

## The Wild Homes of Garden Plants

### Introduction

This book is written for gardeners in the British Isles who are also lovers of the beauty of natural scenery and the wild plants which give it character. Gardeners who think of their plants not so much as material with which to form artificial designs or masses of colour, but as living things. A garden opens up many interests when considered in this way.

It is pleasant while walking round a garden to let the familiar garden plants call up visions of the exotic landscapes from which they come: the high mountain pastures; the sun-baked Mediterranean slopes; the prairies of Nebraska; the forests of Japan. For one whose home is the English countryside it is fascinating to imagine in what miraculous meadows the great Oriental Poppy flares, or how stately the ancient wild forests of Cedars must be on their mountainsides in Lebanon.

When travelling it is often an unexpected delight to come upon plants growing wild which are well known in gardens at home. As a boy in California the author decided that the lupins, lilies, and azaleas which he found apparently wild must have been introduced by the early Spanish missionaries, and only later has realized that he was seeing them in their native home, from which they had come to his English garden. However, many plants have in fact been introduced to most lands all over the world, and it is interesting to learn which are the true natives.

The naturalist-gardener may walk in an Oak-wood in primrose time, or across an Alpine meadow in June, and despair of creating anything half so beautiful in his garden. If he is a good gardener, he already knows the soil and moisture conditions which suit his plants. But he may find he can learn some lessons about where his plants will look best, and with what others to grow them, if he knows their natural environment and associates.

Many gardeners are meticulous in growing only true mountain plants in their rockeries, and the same idea might be extended to other parts of the garden to give variety. Even the most highly developed garden plants descend from wild ancestors and inherit some of the characters of their distant parents, however modified by relocation and cross-breeding. Many, though by no means all, can be fitted into a naturalistic planting.

The gardener may wish to know what conditions cause his plants to be so various – tiny cushions, lank juicy herbs, tangled bushes or tall trees. It is not enough to learn from what country a plant originates, all the above forms are to be found in Yorkshire.

All plants have a “home” to which they are suited, and to which in turn they give special character. The beauty of natural scenery, and especially its unique quality, often lies as much in its vegetation as in its topography. In Britain, for example, consider the difference in landscape between the heather moors of the Scotch hills and the Beech-hangers on the southern English chalk downs. This “home” is not merely a special region of the Earth. The plant can only flourish wild where both soil and climate are not too extreme for its constitution, and where it can survive competition with other plants, as well as the depredations of the local animals. A delicate balance is thus formed between the competing plants and their environment. If the environment remains unchanged, the best fitted plants eventually attain stability amongst themselves. The conditions of life sometimes do remain the same for long periods or over large areas. But climates gradually change; grazing animals (and man), pests and diseases, all increase or decrease in abundance; or the soil slowly alters by the action of the plants themselves. Rocks below differ from place to place; height and aspect of hill slopes affect the sunlight and winds; and even the slightest hollow causes alteration in the water supply.

All these changes in the environment can be traced by the different plant communities, or balances, which inhabit them.

For example, there are commons in England which alternate between grassland and Ling-heath according to the intensity of rabbit-grazing. The rabbits eat down the Ling, allowing the grasses to spread. If the rabbits are destroyed, the Ling grows up and smothers out the grass. Again, along flat, muddy sea coasts, the belts of land submerged by every tide, by most tides, or by spring tides only, are easily distinguished by the different communities growing on them.

The fact that a plant is found in a special community does not necessarily mean, of course, that it will grow nowhere else. In some cases it has been unable to reach another suitable site, during its history, because separated by oceans or deserts, and when carried there, naturalizes itself. The Caucasian cherry-laurel and rhododendron are naturalizing themselves in west British woods. Also, many plants will grow well far beyond their natural limits if only freed from too intense competition. It is interesting in gardens to find out which alien plants can hold their own together; they are by no means always the same as can do so in their natural homes. Nevertheless, plants which grow together in their own lands often complement each other in the garden.

## Climate, Water and Soil

The first great factor which determines the plant community is the amount of warmth. Therefore the vegetation of the world is in belts from round the poles to the tropics. These belts are made irregular by the position of oceans with their warm and cold currents, and the extent and topography of the land masses, low-lying or mountainous.

Within these belts, the second most important factor is the water supply. The precipitation can vary from spasmodic storms, yielding a few inches, with many months' interval between them, to continual or seasonal flooding with several hundred inches. The configuration of the land helps to determine how much of this water shall be available to the plants, from complete submergence in lakes, to steep slopes exposed to wind and sun. The texture of the soil is important in either absorbing and retaining the moisture, as does heavy loam, or swallowing it to great depths as does coarse gravel and fissured limestone.

The chemical nature of some more extreme types of soil has an effect on the availability of water to plants. The presence of strong salt solutions, as by the sea, or in certain deserts, makes it difficult for the plant to generate a strong enough sap to suck up much water, and the same happens in very acid peaty soils. Both of these conditions enforce adaptations in their plants for prevention of excessive water-loss, and economy in its use. It is strange to see the succulent, leafless Marsh-Samphire, so like a desert plants, growing in deep, wet mud, and even inundated by every tide.

The character of the predominant soils of a region is produced by the climate. The underlying rock causes variations, but only within the range permitted by the climate. A clay basis in England will become enriched with humus to form a brown forest-soil. The plentiful rainfall and mild climate allow summer-green trees to flourish and shed large quantities of leaves. Downward percolation of water through these alternates with upward sucking of the moisture in dry periods in summer, bearing with it neutralizing salts. Thus the top soil always has enough salts present for the plant-remains to be rotted down to humus and incorporated by worms. In the region of the Northern Coniferous forest the clay becomes a Podsol soil. The summers are not long and dry enough to draw up the water and salts from the clay, so the topsoil becomes very sour and impoverished by the downward seeping water. The needle-litter decomposes very slowly, and cannot form true humus in the absence of salts. Nor can worms live in these acid conditions, so the litter is not mixed into the soil. A clay in the desert near the Caspian Sea develops into alkaline, or solonchak, soil. The light winter snowfall sinks into the clay, where it dissolves salts. The intense and long summer heats and winds suck the water up again, and evaporate it, leaving the dissolved salts as a gleaming white crust on the surface.

Within a climatic region, the effect on the plants of the chemical nature of the underlying rock is not fully understood. The alteration of the communities, and the plants forming them, is often very obvious as one moves from one type of rock to another – say from a limestone to a sandstone. But it is very difficult to distinguish between effects caused by chemicals directly and those caused by the physical nature of the ground, especially its water-providing capacity. For instance, the Beech flourishes best in England on chalk, which is well-drained and warm, in a wet cool climate, whereas in the Cevennes, in a dry, warm climate, it is a tree of the sands, in which it can reach water more easily than on the local fissured limestones. It seems that there are only a few plants that are confined to soils of a particular chemical character. The harmful effect on some plants of soils of certain chemical compositions seems to be the non-availability of particular food elements, rather than any toxicity. This seems to be the case with the “lime-hating” Rhododendrons which can be grown on limestones with the aid of available iron salts. A possible exception is the rock Serpentine which yields soils on which a characteristic vegetation grows. Some plants have developed races, or closely-related species, one of which is confined to Serpentine, while the other will not grow on it. This appears to be partly due to the toxicity of certain metal salts. A curious instance is the European Forsythia, a relic of earlier vegetation, which is now confined to Serpentine in the Balkans, perhaps because competition is not so severe. All the rest of the Forsythias grow in China.

### **Changes in Plants and their Communities**

Neither plants nor their communities are everlasting. A community, such as an ancient forest, may have achieved a balance between climate, soil, and plant and animal members, and remain self-perpetuating for many centuries. It is then known as the climax for the region. But the climate changes through the epochs, the mountains are raised and worn down, and new species are evolved.

During the ages plants are developing in their structures to be better fitted to their ever-changing conditions of life. New species constantly arise from modifications and mutations. The ones that adapt themselves better have spread and are still spreading, suppressing those which are less competitive. Some of these may survive in refuges where conditions have changed little, or are unfavourable to the new plants. Certain groups of plants seem to be in a state of more rapid change than others, with many closely alike forms which appear to have sprung from a common ancestor fairly recently. The Hawkweeds and Brambles are examples. Together with the natural

variability of all living things, these fast-developing groups cause differences among taxonomists in deciding when to separate one from another as distinct species. Hybridization in the wild is also now thought to be another common confusing factor. The concept of distinct species is therefore a method of description and classification of living things for only a moment in their evolution, to show ancestry as well as peculiarities.

Climates also change radically, becoming more favourable for some species, and even whole communities, and more difficult for others. In Eurasia the ice-sheets of the last Ice Age covered the land north of a line from the Thames across central Germany and Russia and included the lowlands of the Ob in Siberia. Continuous sheets did not form in north-east Siberia, probably because the precipitation was too small, though the climate was intensely cold. In North America the ice-cap reached far south of the Great Lakes. In Europe the most northerly temperate plants were isolated from each other south of the ice and the mountains in the Spanish peninsula, Italy, and the Balkans. Some more hardy relic plants from earlier, warmer climates, were among them, such as the common Horse Chestnut, the Serbian Spruce, and the Haberleas and Ramondas (one in the Pyrenees, the rest in the Balkans) which belong to a largely tropical family. Many others died out.

South Britain bore only arctic tundra vegetation of Mountain Avens and Dwarf Birch between the muddy torrents flowing from under the ice-front. But by 10,000 B.C. the climate was warming, and the ice retreating. Three thousand years later, Silver Birch, followed by Pine and Hazel, already had spread across the land, with a few steppe-plants, in drier conditions than today. Man, the Reindeer-hunter of the Old Stone Age on the tundra, had to move away north, or change his habits and settle along rivers and coasts. The forests were too much for stone tools, and the small tribes lived largely on fish and shellfish, supplemented with occasional venison and other game. The age of dominance of the Pineforests was ended by a mild, wet, period, setting in before 5,000 B.C., when Oak and especially Alder superseded most of the Pine, and the summer-green forests appeared, which have remained the main wild vegetation of Britain ever since. Another fluctuation to rather drier conditions followed for two thousand years, allowing the Pine to reoccupy some of its lost ground. Near the beginning of this period, the first New Stone Age agriculturalists arrived in Britain, bringing their cattle with them. The population grew, and man's alteration of the plant landscape started. A second, but cooler, wet period began some 700 years B.C. and has lasted to the present. These climatic changes have left their effects. Isolated communities, such as arctic plants on the Welsh mountains or steppe plants on warm sands in Norfolk, remain as relics of a previous flora.

## Succession

Much more rapid changes are continually being brought about by other natural causes, and, of course, by man. Forest and bush fires seem to flare up naturally; landslips and avalanches destroy vegetation in mountain districts; exceptional floods sweep away and drown land; the upsurge of an animal species cripples important members of a community; hurricanes strip tracks through forest; volcanoes bury areas under ash or lava; and rivers lay new mudland. New land is everywhere being created, or the plant communities in advanced development are being broken down. Man has vastly increased this process.

It is not usually possible for the climax community to reappear immediately on these destroyed areas. Conditions of life have been too much altered. Pioneer species and communities must intervene. Consider a Beech forest in Europe recently cut down. The shady, moist floor, covered with leaf-litter, is now open to full sun and wind. The shade-plants that grew under the still, cool protection of the trees soon die, and their place is taken by thickets of certain tall herbs and annuals of the forest-edge, whose wind- or bird-carried seed travel far. Half-buried among these, tree and shrub seedlings, including the Beech, germinate and grow up, and after a few years the faster growing of them, Birches and Sallows, begin to shade out the herbs. Woodland grasses now spread in place of the herbs under the Birches, with Bramble and Elder tangles. The young Beeches are still low and half hidden, but they can continue to grow in quite deep shade, unlike the Birches. During the next years the Beeches overtop the Birches and kill them out, but the forest is still not mature.

The Beeches are, as yet, overcrowded, tall and spindly. The ground is very nearly bare of plants, as the shade is so deep, with only thick leaf-litter. As further years pass by, the stronger Beeches spread over and smother the weaker ones, thus opening the forest, the plants of shade reappear on the ground, and the community is once again mature. The pioneer tall herbs and trees still flourish in the sun at the edge of the wood, or wherever there is another clearing.

Successions such as this occur wherever new land is made, or the dominant plants of the district are destroyed. They are fairly uniform on the same soil in the same area.

It frequently happens, especially under the influence of man, but also naturally, that a succession is halted and held in a phase which is not the climax for the region and soil. Many meadows and

pastures would revert to forest if it were not for grazing animals, which eat off the tree seedlings, as well as trampling and manuring the ground, which makes it more favourable for grasses and herbs.

There are also many succession communities in different situations, such as those of lakesides in Britain which slowly develop into climax forest as they clog the margins, raising the level of the mud till it becomes dry land. Other series are the stabilization and overgrowing of sand-dunes, and the salt-mud succession in estuaries. Some of these hardly ever end in the regional climax, but eventually attain a balance of their own, in their peculiar environment, which may be considered a soil-climax.

There are many plants belonging to these various succession communities (which are often very rich in species), and which are never found in the climax.

## **Mountains**

There are certain peculiarities of mountain climate that are constantly found all over the world. In some ways, conditions of growth at high altitudes are similar to those of arctic lowlands, and many arctic plants extend southward into the temperate zone high on mountains. But there are notable and important differences.

As in the great belts of vegetation round the world, the primary limitation to plant growth is the diminution of warmth with altitude. Unlike conditions in the Arctic, however, the light becomes more intense at higher elevations. On ascending mountains, temperature drops regularly with increasing height, due to rarefaction of the atmosphere, which therefore cannot absorb so much heat from the ground. Aspect, whether facing the sun or not, is important, but its effects are most marked at medium heights, that is, below the level where the general cold becomes decisive. For example, in the Western Minor Caucasus, Pine woods grow on the south-facing ridges, and Beech on the north, with a sharp line of demarcation between them. Mountains usually have a wetter climate than nearby lowlands, as they check wet winds and turn them upward to a height where the moisture condenses. So, again, aspect has a profound effect, whether the slopes face prevailing rain-bearing winds, or, in some regions, are exposed to desiccating continental air-streams.

At a certain height, varying with the situation of the mountain chain, the cloud-belt occurs. This is the level at which condensation takes place in the rising warm air. It is higher in the summer, lower in the winter. Here is the wettest region on the mountains. Above this, the winds, having

dropped most of their moisture, are often very dry, especially in winter. The sky is clear, and the rarefied atmosphere allows intense and rapid heating and cooling. Yet, in spring and summer, the sun's heat causes daily up and down air-currents, bringing great variations in moisture, with short storms. These regular rising and falling air-streams also produce strong winds through the passes where the ridges divide into peaks. With all these factors, evaporation is often extreme at high altitudes.

The vegetation alters radically as one ascends, under the influence of these differing conditions. Even in deserts, there is usually enough moisture condensed at high altitudes to enable a richer type of vegetation to grow. Comparable belts of vegetation occur on nearly all mountains, but they vary in range of altitude as well as composition and luxuriance, not only on different chains, but also on the same one, according to whether they face north or south, are exposed to wet winds, or are in the rain-shadow.

Typically there are four belts, or zones.

**Basal Zone.** This zone starts where the rocks outcrop, and the mountains rise steeply. The slopes usually bear the vegetation of the neighbouring lowlands, though often growing more luxuriantly because of a better water supply.

**Montane Zone.** The montane zone includes the cloud belt and is the wettest zone, but colder than the basal. The vegetation is again luxuriant, often more so, but of a type more suited to endure prolonged cold in winter. It is often a zone of forest.

**Subalpine Zone.** Above the cloud belt lies a drier, colder, much more windy zone. Exposed to strong evaporation from wind and sun, but generally well-watered by melting snow and summer showers, grassland becomes widespread where soil can collect, or thickets of bushes (often Rhododendrons) on rocky slopes. Where woods occur, they are of different and hardier species, growing where there is more shelter from wind, and interspersed with meadows. On some more wind-swept, rocky slopes, they become dwarfed to "elfin-wood", with their trunks and branches lying prostrate.

**Alpine Zone.** When conditions of evaporation, cold and wind become extreme, and the growing season very short, vegetation can rarely form a continuous cover, and then only a short turf in the most favourable sites. The plants are low, dense, and adapted to endure periods of intensely dry and often cold air, not only in winter, but during their growing season. They often take the form of

rounded cushions. It is in this belt that Arctic plants can grow far south of their lowland range. There is usually plenty of melted snow-water at their roots.

In mountains, the type of rock of which they are made influences their vegetation more than the bedrock does in the lowlands. This is not only because so much is exposed in precipices, outcrops, and screes, but mainly because the rate and type of weathering varies with the different sorts of rock. In spite of the variety of rocks, they fall into two main groups in the effect on plant growth, due largely to the solubility of calcium carbonate in rain-water, as well as its fissible nature. Calcium carbonate, in the form of limestone, is a widespread mountain-building rock. In limestone mountains, rain water, which is slightly acid, sinking into the fissures, dissolves complicated systems of caves and subterranean streams. In the course of time, these become so large that the roof collapses, leaving valleys between stark cliffs. The large collapses fall vertically in great blocks, and, in the course of ages, only rather isolated towers or massifs remain, with uplands of overgrown detritus at their foot. The calcareous mountains are therefore craggy, with high, wild precipices and walls of bare, pale rock. Large screes pile up at the foot of gullies, the rocks of which break down fairly quickly and become covered with grasses and flowers. The presence of lime in the soil causes rapid decomposition of plant-remains, and a comparatively small quantity of rich earth results as it is subject to erosion by solution of its salts. The soil of calcareous mountains is liable to become dry, as much of the water runs underground, and the plants must largely rely on rain and nearby melting snow. Dolomites and Magnesian limestones weather in the same way.

Mountains formed of non-calcareous, crystalline rocks, such as most schists, and gneisses, as well as granites, weather more slowly. This is brought about by frost action in northern and temperate regions, and the detritus is carried down by surface-running water. These mountains are more massive, with long, steep slopes and great rounded shoulders. Precipitous ridges run high up to their peaks. In their slow breakdown into earth, they yield mainly indestructible silica, with only small quantities of food-minerals. The soil consists of stones, sand and plant-remains and is usually sour. These siliceous rocks do not allow water to sink into them readily, and the mountainsides are netted with rivulets. Hard sandstones and quartzites yield a similar soil. Between these two extremes of calcareous and siliceous rock are some volcanic and hard metamorphic rocks, rich in magnesium and calcium, but which weather and break down very slowly.

The flora of calcareous and siliceous mountains is somewhat different. Very often, of two distinct but closely related species, one is much more abundant, or even confined to one type of rock, while the other behaves in the same way on the opposite type. These species are almost certainly derived from a single ancestor, and often in cultivation become indifferent to the presence or

absence of lime. Whether these preferences are due to chemical factors, to water supply, or to other causes is not fully known.

Disturbances which destroy the plant cover and make way for new colonization happen frequently in the mountains. The bare face of precipices is constantly being attacked by frost. Water percolates into cracks and freezes, and on thawing, bursts the rock. On sunny mornings in the summer in the high mountains, the frequent explosions, like gunshots, followed by the rumble of falling stones, as the sun warms the cliffs, indicates the extent of the destruction; as well as do the mountain torrents, milky turbid with debris.

Growing screes spread in fans into the valleys, as more rocks fall onto their upper slopes. Landslips often occur in the spring. Then, a slowly increasing layer of boulders, gravel and finer detritus, weathered from the cliffs above, and insecurely lodged on a steep slope, becomes turned into mud and loosened by melting snow. The whole mass of mud and rock comes thundering down, sweeping away everything in its path, and leaving a long track and a cone in the valley, bare for colonization. Avalanches also cut swathes through the forest and start successions of a similar kind.

Mountains provide many environments, including some peculiar ones not often found in the lowlands, such as screes, rock-crevices and snow-patches. More generally, where fine, silty soil collects, various forms of meadow and turf are at an advantage, in all but the driest climates. In the lower zones, forests often supplant them, but in the subalpine zone, and extending above locally, they are the main vegetation of these soils. They are not very deep-rooted, and are watered by the summer storms. On sunny slopes they may be dry and open, with many lichens, while in hollows, and by the numerous rivulets, they are marshy and mossy.

On rocky and porous ground the rain and melting snow water penetrates deeply. At altitudes above the forest-line dwarf shrubs, Rhododendrons, and elfin-wood become predominant, as their long roots can reach the water seeping far below.

Both screes and new moraines provide environments in which there may be running water deep down, but which are very dry on the surface. Moraines, which consist of fine, ice-ground rock detritus mixed with sand and rocks of all sizes and dumped in ridges, may be nearly bare, or carry a sparse vegetation of deep-rooted plants. Screes do not slip continually over their whole area, and parts which are temporarily stable are colonized by tap-rooted or running plants. These check the movement for a time, causing long ridges of stability below them, which become overgrown also.

The plants will often survive among the sliding stones for a long time, extending their stems as they become covered, so that their crowns may be several feet downhill from their roots.

Crevice in cliffs provide other varied habitats, tiny cracks, or deep pockets filled with humus; sometimes in sun-baked walls, sometimes in permanent shade. They all share a narrow, but cool root-run which collects small amounts of rich soil; and a freedom both from waterlogging round their crowns and from severe competition. There are some plants which are only found in these conditions.

In some hollows high in the mountains and facing away from the sun, the snow lies very late, and the length of the growing period is therefore very short. These snow-hollows, which are also to be found in the arctic lowlands, are inhabited by special communities of plants.

### **The Transition Regions Between Plant Communities**

The boundary between a plant community and another is called an ecotone. It is, of course, very rarely a sharp division (except in a few instances, such as the tide lines along the base of sea cliffs). Between great groups of communities, such as the Tundra and the Boreal Forest, it may extend over hundreds of miles, depending as it does on a change of climate. Gradually conditions become less and less favourable to one set of plants and more so for another. Locally, due to the presence of mountains, aspect and exposure, soil peculiarities, or unusual water supply, the one community may persist far into the area of another and they may alternate, or mix. In the intermediate "tension zone" some plant species may be able to thrive and compete better than others. There are some species, and even communities, which, though occurring in both great climatic groups, yet flourish best in the zone between them, as the competition is less intense.