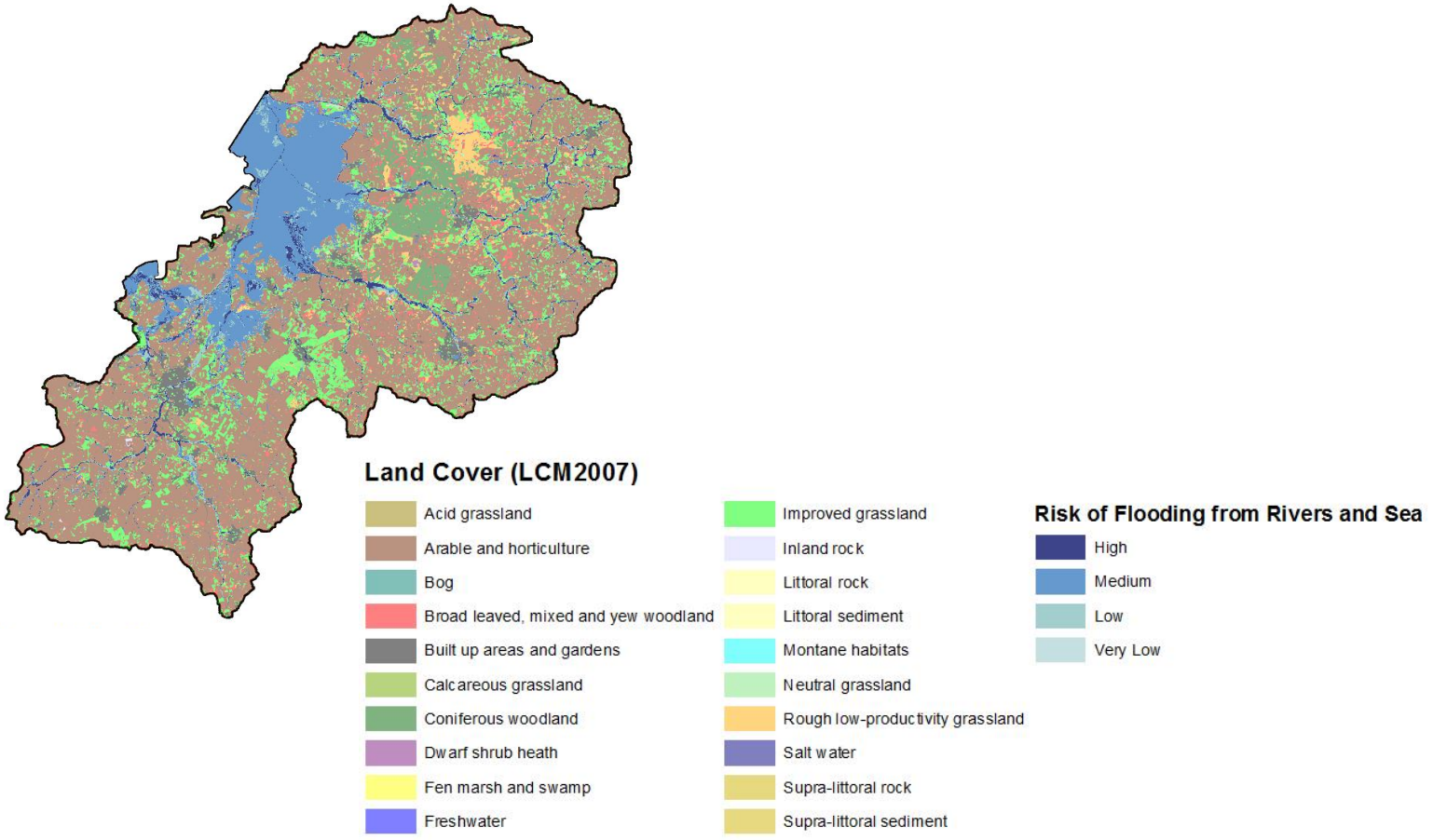
Flood risk in CamEO (2)





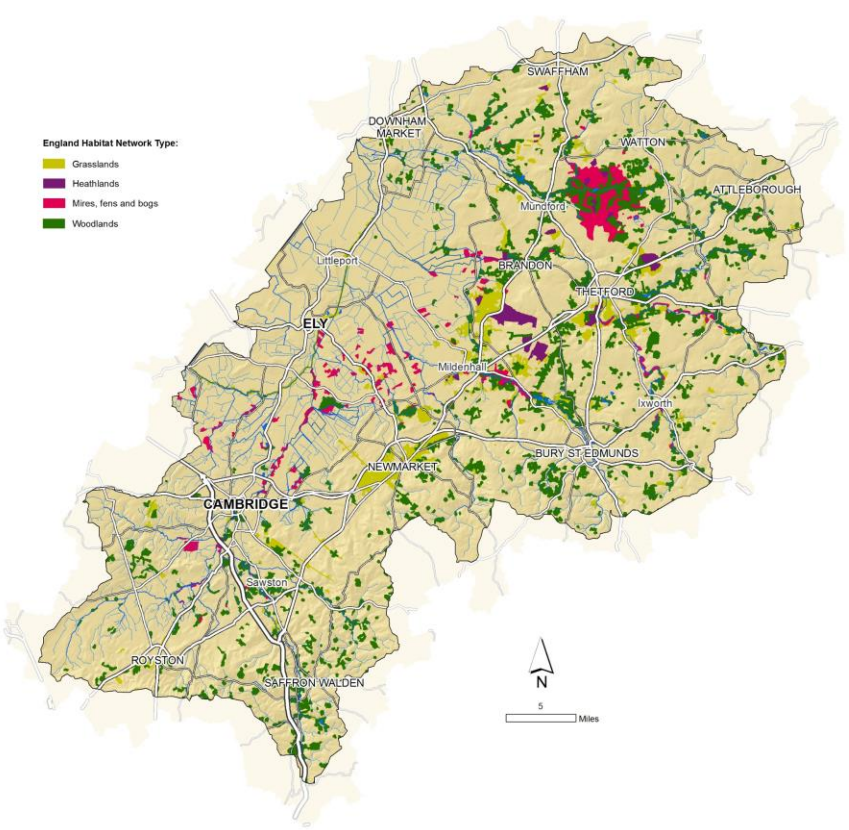
Source: The Rivers Trust

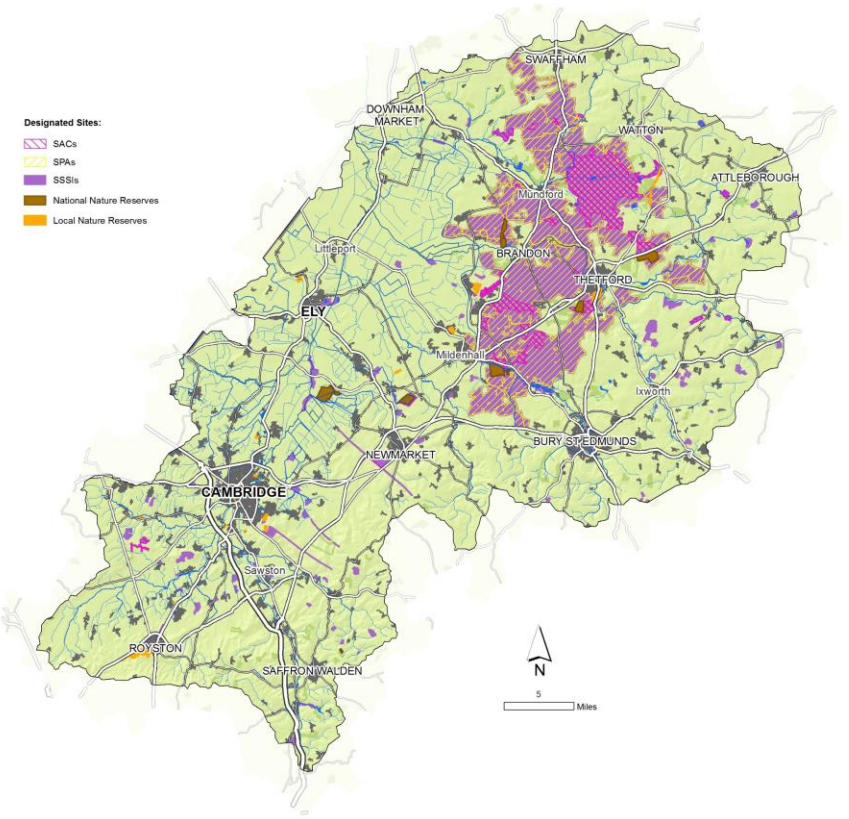
Flood risk in CamEO (3)



Source: Cranfield University

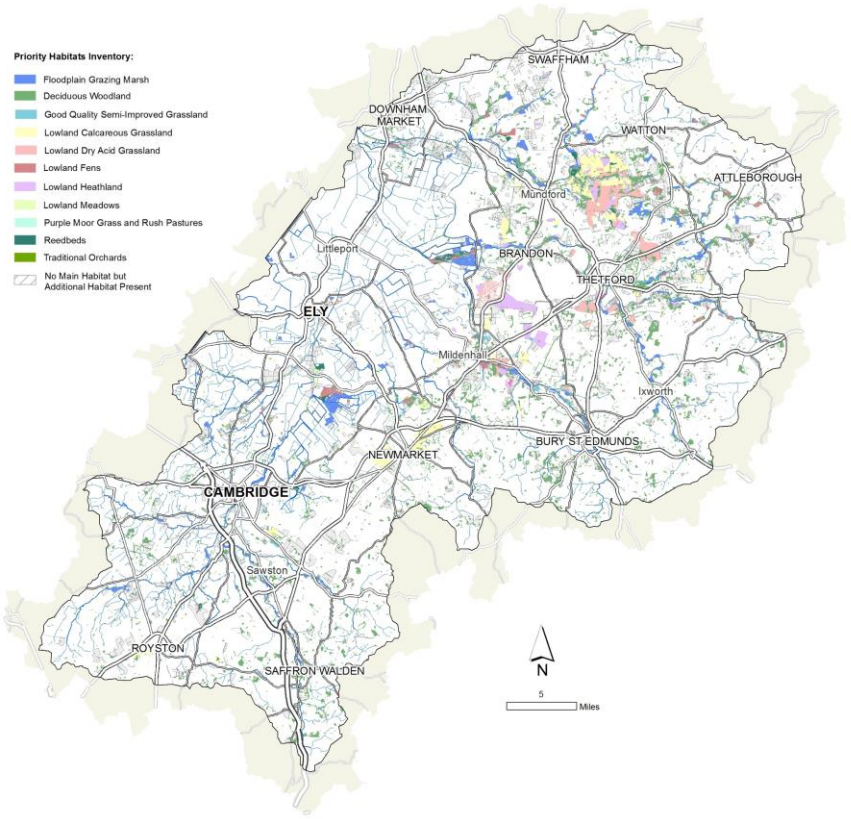
Biodiversity in CamEO (1)

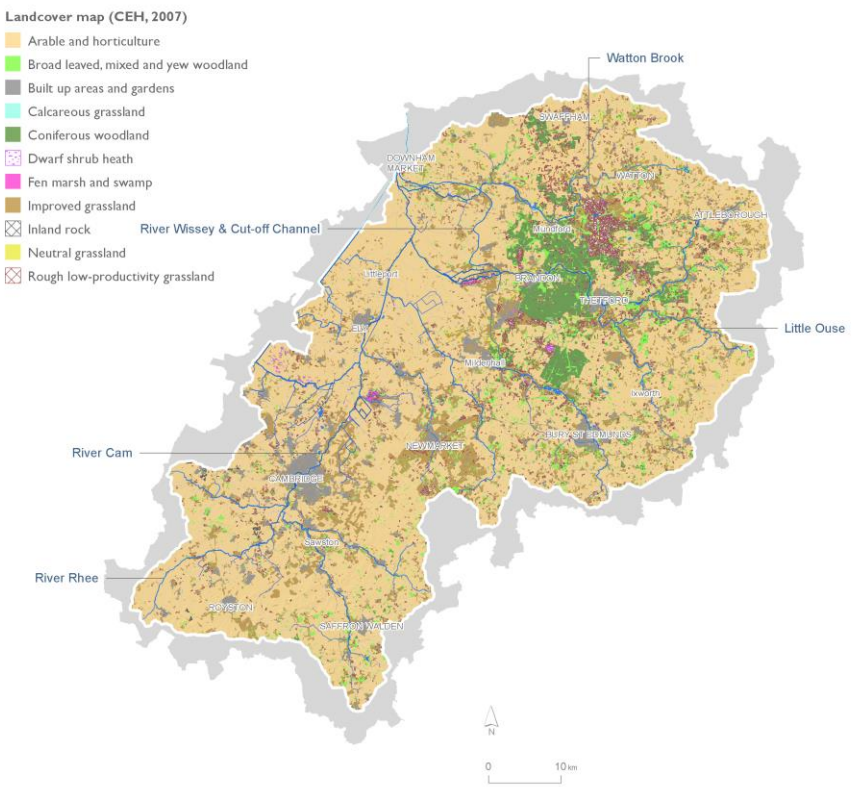




Source: The Rivers Trust

Biodiversity in CamEO (2)





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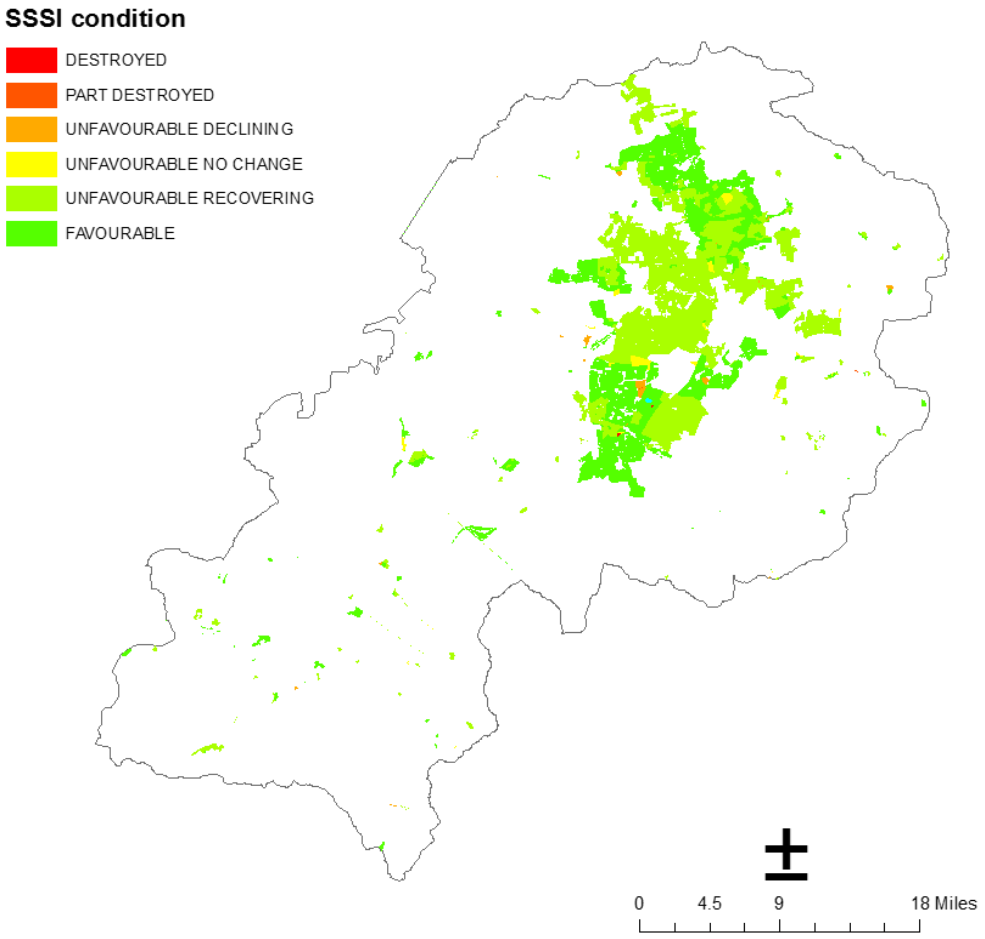

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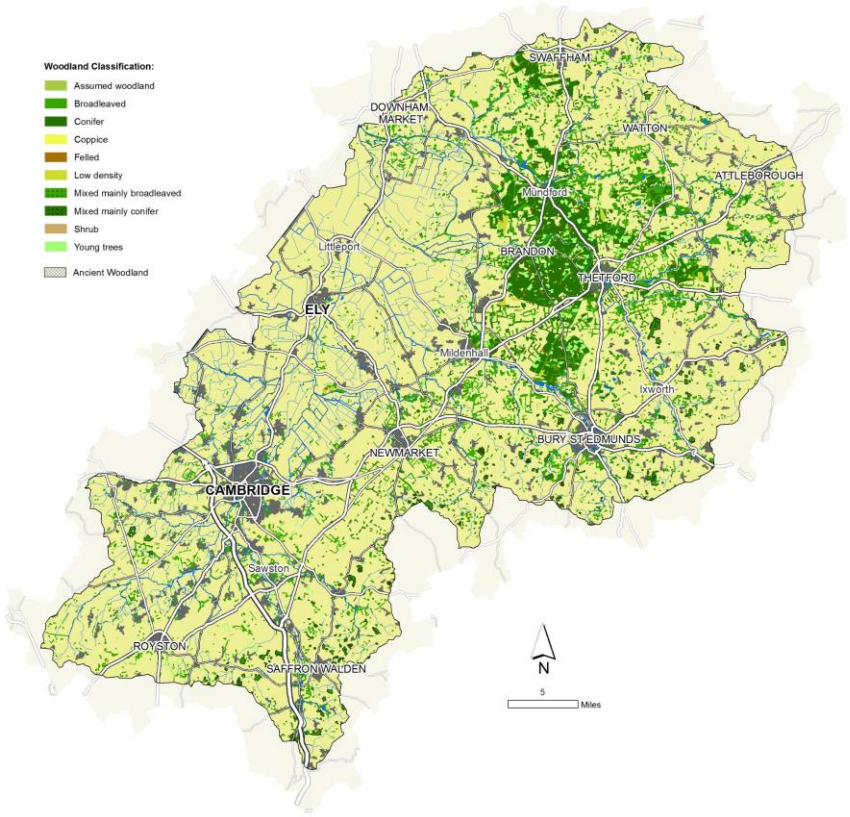
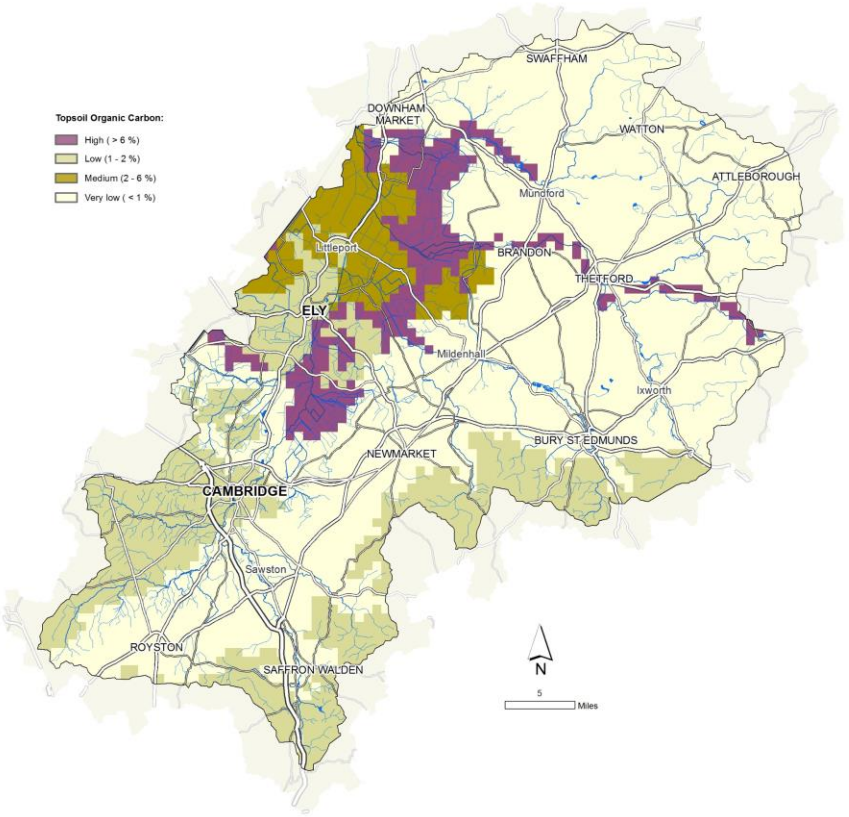
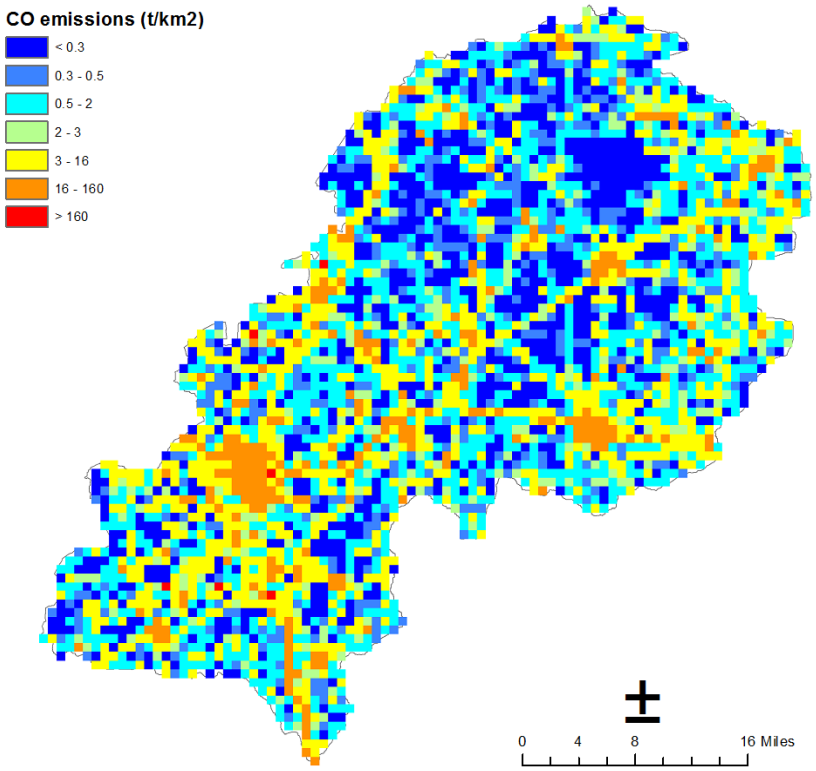
Carbon resources in CamEO

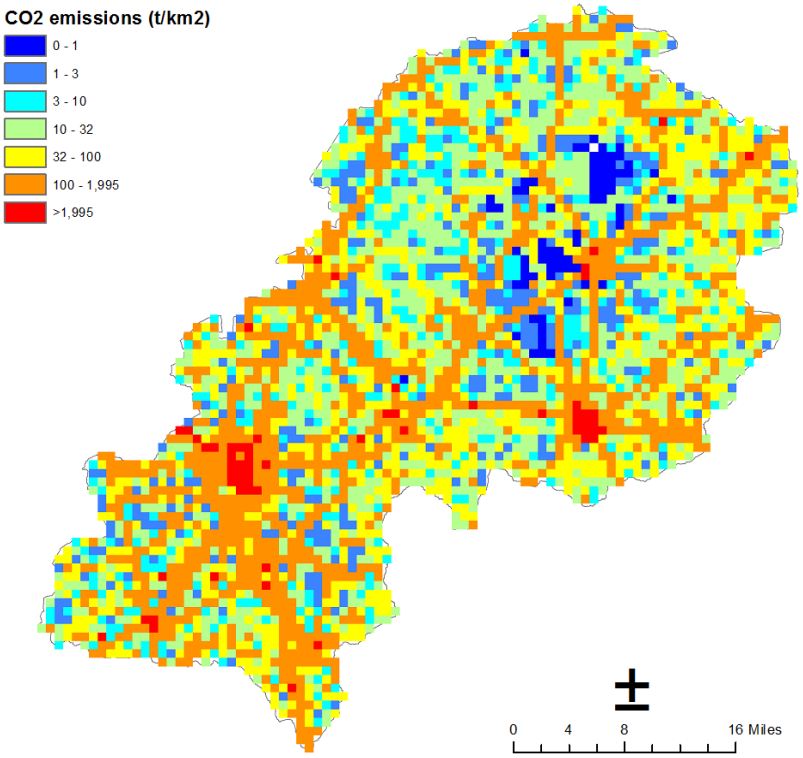




Source: The Rivers Trust

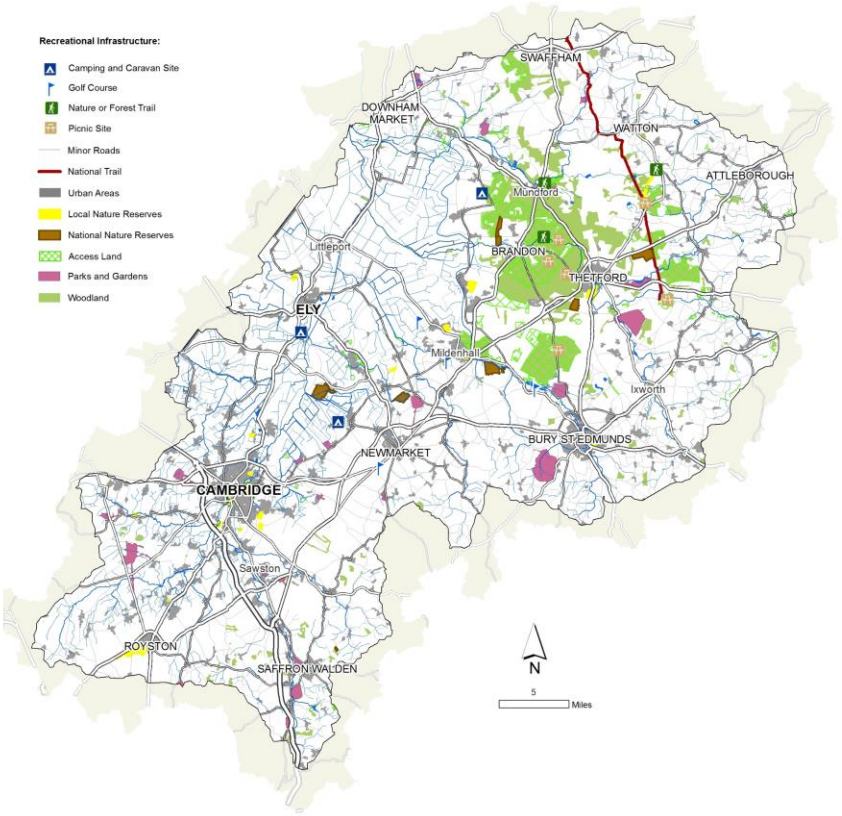
Carbon emissions in CamEO

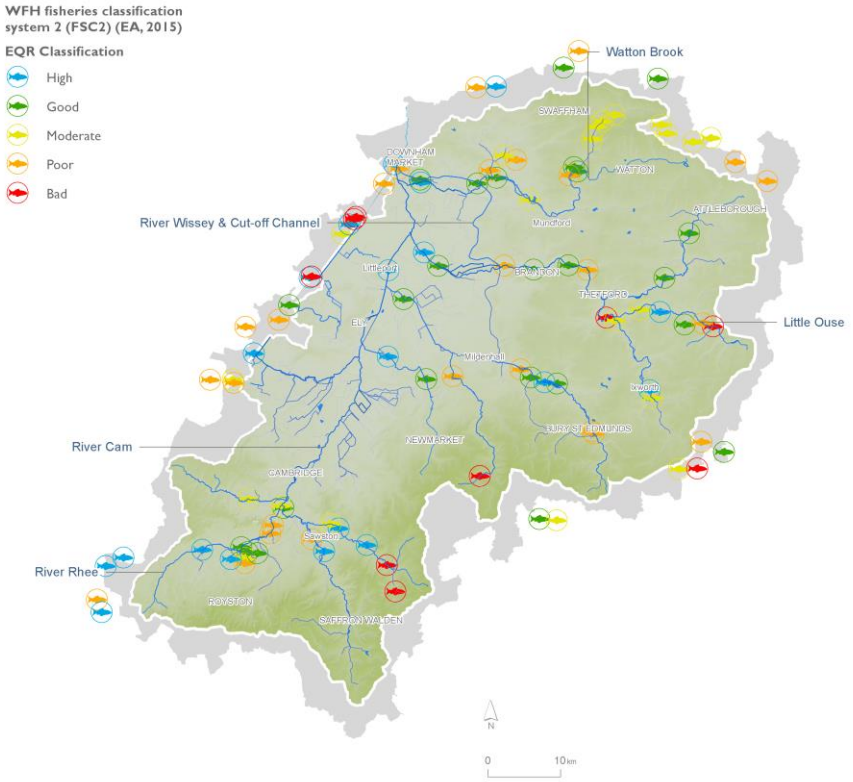




Source: Cranfield University

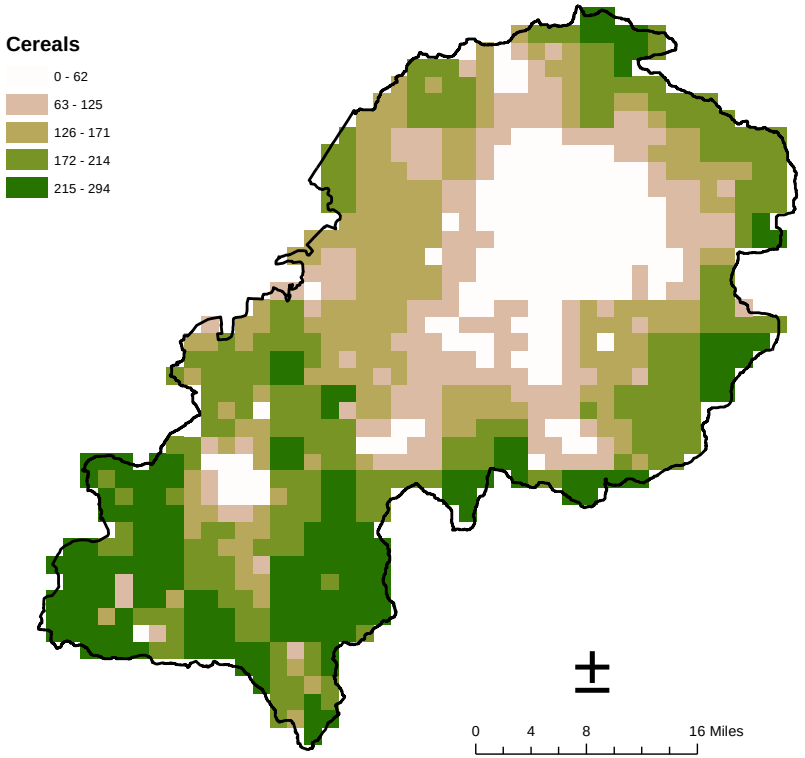
Recreation and fishing in CamEO

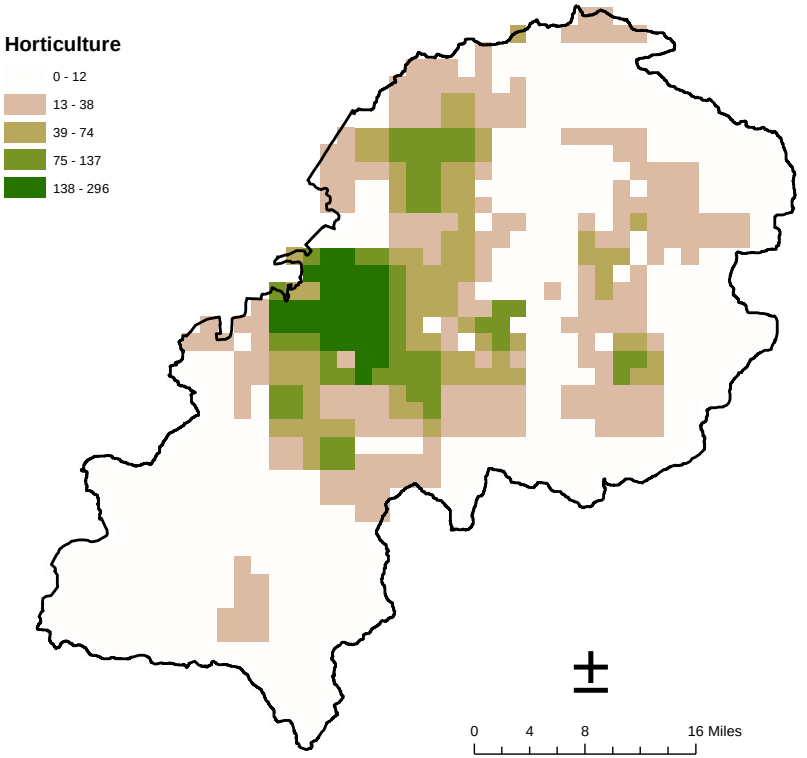




Source: The Rivers Trust

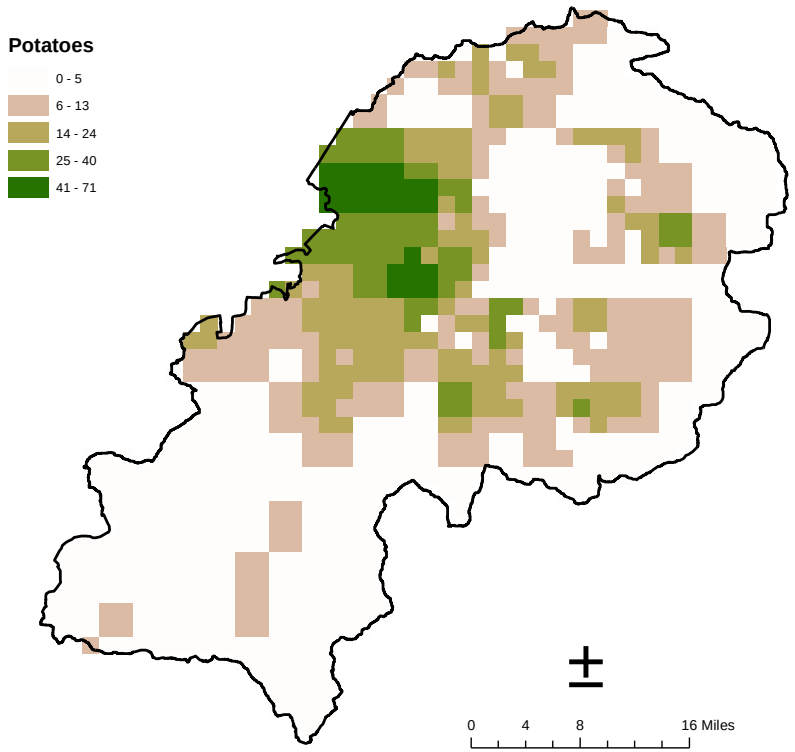
Agriculture in CamEO (1)

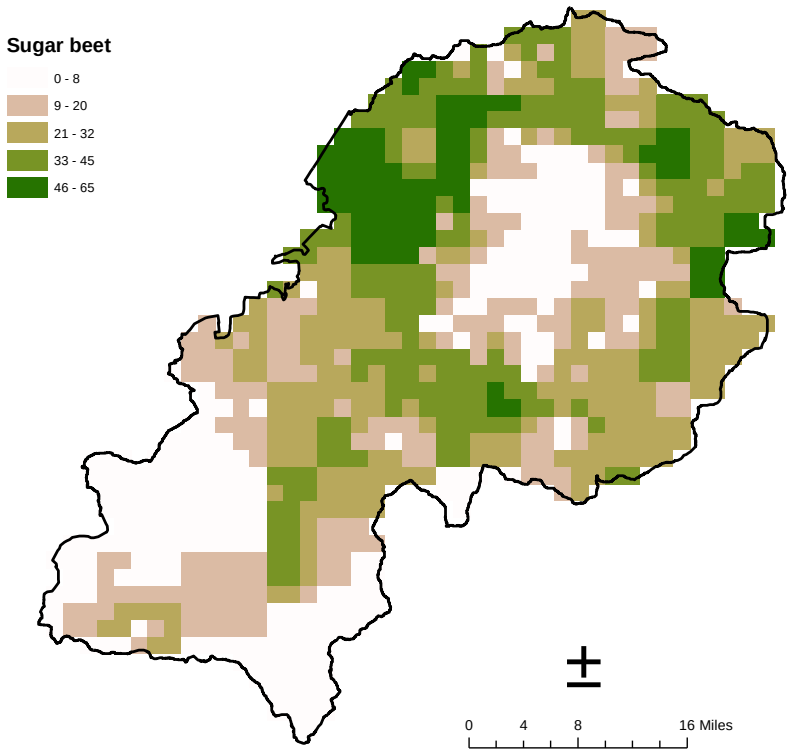




Source: Cranfield University

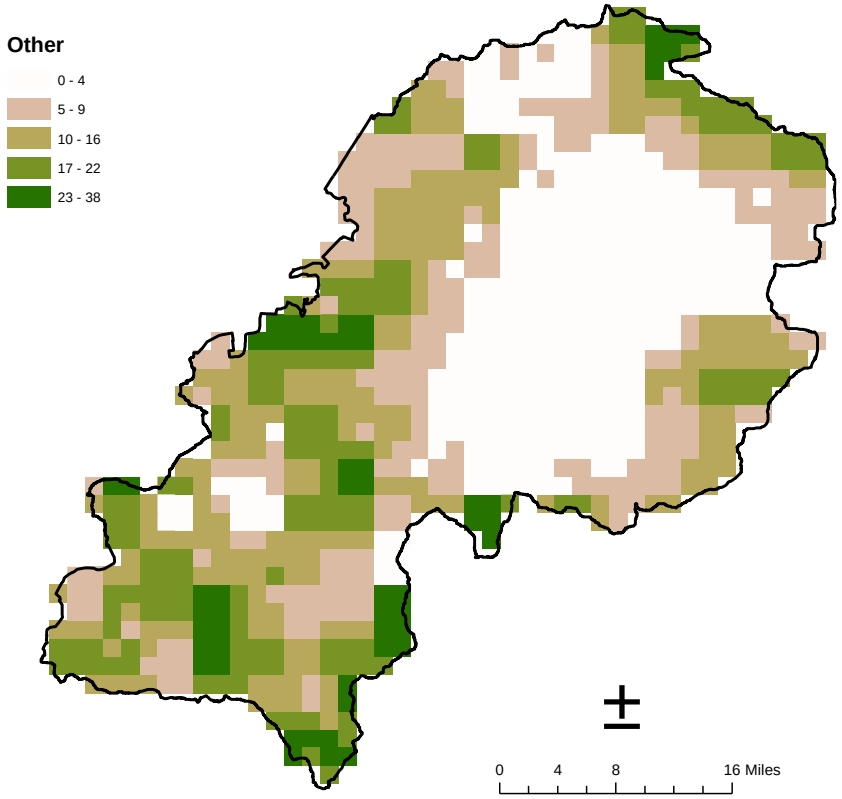
Agriculture in CamEO (2)

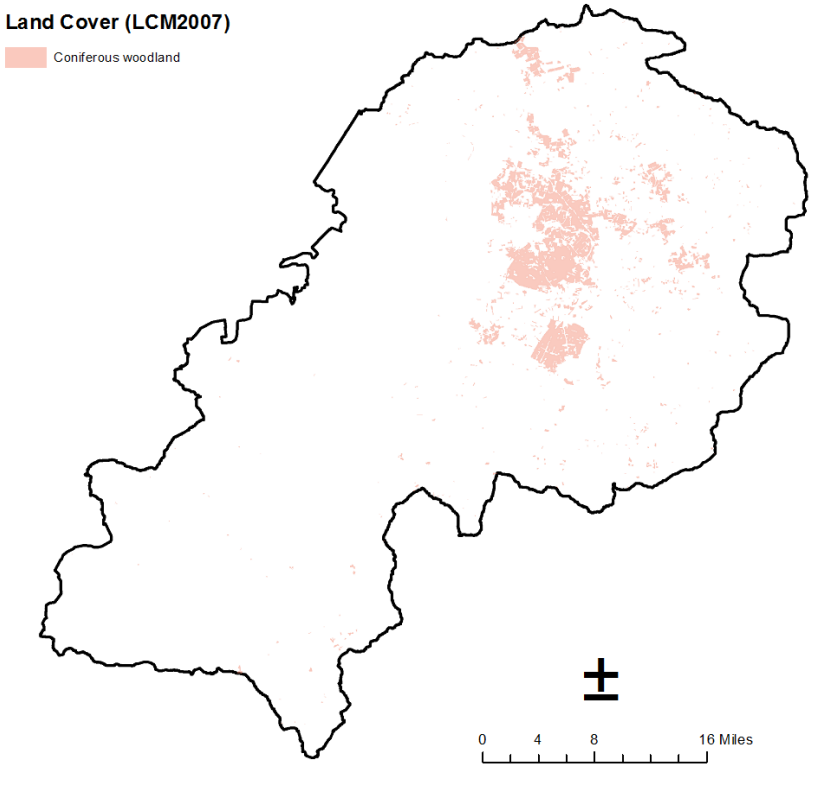




Source: Cranfield University

Agriculture in CamEO (3)





Source: Cranfield University

Agriculture in CamEO

Table 1 Cropped area (ha) and proportion irrigated (%) for the major crop categories in CamEO

Crop type	Cropped area (ha)	share irrigated
Cereals	136,437	1.0%
Horticulture	22,498	37.5%
Potatoes	7,766	60.0%
Sugar beet	20,647	6.0%
Other	8,755	0.5%
Total	196,103	8.0%

Source: Cranfield University

Emissions in CamEO

Table 2 Total emissions of carbon monoxide and carbon dioxide (tonnes) in 2014 per land cover category in CamEO

Land cover category	CO emissions (t)	CO emissions (t/ha)	CO2 emissions (t)	CO2 emissions (t/ha)
Agricultural areas	16,672	0.05	538,988	1.73
Artificial surfaces	5,300	0.22	278,853	11.62
Forest and semi natural areas	305	0.01	18,593	0.62
Water bodies	4	0.02	150	0.82
Wetlands	1	0.004	78	0.23

Source: Cranfield University

Flood risk in CamEO

Table 3 Area (ha) covered by different categories of flood risk and corresponding land cover

Risk of flooding from rivers and sea Land use	Area (ha)	% of total
High	8,113	13.56%
Arable and horticulture	3,367	5.63%
Broad leaved, mixed and yew woodland	784	1.31%
Built up areas and gardens	174	0.29%
Coniferous woodland	52	0.09%
Dwarf shrub heath	28	0.05%
Fen marsh and swamp	21	0.04%
Freshwater	586	0.98%
Improved grassland	2,715	4.54%
Inland rock	15	0.03%
Neutral grassland	203	0.34%
Rough low-productivity grassland	169	0.28%
Low	7,751	12.95%
Arable and horticulture	4,294	7.18%
Broad leaved, mixed and yew woodland	577	0.96%
Built up areas and gardens	249	0.42%
Coniferous woodland	66	0.11%
Dwarf shrub heath	11	0.02%
Fen marsh and swamp	23	0.04%
Freshwater	72	0.12%
Improved grassland	2,195	3.67%
Inland rock	9	0.02%
Neutral grassland	129	0.22%
Rough low-productivity grassland	125	0.21%

Risk of flooding from rivers and sea Land use	Area (ha)	% of total
Medium	43,944	73.43%
Arable and horticulture	34,434	57.54%
Broad leaved, mixed and yew woodland	1,183	1.98%
Built up areas and gardens	449	0.75%
Coniferous woodland	68	0.11%
Dwarf shrub heath	79	0.13%
Fen marsh and swamp	139	0.23%
Freshwater	209	0.35%
Improved grassland	6,420	10.73%
Inland rock	11	0.02%
Neutral grassland	442	0.74%
Rough low-productivity grassland	510	0.85%
Very Low	34	0.06%
Arable and horticulture	18	0.03%
Broad leaved, mixed and yew woodland	2	0.00%
Built up areas and gardens	1	0.00%
Coniferous woodland	0	0.00%
Dwarf shrub heath	0	0.00%
Freshwater	0	0.00%
Improved grassland	11	0.02%
Inland rock	0	0.00%
Neutral grassland	1	0.00%
Rough low-productivity grassland	0	0.00%
Total	59,842	100.00%

Source: Cranfield University

Biodiversity in CamEO

Table 4 Condition, number and size (ha) of SSSIs in the Cam and Ely Ouse catchment

Condition	Number of sites	Area (ha)	% of total area
Destroyed	2	18	0.04%
Part destroyed	2	7	0.02%
Unfavourable declining	17	319	0.74%
Unfavourable no change	17	573	1.33%
Unfavourable recovering	77	24,024	55.62%
Favourable	88	18,249	42.25%
Total	203	43,189	100.00%

Source: Cranfield University

Land quality in CamEO

Table 5 Size distribution (ha) of agricultural land according to its classification in CamEO

Grade	Area (ha)	% of total
Grade 1	29,044	7.87%
Grade 2	122,428	33.19%
Grade 3	124,096	33.64%
Grade 4	45,083	12.22%
Grade 5	1,312	0.36%
Non agricultural	38,094	10.33%
Urban	8,795	2.38%
Total	368,851	100.00%

Source: Cranfield University

Soil Carbon in CamEO

Table 6: Estimated carbon stocks in the top 30cm by land cover and soil group

		Av Carbon Stocks 0-30cm depth (Tg/m2)+			
Land Cover Type	Catchment Area (ha)	clay	silt	sand	peat
Woodland - Broad leaved, mixed and yew	20368	9.1	9.1	9.1	9.1
Woodland - Coniferous	16500	8.2	8.2	8.2	8.2
Enclosed Farmland - Arable and horticulture	238205	10.0	27.1	7.7	36.9
Enclosed Farmland - Improved grassland	58840	10.1	26.8	9.4	34.7
Semi-natural grassland - Rough low-productivity grassland	12210	9.4	13.8	7.3	33.5
Semi-natural grassland - Calcareous grassland	6	0.0	0.0	8.4	0.0
Semi-natural grassland - Neutral grassland	2705	10.0	27.6	19.4	34.8
Water - Fen marsh and swamp	222	27.4	0.0	19.5	32.9
Water - Freshwater	1370	12.5	23.5	12.0	28.1
Mountains, moorland and heath - Dwarf Shrub heath	396	16.7	0.0	8.0	35.0
Mountains, moorland and heath - Inland rock	373	6.8	0.0	7.0	39.4
Coastal margins - Supra-littoral sediment	5	0.0	0.0	17.8	0.0
Urban - Built up areas and gardens	17652	3.7	24.0	3.6	25.8

Source: NATMAP Cranfield University

Soil Carbon in CamEO

Table 7: Indicative estimated cost of changes in organic carbon in the top 15cm of soils for the CamEO catchment

Physical data			
Total area (ha)	328,649		
Area at risk (ha)	322,213		
Soil C loss (t yr-1)	-35,822		
	Total catchment	Total area	Area at risk
	£000	£/ha	£/ha
On-site costs			
Soil amelioration cost	-29	-0.1	-0.09
Off-site costs			
GHG cost of soil C	-4,837	-14.7	-15.0
Total onsite and off site	-4,867	-15	-15

Source: Cranfield University

Soil degradation costs in CamEO

Table 8: Estimated soil compaction costs (£/year) for the CamEO catchment

Physical data				
Total Category areas (ha)	328,649			
Total areas at risk within categories (ha)	113,772			
Proportion at risk (%)	0			
Addtional diesel use (000l yr-1)	2,898			
Fertiliser N loss (t yr-1)	856			
Fertiliser P loss (t yr-1)	32			
Fertiliser K loss (t yr-1)	47			
Offsite costs *				
Costs of N: rivers and waters		63	0.2	0.6
Cost of N: drinking water		64	0.2	0.6
Cost of P: lakes		57	0.2	0.5
GHG cost: NPK		277	0.8	2.4
GHG diesel penalty		575	1.7	5.1
GHG NO2		2,177	6.6	19.1
GHG NH3		102	0.3	0.9
Flooding **		4,995	15.2	43.9
Total off site		8,312	25.3	73.1
Total on site and off site		19,803	60	174

* excludes loss of soil carbon , accounted for separately

** provisional , based on average national estimate of flood costs attributable farm land (Graves, Morris et al, 2015)

Source: Cranfield University

Soil degradation costs in CamEO

Table 9: Estimated soil erosion costs (£/year) for the CamEO catchment

	Total for catchment	Total area	Areas at risk only
On site costs	£000	£/ha	£/ha
Loss in yields	979	3.0	25
NPK loss	3,604	11.0	91
C loss	18	0.1	0.4
Total onsite	4,601	14.0	116
Off site			
Removal of sediments in rivers	1,701	5.2	43
Removal of sediment in drinking water	5,086	15.5	129
Cost N ; rivers and waters	360	1.1	9
Cost N : drinking water	364	1.1	9
Cost P : lakes	754	2.3	19
GHG cost of C soil loss	974	3.0	25
Total offsite	9,239	28.1	234
Total on and off site	13,840	42.1	350

Total Category areas (ha)	328,649	(net of infrastructure)
Total areas at risk within categories (ha)	39,518	
Proportion at risk (%)	12%	
Soil depth loss (mm yr-1)	0.60	
Soil erosion (t yr-1)	258,020	
Average soil erosion (t ha-1 yr-1)	0.79	
Soil N loss (t yr-1)	1,655	
Soil P loss (t yr-1)	419	
Soil K loss (t yr-1)	2,894	
Soil C loss (t yr-1)	20,732	

Source: Cranfield University

Land-based profits in CamEO

Table 10 : Estimated net profit due to land £000/year in the CamEO catchment

	Soil Group					
	Clay	Silt	Sand	Peat	All	All
Farming system	£'000	£'000	£'000	£'000	£'000	% by farming system
Extensive arable	14,686	0	13,481	260	28,427	73%
Intensive arable	4,551	2,717	8,170	2,101	17,539	45%
Horticulture	154	92	276	71	593	2%
Grassland (improved 83%, unimproved 17%)	-2,499	-61	-4,680	-410	-7,650	-20%
Total	16,891	2,748	17,248	2,022	38,909	
% by Soil Group	43%	7%	44%	5%	100%	100%

Source: Cranfield University

Crop margins in CamEO

Table 11: Net farm income and net profit to land by major farm type in the East of England, 2017 prices

Farm types (land use)	Average farm size (ha) (% agric utilised)	Farming system	Net farm Income £/ha, before adjustment	Adjustment £/ha +	Net profit due to land £/ha
Cereals (extensive arable)	230 (97%)	over 75% cereals and combinable crops	271	-83	187
General cropping (intensive arable)	330 (82%)	45-55% cereals and combinable crops, atleast 20% other crops including sugar beet, potatoes and and field vegetables	293	-73	221
Horticulture	25 (90%)	mainly soft fruit and top fruit, salads, protected cropping	1018	-547	471
Lowland Grazing (grassland< improved and unimproved)	161 (97%)	mainly beef and sheep	133	-243	-110

Source: Cranfield University

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Company Profile

Vivid Economics is a leading strategic economics consultancy with global reach. We strive to create lasting value for our clients, both in government and the private sector, and for society at large.

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