Table 6.1: Review of indicators used to detect and interpret change in other UK countries

Endnote number	Country	Title	Authors	Scheme monitored	Target Habitats	Monitoring objective
	Scotland					
100	Scotland	Breadalbane ESA - biological monitoring report, years one to five1989-1993.	MLURI	ESA	Broadleaved woodland, heather moorland, unimproved enclosed grassland.	To detect changes in botanical compositions within the ESA between 1989 and 1993 and the extent to which management prescriptions have been responsible for the change.
110	Scotland	Loch Lomond Environmentally Sensitive Area.	MLURI	ESA	Heather moorland and broadleaved woodland.	To evaluate the effects of the management guidelines of the scheme on heather moorland and broadleaved woodland in ESA.
111	Scotland	The Stewartry, Whitlaw/Eildon and the machair of the Uists and Benbecula, Barra and Vatersay ESA's.	MLURI	ESA	Broadleaved woodlands, semi-natural grasslands, conservation headlands, wildlife strips and basin mires, machair grasslands and wetlands.	To determine the nature and extent of botanical changes on agreement land, to compare to changes on land outside the ESA, identify causes of change.
65	Scotland	Monitoring ESAs in Scotland. Vol. 2: The Argyll Islands ESA monitoring report 1994-1999.	Hewison, R.L.; Henderson, D.J.; Cummins, R.P.; Rees, T.; Mills, C.; Marquiss, M.; Picozzi, N.; Carss, D.N.	ESA	Grassland and dunes(machair), wetland, heathland, blanket bog, woodland.	To maintain and protect land brought into ESA scheme. To enhance and extend conservation value of habitats or features. This report evaluates the effectiveness of the ESA scheme in Scotland.
66	Scotland	Monitoring ESAs in Scotland. Vol 10: The Stewartry ESA monitoring report 1994-1999.	Scott, D.; Bell, J.S.; Hawker, D.; Mills, C.; Rees, T.	ESA	Grassland, woodland, water margins, wetland.	To maintain and protect land brought into ESA scheme. To enhance and extend conservation value of habitats or features. This report evaluates the effectiveness of the ESA scheme in Scotland.
67	Scotland	Monitoring ESAs in Scotland. Vol. 9: The Machair of the Uists and Benbecula, Barra and Vatersay ESA monitoring report.	Pearce, I.S.K.; Nolan, A.J.; Martin, I.S.; Rees, T.; Mills, C.	ESA		To maintain and protect land brought into ESA scheme. To enhance and extend conservation value of habitats or features. This report evaluates the effectiveness of the ESA scheme in Scotland.

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Endnote number	Country	Title	Authors	Scheme monitored	Target Habitats	Monitoring objective
68	Scotland	Monitoring ESAs in Scotland. Vol. 8: The Shetland Islands ESA monitoring report 1994-1999.	McGowan, G.M.; Cummins, R.P.; Martin, I.; Picozzi, N.; Rees, T.; Mills, C.	ESA		To maintain and protect land brought into ESA scheme. To enhance and extend conservation value of habitats or features. This report evaluates the effectiveness of the ESA scheme in Scotland.
69	Scotland	Monitoring ESAs in Scotland. Vol. 7: The Loch Lomond ESA monitoring report 1994-1999.	Henderson, D.J.; French, D.D.; Hallam, C.; Rees, T.; Mills, C.	ESA		To maintain and protect land brought into ESA scheme. To enhance and extend conservation value of habitats or features. This report evaluates the effectiveness of the ESA scheme in Scotland.
70	Scotland	Monitoring ESAs in Scotland. Vol. 6: The Southern Uplands monitoring report 1994-1999.	French, D.D.; Cummins, R.P.; Scott, D.; Scott, R.; Rees, T.; Mills, C.	ESA		To maintain and protect land brought into ESA scheme. To enhance and extend conservation value of habitats or features. This report evaluates the effectiveness of the ESA scheme in Scotland.
71	Scotland	Monitoring ESAs in Scotland. Vol. 5: The Central Borders ESA monitoring report 1994-1999	Hewison, R.L.; Scott, D.; Pearce, I.S.K.; Rees, T.; Mills, C.	ESA		To maintain and protect land brought into ESA scheme. To enhance and extend conservation value of habitats or features. This report evaluates the effectiveness of the ESA scheme in Scotland.
72	Scotland	Monitoring ESAs in Scotland. Vol. 4: The Cairngorms Straths EAS monitoring report 1994-1999	Bell, J.S.; Hewison, R.L.; Cummins, R.P.; Martin, I.S.; French, D.D.; Picozzi, N.; Catt, D.C.; Rees, T.; Mills, C.	ESA		To maintain and protect land brought into ESA scheme. To enhance and extend conservation value of habitats or features. This report evaluates the effectiveness of the ESA scheme in Scotland.
344	Scotland	Monitoring ESA's in Scotland		ESA		To maintain and protect land brought into ESA scheme. To enhance and extend conservation value of habitats or features. This report evaluates the effectiveness of the ESA scheme in Scotland.
	Wales					

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Endnote number	Country	Title	Authors	Scheme monitored	Target Habitats	Monitoring objective
62	Wales	Environmental monitoring in the Cambrian Mountains ESA 1995-1999.	ADAS	ESA	woodland, moorland and hay meadows	To assess botanical quality of broadleaved woodland.To monitor the quality of hay meadows and assess effectiveness of management prescriptions. To assess the botanical quality of heather moorland.
60	Wales	Biological monitoring in the Clwydian Range ESA 1995-1998.	ADAS	ESA	Calcareous grasslands.	To describe the botanical composition of randomly selected calcareous grasslands and the associated changes in butterfly numbers and distribution.
61	Wales	Environmental monitoring in the Lleyn Peninsula ESA 1989-1998.	ADAS	ESA	Coastal grasslands and wetlands.	To monitor the quality of coastal belt and grasslands.
56	Wales	Botanical monitoring in the Radnor ESA 1994-1997.	ADAS	ESA	Hay meadows and wetlands.	To describe the botanical composition of randomly selected hay meadows and wetlands in th Radnor ESA and provide a baseline with which to compare future surveillance data to.
57	Wales	Environmental monitoring in the Ynys Mon ESA 1993-1997.	ADAS	ESA	Coastal belt - semi-natural rough grazing, enclosed unimproved grassland, enclosed partially improved grassland, wetland.	To determine whether the wildlife and landscape value of open heathland, enclosed semi-natural rough grazing, wetland and other rough habitats have been maintained and enhanced under the ESA scheme.
64	Wales	Tir Cymen. Second monitoring and evaluation report.	Entec	Tir Cymen	Many	The extent to which the scheme has achieved its objectives by evaluating results against performance indicators. The effectiveness of the targeting process.
63	Wales	Performance indicators for Tir Gofal habitat management prescriptions.	ADAS	Tir Gofal	Many - woodland, heathland, grassland, wetland, coastland, rock, arable.	To monitor the condition of habitats on Tir Gofal holdings. Monitoring attributes which are a measure of quality or quantity and also factors which may influence features.
59	Wales	Haymeadow reversion monitoring in Preseli ESA 1996-1999.	ADAS	ESA	Hay meadow	To assess the effectiveness of ESA reversion management prescriptions in re-creating specie rich neutral grassland from the various land types entered into this tier.
	N.Ireland					
88	N.Ireland	ESAs in Northern Ireland. Biological monitoring report year 1, 1993 (West Fermanagh and Erne Lakeland) DRAFT.	Queens University, Belfast.	ESA	Hay meadow, wet grasslands, limestone grasslands, improved and unimproved grasslands, heathland and limestone grassland, woodland, hedges and field margins.	To evaluate the impact of the ESA scheme by monitoring specific target habitats.
91	N. Ireland	ESAs in Northern Ireland. Biological monitoring report year 2, 1994 (Antrim Coast, Glens and Rathlin, Sperrin etc).	Queens University, Belfast.	ESA	Heather and woodland.	To provide baseline data on the wildlife value of a range of sites from target habitats.

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Endnote number	Country	Title	Authors	Scheme monitored	Target Habitats	Monitoring objective
90	N. Ireland	ESAs in Northern Ireland. Biological remonitoring report 2000.	Queens University, Belfast.	ESA	Heather moorland and woodland.	To monitor effectiveness of ESA scheme in conserving/enhancing wildlife value. To provide information on suitability and effectiveness of management practices for controlling heather Northern Ireland.
343	N. Ireland	1998 ESA landscape remonitoring (Northern Ireland).	Queens University, Belfast.	ESA	Woodlands and hedgerows, hay meadows, wet grasslands, heathlands,	To test if the habitat diversity had changed over the three years in the ESA.
87	N. Ireland	CMS management scheme - protocol for biological monitoring programme.	Johnstone, R.	Countryside management scheme	25 habitat types	To evaluate effectiveness of CMS prescriptions.
	Republic of Ireland					
89	Republic of Ireland	Botanical monitoring of Rural Environment Protection Scheme (REPS.	Jane Feehan, Trinity College, Dublin.	REPS	General	To assess effectiveness of REPS scheme on insect and plant biodiversity.
	Netherlands					
55	Netherlands	Agri-environment schemes do not effectively protect biodiversity in Dutch agricultural landscapes.	Kleijn, D.; Berendse, F.; Smit, R.; Gilissen, N	Dutch schemes	Grassland	How effectively the management agreement conserves biodiversity on farms, 1. Postponing agricultural activities until June/July to allow waders to hatch chicks. 2. Conservation of species rich vegetation in grasslands restricts fertiliser use.

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Endnote number	Indicators	Analysis	(level of) Data requirement for external data	(level of) data requirement from monitoring method
100	**Woodland**- species composition, spatial extent of regeneration, numbers of seedlings and saplings, sapling heights, growth increments**heather moorland**- height, growth stage, cover and percentage utilisation by animals (aggregating data from point quadrats)**unimproved enclosed grassland**- mean numbers of species/quadrat, indicator species, heights of grasses and forbs.	Compared with land outside ESA, t-tests**woodland**- randomly chosen, woodland grazing exclosure and enclosure species composition, spatial extent of regeneration, numbers of seedlings and saplings, sapling heights, growth increments**Heather** - relationship between heather growth, utilisation and age.**Unimproved enclosed grassland**- stratified random sampling, mean numbers of species/quadrat, indicator species, heights of grasses and forbs.	None	Medium-quadrats
110	**Woodlands**- seedling numbers, sapling numbers, heights of established saplings. **Heather moorland**-species composition, heather height, cover and utilisation.	**Broadleaved woodlands,** sites within and outwith ESA, species composition, seedling and sapling numbers, sapling height, paired t tests.**Heather moorland**- stratified by slope, soil and grazing pressure, paired recently burnt and unburnt, in ESA and out ESA, paired t tests on all variables, transformed data.	None	High
111	**Woodlands**-seedling numbers, sapling numbers, height of saplings.**Low scrub in enclosed fields**-% cover of gorse, mean and max height of gorse. **Wetlands**-species composition, % cover, heights.**Semi-natural grasslands**-species, % cover, height,**Conservation headlands**, wildlife strips-species, % cover, height.**Basin mires**-species, % cover, height, Machair-species, % cover, height	Woodlands stratified by size, comparisons between factors, within and outside of the ESA by paired t-tests. Wildlife strips, DECORANA used to analyse the data set, chi-squared tests on each species whose expected frequency values were greater than 5 to detect sig changes between 1989 and 1993.		
65	Background monitoring-in-scheme and out-scheme to assess and compare trends of change, also compared to national data sets. Key vegetation type, Suited species analysis, Plant association diversity indices- Number of spp., Simpsons index, cover of single most abundant species. Changes in individual spp-spp whose cover had changed significantly-in relation to known strategies, tolerances and affinities.	All analyses of change paired-sample analyses, paired sample t-tests. Analyses for particular KVT's heather cover, height, condition.	Suited species scores modified as some scores not deemed appropriate for species in Scotland.	High
66	Background monitoring-in-scheme and out-scheme to assess and compare trends of change, also compared to national data sets. Key vegetation type, Suited species analysis, Plant association diversity indices- Number of spp., Simpsons index, cover of single most abundant species. Changes in individual spp-spp whose cover had changed significantly-in relation to known strategies, tolerances and affinities.	All analyses of change paired-sample analyses, paired sample t-tests. Analyses for particular KVT's heather cover, height, condition.	Suited species scores modified as some scores not deemed appropriate for species in Scotland.	High
67	Background monitoring-in-scheme and out-scheme to assess and compare trends of change, also compared to national data sets. Key vegetation type, Suited species analysis, Plant association diversity indices- Number of spp., Simpsons index, cover of single most abundant species. Changes in individual spp-spp whose cover had changed significantly-in relation to known strategies, tolerances and affinities.	All analyses of change paired-sample analyses, paired sample t-tests. Analyses for particular KVT's heather cover, height, condition.	Suited species scores modified as some scores not deemed appropriate for species in Scotland.	High

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Endnote number	Indicators	Analysis	(level of) Data requirement for external data	(level of) data requirement from monitoring method
68	Background monitoring-in-scheme and out-scheme to assess and compare trends of change, also compared to national data sets, Key vegetation type. Suited species analysis, Plant association diversity indices- Number of spp., Simpsons index, cover of single most abundant species. Changes in individual spp-spp whose cover had changed significantly-in relation to known strategies, tolerances and affinities.	All analyses of change paired-sample analyses, paired sample t-tests. Analyses for particular KVT's heather cover, height, condition.	Suited species scores modified as some scores not deemed appropriate for species in Scotland.	High
69	Background monitoring-in-scheme and out-scheme to assess and compare trends of change, also compared to national data sets, Key vegetation type. Suited species analysis, Plant association diversity indices- Number of spp., Simpsons index, cover of single most abundant species. Changes in individual spp-spp whose cover had changed significantly-in relation to known strategies, tolerances and affinities.	All analyses of change paired-sample analyses, paired sample t tests. Analyses for particular KVT's heather cover, height, condition.	Suited species scores modified as some scores not deemed appropriate for species in Scotland.	High
70	Background monitoring-in-scheme and out-scheme to assess and compare trends of change, also compared to national data sets, Key vegetation types, Suited species analysis, Plant association diversity indices - Number of spp., Simpsons index, cover of single most abundan species, Changes in individual spp - spp whose cover had changed significantly-in relation to known strategies, tolerances and affinities.	All analyses of change paired-sample analyses, paired sample t-tests. Analyses for particular KVT's heather cover, height, condition.	Suited species scores modified as some scores not deemed appropriate for species in Scotland.	High
71	Background monitoring-in-scheme and out-scheme to assess and compare trends of change, also compared to national data sets, Key vegetation type. Suited species analysis, Plant association diversity indices- Number of spp., Simpsons index, cover of single most abundant species. Changes in individual spp-spp whose cover had changed significantly-in relation to known strategies, tolerances and affinities.	All analyses of change paired-sample analyses, paired sample t tests. Analyses for particular KVT's heather cover, height, condition.	Suited species scores modified as some scores not deemed appropriate for species in Scotland.	High
72	Background monitoring-in-scheme and out-scheme to assess and compare trends of change, also compared to national data sets, Key vegetation type. Suited species analysis, Plant association diversity indices- Number of spp., Simpsons index, cover of single most abundant species. Changes in individual spp-spp whose cover had changed significantly-in relation to known strategies, tolerances and affinities.	All analyses of change paired-sample analyses, paired sample t tests. Analyses for particular KVT's heather cover, height, condition.	Suited species scores modified as some scores not deemed appropriate for species in Scotland.	High
344	Background monitoring-in-scheme and out-scheme to assess and compare trends of change, also compared to national data sets, Key vegetation type. Suited species analysis, Plant association diversity indices- Number of spp., Simpsons index, cover of single most abundant species. Changes in individual spp-spp whose cover had changed significantly-in relation to known strategies, tolerances and affinities.	All analyses of change paired-sample analyses, paired sample t tests. Analyses for particular KVT's heather cover, height, condition.	Suited species scores modified as some scores not deemed appropriate for species in Scotland.	High

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Endnote number	Indicators	Analysis	(level of) Data requirement for external data	(level of) data requirement from monitoring method
62	**Woodland**-NVC, no. of seedlings and saplings.**Hay meadows**- NVC, Suited species scores, A, G, Nu, species richness, Hay meadow indicator species, monocotyledon species richness, dicotyledon species richness. **Heather moorland**- grazing index and BU.	**Woodland** - NVC-MATCH, no. of seedlings and saplings- non-parametric.**Hay meadows** - NVC, Suited species scores, A, G, Nu, species richness, Hay meadow indicator species- ANOVA stand and agreement**Heather moorland** - grazing index and BU, one way ANOVA, GLM for agreement and heather dominance level, regression with stocking level.	Low	Medium
60	NVC, suited species - C, G, A, Nu, changes in the abundance of butterfly larval food plants, vegetation height, species richness, analysis of individual species.	Optimum scale, repeated measures ANOVA - year, agreement, year crossed with agreement. Two levels of agreement status agreement and non-agreement. Mann Whitney tests applied to optimal frequencies for two years if vegetation stands, stand vegetation heights tested for sig. differences.	Low	Medium
61	**Coastal belt** - Suited species scores - Nu, G and S, veg height, species richness. **Wetlands** - W, Nu, G, A, T, quantity of tussock producing species.	ANOVA fixed factors year and tier status, repeated measures, suited species scores, veg height, species richness and soil type.	Low	Medium
56	Suited species - A, G, Nu, W(for wetland), species richness and vegetation height, NVC.	Repeated measures ANOVA with year as repeated measure.**Wetlands** - repeated measures ANOVA with NVC and agreement status as crossed fixed factors,		
57	Land cover, linear features monitored, coastal belt-grassland and heathland - veg height, stands assigned to NVC, suited species - G, Nu, S, abundance of interest species, species richness.	Repeated measures ANOVA with year, agreement and year crossed with agreement, agreement status, non agreement, agreement tier 1a and agreement Tier 2A		
64	Surveyors assessed appropriateness of habitat classification, assessed management, identification of missed opportunities, identification of adverse environmental effects. Increase/decrease in desirable/undesirable species. Species composition, vegetation height in quadrats, heather condition.	Compares percentages of inappropriate habitat classifications. Discusses changes in species composition but no analysis as such.	None- sites assessed by surveyors in the field. No additional input to analysis.	Low- some quadrat data but mostly based on expertise of surveyor in judging whether management has fulfilled objectives for site.
63	DACFOR, veg map, Species cover, vegetation height, each habitat has a series of recording requirements which are linked to particular objectives e.g. woodlands - no. of seedlings, amount of deadwood. Target values such as 75% cover by dwarf shrub, noting increase or decrease of particular species.	No analysis as such.	None	Low-medium
59	Suited species; A, G, Nu, NVC, hay meadow indicator species, species richness.	MATCH, suited species scores-changes in magnitude and consistency.	Low	Medium
88	Vegetation type described using DCA, plant species frequencies, soil properties.	Twinspan and DCA (CANOCO), classified groups used in long term monitoring of ESA. Once habitats had been classified mean soil properties per habitat were calculated and compared using ANOVA and Tukey's multiple comparison test.	None	Medium-quadrat, invert and soil data.
91	NVC, Twinspan, CSR.	One way ANOVA and t-tests on heather vegetation types.	CSR data only.	Quadrat

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Endnote number	Indicators	Analysis	(level of) Data requirement for external data	(level of) data requirement from monitoring method
90	Species richness, t-tests to compare means between 1994 and 2000. Plant strategy theory-CSR. Proportions compared. heather management study looking at mean no. of species for burned and flailed sites.	Not directly comparing ESA and non-ESA numbers. Plant frequency - % of sites for each habitat that a plant species occurred in. Mean abundance -mean % cover within 1mx1m.	None	Medium - quadrat data only
343	Species richness, plant species groups (from TWINSPAN), relative proportion in each of plant strategy theory CSR groups, indicator species	Changes in plant species numbers, frequencies and abundances in habitats on ESA participant farms compared with habitats from non-participant farms, t-tests. Frequency and quadrat composition of indicator species and plant species which have known ecological requirements and CSR plant strategies. Triangles drawn with relative proportions of CSR plants. TWINSPAN and DCA, comparing resul of TWINSPAN analysis between years to assess changes in communities within habitat types.	None	Medium - quadrat data only
87	English Nature Condition Assessment methods for grasslands and heathlands, species number and frequency, frequency of negative indicator species, grass/herb ratio, sward height, bare ground and plant litter.		None	Medium
89	No info on analysis.			
55	Species richness	Residual maximum likelihood method (REML) followed by Wald tests. Data for individual species analysed by GLM assuming a binomial distribution followed by a likelihood ratio test. Models included factors area, pair and management agreement.	None	Medium

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Endnote number	Sensitivity to detecting change	Ease of interpretation	Complexity of analysis	level of expertise required for data manipulation	Statistical Issues	Suitability for monitoring objective	Provides useful management information	Applicable to wide range of habitats
100	Medium- quadrat data, woodland - detailed measurements taken e.g. sapling height which should be good for looking at changes in structure.	Medium-some expertise in interpretation.	Low-medium- t-tests	Medium	Different number of samples in ESA and out of ESA, unbalanced design.	Good- attempts to establish success of ESA by comparing to sites outside of the ESA. Also looks at trends over time Detailed measurements such as woodland regeneration, sapling number and height give good information on how structure is developing.	Yes- local and ESA.	Yes
110	Medium- quadrat data, woodland- detailed measurements taken e.g. sapling height which should be good for looking at changes in structure.	Medium-some expertise in interpretation.	Low-medium- t-tests	Medium	Different number of samples in ESA and out of ESA, unbalanced design.	Good- attempts to establish success of ESA by comparing to sites outside of the ESA. Also looks at trends over time Detailed measurements such as woodland regeneration, sapling number and height give good information on how structure is developing.	Yes- local and ESA.	Yes
111	Medium- quadrat data, woodland- detailed measurements taken e.g. sapling height which should be good for looking at changes in structure. Other habitats - species composition and height. No measures of quality.	Medium-some expertise in interpretation.	Medium	Medium	Problems getting same wetland habitats on same site type within and outside of the ESA . At Whitlaw/Eildon ESA uptake by landowners was low. Permanent dune pasture monitoring, range of sampling dates affected sward height measurements i.e. changes not due to grazing.	Good- attempts to establish success of ESA by comparing to sites outside. Also looks at trends over time. Detailed measurements such as woodland regeneration, sapling number and height give good information on how structure is developing.	Yes- local and ESA.	Yes
65	High-high amount of information				Sample sizes required to obtain robust estimates of change do not necessarily lead to reliable estimates of stock. Difficult to obtain genuinely comparable controls, rationale is to assess and compare trends of change across in-scheme and out-scheme areas in ESA's. Statistical procedures used to select random samples for monitoring. Variance components used to set sample sizes for prescription monitoring. Randomly placed quadrats selected before going into field. Small sample sizes, low uptake ESA's, KVT uncommon, only half of the plots have been re-monitored.	Very good. Difficult to compare waterside plots botanically as they were allocated on basis of proximity to water courses rather than on vegetation type but could still be compared to out scheme sites.	Yes	Yes-used on wide range of habitats.
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70	High-high amount of information.				Sample sizes required to obtain robust estimates of change do not necessarily lead to reliable estimates of stock. Difficult to obtain genuinely comparable controls, rationale is to assess and compare trends of change across in-scheme and out-scheme areas in ESA's. Statistical procedures used to select random samples for monitoring. Variance components used to set sample sizes for prescription monitoring. Randomly placed quadrats selected before going into field. Small sample sizes, low uptake ESA's, KVT uncommon, only half of the plots have been re-monitored.	Very good. Difficult to compare waterside plots botanically as they were allocated on basis of proximity to water courses rather than on vegetation type but could still be compared to out scheme sites.	Yes	Yes-used on wide range of habitats.
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72	High-high amount of information				Sample sizes required to obtain robust estimates of change do not necessarily lead to reliable estimates of stock. Difficult to obtain genuinely comparable controls, rationale is to assess and compare trends of change across in-scheme and out-scheme areas in ESA's. Statistical procedures used to select random samples for monitoring. Variance components used to set sample sizes for prescription monitoring. Randomly placed quadrats selected before going into field. Small sample sizes, low uptake ESA's, KVT uncommon, only half plots been re-monitored.	Very good. Difficult to compare waterside plots botanically as they were allocated on basis of proximity to water courses rather than on vegetation type but could still be compared to out scheme sites.	Yes	Yes-used on wide range of habitats.
344	High-high amount of information				Sample sizes required to obtain robust estimates of change do not necessarily lead to reliable estimates of stock. Difficult to obtain genuinely comparable controls, rationale is to assess and compare trends of change across in-scheme and out-scheme areas in ESA's. Statistical procedures used to select random samples for monitoring. Variance components used to set sample sizes for prescription monitoring. Randomly placed quadrats selected before going into field. Small sample sizes, low uptake ESA's, KVT uncommon, only half plots been re-monitored.	Very good. Difficult to compare waterside plots botanically as they were allocated on basis of proximity to water courses rather than on vegetation type but could still be compared to out scheme sites.	Yes	Yes-used on wide range of habitats.

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62	Medium	Low - requires expertise.	Medium	Medium		Good, different methods for different habitats.	Yes	Yes
60	Medium	Low	Medium	Medium		Good	Yes	Yes
61	Medium	Medium	Medium	Medium		Good	Yes	Yes
56								
57					3 different stand sizes within single sample, size not standardised, calculations of suited species scores and individual species frequencies not comparable. Size of stand could affect species richness of stand.			
64	Low- subjective assessment.	High- Comments given by surveyors give information, some interpretation required.	No analysis.	None	None (no statistics used).	Provides assessment on how well scheme is working. Anecdotal reports of specific indicators. There is no quantitative analysis assessing overall effectiveness of scheme.	Provides management information at the site level which can be extrapolated to make general comments at the scheme level.	Yes- has been applied to different habitats.
63	Low- no quantitative measures, although factors are precisely defined.	High	Low, no analysis	Low	None	Will enable definitions as in common standards i.e. favourable, maintained. Suitable for monitoring objective	Yes	Yes
59	Medium-high	Medium	Medium	Medium		Good, specific objectives matched by indicators.	Yes	Yes
88	Medium - change will be detected by looking at distribution of monitoring sites and plant species frequencies between habitats which will detect change at a larger scale. Data has been collected from permanent quadrats so it may be possible to look at more local changes too.	Medium-high	Medium	Medium		Re-monitoring to determine results of ESA prescriptions will involve recording the change in the distribution of monitoring sites among the main vegetation groups in each habitat, changes in individual plant species frequency and total number of plant species within habitats.	Yes, links vegetation to soils (also a farm management questionnaire).	Yes
91	Medium - condition measures not used to establish base line monitoring but data are adequate to do so.					Establishes baseline data, identifies community types, little measurement of quality.	Yes	Yes

Table 6.1: Review of indicators used to detect and interpret change in other UK countries

Endnote number	Sensitivity to detecting change	Ease of interpretation	Complexity of analysis	level of expertise required for data manipulation	Statistical Issues	Suitability for monitoring objective	Provides useful management information	Applicable to wide range of habitats
90	Medium - re-survey of previous sites using species composition, frequency and abundance data to detect change.	High	Low-Medium	Low		Good- it detected change in species diversity, frequency and abundance using simple tests and some quality/indicator information.	Yes - heather condition assessed by frequency and cover of particular species both generally and at sites where different management techniques had been carried out.	Yes
343	Medium-high, combination of methods, species and community scale used to assess changes.				Partial re-monitoring of habitats, small numbers of sites. Unequal numbers ESA and non ESA.	Good, species diversity + CSR strategy.	Yes, local and ESA.	Yes - used on wide range of habitats.
87	Medium-low					OK, this paper does not go into detail on specific monitoring objectives for habitat so it is difficult to assess whether these will be met. No mention of more detailed analysis e.g. suited species, methods of comparing to CS data.	Potentially	Yes
89								
55	Medium	Medium	Medium	Medium		Good, compared agreement and non-agreement schemes.	Yes - possibly demonstrates where management isn't working.	Yes

Table 6.1: Review of indicators used to detect and interpret change in other UK countries

Endnote number	Usage across AE schemes	Strengths	Weaknesses	Notes
100	Yes	1. Matches objectives well with outputs e.g. detailed structural data on woodlands. 2. Can compare sites within ESA and outside ESA. 3. Quadrats and permanent quadrats can be revisited. 4. Quadrats recorded, 1989, 1991 and 1993, trends looked at.	1. Different numbers of sites inside and outside ESA. Other sources of control data.	
110	Yes	1. Matches objectives well with outputs e.g. detailed structural data on woodlands. 2. Can compare sites within ESA and outside ESA. 3. Quadrats and permanent quadrats can be revisited. 4. Quadrats recorded, 1989, 1991 and 1993, trends looked at.	1. Different numbers of sites inside and outside ESA. Other sources of control data.	
111	Yes	1. Matches objectives well with outputs e.g. detailed structural data on woodlands, changes in cultivated land. 2. Can compare sites within ESA and outside ESA 3. Quadrats and permanent quadrats can be revisited. 4. Quadrats recorded at regular intervals and trends looked at.	1. Monitoring period short in relation to the time scale of ecological change. 2. Small sample sizes for some habitats. 3. Difficulties in recording sapling height increments due to mortality. 4. Sampling date affected vegetation height recording. 5. For habitats other than woodland there were no quality measures.	
65	Yes, it was thought necessary to modify suited species scores for Scotland, does question their widespread application i.e. may need to take care when comparing between schemes.	1. Very detailed, methodology same as CS2000 so enables comparisons to control data. 2. Suited species scores - detailed habitat information used to compare between agreement/non-agreement and as part of objectives for prescriptions of habitat change. 3. Random plots - lot of effort in making sampling strategy statistically valid.	1. Sample sizes small for some Key vegetation types and ESA's and non-scheme. Partly due to small amount of particular vegetation types and partly changes in ESA uptake, matching sites.	Compared to CS1990-results from ESA squares tend to underestimate area of non-agricultural types. Landcover of Scotland database.
66	Yes, it was thought necessary to modify suited species scores for Scotland, does question their widespread application i.e. may need to take care when comparing between schemes.	1. Very detailed, methodology same as CS2000 so enables comparisons to control data. 2. Suited species scores - detailed habitat information used to compare between agreement/non-agreement and as part of objectives for prescriptions of habitat change. 3. Random plots - lot of effort in making sampling strategy statistically valid.	1. Sample sizes small for some Key vegetation types and ESA's and non-scheme. Partly due to small amount of particular vegetation types and partly changes in ESA uptake, matching sites.	Compared to CS1990-results from ESA squares tend to underestimate area of non-agricultural types. Landcover of Scotland database.
67	Yes, it was thought necessary to modify suited species scores for Scotland, does question their widespread application i.e. may need to take care when comparing between schemes.	1. Very detailed, methodology same as CS2000 so enables comparisons to control data. 2. Suited species scores - detailed habitat information used to compare between agreement/non-agreement and as part of objectives for prescriptions of habitat change. 3. Random plots - lot of effort in making sampling strategy statistically valid.	1. Sample sizes small for some Key vegetation types and ESA's and non-scheme. Partly due to small amount of particular vegetation types and partly changes in ESA uptake, matching sites.	Compared to CS1990-results from ESA squares tend to underestimate area of non-agricultural types. Landcover of Scotland database.

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Endnote number	Usage across AE schemes	Strengths	Weaknesses	Notes
68	Yes, it was thought necessary to modify suited species scores for Scotland, does question their widespread application i.e. may need to take care when comparing between schemes.	1. Very detailed, methodology same as CS2000 so enables comparisons to control data. 2. Suited species scores - detailed habitat information used to compare between agreement/non-agreement and as part of objectives for prescriptions of habitat change. 3. Random plots - lot of effort in making sampling strategy statistically valid.	1. Sample sizes small for some Key vegetation types and ESA's and non-scheme. Partly due to small amount of particular vegetation types and partly changes in ESA uptake, matching sites.	Compared to CS1990-results from ESA squares tend to underestimate area of non-agricultural types. Landcover of Scotland database.
69	Yes, it was thought necessary to modify suited species scores for Scotland, does question their widespread application i.e. may need to take care when comparing between schemes.	1. Very detailed, methodology same as CS2000 so enables comparisons to control data. 2. Suited species scores - detailed habitat information used to compare between agreement/non-agreement and as part of objectives for prescriptions of habitat change. 3. Random plots - lot of effort in making sampling strategy statistically valid.	1. Sample sizes small for some Key vegetation types and ESA's and non-scheme. Partly due to small amount of particular vegetation types and partly changes in ESA uptake, matching sites.	Compared to CS1990-results from ESA squares tend to underestimate area of non-agricultural types. Landcover of Scotland database.
70	Yes, it was thought necessary to modify suited species scores for Scotland, does question their widespread application i.e. may need to take care when comparing between schemes.	1. Very detailed, methodology same as CS2000 so enables comparisons to control data. 2. Suited species scores - detailed habitat information used to compare between agreement/non-agreement and as part of objectives for prescriptions of habitat change. 3. Random plots - lot of effort in making sampling strategy statistically valid.	1. Sample sizes small for some Key vegetation types and ESA's and non-scheme. Partly due to small amount of particular vegetation types and partly changes in ESA uptake, matching sites.	Compared to CS1990-results from ESA squares tend to underestimate area of non-agricultural types. Landcover of Scotland database.
71	Yes, it was thought necessary to modify suited species scores for Scotland, does question their widespread application i.e. may need to take care when comparing between schemes.	1. Very detailed, methodology same as CS2000 so enables comparisons to control data. 2. Suited species scores - detailed habitat information used to compare between agreement/non-agreement and as part of objectives for prescriptions of habitat change. 3. Random plots - lot of effort in making sampling strategy statistically valid.	1. Sample sizes small for some Key vegetation types and ESA's and non-scheme. Partly due to small amount of particular vegetation types and partly changes in ESA uptake, matching sites.	Compared to CS1990-results from ESA squares tend to underestimate area of non-agricultural types. Landcover of Scotland database.
72	Yes, it was thought necessary to modify suited species scores for Scotland, does question their widespread application i.e. may need to take care when comparing between schemes.	1. Very detailed, methodology same as CS2000 so enables comparisons to control data. 2. Suited species scores - detailed habitat information used to compare between agreement/non-agreement and as part of objectives for prescriptions of habitat change. 3. Random plots - lot of effort in making sampling strategy statistically valid.	1. Sample sizes small for some Key vegetation types and ESA's and non-scheme. Partly due to small amount of particular vegetation types and partly changes in ESA uptake, matching sites.	Compared to CS1990-results from ESA squares tend to underestimate area of non-agricultural types. Landcover of Scotland database.
344	Yes, it was thought necessary to modify suited species scores for Scotland, does question their widespread application i.e. may need to take care when comparing between schemes.	1. Very detailed, methodology same as CS2000 so enables comparisons to control data. 2. Suited species scores - detailed habitat information used to compare between agreement/non-agreement and as part of objectives for prescriptions of habitat change. 3. Random plots - lot of effort in making sampling strategy statistically valid.	1. Sample sizes small for some Key vegetation types and ESA's and non-scheme. Partly due to small amount of particular vegetation types and partly changes in ESA uptake, matching sites.	Compared to CS1990-results from ESA squares tend to underestimate area of non-agricultural types. Landcover of Scotland database.

Table 6.1: Review of indicators used to detect and interpret change in other UK countries

Endnote number	Usage across AE schemes	Strengths	Weaknesses	Notes
62	Yes	1. Suited species scores well suited to sensitive detection of change. 2. Specific analyses based on Heather grazing and regeneration, detailed analyses multiway ANOVA to assess contribution of different factors - experimental approach enables ANOVA parametric test.		
60	Yes	Diiferent indicators targeted to objectives.		
61	Yes	Suited species scores well suited to sensitive detection of change.	Lack of published data on salt tolerant species.	
56				
57		G score directly links to management prescriptions. Suited species scores.		
64	Potentially comparable with monitoring and evaluation projects for other countryside schemes, claims to have improved on CSS so evaluation cannot be compared to that.	1. Quick, easy, cheap. 2. Based on detailed knowledge of what is desirable in a particular habita.t 3. Some species data available.	1. No quantitative information to detect small scale changes. 2. No analysis carried out.	No, only very subjectively.
63	Yes	1. Quick, easy, cheap. 2. Based on detailed knowledge of what is desirable in a particular habitat.	1. No quantitative information to detect small scale changes. 2. Only records what was decided upon at this date, i.e. in other surveys you can return to the species data if you want to analyse for another factor. 3. No analysis possible.	No
59	Yes	Outcome of reversion should be vegetation associated with targets set by monitoring, i.e. suited species.	List of indicators of hay meadows not complete/finalised.	
88	Yes	1. This study takes baseline data from the first year of a monitoring scheme and classifies habitats by TWINSPAN and DCA, using species information and some environmental information in the form of soils data. It gives a good basis for knowing the distribution of habitats within an area not previously studied.	1. Only potential ESA sites were studied, there will be no comparison at re-survey between agreement and non-agreement sites. 2. May want to use different analysis methods next time rather than distribution of species between habitats, may want to look in more detail at measures that characterise condition to pick up finer scale changes.	Yes
91	Yes	1. Simple. 2. Gives information concerning community types and looks at Heather condition.	1. Not much condition/quality measurement, this may be done in the resurvey but could have been done here.	Yes, (woodland survey/CS methods for woodlands).

Table 6.1: Review of indicators used to detect and interpret change in other UK countries

Endnote number	Usage across AE schemes	Strengths	Weaknesses	Notes
90	Good		1. More could have been done with data. 2. Participants not directly compared to non-participants, see strengths.	Yes
343	Yes	1. Relatively simple, quadrat data - species diversity and CSR, changes in community types. 2. Targeted towards ESA objectives. 3. Comparison of ESA and non-ESA sites.	1. Small sample sizes. 2. Inequality in numbers of sites for ESA and non-ESA.	
87	Yes			
89				
55	Yes	1. Looks at variation in species richness between agreemen and non-agreement land on a large scale.	1. Species richness only indicator of botanical quality- could have used others. 2. No recording of in-field vegetation.	Yes