

The Flora of Stodmarsh National Nature Reserve



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Summary

Stodmarsh NNR is a large nature reserve, by English standards, in the valley of the Stour below Canterbury. It is a river floodplain filled with swamps, willow carr, grazing marshes, ditches and pools, and is about 500 ha in extent. At the western end of the reserve is a huge heap of coal mine waste, around which there are large, shallow lakes which formed when the land subsided in the 1930s into the pits below.

The purpose of the current survey was to document the flora and vegetation of the more natural parts of the NNR as fully as possible, in order to identify its features of interest and to inform the management. I have visited the reserve many times over the last eight years (2013-2020) and identified as many species as possible. The report also includes many records by others, both recent surveys and older data from literature and herbaria. Well over 400 species of vascular plants have now been recorded on the reserve. They are listed here in some detail to inform future surveyors of this site.

There are various features for which Stodmarsh is considered important. For decades it has been known as a bird watching site, particularly attractive for migratory species on the subsidence lakes around the coal tip. Another aspect that is often mentioned is the reedbed, which again has primarily an ornithological interest. For decades it has been considered a potential breeding site for bitterns, although a viable population has never been established. Looking back at previous monitoring exercises, the orchids on the spoil heap and some calcicolous plants along the Lampen Wall have attracted much of the botanical attention in the past. One feature of particular importance is the Nationally Rare pondweed *Potamogeton acutifolius*, which occurs in some of the ditches, and had been known here since the 19th century. Two rare snails, *Segmentina nitida* and *Vertigo moulinsiniana*, are also found in the ditches.

The studies presented here show that the real value of this site has not always been recognised. The most important features are the fields of grassland that have never been ploughed or reseeded and the ditches that run between them. They preserve some elements of the vegetation that arose when they were first reclaimed from saltmarsh, about 1000 years ago, which suggests that these fields are some of the oldest unimproved grasslands in Britain.

The vegetation is certainly exceptional. There are communities such as the *Hordeum secalinum* grassland which is not described in the National Vegetation Classification and others, such as the species rich *Eleocharis palustris* swamp, which deserve greater recognition¹. Rare and uncommon plants occur in large numbers and the reserve certainly ranks as a nationally important site for its vegetation at least as much as for its fauna.

This history of Stodmarsh as a reserve reflects some common trends in the British landscape over the last hundred years or so. What originally brought it to the attention of naturalists was when the land in the westernmost portion was acquired by the colliery company in the 1920s, because of subsidence due to mining. In the absence of intensive farming and shooting, the wildlife briefly flourished. At that time, the remaining fields were considered commonplace and lacking in interest.

As time has passed, the western parts have scrubbed over or succeeded to reedswamp, and the features that originally made it so exciting have declined. Attention has gradually switched to the fields in the east which, under relaxed conservation management, are now strikingly similar to the area in the west that originally attracted the naturalists. The long grass and low swamp support a host of plant and animal species, including birds of prey, while the open ditches are rich in rare and scarce plants, snails and beetles. In every case, the specialities are coastal species that reflect the origins of the habitat. While this has happened at Stodmarsh, almost all the other grazing marsh in Kent, which was once such a common and unremarkable habitat, has been drained and subject to increasingly intensive agricultural management.

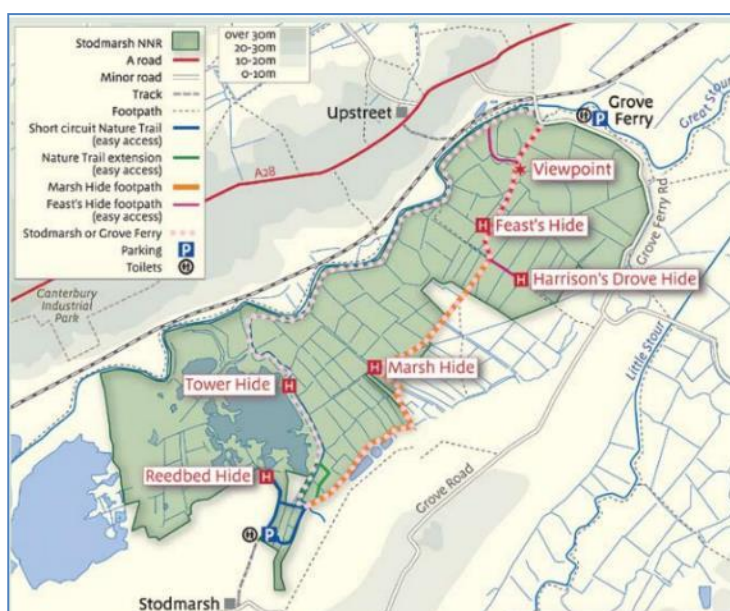
The fields at Stodmarsh are now a rare and invaluable remnant of an ancient, slightly brackish coastal grazing marsh of a quality possibly not equalled elsewhere in Britain. It is essential that continues to be protected, managed and appreciated for its magnificent wildlife and distinctive vegetation.

¹ An *Eleocharis palustris* grassland community has been added to the NVC since that statement was written.

Introduction

A Site Flora is a rather challenging product of botanical recording, being a compilation of everything that is known about the site, with analysis of the features of most importance and any changes that can be detected from the records. In this report I have also included an analysis of the vegetation communities, which turn out to be particularly significant. Site Floras were popular in the 1970s but, owing to the difficulty of handling so much data, they were difficult to produce and have become uncommon, which is unfortunate because they often produce surprising and valuable knowledge about a site and its management, and they provide an evidence-based approach to conservation and monitoring. As the historical research chapter shows, it is a considerable challenge to transmit ecological information from one generation to the next. Readers of this report can play their part if they help to store and pass it on to those who may one day find it useful.

The current version follows on from my draft reports over the last five years. I have vacillated about whether to include the colliery tip, on the grounds that it is not typical of the rest of the reserve; in this version I have excluded it for that reason. Stodmarsh is a wonderful example of a semi-natural ancient habitat, and to include the ruderals and curiosities of the spoil heap would just confuse the account.



The account that follows is based on historical records plus numerous surveys by me with various friends and colleagues since 2013, most of which produced only a few incidental records each time. I have looked for all the species previously recorded and tried to make as full a list for the site as possible. Anything that I cannot find or that has not been seen by someone reliable in recent years is marked with a dagger (†) in the species list section. All recorders, both historical and living, are credited for their records and precise details are given of anything that I have seen, in order to make this report as useful as possible to other researchers and to anyone visiting the site.

This document is not indexed, but if you have the pdf version you can easily find entries for a species by searching {ctrl + f} for its scientific name (which in the main entries is always given in full, not abbreviated). The contents page also allows rapid navigation if you press the {ctrl} button and click on a heading. Compartment numbers are standardised as C1, C2 etc, and ditches in the same way (D1, D2...). There is also a database on which this report is based, which often contains more details than are given here. It is available from the web site of the Botanical Society of Britain and Ireland.

History of recording

Botanical records can be extracted from a variety of places, including herbaria, published reports and Floras, magazine articles and scientific papers. There is currently no comprehensive database of historical records for Kent, so it is not easy to find records relating to Stodmarsh specifically. This is what I have managed to compile so far.

The earliest records traced are from M.H. Cowell's Floral Guide to East Kent of 1839, where he gives several short lists for the Stodmarsh area, supplied by correspondents. Rev T.H.M. Bartlett produced a list of plants at Sturry, 'in the marshes.' This might well have been west of the current NNR (although still within the SSSI) but, in those days, before the coal mine, there was no difference in the habitat. Bartlett recorded *Alisma plantago-aquatica*, *Hydrocharis morsus-ranae*, *Lycopus europaeus*, *Nymphaea alba* and *Valeriana officinalis*. These are all characteristic species of the site now.

In the same publication, Miss Kenrick is credited with records of *Symphytum officinale* and *Utricularia vulgaris*, 'in ditches near Sturry;' William Masters found *Butomus umbellatus*, *Lysimachia nummularia*, *Malva moschata*, *Myosotis scorpioides* and *Ranunculus lingua*; and Miss Sankey recorded *Papaver argemone* and *Symphytum officinale*.

These lists between them are remarkable in that they include many of the characteristic species of the site and three of the Nationally Scarce species, showing that the vegetation is largely unchanged since the early 19th century, with few species that are not there now. The most curious loss is the Comfrey, *Symphytum officinale*. This is now virtually absent from the lower reaches of the Stour and has been replaced by Russian Comfrey, *Symphytum xuplandicum*, but we know Kenrick and Sankey did not confuse them because the latter was not introduced to Britain until 1870. There is no obvious reason why Common Comfrey should have disappeared from the easternmost parts of Kent. The other plant on these lists not currently recorded in the reserve is Prickly Poppy, *Papaver argemone*. This is an arable weed that would probably have been much commoner then, as a casual scattered around and about.

Some of the records in Cowell's Floral Guide are also reproduced in Hanbury & Marshall's 1899 Flora of Kent, but that publication also contains many original records by the authors and other contributors. Frederick Hanbury started recording for the Flora in about 1875, and most of his records and specimens with known dates from this part of the county are from that year. For this reason, I have used 1875 for all his records, although they could have been made at any time before about 1890. Most of his records are very precisely localised to the NNR, with descriptions such as 'Trenches between Stodmarsh and Grove Ferry.' His records give a very good sense of the character of the site, and most of the species are still present (the most interesting exceptions being *Menyanthes trifoliata*, *Triglochin palustris* and *Wolffia arrhiza*).

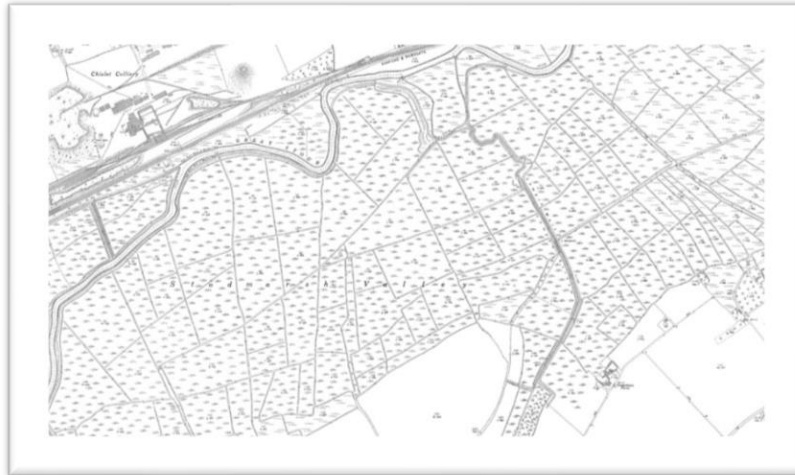
➤ Records for Stodmarsh by F.J. Hanbury, ca. 1875

<i>Chara vulgaris</i>	<i>Lysimachia nummularia</i>	<i>Lemna gibba</i>
<i>Nymphaea alba</i>	<i>Callitriche obtusangula</i>	<i>Wolffia arrhiza</i>
<i>Ceratophyllum demersum</i>	<i>Scutellaria galericulata</i>	<i>Baldellia ranunculoides</i>
<i>Ranunculus sardous</i>	<i>Utricularia vulgaris</i>	<i>Triglochin palustris</i>
<i>Ranunculus lingua</i>	<i>Menyanthes trifoliata</i>	<i>Potamogeton perfoliatus</i>
<i>Ranunculus circinatus</i>	<i>Oenanthe fistulosa</i>	<i>Potamogeton pusillus</i>
<i>Myriophyllum spicatum</i>	<i>Oenanthe fluviatilis</i>	<i>Potamogeton pectinatus</i>
<i>Epilobium tetragonum</i>	<i>Oenanthe aquatica</i>	<i>Zannichellia palustris</i>
<i>Rorippa sylvestris</i>	<i>Spirodela polyrhiza</i>	

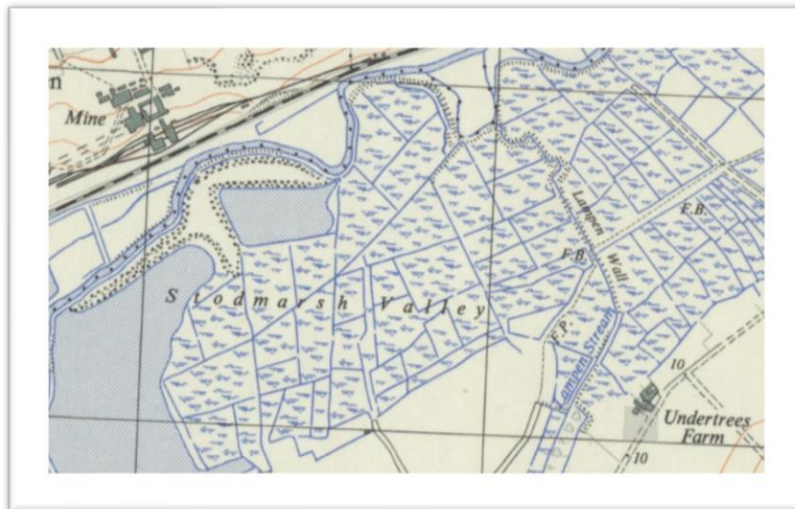
Other contributors to the 1899 Flora were less prolific. The most significant addition was *Potamogeton acutifolius*, found by George Dowker in the 1890s at 'Withamdrewe, west of the Little Stour-Newnham Valley,' which is a pretty good description of our site. Edward Marshall added just one species: *Schoenoplectus tabernaemontani*.

The Chislet Colliery was established in 1914 by the Anglo-Westphalian Coal Syndicate and in 1919 they started extracting coal from beneath the Stodmarsh Valley. Because the bedrock is chalk, the workings were prone to collapse, and they had to pump huge quantities of cement into the ground to stabilise the mine. Nevertheless, the workings regularly fell in, and the ground above began to slowly subside. What had originally been wet grazing marsh now turned into shallow lakes in a process that continued into the 1940s. Presumably the

syndicate was obliged to purchase the now useless farmland, which explains why it began to get overgrown in the 1930s and perhaps why it ended up as part of the NNR when the colliery was closed in 1969.

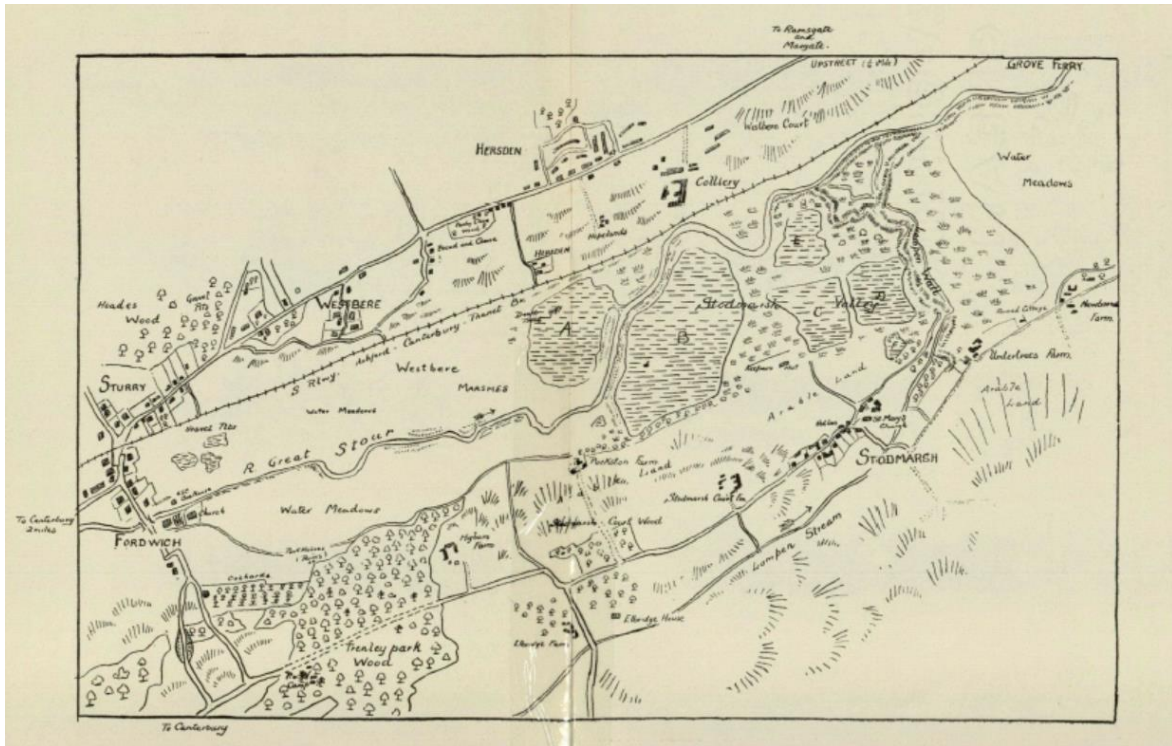


Stodmarsh Valley in the 1920s. The colliery had been established but the pits had not yet collapsed.



The same area in the 1930s. The subsidence lakes started to open up in the late 1920s and continued to expand into the '40s. Note the spoil heap beginning to take shape opposite the mine.

In 1947 Francis Rose led some field trips to Stodmarsh for the Natural History Society of Kings School, Canterbury, with the biology master, C.W. Ward, Esq. They published their findings in the society's newsletter, including a list of some two dozen plants found in the marshes. They were not interested in the 'flood meadows' that make up most of the modern reserve, but concentrated their efforts on the subsidence lakes in the western section. Several other records are very interesting. They claimed to have found *Groenlandia densa*, which is quite possible, and they made the first record for *Myriophyllum verticillatum* and the last one for *Menyanthes trifoliata*. The one record they made which has to be rejected was of *Potamogeton praelongus*, which has never been found in Kent.



Plan of the survey area in 1947 by D. Stainer. Note that the area of interest was entirely in the west of the reserve; the water meadows were considered unimportant and were apparently not even visited.

The attitude of the Kings School naturalists is revealing about the origin of the NNR. They mention that the subsidence lakes had appeared 'in the last fifteen years' and focus much of their attention on the recently abandoned farmland surrounding them. From their perspective, the rapid development of reedbed and scrub was beneficial, but the plants they found were actually relics of the flood meadows that they ignored. At the time, the farmland would have been intensively managed (and the birds shot) while the abandoned land would have seemed full of wildlife.

Their main interest was of course the birds. Undertrees Farm was described as the 'Mecca of the ornithologist' and they were obviously distraught to find a bittern that had been killed by wild fowling. The president wrote: 'Dare one hope that this possible breeding ground of the bittern and the marsh-harrier may, before it is too late, become one of our National Reserves?' As it turned out he could, because Stodmarsh was acquired by the Nature Conservancy just a few years later; but not before half of the marshland had been buried deep in coal mine waste.

The Kings School report may have set the tone for the management of Stodmarsh for the next fifty years, with reedbed and scrub being seen as the real attraction, while the meadows were dismissed as 'rough-grazing... overgrown with tussocks of common rush with, here and there, a grass drove giving access to outlying pastures.' It seems almost incidental that the fields were included in the NNR at all. What has happened since then is a classic example of ecological processes in action. The area that was considered so remarkable in 1947 has succeeded to scrub and reedbed, while the lakes have failed to develop any interesting ecology. In the current report, I have been forced to concentrate almost entirely on the eastern part of the reserve: the blanks on the edge of their map. It is now the western half that is not worth surveying. This was inevitable. It was always the meadows and ditches that were the important habitats for wildlife, and it only took the relaxation of farming and hunting to allow them to flourish.

From the 1940s onwards Francis Rose was active collecting materials for his proposed Ecological Flora. Although it was never completed, his records are beginning to emerge from unpublished documents and specimens; in 1951 he found a rare dandelion *Taraxacum hygrophilum*, and *Oenanthe lachenalii* in 1955.

Eric Philp dominated botanical recording in Kent in the latter half of the 20th century. He was the curator of Maidstone Museum and the BSBI county recorder. On 2nd August 1958 he visited Stodmarsh and collected two specimens of pondweeds. Presumably he also recorded other species, but no record remains of that. The two

pondweeds were sent to J.E. Dandy at the Natural History Museum, who confirmed them as *Potamogeton friesii* and *P. pectinatus* (the latter was collected from the Stour). These two are both still common at Stodmarsh.

Modern recording started in 1974, when Philp visited again and collected *P. friesii* and *P. acutifolius*. It is quite likely that he was looking for the latter, as he would have known about it from Dowker's record. However, there is no dot for it here in Perring & Walters's 1962 *Atlas of the British Flora*, which there should have been. In Philp's subsequent Atlas, Stodmarsh is listed as the only place where it was known to occur in Kent at that time.



Photograph of Stodmarsh by Ian Castle c. 1980, from Philp's Atlas. Note the low vegetation in the meadows and the sparsity of tree cover in the landscape, leaving the ditches in full sunlight.

In 1977 Derek Ratcliffe's Nature Conservation Review was published. This summarises the ecology of all the most important sites in Britain, and Stodmarsh is assigned the status of a Grade 1 site. The intention was to focus attention on the very best places and make sure that they were adequately protected, although since then nature conservation has taken a different direction by designating as many sites as possible and generally not being so concerned with their ecological attributes. In the Nature Conservation Review (often referred to as the NCR) there is a list of what were chosen as characteristic species of the site. This is a compiled list, possibly taken partly from Hanbury & Marshall's Flora and partly from records held by the NCC (which are now lost). The most intriguing species on this list is *Ceratophyllum submersum*, which I suspect is a mistake, as *C. demersum* had already been recorded; but it is possible. *Juncus subnodulosus* is another species on this list that appears not to have been recorded by anyone. In total, eight of the nineteen species in the NCR list are not in the NNR now.

➤ Characteristic species of Stodmarsh listed in the *Nature Conservation Review* (square brackets indicate probable errors)

[<i>Ceratophyllum submersum</i>]	<i>Phragmites australis</i>	<i>Thalictrum flavum</i>
[<i>Comarum palustre</i>]	<i>Ranunculus lingua</i>	<i>Triglochin palustris</i>
<i>Glyceria maxima</i>	<i>Ranunculus sardous</i>	<i>Utricularia vulgaris</i>
<i>Hydrocharis morsus-ranae</i>	<i>Rorippa palustris</i>	<i>Veronica catenata</i>
[<i>Juncus subnodulosus</i>]	<i>Rumex hydrolapathum</i>	<i>Wolffia arrhiza</i>
<i>Menyanthes trifoliata</i>	<i>Schoenoplectus tabernaemontani</i>	
<i>Oenanthe fistulosa</i>	<i>Stellaria palustris</i>	

In 1982 Philp published his first Atlas of the Kent Flora. This contains tetrad maps of species in the county, but unfortunately for us no further details of even the rarest plants. As there is no tetrad (2 km x 2 km square) that falls entirely within the NNR, it is not possible to be certain that any species was actually recorded in the reserve, but it seems a reasonable conclusion that many of them were, especially the more characteristic species of the site. Philp's Atlas was based on records collected between 1971 and 1980, so here I have assigned them the date of 1979, to put them clearly into the correct decade while not exaggerating their antiquity. The recorders' names

are given only in a list at the front of the Atlas, so the records here are all assigned to Philp personally (and the preface suggests that this is not an entirely unreasonable assumption).

Natural England has scientific files on all SSSIs and NNRs, inherited from its predecessors the NCC and English Nature. These scientific files often go back to the 1960s and '70s, or even earlier, but in the case of Stodmarsh there is nothing dated earlier than the 1970s. The files are now available only in digitised form. One of the earliest documents in the file is a 'check list of flowering plants and ferns,' which starts on page 59, suggesting that it comes from a longer report that I have not seen. The check list is undated and anonymous but seems to have been referred to by Gillian Barter (1979) as 'Forbes, J.E. (1978). Species list for Stodmarsh NNR.'

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CHECK LIST OF FLOWERING PLANTS AND FERNS

Scientific nomenclature and sequence follow "Flora Europaea", Tutin, T.G., et al, Eds. Vol 1-5, 1964-80. English names follow Dony, J.G., Rob, C.M., and Perring, F.S., 1974, "English Names of Wild Flowers".

Scientific Name	English Name	Notes
<u>Equisetum fluviatile</u>	Water Horsetail	
<u>E. arvense</u>	Field Horsetail	
<u>E. palustre</u>	Marsh Horsetail	
* <u>Pinus sylvestris</u>	Scots Pine	
* <u>P. nigra</u>	Corsican Pine	
<u>Salix fragilis</u>	Crack Willow	

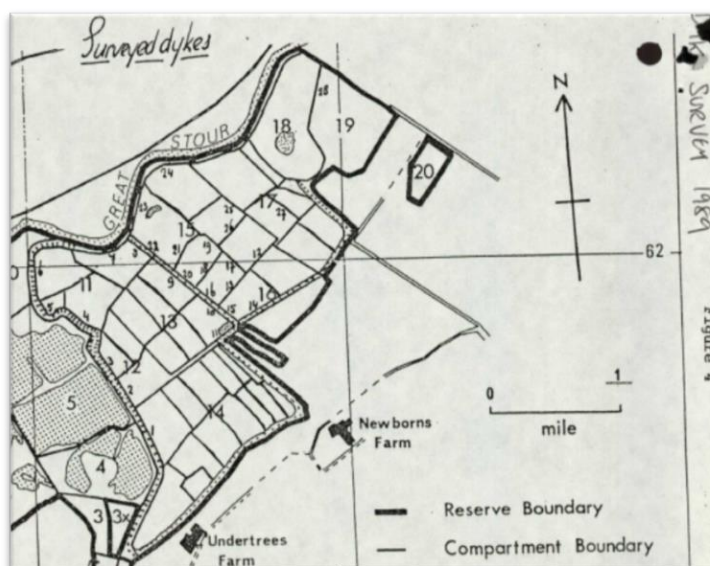
Forbes was based at the NCC regional office at Wye and studied for an MSC at Wye College in the 1970s. His checklist includes some 254 species, including several rare and interesting plants, such as *Samolus valerandi*, which had not been detected before. It also contains many species which seem likely to have been on the spoil heap, and I have excluded them from this report if that seems to be the case.

In 1978 Barter surveyed many SSSIs in Kent, including Stodmarsh, where she made short lists for some of the ditches. Although these were numbered, I do not have the map showing where they were. Her record of *Azolla filiculoides* is the first for the site and shows that this species has been present, on and off, for many years.

Over the next decade or two, the NCC vacillated over what they considered most important about Stodmarsh. There are several rare plant monitoring reports in which people have counted plants that they considered important and drawn detailed maps of where they were. Inevitably, these efforts focused on the western parts of the reserve, which were believed to be the best parts. However, by this time all the characteristic plants had vanished from there and so eclectic things were chosen instead, such as a plant of *Atropa belladonna* and a patch of *Spergularia marina* on the Lampen Wall. These were probably introductions of little significance, ecologically. A lot of effort went into recording the orchids on the spoil heap, but they were just common species (the *Spiranthes spiralis* had not yet appeared). Other species that were monitored included *Lepidium latifolium*, *Ranunculus lingua* and *Stellaria palustris*, which were sensible choices, but no particular attempt ever seems to have been made to protect their habitat and two of them seem to have since gone from the site.

Gradually, the attention of the NCC and, later, English Nature and Natural England, began to shift towards the ditches. In 1989 Paul Glading undertook a ditch survey in the eastern part of the NNR, which does not seem to have survived, but later in the same year Agnes van Dongen and David Painter looked at the western part (but nothing west of the Lampen Wall). They followed the techniques developed by Heather Twigg for the Shropshire Union (now the Montgomery) Canal, with separate lists for the aquatics, marginals and banks, combined with transects. This is a very thorough system for describing the vegetation, although there is no analysis involved. However, we can make use of the records to see how individual ditches have changed over the last thirty years.

Van Dongen's & Painter's survey seems pretty accurate, but I propose some corrections to their data. *Potamogeton obtusifolius* should be changed to



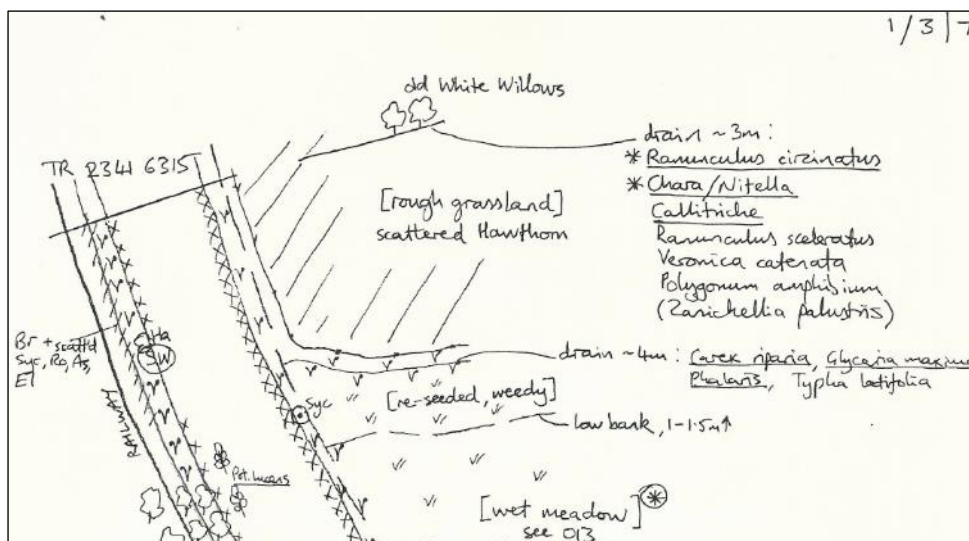
P. friesii, which seems the most likely alternative. *Schoenoplectus lacustris* should probably be changed to *S. tabernaemontani* (it was treated as a subspecies in the 1980s and often ignored). At Stodmarsh *S. lacustris* is mainly (but not exclusively) in the river while *S. tabernaemontani* is generally in the ditches. Their records of *Sparganium emersum* are problematic. I imagine that they saw streamers lying on the surface of the water, in which case it is likely that the plants were *Butomus umbellatus* or a species of *Glyceria*, but it is possible that it was indeed *Sparganium*. Their '*Triplex inundata*' was hard to track down, but I did find an old herbarium sheet that used the name *Atriplex inundata* as a synonym for *Atriplex patula*, so I suppose that is what was intended. *Ranunculus bulbosus* and *Lotus corniculatus* were probably confused with *R. sardous* and *L. tenuis*. Finally, *Veronica anagallis-aquatica* would be easy to mistake for *V. catenata* and I think it would be wise to treat all such records as the latter until the former can be confirmed for the site.

My intention is not to denigrate van Dongen's and Painter's efforts by suggesting these changes. When carrying out a monitoring exercise, someone is generally visiting a site they do not know well and they are expected to identify everything they see, whether it is flowering or not. It is inevitable that errors creep in. Somebody making a simple species list could ignore anything they can't be sure of, but if you did that when making a list that was intended to be used for comparison with later surveys, that would be an error of omission; so there is no solution other than to do your best. However, if we want to be able to use the monitoring data as intended, we have to be able to correct errors to make it compatible with later surveys.

Just a few years later, in 1996, there was a much more extensive survey by Phil Williams and colleagues, which they continued in 1998. The Williams survey is of very good quality and detail: there are few suspect identifications and it is possible to work out almost precisely where everything was found. They sampled well over 100 ditches and identified everything (except charophytes) to species level.

In theory it should be possible to characterise ditches according to their flora, using statistical methods similar to those used for the National Vegetation Classification. In practice, however, such analyses tend to be unsatisfactory. There is no widely accepted or practically useful classification of ditch vegetation, possibly because the plants are too mobile, and the species lists tend to be too short. I have extracted the rare plant records in full detail, in the hope that they might be informative, but even in the case of *Potamogeton acutifolius* there appears to be little correlation between where it was then and where it can be found now, so precise grid references may not turn out to be particularly useful.

In 1991 a River Corridor Survey was carried out by C. Dyson for the National Rivers Authority. A copy is held by the Kent Biological Records Centre. This provides a map of the river and its environs, with notes on the vegetation, and it is a valuable addition to our knowledge (again, possibly, more for the precise locations of rare plants than anything else).



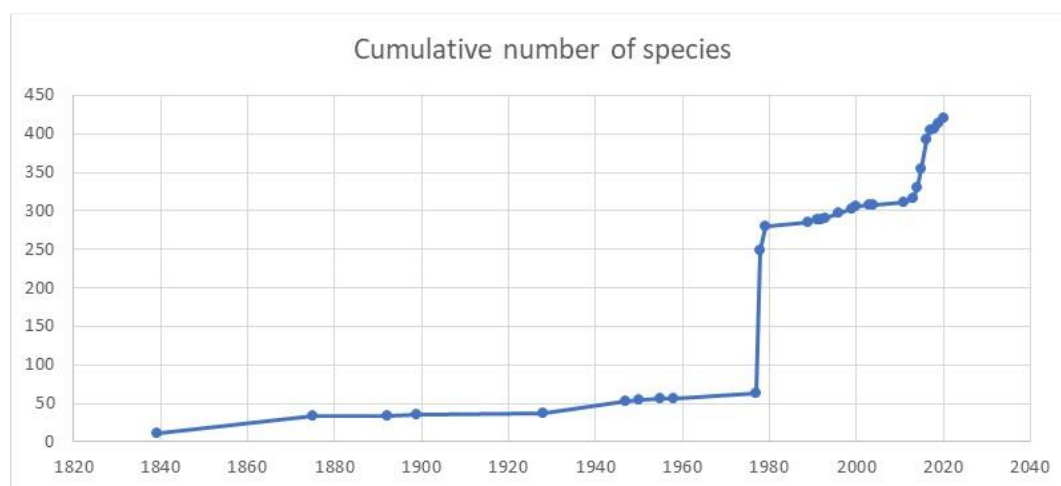
Part of a river corridor survey diagram by C. Dyson, 1991

In 2010 Eric Philp published his second Atlas, the *New Atlas of the Kent Flora*, again on a tetrad basis, so we cannot be confident about the location or date of anything. This adds five or six new species to the site list, including *Sonchus palustris*, one of the Nationally Scarce plants.

Between 2000 and 2010 there were several visits to Stodmarsh by members of the Kent Field Club and others, resulting in short lists of species.

Since 2010 botanical recording in Kent has been transformed by the establishment of the Kent Botanical Recording Group, led by Geoffrey Kitchener and Sue Buckingham. The KBRG has several very competent botanists and they collect full lists by monad (1 km square), enormously increasing the detail of the surveys and the number of records collected. The Botany Group has made quite a few records so far, most particularly a list of 128 species made on a single day in 2014. In the same year Alfred Gay made a list of 79 species on the colliery tip. It was added to by a KBRG visit the following year.

My own surveys have taken place since 2013. I have visited the site many times and at all seasons, making detailed records of interesting plants, recording quadrats and looking for plants that have been found previously. Specimens and photographs have been collected to ensure that identifications are correct, and often the evidence is presented here so that the reader can also be confident of them.



The rate at which new species have been recorded at Stodmarsh

This survey coincided with a major operation in the strengthening of the river embankment in 2015 and 2016, which introduced a large number of alien species to the site, including most of the recent gains. Some were planted in the subsequent restoration, and others were inadvertently introduced. Some of these are so transitory and irrelevant to the ecology of the site that they do not seem worth including in this report, although the records can be found in the database associated with this survey:

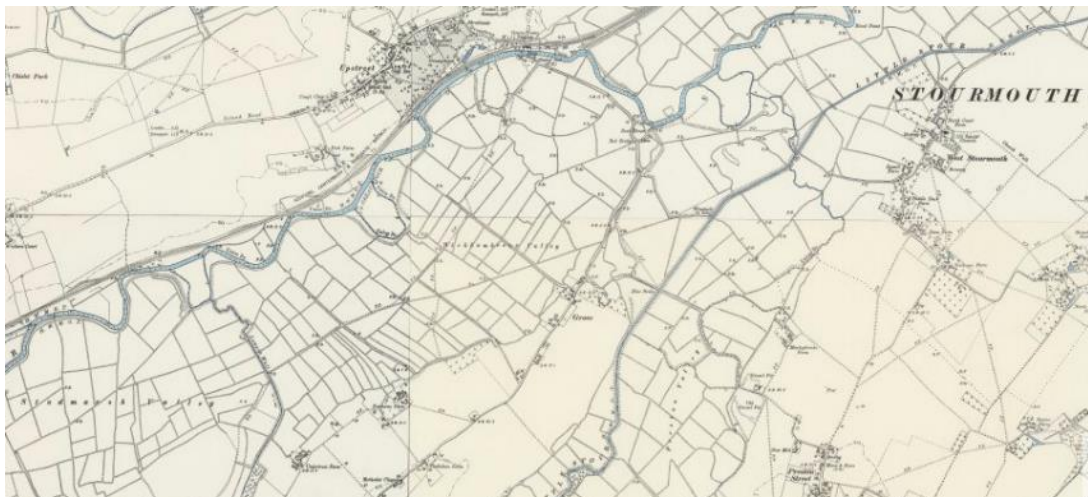
Arabidopsis thaliana (Thale Cress), *Bromus racemosus* (Smooth Brome), *Bryonia dioica* (White Bryony), *Camelina sativa* (Gold-of-pleasure), *Cichorium intybus* (Chicory), *Diplotaxis muralis* (Annual Wall-rocket), *Echinochloa crus-galli* (Cockspur), *Erodium cicutarium* (Common Stork's-bill), *Euphorbia helioscopia* (Sun Spurge), *E. lathyris* (Caper Spurge), *E. oblongata* (Balkan Spurge), *E. peplus* (Petty Spurge), *Fumaria officinalis* (Common Fumitory), *Geranium lucidum* (Shining Cranesbill), *G. rotundifolium* (Round-leaved Cranesbill), *Lepidium didymum* (Lesser Swine-cress), *Malva moschata* (Musk Mallow), *M. neglecta* (Dwarf Mallow), *Mercurialis annua* (Annual Mercury), *Myosotis sylvatica* (Wood Forget-me-not), *Onopordum acanthium* (Cotton Thistle), *Papaver somniferum*, (Opium Poppy), *P. rhoeas* (Common Poppy), *P. dubium* (Long-headed Poppy), *Phalaris canariensis* (Canary-grass), *Silene latifolia* (White Campion), *Solanum lycopersicum* (Tomato), *S. nigrum* (Black Nightshade), *Thlaspi arvense* (Field Penny-cress) & *Triticum aestivum* (Bread Wheat).

Ecology and vegetation

Tracing the origins of the vegetation at Stodmarsh, one can start with the end of the last Ice Age about 13,000 years ago. At that time the area was well above sea level, about 100 m up, and it would have evolved from tundra to forest over a period of a few thousand years. It would presumably have been willow, birch, aspen and pine forest initially, but these species disappeared as the climate warmed until about 5,000 years ago, when it was warmer than now, and broadleaf forest would have dominated the area. The River Stour may have been bigger than it is now, and of course it would have been well above the tides, so at Stodmarsh there would have been freshwater vegetation, quite likely boggy, even peaty, despite the calcareous influence of the chalk downs above. There would probably have been oak woodland on the dry ground and possibly alder woodland along the river valley.

By Roman times things had changed significantly. The sea had risen to almost its modern level as a result of the ice melting and the isostatic rebound of the landmass, and the Wantsum Channel had opened up between mainland Kent and Thanet. This was an arm of the sea at least a mile wide which came as far inland as Stourmouth. Stodmarsh was on the shore and the vegetation was almost certainly saltmarsh. Even now the fields are now only 2 m above mean sea level and they would be regularly flooded by high tides if it were not for the sea defences. However, by about 1,000 years ago the Wantsum Channel had silted up and Stodmarsh was left well inland, easily protected by an embankment along the river, which is shown on the oldest Ordnance Survey maps precisely as it is now. By this time Stodmarsh was therefore fed only by rainwater and the runoff from adjacent fields.

It was the period when Stodmarsh was saltmarsh or saline grazing meadow that was the main determinant of the habitat there now, and it has evidently never been wooded, ploughed or altered much since then. It is reasonable to assume that the vegetation gradually changed from salt marsh to coastal grazing meadow, and the drains were then dug to improve the fields for agriculture. A similar sequence took place in other coastal plains, as at the nearby Minster Marshes and Ash Level, and further afield at Reculver and Seasalter. There are many similarities in the vegetation between these sites, and many relics in the form of salt-tolerant or predominantly coastal species. It is likely that these will slowly disappear as the freshwater influence displaces the salt, but that can be a slow process, and some of the species there now have presumably persisted for centuries.



Ordnance Survey six inch map (1896) of the Stodmarsh area (from the National Library of Scotland web site). Note the field boundaries in the same places as they are now, except where mining subsidence has created lakes.

There is an alternative explanation for the presence of salt-tolerant plants at Stodmarsh, which is that they arrived in the 1953 flood or otherwise recently, but I think this can be discounted. Although there are few historical records of these species at Stodmarsh specifically, they were generally recorded from nearby sites such as Stourmouth, Preston and Sturry, and so the scarcity of records from Stodmarsh is simply because the area was not particularly distinctive at that time, compared with the surrounding marshes. A single flooding event could hardly have modified the soil so much that the vegetation communities were permanently changed.

There are now fourteen main habitats at Stodmarsh: rivers, subsidence lakes, artificial ponds, open ditches, clogged ditches, wet reedbed, dry reedbed, meadow, paths, hedges, willow scrub, alder carr, riparian woodland and the spoil heap. It seems reasonable to describe four of these as relatively natural and ancient: the rivers, open ditches, meadows and alder carr. These are the habitats that have existed for centuries and which would have been carefully maintained by diligent mediaeval farmers. The rest would have been seen as a waste of valuable productive land, to be minimised or eliminated altogether. These habitats are therefore the most ancient – an attribute that cannot be created and which is therefore particularly important for nature conservation.

One can imagine, therefore, that before the deep coal mining began in the 19th century, Stodmarsh was essentially a matrix of flat, level fields of grassland divided by a grid of regularly maintained drainage ditches. There would have been no trees, no lakes or ponds, no hedges, no reedbed. It would have been a very uniform habitat, with more-or-less the same species in field after field, ditch after ditch. The same habitat would have stretched for miles upstream to Fordwich and down to the sea. There would have been little diversity within this area, but it would have had a very particular distinctiveness, for this reclaimed coastal habitat only exists in this form in certain parts of south-east England.

Taking the habitats in the order listed above, (1) the river itself is outside the NNR but within the SSSI and SAC. It has been extensively modified by dredging and ‘canalisation.’ The embankment is ancient, so it has been this way for centuries. The water of the Stour is very turbid along the entire length of the NNR (the turbidity starts abruptly at the ‘Tidal Lake’, TR207612 – above that it is perfectly clear) but aquatic plants are surprisingly abundant beneath the opaque surface. The most common species are *Sagittaria sagittifolia*, *Potamogeton pectinatus* and *P. lucens*. The river is quite heavily used for boating. The smaller Lampen Stream is similarly confined to its channel, but the water is clear and there are beds of *P. lucens* and *Callitriche obtusangula*. I have not explored it except from the bridges, so it might reward further study.

The subsidence lakes (2) date from the 1920s and 1930s and were created when a thin seam of coal was removed from the underlying bedrock, causing the land to collapse in a fairly uniform way for a distance of just a metre or two. The main lake (C5) is said to be surprisingly shallow, and it is reported that the field patterns are still visible beneath the water. The most surprising aspect of these lakes is the almost complete absence of aquatic plants. I do not know why this is: it could be heavy metal toxicity from the spoil heap, grazing by fish or waterfowl, or some other reason. Natural England attribute it to eutrophication from the Stour and have recently (2018-2019) installed a dam to prevent any further inflow of water.

By contrast, the artificial pools (3) are species-rich and varied. The marsh pool (C16A) is full of *Utricularia vulgaris* and *Butomus umbellatus*; Harrison’s Drove pool (C44) has *Potamogeton acutifolius*, various batrachian *Ranunculi*, *Hippuris vulgaris* and abundant *Crassula helmsii*; the viewing platform pool (C45) has *Potamogeton pectinatus* and *Zannichellia palustris* with *Crassula*; whereas the dipping platform pool (C35) and Feast Hide pool (C37) have the same vegetation as is found in the ditches.

These open ditches (4) are without doubt the most significant feature of Stodmarsh. The species-richness and variety are extraordinary, and they contain virtually all the notable features of the site, including *Potamogeton acutifolius*, the water snails *Segmentina nitida* and *Vertigo moulinsiana*, the diving beetle *Hydrophilus piceus*, water voles, *Arvicola amphibius*, and numerous Odonata. I have not attempted to classify the ditches by vegetation, but it is noticeable that some are dominated by pondweeds (*P. acutifolius* and *P. friesii*), others by *Myriophyllum verticillatum* or *Ceratophyllum demersum*, and others by charophytes or bladderwort *Utricularia vulgaris*. Many of them contain brackish-water species such as *Bolboschoenus maritimus* and they almost all have *Hydrocharis morsus-ranae*. It is remarkable that *Crassula helmsii* only occurs in one ditch, but non-native species are certainly not absent: two are completely covered in *Azolla filiculoides*.



Maintenance of the ditches is clearly one of the most important functions of site management, both for water level management and nature conservation purposes. The method used for this looks very dramatic: all the vegetation is dredged out and dumped with the silt on the

adjacent land. This process creates, over time, raised embankments along the edges of the fields which support a different type of vegetation to the level grasslands; often scrub or tall herb. There is remarkably little left in the channel of these ditches following dredging, and algae tends to dominate the newly restored watercourses. But recolonization from adjacent ditches happens quickly. It is not known whether this process permanently changes the flora and fauna or, if the original ecosystem recovers, how long that takes.

Clogged ditches (5) are very different to the cleared ones. These occur where emergent plants such as *Phragmites australis*, *Sparganium erectum*, *Typha latifolia* and *angustifolia*, *Glyceria maxima* and *Schoenoplectus tabernaemontani* fill the channel. Submerged aquatics soon disappear, but other uncommon plants such as *Oenanthe fistulosa*, *Baldellia ranunculoides* and *Samolus valerandi* sometimes thrive, at least for a while. Botanically, the best clogged ditches are the ones which are grazed by cattle.

Wet reedbed (6) is less species-rich than a clogged ditch, because the shade is much deeper. Although it is difficult to survey, there appears to be very little that can survive in a uniform reedbed. A small amount of *Galium palustre* and possibly a few plants of *Typha latifolia* and *Sonchus palustris* is all that might be found in a typical area. Curiously, however, when these reedbeds are cut, the growth of other species is remarkable. *Hippuris vulgaris* can flourish. There are, however, very few patches of cut wet reeds, and the clearing only lasts one summer before the reedbed closes over again.

An RSPB study (Hardman, 2010) found that dry reedbed (7) is better for Diptera (flies) than ditches or wet reedbed. It certainly is not better for plants. At Stodmarsh you might be lucky to find a patch of *Urtica dioica* in an acre of dry reeds, and even that would only be along a track.

The meadows (8) are arguably the second most important habitat at Stodmarsh, and the one that originally made up the majority of the land cover. The vegetation of the grassland is explored in more detail in the following section on communities. It ranges from wet sedge or rush pasture to summer-dry *Hordeum secalinum* grassland, and most of the communities are unique to coastal marshes. The damper areas have rarities such as *Potamogeton coloratus*, *Alisma lanceolatum* and *Veronica catenata* amongst stands of *Eleocharis palustris* and *Agrostis stolonifera*, while the drier grassland has swards of *Trifolium fragiferum*, *Lotus tenuis*, *Carex divisa* and *Juncus gerardii*.

Much of the species diversity in the site is concentrated along the paths (9), several of which are made from imported material on embankments. There used to be patches of *Atropa belladonna* and *Spergularia marina*, and in recent times there have been many weeds and adventives. Of more interest are things like *Petroselinum segetum* and *Sison amomum*, which are found only on the path sides. From the point of view of maintaining the character of the reserve, it would seem better to do away with the paths altogether, and simply have tracks through the fields (as happens at the middle of the reserve, in C22).

Hedges (10) are not a natural feature of the reserve except at the westernmost end, where it abuts arable fields. However, 'hedges' as linear strips of scrub have sprung up or been planted along several paths and ditches, and around bird hides. Planted species include *Salix triandra*, *Crataegus monogyna* and *Cornus sanguinea*; apparently self-sown ones include a wide variety of tree species from *Quercus robur* and *Fraxinus excelsior* to *Juglans regia* and *Prunus cerasifera*. The main effect of these hedges on the vegetation is to act as a source for more woody species to invade the grassland, and in some places whole fields are being colonised by saplings within a year, if left unmown.

One of the few plants that can effectively invade reedbeds is *Salix atrocinerea*, and this is happening rapidly in several parts of the reserve, forming willow carr (11). At first this carr remains very uniform, containing little other than willow and reeds, but the shade cast by the trees soon reduces the dominance of *Phragmites*, allowing other species such as sedges and horsetails to become established. In places along the Lampen Stream the willow carr is well established and contains several species, including *S. alba*, *S. *fragilis*, *S. triandra*, *S. viminalis*, *S. *holosericea* and *S. *mollissima*.

Willow carr eventually succeeds to *Alnus glutinosa* carr (12), which I suspect is the third and least abundant semi-natural habitat at Stodmarsh. It occurs only at the western end, in compartments 2, 14G and 14H. It is very species-rich with a number of uncommon species such as *Lysimachia vulgaris*, *Urtica galeopsifolia* and *Lysimachia nummularia*. The rare hybrid *Myosotis *suzae* occurs in this habitat. The most detrimental aspect of this woodland is that the ditches in it become very shaded and lose many of their aquatics. *Lemna minuta* seems to be the main beneficiary. There does not seem to be any reason to drain an alder carr, though, so unless such a ditch is integral to the hydrology of the site, the easiest solution would be to allow it to silt up.

Alongside the Gt Stour the riparian woodland (13) is very different in character, because it is growing on the mineral spoil of the embankment. This woodland is dominated by *Salix* ^x*fragilis* and *S. viminalis*. Being frequently inundated by the river, it is silty and eutrophic; by summer there is abundant *Urtica dioica*. A few species are largely restricted to this habitat: *Armoracia rusticana*, *Symphytum* ^x*uplandicum* and *Oenanthe crocata* are common.

Finally, the spoil heap (14) itself is part of the NNR. There is no public access, partly because the lichen-rich biological soil crust is considered to be vulnerable to trampling. This area is now about 50% dry birch woodland and 50% open vegetation characteristic of the dry, nutrient-poor soil. It is essentially a weed community, composed of grassland plants, ruderals and a few halophytes. Many of the species are spring ephemerals such as *Trifolium scabrum*, and by late summer the habitat can appear very dry and barren, although *Spiranthes spiralis* is abundant. As this area is so different to the rest of the reserve, it is not included in the remainder of this account.

Vegetation Communities

The grassland at Stodmarsh is primarily coastal grazing marsh, a freshwater habitat with a distinctive element of salt-tolerant species that make it quite different to inland flood meadows. The main component is *Hordeum secalinum*, Meadow Barley, generally with *Agrostis stolonifera* and a suite of coastal species such as *Ranunculus sardous*, *Lotus tenuis*, *Trifolium fragiferum*, *Juncus gerardii* and *Carex divisa*. Curiously there is no NVC classification of this community as far as I can make out, although there are obvious similarities to SM16 *Festuca rubra* saltmarsh. The lack of a *Hordeum secalinum* grassland is a well-known omission from the NVC. If the sward at Stodmarsh is typical, it could be named *Hordeum secalinum* – *Agrostis stolonifera* grassland, and it probably occurs in similar situations around the Thames Estuary and along the East Anglian coast.

As the *H. secalinum* grassland dries out it turns slowly into MG6 *Cynosurus cristatus* or, less likely, to MG5 *Festuca rubra* grassland, and this process can be seen in various stages of succession in a few places at Stodmarsh.

Towards the wetter areas, the proportion of *Agrostis stolonifera* in the sward increases, sometimes until this species forms almost a monoculture. There is a small proportion of *Alopecurus pratensis* here, but it is clearly not MG7 *A. pratensis* grassland. I suggest that this is just the wetter end of the *Hordeum* – *Agrostis* community.

In places there are wet hollows in grazed fields filled with *Alopecurus geniculatus*, Marsh Foxtail. This is a clear example of MG13 *A. geniculatus* grassland in its characteristic form, typically in small patches. These hollows often dry up in the summer, and this plus cattle trampling are possibly key to the formation of this community. It is of limited interest ecologically.

Where the fields are more permanently damp, and possibly less heavily grazed, *Eleocharis palustris* makes an appearance (occasionally with *Crassula helmsii*). Sometimes there is a rather surprising sward of *Agrostis stolonifera* and *E. palustris*, which is probably the S19c *Eleocharis palustris*–*Agrostis stolonifera* community mentioned in the NVC, which is mainly coastal. It was woefully under-sampled in the NVC survey, with just 11 quadrats in total, and possibly none from southern England.

The S19 at Stodmarsh is quite unlike the dreary, species-poor community described, which I have seen in freshwater lakes and pools elsewhere. It is vegetation of the highest importance, ecologically, with an array of rare species. The best stands have abundant *Baldellia ranunculoides*, *Alisma lanceolatum*, *Veronica catenata*, *V. scutellata* and even *Potamogeton coloratus*. At Stodmarsh, this is the characteristic habitat for those species.



Also in the wetter parts of fields there is succession to a number of other swamp communities, most commonly S6 *Carex riparia* swamp, but also S5 *Glyceria maxima* and possibly S18 *Carex otrubae* swamp. These are not particularly noteworthy, but the S14 *Sparganium erectum* near the marsh hide is interesting for its abundance of *Butomus umbellatus*. In places the *Butomus* replaces the *Sparganium* entirely, and if this community was

commoner it might have received its own description in the NVC. However, I think this is just an unusual example of what would normally be a river margin vegetation spreading onto suitable – but artificially created – habitat.

Where the fields have been flooded and left ungrazed, the main community that develops is S4 *Phragmites australis* swamp. This is the most species-poor variety of reedbed, and one of the least species-rich of all vegetation communities, being dominated almost 100% by common reed. It has some value in water quality management and for certain species of birds, but it is almost entirely devoid of botanical interest, except in two regards. Firstly, it seems to have become a suitable habitat for *Sonchus palustris*, Marsh Sow-thistle, which is a Nationally Scarce plant that has become quite abundant at Stodmarsh since it appeared in the 1990s. Secondly, when these reedbeds are cut, there arises a very diverse and interesting community of low-growing swamp species such as *Hippuris vulgaris* and *Oenanthe aquatica*. I believe there is considerable scope for creating high quality habitat at Stodmarsh by regular cutting of areas of wet reedbed, if an economical way can be found to do this.

Wherever the reedbeds are slightly drier, or eutrophicated by river water or other nutrient inputs, the reed swamp is S26 *Phragmites australis-Urtica dioica* fen, which is a more species-rich community that tends to be full of stinging nettle and, often, bramble. There are some more welcome additions, however, such as *Lythrum salicaria*, *Epilobium hirsutum* and *Eupatorium cannabinum*; but no axiophytes.

Most of the ditches at Stodmarsh contain A3 *Hydrocharis morsus-ranae* community, which is quite a rare vegetation type, found in coastal marshes and fenland in southern England. A3 is not considered to be a particularly interesting community: apart from the *Hydrocharis*, which is a Nationally Scarce plant, its only interesting constituent is *Wolffia arrhiza*, which has not been found at Stodmarsh since the 19th century. However, the difference between A3 and the more species-rich A4 is very small. A4 is *Hydrocharis morsus-ranae-Stratiotes aloides* community, and in the NVC is based entirely on samples recorded in the Norfolk Broads. This seems a fairly obvious example of over-sampling in a small area, which one could argue has caused a spurious division of the *Hydrocharis* vegetation into two contrasting communities. It makes more sense to have a broader concept of the H3 *Hydrocharis morsus-ranae* vegetation which allows for species such as *Myriophyllum verticillatum* and *Utricularia vulgaris*. A4 could be relegated to subcommunity status. Rodwell also suggests that this might be the case in his account of the aquatic communities. For our purposes, however, we can consider the ditches to be A3, and note that it is far more species-rich and ecologically important than expected. Other aquatic communities could possibly be described, based on species such as water lilies or hornwort.



➤ A3 *Hydrocharis morsus-ranae* community

In the ditches, and on the edges of lakes, there are tall swamps of S13 *Typha angustifolia* and small areas of S20 *Schoenoplectus tabernaemontani* swamp. I am not sure whether there is enough Greater Reedmace to constitute any S12 *T. latifolia* swamp, but it is a possibility.

Finally, along the rivers, there is some woodland. On the banks of the Gt Stour is W6 *Salix xfragilis* woodland: the typical community of eutrophic lowland rivers in England. Characteristic species include several willows, alder and poplar. The willows are of particular interest to botanists because Purple and Almond willows, *Salix purpurea* and *S. triandra*, have been planted here, and there some uncommon hybrids.

Between the stands of woodland, the riverbank has OV26 *Epilobium hirsutum* tall herb, which can contain some uncommon species such as *Rorippa amphibia*.

The reedbeds have a tendency to succeed to W1 *Salix atrocinerea* carr, which is almost as monotonous as the reedbed it replaces, but along the Lampen Stream the more mature woodland is W5 *Alnus glutinosa* carr, which is typical of peaty soils along mesotrophic rivers. It is not the best example of W5 in Britain, but it does contain some characteristic species such as *Urtica galeopsifolia* and *Lysimachia vulgaris*, and it is of high conservation value.



➤ W5 *Alnus glutinosa* woodland

Species list

Chara globularis Thuill., Fragile Stonewort: rare, in D99, in the middle of the reserve at TR232623 in 2015 (det. T.J. Pankhurst). There appear to be just three previous records of this species in Kent, each with only sketchy details. Some experts consider that all charophytes should be considered axiophytes because of their requirement for clear water, but they are not currently listed as such in Kent, possibly because so little is known about them. From its habitat at Stodmarsh, *C. globularis* would seem a good candidate.



Chara vulgaris L., Common Stonewort: occasional in ditches and pools, most abundantly in ditches around C41, C42 and C47 in 2016. Most plants seem to be var. *vulgaris*, which is a plant with few obvious features; var. *longibracteata* is occasional, and has curved, downward pointing spine cells on the stems (just visible in the picture below); while var. *papillata* is rare (I have only found it in D77 and D152) and has similar spine cells as well as two rows of well-developed stipulodes.



Chara vulgaris var. *longibracteata*

Ophioglossum vulgatum L., Adder's-tongue: in C39 at TR23196220 (Daphne Mills, 18/5/2014). I cannot find it there but have no reason to doubt the record, although to judge from the grid reference there is a possibility that it may have been buried under spoil

when D99 was dredged in the winter of 2014. This is an axiophyte of species-rich grassland and is rare in this part of the county.

Equisetum fluviatile L., Water Horsetail: frequent throughout in ditches and pools. This is an axiophyte of clean water habitats, found in S5 *Glyceria maxima*, S6 *Carex riparia* and S13 *Typha angustifolia* swamps and W5 *Alnus glutinosa* woodland.

Equisetum arvense L., Field Horsetail: occasional throughout, in grassland and hedge bottoms, and often extending into the edges of swamps and ditches, in S26 *Phragmites australis* swamp. Around the boardwalk (C14H) it grows in standing water.



Equisetum palustre L., Marsh Horsetail: mainly at the Grove Ferry end of the reserve, where it is abundant in C62. A good identification tip for this species is to find cones on vegetative stems, as it is otherwise easy to confuse with *E. arvense*.



Azolla filiculoides Lam., Water Fern: completely covering a couple of ditches around C33, near the river at the Grove Ferry, in 2020. It was also in a ditch near the Marsh Hide, where it had been frequent in the 1980s (van Dongen & Painter). This is an invasive non-native species that sometimes forms dense and fast-growing mats over waterbodies, but it cannot survive cold winters, so it tends to disappear again after a while.

Polystichum setiferum (Forsk.) Moore ex Woynar, Soft Shield-fern: one plant in scrub by the path

through C14H (TR22496121, 2020). This is a woodland indicator, and its appearance reflects the increasingly shady conditions in this part of the site.

Dryopteris filix-mas (L.) Schott, Common Male Fern: occasional in scrub and woodland, especially around the mouth of the Lampen Stream. It is a common plant in Kent but almost absent from Thanet.

Dryopteris carthusiana (Vill.) H.P. Fuchs, Narrow Buckler-fern: one plant seen (in May 2016) in W5 *Alnus glutinosa* woodland at TR22416120 (C14H). This is an axiophyte of acid, peaty soils.



Dryopteris dilatata (Hoffm.) A. Gray, Broad Buckler-fern: occasional in woodland in C11 and C14. Another fern that is increasing as a coloniser of secondary woodland.

Taxus baccata L., Yew: one self-sown sapling in scrub by the Lampen Wall, TR223613, in 2017.

Nymphaea alba L., White Water-lily: scattered throughout in ditches and pools. This is a native species of lakes and ditches with mesotrophic water. It has been known at Stodmarsh since 1839 (T.H.M. Bartlett, 'in ditches near Sturry') and is undoubtedly native here. It is a component of the A3 *Hydrocharis morsus-ranae* vegetation.

Nuphar lutea (L.) Smith, Yellow Water-lily: scattered throughout, in ditches and pools; more frequent than *N. alba*. This is more of a river plant than white water-lily, being found in Kent mainly along the Beult, Medway and Stour (Philp, 2010). It is tolerant of more eutrophic conditions.

Ceratophyllum demersum L., Rigid Hornwort: fairly frequent in ditches throughout. First recorded here by F.J. Hanbury c. 1875 and recorded many times since. It is often abundant in waterbodies and is tolerant of quite eutrophic conditions, but it is not common in Kent. The records of *C. submersum*, Soft Hornwort, in the Nature Conservation Review (Ratcliffe, 1977) and Forbes's 1978 Checklist may have been errors for this species.

Caltha palustris L., Marsh Marigold: rare, in wet grassland by Lampen Stream near the car park (C2,

TR221609) and in alder carr nearby. It was found by Williams *et al.* in D128 and D152 but I have not seen it in any of the ditches. It may be decreasing due to the succession of grassland to reedswamp and scrub, or have been cleared out by dredging. It is considered an axiophyte of wet grassland and carr.



Clematis vitalba L., Traveller's Joy: occasional along the river path and the Lampen Wall. This is an uncharacteristic species for the site, being found on calcareous soils. Presumably the bank was built up at some point using calcareous material brought in from elsewhere.

Ranunculus acris L., Meadow Buttercup: occasional in grassland throughout.

Ranunculus repens L., Creeping Buttercup: occasional along paths and in grassland throughout.

Ranunculus sardous Crantz, Hairy Buttercup: frequent in grassland, where it was first recorded by F.J. Hanbury in about 1875. It is characteristic of coastal grazing marshes in north Kent, typically in *Hordeum secalinum* grassland, and it could be a useful axiophyte except that it can also be found on disturbed ground, along paths and even on arable field margins.



Ranunculus sceleratus L., Celery-leaved Buttercup: occasional in ditches, rills and muddy areas in grazed fields. It also springs up quickly in areas of cut S4 *Phragmites australis* fen. This is a common plant of muddy places that can tolerate low to high levels of fertility.

† *Ranunculus lingua* L., Greater Spearwort: first recorded by William Masters in 1839 ('Banks of the

Stour, Grove Ferry') and subsequently by numerous surveyors until 1987 (Natural England) when it was in compartments 6 and 7 (TR218611 & TR216610). This is generally considered to be a plant of freshwater ponds, ditches and wet woodland, but in Kent I suspect that it is more characteristic of ditches in coastal grazing meadows. If correct, then this could be a previously unrecognised native habitat for it. It is (or was) found in similar habitat at Whitstable, Sandwich Bay and Dungeness.

Ranunculus flammula L., Lesser Spearwort: rare, in *Alopecurus geniculatus* grassland in C22 (TR232623) in 2014 and in D99 (TR231622) in 2020. It has previously only been recorded by Forbes in 1978. An axiophyte of slightly acid wetlands in Kent.

Ranunculus trichophyllus Chaix, Thread-leaved Water-crowfoot: occasional in ditches, specifically D77, D80 & D99, and possibly also in two ditches in C62 near Grove Ferry. An axiophyte of ponds and ditches. These plants have small flowers (petals 5 mm) with a semi-circular or lunate nectar pit and no laminar leaves. The petals are not contiguous (adjoining each other). It was apparently new to the site in 2015.



Ranunculus aquatilis L., Common Water-crowfoot: rare, in pools in C15A (TR224621) and C44 (TR234622). This is a common pond plant in Kent but it has not been recorded at Stodmarsh before 2014; it is distinguished from the following by its round nectar pits and shorter peduncles, and from the former by its contiguous petals.



Ranunculus peltatus Schrank, Pond Water-crowfoot: in shallow water in the scrape in front of Harrison's Drove Hide, C44 (TR234623). These plants had peduncles elongating in fruit to 5 cm or more and pear-shaped nectar pits on the petals. This species is considered scarce in Kent.



Ranunculus circinatus Sibth., Fan-leaved Water-crowfoot: rather sporadic in its occurrence in ditches and pools. It was scarce in the pool in front of Harrison's Drove Hide (TR23436229, C44) in 2016 but more recently has become abundant in D82 (M. Cousins, 2019) and the recently dredged D84. It was first recorded by F.J. Hanbury at 'Grove Ferry' in about 1875 and there are occasional records of it since then. This is an axiophyte of low-nutrient open water, mostly in coastal parts of Kent.



Ficaria verna Huds., Lesser Celandine: abundant along the rivers and in hedges around the Stodmarsh car park; a common plant of damp soils everywhere.

Thalictrum flavum L., Meadow-rue: a sizeable patch in the field margin at Stodmarsh Court Farm (TR21846114) which is just within the NNR, and further west at Higham Farm (still within the SSSI, TR19876022). This is an axiophyte of riparian grassland and woodland. At Court Farm the margin is cut but ungrazed, whereas as Higham it is around a pool next to a farm track, where cattle frequently drink. The only other current site for it in East Kent is also by the Gt Stour, near Wye (L. Rooney, 2011).



Ribes rubrum L., Red Currant: occasional in the woodland in C2.

Ribes nigrum L., Black Currant: in open, wet woodland in C2. This is arguably a native species of W6 *Salix* ×*fragilis* woodland in Britain, and it could be counted as an axiophyte in this habitat; but there is a counter argument that it is an ancient introduction and it has spread to these woods (as has Red Currant).

Crassula helmsii (Kirk) Cockayne, New Zealand Pigmyweed: abundant in the pools in front of the bird hides, most notably at the Marsh Hide (C16A), Harrison's Drove (C44) and the viewing platform (C45). It also spreads into wetland vegetation in places like C15 and C59. This species is listed on Schedule 9 of the Wildlife & Countryside Act as an invasive non-native weed but efforts to control it are largely in vain. The mite *Aculus crassulae* was introduced in 2018 but so far there is little sign of any reduction. What *Crassula* favours is permanently wet areas in full sunlight, but it curiously does not seem to colonise the ditches – only the bird lakes, rills and wet reedbed.



Myriophyllum verticillatum L., Whorled Water-milfoil: frequent throughout, in ditches and pools. This is a Nationally Scarce plant and an axiophyte of base-rich still water which was first recorded here by Ward and Rose in 1947. Some of the smaller plants have leaves in whorls of 4, which would normally key out to *M. spicatum*, but late in the year they develop turions, so they must be *verticillatum*. This may account for several records over the years of *M. spicatum*, but I have not found that species in the reserve.



Myriophyllum spicatum L., Spiked Water-milfoil: in the Stour at Grove Ferry (TR2363, C. Osborne, 2014). It was also recorded by F.J. Hanbury in c. 1875 'between Stodmarsh and Grove Ferry.'

Lotus tenuis Waldst. & Kit ex Willd., Narrow-leaved Bird's-foot-trefoil: frequent in grassland. An axiophyte of neutral grassland and grazing marsh; it occurs in the *Hordeum secalinum* grassland. This is one of the plants of the coastal element in the Stodmarsh flora. It was listed by Forbes in 1978 but was otherwise overlooked until 2012, when it was found by Colin Osborne. Some of the older records of *L. corniculatus* therefore seem likely to be errors for this species.



Lotus corniculatus L., Common Bird's-foot-trefoil: occasional in grassland, but much rarer than the above species. Large plants growing along the path at TR228619 (S. Buckingham, 2018) are the introduced var. *sativus* Hyl., which suggests that a seed mix might have been used there at some point.

Lotus pedunculatus Cav., Large Bird's-foot-trefoil: in wet grassland and fen by the Lampen Stream near the Stodmarsh car park, at TR221609 (C2).

Vicia cracca L., Tufted Vetch: occasional in fen by the paths, at TR221609 & TR221612.

Ervum tetraspermum L., Smooth Tare: a large patch by a path in C17C (TR23416285) in 2014.

Vicia sativa L., Common Vetch: occasional in grassland.

Lathyrus pratensis L., Meadow Vetchling: occasional in grassland and hedges.

Lathyrus nissolia L., Grass Vetchling: occasional in grassland towards the middle of the reserve (C21-C23).

Medicago lupulina L., Black Medick: occasional in grassland and on paths.

Medicago arabica (L.) Huds., Spotted Medick: locally abundant in the dry meadows near Grove Ferry (C42, 46 & 47); otherwise largely as a casual weed along paths.

Trifolium repens L., White Clover: frequent in grassland and on paths.

Trifolium fragiferum L., Strawberry Clover: frequent in meadows and occasional along paths. This is an axiophyte of coastal grazing marshes; it occurs in the *Hordeum secalinum* grassland.



Trifolium campestre Schreb., Hop Trefoil: a few plants in the car park at the Stodmarsh end and some scattered patches along paths.

Trifolium dubium Sibth., Lesser Trefoil: occasional in grassland.

Trifolium micranthum Viv., Slender Trefoil: rare, along the path to Grove Ferry (TR23466296) in 2016.

Trifolium pratense L., Red Clover: frequent in the grassland. There is a robust agricultural strain (var. *sativa*) with hollow stems that occurs along the river path, having been sown there in 2015/16 as part of a seed mix.

Prunus cerasifera Ehrh., Cherry Plum: although not recorded before 2014, this tree is scattered throughout, along paths, in the car park and along the river.

Prunus spinosa L., Blackthorn: occasional in hedges and scrub.

Prunus domestica L., Wild Plum: I have only seen one tree, along the path at Harrison's Drove, TR234622.

Prunus avium (L.) L., Wild Cherry: rare, in coppiced hazel woodland at the western end, TR222610.

Pyrus communis L., Pear: one tree on the Lampen Wall at TR22366143.

Malus domestica Borkh., Apple: a few scattered trees, in a hedge near the car park (TR22116097), on the riverbank at TR23026284, and in the lane to Parsonage Farm (TR230620).

Malus ^γpurpurea (E. Barbier) Rehder, Purple Crab: a couple of shrubs in a planted hedge in C62.

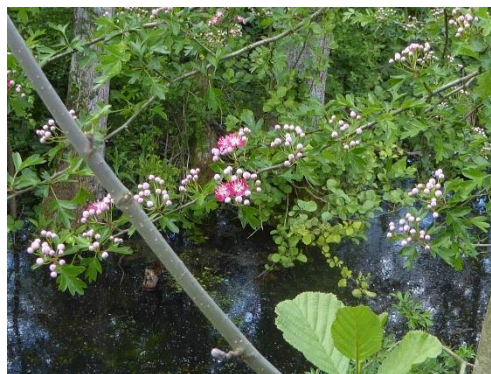
Sorbus aucuparia L., Rowan: in a hedge by the Stodmarsh car park.

Crataegus persimilis Sarg., Broad-leaved Cockspurthorn: one tree by the road in C62 (TR23516310), presumably planted but established now in otherwise native scrub.

Crataegus monogyna Jacq., Hawthorn: occasional in hedges and scrub, especially in lanes around the edges and along the river path. Many of the trees in the fields appear to be intermediate between *monogyna* and *laevigata*, although the flowers all seem to have just one style and so are closer to *monogyna*.



Crataegus laevigata (Poiret) DC., Midland Hawthorn: one small tree in woodland by the path in C14H. It has red petals and could be a self-sown specimen of the cultivar 'Crimson Cloud.'



Filipendula ulmaria (L.) Maxim., Meadowsweet: scattered throughout, in ditches and swamps.

Rubus fruticosus L., Bramble: occasional throughout in hedges, scrub and any patches of grassland that have not been mown recently.

Potentilla anserina L., Silverweed: locally abundant in grassland and swamp.

Potentilla reptans L., Creeping Cinquefoil: frequent along paths and occasional in grassland.

Fragaria ananassa (Duchesne) Duchesne, Garden Strawberry: a couple of plants by the path to the Reedbed Hide, TR22146122, in 2017. Presumably planted there.

Geum urbanum L., Wood Avens: occasional in hedges and scrub.

Agrimonia eupatoria L., Agrimony: occasional in grassland.

Rosa arvensis Huds., Field Rose: in woodland at the western end, TR222610.

Rosa canina L., Dog Rose: occasional in hedges and scrub throughout. Many, if not all, plants are possibly *R. x dumalis* Bechst. (*caesia* x *canina*), Glauous Dog-rose, which is thought to be very common in Kent. I have not attempted to identify all the plants at Stodmarsh, but a shrub in the hedge east of the Marsh Hide, TR229619, appears to be of this type.



Ulmus glabra Huds., Wych Elm: several shrubs in wet woodland by the path in C2 (TR222610), and one tree by the side of the road at Grove Ferry (C62).

Ulmus procera Salisb., English Elm: occasional in hedges and scrub around the edges.

Ulmus minor Mill., Small-leaved Elm: rare, in the hedge of the lane by the Stodmarsh car park.

Humulus lupulus L., Hop: occasional in hedges and wet woodland at the Stodmarsh end, spreading in recent years along the Lampen Wall.

Urtica dioica L., Stinging Nettle: frequent in woodland and around bird hides; scattered throughout.

Urtica galeopsifolia Wierzb. ex Opiz, Fen Nettle: abundant in W5 *Alnus glutinosa* woodland along the

Lampen Stream at the west end of the reserve, compartments 2 & 14 (conf. M.F. Godfrey). Some plants are very tall, up to about 8ft. in height. It is recognisable by its narrow leaves and it has less sting than common nettle. There are no old records of this in Kent because it was not widely recognised as a British species until recently.



Quercus robur L., Pedunculate Oak: rare, scattered throughout.

Juglans regia L., Walnut: a couple of saplings, about 5 ft. high, by paths at TR22316120 and TR23066273; presumably planted.

Betula pendula Roth., Silver Birch: surprisingly rare - a few trees in a hedge in the middle of the reserve at TR229619 and one sapling in a hedge by a ditch at TR225612.

Alnus glutinosa (L.) Gaertn., Alder: frequent in woodland and by the river. This is the most characteristic plant of W5 alder carr which occurs along the Lampen Stream at the western end of the reserve. Some of the alders are dying of 'alder pox' (*Phytophthora alni*). In the picture below the tree on the left is dead, the one in the middle is diseased and has a thin crown, while a third tree on the right is healthy. This is quite normal in cases of alder pox, which rarely wipes out a population, but it often weakens trees sufficiently that they are eventually replaced by willows.



Alnus glutinosa with *Phytophthora alni* infestation

Corylus avellana L., Hazel: in hedges and scrub at the western and eastern ends.

Corylus maxima Mill., Filbert: a purple cultivar, planted along the path from Grove Ferry, TR234630.

Euonymus europaeus L., Spindle: a small patch in scrub on the edge of C62 (TR234630).

Populus x canadensis Moench cv. 'Robusta', a hybrid Black Poplar: in wet woodland by the Lampen Stream in C14H (TR222610) and at the western end of the reserve (C7I and C6F, TR212610). This is a commonly planted tree that is suited to river floodplains.

Salix x fragilis L., Crack-willow: occasional in woodland and by the river. This is one of the characteristic species of W6 riparian woodland, of which there are some good stands by the Stour and in C14 (and, to a lesser extent, in C6 and C7). It is considered to be a hybrid because it does not produce viable seed, but it reproduces freely from broken-off branches.

Salix alba L., White Willow: in wet woodland in C14 and a few scattered trees in hedgerows elsewhere. It is planted wherever it occurs, and is considered an archaeophyte (ancient introduction) in Britain, but it is a suitable tree for W6 *Salix x fragilis* woodland and mature specimens are a valuable part of the habitat.

Salix triandra L., Almond Willow: a sizeable stand by the Stour at TR22726241 and planted as cover around some hides. This is considered to be an archaeophyte in Britain, although it is well naturalised in some places. In Kent it is generally not so well naturalised, and the stands at Stodmarsh appear planted.

Salix x mollissima Hoffm. ex Elwert. (*triandra* x *viminalis*), Sharp-stipuled Willow: a patch of scrub near the Stour at TR220619 (13th July 2016, conf. I.V. Belyaeva). This appears to be a spontaneous hybrid, not previously recorded in Kent.



Salix purpurea L., Purple Willow: several trees on the banks of the Stour, TR22796254. This looks like an old withybed; the trees were obviously planted, originally, but are thriving here. *Salix purpurea* is not native in Kent.



Salix viminalis L., Osier: occasional along the Stour and by a pond at TR232626; also planted around some of the hides.

Salix x holosericea Willd. (*viminalis* x *atrocinerea*), Silky-leaved Osier: a couple of shrubs by the river path (TR22766249, 2015, conf. I.V. Belyaeva, and TR223622), and by ditches at the western end (C6F, TR217610 and C14G, TR223611).

Salix caprea L., Goat Willow: a few shrubs along the edge of the swamp by the path to the reedbed hide (C3, TR221612).

Salix x quercifolia Sennen ex Goerz (*caprea* x *atrocinerea*), Grey x Goat-willow: a couple of shrubs by the river path at TR22166182 and TR22766248.

Salix atrocinerea Brot., Grey Willow: occasional throughout. This can be a very invasive species, sometimes filling shallow ponds or coming to dominate wetlands. This is one of the few species that can colonise the reedbeds and in places it has to be cleared to prevent succession to woodland.

Hypericum perforatum L., Perforate St John's-wort: a small patch by the side of the path to Grove Ferry (TR234629) in 2019.

Hypericum tetrapterum Fries, Square-stalked St John's-wort: on the edge of a field at TR23086210.

Geranium dissectum L., Cut-leaved Crane's-bill: occasional in disturbed areas.

Geranium pusillum L., Small-flowered Crane's-bill: in a field gateway in C20 (TR23226219).

Geranium molle L., Dove's-foot Crane's-bill: occasional in grassland.

Geranium robertianum L., Herb-robert: occasional in scrub, mainly along the riverbank.

Lythrum salicaria L., Purple-loosestrife: occasional in wet woodland, swamps and ditches.

Epilobium hirsutum L., Great Willowherb: frequent throughout in reedbeds, swamps and wet woodland.

Epilobium parviflorum Schreb., Hoary Willowherb: occasional in marshy grassland and wet woodland.

Epilobium tetragonum L., Square-stalked Willowherb: rare in grassland at TR233622 (conf. G.D. Kitchener). Previously recorded (as *E. adnatum*) by F.J. Hanbury c. 1875, 'between Stodmarsh and Grove Ferry.'

Epilobium ciliatum Raf., American Willowherb: frequent in a recently cut area by the boardwalk, TR224612.

Chamerion angustifolium (L.) Holub, Rosebay Willowherb: a few plants in reedbeds by the path in C11C (TR220618).

Circaea lutetiana L., Enchanter's-nightshade: a good patch on the edge of the reedswamp by a hide, TR234628.

Acer platanoides L., Norway Maple: one small shrub in the hedge by the path in C11D (TR220618).

Acer campestre L., Field Maple: in the hedge of the lane into the reserve from the Stodmarsh car park; and along the river path at TR223622, where it was presumably planted in a hedge.

Acer pseudoplatanus L., Sycamore: rare, but scattered throughout.

Malva sylvestris L., Common Mallow: occasional along paths.

Reseda luteola L., Weld: rare, along the Lampen Wall and the river path in a few places.

Capsella bursa-pastoris (L.) Medikus, Shepherd's-purse: occasional in field gateways and along paths.

Barbarea vulgaris R. Br., Winter-cress: on muddy ground in C10A, in an area recently cleared of scrub for flood defence works in 2018.

Rorippa palustris (L.) Besser, Marsh Yellow-cress: a few plants in scattered locations, as on the path at TR23126216 and by the lake near the Tower Hide at TR221617.

† *Rorippa sylvestris* (L.) Besser, Creeping Yellow-cress: recorded by F.J. Hanbury c. 1875 (Hanbury & Marshall, 1899) (as *Nasturtium sylvestre*) 'by the river near Grove Ferry.'

Rorippa amphibia (L.) Besser, Great Yellow-cress: one patch in tall herb by the river at TR23026284 in 2015 (det. T.C.G. Rich). This is an axiophyte of riverbanks; it occurs in S26d *Epilobium hirsutum* vegetation. There are currently only a few known sites for it in East Kent.



Nasturtium officinale W.T. Aiton, Watercress: occasional in ditches.

Armoracia rusticana P. Gaertn., B. Mey. & Scherb., Horseradish: several plants on the river bank at TR23366312.

Cardamine pratensis L., Cuckooflower: occasional throughout.

Cardamine flexuosa With., Wavy Bittercress: occasional in wet woodland at the Stodmarsh end.

Cardamine hirsuta L., Hairy Bittercress: occasional along gravel paths at the western end.

Lepidium latifolium L., Dittander: large stands in three places close to the river and scattered elsewhere. This is normally a coastal plant, growing on shingle beaches and in rough grassland near the sea. It is also found along the River Stour as far inland as Canterbury. It is Nationally Scarce and in its natural habitat could arguably be an axiophyte but it is also widely established outside its natural range. At Stodmarsh it is thriving and noticeably increasing, forming some extensive stands.



Lepidium draba L., Hoary Cress: rare, along paths and around Harrison's Drove hide.

Lepidium coronopus (L.) Al-shehbaz, Swine-cress: rare, in field gateways and path edges.

Brassica rapa L., Wild Turnip: occasional weed on paths.

Brassica nigra (L.) Koch, Black Mustard: rare casuals on the Lampen Wall and river embankment.

Sinapis arvensis L., Charlock: occasional along paths and on disturbed ground.

Hirschfeldia incana (L.) Lagr.-Fossat, Hoary Mustard: occasional on the Lampen Wall and on disturbed ground.

Sisymbrium officinale (L.) Scop., Hedge Mustard: on disturbed ground at Harrison's Drove hide and in the car park at the Stodmarsh end.

Alliaria petiolata (M. Bieb.) Cavara & Grande, Garlic Mustard: occasional in hedges and by paths, particularly in the alder carr at the western end.

Persicaria amphibia (L.) Gray, Amphibious Bistort: frequent in pools, ditches and marshy grassland.

Persicaria maculosa Gray, Redshank: occasional in disturbed areas and along paths.

Persicaria lapathifolia (L.) Gray, Pale Persicaria: on bare ground seasonally inundated places, as along a newly laid path at TR234628 and in a hollow in C15.

Persicaria hydropiper (L.) Spach, Water-pepper: rare, in a swamp at TR23266260.

Polygonum depressum A. Cunn. ex Meisn., Equal-leaved Knotgrass: occasional along paths.

Polygonum aviculare L., Knotgrass: occasional along paths and in trampled fields.

Fallopia convolvulus (L.) Á. Löve, Black Bindweed: in woodland by the Stour and by paths.

Rumex acetosa L., Common Sorrel: rare, in grassland by paths.

Rumex hydrolapathum Huds., Water Dock: frequent in ditches. This is an axiophyte of rivers and wetlands; it occurs in A3 *Hydrocharis morsus-ranae*, S5 *Glyceria maxima* and S6 *Carex riparia* vegetation.

Rumex crispus L., Curled Dock: occasional in fields.

Rumex conglomeratus Murray, Clustered Dock: occasional in ditches and swamps.

Rumex sanguineus L., Wood Dock: occasional in the woodland.

Rumex obtusifolius L., Broad-leaved Dock: occasional on the edges of paths.

Stellaria media (L.) Villars, Chickweed: occasional, on paths and bare patches in grassland.

Stellaria holostea L., Greater Stitchwort: along the lane from the Stodmarsh car park and along the path towards the Reedbed hide.

† *Stellaria palustris* Retz, Marsh Stitchwort: found by Miss Belton in 1928 ('marsh SW of Grove Ferry') and seen there by various people until at least 1955 (Francis Rose). The Nature Conservancy Council had a plan showing it by a ditch by the river at TR226623 ('two plants') in 1987, but it has not been recorded since then. This is an axiophyte of fens and sedge swamps, often by rivers.

Cerastium fontanum Baumg., Common Mouse-ear: occasional in car parks and along paths.

Cerastium glomeratum Thuill., Sticky Mouse-ear: rare, on paths.

Stellaria aquatica (L.) Scop., Water Chickweed: rare, in wet woodland near the Lampen Stream in C2 (TR222610). Previously recorded on the banks of the Stour by C. Dyson in 1991. This is an axiophyte of riverbanks and wet woodland.

† *Spergularia marina* (L.) Griseb., Lesser Sea-spurrey: formerly known along the Lampen Wall at TR220620, where it was recorded by NCC surveyors in 1985 and 1987. It was presumably a casual here.

Spergularia rubra (L.) J.S. & C. Presl, Sand Spurrey: a good-sized patch in cattle-poached ground in C15D in 2019; previously recorded only on the colliery tip.



Silene xhampeana Meusel & K. Werner (*latifolia* x *dioica*), Hybrid Champion: a few plants near the marsh hide at TR221617 in 2016.

Silene dioica (L.) Clairv., Red Champion: occasional in woodland and hedges.

Silene flos-cuculi (L.) Clairv., Ragged Robin: occasional in ditches and swamps.

Oxybasis rubra (L.) S. Fuentes, Uotila & Borsch, Red Goosefoot: occasional in dried-up pools and rills, most abundant in an ephemeral pool in C15A, where some of the plants were infected by what I presume is the fungus *Physothermum pulposum*. This seems to severely weaken the host.



Physoderma pulposum on *Oxybasis rubra*

Lipandra polysperma (L.). S. Fuentes, Uotila & Borsch, Many-seeded Goosefoot: a few plants on the side of a path at TR23356290 in 2015 and near the car park in 2017.

Chenopodium album L., Fat-hen: rare, along paths.

Atriplex prostrata Boucher ex DC., Spear-leaved Orache: scattered, in field gateways and on trampled ground.

Atriplex patula L., Common Orache: scattered, in field gateways and on trampled ground.

Cornus sanguinea L., Dogwood: a few shrubs in hedges and planted around hides.

Lysimachia nummularia L., Creeping-Jenny: occasional along the sides of ditches and in wet woodland at the western end. First recorded in 1839 'between Grove Ferry and Stodmarsh' by William Masters. An axiophyte of marshy grassland and wet woodland.

Lysimachia vulgaris L., Yellow Loosestrife: in the woodland at the western end and by a ditch at TR23266216. This is an axiophyte of riverbanks and wet woodland; it is primarily in W5 *Alnus glutinosa* woodland.

Anagallis arvensis L., Scarlet Pimpernel: rare, along paths.

Samolus valerandi L., Brookweed: occasional in ditches throughout, but especially at the Grove Ferry end (TR237630) where the ditches in cattle-grazed fields are lined with it. This is a scarce and declining plant in Kent, and an axiophyte of unimproved grazing marshes.



Galium palustre L., Common Marsh-bedstraw: frequent in swamps, reedbeds and wet woodland.

Galium album Mill., Hedge Bedstraw: on track sides and by the river.

Galium aparine L., Cleavers: rare, in hedges.

Vinca minor L., Lesser Periwinkle: a well-established patch neat the mouth of the Lampen Stream, C11A (TR22016207).

† *Symphytum officinale* L., Common Comfrey: recorded in Cowell's 1839 Floral Guide for East Kent by Miss Sankey and Miss Kenrick (independently). It is described by Hanbury & Marshall (1899) as common in all districts of the county, but it is now virtually absent from the NE part of Kent.

Symphytum xuplandicum Nyman, Russian Comfrey: abundant along the path by the Stour from TR231629 to TR234628.

Symphytum orientale L., White Comfrey: a planted patch just outside the Feast hide.

Pentaglottis sempervirens (L.) Tausch ex L. Bailey, Green Alkanet: occasional along the river path.

Myosotis scorpioides L., Water Forget-me-not: occasional in ditches and swamps.

Myosotis xuzae Domin (*scorpioides* x *laxa*), Water x Tufted Forget-me-not: many plants in the alder carr at the western end of the reserve (TR222610) in 2019.



Myosotis laxa Lehm, Tufted Forget-me-not: frequent in ditches, woodland and swamps.

Myosotis arvensis (L.) Hill, Field Forget-me-not: on gravel paths at the western end.

Convolvulus arvensis L., Field Bindweed: occasional along paths.

Calystegia sepium (L.) R. Br., Hedge Bindweed: frequent in sedge swamps, reedswamp and woodland. This is the native species of bindweed that is typical of wetlands and relatively infertile soils. All plants are the glabrous form (ssp. *sepium*) and a few plants along the river path have pink corollas with white stripes (f. *colorata* (Lange) Dörf.).

Calystegia ^x*lucana* (Ten.) G. Don (*sepium* x *silvatica*), Hybrid Bindweed: abundant along the river bank, and a few scattered plants elsewhere, where the parents meet, as on the edge of a reedswamp at the base of the colliery tip, TR212613. This is a fairly common hybrid in Kent, and it is interesting to see how it grows on the boundaries of the parents' habitats.



Calystegia silvatica (top), ^x*lucana* (middle) and *sepium* (bottom)

Calystegia silvatica (Kit.) Griseb., Large Bindweed: rare, in field hedges around the edges, in C41 (TR23426290) and along Harrison's Drove. This is the non-native species that is typical of gardens and arable field hedges, not necessarily on damp soils.

† *Atropa belladonna* L., Deadly Nightshade: recorded along the Lampen Wall, around TR223614, by NCC surveyors in 1987 (2 plants). This is an axiophyte of base-rich grassland and woodland; it is most likely to have been a casual in this site, having been introduced with stones used for the embankment.

Solanum dulcamara L., Bittersweet: frequent in ditches and swamps.

Fraxinus excelsior L., Ash: a few trees by the river and numerous saplings in wet woodland.

Ligustrum vulgare L., Wild Privet: planted around hides and near the car park; also apparently self-sown along the Lampen Wall.

Digitalis purpurea L., Foxglove: a few plants on the Lampen Wall at TR22056185.

Veronica scutellata L., Marsh Speedwell: rare, in an S19 *Eleocharis palustris* swamp in C59 (TR240626). In 1996 it was found by Williams *et al.* in D54 (TR228625) & D73 (TR229624). This is an axiophyte of wetlands which is quite rare in Kent. The plants found were *V. scutellata* var. *scutellata*.



Veronica beccabunga L., Brooklime: rare. I have seen just two patches, one in cut reedbed in C8D (TR215614) and the other in cleared scrub in C10A (TR219619).

Veronica catenata Pennell, Pink Water-speedwell: occasional in ditches, pools and swamps. This is an axiophyte of species-rich wetlands. Although it is a perennial, it usually seems to act as an annual here. For example, it was exceptionally abundant on drying mud in a pool in C15A (TR22446208) in 2016; but there was almost none the following year. Wherever it occurs, it seems to be infested by with the galls of the weevil *Gymnetron villosulum* Gyllenhal, which destroy most of the seed.



Veronica persica Poirlet, Common Field-speedwell: rare, on disturbed ground in fields.

Veronica chamaedrys L., Germander Speedwell: rare, in grassland and in woodland by the river.

Veronica arvensis L., Wall Speedwell: occasional along paths.

Plantago coronopus L., Buck's-horn Plantain: rare, on paths.

Plantago major L., Greater Plantain: locally abundant on paths and in field gateways.

Plantago lanceolata L., Ribwort Plantain: frequent in the grassland.

Hippuris vulgaris L., Mare's-tail: locally abundant in ditches, pools and marshy grassland. This is an axiophyte, and Stodmarsh is an exceptionally good site for it with large populations in some areas.



Callitriche platycarpa Kuetz., Various-leaved Water-starwort: abundant in a ditch at the Grove Ferry end, C62 (TR234630) (det. R.V. Lansdown).

Callitriche obtusangula Le Gall, Blunt-fruited Water-starwort: abundant in the Lampen Stream at TR22196090.

Scrophularia auriculata L., Water Figwort: occasional in ditches towards western end (C5, C11 & C14).

Buddleja davidii Franchet, Butterfly-bush: a well-established patch on the bank by the river, TR231629.

Stachys sylvatica L., Hedge Woundwort: rare, in hedges at the Stodmarsh end.

Stachys palustris L., Marsh Woundwort: in swamp by the lake (C5C), on the riverbank and in damp grassland within the oxbow (C18A). This is an axiophyte of rivers and wetlands.

Ballota nigra L., Black Horehound: occasional in the tall grass beside the paths, throughout.

Lamium album L., White Deadnettle: rare, on path sides.

Lamium purpureum L., Red Deadnettle: rare, on path sides.

Galeopsis bifida Boenn., Bifid Hemp-nettle: rare, in reed swamp by the Lampen Stream, C2 (TR221609).



Scutellaria galericulata L., Skullcap: locally abundant in woodland at the western end and in swamps throughout.

Glechoma hederacea L., Ground-ivy: occasional in hedges; rare on ditch-banks. Alongside the nature trail through the swamp at the western end (TR224612), there are numerous plants which in 2019 were infested with the gall-causing insect *Liposthenes glechomae* (Kieffer).



Liposthenes glechomae galls

Prunella vulgaris L., Selfheal: rare, along paths and in grassland.

Lycopus europaeus L., Gipsywort: occasional in ditches and reedswamp; recorded here since 1839 (T.H.M. Bartlett).

Mentha aquatica L., Water Mint: frequent throughout.

Utricularia vulgaris L., Greater Bladderwort: abundant in some of the pools and ditches (confirmed F.J. Rumsey, BM), particularly in the lake in front of the Marsh Hide. It has been recorded here since at least 1839 (Miss Kenrick) and Stodmarsh is one of the key areas for it in East Kent. It has flowered prolifically every year that I have surveyed, despite its reputation as a shy flowerer. Since 2018 it appears to have spread significantly, becoming abundant in recently dredged ditches such as 112. This is an axiophyte of base-rich waters.



† *Menyanthes trifoliata* L., Bogbean: recorded by F.J. Hanbury 'between Stodmarsh and Grove Ferry' in about 1875 and in the western part of the reserve by the C.W. Ward and F. Rose in 1947 but it has not been seen since then.

Arctium lappa L., Greater Burdock: occasional throughout on disturbed ground by paths and on the riverbank.

Arctium minus (Hill) Bernh., Lesser Burdock: rare, along paths.

Cirsium vulgare (Savi) Ten., Spear Thistle: occasional on disturbed ground.

Cirsium arvense (L.) Scop., Creeping Thistle: occasional in grassland.

Centaurea nigra L., Common Knapweed: occasional along the Lampen Wall, where it has been for many years. It is also now present on the river path, where there is a showy form with pseudo-radiate flowers (sometimes called ss. *rivularis* (Brot.) Cout.) which was presumably introduced with a seed mix in 2016 and has persisted for some time.



Ornamental variety of *Centaurea nigra*, in 2020

Lapsana communis L., Nipplewort: occasional on paths and disturbed ground throughout.

Hypochaeris radicata L., Cat's-ear: occasional in grassland and along paths.

Scorzoneroides autumnalis (L.) Moench, Autumnal Hawkbit: occasional in grassland and along paths.

Leontodon saxatilis Lam., Lesser Hawkbit: frequent in the meadows.

Picris hieracioides L., Hawkweed Oxtongue: a small clump by the river path at TR226623 in 2016 and a large number of plants alongside the path to Grove Ferry at TR234629 in 2019.

Helminthotheca echioides (L.) Holub, Bristly Oxtongue: scattered throughout, mainly along paths.

Tragopogon pratensis L., Goat's-beard: a few plants along path sides, scattered throughout.

Sonchus palustris L., Marsh Sow-thistle: occasional clumps in the reedbeds, most abundantly toward the Grove Ferry end, in C40B (TR234627), although it has spread considerably in recent years and is now scattered throughout most areas of reedbed. It is a Nationally Scarce species, thought to be declining in Britain, but it first turned up at Stodmarsh in the 1990s.



Sonchus arvensis L., Perennial Sow-thistle: occasional along paths and around fields.

Sonchus oleraceus L., Smooth Sow-thistle: rare, but scattered throughout.

Sonchus asper (L.) Hill, Prickly Sow-thistle: rare, but scattered throughout.

Lactuca virosa L., Greater Lettuce: occasional along the Lampen Wall at TR22326156 and by the path near the Marsh Hide (C. Osborne, 2016).

Taraxacum officinale Weber, Dandelion: occasional in grassland and along paths. The following varieties have been recorded:

- *hygrophilum* Soest occurs in grazing marshes at Higham Farm, west of the NNR but within the SSSI. This is its only known site in Britain, where it was discovered by Francis Rose in 1949.
- *pseudohamatum* Dahlst. is a common ruderal plant that is found along paths (TR228615, T.C.G. Rich, 2016).

- *pulchrifolium* Markl. is also a common ruderal of path sides (TR222610, Rich, 2016).

Crepis capillaris (L.) Wallr., Smooth Hawk's-beard: occasional on disturbed ground by paths.

Crepis vesicaria L., Beaked Hawk's-beard: occasional along the river path.



Pilosella officinarum F. Schultz & Schultz-Bip., Mouse-ear-hawkweed: locally abundant in grassland on the Lampen Wall at TR22076184.

Gnaphalium uliginosum L., Marsh Cudweed: rare, on mud in C23 (TR233622) in 2014.

Pulicaria dysenterica (L.) Bernh., Common Fleabane: frequent along paths and occasional in meadows. When growing in sedge swamp it can reach a considerable height, up to 1.5 m in some places, when normally it would not be expected to exceed about 50 cm.

Symphotrichum leave (L.) Á & D. Löve var. *concinnum* (Willd.) G.L. Nesom, Delicate Michaelmas-daisy: occasional along the muddy margins of the Stour above Grove Ferry, in W6 *Salix xfragilis* woodland. This identification is by Geoffrey Kitchener and confirmed by Arthur Chater. The plants have very pale ligules and the tops of the stems seem more hairy than typical. The Michaelmas-daisies are a complex group of horticultural plants from North America, and it is unusual to find them well established in such a remote spot.



Erigeron floribundus (Kunth) Sch. Bip., Bilbao's Fleabane: on a track by the Lampen Stream in C10B (TR219620) in 2020.

Erigeron sumatrensis Retz., Guernsey Fleabane: a casual on the Lampen Wall, TR222616, in 2015, and in grassland in C62 in 2020.

Bellis perennis L., Daisy: occasional, on paths and in meadows.

Artemisia vulgaris L., Mugwort: occasional on paths, especially by the river.

Achillea millefolium L., Yarrow: occasional along the paths. It does not seem to be a component of the natural sward in the meadows, but it is fairly frequent along the edges of the paths, where it can grow to a considerable size; I measured several plants in 2020 which were up to 120 cm tall – considerably bigger than allowed in the textbooks.

Leucanthemum vulgare Lam., Oxeye Daisy: occasional by paths.

Matricaria chamomilla L., Scented Mayweed: in field gateways.

Matricaria discoidea DC., Pineapple Weed: in field gateways and along paths.

Tripleurospermum inodorum (L.) Schultz-Bip., Scentless Mayweed: locally frequent on disturbed ground.

Jacobaea vulgaris Gaertn., Common Ragwort: occasional throughout.

Jacobaea erucifolia (L.) P. Gaertn., B. Mey. & Scherb., Hoary Ragwort: occasional in grassland and by paths.

Senecio inaequidens DC., Narrow-leaved Ragwort: a sizeable patch by the side of the path to Grove Ferry (TR234629) in 2019. This is an introduced species that usually turns up on roadsides; presumably brought here on machinery.

Senecio squalidus L., Oxford Ragwort: rare, in field gateways and by paths.

Senecio vulgaris L., Groundsel: occasional on paths.

Tussilago farfara L., Colt's-foot: a few patches, scattered along the paths; it is only really abundant on the river path at about TR227624.

Bidens cernua L., Nodding Bur-marigold: abundant on drying mud in a shallow, ephemeral pool in C15A (TR224621) and in a ditch in C11. It is rather rare in East Kent, and considered to be declining, so this is an important site for it. It is an axiophyte of wetlands, including ponds and ditches.



Bidens tripartita L., Trifid Bur-marigold: occasional on the edges of pools and ditches, and by the river. This is an axiophyte of wetlands by rivers; it occurs in S26 *Phragmites australis* vegetation and W6 *Salix xfragilis* woodland. It is also quite rare in Kent, where it is considered to be primarily a plant of eutrophic rivers.



Eupatorium cannabinum L., Hemp-agrimony: occasional along the edges of swamps and abundant by the lake at TR221617.

Adoxa moschatellina L., Moschatel: in the hedge of the lane at Stodmarsh (TR221610).

Sambucus nigra L., Elder: occasional throughout.

Viburnum opulus L., Guelder-rose: in wet woodland at the western end and planted around hides elsewhere.

Lonicera periclymenum L., Honeysuckle: in hedges around the edges of the reserve.

Valeriana officinalis L., Common Valerian: in swamps and open woodland at the western end (C2); recorded here since 1839 (T.H.M. Bartlett).

Dipsacus fullonum L., Wild Teasel: occasional, scattered throughout.

Hedera helix L., Ivy: frequent in woodland, hedges and scrub.

Hydrocotyle vulgaris L., Marsh Pennywort: rare in a few ditches (D40, D51 & D60).

Anthriscus sylvestris (L.) Hoffm., Cow Parsley: occasional throughout.

Smyrniolum olusatrum L., Alexanders: rare, along paths on the edge of the reserve.

Berula erecta (Huds.) Cov., Lesser Water-parsnip: abundant in all the ditches. This is a wetland axiophyte.

Oenanthe fistulosa L., Tubular Water-dropwort: frequent in ditches and swamps. Known here since the 1870s (F.J. Hanbury), it is a wetland axiophyte.



† *Oenanthe lachenalii* C.C. Gmel., Parsley Water-dropwort: collected by F. Rose in 'swampy fen-meadow' at Stodmarsh in 1955 (MNE).

Oenanthe crocata L., Hemlock Water-dropwort: frequent by the river and in wet woodland.

† *Oenanthe fluviatilis* (Bab.) Coleman, River Water-dropwort: recorded by F.J. Hanbury c. 1875 'between Stodmarsh and Grove Ferry.' This was presumably in the river, and it is still present upstream at Canterbury.

Oenanthe aquatica (L.) Poir., Fine-leaved Water-dropwort: rare, in a patch of cut reedswamp in C27 (TR23246251) and in a ditch in C13A (TR222618). Previously recorded (as *O. phellandrium*) by F.J. Hanbury, c. 1875, and by van Dongen and Painter in several places in 1989. This is an axiophyte of peaty wetlands.



Silaum silaus (L.) Schinz & Thell., Pepper-saxifrage: rare in long grass by paths in several places and in the meadow in C18A.

Conium maculatum L., Hemlock: occasional, by paths and on ditch banks, especially along the path running east from the Marsh Hide.

Heliosciadium nodiflorum (L.) W.D.J. Koch, Fool's Water-cress: occasional in ditches.

Petroselinum segetum (Mill.) Fuss, Corn Parsley: on the riverbank path at TR230626 and along path sides nearby in 2016 and 2017 but disappearing soon afterwards. It appeared as if these plants had sprung up from a buried seedbank, but they could have been introduced.

Sison amomum L., Stone Parsley: occasional in long grass on the edges of paths.

Angelica sylvestris L., Wild Angelica: in woodland at the western end and along the Stour.

Heracleum sphondylium L., Hogweed: occasional in grassland and woodland.

Torilis japonica (Houtt.) DC., Upright Hedge-parsley: occasional in grassland and hedges.

Daucus carota L., Wild Carrot: rare, along paths.

Arum maculatum L., Lords-and-ladies: in scrub around the edges of the reserve.

Spirodela polyrhiza (L.) Schleiden, Greater Duckweed: occasional in the ditches. Known here since the 1870s (F.J. Hanbury).

Lemna gibba L., Fat Duckweed: occasional in the ditches. Known here since the 1870s (F.J. Hanbury).

Lemna minor L., Common Duckweed: abundant in ditches throughout.

Lemna minuta Kunth, Least Duckweed: locally abundant in ditches. First recorded here by Williams *et al.* in 1996.

Lemna trisulca L., Ivy-leaved Duckweed: abundant in the ditches and pools.

† *Wolffia arrhiza* (L.) Horkel ex Wimm., Rootless Duckweed: in 'trenches between Stodmarsh and Grove Ferry,' according to F.J. Hanbury in c. 1875. It was also listed by Ratcliffe (1977) and in Forbes's 1978 checklist, but these are probably repetitions of the original record. It is a Nationally Scarce plant and axiophyte of grazing marshes which has been recorded recently in this part of Kent, but not at Stodmarsh.

Sagittaria sagittifolia L., Arrowhead: abundant in the Stour from Fordwich to Stodmarsh, becoming less common towards Grove Ferry, where the river becomes tidal and silty. Most of the long, narrow

streamers that can be seen floating in the water are the leaves of this species (the remainder are mostly *Butomus umbellatus*), but only in late summer do the characteristic arrowhead-shaped leaves emerge.



Baldellia ranunculoides (L.) Parl., Lesser Water-plantain: scattered populations on the sides of ditches and in rills. Over the last few years, it has occurred in C23, C44, C57, C59 and D70 (in particularly large quantities in C57 & C59), on the edge of *Phragmites australis* or S19 *Eleocharis palustris* swamps. In the 1996, Williams *et al.* found it in D46, D47, D67 & D73. It is an axiophyte of seasonally inundated muddy (or sandy/gravelly) places and oligotrophic conditions, in full sunlight.



Alisma plantago-aquatica L., Water-plantain: occasional throughout, in shallow ditches, and sometimes abundant in ephemeral pools. Recorded since at least 1839 (T.H.M. Bartlett).

Alisma lanceolatum With., Narrow-leaved Water-plantain: scattered throughout in pools and ditches. I have seen it in C23, C44, C57, C59, D77, D82 & D169. The ditches survey in 1996 found it in D28, D41, D65, D74 & D84, and in 2009 Osbourne recorded it in wet woodland in C2. It is an axiophyte of rivers and canals and is uncommon in East Kent.



Butomus umbellatus L., Flowering Rush: abundant in the pond in front of the Marsh Hide, at TR226618; scattered elsewhere. It is an axiophyte of rivers and canals. First recorded by W. Masters in 1839.



Hydrocharis morsus-ranae L., Frogbit: abundant in water bodies throughout. This is an axiophyte of ditches and ponds; it is characteristic of A3 *H. morsus-ranae* community and extends into the more open fens such as T13 *Typha angustifolia* vegetation and cut stands of S4 *Phragmites australis*. First recorded in 1839 by T.H.M. Bartlett.

Elodea canadensis Michaux, Canadian Waterweed: occasional in ditches and pools.

Elodea nuttallii (Planch.) H. St John, Nuttall's Waterweed: abundant in ditches and pools.

† *Triglochin palustris* L., Marsh Arrowgrass: recorded by F.J. Hanbury c. 1875 and by Francis Rose in 1955 (presumably in the meadows around the subsidence lake at the western end). This is an axiophyte of marshy grassland.

Potamogeton natans L., Broad-leaved Pondweed: occasional in ditches and pools.

Potamogeton coloratus Hornem., Fen Pondweed: a sizeable patch in S19 *Eleocharis palustris* swamp in C57 (TR23956242) in 2016; not previously recorded in the reserve. This is a Nationally Scarce plant and an axiophyte of fens. It was previously recorded at nearby

Newnham Valley in 1997, but in Kent it is otherwise only known around Ham.



Potamogeton lucens L., Shining Pondweed: abundant in the Stour and the Lampen Stream and occasionally in ditches. I have seen it in D11.4 and D47. It was also recorded in D31 and D51 by Williams *et al.* in 1996. This species is typical of rivers, ditches and ponds where calcareous water drains off chalk hills. It was first recorded (at the western end) by Ward & Rose in 1947.



† *Potamogeton perfoliatus* L., Perfoliate Pondweed: recorded by F.J. Hanbury c. 1875, 'between Stodmarsh and Grove Ferry' and in about 1950 by R.G. Williams, according to Francis Rose's unpublished Flora.

Potamogeton friesii Rupr., Flat-stalked Pondweed: frequent in ditches and pools, possibly more in the western part of the reserve. This species was first recorded here by E.G. Philp in 1958 (det. J.E. Dandy & G. Taylor, MNE). It can be quite abundant and, owing to its pointed leaves, could easily be mistaken for *P. acutifolius*, so recording must be done with care. The only place it is found in East Kent is in the lower parts of the catchment of the Stour.



Potamogeton pusillus L., Lesser Pondweed: in the lake in front of Harrison's Drove Hide (C44, TR234622, 2014) and in a swamp in C1 (TR221610, 2017). It was first recorded here by F.J. Hanbury c. 1875 (although a voucher specimen would normally be required for a record as old as this) and has been seen several times since then, notably by E.G. Philp & J. Bevan in 2000 and during the ditches survey of 1996, although it might be better to consider the latter as records of *P. pusillus* agg., incorporating either of the following two taxa.

† *Potamogeton berchtoldii* Fieber, Small Pondweed: on Forbes's 1978 checklist and recorded by E.G. Philp & J. Bevan in 2000. These small pondweeds are difficult to identify, and I am not confident that I have seen it at Stodmarsh at all.

Potamogeton trichoides Cham. & Schldl., Hairlike Pondweed: first recorded by N.F. Stewart in 1993. He described the location as being 'not far from the car park.' This species is easily overlooked; it is very similar in size and appearance to *P. pusillus* and *P. berchtoldii*, but it has open stipules and a thick midrib to the leaves. I have seen it in the bird watching lakes in C16A (TR226618), C37 (TR232626), C44 (TR232622) & C45 (TR235627).



Potamogeton acutifolius Link, Sharp-leaved Pondweed: widespread in the ditches and lakes, possibly more frequent in the eastern part of the reserve. It can be difficult to separate from *P. friesii* in the field and collecting voucher specimens is highly recommended if records are to be accepted. This is a Nationally Rare pondweed, first found at Stodmarsh by G. Dowker ('Withamdrewe, west of the Little Stour-

Newnham Valley') in the 19th century (Hanbury & Marshall, 1899). Its habitat is calcareous, mesotrophic water in Norfolk and the south-east of England. As one of the key species at Stodmarsh it would be desirable to know if the population changes, but this is difficult to do. In 1996 Williams *et al.* found it in just 6 out of 169 ditches surveyed, and it has been present in rather more places than that in recent years, which suggests that it is thriving.



† *Potamogeton crispus* L., Curled Pondweed: recorded by Williams *et al.* in numerous ditches in 1996. It was first recorded by Ward & Rose in 1947, and was listed by Forbes in 1978, but there are no recent records.

Potamogeton pectinatus L., Fennel Pondweed: frequent in the Stour, rare in the pond at Harrison's Drove (TR234622) and in D169 (TR24076257). Previously recorded here by F.J. Hanbury in 1875 and by E.G. Philp in 1958 (MNE). It was found to be widespread in the ditch survey of 1996 (Williams *et al.*), who recorded it in D59, D131, D145, D147, D159, D162 and D166. *Potamogeton pectinatus* is typical of sluggish lowland rivers and brackish ditches around the coast.

† *Groenlandia densa* (L.) Fourr., Opposite-leaved Pondweed: recorded by C.W. Ward in 1947, possibly with Francis Rose. This would have been at the western end, around where the spoil heap now is. In his unpublished Flora, Rose mentions a 1949 record for Fordwich Marshes, which could be the same place.

Zannichellia palustris L., Horned Pondweed: in D152, at the Grove Ferry end of the site (TR23716303, 2016). It has previously been recorded about here by F.J. Hanbury in 1875 and C. Dyson in 1991, and there were several records of it in the 1996 ditch survey. This species seems to have declined dramatically in East Kent recently.



Dactylorhiza praetermissa (Druce) Soó, Southern Marsh-orchid: in a damp grassy sward on the margin of a potato field at Stodmarsh Court Farm (TR217610), which is just within the NNR at its western end; it is also on the colliery tip, where it has been known since at least 1987.

Anacamptis pyramidalis (L.) Rich., Pyramidal Orchid: one plant by D165 (TR239629) in 2019 (M. Cousins). This is a calcicole and a surprising addition to the site list, although it was recorded in the vicinity of the colliery tip by Philp in the 1990s.

Iris pseudacorus L., Yellow Iris: occasional throughout in ditches and damp meadows.

Hyacinthoides non-scripta (L.) Chouard ex Rothm., Bluebell: at the base of the hedge along the lane from the Stodmarsh car park and, in 2020, one plant near the path in C14H; possibly a sign of natural succession in this area of secondary woodland.

Asparagus officinalis L., Asparagus: a patch by the footpath at TR22336215.

Sparganium erectum L., Branched Bur-reed: frequent throughout, in ditches and swamps, and along the margin of the rivers.

Typha latifolia L., Great Reedmace: occasional in swamps and ditches. This species is more tolerant of eutrophication and typical of enriched sites than *T. angustifolia*, but its distribution within the reserve appears to be fairly random.

Typha x glauca Godr. (*latifolia* x *angustifolia*), Hybrid Reedmace: rare, in reedswamp at the base of the colliery tip (TR212613) and along the edge of D28 in C15A (TR22366208).

Typha angustifolia L., Lesser Bulrush: abundant in pools and occasional in swamps and ditches. It also occurs around the lakes, forming a fringe to the *Phragmites* reedswamp in the deeper water. It is an axiophyte of pools and ditches.

Juncus acutiflorus Ehrh. ex Hoffm., Sharp-flowered Rush: very rare. I have only found one stand of it, in a swamp in C57 (TR239623).



Juncus articulatus L., Jointed Rush: frequent throughout, on the sides of ditches and in marshy grassland.



Juncus gerardii Loisel., Saltmarsh Rush: occasional in marshy grassland, along a path by C30, around the pool in C44, and in the sward in C19A. Williams *et al.* found it in D67, D79, D80 & D102 in 1996. This is an axiophyte of salt marshes and coastal grazing meadows.

Juncus bufonius L., Toad Rush: occasional along paths and in wet hollows.

Juncus inflexus L., Hard Rush: frequent to abundant throughout.

Juncus effusus L., Soft-rush: occasional in ditches and fields throughout; the var. *subglomeratus* occurs in C23 (TR23306223).

Juncus conglomeratus L., Compact Rush: rare, seen only in C19C (TR23156243).

Bolboschoenus maritimus (L.) Palla, Sea Club-rush: occasional in ditches throughout, and around some of the pools. An axiophyte of coastal grazing marshes. Stodmarsh is one of its most inland sites for it in the county, reflecting the coastal element in the vegetation.



Schoenoplectus lacustris (L.) Palla, Common Club-rush: in patches all along the Stour as it runs past, but I have not found it within the reserve at all.

Schoenoplectus tabernaemontani (C.C. Gmel.) Palla, Grey Club-rush: occasional in ditches and swamps. First recorded here by E.S. Marshall in the late 19th century (Hanbury & Marshall, 1899), in 'ditches near Grove Ferry, in profusion.' This is an axiophyte of coastal wetlands. Several records of *S. lacustris* in the 1980s and '90s can be included here, as this was considered a subspecies in some Floras at the time and was therefore overlooked.

Eleocharis palustris (L.) Roem. & Schult., Common Spike-rush: frequent to abundant throughout in wet grassland, swamps and ditches.

Carex otrubae Podp., False Fox-sedge: frequent throughout in ditches, wet grassland and swamp.

Carex divulsa Stokes ssp. *leersii* (F.W. Schultz) W. Koch, Grey Sedge: one large clump by the path near Grove Ferry, TR23496301 (conf. M.S. Porter).

Carex disticha Huds., Brown Sedge: occasional in swamps throughout.



Carex divisa Huds., Divided Sedge: locally abundant along paths and in some of the grassland; this is an axiophyte of coastal grazing marshes, and Stodmarsh is about as far inland as it reaches. Its presence here demonstrates the maritime influence on the vegetation.



Carex remota L., Remote Sedge: occasional in the woods.

Carex hirta L., Hairy Sedge: a few patches, mostly along the paths.

Carex acutiformis Ehrh., Lesser Pond-sedge: in a few places by the Lampen Stream along ditches.

Carex riparia Curtis, Greater Pond-sedge: abundant throughout.

† *Carex pendula* Huds., Pendulous Sedge: recorded by Ward in 1996 and by Williams *et al.* in D114 (TR233628) in 1996. This is an invasive native woodland plant, which does not seem to have persisted.

Carex flacca Schreb., Glaucous Sedge: in grassland in several places, such as C22, C23 and C59.

† *Carex distans* L., Distant Sedge: recorded by Williams *et al.* in D71, D89 and D102 (TR229622, TR231628 & TR232627) in 1996. This is an axiophyte of coastal grazing marshes.

Carex acuta L., Slender Tufted-sedge: a few clumps in swamp along D60 (TR22966230) (det. A.O. Chater) and in woodland in C2. This are new tetrads for the species, which is scarce in East Kent. It also occurs by ditches at Stodmarsh Court Farm and Higham Farm (the latter outside the NNR but within the SSSI). *Carex acuta* is an axiophyte of lowland river valleys, growing either along the side of rivers or in sedge swamps in the floodplain.



Schedonorus arundinaceus (Schreb.) Dumort., Tall Fescue: only abundant along the path in front of the Marsh hide, but there are scattered clumps in grassland elsewhere. The plants here have uncharacteristically glabrous auricles, but the identification has been confirmed by C.A. Stace.

Lolium perenne L., Perennial Rye-grass: frequent along paths and in meadows.

Lolium ^x*boucheanum* Kunth (*perenne* x *multiflorum*), Hybrid Rye-grass: a few clumps in field gateways and on paths at the eastern end in 2015 (conf. C.A. Stace), and subsequently sown in great abundance along the river path after the regrading work that winter. It has declined considerably since then and has now almost disappeared again (by 2019).

Festuca rubra L., Red Fescue: occasional on drier ground, scattered throughout. There is surprisingly little red fescue at Stodmarsh, considering that it is one of the most common grasses of unimproved meadows in England.

Festuca ovina L., Sheep's-fescue: a few patches on the Lampen Wall.

Vulpia bromoides (L.) Gray, Squirrel-tail Fescue: frequent along the Lampen Wall.

Vulpia myuros (L.) C.C. Gmel., Rat's-tail Fescue: occasional along the Lampen Wall.

Cynosurus cristatus L., Crested Dog's-tail: locally frequent in grassland at the Grove Ferry end; scattered in other meadows.

Poa infirma Kunth, Early Meadow-grass: recorded by S. Buckingham in 2011 and subsequently by L. Rooney in 2014, along paths. This is a non-native species that has been spreading on Britain in recent years and is now quite widespread, although it is generally not found in semi-natural places.

Poa annua L., Annual Meadow-grass: occasional on paths and in grassland.

Poa trivialis L., Rough Meadow-grass: occasional throughout.

Poa pratensis L., Smooth Meadow-grass: occasional in meadows.

Poa nemoralis L., Wood Meadow-grass: rare, on the Lampen Wall at TR223612. This is a woodland grass, typically found on dry banks.

Dactylis glomerata L., Cock's-foot: occasional throughout.

Arrhenatherum elatius (L.) P. Beauv., False Oat-grass: frequent along paths.

Avena fatua L., Wild Oat: rare, as a casual on waste ground by the path to Grove Ferry.

Trisetum flavescens (L.) P. Beauv., Yellow Oat-grass: occasional in the easternmost (driest) fields (C42, TR236630) and along the path to Grove Ferry.

Holcus lanatus L., Yorkshire-fog: occasional throughout, in dry grassland and swamps.

Anthoxanthum odoratum L., Sweet Vernal Grass: rare, in grassland by the path in C30 (TR230626).

Phalaris arundinacea L., Reed Canary-grass: frequent throughout.

Agrostis capillaris L., Common Bent: occasional in dry grassland.

Agrostis stolonifera L., Creeping Bent: frequent in swamps and marshy grassland. This is one of the main grasses making up the sward of the meadows at Stodmarsh.

Alopecurus pratensis L., Meadow Foxtail: occasional in marshy grassland and swamps.

Alopecurus geniculatus L., Marsh Foxtail: frequent in marshy grassland and swamps.

Phleum pratense L., Timothy: occasional in grassland.

Phleum bertolonii DC., Smaller Cat's-tail: occasional in grassland.

Glyceria maxima (Hartman) O. Holmb., Reed Sweet-grass: frequent throughout, in swamps and ditches, and along the edge of the river.

Glyceria fluitans (L.) R. Br., Floating Sweet-grass: occasional in ditches and rills.

Glyceria declinata Breb., Small Sweet-grass: in a ditch at TR23036205.

Glyceria notata Chevall., Plicate Sweet-grass: occasional in wet grassland in C17 & C57, and formerly

recorded by Williams *et al.* in several ditches (73, 83 & 107) in 1996.

Bromus hordeaceus L., Soft-brome: occasional in grassland and by paths.

Anisantha sterilis (L.) Nevski, Barren Brome: occasional by paths. A very large form, with flowers at the upper limit of the range for this species, occurs beside the river path under scrub.

Brachypodium sylvaticum (Huds.) P. Beauv., False-brome: occasional in the woods and hedges.

Elytrigia repens (L.) Desv., Common Couch: occasional in swamps and by paths throughout. It is abundant in the sward within the oxbow lake (C18A) where some of the plants have very long awns – up to 10 mm, sometimes. It is not, however, *E. canina*, as the anthers are too long (c. 5 mm) and the plants are not tufted.

Hordeum secalinum Schreb., Meadow Barley: abundant in meadows. This is the most characteristic species of the old, unimproved fields. It is a plant of coastal pastures and it is particularly abundant on the London clay where salt marshes have been drained and improved for agriculture.

Phragmites australis (Cav.) Trin. ex Steudel, Common Reed: abundant throughout, mainly in fields that have been deliberately flooded to encourage its growth. Historically, it would have been largely confined to the ditches, and even there it would have been strictly controlled to keep the ditches flowing, But when the lakes formed as a result of subsidence in the 1920s, it became locally abundant and was soon colonised by characteristic bird species such as bitterns and reed warblers.

Species recorded by date class

Date classes:
 1 = 1800-1969 (primarily Hanbury & Marshall)
 2 = 1970-1979 (Philp's first Atlas & Forbes's Checklist)
 3 = 1990-2009 (Philp's 2nd Atlas & Williams's ditch survey)
 4 = 2010-2020 (KBRG records & the current survey)

Species	Common Name	Status	DC1	DC2	DC3	DC4
<i>Acer campestre</i>	Field Maple	-	-	+	-	+
<i>Acer platanoides</i>	Norway Maple	-	-	-	-	+
<i>Acer pseudoplatanus</i>	Sycamore	-	-	+	+	+
<i>Achillea millefolium</i>	Yarrow	-	-	+	+	+
<i>Adoxa moschatellina</i>	Moschatel	Axiophyte	-	+	+	+
<i>Agrimonia eupatoria</i>	Agrimony	-	-	+	-	+
<i>Agrostis capillaris</i>	Common Bent	-	-	+	+	+
<i>Agrostis stolonifera</i>	Creeping Bent	-	-	+	+	+
<i>Alisma lanceolatum</i>	Narrow-leaved Water-plantain	Axiophyte	-	+	+	+
<i>Alisma plantago-aquatica</i>	Water-plantain	-	+	+	+	+
<i>Alliaria petiolata</i>	Garlic Mustard	-	-	+	+	+
<i>Alnus glutinosa</i>	Alder	-	-	+	+	+
<i>Alopecurus geniculatus</i>	Marsh Foxtail	-	-	+	+	+
<i>Alopecurus pratensis</i>	Meadow Foxtail	-	-	+	+	+
<i>Anacamptis pyramidalis</i>	Pyramidal Orchid	Axiophyte	-	-	-	+
<i>Anagallis arvensis</i>	Scarlet Pimpernel	-	-	-	+	+
<i>Angelica sylvestris</i>	Wild Angelica	-	-	+	+	+
<i>Anisantha sterilis</i>	Barren Brome	-	-	+	+	+
<i>Anthoxanthum odoratum</i>	Sweet Vernal Grass	-	-	-	-	+
<i>Anthriscus sylvestris</i>	Cow Parsley	-	-	+	+	+
<i>Arctium lappa</i>	Greater Burdock	-	-	+	+	+
<i>Arctium minus</i>	Lesser Burdock	-	-	-	-	+
<i>Armoracia rusticana</i>	Horseradish	-	-	+	+	+
<i>Arrhenatherum elatius</i>	False Oat-grass	-	-	+	+	+
<i>Artemisia vulgaris</i>	Mugwort	-	-	+	+	+
<i>Arum maculatum</i>	Lords-and-ladies	-	-	+	+	+
<i>Asparagus officinalis</i>	Asparagus	-	-	-	+	+
<i>Atriplex patula</i>	Common Orache	-	-	+	+	+
<i>Atriplex prostrata</i>	Spear-leaved Orache	-	-	+	+	+
<i>Atropa belladonna</i>	Deadly Nightshade	Axiophyte	-	+	-	-
<i>Avena fatua</i>	Wild Oat	-	-	+	+	+
<i>Azolla filiculoides</i>	Water Fern	-	-	+	-	+
<i>Baldellia ranunculoides</i>	Lesser Water-plantain	Axiophyte	+	+	+	+
<i>Ballota nigra</i>	Black Horehound	-	-	+	+	+
<i>Barbarea vulgaris</i>	Winter-cress	-	-	+	-	+
<i>Bellis perennis</i>	Daisy	-	-	+	+	+
<i>Berula erecta</i>	Lesser Water-parsnip	Axiophyte	-	+	+	+
<i>Betula pendula</i>	Silver Birch	-	-	+	-	+
<i>Bidens cernua</i>	Nodding Bur-marigold	Axiophyte	-	+	-	+
<i>Bidens tripartita</i>	Trifid Bur-marigold	Axiophyte	-	+	-	+
<i>Bolboschoenus maritimus</i>	Sea Club-rush	Axiophyte	-	+	+	+
<i>Brachypodium sylvaticum</i>	False-brome	-	-	+	-	+
<i>Brassica nigra</i>	Black Mustard	-	-	+	-	+
<i>Brassica rapa</i>	Wild Turnip	-	-	+	-	+
<i>Bromus hordeaceus</i>	Soft-brome	-	-	+	+	+
<i>Bromus racemosus</i>	Smooth Brome	-	-	-	-	+
<i>Buddleja davidii</i>	Butterfly-bush	-	-	+	+	+
<i>Butomus umbellatus</i>	Flowering Rush	Axiophyte	+	+	+	+
<i>Callitriche obtusangula</i>	Blunt-fruited Water-starwort	Axiophyte	+	+	+	+
<i>Callitriche platycarpa</i>	Various-leaved Water-starwort	-	-	-	-	+
<i>Caltha palustris</i>	Marsh Marigold	Axiophyte	-	+	+	+
<i>Calystegia sepium</i>	Hedge Bindweed	-	-	+	+	+
<i>Calystegia *lucana</i>	Large x Hedge Bindweed	-	-	-	-	+
<i>Calystegia silvatica</i>	Large Bindweed	-	-	-	-	+

<i>Capsella bursa-pastoris</i>	Shepherd's-purse	-	-	+	+	+
<i>Cardamine flexuosa</i>	Wavy Bitter-cress	-	-	-	-	+
<i>Cardamine hirsuta</i>	Hairy Bitter-cress	-	-	-	-	+
<i>Cardamine pratensis</i>	Cuckooflower	-	-	+	+	+
<i>Carex acuta</i>	Slender Tufted-sedge	Axiophyte	-	-	-	+
<i>Carex acutiformis</i>	Lesser Pond-sedge	-	+	+	+	+
<i>Carex distans</i>	Distant Sedge	Axiophyte	-	-	+	-
<i>Carex disticha</i>	Brown Sedge	Axiophyte	-	+	-	+
<i>Carex divisa</i>	Divided Sedge	Axiophyte	-	-	+	+
<i>Carex divulsa</i> ssp. <i>leersii</i>	Leers's Sedge	-	-	-	-	+
<i>Carex flacca</i>	Glaucous Sedge	-	-	-	-	+
<i>Carex hirta</i>	Hairy Sedge	-	-	+	+	+
<i>Carex otrubae</i>	False Fox-sedge	-	-	+	+	+
<i>Carex pendula</i>	Pendulous Sedge	-	+	-	+	-
<i>Carex remota</i>	Remote Sedge	-	+	-	-	+
<i>Carex riparia</i>	Greater Pond-sedge	-	-	+	+	+
<i>Centaurea nigra</i>	Common Knapweed	-	-	+	+	+
<i>Cerastium fontanum</i>	Common Mouse-ear	-	-	+	+	+
<i>Cerastium glomeratum</i>	Sticky Mouse-ear	-	-	-	-	+
<i>Ceratophyllum demersum</i>	Rigid Hornwort	-	+	+	+	+
<i>Chamerion angustifolium</i>	Rosebay Willowherb	-	-	+	-	+
<i>Chara globularis</i>	Fragile Stonewort	-	-	-	-	+
<i>Chara vulgaris</i>	Common Stonewort	-	+	-	-	+
<i>Chenopodium album</i>	Fat-hen	-	-	+	+	+
<i>Circaea lutetiana</i>	Enchanter's-nightshade	-	-	-	-	+
<i>Cirsium arvense</i>	Creeping Thistle	-	-	+	+	+
<i>Cirsium vulgare</i>	Spear Thistle	-	-	+	+	+
<i>Clematis vitalba</i>	Traveller's Joy	-	-	+	+	+
<i>Conium maculatum</i>	Hemlock	-	-	+	+	+
<i>Convolvulus arvensis</i>	Field Bindweed	-	-	+	+	+
<i>Cornus sanguinea</i>	Dogwood	-	-	+	+	+
<i>Corylus avellana</i>	Hazel	-	-	+	-	+
<i>Corylus maxima</i>	Filbert	-	-	-	-	+
<i>Crassula helmsii</i>	New Zealand Pigmyweed	-	-	-	+	+
<i>Crataegus laevigata</i>	Midland Hawthorn	-	-	-	-	+
<i>Crataegus monogyna</i>	Hawthorn	-	-	+	+	+
<i>Crataegus persimilis</i>	Broad-leaved Cockspur-thorn	-	-	-	-	+
<i>Crepis capillaris</i>	Smooth Hawk's-beard	-	-	-	-	+
<i>Crepis vesicaria</i>	Beaked Hawk's-beard	-	-	+	-	+
<i>Cynosurus cristatus</i>	Crested Dog's-tail	-	-	+	+	+
<i>Dactylis glomerata</i>	Cock's-foot	-	-	+	+	+
<i>Dactylorhiza praetermissa</i>	Southern Marsh-orchid	-	-	-	-	+
<i>Daucus carota</i>	Wild Carrot	-	-	-	-	+
<i>Digitalis purpurea</i>	Foxglove	-	-	-	-	+
<i>Dipsacus fullonum</i>	Wild Teasel	-	-	+	+	+
<i>Dryopteris carthusiana</i>	Narrow Buckler-fern	Axiophyte	-	-	-	+
<i>Dryopteris dilatata</i>	Broad Buckler-fern	-	-	-	+	+
<i>Dryopteris filix-mas</i>	Common Male Fern	-	-	-	-	+
<i>Eleocharis palustris</i>	Common Spike-rush	Axiophyte	-	+	+	+
<i>Elodea canadensis</i>	Canadian Waterweed	-	+	+	+	+
<i>Elodea nuttallii</i>	Nuttall's Water-weed	-	-	+	+	+
<i>Elytrigia repens</i>	Common Couch	-	-	+	+	+
<i>Epilobium ciliatum</i>	American Willowherb	-	-	-	-	+
<i>Epilobium hirsutum</i>	Great Willowherb	-	-	+	+	+
<i>Epilobium parviflorum</i>	Hoary Willowherb	-	-	-	-	+
<i>Epilobium tetragonum</i>	Square-stalked Willowherb	-	+	-	-	+
<i>Equisetum arvense</i>	Field Horsetail	-	-	+	+	+
<i>Equisetum fluviatile</i>	Water Horsetail	Axiophyte	-	+	+	+
<i>Equisetum palustre</i>	Marsh Horsetail	Axiophyte	+	+	+	+
<i>Erigeron floribundus</i>	Bilbao's Fleabane	-	-	-	-	+
<i>Erigeron sumatrensis</i>	Guernsey Fleabane	-	-	-	-	+
<i>Ervum tetraspermum</i>	Smooth Tare	-	-	-	+	+
<i>Euonymus europaeus</i>	Spindle	-	-	-	-	+

Eupatorium cannabinum	Hemp-agrimony	-	-	+	+	+
Fallopia convolvulus	Black Bindweed	-	-	+	+	+
Festuca ovina	Sheep's Fescue	-	-	-	-	+
Festuca rubra	Red Fescue	-	-	+	+	+
Ficaria verna	Lesser Celandine	-	-	+	+	+
Filipendula ulmaria	Meadowsweet	-	-	+	+	+
Fragaria ananassa	Garden Strawberry	-	-	-	-	+
Fraxinus excelsior	Ash	-	-	+	+	+
Galeopsis bifida	Bifid Hemp-nettle	-	-	-	-	+
Galium album	Hedge Bedstraw	-	-	+	-	+
Galium aparine	Cleavers	-	-	+	+	+
Galium palustre	Common Marsh-bedstraw	-	+	+	+	+
Geranium dissectum	Cut-leaved Crane's-bill	-	-	+	+	+
Geranium molle	Dove's-foot Crane's-bill	-	-	+	-	+
Geranium pusillum	Small-flowered Crane's-bill	-	-	-	+	+
Geranium rotundifolium	Round-leaved Crane's-bill	-	-	-	-	+
Geum urbanum	Wood Avens	-	-	+	+	+
Glechoma hederacea	Ground-ivy	-	-	+	+	+
Glyceria declinata	Small Sweet-grass	Axiophyte	-	-	-	+
Glyceria fluitans	Floating Sweet-grass	-	-	+	-	+
Glyceria maxima	Reed Sweet-grass	-	-	+	+	+
Glyceria notata	Plicate Sweet-grass	Axiophyte	-	-	+	+
Gnaphalium uliginosum	Marsh Cudweed	-	-	-	-	+
Groenlandia densa	Opposite-leaved Pondweed	-	+	-	-	-
Hedera helix	Ivy	-	-	+	+	+
Helminthotheca echioides	Bristly Oxtongue	-	-	+	+	+
Helosciadium nodiflorum	Fool's Watercress	-	-	+	+	+
Heracleum sphondylium	Hogweed	-	-	+	+	+
Hippuris vulgaris	Mare's-tail	Axiophyte	+	+	+	+
Hirschfeldia incana	Hoary Mustard	-	-	+	-	+
Holcus lanatus	Yorkshire-fog	-	-	+	+	+
Hordeum secalinum	Meadow Barley	-	-	+	+	+
Humulus lupulus	Hop	-	-	+	+	+
Hyacinthoides non-scripta	Bluebell	Axiophyte	-	+	+	+
Hydrocharis morsus-ranae	Frogbit	Axiophyte	+	+	+	+
Hydrocotyle vulgaris	Marsh Pennywort	Axiophyte	+	+	+	+
Hypericum perforatum	Perforate St John's-wort	-	-	-	-	+
Hypericum tetrapterum	Square-stalked St John's-wort	-	+	-	+	+
Hypochaeris radicata	Cat's-ear	-	-	+	+	+
Iris pseudacorus	Yellow Iris	-	-	+	+	+
Jacobaea erucifolia	Hoary Ragwort	-	-	+	+	+
Jacobaea vulgaris	Ragwort	-	-	+	+	+
Juglans regia	Walnut	-	-	-	-	+
Juncus acutiflorus	Sharp-flowered Rush	Axiophyte	-	-	-	+
Juncus articulatus	Jointed Rush	-	-	+	+	+
Juncus bufonius	Toad Rush	-	-	+	+	+
Juncus conglomeratus	Compact Rush	-	-	+	-	+
Juncus effusus	Soft-rush	-	+	+	+	+
Juncus gerardii	Saltmarsh Rush	Axiophyte	-	+	+	+
Juncus inflexus	Hard Rush	-	-	+	+	+
Lactuca virosa	Greater Lettuce	-	-	+	-	+
Lamium album	White Dead-nettle	-	-	+	+	+
Lamium purpureum	Red Dead-nettle	-	-	+	+	+
Lapsana communis	Nipplewort	-	-	-	-	+
Lathyrus nissolia	Grass Vetchling	-	-	+	+	+
Lathyrus pratensis	Meadow Vetchling	-	-	+	+	+
Lemna gibba	Fat Duckweed	-	+	+	+	+
Lemna minor	Common Duckweed	-	+	+	+	+
Lemna minuta	Least Duckweed	-	-	-	+	+
Lemna trisulca	Ivy-leaved Duckweed	-	+	+	+	+
Leontodon saxatilis	Lesser Hawkbit	-	-	+	-	+
Lepidium coronopus	Swine-cress	-	-	+	+	+
Lepidium draba	Hoary Cress	-	-	+	+	+

<i>Lepidium latifolium</i>	Dittander	-	-	+	+	+
<i>Leucanthemum vulgare</i>	Oxeye Daisy	-	-	+	+	+
<i>Ligustrum vulgare</i>	Wild Privet	-	-	+	-	+
<i>Lipandra polysperma</i>	Many-seeded Goosefoot	-	-	-	-	+
<i>Lolium *boucheanum</i>	Hybrid Rye-grass	-	-	-	-	+
<i>Lolium perenne</i>	Perennial Rye-grass	-	-	+	+	+
<i>Lonicera periclymenum</i>	Honeysuckle	-	-	+	-	+
<i>Lotus corniculatus</i>	Common Bird's-foot-trefoil	-	-	+	+	+
<i>Lotus pedunculatus</i>	Large Bird's-foot-trefoil	-	-	+	-	+
<i>Lotus tenuis</i>	Narrow-leaved Bird's-foot-trefoil	Axiophyte	-	+	-	+
<i>Lycopus europaeus</i>	Gipsywort	-	+	+	+	+
<i>Lysimachia nummularia</i>	Creeping-Jenny	Axiophyte	+	+	+	+
<i>Lysimachia vulgaris</i>	Yellow Loosestrife	Axiophyte	-	+	-	+
<i>Lythrum salicaria</i>	Purple-loosestrife	-	-	+	+	+
<i>Malus domestica</i>	Apple	-	-	+	-	+
<i>Malus *purpurea</i>	Purple Crab	-	-	-	-	+
<i>Malva sylvestris</i>	Common Mallow	-	-	-	+	+
<i>Matricaria chamomilla</i>	Scented Mayweed	-	-	+	+	+
<i>Matricaria discoidea</i>	Pineapple Weed	-	-	+	+	+
<i>Medicago arabica</i>	Spotted Medick	-	-	+	+	+
<i>Medicago lupulina</i>	Black Medick	-	-	+	+	+
<i>Mentha aquatica</i>	Water Mint	-	-	+	+	+
<i>Menyanthes trifoliata</i>	Bogbean	Axiophyte	+	-	-	-
<i>Myosotis arvensis</i>	Field Forget-me-not	-	-	-	-	+
<i>Myosotis laxa</i>	Tufted Forget-me-not	Axiophyte	-	+	+	+
<i>Myosotis scorpioides</i>	Water Forget-me-not	-	-	+	+	+
<i>Myosotis *suzae</i>	Water x Tufted Forget-me-not	-	-	-	-	+
<i>Myriophyllum spicatum</i>	Spiked Water-milfoil	-	+	+	-	+
<i>Myriophyllum verticillatum</i>	Whorled Water-milfoil	Axiophyte	+	+	+	+
<i>Nasturtium officinale</i>	Watercress	-	-	+	+	+
<i>Nuphar lutea</i>	Yellow Water-lily	-	-	+	+	+
<i>Nymphaea alba</i>	White Water-lily	-	+	+	+	+
<i>Oenanthe aquatica</i>	Fine-leaved Water-dropwort	Axiophyte	+	+	-	+
<i>Oenanthe crocata</i>	Hemlock Water-dropwort	-	-	+	+	+
<i>Oenanthe fistulosa</i>	Tubular Water-dropwort	Axiophyte	+	+	+	+
<i>Oenanthe fluviatilis</i>	River Water-dropwort	Axiophyte	+	-	-	-
<i>Oenanthe lachenalii</i>	Parsley Water-dropwort	Axiophyte	+	-	-	-
<i>Ophioglossum vulgatum</i>	Adder's-tongue	Axiophyte	-	-	-	+
<i>Oxybasis rubra</i>	Red Goosefoot	-	-	+	-	+
<i>Pentaglottis sempervirens</i>	Green Alkanet	-	-	-	-	+
<i>Persicaria amphibia</i>	Amphibious Bistort	-	-	+	+	+
<i>Persicaria hydropiper</i>	Water-pepper	-	-	+	+	+
<i>Persicaria lapathifolia</i>	Pale Persicaria	-	-	+	-	+
<i>Persicaria maculosa</i>	Redshank	-	-	+	+	+
<i>Petroselinum segetum</i>	Corn Parsley	Axiophyte	-	+	-	+
<i>Phalaris arundinacea</i>	Reed Canary-grass	-	-	+	+	+
<i>Phleum bertolonii</i>	Smaller Cat's-tail	-	-	-	+	+
<i>Phleum pratense</i>	Timothy	-	-	+	-	+
<i>Phragmites australis</i>	Common Reed	-	-	+	+	+
<i>Picris hieracioides</i>	Hawkweed Oxtongue	-	-	-	-	+
<i>Pilosella officinarum</i>	Mouse-ear-hawkweed	-	-	+	+	+
<i>Plantago coronopus</i>	Buck's-horn Plantain	-	-	-	-	+
<i>Plantago lanceolata</i>	Ribwort Plantain	-	-	+	+	+
<i>Plantago major</i>	Greater Plantain	-	-	+	+	+
<i>Poa annua</i>	Annual Meadow-grass	-	-	+	+	+
<i>Poa infirma</i>	Early Meadow-grass	-	-	-	-	+
<i>Poa nemoralis</i>	Wood Meadow-grass	Axiophyte	-	-	-	+
<i>Poa pratensis</i>	Smooth Meadow-grass	-	-	+	-	+
<i>Poa trivialis</i>	Rough Meadow-grass	-	-	+	+	+
<i>Polygonum aviculare</i>	Knotgrass	-	-	+	+	+
<i>Polygonum depressum</i>	Equal-leaved Knotgrass	-	-	+	+	+
<i>Polystichum setiferum</i>	Soft Shield-fern	Axiophyte	-	-	-	+
<i>Populus *canadensis</i>	Hybrid Black Poplar	-	-	+	-	+

Potamogeton acutifolius	Sharp-leaved Pondweed	Axiophyte	+	+	+	+
Potamogeton berchtoldii	Small Pondweed	-	-	+	+	-
Potamogeton coloratus	Fen Pondweed	Axiophyte	-	-	-	+
Potamogeton crispus	Curled Pondweed	-	+	+	+	-
Potamogeton friesii	Flat-stalked Pondweed	Axiophyte	+	+	+	+
Potamogeton lucens	Shining Pondweed	Axiophyte	+	+	+	+
Potamogeton natans	Broad-leaved Pondweed	-	+	+	+	+
Potamogeton pectinatus	Fennel Pondweed	-	+	+	+	+
Potamogeton perfoliatus	Perfoliate Pondweed	Axiophyte	+	-	-	-
Potamogeton pusillus	Lesser Pondweed	-	+	-	+	+
Potamogeton trichoides	Hairlike Pondweed	Axiophyte	-	-	+	+
Potentilla anserina	Silverweed	-	-	+	-	+
Potentilla reptans	Creeping Cinquefoil	-	-	+	+	+
Prunella vulgaris	Selfheal	-	-	+	-	+
Prunus avium	Wild Cherry	-	-	-	-	+
Prunus cerasifera	Cherry Plum	-	-	-	-	+
Prunus domestica	Wild Plum	-	-	+	+	+
Prunus spinosa	Blackthorn	-	-	+	+	+
Pulicaria dysenterica	Fleabane	-	-	+	+	+
Pyrus communis	Pear	-	-	-	-	+
Quercus robur	Pedunculate Oak	-	-	+	+	+
Ranunculus acris	Meadow Buttercup	-	-	+	+	+
Ranunculus aquatilis	Common Water-crowfoot	Axiophyte	-	-	-	+
Ranunculus circinatus	Fan-leaved Water-crowfoot	Axiophyte	+	+	+	+
Ranunculus flammula	Lesser Spearwort	Axiophyte	-	+	-	+
Ranunculus lingua	Greater Spearwort	-	+	+	-	-
Ranunculus peltatus	Pond Water-crowfoot	Axiophyte	-	-	-	+
Ranunculus repens	Creeping Buttercup	-	-	+	+	+
Ranunculus sardous	Hairy Buttercup	-	+	+	+	+
Ranunculus sceleratus	Celery-leaved Buttercup	-	-	+	+	+
Ranunculus trichophyllus	Thread-leaved Water-crowfoot	Axiophyte	-	-	-	+
Reseda luteola	Weld	-	-	+	-	+
Ribes nigrum	Black Currant	Axiophyte	-	+	-	+
Ribes rubrum	Red Currant	-	-	+	-	+
Rorippa amphibia	Great Yellow-cress	Axiophyte	-	-	-	+
Rorippa palustris	Marsh Yellow-cress	Axiophyte	-	+	-	+
Rorippa sylvestris	Creeping Yellow-cress	-	+	-	-	-
Rosa arvensis	Field Rose	-	-	-	-	+
Rosa canina	Dog Rose	-	-	+	+	+
Rosa x dumalis	Hybrid Dog-rose	-	-	-	-	+
Rubus fruticosus	Bramble	-	-	+	+	+
Rumex acetosa	Common Sorrel	-	-	+	+	+
Rumex conglomeratus	Clustered Dock	-	-	+	+	+
Rumex crispus	Curled Dock	-	-	+	+	+
Rumex hydrolapathum	Water Dock	Axiophyte	-	+	+	+
Rumex obtusifolius	Broad-leaved Dock	-	-	+	+	+
Rumex sanguineus	Wood Dock	-	-	+	+	+
Sagittaria sagittifolia	Arrowhead	Axiophyte	-	-	+	+
Salix alba	White Willow	-	-	+	+	+
Salix atrocinerea	Grey Willow	-	-	+	+	+
Salix caprea	Goat Willow	-	-	-	-	+
Salix *fragilis	Crack-willow	-	-	+	+	+
Salix *holosericea	Silky-leaved Osier	-	-	-	-	+
Salix *mollissima	Sharp-stipuled Willow	-	-	-	-	+
Salix purpurea	Purple Willow	-	-	-	+	+
Salix *quercifolia	Goat x Grey Willow	-	-	-	-	+
Salix *smithiana	Broad-leaved Osier	-	-	-	-	+
Salix triandra	Almond Willow	-	-	-	-	+
Salix viminalis	Osier	-	-	+	+	+
Sambucus nigra	Elder	-	-	+	+	+
Samolus valerandi	Brookweed	Axiophyte	-	+	+	+
Schedonorus arundinaceus	Tall Fescue	-	-	+	+	+
Schoenoplectus lacustris	Common Club-rush	Axiophyte	-	-	-	+

<i>Schoenoplectus tabernaemontani</i>	Grey Club-rush	Axiophyte	+	+	+	+
<i>Scorzoneroideis autumnalis</i>	Autumnal Hawkbit	-	-	+	+	+
<i>Scrophularia auriculata</i>	Water Figwort	-	-	+	+	+
<i>Scutellaria galericulata</i>	Skullcap	-	+	+	-	+
<i>Senecio inaequidens</i>	Narrow-leaved Ragwort	-	-	-	-	+
<i>Senecio squalidus</i>	Oxford Ragwort	-	-	+	-	+
<i>Senecio vulgaris</i>	Groundsel	-	-	+	+	+
<i>Silaum silaus</i>	Pepper-saxifrage	Axiophyte	-	-	-	+
<i>Silene dioica</i>	Red Campion	-	-	+	+	+
<i>Silene flos-cuculi</i>	Ragged Robin	Axiophyte	-	+	+	+
<i>Silene *hampeana</i>	Hybrid Campion	-	-	-	-	+
<i>Sinapis arvensis</i>	Charlock	-	-	+	+	+
<i>Sison amomum</i>	Stone Parsley	-	-	+	+	+
<i>Sisymbrium officinale</i>	Hedge Mustard	-	-	+	+	+
<i>Smyrniolum olusatrum</i>	Alexanders	-	-	-	-	+
<i>Solanum dulcamara</i>	Bittersweet	-	-	+	+	+
<i>Sonchus arvensis</i>	Perennial Sow-thistle	-	-	+	+	+
<i>Sonchus asper</i>	Prickly Sow-thistle	-	-	+	+	+
<i>Sonchus oleraceus</i>	Smooth Sow-thistle	-	-	+	+	+
<i>Sonchus palustris</i>	Marsh Sow-thistle	-	-	-	+	+
<i>Sorbus aucuparia</i>	Rowan	-	-	-	-	+
<i>Sparganium erectum</i>	Branched Bur-reed	-	-	+	+	+
<i>Spergularia marina</i>	Lesser Sea-spurrey	-	-	+	-	-
<i>Spergularia rubra</i>	Sand Spurrey	Axiophyte	-	-	-	+
<i>Spirodela polyrhiza</i>	Greater Duckweed	Axiophyte	+	+	+	+
<i>Stachys palustris</i>	Marsh Woundwort	Axiophyte	-	+	-	+
<i>Stachys sylvatica</i>	Hedge Woundwort	-	-	+	-	+
<i>Stellaria aquatica</i>	Water Chickweed	Axiophyte	-	-	+	+
<i>Stellaria holostea</i>	Greater Stitchwort	-	-	+	+	+
<i>Stellaria media</i>	Chickweed	-	-	+	+	+
<i>Stellaria palustris</i>	Marsh Stitchwort	Axiophyte	+	+	-	-
<i>Symphyotrichum laeve</i> var. <i>concinnum</i>	Delicate Michaelmas-daisy	-	-	+	-	+
<i>Symphytum officinale</i>	Common Comfrey	-	+	-	-	-
<i>Symphytum orientale</i>	White Comfrey	-	-	-	-	+
<i>Symphytum *uplandicum</i>	Russian Comfrey	-	-	-	+	+
<i>Taraxacum officinale</i>	Dandelion	-	-	+	+	+
<i>Taxus baccata</i>	Yew	-	-	-	-	+
<i>Thalictrum flavum</i>	Meadow-rue	Axiophyte	-	+	-	+
<i>Torilis japonica</i>	Upright Hedge-parsley	-	-	+	+	+
<i>Tragopogon pratensis</i>	Goat's-beard	-	-	+	+	+
<i>Trifolium campestre</i>	Hop Trefoil	-	-	-	-	+
<i>Trifolium dubium</i>	Lesser Trefoil	-	-	+	+	+
<i>Trifolium fragiferum</i>	Strawberry Clover	Axiophyte	-	+	+	+
<i>Trifolium micranthum</i>	Slender Trefoil	-	-	+	+	+
<i>Trifolium pratense</i>	Red Clover	-	-	+	+	+
<i>Trifolium repens</i>	White Clover	-	-	+	+	+
<i>Triglochin palustris</i>	Marsh Arrowgrass	Axiophyte	+	+	-	-
<i>Tripleurospermum inodorum</i>	Scentless Mayweed	-	-	+	+	+
<i>Trisetum flavescens</i>	Yellow Oat-grass	-	-	+	+	+
<i>Tussilago farfara</i>	Colt's-foot	-	-	+	+	+
<i>Typha angustifolia</i>	Lesser Reedmace	Axiophyte	-	+	+	+
<i>Typha latifolia</i>	Great Reedmace	-	-	+	+	+
<i>Typha *glauca</i>	Hybrid Reedmace	-	-	-	-	+
<i>Ulmus glabra</i>	Wych Elm	-	-	-	-	+
<i>Ulmus minor</i>	Small-leaved Elm	-	-	+	+	+
<i>Ulmus procera</i>	English Elm	-	-	-	-	+
<i>Urtica dioica</i>	Stinging Nettle	-	-	+	+	+
<i>Urtica galeopsifolia</i>	Fen Nettle	-	-	-	-	+
<i>Utricularia vulgaris</i>	Greater Bladderwort	Axiophyte	+	+	+	+
<i>Valeriana officinalis</i>	Common Valerian	Axiophyte	+	+	-	+
<i>Veronica arvensis</i>	Wall Speedwell	-	-	-	-	+
<i>Veronica beccabunga</i>	Brooklime	-	-	+	-	+
<i>Veronica catenata</i>	Pink Water-speedwell	Axiophyte	-	+	+	+

Veronica chamaedrys	Germander Speedwell	-	-	+	-	+
Veronica persica	Common Field-speedwell	-	-	+	+	+
Veronica scutellata	Marsh Speedwell	Axiophyte	-	-	+	+
Viburnum opulus	Guelder-rose	-	-	+	-	+
Vicia cracca	Tufted Vetch	-	-	+	+	+
Vicia sativa	Common Vetch	-	-	+	+	+
Vinca minor	Lesser Periwinkle	-	-	-	-	+
Vulpia bromoides	Squirrel-tail Fescue	-	-	+	+	+
Vulpia myuros	Rat's-tail Fescue	-	-	+	-	+
Wolffia arrhiza	Rootless Duckweed	Axiophyte	+	-	-	-
Zannichellia palustris	Horned Pondweed	Axiophyte	+	-	+	+
Total			54	262	227	363

Assessment of conservation status

There are various ways of assessing the conservation status of a site, but there is no one method that is widely accepted or particularly convincing. The Ratcliffe Criteria (Ratcliffe, 1977) provide a philosophical basis for site selection but not a practical process. The key elements of the Criteria are rarity, diversity, naturalness and age, and these concepts are widely accepted as fundamental parts of any conservation assessment, although they can be difficult to evaluate empirically.

Rarity

In general rarity is the most widely used criterion for the selection of important sites. This is obviously useful if a species or habitat is globally restricted, but that rarely applies in Britain. Being rare within the British Isles often means simply that the species is on the edge of its range, and it might be common elsewhere and of no real consequence. Because of this one needs to take a wider view than simply counting rare species.

Stodmarsh has one plant that is Nationally Rare, *Potamogeton acutifolius*, and this is undoubtedly a species which deserves its status. Pondweeds are well represented in the British flora and they are of considerable ecological importance. Six more species are Nationally Scarce: *Carex divisa*, *Lepidium latifolium*, *Myriophyllum verticillatum*, *Potamogeton coloratus*, *P. trichoides* and *Sonchus palustris*, and one more that has apparently been lost: *Wolffia arrhiza*. These are all wetland plants, typical of ditches, swamps, reedbeds and saltmarsh.

The vegetation at Stodmarsh also has a claim to rarity. There is no information on the distribution of the *Hordeum secalinum*-*Agrostis stolonifera* community, but it seems reasonable to assume that it is not widespread. The S19 *Eleocharis palustris* vegetation and A3 *Hydrocharis morsus-ranae* ditches are also uncommon, but again difficult to quantify, owing to the lack of a national register.

Diversity

Diversity alone can clearly be a pointless measure of conservation value: however good a site is, one could always increase its diversity by planting something inappropriate in it, and this shows that diversity itself is not the important issue. However, the diversity of a natural community can be important, and the best way of measuring that is by counting axiophytes. These are the species that tend to be restricted to habitats that have been deemed valuable for conservation purposes. Assuming that the habitats and species have been chosen well, a reasonable approximation of the value of site can be obtained simply by counting the number of axiophytes present. Losses and gains can then be used to assess change.

A total of 80 species of axiophyte has been recorded at Stodmarsh, which is well over the recommended minimum of 30 for a SSSI. This large total would make it one of the top sites in any county. Ten of these species have not been found in the last decade, which leaves 70 as the current count. This is higher than the total recorded at any time in the past so, as far as our data can be interpreted, the diversity of this site is higher than it has ever been before.

Naturalness

If Stodmarsh were a completely natural site, it would probably be a flat area of salty floodplain marshes and wet woodland, periodically inundated by the sea and regularly submerged by the river. But flood protection works, particularly the river embankment, keep the meadows dry almost all year round by an elaborate network of drains and sluices. It is thus an entirely artificial habitat, maintained only by large scale engineering projects and continuous ongoing management. On the other hand, the species present are to a large extent the same ones that would likely be found in this area if it were truly wild. The extent to which Stodmarsh could or should be managed in a more natural way is a question that may become more pertinent as climate change and sea level rise affect the area over the coming decades.

Age

The origin of the vegetation at Stodmarsh can only be surmised from the records, which date back no more than 200 years, and from its current appearance. In many parts of England, for example, an ancient meadow might be characterised by a ridge-and-furrow pattern, which indicates that it was ploughed in the Middle Ages and is therefore no more than 500 or so years old.

At Stodmarsh, the best clue to the age of the habitat is the coastal nature of the vegetation. Stodmarsh was once on the shore, and the vegetation must have been saltmarsh. At some point it was transformed into grazing marsh. The most likely time for this is about when the Wantsum Channel silted up. In Roman times, this was a deep channel of the sea, and ships would use it in preference to sailing around the Isle of Thanet. In places it was over a mile wide.

Despite a small amount of sea level rise since that time, the silt brought down by the rivers filled the channel and raised the level to the point where it could be protected from flooding. This apparently happened around 1,000 years ago. Stodmarsh, at the highest point of the channel, would have been one of the first areas that could have been protected from the sea. This dates the vegetation to about 1,000 AD, which is interesting because that would make these fields some of the oldest in the country, as they have not been ploughed or significantly changed in the interim.

- The silting up of the Wantsum Channel. The top map shows what the coastline is thought to have been like at the end of the Roman era (c. 400 AD). The lower map, from the British Library, dates from about 1548 and shows the Stour as a river rather than an estuary (note that on this map north is down). Stodmarsh would have changed from a coastal site to an inland one at some time between these dates.

This points to what is possibly the most ecologically interesting feature of Stodmarsh. It has not been significantly altered by the changes that have affected the British countryside since the industrial revolution. The agricultural practices have remained the same for a millennium. It was never ploughed or used for military purposes during wartime. It was never abandoned to scrub, or subject to enclosure. The only significant change that has happened is the coal mining in the 20th century – and this has only affected the western portion of the site. Everywhere else seems to have remained as slightly brackish grazing pasture, with ditches for field boundaries, since Saxon times. This history is quite remarkable, and it surely the most important feature of the site.



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The maps in this report were drawn using the BSBI's Distribution Database, <http://bsbidb.org.uk/>.

The following people have recorded plants at Stodmarsh and generously made the records available:

Armishaw, Ms J.	1	Hanbury, Mr F.J.	26	Rich, Dr T.C.G.	1
Banks, Mr B.	500	Heathcote, Mr P.	2	Rooney, Mr L.	2
Barter, Ms G.M.	17	Kenrick, Miss	2	Rose, Dr F.	35
Bartlett, Rev T.H.M.	5	Kileen, Mr I.J.	30	Sankey, Miss	1
Belton, Miss	1	Kitchener, Mr G.D.	10	Stewart, Mr N.F.	1
Bevan, Mr J.	42	Marshall, Rev E.S.	1	Stewart, R.J.	1
Booth, Mr F.	12	Masters, Mr W.	4	van Dongen, Ms A.	420
Bratton, Dr J.H.	2	Mills, Ms D.	12	Ward, Mr C.W.	28
Buckingham, Mrs S.	172	Newbold, Dr C.	23	Warman, L.	1
Cousins, Mrs M.	2	Osborne, Mr C.	25	Wilberforce, Mr P.W.	2
Dowker, Mr G.	1	Painter, Mr D.	420	Williams, Mr P.	505
Dyson, Mr C.	36	Philp, Mr E.G.	406	Williams, Mr R.G.	1
Elder, Ms V.	500	Pitt, Ms J.	2	Wood, Mr R.E.	1
Forbes, J.E.	222	Ratcliffe, Dr D.A.	14		
Grant, Mr D.	1	Reeves, Mr W.W.	1		

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Appendix 1: phytosociological data

Hordeum secalinum grassland

Table 1 lists the quadrats recorded in *Hordeum secalinum* vegetation.

- Q1053 compartment 23 TR23266214, 9th August 2014: typical but rather species-poor grassland.
- Q1054 compartment 22 TR23216234, 9th August 2014: very fine, wet *Hordeum* grassland.
- Q1071 compartment 22 TR23206231, 28th July 2016: typical grassland.
- Q1074 compartment 15D TR22686209, 4th August 2016: this is close to MG6 *Cynosurus cristatus* grassland, but retaining some features of *H. secalinum* grassland.
- Q1075 compartment 49 TR24066267, 13th August 2016: this is an example of a sward that is turning into MG5a *Festuca rubra* grassland, although it is still intermediate.
- Q1077 compartment 23 TR23336224, 31st July 2015: species-poor but typical grassland.

Table 1: *Hordeum secalinum*-*Agrostis stolonifera* grassland quadrats

	Q1053	Q1054	Q1071	Q1074	Q1075	Q1077
<i>Hordeum secalinum</i>	7	4	9	5	6	5
<i>Agrostis stolonifera</i>	5	8	6	7	8	8
<i>Lotus corniculatus</i>	8	-	-	-	2	-
<i>Cynosurus cristatus</i>	-	-	-	6	3	-
<i>Lolium perenne</i>	6	-	-	2	6	3
<i>Ranunculus acris</i>	6	1	1	-	2	-
<i>Juncus inflexus</i>	-	4	4	1	5	4
<i>Lotus tenuis</i>	-	2	5	5	5	4
<i>Medicago lupulina</i>	5	-	-	-	3	-
<i>Potentilla anserina</i>	-	5	-	4	-	-
<i>Ranunculus sardous</i>	-	5	-	-	-	4
<i>Trifolium fragiferum</i>	5	4	5	5	3	5
<i>Alopecurus geniculatus</i>	-	4	-	-	-	-
<i>Alopecurus pratensis</i>	-	4	4	-	-	-
<i>Carex disticha</i>	-	4	-	-	-	-
<i>Juncus effusus</i>	-	1	4	-	-	-
<i>Leontodon saxatilis</i>	-	-	1	-	3	4
<i>Phragmites australis</i>	-	4	-	-	-	-
<i>Trifolium pratense</i>	4	-	-	2	4	-
<i>Trifolium repens</i>	4	1	4	-	-	2
<i>Cerastium fontanum</i>	-	-	-	-	3	-
<i>Dactylis glomerata</i>	-	-	-	3	-	-
<i>Eleocharis palustris</i>	-	3	-	-	-	-
<i>Elytrigia repens</i>	-	3	2	1	-	3
<i>Festuca rubra</i>	-	-	2	-	3	-
<i>Holcus lanatus</i>	-	-	-	-	3	-
<i>Phleum bertolonii</i>	-	-	-	-	3	-
<i>Phleum pratense</i>	-	-	-	3	-	-
<i>Poa pratensis</i>	-	-	3	-	-	-
<i>Carex flacca</i>	-	-	-	-	2	-
<i>Cirsium arvense</i>	2	-	-	1	2	-
<i>Crataegus monogyna</i>	-	-	-	-	2	-
<i>Helminthotheca echioides</i>	-	-	-	-	2	-
<i>Juncus articulatus</i>	-	2	-	-	-	-
<i>Persicaria amphibia</i>	2	-	-	-	-	-
<i>Plantago lanceolata</i>	-	-	-	1	2	-
<i>Poa trivialis</i>	2	-	-	-	-	-
<i>Prunella vulgaris</i>	1	-	-	2	2	-
<i>Pulicaria dysenterica</i>	-	2	2	1	1	-
<i>Ranunculus repens</i>	-	-	-	-	2	-
<i>Rumex crispus</i>	-	2	-	-	-	-
<i>Senecio erucifolius</i>	-	-	-	-	2	-
<i>Agrimonia eupatoria</i>	-	-	-	-	1	-
<i>Bellis perennis</i>	1	-	-	-	-	-
<i>Carex otrubae</i>	-	1	-	1	1	-
<i>Plantago major</i>	-	-	-	1	-	-
<i>Rumex acetosa</i>	-	-	-	1	-	-
<i>Rumex conglomeratus</i>	-	-	-	1	-	-
<i>Taraxacum officinale</i> agg.	-	-	-	-	1	-

S19 *Eleocharis palustris* swamps

Table 2 lists the quadrats in the S19 *Eleocharis palustris* vegetation:

- Q1055 compartment 18a, TR22876235, 12th August 2014: a wet hollow with a typical, rather species-poor *Eleocharis* swamp.
- Q1072 compartment 15a, TR22386209, 5th August 2016: on the edge of a shallow depression of hard, dry mud at the time of survey. This area looked like grassland rather than swamp but, although some people think there should be an *Agrostis-Eleocharis* grassland, to me it seems to fit well within the S19c *Agrostis stolonifera* subcommunity.
- Q1073, compartment 59, TR24026260, 13th August 2016: a wet hollow in a wet field of sedge swamp and marshy grassland. This is a fine example of the community with rare plants like *Baldellia* and *Alisma lanceolatum*.
- Q1076, compartment 57, TR23956242, 13th August 2016: the best example I have found of this community. Note the presence of brackish plants such as *Carex divisa* and the rarity *Potamogeton coloratus*.
- Q1078, compartment 45, TR23476278, 4th September 2016: a rather plain example of this community in the heavily goose-grazed margin of a shallow lake.
- Q1079, compartment 15E, TR22606196, 4th September 2016: a swamp filled with flowering-rush in a muddy hollow in a drying field. This quadrat hints at a relationship between the *Eleocharis* swamps and the *Butomus* swamp, if it counts as distinctive.

Table 2: S19 *Eleocharis palustris* quadrats

	Q1055	Q1072	Q1073	Q1076	Q1078	Q1079
<i>Eleocharis palustris</i>	9	6	10	10	9	8
<i>Agrostis stolonifera</i>	3	10	2	3	-	3
<i>Crassula helmsii</i>	4	3	4	-	8	-
<i>Juncus articulatus</i>	-	5	3	7	4	-
<i>Chara vulgaris</i>	-	-	-	4	5	-
<i>Mentha aquatica</i>	5	4	-	-	-	-
<i>Veronica catenata</i>	-	-	4	-	-	5
<i>Juncus inflexus</i>	-	4	-	4	-	-
<i>Butomus umbellatus</i>	-	-	-	-	-	7
<i>Galium palustre</i>	3	-	1	3	-	-
<i>Hippuris vulgaris</i>	1	3	-	-	3	-
<i>Baldellia ranunculoides</i>	-	-	2	4	-	-
<i>Carex divisa</i>	-	-	-	6	-	-
<i>Oxybasis rubra</i>	-	-	-	-	-	6
<i>Alisma plantago-aquatica</i>	-	-	-	-	4	1
<i>Hydrocharis morsus-ranae</i>	-	-	-	-	5	-
<i>Elodea nuttallii</i>	-	-	-	-	4	-
<i>Glyceria maxima</i>	4	-	-	-	-	-
<i>Persicaria amphibia</i>	4	-	-	-	-	-
<i>Phragmites australis</i>	-	-	-	-	4	-
<i>Potamogeton coloratus</i>	-	-	-	4	-	-
<i>Ranunculus sardous</i>	-	-	1	2	-	-
<i>Rumex conglomeratus</i>	-	2	-	1	-	-
<i>Alisma lanceolatum</i>	-	-	2	-	-	-
<i>Atriplex patula</i>	-	-	-	-	-	2
<i>Bolboschoenus maritimus</i>	-	-	-	-	-	2
<i>Carex hirta</i>	-	-	-	2	-	-
<i>Carex otrubae</i>	-	1	-	1	-	-
<i>Persicaria maculosa</i>	-	-	-	-	-	2
<i>Potentilla anserina</i>	2	-	-	-	-	-
<i>Typha angustifolia</i>	-	-	-	-	-	2
<i>Epilobium hirsutum</i>	-	1	-	-	-	-
<i>Epilobium parviflorum</i>	-	1	-	-	-	-
<i>Juncus bufonius</i>	-	-	-	-	-	1
<i>Persicaria lapathifolia</i>	-	-	-	-	-	1
<i>Ranunculus sceleratus</i>	-	-	-	-	-	1
<i>Rumex crispus</i>	1	-	-	-	-	-
<i>Veronica scutellata</i>	-	-	1	-	-	-

W5 *Alnus glutinosa* and W6 *Salix x fragilis* woodland

- Q1033 compartment 2, TR22216088, 25th July 2013. This is an example of where the woodland is closer to W6 than to W5. The willows, nettles and willowherbs particularly point to this, although the yellow loosestrife in particular is more a W5 plant.
- Q1044, riverbank by compartment 32, TR23056279, 23rd May 2014. Typical W6 woodland by the river, with only *Lepidium latifolium* to give it a regional difference.
- Q1062, close to Q1044, TR23026289, 11th August 2015. The abundance of nettle tends to increase in the summer, and this is an extreme example of eutrophic woodland.
- Q1064, compartment 2, TR22246102, 20th May 2016. Alder and willow carr with an understorey of sedges. Closer to W5 than to W6, but hardly typical.
- Q1065, similar to Q1064, TR22246102, 20th May 2016. Similar to the above, but with white willow in the canopy.
- Q1066, compartment 14G, TR22356117, 20th May 2016. This is grey willow woodland with an understorey of reed sweetgrass. Rather like W1 woodland, but arguably within the range of variability of the W5/W6 continuum.
- Q1067, compartment 14G, TR22346113, 20th May 2016. This is the closest stand to good W5, with characteristic species such as fen nettle.
- Q1080, riverbank by compartment 32, TR23026283, 20th April 2016. W6 woodland by the river.

Table 3: woodland quadrats

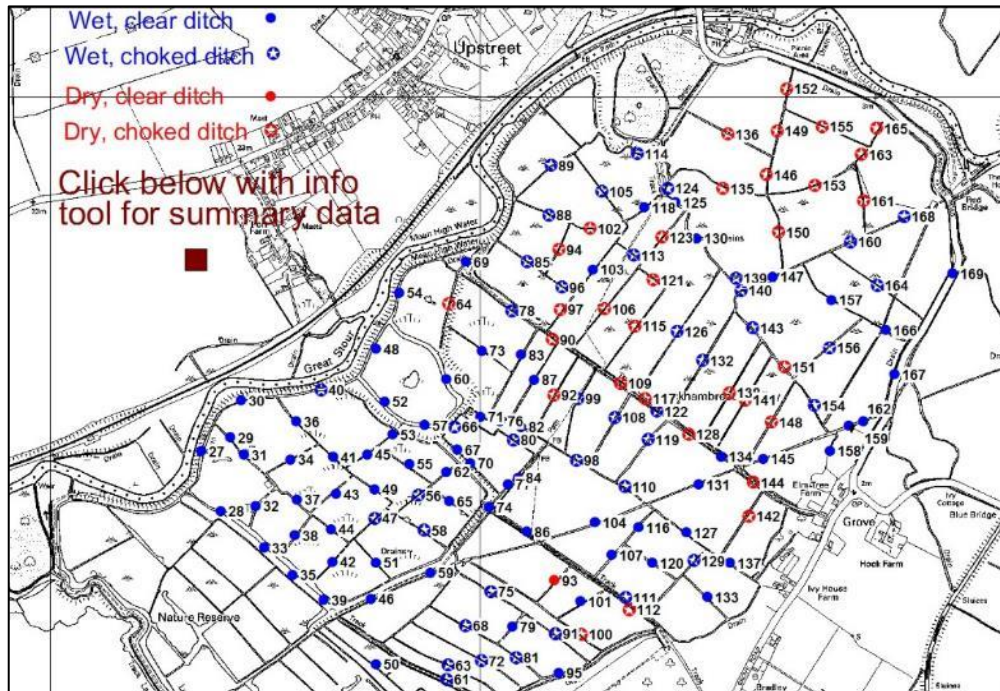
	Q1033	Q1044	Q1062	Q1064	Q1065	Q1066	Q1067	Q1080
<i>Salix x fragilis</i>	7	7	9	5	4	-	4	5
<i>Urtica dioica</i>	4	4	10	2	3	-	2	6
<i>Alnus glutinosa</i>	6	-	-	5	6	1	9	-
<i>Carex riparia</i>	7	-	-	4	2	-	9	-
<i>Iris pseudacorus</i>	4	-	-	4	4	3	5	2
<i>Salix atrocinerea</i>	4	-	-	4	4	9	-	-
<i>Crataegus monogyna</i>	-	4	1	4	5	-	1	4
<i>Glyceria maxima</i>	-	4	-	-	-	8	4	-
<i>Solanum dulcamara</i>	3	3	-	3	1	3	3	-
<i>Oenanthe crocata</i>	-	5	4	-	-	-	1	5
<i>Filipendula ulmaria</i>	5	-	-	2	5	-	-	2
<i>Epilobium hirsutum</i>	4	4	-	2	-	-	2	-
<i>Salix alba</i>	5	-	-	-	7	-	-	-
<i>Phalaris arundinacea</i>	7	-	-	-	3	-	-	-
<i>Phragmites australis</i>	-	7	3	-	-	-	-	-
<i>Lemna minuta</i>	-	-	-	-	-	6	3	-
<i>Populus x canadensis</i>	-	-	-	4	5	-	-	-
<i>Buddleja davidii</i>	-	-	4	-	-	-	-	4
<i>Carex acutiformis</i>	-	-	-	8	-	-	-	-
<i>Fraxinus excelsior</i>	-	1	-	1	4	-	1	1
<i>Hedera helix</i>	-	-	5	-	-	-	-	3
<i>Ribes nigrum</i>	-	-	-	4	4	-	-	-
<i>Viburnum opulus</i>	-	-	-	4	4	-	-	-
<i>Galium palustre</i>	3	-	-	1	3	-	-	-
<i>Angelica sylvestris</i>	1	-	2	-	-	-	-	2
<i>Equisetum fluviatile</i>	-	-	-	-	-	5	-	-
<i>Lysimachia vulgaris</i>	4	-	-	-	1	-	-	-
<i>Lythrum salicaria</i>	-	-	2	2	-	-	1	-
<i>Poa trivialis</i>	2	-	-	2	1	-	-	-
<i>Quercus robur</i>	-	-	-	-	5	-	-	-
<i>Rosa arvensis</i>	-	-	-	-	4	-	-	1
<i>Acer pseudoplatanus</i>	-	-	4	-	-	-	-	-
<i>Calystegia sepium</i>	-	2	-	-	-	-	2	-
<i>Corylus avellana</i>	-	-	-	-	4	-	-	-
<i>Ficaria verna</i>	-	-	-	-	-	-	-	4
<i>Humulus lupulus</i>	-	-	-	2	1	-	-	1
<i>Lepidium latifolium</i>	-	4	-	-	-	-	-	-
<i>Lysimachia nummularia</i>	-	-	-	-	4	-	-	-
<i>Ribes rubrum</i>	-	-	-	-	2	-	-	2
<i>Sambucus nigra</i>	-	-	4	-	-	-	-	-
<i>Scutellaria galericulata</i>	1	-	-	-	1	-	2	-
<i>Urtica galeopsifolia</i>	-	-	-	-	2	-	2	-
<i>Cardamine pratensis</i>	-	-	-	1	-	-	-	2
<i>Galium aparine</i>	-	-	-	-	-	-	3	-
<i>Juncus effusus</i>	-	-	-	2	-	-	1	-
<i>Ranunculus sceleratus</i>	-	-	-	2	-	-	1	-

Cardamine flexuosa	-	-	-	-	-	-	2	-
Carex remota	-	-	-	-	2	-	-	-
Dipsacus fullonum	-	2	-	-	-	-	-	-
Epilobium parviflorum	-	-	-	-	-	-	2	-
Lycopus europaeus	-	-	-	2	-	-	-	-
Mentha aquatica	-	-	-	-	-	-	2	-
Myosotis scorpioides	1	-	-	1	-	-	-	-
Rumex conglomeratus	-	-	-	2	-	-	-	-
Rumex hydrolapathum	-	-	-	-	-	2	-	-
Stachys palustris	-	-	2	-	-	-	-	-
Berula erecta	1	-	-	-	-	-	-	-
Caltha palustris	-	-	-	-	1	-	-	-
Dryopteris dilatata	-	-	-	-	-	-	1	-
Myosotis laxa	1	-	-	-	-	-	-	-
Ranunculus repens	-	-	-	1	-	-	-	-
Rosa canina agg.	-	-	-	-	-	-	-	1

Appendix 2: compartment and ditch numbers

1: Ditch numbers

NB, for ditches that do not have numbers, I assign new ones based on compartment numbers (D62.1, D62.2, etc.), working clockwise from the top.



2: Compartment numbers

