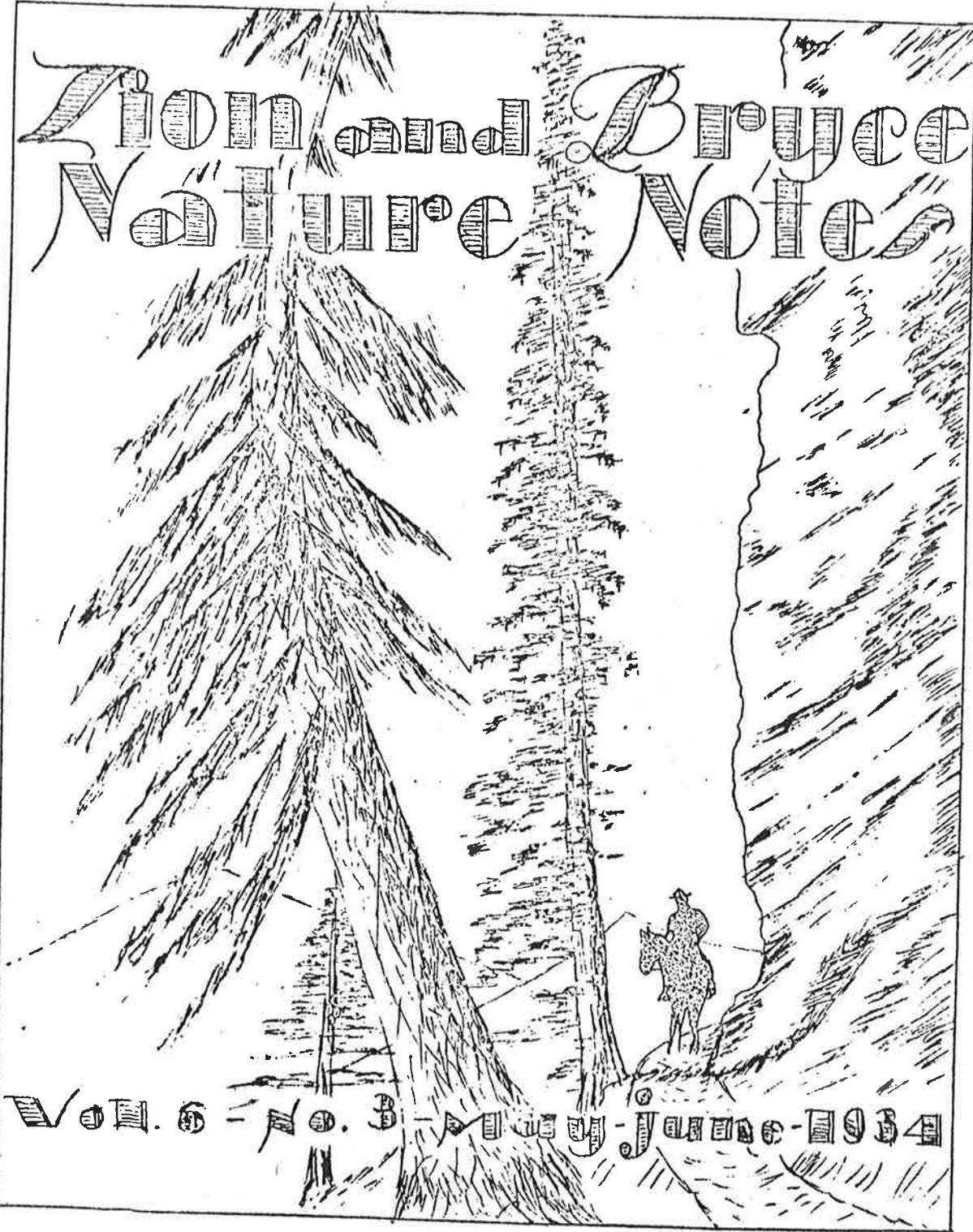


Zion and Bruce Nature Notes



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DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Zion and Bryce Canyon National Parks, Utah

Vol. 6
Zion-Bryce Nature Notes

No. 3
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This bulletin is issued monthly for the purpose of giving information to those interested in the natural history and scientific features of Zion and Bryce Canyon National Parks. Additional copies of these bulletins may be obtained free of charge by those who can make use of them by addressing the Superintendent, Zion National Park, Utah. PUBLICATIONS USING THESE NOTES SHOULD GIVE CREDIT TO ZION-BRYCE NATURE NOTES.

P. P. Patraw, Superintendent

C. C. Preshall, Park Naturalist

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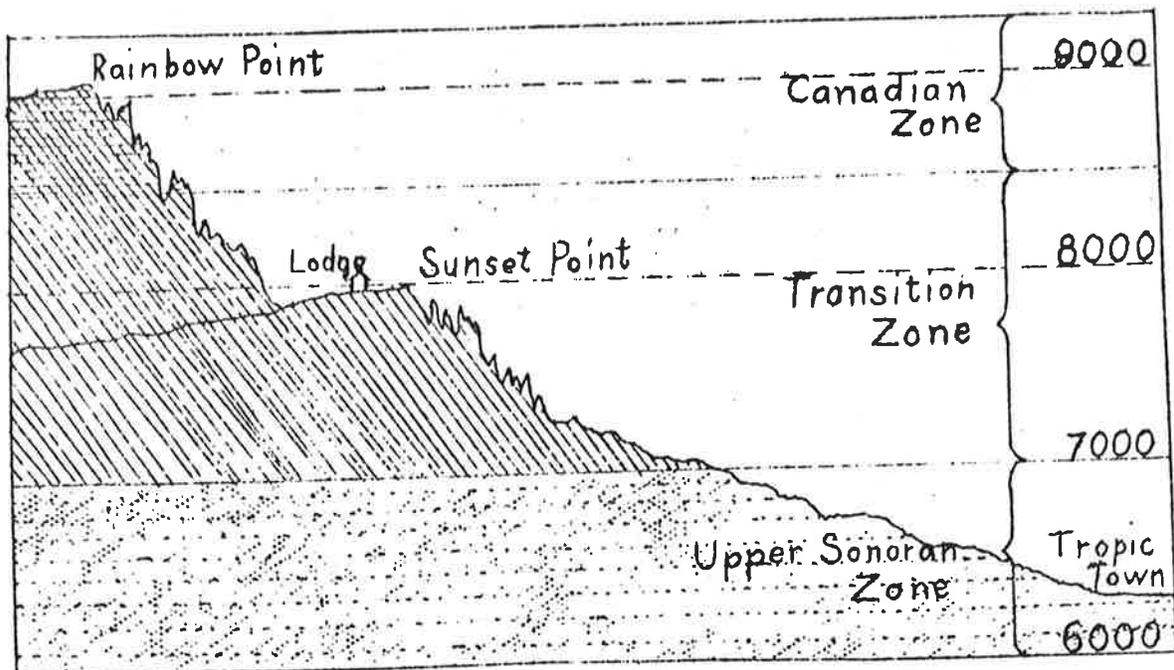
ENVIRONMENTAL FACTORS IN BRYCE CANYON FORESTS

By K.E. Weight

The individual who travels through the southern Utah parks and the west in general is no doubt impressed with the fact that certain plants grow only in certain places. The typical sagebrush prefers the deeper soils of the valleys, the junipers and pinons occupy the lower mountain slopes, and the spruce, fir and yellow pine cover the higher elevations. This preference of habitat is explained on the basis of physiological requirements for each group of plants.

The factors of environment which determine the character of the vegetation in any region are: water, temperature, air, light, soil, and animals. Of the above features, air and light are universally distributed over the earth's surface and play minor roles in plant distribution; both are nevertheless very essential for plant growth. Plants respond very readily to a change in the water content of the soil or the vapor of the air, also to a change in temperature. Likewise, the chemical and physical nature of the soil is a very important factor in plant geography. With moisture and temperature constant over a given area, differences in plant associations are usually due to soil influences.

Considering the area for a hundred miles or more around Bryce Canyon, the topography is so diversified that conditions vary from those at lower elevations with a climate similar to that of Sonora, Mexico, to the almost arctic climate of the mountain tops. Due to this altitudinal change the region contains all the plant life zones except the tropical, although not all of them are represented within the park itself. The lower portions of Bryce support plants typical of the Upper Sonoran Zone, with pinon pine and Utah juniper as the dominant trees. The Transition Zone is completely represented in the park, with the western yellow pine as the most conspicuous tree. More than half of the total tree population within the park is western yellow pine. At the higher elevations near the south boundary this species is almost entirely replaced by blue spruce, white fir, and Douglas fir. All these indicate the presence of the Canadian Zone, although the spruce is the only one found in no other zone. Thus we see that Bryce Canyon National Park contains one entire zone (Transition) and parts of the two bordering zones (Upper Sonoran and Canadian).



Ideal Diagram of Life Zones in Bryce National Park

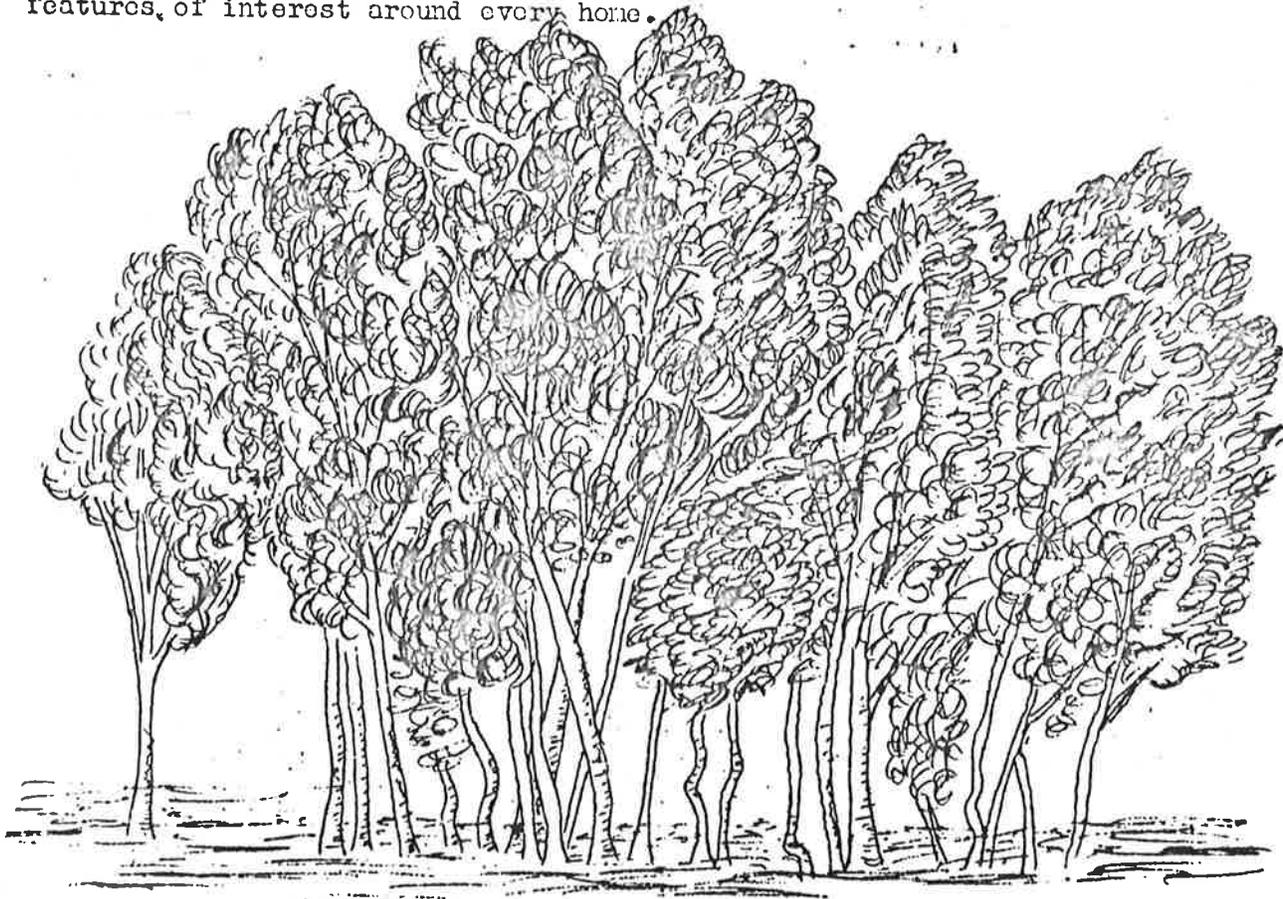
At the latitude of Bryce Canyon the pinon-juniper belt ranges from about 4,000 to 7,000 feet elevation, the yellow pine belt from 7,000 to 8,500, and the blue spruce from 8,500 to nearly 10,000. Englemann spruce and Alpine fir are found at higher elevations some thirty or forty miles to the west, as at Cedar Breaks, 10,400 feet elevation. Changing temperatures due to the differences in elevation, along with changes in amount of precipitation, account for the differences in tree species growing in the various zones.

The pinon pine-juniper association (often called "the pygmy forest") is located on the sunny slopes of the park at lower elevations where the total precipitation is not more than ten to fifteen inches per year. The soil is usually shallow and dries rapidly after a rainstorm. The yellow pine forest on the rim receives twenty inches of rain per year, while the white fir and spruce forests at higher elevations receive probably twenty-five inches or more in the same period of time.

It is interesting to note the effect of local differences in temperature and moisture on the various species of trees. For example, single specimens of the white fir are often found below the rim in the canyon, at an elevation considerably below their normal habitat. They are able to grow there because of a duplication of the environmental factors that favor their growth at higher elevations. The shade of the high canyon walls causes a decrease in temperature and also makes for less evaporation of water both from the soil and the tree. Another example is the Douglas fir growing on the Navajo Trail in what is known as "Wall Street", which

is a very narrow canyon fifteen to twenty feet wide with vortical walls nearly 300 feet high. The temperature at the bottom of the canyon is always cool, and the rather deep soil contains a plentiful supply of moisture. During years of normal snowfall drifts remain in the canyon until the first of June or later. This favorable environment results in larger and finer trees than are found in any other part of the park, trees which bear a remarkably close resemblance to the huge Douglas firs of the Pacific Northwest, which is the metropolis of the species. Similar reaction to favorable environment is shown by the bristle-cone pine, which grows on the more barren and eroded slopes of both the canyon and the plateau. Those on the wind-swept barren slopes in the older parts of the canyon are all dwarfed and gnarled, displaying every symptom of a continual struggle for existence. The soil is usually hard and dry, and is but a few inches deep, the finer surface particles have been removed by running water, and the evaporation is great because of exposure to the rays of the desert sun most of the day. In contrast to those in the canyon, the ones growing on the plateau, in more favorable environment, are fair sized trees. The branches are well foliated and the trees are quite symmetrical in shape.

In conclusion I would like to stress this one thought: If the traveling American people would make close observations of plant life, they would see that it is very sensitive to changes in environment. Each plant has one best habitat in which to live, wherein the natural environment is just right for its growth and development. A study of varying environments encountered during a transcontinental tour should add greatly to the pleasure of such a trip, and once begun, this same study will disclose new features of interest around every home.



THE RARER TREES OF ZION CANYON

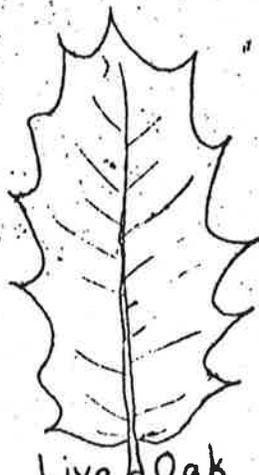
By C. C. Presnall

In previous issues of Nature Notes (Vol. V, Nos. 5 and 6) brief articles were devoted to the more common deciduous trees found growing on the floor of Zion Canyon. In this concluding article of the series the more uncommon deciduous species will be discussed, together with the conifers and exotics.

Among the less important deciduous species the Hackberry (Celtis reticulata) is most noticeable. It grows in a wide variety of environments, from dry rocky hillsides to well watered alluvial flats, but it will not tolerate poorly drained soils. It does not often attain tree size, but I have seen two specimens slightly over a foot in diameter at the base. It is one of the important sources of food among berry eating birds, especially flickers, which in the autumn live almost exclusively on the sweet, dry berries. Other uncommon deciduous trees are the Live Oak (Quercus ~~pungens~~ virginiana), which is very common on talus slopes bordering the canyon, occasionally extending down onto the river bottom; an unidentified Black Oak, of which only one specimen is known in the canyon; and the Southwestern Locust (Robinia neo-mexicana luxurians), which attains tree size only under the most favorable circumstances.



Rocky Mt.
White Oak
Q. utahensis

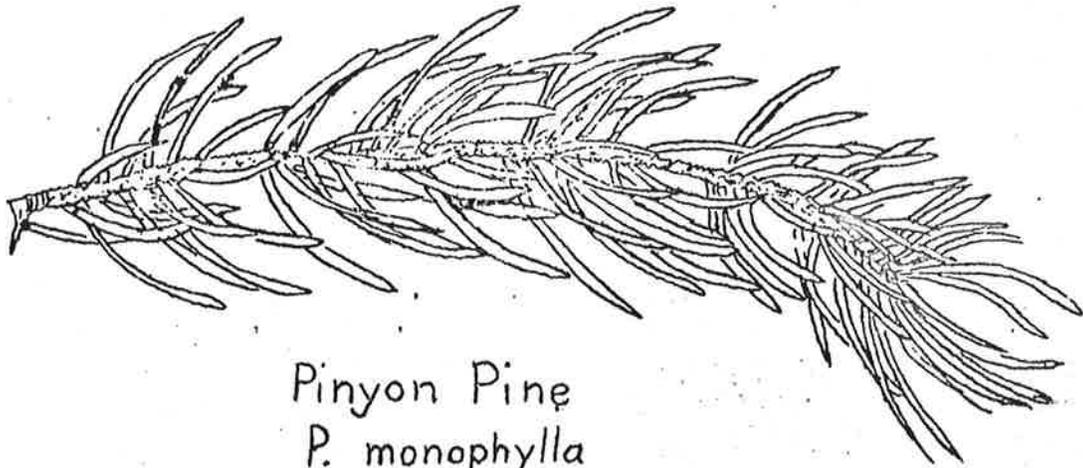


Live Oak
Q. pungens



Black Oak
Quercus sp.

Coniferous trees are numerically unimportant on the floor of Zion Canyon, but certain species have biotic importance as indicators of Transition Zone (islands) in the predominating Upper Sonoran Zone climate. These indicators include Yellow Pine (P. ponderosa), Douglas Fir (Pseudotsuga taxifolia) and White Fir (Abies concolor). They occur together or separately (yellow pine being the most uncommon) in a few cool, moist nooks along the canyon walls, especially towards the upper end. In the same localities are rare specimens of two other high elevation species: Rocky Mountain Red Cedar (J. scopulorum), and Pinon Pine (P. edulis). The two most common conifers, Utah Juniper (J. utahensis) and Single-leaf Pinon (P. monophylla), are typical Upper Sonoran species covering the talus slopes and often extending onto the canyon floor wherever the soil conditions are somewhat dry.



Pinon Pine
P. monophylla

The number of exotics on the floor of the canyon is relatively large, due to previous occupancy by homesteaders. Most of them are fruit trees that fortunately are rapidly dying out because of lack of irrigation and attacks by porcupines, which seem to prefer the bark of cultivated species to that of native trees. As rapidly as possible these dead orchards are being uprooted by the Park Service in its program of restoring and maintaining primitive conditions. There are, however, several exotic species which will probably be allowed to remain because of their value as shade trees. Included in this category are a group of Ailanthus glandulosa near the south entrance, several Black Locusts (Robinia pseudoacacia) in the south end of the canyon, and a Mulberry (Morus nigra) on the Emerald Pool Trail. The last named tree is not over twenty years old (as shown by an increment borer) and is probably an escape from some early pioneer attempt at silk culture. There are also a few scattered specimens of Tamarisk (Tamarix gallica), a species that shows remarkable success in establishing itself on alluvial soils throughout the south. In Zion Canyon it is found on sand bars along the river up as far as the Stadium, $8\frac{1}{2}$ miles north of the south entrance.

VEGETATIVE COVER OF THE UTAH PARKS

By T. B. Plair

This is designed as a continuation and extension of the discussions on tree species which appeared in the Zion-Bryce Nature Notes, Volume 5, Numbers 4-6, August-December, 1933.

The approach will be from the viewpoint of associations of tree and shrub species, or a species and its associates. That is, vegetative types as they have been arbitrarily classified and designated as such will be the basis for the discussions of associations.

ZION NATIONAL PARK

Located in Kane and Garfield counties, Utah, with an area of 148 square miles or 94,770 acres, ranging in altitude from 4,000 to 7,800 feet above sea level, approximately. It contains vegetation characteristic of Lower Sonoran, Upper Sonoran and Transition zones.

On the floor of Shones and Parunuweap Canyons there are small areas which are truly natural gardens of cacti, surrounded by herbaceous forms native to that area.

Along the streams in Shones, Parunuweap and Zion Canyons are cottonwoods, willows, maples, boxelders, and ashes, each contributing its part, whether it be erosion control in the form of stream bank protection, shade for campsites, or both, and by no means least, a refreshing beauty and coolness to the canyons.

On the talus slopes rising from the floors of the canyons to the vertical vari-colored rock cliffs, ascending hundreds of feet, you will find a pygmy forest, consisting mainly of Pinon Pine (Pinus monophylla) and Juniper (Juniperus utahensis), associated and in some areas classified as a co-dominant with them is Service Berry (Amelanchier alnifolia). There are patches of Live Oak (Quercus pungens) and Black Sage (Artemisia tridentata) scattered throughout this pygmy forest, with the live oak being more prevalent at the northern end of Zion Canyon. This type of plant association extends up Pine Creek to Zion Arch and along the highway to the east entrance as far up as the tunnel.

By this time you will have observed that a great portion of the park is occupied with beautifully colored cliffs and peaks, the majority of which are absolutely devoid of vegetation and consequently classified as barren.

After passing through the tunnel going towards the east entrance checking station, on either side of the highway you will observe what is called a mosaic vegetative type, in this case a combination of trees and shrubs, consisting of Western Yellow Pine (Pinus ponderosa) and Black Sage (Artemisia tridentata) and Manzanita (Arctostophylos platyphylla). This particular area is not heavily forested, therefore it is classified as semi-barren.

Along the road in Clear Creek Canyon are occasional White Fir (Abies concolor), indicating entirely different conditions from those on surrounding slopes. Along the top edges of the cliffs north of the highway is a stand of Pinyon (Pinus edulis) and Juniper (Juniperus scopulorum) which only occupies the southern fringe of the mesa.

At the higher altitudes on the mesa east of Deertrap and Great White Throne are large areas of chaparral composed of Rocky Mountain White Oak (Quercus utahensis), Mountain Mahogany (Cercocarpus montanus), Manzanita (Arctostophylos platyphylla) and Black Sage (Artemisia tridentata). This type is typical of the Transition Zone and occurs over large areas of the park above 6,500 feet in elevation.

Scattered over the park in protected spots and at high altitudes on the northern slopes are small areas of Douglas Fir (Pseudotsuga taxifolia) and Western Yellow Pine (Pinus ponderosa). Such areas may be seen just below Angel's Landing on the north side and in Hidden Canyon from the trail to Observation Point. The only pure stand of True Fir (Abies concolor) is in Refrigerator Canyon along the trail to Angel's Landing.

Along the west rim trail north of Cathedral Mountain is a stand of Quaking Aspen (Populus tremuloides) which is the lowest altitudinally that it is found within the park. There are other areas larger and more spectacular at higher altitudes on the west rim, for example in Potato Hollow and on Horse Pasture Plateau.

BRYCE CANYON NATIONAL PARK

The area of this park is 35,240 acres, the majority of which is above the rim on the Paunsaugunt Plateau above 8000 feet in elevation. When entering the park from Ruby's Inn one travels through a beautiful stand of Western Yellow Pine (Pinus ponderosa) which extends south along the highway for a distance of about six miles from the checking station. The elevation at this point is about 8400 feet. It is at this altitude that White Fir (Abies concolor) and Douglas Fir (Pseudotsuga taxifolia) enter to form the pine-fir stand which extends along the rim to a point about a mile south of Natural Bridge. Below the rim, however, this association of pine and fir occurs on north slopes at much lower altitudes, for example, on the north slope of Boat Mountain just south of Fairyland.

From the ridge south of Bridge Hollow to Podunk Pass there is only an occasional yellow pine, at least it constitutes not more than five per cent of the stand. The dominant species are white fir and Douglas fir, with an occasional group of Quaking Aspen (Populus tremuloides) such as is found in a draw about two miles northwest of Rainbow Mountain.

The other vegetative type of interest that may be observed on the rim is on the north slope of Rainbow Mountain. The species is Colorado Blue Spruce (Picea pungens) and may be found in greater abundance on the north slopes of draws along the headwaters of Podunk Creek two miles west.

The Limber Pine (Pinus flexilis) and Hickory or Foxtail Pine (Pinus aristata) are to be found growing in poor, rocky soil on exposed north slopes at relatively high altitudes. They occur at various places in the park, both separately and in association. There are a few places where this particular association covers more or less extensive areas, for example, along the top and down the north slope of the ridge, extending from Sunrise Point to and beyond Mormon Temple. Another area, not easily accessible at present, is the peak about one-quarter mile southeast of Rainbow Mountain.

The area within the park below the rim is covered mainly with pinyon-juniper association interspersed with areas of chaparral and sage. Pinus edulis and Juniperus scopulorum are the dominant species in the pinyon and juniper type, while the chaparral areas are composed of Rocky Mountain White Oak (Quercus utahensis), Manzanita (Arctostaphylos platyphylla), Mountain Mahogany (Corcoecarpus montanus) and Squaw Bush (Rhus trilobata) and the sage type is primarily Black Sage (Artemisia tridentata).

Ce