

TREES OF GRAND CANYON NATIONAL PARK



Natural History Bulletin No. 3
Grand Canyon Natural History Association
March, 1936

NATURAL HISTORY BULLETIN

NO. 3

March, 1936

National Park Service,
Grand Canyon National Park

Grand Canyon Natural
History Association

This bulletin is published by the Grand Canyon Natural History Association as a project in keeping with its policy to stimulate interest and to encourage scientific research and investigation in the fields of geology, botany, zoology, ethnology, archeology and related subjects in the Grand Canyon region. This number is one of a series issued at irregular intervals throughout the year.

Membership to the Grand Canyon Natural History Association is \$1.00 per year and covers cost of all bulletins and other publications of the Association. Additional copies of this bulletin may be obtained at 50¢ each by addressing the Grand Canyon Natural History Association, Grand Canyon, Arizona.

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TREES OF GRAND CANYON NATIONAL PARK

By Natt N. Dodge

Extensive Forests Surprise to Visitors

THROUGH sheer grandeur and magnitude, the geologic and scenic manifestations of the Grand Canyon have monopolized the attention of scientists and publicists alike. The writings of these people have conveyed to the public the impression that other natural history features, if present at all, are so insignificant as to warrant little mention. In consequence, the casual visitor is entirely unprepared for the wealth of floral beauty, the abundance of animal life, and the magnificent forests which he encounters in Grand Canyon National Park.

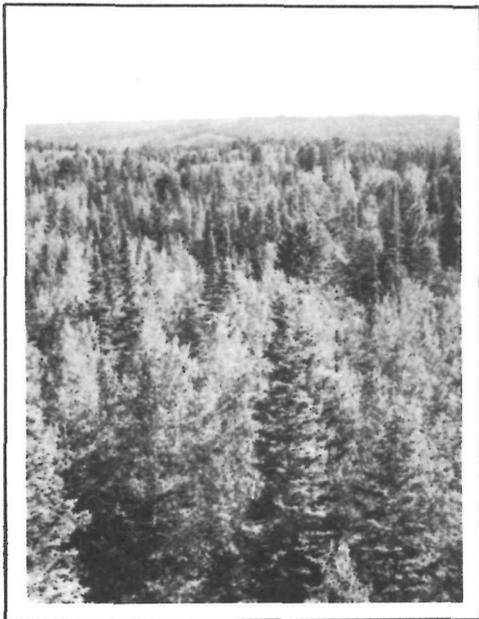
Surprise at the presence of extensive timbered areas in a region popularly considered to be of a semi-desert nature is almost universally followed by expressions of a desire to learn something of the various features of tree life. Forests, as do wild animals, typify to the city dweller the romantic spirit of the out-of-doors.

From close contact with the visiting public, the writer has been immensely impressed with the demand for information regarding trees of the Park. Merely to satisfy this demand would not be difficult, but to completely, accurately, and interestingly convey the story of the important part which the forests play in maintaining the scenic attractiveness of this region is, at present, impossible. No extensive botanical exploration of the Grand Canyon has as yet been made. Incomplete standardization of plant nomenclature promotes confusion. The necessity for conciseness and brevity in this paper requires the omission of many interesting facts.

In the preparation of this publication, the writer makes no claim to originality. He has merely gathered such scattered information as is at present available and has combined it to present as clear a picture as possible of the arboreal life at Grand Canyon National Park.

Trees, and the National Parks Idea

TREES, to the people of America, have in the past meant masts for ships, lumber for homes, and fuel for the boilers of industry. With the widespread exploitation of the timber resources of the United States, the necessity for intelligent harvesting of the lumber crop has become increasingly apparent. To the United States Forest Service, bureau of the Department of Agriculture, has been entrusted the planning and execution of this important phase of commerce.



Kaibab Plateau, North Rim of Grand Canyon

Man Versus Nature

With the increase and spread of population and the consequent occupation and "taming" of the wilderness, there has developed a danger of commercializing and despoiling many of the majestic scenic areas of America. Sensing this, a wise government has set aside the outstanding spots of scenic, sci-

entific, and historic importance before their charm has been marred, and will preserve and protect them for all time. In addition, it is making them accessible to public visitation and endeavoring to present their esthetic, inspirational, and scientific features for the appreciation of the people. This program of simultaneously using and protecting our great natural scenic resources has been placed in the hands of the National Park Service, a bureau of the Department of The Interior.

In the majority of the national parks and in many of the national monuments, the forests constitute a major natural feature. Their importance, however, to scenic and inspirational appeal lies only partially in their mere presence. Animal life, which adds so much to the charm of scenery, is dependent upon plants for food and protection. Floral beauty requires the lavish and luxuriant growth which cannot take place without the fullest cooperation of soil and moisture. Retention of humus and soil moisture, shade, and temperature equalization are affected to a marked degree by the presence of forests. Thus there is a delicate inter-relationship between the many phases of plant and animal life which requires freedom from the interference of man if our great scenic areas are to be retained in all of their original beauty. Whereas the Forest Service protects the commercial, the Park Service protects the natural. Through the enforcement of the "let alone" policy, our national parks and monuments represent another step toward the attainment of an ideal.

Location of Grand Canyon National Park

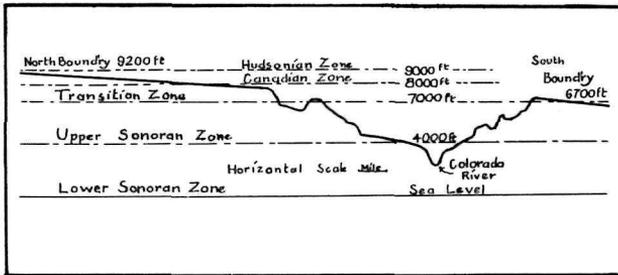
GRAND Canyon National Park with an area of 1,009 square miles is situated somewhat to the west of the north-central portion of the State of Arizona. The reserve is roughly rectangular in shape with an east-west length of 56 miles and an average width of 18 miles. The Grand Canyon of the Colorado River bisects the Park from east to west, the general course of the Canyon in this area being from southeast to northwest. In addition to the great gorge itself which, with its tributary canyons, forms a huge gash in the earth varying in width from four to eighteen miles, the Park includes those portions of the Plateau immediately adjacent to the Canyon. That part of the Park on the Kaibab Plateau flanking the Canyon on the north is known as the North Rim, while the area on the Coconino Plateau on the opposite side is called the South Rim.

Great Variation in Tree Life

FOR an area of this size, the Park contains a remarkable assortment of tree life. Although many species are adaptable to a wide range of climatic conditions, each has an optimum combination of these factors. From the bottom of the Grand Canyon at an elevation of approximately 2,000 feet above sea level to the dome of the Kaibab Plateau slightly more than 9,000 feet in altitude, is found such a wide range of soil, temperature, and moisture conditions that many tree species of widely divergent requirements have found locations fitted for flourishing growth. Thus on the Canyon bottom where there is a rainfall estimated to be about twelve inches per year and where summer temperatures reach 117 degrees F. in the shade, desert varieties such as Mesquite and Catclaw thrive. In contrast to this, (within twenty lineal miles, or one and one-third vertical miles above) on the crest of the Kaibab there is an average of approximately twenty six inches of annual precipitation, much of it in the form of snow, and a winter minimum temperature of 25 degrees below zero F. Here are found such sub-arctic species as the Engelmann Spruce and Alpine Fir. Between these two extremes exist all degrees of intermediate conditions favorable to the growth of many species of trees.

Effect of Altitude on Tree Distribution

IN 1889, Dr. C. Hart Merriam of the United States Biological Survey, while exploring the biological manifestations of the Grand Canyon region, was greatly impressed with the close relationship evidenced between altitudinal variation and the change in type of plant and animal life. This relationship was strikingly similar to the differences he had observed in traveling from south to north across the country at sea level. Dr. Merriam's comparative studies convinced him that there was a close similarity in climatic conditions, hence in biological aspects, between intervals of latitude as measured in miles and intervals of altitude as measured in feet. Types or species of plants encountered near sea level at certain latitudes might be expected to be found in other latitudes where elevations developed climatic conditions suitable for their growth. A latitudinal division occupied by a definite type of biological life might be considered as a life zone and the corresponding altitudinal



Theoretical cross-section of Grand Canyon National Park
showing the Life Zones

division classed as the same life zone. Thus, in the Grand Canyon region, Dr. Merriam developed the life zone theory which has since been adopted by many students of biology throughout the world. Because the terminology of the life zone theory is of considerable aid in expressing limits of range and distribution of tree species, and since it leads to a clearer understanding of the presence of some of the tree varieties in the Park, it will be used throughout this publication.

Theory of the Life Zones

A difference in elevation of 1,000 feet may be considered equivalent in its effect upon plant and animal life to the normal change in 300 miles of latitude at sea level. Because seven major types or associations of plant life are evident between the Equator and the North Pole, seven corresponding life zones have been named. These are; Tropical, Lower Sonoran or Lower Austral, Upper Sonoran or Upper Austral, Transition, Canadian, Hudsonian, and Arctic or Arctic-alpine. So great are the elevational differences within Grand Canyon National Park that four of these life zones, the Lower Sonoran, Upper Sonoran, Transition, and Canadian are fully represented here. In addition, a few plants indicative of Hudsonian Life Zone conditions are found at the extreme summit of the Kaibab Plateau within the Park boundaries. Of course, as is stated by Randolph Jenks in Ornithology Of The Life Zones, "There are no sudden changes from one zone to another, nor any sharp distinctions between the upper edge of one and the lower edge of the next; they blend into each other as the altitudes vary."



Canadian Zone

Marion Photo



Transition Zone

Marion Photo



Upper Sonoran Zone

NPS Photo

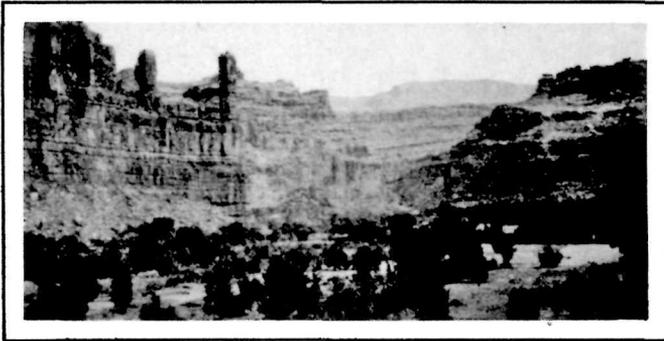


Lower Sonoran Zone

NPS Photo

Other Conditions Affecting Forest Types

In conjunction with altitude, other factors of a local nature strongly influence species distribution. According to Dr. W. L. Jepson of the University of California, these are; insulation, exposure, steepness of slope, accumulating blocks of warm air, flow of cold air and water down a canyon, and physiological islands. Thus, due to modifying conditions, side canyons become zonal fingers intruding deeply into elevations properly belonging to a lower zone, and isolated spots or "islands" may exhibit types apparently out of place.



Stream bank vegetation Lower Sonoran Zone

Considering these factors of local influence and keeping in mind that the blending of zonal indicators (plants limited in range to one life zone) is so gradual as to render impossible any definite line of demarkation, elevational limits of life zones in Grand Canyon National Park may be expressed as follows:

- Lower Sonoran Life Zone...Canyon bottom to 4,000 ft. elevation
- Upper Sonoran Life Zone...4,000 ft. to 7,000 ft.
- Transition Life Zone.....7,000 ft. to 8,200 ft.
- Canadian Life Zone.....8,200 ft. to summit Kaibab Plateau
- Hudsonian Life Zone.....A few "indicator" species at the extreme summit of Kaibab Plateau.

OF the catastrophic factors influencing forest type, fire is possibly preeminent. Areas burned over or forests severely injured by fire are very slowly replaced by a more or less temporary succession of species which eventually terminates in the acquisition of the area by a "climax" type. For example, the aspen found in such abundance throughout the Kaibab Plateau is considered by forestry experts as a representative of one phase of a succession of plants which gain a foothold following forest fires. Tolerance of shade is apparently an important factor in determining the type which will eventually become dominant. Following a fire, the area is gradually taken over by such plants as may endure the hot, dry conditions of a burn. Others slowly obtain a foothold, and with the accumulation of humus, retention of moisture, and shading of the soil, the sun-loving types are succeeded by those more tolerant of shade. Such successions are slow, especially under conditions of heat and drouth, studies of burns indicating that a century or more may pass before the climax type becomes established. Insects, diseases, and other factors may serve to destroy a forest type and start the succession.



Desolation following forest fire in Yellow Pine-Pinyon

There appears also to be a continuous battle between various cover types. Herbaceous plants are constantly attempting to invade the forested lands, while the trees endeavor to capture the meadows. This latter phenomenon is noticed by many visitors to the North Rim where, at the higher



Forest encroachment on meadow. Spruce
Seedlings at border of Aspen-Ponderosa
Pine Forest on the Kaibab Plateau.

elevations, the spruces are gradually encroaching upon the open parklands. Such encroachment is characterized by a fringe of seedlings and young growth bordering the mature stands. Hundreds of visitors annually request information regarding this interesting feature. The majority of people assume that the small trees were planted by human hands, usually crediting the work to the Civilian Conservation Corps. So delicate is the balance and so effective the warfare on both sides of the battle-line that a slight change in climatic conditions over a period of years may upset the deadlock and the tide of encroachment swing the other way.

Influence of Forests on Wild Life

THE presence of a forest is a powerful influence in encouraging the establishment of many forms of plant and animal life. Nearly all fungi of the mushroom type require a moist, shaded, humus-filled soil for growth and reproduction. Some of the most delicate and beautiful flowering plants have similar habitat needs. Squirrels feed upon the seeds of the coniferous trees and, in harvesting the cones, bury many of them for future needs which often fail to materialize. Thus they aid greatly in the spread and perpetuation

of the species. Many varieties of birds find seeds and insects for food, either upon the trees themselves or upon the plants that thrive in their shade. They, in turn, attract the predators, and so hundreds of species of plants and animals become directly or indirectly dependent upon the forests.

Protection of the Forests

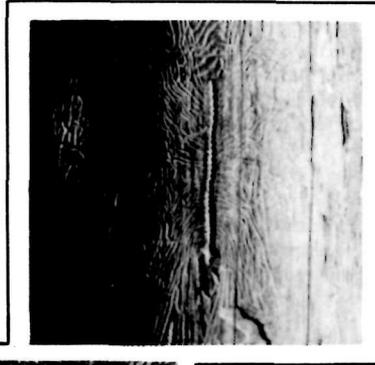
ALTHOUGH a general "hands off" policy toward all forms of life native to a national park has proved to be most effective in maintaining the natural biological population, it occasionally becomes necessary for man to step in to protect some species from injury. A number of tree enemies are constantly at work among the forests of Grand Canyon National Park. Some of them are sufficiently dangerous to require counter activity on the part of the National Park Service.

Fire offers the most spectacular menace to the forests. Severe electric storms during the summer months set occasional fires, particularly in the yellow pine belt on both rims. Unless promptly controlled, these fires might reduce to ashes many acres of beautiful woodland. Lookouts stationed in observation towers at strategic points and a well-equipped fire fighting organization reduce the spread of such fires to a minimum. Due to strict park regulations and to widespread educational programs regarding campfires, smoking in the forests, and burning of debris; man-set fires in the Park are becoming a rarity.

It is undoubtedly true that in North America more wood has been destroyed by insects, fungi and fire than has ever been cut and used by man. Of these various wood destroyers, insects are by no means the least important. In Grand Canyon National Park, defoliators wreak spectacular havoc in some localities, but these pests as a rule do not seriously injure their hosts. Bark beetles annually kill a great many trees, particularly Ponderosa Pines and occasionally become epidemic in effect. A continuous campaign is being carried on in an effort to control their depredations. Other types of insects do more or less damage but not of sufficient proportions to overcome the forces of replacement through natural reproduction.

Diseases and parasites are unobtrusively at work among the forests but as yet none has done sufficient injury to

warrant the expenditure of funds to combat it. Most noticeable of these are several species of parasitic mistletoe which produce masses of olive-green foliage upon the twigs and branches of the host tree. The high percentage of infection among the junipers on the South Rim arouses the curiosity of many visitors.



Above ~
Work of
Engraver beetle

Left ~
Mistletoe on
Ponderosa
Pine

Interesting Forest Facts

CLASSIC because of its powerful influence in pointing out the far-reaching effect of man's interference with the balance of Nature is a "deer epidemic" which seriously curtailed natural reproduction of aspen on the Kaibab Plateau. Many years ago and long before that portion of the Plateau bordering the Canyon was made a national park, cattlemen waged a destructive war against mountain lions. Freed from the persecutions of these powerful predators, deer increased rapidly until there was insufficient forage to support them. Naturally a browsing animal, the deer stripped the aspen branches of foliage as high as they could reach and eagerly consumed each seedling as soon as it raised its head above the soil. For years no aspen reproduction survived. Only since realization by officials has brought sharp reduction of the deer population through the opening of a deer hunting

season in the National Forest beyond the Park boundaries, by permitting the mountain lions to increase unmolested, and by shipping fawns to other areas have the aspen stood a chance on the Kaibab. As a result of this lesson, protection of predators, except in extreme cases, is a fundamental National Parks policy.

Trees Not Native to the Park

PLANTS not native to the region are, as far as possible, kept out of the national parks. Some, however, have gained a foothold in the Grand Canyon reserve and those of tree status will be listed in this publication.

Visitors to the North Rim frequently inquire as to the origin of large "bird nests" in the tops of many spruce trees on the Kaibab Plateau. These masses of dead twigs are "cancerous" growths known as "witches' brooms" caused, it is believed, by abnormal stimulation of tree tissue by insects or disease. Such growths frequently bring about the death of the infected portion of the tree together with the trunk and limbs above.



Specialists of the Bureau of Plant Industry cooperate with park officials in making frequent inspections of the forested areas to note the presence of new diseases and pests and to advise concerning any desirable action for the control of those already present.

Witches' broom in spruce—North Rim

On the North Rim, snowfall amounting to a total of 200 inches (16.6 feet) has been recorded during a winter. This, of course, does not occur during a single storm and as time

passes, it gradually packs and settles. An accumulation of 6 to 7 feet of snow, however, is not uncommon. As the snow piles up and freezes on the branches of aspens, they are frequently bent and broken and on hillsides where the snow mass slips slowly downward, imprisoned trees may be bowed over. In shaded gulches on the Kaibab Plateau where the snow often remains until May or even June, aspen trees held in the drifts are frequently permanently bent by the long maintained snow pressure.



Gisern Photo

Aspens bent by snow, North Rim

Definition of a Tree

IN the preparation of this paper, three puzzling questions confronted the writer, as follows:

1. What is a tree, and where shall we draw the line between shrub and tree?
2. Shall species which occur only as shrubs in Grand Canyon National Park but which attain tree size elsewhere be included?
3. If such be found, shall we include plants that reach tree dimensions here but which are elsewhere considered as shrubs?

In determining the answers to these fundamental questions, it was decided to follow the precept set by George B. Sudworth, Dendrologist of the United States Forest Service. In accordance, the following principles will be maintained throughout:

1. A tree shall be considered as, "A woody plant having one well defined stem and a more or less definitely formed crown, and attaining a height of at least 8 feet and a diameter of not less than 2 inches" - Sudworth.

2. Although they do not reach tree size in Grand Canyon National Park, species are herein listed which elsewhere fulfill Sudworth's definition. As a guide in this respect, and also in both common and technical nomenclature, Sudworth's, "Check List of the Forest Trees of the United States, Their Names and Ranges" has been carefully followed. A note in connection with the discussion of each species will indicate whether it occurs in the Park chiefly in tree or shrub size.

3. Four species have been recorded which reach tree dimensions in the Park but which are not listed by Sudworth as trees. These will not be considered as distinct tree species in this publication, but will be included through mention.

Thirty-nine species of trees make up the forests of Grand Canyon National Park. The remainder of this publication is devoted to a brief discussion of each species; how it may be identified, its range in the United States, its distribution within the Park and the uses to which it has been put by wild animals and by man. Discussion of species will follow the approved order of systematic classification with nomenclature according to Sudworth.

PINYON PINE

(Also Nut Pine and four other common names in use)

Pinus edulis Engelmann

Class: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: Pinyon is a member of the white pine group, usually unsymmetrical in form and attaining a height of about 25 feet and a diameter of 15 inch-

es. The trunk is usually short and crooked with grey, irregularly furrowed bark. The crown may be flat or broadly open with short, twisted branches. The leaves (needles), from 1 to 2-1/2 inches in length, occur in groups of TWO TO THE FASCICLE (bundle). The cones, which mature in the fall of the second season, are rough, 1 to 2 inches long, and contain from 2 to 30 EDIBLE SEEDS. The wood is soft, white, and brittle. Trees have an age limit of about 350 years. This species is confusable only with the Singleleaf Pinyon whose limited distribution in the Park and single leaf to the fascicle make identification comparatively easy.



Marion Photo

Pinyon



Pinyon Pine

Range: Pinyon occurs from Colorado southward to the mountains of western Texas and Oklahoma, westward to Utah and New Mexico, through northern, southern and southeastern Arizona to the mountains of Mexico and into Lower California.

Distribution Within The Park: This is the dominant pine of the South Rim where it occurs in hot, dry localities. On the North Rim it is found fringing the Canyon edge and, usually associated with the junipers, sparsely clothes the Canyon slopes throughout the Upper Sonoran Life Zone.

Uses: For many years the seeds or "nuts" of the Pinyon have been a staple fall and winter food of the Indians of the Southwest and are now widely sold as a delicacy among the Whites. Seeds are also eagerly sought by many species of birds and small mammals. Cliff dwellings, abandoned 700 or 800 years ago, yield Pinyon poles used as braces. The wood was undoubtedly used for fuel by prehistoric peoples.

Modern Indians use the pitch for adhesive, for waterproofing vessels, and as an antiseptic for wounds. The timber serves numerous purposes as fuel, fence and corral posts, telephone poles, mine logging and for making charcoal.

Features of Interest: With Utah Juniper and Cliff Rose, Pinyon is considered by botanists as an indicator of the Upper Sonoran Life Zone. These three species constitute the major forests of the South Rim and the upper walls of the Canyon. An acre of Pinyon trees may produce as much as 300 pounds of edible "nuts", but production varies greatly from year to year. Pure stands of these trees somewhat resemble in appearance an old apple orchard. Pinyon is one of the first species to gain a foothold on lava flows, and is often the advance growth of a forest encroaching on arid lands. The Pinyon will survive under conditions of less than 13 inches of precipitation and within temperature ranges of from 25 degrees below zero F. to 110 degrees above. The species is host to two diseases similar to white pine blister rust, is sometimes lightly attacked by mistletoe, and the seeds are frequently destroyed within the cones by weevils.

SINGLE LEAF PINYON

(Also Gray Pine and 7 other common names in use)

Pinus monophylla Torrey and Fremont

Class: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: In common with the two-needle Pinyon, Singleleaf Pinyon is a member of the white pine group. It is also similar to the Pinyon in size, form



Single
leaf
Pinyon

and general appearance. Leaves, however, occur SINGLY TO THE FASCICLE, in which characteristic it is unique among all American pines and by which it may be readily identified. It is reported as having very slow growth and an age of 100 to 225 years.

Range: This species is found westward from Utah Lake and the western side of the Wasatch Mountains of Utah, into Nevada and California and southward into northern Arizona; also Lower California.

Distribution Within the Park: Singleleaf Pinyon is reported only from Bright Angel Canyon near the power house and from the Nankoweap Basin (Hawbecker). Like the Pinyon, it is a tree of the Upper Sonoran Life Zone.

Uses: Same as Pinyon.

Features of Interest: Foliage examined by the writer in Bright Angel Canyon was of interest because of the presence of an occasional two-leafed fascicle among those with the single leaf.

PONDEROSA PINE or WESTERN YELLOW PINE

(Also 23 other common names in use)

Pinus ponderosa Lawson

Class: Gymnospermae Family: Pinaceae or Coniferae

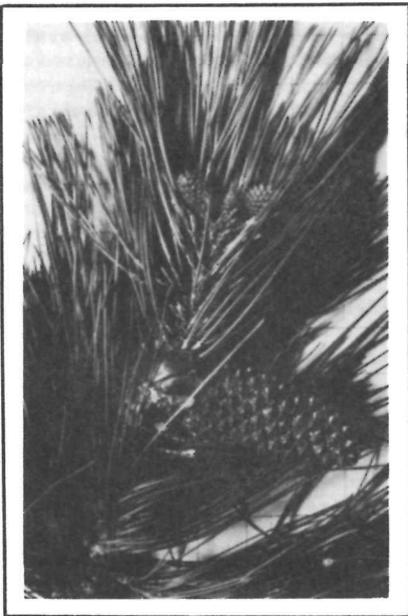
Distinguishing Characteristics: This species is the only member of the yellow pine group that occurs in the Park. It is a massive, straight-trunked, long-crowned tree reaching a height of more than 100 feet and a diameter in excess of 3 feet. The open crown of mature trees is supported on a few hugely developed, grotesquely bent branches. Young trees, sometimes called bull pines, have grey-brown to black, furrowed bark, while the older specimens are characterized by red-brown to russet-red, plated bark which shades to a grey-brown toward the top of the trunk. Leaves (needles) occur in groups of THREE TO THE FASCICLE and are 5 to 11 inches in length. Cones are rough, 2-1/2 to 5-1/2 inches long and 2 inches thick. The wood varies in color from lemon yellow to orange brown. The trees reach an age of 350 to 500 years.

Range: Ponderosa Pine is common throughout the semi-arid portions of the Pacific and Rocky Mountain regions from

interior British Columbia south of latitude 51° and the Black Hills region of North Dakota to western Texas, northwestern Nebraska and Mexico.

Distribution Within the Park: Found in pure stands or associated with the oaks, locust, aspen or White Fir, Ponderosa Pine is a common tree throughout the Transition Life Zone. On the South Rim, it occupies the higher elevations and the courses of cool air drainage, while on the North Rim it covers the warmer flats and slopes, extending below the Canyon edge. An occasional specimen is encountered at as low an elevation as 3600 feet, and a massive individual is conspicuous near the North Rim Checking Station at the 9000 foot level.

Uses: Considered as the most important lumber tree of Rocky Mountain region, Ponderosa Pine is logged throughout its range. Within the Park where it is protected, such individuals as die or are cut in the campaign to control bark beetles are used in construction or for fuel. The pitchy wood is durable and suitable for fence posts. Seeds furnish food for many varieties of birds and small mammals. The Abert and Kaibab squirrels are considered dependent upon this species for food and build their nests among the branches. Porcupines feed on the young, tender bark when other vegetation is absent or snow covered. Indians in the Rocky Mountain region are reported to have stripped and eaten the living cambium tissue just beneath the bark.



Ponderosa Pine

See Cover

Features of Interest: Report of this species was first made by Lewis and Clark in 1804. Because of their height and their location in exposed and prominent points, trees of

this species are particularly susceptible to lightning. The majority of fires in the Park start in the deep, dry duff about the bases of lightning-struck Ponderosa Pines and a high percentage of the older trees show the marks of the "bolts of Thor". This species is also subject to the attack of several species of bark beetles, necessitating extensive control measures to prevent epidemics. Many trees, especially on the North Rim, are hosts to a parasitic mistletoe. In thick stands the lower branches become shaded, hence less useful to the tree so die and break off. This phenomenon is known as "self pruning" and is desirable from the lumberman's standpoint as it leaves more clear lumber. In moist locations decaying duff beneath the trees encourages the growth of shade-tolerant plants, mushrooms and saprophytes.

ENGELMANN SPRUCE

(Also White Spruce and 5 other common names in use)

Picea engelmanni Engelmann

Class: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: One of two species of spruce found in the Park, Engelmann



Engelmann Spruce

has a straight, tapering trunk and sharp-pointed, pyramidal crown with lower branches often touching the ground. The tree attains a height of 80 to 100 feet and a diameter of 18 to 36 inches, although the majority of individuals in the Park are smaller. The leaves (needles) which occur singly are STIFF, KEENLY-POINTED AND FOUR-SIDED IN CROSS SECTION. They are about one inch in length, remain on the tree from 7 to 10 years and, upon falling, leave a sharp basal knob imparting a roughness to the branch. Cross sections of leaves show NO RESIN DUCTS. Cones, which mature in a

single season, are cylindrical or oval and 1 to 3 inches in length. Their scales are thin, papery and without prickles. The young shoots are MINUTELY HAIRY for about three years. The wood is soft, light, straight-grained and yellowish to reddish brown. Longevity is 350 to 460 years. This species is very easily confused with Blue Spruce from which it may be distinguished by its higher, cooler habitat, shorter cones and hairy shoots. It is readily distinguished from the other conifers by its four-sided, sharp-pointed leaves and papery cone scales.

Range: Engelmann Spruce is found from the mountains of southeastern Arizona and southern New Mexico northward throughout the Rocky Mountains to British Columbia and westward to the eastern slope of the Cascades in Oregon and Washington.

Distribution Within the Park: This species occurs in dense stands on north and west facing slopes of the Kaibab Plateau. It is usually associated with Alpine Fir and aspen, and with Blue Spruce at the lower portions of its habitat. Although found at the upper borders of the Canadian Life Zone, it is considered as a typical tree of the Hudsonian Zone.

Uses: The timber is used to some extent for saw lumber, but the species finds its greatest popularity as a Christmas tree and an ornamental in landscape plantings. The seeds are highly prized as food by the Chickaree or Fremont Squirrel which harvests the cones in quantities.

Features of Interest: Within the Park this species is largely responsible for the beautiful, dense forests of the higher elevations of the Kaibab Plateau. Squirrels and birds, attracted by its seeds, add life to the forest and when the seeds are ripe in the autumn, squirrels scold the intruder from the tree tops and may pelt him with cones. The crushed foliage has a "catty" odor. Twig tips of new growth are subject to attack by a gall-forming insect which causes branch ends to turn rusty brown. Some damage is done by bark beetles.

BLUE SPRUCE

(Also Prickly Spruce and 8 other common names in use)

Picea pungens Engelmann

Class: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: Although it does not

grow to the size reached by Engelmann Spruce, Blue Spruce is very similar in shape and general appearance. It occasionally attains a height of 70 to 90 feet and a diameter of 24 inches although specimens of this size are rare in the Park. It is readily distinguished from other conifers by its leaves



Colorado Blue Spruce

which are STIFF, SHARP-POINTED AND FOUR-SIDED IN CROSS SECTION. Trees are symmetrically pyramidal in shape. In comparison with the Engelmann Spruce, the cones are longer ranging from 2-1/2 to 4-1/2 inches, the bark is more furrowed and scaly, the young shoots are hairless and the trees are usually found in a lower, warmer and moister habitat. The longevity is considered to be 275 to 350 years with a maximum of 600 years.

Range: This species is limited to the Rocky Mountain region; Colorado, eastern Utah, southern and northwestern Wyoming and northern New Mexico and Arizona.

Distribution Within the Park: Blue Spruce is usually encountered in dense stands on the shady slopes of the Kaibab Plateau frequently associated with aspen, Dwarf Juniper or Engelmann Spruce. On north-facing slopes and in draws it may be found as low as the rim or wherever Canadian Life Zone conditions prevail.

Uses: For lumber, this species is considered the least desirable type of spruce, as the wood is light, soft, weak, brittle and full of knots. It is used to some extent for fence and corral posts, railroad ties and mine props. The species is greatly in demand for landscaping purposes for which its symmetrical form and silver-blue foliage make it

especially desirable. It is also popular as a Christmas tree. Squirrels and birds use the seeds for food.

Features of Interest: The beautiful silvery-blue foliage is no proof of identification of this species. Seedlings vary considerably in color, the silvery sheen being due to a fine, powdery substance on the surface of the leaf which is easily removed by rubbing. New growth carries much more of this material than the older foliage, consequently trees appear much more silvery in midsummer when the new foliage is fully developed. Nurserymen select seedlings by color and particularly desirable stock is used in grafting. Within the Park, the presence of the species adds greatly to the beauty of the forest and provides a suitable habitat for many forms of plant and animal life.

DOUGLAS FIR

(Also Douglas Spruce and 18 other common names in use)

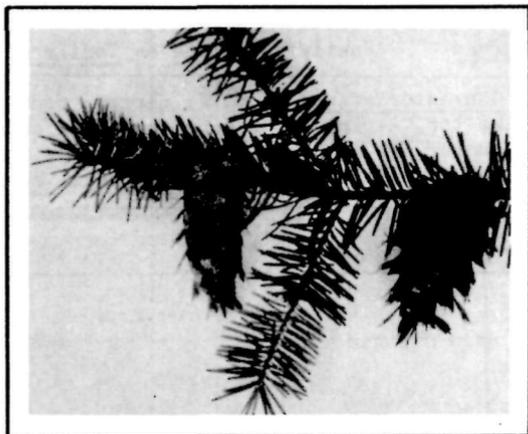
Pseudotsuga taxifolia (LaMarck) Britton

Class: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: Although not a tree of great size in the Park where it attains a height of 50 to 80 feet and a diameter of 18 to 30 inches (occasionally larger), this species in the Pacific Northwest develops immense proportions. The straight trunk and broad, pyramidal crown with lower branches drooping and numerous long side branchlets give the tree a soft, feathered appearance. Considerable variation is found in the bark which in arid sections is inclined to be ashy-brown and but little broken. The leaves are flattened, slightly grooved above, blunt and protruding from all sides of the twig give it a furry appearance. The foliage remains on the tree about 8 years. This species is most readily identified by the pendent, cinnamon to reddish-brown cones 2-1/2 to 3 inches long with distinctive THREE-POINTED, TRIDENT-LIKE BRACTS PROTRUDING FROM BETWEEN THE CONE SCALES. The wood varies from fine grain to coarse and from yellowish to reddish brown. Longevity is reported to be from 200 to 300 years or longer.

Range: Douglas Fir is found throughout the Rocky Mountain region northward into central British Columbia, westward to the Pacific Coast and southward into northern New Mexico and the mountains of western Texas.

Distribution Within the Park: This species is rarely found in pure stands of any extent although it ranges through the Canadian into the Transition Life Zone associated with



Douglas Fir

aspen and the spruces. On the Kaibab Plateau it occurs on the shady slopes of side canyons to below the rim. South of the Colorado River it is found just below the rim in cool, shaded locations.

Uses: Douglas Fir is considered as the most important American lumber tree and in the

Pacific Northwest is the foundation of the great logging industry. The sawdust, the thick heavy bark and the wood unsuitable for lumber are all widely used for fuel. The great strength of the timber renders it suitable for heavy construction, for bridge timbers and the like. The varying qualities of the wood have caused the application of a great many trade names to the lumber. Squirrels and birds make use of the seeds for food and the branches for nest building.

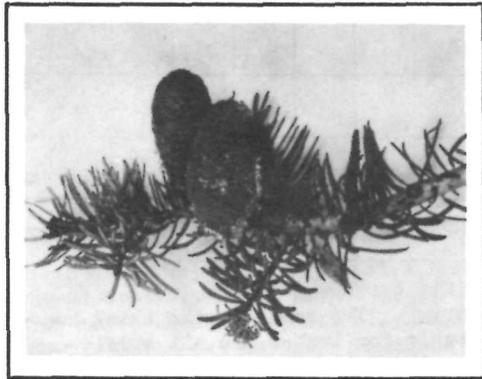
Features of Interest: Although neither pine, spruce, fir nor hemlock, this species has been given a wide variety of common names including all of these terms. The large group of trade names further complicates the nomenclature. Translation of the scientific name is "False hemlock with yew-like leaves". This species is not tolerant of shade and in the Pacific Northwest is gradually giving place to Western Hemlock which thrives under shaded conditions. Following forest fires and in open, sunny locations Douglas Fir seeds readily.

ALPINE FIR

(Balsam and 10 other common names in use)

Abies lasiocarpa (Hooker) NuttallClass: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: A tall, narrow, conical tree with a spire-like top, Alpine Fir reaches a height of 60 to 90 feet and a diameter of 14 to 24 inches. It is as a rule small in the Park. Blister-like resin pockets in the bark of young trees give it the name of Balsam Fir. The bark of older trees is thin, flinty, whitish-gray and shallow seamed. The branches are stiff and extend downward, presenting a dense growth, frequently to the ground. Leaves are flat and blunt except on the upper branches where they become pointed. They project from all sides of the



Alpine Fir

twig, but curve sharply upward. The cones, 2-1/2 to 4 inches long, are PURPLE in color and grow UPRIGHT ON THE BRANCHES near the top of the tree. Upon ripening the cones gradually fall to pieces on the tree, leaving the core as a small upright spike. This species may be distinguished from the spruces with which it is associated by the flat, blunt-tipped leaves and the upright purple cones, and from the White Fir by its small, purple, hairy cones and by its higher elevation habitat. The wood is fine-grained, light, soft and full of knots. Trees are reported to reach an age of 200 to 250 years.

Range: As its name indicates, Alpine Fir is found at the higher and cooler elevations throughout the Rocky Mountains from northern Arizona and New Mexico to Montana and Idaho, westward through the mountains of Oregon and Washington, northward to Alaska and also in the high ranges of British Columbia.

Distribution Within the Park: Alpine Fir is rare in the Park and is found only at the highest elevations of the Kaibab Plateau usually on northwest-facing slopes where it is associated with Engelmann Spruce. It is considered as an indicator of Hudsonian Life Zone conditions.

Uses: This species is of little importance as a lumber tree because it occurs in inaccessible locations, is relatively small and the wood, although straight-grained and easily worked, is full of knots. It makes a beautiful ornamental and is desirable as a Christmas tree. It is reported as occasionally used for paper pulp and box wood.

Features of Interest: Because of its low-growing branches, Alpine Fir is particularly susceptible to crown fires and its thin bark enables it to be easily killed by fire. The resin pockets blaze fiercely and with great heat. Hardy throughout its range, Alpine Fir grows far up mountain sides to timberline where it forms sprawling, dense thickets only a few feet high. The translation of the specific name is "downy fruit".

WHITE FIR

(Also Silver Fir and 11 other common names in use)

Abies concolor Lindley & Gordon

Class: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: This, the commoner of two species of true firs found in the Park, is a massive tree with ashy bark and silver-green leaves. It frequently reaches a height of 80 to 100 feet and a diameter of 30 to 40 inches or more. The horny bark is furrowed and ridged, while the straight trunk is gradually tapered and the dense crown is heavily foliated. The leaves are flat, straight, plump on the upper surface and blunt at the tip, except the leaves on the uppermost branches which are sharp pointed. They are from 1-1/2 to 3 inches in length and stand out distinctly from the horizontal sides of the twig except on the upper branches where they curve upward. The cones are a pale OLIVE GREEN WITH AN ASHEN TINGE and grow in clusters standing UPRIGHT ON THE BRANCHES on the upper limbs. The cones are 3 to 5-1/2 inches long. The wood is light, soft, coarse-grained and white to light brown. Longevity is reported as about 300 years. This species may be easily distinguished from the other conifers of the Park by its long, silvery, flattened

needles and upright green cones, and from the Alpine Fir by its longer, horizontally growing needles, green cones and lower habitat.

Range: White Fir is found from Oregon through southern California and into Lower California; eastward from northern Mexico, New Mexico and Arizona through Colorado, Utah, Nevada and western Wyoming.

Distribution Within the Park: This species is quite common and is usually associated with aspen and Ponderosa Pine on the Kaibab Plateau fringing the Canyon rim and on the cooler slopes below the rim. Occasionally it is found on the shaded slopes just beneath the South Rim. It is a tree of the upper Transition and Lower Canadian Life Zones.

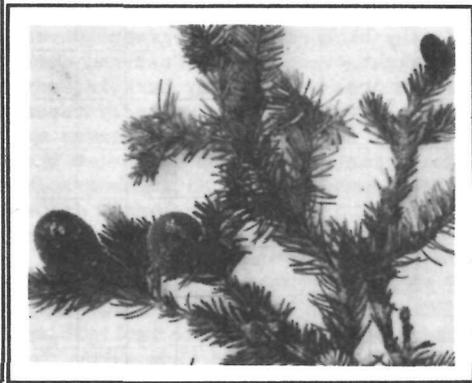
Uses: The wood of the White Fir is suitable for saw lumber for which it is used to some extent. As it imparts no flavor, it is in demand for cheese and butter containers. It is also used for railroad ties, fuel and for building purposes where wood of better quality is not obtainable. The

resin found in blisters in the bark of young trees has several medicinal and scientific uses. Within the Park the larger trees of this species are favored by rangers for fire-observation lookouts. Squirrels gather the cones which they cut down before maturity and store for winter food.



White Fir

Merion Photo



White Fir

DWARF JUNIPER

(Also Ground Juniper and 4 other common names in use)

Juniperus communis Linnaeus

Class: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: (Note: This form is classed by some authorities as Juniperus siberica Burgsd.) In the Park, Dwarf Juniper is a sprawling shrub with slender, half-prostrate stems. The lustrous, green, sharp-pointed, NEEDLE-LIKE, LANCE-SHAPED LEAVES are CHALKY WHITE ABOVE and spread widely from triangular branchlets in groups of threes. They remain for 5 or 6 years. The berry-like fruits mature the second season when they become a dark blue coated with a whitish bloom. The wood is pale yellowish brown, heavy, tough, fine-grained, and durable. Little is known about the longevity of this species which may reach several centuries. There is little danger of confusing this with any other Park tree.



Dwarf
Juniper

Range: Dwarf Juniper is considered as the most widely distributed tree in the Northern Hemisphere although it reaches tree size only in northern Germany and in a few counties in southern Illinois. In the United States it is found from Greenland to Alaska and southward as far as northern California, Arizona, New Mexico, Texas, Nebraska and North Carolina.

Distribution Within the Park: Among the aspens and conifers of the Kaibab Plateau, Dwarf Juniper occurs as a low-growing shrub of the Canadian Life Zone.

Uses: The fruit is relished by small mammals and by birds which may account for the wide distribution of the species. Of no commercial value because of its small size, Dwarf Juniper aids the forester by forming a matted ground cover which helps to hold snow on exposed ridges.

UTAH JUNIPER

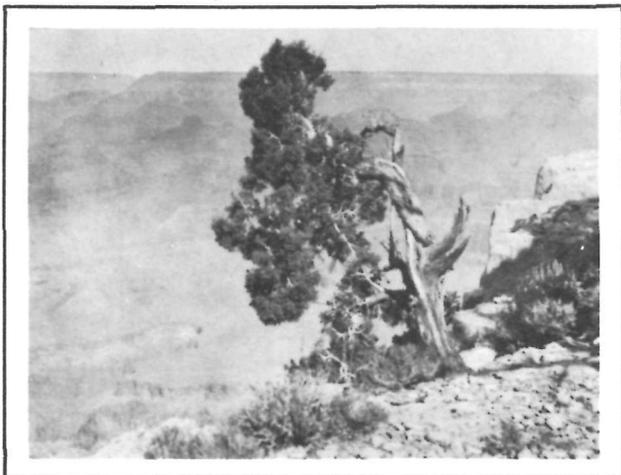
(Also White Cedar and 4 other common names in use)

Juniperus utahensis (Engelmann) Lemmon

Juniperus utahensis megalocarpa Sudworth

Class: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: This is a low, short-trunked, bushy tree 12 to 20 feet in height, occasionally reaching a diameter of 36 inches. The crown is wide, rounded, open and made up of numerous crumpled limbs. The thin, whitish-brown bark is composed of long strips or scales. The tiny, sharp, scale-like leaves of a pale yellowish green occur mostly in alternately opposite pairs closely overlapping each other in four rows. Each has a small pit (gland) on the back. They remain on the tree for 10 or 12 years.



Utah
Juniper

The berry-like fruits which mature the second year have a tough, smooth, RED-BROWN SKIN COVERED WITH A WHITISH BLOOM. The wood is light and yellowish brown with thick, white sapwood. Longevity is 140 to 250 years, perhaps more. Utah

Juniper is readily confused with the Rocky Mountain Red Cedar. The latter, so far as now known, is not found on the South Rim. Utah Juniper may be distinguished by coarser foliage and red-brown fruits in contrast with the oval, blue fruit of the Red Cedar. A variety of the Utah Juniper, Juniperus utahensis megalocarpa Sudworth, is reported from the Park but the characteristics by which it may be distinguished are not known to the writer.

Range: Utah Juniper is found throughout the semi-arid regions from southwestern Idaho, eastern Utah and southwestern Wyoming to southeastern California, northern Arizona, western New Mexico and western Colorado. Another species, Juniperus monosperma (Engelmann) Sargent, has been reported from this locality by one author, but is not listed within the range by Sudworth.

Distribution Within the Park: Characteristic of the semi-arid Upper Sonoran Life Zone, this species is usually found in association with the Pinyon and Cliff Rose. It is very abundant on the Coconino Plateau east of the Grandview section and west of Rowes Well, especially on the Great Thumb. Some of the individuals in the region west of Rowes Well are reported by Williamson to attain great size. This species is also found in open stands on the hot, dry slopes of the upper walls of the Canyon beneath both rims.

Uses: Although difficult to obtain in a size suitable for cabinet work, the aromatic quality of the wood makes it very desirable as a moth repellent for cedar chests. Being durable, it is widely used for fence posts. The fruit is used to some extent for food by the Havasupai Indians, and is credited with mystic powers by the Navahos who utilize the fruit and foliage in many of their religious rites. Birds, small mammals and deer consume the fruit, the latter also use the foliage for winter browse. The wood is widely used for fuel.

Features of Interest: Utah Juniper is particularly susceptible to the attack of parasitic mistletoe, trees which do not show clusters of the olive-green foliage of this growth being rare. Navaho Indians chew up the bitter fruits and spit the debris into the face of a balky horse or donkey to "drive out the evil spirit". Many other uses, of a religious as well as a practical nature, are made of this common tree by the Southwest Indians.

ROCKY MOUNTAIN RED CEDAR

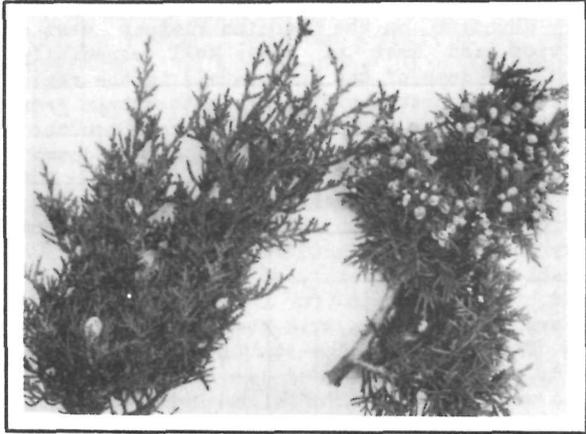
(Also Colorado Juniper and 3 other common names in use)

Juniperus scopulorum Sargent

Class: Gymnospermae Family: Pinaceae or Coniferae

Distinguishing Characteristics: Although similar in general appearance to the Utah Juniper, this species is smaller, usually reaching a height of 15 or 20 feet and a diameter of 12 to 18 inches. The crown is slender with drooping branch ends. Leaves are similar to those of the Utah Juniper although smaller and each usually has on its back a long, indistinct pit (gland). The mature, OVAL fruit which usually contains two seeds is smooth, clear BLUE due to a whitish bloom over the thin blackish skin. The wood is a dull RED to a BRIGHT ROSE RED, fine-grained and has a thick layer of white sapwood. Trees 6 to 8 inches in diameter show an age of 130 to 175 years. One large specimen in

Logan Canyon, Utah, is reported to be 3,000 years in age. This species is easily confused with the Utah Juniper, but is found at higher elevations, has smaller leaves and an oval, blue-black fruit.



Rocky Mountain Red Cedar ~ Utah Juniper

Range: This tree is found throughout the Rocky Mountain states from western Texas to Alberta and westward to the coast of British Columbia and southward into eastern Oregon and Nevada. It extends east from the Rockies into northwestern Nebraska and South Dakota.

Distribution Within the Park: Rocky Mountain Red Cedar occurs on the North Rim at the extremities of points and pro-

mentories along the edge of the Canyon in association with Pinyon, Cliff Rose, Mountain Mahogany and other plants of the Transition Life Zone.

Uses: The wood, where obtainable in quantities of sufficient size, is suitable for cedar chests and for mothproofing closets. Although less durable than Utah Juniper, it is used for fence posts and fuel, and is desirable for the manufacture of pencils. Its foliage is utilized for food by deer when other browse is scarce. Birds and small mammals consume the berries.

Features of Interest: Because it thrives on dry, rocky soils unsuitable for other plants of economic value, there is possibility of a wider commercial use for this species. Since the supplies of Eastern Red Cedar are becoming exhausted, Western Red Cedar may be helpful in replenishing the stocks of pencil and chest wood.

YUCCA

Class: Angiospermae Family: Liliaceae, the Lilies

Several species of yucca are present in the Park. Although none of the species found here are classed as trees by Sudworth, specimens of tree dimensions are reported as present in the western portions of the Park (Sapphire Canyon) by Park Naturalist Edwin McKee. For consideration in this bulletin, however, these will not be classed as trees.

ASPEN

(Quaking Aspen and 7 other common names in use)

Class: Angiospermae Family: Salicaceae, the Willows

Distinguishing Characteristics: It is highly improbable that anyone will confuse this slender, graceful, white-barked tree with any other species in the Park, although many visitors feel that it must be a birch. It commonly attains a height of 20 to 40 feet and a diameter of 8 to 12 inches. The thin, fleshy bark is a clear chalky to yellowish white except at the base of large trees where it becomes thick, hard, furrowed and grey-black. The leaves, which are small, are a yellow-green above, paler beneath, and become a GOLDEN YELLOW in the fall ranging in some trees to bronze, orange and red. Trembling and quivering in the slightest breeze, they have given to the tree its name of Quaking Aspen.

Female trees produce quantities of cotton-like seed in June and July. The silvery-white sapwood forms a major portion of the stem with the pale, brown heartwood small in comparison. The wood is light, fine-grained, soft and not durable. The tree is apparently short lived, probably not living more than 50 years.

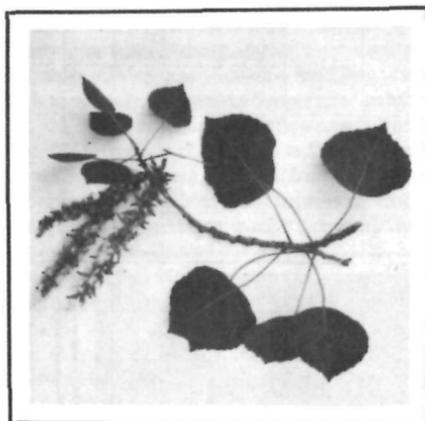


Aspen, Kaibab Plateau

Range: Aspen is found throughout western North America from the Yukon River to Saskatchewan and southward through the Rocky Mountains to the highlands of southern New Mexico and Arizona, westward to Washington, Oregon and California. It also extends eastward to the Dakotas and western Nebraska.

Distribution Within the Park: This species is perhaps the most conspicuous tree of the Kaibab Plateau where it grows in widespread, open stands on the sun-drenched slopes from the Canyon rim to the highest elevations. It is often associated with Ponderosa Pine but also intermingles commonly with firs and spruces and occurs in pure stands. It has been reported from one location in the Park south of the Colorado River, a small grove being located just beneath the rim near Grandview Point. It is a tree of the upper Transition and Canadian Life Zones.

Uses: Unsuitable for lumber because of its lack of durability and its tendency to check and warp while drying, the wood is nevertheless used in making fruit, butter and cheese containers because it imparts no flavor nor odor. For this purpose, seasoned, fire-killed trees are used. Because of its whiteness, the wood is in demand for paper pulp and excelsior. It is also used for fuel. Throughout its range the white, soft bark has tempted the jackknife of the amorous and "artistic" who have left their marks on many a tree. Deer browse the foliage heavily consuming seedlings and eating the low-hanging growth from established trees.



Aspen or Quaking Aspen

Features of Interest: There is a belief among French-Canadians that the Cross of the Crucifixion was made of aspen wood. To the repentance of the species, they lay the continual trembling of the leaves. Such believers will not work in a camp where aspen wood is used for fuel. Aspen, including all of the varieties, is considered to be the most widely distributed tree in America being transcontinental in range.

COTTONWOOD

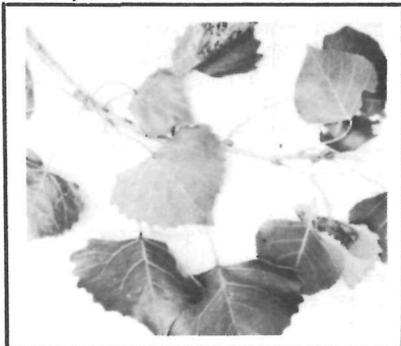
(Also Fremont Cottonwood)

Populus fremontii S. WatsonPopulus fremontii toumeyii SargentClass: Angiospermae Family: Salicaceae, the Willows

Distinguishing Characteristics: The characteristically bowed or leaning position together with the forked trunk usually clear of branches for half its length, and the thick, leathery, shiny-green leaves commonly heart shaped with their flat yellow stems serve to distinguish this tree of the side-canyon stream banks. In Grand Canyon National Park the tree rarely exceeds a height of 50 feet and a diameter of 24 inches. The thick limbs and drooping branchlets form a wide, round-topped, open crown. The thick, greyish-brown bark of older trees is tough and deeply furrowed. The wood is pale, dull brown, fine grained, soft, brittle and not durable. The



Cottonwood at Ribbon Falls



Cottonwood

tree is short lived, possibly not more than 50 years. A sub-species, Populus fremontii toumeyii Sargent, is reported by Sudworth from Hermit Canyon, but no features of identification are listed.

Range: Fremont Cottonwood and its several varieties are found along creeks and canyon

bottoms of California, Arizona and New Mexico. Whether several of these occur in Grand Canyon National Park remains to be determined. Specimens from Hermit Canyon have been listed by Sudworth as the variety toumeyi Sargent.

Distribution Within the Park: Cottonwood is common to watercourses of the Sonoran Life Zones in the Park. It is frequently encountered along Bright Angel Creek from Roaring Springs to the Colorado River. Several specimens in Grand Canyon Village were probably planted by man and thrive as long as they obtain sufficient water. Others at Hermit Camp flourished until the camp was abandoned when they died for lack of water. A small grove furnishes welcome shade at Indian Gardens and the trees are numerous about Phantom Ranch.

Uses: Although utilized to some extent for lumber, Cottonwood checks badly in seasoning. It is suitable for fuel and paper pulp. In the dry heat of the Canyon depths, it provides welcome shelter for man and beast and has been planted for that purpose about several of the Canyon camps. It is of service throughout its range in holding the soft, shifting banks of streams. Beaver use the bark for food and the cuttings for building their dams.

Features of Interest: Cottonwood is the only tree of any size to be found in the lower depths of the Canyon where its greenery attracts the attention of visitors looking down from the rims far above. The cottony seed threads produced in abundance by female trees in the spring have given the tree its name.

BEBB WILLOW

(Also called Beak Willow)

Salix bebbiana Sargent

Class: Angiospermas Family: Salicaceae, the Willows

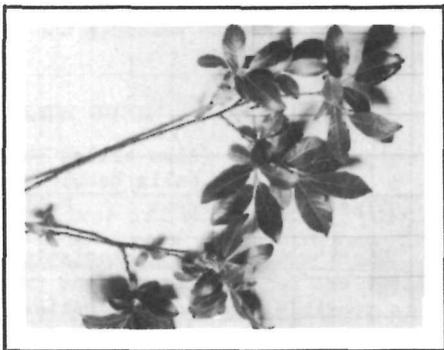
Distinguishing Characteristics: (Note: Four species of Willows are recorded as present in Grand Canyon National Park. It is possible that other species may be identified when a thorough study is made of this group in the Canyon. Willows are extremely difficult to identify even by the experienced taxonomist and it is necessary to study leaves, fruit and flowers of both sexes. Disagreement on nomenclature among authorities renders attempts at accuracy uncertain in listing the willows of the Park.) As found in Grand Canyon National

Park, Bebb Willow is usually a shrub although within its range it attains a height of from 20 to 50 feet. The leaves are long and slender, quite pointed at the tip with a blunt base. They are shiny green above. The CATKINS ARE LONG, especially the staminate which is from 1-1/2 to 4-1/2 inches in length and is quite yellow in color. Leaves are from 2 to 7 inches in length and vary in width from 5/8 to 1-1/4 inches. (Description from Jepson.)

Range: Bebb Willow is credited with a very wide range being reported from the St. Lawrence River to Hudson Bay and northwestward to the Arctic Circle, Alaska, and British Columbia. It ranges southward to Pennsylvania and west to Minnesota, western Idaho, northern Montana, North and South Dakota, Iowa, Nebraska and through Colorado to northern Arizona.

Distribution Within the Park: Bebb Willow has been collected from Point Imperial on the North Rim and is reported as occurring along streams and canyons from the Upper Sonoran through the Canadian Life Zones. It, or similar species, occur in moist locations on the Kaibab Plateau. Kanabowmits, a Paiute word meaning "Willow Spring", is applied to a spring and canyon within the Park on the North Rim.

Uses: Indian ruins found within the Park occasionally contain poles and braces bound together with willow withes indicating the use of the willow by prehistoric inhabitants of the region. Havasupai Indians face their irrigation dams with willow stems to retard erosion and the squaws use smaller twigs in weaving a coarse basketry. Beaver use the bark of the willow for food, and bears strip the bark from the branches, apparently as a "tonic" after coming out of hibernation. Leaves are available for the food of browsing animals, and the thickets



Bebb Willow

serve as protection and nesting places for birds. For centuries willows have been used by white men in the manufacture of basketry and furniture. The wood is suitable for cricket and baseball bats and for making gunpowder.

Features of Interest: Willows, in general, are shrubs or small trees growing in clumps or thickets in moist locations. The twigs are soft and slender, but tough. The leaves are usually long, narrow, alternate and opposite. The bark is notoriously bitter in taste and brownish green in color except on large trees where it is grey and irregularly furrowed. The wood is soft, light, brittle, firm and usually pale in color. Trees probably live to be 50 to 150 years in age, but the great vitality of the roots enables them to send up shoots to replace the decayed and broken trunk. Within the Park willows are shrubs or, at best, slender trees. The largest noted by the writer is at Cottonwood Camp in Bright Angel Canyon. It has an estimated height of about 30 feet and a diameter of approximately 15 inches. The green twigs or branches of willow will take root if placed in moist sand or soil which makes propagation easy. Pieces of twig or stem discarded by beavers may float many miles down stream and lodge against the bank to take root, thus aiding in the spread of the species. Much remains to be learned regarding the various willows in Grand Canyon National Park.

COYOTE WILLOW

(Also called Narrowleaf Willow and Sandbar Willow)

Salix exigua Nuttall

Class: Angiospermae Family: Salicaceae, the Willows

Distinguishing Characteristics: Coyote Willow occurs as a shrub in the Park. Jepson describes it as from 6 to 16 feet in height with leaves linear to narrowly lanceolate, bluish-green in color, somewhat HAIRY PARTICULARLY BENEATH, 1 to 3 inches long and 1/12 to 1/6 of an inch in width.



Sandbar Willow

Range: This species is found from Alberta and British Columbia southward to southern California and Nevada, eastward to Idaho, Wyoming, Nebraska, Colorado, Arizona and Lower California. It attains tree size as far as is

known, only in Washington State.

Distribution Within the Park: Specimens have been collected from the vicinity of Phantom Ranch. Little is known regarding its distribution in the Park.

Uses: See Bebb Willow.

DUDLEY WILLOW

Salix goodingii Ball

Class: Angiospermae Family: Salicaceae, the Willows

Distinguishing Characteristics: (Note: This species is considered by Jepson synonymous with Salix nigra Jepson and Salix nigra vallicola Dudley.) In Grand Canyon, Dudley Willow is a tall shrub but within its range it reaches a height of from 20 to 50 feet. Jepson describes this species as characterized by BRANCHES BRITTLE AT THE BASE, leaves narrowly lanceolate and very long pointed 2 to 7 inches long and from 1/8 to 3/4 of an inch wide. LEAF BASES AND LEAF STEMS ARE NOT GLANDULAR. The bark of larger trees is rough and dark. Pistillate catkins are from 3/4 to 1-1/4 inches long.



Range: Dudley Willow is restricted to the Southwest being found from northern California to Lower California

Dudley Willow (*S. Nigra*) Female left; Male right
and eastward into Arizona, southeastern Nevada and southern New Mexico to northern Mexico and western Texas.

From Sudworth

Distribution Within the Park: This species is reported by Patraw as a dense growth along streams of the Lower Sonoran Life Zone. Hawbecker reports it abundant along the lower

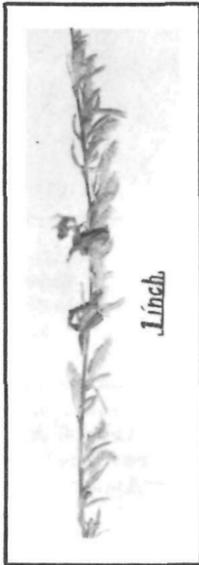
course of Bright Angel Creek and believes it to be the willow found along Shinumo and Nankoweap Creeks.

Uses: See Bebb Willow.

YEWLEAF WILLOW

(Salix taxifolia Humbolt, Bonpland and Kunth)

Class: Angiospermae Family: Salicaceae, the Willows



Yewleaf
Willow

Distinguishing Characteristics: Described by Wootton and Standley as a tall shrub having leaves about twice as long as broad and about 1 to 3 centimeters (1/4 to 1 inch) in length, the leaves finely pubescent. Scales are pale yellow and deciduous with capsules 3 to 4 millimeters long.

Range: This species is found in Texas, southern Arizona and through Mexico to Guatemala and Lower California.

Distribution Within the Park: Specimens have been collected near Santa Maria Spring in Hermit Canyon.

Uses: See Bebb Willow.

RED BIRCH

(Also Canyon Birch and 10 other common names in use)

Betula fontinalis Sargent

Class: Angiospermae Family: Betulaceae, the Beeches

Distinguishing Characteristics: Red Birch is commonly found in the Park as a bushy shrub but occasionally occurs as a slender, graceful tree 10 to 15 feet high and 2 to 3 inches in diameter, usually growing in spreading clusters. It is readily distinguished by its shiny, OLD-COPPER colored bark and the upright, scaly fruiting "cones". The thinly foliated

crown is composed of very slender branches with delicate, pendant twigs. Mature leaves show minute dots on the lighter green under surfaces. The fruiting "cones", which are ripe in early summer, are $7/8$ to $1-1/4$ inches long. The wood is light, yellowish brown with a thick layer of white sapwood. The bark is tight, smooth and does not peel naturally.



Red Birch

Range: This species is found from British Columbia south to California and eastward into Alberta and the valley of the Saskatchewan. It extends southward in the Rocky Mountains through Nevada, Utah, northern New Mexico and Arizona, eastward through Colorado to northwestern Nebraska and South Dakota.

Distribution Within the Park: Usually found near springs in cool canyon bottoms, Red Birch frequents moist locations on the Kaibab Plateau. It has been collected at Bright Angel Spring and at South Big Spring. It has not been reported from the South Rim where its presence is unlikely as it is a tree of the Canadian Life Zone.

Uses: Although similar in the quality of its wood to the eastern birches, this species is too small and too scarce to be of economic importance. It is occasionally used for fencing and for fuel.

WESTERN HOP HORNBEAM

(Also called Knowlton's Hop Hornbeam)

Ostrya knowltonii Coville

Class: Angiospermae Family: Betulaceae, the Beeches

Distinguishing Characteristics: Described by Baker as a small, slender tree 10 or 12 feet in height, Hop Hornbeam has scaly, light ashy-grey bark and simple rounded leaves with double serrate edges and fine teeth. Leaves are 1 to 2 inches in length and resemble those of the beech. The fruit is a



NUTLET within a green to brown, PAPERY, BAG-LIKE INVOLUCRE which shatters readily when ripe. A cluster of these fruits resembles a hop. Staminate flowers occur in clusters of short catkins with ovate scales upon which are borne several stamens on a horny receptacle. Pistillate flowers are in a half-erect catkin.

Range: Western Hop Hornbeam is native to the Upper Sonoran Life Zone in Arizona. It is abundant along trails leading down into the Canyon, and is reported from Oak Creek Canyon in Arizona and on the Grand River, Grant County, Utah.

Western hop-hornbeam

Distribution Within the Park: Hawbecker reports this species as occurring beneath both rims along several of the Canyon trails in the Upper Sonoran Life Zone and extending into the lower portions of the Transition Life Zone.

ALDER

Alnus sps.

Class: Angiospermae Family: Betulaceae, the Beeches

Another genus of the Beech Family, the alder, possibly occurs in the Park. Marion reports an alder about one mile down the Hermit Trail and Hawbecker states that he found an alder near South Big Spring on the North Rim. It is believed that this is Alnus tenuifolia Nuttall, the Mountain Alder, however, specimens were not submitted to recognized authorities for identification, consequently this species cannot be reported definitely from the Park.

CANYON LIVE OAK

(Also Wilcox Oak, Palmer Oak, and Pin Oak)

Quercus chrysolepsis palmeri Engelman

Class: Angiospermae Family: Fagaceae

Distinguishing Characteristics: (Note: This variety is considered by Sudworth to be the same as the species formerly

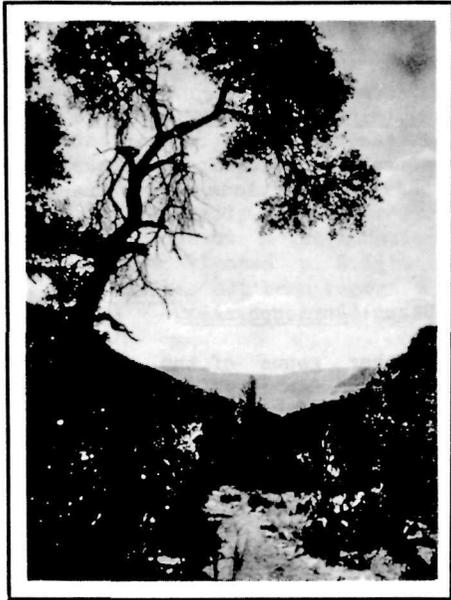


Canyon
Live Oak

This species might be confused with Q. dumosa turbinella Jep., the Park's other live oak, but has larger leaves.

Range: Canyon Live Oak is limited to the Southwest from the boundary between California and Lower California eastward through western Arizona, Utah, Nevada and New Mexico.

known as Quercus wilcoxii Rydberg.) One of the evergreen or "live" oaks, this variety ranges in size from a low, dense chaparral to a wide-spreading tree. In canyon bottoms it is usually 15 to 20 feet high, slender, with a small crown. Trunk bark is soft and scaly. The wide leaves are thick, stiff, circular in outline, with prominent, large, spine-pointed teeth. The acorns are usually SHARPLY CONICAL, often long stemmed with SHALLOW CUPS. The wood is brown, heavy, stiff and tough. Leaves remain on the tree for 2 or 3 years and acorns require two seasons to reach maturity. Longevity is about 150 years.



Live Oak, Bright Angel Canyon

Distribution Within the Park: Specimens have been collected from Bright Angel Canyon by McHenry.

Uses: The wood is particularly prized for wagon tongues

and whiffle trees. It is also suitable for wheel stock and farm implements and for fuel.

Features of Interest: Like the willows, oaks are extremely difficult to identify and to distinguish from one another. Some species have numerous and wide variations.

CALIFORNIA SCRUB OAK

Quercus dumosa turbinella Jepson

Class: Angiospermae

Family: Fagaceae

Distinguishing Characteristics: Although formerly, and by some authorities still, identified as Quercus turbinella Greene, Sudworth considers this oak to be a variety of Q. dumosa. It is especially difficult to identify because of the



California Scrub Oak

great variation in the size and shape of its leaves. In the Park it usually occurs as a stiff, wiry shrub growing in dense thickets with fine branches massed and tangled. It occasionally reaches a height of 15 feet with a slender, twisted trunk and drooping, open crown. Leaves, which are evergreen, remain on the tree a full year, falling in the spring. Although variable, they are usually small, stiff and sharply and irregularly toothed with spine-like points. Acorns are variable but inclined to be LONG AND SLENDER. They mature in one season. The wood is light brown, hard and brittle.

Range: Sudworth reports the range of this variety as being northern Lower California and near Campo, San Diego. The range for Quercus turbinella Greene is recorded as southern Utah and Nevada to New Mexico, southern and Lower California.

Distribution Within the Park: This Oak is reported by Hawbecker as abundant on the Canyon walls north of the Colorado River throughout both Sonoran Life Zones and into the Transition. It attains tree size in Muav, Saddle and Bright Angel Canyons, but at higher elevations is a shrub. It is

also found in Bass Canyon and Hermit Canyon south of the River.

Uses: Because of its small size and limited range, this variety is considered of no economic importance. The roots, which extend deeply into crevices in the rocky soil, send up sprouts soon after a fire has swept over the surface thus rapidly producing cover on a barren slope.

ROCKY MOUNTAIN SHIN OAK

(Also Wavyleaf Oak and 3 other common names in use)

Quercus undulata Torrey

Class: Angiospermae

Family: Fagaceae

Distinguishing Characteristics: Because of extreme variation in the size and shape of its foliage and fruit, this species is classed by Sudworth as polymorphous. Therefore its many manifestations have been taken by students as of specific consequence and several specific and varietal names have been applied to these unstable characteristics. Sudworth considers Quercus pungens Liebm. as one such, although this name is in common use. At higher elevations, this species occurs as a shrub, but lower it is a tree 15 feet in height. Tidestrom describes the species as having leaves broadly oval, 5 to 7 lobed and about 5 centimeters (1-2/3 inches) long with 7 or more pairs of greyish-green ribs. The acorns are oblong, 15 millimeters or less in length with hemispheric cup. This species is readily confused with the Rocky Mountain White Oak but has a different range in the Park.



Range: Shin Oak is found in the Colorado mountains and through New Mexico and Arizona to southern Utah and Nevada.

Rocky Mountain Shin Oak

Distribution Within the Park: Encountered sparingly on the lower slopes of the Canyon, Shin Oak is found mainly in the western portion of the Park north of the Colorado River.

It has been collected in Muav, Saddle, and Bright Angel Canyons. Hawbecker reports it in Powell Saddle. Shin Oak is apparently an Upper Sonoran Life Zone tree but extends its range both above and below the limits of this Zone.

Features of Interest: There is need of considerable study to determine the extent of the variations of this species and to permanently establish such variables as may be of specific or varietal importance.

ROCKY MOUNTAIN WHITE OAK or GAMBEL'S OAK

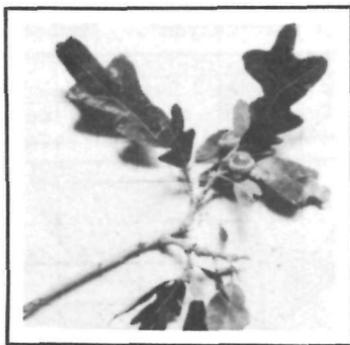
(White Oak and Mountain Oak)

Quercus utahensis (A.Candolle) Rydberg

Class: Angiospermae

Family: Fagaceae

Distinguishing Characteristics: (Note: This species is known by some authorities as Quercus gambelii Nuttall.) Rocky Mountain White Oak displays the major characteristics of the white oak group having round lobed leaves deeply indented, leaves that fall in autumn and acorns that mature in a single season. In the Park, it ranges in size from shrubby chaparral, forming dense thickets, to trees 20 feet in height and 18 inches in diameter. The deeply lobed leaves are oblong in outline and 1-1/2 to 3 inches in length. Acorns are 1/3 to 3/4 of an inch long with hemispheric cups. It is quite possible to confuse this species with the Shin Oak; the latter, however, is found at lower elevations and the two species have very different habitat requirements.



Rocky Mountain White Oak

Range: Rocky Mountain White Oak is found from extreme southwestern Wyoming to Utah, New Mexico and Arizona. A subspecies, Q. utahensis submollis (Rydberg) Sudworth is reported as abundant on the Colorado River Plateau but has not been identified in the Park.

Distribution Within the Park: This is the common oak of Grand Canyon National Park being abundant on both rims where it is usually associated with Ponderosa Pine and other trees of the Transition Life Zone to within the upper portion of the

Upper Sonoran Life Zone. Hawbecker reports it as particularly abundant on Powell Plateau.

Uses: The leaves of this oak are relished by horses and cattle and form one of the major summer foods of the deer. Acorns may be eaten to some extent by squirrels and form an important part of the diet of wild turkeys. The wood was used to some extent by Indians in making bows.

Features of Interest: After the first frosts of autumn, the leaves of this oak turn yellow and light red, adding much to the beauty of the autumn woods throughout the Ponderosa Pine belt in the Park.

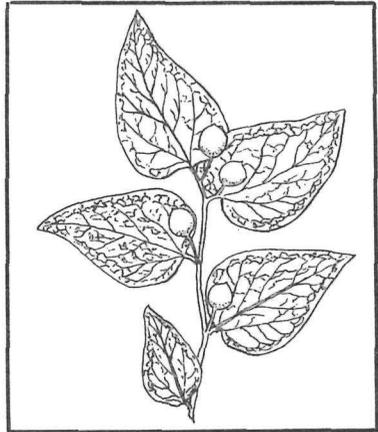
HACKBERRY—PALO BLANCO

Celtis douglassii Planchon

Celtis reticulata Torrey

Class: Angiospermae Family: Ulmaceae, the Elms

Distinguishing Characteristics: (Note: Sudworth reports C. douglassii from "the south slope of Grand Canyon", Patraw states "C. reticulata is found in Havasu Canyon". Hawbecker indicates Celtis sps. at Dripping Springs and along the Bright Angel Trail.) Although probably not arboreal in the Park, these species vary from low, densely-branched shrubs to short round-crowned trees. The bark is bluish to brownish grey with thin ridges and corky warts. Mature leaves are thick, leathery, veiny and rough. The mature fruits (C. reticulata is orange red, C. douglassii is purple brown) are about 1/2 inch in diameter with a minute point at the top. The dry, sweet, thin pulp covers a hard, thick-shelled seed. The sapwood is thick, whitish, heavy, soft, brittle and coarse grained. The heartwood is yellowish white. In general appearance the tree resembles an elm. Its longevity is about 60 to 110 years. It may be recognized



from Sudworth

Palo Blanco

readily by a CHARACTERISTIC BROOM DUE TO AN EVER-PRESENT GALL.

Range: Hackberry (*C. douglassii*) ranges from British Columbia, Washington, Oregon and eastern Idaho to Utah, Colorado, and Arizona. Palo Blanco (*C. reticulata*) is found from western Texas to Oklahoma and through southern New Mexico and Arizona. It grows in gravelly soil along water courses.

Distribution Within the Park: Hackberry is reported from the south slope of the Grand Canyon and Palo Blanco from Havasu Canyon.

Uses: The cherry-like fruit is reported to have been ground up and used as food by Indians of the Southwest. Birds consume the fruit eagerly. The wood, where trees are of sufficient size, is used for fuel.

MEXICAN MULBERRY

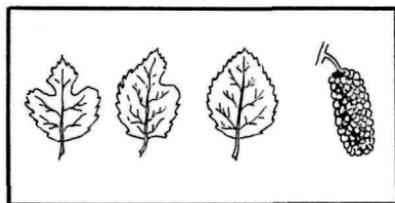
(Also Texan Mulberry)

Morus microphylla Buckley

Class: Angiospermae

Family: Moraceae

Distinguishing Characteristics: This species is described by Wootton and Standley as a small, scrubby tree 15 feet or less in height with oval, serrate-edged leaves about 1 or 2 inches long. Staminate and pistillate flowers are found on



Mexican Mulberry from Baker

different trees, the pistillate trees bearing fruits made up of JUICY DRUPELETS CROWDED TOGETHER to form an edible fruit RESEMBLING A BLACKBERRY. Leaves on the same tree vary from a single blade to a compound leaf made up of three portions.

Range: Mexican Mulberry is limited to the Southwest where it is found from southern New Mexico and Arizona into Old Mexico.

Distribution Within the Park: To date, this small tree has been reported only from Havasupai Canyon where it is cultivated by the Havasupai Indians. There is no definite information as to whether it occurred there originally, or whether it has been introduced by the Indians. Since it is native to

the Southwest, it is considered in this publication as one of the established trees of the Park.

Uses: The fruits are used for food by the Indians and are also relished by birds and small mammals.

HOLLYGRAPE

Berberis fremontii Torrey

Class: Angiospermae Family: Berberidaceae

Because it is not classed as a tree by Sudworth, Holly-grape will be considered as a shrub for purposes of this publication. However, it occasionally reaches tree size in the Park according to Marion and Park Naturalist McKee. It is found throughout the Pinyon belt in southern Colorado, New Mexico, Nevada and Arizona. In the Park it is encountered occasionally throughout the Upper Sonoran Life Zone. Some authorities classify this species as Ocostemon fremontii (Torr) Rydb.

MOUNTAIN MAHOGANY

(Also Curl-leaf Mountain Mahogany)

Cercocarpus ledifolius Nuttall

Class: Angiospermae Family: Rosaceae, the Roses

Distinguishing Characteristics: Although commonly found in the Park as a broad, low, much-branched shrub, this species occasionally becomes a small tree with a height of 15 or 20 feet and a diameter of 6 or 8 inches. The trunk is short and crooked with large crumpled limbs standing out irregularly and numerous stiff twigs that produce a low, dense crown. The bark is hard, firm, thin, scaly and reddish brown, grey tinted. The leaves are evergreen remaining on the tree about two seasons. They are quite thick and the edges CURL TOWARD THE UNDER SIDE which is densely covered with minute, light brown hairs. The hairy, long-tailed fruits surrounded by small, cylindrical cases are stemless and occur singly in the leaf axils. This species is readily confusable with the three other forms that occur in the Park all of which are shrubs (C. intricatus, C. montanus and C. arizonicus). However, the arboreal species may be identified by the curl-leaf characteristic. The wood is very dense, fine-grained, exceedingly heavy and hard when dry. Freshly-cut wood is distinctly mahogany red and darkens with exposure. Longevity is uncertain, perhaps 100 years.

Range: Curl-leaf Mountain Mahogany is reported from eastern Washington and Oregon to Wyoming, through Nevada and Utah to southwestern Colorado and west to California.

Distribution Within the Park: This species, a tree of the Transition Life Zone, is fairly abundant both under and along the rim on the north side of the Canyon, especially on such dry, sunny points as Cape Final and Cape Royal where it attains tree size.

Uses: As it is adaptable to arid, windswept slopes, Mountain Mahogany forms a valuable cover in such locations helping to hold the soil and acting as a retreat for small animals. The rich, attractive color of the wood makes it desirable for cabinet work and curios as it takes a high polish. However, the wood cracks and warps badly in drying and pieces of suitable size are so scarce that its commercial use is greatly res-



Curlleaf Mountain Mahogany
Marion Photo



Mountain Mahogany
C. ledifolius left C. intricatus right

tricted. The hard, heavy wood makes excellent fuel. Navaho Indians formerly made a decoction of the roots of Mountain Mahogany which they mixed with juniper ashes and the powdered bark of alder to form a red dye with which they colored wool.

Features of Interest: Unconfirmed rumors indicate that the use of Mountain Mahogany for firewood is prohibited in the

State of Utah because of the scarcity of timber from this species. The blossom stigmas, upon maturing, form the hairy seed plumes which are carried by the wind and in the fur of animals for considerable distances. When moist, these plumes are straight, but upon drying they twist and curl thus forcing the seed into the hard ground. The heavy wood of Mountain Mahogany is so dense that it will not float on water.

CLIFF ROSE or QUININE BUSH

(Also known as Buckbrush)

Cowania mexicana D. Don

Class: Angiospermae Family: Rosaceae, the Roses

Distinguishing Characteristics: This species, classed as Cowania stansburiana Torrey by some authorities, occurs as a large, many-stemmed shrub or a small, scrawny, open-crowned tree. The trunk, usually twisted and sloping, is frequently divided. The leaves, about 1/4 to 1/2 inch in length, are deeply and finely indented, evergreen, glandular and hairy



which makes them feel "sticky". If chewed, they leave a bitter after taste, hence the name Quinine Bush. The blossoms appear at various times from early spring to late fall and resemble small, whitish-yellow, 5-sepaled wild roses. The fruits are hairy and plume-like, usually five in a cluster and, with the leaves, render the tree easy to identify so that it is not readily confused with any other species.

Range: Cliff Rose is a typical shrub and tree of the semi-arid Upper Sonoran Life Zone. It is found from northern Utah to southern Colorado, southward to New Mexico and Arizona and westward to Nevada, southern California and Mexico.

Distribution Within the Park: This species is one of the common cover plants on the south side of the Grand Canyon where it is usually found associated with Pinyon and

Cliff Rose or Quinine Bush

Utah Juniper. It is especially abundant east of the Grandview district and west of Rowe's Well. North of the Colorado River it occurs in warmer, open locations along the rim and below, being particularly abundant in the west portion toward Kanab Canyon.

Uses: This scrubby tree furnishes a poor grade of fuel. During the winter months the leaves are an important item in the diet of deer. Indians are reported to have stewed the bark to make a medicine.

Features of Interest: The blossoms and plumed seeds in the summer months attract the admiration of visitors and the picturesque appearance of the Cliff Rose tree adds to the atmosphere of the semi-arid plateau lands.



Cliff Rose

WESTERN CHOKE CHERRY

(Also Wild Cherry and 4 other common names in use)

Prunus virginiana demissa (Nuttall) Torrey

Class: Angiospermae Family: Rosaceae, the Roses

Distinguishing Characteristics: (Note: Classed by some authorities as Prunus demissa (Nuttall) Walpers, Sudworth considers this a variety of Prunus virginiana. It may be either P. virginiana demissa or P. virginiana melanocarpa (A. Nelson) Sargent as both varieties come within this range. To determine definitely, additional specimens must be examined). Choke Cherry commonly occurs as a tree-like shrub in dense thickets and occasionally becomes a slender tree reaching a height of 20 or 25 feet and a diameter of 6 or 8 inches. Trunks of young trees are smooth, later becoming seamed and scaly as the bark turns from brown to grey. The leaves are thick, leath-

ery and dull green, being smooth and shiny above, paler and minutely hairy beneath. Leaves and twigs when bruised give off a strong odor similar to that of peach pits. The WHITE FLOWERS ARE BORNE IN DENSE, CYLINDRICAL CLUSTERS AS ARE THE SHINY, BLACKISH FRUITS. The wood is a pale yellowish brown, fine grained, brittle but firm with a thick layer of white sapwood. There is little possibility of confusing this species with any other Park tree.



Range: Variety demissa ranges westward from Nebraska and Kansas throughout the mountains of the western United States and northward to British Columbia. Variety melanocarpa is found from the western Dakotas and Nebraska to southern Colorado, New Mexico, southern Arizona and the Pacific Coast and from southern California to British Columbia.

Western Choke Cherry

Distribution Within the Park: Reported only from the North Rim where it was collected by A. E. Borell at Neal Spring.

Uses: Birds eat the fruit avidly. It is also gathered by humans who use it in making sauces, wine, jelly and jam as it has a very fine flavor when cooked. The astringent properties have given the species the name Choke Cherry but the varieties are reported as being less astringent.

CATCLAW

(Also Wait-a-bit and 5 other common names in use)

Acacia greggii Gray

Class: Angiospermae Family: Leguminosae, the Peas

Distinguishing Characteristics: Catclaw is a short-trunked, much-branched, broad-crowned tree, usually 10 to 20 feet in height and from 2 to 8 inches in diameter. The angled twigs are minutely hairy and light reddish brown, lined with

10 to 20 opposite leaflets which are three-nerved and more or less hoary with minute hairs. The pale brown pods, flat and twisted, ripen in August when they contain shiny, deep brown, almost circular seeds. The pods remain on the branches for 6 or 8 months. The sharp HOOKED THORNS, from which the tree derives its name, occur at frequent intervals on branches and twigs. The wood is a dull red brown, dense, hard, heavy



Catclaw

and durable with a thin layer of lemon-yellow sapwood. Longevity has not been determined, possibly about 50 years. This species may be easily confused with the Mesquite, however the hooked thornes, smaller leaflets, and flat, twisted pods serve to identify it.

Catclaw by Colorado River ✓

Range: Catclaw is found throughout the Southwest from western Texas through southern New Mexico and Arizona to northern Mexico, Lower California, southern California and Nevada.

Distribution Within the Park: This species is abundant in the Lower Sonoran Life Zone where it is found along side Canyons and on the Tonto Platform.

Uses: The wood is of good quality but is of no commercial importance because of its small size and the relatively limited range of the species. In the Canyon's hot depths, this tree furnishes welcome shade and protection for bird and beast.

Interesting Features: Catclaw is one of the few species

worthy of the name tree to be found in the Lower Sonoran Life Zone in the Park. As it is able to thrive in the driest and poorest of soils, it provides an open 'tho scanty cover in an otherwise semi-desert area.

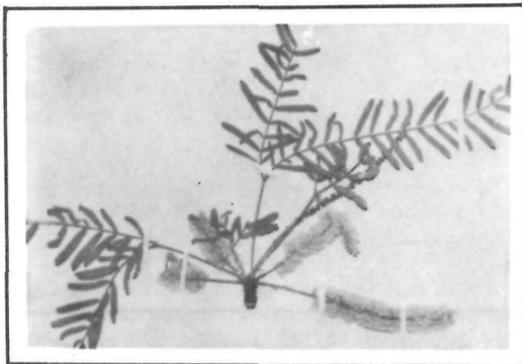
MESQUITE

(Also called Honey Mesquite)

Prosopis juliflora glandulosa (Torrey) Cook

Class: Angiospermae Family: Leguminosae, the Peas

Distinguishing Characteristics: Mesquite occurs in the Park as a shrub or small, short-trunked tree 15 to 20 feet high and 6 to 10 inches in diameter. The branches and leaf stems, with 6 to 60 pairs of opposite leaflets 1/2 to 2 inches long, are smooth. The fragrant, yellow flowers with SMOOTH CALYX appear in May, June and July. The YELLOWISH, STRAIGHT, PLUMP SEED PODS, 4 to 6 inches long, contain 6 to 20 hard, brown, shiny seeds embedded in a sweet, edible pulp. The SHARP, STRAIGHT, SPIKE-LIKE THORNS OCCUR IN PAIRS IN THE LEAF-STEM AXILS. The wood is red-brown, dense, close grained, hard, heavy and durable. The sapwood is thin and lemon yellow. Longevity is 125 years or more. The tree is readily confused with Catclaw, but



Mesquite

may be identified by the straight thorns, larger leaflets and the plump, straight seed pods. This species is classed by some authorities as Prosopis glandulosa Torrey. Although not recorded from the Park, the Screwbean Mesquite, Prosopis odorata Torrey and Fremont, is reported in this range by Sudworth.

Range: Mesquite is found from southern Kansas southward to Oklahoma, Texas and Mexico, and westward to southern California.

Distribution Within the Park: One of the few Lower Sonoran Life Zone trees, Mesquite grows along the banks of the

Colorado River and to some extent on flats flanking the tributary streams near their junction with the Colorado.



Marion Photo

Honey Mesquite, Nankoweap Valley

Uses: The pulp and seeds are used for food by the Havasupai Indians. The wood makes excellent fuel and, where found in sufficient quantities, is suitable for furniture and cabinet work. The immensely developed roots furnish more wood than the trunks. Mesquite is the most important tree of the Southwest desert areas as it grows where no others will survive and the widespread root system is of value in retarding erosion.

Features of Interest: The enormous roots will penetrate 50 or 60 feet for water. Wood from the roots is not only much larger but is also heavier than that from the trunk. Tannin in quantity is contained in the wood, particularly that from the roots. Sap exuding from the trunk hardens to form a material similar to gum arabic and is used as a substitute for that substance.

SOUTHWESTERN LOCUST

(Also Thorny Locust and 3 other common names in use)

Robinia neo-mexicana luxurians Dieck

Class: Angiospermae Family: Leguminosae, the Peas

Distinguishing Characteristics: In the Park, this species varies in size from a vine-like shrub to a slender tree 25 feet in height and 6 to 8 inches in diameter. The fragrant,

showy, pale lavender, wisteria-like blossoms appear in June and the trees occasionally re-bloom in August. The leaves are pinnate, with oval leaflets $1/2$ to $3/4$ of an inch long. The red-brown, hairy pods are three to four inches in length and grow in small but dense clusters. The bark and twigs are dotted with sharp thorns. This species is not likely to be confused with any other tree within its area of distribution within the Park.



Southwestern Locust

Range: This representative of the locusts is found from Colorado through northern New Mexico and Arizona to southern Utah and western Texas.

Distribution Within the Park: Associated with Rocky Mountain White Oak, Southwestern Locust forms the dense chaparral thickets of the Kaibab Plateau fringing the Canyon rim. As it is a Transition Zone tree extending normally but slightly into the Upper Sonoran, it is rare on the South Rim although reported by Hawbecker from as low an elevation as Dripping Springs.

Uses: During the summer months, with the oak, it furnishes valuable food for the deer frequenting the vicinity of the rim on the Kaibab Plateau.

Features of Interest: The beautiful blossoms in spectacular clusters arouse the enthusiasm of many visitors to the North Rim during the early summer.

ARIZONA REDBUD

Cercis arizonica Rose

Class: Angiospermae Family: Leguminosae, the Peas

Distinguishing Characteristics: (Note: This species is not listed by Sudworth, but has been described by Rose since Sudworth's publication, consequently is classed in this publication as one of the Park trees.) Although commonly shrubby

in the Park, Arizona Redbud occasionally reaches tree size, being 10 to 12 feet tall and 2 or 3 inches in diameter. The single trunk is covered with smooth, grey bark and the mature twigs and branches are smooth throughout. The leaves are thick, heart-shaped and have 3 to 5 prominent veins. The small, sweet-pea shaped blossoms occur in clusters of clear magenta covering the branches with a brilliant flame



Arizona Redbud

in March and April. The fruit is a thin, flat, russet-brown pod with small, hard, brown, bean-like seeds. The wood is fine grained and dark yellowish brown with a thin layer of whitish sapwood. Longevity is undetermined.

Range: This species is limited in range to the Grand Canyon and probably other Canyons of the Colorado River Plateau.



Arizona Redbud

Distribution Within the Park: Redbud is fairly common throughout the lower portion of the Upper Sonoran Life Zone in the deep tributary canyons on both sides of the Colorado River.

Uses: The wood of the Redbud is of good quality but is commercially unimportant because of the scarcity and small size. Bernheimer reports its use by the Indians for making bows. The flowers are beautifully spectacular, enlivening the inner-Canyon arroyos and trailsides in the spring.

HOPTREE

(Also Skunkbush and 7 other common names in use)

Ptelea trifoliata Linnaeus

Class: Angiospermae

Family: Rutaceae

Distinguishing Characteristics: (Note: Considered by some authorities as Ptelea baldwinii Torey and Gray.) Where found in the Park, Hoptree occurs as a tall shrub or small tree with smooth, dark colored bark ranging from greenish-yellow to red brown on the young shoots. The bark and leaves are STRONGLY SCENTED. Leaves are three lobed and pointed. The greenish-yellow flowers are small, cymose and mature to a flattened, 2 to 4 seeded, disc-shaped, papery samara (wing-like scale).



Hoptree

Range: Rather widespread in its range, Hoptree is reported from southern Ontario, New York, Pennsylvania and west through southern Michigan, southern Iowa and southeastern Nebraska south to Georgia and west to eastern Texas extending into Arkansas, Oklahoma, Kansas and through New Mexico to Colorado and southern Arizona.

Distribution Within the Park: Finding a suitable habitat in the Upper Sonoran Life Zone, Hoptree occupies tributary canyons on both sides of the Colorado River beneath the rims. It is abundant along the Grandview Trail, Bright Angel Trail and along Bright Angel Canyon in the vicinity of Roaring Springs.

Features of Interest: Its strongly and rather unpleasantly scented bark and leaves give this tree a unique appeal to the casual hiker along Canyon trails. This feature also enables its ready identification.

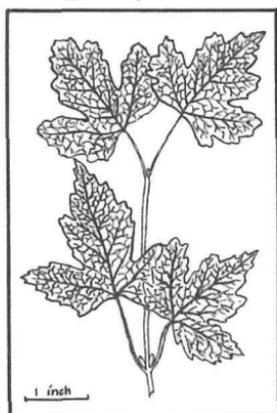
DWARF MAPLE

(Also Mountain Maple and 5 other common names in use)

Acer glabrum Torrey

Class: Angiospermae Family: Aceraceae, the Maples

Distinguishing Characteristics: Dwarf Maple, as its name implies, is commonly a sturdy shrub and it rarely reaches tree size within the Park although elsewhere it becomes 20 feet tall and up to 12 inches in diameter. The trunk bark is smooth and grey to reddish brown. Mature buds and twigs are smooth and RICH REDDISH BROWN. Mature leaves vary in depth of indentation, are smooth and shiny above and pale green beneath with yellowish veins. They are 3 to 5 lobed, the lobes being sharply pointed. LEAF STEMS ARE FREQUENTLY CLEAR RED. Fruit is ROSE RED before ripening but turns to russet brown. The wood is white with a thick sapwood, fine grained, dense, hard and heavy. Longevity is not known. It is possible to confuse Dwarf Maple with Bigtooth Maple, but the large, broad, blunt lobes of the latter's leaves make differentiation relatively easy.



Dwarf Maple

From Sudworth

Range: This species is found in the mountains of California and in the Rockies from Montana to Wyoming, Colorado, Utah, Nevada, Arizona and New Mexico. It also extends into northwestern Nebraska and southwestern South Dakota.

Distribution Within the Park: Although relatively rare in the Park, Dwarf Maple is occasionally encountered in sunny, semi-moist locations of the Transition and Lower Canadian Life Zones, along the North Rim.

Uses: This species is considered of no commercial value. It may offer some browse to deer where sufficiently abundant.

Features of Interest: After the first frosts, the leaves turn a dull bronze red giving color to the somber coniferous forests.

BIGTOOTH MAPLE

(Also Hard Maple and 4 other common names in use)

Acer grandidentatum Nuttall

Class: Angiospermae Family: Aceraceae, the Maples

Identification Characteristics: Usually encountered as a medium sized tree up to 50 feet in height and 12 inches in diameter, Bigtooth Maple occupies moist and shaded locations. The bark is smooth and grey to greyish brown. The flowers, which precede the leaves are BROADLY OBLONG with several teeth broadest near the apex. The fruit has an especially LONG WING, 1 inch or more. It is possible to confuse this species with Dwarf Maple, however, the broadly-lobed leaves and the larger size of the tree are usually sufficient characteristics for identification.

Range: Bigtooth Maple is found in northern Montana, southeastern Idaho, throughout Utah, western Wyoming, northern and southern Arizona, New Mexico, western Texas, southwestern Oklahoma and into Mexico.

Distribution Within the Park: This species occurs in the Park as a small, spreading tree in shaded locations near springs in the Transition and Upper Sonoran Life Zones. It is not reported from above the rim and occurs mainly on the north side of the Colorado River although found occasionally south of the River where climatic and moisture conditions favor its growth.

Uses: Where available, the wood makes excellent fuel.

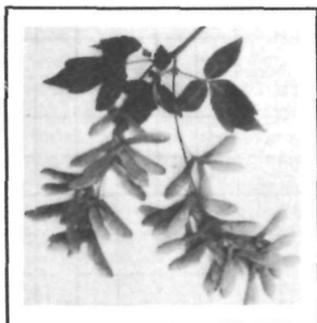


Bigtooth Maple

ROCKY MOUNTAIN BOXELDER

Acer negundo interius (Britton) Sargent
 Class: Angiospermae Family: Aceraceae, the Maples

Distinguishing Characteristics: Although considered by some botanists as a distinct species called Acer interius, Sudworth classes this form as a variety of the eastern boxelder. Usually found as a medium-sized tree, this variety reaches a height of from 20 to 50 feet with a diameter of 10 to 30 inches. The trunk is short and clear supporting a



broad, dense, rounded, usually drooping crown. The bark is a pale greyish brown with regular furrows and narrow ridges. The mature season's twigs are thickly coated with downy hairs as are the **THREE-PARTED LEAVES**, sometimes on both surfaces, always beneath. The greenish flowers differ from the other maples in being **SINGLE SEXED** and only **ONE SEX TO THE TREE**. Seeds remain on the twigs until well into the winter. The wood is creamy white to pale lemon yellow and the sapwood is scarcely

Rocky Mountain Boxelder

distinguishable from the heartwood. It varies from fine to coarse grain, is light, soft, firm but brittle. Longevity has not been determined, but the tree gives evidence of short life. The species is hardly confusable with any other Park tree.

Range: Boxelder is reported from Manitoba, Saskatchewan and Alberta southward through Montana, Wyoming, Colorado and Utah to New Mexico and Arizona. Another variety, Acer negundo arizonicum Sarg., is reported from Coconino County but has not been identified within the Park.

Distribution Within the Park: This species is similar in its choice of habitat to Bigtooth Maple, preferring moist although sunny locations in the Transition Life Zone. It is abundant near Cliff Spring on the North Rim and in the upper portions of Bright Angel Canyon and Roaring Springs Canyon.

Uses: Although the wood is suitable for second-rate finishing and for box boards and paper pulp, the timber is of rather poor quality which, with the limited supply, renders it of very little commercial importance. The tree is used in some localities as an ornamental.

CASCARA

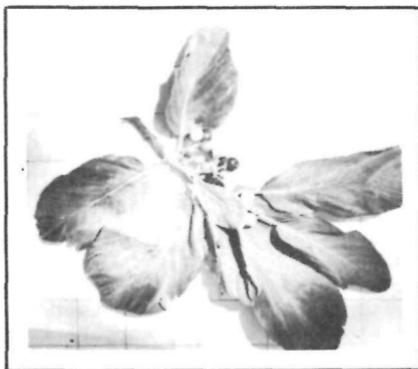
(Also Bitterbark and 19 other common names in use)

Rhamnus purshiana de Candolle

Class: Angiospermae

Family: Rhamnaceae

Distinguishing Characteristics: Reported from the Park only as a dense-clumped shrub, Cascara in its range becomes a widely branched tree over 30 feet tall with a trunk 20 to 30 inches in diameter. The trunk bark is smooth and brown to ashy grey while that of the twigs is a dull red brown and may be somewhat hairy. The mature leaves are rather leathery with pronounced hairyness on the veins and leaf stems. The veins are conspicuously connected in a network. The fruits are cherry-like and red, ripening to black. Within the thin, juicy, sweetish pulp are TWO TO THREE HARD, SMOOTH, OLIVE-GREEN SEEDS which are flattened where they come in contact with each other. The oval leaves, rounded at the tip, are about the same width throughout and persist late into the autumn. The wood is pale yellowish brown with a faint tinge of red. It is moderately heavy, soft, coarse grained and firm but brittle. The thickness of the layer of whitish sapwood varies with the habitat. Longevity is 50 years or more.



Cascara

Range: Cascara occurs from Puget Sound southward to central California, and eastward through northern Washington, northeastern Oregon, Idaho and Montana. In Arizona it is found in the Chiracahua Mountains and in the Grand Canyon.

Distribution Within the Park: As a shrub, this species is reported from the upper portions of Roaring Springs Canyon where it is found under Transition Zone conditions.

Uses: Although the wood is of no commercial importance, the bark is in great demand for medicinal purposes and over half a million pounds are shipped annually from the Pacific Northwest to eastern United States and to Europe.

Features of Interest: Fortunately the roots of this species have great vitality so that the hundreds of trees cut each year for their bark are gradually replaced by new shoots. With proper care and supervision there is little danger of Cascara being exterminated through exploitation.

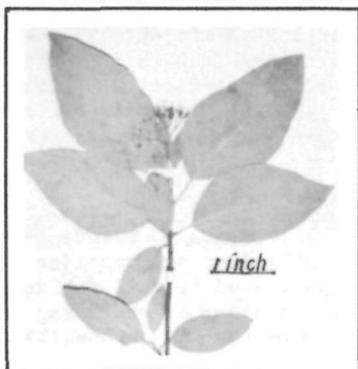
DOGWOOD

Cornus stolonifera Michaux

Class: Angiospermae

Family: Cornaceae

Distinguishing Characteristics: This species very rarely reaches tree size and, as far as is known, is never more than a bushy shrub in the Park. The branches and twigs are markedly reddish brown in hue, the leaves are short stemmed and oval and the FLOWERS ARE SMALL AND CLOSELY GROUPED IN A FLAT CYME. The berry-like fruits are borne in flat, open clusters.



Range: This species is found throughout the Rocky Mountains in the upper portion of the Transition and Lower Canadian Life Zones.

Dogwood

Distribution Within the Park: Dogwood has been observed by the writer in Neal Spring Canyon and near Bright Angel Spring on the North Rim.

MANZANITA

Arctostaphylos sps.

Class: Angiospermae

Family: Ericaceae, the Heaths

Several species of the genus Arctostaphylos are found in the Park. Occasionally they attain tree dimensions here according to observations of Park Naturalist McKee. However, Sudworth considers all of the members of this genus as shrubs,

vis: "The question of what plants can be considered as arborescent is always difficult to decide and in no case is it more perplexing than in the case of two or three species of manzanita. With some reluctance, then, these tree-like forms are for the present excluded from the check list". From Check List of the Forest Trees of the United States, Their Names and Ranges, by George B. Sudworth.

SINGLE LEAF ASH

(Also Dwarf Ash, Ash, and Anomalous Ash)

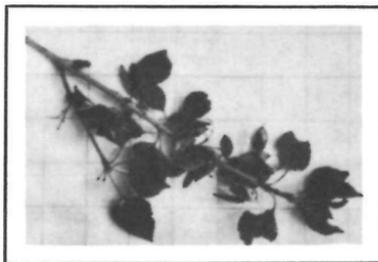
Fraxinus anomala Torrey

Class: Angiospermae

Family: Oleaceae

Distinguishing Characteristics: As the name Dwarf Ash indicates, this tree is usually quite small, not more than 15 or 20 feet in height although larger individuals are reported in Havasu Canyon by Marion. It is readily distinguished from the other ashes by the fact that the leaves are SINGLE, SOMEWHAT HEARTSHAPED and 1-1/2 to 2 inches in length. The flowers are inconspicuous occurring in an open cluster or panicle. The fruit is a SAMARA or wing-like scale which readily distinguishes this genus from the Redbud with which Single-leaf Ash might be confused.

Another species of ash, Fraxinus macropetala Eastw., is found in the Park and is reported of tree size. However, it is not listed by Sudworth who apparently does not consider it as a tree, consequently it will not be listed in this publication as a tree. It is described by Tidestrom as occurring on rocky slopes up to 6,000 feet in elevation in northwestern Arizona. The leaves are pinnate, hairy, somewhat oblong in shape with leaflets 1/4 to 1 inch in length. The flowers contain organs of both sexes, and the calyx and corolla are deeply four cleft. The fruit is oblong and winged above the middle. This species is readily distinguished from the Single-leaf Ash by the PINNATE LEAVES, and from the Hoptree by the fact that the leaves and bark are not odiferous. Several other species in this genus are found throughout the Southwest, but none has been reported from the Park.



Single Leaf Ash

Range: Single-leaf Ash is reported from western and southwestern Colorado, through southern Utah to southern Nevada and California.

Distribution Within the Park: This species occurs, in the main as a tall shrub, through the Upper Sonoran Life Zone occasionally invading the lower portion of the Transition. It



Single Leaf Ash

is more common north of the Colorado particularly in Bright Angel Canyon although it has been observed by Hawbecker along the Grandview Trail and is reported by Marion from Havasu Canyon.

Uses: The ashes, as a group, are important as a source of hardwood lumber. Although the quality of the wood of this species is equal to that of the eastern varieties, its small size and limited range render it of no commercial importance.

Features of Interest: The fact that this species of all the ashes has a simple rather than pinnate leaf makes it of especial interest to the botanist.

MEXICAN ELDER

(Also Elder, Elderberry Tree and Mexican Elderberry)

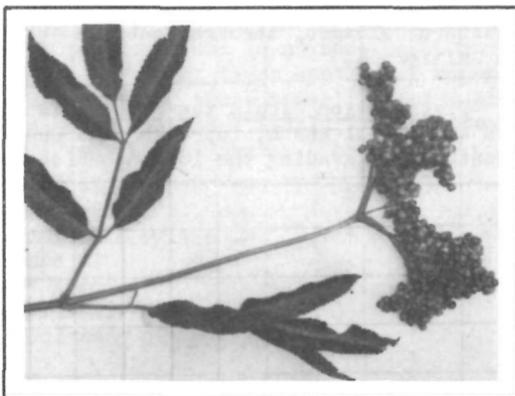
Sambucus coerulea arizonica Sargent

Class: Angiospermae

Family: Caprifoliaceae

Distinguishing Characteristics: (Note: This form is classed by some authorities as Sambucus neo-mexicana Wootton). The Mexican Elder commonly occurs in the Park as a tall, many-stemmed shrub. It occasionally reaches a height of 15 or 20 feet with a trunk diameter of 4 to 8 inches. The lower branches are arched and drooping giving the tree a broad, rounded crown. The thin, yellowish-brown bark is deeply cut into a network of narrow, connecting ridges. The season's twigs are smooth, reddish brown, angled and marked with large, horse-

shoe-shaped leaf scars. The mature leaves are composed of 3 to 9 leaflets, lighter green beneath. The small, CREAM COLORED BLOSSOMS form a CONSPICUOUS, OPEN CYME. Mature berries appear whitish from a chalky bloom which, when rubbed off, exposes a blue-black skin. The fruit occurs in DROOPING OPEN CLUSTERS and is EDIBLE.



Mexican Elder

The berries are 1 to 3 seeded and have a sweetish flavor. The wood is pale brown to yellow with a thin, whitish sapwood. It is wide grained, light, soft and brittle. The tree is short lived. Two other species of Sambucus are listed as present in the Park, but both are of shrub size. These are S. melanocarpa A. Gray and S. microbotrys Rydb.

Range: Mexican Elder is reported from southern New Mexico, Arizona and southern California.

Distribution Within the Park: This species occurs as a large shrub or small tree in the Transition Life Zone. It is abundant on the Walhalla Plateau and just back of the rim on the north side of the Canyon. It has been reported occasionally from the South Rim.

Uses: The wood is of no commercial value, but the berries are eagerly consumed by birds and small mammals and are gathered by humans for jam, jelly, wine and pie. The tree adds to the verdant beauty of the Kaibab Plateau and attracts birds that contribute much to the pleasure of the visitor.

Trees Not Native to the Park

ALTHOUGH it is contrary to the National Parks policy to introduce any biological species not originally native to the area within a park, plants and animals have sometimes been introduced prior to the setting aside of the reserve, or have become established even in the face of preventive efforts. In Grand Canyon National Park, the following trees (and possibly more), not native to the area, are present.

Apple.....Indian Gardens, El Tovar Hotel
 Apricot.....Phantom Ranch, Havasu Canyon
 Peach.....Phantom Ranch, Havasu Canyon
 Fig.....Havasu Canyon
 Nectarine.....Phantom Ranch
 Pomegranite...Phantom Ranch
 Plum.....Phantom Ranch
 Tamarix (Tamarix gallica Lin.) Thickets along Colorado River near eastern end of the Park. It is also reported by Grater as fringing the River near the mouth of Bright Angel Creek.



Grand Canyon sunset

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Illustrations are by the writer except as otherwise noted. Comparative size indicators in detail illustrations are one inch squares.

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