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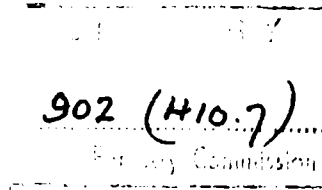
CULBIN

FOREST

E(S) CONSERVANCY

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FORESTRY COMMISSION

HISTORY

of

CULBIN FOREST

1921 - 1951

EAST (SCOTLAND) CONSERVANCY

HISTORY OF CULBIN FOREST

CONTENTS

	Page
CHAIRMAN'S COMMENTS	1
DIRECTOR'S COMMENTS	5
GENERAL DESCRIPTION OF THE FOREST	
Origin of Name	6
History prior to Acquisition	6
Area and Utilization Section	6
Physiography	9
Risks - animals, fungi, insects, fire	9
Roads	10
Labour and Housing	12
SILVICULTURE	
Acquired Plantations	13
Preparation of ground - Fixation of the Sand	14
Choice of species and Planting methods	15
Forestry Commission Plantations	15
Rates of Growth	18
Thinning and Utilization of Produce	18
Research	19
Comments by State Forests Officer	21
APPENDICES	
I Notes from Inspection Reports	22
II Record of Supervisory Staff	26
III Map of the Forest	

HISTORY OF CULBIN FOREST

CHAIRMAN'S COMMENTS

I made one or more inspections of Culbin soon after its first acquisition and possibly one before but there are no records of any visit before September 10th, 1924.

The first acquisition at Culbin was made with some hesitation as the attached extract from Headquarters Acquisition file shows. Personally I was uneasy about some of the early Scottish acquisitions and not disposed to take on any more difficult areas.

As viewed when we were beginning, the afforestation of these dunes was a really formidable undertaking. There was evidence to show that Scots pine would grow, if only slowly, on fixed dunes at low elevations and from the Chadwick Woods at Binsness that Corsican pine could be got to grow better than Scots by using methods which we could not ascertain on what had presumably been moving sand also at low elevations. But the vast stretch of dunes, reaching to about 100 ft. above sea level, and stretching from West to East for some half-dozen miles was a totally different proposition. Here the sand was constantly on the move, tending on the one hand to fill up the inland lakes and on the other to reveal the underlying pebble beaches. A disturbing feature was the constant occurrence of "blow-outs" ("kettle-holes") which rapidly cut into the windward faces of the dunes.

We knew from the classic example of the Landes of Gascony that such dunes could be fixed with the aid of marram grass and other devices and that it was desirable by drainage to control the level of the landward lakes. There the French had used the maritime pine almost exclusively and with great success. The few examples we could find of that species did not encourage its use at Culbin; in fact it was probably well without its natural range.

It was recognized at once that the general drift of the sand was with the prevailing wind, that is from West to East and that sand fixation and planting should proceed accordingly in that direction. In that way the supply of new sand would be progressively cut off at its source.

Marram grass was to be relied on as the first fixing agent before planting, supplemented by a limited amount of thatching of incipient blow-outs. Advances on to the moving sand were to be cautious until more experience was gained and advantage was to be taken of any fixed or semi-fixed sand so as gradually to build up shelter and slow down sand movement. It was hoped in this way gradually to hem in the individual dunes and finally to plant them completely. At the same time such experiments as seemed to show any promise were to be made.

It was decided too that Corsican pine was the best tree for the moving sand and probably also (a mistake as it turned out) on the flats.

As to the early technique, there is an interesting Report by Annand dated 23rd February, 1923.

Progress in the first years was tedious and costly. Marram grass was slow in performing its function and only partly effective. Gradually, however, shelter was built up and the first planted trees began to grow and cover the sand.

Subsequent developments in technique, including the development of thatching to its present large-scale and almost exclusive use in fixation are described in Mr. Kennedy's account. Now, after 30 years' patient work, we are well within sight of the complete afforestation of the moving sands with Corsican pine.

As to drainage, Mr. Annand cut a large drain (see his report of February 1923), a veritable cloaca maxima, which had the effect of lowering considerably the level of the winter lakes. I have not seen it for many years but presumably it is maintained in good order, as indeed it should be maintained.

The fire of June 1939 involved some 382 acres and fully exposed the inadequacy of our protection arrangements. I was in Forres at the time with the Royal Scottish Arborecultural Society and personally took part in the fire-fighting. At the height of the fire I telephoned the local fire brigade, explained the situation and asked for their assistance including the use of the fire engine. The girl at the other end of the 'phone was disposed to be helpful and ended by enquiring, "And when will you be wanting it?" No doubt a better liaison now exists. In the event the engine arrived, got on to a narrow road, knocked a gate post down and

itself out, and so never went into action.

This fire burned not only young plantations but also ran as a crown fire through semi-mature pines 60 ft. or more in height. This was an alarming experience, about which we could do nothing, and the only crown fire I have seen in large trees in Britain.

When the main fire had either burned itself out or was otherwise under control, great difficulty was experienced in preventing fresh outbreaks spreading from a flat on which a thin skin of peat covered the underlying sand. A strong wind was blowing and the only weapons at our disposal were beaters and spades, which were quite ineffective. On ground already gone over, thin wisps of smoke constantly reappeared and, fanned by the wind, began to spread through the peat and on to adjacent land. This continued until midnight when rain began to fall and the fire was quenched.

It was clear from this experience that in some cases at least it was essential to use water in fire suppression. This fire was in fact the starting point in our development of the use of fire pumps.

As regards the future of the Culbin Sands plantations, there are several points on which I will venture to comment. The first is that according to recent soil research the sands may be unable to supply sufficient moisture to maintain the trees in the more mature stages. This I do not believe and the growth of the older Binsness plantations supports my belief.

The second is the part which birch can play in the welfare of the pine plantations. I cannot think that sporadic birch can have any significantly beneficial effect. On the other hand, the control of abundant birch is not easy and if neglected for a few years can spoil a good pine plantation or at best seriously reduce production. There is a danger of birch being erected into a cult and that on very slight experimental evidence.

Lastly there is the question of natural regeneration. There is no reason to think that Corsican pine will regenerate itself satisfactorily in this country (Britain generally). It cones well enough from time to time, but surprisingly few seedlings persist even under favourable conditions. On the other hand Scots pine regeneration is almost everywhere good on sandy soils. We can anticipate with some confidence that Scots will invade Corsican felled areas. Whether it will be better to replant with Corsican or to accept the natural regeneration of Scots will be a question for future foresters to answer.

EXTRACT FROM MINUTE SHEET ON H.Q. FILE No. 931/20

At the last Acquisition Committee Meeting the question of acquiring Culbin Sands was left to the decision of such Commissioners as might be in London when a Report on estimated yield had been received. This Report is now to hand.

(intd) A.G.H.
(A.G. Herbert, Secretary to
Commission).

Lord Lovat.

18.2.21

The return from Scots and Corsican would appear to warrant the Acquisition of the Culbin Sands.

I see that in 1830 Mons. Boppe reported favourably on the tree growth on the Culbin Sands and valued a 50 year old wood there at £50. per acre.

(intd) L.
(Lord Lovat, Chairman of Commission)
18.2.21.

Mr. Robinson

I discussed this with Messrs. Sutherland and Borthwick when I was in Edinburgh last week and agreed in view of the new evidence produced that the acquisition might go through. At the same time I must say that I am not greatly taken with the project.

(intd) R.L.R.
(Mr. R. L. Robinson, Technical Commissioner)
21.2.21

Please notify Mr. Sutherland. Scheme approved.

(intd) L.
21.2.21.

Done

(intd) A.G.H.
22/2

DIRECTOR'S COMMENTS

The question of natural regeneration of Scots pine and Corsican pine is referred to once or twice in the history and I think this may still prove a problem of silvicultural importance in the future. Scots pine regenerates readily, but it is already abundantly clear that a much heavier production can be obtained from Corsican pine on those sites where this species will grow satisfactorily (this applies to a large part of Culbin). I think there is little chance of Corsican pine establishing itself in the frost hollows. What will be more difficult will be to prevent Scots pine ousting Corsican pine in the next rotation.

There are references on the importance, from the silvicultural point of view of encouraging the growth of birch. It is interesting to note that nearly every foreign visitor, particularly from Scandinavia, and the number of these is increasing, recommends the introduction of the maximum extent of broadleaved species and we may yet be wise to heed his advice.

H. C. B. P.

25th September, 1951

HISTORY OF CUBLIN FOREST

General description of the Forest

Origin of Name

As the greater part of the area was that covered by the sand storms of the seventeenth century which buried the lands of the Barony of Culbin and as the site of the forest is known throughout the land as the Culbin Sands, what name could be more appropriate than that of Culbin for this forest?

History prior to Acquisition

Most of the main block of the forest was, in 1694, converted into a virtual desert of quick moving sand, having previously been a thriving agricultural community. This then was the condition under which the Forestry Commission acquired this area except for the Low Wood and the area around Binsness House. The Low Wood, or the landmark area of the main block, was planted with Scots pine from 1839 onwards. These trees were felled in the 1914-18 war. This felled woodland section, when taken over by the Forestry Commission was not moving sand, as the soil was fixed by a rank covering of heather.

Along with the Binsness acquisition the Forestry Commission purchased 106 acres of plantations. These woods were planted by the Chadwick family from the 19th century onwards, the object being to protect the amenities of their home, Binsness House, from the advancing sands. Their plantings were entirely successful except for a small area on the windward or westwood side which "went under".

The detached blocks of the forest comprise old woodlands felled in the first and second World Wars. Although the soil is sand, it is not shifting, and reforestation is more or less a normal operation.

Area and Utilization

Acquisition details and a statement of the utilization of ground at 30.9.51 are given in the following tables (Tables I and II).

CULBIN FOREST HISTORY

Table I

From	By	Date	Plantation Acquired	Plant- able excl. Col. 4	Nurs- eries	Agri- cult- ural	F. W. H.	Unplant- able excl. Col. 4.	Other Land		Total
									Description (10)	Acreage (11)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Iain Robert James Murray Grant of Glenmoriston.	Feu	1921	20	2337	-	2	-	1168			3527
Iain Ashley Moreton Brodie of Brodie	Purchase	1925	-	365				5			370
Iain Robert James Murray Grant of Glenmoriston	Feu	1926		145							145
Col. Norman Macleod of Dalvey	Feu	1927		818½		35		20			873½
Iain Ashley Moreton Brodie of Brodie	Purchase	1931		208				15			223
Capt. Norman Donald Macleod	Feu	1945	7	205				1			213
Trs. of Major Robert Chadwick	Purchase	1946	97	403				19			519
Mrs. Caroline Violet Mary Hope or Brodie of Brodie	Purchase	1946	12	361		20		48			441
The Scottish Agricult- ural Securities Corporation Ltd.	Purchase	1949		33				225			33
Mrs. Caroline Violet Mary Hope or Brodie of Brodie	Purchase	1952	76	901							1202
			212	5776½	7	57		1501			7546½

TABLE II

Utilization of Ground at 30.9.51

(a)	Plantations -			
	Acquired		341 [£]	
	Formed by Commission		<u>4874</u>	<u>5215 acres</u>
(b)	In hand awaiting planting -			
	Blanks after felling		1170	
	Burnt areas		Nil	
	Other Land		<u>659</u>	<u>1829 acres</u>
(c)	Nurseries			<u>- acres</u>
(d)	Agriculture	Number of tenancies	-	Area
				<u>20 acres</u>
(e)	F.W.H.	Number	7	Area
				<u>20 acres</u>
(f)	Unplatable land in hand			<u>225 acres</u>
(g)	Other land (describe if necessary)			<u>237 acres</u>
			<u>Total</u>	<u>7546 acres</u>

£ The difference in the area of acquired plantations as shown in Tables I and II is due to a re-classification of an area which at the time of acquisition consisted mostly of Scots pine scrub. The Scots pine has developed in the course of time into a fair plantation which has now been classified as an acquired plantation.

Physiography

The forest is more or less flat except for the sand dunes. These extend along the coast line and penetrate inland to a depth of a mile at the west end and for a depth of two miles at the east end. The long axis of these dunes points east and west. The slope of the dunes on the west side is gradual and on the east side is steep, approximately 1 in 2.

Risks

(a) Animals and birds

The Culbin area around Shellahead, Binsness and Kinoorth is reputed to have abounded with rabbits in 1921 when the Forestry Commission took over. At the present time there are only a few rabbits within the forest.

Roe deer were numerous at the west end of the forest and were at one time troublesome. So much so, that a deer fence was erected on the western boundary. There are not so very many deer now in the forest and they tend to move in and out and seem to prefer the Low Wood to the coastal dunes.

Squirrels are seldom seen but capercaillie are on the increase at the west end of the forest.

(b) Fungi

The Honey Fungus (Fomes annosus) has made minor attacks on Scots pine on old woodland sites.

(c) Insects

There is evidence that the Pine Shoot Beetle (Myelophilus piniperda) is present but the damage it has caused is very slight. The Pine Weevil (Hylobius abietis) seems to be totally absent at the present time. The last occasion Hylobius was troublesome was four years ago when some old Scots pine was being felled in Compartments 123 and 126. It was then noted that they were present on the brushwood but as this material was laid on the sand dunes it was observed that oyster catchers were very busy on it and all the weevils perished. Evetria purdii has not yet been found on the Corsican pine.

Fire

The chief fire danger is at the west-end of the main block and in the Low Wood. In both these places heather growth is strong. Some of the detached blocks which are skirted by the railway also have a high fire risk.

Prior to the great fire at Culbin which destroyed 382 acres in June, 1939, fire-protection was very primitive. Until then, birch fire brooms were the only form of fire equipment at the unit. Narrow fire lines had been screefed with hand-labour.

After the fire more stringent methods of fire precautions were enforced. Smoking within the forest, except at specific times and places is prohibited. Static fire-tanks were placed throughout the forest at strategic places and fire pumps were issued to pump the water on to a fire.

When the war ceased a still further advance was made in fire equipment and precautions. The static water tanks remained but were reinforced by large water-dams in 1949, dug out in the sands. The main fire dam, it is estimated, holds about 1 million gallons of water and the smaller dams hold from 2,000 to 10,000 gallons of water each. More fire pumps are available and with the opening-up of the forest by roads delay in getting to a fire will be greatly reduced. Four-wheel drive vehicles have been allocated to the forest. Bedford lorries and a jeep which has an attachment for drawing a trailer pump are available for fire. One lorry is kept loaded with fire equipment and a water tank filled with 500 gallons of water is standing by at the forester's house when fire danger is high in readiness for a fire-call.

Hand screefed fire lines were dispensed with as being either too expensive or too useless and these have now been replaced by forest roads or bulldozed tracks.

Roads

Type of Ground

The area generally consists of fine wind blown sand, covered with sparse vegetation not strong enough to carry loaded lorries for any length of time.

Owing to irregularities of the surface some bulldozing was usually necessary to keep depths of gravel down to the minimum necessary.

Spacing of Roads

Existing rides are about 500 yards apart, and the economic horse dragging distance was thought to be somewhere between 200 yards and 300 yards. As far as possible existing rides have been used as road lines.

The length of road already constructed is 23 miles.

The total length of road required will be 38 miles.

Types of Road Construction

- (a) Hand-packed sandstone bottoming, blended with ash or sandstone chips and dust. All the work was done by hand labour, including quarrying for which no compressor was available. The method was very expensive and not suitable for mechanical maintenance.
- (b) Gravel mechanically stabilized with clay. Construction was subject to considerable weather delays, owing to the clay pit being put out of action. The proportioning of the materials also required continuous and careful checking, which was beyond the powers of the supervision available. The cost was therefore £1,700 per mile instead of the £1,200 per mile estimated.
- (c) Findhorn Gravel. Owing to very uneven grading the result was an unsatisfactory running surface, unsuitable for mechanical maintenance and no cheaper than (b) owing to the length of haul.
- (d) Cement Sand Stabilization. The sand was stabilized by mixing in 10% of cement, and a surface coat of Colfix at 7 square yards per gallon and chips added,

Cost	Stabilization	£1,100 per mile
	Surface Coat	£ 250 " "

The cost of stabilization could be reduced, provided the programme was large enough to justify purchase of suitable construction equipment.

This type of road may be seriously damaged by misuse, particularly in frosty weather and is not considered suitable for forestry work unless more of the normal road construction materials are available at a reasonable cost.

- (e) Ash. A dump of ash located near Nairn was used with satisfactory results. The cost was £900 per mile.
- (f) Culbin Gravel. This has some binder in it, and is the most suitable road material used so far. Cost £600 - £800 per mile depending on length of haul.

Both (e) and (f) are suitable for mechanical maintenance so that any damage done can be cheaply repaired.

Labour

From the commencement of forestry operations in 1922 up until 1939 a staff of fifty men were employed. This staff was recruited from Forres, Findhorn, Dyke and Auldearn. At this time there appears to have been quite a large turnover in labour. Many workers left for seasonal work with farmers and the salmon fisheries, during the summer months returning to the forest for the winter months.

In the period 1939 to 1946 the staff was very much reduced and was never more than 20.

From November 1943 to May 1944 the forest and part of the surrounding district was evacuated and the forester and holders had to leave their houses. The area was converted into a battleground. The Royal Navy shelled the area from the sea, and there are still scars in the forest which mark this shelling. The Army also used the area as a battleground for tanks and we are continually being reminded of this occupation when live shells, both naval and military are exposed as a result of the movement the sand. During this occupation the staff was down to four men and their work was confined solely to the Inschoch section.

Since the end of the war, from 1946 onwards, the staff has varied from 60 to 90 and has been recruited from Nairn in the west to Forres in the east as well as from the parishes of Dyke and Auldearn. Transport was laid on to take workers to and from their homes in Nairn. The work of the forest has changed since the end of the war. Hitherto, it was mainly fixation of sand, planting and weeding. From 1946 thinning and road-making have been included. The work has now been largely mechanised. Four-wheel drive lorries and wheeled and crawler tractors are used for the transport of material for thatching, whereas previously horses were man's only aid.

(Horses are, of course, still used for dragging of thatch and produce from the wood to the roadside). On the construction of forest roads bulldozers, diesel road rollers, mechanical loaders, auto-patrols and tipper lorries have played their part. Mechanical excavators have been used to dig fire dams and mechanical water pumps are one of the main aids for fire fighting.

Houses were first built by the Forestry Commission in 1926 when the five Cloddymoss Forest Workers Holdings were erected. In 1933 two more Forest Worker Holdings were erected at Kintessack and also the present house of the forester.

In 1947 two British Timber Houses were completed in Kintessack.

The impediment to house building at this forest is the scarcity of water. A regional water scheme is expected to serve this district soon and when this is completed it will make further house building possible.

SILVICULTURE

Acquired Plantations

There are 341 acres of these plantations at Culbin, 106 acres being on the Binsness section and the remainder being mainly the "remains" of the 1839 plantations or onwards in the Low Wood.

- (a) Low Wood Plantations. The species here is Scots pine of no exceptional quality but of quite fair volume per acre but below Quality Class III.
- (b) Binsness Plantations. These plantations are chiefly of Scots and Corsican pines. The Scots pine in Compartments 171, 173, 174 and 175, have been slow grown and the quality of the timber is quite good but the rate of growth is below Quality Class III. The plantations were thinned in F.Y.48 and again in F.Y.51, but the increment is not great as the trees are 70 years old, and the crowns poor, due to the lack of proper thinning early in the life of the plantations. The Corsican pine in Compartment 176 is 43 years and 48 years old, and both age classes were thinned in F.Y.'s 47 and 50. The growth is much better than that of the neighbouring Scots pine, but here, again, the crowns are smaller than they should be because of lack of thinning in the early years.

(b) The Corsican pines are Quality Class III. The Director General noted the condition of the crowns on his visit in November 1950.

Preparation of ground - Fixation of the sand

Thatching is done for the following reasons:-

- (1) It fixes the sand
- (2) It conserves moisture around the plants
- (3) As the thatch decomposes it makes humus.

The thatch is laid in the same direction as the prevailing wind with the heavy ends of the branches lying to windward. The laying of the thatch thus progresses in an easterly direction.

The best material for use as thatch is undoubtedly pine branches of Scots, Corsican and contorta. The next best is birch branches, with the leaves on, and for this purpose the birch should be felled from mid June to mid October at the latest and applied as thatch as soon after felling as possible. Branches of spruce and Douglas, although useful do not give as good thatch as the branches of pine and birch. When the needles of Douglas/^{and}spruce die off a very fragile skeleton of twigs is left. Broom is useful as thatch and the best material is the older broom which tends to be longer and thus covers the ground more quickly. Broom is more expensive to lay on the ground and it has also the disadvantage that when it withers it becomes liable to get tossed about by wind and may make repair necessary in later years.

For steep dunes it has been found necessary to peg down thatch otherwise wind will certainly scatter it. The pegging is done by driving stakes and running wires along the contour of the dunes. Elsewhere on gradual gradients pegging is not necessary if the branches are overlapped.

The quantity of brushwood required is about 14 loads of 3 tons or 42 tons to the acre. When broom is used the quantity is 15 loads to the acre but broom is lighter than tree branches and although the volume of material is greater, the weight of material is less.

Sweepings from hay lofts sprinkled over the thatch are very useful in binding both the thatch and the sand. These sweepings, after germination, produce grasses and a large variety of weeds.

Choice of Species and Planting Methods

Culbin is undoubtedly a pine forest. The species planted were the three pines, Scots, Corsican and contorta.

On the sand dunes Corsican pine has definitely proved itself to be the best tree. On the flats Scots pine does best and on poorer wetter flats contorta does quite well. Corsican suffers from frost when planted on the flats and it is both difficult and expensive to get Corsican to grow on such sites. Where Corsican is planted on thick marram it is advisable to take out a small "screef" of about 4 in. to 6 in. diameter. This screef helps in the following ways :-

- (1) It catches more moisture for the plant
- (2) The risk of the plant becoming smothered is not so great
- (3) It reduces weeding costs

On the flats Scots pine and Pinus contorta do very well. On such sites, the water table is high especially in winter-time, and this tends to make them all the more liable to frost danger.

In the early days transplants were planted with dibbles. This method was quite suitable among marram grass. With the commencement of thatching Schlich spades have been used. These spades are much better for use through the thatch.

Forestry Commission Plantations

Planting commenced in 1922 along the landward edge of the forest on part of the Low Wood. This area was wet when first planted and draining had to be done. The Low Wood kept the planting going up to P.25., In P.26 a start was made with the planting of the dunes. Thatching did not commence until 1934 on any very large scale and the method adopted in fixing the dunes prior to this was by planting marram grass. The P.26 plantations of Corsican around Compartments 69, 70, 71, 73 and 84, have been very successful (Quality Class II). Corsican pine was sown by The Research Branch in Compartment 73. This has done very well and was cleaned in 1939 by the Research Branch. The 1926 plantations in these compartments were first thinned in 1948 when 200 cu. ft. per acre of thinnings were taken out.

This sowing experiment is the only successful one on Culbin. About this time additional sowings were made in Compartment 51, but these failed.

In 1946 a quarter of an acre was sown in Compartment 67. This also was a complete failure. In this case the severe frost in 1947 destroyed all germination.

A small area of P.28 in Compartments 69 and 74 was in check. Marram grass was not initially planted and no other pre-treatment was carried out in this area. To stimulate growth some thatching was done in 1939 and 1940. Growth is still slow here but there has been a decided improvement since thatching took place although there are still patches which "blow out".

Although thatching was commenced in 1934 it was on a very limited scale until 1937 when "Hill 99" Compartment 22 was tackled on a more elaborate basis. Since then up until the war thatching and planting of the dunes was done on a very small scale. Thatching and planting were restarted in P.47 still on a small scale but from 1948 onwards the scale of these operations was substantially increased. Programmes from then on to 1951 ranged from 100 to 250 acres per year.

With the sand being sealed off from the west it is interesting to note that the marram grass has increased a little along the southern boundary of Compartment 105B. There is also a notable increase of marram throughout the areas thatched from P.47 onwards.

As the plantations on the sand hills grow "winter lakes" in between the dunes change in appearance. As the winter disappears, these lakes become colonized by birch, Scots pine, and Pinus contorta in cases where this tree had been planted round about. Of the trees at Culbin, Corsican alone is the one which does not regenerate well, in fact, regeneration of Corsican is exceedingly sparse. 1948 was a good Corsican seed year and the amount of Corsican seedlings (1 year) on the ground was very large, but by the next year these had all disappeared. Frost lift must largely account for their disappearance.

The removal of brushwood from the plantations for thatch must have an impoverishing action on the soil. This will, however, soon cease as it is expected that all thatching will have been completed by 1953. In an endeavour to counter-balance this impoverishment birch is left in the plantations as much as possible, and the introduction of such hardwoods as birch and sycamore is an operation to be kept in view. Some birch have already been introduced on a small scale.

The main result of afforestation, according to Dr. J. D. Ovington, is the increase in the amount of fine sand in the soil.

Dr. Ovington records that, "Except for the lowermost slopes the water-table of Lady Culbin is not within 2 metres of the surface and is probably much deeper, since at this depth there is no marked rise in the percentage moisture content of the sand. The wind-blown surface sand is dry but the underlying sand remains moist".

"After a continuous dry period followed by a heavy shower, comparison was made at intervals between planted and unplanted dunes. On the open dune the rain shower can be traced as a slowly descending zone of higher moisture content. In the plantation the upper sand is drier and the rain shower is partially retained by the litter. There is a slight increase in the moisture content of the sand".

"Where old and young plantations adjoin in the Culbin Forest the young plantation has a border zone of decreasing tree height with distance from the older trees." This Dr. Ovington says, "is the reverse of what happens in other forests. The average root spread from the old to the young plantation was 3.7 metres".

On soil acidity Dr. Ovington reports that "pH values are variable but become more regular with afforestation. The organic cover in the old plantation is more acid than the sand. Afforestation brings about increasing acidity of the sand, particularly in the upper layer of the profile".

Rates of Growth

Compt. No.	Spp.	P. Year	Age	Geology and Soil	(a) Altitude (b) Aspect (c) Slope (d) Exposure	Mean Height of Dominants (feet)	Mean Annual Height Increment		Current Annual Height Increment during last 5 years	
							ft.	ins.	ft.	ins.
56	S.P.	23	28	Sand	(a) 40 ft. (b) Southerly (c) Gentle to flat. (d) Sheltered.	38	1	4	1	5
22	C.P.	37	14	Sand	(a) 50ft. to 99 ft. (b) Westerly (c) Gentle (d) Sheltered.	15	1	0	1	1
8	C.P.	27	24	Sand	(a) 20 ft. (b) North (c) Gentle (d) Sheltered	26	1	1	1	1
66	P.C.	29	22	Sand	(a) 20 ft. (b) North (c) Flat (d) Sheltered	20		10		10

Thinning and Utilization of Produce

The quality of the material produced at Culbin in thinnings is high, although size is small because the branching of the Scots and Corsican pines is very fine, there are not many wolves in the crop. Thinning has not yet been carried out over a wide area as most of the woods are not at the thinning stage, in fact, very little of Forestry Commission planted woods have reached the stage for first thinning and of course even less for second thinning. The interval between thinnings is five years.

The thinnings have been despatched chiefly to the mines in the form of tonnage wood. Off-cuts are sold at good prices to local merchants who in turn use these logs for conversion into crown wood for the mines or into boxwood. Light telegraph poles of Corsican pine have been produced and these were of good quality.

The policy now is to let the merchants do the thinning by selling the trees standing to them. This is by far the best method and up to the present there has been no cause to complain about the conduct of the merchants.

RESEARCH - Note by the Research Branch

Culbin Forest was one of the earliest in which Research Branch experiments were laid down and has continued as a lesser centre ever since. The local problem, sand fixation, was not dealt with by Research Branch.

The first experiment (2.P.22) was a trial of species planted in 1922 including pine, larches, and Douglas fir which failed. Both European and Japanese larch and also Pinus ponderosa failed in local wet hollows, while growing on the slight intervening ridges. Maritime and Corsican pines have grown slowly while Scots and lodgepole pine have done well. Norway and Sitka spruce were tried on wetter ground in the same year (3.P.22) but both failed.

Five sample plots were established in the Scots and lodgepole pines in and around the experiment in 1948 and having comparable thinning treatments provide interesting information on the relative growth. Quality Class II Scots pine almost equals the Pinus contorta in total basal area while the Quality Class I Scots pine (Plot 140) far surpasses it. On the other hand the total height of the lodgepole pine exceeds the Quality Class II Scots pine by 10 ft. and the Quality Class I by $2\frac{1}{2}$ ft.

In October 1922 a series of monthly planting of Corsican pine was begun which continued until September 1925 (4-6 P.23-25). Early losses showed that in this dry area the closed season for planting must be May-September (losses 25%-50%) while the best months were February - March (losses 5-8%). A sample plot has been established here in the 1923-1924 series where the Corsican pine is of a curious stunted type believed to be Calabrian. After two thinnings its appearance is much improved and it now promises to give a reasonable crop.

In 1923 also a trial plot of one acre was sown with Corsican pine seed at 3 lbs. per acre in raked strips (1.P.23), together with another plot of 1+0 seedlings. Both have been very successful while plots of other ages added in 1924-5 failed badly, as also did a second sowing in 1928 (10.P.28). The 1+0 plot was used in 1948 for sample plot 180, when a second

plot was established in Conservancy plantations nearby.

Three small experiments dating from 1925-8 showed that wrenching of Corsican and grading of Scots pine transplants made very little difference to subsequent behaviour in the field (7 and 8.P.25, 11.P.28).

An early experiment on beating up was carried out in 1925 on an area of P.23 Scots pine. Beating up in P.25 was worthwhile, P.26 possibly justified but P.33 beat up plants were completely suppressed by 1938 (9.P.25).

The last experiments were laid down at Culbin in 1929-30 and are of interest as examples of planting in Anderson groups. 12.P.29 includes groups of Pinus ponderosa and inland Pinus contorta while 12.P.30 includes four provenances of Pinus contorta and five of Scots pine, neither of which show much variation in growth or form. Pinus koraensis planted here has failed.

In 1937 an interesting series of four sample plots were established at Binsness, which was at that time a private estate. Plots 111 and 112 were laid out in a mixed stand of Douglas fir and Corsican pine. The Douglas fir were first noted by Lord Robinson and it was at his request that these plots were established. Plot 111 has been thinned to encourage the Douglas fir, while the thinning of Plot 112 favours the Corsican pine. The Douglas fir in Plot 111 are now growing vigorously and their mean annual basal area increment at the last remeasurement in 1951, surpassed that of former periods. There is prolific regeneration of Douglas fir over the area.

Plot 113 gives a good indication of the possibilities of Corsican pine at Culbin. In its five thinnings it has produced 2162 cu.ft. per acre quarter girth under bark. The Scots pine in Plot 114 stood at 1044 trees per acre at 60 years of age when first thinned in August 1937. Increment over the past 15 years has been maintained around 50 cu. ft. per acre quarter girth under bark. Although there was little crown competition before the 1951 thinning it was decided to reduce the stocking to 396 trees per acre as there must be considerable root competition on this dry site.

At the present time the main points of interest in the Research areas at Culbin are the twelve sample plots and the seven species represented there and in the experiments, some in Anderson groups. All but four of the thirteen experiments have either failed or been written off.

A.M. and J.W.L.Z. October 1951

COMMENTS BY STATE FORESTS OFFICER

Mr. Kennedy has from his extensive knowledge of the area given a good account of Culbin. He has omitted to point out that it is during his own turn of duty in charge of Culbin that the most extensive thatching programmes have been carried out and the most difficult of the moving dunes successfully afforested.

The problem of establishing forest conditions on the sand has been solved. The problem of maintaining these conditions during the regeneration of the present crop, remains to the future. Exposure of the sand on or off Commission ground, and particularly to the westward, will always constitute a risk, besides upsetting what may according to Dr. Ovington, be a delicate water supply position.

When the time does arrive for regeneration it should be remembered that Corsican pine at Culbin is far north of its natural range and that its use vis-a-vis the frost hardy Scots pine has been carefully controlled. Although its power of regeneration on frosty sites may be the Corsican pine's own control, it will be well to ensure that it does not extend itself to the sites of the old winter lakes where frost could possibly cause widespread damage.

There can be little doubt that it is wise silviculture to encourage birch at Culbin and this is being done in every possible way.

(Sgd) T. H. WOOLRIDGE

State Forest Officer.

APPENDIX I

Notes from Inspection reports

The Chairman, then Technical Commissioner, visited Culbin on the 10th September 1924. He noted that the first formed plantations were now beginning to move. Fixation operations with marram grass appeared to be successful to date, even though the grass itself had not made much growth. He thought that greater use should be made of broom which seemed remarkably adapted to fixing sand. Thatching had been very successful in places in arresting blow outs. The twigs would decay, however, in due course and the advantage would be lost unless some permanent fixing agent (i.e. marram, broom or trees) was introduced. Probably this should be done simultaneously with thatching.

Sir John Stirling Maxwell and Col. Stuart Fotheringham on 18.9.28 visited the Binsness plantations then owned by Major Chadwick and now owned by the Forestry Commission. Comment was passed on the necessity to thin the Corsican in order to allow of more crown development. The same comment was made by the Director General on his visit in November, 1950.

The Technical Commissioner, - (the present Chairman, Lord Robinson), visited Culbin on 19.9.29. He commented on the experimental plot of Pinus contorta Compartment 53. At that time the Chairman noted that the contorta were making more rapid growth than the Scots but have the peculiarity of forming canopy very slowly and at this time there was little indication of any tendency to suppress the heather which was making strong growth in this vicinity.

The present Chairman Lord Robinson on his visit of 18.10.32, mentioned that the recently thatched hollows should be planted up as quickly as possible before the brush decayed. The view was also expressed by the Chairman that Corsican should be planted into the marram clumps as far as possible, irrespective of normal spacing. Any likely "blow-holes" could be left unplanted or thatched and planted. In the opinion of the Chairman the establishment of trees in all possible places, however small, would help to stabilize the sand, and at the same time, this method if adopted, would make immediately available for planting a large area of sand and if

combined with a reduced planting programme (say 75 acres) would render unnecessary the large marram planting programme then contemplated.

The report on this visit mentions that the Scots pine east of the Nursery (very likely Compartments 50 to 55) were growing well. The report continues that a few scattered birch are tending to interfere with the pine and that the birch should be cut out.

The Chairman on his visit of 16.10.36, visited Hill 99 and inspected the thatch laid ready for the P.37 planting. He was informed that it was proposed to complete the planting of Hill 99 and similar unfixed sand areas within the afforested block during the next four years.

Compartments 60, 69, 74 and 83 were visited at this time and the report of the visit records that this area planted in 1928 with Corsican pine and patched with marram or thatched and beat up in P.35 or P.36 showed the benefit of these treatments.

The Chairman's experiment in Compartment 95 was visited. These blocks were planted in P.34 in natural marram tussocks bounded by moving sand on all sides. The report of the visit records that 50% to 80% of the trees had been smothered by moving sand. The remaining trees, the report says, were good.

A visit was paid to the woods of Major Chadwick and the Chairman decided after seeing the Douglas fir/Corsican pine mixture, in what is now Compartment 176 that 2 sample plots should be set up in this section. In one plot Douglas fir should be favoured in the other Corsican pine should be favoured. At the same time, the Chairman directed that a small area of this mixture be tried on a similar site on Forestry Commission land. Such a plot was established in 1937, in Compartment 106A.

The Chairman in his remarks of this visit records as follows :-
"I noted a considerable improvement in Culbin and in the way it is being handled".

On June 9th 1938, the Forestry Commissioners visited Culbin. The Chairman considered that the older plantations had reached the stage when, as a fire protection measure, three or four rows of trees along ride and road sides should be brashed and any long heather patches should be cut over and the material disposed of. Such brashing would be extended inwardly from time to time until ultimately, the whole Compartment had been dealt

with. The Chairman also noted that "wolves" were being removed from the plantations and considers that this operation might be expedited .

On his visit of 10.10.41 the Chairman discussed fire protection. The making of roads suitable for the transit of the pump-lorry was advocated. The Chairman also directed that "Supplies of static water and hose fittings should also be attended to".

At the Pinus contorta plot in Compartment 53 the Chairman said that a first thinning was now necessary and that a second thinning should follow soon after.

The following points were brought out by the Chairman, during the discussion :-

- 1) Young plantations require to be watched in respect of young birch growth.
- 2) The removal of "wolves" from the plantations at the earliest opportunity.
- 3) The beating up of small blank patches alongside roads and rides in plantations where the trees are relatively high, can be overdone.
- 4) The continuation of the afforestation from west to east should continue and it is essential to consolidate the plantations along the south flank of the bare sand area.
- 5) Plantations approaching the brashing stage should have inspection paths.

On 24.8.43, the Chairman, Lord Robinson, visited Culbin and was accompanied by the Rt. Hon. Sir Kingsley Wood, M.P., P.C., (Chancellor of the Exchequer) and the Rt. Hon. Sir William Jowitt, M.P., P.C., (Minister without Portfolio) in the Coalition Government of Mr. Winston Churchill. The party travelled over the forest in American jeeps.

Some of the places visited were Hill 99, Binsness Woods, - not at that time acquired by the Forestry Commission, - Compartments 50 to 55, Compartment 35, acquired plantations which is partly buried by moving sand.

On 20.8.46, the Chairman visited Culbin and was accompanied by The Rt. Hon. Hugh Dalton, M.P., P.C., Chancellor of the Exchequer in the Labour Government. The thatching of sand was seen and also the thinning at Binsness, now acquired by the Forestry Commission.

The Chairman instructed that in order to stop the movement of sand into the Binsness Woods, notably Compartment 176, a fringe should be thatched and planted to the north of this compartment. This was carried out in 1948 and this year, - (F.Y.51) - we have linked up with this thatching from the west and ensured that there will be no further advance by the sand into the Binsness plantations. The only loss to this experimental thatching and planting of P.48 was along the north boundary, where action by north-east winds has blown the sand across the outside thatch to a depth of approximately 1 chain. In all, so far, we have only lost about one-fifth of an acre of this P.48 plantation.

On 3.7.47, the Empire Forestry Conference members paid a brief visit to Culbin.

On 4.10.49, the Director for Scotland Sir Henry Beresford Peirse Bart., led a party of pressmen over the forest. This visit coincided with the publication of the booklet on Culbin under the series "Britains Forests".

On 17.11.50, a visit to Culbin was paid by Mr. A.H. Gosling, Director-General.

Mr. Gosling discussed the risk of coast erosion from the sea in the vicinity of Compartment 103B. The Director General stressed that we should watch for such a happening.

A visit was paid to the pending new acquisition on Brodle west of the present boundary. Here the Director-General stressed the need for careful planning of the drainage system on such flat ground. He also gave the opinion that the planting of contorta on the poorer land should not be undertaken if Scots pine had a reasonable chance of growing.

APPENDIX II

Supervision

The following officers have been responsible for Culbin since it was acquired in 1921 :-

1946-1947	H. C. Beresford Peirse, Conservator	
1947 to date	F. Oliver, Conservator	
1921-1932	J. F. Annand	Divisional Officer
1932-1933	R. G. Forbes	" "
1933-1938	H. M. Steven	" "
1938 - 1939	F. Scott	" "
1939-1946	L. A. Newton	" "
1948 to date	T.H. Woolridge	State Forest Officer
1921-1922	I. Clark	District Officer
1924-1925	J.W. Mackay	" "
1926-1927	J.K. Leven	" "
1932-1934	R. Cowell-Smith	" "
1934-1939	A. Warren	" "
1939-1947	I. J. Stewart	" "
1947 to date	J.A.M. Kennedy	" "

Foresters

1922-1934	F. M. Mitchell	(Grade II Forester)
1934-1938	W. Mackay	(" " ")
1938 - 1947	R. W. Campbell	(" " ") (" I from 1946)
1947 to date	W. G. Milne	(Grade I Forester (Head Forester from 1949)

