

Fisheries Technical Reports

1. Sea Trout in England and Wales.
2. Analysis of Sea Trout Catch Statistics for England and Wales.
3. Sea Trout Literature Review and Bibliography.
4. The Feasibility of Developing and Utilising Gene Banks for Sea Trout (*Salmo trutta*) Conservation.

Conservation Technical Handbooks

1. River Corridor Surveys.

Published by:

National Rivers Authority

Rivers House
Waterside Drive
Aztec West
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Bristol
BS12 4UD

Tel: 0454 624400
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NRA

National Rivers Authority

RIVER CORRIDOR SURVEYS

METHODS AND PROCEDURES

NRA Thames 180



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CONSERVATION TECHNICAL HANDBOOK NO. 1

AUGUST 1992

ENVIRONMENT AGENCY



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1 INTRODUCTION

The National Rivers Authority is entrusted with conservation responsibilities in respect of wildlife, landscape and natural beauty, geological and physiographical features, buildings and other objects of archaeological, architectural or historic interest. These responsibilities relate to all inland and coastal waters and to land associated with such waters in England and Wales.

1.1 Statutory Duties and Obligations

Section 16 of the Water Resources Act 1991 imposes a duty to further conservation in respect of proposals relating to the NRA's functions, to protect sites of conservation interest and to take account of the effects that any proposals would have. The expression 'to further' implies a positive obligation toward conservation. Section 2(2) of the Act imposes a general duty to promote conservation to the extent that the NRA considers desirable (Appendix 1).

Practical guidance in respect of the NRA's environmental duties is given in a Code of Practice on Conservation, Access and Recreation approved by the Minister under Section 18 of the Act. The NRA is also expected to follow the Conservation Guidelines for Drainage Authorities published by MAFF, DOE and The Welsh Office.

1.2 Sustaining and Furthering Conservation

There is a rich variety of landscapes, habitats, wildlife and historical/archaeological features associated with the streams, rivers, ponds, lakes, wetlands, estuaries and coastal waters of England and Wales. This reflects a diverse network of inland watercourses totalling more than 250,000km and a coastline exceeding 4000km in length.

Features of special conservation interest are currently protected by a variety of different designations. A number of rare plants and animals associated with water are also specifically protected. The NRA has a duty to ensure that the special conservation interest of sites associated with the water environment is sustained.

A substantial proportion of the aquatic environment and associated lands has, however, been subjected to a long history of modification associated with agricultural, industrial and residential development. Straightening of river channels, water pollution, drainage of wetlands and excessive abstraction of water have all significantly reduced the conservation status of many sites. Consequently, there is a substantial opportunity for the NRA in fulfilling its duty to further conservation, to rehabilitate degraded sites and to promote the restoration of habitats previously damaged by environmentally insensitive practices.

1.3 The NRA's Strategic Conservation Objectives

- Assess and monitor the conservation status of inland and coastal waters and associated lands.
- Ensure that the NRA's regulatory, operational and advisory activities take full account of the need to sustain and further conservation.
- Promote conservation to enhance the quality of the aquatic and related environment for the benefit of wildlife and people.

An essential pre-requisite underpinning these objectives is to develop and implement effective standard methods to describe, classify and monitor the conservation "resource". A standard river corridor survey (RCS) is one such method. By highlighting important features which need protecting and identifying opportunities to rehabilitate and enhance degraded habitats, RCS is essential if the NRA is to fulfil its statutory duties to further conservation.

2 THE GUIDELINES

2.1 Purpose of the Handbook

This handbook describes, for both surveyors and survey supervisors, the basic technique for a standard ecological survey of river corridors. It provides the framework for a consistent national approach to gathering and recording information. It is the agreed standard methodology for NRA requirements, to be used by in-house and contract staff. More detailed site-specific surveys should be regarded as additional to the basic approach and not as alternatives.

Methods outlining standard survey techniques for other aspects of rivers (e.g. landscape, birds, mammals etc.) and other inland waters will be published separately in the Conservation Technical Handbook series.

This handbook has been developed through the NRA River Corridor Survey Task Group which was established in November 1989. The method is largely derived from "Surveys of Wildlife in River Corridors, Draft Methodology", formulated by the Nature Conservancy Council in 1984. It is based on recording the major habitats, vegetation and physical features of the river corridor, rather than on a detailed species or community record.

2.2 Definition of River Corridor

River corridor is a term generally used to describe a stretch of river, its banks and the land close by. The width of the corridor depends on how much the nearby land is affected by the river and vice versa. Usually the river corridor includes land and vegetation within 50 metres of the river bank, but where there are extensive water meadows, marshes or other wetland areas, the corridor may be wider to include these associated features.

A standard river corridor survey (RCS) should include four zones (Figure 1):

- Aquatic Zone
- Marginal Zone
- Bank Zone
- Adjacent Land Zone

The width of the river corridor and the component zones will vary according to channel and floodplain morphology.

The adjacent land zone should include a width of 50m on either side of the river channel unless the land or its uses are believed to have a particularly significant effect on the river or vice versa. In such cases the RCS should record information on land and habitats over the relevant, wider zone.

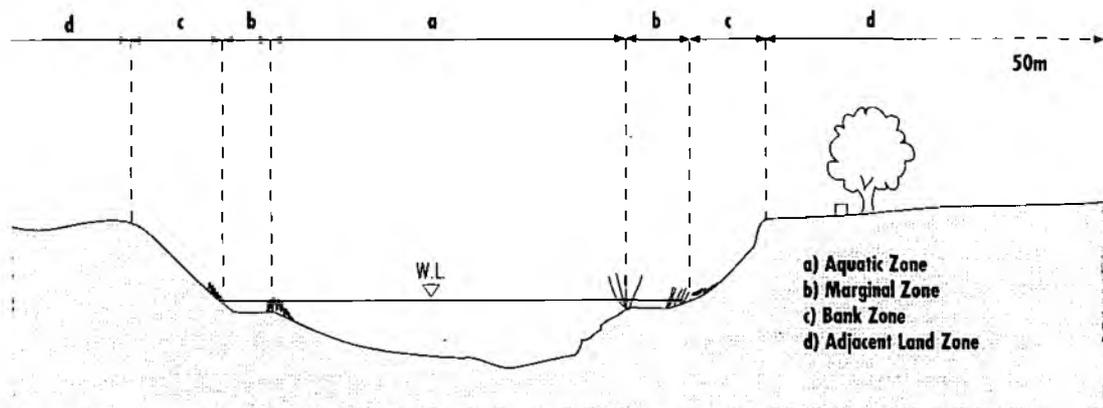


Fig 1 Diagrammatic Cross-section of a River Corridor Indicating Survey Zones

3 METHODS AND PROCEDURES

The standard RCS should be based on mapping defined 500m sections of river corridor, using outline maps derived from Ordnance Survey information.

Ideally, a survey of a small river should cover both banks simultaneously, but for large or embanked rivers each bank should be surveyed separately within a few days.

All fieldwork must be carried out in accordance with the general guidance on Health and Safety (Chapter 5) and Access (Chapter 6).

It is important that surveyors report incidents of pollution, fish kills, river blockages and other relevant problems to the appropriate NRA office at the earliest opportunity.

3.1 Seasonal Timing

The preferred time for survey is between late April - early May and early October, when vegetation should be readily identifiable. However, variation in the beginning and end of the season must be taken into consideration.

3.2 Preliminary Preparation

- Prepare base maps for fieldwork. These should be at a scale large enough to define the detailed outline of the river channel (1:2,500 or if not available, 1:10,000).
- Define 500m sections using readily identifiable landmarks or NRA standard reaches if already defined for the river.
- Arrange necessary permissions for access.
- Prepare identification for showing to landowners, particularly in cases where it has not been possible to obtain prior permission.

3.3 Producing an RCS Map

The 500m section maps should be based on Ordnance Survey information modified as necessary to a different scale which includes the basic channel outline and significant corridor features. Ordnance Survey copyright must be observed.

It is important that:

- Each RCS map is orientated so that the direction of flow is from the bottom to the top of the page. The left bank will therefore appear on the left-hand side of the page.
- Survey sections should be numbered in order, sequentially downstream to upstream.

Each RCS map should include the following information:

- **name of river**
- **reach reference number**
- **surveyor's name(s)**
- **six-figure grid references of the upstream and downstream limits of the reach**
- **date of survey**
- **grid north orientation**
- **scale-bar indicating length and width (m)**
- **arrow showing direction of stream flow**

The approximate scale of length and width should be indicated on redrawn maps by means of an L-shaped scale-bar representing appropriate distances (e.g. 50m length and 10m width).

If the width of the river channel and/or corridor is modified on the final drawing, the scale-bar must reflect any exaggeration.

3.4 Detail to be Included in RCS Maps

For each 500m section, the following should be recorded and mapped:

- **Aquatic Zone** **plant communities**
 flow and current features
 substrate and physical features
- **Marginal Zone** **plant communities**
 substrate and physical features
- **Bank Zone** **tree species**
 other plant communities
 physical features
- **Adjacent Land Zone** **habitat types**
 land use

The standard symbols and definitions of features to be included in the aquatic, marginal and bank zones appear as Appendix 2 and 3 respectively. Symbols on the RCS map and on any cross-sections should, as accurately as possible, reflect the position of features or vegetation in each of the four RCS zones. A waterproof card illustrating the RCS symbols is available for use in the field.

For the aquatic, marginal and bank zones, vegetation records should include visually dominant species. When annotated onto the map, abbreviated plant species names should follow the convention of the first letter of the generic name in upper case followed by the first three letters of the specific name in lower case (Appendix 4). Species of conservation significance (e.g. locally or nationally rare; alien; invasive) should be highlighted.

Surveyors should be aware of and able to recognise vulnerable, rare or endangered species. Guidance on locally and regionally rare plant species based on NRA regions is available in Palmer and Newbold (1983). Records of rare or endangered species will have to be verified by at least one recognised expert. Unverified records must be highlighted in the final report.

For the adjacent land zone, a "Phase 1" habitat-type survey is desirable (Appendix 5). In general, individual plant species should not be recorded, except in areas hydrologically linked to the river such as marshes, oxbows or fen. In these cases both habitat and vegetation type should be recorded in appropriate detail.

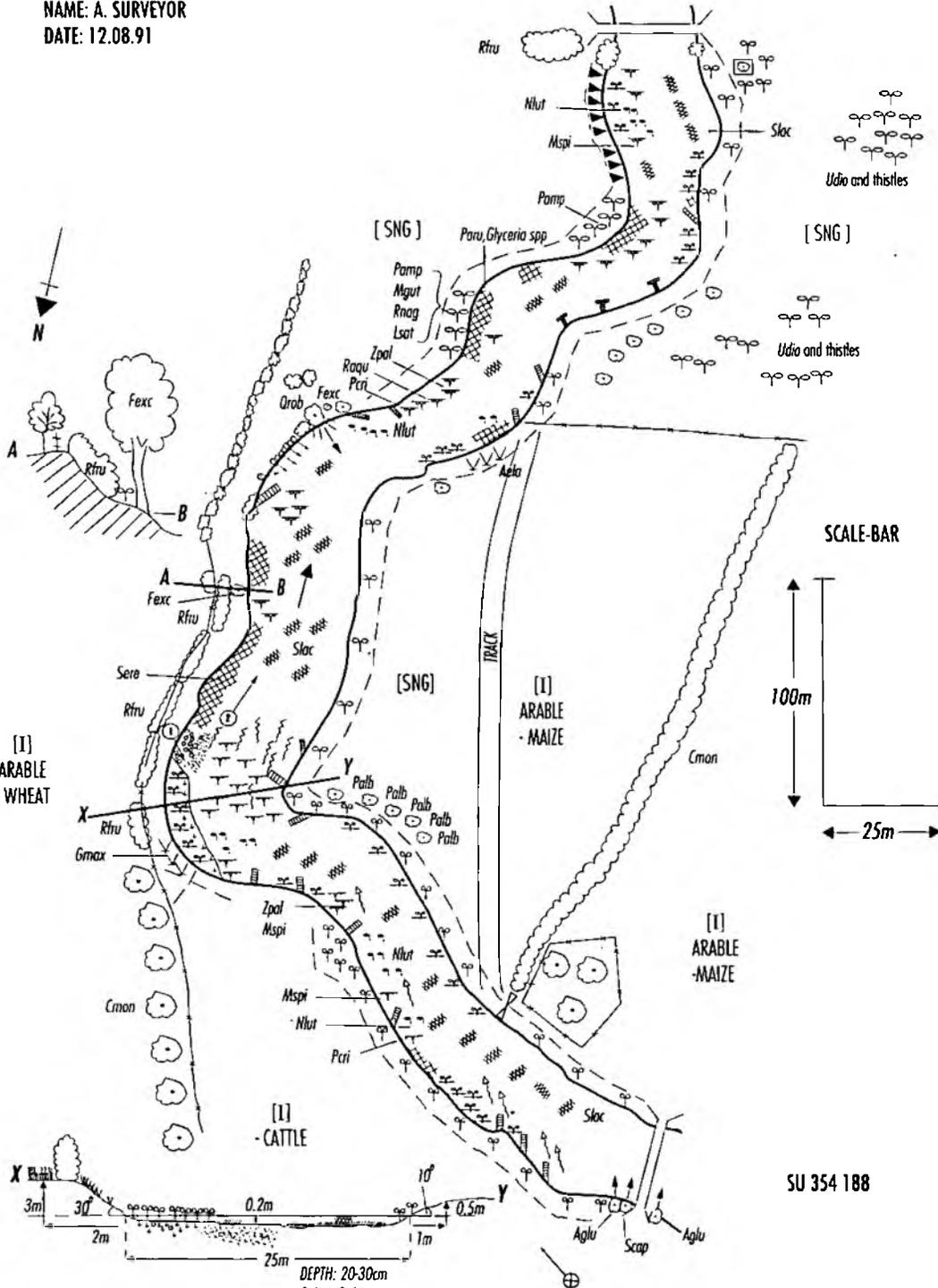
Critical areas such as easily damaged and non re-creatable habitats should be highlighted on RCS maps with an asterisk.

Examples of completed RCS maps are shown in Figures 2 and 3.

Figure 2 Example RCS Map: River Test

RIVER TEST
 REF: NO 158
 NAME: A. SURVEYOR
 DATE: 12.08.91

SU 356 184



3.5 Cross-sections

At least one representative sketch cross-section should be drawn for each 500m section (Figure 4). More may be necessary where morphology changes significantly. It is preferable to include the cross-sections on the RCS map to which they refer.

Cross-sections should indicate:

- width of the water-filled channel
- depth of water
- bank height, slope and width
- flood bank height and width where appropriate
- water level relative to the top of the bank
- land use to a minimum of 50m either side of the river.

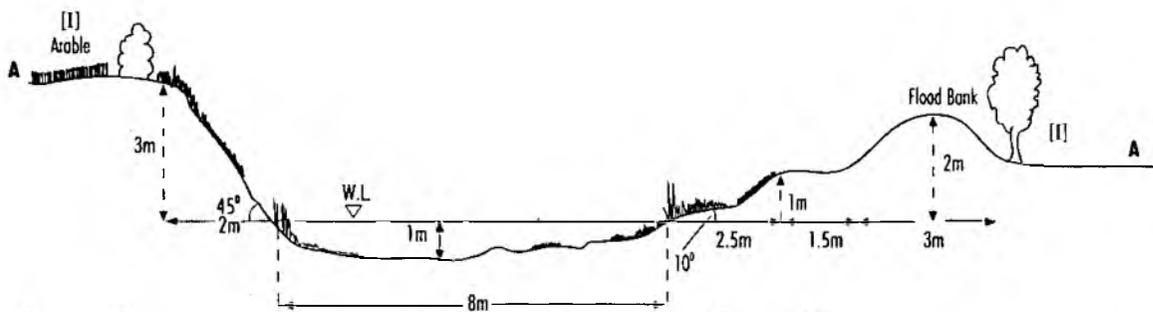


Figure 4 Cross-section Illustrating Features to be Recorded

3.6 Summary Description

A summary description of each 500m section should accompany the RCS map, giving details of:

- conditions on the day of the survey (e.g. weather, water-level)
- special and typical features of the river channel
- marginal vegetation on both banks where possible
- bank zone habitats
- adjacent land-use

- notes of insects, birds, and mammals of special interest
- recreation features
- existing management such as bank mowing or tree pollarding
- observed or potential threats which may affect conservation value such as crop spraying, scrub invasion, hedge removal, refuse dumping etc.
- habitats to be retained intact and the proposed means of achieving this
- suggestions for habitat improvement

All text and notes should be clear and concise. The basic information should be readily understood by non-technical staff or by practitioners in other disciplines since this will minimise mistakes and misunderstandings during for instance, the detailed planning phase of flood defence works.

The end product should be a clear, annotated RCS map supported by a descriptive summary text and, if required, a record card for each 500m section of river corridor.

3.7 Habitat Enhancement Map

Potential for habitat retention and enhancement, or alternative management should be annotated on a separate outline map which also summarises the main habitat features (Figure 5). Examples of enhancement opportunities include:

- the creation of new "in-stream" features
- tree planting on adjacent land
- restoring ponds or wetlands fed from the river
- extending adjacent habitats such as water meadows

To distinguish them from existing features, enhancement suggestions should be highlighted by putting the text in a box and indicating the exact location with an arrow. Numbering the box(es) will allow easy cross-referencing to the summary notes.

3.8 Photographs

A photograph representative of each 500m section should be taken using colour print film. Additional photographs can illustrate special ecological or physical features. All relevant prints should be included as part of the final survey report. The

location and orientation of each photograph should be indicated on the RCS map by an encircled number and arrow (Appendix 2).

3.9 The Survey Report

The survey report should be in A4 format and bound in such a way that it can be easily dismantled and photocopied. It should be based on the original field maps and notes redrawn to produce a high quality end product. Final RCS maps should be in black and white only for ease of copying. Notes annotated on the RCS maps should be clearly legible, in upper case handwriting, except where it is necessary to give the full or abbreviated scientific name of a species. An example of the minimum acceptable standard of an RCS map is illustrated in Figure 6.

The report should be arranged as follows:

A contents page.

Introduction and location map, showing numbered survey sections.

A typed summary of the general ecological, morphological and other interest of the total length of river surveyed.

Text, using maps if relevant, highlighting those sections which are believed to be of special importance or sensitivity, or offer practical scope for enhancement. The use of matrices for summarising the location of key features along a river may be useful.

For each 500m section there should be:

- **an RCS map, containing all the relevant information.**
- **a typed summary of the main ecological and physical features.**
- **a typed summary and map outlining the type of management needed to sustain or, where appropriate, enhance the conservation of habitats, flora and fauna and other features of interest.**

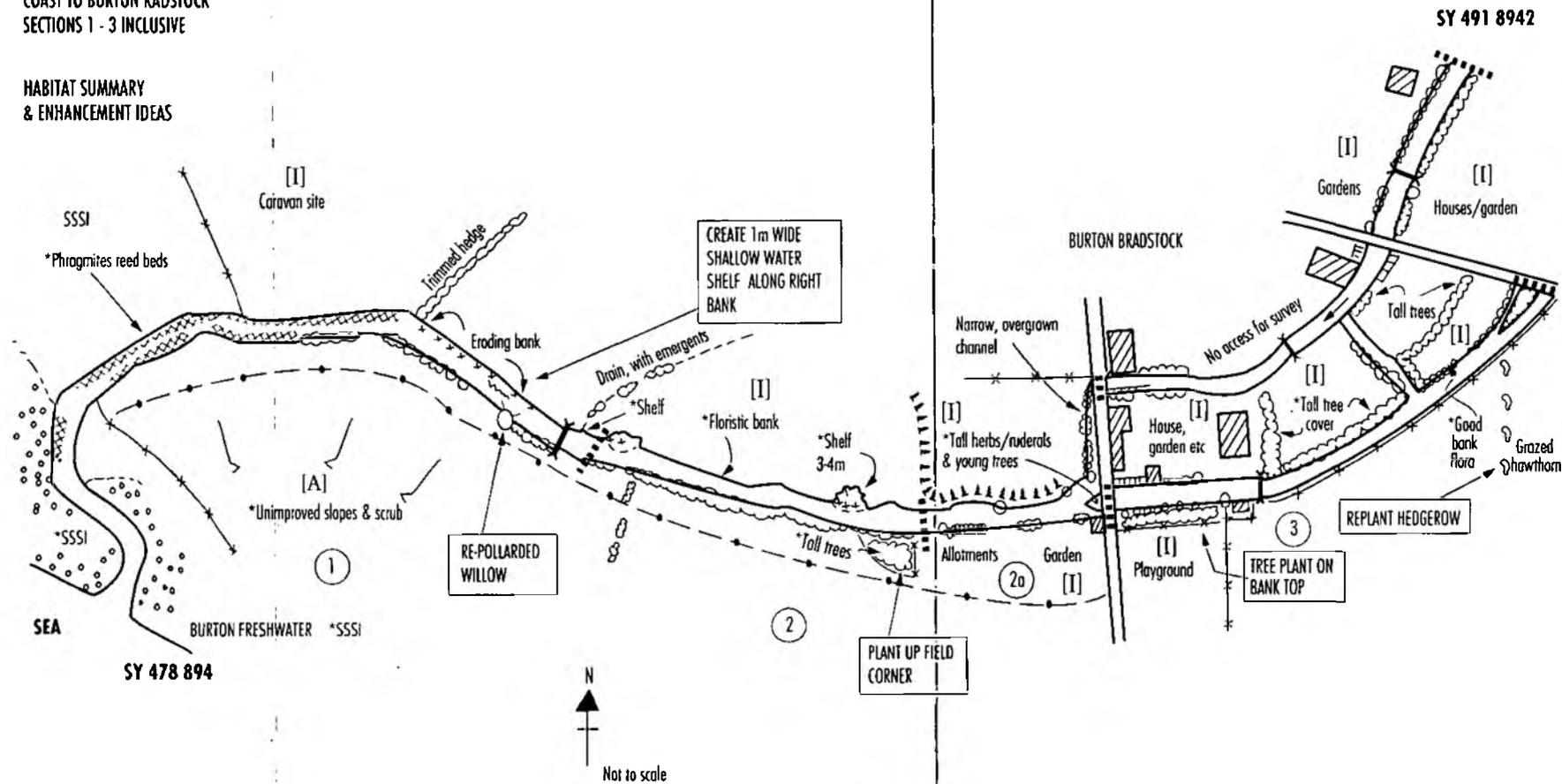
A copy of the standard RCS symbols should be incorporated in the report (Appendix 2). Any additional abbreviations or symbols used should be fully explained and referenced.

Photographs, except for those used to illustrate the report, should be stored and indexed separately, with a cross-reference to the survey report.

Figure 5 Summary Map showing Main Habitat Features and Enhancement Suggestions included in a Final RCS Report

RIVER BRIDE (SHEET 1)
COAST TO BURTON RADSTOCK
SECTIONS 1 - 3 INCLUSIVE

HABITAT SUMMARY
& ENHANCEMENT IDEAS



4 GUIDELINES FOR SURVEY SUPERVISORS

The survey supervisor will, in all instances, be the appropriate NRA Conservation Officer.

4.1 Quality Assurance and Control

Mechanisms and procedures for ensuring high standards are fundamental.

The highest standards of survey and reporting are essential to ensure the most effective collection and use of RCS information. Quality assurance and control are both the responsibility of the survey supervisor.

Critical requirements include:

- detailed specifications for surveyors
- adequate timing and resources for fieldwork
- well-trained surveyors, to ensure technical competence, consistency of approach and understanding
- the ability to overcome technical difficulties associated with survey techniques and identification of species
- regular checking of the quality of RCS outputs

4.2 Survey Specifications

Full specifications must be established before a survey begins, including the precise location, timing, and components of the survey, including the level of any additional detail required. The contents of the final report, including the format of maps and summary descriptions, must be clearly identified as part of the specifications.

If species lists are being compiled for use on a computerised database it is recommended that the standard BSBI species numbers are used.

4.3 Timing and Resources for Field Survey

A well-trained surveyor should be able to complete four or five 500m sections each day, though this will vary with the type and size of river, the terrain, habitat, riparian access, weather conditions and any extra level of survey detail specified. Production of RCS maps and the full survey report at an acceptable standard of presentation will probably result in a rate of 1.5km of reported

river-length per day. Adequate time must be allowed, taking all relevant factors into consideration.

In all cases, supervisors must allow sufficient time to enable the specified survey programme to be completed to the required standard.

Surveys of an urgent nature which cannot be carried out between late April and early October should be repeated, wherever possible, within the recommended season provided that significant modification to the river has not occurred in the meantime.

Ideally, RCS should involve pairs of surveyors with one working on each bank. In most cases, this may not be possible and the NRA Lone Worker Policy should be followed (Appendix 6).

4.4 Technical Competence

All surveyors should be trained to the standard required for identifying all relevant environmental and other features included in RCS. They should either be experienced in RCS methods or work under close supervision until they reach the required standard of competence. National Vegetation Classification (NVC) experience or training for field surveyors is desirable.

All surveyors should be aware of the rationale behind RCS including the value and potential uses of the information gathered. Wherever possible surveyors should have on-site training in field techniques. They should also be familiar with the writing and preparation of RCS reports. Refresher courses for experienced surveyors are recommended at appropriate intervals.

4.5 Resolving Technical Problems

Supervisors must ensure that surveyors seek advice at the earliest opportunity in the event of any technical problems regarding survey methodology, identification of species or assessing special or unusual features. In the first instance the survey supervisor is the primary contact who is responsible for liaising with the relevant expert(s).

All surveyors should be made fully aware of the offences relating to birds, animals and plants specially protected under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981. Supervisors should clarify the need for obtaining licences by contacting Species Protection Officers at English Nature or the Countryside Council for Wales as appropriate.

5 HEALTH AND SAFETY

Being near rivers, streams or any other body of water, either for work or recreation, is potentially dangerous.

The survey supervisor is responsible for making all field staff aware of potential dangers and the procedures in case of accidents.

Safety should be an integral part of any RCS training programme. For example, knowledge about Weil's disease is essential; a waterproof card giving information on Weil's Disease is available from NRA Regional Health and Safety Advisors (Appendix 7).

Every effort should be made to minimise risks in the field by commonsense behaviour such as :

- avoiding steep or unstable banks
- avoiding rivers during spate conditions
- not entering the water if the river-bed is not visible
- working in pairs if river channels need to be crossed
- watching out for hazards, especially in urban rivers, such as broken glass, sharp metal or decomposing waste
- taking care to avoid contact with the water, soil or low vegetation before eating or drinking during field work
- wearing the right clothes for the job and weather conditions
- carrying a basic first-aid kit
- following reporting-in and signing-off procedures, linked to a home base; this is especially important for surveyors working alone
- survey supervisors ensuring that the location of each surveyor is known each working day
- establishing an agreed system of emergency action in case a surveyor does not report in or sign off at the end of the day.

6 ACCESS

Although not always possible, every effort should be made to obtain prior permission for access to private land. Indeed, presume that unless otherwise indicated, riparian land is privately-owned.

If not obtained in advance, surveyors should always attempt to obtain permission by approaching nearby houses or farms or asking people working in nearby fields or other appropriate land.

If a surveyor is working without permission and is challenged by an owner or tenant, he or she should :

- provide proof of identity
- apologise for not obtaining prior permission
- describe the work in progress
- explain exactly what the survey involves and how long it will take
- offer the owner, or tenant an extract of the RCS report, when available
- leave the site without fuss if the person becomes aggressive or distressed
- report the incident(s) to the survey supervisor.

RIVER CORRIDOR SURVEYORS SHOULD AT ALL TIMES BE COURTEOUS AND HELPFUL TO LANDOWNERS, AND MUST ABIDE BY THE COUNTRY CODE.

7 ACKNOWLEDGEMENTS

The original NRA River Corridor Survey Task Group comprised John Hogger (Chairman), Liz Chalk, Judith Crompton, Mark Diamond, Alastair Driver, David Hickie, Richard Howell, John Morgan, Peter Nicholson and Chris Spray.

Peter Barham, Lyn Jenkins, Teg Jones and John Pygott were involved at later stages.

Nigel Holmes (Alconbury Environmental Consultants) and Terry Langford (Hopehead Consultants) are acknowledged for their contributions in developing this handbook.

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APPENDIX 1

THE NRA'S STATUTORY DUTIES TO CONSERVATION UNDER SECTIONS 16(1), 16(2) AND 2(2) OF THE WATER RESOURCES ACT 1991

General environmental and recreational duties.

16.(1) It shall be the duty of each of the Ministers and of the Authority, in formulating or considering any proposals relating to any functions of the Authority-

(a) so far as may be consistent-

(i) with the purposes of any enactment relating to the functions of the Authority; and

(ii) in the case of the Secretary of State, with his duties under section 2 of the Water Industry Act 1991,

so to exercise any power conferred on him or it with respect to the proposals as to further the conservation and enhancement of natural beauty and the conservation of flora, fauna and geological or physiographical features of special interest; - - -

(b) to have regard to the desirability of protecting and conserving buildings, sites and objects of archaeological, architectural or historic interest; and

(c) to take into account any effect which the proposals would have on the beauty or amenity of any rural or urban area or on any such flora, fauna, features, buildings, sites or objects.

16.(2) Subject to subsection (1) above, it shall be the duty of each of the Ministers and of the Authority, in formulating or considering any proposals relating to the functions of the Authority-

(a) to have regard to the desirability of preserving for the public any freedom of access to areas of woodland, mountains, moor, heath, down, cliff or foreshore and other places of natural beauty;

(b) to have regard to the desirability of maintaining the availability to the public of any facility for visiting or inspecting any building, site or object of archaeological, architectural or historic interest; and

(c) to take into account any effect which the proposals would have on any such freedom of access or on the availability of any such facility.

Duty to promote Conservation

2.(2) Without prejudice to its duties under section 16 below, it shall be the duty of the Authority, to such extent as it considers desirable, generally to promote-

(a) the conservation and enhancement of the natural beauty and amenity of inland and coastal waters and of land associated with such waters;

(b) the conservation of flora and fauna which are dependent on an aquatic environment; and

(c) the use of such waters and land for recreational purposes.

APPENDIX 2

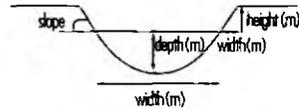
Standard Symbols for use in River Corridor Surveys

AQUATIC AND MARGINAL ZONES

CHANNEL FEATURES

	Bridge (road/track)
	Footbridge
	Lock
	Inlet
	Weir
	Pool
	Riffle
	Rapids
	Run
	Waterfall
	Protruding rock
	Island (with vegetation)
	Direction of flow

CHANNEL CROSS-SECTION



SUBSTRATE

	Mud
	Sand
	Bare gravel/shingle
	Vegetated gravel/shingle
	Cobbles
	Boulders

CHANNEL VEGETATION

	Emergent Monocots
	Emergent Dicots
	Submerged Monocots
	Submerged Dicots
	Bryophytes
	Floating leaves

SURVEY INFORMATION

	Direction of survey/bank used
	Photograph

BANK AND ADJACENT LAND ZONES

BANK FEATURES

	Base of bank
	Top of bank
	Slump
	Stable earth cliff
	Eroding earth cliff
	Rock cliff
	Artificial bank protection
	Cattle drink
	Shelf / berm
	Spring / flush
	Inflow stream
	Outfall
	Dredgings/spoil

ADJACENT LAND FEATURES

	Fence
	Gate
	Road / track
	Railway
	Footpath
	Power lines
	Building
	S.T.W. Sewage works
	Flood bank
	Land use category Defined name / Phase 1 code

VEGETATION

Trees	
	Conifer
	Broadleaf
	- overhanging
	- fallen
	- exposed roots
	Woodland + symbol for type
<i>P</i> + symbol	Pollarded tree
<i>(P)</i> + symbol	Tree needs pollarding
<i>C</i> + symbol	Coppiced tree
	Sapling

Shrubs/hedgerows

	Shrub (single)
	Dense shrubs
	Sparse shrubs
	Hedgerow
	Hedgerow with trees

Grasses and herbs

	Reed / sedge
	Tall grass
	Tall herb / ruderal
	Tall grass with herbs
	Short grass
	Mown

APPENDIX 3

SUMMARY DEFINITIONS FOR AQUATIC, MARGINAL AND BANK ZONES

1 AQUATIC ZONE

a) Depth:	Indicate on cross-sections (m)	Protruding rocks	In upland rivers boulders are frequently visible above the water level. These provide important habitats for several plant and animal species and the area within a 500m length occupied by them should be indicated by a percentage estimate.
b) Width:	Indicate on cross-sections (m)		
c) Substrate:	Expressed as a percentage of area of section		
Silt/Mud	Unlike fine sands, these are of a soft texture and not abrasive to the hands if rubbed. A fine layer of silt through which gravel, rocks etc. can be seen should be typed according to underlying substrate but the presence of silt noted separately.	d) Flow:	Expressed as a percentage of length of the section
		Pool	A distinct, deeper area of slow-flowing water, often with an eddying flow, between fast-flowing stretch.
		Slack	Area of deep or shallow water where the velocity is slow due to a very shallow slope in the river, natural or artificial ponding. There is no widespread eddying and as river levels rise the water velocity increases much quicker than areas recorded as "pool".
Clay	Reserved for solid surfaces where flow does not remove the substrate.		
Sand	Includes coarse and fine sands, the former merging into fine gravel and the latter merging into mud and silt (<2mm).		
Fine gravel/shingle	2-16mm diameter.	Riffle	Fast flowing; shallow water with a distinctly broken or disturbed surface.
Coarse gravel/shingle	16-64mm diameter (conker to half-fist size).	Run	Fast or moderate flowing, deeper water with a surface generally undisturbed except for occasional swirls and eddies.
Cobbles	64-256mm diameter (half-fist to approximately large head size).		
Boulders	Any rocks larger than 256mm in diameter	Rapids	Rapid water velocity with a severely broken surface, deeper than a riffle.
Bedrock	Exposure of underlying solid rock in river bed.	Waterfall	Solid rock falls exposed causing a vertical (>1m) drop in the river water. If large, in some cases it may be appropriate to record separately.
Peat	Strictly pure peat, not fine peaty deposits over more substantial substrates.		
Artificial	Any artificial materials covering the river bed e.g. concrete, brick, timber, etc.		

2 MARGINAL ZONE

- a) **Width:** Indicate on cross-sections (m)
- b) **Substrate:**
- Mud Flat areas of mud in slow-flowing stretches often occurring in the river directly adjacent to steep banks.
- Sand As for mud but formed of sand.
- Bare gravel/cobbles Loose material thrown up by the river. A temporary habitat liable to be re-contoured by each flood.
- Vegetated gravel/shingle More permanent shallow marginated area comprising cobbles constantly being inundated and exposed by variations in flow levels. It should be distinct from the bank yet not forming an island.
- Rock Areas of rock normally under a shallow depth of water and only exposed by the lowest flows.
- Artificial As above, but of artificial substrates.

3 BANK ZONE

- a) **Height:** Indicate on cross-sections (m)
- b) **Width:** Indicate on cross-sections (m)
- c) **Slope:** Indicate on cross-sections (°)
- d) **Bank characteristics:** Expressed as a percentage length of section
- e) **Trees:** Number per section. NB. This refers to numbers of individual trees where these can be identified (i.e. not woodland).

APPENDIX 4

ABBREVIATED PLANT NAMES

All plants should be recorded using an abbreviated version of their scientific name. The following list is indicative; additions should be abbreviated using the convention of the first letter name (i.e. the first letter of the generic name and the first three letters of the specific name). Duplicate abbreviations thus created should be clarified by using the BSBI abbreviation or code number. Plants not identified to species should be recorded using initial of generic name and (sp) in brackets. Nomenclature follows Stace (1991).

DICOTYLEDONS

Herbs

Anod	<i>Apium nodiflorum</i>	Fool's Water-cress
Asyl	<i>Angelica sylvestris</i>	Wild Angelica
Bere	<i>Berula erecta</i>	Lesser Water-parsnip
Bcer	<i>Bidens cernua</i>	Nodding Bur-marigold
Btri	<i>B. tripartita</i>	Trifid Bur-marigold
Cobt	<i>Callitriche obtusangula</i>	Blunt-fruited Water-starwort
Csta	<i>C. stagnalis</i>	Common Water-starwort
Cpal	<i>Caltha palustris</i>	Marsh-marigold
Cpra	<i>Cardamine pratensis</i>	Cuckooflower
Cdem	<i>Ceratophyllum demersum</i>	Rigid Hornwort
Cmac	<i>Conium maculatum</i>	Hemlock
Dful	<i>Dipsacus fullonum</i>	Wild Teasel
Dpil	<i>D. pilosus</i>	Small Teasel
Ehir	<i>Epilobium hirsutum</i>	Great Willowherb
Ecan	<i>Eupatorium cannabinum</i>	Hemp-agrimony
Fulm	<i>Filipendula ulmaria</i>	Meadowsweet
Lped	<i>Lotus pedunculatus</i>	Greater Bird's-foot-trefoil
Lfcu	<i>Lychnis flos-cuculi</i>	Ragged-Robin
Leur	<i>Lycopus europaeus</i>	Gipsywort
Lvul	<i>Lysimachia vulgaris</i>	Yellow Loosestrife
Lsal	<i>Lythrum salicaria</i>	Purple-loosestrife
Maqu	<i>Mentha aquatica</i>	Water Mint
Msc0	<i>Myosotis scorpioides</i>	Water Forget-me-not
Mspi	<i>Myriophyllum spicatum</i>	Spiked Water-milfoil
Nalb	<i>Nymphaea alba</i>	White Water-lily
Nlut	<i>Nuphar lutea</i>	Yellow Water-lily
Ocro	<i>Oenanthe crocata</i>	Hemlock Water-dropwort
Oflu	<i>O. fluviatilis</i>	River Water-dropwort
Phyb	<i>Petasites hybridus</i>	Butterbur
Pamp	<i>Polygonum amphibium</i>	Amphibious Bistort
Phyd	<i>P. hydropiper</i>	Water-pepper
Pdys	<i>Pulicaria dysenterica</i>	Common Fleabane
Raqu	<i>Ranunculus aquatilis</i>	Common Water-crowfoot
Rcir	<i>R. circinatus</i>	Fan-leaved Water-crowfoot
Rfla	<i>R. flammula</i>	Lesser Spearwort
Rflu	<i>R. fluitans</i>	River Water-crowfoot
Rpel	<i>R. peltatus</i>	Pond Water-crowfoot

Rpen	<i>R. penicillatus</i>	Stream Water-crowfoot
Rsce	<i>R. sceleratus</i>	Celery-leaved Buttercup
Rnaq	<i>Rorippa nasturtium-aquaticum</i>	Water-cress
Rhyd	<i>Rumex hydrolapathum</i>	Water Dock
Saur	<i>Scrophularia auriculata</i>	Water Figwort
Sgal	<i>Scutellaria galericulata</i>	Skullcap
Sdul	<i>Solanum dulcamara</i>	Bittersweet
Soff	<i>Symphytum officinale</i>	Common Comfrey
Tfla	<i>Thalictrum flavum</i>	Common Meadow-rue
Udio	<i>Urtica dioica</i>	Common Nettle
Voff	<i>Valeriana officinalis</i>	Common Valerian
Vaaq	<i>Veronica anagallis-aquatica</i>	Blue Water-Speedwell
Vbec	<i>V. beccabunga</i>	Brooklime
Vcat	<i>V. catenata</i>	Pink Water-Speedwell

MONOCOTYLEDONS

Grasses

Aela	<i>Arrhenatherum elatius</i>	False Oat-grass
Asto	<i>Agrostis stolonifera</i>	Creeping Bent
Caqu	<i>Catabrosa aquatica</i>	Whorl-grass
Dces	<i>Deschampsia cespitosa</i>	Tufted Hair-grass
Gdec	<i>Glyceria declinata</i>	Small Sweet-grass
Gflu	<i>G. fluitans</i>	Floating Sweet-grass
Gmax	<i>G. maxima</i>	Reed Sweet-grass
Gnot	<i>G. notata</i>	Plicate Sweet-grass
Paru	<i>Phalaris arundinacea</i>	Reed Canary-grass
Paus	<i>Phragmites australis</i>	Common Reed

Sedges & rushes

Cacu BSBI 340	<i>Carex acuta</i>	Slender Tufted-sedge
Cacu BSBI 341	<i>C. acutiformis</i>	Lesser Pond-sedge
Cfla	<i>C. flacca</i>	Glaucous Sedge
Chir	<i>C. hirta</i>	Hairy Sedge
Cnig	<i>C. nigra</i>	Common Sedge
Cobt	<i>C. obtrubae</i>	False Fox-sedge
Cpan	<i>C. paniculata</i>	Greater Tussock-sedge
Cpen	<i>C. pendula</i>	Pendulous Sedge
Crip	<i>C. riparia</i>	Greater Pond-sedge
Epai	<i>Eleocharis palustris</i>	Common Spike-rush

Jacu	<i>Juncus acutiflorus</i>	Sharp-flowered Rush
Jart	<i>J. articulatus</i>	Jointed Rush
Jeff	<i>J. effusus</i>	Soft-rush
Jinf	<i>J. inflexus</i>	Hard Rush
Slac	<i>Schoenoplectus lacustris</i>	Common Club-rush
Ssyl	<i>Scirpus sylvaticus</i>	Wood Club-rush

Other monocotyledons

Apaq	<i>Alisma plantago-aquatica</i>	Water-plantain
Alan	<i>A. lanceolatum</i>	Narrow-Leaved Water-plantain
Bumb	<i>Butomus umbellatus</i>	Flowering-rush
Ecan	<i>Elodea canadensis</i>	Canadian Waterweed
Hmra	<i>Hydrocharis morsus-ranae</i>	Frogbit
Ipsc	<i>Iris pseudacorus</i>	Yellow Iris
Lgib	<i>Lemna gibba</i>	Fat Duckweed
Lmin	<i>L. minor</i>	Common Duckweed
Ltri	<i>L. trisulca</i>	Ivy-leaved Duckweed
Peri	<i>Potamogeton crispus</i>	Curled Pondweed
Pluc	<i>P. lucens</i>	Shining Pondweed
Pnat	<i>P. natans</i>	Broad-leaved Pondweed
Ppec	<i>P. pectinatus</i>	Fennel Pondweed
Pper	<i>P. perfoliatus</i>	Perfoliate Pondweed
Ssag	<i>Sagittaria sagittifolia</i>	Arrowhead
Seme	<i>Sparganium emersum</i>	Unbranched Bur-reed
Sere	<i>S. erectum</i>	Branched Bur-reed
Spol	<i>Spirodela polyrhiza</i>	Greater Duckweed
Tlat	<i>Typha latifolia</i>	Bulrush
Warr	<i>Wolffia arrhiza</i>	Rootless Duckweed
Zpal	<i>Zannichellia palustris</i>	Horned Pondweed

TREES & SHRUBS

Acam	<i>Acer campestre</i>	Field Maple
Apse	<i>A. pseudoplatanus</i>	Sycamore
Aglu	<i>Alnus glutinosa</i>	Alder
Ahip	<i>Aesculus hippocastanum</i>	Horse-chestnut
Cave	<i>Corylus avellana</i>	Hazel
Cbet	<i>Carpinus betulus</i>	Hornbeam
Csan	<i>Cornus sanguinea</i>	Dogwood
Cmon	<i>Crataegus monogyna</i>	Hawthorn
EUR	<i>Euonymus europaeus</i>	Spindle
Fexc	<i>Fraxinus excelsior</i>	Ash
Fsyl	<i>Fagus sylvatica</i>	Beech
Iaqu	<i>Ilex aquifolium</i>	Holly
Palb	<i>Populus alba</i>	White Poplar
Pcan	<i>P. canescens</i>	Grey Poplar
Pnig	<i>P. nigra</i>	Black-poplar
Ptre	<i>P. tremula</i>	Aspen
Pspi	<i>Prunus spinosa</i>	Blackthorn
Psyl	<i>Pinus sylvestris</i>	Scots Pine

Qrob	<i>Quercus robur</i>	Pedunculate Oak
Rfru	<i>Rubus fruticosus</i>	Bramble
Salb	<i>Salix alba</i>	White Willow
Scap	<i>S. caprea</i>	Goat Willow
Scin	<i>S. cinerea</i>	Grey Willow
Sfra	<i>S. fragilis</i>	Crack-willow
Snig	<i>Sambucus nigra</i>	Elder
Ugla	<i>Ulmus glabra</i>	Wych Elm
Vopu	<i>Viburnum opulus</i>	Guelder-rose

FERNS

Eflu	<i>Equisetum fluviatile</i>	Water Horsetail
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SELECTED ALIEN PLANTS

Afil	<i>Azolla filiculoides</i>	Water Fern
Chel	<i>Crassula helmsii</i>	New Zealand Pigmyweed
Fjap	<i>Fallopia japonica</i>	Japanese Knotweed
Hman	<i>Heracleum mantegazzianum</i>	Giant Hogweed
Icap	<i>Impatiens capensis</i>	Orange Balsam
Igla	<i>I. glandulifera</i>	Indian Balsam
Mgut	<i>Mimulus guttatus</i>	Monkeyflower

APPENDIX 5

SUMMARY DEFINITIONS FOR ADJACENT LAND ZONE

For full definitions of the following, refer to "Handbook for Phase 1 Habitat Survey - a technique for environmental audit", (NCC 1990).

A Woodland

Vegetation dominated by trees forming a distinct, though sometimes open, canopy.

- Broadleaved - <10% conifers
- Coniferous - <10% broadleaved
- Mixed - 10-90% either broadleaved or conifer
(note approximate proportion)
- Scrub - woody species <5m tall
- Carr - Willows or alders with a marshy understorey
- Open - scattered trees with pasture below (trees <30%)

B Grassland

Vegetation dominated by grasses

- Unimproved - generally species-rich with ancient meadow indicators.
(Unimproved acid, neutral and calcareous grassland should be differentiated.)
- Semi-improved - herb-rich grassland lacking ancient meadow indicators
- Improved - species poor, lush green
- Marshy - wet grassland often with sedges, rushes, and other wetland species

C Tall Herb/Fern

Vegetation dominated by ferns, wasteland species such as nettles and willowherb or other tall plants

- Bracken
- Other tall vegetation

D Heathlands

Vegetation often dominated by heathers, gorse, or lichens and bryophytes

- Lowland - heather-dominated areas in the lowlands, often on sandy soils
- Upland Moor - heather-dominated areas in the uplands, often on peat

E Mire

Wet habitats developing upon peat

- Bog - moss-dominated habitats on acid peat
- Fen - marsh species growing on basic peat

F Swamp

Wet habitats, with the water table generally above the ground surface

- Single species swamp - >90% of one species of reed, sedge, etc
- Mixed swamp - mixture of emergent species, no single species dominant

G Open Water

Habitats of open water, either running or still

H Rock

Largely unvegetated rock, either natural or artificial (i.e. quarries)

- Cliff - solid rock faces
- Scree - broken rock at the foot of a cliff

I Other

Includes buildings, bare ground, etc

Note that the adjacent land zone should be recorded both in terms of the semi-natural habitats and the land-use. For example a football pitch will be both "improved grassland" and "amenity grassland".

APPENDIX 6

NRA LONE WORKER STATEMENT

Lone working is a common feature of the National Rivers Authority's operations. The Authority recognises that lone workers face particular problems due to the nature of their work and will not require employees to work alone where this results in unacceptable risks. Management must therefore assess the risks its lone workers face and wherever possible should strive to remove or reduce the risks to an acceptable level.

The Authority is responsible for the health and safety at work of its employees and those affected by its operations. These responsibilities cannot be transferred to its lone workers. The Authority has a duty to organise and control the working activity of its lone workers in a safe manner.

On-site assessments by individuals forms a vital part of implementing the lone worker policy and safe working practices. It must be stressed that where lone workers find themselves in situations, which in their opinion, may be stressful or hazardous, then they are able without fear or prejudice to request assistance. The conditions that give rise for concern should, in future, be regarded as unsuitable as a lone worker task.

All NRA employees have a responsibility to act in such a way as not to put themselves or their colleagues at risk and to co-operate with their employer in the discharge of their legal obligations.

- Further details of the Lone Worker Policy are available from the NRA.

APPENDIX 7

NRA WEIL'S DISEASE CARD



NRA

National Rivers Authority

LEPTOSPIROSIS (WEIL'S DISEASE)

**Instructions to persons working
in contact with rivers or other
water sources**

**THIS CARD IS FOR
YOUR PROTECTION**

Whenever you go to your Doctor or
to a Hospital on account of illness
show this card and make sure that
those attending you know of
your occupation.

INSTRUCTIONS TO CARD HOLDERS

1. As infection may enter through breaks in the skin ensure that any cut, scratch or abrasion is thoroughly cleansed and covered with a waterproof plaster.
2. Avoid rubbing your eyes, nose and mouth during work.
3. Clean protective clothing, footwear and equipment etc. after use.
4. After work and particularly before taking food or drink wash hands thoroughly.
5. Report all accidents and/or injuries however slight.
6. Keep this card with you at all times.

MEDICAL INFORMATION

The holder of this card is engaged in work which may bring them into contact with water which may contain *Leptospira*.
None of the symptoms of early Leptospirosis or Weil's disease are pathognomonic and diagnosis is based on laboratory investigations. Should you suspect the holder may have been infected please arrange for the appropriate tests. The infection may resemble influenza in the early stages.

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ISBN 0-11-885819-X



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