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BOTANY

The Plant Communities of Grand Canyon National Park, Arizona

Best known as one of the geological wonders of the world, the Grand Canyon of the Colorado River in northeastern Arizona presents as well an interesting array of plant communities. This paper summarizes the results of a reconnaissance study of the plant communities of roughly the eastern third of the canyon—the area of Grand Canyon National Park. Here the Colorado River cuts through a large dome, dividing the surface into two well-defined plateaus separated by a magnificent canyon which averages ten miles in width and a mile in depth. Within the park, the slope of the dome is to the south, the maximum elevation being 9200 ft. at the North Rim entrance station, 10 miles north of the rim. The elevation at the North Rim is 8200 ft., whereas on the South Rim the average elevation is 7000 ft. The river flows at 2200 ft. through a narrow, v-shaped gorge. Erosion, therefore, is greater north of the river where all of the surface run-off drains into the canyon. It is less on the south slopes where only that water which falls on the rim is an active erosion agent. Hundreds of erosion buttes are present in the canyon. Although many are quite small, some are covered with isolated stands of forest several acres in extent. Side canyons cut into the main canyon at all elevations. A few contain permanent streams, but most are dry except immediately following a rain when water collects in them and cascades towards the inner gorge in spectacular waterfalls. The walls of the main canyon and the side canyons provide temporary habitats for various species of plants. Some are sheer cliffs three hundred or more feet in height, others are long slopes of crumbling talus.

Six major plant communities occur within the park.

(1). A spruce-fir forest grows at the highest elevations on the North Rim, above 8200 ft. *Abies lasiocarpa* (subalpine fir), *A. concolor*

(white fir), *Picea engelmanni* (Engelmann spruce), and *Populus tremuloides* (aspen) are the dominant trees of the highest slopes. At slightly lower elevations, but still within the limits of this type, *Pseudotsuga taxifolia* (Douglas fir) and *Picea pungens* (blue spruce) occur. Scattered throughout the forest at the higher elevations are mountain meadows of considerable size, the largest of several hundred acres lying just outside the park boundary to the north. Small ponds, locally called "tanks", are prevalent throughout the forest and contain hydrophytes of many species. At the lower elevations of this type, *Pinus ponderosa* (ponderosa pine) becomes important on the drier sites.

(2). Between 8200-7000 ft. on the North Rim and from the highest elevations to 6800 ft. on the South Rim, ponderosa pine forests occur. Ponderosa is present in almost pure stands in the best developed of these and the forest is open. Low-growing shrubs, grasses, and forbs are abundant. Outside of the park this forest is important as a source of lumber and is also extensively grazed.

(3). Below the ponderosa pine on both rims and extending well into the canyon is the pinyon pine-juniper community. Two trees, *Pinus edulis* (pinyon pine) and *Juniperus utahensis* (Utah juniper), dominate the forest. This is the most extensive community of the South Rim. Occasional isolated individuals of pinyon and juniper occur on the walls of the canyon almost to the river. In the transition zone between the ponderosa and the pinyon-juniper forests, *Quercus gambelii* (Rocky Mountain white oak) is often abundant. *Cowania mexicana* (cliffrose) and *Arctostaphylos spp.* (manzanita) are locally important members. Shrubs are common and include such species as *Cercocarpus ledifolius* (mountain mahogany), *Berberis fremontii* (hollygrape), *Fallugia paradoxa* (Apache plume), *Artemisia spp.* (sagebrush), and *Chrysothamnus spp.* (rabbit brush). Herb species are varied, but individuals are scattered.

(4). The semi-desert grassland-shrub community consists of a heterogeneous mixture of xerophytes able to live within the canyon where soil moisture is low during most of the year and temperatures are high. In some of the side canyons small deciduous trees such as *Cercis arizonica* (redbud), *Ptelea trifoliata* (hoptree), *Fraxinus spp.* (ash), *Robinia neomexicana* (N. Mex. locust), and *Quercus spp.* (oak)

are common, but where this type reaches its best development on the Tonto Shelf, a broad platform running the length of the canyon 1200 ft. above the river, only *Acacia greggii* (catclaw) is of any importance. The Tonto is covered by widely spaced *Coleogyne ramosissima* (blackbrush) shrubs, scattered among which are century plants (*Agave spp.*). Only a few of the more heat-resistant herbs are evident during the summer, but in April and May when temperatures are mild and moisture is abundant, the Tonto is covered with bloom.

(5.). At the lowest elevations within the park and following up the side canyons to about 3000 ft., a true desert community exists. *Opuntia spp.* (prickly pear), *Mammillaria tetrancistra* (pincushion), *Echinocactus acanthodes* (barrel), and *Echinocereus spp.* (hedgehog) are common cacti of the canyon floor. *Prosopis juliflora* (mesquite) thickets are present in many localities. Temperatures during the summer are hot, 118°F. being the maximum recorded, and winter temperatures are mild. Frost is rare within the canyon.

(6). Hydrophytes and phreatophytes are present throughout the park despite the fact that much of the area is extremely arid. Along the major side streams and on the floodplains of the Colorado River, luxurious growths of *Baccharis spp.* (seepwillow) and *Salix spp.* (willow) intermingle with *Typha latifolia* (cattail), *Phragmites communis* (reed grass), *Scirpus spp.* (bulrush), *Juncus spp.* (rush), and other hydrophytes. Around the seeps and springs of the canyon interior are to be found many similar communities. *Populus fremonti* (cottonwood) grows to large size in many of these areas.

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