A Preliminary Floral Inventory of Cathedral Cave Preserve, Yavapai County, Arizona, USA

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Study Area

The Cathedral Cave preserve is a privately owned 40 acre parcel of land (surrounded by public and private land parcels) that guards entrances to a cave system eroded into the Redwall Limestone. Located approximately 8.75 miles (14 km) southwest of Ash Fork in Yavapai County, Arizona (Figure 1), the preserve sits at approximately 5400 feet (1645 m) elevation. The area is characterized by a temperate climate (Figures 2 and 3) with an average annual precipitation of 17.42 inches (44.25 cm).



Figure 1. Landscape-scale map of Cathedral Cave Preserve. Map generated by National Geographic TOPO!



Figure 2. Average minimum and maximum temperature (degrees Fahrenheit) at Ash Fork, Arizona based on climate data from Weather Station 020482 between 1902 and 1987. Data were accessed from the Western Regional Climate Center website on 4/5/2008 (www.wrcc.dri.edu).





The vegetative species list (Appendix A) presented in this report is based on visits to the preserve on April 9, 2006; August 26, 2006; and September 21, 2007 and should be

considered a preliminary flora, as several unique species were not identifiable during any of the visits. The list of annuals in particular is almost certainly incomplete.

Vegetation

The dominant vegetation type near Cathedral Cave is pinyon pine (*Pinus edulis*) and Utah juniper (*Juniperus osteosperma*) woodland. Dominant understory shrubs include cliffrose (*Purshia stansburiana*), bitterbrush (*Purshia tridentata*), and prickly pear (*Opuntia engelmannii*). Common native bunchgrasses at the site include side-oats grama (*Bouteloua curtipendula*) and blue grama (*Bouteloua gracilis*).

Introduced species

The flora of Cathedral Cave is predominately native, with only four identified introduced species: cheatgrass (*Bromus tectorum*), red brome (*Bromus rubens*), stork's bill (*Erodium cicutarium*), and horehound (*Marrubium vulgare*). None of these species are considered noxious weeds by the state of Arizona. These four introduced species are commonly found on disturbed lands, with the brome grasses and stork's bill often associated with livestock-grazed areas. Ecologically, the brome grasses can increase fuel loads and potentially increase fire frequency where these grasses occur at high densities.

Unusual species

Two species found at the preserve occur outside of their normal distribution in the state. First is Texas mulberry (*Morus microphylla*), a tree or shrub usually found in riparian drainages at slightly lower elevations in the state of Arizona. At the preserve it grows near the entrance to Indian Cave. This fruit-bearing tree may have been planted by earlier inhabitants.

The second unusual species is Fort Bowie prairie clover (*Dalea brachystachya*). According to the Arizona Flora (Kearney and Peebles 1960), this species has a much more southerly distribution in Arizona. It is, however, a limestone affiliate. A voucher specimen of this species was collected nearby during a previous, unconnected study (Fabaceae of Arizona) and is housed at the Deaver Herbarium, Northern Arizona University, Flagstaff, Arizona.

Annotated species list

Ethnobotanical uses are compiled from Bowers (1993), Dunmire and Tierney (1997), Elmore (1976), Kearney and Peebles (1960) and public sources.

Trees

Cypress Family - Cupressaceae

Utah juniper (*Juniperus osteosperma*)

Juniper trees have a wealth of useful properties and juniper berries were regularly eaten by prehistoric and historic native peoples. The bark breaks down into fibrous strands that make excellent kindling, and the shredded bark can be braided into twine. Numerous medicinal and ritual uses for juniper have also been reported. Pine Family - Pinaceae

Pinyon pine (*Pinus edulis*)

Pinyon nuts are historically one of the premier foodstuffs of the southwestern United States, containing all the amino acids necessary for complete proteins and weighing in at over 3000 calories per pound! Pinyon pitch was used by native Americans as an adhesive and to form watertight seals.

Shrubs

Sumac Family - Anacardiaceae

Skunkbush sumac (*Rhus trilobata*)

This plant is commonly known as "lemonade berry," because the red berries impart a tart flavor when placed in water. The branches are a preferred material for native basket makers. The leaves turn a bright red in fall.

Barberry Family - Berberidaceae

Red barberry (Mahonia haematocarpa)

Barberry's yellow flowers smell deliciously like honey, and the red berries are edible. This genus contains the alkaloid berberin and has been utilized in many traditional medicines.

Jointfir Family - Ephedraceae

Mormon tea (*Ephedra viridis*) The bitter photosynthetic branches can be brewed into a mildly stimulating medicinal tea.

Oak Family - Fagaceae

Scrub oak (*Quercus turbinella*) Acorns were probably an important native food source. The tree's hard wood was used for a variety of implements.

Currant Family - Grossulariaceae Trumpet gooseberry (*Ribes leptanthum*) This spiny shrub produces edible berries.

Mulberry Family - Moraceae

Texas mulberry (*Morus microphylla*) The fruits of this large shrub are edible, and this species has been cultivated by the Havasupai nation.

Olive Family - Oleaceae

New Mexico olive (*Forestiera pubescens*) The hard wood was used by Hopi for their digging sticks.

Rose Family - Rosaceae

Alderleaf mountain mahogany (Cercocarpus montanus)

Navajo use this plant for producing dyes, and it provides forage for native ungulates.

Desert sweetbush (Chamaebatiaria millefolium)

Blackbrush (*Coleogyne ramosissima*)

Cliffrose (*Purshia stansburiana*)

The sweet-smelling flowers are a welcome fragrance in late spring. Native Americans used the shreddy bark as padding or stuffing, and the wood for making arrows. The plant has many medicinal uses and is a Navajo dye plant.

Antelope bitterbrush (*Purshia tridentata*) Closely related to cliffrose, these two plants can hybridize and are used in much the same way by historic tribes.

Citrus Family - Rutaceae

Common hoptree (*Ptelea trifoliata*) The bitter fruits of this large shrub have been used as a substitute for hops.

Cactus

Cactus Family - Cactaceae Cholla (*Cylindropuntia* sp.)

> Hedgehog cactus (*Echinocereus* sp.) Brilliant red blooms festoon these tufted cacti. The small fruits are sweet and edible.

Prickly pear (*Opuntia engelmannii*) The fruits are edible and were widely collected by prehistoric and historic native peoples.

Subshrubs

Agave Family - Agavaceae

Parry's agave (Agave parryi)

Agave roasting pits are found throughout the southwest, a sign that this genus was an important foodstuff.

Banana yucca (*Yucca baccata*)

Cordage can be produced from the fibrous leaves of yucca. The flowers and fruits are edible and the roots contain saponin which produces soapy suds when churned in water.

Composite Family - Asteraceae California brickellbush (*Brickellia californica*) Rose heath (*Chaetopappa ericoides*) Showy, white daisy-like flowers bloom in late spring and early summer.

Broom snakeweed (*Gutierrezia sarothrae*) Snakeweed is a strongly medicinal plant and is one of the Navajo Life Medicines. The leaves are unpalatable to livestock, and an abundance of this low shrub is often an indicator of heavy grazing.

Crossosoma Family - Crossosomataceae Spiny greasebush (*Glossopetalon spincescens* var. *aridum*)

Legume Family - Fabaceae Feather plume (*Dalea formosa*) Deep purple pea-type flowers bloom in spring and sometimes in fall.

Mint Family – Lamiaceae

Horehound (*Marrubium vulgare*) This exotic species is used for its medicinal properties in Europe and as a flavoring for hard candies.

Lily Family – Liliaceae Sacahuista (*Nolina microcarpa*)

Mallow Family – Malvaceae

Globemallow (*Sphaeralcea* sp.) Plants in this genus produce attractive orange flowers. They are also used in a variety of native medicines, and seeds are commonly found in prehistoric archeological sites.

Olive Family – Oleaceae

Rough menodora (Menodora scabra)

Polygonaceae

Wright's buckwheat (*Eriogonum wrightii*) This genus produces edible seeds that can be ground into buckwheat flour. There are also many medicinal uses.

Rose Family – Rosaceae

Rockmat (*Petrophytum caespitosum*) This plant is a limestone affiliate that grows in rock crevices and on rock walls.

Scrophulariaceae

Wyoming Indian paintbrush (*Castilleja linariifolia*) Conspicuous scarlet flowers make this plant easy to spot. The roots were used by the Hopi to form a kind of paint.

Grasses

Grass Family – Poaceae Purple three-awn (*Aristida purpurea*)

Needle grama (Bouteloua aristidoides)

Side-oats grama (*Bouteloua curtipendula*) This grass has unusually showy orange anthers, giving it an almost floral appearance in rainy years.

Blue grama (*Bouteloua gracilis*) Blue grama is a highly palatable forage grass.

Red brome (Bromus rubens)

Cheatgrass (*Bormus tectorum*) Ubiquitous throughout the region, cheatgrass provides the first green of late winter and early spring. The dried stems can create an unnatural fire hazard.

Squirreltail (*Elymus elymoides*) This grass provides fair forage until the awns mature. The inflorescence breaks apart at maturity.

Nine-awn pappusgrass (Enneapogon desvauxii)

Mexican lovegrass (Eragrostis mexicana)

Common wolfstail (Lycurus phleoides)

Delicate muhly (*Muhlenbergia fragilis*)

Mexican panicgrass (*Panicum hirticaule*)

Vine mesquite (*Panicum obtusum*)

Slim tridens (Tridens muticus)

Forbs

Composite Family – Asteraceae

Brownfoot (*Acourtia wrightii*) Produces pretty pink flowers appearing in early spring.

Thistle (*Cirsium* sp.) Thistles are often prepared as medicines and may have been eaten by prehistoric native peoples. Abert's creeping zinnia (Sanvitalia abertii)

Narrowleaf wirelettuce (Stephanomeria tenuifolia)

Mustard Family – Brassicaceae

Mountain tansymustard (*Descurainia incana* var. *viscosa*) The greens and seeds are edible and plant remains have been found at many archeological sites in the region. The leaves are high in iron and are used in a black paint for pottery.

- Morning Glory Family Convolvulaceae Crest-rib morning glory (*Ipomoea costellata*)
- Spurge Family Euphorbiaceae Sonoran sandmat (*Chamaesyce micromera*)

Branched noseburn (*Tragia ramosa*) This small perennial has stinging hairs.

Legume Family – Fabaceae Fort Bowie prairie clover (*Dalea brachystachya*) This is a limestone affiliate.

Geranium Family – Geraniaceae Redstem stork's bill (*Erodium cicutarium*) In heavily grazed areas, this exotic often forms a green carpet with small pink flowers in early spring.

Fern Family – Pteridaceae Slender lipfern (*Cheilanthes feei*) This species is a limestone affiliate.

Acknowledgements

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The entrance to Indian Cave. Gooseberry (*Ribes leptanthum*) bushes grow near the opening, while a few branches of the Texas mulberry (*Morus microphylla*) are shown in the right foreground. Pinyon-juniper woodland dominates the area above the cave.

Appendix A. Species list for Cathedral Cave Preserve, Yavapai County, Arizona. Habit: F = forb, G = graminoid, S = shrub, subS = subshrub, T = tree. Duration: A = annual, B = biennial, P = perennial. Nativity: N = native, I = introduced.

Family	Latin Name	Common Name	Habit	Duration	Nativity
Agavaceae	Agave parryi	Parry's agave	subS	Р	Ν
Agavaceae	Yucca baccata	Banana yucca	subS	Р	Ν
Anacardiaceae	Rhus trilobata	Skunkbush sumac	S	Р	Ν
Asteraceae	Acourtia wrightii	Brownfoot	F	Р	Ν
Asteraceae	Brickellia californica	California brickellbush	subS	Р	Ν
Asteraceae	Chaetopappa ericoides	Rose heath	subS	Р	Ν
Asteraceae	Cirsium	Thistle	F	В	Ν
Asteraceae	Gutierrezia sarothrae	Broom snakeweed	subS	Р	Ν
Asteraceae	Sanvitalia abertii	Abert's creeping zinnia	F	Α	Ν
Asteraceae	Stephanomeria tenuifolia	Narrowleaf wirelettuce	F	Р	N
Berberidaceae	Mahonia haematocarpa	Red barberry	S	P	N
Derbenuaceae	Descurainia incana var.	Red barberry	3	Г	IN
Brassicaceae	viscosa	Mountain tansymustard	F	В	Ν
Cactaceae	Cylindropuntia	Cholla	S	Р	Ν
Cactaceae	Echinocereus	Hedgehog cactus	S	Р	Ν
Cactaceae	Opuntia engelmannii	Engelmann's prickly pear	s	Р	N
Convolvulaceae	Ipomoea costellata	Crest-rib morning glory	F	A	N N
Convolvulaceae	Glossopetalon	Crest-no morning giory	Г	A	IN
Crossosomataceae	spinescens var. aridum	Spiny greasebush	subS	Р	Ν
Cupressaceae	Juniperus osteosperma	Utah juniper	Т	Р	Ν
Ephedraceae	Ephedra viridis	Mormon tea	S	Р	Ν
	Chamaesyce				
Euphorbiaceae	micromera	Sonoran sandmat	F	A	Ν
Euphorbiaceae	Tragia ramosa	Branched noseburn	F	Р	Ν
Fabaceae	Dalea brachystachya	Fort Bowie prairie clover	F	A	Ν
Fabaceae	Dalea formosa	Featherplume	subS	Р	Ν
Fagaceae	Quercus turbinella	Sonoran scrub oak	S	Р	N
Geraniaceae	Erodium cicutarium	Redstem stork's bill	F	A	
Grossulariaceae	Ribes leptanthum	Trumpet gooseberry	S	Р	N
Lamiaceae	Marrubium vulgare	Horehound	subS	Р	
Liliaceae	Nolina microcarpa	Sacahuista	subS	Р	Ν
Malvaceae	Sphaeralcea	Globemallow	subS	Р	Ν
Moraceae	Morus microphylla	Texas mulberry	S	Р	Ν
Oleaceae	Forestiera pubescens	New Mexico olive	S	Р	Ν
Oleaceae	Menodora scabra	Rough menodora	subS	Р	Ν
Pinaceae	Pinus edulis	Two-needle pinyon	Т	Р	Ν
Poaceae	Aristida purpurea	Purple three-awn	G	Р	Ν
Poaceae	Bouteloua aristidoides	Needle grama	G	А	Ν
Poaceae	Bouteloua curtipendula	Side-oats grama	G	Р	Ν
Poaceae	Bouteloua gracilis	Blue grama	G	Р	Ν
Poaceae	Bromus rubens	Red brome	G	А	
Poaceae	Bromus tectorum	Cheatgrass	G	Α	I

Family	Latin Name	Common Name	Habit	Duration	Nativity
Poaceae	Elymus elymoides	Squirreltail	G	Р	Ν
Poaceae	Enneapogon desvauxii	Nine-awn pappusgrass	G	Р	Ν
Poaceae	Eragrostis mexicana	Mexican lovegrass	G	Α	Ν
Poaceae	Lycurus phleoides	Common wolfstail	G	Р	Ν
Poaceae	Muhlenbergia fragilis	Delicate muhly	G	Α	Ν
Poaceae	Panicum hirticaule	Mexican panicgrass	G	А	Ν
Poaceae	Panicum obtusum	Vine mesquite	G	Р	Ν
Poaceae	Tridens muticus	Slim tridens	G	Р	Ν
Polygonaceae	Eriogonum wrightii	Wright's buckwheat	subS	Р	Ν
Pteridaceae	Cheilanthes feei	Slender lipfern	F	Р	Ν
Rosaceae	Cercocarpus montanus	Alderleaf mountain mahogany	S	Р	N
Rosaceae	Chamaebatiaria millefolium	Desert sweet	S	Р	Ν
Rosaceae	Coleogyne ramosissima	Blackbrush	S	Р	Ν
Rosaceae	Petrophytum caespitosum	Rockmat	subS	Р	Ν
Rosaceae	Purshia stansburiana	Cliffrose	S	Р	Ν
Rosaceae	Purshia tridentata	Antelope bitterbrush	S	Р	Ν
Rutaceae	Ptelea trifoliata	Common hoptree	S	Р	Ν
Scrophulariaceae	Castilleja linariifolia	Wyoming Indian paintbrush	subS	Р	Ν