

THE RECORD OF THE RINGS

"Here and there they have set aside
A few old trees, with their arms still wide
To the winds of God; and the reverent hears
The whispering tongues of a thousand years. "

The great age of the Big Trees has interested scientists and historians, who have thought to find in the variation of annual growth rings proof of climatic changes which have affected history and the migrations of the human race. A tree that has lived several thousand years, if it can tell its story, may well bear historical evidence of climatic changes. There is great variation in the diameters of the annual rings. On a cross section of a *Sequoia gigantea* there are places where a hundred or more rings may be found within the compass of an inch, and other places where the annual ring is an eighth or even a quarter of an inch in diameter. What has caused this difference? It has been assumed that the years when the annual ring growth was small were years when the annual rainfall was less, and that the years when the ring growth was large were the wetter years. Can we reason from the ring growth to climate, or vice versa? I think we can. But a careful study of the growth of the sequoias over more than thirty years, conducted in the forests rather than in a laboratory, convinces me that the Big Trees have made their greatest growth in the dry years rather than in the wet years.

During the past forty years, I have measured and counted the annual rings of 1,982 Big Trees in Tulare and Fresno counties, California. These trees ranged in age from saplings up to veterans of 3,126 years. Of the 1,982 trees, two were above 3,000 years, 54 above 2,500, and 171 above the

the age of 2,000 years. The rest were all below 2,000 years. The older trees revealed a fascinating historical record of climatic changes affecting the growth of plant life during past centuries. The annual rings show that there were periods, lasting for centuries or more, during which the trees made abnormally large growth, only to recede again to normal or below normal. These extremes of climate have not been so pronounced in recent times as in past centuries. Thus the older trees show that they made their greatest growth between 700 and 650 B. C., and also between 450 and 250 B. C., while they made their smallest growth between A. D. 650 and 750, and again between A. D. 1450 and 1500.

The wide variations in annual growth did not come about suddenly, but required approximately ten years to reach a peak and about the same length of time to drift back to normal, either from a wet or a dry peak. There are other cycles than those above listed during which the trees showed growth above or below normal, but none are so notable as those indicated. Apart from these periods, the growth of the trees in ancient times indicates that climatic conditions compared closely with those of modern times; during the periods of greatest growth the annual rings average well with those of the dry season of 1923--24, and the periods of smallest growth show rings quite as small as or possibly even smaller than those of the wet season of 1905--1906.

What happened to cause such wide variations in the growth of the trees in past centuries? Surely we cannot attribute the larger growth periods to a succession of dry years, such as that of 1923--1924, which gave a growing period of four months. Neither does it seem probable that the smaller growth periods were due to a series of wet years, similar to that of 1905--1906, which gave a growing period of only one month. Drought and precipitation alone are not sufficient to explain the wide

and constant variations in annual ring growth. We must hypothecate some other factor as responsible for the variations.

To me it seems plain that the periods of abnormal growth were brought about by a lengthening and a shortening of the annual growing seasons through variations of temperature. A few degrees higher or lower temperature than the normal would, undoubtedly, bring about such results. The Big Tree groves are situated on the western slopes of the Sierra Nevada, chiefly between the elevations of 5,000 and 7,000 feet. They occupy a long, narrow strip running northward and southward along the side of the mountain range about midway between the foothills on the west and the crest of the summit on the east. The mountains extend from the 1,000-foot level on the west up to 14,500 feet on the east. In ascending from the west the temperature becomes lower at the rate of about four degrees for each added 1,000 feet of elevation, thus giving a variation in temperature of fifty-three degrees between the two extremes. As our principal storm season over the region is from September to May, precipitation occurs in the form of rain at the lower elevations and in that of snow at the higher, with the dividing line between the two at about the 5,000-foot level. There is, however, a long growing season in the lower portions. Under the ordinary weather conditions of the present, the spring season opens for the growth of plant life in the high country as follows: at the 4,000-foot level, May 1 ; at the 6,000-foot level, June 1 ; at the 8,000-foot level, July 1 ; at the 10,000-foot level, August 1 ; at the 12, 000-foot level, August 15 ; and at the 13,000-foot level, August 20.

Now if the daily average temperature were raised but eight degrees, the spring opening would be one month earlier at each of the ~~x~~ indicated

elevations. For instance, the spring opening at the 6,000-foot level then would be equivalent to that of the 4,000-foot level under present conditions, with the growing period perhaps extending likewise somewhat later in the fall. On the other hand, if the temperature were eight degrees colder, the spring opening would be one month later at each elevation; in other words, the spring opening at the 6,000-foot level would be equivalent to that at the 8,000-foot level, with perhaps a little curtailing of the fall period. The assumed warmer periods would give to the trees a growing season of about six months, as against about one month for the assumed colder periods. Of course, there would be variations in individual trees according to elevation within the range.

Thus it will be seen that a few degrees of variation in the average temperature over the Sierra for a given period would modify in a marked manner the growth of the Big Trees, and would account for corresponding variations in their annual ring growth. But my observations lead me to suppose that the Big Trees make their greatest growth during dry seasons and their least growth during wet seasons, whereas others have supposed the reverse to be the case and have shown analogies between historic world periods of drought and even migration of races and the annual growth rings of our California Big Trees which I cannot indorse. This disagreement must be justified.

Of course, a protracted cycle of dry years might result in drying up underground fountains from which a sequoia is fed even during the driest seasons; and then the annual ring growth would be as small in a dry year as in a wet one. But a protracted cycle alone would accomplish

this.

No Big Tree will start its growth in the spring of the year as long as there is a cold blanket of snow on the ground beneath it. On the contrary, if the winter is a dry one, with light snowfall that melts off early in the spring, a longer growing period is afforded. Now, owing to the height of the Big Tree forests above sea-level, their period of annual growth is comparatively short. As against a growing season of six or seven months in the valley, the sequoia region has one of only from one to four months. The amount of winter snowfall affects the growing period, and if the winter is a wet one that piles up in the sequoia belt heavy snow to melt off late in the following spring, the season is shortened and only a small growth is made.

The general impression, then, that a wet winter means heavier sequoia growth than a dry one is erroneous. Instead, the contrary is the case. The reasoning stated above is enforced by the following illustrations. These instances showing the two extremes in seasonal growths between wet and dry years are from observations made at Giant Forest, Sequoia National Park.

The winter of 1905--1906 was exceptionally wet. Snow was piled up under the sequoias at Giant Forest to a depth of twenty-nine feet. As late as July 4, 1906, there was still twelve feet of snow on the level in protected spots, and the ground was not bare until the end of that month. As a result of the wet cold ground, the trees plainly did not start their summer growth until the first week in August; and they stopped growing about September 1. But in 1923--1924, which was the driest season since records have been kept, there was little snowfall in the groves and that little was melted by the middle of March.

That season the trees started their summer growth early in May and grew until September 1, a growing season of about four months. These conditions applied alike to young and to old trees. Nursery stock grew only two inches in the 1906 season, as against eight inches in the 1924 season; and examination of the annual rings on two adult trees that have fallen in Giant Forest since 1925 shows seasonal growth inversely proportional to the snow fall and snow retention of the above-mentioned seasons.

Therefore it would seem an easy matter to determine both the wet and the dry cycles of past centuries by merely ~~examining~~ checking over the annual ring growths on any fallen tree, crediting the large growths to the dry years and the small growths to wet years. But it is not so simple, for we are up against confusing factors.

For instance, the winter season of 1913--1914 was wet above normal, and a heavy snow piled up in the forest belt. As late as May 1, there was thirteen feet of snow on the level over the forest floor, which under normal weather conditions would have lasted until well along in June. But a warm, drizzling rain set in on the fifth of May that kept up intermittently for ten days and melted off the snow. Because of this rapid disappearance of the snow, the trees put forth their summer growth about June 1, thus giving a growing period of about three months, practically the normal. So the annual growth for this season was normal, despite the abnormally wet winter preceding it. It therefore appears that calculations of seasonal growth, based on abnormally wet or dry winters, can be only generally correct and must not be considered specifically accurate.

Then again, how may seasonal growth be ascertained during long cycles of dry or wet years? Of course, if the seasons were exceptionally ~~a~~ wet and the forest floor was well covered with ice and snow throughout the summer, the trees would show little growth. But if at any time a rain occurred, such as that of 1913--1914, and the snow was melted off, a normal growth would occur even after ~~arriving~~ a very wet

mal growth would occur even after a very wet winter. On the other hand, if a succession of seasons were exceptionally dry and very little snow fell on the forest floor, doubtless the trees would show large growth, at least for the first few years, as long as their watersheds supplied them with moisture from the immediately preceding seasons; but finally, as the water table lowered and the roots failed to reach moisture, the seasonal growths would dwindle till they were no more, or even less, than the growth in abnormally wet years.

Furthermore, growing conditions are not the same over the entire Big Tree belt, for the *Sequoia gigantea* has a longitudinal range of two hundred and fifty miles. The normal annual precipitation for the northernmost portion is about fifty inches, as against about thirty inches for the southernmost portion. Most of the precipitation is snow, which falls from October to May inclusive. Occasional thunder storms give some rain in the summer, but these storms are local in character, and usually of brief duration. Once in a while there is a season which varies regular precipitation so that the snowfall in the north and the south is about equal, or one in which they may differ more than usual. Warm rains fall in the spring over certain areas of the range; and in those areas the snow is melted off earlier, thus giving a longer growing season than one where the snow melts slowly.

Because of these changing local climatic conditions, the proportional growth of adult and seedling trees varies greatly with the locality and the season. Comparing seasonal growth rings with meteorological records in the cases of thirteen young sequoia trees which either were cut or fell of their own accord in Fresno and Tulare County Groves, between the dates of 1910 and 1927, I find that their annual ring growths during

the fifty years that records have been kept at the Weather Bureau stations at Visalia and Fresno, the nearest rainfall stations to the groves, vary with the precipitation, except during two years. These two off years are 1883--1884 and 1913--1914, both of which were abnormally wet. The latter season I have already mentioned. Similar conditions doubtless prevailed during the season of 1883--1884. Both of these seasons were abnormally wet. But throughout the entire period of fifty years, all dry years showed large ring growths, while all unusually wet years except the two above-mentioned wet winters showed small growth.

VISALIA, June-----Advocates of the Barbour bill which would more than double the present size of the Sequoia National Park and renamed it the Roosevelt-Sequoia National Park are having their troubles in getting the measure through Congress. The battle against the opposition, however, is slowly being overcome, according to the general belief of those closely connected with the details, and it is believed time will witness the success of the program. The fight has been described as one of importance, involving the City of Los Angeles and its power filings on the Kings river, and there have been those who term it one of the most important struggles in the history of the national park development.

Col. George W. Stewart, of Visalia, former editor of the Visalia Delta and later registrar for the United States land office in that city, is one of staunchest supporters of the enlarged park program and, as such, keenly awake to the various angles of the controversy. He fully realizes the magnitude of the struggle between the opposing forces but he smiles, at times, at statements to the effect that the struggle is the "most" bitter of any connected with the development of the great scenic wonderlands of the country. Col. Stewart remembers back into the eighties when the fight to save the giant Sequoias from the ax of the lumberman drew into opposing camps the greatest industries and the biggest men in the country, stirred up enmities which still exist to some degree and gave to the country, forever, the Sequoia National Park, as it stands today, the General Grant National Park and the Yosemite National Park--a fight which started in Visalia, was prompted by himself initiated through the columns of the Delta, which he then edited

and later owned, and was fostered by the entire San Joaquin valley excepting those lumber interests which sought control of the wonderful stands of timber, and who nearly won.

The struggle to enlarge the park and thus to preserve still more of the wonderful mountain territory of the Sierras for the future vacationists, is as nothing compared with the struggle against the timber barons nearly fifty years ago which brought about creation of the three national parks above mentioned.

Even prior to 1880 the matter of preserving the largest big trees and preventing their cutting occupied the attention of some newspapers and General Miller, then senator, introduced a bill to have the General Grant tree and adjacent territory included in a national park. The bill failed of passage but this was the signal for timber barons to swoop down upon the virgin stands which many of them did not know existed until the advertising the trees received through this legislative attempt. In a few years at least three bold attempts were made to gain possession of the Grant timber stand under the timber and stone entry act. Protests from San Joaquin Valley nature lovers were successful in having these entries overruled and denied. Had they been allowed the giant trees could have been purchased at the rate of \$2.50 per acre. Entries filed were usually made by many people, presumably, acting for the groups representing lumber kings.

It was not until 1895, however, that the virgin stand now Giant Forest came to the attention of the lumber men and efforts were started at once to get possession, the same methods being used which had been

applied to the Grant domain. The real battle of those who wanted to see these giant trees preserved then started--a fight which continued until 1890 and stirred the whole country, perhaps as much as the Evans and Sontag episode which opened in 1892, or the Mussle Slough tragedy of 1880. —

When it became apparent to Col. Stewart and others vitally interested in the preservation of the trees that the stand of timber was in grave danger of becoming prey to the axman, petitions were forwarded to Washington asking that the land now included in the Sequoia National Park be withdrawn from entry under the timber and stone applications. But both sides were working diligently and within a short time independent entries on the timber were made by a group of people, mostly from San Francisco and Oakland, with a few from the San Joaquin Valley. Claims covered every acre of land in the Giant Forest taking in practically every tree there standing and it did not appear to those interested in preservation that success would ever attend their efforts.

Then, as if Kind Providence had come to the side of the conservationists, luck stepped in. The law specified that legal publication of the entries should be made for a period of 60 days and the Visalia Delta was the paper securing these legal notices. J. O. Blakeley, then owner, had Col. Stewart as his editor. In reading proof on the legal notices Mr. Stewart observed that several notices bore the same name, with different initials; that the addresses were the same--seven applicants giving a boarding house at 217 Broadway, San Francisco, as their address. Col. Stewart called the attention of Mr. Blakeley to

this unusual situation and forthwith both went to the United States land office of which J. D. Hyde was registrar. The applications on their face appeared irregular and an investigation was quickly made with the startling additional discovery that fourteen applicants were not citizens of the United States, having taken out their first papers on that very day. Register Hyde, sizing up the situation and realizing that there was likelihood of a fraud being perpetrated, wired the general land office at Washington, to suspend the entries pending an investigation; that he was not satisfied they had been made in good faith.

The very evening the wire went to Washington those who had thus "independently" filed on the land met, as if by call, in Visalia, and organized the Tulare Valley and Giant Forest Railroad company. Shortly after, contracts were entered into by which their holdings were assigned to parties originating the entry scheme, which was contrary to law.

To keep things apparently above board, however, the 60-day period was allowed to run and the applicants were then supposed to come to the land office, complete their proof of entry and pay \$2.50 an acre for the land. Only six had the money to make the payments and no one was allowed to make his proof; The entries remained suspended.

The fight, however, was by no means ended for timber interests continued to press for the reopening of the land to entry and the situation was constantly fraught with danger insofar as those interested

in the preservation of the "Big Trees" were concerned. The department of the Interior and other governmental agencies were continually being pressed by moneyed interests and it was with grave concern that the San Joaquin valley people, especially those close at hand, watched each new order and development, constantly themselves trying to find some method of securing preservation of the area.

In 1889 the Delta, editorially, suggested that a forest reserve might be created and Courtney Talbot, head of the Tulare Grange, called a meeting for Visalia to discuss the matter and take steps for the forest reserve creation. Dr. S. G. George, of Porterville acted as temporary president and P. Y. Baker, of Traver, temporary secretary. Permanent organization was formed on October 9, 1889, with Tipton Lindsey of Visalia, recorder of the United States land office, as president; and Col. George W. Stewart as secretary. An adjourned meeting was held in Fresno October 19 attended by a few members of the Fresno Chamber of Commerce.

In the meantime Messrs. Lindsey and Stewart outlined the proposed boundaries of the reserve thus sought. They embraced nearly the entire mountain country from the Yosemite Valley on the north to the Greenhorn Mountain, in Kern County, on the south not breaking any townships and taking in all the timbered area. A committee of three was named and a petition prepared and sent from county to county in California, signed and forwarded to Washington. Although it was pigeoned-holed, Secretary on the Interior Noble mentioned it in his annual report.

But through the year which followed the Delta continued to carry articles concerning this project, marked copies being sent to Washington. And then another strange thing happened which, perhaps, had more to do with the final success of the movement than would be supposed in that big timber interests in Michigan were indirectly responsible for the permanent suppression of timbering in these mountains.

The story goes that these men, recognizing the fact that their stand of timber was soon to be exhausted, came to California and made timber and stone entries on lands in Eldorado county. Not wishing to prove up on the land at once, until their Michigan timber was exhausted they allowed their filings to fall delinquent, having the right to redeem them later, when they wished to timber on them. This they could do by having the suspension revoked, through pull; pay the fee, fines and \$2.50 an acre. Knowing that their land would be more valuable if timbering was not permitted in the forest section of Tulare and Fresno counties these Michigan men, it is now admitted, were instrumental in keeping the Giant Forest and other timber areas of this section withdrawn from entry.

Secretary Noble, however, restored a small section of the land in Fresno county to entry, contrary to the wishes of the people here who wanted all saved for posterity. The act threw the camp of the conservationists into new turmoil for they feared further orders of like character. It was a fact, also, that men were ready and did

file on the Fresno county timber lands the very day they were thrown open though no one here, apparently, had any advance information to the effect that such an order was to be issued. The Fresno County timber lands now belong to the Hume-Bennett Lumber Company. Rumors came through from Washington that more of the land was to be opened and at one time forty men went back into the forest country ready to file, with the snow still deep on the ground. Wired protests went again to Washington and the order was never issued.

Rumors of coming orders reopening the land continued to come thick and fast and the situation became very grave for the conservationists. Col. Stewart was then registrar of the land office and F. J. Walker had become the publisher of the Delta. They discussed the matter frequently and, with others, tried to fathom a way to safety for their hopes. It was quite evident that unless something was done the Giant Forest lands would be thrown open to entry. Creation of a forest reserve, it developed, would not save the Sequoias permanently or presidential proclamation could open such lands to entry. John Tuohy of Tulare, ~~ix~~ well posted on such matters, was called in. Then Col. Stewart recalled the creation of the Yellowstone National Park. The law creating that park was studied diligently. It was agreed by these three that there might be hope through a park creation and four men got busy, Messrs. Tuohy, Walker, Lindsey and Stewart, and wrote to every paper in the United States which had been found to be at all interested in saving the Sequoias. Publicity was their channel and even in those early days, the power of the press and the value of advertising was ably demonstrated. Days and nights were spent writing articles, letters, appeals and mailing them to the press of the country.

Similar letters were addressed to congressmen who had in any way expressed themselves upon the subject.

General Vandever, of Ventura, then congressman from this district, won support in the east for the measure he had prepared creating the park under the name "National Sequoia Park" as suggested by the Delta. It was introduced in Congress August 7, 1890, and passed and approved on September 25 of the same year.

In the meantime people in the east had been working for the creation of the Yosemite National Park and the passage of the bill creating the Sequoia park was a stimulant to their aims and ambitions. So a new bill was prepared providing for the creation of the Yosemite National Park, and for an enlarged Sequoia National Park taking in all the territory included ~~y~~ in the Sequoia park prior to its second enlargement in 1926. (The original Sequoia park comprised township 18 south, range 30 east and range 31 east, and sections 31, 32, 33, and 34 of township 17 south range 30 east). In the meantime D. K. Zumwalt, of Visalia, who was in Washington visiting at the Vandever home, inquired of the Congressmen as to why General Grant could not be included in the bill. Congressman Vandever admitted he did not know such a tree or group of trees existed. He was told of correspondence on file in the land office regarding it, looked it over and asked and received consent of Congress to include ^d the General Grant National Park in his bill. The final bill creat^ting all three famous parks was passed by Congress october 1, 1890. A little later Seth ^s Smith, then county surveyor of Tulare County, was asked by T. W. Wagner, United States Surveyor General, to locate accurately the

Boundaries of the General Grant National Park which he did.

In 1893 the forest reserves known as the Sierra and Sequoia National forests and comprising almost the same area as originally outlined by Col. Stewart and Tipton Lindsey were created, ending forever the fight for control of the timber lands and vindicating the efforts of the San Joaquin valley folks who for thirteen years fought diligently for the preservation of this playground area.

The fight was by no means without its individual hardships and many people who had come into the country honestly x but , it is held by many old timers, the unwitting tools of timber barons, suffered . According to the most accredited story of one of those incidents which resulted in financial ruin and many hardships during that period is the story of the Kaweah Colony. Here gathered scores of hard-working, diligent people from many eastern states under a semi-socialistic creed; gathered in response to an organization scheme by which they were to timber the Giant Forest mountains, pool their efforts and sell to some lumber concern. Many responded, sold all they had in the east, and came west. Many were included among those who filed on the land, perhaps in good faith; others built the Giant Forest road from Three Rivers to Colony Mill, intending to build on the the Giant Forest. Here the government stopped them, the claims were thrown out on the basis of the general fraud which, it was x believed, existed and by which these people were made the tools of others. They did not get even their pay for building the road and to many of them there still remains some bitterness. Burnett Heiskell, of San Francisco, was the leader of the colony and there are living in Tulare County today a

dozen or more who were members.

The Sequoia and General Grant National Parks lay idle for many years and on May 14, 1891, Col. J. H. Dore, Troop K, 4th Cavalry, camped at Visalia and started with his men for the mountains, the first government troops to enter the park. Government troops spent each summer guarding the parks with the few rangers until 1913 when the the park service was created and the new regime existing today was inaugurated.

The development of these parks from that time is well-known to most San Joaquin Valley people. General Grant and Sequoia have been visited by well over a million people and the influx is growing greater annually; and, perhaps, not one out of every ten thousand who view these wonders and stand with reverence and awe beneath the shadow of General Sherman tree or of General Grant tree knows anything of the thirteen-year-old battle which was waged that those five-thousand year old giants with their thousands of comrades might continue to live and bring peace, happiness and true appreciation of the works of the Almighty to millions more.

Sequoia park was enlarged from 252 to 604 square miles by the Barbour bill passed in 1926.