



5.5 Land and sea management

The way we manage our land and seas to produce food and raw materials has a profound impact on the natural environment. Some 80% of the area of England is managed either for agriculture or forestry (Figure 5.8), and much modern land management is intensive and specialised. For some areas, however, neglect (where the current level of management is very low or management has ceased altogether) rather than intensification, now impacts on the environment. In our seas, intensive commercial fishing has significantly changed populations and ecosystems.

5.5.1 Agriculture

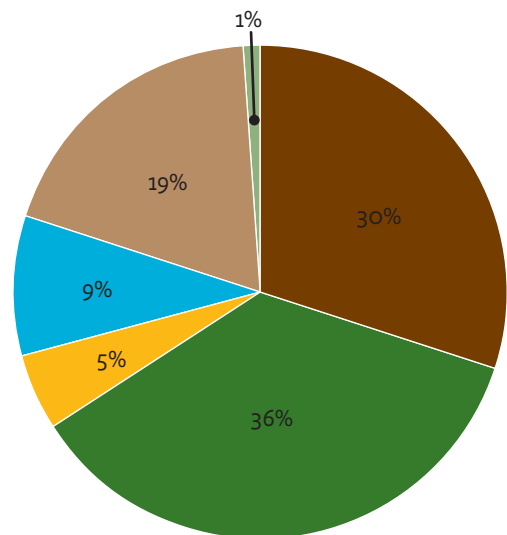
Most modern agriculture is based upon intensive land use. Systems have become specialised, with increasing numbers of farms concentrating on a small number of products to increase efficiency. This combination of intensification and simplification has led to landscape change, habitat degradation and loss, reduction or loss of species, and damage to soils. Key threats to the natural environment arising from intensive modern agriculture include nutrient input; overgrazing in the uplands encouraged by the previous subsidy regime; and drainage, which is a hangover from past subsidies and management, especially on upland blanket bogs.

5.5.1.1 The current situation

Agricultural land covers 71% of England's land area. Between 1996 and 2006, the area of agricultural land fell by 1%. The area of crops fell by 4% in the same period and rough grazing also fell by 4% (although grassland increased by 5% and forest and woodland by 14%) (Defra 2006a). Development for housing and infrastructure was a significant factor in this agricultural contraction: around 5-6,000 ha of rural land is currently converted to urban development annually (Defra 2005e).

Agricultural land in the lowlands is more versatile than in the uplands, and the mix of farming enterprises more liable to change. In recent years arable farming has been more profitable due to factors such as restriction of worldwide supply and the expanding domestic biofuel market. Numbers of grazing animals have declined as increases in regulation and feed prices have forced out smaller livestock producers. This has led to less diverse farming: there are fewer mixed, small or low-intensity farms.

Figure 5.8 Broad land uses in England



- Crops and bare fallow
- Grasses and rough grazing
- Other agricultural land (set aside and other land on agricultural holdings. Excludes woodland)
- Forest and woodland
- Urban land and land not otherwise specified
- Inland water

England total land area = 13.3 m ha

(Sources Defra, Ordnance Survey, Forestry Commission, Forest Service)

5.5.1.2 Implications for the natural environment

Intensification of agricultural land has led to the loss of some habitats and landscape features. Drainage has destroyed wetlands, and the demise of mixed farming systems in particular has also led to the loss of other features such as hedgerows, field margins and orchards. In addition, radical changes in management can result in damage to habitats, such as fertiliser application on species-rich grassland. Other impacts include soil compaction, erosion and loss of organic matter, which reduces soil capability for carbon sequestration. Conversion to arable land from other uses can also increase the rate of water runoff, contributing to erosion, greater sediment load in rivers and increasing the likelihood of flooding.

Prior to policy changes in the late 1980s and 1990s, which stemmed the rate of intensification, 97% of lowland unimproved grassland was lost between 1930 and 1984 (Fuller 1987), and 20% of hedgerows were lost between 1984 and 1990 (Petit *et al.* 2003).

Increased grazing pressure has also changed upland landscapes and their biodiversity. Here the impacts on shallow, relatively infertile soils ranged from increased erosion to loss of biodiversity, particularly the highly valued landscape dominated by heather and other dwarf shrubs. These trends have been exacerbated by over-intensive burning, either to aid game production (though traditional regimes can sustain typical upland landscapes) or to control coarser grasses to improve stock grazing. Other adverse impacts include draining, liming, ditch-digging and re-seeding. These impacts have had a significant effect on upland peatlands: 74% of upland heathland by area is designated SSSI and of this 29% remains in unfavourable condition; 69% of blanket bog is designated SSSI and 30% is in unfavourable condition. As well as the impacts on biodiversity, eroded peat affects the landscape, water run-off and quality, and restricts access. There are also implications for climate change due to carbon emissions from the eroded peat. Over half of the UK carbon is stored in peat, and the majority of peat in England and Wales (over 80%) is in the uplands (Holden *et al.* 2007).

Agriculture has had a profound effect on BAP priority habitats, with 11 of the 15 declining habitats doing so at least partly as a result of agricultural practices.

Intensive fertiliser and pesticide application affects field margins and boundaries. Intensive stock rearing leads to run-off from slurry and manure, and can have a pervasive effect on watercourses and open water through the leaching of excess nitrates and phosphates. It is also a source of atmospheric pollution (particularly nitrogen), which has a significant effect on terrestrial wildlife (see Section 5.6).

In the lowlands, and particularly in the south-east of England, agricultural change has led to under-management of areas valuable for biodiversity and landscapes, which can be difficult to reverse. Often small fragments of land have been left isolated, and they are then not economic or practical to manage. The lack of management leads to development of rank vegetation and eventually scrubbing up of grassland and heathland. Small areas are also more vulnerable to impacts from surrounding areas; for example changes in water level on adjacent land leading to drying out of wetland habitats such as lowland fen.

5.5.1.3 Forward look

A number of factors will affect agriculture and its impacts on the natural environment. The future direction of the Common Agricultural Policy following the current 'healthcheck' could have a major effect as the agricultural industry becomes more market-led. The outlook is currently difficult to judge. It may provide opportunities to find beneficial alternative uses for land no longer economically viable for agriculture, but may also signal the prospect of further intensification. This may depend on whether cereal commodity prices continue to rise, impacting on food prices and affecting the amount of arable land and the crops grown. The likely introduction of genetically modified organisms and other biotechnology may have direct effects from the introduction of new crops, and indirect effects on biodiversity through modified strains of existing crops requiring different patterns of herbicide or pesticide use. The impacts of biofuel and biomass crops have been outlined in Section 5.4.

The decline in lowland and upland stock farming, driven by regulation, economics and the risk of disease, is expected to continue. This will lead to continued neglect of some lowland habitats, such as grassland and heath, and the undergrazing or abandonment of some upland areas and habitats such as hay meadows, which are dependent on traditional upland livestock systems.

Climate change may gradually impact upon production: warmer summers may result in the introduction of new crops or strains of existing crops and higher productivity of some existing crops.

5.5.2 Forest and woodland management

5.5.2.1 The current situation

Woodland cover has increased, particularly since 1947, from a low of around 5% of England's land area in 1900 to around 9% now (Forestry Commission 2006b). This was mostly through conifer planting. However, since 1985 the earlier clearance of ancient woods and conversion of native woodland to plantations has been partly reversed under the Forestry Commission's Broadleaves Policy by replacing conifers with native broadleaves. New planting of woodland continues with a total of 3,174 ha in 2006/07 (Forestry Commission, 2007b).

The emphasis on timber production as an output from forestry and woodland management has been decreasing for the last 20-30 years, though there are signs that this trend may be reversing. According to Defra's 2007 Forestry Strategy, we currently harvest only around a quarter of the annual growth of timber from our native woodland and only 60% from our conifer forests each year. Woods are increasingly being managed for biodiversity, access and amenity – non-timber based woodland businesses, such as those involving recreation and tourism, are equivalent to around 16% of the value of all timber and woodland management in England. The Forestry Commission estimates that there were 222 million visits to woodland in 2002/03 (see Section 4.2.2).

5.5.2.2 Implications for the natural environment

Not all woods need to be actively managed, but there are lost opportunities from the current under-management of woodland in terms of lowered sustainable production and declines in some key species, and many woods have become less attractive for recreation. The Woodland Management Grant scheme funding has proved insufficient to bring enough woods into management to meet current BAP targets, and costs of sustainable forestry certification are acting as a barrier to management for many woodland owners. This has a particularly adverse impact on species that depend on open space or young growth because under-management and abandonment reduce the structural as well as the species' diversity within woods; it also reduces their amenity value. Additionally, overgrazing by deer is having significant effects by limiting natural regeneration and damaging existing young trees and shrubs and ground flora with consequent impact on the diversity of woodland plants and birds. There have been major changes to woodland shrub layers as a result of deer browsing (e.g. Kirby 2003a).

In the public sector, management of the Forestry Commission's estate has provided benefits for biodiversity and access. These have extended beyond semi-natural woodland habitats. For example, rotational felling within conifer plantations, in themselves of limited biodiversity value, can create valuable breeding habitat for bird species such as woodlark and nightjar (see Section 3.5.3).

The risks of woodland being under-managed have increased due to poor returns from wood and timber (related to low world timber prices and often poor quality of the current tree crops) combined with perceived burdens of regulation and insufficient incentive through grants etc. In addition, woodland management may not be the primary objective for some private owners who value their woodland for other reasons, for example because it provides privacy.

Increasingly economic and other factors are also militating against further forestry expansion. In particular, rising food or energy crop prices are discouraging farmers and other land managers from making land available for new woodland. The cost and complexity of establishing wooded urban green space limits the creation of new woods while, especially in the south-east, urban and infrastructure development continues to erode the ancient woodland resource.

5.5.2.3 Forward look

Continued climate change is likely to have effects on our woods though these are as yet not completely understood. The introduction or spread of further pest and diseases could have drastic effects on individual species and thus on our landscapes and biodiversity. There are also opportunities for climate change mitigation – woodland can sequester carbon more rapidly than an equivalent area of peatland.

If demand for wood-fuel and fibre increases, opportunities could be created for the natural environment. The Forestry Commission estimates that there is the potential by 2020 to harvest 2 million tonnes annually of currently unharvested material: this biofuel would power the equivalent of 250,000 homes per year (Forestry Commission 2007a). While bringing neglected woodland back into management would provide benefits for biodiversity and people, there would be risks of localised over-intensive management. Consequently, there would need to be careful planning of how any expansion of harvesting takes place.

New development, green space provision and leisure could lead to further opportunities to provide new woods and access to and use of existing woods. Benefits will be greatest where forestry is closely integrated with agriculture, environmental conservation, energy, transport and social agendas such as the proposed creation of 'eco-towns'. The Community Forests programme (see also Section 4.4.3) has shown how this can be done: since 1990, over 10,000 ha of new woodland have been planted, more than 27,000 ha of existing woodland have been brought under management and 16,000 ha of woods and green space have been opened up for recreation and leisure (England's Community Forests 2005).

5.5.3 Sea fisheries

5.5.3.1 The current situation

Fishing is the most widespread and significant exploitative activity in the marine environment. The most common methods involve towed fishing gear such as trawls or dredges pulled through water. Depending on the species to be caught, these can be either demersal (towed on the seabed) or pelagic (towed clear of the seabed). In shallower, inshore waters, static fishing methods are more common, such as the use of baited pots or traps, baited hooks on set lines and fixed nets.

At present, most fishery management is based on the size and distribution of stocks of individual fish species. Management of fisheries to keep stocks above a 'safe biological level' puts limits on fish numbers caught, the gear that can be used, and the number of fishing days. In north-west European waters, fisheries management has largely failed to meet this objective, leading to fewer fish being available for fishermen to catch and the effects on populations outlined below.

5.5.3.2 Implications for the natural environment

There have been very significant impacts on marine species (especially fish) populations, particularly through targeting large and long-lived species, advances in technology and the intensity of fishing.

In addition, there are the unintended effects of fisheries activities such as by-catch that further reduce populations of key species.

Since 1990, at least 70% of overall UK fish stocks have declined in their reproductive capacity and have been harvested unsustainably. The situation varies widely between species. In 2005, only 65% of assessed UK fish stocks (largely whitefish) were fished sustainably and only 35% of fish stocks around the UK were at full reproductive capacity (Defra 2004a). In 1998, UK vessels landed £137 million of cod and haddock (about 25% of UK landings by value), but this fell to just £70 million in 2002 (Cabinet Office 2004). Recent changes in stocks of commercially fished species are given in Table 5.6.

Table 5.6 Changes in stocks of key fish species, 1996-2004

Location	Species	% Change in stock level (1996-2004)
North Sea	Herring	+300%
	Haddock	+50%
	Plaice	+5%
	Cod	-50%
NE Atlantic	Mackerel	0%

(Source: ICES, 2006)

Though these major impacts on fish stocks are largely due to towed fishing methods, static techniques may have significant localised or wider impacts on vulnerable species and populations. For example, mono-filament gill nets are highly effective at catching slow-growing species of fish such as sharks or rays, which can be difficult to catch with towed gear because of seabed topography, and hence may have major impact on their populations.

By-catch, the inadvertent capture of non-target species, is a major problem and can affect nearly all marine species: animals living on the seabed, mammals, reptiles (such as turtles) and seabirds. It can occur during active fishing, or as a result of 'ghost fishing' (see below). Two forms of fishing gear towed on the seabed (demersal gear) are particularly damaging. By-catch can constitute up to 60% of the fish caught in beam trawls (where chains may be used to disturb fish from sediment), and up to 40% of those caught in otter trawls (which travel over rocky sea beds and can crush seabed organisms) (Commission of the European Communities 2007).

Set gears are also responsible for by-catch. There are numerous records of birds and cetaceans becoming entangled in static nets (Dayton *et al* 1995). Even gear no longer in use can have an effect: in 'ghost fishing', organisms become entangled in snagged or lost gear (including torn nets, lost crab and lobster pots) made from non-biodegradable materials. More evidence is needed about its impacts on marine species.

Fishing affects marine ecosystems in complex ways, and establishing precise cause and effect can be difficult. However, if a major part of a marine food web is removed or severely depleted by fishing, it is likely that several other component species will be affected

as their competitors, predators, or food sources are removed. Cod stocks are a good example. Full-sized cod prey on smaller species such as herring, which compete for food with small cod. However, fishing has reduced the number of older, larger cod. Cod can live for approximately 40 years but, as a result of fishing, only 10% of the individuals in the North Sea are more than one or two years old and less than 0.5% are five years old or more. This skewed age structure also leads to the selection and survival of smaller, faster-maturing individuals. The long-term effects of such genetic shift are unknown, and more evidence is needed on whether it reduces fish species' resistance to further environmental changes. Conversely, other species, such as prawns, scallops and lobsters, whose predators (mainly fish) have been greatly reduced in abundance by fishing, thrive today in the much more sparsely populated seas that surround England (Roberts & Thurstan unpublished).

Numerous studies have shown that the physical effects of using benthic fishing gear reduce both species richness and productivity in most marine seabed types (eg Kaiser *et al.* 2002). The reefs of Lyme Bay are a good example of the damage that can be caused. The hauling of set nets and pots, particularly across reefs, affects less of the seabed than mobile fishing gears, but they may be locally significant in areas with communities of long-lived fauna particularly those of high conservation value (Gray *et al.* 2006).

5.5.3.3 Forward look

The English fishing fleet is now much smaller than in the past yet technical efficiency means these impacts on marine biodiversity will continue (JNCC 2008b). It seems likely that the current adverse effects on fish stocks and the marine environment will continue unless there is significant reform of the Common Fisheries Policy. This requires a long-term approach to management of fish stocks, the adoption of both an ecosystem approach to management and the precautionary principle, reduction in overall fleet capacity, environmental protection requirements and a reduction in by-catch. Common Fisheries Policy measures agreed in late 2007 have focussed on protecting cod stocks and reducing discards.