Comhairle Chontae Uíbh Fhailí
Offaly County Council

Áras an Chontae, Bóthar Charleville,
An Tulach Mhór, Contae Uíbh Fhailí, R35 F893
Áras an Chontae, Charleville Road,
Tullamore, Co. Offaly, R35 F893
T. [redacted] F. [redacted]
E. [redacted]

offaly.ie

Our Ref: DEC 23/24
Your Ref: ABP – 318373-23
22/04/2024

AN BORD PLEANÁLA
LDG- 071505-24
ABP-
24 APR 2024
Fee: € 110 Type: Chq
Time: 9:49 By: post

REGISTERED POST

Aisling Reilly,
Executive Officer,
An Bord Pleanála,
64 Marlborough Street,
Dublin 1,
D01 V902.

Re: Section 5 Declaration: Whether the peat extraction on a bog and associated works is or is not development and is or is not exempted development at Annaghmore, Lough Fen, Co. Offaly

Dear Sir/Madam,

I refer to the Section 5 Declaration referral previously submitted and invalidated on 10/11/23 under your ref ABP – 318373-23. I now set out hereunder the grounds of referral as required.

Offaly County Council Re: DEC23-24 / UD22-029 –The peat extraction at Annaghmore. Lough Fen, Co. Offaly

Tim O'Rourke St. O'Hara's Hill Cloonagh, East Tullamore Co. Offaly

Whether peat extraction on a bog and associated works at Annaghmore, Lough Fen, Co Offaly is or is not development and is and or is not exempted development.

This referral is ancillary to a request for a section five declaration under reference number Dec 23/24 to Offaly County Council. A copy of application for a declaration Dec 23/24 is included.

In relation to whether the peat extraction on a bog and associated works is or is not development and is or is not exempted development at Annaghmore. Lough Fen, Co. Offaly.

The works have been subject of an Enforcement file under Offaly County Council reference number UD 22/29. It is noted that An Bord Pleanála is currently considering a number of similar declarations under reference numbers RL 19. RL 3518, RL19.RL 3517, RL19.RL3528, RL19.RL 3526 and RL 19. RL3535.

Decisions reached by An Bord Pleanála in relation to the above declarations will be material considerations in reaching a decision in the current referral. Offaly County Council is not in a

position to make a determination on this section five declaration in the absence of the national Body's, An Bord Pleanála, decision on these matters. I enclose herewith cheque in the sum of €110.00 for same.

Yours faithfully,

Administrative Officer
Planning Department

OFFALY COUNTY COUNCIL

Áras an Chontae, Charleville Road, Tullamore, Co. Offaly.
Tel: [redacted] **Fax:** [redacted]
Website: www.offaly.ie **Email:** [redacted]

FEE: €80.00

DECLARATION ON DEVELOPMENT & EXEMPTED DEVELOPMENT

SECTION 5 APPLICATION FORM

1. Name and Address of the applicant and of the person, if any, acting on behalf of the applicant.

Tim O'Rourke
St. O'Hara's Hill.
Cloonagh East,
Tullamore.

2. Address to which any correspondence relating to the application should be sent.

St. O'Hara's Hill.
Cloonagh East,
Tullamore.

3. Location, townland or postal address of the land or structure concerned as may be appropriate.

Annaghmore Lough Fen
Site Code 000413

4. Legal interest in the land or structure held by the applicant. If applicant is not owner of site, please provide name & address of owner:

Owners name not known.

5. Please provide details of works (where applicable) or proposed development. (Note: only works listed and described under this section will be assessed under this section 5 application. Use additional sheets if required.)

Details of works provided on attached typed page.

6. List of plans, drawings etc. submitted with this application

- Planning Enforcement Complaint Form
- Site location map
- Habitats Map
- Letter dated July 18th 2023
- " " August 13th 2023
- Annaghmore Lough Fen pNHA Ecological Survey
- Photos taken July 16th 2023

2 Copies of each.

No.

7. Are you aware of any enforcement proceedings connected to this site? If so please supply details:

8. Where there previous planning application/s on this site? If so please supply details: None that I know of.

FEE: €80.00 Attached.

Signature: Timothy O'Rourke **Date:** 11 September 2023

NOTES
Application shall be accompanied by 2 copies of site location map with site clearly outlined in red and a fee of €80.00. Please submit 2 copies of any additional plans/reports etc. you may wish to include as part of the application.

Application shall be forwarded to: Offaly County Council, Áras an Chontae, Charleville Road, Tullamore, Co. Offaly.

12 SEP 2023

Section 5 Application Form
Response to Q. 5.

Details of works carried out.

1. Development causing damage to a large area of raised bog for the commercial production of horticultural peat blocks as complained of on 30 Jan. 2023 in UD22/029 and follow up letter, photographs and map 13 August 2023. Also letter dated 18 July 2023.
2. Development causing damage to an area used for access, machinery, loading etc.
3. Development causing damage to an Annex 1 'alkaline fen (7230)', 'bog woodland 91(DO)' and other habitats of 'national nature conservation value'. (Details of habitats and maps provided in attached Blackthorn Ecology report).
4. Digging of deep trenches for peat block harvesting which feed into new drains on all sides of the peat block harvesting area and deepening and widening of old drains leading directly to lowering of the water table over large areas of the adjacent fen, bog woodland and other habitats. The developer has dug a 2m deep drain along the line of the 'bog lagg', the natural transition from raised bog to fen. The NPWS Site Synopsis states that 'the transition through to the fen area occupying the site of Annaghmore Lough is remarkable and may represent one of the only intact raised bog laggs in the country'. The developer has dug this drain since I made my Unauthorised Development complaint to Offaly County Council in January 2023.
5. Drainage and release of large amounts of faster flowing water carrying sediments to the Ballynacarrig_010 and Silver River (Kilcormac)_020 and general interference with the hydrology of the entire Annaghmore Lough Fen, Site 000413, covering several hundred acres.

All of the above works are contrary to the Offaly County Development Plan 2021-2027, which states in Ch. 4, Biodiversity and Landscape and which has as its Strategic Aim:

> Protect and enhance Offaly's natural assets of clean water, biodiversity, landscape, green infrastructure, heritage and agricultural land.

The above works and damage to habitats and water are also contrary to the regulations on the drainage of wetlands.

> These regulations bring the drainage and reclamation of Wetlands under Planning Control, making planning permission a requirement for the drainage or infilling of wetland areas 0.1 ha or above, and requiring an Environmental Impact Assessment (EIA) to accompany applications of 2 ha or more. Where a Planning Authority considers that applications for drainage which fall under the above thresholds (i.e. less than 0.1 ha) are likely to have a 'significant effect on the environment' an EIA will also be required (Department of the Environment, Community and Local Government 2011.

Tim O'Rourke 10 September 2023

Offaly County Council

Planning Enforcement Complaint Form

Notes:

1) Please Read Carefully Before Completing Form

2) The Council is not obliged to investigate any complaint that is not provided in writing:

3) The Planning and Development Act, 2000 places statutory time limits on the taking of Enforcement action by the Council. Therefore, should legal proceedings be instituted in this matter, the person making the complaint may be requested to give evidence in court as to the date of commencement of the unauthorized development. If this evidence is not forthcoming the Council may not be able to fully deal with the complaint.

4) Freedom of Information Act, 1997-2003 – Complaints regarding unauthorised development constitute part of the Council's records for the purposes of the above acts. The Council will endeavor to maintain as confidential any complaints made to it in confidence and in good faith. The Council cannot however, give absolute guarantees on this as requests under the Freedom of Information Act can be appealed by requesters to the Information Commissioner.

5) Completed forms should be returned by post to Planning Section, Offaly County Council, Áras an Chontae, Charleville Road, Tullamore, Co. Offaly.

Please Complete in Block Capitals

Complainant's name: Tim O'Rourke

Complainant's address: St. C' Hara's Hill, Cloonagh East, Tullamore, Co. Offaly

Complainant's phone number: [redacted]

Complainant's e-mail address (if any): [redacted]

Location of alleged unauthorised development (Please provide a site location map where possible): Annaghmore Lough Fen Site Code ~~000143~~ 000413 Folio OY28437F Grid reference N300143.

Name and address of person(s) carrying out alleged unauthorised development:
Not Known

Name and address of land owner if different to above: Not Known
Folio CY28437F

Planning Permission relating to development (if applicable): Not Known.

Date on which activity commenced: Recent - Exact date not Known.

Details of complaint: Peat extraction for horticultural use on Derry Bog (Offaly) part of Site ~~CCC413~~ CCC413. Possibly in excess of 20 acres in site. Several acres with network of drains and peat sods lined and stacked mechanically for drying. Machine on site, work ongoing.

Reason for complaint: Damage to site including rare habitats recorded by Dr George Smith 2014. Intact bog "lagg" and transitions now damaged. Hydrology now changed. Contrary to C.C.C. Dev. Plan, Water Framework Directive, EU Habitats Directive, Government Policy on biodiversity.

If unauthorised change of use please state previous use: NHA or pNHA.
Previously undisturbed series of habitats of high conservation value. Of "national importance" "Rare" and possibly "unique" series of habitats.

For this complaint, do you wish you name to be kept confidential (see note 4 above):

Yes: ☑ No: ☐

Complainant's signature: Tim O'Rourke

Date: 30 Jan. 2023

If immediate action is taken to stop the extraction of peat the damage done can be reversed. Work should cease while the matter is investigated.

Peat block harvesting area

) Red circle indicates location only, not the extent of damage

Offaly/Clare border.

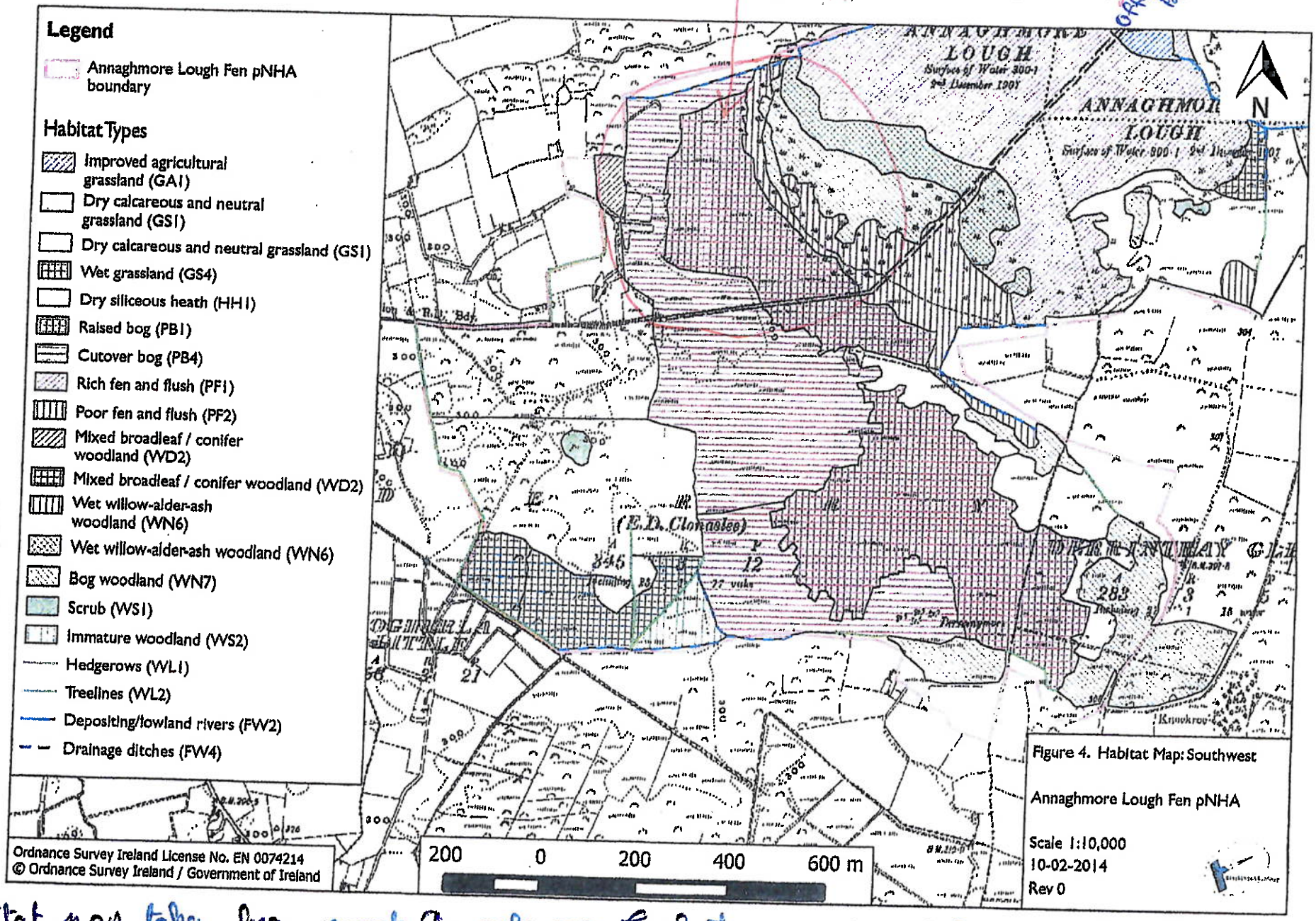


Figure 4. Habitat Map: Southwest

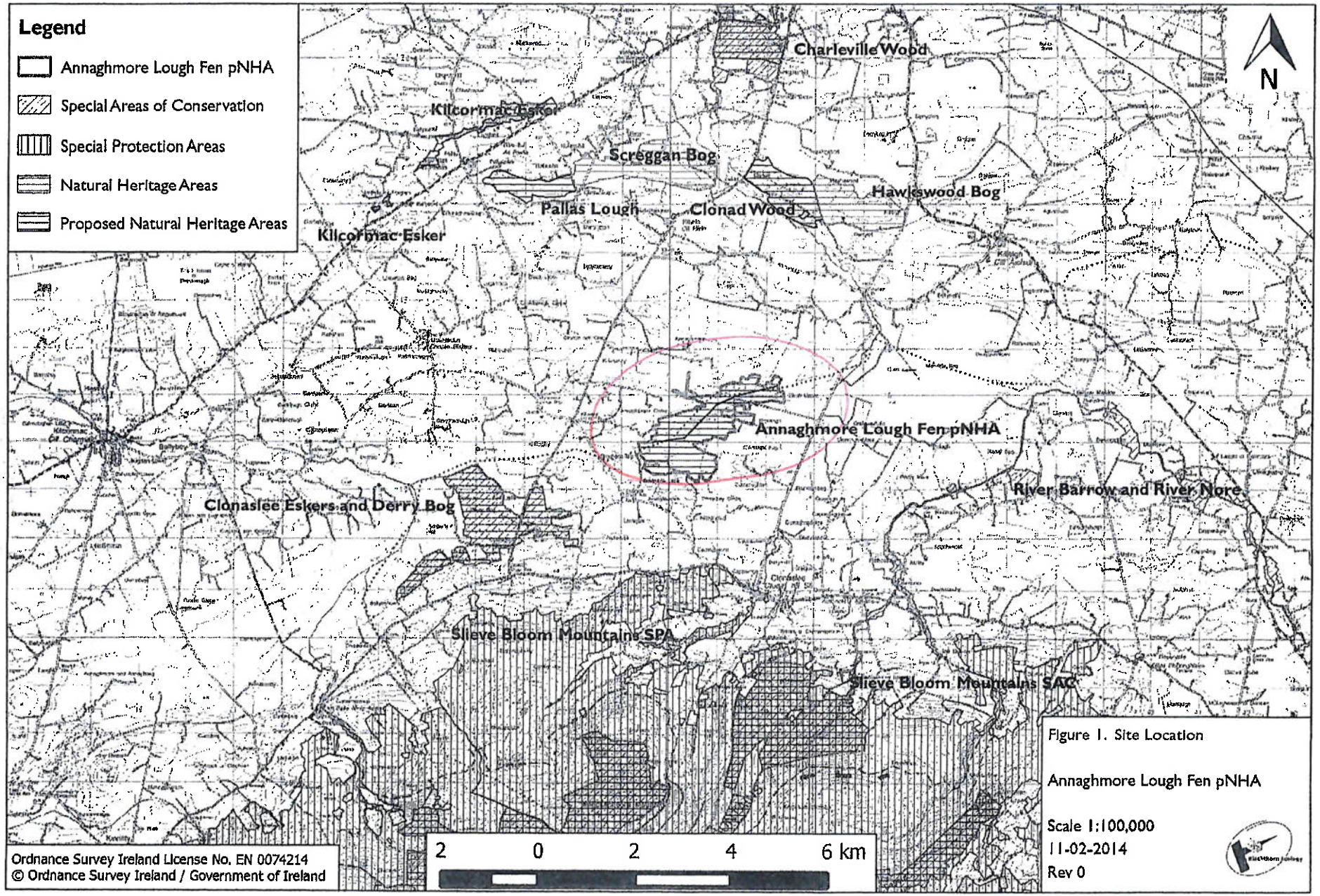
Annaghmore Lough Fen pNHA

Scale 1:10,000

10-02-2014

Rev 0

Habitat map taken from report Annaghmore Lough Fen pNHA. Blackthorn Ecology 2014.


Legend
Annaghmore Lough Fen pNHA
Special Areas of Conservation
Special Protection Areas
Natural Heritage Areas
Proposed Natural Heritage Areas
N
Charleville Wood
Kilcormac Esker
Screggan Bog
Hawkswood Bog
Pallas Lough
Clonad Wood
Kilcormac Esker
Annaghmore Lough Fen pNHA
River Barrow and River Nore
Clonaslee Eskers and Derry Bog
Slieve Bloom Mountains SPA
Slieve Bloom Mountains SAC
2 0 2 4 6 km
Ordnance Survey Ireland License No. EN 0074214
© Ordnance Survey Ireland / Government of Ireland
Figure 1. Site Location
Annaghmore Lough Fen pNHA
Scale 1:100,000
11-02-2014
Rev 0

St. O'Hara's Hill,
Cloonagh East,
Tullamore,
Co. Offaly.
July 18th 2023.

Ms Caroline Dempsey, Senior Executive Officer,
Planning Department,
Aras an Chontae,
Charleville Road,
Tullamore.

Re. Annaghmore Lough Fen Site Code 000413.

Dear Senior Executive Officer,
In January 2023 I informed the Planning and Environment Departments of Offaly County Council of horticultural peat harvesting on an area of raised bog adjacent to and part of the extensive fen site at Annaghmore Lough Fen, Site Code 000413. I submitted a Planning Enforcement Complaint Form dated 30 Jan. 2023. I was contacted by a planner for background information. I was promised that I would be informed of progress in the investigation into the peat harvesting on the site and that I would receive a copy of any enforcement letter sent to the developer. I have phoned the Planning Department several times since then, but I still have no information regarding the progress of the investigations.

I have not received any written acknowledgement or correspondence from the Planning Department nor have I been given any reference number for my complaint or the investigation which Offaly County Council says is ongoing.

As I could get no information from the Planning Department I went back to Annaghmore on 16 July. Work has continued at the site but it appears that as yet no peat has been transported out of the area. What is very clear is that there has been further extensive deep drainage all round the area where harvesting is taking place. This work has been carried out while Offaly County Council have been investigating. The damage to the site is now far greater than I reported in January and indicates that any effort made by Offaly County Council to stop work at the site has been a failure. While this is extremely disappointing the fact that no peat blocks have left the site means that mitigation can still save the site if urgent action is taken to prevent the drying out of the bog and fen.

To understand the significance of the damage to the site from recent drainage it is necessary to look at the history of the site and in particular the lagg or transition from the raised bog to the fen and associated range of habitats. The site synopsis states:

> Peat is being cut from the southwest of the bog area. Although this is a low volume operation, on such a small area of raised bog it has a seriously adverse effect. The loss of Monettia Bog 3km to the east of this site underlines the vulnerability of peatlands in Ireland, and although the area of raised bog is small (about 35ha) the transition through the fen area occupying the site of Annaghmore Lough is remarkable and may represent one of the only intact raised bog laggs in the country.

The area of Annaghmore that is currently being damaged is at least partly within Folio OY28437F which is to the northwest of the site (shown on accompanying map). No turf cutting had been undertaken in this raised bog area for many decades while turf cutting did continue in the bog to the south. Hope remained that the undisturbed raised bog which protected the lagg and fen to the east would survive long enough for action to be taken by the State to properly ensure the long-term future of the site. From west to east of the site the raised bog, lagg and fen extending to bog and alkaline woodland and the small remnant lake formed an undisturbed wilderness and very remarkable survivor considering the many decades of neglect by authorities who knew of its importance. While Offaly County Council have been investigating, a deep drain following the line of the lagg has been excavated, the first ever intrusion into the remarkable and rare feature. From the southeast of the peat harvesting area close to the Laois Offaly border the drain takes water north along the lagg to where it meets farmland. It then turns west between farmland and raised bog before turning south along the western side of the bog and into streams that flow towards the Silver River. Photographs and a map accompany this letter to show the extent and route of the drain and the direction of flow.

It should be noted that protected bogs such as Clara Bog and Raheenmore Bog do not have intact laggs as turf cutting over centuries gradually removed the natural edges. At Annaghmore the lagg had been protected by a lake of over 200 acres which was greatly reduced in area by drainage around the 1950's and is now replaced by a fen. The lake had two crannogs and other archaeology. The timbers forming raised platforms over the water were noted as being still visible in 1972 when the ASI report by Farrell was written. Prior to being drained the lake was an important amenity for the area with boats held by families from Tullamore and a beach used by visitors in summertime. Local children took freshwater mussels from the lake and sold them to visitors as snacks. Wildlife included Greenland white-fronted geese, red grouse and a great variety of waterfowl and waders.

The new drain now takes water from the bog, lagg and the adjacent fen greatly increasing the area being damaged and threatening the entire site of several hundred acres. This now includes that part of the fen which is in County Laois. Offaly County Council must urgently re-evaluate the size of the area affected by harvesting. The developer must be held responsible for damage to the fen which directly results from work undertaken to harvest horticultural peat in the raised bog. Offaly County Council has the opportunity to issue enforcement proceedings based on the much increased area being damaged and also under the Water Framework Directive which prohibits such large scale drainage of wetlands.

The survey for ASI (Farrell 1972) rated Annaghmore Lough Fen as of Regional Importance. It was 760 acres in extent at that time. The lake was said to have covered '207 acres, 1 rood, and 14 perches in 1850'. The 1972 report noted its botanical, geological, ornithological, ecological and archaeological interest. In its recommendations the report stated that 'The whole basin and enclosing bog is of sufficient diversity as to recommend the site as a nature reserve. It would make an excellent educational area.'

In 2014 Dr George Smith, Blackthorn Ecology, carried out an extensive survey of the site for a local group who were concerned about a proposal to erect wind turbines on the northern edge of the site. Of particular concern was the known existence of a whooper swan flight path between Annaghmore Lough and Pallas Lake to the northeast and the use of the Annaghmore fen site by hen harriers. The size and impenetrability of the fen in winter make it a suitable hen harrier roost site. The same features have most likely led to under-recording of the species at Annaghmore. A thorough survey at dawn or dusk would need several observers at different locations around the site to get an accurate picture of use by hen harriers. Whooper swans use the lake for safety at night having grazed in nearby fields during the

day. Records for both species are with NPWS, the Biodiversity Data Centre and *Birds in Central Ireland, Sixth Mid-Shannon Bird Report 2012-2016.*

Dr Smith mapped all the habitats and evaluated each. His listed 50 bryophyte species. In his assessment of the conservation value of the site he noted:

> The present survey has also found that Annaghmore Lough Fen is a site of high nature conservation value. The centrepiece of the site is the extensive fen that has developed on the former lake bed. This fen corresponds to a habitat type that is rare and declining in Ireland and in Europe, and corresponds with the Annex 1 habitat type *'alkaline fen (7230)'*. Other habitats of high conservation interest in the site include remnant raised bog, calcareous grassland and bog woodland, corresponding to the Annex 1 types *'degraded raised bog (7120)', orchid-rich calcareous grassland (6210)'* and *'bog woodland (91DO)'*. Also of interest is the poor fen, wet grasslands, habitats developing on long abandoned cutover bog, and the lake itself, which may be an example of the Annex 1 type *'hard water lakes (3140)'*. This combination of habitats results in a high biodiversity of plant species within the site.

Dr Smith noted that because the bog woodland is within a 'fen/bog transition zone' it is Annex 1 *'bog woodland (91DO)'* habitat type. He continued:

> The most important feature of the site as a whole, however, are the ecological transitions it demonstrates over space and time. The unbroken sequence of habitats from raised bog through poor fen and woodland zones to alkaline fen and lake is extremely rare in Ireland. Intact raised bog-fen transitions are rare, but occur in other sites, such as at bogs within Lough Corrib SAC. The presence of the woodland zone transitional from acidic birch woodland to base-rich willow and birch fen woodland within the raised bog-fen sequence, however, may be unique. Woodland expansion and development in or at the edge of the former lake also demonstrates ecological succession over time. Succession processes are also evident in the development of new habitats on cutover bog. These added features add ecological interest to the site and have significant educational potential.
>
> In summary, this survey has found Annaghmore Lough Fen to be a site of national conservation importance and a significant potential resource for education and ecological research.

Dr Smiths report was sent to Offaly County Council, National Parks and Wildlife Service and the Irish Peatland Conservation Council early in 2014. Since then, efforts have continued to highlight the importance of the site in the hope that its status as a pNHA would be reviewed and upgraded and measures taken to protect it. In a submission to the current Offaly County Development Plan I mentioned the importance of Annaghmore Lough Fen and other similar sites and the need for their conservation. In 2022 I made a detailed submission to Minister of State with responsibility for Biodiversity in Agriculture, Senator Pippa Hackett, requesting that consideration be given to supporting groups of farmers and landowners around sites such as Annaghmore Lough Fen who would work to a basic management plan and targets to improve the status of the sites and be rewarded financially for doing so. I informed her that a detailed survey of Annaghmore Lough Fen by Dr George Smith was already with NPWS.

As a matter of urgency the new drain dug around the raised bog from which horticultural peat is being harvested needs to be blocked in several places to avoid further loss of water from the fen. This could be done in a few hours and would be legally supported by the Water Framework Directive. The

developer needs to be informed that the site being developed extends well beyond the area used for harvesting to include the fen which is also being damaged by drainage which the developer has completed. The total area now far exceeds the area set down in regulations requiring an EIA. All work either cutting of peat or drainage should cease immediately. In the longer term the site will need to be restored as close as possible to what it was before horticultural peat harvesting began.

Yours sincerely,

Timothy O'Rourke. [redacted]

St O'Hara's Hill,
Cloonagh East,
Tullamore,
County Offaly,
13 August 2023.

Ms. Caroline Dempsey, Senior Executive Officer,
Planning Department,
Aras an Chontae,
Charleville Road,
Tullamore.

Re. Annaghmore Lough Fen Site Code 000413.

Dear Ms Dempsey,

I completed a Planning Enforcement Complaint Form dated 30 January 2023, made follow up queries by phone and sent a further letter dated 18 July 2023 to Offaly County Council, Planning Department, regarding harvesting of horticultural peat blocks at Annaghmore Lough Fen. I have not been given any information on the progress made by Offaly County Council, Planning Department, on this issue nor have I any reference number for the file on the matter. In view of the recent and ongoing damage at Annaghmore I once again request a reply to my letters and in particular to the following questions.

Could I have the reference number relating to my complaint?
Has the developer carrying out the horticultural peat harvesting at Annaghmore been identified?
Has a letter of enforcement been sent to the developer?
If an enforcement letter has been sent could I have a copy as promised?
Has the developer been held accountable for the damage done and instructed to return the site to the condition it was in before horticultural peat harvesting began. In my letter of 18 July 2023 I pointed out the urgent need to block a newly dug drain along the bog lagg between the raised bog and the fen. Photographs and a map showing this drain were provided with my letter. This drain was dug after I made my complaint and is clearly illegal.

The planning regulations regarding drainage of wetlands is clear. This is an entirely separate issue to the drainage of agricultural land. A wetland is defined as follows:

> 'Wetlands' means natural or artificial areas where biogeochemical functions depend notably on constant or periodic shallow inundation, or saturation, by standing or flowing fresh, brackish or saline water.[1]

According to the DAFM Guide to Farmers on EIA (Agriculture) Regulations, wetlands include swamps and marshes, fens, wet woodland and floodplains that are permanently inundated with water or inundated for a period each year.[2] All of these descriptions apply to habitats at Annaghmore Lough Fen and have

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+[1] County Laois Wetland Survey 2021, Phase 1 Desktop Study. Report prepared for Laois County Council by P. Foss, M.C. Gallagher & P. Crushell, November 2021.
The report contains references to the 'Nationally Important', Annaghmore Lough Fen and its various habitats on pages 97, 99, 110, 114, 115.

[2] Department of Agriculture, Food and the Marine Environmental Impact Assessment (Agriculture) Regulations, Guide for Farmers. European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011, European Commission (Environmental Impact Assessment) (Agriculture) (Amendment) Regulations 2017.

been surveyed in detail by Dr George Smith, Blackthorn Ecology, who produced a report in 2014 which Offaly County Council received at that time.

At 5.2 the Guide to Farmers states that

> Drainage (open drain, pipe drainage or other method) or reclamation (by infilling or other method) of wetlands can have a major impact on habitats and wildlife. Such drainage works are not subject to the EIA (Agriculture) Regulations but are subject to alternative controls ---.

These alternative controls are set out in 'Part F, Drainage or Reclamation of Wetlands'.

> 12. Planning and Development (Amendment) (No. 2) Regulations 2011.
> Drainage or reclamation of wetlands --- is controlled under the Planning and Development (Amendment) (No. 2) Regulations 2011 and the European Communities (Amendment to Planning and Development) Regulations 2011 which regulations are implemented by the Local Authorities. If you propose to drain or reclaim a wetland you must apply to your local County Council for planning permission. **Permission is required where the area impacted by the works exceeds 0.1 hectares or the works may have a significant impact on the environment.**

The regulations specify that a planning application is required above 0.1 hectare or where the work 'may have a significant effect on the environment'. For any area above 2 hectares a Planning Application with Environmental Impact Statement is required. Based on the regulations and the deep drainage work completed at Annaghmore I believe that the development is illegal as it will lead to a lowering of water levels across a wide area of the raised bog and Annex 1 bog woodland and fen including into that part of the site which is in County Laois. The developer must be held accountable for damage done not only to the raised bog, but also to rare habitats beyond the immediate area where horticultural peat harvesting is taking place.

Damage to Annaghmore Lough Fen is also contrary to the aims of the Water Framework Directive to which Ireland has committed 'to protect and improve water quality in all waters'. The range of habitats at Annaghmore Lough Fen assist with water purification contributing to improved water quality in the Clodiagh River and the Silver River. Industrial peat harvesting causes a deterioration in water quality. As drains are opened and deepened water will be released much faster into both river catchments adding to flooding downstream at a time when the need for flood prevention is even more acute with predicted heavy rainfall events due to climate change.

If Offaly County Council has an alternative view it must explain its position and how it intends to proceed. I would be grateful for an early, written reply outlining the current situation regarding your investigations and enforcement proceedings relating to Annaghmore.

Yours sincerely,

Tim O'Rourke.

Blackthorn Ecology

ANNAGHMORE LOUGH FEN pNHA

ECOLOGICAL SURVEY

10TH MARCH 2014

24 Lisle Road, Walkinstown, Dublin 12
Church Street, Moate, Co. Westmeath
T [redacted]

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Context

Blackthorn Ecology was appointed to carry out an ecological survey of Annaghmore Lough Fen proposed Natural Heritage Area (pNHA) (site code 000413) by the Killurin, Annaghmore & Gurteen Wind Turbine Concern Group. The key objective of the survey was to assess the conservation value of the site and evaluate its sensitivities. This work was considered necessary due to the lack of recent, detailed ecological information on the habitats and species in the site. An immediate concern was the proposed development of a wind farm on land adjacent to the pNHA. This report may also provide baseline information for potential educational or recreational opportunities.

Annaghmore Lough Fen pNHA is situated on the Laois-Offaly county border a short distance north of the Slieve Blooms and near the village of Clonaslee. It is one of a cluster of designated bog and fen sites in the immediate area (Figure 1). Approximately 1.8 km to the southwest is Clonaslee Eskers and Derry Bog Special Area of Conservation (SAC), designated mainly for the presence of alkaline fen, orchid-rich grassland and Geyer's whorl snail. Screggan Bog and Hawkswood Bog NHAs lie approximately 4 km to the north. Pallas Lough pNHA is located about 4.5 km northwest of Annaghmore Lough and is ecologically similar in that the site comprises a lake surrounded by successional wetlands.

This report has been prepared by Dr George F Smith CEcol CIEEM of Blackthorn Ecology. Dr Smith has extensive experience in ecological survey and conservation management. He is a highly experienced botanist and British Bryological Society Regional Recorder for Offaly. He is a Chartered Ecologist and a full member of the Chartered Institute of Ecology and Environmental Management, the chief professional society in Ireland for ecological professionals, and as such, he is bound by their Code of Professional Conduct.

1.2 Methods

1.2.1 Desk Study

Available information on Annaghmore Lough Fen pNHA was reviewed, including:

- Areas of Scientific Interest (ASI) reports for Offaly (Farrell, 1972a) and Laois (Farrell, 1972b)
- Site Synopsis (National Parks and Wildlife Service, 1995) (reproduced in Appendix A)
- Species records held by the National Biodiversity Data Centre
- Information in the site file held by National Parks and Wildlife Service (NPWS)
- National Survey of Native Woodland (NSNW) data
- NPWS mapping data for Habitats Directive Annex I types

Several individuals with knowledge of the ecology of the site were also consulted.

1.2.2 Field Survey

A field survey was carried out on 21st-22nd January 2014. Habitat mapping was carried out following the Heritage Council's Best Practice Guidance (Smith *et al.*, 2011), and habitats

were classified according to the Heritage Council (Fossitt, 2000) and Habitats Directive (European Commission, 2013) systems. Surveys were aided by the use of a handheld GPS (Garmin eTrex) and a GPS-enabled camera (Sony Cybershot DSC-HX9V). It was not possible to survey all habitats in the field in detail. In some cases, habitats were identified from a distance or from inspection of Bing aerial imagery (http://www.bing.com/maps/). The level of survey detail is provided in the habitat GIS (under DATA_QUAL), as per *Best Practice Guidance* (Smith et al., 2011).

Habitat mapping data were incorporated into a GIS using QGIS 2.0 (QGIS Development Team, 2013) and following the Heritage Council's Best Practice Guidance (Smith *et al.*, 2011). Habitat polygons and polylines were digitised over Bing aerial imagery at a scale of 1:2500. Habitat datasets are in Irish Grid, but were reprojected to Bing's WGS84 / Pseudo Mercator (EPSG: 3857) during digitising. Where possible, polygon boundaries and polylines split underlying features, such as hedgerows. Further details are provided in the habitat dataset metadata. The habitat GIS and metadata have been archived with the National Biodiversity Data Centre and are also available from Blackthorn Ecology.

Habitat polygon boundaries and polylines shown in Figures 2-4 below do not exactly match the pNHA boundaries or underlying 25-inch OS map features. This is primarily because the pNHA boundaries were drawn using 25-inch base maps, which employ an older map projection (Cassini) that suffers from increasing error towards the county boundaries. This error can be seen in the discrepancy in the county boundary location between the Laois and Offaly map sheets, which appears as a double boundary line in Figures 2-4.

Due to the time of year of survey, it was not possible to compile a comprehensive list of vascular plant species. A comprehensive list of bryophytes present was prepared, however, and these assisted in identifying and evaluating the habitats on site. Caitríona Douglas and Grace O'Donovan carried out a survey of the fen on 3rd September 1993, and a copy of the species list they compiled and brief site notes held in the NPWS site file was reviewed. Lists of the species recorded in this survey and in others are presented in Appendix B.

2 ANNAGHMORE LOUGH FEN

2.1 Overview

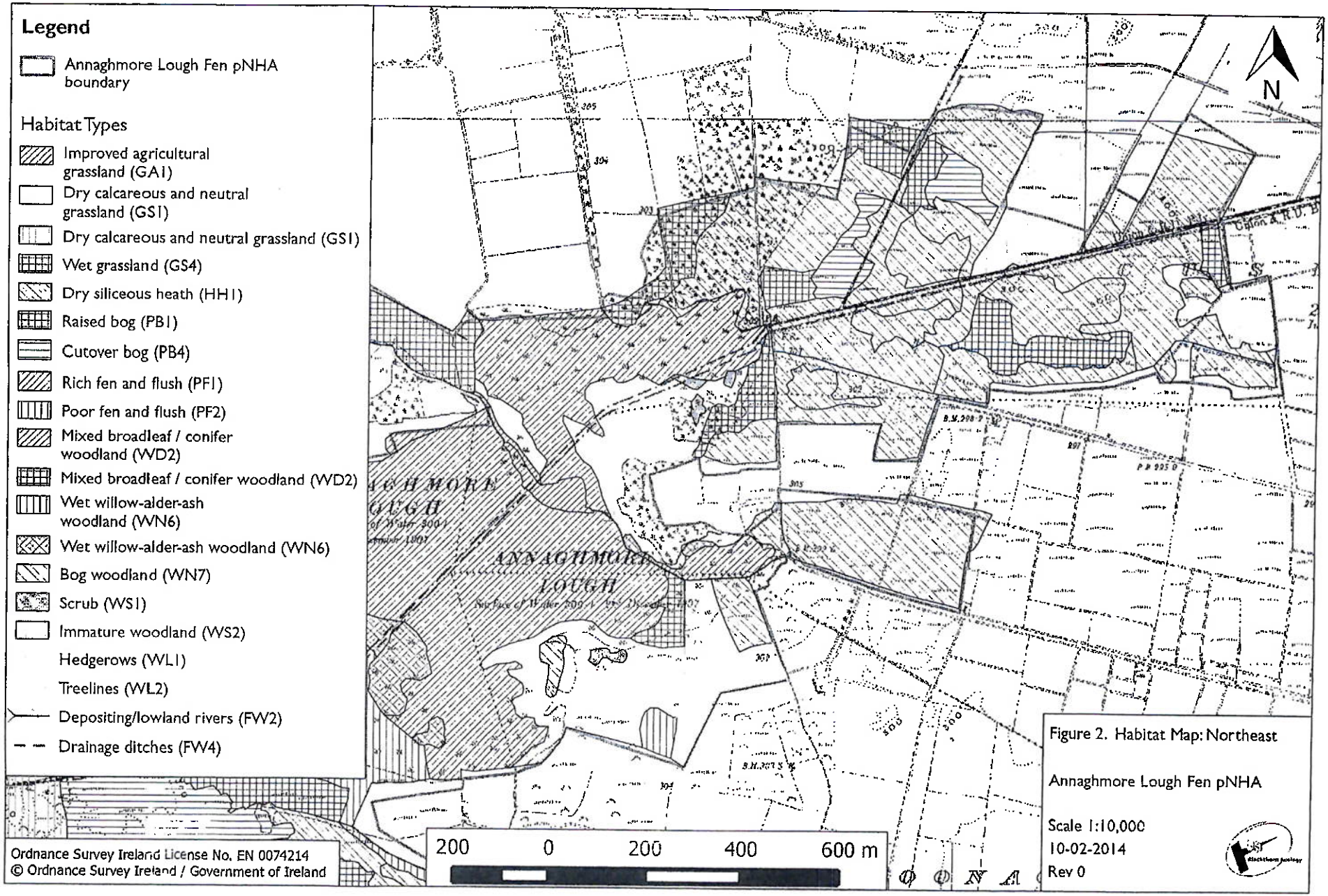
Annaghmore Lough Fen was formerly a relatively large lake. Its extent can be seen in the Ordnance Survey 25-inch maps for the area: in 1907 it covered just over 300 acres or 121.5 ha. According to Farrell (1972a), it was drained as a result of arterial drainage works in the 1960s. According to the Site Synopsis (Appendix A), it is unclear whether the virtual loss of the lake is due to natural sedimentation or to drainage. Observations by local residents that the lake level dropped quickly some time in the mid-20th century supports the drainage hypothesis. The change in water levels has led to ecological succession in the former lake bed and the development of several wetland habitats that demonstrate an unbroken transition from lake to raised bog.

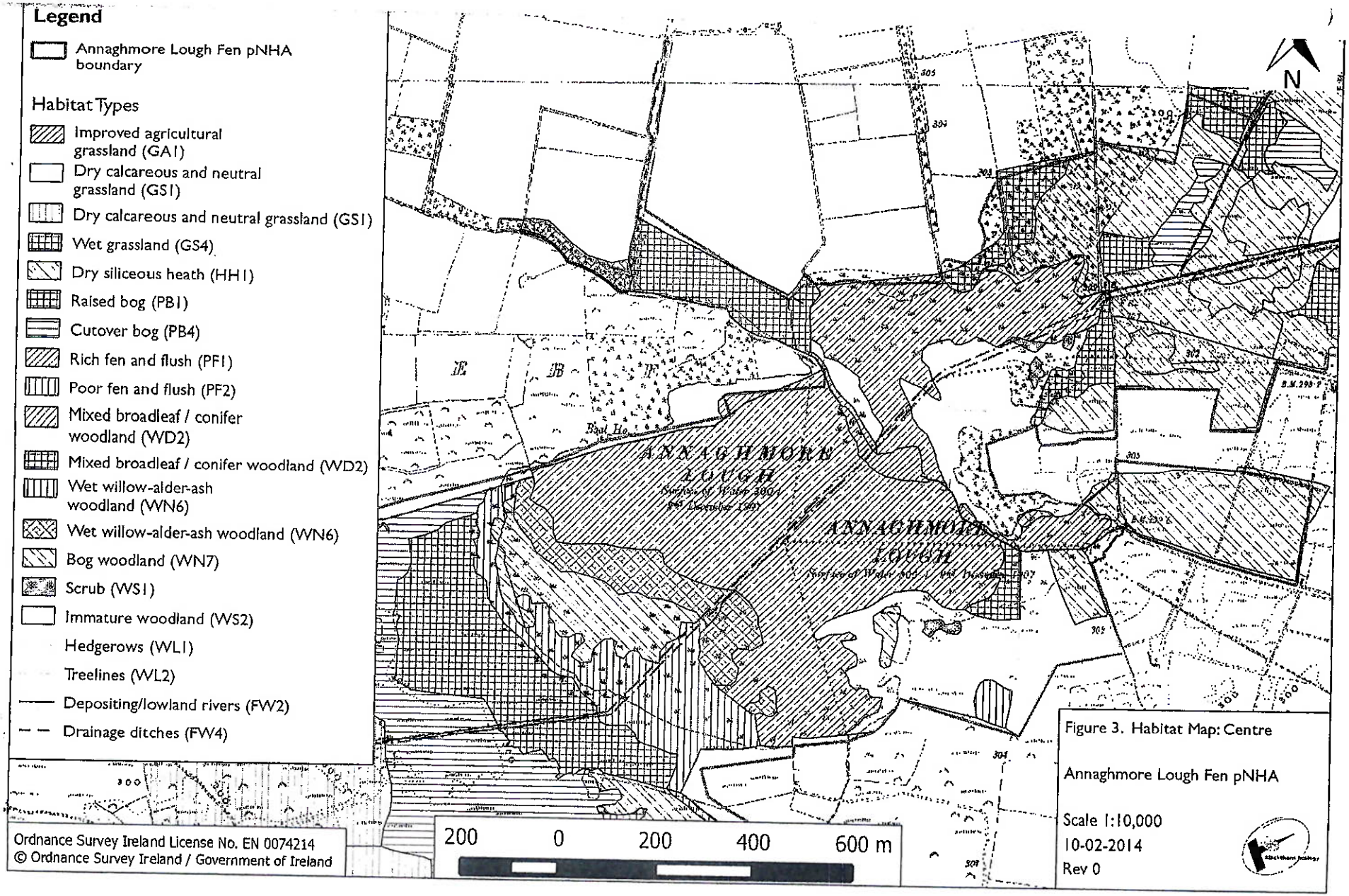
View of bog woodland over Annaghmore Lough Fen

At present, the *Lake* only occupies c. 0.90 ha, though local residents report that it fluctuates significantly. The former lake basin is now mainly occupied by an area of *Alkaline Fen* that extends primarily to the west of the extant lake. To the southwest of the main body of the fen is an area of woodland and poor fen occupying a *Transitional Zone* to a remnant *Raised Bog (SW)* to the west and south. Most of the bog has been cut over and some of the old cutover is occupied by heath and birch woodland. To the west of the bog is an area of *Esker Grassland*. To the northeast of the lake and fen is another area of *Cutover Bog (NE)* now occupied mainly by birch woodland. North and south of the fen is improved agricultural grassland on reclaimed peatland.

The habitats present within the site are mapped in Figures 2-4. Habitat mapping focused on semi-natural habitats within the pNHA boundary. Some small areas of improved grassland within the pNHA boundary are not mapped, and some areas of semi-natural habitat contiguous with habitats within the site boundary are mapped. As noted above, discrepancies between habitat mapping and site boundaries or base mapping are the result of map projection error. The pNHA site boundary is irregular mainly as the result of reclamation of lands for agriculture. The original ASI boundary proposed by Farrell (1972a, b) was amended to exclude improved areas insofar as was feasible, as the NPWS NHA boundary survey files show.

Plant species recorded from the site are listed in Appendix B.


Legend
Annaghmore Lough Fen pNHA boundary
Habitat Types
Improved agricultural grassland (GA1)
Dry calcareous and neutral grassland (GS1)
Dry calcareous and neutral grassland (GS1)
Wet grassland (GS4)
Dry siliceous heath (HH1)
Raised bog (PB1)
Cutover bog (PB4)
Rich fen and flush (PF1)
Poor fen and flush (PF2)
Mixed broadleaf / conifer woodland (WD2)
Mixed broadleaf / conifer woodland (WD2)
Wet willow-alder-ash woodland (WN6)
Wet willow-alder-ash woodland (WN6)
Bog woodland (WN7)
Scrub (WS1)
Immature woodland (WS2)
Hedgerows (WL1)
Treelines (WL2)
Depositing/lowland rivers (FW2)
Drainage ditches (FW4)
N
200 0 200 400 600 m
Ordnance Survey Ireland License No. EN 0074214
© Ordnance Survey Ireland / Government of Ireland
Figure 2. Habitat Map: Northeast
Annaghmore Lough Fen pNHA
Scale 1:10,000
10-02-2014
Rev 0


Legend
Annaghmore Lough Fen pNHA boundary
Habitat Types
Improved agricultural grassland (GA1)
Dry calcareous and neutral grassland (GS1)
Dry calcareous and neutral grassland (GS1)
Wet grassland (GS4)
Dry siliceous heath (HH1)
Raised bog (PB1)
Cutover bog (PB4)
Rich fen and flush (PF1)
Poor fen and flush (PF2)
Mixed broadleaf / conifer woodland (WD2)
Mixed broadleaf / conifer woodland (WD2)
Wet willow-alder-ash woodland (WN6)
Wet willow-alder-ash woodland (WN6)
Bog woodland (WN7)
Scrub (WS1)
Immature woodland (WS2)
Hedgerows (WL1)
Treelines (WL2)
Depositing/lowland rivers (FW2)
Drainage ditches (FW4)
N
ANNAGHMORE LOUGH
ANNAGHMORE LOUGH
200 0 200 400 600 m
Ordnance Survey Ireland License No. EN 0074214
© Ordnance Survey Ireland / Government of Ireland
Figure 3. Habitat Map: Centre
Annaghmore Lough Fen pNHA
Scale 1:10,000
10-02-2014
Rev 0

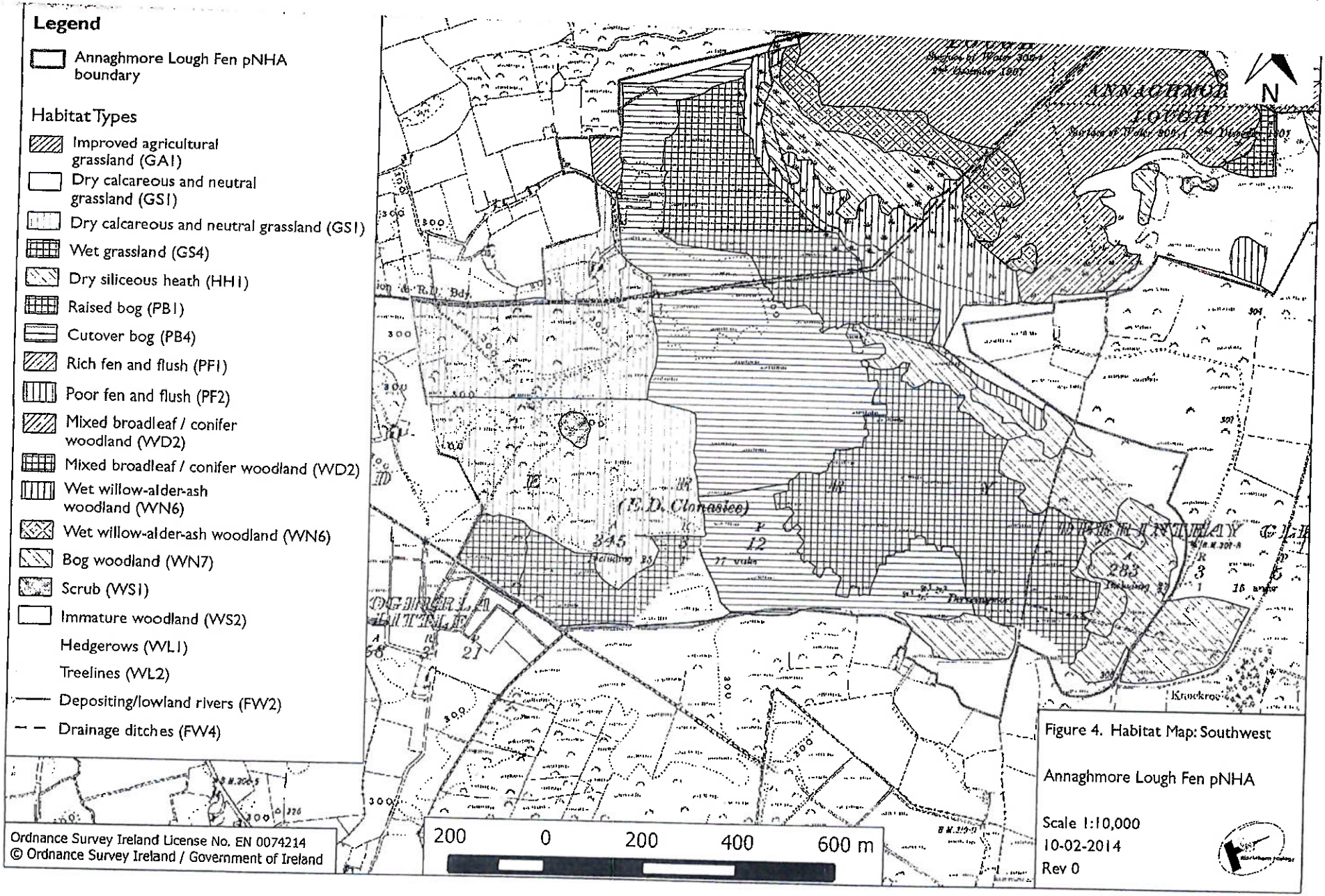


Figure 4. Habitat Map: Southwest

Annaghmore Lough Fen pNHA

Scale 1:10,000
10-02-2014
Rev 0

2.2 Lake

Annaghmore Lough and adjacent fen

The remnant Annaghmore Lough was mapped as a **mesotrophic lake (FL4)** in the absence of more complete information on its trophic status. The surrounding alkaline fen vegetation indicates that the waters are calcareous, but the time of year of survey was not suitable for assessing trophic status. NPWS have mapped Annaghmore Lough as a potential example of the Habitats Directive Annex I habitat *'hard water lakes (3140)'*. The classification was based on the geological, soil, watercourse, topographic and other characteristics in the catchment; as the Annex I type is defined according to lake vegetation, a definite classification needs suitable survey work from the appropriate season. There are no EPA water quality data available for the lake or the inflowing or outflowing streams. No floating or emergent vegetation was present, apart from marginal stands of fool's watercress and sweet-grass species.

The lake is very shallow, perhaps c. 1 m deep at the time of survey. The presence of a plant debris forming a strand line shows that the water levels fluctuate during wet and dry seasons. Local residents report that cattle often wade into the centre of the lake in summer, and so summer water levels must be quite shallow. The Site Synopsis (Appendix A) claims that it is only a "couple of centimetres" deep, but this is likely to be an exaggeration.

Channelised stream feeding Annaghmore Lough with semi-improved grassland to left

The lake is fed by a **lowland / depositing river (FW2)** flowing in from the northwest. Near its entry, the stream is approximately 2 m wide and 0.5 m deep. It has a gravel substrate and supports marginal stands of fool's water-cress and water starwort. The stream has been dredged in the past, as shown by its straight course, depth and grassed-over mounds of spoil on the northeast bank. Further to the west, the inflowing stream is bounded by a **treeline (WL2)** of alder with some rusty sally, hawthorn and gorse.

The outflow stream is similar. There is a muddy place where cattle cross the stream to access the fen on the southwest side of the lake and stream. Filamentous algal growth was

noticeable here, perhaps indicating nutrient enrichment of the lake and stream system as a whole or perhaps only local enrichment.

2.3 Alkaline Fen

2.3.1 Western Fen

Surrounding the lake was **rich fen and flush (PF1)** habitat, which corresponds to the EU Habitats Directive type *'alkaline fen (7230)'* (European Commission, 2013). The main part of the fen lay southwest of the lake and stream. It was dominated by a low sward of sedges and a relatively high cover of mosses. Sedges recorded included glaucous sedge and yellow sedge, but the time of year was not suitable for identifying sedges, and so no efforts were made to compile a comprehensive list. In 1993, Douglas and O'Donovan recorded six sedges, including glaucous sedge, long-stalked yellow sedge, common sedge, carnation sedge, bottle sedge, and what they suspected was tawny sedge. The dominant moss was *Calliergonella cuspidata*, a common wetland species, but several characteristic fen mosses were present, including *Scorpidium cossonii, Bryum pseudotriquetrum, Campylium stellatum* and *Calliergon cordifolium*.

Alkaline fen on west side of the lake

The vegetation structure of the fen was not uniform. Patches dominated by common cottongrass were frequent, often associated with iron-rich flushes. Stands of common reed and some bulrush were also present. Scattered saplings and low scrub of dwarfed birch and rusty sally were frequent, especially to the west and southwest where the fen was slightly drier and probably less calcareous. In these places, mounds of *Aulacomnium palustre* were frequent along with patches of *Rhytidiadelphus triquetrus* and wild angelica. Nearer the lake, the sward became more dense with abundant creeping bent, which suggests a degree of nutrient enrichment. Along the northwest margin, the fen was quite wet and the substrate was quaking. Here, water horsetail was abundant with frequent bulrush.

Additional plant species recorded here included lesser spearwort, marsh-marigold, marsh bedstraw, mare's-tail and *Hylocomium splendens*.

Although cattle had access to this part of the fen by crossing the outflowing stream south of the lake, grazing pressure appeared low and concentrated in the parts nearest the crossing point.

2.3.2 Eastern Fen

The fen northeast of the lake was tussocky and characterised by abundant black bog-rush and frequent purple-moor grass. Other plants present in this part of the fen included jointed rush, marsh ragwort, water horsetail, water mint, marsh bedstraw and sedges.

Pointed spear-moss was again abundant and intermediate hook-moss was encountered frequently. A similar patch of tussocky fen was mapped to the north of the outflow stream.

Further east where the fen would have been transitional to raised bog, great fen-sedge was frequent. Some of this fen appeared to occupy cutover bog. The eastern fen was divided by a fence running east-west. The northern part of the fen was observed from a distance, and it was noted that much of the great fen-sedge and associated fen vegetation north of the fence had been recently mown or cleared.

Alkaline fen on east side of lake

The eastern fen south of the fence was grazed by cattle at the time of survey. This resulted in a short sward. Supplementary feeding was also occurring, with fodder delivered to grassland areas adjacent to the fen and fields outside the pNHA site boundary. Cattle spent most of their time during the field survey in the grassland areas. These occupied ground sloping up from the fens to the east. The grasslands appeared to be a semi-improved variant of **improved agricultural grassland (GA1)**. Due to the time of year and cattle grazing, it was difficult to evaluate and may be better considered semi-natural grassland.

Also scattered in the eastern part of the site in association with the fen and grassland habitats were pockets of gorse-dominated **scrub (WS1)**, young **wet willow-alder-ash woodland (WN6)** and a small copse of Scots pine, birch, holly and hawthorn too small to map as woodland. The wet woodland patches mainly comprised rusty sally with frequent hawthorn and some Irish whitebeam, holly and gorse. The wet woodland understories were peaty and cattle-poached or grassy where not disturbed.

2.3.3 Vegetation Development

The fen was found to be largely as described by Douglas and O'Donovan in their brief site notes from their 1993 survey, and species composition was generally similar (Appendix B). They noted that "sedges dominate in general, though species dominance varies locally", with patches characterised by common cottongrass, water horsetail or common reed. They noted that the eastern end of the fen was more calcareous in character than the western, and this matches 2014 observations that bryophytes indicative of more transition characteristics, such as *Aulacomium palustre* and *Hylocomium splendens*. It is almost certain that ecological succession and land-use have driven changes in vegetation and habitat, but the 1993 site description is too brief for any conclusions to be drawn, and there is insufficient information on the species present.

Descriptions of the lake basin in the early 1970s by Farrell (1972a, b), however, show that vegetation change since then has been significant. At that time, the eastern part of the former lake bed is described as having a gravel floor colonised by a "sedge carpet about ½ inch high, made up of *Carex flacca* and *Carex panicea*". Low-growing species were reported

as prominent in the vegetation at that time, and many of these either have not been recorded from the site since (e.g. brookweed (*Samolus valerandi*)) or are now infrequent (e.g. lesser clubmoss (*Selaginella selaginoides*) and bristle club-rush (*Isolepis setacea*)). The western fen was described as an area of taller sedge and cottongrass with a few stunted willow and birch trees (Farrell, 1972a, b), and so appears to have changed less in the intervening period.

2.4 Transitional Zone

Southwest of the *Alkaline Fen* was a transition zone of vegetation lying between the fen and raised bog. The transition zone includes three distinct habitats: a band of **wet willow-alder-ash woodland (WN6)**, a contiguous band of more open birch and Scots pine woodland best classified as **bog woodland (WN7)**, and a strip of open **poor fen and flush (PF2)** vegetation. These habitats are not known to have been previously surveyed in any detail.

2.4.1 Wet Woodland

Wet woodland edge with transition to open alkaline fen in foreground

Adjacent to the fen was a young stand of birch and rusty sally forming a closed canopy (c. 90% cover) woodland. The understorey was dense and occupied by birch and willow saplings with frequent guelder-rose and occasional young holly. The field layer was sedgy with abundant bottle sedge, patches of ivy and bramble and frequent meadowsweet. *Calliergonella cuspidata* and *Pseudoscleropodium purum* were abundant and *Rhytidiadelphus squarrosus* was frequent. Water horsetail, devil's-bit scabious and broad buckler fern were also present.

The species present indicated a wet woodland on peaty soils that are more base-rich than acidic. It is best classified as **wet willow-alder-ash woodland (WN6)** under the Heritage Council classification (Fossitt, 2000) and is mapped as such in Figures 2-4. Under the more detailed woodland classification system developed from the National Survey of Native Woodland (Perrin *et al.*, 2008), this part of the woodland is best considered **BM5 birch-purple moorgrass woodland, grey**

South-eastern section of wet woodland: more mature and open woodland structure with grassy field layer

willow-marsh bedstraw subtype (Cross *et al.*, 2010).

The south-eastern end of this woodland band was more mature and open and appeared to be less wet. Birch and rusty sally were the dominant trees, and a single ash tree was also present. The understorey was sparse, and the field layer was grassy and dominated by creeping bent and common sedge. Also frequent were the grasses red fescue and Yorkshire fog, meadowsweet and bramble. This section is also best classified as **wet willow-alder-ash woodland (WN6)** and **BM5 birch-purple moorgrass woodland, grey willow-marsh bedstraw subtype**. There are some similarities with another subtype **BM3 birch-purple moorgrass woodland, Yorkshire fog-bent grass subtype** which also characteristically grassy, but tends to occur on more acidic sites. The stand showed no signs of grazing, but the grassy field layer and lack of an understorey suggests it may have been grazed in the past.

2.4.2 Bog Woodland

The transition from the wet woodland described above to a generally more open and acidic **bog woodland (WN7)** was relatively abrupt and quite noticeable in the field. Birch was again the most abundant canopy tree species, but rusty sally was only occasional, and Scots pine was frequent. Canopy cover averaged only about 40%. The understorey layer was patchy and mainly occupied with birch and Scots pine saplings. Purple moor-grass dominated the field layer, while bog-myrtle, bramble, *Pseudoscleropodium purum* and *Hylocomium splendens* were frequent. Other typical species included ivy, devil's-bit scabious, ling heather and *Loeskeobryum brevirostre*.

Bog woodland edge and poor fen with abundant bog-myrtle in foreground

Closed canopy bog woodland corresponding to Annex I habitat type

In the centre of the woodland, at the transition to more base-rich wet woodland, patches of the woodland have affinities to the Habitats Directive Annex I type *'bog woodland (91D0)'*. Here, the birch canopy was more full (c. 75%) with rusty sally and Scots pine both occasional. The field layer was characterised by abundant bottle sedge with some bramble, but was distinctly more mossy. *Aulacomnium palustre* and *Hylocomium splendens* were most abundant, but *Sphagnum* species characteristic of

flushed bog woodland were frequent, including *S. fimbriatum, S. squarrosum* and *S. palustre.* Great fen-sedge was also occasional. Indicator species of good quality Annex I bog woodland present in this part of the wood included bottle sedge, purple moor-grass, *Sphagnum fimbriatum, S. palustre, Hylocomium splendens,* and *Aulacomnium palustre* in addition to birch and rusty sally (Cross and Lynn, 2013).

Towards the northern end of the woodland block, the distinction between WN6 wet woodland and WN7 bog woodland is less distinct as purple moor-grass and common reed both increase in abundance to the exclusion of more distinctive indicator species.

Where the plant species composition indicates more acid peaty conditions, those parts of the woodland block are mapped in Figures 2-4 as **bog woodland (WN7)** under the Heritage Council classification (Fossitt, 2000). Under the more detailed woodland classification system developed from the National Survey of Native Woodland (Perrin *et al.*, 2008), this part of the woodland is best considered **BM6 birch-purple moorgrass woodland, purple moorgrass-tormentil subtype.**

2.4.3 Poor Fen

The bog woodland petered out into a zone of purple moorgrass dominated **poor fen (PF2).** The purple moor-grass was quite dense and tussocky and afforded very little habitat for bryophytes, such as *Hypnum jutlandicum* and *Sphagnum capillifolium* ssp. *rubellum.* Vascular plants scattered amongst the purple moorgrass included bog-myrtle, ling heather and cross-leaved heath. Also present closer to the woodland margin were more open patches where great fen-sedge was locally abundant, and purple moorgrass was less so, and other species, such as devil's-bit scabious and *Pseudoscleropodium purum* could gain a foothold. The transition to **raised bog (PB1)** to the southwest was rather sharp.

Purple moor-grass dominated poor fen in middle ground with raised bog margin in foreground and bog woodland in back

2.5 Raised Bog (SW)

2.5.1 Uncut Bog

A large proportion of the bog to the west and south of the former lake basin was remnant, uncut **raised bog (PB1).** This habitat was split into two sections, north and south, divided by an area of old cutover bog supporting **dry heath (HH1)** vegetation (Figure 4).

The northern section of uncut raised bog was dry and degraded, firm underfoot, and with less than 5% cover of *Sphagnum* (mainly *Sphagnum capillifolium* ssp. *rubellum*). The habitat corresponded with the *marginal* raised bog ecotope, as defined and used in NPWS raised bog monitoring projects (Kelly *et al.*, 1995, Fernandez Valverde *et al.*, 2005, Fernandez Valverde *et al.*, 2012, Fernandez Valverde *et al.*, in press). Ling heather, hare's tail cottongrass

and reindeer lichen were the most abundant species. Also frequently occurring were bog asphodel, cross-leaved heath, *Hypnum jutlandicum* and *Odontoschisma sphagni*, and pine saplings were scattered in places. An old, dry drain marks the county boundary.

Uncut but drying and degraded raised bog

Most of the southern section of uncut **raised bog (PB1)** was similar. A southwestern lobe supported abundant white beak-sedge and was wetter underfoot, most likely because of water flow off the bog towards the cut face. The centre of the section was wetter and higher quality, however, and was borderline active raised bog. Cover of *Sphagnum* was approximately 50-60%. This mostly comprised *S. capillifolium* ssp. *rubellum*, but patches where *S. papillosum* was abundant were frequent. The latter, but not the former, is a good peat-forming species; neither indicate very high quality raised bog. Small (c. 50 cm diameter) pools with *S. cuspidatum* were scattered throughout the area. The most abundant vascular plant species were hare's-tail cottongrass, northern deergrass and ling heather. This section would be classed as high quality *sub-marginal* ecotope, as used in NPWS raised bog monitoring projects.

At least some of the uncut bog could be considered the Habitats Directive habitat type *'degraded raised bog (7120)'*. Explicit in the definition of this habitat type is the capability to be restored to active peat formation within 30 years, which can be difficult to assess. Due to the condition of the bog and the extent of turf-cutting banks and drains surrounding the high bog remnants, significant effort would be required to restore active raised bog at this site. A draft review of NHA and undesignated bog sites also found no *'active raised bog (7110)'* at Annaghmore Lough (Department of Arts, 2014). A hydrological assessment in the same review estimated that only 1.2 ha of the bog is capable of restoration.

2.5.2 Cutover Bog

Most of the remnant bog was surrounded by cutover bog of varying ages. The most recent and actively cutover areas were mapped simply as **cutover bog (PB4)** (Figures 3-4). There were also areas of old cutover bog that have probably been cut by hand in the past. These have regenerated vigorous stands of ling heather with some hare's-tail cottongrass, and so have been mapped as **dry heath (HH1)**, according to habitat mapping guidance (Fossitt, 2000, Smith *et al.*, 2011).

Dry heath vegetation on old cutover bog

Some cutover bog has developed into stands of birch-dominated **bog woodland (WN7)**. These were not surveyed in detail, but were probably similar to those described below. One mature stand of birch woodland was situated due south of the remnant bog, at the eastern end of the active turf-cutting zone. This stand was on thin peat with some bare rock exposed and so may not have originally been raised bog. Hawthorn and a little ash were also present. The stand was horse-grazed and so the field layer was not well developed. It appeared to be mainly bramble, creeping bent and Yorkshire fog.

2.6 Cutover Bog (NE)

To the northeast of the former lake basin was another extensive area of cutover bog with a few remnant islands of high bog. All of this area could not be surveyed in detail.

As above, recently cutover bog that had not yet developed well-established vegetation cover was mapped simply as **cutover bog (PB4)** (Figure 2). Older cutover, where open and dominated by ling heather, was mapped as **dry heath (HH1)**. A few remnant fragments of high bog remained and were mapped as **raised bog (PB1)**. These areas were quite dry, degraded and dominated by ling heather, northern deergrass, hare's-tail cottongrass and white beak-sedge with very little *Sphagnum* cover.

Bog woodland on cutover in north-east part of site

The majority of this part of the site was occupied by **bog woodland (WN7)** that has developed on the cutover. The woodland was a heterogeneous mixture of ages and species composition, depending on age and management. Birch was the main canopy species throughout, however, with bramble and bracken usually abundant in the field layer. Holly, rusty sally, ivy, broad buckler fern, *Kindbergia praelonga*, *Hypnum* species and *Polytrichastrum formosum* were also common. Different parts were surveyed on two occasions by the National Survey of Native Woodland (NSNW) in 2002 (eastern part in Offaly) and 2003 (western part in Laois). The western part was classified by the project as **BM6 birch-purple moorgrass woodland, purple moorgrass-tormentil subtype** (Perrin *et al.*, 2008, Cross *et al.*, 2010). The eastern part was grazed by cattle and

supported a grassy field layer. It was classified as **BM3 birch-purple moorgrass woodland, Yorkshire fog-bent grass subtype**. The full list of species recorded by the NSNW is provided in Table 4 in Appendix B.

The south-western corner of this woodland supports a more mature patch of woodland mapped as **mixed broadleaf / conifer woodland (WD2)**. Scots pine, birch and European larch comprised the mixed canopy over a dense understorey of holly, young Sitka spruce and occasional rusty sally. The field layer was dominated by bramble. Signs of badger foraging were noted here.

2.7 Esker Grassland

In the southwestern part of the site, there is an area of grassland occupying an esker. Due to time constraints and as the time of year was unsuitable for assessing grassland conservation status, it was not surveyed in the field. Habitats in Figure 4 were mapped after viewing them from the bog road and from aerial imagery. Apart from low-lying areas, most of the esker grassland was mapped as **dry calcareous and neutral grassland (GS1)**. NHA survey notes in NPWS files record this as "a large area of meadow, some of it improved but a lot of it natural and unfertilised." Unimproved calcareous grasslands on eskers typically correspond to the Habitats Directive Annex I priority habitat type *'orchid-rich calcareous grassland (6210)'*. This area should be surveyed in detail during the appropriate season (i.e. June-July).

2.8 Fauna

There are no comprehensive bird survey results from Annaghmore Lough Fen. Birds that have been recorded in the site by various surveyors from 1993 to the present survey are listed in Table 1 along with their conservation status according to the list of birds of conservation concern in Ireland (Lynas *et al.*, 2007) and the Birds Directive. Birds noted during the ASI surveys were not listed, as the site appears to have significantly changed since the early 1970s.

None of the birds listed in Table 1 has been confirmed as a breeding species in the site. The fen, however, may provide habitat for breeding waders, including species of conservation concern. According to local observations, a flock of approximately 60 Whooper Swans are known to regularly winter in the area and use Annaghmore Lough on a regular basis; these birds also commute regularly to Pallas Lough pNHA (site code 000916) approximately 4.5 km northwest of the site. A flock of 350 Golden Plover was recorded in early March 2014. Hen Harrier has been known to roost in and near the site in winter months.

The National Biodiversity Data Centre holds Dragonfly Ireland records of six dragonflies and damselflies from the site, recorded from 1983 to 2003. These are: common hawker, variable damselfly, common blue damselfly, blue-tailed damselfly, four-spotted chaser and common darter. The yellow shell moth has also been recorded from the site, as has been the Vulnerable (Byrne *et al.*, 2009) swan mussel.

As noted above, signs of badger foraging were noted on site, and an Irish hare was seen during the field survey.

Table 1. Bird species recorded at Annaghmore Lough Fen

Species	Conservation Status
Black-headed Gull	Red (breeding only)
Curlew	Red (breeding only)
Golden Plover	Red (breeding only)
Lapwing	Red (breeding only)
Redshank	Red (breeding only)
Grasshopper Warbler	Amber
Hen Harrier	Amber; Birds Directive
Kestrel	Amber
Kingfisher	Amber; Birds Directive
Linnet	Amber
Mute Swan	Amber
Sand Martin	Amber
Shelduck	Amber
Snipe	Amber
Starling	Amber
Swallow	Amber
Swift	Amber
Teal	Amber
Whinchat	Amber
Whooper Swan	Amber; Birds Directive
Blackbird	Green
Bullfinch	Green
Chiffchaff	Green
Fieldfare	Green
Goldfinch	Green
Greenfinch	Green
Grey Heron	Green
Mallard	Green
Meadow Pipit	Green
Mistle Thrush	Green
Raven	Green
Redpoll	Green
Redwing	Green
Reed Bunting	Green
Sedge Warbler	Green
Sparrowhawk	Green
Stonechat	Green
Whitethroat	Green
Willow Warbler	Green

peregrine falcon
gadwall
skylark
snipe
pied wagtail
moorhen
wood pigeon
tufted duck
buzzard
pheasant 49

3 CONSERVATION ASSESSMENT

3.1 Evaluation

The original ASI surveys (Farrell, 1972a, b) evaluate Annaghmore Lough Fen as being of Regional Importance for nature conservation due to its botanical, geological, ecological and ornithological interest. The surveys also highlight its archaeological interest due to the presence of a crannóg in the lake. Farrell (1972a, b) also notes that the site "would make an excellent education area.

Subsequent NHA assessment surveys evaluated the site as being of high conservation importance, according to the NPWS site file. As it is proposed for NHA status under the Wildlife Acts 1976-2010, it can be considered to be of National nature conservation value (c.f. the evaluation scheme by National Roads Authority, 2009).

The present survey has also found that Annaghmore Lough Fen is a site of high nature conservation value. The centrepiece of the site is the extensive fen that has developed on the former lake bed. This fen corresponds to a habitat type that is rare and declining in Ireland and in Europe, and corresponds with the Annex I habitat type *'alkaline fen (7230)'*. Other habitats of high conservation interest in the site include remnant raised bog, calcareous grassland and bog woodland[1], corresponding to the Annex I types *'degraded raised bog (7120)'*, *'orchid-rich calcareous grassland (6210)'* and *'bog woodland (91D0)'*. Also of interest is the poor fen, wet grasslands, habitats developing on long abandoned cutover bog, and the lake itself, which may be an example of the Annex I type *'hard water lakes (3140)'*. This combination of habitats results in a high biodiversity of plant species within the site.

Although small, the lake is of regional conservation importance, as lakes are quite rare in Offaly and Laois. This contributes to the bird diversity in the site, particularly the waterfowl and waders, many of which are of conservation concern and would not otherwise occur in the area. The fen may be a valuable habitat for breeding waders, however, additional surveys would be needed to confirm this.

The site can also be considered a 'stepping stone' (as per Article 10 of the Habitats Directive) for birds and other fauna in the wider landscape. As noted above, it is one of a cluster of designated bog and fen sites in the immediate area, including Clonaslee Eskers and Derry Bog SAC, Screggan Bog NHA, Hawkswood Bog NHA, Pallas Lough NHA, and the Slieve Bloom Mountains SPA/SAC (Figure 1). The site's functionality is shown by its use by the same Whooper Swan flock that also use Pallas Lough and as a winter roost by Hen Harriers breeding in the Slieve Blooms.

The most important feature of the site as a whole, however, are the ecological transitions it demonstrates over space and time. The unbroken sequence of habitats from raised bog through poor fen and woodland zones to alkaline fen and lake is extremely rare in Ireland. Intact raised bog-fen transitions are rare, but occur in other sites, such as at bogs within Lough Corrib SAC. The presence of a woodland zone transitional from acidic birch

[1] Most woodland classified as bog woodland (WN7) according to Fossitt (2000) does not correspond to the Annex I *'bog woodland (91D0)'* habitat type (European Commission, 2013). The exception is the woodland in the fen/bog transition zone.

woodland to base-rich willow and birch fen woodland within the raised bog-fen sequence, however, may be unique. Woodland expansion and development in or at the edge of the former lake also demonstrates ecological succession over time. Succession processes are also evident in the development of new habitats on cutover bog. These added features add ecological interest to the site and have significant educational potential.

In summary, this survey has found Annaghmore Lough Fen to be a site of national conservation importance and a significant potential resource for education and ecological research.

3.2 Conservation

The site synopsis (Appendix A) highlights a number of pressures that may negatively affect the conservation condition of Annaghmore Lough Fen. Drainage and reclamation for agriculture are highlighted as the most significant potential threats. The fen developed as a result of past drainage, which demonstrates how sensitive the site could be to future local or arterial drainage or other work that could impact on local hydrology. Fens are typically groundwater dependent habitats, and impacts on the regional water table could result in further drying of the wetlands and the possible loss of the lake. Local drainage and agricultural reclamation resulted in loss of some of the area of fen between the 1972 and 1993 surveys. The 2014 surveys suggested that some agricultural improvements may still be taking place.

Related to agricultural improvement is eutrophication. There are signs that nutrient enrichment is changing the fen vegetation near the lake. The sources of the eutrophication are not know, and more distant sources upstream may contribute. Although livestock grazing is usually beneficial for fens by reducing the abundance of the more competitive species, reducing access in winter and early spring may benefit fen biodiversity.

Turf cutting is highlighted in the site synopsis (Appendix A) as having an adverse effect on the raised bog on site. The raised bog was found during the 2014 surveys to be relatively dry and degraded as a result of turf cutting and associated drainage. Although the size and quality of raised bog remaining on site may not be worth attempting to conserve and restore for its own sake, conserving the site feature of greatest interest, the raised bog – alkaline fen transition, would require cessation of turf cutting in the future.

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APPENDIX A SITE SYNOPSIS

SITE SYNOPSIS

SITE NAME: ANNAGHMORE LOUGH FEN (OFFALY)

SITE CODE: 000413

Situated about 10km south of Tullamore, on the border of Laois and Offaly below the Slieve Blooms, Annaghmore Lough Fen is a Natural Heritage Area (NHA).

All that remains of Annaghmore Lough itself is a small remnant pool, barely 2ha and only a couple of centimetres deep. It is not clear whether the lake shrinkage has been purely the result of the natural process of sediment accumulation, or whether this has been accelerated by drainage. However, the area once occupied by the lake, is now a peat accumulating, calcareous fen. In general sedges (Carex spp.) dominate, although other species such as Common Cottongrass (Eriophorum angustifolium), Water Horsetail (Equisetum fluviatile) and Common Reed are locally prominent. The presence of sedges such as Carex flacca and C. lepidocarpa and other species such as Black bog-rush (Schoenus nigricans), Grass-of-parnassus (Parnassia palustris) and Marsh Helleborine (Epipactis palustris) one indicative of high levels of calcium in the soil.

To the south of the old lake site, Willows (Salix) and Downy Birch (Betula pubescens) are colonising the fen area which becomes increasingly acidic with species such as Purple Moor-grass (Molinia caerulea) and Bog Myrtle (Myrica gale), before rising into the dome of a small raised bog domoinated by Ling-heather (Calluna vulgaris) and Hare's-tail Cottongrass (Eriophorum vaginatum), with Bog mosses (Sphagnum spp.). To the west of the bog the NHA area continues, to include much of a belt of land reclaimed across the periphery of what was once a more extensive bog. Management of this area is important as it will affect the remaining bog itself. In addition, there are sections of pasture here that have not been heavily fertilised, but allowed to develop a more natural, and species-rich cover.

A scrub cover of Birch (Betula pubescens) has developed to the north of the old lake site.

The system is vulnerable to drainage and reclamation, and indeed in some areas this has already occurred causing sizeable intrusions into the site. Nutrient runoff from fertilisers applied to this area would damage the vegetation of the low-lying and wet fen areas through the process called eutrophication, which would allow plant species adapted to high nutrient conditions to outcompete the current fen species. Further reclamation or drainage work of any kind should not be undertaken.

Peat is being machine cut from the southwest of the bog area. Although this is a low volume operation, on such a small area of raised bog it has a very seriously adverse effect. The loss of Monettia Bog 3km to the east of this site underlines the vulnerability of peatlands in Ireland, and although the area of raised bog dome is small (about 35ha) the transition through to the fen area occupying the site of Annaghmore Lough is remarkable and may represent one of the only intact raised bog laggs in the country.

16 February, 1995

APPENDIX B SPECIES LISTS

The tables below summarise vascular plant, bryophyte and lichen species recorded at Annaghmore Lough Fen during various surveys from 1993-2014. Scientific names follow Stace (2010) for vascular plants, Hill *et al.* (2008) for bryophytes and Smith *et al.* (2009) for lichens.

Table 2 below lists species recorded during the January 2014 survey. This survey covered the majority of the site with the exception of the esker grassland. It should be noted that due to the time of year of survey, the vascular plant list cannot be considered comprehensive.

Table 2. Species recorded 21-22 January 2014 by G.F. Smith

Common Name	Scientific Name
Vascular Plants	
Creeping Bent	*Agrostis stolonifera*
Alder	*Alnus glutinosa*
Wild Angelica	*Angelica sylvestris*
Fool's-water-cress	*Apium nodiflorum*
Downy Birch	*Betula pubescens*
Water starwort	*Callitriche* sp.
Heather	*Calluna vulgaris*
Marsh-marigold	*Caltha palustris*
Glaucous Sedge	*Carex flacca*
Greater Tussock-sedge	*Carex paniculata*
Bottle Sedge	*Carex rostrata*
Yellow-sedge	*Carex viridula* s.l.
Marsh Thistle	*Cirsium palustre*
Great Fen-sedge	*Cladium mariscus*
Hawthorn	*Crataegus monogyna*
Hawthorn	*Crataegus monogyna*
Crested Dog's-tail	*Cynosurus cristatus*
Foxglove	*Digitalis purpurea*
Broad Buckler-fern	*Dryopteris dilatata*
Water Horsetail	*Equisetum fluviatile*
Cross-leaved Heath	*Erica tetralix*
Hare's-tail Cottongrass	*Eriophorum vaginatum*
Red Fescue	*Festuca rubra*
Meadowsweet	*Filipendula ulmaria*

Common Name	Scientific Name
Ash	*Fraxinus excelsior*
Marsh-bedstraw	*Galium palustre*
Herb-Robert	*Geranium robertianum*
Sweet-grass	*Glyceria* sp.
Ivy	*Hedera helix*
Hogweed	*Heracleum sphondylium*
Mare's-tail	*Hippuris vulgaris*
Yorkshire-fog	*Holcus lanatus*
Holly	*Ilex aquifolium*
Jointed Rush	*Juncus articulatus*
European Larch	*Larix decidua*
Crab Apple	*Malus sylvestris*
Water Mint	*Mentha aquatica*
Purple Moor-grass	*Molinia caerulea*
Bog-myrtle	*Myrica gale*
Bog Asphodel	*Narthecium ossifragum*
Common Reed	*Phragmites australis*
Sitka Spruce	*Picea sitchensis*
Scots Pine	*Pinus sylvestris*
Polypody	*Polypodium vulgare*
Bracken	*Pteridium aquilinum*
Sessile Oak	*Quercus petraea*
Bulbous Buttercup	*Ranunculus bulbosus*
Lesser Spearwort	*Ranunculus flammula*
White Beak-sedge	*Rhynchospora alba*
Bramble	*Rubus fruticosus* agg.

Common Name	Scientific Name
Rusty Sally	*Salix cinerea* subsp. *oleifolia*
Black Bog-rush	*Schoenus nigricans*
Marsh Ragwort	*Senecio aquaticus*
Rowan	*Sorbus aucuparia*
Irish Whitebeam	*Sorbus hibernica*
Devil's-bit Scabious	*Succisa pratensis*
Northern Deergrass	*Trichophorum germanicum*
Bulrush	*Typha latifolia*
Gorse	*Ulex europaeus*
Guelder-rose	*Viburnum opulus*
Bryophytes	
Bog Groove-moss	*Aulacomnium palustre*
Rough-stalked Feather-moss	*Brachythecium rutabulum*
Capillary Thread-moss	*Bryum capillare*
Marsh Bryum	*Bryum pseudotriquetrum* s.l.
Heart-leaved Spear-moss	*Calliergon cordifolium*
Pointed Spear-moss	*Calliergonella cuspidata*
Common Pouchwort	*Calypogeia fissa*
Yellow Starry Feather-moss	*Campylium stellatum*
Heath Star Moss	*Campylopus introflexus*
Tree-moss	*Climacium dendroides*
Fern-leaved Hook-moss	*Cratoneuron filicinum*
Chalk Comb-moss	*Ctenidium molluscum* var. *molluscum*
Broom Fork-moss	*Dicranum scoparium*
Fallacious Beard-moss	*Didymodon fallax*
Common Striated Feather-moss	*Eurhynchium striatum*
Dilated Scalewort	*Frullania dilatata*
Glittering Wood-moss	*Hylocomium splendens*
Mamillate Plait-moss	*Hypnum andoi*

Common Name	Scientific Name
Cypress-leaved Plait-moss	*Hypnum cupressiforme* var. *cupressiforme*
Heath Plait-moss	*Hypnum jutlandicum*
Slender Mouse-tail Moss	*Isothecium myosuroides* var. *myosuroides*
Common Feather-moss	*Kindbergia praelongum*
Large White-moss	*Leucobryum glaucum*
Short-beaked Wood-moss	*Loeskeobryum brevirostre*
Blueish Veilwort	*Metzgeria violacea*
Fairy Beads	*Microlejeunea ulicina*
Flat Neckera	*Neckera complanata*
Dwarf Neckera	*Neckera pumila*
Bog-moss Flapwort	*Odontoschisma sphagni*
Wood Bristle-moss	*Orthotrichum affine*
Red-stemmed Feather-moss	*Pleurozium schreberi*
Bank Haircap	*Polytrichastrum formosum*
Neat Feather-moss	*Pseudoscleropodium purum*
Even Scalewort	*Radula complanata*
Springy Turf-moss	*Rhytidiadelphus squarrosus*
Big Shaggy-moss	*Rhytidiadelphus triquetrus*
Intermediate Hook-moss	*Scorpidium cossonii*
Red Bog-moss	*Sphagnum capillifolium* subsp. *rubellum*
Feathery Bog-moss	*Sphagnum cuspidatum*
Cow-horn Bog-moss	*Sphagnum denticulatum*
Fringed Bog-moss	*Sphagnum fimbriatum*
Magellanic Bog-moss	*Sphagnum magellanicum*
Blunt-leaved Bog-moss	*Sphagnum palustre*
Papillose Bog-moss	*Sphagnum papillosum*
Spiky Bog-moss	*Sphagnum squarrosum*
Brownish Bog-moss	*Sphagnum subnitens*
Soft Bog-moss	*Sphagnum tenellum*

Common Name	Scientific Name
Common Tamarisk-moss	*Thuidium tamariscinum*
Bruch's Pincushion	*Ulota bruchii*
Frizzled Pincushion	*Ulota phyllantha*
Lichens	
Reindeer lichen	*Cladonia portentosa*

Common Name	Scientific Name
a foliose lichen	*Flavoparmelia caperata*
a foliose lichen	*Hypogymnia tubulosa*
a foliose lichen	*Nordmannia pulchella*

Table 3 lists species recorded in 1993 by Caitríona Douglas and Grace O'Donovan. This list was derived from a photocopy of their field notes held in the NPWS pNHA file. The survey was limited to the fen and lake areas and did not cover the woodlands, cutover bog, remnant raised bog or esker grassland.

Table 3. Species recorded 03-09-93 by C. Douglas and G. O'Donovan

Common Name	Scientific Name
Vascular Plants	
Creeping Bent	*Agrostis stolonifera*
Alder	*Alnus glutinosa*
Bog Pimpernel	*Anagallis tenella*
Wild Angelica	*Angelica sylvestris*
Downy Birch	*Betula pubescens*
Yellow-wort	*Blackstonia perfoliata*
Quaking-grass	*Briza media*
Marsh-marigold	*Caltha palustris*
Cuckooflower	*Cardamine pratensis*
Tawny Sedge	*Carex* cf. *hostiana*[2]
Glaucous Sedge	*Carex flacca*
Long-stalked Yellow-sedge	*Carex lepidocarpa*
Common Sedge	*Carex nigra*
Carnation Sedge	*Carex panicea*
Bottle Sedge	*Carex rostrata*
Marsh Thistle	*Cirsium palustre*
Marsh Cinquefoil	*Comarum palustre*
Crested Dog's-tail	*Cynosurus cristatus*
Marsh Willowherb	*Epilobium palustre*
Marsh Helleborine	*Epipactis palustris*
Water Horsetail	*Equisetum fluviatile*
Marsh Horsetail	*Equisetum palustre*
Common Cottongrass	*Eriophorum angustifolium*
Hemp-agrimony	*Eupatorium cannabinum*

Common Name	Scientific Name
Marsh-bedstraw	*Galium palustre*
Yorkshire-fog	*Holcus lanatus*
Marsh Pennywort	*Hydrocotyle vulgaris*
Perforate St John's-wort	*Hypericum perforatum*
Cat's-ear	*Hypochaeris radicata*
Jointed Rush	*Juncus articulatus*
Fairy Flax	*Linum catharticum*
Ragged Robin	*Lychnis flos-cuculi*
Purple-loosestrife	*Lythrum salicaria*
Water Mint	*Mentha aquatica*
Bogbean	*Menyanthes trifoliata*
Grass-of-Parnassus	*Parnassia palustris*
Marsh Lousewort	*Pedicularis palustris*
Common Reed	*Phragmites australis*
Selfheal	*Prunella vulgaris*
Lesser Spearwort	*Ranunculus flammula*
Yellow-rattle	*Rhinanthus minor*
Common Sorrel	*Rumex acetosa*
Knotted Pearlwort	*Sagina nodosa*
Rusty Sally	*Salix cinerea* subsp. *oleifolia*
Black Bog-rush	*Schoenus nigricans*
Autumn Hawkbit	*Scorzoneroides autumnalis*
Common Ragwort	*Senecio jacobaea*
Devil's-bit Scabious	*Succisa pratensis*
Red Clover	*Trifolium pratense*
Marsh Arrowgrass	*Triglochin palustris*
Bulrush	*Typha latifolia*
Common Valerian	*Valeriana officinalis*

[2] "c.f. indicates uncertain but probable species identification.

Common Name	Scientific Name
Stoneworts	
a stonewort	*Chara* sp.
Bryophytes	
Great Scented Liverwort	*Conocephalum conicum* s.l.
Bog Groove-moss	*Aulacomnium palustre*
Pointed Spear-moss	*Calliergonella cuspidata*
Yellow Starry Feather-moss	*Campylium stellatum*
Maidenhair Pocket-moss	*Fissidens adianthoides*
Fountain Apple-moss	*Philonotis* cf. *fontana*
Hooked Scorpion-moss	*Scorpidium scorpioides*
Lichens	
a foliose lichen	*Lecanora chlarotera*
a foliose lichen	*Parmotrema perlatum*
a foliose lichen	*Physcia aipolia*
a fruticose lichen	*Ramalina fastigiata*
a fruticose lichen	*Ramalina fraxinea*
a foliose lichen	*Xanthoria parietina*

Table 4 lists species recorded in two surveys by the National Survey of Native Woodlands in 2002 (no date specified) and August 2003. These surveys covered two blocks of bog woodland in the north-eastern part of the site.

Table 4. Species recorded in 2002 and on 14-08-2003 by the National Survey of Native Woodlands

Common Name	Scientific Name
Vascular Plants	
Common Bent	*Agrostis capillaris*
Creeping Bent	*Agrostis stolonifera*
Wild Angelica	*Angelica sylvestris*
Sweet Vernal-grass	*Anthoxanthum odoratum*
False Oat-grass	*Arrhenatherum elatius*
Lady-fern	*Athyrium filix-femina*
Daisy	*Bellis perennis*
Downy Birch	*Betula pubescens*
Hard-fern	*Blechnum spicant*
Heather	*Calluna vulgaris*
Hedge Bindweed	*Calystegia sepium*
Star Sedge	*Carex echinata*
Glaucous Sedge	*Carex flacca*
Remote Sedge	*Carex remota*
Carnation Sedge	*Carex panicea*
Common Knapweed	*Centaurea nigra*
Common Mouse-ear	*Cerastium fontanum*
Rosebay Willowherb	*Chamerion angustifolium*
Hawthorn	*Crataegus monogyna*
Montbretia	*Crocosmia x crocosmiiflora*
Cock's-foot	*Dactylis glomerata*
Foxglove	*Digitalis purpurea*
Narrow Buckler-fern	*Dryopteris carthusiana*
Broad Buckler-fern	*Dryopteris dilatata*
Male-fern	*Dryopteris filix-mas*
Common Couch	*Elytrigia repens*
Hoary Willowherb	*Epilobium parviflorum*
Hemp-agrimony	*Eupatorium cannabinum*
Red Fescue	*Festuca rubra*
Meadowsweet	*Filipendula ulmaria*
Ash	*Fraxinus excelsior*
Cleavers	*Galium aparine*
Fen Bedstraw	*Galium uliginosum*
Herb-Robert	*Geranium robertianum*
Floating Sweet-grass	*Glyceria fluitans*
Ivy	*Hedera helix*
Hogweed	*Heracleum sphondylium*
Yorkshire-fog	*Holcus lanatus*
Imperforate St John's-wort	*Hypericum maculatum*
Slender St John's-wort	*Hypericum pulchrum*
Cat's-ear	*Hypochaeris radicata*
Holly	*Ilex aquifolium*
Soft-rush	*Juncus effusus*
Nipplewort	*Lapsana communis*

Common Name	Scientific Name
European Larch	*Larix decidua*
Wild Privet	*Ligustrum vulgare*
Fairy Flax	*Linum catharticum*
Honeysuckle	*Lonicera periclymenum*
Heath Wood-rush	*Luzula multiflora*
Purple-loosestrife	*Lythrum salicaria*
Purple Moor-grass	*Molinia caerulea*
Royal Fern	*Osmunda regalis*
Sitka Spruce	*Picea sitchensis*
Scots Pine	*Pinus sylvestris*
Ribwort Plantain	*Plantago lanceolata*
Greater Plantain	*Plantago major*
Silverweed	*Potentilla anserina*
Tormentil	*Potentilla erecta*
Marsh Cinquefoil	*Comarum palustre*
Creeping Cinquefoil	*Potentilla reptans*
Selfheal	*Prunella vulgaris*
Bracken	*Pteridium aquilinum*
Pedunculate Oak	*Quercus robur*
Creeping Buttercup	*Ranunculus repens*
Field-rose	*Rosa arvensis*
Dog-rose	*Rosa canina*
Bramble	*Rubus fruticosus agg.*
Raspberry	*Rubus idaeus*
Common Sorrel	*Rumex acetosa*
Sheep's Sorrel	*Rumex acetosella*
Eared Willow	*Salix aurita*
Rusty Sally	*Salix cinerea subsp. oleifolia*
Elder	*Sambucus nigra*
Common Ragwort	*Senecio jacobaea*
Rowan	*Sorbus aucuparia*
Hedge Woundwort	*Stachys sylvatica*
Common Chickweed	*Stellaria media*
Dandelion	*Taraxacum officinale agg.*
White Clover	*Trifolium repens*
Gorse	*Ulex europaeus*
Wych Elm	*Ulmus glabra*
Common Nettle	*Urtica dioica*
Bilberry	*Vaccinium myrtillus*
Common Valerian	*Valeriana officinalis*
Tufted Vetch	*Vicia cracca*
Bush Vetch	*Vicia sepium*
Bryophytes	
Rough-stalked Feather-moss	*Brachythecium rutabulum*
Pointed Spear-moss	*Calliergonella cuspidata*
Common Pouchwort	*Calypogeia fissa*
Tree-moss	*Climacium dendroides*
Common Striated Feather-moss	*Eurhynchium striatum*
Cypress-leaved Plait-moss	*Hypnum cupressiforme*
Heath Plait-moss	*Hypnum jutlandicum*
Larger Mouse-tail Moss	*Isothecium alopecuroides*
Common Feather-moss	*Kindbergia praelonga*
Swan's-neck Thyme-moss	*Mnium hornum*
Waved Silk-moss	*Plagiothecium undulatum*
Bank Haircap	*Polytrichastrum formosum*
Neat Feather-moss	*Pseudoscleropodium purum*

Table 5 lists species recorded in 2005 by D. Holyoak. These records were extracted from the National Biodiversity Data Centre database. The extent of the survey is not known, but it is likely only the fen was covered.

Table 5. Species recorded on 23-08-2005 by D. Holyoak

Common Name	Scientific Name
Lesser Water-plantain	*Baldellia ranunculoides*
Marsh-marigold	*Caltha palustris*
Common Knapweed	*Centaurea nigra*
Marsh Willowherb	*Epilobium palustre*
Marsh Helleborine	*Epipactis palustris*
Common Cottongrass	*Eriophorum angustifolium*
Tall Fescue	*Festuca arundinacea*
Marsh-bedstraw	*Galium palustre*

Common Name	Scientific Name
Mare's-tail	*Hippuris vulgaris*
Square-stalked St John's-wort	*Hypericum tetrapterum*
Cat's-ear	*Hypochaeris radicata*
Bristle Club-rush	*Isolepis setacea*
Hard Rush	*Juncus inflexus*
Lesser Hawkbit	*Leontodon saxatilis*
Purple moor-grass	*Molinia caerulea*
Tufted Forget-me-not	*Myosotis laxa*

Common Name	Scientific Name
Common Fleabane	*Pulicaria dysenterica*
Knotted Pearlwort	*Sagina nodosa*
Creeping Willow	*Salix repens*
Lesser Clubmoss	*Selaginella selaginoides*
Lesser Trefoil	*Trifolium dubium*
Blue Water-speedwell	*Veronica anagallis-aquatica*
Giant Spear-moss	*Calliergon giganteum*

Annaghmore Lough Fen 16 July 2023.

Picture 1
The drain through the lagg facing north with fen to the right and raised bog to the left. Other drains that run west to east across the peat harvesting area feed into this north flowing drain.

Picture 2
Facing south to the Laois Offaly border from roughly the same place the fen is now on left with the raised bog to the right. The Slieve Blooms are in the background.

Picture 3
Looking north along the newly dug drain through the lagg with the fen on the right and the raised bog on the left. This area was totally undisturbed prior to recent drainage work. The drain turns left (west) when it meets the boundary with the field.

Picture 4
One of the new trenches that connects with the outer head drain and flows north through the lagg. Peat from this drain has been spread across the bog surface.

Picture 5
This trench from which peat blocks have been extracted connects with the drain through the lagg which is not visible here. The fen is in the background. At top left is woodland in the fen.

Picture 6
One of the trenches with stacked peat blocks. The view is to the west towards the quarry area.