

Northern Ireland Countryside Survey 2007: Field Boundary - Summary Report 1998-2007



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Northern Ireland Countryside Survey 2007: Field Boundary - Summary Report 1998-2007

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Introduction

This report presents field boundary length estimates derived from the 2007 Northern Ireland Countryside Survey (NICS2007). It includes an estimate of the length of Priority Habitat hedges. The report also monitors the length of field boundaries compared with NICS1998 and gives transition estimates (losses and gains) between the different types of field boundary.

The NICS field boundary recording methodology was modified for 2007 survey. Additional boundary attributes were recorded. Single sided earth banks (Half-banks) were recorded separately from doubled-sided (mounded) earth banks. Ditches and Lines of trees were also recorded separately. Woody species were defined as shrubs or trees based on measured growth form (McCann et al., 2009).

Unlike previous surveys, a GIS method was used to calculate lengths of field boundaries in NICS2007. In 1991 boundary lengths were measured by ruler and inserted manually into a database. In 1998 the length of field boundaries that had changed, was measured using a digitising tablet, and inserted into a transition (change) database. Boundary lengths for the 1998 database were then constructed by relational database methods.

In the NICS2007 GIS method, OSNI 1:2500 digital polyline maps were clipped to the outline of NICS sample squares. The digital polylines template was then edited to allocate NICS field boundary parcel numbers by referring to the 1:2500 annotated field survey maps. Digital lengths were subsequently calculated and inserted into the 2007 field boundary database. Digital lengths were also back-edited into the 1998 database. The 1998 and 2007 digital datasets were overlaid to produce a digital transition dataset. A subsequent quality assurance process was carried out to check for any major queries/amendments. In addition, some of the main transitions were checked against any written field survey notes. As a result, some editing of the databases was carried out.

Boundary polyline queries were then highlighted using GIS overlay of the 1st draft digital boundary polyline dataset and the final NICS land cover polygon dataset. This produced a GIS polyline shapefile of possible queries. These were checked and the query shapefiles annotated as required. All edits were incorporated into the NICS 1:2500 digital polyline boundary template. Quality Assurance of the editing process was programmed into a relational database methodology.

Digital boundary polyline shapefiles were created using a GIS building methodology carried out as a batch process. The process of snapping boundary polylines to land cover polygons was then completed. Currently the databases contain records for NICS sample square number, parcel number and boundary type only. Boundary parcel database attribute codes for 2007 and for 1998 still need to be checked and edited. Attributes for each boundary parcel (polyline) will then be inserted into the digital datasets using relational database methods.

Statistical analysis for boundary stock, net change and transitions has been carried out based on the database from the completed digital dataset. Attributes for the number of woody species, have been checked and added into the database.

Field Boundary Types

Field boundaries are a major source of biodiversity in the farmed landscape. Field boundaries are mapped in the field as primary or secondary types.

Primary Types

These are Hedges, Earth banks, Walls and Fences. Descriptors for primary boundary types are given in Appendix 1. For further information see McCann et al., (2009). A field boundary can consist of several components. Hedges, Earth banks and Dry stone walls often have Fences on them or next to them. Hedges often occur on Earth banks and can also be found

associated with Dry stone walls. In NICS2007 all associated components of each field boundary were recorded. In cases where two or more primary field boundary components occur together, the classification hierarchy Hedge -> Wall -> Bank -> Fence, is used for field mapping and attribute recording, and for statistical estimates.

Secondary Types

The secondary field boundary types are Half-banks, Ditches and Line of trees. These often occur as a component of primary boundary types. Descriptors for secondary boundary types are given in Appendix 1. In cases where secondary boundary types occur without a primary type present, the classification hierarchy Half-bank -> Ditch -> Line of trees, is used for field mapping and attribute recording, and for statistical estimates.

Reporting categories are therefore:-

Category	Database code
Hedge	02.
Mortared wall	07.
Dry stone wall	04. Dry stone wall
	05. Capped dry stone wall
Ruined dry stone wall / Stone bank	06.
Earth bank	10.
Fence	09. Sheep fence
	11. Wood post & wire fence
	12. Other fence
Half-bank	Hb.
Ditch	Di.
Line of Trees	Lt.

Net Change

Length estimate analysis is based on the classification hierarchy. Field boundary stock and net change length estimates are given in Table 1. There was an overall decrease of -2.1% (-4600km) in the total length of primary field boundary types. Hedges decreased by -4.6% (-5427km) from an estimated 119120km in 1998 to 113648km in 2007. Dry stone walls decreased from an estimated 6876km in 1998 to 5973km in 2007, i.e. -13.1% (-903km). The length of Mortared walls increased from 1899km to 2288km (20.5%, 390km). Ruined dry stone wall / Stone banks decreased (-229km) to 3084km, i.e. -6.9%. There was a net decrease (-4387km) of Earth banks to 32387km, i.e. -11.9%. Fences increased by 11.0% (6001km) to 60411km.

In 1998 secondary type field boundary components were not reported separately. The separate recording of secondary boundary types, i.e. mainly Half-banks from Earth banks, in NICS2007, was back-edited to 1998. Secondary field boundary types are a small percentage of the total length of all field boundaries.

Note that the 1998 estimates based on the current digital databases differ slightly from those published in Cooper et al., 2002. This is due to

- GIS digitising of boundaries
- separate recording of Half-banks from Earth banks
- the 0.5% proportional sample used in NICS2007
- the addition of 8 new sample squares to ensure proportionality

Transitions (Losses & Gains)

A field boundary type transition is a change from one primary or secondary type to another, or when a boundary has been lost or newly created in the time period between 1998 and 2007. Information on each transition was recorded onto a data form in the field. Up to three codes were used in combination with field notes to describe transitions related to e.g., hedge planting, fencing, wall construction, and boundary management such as cutting/coppicing resulting in changes between tree and shrub growth forms. Also included were codes for transitions related to agricultural field enlargement, buildings construction and woodland planting (see McCann et al., 2009). Drivers of change were extracted from this data.

Tables 2a (km) and 2b (%) give the losses and gains transition matrices for each field boundary type. Rows are losses and columns are gains. Note that net change is the difference between losses and gains. Table 3 displays the transition estimates and descriptive statistics for each field boundary type in list format. Analysis is based on the classification hierarchy.

The main loss of Hedges was to “No field boundary”, i.e. 7514km (-6.3%). Loss was by physical removal due to building construction or field enlargement, and also subsumption within woodland planting and scrubbing up. There were also Hedge losses 1976km (-1.7%) to Earth banks mainly by changes from shrub to tree growth forms. Loss of 2406km (-2.0%) also occurred to Fences, mainly by changes from shrub to tree growth forms, and occasionally by removal in the course of fencing activity. Hedge gains were mainly from Earth banks (2548km) and Fences (2448km), mostly due to colonisation, planting and management such as cutting/coppicing etc. of tree growth forms to shrub growth forms. There was a gain of 1271km from “No field boundary” mainly by new planting. Losses and gains, and net change for hedges are displayed as a flow diagram (Figure 1).

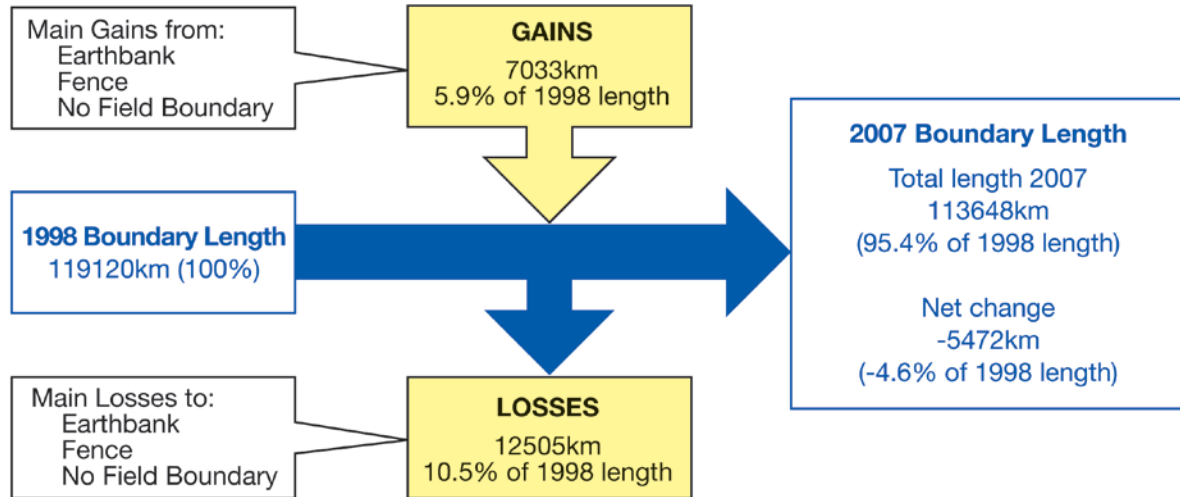


Figure 1. Hedge losses and gains and net change flow diagram.

The main transitions for Mortared walls were a loss of 117km (-6.2%) associated with building, gains from Fences (210km) and 256km from “No field boundary” by new construction.

The main loss of Dry stone walls was to Ruined dry stone wall / Stone banks, 701km (-10.2%) and to Hedges 437km (-6.4%) by colonisation, planting or management such as cutting/coppicing etc. of tree growth forms to shrub growth forms. There was a gain of 213km from Ruined dry stone wall / Stone banks by management/repair.

There was a loss of 180km (-5.4%) of Ruined dry stone wall / Stone banks to Hedges mostly by colonisation or management such as cutting/coppicing etc. of tree growth forms to shrub growth forms. Transitions to Dry stone walls (213km, -6.4%) were by management/repair. There was a loss of Ruined dry stone wall / Stone banks 247km (-7.5%) to Earth banks by a process of earthing up/vegetation development. Also 292km (-8.8%) was lost to “No field boundary” by removal/dereliction or by lateral woody outgrowth resulting in Scrub development. The main gain of Ruined dry stone wall / Stone banks was from Dry stone walls (701km) by dereliction.

The main loss of Earth banks was 2996km (-8.2%) to “No field boundary”, by removal/dereliction or by lateral woody outgrowth resulting in Scrub development. There was Earth bank loss of 2548km (-6.9%) to Hedges by colonisation, coppicing etc. of tree growth forms or by planting. There was a loss of 1254km (-3.4%) to Fences by fencing activity or by dereliction. The main gain of Earth banks was from Hedges (1976km) mostly by the development of shrub growth forms to tree growth forms.

There was a transition of 2448km (-4.5%) of Fences to Hedges by colonisation, management such as cutting/coppicing etc. of tree growth forms to shrub growth forms, or by planting. The main loss of Fences was by removal, 5560km (-10.2%), i.e. to “No field boundary”. The main gain for Fences was 10935km by new fencing activity. There was also a gain of 2406km of Fences from Hedges, mostly by the development of shrub growth forms to tree growth forms, or occasionally by removal in the course of fencing activity.

The main transitions for boundaries classified as secondary types are gains from Hedges, Earth banks and Fences mostly by dereliction.

Hedge Priority Habitat (Species-rich Hedgerows)

Hedges which are species rich, are a Priority Habitat. NIEA (2003) has defined species-rich hedges as:

- a. Hedges with six or more woody species in a 30m length.
- b. Hedges containing fewer woody species (≤ 5) in a 30m length, but which have a rich ground flora of herbaceous species.
- c. Townland hedges. These are considered the oldest, most ancient, hedge types in Ireland.

NICS1998

In NICS1998 the number of woody species per 30m length was recorded for each hedge mapped in the sample squares. NICS includes climbers/scramblers e.g. Bramble (*Rubus fruticosus*) as woody species (McCann et al., 2009). Non-native species are included.

Using the criterion of six or more woody species in a 30m length (from NICS1998), it was estimated that about 37% of NI hedges were species-rich.

NICS2007

The definition of Priority Habitat ancient and/or species rich hedgerows has been amended from the pre-existing Habitat Action Plan (Maddock, 2010). However the above criteria (NIEA, 2003) have been maintained for analysis of NICS2007 data.

In NICS2007 the field boundary recording methodology was modified to include a recorded list of all woody species in a 30m length for each hedge parcel. The number of woody species was then calculated from this list. NICS2007 also recorded if a species-rich ground layer was

present for each hedge. Note: NICS2007 included some fern-rich ground layers. Attributes denoting a species-rich ground layer have been checked and added into the database

Examination of feature codes in the OSNI digital 1:2500 scale polylines dataset indicated that OSNI code "1197" related to townland boundaries. Polylines with this feature code were extracted to produce a 1:2500 scale townland polyline shapefile for each NICS sample square. This was then overlaid on the 2007 1:2500 scale digital boundaries to identify townland hedges.

A townland boundary polyline can overlay directly on a digital polyline boundary, thus identifying it as a townland boundary. This may apply to all or part of a parcel length. A townland polyline can also run along the centre of a road, ditch, stream or river. These features may have adjacent boundaries. Criteria for allocating a townland boundary were set up and implemented in this case, as follows

- where a townland polyline runs along the centre of a road, ditch, stream or small river (ca. 10m wide), adjacent boundaries on both sides were allocated with a townland attribute.
- where a townland polyline runs along the side of e.g. a road, only boundaries on that side were allocated with a townland attribute.

The townland boundary line was also checked against OSNI 1st and 2nd edition County Series historic maps. These are available as digital copies currently licensed (DMOU203) under the NI mapping agreement.

It is not practical in the field mapping or in the lab to split digital parcels by the townland polylines. Therefore the length of a hedge parcel which qualified as a townland hedge was inserted as a database attribute. This allowed analysis to be carried out on the 2007 boundary database.

In the analysis only parcels with a minimum length of 29.50m were included. Of these, ca. 500 parcels were classified as townland hedge parcels. All woody species were also included, no consideration or definition of native species was incorporated.

Database analysis indicated that about 35.2% of the estimated length of hedges have 6 or more woody species (a.) in a 30m length (Table 4.). Using the criterion of hedges which contain fewer woody species (≤ 5) per 30m length, but which have a rich ground layer of herbaceous species (b.), analysis indicates that about a further 8.5% of hedges would be included as priority habitat. Estimates of a. and b. already include some townland hedges. Townland hedges with (≤ 5) woody species per 30m length, and which do not have a rich ground layer of herbaceous species account for a further 4.6% of the total estimated length of hedges (Table 4.). In total about 48.3% of the estimated length of hedges in NI could potentially be considered as Priority Habitat.

It should be noted that other townland boundaries, such as those recorded as Earth banks in the field methodology, may have a species rich ground layer. They may also have a number of associated woody species. There may be potential for these to be included as Priority Habitat.

Table 1. Field boundary length estimates (km) for 1998 and 2007 with net change. Significance ($p = 0.05$) is indicated by asterisk.

	1998			2007			NET CHANGE			
Primary Types	km	SE(km)	CV%	km	SE(km)	CV%	% 1998	km	SE(km)	CV%
Hedge.	119120	4516	3.8	113648	4394	3.9	-4.6	-5472	1186	21.7 *
Mortared wall	1899	272	14.3	2288	299	13.1	20.5	390	121	31.1 *
Dry stone wall	6876	1661	24.2	5973	1517	25.4	-13.1	-903	414	45.8 *
Ruined dry stone wall / Stone bank	3313	660	19.9	3084	645	20.9	-6.9	-229	229	100.0
Earth bank	36774	2644	7.2	32387	2413	7.5	-11.9	-4387	632	14.4 *
Fence	54410	2438	4.5	60411	2511	4.2	11.0	6001	975	16.3 *
<i>Sub-Total</i>	222391	5916	2.7	217790	5954	2.7	-2.1	-4600	1408	30.6 *
Secondary Types										
Half-bank	1108	277	25.0	1348	311	23.1	21.6	239	88	36.8 *
Ditch	1955	322	16.5	2296	365	15.9	17.4	341	114	33.5 *
Line of Trees	13	9	70.9	71	25	36.0	461.2	58	24	41.4 *
<i>Total</i>	225467	6038	2.7	221505	6091	2.8	-1.8	-3962	1420	35.8 *

Table 2a. Transition matrix of estimated losses and gains (km) for each field boundary type. Rows are losses and columns are gains.

			2007										
Field Boundary Type			1	2	3	4	5	6	7	8	9	10	Total
1998	Hedge	1	---	96.2	133.3	49.5	1975.6	2405.7	110.5	169.8	50.2	7514.1	12504.8
	Mortared wall	2	41.9	---	5.5		5.4	44.6				117.1	214.6
	Dry stone wall	3	436.5	41.9	---	701.4	12.8	36.7				192.2	1421.6
	Ruined dry stone wall/Stone bank	4	179.9		212.7	---	246.9	72.2				292.2	1003.9
	Earth bank	5	2547.8		129.1		---	1253.9	111.5	49.5		2995.7	7087.5
	Fence	6	2447.8	210.0	30.8		247.6	---	59.1	247.8	7.9	5559.7	8810.8
	Half-bank	7	78.1					23.5	---			12.8	114.4
	Ditch	8	29.9				43.0	40.2		---		13.0	126.1
	Line of Trees	9									---		0.0
	No Field Boundary.	10	1271.3	256.0	6.7	23.9	169.6	10934.5	72.5			---	12734.6
<i>Total</i>			7033.3	604.1	518.3	774.8	2700.9	14811.4	353.5	467.1	58.1	16696.7	---

Table 2b. Transition matrix of estimated losses and gains (% of 1998) for each field boundary type. Rows are losses and columns are gains.

			2007										
Field Boundary Type			1	2	3	4	5	6	7	8	9	10	Total
1998	Hedge	1	---	0.08	0.11	0.04	1.66	2.02	0.09	0.14	0.04	6.31	10.50
	Mortared wall	2	2.21	---	0.29		0.29	2.35				6.17	11.30
	Dry stone wall	3	6.35	0.61	---	10.20	0.19	0.53				2.80	20.68
	Ruined dry stone wall/Stone bank	4	5.43		6.42	---	7.45	2.18				8.82	30.30
	Earth bank	5	6.93		0.35		---	3.41	0.30	0.14		8.15	19.27
	Fence	6	4.50	0.39	0.06		0.46	---	0.11	0.46	0.02	10.22	16.19
	Half-bank	7	7.04					2.12	---			1.16	10.32
	Ditch	8	1.53				2.20	2.06		---		0.67	6.45
	Line of Trees	9									---		0.0
	No Field Boundary.	10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	---	n/a

Table 3. Transition estimates for each field boundary type. An asterisk indicates significance (p = 0.05).

FIELD BOUNDARY TYPE 1998		TRANSITION				FIELD BOUNDARY TYPE 2007	
Row	Type	% 1998	km	SE(km)	CV%	Column	Type
1	Hedge	0.08	96.2	41.3	42.9 *	2	Mortared wall
1	Hedge	0.11	133.3	73.3	55.0	3	Dry stone wall
1	Hedge	0.04	49.5	21.1	42.5 *	4	Ruined dry stone wall/Stone bank
1	Hedge	1.66	1975.6	260.8	13.2 *	5	Earthbank
1	Hedge	2.02	2405.7	254.7	10.6 *	6	Fence
1	Hedge	0.09	110.5	42.4	38.4 *	7	Half-bank
1	Hedge	0.14	169.8	59.3	34.9 *	8	Ditch
1	Hedge	0.04	50.2	22.8	45.5 *	9	Line of Trees
1	Hedge	6.31	7514.1	856.0	11.4 *	10	No Field Boundary
1	Hedge	10.50	12504.8	1002.2	8.0 *	<i>Total</i>	Total Transitions
2	Mortared wall	2.21	41.9	18.2	43.5 *	1	Hedge
2	Mortared wall	0.29	5.5	5.4	98.2	3	Dry stone wal
2	Mortared wall	0.29	5.4	5.5	100.8	5	Earthbank
2	Mortared wall	2.35	44.6	20.3	45.5 *	6	Fence
2	Mortared wall	6.17	117.1	34.0	29.0 *	10	No Field Boundary
2	Mortared wall	11.30	214.6	49.9	23.2 *	<i>Total</i>	Total Transitions
3	Dry stone wall	6.35	436.5	179.0	41.0 *	1	Hedge
3	Dry stone wall	0.61	41.9	29.0	69.1	2	Mortared wall
3	Dry stone wall	10.20	701.4	195.6	27.9 *	4	Ruined dry stone wall/Stone bank
3	Dry stone wall	0.19	12.8	13.2	102.7	5	Earthbank
3	Dry stone wall	0.53	36.7	20.4	55.7	6	Fence
3	Dry stone wall	2.80	192.2	59.8	31.1 *	10	No Field Boundary
3	Dry stone wall	20.68	1421.6	353.6	24.9 *	<i>Total</i>	Total Transitions

- continued

Table 3. – continued

FIELD BOUNDARY TYPE 1998		TRANSITION				FIELD BOUNDARY TYPE 2007	
Row	Type	% 1998	km	SE(km)	CV%	Column	Type
4	Ruined dry stone wall/Stone bank	5.43	179.9	63.6	35.4 *	1	Hedge
4	Ruined dry stone wall/Stone bank	6.42	212.7	66.6	31.3 *	3	Dry stone wall
4	Ruined dry stone wall/Stone bank	7.45	246.9	117.0	47.4 *	5	Earthbank
4	Ruined dry stone wall/Stone bank	2.18	72.2	37.2	51.6	6	Fence
4	Ruined dry stone wall/Stone bank	8.82	292.2	85.0	29.1 *	10	No Field Boundary
4	Ruined dry stone wall/Stone bank	30.30	1003.9	174.0	17.3 *	<i>Total</i>	Total Transitions
5	Earthbank	6.93	2547.8	327.1	12.8 *	1	Hedge
5	Earthbank	0.35	129.1	61.7	47.8 *	3	Dry stone wall
5	Earthbank	3.41	1253.9	220.7	17.6 *	6	Fence
5	Earthbank	0.30	111.5	46.0	41.3 *	7	Half-bank
5	Earthbank	0.14	49.5	24.1	48.7 *	8	Ditch
5	Earthbank	8.15	2995.7	364.4	12.2 *	10	No Field Boundary
5	Earthbank	19.27	7087.5	537.1	7.6 *	<i>Total</i>	Total Transitions
6	Fence	4.50	2447.8	320.3	13.1 *	1	Hedge
6	Fence	0.39	210.0	50.7	24.1 *	2	Mortared wall
6	Fence	0.06	30.8	24.9	80.9	3	Dry stone wall
6	Fence	0.46	247.6	63.4	25.6 *	5	Earthbank
6	Fence	0.11	59.1	31.5	53.2	7	Half-bank
6	Fence	0.46	247.8	80.6	32.5 *	8	Ditch
6	Fence	0.02	7.9	7.9	100.1	9	Line of Trees
6	Fence	10.22	5559.7	398.9	7.2 *	10	No Field Boundary
6	Fence	16.19	8810.8	519.5	5.9 *	<i>Total</i>	Total Transitions

- continued

Table 3. – continued

FIELD BOUNDARY TYPE 1998		TRANSITION				FIELD BOUNDARY TYPE 2007	
Row	Type	% 1998	km	SE(km)	CV%	Column	Type
7	Half-bank	7.04	78.1	42.9	55.0	1	Hedge
7	Half-bank	2.12	23.5	13.1	55.5	6	Fence
7	Half-bank	1.16	12.8	7.7	60.3	10	No Field Boundary
7	Half-bank	10.32	114.4	39.4	34.5 *	<i>Total</i>	Total Transitions
8	Ditch	1.53	29.9	30.0	100.1	1	Hedge
8	Ditch	2.20	43.0	26.4	61.4	5	Earthbank
8	Ditch	2.06	40.2	27.7	68.9	6	Fence
8	Ditch	0.67	13.0	11.7	90.0	10	No Field Boundary
8	Ditch	6.45	126.1	49.6	39.3 *	<i>Total</i>	Total Transitions
10	No field boundary	n/a	1271.3	197.6	15.5 *	1	Hedge
10	No field boundary	n/a	256.0	56.7	22.2 *	2	Mortared wall
10	No field boundary	n/a	6.7	6.7	100.0	3	Dry stone wall
10	No field boundary	n/a	23.9	17.3	72.7	4	Ruined dry stone wall/Stone bank
10	No field boundary	n/a	169.6	56.3	33.2 *	5	Earthbank
10	No field boundary	n/a	10934.5	748.7	6.8 *	6	Fence
10	No field boundary	n/a	72.5	47.1	64.9	7	Half-bank
10	No field boundary	n/a	12734.6	836.8	6.6 *	<i>Total</i>	Total Transitions

Table 4. Percentage length of hedges which are Priority Habitat. Minimum parcel length is 29.50m.

Number of woody species per 30m criteria		% of hedge Length
a.	>= 6	35.2
b.	<= 5 with sp.-rich ground layer	8.5
c.	<= 5 and townland boundary not with sp.-rich ground layer	4.6
<i>Total</i>		48.3

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Appendix 1. Field boundary type descriptors

Primary Types

02. Hedge: a line (< 5m wide) composed of hedge-forming species covering more than 25% of the length of the boundary. Cover can be complete or gappy, but with individual gaps not more than 20m. There are two main types of hedge component:

- (a) *Shrubby (Shrub-Growth-Form) hedge:* a hedge composed mainly of shrub growth-forms either natural or induced in tree species (see Appendix 2.).
- (b) *Coppice Tree-Growth-Form hedge:* a hedge composed mainly of coppice tree growth-forms, i.e., multi-stemmed with dbh 5 – 15 cm (see Appendix 2.).

A mix of the components can occur. The natural shrubs, gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) are not considered to be hedge forming species. Neither are the woody climbers/scramblers, i.e. ivy (*Hedera helix*), honeysuckle (*Lonicera periclyclamen*), dog-rose (*Rosa canina*) and bramble (*Rubus fruticosus*). These species are not part of the hedge component and are therefore excluded from decision making. Individual gaps more than 20m would be recorded as some other field boundary type where applicable.

- 07. Mortared brick/stone wall:** a wall constructed with mortar and brick, concrete blocks or stone. They can often be coated with plaster.
- 04. Dry stone wall:** a stone wall constructed without mortar. It is mainly hand-built but is sometimes built with machinery resulting in larger structures. The intact built structure must comprise at least 50% of the length of the boundary, i.e., there should be no more than 50% gaps, otherwise record as a Ruined dry stone wall / Stone bank (06.). A gap is defined as a break in the built structure of the wall due to collapse, removal of stones or trampling by farm stock.
- 05. Capped dry stone wall:** a dry stone wall similar to above (04.) but which has been cemented and capped on the top to strengthen the structure.
- 06. Ruined dry stone wall / Stone bank:** a derelict dry stone wall, where the built structure has collapsed but where the stones remain in place. Old ruined dry stone walls have the appearance of a stone bank. This type also includes dry stone walls with >50% gaps in the built structure. Where Ruined dry stone wall / Stone banks become >50% earthed up and adopt, e.g., a grassland ecology, record as an Earth bank (10.). If gaps due to stone removal/dispersal account for >50% of the length of the boundary (individual gaps >20m are mapped separately) label the boundary as removed on the field data map.
- 10. Earth bank:** a mounded (i.e. double-sided) earth bank higher than 25cm comprising mainly mineral or peaty soil, often with an integral dry stone component and sometimes stone faced. The vegetation is often a grassland habitat or occasionally heath. There are often shrubs or trees present. Hedges are often planted on Earth banks. Therefore Earth banks can develop if hedges have lost their hedge forming shrub/coppice component (to <25% cover). This can be by tree growth form development or by shrub death. One sided banks (i.e. Half-banks) associated with a difference in levels between adjacent fields or along roads are recorded separately. The vertical bank of a ditch or stream should not be recorded as an earth bank. An earth bank gap is defined as ≥ 1 m in length with a height ≤ 25 cm. If gaps in the bank structure account for >50% of the length (individual gaps >20m are mapped separately), an Earth bank is not recorded.
- 09. Sheep wire fence:** usually square-shaped wire mesh between wooden posts often with a strand of barbed wire above.
- 11. Wood post and wire fence:** these have several strands (≥ 2) of usually barbed wire between wooden posts.
- 12. Other fence:** all other fences. These include wire or netted wire mesh strung between concrete or metal posts. Also recorded with this code are wood post fences with a wooden rail.

Secondary Types

Ditches, half-banks and trees are mainly recorded as associated components of a primary field boundary type. However occasionally these features can occur without being associated with a primary field boundary type such as a hedge, wall, earth bank or fence. They may occur individually or together.

- Hb. *Half-bank*:** A one-sided bank associated with any field boundary type. The minimum mapping height is 50cm (0.5m) and the modal (most common) height is recorded. Half-banks occur, usually due to an obvious difference in land levels between adjacent fields on either side of a field boundary. They are often found along roadside boundaries. The vertical sides of a ditch or stream should not be recorded as a half-bank. Therefore discount the height of any earth banks or depth of associated ditches.
- Di. *Ditch*:** A ditch is defined as having an average depth of greater than 25cm. The convention is that single blue lines on the OSNI 1:2500 map are used to indicate a linear water feature less than 2.5m wide. This can represent a river, stream or a ditch. Ditches can be permanently wet with either flowing or standing water in the bottom. Species indicative of wetland vegetation are usually present in permanently wet ditches unless there are signs of recent management. Also included are ditches which dry out seasonally, i.e., not permanently wet (only so after heavy rainfall), where grasses and rushes often predominate.

Ditch category codes:

- A. *Open water*:** a ditch with open water.
- B. *Wetland vegetation*:** a ditch with wetland vegetation (e.g. Fen, Swamp or Reedbeds from SeminatURAL habitats).
- C. *Grasses/rushes*:** a ditch with grasses and/or rushes.
- D. *Tall herb/other*:** a ditch with tall herb or other vegetation.

Double blue lines OSNI 1:2500 map are used to indicate a linear water feature 2.5m or more wide. Occasionally Ditches ≥ 2.5 m (the minimum mapping width for land cover), with wetland vegetation usually with permanent standing water and are also recorded with the appropriate wetland habitat on the seminatural vegetation data sheet. Ditches ≥ 2.5 m, with permanent standing open water without wetland vegetation cover ($< 25\%$) are also recorded on the Landscape Features data sheet. Ditches internal to a land cover parcel and not associated with a primary field boundary type are not recorded on the field boundary data form. These are marked with a "D" on the field boundary map and are recorded as attributes of the land cover parcel.

- Lt. *Line of Trees*:** Occasionally a line (one tree wide) of tree growth-forms, i.e. a "line of trees" occurs which is not associated with a primary field boundary type and is not alongside a ditch or half-bank,. These are allocated a parcel number and the data is recorded in the "Total Tree Canopy Continuity (%)" column on the field data form. The main tree growth-form species (1 - 3) should be recorded. Standard Trees – Number should also be recorded if present. If a line of trees is recorded on its own, there should be at least three trees. The usual minimum mapping length (20m) applies and there should not be more than 20m between individual tree trunks.

Appendix 2. Shrub and Tree growth form descriptors.

Shrub growth-form

A shrub growth form can be natural or be induced by management. A combination of features are used to define the term shrub growth form:

- a bushy/shrubby and/or multi-stemmed (i.e. 3 or more) structure, either natural or induced.
- in the case of natural trees with several stems arising from the same bole, induced by previous coppicing or flat-topping, multi-stemmed means at least 3 stems near the base, i.e., below about 1.3m. Individual stems are usually less than about 5cm dbh (1.3m).
- some leaf foliage and lateral branch/shoot growth generally within the bottom 2m (i.e. not old, bare, leggy and very thickly wooded with a high canopy).

Natural Shrub growth-form

Some woody species tend to grow naturally as shrubs, e.g. Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Hazel (*Corylus avellana*), Holly (*Ilex aquifolium*), Gorse (*Ulex europaeus*) and Broom (*Cytisus scoparius*), see McCann et al., 2009. They are bushy and/or multi-stemmed by nature and do not usually attain a height of more than 5m. Height is measured from the base of the stems at ground level excluding the height of any associated banks etc. These species are almost always recorded as shrub growth forms, except when very occasionally they have become old, large (>5m), leggy, thickly wooded and the bottom 2m has become completely bare and devoid of leaf foliage and lateral branch/shoot growth resulting in apical dominance. The management of natural shrubs can range from current or recent flat-topping/flailing, old flat-topping to long term unmanaged. Therefore almost always record natural shrubs as shrub-growth-forms

Induced Shrub growth-form

Woody species which grow naturally as trees (see McCann et al., 2009) with apical dominance such as ash (*Fraxinus excelsior*) and sycamore (*Acer pseudoplatanus*), can be managed to induce a shrub growth form and therefore be recorded as an integral part of the shrub canopy, mainly of hedges. A bushy or multi-stemmed structure can be induced by management such as coppicing or flat-topping at or near the base. In this case multi-stemmed is defined as at least 3 stems below 1.3m (measured from the base). As a general guide individual stems are usually around 5cm or less dbh (1.3m). Regular management such as flat-topping, is required to maintain these species as shrub growth forms, otherwise a multi-stemmed "coppice" tree growth form will develop.

In some cases, trees with woody outgrowths at the base which might be, e.g. flailed to produce a dense leaf foliage growth would be recorded as having a shrub layer as well. Most trees readily adopt a shrub growth form if they have been cut or grazed by stock when young.

Tree growth form

Single-stemmed Tree growth form

Woody species which grow naturally as trees usually have a single or forked stem with apical dominance, e.g., Ash (*Fraxinus excelsior*), Beech (*Fagus sylvatica*) or Sycamore (*Acer pseudoplatanus*). All ages, sizes and dbh's are included. "Standard" tree growth forms arise when the dbh is ≥ 20 cm for single-stemmed or forked trees.

Multi-stemmed (coppice) Tree growth form

Included are multi-stemmed (i.e. 3 or more stems) trees previously managed to induce a shrub growth form by coppicing or flat-topping. Left unmanaged they have grown out, become more thickly wooded with individual stems more than 5cm dbh and have regained apical dominance. They have the appearance of "coppice" (5cm – 15cm dbh). This structure reflects long term coppice management. If they continue to be unmanaged "Standard" tree growth forms can arise.

Also very occasionally classified as tree growth forms are former natural shrubs which have become very large with thickened woody stems and apical growth having out-grown their shrub growth form.

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