Scottish Geographical Magazine

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/rsgj19>

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Published online: 27 Feb 2008.

To cite this article: F.R.S. Balfour (1908) A trip to Western America , Scottish Geographical Magazine, 24:9, 477-485, DOI: [10.1080/00369220808733893](https://doi.org/10.1080/00369220808733893)

To link to this article: <http://dx.doi.org/10.1080/00369220808733893>

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another \$60,000,000 will have taken its place, with conditions then no better than they are now. Considered solely on their own merits from the standpoint of control afforded, the present system has nothing, and the reservoir plan has everything, to recommend it.

In order to bring the river route to its highest possible degree of efficiency, it would be necessary to combine the reservoir system with a straightened course for the lower river, by which combination every evil would be removed and absolute control for all time would be ensured. The reservoirs would make it possible to regulate the flow of the streams, preventing both floods and very low water, and at the same time, through developed horse power, pay for the improvements. The corrected or straightened course would shorten the route and effectively put an end to caving of the banks with all the difficulties arising from it at present. The reservoirs, together with the necessary forest conservation and corrected course, would remove the sand-bar problem—the one greatly lessening the actual amount of sand carried into the river, the other giving the current increased power to sweep its own channel clean.

It is undeniable that this plan calls for a large expenditure for its completion, but in the long-run so does the levee-revetment system, without anything tangible to show for the outlay in the end. The whole question narrows itself down to a single issue: whether it is not better policy to do the right thing at the start, even if it require great initial outlay, rather than follow a plan which means the reconstruction of part of the so-called improvements every decade for centuries; with the region concerned always chafing under the handicap of a mediocre, inadequate waterway and suffering heavy annual losses from uncontrollable floods. The waste of money on levees and revetments ought to cease once for all. Let the federal government authorise the completion of the entire reservoir system with a straightened course for the lower river, and loose the bonds which every year are drawn tighter over this heart of our nation.

A TRIP TO WESTERN AMERICA.¹

By F. R. S. BALFOUR.

(*With Illustrations.*)

My wife and I have recently made a trip to the Pacific coast, and perhaps our chief object in so doing was to see the trees of that region, the richest belt of coniferous timber in the world.

We sailed in July to Quebec, and crossed the continent by the C.P.R. We stayed for a few days at the Lake Louise Hotel at Laggan in the Rockies, about 6000 feet above sea-level, and 960 miles west of Winnipeg. The hotel lies at the north end of Lake Louise, six miles

¹ See also *Transactions of the Royal Scottish Arboricultural Society*, xxi. (1908).

from the railway, and 1000 feet above it. Soon after leaving Calgary, the youngest and one of the most prosperous towns on the continent, the train begins to wind its way up the Bow River, with the towering Rockies to the north and south. The first tree we have seen for over a thousand miles is the ubiquitous *Pinus contorta*, springing up thick and straight in all directions. No tree in America covers such an area—from Alaska to Colorado. It is well called the lodge pole pine by the Indians.

It was a mild rainy day when we arrived, and after reaching the hotel it did not take me many minutes to recognise, with my glasses,

Lake Louise, with *Larix Lyallii* growing at timber line.

the light green of the Lyall larch, growing at timber-level — 7000 to 8000 feet. I started through the thick undergrowth of azalea and blae-berry, and was soon thoroughly drenched. The *Pinus contorta* had been left behind before Lake Louise was reached, and the timber here is *Picea Engelmanni* and *Abies lasiocarpa* solely. Both

were covered with cones—even trees only six feet high—and indeed the two are much alike, but for the red drooping cones of the *Picea* and the black erect ones of the *Abies*. After a good deal stiffer climb than I expected, I reached the first of the *Larix Lyallii*, and managed to get some photographs taken while the rain was falling. The tree was first discovered by David Lyall, a Scotsman who accompanied the expedition which settled the International Boundary in 1857. It never exceeds 85 feet in height, and 2 to 3 feet in diameter. The woolly tomentum which covers the twigs and buds makes it easily recognisable. As far as I am aware, it has never before been brought to this country, but I arranged with a Chinaman to get me later on a supply of the seed and about a dozen plants which I have growing at Dawyck. The seeds ripen and are shed in the first three weeks of September; they do not remain in the cones as with our larch. I hope I may raise some plants and keep those I have got. This larch is so purely Alpine in its habit, that I have no expectation that it would ever be a useful tree in this country. Its great kinsman, *Larix occidentalis*, however, is perhaps better worth growing as a timber-tree in Great Britain than any other exotic. This tree, which unfortunately did not seed last season, does not grow so high up or extend so far north as *Lyallii*, and covers a much wider area

throughout Eastern Oregon and Washington, parts of Montana and Idaho, and the Kootenay County of British Columbia. A splendid tree, it often grows to 200 feet high; the largest specimen I know of is 24 feet round, 6 feet from the ground, and occurs in the Wallowa Mountains of Oregon. This is incomparably the grandest variety of larch in the world. Throughout this country there is a thick undergrowth of azalea covered with lemon-coloured blossom, not the azalea of the West, but one with small, waxy bell-like flowers. We made an expedition on horseback to the glacier which discharges into the south end of the lake, and also to two small lakes a thousand feet higher up than the hotel, where we left the timber-line behind, and found Lyall's larch growing pure. The trees of this region have their branches very short from base to top, owing to the immense weight of snow and ice which covers them for so much of the year.

I shall say little of our journey from the Rockies, across the Selkirks and Coast Mountains, to the Fraser River Cañon. Suffice to say that four miles west of Laggan the line crosses the continental divide through the Kicking-horse Pass, and almost at once the timber begins to grow western in its character. Douglas fir and *Thuja gigantea* were seen for the first time as we dropped down into the valley of the Upper Columbia River. Then when we crossed the river and began to climb up the precipitous Beaver Cañon of the Selkirks, we saw splendid *Tsuga Albertiana*, *Pinus monticola*, *Picea Engelmanni* and *Pinus contorta* which gave way gradually to the Thujas and to Douglas fir. The day's run from Laggan to Revelstoke is through as splendid mountain scenery as exists anywhere.

In the lower Fraser River valley grows that finest of all birches—*Betula occidentalis*,—a tree practically unknown here, though there is no reason why it should not thrive in our climate, so like its own of British Columbia.

Our objective point was Tacoma, in the State of Washington, on Puget Sound. In the valleys of Northern Washington through which our line—the Northern Pacific—ran, we saw Douglas and *Thuja gigantea* growing as only they do grow on the mild sea-board of the North Pacific. Terrible burnt areas too we passed, where not a seedling was to be seen, and only bracken and willow-herb springing up among the blackened stumps. Happily this destruction by fire has been reduced about eighty-five per cent. during the past season, owing to the excellent arrangements, regulations, and active supervision of the officers of the United States Timber Reservations. We saw large specimens of the greatest of American maples (*Acer macrophyllum*) growing among the tangles of the vine maple (*Acer circinnatum*) in all the river bottoms. Here and there was an occasional *Picea Menziesii*—it never occurs over thirty miles from the sea, and we were now well within that distance of Puget Sound.

The luxuriance of all this western timber, its size, the freedom with which it seeds itself, and its rapidity of growth, render these forests quite unlike anything to be seen east of the Coast Mountains. It is the land, too, of flowering and berried shrubs, *Spirea*, *Berberis* of several

kinds (including our well-known *B. aquifolium*), *Ribes*, numerous *Rubus*, *Gaultheria shalon*, sometimes a tree 20 feet high—the Sal-lal of the Indians,—that most striking of arbuti, the Madrona tree, the lovely western dogwood (*Cornus nuttallii*), two beautiful elders, one red and one blue-berried (*Sambucus aborescens* and *S. glauca*), several *Rhamnus*, and five great blaeberrries or *Vaccinium*, some red and some blue-berried, but all, as a rule, 6 feet high.

There is a range of mountains still almost entirely unexplored, occupying the triangle of land which forms the portion of the State of Washington that overlaps the south end of Vancouver Island. A couple of days after reaching Tacoma, we set out for these Olympic Mountains, crossing Puget Sound, and driving for two days over nearly impossible roads through as fine Douglas and *Albertiana* forest as I have ever seen. The summer climate of those parts is quite delightful, never too warm, with cloudless skies and only occasional showery days. Our first resting-place was the little log hotel on Lake Cushman, surrounded by Douglas fir and *Thuja gigantea*. Seven years ago I made a small expedition after black bears across the mountains at the head of this lake, and then found at snow-level whole gardens of lovely flowers, *Fritillaria*, *Brodiaea*, *Calochortus*, orchids, and, most charming of all, the beautiful *Calypso borealis*, but that was in June. The river which feeds the lake, for a couple of miles of its course, flows through alluvial land well sheltered by the surrounding mountains from the winds of the Pacific, and here we found a grove of extraordinarily tall *Acer macrophyllum*, intermingled with *Populus tricarpha*, *Alnus Oregona*, and *Thuja gigantea*. Their branches are thickly clothed with dense growth of yellow moss and ferns: the height of the trees I judged to be rather over 150 feet. The poplar of this region commonly grows to nearly 200 feet, and is the largest deciduous tree west of the Rockies—or, I believe, on the continent—and this great maple is second to it. I here, too, saw the largest *Thuja gigantea* I ever came across; it measured just 40 feet round, breast high, and was about 300 feet high. This is, however, by no means the record. Throughout the valleys of this range the Douglas fir must average about 250 feet, and the *Tsuga* little short of it. I stepped some trees, and found they measured 210 feet before the first branch was reached. A guide whom I had taken with me when last in these mountains told us that a party of prospectors had cut a trail up the South Fork of the Skokomish River (the North Fork was the river flowing out of Lake Cushman, up which we had come). We determined to follow this trail for a few days' fishing and exploring. We were well repaid. The first day out, with four horses and our two men, we reached the river, and camped in a clump of aspen poplars (*Populus tremuloides*), sleeping on beds of *Thuja gigantea* boughs. Most of our day's march was through dense *Albertiana* spruce, and we noticed how wonderfully this tree seeds itself, more especially on the soft bark of a rotten fallen tree trunk. Attempts at photographing it, however, were not very successful. We found *Pinus monticola* growing on the ridge between the North Fork and the South Fork. Next day we continued our way, and made our camp for three days on a little plateau in

a bend of the river in a grove of *Abies grandis*, our tent shaded by the branches of *Rhamnus purshiana*—the tree from which the cascara sagrada bark is got. It was covered with ripe black fruit, of which I dried a portion, and am sowing it in the hope of establishing the tree here. The Rainbow trout fishing was too excellent to be neglected, even for trees, as I think you will agree when I tell you that in my last four hours' fishing on that stream I caught 53 trout, weighing just 60 lbs. My wife landed a 4½ pounder off her second cast. To picture this country, you must realise that the whole land is dense forest, with open spaces nowhere except where the peaks of the hills struggle through in rocky pinnacles. Our trail was for the most part along the river-bed, which we crossed and re-crossed countless times. As in all the densely wooded regions of the North-West, one sees few birds and beasts. An occasional black-tailed deer, a still more occasional black bear, and a frequent mink in the river bottoms, were all we saw. Of birds there were a few small warblers, several woodpeckers, and a beautiful great grey kingfisher, this last to be seen everywhere.

We returned to Tacoma, and my next expedition was to the Nisqually Glacier, which flows down the south-west side of the great

Mount Tacoma—15,000 feet. The United States Government have made a national park of 3,000,000 acres, with this splendid cone in the middle, and no better or wiser thing has the American administration ever done

Mount Hood, 12,000 ft., Oregon, from Lone Lake.

than to establish the great timber reserves—and also the five National Parks, in the most interesting localities: these are the "Yellowstone" of Wyoming, the "Yosemite" and "Sequoia Forest" of California, the Grand Cañon of Arizona, and this "Rainier National Park" of Washington, to be inviolate for all time. I may here digress for a moment to say a little on this subject. Until recently, the timber, in the West at any rate, was regarded as quite inexhaustible, and only in the last few years have the people awakened to the fact that unless a great part of the remaining forests were preserved, there would soon be no more. The total lumber cut in the United States in 1906 was about forty billion feet, board measurement. It is estimated that the West has about sixty years of timber for itself—over 70 per cent. of which is "Oregon pine," or rather Douglas—but the East, whose own supply will probably last for not more than twenty years, is drawing on the West for prodigious quantities of sawn timber. Washington is now the State which supplies the greatest amount of timber of any. From 1870 to 1890 Wisconsin, with its white pine (*P. strobus*), had the predominance, then Louisiana, where *Pinus palustris* is cut in enormous quantities

(the Americans call it "yellow pine" and we call it "pitch pine"), but now Douglas fir provides more lumber than any other tree on the continent. The United States Government Timber Reserves now amount to 126,000,000 of acres, by far the larger part of which is in the West. These are being well looked after when we consider the magnitude of the task, the supineness of the State legislatures, the opposition of the lumber magnates, and the fact that the whole organisation has only recently been started.

A little light railway through the Douglas and Thuja takes one to within a few miles of the boundary of the Mount Tacoma Government Reserve, and a drive of a dozen miles or more of steep climbing brings one to the hotel recently built at Longmires Springs. The Government carriage road is completed to a little beyond this point, but the intention is that it shall be continued to Paradise Valley—9000 feet above the sea—which is at timber-line. The spot is well named, as, perhaps, there is no finer Alpine garden in the world than this huge belt immediately above the trees, and below the eternal ice of the mighty cone of Mount Tacoma. The trees here are very fine, Thuja, Douglas fir, and *Tsuga Albertiana*, *Abies grandis* in the river-bed, and an occasional Menzies' spruce, till the eastern limit of this tree was passed. Then *Abies amabilis*, *Pinus monticola*, *P. Murrayana*, and at Longmires *Abies lasiocarpa*, *Tsuga Pattoniana*, and *Chamaecyparis nootkatensis*. I never before saw this last-named tree, and feel sure it is worthy of general planting in our country as a forest-tree. It covers a wide area from Alaska to Washington. The specimens in this country have mostly been raised from cuttings, and I believe it would be desirable to get large supplies of seed from its native place. Its wood is practically imperishable, but is no use for shingles, as it cannot be split like Thuja or Libocedrus. I went on to the Nisqually glacier, to which the Government road has just reached. The difficulties of blasting out stumps and rocks for such a road may be imagined. I found here the charming little *Acer glabrum*, which only grows at high altitudes in the western country. I know of no other valley in Western America where such a variety of conifers may be seen growing together, and all at their best—two hemlocks, four Abies, two pines, one Picea, one Thuja, one cypress, the omnipresent Douglas—twelve altogether.

We next travelled south to Grant's Pass in South-West Oregon. Unfortunately our day in Portland was cloudy, and no view was had of Mount Hood (see p. 481), the great rival of Mounts Tacoma and Shasta. The Siskiyou Mountains, which run east and west more or less, divide Oregon and California, and this is the home of that rarest of all spruces, *Picea Breweriana*. The character of the soil is greatly changed here from that of the north. The ground is dry, and there is not the great depth of rich humus in all the valleys which one sees in Washington. We drove thirty miles to the old mining settlement of Kerby, and next day started over an abominable road to find our spruce. A friendly placer-miner acted as guide, and after a climb of 4000 feet through almost impenetrable and what seemed interminable thickets, we found our tree just at timber-line, growing singly among Douglas fir, *Pinus*

ponderosa, and *Pinus tuberculata* (the knob-cone pine). It is a beautiful tree, utterly distinct in character, with drooping branchlets often eight feet long. The tops of the trees were covered with cones a good month from being ripe. It was first discovered in 1884, and named after an eminent Californian botanist. Its cones, when the seed is shed, reflex their scales, and are of a rich brown. The unripe cones are purple, about $2\frac{1}{2}$ inches long. I imagine the wood of the tree is extremely hard, growing as it does at a fairly high altitude, and evidently making small annual growth. The bark is grey, and in flakes not unlike that of our larch. The trees of this district are very different from what we had left: *Pinus ponderosa* and *Pinus Lambertiana*—those two kings among pine trees—predominated. *Thuja gigantea* had given way to *Libocedrus decurrens*, and in the valleys grew the *Umbellularia Californica*—a mighty bay which occasionally reaches 100 feet; the *Castanopsis chrysophyllum*, with its shining leaves, bright yellow underneath, and chestnut-like fruit; and the *Pasania*, or tan-bark oak. The *Fraxinus Oregona* I saw here finer than elsewhere; it is an ash which I hope may succeed admirably in our own country, judging by the fine young tree at Kew. It is the most valuable hardwood in the west. I have distributed the seed of this tree to sixteen or more localities in Great Britain. I saw the *Chamaecyparis Lawsoniana* that day—3rd September—for the first time; but to see this splendid tree at its best we ought to have gone west a farther fifty miles to the coast. No tree in Western America is more prized than this “Port Orford Cedar,” as the lumbermen call it. Its wood is almost imperishable, and its delicious scent makes it highly suitable for interior finishing, etc.

A stranger in the country has a little difficulty in identifying trees by their local names. For instance, I was told I ought to see the “larch” on Mount Tacoma. This I found was *Abies nobilis*. “Red cedar” in British Columbia and Washington means *Thuja gigantea*; “red cedar” in South Oregon and California means *Libocedrus decurrens*. “White cedar” in Washington means *Cupressus nootkatensis*; “white cedar” in Oregon means *Cupressus Lawsoniana*. But, worst of all, the name “Tamarack” is applied in different neighbourhoods to *Larix occidentalis*, *Pinus tuberculata* and *Pinus Murrayana*. This confusion of nomenclature also extends in America to the birds and beasts.

We made a four days' camping expedition from Kerby southwards to the main ridge of the mountains, crossing the Californian boundary. It is a beautiful countryside. There are several fine oak trees—*Quercus densiflora* or *pasania*, mentioned above, *Quercus Wislizeni*, and *Quercus Garryana*—said to grow to 150 feet high, and nearly a dozen species of willow; quantities of gentians occur in the marshy spots, with the yellow pitcher plant (*Darlingtonia Californica*). We found groves of the *Prunus demissa* with the fruit ripe and hanging in bunches—a charming tree. The hill-sides are clothed with *Manzanita* and *Ceanothus* bushes. Our guide was anxious to take us to what he believed to be the “weeping spruce” we were in search of; but after a hard day's toil up steep hills, over trails which none but a backwoodsman could differentiate from the surrounding brush, we found ourselves among a number of Douglas fir,

whose branches, growing in a curious bunchy form, had misled our man. However, the scenery well repaid the extra labour. That night we camped close to the divide, and next day, while hunting the hill-tops for black-tail deer, I came quite unexpectedly on a splendid grove of *Picea Breweriana* in a corry facing north. I took numerous photographs of the trees; they were growing among *Abies concolor*, *Abies magnifica*, *Libocedrus*, and Douglas. I saw no cones on these trees. They stood distinct and beautiful, with their long fronds often hanging 8 feet to the ground. On this ridge the *Libocedrus* and Douglas were gnarled and twisted by the wind into the most fantastic shapes. We returned to Kerby and Grant's Pass highly satisfied with our week's trip, and pleased to have found what we had gone so far in search of.

We took train from Grant's Pass, by night unfortunately, as we were limited as to time, and next morning found ourselves at Sisson, at the

Mount Shasta, 14,400 feet, Northern California.

base of Mount Shasta in North California. Here a small branch line leaves the Southern Pacific, and proceeds due east to a timber settlement called M'Cloud, after its founder—doubtless a Skye-man. Six miles from here is the charming house of a friend of mine, on the edge of the great Shasta Timber Reserve, in a bend of the M'Cloud River. Its banks are clothed with a huge saxifrage,

among which the vine maple leaves were just turning scarlet. The timber is Douglas and *Abies concolor* close beside the river; higher up *Pinus ponderosa* and *Pinus Lambertiana*, growing finer than any I have seen elsewhere in California; while still higher are *Pinus monticola* and *Abies magnifica*—the *Shastanensis* variety, which has dark bark instead of red, as in the common form; and last of all *Pinus albicaulis*, sometimes dwarfed to a tree 2 or 3 feet high, although a hundred years old. The photographs of Mount Shasta—14,400 feet—will show you how that splendid cone overlooks the whole country for at least one hundred miles in every direction. Down by the M'Cloud *Taxus brevifolia* is abundant, never such a large yew, however,

as our *T. baccata*, but very beautiful, with its red berries and dark branches sheltering the lovely Shasta and Humboldt lilies, which grow tall and straight in the moist glades where the sun seldom penetrates. I found here, for the first time, *Crataegus Douglasii*, the only hawthorn which grows in the western country, although 400 or 500 species are known east of the Rockies. I also saw a small mountain ash which I could not identify. The brushwood is wild plum (*Prunus subcordata*), at this time covered with fruit, much sought after by the Indians, the Californian hazel (*Corylus Californica*)—to me quite indistinguishable from our own, and, of course, the universal manzanita scrub and alder. While we rode with our host to "salt-licks," where the deer were to be found in the early mornings, we got many lovely glimpses of Mount Shasta towering above the surrounding forests. We scrambled up banks of incredibly slippery pine needles to gather the huge cones of the sugar pines, many of them 20 inches long: these we brought home in sacks tied to our Mexican saddles. Our host every year has new trails cut through the brush, and this summer came on two enormous specimens of sugar pine and yellow pine. My photograph of the latter was a failure, but it shows to what a gigantic size *Pinus Lambertiana* sometimes grows. The summer climate of this Northern California country is wellnigh perfect, six months of unbroken sunshine.

THE PRIMITIVE RACES OF SOUTH-EASTERN ASIA.

In the *Revue Générale des Sciences* for April 30, there appears a very instructive article on the primitive types of humanity to be found in South-Eastern Asia, the article being by Dr. Fritz Sarasin, known, together with his cousin M. Paul Sarasin, for his explorations in Celebes. As the questions dealt with are of great interest in connection with the evolution and classification of the human race, an abstract of this article may be found useful by many of our readers.

It is well known that, hidden among the forests and rocky chains of tropical Asia, there exist remnants of primitive races which hold themselves apart from the more civilised tribes surrounding them, and which seem to represent a primitive layer of humanity, whose scattered existing members are as it were living fossils, witnesses of bygone conditions. Among the representatives of this group which have been longest known are the Veddas of Ceylon, the most celebrated of all, and after them certain forest tribes in British India. Until a few years ago it was believed that this Vedda layer, as the Sarasins have named this dying group, was not represented outside of Ceylon and British India. Within this period, however, various researches have proved that the Vedda layer is still represented elsewhere. Thus Martin has shown that the Senoi, found in the forest-covered mountains of the interior of the Malay Peninsula, have certainly Vedda affinities. Again, the work of the Sarasins on Celebes showed that the Toalas, a small tribe largely enslaved by the surrounding tribes, are of Vedda