NRA

Urban Waste Water Treatment Directive Monitoring of Desiganted and Candidate Sensitive Areas (eutrophic)

1995 Macrophyte Surveys

December 1995

ENVIRONMENT AGENCY

National Rivers Authority
Anglian Region

Urban Waste Water Treatment Directive Monitoring of Designated and Candidate Sensitive Areas (eutrophic)

1995 Macrophyte Surveys

1. Introduction

The aim of the macrophyte surveys which are being carried out over three seasons (1994 -1996) is to monitor designated Sensitive Areas (eutrophic) (SA(e)) and collect data on candidate SA(e)s for the review in 1997. There are 13 designated Sensitive Areas (eutrophic) (SA(e)) within Anglian Region and 26 candidate SA(e)s.

The data collected from macrophyte surveys will be used for two purposes:

1) to assess whether an SA(e) is eutrophic
2) to assess the impact of qualifying discharges on SA(e)s

This report presents a summary of the data collected during 1995 together with suggestions regarding data presentation. Recommendations for the final year of survey work are also made.

2. Methods

Macrophyte surveys were carried out by the Areas between June and September 1995 using the Standard methodology[1] developed in the Anglian Region and issued for guidance by the National Group convened to co-ordinate UWWTD monitoring. In many cases two surveys have been carried out at each site during 1995 - one early in the season and one later when macrophyte cover is at a maximum.

Briefly, where possible, comparable 100m stretches of the river channel upstream and downstream of qualifying discharges were surveyed. All taxa present on the issued checklists were recorded, together with an estimate of the abundance of each on a 9 point abundance scale. In addition, the total percentage cover was estimated. A variety of other habitat variables were also assessed, including width, depth, water clarity, substrate composition, flow, bed stability and shading. These parameters are simply used to assess whether U/S and D/S survey stretches are broadly similar.

The data have been transferred from field sheets to a spreadsheet and Mean Trophic Ranks have been calculated using the 9 point abundance scale[2]. A Trophic Score of 1 to 10 has been assigned to each of 126 aquatic macrophyte species. Those species which indicate eutrophic (nutrient rich) conditions score 1 and those which are intolerant to high nutrient levels score 10. The Mean Trophic Rank is calculated as follows:

$$\frac{\textit{Total of (Trophic Score} \times \textit{Abundance Category)}}{\textit{Total of Abundance Categories}} \times 10$$

3. Results

3.1 Surveys

Macrophyte surveys have been carried out at 63 STWs with a total of 182 100m surveys completed. A full list of designated and candidate SA(e)s and qualifying discharges are given in Tables 1-3 together with survey details for 1994 and 1995.

3.2 Summary data

Summary data have been produced and plotted in the form of MTR, total percentage cover and total number of taxa for each survey. For some a brief commentary has been added as an example. This is the basic information likely to be required for the 1997 review.

The 1995 macrophyte survey data are presented in three sections, one for each Area. Within each section data are presented by SA(e). In some cases, where the qualifying discharges are relevant to one or more SA(e), graphs have been combined.

The data are encouraging, in terms of making an assessment of the trophic status of the SA(e)s. Generally, Mean Trophic Ranks are reasonably low (<30) indicating high nutrient conditions. Average scores for different river types, using the 5 point scale, range from 30.2 (Type 2 - Lowland) to 69.3 (Type 10 - upland rivers).

In addition, total percentage covers are quite high (mean = 60.9% $\pm$ 30.5).

If the nutrient load from an STW has a significant impact on the macrophyte community one would expect the MTR to go down while the total percentage cover increases. In addition, the number of taxa should reduce. The data from 1994 suggest that where an STW input does affect the macrophyte community the macrophyte survey results can indicate this. There is, however, a danger in expecting data to show an increase in nutrient status downstream of an STW. There are a variety of factors which also affect the macrophyte community, such as flow, substrate and upstream nutrient status, which will confound the identification of an individual STWs impact on nutrient status.

In many cases it is difficult to explain trends in the data as local knowledge is required and in the current format catchment trends are difficult to assess.

3.3 Data presentation

The format for the review reports has not yet been decided and consideration must be given to the most effective way of presenting the macrophyte evidence. The information presented to AWS and DoE must be simple and readily understandable.

The information collected during the three years of survey work will be considerable. Despite being a summary of the full taxa lists, the data presented on the graphs are not easy to interpret. One difficulty is that the graphs do not give any indication as to the geographical spread of the data throughout a SA(e).

An example of an alternative presentation format produced using EasyMap is appended for consideration. If this type of presentation is considered to be useful graphs can be produced by EasyMap provided that suitable .RES files are constructed.

4. Quality assurance

Quality assurance for this work has been implemented in a number of ways.

The Standard Methodology manual should provide a consistent basis for the surveys.

All staff carrying out the survey work received some form of training prior to carrying out surveys during 1995. A National 2 day training course, lead by Nigel Holmes was attended by three of the Region's staff (one from each Area). A one day field workshop was also run in the Region for all staff carrying out macrophyte surveys. This consisted of a practice session and discussion plus a spot test of identification skills.

In addition, the re-surveying of survey sections was carried out. During 1995 two 100m survey stretches (one U/S and one D/S of a qualifying discharge) were re-surveyed in each Area by a team of biologists from a different Area. A full report on the results of these surveys has previously been produced and circulated. In general the exercise suggested that the results of macrophyte surveys are reproducible. The exercise highlighted some differences between the Areas which should be addressed in future workshops.

5. Recommendations

Before the 1996 survey season it is recommended that all survey sites should be reviewed to ensure that they are suitable for macrophyte surveying. Sites which are heavily maintained (dredged, weed-cut or recently engineered), have considerable boat traffic or are tidal are probably not going to yield macrophyte data representative of the trophic status. This cannot however be used as an excuse simply to reduce the work programme. As has been stated previously NRA HO and DoE are expecting to see macrophyte data and a very good case must be made not to carry out repeat surveys in 1996.

At some sites it has been difficult to find suitably matched U/S-D/S survey stretches. Where this has not been possible it is suggested that surveys to characterise the SA(e) are carried out further away from the STW.

If it is felt that surveys away from STW inputs would provide additional evidence to support the designation then these should be done in addition to U/S-D/S comparisons at qualifying discharges.

Every effort must be made to complete surveys U/S and D/S of STWs input. Where total percentage macrophyte cover is 100% then the underwater camera must be used to assess the 3D abundance of individual species. It is especially important to make as full a

record as possible at sites which have a high percentage cover - this is the best type of evidence in support of an SA(e).

Every effort should be made to survey qualifying discharges in individual SA(e)s on the same day. If this is not possible because of the number of discharges then they should be covered over as short a time as possible so that they are more directly comparable. This is particularly important when two surveys in a single season are being carried out. If the surveys in a SA(e) are spread over several weeks as any changes between early season and peak season growth will be confused.

If the data do not support P-stripping or SA(e) designation then this too must be accurately recorded. The macrophyte data is only one part of a whole range of information which we are required to collate for the 1997 review. It is the weight of evidence as well as negotiation with AWS which will tip the balance.

A number of qualifying discharges have not been surveyed to date. Some may not be suitable for macrophyte surveys but those which have not been surveyed in 1994 and/or 1995 must be considered for the 1996 survey season.

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[1] Standard methodologies. Assessment of Freshwater Riverine Environments using Macrophytes. NRA Anglian Region Final Draft April 1994

[2] Macrophytes for Water & Other River Quality Assessments. A report to the National Rivers Authority. Nigel Holmes. March 1995

Table 1(a) Macrophyte Surveys - Central Area

Designated SA(e)	Qualifying discharges	Monitored 1994	Monitored 1995
Cutoff & Relief Channel	Watton Brook:		
	Watton (I)		✓
	Cam & Ely Ouse:		
	Saffron Walden (I)		
	Sawston (I)		
	Royston (I)		
	Cambridge (I)		✓
	Ely (I)		✓
	Haslingfiled (I)	✓	✓
	Old West River:		
	Over (I)		✓
	Soham Lode:		
	Newmarket (I)		
	Soham (I)	✓	✓
	Lark:		
	Bury St Edmunds (I)		✓
	Mildenhall (I)		✓
	Little Ouse:		
	Thetford (I)	✓	✓
	Attleborough (I)	✓	✓
Foxcote Reservoir	Brackley (I)		✓
Grafham Water	Great Ouse:		
	Cotton Valley (I)		✓
	Uttons Drove (I)	✓	
	Bedford (I)		✓
	St Neots (I)		✓
	Huntingdon (I)		✓
	St Ives (I)		
	Gt Ouse Headwaters:		
	Brackley (I)		✓
	Buckingham (I)		✓
	Towcester (I)	✓	✓
	Ouzel:		
	Dunstable (I)		✓
	Leighton Linslade (I)	✓	✓
	Ivel:		
	Hitchin (I)		✓
	Letchworth (I)		✓
	Poppy Hill (I)		✓
	Clifton (I)		✓
	Biggleswade (I)		✓
	Sandy (I)	✓	✓
	Flit:		
	Flitwick (I)		✓
	Chalton (I)		

(I) - indirect discharge; (D) - direct discharge

Table 1(b) Macrophyte Surveys - Central Area

Candidate SA(e)	Qualifying discharges	Monitored 1994	Monitored 1995
Cam & Ely Ouse (put forward to DoE but not designated)	Cam & Ely Ouse:		
	Saffron Walden (I)		
	Sawston (I)		
	Royston (I)		
	Cambridge (D)		✓
	Ely (I)		✓
	Haslingfiled (I)	✓	✓
	Old West River:		
	Over (I)		✓
	Soham Lode:		
	Newmarket (I)		
	Soham (I)	✓	✓
	Lark:		
	Bury St Edmunds (I)		✓
	Mildenhall (I)		✓
	Little Ouse:		
	Thetford (I)	✓	✓
	Attleborough (I)	✓	✓
Little Ouse (put forward to DoE but not designated)	Thetford (I)	✓	✓
	Attleborough (I)	✓	✓
Great Ouse (1997 review)	Great Ouse:		
	Cotton Valley (D)		✓
	Uttons Drove (I)	✓	✓
	Bedford (D)		✓
	St Neots (D)		✓
	Huntingdon (D)		✓
	St Ives (D)		
	Gt Ouse Headwaters:		
	Brackley (I)		✓
	Buckingham (I)		✓
	Towcester (I)	✓	✓
	Ouzel:		
	Dunstable (I)		✓
	Leighton Linslade (I)	✓	✓
	Ivel:		
	Hitchin (I)		✓
	Letchworth (I)		✓
	Poppy Hill (I)		✓
	Clifton (I)		✓
	Biggleswade (I)		✓
	Sandy (I)	✓	✓
	Flit:		
	Flitwick (I)		✓
	Chalton (I)		
Headwaters of the Great Ouse (1997 review)	Brackley (D)		✓
	Buckingham (D)		✓
	Towcester (D)	✓	✓

(I) - indirect discharge; (D) - direct discharge

Table 1(b) Macrophyte Surveys - Central Area

Candidate SA(e)	Qualifying discharges	Monitored 1994	Monitored 1995
Middle Level System (1997 review)	Whittlesey (D) March (D) (Nene Catchment Discharges)	✓	✓ ✓
Old West River (1997 review)	Over (I)		✓
Ouzel (1997 review)	Ouzel: Dunstable (I) Leighton Linslade (I)	 ✓	 ✓ ✓
River Flit (1997 review)	Flitwick (D) Chalton (D)		✓
River Ivel (1997 review)	Hitchin (D) Letchworth (D) Poppy Hill (D) Clifton (D) Biggleswade (D) Sandy (D) Flit: Flitwick (I) Chalton (I)	 ✓ 	✓ ✓ ✓ ✓ ✓ ✓
River Lark (1997 review)	Bury St Edmunds (D) Mildenhall (D)		✓ ✓
Soham Lode (1997 review)	Newmarket (D) Soham (D)	 ✓	 ✓

(I) - indirect discharge; (D) - direct discharge

Table 2(a) Macrophyte Surveys - Eastern Area

Designated SA(e)	Qualifying discharges	Monitored 1994	Monitored 1995
Hanningfield Reservoir	Bocking (I) Braintree (I) Shenfield (I)	✓ ✓ ✓	✓ ✓
Alton Water	Gipping: Needham Market (I) Stowmarket (I)	 ✓ ✓	 ✓ ✓
River Bure	Belaugh (D) Ant: Stalham (I)	✓ ✓	✓ ✓
River Ant	Stalham (D)	✓	✓
Ardleigh Reservoir	Halstead (I)	✓	✓

(I) - indirect discharge; (D) - direct discharge

Table 2(b) Macrophyte Surveys - Eastern Area

Candidate SA(e)	Qualifying discharges	Monitored 1994	Monitored 1995
Rivers Brain & Blackwater (insufficient evidence)	Bocking (D) Braintree (D)	✓ ✓	✓ ✓
Rivers Wid, Can & Chelmer (insufficient evidence)	Shenfield (D)	✓	✓
River Gipping (1997 review)	Needham Market (D) Stowmarket (D)	✓ ✓	✓ ✓
River Colne (insufficient evidence)	Halstead (D)	✓	✓
River Waveney/Starston Brook (1997 review)	Diss (D) Harleston (D) Eye (I) Beccles (D)	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
Abberton Reservoir (put to DoE but not designated)	Stour/Stour Brook: Haverhill (I) Sudbury (I)	 ✓ ✓	 ✓ ✓
River Yare/Witton Run (1997 review)	Wymondham (D) Whitlingham (D) Strumpshaw (D)	✓ ✓ ✓	✓ ✓ ✓
River Wensum (1997 review)	East Dereham (D) Fakenham (D)	✓ ✓	✓ ✓
River Stour/Stour Brook (put to DoE but not designated)	Haverhill (I) Sudbury (I)	✓ ✓	✓ ✓
Mardyke (insufficient evidence)	Upminster (D)	✓	✓

(I) - indirect discharge; (D) - direct discharge

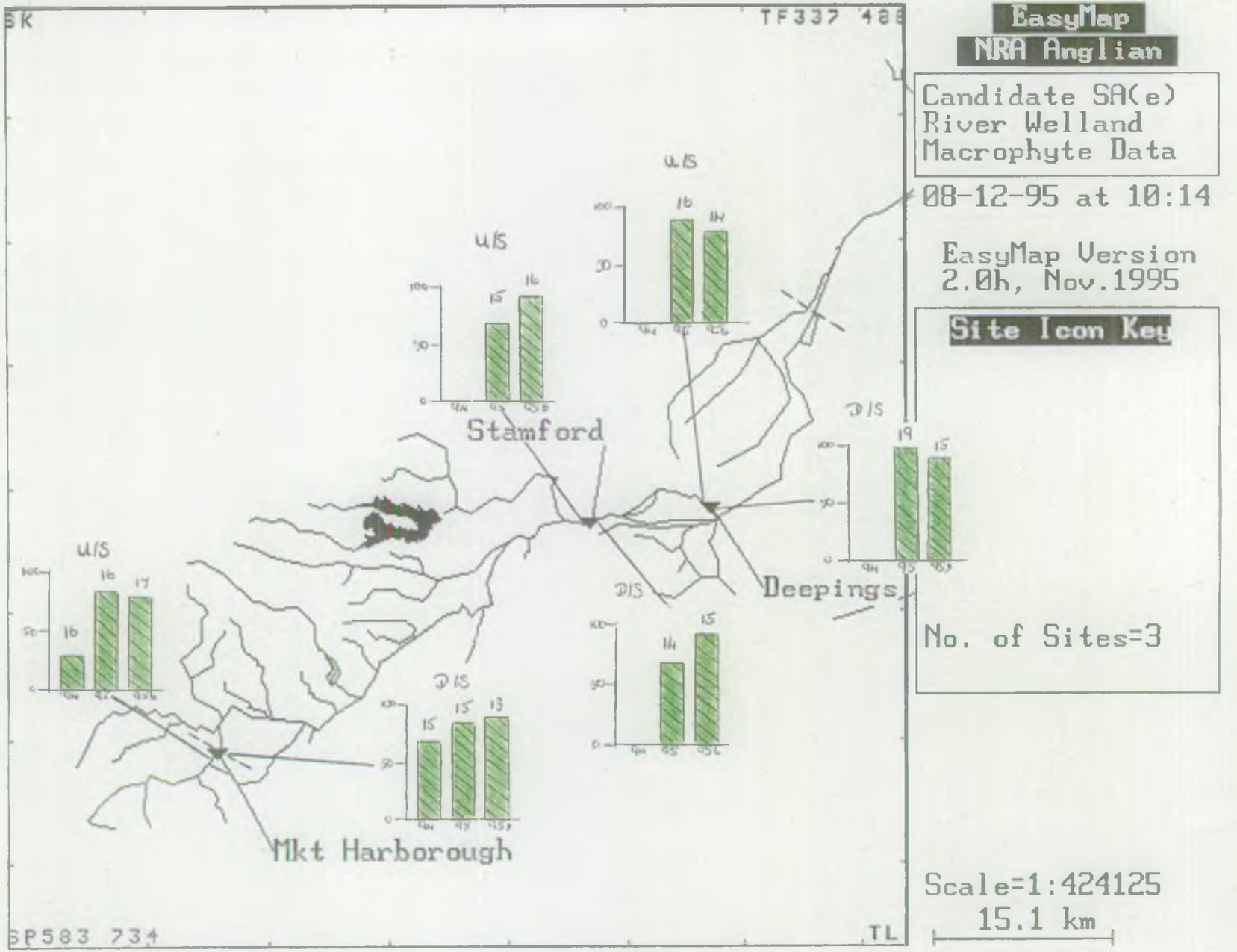
Table 3(a) Macrophyte Surveys - Northern Area

Designated SA(e)	Qualifying discharges	Monitored 1994	Monitored 1995
River Nene	Gt Billing (D)	✓	✓
	Broadholme (D)	✓	✓
	Whilton (I)	✓	✓
	Raunds (D)	✓	✓
	Corby (D)	✓	✓
Covenham Reservoir	Louth (I)	✓	✓
Louth Canal	Louth (D)	✓	✓
Pitsford Reservoir	Whilton (I)	✓	✓
Rutland Water	Oakham (D)	not suitable	
	Market Harborough (I)	✓	✓
	Nene:		
	Gt Billing (I)	✓	✓
	Broadholme (I)	✓	✓
	Whilton (I)	✓	✓
	Raunds (I)	✓	✓
	Corby (I)	✓	✓

Table 3(b) Macrophyte Surveys - Northern Area

Candidate SA(e)	Qualifying discharges	Monitored 1994	Monitored 1995
River Welland (put to DoE but not designated)	Deepings (D)		✓
	Stamford (D)		✓
	Market Harborough (D)	✓	✓
River Witham (put to DoE but not designated)	Marston (D)		✓
	North Hykeham (D)		✓
	Lincoln (Canwick) (D)		✓
	Sleaford ()		
	Anwick (I)		✓
Bourne Eau/R.Glen (insufficient evidence)	Bourne (D)		
Farroway Drain (insufficient evidence)	Anwick (I)		✓
Kyme Eau (insufficient evidence)	Sleaford (I)		✓

(I) - indirect discharge; (D) - direct discharge



EasyMap
NRA Anglian

Candidate SA(e)
River Welland
Macrophyte Data

08-12-95 at 10:14

EasyMap Version
2.0h, Nov.1995

Site Icon Key

No. of Sites=3

Scale=1:424125
15.1 km

SECTION 1

CENTRAL AREA

Designated SA(e) - Cutoff & Relief Channel

Macrophyte Survey Results 1995

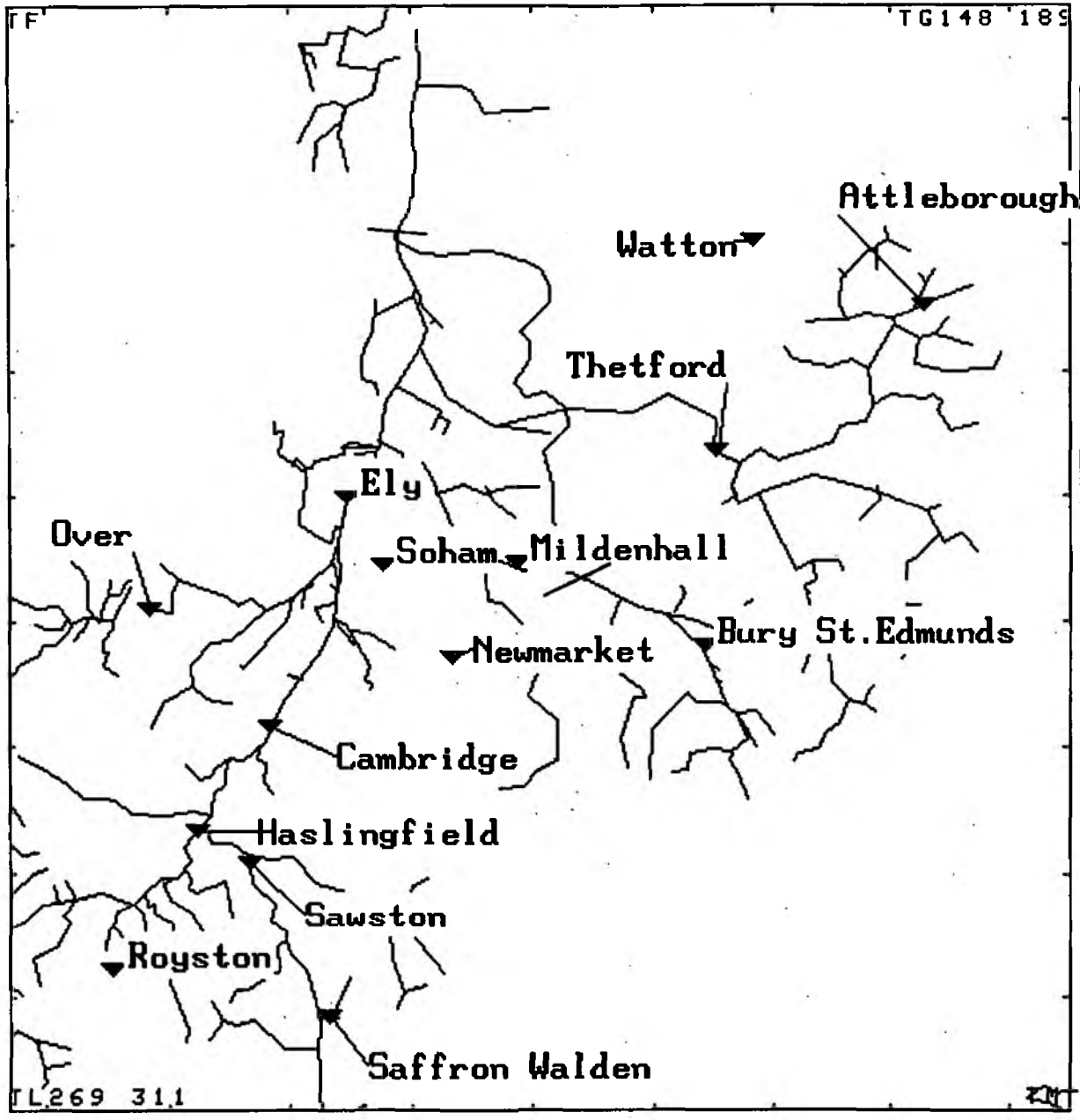
Qualifying discharges

Figure 1	Watton Brook:	Watton (I)
Figure 2	Cam & Ely Ouse:	Cambridge (I) Ely (I) Haslingfield (I)
Figure 3	Old West River:	Over (I)
Figure 4	Soham Lode:	Soham (I)
Figure 5	Lark:	Bury St Edmunds (I) Mildenhall (I)
Figure 6	Little Ouse:	Thetford (I) Attleborough (I)

Commentary (example)

Central Area
Designated SA(e) - Cutoff & Relief Channel

Generally, the data suggest that the systems flowing into the Cutoff and Relief channel designated SA(e) are of high nutrient status with macrophyte communities with relatively low Mean Trophic Ranks, mostly less than 30, and low diversity. Some sites have very high total percentage cover both U/S and D/S of the STW input *eg* Haslingfield, Soham, Mildenhall and Thetford. Of all the STWs monitored in 1995 in this SA(e) only Bury St Edmunds STW shows a marked increase in macrophyte cover D/S of the STW input combined with a MTR of 25 or less which suggests that the STW is having a significant impact on the nutrient status of the river.



EasyMap
NRA Anglian

Designated SA(e)
Cutoff & Relief
Channel

18-12-95 at 14:41

EasyMap Version
2.0h, Nov.1995

Site Icon Key

No. of Sites=94
Search Was Halted

Scale=1:494325
17.6 km

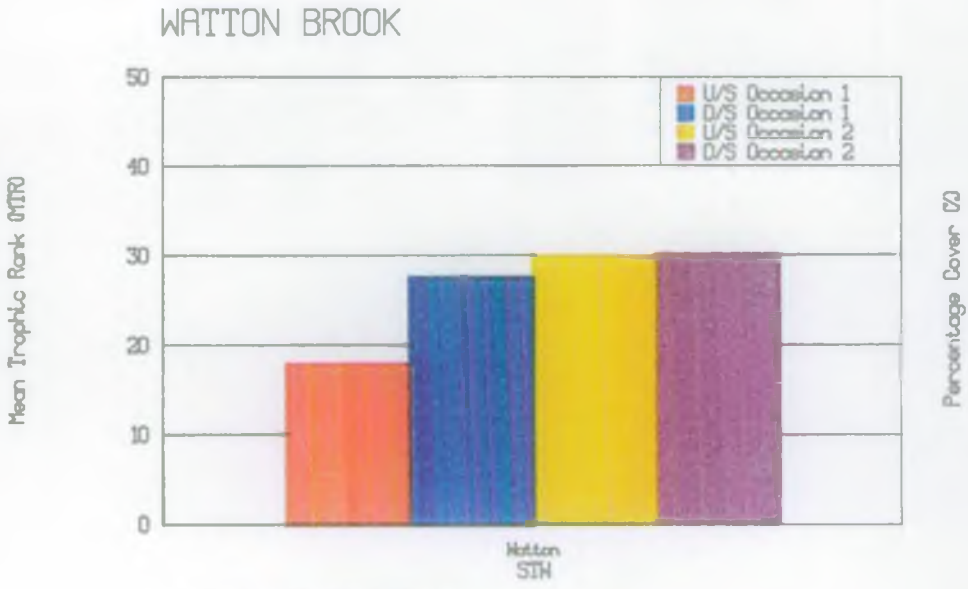


Figure Xa) - Mean Trophic Rank (MTR)

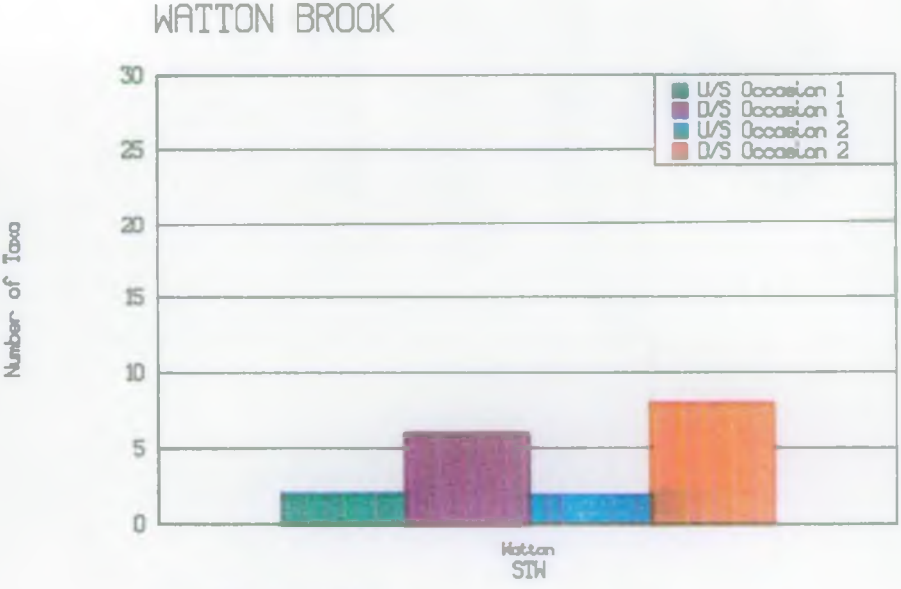


Figure Xa) - Number of Taxa

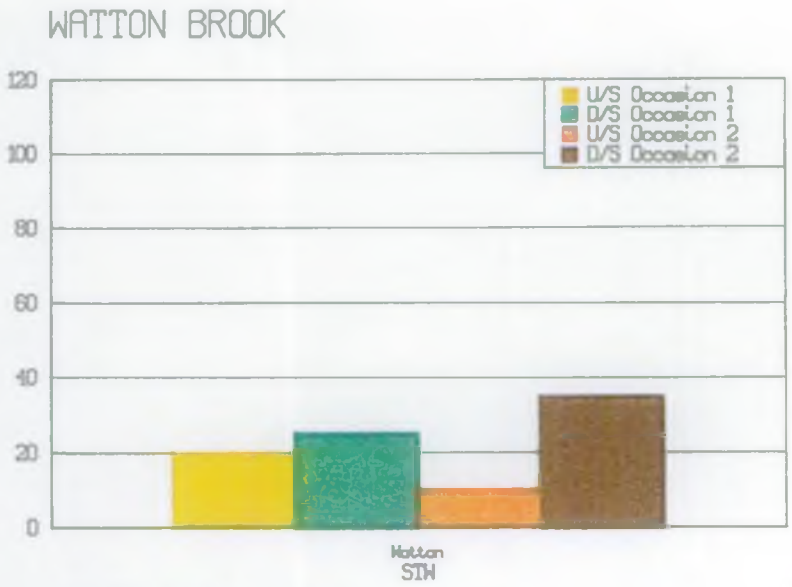


Figure 10b) - Total Percentage Cover

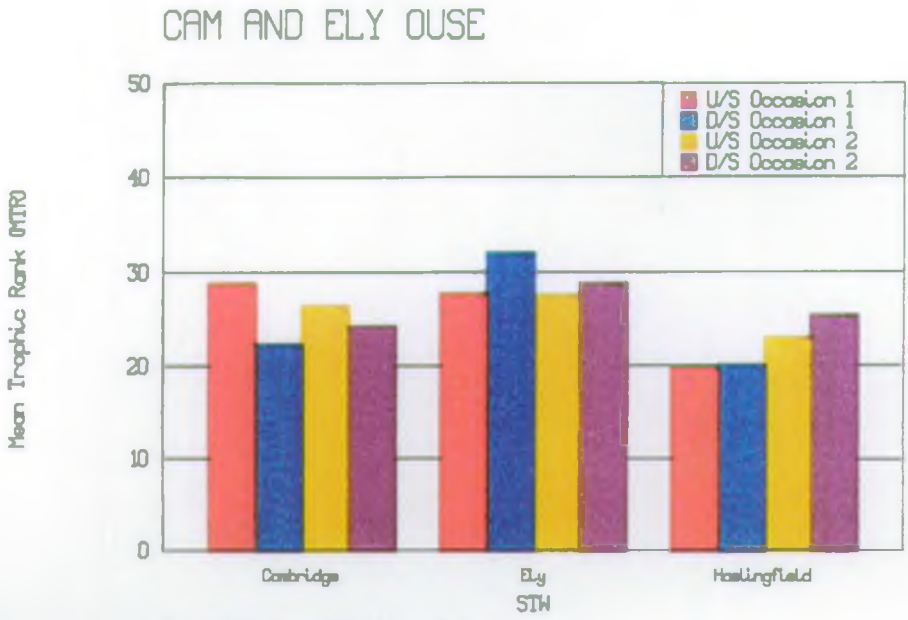


Figure 2(a) - Mean Trophic Rank (MTR)

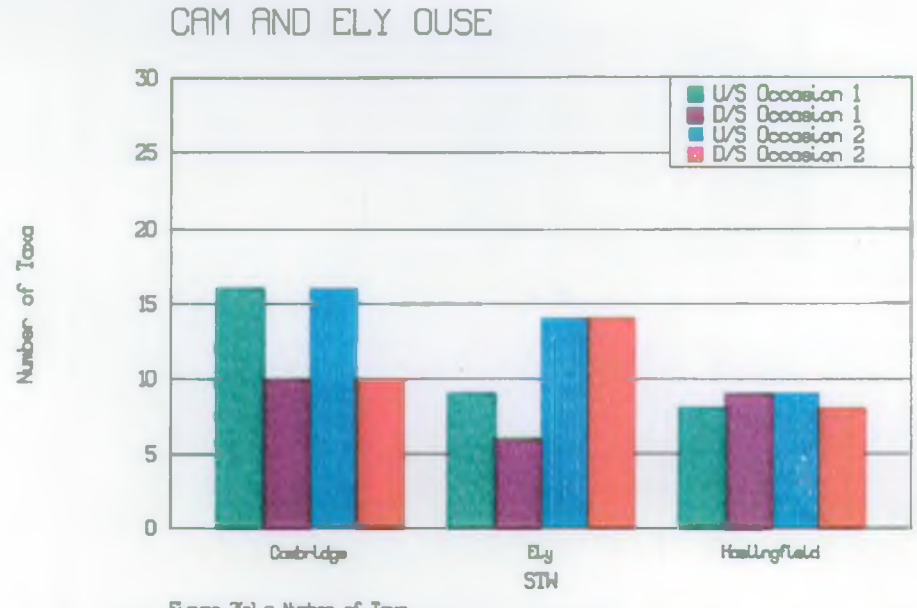


Figure 2(a) - Number of Taxa

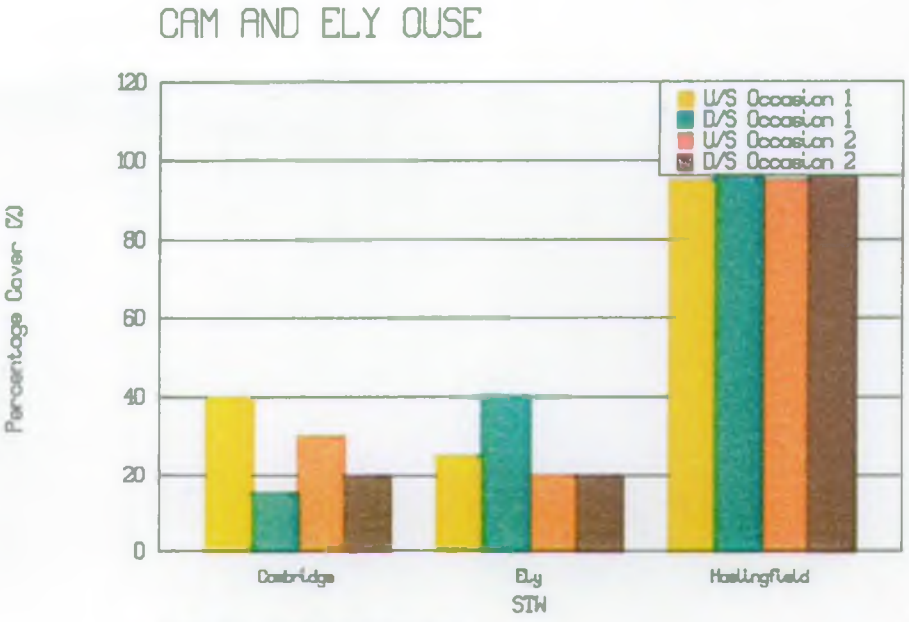


Figure 2b) - Total Percentage Cover

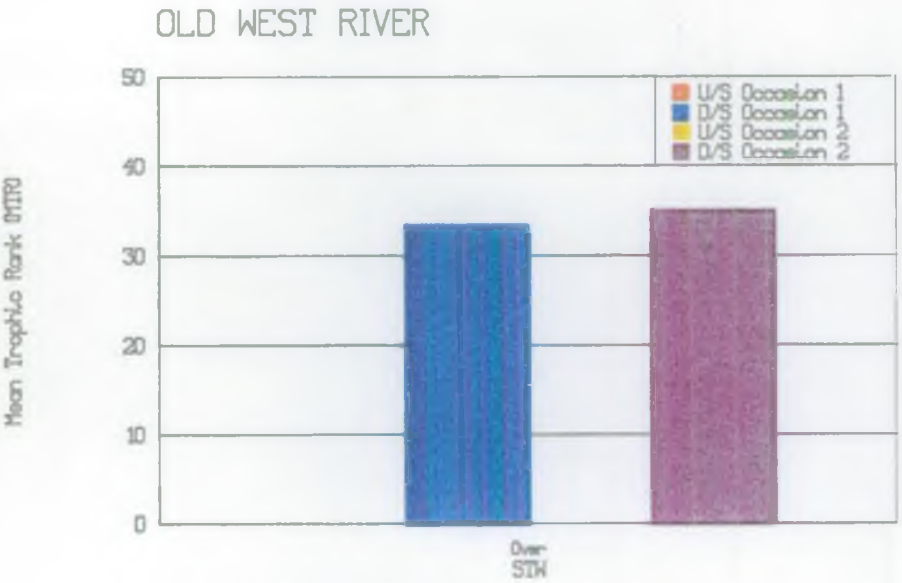


Figure 3a) - Mean Trophic Rank (MTR)

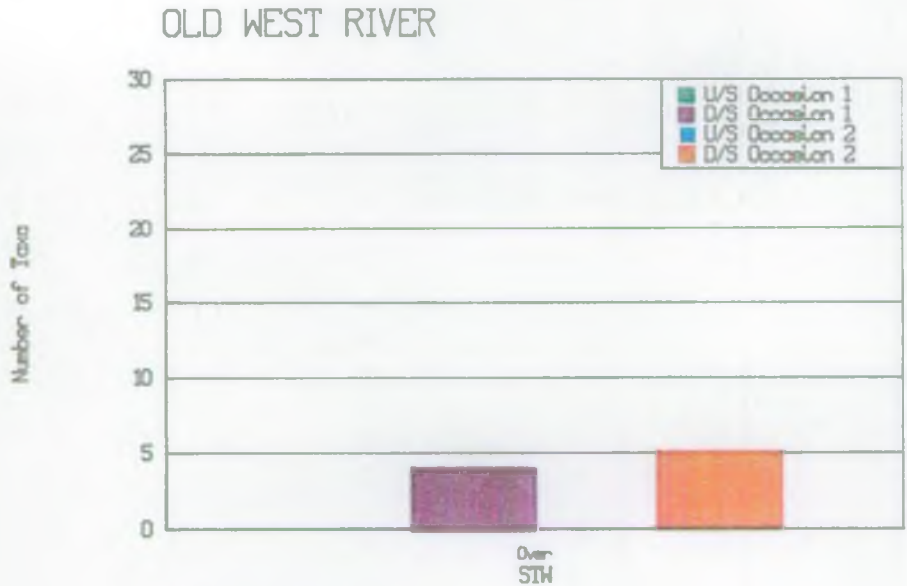


Figure 3a) - Number of Taxa

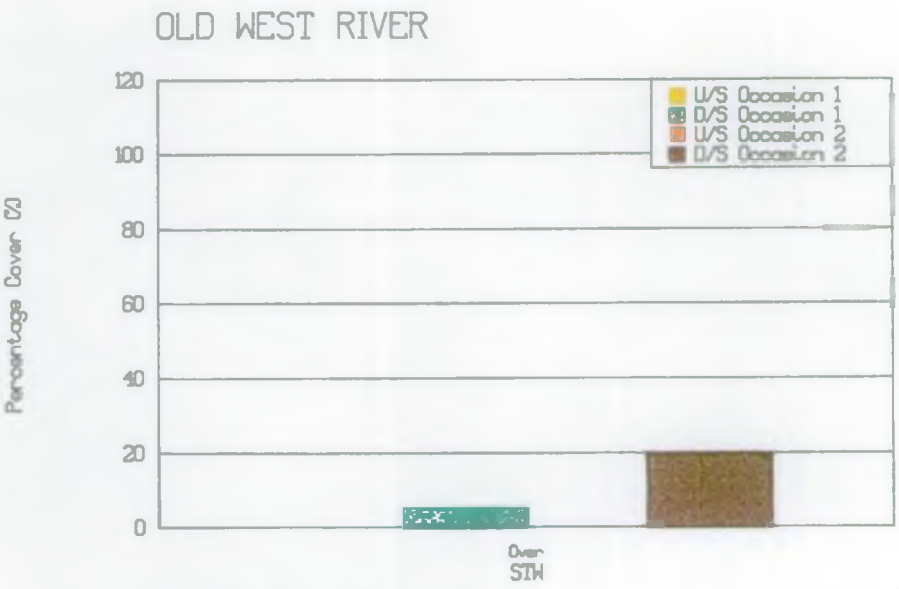


Figure 3b) - Total Percentage Cover

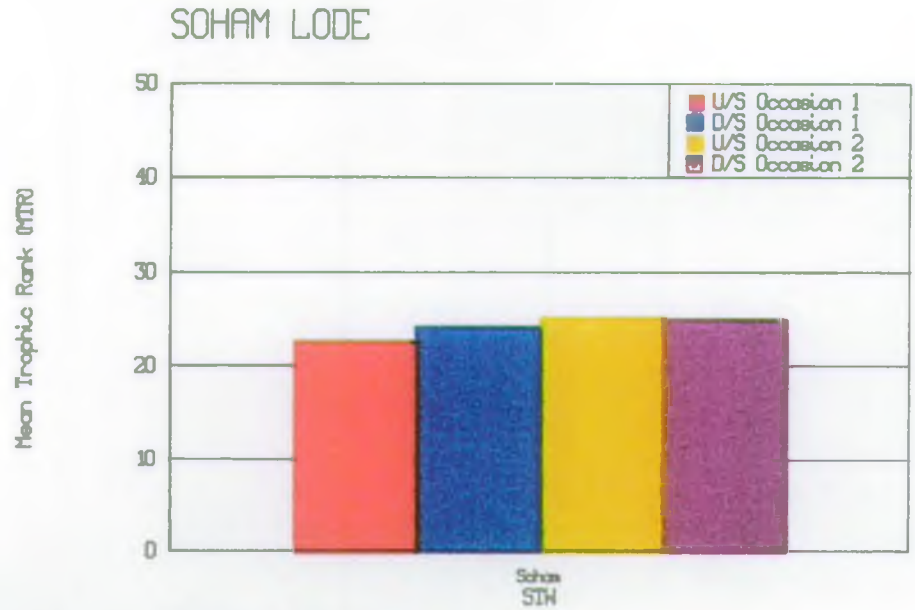


Figure 4a) - Mean Trophic Rank (MTR)

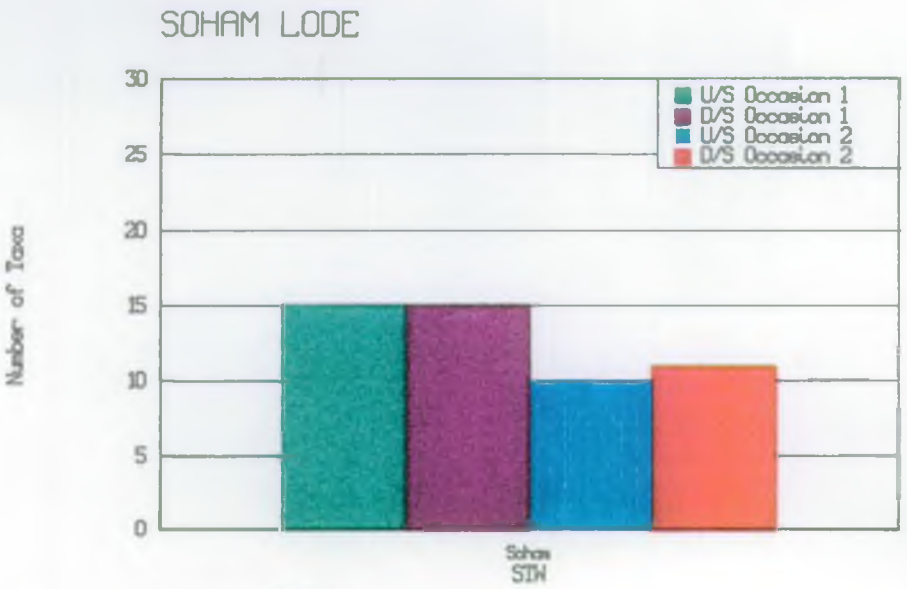


Figure 4a) - Number of Taxa

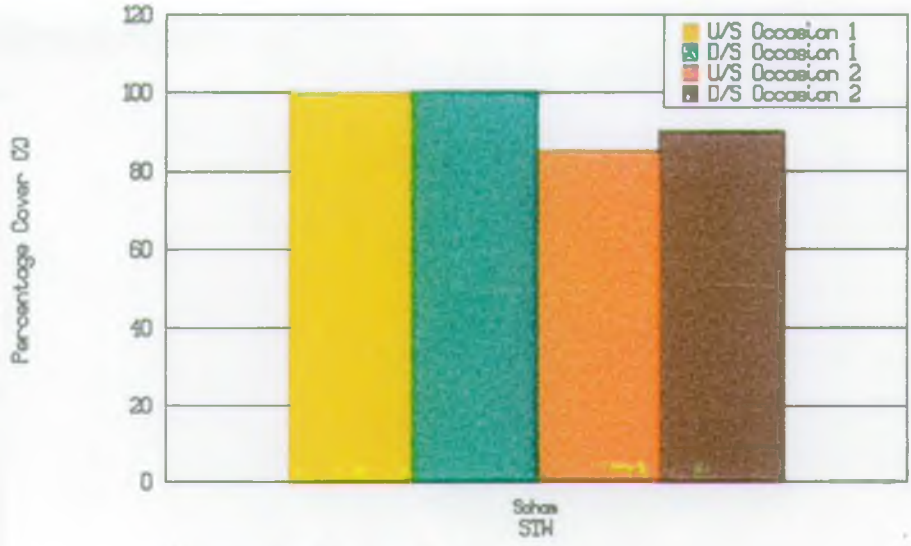


Figure 4(b) - Total Percentage Cover

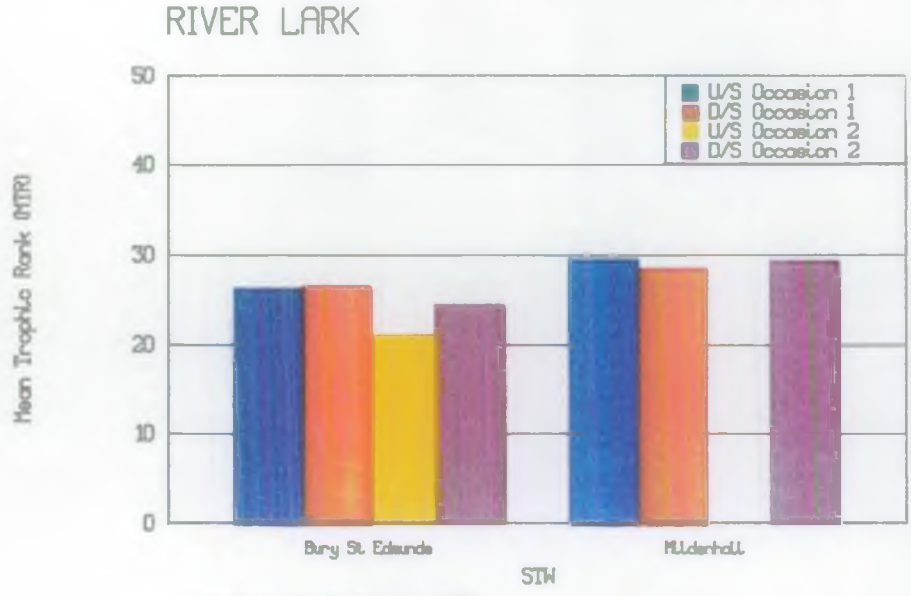


Figure 5(a) - Mean Trophic Rank (MTR)

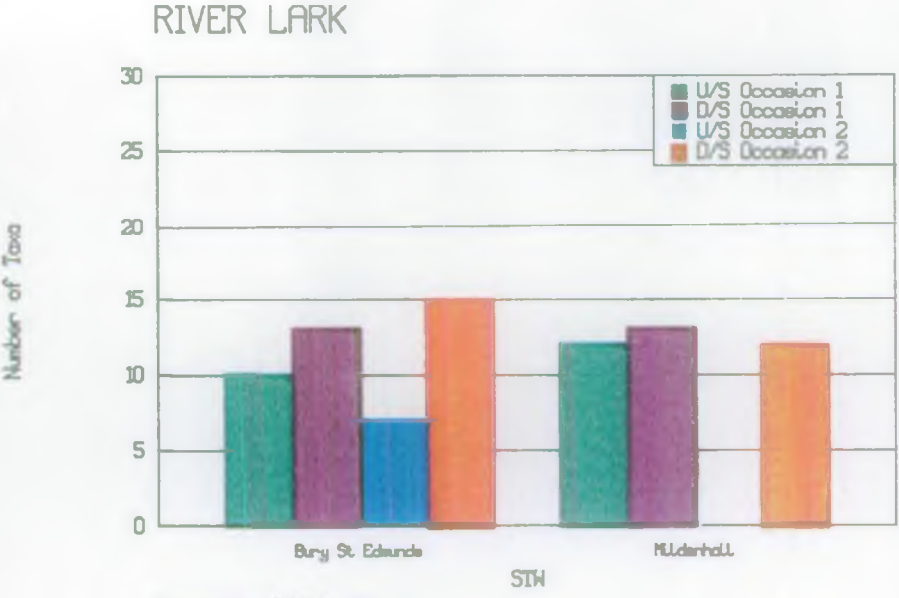


Figure 5(a) - Number of Taxa

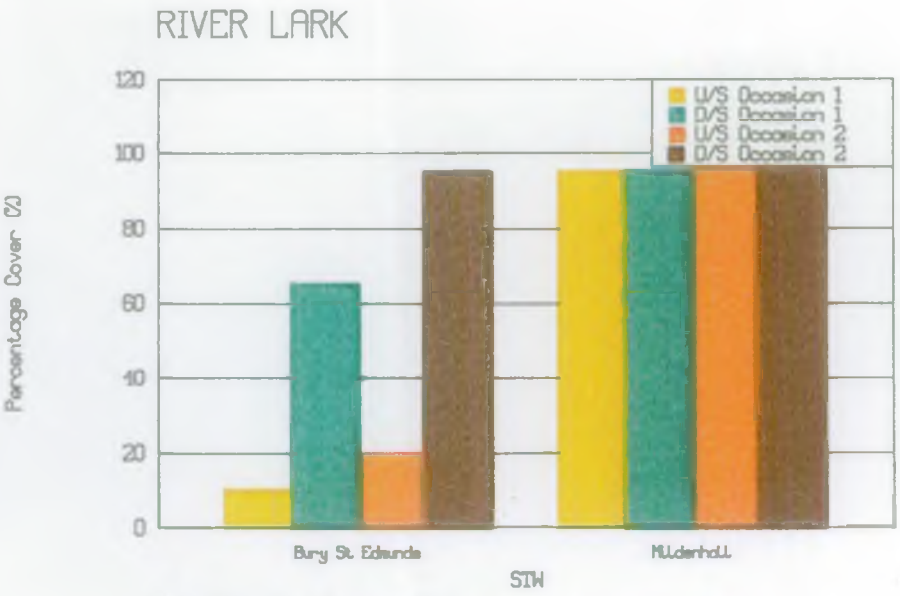


Figure 5b) - Total Percentage Cover

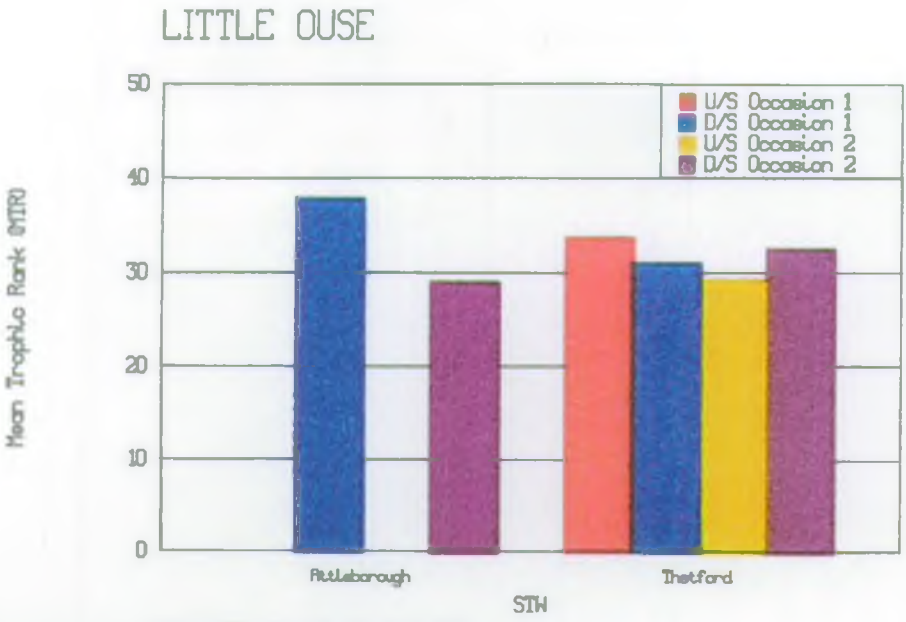


Figure 6(a) - Mean Trophic Rank (MTR)

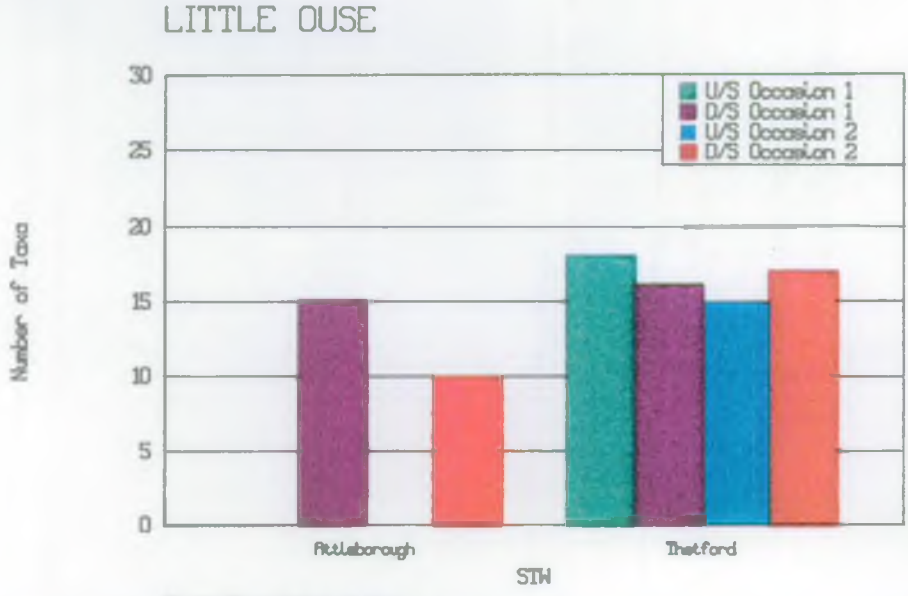


Figure 6(a) - Number of Taxa

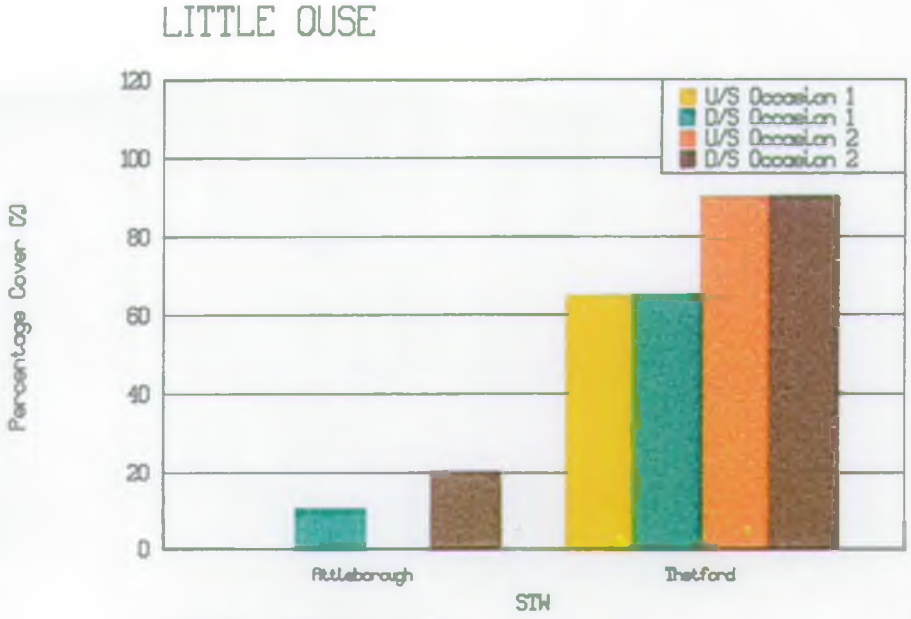


Figure 6(b) - Total Percentage Cover

Designated SA(e) - Foxcote Reservoir

Macrophyte Survey Results 1995

Qualifying discharges

Figure 7 Foxcote Reservoir: Brackley (I)

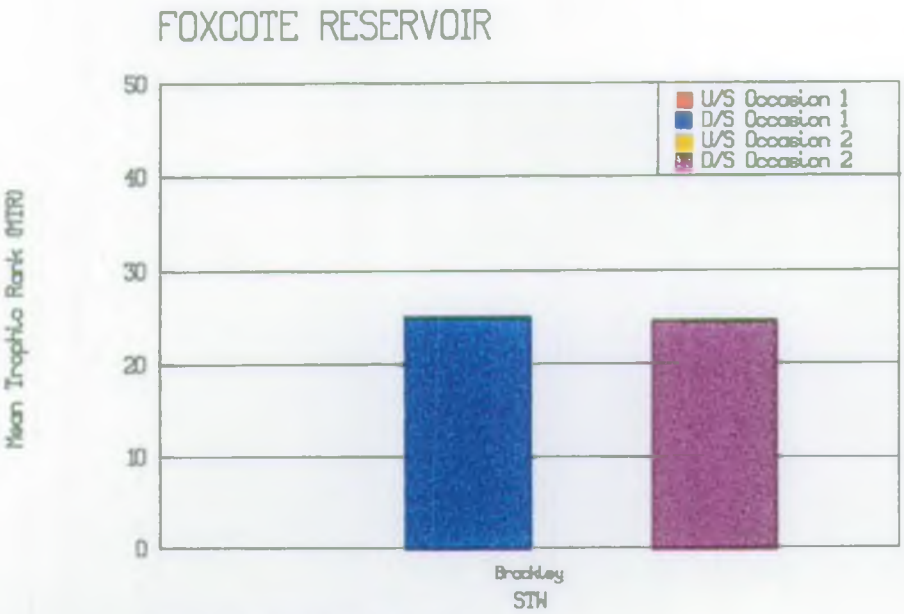


Figure 7(a) - Mean Trophic Rank (MTR)

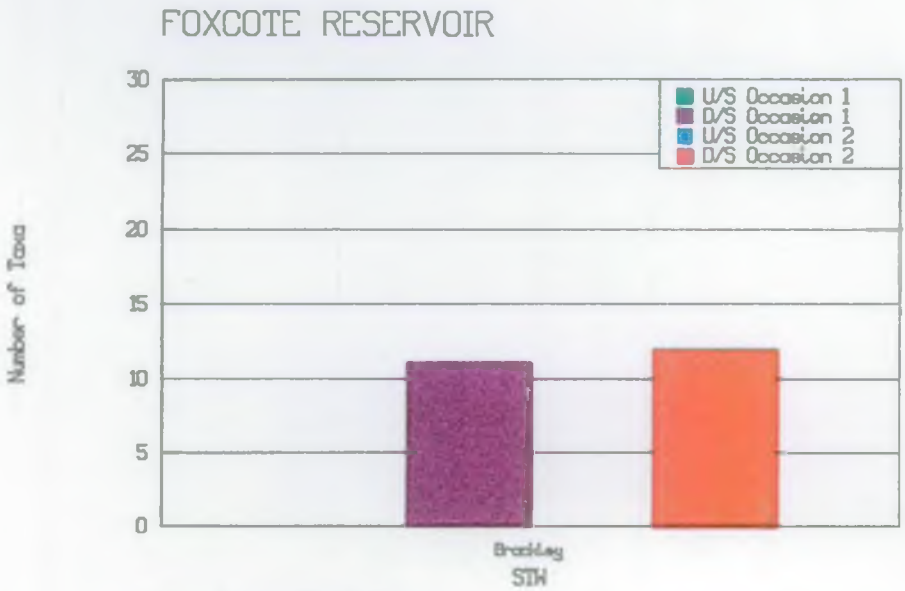


Figure 7(a) - Number of Taxa

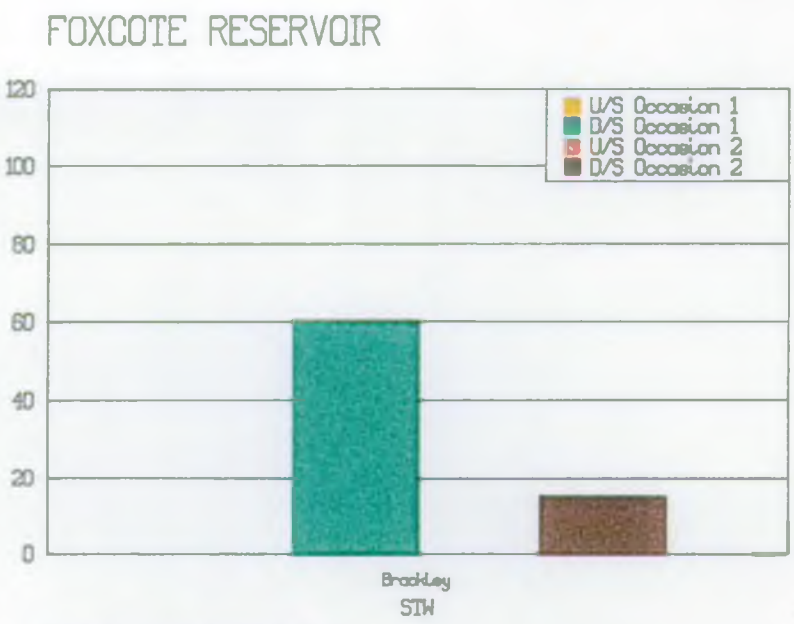


Figure 7(b) - Total Percentage Cover

Designated SA(e) - Grafham Water

Macrophyte Survey Results 1995

Qualifying discharges

Figure 8	Great Ouse:	Cotton Valley (I) Bedford (I) St Neots (I) Huntingdon (I)
Figure 9	Gt Ouse Headwaters:	Brackley (I) Buckingham (I) Towcester (I)
Figure 10	Ouzel:	Dunstable (I) Leighton Linslade (I)
Figure 11	Ivel:	Hitchin (I) Letchworth (I) Poppy Hill (I) Clifton (I) Biggleswade (I) Sandy (I)
Figure 12	Flit:	Flitwick (I)

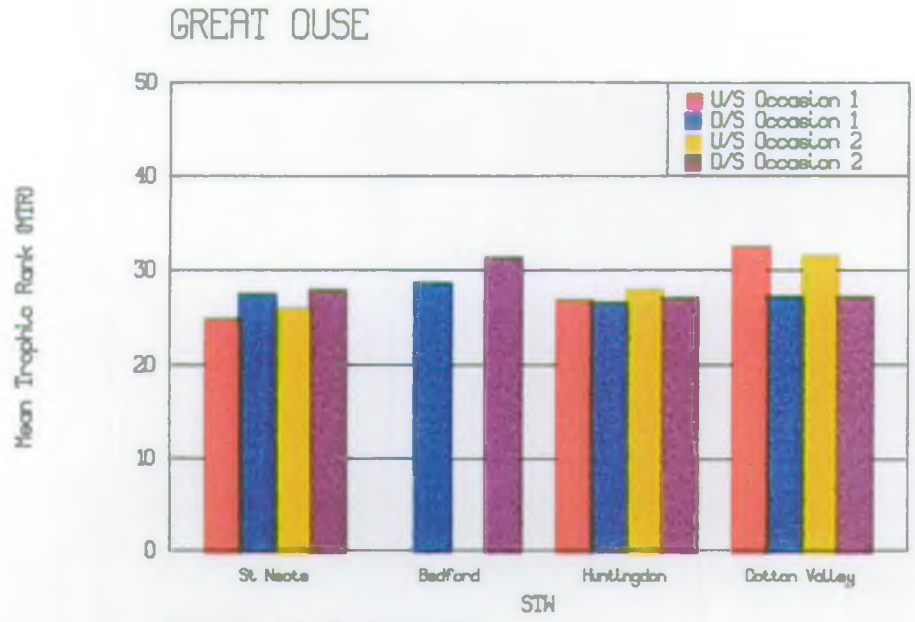


Figure 8(a) - Mean Trophic Rank (MTR)

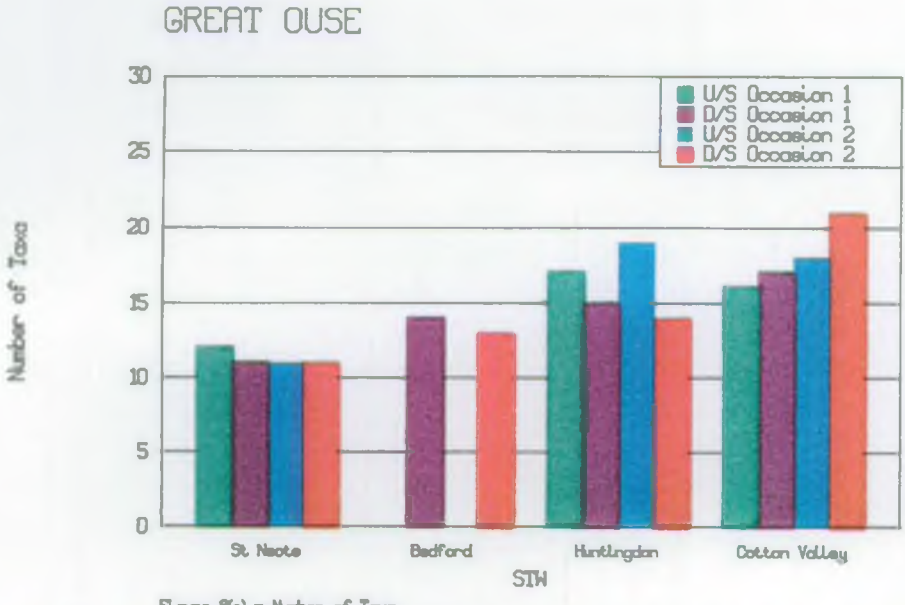


Figure 8(a) - Number of Taxa

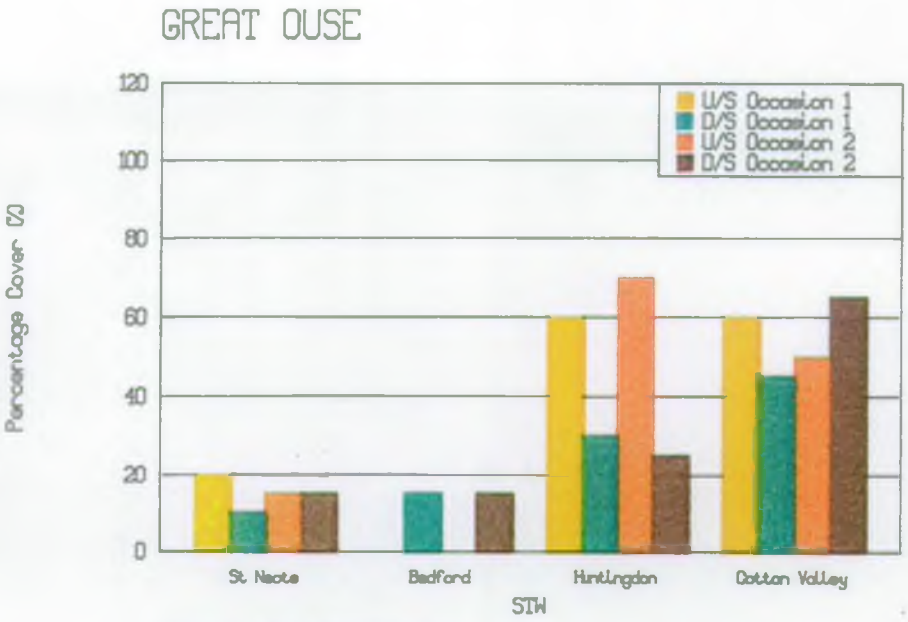


Figure 8(b) - Total Percentage Cover

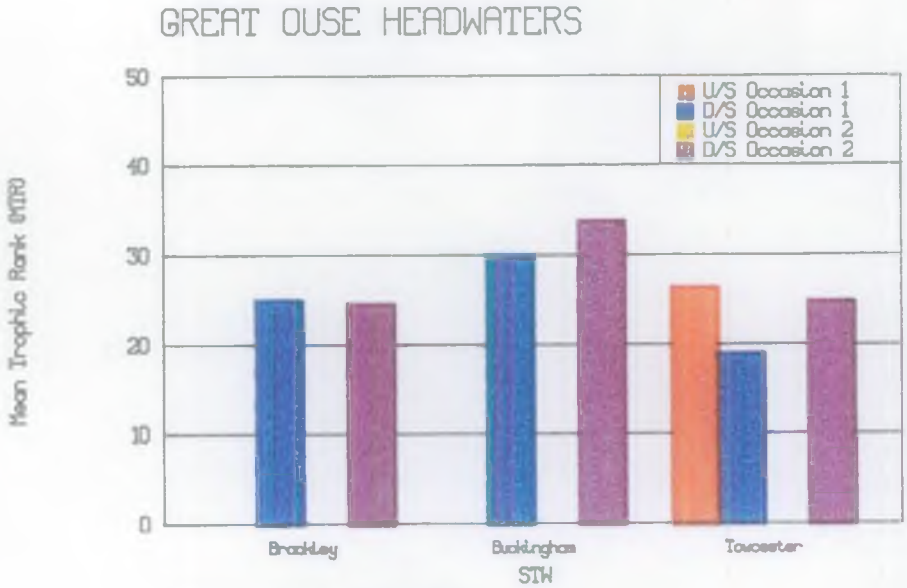


Figure 9(a) - Mean Trophic Rank (MIR)

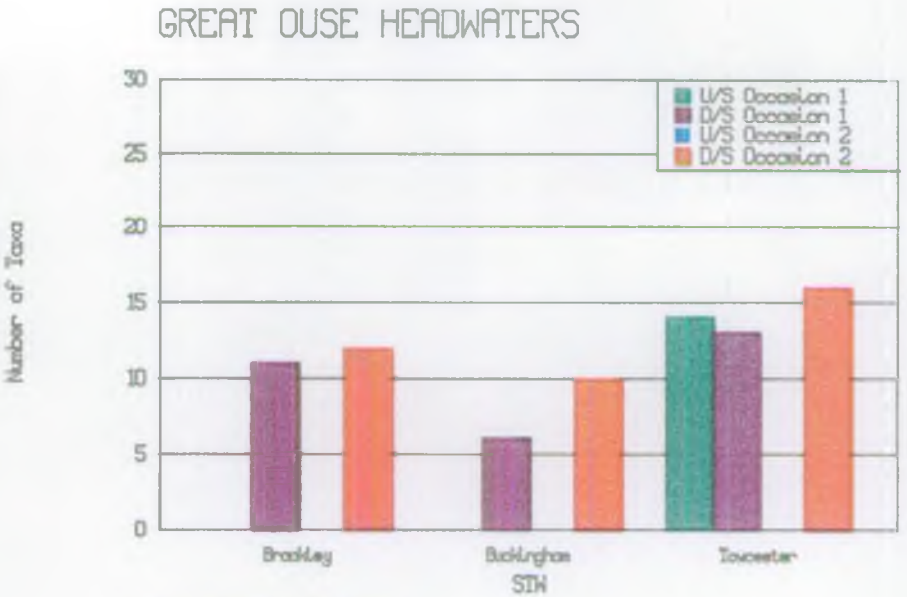


Figure 9(a) - Number of Taxa

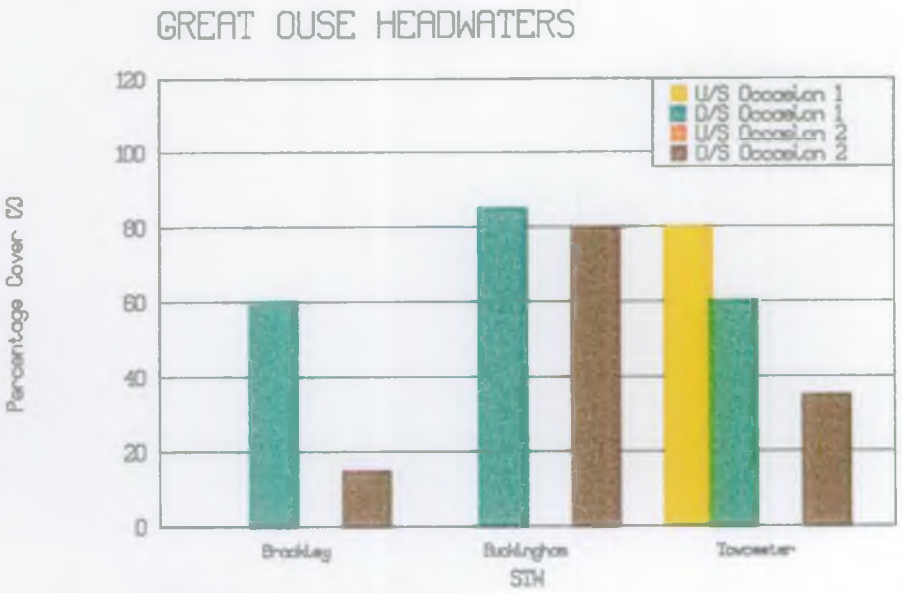


Figure 9b) - Total Percentage Cover

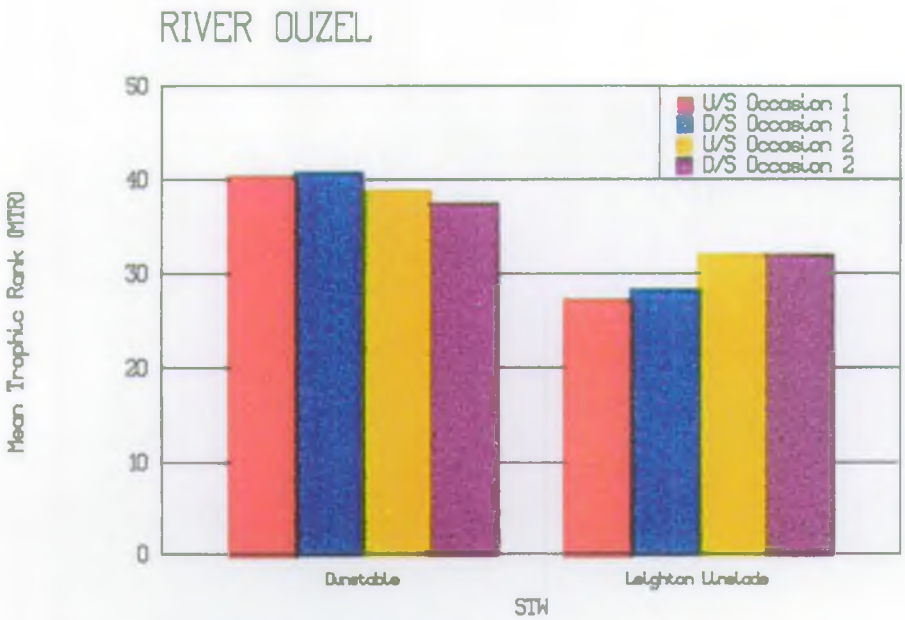


Figure 10(a) - Mean Trophic Rank (MTR)

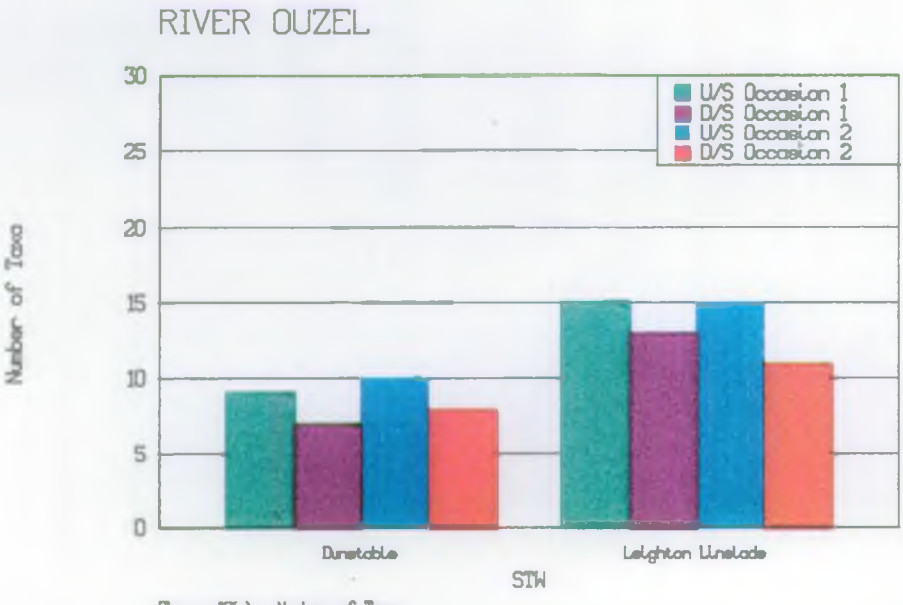


Figure 10(a) - Number of Taxa

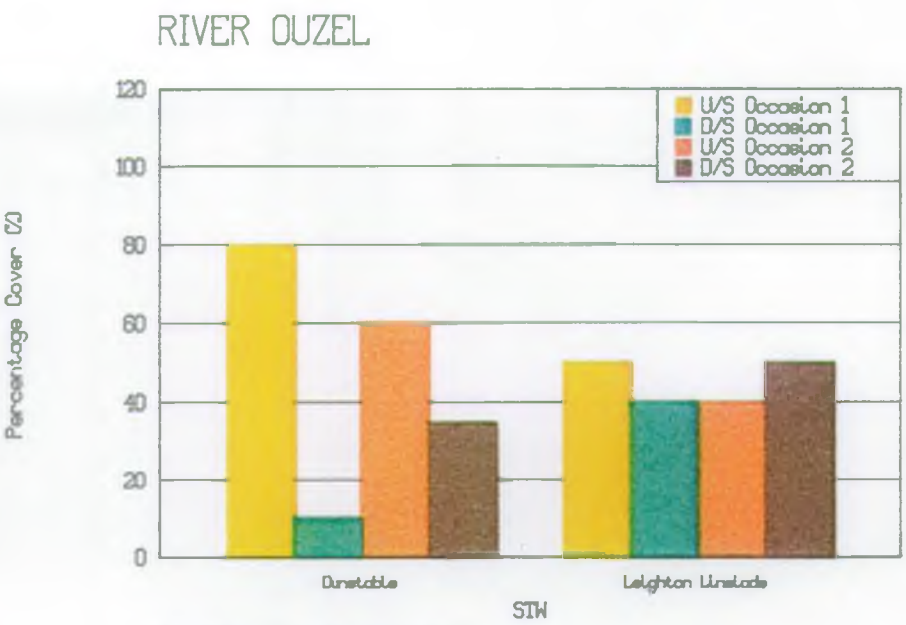


Figure 10b) - Total Percentage Cover

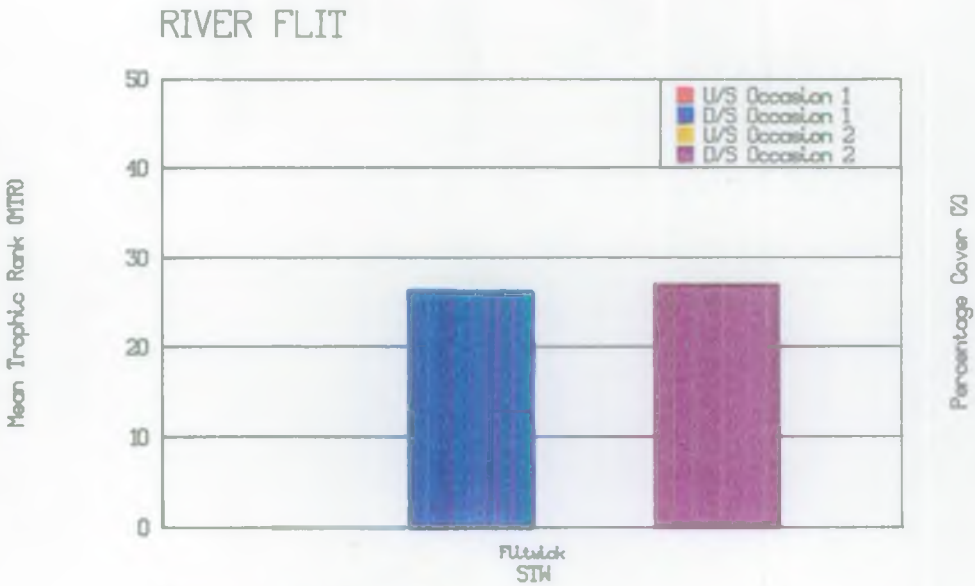


Figure 12(a) - Mean Trophic Rank (MTR)

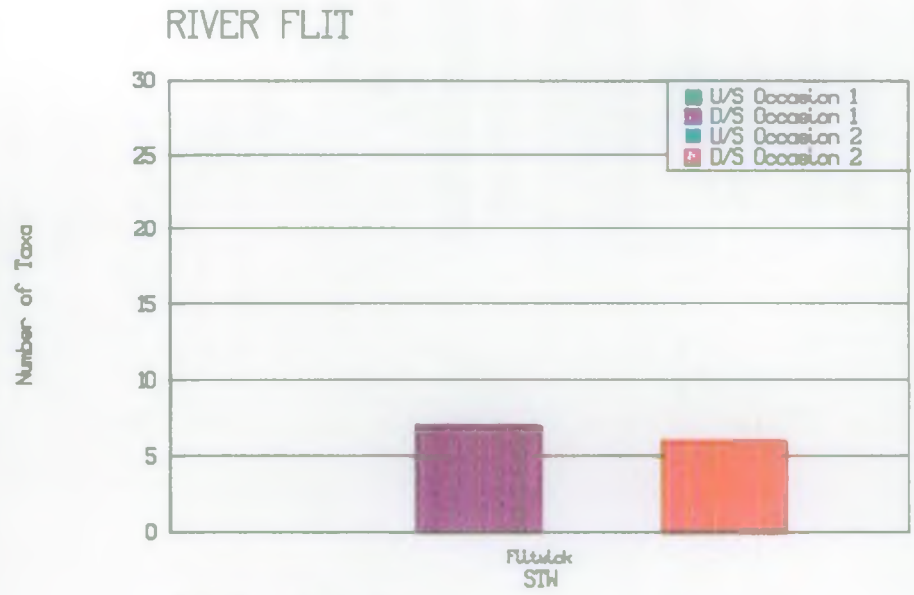


Figure 12(a) - Number of Taxa

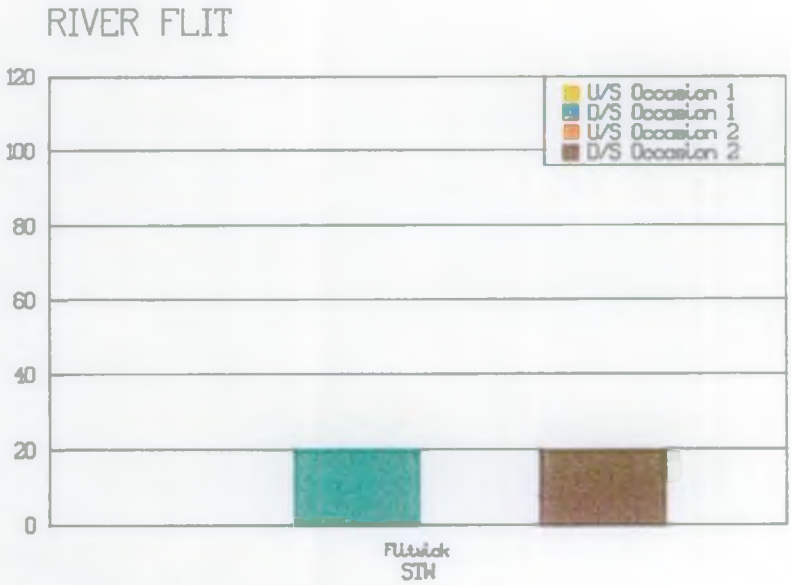


Figure 12(b) - Total Percentage Cover

RIVER IVEL

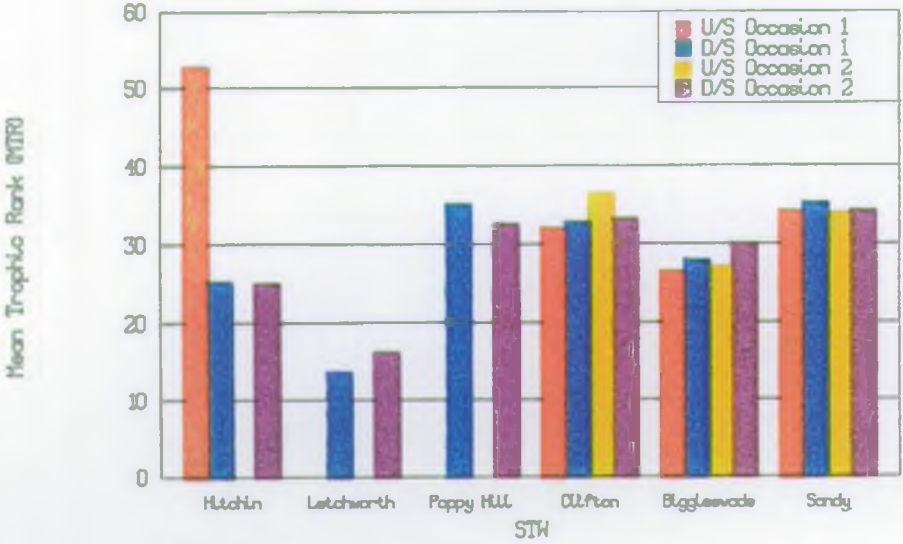


Figure 11(a) - Mean Trophic Rank (MTR)

RIVER IVEL

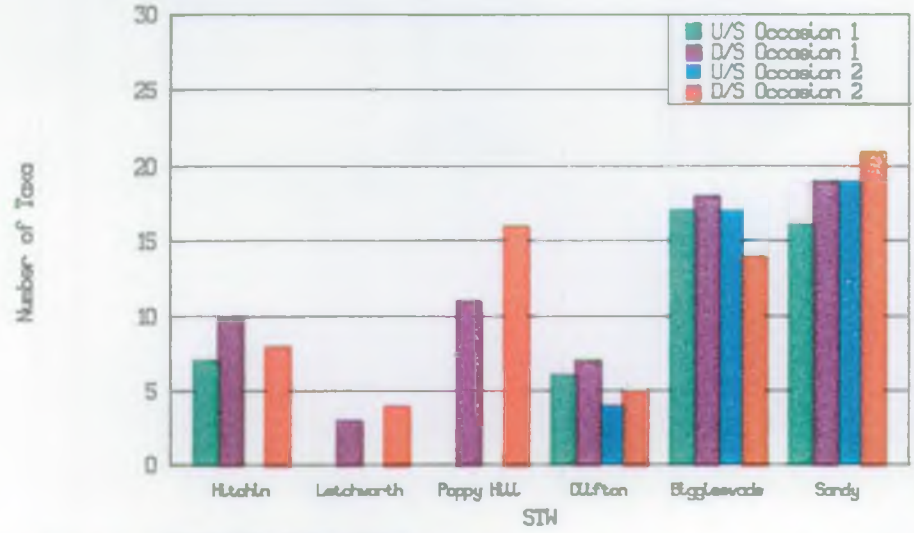


Figure 11(a) - Number of Taxa

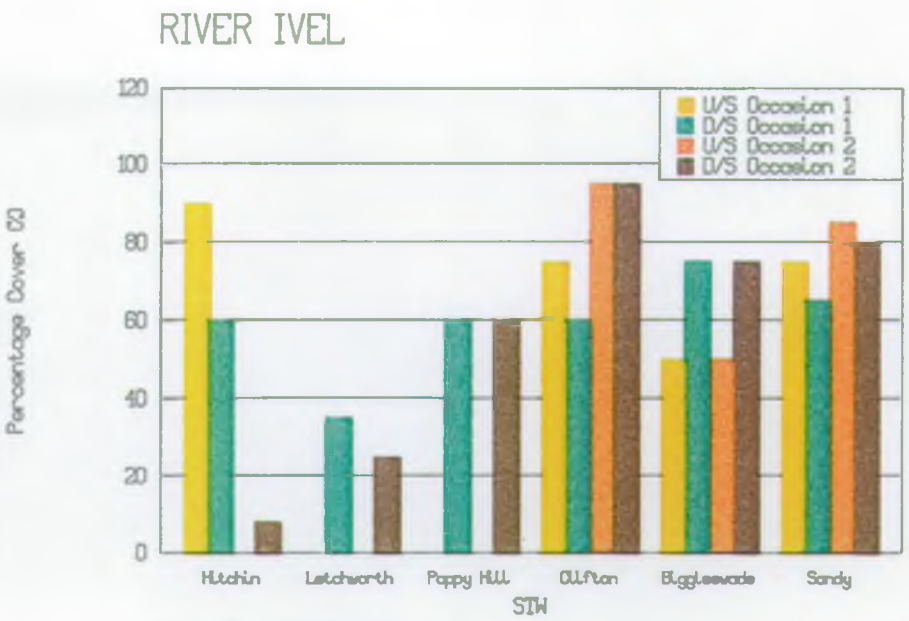


Figure 11b) - Total Percentage Cover

Candidate SA(e) - Cam & Ely Ouse

Macrophyte Survey Results 1995

Qualifying discharges

Figure 2	Cam & Ely Ouse:	Cambridge (D) Ely (I) Haslingfield (I)
Figure 3	Old West River:	Over (I)
Figure 4	Soham Lode:	Soham (I)
Figure 5	Lark:	Bury St Edmunds (I) Mildenhall (I)
Figure 6	Little Ouse:	Thetford (I) Attleborough (I)

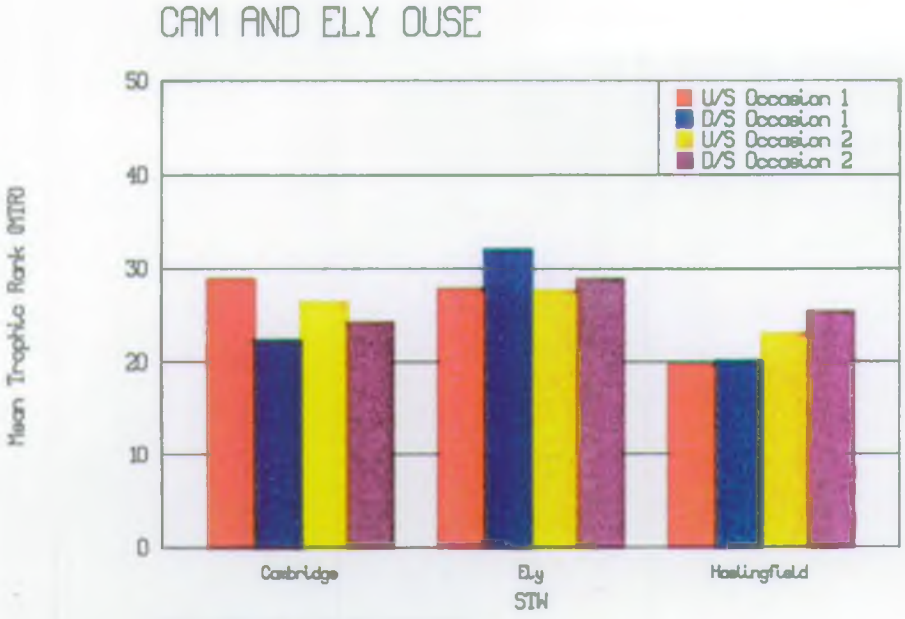


Figure 2(a) - Mean Trophic Rank (MTR)

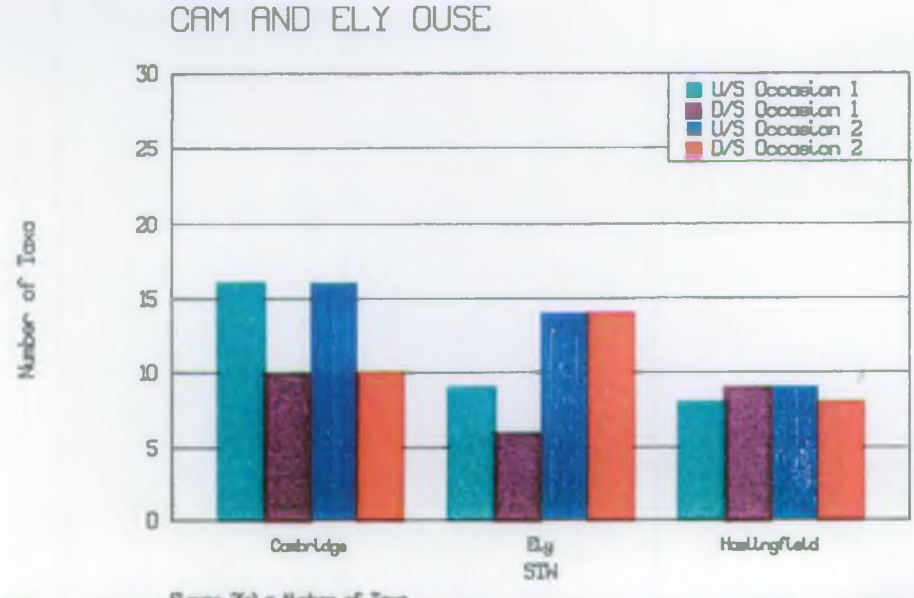


Figure 2(a) - Number of Taxa

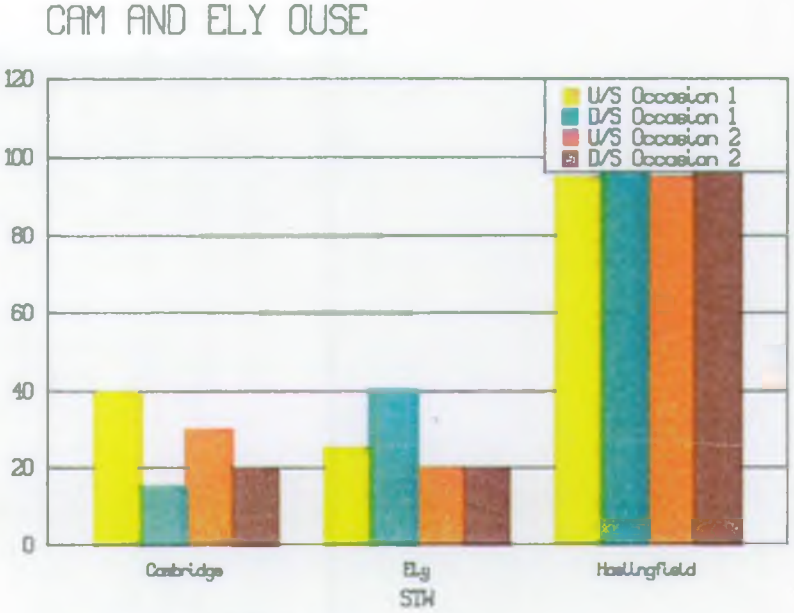


Figure 2b) - Total Percentage Cover

Figure 4a) - Mean Trophic Rank (MTR)

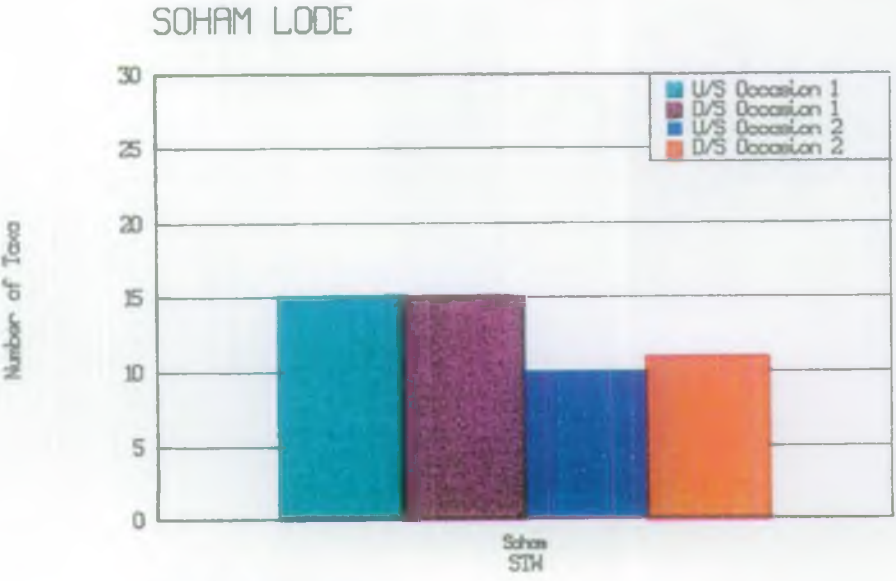


Figure 4a) - Number of Taxa

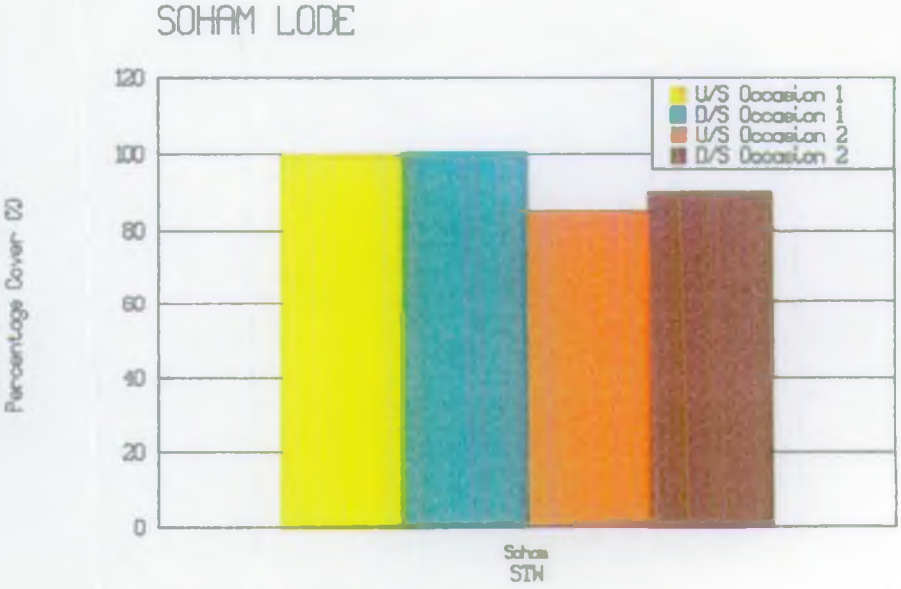


Figure 4b) - Total Percentage Cover

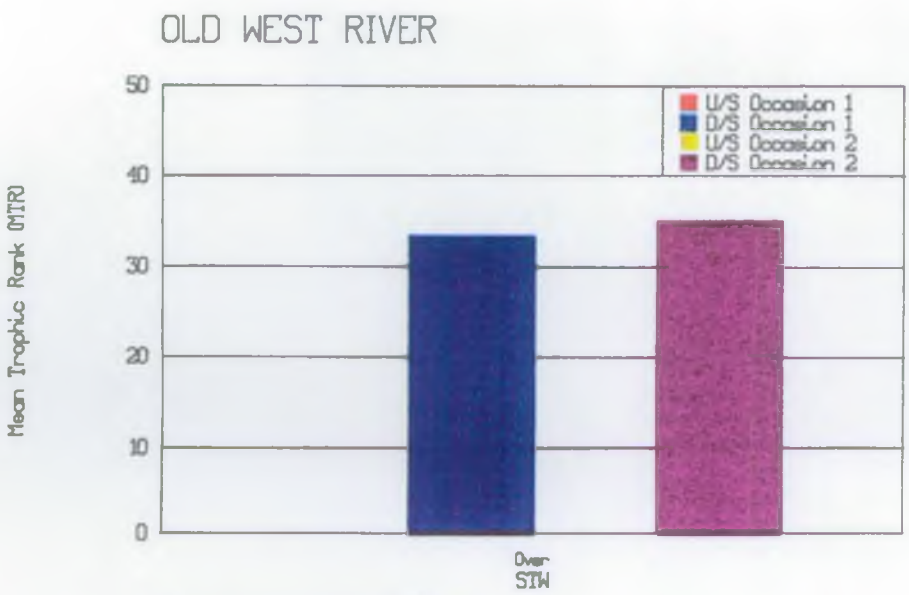


Figure 3(a) - Mean Trophic Rank (MTR)

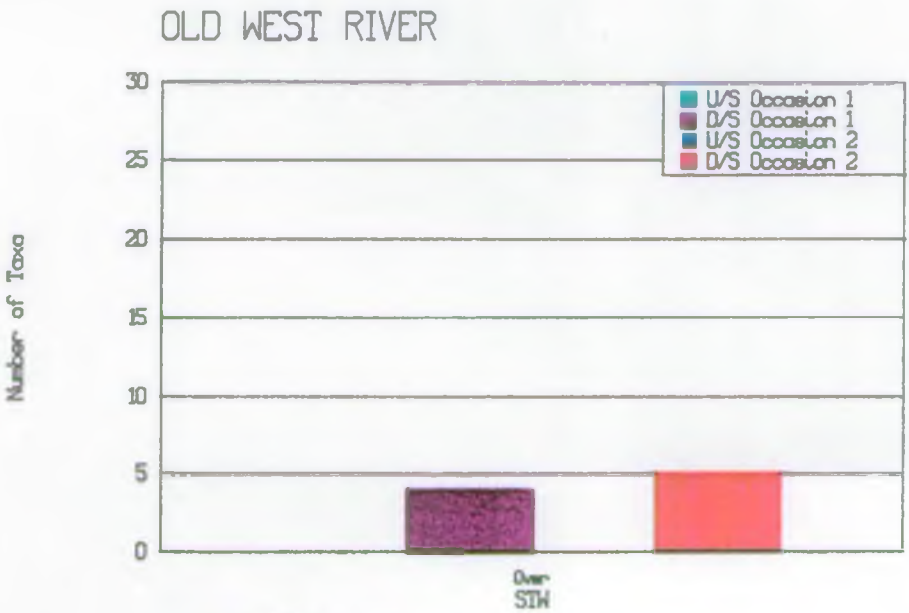


Figure 3(a) - Number of Taxa

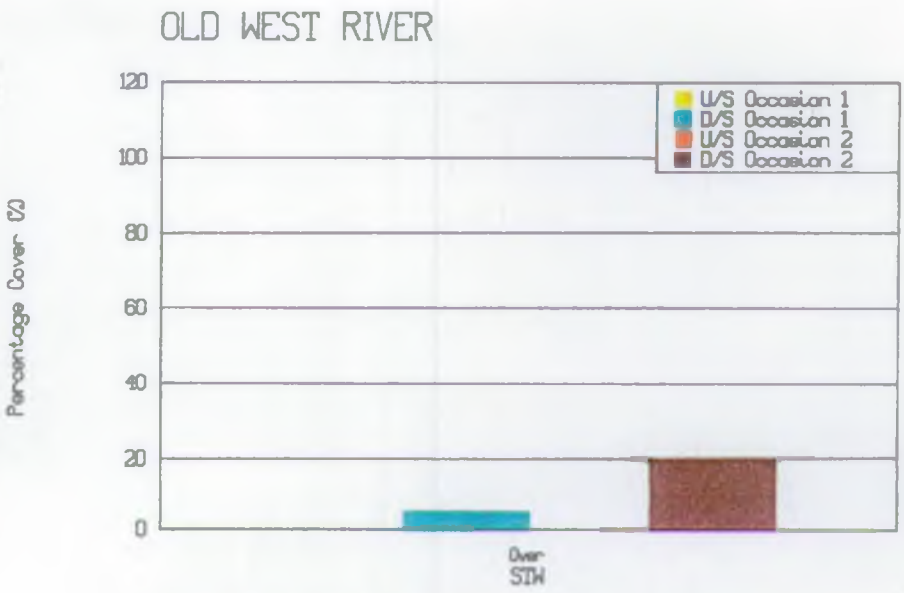


Figure 3b) - Total Percentage Cover

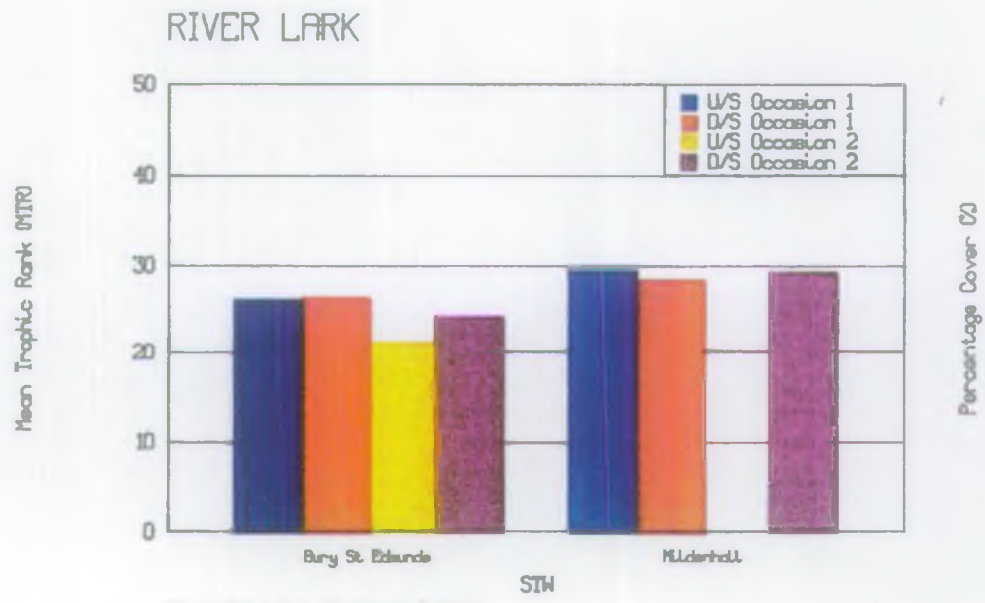


Figure 5(a) - Mean Trophic Rank (MTR)

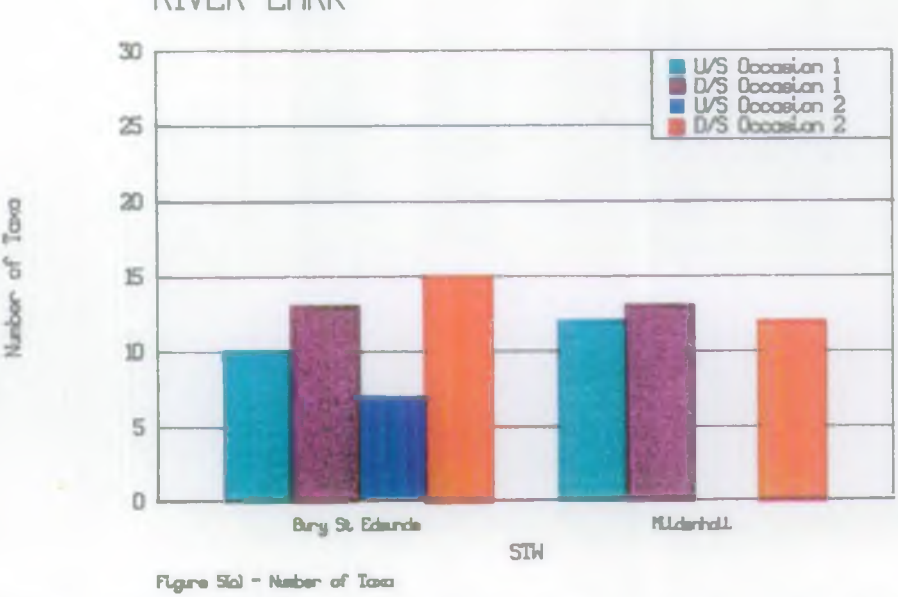


Figure 5(a) - Number of Taxa

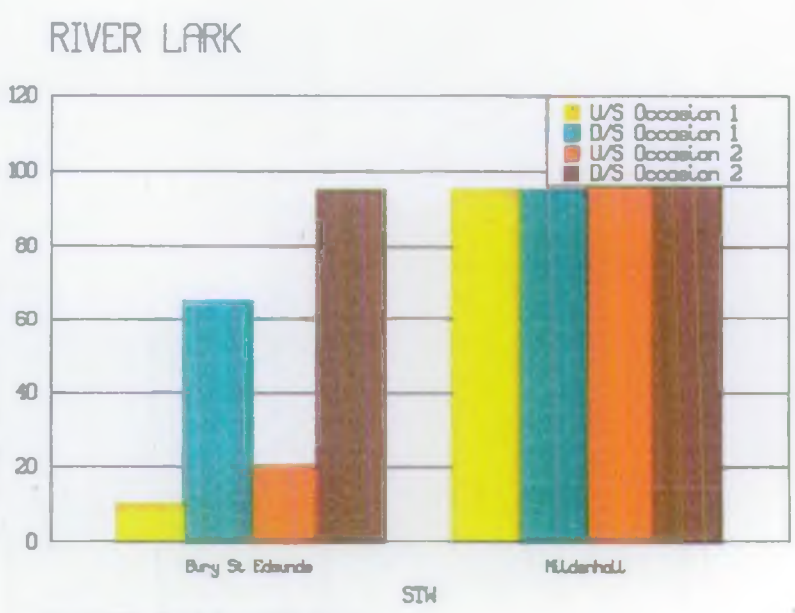


Figure 5b) - Total Percentage Cover

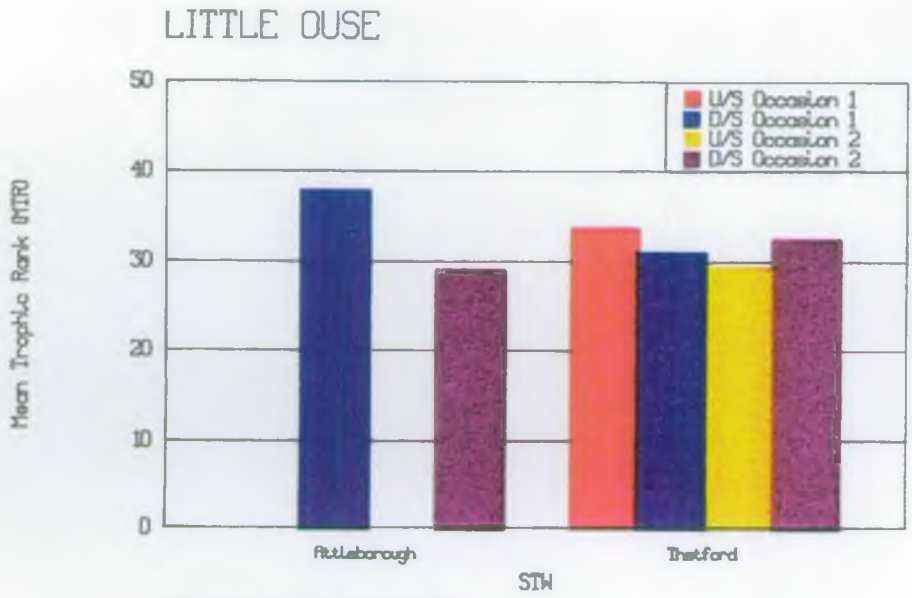


Figure 6(a) - Mean Trophic Rank (MTR)

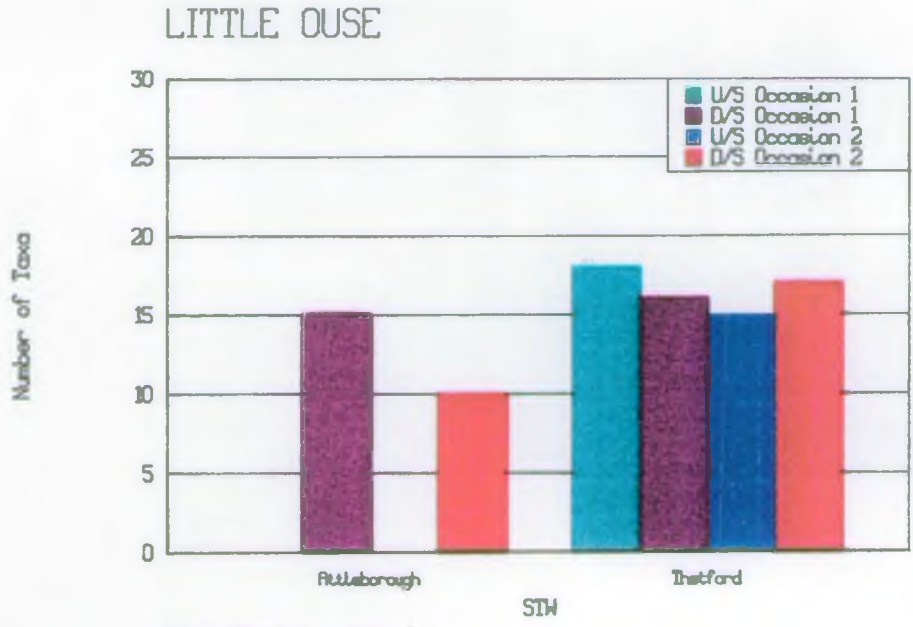


Figure 6(a) - Number of Taxa

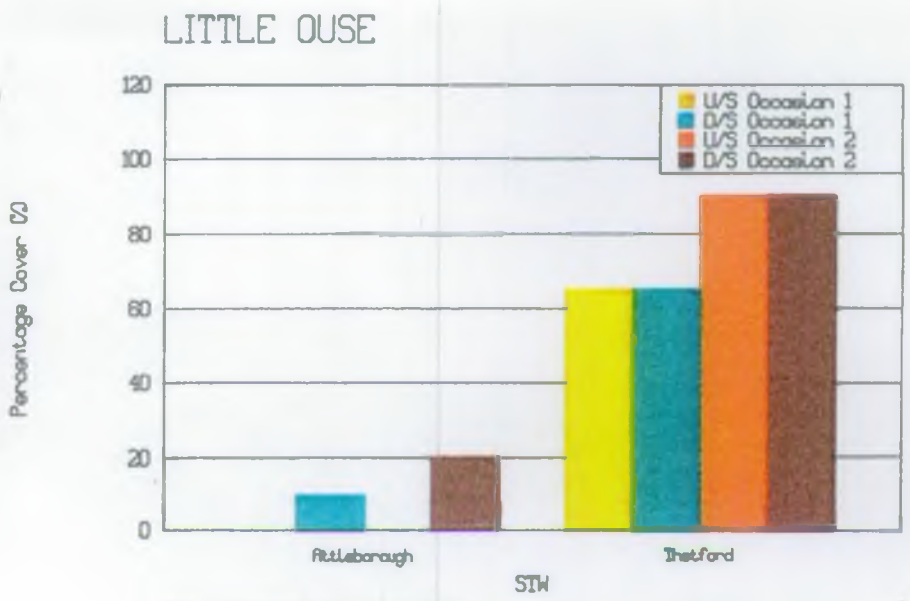


Figure 6b) - Total Percentage Cover

Candidate SA(e) - Little Ouse

Macrophyte Survey Results 1995

Qualifying discharges

Figure 6 Little Ouse: Thetford (I)
Attleborough (I)

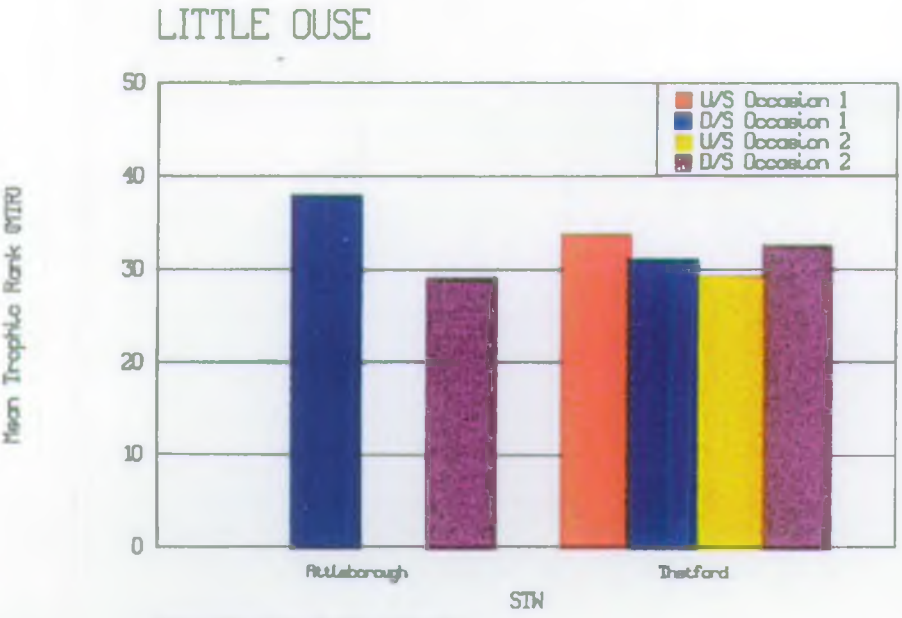


Figure 6(a) - Mean Trophic Rank (MTR)

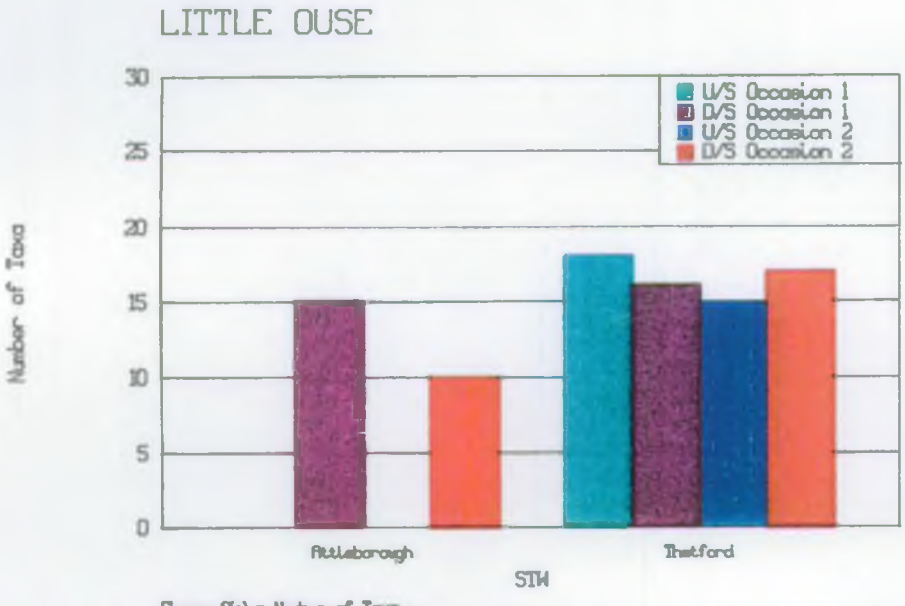


Figure 6(a) - Number of Taxa

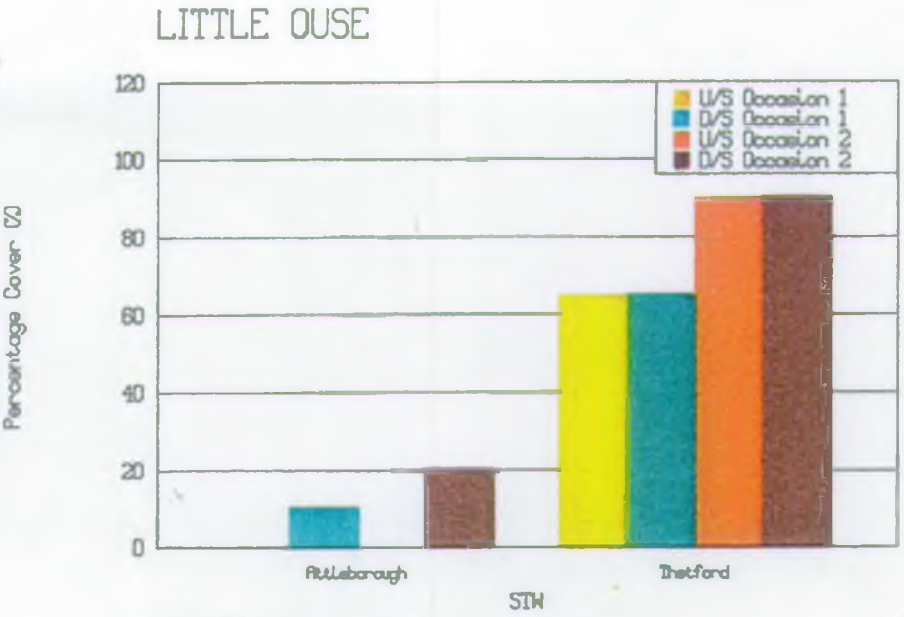


Figure 6b) - Total Percentage Cover

Candidate SA(e) - Great Ouse

Macrophyte Survey Results 1995

Qualifying discharges

Figure 8	Great Ouse:	Cotton Valley (D) Bedford (D) St Neots (D) Huntingdon (D)
Figure 9	Gt Ouse Headwaters:	Brackley (I) Buckingham (I) Towcester (I)
Figure 10	Ouzel:	Dunstable (I) Leighton Linslade (I)
Figure 11	Ivel:	Hitchin (I) Letchworth (I) Poppy Hill (I) Clifton (I) Biggleswade (I) Sandy (I)
Figure 12	Flit:	Flitwick (I)

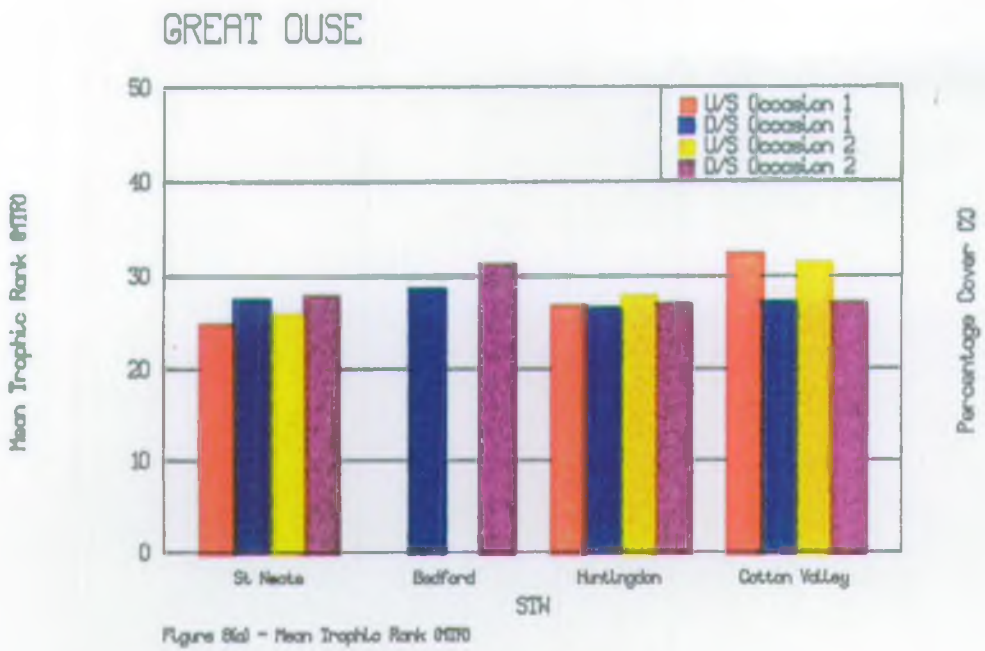


Figure 8(a) - Mean Trophic Rank (MTR)

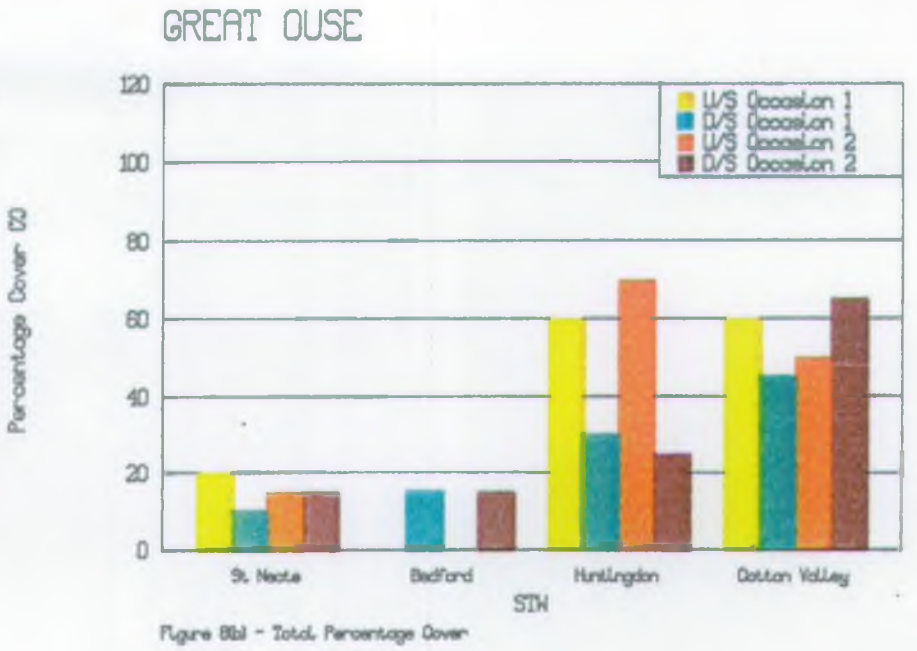


Figure 8(b) - Total Percentage Cover

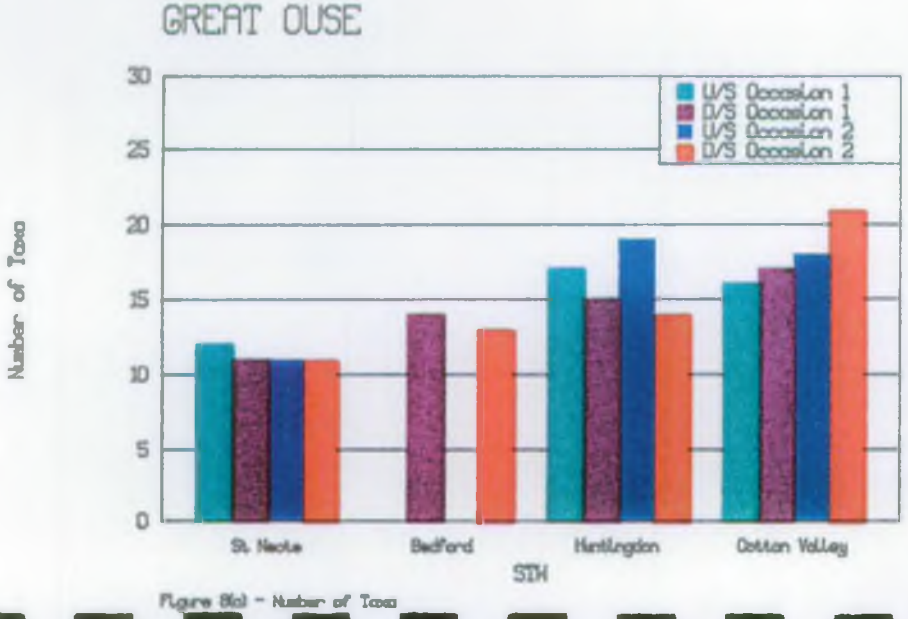


Figure 8(c) - Number of Taxa

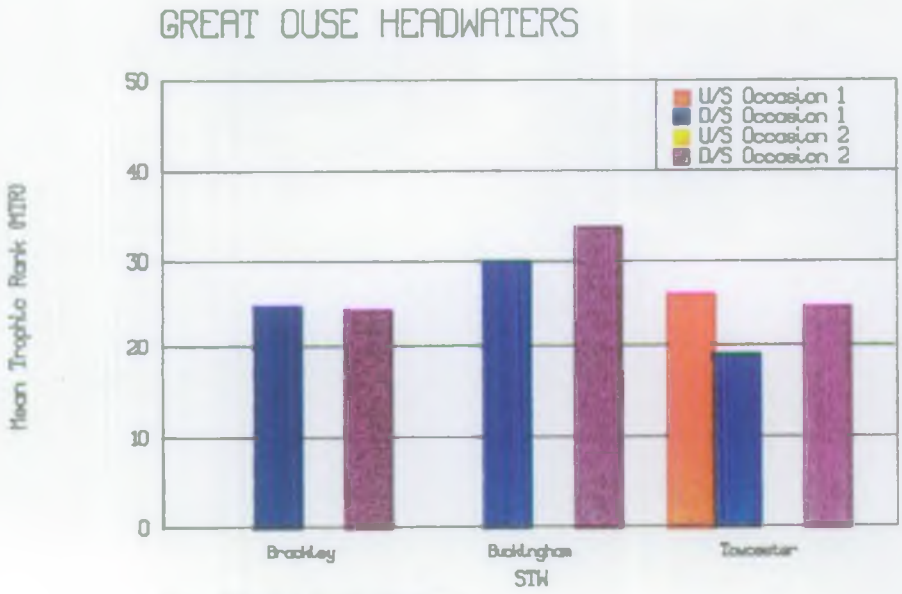


Figure 9(a) - Mean Trophic Rank (MTR)

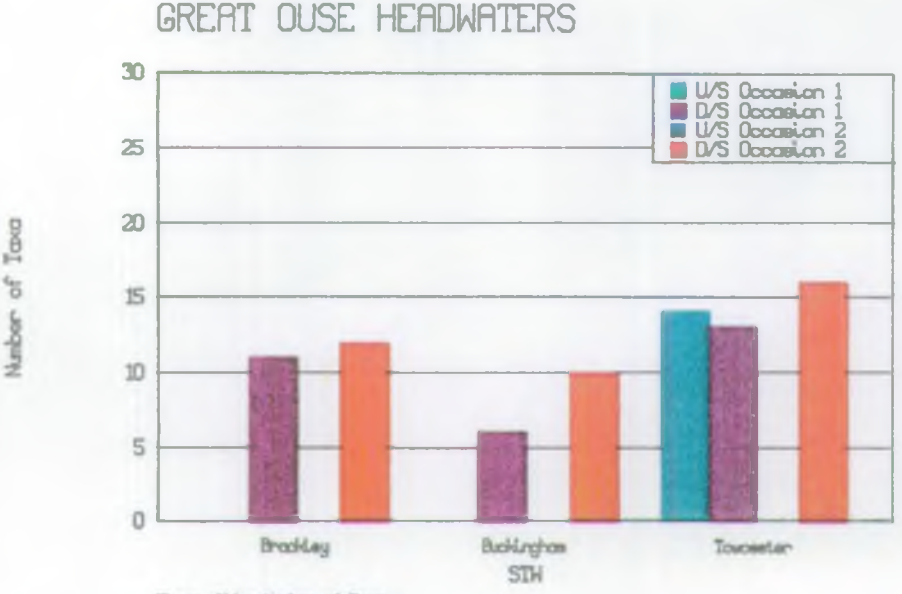


Figure 9(b) - Number of Taxa

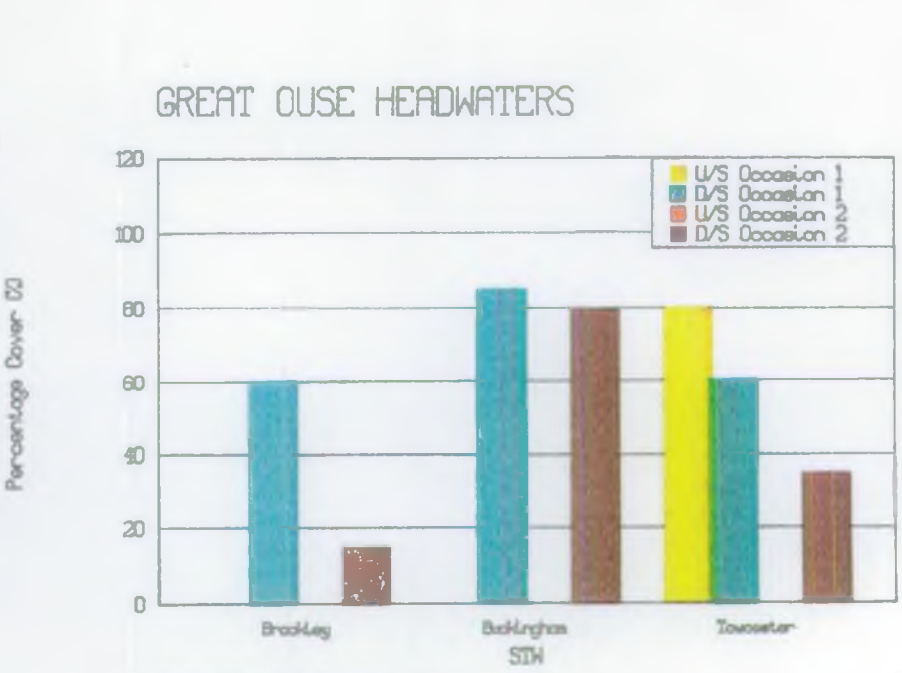


Figure 9b) - Total Percentage Cover

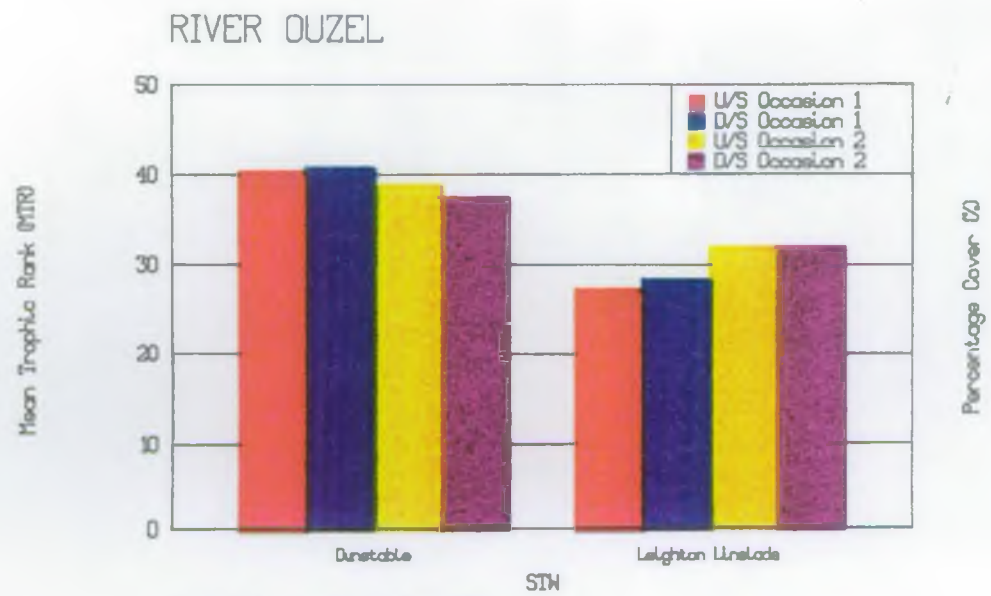


Figure 10(a) - Mean Trophic Rank (MTR)

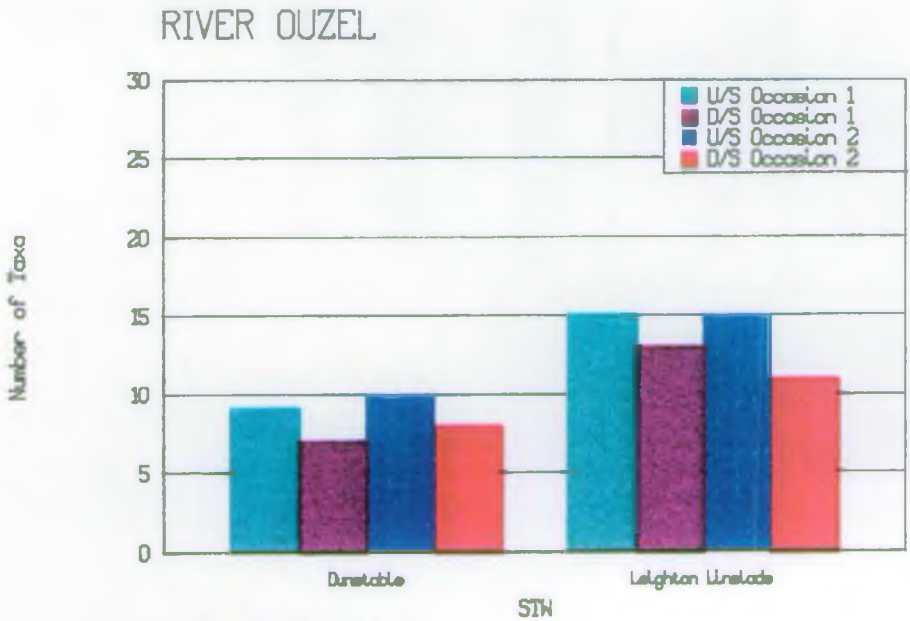


Figure 10(a) - Number of Taxa

RIVER OUZEL

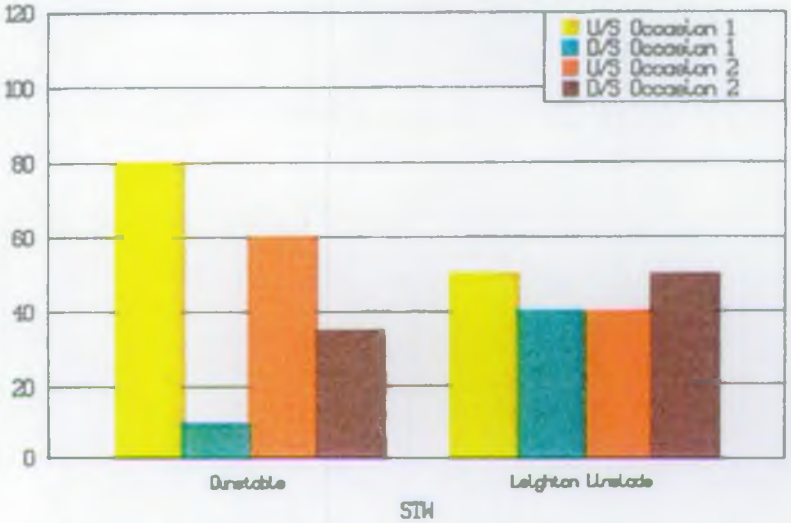


Figure 10(b) - Total Percentage Cover

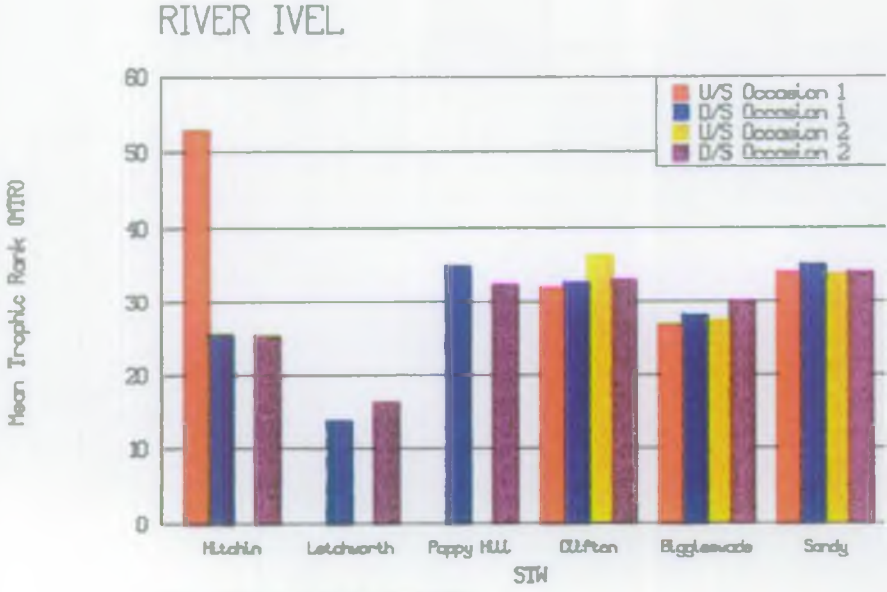


Figure 11a) - Mean Trophic Rank (MTR)

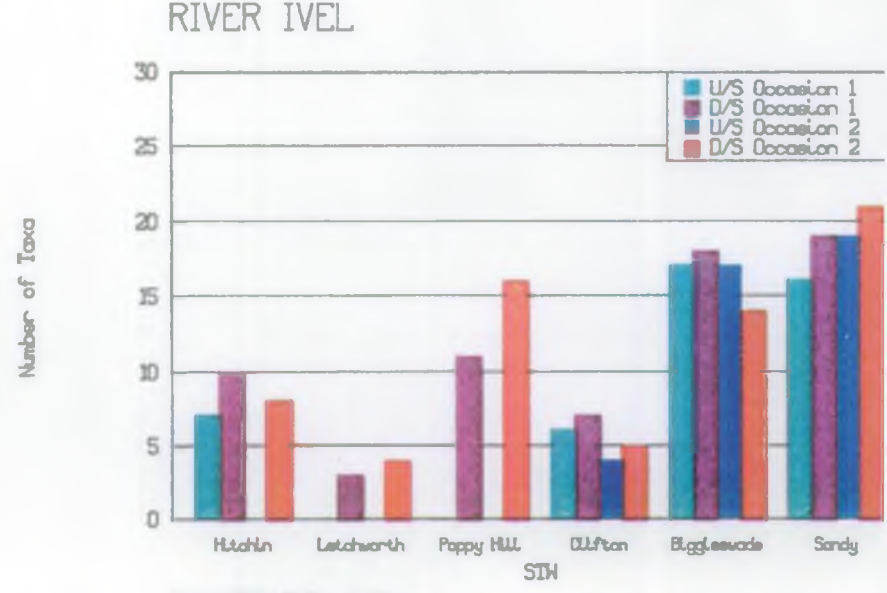


Figure 11a) - Number of Taxa

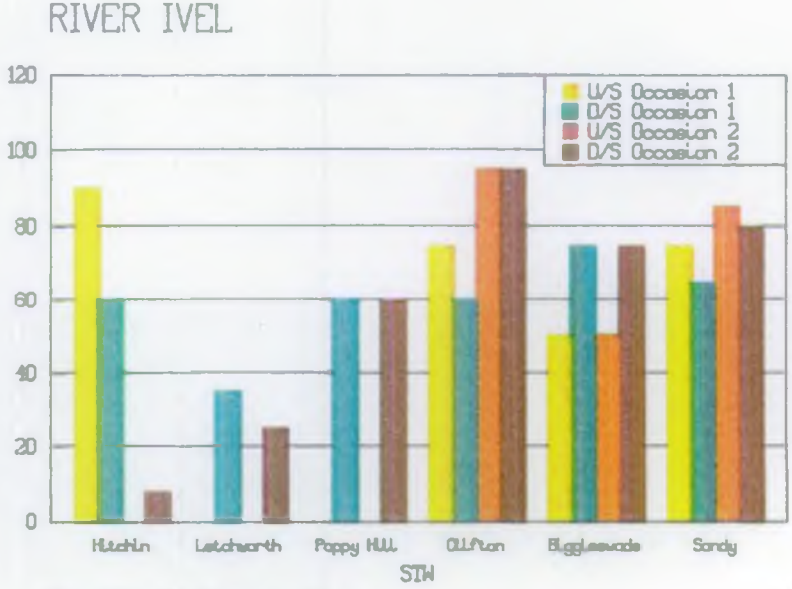


Figure IIIb) - Total Percentage Cover

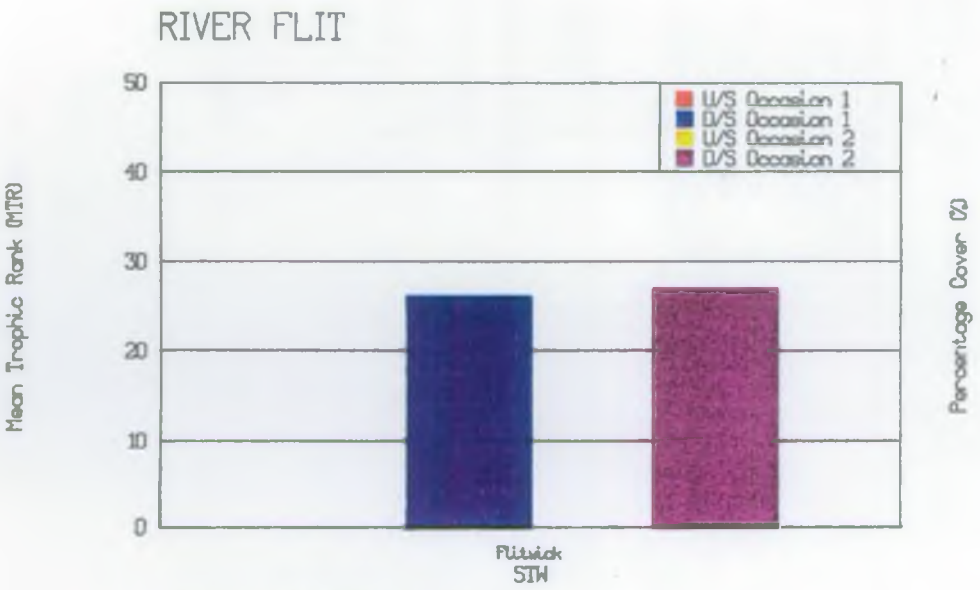


Figure 12(a) - Mean Trophic Rank (MTR)

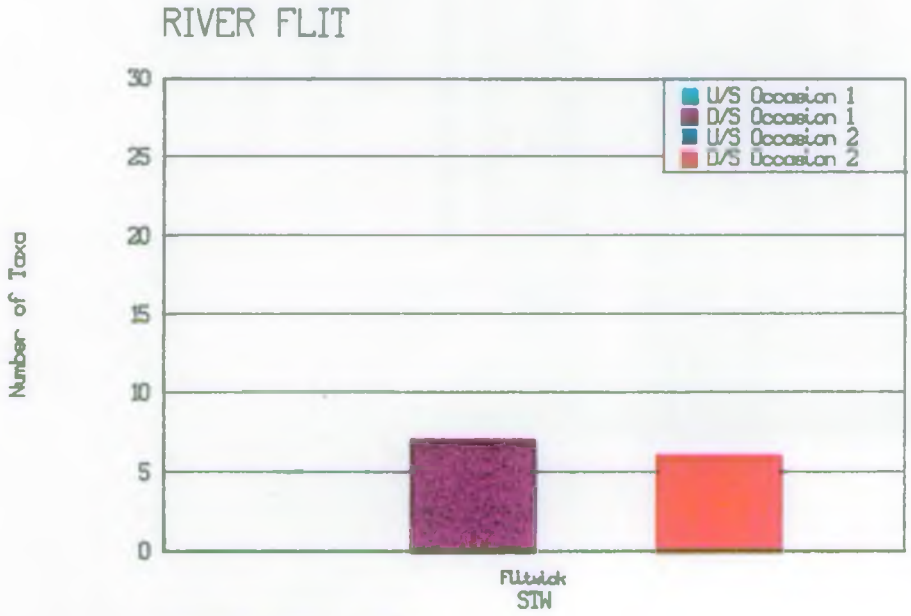


Figure 12(a) - Number of Taxa

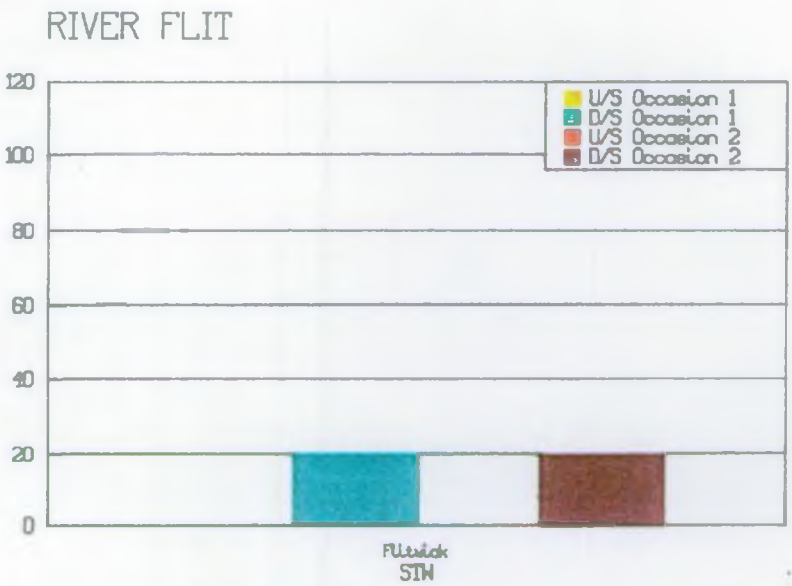


Figure 12b) - Total Percentage Cover

Candidate SA(e) - Headwaters of the Great Ouse

Macrophyte Survey Results 1995

Qualifying discharges

Figure 9	Gt Ouse Headwaters:	Brackley (D) Buckingham (D) Towcester (D)

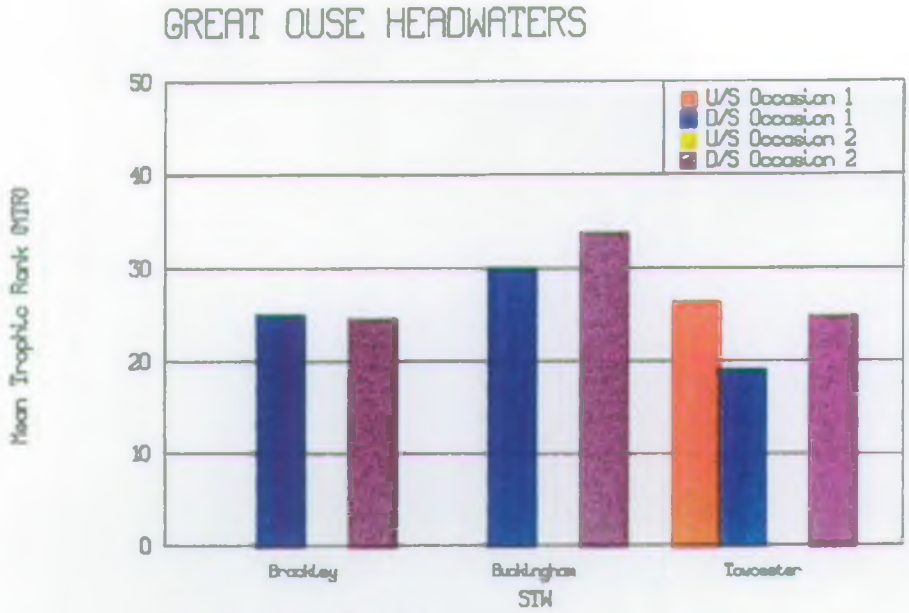


Figure 9(a) - Mean Trophic Rank (MTR)

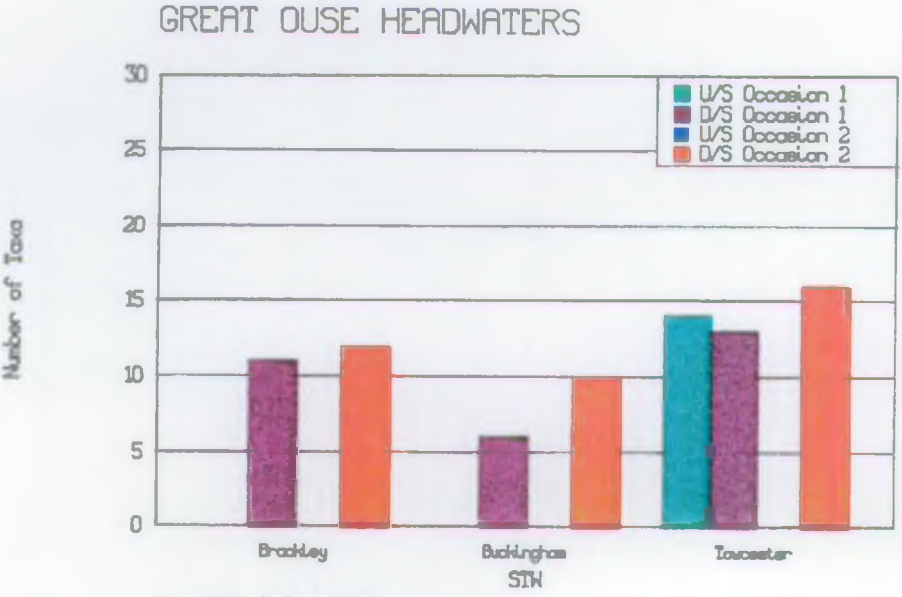


Figure 9(a) - Number of Taxa

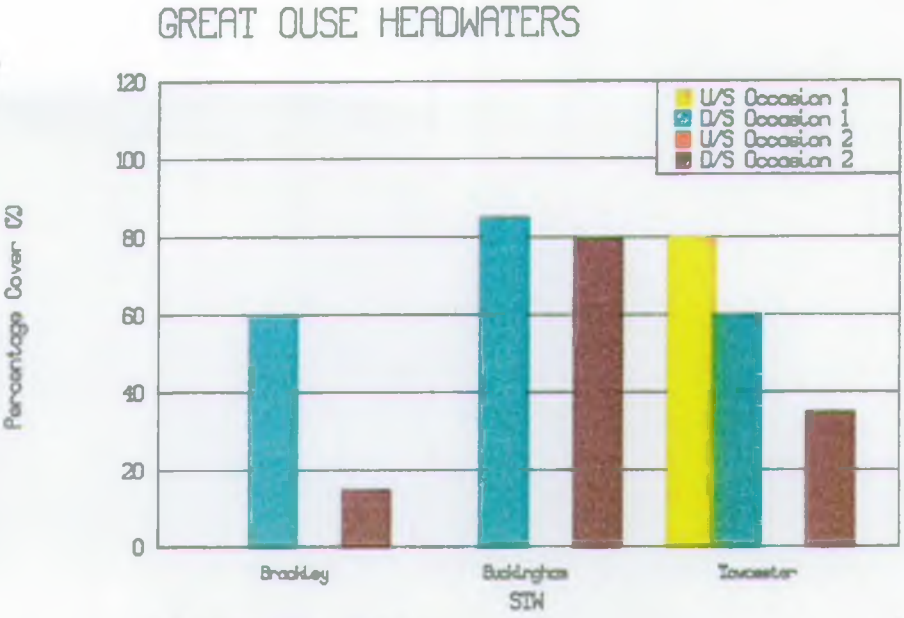


Figure 8b1 - Total Percentage Cover

Candidate SA(e) - Middle Level System

Macrophyte Survey Results 1995

Qualifying discharges

Figure 13 Middle Level System: Whittlesey (D)
March (D)
(Nene Catchment Discharges)

Figure 13(a) - Mean Trophic Rank (MTR)

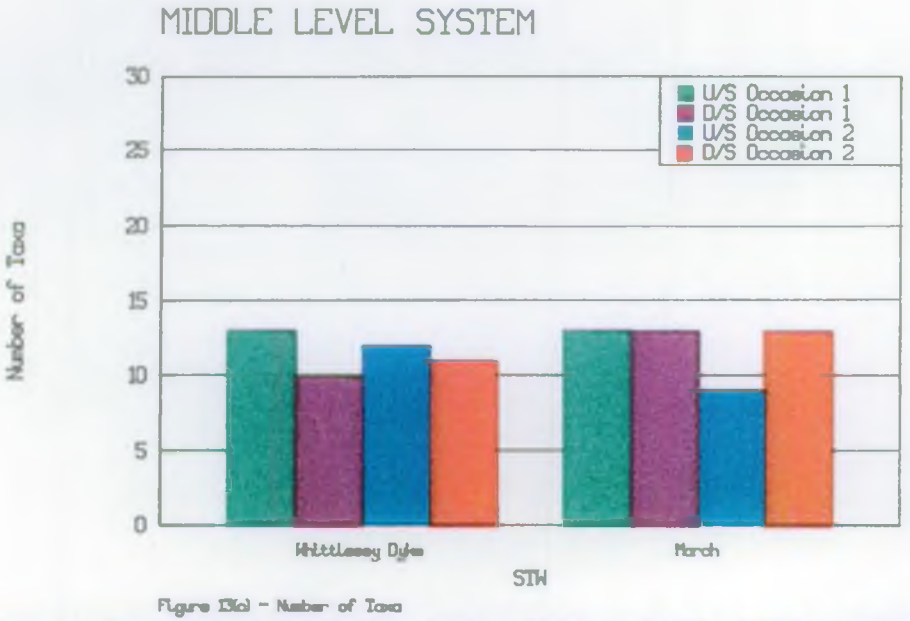


Figure 13(a) - Number of Taxa

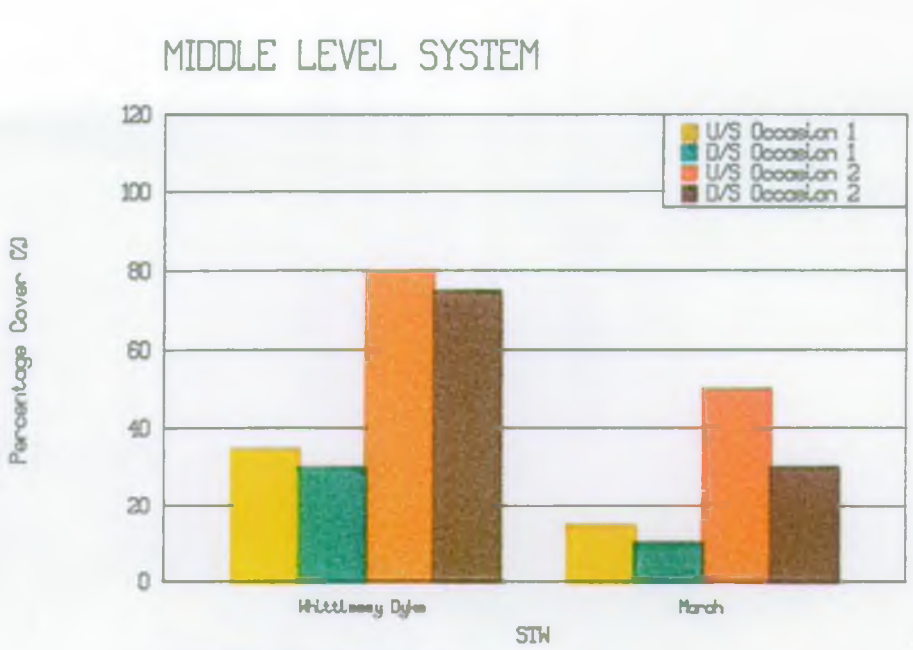


Figure 13b) - Total Percentage Cover

Candidate SA(e) - Old West River

Macrophyte Survey Results 1995

Qualifying discharges

Figure 3 Old West River: Over (I)

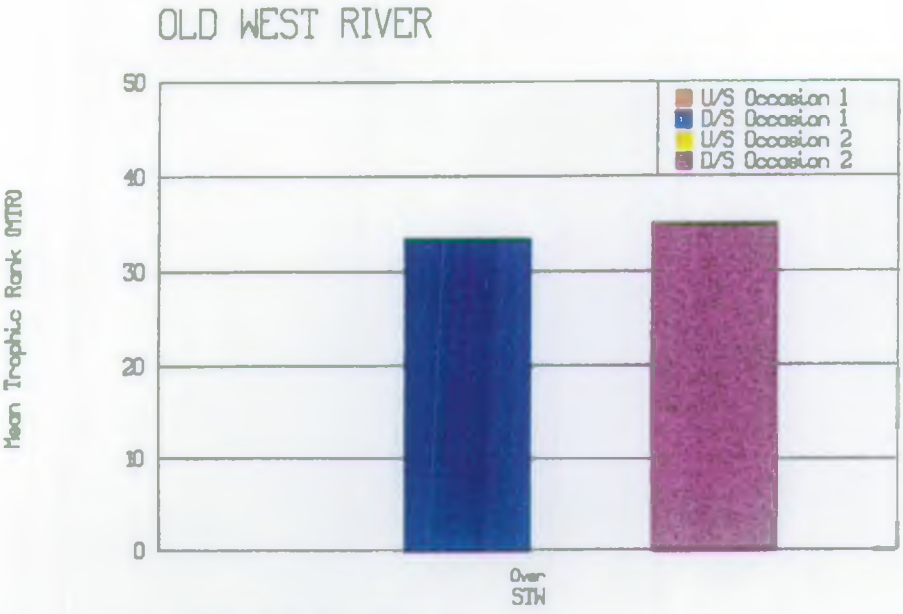


Figure 3(a) - Mean Trophic Rank (MTR)

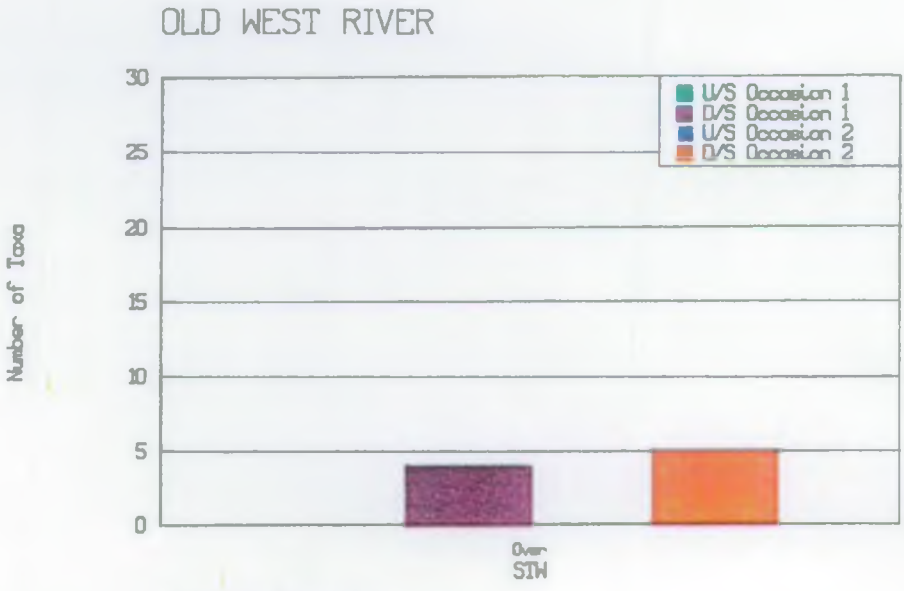


Figure 3(a) - Number of Taxa

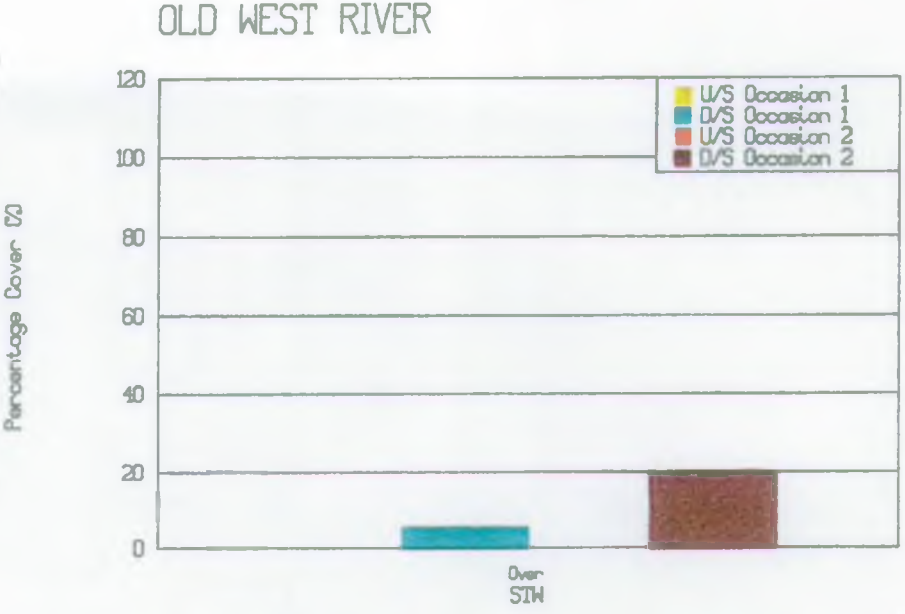


Figure 3b) - Total Percentage Cover

Candidate SA(e) - Great Ouse

Macrophyte Survey Results 1995

Qualifving discharges

Figure 10 Ouzel: Dunstable (I)
Leighton Linslade (I)

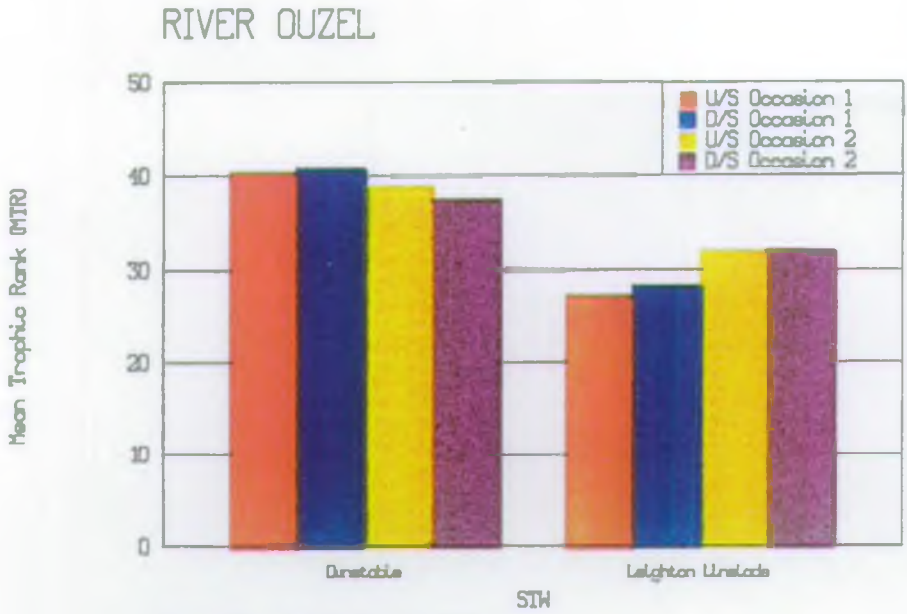


Figure 10(a) - Mean Trophic Rank (MTR)

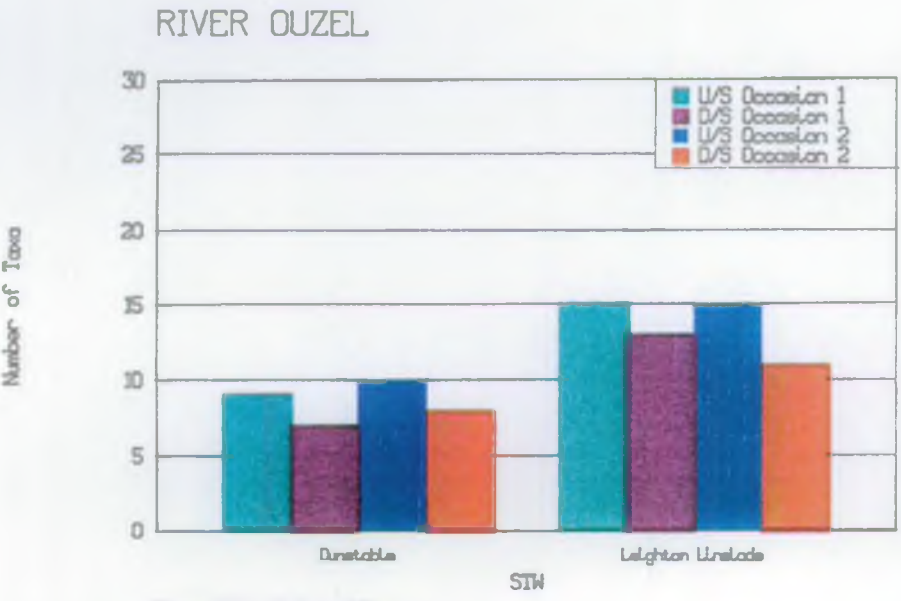


Figure 10(a) - Number of Taxa

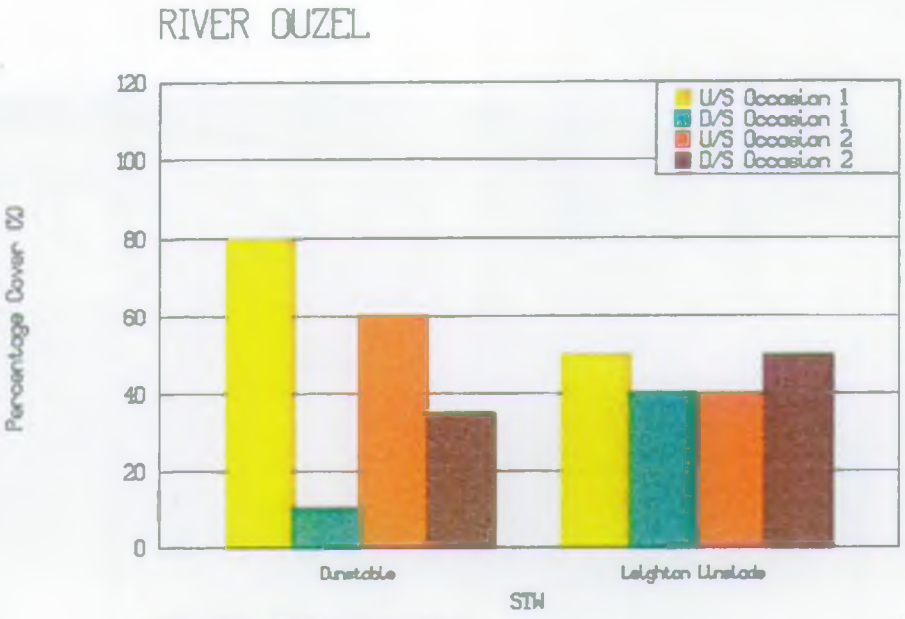


Figure 10(b) - Total Percentage Cover

Candidate SA(e) - River Flit

Macrophyte Survey Results 1995

Qualifying discharges

Figure 12 Flit: Flitwick (D)

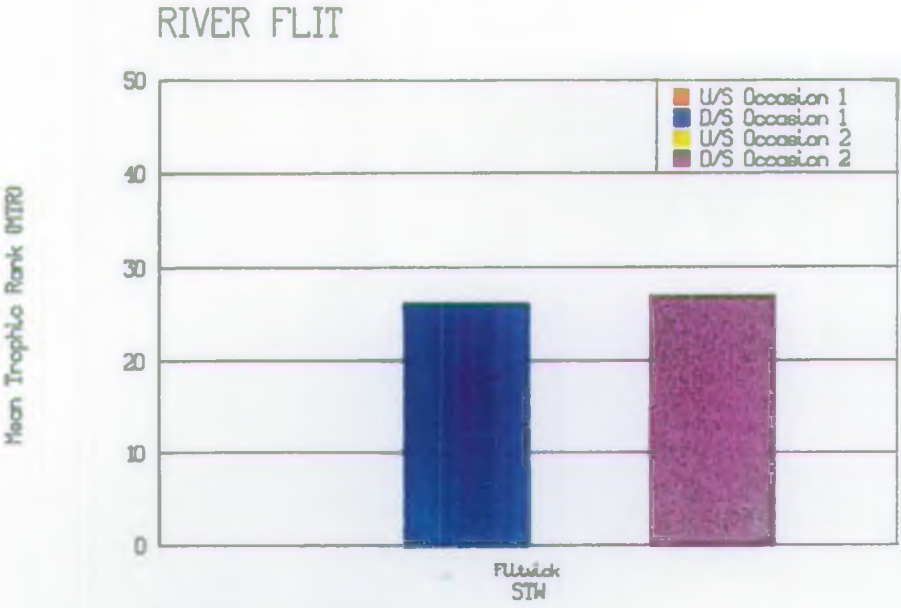


Figure 12a) - Mean Trophic Rank (MTR)

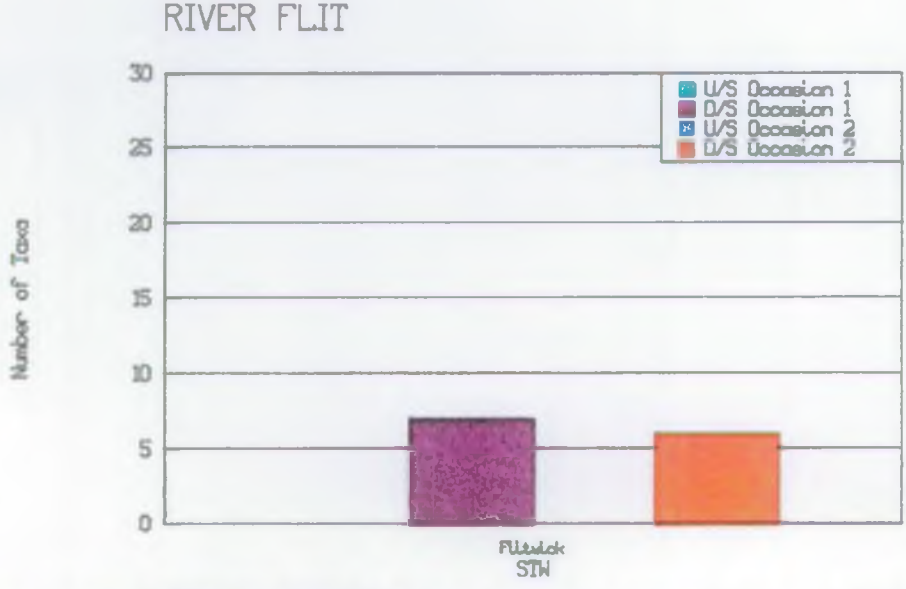


Figure 12a) - Number of Taxa

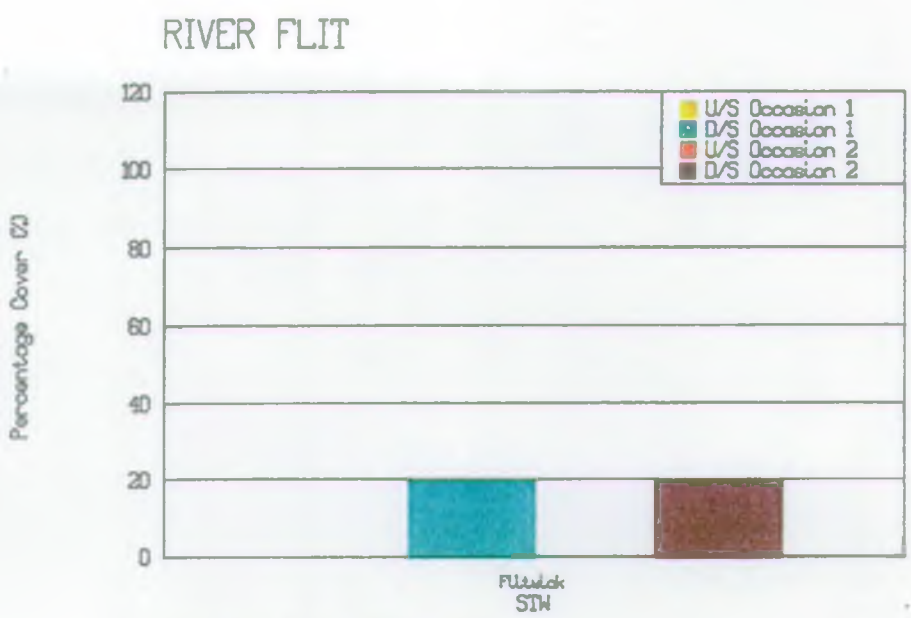


Figure 12b) - Total Percentage Cover

Candidate SA(e) - River Ivel

Macrophyte Survey Results 1995

Qualifying discharges

Figure 11	Ivel:	Hitchin (D) Letchworth (D) Poppy Hill (D) Clifton (D) Biggleswade (D) Sandy (D)
Figure 12	Flit:	Flitwick (I)

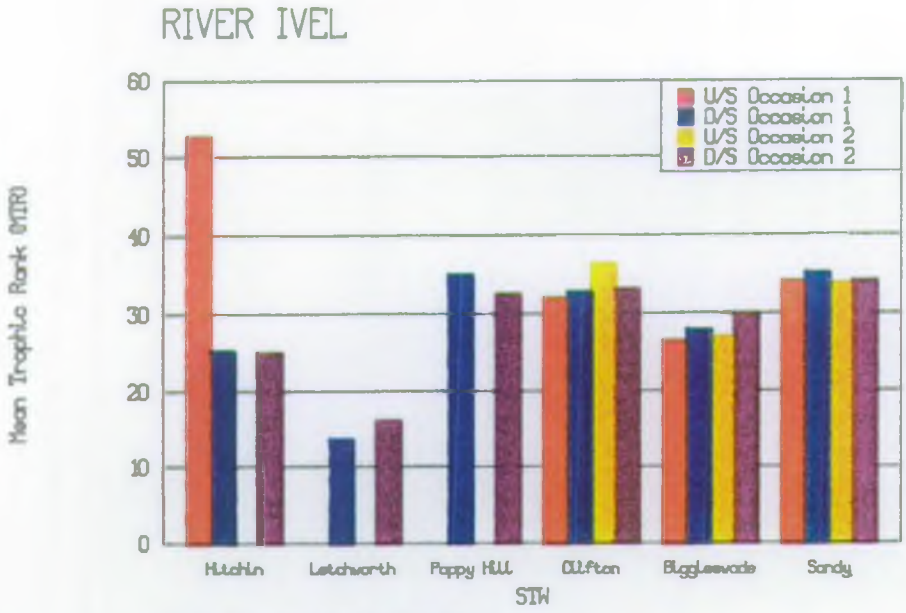


Figure II(a) - Mean Trophic Rank (MTR)

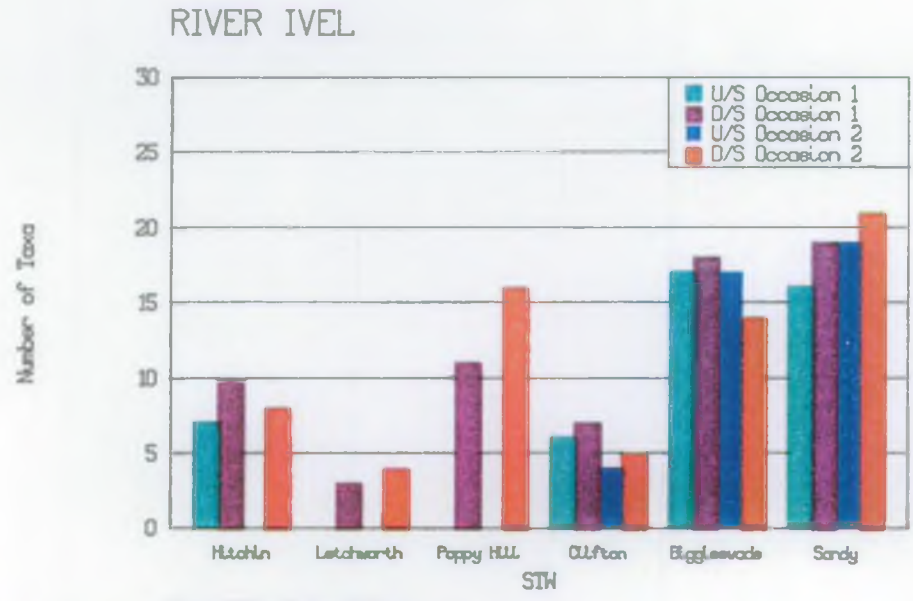


Figure II(a) - Number of Taxa

RIVER IVEL

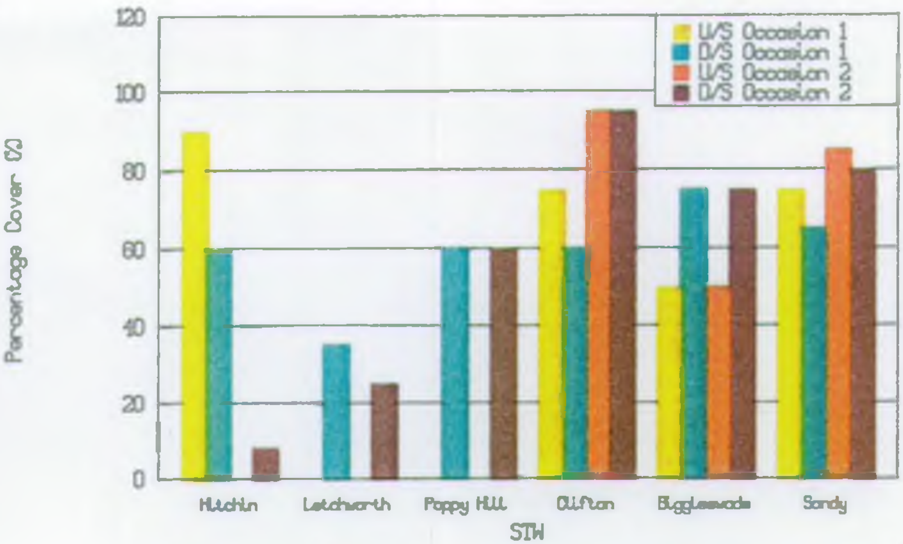


Figure 3(b) - Total Percentage Cover

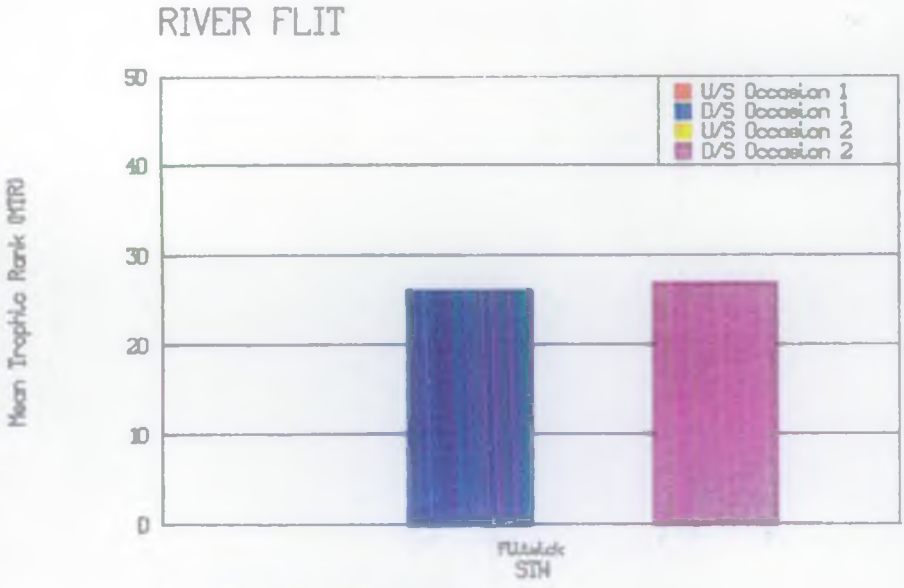


Figure 12(a) - Mean Trophic Rank (MTR)

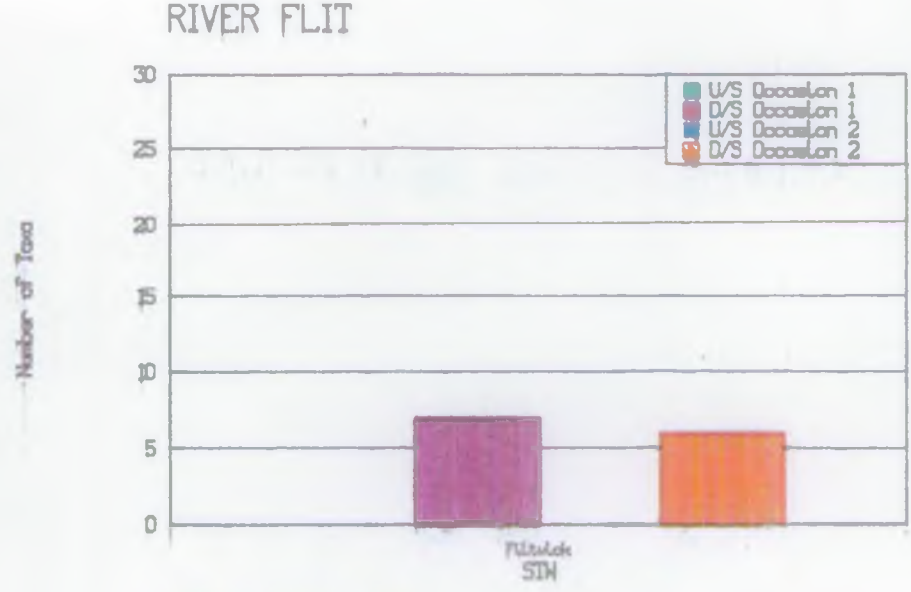


Figure 12(a) - Number of Taxa

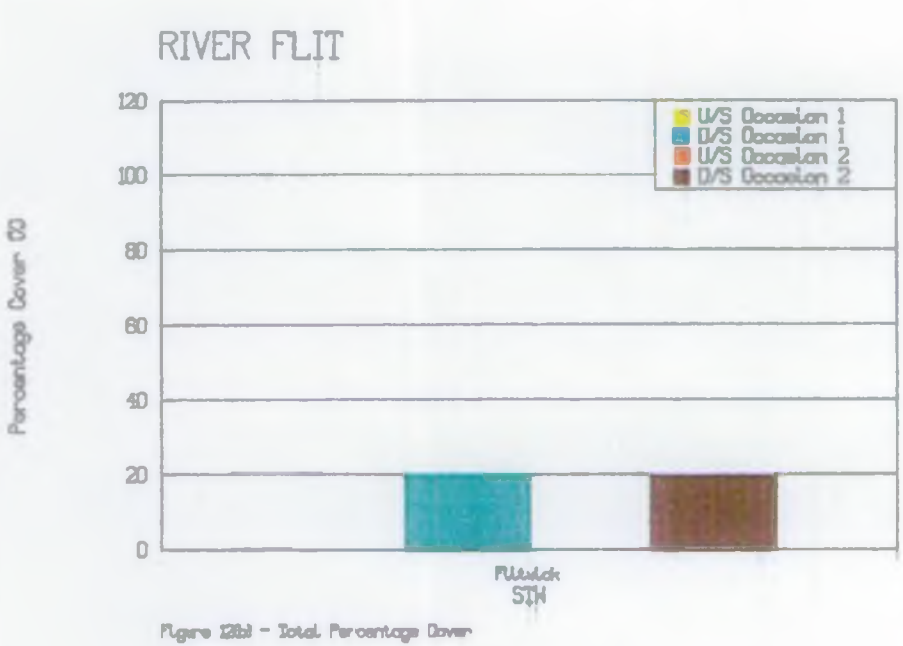


Figure 12b) - Total Percentage Cover

Candidate SA(e) - River Lark

Macrophyte Survey Results 1995

Qualifying discharges

Figure 5 Lark: Bury St Edmunds (D)
Mildenhall (D)

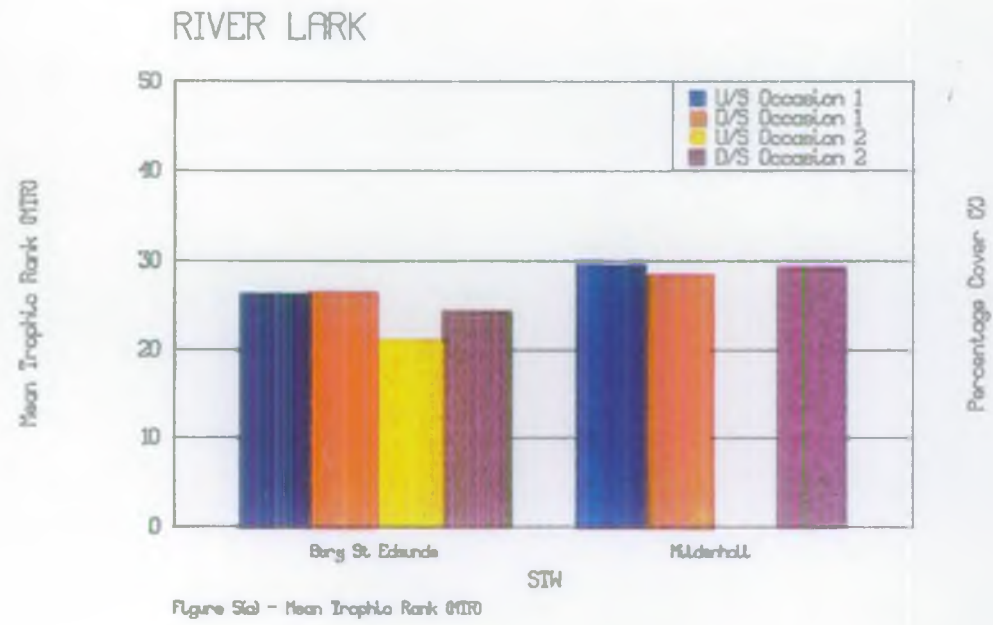


Figure 5(a) - Mean Trophic Rank (MTR)

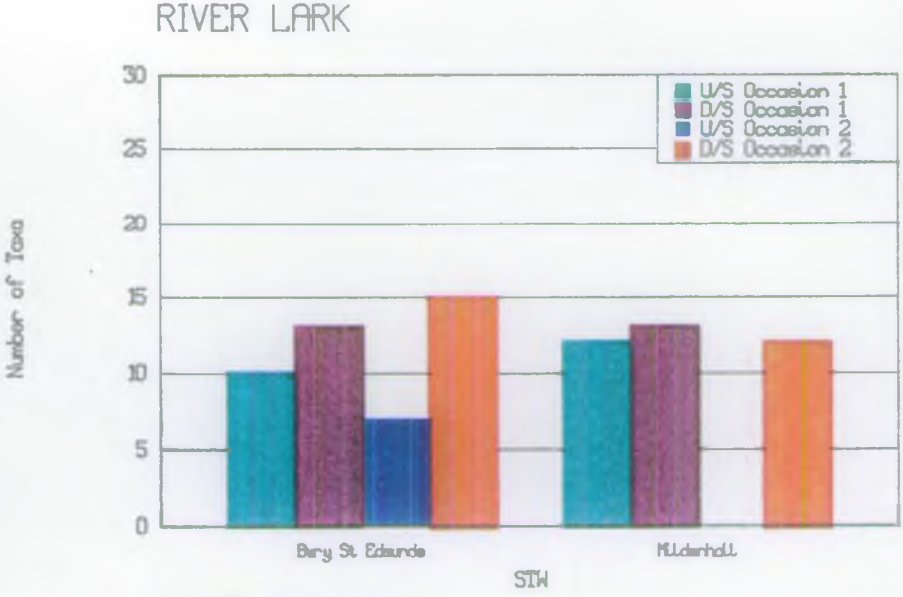


Figure 5(a) - Number of Taxa

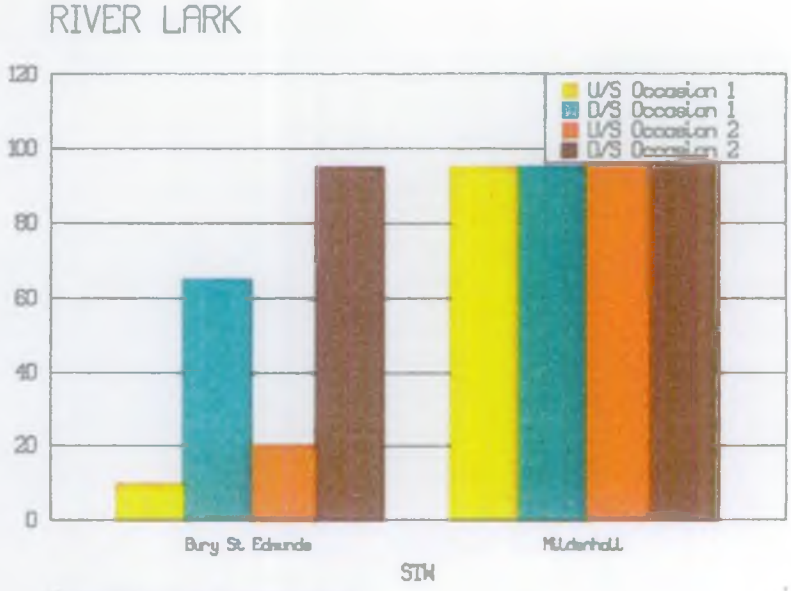


Figure 5b) - Total Percentage Cover

Candidate SA(e) - Soham Lode

Macrophyte Survey Results 1995

Qualifying discharges

Figure 4 Soham Lode: Soham (D)

Figure 4(a) - Mean Trophic Rank (MTR)

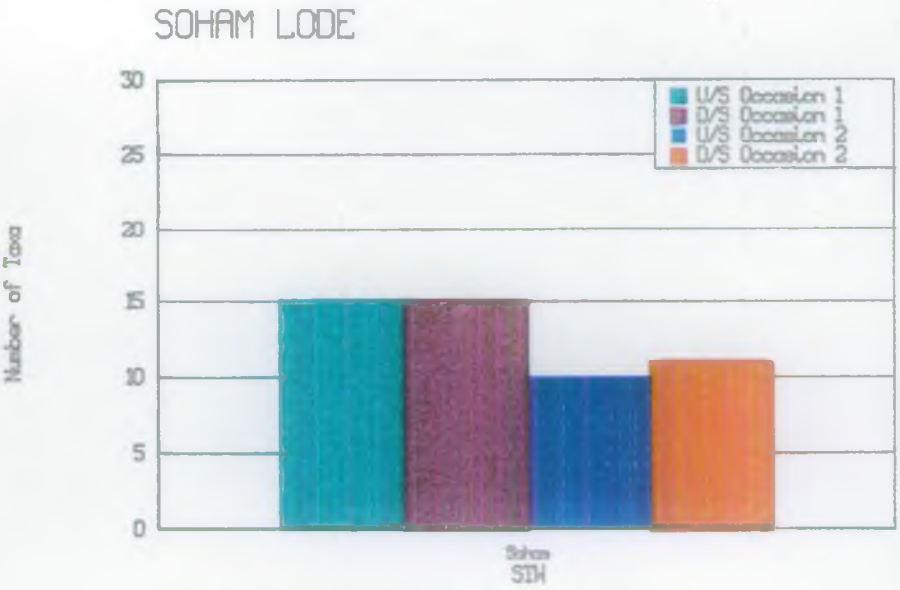


Figure 4(a) - Number of Taxa

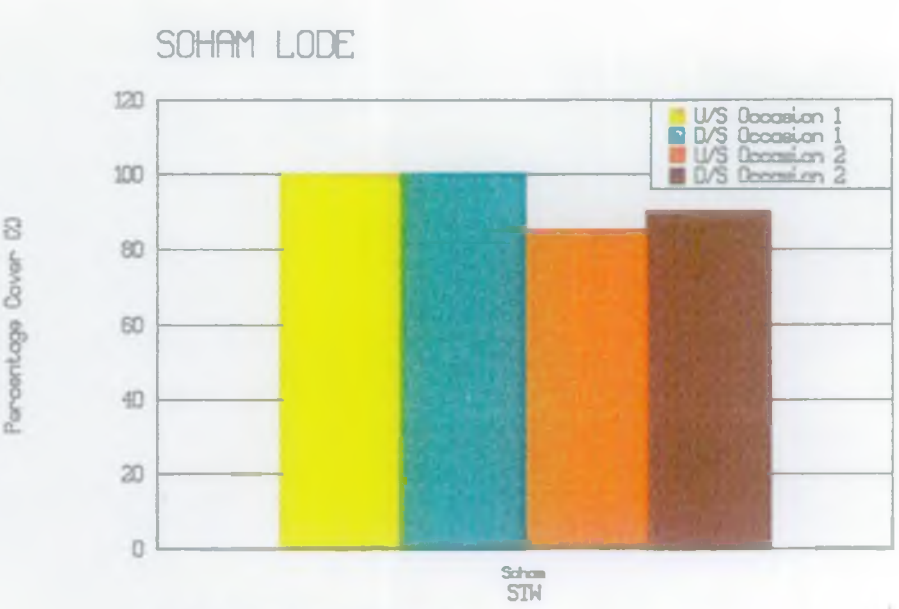


Figure 4b) - Total Percentage Cover

SECTION 2

EASTERN AREA

Designated SA(e) - Hanningfield Reservoir

Macrophyte Survey Results 1995

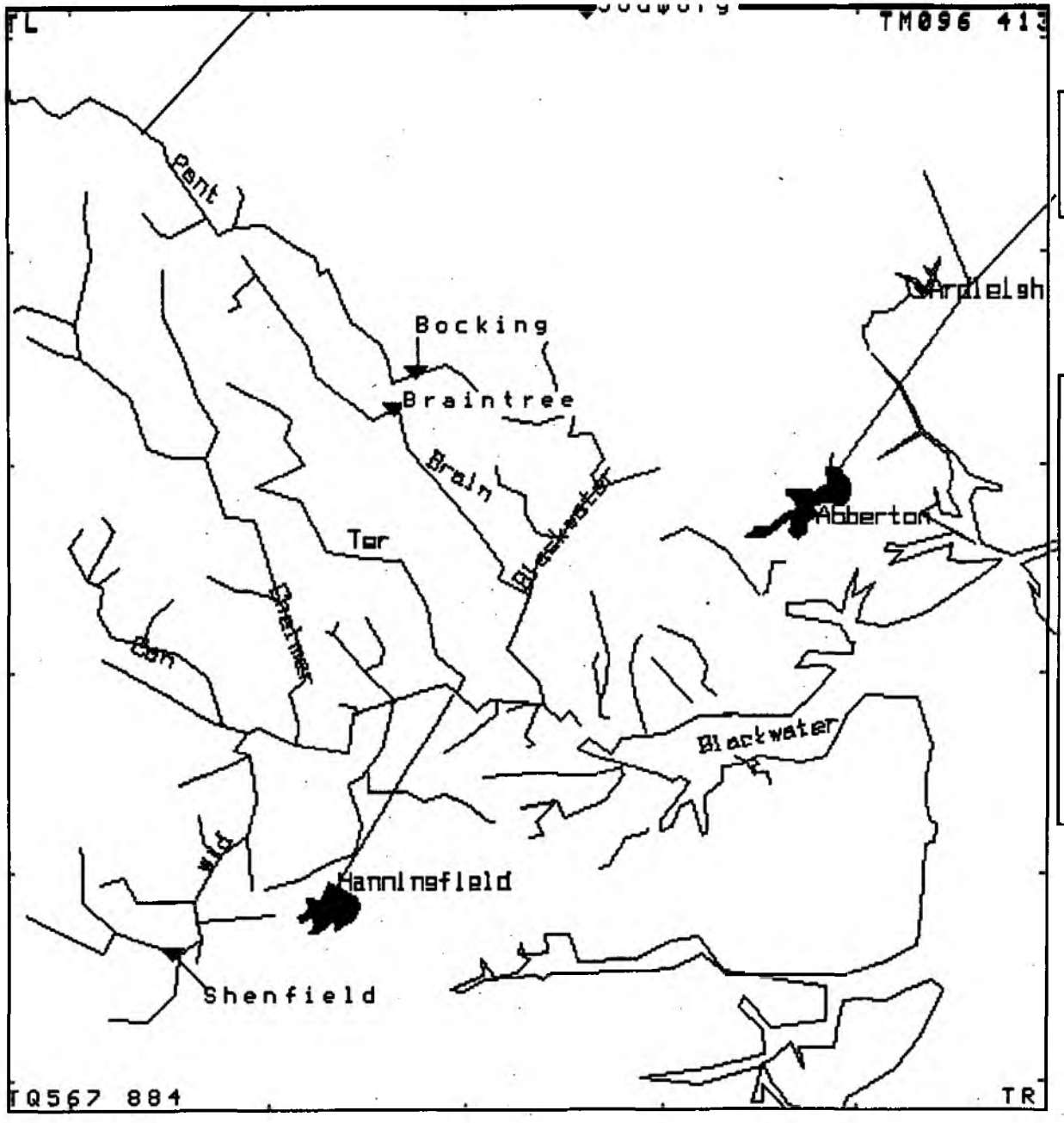
Qualifying discharges

Figure 1 Bocking (I)
Braintree (I)
Shenfield (I)

Commentary (example)

Eastern Area
Designated SA(e) - Hanningfield Reservoir

Generally the macrophyte survey data indicate that the river at the qualifying discharges is eutrophic. The MTRs are all less than 30. Total percentage cover is fairly high. At Bocking and Shenfield total percentage cover is higher downstream of the input compared with U/S. Shenfield in particular looks to have a significant impact on the macrophyte community.



EasyMap

NRA Anglian

Designated SA(e)
Hanningfield
Reservoir

18-12-95 at 17:12

EasyMap Version
2.0h, Nov.1995

Site Icon Key

No. of Sites=4
Search Was Halted

Scale=1:297478
10.6 km

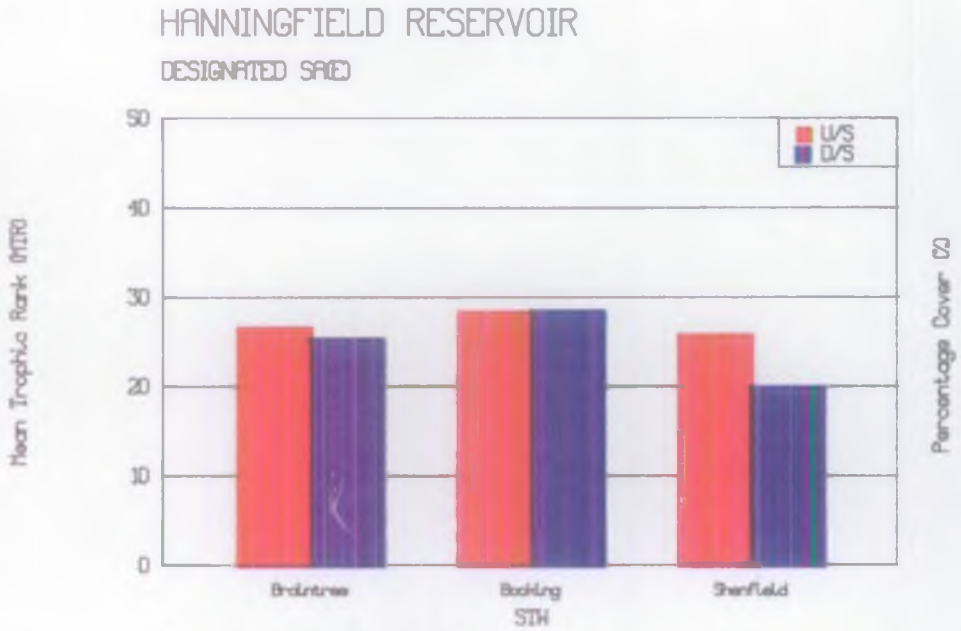


Figure 6a) - Mean Trophic Rank (MTR)

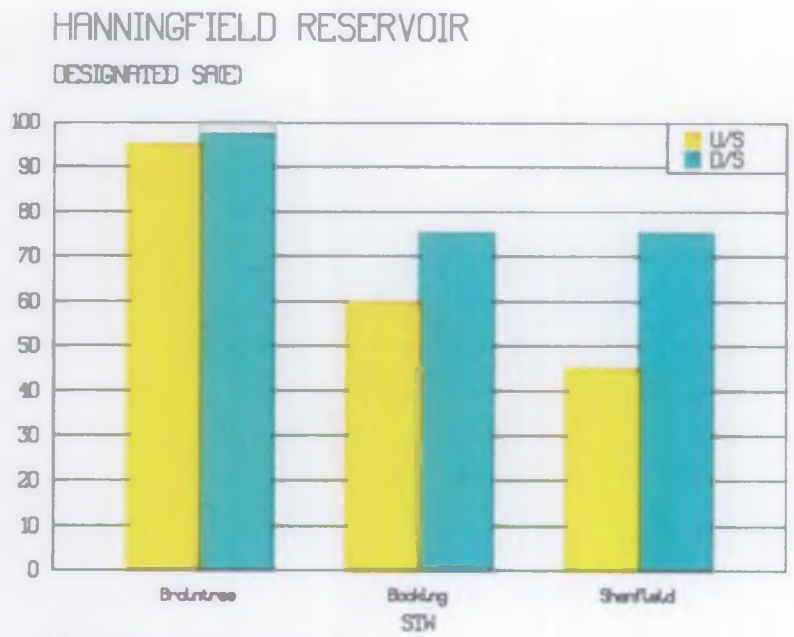


Figure 6b) - Total Percentage Cover

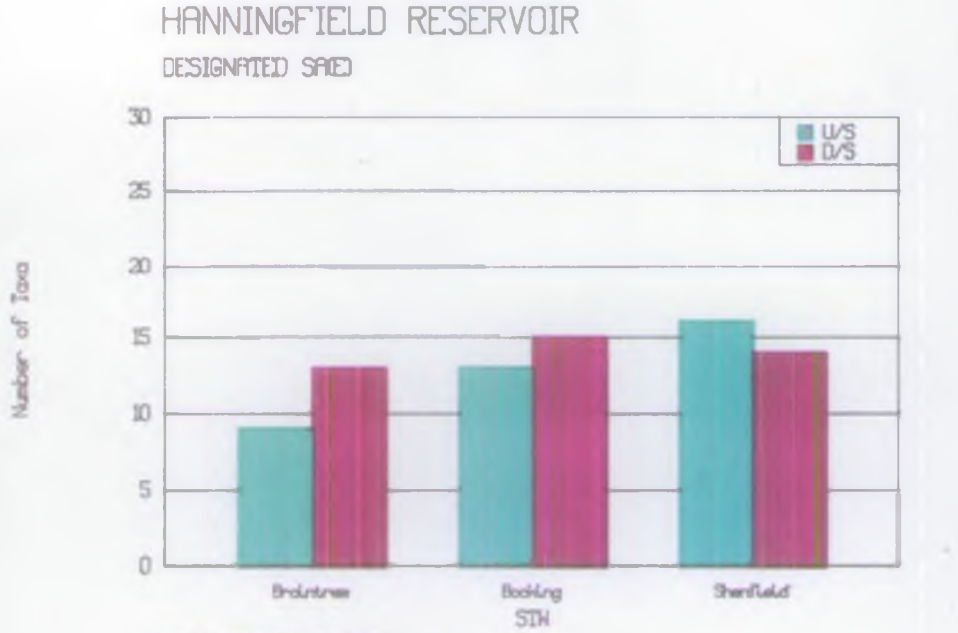


Figure 6c) - Number of Taxa

Designated SA(e) - Alton Water

Macrophyte Survey Results 1995

Qualifying discharges

Figure 2 Gipping: Needham Market (I)
Stowmarket (I)

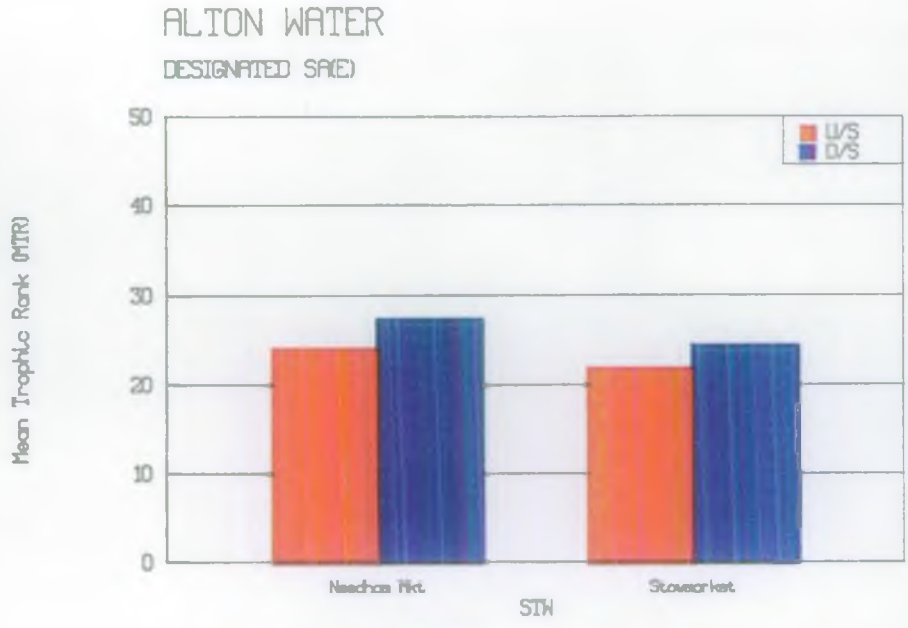


Figure 2(a) - Mean Trophic Rank (MTR)

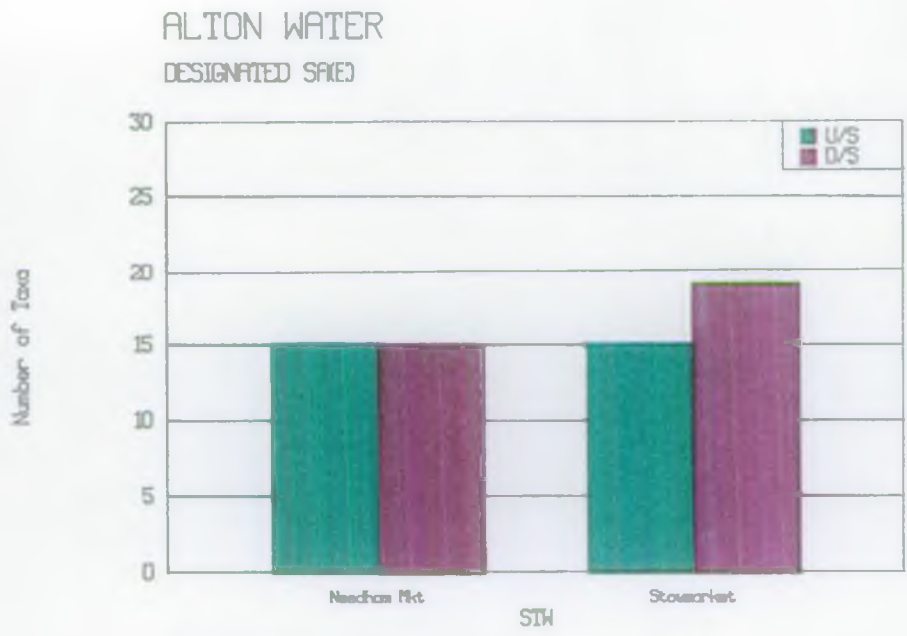


Figure 2(a) - Number of Taxa

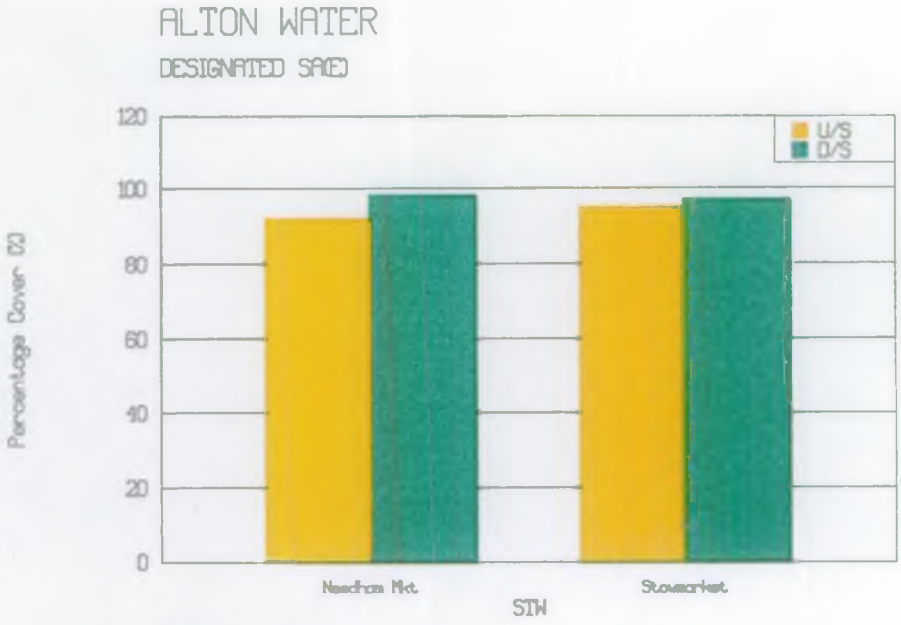


Figure 2(b) - Total Percentage Cover

Designated SA(e) - River Bure

Macrophyte Survey Results 1995

Qualifying discharges

Figure 3

Bure:
Belaugh (D)

Ant:
Stahlam (I)

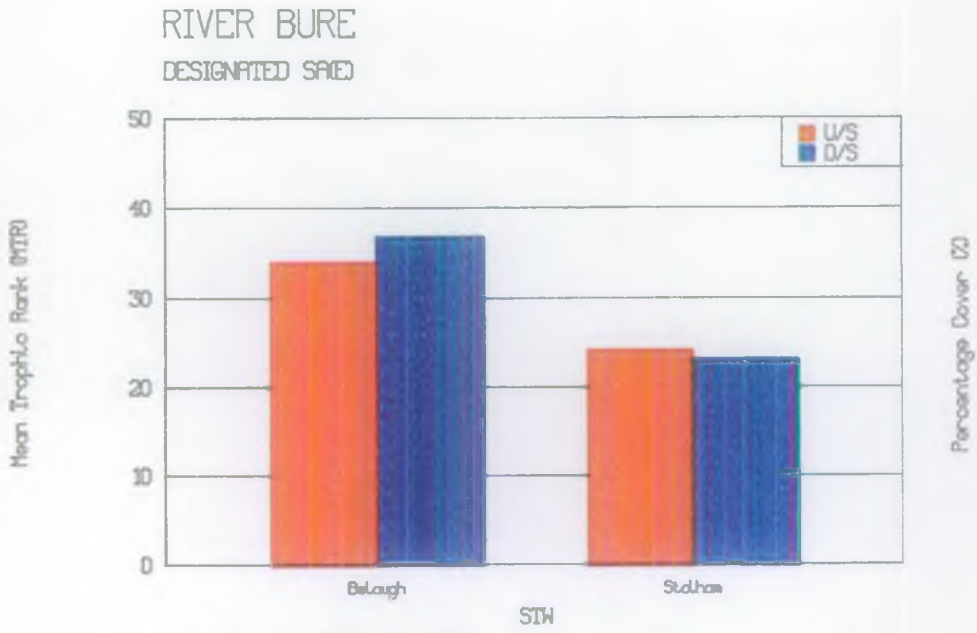


Figure 3(a) - Mean Trophic Rank (MTR)

Figure 3(a) - Number of Taxa

RIVER BURE

DESIGNATED SAED

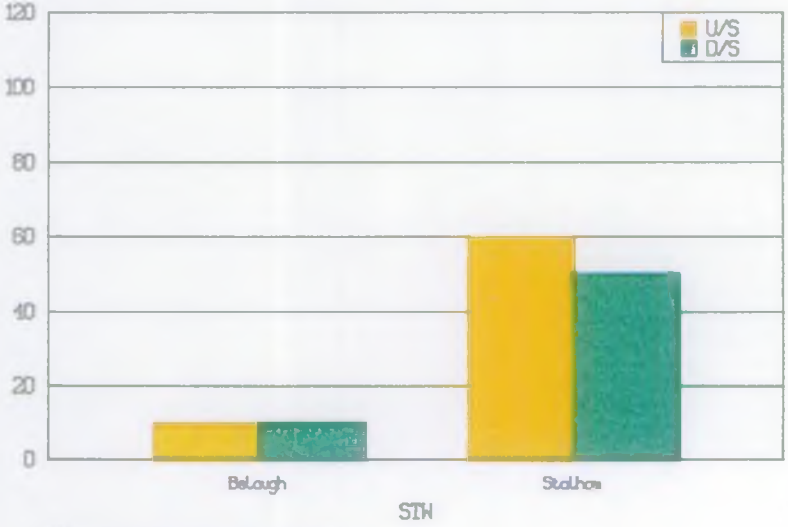


Figure 3(b) - Total Percentage Cover

Designated SA(e) - River Ant

Macrophyte Survey Results 1995

Qualifying discharges

Figure 4 Ant: Stahlam (D)

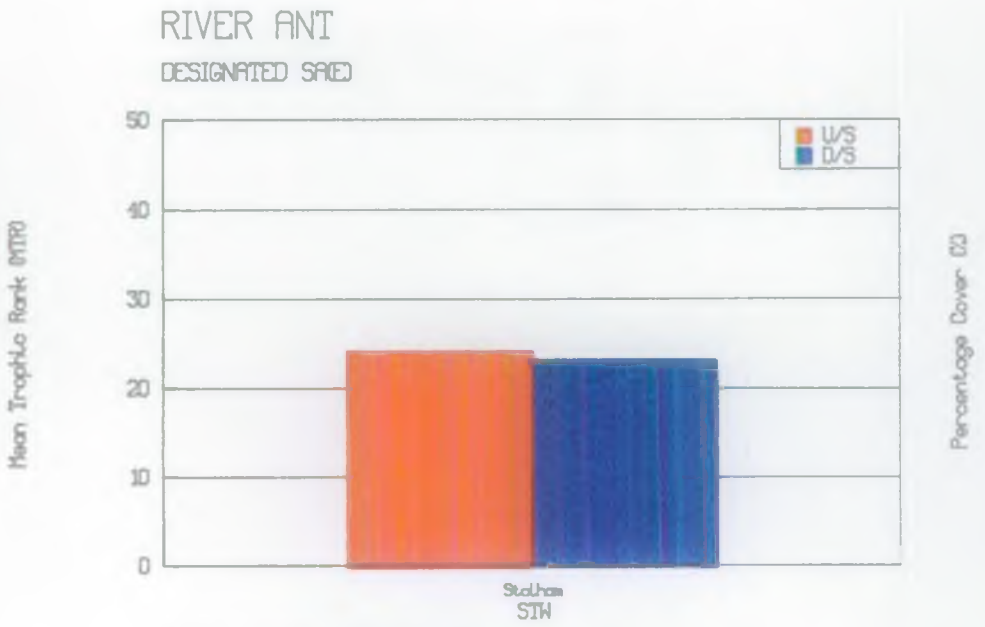


Figure 4(a) - Mean Trophic Rank (MTR)

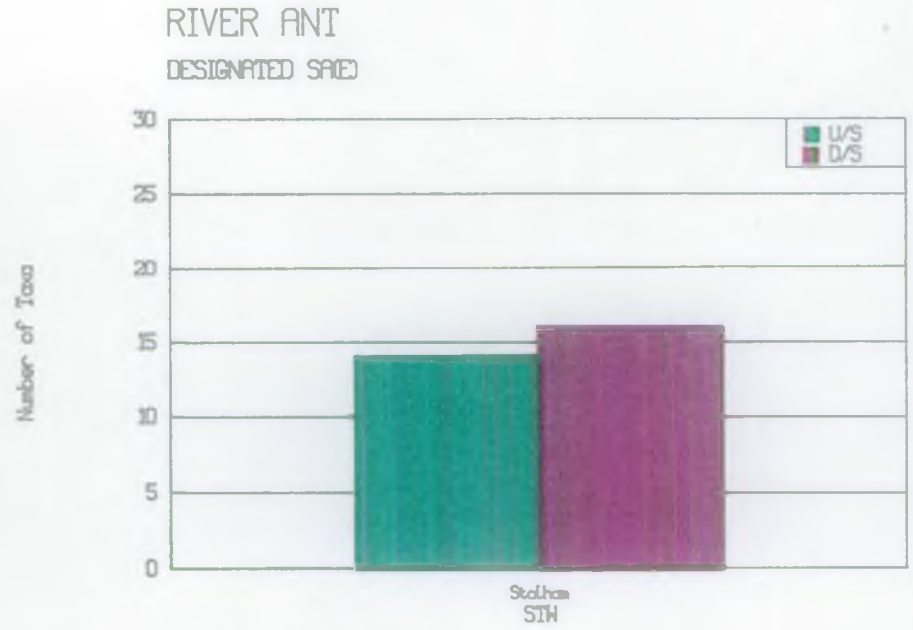


Figure 4(a) - Number of Taxa

RIVER ANT

DESIGNATED SAME

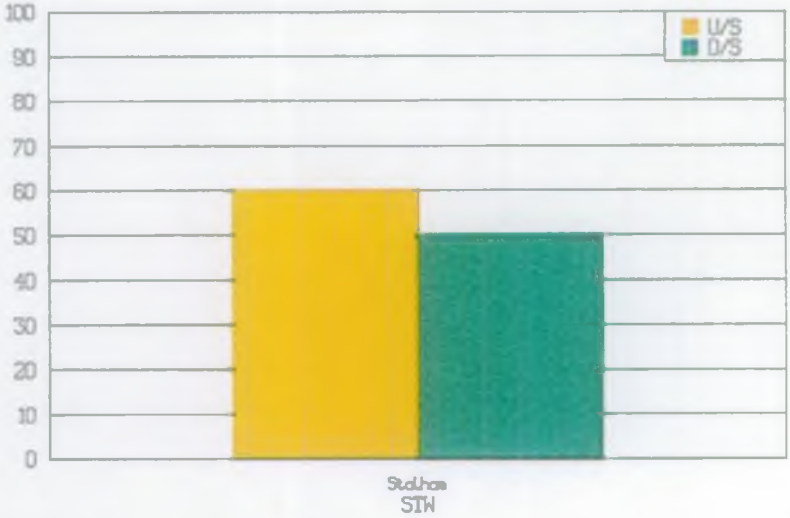


Figure 4(b) - Total Percentage Cover

Designated SA(e) - Ardleigh Reservoir

Macrophyte Survey Results 1995

Qualifying discharges

Figure 5 Halstead (I)

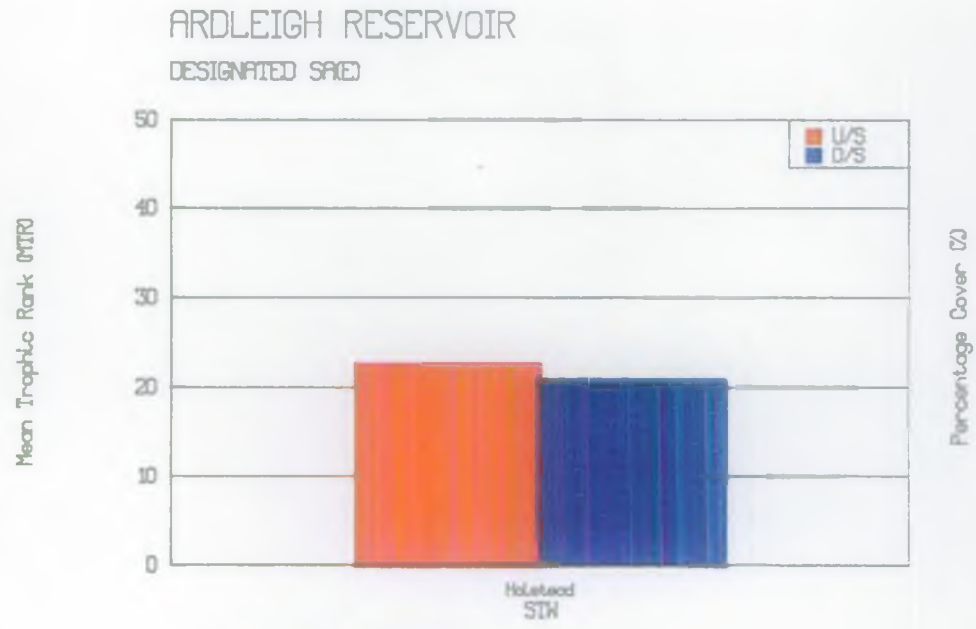


Figure 5(a) - Mean Trophic Rank (MTR)

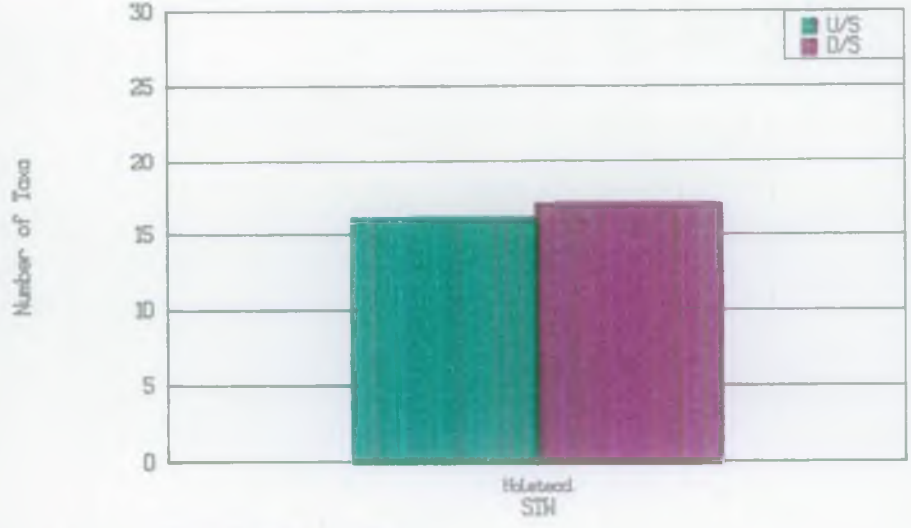


Figure 5(a) - Number of Taxa

ARDLEIGH RESERVOIR

DESIGNATED SAC)

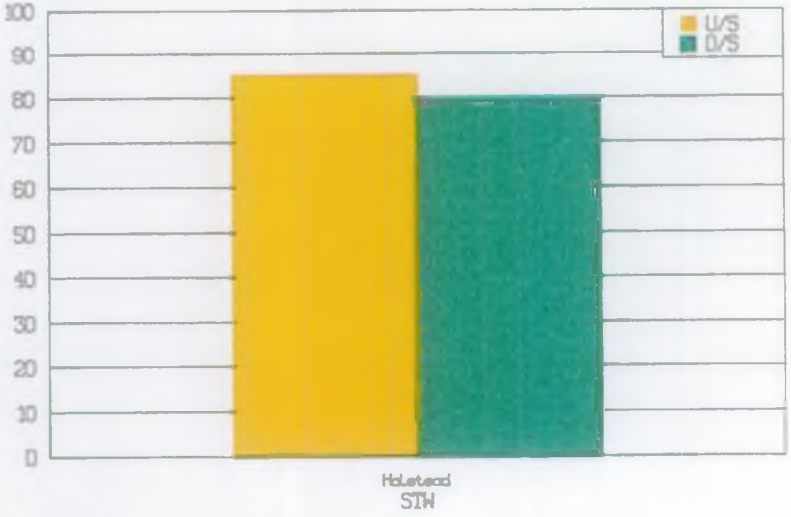


Figure 5b) - Total Percentage Cover

Candidate SA(e) - Rivers Brain & Blackwater

Macrophyte Survey Results 1995

Qualifying discharges

Figure 1 Bocking (D)
Braintree (D)

Candidate SA(e) - Rivers Wid, Can & Chelmer

Macrophyte Survey Results 1995

Qualifving discharges

Figure 1 Shenfield (D)

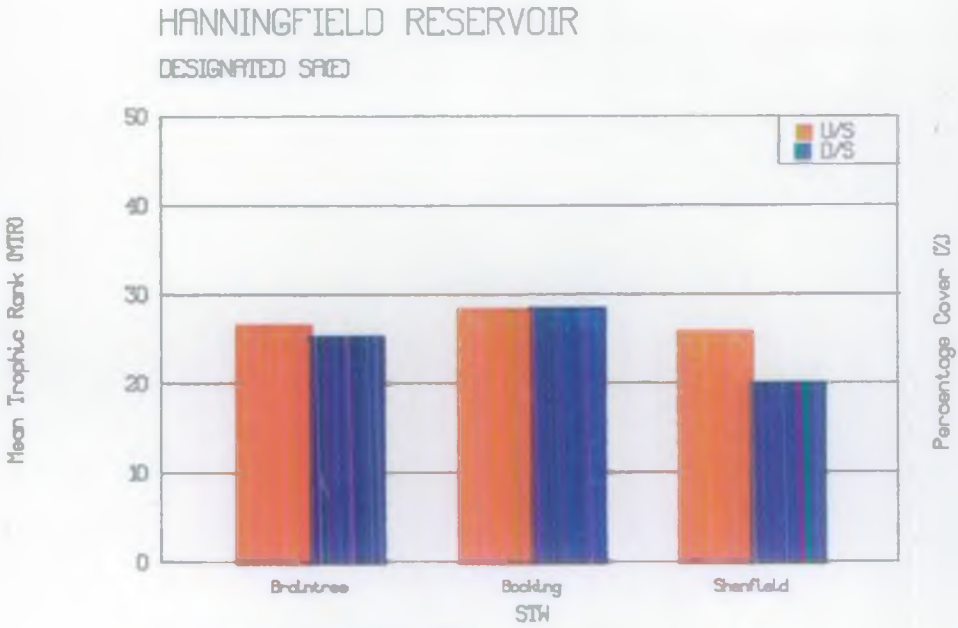


Figure 1(a) - Mean Trophic Rank (MTR)

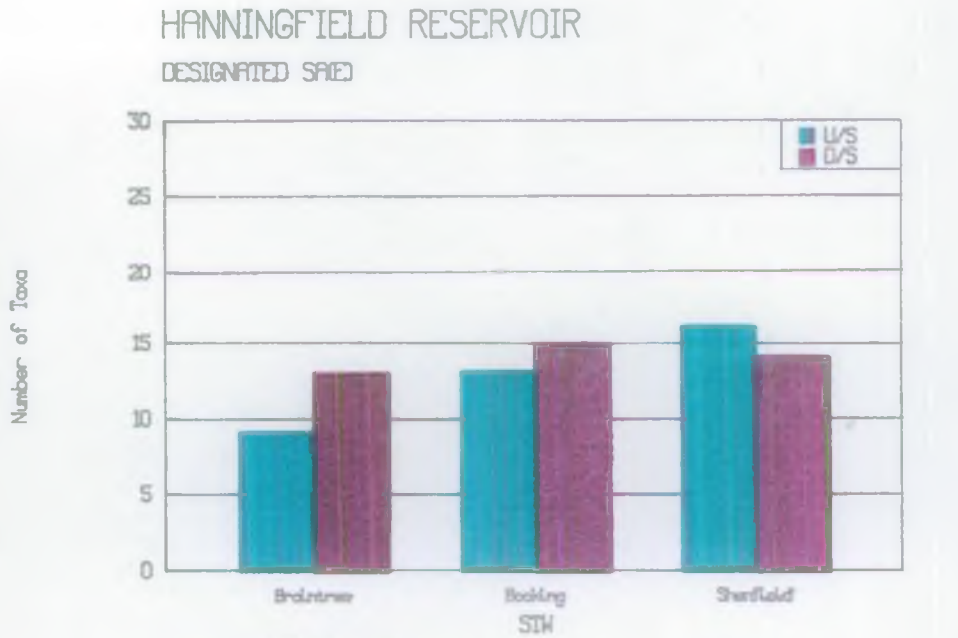


Figure 1(a) - Number of Taxa

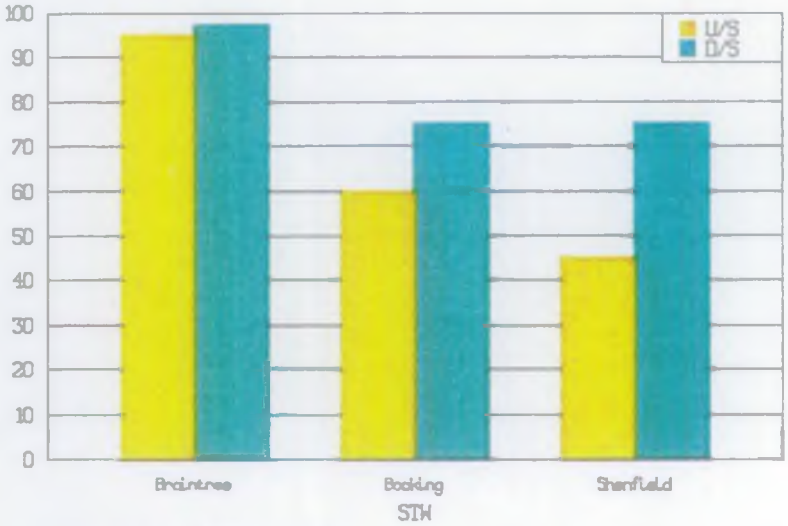


Figure 1b1 - Total Percentage Cover

Candidate SA(e) - River Gipping

Macrophyte Survey Results 1995

Qualifying discharges

Figure 2 Needham Market (D)
Stowmarket (D)

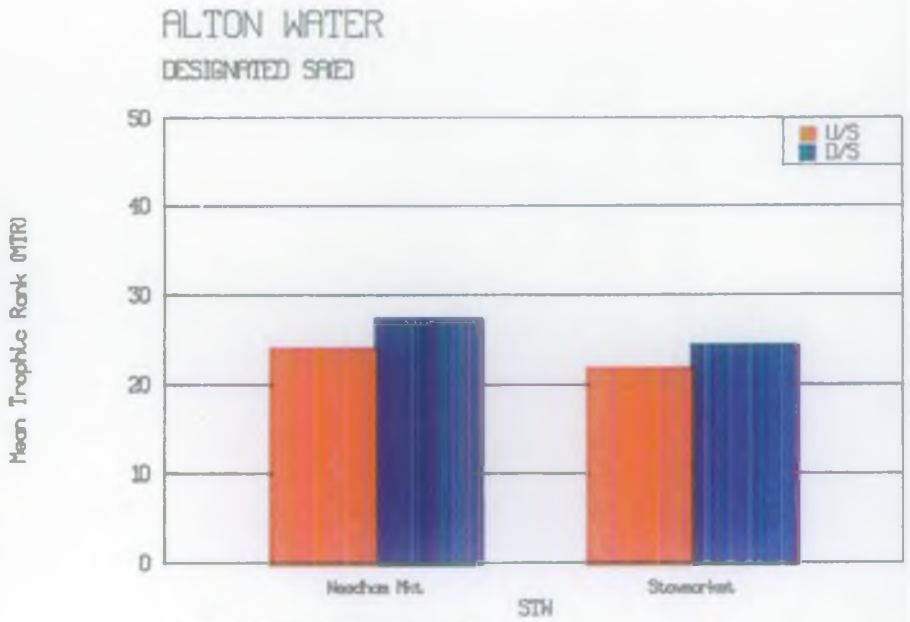


Figure 2(a) - Mean Trophic Rank (MTR)

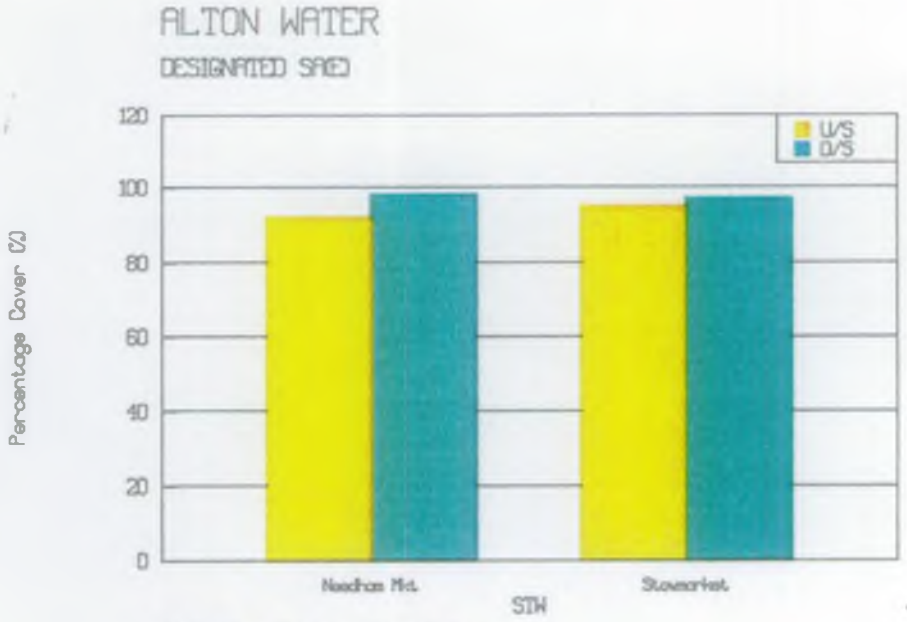


Figure 2(b) - Total Percentage Cover

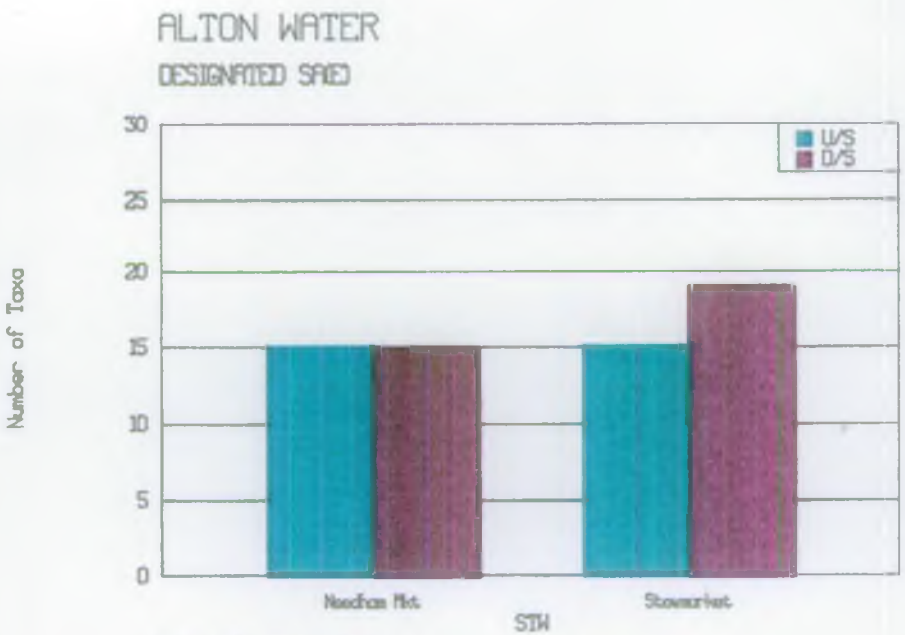


Figure 2(c) - Number of Taxa

Candidate SA(e) - River Colne

Macrophyte Survey Results 1995

Qualifying discharges

Figure 5 Halstead (D)

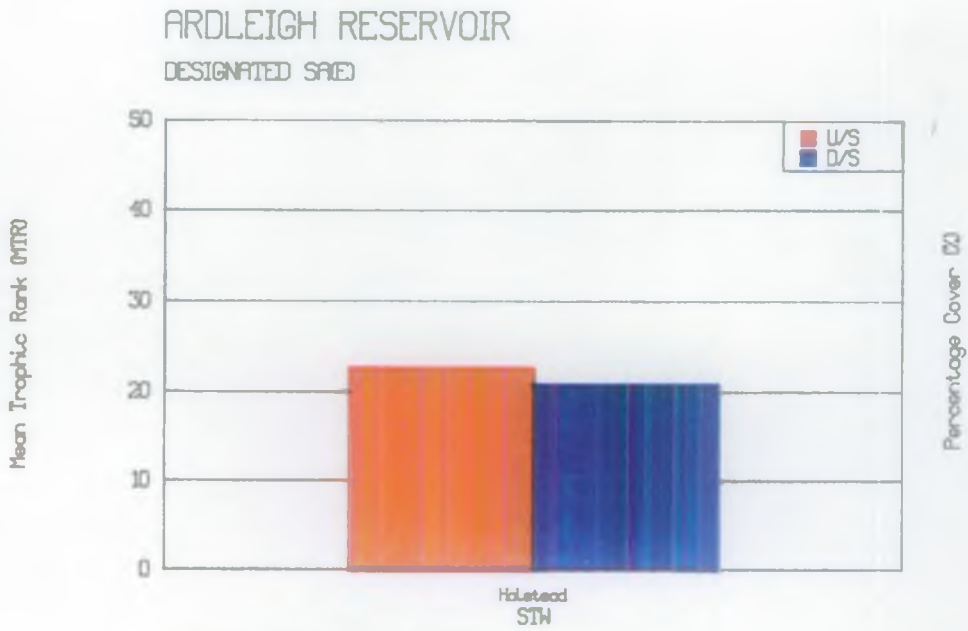


Figure 5a) - Mean Trophic Rank (MTR)

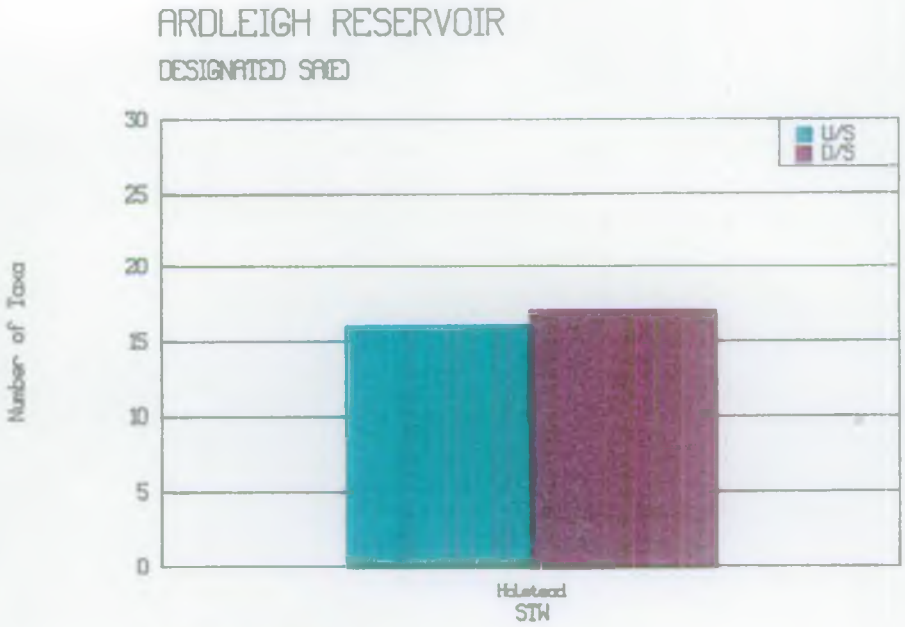


Figure 5a) - Number of Taxa

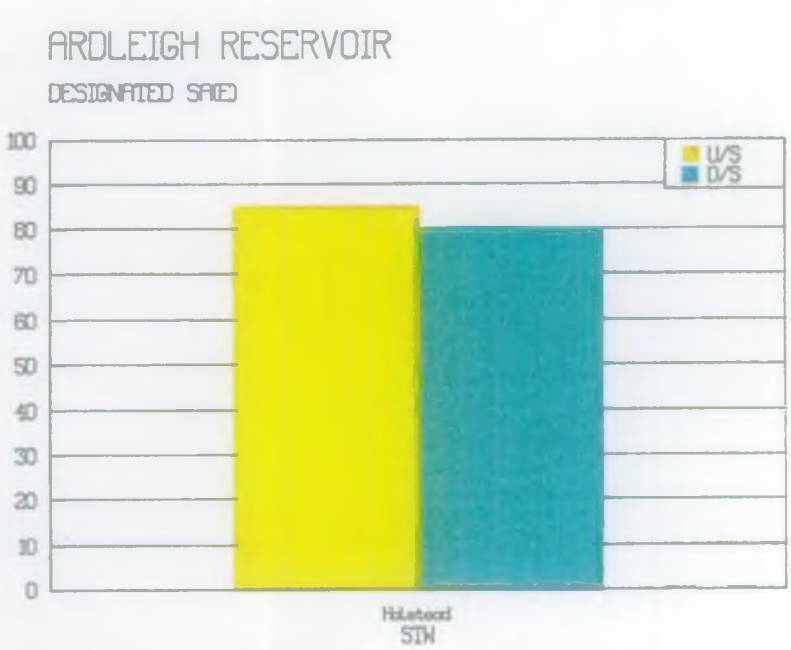


Figure 5b) - Total Percentage Cover

Candidate SA(e) - River Waveney/Starston Brook

Macrophyte Survey Results 1995

Qualifying discharges

Figure 6

Diss (D)
Harleston (D)
Eye (I)
Beccles (D)

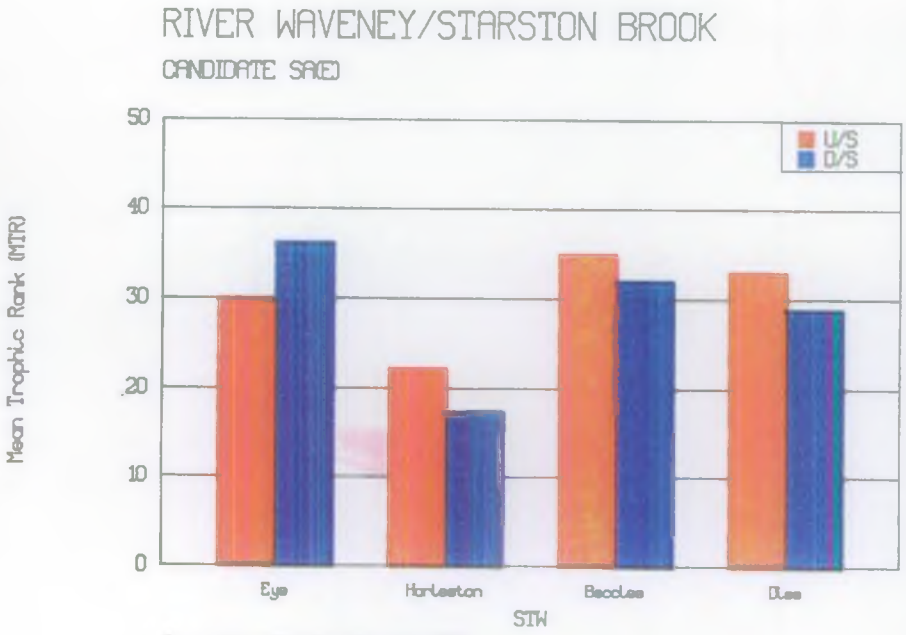


Figure 6(a) - Mean Trophic Rank (MTR)

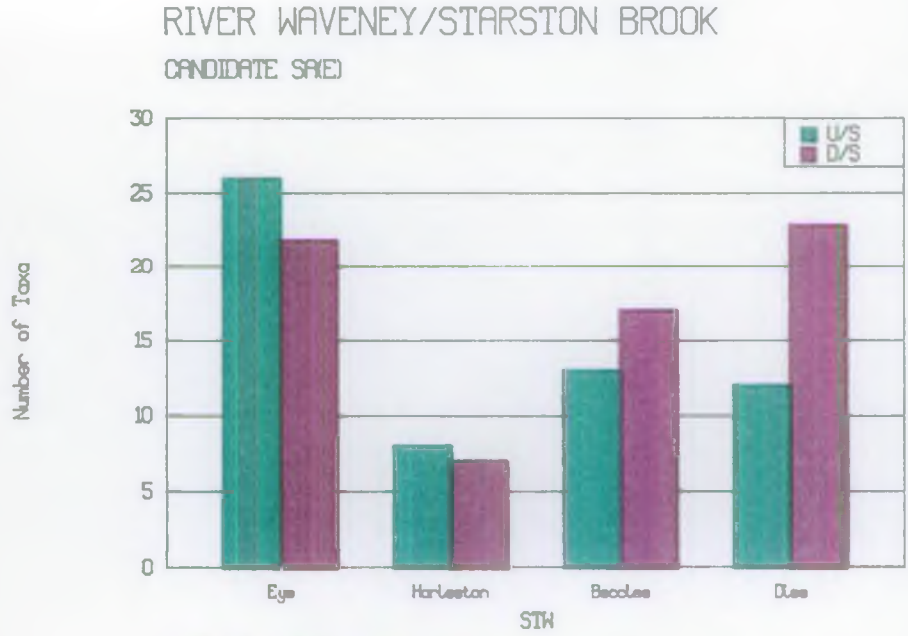
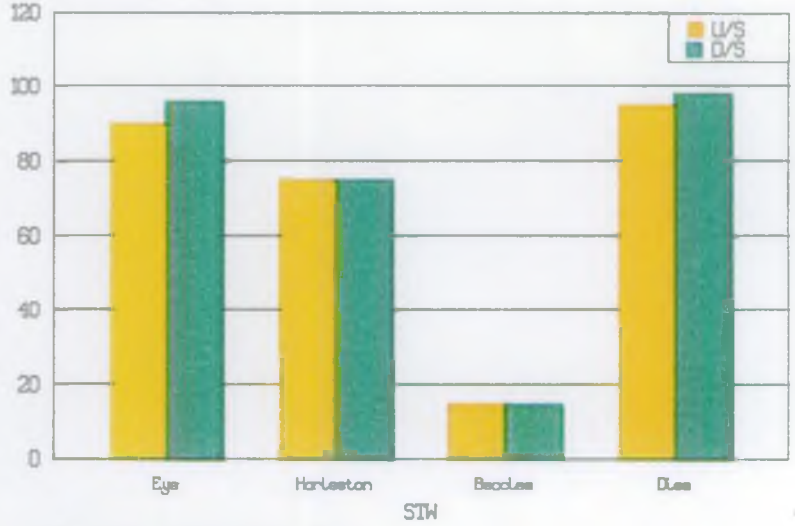


Figure 6(a) - Number of Taxa

RIVER WAVENEY/STARSTON BROOK

CANDIDATE SAE)



Percentage Cover (%)

Figure 6b) - Total Percentage Cover

Candidate SA(e) - River Yare/Witton Run

Macrophyte Survey Results 1995

Qualifying discharges

Figure 7 Wymondham (D)
Whitlingham (D)
Strumpshaw (D)

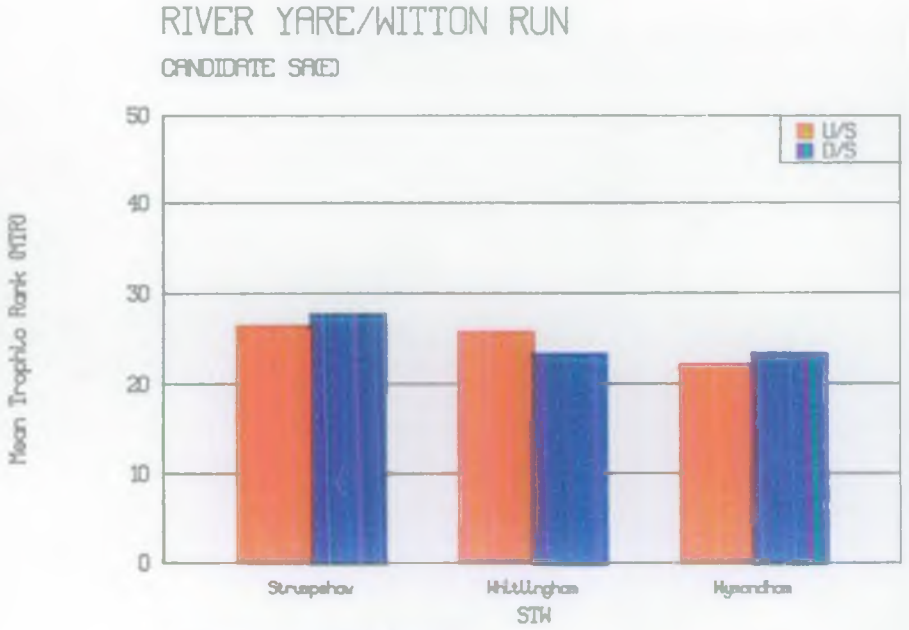


Figure 7(a) - Mean Trophic Rank (MTR)

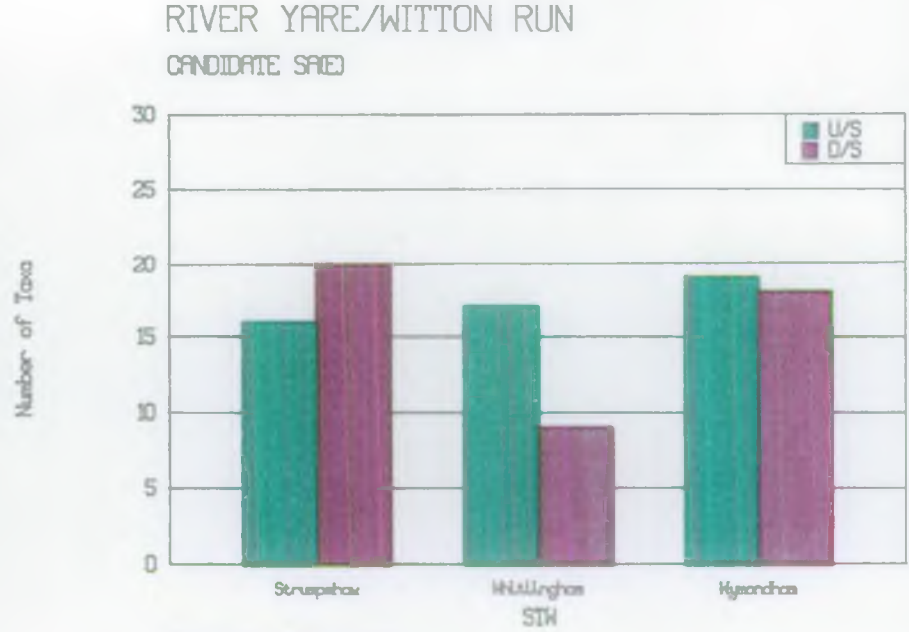


Figure 7(a) - Number of Taxa

RIVER YARE/WITTON RUN

CANDIDATE SAE)

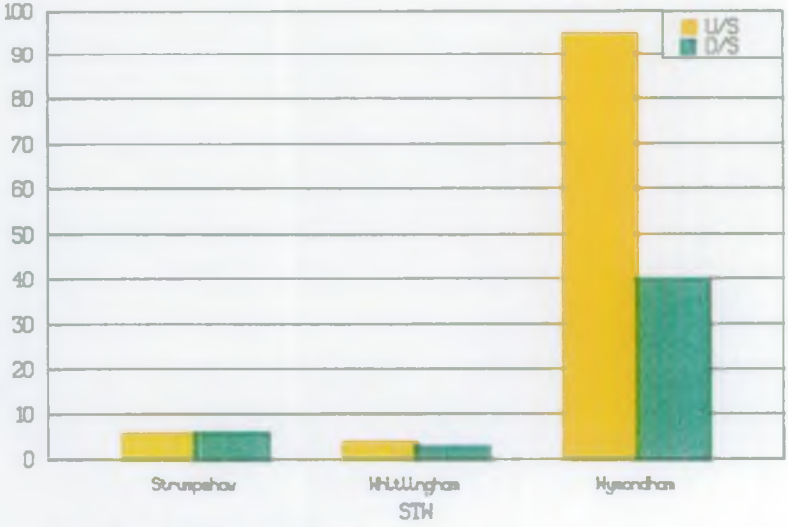


Figure 7(b) - Total Percentage Cover

Candidate SA(e) - River Wensum

Macrophyte Survey Results 1995

Qualifying discharges

Figure 8 East Dereham (D)
Fakenham (D)

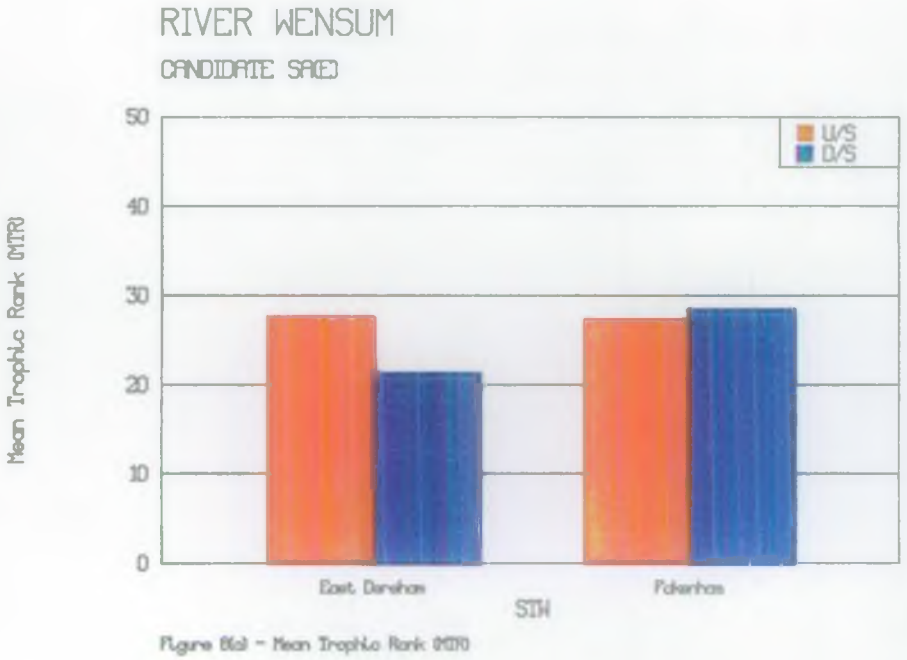


Figure 6b) - Mean Trophic Rank (MTR)

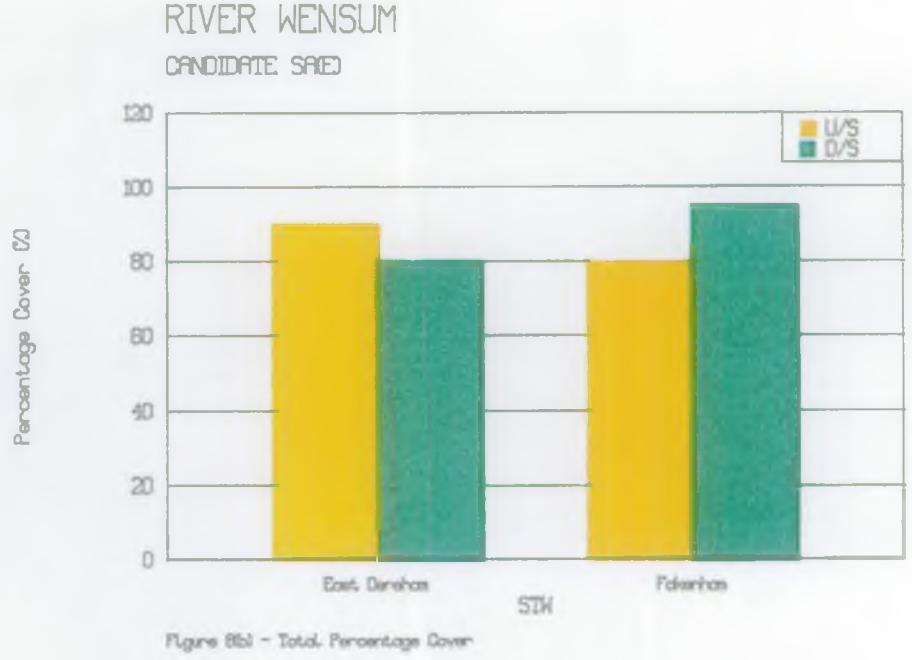


Figure 6b) - Total Percentage Cover

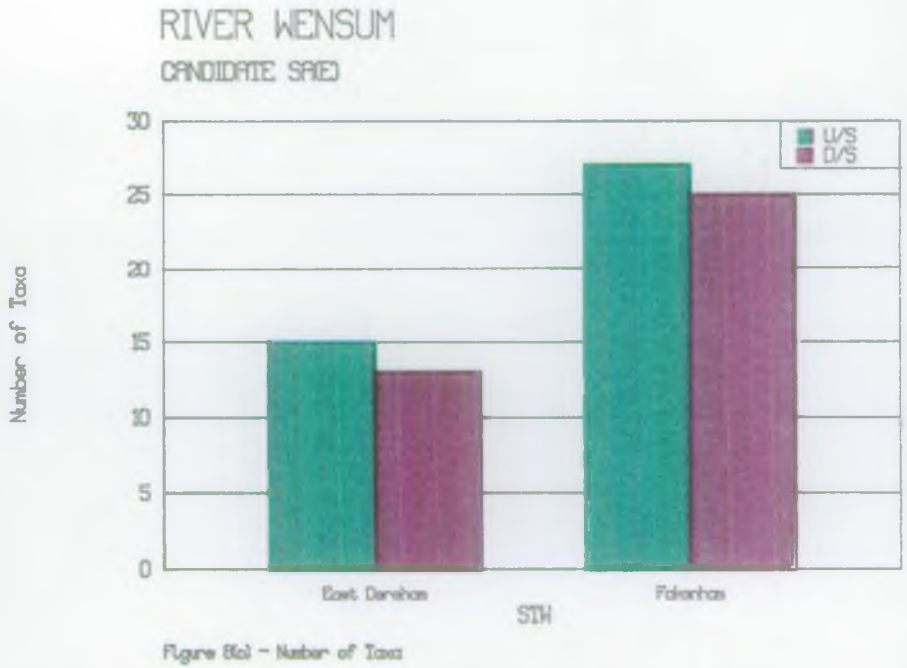


Figure 6b) - Number of Taxa

Candidate SA(e) - River Stour/Stour Brook & Abberton Reservoir

Macrophyte Survey Results 1995

Qualifying discharges

Figure 9 Haverhill (I)
Sudbury (I)

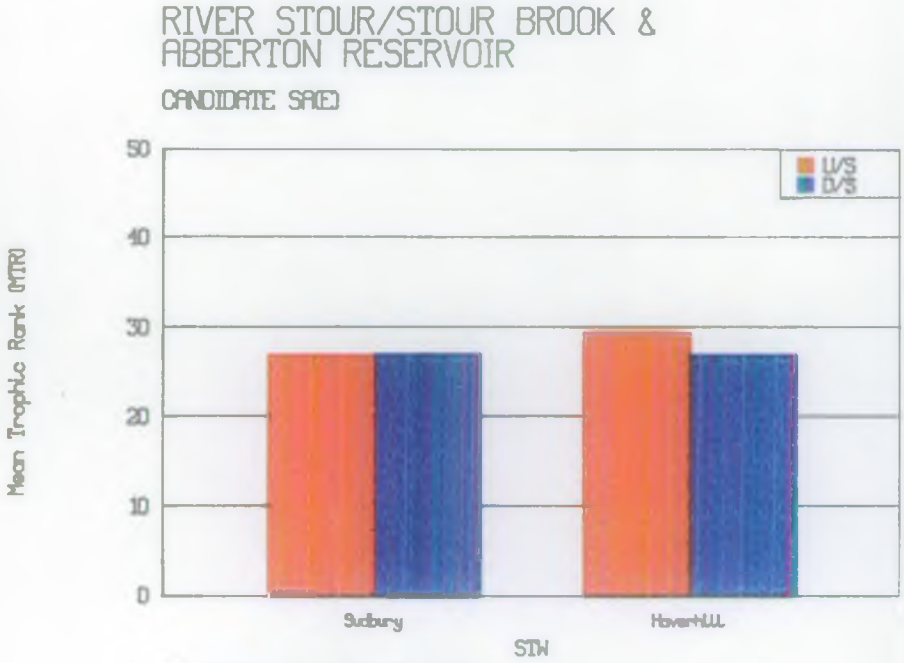


Figure 5(a) - Mean Trophic Rank (MTR)

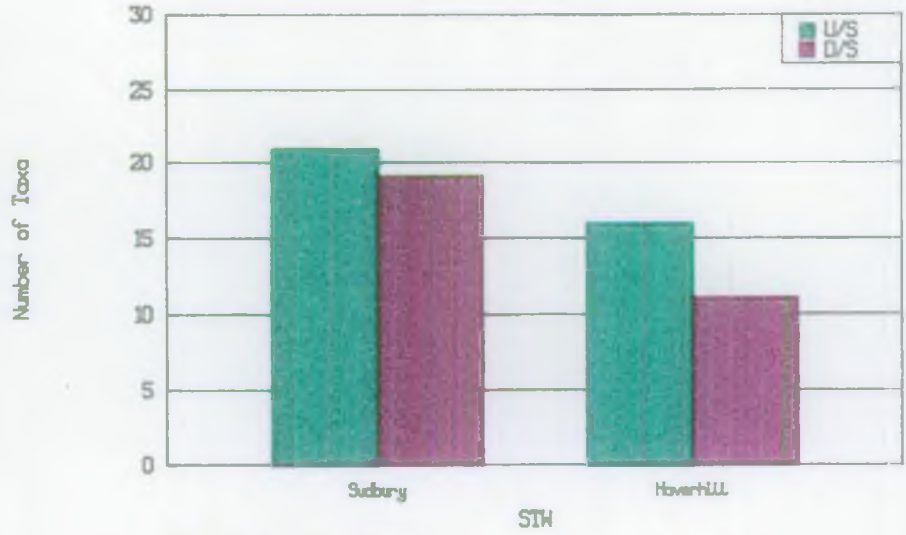
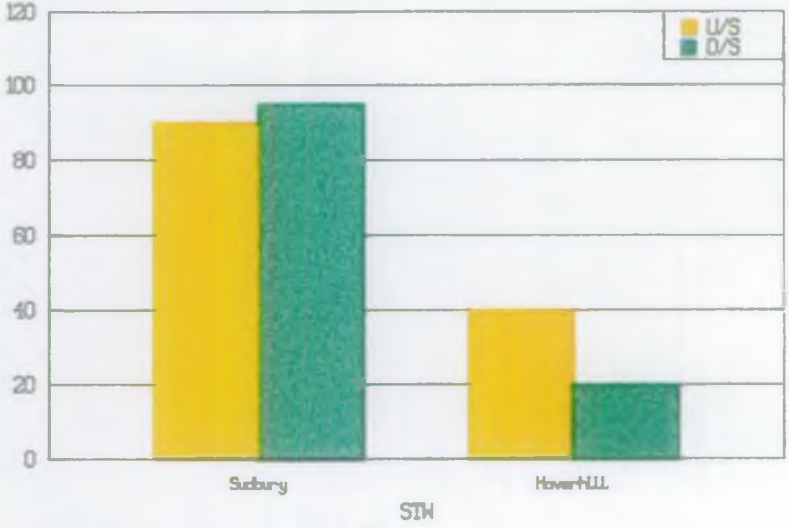


Figure 5(a) - Number of Taxa

RIVER STOUR/STOUR BROOK & ABBERTON RESERVOIR

CANDIDATE SAED



Percentage Cover CD

Figure 9(b) - Total Percentage Cover CD

Candidate SA(e) - Mardyke

Macrophyte Survey Results 1995

Qualifying discharges

Figure 10 Upminster (D)

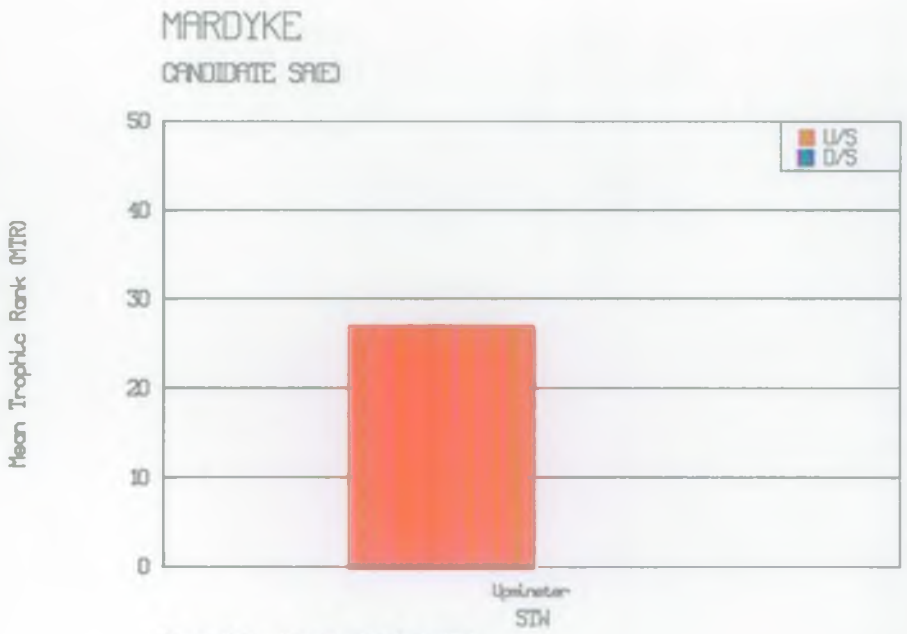


Figure 10a) - Mean Trophic Rank (MTR)

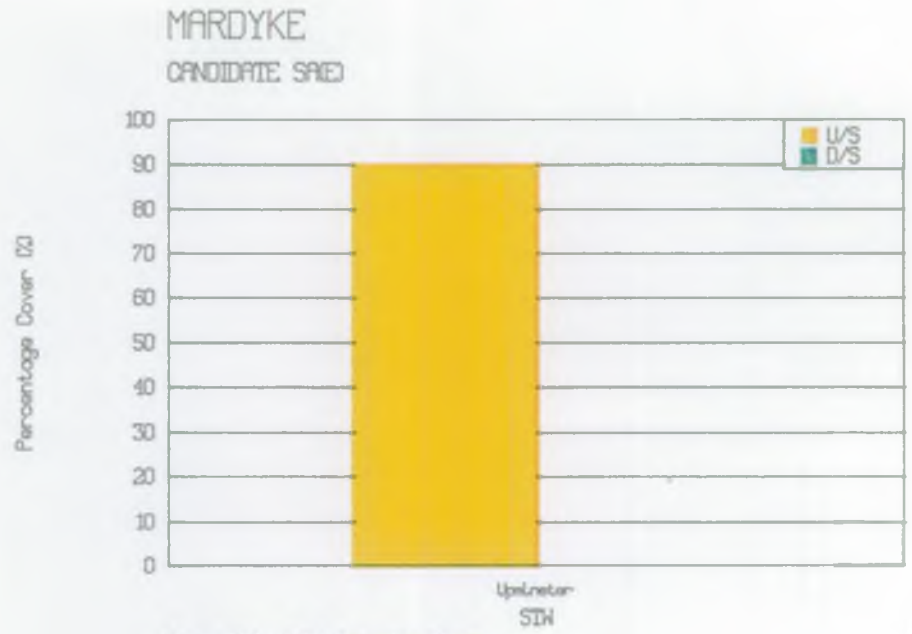


Figure 10b) - Total Percentage Cover

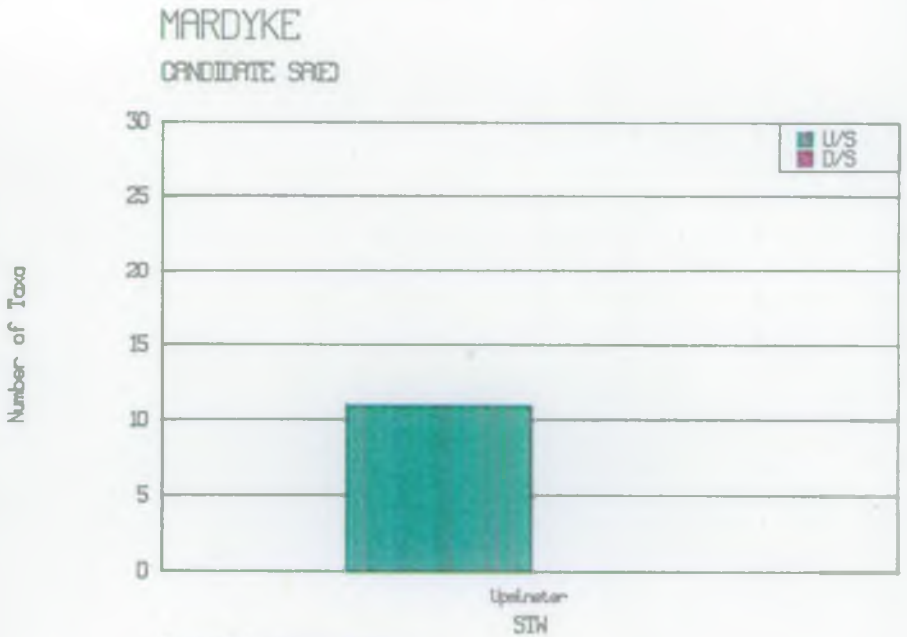


Figure 10c) - Number of Taxa

SECTION 3

NORTHERN AREA

Designated SA(e) - River Nene

Macrophyte Survey Results 1995

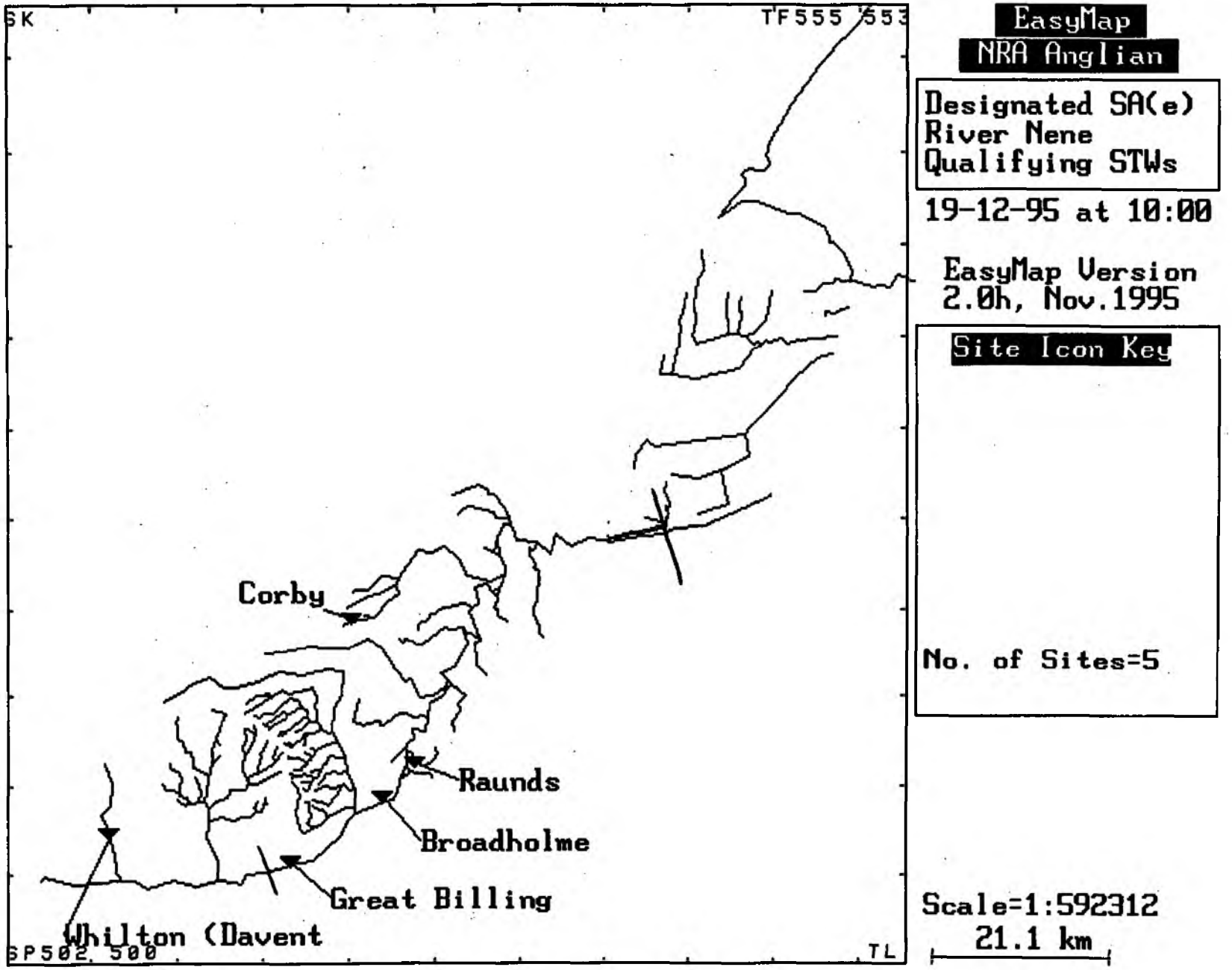
Qualifying discharges

Figure 1 Gt Billing (D)
Broadholme (D)
Whilton (I)
Raunds (D)
Corby (D)

Commentary (example)

Northern Area
Designated SA(e) - River Nene

Generally the data suggest that the R.Nene is eutrophic. The MTRs are generally low (<30). Billing, Broadholme, Raunds and Corby all have an impact on the macrophyte community D/S of their input. In all cases the total percentage cover increases (largest increase U/S to D/S of Broadholme and Raunds). The drop in MTR from 35 to <20 U/S to D/S of Corby with an associated increase in total percentage cover and low abundance indicates a significant impact on the macrophyte community.


SK
TF555 553
Corby
Raunds
Broadholme
Great Billing
Whilton (Davent
SP502 500
TL
EasyMap
NRA Anglian
Designated SA(e)
River Nene
Qualifying STWs
19-12-95 at 10:00
EasyMap Version
2.0h, Nov.1995
Site Icon Key
No. of Sites=5
Scale=1:592312
21.1 km

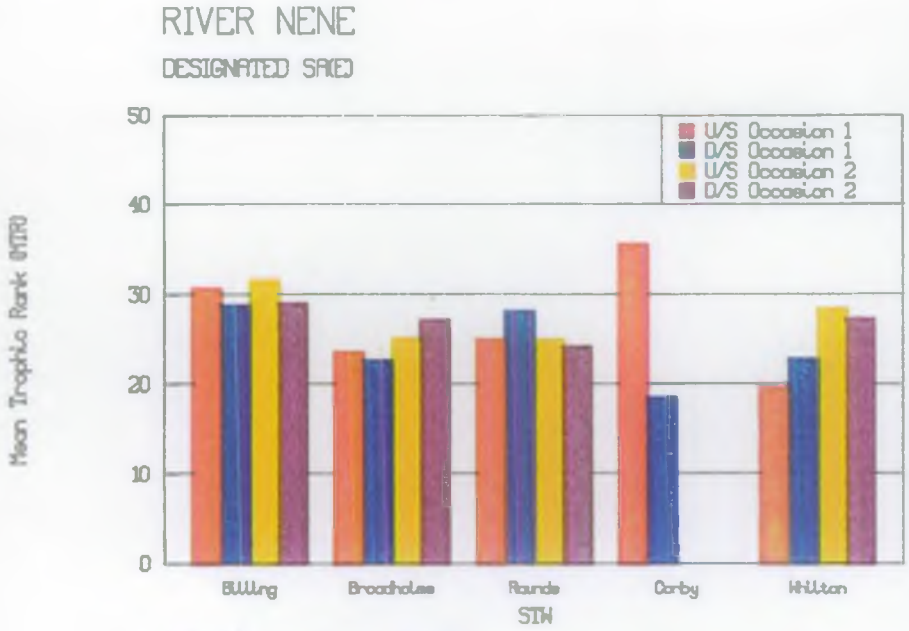


Figure No. - Mean Trophic Rank (MTR)

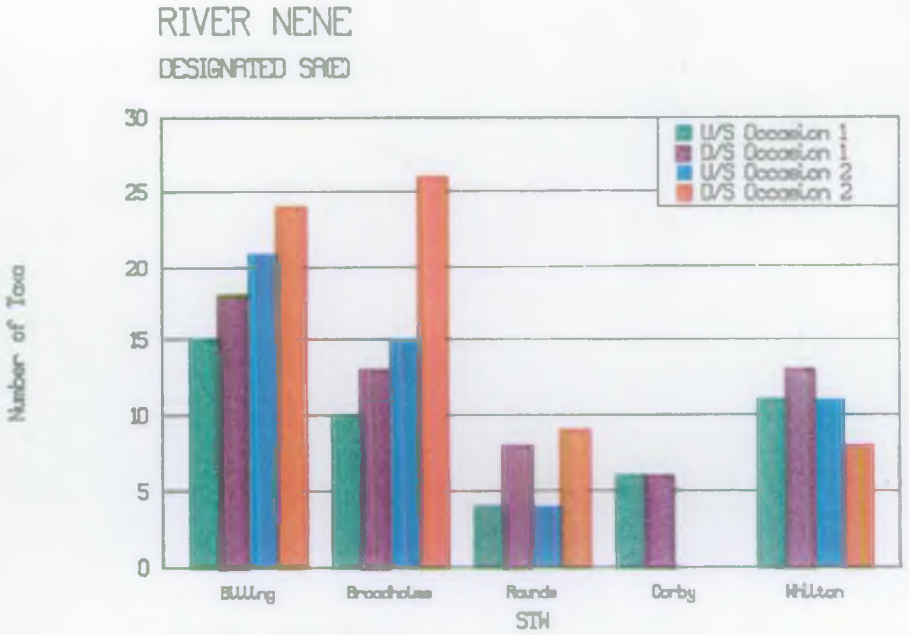


Figure No. - Number of Taxa

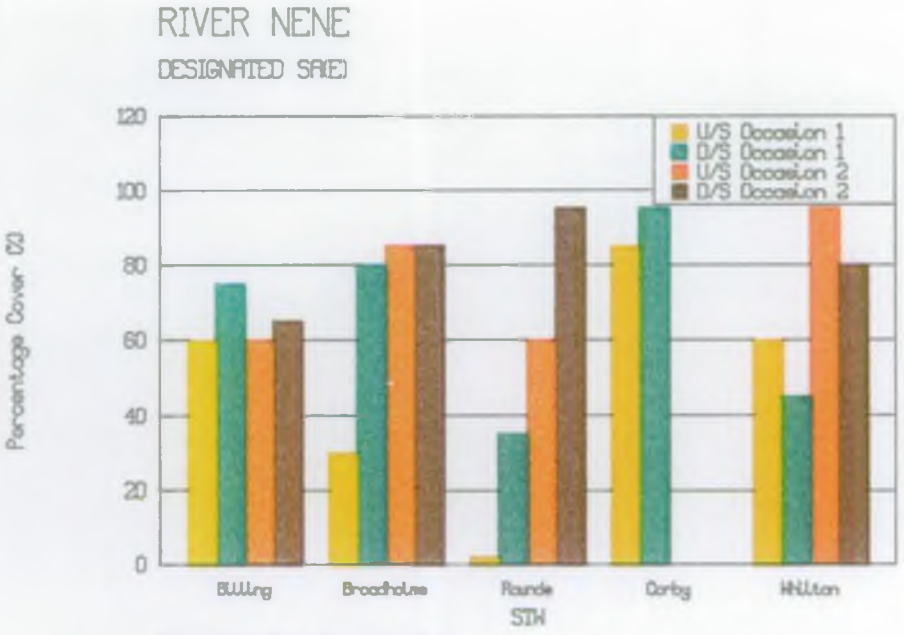


Figure 16) - Total Percentage Cover

Designated SA(e) - Louth Canal & Covenham Reservoir

Macrophyte Survey Results 1995

Qualifying discharges

Figure 2 Louth Canal (D) and (I)

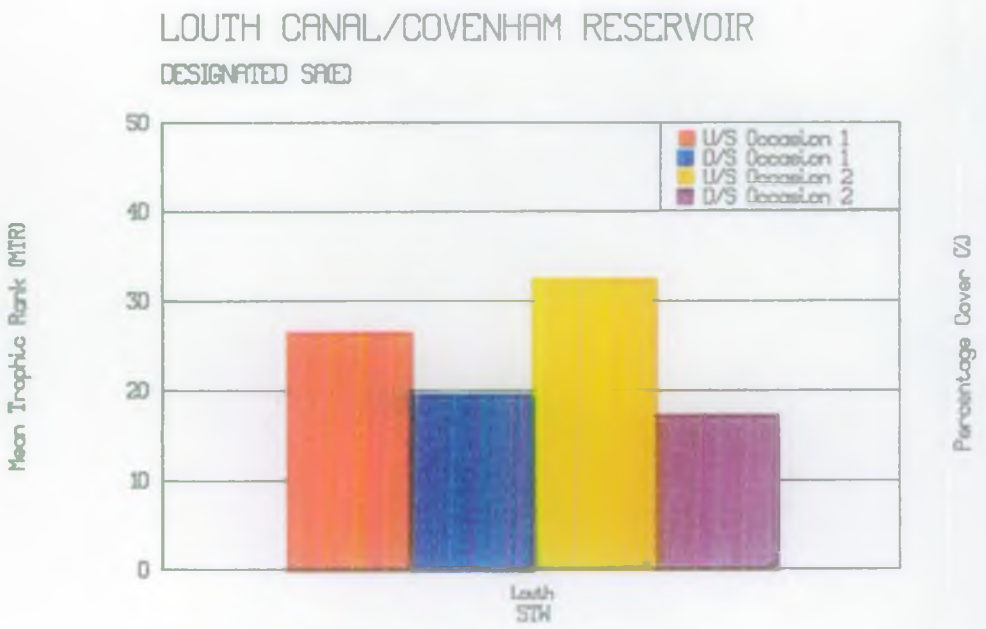


Figure 2(a) - Mean Trophic Rank (MTR)

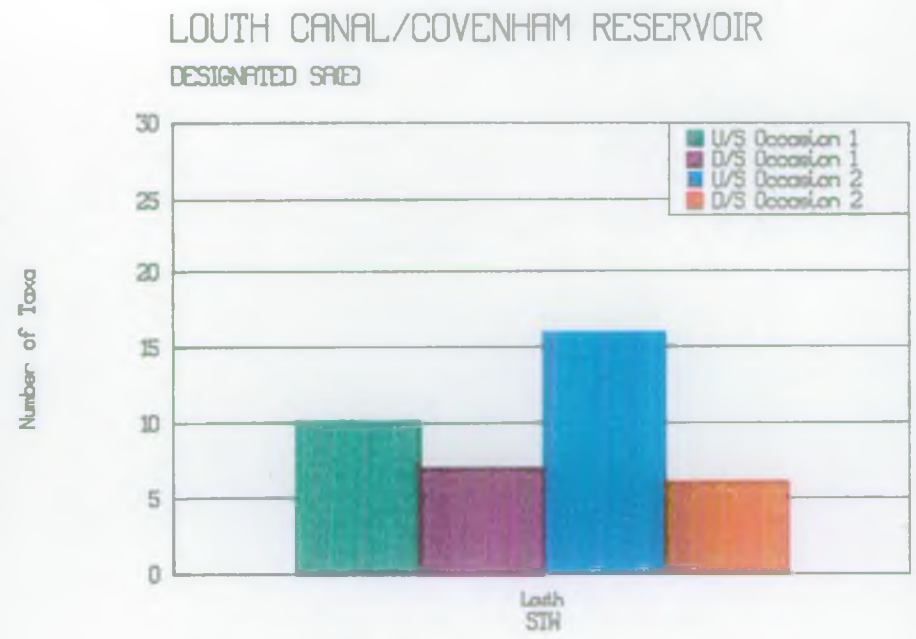


Figure 2(a) - Number of Taxa

LOUTH CANAL/COVENHAM RESERVOIR

DESIGNATED SAC)

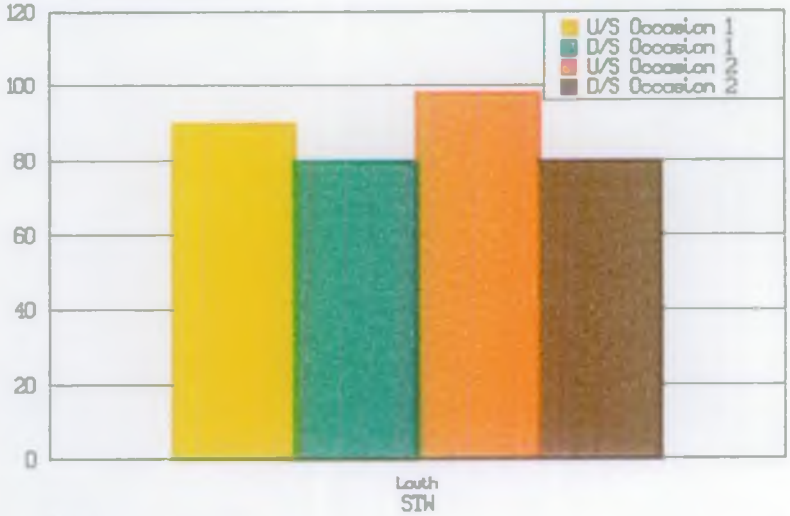


Figure 2b) - Total Percentage Cover

Designated SA(e) - Pitsford Reservoir

Macrophyte Survey Results 1995

Qualifying discharges

Figure 3 Whilton (I)

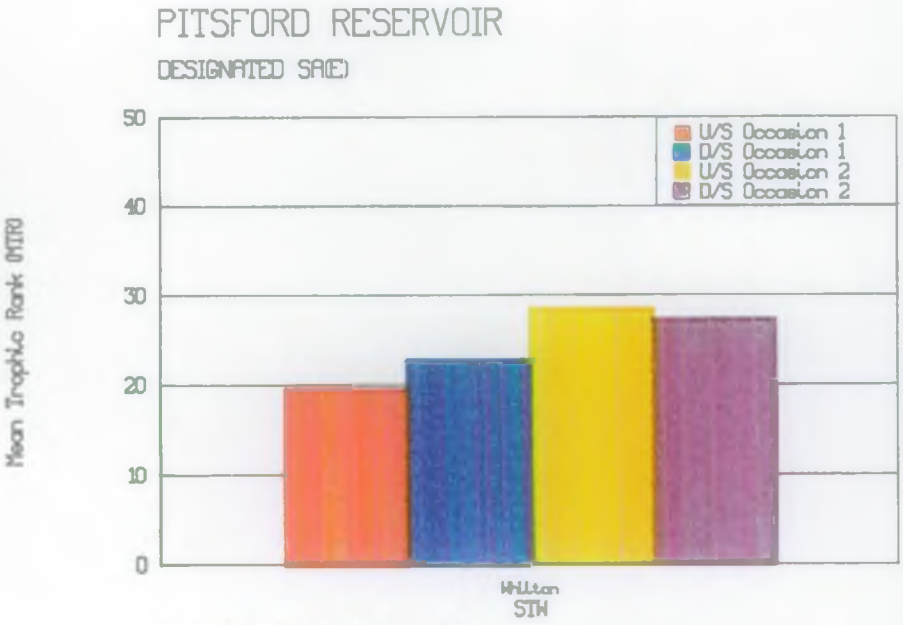


Figure 3(a) - Mean Trophic Rank (MTR)

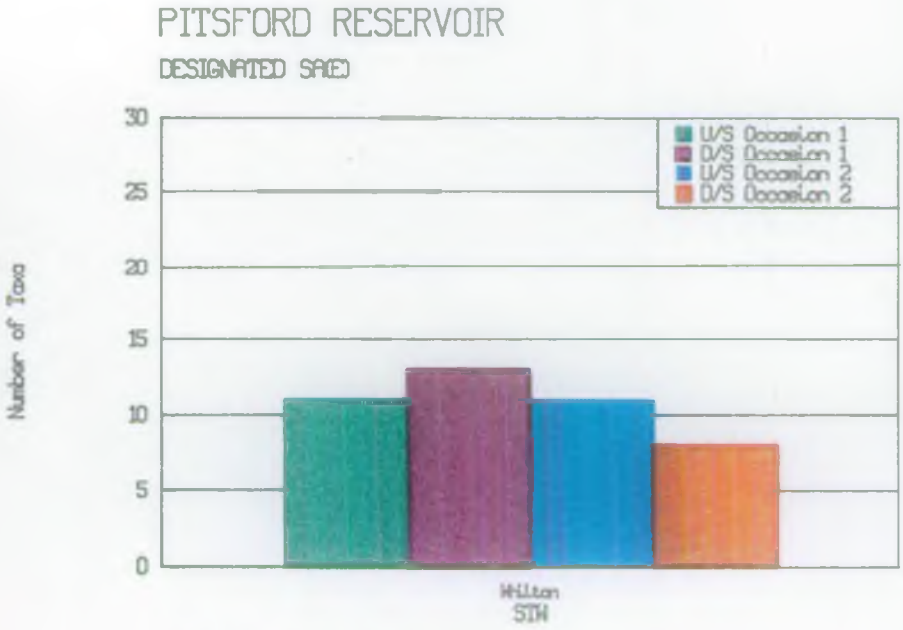


Figure 3(a) - Number of Taxa

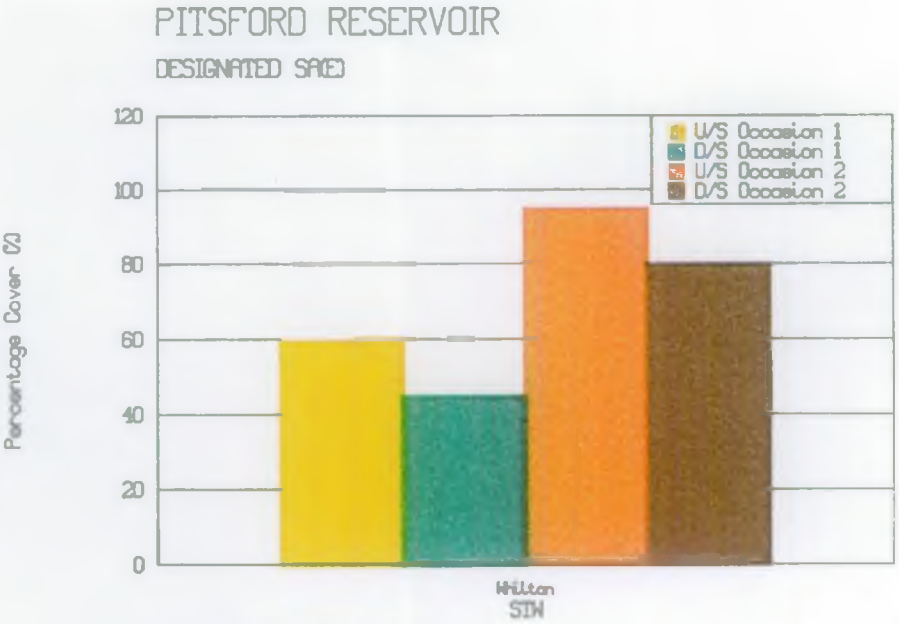


Figure 3b) - Total Percentage Cover

Designated SA(e) - Rutland Water

Macrophyte Survey Results 1995

Qualifving discharges

Figure 7 Market Harborough (I)

Nene: Gt Billing (D)
Broadholme (D)
Whilton (I)
Raunds (D)
Corby (D)

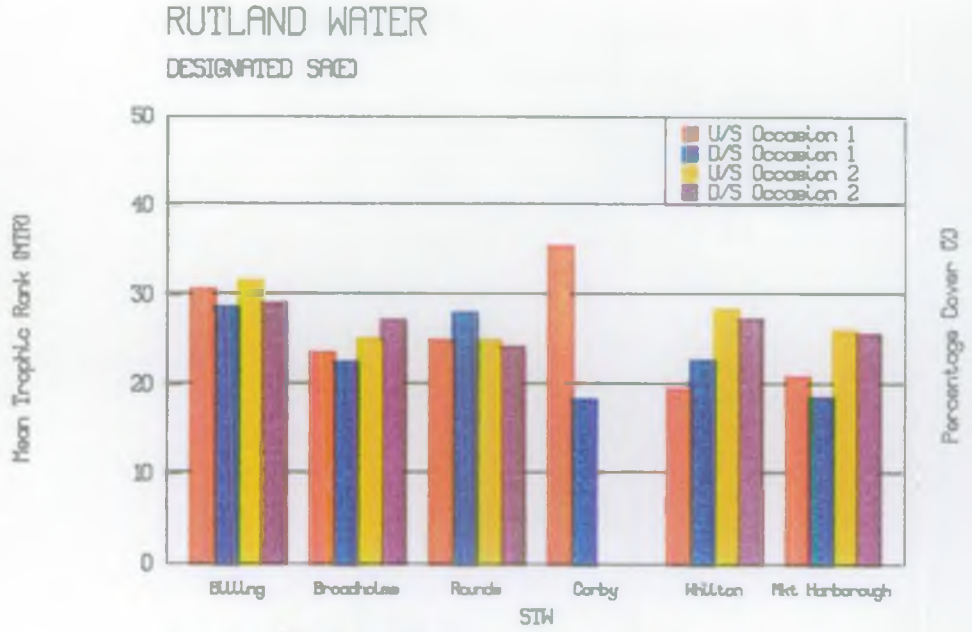


Figure 7(a) - Mean Trophic Rank (MTR)

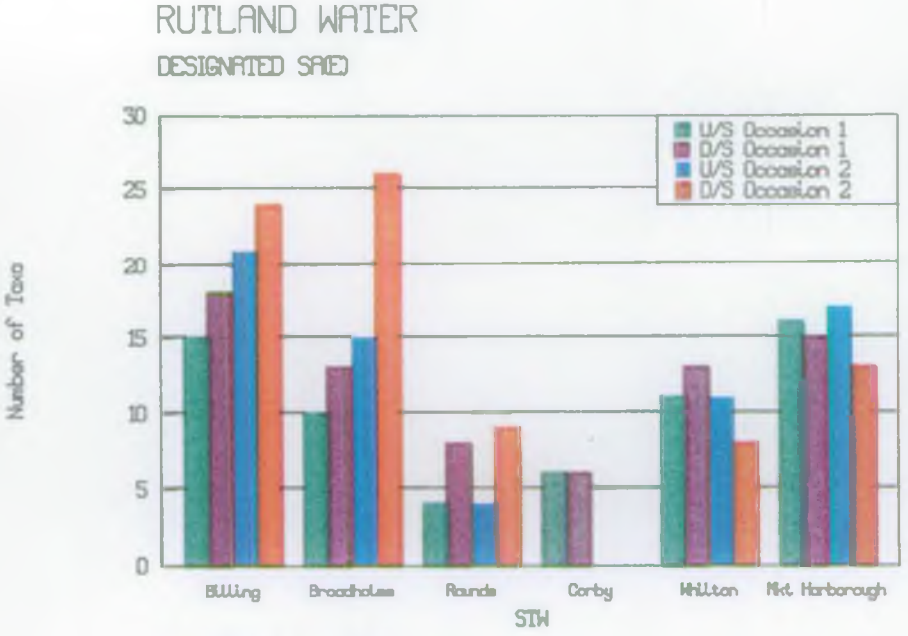


Figure 7(a) - Number of Taxa

RUTLAND WATER

DESIGNATED SITES

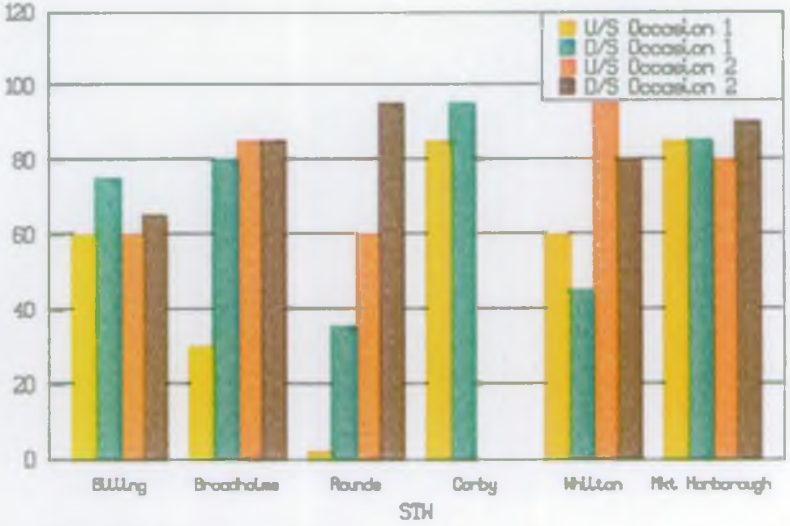


Figure 7(b) - Total Percentage Cover

Candidate SA(e) - River Welland

Macrophyte Survey Results 1995

Qualifying discharges

Figure 4 Deepings (D)
Stamford (D)
Market Harborough (D)

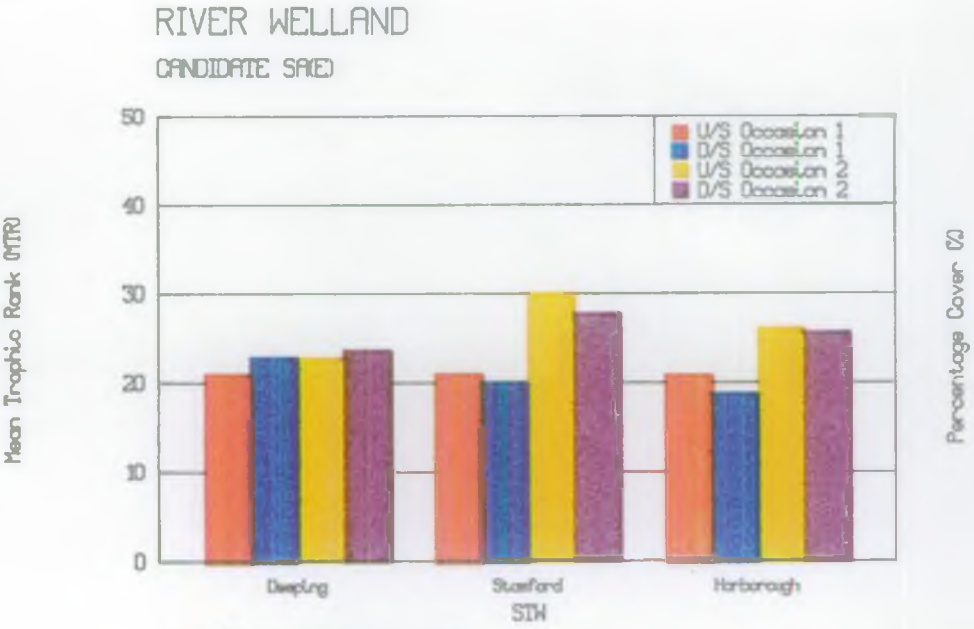


Figure 4(a) - Mean Trophic Rank (MTR)

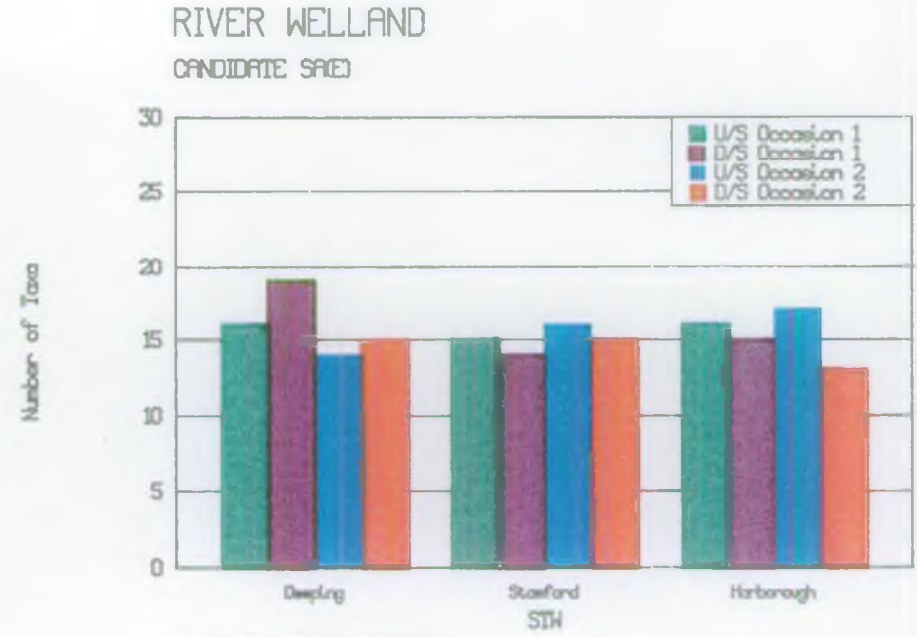


Figure 4(a) - Number of Taxa

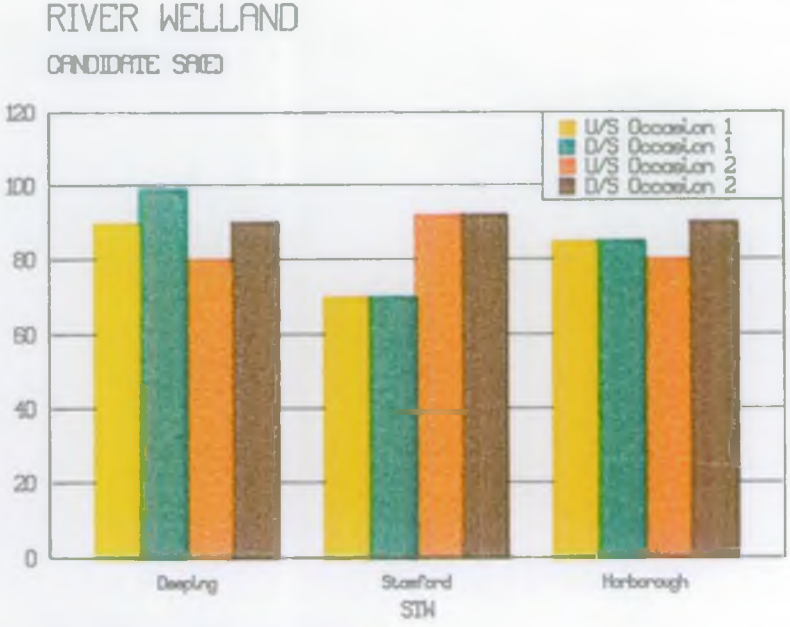


Figure 4b) - Total Percentage Cover

Candidate SA(e) - River Witham

Macrophyte Survey Results 1995

Qualifying discharges

Figure 5

Marston (D)
North Hykeham (D)
Canwick (D)
Anwick (I)

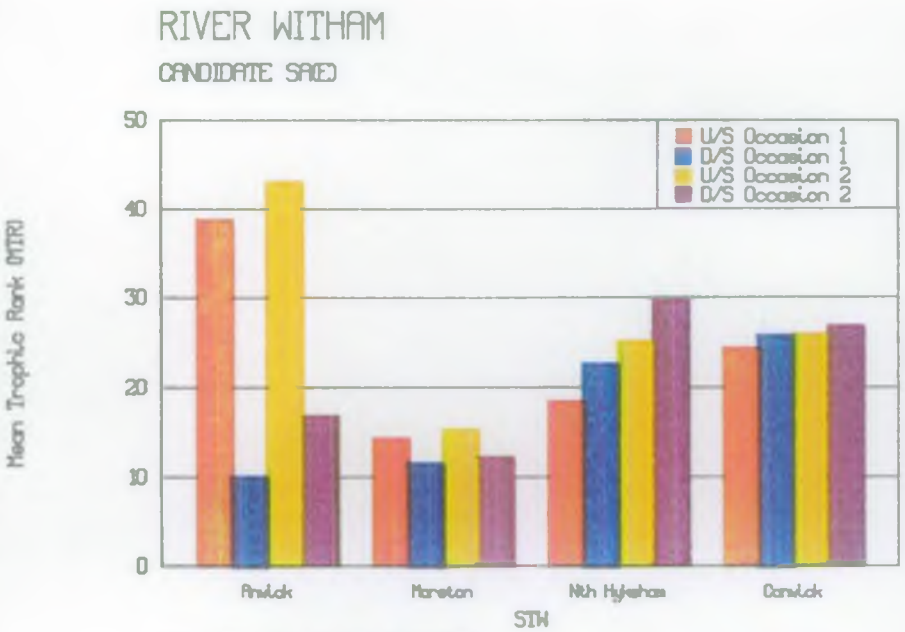


Figure 5(a) - Mean Trophic Rank (MTR)

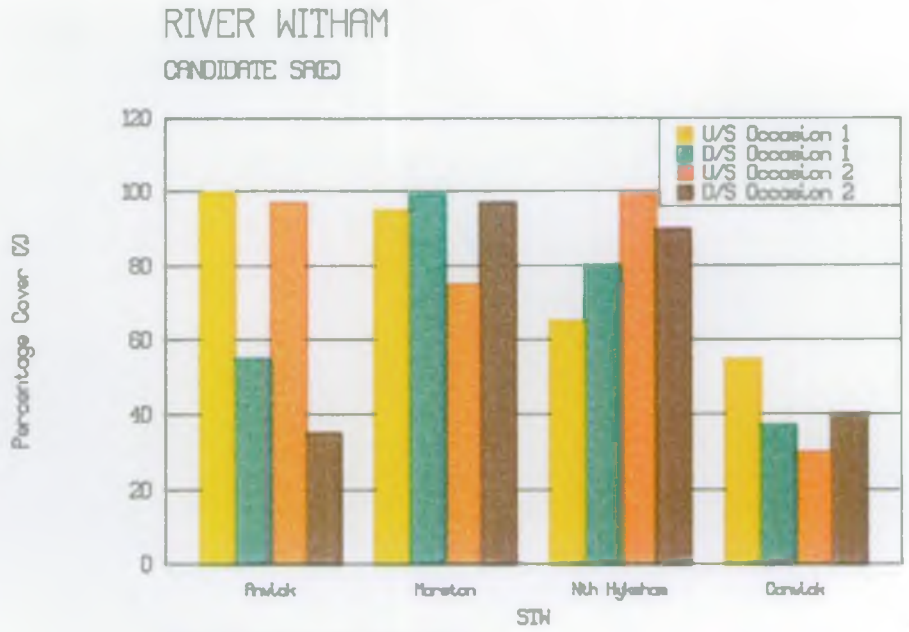


Figure 5(b) - Total Percentage Cover

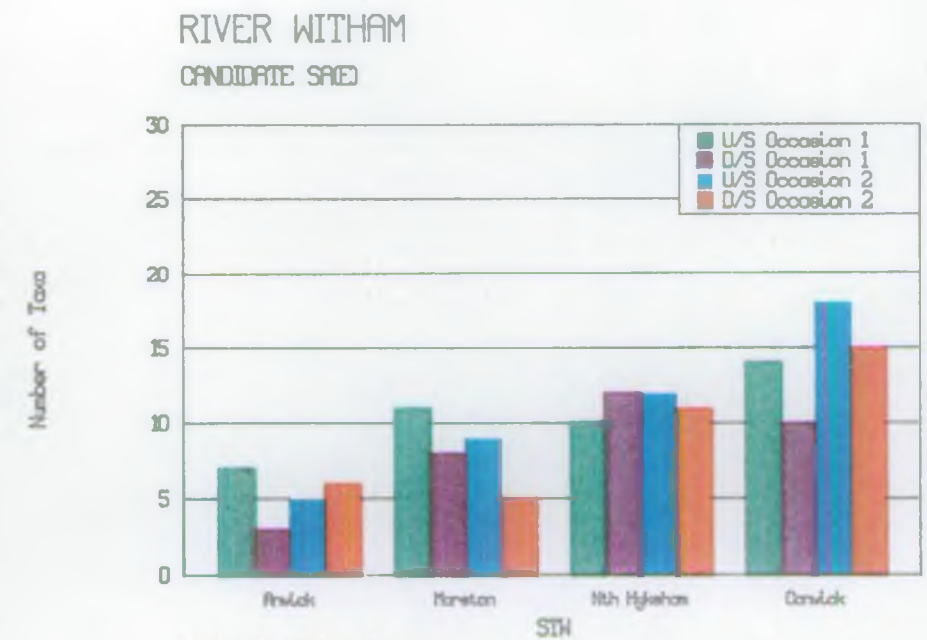


Figure 5(c) - Number of Taxa

Candidate SA(e) - Farroway Drain

Macrophyte Survey Results 1995

Qualifying discharges

Figure 6 Anwick (I)

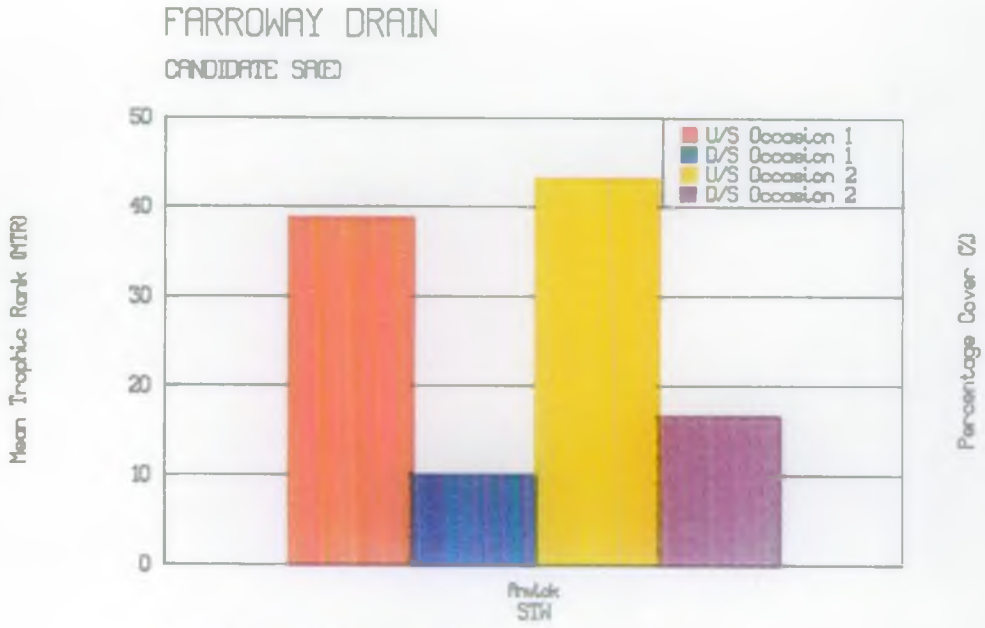


Figure 6(a) - Mean Trophic Rank (MTR)

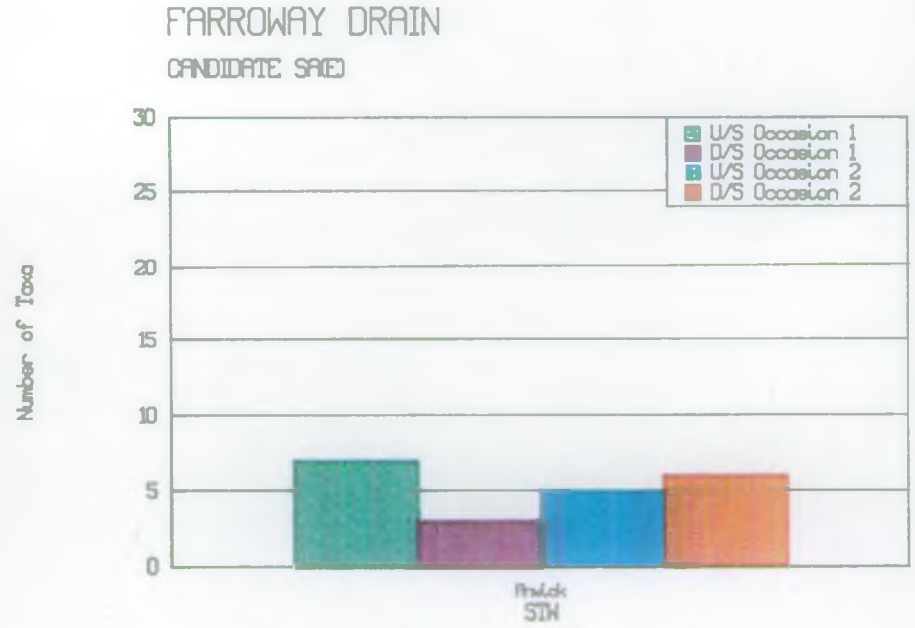


Figure 6(a) - Number of Taxa

FARROWAY DRAIN

CANDIDATE SPECIES

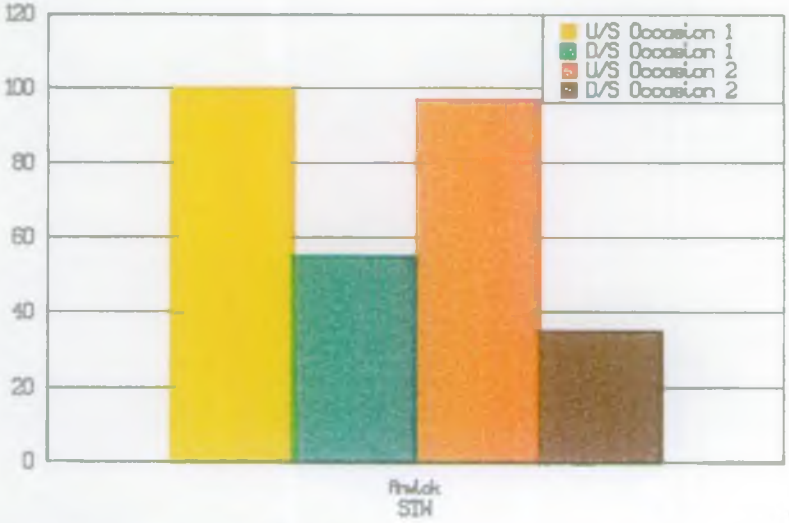


Figure 6b) - Total Percentage Cover