MSc. Ecological Assessment Dissertation

Ecological Assessment of Glenbower Wood

Submitted in part fulfilment of the requirements for the Masters Degree in Ecological Assessment to University College Cork.

By

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1. SUMMARY

This baseline ecological report forms part of the requirements for an MSc. Course in Ecological Assessment at University Cork. The site assessed was part of Glenbower Wood, situated adjacent to Killeagh Village in County Cork. The desktop review and survey work revealed a number of notable species and habitats present within the site. The primary aim of the assessment was to identify and evaluate habitats of conservation value, however species of note as well as certain aspects of the historical value of the site are included in the evaluation.

2. SITE LOCATION AND GENERAL DESCRIPTION

The site is a woodland site composed predominantly of conifer with some broadleaved dominated sub-sites. The site is located on the main road between Cork and Waterford adjacent to the village of Killeagh, in Co. Cork. c.33kms east of Cork city and 9.5kms west of Youghal. The southern extent of the site is located at 51^0 56' 37.3"N, 7^0 59' 37.3"W, +/- 10m. This is the main entrance by foot to the site. The northern extent is at the northernmost of three bridges in the site that cross the Dissour river, which runs through the site. This bridge is known locally as the Black Bridge, located at 51^0 57' 24.2" N, 008^0 00' 57.7" w+/- 23ms. The site is aligned, mainly, in a south east to north west direction.

The southern third of the site is low lying but rising steeply to east and west for the northern two thirds. A valley lies in the centre, formed by the river Dissour which flows, mainly, from north west to south east through the site. The site is wooded throughout, apart from recently felled areas, paths, a large area of scrub on the site of a drained artificial lake, and some smaller areas of scrub.

The length of the site is c. 2.6kms but the sinuous nature of the site means that on the ground this is closer to 3kms. The width of the site at its narrowest is c. .03kms, and at its widest almost .7kms. For the majority of the site however the width is closer to .25kms in width. These measurements are derived from aerial photography measured

online at the Geological Survey of Ireland (GSI) Public Data Viewer (see bibliography / sources of information for URL). As a considerable portion of the site is on steep

valley sides, on the ground the widths are greater. The approximate overall area of the site, derived from the same website, is c. 53 hectares.

3. SITE BACKGROUND

The majority of the site is owned by Coillte with a part owned by Glenbower Wood and Lake Ltd., a voluntary community organisation. While all of the Glenbower Wood and Lake owned section of the site was included in this assessment, the most easterly parts of the Coillte owned portion of the woodland were not included as this is comprised solely of conifer plantation. A section of Coillte owned property to the west of the site was not included for the same reason. A map of ownership is included in Fig. 1

3.1 HISTORY

The site at Glenbower is located in lands granted to Philip De Capell in the early 12th century. The lands remained in the family for nearly 800 years. There is evidence of modification to the woods in the 18th century. In Lewis's Topographical Dictionary of Ireland (Lewis, 1837) he refers to Glenbower as being 'one of the few remnants of the ancient forests'. However he further refers to the presence of an 'ancient sycamore of very great size' and the presence of a bladdernut tree (*Staphylea* spp.), neither a native Irish species. If in 1837 the sycamore (*Acer pseudoplatanus*) referred to was 'of very great size' it must certainly have been in the woods in the 18th century. The woods were planted with specimen trees and commercial planting around the time of Lewis's dictionary, in the 19th century, and development in the woods continued during the following 90 years (Supple, 2008). The symbology on Ordnance Survey maps from c.1843 to a Records of Monuments and Places (RMP) map of c.1930 show a mixture of broadleaf and conifer throughout the wood, and the progression of the laying out of paths through the wood can be seen by comparing the maps.

A lake was constructed, damming the river Dissour, in the mid- to late 19th century to supply power to corn mills built downstream in Killeagh village during the same time

period. The dam was breached in the 1980s due to safety concerns (Supple, 2008). In 1933 Glenbower Wood became the property of the Forestry as was, now Coillte (Cronin, 2001). The greater part of the wood is devoted to the production of timber for commercial use. The name Glenbower is used throughout the report, although the wood also incorporates Glenane Wood at its north west. Glenane Wood belongs to the parish of Mogeely, Glenbower to that of Killeagh, with the parish boundary between them formed partly by the river Dissour in the northern third of the wood. The Dissour also forms the boundary line between a number of townlands in Killeagh parish on its route through Glenbower. The role of woods as markers of parish boundary's has been cited as an indicator of 'ancientness' (Rackham, 1980) which will be referred to in more depth in the assessment section of this report.

3.2 GEOLOGY

Glenbower is situated on Old Devonian Sandstone bedrock of three formations, Ballytrasna (purple mudstone with some sandstone), Gyleen (sandstone with mudstone and siltstone), and Cuskinny member (Flaser-bedded sandstone & mudstone). The Ballytrasna formation underlies the vast majority of the site, the Gyleen a small portion in the southern end and the Cuskinny member formation underlies the very far south western corner. This information was sourced from the GSI website.

3.3 SOIL AND SUB-SOIL

From the Enivronmental Protection Agency's (EPA) ENvision online map viewer (URL available in bibliography / sources of information section) soil in the site is classified as shallow well drained mineral lithosol / regosol with the subsoil classified as 'bedrock lying close to the surface'. Regosols and lithosols are 'skeletal soils' i.e., poorly developed often associated with eroding environments.

A management plan, (http://www.esatclear.ie/~exfish/glenbower_frameset.htm), for the Glenbower Wood and Lake Ltd. owned section of the site was developed in 2005 by Dr. Tom Gittings. This management plan, which will be referred to hereafter as the

2005 management plan, had soil classified as brown earth, with some alluvial soils along the river in the northern section of the wood, based on information from the Coillte forest inventory database.

The land surrounding the site is classified in the EPA ENvision map viewer as deep, well drained mineral Acid Brown Earth, with Devonian Till as the subsoil.

The lithosols / regosols are classified on the EPA site as derived from non-calcareous parent material, i.e. likely to be neutral to acid.

In visiting the wood it would be noticeable that on some of the higher portions of the site, the bedrock was visible. On the valley floor in some areas immediately adjacent to the river the, soil would be seen to have a silty, alluvial texture. To some degree a synthesis of the information from the sources quoted above would then accurately reflect the soil types in the site.

3.4 HYDROLOGY

The river Dissour flows through the centre of the site from northwest to southeast. Within the site four small streams, from springs located in the surrounding agricultural land, feed into the river-two from the west and two from the east. Apart from these streams, which are identifiable on Ordnance survey maps, a number of smaller seasonal rivulets flow from the surrounding high ground, as many as 6 from the east and 6 from west were observed, half of these with water running or dripping even in August. The river and springs are within the South Western Region River Basin District.

3.5 TOPOGRAPHY

The southern end of the site lies on the 20m. contour line on Ordnance Survey maps with the surrounding agricultural land rising gently to the east and west. Further north the rising ground to the east and west becomes steeper rising to between the 115m and 120m contour line on the west and just over the 80m contour line on the east. At its steepest the slope can rise by 30ms over 70ms. The valley floor at the north end of the site lies on or about the 50m contour line. The valley floor is widest in the southern

half of the site, with the northern half taking on an almost ravine like character. Lewis in his Topgraphical Dictionary of 1837 referred to the 'richly wooded, precipitous sides' of the woods.

The topography is the result of the interaction of the geology and hydrology outlined above, with the Dissour wearing a gorge through the relatively easily erodible sandstone. The Glen in the name of Glenbower, Gleann in Irish, forms part of a concentration of this usage in place names around the Cork-Waterford border associated with a number of similar river eroded sandstone valleys in this area (O'Connor, 2001).

3.6 SURROUNDING LAND USE

The majority of the surrounding land is a mixture of arable and pasture land. The village of Killeagh lies immediately to the south of the woods, with a recently built housing estate adjacent to its south western extremity. The Dissour flows mainly through arable / pasture land on its journey south to Glenbower, although some of its tributary streams abut forestry plantations composed mainly of conifer. This information was again obtained from the EPA's online map viewer.

3.7 DESIGNATIONS

3.7.1 HABITATS

The site at Glenbower has no statutory designations, such as SAC, SPA or NHA. It had been listed in a report on sites of scientific interest in 1986 by Roger Goodwillie for Cork County Council. It was evaluated as of Local Interest, from possible evaluations of International, National, Regional or Local Interest. There is no statutory protection arising from the evaluation of Glenbower in the Goodwillie report.

c. 2.5 kms south east of where it leaves Glenbower Wood, the Dissour river flows into the Womanagh river c. 3 kilometres north west of where the Womanagh enters the Ballymacoda SPA / Ballymacoda (Clonpriest and Pilmore) SAC. Clasharinka Pond NHA is located c. 4kms to the south west of Glenbower Wood as sourced from the National

Biodiversity Data Centre on line map viewer (see bibliography/other sources of information for URL).

3.7.2 SPECIES

From previous sources a variety of mammal, fish, birds, amphibians and reptiles have been identified as residents of, or visitors to, Glenbower wood. A Coillte booklet (Anon. 1992), and the 2005 management plan listed a large number for each taxon. Lists of species recorded are included in Tables 1-4 below. Those species listed in the European Union Habitats Directive Annexes, as well of those listed as of conservation concern elsewhere, are indicated. No plant species recently recorded at Glenbower Wood are listed as designated species or recorded as being of conservation concern. Some species of note have been listed in previous reports on Glenbower. One moss species listed on Annex V of the European Habitats Directive was recorded during this assessment. These plant species are listed in Table 5 below.

MAMMALS

Common name	Scientific name
American mink	*Mustela vison*
Badger	*Meles meles*
Bank vole	*Clethrionomys glareolus*
Hedgehog	*Erinaceus europaeus*
Fox	*Vulpes vulpes*
Otter***	*Lutra lutra*
Pine marten*	*Martes martes*
Pygmy shrew	*Sorex minutus*
Red squirrel **	*Sciurus vulgaris*
Stoat	*Mustela erminea*
Woodmouse	*Apodemus sylvaticus*
Rabbit	*Oryctolagus cunniculus*

* Listed on Annex V of the EU Habitats Directive

** Listed as near threatened on the Irish Red List of Terrestrial mammals

*** Listed on Annexes II & V of the EU Habitats Directive and as near threatened on the Irish Red List of Terrestrial mammals

Table 1. Mammal species previously recorded at Glenbower . Adapted from the 2005 Management Plan for Glenbower Wood and Lake Ltd.

FISH

Common name	Scientific name
Atlantic salmon**	*Salmo salar*
Brown trout	*Salmo trutta*
Eel***	*Anguilla anguilla*
Lamprey species*	*Lampetra spp*

* 3 species listed on Annex II, 1 of which is also listed on Annex V, of the EU Habitats Directive

** Listed on Annexes II and V of the EU Habitats Directive

***Listed on IUCN red list, subject to EC Regulation 1100/2007

Table 2. Fish species previously recorded at Glenbower . Adapted from the 2005 Management Plan for Glenbower Wood and Lake Ltd.

AMPHIBIANS AND REPTILES

Common name	Scientific name
Common frog*	*Rana temporania*
Common lizard	*Lacerta vivparia*

*Listed on Annex V of the EU Habitats Directive

Table 3. Mammal species previously recorded at Glenbower. Adapted from the 2005 Management Plan for Glenbower Wood and Lake Ltd.

BIRDS

Common name	Scientific name	Common name	Scientific name
Resident species			
Barn owl**	*Tyto alba*	Linnet*	*Carduelis cannabina*
Blackbird	*Turdus merula*	Long eared owl	*Asio otus*
Blue tit	*Parus caeruleus*	Long tailed tit	*Aegithalus caudatus*
Bullfinch	*Pyrrhula pyrrhula*	Magpie	*Pica pica*
Chaffinch	*Fringilla coelebs*	Mistle thrush	*Turdus viscivorous*
Coal tit	*Parus ater*	Pheasant	*Phasianus colchicus*
Dipper	*Cinclus cinclus*	Pied wagtail	*Motacilla alba ssp yarrelli*
Dunnock	*Prunella modularis*	Robin	*Erithacus rubecula*
Goldcrest	*Regulus regulus*	Siskin	*Carduelis spinus*
Goldfinch	*Carduelis carduelis*	Song thrush	*Turdus philomelos*
Great tit	*Parus major*	Sparrowhawk	*Accipiter nisus*
Greenfinch	*Carduelis chloris*	Stock dove*	*Columba oenas*
Grey wagtail	*Motacilla cinerea*	Treecreeper	*Certhia familiaris*
House sparrow*	*Passer domesticus*	Woodpigeon	*Columba palumbus*
Hooded crow	*Corvus corone ssp. cornix*	Wren	*Troglodytes troglodytes*
Jay	*Garrulus glandarius*	Yellow hammer**	*Emberiza citrinella*
Kestrel*	*Falco tinnunculus*		
Visiting species			
House martin*	*Delichon urbica*	Cuckoo*	*Cuculus canorus*
Redpoll*	*Carduelis cabaret*	Woodcock*	*Scolopax rusticola*
Sand martin*	*Riparia riparia*	Kingfisher*	*Alcedo atthis*
Spotted flycatcher*	*Muscicapa striata*	Swallow*	*Hirundo rustica*

* Listed on BoCCI Irish Amber List

** Listed on BoCCI Irish Red List

Table 4. A selection of Bird species previously recorded at Glenbower. Adapted from the 2005 Management Plan for Glenbower Wood and Lake Ltd.

PLANTS

Common name	Scientific name	Conservation Status
Bird's nest orchid*	*Neottia nidus-avis*	Nationally scarce
Sweet violet	*Viola odorata*	Introduced
Tunbridge filmy fern*	*Hymenophyllum tunbrigense*	Nationally scarce
Killarney fern	*Trichomanes speciosum*	Flora Protection Order and Annex II & V
Great horsetail*	*Equisetum telmateia*	Scarce in Cork
Slender rush*	*Juncus tenuis*	Introduced
Largewhite moss*	*Leucobryum glaucum*	Listed on Annex V

*Recorded during this assessment

Table 5. A selection of notable Plant species recorded at Glenbower . Adapted from the 2005 Management Plan for Glenbower Wood and Lake Ltd.

4. MAPPING

The minimum size for mapping individual habitats was 20msx20ms in accordance with the suggested minimum size for habitat mapping for a site of this size in the Heritage Council's 'Best Practice Guidance for Habitat Survey and Mapping' (Smith G.F., O'Donoghue P., O'Hora K, Delaney E., 2010). The minimum size for most linear features was 20ms as recommended in the same guidance document. However the three bridges in the Glenbower site are under 20ms in length but have been classified and mapped as they were felt to be important for orientation in the habitat maps included, and are referred to at various points in this assessment report. The base map for production of habitat maps was the 1930 RMP map. This map had sufficient detail to enable mapping of habitats, however some of the paths on the map do not match with the current layout of these features, and these were corrected where necessary.

Due to the size and shape of the site it was necessary, for clarity, to do produce 4 habitat maps. A key to these maps, which includes an outline of the boundary of the site and the areas of ownership within it, is available in Fig. 1. Figs. 2-5 contain the habitat maps. Maps of the site are referred to by map number in the text. Particular

mapped habitats or features discussed in the report are referred to by their location on the maps. For ease of reference these locations are identified by number in the text, with the numbers printed on the maps. The maps are included after the main text of this report.

5. METHODS

5.1 SURVEY

The survey of the site took place during the academic year of the MSc. course for which this project was undertaken. A consequence of this is that, due to study, assignments, and exam requirements of the course, individual elements of the overall survey took place at various times through the year from March to August often with large gaps in the timing. Such gaps in timing would be unusual for a survey of this kind for a site of this size and type.

The site was initially walked in mid-March. Notes on observations of flora, fauna and habitat types observed were made. A preliminary habitat map was devised based on the canopy and under-storey observed from the various paths through the site. The mapping was made on a 1930s RMP map (see also section on mapping above). This was then correlated with aerial photography from 2005 and 2010 obtained via the Ordnance Survey online map viewer (http://www.osi.ie/), to verify the location of stands predominantly composed of conifer. Combining the information from these stages, locations for sub-sites approaching the description of semi-natural were identified. Habitats were assigned preliminary classifications according to the habitat classes contained in The Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2007). This classification will be referred to as the Fossit classification, or simply Fossitt in this report.

A second walk through of the site was carried out in mid-April, to record species composition for the ground flora in areas identified as approaching semi-natural status, based on the DAFOR scale, and to identify any sub-sites that may have been overlooked on previous walk-throughs.

A preliminary assessment based on the findings from these surveys was used to choose sub-sites in which to carry out more intensive vegetation analysis. Sites composed exclusively of conifer were summarily ruled out for further vegetation analysis due to time and personnel constraints as they are not defined as semi-natural in Fossitt. One sub-site which was a mixture of conifer and broadleaf, and would have been classified as highly modified (i.e. not semi-natural) in the Fossitt classification, was investigated based on the native status of elements of the canopy and understory components and the nature of the ground flora. This sub-site was classified and mapped under the dominant 'highly modified classification', with the semi-natural habitat as a sub-classification in accordance with 'Best Practice Guidance for Habitat Survey and Mapping' (Smith et al, 2010) previously mentioned. This approach was adopted for two other sub-sites / habitats.

5.2 VEGETATION SAMPLING

Where possible, (see also 'Constraints' below), at least one nested quadrat of 16msx16ms was sampled within a sub-site. The nested quadrats within these were at .25ms x.25ms, .5msx.5ms, 1msx1ms, 2msx2ms, 4msx4ms, 8msx8ms and 16msx16ms from the origin. The percentage cover of the ground flora was estimated and converted to the Domin Scale. Domin scale figures appear in tables as 'Cover', with results from nested quadrats averaged. Within the quadrats tree species were identified in the canopy and under-storey. Circumference at breast height (CBH) was recorded for trees species, and later converted to Diameter at breast height (DBH). Height was estimated visually. Observations on dead wood within quadrats were also made. An estimation of bryophyte cover on tree trunks was also made. Observations of slope and soil moisture were made. Two sub-sites were sampled using quadrats in July 2010, one in August 2010. The weather was mild, dry and calm when all quadrats were sampled.

5.3 BRYOPHYTE SAMPLING

As bryophytes are abundant in the site, bryophytes were included in the vegetation surveys. However particular areas, some connected with sub-sites selected for in

depth vegetation analysis, some not, were also identified as of sufficient interest to sample for bryophytes. Bryophytes were identified on-site where possible, but appropriately sized samples of some species were collected for later identification in the laboratory.

Apart from species identified in vegetation sampling, bryophyte cover was felt to be more diverse at certain locations through the wood. It was felt that, due to the moist, ravine like location, notable bryophtyes might be located. For bryophytes, sampling depended on the sub-sites sampled. For two sub-sites transects were walked, at a third stratified / random samples were taken as it was a discrete site in a small (c.5ms width) seepage zone.

5.4 CONSTRAINTS

One of the sub-sites sampled was a narrow sub-site, on a steep slope with bryophytes abundant in the ground flora. It was decided that nested quadrats, as they require a degree of constant traversing of the sub-quadrats over the 1m x 1m size, would prove dangerous to use, as slipping on such a steep slope may have resulted in injury. The tree species within a 10msx10ms quadrat were surveyed as described under Vegetation Sampling above. The ground flora was surveyed in .5m x .5m quadrats on a stratified random basis along lines formed at 1m intervals, from 1m to 10ms, perpendicular to the x and y axes of the 10ms x 10ms quadrat.

As the purpose of the survey was for assessment rather than comparison, this was not felt to be inappropriate.

For two of the sub-sites which, based on the tree species composition of the canopy, suggested that an in depth analysis of the ground vegetation would be appropriate, this proved not possible for the survey. This was due to the dominance of brambles in the shrub layer. For one of these two sub-sites it was possible to partially trample the brambles and carry out a DAFOR analysis of the ground layer vegetation. For the other sub-site this proved possible for a small area but the brambles were of such an impenetrable nature even the DAFOR analysis was compromised.

Three more sub-sites of interest were assessed on a purely DAFOR basis due to a) the percentage of bare ground and / or b) the degree of heterogeneity in the internal topography of those sub-sites or c) their situation in areas of high visitor traffic. Other areas, which were classified as transitional, were not possible to assess apart from visually due to slope and impenetrability of the shrub layer. This was done using binoculars from the most opportune vantage point. Where only visual assessment was possible, this is indicated in the appropriate section of the results section. No vegetation sampling was carried out in the river Dissour for Helath and Saferty reasons but notes on vegetation observed were made.

5.5 NOMENCLATURE

Nomenclature for forbs and trees follows Stace (1991) and Kent (1992) in Rose (2006). Nomenclature for grasses, sedges, rushes, ferns and horsetails follows Clapham, Tutin and Warburg in Rose (1989). Nomenclature for mosses and liverworts was that used in the Bryological Society's Field Guide, Atherton I. Bosanquet S.,and Lawley M. (2010)

6. RESULTS

The findings from the initial surveys and the vegetation surveys were used to assess the sub-sites and assign them a final Fossitt classification. The findings from the vegetation surveys were compared to those from the classification section of the National Survey of Native Woodlands – (NSNW)-(Perrin P, Martin J., Barron S.,

O'Neill F., McNutt K.& Delaney, A., 2008). Reference was also made to the classification section of the Forest Service's 'Native Woodland Scheme Manual' (Cross, 2008), British Plant Communities Vol. I, (Rodwell 1991), and the Interpretation Manual of European Union Habitats (Anon. 2007).

6.1 PRESENTATION OF RESULTS

Due to the history of the site to date, there has been modification to all of the previously existing semi-natural habitats in Glenbower Wood including, as discussed in the site history section, the river Dissour itself. There follows below a list (Tables 6-9 below) of the habitats identified as defined in the Fossitt classification, which in turn is followed by a description of the habitats. Tables produced from the results of Vegetation Sampling are included for habitats for which they were conducted. Tables produced from DAFOR analysis are included for some habitats where appropriate. The findings from Bryophyte Sampling are discussed in the Evaluation section, which follows the results section.

6.2 HABITAT LISTS

2nd Level Fossitt Classification	3rd Level Fossitt Classification	Fossitt Code
Semi-natural woodland	Oak-birch-holly woodland*	WN1
Semi-natural woodland	Oak-ash-hazel woodland	WN2
Semi-natural woodland	Wet pedunculate oak-ash woodland	WN4
Highly modified woodland	Broadleaved woodland	WD1
Highly modified woodland	Mixed broadleaved /conifer woodland	WD2
Highly modified woodland	Conifer plantation	WD4
Scrub / Transitional woodland	Scrub	WS1
Scrub / Transitional woodland	Immature woodland	WS2
Scrub / Transitional woodland	Ornamental / non-native shrub**	WS3
Scrub / Transitional woodland	Recently-felled woodland	WS5
Linear woodland / scrub	Hedgerows	WL1
Linear woodland / scrub	Treelines	WL2

*Identified only as a component of a 'highly modified' habitat.

** Mapped as point features.

Table 6. Fossitt classification woodland habitat types identified in the Glenbower site.

For one sub-site classified as WD2, Mixed broadleaved / conifer woodland, a significant element of the broadleaved component and the ground flora was consistent with the Fossitt classification WN1 Oak-birch –holly woodland. This is discussed and mapped as a sub-classification of the WD2 habitat type. One sub-site classified as WL2 Treeline

had an earth bank BL2 (see below) associated with it. This is discussed and mapped as a sub-classification of the WL2 habitat type.

FRESHWATER

2nd Level Fossitt Classification	3rd Level Fossitt Classification	Fossitt Code
Watercourses	Eroding / upland rivers	FW1

Table 7. Fossitt classification freshwater habitat types identified in the Glenbower site.

EXPOSED ROCK AND DISTURBED GROUND

2nd Level Fossitt Classification	3rd Level Fossitt Classification	Fossitt Code
Exposed rock	Exposed siliceous rock	ER1
Disturbed ground	Spoil and bare ground	ED2
Disturbed ground	Recolonising bare gound	ED3

Table 8. Fossitt classification exposed rock and disturbed ground habitat types identified in the Glenbower site

CULTIVATED AND BUILT LAND

2nd Level Fossitt Classification	3rd Level Fossitt Classification	Fossitt Code
Built Land	Stone walls and other stone work	BL1
B	Earth banks*	BL2

* Identified also as a component of Treelines WL2

Table 9. Fossitt classification cultivated / built land habitat types identified in the Glenbower site.

6.3 HABITAT DESCRIPTIONS

Oak-ash-hazel woodland WN2

This woodland type was found towards the very south of the wood. (Map 1 No. 31). The dominant tree species was ash (*Fraxinus excelsior*). The structure was poorly developed. The canopy was generally over 18ms, with average DBH of 19.1 cms. The under-storey was sparse containing ash, hazel (*Corylus avellana*) and western hemlock

(*Tsuga heterophylla*). The shrub layer was also sparse with elder (*Sambucus nigra*), sycamore (*Acer pseudoplatnus*) and holly (*Ilex aquifolium*) under 2ms. The ground and field layer flora from the sample quadrat is shown in Table 10 below.

Common name	Scientific name	Frequency	Cover
Ivy	*Hedera helix*	V	10
Bramble	*Rubus*	III	2.85
Honeysuckle	*Lonicera periclymenum*	I	.71
Enchanter's nightshade	*Circea lutetiana*	I	.71
Lords and ladies	*Arum maculata*	I	.14
Wood speedwell	*Veronica montana*	I	.14
Germander speedwell	*Veronica chamaedrys*	I	.14
Bugle	*Ajuga reptans*	I	.14
Bluebell	*Hyacinthoides non-scripta*	I	.14
Yellow pimpernel	*Lysimachia nemorum*	I	.14
Common dog violet	*Viola riviniana*	I	.14
Herb robert	*Geranium robertianum*	I	.14
Scaly male fern	*Dryopteris affinis*	II	2.14
Soft shield fern	*Polystichum setiferum*	II	1.57
Common feather moss	*Kindbergia praelongum*	IV	4.71
Common tamarisk moss	*Thuidium tamariscinum*	III	3.14

Table 10. Floristic Table for WN2 Woodland quadrat at Glenbower Wood

The vegetation analysis in conjunction with the canopy, understory and shrub layer for this sub-site indicated affinity with the NSNW classifications of *Fraxinus excelsior – Hedera helix* woodland group, sub-community *Geum–Veronica* and sub-community *Acer Crataegus.* The absence of significant non-native tree component, in conjunction with the observation of opposite-leaved golden saxifrage (*Chrysosplenium oppositifolium*) in moister areas of the sub-site resulted in it being allotted to the first of these two NSNW sub-communities. This is referred to the Fossitt classification WN2 by NSNW. The NSNW site report classified the area of Glenbower sampled by the

NSNW in August 2006 as WN2. From the description of the area visited it was most likely the area containing this sub-site.

Oak-ash-hazel woodland WN2 has no links to Habitats Directive Annex I habitat types, however good examples of this woodland type are rare in Ireland (Fossitt, 2007).

Wet pedunculate oak-ash woodland WN4

The six sub-sites fitting this classification occurred adjacent to the Dissour. At one of these a full vegetation analysis was carried out (Map 3 No.3) using two 16mx16m nested quadrats. The ground and field layer flora from the sample quadrats is shown in Table 11 below. The field and ground layer flora for sub-sites in this classification at the Glenbower site had affinities with NSNW classifications of the *Alnus glutinosa-filipendula ulmaria* woodland group, albeit alder (*Alnus glutinosa*) was absent from some sub-sites and meadowsweet (*Filipendula ulmaria*) rarely recorded at any sub-sites in this classification. Hazel (*Corylus avellana*) was present in the poorly developed understorey at the majority of sub-sites.

Two sub-communities of the NSNW woodland group mentioned *, Fraxinus excelsior carex remota* and *Alnus glutinosa-rubus fruticosus*, were the closest to the field and ground layer flora recorded at Glenbower. The NSNW refers these primarily to the Fossitt classification WN6, Wet-willow-alder-ash woodland, with a lesser affinity also to the Fossitt WN4 classification, applied here. However the hydrological conditions described in the Fossitt classification would have the sub-sites in Glenbower better placed in its WN4, Wet pedunculate-oak-ash woodland.

The canopy trees at the sub-site where quadrats were sampled, although over 18ms in height on average, had an average DBH of only c.15 cms.

At a second sub-site in this classification, (Map 4 No.4), due to the presence of abundant bramble (*Rubus* agg.) cover in the shrub layer a DAFOR analysis only was possible, however, the constituent species were very similar to those in the sub-site described above. Canopy trees at this sub-site were of similar height and DBH to those at the sub-site described above. The third sub-site in this classification (Map 3 No. 30) was assessed using DAFOR. Again there were considerable thickets of bramble which

made assessment difficult. The dominant canopy species was ash (*Fraxinus excelsior*), with sycamore (*Acer pseudoplatanus*) also present. The under-storey consisted of ash, hazel (*Corylus avellana*), sycamore but also beech (*Fagus sylvatica*). The under-storey beech was locally dominant, mostly adjacent to older beech trees. These older beeches formed part of an emergent layer in the canopy consisting of other widely scattered, older trees some of which were ash, others oak (*Quercus* spp).

Common name	Scientific name	Frequency	Cover
Bramble	*Rubus fruticosus*	V	5.07
Honeysuckle	*Lonicera periclymenum*	III	1.0
Ivy	*Hedera helix*	II	.72
Remote sedge	*Carex remota*	III	1.07
Wood sedge	*Carex sylvatica*	I	.21
Oak seedling	*Quercus sp seedling*	I	.07
Hawthorn seedling	*Craetegus monogyna* seedling	I	.07
Opposite leaved golden saxifrage	*Chrysosplenium oppositifolium*	IV	4.21
Enchanters' nightshade	*Circea lutetiana*	III	3.14
Wood speedwell	*Veronica montana*	III	2.36
Creeping buttercup	*Ranunculus repens*	II	1.43
Wavy bittercress	*Cardamine flexuosa*	II	1
Wood sorrel	*Oxalis acetosella*	II	1.79
Lords and ladies	*Arum maculatum*	II	.71
Yellow pimpernel	*Lysimachia nemorum*	II	.57
Germander speedwell	*Veronica chamaedrys*	II	.36
Hedge woundwort	*Stachys sylvatica*	II	.29
Herb robert	*Geranium robertianum*	I	.64
Bluebell	*Hyacinthoides non-scripta*	I	.07
Bugle	*Ajuga reptans*	I	.07
Common tamarisk moss	*Thuidium tamariscinum*	V	7.21
Mouse tail moss	*Isothecium myosuroides*	II	1.93
Common feather moss	*Kindbergia praelonga*	II	.71
Little shaggy moss	*Rhytidiadelphus loreus*	I	.43
Catherine's moss	*Atrichum undulatum*	I	.29
Hart's-tongue thyme moss	*Plagiomnium undultatum*	I	.07
Pellia	*Pellia sp*	I	.43
Scaly male fern	*Dryopteris affinis*	III	3.57
Broad buckler fern	*Dryopteris dilatata*	III	1.79
Male fern	*Dryopteris filix-mas*	II	1.93
Hard fern	*Blechnum spicant*	I	.64
Soft shield fern	*Polystichum setiferum*	I	.50

Table 11. Floristic Table for WN4 Woodland field and ground layer quadrats at Glenbower Wood

The fourth of the sub-sites (Map 2 No.2) in this classification had an internal topography which varied considerably in elevation over very short distances and was not assessed using quadrats, but the vegetation was still recorded. The classification for this site was again based on a DAFOR analysis. There were very obvious channels worn by water through this sub-site with areas of standing water in some. The native canopy trees, ash and alder (*Alnus glutinosa*) were of much greater width (DBH c. 38cms on average) and height (greater than 20ms.), to those at other sub-sites in this classification. The constituent species in the field layer were very similar to that in the first and second sub-sites described in this classification, although bryophtyes were all but absent in the ground layer. There was considerable wear from foot traffic at this sub-site, and a number of non-native broad leaf and conifer species in the canopy, as well as considerable invasion by cherry laurel (*Prunus laurocerasus*) in the understorey.

For the fifth sub-site (Map 1. No.1) in this classification an in depth vegetation analysis was not carried out due to the fact that the defining dominant vernal vegetation, ramsons (*Allium ursinum*), had died back by the time it was possible to carry out vegetation analysis, leaving mainly bare ground with the remains of the plants clearly visible, and the scent of garlic still perceptible. This sub-site was analysed using DAFOR.

The sixth WN4 sub-site (Map 1 No. 29) was similar to the fourth described above. The average DBH was c.38cms and the native canopy tree species, ash and alder, were over 20ms, however evidence of foot traffic was considerably less and no cherry laurel was recorded.

Wet pedunculate oak-ash woodland WN4 has links to the Habitats Directive priority Annex I habitat, 'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno padion, Alnion incanae, Salicion albae)' (91E0).

(Mixed) Broadleaved woodland WD1

Sub-sites classified as WD1 were classified as such based on the relevant proportions of non-native broadleaf and/or conifer in the canopy as outlined in the Fossitt classification. Most sub-sites had canopies where sycamore and beech formed the majority species in the canopy. Most of the sub-sites in this classification had an under-storey comprised of the same species as the canopy, with a shrub layer comprising bramble (*Rubus* agg.) and bracken (*Pteridium aquilinum*).

One sub-site in this classification near the southern end of the site (Map 1 No.25), had a field and ground flora similar to the WN2 Oak-ash-hazel woodland described previously, but a) the canopy was predominantly non-native and b) the ground flora was considerably supressed by foot traffic. Another sub-site in this classification (Map 1 No. 28) however had a field and ground layer similar to a sub-site classified as WD3, Mixed conifer / broadleaved woodland (see below), which contained elements of the WN1 Oak-birch-holly Fossitt classification, however the bryophyte element of the ground flora here was not as developed as at the WD3 type sub-site.

Mixed broadleaved woodland WD1 has no links to Habitats Directive Annex I habitat types.

Mixed broadleaved / conifer WD2 &

Mixed broadleaved /conifer WD2_Oak-birch-holly woodland WN1

WD2 sub-sites represent a relatively small section of the overall woodland cover in Glenbower. The larger section (Map 4, No.6) is in the north east of the wood. A smaller section to the south west (Map 2, No.5) was chosen for in depth vegetation analysis. This sub-site was selected based on the initial survey. Among the tree species recorded in the area were oak (*Quercus* spp), downy birch (*Betula pubescens*), holly (*Ilex aquifolium*) and rowan (*Sorbus aucuparia*), species typical of the Fossitt classification Oak-birch-holly woodland WN1, and other Irish classifications, linked to the Habitats Directive Annex I habitat 'Old sessile oak woods with Ilex and Blechnum in the British Isles (91A0)'. The subsequent DAFOR analysis in that area revealed the presence of

higher plants such as bilberry (*Vacinnium myrtilis*), wood sorrel (*Oxalis acetosella*) and great wood rush (*Luzula sylvatica*) as well as ferns such as hard fern (*Blechnum spicant*) and the tunbridge filmy fern (*Hymenophyllum tunbrigense*).

Additionally, there appeared to be a far higher diversity of moss species in this area of the wood, than seen in other areas-another indicator of certain types of this oak woodland. The ground and field layer flora from the sample quadrat is shown in Table 12 below.

Common name	Scientific name	Frequency	Cover
Bilberry	*Vaccinium myrtillus*	II	2.2
Great wood rush	*Luzula sylvatica*	II	1.6
Ivy	*Hedera helix*	III	1.7
Honeysuckle	*Lonicera periclymenum*	I	0.4
Hard fern	*Blechnum spicant*	I	1.1
Broad buckler	*Dryopteris dilatata*	I	1
Rhododendron Seedling	*Rhodendron ponticum* seedling	I	0.4
Holly seedling	*Ilex aquifolium* seedling	I	0.1
Common tamarisk moss	*Thuidium tamariscinum*	V	6.2
Broom fork moss	*Dicranum scoparium*	II	2.2
Heath plait moss	*Hypnum iutlandicum*	II	1.2
Mouse tail moss	*Isothecium myosuroides*	II	1.6
Catherine's moss	*Atrichum undulatum*	I	1.7
Elegant silk moss	*Pseudotaxiphyllum elegans*	I	0.7
Silky forklet moss	*Dicranella heteromalla*	I	0.4
Bifid crestwort	*Lopohocolea bidentata*	II	0.9
Common pouchwort	*Calypogeia fissa*	I	0.5
Rock fingerwort	*Lepidozia cupressiform*	I	0.5
Creeping fingerwort	*Lepidozia reptans*	I	0.4
Mueller's pouchwort	*Calypogeia muellariana*	I	0.4

Table 12. Floristic Table for WD2_WN1 ground flora quadrats at Glenbower Wood

A sub-site of immature woodland, to the west of this (Map 2, No.18) includes also young birch and oak with some older holly.

The western extent of this sub-site (Map 2, No.5) is on a precipitous cliff of old red sandstone. Many of the trees there are of considerable age, with one very large old oak recently fallen.

Mixed broadleaved / conifer WD2 woodland, in Ireland, has no links to Habitats Directive Annex I habitat types. A sub-site of this habitat type in Glenbower Wood contained elements of the Annex I habitat 'Old sessile oak woods with Ilex and Blechnum in the British Isles' (91A0))

Conifer plantation WD4

Some of the areas mapped and classified as conifer plantation might equally have been classified as Mixed conifer woodland WD3, however as even those stands of conifer in the Glenbower Wood and Lake section of the wood are owned by Collite, the overriding interest was adjudged to be commercial timber production, thus necessitating the classification of Conifer plantation, WD4. Most of the WD4 woodland is of similar age and approaching felling (some sub compartments are due for felling in 2012 and 2015, but most after 2015). There are some areas of young plantation (Map 3 Nos. 7 and 8), and seedling plantation (Map 3 No.9). There is a mixture of conifer species planted between conifer stands and variation between areas where the canopy is almost exclusively conifer, closed, and leaf litter high, suppressing most ground flora (Map 1 No. 10, Map 2 Nos. 11 and 12 Map 4 No. 13 are examples), and those with a small proportion of broadleaf in the canopy and / or understory, less leaf litter and a richer ground and field layer flora. (Map 2 No. 14, Map 4 No.15 are examples).

Conifer plantation WD4 has no links to Habitats Directive Annex I habitat types.

Scrub WS1

The classification of sub-sites as scrub relied heavily on visual assessment due to the impenetrability of the vegetation for all sub-sites coupled with steep slope for two of the sub-sites.

The single largest discrete area of scrub is that located on the former bed of the drained lake. The lake was drained in 1989 (Map 2 No.16 a,b,&c). The majority of the component of scrub in this area is bramble (*Rubus* agg.), with stinging nettle (*Urtica dioica*) and bindweed (*Calystegia* spp.) also present. A proper DAFOR analysis was not possible for the whole site as the bramble is quite impenetrable. There are also willow trees, particularly along the banks of the river but also in other areas of the former lake bed. There are at least two hummocks of greater tussock sedge (*Carex paniculata*) extending into the former lake bed. At the edges of the former lake bed there are areas of ash (*Fraxinus excelsior*) and / or willow (*Salix* spp), with bramble less abundant. Here the soil was wet receiving as it does run-off from the adjacent high ground. Ground flora species recorded in the wet woodland classification discussed previously were obvious, but the canopy was discontinuous and was not mapped as a separate woodland type. As well as *Hypotrachyna revoluta* and *Ramalina fastigiata*, the lichen species *Usnea sub-floridana* was recorded on twigs on some of the willows here. This last species is an indicator of good air quality. This sub-site was qualified with a sub-categorisation of recolonizing bare ground ED3 in the 2005 management plan, but bramble coverage would appear to have increased since that assessment.

Those areas of scrub on higher ground again had a high proportion of bramble but also extensive areas of bracken (*Pteridium aquilinum*) as a component with scattered birch (*Betula* spp), and eucalyptus (*Eucalyptus* spp.) in some areas (Map 3 No.17). It was not possible to confidently estimate the coverage of bracken in these sub-sites. Consequently the qualifying sub-category of dense bracken HD1 was not applied. Scrub WS1, of the type recorded at Glenbower has no links to Habitats Directive Annex I habitat types.

Immature woodland WS2

Included in this classification is one sub-site (Map 3 No. 19) which is a recent plantation of young oak (*Quercus* spp).

Other sub-sites in this classification are stands comprised predominantly of mixed broadleaf and / or conifer species, which are under the threshold size for other woodland categories. The tree species were a mixture of native and non-native species (e.g. Map 4 No.20). In this latter type of immature woodland the shrub layer was predominantly bramble (*Rubus* agg.) and / or bracken (*Pteridium aquilinum*). At some locations, at the edge of this latter type, oak (*Quercus* spp.), holly (*Ilex aquifolium*) downy birch (*Betula pubescens*) and rowan formed part of the canopy, with bilberry (*Vacinnium myrtillis*), hard fern (*Blechnum spicant*) and wood sorrel (*Oxalis acetosella*) on contiguous banks at the edge of the forestry road (these banks would seem to be the result of excavation to widen forestry roads and do not fit the Earth banks BL2 Fossitt classification).

For both types of immature woodland, aerial photography from 2000 shows a lot of bare earth in the position of these sub-sites suggesting there may have been felling at those sub-sites shortly prior to that year. The predominant broadleaf species were beech (*Fagus sylvatica*) and oak. A Coillte booklet of 1992 (Anon. 1992) indicated recently felled conifer stands in Glenbower were being replaced with beech and oak at that time. Older mixed broadleaved / conifer WD2 stands on the north east of the site may date from then, with these younger stands being a continuation of that planting regime.

Immature woodland WS2, of the type recorded at Glenbower has no links to Habitats Directive Annex I habitat types.

Recently-felled woodland WS5

Three sub-sites within Glenbower were felled in the early part of 2010, according to the Coillte fell map of that year (Map 2 No. 22 and Map 3 Nos. 21 and 23).

At one sub-site (Map 3, No. 23) those trees left standing after felling were birch (*Betula* spp.), oak (*Quercus* spp.) and holly (*Ilex aquifolium*). The field layer contained abundant great wood rush (*Luzula sylvatica*), with hard fern (*Blechnum spicant*), broad buckler fern (*Dryopteris dilatata*) and honeysuckle (*Lonicera periclymenum*) was also present. Interestingly on, the excavated banks falling away from this sub-site wood sorrel (*Oxalis acetosella*), bilberry (*Vacinnium myrtilis*) and hard fern (*Blechnum spicant*) featured quite strongly in the vegetation. All the species mentioned are indicators of the Fossitt oak-birch-holly WN1 classification discussed previously under Mixed broadleaf / conifer WD2.

In the WS5 sub-site shown on Map 2 No. 22, remnant canopy height trees consisted predominantly of ash, with some oak and, on lower reaches of the sloping site, alder (*Alnus glutinosa*). The understory remnants consisted of hazel (*Corylus avellana*), holly, willow (*Salix* spp), birch and rowan (*Sorbus aucuparia*). There was also some non- native cherry observed. The field layer contained abundant great wood rush with honeysuckle, ivy (*Hedera helix*) and scaly male fern (*Dryopteris affinis*) also present.

The sub-site No.21 remnant canopy height trees were predominantly sycamore (*Acer pseudoplatanus*) and beech (*Fagus sylvatica*), with holly, hazel and beech as understory remnants. The field layer was similar that of WS5 sub-site at Map 2 No.22 above.

Recently felled woodland WS5, has no links to Habitats Directive Annex I habitat types.

Hedgerows WL1

Those features classified and mapped as hedgerow WL1 fit only loosely the description in the Fossitt classification, as such features are distinguished in the classification as much by their function (as boundaries) as by their vegetation composition and linear nature. The linear nature, and the width of features mapped here as hedgerow being under 4ms and less than 5ms in height precluded their classification as scrub.

Features mapped as hedgerow were separated from associated sub-sites based on the criteria outlined above, and on their difference in vegetation composition from that in associated sub-sites, or difference in structure, in some cases specifically height, from that of associated sub-sites.

The dominant vegetation component in all hedgerow features was bramble, although isolated patches of gorse also featured. Where tree species featured as a component, these were generally widely dispersed.

Hedgerows WL1, has no links to Habitats Directive Annex I habitat types.

Treelines WL2 &

Treeline WL2_ Earth Banks BL2

The most significant features classified and mapped as Treeline WL2 are those located in that section of Glenbower shown on Map 1. They are associated with the sides of what is now a footpath, but was initially constructed as a mill-race in the late 19th century to connect the then extant lake with the corn mills located in the village of Killeagh. The canopy from trees on either side of the footpath merge, and the canopy of the treeline on the west of the footpath merges with the canopies of other mapped sub-sites in that area of Glenbower. From this perspective they could have been subsumed under the general classifications for those sub-sites. However they are of such a different age class to the trees in those sub-sites and so closely associated with other significant features that they have been mapped and classified separately.

The treeline on the west side of the footpath is associated with a bank constructed as containment for the mill-race. The containment on the east side was apparently formed by the excavation of the mill race rather than having been constructed. In the absence of documentary evidence it can only be assumed that the bank on the west was at least partly constructed from the rubble resulting from the excavation. The treeline canopy on the bank has no dominant species with large old oaks (*Quercus* spp.) and beech (*Fagus sylvatica*) as well as some large, but younger ash (*Fraxinus excelsior*). From examining maps, and based on the estimated age of trees, some of

the beech and oak may date from the time the bank was constructed, located as they are on the bank. The trees on the east treeline appear to be of similar age and are of similar species composition to that on the west. The treeline on the east is associated with areas of amenity grass verge.

Apart from the treeline canopy, the bank (BL2) on the west side of the path has a diverse vegetation associated with it, as can be seen in the DAFOR listing for field and ground layer vegetation for that feature in Table 13 below. The bank also exhibited an interesting variation from species of drier woodlands at its top to species more typical of wetter situations at its base.

Common name	Scientific name	DAFOR
Bramble	*Rubus agg.*	A
Gorse	*Ulex europaea*	R
Ivy	*Hedera helix*	A
Honeysuckle	*Lonicera periclymenum*	F
Lesser celandine*	*Ranunculus ficaria*	F
Common dog violet	*Viola riviniana*	F
Wood sorrel	*Oxalis acetosella*	F
Enchanters' nightshade	*Circea lutetiana*	F
Wood anemone	*Anemone nemorosa*	F
Woodruff	*Galium odoratum*	F
Bluebell	*Hyacinthoides non-scripta*	O
Bush vetch	*Vicia cracca*	O
Germander speedwell	*Veronica chamaedrys*	O
Lords and ladies	*Arum maculatum*	O
Ramsons	*Allium ursinum*	O
Wood avens	*Geum urbanum*	O
Wood speedwell	*Veronica montana*	O
Wood dock	*Rumex sanguineus*	R
Yellow pimpernel	*Lysimachia nemorum*	R
Scaly male fern	*Dryopteris affinis*	F
Soft shield fern	*Polystichum setiferum*	F
Bracken	*Pteridium aquilinum*	O
Hard fern	*Blechnum spicant*	O
Harts tongue	*Scolopendrium phylittis*	O
Lady fern	*Athyrium filix-femina*	O
Male fern	*Dryopteris filix-mas*	O
Remote sedge	*Carex remota*	F
Wood sedge	*Carex sylvatica*	F
Pendulous sedge	*Carex pendula*	O
Lesser pocket moss	*Fissidens bryoides*	F
Swan's neck thyme moss	*Mnium hornum*	F
Great scented liverwort	*Conocephalum conicum*	R
Pellia	*Pellia spp*	R

Table 13. DAFOR for field and ground layer flora of WL2_BL2 feature at Glenbower Wood

The excavated bank on the east side was notable for some luxuriant populations of the Great scented liverwort (*Conocephalum conicum*).

The treeline and associated bank continue into the area mapped on Map 2. The main access point for visitors who have arrived by car, is close to the south west area of that map and the bank there is quite degraded due to it being used as an alternative path and so does not have the same coverage or diversity of vegetation as on that section further south.

Treeline WL2 and Earth banks BL2, have no links to Habitats Directive Annex I habitat types.

WATERCOURSES

Eroding / upland rivers FW1

The Dissour is a second order stream fed by a number of tributaries on its journey to Glenbower, where it is fed by springs and numerous seasonal rivulets. The most recent (2005) Q rating available from the EPA, at sampling sites to the north and south of that reach of the river running through Glenbower was 3-4 i.e. good water quality. The most recent data on chemical analysis of the Dissour at the same stations, however, indicates problems with the levels of ortho-phosphates, oxidised nitrogen and total ammonia in the river (see also Table 14 below).

The river is important as a spawning area for salmon and trout as reported in the 2005 management plan, and during the Summer months salmonids were observed in the river from the White Bridge (Map 2 No. 24). The river has many riffles and pools with pebble bars exposed in the drier months. These bars were variably colonised by hemlock water drop (*Oenanthe crocata*) and / or watermint (*Mentha aquatica*). At the White Bridge, N 51^0 57’ 08.7 “ W 007^0 00’ 35.0” +/- 15ms, there is a weir, upstream of which the river is slower and wider (c. 10ms) for a distance of about 15ms. than it is on the rest of its route through Glenbower (usually c. 5ms wide). It was in this slower section that salmonids were observed. An unidentified (due to distance) dragonfly species was also observed here.

Dragonflies and damselflies were recorded in Glenbower in the course of a survey for the 2005 management plan for the Glenbower Wood and Lake Ltd. section of the site.

Parameter	Parameter Units	Minimum	Median	Maximum	No of Samples	Source	Source Type
Ortho-Phosphate	mg P 1-1	**<0.01**	**0.03**	**0.10**	22	Cork County Council	LA
Oxidised Nitrogen	mg N 1-1	**3.4**	**4.3**	**5.4**	17	Cork County Council	LA
Temperature	oC	**7.0**	**11.9**	**16.0**	13	Cork County Council	LA
Total Ammonia	mg N 1-1	**<0.02**	**0.02**	**0.12**	22	Cork County Council	LA

Table 14. Chemical data for Dissour recorded at Killeagh Bridge 2001-2003. Values in **bold** indicate stations where there may be problems with water quality at a recording station.

(Source: http://www.epa.ie/rivermap/code/results.asp?ID=4698&date=2001&location=Killeagh+Bridge&dateto=2003&station=0400)

Clear unpolluted eroding / upland rivers can contain the Habitats Directive Annex I Habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' (3260) and are linked to the Annex I habitat Rivers with muddy banks with *Chenopodion rubri* p.p.and *Bidention* p.p. vegetation (3270).

EXPOSED ROCK

Exposed siliceous rock ER1

There are two relatively large areas of exposed rock within Glenbower wood, one in the south west (Map 2) and one in the north east (Map 4). The exposed area in Map 2 is possibly the result of construction of the weir associated with the now drained lake. Principally covered with mouse tail moss (*Isothecium myosuroides*), the liverwort fairy

beads (*Microlejeunea ulicina*) was recorded here during the course of this asessment. This particular feature is not identifiable on OS maps.

The outcrop of sandstone, named as Fox's Rock in a map of Glenbower Wood on the Glenbower Wood and Lake website, can be seen (although not named) on the c.1843 OS map. The rock is also known locally as Phair's Rock according to a local resident (Sean McCarthy pers. comm). It does have a considerable infestation of rhododendron (*Rhodendron ponticum*) but also supports an extensive population of the tunbridge filmy fern (*Tunbrigense hymenophyllum*), with maidenhair spleenwort (*Asplenium adiantum -nigrum*) also present.

Other smaller exposed sections of rock occur in Glenbower, which are too small to map, but one particular section just east of the lake is particularly striking due to a number of holly trees growing on it. This is an area also with quite intensive infestation of both rhododendron and cherry laurel (*Prunus laurocerasus*).

Exposed siliceous rock ER1, of the type found in Glenbower has no links to Habitats Directive Annex I habitat types.

DISTURBED GROUND

Spoil and bare ground ED2

This classification occupies a large area of Glenbower wood, as it is primarily used to categorise the bare ground formed by forestry roads and paths through the woods. The turning points for forestry roads occupy relatively large areas (Map 4 No. 26 and Map 2 No. 27 are examples). The hedgerows WL1 described previously are associated

with this ED2 feature. For the main stretches of forestry road on the west of the woods and in the centre of the wood, at their edges adjacent to slopes, they receive such a degree of runoff from these slopes that a variety of moisture loving water species are found. These wet areas, although they function to some degree as drainage features, due to their small width and discontinuous nature are not mapped separately. In these wet areas, at the edges of forestry roads and paths, plant species such as watercress (*Rorippa nasturtium aqautica*), watermint (*Mentha aquatica*), bugle (*Ajuga reptans*) and common marsh bedstraw (*Galium palustre*) and others were recorded. By the

north west end of the westernmost forestry road, a colony of the impressive great horsetail (*Equisetum telmateia*) was recorded. At some of the turning areas, cats-ear (*Hypochaeris radicata*), red bartsia (*Odontites vernus*), eyebright (*Euphrasia* agg.), corn mint (*Mentha arvensis*) and marsh ragwort (*Senecio aquaticus*) form communities.

Also associated with the bare ground areas are rushes such as slender rush (*Juncus tenuis*), toad rush (*Juncus bufonius*) and soft rush (*Juncus effusus*). In one area at the edge of a turning point near a sub-site of recently felled wood (Map 3 No. 23) a very small community with bell heather (*Erica cinerea*), common haircap moss (*Polytrichum commune*) and blunt-leaved bog moss was recorded (*Sphagnum palustre*) was recorded.

Other plant species associated with the edges of forestry roads and paths in the wood included, ragged robin (*Lychnis flos-cuculi*), meadowsweet (*Filipendula ulmaria*), sanicle (*Sanicula europaea*), three-nerved sandwort (*Moehringia trinervia*), greater stitchwort (*Stellaria holostea*), self-heal (*Prunella vulgaris*)and also some impressive (over 2ms in height) marsh thistles (*Cirsium palustre*). Grasses were rarely recorded in woodland sites at Glenbower. The main feature, apart from amenity grassland, with which they were associated was forestry roads and paths. Apart from woodland species, species typical of agricultural and waste ground such as timothy grass (*Phleum pratense*) were recorded.

Spoil and bare ground ED2, has no links to Habitats Directive Annex I habitat types.

Recolonising bare ground ED3

This feature was located on the site of a path identifiable on OS maps from c.1843. Located between two areas of recent conifer plantation (Map 3, Nos. 7 and 8), it may have been used as access during planting. There is some bramble (*Rubus* agg.) present, but mainly herbs and ferns with rosebay willowherb (*Chamerion angustifolium*) a noticeable component of the vegetation in late Summer.

Recolonising bare ED3, has no links to Habitats Directive Annex I habitat types.

BUILT LAND

Stone walls and other stone work BL1

The most significant stretch of stone wall in the wood is that located on the eastern boundary of the site (Map 2). The wall is old red sandstone, and at present has quite a significant coverage of mosses, mainly Common tamarisk moss (*Thuidium tamariscinum*) and also higher plant species such as wood sage (*Teucrium scorodonia*). However a large section of this wall is adjacent to a recently felled area (Map 2 No. 22) so that section is quite exposed now and the species composition of the plants on it may change over the coming years. The wall is visible on the OS map of c.1843. Sandstone, being a component of not only this wall but also of the surrounding geology, means that species associated with limestone geology would be expected to

be rare in the site.

The remaining decorative piers at either end of the White Bridge (Map 3 No.24) are constructed of sandstone and limestone, possibly with a lime mortar and here two lime loving ferns, the maidenhair spleenwort (*Asplenium trichomanes*) and wall rue (*Asplenium ruta-muraria*) were recorded. The White Bridge is also seen on the OS map of c.1843.

Stone walls and other stone work BL1, has no links to Habitats Directive Annex I habitat types.

Earth banks BL2

In one sub-site (Map 1 No. 25) a length of earth bank visible on the OS map of c.1843 is still extant. It is set back slightly from the east bank of the river Dissour and separates a small section of wood immediately adjacent to the river from the rest of the woodland in the area. A number of mammal burrows are visible in the bank. An exploration of the width of the mouths of some of these tunnels indicated they may have been excavated by a larger mammal, such as a badger, but droppings near the mouth indicated the presence of rabbits. The function of the bank is not known.

It lies near, but not on, a townland boundary. It is possible that it was constructed to prevent flooding of the wood in this area, however a section of wood further south

(Map 1No.1) seems to flood seasonally and there is no such bank in that area. There is very little vegetation cover on this bank.

Earth banks BL2, has no links to Habitats Directive Annex I habitat types.

7.EVALUATION

Evaluation of habitats within Glenbower follows based on the results above and established criteria for evaluation. For individual woodland habitats, criteria used in the assessment of woodlands for the NSNW were referred to (included in Appendices I-III for reference). For hedgerows the 'Hedgerow Survey Handbook' (Anon., 2007), prepared by the UK's Department for Environment, Food and Rural Affairs was consulted.

For overall evaluation of the site criteria suggested for ecological assessment by the National Roads Authority were consulted (URL available in bibliography/sources of information. Habitats with links to Habitats Directive Annex I habitat types are assessed first.

7.1 ANNEX I HABITAT TYPES

Only two habitat types in Glenbower are habitats with links to Annex I of the Habitats Directive. Those sub-sites classified as Wet pedunculate oak-ash woodland WN4, are linked to the habitats directive habitat 'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) (91E0)'. The habitat classified as Mixed conifer/ broadleaved woodland WD3, contained one sub-site that indicated its pre-modified status would have qualified it as being consistent with the Annex I habitat type ' Old sessile oak woods with Ilex and Blechnum in the British Isles (91A0)'.

Oak-birch-holly woodland (WN1)

This habitat type is of limited areal extent, contains non-native broadleaf and conifer species in the canopy and understorey as well as having a degree of infestation with rhododendron.

The field and ground layers contain fern and moss coverage consistent with the Annex I type. Of all the sub-sites indicated for in depth vegetation analysis, this sub-site had the greatest diversity of moss species. The presence of, particularly the tunbridge filmy fern (*Hymenophyllum tunbrigense*), and other fern species, in conjunction with the relatively diverse moss flora, is partially consistent with the Interpretation Manual of European Union Habitats (Anon., 2007) description of the habitat type as containing many 'ferns, mosses, lichens and evergreen bushes'. The only lichen species identifiable on twigs fallen from the canopy here was *Hypotrachyna revoluta*. The lichen *Cladonia macilenta* was recorded on the ground at the sub-site, but not in the vegetation sample, and was of very rare occurrence. Neither lichen is particularly uncommon. The moss and liverwort species recorded might equally have been recorded in conifer plantations (Atherton I., Bosanquet S., and Lawley M., 2010).

There are currently no individual sub-sites in the wood over 10mx10m that, based on the canopy species and structure, would be of Annex I type 91A0 SAC quality. Of the 15 non-designated sites in County Cork listed on a NPWS conservation status report for the 91A0 Annex I habitat type, 3 occur in the East Cork vice county, where Glenbower is located. These are Ballyedmond, Drinshane Beg and Coolmoohan woods.

These sites adjudged of good annex quality for the 91A0 EU habitats type, being located in the same vice county, would indicate the portion of this habitat type in Glenbower is of local interest.

Wet pedunculate-oak-ash woodland (WN4)

The 91E0 Habitats Directive habitat type 'Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) (91E0)' is defined in the Interpretation manual of European Habitats (Anon. 2007), apart from by vegetation, by the term alluvial i.e. receiving alluvial deposits from flowing rivers or streams, and by

the hydrological regime, that the flooding is seasonal, with soil drying out for part of the year. The vegetation types resulting from such a hydrological regime can also occur in other hydrological regimes, for example in areas of groundwater seepage or runoff from higher ground. The valley nature of the site and the presence of numerous conduits to direct water from higher ground towards the river via woodland areas, indicated that the latter hydrological regime is in operation in at least some of the valley floor habitats at Glenbower. For some of the WN4 type sub-sites, it is difficult to be certain which regime is in force.

At two sub-sites (Map 1 No 29 and Map 2 No. 2) the existence of channels parallel to the flow of the river containing standing water in the Summer was taken as one indication of seasonal flooding. The presence of ramsons (*Allium ursinum*), which is particularly, but not exclusively, associated with WN4 habitats, for example those in the Gearagh, was another indicator. A third sub-site (Map 1 No.1) had a faint channel leading from and perpendicular to the river. This sub-site was noticeable for the blanket of ramsons recorded there in Springtime, as well as for the blanket of silty soil remaining when they died back in the Summer.

Information from a local resident, closely involved with the group that owns the section of wood in which these sub-sites occur (Paudie Lee pers. comm.), confirmed that seasonal flooding from the river occurs at these three sub-sites. However one of these sub-sites, the sub-site with a field layer dominated by vernal ramsons, is also influenced by a conduit which allows run-off from higher ground to its east to flood it at times of high rainfall throughout the year.

Of the remaining three sub-sites one (Map 4 No. 4) had a channel leading into it diagonally from the river. There was no indication of the sub-site receiving run-off from higher ground. However this sub-site was the location for a tennis court seen on maps from c.1899 and c.1930. The bank on both sides of the river at this location appears to have been raised artificially at some time in the past. Where inundation from the river is indicated, the shape of the river at that point indicates that, in spate, the area where the bank is worn and allows water in to the wood, would be under considerable pressure from flood-water.

The remaining two sub-sites in this classification, one of which is an area where vegetation was sampled systematically, would seem to be more influenced by run off from high ground than from inundation, although in the absence of information to the contrary, this is not certain. These are sub-sites Nos. 3 and 30 on Map 3, which are contiguous.

Assessing the sub-sites classified as WN4 using the criteria suggested by the NSNW for monitoring the structure and function of Annex I habitat type 91E0, would have resulted in them not passing most of the criteria. See Appendix II for these criteria. Most of the trees in these sub-sites had moss coverage (mainly mousetail moss (*Isothecium myosuroides*) and, very rarely, crisped pincushion moss (*Ulota crispa*) as well as liverwort coverage, forked veilwort (*Metzgeria furcata*) and dilated scalewort (*Frullania dilatata*), over the recommended 4% (estimated visually). Although six of the target indicator herb, fern, moss or liverwort species from the criteria were recorded, the majority were only rarely recorded. Non-native broadleaf or conifer species were recorded at most sub-sites. Non-native shrub species were recorded at one sub-site. Mature trees with a DBH of >40cms were not recorded at any sub-sites. Although dead wood was recorded at most of the sub-sites, not all the categories suggested by the criteria were recorded.

Of the 5 non-designated sites in County Cork listed on a NPWS conservation status report for the 91E0 Annex I habitat type, one- Corbally South- is located in the same vice-county as Glenbower. The habitat type in Glenbower is fragmented, with individual sub-sites of limited areal extent. These factors would suggest that the WN4 sub-sites at Glenbower are of local interest.

Eroding/ upland rivers (FW1)

This habitat in the form of the river Dissour, based on information from the 2005 management plan and visual confirmation provides a habitat for salmonids and specifically the Annex II Altantic salmon (*Salmo salar*). The Q-value water rating is good, however there are indicators of issues with certain aspects of water quality as discussed previously. There are a number of rivers of a similar size to the Dissour in the vice county some of which flow through woodland. The Tourig and the Owenacurra ,

although slightly higher order rivers, flow through woodlands previously mentioned as listed on NPWS conservation status lists for Annex I woodland types. The Owenacurra is also an important salmon river (Cummins C., O'Donnell C, 2005).

Vegetation consistent with that described in the Interpretation manual of European Union Habitats (Anon., 2007) for Annex habitats (3260) and (3270) were not observed in the Glenbower site. The Annex II listed otter is also recorded as using the Dissour river. For these reasons the FW1 at Glenbower is assessed as being of high local interest.

7.2 NON-ANNEX I SEMI-NATURAL HABITAT TYPES

Oak-ash-woodland WN2

This woodland habitat type, although not referred to any Habitats Directive Annex I habitat type, is noted as rare in Ireland in the Fossitt classification. The sub-site containing this habitat type at Glenbower is of limited areal extent. The under-storey for this habitat is poorly developed at Glenbower and it did not contain all the tree species indicated for this type. The average DBH for the native canopy species is low (19.02cms). Although the distribution maps for this habitat type in the NSNW show few examples in the vice county, it is generally widespread in Ireland. Most of the indicator field layer herbs mentioned in the NSNW classification were recorded during vegetation sampling.

The sub-site containing this habitat type at Glenbower would be of local interest.

7.3 HIGHLY MODIFIED AND TRANSITIONAL WOODLAND HABITAT TYPES

Conifer plantation WD4

This habitat type occupies the greater part of the Glenbower site. The stands of conifer are at various stages of rotation. Such variation provides a diversity of habitat types for bird and mammal life (Whelan, 1995). Visually the conifer stands are not intrusive and are frequently edged by hedgerow and / or native tree species. From examination of recently felled areas and some of the older stands, the native field and ground flora

appears to be preserved, although in other areas it is considerably supressed. Dense shading of the river Dissour by conifer was rare in the site.

Hedgerow WL1

Hedgerows in Glenbower are largely composed of bramble (*Rubus* agg.). In the Hedgerow Survey Handbook (Anon., 2007) prepared for hedgerow survey in the U.K., stretches of bramble are classified as gaps in hedgerow, so those features classified as hedgerow in the Glenbower site would be considered poor, structurally. The Silver washed fritillary (*Argynnis paphia*), previously recorded in the Glenbower Wood and Lake Management Plan survey, was seen frequently in this habitat type during the Summer months.

Conifer (WD4), and hedgerow (WL1) habitat features, in common with the remaining woodland habitats of the Fossitt classification identified at the Glenbower site are not afforded a conservation status such those afforded to the WN1 and WN4 woodland habitat types. They do though contribute to a diversity of habitats types available to flora and fauna within the site.

7.4 OTHER HABITAT TYPES

Earth banks (BL2)

In Glenbower earth banks were recorded at two sub-sites located close to each other. One bank supported little vegetation, but did appear to provide a habitat for mammals, most likely rabbits. The other earth bank feature was recorded as a component of the treeline (WL2) habitat in Glenbower. This earth bank supported a diverse field and ground layer fauna, which bore similarities to the species rich *Corylus avellana-oxalis acetosella* woodland sub-community of the NSNW, which equates to Fossitt WN2 woodland type. It was much more diverse than the woodland sub-site classified as WN2, situated close by.

The NSNW, in the scoring of woodland sites, does award scores for man-made features within woodland sites, specifically banks and walls. As the treeline, with which the earth bank is associated contains some very mature oaks (although also beech) of DBH over 2ms –estimated visually- and as the earth bank also has a historical significance in addition to the diverse flora it supports, this affords the feature a higher conservation status.

It is assessed as being of high local importance.

Other non-semi natural, non-woodland habitats in Glenbower, again add diversity to the habitat ranges available for flora and fauna, in the case of on feature of Exposed siliceous rock (ER1) supporting a population of a scarce fern species.

Ornamental / non-native shrub (WS3)

This classification is shown on the various maps as a point feature to indicate particularly severe infestations of the invasive shrub species rhodedednron (*Rhodedendron ponticum*) and cherry laurel (*Prunus laurocerasus*).

7.5 BRYOPHYTES

Apart from byrophytes (mosses and liverworts) identified in vegetation samples, sub-sites in the wood were sampled to investigate whether any notable species would be found. The sub-site with the most diverse bryophytes was the excavated bank bordering a path through the area of woodland containing WN1 type field and ground flora. Table 15 contains a list of all bryophyte species recorded within the Glenbower site.

As can be seen from the table a high number of species were only recorded near the Mixed broadleaved / conifer(WD2)_Oak-ash-holly (WN1) sub-site. Other species on the list were also recorded there. The moss species listed in Annex V of the Habitats Directive has a widespread distribution in Ireland, but was a small, discrete population.

Common name	*Scientific name*
Catherine's moss	*Atrichum undulatum*
Common haircap	*Polytrichum commune*
Common pocket moss	*Fissidens taxifolius*
Common tamarisk moss	*Thuidium tamariscinum*
Bank haircap	*Polytrichastrum formosum*
Blunt leaved Bog-moss	*Sphagnum palustre*
Broom fork moss*	*Dicranum scoparium*
Dotted thyme moss	*Rhizomnium punctatum*
Dwarf feather moss *	*Rhynchostegiella pumilum*
Elegant silk moss*	*Pseudotaxiphyllum elegans*
Fox-tail feather moss	*Thamnobryum alopecurum*
Greater fork moss*	*Dicranum majus*
Hart's-tongue thyme moss	*Plagiomnium undulatum*
Heath plait moss*	*Hypnum jutlandicum*
Larger mouse-tail moss	*Isothecium alopecuroides*
Lesser pocket moss	*Fissidens bryoides*
Large white moss***	*Leucobryum glaucum*
Little Shaggy Moss	*Rhytidiadelphus loreus*
Mousetail moss	*Isothecium myosuroides*
Shining hookeria	*Hookeria lucens*
Short-beaked Wood-moss	*Loeskeobryum briviroste*
Silky forklet moss*	*Dicranella heteromalla*
Supine plait moss*	*Hypnum resupinatum*
Swan's-neck thyme moss	*Mnium hornum*
Waved silk-moss*	*Plagiothecium undulatum*
Bifid crestwort*	*Lopohocolea bidentata*
Creeping fingerwort*	*Lepidozia reptans*
Common pouchwort	*Calypogeia fissa*
Dilated scalewort	*Frullania dilatata*
Fairy beads	*Microlejeunea ulicina*
Forked veilwort	*Metzgeria furcata*

Jagged germanderwort**	*Riccardia chamedryfolia*
Maidenhair pocket moss**	*Fissidens adianthoides*
Mueller's pouchwort*	*Calypogeia muellariana*
Straggling pouchwort *	*Saccogyna viticulosa*
Rock fingerwort	*Lepidozia cupressiform*
White earwort	*Diplophyllum albicans*
Great scented liverwort	*Conocephalum conicum*
Pellia spp.	*Pellia spp.*

* Only recorded adjacent to sub-site with WN1 features

** Only recorded from sub-site with running water

*** Listed on Annex V of the Habitats Directive

Table 15. Bryophytes recorded in the Glenbower Wood site.

7.6 OVERALL SITE EVALUATION

Glenbower wood appears on OS maps from the earliest edition c.1843, and the NSNW report mentions that woodlands appearing on those maps are generally more diverse than woodlands which were established after the maps were first published. The NSNW advises against using the term 'ancient woodland' for Irish woods, as in the UK that term is used solely to apply to woods that can be proved to have been continuously wooded since at least the 1600s. The recorded ownership of the lands in which Glenbower is situated date back to the 13th century, but this does not automatically mean that the woods were extant at that time. The earliest documentary evidence for Glenbower wood discovered for the purpose of this assessment is a reproduction of a 1700 estate map, renewed in 1738 (Mulcahy, 1973) . That map (see Fig. 6) shows the wood with very much the extent and shape it has today. As the reproduction is based on the 1738 renewed map, it is possible, although unlikely, that the wood had been planted between 1700 and 1738. The early 1700s were the beginning of a period of new woodland plantation in Ireland (McCracken 1971). Remnant ancient woodland in Ireland, as in England, is usually oak (*Quercus* spp) woodland with holly (*Ilex aquifolium*)and rowan (*Sorbus aucuparia*) on steep infertile acid valley slopes (Rackham,1994). Evidence of this oak woodland type was identified at Glenbower during in the course of this assessment.

Apart from examining historical records another method of assessing the ancient status of woodlands is through the use of indicator plant species. Although such lists have been compiled for various locations in the UK no such lists have been derived and published for Ireland. A list has been prepared for the south west of England, probably the most appropriate list available which may be applied to Co. Cork. Certain species on that list do not occur in Ireland or occur in Ireland only as introduced species. The list of species in Table 16 below were recorded in Glenbower during the course of this assessment, and appear on the ancient woodland indicator list for south west England.

From the list of 99 ancient indicator species prepared for the south west of England 68 are native to Ireland, c. 69%. This is similar to the overall proportion of Irish native flora compared to the UK native flora. Just over 38% of the 68 species occur at

Glenbower. Some of these species occur in situations outside of woodlands, others, such as the Bird's nest orchid (*Neottia nidus-avis*), which is a saprophyte, are less likely to be recorded outside of woodland situations. It is the occurrence of a suite of indicator species at a given site, rather than individual species from a list, that would be considered a good indication of ancientness. However variation between locations within and between countries has to be borne in mind (Wulf, 1997).

Flowering Plants	
Barren Strawberry (*Potentilla sterilis)*	Sanicle (*Sanicula europaea)*
Bilberry (*Vaccinium myrtillus)*	Slender St John's-wort (*Hypericum pulchrum)*
Bird's nest orchid (*Neottia nidus-avis)*	Three-nerved Sandwort, (*Moehringia trinervia)*
Bluebell (*Hyacinthoides non-scripta)*	Wood anemone (*Anemone nemorosa)*
Holly (*Ilex aquifolium)*	Woodruff (*Galium odoratum)*
Opposite-leaved golden-saxifrage (*Chrysosplenium oppositifolium)*	Wood sorrel (*Oxalis acetosella)*
Pignut (*Conopodium majus)*	Wood speedwell (*Veronica montana*)
Ramsons *(Allium ursinum)*	Yellow pimpernel (*Lysimachia nemorum)*
Ferns	
Hard-fern (*Blechnum spicant)*	Soft Shield-fern (*Polystichum setiferum)*
Hart's tongue fern (*Phylittis scolopendrium)*	Scaly Male-fern (*Dryopteris affinis*
Polypody (*Polypodium vulgare)*	Tunbridge Filmy Fern *Hymenophyllum tunbrigense)*
Sedges	
Pendulous Sedge (*Carex pendula)*	Wood-sedge (*Carex sylvatica)*
Remote Sedge (*Carex remota)*	
Grasses	
Hairy-brome (*Bromus ramosus)*	

Table 16. Ancient Woodland Indicator species for south west England recorded at the Glenbower site.

(Adapted from Rose, 2006)

From the list of notable species listed in the conservation scoring system for the NSNW (see Annex III), 3 were recorded in the Glenbower site giving it the maximum score for that criterion. Other criteria in the scoring system, particularly those relating to structure, give the Glenbower site overall quite a low scoring.

The notable plant and animal species, some of which were recorded during the survey of the site, would be rated as of county interest. Plant species such as the Tunbridge filmy fern (*Hymenophyllum tunbrigense*), the birds nest orchid (*Neottia nidus-avis*) and the Great horsetail (*Equisetum telmateia*) were all recorded during the survey. The red squirrel (*Sciurus vulgaris*) was also observed. Although the river Dissour was assessed as being of local interest, the recorded presence of Atlantic salmon (*Salmo salar*), given its decline would also confer an assessment of county importance.

Combining all the findings of this assessment the final assessment of the Glenbower site would be of high local interest.

8. THREATS

Although no attempt is made here to quantify threats, those observed are outlined below, adapted from the framework adopted by the NPWS in assessing threats to Annex I woodlands.

8.1 GRAZING

No evidence of grazing was observed within the site, although rabbits were observed within the site near its boundaries and evidence from droppings and warrens were observed at one sub-site. Immature birch and oak trees were seen to be protected by sleeves at their bases.

8.2 INVASIVE SPECIES

Sycamore (*Acer pseudoplatanus*), beech (*Fagus sylvatica*), rhodendron (*Rhodedendron ponticum*) and Cherry laurel (*Prunus laurocerasus*), were all identified. Of particular concern were those infestations by the latter two near sub-sites identified as containing Annex I habitat types and a rare fern as well as near a population of Annex V listed moss. The Coillte District Strategic Plan highlighted tackling this infestation as an aim, however that is constrained by financial considerations. Some of the infestation is in the Coillte owned area, some in that owned by Glenbower Wood and Lake Ltd.

The invasive slender rush (*Juncus tenuis*) was also recorded within the Coillte owned area.

8.3 PLANTING OF NON-NATIVE CONIFERS

As the majority of the site is owned by Coillte this threat is an established one in the site. However the Coillte 2006 District Strategic Plan highlights Glenbower as a property where the restoration and maintenance of native broadleaf species in its most suitable parts is an aim. The carrying out of forestry work can lead to damage to native field and ground flora. Conversely, this activity also disturbs the forestry roads and paths which allows for a diversity of colonising herbs.

8.4 FELLING OF NATIVE TREE SPECIES

This is again constrained by the ownership discussed in 8.3 above. Felling of native ash in an area classified as WN4 was recorded in the Glenbower Wood and Lake Ltd. owned area apparently to limit interference with overhead powerlines. This area of woodland is one which contains a particularly noticeable vernal carpet of ramsons.

8.5 TRAMPLING

This threat is not included in the NPWS threat assessment, however it was noticed as an occurence in areas in the Glenbower Wood and Lake area, with a resultant suppression of field and ground flora in some areas. However such trampling is limited to specific areas within the wood, and is an indication of its value as an amenity resource.

9. CONCLUDING REMARKS

The site at Glenbower has a diversity of habitats, flora and fauna. Invertebrates were not mentioned as a significant component, although observations were noted, but it is likely to have a diverse range of species. The not uncommon, but attractive, moisture loving ground beetle *Elaphrus cupreus* was recorded. Apart from its ecological conservation value, it has a well explored historical value and, although not in the site assessed, there are a number of archaeological sites within the wider wood area. It is also a popular amenity area and highly valued by local residents, and as became clear in the course of conducting this assessment, by residents of Cork city and county also.

10. ACKNOWLEDGEMENTS

I would like to thank Paudie Lee, of Glenbower Wood and Lake Ltd., for giving permission to use the area of the site owned by them, and for information which proved invaluable in classifying some areas of the site. Also I would like to thank John Landy, Forest Manager, Coillte organising access to the Coillte owned area of the site, and for access to maps.

11. SITE MAPS

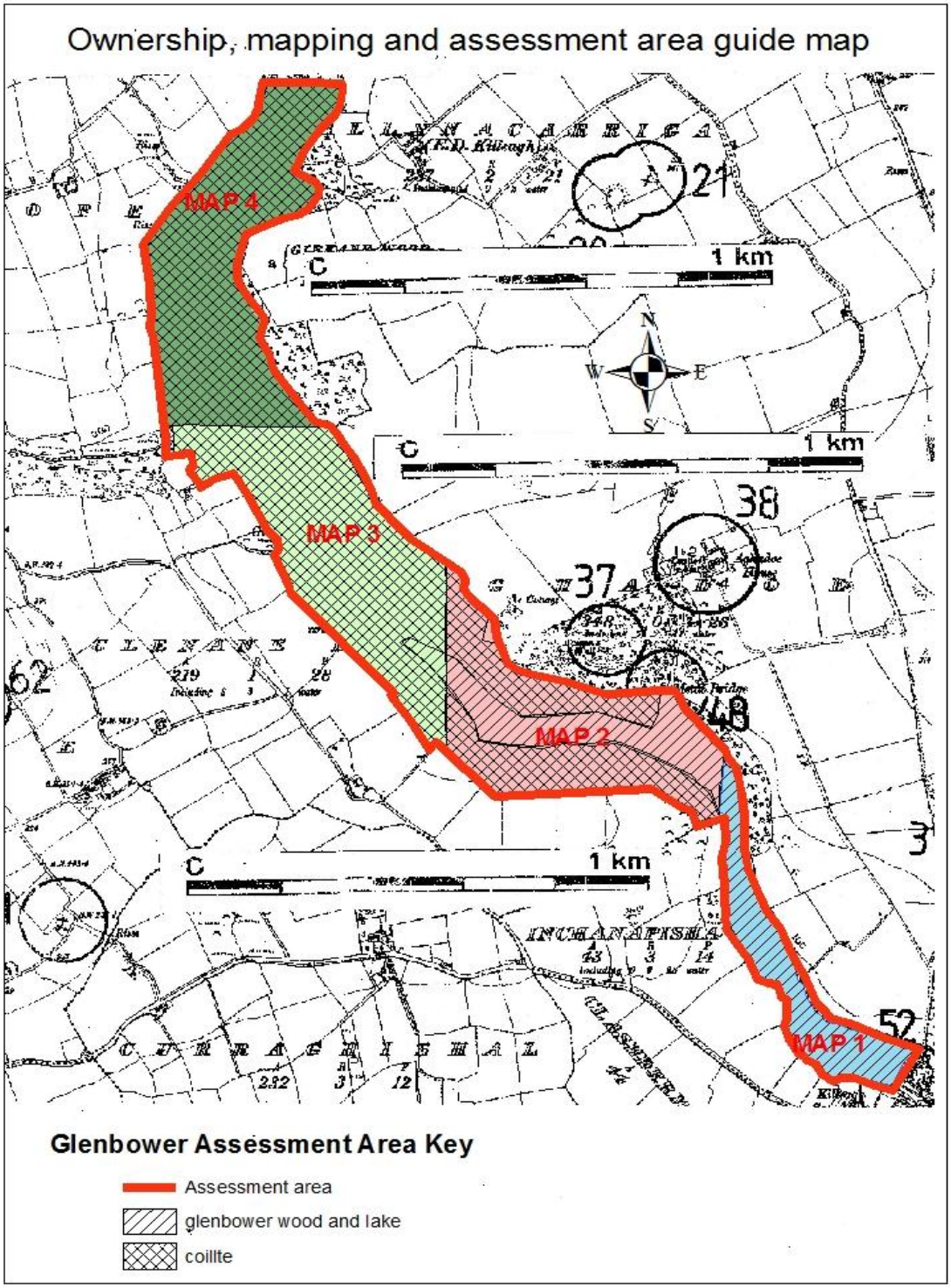

Fig. 1 Key to assessment area, maps and ownership of the Glenbower site

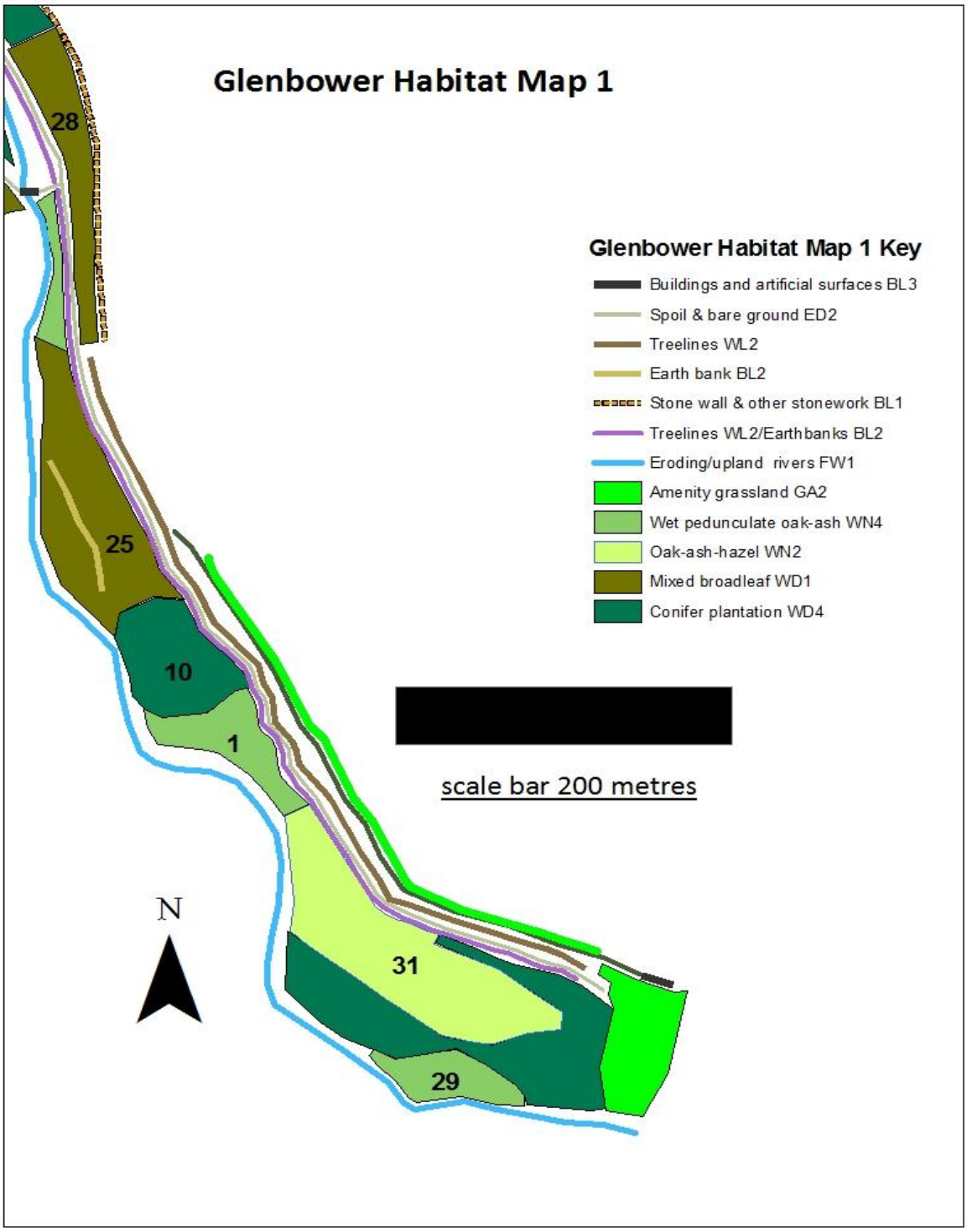

Fig. 2 Habitat Map 1 of the Glenbower site

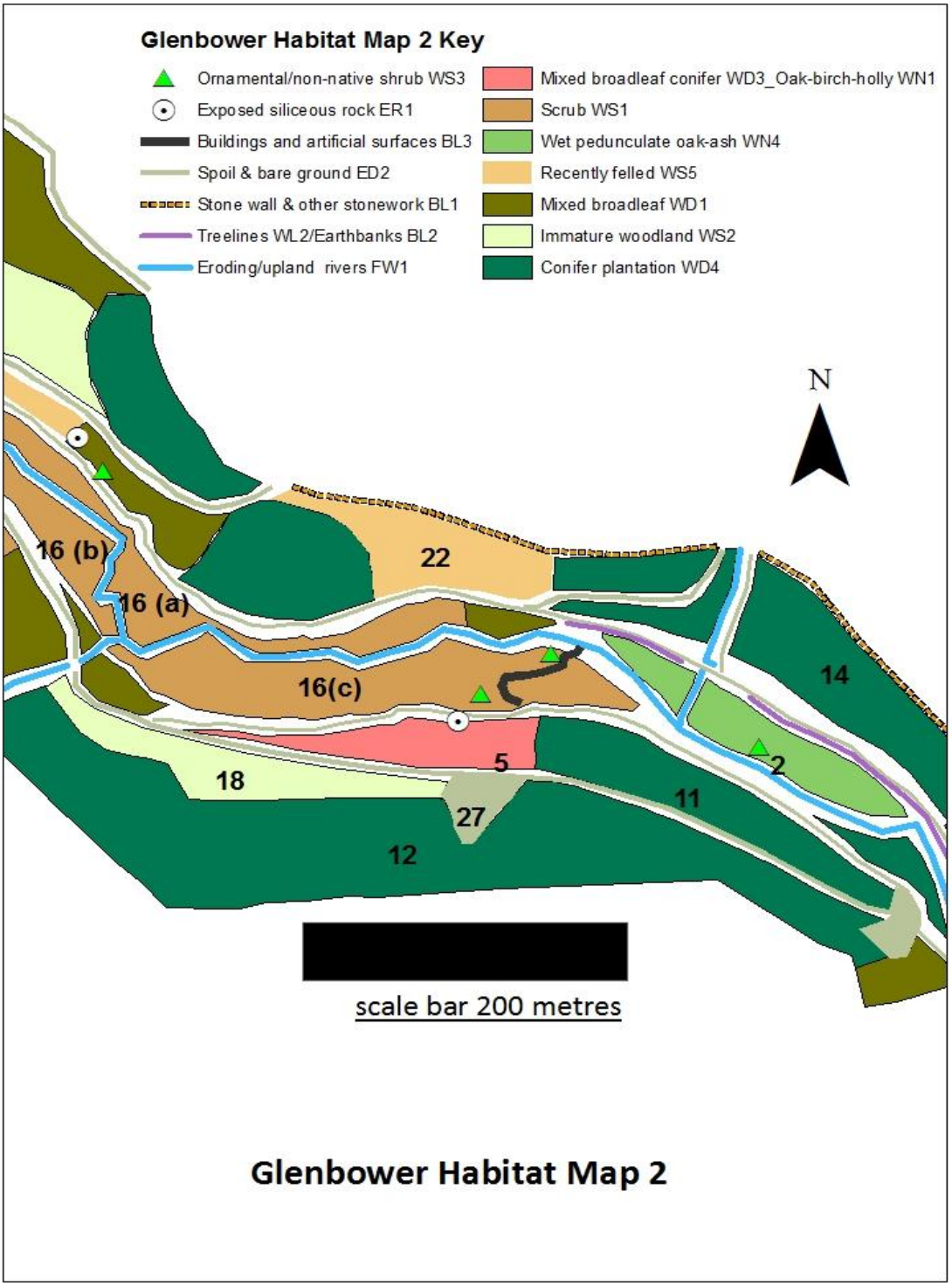

Fig. 3 Habitat Map 2 of the Glenbower site

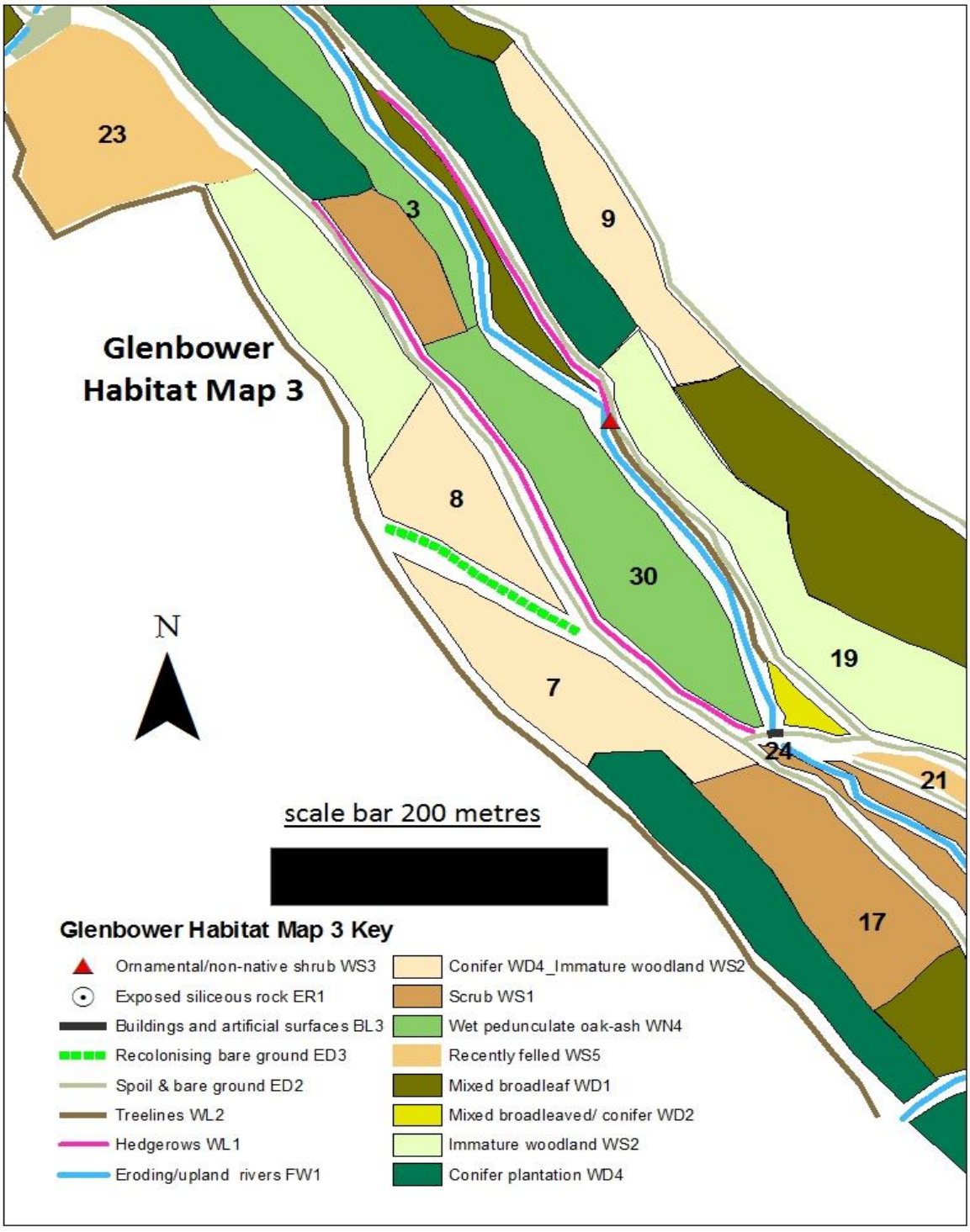

Fig.4 Habitat Map 3 of the Glenbower site.

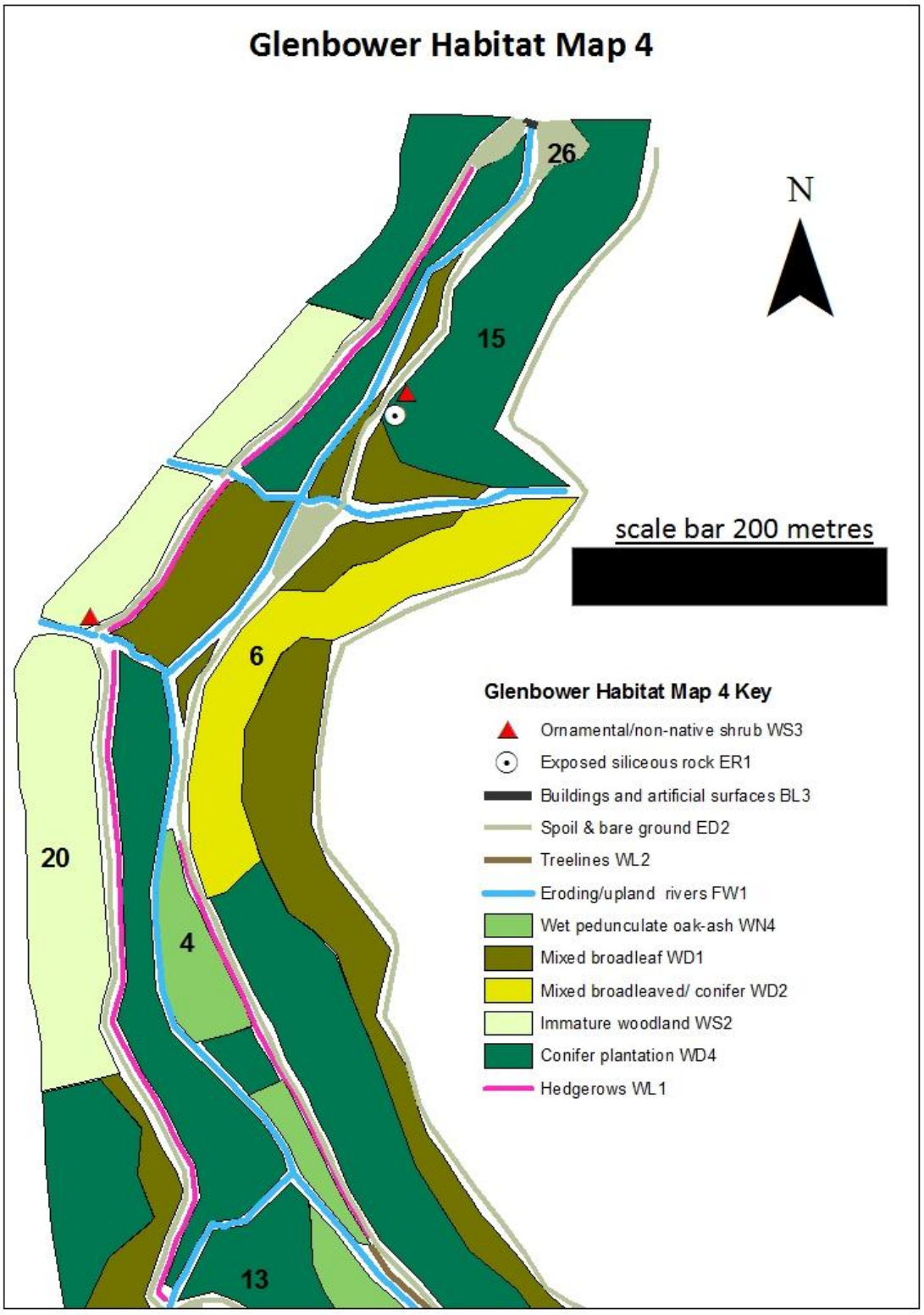

Fig. 5 Habitat map 4 of the Glenbower site

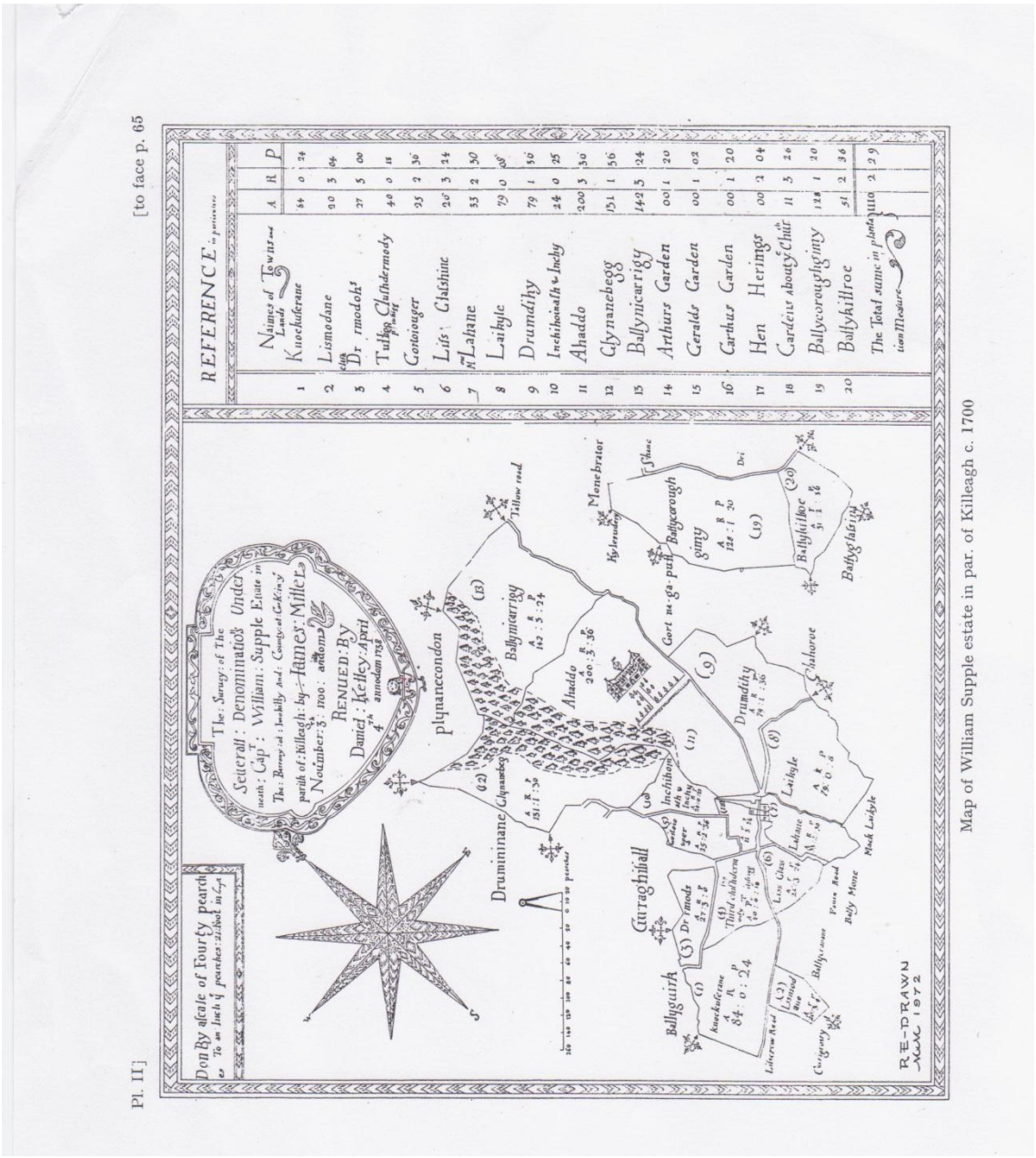

Fig. 6 Map of the Supple Estate including Glenbower Wood (un-named) c.1738

Source: Journal of the Cork Historical and Archaeological Society Vol. 78, No. 227

Fig. 7 Large White-moss (*Leucobryum glaucum*) at Glenbower

Fig. 8 Bird's nest orchid (*Neottia nidus-avis)* at Glenbower

Fig.10 Clockwise from right, The Tunbridge filmy fern, the millrace bank in Spring, and wet woodland at Glenbower

12. BIBLIOGRAPHY AND SOURCES CONSULTED

Enivronmental Protection Agency Envision mapviewer

(http://maps.epa.ie/internetmapviewer/mapviewer.aspx),

Geological Survey of Ireland Public Data Viewer (http://www.gsi.ie/mapping.htm)

National Biodiversity Data Centre online mapviewer

(http://maps.biodiversityireland.ie/Map.aspx.).

Ordnance Survey online map viewer (http://www.osi.ie/)

Anon. (1992) Discovering Ireland's Woodlands. Coillte

Anon. (2007) Interpretation Manual of European Union Habitats

(http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/2007_07_im.pdf)

Anon. (2007a) The Status Of EU Protected Habitats And Species In Ireland. National Parks and Wildlife Service

Atherton I. Bosanquet S.,and Lawley M. (2010) Mosses and Liverworts of Ireland. British Bryological Society

Cronin, M. (2001) De Capell Brooke or Supple (of Northamptonshire and Killeagh), (http://myhome.ispdr.net.au/~mgrogan/cork/supple.htm)

Cross, J. (2008) classification section of the Native Woodland Scheme Manual. Forest Service.

Cummins C., O'Donnell C.(2005). In Atlas of Cork City. eds. Crowley,J. Devoy,R Linehan,D. O'Flanagan, P.

Fossitt, J.A. (2007) A Guide to Habitats in Ireland. The Heritage Council

Gittings, T. (2005) Management Plan for Lands Owned by Glenbower Wood & Lake Ltd.: 2006-2010

(http://www.esatclear.ie/~exfish/glenbower_frameset.htm)

Goodwillie, R. (1986) Report on areas of scientific interest in County Cork. Unpublished report to Cork County Council.

(http://www.npws.ie/en/media/NPWS/Publications/ASI/Media,5146,en.PDF)

Lewis, S. (1837) A Topographical Dictionary (1837). S.Lewis &Co.

McCracken E. (1971) The Irish Woods since Tudor Times. David & Charles

Mulcahy, M. (1973) Killeagh Burial Ground, Survey of the Supple Estate.

Journal of the Cork Historical and Archaeological Society Vol. 78, No. 227

O'Connor, P.J. (2001) Atlas of Irish Placenames, Oireachtas na Mumhan

Perrin P, Martin J., Barron S., O'Neill F., McNutt K. & Delaney, A. (2008) National Survey of Native Woodlands Vols. I-III, Unpublished Report to the National Parks & Wildlife Service.

Rackham, O. (1994) Looking for ancient woodland in Ireland (keynote address). In Woods,Trees and Forests in Ireland. eds. Pilcher, J.R. and Mac an tSaoir, S. Royal Irish Academy

Rackham, O. (1980) Ancient woodland. Its history, vegetation and uses in England. Edward Arnold, London

Rodwell, J.S. (1991) British Plant Communities Vol.I. Cambridge University Press

Rose, F. (2006) The Wildflower Key.

Smith G.F., O'Donoghue P., O'Hora K, Delaney E., (2010) Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council

Supple, S. (2008) Supple Family History, (http://www.shanesupple.com/supple.html)

Wulf, M. (1997) Plant Species as Indicators of Ancient Woodland in Northwestern Germany. Journal of Vegetation Science Vol. 8 No. 5

APPENDIX I. 91A0 Old Sessile Oak Woods structure and functions assessment criteria used in NSNW

Indicator species and criteria to be scored at each 20 m x 20m assessment stop

Positive indicator species	✓	**Positive indicator species**	✓
Trees & woody species		Mosses & liverworts (Cont.)	
Betula pubescens		*Kindbergia praelonga*	
Corylus avellana		*Mnium hornum*	
Ilex aquifolium		*Plagiothecium undulatum*	
Lonicera periclymenum		*Polytrichastrum formosum*	
Quercus petraea		*Pseudotaxiphyllum elegans*	
Sorbus aucuparia		*Rhytidiadelphus loreus*	
Vaccinium myrtillus		*Saccogyna viticulosa*	
Herbs & ferns		**Negative indicator species**	✓
Blechnum spicant		Non-native tree species	
Luzula sylvatica		*Acer pseudoplatanus*	
Oxalis acetosella		*Fagus sylvatica*	
Polypodium vulgare		Non-native conifer species	
		Other:	
Mosses & liverworts		Non-native shrub species	
Calypogeia muellerana		*Cotoneaster* spp.	
Dicranum scoparium		*Prunus laurocerasus*	
Scapania gracilis		*Rhododendron ponticum*	
Thuidium tamariscinum		*Symphoricarpos albus*	
Diplophyllum albicans		Other:	
Eurhynchium striatum			
Hylocomium brevirostre		Pass = No negative indicator species recorded	
Hypnum cupressiforme		**Structural data**	✓
Hypnum jutlandicum		Median canopy height >11m	
Isothecium myosuroides		Total canopy cover >30% of plot	
Pass = *Quercus petraea* or *Q.* x *rosacea* plus ≥6 of the other listed species present		*Q. petraea* or *Q. x rosacea* >50% of canopy Total shrub layer cover 10-50% Field layer ≥ 20% cover and ≥20 cm high	
Other stop data	✓		
Evidence of bark stripping (present = fail)		Pass = all five criteria met	
% bryophyte cover (pass = ≥4%)			

Criteria to be assessed at a habitat or multiple stop level

Target tree species dbh		**Old trees and dead wood**	
No. of young stems 7-19cm dbh No. of stems 20-40cm dbh No. of mature stems >40cm dbh		No. of old/senescing trees >30cm dbh No. of standing dead trees >30cm dbh No. fallen dead trees >30cm dbh	
Pass = Over all stops each size class represents ≥ 20% of total stems		Pass = 1+ old/senescing tree in ≥ 25% of stops *and* 4+ standing dead trees/ha *and* 3+ fallen dead trees/ha	
Target tree species regeneration		**Native tree species regeneration**	
Pass = 1+ target sapling >2m tall present in Annex I habitat *(only assess if canopy gaps occur)*		Pass = 1+ native sapling >2m tall present in ≥50% of plots	
Target tree species = *Quercus petraea* and *Quercus* x *rosacea*			

Table 1A . 91A0 Old Sessile Oak Woods structure and functions assessment criteria

Source:National Survey of Native Woodlands Vo. I Main Report

http://www.npws.ie/en/media/NPWS/Publications/Reports/Media,6688,en.pdf

APPENDIX II. 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* structure and functions assessment criteria used in NSNW

Indicator species and criteria to be scored at each 20 m x 20m assessment stop

Positive indicator species	✓	Negative indicator species	✓
Trees & woody species		Non-native tree species	
Alnus glutinosa		*Acer pseudoplatanus*	
Betula pubescens		*Fagus sylvatica*	
Crataegus monogyna		Non-native conifer spp.	
Fraxinus excelsior		Other:	
Salix cinerea			
		Non-native shrub species	
Herbs & ferns		*Cotoneaster* spp.	
Agrostis stolonifera		*Prunus laurocerasus*	
Angelica sylvestris		*Rhododendron ponticum*	
Filipendula ulmaria		*Symphoricarpos albus*	
Galium palustre		*Cornus sericea*	
Iris pseudacorus		Other:	
Mentha aquatica			
Phalaris arundinacea			
Rumex sanguineus			
Urtica dioica			
Mosses & liverworts			
Calliergonella cuspidata			
Hypnum cupressiforme			
Kindbergia praelonga			
Ulota bruchii		Pass = No negative indicator species recorded	
Ulota crispa		**Structural data**	✓
		Median canopy height >7m	
Pass = *F. excelsior*/*Alnus glutinosa*/ *S. cinerea* plus ≥6 of the listed species present		Total canopy cover >30% of plot	
		Target species >50% of canopy	
		Total shrub layer cover 10-50%	
Other stop data	✓	Field layer ≥20% cover and ≥ 20 cm high	
Evidence of bark stripping (present = fail)		Pass = all five criteria met	
% bryophyte cover (pass = >4%)			

Criteria to be assessed at a habitat or multiple stop level

Target tree species dbh		**Old trees and dead wood**	
No. of young stems 7-19cm dbh		No. of old/senescing trees >30cm dbh	
No. of stems 20-40cm dbh		No. of standing dead trees >30cm dbh	
No. of mature stems >40cm dbh		No. of fallen dead trees >30cm dbh	
Pass = Over all stops each size class represents ≥ 20% of total stems		Pass = 1+ old/senescing tree in ≥ 25% of stops *and* 4+ standing dead trees/ha *and* 3+ fallen dead trees/ha	
		Native tree species regeneration	
		Pass = 1+ native sapling >2m tall present in ≥50% of plots	
Target tree species = *F. excelsior* or *A. glutinosa* or *S. cinerea*			

Table 2A 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* structure and functions assessment criteria

Source:National Survey of Native Woodlands Vo. I Main Report

http://www.npws.ie/en/media/NPWS/Publications/Reports/Media,6688,en.pdf

APPENDIX III. Criteria used in the calculation of the conservation score of each site for the NSNW

Criteria	Scoring	Max.
Vascular plant diversity	1 = ≤50 species 2 = 51-65 species 3 = 66-80 species 4 = >80 species	4
Bryophyte diversity	0 = 0 species 1 = <12 species 2 = 12-24 species 3 = >24 species	3
Free regeneration of native species	0 = no saplings 1 = 1-4 saplings 2 = ≥5 saplings	2
Horizontal diversity	0 = σ of <7 cm 1 = σ of 7-14 cm 2 = σ of >14 cm	2
% native basal area	0 = ≤50% 1 = 50.1-75% 2 = 75.1-90% 3 = 90.1-100%	3
Annex I woodland habitats	0 = no Annex I woodland habitat 1 = 1 Annex I woodland habitat 2 = ≥2 Annex I woodland habitats	2
Notable species	0 = 0 species 1 = 1 species 2 = 2 species 3 = >3 species	3
Area	0 = <2 ha 1 = 2-3.9 ha 2 = 4-6.9 ha 3 = 7-13 ha 4 = 13.1-50 ha 5 = ≥50 ha	5
Diversity of native woodland habitats	1 = 1 habitat 2 = 2 habitats 3 = ≥3 habitats	3
Presence in the 1840s	0 = no woodland indicated in 1840s 1 = some woodland indicated in 1840s	1
Adjacent semi-natural habitats	0 = no adjacent semi-natural habitats 1 = ≥1 adjacent semi-natural habitats	1
Natural hydrological features	0 = no natural hydrological features 1 = ≥1 natural hydrological features	1
Petrifying springs with tufa formation	0 = no petrifying springs 1 = petrifying spring recorded	1
Dead wood	0 = coarse woody debris, standing dead, standing damaged and snags/snapped all recorded as rare or occasional and uprooted root plates recorded as rare, frequent or abundant. 1 = ≥1 of coarse woody debris, standing dead, standing damaged or snags/snapped recorded as frequent or abundant or uprooted root plate recorded as occasional	1
Man-made features and woodland management	0 = no notable man-made features or coppice/pollard recorded 1 = ≥1 man-made features or coppice/pollard recorded	1
Maximum Score		*33*

Table 3A. Criteria used in the calculation of the conservation score of NSNW sites

Source: National Survey of Native Woodlands Vo. I Main Report

http://www.npws.ie/en/media/NPWS/Publications/Reports/Media,6688,en.pdf

NOTE. Scores are calculated as a percentage of the possible overall score in the NSNW system

Vascular species	
Anemone nemorosa	*Milium effusum*
Arbutus unedo	*Monotropa hypopitys*
Bromus racemosus	*Neottia nidus-avis*
Cardamine amara	*Orobanche hederae*
Campanula trachelium	*Phegopteris connectilis*
Carex depauperata	*Prunus padus*
Carex strigosa	*Pyrola media*
Cephalanthera longifolia	*Pyrola minor*
Frangula alnus	*Pyrola rotundifolium*
Galium odoratum	*Rhamnus cathartica*
Gymnocarpium dryopteris	*Sorbus devoniensis*
Hordelymus europaeus	*Sorbus hibernica*
Hypericum hirsutum	*Stachys officinalis*
Lamiastrum galeobdolon ssp. *montanum*	*Trichomanes speciosum*
Melica uniflora	*Viola hirta*
Lichen species	
Dimerella lutea	*Lobaria* spp.
Peltigera horizontalis	*Sticta spp.*

Table 4A. Notable species referred to in Table 3A above

Source: National Survey of Native Woodlands Vo. I Main Report

http://www.npws.ie/en/media/NPWS/Publications/Reports/Media,6688,en.pdf

APPENDIX IV. Plant species recorded during the course of assessment (non-native conifers not included)

Ash	*Fraxinus excelsior*
Birch	*Betula pubescens*
Elder	*Sambucus nigra*
Hazel	*Corylus avellana*
Holly	*Ilex aquifolium*
Oak	*Quercus (robur / petraea)*
Rowan	*Sorbus aucuparia*
Cherry laurel	*Prunus laurocerasus*
Rhodedendron	*Rhodedendron ponticum*
Bay tree	*Laurus nobilis*
Bilberry	*Vaccinium myrtillus*
Bramble	*Rubus*
Barren strawberry	*Potentilla sterilis*
Bell heather	*Erica cinerea*
Bird's nest orchid	*Neottia nidus-avis*
Bluebell	*Hyacinthoides non-scripta*
Bugle	*Ajuga reptans*
Bush vetch	*Vicia sepium*
Cat's-ear	*Hypochaeris radicata*
Cleaver	*Galium aparine*
(Common) Dog-violet	*Viola riviniana*
Corn mint	*Mentha arvensis*
Creeping buttercup	*Ranunculus repens*
Enchanter's nightshade	*Circaea lutetiana*
Eyebright	*Euphrasia agg.*
Figwort	*Scrophularia nodosa*
Fool's parsley	*Aethusa cynapium*
Fool's watercress	*Apium nodiflorum*
Foxglove	*Digitalis purpurea*
Gorse	*Ulex europaea*
Greater stitchwort	*Stellaria holostea*
Hedge woundwort	*Stachys sylvatica*
Herb robert	*Geranium robertianum*
Honeysuckle	*Lonicera periclymenum*
Ivy	*Hedera helix*
Lesser celandine	*Ranunculus ficaria*
Lesser spearwort	*Ranunculus flammula*
Lords and ladies	*Arum maculatum*
Marsh thistle	*Cirsium palustre*
Marsh ragwort	*Senecio aquaticus*
Montbretia*	*Crocosmia x crocosmiflora*
Nettle	*Urtica dioica*

Opposite-leaved golden-saxifrage	*Chrysosplenium oppositifolium*
Pignut	*Conopodium majus*
Ragged robin	*Lychnis flos-cuculi*
Ramsons	*Allium ursinum*
Red bartsia	*Odontites vernus*
Rosebay willowherb	*Chamerion angustifolium*
Sanicle	*Sanicula europaea*
Self-heal	*Prunella vulgaris*
Slender St John's-wort	*Hypericum pulchrum*
Snow in Summer*	*Cerastium tomentosum*
Three-nerved sandwort	*Moehringia trinervia*
Tufted vetch	*Vicia cracca*
Tutsan	*Hypericum androsaemum*
Watercress	*Rorippa nasturtium aquaticum*
Water mint	*Mentha aquatica*
Wavy bittercress	*Cardamine flexuosa*
Wood anemone	*Anemone nemorosa*
Wood avens	*Geum urbanum*
Wood dock	*Rumex sanguineus*
Woodruff	*Galium odoratum*
Wood sage	*Teucrium scorodonia*
Wood sorrell	*Oxalis acetosella*
Wood speedwell	*Veronica montana*
Yellow Pimpernel	*Lysimachia nemorum*
Great wood-rush	*Luzula sylvatica*
Slender rush	*Juncus tenuis*
Soft rush	*Juncus effusus*
Toad rush	*Juncus bufonius*
Pendulous sedge	*Carex pendula*
Remote sedge	*Carex remota*
Tussock sedge	*Carx paniculata*
Wood-sedge	*Carex sylvatica*
Black spleenwort	*Asplenium adiantum-nigrum*
Bracken	*Pteridium aquilinum*
Broad buckler fern	*Dryopteris dilatata*
Hard fern	*Blechnum spicant*
Hart's tongue fern	*Phylittis scolopendrium*
Lady fern	*Athyrium filix-femina*
Maidenhair spleenwort	*Asplenium trichomanes*
Male fern	*Dryopteris filix-mas*
Polypody	*Polypodium vulgare*
Scaly male fern	*Dryopteris affinis*
Soft shield fern	*Polystichum setiferum*
Tunbridge filmy fern	*Hymenophyllum tunbrigense*
Wall rue	*Asplenium ruta-muraria*
False brome	*Brachypodium sylvaticum*

False oat grass	*Arrhenatherum elatius*
Hairy brome	*Bromus ramosus*
Timothy grass	*Phleum pratense*
Great horsetail	*Equisetum telemateia*

APPENDIX V. RISK ASSESSMENT

COLLATE – HAZARD IDENTIFICATION – RISK ASSESSMENT

OPERATION Research LOCATION Glenbower

HAZARD	CONSEQUENCE	RISK			CONTROLS	PERSON(S) RESPONSIBLE	RESULTANT RISK
		SEVERITY	LIKELIHOOD	NO. OF PEOPLE AFFECTED			
Uneven ground	Slips trips and falls	M	M	All	Awareness	Finbarr Wallace	L
Vegetation	Trips , falls, eye injury	M	M	ALL	Awareness, Eye Protection	Finbarr Wallace	L
Stinging insects	Allergic reaction to stings	H	M	All	First aid kit to include sting treatment. Be vigilant for the present of insects	Finbarr Wallace	L
Working alone	Isolated and unable to get help if injured	H	H	All	Notify friend or family member when working in the wood, expected time of arrival, carry mobile phone, give Forest Managers number to family member 087-9681074 in case of emergency.	Finbarr Wallace	L

SITE SAFETY CO-ORDINATOR _____ NAME: _____

ASSESSMENT COMPLETED BY John Landy SEEN BY _____

DATE 14/05/2010 DATE 10/6/10

APPENDIX VI: DAFOR & other statistics from selected sub-sites

Common Name	Scientific name	DAFOR
Canopy		
Sycamore	*Acer pseudoplatanus*	A
Beech	*Fagus sylavatica*	F
Ash	*Fraxinus excelsior*	A
Conifer	*Pinus spp*	O
Oak	*Quercus spp*	O
Understory		
Sycamore	*Acer pseudoplatanus*	F
Hazel	*Corylus avellana*	O
Holly	*Ilex aquifolium*	O
Elder	*Sambucus nigra*	O
Field		
Ivy	*Hedera helix*	D
Honeysuckle	*Lonicera periclymenum*	F
Bramble	*Rubus agg.*	F
Enchanters' nightshade	*Circea lutetiana*	F
Wood speedwell	*Veronica montana*	F
Germander speedwell	*Veronica chamaedrys*	F
Ramsons	*Allium ursinum*	O
Creeping buttercup	*Ranunculus repens*	R
Lords and ladies	*Arum maculata*	R
Hart's tongue fern	*Phyllitis scolopendrium*	O
Scaly male fern	*Dryopteris affinis*	O
Soft shield fern	*Polystichum setiferum*	O
Lady fern	*Athrium filix-femina*	R

Table 5A. Sub-site mapped as No. 25 Map 1 WD1

Common name	Scientific name	DAFOR
Canopy		
Sycamore	*Acer pseudoplatanus*	F
Ash	*Fraxinus excelsior*	A
Understorey		
Sycamore	*Acer pseudoplatanus*	O
Ash	*Fraxinus excelsior*	O
Field		
Ramsons	*Allium ursinum*	D
Scaly male fern	*Dryopteris affinis*	O
Soft shield fern	*Polystichum setiferum*	O
Ivy	*Hedera helix*	O
Bluebell	*Hyacinthinthoides non-scripta*	O
Wood dock	*Rumex sanguineus*	R
Cleaver	*Galium aparine*	R
Nettle	*Urtica dioica*	R
Common figwort	*Scrophularia nodosa*	R
Herb robert	*Geranium robertianum*	R
Pendulous sedge	*Carex pendula*	R
Bare soil		A
Dead wood/flotsam		F

Table 6A. DAFOR from sub-site mapped as No. 1 Map 1 WN4

Common name	*Scientific name*	DAFOR
Canopy		
Ash	*Fraxinus excelsior*	A
Alder	*Alnus glutinosa*	F
Conifer	*Pinus spp.*	F
Understorey		
Sycamore	*Acer pseudoplatanus*	O
Hazel	*Corylus avellana*	O
Elder	*Sambucus nigra*	O
Ivy	*Hedera helix*	F (tree bases)
Bramble	*Rubus agg*	F
Field		
Remote sedge	*Carex remota*	F
Veronica montana	*Wood speedwell*	O
Wavy bittercress	*Cardaminde flexuosa*	O
Opposite leaved golden saxifrage	*Chrysosplenium oppositifoilium*	F
Yellow pimpernel	*Lysimachia nemorum*	
Herb robert	*Geranium robertianum*	O
Lesser spearwort	*Ranunculus flammula*	
Bare ground		A

Table 7A DAFOR for sub-site mapped as No. 26 Map 1 WN4

Common name	Scientific name	DAFOR
Canopy		
Ash	*Fraxinus excelsior*	D
Understorey		
Hazel	*Corylus avellana*	O
Ash	*Fraxinus excelsior*	O
Field/shrub		
Bramble	*Rubus agg.*	D
Field		
Opposite leaved golden saxifrage	*Chrysosplenium oppositifolium*	A
Enchanters' nightshade	*Circea lutetiana*	F
Wavy bitteercress	*Cardamine flexuosa*	O
Herb robert	*Geranium robertianum*	O
Creeping buttercup	*Ranunculus repens*	O
Lord's and ladies	*Arum maculatum*	R
Ground		
Common tamarisk moss	*Thuidium tamariscinum*	D
Common feather moss	*Kinbergia praelongum*	F
Shining hookeria	*Hookeria lucens*	R
Soft shield fern	*Polystichum setiferum*	F
Scaly male fern	*Dryopteris affinis*	F
Hart's tongue fern	*Scolopendrium phyllitis*	R
Liverworts on ash		
Forked veilwort	*Metzgeria furcata*	F
Dilated scalewort	*Frullania dialata*	F

Table 8A DAFOR for sub-site mapped as No.4 Map 4 WN4

Understorey	Canopy	Shrub
Holly	Tsuga	Vacinnium
Sorbus	Standing dead (tsuga)	Vacinnium
Holly	Oak 49cms	Vacinnium
Holly	Birch 54cms	Vacinnium
Holly	Standing dead (tsuga)	Vacinnium
Oak	Tsuga	Sorbus
Tsuga	Birch coppice 87cms largest	Vacinnium
Tsuga	Birch 37cms	Vacinnium
Holly	Oak 48cms	Oak
Holly	Tsuga 124cms	Rhodedendron
Holly	Tsuga 109cms	Rhodedendron
Holly		

Table.9ACanopy and under storey statistics from sub-site mapped as No. 5 on Map 2 WD3_WN1

APPENDIX VI: Glossary

ANNEX HABITATS

'Natural Habitats of Community Interest whose conservation requires the designation of Special Areas of Conservation 'under the EU Habitats Directive 92/43/EU. Habitats appear in Annex I of the Directive

ANNEX SPECIES

Species appearing on Annexes II to V of the EU Habitats Directive 92/43/EC and Annexes I-IV of the Birds Directive 79/409/EC (as amended).

BoCCI Birds of Conservation Concern in Ireland

DAFOR A subjective, semi-quantitative, rapid method for assessing e.g. the vegetation composition of sites rating individual species or other taxa in an area as Dominant, Abundant , Frequent or Rare

DOMIN SCALE

A more quantitative measure of estimating cover of vegetation in a given area

Cover of 91-100% is recorded as Domin 10

Cover of 76-90% is recorded as Domin 9

Cover of 51-75% is recorded as Domin 8

Cover of 34-50% is recorded as Domin 7

Cover of 26-33 is recorded as Domin 6

Cover of 11-25% is recorded as Domin 5

Cover of 4-10% is recorded as Domin 4

Cover of <4% with many individuals is Domin 3

Cover of <4% with several individuals is Domin 2

Cover of <4% with few individuals is Domin 1

EPA Environmental Protection Agency. Irish governments agency protecting the environment through licensing, enforcement and monitoring.

IUCN International Union for the Conservation of Nature

NHA National Heritage Area. Sites designated for protection under Irish statutory instrument Wildlife Act (Amendment) 2000

RMP Record of Monuments and Places

SAC Special Area of Conservation. Areas designated for protection based on the EU Habitats Directive 92/43/EEC

SPA Special Protection Area. Areas designated for protection based on the EU Birds Directive 79/409/EEC