

# **A SURVEY OF THE AQUATIC VEGETATION OF LOUGH SEWDY, WESTMEATH, 2022**

**Nick Stewart  
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*Western bay of Lough Sewdy*

**Nick Stewart, Kingfishers, 4 Hexton Road, Glastonbury, BA6 8HL**

## 1. Introduction

Lough Sewdy is a medium-sized lake close to Ballymore in Co. Westmeath. It is about one kilometre at its longest dimension but it has an irregular outline and is divided into several bays by headlands and islands. It is an example of a marl lake and recognised as the threatened habitat E3140 “Oligo- to mesotrophic hard waters with *Chara* formations” in the EU Habitats Directive. The lake does not currently have any nature conservation designation but, together with the surrounding fen, it is being proposed as a Natural Heritage Area.

Nevertheless the aquatic vegetation has been rather little-studied. Aside from a couple of casual plant records the first more detailed survey was in 2003 by the Environmental Protection Agency. More recently there have been a few visits by botanists but these have been land-based visits and access to the open water is very limited by the extent of swamp fringe. A summary of the aquatic plants noted on these surveys is given in table 1.

Table 1 – Summary of the aquatic plants recorded from Lough Sewdy on various vegetation surveys (source Botanical Society of Britain and Ireland and Environmental Protection Agency).

Lough Sewdy	BSBI Field Meeting	O'Criodain, C.	EPA	Green, P.R.	Northridge, R., Faulkner, J., Stewart, N.F.	Stewart, N.F. et al.
N24, N25	1982	1988	2003	2017	2018	2022
<i>Baldellia ranunculoides</i>				#	#	#
<i>Chara aculeolata</i>				#	#	#
<i>Chara contraria</i>				#	#	#
<i>Chara curta</i>						#
<i>Chara globularis</i>					#	
<i>Chara hispida</i>				#	#	#
<i>Chara subspinoso (rudis)</i>			# sp.	#	#	#
<i>Chara virgata</i>				#		#
<i>Chara vulgaris</i>					#	
<i>Hippuris vulgaris</i>			#	#	#	#
<i>Lemna minor</i>						#
<i>Lemna trisulca</i>			#			#
<i>Littorella uniflora</i>		#				
<i>Menyanthes trifoliata</i>				#		
<i>Myriophyllum spicatum</i>			#	#		
<i>Myriophyllum verticillatum</i>				#	#	#
<i>Nitella flexilis</i> agg.			# sp.			#
<i>Nuphar lutea</i>			#	#		#
<i>Potamogeton coloratus</i>	#				#	
<i>Potamogeton natans</i>			#	#	#	#
<i>Ranunculus lingua</i>				#	#	#
<i>Utricularia vulgaris</i> agg.				#		

The aim of this survey was to undertake a more thorough exploration of the aquatic vegetation of the lake with the aid of a boat in order to assess the current interest and importance of the lake and to identify any threats.

## 2. Methods

This survey was undertaken on 23<sup>rd</sup> September 2022 by the author assisted by local ecologists Dara Reid and Therese Kelly. It was primarily undertaken from a boat with the aid of a bathyscope and a grapnel device to retrieve plants from the water. Additional exploration by wading was undertaken in a few areas where the shallows were open from swamp vegetation. Two approaches were employed.

### 2.1 Quantitative transects

This followed the standard method used by the Environmental Protection Agency to assess the status of water bodies in relation to the EU Water Framework Directive. This method is set out in Environmental Protection Agency (2020) and involves sampling along four 100 metre transects out from the lake margin. At nine sampling positions along each transect, plants are viewed using a bathyscope (where these are visible) and sampled with four grapnel trawls. Each species is noted at each point and an assessment made of their abundance on a five point DAFOR scale. Water depth and GPS position is also recorded at each sampling point. In addition, on each transect the maximum depth of vegetation was investigated and recorded.

Data from this transect survey was analysed using the Free Index (Environmental Protection Agency 2017) to assess the status of the lake in relation to the EU Water Framework Directive. This involves the calculation of several metrics:

- Relative abundance of *Chara* species
- Relative abundance of Elodeid (i.e. water-column) species
- Relative abundance of nutrient tolerant species
- Nutrient index score based on scores of certain key species related to their sensitivity to raised nutrient levels
- Overall maximum depth of vegetation
- Average depth where vegetation is present.

These are drawn together in the “Free Index” from which is derived the “Ecological Quality Ratio” and thence the water body status.

The data has also been used to assess the conservation condition of the lake in relation to the EU Habitats Directive (Roden et al. 2020b). Although, the data was not collected in the format recommended for such as an assessment (which involves relevés recorded by snorkelling), it was possible to adapt the data to assess most of the parameters used. These are:

- Changes in lake area
- Number of vegetation zones
- Euphotic depth (m)
- Crust cover %
- Crust chlorophyll-a  $\mu\text{g}/\text{cm}^3$
- Crust chlorophytes %
- C&K score
- Lake level
- Total phosphorous (TP) mg/l
- Colour Hazen units
- Index TP x colour

These parameters are discussed further in section 3.3 below.

### 2.2 Qualitative survey

This involved a non-systematic exploration around the lake using grapnel and bathyscope to assess the patterns and distribution of vegetation around the lake. Much of this was from a boat but wading was also undertaken in a few areas where the shore was accessible. This survey involved exploring the different bays of the lake and paying particular attention to areas which appeared to have different niches.

### 3. Results

#### 3.1 Description of the vegetation (see also map in appendix 1)

Lough Sewdy is about a kilometre long by up to 600 metres at its widest point. A large island nearly cuts off the north-eastern bay from the rest of the lake although there are open but shallowish connections through to the main lake. There are also three smaller islands. Much of the lake is fairly shallow (<3 metres) but some areas are deeper with a maximum depth of 4.8m recorded to the south-east of the large island. Other deeper areas are SW of the large island and in the north-eastern bay.

The lake is almost entirely fringed by swamp which in places appeared to be 10s of metres wide, although the width was difficult to assess from the boat. Examination of aerial photographs on Google Earth suggests that the lake area has not changed much over the last 40 years but older maps (e.g. OSI half inch series) indicate that there has been some loss to swamp, particularly in the middle of the south-western side and extending out towards the large island from the north-eastern side.

There is a fairly consistent pattern of vegetation around the lake. The fringing swamp is often a mixture of species. Along the south-western and eastern sides *Phragmites australis* is often the main species with an intermittent band of *Schoenoplectus lacustris* along the lakeward edge. On the northern shore and around the south-eastern inlets there is often a mixture with *Phragmites australis*, *Typha latifolia* and *Carex rostrata* varyingly prominent and locally some *Equisetum fluviatile*.



View along the length of Lough Sewdy from the western end

Beyond the swamp there are a mixture of areas dominated by *Myriophyllum verticillatum* and patches of dense *Chara subspinoso (rudis)*. The *Chara* seems to be frequent in some areas but nearly absent in others with no clear pattern. However the *Chara* generally disappears beyond 1.5 metres depth with the *Myriophyllum* tending to be dominant beyond this. This also begins to thin out beyond 2.5 metres depth although a few bits of *Myriophyllum* were detected at 4 metres. It is possible however that these were detached fragments and that the maximum vegetation depth is a little less than this.



There are some patches of *Potamogeton natans* and *Nuphar lutea* dotted around the lake, particularly in the western inlet but floating vegetation is mostly very limited.

It was noticeable that there was a contrast between the *Chara* beds, which were quite bedded down and matted and often did not reach above 50 cm below the water surface, while the *Myriophyllum* beds were more vigorous and regularly reached up to the water surface. It is thought that this was because of the dry summer for much of which the water level was significantly lower than at the time of survey. With higher water levels after recent rains the *Myriophyllum* with its natural buoyancy due to air-cells would have been able to grow rapidly towards the surface. However, charophytes have no natural buoyancy and would have to build against each other to grow upwards. It is presumed that this contrast in growth would become less obvious when water levels have been higher for longer. However, this ability to overtop the *Chara* could give the *Myriophyllum* an advantage in certain conditions.



*Beds of Chara subspinososa (rudis)*

In the north-eastern bay, it was noticeable that charophytes were more or less absent and that the only submerged aquatic species was the *Myriophyllum verticillatum*. Charophytes started to reappear in the narrows at the western entrance to that bay. This suggests that the water quality may be more enriched in this bay and further investigation of possible sources is needed. Most likely is the ditch entering the north-eastern corner of the bay which drains through improved farmland to the north-east and has been recently cleared.

There are only a few small areas where there are breaks in the fringing swamp. The largest of these is next to the GAA car park on the eastern of the south-eastern inlets. This may be kept open by swimmers and anglers and dogs chasing into the water and there is a jetty at this point. There is another opening on the western side of the southern inlet where the gap extends behind the swamp fringe. This opening is probably due to livestock entering the water from the adjacent pasture field although there was no indication of recent grazing. Other smaller openings occur on the south-western side of the large island and a swamp-connected smaller island but the bottom shelves rather

steeply at these points and there is some shade from onshore trees. At all of these openings there is a more open community in depths up to 1 metre. This includes scattered plants of the deep water species (*Chara subspinos* (*rudis*) and *Myriophyllum verticillatum*) but mixed with a range of other *Chara* species, including *Chara aculeolata*, *Chara hispida*, *Chara contraria*, *Chara virgata*, *Chara vulgaris* and *Chara curta*. Also of note in these areas are *Baldellia ranunculoides*, *Berula erecta*, *Alisma plantago-aquatica* while the opening on the southern inlet included a patch of *Schoenoplectus tabernaemontani*. On the other hand, filamentous algae, which is generally sparse in much of the lake, tends to be more frequent in the shallows. The scarce *Potamogeton coloratus* has previously been recorded from semi-connected pools in the swamp near the jetty by the GAA ground (most recently in 2018). However, the very dry summer had resulted in these pools being more or less dry. Although some water had refilled in these pools at the time of survey, they were heavily dominated by *Chara* species.

### 3.2 Water Framework Directive status

The results of the transect surveys are presented in a spreadsheet submitted with this report. The transect locations are indicated in appendix 2 of this report. The key metrics for calculating the Free Macrophyte Index and Water Framework Directive status are given in table 2. This results in a status that is high in the “Good” status band. As will be discussed later this seems a fair assessment of the status of the lake, based on the experience of the author with Water Framework Directive and other aquatic surveys elsewhere. In other words it appears to be in reasonably good condition but not pristine.

Table 2 – Key metrics for the calculation of the Free Macrophyte Index and Water Framework Directive status

%RF Chara	25.8	Metric 1 - %RF Chara	0.6
%RF Elodeid	54.8	Metric 2 - %RF Elodeids	0.5
%RF Tolerant	29.0	Metric 3 - %RF Tolerant	0.9
Trophic score	41.2	Metric 4 - Trophic score	0.2
Zc	4	Metric 5 - Zc	0.8
Average depth of presence	1.39	Metric 6 - Average depth of presence	0.7
		Free Macrophyte Index	0.62
EQR	0.77	Status	Good

### 3.3 Conservation status

National Parks and Wildlife Service have developed a system for assessing the conservation condition of marl lakes (Roden et al. 2020b) for the EU Habitats Directive. This is a more stringent system than the Water Framework Directive assessment discussed above and reflects the high importance of this habitat in international terms and also the importance of Ireland for this habitat. Although the data collected on this survey is in a different form from the method advocated in Roden et al. (2020b), it is possible to interpret the data for many of the categories used there.

The results of the assessment are set out in table 3. Roden et al. (2020b) indicates that most weight should be given to vegetation zones, euphotic depth, the cyanobacterial crust characters (which are not relevant here) and the C&K scores when making the overall assessment and this results in an overall assessment of “Unfavourable – Inadequate/Poor”. This tallies with other observations in this report but it is perhaps worth noting that in the Water Framework Directive system “Good” status counts as a pass but in the Habitats Directive system “Unfavourable – Inadequate/Poor” counts as a fail.

Table 3 – Assessment parameters for Habitats Directive conservation condition

Parameter	Assessment	Comments
Area	Favourable/Good	Aerial photographs suggest no change in area over the last 40 years
Number of vegetation zones	Unfavourable - Inadequate/Poor	Three vegetation zones: open shallows/swamp, Chara subspinoso (rudis)/Myriophyllum, and Myriophyllum only. However the latter could be included in the Chara/Myriophyllum zone given that in pristine conditions the Chara is likely to have spread much deeper. Because this is a shallow lake (max depth recorded was 4.8m) this would have limited the number of zones in the pristine state.
Euphotic depth (m)	Unfavourable - borderline Inadequate/Poor to Bad	Max vegetation depth measured at 4.0m
Crust cover %	Not applicable	The lake is very largely swamp fringed with only a few very small areas of open shore
Crust chlorophyll-a $\mu\text{g}/\text{cm}^3$		
Crust chlorophytes %		
C&K score	Unfavourable - Inadequate/Poor	Estimated at around 0.35 using the transect data and allocating mean covers as D = 90%, A = 50%, F = 20%, O = 10%, R = 2%.
Lake level	Favourable/Good	Although there is no crust zone to measure against, the water levels seemed to be around normal
Total phosphorous (TP) mg/l	Data not available	
Colour Hazen units	Favourable/Good	Although not accurately measured, the water was very clear and not visibly coloured
Index TP x colour	Data not available	
<b>Overall assessment</b>	<b>Unfavourable - Inadequate/Poor</b>	

## 4. Discussion

This survey has confirmed the substantial interest of this lake. There are some significant areas of *Chara* beds and therefore represents a reasonable example of the threatened marl lake habitat recognised as threatened in the EU Habitats Directive (E3140 Oligo- to mesotrophic hard waters with *Chara* formations). It also contains a very good range of charophyte species with eight species recorded on this survey and a ninth recorded in 2018. For comparison, a study by the author in Britain (Stewart 2004) identified “Important Stonewort Areas” based on the diversity charophyte species. In this study, five or more species qualified a site, or cluster of sites, as “Nationally Important”. Because of the richness of Ireland for this group of plants, a similar study would need a higher threshold but it is clear that nine species would easily qualify the site as “Nationally Important”.

Furthermore, Lough Sewdy forms part of a chain of similar sites with considerable charophyte diversity in central Westmeath. Although not as rich as sites like Lough Owel (14 charophytes recorded), it is still a significant component to this cluster of sites.

Nevertheless, there are some matters of concern, in particular the fact that charophyte beds mostly do not extend beyond 1.5 metres depth, the absence of charophytes in the north-eastern bay and the probable over-abundance of *Myriophyllum verticillatum*. In a marl lake of this type one would expect charophyte beds to be the dominant vegetation throughout the lake (e.g. Roden et al. 2020a) and the fact that this is not the case here suggests that there may be issues of enrichment. Charophytes are extremely sensitive to nutrient enrichment, being affected by increased water turbidity, increased competition from more nutrient tolerant filamentous algae and vascular plants and sometimes due to increased deposition of organic sediments. Both raised nitrate and raised phosphate levels have been identified as major causes of charophyte loss and total phosphorous levels above 10 micrograms per litre have been shown to have an impact on charophytes (Roden et al. 2020b). Further investigation of the possible sources of these nutrients is needed and the absence of charophytes in the north-eastern bay points to this a possible source direction. The inflow channel in the north-eastern corner here was dredged and deepened right up to the lake edge around 2019, with silty dredgings spread along the river bank (D.Reid *pers. comm.*). This might be an explanation for the lack of charophytes in this area. For example, the digging out of a ditch at a similar marl lake in Fermanagh (Annachullion Lough) caused the complete crash of charophyte beds which had dominated the lake (personal data) and it is possible that something similar has happened here.

The dredging operation could have affected that part of the lake in several ways:

- A turbidity shock from silt dislodged during the dredging operations
- Inwash of nutrient-rich silt which is now sitting on the bottom of this bay
- Greater through-flow of more nutrient-rich water
- Reduced contribution of fen-filtered water because of lowering of the water table in the adjacent fens.

It is uncertain which of these might be most significant and it would be useful to find out if the impacts are/were temporary or ongoing as this will affect whether or how quickly the area recovers..

However, investigation of nutrient issues should not be limited to this area, The setting of the lake within a landscape dominated by improved pastureland means that the water chemistry of all of the inputting water courses would be worth investigation.

Open shallow water communities in depths less than one metre are rare within the lake but are an important habitat for the diversity of charophytes and other aquatic species. It is important that this niche remains present within the site and the diversity of *Chara* species is likely to be significantly reduced if this niche disappears. It is a commonly held view that grazing of lake shores is bad for the ecology of sites. However, grazing of shorelines in moderation can be important in maintaining more open fen and water's edge communities.



## 5. References

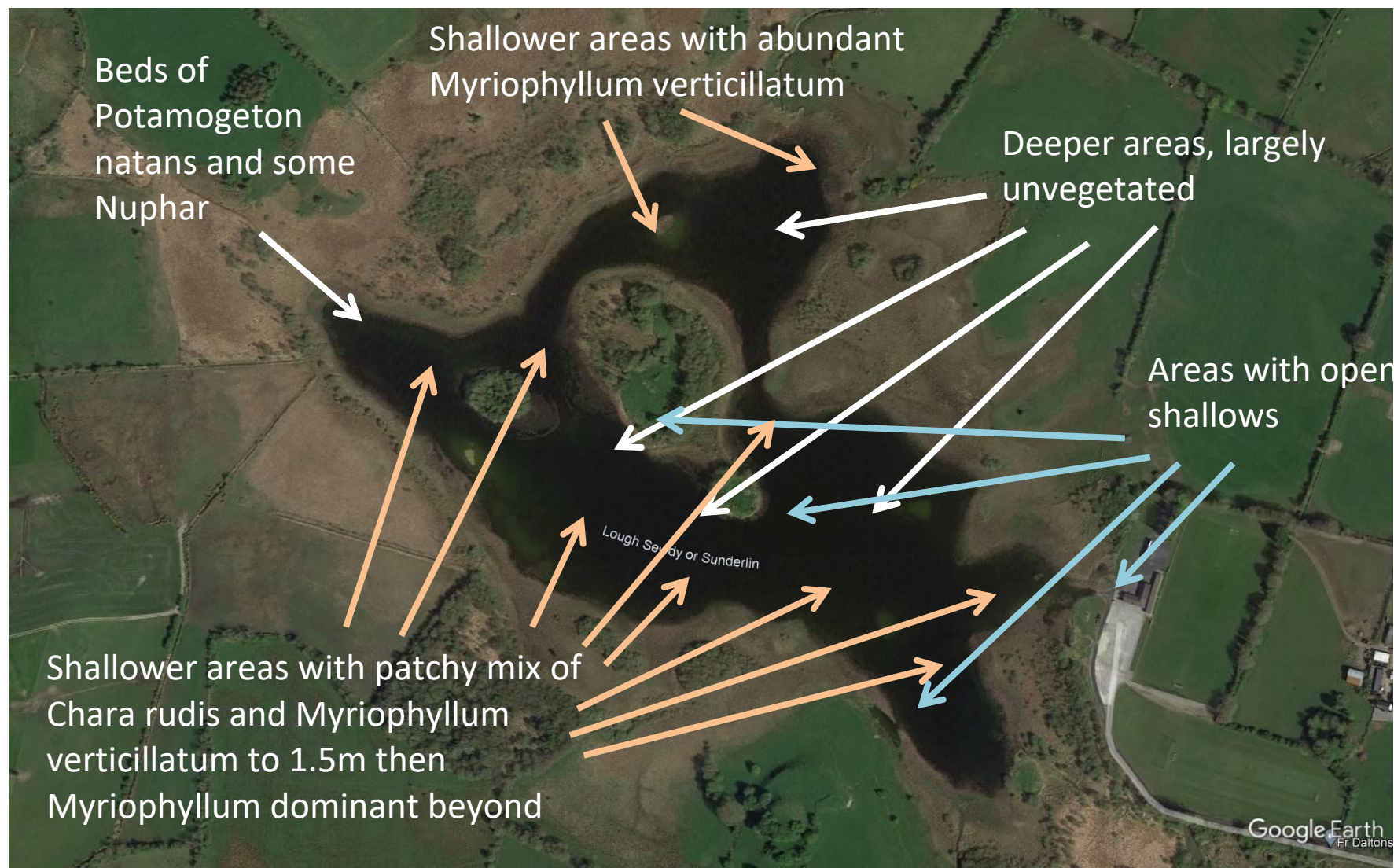
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## Appendix 1 – List of aquatic and wetland species recorded on this survey

<i>Agrostis stolonifera</i>	<i>Juncus effusus</i>
<i>Alisma plantago-aquatica</i>	<i>Juncus inflexus</i>
<i>Angelica sylvestris</i>	<i>Juncus subnodulosus</i>
<i>Baldellia ranunculoides</i>	<i>Lemna minor</i>
<i>Berula erecta</i>	<i>Lemna trisulca</i>
<i>Carex disticha</i>	<i>Lythrum salicaria</i>
<i>Carex hirta</i>	<i>Mentha aquatica</i>
<i>Carex paniculata</i>	<i>Mentha aquatica</i>
<i>Carex pseudocyperus</i>	<i>Myosotis scorpioides</i>
<i>Carex rostrata</i>	<i>Myriophyllum verticillatum</i>
<i>Chara aculeolata</i>	<i>Nasturtium microphyllum</i>
<i>Chara contraria</i>	<i>Nitella flexilis agg.</i>
<i>Chara curta</i>	<i>Nuphar lutea</i>
<i>Chara hispida</i>	<i>Parnassia palustris</i>
<i>Chara subspinosa (rudis)</i>	<i>Phalaris arundinacea</i>
<i>Chara virgata</i>	<i>Phragmites australis</i>
<i>Chara vulgaris</i>	<i>Potamogeton natans</i>
<i>Cicuta virosa</i>	<i>Potentilla anserina</i>
<i>Comarum palustre</i>	<i>Ranunculus flammula</i>
<i>Eleocharis palustris</i>	<i>Ranunculus lingua</i>
<i>Epilobium hirsutum</i>	<i>Salix cinerea</i>
<i>Equisetum arvense</i>	<i>Schoenoplectus lacustris</i>
<i>Equisetum fluviatile</i>	<i>Schoenoplectus tabernaemontani</i>
<i>Filipendula ulmaria</i>	<i>Sparganium erectum</i>
<i>Galium palustre</i>	<i>Typha latifolia</i>
<i>Hippuris vulgaris</i>	<i>Valeriana officinalis</i>
<i>Hydrocotyle vulgaris</i>	<i>Veronica anagallis-aquatica</i>
<i>Juncus articulatus</i>	<i>Veronica beccabunga</i>



*Lough Sewdy, summary of vegetation*





*Lough Sewdy, transect locations*