Field Key to Southern Arizona Conifer Trees
(Arizona South of the Mogollon Rim/Salt River)

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A. Leaves are needles, single or clustered as fascicles bearing 2–5 needles each; seed cones woody, more than 1 inch long …….. Key A (Family Pinaceae - pines, firs and spruces)

B. Leaves are scales, opposite-paired or whorled along branch; seed cones woody, or fleshy and berrylike, less than 1 inch long …….. Key B (Family Cupressaceae - cypress and junipers)

Key A. Pinaceae (pines, firs, Douglas-fir, and spruces)[A]

1 Needles single, not arising as fascicles (spruce, fir, and Douglas-fir) …….. 2

1' Needles multiple (very rarely single), arising as fascicles in clusters of 2–5 (pines) …….. 6

2 Needles square or rectangular in cross-section, and always sharp-tipped; needles with bluish or silverish hue; needles leave large raised scars on stems when they fall off; cones pendant, hanging downward (spruces) …….. 3[B]

2' Needles not square in cross-section (flattened) and not sharp-tipped (but may be acutely rounded); needles green to blue-greenish; needles do not leave large raised scars on stems when they fall off; cones pendant (Douglas-fir) or erect/upright (true firs) …….. 4

3 Needles 0.5–1.0 inches long, very stiff; needles end in very sharp spinelike point (painful to firmly squeeze branches); cones 2–4 inches long; needles sub-squarish in cross-section; bark of mature trees gray and furrowed; central western U.S. to AZ and NM; generally >8000 feet …….. **Blue spruce (*Picea pungens*)**

3' Needles 0.75–1.4 inches long, less stiff; needles sharp-tipped, but not so spinelike (not painful to firmly squeeze branches); cones 1.5–2.5 inches long; needles sub-rectangular in cross-section; bark purplish/reddish, thin and scaly; Canada and western U.S. to AZ and NM; generally >9000 feet …….. **Engelmann spruce (*Picea engelmannii*)**


Engelmann spruce branches; note immature seed cone (right)


Blue spruce, with conelike gall of *Adelges cooleyi* (left) and with seed cones (right)

4 Needles 1–1.5 inches long, borne on a slender, elbowed, yellowish stem (petiole); needles arranged subspirally around branch; needles yellow-green to dark-green, often with a groove on top (and 2 rows of white underneath); needle scars not flush with stem, slightly tilted up on side closest to trunk; cones hanging down (pendant) from branches and with diagnostic 3–pointed bracts extending beyond the cone scales (central point on bract very long); bark hard, dark, and becoming more furrowed in mature trees; trunks not "self-pruning," so many dead branches occur below level of foliage; tallest of all "firs" in region; Canada and western U.S. into Mexico; 5000–10,000 feet …… **Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* var. *glauca*)**



(Cont.)

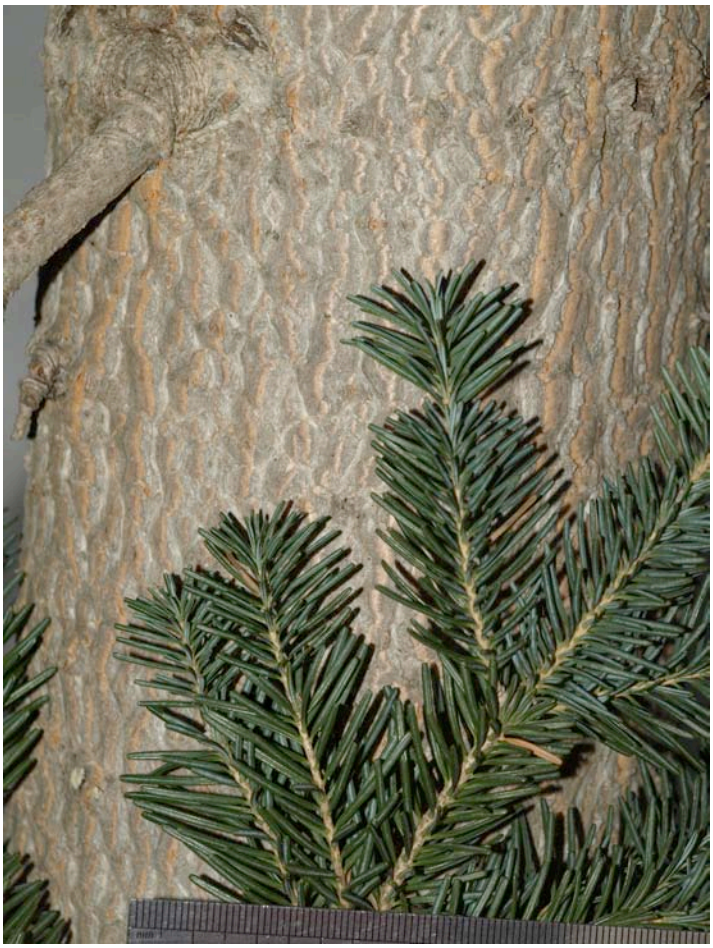

Rocky Mountain Douglas-fir (*Pseudostuga menziesii* var. *glauca*). Note the young and old cones.

4’ Needles 0.5–2.5 inches long, not borne on a slender, elbowed stalk (petiole); needles not arranged subspirally around branch; needles green to blue-green, often with silvery sheen due to faint whitish lines; needle scars flush with stem; cones perched upright (erect) in dense clusters near top of tree, with short, hidden bracts not 3-pointed; bark may be corky or hard; trunk may or may not be “self-pruning”
…… 5

5 Needles 1–2.5 inches long, tending to curl upward; needles usually arranged roughly in 2 rows on branch, greater than ~90 degrees apart; needles with silvery sheen due to faint whitish

lines on both surfaces; cones 3–5 inches long (rarely seen on ground due to cone axis persisting on the tree, scales and seeds falling separately, and by heavy consumption of seeds by birds and squirrels); younger bark thin with resin blisters (bark penetrable with fingernail, leaving a puncture), although large trees have a thick, rugose, furrowed bark near the base; western U.S. into northernmost Mexico; 6000–10,000 feet …….. **White fir (*Abies concolor*)**

5’ Needles 0.5–1.0 inches long, straight (not curling, or barely curling upward); needles not in 2 distinct rows, but set less than 90 degrees apart on top side of branch, and greater than 90 degrees apart on underside; needles deep blue-green, lighter underneath due to 2 distinct white lines; cones 2–4 inches long (cones tend to stay on tree until they disintegrate); bark distinctly corklike in younger and mature trees, without resin blisters, and penetrable with fingernail without leaving a puncture; never a very large tree; Rocky Mountains of southern CO, into AZ and NM; 8000–12,000 feet …….. **Corkbark fir (*Abies bifolia* var. *arizonica*)**[C]



Corkbark fir (*Abies bifolia* var. *arizonica*)

White fir (*Abies concolor*) tree, in center foreground, and needles on bark

6 Needles always clustered at ends of branches; needles long, 4–16 inches; parchment of leaf fascicle base persisting, shed with needles; cone scales usually tipped with sharp pointed spine ……… 7

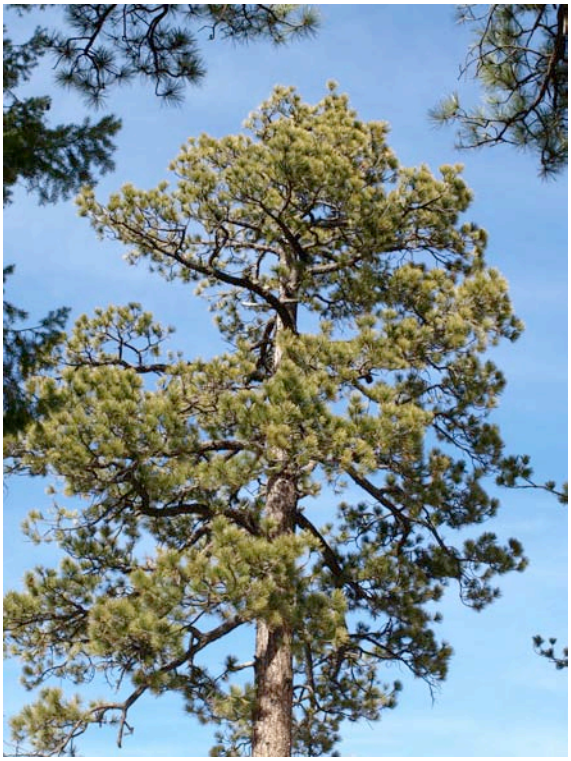
6’ Needles may or may not be clustered at branch ends; needles shorter, 1–6 inches; parchment of leaf fascicle base not persisting, shed before needles fall or coiled back at base; cone scales mostly without a pointed tip spine ……………………………………………………………………… 9

7 Needles primarily in clusters of 3, 8–16 inches long; parchment of leaf fascicle base large, 1–1.5 inches long; needle groups form brushes at ends of branches, often the branch thick and curling; cones 3.5–8.5 inches long, asymmetrical; a Mexican species, barely entering southeastern AZ and southwestern NM; 5500–7500 feet …. **Apache pine (*Pinus engelmannii*)**[D]


Apache pine (*Pinus engelmannii*)

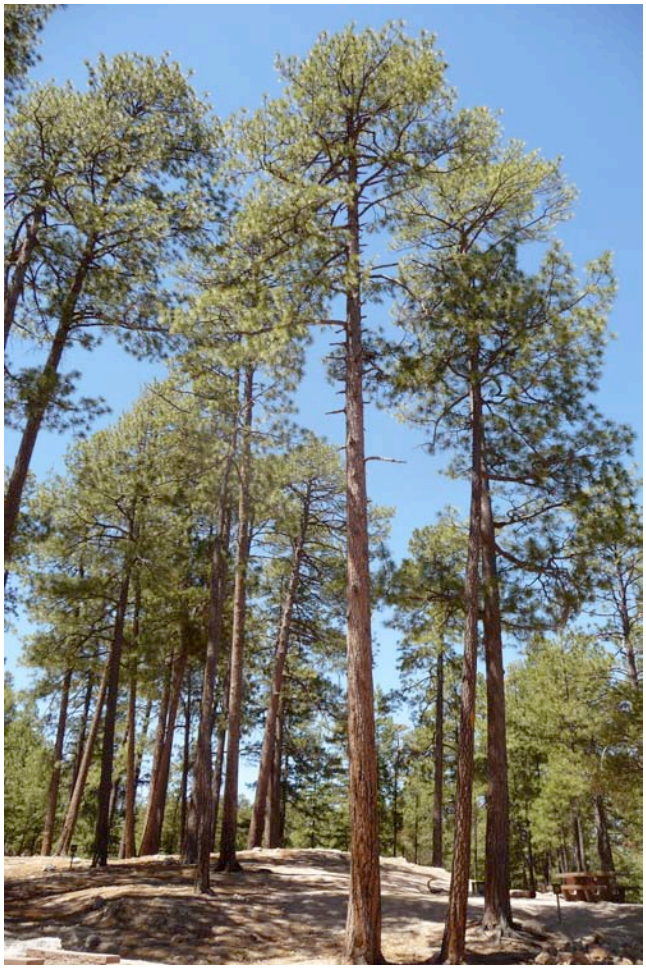
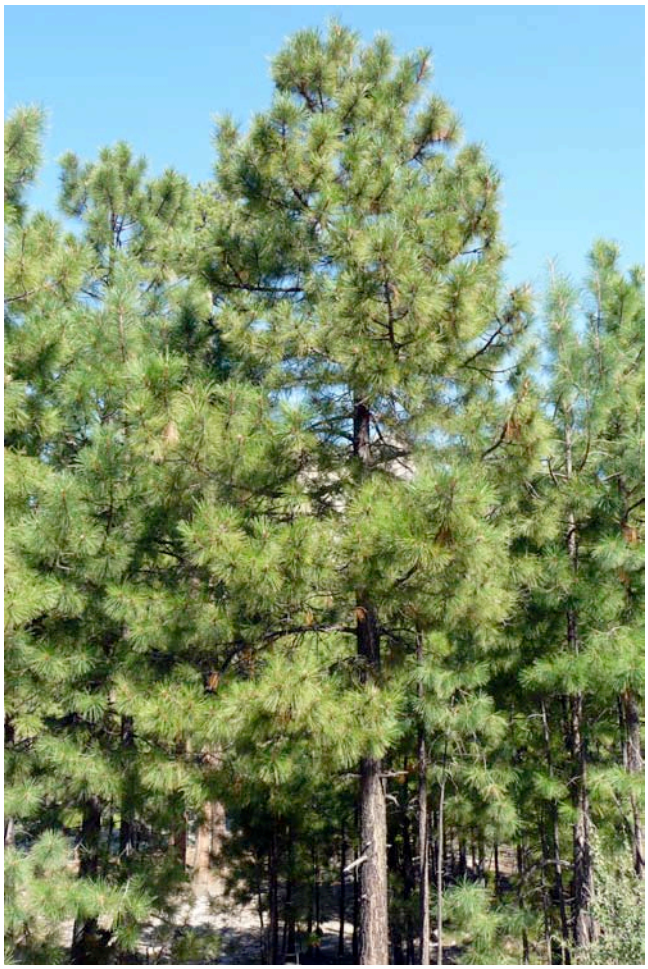
7’ Needles primarily in clusters of 3 or 5, shorter, 4–9 inches long; parchment of leaf fascicle base small, less than 1 inch long; needles clustered on ends of branches, but branches not markedly thick or curling; cones only slightly asymmetrical …… 8

8 Needles primarily in clusters of 3; cones 2–5 inches long; cone scales tipped with a sharp spine; bark thick and rough, dark brown in young trees, but taking on a distinct reddish-brown color with age (except in “blackjack pine” variant, which remains dark); trunk largely “self-pruning,” with lowermost dead branches falling to ground; widespread in the western U.S. (NM and AZ) and into northwestern Mexico; 5000–10,000 feet …… **Rocky Mountain ponderosa pine (*Pinus ponderosa* var. *scopulorum*)**[E]




Rocky Mountain ponderosa pine (*Pinus ponderosa* var. *scopulorum*)

8’ Needles in clusters of 5 (rarely less); cones short, 2–3 inches long; cone scales merely pointed at tip; bark of mature trees relatively smooth, brown, or with reddish hue; primarily a Mexican species, found in southeastern AZ and southwestern NM; 6000–8200 feet …….. …….. **Arizona pine (*Pinus arizonica*)**[E]

Arizona pine (*Pinus arizonica*); note basal parchment on needle fascicles

Arizona pine (*Pinus arizonica*)

9 Needles 1–2 inches long and curved toward branch; cones 1–2 inches long, small and stumpy-appearing, on very short stalks; cone scales irregular and stubby, the seeds noticeably large for the size of the cone; tree crown spreading and rounded, rarely over 18 feet in height …… 10

9’ Needles 1.5–6 inches long, curving or straight; cones 1.5–10 inches long, not stumpy-appearing, on longer stalks; cones normal, scales with or without tip spines, the seeds not large for the cone size; tree crown pointed or evenly rounded; commonly over 18 feet tall …….…… 11

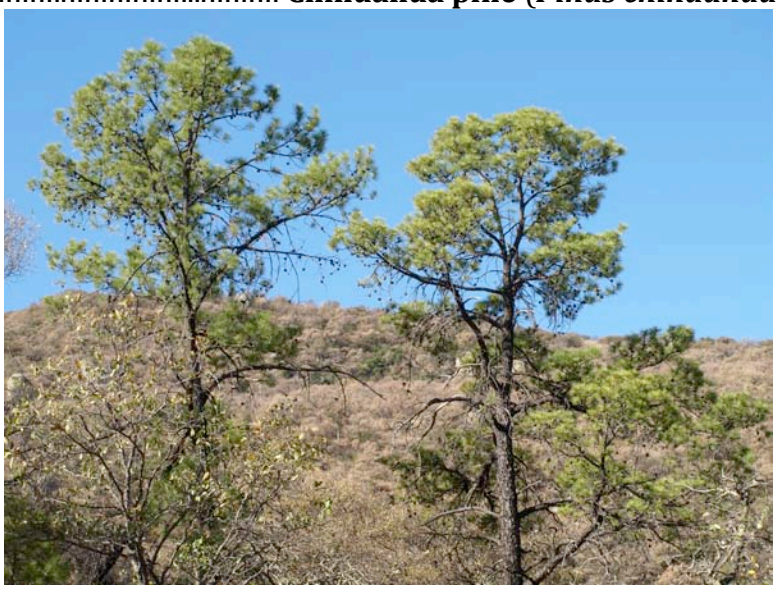
10 Needles flexible, in clusters of 3 (rarely 2 or 4); needle surfaces contrasting, with white lines only on the sides facing the middle of each fascicle; bark gray-brown and flaking; primarily in the borderland of northern Mexico, southeastern AZ, and adjacent NM; 4500–8000 feet ……. ……..... **Border pinyon (*Pinus discolor*)**

Border pinyon (*Pinus discolor*)

10’ Needles stiff, in clusters of 2 or 1 (occasionally 3); needle surfaces more uniform, with less obvious white lines; bark dark brown and hard; western U.S. into southeastern AZ and southern NM; 4000–8500 feet ..... **Colorado/two-needle pinyon (*Pinus edulis*) and singleleaf pinyon (*P. edulis* var. *fallax*)**[F]


Left: Colorado/two-needle pinyon (*Pinus edulis*). Right: singleleaf pinyon (*P. edulis* var. *fallax*)

11. Needles in clusters of 3 (rarely 2 or 4), dark green or yellow-green, never with white lines from base to tip; branches very flexible, but not so flexible that it can be bent nearly double without breaking; cones 1.5–3 inches long, on long thin stalk, remaining on tree long after dry and seedless (“persistent cones”); cone scales blunt but often forming a small tip spine; bark often dark or black on mature trees; a Mexican species with its range extending into central and southeastern AZ and adjacent NM; 5000–7000 feet ..... **Chihuahua pine** (***Pinus chihuahuana****; =P. leiophylla* var. *chihuahuana*)




Chihuahua pine (*Pinus chihuahuana*)


Chihuahua pine (*Pinus chihuahuana*)

11’ Needles always in clusters of 5, bright glossy green to yellowish green usually with white lines; branches very flexible, can be bent almost double without breaking; cones 3–10 inches long, on short thick stalk, falling from tree when mature; cone scales always blunt, without a tip spine; bark gray, rarely black on mature trees …… 12

12. Needles soft & flexible, 1.5–4 inches long; needle surfaces contrasting, with white lines more or less visible only on the sides facing the middle of each fascicle; cones very large (largest cones of any Arizona pine), 5–10 inches long; cone scales with pointed white-resinous tip that bends strongly backward when cone is open; trunk single, typically covered with dead branches nearly all the way to the ground (not “self-pruning”); tree crown may be irregular, but always pointed (Xmas-tree shape); a central Mexican species widespread in the southwestern U.S.; 6000–11,000 feet …… **Southwestern white pine (*Pinus strobiformis*)**




Southwestern white pine (*Pinus strobiformis*). Note the reduced/absent basal parchment on the needle fascicles.


Southwestern white pine (*Pinus strobiformis*)

12’ Needles less flexible, 1–3 inches long; needle surfaces all with white lines from base to tip; cones 3–6 inches long; cone scales more horizontal, not bent backward when cone is open; trees with single or multiple short crooked trunks; tree crown pointed or rounded; Canada and western U.S. into northern NM and north-central & eastern AZ; 7500–10,000 feet …… …… **Limber pine (*Pinus flexilis*)[G]**

Limber pine (*Pinus flexilis*)

Notes on Pinaceae (pines, firs, spruces, Douglas-fir)

A. Pines (the genus *Pinus*) are primarily a northern temperate group with 100 species described worldwide, about half of which are native to Mexico. They are distinguished by having leaves and branchlets modified into fascicles, consisting of a basal sheath of scales (a modified branchlet and specialized leaves) plus the needles (modified leaves).

B. In the Sky Islands, spruces are common only in the Pinaleño and Chiricahua Mountains (mostly above 9000 feet). Spruces do not occur naturally in the Catalina Mountains, although a few have been planted in Summerhaven and at the Ski Lift area. Blue and Engelmann spruce are difficult to differentiate and some workers believe they might be ecotypes of a single species.

C. Corkbark fir, the more southern *Abies bifolia*, now recognized as a distinct variety, *A. bifolia* var. *arizonica* (= *Abies lasiocarpa* var. *arizonica*), is uncommon in the Sky Islands, occurring only on the highest, north-facing slopes of the Catalina Mountains above 8000 feet, and in the Pinaleño Mountains where the population has declined since 2000 due to insect infestation. Rocky Mountain subalpine fir, the more northern variety, *Abies bifolia* var. *bifolia*, lacks corky bark and does not occur south of the Mogollon Rim.

D. Apache pine probably does not occur in the Catalina Mountains. The U.S. Forest Service claims it was recorded from the Catalinas 100 years ago but is absent there today. Most populations of Apache pine are in extreme southwestern New Mexico, extreme southern/southeastern Arizona, and in northern Mexico.

E. Because Arizona pine and ponderosa pine can be difficult to distinguish from one another, and because they share very similar physiology and demography, the Coronado National Forest manages them as if they were a single species. In fact, in the past some workers had considered Arizona pine to be a variety of ponderosa pine (*P. ponderosa* var. *arizonica*), but this is not current opinion. Rocky Mountain ponderosa pine can be distinguished from Arizona pine because it primarily has 3-needled clusters, whereas Arizona pine almost invariably has 5-needled clusters. Rocky Mountain ponderosa pine usually has reddish bark plates bordered in black (in mature trees) although sometimes trees with dark bark and narrower trunks (in mature trees) are known as "blackjack ponderosa." In the Catalinas, Arizona pine begins to dominate the "tall pine" forests at around 6500 ft; at around 8000 ft Rocky Mountain ponderosa pine and Douglas-fir begin to take over as the dominant "tall pines" and Arizona pine has largely disappeared.

F. This couplet keys out both the Colorado (two-needle) pinyon (*Pinus edulis*) which occurs throughout the Colorado plateau, and the Arizona singleleaf pinyon (*P. edulis* var. *fallax*, =*P. monophylla* var. *fallax*) which is abundant in northwestern and central Arizona at the southern limit of the Colorado Plateau, yet both are rarely encountered south of there in Arizona or New Mexico. Only the border pinyon (*P. discolor*) occurs in most Sky Islands, including the Catalina Mountains, but the border pinyon, singleleaf, and Colorado/two-needle pinyon all occur in the Chiricahua Mountains. Very few of any of the pinyons occur in the Pinaleño Mountains.

G. Limber pine is a northern species, barely reaching into New Mexico and Arizona, and it is related to *P. strobiformis* (the more southern of these white pines, which is abundant in the higher Sky Islands and Sierra Madre). However, according to a Forest Service tree biologist in the Catalinas, a few limber pines occur in the Catalinas along the highway, where they have been planted. This species also occurs in east-central Arizona and has been reported from the Galiuros and Pinaleños.

Key B. Family Cupressaceae (cypress and junipers) [(a)]

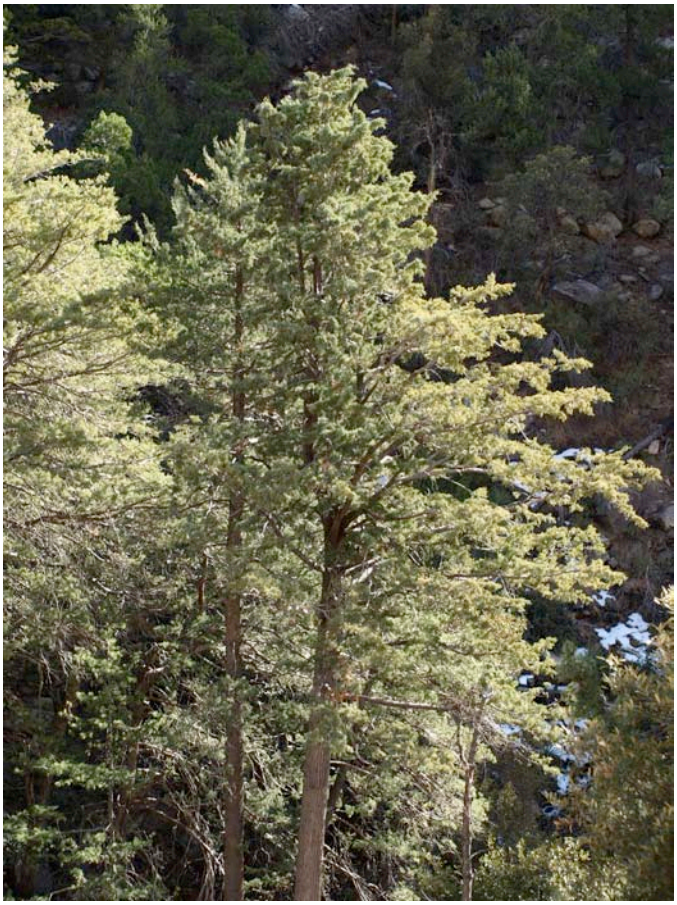
1 Bark thick and hard, fissured into large rectangular blocks; leaves with a conspicuous white resin dot; seed cones 0.3–0.6 inches, fibrous but not woody, tan or reddish-brown under greenish-gray coat; seeds usually 2–4 per cone; southwestern U.S. and Mexico; 4500–8500 ft …… **Alligator juniper (*Juniperus deppeana* var. *deppeana*)**



Alligator juniper (*Juniperus deppeana* var. *deppeana*)

1' Bark thin (sometimes thick), fissured vertically into interlacing strips (or plates); white resin dots usually only visible on leaves of branchlet tips, or not visible at all; seed cones either woody or fleshy …… 2

2. Trees conical-crowned, to 25–65 feet tall; trunk usually straight, not forked below crown; branches spreading or somewhat drooping, horizontally tiered and fir-like; seed cones woody, 0.7–1 inches in diameter; pollen and seed cones borne together on the same tree; leaves with clear resin dot (not often white); riparian on stream banks or moist north-facing slopes in central and southeastern AZ into Mexico; 5000-7000 feet …… **Arizona cypress (*Cupressus arizonica* spp. *arizonica*)[(b)]**




Arizona cypress (*Cupressus arizonica*), with pollen and seed cones.

2’ Trees with rounded crown, usually <25 feet tall; trunk usually forked or branched below crown; branches upright, the branchlets clumping on grayish twigs; seed cones soft and fleshy, 0.25–0.30 inches in diameter; pollen and seed cones borne separately on male and female trees; white resin dot mostly visible (on leaves of branchlet tips); in more arid habitats …….. 3

3 Seed cones bluish to brownish-blue under whitish blush; seeds 1 (rarely 2–3) per cone; near southern limit of Colorado Plateau and northward, often bordering grassland; 4500–7500 feet. …….. **One-seeded juniper (*Juniperus monosperma*)**

3’ Seed cones red-orange under whitish blush, appearing pink or rose-colored; seeds 1 (rarely 2) per cone; southern limit of Colorado Plateau and south into northern Mexico, scattered in desertscrub or desert grassland; 3500–5500 ft …….. …….. **Arizona juniper** (***Juniperus arizonica***; = *J. coahuilensis* var. *arizonica*)

Arizona juniper (*Juniperus arizonica*

Notes on Cupressaceae - cypress and junipers

(a) The common juniper (*Juniperus communis* var. *depressa*) is a circumboreal species from sea level to 9200 feet. The seed cones are used to flavor gin. However, in Arizona it occurs only north of the Mogollon Rim. It can be distinguished from the junipers in this key by its elongated (rather than beadlike) scales/leaves, and low spreading shrub form. Utah juniper (*Juniperus osteosperma*) and Rocky Mountain juniper (*Juniperus scopulorum*) are large trees, occurring peripherally to the Sky Islands in Arizona and New Mexico, from the southern Colorado Plateau into the Rocky Mountains. To distinguish Utah juniper from others in this key, the male and female cones are borne on the same tree, with a single large seed per cone. The bark is not checkered in either, although in Rocky Mountain juniper it can be slightly plated, but the foliage of the latter is drooping, and the cones are fleshy, usually containing two seeds per cone.

(b) The current taxonomy of Arizona cypress (*Cupressus arizonica*) recognizes 3 subspecies, but does not recognize the former variety "*glabra*" (which has been subsumed in *C. arizonica arizonica*). Arizona cypress is localized in distribution, with relicts occurring in only a few Sky Island canyons (most noticeably in canyons of the Chiricahua, Catalina and Dragoon Mountains). It is more common in the Sierra Madre ranges of western and eastern Mexico. A more smooth-barked form (once considered a distinct variety, "*glabra*") occurs in central Arizona, along the Verde River drainage, and is cultivated elsewhere. However, the smooth and furrowed-bark forms show complete intergradation.