 **Question 17: How are agri-environment schemes represented in the CS2000 field survey sample? What evidence is there that agri-environment schemes have contributed to the changes in the Broad Habitats and landscape features recorded in CS2000?**

**DUE START DATE:**

- March 2002

**DUE FINISH DATE:**

- June 2002

**OVERALL PROGRESS**

- The work has been completed as far as possible given the limited provision of data sets by relevant government bodies.

**DEFINITIONS**

- Agri-environment schemes are schemes whereby farmers receive government support for enhancing/maintaining the farm environment for landscape, wildlife and historical interest. Details of particular schemes looked at are given below.
- Broad Habitats are the 21 habitat types as used in CS2000, of the 28 Broad Habitats listed in the UK Biodiversity Action Plan.

**POLICY CONTEXT STATEMENT**

- 1 *The following Policy Context Statement was drafted in May, and takes account of comments made by attendees at the May FOCUS workshop:*
- 2 Agri-environment schemes in the UK are government-funded schemes designed to maintain and enhance the landscape, wildlife and historical interest of areas of the countryside. The first of these schemes to be introduced was the Environmentally Sensitive Areas (ESA) Scheme, which was established in 1987 under the 1986 Agriculture act and originally designated 5 areas in England as ESA's (extending to 22 areas by 1993). Under this scheme farmers and landowners receive annual payments for entering into 10-year management agreements that require them to manage their land according to a set of management prescriptions. The Countryside Stewardship Scheme (CSS), which operates outside the ESA's, was open for applications in 1991 and is the governments main scheme for the wider countryside, under which farmers are paid grants to conserve landscapes and features. Each county has specific targets for landscape features that are important within their area.
- 3 Other schemes which have been introduced subsequently include the Organic Aid Scheme which ran from 1996-1999 when it was replaced by the Organic Farming Scheme (OFS), the Farm Woodland Premium Scheme (FWPS) which begun in 1992, the Habitat Scheme which

ran from 1994 until it was incorporated into Countryside Stewardship in 2000, the Moorland Scheme which began in 1995 and was later incorporated into Countryside Stewardship, the Nitrate Sensitive Areas Scheme which ran between 1996 and 1998 and the very small scale Countryside Access Scheme which ran between 1994 and 1997 before becoming part of Countryside Stewardship. Since the advent of the England Rural Development Plan (ERDP) in 2000, many previously existing schemes have been re-organised and new ones implemented, however, this question concerns only the schemes described above which were operating during the period 1990-1998.

- 4 Whilst the schemes described above operated in England, as a result of devolution, schemes operating in Wales and Scotland differed slightly. As well as the above, specific to Wales was Tir Cymen, which opened in Oct 1992 and closed to applications in April 1998 (Tir Gofal, its successor began in April 1999 and will ultimately incorporate many of its predecessors). In Scotland as well as the above the Countryside Premium Scheme ran during the period 1990-1998.
- 5 The agri-environment schemes are important to the UK government in terms of their contribution towards achieving the objectives of the ERDP and the UK Biodiversity Action Plan (HMSO 1994), which identifies agri-environment measures as one of the key instruments to be used to achieve its goals. For the ERDP, the EU requires information about the nature and extent of scheme uptake, as well as an evaluation of their impact. The evaluation will need to assess the outcomes of the programmes in relation to stated objectives and targets in the ERDP. Biodiversity goals are to be achieved through both the Environmentally Sensitive Areas Scheme (ESA's) and the Countryside Stewardship Scheme (CSS). The extent to which biodiversity has been maintained or enhanced by agri-environmental measures through the protection of species on farmland, the conservation of high nature-value habitats and the enhancement of environmental infrastructure will be considered at both national and regional levels.
- 6 In addition, a review of Agri-environment schemes is currently being carried out by DEFRA (Department for Environment, Food and Rural Affairs) as a result of concerns about the complexity of the current system. The results from this review will feed into the mid-term review for the ERDP with the main focus on the ESA's and CSS but the review will also consider the FWPS, OFS, and HFA. The scope of this review is broad, it will consider the performance of existing schemes (including methods for monitoring performance), scheme objectives, relationship to other schemes and policy instruments and the basis of payments and will provide a follow up to Hills Task Force & Policy Commission.
- 7 This question investigates the extent to which Countryside Survey data can be used to explore the impacts of agri-environment schemes on the wider countryside. The starting point is to examine the representation of agri-environment schemes in Countryside Survey samples. Countryside Survey data provides an ideal comparative dataset representing the 'wider picture' of the British countryside and providing a context with which to compare to land under agreement. The 1km survey squares were randomly chosen and detailed information for landscape features such as hedges, stonewalls, land-cover and the condition of vegetation collected. The same features and habitats are being monitored to assess the effectiveness of agri-environment schemes, and there is a desire to use the Countryside Survey data as reference data with which to compare the monitoring of agri-environment schemes. Although some monitoring of agri-environment schemes has attempted to compare agreement land with non-agreement land there are problems with this. For example, sampling strategies for the ESA monitoring schemes were set up before the land was entered into agreement and subsequently some of the land originally not in agreement came under agreement thereby rendering the comparison invalid. There may also be fundamental differences between agreement and non-agreement land relating to the farmer's choice to enter the scheme. The recent monitoring of the Countryside Stewardship scheme characterised the ecological quality of land within the scheme

by using the same methods as CS and comparing subsequent results in terms of Broad and Priority habitats (CEH 2001). If CS2000 data is to be used as a control data set, it is useful to know to what extent the agri-environment schemes are represented within the CS squares.

- 8 If CS data can provide valuable information on agri-environmental schemes both as a control data set and as a monitoring tool to assess the performance of land under agreement it will provide a valuable tool for policy makers.

### **Agri-environment schemes 1990-1998**

- 9 The England Rural Development Plan (EDRP) approved in October 2000 incorporates a range of agri-environment schemes, a number of which pre-date its introduction. Whilst this question concentrates on those schemes which were in place during the period 1990-1998, it is worth observing that the CS2000 database may provide ideal baseline data for land entering into agri-environment schemes which started up shortly after 1998 (e.g. Energy Crops Scheme, Hill Farm Allowance Scheme in England and the Rural Stewardship scheme in Scotland) as part of the EDRP. Table 17.1 shows which agri-environment schemes were in place during the period 1990-1998 and the availability (for our purposes) of spatial data for those schemes.
- 10 A number of the schemes listed above were on a small scale and included a relatively small area of land and are therefore not appropriate for inclusion in a study of this kind. Spatial data on all the above schemes were sought from The Department of the Environment Food and Rural Affairs (DEFRA), The Scottish Executive Environment and Rural Affairs Department (SEERAD) the Countryside Council for Wales (CCW) and the National Assembly for Wales.
- 11 The problem of access to appropriate data has had a significant impact on the progress made under this question. SEERAD were unable to provide any agri-environment scheme data due to resource constraints within the department. DEFRA provided access to data that included spatial data and vegetation data on the two largest schemes operating in England (ESA and CSS). Spatial data are not held for land in any of the other agri-environment schemes running during the period 1990-1998. In Wales, data on agri-environment schemes is held by both CCW (Countryside Council for Wales) and the National Assembly for Wales. CCW hold the data for the exclusively Welsh schemes Tir Gofal and Tir Cymen. Whilst Tir Gofal data was available, the scheme began after 1998 and is therefore not relevant to the period of time being looked at under this question. Data for the Tir Cymen scheme consisted of point data (with the exception of open access agreement maps) rather than spatial coverage data and was therefore not useful in the context of this question. Welsh ESA data was provided by the National Assembly for Wales, but has taken some time to acquire (only arriving in mid-September), thereby limiting the amount of analysis that has been done on it.

**Table 17.1 All agri-environment schemes in place 1990-1998 and availability of spatial data for this study.**

<b>Name of Scheme</b>	<b>Country of operation</b>	<b>Start date</b>	<b>End date</b>	<b>Availability of spatial data</b>
Countryside Stewardship Scheme	ENG & SCO	1991	Ongoing	ENG – ok SCO - None
Environmentally Sensitive Area Scheme	ENG, SCO & WAL	1986	Ongoing	ENG – ok (no dates) SCO – None WAL - ok
Organic Aid Scheme	ENG, SCO & WAL	1996	1999	ENG, SCO & WAL - None
Farm Woodland Premium Scheme	ENG, SCO & WAL	1992	Ongoing	ENG, SCO & WAL - None
Tir Cymen	WAL	1992	1998	WAL - None
Countryside Premium Scheme	SCO	1997	2000	SCO - None
Moorland Scheme	ENG, SCO & WAL	1995	Will be incorporated into stewardship 2003	ENG, SCO & WAL - None
Habitat Scheme	ENG	1994	Incorporated into stewardship 2000	ENG, SCO & WAL - None
Nitrate Sensitive Areas Scheme	ENG	1996	1998	ENG, SCO & WAL - None
Countryside Access Scheme	ENG	1994	Incorporated into stewardship 1997	ENG, SCO & WAL - None

## SCIENCE OUTPUTS

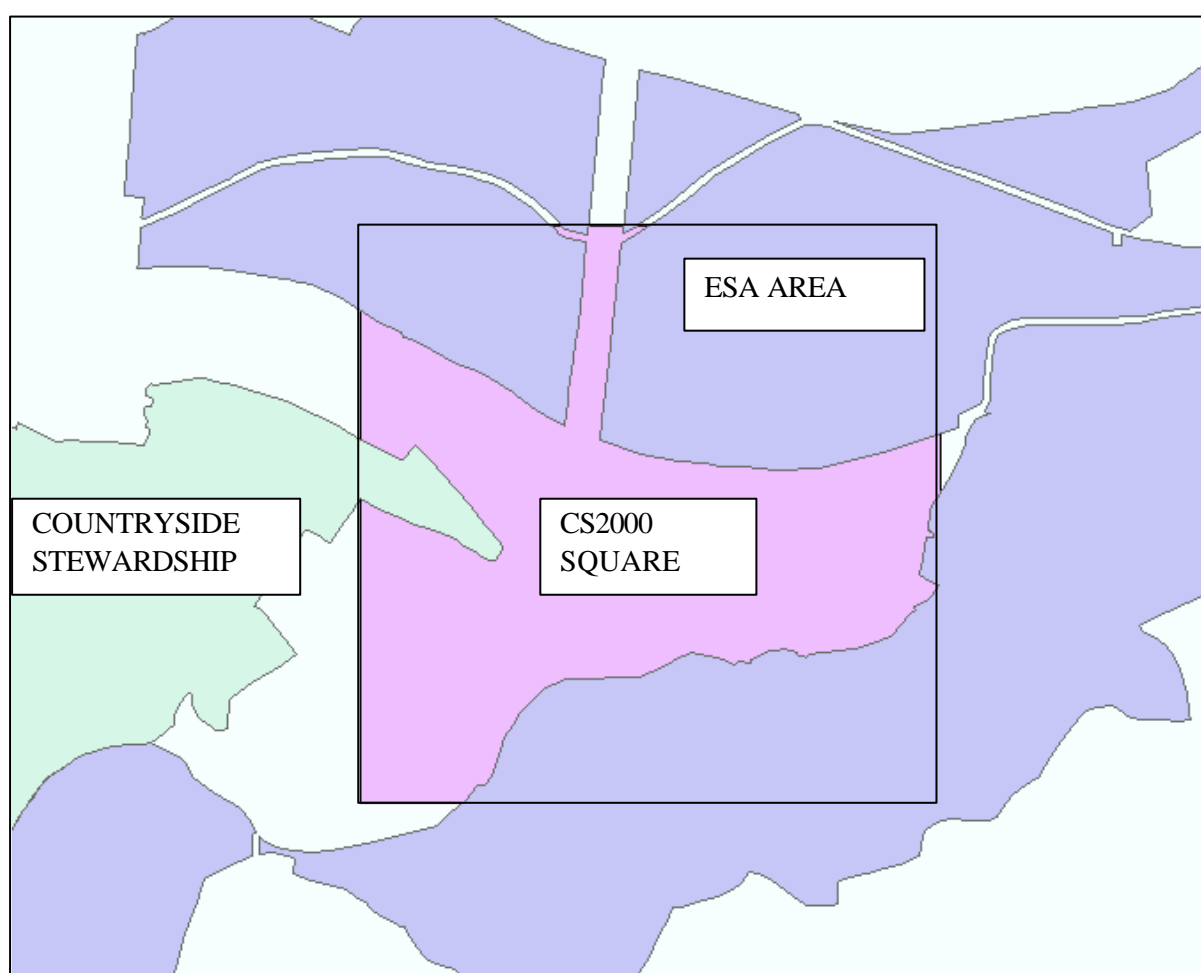
### Coverage of agri-environment schemes within the CS dataset

- 12 Whilst all the schemes listed in the table above were operating during the period 1990-1998, for a variety of reasons, it has not been possible to access spatial data for the majority of the schemes. However, many of the schemes were on a limited scale and therefore unlikely to be

represented within the Countryside Survey dataset. However, it has been possible to access the relevant spatial data for the most extensive of the agri-environmental schemes in England and Wales, i.e. CSS and ESA in England and ESA in Wales.

- 13 Once data was received from DEFRA and the Welsh Executive, the spatial coverage's of the schemes across England and Wales were overlaid on the spatial coverage of CS squares. Figure 17.1 gives an example of an overlay of spatial coverage's of ESA and CSS schemes onto a CS square. In the case presented and in 5 other squares, land included in both ESA and CSS fell within the 1km survey square). Once the two sets of spatial data were overlaid it was possible to calculate the area of land within each square, which was part of either an ESA or CSS scheme, and to look more closely at the data collected for Countryside Survey in that parcel of land.

**Figure 17.1. A CS2000 square showing land in both CSS and ESA.**



- 14 Table 17.2 shows; 1) the numbers of Countryside Survey squares in which there was/is land under agreement as part of an agri-environment scheme, 2) whether that was the case during the

1990 and 1998 surveys and 3) what proportion that represents of the total number of squares in Countryside Survey in each country concerned. The number of CS plots recorded within the land under agreement is also given where possible.

**Table 17.2 Coverage of CS squares by land in agri-environment schemes (CSS – Countryside Stewardship Scheme, ESA – Environmentally Sensitive Area scheme). The total number of squares surveyed in 1998 was 302 in England and 64 in Wales.**

	CSS	ESA - England	ESA -Wales
No of CS squares surveyed in 1998 with agreement land	92	41	12
No of CS squares surveyed in 1990 & 1998 with agreement land	79	34	7
No of CS squares surveyed in 1990 & 1998 with agreement land, where agreement was entered into during the period 1990-1998	47	No data Dates of scheme entry unavailable.	4
Proportion of CS squares in England or Wales with agreement land, where agreement was entered into during the period 1990-1998	15%	No data Dates of scheme entry unavailable.	6.25%
No of CS plots in 1998 squares with agreements entered into between 1990 & 1998	318	No data Dates of scheme entry unavailable.	May be done at a later date

- 15 For the Countryside Stewardship scheme, of the 47 squares with agreement land during the period 1990-1998 which were included in both CS1990 and CS2000, 38% of squares had less than 10% of land under agreement and 79% had less than 50% of land under agreement. The area of CSS agreement land (England) included in CS 1990 & 2000 was 153,600ha or approximately 5% of the CS sample.
- 16 Due to lack of information on dates of scheme entry, it is impossible to be precise about the amount of land under ESA agreement (in England) between the period of the last two Countryside Surveys, which was in CS squares, as the data probably includes land entered into agreement post 1998. However, the data provided indicates that the area of the squares surveyed for CS2000, which is under ESA agreement is around 34km<sup>2</sup> at the present time indicating that the figure for the period between the last two Countryside Surveys may be of a similar magnitude to that which was under CSS agreement, i.e. <10%.
- 17 Welsh ESA data does include dates of entry to the scheme and it is therefore possible to work out the amount of land under ESA agreement during the period 1990-1998, i.e. 2.8%. However, it should be made clear that of the 4 squares with land in agreement and in both surveys, 2 of them had land entered into agreement in late 1997, and without that land the figure would be only 0.5%.
- 18 The lack of significant quantities of data from CS on land in any one agri-environment scheme resulted in the suggestion that it may be advisable to aggregate data from all schemes for which we have appropriate data in order to carry out an analysis of the way in which the schemes impact on the landscape. However, the proportion of land in agri-environment schemes, which

is covered by the last two Countryside Surveys, for which we have spatial data and dates of scheme entry, is currently very small. The CSS and ESA schemes cover significant areas of GB, in 1998 the total area covered by both schemes in England was approximately 523,000ha. The percentage of the land under agreement in agri-environment schemes covered by the CS data is around 0.2% where CS represents a sample of approximately 0.2% of GB.

### **CS measures relevant to features targeted in agri-environment schemes.**

- 19 The agri-environment schemes, which were first implemented in the late 1980's, were a way of ensuring protection and enhancement of the GB landscape by rewarding farmers for beneficial environmental management practices. This question seeks to discover whether it is possible to measure the success of the agri-environment schemes using CS data. The results given above indicate that the area of land in agreement (for which we have data) covered by CS is currently relatively small and therefore to attempt to use that data to draw detailed conclusions about impacts of the schemes on certain aspects of the countryside would be unwise. However, it is possible to look in general at impacts on certain features and to explore possibilities given bigger and better datasets on the agri-environment schemes.
- 20 The schemes for which we have received data differ in terms of their localities, with English ESA schemes concentrated in 22 areas of particularly high landscape, wildlife or historic value covering some 10% of agricultural land, and Countryside Stewardship covering all areas outside of ESA's. Both schemes are entered into for a 10-year duration and aim to improve the natural beauty and diversity of the countryside. Unlike CSS, ESA schemes may be entered into at one or more tiers of entry with each tier requiring different agricultural practices to be followed. Although, we have access to some information on tier entry level for English and Welsh ESA's, sample sizes are too small at this stage to allow a closer look at differential impacts of tier management.
- 21 The kinds of landscape benefits which both the CSS and ESA schemes aim at, which may be picked up within the Countryside Survey dataset include; changes in hedges (both quantity and quality), changes in habitat quality (increased diversity) and changes in Broad Habitats (e.g. conversion of arable to grassland on land under agreement).

### **Are changes in specific features of agri-environment schemes detectable using CS data?**

#### **Hedges**

- 22 Data for the quantity of hedgerows in survey squares show that across the 10 squares (recorded in both 90 and 98) in which more than 50% of the land was under CSS at some time there was a loss of 1,006m of hedgerow and a gain of 768m. For those squares in which less than 50% of the land (18 of which with under 10%) was under CSS at some time there was a loss of 3,861m of hedgerow and a gain of 6,774m.
- 23 It is possible to test whether these results differ from those from a random set of squares, or to pursue a more lengthy option of looking at the actual parcels of land under agreement that fall within the CS squares. However, the dataset is clearly too limited at present to draw any definitive conclusions. High variability in the length of hedgerow in 1km squares dependent on their location and land use mean that there would need to be a substantial amount of data in order to establish a significant difference between land 'in ' and 'out' of agri-environment schemes.
- 24 Results for squares with land in ESA agreement show similar results with a much larger gain in hedgerows for squares with less than 50% land under stewardship, but as the data does not give dates for entry into the scheme, it is unclear as to whether land was even part of the ESA scheme at the time of either the 1990 or 1998 CS surveys. If data for both English ESA and



CSS are put together (ignoring the lack of date information for English ESA) there are still only 24 squares with more than 50% land in agreement and those agreements will include a whole range of management options including restoration of historical features, access, field boundary, hedge maintenance, low input land etc.

- 25 Undoubtedly, changes in lengths of hedgerows in all squares with land in an agri-environment scheme will be due both to a number of factors including the nature of the particular stewardship or ESA agreements, the year of entry to those agreements and, of course, any changes in the land in the square that was not under agreement. In order to pick up changes that are due to management under agri-environment schemes, it will require both an increase in the amount of land under agreement as well as access to detailed data on all national schemes.

### **Broad Habitats**

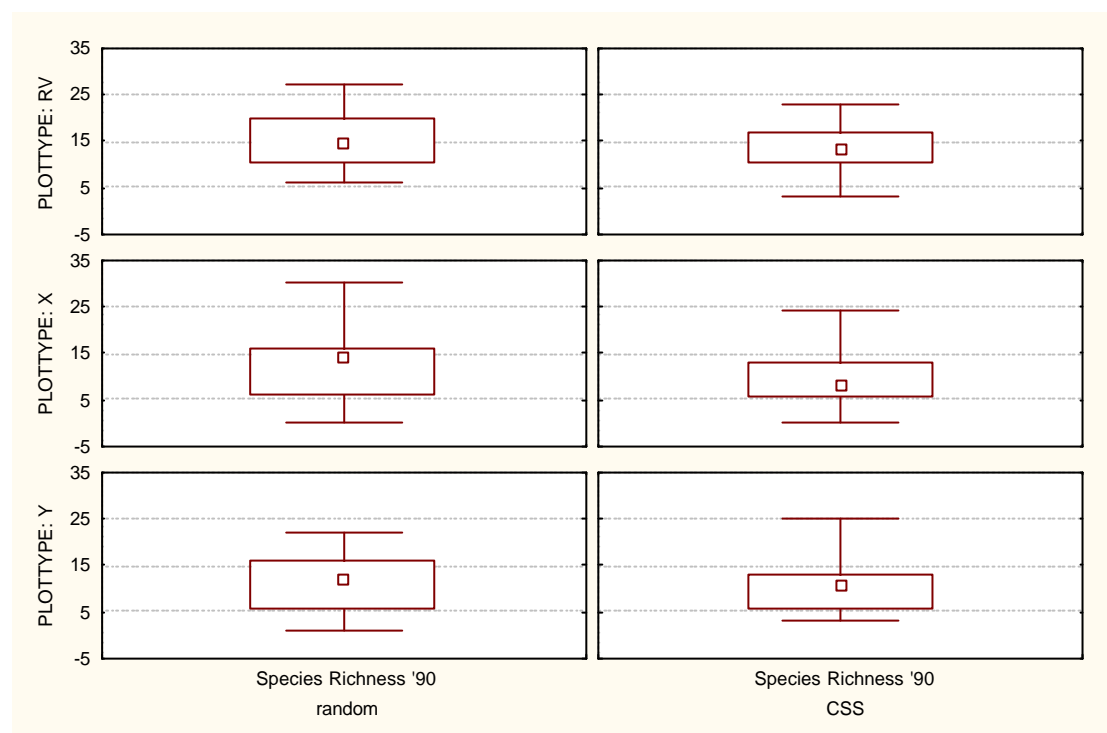
- 26 To investigate whether land in agri-environment schemes has altered in terms of Broad Habitat, changes in Broad Habitat within the land under CSS agreement was looked at. On average approximately 13% of the land in schemes for some of the period between 1990 and 1998 changed Broad Habitat between the two surveys. This compares with a figure of around 14.2% change between Broad Habitats across England as a whole, indicating that using the data we have, it appears that land within agri-environment schemes is no more likely to change Broad Habitat than land outside of schemes. It is possible to go further and look in detail at what the changes in Broad Habitats are within scheme land, in order to discover whether those changes can be seen as improvements. However, given the limited quantity and quality of data available at present it would be impossible to detect any significant changes or even reliable trends.

### **Vegetation quality/ plant diversity**

- 27 Using the Countryside Stewardship data it is possible to look at the vegetation within plots that have been part of the stewardship scheme and compare the vegetation of those plots with the vegetation of random plots of the same type to identify whether any changes have occurred as a result of being part of the stewardship scheme. In order to do this, vegetation condition data from plots surveyed in both 1990 and 1998, which were in Countryside Stewardship for at least 2 of the years between 1990 and 1998, were compared to random plot data.
- 28 Comparisons were carried out using data from Main (X), Targeted (Y) and Roadside verge plots (RV), with the total number of plots within stewardship land used being 88. Analysis of Variance (ANOVA) was carried out to investigate the effect of being part of CSS on condition measures across all three plot types. Initial comparisons between data from random plots and from CSS land (prior to its inclusion in the scheme) were carried out by looking at differences in condition measures in 1990 for random plots versus those located on land that later went into the CSS. These results showed that species richness was significantly lower in the land that was later to become part of the Countryside Stewardship scheme, than in the random plots ( $F_{1, 174} = 4.16$ ,  $p < 0.05$ ). Figure 17.2 shows box plots of the species richness scores for random plots, and plots, which were later part of the CSS scheme, for each of the three, plot types (X, Y and RV). The C-radius (which is in effect a measure of the proportion of competitive species in the plot) was higher in the scheme plots than in random plots ( $F_{1, 168} = 9.41$ ,  $p < 0.01$ ). Associated with that, the S radius (which is a measure of the numbers of species in plots which are tolerant to environmental stress) was higher in random plots than in scheme plots ( $F_{1, 168} = 9.72$ ,  $p < 0.01$ ). These findings point towards a higher nutrient status in the land that was later entered into the scheme and indeed the N score (nitrogen) was marginally significantly higher in scheme plots than in random plots ( $F_{1, 174} = 6.44$ ,  $p < 0.05$ ) in 1990.



**Figure 17.2** Box plots (including 75% of species in boxes, 25% outside, and median) showing species richness in 1990 for main (X), targeted (Y) and roadside verge (RV) plots, in random plots and plots later included in Countryside Stewardship.



- 29 Comparisons of the same set of random plot data with plot data from land that had been part of CSS for a minimum of 2 years, showed that in 1998 there was no significant difference in species richness, indicating that the numbers of species increased in the scheme plots (from significantly lower to no significant difference). Significant differences between random and scheme plots in C and S radii remained, with more competitive species in the scheme plots in 1998 as in 1990 and more stress tolerators in the random plots.
- 30 These results could be taken to indicate that the Countryside Stewardship Scheme is raising plant diversity on agricultural land, but the plot types cover a wide range of Broad Habitats within agricultural land and they are not sufficient in number to allow an analysis by Broad Habitat. Species richness is significantly affected by both plot type and Broad Habitat, indicating the importance of looking at differences by both Broad Habitat and plot type as well as just 'part of a scheme' or 'not part of a scheme'. The length of time which land has been part of a scheme is also likely to have a large impact on vegetation condition measures and it may take some time for beneficial effects of schemes to show through in surveys like Countryside Survey. For example, it may take more than 5 years for land to show any benefits of being part of an agri-environment scheme and of the 88 plots used in the above analysis only 34 were in CSS for more than 5 years.

### Review of comparisons, use of LCM.

- 31 It was felt that the CSS Overview Report (Carey *et al.* 2000) had made adequate comparison between land in CSS and land in the wider countryside. The aims of this study differ from the kind of comparisons made by CEH (2001). This study seeks to discover the effects of inclusion in CSS on the landscape by looking at data from both CS90 and CS2000 whereas that of Carey *et al.* (2000) sought to identify how land within the CSS scheme differed from the wider

countryside at a specific point in time. The importance of entry date information is therefore more pertinent in this study and affects what can be done effectively.

- 32 The same problem occurs with the use of the Land Cover Map in making broad scale comparisons. It is possible, although a large task, to look at land in and out of schemes using the Land Cover Map (LCM) 2000 to make broad scale comparisons at a single point in time. It is not possible to look at changing aspects of land under agri-environmental schemes using LCM because of the incompatibility of LCM 1990 and LCM 2000. However, given the data that we have received on agri-environment schemes which either does not include date of scheme entry, or includes large numbers of parcels with entry dates in the late 1990's, it is not clear how effective such a comparison would be if it was possible.

### **Limitations of the study.**

- 33 At present, the amount of overlap between CS data and data on agri-environment schemes is too limited to show how much of an impact those schemes are having on the broader landscape of GB. Undoubtedly, with increases in both the take up of the schemes and in the comparability and availability of data from the various government bodies running the schemes, it should be possible to get a much clearer picture of scheme impacts. The data collected for CS2000 has the potential to provide excellent baseline data for assessment of changes in landscape features as a result of many of the new schemes being introduced under the EDRP. However, whilst CS2000 covers a representative 0.2% of GB, the 0.2% of agri-environment scheme land that it covers is not part of a stratified random sample and does not therefore represent all scheme options across all landscape types. This is a problem as it means that in order to attain reasonable sample sizes for analysis taking into account the impacts of other factors on the measures made within Countryside surveys, there will need to be a considerable increase in the amount of land under agri-environment schemes within the CS sample.

### **SUMMARY STATEMENT**

- 34 In order to be able to use the CS database as a means of investigating changes in the wider countryside in relation to agri-environment schemes, there needs to be a substantial increase in the area of land in agreement (from 1998 figures) in combination with considerable improvement in compatible databases from the bodies administering the schemes as well as easy access to that data.

### **FURTHER WORK**

- 35 Many of the plot types used in CS already sample important features that form part of the agri-environment schemes. Recommendations provided to DEFRA, as part of a contract to review botanical monitoring of agri-environment schemes and recommend future strategies (Critchely *et al.* 2002), include the use of a standard 1m<sup>2</sup> quadrat. This would be used for both the monitoring of all agri-environment schemes and for use within the CS nested main plot (which has previously included a minimum plot size of 2m<sup>2</sup>) and would help to provide directly comparable datasets.
- 36 Future Countryside Surveys with their random stratified sampling technique are likely to cover a statistically valid sample of farms with land in agreement under Countryside Stewardship (given a substantial increase in agreements on the figures for pre 1998). However, the 22 ESA's are by their nature highly localised and therefore unlikely to be sampled effectively by the CS strategy. In order to use CS to provide information about change in the ESA areas it would be necessary to increase the numbers of sample squares in those areas (and those additional squares would then not form part of the dataset used to look at changes in GB as a whole).

- 37 In mid-November the government announced four pilot areas for a new 'broad and shallow' entry-level agri-environment scheme. The scheme aims at including 50% of farmers nationally when the scheme begins in 2005 and it is hoped that it will deliver dramatic improvements to the environment. If the next Countryside Survey takes place around the time of the schemes implementation it will provide excellent baseline data for an assessment of whether the scheme delivers its aims. If 50% coverage nationally is achieved, the problem encountered in this study of low plot numbers for land in schemes, will disappear.

## REFERENCE

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