

ABBEYLEIX BOG PROJECT

ABBEYLEIX BOG BRYOPHYTE AND SWAMP WOODLAND SURVEYS

DRAFT REPORT

19TH OCTOBER 2021



An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage



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1 INTRODUCTION

1.1 Background

In 2019, we conducted an ecological survey of the cutover and lagg zones at Abbeyleix Bog, focusing primarily on the habitats and management of the site (Smith and Crowley, 2019). In the course of that study, some information gaps became apparent that would add to the understanding of the site and facilitate conservation and management. Our report recommended detailed surveys of the petrifying spring and fen/flush habitats at Abbeyleix Bog, a wider bryophyte survey of the site, and gathering additional data on the greater tussock sedge (*Carex paniculata*) dominated swamp woodlands. In 2020, we completed a survey of the fens, flushes and springs of Abbeyleix Bog (Smith and Crowley, 2020). This report summarises the findings of the bryophyte and swamp woodland surveys.

1.2 Objectives

The objective of the bryophyte survey was to compile a comprehensive list of bryophytes across Abbeyleix Bog as a baseline for assessing future condition.

The objective of the swamp woodland survey was to collect information on this habitat type, which appears to be rare or at least understudied in Ireland (Cross *et al.*, 2010).

The data produced are presented here and will be submitted to the National Biodiversity Data Centre.

2 METHODS

The bryophyte survey covered all of Abbeyleix Bog in Restoration Zones A-I. Bryophytes were recorded at the monad (1x1 km) scale, and the habitat(s) in which they occur were recorded. Where required, bryophyte samples were collected for microscopic determination in the lab, and voucher specimens were collected of potential new vice-county records and “debracketers”, i.e. species not recorded in the vice-county since 1960. Dedicated bryophyte surveys were carried out on 12th, 15th and 22nd March 2021. Records collected during previous surveys (Smith and Crowley, 2019, Smith and Crowley, 2020) were added to these.

In the tussock sedge swamp woodland survey, vegetation data were collected in four 400 m² quadrats located across the extent of the habitat at Abbeyleix on 9th and 26th July 2021. It was hoped that more quadrats could be recorded over the two field survey days, but the swampy and treacherous terrain meant that getting to and moving around in the quadrats was time consuming. The abundance of each vascular plant and bryophyte species within the quadrat was estimated using the Domin scale (Table 1). The data were analysed to evaluate correspondences with existing Irish Vegetation Classification (IVC) woodland types (National Parks and Wildlife Service *et al.*, 2019) and previous descriptions of similar habitats in Ireland (e.g. Kelly and Iremonger, 1997). The ERICA web tool (Perrin, 2020) was used to determine the affinities of quadrats to IVC types.

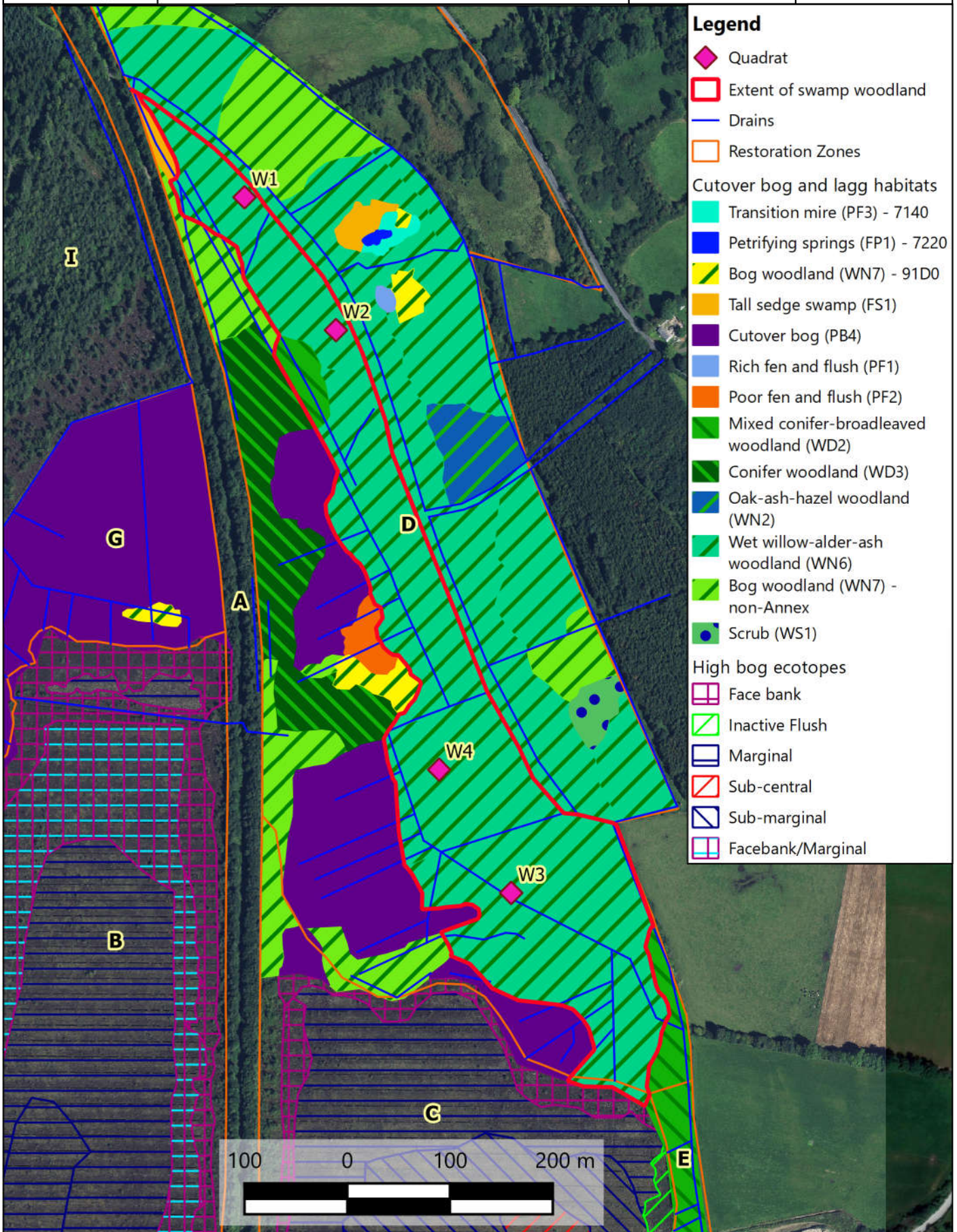
Table 1. Cover-abundance values of the Domin scale

Domin Value	Percent Cover
10	91-100%
9	76-90%
8	51-75%
7	34-50%
6	26-33%
5	11-25%
4	6-10%
3	1-5%
2	< 1%, many plants
1	< 1%, few plants
+	< 1%, present



Figure 1. Greater tussock sedge swamp woodland quadrat locations
Abbeyleix Bog Swamp Woodland Survey

Scale: 1:5,000
19-10-2021
Rev 0



3 BRYOPHYTES OF ABBEYLEIX BOG

3.1 Results

A total of 30 liverworts and 95 mosses have been recorded at Abbeyleix Bog in the period 2019-2021 (Table 2). These include one or two¹ species that are considered Vulnerable on the bryophyte Red List (Lockhart *et al.*, 2012a). Five species have been recorded from Co. Laois for the first time, with two other new county records subject to confirmation.

Table 2. Bryophyte species list

Name	Notes	Name	Notes
Liverworts		Mosses	
<i>Calypogeia fissa</i>		<i>Odontoschisma denudatum</i>	
<i>Calypogeia muelleriana</i>		<i>Odontoschisma sphagni</i>	
<i>Calypogeia sphagnicola</i>		<i>Pellia endiviifolia</i>	
<i>Cephalozia bicuspidata</i>		<i>Plagiochila asplenioides</i>	
<i>Cephalozia connivens</i>		<i>Radula complanata</i>	
<i>Cephalozia curvifolia</i>		<i>Riccardia chamedryfolia</i>	
<i>Cephalozia pleniceps</i>	Red List Vulnerable. 1st county record	<i>Riccardia multifida</i>	1st county record? To be confirmed.
<i>Cephaloziella</i> sp.	To be determined	<i>Riccardia palmata</i>	
<i>Conocephalum conicum</i>		<i>Schistochilopsis incisa</i>	
<i>Frullania dilatata</i>			
<i>Frullania tamarisci</i>		<i>Amblystegium serpens</i>	
<i>Kurzia pauciflora</i>		<i>Atrichum undulatum</i>	
<i>Lepidozia reptans</i>		<i>Aulacomnium palustre</i>	
<i>Lophocolea bidentata</i>		<i>Barbula unguiculata</i>	
<i>Lophocolea heterophylla</i>		<i>Brachythecium mildeanum</i>	
<i>Lophozia ventricosa</i>		<i>Brachythecium rivulare</i>	
<i>Marchantia polymorpha</i> subsp. <i>polymorpha</i>	1st county record	<i>Brachythecium rutabulum</i>	
<i>Metzgeria furcata</i>		<i>Bryoerythrophyllum recurvirostrum</i>	
<i>Metzgeria violacea</i>		<i>Bryum capillare</i>	
<i>Mylia anomala</i>		<i>Bryum pseudotriquetrum</i>	
<i>Myriocoleopsis minutissima</i>	1st county record		

¹ One subject to confirmation from the British Bryological Society.

Name	Notes
<i>Calliergon giganteum</i>	
<i>Calliergonella cuspidata</i>	
<i>Campylium protensum</i>	To be confirmed
<i>Campylium stellatum</i>	
<i>Campylopus flexuosus</i>	
<i>Campylopus introflexus</i>	
<i>Campylopus pyriformis</i>	Debracketer? To be confirmed.
<i>Climacium dendroides</i>	
<i>Cratoneuron filicinum</i>	
<i>Cryphaea heteromalla</i>	
<i>Ctenidium molluscum</i>	
<i>Dicranella heteromalla</i>	
<i>Dicranum bonjeanii</i>	
<i>Dicranum majus</i>	
<i>Dicranum scoparium</i>	
<i>Didymodon fallax</i>	To be confirmed
<i>Encalypta streptocarpa</i>	
<i>Eurhynchium striatum</i>	
<i>Fissidens adianthoides</i>	
<i>Fissidens dubius</i>	To be confirmed
<i>Fissidens taxifolius</i>	
<i>Hookeria lucens</i>	
<i>Hylocomiadelphus triquetrus</i>	
<i>Hylocomium splendens</i>	
<i>Hypnum cupressiforme</i>	
<i>Hypnum cupressiforme</i> var. <i>resupinatum</i>	
<i>Hypnum jutlandicum</i>	
<i>Isothecium alopecuroides</i>	

Name	Notes
<i>Isothecium myosuroides</i>	
<i>Kindbergia praelonga</i>	
<i>Leucobryum glaucum</i>	
<i>Lewinskya affinis</i>	
<i>Loeskeobryum brevirostre</i>	
<i>Mnium hornum</i>	
<i>Neckera complanata</i>	
<i>Neckera pumila</i>	
<i>Orthotrichum pulchellum</i>	
<i>Oxyrrhynchium hians</i>	
<i>Oxyrrhynchium speciosum</i>	1st county record. Red List Near Threatened
<i>Palustriella commutata</i>	
<i>Palustriella falcata</i>	
<i>Philonotis calcarea</i>	
<i>Plagiomnium affine</i>	To be confirmed
<i>Plagiomnium undulatum</i>	
<i>Plagiomnium undulatum</i>	
<i>Plagiothecium curvifolium</i>	1st county record? To be confirmed. Red List Vulnerable
<i>Plenogemma phyllantha</i>	
<i>Pleurozium schreberi</i>	
<i>Pogonatum aloides</i>	
<i>Polytrichum commune</i>	
<i>Polytrichum formosum</i>	
<i>Polytrichum juniperinum</i>	
<i>Polytrichum strictum</i>	
<i>Pseudoscleropodium purum</i>	
<i>Rhizomnium punctatum</i>	
<i>Rhynchostegiella tenella</i>	
<i>Rhynchostegium confertum</i>	To be confirmed

Name	Notes
<i>Rhytidiadelphus squarrosus</i>	
<i>Schistidium crassipilum</i>	
<i>Scorpidium cossonii</i>	
<i>Scorpidium revolvens</i>	
<i>Scorpidium scorpioides</i>	
<i>Sphagnum austinii</i>	
<i>Sphagnum beothuk</i>	
<i>Sphagnum capillifolium</i>	To be confirmed
<i>Sphagnum cuspidatum</i>	
<i>Sphagnum divinum</i>	1st county record
<i>Sphagnum fallax</i>	
<i>Sphagnum fimbriatum</i>	
<i>Sphagnum inundatum</i>	To be confirmed
<i>Sphagnum medium</i>	
<i>Sphagnum palustre</i>	

Name	Notes
<i>Sphagnum papillosum</i>	
<i>Sphagnum rubellum</i>	
<i>Sphagnum squarrosum</i>	
<i>Sphagnum subnitens</i> subsp. <i>ferrugineum</i>	To be confirmed
<i>Sphagnum subnitens</i> subsp. <i>subnitens</i>	
<i>Sphagnum tenellum</i>	
<i>Streblotrichum convolutum</i> var. <i>commutatum</i>	
<i>Thamnobryum alopecurum</i>	
<i>Thuidium tamariscinum</i>	
<i>Tortula muralis</i>	
<i>Ulota bruchii</i>	
<i>Zygodon conoideus</i> var. <i>conoideus</i>	
<i>Zygodon viridissimus</i>	

This is a large number of bryophytes for a lowland site in the east. The two main reasons are the diversity of habitats, most of which are wetlands, and the relatively unmodified nature of some of them.

Active raised bog is a well-known habitat of importance for bryophytes. The bog at Abbeyleix supports the typical array of raised bog *Sphagnum* species, including *S. beothuk* and *S. austinii*, which tend to be restricted to good quality active raised bog. Other typical bog bryophytes at Abbeyleix include the liverworts *Kurzia pauciflora*, *Odontoschisma sphagni* and *Cephalozia* species, and the mosses *Hypnum jutlandicum*, *Leucobryum glaucum* and *Polytrichum strictum*.



Polytrichum strictum in active raised bog

The petrifying spring supports a completely different array of bryophytes, especially the brown mosses *Scorpidium scorpioides*, *S. cossonii*, *Palustriella commutata*, *P. falcata*, *Campylium stellatum* and *Ctenidium molluscum*.

In between these two extremes of acidic and base-rich, is a range of intermediate pH wetland habitats, including some areas of cutover bog. Mosses such as *Hylocomium splendens*, *Pleurozium schreberi*, and

Aulacomnium palustre are typical of acidic flush conditions present in some cutover bog. Bog woodland is home to an abundance of *Sphagnum palustre* as well as *S. fimbriatum*, *S. squarrosum*, *S. fallax*, *S. divinum* and *S. subnitens*. The Vulnerable liverwort *Cephalozia pleniceps* was found in a groundwater-influenced flush on acid peat at the transition between cutover bog and greater tussock sedge swamp woodland along with the flush species *Dicranum bonjeanii* and *Polytrichum commune*.



Sphagnum palustre in bog woodland



Deadwood with *Hypnum cupressiforme*, *Lepidozia reptans* and bright red patches of *Cephalozia curvifolia*

The wet woodlands at Abbeyleix provide habitat for several typical woodland mosses, such as *Eurhynchium striatum*, *Thamnobryum alopecurum*, *Kindbergia praelonga* and *Thuidium tamariscinum*, and more specialist wet woodland species, such as *Climacium dendroides*, *Hookeria lucens* and *Rhizomnium punctatum*. Epiphytic mosses include *Hypnum cupressiforme* var. *resupinatum*, *Neckera complanata*, *N. pumila*, *Lewinskya affinis*, *Ulota bruchii* and *Plenogemma phyllantha*; epiphytic liverworts included *Metzgeria furcata*, *M. violacea*, *Radula complanata*, *Frullania dilatata* and the more western *F. tamarisci*. The deadwood bryoflora was notably rich, suggesting a long history of woodland on the site and/or recolonisation from the nearby ancient oak woodland in the Abbeyleix Estate.

Cephalozia curvifolia, *Lepidozia reptans* and *Riccardia palmata* are absent from many woodlands of more recent origin.

Lastly, the manmade habitats support several species that would otherwise be absent from the site. The mortar in the old stone railway bridge at the southern end of the track provides space for *Rhynchostegiella tenella*, *Encalypta streptocarpa* and *Bryum capillare*. Abandoned concrete culvert pipes are a home for *Schistidium crassifolium* and *Tortula muralis*.



Trackside mosses, including the reddish *Bryoerythrophyllum recurvirostre* and pale pinwheels of *Didymodon fallax*

The edges of the walking track along the old railway had species typical of disturbed habitats, such as *Barbula unguiculata* and *Bryoerythrophyllum recurvirostre*, as well a potential record of the Vulnerable moss *Plagiothecium curvifolium*.

3.2 Evaluation

As noted above, Abbeyleix Bog is a bryophyte-rich site for a lowland eastern location in Ireland. For example, a total of 37 bryophytes were recorded from the track alone between the entrance and the beginning of the boardwalk around the northern end of the high bog.

Lockhart *et al.* (2012b) identify 47 Important Bryophyte Areas (IBrAs) in Ireland, including such sites as Clara Bog, Lough Ree and Scragh Bog. IBrAs are part of the Important Plant Area (IPA) programme promoted by Plantlife International to identify a network of the best sites for plant conservation. IPAs are sites that have exceptional plant species richness, that support an outstanding assemblage of rare or threatened species, or that support vegetation of high botanical value. Lockhart *et al.* (2012b) adapted Internationally published principles for site identification to selecting Irish IBrAs. The final criteria used are:

- A. The site holds significant populations of ≥ 1 legally protected taxon, or ≥ 3 Red List taxa, or ≥ 5 Red List, Near Threatened or Data Deficient taxa.
- B. The site is exceptionally rich in oceanic species for which Ireland has a special responsibility.

- C. The site contains an outstanding example of a habitat type of global or European plant conservation importance, containing rich assemblages of habitat-specific taxa.

Most IBrAs overlap with SACs and other designated areas. Most are “defined by the boundaries of protected sites that lie within the ‘hotspot’ or ‘core’ hectads... and also include the localities of taxa that occur on unprotected land located nearby” (Lockhart *et al.*, 2012b).



Thuidium tamariscinum, a common woodland moss

Abbeyleix Bog nearly qualifies as an IBrA on its own merits as it holds populations of one or two (subject to confirmation) Red List species (*Cephalozia pleniceps* and *Plagiothecium curvifolium*). With regard to Criteria B and C, Abbeyleix Bog does not support a rich oceanic bryoflora, and although it contains examples of important habitats rich in bryophytes, including active raised bog, petrifying springs and bog woodland, they could

not be described as “outstanding”.

IBrA 38 is the River Barrow and River Nore IBrA. It includes the areas of the River Barrow and River Nore SAC and Spahill and Clomantagh Hill SAC within the core hectads S36, S55, S62, S70, S73, S74 and S75. Abbeyleix Bog is within 530 m of the River Barrow and River Nore SAC, but is within S48, heretofore not a known bryological hotspot. Should the list of IBrAs be reviewed in the future, the inclusion of Abbeyleix Bog in an expanded River Barrow and River Nore IBrA should be considered.

4 SWAMP WOODLAND SURVEY

4.1 Results

The abundances of species recorded in the four swamp woodland quadrats are presented in Table 3.

Table 3. Domin cover-abundance values of species in swamp woodland 400 m² quadrats. Species that differentiate one or two quadrats from the remainder are highlighted.

Species	W1	W2	W3	W4
<i>Salix cinerea</i>	8	8	8	6
<i>Carex paniculata</i>	7	8	6	8
<i>Betula pubescens</i>	5	5	5	5
<i>Calliergonella cuspidata</i>	4	4	5	4
<i>Mentha aquatica</i>	3	4	4	2
<i>Alnus glutinosa</i>	1	1	4	6
<i>Agrostis stolonifera</i>	1	2	4	3
<i>Oxyrrhynchium speciosum</i>	1	3	3	2
<i>Frullania tamarisci</i>	2	2	2	2
<i>Galium palustre</i>	2	2	2	2
<i>Molinia caerulea</i>	1	1	3	1
<i>Hypnum cupressiforme</i> var. <i>cupressiforme</i>	2	2	1	2
<i>Hedera hibernica</i>	2	1	2	1
<i>Potentilla erecta</i>	2	1	1	+
<i>Valeriana officinalis</i>	2	1	1	1
<i>Deschampsia cespitosa</i>	4		3	1
<i>Filipendula ulmaria</i>	3	2	2	
<i>Hypnum cupressiforme</i> var. <i>resupinatum</i>	+	1	2	2
<i>Carex acutiformis</i>	7	4		
<i>Carex rostrata</i>	4	2		
<i>Carex flacca</i>	3	2		
<i>Lythrum salicaria</i>	3	1		
<i>Juncus inflexus</i>	2			
<i>Phalaris arundinacea</i>	2	4		
<i>Pellia endiviifolia</i>		3	+	
<i>Myosotis laxa</i>		3		
<i>Conocephalum conicum</i>		2		
<i>Marchantia polymorpha</i> subsp. <i>polymorpha</i>		2		
<i>Pinus sylvestris</i>			4	5
<i>Apium nodiflorum</i>			6	2
<i>Alnus incana</i>			5	1
<i>Carex remota</i>		2	3	
<i>Arrhenatherum elatius</i>			2	
<i>Equisetum fluviatile</i>			2	

Species	W1	W2	W3	W4
<i>Thuidium tamariscinum</i>		2	2	5
<i>Lemna minor</i>				5
<i>Picea abies</i>				3
<i>Sphagnum subnitens</i>				3
<i>Eurhynchium striatum</i>	2	1	1	
<i>Equisetum palustre</i>	2	1		1
<i>Kindbergia praelonga</i>	1	2	1	
<i>Fissidens adianthoides</i>	1		1	2
<i>Cardamine pratensis</i>		+	2	2
<i>Lemna trisulca</i>		+	1	2
<i>Caltha palustris</i>		2		2
<i>Angelica sylvestris</i>		1		+
<i>Brachypodium sylvaticum</i>	+			
<i>Brachythecium cf. rivulare</i>	+	1		
<i>Bromopsis ramosa</i>			+	
<i>Bryum pseudotriquetrum</i>				+
<i>Calliergon giganteum</i>			1	
<i>Calypogeia muelleriana</i>				1
<i>Calystegia sepium</i>		+		
<i>Campylium stellatum</i>	1	+	+	
<i>Campylopus introflexus</i>	+			1
<i>Cardamine flexuosa</i>			+	
<i>Carex nigra</i>	1			
<i>Carex panicea</i>	1	+		
<i>Cirsium palustre</i>				+
<i>Crataegus monogyna</i>		1		
<i>Cratoneuron filicinum</i>		1		
<i>Cynosurus cristatus</i>			+	
<i>Dactylorhiza fuchsii</i>	1	+		
<i>Dichodontium sp.</i>			1	
<i>Dicranum scoparium</i>		1	+	
<i>Dryopteris carthusiana</i>	+		1	+
<i>Epilobium palustre</i>			+	1
<i>Fraxinus excelsior</i>	1	1		+
<i>Frullania dilatata</i>			1	
<i>Galium uliginosum</i>				1
<i>Geranium robertianum</i>			1	
<i>Holcus lanatus</i>			1	1
<i>Homalothecium sericeum</i>			1	
<i>Hylocomiadelphus triquetrus</i>	1	1		+
<i>Hypnum jutlandicum</i>	+		+	1
<i>Ilex aquifolium</i>			1	1
<i>Iris pseudacorus</i>		1		
<i>Isoetecium alopecuroides</i>	+	+		

Species	W1	W2	W3	W4
<i>Isoetecium myosuroides</i>		1	1	1
<i>Juncus acutiflorus</i>	1			
<i>Juncus effusus</i>		+	1	1
<i>Lathyrus pratensis</i>	1			
<i>Leskea cf. polycarpa</i>	+			
<i>Lewinskya affine</i>			1	
<i>Lonicera periclymenum</i>	1			
<i>Lophocolea bidentata</i>		+	+	+
<i>Luzula multiflora</i>				1
<i>Metzgeria furcata</i>	+		1	1
<i>Neckera complanata</i>	1	1		
<i>Plagiomnium cf. affine</i>	1			
<i>Plagiomnium undulatum</i>			+	
<i>Plenogemma phyllantha</i>		+	+	
<i>Poa pratensis</i>			+	
<i>Pseudoscleropodium purum</i>				1
<i>Quercus robur</i>				1
<i>Radula complanata</i>	1		1	1
<i>Ranunculus flammula</i>	+			
<i>Rhizomnium punctatum</i>				+
<i>Rhododendron ponticum</i>				1
<i>Riccardia chamedryfolia</i>				1
<i>Rosa arvensis</i>	1			
<i>Rubus fruticosus</i> agg.	1	1		1
<i>Senecio aquaticus</i>				+
<i>Thamnobryum alopecurum</i>	+	1		
<i>Ulota bruchii</i>	1		1	+
<i>Veronica anagallis-aquatica</i>		+		
<i>Vicia cracca</i>	1			
<i>Vicia sepium</i>		1		
<i>Viola</i> sp.	1			
<i>Zygodon cf. conoideus</i> var. <i>conoideus</i>	1			
<i>Zygodon cf. viridissimus</i>		+	1	

In the woodland quadrats, grey willow (*Salix cinerea*) was the principal tree species, accompanied by downy birch (*Betula pubescens*). Alder (*Alnus glutinosa*) was present in all quadrats and frequent in W3 and W4, whereas the invasive non-native grey alder (*Alnus incana*) was frequent in W3. Scots pine (*Pinus sylvestris*) was also frequent in W3 and W4. Ash (*Fraxinus excelsior*) was a minor presence in the canopy of three quadrats.

The main features of the field layer were frequent to abundant high tussocks of greater tussock sedge (*Carex paniculata*). In W1 and W2, it was accompanied by another tall sedge, lesser pond sedge (*Carex acutiformis*). Soft mud, poached by deer, and pools of open water occupied

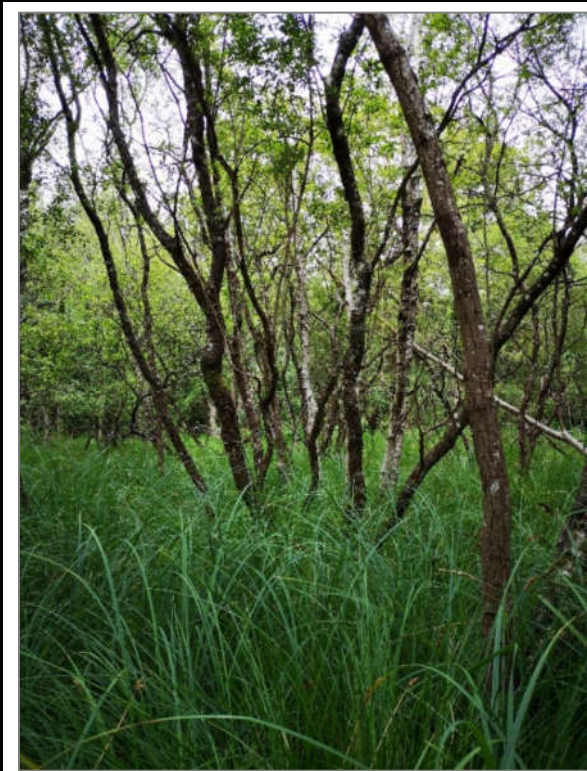
the spaces amongst the tussocks. In the mud or at the base of the tussocks, a range of wet woodland plants were found, including water mint (*Mentha aquatica*), meadowsweet (*Filipendula ulmaria*), marsh bedstraw (*Galium palustre*), tufted hair grass (*Deschampsia cespitosa*) and purple moor-grass (*Molinia caerulea*). Common reed (*Phragmites australis*) and bottle sedge (*Carex rostrata*) were frequent in W1 and W2, whereas fool's watercress (*Apium nodiflorum*) and common duckweed (*Lemna minor*) were common in W3 and W4, respectively. There were patchy areas of drier ground, especially associated with tree bases, and these as well as the higher parts of tussocks supported species such as ivy (*Hedera hibernica*), glaucous sedge (*Carex flacca*), remote sedge (*Carex remota*) and the woodland moss *Thuidium tamariscinum*.



Pellia endiviifolia in swamp woodland on former sedge tussock

The wetland mosses *Calliergonella cuspidata* and *Oxyrrhynchium speciosum* were the most widespread bryophytes on wet ground. Drier patches and sedge tussocks provided habitat for *Thuidium tamariscinum*, *Eurhynchium striatum*, *Kindbergia praelonga* and *Hylocomiadelphus triquetrus*. Epiphytic bryophytes were well represented, including the mosses *Hypnum cupressiforme* var. *cupressiforme*, *H. c.* var. *resupinatum* and *Ulota bruchii* and the liverworts *Frullania tamarisci*, *Radula complanata* and *Metzgeria furcata*. Large thallose liverworts were a notable feature of W2, the muddiest quadrat, including *Pellia endiviifolia*, *Conocephalum conicum* and *Marchantia polymorpha* subsp. *polymorpha*.

There were differences in species composition among the four quadrats (Table 3). None of these, however, were based on obvious environmental differences. Mean, abundance-weighted Ellenberg indicator values (Ellenberg, 1974, Hill *et al.*, 2007, Hill *et al.*, 2004) were calculated for wetness, reaction (pH) and soil fertility for each quadrat. All values were quite similar, with the exception of reaction, which suggested that W4 was slightly more acidic (R = 5.4) than the average of the other three quadrats (R = 5.9). This may be due to the presence of a small amount of *Sphagnum subnitens* in W4, the only *Sphagnum* species recorded in any of the quadrats. Differences among the quadrats are most likely related to differences in past management among the quadrat locations, such as conifer planting in W3 and W4, microtopography within quadrats, and chance establishment of different species in different locations.



Quadrat W1



Quadrat W2



Quadrat W3



Quadrat W4

4.2 Evaluation

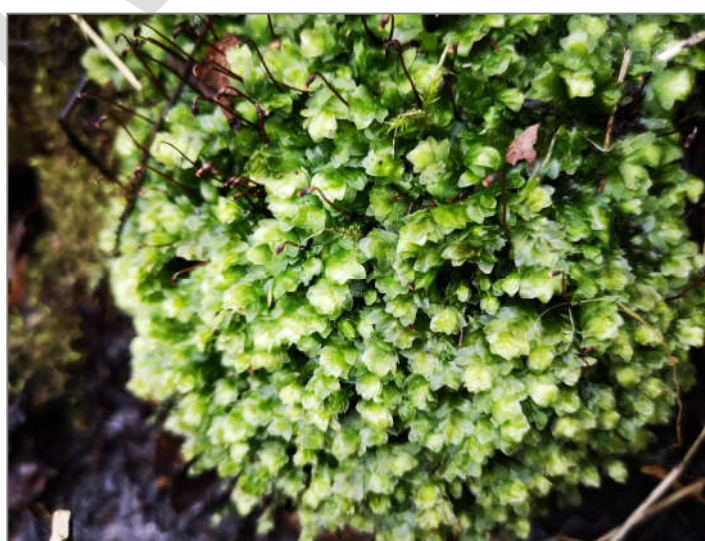
All four quadrats were assigned to the *Salix cinerea* – *Galium palustre* woodland (WL3E) community by ERICA (Table 4). The affinities (in percent) to the community were highest for W1 and W3 and lowest for W4. The IVC with the next highest affinities to the quadrats were the *Salix cinerea* – *Phalaris arundinacea* woodland (WL3F) and the *Betula pubescens* – *Salix cinerea* woodland (WL4F) communities. The affinity with *Salix cinerea* – *Galium palustre* woodland (WL3E) is not obvious when reading the community synopsis as greater tussock sedge, the most notable species of the swamp woodlands, is not mentioned in the synoptic table, as it occurs in less than 20% of the IVC relevés, and alder is listed as occurring in only 21-40% of the relevés.

Table 4. Swamp woodland quadrat affinities to IVC communities

Community	W1	W2	W3	W4
WL3E	93.0%	75.4%	94.2%	62.3%
WL3F	4.8%	22.3%	3.0%	12.5%
WL4E	1.1%	0.9%	1.1%	12.2%

The *Salix cinerea* – *Galium palustre* woodland (WL3E) community is described as a wet woodland community of infertile and slightly base-rich basin peats. The community is considered to be transitional between the base-rich wet woodlands of the WL3 group and the acidic, birch dominated woodlands of the WL4 group. *Salix cinerea* – *Galium palustre* woodland (WL3E) is described as being a species-rich woodland community with a diverse bryophyte flora, and the quadrats recorded here support this description.

As discussed in a previous report (Smith and Crowley, 2019), the Abbeyleix Bog swamp woodlands can be classified as AF6 Alder – tussock sedge type under the Native Woodland Classification (Cross *et al.*, 2010). We speculated that the closest affinity between this type and the IVC was probably with *Salix cinerera* – *Galium palustre* woodland (WL3E) (Smith and Crowley, 2019), which has been borne out by the results of this study.



Hookeria lucens in swamp woodland



Swamp woodland showing greater tussock sedge and inter-tussock pool

Swamp woodlands of this type were first described in Ireland by Kelly and Iremonger (1997); they present the results of three relevés from Cloghereen Pool Wood in Killarney and Clondallow, Co. Offaly. Both these sites, like the ones at Abbeyleix, are peaty basins irrigated by calcareous groundwater with a canopy of alder, grey willow, downy birch and ash over abundant greater tussock sedge. Kelly and Iremonger (1997) also identify the moss *Hookeria lucens* as a potential indicator of the vegetation community; this species was not recorded in any of the quadrats, but it is present in the swamp woodlands at Abbeyleix. Other species occurring in 2-3 of their relevés that were also common in the Abbeyleix quadrats included marsh bedstraw, stoloniferous bent (*Agrostis stolonifera*), water mint, common reed, Yorkshire fog (*Holcus lanatus*), narrow buckler fern (*Dryopteris carthusiana*), the moss *Calliergonella cuspidata* and several other widespread wet woodland species. The Abbeyleix quadrats appear to be more base-rich than those in the previous study, as the brown mosses *Campylium stellatum* and *Fissidens adianthoides* were frequent in Abbeyleix, but not recorded by Kelly and Iremonger (1997). The previous study notes the similarities between the greater tussock sedge swamp woodlands they surveyed and the swamp carr of East Anglia in Britain and other examples in the Netherlands. In these places, swamp carr is a successional stage from open reedswamp to *Sphagnum*-rich bog woodland. There is evidence of succession to bog woodland at Cloghereen Pool Wood (Kelly and Iremonger, 1997), and it is possible the swamp carr at Abbeyleix is on a similar trajectory.

Swamp carr woodlands appear to be a rare habitat type in Ireland (Kelly and Iremonger, 1997, Cross *et al.*, 2010), and there seem to be too few relevés included in the IVC classification for a clear community type to be defined. The addition of these relevés to the Irish vegetation database may influence future classification work. Regardless, it seems appropriate to recognise a *Carex paniculata* sub-community (WL3Eii) within the *Salix cinerea* – *Galium palustre* woodland community (WL3E).

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