Question 14 What were the characteristics and locations of the new ponds recorded in 1998? How do the 1996 figures on pond numbers and condition relate to changes in 1998?

Rick Stuart, John Watkins & Helen Anderson

Due start date:

- October 2002

Due finish date:

- February 2003

Overall progress

DEFINITIONS

- 'Pond – defined as a body of standing water 0.25 ha to 2 ha in area, which usually holds water for at least four months of the year.
- 'Lowland' – Is defined in CS as Environmental Zones 1, 2 and 4 and excludes garden and farmyard ponds.
- For the Lowland Pond Survey1996, 'Lowland Britain' was defined as the area of the ITE 'pastural' or westerly lowlands and 'arable' or easterly lowlands, landscape types. This area covered about 64% of the land in Great Britain. In order for datasets to be comparable between 1990-1996-1998 estimates on numbers of ponds are generated and reported using the same statistical techniques and reporting framework as the LPS1996.

POLICY CONTEXT STATEMENT

1 Ponds are an important landscape element as recognised by their inclusion in the S5 *Quality of Life Counts* indicator. Though there are no specific targets for ponds with the UK BAP they can play an important role in biodiversity as '*ponds collectively support at least two-thirds of Britain's freshwater plants and animal species*' as stated in the indicator description. Protection, restoration and creation of ponds is specifically encouraged to under the *Countryside Stewardship Scheme*.

2 As part of the CS2000 programme, a detailed analysis of changes in number of all standing water bodies surveyed between 1990 and 1998 was carried out[1]. These analyses indicated that an overall increase in numbers was concentrated on water bodies of less than 20 x 20 m in area in the westerly lowlands of England and Wales. Changes in these small water bodies or ponds were reported as an update to the Quality of Life Counts indicators[2]. These results showed that the losses of lowland ponds that occurred in the 1980s had been reversed by the late 1990s. Specific analysis of changes in lowland ponds used a definition of ponds introduced in 1996 , which included seasonal ponds. This definition was used in the Lowland Pond Survey in 1996[3], which

used a restricted sub-sample of 150 of the 1 km x 1 km CS2000 sample squares. The direct comparison of these squares for 1990, 1996 and 1998 showed a net increase of 6% for this period with a losses occurring between 1990 and 1996 being reversed by increases between 1996 and 1998.

3 Further analysis is required to elucidate type and location on new ponds and whether the gain in ponds masks a net change in the ecological character of ponds. This should inform questions of whether creation new ponds can compensate for earlier losses in ponds and clarify the use of the Quality of Life Counts indicators.

Background:

4 At the time of the Countryside Survey 1990 ponds were not defined and were mapped only where standing open water occurred. Countryside Survey 1990 methods excluded from survey features within woodland, recreational areas or within curtilage. This means that ponds in woodland, farmyards, gardens or golf courses were not mapped. In the uplands areas of numerous adjacent pools were often mapped as one large area of 'scattered pools'

5 The definition of a pond was tightened by the time of the LPS96 and importantly, included seasonally dry ponds , those '…which usually holds water for at least four months of the year'. The survey methods for the LPS96 differed from the Countryside Survey methods in that surveyors were asked to survey within woodland and recreational land.

6 The LPS96 definition of ponds was used during the Countryside Survey 2000. For the sample squares included in the LPS96 survey, surveyors were given the LPS96 information and asked to survey for ponds within woodland and recreational areas.

<u>Analysis of pond figures during CS2000 Module 1.</u>

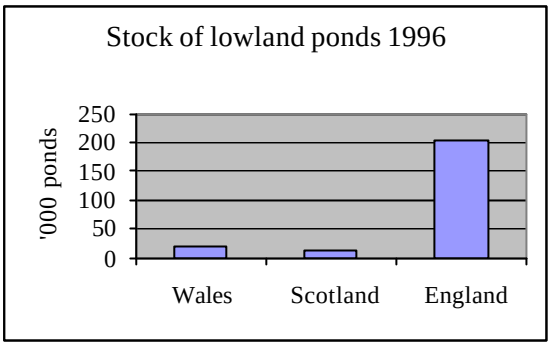
7 A database had been completed from all records of lowland ponds for any year from surveys in 1984, 1990, 1993, 1996 or 1998.

8 All records were reviewed for changes in the light of the 1996 definition of 'seasonally dry' ponds in 1996. Field assessment maps and data sheets were reviewed where a new pond (including 'seasonally dry') was recorded in 1996. If 1990 records showed a 'lost' pond due to it being recorded as 'dried-up' these were reinstated as present in 1990.

9 The analysis of pond figures for 1990 – 1998 took the 1996 dataset into account. As the new definition and methods applied in both 1996 and 1998 the 1990-1998 dataset was not directly comparable. Losses and gains were analysed separately for the two periods 1990-96 and 1996-98 to produce 1990 to 1998 net change. These figures were used for the Quality of Life Counts indicators.

10 CS2000 estimate that there were 227,000 lowland ponds in Great Britain in 1996 mostly located in England as shown in Fig 14.1 below.

Figure 14.1 Stock of lowland ponds in Great Britain in 1996, by country.



11 A summary of the differences in survey methods and the resultant estimated numbers of lowland ponds is shown in Table 14.1 below.

Table 14.1 Differences in survey methods and the resultant estimated numbers of lowland ponds between 1990 and 1996 and 1998.

Year	*Survey includes 'seasonally dry'*	*Survey includes woodland*	*Survey includes recreational*	*comment*
1990	n	n	n	
1996	y	y	y	Increase from LPS figures due to 1 sqr having 12 new ponds that were missed in 1996.
1998	y	y	y	
1990-96 loss	n	n	n	LPS figures show –2k, now +2k due to 1 sqr having 12 new ponds found in '98 that were missed in '96. All losses looked at to see if real.
gain	n	n	n	Looked at all gains to check if real
Net change	n	n	n	
1996-98 loss	y	y	y	
gain	y	y	y	
Net change	y	y	y	

Effects of rainfall.

12 The rainfall leading up to and during the survey is likely to have an effect on numbers of ponds. However no figures on rainfall are presented in this report as they are open to misinterpretation and are likely to be masking very complex processes.

13 Water levels of ponds are likely to be affected by many processes operating at the catchment level including rate of surface run-off and sub-surface infiltration. Therefore in interpreting rainfall figures these processes would need to be take into account.

Additionally there are geo-referencing and temporal difficulties in interpreting rainfall data. Although each square is consistently mapped in the same week as the previous survey interpretation of rainfall data is further complicated in that different sample squares were surveyed between May and September. Rainfall figures would have to be analysed for a period leading upto but not beyond the week each sample square was surveyed for each square separately. More general figures covering for example, Sept(year1) to Sept(year2) applied to all squares could be misleading.

Approach:

14 The CS2000 data for changes in ponds were further analysed to allocate the type of new pond occurring in survey squares to particular categories. These analyses incorporated the 1996 Lowland Ponds Survey data.

15 Four size categories were produced and 3 change categories.

16 Landscape context was analysed by identifying the Broad Habitat of the land surrounding new ponds, both contemporary and historic. The Broad Habitat of the land replaced by new ponds was also identified and reported in the same way.

17 Location of gained and lost ponds was reported at the national scale level in terms of ITE land class amalgamated groups of pastural or arable landscape types equating to 'westerly' or 'easterly' lowlands of Great Britain respectively.

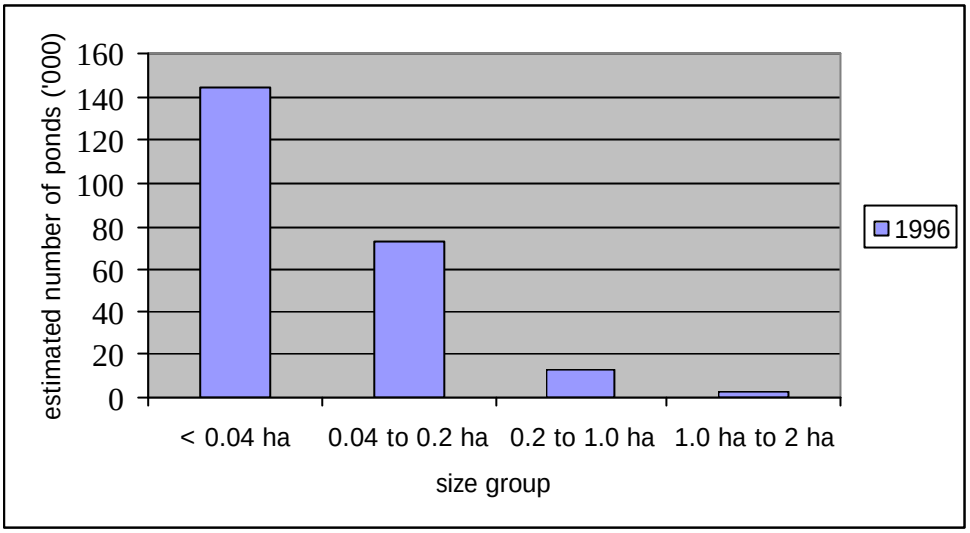
18 National estimates based on the sample were produced following the LPS96 analysis methods[3].

19 A dataset of biological and physiological condition data collected for all lowland ponds in 1996 were analysed to asses changes in conditions of ponds. There were 269 extant ponds in 1998 where data was available whose condition in 1996 was compared to those of 9 ponds lost between 1996-1998. Although the sample size for lost ponds is small the 9 ponds represent 60% of the total lost between 1996 and 1998. Analysis of differences in the means of the two datasets of pond conditions were carried out.

Size categories:

20 The stock of lowland ponds in 1996 in Great Britain show that nearly two thirds of ponds are small, having an area of less than 0.04ha. Almost another third are of the next smallest size group 0.04 to 0.02ha.

Figure 14.2 Stock of lowland ponds in Great Britain in 1996, by size group.



21 Ponds that were gained and lost between 1990 and 1998 were mostly small in size (<0.04ha) as shown separately for the periods 1990-96 and 1996-98 in Figures 14.3 and 14.4. This no doubt reflects that small size ponds are the most abundant size pond in the landscape as shown above. It would appear that small size ponds are more sensitive to changing water levels.

22 Gains and losses in the smallest size group show little net change between 1990 and 1996 but a large increase in 1996-1998. This may have been due to 1998 being a wetter summer than 1996.

Figure 14.3 Gains and losses of lowland ponds in GB between 1990-199**6**

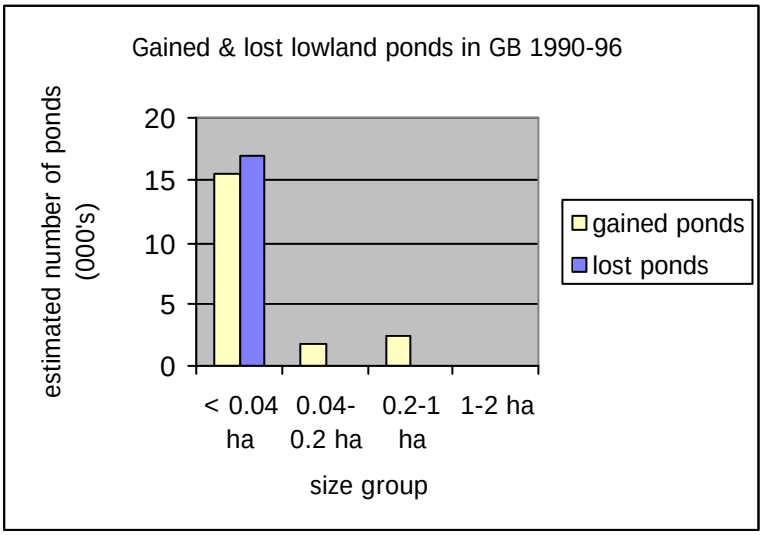
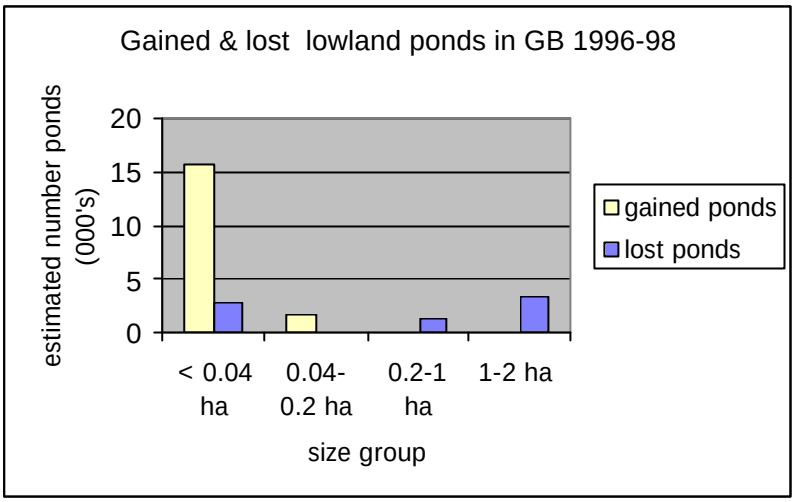


Figure 14.4 Gains and losses of lowland ponds in GB between 1996 - 1998



Categories of change

23 Examination of GIS datasets and field-assessment booklets for gained ponds revealed information that would enable ponds to be categorised by type of change. Again this was done separately for the periods 1990-1996 and 1996-1998 as the survey methods were different.

24 The previous recorded features were looked at and ponds were allocated to one of three categories of change. These are shown in Tables 14.2 a and b

Table 14.2a Allocation to categories of change types and number of ponds in each category for gained ponds 1990-1996.

1990-1996	***Category and frequency of ponds***		
Previous recorded feature	*Previous other dry feature*	*Previous other wet feature*	*Newly created pond*
none			14
Slurry pit		1	
Ditches that were dammed to form ponds		12	
Stream		1	

Table 14.2 b Allocation to categories of change types and number of ponds in each category for gained ponds 1996-1998.

1996-1998	*Category and frequency of ponds*		
Previous recorded feature	*Previous other dry feature*	*Previous other wet feature*	*Newly created pond*
none			19
Dry hollow/pond	8		
Slurry pit		1	
Concrete water storage tank		1	
Lake		3	
Wide levee		1	
Ditch	1		
Fen at stream bend		1	

25 A large proportion (43%) of all gains in 1990-1996 shown in Table 14.2a were from one survey square where ditches had been dammed to raise water levels, forming pools. The ponds previously recorded as 'Lake' in Table 14.2b were found to be where a large lake had fragmented into smaller areas.

26 Totals of new ponds allocated to the three categories between 1990-1996 and 1996-1998 and then combined for 1990-1998 are shown in Figures 14.5 a, b and c respectively. Just over half of the ponds gained in any time period were from features that had not been previously described as a dried-out pond or other wet feature. Conversely, nearly half of the new ponds in any period were from features that may have been either dry depressions or wet features that may have increased in water volume. As no pond was treated as 'new' if the gain was from a feature previously described (or retrospectively treated) as a 'seasonally-dry pond' these gains suggest that ponds are highly dynamic features and highlights that ponds are difficult landscape features to define and record over time.

Figure 14.5a Change categories of new ponds between 1990-1996

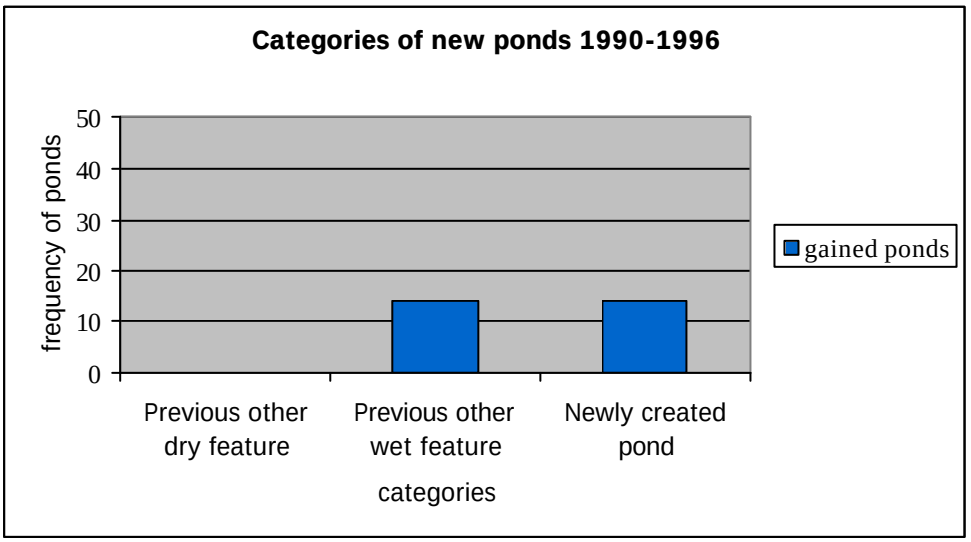


Figure 14.5b Change categories of new ponds between 1996-1998

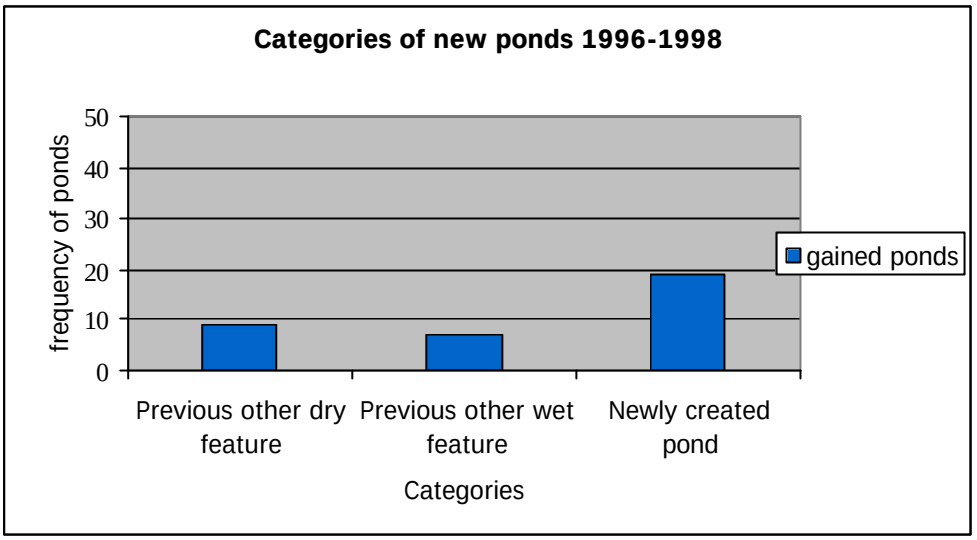
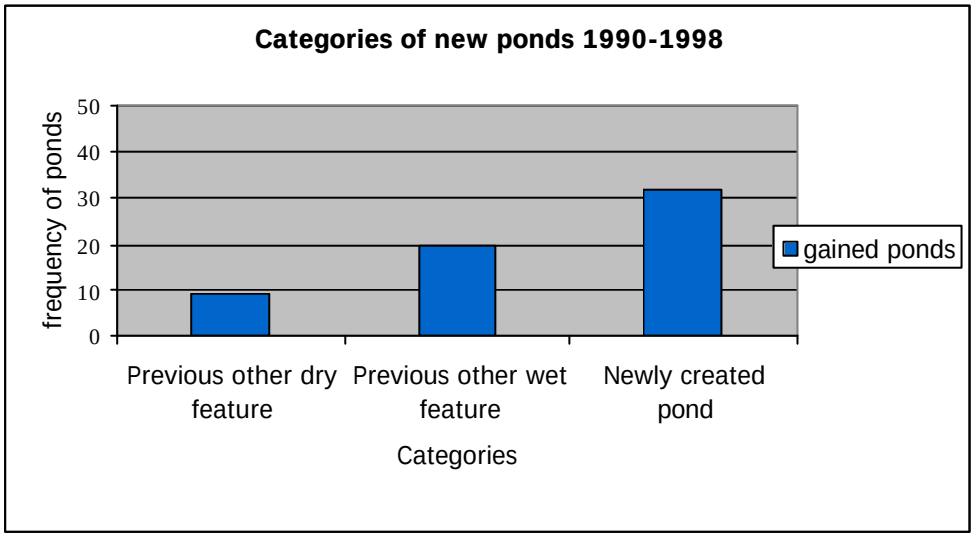


Figure 14.5c Change categories of new ponds between 1990-1998



27 Similarly Tables 14.3 a, b and c shown below, describe the reasons for loss of ponds and numbers of ponds allocated to three corresponding categories to ponds gained shown in Figures 14.5 a,b and c above.

Table 14.3a Allocation to categories of change types and number of ponds in each category for lost ponds 1990-1996.

1990-1996	*Category and frequency of ponds*			
Lost Reason	*now other dry feature*	*now other wet feature*	*Filled in*	*unknown*
Infilll			17	
Dry pit	1			
enlarged to lake		4		
meander on widened ditch/stream		1		
Reservoir		1		
Dried out pond	4			
Shallow depression	2			
Unknown				3

Table 14.3 b Allocation to categories of change types and number of ponds in each category for lost ponds 1996-1998.

1996-1998	*Category and frequency of ponds*			
Lost Reason	*now other dry feature*	*now other wet feature*	*Filled in*	*unknown*
Infill			11	
Dry Pit	1			
enlarged to lake		1		
Dry ditch	1			
Shallow depression	1			

Table 14.3c Allocation to categories of change types and number of ponds in each category for lost ponds 1990-1998.

1990-1998	*Category and frequency of ponds*			
Lost Reason	*now other dry feature*	*now other wet feature*	*infilled*	*unknown*
Infill			28	
Dry Pit	2			
enlarged to lake		4		
meander on widened ditch/stream		1		
Reservoir		1		
Dried out pond	5			
Shallow depression	3			
Dry ditch	1			
Unknown				3

28 A similar trend to gained ponds is seen in Figure 14.6 a, b and c with ponds that have been lost. Although the majority are lost as a result of infill, for the combined totals for the period 1990-1998 one third are lost to features that, although do not hold water for more than 4 months of the year (and therefore are not recorded as seasonal ponds) nevertheless may at some point return to a pond. A lesser number (18%) have become other wet features. The 'infilled' category shows that there are still a large number of ponds being lost possibly by deliberate management.

Figure 14.6a Change categories of lost ponds between 1990-1996

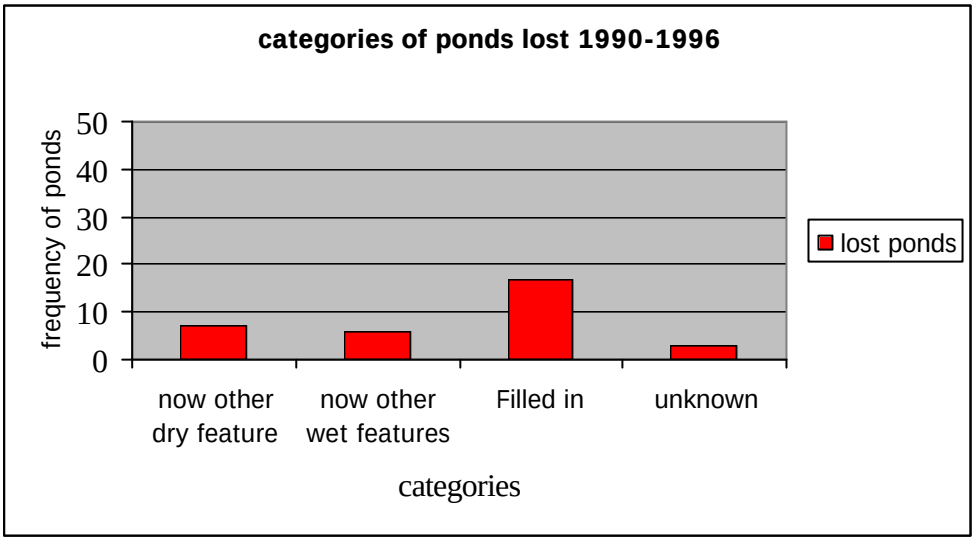


Figure 14.6 b Change categories of lost ponds between 1996-1998

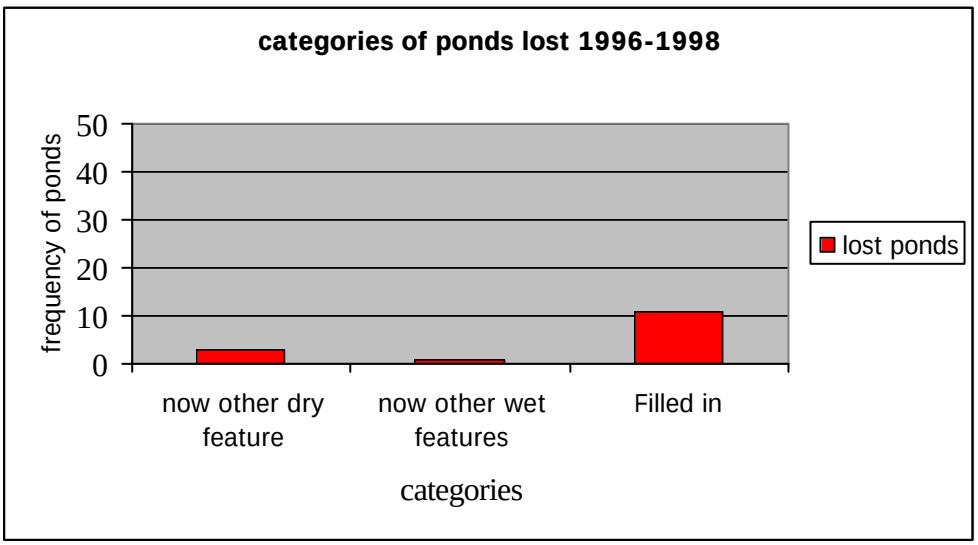
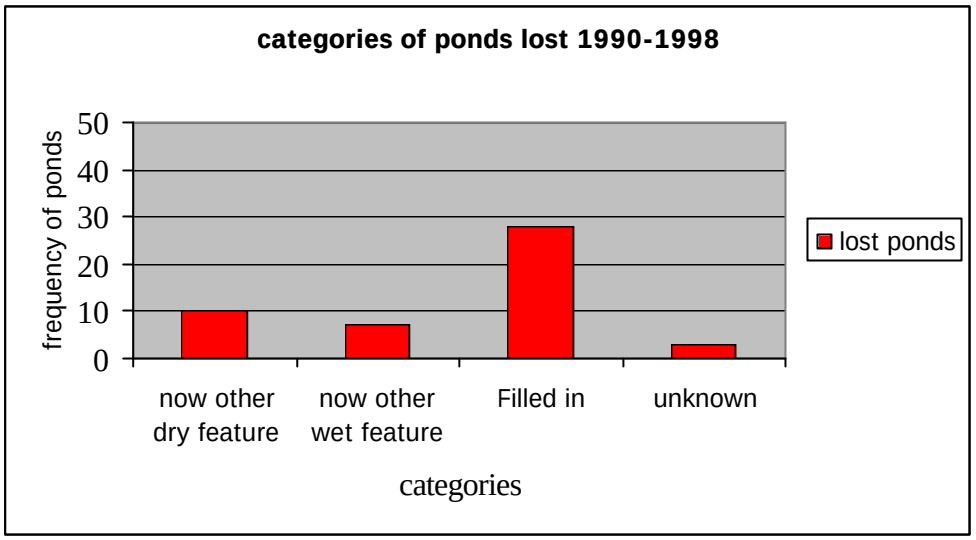


Figure 14.6c Change categories of lost ponds between 1990-1998



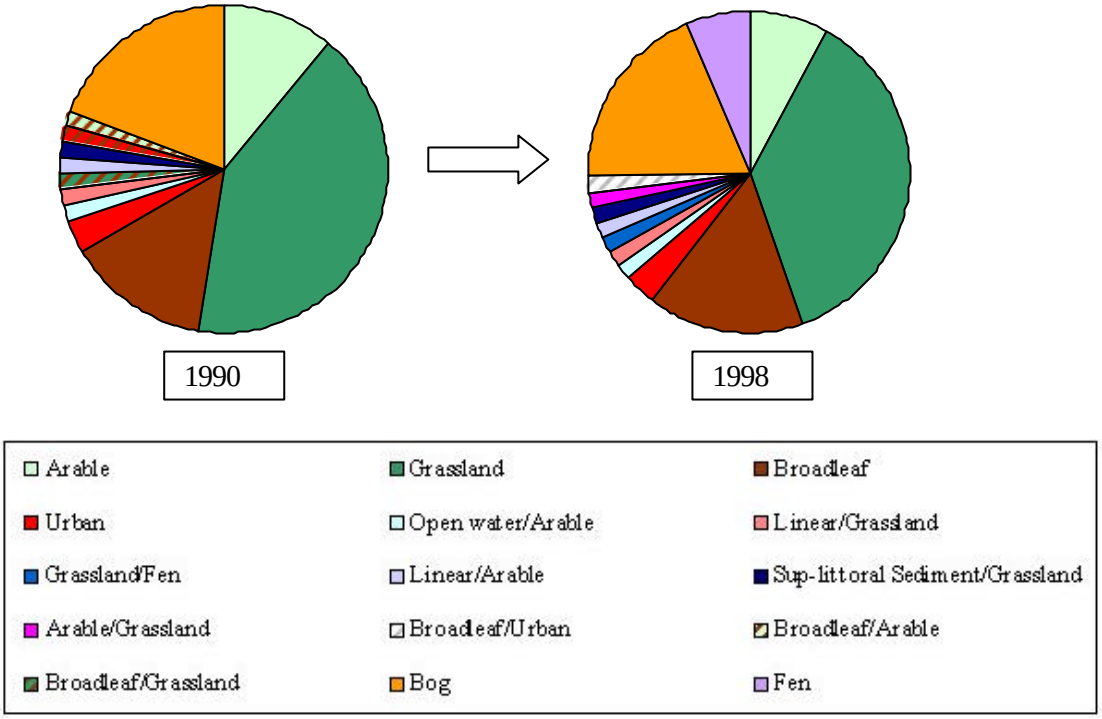
Landscape context of new ponds.

29 GIS analysis was carried out to identify the Broad Habitat of the land immediately surrounding the new ponds and of the area the new ponds had replaced. These are shown separately. Grassland Broad Habitats have been grouped and include Improved, Neutral, Acid and Calcareous Grassland.

30 Ponds that were gained and lost between 1990 and 1998 were adjacent to a variety of Broad Habitats. Figure 14.7 shows the surrounding landscape context of ponds that were gained between 1990 - 1996 - 1998 by frequency of pond. The context of which landscapes ponds were gained from is shown by the Broad Habitat surrounding the location in 1990 and 1998. Landscape context is not available for 1996.

31 It can be seen in Figure 14.6 that the landscapes surrounding the gained ponds have not changed dramatically where ponds have been gained with most ponds being surrounded entirely by one of 4 Broad Habitats or Broad Habitat groups: grasslands, Broadleaf, Bog, Arable. Most new ponds are gained from grassland landscapes. It would appear at first that the ponds surrounded by Broadleaf in 1998 ought to be excluded as the 1990 methodology did not record features within woodland. However, the Broadleaf Broad Habitat covers a wide range of habitats including scrub. One pond was gained from an Urban area and as such ought not have been included as a gained pond as surveyors were not supposed to map within areas of curtilage.

Figure 14.7 Surrounding landscape context of location of new ponds gained 1990-1996-1998 by frequency of pond.



Broad Habitat replaced or gained

32 Ponds that were gained and lost between 1990 and 1998 replaced or were replaced by a variety of land-cover reported here by Broad Habitat.

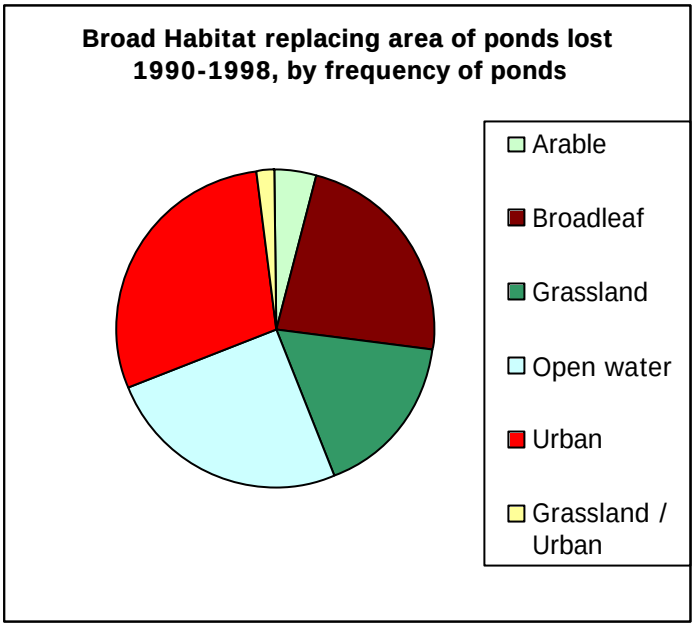
33 Ponds lost between 1990 and 1998 shown in Figure 14.8 were replaced by 4 main Broad Habitats:

- Broadleaf Woodland suggesting succession from overgrown vegetation
- grasslands (including Improved, Neutral, Calcareous and Acid)
- Urban included examples of ponds filled-in with concrete
- Open water Broad Habitat including areas recorded as 'dried-up' ponds.

34 The figures for the period 1990-1998 are calculated from gains and losses for the period 1990-96 and for 1996-98 separately. This meant that gains from 1996-98 would often be as a result of ponds lost in 1996 being recovered. For ponds lost, analysis of Broad Habitat in many cases showed that the land-cover was a dried-up feature which would be allocated to the 'Open water' Broad Habitat.

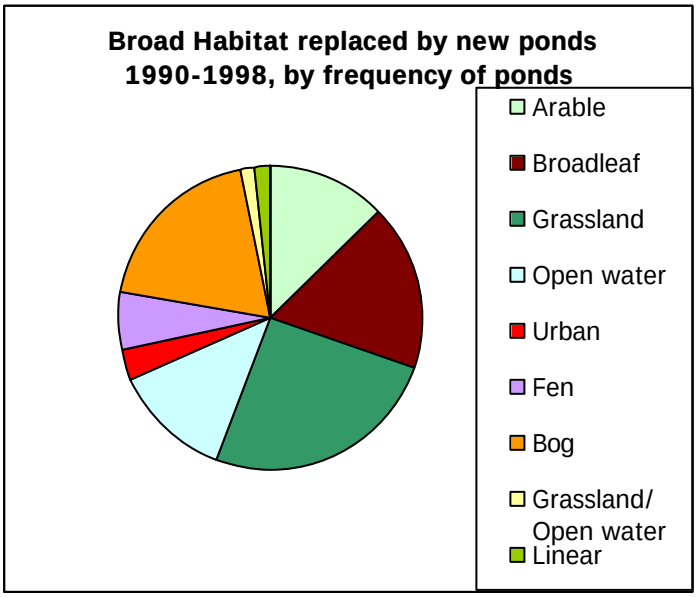
35 The type of land replacing lost ponds are shown in Figure 14.8. 'Open water' appears as this is the Broad Habitat that 'dried-up' ponds would be allocated to. Broadleaf gains may be as a result of successional habitats drying the ponds out.

Figure 14.8 Lost ponds 1990-1998, Broad Habitat gained, by frequency of ponds.



36 The type of land actually displaced by new ponds are shown below in Figure 14.9. There were large gains of ponds from grassland. The large number of new ponds replacing 'Bog' habitat was as a result of one survey square having 12 new ponds where ditches had been dammed to restore water-levels to an area of drained lowland-mire. Gains of ponds previously allocated to Broadleaf Woodland may be as a result of clearance of successional vegetation. Ponds gained from previously dried-up features or other wet features would be included in the 'Open water' Broad Habitat.

Figure 14.9 Gained ponds 1990-1998, Broad Habitat replaced, by frequency of ponds.



37 The dataset does not enable more detailed analysis of location of ponds other than at the regional level. Ponds gained between 1990 and 1996 are shown to be mostly in the westerly lowlands as seen in Figures 14.10. This contrast markedly with the period 1996-1998 shown in Figure 14.11 where ponds were gained in the easterly lowlands.

Figure 14.10 Estimates of lowland ponds gained between 1990 and 1996 by size group and by region

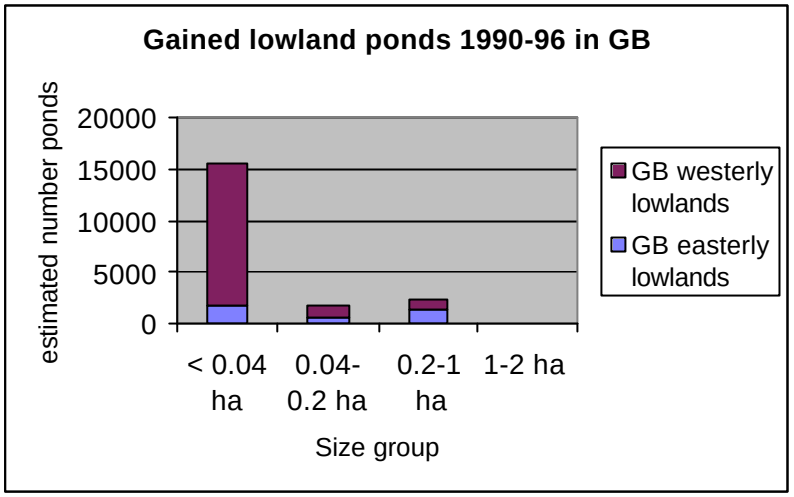
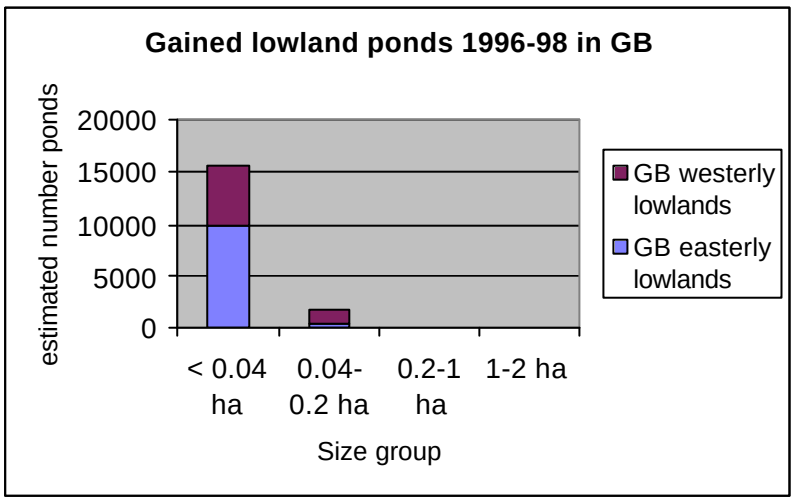


Figure 14.11 Estimates of lowland ponds gained between 1996 and 1998 by size group and by region



38 The changes in ponds observed within the dataset and the categories of ponds describing them generally reflect the national view of the Ponds Conservation Trust: Policy & Research. Small ponds are very changeable especially over long periods of time and are difficult to define even with the definitions we have. The change categories again reflect the dynamic nature of ponds.

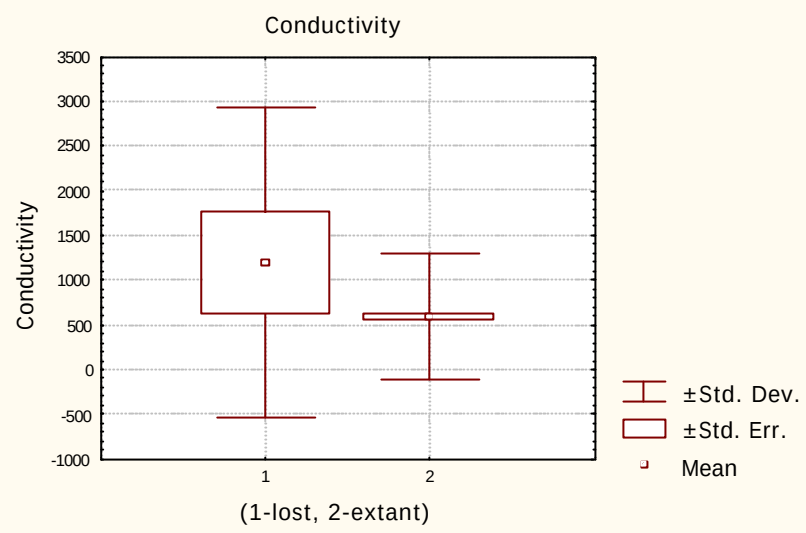
Condition of ponds lost from 1996-1998

39 Data was obtained on detailed pond condition from the LPS96. However, statistical testing of pond condition data was invalid due to the small sample size of lost ponds from 1996 to 1998 where pond condition data was available (n=9).

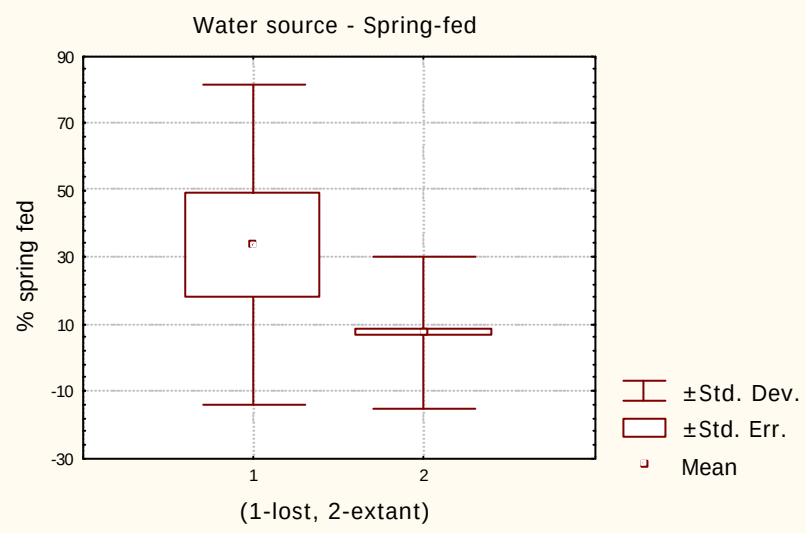
40 However, an examination of descriptive statistics of the two datasets of pond conditions suggested that there were some differences in both the biological and physiological condition of ponds that were lost. Figures 14.12a,b,c,&d suggest that ponds lost

between 1996 and 1998 tended to be fed by spring or direct precipitation and not by run-off. Lost ponds also tended to have higher conductivity.

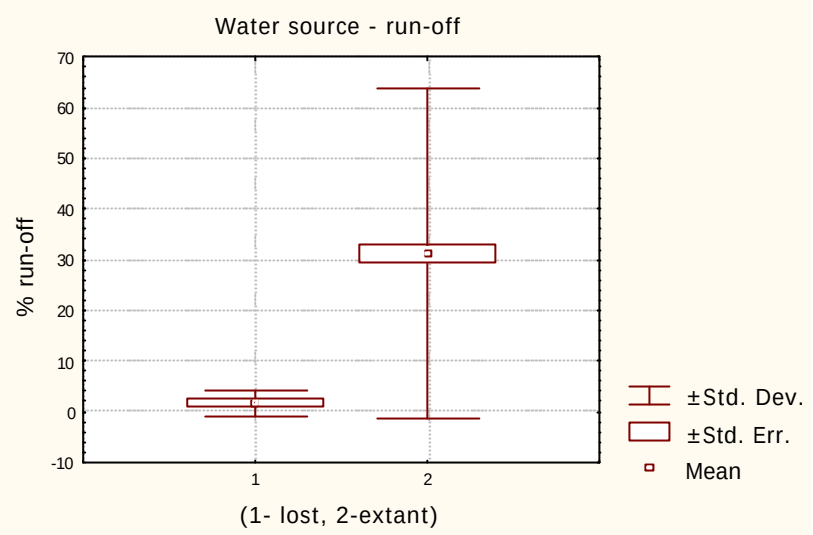
Figures 14.12a



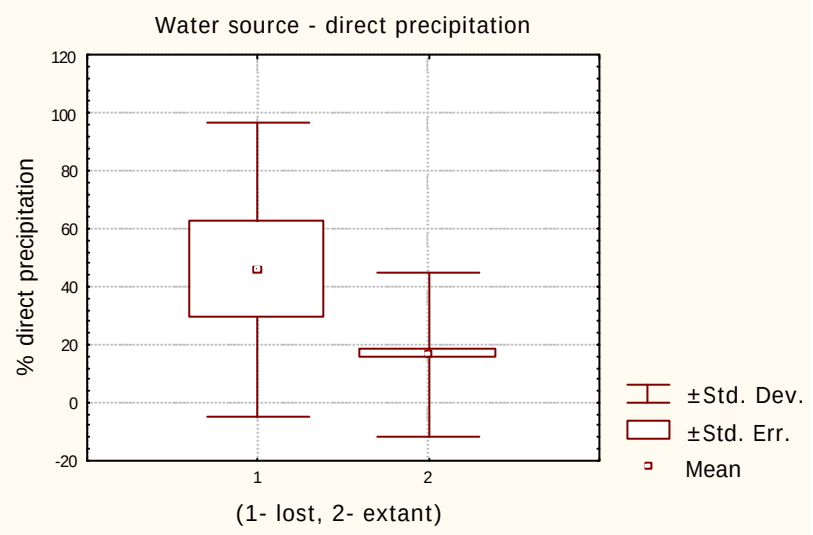
Figures 14.12b



Figures 14.12c



Figures 14.12d



SUMMARY

41 Ponds gained tend to be small in size and largely balance losses within the same size class. Many ponds gained are from features previously defined as either other wet features or permanently dried-up. Small ponds are therefore seen to be sensitive to change and may change status frequently.

42 Most ponds are gained from a variety of habitats occurring within a wider grassland system.

43 The CS dataset for ponds are limited in their ability to inform policy due to the limited data collected for these features during the main CS surveys. Additionally, changing definitions and methodologies over time add to the difficulties interpreting the data.

FURTHER WORK AND RECOMMENDED CHANGES TO CS METHODS

44 The information collected as part of the LPS is more detailed than that collected by CS surveys. However, to include such detailed information during CS surveys would require specialist surveyors. Better information of change in ponds may require a parallel survey in future though it would need to be more extensive than the LPS to provide better national estimates.

REFERENCES

1 Haines-Young R.H., Barr C.J., Black H.I.J., Briggs D.J., Bunce R.G.H., Clarke R.T., Cooper A. Dawson F.H., Firbank L.G., Fuller R.M., Furse M.T., Gillespie M.K., Hill R., Hornung M., Howard D.C., McCann T., Morecroft M.D., Petit S., Sier A.R.J., Smart S.M., Smith G.M., Stott A.P., Stuart R.C., Watkins J.W. (2000) Accounting for nature: assessing habitats in the UK countryside. London: DETR Countryside Survey 2000

2 Government Statistical Service (1999) Quality of Life Counts – Indicators for a strategy for sustainable development: a baseline assessment, DETR, London.

3 Williams P.J., Briggs, J., Barr, C.J., Cummins, C.P., Gillespie, M.K., Rich, T.C.G., Baker, A., Beaseley, J., Corfield, A., Dobson, D., Collin, A.S., Fox, G., Howard, D.C., Luursema, K., Rich, M., M., Samson, D., Scott, W.A., White, R. and Whitfield, M. (1998) Lowland Pond Survey 1996: Final Report, DETR, London