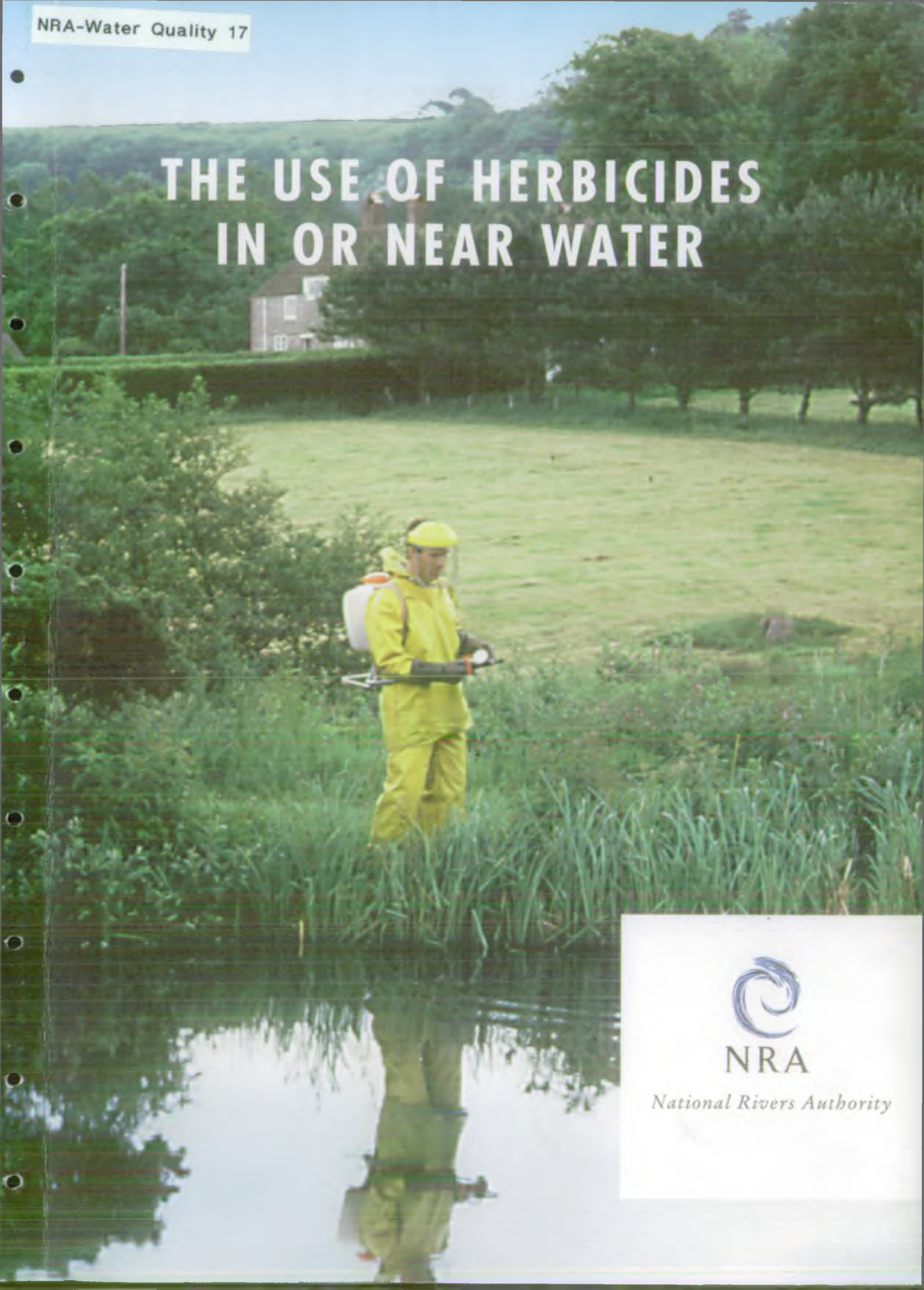
NRA-Water Quality 17

THE USE OF HERBICIDES IN OR NEAR WATER



NRA

National Rivers Authority

THE USE OF HERBICIDES IN OR NEAR WATER

This document was produced for use by the NRA and deals with procedures for proposed aquatic herbicide applications by external users, herbicide use by the NRA and herbicide use under contract to the NRA.

The publication is also available externally and may be obtained from the TAPS Centre, National Rivers Authority (Anglian Region), Kingfisher House, Goldhay Way, Orton Goldhay, Peterborough, PE2 5ZR at a charge of £5.00.

January 1995

HOW TO USE THIS GUIDE

Who will find this guide useful?

NRA staff who use, supervise, have management responsibilities for or advise on the use and storage of herbicides.

Contractors using herbicides on behalf of the NRA.

People outside the NRA who use herbicides in or near water.

What does the law say?

An outline of the legal requirements is given in Section 3.

How do I decide which herbicide to use?

Once you have considered all the weed control methods available and opted to use a herbicide, Section 4 provides detailed information about the herbicides and the plants species they control, to help you to choose the appropriate one to use. Figure 2 gives a simple step by step guide to the most appropriate herbicide.

How do I consult and obtain the NRA's agreement?

Section 5 covers the notification and consultation procedures necessary to ensure that the environment is protected and herbicides are used effectively.

As a user is there a code I should follow?

A code of practice for the user is presented in Section 6 covering hazards, protective clothing and safety, storage and transportation, training and instruction, application equipment and methods, preparation, calibration, application, after spraying, spillage and emergencies. Disposal is dealt with separately in Section 7.

How do I obtain the necessary training?

Section 8 provides more information about training requirements.

1) CONTENTS

1) INTRODUCTION

Sometimes aquatic plants growing on floodbanks, riverbanks or in watercourses need controlling to prevent flooding, for fishery management or other reasons. Plants growing where they are not wanted are termed weeds. A number of methods are available to the NRA and riparian owners to control these weeds, one is the use of herbicides. Covering all these methods is beyond the scope of this manual, but details can be found in R & D Project Note 189 "Aquatic Weed Control Operations". It is essential that the most appropriate method is used in each situation. (See Section 2.1)

If a herbicide is considered the most suitable method of control, this manual should be used to ensure that the correct procedures are followed. It aims to provide a clear and comprehensive framework to regulate herbicide use, to help operators determine the most appropriate herbicide to apply, and to provide procedures on correct use and safe disposal of herbicides.

It is a document for use by the NRA and it deals with:

a) herbicide use by the NRA;
b) herbicide use under subcontract to the NRA; and
c) proposed herbicide applications by external users.

A large number of pesticides are in general agricultural use. Only a very small proportion are presently Approved by the Ministry of Agriculture, Fisheries and Food (MAFF) for use in or near watercourses and lakes. **This document only refers to products for use in or near water.** The latter includes areas immediately adjacent to drainage channels, streams, rivers, ponds, reservoirs, canals, boreholes, dry ditches and areas designated for water storage and will, in most cases, include areas within floodbanks. Where floodbanks are far away from the watercourse each site must be assessed individually.

It is NRA policy that the Authority and its contractors ONLY use herbicides with approval for use in or near water whatever the situation. This refers to all herbicide applications, including those to car parks etc. The herbicides approved are shown in Tables 1a and 1b.

All products approved for use in or near water are listed annually in the MAFF/HSE Reference book 500 (The Blue Book)*. The list of Approved products is occasionally amended (i.e. some products have had their Approval withdrawn) so regular enquiries should be made to ensure that the list is up to date. The UK Pesticide Guide (published by CAB International and BCPC) lists all approved products and also lists separately those products approved for use in or near water.

Herbicides are one type of pesticide and are potentially poisonous, noxious and polluting, therefore, strict guidance and regulation of their use by the NRA is necessary. The NRA has a statutory duty to protect and safeguard: water abstracted for potable supply; irrigation and stock watering; the diversity of aquatic life; the amenity of the water environment and to maintain rivers and waterways to minimise flooding. This guide illustrates how the NRA can implement its statutory duties and comply with legislation governing pesticides; when using aquatic herbicides itself, and regulating their use by others.

* - The Blue Book lists all approved products whether they are still available or not. e.g dalapon is still approved for use in or near water, but is not currently being produced.

2) NRA POLICY

2) NRA POLICY ON THE USE OF HERBICIDES

i) A variety of methods is available for controlling weeds. When weed control is necessary, the control of these plants by non chemical methods (cutting/mowing/ pulling) should always be considered as the first option. If this is not suitable or practical for the particular situation, a herbicide may be used.

ii) Only herbicides that have MAFF Approval for use in or near watercourses and lakes should be used by the NRA whatever the situation.

iii) The use, storage and disposal of herbicides and their containers must be in accordance with legislation governing pesticides and this document.

iv) All NRA staff involved with the use and storage of herbicides or giving advice on herbicides must have the appropriate training.

2.1) NRA POLICY ON THE USE OF HERBICIDES IN OR NEAR WATER

i) Herbicides should not be applied where there is a risk of contaminating potable water supplies or where agricultural abstractions are used for spray irrigations without informing licensed abstractors.

ii) A written application is required both from internal and external users before a herbicide can be used in or near water. This should be submitted to a designated officer in each region and appraised according to the procedures in this document.

iii) Applications to use aquatic herbicides should be appraised by Biology, Water Quality, Water Resources, Flood Defence, Fisheries and Conservation Functions if appropriate. Designated officers should collate the responses and give approval in writing where appropriate.

iv) Applicants should be informed in writing if an application is refused and the letter should include the reasons for the refusal.

v) Once permission has been granted, the onus is on the USER to ensure that the interests of other water users are not adversely affected, and to inform:

- abstraction licence holders (where appropriate):
  those who may be affected, should be notified prior to application of a herbicide;

- relevant conservation bodies:
  if an approved herbicide is to be applied to an area of conservation interest such as a Site of Special Scientific Interest (SSSI), English Nature or the Countryside Commission for Wales must be consulted 4 months prior to the application, as stated in the Wildlife and Countryside Act 1981;

- riparian owners and occupiers:
  all riparian owners and occupiers who may be affected, should be notified. A notice should also be erected on the site two days prior to the application of the herbicide. A second notice should also be erected on adjacent (downstream) owners land.

A list of the names and addresses of relevant abstraction licence holders and conservation bodies should be supplied by the NRA if requested.

vi) Designated officers should inform NRA Pollution control of approvals.

3) THE LEGISLATIVE FRAMEWORK GOVERNING THE USE OF PESTICIDES

3) THE LEGISLATIVE FRAMEWORK GOVERNING THE USE OF PESTICIDES

Comprehensive legislation governs the use of pesticides in the UK. As a user of pesticides, the NRA has a statutory obligation to ensure that all relevant legislation is complied with.

Pesticide users are subject to the following legislation:-

3.1) Control of Pesticides Regulations 1986 (COPR)

The Control of Pesticides Regulations 1986 (COPR) were made under the Food and Environment Protection Act 1985 (FEPA). COPR came into force in October 1986, replacing the Pesticides Safety Precautions Scheme (PSPS) and the voluntary Agricultural Chemicals Approval Scheme (ACAS).

COPR requires that:

- any user of a pesticide should take all reasonable precautions to protect the health of human beings, creatures and plants, and to safeguard the environment and in particular to avoid pollution of water;

- no pesticide may be supplied, stored or used unless it has been given provisional or full approval and the conditions of approval must be strictly observed and complied with;

- all users (except home gardeners) are required to ensure that they are competent in their duties and have received adequate instruction in the safe, efficient and humane use of pesticides; certificates of competence are also required by some specified users, i.e. all users applying pesticides to either land or water which is not their property or that of their employers; and all users born after the 31 December 1964, unless they are under direct supervision (i.e. within eyesight and voice contact) of a certificate holder;

- a register of all pesticides used must kept for a minimum of three years;

- the use of adjuvants must conform to the conditions of approval;

- notification must be given to all potentially affected persons;

- English Nature and/or the Countryside Commission for Wales, must be consulted by the owner/occupier at least four months prior to herbicide applications in Sites of Special Scientific Interest (SSSI). It is also advisable to consult over applications adjoining SSSIs. Applications in or near a Nature Reserve will require permission from the reserve owners and managers which may be completely independent of EN/CCW.

- Codes of Practice are statutory and under Section 17 of FEPA, they may be issued by Ministers to give practical guidance in respect of FEPA.

3.2) Water Resources Act 1991

Under Section 85 of the Water Resources Act it is an offence to cause or knowingly permit any poisonous, noxious or polluting matter or any solid waste matter to enter any controlled waters. Given that a pesticide is potentially a "poisonous, noxious or polluting matter", this legislation applies to the use, storage and disposal of pesticides.

3.3) Control of Pollution Act 1974

Under this Act the dumping of pesticides or their containers in or near waterways, ditches, ponds and other areas of water is prohibited.

3.4) Dangerous Substances Directive (76/464/EEC)

This directive creates a framework for the elimination or reduction of pollution of inland, coastal and territorial waters by dangerous substances, including some pesticides.

3.5) The Water Industry Act 1991 and The Water Supply (Water Quality) Regulations 1989

The legislation provides a regulatory framework for securing the quality of drinking water supplies. The standards are based on the EC Drinking Water Directive 80/778/EEC which sets a maximum admissible concentration of 0.1 µg/l for individual pesticides and 0.5 µg/l for total pesticides and related substances.

3.6) Surface Water Directive (75/440/EEC)

This directive is implemented through Regulations under the Water Resources Act 1991 and protects public water supplies. It specifies values for the pesticides parathion, lindane and dieldrin.

3.7) Ground Water Directive (80/68/EEC)

This directive is implemented through Regulations under the Water Resources Act 1991 and safeguards the quality of groundwaters in relation to abstraction for water supply.

3.8) Wildlife and Countryside Act 1981

This Act specifies the protection of certain plants, animals and their habitats from accidental or purposeful destruction or disturbance. Where a watercourse passes through land classified as a Nature Reserve, such as an SSSI, the Wildlife and Countryside Act 1981 states that English Nature and/or Countryside Commission for Wales, must be notified in writing if a pesticide is to be used. Pesticides should not be applied to any nature reserve without consulting the organisation responsible for its management. The Wildlife and Countryside Act also gives protection to certain aquatic plants and animals if these occur in the locality of the proposed applications, EN/CCW should be informed.

3.9) Health and Safety at Work Act 1974

Under Section 2(2)(b) it is the responsibility of the employer to make arrangements for ensuring, so far as is reasonably possible the safety and absence of risks to health connected to use, handling, storage and transport of pesticides.

3.10) Control of Substances Hazardous to Health Regulations 1988

The (COSHH) Regulations were made under the Health and Safety at Work Act 1974 and came into force on 1 October 1989. They lay down essential requirements and a step by step approach to the control of exposure to hazardous substances including pesticides. All employers, contractors, sub-contractors, and self-employed individuals are required to:

i) make an assessment of the health risks involved with the operation to be performed e.g. the application of pesticides; and

ii) ensure that the exposure of anyone likely to be involved with hazardous substances is prevented or if this is not reasonably practical, adequately controlled.

The COSHH assessment must be comprehensive and should be made available to appropriate staff. The COSHH Safety Policy and training certificates of potential contractors should be checked. Contracts should specify the herbicides which may be used and the standards to which the contractor must operate. For both NRA staff and contractors working practices should be checked and the effectiveness of the herbicide monitored.

3.11) Fire Precautions Act 1971

The duties set out in this Act belong to the Home Office and are administered by the Fire Authorities and by the Fire Services Inspectorate. Therefore advice on these matters should be sought from the Fire Authority.

3.12) Safety Signs Regulations 1980

3.13) Road Traffic (Carriage of Dangerous Substances in Packages etc.) Regulations (1986).

4) SELECTION

4) SELECTION

4.1) INTRODUCTION

Before considering using a herbicide the objective of the aquatic plant management must be clearly defined. This should lead to an assessment of the most appropriate form of control taking the likely environmental impact into account.

In some situations, using herbicides may cause rapid dieback of mature plants, leading to very low dissolved oxygen levels, which are harmful to aquatic life. Therefore, mechanical or physical methods may be more suitable for controlling aquatic weeds in these conditions. However, sometimes mechanical removal of fully grown aquatic plants may remove the organisms which rely on the plants for shelter, or leave potentially poisonous plants on the banks which may become palatable to grazing animals. It is therefore essential that all the options are fully appraised for each individual situation and the most appropriate method of control used. If there is any doubt about the selection of the most appropriate method of weed control or any other aspects of aquatic weed control, the Aquatic Weeds Research Unit at Sonning should be contacted under the NRA's contractual agreement with them, which allows for the provision of technical advice on this subject. The address and telephone number can be found in Section 11.1.

This guide assumes that all methods have been considered and a herbicide is deemed the most appropriate.

Figures and Tables are provided which should assist in the selection of the most suitable herbicide. Appendix 4.4.1 provides details of each herbicide including timing of application and restrictions for abstractions and livestock watering. All these factors should be considered prior to application because failure to follow the instructions on the product label may result in a prosecution under the Control of Pesticides Regulations 1986 (COPR).

4.2) HERBICIDES FOR USE IN OR NEAR WATER

4.2.1) Restrictions

Only Products approved under the Control of Pesticide Regulations 1986 (COPR) for use in or near water can be used. These are listed in Tables 1a and 1b. Further detailed information on these products can be found in Appendices 4.4.1. and 4.4.2.

Herbicides should not be used where there is a risk of contamination of potable water supplies and groundwater. Each application must be assessed on its merits. It is essential to obtain the advice of the appropriate NRA Officer (see Section 5 Notification Procedure).

To comply with Sections 2(2),16 and 17 of the Water Resources Act 1991 (conservation of flora, fauna etc), prior notification of the intention to use a herbicide should be given to EN/CCW, if the application is to be in or near a Site of Special Scientific Interest.

No herbicides can be used to control planktonic algae. These must not be confused with filamentous algae (cott/blanket weed) which can be controlled with terbutryn or diquat.

4.2.2) Selection

Before selecting a herbicide it is essential to correctly identify the target weed species. Where applicants are in doubt, refer to BASIS trained NRA staff or other suitably qualified individuals.

Figure 1 gives a cross section of a watercourse showing different types of vegetation and indicating the main areas of use of aquatic herbicides. NB. fosamine ammonium, maleic hydrazide and asulam are only approved for use NEAR water e.g. on banks and land adjacent to water and therefore must NOT be applied directly to water.

Each herbicide is effective in different situations and on distinct plants, therefore it is very important that the appropriate herbicide is selected. The flow diagram (Figure 2) should assist in this process. If the final box contains more than one herbicide, the user should refer to the additional information in Appendix 4.4.1, which gives restrictions, irrigation intervals, timing of application and susceptibility of plants. The susceptibility of some of the more common plants is given in Table 2.

Products containing the same active ingredient are not always identical and ONLY products specifically approved for aquatic use can be applied. e.g. Clarosan granules contain terbutryn, and are approved for use in or near water. Terbutryn is also the herbicide in Prebane, a product used by farmers to control terrestrial weeds. Prebane, however, does NOT have approval for use in or near water.

Several plants have been the subject of an R&D Project "Control of Invasive Riparian and Aquatic Weeds". Details of the optimum control methods for *Reynoutria japonica* (Japanese Knotweed), *Impatiens glandulifera* (Himalayan Balsam) and *Heracleum mantegazzianum* (Giant Hogweed) are now available in an NRA leaflet "Guidance for the Control of Invasive Plants Near Watercourses".

It is recommended that users refer to Appendix 4.4.1 and Appendix 4.4.2, to check that the herbicide chosen is appropriate. However, this summary may not be fully comprehensive and the regulations demand that the instructions on the product label are read and adhered to.

4.2.3) General Precautions

The risk of fish deaths, due to deoxygenation of the water by either the inhibition of photosynthesis by some herbicides and/or from the decay of killed vegetation, should be minimised by ensuring that the appropriate herbicide is applied early in the year for submerged weeds when weed growth is active but bulk is small.

Sealing off stretches of slowly moving watercourses can improve the efficacy of diquat, dichlobenil or terbutryn, although dichlobenil can also be used in slow moving water for partial treatment. The alginate formulation of diquat is suitable for use in flowing water.

Particular care should be given to the removal of potentially poisonous plants which may become palatable to livestock during decay and remain toxic after death. These plants are listed in Appendix 4.4.3.

Applications of foliar acting herbicides to emergent and bankside vegetation should not be made if wet weather is forecast, as this may reduce the effectiveness of the herbicide.

4.2.4) Partial Weed Control

Total weed removal is rarely desirable, except in the case of some land drainage channels. Normally areas of weed should be left to maintain food chains and to provide shelter for fish fry and invertebrates. A guideline of 40% remaining is suggested. However, if weed bulk is large there may be a risk of deoxygenation from weed decay in warm weather and treatment of only 20%, or even 10%, at a time may be advisable. Treatments should be staggered with at least 7 to 10 days interval. See manufacturers recommendations for details specific to each product.

It is usually possible to achieve operational requirements without treating whole waterbodies. e.g. only treating the area around a flow gauging weir, not the whole river upstream and downstream, providing clear areas for fishing, but leaving large areas of weed to provide fish cover; and only clearing areas around landing stages for boats.

Targeting partial treatment allows the optimal use of herbicides to remove the less desirable plant species and encourages the plants which provide better shelter for aquatic organisms, thereby improving the general diversity of habitat.

Partial treatment of emergent or surface-floating plants is easily achieved with herbicides which are applied directly to leaves (2,4-D amine, glyphosate, dalapon, diquat) as only the areas chosen for weed suppression are sprayed. Partial control of free floating weeds such as duckweed are not of value as the weeds can spread back into the treated area.

Localised control of submerged plants is more difficult as not all products are suitable. Dichlobenil is absorbed from the mud by plant roots so it can be used for partial treatment of submerged rooted plants such as *Potamogeton* (Pondweed), *Myriophyllum* (Milfoil) or *Ranunculus* (Water-crowfoot). A minimum area of 20m x 20m is suggested by the manufacturer. Dichlobenil is not effective for partial control of detached, free-floating weeds such as *Ceratophyllum* (Hornwort) and gives only poor control of weakly rooted plants. e.g *Elodea*.

The alginate formulation of diquat (Midstream), is also suitable for partial treatment of submerged weeds and can also be used on non-rooted plants. The alginate sticks to the plants and restricts movement of the active ingredient, diquat, into the surrounding water. Hence accurate, localised, treatment can be achieved, particularly in still waters.

4.3) USE OF HERBICIDES ON LAND

Only a few herbicides are available for use in or near water, to control bankside, emergent, submerged or floating vegetation (Tables 1a and 1b). Most of these were developed as herbicides for use on land, but have subsequently been found to be effective for aquatic weed control and have low toxicity to aquatic organisms. Therefore, when a herbicide is needed in a terrestrial environment, the NRA policy is to select herbicides which are approved for use in or near water, so ensuring maximum protection for the environment.

This policy also applies to the NRA's contractors. Table 3 gives the suggested terrestrial uses for these herbicides.

TABLE 1a

LIST OF APPROVED PRODUCTS FOR USE AS HERBICIDES ON WEEDS IN WATER

CHEMICAL	INTERVAL BEFORE IRRIGATION	APPROVED PRODUCT	MAFF NO	FOR CONTROL OF
2,4-D AMINE	3 weeks	DORMONE ATLAS 2, 4-D	05412 03052	Floating and emergent water weeds and many broad-leaved weeds on banks of waterways or ditches
DICHLOBENIL	2 weeks	CASORON G CASORON GSR	00448 00451	Rooted floating-leaved and submerged weeds
DIQUAT LIQUID	10 days	REGLONE (Zeneca) REGLONE (ICI)	06703 04444	Floating and submerged weeds including algae
DIQUAT ALGINATE	10 days	MIDSTREAM	01348	Submerged weeds in still or moving water
GLYPHOSATE	Nil	GALLUP AMENITY GLYPHOGAN HELOSATE ROUNDUP ROUNDUP ROUNDUP PRO ROUNDUP BIACTIVE ROUNDUP PRO BIACTIVE SPASOR STETSON	06753 05784 06499 01828 03947 04146 06941 06954 03436 05136	Emergent and floating weeds including reeds and water lilies. All weeds on banks.
TERBUTRYN	7 days	CLAROSAN 1 FG ALGAE-KIT) Amateur BLANC-KIT) Products	03859 04545 04546	Floating and submerged weeds including algae.

TABLE 1b

LIST OF APPROVED PRODUCTS FOR USE AS HERBICIDES ON WEEDS NEAR WATER BUT NOT IN WATER

CHEMICAL	INTERVAL BEFORE IRRIGATION	APPROVED PRODUCT	MAFF NO	FOR CONTROL OF
ASULAM	nil	ASULOX	05235	Bracken and docks on banks beside water
DALAPON + DICHLOBENIL	5 weeks	FYDULAN G	00958	Control of all weeds on banks
FOSAMINE AMMONIUM	nil	KRENITE	01165	Deciduous trees and shrubs on banks
MALEIC HYDRAZIDE	3 weeks	REGULOX K ROYAL MH 180	05405 06233	Weeds and grasses on river banks

FIGURE 1. DIAGRAM OF CROSS SECTION OF WATER COURSE SHOWING TYPES OF VEGETATION AND INDICATING THE MAIN AREAS OF USE OF AQUATIC HERBICIDES.

Submerged weeds - water or soil acting herbicides	Emergent weeds - Foliar acting herbicides
Terbutryn - submerged and floating weeds and algae	2,4 - D - broad leaved weeds on banks and emergent weeds in water
Diquat - submerged and floating weeds, most algae	Dalapon - marginal weeds and bulrushes.
Dichlobenil - rooted submerged weeds	Glyphosate - water lilies, reeds and emergent weeds
	Fosamine ammonium - trees, shrubs adjacent to water
	Maleic hydrazide - suppression of grass
	Asulam - bracken and broad-leaved weeds adjacent to water

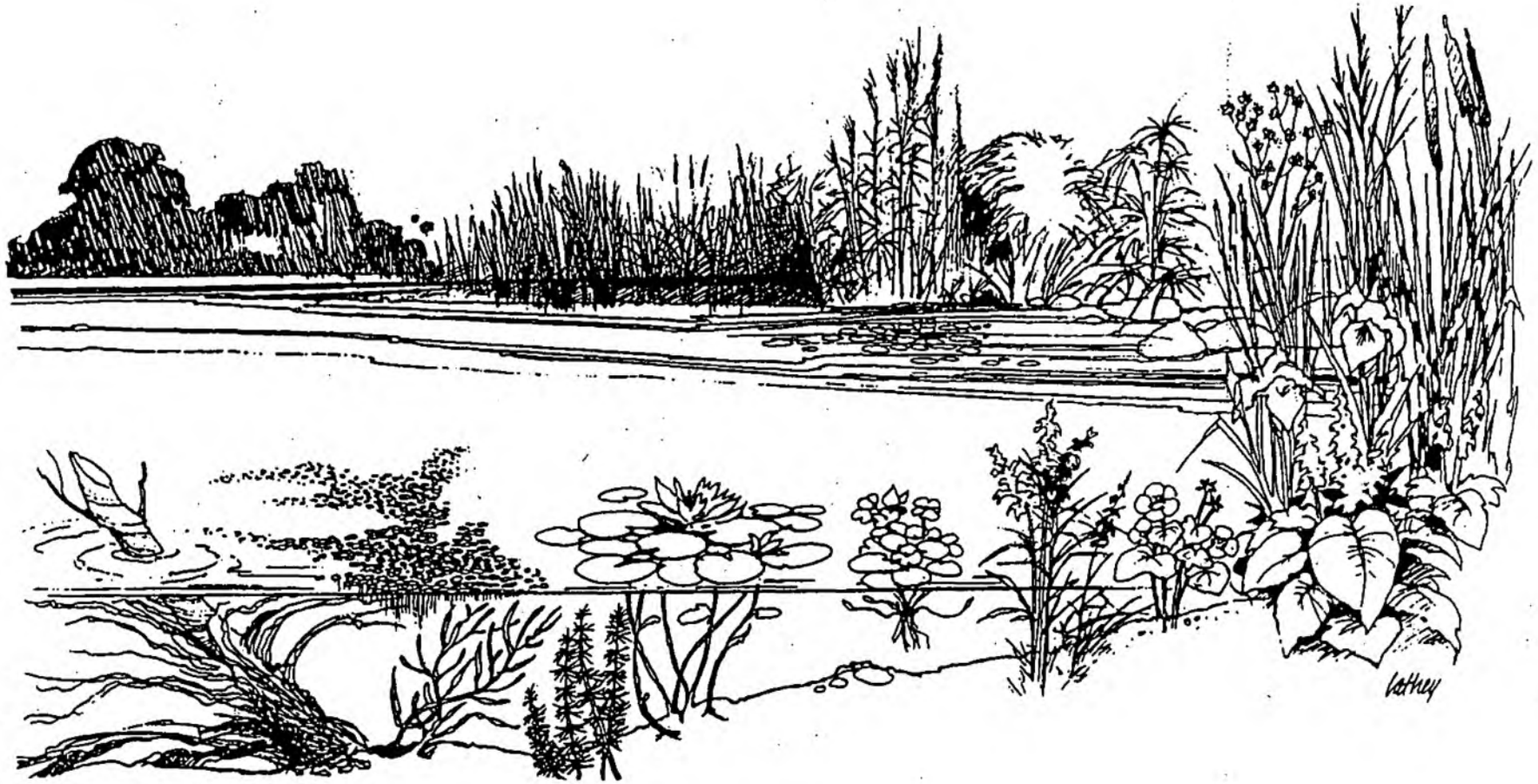


FIGURE 2. DIAGRAMMATIC GUIDE TO CHOICE OF AQUATIC HERBICIDES

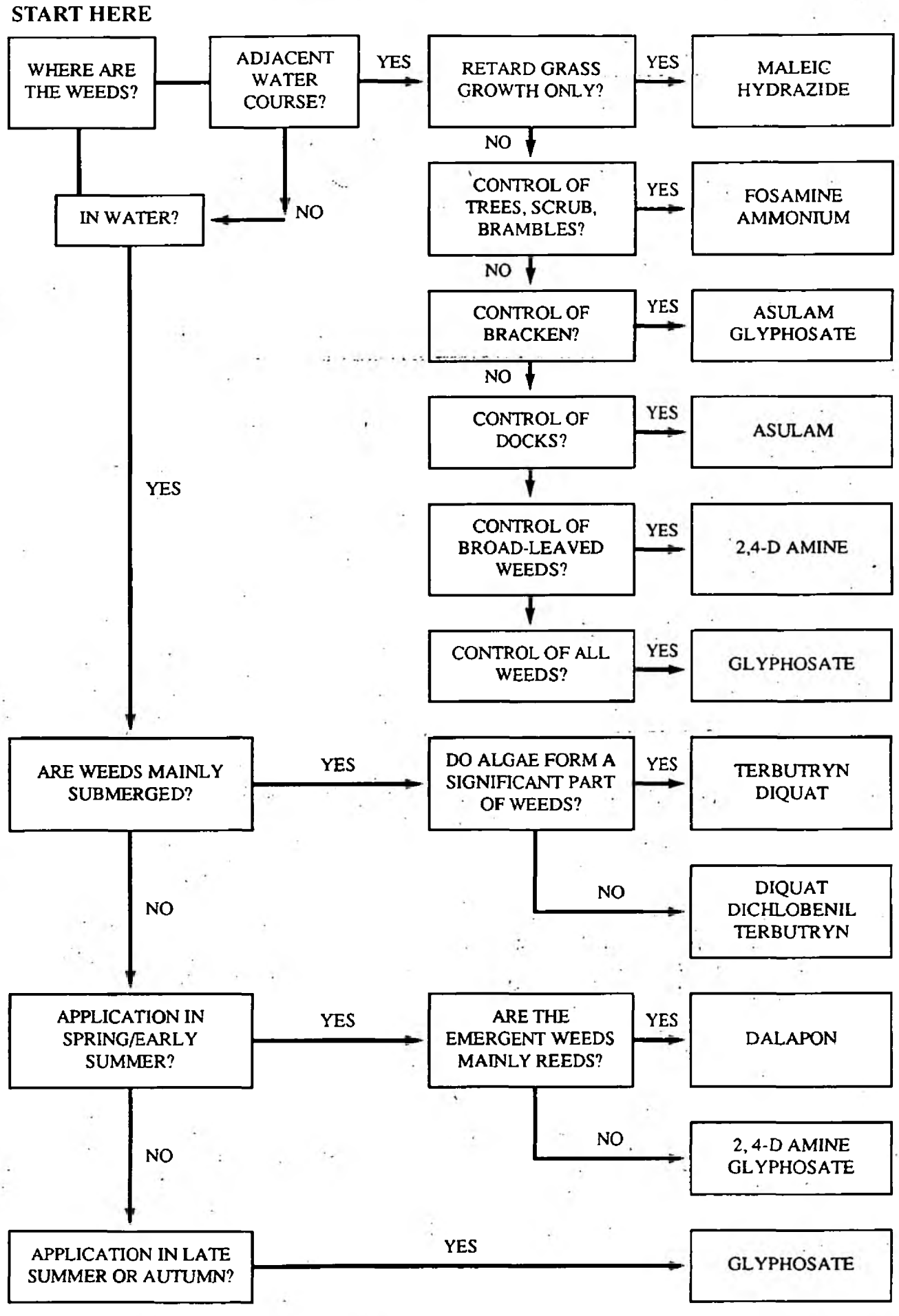


TABLE 2

SUSCEPTIBILITY TO HERBICIDES OF SOME COMMONLY OCCURRING AQUATIC WEEDS

		Dalapon	2, 4-D Amine	Diquat	Dichlobenil	Glyphosate	Terbutryn	Asulam
EMERGENT MONOCOTYLEDONS (Reeds/Grasses)								
Butomus umbellatus	(Flowering rush)	-	-	R	R	-	R	-
Carex spp	(Sedges)	-	R	R	R	S	R	-
Glyceria fluitans	(Floating Sweet-grass)	-	R	R	S	-	R	-
Glyceria maxima	(Reed Sweet-grass)	-	R	R	-	S	R	-
Juncus spp	(Rushes)	-	-	R	R	S	R	-
Phalaris arundinacea	(Reed Canary Grass)	-	R	R	R	S	R	-
Phragmites communis	(Common Reed)	-	R	R	R	S	R	-
Schoenoplectus lacustris	(Common Clubrush)	-	R	R	R	-	R	-
Sparganium erectum	(Branched bur-reed)	-	MS	R	MR	-	R	-
Typha latifolia	(Reedmace)	-	-	R	R	S	R	-
EMERGENT DICOTYLEDONS								
Alisma plantago aquatica	(Water-plantain)	-	S	R	MS	-	R	-
Equisetum fluviatile	(Water-horsetail)	-	MR	R	S	-	R	-
Equisetum palustre	(Marsh horsetail	-	-	R	S	-	R	-
Hippuris vulgaris	(Marestail)	-	-	R	S	-	MR	-
Nasturtium officinale	(Watercress)	-	S	R	MS	S	-	-
Rumex hydrolapathum	(Water Dock)	-	-	R	S	-	R	-
Sagittaria safittifolia	(Arrowhead)	-	MR	R	S	-	R	-
FLOATING SPP								
Callitriche stagnalis	(Common Water starwort)	-	-	S	S	-	S	-
Lemna minor	(Common Duckweed)	-	-	S	R	-	S	-
Nuphar lutea	(Yellow Water-lily)	-	MR	R	MR	S	MR	-
Nymphaea alba	(White Water-lily)	-	MS	R	MR	S	MR	-
Potamogeton natans	(Broad-leaved pondweed)	-	-	MS	MS	-	MR	-

		Dalapon	2, 4-D Amine	Diquat	Dichlobenil	Glyphosate	Terbutryn	Asulam
Polygonum amphibium	(Amphibious Bistort)	-	MR	R	MR	-	R	-
Ranunculus spp	(Water-crowfoots)	-	-	S	S	-	S	-
SUBMERGED VASCULAR								
Ceratophyllum demersum	(Rigid Hornwort)	-	-	S	S	-	S	-
Elodea canadensis	(Canadian Pondweed)	-	-	S	MS	-	S	-
Hottonia palustris	(Water-violet)	-	-	-	S	-	S	-
Lemna trisulca	(Ivy-leaved Duckweed)	-	-	S	S	-	S	-
Myriophyllum spp	(Water-milfoils)	-	-	-	S	-	S	-
Potamogeton crispus	(Curled Pondweed)	-	-	S	S	-	S	-
Potamogeton pectinatus	(Fennel-leaved Pondweed)	-	-	S	S	-	S	-
Zanichellia palustris	(Horned Pondweed)	-	-	S	MS	-	-	-
ALGAE								
Cladophora	(Cott)	-	-	MS	R	-	S	-
Enteromorpha intestinalis	(Bladderweed)	-	-	MS	-	-	S	-
Rhizoclonium spp)	)	-	-	-	R	-	S	-
Spirogyra spp)	) (Cott)	-	-	MS	R	-	-	-
Vaucheria spp)	)	-	-	-	R	-	S	-

S Susceptible :- Complete or almost kill. Little or no regrowth during season of application.
MS Moderately susceptible:- Partial kill or effectively suppressed during season of application
MR Moderately resistant:- Temporary suppression - regrowth during year of treatment.
R Resistant:- no effect.
- No information on product labels

TABLE 3

USES OF TERRESTRIAL HERBICIDES AND SUGGESTED PRODUCTS

USE	SUGGESTED HERBICIDES
1. Control or prevention of weeds in, on or near paths and drives.	Glyphosate[a] Diquat[b] Dichlobenil[c]
2. Retarding growth of grass.	Maleic hydrazide[d]
3. Bracken control.	Asulam[e],Glyphosate[a]
4. Control of trees, scrub, brambles.	Fosamine ammonium[f]
5. Control of broad-leaved weeds in amenity/landscape areas.	Glyphosate[a] (spot treatment) 2,4-D (amine)[g] Asulam[e]
6. Control of broad-leaved weeds in grass.	2,4-D (amine)[g] Asulam[e] (for docks)

Recommended products

a) Barclay Gallup Amenity, Glyphogan, Helosate, Roundup, Roundup Pro, Roundup Biactive, Roundup Pro Biactive, Spasor, Stetson
b) Reglone
c) Casoron G
d) Royal MH 180, Regulox K
e) Asulox
f) Krenite
g) Dormone, Atlas 2,4-D

APPENDIX 4.4.1 HERBICIDE DATA SUMMARY

The information presented in this Appendix is general information on the herbicides available for aquatic weed control. It is also appropriate when the herbicides are used in a terrestrial environment.

The information has been collated from data supplied by manufacturers and other sources. Whilst every attempt has been made to ensure the accuracy of the information, it should only be treated as a guide, and the details **must** be checked by reading the product label.

The numbers in the sections headed "suitable for" or "unsuitable for" refer to the plants listed in Appendix 4.4.2.

Moderately susceptible or moderately resistant plants are listed in brackets.

The dose rates are not included in the appendix because the information provided refers to the active ingredient and not the individual Products. The Products may have different application rates, therefore it is essential to check the appropriate dose rate from the product label.

Data on "Permitted" and "Safe" concentrations for environmental safeguards and irrigation apply to water analysis.

Data on toxicity refers to the toxicity of the active ingredient and NOT the formulation as these may be different.

1) ASULAM (LIQUID)

Type	Translocated herbicide
Suitable for	Bracken, docks
Apply	i) Bracken - treat in full frond, usually between early July and late August. ii) Docks - treat when plants are actively growing, usually between April and September
Permitted Concentration	1 mg/l
Safety interval before irrigation	None specified
Restrictions	Do not apply in drought or hot dry conditions. Do not apply less than 3 weeks after cutting. Keep livestock out of treated areas for at least two weeks after spraying bracken, and at least 4 - 6 weeks after docks, or until foliage has died and become unpalatable. Only one application per year permitted.
Special instructions to operators	Wear suitable protective gloves, rubber wellingtons, coveralls and face/eye protection when handling equipment. Use suitable respiratory equipment during application.
Comments	Can give control for up to 3 years. The growth of some grasses may be affected. Short persistence in soil, half life 6-14 days.
Toxicity Data	LC50 (96hrs) for rainbow trout, goldfish >5000 mg/l Acute oral LD50 mallard ducks >4000 mg/l
Trade name/ manufacturer/MAFF number	Asulox - RP env - MAFF No 05235

2) 2,4,D AMINE (LIQUID)

Type	Translocated foliar/root herbicide. Distorts new growth.
Suitable for	Broad leaved weeds on banks and some emergent weeds. Susceptible plants include: 1, (8), (9), 15, (16), 17, 18, (21), (25), (28), (37), (38), (39), (40), (41b), (57), (58). Plant such as 9, 16, 21, 25, 37, 38, 40, 57, and 58 may regrow and require another dose. 15 may be controlled if cut 4 weeks before or 4 weeks after spraying.
Unsuitable for	Grasses, reeds, rushes, sedges and therefore sometimes mixed with other herbicides for greater control.
Apply	Direct to foliage in early summer (May - September), but most effective when used early on fast-growing weeds. Only one application of Dormone may be used in or near water per year.
Permitted Concentration	5 mg/l active ingredient
Safety interval before irrigation	3 weeks or until less than 0.05 mg/l active ingredient present.
Restrictions	At 0.001 mg/l can taint and colour water after chlorination. (Not to be used where any risk to potable supply). Do not spray during rain or when rain is imminent. Do not cut grass for 10 days. Keep livestock out of treated areas for at least 2 weeks until potentially poisonous plants present have died (See Appendix 4.4.3).
Special instructions to operators	Harmful to skin or if swallowed. Irritating to eyes. Wash concentrate from skin or eyes immediately. Wear suitable protective gloves, rubber wellingtons and face/eye protection when handling concentrate.
Comments	Residual activity in the soil approximately 6 weeks.
Toxicity Data	LC50 (96hrs) rainbow trout 100 mg/l Acute oral LD50 wild ducks >1000 mg/kg
Trade name/ manufacturer/MAFF number	Dormone - RP Environ - MAFF No 05412 Atlas 2,4-D - Atlas Agrochemicals Ltd - No 03052

3) DALAPON AND DICHLOBENIL (GRANULES)

Type	Broad spectrum herbicide acting through the roots.
Suitable for	Annual weeds, seedling perennials, most perennial grasses, rushes, sedges and bracken on banks.
Unsuitable for	Bindweed, Hogweeds, Silverweed, Buttercup.
Apply	Late winter to early spring to moist soil.
Permitted Concentration	None specified
Safety interval before irrigation	Nil.
Restrictions	
Special instructions to operators	Irritating to eyes, skin and respiratory system. Wash any contamination from skin or eyes immediately. Do not breathe in dust.
Comments	
Toxicity Data	LC50 (48hrs) rainbow trout 8 mg/l
Trade name/ manufacturer/MAFF number	Fydulan - Zeneca - MAFF No 00958

4) DICHLOBENIL (Granules)

Type	Persistent, soil-acting herbicide, affecting growing points of roots and shoots. Powerful inhibitor of germination and of actively dividing meristems.
Suitable for	Rooted submerged or rooted emergent broad-leaved weeds including: (1), (3), 4, 9, 11, 12, 13, (18), (21), 23, 24, 25, (28), 29, (31a), 33, 34, (37), (38), (41), 42, 43, 44, (47), 49, 50, 51, 52, 54, 55, 56, (57), (58), 61, (62), 63, 68, 69, 74, 76,
Unsuitable for	Flowering Rush, Marsh Marigold. Narrow-leaved weeds and free-floating, rootless weeds or algae (except *Chara sp.* Stonewort): 6, 14, 15, 19, 20, 31, 36, 70.
Apply	In still water use as soon as weed growth commences (late March, early May) because most effective and also minimises effects of decaying weeds later. In slowly moving water up to 90m/hour apply in May having attempted to stop flow for at least 7 days. Apply by hand, air-assisted motorised knapsack or other mechanical applicator direct to water surface or mud. Even distribution of granules is important.
Permitted Concentration	Not to exceed 3 mg/l active ingredient. Normally apply at 1 mg/l active ingredient.
Safety interval before irrigation	2 weeks or until concentration in water is less than 0.3 mg/l active ingredient
Restrictions	Threshold odour concentration 0.02 mg/l active ingredient, but unaffected by chlorination. Has a small safety margin with respect to its acute toxicity to fish and is accumulated in fish tissues. If fish are known to be present only partial treatment i.e. localised treatment is recommended. A single application will provide control of susceptible weeds for an entire season.
Special instructions to operators	Normal hygiene precautions when handling concentrate and during application. Avoid contact with skin and eyes.
Comments	Water treated with dichlobenil may be invaded by algae to give an equally dense vegetation as before treatment. Needs extra care to avoid problems of deoxygenation and fish mortalities. Can be used for localised control, particularly for weeds having extensive root systems in mud e.g. *Myriophyllum* (Water-milfoil), *Hippuris* (Mares-tail), *Potamogeton* (Pondweed).
Toxicity Data	LC50 (48hrs) guppies >18 mg/l

DICHLOBENIL (Granules) continued

Trade name/ manufacturer/ MAFF number	Casoron G - ICI Professional Products - No 00448 Casoron G-SR - ICI Professional Products - No 00451

APPLICATION RATE (CASORON AND CASORON G-SR)

Water Depth (ft)	Water Depth (m)	Casoron G		Casoron G-SR	
		kg/ha	lb/acre	kg/ha	lb/acre
3	1	45	40	-	-
6	2	84	75	28*	25*
9	3	123	110	40	37
9+	3+	150	135	50	45

* NOTE - It is impractical to apply this rate to waterbodies less than 1.5 m (5 feet) in width or 6 m (2 feet) in depth. In shallow and narrow waterways use Casoron G.

5a) DIQUAT (LIQUID)

Type	Contact herbicide, also translocated through leaves. Rapid defoliant.
Suitable for	Wide range of aquatic plants but especially submerged and floating weeds, including the blanketweed *Cladophora*. 23, 35, 36, (41), 43, 45, 45b, 47, 53, 54, 55b, 59, 61, (62), (63), 64, 65, 66, (67), 68, (73), 76.
Unsuitable for	Most algae except *Cladophora*, emergent vegetation.
Apply	May - September but early treatment advisable to avoid severe deoxygenation. Short persistence of herbicide may result in subsequent regrowth, especially of normally later-maturing weeds. Where repeated applications are necessary, treat only part of the area followed by the remainder 2-3 weeks later. Plants in water flowing up to 90m/hr can be treated but flow should be halted, if possible, for one day to improve contact. Diquat is rapidly inactivated in muddy water. Application may be direct to foliage, direct to water, or sub-surface injection as appropriate. Not effective in hard or turbid waters or where the plants are covered by epiphytic algae or silt on stem and leaves.
Permitted Concentration	2 mg/l active ingredient
Safety interval before irrigation	Ten days or until concentration in water falls below 0.02 mg/l.
Restrictions	Livestock should be kept out of the treated area for 24 hours. Treated water should not be used for human consumption for 24 hours.
Special instructions to operators	Wash any contamination from skin or eyes immediately. Take extreme care to avoid spray mist. Wear protective gloves and face shield when handling concentrate. Harmful if swallowed. Irritating to eyes and skin. If clothing becomes contaminated remove immediately and wash underlying skin.
Comments	When duckweed (*Lemna*) is present, penetration is poor and respraying may be necessary. Booms may be used to prevent reinvasion until the total area has been treated. Regrowth of certain filamentous algae is possible. Rapidly and completely inactivated on contact with soil.
Toxicity Data	LC50 (96hrs) rainbow trout 21 mg/l LC50 (96hrs) mirror carp 67 mg/l
Product name/ manufacturer/ MAFF number	Reglone - ICI Professional Products - No 04444 Reglone - Zeneca - No 06703

5b) DIQUAT ALGINATE

The alginate formulation of diquat is similar in many ways but possesses certain advantages compared with the liquid formulation.

Advantages:

i) can be used in flowing water to clear the whole of, or part of the channel width
ii) can be used for accurate localised control in still waters
iii) controls certain plants more effectively (especially filamentous algae) due to the adhesion of the herbicide to the plant
iv) alginate formulation does not drift
v) no dilution necessary

Disadvantages:

i) needs to be applied using a specially modified knapsack sprayer (Modified Solo Jetpack 425 Sprayers - Claxton Engineering, Skillington, Grantham, Lincs).

Type	Contact herbicide, also translocated through leaves. Rapid defoliant.
Suitable for	(41), 42, 43, 45b, 47, (48), 55b, 61, (62), (63), 68, (71), (73), 76.
Unsuitable for	All emergent plants and 11, 37, 38, 40.
Apply	Spring to early summer when weeds are actively growing but before plants become covered with protective layer of epiphytic algae. Avoid stirring up mud from lake or river bed during or after application. Inactivated by mud, suspended solids and organic matter e.g d/s of STW. A full season's control of susceptible plants may be expected from one correctly timed application.
Permitted Concentration	2 mg/l active ingredient
Safety interval before irrigation	Ten days or until concentration in water falls below 0.02 mg/l.
Restrictions	Livestock should be kept out of the treated area for 24 hours. Treated water should not be used for human consumption for 24 hours.
Special instructions to operators	Wash any contamination from skin or eyes immediately. Take extreme care to avoid spray mist. Wear protective gloves and face shield when handling concentrate. Harmful if swallowed. Irritating to eyes and skin. Remove contaminated clothing immediately and wash skin.
Comments	Product should not be diluted and spraying equipment will require special cleaning. When duckweed (*Lemna*) is present, penetration is poor and respraying may be necessary. Booms may be used to prevent reinvasion until the total area has been treated. Regrowth of certain filamentous algae is possible. Rapidly and completely inactivated on contact with soil.

DIQUAT ALGINATE continued

Toxicity Data	LC50 (96hrs) rainbow trout 21 mg/l LC50 (96hrs) mirror carp 67 mg/l
Product name/ manufacturer/M AFF number	Midstream - ICI Professional Products No 01348

6) FOSAMINE AMMONIUM (Liquid)

Type	Contact growth retardant/herbicide, with slight translocation, which inhibits cell division in buds.
Suitable for	Control of most deciduous trees and shrubs including brambles. Cleared for use on plants adjacent to water but should not be sprayed onto water.
Unsuitable for	Evergreen trees, heather, broom, willows (suppressed), rhododendron, gorse, heath, heather, honeysuckle, dogwood (suppressed), maple (suppressed), rowan (suppressed), sycamore (suppressed), broad leaved and grassy terrestrial weeds.
Apply	To foliage between August and October, but before the onset of natural autumn discolouration of leaves. An approved non-ionic wetting agent should be added to improve leaf wetting.
Permitted Concentration	None specified.
Safety interval before irrigation	None specified.
Restrictions	Do not spray in windy weather or when foliage is wet. Rainfall within 24 hours of application may reduce performance.
Special instructions to operators	Do not apply excessively high volumes of water which are liable to run off and waste chemical. Do not leave chemical in machine overnight. Wash concentrate from skin or eyes immediately. Normal hygiene precautions when handling or using herbicide.
Comments	No immediate effect is visible after application but following normal leaf drop, spring bud and shoot development is severely or completely limited. Can be used for chemical pruning ie. to kill only certain branches without destroying whole bush or tree. Fosamine ammonium is of low toxicity and is rapidly decomposed in the soil. Half life in soil approximately 10 days. Store away from frost.
Toxicity Data	LC50 (96hr) rainbow trout >415 mg/l (formulated product). Acute oral LD50 mallard duck >4150 mg/kg (form prod).
Trade name/ manufacturer/MAFF number	Krenite - DuPont - No 01165

7) GLYPHOSATE (Liquid)

Type	Foliar acting herbicide which is translocated from treated vegetative growth to underground roots, rhizomes and stolons.
Suitable for	Control of emergent and floating species including reeds, rushes, sedges, waterlilies, grass weeds on banks including creeping bent and whort grass: 5, 6, 10, 15, 18, 19, 20, 26, 37, 38.
Unsuitable for	Algae, submerged weeds.
Apply	To foliage from mid July to mid August for floating plants and from mid August to mid September for reeds. Optimum timing for watercress is June, treat when plants are actively growing and fully developed, preferably just before beginning to die back naturally. Only one application per season. Can be applied early summer but control may be reduced compared to late summer treatments.
Permitted Concentration	Up to 0.2 mg/l active ingredient in the water
Safety interval before irrigation	Nil
Restrictions	Do not spray in windy conditions or use high pressure. Drift on to crops can severely damage them. No taint detectable up to 10 mg/l a.i. A rain free period of at least 6 hours (preferably 24 hours) must follow spraying. Must not be used on raw water to be used for domestic purposes of drinking, washing and cooking.
Special instructions to operators	Wash any contamination from skin or eyes immediately. Take extreme care to avoid spray mist . Wear protective rubber boots, gloves and face shield when handling concentrate, wash all protective clothing thoroughly after use especially inside of gloves. Do not mix, store or apply in galvanised or unlined mild steel containers or spray tanks since an inflammable gas (hydrogen) may be produced. Store away from frost. May be used with CDA equipment with appropriate protective clothing. In confined areas wear breathing apparatus.
Comments	Can be used successfully for partial clearance ie spraying only those patches needing to be cleared. Glyphosate is rapidly inactivated in soil and degraded by aquatic microorganisms. (Note a spray volume of 100 l/ha gives the same control as 500 l/ha). Half-life in soil is normally less than 60 days.
Toxicity Data	LC50 (96 hrs) trout 86 mg/l 8 day dietary LC50 ducks >4640 mg/kg diet.

GLYPHOSATE continued

Trade name/ manufacturer/ MAFF number	Roundup - Monsanto Ltd - No 01828 Roundup - Schering - No 03947 Roundup Pro - Nomix Chipman - No 04146 Roundup Pro - Hortichem - No 04146 Roundup Biactive - Monsanto - No 06941 Roundup Pro Biactive - Monsanto - No 06954 Spasor - RP Environ - No 03436 Stetson - Monsanto - No 05136 Gallup Amenity - Barclay - No 06753 Glyphogan - Makhteshim Agan (UK) - No 05784 Helosate - Helm Ag - No 06499

8) MALEIC HYDRAZIDE (liquid)

Type	Translocated growth regulator which inhibits cell division and retards growth of grasses. Inhibits certain broad-leaved weeds growth.
Suitable for	Control of grass on watercourse banks after cutting to maintain a short grass sward, sometimes combined with 2,4-D amine to control broad-leaved weeds. Can also be used to kill grass (see below)
Unsuitable for	
Apply	Spraying should be carried out in calm weather when the vegetation is dry. A period of 8 hours dry weather is required for effective results. Use when active growth starts (March - May) to retard growth for 12 - 14 weeks. If applied in autumn it will give control for 5 -7 weeks in the following spring. Employing this technique, an application rate of Regulox K at 16 l/ha in 900-1100 litres of water must not be exceeded. Do not allow spray to enter water. A minimum of 8 weeks must be observed between repeated applications to areas near water.
Permitted Concentration	2 mg/l active ingredient
Safety interval before irrigation	3 weeks or less than 0.02 mg/l active ingredient residue.
Restrictions	Can affect a range of crops; care is needed to avoid spray drift and contamination of irrigation water. If used too frequently or in too high a concentration, maleic hydrazide can turn grass yellow and may encourage a tough wiry growth that is difficult to cut. Do not treat fine turf or grass seeded less than 8 months previously. Only apply to grass not to be used for grazing.
Special instructions to operators	Wash any contamination from skin or eyes immediately. Normal hygiene precautions when handling or using herbicide. Wear rubber wellingtons, gloves and clothing which covers as much of the body as possible.
Comments	Half life in soil approximately 2 - 8 weeks. Rapid photochemical degradation in water.
Toxicity Data	LC50 (96 hrs) rainbow trout 1435 mg/l
Trade name/ manufacturer/ MAFF number	Regulox K - RP Environ - No 05405 Antergon MH 180 - Uniroyal Chemicals Ltd - No 06502

9) TERBUTRYN (Granules)

Type	Translocated herbicide absorbed by foliage and roots. Photosynthesis inhibitor. Not persistent but slow release formulation controls regrowth.
Suitable for	Wide range of submerged and floating weeds and algae: 4, (11), 12, 23, 35, 36, (38), (41), (41a), 42, 43, 45, 45b, 47, 48, 52, 53, 54, 55, 55b, 61, 63, 67, 68, 72, 73, (75), (77), 78.
Unsuitable for	Reeds, rushes, emergent weeds, water lilies (moderately suppressed or damaged) or certain other plants with floating leaves. 40 is resistant.
Apply	Early in the year (April - May) to avoid deoxygenation problems arising from plant decay. Can be used in sluggish flows of up to 20 m/hour but best effects are obtained if flow is stopped for 7 days. Apply granules evenly over water surface. Effectiveness reduced in waters with a peaty bottom. If dense weed growth needs controlling, it is suggested sections of 400 m of water course or not more than a quarter of the total area of a lake be treated with an interval of 14 days between applications.
Permitted Concentration	Not more than 0.1 mg/l active ingredient.
Safety interval before irrigation	At least 1 week.
Restrictions	The potentially severe problems arising from oxygen depletion with this herbicide mean that it cannot be recommended where a valuable fishery is at risk, or where suitable alternative herbicides may be used. Experience has shown that partial treatment is not possible. Terbutryn appears to become ineffective at or below temperatures around 5 - 8°C. Threshold odour concentrations: 5.7 mg/l (soft water) 4.8 mg/l (hard water) 16.8 mg/l after dechlorination
Special instructions to operators	Normal precautions when handling concentrate and during application.
Comments	Large safety margin in its acute toxicity to mammals and birds. Weed growth ceases after application but obvious signs of death may not occur for 2-4 weeks. Residual activity in soil is 3 - 10 weeks.
Toxicity Data	LC50 (96hrs) rainbow trout 3 mg/l. 8 day dietary LC50 mallard ducks >4640 mg/kg.

TERBUTRYN continued

Trade name/ manufacturer/ MAFF number	Clarosan 1 FG - Ciba-Geigy Agrochemicals - 03859

APPENDIX 4.4.2 CHECK LIST OF PLANTS AND EFFECTIVE HERBICIDES

Herbicides given in brackets give only partial control

EMERGENT SPECIES			
1.	*Alisma plantago-aquatica*	Water-plantain	2,4-D amine, (dichlobenil)
2.	*Apium nodiflorum*	Fool's Water-cress	Glyphosate
3.	*Berula erecta*	Narrow-leaved Water Parsnip	(Dichlobenil)
4.	*Callitriche spp.*	Water-starwort	Dichlobenil, terbutryn
5.	*Carex riparia*	Great Pond Sedge	Dalapon, glyphosate
6.	*Carex spp.*	Sedge	Dalapon, glyphosate
7.	*Crassula helmsii*	Swamp Stonecrop	(Diquat), (glyphosate)
8.	*Epilobium hirsutum*	Great Willow Herb	(2,4-D amine)
9.	*Equisetum spp.*	Horsetail	(2,4-D amine), dichlobenil
10.	*Glyceria maxima*	Reed Sweet-grass	Glyphosate
11.	*Hippuris vulgaris*	Mare's-tail	Dichlobenil, (Terbutryn - only when fully submerged for at least 3 weeks after treatment)
12.	*Hottonia palustris*	Water-violet	Dichlobenil, terbutryn
13.	*Hydrocharis morsus-ranae*	Frog-bit	Dichlobenil
14.	*Iris pseudacorus*	Yellow Flag	Glyphosate
15.	*Juncus effusus*	Soft Rush	2,4-D amine, glyphosate
16.	*Lythrum salicaria*	Purple-loosestrife	(2,4-D amine)

17.	*Mentha aquatica*	Water Mint	Glyphosate, (2,4-D amine)
18.	*Nasturtium officinale*	Water-cress	2 4-D amine, glyphosate, (dichlobenil)
19.	*Phalaris arundinacea*	Reed Canary Grass	Dalapon, glyphosate
20.	*Phragmites australis*	Common Reed	Dalapon, glyphosate
21.	*Polygonum amphibium*	Amphibious Bistort	(2,4-D amine) (dichlobenil)
22.	*Pteridium aquilinum*	Bracken	Asulam
23.	*Ranunculus spp.*	Water-crowfoot	Dichlobenil, diquat, terbutryn
24.	*Rumex hydrolapathum*	Water Dock	Asulam, dichlobenil
25.	*Sagittaria sagittifolia*	Arrowhead	Dichlobenil, (2,4-D)
26.	*Scirpus lacustris*	Common Bulrush, Clubrush	Glyphosate
27.	*Sparganium emersum*	Unbranched Bur-reed	Diquat, (dalapon)
28.	*Sparganium erectum*	Branched Bur-reed	(Dalapon), (Dichlobenil), (2,4-D amine)
29.	*Stratiotes aloides*	Water-soldier	Dichlobenil
30.	*Typha angustifolia*	Narrow-leaved Reedmace	Dalapon, glyphosate
31.	*Typha latifolia*	Reedmace	Dalapon, glyphosate
31a	*Berula erecta*	Lesser Water Parsnip	(Dichlobenil)
	FLOATING SPECIES		
32.	*Azolla filiculoides*	Water Fern	Glyphosate, diquat
33.	*Glyceria fluitans*	Floating Sweet-grass	Dichlobenil, glyphosate
34.	*Hydrocharis morsus-ranae*	Frog-bit	(Dichlobenil), (diquat)
35.	*Lemna spp.*	Duckweed	Diquat, glyphosate, terbutryn

36.	*Lemna minor*	Lesser Duckweed	Diquat, glyphosate, terbutryn
37.	*Nuphar lutea*	Yellow Water-lily	(Dichlobenil), glyphosate, (2,4-D amine)
38.	*Nymphaea alba*	White Water-lily	(Dichlobenil), (2,4-D amine) glyphosate, (terbutryn)
39.	*Nymphoides peltata*	Fringed Water-lily	Dichlobenil, (glyphosate)
40.	*Polygonum amphibium*	Amphibious Bistort	(2,4-D amine)
41.	*Potamogeton natans*	Broad-leaved Pondweed	Diquat, (dichlobenil)
41a.	*Nuphar spp*	Water-lilies	Glyphosate, (terbutryn)
41b.		Great Water-lily	Glyphosate, (2,4-D amine)
		SUBMERGED SPECIES	
42.	*Callitriche spp*	Water starwort	Dichlobenil, terbutryn, diquat
43.	*Ceratophyllum demersum*	Hornwort (Rigid)	Dichlobenil, diquat, terbutryn
44.	*Chara spp.*	Stonewort	Dichlobenil
45.	*Cladophora glomerata*	Blanketweed	(Diquat) terbutryn
45b.	*Cladophora spp.*	Blanketweed	(Diquat) terbutryn
46.	*Crassula helmsii*	Swamp stonecrop	(Diquat), glyphosate
47.	*Elodea canadensis*	Canadian Pondweed	Dichlobenil, diquat, terbutryn
48.	*Enteromorpha intestinalis*	Bladderweed	Terbutryn (diquat)
49.	*Fontinalis spp*	Willow Moss	Dichlobenil, diquat
50.	*Glyceria fluitans*	Floating Sweet-grass	Dichlobenil, glyphosate
51.	*Hippuris vulgaris*	Mares-tail	Dichlobenil
52.	*Hottonia palustris*	Water-violet	Dichlobenil, glyphosate, terbutryn

53.	*Lemna Spp.*	Duckweed	Diquat, glyphosate, terbutryn
54.	*Lemna trisulca*	Ivy-leaved Duckweed	Dichlobenil, diquat, terbutryn
55.	*Myriophyllum spp.*	Water-milfoil	Dichlobenil, terbutryn
55b.	*Myriophyllum spicatum*	Spiked Water-milfoil	Dichlobenil, terbutryn
56.	*Nitella spp.*	Stonewort	(Dichlobenil)
57.	*Oenanthe aquatica*	Fine-leaved Water-dropwort	(2,4-D), dichlobenil
58.	*Oenanthe crocata (*poisonous)*	Hemlock Water-dropwort	(2,4-D), (dichlobenil)
59.	*Potamogeton berchtoldii*	Small Pondweed	Diquat
60.	*Potomogeton compressus*	Grass/wrack Pondweed	Diquat
61.	*Potamogeton crispus*	Curled Pondweed	Dichlobenil, diquat, terbutryn
62.	*Potamogeton lucens*	Shining Pondweed	(Diquat) (Dichlobenil)
63.	*Potamogeton pectinatus*	Fennel-leaved Pondweed	Dichlobenil, (diquat) terbutryn
64.	*Potamogeton perfoliatus*	Perfoliate Pondweed	Diquat
65.	*Potamogeton praelongus*	Long-stalked Pondweed	Diquat
66	*Potamogeton pusillus*	Small pondweed	Diquat
67.	*Rhizoclonium hieroglyphicum*	Filamentous Alga	(Diquat), terbutryn
68.	*Ranunculus spp*	Water-crowfoot	Dichlobenil, diquat, terbutryn
69.	*Sagittaria sagittifolia*	Arrowhead	Dichlobenil, diquat
70.	*Scirpus lacustris*	Common Bulrush, Clubrush	Diquat, glyphosate
71.	*Sparganium emersum*	Unbranched Bur-reed	(Diquat)
72.	*Spirodela polyrrhiza*	Great Duckweed	Terbutryn
73.	*Spirogyra sp.*	Filamentous Alga (Blanketweed or Cott)	Terbutryn, (diquat)
74.			

75.	*Vaucheria sessilis*	Filamentous Alga	(Diquat), (terbutryn)
76.	*Zannichellia palustris*	Horned Pondweed	Dichlobenil, diquat
77.	*Vaucheria spp*	Cott	(Diquat), terbutryn
78.	*Rhizoclonium spp*	Blanketweed or Cott	Terbutryn

APPENDIX 4.4.3 POISONOUS PLANTS

Although livestock usually avoid eating poisonous plants, some species become palatable when wilted following cutting or spraying. They are then attractive to livestock while retaining their toxicity. Other poisonous species may be eaten as a result of being made more accessible to the livestock or when mixed with other vegetation following dredging/cutting.

Species	Notes
Atropa belladona (Deadly Nightshade)	
Caltha palustris (Marsh Marigold)	
Cicuta virosa (Cowbane)	Remains toxic after death
Conium maculatum (Hemlock)	
Digitalis purpurea (Foxglove)	Remains toxic after death
Equisetum spp (Horsetails)	Remains toxic after death
Iris pseudacorus (Yellow Flag)	Remains toxic after death
Juncus inflexus (Hard Rush)	
Oenanthe crocata (Hemlock Water-dropwort)	Remains toxic after death
Polygonum hydropiper (Water-pepper) & other *Polygonum spp*	
Pteridium aquilinum (Bracken)	Remains toxic after death
Ranunculus spp (Most-yellow flowering Buttercup species)	
Rhododendron ponticum (Rhododendron)	
Scrophularia aquatica (Water Figwort)	
Senecio jacobaea (Common Ragwort)	Remains toxic after death
Sium latifolium (Great Water-parsnip)	
Solanum dulcamara (Bittersweet)	

5) NOTIFICATION & CONSULTATION PROCEDURES

5) NOTIFICATION & CONSULTATION PROCEDURES

5.1) General

Notification and consultation applies to herbicide use by the NRA, use under subcontract to the NRA and proposed herbicide application by external users.

The NRA uses herbicides in or near water and also deals with proposed herbicide applications from outside persons. MAFF guidelines (1985) state that for the use of herbicides on weeds in or near watercourses and lakes the appropriate Water Authority must be consulted before a herbicide is applied in or near water. It is accepted that this now applies to the NRA. This is reinforced in the "Conservation Guidelines for Drainage Authorities" (1988) and DoE booklet "Guidance for control of weeds on non-agricultural land" (1992). The latter states that the NRA must be consulted if the intention is to use any herbicide in or near water, and their agreement is needed before herbicides or growth regulators can be used to control aquatic weeds. The provision of such information is reasonably required by the Authority to carry out its functions under parts of the Water Resources Act 1991 dealing with Pollution Control. As herbicides are potentially poisonous, noxious or polluting matter, anybody refusing or failing to provide the information reasonably requested could be served a notice under S202 of the Water Resources Act 1991. The user of the herbicide is responsible for providing this information. The NRA can then give advice to the user about abstraction licence holders and other interested parties which may be affected such as fisheries and conservation.

Notification procedures are necessary to ensure that consultation takes place between the herbicide user, relevant NRA sections and other organisations, so decisions can take account of all environmental aspects. Notification should be made for all proposals to apply herbicides in or near water, including land adjacent to watercourses that are susceptible to flooding.

NRA managers responsible for specifying contracts should note the responsibilities under the COSHH Regulations, i.e. the COSHH Assessment Safety Policy and Certificates of Competence of potential contractors should be checked. Contracts should specify the herbicides which may be used and the standards to which the contractor must operate. For both NRA staff and contractors working practices should be checked and the effectiveness of treatment monitored.

A forms system has been devised to provide a formal framework to help ensure that consultations are carried out in a consistent manner across the regions. Notification of intent to use a herbicide is often received very close to the proposed treatment date. Thus the internal consultation mechanism must be rapid and easy to execute. Where applications have been approved at the same location previously, a quicker response time should be possible. It is recommended that consultation with large users e.g. Internal Drainage Boards commences early in the New Year. The system involves a notification form for:

1) herbicide use in or near water; and
2) aerial application.

These forms should be used by the NRA and its subcontractors and also by external users.

5.2) Designated Officers

Each Area should appoint a designated officer to deal with herbicide applications. In most instances this will be a biologist, but some Areas may prefer to identify someone from another function. However, it is expected that the designated officer will have the BASIS Certificate in Aquatics and be a member of the BASIS Professional Register.

It is recommended that the appointed designated officer contacts local contractors and informs them that any correspondences should come through them at the appropriate address.

5.3) Notification Forms

5.3.1) Notification of Proposal for the Use of Herbicides in or near Water (excluding aerial application of herbicides)

Standard application forms and letters can be found in Appendix 5.9 and in Wordperfect format on the computer disks provided.

The Notification form should provide information about the proposed herbicide use. The information should then assist in the decision making process.

The applicant should complete form H1 (Figure 3) and receive a copy of the Notes attached. A standard letter to accompany form H1 is given in Figure 4. Where notification comprises a long list of watercourse stretches to be treated, a coded map should be submitted with the form, clearly indicating treatment stretches and dates. The form should help to ensure that the intended user approaches the use of herbicides in a serious manner and is a reminder that NRA agreement is required. This should be widely publicised to help stop herbicide applications being made without NRA knowledge. The existence of the NRA policy and procedures should be advertised through Regional Advisory Committees and Public Relations sections e.g. direct to fishing clubs, in NRA fishing literature and angling magazines, in the ADA gazette and at exhibitions. The form also provides a means of imparting 'key' information to users and documenting the NRA's response. Senior Biologists or designated scientists are used as the central contact point for the return of forms and should be responsible for maintaining a database.

5.3.1.1 Internal Consultation Procedures

A flow diagram for internal consultation in response to an external or internal proposal to use a herbicide in or near water is shown in Figure 5. Form H2 (Figure 6) is used to communicate the receipt of an enquiry and obtain a response from other NRA departments. Finally a letter of agreement/objection (Figure 7 & 8) is sent to the applicant. For some applications it may not be necessary to consult all those listed; this should be at the discretion of the co-ordinating officer.

5.3.2) Notification of Proposal for the Aerial Application of Herbicides

Conditions are laid out within the Food and Environment Protection Act 1985 (FEPA) part III (Control of Pesticides Regulations 1986, Schedule 4) for the aerial application of pesticides. They are also listed in Annex 1A of the annual MAFF/HSE Pesticides reference book. Those conditions relevant to the NRA are as follows:

No person shall undertake an aerial application unless he, or a person on his behalf has:

a) not less than 72 hours before the commencement of the aerial application, consulted the NRA for the area in which he intends to apply the pesticides if the land to which he intends to apply the pesticides is adjacent to water; and

b) obtained the consent of the NRA for the area in which the aerial application will take place if he intends to apply the pesticides for the purpose of controlling aquatic weeds or weeds on the banks of watercourses and lakes.

The form, H3, (Figure 9) and standard letter (Figures 10) will assist the user to comply with the COPR, provide a record that the regulations have been followed and give the Authority information required to carry out its pollution control functions. This includes the protection of public water supply sources.

The only herbicide which is cleared for both aerial application and for use in or near water is asulam (Asulox), which is used to control bracken in grassland. During the application the spray may enter a watercourse and thus the prior agreement of the NRA must be obtained before application.

5.3.2.1 Internal Consultation Procedures

The procedure should be similar to that in Figure 5 except that the response time must be 72 hours. Form H3 should be completed by the applicant and returned to the designated officer. After consultation with the relevant NRA departments the designated officer will send a letter of agreement/objection (Figures 11 and 12) as necessary.

5.4) Consultee Responsibilities

It is the responsibility of the:

- **Conservation Officer** to ensure protection and enhancement of nature conservation, landscape, amenity and recreation interest. In particular he/she may need to ensure that the applicant has liaised with English Nature and the Countryside Commission for Wales and the National Parks where necessary. It is essential for the applicant to contact the former for sites designated as Sites of Special Scientific Interest (S.S.S.I's). (Wildlife and Countryside Act 1981). Herbicides should not be applied within any nature reserve without consultation of the organisation responsible for its management. EN must be consulted by the owner/occupier at least 4 months prior to herbicide applications within SSSIs.

- **Water Resources Officer** to ensure that licensed abstractions and any designated aquifer protection zones are unaffected, and where necessary provide information about abstractions;

- **Fisheries Officer** to provide input in relation to the protection of fish life and management of the fishery.

- **Pollution Control Officer** to advise on any concerns related to protection of Controlled Waters against pollution;

- **Flood Defence Officer** to ensure that proposals do not interfere with flood defence activities;

- **Biologist** to ensure that plant and invertebrate life is protected and verify identity of weeds submitted.

5.5) Approval Decision

If approval is given certain conditions may be imposed. e.g. an alternative application method. A standard letter of agreement for applications to water is illustrated in Figure 7 and for aerial applications in Figure 11. If the proposed application is refused, this should be communicated using the standard letters (Figure 8 for water and Figure 12 for aerial) and the reason(s) for the objection should be clearly stated. Any disagreement with the final decision may be referred to the Regional General Manager.

The Authority reserves the right to take chemical and biological samples in order to monitor the environmental impact of the application. A protocol for investigating pollution incidents associated with pesticides is given in the 'Guidelines for Monitoring and Reporting Pesticide Pollution Incidents in the Aquatic Environment' (1992).

Approvals are given on the assumption that:

a) the details provided to the NRA are correct;
b) the statutory procedures are adhered to; and
c) spraying is carried out in the correct conditions.

NRA permission to use a herbicide is required for each application made. Repeat applications therefore require separate notification using form H1 or H3 as appropriate. Applications must not take place until permission is granted.

5.6) User Responsibilities

Herbicide users have a responsibility to ensure that the interests of other water users are not adversely affected. This applies in particular to water abstractors for public supply, livestock and crop irrigation.

The user should notify all riparian owners and occupiers of the site and downstream of it of the intention to apply a herbicide. This should take the form of a notice erected two days prior to the herbicide application. A second notice should be erected on the adjacent (downstream) owners land. Enquiries should also be made to ensure that nature reserves or Sites of Special Scientific Interest are not likely to be adversely affected by the proposed treatment (Wildlife and Countryside Act 1981).

In all cases the safety interval for irrigation stated on the product label must be observed. An upper limit for the active ingredient concentration is also stated on the product label. The length of river over which the irrigation safety interval applies will be that length of river in which the upper limit for the active ingredient is exceeded. No herbicide should be used where there is a risk of contamination of potable water supplies or groundwater.

Where poisonous plants are present in or near the weeds to be controlled the area, should be fenced off from livestock until the weeds have decomposed or been removed and burned. Appendix 4.4.3 lists poisonous plants growing in or near water.

All herbicide users should follow guidelines on the safe storage, use and disposal of pesticides (See Appendix I).

5.7) Record Keeping

5.7.1) Applications of Herbicides

A database should be kept in a national format. (Information will be supplied separately).

5.7.2) Individual Users

COSHH regulations require that for Health and Safety reasons, records of individual users must be kept for risk assessment for up to 30 years.

5.8) Procedure for Dealing with Unauthorised Herbicide Applications

Any contravention of FEPA including the use of a herbicide to water without NRA approval should be referred to the Health and Safety Executive (HSE) according to the HSE/NRA Memorandum of Understanding. It is the responsibility of HSE to administer FEPA and to prosecute where appropriate.

APPENDIX 5.9

STANDARD LETTERS FOR HERBICIDE NOTIFICATIONS

FIGURE 3. NOTIFICATION OF PROPOSALS FOR THE USE OF HERBICIDES IN OR NEAR WATER
FORM: H1

NATIONAL RIVERS AUTHORITY
_____ REGION

NOTIFICATION OF PROPOSALS FOR THE USE OF HERBICIDES IN OR NEAR WATER
(excluding aerial application of herbicides)

IMPORTANT - PLEASE READ THE NOTES ON THE ATTACHED SHEET BEFORE COMPLETING THIS FORM.

1. Name			
Address			
Telephone		Date	

2. Location/ Name of Site (please attach a map or site plan - for waterbodies show inlet(s)/outlet(s)		Ordnance Survey Map Reference	
Was the site approved for herbicide use previously	YES/NO	If yes, please specify date	

3. Reason for weed control			
Flood Defence	Angling	Leisure	Other - please specify.
YES/NO	YES/NO	YES/NO	

4. Weeds to be controlled - species and % cover (* see footnote)			
Submerged	Floating	Emergent	Bankside
Identity of other plants present			

5. Are fish present	YES/NO	Species if known	

6. Is the site designated as a nature reserve	YES/NO	If yes please specify	

7. Downstream water bodies and their uses if known	

8. Proposed herbicide	Product		Active ingredient	
Amount of herbicide to be used (kgs or litres)				

9. Total area of waterbody/ watercourse/bankside (hectares)		Average depth of waterbody (metres)	

10. Area and average depth of section to be treated if different to 9		Average depth of waterbody (metres)	

11. Mean velocity of water if flowing (metres/second)	

15 Proposed date of application	

16 Name of spray operator	
NPTC Certificate number (please provide a photocopy for the first notification (not necessary for subsequent applications unless details change)	

17 Any other information that you consider relevant	

* if identity is unknown specimens may be submitted to the NRA for identification

Please return completed form to:
Title:
Address: Tel no:

Office Use

1) Are the proposals considered effective YES/NO
2) Are the proposals likely to prejudice any NRA operations YES/NO
3) Any objections to use YES/NO
4) If yes to (3), reason
5) Informant notified of (3) above:_____Date:_/_/_

NOTIFICATION OF PROPOSALS FOR THE USE OF HERBICIDES IN OR NEAR WATER

NOTES

Herbicides should only be used once all other methods of weed control have been considered.

The information overleaf is required in order to:

a) protect the environment;

b) determine whether the proposed treatment will be effective for the purpose outlined; and

c) determine whether the proposed treatment will interfere with downstream water uses (e.g. crop irrigation, stock watering etc);

Approvals are given subject to:

i) the details given to the NRA being correct
ii) the statutory procedures being adhered to
iii) applications only being made in the correct weather conditions.

It is the responsibility of the user to ensure that other water uses, such as water abstraction for public supply and livestock, crop irrigation and fisheries, are not adversely affected. A list of licensed abstractors on the relevant watercourse can be provided by the NRA if requested. The user should also notify all riparian owners and occupiers of the site and downstream of it of the intention to apply a herbicide. This should take the form of a notice erected two days prior to the herbicide application. A second notice should be erected on the adjacent (downstream) owners land. Enquiries should also be made to ensure that nature reserves or Sites of Special Scientific Interest are not likely to be adversely affected by the proposed treatment (Wildlife and Countryside Act 1981).

Statutory controls under the Food and Environment Protection Act 1985 (Control of Pesticides Regulations 1986) also place a number of responsibilities on herbicide users:

1) Users must take all reasonable precautions to protect the health of human beings, creatures and plants and to safeguard the environment. They must in particular take precautions to avoid the pollution of water.

2) Users must comply with the instructions on the product label or in the published approval for the pesticide.

3) All users must be competent in their duties and have received adequate instruction and guidance in the safe, efficient and humane use of pesticides.

contd/...

4) Certificates of competence are required by:

(a) Anyone born after 31 December 1964, who is using pesticides approved for use in agriculture, horticulture, and forestry, unless they are working under the direct and personal supervision (within eyesight and vocal contact) of a certificate holder.

(b) Contractors; unless they are working under the direct supervision of a certificate holder. A "contractor" is defined as anyone applying pesticides to property or premises which are not owned or occupied by themselves or their employer.

Training courses are organised by the Agricultural Training Board (ATB) and testing leading to certification by the National Proficiency Tests Council (NPTC).

Before using aquatic herbicides it is advisable to read the MAFF "Guidelines for the use of herbicides on weeds in or near watercourses and lakes" booklet No B2078 (Revised 1985). (This is presently out of print, but is currently being revised).

The book "Aquatic Plants - A Guide to Recognition", D Spencer-Jones & M Wade 1986. ICI Professional Products ISBN 0 901747 03 3 is a useful guide to help weed identification.

If the proposed application is refused, the reason(s) for the objection will be put in writing. Any disagreements with the final decision may be referred to the Regional General Manager.

FIGURE 4. STANDARD LETTER FOR APPLICATION OF HERBICIDES IN OR NEAR WATER (EXCLUDING AERIAL)

Our Ref:<>

Your Ref:<>

<>

<>
<>
<>
<>
<>
<>
<>

Dear <>

PROPOSED HERBICIDE APPLICATION IN OR NEAR WATER

Thank you for your enquiry dated <>, about the use of a herbicide in or near water.

The Authority's agreement is needed before a herbicide is used for this purpose. To help us protect the environment and judge your proposed usage, I would be grateful if you would complete the enclosed notification form, H1, and return it to the Senior Biologist (or designated officer) at the address below.

We will subsequently inform you of our decision in writing.

I would like to take this opportunity to draw your attention to your responsibilities under the Food and Environment Protection Act 1985 (Control of Pesticides Regulations 1986). The main ones are summarised in the notes attached to the notification form.

Yours sincerely

For telephone enquiries please contact - <>

FIGURE 5 - EXTERNAL/INTERNAL ENQUIRIES FROM OUTSIDE BODIES REGARDING THE USE OF HERBICIDES IN OR NEAR WATER

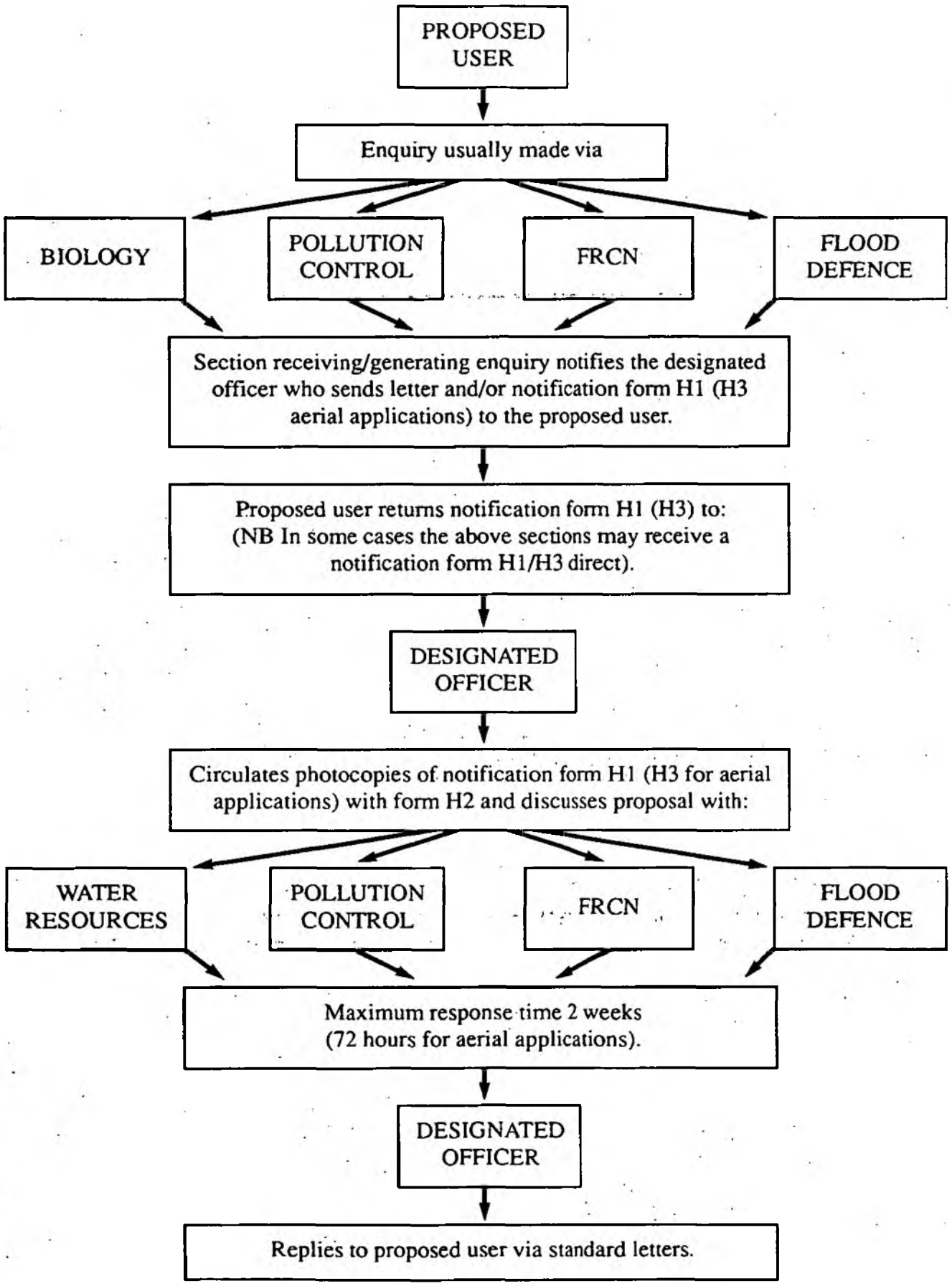


FIGURE 6

FORM: H2

CIRCULATION LIST:		
FROM	Designated Officer	DATE
		LOCATION
TO:	Conservation Officer	
	Water Resources Officer	
	Fisheries Officer	
	Pollution Control Officer	
	Flood Defence Officer	
	Biology Officer	
For Comment		
Please enter your comments and return by:		

RETURN SLIP

RESPONSE TO NOTIFICATION FORM H1 - Number:

From:

To:
Designated Officer

Proposed Herbicide Application Site:

Comments:

Signature:
Date:

FIGURE 7.(A) STANDARD LETTER OF AGREEMENT FOR THE USE OF HERBICIDES IN OR NEAR WATER (EXCLUDING AERIAL APPLICATIONS).

Our Ref: < >

Your Ref: < >

< >

< >
< >
< >
< >
< >
< >
< >

Dear < >

PROPOSED USE OF THE HERBICIDE < > AT < >

Thank your for your notification form H1 dated < > concerning your proposal to use the herbicide "< >" to treat < > in < >.

The Authority agrees with you proceeding with the application provided that:

1) the application proceeds as notified on form H1;

2) the manufacturers' instructions and the Control of Pesticide Regulations 1986 are complied with;

3) spraying is carried out in the correct conditions.

It is the responsibility of the user to inform the NRA when the operation has been completed.

Thank you for your co-operation with this matter.

Yours sincerely

For telephone enquiries please contact - < >

FIGURE 8.(B) STANDARD LETTER OF OBJECTION FOR THE USE OF HERBICIDES IN OR NEAR WATER (EXCLUDING AERIAL APPLICATIONS).

Our Ref: < >

Your Ref: < >

< >

< >
< >
< >
< >
< >
< >
< >

Dear < >

PROPOSED USE OF THE HERBICIDE < > AT < >

Thank you for your notification form H1 dated < > concerning your proposal to use the herbicide "< >" to treat < > in < >. I regret to inform you that the Authority is unable to give approval for this herbicide application for the following reason(s):

Yours sincerely

For telephone enquiries please contact - < >

FIGURE 9 NOTIFICATION FORM FOR AERIAL APPLICATION OF HERBICIDES

FORM: H3

NATIONAL RIVERS AUTHORITY - REGION

Address Tel: Fax:

CONTROL OF PESTICIDES REGULATIONS 1986
(Schedule 4, Paragraphs 2(b) & (c))

AERIAL APPLICATION OF HERBICIDES

In the event of aerial application for the purpose of controlling aquatic weeds or weeds on the banks of watercourses or lakes, National Rivers Authority consent is required. Under the above legislation you are required to notify the National Rivers Authority not less than 72 hours before commencement of aerial application of herbicides to land adjacent to water.

This form is to assist you in complying with the above requirements and to provide a record that the regulations have been followed.

1. Name and Address of Company Telephone Number	
2. Location to be treated (please give OS map grid ref(s) and sufficient information for the area to be identified). Please submit a marked site plan	
3. Approx date(s) of application	
4. Is it for the control of:- a) weeds on the banks of lakes, ponds or watercourses b) bracken c) other (please give details)	
5. Name of pesticide to be applied	
6. Please state dose rate and total amount to be used	

contd/...

"Water" means water held in sources of public water supplies, including reservoirs, upland catchment streams, lakes and rivers, groundwaters, springs, esturial and coastal waters, water used for fishing, including spawning sites, small watercourses and lake fisheries, water used for fish farming, water used for the growing of watercress, water used for the watering of livestock or for the irrigation of land.

Signed:_____

Position:_____

Date:_____

Please complete and return to:-
Designated Officer (eg: Senior Biologist)
National Rivers Authority

FIGURE 10. STANDARD LETTER FOR AERIAL APPLICATION OF HERBICIDES

Our Ref: <>

Your Ref:<>

<>

<>
<>
<>
<>
<>
<>
<>

Dear <>

AERIAL APPLICATION OF <>

With reference to your letter of <> the Authority has the following general comments and requirements to make on the aerial application of any pesticides:-

a) The user should abide by the conditions of Schedule 4 of the Control of Pesticides Regulations 1986 and the conditions in the Civil Aviation Authority's booklet CAP 414 *Information on Requirements to be met by Applicants and Holders of the Aerial Application Certificate.*

b) The Authority should be notified in writing as early as possible, ideally at least three weeks, and legally not less than 72 hours before the commencement of the aerial spraying programme. This notification should include the submission of a map which clearly identifies the proposed areas of spraying and possible helicopter landing sites, plus a completed form, H3 (enclosed).

c) It is the responsibility of the user to ensure that interests such as water abstraction for public supply and livestock, crop irrigation and fisheries are not adversely affected. Because of the large number of reservoirs and abstractions within the area, full details of the former cannot be given at this time. However once you have provided us with the details required in a) above, we will be able to send you details of any water abstractions registered with the Authority within and close to the affected areas. An early notification helps the Authority to provide you with information in time to take measures to safeguard the environment.

Please note that many small private drinking water supplies are not license by us, but are regulated by the local Environmental Health Officer, who can provide you with details of these in order that you can avoid contaminating any such sources.

/Continued.....

d) The Authority's consent is required if it is intended to apply the pesticide to control aquatic weeds or weeds on the banks of watercourses and lakes. The only herbicide which is cleared for both aerial application and use near water is asulam. Clearance for the aerial application of asulam is given for the control of bracken in grassland. During the application the spray may enter a watercourse and thus the prior agreement of the Authority must be obtained before application.

e) As a general rule, helicopter landing sites should not be located at:-

< >
< >
< >
< >

It is expected that there will be liaison between landowners/agents/contractors regarding the fulfilment of the above requirements.

We will subsequently inform you of our decision regarding your application in writing.

Yours sincerely

FIGURE 11. STANDARD LETTER OF AGREEMENT FOR AERIAL APPLICATION OF HERBICIDES FOR BRACKEN CONTROL

Our Ref: < >

Your Ref: < >

< >

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< >
< >
< >
< >
< >
< >

Dear < >

AERIAL APPLICATION OF < > ON < >

Thank you for your letter dated < > and enclosed map and form.

The Authority has no objection to bracken spraying in the areas proposed provided the following conditions are adhered to.

The manufacturer's recommendations should be strictly followed. In order to minimise the risks spraying should be avoided when rain is expected, during windy periods (ref. Schedule 4, Control of Pesticides Regulations 1986) and when the soil is saturated. If these conditions are avoided much greater absorption by the bracken and soil will occur. Watercourses, < > lie within the proposed treatment areas. These watercourses, contain sensitive invertebrate animal life, and great care should be taken to avoid spray drift/run off into these waters.

It is the responsibility of the person spraying to notify and consult with any downstream water user and to avoid contaminating water abstraction sources. *The following abstractions are registered with the Authority in this area:/There are no licensed abstractions within 500 m of the proposed treatment area. There are almost certainly unlicensed, spring abstractions within the affected areas, of which we have no record. Your local Environmental Health Office <name and number> should have details of these.

*In order to protect public water supplies the Authority considers it necessary to impose a buffer zone of < m> around < >. (Other restrictions may be added if necessary.)

contd/...

Helicopters should be washed off on waste ground at least 10 metres from a watercourse. The spray tanks should be filled with clean water and the contents sprayed within the treated area; they should not be emptied onto land.

Follow the conditions in the Civil Aviation Authority booklet CAP 414 *Information on requirements to be met by Applicants and Holders of the Aerial Application Certificate* at all times..

The National Rivers Authority must be notified, immediately in the event of any accidental spillage of chemical, by means of the telephone number given below (24 hour emergency number).

Subject to these conditions being met, the Authority has no objection to bracken spraying being carried out this year in the areas proposed. The National Rivers Authority maintains the right to take water samples before, during and after spraying, and may take proceedings under the relevant legislation if a pollution occurs as a result of spraying.

It is the responsibility of the user to inform the NRA when the operation has been completed.

Yours sincerely

For telephone enquiries please contact - < >

* use whichever is appropriate

FIGURE 12. STANDARD LETTER OF OBJECTION FOR AERIAL APPLICATION OF HERBICIDES FOR BRACKEN CONTROL.

Our Ref: < >

Your Ref: < >

< >

< >
< >
< >
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< >
< >

Dear < >

AERIAL APPLICATION OF < > AT < >

Thank you for your notification form H3 dated < > concerning your proposal to aerially apply the herbicide " < > " for the control of < > at < >. I regret to inform you that the Authority is unable to give approval for this herbicide application for the following reason(s):

Yours sincerely

For telephone enquiries please contact - < >

6) USERS - CODE OF PRACTICE

6.1) INTRODUCTION

The application of herbicides is one method of weed control used in the water environment. Herbicides must always be used with care and according to the guidelines.

It is essential that all employees who may use or come into contact with herbicides are given sufficient training and instruction to ensure that they do not endanger themselves, other employees, the public or the environment.

All supervisory staff must be aware of the legislation governing pesticides and must comply with and implement this Code of Practice. Any Safe Working Procedures and Local Safe Systems of Work should be read in association with this Code of Practice.

If there are any difficulties or queries about implementing the Code, the NRA Safety Adviser should be contacted to resolve the problem and give appropriate advice.

6.2) POTENTIAL HAZARDS ASSOCIATED WITH PESTICIDES

The herbicides the NRA uses are of low toxicity to humans and aquatic life, and provided precautions are taken will not harm operators or persons nearby. However, the following are some of the hazards associated with pesticides and care should be taken at all times.

a) Poisoning of humans by inhalation, ingestion or absorbtion of chemical.

b) Damage to eyes.

c) Poisoning of domestic animals or wildlife.

d) Production of toxic fumes and compounds if involved in fire.

e) Contamination of water supplies and environmental pollution.

6.3) STORAGE AND TRANSPORTATION OF PESTICIDES

6.3.1) Main Stores

Stocks of pesticides should be kept to the minimum needed to meet foreseeable operational requirements for the season. The store must be under the direct control of a nominated person. Certificates of Competence for storekeepers are issued by BASIS (the independent registration scheme for the pesticide industry recognised under the Control of Pesticide Regulations 1986) and are required by all NRA personnel responsible for pesticide stores. The storekeeper should also be issued with a copy of this guide and other relevant documents.

Appropriate security precautions must be taken and access to the store must be restricted to authorised personnel only.

All NRA pesticide stores must be inspected by pollution control staff to ensure adequate pollution prevention measures are in place. The stores should comply with CS19 - Storage of Approved Pesticides by farmers and other users. Further specialist advice may be obtained from the Fire, Crime and Pollution Control Officers of the appropriate Authorities.

The location and structure of main stores should be chosen to provide maximum safety in the event of spillage or fire. It should be a frost-proof building with ample working space, headroom, lighting, ventilation and access, with level and dry floors. There should be no water pipes or drains in the storage area and any spillage must not be able to escape from the building.

The doors giving access to stores must be marked with warning signs (black exclamation mark in yellow triangle) at a height of about 1.7 metres from the ground and bins or cabinets used for herbicide/pesticide storage should carry similar signs.

Washing facilities should be available near, but not in, each store for the use of store personnel and proper arrangements must be made for accommodation of protective and personal clothing.

Smoking and eating or drinking in the storage area or its vicinity is forbidden.

Pesticides should be stored in their original containers or clearly marked suitable substitutes, which carry the manufacturer's full safety warnings.

Detailed information on storage of pesticides is provided in HSE Guidance Note CS19 "Storage of Approved Pesticides - Guidance for Farmers and other Professional Users".

6.3.2) Product Segregation

Within the store, products should be grouped by type, e.g. herbicides, insecticides, fungicides, rodenticides, etc. with separate stocks for liquids and solids. Granules and powders should not be stored below liquids. Readily combustible chemical materials should be kept segregated in a safe place.

6.3.3) Stacking

Stacks should be arranged, with labels visible, to allow easy access for:

i) issuing on a "first in - first out" basis;

ii) stack inspection;

iii) fire fighting; and

iv) cleaning and spillage removal.

All containers and packages should be stored off the floor. Careful attention should be given to the pattern and height of stacking so as to achieve stability and avoid damage to containers.

A high standard of housekeeping must be maintained in the store at all times.

All issues and receipts of herbicides are the responsibility of the storekeeper and must be recorded in a Storage Stock Register maintained and held separate to the store building.

6.3.4) Local Sub-Stores

Quantities of approved products may be issued to a sub-store for local use. Such issues should be restricted to a single container of each chemical whenever possible.

Local storage conditions must comply as far as reasonably practicable with conditions set out for Main Stores. Proprietary storage bins form useful local stores. Several types of small self-contained prefabricated steel stores with integral spill-tank are available, such as "Chem Safe" from Cleveland Sitesafe Ltd and the "Chemvault" from Portasilo Ltd.

6.3.5) Fire Precautions in Stores

The advice of the local fire prevention officer must be sought about all Main Stores and the Fire Brigade must be informed that the store contains pesticides.

A fire and spillage emergency procedure must be produced, displayed prominently and regularly practised. A list of materials stored should be kept off site.

Fire extinguishers of adequate capacity must be readily available. Use of water for fire fighting can cause a risk of pollution and therefore extinguishers containing water must not be used on fires involving pesticides. Ideally there should be an automatic fire alarm fitted in each Main Store if significant quantities of potentially hazardous chemicals are held.

Combustible material, e.g. packing, paper, wood and empty sacks, must not be allowed to accumulate in the store and proper arrangements should be made for the safe storage and disposal of empty containers.

6.3.6) Safety Equipment

The following items of equipment should be available at the store in case of any spillages:

Rubber Boots
Rubber or PVC Gloves
PVC Trousers, Jackets or Suits
Goggles (Gas Resistant)
Suitable Respirators (Full Face or Ori-Nasal)
Supply of Dry Sand, Soil or Oil Absorbent
Shovel
Brush
Plastic Bags
Eye Irrigation Facilities

Proper storage and maintenance facilities must be provided for protective clothing and equipment.

6.3.7) Transportation

Bulk quantities of herbicides should not be carried in NRA vehicles unless special arrangements are made. When transporting herbicides, they should always be carried in a locked, water tight container and must be physically separated from the driver compartment.

Transport should be limited to the transfer of quantities required by local sub-stores or for use in the working day. The drivers must be aware of nature of the materials, relevant safety procedures and how to obtain assistance in an emergency. Written emergency information on the material being transported must be carried in a prominent, readily accessible place in the vehicle.

6.4) PERSONNEL TRAINING AND INSTRUCTION REQUIREMENTS

All persons involved in the storage, handling and application of herbicides, should be instructed and trained in how to carry out their duties safely and correctly.

Training requirements must meet the Control of Pesticides Regulations 1986 (COPR) and the Control of Substances Hazardous to Health 1988 (COSHH) Regulations.

To comply with these obligations people will need training that provides information on legislation, hazards and risks posed by pesticides, safe working practices, emergency action, health surveillance and record keeping.

First line supervisors must be fully familiar with the manufacturers' instructions and safe operating procedures for all herbicides and application equipment used by their staff.

Only responsible, competent and certificated employees who have been given adequate instruction in the handling, mixing and application of such materials are permitted to work with herbicides.

Reference should be made to Section 8, Training.

6.5) APPLICATION EQUIPMENT AND METHODS

a) Hand application is normally used for spreading granular chemicals over small areas.

b) Mechanical spreading is used for applying granular materials over medium sized areas,

Application machines can be either hand powered or engine driven and safety precautions appropriate to the method of drive must be taken.

With all granular herbicides the inhalation of dust from the chemical must be avoided.

c) Hand held air pressurised sprayers are normally used for applying diluted liquid chemicals to very small areas with good accuracy.

d) Back-pack pump sprayers are used for applications of diluted liquid chemicals to fairly small areas. The weight of the tank can cause difficulty to operators on uneven ground.

e) Vehicle mounted sprayers are normally used for the application of diluted liquid chemicals to large areas.

These machines require specialised training and considerable experience for safe operation. Maintenance requirements are far more complex than other methods.

f) Specialised droplet applicators using undiluted liquids are available from some manufacturers for use with specially formulated materials. These reduce the potential loss or wastage and permit better dose control.

6.6) PERSONAL PROTECTIVE CLOTHING, SAFETY EQUIPMENT AND HYGIENE REQUIREMENTS

6.6.1) Protective Clothing and Equipment

This may include:

a) eye protection (full face shield);
b) unlined gloves (gauntlet type - chemical resistant);
c) disposable coveralls;
d) waterproof jacket and over-trousers;
e) wellington/safety boots;
f) respirator (ori-nasal filter type with appropriate cartridge);
g) PVC aprons;
h) first aid facilities including eye washing;
i) 5 litre container of fresh tap water for emergency washing;
j) soap;
k) paper towels;

Operators should use protective clothing and equipment issued to them and comply with safe working procedures and instructions that are applicable to the task, taking reasonable practicable steps to ensure their own safety and that of others. Items of personal protection should not be used for purposes other than those for which they are designed and issued.

Items of equipment which are personally issued should be maintained in clean and hygienic conditions.

Breakages or damage to items of protective clothing/equipment which affect their efficiency should be reported immediately to supervisors so that exchanges can be arranged.

6.6.2) Personal Hygiene

People handling herbicides should:

a) Always wash hands thoroughly before eating, drinking, smoking and using the toilet.

b) Never smoke whilst handling or applying herbicides or visiting any area where herbicides are being stored or used.

c) Be aware that contamination by herbicides may still occur through protective clothing. If so, operators should stop work, wash and change from the contaminated clothing into clean clothing. Contaminated clothing should be disposed of via a reputable waste contractor.

6.7) PREPARATION AND CALIBRATION

a) Check spray equipment

Operators must check that spray equipment is in good working order.

It is a legal requirement to **READ THE PRODUCT LABEL** before use.

b) Dilution

An area should be designated/constructed for filling and washing, so that in the case of a spillage the contaminated area will be isolated. Criteria for the selection of a site must consider possible contamination of groundwater or run-off into surface waters.

Mixing and diluting should be carried out according to the manufacturer's instructions and preferably out of doors. Avoid breathing fumes or dust. If the concentrate is spilled on the skin, wash it off immediately.

Pesticides should not be mixed together unless it is recommended on the product label.

Herbicide sprays which are already in fluid form and need no pre-mixing or diluting are recommended. (Currently none are available for aquatic use).

The container should be rinsed when empty and the washings added to the spray tank. The empty containers should be made unusable. i.e punctured. See Chapter 7, Disposal.

c) Assessment/Estimate of Requirements

Only mix the quantity of pesticide required, taking into consideration the area to be sprayed and the weather conditions. If in doubt, it is better to underestimate and to leave a small area untreated. This can be sprayed at the end, when it will be easier to calculate exactly how much more is needed.

d) Select Nozzle and Calibrate Sprayer

In order to apply the correct dose rate the exact output of the equipment must be known. Check the recommended nozzle size with the manufacturer's instructions. The sprayer should be calibrated using water at the beginning of the season and again every two or three months or whenever settings, equipment or personnel are changed.

Output is dependent on:

(i) speed of operator;
(ii) operating pressure;
(ii) size of nozzles.

It is important that the sprayer is calibrated in accordance with manufacturers' instructions.

e) **Wear Protective Clothing**

The protective clothing specified for the job should be worn and this should be checked to ensure that all items are in good condition.

6.8) APPLICATION

6.8.1) General

The application rate can be found in the manufacturer's instructions. This and any other instructions in the manual or from your Supervisor must be strictly followed.

The material should be applied at a steady and continuous rate of application. This requires walking at the speed which achieves the correct application and frequent checking of equipment to ensure that it is working correctly is necessary.

A steady pumping action should be used to ensure that the calibrated pressure is maintained. The nozzle should be kept at a height which will ensure the correct band width coverage.

It is important to:

i) Turn off the spray before carrying out any work on the nozzle;

ii) Never blow through the nozzle to try and clear blockages;

iii) Keep gloves on when removing nozzles.

6.8.2) Spray Drift

To avoid herbicide drifting onto non target species, application must only be made:

i) When the wind speed is between Force 1 and 3 - check with your Supervisor if in doubt. (When there is no wind thermals cause the spray to drift).

ii) Through suitable and undamaged nozzles.

Do not allow spray to be accidentally directed onto adjacent crops. Equipment, and particularly the spray nozzles, should be selected to give a spray pattern to fit the target. When a herbicide is applied as a granular formulation, an even distribution over the area of water surface to be treated is required.

6.8.3) Checks before Operating

Depressurise the sprayer before carrying out maintenance.

6.8.4) Spraying Machines

i) Clean the spray tank and lines to ensure there is no contamination from the previous application.

ii) Ensure spray nozzles are clean and not cracked or chipped so that the correct spray pattern is being formed.

iii) Set pressure control to that required. Low pressure is desirable for aquatic situations.

iv) Ensure pump is in good working order

v) Ensure all nuts are tight.

vi) Ensure all joints are leak proof.

vii) Clear filter and air vent.

viii) Clean trigger filter and clear nozzle aperture.

6.8.5) Spreaders

i) The hopper should be clean and not contaminated with material from the last application.

ii) Rollers and grids etc., responsible for metering out the correct dosage rate, should be working properly.

iii) If the rate of application is altered by adjustable levers, these should be securely fastened so that they cannot alter their setting due to vibration when the machine is in operation.

6.9) AFTER SPRAYING

i) Ensure any surplus material is placed in a clearly labelled container.

ii) Return all empty containers to the store for safe disposal.

iii) Equipment and containers should be wiped down if necessary with a clean rag or paper towels and placed in correct storage. Used rags or towels should be put in plastic bags, etc. for disposal.

iv) Complete spray records and log sheets.

Disposal of Surplus Material and Empty Containers

It is very important that surplus dilute herbicides and empty containers are correctly disposed of. If this is not done correctly and safely it could cause hazards to people and the environment.

The following should be followed:

a) Good Estimation

The best way of avoiding disposal of surplus mix is to accurately estimate the quantity needed to do the job. Underestimate rather than overestimate.

b) Excess

If surplus mix remains it should be disposed of appropriately. It is NOT acceptable to reapply to the treated area in aquatic situations because of the risk of causing a pollution. The Code of Practice for the Safe Use of Pesticides on Farms and Holdings permits disposal of dilute pesticide waste onto an area of non-cropped land of minimal wildlife value. However, this is only acceptable if the land is the property of the applicant or if **written permission** from the landowner has been given. Therefore, in most instances the most appropriate method of disposal is via a reputable waste disposal contractor. Herbicides should NEVER be emptied down drains.

c) Container Rinsing

It is essential that containers are emptied and not left with small amounts of material in them. They should be rinsed at the time of application and the washings added to the spray tank. Before disposing of any container it must be thoroughly emptied.

d) Empty Containers

Empty containers must be kept in a specially designated area of the pesticide store for safety; any part-used containers should be tightly closed and placed back into the store for use at a later date.

e) Container Disposal

The NRA policy is to dispose of containers via a reputable waste disposal contractor.

Other methods of disposal of containers, such as burial and incineration, suggested by the Code of Practice for the Safe Use of Pesticides on Farms and Holdings, produced by MAFF/HSE are NOT to be used by the NRA.

For further information, see Chapter 7, Disposal.

6.10) SPILLAGES AND EMERGENCIES

If a spillage occurs, every effort must be made to prevent the material escaping into sewers, watercourses, ponds or land drains. All personnel must wear appropriate protective clothing and equipment for the circumstances to ensure their safety.

Spillages of granular or powdered materials must be removed in such a way that dust is not spread or inhaled. If the material has become wet it must be placed in waterproof containers and kept in a well ventilated place pending safe disposal.

Minor liquid chemical spillages, well away from watercourses, drains, etc., may be dealt with locally by absorbing the material into dry sand, earth, etc.. The contaminated absorbent material must then be put into waterproof containers pending appropriate disposal.

Major spillages, or where the chemical has already entered a watercourse or drain, require prompt action and Senior Supervisory Staff must be informed at once. These officers will alert the Pollution Control Section and other specialist officers, including the Safety Officer.

In the event of a major incident the assistance of the Emergency Services may be necessary. It may also be necessary to inform the Health and Safety Executive.

Some chemicals are non-hazardous alone but, if mixed with other materials, become extremely dangerous. Any spillage involving several types of chemical must therefore be treated as a major spillage and appropriate action must be taken.

In the event of herbicides becoming involved in fire, toxic smoke will be given off and if immediate use of fire extinguisher is unsuccessful, the area affected by smoke must be evacuated.

Fire Brigade assistance must always be obtained if a fire of any significant size involves chemicals. Clear information on the location of the incident and the fact that herbicides are involved must be given.

APPENDIX 6.11.1

OPERATOR'S SAFETY RULES

If you have to use herbicides

Record personal details to satisfy COSHH Regulations in Record Book.

Always read instructions and handling precautions on labels and in appropriate leaflets; if you do not understand them ask your supervisor.

Make sure you have the correct protective clothing.

Keep protective clothing clean (both inside and out) and in good condition.

Store protective clothing separately from personal clothing so that the latter does not become contaminated.

Dispose of contaminated protective clothing via a waste disposal contractor.

Ensure that food, drink and tobacco are not in the vicinity of pesticides.

Keep all pesticide containers closed when not in use.

Keep undiluted pesticides in their original labelled container.

Keep pesticides locked in a safe place, out of reach of children and animals.

Make sure all equipment including measuring vessels are kept clean.

Take care to avoid spillages, particularly of concentrated pesticides. If spillages do occur dispose of safely as instructed. Do not contaminate waterways or ponds.

If eyes are contaminated with chemical, wash out with plenty of water and seek medical attention.

Wash all contaminated skin immediately with plenty of soap and water.

Wash hands and exposed skin thoroughly before eating, drinking, smoking, using the toilet and after work.

Always dispose of surplus chemicals and containers safely. Do not leave them so that children or animals can be affected by their contents.

If you become unwell when using or after using herbicides report immediately to your Supervisor, rest, and if the symptoms continue go to the doctor taking the product label or leaflet with you. If a herbicide is swallowed, get medical assistance immediately.

Never blow or suck nozzles or other parts of equipment to clear obstructions.

Never eat, drink or smoke whilst handling or applying herbicides or cleaning application equipment or containers.

Never repair or send for repair any equipment which has not been thoroughly cleaned.

Never allow untrained persons to handle herbicides unsupervised.

Never work in spray mist and stop spraying if the wind starts blowing the spray out of the target area.

Never put herbicides, concentrated or diluted, into containers which normally contain food or drink, e.g. beer bottles, cups, jugs, etc.. This is probably the most common cause of poisoning with herbicides.

The precautions which are printed on the herbicide container or on the leaflet which is supplied with the product, must always be followed.

If there are no instructions as to use and the precautions to be taken by the operators, the herbicide is NOT TO BE USED.

If the instruction leaflet specifies clothing or equipment, this must be obtained before the herbicide is used.

APPENDIX 6.11.2

FIRST AID MEASURES

If an incident occurs, check the product label and the COSHH data sheet for emergency information. If in a remote area, it may be necessary to take the casualty for medical assistance immediately rather than waiting for an ambulance.

a) **Eyes**

If pesticides get into the eyes the operator should wash them immediately with copious amounts of tap water for at least 20 minutes and seek medical advice urgently.

b) **Skin**

If pesticides get on the skin, contaminated clothing should be removed and the area washed thoroughly for 20 minutes. If contamination is extensive, medical advice should be sought without delay. Skin contamination should not be cleaned using organic solvents.

c) **Swallowing**

If pesticides have been swallowed, the patient should rest and get medical advice immediately. Nothing should be taken by mouth, and the patient should not be made sick. The data sheet, label or leaflet for the product should be taken to the medical services with the patient, so the appropriate treatment can be given. If the patient is sick, a sample of vomit should be taken to the hospital with data sheets, etc.

d) **Inhalation**

If pesticides have been inhaled, the patient should be removed to fresh air, kept at rest and medical advice obtained. Check breathing; any difficulties may require artificial respiration and hospital care. Hospital help should be sought especially if the patient begins to feel unwell.

7) DISPOSAL OF WASTE HERBICIDES, CONTAINERS AND EQUIPMENT.

7) DISPOSAL OF WASTE HERBICIDES, CONTAINERS AND EQUIPMENT

7.1) Regulations

Regulations governing the disposal of pesticides and their containers are contained within the Food and Environment Protection Act 1985 (FEPA), Health and Safety at Work Act 1974, Control of Pollution Act 1974 (COPA), Environmental Protection Act 1990 and Water Resources Act 1991. These regulations must be strictly adhered to by all users.

Under COPA it is an offence to abandon or dispose of waste which is poisonous noxious, or polluting, on any land where the environment may be at risk. Local Authority Waste Disposal Departments can:

a) provide advice on general disposal matters which may include details of specialist disposal contractors; and

b) issue disposal licences under COPA, for waste disposal activity on land in the area.

Under the Water Resources Act 1991 it is an offence to cause or knowingly permit any poisonous, noxious or polluting matter, or any solid waste matter to enter any controlled waters.

The NRA Policy and Practice for Protection of Groundwater (1992) seeks to ensure use and disposal of pesticides/herbicides is restricted in water supply protection zones.

7.2) Preparation Prior to Application

To satisfy the COSHH Regulations 1988 it is necessary to consider whether it is absolutely necessary to use a herbicide to achieve the required effect. Assuming that a herbicide is justified; it is essential to carefully plan and prepare the application to minimise the quantity of waste herbicide produced. Estimate, as accurately as possible the quantity required and only buy what is needed.

Methods of disposing of waste should be considered and solved, prior to purchase and application. All methods of reducing waste herbicide must be considered.

7.3) Disposal of Container Washings

Containers should be rinsed at the time of mixing, by following the conditions on the product label or by successive rinsing. The rinse should be added to the spray tank.

7.4) Disposal of Spray Tank Washings

If surplus mix remains it should be disposed of appropriately. It is NOTacceptable to reapply to the treated area in aquatic situations because of the risk of causing a pollution. The Code of Practice for the Safe Use of Pesticides on Farms and Holdings permits disposal of dilute pesticide waste onto an area of non-cropped land of minimal wildlife value. However, this is only acceptable if the land is the property of the applicant or if **written permission** from the landowner has been given. Therefore, in most instances the most appropriate method of disposal is via a reputable waste disposal contractor. Herbicides should NEVER be emptied down drains.

After application all equipment used should be cleaned, washed and rinsed thoroughly in an area where contaminated water cannot enter drains or watercourses.

When washing great care must be taken to ensure that back-siphoning of pesticides into the water supply cannot occur.

7.5) Disposal of Waste Concentrates

Disposal of concentrates should be minimal if correct purchase and storage procedures are adhered to. However, in the following circumstances, concentrates may need disposing:

a) Date of shelf life expired
b) Un-approved or approval revoked
c) Container damaged. (possible hazard)

Disposal of concentrates should always be via a reputable waste contractor. Duty of Care applies - see PIN SC/CC/013 Controlled Waste: The Duty of Care.

If unopened pesticides are surplus to requirements they should be returned to the supplier if possible, or used at another time. If neither of these options is available, they must be disposed of via a reputable waste contractor.

Waste Disposal Authorities

a) for any non-metropolitan county in England - the county council;
b) for Greater London - the London Waste Regulation Authority;
c) for the metropolitan county of Greater Manchester - the Greater Manchester Waste Disposal Authority.
d) for the metropolitan county of Merseyside - the Merseyside Waste Disposal Authority;
e) for any other metropolitan county - the district council;

For further information consult publications listed in Section 10.

7.6) Disposal of Containers

Rinsed containers (see 7.3), should be punctured so that they cannot be re-used. If possible, the label should be kept intact.

The NRA policy is to dispose of containers via a reputable waste disposal contractor. Other methods of disposal of containers, such as burial and incineration, suggested by the Code of Practice for the Safe Use of Pesticides on Farms and Holdings,, produced by MAFF/HSE are NOT to be used by the NRA.

8) TRAINING

8) TRAINING

8.1) Introduction

In order to comply with the Control of Pesticides Regulations 1986 and the Control of Substances Hazardous to Health 1988, all people involved with pesticides must be properly trained.

Schedules 2 and 3 of the Control of Pesticides Regulations 1986 specify a number of conditions covering the storage and use of pesticides. The relevant conditions are:

a) No person should use a pesticide in the course of business unless he/she has received adequate instruction and guidance in the safe, efficient and humane use of pesticides and is competent for the duties which he/she is called upon to perform.

b) No person who was born later than 31 December 1964 shall use a pesticide approved for agricultural use unless he/she has obtained a Certificate of Competence or he/she uses the pesticide under the direct and personal supervision i.e. within eyesight and visual contact of a person who holds such a certificate.

c) No person shall use a pesticide approved for agricultural use on land not in his or her employers ownership or occupation, unless he/she has obtained a Certificate of Competence or uses the pesticide under the direct and personal supervision of a person who holds such a certificate. (This condition would apply to any work undertaken by the NRA under contract for example for Internal Drainage Boards or Angling Clubs).

d) It is the duty of every employer to ensure that any person in his/her employment who may be required to use or store a pesticide during the course of that employment is provided with such instruction and guidance to achieve the required standard of competence.

e) Any person who uses a pesticide shall take all reasonable precautions to protect the health of human beings, creatures and plants, to safeguard the environment and in particular to avoid pollution of water.

Under the Control of Substances Hazardous to Health Regulations 1988 information must be given to employees about any risks to health which may arise from using a pesticide; and they must be trained in the precautions necessary to prevent or adequately control exposure and in emergency measures.

All persons involved with storing, using and advising on herbicides MUST receive adequate training and instruction to fulfil the above. Only responsible competent employees who have been given adequate instruction in the handling, mixing and application of such materials are allowed to work with herbicides.

8.2) Users

Users of pesticides are required to have knowledge of relevant legislation, hazards and risks posed by pesticides, safe working practices, emergency action, health surveillance and record keeping.

The Certificates of Competence recognised by the Ministry for pesticide users are the pesticide application module certificates issued by the National Proficiency Testing Council (NPTC). Test candidates are required to pass the appropriate proficiency tests i.e. the Foundation Module and subsequently at least one other practical test module on the application equipment appropriate to their job.

Possession of a recognised Certificate of Competence is sufficient basic training for COSHH.

8.3) Store Keepers

Certificates of Competence for storekeepers are issued by BASIS and should be held by all NRA storekeepers.

8.4) Advisors and Regulators

A BASIS Certificate of Competence is needed by all NRA staff giving internal and external advice on herbicides, since they may be liable to prosecution if they give incorrect advice which results in an offence under Section 16 (12) of FEPA (a person who causes or permits another person to contravene the regulations).

A training course on aquatic weed control for advisors has been tailored to meet the NRA's needs. (For further information contact Kathryn Eke, Pesticides Scientist, Anglian).

BASIS also operate a Register of Practitioners for Pesticide Advice, which is open to all who hold the appropriate Certificate of Competence and are prepared to update their training on an annual basis.

8.5) Scope of Training

Matters which need understanding include:

- legislation applied to pesticides;
- decisions on whether a pesticide has to be used;
- selection of appropriate pesticide for the job;
- interpretation of labels and Codes of Practice;
- hazards and risks to human health and to the environment;
- protective clothing requirements;
- calibration and safe operation of equipment;

- safe storage and disposal of pesticides;
- emergency action in case of poisoning or contamination;
- how to contain and deal with accidental spillage;
- constraints imposed by weather and other factors;
- appropriate record keeping;
- need for exposure monitoring or health surveillance;
- particular requirements relating to use in or near water.

8.6) Providers of Training

Training requirements can be met by recognised training courses, by in house training or both. MAFF produces a list of recognised providers of pesticide training for users and suitable courses are provided by Agricultural Colleges, The Agricultural Training Board and other bodies.

'In house' courses using certificated instructors and input from regional safety advisors are also recommended for refresher purposes and to reinforce ATB courses. It is important that 'in house' training is given by someone who is competent to do so and to an equivalent standard. It should also be adequately recorded by Training Sections.

8.7) Who Should be Trained?

All NRA Staff involved with the application of pesticides should attend ATB courses of basic training for the module on the 'Safe Use of Pesticides' plus other relevant modules e.g. 'Hand Held Applicators' and 'Safe Use of Pesticides in or Near Water' and undertake the NPTC tests to gain a Certificate of Competence. All NRA users of pesticides, irrespective of age, must have the NPTC Certificate by the end of 1995.

The above training and testing should also apply to first line supervisors of pesticide users, who must be fully familiar with the manufacturers instructions and safe operating procedures for all pesticides and application equipment used by their staff.

All persons working in or having access to the store must have been given adequate training to ensure that they can carry out their routine duties safely and can deal with any emergency in an effective manner. The storekeeper should attend a BASIS storekeeper training course and obtain a BASIS Storekeepers Certificate of Competence.

Staff acting in an advisory or regulatory capacity should undertake the aquatic BASIS course and obtain BASIS certification. They should then update their training annually and become BASIS registered.

Training requirements should be co-ordinated by the National Training Officer and implemented by Regional Training officers in liaison with line managers. These should be subject to annual review.

The organisations involved in training are listed in Section 11.

9) GLOSSARY

Active Ingredient	The component of a pesticide, with the pesticidal activity.
Adjuvant	Substance other than water without significant pesticidal properties used in conjunction with a pesticide to enhance its effectiveness.
Aerial Application	The application of a pesticide from an aircraft in flight.
Algae	Relatively simple but diverse major group of plants including: - microscopic algae, whose individual structure cannot be seen, but can make the water look discoloured; - filamentous algae which can form large visible, sometimes floating masses, sometimes called 'blanket weed' or 'cott'; - stoneworts, which are highly developed forms of algae, sometimes mistaken for submerged rooted plants.
Alginate	Viscous sodium alginate solution used in conjunction with diquat to form diquat alginate gel solution which can stick to plants.
Amine	Derivative of Ammonia (NH_3) in which one or more hydrogen atoms are replaced by an alkyl radicle eg. methylamine CH_3NH_3. Soluble in water.
Contact Herbicide	A weedkiller which kills weeds on contact with the foliage of the plant (leaves and stem) usually with no residue effect. (also known as a foliar-acting herbicide).
Contractor	Anyone applying herbicides to property or premises which are not in the ownership or occupancy of themselves or their employer.
Controlled Waters	Waters subject to the Water Resources Act 1991 and includes all rivers, lakes, groundwaters, estuaries and coastal waters.
Dicotyledon	Plants with a pair of seed leaves. Typically with leaves relatively wide and shoots bushy.
Efficacy	Effectiveness.

Emergent Weed	Plant which grows through the water with leaves extending above the water.
Epiphytic	Plant living attached to another plant, usually algae living on large plants.
Ester	A molecule derived from an acid and an alcohol by the elimination of water. They are usually only sparingly soluble.
Filamentous	Thread-like.
Foliar	Pertaining to or consisting of leaves.
Herbicide	A pesticide which acts on plants.
LC50	Lethal concentration 50, concentration which has caused the death of 50% of a defined test population.
LD50	Lethal dose 50, a calculated dose affecting 50% of exposed test population.
Macrophyte	Plant visible to the naked eye including flowering plants, horsetails, ferns, mosses and large algae eg. *Chara*, *Cladophora*.
Meristem	Growth area of a plant tissue where new cells are produced.
Monocotyledon	Plant with one seed leaf. Typically with narrow leaves, grasses etc.
Near Water	Areas immediately adjacent to drainage channels, streams, rivers, ponds, reservoirs, canals, boreholes, dry ditches and areas designated for water storage and will in most cases include area within flood banks.
NOEL	No Observed Effect Level.
Pesticide	Any substance, preparation or organism prepared or used for destroying any pest (FEPA). This includes herbicides, fungicides, insecticides, growth regulators, masonry and timber preservatives.

Photosynthesis	Process by which plants manufacture carbohydrates using energy from light.
Planktonic algae	Algae in suspension in the water liable to movement by wind and currents.
Potable	Drinkable.
Riparian	Riverside, bankside.
Rhizomes	Perennial underground horizontal stem often thickened and tuber shaped.
SSSI	Site of Special Scientific Interest.
Stolons	Creeping horizontal stems.
Submerged Weed	Plant which permanently grows under the surface of the water
Sward	Turf or grass.
Translocation	Movement of substances within the plant.
Vascular Plant	Plant with channels/vessels for transportation of fluids through the plant.

10) USEFUL PUBLICATIONS

Guidelines for the use of herbicides on weeds in or near watercourses and lakes. Booklet B2078 - obtainable from MAFF (Publications) Lion House, Alnwick, Northumberland NE66 2PF Revised 1985. (Currently being revised 1994)

Pesticides 19XX; Pesticides approved under the Control of Pesticides Regulations 1986. MAFF/HSE Reference Book 500. HMSO. Revised annually.

Guidelines for the Disposal of Unwanted Pesticides and Containers on Farms and Holdings MAFF Booklet 2198 London 1980 - obtainable from MAFF Publications Branch. Free.

Chemical compounds used in agriculture and food storage: recommendations for safe use in Great Britain. MAFF, Pesticides Branch, Great Westminster House, Horseferry Road, London SW1P 2AE.

Guidelines for the safe disposal of unwanted pesticides and used containers from stores of local authorities, agricultural merchants and agricultural spraying contractors - obtainable from the Secretary, British Crop Protection Council, 144-150 London Road, Croydon, Surrey. Tel: 01 681 6851.

Poisonous chemicals on the farm HS(G)2 available from local offices of the Health and Safety Executive or through HMSO bookshops.

The UK Pesticide Guide 19XX CAB International and the British Crop Protection Council. Revised annually.

Pesticides; Code of Practice for the safe use of pesticides on Farms and Holdings 1990 MAFF/HSC publication. HMSO.

Code of Practice for supplies of pesticides to agriculture, horticulture and forestry 1990 MAFF publication.

Code of Good Agricultural Practice for the Protection of Water 1991 MAFF Publication

Storage of approved pesticides guidance for farmers and other professional users HSE Guidance Note CS19

Working with Pesticides Guide: The Regulations and Your Responsibilities. Schering Agriculture. A Green Science Publication

Guidance for Control of Weeds on Non-agricultural Land
Department of the Environment 1992 92 EP 240

Aquatic Plants. A Guide to Recognition: David Spencer-Jones and Max Wade. Published by ICI Professional Products, ISBN 0901747033.

British Water Plants. Field Studies 4: Haslam, Sinker and Wolseley (1975)

11) USEFUL ADDRESSES

11.1) ADVISORY BODIES

ADA
Association of Drainage Authorities
The Mews
3 Royal Oak Passage
High Street
Huntingdon
Cambridge
PE18 6EA
(0480) 411123

ADAS
ADAS Headquarters
Oxford Spires Business Park
The Boulevard
Kidlington
Oxford
OX5 1NZ
Oxford (0865) 842742

AWRU
Aquatic Weed Research Unit
Broadmoor Lane
Sonning
Reading
Berks
RG4 0TH
Reading (0734) 690072

BAA
British Agrochemicals Association
4 Lincoln Court
Lincoln Road
Peterborough
PE1 2RP
(0733 349225)

BCPC British Crop Protection Council
BCPC Publications Sales
Bear Farm
Binfield
Bracknell
Berkshire
RG12 5QE
(0734) 341998)

HSE Health and Safety Executive
Library Information Services
Broad Lane
Sheffield
South Yorkshire
S3 7HQ

MAFF Pesticide Safety Directorate
Rothamsted
Harpenden
Herts
AL5 2SS
(0582) 462100)

WCA Water Companies Associates
14 Great College Street
London
SW1 3RX

WSA Water Services Association
1 Queens Anne's Gate
London
SW1H 9BT

11.2) TRAINING ORGANISATIONS

ATB
Agricultural Training Board
Summit House
Glebe Way
West Wickham
Kent
BR4 0RF

(081) 777 9003

BASIS
BASIS Ltd
2 St John Street
Ashbourne
Derbyshire
DE6 1GH

(0335) 43945/46138

NPTC
National Proficiency Tests Council
Tenth Street
National Agricultural Centre
Stoneleigh
Kenilworth
Warwickshire
CV8 2LG

(0203) 56132

11.3) MANUFACTURERS/DISTRIBUTORS

Atlas Interlates Ltd
PO Box 38
Low Moor
Bradford
W Yorks
BD12 UJ2
Bradford (0274) 671267

Barclay Chemicals (UK)
28 Howard Street
Glossop
Derbyshire
SK13 9DD
(0457) 853386

Bos Chemicals Ltd
Paget Hall
Tydd St Giles
Wisbech
Cambs
PE13 5FL.
Wisbech (0945) 870118

Ciba-Geigy Agrochemicals
Whittlesford
Cambridge
CB2 4QT.
Cambridge (0223) 833621-7

Complete Weed Control Ltd
7 Astley House
Cromwell Business Park
Banbury Road
Chipping Norton
Oxon
OX7 5SR
(0608) 644044

DuPont (UK) Ltd
Agricultural Products Dept
Wedgwood Way
Stevenage
Herts
SG1 4QN
(0438) 734000

Embetec Crop Protection
Springfield House
Kings Road
Harrogate
North Yorkshire
HG1 5JJ
(0423) 509731

Helm Great Britain Chemicals Ltd
Wimbledon Bridge House
1 Hartfield Road
London
SW19 3RU
(081) 544 9000

Hortichem Ltd
1 Edison Road
Churchfields Industrial Estate
Salisbury
Wilts
SP2 7NG
(0722) 20133

Mirfield Sales Services Ltd
Moorend House
Moorend Lane
Dewsbury
West Yorkshire
WF 3QO
Dewsbury (0484) 842450

Monsanto PLC
Thames Tower
Burleys Way
Leicester
LE1 3TP.
Leicester (0533) 620864

Nomix-Chipman Ltd
Portland Building
Portland Street
Staple Hill
Bristol
BS16 4PS
(0272) 574574

Rhone Poulenc Environmental Products
(RP Environ)
Regent House
Hubert Road
Brentwood
Essex
CM14 4T2
Brentwood (0277) 261414

Rigby Taylor (South) Ltd
Unit 7
The Riverway Estate
Peasmarsh
Guildford
Surrey
GU3 1LZ.
Guildford (0483) 35657

Schering Agriculture
Nottingham Road
Stapleford
Nottingham
NG9 8AJ
Nottingham (0602) 390202

Selectokil
Abbey Gate Place
Tovil
Maidstone
Kent
ME15 0PP
Maidstone (0622) 55471

Top Farm Formulations Ltd
115 Carrowreagh Road
Garragh
Coleraine
Londonderry
Northern Ireland
BT51 5LQ

Uniroyal Chemicals Ltd
Kennet House
4 Langley Quay
Slough
Berks
SL6 9DS
(0753) 580888

Zeneca
ICI Professional Products
Fernhurst
Haslemere
Surrey
GU27 3JE
Haslemere (0428) 645454

APPENDIX I - GENERAL POLLUTION PREVENTION GUIDELINES

Before applying a herbicide you should consider all alternative methods of weed control. If a herbicide is needed, the risk of pollution can be minimised by following these guidelines.

STORAGE

Even if only small quantities of herbicides are stored you should:

* keep them in a suitable store, protected against fire and theft
* only store MAFF approved and numbered products
* only store enough herbicide for your immediate need
* always keep the store locked and clearly marked
* keep records of the store contents in a separate place in case of an incident
* site any stores well away from any watercourses, drains, boreholes and areas prone to flooding

MIXING

When mixing herbicides always take extreme care. To minimise risks:

* mix herbicides in a designated area where any spillages will not get into drains, watercourses or groundwater
* in case of an accident absorb spillages with an inert material such as fine sand and dispose of in a safe manner
* use closed transfer and induction mixing systems whenever possible to avoid the need for manual mixing
* avoid back siphoning by ensuring that there are no direct connections between a spray tank and the water supply

USE

When herbicides are applied correctly there is minimal risk of water pollution. Follow these measures to reduce the risk further:

* only use herbicides when absolutely necessary
* only use herbicides with approval for use in or near water
* follow instructions on the manufacturers label
* only prepare the amount of chemical you need, so you don't have to dispose of the surplus

* don't mix up large quantities if there is a risk that the weather will prevent you from spraying

* only apply herbicides when the weather conditions are suitable i.e. not if the wind will cause the spray to drift onto non target plants or if heavy rain is forecast

DISPOSAL

Careless or incorrect disposal of even very small amounts of pesticide is a potential source of pollution. Disposal of all wastes must be carried out in a safe manner.

Dilute pesticides

There should be no need to dispose of dilute pesticides if the amount required is accurately estimated. Disposal of unavoidable waste should:

* be onto an area of non-cropped land of minimal wildlife value. This is **only** acceptable if the land is the property of the applicant or if **written permission** from the landowner has been given

* preferably be via a reputable waste disposal contractor.

Concentrates

If the product still has MAFF approval, it should be used in an appropriate application. Otherwise, it must be disposed of via a specialist waste disposal contractor.

Containers

The NRA policy is to dispose of containers via a reputable waste disposal contractor. Other methods of disposal of containers, such as burial and incineration, suggested by the Code of Practice for the Safe Use of Pesticides on Farms and Holdings, produced by MAFF/HSE are NOT to be used by the NRA.

Further information can be found in:

Chapters 6 and 7 of this document.
Agricultural pesticides and water leaflet
Pollution Prevention Guidance Note - Pesticides

APPENDIX II - BASIS QUALIFIED NRA STAFF

Anglian

Chris Adams
Richard Chadd
Terry Clough
Kathryn Eke
Paul Espin
Chris Extence
Sue Hogarth
Sue Loveridge
Eliot Taylor
Louise Waring

Northumbria/Yorkshire

Elaine Axford
Jonathon Brickland
Caroline Essery
Leonore Gilligan
Jim Heslop
Vicky Hirst
Vicki Warren

North West

Elaine Fisher
Steve Garner
Niel Guthrie
Pam Nolan

Severn Trent

Ayleen Clements
Alan George
Phil Harding
Shelley Howard
Ray Martin
Lucy Morris
Pete Sibley
Sarah Thomas
Jonathan Thompson

Southern

Rebecca Dorman
John Frake
Nancy Haylor
David Horne
Robert Pilcher
Bob Slatcher
Cedric Stuart
Nick Williams

South Western

Colin Babb
Jeanette Collett
Steve Griffiths
Paul King
John Ponting
Leen Portlock
Trevor Renals
Mike Williams

Thames

Sarah Davies
Robert Jeffery
Ian Larkins
Bruce McGlashan
Pete Rudd
Ruth Shaw
John Waxman

Welsh

Kate Cameron
John Coombe
Peter Edwards
Teg Jones
Carrie Lane
Hannah Wilkinson

APPENDIX III - CONVERSION TABLES

To convert	To	Multiply by
Yards	Metres	0.9144
$Yards^2$	$Metres^2$	0.836
Acres	$Metres^2$	4047
Acres	Hectares	0.4047
Gallons(UK)	Litres	4.546
$Yards^3$	$Metres^3$	0.76
Metres	Yards	1.0936
$Metres^2$	$Yards^2$	1.196
Hectares	Acres	2.471
Litres	Gallons	0.22
$Metres^3$	$Yards^3$	1.308

Ratios

Solids in Liquids	1 ppm = 1 mg/l = 1:1,000,000 1000 ppm = 1 gm/l = 1:1,000
Solids in Solids	1 ppm = 1g/1000 kg = 1 mg/kg
Liquids in Liquids	1 ppm = 1 ml/1000l = 0.001 ml/l

Useful Reminders

1 m^3 = 1,000l = 220 gallons
1 kg = 1000 g = the weight of 1 l water
1 Ml = 1,000,000l =1,000 m^3
1 l = 1,000 ml = 1,000cm^3
1 g = 1,000 mg
1 ha = 10,000m^2