▲ Newly planted hedge • © *SNH*

5. Boundary and Linear Features Broad Habitat

Summary

- The total length of woody linear features decreased by 5% in Scotland between 1998 and 2007 following an increase between 1990 and 1998 and 1984 and 1990.
- The length of managed hedgerows decreased by approximately 7% in Scotland between 1998 and 2007 after a period of increase between 1990 and 1998.
- The length of walls decreased marginally in upland areas of Scotland between 1998 and 2007.
- The Species Richness Score in Hedge Plots in Scotland decreased by 22% between 1998 and 2007. Decreases in species richness were aligned with decreases in the number of plant species used for food by farmland birds or butterfly caterpillar food plants across the same period. Grass species characteristic of shaded conditions increased between 1998 and 2007.
- There was no change in the Species Richness Score in Roadside Plots across Scotland between 1998 and 2007, but there was a decrease of approximately 4 species per plot from 21.9 to 17.8 between 1978 and 2007. The Species Richness Score in Roadside Plots has decreased significantly since 1998 in the Lowlands (EZ4).
- Species richness in vegetation associated with boundary features in Scotland has decreased by 13% since 1998 and by 23% since 1978.
- The numbers of woody species increased in vegetation associated with boundary features in Scotland, a continuing trend since 1978.
- Competitive species increased in Roadside Plots in the Intermediate Uplands and Islands (EZ5) between 1998 and 2007; in the Lowlands (EZ4) and the Intermediate Uplands and Islands (EZ5) they have increased since 1978.

- **An average of 2.2 woody species per 30m section of hedge was recorded in Scotland in 2007, an increase from 1.8 species in 1998.**
- **Thirty six percent of managed hedges were in good structural condition in Scotland in 2007.**
- **Only 6% of managed hedges on arable land were in both good structural condition and had appropriately managed margins in Scotland in 2007.**
- **Approximately one third of walls (35%) in the Lowlands (EZ6) were in 'sound' condition, but walls in the Intermediate Uplands and Islands (EZ5) and in the True Uplands (EZ6) were more likely to be classified as 'derelict' (37% and 55% respectively).**

5.1 Introduction[1]

The Boundary and Linear Features Broad Habitat includes many landscape features which characterise the landscape and reflect the history of its management. Within Scottish landscapes linear features are concentrated mainly in the Lowlands (EZ4).

Whilst the role of linear features has always been to mark boundaries and manage stock, ecologically they constitute an important Broad Habitat within enclosed farmland. As well as providing a refuge for species unable to persist in managed fields, the Boundary and Linear Features Broad Habitat can provide corridors for the movement and dispersal of a range of species.

The recording and reporting of the lengths of linear features is complex as they often occur at the same location. An explanation of the approach taken in Countryside Survey (CS) in 2007 is provided in *Section 5.2 of the UK Report*. Data were collected on both the lengths of different feature types *(Table 5.1)* and their structural condition. Hedgerows (including managed hedgerows, lines of trees/shrubs and relict hedges) are listed as a Priority Habitat in the UK and have a Biodiversity Action Plan (see *Box 1.1*). This includes agreed conservation targets, based on measures of the extent and condition of hedgerows over time. Various criteria are being used to measure change in condition: some are structural (e.g. cross-sectional area) and others relate to species composition and to adjacent margin management. In the following analyses condition criteria were only applied to managed hedgerows.

The condition of vegetation associated with linear features has been recorded since the first CS in 1978, using a 10m x 1m plot (Boundary Plot) placed alongside field boundaries of all types (hedgerows; roads and tracks; streams, ditches and riversides). Numbers and types of plots have been increased in subsequent Countryside Surveys to provide information on specific feature types in addition to the original Boundary Plots. These include: Hedge Plots in which vegetation forming the hedge and also along the hedge bottom were recorded; Roadside Plots which were introduced to sample vegetation alongside roads and tracks; and Hedge Diversity Plots, which provide information about the woody species within hedges, but may also be used on other types of woody linear feature. These latter plots span the width of the hedge and are 30m long. Alongside species information, other data on the condition of hedgerows and other types of woody linear features were collected at Hedgerow Diversity Plots in both 1998 and 2007, but only that collected in 2007 allows a full assessment of Hedge condition against a range of criteria.

▲ Managed hedgerow • © *SNH*

Results showing species richness for all linear plot types use Aggregate Classes as reporting categories (see *section 1.2, UK Report*).

▼ **Table 5.1:** Boundary and Linear Feature types

Linear Features	Description/condition criteria
Hedge	A line of woody vegetation that has been subject to management so that trees no longer take their natural shape. Hedges may be present with any feature below. These are also known as 'managed' hedgerows.
Wall	A built structure of natural stone or manufactured blocks, mostly of traditional dry stone wall construction but including mortared walls. Includes walls with fences or banks/grass strips and/or lines of trees or shrubs.
Line of trees/ shrubs and relict hedge and fence	Line of trees or shrubs, in which trees/shrubs take their natural shape, including those originally planted as hedges with a fence. May also include banks/grass strips.
Line of trees/ shrubs and relict hedge	Line of trees or shrubs, in which trees/shrubs take their natural shape, including those originally planted as hedges. Includes avenues of trees. May also include banks/grass strips.
Bank/grass strip	An earth or stone-faced bank or grass strip with or without a fence.
Fence	A permanent post and wire or rail structure, including wooden, concrete or metal posts without any other associated feature other than a ditch or stream. Fences made from slate threaded on wire in Wales are included in this category.

[1] **Note:** For further information on the Broad Habitat classification, Vegetation Aggregate Classes or ACs, sampling plots and other Countryside Survey terminology see *Chapter 1 (Methodology)*.

▼ **Table 5.2:** The length and standard error ('000s km) and direction of change in length of Boundary and Linear Features in Scotland, from 1984 to 2007. SE = Standard Error, arrows denote significant change (p<0.05) in the direction shown.

	Country	1984		1990		1998		2007		Direction of significant shanges		
		Length ('000s km)	SE	Length ('000s km)	SE	Length ('000s km)	SE	Length ('000s km)	SE	1984-1990	1990-1998	1998-2007
Total woody Linear Features[2]	Scotland	37.6	5.6	42.3	5.3	49.1	5.9	46.5	5.5	↓	↑	↓
	EZ4	34.1	5.3	35.6	5.0	39.1	5.4	37.0	5.0			↓
	EZ5	3.2	1.7	6.0	1.9	8.3	2.6	7.8	2.5	↑	↑	
	EZ6	0.2	0.1	0.7	0.4	1.7	0.8	1.7	0.9		↑	
Hedges	Scotland	27.5	5.1	21.2	4.1	22.9	4.3	21.2	4.0	↓		↓
	EZ4	25.6	4.9	20.2	4.0	20.1	4.1	18.6	3.8	↓		↓
	EZ5	1.9	1.3	1.0	1.0	2.8	1.3	2.6	1.2	↓	↑	
	EZ6	0	0	0	0	0	0	0	0			
Line of trees/ shrubs/relict hedge/fence	Scotland	5.9	1.3	9.0	1.3	12.2	1.8	12.1	1.8	↑	↑	
	EZ4	4.3	1.2	6.1	1.0	9.2	1.4	9.3	1.5		↑	
	EZ5	1.4	0.7	2.8	0.9	2.8	1.1	2.6	1.1	↑		
	EZ6	0.2	0.1	0	0	0.2	0.1	0.2	0.1	↓	↑	
Line of trees/ shrubs/relict hedge	Scotland	4.6	1.0	12.1	1.7	13.8	1.7	13.1	1.6	↑		
	EZ4	4.4	0.9	9.2	1.3	9.8	1.3	9.1	1.2	↑		↓
	EZ5	0.1	0.2	2.2	0.8	2.6	0.7	2.4	0.6	↑		
	EZ6	0	0.1	0.7	0.4	1.5	0.8	1.6	0.9		↑	
Wall	Scotland	78.8	10.0	79.5	9.8	80.2	9.5	78.6	9.5			↓
	EZ4	44.2	7.8	46.2	7.5	44.8	7.3	44.6	7.3			
	EZ5	20.9	4.8	21.8	4.8	22.1	4.7	21.6	4.6			↓
	EZ6	13.7	4.0	11.5	4.1	13.3	4.2	12.4	4.0		↑	↓
Bank/grass strip	Scotland	15.4	3.9	3.4	0.8	6.0	1.1	6.2	1.1	↓	↑	
	EZ4	10.3	3.6	1.2	0.4	2.3	0.5	2.2	0.5	↓	↑	↓
	EZ5	3.5	0.8	1.7	0.5	3.1	0.8	2.9	0.8	↓	↑	
	EZ6	1.5	1.0	0.5	0.5	0.7	0.4	1.0	0.4	↓		
Fence	Scotland	208.6	18.5	223.7	18.6	231.9	18.5	226.6	18.3	↑		↓
	EZ4	110.2	8.9	116.0	9.2	114.8	8.5	112.2	8.3			↓
	EZ5	63.3	8.9	70.2	8.6	77.5	8.9	76.5	8.7	↑	↑	
	EZ6	35.1	13.7	37.5	13.6	39.6	13.8	37.8	13.8			↓

Results from the Waterside Plots are included in the Rivers and Streams Broad Habitat, covered in *Chapter 8*; linear Managed Margin Plots are included in the Arable and Horticulture Broad Habitat (*Chapter 3*). Results for all other linear plot types are reported here.

Data collected on linear features during the mapping of CS squares also provide information on the type and condition of the different feature types, some of which are reported here.

5.3 Length of Boundary and Linear Features

- **The total length of woody linear features decreased by 5% in Scotland between 1998 and 2007 following an increase between 1990 and 1998 and 1984 and 1990.**
- **The length of managed hedgerows decreased by approximately 7% in Scotland between 1998 and 2007 after a period of increase between 1990 and 1998.**
- **The length of walls decreased marginally in upland areas of Scotland between 1998 and 2007.**

[2] **Note:** that because of the statistical model used (see *Annex 6*) the total woody linear features is not simply the sum of hedges, line of trees/shrubs/relict hedge/fence and line of trees/shrubs/relict hedge.

▲ Field boundary landscape • © *Colin Barr*

Results from CS in 2007 showed a 5.3% decrease in the length of woody linear features between 1998 and 2007 ***(Table 5.2 gives rounded values)***. The improvements and modifications to the definitions of woody linear features mean that the categories reported here are not exactly comparable with those reported previously in CS. However, the results using the new methods show the same patterns of change for managed hedges as reported previously for Great Britain, with decreases between 1984 and 1990 and no significant change in the period 1990 and 1998.

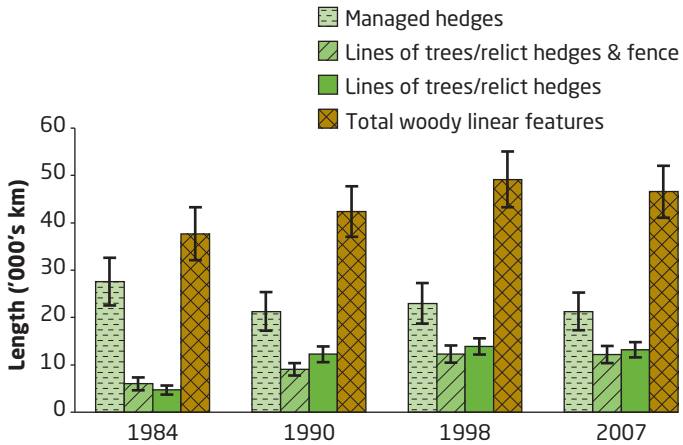
The process of back-checking and adjustment was only applied to the 1998 data and not to previous datasets from 1984 and 1990. This means that the comparison of clearly defined linear features in the 1998 and 2007 data is more rigorous than for other pairs of years. Reduced variability in the estimates for 1998 and 2007 allowed the change between estimates to be identified as significant. When comparing results for years where the estimates are less precise, e.g. between 1990 and 1998, changes are less likely to be significant even though the difference between stock estimates may be larger.

Investigations of the changes between the six different linear feature types for 1998 and 2007 indicate that the vast majority of hedges in 1998 were also hedges in 2007.

Changes between woody linear feature types across the period 1998 and 2007 were quite limited. Fewer than 2% of hedges moved into either of the 'line of trees/shrubs, relict hedge (+ /- fence)' categories. The only other shifts between feature types which exceeded 1% were movements between the 'line of trees/ shrubs, relict hedge (+/- fence)' categories dependent on the addition or removal of fences.

Regularly managed, stock proof hedges have declined in Scotland from 1984 through to 2007, but with a period of stability between 1990 and 1998 during which there were apparent increases in the Intermediate Uplands and Islands (EZ5). This result requires further investigation as it may be the result of analytical anomalies rather than a true change. In contrast to the results across Great Britain, the decrease in managed hedgerows between 1998 and 2007 does not appear to have been primarily due to conversion to trees/shrubs and relict hedges ***(Fig. 5.1, Table 5.2)***. Whilst analysis suggests that some movement from managed hedges to relict hedges and lines of trees/shrubs has occurred, there were no increases in the length of these feature types in that time period, although they did increase between 1990 and 1998 ***(Table 5.2)***. The long-term pattern of change from 1984 to 2007 is a decrease in managed hedges and an increase in relict hedges and lines of trees/shrubs ***(Fig 5.1)***.

▼ **Figure 5.1:** The change in total length ('000s km) of woody linear feature types in Scotland between 1984 and 2007 with SE.



There were small but significant changes in the lengths of walls between 1998 and 2007 ***(Table 5.2)***. The results indicate a number of changes in banks/grass strips which may have arisen from both the transient nature of grass strips and the likelihood that banks are relatively easily overlooked and are therefore recorded inconsistently. Changes in the lengths of fences indicate that, in contrast to previous decades, the lengths of fences in Scotland decreased between 1998 and 2007, particularly in the Lowlands and True Uplands.

▲ Drystane dyke • © *SNH*

5.4 The condition of vegetation in Boundaries and beside Linear Features[3]

- **The Species Richness Score in Hedge Plots in Scotland decreased by 22% between 1998 and 2007. Decreases in species richness were aligned with decreases in the number of plant species used for food by farmland birds or butterfly caterpillar food plants across the same period. Grass species characteristic of shaded conditions increased between 1998 and 2007.**
- **There was no change in the Species Richness Score in Roadside Plots across Scotland between 1998 and 2007, but there was a decrease of approximately four species per plot from 21.9 to 17.8 between 1978 and 2007. The Species Richness Score in Roadside Plots has decreased significantly since 1998 in the Lowlands (EZ4).**
- **Species richness in vegetation associated with boundary features in Scotland has decreased by 13% since 1998 and by 23% since 1978.**
- **The numbers of woody species increased in vegetation associated with boundary features in Scotland, a continuing trend since 1978.**
- **Competitive species increased in Roadside Plots in the Intermediate Uplands and Islands (EZ5) between 1998 and 2007; in the Lowlands (EZ4) and the Intermediate Uplands and Islands (EZ5) they have increased since 1978.**

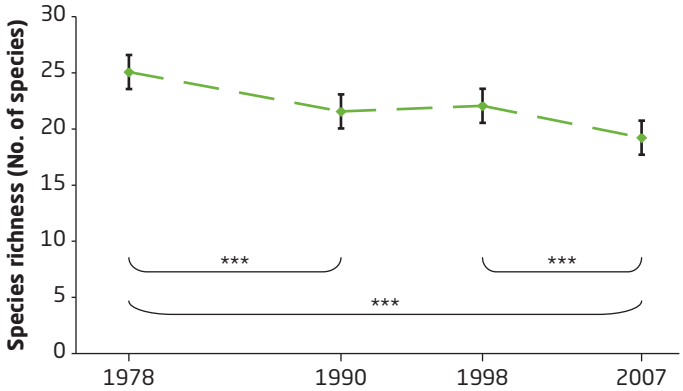
▲ Flag fencing • © *SNH*

▲ Relict hedegrow • © *Lisa Norton*

5.4.1 Condition of vegetation in Boundary Plots

Species Richness: The Species Richness Score of all linear plots (excluding Hedge Plots) decreased by 13% between 1998 and 2007. Over the longer term (since 1978), a significant decrease of 23% (25.1 to 19.2 species per plot) was recorded in these plots *(Fig. 5.2)*. There was also a significant decrease in Species Richness Score in these plot types in Scotland in Infertile Grassland and Moorland grass mosaics between 1998 and 2007. A decrease occurred in all Aggregate Classes represented within these plot types between 1978 and 2007, except for the Heath and Bog AC *(Table 5.3)*.

▼ **Figure 5.2:** Change in the Species Richness Score of all linear plots (excluding Hedge Plots) alongside a random sample of feature types across Scotland between 1978 and 2007. Significant changes (*** p<0.001) are shown between the dates bracketed. 95% Confidence Intervals are shown for each data point. Confidence Intervals on change are not shown.



[3] Footnote required???

▼ **Table 5.3:** Changes in mean Species Richness Score of all linear plots (excluding Hedge Plots) in different vegetation Aggregate Classes alongside linear features across Scotland between 1998 and 2007. Arrows denote significant change ($p<0.05$) in the direction shown. Grey cells with diagonal strikethrough indicate that insufficient data were available for analysis.

	Mean values (Scotland)		Direction of significant changes 1998 - 2007				Direction of significant changes 1990 - 1998				Direction of significant changes 1978 - 1990				Direction of significant changes 1978 - 2007			
Aggregate Class	1998	2007	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6
All Classes	22	19.2	↓	↓	↓						↓	↓		↓	↓	↓	↓	
Crops and weeds																		
Tall grass and herb	16.4	15.6									↓	↓			↓	↓		
Fertile grassland	17.7	16.4						↓			↓	↑			↓			
Infertile grassland	23.9	19	↓	↓				↑			↓	↓			↓	↓		
Woodland (upland & lowland)	22.1	20.3									↓		↓		↓	↓		
Moorland grass mosaic	23.2	20	↓	↓							↓	↓		↓	↓	↓		↓
Heath & Bog	23.2	21.3																

▼ **Table 5.4:** Changes in the characteristics of vegetation in 10m x1m Hedge Plots across Scotland between 1978 and 2007. Mean values for 1998 and 2007 are presented; those for 1978 and 1990 are available on the website, www.countrysidesurvey.co.uk. Arrows denote significant change ($p<0.05$) in the direction shown. The condition measures are described in ***Box 1.3, UK Report***.

	Mean values (Scotland)		Direction of significant changes 1998 - 2007				Direction of significant changes 1990 - 1998				Direction of significant changes 1978 - 1990				Direction of significant changes 1978 - 2007			
Vegetation Condition Measures	1998	2007	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6
Species Richness (No. of Species)	18.9	14.7	↓															
No. of Bird Food Species	10.1	7.9	↓															
No. of Butterfly Food Species	8.8	7	↓															
Grass:Forb Ratio	0.47	0.44	↓	↓											↓	↓		
Competitor Score	3.22	3.32																
Stress Tolerator Score	1.97	1.97																
Ruderal Score	2.47	2.38																
Light Score	6.55	6.37	↓	↓														
Fertility Score	6.04	6.14																
Ellenberg pH Score	6.25	6.35																
Moisture Score	5.43	5.47																

In a further analysis the mean number of woody species recorded per linear plot was investigated. Across all linear plot types (excluding plots exclusively associated with hedges), the cover of woody species significantly increased from 1.6 to 2.1 species in Scotland between 1998 and 2007, and from 1.3 to 2.1 species per plot between 1978 and 2007.

5.4.2 Condition of vegetation in Hedge Plots

Of the 60 Hedge Plots across Scotland used in this analysis, 56 were in the Lowlands (EZ4). The remaining four plots were in the Intermediate Uplands and Islands (EZ5) and did not constitute a large enough sample to provide results for EZ5.

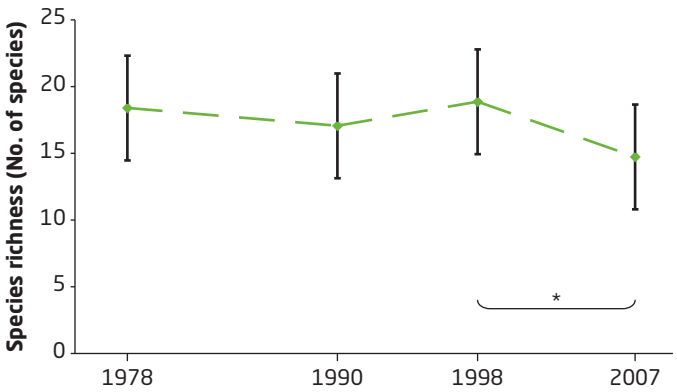
Species Richness: Species Richness Score decreased in Hedge Plots in Scotland between 1998 and 2007 by 22%. Over the longer term (1978 to 2007) there was a non-significant decrease of similar magnitude from 18.4 species in 1978 to 14.7 in 2007 *(Fig. 5.3)*.

Other characteristics: Decreases in species richness were aligned with decreases in the number of plant species used for food by farmland birds or butterfly caterpillar food plants between 1998 and 2007 *(Table 5.4)*. Across this same period, grass species became more dominant in hedgerow both in the Lowlands (EZ4) and across Scotland. This increase in grass species was also evident between 1978 and 2007 in the Lowlands (EZ4) and across Scotland.

▲ Roadside hedge • © *SNH*

Over the period 1998 to 2007 Hedge Plots also became more shaded as demonstrated by the significant decrease in the mean Light Score *(Table 5.4)*.

▼ **Figure 5.3:** The change in Species Richness Score in 10m x1m Hedge Plots across Scotland between 1978 and 2007. Significant changes (* p<0.05) are shown between the dates bracketed. 95% Confidence Intervals are shown for each data point. Confidence Intervals on change are not shown.



5.4.3 Condition of vegetation in Roadside Plots

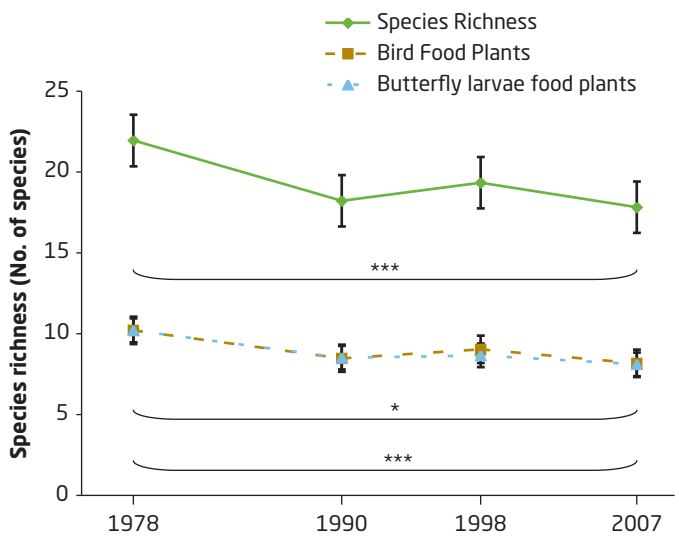
Species Richness: There was no change in the Species Richness Score in Roadside Plots in Scotland between 1998 and 2007 across Scotland, but there was a decrease of approximately four species per plot from 21.9 to 17.8 between 1978 and 2007 *(Fig. 5.4, Table 5.5)*. There was a significant decrease in species richness in Roadside Plots between 1998 and 2007 in the Lowlands (EZ4) where the majority of plots of this type were located. This decrease was also evident across the period 1978 to 2007.

Other characteristics: The number of species used as food plants by farmland birds decreased across Scotland and in the Lowlands (EZ4) in Roadside Plots between 1998 and 2007 by approximately one species *(Table 5.5)*. There was also an overall decrease in both Bird and Butterfly larvae Food Plants both across Scotland and in the Lowlands (EZ4) between 1978 and 2007. The only other significant change in Roadside plots between 1998 and 2007 was an increase in competitive species in the Intermediate Uplands and Islands (EZ5). This increase was also evident across the period 1978 to 2007 for Scotland, the Lowlands (EZ4) and the Intermediate Uplands and Islands (EZ5). There was also an increase in species associated with wetter conditions in Roadside Plots both across Scotland and in the Intermediate Uplands and Islands (EZ5) between 1978 and 2007.

5.5 Condition of Boundary and Linear Features

- **An average of 2.2 woody species per 30m section of hedge was recorded in Scotland in 2007, an increase from 1.8 species in 1998.**
- **Thirty six percent of managed hedges were in good structural condition in Scotland in 2007.**
- **Only 6% of managed hedges on arable land were in both good structural condition and had appropriately managed margins in Scotland in 2007.**
- **Approximately one third of walls (35%) in the Lowlands (EZ6) were in 'sound' condition, but walls in the Intermediate Uplands and Islands (EZ5) and in the True Uplands (EZ6) were more likely to be classified as 'derelict' (37% and 55% respectively).**

▼ **Figure 5.4:** The changes in Species Richness Score, No. of Bird Food Plant species and No. of Butterfly Food Plant Species in 10m x1m Roadside Plots across Scotland between 1978 and 2007. Significant changes (* p<0.05, ***p<0.001) are shown only for the entire period 1978 to 2007, others given in ***Table 5.5***. 95% Confidence Intervals are shown for each data point. Confidence Intervals on change are not shown.



▼ **Table 5.5:** Changes in the characteristics of vegetation in 10m x1m Roadside Plots across Scotland between 1978 and 2007. Mean values for 1998 and 2007 are presented; those for 1978 and 1990 are available in ***Annex 7***. Arrows denote significant change (p<0.05) in the direction shown. The condition measures are described in ***Box 1.3, UK Report***.

	Mean values (Scotland)		Direction of significant changes 1998 - 2007				Direction of significant changes 1990 - 1998				Direction of significant changes 1978 - 1990				Direction of significant changes 1978 - 2007			
Vegetation Condition Measures	1998	2007	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6	S	EZ4	EZ5	EZ6
Species Richness (No. of Species)	19.3	17.8		↓				↑			↓	↓			↓	↓		
No. of Bird Food Species	9	8.2	↓	↓							↓	↓		↓	↓	↓		
No. of Butterfly Food Species	8.7	8.1									↓	↓			↓	↓		
Grass:Forb Ratio	1	0.95																
Competitor Score	2.72	2.77			↑		↑								↑	↑	↑	
Stress Tolerator Score	2.25	2.28					↓											
Ruderal Score	2.86	2.82																
Light Score	6.93	6.9					↑		↑		↓		↓					
Fertility Score	5.16	5.14								↑				↓				
Ellenberg pH Score	5.7	5.69																
Moisture Score	5.53	5.56					↑						↑		↑		↑	

▲ Species-rich hedge-bottom • © *SNH*

5.5.1 *Woody species richness of hedgerows*

The mean number of native woody species per 30m length of hedgerow increased significantly in Scotland between 1998 and 2007 from 1.8 to 2.2 (*see further information at www.countrysidesurvey.co.uk*). The increase in the Lowlands (EZ4) where most hedges are located was also significant from 1.7 to 2.2 species. This is probably due to planting of new 'species rich' hedges under agri-environment schemes, and the policy to sample new hedges in CS in 2007 which resulted in a number of Hedge Diversity Plots being places on new hedges in Scotland. Hedge Diversity Plots were not recorded before 1998.

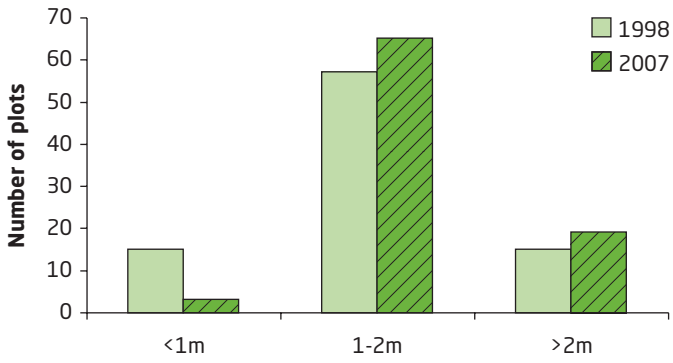
5.5.2 *Structural condition of hedgerows*

Condition criteria collected at Hedgerow Diversity Plots reveal that around a third (36%) of the managed hedges in Scotland, which comprised 46% of all woody linear features surveyed, were in good structural condition in 2007. Good structural condition was determined by a number of different criteria as outlined in *Table 5.6*. Hedgerow condition also depends on two criteria relating to adjacent land *(Table 5.6)*. If the distance from the centre of the hedge to adjacent disturbed ground is taken into account alongside structural condition measures, 16% of all hedgerows on arable land in Scotland would then meet condition criteria. A further criterion is the width of perennial vegetation at the base of the hedge, which should be greater than 1m. Applying all criteria, only approximately 11% of managed hedges in Scotland were in overall good condition on all land, including arable. As the majority of hedges in Scotland are located in the Lowlands (EZ4), (93% of Hedgerow Diversity Plots were located in EZ4) results are given for Scotland only. Data collected on Hedgerow Diversity Plots revealed that managed hedges in Scotland were wider in 2007 than in 1998 *(Fig. 5.5)*.

▼ **Table 5.6:** The structural and margin condition criteria assessed by surveyors in Countryside Survey 2007.

Structural Condition Criteria	Margin Condition Criteria
Height >1m	Distance between centre of hedge and disturbed ground >2m
Width >1.5m	Width of perennial vegetation >1m
Vertical gappiness <10%	
No gaps >5m	
Non-native species at >10% cover	
Height of base of canopy <0.5m	

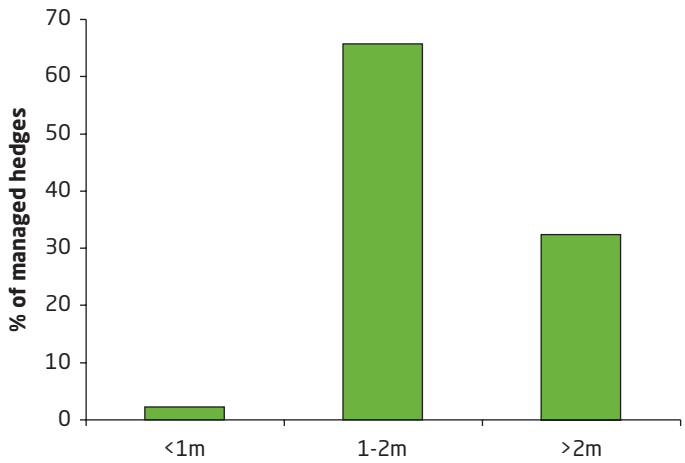
▼ **Figure 5.5:** Hedgerow width in hedgerow Diversity Plots in Scotland in 1998 and 2007.



5.5.3 Hedgerow height and management

The 2007 results indicate that approximately 69% of hedges were between 1-2m high, 30% were over 2m and less than 1% were less than 1m high. In terms of management, over 70% were cut with a flail or saw, 25% showed no signs of recent management and the remaining 5% were newly planted hedges *(Fig 5.6)*. Results pre-2007 are not sufficient to enable reporting on change in hedgerow height and management.

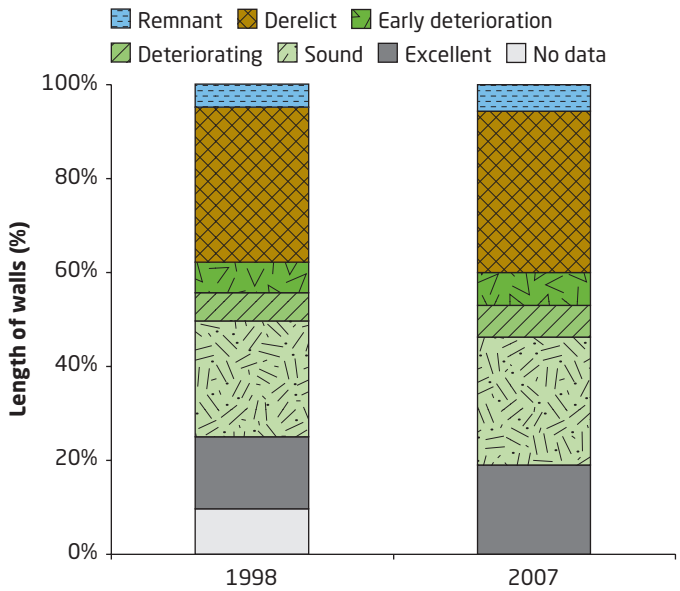
▼ **Figure 5.6:** Hedgerow height on mapped managed hedges in Scotland in 2007



5.5.4 Structural condition of walls

More walls across Scotland fell into the 'Derelict' condition category than any other in both 1998 and 2007 *(Fig 5.7)*. Wall condition in 2007 varied across Scotland with around a third of walls in 'sound' condition (35%) in the Lowlands (EZ4). In the Intermediate Uplands and Islands (EZ5), around a third of walls were in 'derelict' condition (37%), rising to 55% in the True Uplands (EZ6). As with condition of mapped hedgerow features, changes are difficult to detect as a result of missing data in 1998.

▼ **Figure 5.7:** The percentage of the total length of walls in different structural condition categories across Scotland in 1998 and 2007.



▲ Derelict drystane dyke, uplands • © *Stuart Greig*

5.5.5 Lines of trees, individual trees

Where trees taking their natural shape were recorded as a woody linear feature they were recorded in CS as lines of trees/shrubs or relict hedges (where they showed signs of historic management). Some of these features were planted avenues of trees but in most cases they were relict hedges. Individual trees were recorded in 2007, as they have been previously in CS. Analysis of data on the occurrences of both individual trees and trees associated with woody linear features will be presented in a future report.

5.6 Summary and Discussion

5.6.1 Summary – Changes in Boundary and Linear Features

The 2007 Countryside Survey results indicate that despite a halt in the loss of managed hedgerows between 1990 and 1998, the overall trend for the period 1984 to 2007 was a steady decrease. The condition of the vegetation associated with the Boundary and Linear Broad Habitat in Scotland has generally deteriorated with decreases in species in linear plot types both between 1998 and 2007 and longer-term between 1978 and 2007. Hedge-bottom vegetation became less species-rich and more shaded between 1998 and 2007, and since 1978 Roadside Plots have shown long-term reductions in species richness including loss of Bird and Butterfly larvae Food Plants. The extent and condition of walls in the True Uplands (EZ6) and the Intermediate Uplands and Islands (EZ5) also appear to be deteriorating.

5.6.2 Discussion

Most boundaries prior to the late 18th century in Scotland were marked by stone walls or turf banks, with hedgerows distributed within the lowland farmed landscapes of central and southern Scotland. Between the late 1940s and 1980s, there was a reduction in boundary habitats as farming intensified. Many hedges and dykes were removed to create larger fields, or replaced by fencing. The use of pesticides and fertilizers in intensively farmed areas has contributed to a loss of biodiversity in boundary features.

Actively managed hedges appear to be in reasonable condition in terms of the woody components (species composition, height and width), suggesting that advice and incentives through agri-environment schemes are effective. The percentage of newly planted hedges picked up in the survey is likely to be a reflection of take-up of hedge-planting incentives. However, many managed hedgerows failed to meet the criteria applied for condition of associated vegetation, particularly those in arable situations. Managed hedges are beneficial to the landscape and wildlife, as well as useful for farmers. Where hedges no longer serve an agricultural purpose they may remain beneficial as food and shelter for birds, mammals and insects for a time, but if they are not maintained, their value for wildlife can eventually decline.

Drystane dykes form the dominant field boundary type in upland Scotland. From a biodiversity perspective, although they tend to support fewer species than hedgerows, dykes provide an important wildlife habitat for lichens, mosses, ferns and flowering plants, as well as small mammals and amphibians. The percentage of dykes in derelict condition remains high, particularly in the uplands, possibly reflecting reductions in rural labour and traditional skills.

▲ Newly planted hedge • © *SNH*

Although there was no significant decrease in species richness in Roadside Plots between 1998 and 2007, the longer-term decline since 1978 remains significant. Some species-rich road verges continue to be threatened by inappropriate management including herbicide spraying and frequent cutting, which may prevent flowering of some species. Cutting twice a year has been shown to result in the highest species-richness for road verges, whereas if verge cutting ceases, this may allow invasion of taller grasses and scrub. However, diversity is also influenced by eutrophication, impacts of salt spray from gritting, and airborne pollution.

Boundary and linear features are identified as UK BAP Priority Habitats, and options for current and future management of hedgerows, hedgerow trees and drystane dykes are available to farmers and landowners under the Scotland Rural Development Programme 2007-13 (SRDP). Success in halting the loss of biodiversity and increasing the extent of boundary and linear features is promoted by these options.

Countryside Survey

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*
- Detailed Northern Ireland Countryside Survey results – *published April 2009*
- England Results from 2007 – *due to be published August 2009*
- Scotland Results from 2007 – *due to be published June 2009*
- Wales Results from 2007 – *due to be published July 2009*
- Ponds – *due to be published July 2009*
- Streams – *October 2009*
- Soils – *November 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 the **actual data** – data from individual survey squares used to generate all the results presented in Countryside Survey reports from the 2007 survey – licensed access available from June 2009
- The UK Land Cover Map for 2007 – September 2009

The data generated by Countryside Survey will continue to be investigated in conjunction with other information such as climate, pollution and agricultural statistics. It is anticipated that future analysis of Countryside Survey data will lead to many 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

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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.

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