The flora and vegetation of the Fontainebleau Forest

By François Beaux

A flora that has been studied for a long time

The rich flore of the Fontainebleau forest has been a subject of study for several centuries and many botanists came and worked there. Let's only mention Tournefort who as soon as 1698 described some rare species of the Ile-de-France such as the spider Wort, the spotted Porcelle, the hart's Wort, the autumn lady's Tresses or the large-flowered Sabline, all of them are still present in the forest.

Data

Since « à Fontainebleau » a succession of botanists have observed the presence of 1424 species of superior plants (called Phanerogams) that can be classified as follows.

- Trees : 186 species, 77 spontaneous and 109 planted,
- Shrubs : 100 species, 79 of them spontaneous,
- Other superior plants : 1138 species.

The Cryptogams should be added to them : the ferns and their relatives, the mosses and liverworts, the lichens, even some mushrooms and algae, so that the flora of Fontainebleau would offer a list of over 5000 species of plants, a number that stresses the importance of the rich floristic diversity of the forest.

What are the reasons of such a wealth ?

The rich diversity that characterizes the forest of Fontainebleau is due to a number of factors. The forest offers an alternance of : plains, plateaus and hills with variously exposed slopes composed of siliceous sands and rocks, limestone mounts and alluvial soils, either dry or wet and even aquatic environnements associated with highly variable climatology. The forest is deliberately productive with leisure activities that entail an intense frequentation. Morever influence but a continental this forest is located at the biogeographic crossroad that is influenced mainly by the atlantic but alsa by a continental, a mountain and even a mediterranean climate. This complex mosaïc results in a great variety of landscapes, forest planting, flora and fauna.

The major plant groups

It would be fastidious to refer to an exhaustive list of the plants at Fontainebleau. In a rather subjective way we propose about one hundred species selected among the most characteristic, interesting or rare. To simplify, we shall classify them into vegetal groups selected among the most commonly met. These groups will be borrowed from Marcel Bournerias' descriptions.

The beech grove on acid soil

A forest cluster mainly located on blown-sands covering the limestone high grounds. They appear as a forest dominated by sessile Oak and Beech. Common Holly and butcher's Broom accompany them in the undergrowth. In spring, before he covering of foliage darkens the soil, a carpet of wood Anemone and sometimes the rare yellow wood Anemone will bloom. Later, the ferns develop like the narrow buckler Fern or the male Fern. In the South East quarter of the forest wherever the Pine has infiltrated, the common Prince's pine may bloom.

Wood Anemone (*Anemone nemorosa)*

Narrow buckler Fern (*Dryopteris carthusiana)*

Butcher's Broom (*Ruscus aculeatus*)

Yellow wood Anemone (*Anemone ranunculoides)*

The sessile Oak on poor soil

A forest cluster looking like a clearer forest on more acid and fairly poor sands, is dominated by sessile Oak often accompanied by Beech, verrucous Birch or Chesnutt. In the underwood grows the Medlar whose fruits are edible only after the early first frost ; also the alder Buckthorn and the Honeysuckle that seldom blooms. Here and there, areas of Lilies of the valley appear whose toxic blades should never be sucked and most often the Bracken that invades the underwood. Along the alleys the wood Sage, the common Speedwell or the broadleaved Helleborine, which is a frequently seen orchid, develop. In the years after the woodcuts for thinning beautiful populations of Fox glove will enjoy to appear.

Medlar *(Mespilus germanica)*

Spindle tree *(Evonymus eurpaeus)*

Lily-of-the-valley *(Convallaria majalis)*

Common Speedwell *(Veronica officinalis)*

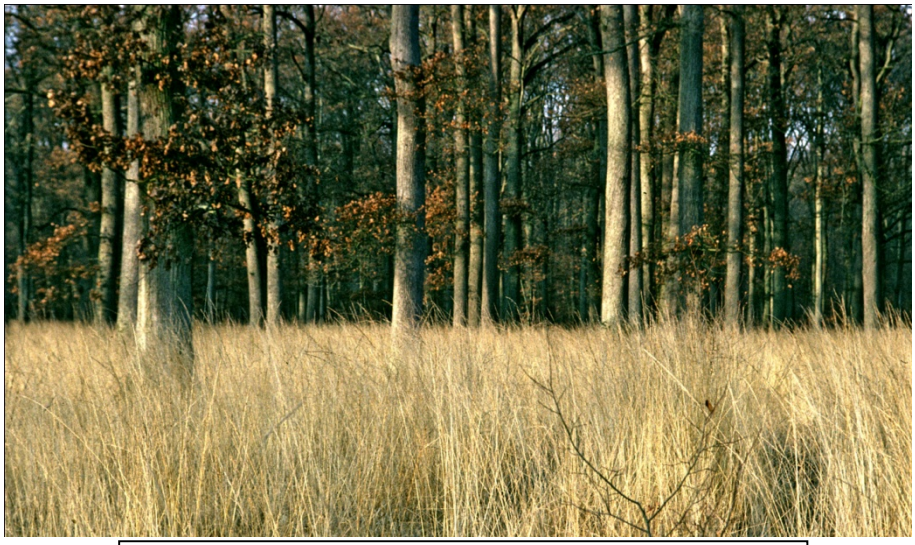
Wood Sage *(Teucrium scorodonia)*

Broad-leaved Helleborine *(Epipactis helleborine)*

Foxglove *(Digitalis purpurea)*

The common Oak on poor soil

A forest cluster on soils predominent sandy though wet and even flooded occasionally in the Northern part of the forest. It is mainly composed of common Oak trees accompanied by the Wildservice tree and the wild Birch. The undergrowth is rather poor, mainly composed of purple Moor-grass, a large stalk grass affecting wet lands, and sometimes by the French Wort.



Purple Moor-grass under Common Oaks *(Molinia coerulea)*

The oak-Hornbeam

A dense forest cluster though thinner or fragmented upon fresh and almost moist land. On the borders or mixed with Oak or Beech woods, it is dominated by the sessile Oak associated with the Hornbeam. The wild Cherry and the Ash are often found with the Hazelnuts. Due to the density of the canopy it is especially in spring that, taking advantage of the light Daffodils, wood Anemones and more rarely Bluebells develop. The most scattered are the common dog Violet, the lesser Celandine or early Squil. The wood Spurge, the angular Solomon's Seal and the greater Stitchwort are frequently met. Later the male Fern, the lady Fern, the enchanters Nightshade and the more rarely the hedge Woundwort.

Wild Daffodil *(Narcissus pseudonarcissus)*

Early Squil *(Scilla bifolia)*

Wood Spurge *(Euphorbia amygdaloides)*

Lesser Celandine *(Ranunculus ficaria)*

Angular Salomon's Seal *(Polygonatum odoratum)*

Greater Stitchwort *(Stelleria holostea)*

Enchanter's Nightshade *(Circea lutetiana)*

Lady Fern *(Athyrium filix-femina)*

The beech wood on limestone

A forest group of full-grown timber trees developing on the limestone plateaus. It is essentially constituted by the Beech episodically associated with the If and the sessile Oak. Often dense and dark the underwood is poorly covered. Yet the bird nest Orchid, a peculiar orchid without chlorophylle, sometimes the larger Wintergreen and rarely the fragrant small-leaved Epipactis. When the trees are thinner and allow more light, other orchids characterize it : the white Helleborine, the long-leaved Helleborine and the broad-leaved Helleborine.

Bird-nest Orchid *(Neottia nidus-avis)*

Small-leaved Helleborine *(Epipactis microphylla)*

White Helleborine
(Cephalanthera damasonium)

Long-leaved Helleborine
(Cephalanthera longifolia)

The meadow wood with pubescent Oak

Typically located on the southern edges of the limestone mounts these well-exposed lawns are more or less loosely covered by the pubescent Oak, producing a well-lighted underwood covered with herbaceous plants providing a rich variety of species. The shrub stratum offers the service Tree of Fontainebleau (an endemic specie) and the snowy Mespilus both having edible fruit but also different thorny bushes as the sloe Tree or the dog Rose. In the meadow the swallow Wort, the Nottingen Catchfly, the Paperbell-flower, the bastard Balm and the bloody Cranesbill can commonly be seen.

Sloe Tree *(Prunus spinosa)*

Service Tree of Fontainebleau *(Sorbus latifolia)*

Snowy mespilus *(Amelanchier ovalis)*

Noottingham Catchfly *(Silene nutans)*

Bloody Cranesbill *(Geranium sanguineum)*

Violet Limodorum *(Limodorum abortivum)*

There are many rare or/and protected species in the Ile-de-France to be met there: the St-Bernard Lily, the grass-leaved Buttercup, the purple-Klee, the lesser meadow Rue, the dyer's Woodruft, the Austrian Scorzone, the black Pea, the violet Limodorum with aborted leaves and above all the red Helleborine, of which it is the only current location in the whole of the Ile-de-France.

Swalloow Wort
(Vincetoxicum hirundinaria)

Paperbell Flower
(Campanula persicifolia)

Grass-leaf Buttercup
(Ranunculus gramineus)

Purpur-Klee *(Trifolium rubens)*

St-Bernard Lily
(Anthericum liliago)

Red Helleborine
(Cephalanthera rubra)

When the pubescent Oak becomes too abundant, the number of species goes down in the underwood. Conversely, when the Oak is rare or absent in open surroundings, there appears a calcareous lawn that is rich in orchids such as the military Orchid, the hangedman Orchid, the bee Orchid, the early spider Orchid and the late spider Orchid.

Military Orchid *(Orchis militaris)*

Early Spider Orchid *(Ophrys sphegodes)*

Man Orchid
(Aceras anthropophorum)

Late Spider Orchid
(Ophrys fuciflora)

The limestone sandy lawns

The vegetation in valleys and warm dry plains where the limestone elements have mixed with the sand. To the exc eption of the Scot Pine it shows few woods as they can only develop with difficulty. Conversely the herbaceous stage calls up the image of a steppe and in fact displays many plants, some of which are rare and typical of the place. Thus the Pasque Flower, which blooms in spring, can be found easily followed by the mountain Cinquefoil frequent in the South East quarter of the forest, the umbel-flowered Sun rose, the army false Plantain, the burnet Rose and the very rare burnt Orchid. Spiked Speedwell in ears, the white Scabious and the autumn Squill appear in late summer. In very rare sites might be found the spotted Cat-ear, yellow Onion, Honewort and the exceptional large flowered Sandwort and autumn lady's Tresses, all of them are protected.

Mountain Cinquefoil *(Potentilla montana)*

Pasques Flower *(Pulsatilla vulgaris)*

Burnet Rose
(Rosa pimpinellifolia)

Burnt Orchid *(Neotina ustulata)*

Autumn Squil
(Scilla automnalis)

Spiked Speedwell *(Veronica spicata)*

Large-flowered Sandwort *(Arenaria grandiflora)*

Autumn Lady's Tresses *(Spiranthes spiralis)*

Umbel-flowered Sun Rose *(Halimium umbellatum)*

The sand and rocks

The famous rocky sandstone chaos that has collapsed down the slopes and is resting on sand does not present a very varied vegetation apart from lichens and mosses. Common Heather and Bracken share the non-rocky soil. The common Birch, the Scot Pine and sometimes the oak are irregularly distributed allowing other ferns to develop in their cool shade. Thus the common Polypody or licorice of the woods abound as well as the narrow buckler Fern. On the colder Northern slope the broad buckler Fern is common but the Blueberry is much rarer. It may happen, though exceptionally, to find rare and protected plants which are fond of such environments : the Billot's Asplenium, a small fern that rather seeks the shelter of hanging rocks, and the gravel Fescue a small grass that likes the drier sandstone tumbles offered by the waste of sandstone quarries. Finally the snowy Mespilus even though it is known to love limestone can often be seen in the cracks and fissures of the sandstone, a fact that can hardly be explained.

Braken *(Pteridium aquilinum)*

Common Heather *(Calluna vulgaris)*

Broad Bucker Fern *(Dryopteris dilatata)*

Common Polypody *(Polypodium vulgare)*

Blue Berry *(Vaccinium myrtillus)*

Billot's Fern *(Asplenium billotii)*

The heath moors

In their dryer parts the sandstone flats are covered with a Heath mainly constituted by Callune but also by common Heather, broom Genet, hairy Genet or local spotted Rockrose. On the bare sands readily colonised by the grey hair Grass, the bare stemmed shepherd's Cress or the rare Morison Spurey grow in spring. When the soil is deep enough the common Birch may settle there.

Common Heather *(Calluna vulgaris)*

Spotted Rock Rose *(Tuberaria guttata)*

Bell Heather *(Erica cinerea)*

Hairy Greenweed *(Genista pilosa)*

Morison's Spurrey *(Spergula morisonii)*

In their moist parts these moors shelter the common Birch, the blue Molinia, the needle Furze and eventually the cross-leaved Heather.

Purple Moor-grass *(Molinia coerulea)*

Cross-leaved Heath *(Erica tetralix)*

The vegetation of the ponds

In the plains the pools have often been dug and maintained by man to water the herds or hunting crews. They are fed by rainfalls and underground sheets of water. Their waters are often mineralized and not very acid, eventually close to neutral. As they are surrounded by amphibious plants like Willows, Reed mace, common Reeds, various large sedges (*Carex*), Gipsy-wort, yellow Loosestrife or bittersweet and black Nightshade. In their waters they favour the growth of various water Lilies, water Crowfoot, broad-leaved Pondweed, water Plantain or water Violet.

Reed Mace *(Typha latifolia)*

Common Read *(Phragmite australis)*

Gips-wort *(Lycopus europaeus)*

Bitter Sweet *(Solanum dulcamara)*

Broad-leaved Pon Weed *(Potamogeton natans)*

Water Plantain *(Alisma plantago-aquatica)*

Water Crowfoot *(Ranunculus aquatilis)*

Water Lily *(Nymphea ssp)*

Water Violet *(Hottonia palustris)*

Yellow Loosestrife *(Lysimachia vulgaris)*

The ponds on flat slabs are located in the hollows of an undulating sandstone slab that covers a rocky spot. They are only fed by rainfalls. Most of them contain a water deficient in nutrients and minerals.

Some of them are permanent because they are deep and allow the development of a diversified flora. The floating Sweet-grass is frequent there. The bog Pondweed, the lesser Marshwort, the austral Bladderwort which is a carnivorous plant, the three-lobbed Crowfoot and the white flower Buttercup can more rarely be found there.

Floatind Sweet-grass *(Glyceria fluitans)*

Bog Pondweed *(Potamogeton polygonifolius)*

Three-lobed Crowfoot *(Ranunculus tripartitus)*

Lesser Marshwort *(Apium inundatum)*

Austral Bladderwort *(Utricularia australis)*

Other species are temporary because the ponds are shallow. Summer dryes alternating with periods of high waters create difficult ecological conditions to which however some rare plants have managed to be adapted, thus making such environments particulary valuable. This is the case with the narrow-leaved mossy Stonecrep, the corral Necklace, the knot-flowered Crowfoot and two smal ferns : the Pilwort and the small adder's tongue Fern.

Narrow-leaved Mossy Stonecrep *(Crassula vaillantii)*

Corral Necklace *(Illecebrum verticillatum)*

Knot-flowered Crowfoot *(Ranunculus nodiflorus)*

Small Adder's-tongue Fern *(Ophioglossum azoricum)*

Some slab-ponds have definitely more acid waters. Whether they are permanent or temporary, they are surrounded by purple Moor-grass often organized in small towers (« touradons »). Their wet surroundings favour the growth of very special mosses, namely the Peat Moss (Sphagnum) a dozen of species of which have been listed in these surroundings.

Small towers of Purple Moor-grass *(Molinia coerulea)*

Blunt-leaved Bogmoss *(Sphagnum palustre)*

The pinewoods

10 000 years ago the Scot Pine could already be seen. It was reintroduced as a plantation in the 18th century. Very quickly acclimatized, it has spontaneously spread ever since, and can now be found in almost all the forest. Other softwood species have also been introduced such as the Norway Pine, the common Silver Fir, the Douglas Fir, the Cedar, the black Pine and even the giant Sequoia but they do not settle permanently. Owing to their needles that classically acidify the soil the scot Pine do not favour the underwood vegetation, the mosses and the famous delicious saffron milk Cap being excepted. Even though it was brought in with the plants a formerly very rare orchid is now nearly common : namely the creeping lady's Tresses. Finally the Pine forest may shelter the rare Prince's-pine.

Creeping lady's Tresses *(Goodyera repens)*

Common Prince's-pine *(Chimaphylla umbellata)*

A heritage in evolution

The present very incomplete panorama over the vegetation of Fontainebleau forest is but an instant and very partial snapshot at the present situation. By the end of the Middle Age period only one half of the forest was covered with trees, the rest was but moors and open lawns that the fires, the rabbits and mainly the pastures maintained. Ever since the century of Louis XIV the foresters have carried out such an effort of plantation that now the forest has spread nearly all over the region. The essence that was needed was mainly the Oak, a noble wood that ensured that the many ships of the Royal or Imperial fleets were seaworthy. Later when coniferous trees were re-introduced the covering process was highly increased. This afforestation was carried out on open spaces whose surface was then severely restricted to the great damage of the plants that needed light. Some of them have taken refuge on the borders and edges of the forest. In the latest few decades the importance of the ecological role played by these open spaces has been better understood and the present tendency is to protect the moors and meadows, to enlarge them or even to re-create them. Quite similarly the wetlands that used to be drained in the past are now recognized as important reserves of water and mainly as a reservoir of biodiversity. An important maintenance and management of these environments has been carried out ever since to the great benefit of the species that need water.

The role played by forestry that used to aim at productivity and was careless of the flora has now enabled some species to become common. Morever in the past the management of some reserves may have neglected their maintenance and impoverished the flora but in the latest decades a more precise and respectful management has become the rule.

Finally the intensive frequentation of tourists and visitors since the middle of 19th century has played an important role. Not much because of the gathering of abundant plants such as the Daffodils in spring but because the keeping of herbariums became fashionable among many amateur botanists who were more interested in their collections than respectful of Nature.

A heritage to be protected

The protection of plants and species is closely linked with the protection of their favourite ecological environment. The forest of Fontainebleau is now protected by law :
- classification : Monuments and sites 1930,
- classification : Natura 2000,
- classification : World heritage reserve « Man and Biosphere » 1998
- classification : Forest Protection 2002.

On the land itself, the Artistic reserves (1870) later named Biologic reserves (1953) keep enlarging. At the present time over 1049 ha of full biologic reserves where man does not interfere at all allow Nature to care for itself on its own. This does not favour the phanerogames but the cryptogames and mainly the smaller fauna of the forest increase in number to the greater benefit of observers. 1163 ha of biologic reserves under control were added where some definite spaces may be under maintenance to the great benefit and advantage of the phanerogames.
Maintaining and caring for the integrity of this heritage mustn't only depend on law and reserves. The whole forest must be respected and protected, which implies everybody's involvement ; an involvement of the foresters as well as that of the many visitors.

Let's conclude with a practical proposition that the wanderers should keep in mind when they gather plants, that is the « one per cent law ». Before picking such flower that you really like, look around ; if you can see at least one hundred of them, then you can pick up one, otherwise just refrain for the moment for it may be a rare or protected plant.

Pick if plenty !

Big thanks to Alain Roupsard for the translation.

LEXICON

En français	*latin*	In English
Anemone Sylvie	*Anemone nemorosa*	Wood Amenone
Dryoptéris des Chartreux	*Dryopteris carthusiana*	Narrow buckler Fern
Anemone à feuilles de renoncule	*Anemone ranunculoides*	Yellow wood Anemone
Fragon	*Ruscus aculeatus*	Butcher's Broom
Néflier	*Mespilus germanica*	Medlar
Fusain	*Evonimus europaeus*	Spindle tree
Muguet	*Convallaria majalis*	Lily-of-the-valley
Véronique officinale	*Veronica officinalis*	Common Speedwell
Germandrée	*Teucrium scorodonia*	Wood Sage
Epipactis à larges feuilles	*Epipactishelleborine*	Broad-leaved Helleborine
Digitale pourpre	*Digitalis purpurea*	Foxglove
Chênaie sur Molinie bleue	*Molinia coerulea*	Purple Moor-grass
Jonquille	*Narcissus pseudonarcissus*	Wild Daffodil
Scille à deux feuilles	*Scilla bifolia*	Early Squil
Euphorbe des bois	*Euphorbia amygdaloides*	Wood Spurge
Ficaire	*Ranunculus ficaria*	Lesser Celandine
Sceau de Salomon	*Polygonatum odoratum*	Angular Salomon's Seal
Stellaire holostée	*Stellaria hholostea*	Greater Stitchwort
Circée de Paris	*Circea lutetiana*	Enchanter's Nightshade
Fougère femelle	*Athyrium filix-femina*	Lady Fern
Neottie nid-d'oiseau	*Neottia nidus(avis*	Bird-nest Orchid
Epipactis à petites feuilles	*Epipactis microphylla*	Small-leaved Helleborine
Cephalanthère à grandes fleurs	*Cephalanthera damasonium*	White Helleborine
Cephalanthère à feuilles étroites	*Cephalanthera longifolia*	Long-leaved Helleborine
Prunellier	*Prunus spinosa*	Sloe Tree
Alisier de Fontainebleau	*Sorbus latifolia*	Service Tree of Fontainebleau
Amélanchier	*Amelanchier ovalis*	Snowy Mespilus
Silène penchée	*Silene nutans*	Nottingham Catchfly
Géranium sanguin	*Geranium sanguineum*	Bloody Cranesbill
Limodore à feuilles avortées	*Limodorum abortivum*	Violet Limodorum
Dompte-venin	*Vincetoxicum hirundinaria*	Swallow Wort
Campanule à feuilles de pêcher	*Campanula persicifolia*	Paperbell Flower
Renoncule à feuilles de graminées	*Ranunculus gramineus*	Grass-leaf Buttercup
Trèfle rougeâtre	*Trifolium rubens*	Purpur-Klee
Phalangère à fleurs de lys	*Anthericum liliago*	St-Bernard Lily
Céphalanthère rouge	*Cephalanthera rubra*	Red Helleborine
Orchis militaire	*Orchis militaris*	Military Orchid
Ophrys araignée	*Ophrys sphegodes*	Early Spider Orchid
Orchis homme pendu	*Orchis anthropophorum*	Man Orchid
Ophrys bourdon	*Ophrys fuciflora*	Late Spider Orchid
Potentille des montagnes	*Potentilla montana*	Mountain Cinquefoil

Anémone pulsatiile	*Pusatilla vulgaris*	Pasque Flower
Rosier ppimprenelle	*Rosa pimpinellifolia*	Burnet Rose
Orchis brûlé	*Neotina ustulata*	Burnt Orchid
Scille d'automne	*Scilla automnalis*	Autumn Squil
Véronique en épis	*Veronica spicata*	Spiked Speedwell
Sabline à grandes fleurs	*Arenaria grandiflora*	Large-flowered Sandwort
Hélianthème en ombelle	*Halimium umbellatum*	Umbel Flowered Sun rose
Spiranthe d'automne	*Spiranthes spiralis*	Autumn Lady's Tresses
Fougère aigle	*Pteridium aquilinum*	Braken
Callune	*Calluna vulgaris*	Common Heather
Dryoptéris diilaté	*Dryopteris dilatata*	Broad Bucker Fern
Polypode vulgaire	*Polypodium vulgare*	Common Polypody
Myrtille	*Vaccinium myrtillus*	Blue Berry
Doradille de Billot	*Asplenium billotii*	Billot's Fern
Lande à Callune	*Calluna vulgaris*	Common Heather
Hélianthème à goutte	*Tuberaria guttata*	Spotted Rock Rose
Bruyère cendrée	*Erica cinerea*	Bell Heather
Genêt poilu	*Genista pilosa*	Hairy Greenweed
Sprgoutte printannière	*Spergula morisonii*	Morison's Spurrey
Molinie	*Molinia coerulea*	Purple Moor-grass
Bruyère à quatre angles	*Erica tetralix*	Cross-leaved Heath
Massettes	*Typha latifolia*	Reed Mace
Roseaux	*Phragmite australis*	Common Reed
Lycope	*Lycopus europaeus*	Gips-'wort
Douce amère	*Solanum dulcamara*	Bitter Sweet
Potamotgeton nageant	*Potamogeton natans*	Broad-leaved Pon Weed
Grand plantain d'eau	*Alisma plantago-aquatica*	Water Plantain
Renoncule aquatique	*Ranuncuus aquatilis*	Water Crowfoot
Nénuphar	*Nymphea sp.*	White Water Lily
Hottonie des marais	*Hottonia palustris*	Water Violet
Lysimaque commune	*Lysimachia vulgaris*	Yellow Loosestrife
Glycérie flottante	*Glyceria fluitans*	Floating Sweet-grass
Potamot à feuilles de renouée	*Potamoogeton polygonifolius*	Bog Pondweed
Renoncule tripartite	*Ranunculus tripartitus*	Three-lobed Crowfoot
Ache inondée	*Apium inudatum*	Lesser Marshwort
Grande utriculaire	*Utricularia australis*	Austral Bladderwort
Crassule de Vaillant	*Crassuula vaillantii*	Narrow-leaved Mossy Stonecrep
Illécèbre verticillé	*Illecebrum verticillatum*	Corral Necklace
Renoncule à nœuds fleuris	*Ranunculus nodiflorus*	Knot-flowered Crowfoot
Ophioglosse des Açores	*Ophioglossum azoricum*	Small Adder's-tongue Fern
Molinie	*Molinia coerulea*	Purple Moor-grass
Sphaigne des marais	*Sphagnum palustre*	Blunt-leaved Bogmoss
Goodyère ramppante	*Goodyera repens*	Creeping lady's Tresses
Pyrole en ombelle	*Chimaphylla umbellata*	Common Prince's-pine