AUDIT SURVEYS IN THE NRA THAMES REGION

A report on the surveys carried out in 1992/93 to assess the retention and enhancement of wildlife habitats during routine dredging operations

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April 1993

NRA THAMES REGION : AUDIT SURVEYS 1992/93

Summary

Audit surveys of maintenance dredging operations have been used to assess the effectiveness of the river corridor survey in integrating wildlife and engineering requirements. These surveys have now been carried out in the Thames Region for three and a half years.

The 1992-93 programme has followed the format used in 1991-92, covering a number of rivers across the Thames Region in order to assess the range of variation on different types of watercourse. The number and variety of enhancements carried out has been studied as well as the conservation of existing features during routine dredging.

The selection of lengths of river for audit was made so that examples were taken from each of the three Areas within the Region and also the sub-areas within them, wherever possible. The lengths cover a range of river types and engineering problems. In order to achieve a good coverage some of the rivers are from those originally surveyed in the 1989/90/91 river corridor surveys but not dredged until 1991 or later are included. Twenty-three stretches of river totalling 44.5km have been re-surveyed (See Appendix 1).

The method used to carry out audit surveys is as in 1991/92. Some of the most frequent problems encountered by operational staff in following the recommendations in the river corridor survey reports are similar to those reported last year:

i) disagreement with landowners over recommended conservation or enhancement works;
ii) work carried out by landowners on sections of main river or adjacent land either before or after dredging;
iii) operational difficulties and the constraints of flood defence requirements.

The main conclusions from the audit are:

a) there is a good approach to the retention of wildlife habitats and important features along the river corridor in all of the areas, with no significant difference between areas (see Table 1);
b) the greatest success has been with retention of riffles and runs, trees and shrubs and low branches; the retention of gravel bed and shoals and low branches has been much improved over last year;
c) the least success has been with retention of bank and aquatic flora and marginal flora and fringes (see Table 2);
d) there is a much lower take-up of enhancements than the retention recommendations, with little variation across the region;
e) the greatest response has been to the construction of in-channel features such as berms and groynes, and the least response, with some allowance for the number of times recommended, to tree work and deepening in-channel pools, similar to 1991/92 (see Table 3).
f) most of the enhancements recommended and implemented were on special projects; as in previous years there is a low level of uptake of enhancements on routine maintenance dredging.

INTRODUCTION

Audit surveys are carried out in the Thames Region as a part of the routine monitoring of the working practices employed in maintenance dredging for flood defence and land drainage. These surveys are used to assess the impact of engineering works on the flora and fauna and study the success of techniques used to mitigate those impacts. They also serve to monitor the work of the conservation section, assess the advice given and the effectiveness of liaison. Audit surveys should aim to identify:

a) the habitats and features which are routinely safeguarded and those which are more vulnerable;
b) the types of enhancement which are carried out and those which are not;
c) any differences between the approach in different areas;
d) the success or otherwise of the river corridor survey and working map approach and how well the maps are understood;
e) any other problems which affect the retention and enhancement of wildlife during routine dredging operations.

METHODOLOGY

The lengths of river re-surveyed are listed in Appendix 1 with the dates of river corridor surveys, audit surveys and dredging work. As far as possible an equal number and total length of river reaches have been selected from each of the three areas, North East, South East and West. The spread of reaches across each area was the best which could be achieved from those which had been surveyed and dredged. The time between dredging and audit ranges from two years (Lee feeder stream) to five months (Sulham Brook).

The methodology is essentially the same as in 1991/92. The re-surveys were executed by walking the river and over-marking the original river corridor survey dredging recommendations with current information, noting the features retained, lost or enhanced. Photographs were taken at the points used in the original survey and at any key locations. A visual assessment was made of the degree of success achieved (a) in retaining features and species highlighted in the original report and (b) of any enhancement works carried out.

Discussions were then held with the relevant Inspector or Supervisor, either directly or through the Conservation Officer, to record their opinions of the work and note any problems or constraints encountered.

A report has been written for each stretch, including a brief description of the site, dates of surveys, a summary of the maintenance operation and an appraisal of the effects of the work. A table has been drawn up for each audit, summarising the findings under three headings:-

a) Bank and channel features
b) Bank vegetation
c) Channel vegetation

An example of an audit report is given in Appendix 2. Each line of the table at the back of the report covers one 500m length and the 0-5 scores are in percentage bands, as follows:

0 : No retention or enhancement carried out
1 : 1-20% of recommendations undertaken
2 : 21-40% " " "
3 : 41-60% " " "
4 : 61-80% " " "
5 : 81-100% " " "

N/A or Not Applicable means that there were no recommendations for enhancement on that 500m length. RET. stands for Retention and ENH. for Enhancement.

RESULTS

For each survey average scores have been calculated down the columns. The average scores for all of the audit surveys within each area have been drawn together and shown in a single table, Appendix 3. The percentage scores and abbreviations are as above, with one modification. The enhancement columns may show both a score and NA; for example 0/NA. where recommended enhancements were not carried out in one length (0) and no enhancements were recommended in another length (NA).

An overall average score for each area is given along the bottom line in Appendix 3 and is abstracted below. The figures for the 1991/92 audit surveys are given in brackets for comparison.

Table 1. Average Scores for Retention and Enhancement

Area	Bank & Channel Features		Bank Vegetation		Channel Vegetation		No. Surveys	Km.
	RET	ENH	RET	ENH	RET	ENH		
North East 92/93	**4.17**	**3.2**	**4.06**	**1.05**	**3.14**	0	**7**	**11.0**
(91/92)	(4.79)	(1.5)	(4.04)	(0)	(4.46)	(0)	(7)	(14.0)
South East 92/93	**4.58**	**2.21**	**4.69**	**2.2**	**3.56**	0	**9**	**17.5**
(91/92)	(4.87)	(3.0)	(4.57)	(2.87)	(4.32)	(1.50)	(9)	(6.0)
West 92/93	**4.63**	**2.05**	**4.5**	**2.72**	**3.93**	N/A	**7**	**15.0**
(91/92)	(4.88)	(1.61)	(4.75)	(1.27)	(4.62)	(5.0)	(13)	(28.5)

The figures for both years are shown graphically in Appendix 4.

The West and South East Areas have similar scores the for retention of existing features and the North East Area again scores the lowest, but there is a decrease in all areas when compared with the 1991/92 audit surveys. The scores for enhancements are less consistent but overall are marginally lowest in the North East Area and highest in the West Area. There has been an overall increase in the enhancement scores for the North East Area and a decrease in the other two areas. More detail on the retention and enhancement of different features is given below.

1 Habitat Retention

The overall retention of existing features and habitats has been good, although slightly down on last year. The individual features are discussed below under the categories Bank Features, Channel Features, Bank Vegetation and Channel Vegetation, following the general format of the tables.

1.1 Bank Features

Shelves and Shallow Banks
A good percentage of the identified features have been retained, although the percentage is lower than in the surveys last year. Banks have been left untouched in the majority of dredging operations, apart from some unavoidable scraping and spoil spillage. There have been losses of riparian/marsh flora where spoil was spread on areas of shallow bank or shelves which were identified to be left untouched. This has occurred in each area. Reasons include landowner pressure (NE, W), a decision of the engineers on site (SE) and potential damage to an SSSI by transporting off site (W). In the latter case there was agreement with English Nature and the Conservation Officer. On one scheme (SE) although the shallow banks have been left untouched the bed has been considerably deepened and the riparian flora on the banks is above the water level and likely to dry out.

Cliffs
Few proper cliffs were noted on the surveys, but where vertical banks are present they have been left untouched.

1.2 Channel Features

Runs, Riffles and Gravel Beds
There has been a good retention of these features and much higher than in previous audits. The most damaging losses have been where a landowner carried out illegal dredging work (NE) and where work was being carried out on contract and the landowner insisted on much deeper dredging than recommended by the Conservation Officer (NE). Two areas of shallow gravel were over-dredged, possibly due to misunderstanding of the requirements (W, NE).

The river corridor surveys were carried out after a series of dry summers and the audits after a period of heavy rain. This has meant that several reaches which were previously recorded as shoals or riffles were much deeper on the re-survey and the "loss" of these features was not due to the dredging operations. In one case, however, dredging resulted in a lowered water level which exposed new gravel riffles (SE).

In-Channel Pools
Existing pools have been retained, although some silting up of pools has occurred where there was no recommendation to deepen, or deepening has not been carried out (all areas).

Islands
One very small island was removed (W) but another of similar size was created on the same reach. Other islands (NE) have been retained.

1.3 Bank Vegetation

Herbaceous Plants

As in previous years, only a few of the rivers audited had sections with a particularly rich bank flora. The banks have been left largely untouched and so existing bank floras have been retained over the majority of the lengths. Small losses have occurred where spoil has been spilt accidentally or the working bank has been scraped. This is a problem particularly where reaching into the channel is difficult on narrow watercourses.

In a few cases in all three areas there has been deliberate damage to the bank flora or key stands of plants such as sedges and yellow flag. In the western area the spreading of spoil was agreed between conservation, engineering and English Nature in order to safeguard an SSSI. On another river the flora of a shallow bank and margin were lost due to spoil spreading where the landowner did not want the spoil on his pasture. In the North East the most damage was caused on the contract scheme referred to above, where an adjacent area of marshy ground as well as the bank was spread with spoil under the instructions of the landowner. In the South East small areas of adjacent land and both river banks were re-seeded with rye-grass after unavoidable disturbance during the construction of a sluice. The re-seeding was probably done either in good faith or at the request of the landowner. However, it would have been better left to recolonise naturally in a woodland setting. On another site in the South East Area the banks of a stream running though a garden were faced with timber at the insistence of the landowner whose permission was needed to gain access to a culvert.

Damage has also been caused by excessive stock poaching, by landowners carrying out dredging and other work and by activities such as gardening.

Trees and Shrubs

A great deal of care has been taken in all the areas to work round trees and shrubs and there has been a high response to the recommendation to retain low branches, a great improvement on last year. The only significant loss of low and shading branches was due to the farmer siding up shrubs with a flail after the dredging was completed (SE). The clearance of an access strip along the bank, probably by the landowner (NE), has resulted in the loss of some overhanging willows.

Adjacent Habitats

Fewer of the good wildlife habitats identified in the river corridor surveys have been left untouched this year, but this is the result of action by landowners or tenants. A shelterbelt has been removed, a corner of woodland "tidied" and underplanted with garden plants, a narrow strip of rough land ploughed and a bonfire held on a wet meadow. Attributable to the NRA are the re-seeding of the ground under woodland with rye-grass (SE) and the filling of a marshy strip with spoil (NE), problems already mentioned above. The percentage of retention is still high (70%) and all the most valuable areas of sedge fen, wet meadow and woodland have been left untouched.

1.4 Channel Vegetation

The recommendations in a number of the river corridor survey reports include leaving an undredged strip along one or both sides of the channel to retain both aquatic and marginal floras. This has been carried out in some of the wider rivers in all three areas with success, retaining specific plants such as reed, rich fringes or beds of aquatic plants. However, there is frequently a narrower fringe retained than recommended.

In two cases in the North East Area the landowners requested/insisted on this wider open channel, with on one of these the threat of otherwise carrying out the work themselves. Elsewhere some wide fringes of water-cress were removed by the local council in response to

public complaints. Machine operators also reported difficulty in leaving a narrow fringe of water-cress as this vegetation tends to grow as a dense mat and "come out in one lump".

In the South East Area the narrowness of one channel made it impossible to leave any vegetation deliberately, especially as the driver could not see the bed from the cab. However, the recolonisation of the margins from seed on this reach has been good, although the balance of species has changed. Flood capacity requirements on another watercourse meant the removal of all fringing vegetation along one side and most along the other.

In the West Area one reach was dredged before a job card had been made out, whilst the gang were waiting for materials to arrive to complete a new weir. This unsupervised work resulted in the loss of a large percentage of the rich aquatic and marginal flora. A wider fringe was retained along the non-working bank of one river and little on the working bank because of the limited reach of the machine. This was not discussed with the Conservation Officer. Disagreement with the conservation recommendations by the Inspector and the starting of the job without informing the Conservation Officer meant that more fringing sedge was removed than recommended along another section of brook in the western area.

On some schemes (NE, SE) the reasons are not known for what is considered to be excessive removal of marginal vegetation, but flood defence considerations are likely to be important factors. Individual stands or fringes of key species were noted in many of the river corridor surveys. Most have been retained by leaving undredged areas, retaining a proportion of stands such as reed or by working round individual clumps where they could be identified on site. Losses have occurred possibly because the plant species could not be seen or identified by the engineers. In other cases the audit survey was carried out too early in the year to be able to see whether particular species such as flowering rush were still present.

On the few reaches where rich beds of aquatic plants or good stands of plants such as water-crowfoot were highlighted have been left undredged or partially dredged so that at last a proportion of these important features have been retained. The major exception is the removal of a small bed of a rare pondweed growing near the margin (SE). The reason for this is not known. Where gravel beds have been lightly scraped to remove silt there has generally been a good recovery of aquatic plants such as water starwort. However, the high river levels experienced on many of the audit surveys made this difficult to assess. In some cases the removal of dense emergent vegetation has had the beneficial effect of allowing smaller aquatic plants to become established or spread (NE).

A table summarising retention of features and habitats in the audited reaches is given below.

Table 2. Summary of Retention of Features and Habitats

Feature or Habitat	Occasions Retained	Occasions Not Retained	Percent Retained
1.1 Bank Features			
Shelves and Shallow Banks	27 (18)	7 (3)	79.4% (86)
Cliffs	1 (3)	0 (0)	100%
1.2 Channel Features			
Runs and Riffles	11 (6)	2 (3)	85% (67)
Gravel Bed and Shoals	19 (10)	5 (6)	79% (62.5)
In-channel Pools	5	0	100%
Islands	1	1	50%
1.3 Bank Vegetation			
Herbaceous General	16 (16)	11 (12)	59% (57)
Key Stands	17 (11)	6 (5)	74% (69)
Trees and Shrubs	22 (21)	2 (2)	92% (91)
Low Branches	18 (14)	1 (6)	95% (70)
Adjacent Habitats	14 (13)	6 (3)	70% (81)
1.4 Channel Vegetation			
Marginal Flora and Fringes	23 (25)	14 (15)	62% (62.5)
Aquatic Flora	12 (14)	8 (4)	60% (78)

Figures in brackets are those for the 1991/92 audit surveys, from last year's report.

["Occasions" is equivalent to the number of surveys; i.e. if on one survey both damaged and undamaged cliffs were noted this would give a score of 1 in both columns "Retained" and "Not Retained", regardless of how many cliffs there were on that stretch.]

Summary of Reasons For Loss or Partial Loss of Identified Features

1.1 Bank Features

a) Removal of shelves or berms, no reason given.
b) Shallow banks at confluence of side stream had to be built up to control silt/sand blocking main channel.
c) Shallow bay and bank reprofiled as landowner unwilling to have spoil on field.

1.2 Channel Features

a) Loss of riffles due to natural scour and movement gravels; raised water level on audit.
b) Dredging by landowner, removing gravel.
c) Deepening of bed and loss of shallow banks at request of landowners on a contract job.
d) Excessive removal of material from gravel shallows to extend island.
e) Dredged without job card or supervision; island and gravel riffles removed and backwater over-deepened.

1.3 Bank Vegetation

a) Work by landowners, including re-profiling and spoil spreading on the banks, tree-felling, flailing of scrub, mowing, ploughing and gardening.
b) Decision by engineers on site to spread spoil on areas of bank or shallow margin, no reasons known.
c) Accidental spillage (small areas).
d) Heavy poaching and grazing of banks and margins.
e) Re-seeding of areas unavoidably damaged when dredging and/or carrying out enhancement projects, preventing natural recolonisation of banks or shelves.
f) Bank scraped due to narrowness of channel.
g) Spoil spread on bank to avoid vehicle damage to SSSI by removal off-site.
h) Marshy hollows and banks spread with spoil at request of landowners.
i) Natural banks reinforced with timber at request of landowner where needed access across his land to repair a culvert.
j) Tree trimming gangs do not see working maps and are therefore unaware of recommendations.

1.4 Channel Vegetation

a) Wide fringes not retained as extra channel width required for flood flows in "flashy watercourse".
b) Excessive removal of fringes at request of landowner/ where landowner threatened to dredge.
c) Damage by landowner/local council.
d) Difficulty leaving proportion of cress margins due to matted growth.
e) Disagreement between conservation and engineering over amount of fringe to be retained.
f) Work carried out before job card made up/conservation recommendations not seen by machine driver.
g) Removal of wider strips of fringing emergent vegetation, no reason known.
h) Narrowness of channel meant driver unable to see bed or leave fringe.
i) Loss of flora due to replacing gravel bed.
j) Fringes and shallow banks retained but above water level due to drop in bed; flora will dry out.
k) Rare pondweed removed, no reason given.
l) Not possible to locate or identify plant or patch of vegetation.

2. Enhancements

There has generally been a low uptake of suggested enhancements, except on those schemes which were largely enhancement orientated and where there has been a considerable input from all sides and significant habitat improvements. These projects have involved the construction of a variety of enhancements on each section of river, including weirs, groynes and berms. On routine dredging operations the implementation of enhancement recommendations is poor as in previous years, although a variety of small improvements have been undertaken.

2.1 Bank Features

Shelves just above the water level have been created in all three areas by bank re-profiling. In the north-east the shelves were narrow, 0.5m wide as recommended but very uniform in character. The width has proved to be limiting and although the shelves are low they are trampled and unlikely to develop a rich wetland flora. It was not possible to use "green fix" matting to aid floral development owing to the need by the local council to mow the banks. In the west area a shelf cut on one reach is shaped like a small bay 0-1m wide but only 5m long, the minimum recommended, and also of limited value. This shelf was underwater on the day of survey due to flooding. A second shelf was not constructed.

In the south-east the means of constructing shelves is more varied. On one river they have been created by spreading spoil on the lower bank behind a retained fringe of sedge. These shelves are wet and the spoil used in their construction contains the roots and seeds of riparian plants, aiding the development of a wetland flora on the shelves. However, the idea was extended to a section of rich bank which should have been left untouched. On another river the creation of shelves has been the result of construction of a two stage channel by dredging a central strip and leaving the margins. These shelves are dry and grassy in some lengths, but at the upstream end they are wet and support a rich marsh flora. A similar partial dredge of the channel has left two wet shelves in the meanders of another river. The fourth scheme involved the use of Nicospan backfilled with silt from the channel (similar to the in-channel berms discussed below). This has been skilfully done so that the Nicospan is hidden by developing wetland vegetation and the shelves appear very "natural".

2.2 Channel Features

In-channel pools have been created by deepening the bed during dredging, but on the smaller watercourses these pools are small and unlikely to persist. Natural scour and movement of silt has also created small pools and may have filled in some of those which were dug. On one river (NE) the pools are of a good size and probably valuable for fish.

Marginal berms or shelves have been constructed as part of river improvement projects in all areas, to reduce over-wide channels and create areas for wetland vegetation. In the north-east and south-east they have been constructed either by redistribution of gravel or spoil within the channel or by using hazel hurdles or Nicospan backfilled with silt from the centre of the channel. The former method has created a good lengths of gravel shallows which are being colonised by aquatic vegetation, although the raised water level on one river made it impossible to locate all the berms. The retaining materials used in the other schemes have been well disguised on all but one of the rivers, using spoil and vegetation. These berms a good width and are already developing stands of emergent vegetation. The one exception (NE) is where the height of the shelves varies from below normal water level to just above, the metal stakes and Nicospan are visible and the drier shelves are bare(trampled?) mud. There were difficulties in that this section of river had to be drained in order to carry out dredging and enhancement works and the bed was deep.

In the west berms were constructed using blockstone or a biodegradeable material called Dekowe, backfilled with silt. The Dekowe proved unreliable and parts of the berms have eroded away. All the berms were underwater on the days of the audits, but on one river they apparently dry out in summer and thus may not develop a permanent wetland flora. These berms have also been re-seeded with grass at the request of the landowner. On the second river some sedges and other riparian plants are becoming established on the berms.

Groynes have been used in all areas on major enhancement projects to diversify the channel flow, using hazel hurdles (NE and SE) and large stone (SE and W). In some cases they have been backfilled with spoil and vegetation to create small wet margins. At a few sites there is a small amount of scour at the bank and some of the hurdles appear to have been poorly keyed into the bank. Nevertheless, they all seem to be creating the desired effects. Groynes were not erected or rebuilt where recommended if reaches were not dredged.

Fish spawning weirs have been constructed in two rivers in the west, one in association with a long, low island constructed from gravel spoil. These weirs are very successful in creating reaches of rapid flow and will hopefully prove valuable for fish and invertebrates. The low island was partly flooded on the day of survey, but should be a valuable additional feature. In the south-east area a weir or sluice has been constructed to divert flow down a mill channel and a series of notched weirs made of large stone used to diversify the flow on another river to great effect, despite the attempts of local children to remove them.

The introduction of gravel, pebbles or large stones has been used to reduce the depth in overdeepened reaches and vary the bed profile on enhancement schemes in the west and south-east areas. There have been improvements in the variety of flow patterns, with the creation of riffles and small pools. At the time of the audits the gravels were relatively free of overlying silt and there is potential for a significant improvement in the invertebrate and fish populations. One good riffle has appeared as a result of the lowered water level after dredging (SE) and another due to natural gravel movements (NE).

Islands have been constructed on a few rivers in all areas. Apart from the one mentioned above, most of the islands are very small, formed by cutting off a meander (SE) or isolating single trees (SE, W). In the north-east area an existing island was extended in length using gravel dredgings and an island was created on a contract operation on a section which should have been left untouched.

2.3 Bank Vegetation

Pollarding has been carried out in all three areas, although in the north-east this amounted to only one tree out of the many recommended as at the time the policy for the area was that pollarding is not flood defence work. More pollarding was recommended than was carried out and on some schemes none of the pollarding was carried out. However, on one scheme a number of old willows were pollarded whilst the gang were on site even though it was not in the recommendations. This has been beneficial. There is still a tendency to lop, cutting only the overhanging branches (W, NE) rather than carrying out a proper pollarding or coppicing operation. The number of rivers on which pollarding has been carried out is similar to 1991/92.

Very little tree-planting has been carried out, a reduced percentage from last year although there were more cases where it was recommended. This is probably due to the time of year when the dredging is carried out, but may also be the cost or a lack of agreement by landowners.

A pond has been dug to provide material for construction of berms (W). The constraints of available area and the amount of material needed meant that the pond is deep, but there are some shallow margins. If fenced to keep stock off at least a part of the banks and margins it should develop some aquatic flora.

Fencing of the banks of one river (SE) has allowed the flora of the bank and margin to recover from heavy poaching.

2.4 Channel Vegetation

Lifting sedge or other vegetation from the centre of channel and replanting on the margins has not been carried out (NE, SE). This may be because of difficulty identifying the plant in one case.

A sinuous channel has been created by leaving margins of varying width along one watercourse. This was recommended in two other cases but not carried out on one, possibly because of difficulty in seeing the reach just dredged. On the other river a sinuous dredge may have been carried out but was not visible owing to a raised water level. All three rivers were in the south-east area.

A table summarising the enhancement work is given below.

Table 3. Summary of Enhancements

Type of Enhancement	Enhanced	Not Enhanced	Percent Executed
1.1 Bank Features			
Construction of Shelf	6 (2)	7 (4)	46% (33)
1.2 Channel Features			
Deepen/Create In-Channel Pools	4 (2)	7 (6)	36% (25)
Construct In-channel Berm	5 (4)	2 (0)	71% (100)
Introduce Groynes	5 (1)	3 (0)	63% (100)
Construct Weirs	4 (1)	1 (0)	80% (100)
Construct 2-stage Channel	2 (0)	1 (1)	67% (0)
Riffle Creation	4	0	100%
Introduce Stone/Gravel	2	1	67%
Create Island	5 (1)	1 (0)	83% (100)
Dredge Sinuous Channel	1	2	33%
1.3 Bank Vegetation			
Pollard Willows	7 (8)	10 (12)	41% (40)
Coppice Trees/Shrubs	1	3	25%
Plant Trees/Shrubs	4 (4)	7 (3)	36% (57)
De-silt Existing Ponds	0	1	0%
Create Off-channel Ponds	1 (5)	0 (2)	100% (71)
Fence Bank	1	0	100%
1.4 Channel Vegetation			
Transplant Vegetation	0 (3)	2 (4)	0% (43)

Figures for 1991/92 are given in brackets where comparable recommendations were made.

[These figures refer to the number of occasions when each enhancement was recommended; e.g. shelf creation or lowering was recommended in 6 river corridor survey reports, but only carried out on 2 rivers.]

Summary of Reasons for Not Carrying Out Enhancements

All Categories

a) Section not dredged therefore enhancements not carried out.
b) Enhancement work not agreed by landowner.
c) No reasons given.

1.1 Bank Features

a) Shelf not constructed because of cost/as material costs not included in job specification.

1.2 Channel Features

a) Pools not created as proposals to create a two-stage channel on reach in future.
b) Erection of groynes where recommended would obstruct land drain.
c) Berm not constructed because of cost, given extent of enhancement works carried out upstream.

1.3 Bank Vegetation

a) Not all selected trees pollarded but additional ones done.
b) Pollarding not considered to be flood defence work.
c) Recommendations taken by Inspector to be a guide to pollarding not a fixed plan.
d) Trimming gangs do not see conservation recommendations and carry out work well before dredging.
e) Tree planting not carried out due to time of year maintenance work carried out.
f) Tree planting not carried out on adjacent field as area to be covered by a comprehensive management plan.

1.4 Channel Vegetation

a) Vegetation not transplanted to other sites as timing of work not compatible.
b) Sinuous channel not dredged as difficult to see section already dredged and follow line.
c) Difficulty locating stands or particular plants.

DISCUSSION

1. Methods

The number of surveys and total length of river audited in each area is similar, an improvement on the audits carried out in 1991/92. The North East Area has the lowest total length. One on the rivers included in the South East Area in this report is now in the North East owing to boundary changes. There is some confusion over which area supervised the work as the changeover occurred when the work was in progress.

Once again it has not been possible to carry out all of the audit surveys one year after the river corridor survey and there is a variable interval between the dredging operations and audits. Where an audit has been carried out relatively soon after completion of the dredging it has been easier to see clearly which recommendations have been followed and how many enhancements have been carried out, although the success of those enhancements could not be fully evaluated. In these cases the vegetation has not re-established and events such as flood flows have not "tested" the various enhancements. Audits carried out some twelve months after dredging allow a better assessment of the success of the work and the recovery of the river flora, but the extent to which some of the recommendations have been followed can be obscured by vegetation, damaged by floods or even negated by work carried out by landowners. For most maintenance operations an audit twelve months later is a reasonable compromise. However, for important schemes such as those where major enhancements are incorporated at least two surveys should be carried out if possible, with the first soon after the work is completed. This would enable a better assessment of the quality of the conservation recommendations as well as the method of execution. In some key projects there should be consideration given to long-term monitoring, covering freshwater invertebrates, fish and possibly geomorphology as well as the flora and habitats. It is understood that some work on this scale is proposed in Thames Region and this should provide a good baseline of information for designing future enhancement projects.

More attention has be paid by the surveyor to marking on the working maps fences and other features which facilitate the location on site of key species or habitats for retention, or areas for potential enhancement. There has been a much greater input on site since the appointment of Conservation Officers to cover each of the three areas in the Thames Region and this has greatly improved communication and discussion about the conservation recommendations. However, comments from the operational staff on the working maps would be very welcome. To date there has been little feedback about problems such as the inability to locate particular plants or habitats, but there are probably areas of confusion or misunderstanding which could be addressed.

The check list of main features, habitats and the most common enhancements suggested in Appendix 4 of the previous report has been used for each survey. It provides additional information on the habitats and features most readily retained and enhanced and is useful in preparing this final report, although does not speed up the work significantly.

2. Records and Liaison

Records of work carried out have been easier to obtain this year with the improvements made in each area office. With the number of schemes delayed for various reasons the choice of audits has been restricted, but a much better spread of surveys across the region has been achieved.

Re-scheduling of programmes is a continuing problem due to the need to respond to emergencies, machine availability and the requirements of landowners. This means that some work is still carried out without a full river corridor survey, but the majority of dredging operations are covered either by these surveys or by site visits or both. Liaison has greatly improved with a Conservation Officer in each area, but there have been occasions when the Inspectors or other operational staff have not informed the relevant Conservation Officer of changes in the programme or proposed detailed

execution of a job. There are still some misunderstandings and differences of opinion about the role of the working maps and conservation recommendations, and whether there is a need to discuss any areas of disagreement or necessary change. These need to be resolved.

3. Results

As in previous years the overall retention of features and habitats of nature conservation value has again been high, but in all areas within the Thames Region implementation of enhancement recommendations has been lower than retention. Good enhancement projects have been carried out in all areas, but it seems that enhancements are still not adopted as a part of routine maintenance work.

The lowest scores for retention have again been recorded for the vegetation of banks and channel, apart from trees and shrubs. Some unintentional damage to the bank flora is unavoidable, for example on narrow watercourses, and the amount of marginal or channel vegetation which can be retained is largely determined by channel capacity and flood control considerations. Damage by and at the instigation of landowners is also included in these scores. However, this year there have been more losses of important beds of aquatic vegetation for which no reasons have yet been determined. For trees and shrubs the percentage retention is again high and there has been a greatly improved response to the recommendation to retain low branches wherever possible.

More enhancements have been recommended and more undertaken in the 1992/93 dredging year than in 1991/92. The percentage figures are thus based on more records than those in last years' report and so the year-on-year comparisons are not a very accurate reflection of the changing approach to different types of enhancement in different areas. The lowest achievements are for enhancement of flora, including transplanting channel vegetation and coppicing willows, and for deepening/creating in-channel pools. There have been several good enhancement projects involving the construction of shelves or berms, islands, weirs, groynes and two-stage channels, but in normal maintenance dredging operations only a few of the recommended enhancements have been implemented.

It would be an advantage if the tree trimming gangs could see the agreed conservation recommendations as a matter of routine, although the level of retention of trees, shrubs and low branches has been high this year and a fair amount of pollarding has been carried out on a few rivers.

4. Comparisons Between Areas

Overall the differences between the three areas are not marked in the rivers and reaches covered by this report, as was noted last year. The West Area scores highest and the North East Area scores lowest by small margins for both retention of existing features and enhancements in total. However, the percentage scores should be viewed with caution where they are based on low numbers of "occasions" (See Tables 2 and 3).

In the North East most of the surveys are in one part of the area as it was not possible to obtain a better spread of rivers to audit. The scores for retention as shown in Table 1 are lower than last year and lower than the other two areas for each category, Bank and Channel Features, Bank Vegetation and Channel Vegetation. However, there have been more problems and damage caused by landowners over the last dredging year, affecting all three categories. The results reflect a mixture of good and poor reaches within a survey as well as between watercourses. In some cases this is because there were sections left undredged and so the score for retention is high in those reaches. Enhancement results are more varied, with a higher score for Bank and Channel Features than the other areas and a lower score for Bank Vegetation. There has been an improved implementation of enhancement recommendations in comparison with 1991/92, but this is mainly on the special enhancement projects rather than maintenance dredging.

The South East Area has a lower score for retention of Bank and Channel Features and Channel Vegetation, giving a total score which is down on 1991/92. Some of the losses are unexplained at the time of writing. Others are because of the "flashy" nature of the watercourses (i.e. flood defence considerations) or the narrowness of the channels. The scores for enhancement are lower than last year in all three categories. As in the north east the enhancements carried out have been mostly on special projects.

The Western Area also has a lower score for retention in each category when compared to last year, with similar scores to the South East Area. The poorer scores are mainly due to two jobs, one where there was an unresolved difference of opinion between conservation and engineering and one where unsupervised work was carried out during a delay in supply of materials. On the remainder of the rivers there was a good retention of identified features. Enhancement scores are higher than last year on Bank and Channel Features and Bank Vegetation due to special projects and the amount of pollarding work. Otherwise the same criticism applies as above.

Problems caused by landowners are an unavoidable part of maintenance dredging. This year they again include disagreement over working practice, refusal to allow enhancements to be carried out and dredging and various other works carried out by the landowners along the river corridor. A greater number of major enhancement projects have been carried out and included in the audit survey programme. These projects and the success of their implementation in all areas reflect a high level of input from conservation, fisheries and engineering staff, the good cooperation of some landowners and improved liaison. However, there is still a need to improve the amount of enhancement work included in routine maintenance dredging. These enhancements need not be major structural works but could include small scale constructions such as groynes and more pollarding and other tree work, all of which contribute to the improvement of our watercourses for wildlife and fisheries.

APPENDIX 1

NRA THAMES REGION - AUDIT SURVEYS 1992-93

River and Reach	Km	Date Surveyed	Date of Audit	Date Dredged
A. North East Area				
North				
1. R. Mimram, Codicote	0.5	24.6.91	17.2.93	Sept 91
2. R. Lynch, Hoddesdon, 1 & 2	1.5	20.8.91	10.12.92	Dec 91
3. R. Lee, Cory-Wright Way	1.5	8.10.91	17.2.93	April 92
4. Houghton Brook d/s M1, Luton, 1 & 2	1.5	11.12.90 21.1.91	28.10.92 "	March 92 May 92
5. R. Lee, Leagrave Marsh & Linbury, Luton	4.0	5.11.90	15.12.92	April 92 Before April 92
6. Lee Feeder, Castle Farm	1.0	11.12.90	3.3.93	Feb 91
West				
7. R. Colne, Springwell Lane	1.0	14.1.92	19.2.93	July/Aug 92
Total km NE	11.0			
B. South East Area				
North				
1. Bisham Brook,Temple Park	2.0	15.7.91	19.2.93	Feb 92
2. Couty Ditch, Staines	0.5	3.9.91	19.2.93	Spring 92
3. River Ash, Staines, phase 2	0.5	20.9.90	13.10.92	Dec-May 92
East				
4. Addlestone Bourne, MimBridge	2.0	1.8.89	19.1.93	Sept 91-Jan 92
West				
5. R. Tillingbourne, Chilworth	3.0	3.4.91	3.2.93	Nov 91- Mar 92
6. Cove Brook, Farnborough	3.5	27.6.91	4.11.92	July-Sept 91
7. Holly Cross Stream, Stratfield Saye	3.0	12.9.91	4.2.93	Winter 91
8. R. Loddon, Sherfield-on-Loddon	1.0	25.9.91	18.1.93	Spring 92
9. R.Blackwater, Ford Lane	2.0	10.10.90	18.1.93	Aug/Sept 91
Total km SE	17.5			

APPENDIX 1

River and Reach	Km	Date Surveyed	Date of Audit	Date Dredged
C. Western Area				
Bernwood				
1. R. Thame, Shabbington	3.0	15.5.91 (r)	25.1.93	July-Dec 91
Kennet				
2. Sulham Brook	1.0	10.10.91	25.1.93	July-Aug 92
Thameshead				
3. R. Windrush, Witney	0.5	15.5.91	10.2.93	July-Aug 91
4. R. Windrush, Worsham	3.0	20.5.91	10.2.93	Jan 92
5. R. Coln, Quenington	4.0	28.8.91	23.2.93	Jan-March 92
6. R. Thames, Ashton Keynes to Cricklade	3.0	5-10.11.91	12.2.93	Feb-May 92
Wychwood				
7. R. Cherwell, North Aston Mill	0.5	25.7.91	12.2.93	Aug-Oct 91
Total km West	**15.0**			
OVERALL TOTAL KM	**43.5**			

APPENDIX 2

AUDIT SURVEY, BISHAM BROOK, TEMPLE PARK

1. Site Description

2.0km of river flowing through improved and semi-improved pasture, ley, arable land and a small amount of willow/alder woodland.

The banks vary in height and profile but are generally low, especially in lengths 3 and 4. The cattle grazed banks are shallow and poached and provide wet areas. These are the richest banks for their flora, notably the left bank in parts of lengths 1 and 2. Tree and shrub cover is good, with a variety of species.

The marginal flora is dominated by wide fringes of reed sweet-grass, with some branched bur-reed, greater pond-sedge, reed canary-grass and a variety of riparian herbs. In the shaded reaches of lengths 1 and 2 the fringes are narrow. Elsewhere the marginal vegetation is encroaching across the channel,

There are good beds of flowering rush and arrow-head in length 3.

2. Dates of Survey

River Corridor Survey	15.7.91
Audit Survey	19.2.93

3. Maintenance Summary

The centre of channel was cleared of silt and encroaching vegetation. The upstream end of length 1, alongside the wood, was not dredged and the downstream end of length 4 was also left, despite the dense bur-reed in the channel. Work was carried out in February 1992.

4. Effects of Work

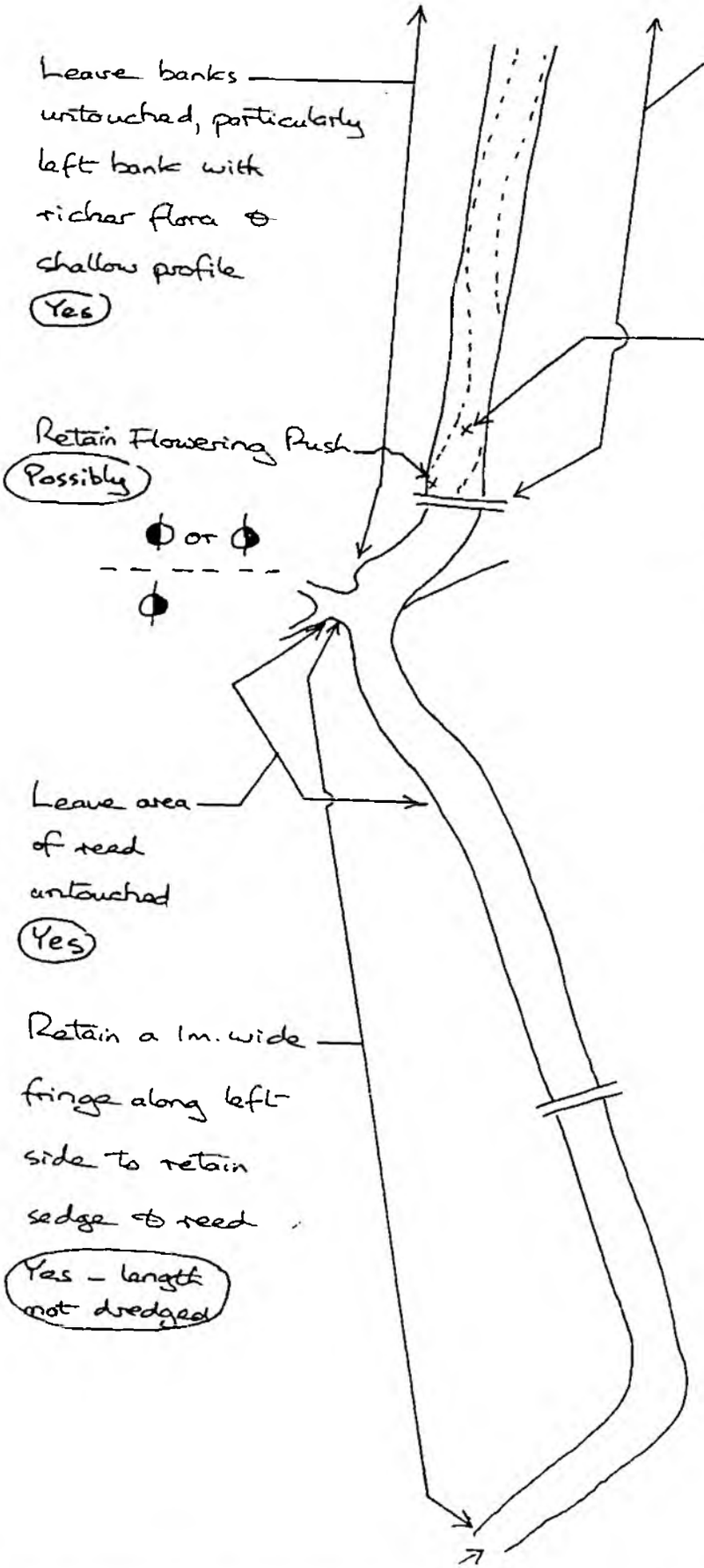
The woodland at the upstream end has been left untouched.

The shallow banks and stands of reeds and other wetland plants on the banks have been retained. Good margins have also been retained where requested, although it did not appear that the central channel was sinuous in form. This may be due to difficulties in creating a sinuous dredge as discussed for the River Tillingbourne. It was too early to see growth of the clumps of flowering rush or whether any had been lifted and replanted on the margins. Judging by the line of other marginal vegetation these stands have probably gone.

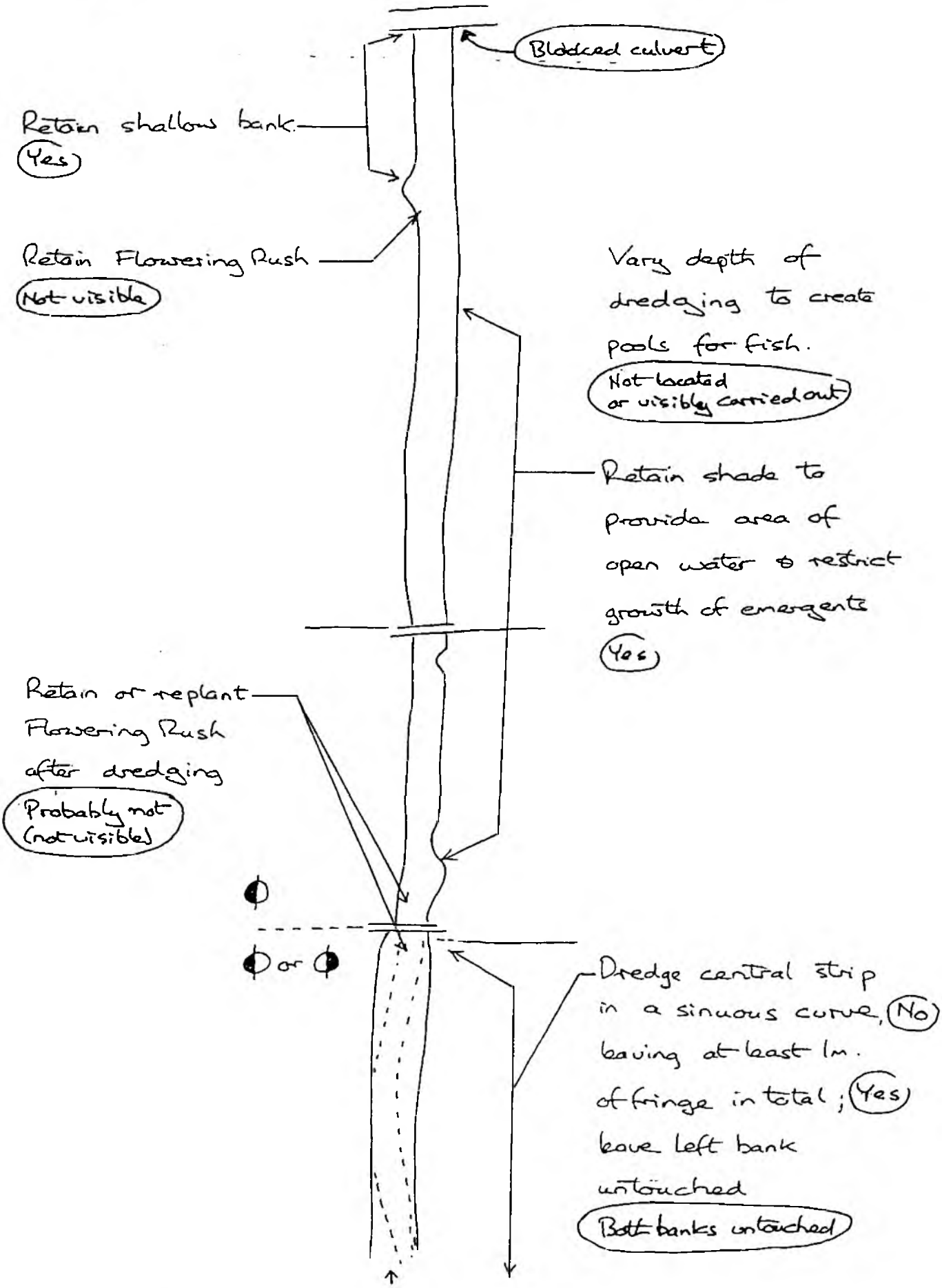
It was not possible to use the spoil with flowering rush and arrowhead from length 3 to plant up other sites as the timing of other nearby operations was not compatible. There did not appear to be any variation in the depth of dredging to create pools.

Care has been taken to work round the trees and shrubs and retain low branches. The partially pollarded willows at the downstream end of length 4 were not re-pollarded as this reach was not dredged.

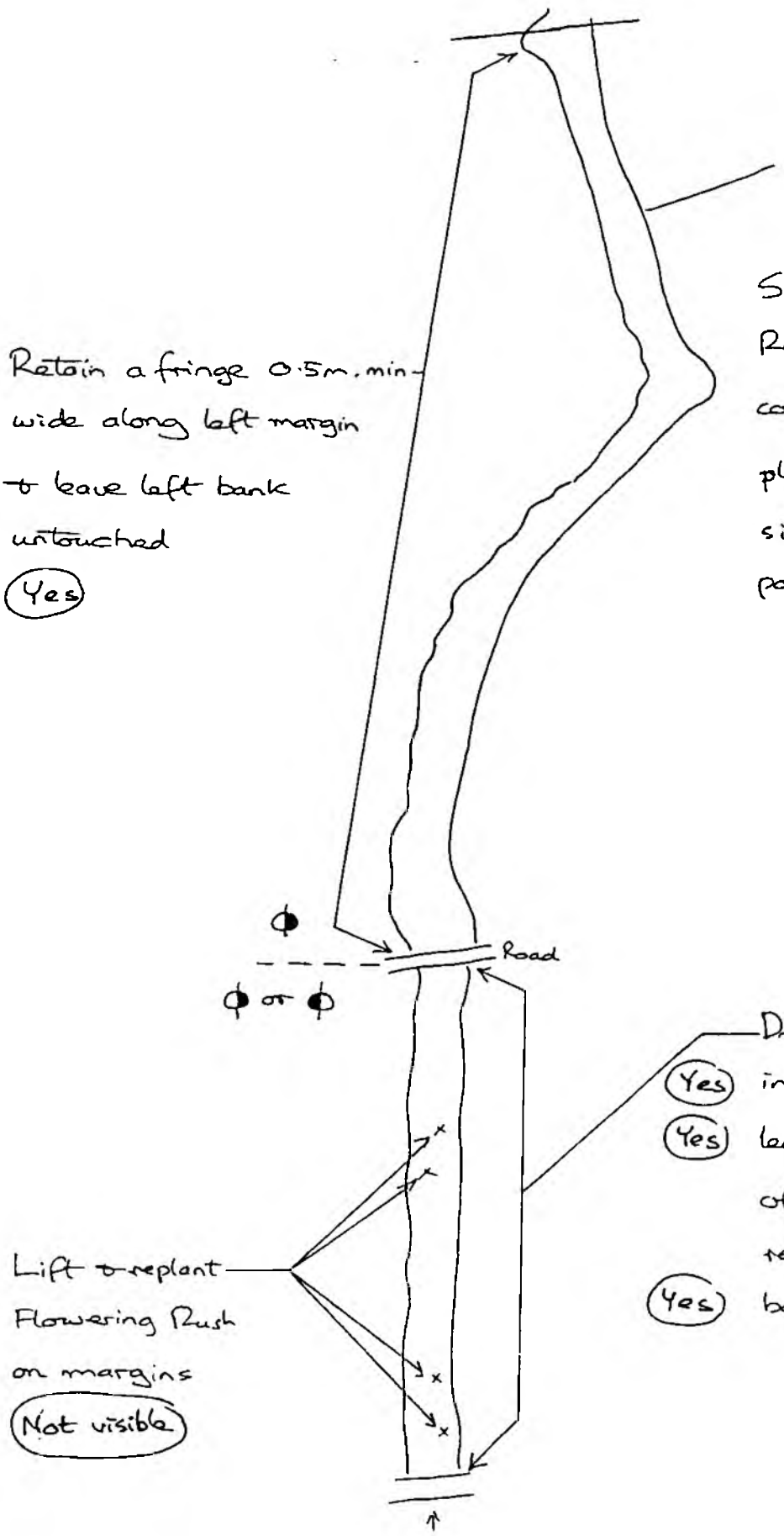
Bisham Brook Dredging Recommendations ①



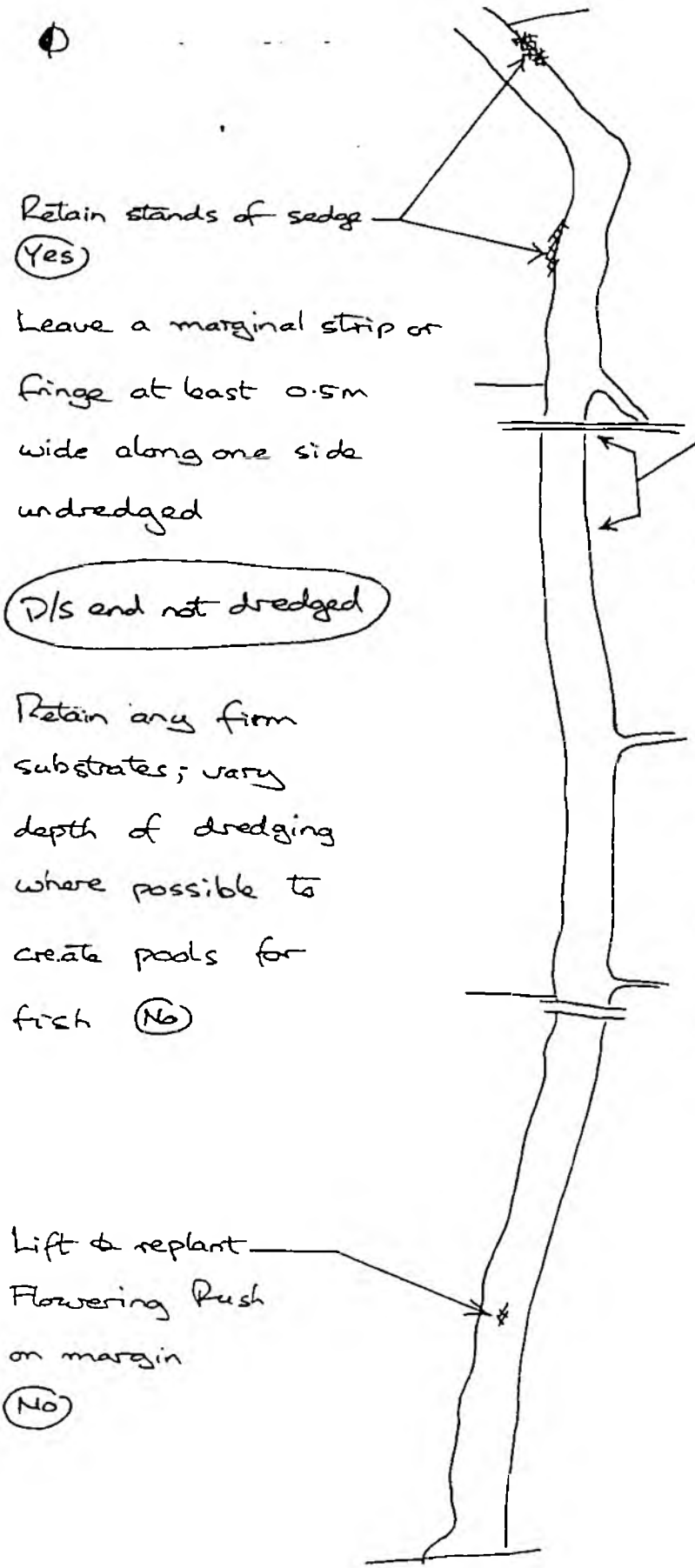
Bisham Brook Dredging Recommendations ②



Bisham Brook Dredging Recommendations (3)



Bisham Brook Dredging Recommendations ④



Bisham Brook, Temple Park

SURVEY SECTION	BANK AND CHANNEL FEATURES RET.	ENH.	BANK VEGETATION RET.	ENH.	CHANNEL VEGETATION RET.	ENH.	COMMENTS
1	N/A	N/A	5	N/A	3	0	Good retention fringes; possible loss of flowering Rush; no sinuous dredge U/S. end not dredged.
2	5	0	5	N/A	3	0	As 1 No pools
3	N/A	N/A	5	N/A	3	0	As 1
4	5	0	5	0	3	0	As 1 No pools or poaching D/S end not dredged.
	5		5		3		

KEY

RET : Retention
ENH : Enhancement
N/A : Not applicable

0 : No retention or enhancement carried out
1 : 1 - 20% Recommendations undertaken
2 : 21 - 40% " "
3 : 41 - 60% Recommendations undertaken
4 : 61 - 80% " "
5 : 81 - 100% " "

Bisham Brook, Temple Park

Check-Lists for Preparation of Audit Report

Retention of Features	Yes	No
Bank Features Shelves		
Shallow Banks	2	
Cliffs		
Channel Features Runs and Riffles		
Gravel Beds and Shoals	4	
In-channel Pools		
Islands		
Bank Vegetation Herbaceous	1	
Key Stands	1 4	
Trees and Shrubs	1 2 3 4	
Low Branches	1 2 4	
Adjacent Habitats	1	
Channel Vegetation Marginal Flora	1 2 3 4	
Aquatic Flora		1? 2? 3? 4?

Lengths

Enhancements	Yes	No
Bank Features Construction of Shelf		
Construction of Cliff		
Channel Features Deepen/Create In-channel Pools		2 4
Construct In-channel Berm		
Introduce Groynes		
Introduce Weirs		
Construct Two-stage Channel		
Riffle Creation		
Introduce Large Rock/Boulders		
Bank Vegetation Plant Sedge/Reed/Other		
Plant Trees/Shrubs		
Pollard Willows		4
Coppice Trees/Shrubs		
De-silt Existing Ponds		
Create Off-channel Ponds		
Channel Vegetation Transplant Vegetation		1? 2? 3 4

Dredge Sinuous channel 1 2 3

APPENDIX 3

AVERAGE SCORES

NORTH-EAST AREA

	RIVER AND REACH	BANK & CHANNEL FEATURES		BANK VEGETATION		CHANNEL VEGETATION		KM.
		RET.	ENH.	RET.	ENH.	RET.	ENH.	
1.	**North** R. Mimram, Codicote Mill	4	N/A	4	0	3	N/A	0.5
2.	R. Lynch, Hoddesdon, 1 & 2	4.67	N/A	3.33	0	3.33	N/A	1.5
3.	R. Lee, Cory-Wright Way	5	4.67	4.75	0/NA	4.67	N/A	1.5
4.	Houghton Brook, Luton, 1 & 2	5	0	5/NA	1	2.67	N/A	1.5
5.	R. Lee, Leagrave/Linbury	5	3.12	4.85	0.28	2.33	N/A	4.0
6.	Lee Feeder, Castle Farm	1	N/A	1.5	N/A	1	0	1.0
7.	**West** R. Colne, Springwell Lane	4.5	5	5	5/NA	5	N/A	1.0
	Average Scores	**4.17**	**3.2**	**4.06**	**1.05**	**3.14**	**0**	

KEY

RET : Retention
ENH : Enhancement
N/A : Not Applicable

0 : No retention or enhancement carried out
1 : 1-20% recommendations undertaken
2 : 21-40% " "
3 : 41-60% " "
4 : 61-80% " "
5 : 81-100% " "

APPENDIX 3

AVERAGE SCORES

SOUTH EAST AREA

	RIVER AND REACH	BANK & CHANNEL FEATURES		BANK VEGETATION		CHANNEL VEGETATION		KM.
		RET.	ENH.	RET.	ENH.	RET.	ENH.	
	North							
1.	Bisham Brook, Temple Park	5/NA	0/NA	5	0/NA	3	0	2.0
2.	County Ditch, Staines	5/NA	0/NA	4.5	2/NA	2.5	0/NA	0.5
3.	River Ash, Staines, phase 2	5	5	5	5	5	N/A	0.5
	East							
4.	Addlestone Bourne, Mimbr.	5/NA	2/NA	4.25	0/NA	2	N/A	2.0
	West							
5.	R. Tillingbourne, Chilworth	4.75 /NA	4.75	5	N/A	5	N/A	3.0
6.	Cove Brook, Farnborough	5	0	5	N/A	3.71	N/A	3.5
7.	Holly Cross Stream	2.5 /NA	0	4	N/A	3.33	N/A	3.0
8.	R. Loddon, Sherfield	4	3.5	4.5	N/A	2.5	N/A	1.0
9.	R. Blackwater, Ford Lane	5	4.67	5	4	5	N/A	2.0
	Average Scores	**4.58**	**2.21**	**4.69**	**2.2**	**3.56**	**0**	

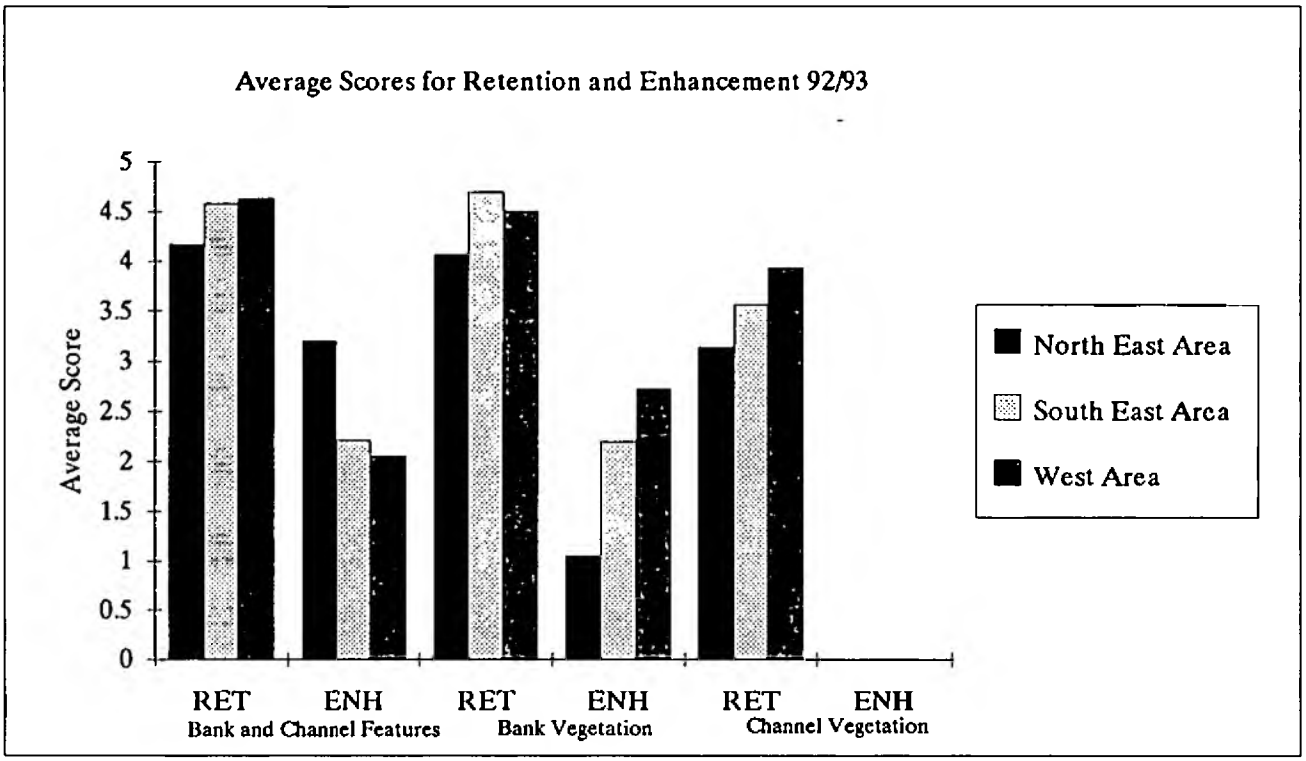
APPENDIX 3

AVERAGE SCORES

WESTERN AREA

	RIVER AND REACH	BANK & CHANNEL FEATURES		BANK VEGETATION		CHANNEL VEGETATION		KM.
		RET.	ENH.	RET.	ENH.	RET.	ENH.	
1.	**Bernwood** R. Thame, Shabbington	5	NA	5	5	4	N/A	3.0
2.	**Kennet** Sulham Brook	5	1.5	3.5	3	2.5	NA	1.0
3.	**Thameshead** R. Windrush, Witney	5	3	5	0	5	N/A	0.5
4.	R. Windrush, Worsham	4.44	2.6	4.17	2.2	5	N/A	3.0
5.	R. Coln, Quenington	5	3.17	5	0.83	5	N/A	4.0
6.	R. Thames, Ashton/Cricklade	5	0	4.8	4	5	N/A	3.0
7.	**Wychwood** R. Cherwell, N Aston Mill	3	NA	4	4	1	N/A	0.5
	Average Scores	**4.63**	**2.05**	**4.5**	**2.72**	**3.93**	**N/A**	

APPENDIX 4


Average Scores for Retention and Enhancement 92/93
Average Score
5
4.5
4
3.5
3
2.5
2
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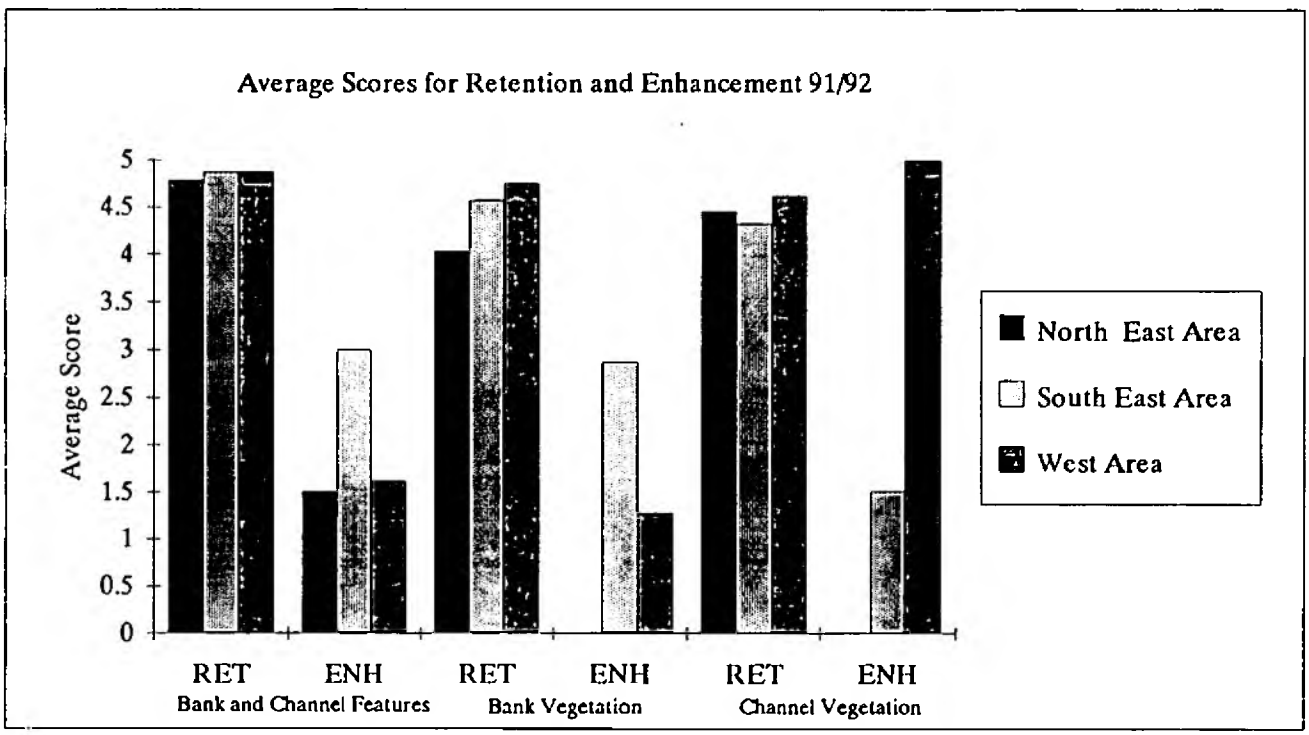
RET
ENH
RET
ENH
RET
ENH
Bank and Channel Features
Bank Vegetation
Channel Vegetation
North East Area
South East Area
West Area


Average Scores for Retention and Enhancement 91/92
Average Score
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RET
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Bank and Channel Features
Bank Vegetation
Channel Vegetation
North East Area
South East Area
West Area