884

PONDACTION

RIVER CORRIDOR SURVEY OF SELECTED REACHES OF THE RIVER COLE

ARDEOLA ENVIRONMENTAL SERVICES

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1 INTRODUCTION

1.1 Survey method and timing

River Corridor Surveys (RCS) were carried out according to the guidelines set out by NRA (1992), however more detailed information was collected on the bankside, marginal and instream vegetation, including collection of DAFOR values and collection of specimens of some mosses (which were identified by Dr.N.T.H.Holmes). Surveys were carried out two dates, initial mapping and data collection on 10 August 1994, followed by a second visit on 4 October 1994 to confirm the location and distribution of plants species, features etc.

It is very difficult of accurately map the distribution of individual stands of plants against uniform reaches of river and therefore some locations may be up to e few metres out.

Opportunistic data were collected on other wildlife, particularly birds and a transect was carried out over the whole route recording contacts with bats using a Skye Instrument SBR 2100 Digital Frequency Control bat detector - however a fairly strong wind during the survey (4-5 westerly) may have biased the distribution of feeding bats toward sheltered sites.

1.2 Overview

The River Cole throughout the reaches surveyed has been dramatically modified by man and now displays four or five changes in character:

- reaches Nos. 1-4 are characterised by steep banks covered by a dense growth of ruderals and some trees shading the channel margins, and a uniform channel profile resulting in a poor quality, deep glide shallowing gradually upstream, except where weirs have been installed, proving an artificial riffle-pool sequence. At the upstream end of reach No. 4 a dense growth of Myriophyllum spicatum resulted in faster flow.

- reach No. 5 is diverse in that it contains a few good riffles which support Ranunculus penicellatus var. pseudofluitans and Fontinalis antipyretica. It also contains flow management structures associated with the old mill.

- reaches Nos. 6 and 7 are deep and canalised with little channel variation. However cattle grazing has created a low marshy berm along the left bank which supports a diverse aquatic plant community.

- reaches 8 and 9 are heavily shaded by bankside trees and ruderals, the lower part of the banks are vertical throughout and there is very little channel or marginal vegetation.

Reaches 5, 5 and 7 have elements of conservation value which should be maintained:

- the riffle-pool sequence downstream of the mill and of the road bridge;

- the low berm with diverse aquatic plant community.

1.3 Aquatic plants

No rare or uncommon aquatic plant species were recorded. Only reach No. 5 supported good populations of Ranunculus penicellatus var. pseudofluitans in association with the riffle-pool sequence. The fringe of aquatics in reaches Nos. 6 and 7 although diverse is of relatively low conservation value.

1.3 Birds

Birds were recorded along each reach on both visits. However, it should be noted that both visits were made after the end of the breeding season and as such can only be considered to provide a

snapshot of the species which use the river corridor in late summer and early winter. Records of species such as kingfisher and buzzard are likely to indicate the presence of breeding, other records cannot be taken as such.

1.4 Mammals

As with birds, records of mammals will only provide a snapshot of use of the corridor by mammals. However all mammals recorded are likely to be resident within the area.

There is a great degree of uncertainty in the results obtained from bat detector surveys, due to the difficulty in identifying bat by their calls and unknowns in the range of the detectors. In this survey, I employed a method based on and very similar to that described by Limpens (1993). However, it must be recognised that due to the relatively untested nature of the methods and equipment used, the results presented must be considered only as an indication of possible species representation.

Although there are few published data on the comparative ability of detectors to pick up the calls of different species, Catto (1994) suggests that species such as the two long-eared bats and natterer's bat are less likely to be detected due to the nature of their calls, whereas "loud" species such as pipistrelle can be detected at times up to 50m and noctule up to 200m. Similarly although, with practice, tentative species identification can be made (particularly when the animal can be simultaneously observed), the reliability of such identifications is debatable. Therefore, any species specific identification must be considered tentative. It is unlikely that all bats present in the vicinity of the observer were recorded, but the marked difference in the number of contacts made indicates a greater degree of bat activity on certain reaches.

There are a number of buildings which appear suitable for bat roosts in the immediate vicinity of the river - particularly the mill house and Fresden Farm care should be taken to avoid risk of disturbing these or interrupting flightlines between the river and these buildings during works.

In the last couple of years Pipistrellus pipistrellus has been separated into two species. These can generally be separated in the field by the frequency of their calls - one at 45kHz and one at 55kHz. Where this is relevant, the species has been indicated by placing the frequency in parenthesis against the english name.

1.5 Other wildlife

Some opportunistic data were collected on other wildlife such as butterflies and fungi. These represent only individuals seen in the course of surveys and not any attempt to carry out comprehensive surveys.

2 RIVER CORRIDOR SURVEY DATA

RIVER: Cole REACH: 1

GRID REF: u/s SU22199433 d/s SU22009466 DATE: 10 August 1994

CONDITIONS: Survey from left bank; weather sunny, wind 4-5W; flow normal - slightly cloudy (4 November, flow high)

NATURE: Meandering; deep glide throughout.

SUBSTRATE: Silt throughout.

DIMENSIONS: Reach 500m long; 2-3(4)m wide; 0.25-0.5(1m) deep. (4 November 1-1.5m)

BANK TYPE: RB: 2m high, 60° slope; LB: 2m high, 45° slope, in places the margin comprises a vertical bank c50cm high; both banks open, to light shade from trees - however overhanging ruderals shade margins;

ADJACENT LAND USE: RB: Wheat with some growth of Conium maculatum; LB: First field horse-grazed pasture with heavy growth of Cirsium arvense and Dactylis glomerata, followed by close-cropped, cattle-grazed Lolium ley. Two hedges join from right bank, and there is a small stand of Salix fragilis on the bend in the upstream third of the section.

RIGHT BANK VEGETATION: Dominated by a dense growth of ruderals with a few trees and few aquatics:

Anthriscus sylvestris	F	Epilobium hirsutum	A
Arctium minus	F	Filipendula ulmaria	O
Arrhenatherum elatius	A	Rumex obtusifolius	O
Calystegia sepium	A	Salix caprea	R
Carduus crispus	F	Salix cinerea var oleifolia	O
Cirsium arvense	F	Symphytum officinale	O
Conium maculatum	A	Urtica dioica	D
Dipsacus fullonum	O		

LEFT BANK VEGETATION: Dominated by dense growth of tall ruderals with a few trees and few aquatics:

Achillea millefolium	F	Myosoton aquaticum	R
Alnus glutinosa	R	Picris echioides	R
Arrhenatherum elatius	D	Plantago lanceolata	F
Atriplex hastata	R	Plantago major	O
Cirsium arvense	A	Potentilla reptans	R
Cirsium vulgare	O	Ranunculus repens	F
Crataegus monogyna	R	Rumex conglomeratus	O
Dactylis glomerata	A	Rumex obtusifolius	O
Deschampsia cespitosa	R	Salix fragilis	O
Dipsacus fullonum	F	Salix viminalis	R
Elymus repens	F	Sambucus nigra	R
Epilobium hirsutum	F	Sonchus asper	R
Hordeum secalinum	F	Taraxacum sp.	R
Lamium album	R	Trifolium repens	F
Leontodon autumnalis	O	Urtica dioica	A
Lolium perenne	A		

MARGINAL VEGETATION: Both margins: intermittent, apparently dictated by shade of both trees and ruderals;
RB: dominated by Sparganium erectum, Schoenoplectus lacustris and Phalaris arundinacea;

Species	Rel	Cov
Carex riparia	1	1
Phalaris arundinacea	4	3
Salix cf. x smithiana	1	1
Salix cinerea var oleifolia	2	1
Schoenoplectus lacustris	3	3
Sparganium erectum	3	3

LB: dominated by Phalaris arundinacea, Glyceria maxima and Schoenoplectus lacustris.

Species	Rel	Cov
Alisma plantago-aquatica	1	1
Carex riparia	1	1
Glyceria maxima	3	2
Myosotis scorpioides	1	1
Phalaris arundinacea	4	3
Polygonum amphibium	1	1
Polygonum hydropiper	1	1
Salix fragilis	1	1
Schoenoplectus lacustris	3	2
Sparganium erectum	3	1
Veronica beccabunga	1	1

CHANNEL VEGETATION: Sparse, Myriophyllum spicatum most frequently encountered, but Glyceria maxima dominates locally:

Species	Rel	Cov
Glyceria maxima	3	1
Myriophyllum spicatum	1	1
Schoenoplectus lacustris	4	2

FEATURES: None

PRESENT MANAGEMENT:		Presumably dredged at intervals, hence vertical bank left and odd short deeper reaches
POTENTIAL THREATS:		None
RECOMMENDATIONS:		Increase rate of flow, to encourage instream habitat and consequently species diversity. Control growth of ruderals on banks, to allow light to margins, lower the banks in places to allow development of more species-rich communities and access for larger animals.
NOTES:	Birds:	Blue tit, buzzard, chaffinch, cuckoo, grey wagtail, grey heron, kestrel, lapwing, meadow pipit, mute swan, reed warbler, whitethroat, wood pigeon, wren, yellow wagtail.
	Butterflies:	Brimstone, large white, speckled wood.
	Mammals:	Fox, (55) pipistrelle bat, rabbit, whiskered/Brandt's bat.

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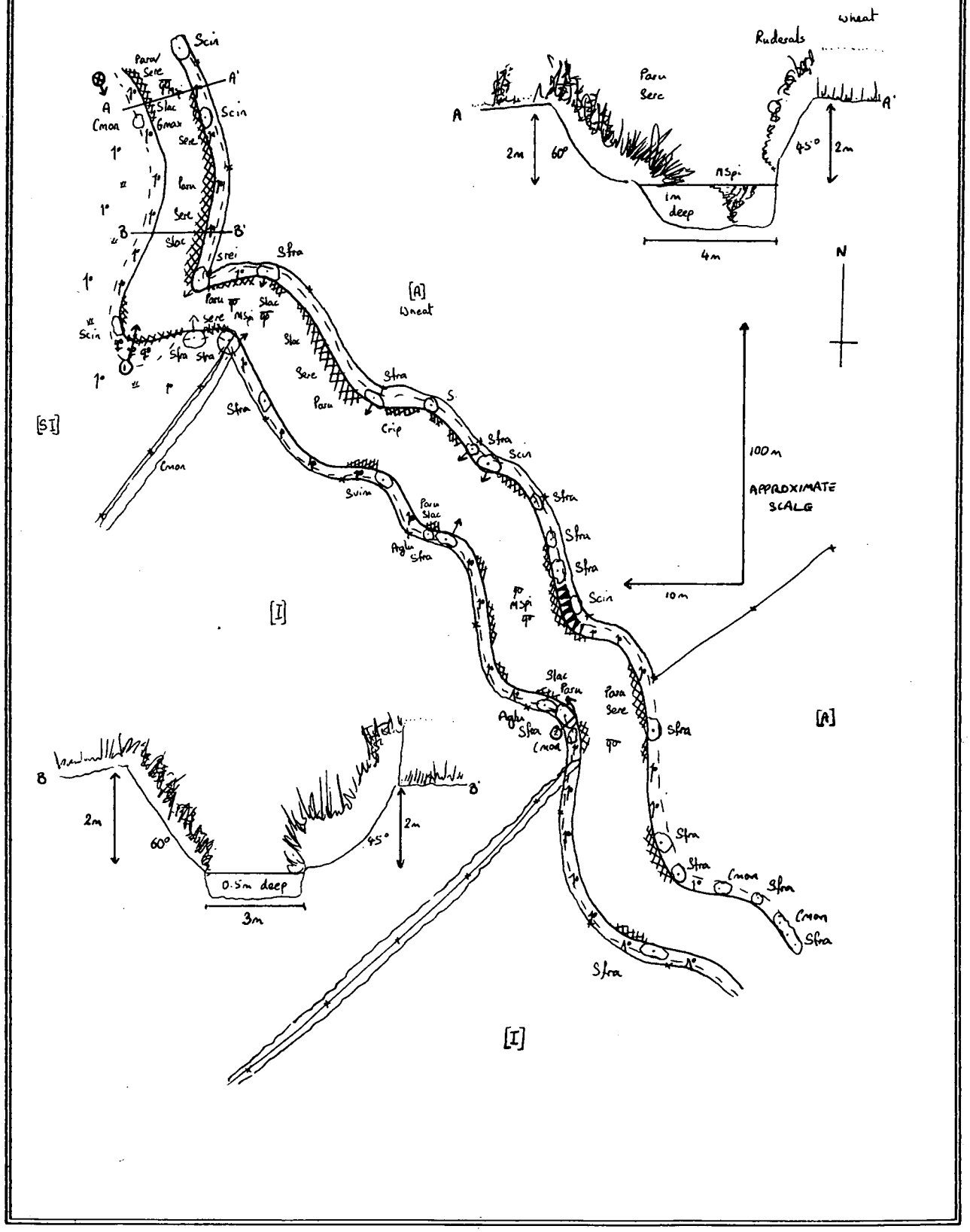
2

River: COLE	Reach No: 1	Grid Ref: w/s22199433 d/b22009466	Date: 10 August 1994



River Corridor Survey Map

RIVER: Cole REACH: 2

GRID REF: u/s SU22409395 d/s SU22199433 DATE: 10 August 1994

CONDITIONS: Survey from left bank; weather sunny, wind 4-5W; flow normal - slightly cloudy.

NATURE: Meandering, deep glide except one small riffle and changes resulting from the weir.

SUBSTRATE: Silt throughout except for one small gravel-bed riffle.

DIMENSIONS: Reach 500m long; 4-5(6)m wide; 0.25-0.5(1m) deep.

BANK TYPE: RB: 2-3m high, 45° slope; LB: 2-3m high, 45° slope, in places the margin is a vertical bank c50cm high; both banks open - light tree shade - but overhanging ruderals shade margins;

ADJACENT LAND USE: RB: Arable, wheat, subsequently rape throughout; LB: close-cropped, cattle-grazed pasture throughout.

RIGHT BANK VEGETATION: Dominated by a dense growth of ruderals with a number trees and few aquatics:

Achillea millefolium	R	Elymus repens	A
Arctium minus	O	Epilobium hirsutum	F
Carduus crispus	O	Galium aparine	A
Cirsium arvense	O	Heracleum sphondylium	O
Conium maculatum	A	Salix fragilis	O
Crataegus monogyna	F	Symphytum officinale	O
Dipsacus fullonum	O	Urtica dioica	D

LEFT BANK VEGETATION: Dominated by a dense growth of ruderals with fewer trees than RB:

Achillea millefolium	O	Eupatorium cannabinum	R
Agrostis stolonifera	F	Filipendula ulmaria	R
Anthriscus sylvestris	A	Heracleum sphondylium	F
Arrhenatherum elatius	D	Lamium album	R
Calystegia sepium	O	Polygonum amphibium	O
Cirsium arvense	F	Rumex conglomeratus	R
Cirsium vulgare	O	Rumex obtusifolius	O
Crataegus monogyna	O	Salix viminalis	R
Dactylis glomerata	A	Sambucus nigra	R
Dipsacus fullonum	O	Scrophularia auriculata	R
Elymus repens	A	Sonchus asper	R
Epilobium hirsutum	R	Urtica dioica	A

MARGINAL VEGETATION: RB: almost continuous, dominated by Sparganium erectum and Phalaris arundinacea;

Species	Rel	Cov
Calystegia sepium	2	1
Carex riparia	1	1
Glyceria maxima	1	1
Phalaris arundinacea	3	2
Salix cinerea var oleifolia	1	1
Salix fragilis	2	1
Schoenoplectus lacustris	1	1
Sparganium erectum	3	2

LB: more intermittent (more shade from overhanging ruderals) fairly even representation of Salix fragilis, Phalaris arundinacea, Glyceria maxima and Sparganium erectum.

Species	Rel	Cov
Glyceria maxima	1	1
Phalaris arundinacea	4	1
Salix fragilis	1	1
Sparganium erectum	1	1

CHANNEL VEGETATION: Sparse, Myriophyllum spicatum most frequently encountered:

Species	Rel	Cov
Myriophyllum spicatum	3	1
Nuphar lutea	1	1
Schoenoplectus lacustris	2	1
Sparganium erectum	1	1

FEATURES: Water backs up behind weir in southern third, with corresponding pool below weir.

PRESENT MANAGEMENT: Presumed dredged at least in places.

POTENTIAL THREATS: None apparent.

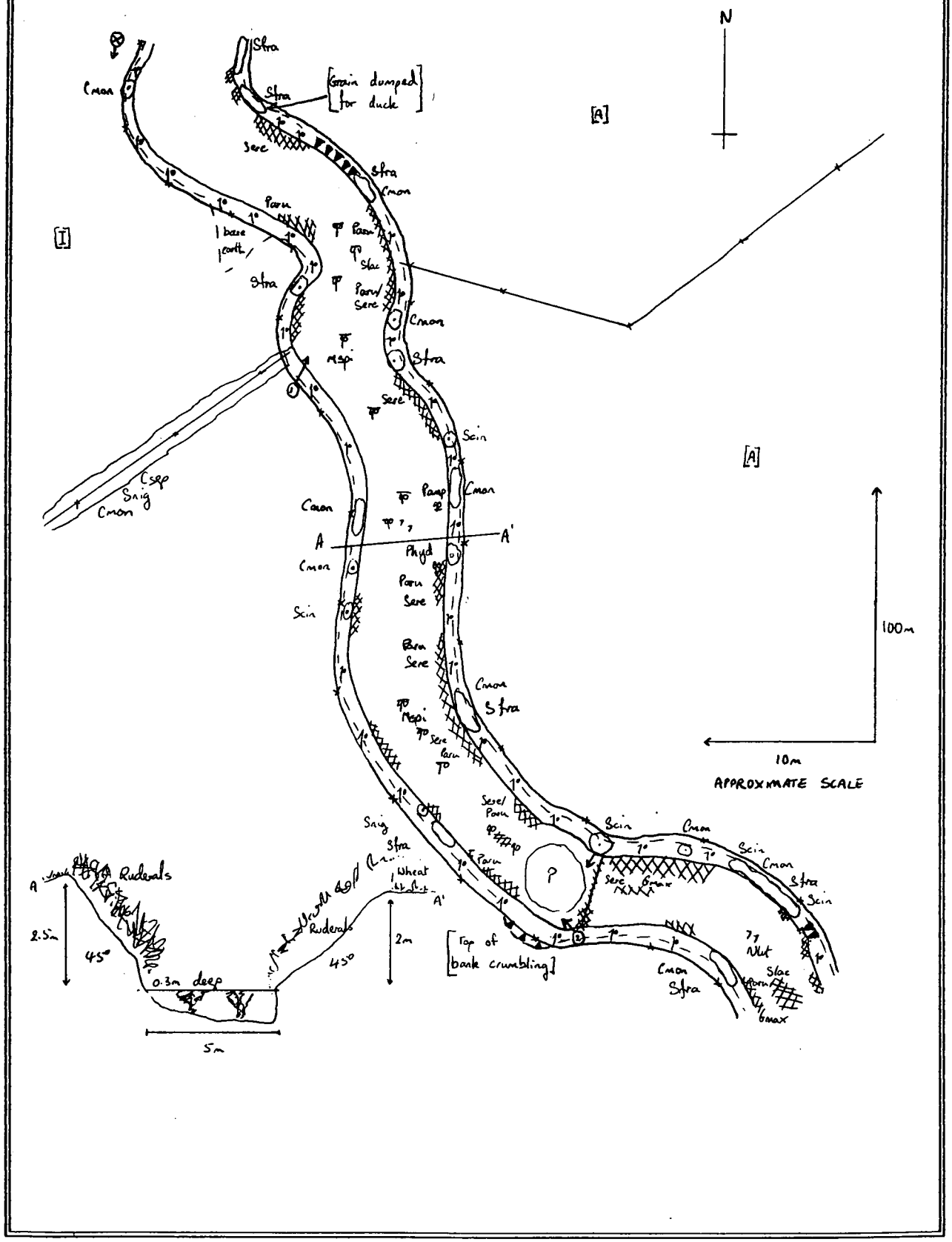
RECOMMENDATIONS: Increase rate of flow, to encourage instream habitat and consequently species diversity. Control growth of ruderals on banks, to allow light to margins

NOTES:
Birds: Chaffinch, goldfinch, linnet, little owl, mallard, pheasant, reed bunting, sparrowhawk, stock dove, wood pigeon, wren, yellowhammer.
Mammal: Rabbit.
Butterflies: Gatekeeper, Large white, Peacock.
Dragonfly: Sympetrum striolatum.
Fungi: Agaricus arvensis, Marasmius oreades.

1

2

River: COLE	Reach No: 2	Grid Ref: 4/522409395 d/522194433	Date: 10 August 1994



River Corridor Survey Map

RIVER: Cole REACH: 3

GRID REF: u/s SU22599366 d/s SU22409395 DATE: 10 August 1994

CONDITIONS: Survey from left bank; weather sunny, wind 4-5W; flow normal - slightly cloudy.

NATURE: Mainly meandering deep glide, however two full weirs and a part weir vary the nature of flow.

SUBSTRATE: Silt throughout.

DIMENSIONS: Reach 500m long; 4-5(6)m wide; 0.25-0.5(1m) deep.

BANK TYPE: RB: 2-3m high, 45° slope; LB: 2-3m high, 45° slope, in places the margin is a vertical bank c50cm high; both banks open - fairly light tree shade - but overhanging ruderals shade margins;

ADJACENT LAND USE: Rape on both banks throughout, except the final part of the first field on the left bank, which is close-cropped, cattle-grazed pasture.

RIGHT BANK VEGETATION: Ruderals, with some sparse scrub and a number of mature willows:

Arctium minus	R	Salix cinerea var oleifolia	O
Arrhenatherum elatius	A	Salix fragilis	O
Calystegia sepium	F	Sambucus nigra	R
Conium maculatum	A	Solanum dulcamara	O
Crataegus monogyna	F	Stachys palustris	R
Eupatorium cannabinum	O	Symphytum officinale	O
Rhamnus catharticus	R	Urtica dioica	D
Rumex obtusifolius	O		

LEFT BANK VEGETATION: Predominately ruderals, with some willows:

Agrostis stolonifera	A	Filipendula ulmaria	O
Anthriscus sylvestris	F	Phleum pratense	O
Arrhenatherum elatius	A	Prunus spinosa	R
Calystegia sepium	A	Rubus fruticosus agg	R
Dactylis glomerata	F	Rumex obtusifolius	F
Dipsacus fullonum	R	Salix fragilis	O
Elymus repens	A	Trifolium repens	O
Epilobium hirsutum	O	Urtica dioica	D
Equisetum arvense	O		

MARGINAL VEGETATION: Both margins: intermittent, apparently dictated by shade of both trees and ruderals;
RB: dominated by Phalaris arundinacea and Sparganium erectum, more diverse than reaches 1 and 2:

Species	Rel	Cov
Calystegia sepium	1	1
Filipendula ulmaria	1	1
Glyceria maxima	2	1
Phalaris arundinacea	4	2
Polygonum amphibium	1	1
Salix caprea	1	1
Salix cinerea oleifolia	2	1
Solanum dulcamara	1	1
Sparganium erectum	3	2

LB: generally more shade from bankside trees, resulting in less marginal vegetation, dominated by Glyceria maxima and Phalaris arundinacea:

Species	Rel	Cov
Calystegia sepium	1	1
Epilobium hirsutum	1	1
Glyceria maxima	3	1
Phalaris arundinacea	4	3
Schoenoplectus lacustris	1	1
Sparganium erectum	2	1

CHANNEL VEGETATION: generally sparse, however species diversity and cover higher than preceding reaches, a small clump of Butomus umbellatus occurs on the upstream wier:

Species	Rel	Cov
Butomus umbellatus	1	1
Myriophyllum spicatum	4	2
Nuphar lutea	2	1
Schoenoplectus lacustris	1	1
Sparganium erectum	1	1

FEATURES: Three weirs, one of which is interrupted in the middle. Consequently there is a greater degree of variation in the nature of flow throughout this reach, with pools and shallower, faster reaches downstream of weirs and generally slower more sluggish flow upstream.

PRESENT MANAGEMENT: Presumed dredged at least in places.

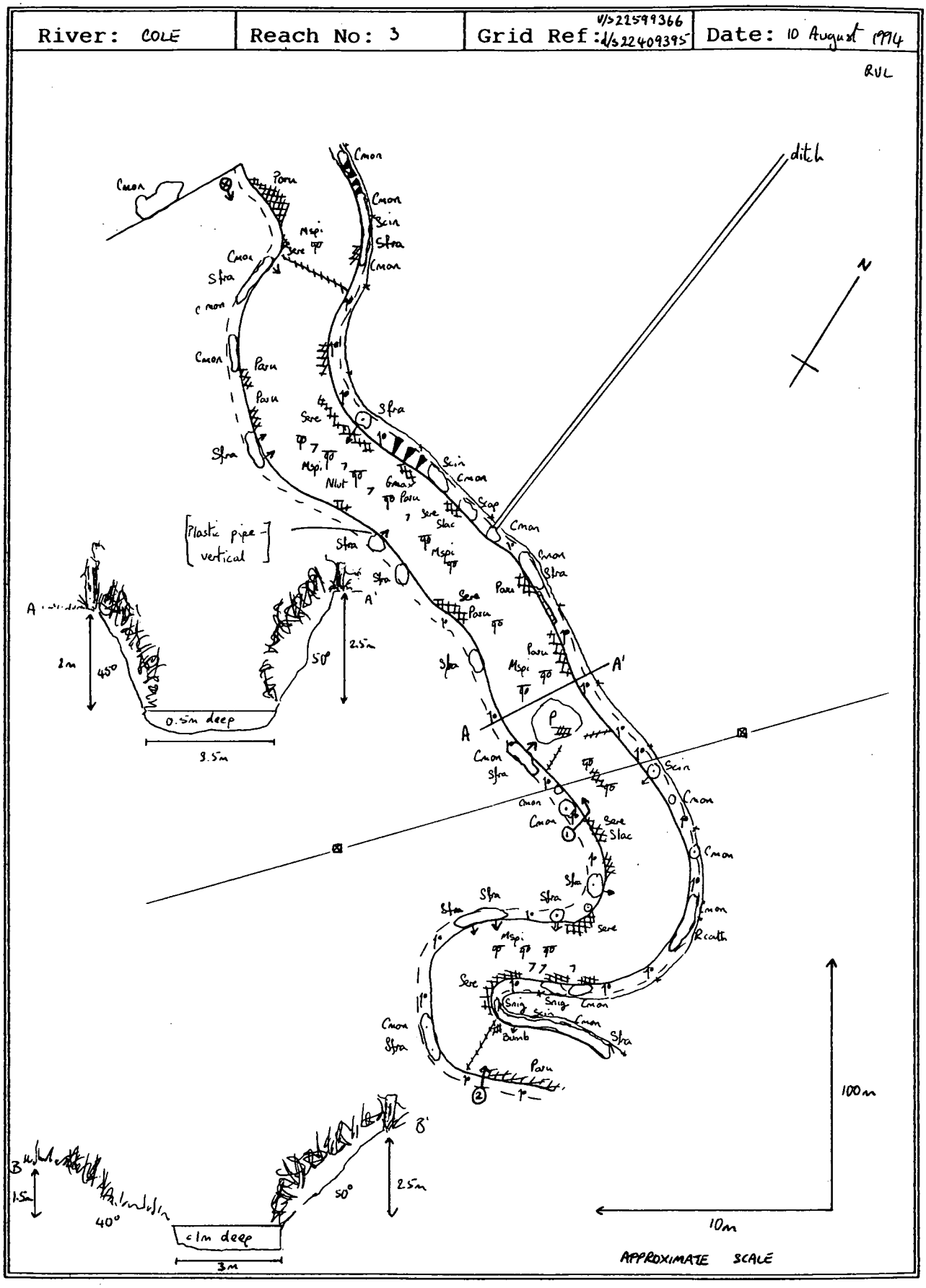
POTENTIAL THREATS: None apparent.

RECOMMENDATIONS: Increase instream variety by varying height and slope of banks, creating a two-stage channel in places with berms, to increase rate of flow and encourage instream habitat and consequently species diversity. Control growth of ruderals on banks, to allow light to margins

NOTES:

Birds:	Blackbird, blue tit, chaffinch, goldfinch, jackdaw, linnet, long-tailed tit, reed bunting, sparrowhawk, woodpigeon, wren, yellow wagtail, yellowhammer.
Butterflies:	Peacock, Large white.
Mammal:	Rabbit.

2



River Corridor Survey Map

RIVER: Cole REACH: 4

GRID REF: u/s SU23849358 d/s SU22599366 DATE: 10 August 1994

CONDITIONS: Survey from left bank; weather sunny, wind 4-5W; flow normal - slightly cloudy.

NATURE: Mainly shallow to deep glide throughout, little variation in structure, but in places sediment has built up, effectively narrowing channel and creating reaches of shallow water.

SUBSTRATE: Silt

DIMENSIONS: Reach 500m long; 4-5(6)m wide; 0.25-0.5 deep.

BANK TYPE: RB: 2-3m high, 45° slope; LB: 2-3m high, 45° slope; medium tree shade - overhanging ruderals shade margins;

ADJACENT LAND USE: Rape on both sides throughout.

RIGHT BANK VEGETATION: Open, generally sparse trees and a dense growth of ruderals.

Alnus glutinosa	R	Rosa canina	R
Anthriscus sylvestris	F	Rubus fruticosus agg.	O
Calystegia sepium	F	Salix fragilis	A
Crataegus monogyna	A	Salix triandra	R
Filipendula ulmaria	O	Sambucus nigra	O
Galium aparine	F	Urtica dioica	D
Heracleum sphondylium	O		

LEFT BANK VEGETATION: Mainly open, although with some scrub/trees in upstream part; generally a diverse ruderal community throughout:

Anthriscus sylvestris	A	Plantago major	O
Arctium minus	O	Polygonum persicaria	R
Calystegia sepium	O	Rosa canina	R
Carduus crispus	O	Rubus fruticosus agg.	O
Cirsium arvense	F	Rumex crispus	R
Conium maculatum	O	Rumex obtusifolius	F
Crataegus monogyna	O	Salix caprea	R
Elymus repens	A	Salix cinerea oleifolia	R
Epilobium hirsutum	F	Salix fragilis	F
Equisetum arvense	O	Senecio jacobaea	R
Galium aparine	O	Symphytum officinalis	R
Heracleum sphondylium	F	Taraxacum sp.	R
Lamium album	R	Trifolium repens	A
Phleum pratense	A	Urtica dioica	D

MARGINAL VEGETATION: RB: Intermittent in the downstream third, absent due to deep shade in the upstream third, almost continuous in the middle. Dominated by Phalaris arundinacea.

Species	Rel	Cov
Epilobium hirsutum	1	1
Phalaris arundinacea	5	2
Sparganium erectum	2	1
Veronica anagallis-aquatica	1	1

LB: Intermittent, generally short patches, mainly of Phalaris arundinacea. Almost absent in upstream third, due to heavy shade from Salix spp. Higher species diversity than preceding reaches:

Species	Rel	Cov
Calystegia sepium	1	1
Epilobium hirsutum	1	1
Eupatorium cannabinum	1	1
Glyceria maxima	2	1
Phalaris arundinacea	5	3
Salix fragilis	1	1
Solanum dulcamara	1	1
Sparganium erectum	2	1
Symphytum officinale	1	1

CHANNEL VEGETATION: Generally sparse, with poor species diversity. Mainly represented by small stands of Myriophyllum spicatum.

Species	Rel	Cov
Myriophyllum spicatum	4	1
Nuphar lutea	1	1
Schoenoplectus lacustris	2	1
Sparganium erectum	1	1

FEATURES: None

PRESENT MANAGEMENT: Presumed dredged at least in places.

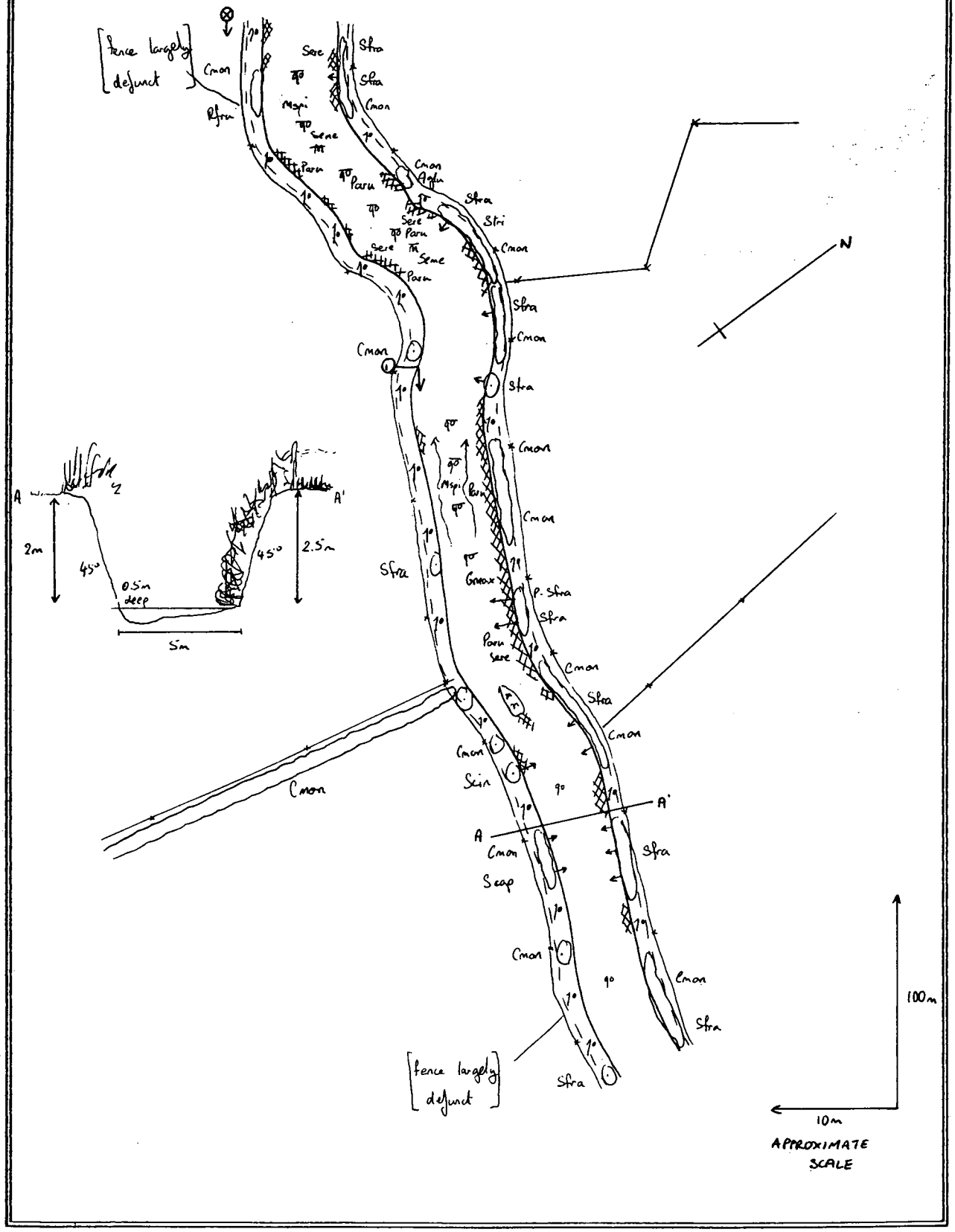
POTENTIAL THREATS: None apparent

RECOMMENDATIONS: Increase instream variety by varying height and slope of banks, creating a two-stage channel in places with berms, to increase rate of flow and encourage instream habitat and consequently species diversity. Control growth of ruderals on banks, to allow light to margins

NOTES: Bird: Blackbird, blue tit, chaffinch, dunnock, great tit, linnet, long-tailed tit,

	pheasant, robin, rook, wren, yellowhammer.
Butterflies:	Large white, Small white, Gatekeeper.
Mammals:	(45) Pipistrelle and (55) Pipistrelle bats, (cf.) Natterer's bat.

River: COLE	Reach No: 4	Grid Ref: u/s 238493358 d/s 225993366	Date: 10 August 1994



River Corridor Survey Map

RIVER: Cole REACH: 5

GRID REF: u/s SU23479337 d/s SU23849358 DATE: 10 August 1994

CONDITIONS: Survey from left bank; weather sunny, wind 4-5W; flow normal - slightly cloudy.

NATURE: Mainly shallow glide, up to up to downstream of the road bridge. Immediately downstream of the road bridge, there is a good riffle - pool sequence, this continues upstream of the road bridge to the confluence of the old mill stream with the main flow where there is a short reach of deep glide. On the main channel upstream, there is a shallow reach running down from the mill pool.

SUBSTRATE: Mainly silt in the downstream part, with gravel and sand where there are riffles.

DIMENSIONS: Downstream part, rather uniform 4-5(6)m wide, 0.1-0.5m deep; further upstream varied, from 0.01m deep over riffles to >1m in deep glide and mill pool, 5-6m wide in main channel to >10m at pool.

BANK TYPE: Downstream part similar to preceding reaches - RB: 2-3m high, 45° slope; LB: 2-3m high, 45-60° slope; medium tree shade - overhanging ruderals shade margins; further upstream, RB: 60-90° slope, deep tree shade; LB: 45-60° slope with no - deep shade.

ADJACENT LAND USE: RB: Rape to road, then gardens and ungrazed pasture; LB: Rape to road bridge, then grazed/mown pasture throughout.

RIGHT BANK VEGETATION: Varied, high representation of scrub and trees, with a line of Ulmus procera immediately downstream of the road bridge, which leads into Crataegus monogyna and Prunus spinosa downstream. Upstream of the bridge bank vegetation is dominated by mature salices and some introduced tree species:

Acer campestris	R	Rosa canina	O
Alliaria petiolata	R	Rubus fruticosus agg.	R
Anthriscus sylvestris	A	Sambucus nigra	O
Fraxinus excelsior	R	Salix cinerea oleifolia	O
Hedera helix	R	Salix fragilis	F
Juglans regia	R	Symphytum officinale	R
Populus tremula	R	Tilia x vulgaris	R
Prunus spinosa	O	Ulmus procera	F
Rhamnus catharticus	O	Urtica dioica	D

LEFT BANK VEGETATION: Varied, corresponding to varied nature of adjacent habitats, initially open, then dominated by mature salices to mill pool where it is mainly open again - the species recorded represent this with a greater number of grasses and ruderals:

Agrostis stolonifera	F	Lolium perenne	F
Angelica sylvestris	R	Plantago major	R
Anthriscus sylvestris	A	Polygonum persicaria	R
Arctium minus	O	Populus alba	O
Barbarea vulgaris	R	Rosa canina	R
Cirsium arvense	O	Rumex conglomeratus	R
Cirsium vulgare	R	Rumex obtusifolius	F
Conium maculatum	O	Salix alba alba	R
Crataegus monogyna	O	Salix alba vitellina	R
Dactylis glomerata	A	Salix fragilis	O
Epilobium hirsutum	F	Scrophularia auriculata	R
Heracleum sphondylium	F	Symphytum officinale	O

Hypochoeris radicata	R	Urtica dioica	D

MARGINAL VEGETATION: RB: intermittent, generally only really important cover alongside the mill pool. Overall dominated by Glyceria maxima and Phalaris arundinacea:

Species	Rel	Cov
Carex riparia	1	1
Epilobium hirsutum	1	1
Glyceria maxima	4	3
Myosoton aquaticum	1	1
Phalaris arundinacea	3	2
Polygonum hydropiper	1	1
Sparganium erectum	1	1

LB: Generally very little due to overhanging ruderals, except at and immediately downstream of the mill pool, where there is some diversity, dominated by Phalaris arundinacea, Glyceria maxima and Sparganium erectum:

Species	Rel	Cov
Alisma plantago-aquatica	1	1
Apium nodiflorum	1	1
Butomus umbellatus	1	1
Epilobium hirsutum	1	1
Glyceria maxima	3	2
Phalaris arundinacea	4	2
Polygonum hydropiper	1	1
Sparganium erectum	3	2
Veronica beccabunga	1	1

CHANNEL VEGETATION: More diverse than preceding reaches, mainly due to high variation in channel morphology - downstream reach very similar to preceding reaches; water crowfoot and mosses on riffles; upstream of the road bridge there are small patches of emergent herbs instream; an island downstream of the mill pond has a good stand of emergents, the wier at the upstream end of the pool has a very dense growth of Rynchostegium riparioides with a fine layer of Vaucheria sp.:

Species	Rel	Cov
Epilobium hirsutum	1	1
Fontinalis antipyretica	1	1
Glyceria maxima	2	1
Amblystegium riparioides	1	1
Myosotis scorpioides	1	1
Myriophyllum spicatum	3	2
Ranunculus penicellatus pseudofluitans	2	1
Salix fragilis	1	1
Schoenoplectus lacustris	2	1
Sparganium emersum	1	1
Sparganium erectum	1	1

FEATURES: Downstream of the road bridge - none; above the road bridge there is an old mill pool with a small leat coming down forming a large island with a house on the right bank.

PRESENT MANAGEMENT: Presumably dredged and trees are trimmed in parts.

POTENTIAL THREATS: None apparent.

RECOMMENDATIONS: The banks are high and shading downstream of the road bridge and the left bank could be lowered in places, apart from this, the existing diversity of structure and consequent plant species diversity is relatively high. The complex of trees, relatively narrow channel and mill pool provide excellent bat habitat.

NOTES: Birds: Blackbird, blue tit, bullfinch, dunnock, goldfinch, great tit, greenfinch, grey wagtail, jackdaw, kestrel, kingfisher, linnet, long-tailed tit, marsh tit, moorhen, robin, rook, swallow, woodpigeon, wren, pied wagtail.

Lepidoptera: Large white, small white, brimstone, gatekeeper, silver-Y

Mammals: Daubenton's, Whiskered/Brandt's, Natterer's, (45) Pipistrelle

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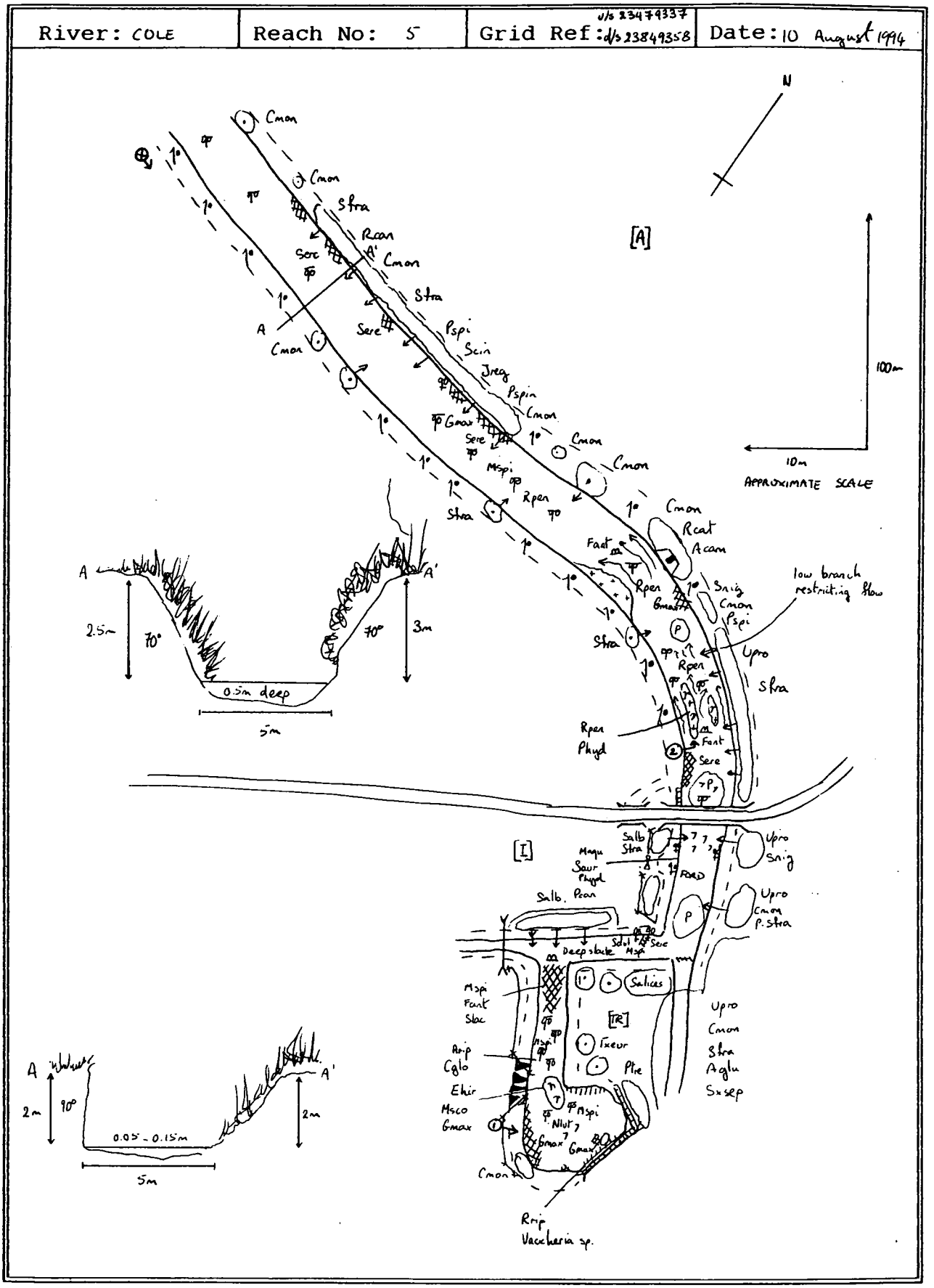

River Corridor Survey Map

RIVER: Cole REACH: 6

GRID REF: u/s SU23649298 d/s SU23479337 DATE: 10 August 1994

CONDITIONS: Survey from left bank; weather sunny, wind 4-5W; flow normal - slightly cloudy.

NATURE: Canalised, deep slack throughout, extensive marginal and instream vegetation, the left bank has a broad berm created by cattle poaching through the latter two-thirds.

SUBSTRATE: Silt

DIMENSIONS: Reach 500m long; 4-5m wide; 0.5->1m deep.

BANK TYPE: RB: steep, artificial throughout although apparently collapsing in places; LB: downstream half as RB: upstream, slope 45° to 1m wide berm, and apparently subsequently remnant artificial, vertical bank.

ADJACENT LAND USE: Grazed/mown pasture throughout on both banks.

RIGHT BANK VEGETATION: Limited diversity as most is contained within a narrow (c1m wide) strip along the top of the artificial bank:

Cirsium arvense	A	Rubus fruticosus agg.	O
Conium maculatum	O	Salix fragilis	F
Elymus repens	O	Sambucus nigra	R
Populus x canadensis	R	Ulmus procera	R
Populus tremula	R	Urtica dioica	A
Quercus robur	R		

LEFT BANK VEGETATION: More diverse, with a scrub/ruderal fringe contained and protected by a fence; merges into berm in upstream half:

Achillea millefolium	O	Matricaria matricarioides	R
Agrostis stolonifera	A	Phleum pratense	F
Arrhenatherum elatius	D	Poa annua	R
Carduus crispus	R	Polygonum amphibium	R
Cirsium arvense	F	Potentilla sterilis	R
Cirsium vulgare	O	Prunus spinosa	R
Crataegus monogyna	O	Rhamnus catharticus	R
Dactylis glomerata	A	Rosa canina	R
Dipsacus fullonum	R	Rubus fruticosus agg.	O
Epilobium hirsutum	F	Rumex conglomeratus	O
Geranium rotundifolium	R	Salix fragilis	O
Glechoma hederacea	R	Symphytum officinale	O
Heracleum sphondylium	O	Urtica dioica	A
Hordeum secalinum	F		

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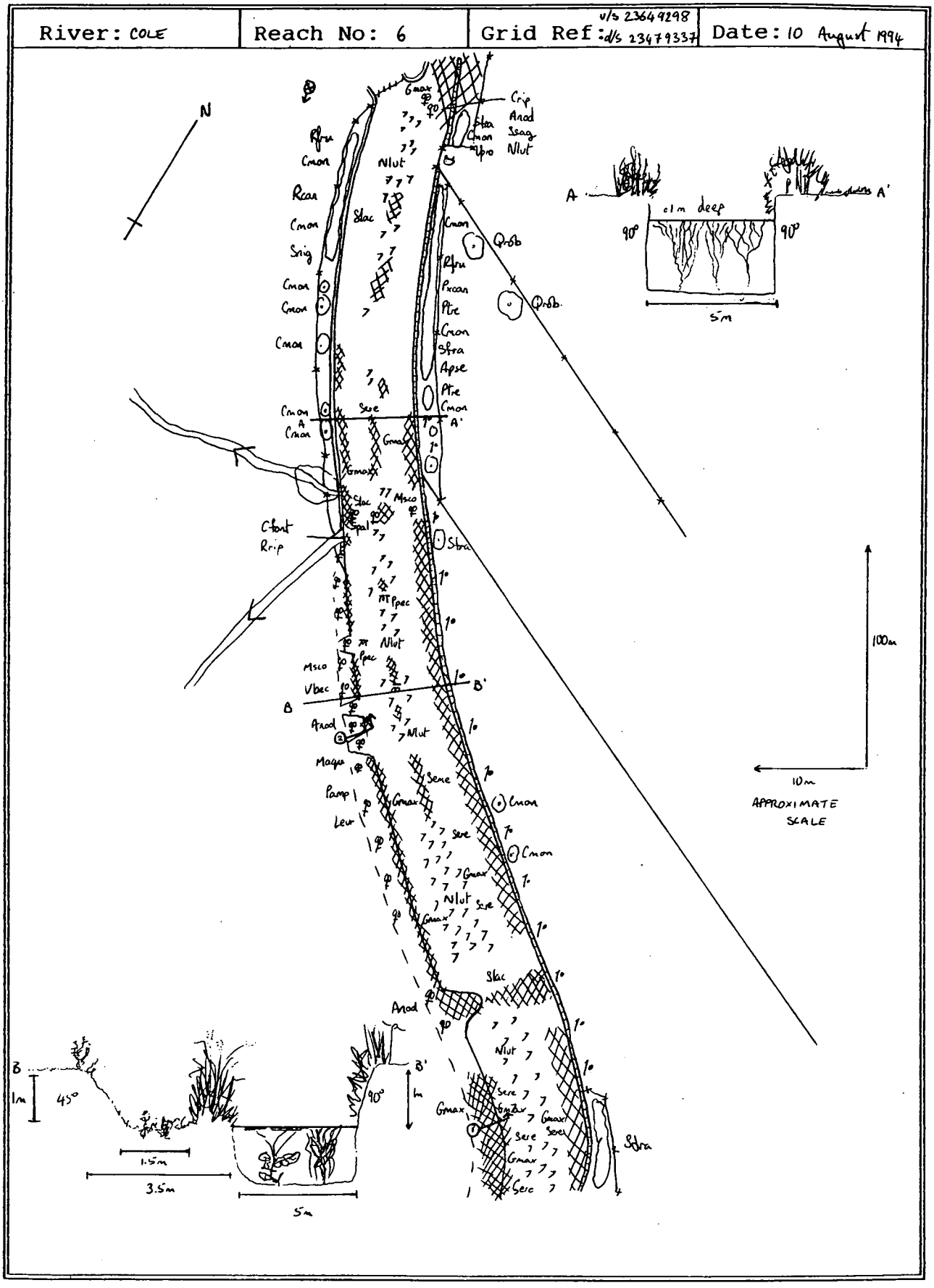


River Corridor Survey Map

RIVER: Cole REACH: 7

GRID REF: u/s SU23469257 d/s SU23649298 DATE: 10 August 1994

CONDITIONS: Survey from left bank; weather sunny, wind 4-5W; flow normal - slightly cloudy.

NATURE: Canalised, deep slack throughout.

SUBSTRATE: Silt.

DIMENSIONS: Reach 500m long; 1-5(7)m wide; >1m deep.

BANK TYPE: RB: steep, artificial throughout although apparently collapsing in places; LB: slope 45° to 1m wide berm, and apparently subsequently remnant artificial, vertical bank.

ADJACENT LAND USE: Grazed/mown pasture throughout on both banks.

RIGHT BANK VEGETATION: Limited width of dense aquatic grasses between grazed pasture and margin, occasional salices:

Cirsium arvense	F	Glyceria maxima	D
Dipsacus fullonum	R	Rumex obtusifolius	R
Epilobium hirsutum	O	Salix fragilis	O
Eupatorium cannabinum	O	Urtica dioica	F

LEFT BANK VEGETATION: Narrow grazed grassland fringe on bank leading down to berm:

Agrostis stolonifera	O	Matricaria matricarioides	R
Cirsium arvense	O	Phleum pratense	O
Cirsium vulgare	R	Polygonum persicaria	R
Dipsacus fullonum	R	Taraxacum sp.	R
Leontodon autumnalis	R	Urtica dioica	F
Lolium perenne	D		

MARGINAL VEGETATION: RB: Dense Glyceria maxima throughout.
LB: Diverse aquatic community on berm, fringe of aquatic grasses on the edge of the main channel:

Species	Rel	Cov
Agrostis stolonifera	3	1
Alisma plantago-aquatica	1	1
Apium nodiflorum	1	1
Carex riparia	1	1
Carex hirta	1	1
Filipendula ulmaria	2	1
Glyceria maxima	4	5
Juncus effusus	1	1
Juncus inflexus	1	1

CHANNEL VEGETATION: Dense and almost continuous, dominated heavily by Nuphar lutea, with stands of Schoenoplectus lacustris:

Species	Rel	Cov
Nuphar lutea	5	5
Potamogeton pectinatus	2	1
Sagittaria sagittifolia	1	1
Schoenoplectus lacustris	2	2
Solanum dulcamara	1	1
Sparganium emersum	3	1

FEATURES: Overflow stream from left bank about halfway along reach, weir separates it from the main channel. The wier supports Cinclidotus fontinaloides and serial forms of Rhynchostegium riparioides. Inflowing stream from right bank in upstream third.

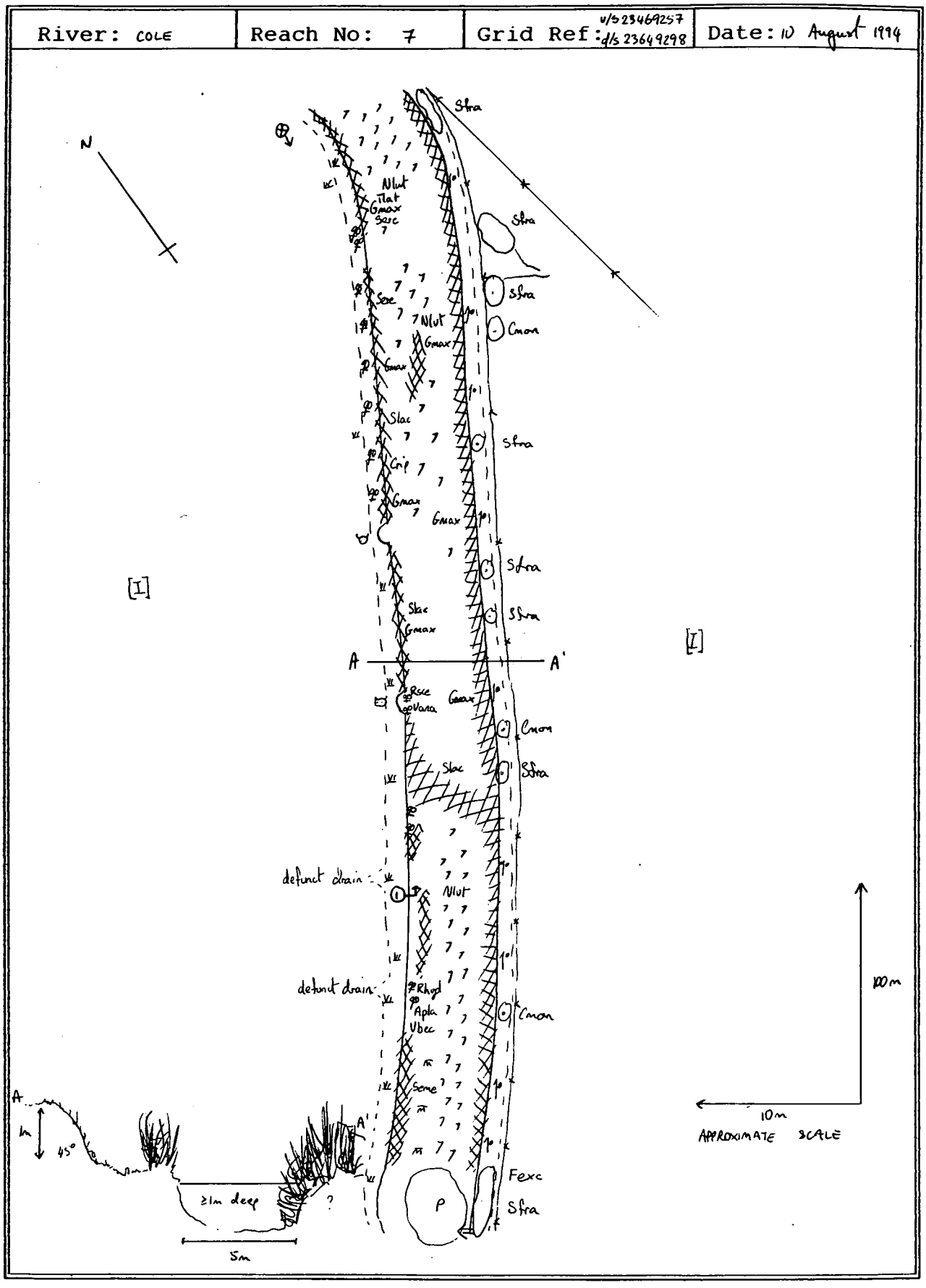
PRESENT MANAGEMENT: Little or none.

POTENTIAL THREATS: None obvious, except possibly growth of aggressive weeds blocking channel.

RECOMMENDATIONS: If works are carried out, the berm should be retained. It should be possible to retain the berm and introduce meanders and some variation in the morphology of the channel.

NOTES: Birds: Goldfinch, green woodpecker, greenfinch, grey heron, house martin, jackdaw, kingfisher, linnet, mallard, moorhen, reed bunting, robin, rook, snipe, stock dove, swallow, wren.

Mammals: Daubenton's and (45) Pipistrelle bats



River Corridor Survey Map

RIVER: Cole REACH: 8

GRID REF: u/s SU23129229 d/s SU23469257 DATE: 10 August 1994

CONDITIONS: Survey from left bank; weather sunny, wind 4-5W; flow normal - slightly cloudy.

NATURE: Canalised deep slack throughout.

SUBSTRATE: Silt.

DIMENSIONS: Reach 500m long; 5m wide; 0.5->1m deep throughout.

BANK TYPE: Steep, nearly vertical earth banks throughout.

ADJACENT LAND USE: RB: Larix/Picea plantation with border of broadleaf trees throughout; LB: harvested wheat, except for a copse over a dry drain.

RIGHT BANK VEGETATION: Woodland ground flora and trees:

Brachypodium sylvaticum	R	Ribes rubrum	O
Corylus avellana	F	Rubus fruticosus agg.	O
Crataegus monogyna	O	Salix cinerea oleifolia	R
Festuca gigantea	R	Sambucus nigra	O
Fraxinus excelsior	O	Symphytum officinale	O
Populus nigra	F	Urtica dioica	D
Quercus robur	O		

LEFT BANK VEGETATION: Ruderal fringe between arable and vertical bank:

Arrhenatherum elatius	A	Galium aparine	O
Calystegia sepium	A	Heracleum sphondylium	O
Carduus crispus	F	Lamiastrum galeobdolon	R
Cirsium arvense	F	Phalaris arundinacea	R
Conium maculatum	O	Prunus spinosa	O
Crataegus monogyna	O	Reynoutria sachalinensis	O
Deschampsia cespitosa	R	Rumex conglomeratus	R
Dipsacus fullonum	R	Salix fragilis	O
Dryopteris filix-mas	R	Sambucus nigra	R
Elymus repens	A	Symphytum officinale	O
Equisetum arvense	R	Urtica dioica	D
Festuca gigantea	R	Viburnum opulus	R

MARGINAL VEGETATION: RB: None; LB: sparse and intermittent:

MARGINAL VEGETATION: RB: Dense growth, dominated by monocots and limited because of steep banks:

Species	Rel	Cov
Angelica sylvestris	1	1
Carex riparia	1	1
Epilobium hirsutum	2	1
Glyceria maxima	5	3
Myosotis scorpioides	1	1
Schoenoplectus lacustris	2	1
Solanum dulcamara	1	1
Sparganium erectum	1	1

LB: Including berm, supports a species-rich complex of aquatics, with some grassland species. The bankside part of the berm is heavily poached by cattle and supports many marsh species, the river side is then similar to the right bank and is heavily dominated by aquatic monocots:

Species	Rel	Cov
Alisma plantago-aquatica	1	1
Carex riparia	1	1
Epilobium hirsutum	2	1
Eupatorium cannabinum	1	1
Filipendula ulmaria	1	1
Glyceria maxima	4	5
Juncus inflexus	2	1
Juncus effusus	1	1
Lycopus europaeus	1	1
Mentha aquatica	1	1
Myosotis laxa	1	1
Myosotis scorpioides	3	1
Nasturtium officinale	1	1
Ranunculus sceleratus	1	1
Ranunculus repens	2	1
Rumex conglomeratus	1	1
Schoenoplectus lacustris	2	1
Veronica beccabunga	3	2
Veronica anagallis-aquatica	1	1

Species	Rel	Cov
Lycopus europaeus	2	1
Mentha aquatica	3	1
Myosotis scorpioides	2	1
Nuphar lutea	1	1
Poa annua	1	1
Polygonum amphibium	2	1
Polygonum hydropiper	2	1
Polygonum persicaria	1	1
Rorippa palustris	1	1
Rumex conglomeratus	1	1
Schoenoplectus lacustris	1	1
Solanum dulcamara	1	1
Sparganium erectum	2	1
Stachys palustris	1	1
Typha latifolia	1	1
Veronica beccabunga	4	2

CHANNEL VEGETATION: Almost continuous, dominated by Nuphar lutea:

Species	Rel	Cov
Nuphar lutea	5	5
Polygonum amphibium	1	1
Sagittaria sagittifolia	1	1
Schoenoplectus lacustris	2	1
Sparganium emersum	1	1
Sparganium erectum	2	1

FEATURES: None.

PRESENT MANAGEMENT: Little or none.

POTENTIAL THREATS: None apparent.

RECOMMENDATIONS: Introduce variation in instream morphology without loss of the berm.

NOTES: Birds: Carrion crow, chaffinch, dunnock, jackdaw, linnet, meadow pipit, moorhen (nests), reed bunting, rook, skylark, woodpigeon.
Butterflies: Brimstone, gatekeeper.
Mammals: (45) Pipistrelle, hare.

Species	Rel	Cov
Epilobium hirsutum	1	1
Filipendula ulmaria	1	1
Lycopus europaeus	1	1
Myosotis scorpioides	1	1
Myosoton aquaticum	1	1
Polygonum hydropiper	2	2
Salix fragilis	2	1
Pellia epiphylla	3	2

CHANNEL VEGETATION: Nuphar lutea in patches throughout.

FEATURES: Old drain on downstream end of left bank.

PRESENT MANAGEMENT: None apparent.

POTENTIAL THREATS: None apparent.

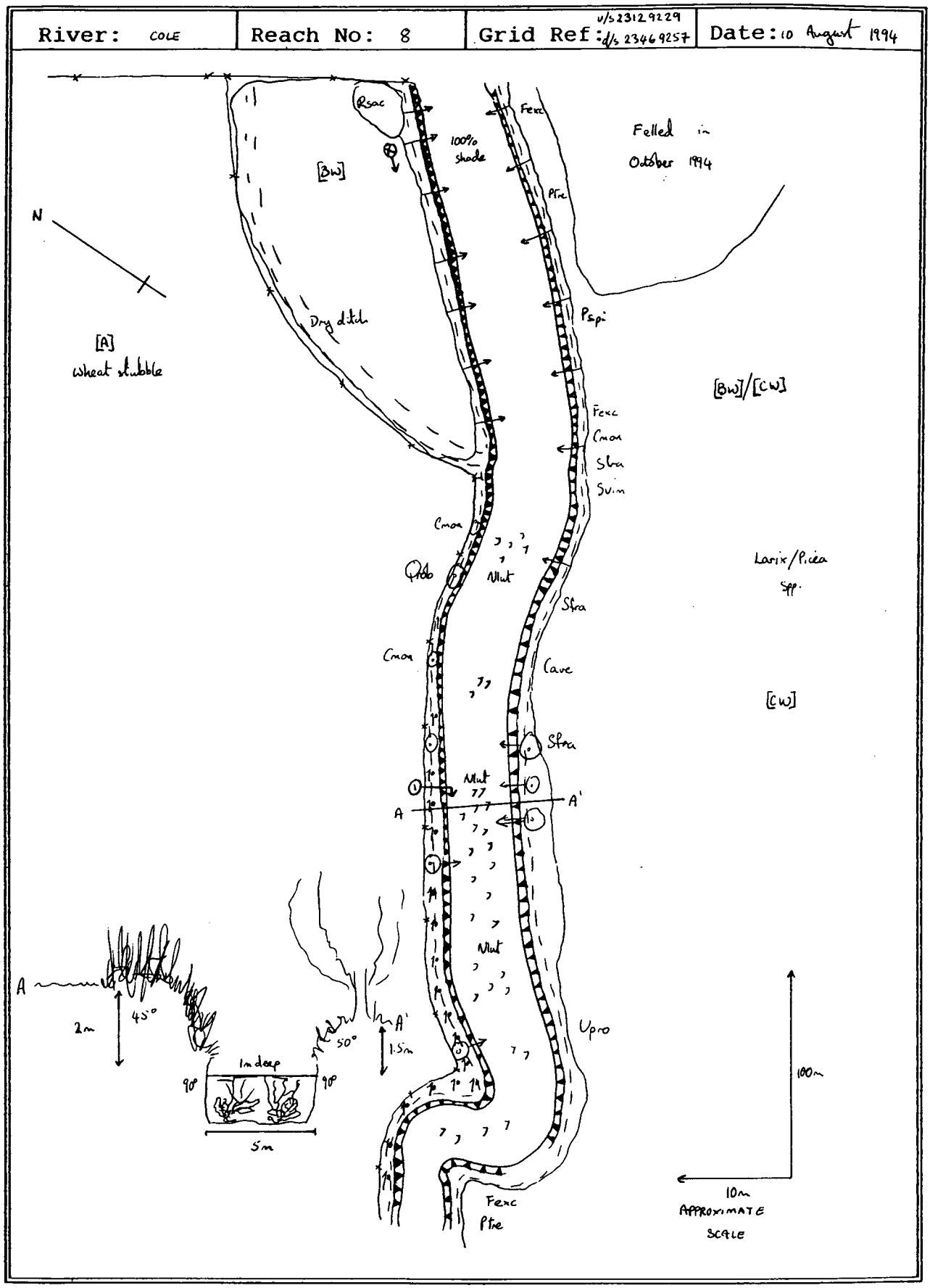
RECOMMENDATIONS: Diversify structure of channel and nature of flow - lowering banks, narrowing channel and creation of instream structures.

NOTES: Birds: Blue tit, buzzard, chaffinch, coal tit, goldcrest, great spotted woodpecker, great tit, grey heron, kingfisher, long-tailed tit, magpie, mallard, marsh tit, moorhen, robin, skylark, tawny owl, treecreeper, willow warbler, woodpigeon.

Butterflies: Large white, Small white

Mammals: Roe deer, Hare, Pipistrelle, Whiskered/Brandt's bat, Natterer's bat.

Fungus: Daldinia concentrica.



River Corridor Survey Map

RIVER: Cole REACH: 9

GRID REF: u/s SU22989192 d/s SU23129229 DATE: 10 August 1994

CONDITIONS: Survey from left bank; weather sunny, wind 4-5W; flow normal - slightly cloudy.

NATURE: Canalised, deep slack throughout.

SUBSTRATE: Silt.

DIMENSIONS: Reach 500m long; 5m wide; depth 0.25->1m.

BANK TYPE: Vertical earth banks on both sides throughout.

ADJACENT LAND USE: RB: Larix/Picea plantation with border of broadleaf trees Fraxinus excelsior with Quercus robur, Populus tremula, Populus x canescens over a dense ground flora dominated by Urtica dioica; LB: harvested wheat, except field of cattle-grazed pasture in upstream third.

RIGHT BANK VEGETATION: Narrow fringe of aquatics and woodland herbs throughout :

Calystegia sepium	O	Populus tremula	F
Conium maculatum	F	Ribes rubrum	R
Crataegus monogyna	L	Rosa canina	O
Festuca gigantea	R	Symphytum officinale	O
Fraxinus excelsior	F	Ulmus procera	A
Lycopus europaeus	R	Urtica dioica	D
Populus canescens	R	Vibernum opulus	R

LEFT BANK VEGETATION: 2m wide fringe of ruderals at top of vertical bank:

Aegopodium podagraria	R	Heracleum sphondylium	O
Anthriscus sylvestris	O	Lapsana communis	R
Arrhenatherum elatius	A	Phalaris arundinacea	R
Calystegia sepium	O	Polygonum persicaria	R
Chaerophyllum temulentum	R	Reynoutria sachalinensis	R
Cirsium arvense	F	Rumex obtusifolius	O
Cirsium vulgare	O	Symphytum officinale	O
Dactylis glomerata	O	Taraxacum sp.	R
Elymus repens	F	Urtica dioica	D
Epilobium hirsutum	O	Veronica chamaedrys	R
Glechoma hederacea	R		

MARGINAL VEGETATION: RB: Sparse, mainly where the pasture slopes slightly more gently to the water in the upstream third:

Species	Rel	Cov
Filipendula ulmaria	1	1
Myosotis scorpioides	1	1
Phalaris arundinacea	1	1
Polygonum hydropiper	1	2
Salix fragilis	2	2
Scrophularia auriculata	1	1

LB: As right bank:

Species	Rel	Cov
Eupatorium cannabinum	1	1
Filipendula ulmaria	1	1
Myosotis scorpioides	1	1
Pellia epiphylla	2	2
Phalaris arundinacea	1	1
Polygonum hydropiper	1	2
Salix cinerea oleifolia	1	
Salix fragilis	2	2
Sparganium erectum	1	1

CHANNEL VEGETATION: Limited, sparse Nuphar lutea (%,3) and Schoenoplectus lacustris (1,1).

FEATURES: Ditch overgrown with ruderals on right bank.

PRESENT MANAGEMENT: Little or none.

POTENTIAL THREATS: None apparent

RECOMMENDATIONS: Diversify structure of channel and nature of flow - lowering banks, narrowing channel and creation of instream structures.

NOTES: Birds: Blackcap, buzzard, carrion crow, chaffinch, goldfinch, grey heron, jackdaw, kestrel, kingfisher, mallard, marsh tit, moorhen, rook, skylark, treecreeper, willow warbler, woodpigeon, wren.

Butterflies: Comma, Large white, Peacock, Small white

Mammals: Roe deer, Natterer's bat, (45) Pipistrelle, Whiskered/Brandt's bat, cf. Leisler's bat.

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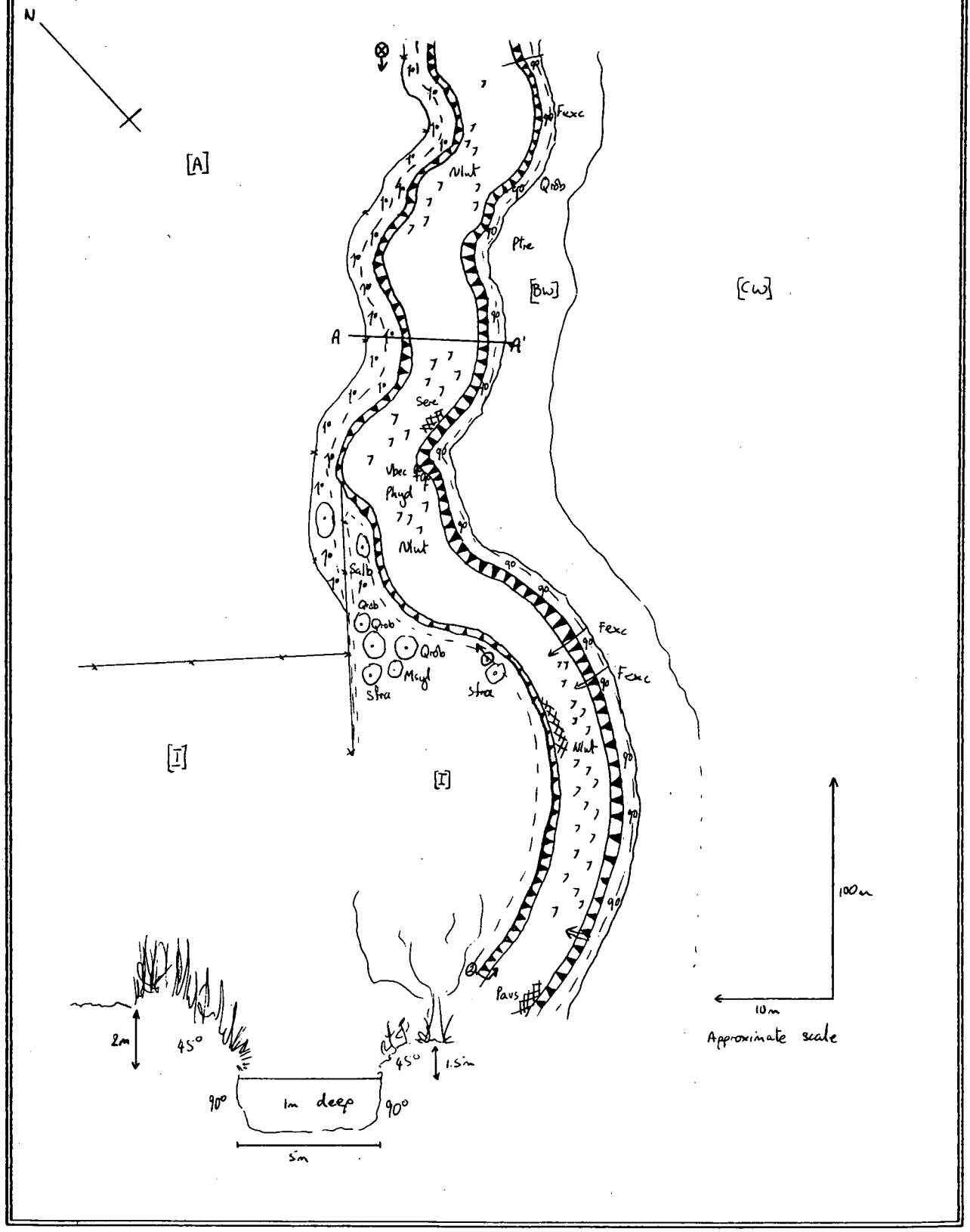
River: COLE	Reach No: 9	Grid Ref: u/s 22989192 d/s 23129229	Date: 10 August 1994



River Corridor Survey Map

3 KEY TO CODES USED FOR PLANTS ON RCS MAPS

Acam	Acer campestre
Aglu	Alnus glutinosa
Anod	Apium nodiflorum
Apla	Alisma plantago-aquatica
Arip	Amblystegium riparioides
Bumb	Butomus umbellatus
Cave	Corylus avellana
Cfon	Cinclidotus fontinaloides
Cglo	Cladophora glomerata
Cmon	Crataegus monogyna
Crip	Carex riparia
Ehir	Epilobium hirsutum
Fant	Fontinalis antipyretica
Fexc	Fraxinus excelsior
Gmax	Glyceria maxima
Jreg	Juglans regia
Leur	Lycopus europaeus
Maqu	Mentha aquatica
Msco	Myosotis scorpioides
Mspi	Myriophyllum spicatum
Msyl	Malus sylvestris
Nlut	Nuphar lutea
Pamp	Polygonum amphibium
Paru	Phalaris arundinacea
Phyd	Polygonum hydropiper
Ppec	Potamogeton pectinatus
Pspi	Prunus spinosa
Ptre	Populus tremula
Pxcan	Populus x canadensis
Qrob	Quercus robur
Rcan	Rosa canina
Rcath	Rhamnus catharticus
Rfru	Rubus fruticosus agg.
Rhyd	Rumex hydrolapathum
Rpen	Ranunculus penicellatus var. pseudofluitans
Rrip	Rhynchostegium riparioides
Rsac	Reynoutria sachalinensis
Salb	Salix alba
Saur	Scrophularia auriculata
Scap	Salix caprea
Scin	Salix cinerea
Sdul	Solanum dulcamara
Seme	Sparganium emersum
Sere	Sparganium erectum
Sfra	Salix fragilis
Slac	Schoenoplectus lacustris
Snig	Sambucus nigra
Spal	Stachys palustris
Ssag	Sagittaria sagittifolia
Stri	Salix triandra
Svim	Salix viminalis
Sxsep	Salix x sepulcralis nothovar. chrysocoma
Sxsmi	Salix x smithiana
Tlat	Typha latifolia
Upro	Ulmus procera
Vbec	Veronica beccabunga

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