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George Brown M.A.

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TRANSACTIONS
OF THE
BOTANICAL SOCIETY OF EDINBURGH.

SESSION LXXVII.

SURVEY OF THE VEGETATION OF THE PARISH OF SHOTTS,
LANARKSHIRE. By GEORGE BROWN, M.A. (Plate IV.)

Introduction.

The following survey of the vegetation of the parish of Shotts was begun in July 1908, and has been continued at vacation times during the past four years. It is an attempt, not to give exhaustive lists of the plants of the area, but to study the various plant associations and their relation to the topographical, geological, and climatic characteristics of the district.

For much help in connection with the finding and naming of certain of the plants I am greatly indebted to my old schoolmaster and friend, Mr. Dunn, Schoolhouse, Harthill. The various agricultural statistics were kindly supplied by the Board of Agriculture.

Topography.

Shotts Parish is in the north-east of the Middle Ward of Lanarkshire. It is bounded on the N.W. and N. by the parish of New Monkland, being separated therefrom by the North Calder Water; on the N.E. and E. by the parishes of Torphichen, Bathgate, and Whitburn, in Linlithgowshire, separated from these by Barbauchlaw Burn and How Burn; on the S.E. and S. by the parish of Cambus-

nethan; and on the S.W. and W. by the parishes of Dalziel and Bothwell, the natural boundaries being the South Calder Water, Tillan Burn, and Shotts Burn.

It has an area of about thirty-nine square miles (24,835 acres). Its greatest length—from the point on South Calder Water, where the parishes of Shotts, Cambusnethan, and Dalziel meet to the boundary line beyond Southrigg—is about eleven miles; its greatest breadth—from Shotts Iron Works, on the South Calder Water, to North Calder Water—being about seven miles.

The surface consists to a large extent of undulating ridges¹ varying in height from 700 to 900 feet. The altitude ranges from 340 feet on the Shotts Burn to nearly 1000 feet on the Cant Hills, which form part of the ridge that is the water-parting of the basins of the Clyde and the Forth.

The chief streams, besides those mentioned under boundaries, are the River Almond and Forrestburn Water. The former rises within the parish and flows towards the east; the latter flows east into Forrestburn Reservoir, the overflow continuing to join Barbauchlaw Burn.

The main water areas are: Hillend Reservoir, on the northern border, which supplies the Forth and Clyde Canal—of its area (300 acres) only 172 acres are in the parish; Lilly Loch, lying a little to the south of this and being a compensation reservoir for the same canal—the loch previous to its being altered for this purpose had water-lilies growing in it; Forrestburn Reservoir, being the water supply for Linlithgowshire; Roughrigg Reservoir, farther to the west, supplying the Airdrie and Coatbridge district.

Geology and Soil.

The district consists entirely of Carboniferous rocks overlaid by glacial drift or boulder clay which varies both in composition and thickness in different parts. In some places there are present in the clay sandstone and gravel, but generally boulders of volcanic origin. The most notable

¹ Cf. the following place and farm names: Northrigg, Southrigg, Hillhouseridge, Westeraigs, Craighead, Knowehead, Roundknowe, Blairmuckhill, Bridgehill, Dewshills, Brownhill, Drumfin (=“the fair ridge”), Drumbowie (=“the yellow ridge”), etc.

feature of the geological structure is the intrusion of a number of quartz-dolerite sills in the northern region of the parish, these being prominent features of the landscape. The dolerite varies much in structure, from a fine-grained rock to one of a more coarsely granitic structure.

There is much variation in the soil—from a stiff, almost unworkable clay to a more easily worked and lighter sandy or gravelly soil, sometimes mixed with peat earth.

Peat covers large areas, making bleak the district where it is dominant. In places it rests on glacial drift and in others on the dolerite bosses. But where the rock crops out, and where the coating of soil is consequently thin, there is often an absence of peat, a feature which is no doubt accounted for by the chemical composition of the dolerite.¹

Region of Cultivation.

Of the total area of the parish something like 14,000 acres are arable. It is a region which may be characterised as “without wheat cultivation,” there being only $2\frac{1}{2}$ acres of wheat according to the latest returns. Oats are cultivated all over, almost to the highest point of the parish.

The following statistics from the Board of Agriculture (see next page) give the chief subdivisions of the cultivated area and the comparison of these divisions for the years 1867 (the year in which returns were first collected on a basis similar to that of the subsequent years), 1902, and 1912.

One noticeable feature is the increase in permanent grass, the returns for 1912 being 3082 acres and 244 acres more than those for 1867 and 1902 respectively. There is a decrease in the acreage under cereals as compared with 1867, and an increase as compared with 1902.

Both with regard to position and to the character of the soil oats cultivation is favoured. Owing to the altitude, the unsheltered position of the land, and the amount of rainfall, the parish does not lend itself to wheat raising. In many places the country-side is bleak, the westerly winds sweeping across it unhindered by mountain or hill.

¹ Cf. C. B. Crampton, “Stable and Migratory Plant Formations” (“Scot. Bot. Review,” vol. i., No. 2).

*Acreage under Crops and Grasses in the Parish
of Shotts, County of Lanarkshire.*

Crop.		1867.*	1902.	1912.
Corn Crops.	Wheat	10	29½	2½
	Barley or Bere	25	11½	20½
	Oats	1869	1556	1844½
	Rye	25
	Beans and Peas	28	7½	...
Totals		1957	1604½	1867½
Green Crops.	Potatoes	112	63½	51½
	Turnips and Swedes	279	292½	306
	Cabbage, K.-Rabi, Rape	22	35½ (Including Mangold ½)	85
	Vetches or Tares	12½
Totals		413	392	454½
Clover, Sainfoin and Grasses under Rotation		2526	3423½	2611½
Permanent Grass		5263	8101	8345
Other Crops		70	27½	11½
Bare Fallow		144	½	26
Total Acreage under Crops and Grasses		10,373	13,549½	13,316½
Mountain and Heath Land used for Grazing		No return.	4531½	4980

* Board of Agriculture Note.—“Returns of the area under mountain and heath land used for grazing were not collected in 1867, and as the returns generally, especially the areas under grass, may not have been so accurate in the earlier years as at present, comparison over so long a period should only be made with caution.”

Rainfall statistics for the parish are not available, except for the district of Hillend Reservoir. But the following table, made up from “The Mean Annual Rainfall of Scotland,” 1871–1910, by A. Watt, M.A., F.R.S.E., gives statistics

DIAGRAMS.

(From "Agricultural Returns," 1912.)

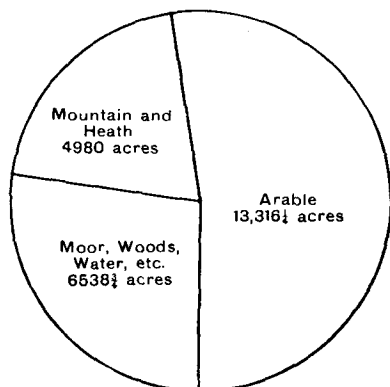


Fig. 1.—Proportionate Areas of Arable and Non-arable Lands.

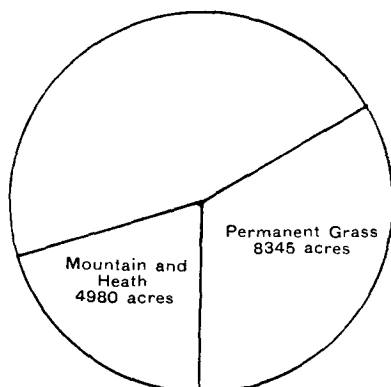


Fig. 2.—Proportionate Areas of Permanent Grass and Mountain and Heath Land.

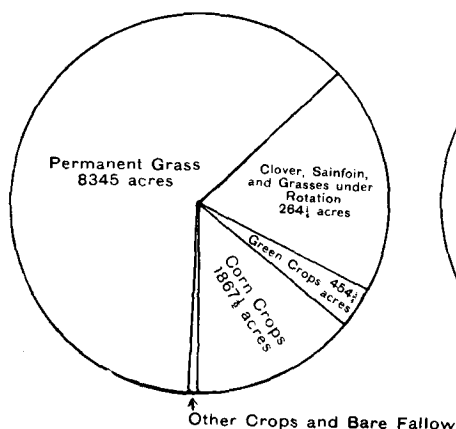


Fig. 3.—Proportionate Areas of Arable Land.

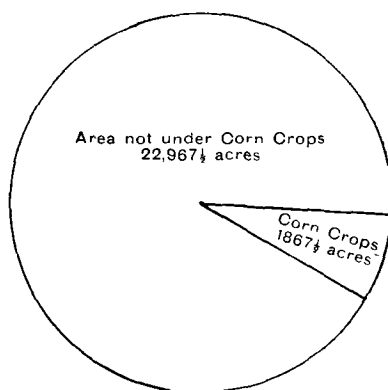


Fig. 4.—Proportionate Area under Corn Crops.

for rainfall for certain stations—just outside the boundaries—in Lanarkshire and Linlithgowshire, having heights similar to those within the parish:—

Stations.	Height above Sea.	Period.	No. of Years.	Mean Annual Rainfall.
<i>Lanarkshire—</i>				
Hillend Reservoir . .	620 ft.	1871–1910	40	37·78 ins.
Roughrigg Reservoir .	661 „	1906–1910	5	38·61 „
Hamilton Waterworks .	436 „	1881–1910	30	35·48 „
<i>Linlithgowshire—</i>				
Polkemmet (Whitburn) .	600 „	1881–1900	20	43·64 „
Bathgate, Boghead . .	500 „	1901–1910	10	39·16 „

The region lies within the area of mean annual rainfall of 30–40 inches.

The following table, made up from Dr. Buchan's paper, gives the statistics of the mean January, July, and annual temperatures for stations in Lanarkshire having altitudes similar to places within the parish:—

Stations.	Height above Sea.	Mean Temperatures.		
		January.	July.	Annual.
Lanark	630 ft.	36·2	56·7	45·4
Carnwath	693 „	36·0	56·3	45·1
Douglas Castle	783 „	35·8	56·0	44·9

In the “Statistical Account of Lanarkshire” (1841) is found the following account of the state of the land in the parish at that time:—“From one-half to two-thirds of the lands in the parish are arable; the remainder is uncultivated. At least one-half of the uncultivated land might be profitably improved. . . . There is a very marked contrast between the state of the parish as it now exists, and as it is represented in the last Statistical Account. A large portion of these lands which were then unreclaimed, and which are there spoken of as unimprovable, is now made tillage and bears astonishingly good crops.” Parts of the

uncultivated land referred to in the later account have been, and are being, reclaimed and cultivated.

An interesting note on the early tillage of the region occurs in Dr. Grossart's History of the Parish: "A circumstance worth mentioning is that at the end of last century (eighteenth) farmhouses were more numerous on the high-lying central ridge (*i.e.* from Cant Hills across to Moffat Hills, the watershed of the Forth and the Clyde) than in the lower and more fertile parts. At the present day this is reversed. The cause is obvious: larger farms have been created out of the ruins of the smaller. . . . On the flat top of Paperthill Crag (865 feet above sea-level) are found the remains of old tillage, its age beyond the ken of the present generation. On the Cant Hills, the highest land in the parish, are to be seen the remains of a still more ancient tillage, pertaining to a long-forgotten era."¹

The character of the soil has already been dealt with under Geology. There are some good farms where satisfactory crops are raised; while there are other farms where, owing to the poverty of the soil, poor crops are harvested.

Woodland.

What natural woods exist are to be found along the banks of streams, as, for example, on the South Calder² Water, Shotts Burn, Forrestburn Water, and North Calder Water. The others, except in the case of some of the small birch formations, are of an artificial character, being plantations of mixed deciduous trees, with conifers often very numerous.

DECIDUOUS TREES.—The beech (*Fagus sylvatica*, Linn.) is predominant, but most of the trees attain no great size, many of them being of a restricted, contorted growth. The woods of beech are small and occur in the cultivated area, some of them running in a north and south direction, thus serving as shelter and protection to the cultivated

¹ "But what struck him (the traveller) most was the sight of huge yokes of oxen dragging the plough far up the steep hill-sides in almost inaccessible places; and on his asking why? he learnt that the farmer was obliged to till the dry, steep braes because the ground below was hopelessly swampy."—H. G. Graham, "Social Life of Scotland in the Eighteenth Century."

² Calder = "the wooded stream."

parts from the prevailing winds. In these woods the beech is often uprooted by storms, and examination of some of the root systems has revealed that the roots are oftentimes superficial, spreading out all round but not sending down strong anchorage into the soil.

The trees occurring in the mixed deciduous woods are : *Fraxinus excelsior*, Linn. (ash); *Quercus Robur*, Linn. (oak); *Ulmus montana*, Stokes (elm); *Pyrus Aucuparia*, Ehrh. (rowan); *Crataegus Oxyacantha*, Linn. (hawthorn); *Sambucus nigra*, Linn. (elder); *Corylus Avellana*, Linn. (hazel); *Prunus Padus*, Linn. (bird cherry); *Prunus spinosa*, Linn. (sloe); *Salix*, spp. (willows). Sycamore and horse-chestnut are also met with in the plantations.

BIRCH WOODS.—There is some extent of birch (*Betula*) in the districts of Fortisset, Hartwood, and Dykehead, and in the estate of Murdostoun. To the north-east, in the neighbourhood of Harthill, at a height of between 600 and 700 feet, there are three much-depleted woods of small extent. The farthest out, towards the east, consists of about two dozen stunted and contorted trees with some scores of old stumps. To the south-west of this there is another wood with many more trees and fewer stumps, and still farther to the south-west are traces of an old birch wood. These are probably the remains of what was originally a much greater extent of birch. No conifers seem to be present in any of these remnants. The trees are growing in peat of some depth—one of the characteristics of the birch being its adaptability to acidity of soil due to humus formation. Seedlings of both the birch itself and mountain ash are frequent in the birch woods generally. The herbaceous undergrowth is that of the adjoining heath, *Calluna* occupying much of the ground in the opener and drier woods.

CONIFEROUS WOODS.—The dominant tree is the Scots pine (*Pinus sylvestris*, Linn.). The most extensive development of the pine is to be found in the south-west of the parish, in the district of Fortisset, Dykehead, and Hartwood, and on the estate of Murdostoun; but such woods are to be found all over the district. Some of the plantations are old and have undergone, and are undergoing, decay, while others have but recently been planted. In

the region of Hirst¹ Hill there are the remains of such old woods, many of the trees still standing but decayed, while alongside there is a young plantation, many of the trees but recently planted. Plantations of healthy young conifers are found also on the north and south sides of Forrestburn Reservoir, around Fortisset, and in certain parts of the Murdostoun estate; on a heather moor west of Hartwood young conifers and birches have been planted a year or two ago. In the "Statistical Account of Lanarkshire" (1841), the following is recorded of the parish: "Formerly Scotch fir was planted to the exclusion of all other trees, but now spruce and larch are preferred, both of which thrive remarkably well." Spruce and larch are found intermingled with the pines both in the older and the younger plantations, but the pine is dominant.

The examination of a small wood of *Pinus sylvestris* (in December 1911) in the north-east of the parish revealed the fact that the trees were of from thirty to forty years' growth. Measurements taken from the surface of the covering of needles to the harder layers, gave depths of from 12 to 18 inches, the layers being composed of humus and peat—peat being present at the surface in the opener parts of the wood. Birches and willows are scattered throughout the pines. Owing to the density of shade the flora is extremely limited, the only plants found being in the opener spaces and in the clearings of the wood, the following being the chief:—*Potentilla Tormentilla*, Scop.; *Galium saxatile*, Linn.; *Scabiosa Succisa*, Linn.; *Cnicus palustris*, Willd. (in wet places); *Vaccinium Myrtillus*, Linn.; *Calluna vulgaris*, Hull (in isolated patches); *Rumex Acetosa*, Linn.; *Juncus*, spp. (in wet places); *Anthoxanthum odoratum*, Linn. (in patches); *Agrostis vulgaris*, With. (in patches); *Deschampsia flexuosa*, Trin. (in patches); *D. caespitosa*, Beauv. (in wet places); *Athyrium Filix-foemina*, Roth; *Lastrea Filix-mas*, Presl; *Lastrea dilatata*, Presl.

The effect of shade—which is determined generally by the age of the trees and their distance apart—may be shown from another wood on the South Calder Water.

¹ Hirst—"a thick wood." Close at hand are two farms called "Blairmains" and "South Blair," respectively. Blair—"a part cleared of trees."

This wood is on rising ground. A few spruce and larch are mixed with the dominant Scots pine. On the outskirts of the wood are deciduous trees—beech, oak, birch, rowan, elm, and sycamore, seedlings of the rowan being common. Where the shade is dense and the covering of needles thick, plants are absent. In the opener spaces, however, most of the above are found along with *Oxalis Acetosella*, Linn.; *Lonicera Periclymenum*, Linn.; *Veronica Chamaedrys*, Linn.; and *Ranunculus repens*, Linn., towards the outside of the wood. In a wood farther to the west, where birch and rowan are numerous, the rasp (*Rubus idaeus*, Linn.) is abundant.

A study of the coniferous woods reveals the following characteristics of this formation and association:—

1. The dense shade affects both the trees and the undergrowth. The lower branches of the trees themselves decay, leaving bare stems with a dense crown. The undergrowth is either absent or very sparse, the plants present being mainly the two Xerophytes, *Deschampsia flexuosa*, Trin.; and *Vaccinium Myrtillus*, Linn.

2. The covering of decayed and decaying needles also prevents the development of undergrowth.

3. *Calluna*, when present, is found only in the opener and drier parts of the woods.

4. *Deschampsia caespitosa*, Beauv., *Cnicus palustris*, Willd., and *Juncus*, spp., are characteristic of the wetter parts.

5. *Athyrium* and *Lastrea* form patches, occasionally of some extent, in the less dense parts of the woods.

6. Seedlings of birch, rowan, and willow frequently occur.

7. Many of the plants are invaders from the surrounding heaths or pastures.

The parish is by no means rich in woodland flora; in fact there can hardly be said to be any true woodland plants as such, except perhaps in the woods on the banks of the streams. The following, in addition to those already mentioned, are found:—*Anemone nemorosa*, Linn.; *Viola Riviniana*, Reichb.; *Stellaria Holostea*, Linn.; *Hypericum pulchrum*, Linn.; *Vicia sepium*, Linn.; *V. sylvatica*, Linn. (recorded by Dr. Grossart for Fairybank district); *Spiraea*

Ulmaria, Linn.; *Rubus fruticosus*, Linn. (very poorly represented in the parish); *Geum urbanum*, Linn.; *G. rivale*, Linn.; *Fragaria vesca*, Linn.; *Rosa*, spp.; *Chrysosplenium oppositifolium*, Linn.; *Epilobium montanum*, Linn.; *Hedera Helix*, Linn.; *Cnicus heterophyllus*, Willd. (recorded by Dr. Grossart for Fortisset district; also found in the east of parish); *Primula vulgaris*, Huds.; *Stachys sylvatica*, Linn.; *Mercurialis perennis*, Linn. (forming communities in woods on South Calder Water); *Urtica dioica*, Linn.; *Listera ovata*, Br. (recorded by Dr. Grossart for Murdostoun woods); *Epipactis latifolia*, Sw. (recorded by Dr. Grossart for Murdostoun woods; also found in wood just outside eastern boundary).

Grassland.

This may be divided into three sections, all of which are represented in the parish:—

1. *Natural Pasture*.—Grasses are dominant, the soil is well drained, and there is an absence of peat. Under this heading is included the vegetation of the dolerite sills.

2. *Artificial Pasture and Meadowland*.—The soil has undergone tillage and is rich in plant food.

3. *Grass Heaths*.—Grasses are dominant but the flora is that of the moorland.

1. **NATURAL PASTURE**.—There are fair stretches of this vegetation, but it often passes into grass heath, and peat bog. It is, however, easily distinguished from these at a distance by its greener covering and compact turf. There is much difference in the grasses composing the various associations, the chief, however, are: *Festuca ovina*, Linn.; *Anthoxanthum odoratum*, Linn.; *Agrostis vulgaris*, With.; *Poa pratensis*, Linn.

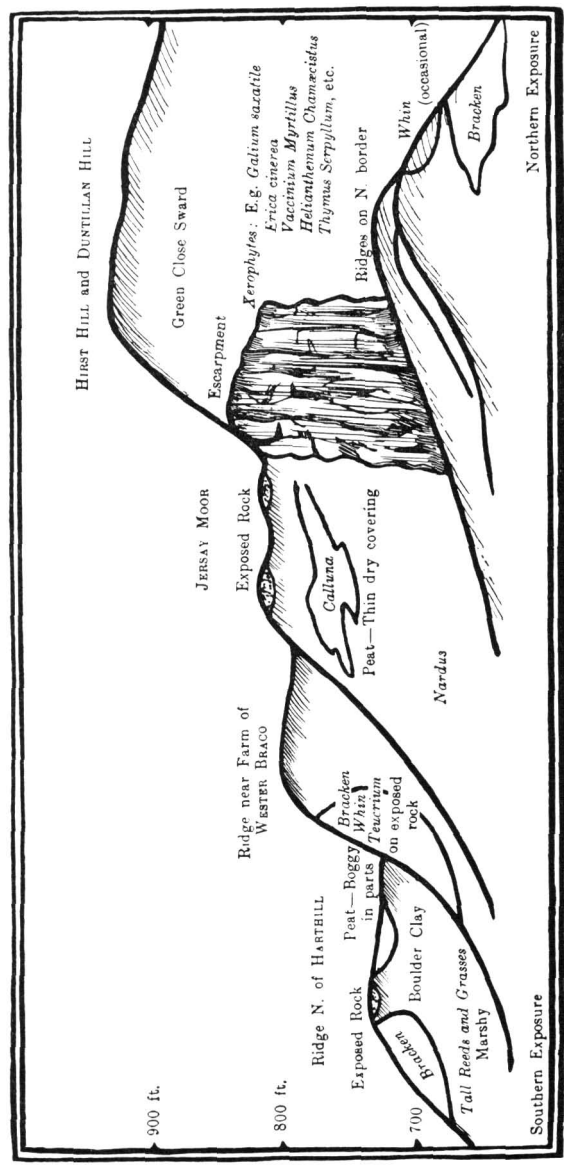
The flora is varied, the following plants occurring:—*Ranunculus acris*, Linn.; *R. repens*, Linn.; *Viola sylvatica*, Fries; *V. tricolor*, Linn.; *Polygala vulgaris*, Linn.; *Linum catharticum*, Linn.; *Trifolium pratense*, Linn.; *T. repens*, Linn.; *Lotus corniculatus*, Linn.; *Potentilla Tormentilla*, Scop.; *Alchemilla vulgaris*, Linn.; *Galium saxatile*, Linn.; *G. verum*, Linn.; *Scabiosa Succisa*, Linn.; *Gnaphalium sylvaticum*, Linn.; *Carlina vulgaris*, Linn.; *Centaurea nigra*, Linn.; *Achillea Millefolium*, Linn.;

A. Ptarmica, Linn.; *Hieracium Pilosella*, Linn.; *Campanula rotundifolia*, Linn.; *Veronica officinalis*, Linn.; *Euphrasia officinalis*, Linn.; *Thymus Serpyllum*, Linn.; *Plantago lanceolata*, Linn.; *Rumex Acetosa*, Linn.; *R. Acetosella*, Linn.; *Urtica dioica*, Linn.; *Orchis maculata*, Linn.; *Habenaria viridis*, Br.; *H. bifolia*, Br.; *Briza media*, Linn.; *Pteris aquilina*, Linn.; *Ophioglossum vulgatum*, Linn.; *Botrychium Lunaria*, Sw.

VEGETATION OF DOLERITE SILLS.—As mentioned under Geology, a characteristic feature of the district is the number of transgressive sills of quartz-dolerite, the ridges ranging in height from 700 to over 900 feet. The rounded tops of these sills are clothed with grass which is usually shorter and greener than that of the adjoining region—for instance, in places, damp reedy grassland gives way to a dwarf grass covering with drier conditions, having the following plants—the list being made from one such case in the neighbourhood of Harthill:—*Potentilla Tormentilla*, Scop.; *Galium saxatile*, Linn.; *G. verum*, Linn.; *Scabiosa Succisa*, Linn.; *Campanula rotundifolia*, Linn.; *Thymus Serpyllum*, Linn.; with *Vaccinium Myrtillus*, Linn., and *Calluna vulgaris*, Hull, on dry mounds.

The following is a list from the dolerite knoll on the north side of the Lilly Loch. The plants are similar to those given for the basaltic hills of the Edinburgh district, and the hills of the Carboniferous area of Fife and Kinross:¹—*Trifolium repens*, Linn.; *T. pratense*, Linn.; *Lathyrus pratensis*, Linn.; *Potentilla Tormentilla*, Scop.; *Galium verum*, Linn.; *G. saxatile*, Linn.; *Scabiosa Succisa*, Linn.; *Achillea Millefolium*, Linn.; *A. Ptarmica*, Linn.; *Campanula rotundifolia*, Linn.; *Rumex Acetosa*, Linn.; *R. Acetosella*, Linn.; *Festuca ovina*, Linn.; *Agrostis*, spp.; *Poa pratensis*, Linn.; *Anthoxanthum odoratum*, Linn.; with *Ulex Europaeus*, Linn., *Vaccinium Myrtillus*, Linn., *Calluna vulgaris*, Hull, and *Erica cinerea*, Linn., in occasional small patches; and *Polygala vulgaris*, Linn., *Cnicus lanceolatus*, Willd., *Centaurea nigra*, Linn., *Euphrasia officinalis*, Linn., *Plantago lanceolata*, Linn., and *Hieracium*, spp., at the foot of the escarpment.

¹ “Botanical Survey of Scotland—Edinburgh District”; “Botanical Survey of Scotland—Forfar and Fife.”



Composite Sketch giving Typical Vegetation of Dolerite Sills.

Most of the above plants are also found on the steep southern escarpment of Hirst Hill, along with the following:—*Draba verna*, E. Meyer; *Helianthemum vulgare*, Gaertn.; *Geranium Robertianum*, Linn.; *Cytisus scoparius*, Link; *Prunus Padus*, Linn.; *P. spinosa*, Linn.; *Rosa canina*, Linn.; *Epilobium angustifolium*, Linn.; *Hedera Helix*, Linn.; *Lonicera Periclymenum*, Linn.; *Vaccinium Vitis-Idaea*, Linn.; *Teucrium Scorodonia*, Linn.; *Betula alba*, Linn.; *Corylus Avellana*, Linn.

Somewhat similar lists to those above were got from Duntillan Hill, and the high ridge near the farm of Wester Braco. On the dolerite of the latter (700 to 800 feet), with a south-western aspect, there is a conspicuous development of whin (*Ulex*) and bracken (*Pteris aquilina*, Linn.). Where the whin and bracken are in extensive patches there is an absence of other plants, but in the intervening spaces there is a covering of grass and other vegetation, the dominant plant being *Teucrium Scorodonia*, which clothes the rock in somewhat mat-like formations. The hawthorn (*Crataegus Oxyacantha*, Linn.) is present, scattered over the face of the rock.

Pteris aquilina, Linn., is found in some abundance on many of the southern slopes of these dolerite bosses. It is also present on some of the northern slopes—for example, on the ridges of the northern border of the parish to the west of Forrestfield.

2. ARTIFICIAL PASTURE AND MEADOWLAND. — This pasture is the grazing land for cattle in the cultivated areas. The grasses are of a more luxuriant growth, due to a greater richness of soil resulting from manuring, and there is greater variety:—*Anthoxanthum odoratum*, Linn.; *Phleum pratense*, Linn.; *Alopecurus pratensis*, Linn.; *Agrostis*, spp.; *Holcus lanatus*, Linn.; *Cynosurus cristatus*, Linn.; *Dactylis glomerata*, Linn.; *Festuca ovina*, Linn.; *F. pratensis*, Huds.; *Lolium perenne*, Linn.; *Poa pratensis*, Linn.; *P. trivialis*, Linn.

Many of the plants of the natural pasture are present along with the following: *Cerastium triviale*, Link; *C. glomeratum*, Thuill.; *Stellaria graminea*, Linn.; *S. media*, Vill.; *Vicia sepium*, Linn.; *V. Cracca*, Linn.; *Potentilla Anserina*, Linn.; *Spiraea Ulmaria*, Linn.; *Epilobium*

parviflorum, Schreb.; *Anthriscus sylvestris*, Hoffm.; *Galium Aparine*, Linn.; *G. cruciata*, Scop.; *Bellis perennis*, Linn.; *Chrysanthemum Leucanthemum*, Linn.; *Tussilago Farfara*, Linn.; *Senecio vulgaris*, Linn.; *S. Jacobaea*, Linn.; *Cnicus palustris*, Willd.; *C. arvensis*, Hoffm.; *C. lanceolatus*, Willd.; *Taraxacum officinale*, Weber; *Myosotis arvensis*, Hill; *Veronica Chamaedrys*, Linn.; *Rhinanthus Crista-galli*, Linn.; *Prunella vulgaris*, Linn.; *Ajuga reptans*, Linn.; *Plantago major*, Linn.; *Rumex crispus*, Linn.; *Polygonum aviculare*, Linn.; *P. Persicaria*, Linn.; *Equisetum arvense*, Linn.

3. GRASS HEATHS.—There is always present a certain amount of peat, and according to the amount of peat and water there is variation in the heath. In his survey of the vegetation of the Rivers Eden, Tees, Wear, and Tyne, F. J. Lewis distinguishes between two well-marked types of heath—

(1) *Molinia* Heath—having wet conditions of soil with peat and water in abundance, the plants being mainly sedges, grasses, and a few heather plants.

(2) *Nardus stricta* Heath—where the soil is dried and better drained, with peat less abundant, the covering being often very thin.

Both of these types may be distinguished in the parish. *Nardus stricta*, for example, occurs associated with *Calluna* on the sloping, dry ground of Jersay Moor, occurring in somewhat extensive patches. It is also found in many places of the moorlands associated with *Vaccinium Myrtillus*, but the grass usually associated with *Vaccinium* is the dry, wiry *Deschampsia flexuosa* which forms dense tussocks, and is dominant on most of the heaths of the parish. *Molinia varia* is characteristic of the low-lying, flat, and badly drained parts of the moors. The following are the chief plants found:—

Under dry conditions: *Nardus stricta*, Linn.; *Deschampsia flexuosa*, Trin.; *Agrostis vulgaris*, With.; *Potentilla Tormentilla*, Scop.; *Galium saxatile*, Linn.; *Vaccinium Myrtillus*, Linn.; *Calluna vulgaris*, Hull; *Erica Tetralix*, Linn.; *Luzula campestris*, DC.

Under wet conditions: *Molinia varia*, Schrank; *Deschampsia caespitosa*, Beauv.; *Lotus uliginosus*, Schkuhr;

Potentilla palustris, Scop.; *Calluna vulgaris*, Hull (on drier mounds); *Erica Tetralix*, Linn. (in small patches); *Narthecium ossifragum*, Huds.; *Juncus*, spp.; *Eriophorum vaginatum*, Linn.; *Carex*, spp.; *Sphagnum*, spp.

Moorland.

There are great stretches of moorland, imparting to it that bleakness which has become proverbial of the parish. Peat is developed more or less all over; from the district of Lilly Loch on the north-west—Lady Bell's Moss covering a large area—across to the south by Salsburgh to Jersay Moor and the region beyond; then to the east by Fortisset and Baton to the wide expanse of Benhar Moor which runs into Polkemmet and Fauldhouse Moors in Linlithgowshire; and on the north-east there is peat.

The grass heaths which should come under this heading also have already been dealt with.

Calluna is not found in very great abundance on the moors. It is occasionally found in somewhat extensive patches on the grass heaths, as on Jersay Moor. To the west of Hartwood there is some development of *Calluna*, but the ground has recently been planted with conifers and birches.

Sphagnum is found in the boggy parts, and associated with it are found the following plants:—*Drosera rotundifolia*, Linn.; *Vaccinium Oxycoccus*, Linn.; *Erica Tetralix*, Linn.; *Pinguicula vulgaris*, Linn.; *Narthecium ossifragum*, Huds.; *Eriophorum vaginatum*, Linn.; *Juncus*, spp.; *Carex*, spp.

There are stretches of *Eriophorum* in places, *e.g.* in the north-east and south-east. The peat here is very thick and much water is present. *Eriophorum vaginatum*, Linn., and *E. angustifolium*, Roth, are both found—the waving of their silky heads doing much to relieve the monotony of the bleak, brown moorland. The extent of *Eriophorum* to the south-east—on Benhar Moor—may be of late development. Inquiries have elicited the fact that, previous to the opening up of the mineral resources of this district, about forty years ago, there was a great development of ling (*Calluna*) which, however, was killed off by the smoke and fumes from iron-stone burning.

It is interesting to notice how the various moorland associations merge into one another according as the environment changes, either as regards variation in the amount of moisture present or in the thickness of the peat.

The Flora of the Streams and Marshes.

Marshes and bogs occupy parts of the low-lying land, which is subjected to lengthened periods of submergence under water and to shorter periods of dry or less wet conditions. The roots, rhizomes, and, in many cases, the lower parts of the stems are under water, while the assimilating parts are aerial. Many of the plants are such as can adapt themselves to the varying conditions, partaking of such characteristics as the prevailing state of the soil requires. Reed swamps characterise such features as the reservoirs—one example being found at the western end of Forrestburn Reservoir. To the north-west of Lochill Farm, near Lady Bell's Moss, there is a somewhat extensive marsh where the vegetation appears to be zonally arranged. When this was visited, the ground around was so sodden, owing to heavy rains, that the marsh could not be thoroughly investigated, but closer study will yet be made. The various streams have many of the characteristic water plants.

The following are among the plants found in the streams and marshes:—

Ranunculus Flammula, Linn.; *R. hederaceus*, Linn.; *Caltha palustris*, Linn.; *Nuphar luteum*, Sibth. et Sm.; *Cardamine pratensis*, Linn.; *Lychnis Flos-cuculi*, Linn.; *Stellaria uliginosa*, Murr.; *Montia fontana*, Linn.; *Potentilla palustris*, Scop.; *Parnassia palustris*, Linn.; *Callitriche verna*, Linn.; *C. autumnalis*, Linn.; *Epilobium palustre*, Linn.; *Galium uliginosum*, Linn.; *Valeriana officinalis*, Linn.; *Senecio aquaticus*, Hill; *Lysimachia thyrsiflora*, Linn.; *Menyanthes trifoliata*, Linn.; *Myosotis palustris*, Hill; *Veronica scutellata*, Linn.; *V. Anagallis*, Linn.; *V. Beccabunga*, Linn.; *Pedicularis sylvatica*, Linn.; *P. palustris*, Linn.; *Pinguicula vulgaris*, Linn.; *Mentha aquatica*, Linn.; *Orchis maculata*, Linn.; *O. latifolia*, Linn.; *Iris Pseudacorus*, Linn.; *Juncus*, spp.; *Sparganium ramosum*, Curt.; *S. simplex*, Huds.; *Lemna*

minor, Linn.; *Potamogeton natans*, Linn.; *Carex*, spp.; *Equisetum palustre*, Linn.; *E. limosum*, Linn.

This survey of the vegetation of the parish is by no means exhaustive. Doubtless it is also imperfect and faulty owing to its being the work of one working alone. It is given as a first study of the vegetation on modern lines. Much remains to be accomplished in the study of distribution and the relationship existing between dominant, sub-dominant, and associated species.

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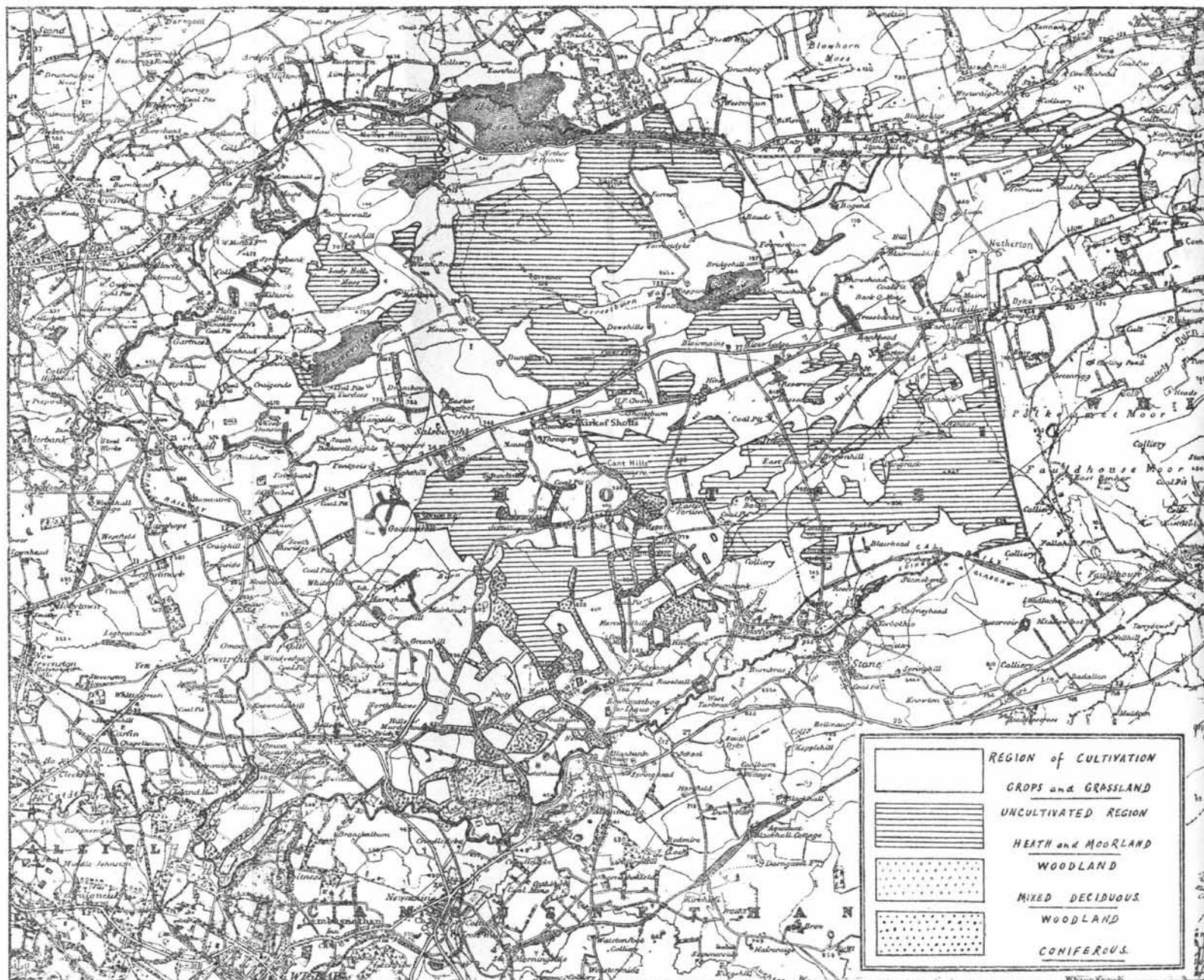
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TWO NEW HIMALAYAN PRIMULAS FROM THE CHUMBI VALLEY. By W. W. SMITH, M.A.

Primula chumbiensis, W. W. Sm. Sp. nov.

Species valde affinis *Primulae reticulatae*, Wall.; forsan subspecies orta in valle tibetica Chumbi, multo minus humidiore quam provincia sikkimensis; interim pro specie propria melius habetur; foliis multo minoribus, coriaceis, bracteis subulatis, differt.

Planta 15–25 cm. alta, glabra, ut videtur lutaria, radicibus fibrosis crassis multis praedita. Folia petiolata; lamina 1–4 cm. longa (plerumque circ. 2.5 cm.), 1–2 cm. lata, ovato-



G. BROWN.

PARISH OF SHOTTS. (Scale $\frac{1}{4}$ inch to 1 mile.)

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