Summary

Area and Change

• The Arable and Horticulture Broad Habitat covered about 4.0 million ha or 30.4% of the area of England in 2007. Most was in the Easterly Lowlands Environmental Zone.

• The Improved Grassland Broad Habitat covered an area of approximately 2.9 million ha or 21.7% of the area of England in 2007. Most was in the Westerly Lowlands Environmental Zone.

• Since 1998, the area of land in the Arable and Horticulture Broad Habitat decreased significantly by 8.8% (387,000ha) in England, and by 7.0% (approx 220,000ha) and 13.3% (approx 160,000ha) in the Easterly and Westerly Lowlands Environmental Zones respectively.

• The area of Improved Grassland increased by 5.2% in England between 1998 and 2007, although this was not statistically significant. There was a significant increase of 14% (approx 130,000ha) in the Easterly Lowlands.

Condition of Arable and Horticulture Broad Habitat

• Plant species richness in the Main Plots within the cropped area of the Arable and Horticulture Broad Habitat increased by 36% (from 7.5 to 10.2 species per plot), including species used as food by farmland birds and butterfly caterpillars in England between 1998 and 2007.

• There were significant decreases in Light, Competitor, Fertility, Ellenberg pH Scores and Grass:Forb ratio but a significant increase in Ruderal Scores of Main Plots in the cropped area of the Arable and Horticulture Broad Habitat across England between 1998 and 2007. Most of these changes were also significant in the Easterly Lowlands Environmental Zone.

• In contrast to the results for the Main Plots, the species richness in plots targeted for their botanical interest in the Arable and Horticulture Broad Habitat decreased significantly across England from 13.0 to 9.2 species per Targeted Plot between 1990 and 2007.
Arable margins had a higher species richness and cover of plants than arable fields or the edges of crops in England in 2007. The species richness was 10.7, 8.5 and 5.1 species per 2m x 2m core plot in Margin (where at least 6m wide strip was present), Crop Edge and Main Plots (within the cropped area) respectively.

**Condition of Improved Grassland Broad Habitat**

• There was no significant change in species richness in Main Plots in Improved Grassland Broad Habitat between 1998 and 2007 or between 1990 and 2007. This contrasts to the report for Great Britain where a significant decrease was observed between 1990 and 2007. The average was 14.6 species per 200m² Main Plot in England in 2007.

• There were significant decreases in the Grass:Forb ratio, Light and Ellenberg pH Scores and an increase in stress tolerating species in Main plots in the Improved Grassland Broad Habitats across England between 1998 and 2007. Most of these significant changes were also detected in the Westerly Lowlands Environmental Zone, but the Easterly Lowlands showed a significant decrease in ruderal species and Light Score. A significant decrease in Ellenberg pH was detected in the Uplands Environmental Zone.

• Plant species richness in Improved Grassland in areas targeted for their botanical interest decreased significantly by 11% (from 13.1 to 11.6 species per Targeted Plot) in England between 1998 and 2007 and by 25% (from 15.5 to 11.6 species per Targeted Plot) between 1990 and 2007.

**Soils**

• pH in soil (0-15cm) increased in both Arable and Horticulture (from 7.02 to 7.43) and Improved Grassland (from 6.29 to 6.58) Broad Habitats in England between 1998 and 2007, continuing the trend from 1978.

• There was a significant decrease in the concentration of carbon in soil (0-15cm) from 29.8g/kg to 27.2g/kg in Arable and Horticulture Broad Habitat in England between 1998 and 2007. This is the only Broad Habitat where soil (0-15cm) carbon concentrations were significantly lower in 2007 than in 1978. There was no difference in concentration of carbon in soil (0-15cm) in Improved Grassland.

**Extra analysis**

• Set-aside and agri-environment schemes are the most probable cause of the increase in plant species richness of the Arable and Horticulture Broad Habitat in England between 1998 and 2007.
The two Broad Habitats covered in this Chapter are among those most likely to change in both area and condition over time, because their management is so responsive to the economics of farming, the introduction of new technologies and to changes in agricultural policy.

Countryside Survey describes the condition of these two Broad Habitats using several linked approaches: in both Broad Habitats the randomised Main Plots describe the condition of the habitats as a whole whilst Targeted Plots explore change in those pockets of less intensively managed land within otherwise intensively farmed land. Specific to the Arable Broad Habitat, two additional types of plot (Crop Edge and Managed Margin) explore the quality of habitat provided at the crop/boundary interface, where policy instruments have in recent years sought to reduce the impacts of intensive management.

### 3.2.1 Change in Area

The Arable and Horticulture Broad Habitat covered about 4.0 million ha or 30.4% of the area of England in 2007, although this was not statistically significant. This increase followed decreases from 1984 to 1998 (Table 3.1). A significant decrease was observed in the Easterly and Westerly Lowlands Environmental Zones.

The Improved Grassland Broad Habitat in England covered an area of approximately 2.9 million ha in 2007, with the largest area in the Westerly Lowlands. The area of Improved Grassland in England increased by 5.2% (142,000ha) between 1998 and 2007, although this was not statistically significant. This increase followed decreases from 1984 to 1998 (Table 3.2). A significant increase of 14% (approx 130,000ha) was observed in the extent of Improved Grassland in the Easterly Lowlands, where the Arable and Horticulture Broad Habitat was the predominant agricultural habitat type (Table 3.1).

### 3.2.2 Changes between Broad Habitats

Over 90% of land in the Arable and Horticulture Broad Habitat in 1998 remained in the same Broad Habitat in 2007, but CS recorded net flows from Arable to Improved and Neutral Grasslands (see www.countrysidesurvey.org.uk).

Approximately 75% of the Improved Grassland Broad Habitat in 1998 was also recorded as Improved Grassland in 2007. Nearly all of the losses of Improved Grassland was to Neutral Grassland.
This was more than compensated by net flows from the Arable and Neutral Grassland Broad Habitats, leading to the significant overall increase in area of this Broad Habitat observed.

### 3.3 The condition of the Broad Habitats of enclosed farmland

#### 3.3.1 Arable and Horticulture Broad Habitat

- **Plant species richness in the Main Plots within the cropped area of Arable and Horticulture Broad Habitat** increased by 36% (from 7.5 to 10.2 species per plot), including species used as food by birds and butterfly caterpillars in England between 1998 and 2007.

- There were significant decreases in Light, Competitor, Fertility, Ellenberg pH Scores and Grass:Forb ratio but a significant increase in Ruderal Scores of Main Plots in the cropped area of the Arable and Horticulture Broad Habitat across England between 1998 and 2007. Most of these changes were also significant in the Easterly Lowlands Environmental Zone.

- **In contrast to the results for the Main Plots, the species richness in plots targeted for their botanical interest in the Arable and Horticulture Broad Habitat decreased significantly across England from 13.0 to 9.2 species per Targeted Plot between 1990 and 2007.**

- **Arable margins had a higher species richness and cover of plants than arable fields or the edges of crops in England in 2007.** The species richness was 10.7, 8.5 and 5.1 species per 2m x 2m core plot in Margin (where at least 6m wide strip was present), Crop Edge and Main Plots (within the cropped area) respectively.

**Main Plots**

**Plant species richness:** The number of plant species found in Main Plots within the Arable and Horticulture Broad Habitat increased (from 7.5 to 10.2 species per plot) between 1998 and 2007, continuing the trend from 1990 to 1998 (Table 3.3). Corresponding increases were seen in the observed numbers of plant species used as food by farmland birds and butterfly caterpillars (Table 3.3). In addition to changes in the numbers of species present, there were also changes in the percentage of cover (see Table 3.5).

**Other condition characteristics:** The condition characteristics of the vegetation in Main Plots in the Arable and Horticultural Broad Habitat showed variability in those characteristics that changed and also in the direction of change for all periods since 1990.

Between 1998 and 2007, there were significant decreases in Light, Competitor, Fertility, Ellenberg pH Scores and Grass:Forb ratio but significant increases in Ruderal Scores of Main Plots in the cropped area of the Arable and Horticulture Broad Habitat across England. The change in Grass:Forb ratio indicates that the cover of forbs increased at the expense of grasses, but the ecological significance of this in the context of arable fields is uncertain. Most of these changes were also significant in the Easterly Lowlands Environmental Zone (Table 3.3).
The decreases in Competitor, Fertility, Ellenberg pH and Ellenberg Light Scores in addition to an increase in Moisture Score were also significant across the long-term, between 1990 and 2007. These significant changes were also detected in the Westerly and Easterly Lowlands Environmental Zones (Table 3.3).

This was consistent with moderately less intensive management on this most intensively managed of all Broad Habitat types. Taken together, the changes in plant Species Richness Score and condition in the Main Plots of the Arable Broad Habitat are consistent with an increase in the number of non crop plants (i.e. weediness) within the cropped area between 1998 and 2007.

### Targeted Plots

**Plant species richness**: Fragments of uncultivated or unmanaged land within the Arable and Horticulture Broad Habitat (e.g. corners of fields, areas around field trees, or areas sometimes termed 'mid-field islets') can provide important wildlife refuges for a range of species that would not otherwise persist in intensive agricultural landscapes. These areas are sampled by Targeted Plots. In contrast to the results for the Main Plots in the cropped areas, (which showed a significant increase in plant Species Richness) in Targeted Plots species richness decreased significantly across England from 13.0 to 9.2 species per Targeted Plot (Fig. 3.1) and it also

---

3 Targeted Plots (2m x 2m) are positioned by surveyors to assess small areas of botanical interest which may be overlooked by the randomly located Main Plots.
decreased significantly in the Easterly and Westerly Environmental Zones between 1990 and 2007. A similar pattern of decreases was also observed in the number of plant species used as food by farmland birds and butterfly caterpillars. No significant changes were observed across England between 1998 and 2007, but the Species Richness continued to decrease in the Easterly Lowlands Environmental Zone (Table 3.4).

**Other condition characteristics:** In contrast to Main Plots, Ruderal Scores decreased in Targeted Plots across England and in the Easterly Lowlands Environmental Zone between 1998 and 2007. Over the same period Light Scores decreased across England and in the Westerly Lowlands Environmental Zone and Moisture Scores increased in the Westerly Zone (Table 3.4).

**Arable field margins:** Crop Edge Plots of 100m length were recorded within the first metre of crop from the edge of the field in both 1998 and 2007. An average of 15.5 species per plot were found in 1998 and 16.5 species per plot in 2007 but this apparent increase was not significant. In contrast to the results found for Main Plots, in Crop Edge Plots there was no significant increase in the number of plant species used as food by farmland birds and there was a significant decrease in the number of plant species used as food by butterfly caterpillars, from 5.1 per plot in 1998 to 4.7 in 2007. Other condition measures of the Crop Edge Plots were broadly similar to those in the Main Plots.

Managed Margin Plots were recorded for the first time in 2007, to help understand the impacts of incentives for managing field margins through agri-environment schemes. Managed Margin Plots were recorded where a field margin of a minimum width of 6m was present, in those arable fields where a Main Plot was located. A total of 87 such plots were recorded in England. On average 11 plant species were found in each Managed Margin Plot.

The Managed Margin Plots, Main Plots and Crop Edge Plots are of different sizes but all have a central 2m x 2m core that allows overall comparison of key measures (Table 3.5). This shows that the Managed Margin Plots had the highest plant Species Richness Score (10.7) and the highest percentage cover of plants (21.1%), whereas Main Plots had the lowest plant Species Richness Score (5.1). The percentage cover of plants was similar in Main Plots (16.4%) and Crop Edge Plots (16.1%).

**3.3.2 Improved Grassland Broad Habitat**

- **There was no significant change in species richness in Main Plots in Improved Grassland Broad Habitat between 1998 and 2007 or between 1990 and 2007. This contrasts to the report for Great Britain where a significant decrease was observed between 1990 and 2007. The average was 14.6 species per 200m² Main Plot in England in 2007.**

- **There were significant decreases in the Grass:Forb ratio, Light and Ellenberg pH Scores and an increase in stress tolerating species in Main plots in the Improved Grassland Broad Habitats across England between 1998 and 2007. Most of these significant changes were also detected in the Westerly Lowlands Environmental Zone, but the Easterly Lowlands showed a significant decrease in ruderal species and Light Score. A significant decrease in Ellenberg pH was detected in the Uplands Environmental Zone.**

- **Plant species richness in Improved Grassland in areas targeted for their botanical interest decreased significantly by 11% (from 13.1 to 11.6 species per Targeted Plot) between 1998 and 2007 and by 25% (from 15.5 to 11.6 species per Targeted Plot between 1990 and 2007.**

**Main Plots**

**Plant species richness:** There was no change in the number of plant species found in plots within the Improved Grassland Broad Habitat since 1990 in England. There was also no change in the frequency of food plant species for farmland birds or butterfly caterpillars.

**Other vegetation characteristics:** The decrease in the ratio of grasses to forbs and the value of the Light Score between 1998 and 2007 (Table 3.6) suggests that Improved Grassland swards became denser and more shaded, favouring shade-tolerant species.
Unlike the results for Great Britain there was no detectable increase in competitive species and no decrease of ruderal species, but there was an increase in stress tolerating species.

Over the longer term, 1990-2007, there were significant increases in Competitor, Stress Tolerator and Moisture Scores and significant decreases in Ruderal, Light, Fertility and Ellenberg pH Scores in the Improved Grassland Broad Habitat in England, most of which were also significant in the Easterly and Westerly Lowlands Environmental Zones. The significant decrease in Competitor, and increase in Ruderal Scores in this Broad Habitat in the Uplands Environmental Zone contrasts with the significant trends shown in the other Environmental Zones, while the decrease in Ellenberg pH is consistent with significant trends shown in the other Environmental Zones and England as a whole.

### Table 3.6: Change in the characteristics of vegetation in 200m² Main Plots in the Improved Grassland Broad Habitat across England (E) and the three Environmental Zones (EL: Easterly Lowlands, WL: Westerly Lowlands, UP: English Uplands, between 1990 and 2007. Mean values for 1998 and 2007 are presented; those for 1990 are available at www.countrysidesurvey.org.uk. Arrows denote significant change (p<0.05) in the direction shown. The condition measures are described in Box 1.3 of the UK Results from 2007 report.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Species Richness (No. of Species)</td>
<td>14.1 14.6</td>
<td>↓</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>No. of Bird Food Species</td>
<td>8.8 9.2</td>
<td></td>
<td>↑</td>
<td></td>
</tr>
<tr>
<td>No. of Butterfly Food Species</td>
<td>7.2 7.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grass:Forb Ratio</td>
<td>1.68 1.47</td>
<td>↓</td>
<td></td>
<td>↓</td>
</tr>
<tr>
<td>Competitor Score</td>
<td>2.73 2.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress Tolerator Score</td>
<td>1.85 1.88</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ruderal Score</td>
<td>3.19 3.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light Score</td>
<td>7.11 7.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertility Score</td>
<td>5.84 5.79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ellenberg pH Score</td>
<td>6.21 6.17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture Score</td>
<td>5.31 5.33</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Targeted Plots**

The Species Richness Score in areas targeted for their botanical interest within the Improved Grassland Broad Habitat decreased by 11% (from 13.1 to 11.6 species per Targeted Plot) between 1998 and 2007 and by 25% (from 15.5 to 11.6 species per Targeted Plot between 1990 and 2007. This was similar to findings in the Arable and Horticulture Broad Habitat (*Fig. 3.2*).

**Figure 3.2:** Changes in the Species Richness Score in 2m x 2m Targeted Plots in the Improved Grassland Broad Habitat across England between 1990 and 2007. Significant changes (**p<0.01, ***p<0.001) are shown between the dates bracketed. 95% CI are shown for each data point.
### 3.4 Changes in soils (0-15cm) in the Broad Habitats of enclosed farmland

- **pH in soil (0-15cm)** increased in both Arable (from 7.02 to 7.43) and Horticulture and Improved Grassland (from 6.29 to 6.58) Broad Habitats in England between 1998 and 2007, continuing the trend from 1978.

- There was a significant decrease in the concentration of carbon in soil (0-15cm) from 29.8g/kg to 27.2g/kg in Arable and Horticulture Broad Habitat in England between 1998 and 2007. This is the only Broad Habitat where soil (0-15cm) carbon concentrations were significantly lower in 2007 than in 1978. This is consistent with a significant decrease in carbon concentration over the long-term, between 1978 and 2007 (See also Chapter 2, Table 2.11).

#### 3.4.1 Soil (0-15cm) pH

The mean pH of soil (0-15cm) samples from the Arable and Horticulture Broad Habitat in England increased significantly from 7.02 to 7.43 between 1998 and 2007. Coupled with the increase between 1978 and 1998, a trend is apparent between 1978 and 2007 (See Fig. 3.3 and Chapter 2, Table 2.11).

#### 3.4.2 Soil (0-15cm) carbon concentration

There was a significant decrease in the mean carbon concentration of soil (0-15cm) in the Arable and Horticulture Broad Habitat between 1998 and 2007. It was 29.8g/kg in 1998 and 27.2g/kg in 2007. This is the only Broad Habitat where soil (0-15cm) carbon concentrations were significantly lower in 2007 than in 1978. This is consistent with a significant decrease in carbon concentration over the long-term, between 1978 and 2007 (See also Chapter 2, Table 2.11).

There was no detectable change in the mean carbon concentration of soil (0-15cm) in the Improved Grassland Broad Habitat between 1998 and 2007. It was 49.6g/kg in 1998 and 48.2g/kg in 2007. The carbon concentration also did not change significantly between 1978 and 2007 (See also Chapter 2, Table 2.11).
### 3.4.3 Bulk density and soil (0-15cm) carbon stock

The mean bulk density of soils (0-15cm) in the Arable and Horticulture Broad Habitat in England in 2007 was 1.25 g/cm³ which when combined with soil (0-15cm) carbon concentration gave a soil (0-15cm) carbon stock estimate of approximately 43tC/ha. This was the lowest carbon stock estimate of all Broad Habitats (See also Chapter 2, Table 2.13).

The mean bulk density of soils (0-15cm) in the Improved Grassland Broad Habitat in England in 2007 was 1.02 g/cm³, which when combined with soil (0-15cm) carbon concentration gave a soil (0-15cm) carbon stock estimate of approximately 59tC/ha (See also Chapter 2, Table 2.13).

### 3.5 Further analysis and discussion to explain changes in the Arable and Horticulture and Broad Habitats

#### 3.5.1 Arable and Horticulture Broad Habitat

- Set-aside and agri-environment schemes are the most probable cause of the increase in plant species richness of the Arable and Horticulture Broad Habitat in England between 1998 and 2007.

In 2007, the Arable Broad Habitat occupied 33% of the land area in England (Table 3.1). The total area increased slightly between 1990 and 1998 but decreased by 8.8% (0.4 million ha) between 1998 and 2007, mainly through conversion to Improved and Neutral Grassland.

Plant species richness within Main Plots in Arable land increased by 45%, between 1990 and 2007 (from 6.3 to 10.2 species) and by 36% between 1998 and 2007. The most likely explanation for this increase is a combination of the impacts of set-aside and agri-environment schemes. This follows a decrease in plant species richness between 1978 and 1990 reported in previous Countryside Surveys. Increases in the numbers of plants which provide food for farmland birds and butterfly caterpillars are accompanied by increases in the percentage cover of non-crop species in arable fields. These changes are likely to be a result of marked increases in the area of set-aside and fallow land, which could have been driven by low commodity prices as well as direct policy (Table 3.7).

Although Crop Edge Plots in the Arable Broad Habitat showed no detectable change in Species Richness between 1998 and 2007, plots within the subdivisions (attributes recorded by surveyors) of ‘arable crops’ and ‘annual early successional vegetation’ did show change. Both Main Plots and Crop Edge Plots in land with early successional vegetation (possibly set-aside) contained more species than cropped land in 2007 (Table 3.8). In 1998 Crop Edge Plots contained more species when they were next to arable crops rather than adjacent to annual early successional fields. While arable crops as represented by Main Plot data are less species-rich than crop-edges, fields potentially under set-aside management have roughly the same species richness as the crop-edge. The end of compulsory set-aside in 2008 is likely to result in a large reduction in the area of annual early successional habitat and a subsequent decrease in numbers of plants species used as food by farmland birds and butterfly caterpillars.

#### Table 3.7: Change in estimated area (’000s ha) of land recorded by the code ‘annual early successional’ (an indicator of set-aside and other fallow land) in the Arable and Horticulture Broad Habitat in England between 1998 and 2007. Arrows denote significant change (p<0.05) in the direction shown.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>22</td>
<td>35</td>
<td>149</td>
<td>330</td>
<td>↑</td>
</tr>
<tr>
<td>Easterly Lowlands</td>
<td>18.5</td>
<td>16.8</td>
<td>111.8</td>
<td>563.8</td>
<td>↑</td>
</tr>
<tr>
<td>Westerly Lowlands</td>
<td>3.5</td>
<td>17.2</td>
<td>36.7</td>
<td>113</td>
<td></td>
</tr>
<tr>
<td>Uplands</td>
<td>0.001</td>
<td>0.5</td>
<td>0.06</td>
<td>.87.1</td>
<td></td>
</tr>
</tbody>
</table>

#### Table 3.8: Plant Species Richness Scores in 200m² Main Plots and Crop Edge Plots (No. of species) in land recorded by the codes ‘arable crops’ and ‘annual early successional’ (an indicator of set-aside and other fallow land) in the Arable and Horticulture Broad Habitat in England between 1998 and 2007.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Plots (No. of species)</td>
<td>6.3</td>
<td>9</td>
<td>8.2</td>
<td>17.7</td>
</tr>
<tr>
<td>Crop Edge Plots (No. of species)</td>
<td>14.9</td>
<td>16.3</td>
<td>10.2</td>
<td>17.4</td>
</tr>
</tbody>
</table>

The change in overall plant diversity in crop edges in Great Britain between 1998 and 2007 was not statistically significant, but the numbers of plants which provide food for butterfly caterpillars decreased. The vegetation changes both within crops (Main Plots) and on the edges of crops (Crop Edge Plots) suggest a reduction in soil fertility. In contrast to results based on vegetation analysis, a significant increase in soil (0-15 cm) pH and a decrease in soil (0-15cm) carbon concentration was detected between 1978 and 2007.

Field margins established under agri-environment schemes have more species than the crop area as measured by Main Plots, but the plant species richness and cover are still low (on average 11 species per plot and 21% cover) when compared to other Broad Habitats and to set-aside land. The results demonstrate that many arable field margins are comprised of relatively simple sown grass mixes and are almost as species-poor as the cropped area although...
percentage cover is higher. However, they provide structural diversity which is valuable for a range of wildlife as well as shelter and food for invertebrates.

### 3.5.2 Improved Grassland

In 2007 the estimated area of Improved Grassland was 2.9 million ha, around a fifth of the land area of England. The area of Improved Grassland decreased significantly between 1990 and 1998 but increased again between 1998 and 2007, largely as a result of conversion of arable land to grassland.

Although the plant species richness of Improved Grassland in England has not changed significantly since 1990 those areas targeted for their botanical interest in the 1990 Countryside Survey showed species richness had decreased by 25% by 2007. The vegetation plots in Improved Grassland also changed in ecological character between 1998 and 2007 with a shift towards later successional, shaded vegetation and slightly less alkaline/more acidic conditions.

### 3.6 Discussion and Conclusions

#### 3.6.1 General Trends in Enclosed Farmland

Enclosed farmland encompasses the two Broad Habitats that are dominated by intensive agriculture and are responsible for the bulk of food production in England. Changes observed by Countryside Survey in the land-use and biodiversity of enclosed farmland are likely to be responses to economic and technological drivers affecting farming at global or national scales, as well as to policy responses delivered at the Europe and England levels (See also Chapter 4 Semi-improved Grassland, and Chapter 5 Boundary and Linear Features).

The Arable and Horticulture Broad Habitat in the UK is dominated by production of cereals and oilseeds. Economically, the period between the 1998 and 2007 surveys was largely characterised by low arable commodity prices on world markets, leading to pressure on farm profitability. Improved Grassland supports productive livestock enterprises, primarily dairying and beef and sheep rearing. Trends in these sectors have been less clear-cut: the dairy sector has seen ongoing supply-chain driven pressure on milk prices, forcing many smaller producers out of the sector, and where dairying has remained viable, the pressure has been to reduce costs through maximising utilisation of grassland. The beef and sheep sector has seen fluctuating meat prices during the period under review.

Within the European Union, the Common Agricultural Policy (CAP) provides the overarching framework for farm support, and has been subject to an ongoing process of reform since 1998; the Agenda 2000 reforms introduced the concept of the two ‘pillars’ of the CAP; the first (Pillar 1) making direct subsidy payments to farmers, but balanced by a second (Pillar 2), intended to promote rural development and moderate the environmental footprint of farming.

Subsequently, from 2005, the basis for Pillar 1 to support itself has fundamentally changed, through the decoupling of the direct subsidies from production. In England, the new framework involves a single area-based payment, linked to a series of cross-compliance measures designed to enhance the quality of basic environmental management. England has also taken the opportunity to ‘modulate’ a proportion of Pillar 1, using it to enhance the resources available for incentive schemes under Pillar 2. This enabled the roll-out in 2005 of Entry Level Stewardship as an agri-environment scheme intended to be attractive and available to almost all farmers. Most recently, the decision was taken to abandon the use of compulsory set-aside as a production limiting measure. This is not likely to have impacted on the Countryside Survey data for 2007, but may have implications in the future.

CAP reform, and in particular the growth of Pillar 2, is in part a response to increased policy awareness of the negative externalities of agriculture, particularly in relation to impacts on water quality and biodiversity, resulting in market failure. For England, policy responses have been developed across both Pillars of the CAP involving a range of voluntary, incentive-driven and regulatory measures. Taken together, these encourage farmers to evaluate the environmental impacts of their farm business and to modify management to reduce its external impacts. The data set generated by Countryside Survey offers an opportunity to assess the success of these measures in an integrated way.

There has been increased recognition since the mid 1970’s that effective conservation of biodiversity requires action beyond sites of known high wildlife value. This emerged from recorded declines in characteristic farmland wildlife, especially bird species such as Tree Sparrow (*Passer montanus*) and Corn Bunting (*Emberiza calandra*). This has been a key driver in the evolution of agri-environment policies from those addressing specific cases (Breods Grazing Scheme, 1986), to high landscape value areas (Environmentally Sensitive Areas Schemes, from 1987), to targeted landscapes in the wider countryside (Countryside Stewardship, 1991; Arable Stewardship Pilot, 1998), to a scheme designed to provide benefits across all landscapes (Entry Level Stewardship, 2005). Combined with effective regulation and supported by availability of conservation advice, there is a policy expectation that adverse trends in biodiversity in the wider countryside can be reversed, as exemplified by the Government commitment made in 2000 to reverse declines in farmland bird numbers by 2020, and articulated in a biodiversity strategy for England.

There is also an Implementation Group, charged with taking forward the Biodiversity Action Plan developed under the UK strategy for the sustainable use of plant protection products. The authorisations system aims to limit the adverse effects of pesticides on non-target species. These controls are under continuous development. However, the authorisation system alone will not eliminate effects on non-target species altogether and other initiatives are likely to have a major part to play in supplementing the pesticide regulatory controls. Initiatives are also required to address the indirect effects of pesticides on biodiversity. The Biodiversity Action Plan is based around taking some of these key initiatives forward.

---


5. available at http://www.pesticides.gov.uk/environment.asp?id=1834
3.6.2 Arable and Horticulture Broad Habitat

The Arable and Horticulture Broad Habitat is highly influenced by large-scale trends in agriculture which have a significant impact on farm-scale planning, often within short cycles, and some of these impacts are clearly visible in Countryside Survey data. In particular, low commodity returns have made arable cropping less profitable on marginal land, and have driven widespread reversion to grassland, either voluntarily through long-term set-aside or through diversification of farm enterprises. In many cases, however, these decisions will have taken into account the potential to utilise agri-environment incentives, where arable reversion has been targeted to enhance biodiversity, reinforce landscape character, conserve historic features and latterly to protect vulnerable water-bodies. It is very likely that a combination of these drivers and policy mechanisms explains the observed 8.8% decrease in the area of the Arable and Horticulture Broad Habitat and the corresponding 5.2% increase in area of Improved Grassland between 1998 and 2007.

The survey identifies the relative importance of field margins as refuges for biodiversity in the arable landscape. Arable field margins are targeted as a Priority Habitat within the UK Biodiversity Action Plan and are a key element of agri-environment schemes\(^6\). A range of options are available that include grass margins, pollen and nectar mixes and wild bird cover. In general, field margin options are popular with farmers as they can be managed separately from the cropped area. Uptake has been high and the initial UKBAP target was met ahead of schedule in England\(^7\). The results from CS are encouraging in demonstrating that the enclosed farmland habitats, especially the margins of arable fields, support plant biodiversity which also supports a range of animals, including pollinators and predatory species that provide ecosystem services for farmed land. The CS results indicate that not only did overall plant species richness increase, but those species of specific value to farmland birds and butterflies also increased and the habitat became weedier between 1998 and 2007. However, despite this apparent good news, the Farmland Bird Index has continued to decline over this period reaching its lowest ever level in 2007, so the CS results need to be interpreted carefully and other data analysis is needed to explore the relationship between the changes in the vegetation and numbers of farmland birds.

3.6.3 Improved Grassland Broad Habitat

Countryside Survey has found the species richness of Improved Grassland since 1990 to be fairly constant in terms of number of species per plot. Improved Grassland is typically very intensively managed, such as management for silage. It is perhaps less likely to respond to agri-environment delivery than the Arable Broad Habitat, where it is possible to deliver environmental management separately to the intensively farmed area.

3.6.4 Habitat Fragments in Enclosed Farmland

Countryside Survey measures species richness in plots targeted as residual areas of botanical interest within otherwise intensively managed farmland. In the Arable Broad Habitat, a significant decline was identified from 1990 to 1998 but not repeated in 2007, although there are indications that the trend has not been reversed.

---

\(^5\) Information and claim forms available at [http://www.naturalengland.gov.uk/ourwork/farming/funding/assistance/default.aspx](http://www.naturalengland.gov.uk/ourwork/farming/funding/assistance/default.aspx)

\(^6\) The 1995 BAP target for England was to maintain, improve and restore by management the biodiversity of some 32,725ha of cereal field margins by 2010. The target was assessed as met (exceeded) in the 2005 reporting round (90,242ha). Further details are available at [http://www.ukbap.org.uk/GenPageText.aspx?id=105](http://www.ukbap.org.uk/GenPageText.aspx?id=105)
Within the Improved Grassland Broad Habitat, a continued decline of 11.4% has been observed since 1998. ‘Patches’ of habitat are seen as important for maintaining the overall biodiversity value of farmland, and are targeted for positive management through agri-environment schemes, including action to buffer and link patches. It is possible that population effects resulting from isolation\(^8\), (island biogeography) could be outweighing the benefits of positive management; it is also possible that 2007 is too early to evaluate any impact of the introduction of Entry Level Environmental Stewardship in 2005. In the context of the policy emphasis now being placed on Ecosystem Services, in particular regulatory services associated with mitigation of climate change, it will be important to understand the scale of habitat required to maintain functioning habitat networks at landscape scale.

### 3.6.5 Soils

In terms of ecosystems services, the enclosed farmland Broad Habitats provide us with our food, fibre and even sources of renewable energy, so the fertility and structures of the soils are essential to human well being, and wealth of the nation.

Sustainable use of soil has been increasingly identified as a key policy goal, with the first Soil Action Plan published by Defra in 2004\(^10\) and the adoption of the Soil Protection Review as a cross-compliance requirement for the single area payment, and a recognition that soil management may have a contributory role in climate change mitigation. Countryside Survey has identified an increase in the pH of topsoil between 1998 and 2007 in both enclosed land Broad Habitats, extending a trend from the first survey in 1978. It is possible that the key driver has been a decrease in acid deposition, as a result of regulation to encourage less pollution from burning of industrial and domestic fossil fuels. These soils will also be affected by changes in agricultural management, for example through lime fertiliser additions which will influence soil pH.

The reduction in carbon concentration in soils recorded in the Arable and Horticulture Broad Habitat was not reflected in the Improved Grassland Broad Habitat, indeed it is the only Broad Habitat where a decline has been observed since 1978. It is not immediately clear why a continued decline in carbon concentration is evident, but intensity of management, reductions in ley management and changes to stubble treatment may be factors and this will be explored further in future work. Maintenance of soil organic matter provides both agronomic and environmental benefits. Recently, in response to economic and environmental drivers, there has been an increase in direct crop drilling and other forms of minimum tillage, with incentives provided in defined circumstances through Environmental Stewardship. Land management practices to reduce green house gasses have been promoted in the Natural England guidance document, *Carbon Management by Land and Marine Managers Natural England Research Report NERR026*.

### 3.6.6 Conclusions

The Broad Habitats discussed in this chapter occupy approximately half the land area of England, especially across much of the lowland landscape and they are managed primarily within intensive agricultural systems. The impact of post-war agricultural intensification across our landscapes has been well documented and has resulted in policy responses designed to mitigate the impact of agriculture, most recently through the introduction of Entry Level Environmental Stewardship (ELS) in 2005.

Countryside Survey has found some evidence of positive change since 1990, most notably through increased species richness in the Arable and Horticulture Broad Habitat, and the evidence of an increase in numbers of plant species that are used by farmland wildlife for food. However, it is not clear whether the benefits observed are driven by policy or economic responses, and hence whether they will be sustained. In contrast, the main change observed in Improved Grassland has been an increase in its extent whilst species richness has not changed.

---

\(^8\) JNCC Report No: 383 ‘The conservation of genetic diversity: Science and policy needs in a changing world’


\(^10\) Available at: http://www.defra.gov.uk/ENVIRONMENT/land/soil/sap/
The ongoing decline in species richness of habitat fragments within both Broad Habitats is a concern given the contribution such habitats may make as sanctuaries, sources of colonists and to delivery of ecosystem services. This could be particularly important in policies addressing the need to make provisions for biodiversity to adapt to climate change. The policy intention would be that these environmental features would be managed through agri-environment schemes and in particular ELS. At this time it is not clear whether the current schemes are playing an effective role; albeit the 2007 survey may have been too early to detect full impacts of the introduction of ELS.
Further information

More details of the methodology, analyses and results from Countryside Survey can be found in other companion reports and data resources available for the Countryside Survey website [www.countrysidesurvey.org.uk] including:

Reports:
- UK Headline Messages – published November 2008
- UK Results from 2007 – published November 2008
- Scotland Results from 2007 – published June 2009
- Wales Results from 2007 – published July 2009
- England Results from 2007 – this report, published September 2009
- Northern Ireland Countryside Survey results – published April 2009
- Ponds – late 2009
- Headwater Streams – late 2009
- Soils – late 2009
- Integrated Assessment – 2010

Data resources:
- Web access to summary data - a systematic summary of the results used to inform the UK and country level reports – launched in November 2008 and updated in January 2009
- Web access to data from individual survey squares used to generate the results presented in Countryside Survey reports from the 2007 survey - licensed access available from June 2009
- The UK Land Cover Map for 2007 (to be released in 2010)

The data generated by Countryside Survey will continue to be investigated in conjunction with other information such as climate, pollution and agricultural statistics. The data is being used in the UK National Ecosystem Assessment. Phase 1 will report in February 2010 and Phase 2 in February 2011 [see http://www.unep-wcmc.org/eap/ukNationalEA.aspx]. It is anticipated that future analysis of Countryside Survey data will lead to scientific journal articles over the coming years. These investigations will improve understanding about the possible causes of the changes detected in the countryside and, for example, provide an opportunity to explore the results for Priority Habitats in more detail.

Contacts

For further information on Countryside Survey see www.countrysidesurvey.org.uk or contact:
Countryside Survey Project Office, Centre for Ecology and Hydrology, Lancaster Environment Centre, Library Avenue, Bailrigg, Lancaster LA1 4AP
Telephone: 01524 595811
Email: enquiries@ceh.ac.uk

COPYRIGHT: This publication is the Copyright of the Natural Environment Research Council, September 2009

Copyright: of all graphs, diagrams and charts is owned by the Natural Environment Research Council

Copyright of photographs: Copyright of photographs is as acknowledged in individual captions

Copyright enquiries should be addressed to: Knowledge Transfer Team, Centre for Ecology and Hydrology, Maclean Building, Benson Lane, Wallingford OX10 8BB

This publication, excluding logos, may be reproduced free of charge in any format or medium for research, private study or the purposes of internal use within an organisation. This is subject to it being reproduced accurately and not being subject to any treatment that could be considered derogatory. The reproduced material must be acknowledged as NERC Copyright (except where otherwise stated) and the publication named in full.

Disclaimer

Any decisions or actions informed by these results are taken entirely at your own risk. In no event shall NERC be liable for any damages, including loss of business, loss of opportunity, loss of data, loss of profits or for any other indirect or consequential loss or damage whatsoever arising out of the use of or inability to use the results presented in this report.

The Countryside Survey partnership has endeavoured to ensure that the results presented in this report are quality assured and accurate. Data has been collected to estimate the stock, change, extent and/or quality of the reported parameters. However, the complex nature of the experimental design means that results can not necessarily be extrapolated and/or interpolated beyond their intended use without reference to the original data.