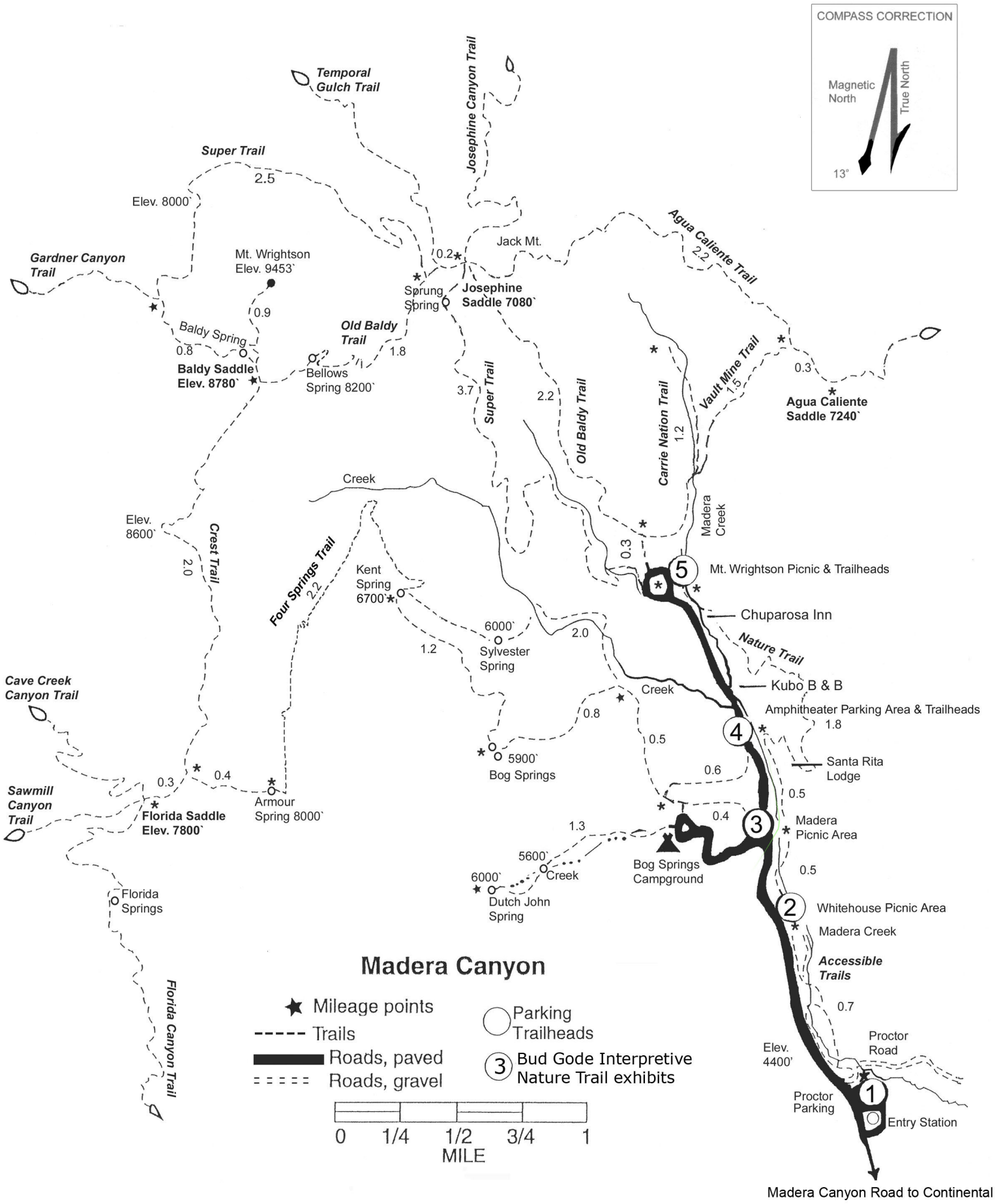

COMPASS CORRECTION
Magnetic North
True North
13°
Temporal Gulch Trail
Josephine Canyon Trail
Super Trail
2.5
Elev. 8000`
Gardner Canyon Trail
Mt. Wrightson Elev. 9453`
0.9
Baldy Spring
0.8
Baldy Saddle Elev. 8780`
Old Baldy Trail
1.8
Bellows Spring 8200`
0.2
Sprung Spring
Josephine Saddle 7080`
Jack Mt.
Agua Caliente Trail
2.2
3.7
Super Trail
2.2
Old Baldy Trail
Carrie Nation Trail
1.2
Vault Mine Trail
1.5
0.3
Agua Caliente Saddle 7240`
Creek
Elev. 8600`
Crest Trail
2.0
Four Springs Trail
2.2
Kent Spring 6700`
1.2
6000`
Sylvester Spring
2.0
Madera Creek
0.3
5
Mt. Wrightson Picnic & Trailheads
Chuparosa Inn
Nature Trail
Kubo B & B
Creek
Amphitheater Parking Area & Trailheads
1.8
4
Santa Rita Lodge
0.8
0.5
5900`
Bog Springs
0.6
0.5
0.4
3
Madera Picnic Area
1.3
5600`
Creek
6000`
Dutch John Spring
Bog Springs Campground
0.5
2
Whitehouse Picnic Area
Madera Creek
Accessible Trails
0.7
Proctor Road
Elev. 4400`
Proctor Parking
1
Entry Station
Madera Canyon Road to Continental
Cave Creek Canyon Trail
Sawmill Canyon Trail
0.3
0.4
Florida Saddle Elev. 7800`
Armour Spring 8000`
Florida Springs
Florida Canyon Trail
Madera Canyon
Mileage points
Trails
Roads, paved
Roads, gravel
Parking Trailheads
3 Bud Gode Interpretive Nature Trail exhibits
0
1/4
1/2
3/4
1
MILE

Trails and Hike Descriptions

For each hike in the following list you will find the round-trip length (unless specified as one-way), map (see right side of page) on which the trailhead is located, graded difficulty (with A = difficult, B = moderately difficult, C = moderate, D = moderately easy, E = easy), cumulative elevation gain (CEG), and a brief description. The hikes are in alphabetic order starting with map A. Trailheads on each map are denotedby a filled circle. Note that south is up on the trailhead and parking maps, and on the trail map.

Baldy Saddle
Length: 9.0 miles **Map:** A **Grade:** B **CEG:** 3500'
From the SE trailhead go south 0.3 mile to a signed trail intersection. Turn left and follow rocky Old Baldy Trail to Josephine Saddle. Continue on Old Baldy Trail past Bellows Spring to Baldy Saddle. There are 32 switchbacks between the Spring and Saddle. Return by the same route.

Carrie Nation Mine
Length: 3.0 miles **Map:** A **Grade:** C **CEG:** 1200'
From the SE trailhead go south 0.3 mile to a signed trail intersection. Turn right and follow Vault Mine Trail about 0.5 mile to a second trail junction. Follow Carrie Nation Trail to the left and up to an abandoned mine. Return by the same route.

Crest Trail Crossover
One-way Length: 11.5 miles **Map:** A **Grade:** A **CEG:** 4000'
Proceed to Baldy Saddle (see above), turn left and follow Crest Trail to Florida Saddle. A side trip to Armour Spring adds 0.8 mile. Follow Florida Canyon Trail to a parking area at the USDA Experimental Station. A shuttle car is needed for the return to the starting point.

Josephine Canyon
Length: 10 miles **Map:** A **Grade:** B **CEG:** 3200'
From the SE trailhead go south 0.3 mile to a signed trail intersection. Turn left and follow rocky Old Baldy Trail to Josephine Saddle. Cross the saddle and follow trail south down into Josephine Canyon for about 2.5 miles to the remains of an old stone building. Return by same route.

Josephine Saddle Loop
Length: 6.2 miles **Map:** A **Grade:** C **CEG:** 1700'
From the NE trailhead follow Super Trail 3.7 miles to Josephine Saddle. Return to Mt Wrightson Picnic Area by following Old Baldy Trail 2.2 miles to a signed trail intersection. Turn right.

Mt Wrightson
Length: 10.8, 12.2 miles **Map:** A **Grade:** A **CEG:** 4200'
From the SE trailhead go south 0.3 mi to a signed trail intersection. Turn left and follow rocky Old Baldy Trail to Josephine Saddle. Continue on Old Baldy Trail past Bellows Spring to Baldy Saddle. Follow signed trail to right and up to summit. A return by the same route is a 10.8 mi hike. A return via the upper part of Super Trail to Josephine Saddle is a picturesque route adding 1.4 mi.

Vault Mine - Old Baldy Loop
Length: 6.5 miles **Map:** A **Grade:** B **CEG:** 2100'
From the SE trailhead go south 0.3 mi to a signed trail intersection. Turn right and follow Vault Mine Trail about 0.5 mile to a second trail junction. A steep, rocky climb up Vault Mine Trail ends at Agua Caliente Trail. Turn left and follow trail to Josephine Saddle. Return via Old Baldy Trail.

Nature Trail
One-way Length: 1.8 miles **Map:** A or B **Grade:** E **CEG:** 100' or 600'
Starting at the NW parking area on Map A, follow trail down Madera Canyon to the Amphitheater. Cross bridge to parking area and main road. Doing hike in reverse direction (up canyon) gives larger CEG. Round-trip length with loop closed by hiking road is 2.7 miles.

Bog Springs
Length: 3.8 (B), 3.4 (C) miles **Map:** B or C **Grade:** D **CEG:** 1000' (B), 1200' (C)
This hike can be started at either of two trailheads on the east side of the main road, as shown on Maps B and C. From the trailhead on B follow trail 0.6 mile to sign on a former jeep road, turn right and proceed to trail intersection with Kent Spring Trail. Turn left and go to Bog Springs.
From the trailhead on C follow trail 0.4 mile to sign at intersection with trail coming from B. Proceed straight ahead to trail intersection with Kent Spring Trail. Turn left and go to Bog Springs.

Dutch John Spring
Length: 3.0 (B), 2.6 (C) miles **Map:** B or C **Grade:** D **CEG:** 1000' (B), 1200' (C)
This hike can be started at either of the same two trailheads used for the Bog Springs hike. From the trailhead on B follow trail 0.6 mile to sign on a former jeep road. Turn left and go about 0.1 mile. Turn right on a former jeep road descending into a wash and up to the Bog Springs Campground. At the paved campground road turn right and follow about 0.1 mile to a sign at the trailhead for Dutch John Spring. This sign is across from a toilet. Follow trail to spring.
From the trailhead on C follow trail 0.3 mile to former jeep road on the left descending into a wash. Follow this road through wash and into campground. Follow directions in preceding paragraph.

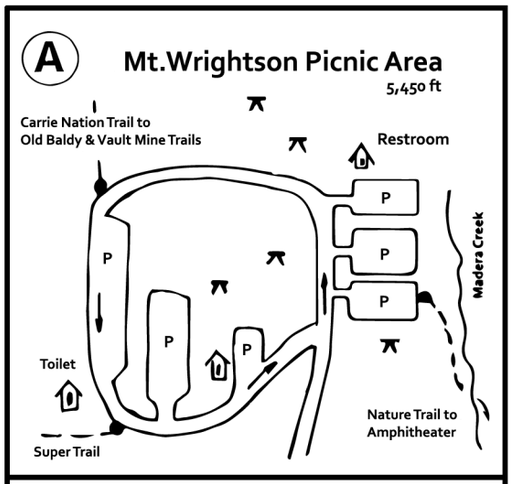
Kent Spring
Length: 6.2 (B), 5.8 (C) miles **Map:** B or C **Grade:** C **CEG:** 1700' (B), 1900' (C)
This hike can be started at either of the two trailheads used for the Bog Springs hike. Follow the directions for the Bog Springs hikes until the fork for the Bog Springs - Kent Spring trail is reached. Proceed straight ahead at this juncture to Kent Spring. Return by same route.

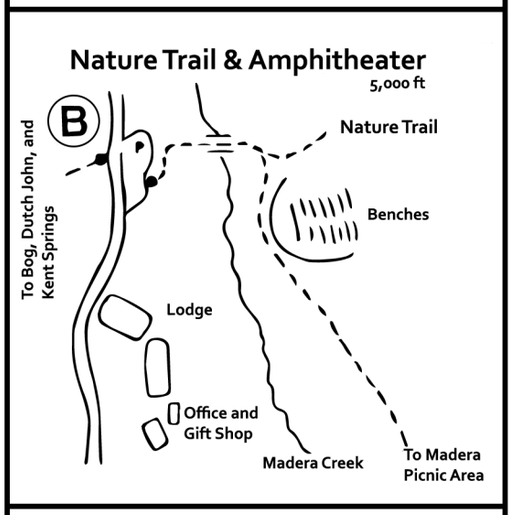
Accessible Trails
Two paved trails are accessible to those who are physically handicapped. The longer one (0.8 mile) starts at the Proctor Parking Area (Map E). The shorter one (0.5 mile) begins at the Whitehouse Picnic Area (Map D). CEG is approximately 100' on each trail.

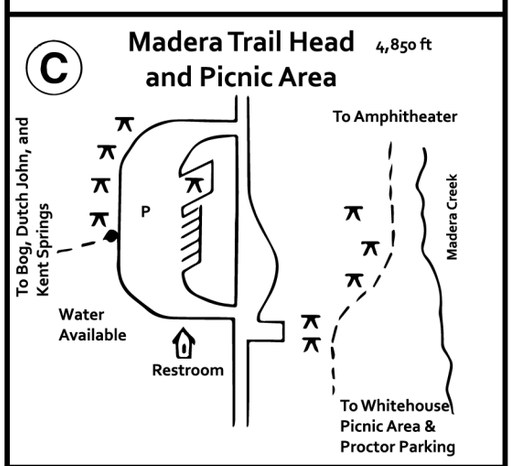
Madera Creek Trail
This trail is accessed from points on Maps B, C, and D. It joins the Nature Trail at the Amphitheater and Accessible Trails at Whitehouse Picnic Area.

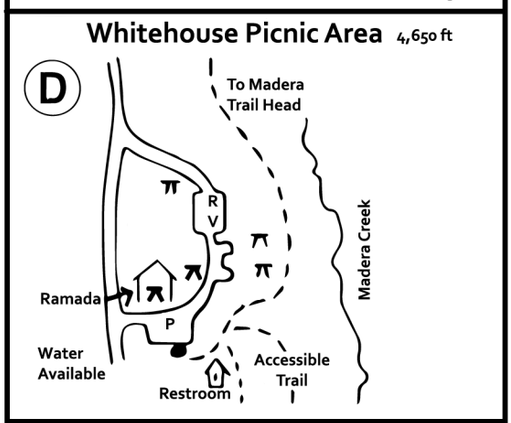
ENJOY THE BEAUTY OF MADERA CANYON AND THE SANTA RITA MOUNTAINS!

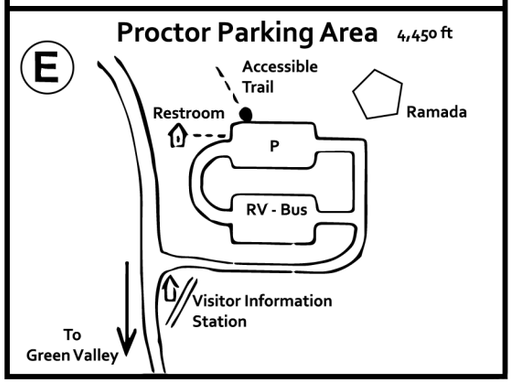
REMEMBER!!! TWO QUARTS OF WATER OR MORE ON LONG DAY HIKES











Mimids (continued)	**Sp**	**Su**	**F**	**W**
____ Crissal Thrasher	u	u	r	r
Waxwings & **Silky Flycatchers**				
____ Cedar Waxwing	u	-	u	u
____ Phainopepla	c	c	c	c
Olive Warbler				
____ Olive Warbler	u	u	u	u
Longspurs				
____ Chestnut-collared Longspur	r	-	-	r
Wood Warblers				
____ *Ovenbird*	x	-	-	-
____ *Worm-eating Warbler*	x	-	-	-
____ *Louisiana Waterthrush*	-	-	x	x
____ Northern Waterthrush	r	-	r	-
____ *Golden-winged Warbler*	-	-	x	x
____ Black-and-white Warbler	r	-	-	r
____ *Crescent-chested Warbler*	x	x	x	x
____ *Tennessee Warbler*	-	-	-	x
____ Orange-crowned Warbler	c	-	c	u
____ Lucy's Warbler	c	c	u	-
____ Nashville Warbler	u	-	u	-
____ Virginia's Warbler	u	u	u	-
____ MacGillivray's Warbler	u	-	u	-
____ *Hooded Warbler*	x	x	-	-
____ *American Redstart*	-	-	x	-
____ *Cerulean Warbler*	x	-	-	-
____ *Northern Parula*	x	x	-	x
____ *Tropical Parula*	-	x	-	-
____ *Blackburnian Warbler*	x	-	-	-
____ Yellow Warbler	r	r	r	-
____ *Chestnut-sided Warbler*	-	x	-	-
____ *Black-throated Blue Warbler*	x	-	-	x
____ *Pine Warbler*	x	-	-	-
____ Yellow-rumped Warbler	c	u	c	u
____ *Yellow-throated Warbler*	x	-	-	x
____ *Prairie Warbler*	x	-	-	-
____ Grace's Warbler	c	c	u	-
____ Black-throated Gray Warbler	c	c	u	r
____ Townsend's Warbler	c	u	c	r
____ Hermit Warbler	u	r	u	x
____ *Black-throated Green Warbler*	-	-	x	-
____ *Fan-tailed Warbler*	x	-	-	-
____ Wilson's Warbler	c	u	r	-
____ Red-faced Warbler	c	c	u	-
____ Painted Redstart	c	c	c	u
____ *Slate-throated Redstart*	x	-	-	-
____ Yellow-breasted Chat	r	r	r	-

Towhees & Sparrows	**Sp**	**Su**	**F**	**W**
____ Green-tailed Towhee	u	-	u	c
____ Spotted Towhee	u	u	u	u
____ Rufous-crowned Sparrow	c	c	c	c
____ Canyon Towhee	c	c	c	c
____ Abert's Towhee	r	r	r	r
____ Rufous-winged Sparrow	c	c	u	u
____ Botteri's Sparrow	c	c	u	x
____ Cassin's Sparrow	u	c	u	r
____ Chipping Sparrow	c	-	c	c
____ *Clay-colored Sparrow*	x	-	-	-
____ Brewer's Sparrow	c	-	c	c
____ Black-chinned Sparrow	r	-	r	r
____ Vesper Sparrow	c	-	u	c
____ Lark Sparrow	u	-	u	c
____ *Five-striped Sparrow*	x	-	-	-
____ Black-throated Sparrow	c	c	c	c
____ Lark Bunting	u	-	u	u
____ Savannah Sparrow	u	-	u	c
____ Grasshopper Sparrow	-	-	-	r
____ Fox Sparrow	-	-	-	r
____ Song Sparrow	r	-	r	-
____ Lincoln's Sparrow	u	-	u	u
____ *White-throated Sparrow*	x	-	-	x
____ White-crowned Sparrow	c	-	c	c
____ *Golden-crowned Sparrow*	-	-	-	x
____ Dark-eyed Junco	c	-	c	c
____ Yellow-eyed Junco	c	c	c	c
Tanagers				
____ Hepatic Tanager	c	c	u	r
____ Summer Tanager	c	c	u	-
____ *Scarlet Tanager*	-	x	-	-
____ Western Tanager	c	c	c	-
____ Flame-colored Tanager	r	r	-	-
Cardinals, Grosbeaks & Buntings				
____ Northern Cardinal	c	c	c	c
____ Pyrrhuloxia	u	u	u	u
____ *Yellow Grosbeak*	-	x	-	-
____ Rose-breasted Grosbeak	r	r	r	x
____ Black-headed Grosbeak	c	c	c	-
____ Blue Grosbeak	c	c	u	-
____ Lazuli Bunting	u	-	u	-
____ Indigo Bunting	r	-	r	-
____ Varied Bunting	c	c	c	-
____ *Painted Bunting*	-	-	x	-
Blackbirds & Orioles				
____ Red-winged Blackbird	-	r	r	-
____ Eastern Meadowlark	c	c	c	c
____ Western Meadowlark	r	-	r	u

Blackbirds & Orioles (continued)	**Sp**	**Su**	**F**	**W**
____ Brewer's Blackbird	r	-	r	r
____ Great-tailed Grackle	r	r	r	r
____ Bronzed Cowbird	u	u	u	-
____ Brown-headed Cowbird	c	c	u	-
____ Hooded Oriole	c	c	c	-
____ Bullock's Oriole	c	u	u	-
____ Scott's Oriole	c	c	c	r
Cardueline Finches				
____ *Purple Finch*	-	-	-	x
____ Cassin's Finch	i	-	-	i
____ House Finch	c	c	c	c
____ Red Crossbill	r	r	r	r
____ Pine Siskin	c	-	u	c
____ Lesser Goldfinch	c	c	c	c
____ Lawrence's Goldfinch	r	-	r	r
____ American Goldfinch	r	-	-	r
____ Evening Grosbeak	r	-	-	r

Please report your sightings of any of the accidental species listed above, or any species found outside its normal season or habitat to: *info@friendsofmaderacanyon.org.*

Birds of Madera Canyon

Santa Rita Mountains, Coronado National Forest, Arizona

Published by the Friends of Madera Canyon
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February 2013

Coverage - The grassland *bajada*, mesquite brush, and grazing land along Madera Canyon Road from the Florida Wash uphill in and along both sides of Madera Canyon through the oak and juniper forests and pine and fir forests to the tops of Mt. Wrightson and Mt. Hopkins (See map).

Sp = Spring (March through May)
Su = Summer (June and July)
F = Fall (August through November)
W = Winter (December through February)

c = common - Species seen on almost every trip to the Canyon in the appropriate season and habitat.
u = uncommon - Species may only be found on half of the trips to the Canyon or fewer.
r = rare - Species may be found on only one of many trips to the Canyon and then with some luck.
i = irregular - Species occur at irregular intervals; present in some years and absent in others, but usually within the same season and habitat.
x = *accidental* - Species that have been found in the Canyon less than five times in the past 20 years.

This checklist was compiled by Laurens Halsey, George West, Jack Murray, and Mark Stevenson for the ***Friends of Madera Canyon.***

Quail & Turkey	**Sp**	**Su**	**F**	**W**
____ Scaled Quail	i	i	i	i
____ Gambel's Quail	u	u	u	u
____ Montezuma Quail	u	u	u	u
____ Wild Turkey	c	c	c	c

Vultures, Kites, Hawks, Eagles & Falcons				
____ Black Vulture	-	r	-	-
____ Turkey Vulture	u	c	c	-
____ *Osprey*	-	-	x	-
____ *White-tailed Kite*	-	x	-	-
____ Northern Harrier	u	-	u	u
____ Sharp-shinned Hawk	r	-	-	u
____ Cooper's Hawk	c	c	c	c
____ Northern Goshawk	r	r	r	r
____ *Common Black-Hawk*	x	-	-	-
____ *Broad-winged Hawk*	x	-	-	-
____ Gray Hawk	r	r	-	-
____ *Short-tailed Hawk*	-	x	x	-
____ Swainson's Hawk	u	u	u	-
____ Zone-tailed Hawk	u	u	u	-
____ Red-tailed Hawk	c	c	c	c
____ Ferruginous Hawk	-	-	-	r
____ Golden Eagle	u	u	u	u
____ American Kestrel	u	u	u	u
____ Merlin	r	-	r	r
____ Peregrine Falcon	u	r	u	u
____ Prairie Falcon	r	r	r	u

Rails				
____ *Sora*	-	-	x	-

Pigeons & Doves				
____ Band-tailed Pigeon	u	u	u	r
____ White-winged Dove	u	c	c	-
____ Mourning Dove	c	c	c	u
____ Inca Dove	r	r	r	r
____ Common Ground-Dove	r	r	r	r

Cuckoos & Roadrunners				
____ Yellow-billed Cuckoo	-	u	-	-
____ Greater Roadrunner	u	u	u	u

Owls				
____ Barn Owl	r	r	r	r
____ Flammulated Owl	r	r	-	-
____ Western Screech-Owl	u	u	u	u
____ Whiskered Screech-Owl	c	c	r	r
____ Great Horned Owl	u	u	u	u
____ Northern Pygmy-Owl	u	u	u	u
____ Elf Owl	c	c	-	x
____ Spotted Owl	r	r	r	r

Nighthawks & Nightjars	**Sp**	**Su**	**F**	**W**
____ Lesser Nighthawk	c	c	c	-
____ Common Nighthawk	-	r	-	-
____ Common Poorwill	c	c	u	-
____ Buff-collared Nightjar	i	i	-	-
____ Mexican Whip-poor-will	c	c	u	-

Swifts				
____ Vaux's Swift	r	-	u	-
____ White-throated Swift	c	c	c	u

Hummingbirds				
____ Broad-billed Hummingbird	c	c	c	r
____ White-eared Hummingbird	r	r	-	-
____ Berylline Hummingbird	-	r	r	-
____ Violet-crowned Hummingbird	r	r	r	-
____ Blue-throated Hummingbird	u	u	u	r
____ Magnificent Hummingbird	c	c	c	u
____ Lucifer Hummingbird	-	r	-	-
____ Black-chinned Hummingbird	c	c	c	-
____ Anna's Hummingbird	c	c	c	r
____ Costa's Hummingbird	u	u	u	r
____ Calliope Hummingbird	r	r	r	-
____ Broad-tailed Hummingbird	c	c	c	-
____ Rufous Hummingbird	c	u	c	-
____ Allen's Hummingbird	r	r	r	-

Trogons & Kingfishers				
____ Elegant Trogon	c	c	u	r
____ *Eared Quetzal*	-	-	x	-
____ Belted Kingfisher	-	x	x	-

Woodpeckers				
____ Acorn Woodpecker	c	c	c	c
____ Gila Woodpecker	u	u	u	u
____ Williamson's Sapsucker	r	-	r	r
____ Yellow-bellied Sapsucker	-	-	r	r
____ Red-naped Sapsucker	u	-	u	u
____ Red-breasted Sapsucker	-	-	-	r
____ Ladder-backed Woodpecker	c	c	c	c
____ Hairy Woodpecker	u	u	u	u
____ Arizona Woodpecker	c	c	c	c
____ Northern Flicker	c	u	c	c

Tyrant Flycatchers				
____ Northern Beardless-Tyrannulet	u	u	r	r
____ Olive-sided Flycatcher	u	-	u	-
____ Greater Pewee	c	c	r	r
____ Western Wood-Pewee	c	c	u	-
____ *Eastern Wood-Pewee*	-	x	-	-
____ Hammond's Flycatcher	c	-	c	r
____ Gray Flycatcher	u	-	r	r

Tyrant Flycatchers (continued)	**Sp**	**Su**	**F**	**W**
____ Dusky Flycatcher	u	-	u	r
____ Pacific-slope Flycatcher	u	-	u	-
____ Cordilleran Flycatcher	c	c	u	-
____ Buff-breasted Flycatcher	r	-	r	-
____ Black Phoebe	u	u	u	r
____ *Eastern Phoebe*	-	-	-	x
____ Say's Phoebe	c	c	c	u
____ Vermilion Flycatcher	r	r	r	-
____ Dusky-capped Flycatcher	c	c	u	-
____ Ash-throated Flycatcher	c	c	c	r
____ Brown-crested Flycatcher	c	c	u	-
____ Sulphur-bellied Flycatcher	c	c	-	-
____ Cassin's Kingbird	c	c	u	-
____ *Thick-billed Kingbird*	x	-	-	-
____ Western Kingbird	c	c	c	-
____ *Rose-throated Becard*	x	x	-	-

Shrikes				
____ Loggerhead Shrike	u	u	u	u

Vireos				
____ *White-eyed Vireo*	-	-	x	-
____ Bell's Vireo	c	c	u	-
____ Gray Vireo	r	r	-	-
____ *Yellow-throated Vireo*	-	-	x	-
____ Plumbeous Vireo	c	c	c	r
____ Cassin's Vireo	c	-	u	-
____ Hutton's Vireo	c	c	c	c
____ *Red-eyed Vireo*	-	-	x	-
____ Warbling Vireo	c	c	u	-
____ *Yellow-green Vireo*	-	x	-	-

Jays, Crows, & Ravens				
____ Steller's Jay	u	u	u	u
____ Western Scrub-Jay	r	r	r	r
____ Mexican Jay	c	c	c	c
____ Chihuahuan Raven	u	u	u	u
____ Common Raven	c	c	c	c

Larks				
____ Horned Lark	r	r	r	r

Swallows				
____ Purple Martin	r	r	r	-
____ Tree Swallow	r	-	x	-
____ Violet-green Swallow	r	r	r	-
____ Northern Rough-winged Swallow	r	-	r	-
____ Cliff Swallow	u	u	u	-
____ Barn Swallow	u	u	u	-

Titmice & Chickadees	**Sp**	**Su**	**F**	**W**
____ *Mountain Chickadee*	-	-	x	-
____ Bridled Titmouse	c	c	c	c

Verdin & Bushtit				
____ Verdin	c	c	c	c
____ Bushtit	u	u	u	u

Nuthatches				
____ Red-breasted Nuthatch	i	i	i	i
____ White-breasted Nuthatch	c	c	c	c
____ Pygmy Nuthatch	i	i	i	i

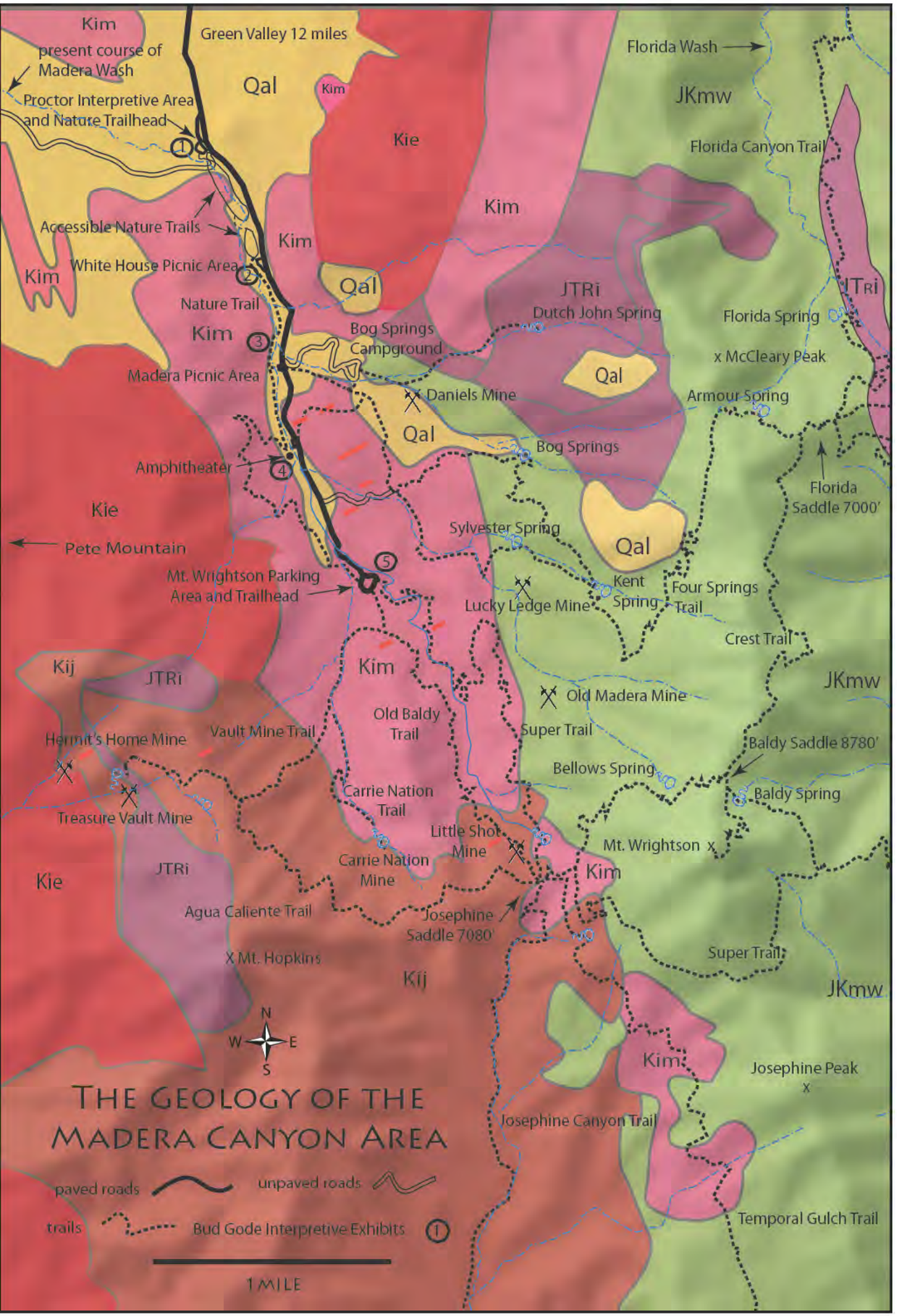
Creepers				
____ Brown Creeper	c	c	c	c

Wrens				
____ Cactus Wren	u	u	u	u
____ Rock Wren	u	u	u	u
____ Canyon Wren	c	c	c	c
____ Bewick's Wren	c	c	c	c
____ House Wren	c	c	c	u
____ Pacific Wren	-	-	-	r
____ Winter Wren	-	-	r	r

Gnatcatchers & Kinglets				
____ Blue-gray Gnatcatcher	u	r	u	r
____ Black-tailed Gnatcatcher	u	u	u	u
____ Black-capped Gnatcatcher	r	r	r	r
____ Golden-crowned Kinglet	r	-	r	r
____ Ruby-crowned Kinglet	c	r	c	c

Thrushes				
____ Eastern Bluebird	r	r	r	r
____ Western Bluebird	u	r	u	u
____ Mountain Bluebird	i	-	-	i
____ Townsend's Solitaire	r	-	r	u
____ *Brown-backed Solitaire*	-	-	x	-
____ Swainson's Thrush	u	-	u	-
____ Hermit Thrush	c	c	c	c
____ *Wood Thrush*	-	x	-	-
____ *Rufous-backed Robin*	-	-	x	-
____ American Robin	c	c	u	r
____ *Varied Thrush*	-	-	x	x
____ Aztec Thrush	-	-	r	x

Mimids				
____ *Gray Catbird*	-	-	x	x
____ Northern Mockingbird	c	c	c	c
____ Sage Thrasher	r	x	r	-
____ *Brown Thrasher*	x	-	-	-
____ Curve-billed Thrasher	u	u	u	u



The Rock Formations around Madera Canyon

Qal

Loose silt, sand, gravel and boulders in the valley bottoms and sand and gravel deposits on the Madera fan. They are Quaternary, less than 2.6 million years old.

Late Cretaceous and Tertiary intrusive dikes and hydrothermal veins.

Kie

The Cretaceous granitic intrusive igneous rocks of Elephant Head, Pete Mt. and the western mountain front.

Kim

The Cretaceous granitic intrusive igneous rocks of Madera Canyon. Several different phases of intrusion are included.

Kij

The intrusive igneous rocks of the Josephine pluton. The first of the Cretaceous plutons was intruded around 65 Ma.

JKmw

The Mt. Wrightson Formation: volcanic and sedimentary rocks around explosive volcanoes. Lava flows, ash and pyroclastic flows, volcanic glass and rhyolite. Eruptions occurred in the Jurassic from 185 to about 170 Ma.

JTRi

Early granitic intrusive rocks about 205 to 210 Ma.

Geologic Time Scale

Numbers are millions of years ago, 1 Ma = 1 million years.

Cenozoic	Quaternary	NOW
	Tertiary: Pliocene	2.6
	Tertiary: Miocene	5.3
	Tertiary: Oligocene	23
	Tertiary: Eocene	34
	Tertiary: Paleocene	56
		65
Mesozoic	Cretaceous	
		145
	Jurassic	
		201
	Triassic	
		251
Paleozoic	Permian	
		299
	Pennsylvanian	
		326
	Mississippian	
		359
	Devonian	
		416
	Silurian	
		444
	Ordovician	
		448
	Cambrian	
		542
Precambrian		
		4600

Memorable Events in the History of the Santa Rita Mountains

6 Ma - NOW: The formation of modern landscapes, erosion of mountains and filling of deep fault basins. The building of Madera alluvial fan and creation of Santa Cruz River valley happened most recently.

30 - 6 Ma: Another major igneous episode occurred followed by Basin and Range rifting (12-6 Ma). Rifting was caused by stretching of the crust and down-dropping of fault basins thousands of feet.

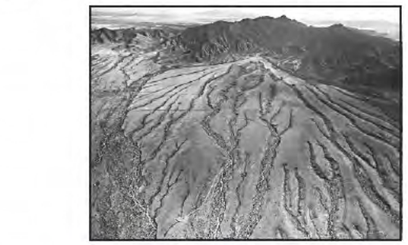
100 - 50 Ma: Later mountain building and igneous activity produced the Madera Canyon granites from rising masses of magma about 60-70 Ma ago. Erosion later exposed them.

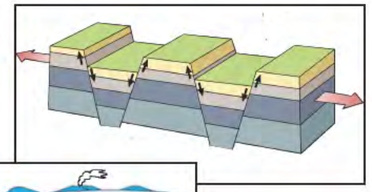
150 - 100 Ma: The deposition of continental sedimentary rocks. The herbivorous dinosaur *Sonorasaurus* was discovered in these rocks on the east side of the mountains.

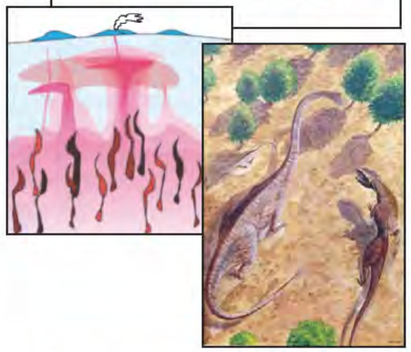
200 - 165 Ma: A major episode of mountain building and magmatic activity. Eruption of Mt. Wrightson volcanics and intrusion of early plutonic rocks. These rocks form the crest of the Santa Rita Mts. today. The Philippine eruption photo shows what the Mt. Wrightson volcano might have looked like before it eroded away millions of years ago.

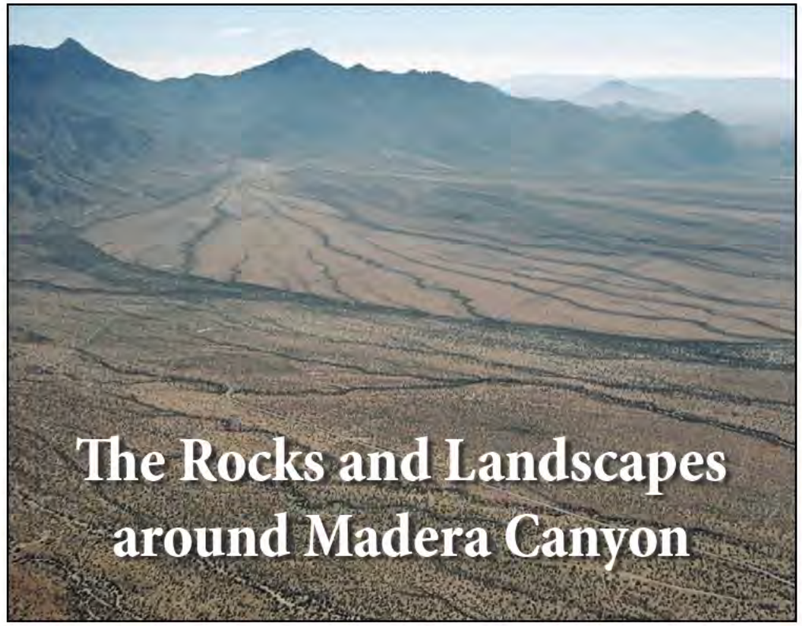
550 - 250 Ma: Paleozoic limestones and shales deposited on a seabed during flooding by a shallow continental sea. The limestones seen near Whipple Observatory Visitor Center and the mining area around Helvetia and Rosemont are examples.

1800 - 1600 Ma: The oldest rocks in the Santa Rita Mts. are Precambrian rocks that do not occur in Madera Canyon. The map shows ancient North America 1700 million years ago and the relative position of Arizona. Two "microcontinents" (outlined in white) are colliding with growing North America. The arrows show the direction of their motion.



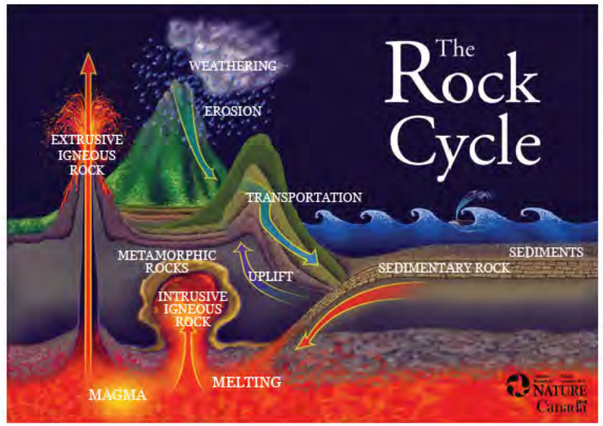






The Rocks and Landscapes around Madera Canyon

The geology of the Santa Rita Mountains is as complex as any of the ranges in southeast Arizona. Fortunately the rocks around Madera Canyon and its trail system are pretty easy to understand and provide a very nice introduction to the area's geology. This guide focuses on the area of Madera Canyon, but you are encouraged to explore other areas of the Santa Rita Mts. and all of southern Arizona!



There are three different kinds of rocks that are interrelated to one another by the basic geological processes. The Rock Cycle shows the rocks and the processes that connect them. Almost all rocks are made of minerals which are naturally occurring solid pure substances like quartz and diamond. A rock, like sandstone or granite, is a mixture of grains. Some of these grains may be minerals and some may be older rocks. Madera Canyon's rocks are mostly igneous — formed by the cooling of magma (molten liquid rock). Magma can rise from where it melted deep in the Earth all the way to the surface, where it appears as lava and ash and can make a volcano — extrusive (volcanic) rock. If the magma does not make it all the way to the surface, but cools and crystallizes under the surface it is called intrusive (plutonic) rock. You can see both kinds of igneous rocks in Madera Canyon.

CREDITS: topographic base from USGS Mt Wrightson and Mt Hopkins 7.5 quadrangles, shaded relief USGS, geology by Harald Drewes USGS 1971, title photo courtesy Mark Heitlinger SRER, rock cycle © Canadian Museum of Nature, chronology images in order: Peter Kresan, USGS, John Ratkevitch, Peter Lipman, USGS, Illinois State Museum and Ron Blakey. For more information go to seazrx.intuitwebsites.com. Written by Richard Conway. Sponsored by The Friends of Madera Canyon in cooperation with the USFS and Coronado National Forest. The Friends of Madera Canyon is an equal opportunity provider.

Friends of Madera Canyon

THE BEDROCK IN MADERA CANYON

All the bedrock in the bottom of the canyon is intrusive (plutonic) and can be called granite, but if you look closely there are several different kinds. The differences have to do with the size of the grains and what minerals are in them. They are also different ages. The photo to the right shows an example from the Proctor Loop Trail. These rocks are labeled Kim and Kie on the map and are 60-70 million years old. Each includes several different intrusive phases. They occur as intrusive masses called dikes and stocks.

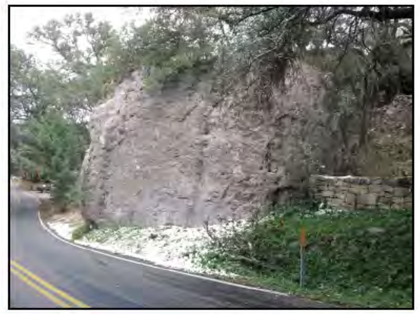
Shown above are close-ups of two granites, one from the Proctor Loop Trail area and one from the Amphitheater. They both have mostly light-colored minerals, but notice the dark-colored minerals in the second. The crystals are big enough to be seen in both so they had plenty of time to grow. The white and pinkish minerals are feldspars, the gray is quartz and the black mineral is hornblende. Note the large shiny feldspar crystal in left photo.

THE ROCKS OF MT. WRIGHTSON

High on Mt. Wrightson and the crest of the Santa Rita Mts. are volcanic rocks created by very vigorous eruptions. If you are not a hiker you can still see them because huge boulders have tumbled down the slopes and the bed of Madera Creek is strewn with them. You can see the most impressive one at Kubo Lodge. These rocks are labeled JKmv on map and are about 180 million years old.

The volcanic deposits are lava flows, ash (which forms a rock called tuff), pyroclastic flows containing welded tuff deposits and volcanic debris worked by water. Most of the welded tuff deposits, which were deposited while still hot, are dense, glassy and show streaking and banding that reflects the flow of the hot material. Most of the rocks are rhyolites and colored red, purple and gray with streaks and light-colored inclusions. Look closely at the inclusions. If they have geometric shapes they are crystals. If they don't, they may be ejected fragments of pumice and other volcanic fragments. These rocks were altered during later intrusions by silica introduction, which made them more resistant to weathering.

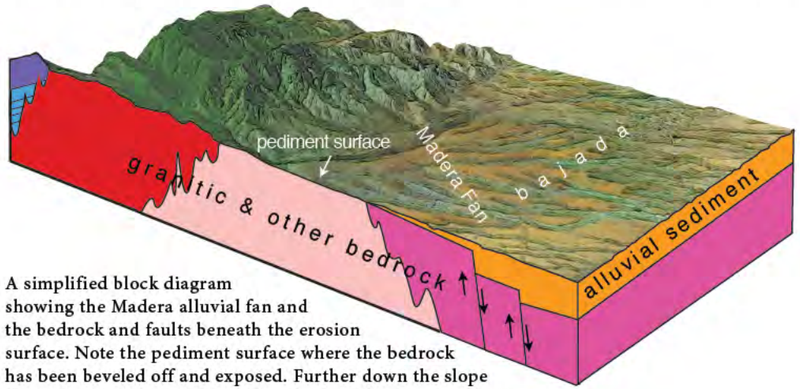
THE MADERA ALLUVIAL FAN



Loose sand, gravel and boulders, some huge, abound in Madera Canyon and out on the Madera fan. It all attests to the weathering and erosion that has been going on ever since the Santa Rita Mts. have existed, beginning about 5 million years ago. Geologists call this loose surficial debris Quaternary alluvium (Qal) and it is less than two million years old. It is the result of the power of running water and gravity. An earthquake probably helped bring down this huge boulder near Kubo Lodge.

The Proctor Interpretive Area is at the head of the Madera alluvial fan. The Madera fan is an example of an important feature of Basin and Range topography dominated by flash-flood erosion and deposition. A flash flood can move many thousands of tons of sediment including huge boulders. As the sediment-laiden torrents leave the canyon, the streams fan out, carrying sediment into the valley. The sediment is deposited in a fan-shaped landform with boulders and the coarsest gravel at the head, generally grading to finer sediments where the floods empty into the Santa Cruz River. See the photo on the front page and the photo at the top of the chronology.

Today Madera Wash takes a hard left as it leaves the canyon and heads west. Several tens of thousands of years ago it drained northward toward Florida Wash, then later it drained in a more northwesterly direction across the fan. The many channels and valleys incised in the fan surface attest to its constantly changing dynamics.



A simplified block diagram showing the Madera alluvial fan and the bedrock and faults beneath the erosion surface. Note the pediment surface where the bedrock has been beveled off and exposed. Further down the slope the pediment is buried beneath a blanket of sediments that is called a bajada.

Near the Proctor Interpretive Area you can look down the fan toward the Santa Cruz River valley. Turning around towards the peaks you can see where all the sediment came from. If you pick around on the alluvial surface, sooner or later you will find all the kinds of rocks in Madera Canyon!

Look southward beyond Elephant Head and you will see that there is a gentle nearly planar surface sloping westward away from the mountain front. This is another feature of arid flash-flood Basin and Range country. Rather than a mountain range eroding to gradually form a lower and more subdued topography, in an arid climate the mountain front retreats laterally, leaving a beveled planar bedrock surface where the mountains once were. This surface is called a pediment. In the illustration above you can see the Madera pediment where the granite bedrock is exposed on the tops of hills north of Madera Canyon. The sloping pediment surface is usually covered with a blanket of alluvial sand and gravel from coalescing fans. This is often called a bajada and is a very distinctive feature as you drive south on I-19.