

1) SUMMARY OF THE IMPORTANCE OF CULBIN FOREST FOR BIRDS

a) Breeding Bird Community

In 1978 Culbin Forest was recognised by the British Trust for Ornithology (BTO) as a site of national importance for its woodland breeding bird community. This assessment has recently been confirmed by application of published SSSI selection criteria to the assemblage of breeding bird species known to occur in the Forest. These guidelines indicate that any woodland site which has an especially good range of characteristic bird species (defined in NE or NW Scotland as a 'BTO Index' of 35 or more) is eligible for SSSI designation on that criteria alone.

Recent observations show that the relevant BTO Index for Culbin Forest is 44.5, made up of the following species:-

Heron	- Up to 15 prs breed near Binsness.
Sparrowhawk	- At least 2 - 3 prs breed, possibly as many as 6 prs.
Buzzard	- At least 2 prs breed.
Osprey	- At least 1 pr regularly breeds in the forest or immediate vicinity.
Capercaillie	- See d below.
Woodcock	- Frequent breeding species.
Tawny Owl	- Frequent breeding species.
Long-eared Owl	- Probably at least 2 prs breed.
Greater spotted Woodpecker	- Frequent breeding species.
Tree pipit	- Frequent breeding species, especially in clearings.
Redstart	- Several pairs breed e.g. in boxes in the west and near Binsness.
Goldcrest	- Frequent breeding species.
Spotted Flycatcher	- Frequent breeding species.
Long-tailed Tit	- Frequent breeding species.
Crested Tit	- See b below.
Coal Tit	- Frequent breeding species.
Treecreeper	- Frequent breeding species.
Siskin	- Frequent breeding species.
Redpoll	- Known to breed.
Scottish Crossbill	- See c below.
Bullfinch	- Known to breed.

It is possible or probable that several other important species also breed within the Forest including stock doves, chiffchaff, garden warbler and blackcap. Stock doves were described as plentiful in the Forest in 1977 but there are no confirmed records of recent breeding. Chiffchaff are regularly heard singing.

Other important species have been recorded in Culbin Forest. Black grouse were present until the 1950's and nightjars (up to 4 prs) until c 1965. Goshawks were seen in the Forest on several occasions around 1975.

b) Crested Tit

The crested tit is one of Britain's scarcest breeding birds and our population is considered to be a distinct subspecies, *Parus cristatus ssp. scoticus* from Continental populations. The species is largely restricted to areas of native and planted Scots pine woodland in Moray, Inverness-shire and Easter Ross and the total British population is estimated to be only c 900 breeding pairs. The crested tit is protected by special penalties under Schedule 1 of the Wildlife and Countryside Act (1981).

Crested/

Crested tits were first recorded in Culbin in 1948 and the first nest was found in 1953. It is now widespread in the Forest. Recent studies have shown that it is particularly associated with areas of Scots pine rather than Corsican pine, it favours fairly open areas (e.g. areas of stunted trees) or areas with strongly side branching trees and it tends not to occur in young plantations (under 20 years old). Natural nest sites are usually excavated holes in Scots pine stumps but, given the relative scarcity of such sites, crested tits frequently use nest boxes in Culbin (12 pairs were known to breed in nest boxes in 1989).

The number of breeding pairs in Culbin Forest is very difficult to assess. M Crooke in the 1960's estimated a density of 0.05 pairs/hectare and a total population of 150 - 200 breeding pairs. A Deadman in 1973 estimated 0.1 prs/ha in parts of the Forest. M Cook in 1982 estimated an overall density in coastal pine plantations of 0.01 prs/ha but accepted that this figure could be an underestimate in some plantations such as Culbin Forest. Both M Cook and R Dennis (RSPB) now estimate the total breeding population in Culbin to be c 50 pairs, possibly more.

Any site which supports 1% or more of the British breeding population of a species is considered to be eligible for SSSI designation on this criteria alone. Culbin supports at least 5% of the British population of crested tits and is therefore clearly of national importance for the species. It is also worth noting that the coastal pine plantations, and particularly Culbin Forest, are the stronghold for the crested tit in Moray and Nairn with considerably greater densities than inland Scots pine plantations in Speyside and the Findhorn Valley.

It is likely that the population of crested tit in Culbin forest is subject to considerable short and longer term fluctuations. Short-term fluctuations may arise from occasional severe winters or mortality from pesticide applications (as is believed to have happened in the 1950's). Longer term factors could include the availability of natural nest sites and/or nest boxes and fluctuations in the overall species composition or age structure of stands in the Forest.

c) Scottish Crossbill

The Scottish crossbill is believed to be the only bird species which is endemic to Britain and it is largely restricted to native and planted Scots pine woodland in the Scottish Highlands. It is protected by special penalties under Schedule 1 of the Wildlife and Countryside Act (1981) and is identified in Annex 1 of the EC Directive on the Conservation of Wild Birds (79/409/EEC). The latter designation requires Member States to take special conservation measures concerning the habitat of listed species.

The total population of this species varies from year to year but is thought to be of the order of 500 breeding pairs. The species is known to breed in Culbin Forest and although no estimate of the population in Culbin is available, it is likely that this exceeds 1% of the British total. Culbin Forest is therefore probably of national importance for the Scottish crossbill.

d) Capercaillie

The capercaillie is another species associated with native and planted Scots pine woodland in the Scottish Highlands which is listed in Annex 1 of the EC Directive on the Conservation of Wild Birds (79/409/EEC). Following reintroduction of this species from Sweden in 1837, capercaillie became common in many parts of the eastern Highlands but have undergone a rapid decline in recent years (for reasons as yet unknown). The total British population is now thought to be c 2,000 birds.

Capercaillie/

Capercaillie were recorded in Culbin Forest in 1922 and almost certainly occurred before then. In 1975 there were estimated to be 60 - 80 birds in the Forest and 14 nest sites were discovered. The birds tended to favour the predominantly Scots pine stands of the Low Wood rather than the increasing proportion of Corsican pine in the east or the younger plantations near Loch Loy in the west. Detailed studies by A Jones between 1977 and 1980 confirmed a preference for older stands (especially in winter) and Scots pine. He also showed that although the breeding density was lower than in native pinewoods, it did reach 6.4 nests/km² in one area of Culbin Forest in 1978 with a total population density of 2 - 6 birds/km².

In 1986 only 3 capercaillie broods were recorded in Culbin Forest and recent observations of capercaillie have become infrequent. However, the Forest has until recently supported a significant population of this species and could have an important role in its possible future recovery.

e) References

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2) THE IMPORTANCE OF CULBIN FOREST FOR MAMMALS

Although the Culbin Forest has not been designated as part of the SSSI on the basis of any of the mammal populations it contains, several protected species do occur and enhance the value of the area.

- a) Otter The otter has undergone a serious decline over much of Europe, England, Wales and lowland parts of Scotland. Northern and western Scotland now form a major European stronghold for this species which is fully protected under Appendix II of the Berne Convention and Schedule 5 of the Wildlife and Countryside Act (1981).

Otters regularly breed in the vicinity of Loch Loy and Cran Loch immediately adjacent to the Culbin Forest. They also range over large areas of the nearby freshwater marshes, the foreshore and the drainage systems in the west of the Forest which connect these areas.

- b) Wildcat The wildcat has also undergone a decline over much of its European range and in Britain it is restricted to the Scottish Highlands. Wildcats are now also fully protected under Appendix II of the Berne Convention and Section 5 of the Wildlife and Countryside Act (1981).

Wildcats have been recorded in Culbin Forest on several occasions and whilst there are no confirmed records, it is probable that they do breed there.

- c) Pine Marten Pine martens have a very restricted distribution in Britain and are largely confined to the NW Highlands of Scotland. They are fully protected under Schedule 5 of the Wildlife and Countryside Act (1981).

In recent decades their range appears to have extended southwards and eastwards very slowly. Breeding has been reported in the Darnaway and Cawdor areas and individual animals have occasionally been seen elsewhere in Moray since the early 1970's. In Culbin Forest one was shot in 1970 and another seen near Binsness. A third sighting occurred near Binsness in 1971.

Whilst pine martens are almost certainly not yet resident in Culbin Forest, colonisation in the near future is a possibility and would be an important step in any future spread into Grampian Region.

- d) Red Squirrel The red squirrel has declined seriously in much of England, Wales and lowland Scotland where it has largely been replaced by the introduced grey squirrel. It is becoming increasingly restricted to mature native conifer (Scots pine) woodlands particularly in Scotland. Red squirrels are now fully protected under Schedule 5 of the Wildlife and Countryside Act (1981).

Red squirrels are fairly common in Culbin Forest.

- e) Badger Badgers remain common and widespread throughout most of Britain but due to increasing persecution in some areas they now receive special protection under the Badgers Act (1973), the Wildlife and Countryside Act (1981) and various later amendments to that Act.

In Culbin Forest, badgers are fairly common and there are several setts, mainly along the raised beach and close to the southern edge of the Forest.

- d) Bats All species of bats are protected under Schedule 5 of the Wildlife and Countryside Act (1981). Pipistrelles and possibly long-eared bats have been recorded in Culbin Forest.

3) SUMMARY OF THE IMPORTANCE OF CULBIN FOREST FOR INVERTEBRATES

In 1980, the NCC established the Invertebrate Site Register (ISR) in order to collate existing recent information on invertebrates throughout Great Britain and to evaluate sites of importance for the conservation of invertebrates. The Culbin Sands, Culbin Forest and Findhorn Bay SSSI is the only site in North Grampian (i.e. the Districts of Moray, Banff and Buchan and Gordon) which was identified as being of Grade A for its entomological interest. It is therefore considered worthy of designation as a top grade SSSI (or Nature Conservation Review Site) for this aspect of conservation interest alone.

The importance of the SSSI lies in the presence of several rare beetles, flies, butterflies and moths (at least 11 are listed in the 'Red Data Book'), the diversity of the beetle fauna and the presence of at least 3 species of beetle regarded as indicators of native pine woodland.

Many of the rare flies are associated with freshwater or saltmarsh habitats outside the Culbin Forest itself but the commercial plantations of the Forest are the main areas for many of the important beetles, moths and butterflies. Table 1 details those species which are wholly or partly associated with the Culbin Forest together with an indication of their status in Britain and sources of information.

ISR Report No. 66 describes a method of assessing the value of a site by using the occurrence of rare species. It proposes a scoring system dependent on the number and rarity of species found on a site and suggests that any site scoring 200 or more is of a suitable standard to be selected as an SSSI on the basis of its invertebrates. Applying this system to the species listed in Table 1, Culbin Forest would score 1320. This therefore supports the assessment that the Culbin Forest itself is worthy of SSSI status for its invertebrates even without considering neighbouring habitats within the existing SSSI or other wildlife or geomorphological features.

Further Details On Various Invertebrate Species

- a) Kentish Glory Moth - Recent surveys have shown that this spectacular moth is now only known to occur at 16 sites in Britain, mainly in Speyside, Deeside and the Moray Coast. 3 of these sites occur at Culbin. Adult males fly actively in sunshine during March and April but females fly only at night. Larvae feed largely on young regenerating Betula pendula where it occurs in a fairly open matrix with many interconnecting clearings.

At Culbin, the Kentish Glory has been found near Loch Loy, Maviston Dunes and near Binsness. It appears to be associated with birch regeneration or stump regrowth in open clearings, particularly where there is significant failure of newly planted conifers. Culbin is clearly a stronghold for this species in Britain.

- b) Narrow-bordered Bee Hawkmoth - This species is mainly associated with bogs, wet meadows and woodlands where it often visits the flowers of bugle (Ajuga). It is diurnal, flying in May and June. Larvae feed on scabious (Succisa).
- c) Small Blue Butterfly - A scarce and vulnerable species in Scotland where it is largely restricted to a few sheltered coastal areas in eastern Scotland. Culbin contains one of the largest populations on the Moray Firth. The small blue larvae feed on kidney vetch (Anthyllis). At Culbin the species is mainly found on dunes at the edge of the Forest but it also occurs in open rides within the Forest e.g. the area of Maviston sandhills. Adults emerge from late May to early July.

d)/

- d) **Dingy Skipper Butterfly** - Another scarce and inconspicuous butterfly in Scotland, where it is virtually restricted to Moray, Strathspey and SW Scotland. Culbin contains one of the largest populations in Moray and, as with the small blue, it is mainly found on dunes at the edge of the Forest or in rides with bare earth or pebbles. Larvae feed on birdsfoot trefoil (Lotus) and adults emerge from late May to early July.
- e) **Southern Hawker Dragonfly** - This species was not thought to occur in Scotland until 1978 when a small breeding colony was discovered at a pond in Culbin Forest. It has since been recorded at 2 other sites (on the Black Isle and in Sutherland).
- f) **Pinewood Beetles** - The diversity and quality of the beetle fauna in Culbin Forest is of considerable nature conservation interest, particularly due to the occurrence of several scarce species and also some species which are usually associated with native pinewood relics.
- g) **Water Beetles** - 3 notable water beetles have been recorded in pools near the Buckie Loch prior to 1951. These may still survive there (2 spp still occur at Loch Loy) as might 5 other notable species recorded at "Culbin" in 1892.

TABLE 1**Important Invertebrate Species Recorded From Culbin Forest (excluding the coast and Lochloy areas)**

<u>Species</u>	<u>Status</u>	<u>Source</u>
<u>Lepidoptera</u>		
Kentish Glory Moth (<u>Endromis versicolora</u>)	RDB 3	Shirt (1987); ISR Report No. 46 (1983); Barbour (1989); ISR Report No. 66 (1986).
Narrow-bordered Bee Hawk-moth (<u>Hemaris tityus</u>)	Notable A (previously con- sidered RDB 2)	ISR Reports No. 24 (1983), No. 46 (1983), No. 66 (1986).
<u>Monopis imella</u>	Notable B	ISR Reports No. 24 (1983), No. 66 (1986).
<u>Anerastia lotella</u>	Notable (Scotland) D2	ISR Reports No. 24 (1983), No. 66 (1986).
<u>Batia lambdella</u>	Notable (Scotland) C1	ISR Reports No. 24 (1983), No. 66 (1986).
Small Blue Butterfly (<u>Cupido minimus</u>)	Notable (Scotland)	ISR Reports No. 24 (1983), No. 66 (1986).
Dingy Skipper Butterfly (<u>Erynnis tages ssp. tages</u>)	Notable (Scotland) B2	ISR Reports No. 24 (1983), No. 66 (1986).
<u>Diptera</u>		
A Robber Fly (<u>Laphria flava</u>)	RDB 3	Shirt (1987); ISR Report No. 24 (1983); ISR Report No. 66 (1986).
<u>Odonata</u>		
Southern Hawker Dragonfly (<u>Aeshnea cyanea</u>)	Notable (Scotland)	Hammond (1985); ISR Report No. 66 (1986).
<u>Coleoptera</u>		
<u>Magdalis phlegmatica</u>	Notable A/PW2	ISR Report No. 24 (1983), No. 66 (1986).
<u>Thanasimus rufipes</u>	Notable A/PW1	ISR Report No. 24 (1983), No. 66 (1986).
<u>Tropiphorus obtusus</u>	Notable A	ISR Report No. 24 (1983), No. 66 (1986).
<u>Cetonia cuprea</u>	Notable B	Barbour (pers. comm. 1990); ISR Report No. 66 (1986).
<u>Chrysomela aenea</u>	Notable B	ISR Report No. 24 (1983), No. 66 (1986).
<u>Cimberis attelaboides</u>	Notable B	Hunter (1977), ISR Report No. 66 (1986).
<u>Ernobius nigrinus</u>	Notable B/PW1	ISR Report No. 24 (1983), No. 66 (1986).
<u>Hallomenus binotatus</u>	Notable B	ISR Report No. 24 (1983), No. 66 (1986).
<u>Orchesia minor</u>	Notable B	ISR Report No. 24 (1983), No. 66 (1986).
<u>Pissodes castaneus</u>	Notable B/PW2	ISR Report No. 24 (1983), No. 66 (1986).
<u>Pogonocherus fasciculatus</u>	Notable B/PW2	ISR Report No. 24 (1983), No. 66 (1986).
<u>Rhagium/</u>		

<u>Rhagium inquisitor</u>	Notable B/PW1	ISR Report No. 24 (1983), No. 66 (1986).
<u>Strangalia quadrifasciata</u>	Notable B	ISR Report No. 24 (1983), No. 66 (1986); Drane (1984).
Bee Beetle (<u>Trichius fasciatus</u>)	Notable B	ISR Report No. 24 (1983), No. 66 (1986); Barbour (pers. comm. 1990).
<u>Xantholinus laevigatus</u>	Notable B	ISR Report No. 24 (1983), No. 66 (1986).
<u>Anisotoma glabra</u>	Notable (Scotland)/ PW2	ISR Report No. 24 (1983), No. 66 (1986).
<u>Lagria hirta</u>	Regionally notable	ISR Report No. 24 (1983), No. 66 (1986).
<u>Omalium rugulipenne</u>	Regionally notable	ISR Report No. 24 (1983), No. 66 (1986).

Coleoptera (Water beetles recorded from near Buckie Loch)

<u>Acilius canaliculatus</u>	Notable B	Richter (1951)
<u>Agabus labiatus</u>	Notable B	Richter (1951)
<u>A. chalconatus</u>	Notable B	Richter (1951)

Notes on Status:-

RDB 2	Vulnerable in G.B. Species with rapidly decreasing populations under threat throughout their range.
RDB 3	Rare in G.B. Species with small populations at risk in part or all their range.
Notable A	Species with a very restricted distribution in G.B., recorded from 30 or less 10km squares.
Notable B	Species with a restricted distribution in G.B., recorded from 100 or less 10km squares.
Notable (Scotland)	Equivalent to Notable B within Scotland.
Regionally notable	Regionally notable in Scotland. Known from 10 or fewer localities.
B2	Northern sub-species with a very restricted range in Scotland.
C1	Thinly distributed species with up to 5 squares in Scotland.
D2	Southern species (at least 100 squares in G.B.) with 2 - 5 squares in Scotland.
PW1	Species whose geographic range in G.B. lies within the relic Caledonian forests.
PW2	Pine species which occur more widely than the relic Caledonian forest.

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4) SUMMARY OF THE IMPORTANCE OF CULBIN FOREST FOR RARE FLOWERING PLANTS

Mary McCallum-Webster (1968) listed over 550 species of flowering plant which have been recorded in the Culbin Forest and immediate area. This diversity derives from the wide range of habitats which occur in the area and the position of Culbin and Findhorn Bay on a significant phytogeographical boundary. 48 species occur at their northern limit on the east coast and 3 at their southern limit.

At least 28 nationally or regionally scarce species are known to occur (or to have occurred) within the area of Culbin Forest (i.e. excluding the foreshore and privately-owned areas around Loch Loy and Cran Loch). Many of these have apparently disappeared, however, due to afforestation, drainage and changes in the Buckie Loch area.

a) One-flowered Wintergreen (*Moneses uniflora*)

Moneses is an evergreen perennial herb which is now very rare in Britain and is only known to occur in 15 localities (in Moray, Nairn, Inverness-shire and East Sutherland). It is listed in the British Red Data Book on Plants as "Vulnerable" and several colonies have disappeared or are declining as a result of felling and other forestry operations.

In the past this species was described as increasing rapidly in Culbin, especially in the east of the forest, and it has been recorded in at least 13 of the 1km squares which cover the area. It is presently known from 5 localities within the FC Forest and another in privately owned woods at nearby Loch Loy. Several colonies have only recently been rediscovered and it is likely that further colonies may still survive within Culbin Forest.

Given the presence of 5 of the 15 British *Moneses* localities in Culbin Forest, the Forest is clearly of national importance for this species. 2 of the colonies in Culbin contain over 100 flowering heads and are therefore also amongst the largest of the surviving colonies in Britain.

Our knowledge of the requirements of *Moneses* is still poor. It seems to require moist ground conditions and appears to grow equally well on the edge of lochans, in wet birch/willow woods and in pinewoods (including plantations). Studies have been set up at Balblair in Sutherland and at Kew Gardens to investigate the longevity of individual plants, the growth form, seed viability etc.

b) Other Rare "Pine Woodland" Species

In addition to *Moneses*, Culbin Forest also contains colonies of 5 other nationally scarce flowering plants often associated with native pinewoods. These are toothed wintergreen (*Orthilia secunda*), intermediate wintergreen (*Pyrola media*), creeping lady's tresses (*Goodyera repens*), twinflower (*Linnaea borealis*) and coralroot orchid (*Corallorhiza trifida*). These species all have a strongly continental or northern distribution in Britain.

Orthilia occurs in at least 12% of the compartments of the Forest, mainly to the NE of Wellhill and in the Maviston Dunes area. It occasionally forms spectacular stands in Culbin.

Pyrola media is described by McCallum-Webster as very rare in Culbin, occurring on fixed dunes to the west of Buckie Loch. Recent reports from this area in 1986 and 1990 require confirmation and the species may well be extinct in the Forest.

Goodyera/

Goodyera is even more widespread and abundant in the Forest and occurs in at least 81% of forest compartments. The abundance of this species in Culbin is outstanding in Scotland, and therefore in Britain.

Linnaea has only recently been found in Culbin and 2 colonies are now known.

Corallorhiza was described as abundant in mature plantations and beneath willows by McCallum-Webster but it is now only locally abundant in wet hollows to the west of the Buckie Loch and appears to be very rare elsewhere in Culbin Forest.

In addition to the above nationally scarce species, Culbin Forest may also still support a regionally rare species, yellow bird's-nest (Monotropa hypopitys), which is also often associated with pine woodland. 20 plants were recorded in Culbin Forest in 1975.

c) Other Rare Species

A number of other nationally and regionally scarce plants have been recorded from several marshy areas in Culbin Forest and particularly the Buckie Loch. Many of these have however declined or disappeared due to drainage, afforestation and coastal changes.

Nationally scarce species recorded at the Buckie Loch or nearby drainage systems include the lesser tussock sedge (Carex diandra) and water sedge (Carex aquatilis) both of which still occur. Regionally scarce species include adder's tongue (Ophioglossum vulgatum), greater spearwort (Ranunculus lingua), greater butterfly orchid (Platanthera chlorantha), twayblade orchid (Listera ovata), gypsywort (Lycopus europaeus), skullcap (Scutellaria galericulata), greater tussock sedge (Carex paniculata), false fox sedge (C. otrubae) and whorl grass (Catabrosa aquatica). Of these Ophioglossum, Ranunculus, Platanthera and Catabrosa have not been recorded in recent years.

A number of damp slacks or "Winter" lochs also existed in the eastern part of Culbin Forest earlier this century. These contained nationally scarce species namely marsh clubmoss (Lycopodiella inundata) and bog hair grass (Deschampsia setacea) and also the regionally rare many-stalked spike-rush (Eleocharis multicaulis) and royal fern (Osmunda regalis). Lycopodiella was last seen in a dry slack in 1976 and the others were last reported in the 1950's. All are probably now extinct in Culbin Forest.

The water violet (Hottonia palustris) was another regionally rare plant which occurred in a water dam near Binsness until this was drained in 1958.

Finally, a number of nationally scarce species still occur on the margins of the nearby saltmarshes including various open areas on the edge of the Forest to the west of the Buckie Loch, in the Maviston Dunes area and to the north of Loch Loy. These species include Scottish scurvy-grass (Cochlearia scotica), sand centaury (Centaureum littorale), baltic rush (Juncus balticus) and the eyebright Euphrasia foulaensis. The regionally scarce sea rush (J. maritimus) also occurs.

Recently published guidelines for the selection of biological SSSI use a scoring system based on the number of nationally rare or nationally scarce species to indicate whether a site is eligible for SSSI designation on the basis of plant species found there. Any site scoring 200 or more is considered suitable for designation.

Using this system, the plantations of Culbin Forest would score 300 - 350 based on the occurrence of the 5 or 6 species described in a and b above. The Forest would also qualify/

qualify as an SSSI on the basis of supporting a substantial proportion of the British localities of a Red Data Book species (Moneses) and exceptional populations of Goodyera, Orthilia and Pyrola minor.

Similarly, the Buckie Loch area and coastal fringe would score 300 based on the 6 nationally scarce species described in c above which are still known to occur in the area.

5) SUMMARY OF THE LICHEN INTEREST OF CULBIN FOREST

In 1984 NCC contracted the British Lichen Society to undertake a survey and assessment of the lichen interest of lowland heath, dune and machair sites in Great Britain. Approximately 600 sites were surveyed and this led to the fullest evaluation of sites of terricolous lichen interest ever made in Britain.

Of the 600 sites assessed, Culbin Sands was one of only 4 sites evaluated as Grade 1, i.e. sites of "International Importance" containing the best known examples of particular communities or assemblages. The BLS report describes the site as follows:-

"The largest sand dune system in Britain but now extensively afforested with conifers (especially Pinus sylvestris and P. nigra var. maritima), dating from 1839. Amongst the forest cover are areas of shingle and sandy ridges on which trees remain stunted. This provides open, yet sheltered environments for one of the finest examples of lowland, acidic lichen-heath in the British Isles, in terms of both luxuriance and floristic diversity.

27 species of Cladonia have been recorded (in 1987 this had risen to at least 30 species). It is the most westerly European, and the only British site for the boreal-continental Cladonia uncialis subsp. uncialis (the oceanic subsp. biuncialis being common in Britain). The rare Stereocaulon condensatum is extremely abundant here, is richly fertile and often hosts the rare lichenicolous fungi Polycoccum tryphelioides and Scutula stereocaulorum. The often taxonomically difficult pair, Coleocaulon aculeatum and C. murricatum present no problems here as they occur in discrete, abundantly fertile cushions, unaffected by trampling or exposure. Other noteworthy terricoles include Cladonia carneola, C. coccifera f. ochrocarpia, C. cornuta, C. rangiferina, C. zopfii and Ochrolechia frigida. However, the lichenological importance of Culbin lies not so much in its rarities, but more with its unique and well documented history and consequent luxuriant lichen communities. It is of immense potential interest for studies in ecology, dynamics, phytosociology and biosystematics. There is no comparable site in Britain, with the minor exception of the much smaller, and only recently planted, Kinnaber Links in Angus. Furthermore, we are not aware of any closely similar site in mainland Europe (e.g. Denmark); some pine forests in Sweden or Finland may be superficially similar but lie within different climatic and phytogeographical regions".

Further studies by Dr B J Coppins, Dr P Lusby, K Ross etc. have identified at least 130 taxa (excluding forms) including 49 terricolous taxa and 15 species on pebbles in lichen heath. These include 9 species which are rare in the British Isles (5 terricolous, 3 saxicolous and 1 on pine trees) and 2 species which are normally found at high altitudes in the British Isles. The composition of the Cladonia dominated communities on open fixed shingle and on needle litter under a tree canopy differ markedly with the latter being very spectacular but relatively less species-rich.

Recent surveys by P Lusby have confirmed that the richest and most important areas for lichens occur in some 32 (14%) forest compartments at Culbin, particularly areas of shingle substrates in the east of the Forest. Elsewhere, other areas of lichen interest occur under older plantings and on more open dune substrates.

In addition to the terricolous lichen interest, the BLS also indicated that:-

"Culbin/

"Culbin Forest is of additional interest for studies on epiphytic lichens as it is a site with relatively old, planted Pinus sylvestris, remote from existing native pinewoods, and as such is valuable for the determination of old woodland indicator lichen species for the native pinewoods".

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6) SUMMARY OF THE IMPORTANCE OF THE CULBIN FOREST FOR FUNGI

The following summary was provided by Dr R Watling of the British Mycological Society and Royal Botanic Garden, Edinburgh in December 1990:-

"The larger fungi of Culbin Forest, reflect the history, geographical position, soil structure and higher plant community. In so doing there is really no comparable locality in Scotland. Indeed the complex flora composed of members of the remnant caledonian pine-forest and exotic taxa intermixed with many of the more familiar woodland fungi especially those of some northern communities is unique. The flora which has evolved has in some ways the composition of the macromycete floras of the Great Lake region, or the Pine-barren of the N Atlantic sea-board of North America.

Culbin Forest also holds its real treasures, one being the rare Laccaria maritima Thoe. With the presence of sand-dune communities, dense willow carrs, developing birchwoods and a spectrum of exotic conifers within a single area there is an exceedingly rich flora.

With the artificial nature of the Culbin Forest a fungal flora has developed which has not been recorded elsewhere undoubtedly because certain elements were not able to invade the community or if they did were pushed out and not allowed to establish themselves because of competition. Others have become even more dominant than in their native communities, including some otherwise rather rare fungi. Thus Suillus flavidus usually confined to Sphagnum bogs is well established."

7) SUMMARY OF THE IMPORTANCE OF CULBIN FOREST FOR VEGETATION COMMUNITIES

The Culbin Sands, Culbin Forest and Findhorn Bay SSSI is recognised as a key SSSI of national importance for the vegetation communities associated with the largest sand dune system in Britain and related coastal features. The site is particularly important for the exceptional extent of several vegetation types, their characteristically northern or north-eastern composition and the occurrence of several outstanding examples of vegetation successions including the following:-

- a) Intertidal flats → saltmarsh → brackish marsh → alder woodland.
- b) Strandline → mobile dunes → dune grassland → dune heath → Scots pine woodland.
- c) Seasonally flooded dune slacks → alder/willow/birch woodland.
- d) Permanent open water → mires (bogs or fens) → woodland (pine or alder).
- e) Bare shingle → shingle (or lichen) heath → scrub.

Several of these important vegetation communities occur outside the Culbin Forest itself (e.g. open waters and intertidal flats) and afforestation has clearly had a major impact on large areas of the former dune system. The extent of mobile dune, dune grassland, slack and dune-heath vegetation has been greatly reduced whereas the extent of pine woodland vegetation (albeit under a modified canopy) and lichen heath has been greatly increased. However, virtually all the component elements of the former dune and related coastal vegetation are still present and the Forest remains an important part of the SSSI for this reason.

The following account briefly describes the main vegetation communities which are of interest within Culbin Forest (as opposed to other parts of the SSSI).

a) Saltmarsh

Extensive and important saltmarsh vegetation occurs to the NW of the Forest boundary and extends into the Forest itself at several points between the Buckie Loch and Kingsteps. The areas of marsh within and immediately adjacent to the Forest are only rarely inundated by High Tides and are largely composed of "upper marsh" vegetation with Festuca rubra, Agrostis stolonifera, Glaux maritima, Armeria maritima, Plantago maritima, Triglochin maritima, Juncus gerardii and Cochlearia spp. The upper edge of the marsh also supports a short turf grassland which extends along much of the Forest edge and several dry hollows in compartment 67 (west of Buckie Loch). This contains abundant Juncus balticus, Centaureum littorale, Empetrum nigrum, Euphrasia foulaensis, Potentilla anserina, Ligusticum scoticum and Sagina spp.

At several points on the upper shore, freshwater channels enter the saltmarsh and create brackish conditions. Species such as Erica tetralix, Schoenus nigricans, Carex flacca and Scirpus maritimus occur. Brackish marsh is particularly extensive in compartment 67 where it contains scattered alder "bushes" and there is an unusual transition to alder carr woodland.

Some of the most important features of the Culbin saltmarshes are the extent and richness of these upper marsh and transition vegetation communities. These have often been lost from other systems due to reclamation etc. and Culbin represents some of the most exceptional remaining examples in northern Scotland. A significant extent of these communities occurs within or immediately adjacent to Culbin Forest and are an important feature of the Forest.

b)/

b) Strandline and Mobile Dunes

These habitats and their associated plant communities were formerly very extensive in the area of the Culbin Forest, especially in the east and the Maviston Dune area. They are now largely confined to the offshore bars, the "New" Spit (west of Buckie Loch) and the coastal edge at Buckie Loch itself. These are all areas where there is still regular movement of sand and where plant species and communities which can tolerate such conditions can thrive. At Culbin the vegetation largely consists of Ammophilla arenaria, Elymus farctus, Leymus arenarius, Cakile maritima, Atriplex spp, Honkenya peploides, Cirsium arvense and Senecio jacobea. Such communities are fairly typical of such habitats in Scotland and are not exceptional. However, those areas which do remain (some on the edges of Culbin Forest itself) are representative of former vegetation cover over large areas of the Forest and are therefore of conservation interest.

c) Dune-Grassland

Where dunes become more stable and "fixed", a more complete vegetation cover develops consisting of less vigorous Ammophilla together with a wide range of other species including Carex arenaria, Festuca rubra, Agrostis capillaris, Lotus corniculatus, Viola spp, Ligusticum scoticum and several mosses and lichens. Such communities would have been more extensive at Culbin in the past but still occur in the Buckie Loch area, the "New" Spit to the west, compartment 67 and at several points along the margin between plantations and saltmarshes between compartment 67 and Kingsteps. Modified vegetation resembling these communities also occurs within the forest itself such as on rides and in some felled areas.

Dune grassland vegetation at Culbin is also fairly typical of such habitats in Scotland and is not exceptional. However, those areas which remain (most of which are within or on the margins of Culbin Forest) are representative of former vegetation cover over large areas of the Forest and are therefore of conservation interest.

d) Dune-Heath

The fixed sands at Culbin are acid in composition due to initially low lime content and subsequent leaching. On stable dunes there is therefore a rapid succession from dune grassland to a distinctive dune-heath vegetation community and this was one of the most extensive habitats in the Culbin Sands, particularly in more stable areas in the west. Dune-heath is still fairly widespread in Culbin Forest. Significant open areas remain in compartment 67, along the coastal edge and in parts of the west (e.g. the firebreak in compartment 214). There are also large areas of Culbin Forest (again mainly on the coastal edge and in the west) where dune-heath vegetation survives under a planted Scots Pine canopy, on rides and on track margins.

The main components of dune heath at Culbin are Calluna vulgaris (var. pubescens), Empetrum nigrum, Carex arenaria and abundant lichens (especially Cladonia spp). Grasses include Festuca ovina, F. rubra, Agrostis canina, Nardus stricta, Deschampsia flexuosa and Anthoxanthum odoratum and there are several associated herbs such as Potentilla erecta and Anthyllis vulneraria. Species such as Ammophilla, Armeria and Plantago maritima also occur in small amounts. Shrubs such as juniper, whins and broom are locally common.

Few/

Few dune systems in Britain are sufficiently large, stable, acid and relatively unmodified to support extensive areas of such dune-heath vegetation, the best example being the Sands of Forvie near Aberdeen. Despite its modification, the dune-heath which remains in Culbin Forest is still amongst the most extensive examples in Britain and is therefore of considerable conservation importance.

e) Pine Woodland

In an unmodified dune system, there would tend to be a natural succession from dune-heath to woodland where conditions within the system were particularly stable and sheltered. The size of the system at Culbin would have allowed considerable scope for such communities to develop through natural colonisation and regeneration of birch species and Scots pine. In 1906, about half the Culbin Sands supported a tree cover and whilst much of this was a result of plantings by private owners since 1839, significant areas were likely to have been a result of natural regeneration. Several descriptions prior to FC purchase in 1922 refer to the presence of open woodland of self-sown birch and old pine on the inland parts of the Sands and in the Low Wood.

At present, exceptional examples of semi-natural pine-birch juniper woodland developed on blown sands can be seen in the Maviston/Loch Loy area. However, large areas of the Culbin Forest also support a characteristic pine woodland vegetation community, albeit under a modified canopy. Such vegetation consists of Calluna with Erica cinerea, Goodyera repens, Deschampsia flexuosa and many pleurocarpous mosses such as Hylocomium splendens, Pleurozium shreberi, Hypnum jutlandicum, Rhytidiadelphus triquetrus, Dicranum scoparium and Plagiothecium undulatum. The moss Ptilium crista-castrensis, a species usually associated with "Atlantic" woodlands in western Scotland, is also present in several areas. Other species include birch (Betula pendula), rowan, holly, juniper, Vaccinium spp, Lycopodium clavatum, Trientalis europaea, Listera cordata, Pyrola minor, P. media, Orthilia secunda, Moneses uniflora, Linnaea borealis and Corallorhiza trifida. In some areas, possibly due to heavy shading, Calluna becomes scarce and the vegetation becomes more dominated by mosses and a sparse cover of Deschampsia.

Such vegetation is clearly recognisable as the Erica cinerea - Goodyera repens sub-community of Pinus sylvestris - Hylocomium splendens woodland in the National Woodland Classification. Such woodland is confined to the eastern Highlands where it occurs in a few areas of dense native pinewoods but also in Scots pine plantations around the Moray Firth. The Culbin Forest represents the most extensive and well-developed example of this community and is therefore of major conservation importance.

f) Oak/Birch Woodland

The pine woodland vegetation community described in e) above is associated with the large areas of acid soils in Culbin Forest derived from blown sands. In some areas of the Forest, however, richer soils occur due to either enrichment by ground water movement or different parent material. The latter is particularly evident above the raised cliff in the High Wood and parts of Loch Loy Woods.

In such areas the tree canopy may still be predominantly planted Scots pine but the shrub and ground vegetation are often considerably different from that found in e). Species such as sessile oak, downy birch, hazel, holly and hawthorn occur. The ground/

ground vegetation is largely dominated by grasses (Holcus and Poa spp) with a wide variety of herbs and fens etc. including Lonicera periclymenum, Melandrium rubrum, Rubus fruticosus, R. idaeus, Oxalis acetosella, Viola riviniana, Ajuga reptans, Corydalis claviculata, Dryopteris spp, Blechnum spicant, Luzula pilosa and L. sylvatica.

Such vegetation is normally associated with the Quercus petraea - Betula pubescens - Oxalis acetosella woodland community identified by the National Vegetation Classification. This community is widespread in northern Scotland and the examples at Culbin Forest are not of outstanding conservation importance. However, they are of interest in demonstrating the contrast between vegetation on different soils in the Culbin area and they also add to the diversity of Culbin Forest.

g) Dune Slacks

Dune slacks are seasonally flooded or damp hollows which develop within dune systems where sand movement exposes the underlying water table. They support particularly distinctive and diverse plant communities which are tolerant of a fluctuating water table. In a mobile dune system such slacks tend to be temporary features, older areas being eventually inundated by sand and newer areas being created behind advancing dunes.

The area of Culbin Forest contained outstanding dune slack communities in the past. Most have been lost due to afforestation and drainage. The fixing of the dune system has resulted in many of those which do remain developing through succession to woodland and no new slacks being created.

However, some dune slack communities do still occur within the Forest, particularly in open areas of Loch Loy/Maviston woodlands, in adjacent areas in the west of Culbin Forest itself, and near the Buckie Loch. They consist of Calluna, Erica tetralix, Salix repens, Potentilla anserina, Hydrocotyle vulgaris, Ranunculus flammula, Carex nigra, C. echinata and Juncus squarrosus. Such slack vegetation is generally very limited in extent throughout Britain and although much depleted in size, the few remaining areas of open slack vegetation in Culbin Forest are nevertheless of considerable conservation value and should be retained.

Within the majority of Culbin Forest, however, open slack vegetation in damp hollows has been replaced by pine plantation or by natural succession of birch and willow scrub. Salix repens occasionally still occurs but the ground vegetation often consists of Juncus effusus, Carex nigra, Sphagnum capillifolium, S. fimbriatum, S. girgensohnii and Polytrichum commune. Such modified communities are generally of little conservation value but do add diversity to the overall Forest.

h) Fens/Alder Woodland

Fens are associated with areas where a permanently high water-table gives rise to fairly nutrient rich conditions. The only such areas within Culbin Forest occur in the area of the former Buckie Loch and in nearby compartments 67 and 70. These have long been known as important botanical sites with several rare species (see section 4) and although the site has progressively dried out and several species have disappeared, these fen areas remain regionally important examples of fen habitat.

The wettest areas support open fen swamp with Typha latifolia, Menyanthes trifoliata, Caltha palustris, Iris pseudacorus, Potentilla palustris, Equisetum fluviatile, Lychnis flos-cuculi, Carex rostrata, C. diandra, Eriophorum angustifolium and Lycopus europaeus. Drier areas support significant stands of alder and willow woodland with a predominantly grassy/

grassy ground vegetation. These woods also contain Listera ovata, Filipendula ulmaria, Scutellaria galericulata, Viola palustris, Carex remota and C. paniculata.

The recent erosion of dunes to the north of the former Buckie Loch now allows periodic inundation of the eastern parts by saltwater. This is already having a major impact on the grassland and vegetation in these areas including the death of many willows. The vegetation of these areas now resembles dune slack communities and it is likely that further changes will continue to affect these former fens. However, such changes are of some conservation interest themselves.

i) Shingle Heath

Culbin SSSI contains several extensive areas of mobile and fixed shingle ridges and these support a distinctive range of vegetation communities which are associated with the peculiar growing conditions which shingle provides. The majority of these communities are located on the Nairn Bar which is one of the most outstanding shingle sites in northern Britain and Europe. Several areas of shingle heath also occur within the Culbin Forest and although modified by plantations these are also nationally and internationally important examples of the associated vegetation communities.

The principal areas within Culbin Forest occur in the "Central Shingle Fans" (compartments 60, 68, 69, 71 - 74 etc.), south and east of the Buckie Loch (compartments 64, 39 - 44 etc.) and the Hill of Findhorn (compartments 3, 6 and 10). These contain shingle-heath vegetation which has a characteristically sparse cover of vascular plants (mainly occasional clumps of Calluna, Empetrum and broom) and an abundance of lichens. In the most extreme situations the vegetation is almost entirely composed of a wide range of lichen species and such communities in Culbin Forest are of international importance - see section 5.

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