



Important Stonewort Areas

An assessment of the best
areas for stoneworts in the
United Kingdom (summary)

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This report is a summarised version of *Important Stonewort Areas of the United Kingdom* (see back cover for details).

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Front cover: Uath Lochan is one of 44 key nationally or internationally important ISAs in Scotland, notable for one of the few UK populations of least stonewort *Nitella confervacea*



The extensive network of ditches on the Somerset Levels support the largest UK populations of great tassel stonewort.

Summary

Where are the best places in the UK for stoneworts? This report provides the answer. It offers a comprehensive list of important sites for these fascinating algae, and prioritises those most in need of *in-situ* conservation action.

By collating records from a wide group of organisations and individuals over many years, we have collated an inventory of 118 Important Stonewort Areas (ISA), of both national and European importance, as a prelude to targeted conservation effort. Key stonewort sites have been identified and assessed on the presence of threatened or rare species; of overall species richness; and/or of excellent examples of habitats of particular importance to stonewort conservation. This knowledge will be fed into existing conservation programmes as well as the project to identify and protect a network of the best sites for plant conservation throughout Europe - the Important Plant Areas (IPA).

Contents

Summary	3
Why stoneworts?	4
Ideal homes for stoneworts	6
How sites were chosen	8
Overview: results, protection and threats	10
Map and list of sites	12
Next steps	14
References	15

Why stoneworts?

Box 1: Revised threat status of UK red list stoneworts

(Stewart – in preparation; and can be seen on <http://www.jncc.gov.uk/species/plants/threatened/charo.htm>)

Britain

Baltic stonewort <i>Chara baltica</i>	VU
Bearded stonewort <i>Chara canescens</i>	EN
Bird's nest stonewort <i>Tolypella nidifica</i>	EN
Convergent stonewort <i>Chara connivens</i>	EN
Dwarf stonewort <i>Nitella tenuissima</i>	EN
Foxtail stonewort <i>Lamprothamnium papulosum</i>	nt
Great tassel stonewort <i>Tolypella prolifera</i>	EN
Intermediate stonewort <i>Chara intermedia</i>	EN
Least stonewort <i>Nitella confervacea</i>	nt
Many-branched stonewort <i>Nitella hyalina</i>	EX
Mossy stonewort <i>Chara muscosa</i>	DD
Rugged stonewort <i>Chara rudis</i>	nt
Slender stonewort <i>Nitella gracilis</i>	VU
Slimy-fruited stonewort <i>Nitella capillaris</i>	EX
Starry stonewort <i>Nitelopsis obtusa</i>	VU
Strawberry stonewort <i>Chara fragifera</i>	VU
Tassel stonewort <i>Tolypella intricata</i>	EN

Nationally Scarce species without an IUCN designation

Clustered stonewort <i>Tolypella glomerata</i>
Hedgehog stonewort <i>Chara aculeolata</i>
Lesser bearded stonewort <i>Chara curta</i>
Pointed stonewort <i>Nitella mucronata</i>
Smooth stonewort <i>Nitella flexilis</i>

Northern Ireland

Least stonewort <i>Nitella confervacea</i>	nt
Pointed stonewort <i>Nitella mucronata</i>	EN

IUCN threat statuses, according to IUCN (2001):

- EX** – Extinct;
- EN** – Endangered;
- VU** – Vulnerable;
- DD** – Data Deficient;
- nt** – Near Threatened

Stoneworts are a unique group of complex algae that typically grow in fresh or brackish water that is clear and unpolluted. Thirty species are found in the United Kingdom. They take their name from their encrusted appearance, as most stoneworts build an external skeleton of calcium carbonate instead of using cellulose for structural support as seen in the flowering plants. Evolutionists suspect these remarkable plants may have played a part in the evolution of the earliest land plants (Graham, 1993). If another group of algae - the seaweeds - are the botanical masters of the sea, sometimes reaching hundreds of metres in length, stoneworts are the principal algae of freshwater.

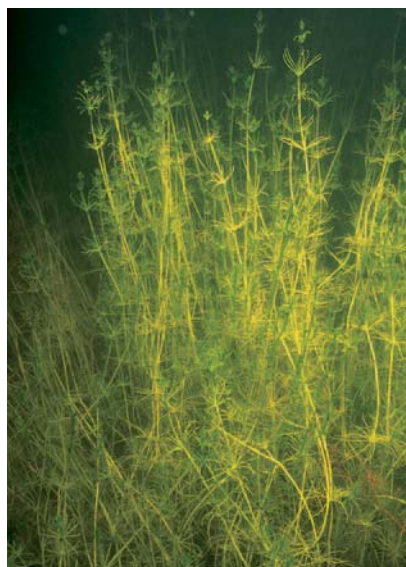
At first glance, stoneworts don't look like algae at all. In fact, they look rather like vascular plants with what appear to be roots, stems and whorls of slender leaves. This appearance led, for a time, to their mistaken classification, with the horsetails *Equisetum*, even though they grow completely under water. Only an anatomical examination reveals their true affinities: these are algae with enormous cells, up to 20 centimetres long, the largest known to science.

Over the years, pond-dipping botanists have often scooped up stoneworts along

with flowering aquatic plants, so a great deal is now known about their distribution and ecology. Stoneworts are amongst the first plants to arrive in a new pond or ditch, where there is plenty of bare substrate for them to attach their rootlike rhizoids. They are often pioneers on the open beds of newly cleaned or created water bodies, often quickly forming dense underwater 'meadows'. As long as nutrient levels remain low, they can persist quite well, but in more nutrient-rich sites they are often swamped by the vigorous growth of flowering plants. In these circumstances, they can survive only if the habitat is kept open by some sort of disturbance – for example, by dredging, livestock poaching, or even wave turbulence near a lake edge. These exacting requirements restrict them to certain habitats such as coastal lagoons, ditches, seasonal pools or meres, marl lakes and calcareous fen pools. Luckily, their durable spores, which can remain dormant yet viable for decades, allow them to persist through periods when conditions are unsuitable.

Most stoneworts are unable to tolerate significant levels of phosphates and nitrates from nutrient pollution and, as a result, they are exceptional indicators of

SUE SCOTT



Under suitable conditions stoneworts can form dense underwater meadows, such as *Chara hispida* shown here.



Formerly the single richest aquatic system in Britain for macrophytes, the Basingstoke Canal has suffered the effects of excess boating, heavy stocking of fish and shading by overhanging trees.

water quality. This pollution is detrimental to stoneworts primarily because it encourages competitors, particularly epiphytic algae, which coat the surface of the stonewort plants, or makes the water too turbid for sunlight to penetrate. Epiphytic algae inhibit nutrient exchange: stoneworts have no vascular system and largely rely on movement of ions through their cell walls. At the same time, stoneworts themselves help to promote clear water. They capture nutrients and help to clarify the water by stabilising sediments, and perhaps even by production of inhibitory chemicals.

Stoneworts are well worth conserving in their own right, and their sensitivity to pollutants makes them the 'canaries' of the freshwater world. As clean water bodies become contaminated with sewage, farming effluent and agricultural run-off, stoneworts are often the first plants to disappear.

Conservation priority

In recent years, stoneworts have undergone a catastrophic decline that has resulted from both the nutrient enrichment, eutrophication, of water bodies, and from the loss of traditional management practices that kept fenland ditches and small ponds and the like open rather than overgrown.

Over 10 years ago, the status of the 30 UK species of stonewort was recorded in the *Red Data Books of Britain and Ireland: Stoneworts* (Stewart & Church 1992). This was the first Red Data book in the UK for any group of non-vascular plants. Today, 17 species in Britain are deemed nationally rare or extinct, together with a further two species in Northern Ireland (see Box 1) that remain relatively widespread in Britain, using the 2001 IUCN threat category criteria (IUCN 2001). Accordingly, stoneworts are among the most severely threatened group of plants or animals in the United Kingdom.

Ideal homes for stoneworts

Stoneworts thrive in aquatic habitats that are relatively free from pollution and offer an abundance of bare substrate in the early stages of succession. Thirteen stonewort habitats are priority or threatened habitats on Annex I of the EU Habitats Directive (see Box 2).

Important stonewort habitats

Ephemeral pools and seasonally-flooded slacks in **calcareous sand dunes** often contain a variety of stonewort species that can tolerate periodic drying out in summer, including bristly stonewort and clustered stonewort. Unfortunately, continued holiday development, dune erosion from recreational pressure, combined with stabilisation of the dune vegetation, as a result of coastal protection work, all remain significant threats. Moderate grazing levels by livestock can help slow the natural succession, and therefore slow dune stabilisation.

Along the western seaboard of Ireland and Scotland, substantial wind-blown accumulations of calcareous shell sand have fostered the development of a rich and unique vegetation type - **machair** - when managed under a traditional crofting regime. Irish loughs and Scottish lochs are a feature of this coastal vegetation, and are of particular interest. These loughs or lochs are often influenced by both the calcareous nature of the dune sand itself, and the acid waters from the adjacent rocky and peaty areas. Stoneworts tend to be best developed on the machair sand, where there are often extensive open communities of rough stonewort. Human population pressure is usually low in these areas although pollution from fish farming and holiday developments is a problem at a few sites.

A number of stonewort species are tolerant of brackish conditions, and as a result **coastal lagoons** on sand and clay are of considerable importance for their specialist, though limited, stonewort

flora, which includes species such as bearded stonewort and foxtail stonewort. Both are nationally rare species listed on Schedule 8 of the Wildlife and Countryside Act 1981. Once, brackish lagoons were scattered around the coast, but today significant examples only survive in Devon, the south-central English coast, the Norfolk Broads, and western Scotland. The southern sites are highly vulnerable to the impacts of diffuse pollution.

Areas of lowland **calcareous fens** – notably the fens of Anglesey, Cambridgeshire, the Norfolk and Suffolk Broads, and the Somerset Levels – and **grazing marshes** support a very rich flora. Stoneworts thrive in traditional peat cuttings and unpolluted drainage ditch systems that are particularly important where the original fenland habitat has been drained and destroyed. Important species of the fenland areas include hedgehog stonewort and dwarf stonewort. The process of natural selection results in the gradual infilling of ditches and peat cuttings if left undisturbed, with the resultant loss of their aquatic plants, and so depend on the periodic dredging and raking out to re-establish the open water habitat. The Norfolk and Suffolk Broads remain particularly important for their stonewort populations, and support the richest stonewort flora of any area in Britain: within the UK, intermediate stonewort and starry stonewort are largely or wholly confined to the Broads. However, these habitats have been damaged severely over the past decades by pollution, natural succession and the impacts of boating and other recreation.

With their inability to survive in dense vegetation, and their demand for clear, unpolluted waters, the **seasonal pools** (often created for watering stock) and **flooded trackways** of Britain's southern heathland districts are particularly important for a range of local and rare ephemeral species. The

New Forest (Hampshire) and the Lizard (Cornwall) are particularly important and include populations of rare and local species such as strawberry stonewort and clustered stonewort. While not greatly susceptible to pollution, such small habitats are highly vulnerable to natural succession if traditional land practices cease. However, restoration of such features can lead to remarkable reappearances of many of these species, as recently witnessed following conservation management work on the Lizard and Kynance Downs.

A number of man-made habitats are of particular importance to stoneworts. The bare substrates of newly created **clay, sand and gravel pits**, combined with their typically unpolluted nature, means that such habitats are often rich in stoneworts. Pits such as the Peterborough Brick Pits and the Cotswolds Water Park are of particular importance for rarer species such as bearded stonewort and lesser bearded stonewort, while Frampton Pits (Gloucestershire) remains the only extant locality for starry stonewort outside the Norfolk Broads. However, quarries and pits often undergo rapid vegetational succession, as willow and other coarse vegetation colonise their banks and shallows: many sites therefore become largely unsuitable for stoneworts within a matter of a few years, without intervention. Poorly-used **canals** are also of importance for stoneworts: two canal systems have been identified as being of particular importance (namely the Basingstoke Canal and the Montgomery Canal) but the future of both sites is in doubt as they are increasingly used for recreational boating. Heavy stocking of coarse fish, the spread of the alien signal crayfish, and the over-shading by trees are all thought to be major threats to the survival of the aquatic interests of the Basingstoke Canal.



The fens of Anglesey (Cors Erddreiniog NNR shown) are the richest complex of sites for stoneworts in Wales, and of particular importance for their populations of endangered dwarf stonewort.

Box 2: Priority stonewort habitats

HABITATS DIRECTIVE CODE	HABITATS DIRECTIVE DESCRIPTION
1150*	Coastal lagoons*
2190	Humid dune slacks
21A0	Machair
3110	Oligotrophic waters containing very few minerals of sandy plains: <i>Littorelletalia uniflorae</i>
3130	Oligotrophic to mesotrophic waters with vegetation of the <i>Littorelletalia uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i> .
3140	Hard oligo-mesotrophic water with benthic vegetation of <i>Chara</i> spp.
3150	Natural eutrophic lakes with <i>Magnopotamion</i> or <i>Hydrocharition</i> -type vegetation
3170*	Mediterranean temporary ponds*
3180*	Turloughs*
3260	Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation
7210*	Calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallinae</i> *
7220*	Petrifying springs with tufa formation (<i>Cratoneurion</i>)*
7230	Alkaline fens

* Priority threatened habitats on Annex I of the EU Habitats Directive

How sites were chosen

Box 3: Definition of an Important Plant Area:

An Important Plant Area (IPA) is a natural or semi-natural site exhibiting exceptional botanical richness and/or supporting an outstanding assemblage of rare, threatened and/or endemic plant species and/or vegetation of high botanic value.

Three basic principles for IPA identification:

Criterion A

The site holds significant populations of one or more species that are of global or European conservation concern.

Criterion B

The site has an exceptionally rich flora in a European context in relation to its biogeographic zone.

Criterion C

The site is an outstanding example of a habitat type of global or European plant conservation and botanical importance.

Interest in stonewort distribution in the United Kingdom began in the mid - nineteenth century, but since then interest in this group has surged and waned. Perhaps the first attempt to systematically identify key stonewort sites for conservation was made by Nick Stewart (1996), who identified around 45 hotspots for this group around the United Kingdom. Considerable additional information has become available since 1996 - much collated by the author - and this report represents a provisional reassessment of the Important Stonewort Areas in the UK. This new stonewort inventory is based on an initial shortlist of candidate sites compiled by noting hotspots of species diversity when distributions were mapped at the 10-km square level; and also a wealth of historic and extant records of uncommon stonewort species was used, collated from a range of data sources, including the Biological Records Centre (BRC), stonewort county floras, and museum herbaria, as well as the author's private records.

The criteria for the selection of Important Stonewort Areas presented here are based on those developed by Plantlife International to aid the process of identifying key botanical sites across Europe: the Important Plant Areas programme (see Box 3). While the European IPA process seeks to identify plant areas of international importance, two classes of important stonewort areas have been identified here: sites of national importance and sites of European importance. Criteria were adapted and developed from the European Important Plant Area programme site selection manual (Anderson, 2002). The application of criteria was critical to the qualification of sites and are briefly summarised in Box 4.

Box: 4

Criterion A:

THREATENED SPECIES

Sites of European importance

All sites thought, or inferred to contain 5% or more, OR the five 'best' sites, of the UK population of species listed as threatened on internationally-recognised red lists.

Sites of UK importance

All significant sites of species listed on Schedule 8 of the Wildlife and Countryside Act 1981 (plus amendments); AND up to five best sites for additional red data list species.

Criterion B:

SPECIES RICHNESS

Sites of European importance

Up to five richest sites (or 10 under exceptional circumstances) for stoneworts within each appropriate level 2 European Nature Information System (EUNIS) habitat type.

Sites of UK importance

All sites with five or more stonewort species present; OR all sites with one red list/near near-threatened species and at least two additional species.

Criterion C:

THREATENED PLANT HABITATS

Sites of European importance

All sites thought or inferred to contain 5% or more of the national resource (by area), or the five 'best' sites, of priority threatened habitats of major significance to stoneworts listed on Annex I of the EU Habitats Directive; OR up to five 'best' sites of other threatened (but non-priority) habitats listed on Annex I.

Sites of UK importance

Not applicable.



Newly created water bodies such as gravel and clay pits often provide ideal conditions for stonewort colonisation. Peterborough Brick Pits now support the largest populations of bearded stonewort in the UK.

Overview: results, protection and threats

Overview of results

A total of 118 sites have been identified as Important Stonewort Areas of either national or European importance. Of these, 38 are regarded as of European (as well as national) importance for their stonewort interest, while 81 are considered to be of national importance. There are 123 sub-sites within 47 site complexes that qualify in their own right as Important Stonewort Areas of at least national importance.

Additional sites - more than 150 in all - were identified as part of this study which did not qualify, on current knowledge, as being of national or European importance and so have not been identified as Important Stonewort Areas. However, they are either of interest at the local level or are known to have been of interest in the past, and further study may permit a reassessment of their interests.

Level of protection for stonewort sites

This inventory of Important Stonewort Areas has made it possible to assess the protection afforded to stoneworts by

national and international statutorily-protected sites. The most important are:

• Sites of Special Scientific Interest/ Area of Special Scientific Interest

A total of 96 Important Stonewort Areas lie in part or in whole within a notified Site of Special Scientific Interest (SSSI) in Britain or Area of Special Scientific Interest (ASSI) in Northern Ireland, representing 81 per cent of the total. While the representation of ISAs in the United Kingdom is well covered by the statutory SSSI and ASSI network, the formal site citations rarely mention this interest specifically, indicating that such sites have been selected for scientific interests other than their stonewort floras. In England the stonewort interest is mentioned for just 7 per cent of the notified sites, whilst the situation is marginally better in Wales and Scotland, with stonewort interests mentioned in 27 per cent and 14 per cent of the formal citations respectively.

• Special Areas of Conservation

Of the 38 ISAs identified as being of European importance by this report, 30 have been designated as (candidate)

Special Areas of Conservation (cSACs) in whole or part - 79 per cent of the total. Important Stonewort Areas that remain unprotected as cSACs are Peterborough Brick Pits, Somerset Levels (both England); Clones-Roslea area (Northern Ireland); and Loch Stack area, Sanday Lochs, Ardmore Pool and Loch Bee, and Isle of Berneray (all Scotland). All eleven Welsh ISAs have been identified as cSACs. A further 19 nationally important ISAs also receive protection through recognition as (candidate) SACs: therefore, 41 per cent of the total listing of 118 ISAs are protected, at least in part, through identification as cSACs.

• **Ramsar Sites** ISAs of European Importance were compared against coverage by the Ramsar Convention on Wetlands, the intergovernmental treaty that promotes the conservation and wise use of wetlands and their resources. In England, 80 per cent of these sites have been recognised as wetlands of international importance under Ramsar. In Northern Ireland one of two of the ISAs of European Importance has been recognised as a Ramsar site – the undesignated Clones-Roslea area may warrant assessment for possible future designation. But coverage in Scotland (7 of 16 sites / 44 per cent) and Wales (1 out of 4 / 25 per cent) is less complete, and this report strongly urges that the relevant statutory agencies review their listing of Ramsar sites taking account of the internationally important sites listed here.

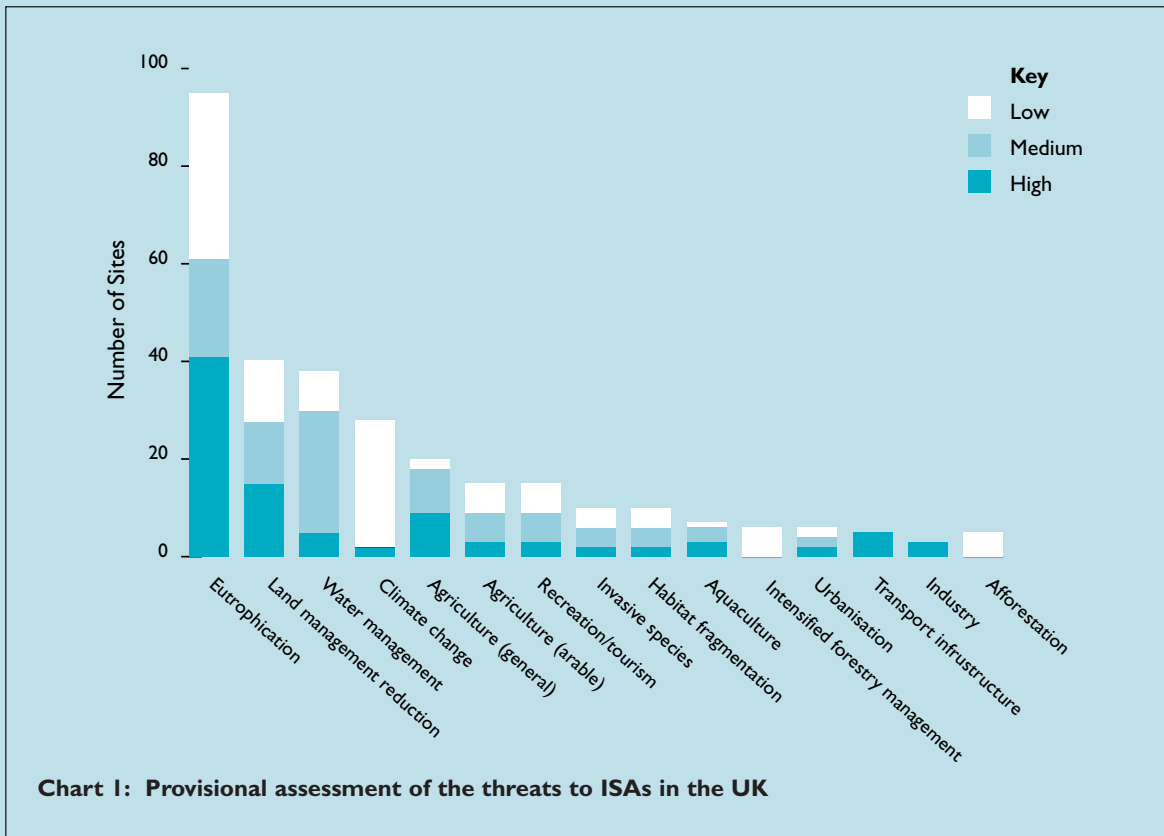
Threats to stoneworts sites

This study identified a total of 15 factors that pose a threat to the 118 ISAs across the UK. This analysis is provisional and may underestimate the level or frequency of some threats.

Most stoneworts are sensitive to **eutrophication**, caused by nutrient pollution, and this was identified as the single most significant threat to ISAs (in terms of number of sites affected to

Eutrophication due to agricultural run-off results in habitats unsuitable for stoneworts





some degree), including many sites already receiving formal protection. The main pollutants that cause damage are phosphates and nitrates, principally from sewage, farming effluent and agricultural run-off. Several sites are in an unstable state with periodic algal blooms utilising the high nutrient loading of enriched waterbodies, and overwhelming the rooted macrophyte vegetation (e.g. Widdicombe Ley, Slapton Ley, Westwood Great Pool and Hickling and adjacent Broads). More than a third of all populations of the UK’s priority stonewort species are threatened by eutrophication.

A second significant threat arises from **abandonment and reduction of land management**, many to a high or

medium level, and this particularly affects smaller water bodies such as seasonal pools and peat cuttings in fen, heathland and sand dune habitats, as well as some man-made habitats such as quarry pools. Many stonewort species flourish best in recently disturbed or newly created water bodies, and are highly vulnerable to swamp and flooded-woodland communities that develop when sites are left unmanaged.

The third greatest threat to sites results from **water management issues**, reflecting the continued reliance of water engineering programmes to manipulate water levels and flows, including water abstraction, canalisation and the introduction of water management systems.

Interestingly the impacts of **sea level rise** as a result of climate change has been identified as the fourth most

significant threat to ISAs, reflecting the lowland, coastal nature of many ISAs in the UK.

Other highly significant threats include the direct impacts of agriculture; the continued spread of non-native invasive species (such as Australian swampweed *Crassula helmsii*, and parrot’s-feather *Myriophyllum aquaticum*); and the harmful effects of habitat fragmentation.

MAP: NIGEL HAWTIN



UK map showing site locations



Eutrophication, caused by nutrient pollution, poses the single greatest threat to stonewort sites in the UK, such as Slapton Ley (Devon) often in spite of formal protection measures.

Important Stonewort Areas list (Bold = European Importance)

1 Marston Vale Clay Pits	29 Malham Tarn	61 Ynyslas	91 Loch Stack lochans
2 Chippenham Fen	30 Hawes Water	62 Llynnau Mymbyr	92 Sandwood Loch
3 Peterborough Brick Pits	31 Sefton Coast dunes	63 Llyn Dwythwch	93 Sanday lochs, Orkney
4 Coldham's Common	32 Gordano Valley	64 Gwent Levels	94 West Mainland Orkney lochs
5 Great Ouse floodplain, St.Neots to St.Ives	33 Lizard heaths and quarries	65 Bosherton Lakes / Stackpole Warren	95 Egilsay lochs
6 Wicken Fen	34 Braunton Burrows	66 Lough Beg	96 Rousay lochs
7 Ramsey area	35 Newton Abbot/Bovey Tracey clay pits and heaths	67 Loughkeelan	97 Central Fetlar
8 Ouse Washes and Block Fen	36 Slapton Ley	68 Ely Lodge Forest	98 Loch of Kirkigarth and Loch of Bardister
9 Quy Fen	37 Tinhay Quarry	69 Lough Navar Forest	99 Loch of Tingwall and Loch of Asta
10 Newborough / Borough / Deeping Fens	38 Widdicombe Ley	70 Lower Lough Erne	100 Scousburgh-Quendale area
11 Shingay-cum-Wendy	39 The Fleet	71 Upper Lough Erne complex	101 Southern Unst
12 Norfolk Broads: Ant system	40 Inglestone Common area	72 Clones-Roslea area	102 Ardmore Pool & Loch Bee, South Uist
13 Norfolk Broads: Bure system, Hoveton to Upton	41 Somerset Levels	73 Dungannon-Auchnacloy area	103 Isle of Baleshare lochs
14 Norfolk Broads: Thurne system	42 Eight Acre Pond, Lymington	74 Lough Neagh	104 Isle of Berneray
15 Norfolk Broads: Muck Fleet and Bure (middle part) systems	43 Fort Gilkicker Moat	75 Isle of Coll	105 Loch Eport inlets, North Uist
16 Norfolk Broads: Yare system (middle part)	44 New Forest	76 Isle of Lismore	106 Loch Ollay area, South Uist
17 Holt to Melton Constable	45 Harbour Farm Lagoons, Bembridge	77 Isle of Tiree	107 Loch Stilligary and Loch Druidibeg, South Uist
18 Narborough area	46 Little Stour valley	78 Ballygrant area, Islay	108 Lochmaddy area, North Uist
19 North Breckland	47 Naccolt Clay Pit	79 Killinallan Dunes, Islay	109 Balranald area, North Uist
20 Grendon Gravel Pits	48 Lower Arun grazing marshes	80 Tayvallich Peninsula	110 Carloway area, Lewis
21 Yardley Chase	49 Thorney Island	81 The Machrins, Colonsay	111 Glen Stuladail, Harris
22 Upper Waveney/Little Ouse fens	50 Epping Forest	82 Black Loch and Long Loch	112 Loch Greivat area, Lewis
23 Frampton Pools	51 Cotswold Water Park	83 Uath Lochan	113 West Benbecula
24 Richard's Wood, Over	52 Basingstoke Canal	84 Loch Watten to Sinclair's Bay area	114 Dunkeld-Blairstown Lochs
25 North Idle Drain	53 Otmoor	85 Loch a'Bhada Dhariach and Lochan a'Chuirn Dubh, North Morar	115 Fincastle/Tulach Hill lochs
26 Lound area gravel pits	54 Stanton Harcourt area	86 Western Ardnamurchan	116 Loch Leven
27 Grafton Flyford	55 Anglesey Fens	87 Loch Loy	117 Loch Moraig
28 Fringes of Thorne Moors	56 Newborough Warren	88 Morrish More and Loch Eye	118 Hawick-Selkirk area
	57 Kenfig Burrows	89 Loch Cill Chriosd, Skye	
	58 Pembrey Coast	90 Durness lochs	
	59 Laugharne/Pendine Burrows		
	60 Llyn Gynon		

Next steps

This provisional list of Important Stonewort Areas draws attention to the UK's most significant aquatic habitats for these important algae. Plantlife International hopes that this exercise will encourage botanists to study and document stoneworts in the wild, and will catalyse and inform future conservation action for this poorly understood group of plants by both the statutory conservation agencies and the non-governmental conservation community.

This report highlights a variety of actions that can promote the conservation of stoneworts in the UK. These include:

- Informing the Important Plant Areas selection process in the UK and elsewhere in Europe
- To draw attention to the stonewort interests and management requirements in statutorily protected sites such as SSSIs, SACs and Ramsar Sites
- Reviewing the designation of statutory protected sites, particularly under the Ramsar Convention
- Addressing the problems of eutrophication in the wider countryside, which continue to impact on the protection of key sites
- Tackling management threats, notably the cessation of traditional management, conversion of areas to arable, the impacts of water management issues, and the effects of global warming (particularly on lowland, coastal sites)
- Producing dossiers on the rarer stonewort species, and the revision of the existing Red Data Book with up-to-date stonewort information.

LORNE GILL



The sand dune and machair systems of the western coast of Scotland are of exceptional importance to stoneworts, but may be at threat from sea-level rise.

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Heavy poaching by domestic livestock create the open conditions favoured by stoneworts. The marl pits of the Crockford Bridge area of the New Forest (Hampshire) support no fewer than eight species.



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