

Birding and Natural History in Southeast Arizona

Mark Pretti Nature Tours, L.L.C. and the Golden Gate Audubon Society

May 5 - 11, 2020

The style of this trip is designed to provide a high quality experience of seeing, enjoying and learning about the birds, wildlife and general natural history of Southeast Arizona. Although we will be doing a good amount of birding and may see about 150 species, including many of the regional specialties, we will also spend time enjoying and learning about general ecology, plants, mammals, insects (especially butterflies), and reptiles and amphibians.

Day 1, May 5 – The trip begins today in Tucson where I'll meet the group at the airport. After I receive everyone's flight information, I'll let you know the exact pick-up time. It will likely be between noon and 1 PM. As you exit the front door of the airport on the lower arrivals area, go left to an obvious shaded area with tables and chairs. This will be our pick-up spot.

If you are not able to arrive in Tucson before 1 PM, you'll need to arrive the evening before and stay at a nearby hotel. There are about ten clean, quiet hotels right at the airport. You can choose the one that works best for you – I've stayed at the Quality Inn – 520-294-2500 – and the Holiday Inn Express – 520-889-6600. Both are reasonably priced with continental breakfasts. I'll pick you up at your hotel on the way in to the airport.

After I pick the group up, we'll stop at a nearby Subway to pick up sandwiches. I'll also have snacks (fruit, chips, carrots, bars) and drinks. We'll head to Tucson's Sweetwater Wetlands, a nice desert oasis, about 35 mins. away. At Sweetwater, where cottonwoods, willows, and cattails border the ponds, we'll have chances to see a wide variety of birds including verdin, Gila and ladder-backed woodpeckers, yellow warbler, the local race of song sparrow, several ducks, Gambel's quail, and maybe Harris' hawk. We'll also have good chances to see a few "target" species we may not see elsewhere on the trip - tiger whiptail, zebra-tailed lizard, desert spiny lizard, and round-tailed ground-squirrel. It will be pretty warm (high 80s/low 90s), but we'll try to stay in the shady areas. The walking is completely flat. From there, we'll drive about 45 mins. to the Amado Territory Inn where we'll spend the night. The lovely inn, adjacent to the Santa Cruz River, has pretty good birding right on the grounds (vermillion and ash-throated flycatchers, gray hawk, broad-billed hummingbird, summer tanager, northern cardinal, Abert's towhee), and we should have some time to enjoy the late afternoon action before dinner at a nearby restaurant.

Day 2, May 6 – After breakfast at 6, we'll drive about 35 mins. to Madera Canyon in the Santa Rita Mtns. We'll bring a packed lunch and spend the morning and early afternoon there. We'll begin in the desert scrub below Madera where we'll look for the range-restricted rufous-winged sparrow as well as black-throated sparrow, Bell's vireo, Costa's hummingbird, and others. We'll

then proceed to the canyon mouth where the desert grasses, ocotillo, and cacti of the valley merge with oaks and sycamores of the higher elevations. The birding possibilities are many – Hutton’s and plumbeous vireos, hooded and Scott’s orioles, ash-throated, dusky-capped, and brown-crested flycatchers, black-throated gray and Lucy’s warblers, painted redstart, Say’s phoebe, phainopepla, rufous-crowned sparrow, Arizona and acorn woodpeckers, and many more. We’ll work our way up the canyon, have a picnic lunch, and spend some time at a feeding station where we’ll look for magnificent, black-chinned, and broad-billed hummingbirds as well as Mexican jay, grosbeaks, buntings, and others. Rock squirrel and Arizona gray squirrel are also found at the feeders, and the local race of white-tailed deer is fairly common in the area. The walk in Madera Canyon is about a half mile up a gradual incline. Most of it is paved, but there are some dirt sections with uneven surfaces.

In the afternoon we’ll pass through some beautiful habitat - with a great mix of desert scrub, grassland, and woodland vegetation – on our way to the town of Patagonia where we’ll spend two nights. We should arrive in time to visit a private feeding station, the Paton’s, where we’ll have chances to see many specialty species, including violet-crowned hummingbird, gray hawk, Abert’s towhee, and thick-billed-kingbird. We’ll stay at the Duquesne House B&B for two nights, May 12 and 13. The B&B has a beautiful garden, very nice rooms, good birds, and the best breakfast I’ve had at any B&B.

Please note that the Duquesne House has only 4 rooms and that a single will only be possible if you stay at the nearby home.

Day 3, May 7 - After breakfast at 6, we’ll drive about 30 mins to Patagonia Lake State Park, another desert oasis. Rich desert scrub and grassland on the hillsides is home to pyrrhuloxia and Botteri’s sparrow, while the cottonwood and willow-lined lake is perfect for many lowland riparian species. We’ll follow the lake’s edge as we look for summer tanager, Gila and ladder-backed woodpeckers, vermilion flycatcher, northern beardless-tyrannulet, yellow, Lucy’s, and Wilson’s warblers, and the rare black-capped gnatcatcher as well as ducks and neotropic cormorant. Except for some stairs at the beginning, the roughly 1-mile walk at Patagonia Lake is flat but with a few uneven surfaces. Before returning to town for lunch, we’ll stop at the roadside rest which is a good spot for thick-billed kingbird. In the afternoon, we’ll return to the private feeding station.

Day 4, May 8 – After a 6 AM breakfast, we’ll visit the Las Cienegas Conservation Area to look for grassland species such as grasshopper and lark sparrows, the Lillian’s race of eastern meadowlark, loggerhead shrike, scaled quail, ash-throated flycatcher, horned lark, golden eagle, and perhaps pronghorn. This is perhaps the most pristine grassland in the region with an excellent variety of native grasses and forbs and intact fire ecology. We’ll then continue to Sierra Vista where we’ll have a few errands to take care of – Fort Huachuca passes and lunch – before checking in to the hotel if the rooms are ready. We’ll be staying at the Windemere Hotel for three nights – May 3, 4, and 5. We may make a few short stops near Sierra Vista before arriving at the hotel. One may be at the wastewater treatment facility which, while it isn’t a great birding spot, is the best spot for the Grand Vista tour of the Sky Islands as we can see about a dozen separate ranges. After check-in we’ll head to Carr Canyon for a picnic lunch and then head to Ash Canyon where we’ll visit the home of Mary Jo Ballator who has an excellent

feeding station. In addition to a perfect location, the great diversity of native plants attracts great birds (Mexican jay, lazuli bunting, white-breasted nuthatch, ladder-backed woodpecker, Scott's oriole, black-headed grosbeak). Though they can be a bit tough in late April and early May, this is THE place for Lucifer hummingbird (which we may have to return for in the early evening which is often the best time).

Depending on our timing and the group's interest, we may head to nearby Miler Canyon where we'll look for day-roosting spotted owls which have been pretty consistent for several years. We'll also have chances to see red-faced warbler, Arizona woodpecker, dusky-capped flycatcher, and others. The hike from the trailhead to the owl spot is a little over a mile, with mostly uphill walking on uneven surfaces with a few steep sections. This is not an easy hike, and we'll decide as a group how to approach this depending on interest, ability, and safety. We'll then return to Sierra Vista for a short break before dinner. After dinner we'll head to Ramsey Canyon where we'll do some night birding. We'll have very good chances to see whiskered screech and elf owls (which are usually nesting there), and fair chances of finding western screech-owl, Mexican whip-poor-will, and common poor-will.

Day 5, May 9 – We'll spend most of the day in the Huachuca Mountains where we'll visit Huachuca, Garden, and Sawmill Canyons. The area is home to Madrean evergreen woodland (alligator juniper, silverleaf oak, Apache pine) through which runs southwestern canyon riparian woodland (AZ sycamore, Fremont cottonwood, arroyo willow, bigtooth maple). Along with Yarrow's spiny lizards, Coues' white-tailed deer, rock and Arizona gray squirrels, we'll look for southeast AZ specialties such as AZ woodpecker, hepatic and western tanagers, elegant trogon, black-throated gray and Grace's warblers, plumbeous and Hutton's vireos, dusky-capped flycatcher, bridled titmouse, painted redstart, western wood-pewee, and others. The walking in most of these canyons will include gradual uphills with several flat sections. We'll have a picnic lunch in Huachuca Canyon at a nice spot that usually has an active gray hawk nest. We'll return to the hotel in the late afternoon for a break before dinner. After dinner we may make a short stop to look for lesser nighthawk, which can be seen surprisingly well right in the heart of town.

Day 6, May 10 – Today we'll spend much of the day at higher elevations as we head up Carr Canyon to the mixed conifer forest at 7100'. In this habitat, we'll have good chances to find greater pewee, buff-breasted flycatcher, Steller's and western scrub jays, white-throated swift, yellow-eyed junco, and a suite of warblers, including Grace's, hermit, Townsend's, olive, and red-faced. Most of our walking will be flat and easy in some campgrounds. Depending on our luck with the warblers, we may do a hike of about 1.5 miles (total) with a gradual incline to a moist spot that can be good for red-faced and Virginia's warblers as well as northern pygmy-owl. We'll have a picnic lunch in the cool mountains, and in the afternoon we'll return to the hotel for a break before dinner.

Day 7, May 11 – After breakfast, we'll visit the San Pedro River, the last free-flowing river in the Southwest that still retains extensive, high quality cottonwood-willow riparian forest. The river serves as a major corridor for migratory birds and has the highest breeding bird density of any habitat type (excluding that of colonial nesting birds) in the U.S. Reptile and mammal diversity - 42+ and 80+ species, respectively - within the 56,000-acre conservation area is impressive. Birds we may see include black-throated sparrow, crissal thrasher, vermilion, ash-

throated, and brown-crested flycatchers, Abert's and canyon towhees, blue grosbeak, ladder-backed woodpecker, lazuli bunting, Swainson's hawk, Pacific-slope and gray flycatchers, yellow-breasted chat, Lucy's warbler, and many others. Our walk at the river will be completely flat with a few uneven surfaces.

We'll return to the hotel about 10 AM (depending on flight times) and will have a little time to clean up and pack. We'll then head to the Tucson airport about 1 hour and 20 minutes away. Please try to plan for an airline departure time of 12:30 PM or later. **If you can't get an afternoon flight, you may need to overnight at one of the airport hotels. I'll have snacks, but you'll be on your own for lunch this day.**

Trip Payment Information

Please fill out the attached personal information and release forms and return them with payment for the trip, a check for \$ 2300 / person made out to Mark Pretti Nature Tours, L.L.C., by March 10th, 2019, to:

**Mark Pretti Nature Tours, L.L.C.
1881 Loma Lane
Sierra Vista, AZ 85650**

Please add \$190 (sharing at Patagonia) or \$260 (not sharing) for a single supplement.

Cancellation Policy – There are no refunds for cancellation after the final payment date of March 10th, 2019, unless a replacement can be found, upon which you will receive a full refund. IT IS STRONGLY RECOMMENDED THAT YOU PURCHASE TRIP CANCELLATION AND/OR EMERGENCY MEDICAL INSURANCE, WHICH A TRAVEL AGENT OR ONLINE SERVICE CAN ASSIST YOU WITH. Though I do not recommend one company over another, the following companies, used by past participants, offer trip cancellation insurance and/or emergency medical insurance for single trips or annual policies – www.allianztravelinsurance.com, www.travleinsured.com, www.accessamerica.com, www.aaa.com, www.travelinsurancecenter.com.

General Trip Information

- **Travel to Tucson, Arizona** – There are several airlines with regular service to Tucson. Please need to make the arrangements that work best for you. You'll need to be at the Tucson airport between 11 AM and 1 PM on May 5, 2020. After I receive everyone's flight information, I'll let you know the exact pick-up time, but it will be between 11:00 AM and 1 PM. As you exit the front door of the airport, go left to an obvious shaded area with tables and chairs. This will be our pick-up spot.

If you are not able to arrive in Tucson before 1 PM, you'll need to arrive the evening before and stay at a nearby hotel. There are about ten clean, quiet hotels right at the airport. You can choose the one that works best for you – I have stayed at the Quality Inn – 520-294-2500 – and the Holiday Inn Express – 520-889-6600. Both are reasonably priced with continental breakfasts. I'll pick you up at your hotel on the way in to the airport.

- The accommodations on the trip are clean, quiet, and comfortable. They include;

May 5 - Amado Territory Inn, Amado – 520-398-8684 or www.amadoterritoryinn.com.

May 6 & 7 - Duquesne House B&B, Patagonia – 520-394-2732

May 8, 9, and 10 – Windemere Hotel, Sierra Vista – 520-459-5900

Mark Pretti – home, 520-803-6889, cell, 520-226-5446

- This will be an “early to bed, early to rise” trip. We'll have breakfasts at 6 AM. We'll have some break time before dinners and on some afternoons.
- **Food** – The B&Bs and the Windemere Hotel will have breakfasts for us, and we'll eat in local restaurants for dinner. For our picnic lunches, we'll need to get Subway sandwiches a few days and then have options of sandwiches and all kinds of salads at Safeway the other days. I'll have some granola-type bars, fruit, and chips as well as plenty of water and drinks available as well. On the night that we'll go owling in Ramsey, we'll need to go for convenience and eat at a nearby buffet restaurant.
- Prior to the trip, I'll send trip participants, via email, two forms (release and personal info. form) that you will need to fill out and mail to me with your trip payment.
- **Books** – I'll have several reference books with us on the trip and available to you. These will include the Sibley Guide to Western Birds, and regional books on plants, butterflies and other insects, and reptiles/amphibians. I will also have bird lists for everyone.
- **Trip Style** – the itinerary is designed to minimize our “in the van” time and optimize our time in the field enjoying the biodiversity of southeast AZ. The pace is comfortable and relaxed. In addition to birding, there are countless fascinating stories to be told about the local flora and fauna so we'll include plenty of general natural history, too. Though we'll be doing some serious birdwatching (which will include ecology and behavior as well as basic identification), we will also learn about plants, mammals, reptiles, insects, geology, biogeography, local conservation challenges, and some cultural history.
- Trip difficulty – **for your safety and for an optimum experience for everyone, you should be in good physical condition for this trip. If you can comfortably walk 1-2 miles on gently rolling terrain and are used to spending the kind of time on your feet that birdwatching usually entails, then you should have no problems.** The short hikes we'll take vary from completely flat, to mostly flat with some uneven surfaces, to a moderate incline up a trail with intermittently uneven surfaces. Our longest walk will be a little over a mile on the hike up Miller Canyon to look for the spotted owl. **I recommend good walking/hiking shoes for the entire trip so that you will always have good foot support**

and protection. Unless you really need the extra support, you probably won't need heavy boots. I'll have several walking sticks with us. Note that Ramsey Canyon is at 5500 feet, while the San Pedro River and the Patagonia areas are at 4000 feet. Our highest point in Carr Canyon will be about 7100 feet. **It is of the utmost importance that you are safe on the trails. If you feel unsafe on any section, then you should either return to a designated area or wait for the group to return.**

- **Trip Cost** – included in your trip cost is all lodging, food, entrance fees, transportation from the Tucson airport, and hotel and restaurant tips. Also included are donations at the private residences with feeding stations. If you would like to leave something extra for these generous folks, it would be greatly appreciated.
- **Drinks** - You 'll need to pay for alcoholic beverages at our dinners except for our first night when this is included. You can either do this at the restaurant or I can keep a tab for you.
- **Communication** – You should have cell phone service in most places on the trip. There may be a few spots in the canyons or down on the San Pedro River where there is poor reception or no service. All of our hotels have free wifi.
- **Weather** – the April/May time period is one of the best for weather in southeast AZ. Expect warm daytime temperatures, 70-85 degrees, and mild to cool nights, 45-65 degrees. Though we should have dry weather and clear skies for the entire trip, I always recommend that people check the weather online before coming. We've never had wet weather at this time, but it can be cool, especially in the early morning in Patagonia (where there is a cold air sink) and also when we are at 7000 feet in the mountains. You'll want a good jacket. Please keep in mind that we will spend only one afternoon in Tucson where it can be warm and that for the rest of the trip the weather is generally much cooler (10 – 20 degrees lower) than in Tucson and Phoenix.
- **Transportation** – We will be traveling in a comfortable, air-conditioned van with plenty of room for luggage. Most drives will be fairly short and straight, anywhere from 35 mins. to an hour and 20 mins., and road conditions are good. The dirt roads out of Madera Canyon and up into Garden and Carr Canyons are moderately rough. We can rotate seats and try to accommodate any special needs. **If you're prone to carsickness, please let me know and please be sure to bring whatever remedy you normally use.**
- **Shopping** – There are several gift shops available during the trip – Madera Canyon, Patagonia, Ramsey Canyon – with t-shirts, books, postcards, etc.
- **Laundry** - Laundry service is available at the Windemere Hotel in Sierra Vista where we'll be for three nights

Things To Bring

You MUST bring the following items;

Binoculars – I also recommend having something to clean your binoculars with. A microfiber cloth (available at any eyeglass store) or a LensPen is good.

Day pack/fanny pack in which you should **always** have water and sunscreen.

Water bottle – please be sure to bring a reusable water bottle (or two), preferably something with a wide mouth. We'll have plenty of water to refill. Hydration in the dry climate is VERY important.

Broad-brimmed hat for good sun protection

Sunscreen (minimum 30 SPF recommended)

Small flashlight – this will be needed for our short night outing in Ramsey Canyon.

Sturdy walking/hiking shoes – there will be uneven surfaces and inclines in some places so hiking shoes with good support are best. Some folks might find a walking stick useful in some places – I'll have several. Unless you really need the extra support, heavy boots are probably not necessary.

Personal medications – if you regularly take medications, be sure to bring them. If you are prone to allergies, get migraines, etc. you should bring appropriate remedies. We will have some access to drugstores if you need to get anything. It is also good to bring some aspirin and/or ibuprofen.

Alarm clock – we'll be having early breakfasts in order to get out in the field at optimum times.

Patience and flexibility – if you've traveled just about anywhere with another person or with a group, then you know the importance of being patient and flexible.

Picture ID – you'll need this to enter Fort Huachuca where Huachuca Canyon is located.

Insect repellent – I can't think of a more biting-insect-free place than southeast AZ, but if you're one of those people who insects just love to feed on, you might want to bring a small container of whatever repellent works for you. I'll have some insect repellent available for you at all times but will be downright shocked if anyone needs to use it.

Sunglasses

The remaining items to bring are up to you – **casual clothes are fine.** Expect warm daytime temperatures, 80-85 degrees, and mild nights, 60-65 degrees. **Cool, breathable, light-colored clothes are best** for the days, layers for the nights. The quick-dry nylon travel clothes made by Ex-Officio or Columbia are ideal for warm temperatures as they are light and cool, protect you from the sun and insects, and dry quickly. **If you have any questions about what to bring, please contact me.**

References

I'll have the first four of these books with us. I'll also have species checklists for everyone.

The Sibley Field Guide to Birds of Western North America, David Sibley, 2003. Chanticleer Press

Amphibians and Reptiles in Arizona, Thomas Brennan and Andrew Holycross, 2006. Arizona Game and Fish Department.

Butterflies of Arizona, Bob Stewart, Priscilla and Hank Brodtkin. West Coast Lady Press. 2001.

Plants of Arizona, Anne O. Epple. Falcon Press, 1995.

Mountain Islands and Desert Seas, Fred Gehlbach, 1993. Texas A&M University Press

A Natural History of the Sonoran Desert. Arizona-Sonora Desert Museum, 2000.

Biotic Communities - Southwestern U.S. and Northwestern Mexico, David E. Brown, ed. University of Utah Press, 1994.

Southeast Arizona Birds

Among the many species of birds possible on this trip are the following, all of which have been seen on prior trips. As with any location, some are fairly common and easily seen, while some are less common and more difficult to see. This list is far from complete and is intended to help with pre-trip studying. On the trip I'll provide you with a checklist for the area. On past trips, we've seen 150-160 species.

Gray hawk
Swainson's hawk
Zone-tailed hawk
Harris' hawk
Golden eagle
Gambel's quail
Scaled quail
Montezuma quail
Wild turkey
White-winged dove
Inca dove
Common ground dove
Band-tailed pigeon

Greater roadrunner
Elf owl
Whiskered screech owl
Northern pygmy owl
Lesser nighthawk
Common poorwill
Mexican whip-poor-will
White-throated swift
Violet-crowned hummingbird
Magnificent hummingbird
Blue-throated hummingbird
Broad-billed hummingbird
Broad-tailed hummingbird

Black-chinned hummingbird
Anna's hummingbird
Lucifer hummingbird
Calliope hummingbird
Rufous hummingbird
Elegant trogon
Acorn woodpecker
Arizona woodpecker
Gila woodpecker
Ladder-backed woodpecker
Greater pewee
Western wood-pewee
Buff-breasted flycatcher
Willow flycatcher
Dusky flycatcher
Gray flycatcher
Hammond's flycatcher
Pacific-slope flycatcher
Cordilleran flycatcher
Vermilion flycatcher
Ash-throated flycatcher
Dusky-capped flycatcher
Brown-crested flycatcher
Sulphur-bellied flycatcher
Western kingbird
Cassin's kingbird
Thick-billed kingbird
Say's phoebe
Black phoebe
Northern beardless-tyrannulet
Loggerhead shrike
Hutton's vireo
Plumbeous vireo
Cassin's vireo
Bell's vireo
Warbling vireo
Chihuahuan raven
Mexican jay
Steller's jay
Bridled titmouse
Verdin
Bushtit
Bewick's wren
Cactus wren
Canyon wren
Swainson's thrush

Hermit thrush
Curve-billed thrasher
Crissal thrasher
Phainopepla
Lucy's warbler
Black-throated gray warbler
Townsend's warbler
Hermit warbler
Grace's warbler
Virginia's warbler
Red-faced warbler
Painted redstart
Yellow-breasted chat
Olive warbler
Hepatic tanager
Western tanager
Summer tanager
Northern Cardinal
Pyrrhuloxia
Black-headed grosbeak
Blue grosbeak
Lazuli bunting
Indigo bunting
Canyon towhee
Spotted towhee
Abert's towhee
Green-tailed towhee
Lark sparrow
Black-throated sparrow
Rufous-winged sparrow
Rufous-crowned sparrow
Botteri's sparrow
Yellow-eyed junco
Scott's oriole
Bullock's oriole
Hooded oriole

Biodiversity in Southeast Arizona

Arizona is well known for its amazing diversity of landscapes, which include the Grand Canyon, the Sonoran Desert, the ponderosa pine forests of the Mogollon Rim, and the “sky island” mountains of the southeast. Within this variety of landscapes is found an astounding diversity of flora and fauna. This diversity reaches a biologically fascinating peak in the southeast corner of the state where approximately 400 species of birds, 250 species of butterflies, 26 species of bats, thousands of species of plants, and 90 species of reptiles and amphibians have been recorded. This ecological richness is the product of a unique interplay of biogeography, climate, and topography, each of which will be discussed here.

Despite historic changes and present environmental pressures, biological diversity in southeast Arizona remains high and the landscapes largely intact. A number of dedicated conservation organizations are working hard to protect this diversity and its many benefits.

The elements contributing to worldwide biodiversity--clean air, clean water, clean and fertile soil, and functionally intact habitat--are fortunately still part of our landscape in southeast Arizona. Cochise County covers approximately 5000 square miles yet has a human population of only about 130,000. The region still has lots of open space dominated by native species, and such a landscape is favorable to biological richness.

In addition to generally good environmental quality there are three other key features that make southeastern Arizona so biologically rich. These are biogeography, topography, and climate.

A. Biogeography

Biogeography is the geographic distribution of plants and animals. Southeastern Arizona lies at an ecological crossroads of four major bioregions. To the west is the Sonoran Desert, to the east the Chihuahuan Desert, to the north the Rocky Mountains, and to the south the Sierra Madre or "Mother Mountains" of Mexico.

Southeastern Arizona harbors habitats and species from all of these bioregions. In the area of the Upper San Pedro River and the Huachuca Mountains, we see a little influence from the Sonoran Desert. Though saguaro cacti, one of the indicator species of the Sonoran Desert, are absent from our area, they are found only a short distance to the west. Species common in the land of the saguaro that enter our area are Gila Woodpecker, Gilded Flicker, and Gila monster. As expected, these species are confined to the lower, warmer elevations.

Chihuahuan Desert influence is strong, and in fact we are within the northwestern reaches of this bioregion. Our valley lowlands are dominated by Chihuahuan desert scrub and semidesert grassland and include characteristic species such as Chihuahuan Raven, Scaled Quail, banner-tailed kangaroo rat, black-tailed prairie dog (extirpated from Arizona in the 1930s but still found in the upper reaches of the San Pedro River in Sonora, Mexico), soaptree yucca, tarbush, sotol, and numerous agaves.

The “Sky Island” mountains of southeast Arizona are home to species from both the Rocky Mountains and the Sierra Madre. Each mountain range is unique in its level of northern or southern influence. For example, the Huachucas are very Madrean in nature with about 70% of the flora having Madrean affinity. The Pinalenos, however, which lie 80 miles to the north, are more Rocky Mountain-ish, especially at their upper elevations where one can find moist meadows, Engelman spruce, subalpine fir, and mountain chickadees, all of which are absent in the Huachucas. The Chiricahua Mountains fall somewhere in between.

While latitude, slope aspects, and peak elevation play roles in determining the nature of each sky island, most of the differences are due primarily to variation in the overall volume or bulk of each of the ranges. The larger a mountain range is, not just in terms of its highest elevation, but in terms of its mass, the longer it takes for that range to warm up each spring and summer. The net effect is that over the course of the year, a larger range will be cooler and wetter than a smaller range with an equal elevation but smaller mass. This phenomenon is known as the Merriam Effect, after C. Hart Merriam, a naturalist whose work in the San Francisco Peaks of northern Arizona led to his well-known classification of North American life zones.

Thus in the Pinaleno Mountains we find Mountain Chickadee, Golden-crowned Kinglet, Englemann spruce, subalpine fir, and thinleaf alder, all species common in the Rocky Mountains but absent in the Huachucas. In the Huachucas we find species common to the Sierra Madre of Mexico--Arizona Woodpecker, Mexican Jay, Bridled Titmouse, Elegant Trogon, coatimundi, ridge-nosed rattlesnake, Apache pine, and silverleaf oak.

Clearly, biogeography contributes greatly to ecological diversity in southeast Arizona.

B. Topography and Geology

Topography is the description of the features of a landscape. "Basin and Range" is the term that best describes our local topography. Not only is this landscape dramatic in its beauty, it is also rich in habitat variety. It is the product of geologic processes dating back hundreds of millions of years. Prior to 240 million years ago, much of southeastern Arizona experienced gradual invasions and recessions of inland seas. The sands, muds, silts, calcareous exoskeletons of planktonic organisms, and eroded coral reefs of that period formed sedimentary deposits that eventually became sandstone, shale, and limestone.

Between approximately 150 and 90 million years ago, what is now western North America experienced a period of intense volcanism and mountain building called the Laramide Orogeny. During this period, extrusive and intrusive igneous rock contributed to thickening of the earth's crust in the area. It was during this time that the granitic backbones of the major mountain ranges in the west – the Sierra Nevada, the Rockies, and the Sierra Madre – were emplaced. There is good evidence indicating that at the end of this period southeastern Arizona stood as an extensive upland with fairly flat terrain. Between 40 and 20 million years ago, during what is known as the Mid-Tertiary Deformation, the area underwent an interesting geologic event. In addition to scattered volcanic activity in the area, there was intense heating below the surface, so intense, in fact, that portions of the crust were softened and melted, making the crust somewhat malleable. This heating and malleability became important when the Pacific

Ocean tectonic plate began to rotate northwest, pulling the western part of North American plate with it. The tremendous tension caused by this movement stretched the layers of the earth's crust in the area and caused faulting, fracturing, spreading, and thinning. From about 18 to 5 million years ago, an event called Basin and Range block faulting, occurred from southern Oregon to Sonora, Mexico. As the area continued to stretch out, the crust shattered into long segments. Some of the segments maintained most of their original height, while adjacent segments sank. The sinking of alternating segments formed the basic mountain and valley topography we see today.

By about 5 million years ago, the stretching stopped and the crust cooled, thus stabilizing the Basin and Range mountains and valleys. In our area the Huachuca and Mule Mountains border the Upper San Pedro River valley. Since that event, time, gravity, and weather have eroded parts of the mountaintops, filling the valley with alluvium 1,000 feet deep in some areas.

Topography is closely related to and has strong effects on climate. Most of the annual precipitation in our area falls in the mountains – in fact rainfall in the mountains can be two to three times what it is in the valley. Precipitation in the mountains is collected, stored, filtered and transported by the mountain watershed. Gravity draws it downhill where it reaches a porous zone along the mountain base. At this point, known as the zone of recharge, the water percolates deep into the alluvial fill and enters the valley aquifer. Outside of the rainy season, almost all of the water flowing in the San Pedro River is discharged into the river directly from the aquifer. The aquifer supports not only the entire human population of the Upper San Pedro River basin, but also the millions of wild plants and animals that depend on the same water. An understanding of the geologic history and structure of this area is important in understanding current stresses and threats to the ecologically diverse basin.

Now that we see how the peaks and valleys came to be, what does it mean in terms of biodiversity? The answer lies in elevation change. As one ascends, temperatures decline and moisture levels rise. Climbing a mountain is similar to traveling north in terms of the habitats that one passes through. We can use Merriam's Life Zones to describe our local situation. Our lowlands, semidesert grassland and Chihuahuan desert scrub, lie at the upper edge of the Lower Sonoran Zone.

Moving upwards into the Huachuca Mountain foothills we reach the Upper Sonoran Zone. In our area, this zone contains an interesting mix of plant communities. Here grassland gives way to oak savanna and then oak woodland. Common oaks are Emory, Arizona, and silverleaf. Alligator juniper and Mexican pinyon are also present. On the lower edges of this zone and at slightly higher elevations on south facing slopes we also find evergreen chaparral plants such as manzanita, mountain mahogany, silk tassel, and sumac.

Higher still is the Transition Zone, where oak woodland becomes oak-pine woodland and then pine forest. It is here that we find Madrean Evergreen Woodland. It contains Chihuahua and Apache pine, Arizona madrone and oaks, as well as Douglas fir and white fir in the cooler spots. Toward the summit of the Huachucas we enter the Canadian or Montane Zone, characterized by white fir, Douglas fir, quaking aspen, and southwestern white pine.

Coursing through many mountain canyons and passing through most of these life zones are creeks, which bear along their banks Canyon Riparian Woodland. The trees bordering the stream include sycamore, cottonwood, arroyo willow, bigtooth maple, ash, walnut, and locust. Some of these species, like Fremont cottonwood and Arizona sycamore, are known as riparian obligates. This means that they only grow in riparian (water's edge) areas with their roots in contact with the water table. The presence of water, as well as the variety of tree types, makes the riparian area particularly attractive to wildlife.

Of course, the distinctions between each zone are not clear-cut. Life zones blend into one another, intermingling in areas called ecotones. Slope aspect, either north or south-facing, will affect temperature and moisture levels and therefore the mix of plants located there. Over the course of the year, south-facing slopes receive much more solar radiation than north-facing slopes and are, as one would expect, warmer and drier. In Ramsey Canyon we find tall pines growing on the canyon's north-facing slope while at the same elevation on the opposing south-facing slope, we find oaks and juniper.

In summary, diversity of elevations begets diversity of habitat begets diversity of plants and animals. The sky islands are exceptional in illustrating this principle.

C. Climate

The unique climate of southeast Arizona provides an additional stimulus for biological richness. We often boast of having five seasons here. There is fall with its wonderful pockets of color, winter with snow-capped peaks, spring with greening cottonwoods and sycamores, and summer with long, hot dry days. In between summer and fall is the rainy season during which the landscape is transformed.

The monsoon rains come during the summer months of July, August, and early September. During this time we might receive 50-80% of our annual rainfall. The climatic origin of our monsoon rains is a large belt of warm, moist, rather still air called the "doldrums", or equatorial calms, located to the west of Ecuador. In early spring this mass of air begins to move north, eventually reaching a limit of 12 degrees N latitude by August, at which point it then returns south. Its northwest movement appears to be the main factor causing the wet season along the Pacific Coast from Central America to northwest Mexico. The warm air brought by the doldrums heats the land, causing onshore breezes and convective rains. These rains begin in April in Central America but do not reach northwest Mexico and southeastern Arizona until late June or early July. A similar process occurs on the Gulf Coast, where the "Bermuda High" brings moisture-laden air east and north into Mexico. Some of this moisture also reaches our area.

The summer monsoon season is our verdant time, when bunchgrasses are lush and green, summer wildflowers are in bloom, and various species of creeping and climbing vines ramble over any substrate they can wrap their tendrils around. The burst in plant growth is paralleled by a profusion of insects, especially beetles, grasshoppers, butterflies, and moths.

The pervasive mood is subtropical. Indeed, we have subtropical species that time their reproduction to this most bountiful time; Elegant Trogons, Sulphur-bellied flycatchers, Botteri's

sparrows, coatimundi, Coue's white-tailed deer, spadefoot toads, red-bordered satyr butterflies, giant root borer beetles, and countless plants are most active during the monsoon months. Few other times of year are as exciting as summer when it comes to wildlife diversity.