EPPING FOREST.

Our greatest legal authorities will not admit that the people of England have any right whatever to enjoy the beautiful scenery of their native land, beyond such glimpses as may be obtained of it from highways and footpaths. Legally there is no such thing as a "common," answering to the popular idea of a tract of land over which anybody has a right to roam at will.[1] Every supposed common is said by the lawyers to belong absolutely to some body of individuals, to a lord or lords of the manor and the surrounding owners of land who have rights of common over it; and if these parties agree together, the said common may be enclosed, and the public shut out of it for ever. The thousands of tourists who roam every summer over the heathy wastes of Surrey or the breezy downs of Sussex, who climb the peaks or revel on the heather-banks of Wales or Scotland, are every one of them trespassers in the eye of the law; and there is, perhaps, no portion of these favourite resorts of our country-loving people that it is not in the power of some individual or body of individuals to enclose and treat as private property.

How far this legal assumption accords with justice or sound policy, it is not our purpose now to inquire; that question having been treated by many able pens, and being one which will assuredly not become less important or less open to discussion as time goes on. We have now a far pleasanter task, that of calling attention to one of our ancient woodland wastes, Epping Forest, which, in the words of an Act of Parliament passed at the end of last session, is to be for ever preserved as "an open space for the recreation and enjoyment of the public." Here at length every one will have a right to roam unmolested, and to enjoy the beauties which nature so lavishly spreads around when left to her own wild luxuriance. We shall possess, close to our capital, one real forest, whose wildness and sylvan character is to be studiously maintained, and which will possess an ever-increasing interest as furnishing a sample of those broad tracts of woodland which once covered so much of our country, and which play so conspicuous a part in our early history and national folk-lore. Unfortunately the spoilers have been at work, and much of the area now dedicated to the people has been more or less denuded of its woodland covering and otherwise deteriorated. Before, however, we describe the present state of the forest, and discuss the important

(1) "Although the public have long wandered over the waste lands of Epping Forest without let or hindrance, we can find no legal right to such user established in law." (Preliminary Report of the Epping Forest Commissioners, 1875, p. 12.)

question of how best to restore its beauty and increase its interest, it will be well to give our readers some notion of its former extent and of the circumstances that have led to its preservation.

It appears by the Reports of the Epping Forest Commission (1875 and 1877) that in the reign of Charles I. the Forest of Essex, or of Waltham, as it was then called, comprised the whole district between the rivers Lea and Roding, extending southward to Stratford Bridge, thus including the site of the great Stratford Junction Station, and northward to the village of Roydon, a distance in a straight line of sixteen miles. Much of this wide area was, however, even at that early date, only forest in a legal sense, for it included many towns and villages and much cultivated land, and these seem to have left the actual unenclosed forest not much larger than in the first half of the present century. We are told, for example, that during the two centuries from 1600 to 1800 only 80 acres of the forest were enclosed, and that even up to 1851 barely 600 acres had been enclosed. The unenclosed forest at that date is estimated by the Commissioners at 5,928 acres. Then came the development of our railway system, and the discovery of Californian and Australian gold. The wealth of the country began to increase at an unprecedented rate; the growth of London became more rapid than ever, and its citizens more and more acquired the habit of residing in the country. Land everywhere rose in value, the wastes of Epping were temptingly near at hand, and illegal enclosures went on at such a pace that during the twenty years between 1851 and 1871 they amounted to almost exactly half the entire area, leaving only 3,001 acres still open.

This wholesale process of enclosure, which, if quietly submitted to, would soon have left nothing of Epping Forest but the name, roused the indignation of many who dwelt near the forest or felt an interest in it, and a powerful agitation was commenced, in which the Corporation of the City of London and many members of the Legislature took a prominent part. In 1871 the Epping Forest Commissioners were appointed by Act of Parliament, and they gave in their final report only in the spring of last year. But in the meantime a most important case had been decided in the courts. At the request of the Corporation of London, which supplied all the necessary funds, the Commissioners of Sewers (as freeholders in the forest) commenced a suit in Chancery against the lords of manors and persons to whom they had granted lands, claiming a right of common over all the waste lands of the forest, and that all enclosures made since 1851 should be declared illegal. The Master of the Rolls decided (on the 24th November, 1874) in favour of the plaintiffs, and against this decision the defendants did not appeal. It has therefore been made the basis of legislation in the Act just passed,

which declares, that the whole 5,928 acres which the Commissioners found to have been open waste of the Forest in 1851 are to be treated as common lands, and (the lords of manors or their grantees being first duly compensated for their manorial rights and property in the soil) that the whole of this extensive area, with the exception of lands built upon before 1871, gardens, and pleasure-grounds, is to be preserved "uninclosed and unbuilt upon as an open space for the recreation and enjoyment of the public."

Large sums of money were, however, required to buy up the manorial rights, and although this might possibly have been done by public subscription, the necessity for this course was obviated by the liberality and public spirit of the City of London, which offered to supply all the needful funds, not only for this purchase, but also for all work that might be found necessary for the preservation, management, and replanting of the forest. This munificent offer was accepted, and the very reasonable desire of the Corporation to have the chief voice in the management of the newly acquired domain in trust for the public, was acceded to by the Legislature; and the Act accordingly declares that Epping Forest is to be managed by a committee consisting of twelve members of the Corporation of London, and four verderers, chosen by the commoners of the twelve parishes in which the forest is situated.

Let us now take a brief glance at the present state of the land thus dedicated to the public, before proceeding to discuss the question—how it may be made the most of. First, and nearest to London, we have the open expanse of Wanstead Flats, not half a mile from the Forest Gate Station of the Great Eastern Railway, and which, together with some illegally enclosed ground northwards towards the village of Wanstead, comprises an area of nearly five hundred acres. Crossing it from north to south opposite Lake House is an avenue of lime-trees, never very fine, and now rapidly dying from the combined effects of want of shelter and the smoky atmosphere. With this exception almost the whole of the Flats is denuded of trees, and offers a drear expanse of wiry grass interspersed with a few tufts of broom, stretching for more than a mile in length and not far short of half a mile wide. On the northern side considerable excavations have been made for brickfields, and here, where the ground rises somewhat, there is a very nice turf, with fern, broom, and even heather, in considerable patches. North-westward is a large piece of recovered land, about fifty acres in extent, dotted over with oaks and bushes, and intersected by a fine double avenue of limes a third of a mile long, but many of the trees, in the part nearest London, are rapidly dying. Planes are probably the only trees which would now thrive well here. This is, on the whole, a rather pretty piece of half-wild woodland, well worth careful preservation for the use of the dense population surrounding it.

To the west of Wanstead and Snaresbrook, and northward towards Woodford, is a fine expanse of unenclosed land, nearly a mile long, and from a quarter to half a mile wide; and when some illegal enclosures are thrown open, this will be continued uninterruptedly to Woodford Green. The southern portion of this tract between Wanstead Orphan Asylum and Whip's Cross has been utterly devastated by gravel-digging, the whole surface being a succession of pits and hollows with stagnant pools of water, and a few miserable oaks left standing on mounds where the gravel has been dug away around them. One would think that here the lords of the manors had infringed on the rights of the commoners, by destroying the pasture and even the surface soil on which any herbage can grow; and that in equity they should be called on to pay damages instead of receiving payment for their alleged property in the soil, which they have here succeeded in rendering almost wholly worthless either for use or enjoyment. North-westward, towards Woodford Green, is a rather pretty piece of wild forest-land, with open grassy glades, intervening thickets, and ponds swarming with interesting aquatic plants. There are, however, very few ornamental trees, the oaks being mostly small, with a quantity of miserable pollard-beeches hardly more sightly than so many mops.

Passing Highham Park we come upon a large extent of illegally enclosed land, now to be thrown open, and much of it already given up. Between Woodford Green and Chingford Hatch there are about sixty acres of poor grass and fallow-land adorned with a few bushes and one fine oak-tree, but sloping gently towards the north-west, and with extensive views over the wooded country beyond. Further north there are more than a hundred acres of small enclosures—rough pasture, fallow-land, or cultivated fields, dotted with a few poor trees, and at present far from picturesque, but with an undulating surface offering considerable opportunity for improvement. To the west these fields are bounded by Chingford brook, by the side of which are some very handsome willow-trees growing in stiff clay and indicating what this part of the land is adapted for. A little to the north-east is the new village of Buckhurst Hill, to the south-east of which is a fine piece of enclosed forest, about a hundred acres in extent and called the Lodge Bushes.

We now enter the northern and grandest division of the Forest, which stretches away for a distance of five miles from Queen Elizabeth's Lodge to near the town of Epping. North and west of the Lodge are nearly three hundred acres of illegally enclosed fields, now dreary fallows and poor pastures, but with fine slopes affording opportunity for producing new effects of forest-scenery. To the west and south of Loughton village are more extensive enclosures of several hundred acres of land, much of it arable or pasture land of

good quality; and further north, near Theydon Church and on towards Epping, are other enclosures of less extent, and almost all of this will again be thrown open to the forest.

To the north of the road from Loughton to High Beech there is a vast extent of rough forest-land, nearly three miles long and from half a mile to a mile wide, which has all been recovered after having been illegally enclosed by the lords of the manors, but not before they have denuded large portions of it of everything deserving the name of a tree, and left it a scrubby waste without any pretensions to sylvan beauty. Here are square miles of land, once as luxuriant as the unenclosed portions further west, but now presenting a hideous assemblage of stunted mop-like pollards rising from a thicket of scrubby bushes.

From this brief sketch of the present condition of Epping Forest, with more especial reference to the newly recovered portions of it, we find, that probably not much less than a thousand acres, which are now or have recently been enclosed and cultivated fields, will soon be thrown into the forest; while, in addition to this, there are considerably more than a thousand acres which are almost entirely denuded of trees and in a generally unsightly condition. The question at once arises—How can these wide tracts of land be *best* dealt with for the future recreation and enjoyment of the public? The Act of Parliament, it is true, empowers the Conservators to form playgrounds and cricket-grounds in suitable places, and some portion of these lands may be so applied. But a very few acres will serve for this purpose, or indeed are at all suitable for it; and there will remain by far the larger portion to be otherwise dealt with. After all the agitation, all the arduous legal struggles, all the liberal, nay lavish, expenditure of money to secure this land to the people, it cannot surely be left as it is. Some steps must be taken to make it beautiful and picturesque in the future, and at least as well adapted for the recreation and enjoyment of coming generations as the old forest was for those which have passed away. The obvious course, and that which will at once occur to every one, is to plant this ground in some way or other. It was once all forest. It is as a forest that the whole domain is dedicated to the public; and it is the forest scenery which has always given to the entire district its peculiar charm. Our country still has wide tracts of common and of open wastes, as well as extensive enclosed woods, and parks, and plantations; but our genuine forests are few and far between. Undoubtedly, therefore, as forest or woodland of some kind this land should be restored; and the question we have to decide is—Of what kind?

Some may say, restore it as much as possible to its ancient state; plant it with oaks and beeches, with a sprinkling of elm, birch, and ash. This may be the easiest and the simplest, but it is certainly

the least advantageous mode of dealing with the land. While these trees were growing—for a couple of generations at least—they would be utterly uninteresting woods, and even in the far-distant future would hardly surpass many other parts of the forest, while they would increase the monotony which is its chief defect. Another plan would be, to make a mixed planting of choicer trees, shrubs, and evergreens, which would be more beautiful while growing, and would in time form a forest of a more diversified character. Or again, a regular arboretum might be formed, a great variety of trees, and especially choice pines and firs, being planted so as to form specimens. Either of these plans would at once possess some interest; but they would be utterly deficient in novelty, or in that special and peculiar interest we should aim at, when we have to deal with such an extensive and varied area as the recovered portions of Epping Forest. We have already fine mixed plantations and woods, and many splendid arboretums; and at Kew we have in process of formation a magnificent collection of specimen trees which it would be out of place to attempt to imitate, while the expense would be far greater than almost any other kind of planting.

The plan I have now to propose is very different from all these. It is one which would be perfectly novel, perfectly practicable, intensely interesting as a great arboricultural experiment, attractive alike to the uneducated and to the scientific, not more expensive than any other plan, and perfectly in harmony with the character of the domain as essentially "a forest." It is, briefly, to form several distinct portions of forest, each composed solely of trees and shrubs which are natives of one of the great forest regions of the temperate zone.

In order to understand how interesting and how instructive this would be, and, especially, to how great an extent it would add to the variety and beauty of the scenery, while retaining to the fullest extent its character as a wild and picturesque woodland district, it will be necessary to give a brief sketch of the great forests of the north temperate zone, to point out their comparative richness, their distinctive characters, and their different styles of beauty; and in doing this I shall avail myself largely of the writings of the greatest authority on the subject, Professor Asa Gray, who has made the relations and origin of the various forest regions of the Northern Hemisphere the study of his life.

The two northern continents, America on the one side, Europe and Asia on the other, have each two great and contrasted forest regions, an eastern and a western; and in both cases the eastern is very rich, while the western is comparatively poor. The trees of our own country belong to the western or European forest region, which includes also the adjacent parts of Western Asia. That

region contains about 85 different kinds of trees (17 being conifers, or firs and pines), and of these only 28 are really natives of Britain, about 20 being tolerably common, and forming the wild trees of our woods and wastes, with which we are all more or less familiar.

If we compare the European set of trees with that of the forest region of Eastern America we find a wonderful difference. Instead of a total of 85, we have there no less than 155 different kinds of trees, and a large number of these are very distinct from those of Europe, constituting altogether new types of vegetation, many of which, however, we have long cultivated for ornament. Among these are magnolias, tulip-trees, red and yellow horse-chestnuts, the locust or common acacia, the honey-locust (a far handsomer tree), the liquidambar, the sasafras, the hickories, the catalpa, the butternut and black walnut, many fine oaks, the hemlock spruce, the deciduous cypress, and a host of others less generally known. Most of these differ from our native trees by their more varied and beautiful foliage, by many of them being flowering trees often of the most magnificent kind, and, what is equally important, by the glorious tints which a large proportion of them assume in autumn. Every one has heard of the rich autumnal tints in Canada and the United States as something of which our woods, beautiful as they are, give hardly any idea. Instead of the yellows and browns of our trees, there is in the American forest every tint from the richest scarlet and crimson to yellow, which, combining in endless varieties, give a splendour to the autumnal landscape which is worth a journey across the Atlantic to behold. The Virginian creeper, which drapes our houses with a crimson mantle even amid the smoke of London, the red maple and the sumach of our shrubberies, give us some notion of these tints, but hardly any idea of the effect they produce when their colours are lavishly spread over a varied landscape. Most of the trees which acquire these brilliant hues grow as well with us as in their native country. Some American trees, strange to say, seem to grow even better, for the beautiful ash-leaved Negundo is a small tree in its native country, rarely exceeding thirty feet high, while Loudon tells us that it grows to forty feet in England; the white maple reaches only forty feet in America and fifty feet here; and a similar difference occurs with many other trees. So favourable, indeed, is our climate to the growth of trees generally, that, according to Professor Asa Gray, we "can grow double or treble the number of trees that the United States can," although their native species are five times as numerous as ours!

There is therefore really no difficulty in producing in England an almost exact copy of a North American forest, with all its variety of foliage, with its succession of ornamental flowers, and with its glorious autumnal tints; yet this has never been attempted either in

this country or in any part of Europe. That many of these trees will reach noble dimensions there is no doubt whatever. A honey-locust (*Gleditschia triacanthos*) in Professor Owen's garden at Richmond Park was, in 1872, a magnificent tree nearly eighty feet high, and was then sixty years old. There is at Dorking a tulip-tree about the same size; while the many beautiful American oaks, maples, birches, and poplars, form noble forest trees in many of our parks and pleasure-grounds. Were such trees planted in masses, they would grow upwards more rapidly and produce a forest-like effect in from twenty to forty years; while from their varied foliage and general novelty of aspect, they would be both beautiful and interesting at a far earlier period.

Here, then, we may do something which has never been done before, which is sure to succeed (since it is only growing trees in masses which have already been grown singly), and which will ultimately produce a real addition to our landscape, while the individual trees will be a constant source of gratification and delight. As yet we have only mentioned the different kinds of trees, but North America is not less rich in beautiful shrubs to form an underwood to the forest or open patches here and there in its recesses. The rhododendrons, azalias, and kalmias, will grow as underwood wherever there is peat or loam, while the well-known snowberry, the aloe-like yuccas, several fine spiræas, American blackberries, and many others, would grow anywhere.

Now let us suppose one of the most suitable of the open tracts recovered at Epping to be thus converted into an American forest, in which as many trees and shrubs peculiar to Eastern North America as we know to be hardy, are planted in masses and variously intermingled. Such an experiment would excite interest at every stage of its growth. The paths and open glades intersecting it would be visited year after year to see how it was thriving, and this would necessarily lead many of its visitors to acquire an intelligent interest in the trees, and shrubs, and flowers of other lands. And as time rolled on, and one kind of tree after another arrived at its period of blossoming, and displayed each succeeding year in greater perfection its glowing autumnal tints, the "American forest" would become celebrated far and wide, and would attract visitors who would never think of going to see the more homely beauties of a native woodland, and still less a young plantation of common trees.

Before proceeding to describe the other characteristic "forest pictures" which might be produced in the wilds of Epping, it will be well at once to answer an objection sure to be made, that the kind of planting here proposed, consisting wholly of foreign, and largely of rare trees and shrubs, would be very expensive. This, however, is a complete error. Many of the trees in question are certainly

rather expensive when large specimens are purchased of nurserymen; but this is chiefly because there is so little demand for them, and they occupy ground and require attention for many years unprofitably. But nearly all these American trees could be raised from seed almost as cheaply as the very commonest kinds. The seeds could be obtained from their native country at a mere nominal cost; and by forming a nursery-ground, small at first, and increased year by year, in which to raise them, their removal at the most suitable age and season to the places which they were permanently to occupy would ensure rapid and vigorous growth. The great item of expense in forming any extensive plantation is labour, and this would be little if any more in growing one kind of tree than another, supposing both to be raised from seed and to be equally hardy. The question of expense cannot, therefore, be of importance, as compared with the vast difference in permanent results between the plan here advocated and that of the ordinary English wood, the mixed plantation, or the systematic arboretum. The latter, indeed, would be very much more expensive, because, few specimens being wanted, it would not be worth while raising them from seed, while an arboretum would require more weeding and pruning, as well as some amount of permanent gardening, which in a forest is unnecessary.

Another important feature of such a forest would be, that it would furnish reliable information as to what valuable timber trees may be profitably grown in this country. Among American trees the sugar-maple, hickory, tulip-tree, redwood, and locust, are well-known as producing valuable timbers for special purposes; and there are many trees of Eastern Europe and Asia equally valuable, which it might be profitable to grow largely. As, however, they have been hitherto almost always grown singly for ornament, we have been unable to test, either the rapidity of their growth under more natural conditions, or the quality of their timber at different ages; all which points would be determined, were they grown in quantity as here proposed, by the mere periodical thinnings-out necessary to encourage the free development of those that were to remain and form the permanent forest.

Passing now to the western or Californian coast of North America, we find another forest region, remarkably different from that of the Eastern States. It is characterized at once by extreme richness in coniferous trees, and what Professor Asa Gray terms its "desperate poverty" in deciduous kinds, of which it has only one-fourth as many as Eastern America, and one-half as many as Europe.[1] Almost all the trees which are especially characteristic of Eastern America are wanting, their place being chiefly supplied by peculiar species of oaks, maples, ashes, birches, and poplars, groups which are

(1) Deciduous trees, 34 species; conifers, 44 species!

equally abundant on both sides of the Atlantic. When we turn to the coniferous trees, however, Western America stands pre-eminent, possessing nearly twice as many different kinds as the Eastern States, and nearly three times as many as all Europe, while it exhibits the grandest, tallest, and most beautiful firs, pines, and cypresses in the world. Here we find the giant Wellingtonia and redwood, the magnificent Douglas fir, the exquisitely beautiful piceas, *nobilis* and *lasiocarpa*, such fine cypresses as *Lawsoniana* and *Lambertiana*, such unequalled pines as *insignis* and *macrocarpa*, the well-known handsome thujas, *gigantea* and *Lobbii*, and many others. These glorious trees form forests by themselves, surpassing in grandeur those of any other temperate land; and every one of these grows freely and rapidly with us (which they do not in Eastern America), and, if grown under natural conditions, would probably attain nearly as great a size as in their native country. Their extreme beauty has, however, caused them to be almost always grown singly as specimens, and even thus the rapidity of their growth is often amazing. The Wellingtonia will reach twenty feet in ten years; the Douglas fir grows even more rapidly when young, and a specimen at Dropmore, fifty years old, is now more than a hundred feet high, while its branches, spreading on the ground, cover a space sixty-six feet in diameter. The beautiful grass-green Pinus insignis at the same place reached sixty-eight feet high in thirty-four years; and were these trees planted in masses, so as to draw each other upward, and cause the lower branches to drop off as in their native forests, they would almost certainly grow even more rapidly, and the present generation might walk amid forests of these noble trees not much inferior to those which excite so much admiration on the mountains of California and Oregon.

Here, again, there is no question of success. The experiment has been made already for us hundreds of times over, and we have only to profit by it. These trees succeed well in every part of England without exception, and they would certainly not fail at Epping. An expanse of a hundred or two hundred acres covered with the coniferous trees of Western America, planted in masses, groups, or belts, and with winding paths, broad glades, and occasional shrub-planted openings admitting of free access to every part of it, would probably be even more attractive than the forest of Eastern America. For many of these trees are exquisitely beautiful objects in their young state, the varying colours of the under and upper surfaces of their foliage and the delicate tints of the new growth in summer, being especially remarkable. Their different rates of growth would soon cause some species to tower above others, and thus produce that charm of variety which is wanting where large areas are planted with trees which all grow at about the same rate.

The next forest type of which we should have an example, is that of Eastern Europe and Western Asia, containing all those interesting trees of the European forest region which are not natives of our own country. Here we should grow the various European pines and firs, including the symmetrical pinsapo of Spain, the well-known silver fir of the Alps, and the allied but more beautiful Nordman's fir of Russia. Here, too, we should have the nettle-tree, the Judas-tree, the flowering ash, the wild olive, the hop-hornbeam, the almost evergreen Neapolitan alder, and our old favourites the plane, the walnut, the laburnum, and the Portugal laurel. Along with these we should plant the many beautiful and often sweet-scented shrubs of the same districts—laurestinas, myrtles, Spanish broom, coronillas, cistuses, Mediterranean heaths, the favourite lilac, and the luscious Philadelphus, or syringa. A smaller space would serve to exhibit these trees and shrubs in forest growth, as they are less numerous and generally not of large size; but as they comprise so many of our garden favourites, the forest of Eastern Europe would certainly be very attractive.

We now come to the most remarkable of all the forest regions of the temperate zone—that of Eastern Asia and Japan. This forest is even richer than that of Eastern America in deciduous trees, and at the same time richer than that of Western America in conifers;[1] and, as it is only partially explored, while the others are well known, its comparative richness will certainly increase as future discoveries are made. We find here a number of the deciduous trees of Eastern America represented by closely allied species, and, in addition, a number of altogether peculiar types. Among these are the well-known ailanthus, on the leaves of which silkworms are fed, and which grows with extreme rapidity; the beautiful paulownia, with flowers like those of a foxglove; the handsome Sophora japonica; and of smaller trees and shrubs, the winter-flowering chimonanthus, the crimson-flowered japonica which adorns our walls in early spring, the favourite weigelia, the yellow-flowered forsythia, the red-berried aucuba, and, last, but not least important for our purpose, the camellia. This glorious evergreen is really as hardy as the common laurel, and will grow out of doors in perfect health and vigour. Its beautiful flowers will, indeed, be often destroyed by the wet and frosts of our springs, but if a sunny bank in the midst of the protecting forest were covered with these shrubs, they would blossom abundantly whenever we had a mild spring, and would then, indeed, be worth a walk to see; while at all times their splendid glossy green foliage would be a delightful spectacle.

Even more varied and more beautiful than the conifers of California are those of Japan and China, of which there are no less than

(1) Deciduous trees, 123 species; conifers, 45 species.

forty-five species belonging to nineteen generic groups, many of which are altogether peculiar to this region. Here are the elegant cryptomeria and retinosporas, the remarkable salisburia, or gingko-tree, a pine with foliage like that of a gigantic maiden-hair fern, and the hardly less curious sciadopitys, or umbrella-pine. To these we may add the fine cunninghamia, the funereal cypress, and some interesting species of arbor-vitæ.

The space required for this Asiatic forest would not at first be large, as only the most distinct and interesting species need be made use of, while many are not yet to be obtained in this country. Some of the Japanese trees grow slowly, but it is not improbable that when planted in greater quantities they might make more rapid progress. Anyhow, the plants themselves are usually so peculiar and generally so beautiful, that in every stage of their growth they would be sure to prove attractive to the public.

We might, however, increase the extent of our Asiatic forest by adding to it another small piece of land in order to cultivate several beautiful plants which characterize the temperate regions of the higher Himalayas, among which are the favourite deodara, some beautiful maples, birches, and oaks, the elegant leycesteria, some fine berberries, rhododendrons, and other interesting plants.

There remain the temperate forests of the Southern Hemisphere, chiefly represented in Chili and Patagonia, in Australia, and in New Zealand, and comprising a number of very interesting plants, many of which will grow in this country. From Chili there is a peculiar pine, libocedrus, and the well-known araucaria, which when grown in avenues or masses produces a very grand effect. Many of our favourite shrubs come from this region, as the golden-balled buddlea, the lovely flowering evergreens, escallonia and berberis, and the pretty cross-leaved veronica. These would form exquisite flowering-thickets to set off the stiff forms of the araucarias. From Australia and New Zealand more variety may be obtained, though comparatively few of the trees of these countries have yet been proved to be perfectly hardy. The common *Eucalyptus globulus*, celebrated as a remover of miasma, suffers much from frost when young, but may possibly become hardier as it grows older. Other species of eucalyptus are much more hardy and more ornamental. One raised from seed by myself has, in an exposed situation, reached a height of twenty feet in five years, though once cut down by frost. Another mountain species raised at the same time, is only five feet high, but is perfectly hardy, the leaves being quite uninjured by frost, and it will probably grow into a lofty tree. Some of the acacias are also probably hardy, as they grow well and flower beautifully out of doors; but the most elegant of these southern trees are the pittosporums of New Zealand, which in five years have formed splendid

bushes nearly six feet high and as much in diameter, with delicate foliage of a pale green colour which does not appear to suffer the least from any ordinary winter's frost. These will grow into small flowering-trees fifteen or twenty feet high, having an appearance quite distinct from anything at present in cultivation. The celebrated huon pine of Tasmania is another fine tree of this region; and one of the proteaceæ (*Lomatia longifolia*) has lived more than twenty years in a garden near London. These, with such shrubs as the white-flowered leptospermum and the purple veronicas, will form a group of plants well illustrating the beautiful evergreen woods of the Southern Hemisphere.

There remain still the climbing plants, which form a conspicuous ornament of all these forests, and many of which are quite as hardy as the trees they decorate. We might adorn our North American forest with festoons of the Virginia creeper and wild vine, while the red trumpet-creeper and the passion-flower of the Southern States would form beautiful objects, climbing over the bushes and among the branches of trees, and displaying their showy blossoms, which are hardly surpassed by the denizens of our hothouses. The Asiatic forest would in like manner be ornamented with lilac-flowered clematises, the Japan honeysuckle, the evergreen banksian rose, the winter-flowering yellow jasmine, and the glorious wistaria, the very queen of climbing plants. It is the opinion of some eminent horticulturists, that even the superb Chilian *Lapageria rosea* would grow freely out of doors in a suitable soil and situation, and it might well be tried in association with the trees and shrubs of the same country.

Quitting now that portion of Epping Forest which requires to be replanted, we find extensive tracts still more or less covered with wood, and which require, comparatively speaking, little to be done to them; but that little should be well considered and carefully executed. The preservation of "the natural aspect of the forest," as specially mentioned in the Act of Parliament, should always be kept prominently in view, and this principle should influence the character of such foot-bridges, dams, banks, or other building or engineering works as may be found absolutely necessary. Every such work should be carefully studied, so as to be at once in harmony with the surroundings, permanent, and picturesque. Unpainted wood and stone, both as bold and substantial as possible, should alone be employed, brick being, whenever possible, avoided as both commonplace and unsightly. Wherever possible, earthwork or natural masses of rock should be used, so as to blend imperceptibly with the surrounding forest scenery. Among the works absolutely needed for the enjoyment of the forest are numerous footpaths; and these should be systematically laid out in connection with broader

"rides" traversing the larger wooded tracts between well-marked points on either border, thus serving as a means of extricating any unfortunate tourist who may have lost his way. Grassy or shrubby openings might also be occasionally formed in the most densely wooded portions, such clear spaces being very pleasing, admitting air and sunshine, and forming agreeable contrasts. Trees which are any way remarkable for their age, size, or picturesque beauty should be cleared of surrounding thicket, so that they may be properly seen and admired; and this comprises nearly all that need be done here, beyond the ordinary forester's duty of keeping up a sufficient stock of healthy young trees to supply the place of those which die or are accidentally destroyed.

Among the powers conferred upon the conservators is that of draining where needed, and as very great misconception prevails on this subject a few remarks here may not be out of place. People have been so accustomed to hear "draining" spoken of as one of the greatest and most necessary of improvements, that they may not unnaturally think it equally necessary in a forest as in a farm or private estate. It is true that where some particular timber is to be grown for profit, draining may be necessary, but when you only require trees growing naturally, so as to produce beauty and variety, then every variety of soil and every degree of moisture are beneficial. Forests as a rule grow better in damp than in dry soils, and there is no ground so wet that some kinds of trees will not flourish in it. It is only necessary, therefore, to plant the right kinds of trees, and the wet places may be covered with wood even more quickly than the dry.

It must be remembered, too, that a proportion of bog and swamp and damp hollows, are essential parts of the "natural aspect" of every great forest tract. It is in and around such places that many trees and shrubs grow most luxuriantly; it is such spots that will be haunted by interesting birds and rare insects; and there alone many of the gems of our native flora may still be found. Every naturalist searches for such spots as his best hunting-grounds. Every lover of nature finds them interesting and enjoyable. Here the wanderer from the great city may perchance find such lovely flowers as the fringed buck-bean, the delicate bog pimpernell and marsh campanula, the insect-catching sundew, and the pretty spotted orchises.[1] These and many other choice plants would be exterminated if, by too severe drainage, all such wet places were made dry; the marsh birds

(1) Besides those above mentioned, the following rare or interesting marsh or bog plants inhabit Epping Forest: marsh St. John's wort (*Hypericum Elodes*), opposite-leaved golden saxifrage (*Chrysosplenium oppositifolium*), red cranberry (*Vaccinium oxycoccos*), bladderwort (*Utricularia vulgaris*), water-violet (*Hottonia palustris*), and the royal fern (*Osmunda regalis*), but this last is, perhaps, extinct.

and rare insects which haunted them would disappear, and thus a chief source of recreation and enjoyment to that numerous and yearly-increasing class who delight in wild flowers, and birds, and insects, would be seriously interfered with.

There is also a wider and more general point of view from which it may be important to survey this question of drainage. Epping Forest lies within the area of scanty rainfall, which extends over much of the eastern part of England, and as its surface consists largely of gravel, the rain-water rapidly passes away, and thus tends to create an aridity not favourable to luxuriant vegetation. Now, every marsh and bog and swampy flat acts as a natural reservoir, retaining a part of the rainfall, and permanently moistening both the atmosphere and the surrounding soil. In order to improve the climate and foster the vegetation of the forest, it should be the object of its conservators to retain as much as possible of the rainfall-water within the area under their jurisdiction. The forest streams might be dammed up at intervals, so as to form permanent ponds or lakes, by which means, combined with the natural reservoirs already alluded to, and aided by the check to evaporation which additional planting will produce, the forest itself and even the surrounding country would be permanently benefited. By extensive draining, on the other hand, water is carried away rapidly from the district, and with it much fertilising matter; the climate is made dryer, and the growth of herbage as well as of trees and shrubs is rendered less luxuriant.

Coming back now to the general question of forest distribution in the Northern Hemisphere, many of my readers must have been struck by the singular inequality and remarkable contrasts of the four great temperate forests of which we have proposed that illustrations should be grown at Epping. In a lecture recently delivered before the Harvard University Natural History Society, Professor Asa Gray has given an explanation of these contrasts, which will commend itself to all naturalists who know how important has been the agency of the glacial period in bringing about the existing relations between Alpine and Arctic plants.

Let us now first consider the remarkable difference between the forest vegetation of Eastern America and that of Europe and Western Asia. The latter area is the more extensive and more varied of the two, yet its trees, both deciduous and coniferous, are scarcely half as numerous or half as diversified. Why, we naturally ask, is America so rich? Professor Asa Gray answers, it is not America that is exceptionally rich, but Europe that is exceptionally poor. This is shown in two ways. Firstly, because America, rich as it is, is surpassed by Eastern Asia; and, secondly, because Europe itself

was formerly at least as rich as America is now. During the Pliocene or later Miocene periods, Europe possessed most of the generic groups of trees now confined to North America and East Asia, and was wonderfully rich in different kinds. The later Tertiary deposits of Switzerland alone have yielded, according to Professor Heer, 291 species of trees and 242 shrubs, or far more than the present rich flora of Eastern Asia added to the poorer one of Europe. It is true that this number includes the species of several distinct deposits of somewhat different ages. But in the beds of one single locality and period, at Œninghen, the remains of nearly two hundred species of trees have been found; and it is in the highest degree improbable that all which lived there have been preserved, while it is certain that the flora of Œninghen was not so rich as that of Switzerland, and was, *à fortiori*, very much poorer than that of Europe. Making, therefore, all necessary deductions for imperfect determinations of species, it is impossible to doubt that the kinds of trees inhabiting Europe in late Tertiary times were far more numerous and varied than they are now even in Eastern Asia, which, as we have seen, is the richest part of the north temperate zone. Since the period of these deposits the climate of all these regions has greatly deteriorated, culminating in a Glacial epoch which has only recently passed away; and to this is naturally imputed the wonderful change from riches to poverty which has come over the woody plants of Europe. But we have still to ask, Why did not Eastern America and Eastern Asia become equally poor? And Professor Asa Gray has now answered that question for us in a very satisfactory manner.

We must first call attention to the fact that when Europe enjoyed a milder climate, with a rich and varied flora, there was also an abundant vegetation, very similar in character to that which now clothes our north temperate latitudes, extending northward to the Arctic circle and far beyond it. In Arctic America, in Greenland, and even in Spitzbergen, there have been found well-preserved remains of maples, poplars, birches, and limes, like those of Europe; of magnolias, hickories, sassafras, and Wellingtonias, like those of America; as well as of gingko-trees and several other kinds now peculiar to Japan. The period when these Arctic woods flourished was no doubt earlier than that of the forests of Œninghen (though both are usually termed Miocene), the northern plants having migrated southward owing to the lowering of the mean temperature. As the severer cold of the Glacial epoch came on, the same species could only live by migrating still farther south; and then, when the cold period had passed away, they moved back again, and many of them now occupy the same countries as they did before the Glacial epoch.

And now we arrive at the explanation of the exceptional poverty

of Europe. If we look at a good map or large globe, we shall see that in North America the Alleghany Mountains run north and south, and the lowlands east and west of them extend uninterruptedly to Florida, to Texas, and to the Gulf of Mexico. There was, therefore, nothing to prevent the southward migration of the flora, and its northward return, when the mountains were covered with snow and ice. But in Europe the geographical conditions are very different. There is a great chain of mountains, the Alps and Pyrenees, running in an east and west direction, and farther south a great sea, the Mediterranean, also running east and west. As the Glacial epoch came on, the icy mantle crept southward from the Arctic Ocean and downward from the mountain heights, thus preventing the plants of Central Europe from migrating southward, and destroying all that were not capable of enduring a very severe climate, or which did not also exist south of the Alps. But here, too, the Mediterranean prevented any southern migration; and being crowded into a diminished area between the mountains and the sea, many species must have perished. When the cold passed away, the survivors spread northwards and rapidly covered the whole country, but their greatly diminished numbers and the prevalence of a few hardy species over very wide areas, sufficiently attest the severe ordeal they have passed through.

The correctness of this explanation can hardly be doubted, more especially as it equally serves to explain the superior riches of Eastern Asia. For here we find a far greater extent of northern land from which the existing forest-trees originally came, and also a greater extent of southern lowlands extending uninterruptedly into the tropics, for them to retreat to during the period of cold. All the conditions were here favourable, first for the production and next for the preservation of a rich flora.

The poverty of Western America in deciduous trees and its richness in conifers, Professor Asa Gray considers to be a more difficult and at present an insoluble problem. But here, too, a consideration of the physical character of the country suggests an intelligible explanation. Conifers are more especially mountain plants, while deciduous trees abound most in the lowlands. Now in North-West America there is a vast stretch of mountains from the extreme north to the far south, and no extensive lowlands—exactly the reverse of what obtains in Eastern America, where the lowlands are vastly more extensive than the mountains. Conifers, therefore, most likely always abounded most on the western side of the continent, and during their enforced southern migrations always found suitable mountain habitats. The deciduous trees, on the other hand (always, probably, few in number), were many of them exterminated in their migrations first southward and again northward, for want of suitable places of

growth, or were overpowered by the greater vigour of the competing coniferous trees.

Turning again to Eastern Asia we find a combination of both these conditions. Ample mountain ranges traverse every part of it from the Arctic circle to the tropics, but these are everywhere interrupted by great river-valleys and extensive plateaus of moderate elevation, thus offering equally favourable conditions for the preservation of both kinds of trees; and here we accordingly still find the richest and most perfectly balanced woody vegetation of the north temperate zone.

The marvellous history that we have here sketched in the merest outline, teaches us that our own country has been denuded of its proper share of wild trees and shrubs by a great natural catastrophe—the Glacial epoch—which destroyed them just as a hurricane or a conflagration might have destroyed them, only more gradually, and at the same time more thoroughly. In replanting the same or similar trees as those which inhabited Europe before the Glacial period, we may be said to be only bringing back our own, and again clothing our land with those forest denizens which at no very distant epoch it actually possessed.

Returning again to the more special subject of this paper, I would remark, in conclusion, that the preservation and restoration of Epping Forest is a matter of wide and even of national interest. The method of procedure now decided on will determine its condition for generations to come, and our successors will not forgive us if, for want of due consideration, we fail to make the most of the great opportunity which here offers itself. Whatever is now done will be practically irreversible. It is, therefore, of the highest importance that those who have given thought to the subject, or who possess experience bearing upon it, should now make their views known, in order that conflicting suggestions may be submitted to the ordeal of free criticism, and lead to the adoption of a plan worthy of the occasion, and which we may not at some future time have reason to regret.

ALFRED R. WALLACE.