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VOLCANOES IN THE NATIONAL PARKS—

Radio Talk, KHBC, Sept. 28, 1937, Hugh H. Waesche

Because of their spectacular nature and their interference with man's activities, volcanoes have always been of intense interest to the human race. With primitive peoples they have been associated with the supernatural, but when attacked by modern scientific thought they serve as major stepping stones in the solution of many problems concerning the origin and history of the earth on which we live. Most advanced, and going beyond previous thought is the systematic study of volcanoes with protection of life and property in mind.

Many of our National Park areas contain volcanoes as major features. Other National Parks contain volcanic features of secondary importance. Of twenty-seven National Parks listed August first of this year, five have volcanic histories of major interest, and at least nine others contain some evidence of past volcanic history. So, more than half of our National Parks have a geologic story to tell of which some portion is volcanic.

In this series of Parks, volcanic conditions of practically every kind known are demonstrated, from the currently very active lava volcanoes in Hawaii, to ash deposits laid down in Shenandoah and Mammoth Cave National Parks many millions of years ago in that geologic period known as the Ordovician, when man's arrival on earth was in the very distant future and probably all life was still confined to the oceans. This variety of volcanic evidence applies equally to both kinds of activity, and amounts of activity.

Five National Parks illustrate stages of volcanic activity very clearly. Hawaii National Park heads the list as the most active, being the location of Kilauea and Mauna Loa. Lassen Volcano in Northern California illustrates a second stage of activity as well as holding the unique position of being rated the only active volcano within the boundaries of continental United States, excepting Alaska. Mount Rainier in Washington represents the dormant stage, Crater Lake a dormant or extinct volcano with a special history, and Yellowstone, an ancient volcanic region much eroded but with enough residual heat to produce a very special type of geyser activity found at only three localities in the world.

Not one of these volcanoes has been listed definitely as extinct, as that is a term which should not be applied too hastily. No doubt some of these volcanoes are extinct, but definite statement to that effect would certainly be open to question. Vesuvius in Italy was considered extinct until seventy-nine A. D. but that opinion was rudely changed with the destruction of Pompeii.

Aside from the volcanoes in the National Parks there are others in National Monuments such as Katmai in Alaska, Sunset Crater, Arizona, Capulin Mountain, New Mexico, and the Lava Beds of California. Various types of volcanic structures are also exhibited in Craters of the Moon in Idaho, Devil's Post Pile in California, Devil's Tower, Wyoming, Grand Canyon National Monument and Death Valley National Monument.

It is not surprising that the first and greatest area to be set aside as a national park was volcanic. Only a volcanic region could produce the superlative and dynamic landscape which holds this honor. Everyone has heard of and knows something of Yellowstone, the "Grand Old Man" of all the parks, both in the United States and elsewhere. It is located in the northwestern corner of Wyoming with a slight overlap into the states of Idaho and Montana. This region was rather inaccessible and practically unknown until the middle of the last century. A few men had visited the region, however, and brought back glowing tales of the wonders to be seen there. As far as these reports were concerned the public was very incredulous and the situation was such that few dared to tell of the things they had seen, as several lecturers were actually stoned in the streets as imposters. The first official and accredited exploration of the Yellowstone region was made by the Washburn-Langford expedition of 1869. Their glowing reports of the wonders of the region led to its establishment as our first National Park in 1872.

The feature of greatest interest in Yellowstone is that unusual form of volcanic activity, the geyser. It is justly celebrated in this respect as there are only two other places in the world where geysers are common, New Zealand and Iceland, and Yellowstone has more geysers than those two combined. There are more than three thousand geysers or hot springs within the Park and every conceivable type or form of either is represented.

A geyser may be thought of as a water volcano. They can occur only in places where the internal heat of the earth is near the surface. Water from the surface plus some added from depth flows into an opening in the form of a more or less tubular vent, or maybe even a crack, and eventually reaches regions of highly heated rocks below. When this happens steam is formed but does not escape because of the heavy column of water above. After a time, however, the steam pressure becomes equal to or slightly greater than that exerted by the water column and as soon as this condition is reached the water is forced out and appears at the surface as a fountain.

The height of the fountain, frequency of play, and force of the water depend on conditions which vary widely with the different geysers. Such conditions are size of orifice at the surface, temperature below the surface, length and size of the tube leading to the hot rocks, ground water level, and probably other conditions which are not known.

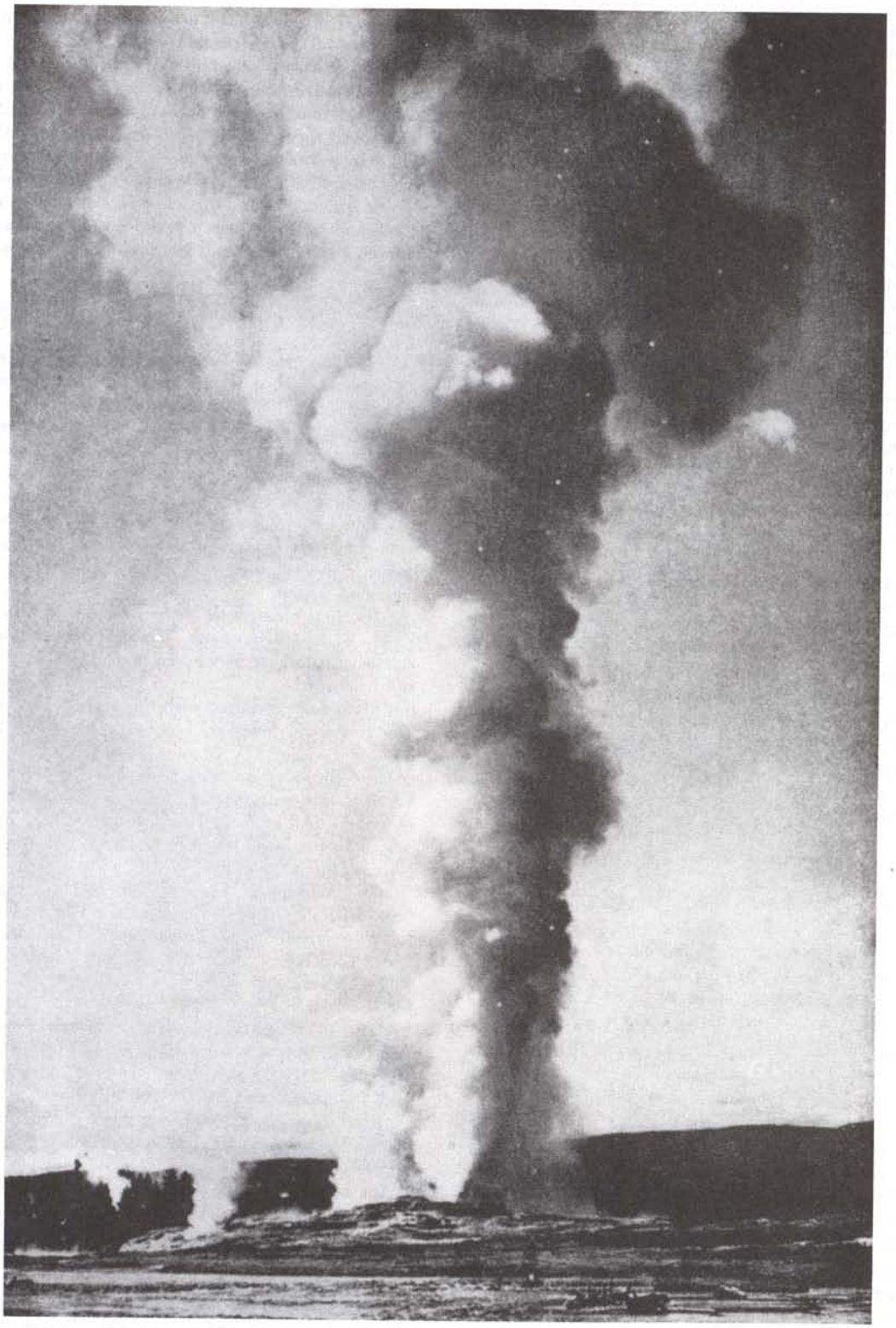
There are six principal geyser basins in the Yellowstone, all lying in the west and south-central sections of the Park. Some geysers erupt quite regularly. The most famous of these are Old Faithful, Daisy and Riverside. Old Faithful erupts about once an hour year in and year out and shoots a shaft of water over one hundred and fifty feet in the air for four minutes. The water temperature is about two hundred degrees Fahrenheit. Besides the geysers, the entire region contains many hot springs which are in most cases clear water with a beautifully colored background of orange, yellow, green or blue created by algae which live on the rocks forming the container. Other springs are filled with mud in constant agitation which, in one case, is named the Paint Pot. At Mammoth Hot Springs the water has brought to the surface large amounts of lime in solution which is precipitated on reaching the air. These mineral deposits build high terraces of beautifully encrusted basins over which the water flows.

Practically the entre region incorporated in Yellowstone is volcanic. Not only the surrounding mountains but the great interior plain is made of material once ejected as ash and lava from depths far below the surface. In some places entire forests have been buried by ashes blown from these ancient volcanoes, in another place lava which poured out on the surface cooled so rapidly that volcanic glass was formed, now represented by the famed Obsidian Cliffs. Yellowstone's volcanoes were probably active in that geologic age known as the Tertiary, millions of years ago. Since that time the region has quieted down, and has even been through a period of glaciation. The stage of erosion there, plus the lack of recent activity, marks the area as one in which a great volcanic exhibition had been through its youth, maturity and is now in advanced old age with only enough heat left over to keep the geysers busy.

Several hundred miles west of Yellowstone lies an area of a quarter million square miles which is the greatest field of volcanic activity in the United States and one of the greatest in the world. Large portions of the States of Washington and Oregon, and lesser portions of California, Nevada, Idaho, Montana and Wyoming are within this area. It includes the Cascade Range of Mountains extending from northern California across Oregon into Washington.

Within this range are three of our National Parks, all volcanoes, and they are, in order, south to north, Lassen Peak, Crater Lake and Mt. Rainier. Of this group, only Lassen is considered active. Crater Lake was probably active as recently as eight hundred years ago. Mt. Rainier near Tacoma, Washington, is considered "king" of all the towering volcanoes of this region. It is a huge volcanic cone over 14,000 feet in height and covering more than 100 square miles. A few steaming vents and hot springs are all that remain of activity which was evidently on a very grand scale in its past history. Now this huge mass of lava, cinders and ashes is covered by snow and ice resulting in a glacier system. Mt. Rainier is now an imperect cone, but once it was complete like the famous Fujiyama of Japan. Then it was probably 16,000 feet high. Sometime in its late history an explosion or engulfment occurred which took 2,000 feet off the top and left Mt. Rainier beheaded. Indian legends tell of a great eruption, but no man really knows when this great mountain was last active.

The southern limit of the Cascade Range is marked by Lassen Peak. This volcanic pile is the only aggressive member of the group to which it belongs. It had been quiet for over two hundred years although one or more doubtful eruptions are reported, and "mud" flows have occurred within the last five hundred years as estimated from buried logs.



Yellowstone National Park. Wyoming.

On May 30, 1914, a series of eruptions began from Lassen which lasted through June of 1917. The first eruption was short and mild, opening a new vent in the summit crater. The materials thrown out the first year were not excessively hot. By March of 1915 over one hundred and fifty explosions had occurred, probably aided by water from an unusually heavy winter snowfall. On May 19, 1915, there appeared the first glowing lava which spilled over the western edge of the crater to flow down the slope one thousand feet. That night several destructive mud flows poured into valleys down the slope.

Three days later a mushroom-shaped cloud of smoke and dust arose four miles in the air accompanied by a hot blast of gas which rushed down the northeast slope destroying every living thing for ten miles. So violent was this blast that trees on Raker Peak three miles away were all felled uniformly in the direction of the outburst. The heat turned snow in its path to water. After this convulsion the energy of the Volcano was mostly spent although occasional outbursts of steam and ash continued for two years when it finally subsided.

At the present time Lassen is quiet, although from time to time there are earthquake shocks. There are many hot springs, boiling mud pots and sulfurous deposits in and around Lassen Peak. A seismograph station is maintained at Lassen for recording earthquakes as is done here in Hawaii. Lassen was formerly a part of the study program of the Hawaiian Volcano Observatory. Lassen Peak is 10,453 feet above sea level and is surround by lava fields, and other volcanic cones illustrating many phases of volcanic activity. Lassen's activity will probably be resumed in the future.

Although Grand Canyon National Park is set aside as a great example of stream erosion, it has some evidences of volcanic activity of a minor nature which occurred millions of years ago. However, within sixty miles of Grand Canyon is one of the largest extinct volcanoes in the United States. This is the San Francisco Mountain area of Arizona. Included in this region is Sunset Crater, a 700-foot cinder cone and associated lava fields. The latter locality has been recently active—that is within a thousand years. Some of the lava associated with Sunset Crater is very similar to our Hawaiian aa. Sunset Crater is a National Monument.

The Devil's Tower in Wyoming is an interesting volcanic exhibit. It is a 600-foot pile of vertical jointed lava similar to that to be seen in Makaopuhi Crater here in Hawaii National Park. It tops a 600-foot mound of sedimentary rock and can be seen for a hundred miles in any direction. Some people think it is an intrusive plug, but there are others who think it is a remnant of an old intrusive sheet, and there is a lot of evidence to back this latter theory.

In the country north of Lassen National Park there is an area in California near the Oregon line known as the Lava Beds National Monument. This large region is typical of its name and contains many lava tubes similar to our Thurston Lava Tube. Some of the tubes contain ice the year around and are known as ice caves.

Alaska is one of the most active volcanic regions of the world. A belt of volcanoes extends for 1,500 miles through the Alaskan Peninsula to the west part of the Aleutian Islands. Katmai is one of this series of volcanoes. It is 6,970 feet high, located on treacherous Shelikof Strait, opposite Kodiak Island.

Very little attention was paid to Katmai until June, 1912, when it announced itself to the world with an explosion that was heard in Juneau, 750 miles away. Earthquakes followed this blast and then came a spell of smoke and dust causing sixty hours of darkness in Kodiak, a hundred miles away. Dust fell in Ketchikan, 900 miles away and fume was carried by the wind to Vancouver, fifteen hundred miles away. Hazy atmosphere was noted over the United States the succeeding weeks and even peculiar atmospheric effects were noticed in Europe the following summer.

The scene of this explosion was made a National Monument in 1918. One of the most interesting phases of development at Katmai was the formation of the valley of 10,000 smokes near by. This has been described at length in the National Geographic Society's publications.

This review of volcanic National Parks and Monuments is by no means conclusive. However, it does give an idea of the great variety of volcanic activity to be found within the United States and its territories, with unlimited possibilities for study and research, or entertainment for those who prefer a spicier type of geologic story, connected with their Parks. Volcanoes can be depended upon to put on a good show when they are so minded in spite of their temperamental natures. To people of Hawaii, visits to the other areas should be interesting.

Kilauea Lava Flow of 1823

A major structural feature of Kilauea is the fracture zone extending twenty miles SW of the Crater, in the general direction of Pahala. This rift disappears out into the sea. It is commonly spoken of as the Kilauea SW Rift and is the feature indicated by that term frequently used in the Volcano Letter.

Although most of the Kilauea eruptions have occurred in the summit crater within historic times, some major activity has taken place in the regions associated with the SW Rift. The numerous prominent cinder cones and flows of the Kau desert in this vicinity testify to abundant activity before historic recording began.

The first nineteenth century flow from Kilauea occurred in 1823. It issued from the "Great Crack" twelve miles SW of Kilauea Crater. A minor flow took place in the SW rift zone eight miles from the Crater in 1868. The identity of this flow has often been confused with the more extensive flow of 1823. The confusion, however, has been straightened out with reasonable certainty by Stone, Stearns, and Jaggar, who have covered the question in published articles. The third and last SW Rift flow was that of 1920, resulting in the formation of Maunaiki. All of these flows are correctly shown on the latest maps. In the last 110 years there have been only three known periods of activity in the SW Rift.

The morning of February 26, 1937, a party of National Park officials visited the area of the Keaiwa Flow (local name for 1823 flow). This group included Mr. John D. Coffman, Chief Forester of the National Park Service, and Mr. E. E. Tillett, Field Supervisor of the Emergency Conservation work for the Islands.

The 1823 flow was found to be of considerable interest and unusual in that it seemed to have issued from the Great Crack which probably opened up immediately preceding the eruption and, no doubt, was accompanied by rather strong earthquakes. By Ellis' dates the outflow was about February, 1823, and the most serious earthquake about May. The lava formed a comparatively thin skin over older flows, leaving many small kipukas or islands of the older material and thus indicating a very fluid condition. Lining the Great Crack, there are rounded lava balls similar in appearance to bombs but of a much different origin and in two localities there are indications of phreatic explosions. The lava balls are accretion-spheres formed of hardened liquid lava around fragments in the chasm, swept out by later gushes which embedded them. The absence of cinder or driblet cones would indicate that the lava issued from the earth in a somewhat different fashion from the usual Hawaiian flow which has both at its source. A very striking and prominent feature is the presence of many tree molds. These are of a wide variety as to form. Some are several feet in thickness and