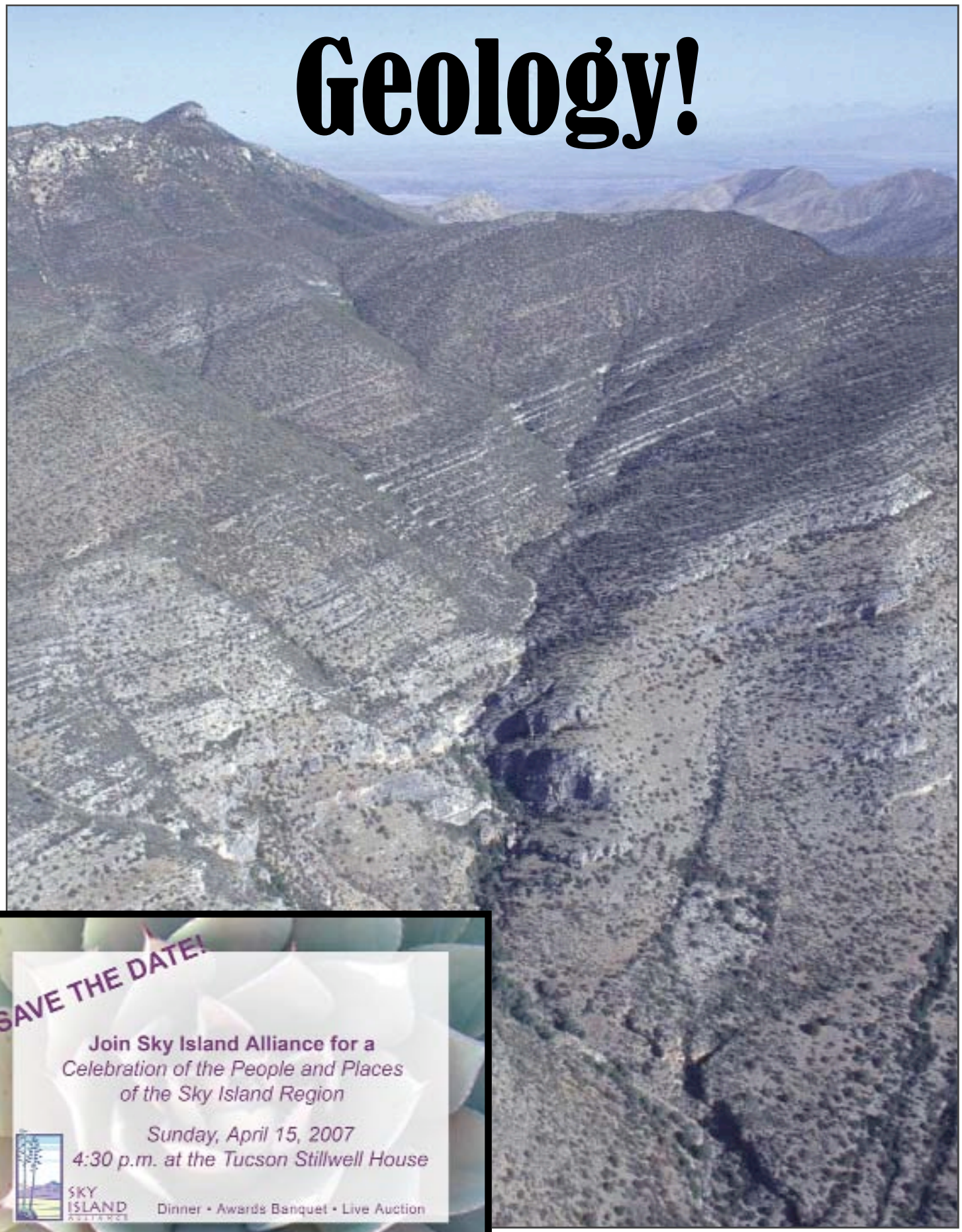
SKY ISLAND ALLIANCE
Protecting our Mountain Islands and Desert Seas

Restoring Connections

Vol. 10 Issue 1 Spring 2007 Newsletter of the **Sky Island Alliance**

Geology!



Tilted limestone beds of the Whetstones *courtesy Cecil Schwalbe*

In this issue:

Mining in the Sky Islands!

A special pull-out with take-home information on the outdated 1872 Mining Law, the call for Real Reform and how you can make a difference! We've printed extras… Please distribute them!

From the Director's Desk:

On a fair to middling number of occasions, my mind retreats to a place and time that I can only imagine, and never experience. It is a vision and dream that surely I share with many others. The virtual journey begins in the Sulphur Springs Valley on a sunny August day sometime in the late 1600s. The sky is vivid blue, cleansed from rains the evening prior. The chest-high grass that reaches out as far as I can see, south towards the Swisshelms, glows green and amber in the evening light. I look back towards the Chiricahuas and notice a few small smoke trails slowly rising off the high country. As I move through the landscape, I come across critters I'm not accustomed to; wolves running down a fawn near Canelo, buffalo dotting the landscape around Animas, and grizzly bears lumbering through the never-ending Cienegas of a river that would someday be called the Beaver, then San Pedro. It wasn't that long ago, but it sure seems so. What was it really like, I ask myself? I fully understand the tendency of the mind to create realities that may have never been, but I also catch glimpses of that beautiful vision in old trip accounts, science literature, and stories passed down from generation to generation. Should we recreate that vision? Would we want to if we could? Much has changed in a short amount of time here in the Sky Islands. This much is clear — we have a long way to go to get to where we want to be.

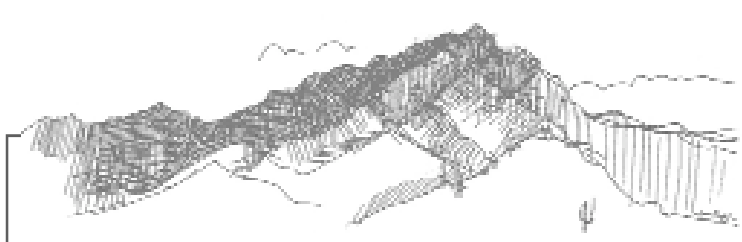
Sky Island Alliance has carried and worked towards a vision of interconnected wildlands, wild critters, and a wonderful sense of community for 16 years. With a vision that is as bold as ours, you've come to learn that we have a long-term perspective on many goals, though work with an urgency that reflects today's reality. We celebrate our successes, acknowledge our own, and turn a face towards the future. Twenty years from now, we'll do the same. It is because of that long-term vision that Sky Island Alliance is embarking upon a quest to ensure its resiliency, sustainability, and strength long into the future.

I'm proud to announce a two-year campaign — *Building for Tomorrow* — dedicated to putting Sky Island Alliance in its own home. Not only do we need to have our own home for staff, members, and volunteers, but it makes financial sense. Instead of paying rent, we'll build equity. Since there's no doubt we'll need to be here in twenty, fifty, or seventy years from now protecting lands, working with communities, and ensuring that a post-carbon society means everything we hope it does for the integrity of our natural heritage, we need to plan for it now. We'll need your help. Help us change Sky Island Alliance from a frugal, grassroots, hard-hitting organization that goes month to month with rent checks, to a frugal, grassroots, hard-hitting Sky Island Alliance that puts ALL its dollars directly towards conservation. You can even have your name on the building (I think). I'll look forward to talking more about *Building for Tomorrow* in the months to come. It's a novel idea for us, but it makes all the sense in world. In the meantime, consider making an initial donation specifically to our quest — it'll go straight towards the purchase or construction of a Sky Island Center. I have another vision, but this one is in the future. Restoration volunteers are perusing a library of everything Sky Island, a workshop of landowners and conservationists is being hosted in the adjacent conference room, and our dedicated staff are working hard in a place that all of us can call home. I hope you'll join us.

Matt Skroch, Executive Director

Join the Legacy Club!

Comprised of our monthly and quarterly donors, this program is an easy way to donate to SIA and helps us tremendously! By donating just $10 a month, you can turn your yearly $35 membership contribution into $120. Or, by donating $50 every quarter, your yearly contribution would total $200! There are many different donation options through this program. If you are interested, please call Acasia at 520.624.7080 x10 or click on the Donate Now button at **www.skyislandalliance.org**.



520.624.7080 ✶ fax 520.791.7709 ✶ info@skyislandalliance.org ✶ PO Box 41165, Tucson, AZ 85717

www.skyislandalliance.org

Sky Island Alliance is a non-profit membership organization dedicated to the protection and restoration of the rich natural heritage of native species and habitats in the Sky Island region of the southwestern United States and northwestern Mexico. Sky Island Alliance works with volunteers, scientists, land owners, public officials and government agencies to establish protected areas, restore healthy landscapes and promote public appreciation of the region's unique biological diversity.

SKY ISLAND ALLIANCE
Protecting our Mountain Islands and Desert Seas

I can tell you many stories about the rocks and minerals in my life. As soon as I could toddle, how easily I could be engrossed picking out the pretty rocks in our driveway, and a few years later, alternately thankful and worried that my younger sister would just pick up any ol' grey rock, merely to be with me; our teenage neighbor Pete, too young yet to be drafted for Vietnam, who brought back geodes from a canoe trip and cracked them open to reveal the crystals inside (I still have mine); the 50 pounds of jade, jasper and agate we collected in our wanderings along the beach in Lincoln City, Oregon, and brought back in our Pan Am bag to polish at home (we did buy the tumbler, but never got around to it); the day we spent investigating roadcuts in Kansas with Uncle Pete, a friend of my dad's, who did that sort of thing for fun; and then, skip a few years, walking in a swank Dallas mall with my boyfriend, a fresh emigré from Texas A&M with a useless Master's degree in Geology (the oil market plummeted upon graduation), and listening as he greeted the polished floors like old friends, telling me their names and origins.

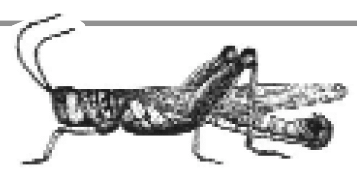
It wasn't until I arrived in Tucson that my relationship began shifting. How could it not? For once the rocks were bigger than me. I could not fit them in my hand, I could not pick them up. They called me up washes, they gave me a better view. Sure, I collected rocks and brought them home; but more and more I left them where they lay, perhaps arranged artfully in an out-of-the-way place where I could find and visit them again. You see, I had read Richard Shelton's poem (many thanks to Richard, for letting us reprint *The Stones*), and I had to respect the fact that many rocks do not like to be moved. And it should be no surprise that a few years later I discovered John McPhee's eloquent ramblings along Interstate 80.

Mining. It's a double-edged sword, isn't it? I remember my trip to Chile with friends, one of whom grew up in Peru — her dad was a geologist who now worked out of Santiago. We stayed with him and had the obligatory dinners with family friends (all geologists), and on our way back from the Lake District, the obligatory tour of a silver mine. The mine looked over a beautiful valley that Wallace Stegner could have described in loving detail. There I was, wearing the Mapuche silver earrings I'd just bought, trying to ask in halting Spanish, "where do you leach the silver? will the chemicals you use get into the water that makes this valley so fertile? how will your extraction processes effect the people who live in the valley, yourselves included?" Yet how could I separate myself from this mine? My earrings — by now burning much larger holes in my ears — and so many of the everyday things in my life that add functionality or beauty… they are by-products of these and other mines.

Ecologically, spiritually, I do not want mining going on at Rosemont Ranch or the Empire-Fagan Valley or the Dragoons. But does that mean someone else somewhere else is going to have to foot the bill for keeping my life running in beauty and function? How can we, who live in such an affluence-driven culture, begin to live more sustainably? Am I naïve to ask why can't we recycle and reuse what we already have? One third of our copper is in landfills!

I missed Congressman Grijalva's field hearing on February 24th. The testimony I have read at **resourcescommittee.house.gov/hearings/hearingdetail.aspx?NewsID=15** is compelling. I encourage you to explore this issue, and your heart, and do whatever you can. Thank you, *Julie*

Next issue: Stories from the field!



We want to keep this newsletter filled with inspirational, informative material, and we'd like your help! Do you write poetry? Draw, sketch, paint or photograph? Like to address regional conservation issues? Review books or websites? Anything that related to the Sky Islands region is fair game! You can respond to items in our recent newsletter, comment on your experiences as a volunteer or conference-goer, etc. Or give your favorite small-town restaurant a boost by writing a review and letting us promote it!

Restoring Connections is published three times a year and the deadline for our next newsletter is May 15, 2007. Material submitted after that date may be saved for subsequent issues.

Please email submissions to: **julie@skyislandalliance.org**, or mail them to Sky Island Alliance, PO Box 41165, Tucson, AZ 85717. Resolution of digital images should be at least 300 dpi if possible.

Grasshopper *by Sky Jacobs © 1993*

The Time to Act is Now: A Report from the Coronado Planning Partnership

by David Hodges

The Coronado National Forest is engaged in two planning processes that will have tremendous impact on the future of our local forest.

The first of these, initiated in June of 2006, will revise the Coronado NF Land and Resource Management Plan, the forest service's guiding document for management of national forest lands. These plans were first provided for by Congress in 1976, through passage of the National Forest Management Act. Under this Act, all national forests were directed to establish management plans which would identify and guide all land management activities undertaken by the forest service. This was a crucial step in improving management of our national forests, as for the first time, land managers were required to plan in advance, while looking into the future and planning for long-term sustainability.

The initial plan for the Coronado was completed in 1986. Though Congress had intended for these to be revised every 10-15 years, we are now 21 years into the existing plan and counting. In 2005, the USFS released a new planning rule, which established guidelines for how revision of existing plans would take place.

Recognizing the importance of this process and the need to ensure a conservation-based management plan, Sky Island Alliance worked with other stakeholders who share our conservation interests, to establish the Coronado Planning Partnership.

The second process, mandated by the Transportation Planning Rule, was initiated in December of 2006. This planning rule was developed in response to a tremendous maintenance backlog on national forests nationwide. The goal of this directive is that each forest would identify the minimal network of roads on their forest that would allow them to carry out their mission. If done well, this process will restore many areas of the Coronado in which habitat fragmentation is a problem, and prevent such impacts in the future. With the population of southern Arizona expected to double during the life of the new management plan, it is urgent that we get this right.

Will these landscapes retain their greatest value as wildlife habitat, watersheds, and places of solace where we escape our busy, crazy world from time-to-time? Or, will they become a recreational playground for a burgeoning urban and rural population. Will our roadless areas continue to be managed as primitive, non-motorized areas, or will they become sacrifice areas for motorized recreation. Will road density standards be retained, or will they be relaxed or abolished to allow for more recreational development. These are some of the important questions that will be answered by these two processes.

We are at one of those crucial points in history where decisions made now will result in permanent trends in a particular direction. If we can ensure conservation-based management plans now, as these new plans are created, in 20 years the management emphasis will be conservation. If these upcoming plans emphasize roads and motorized recreation, that will be our future.

We need your help.

Get involved in forest and transportation planning, by contacting David at **dhodges@skyislandalliance.org**, *or 624.7080 x13.*

Looking at the Sky Islands Through a Geologist's Eyes

By David Coblentz

"The real voyage of discovery consists not in seeking new landscapes but in having new eyes."
—Marcel Proust (1871–1922)

What each of us sees when we look across the vistas of the sky islands depends in large part on who we are. Visitors haling from more verdant regions see a desolate, dry desert while those from more arid deserts see a lush wonderland of exotic plants. The naturalists among us see salvation in the broad vistas and open landscape, while developers see golden economic opportunity. The geologists — who think in terms of hundreds of millions of years, who see the rocks as the signature of thermal and chemical processes deep within the Earth, and who can follow the motion and deformation of large regions of the Earth — must certainly view the landscape in a different way. What does the geologist see when looking at the landscapes of the sky islands?

The topography of the sky islands tells a geologist many things. Perhaps most importantly, the high relief and rugged mountains speak of a geologically young landscape, an area that is tectonically "alive" and a place where the restless forces of the Earth are still molding the landscape. Mountains do not last very long, geologically speaking. They remain high and rugged so long as the crust of the Earth is actively deforming. When the tectonic forces causing the deformation relax, mountains quickly succumb to the erosional power of wind and water. Thus, the small topographic wrinkles of the Appalachian and Ural Mountains are all that is left of mountain ranges that formerly rivaled the Andes in grandeur.

If the topography of the sky islands tells us that the region is tectonically "alive," what geologic forces are responsible for molding the landscape? For the answer, we must look many hundreds of miles away to the western boundary of North America and the plate tectonic forces arising from the motion between the Pacific and North American plates.

The western boundary of the North American plate has been active for more than 200 million years and this long history has produced a rich mosaic of geographical features. Here one can find uplifted but relatively undisturbed plateaus (Colorado Plateau), actively extending regions (the Basin and Range province), a major continental rift system (The Rio Grande Rift), the remnants of a Paleozoic mountain belt of Andean proportions (the Rocky Mountains), and immense piles of volcanic rock (the Sierra Madre Occidental). Preserved in the geology of the sky islands is a 300-million-year story of ancient oceans, long-cooled volcanoes, and long periods of quiescence followed by periods of violent deformation of the Earth's crust. The granites of Texas Canyon are the frozen remnants of mountain roots that cooled about 50 million years ago; the volcanic rocks of the Chiricahuas are evidence of a massive eruption that occurred 25 million years ago; the gneisses and schists found along the front range of the Catalinas, Rincons and Pinaleños are metamorphic rocks that have been exhumed from miles below the Earth's surface; while sedimentary rocks, deposited during quiescent periods more than 300 million years ago make up the limestones of the Dragoon and Whetstone Mountains.

This diverse geology formed as the tectonic plates off the western coast of North America have jostled and ground against each other starting about 150 million years ago. This was the Jurassic Age and as dinosaurs roamed throughout Western North America, the supercontinent Pangea was breaking up into a number of smaller plates. The Farallon Plate, a remnant of this break-up, began subducting under the west coast of North America, which at that time ran through modern Utah and Arizona.

This subduction produced compressional tectonic forces throughout Western North America which built massive mountain ranges the size of the present day Andes. Geologists see evidence for two types of mountain building. The first, called the Sevier Orogeny (from *orogenesis* or mountain-building), was 'thin-skinned' in the sense that the deformation involved only the upper-most (less than ten kilometers) of the Earth's crust where the lithosphere

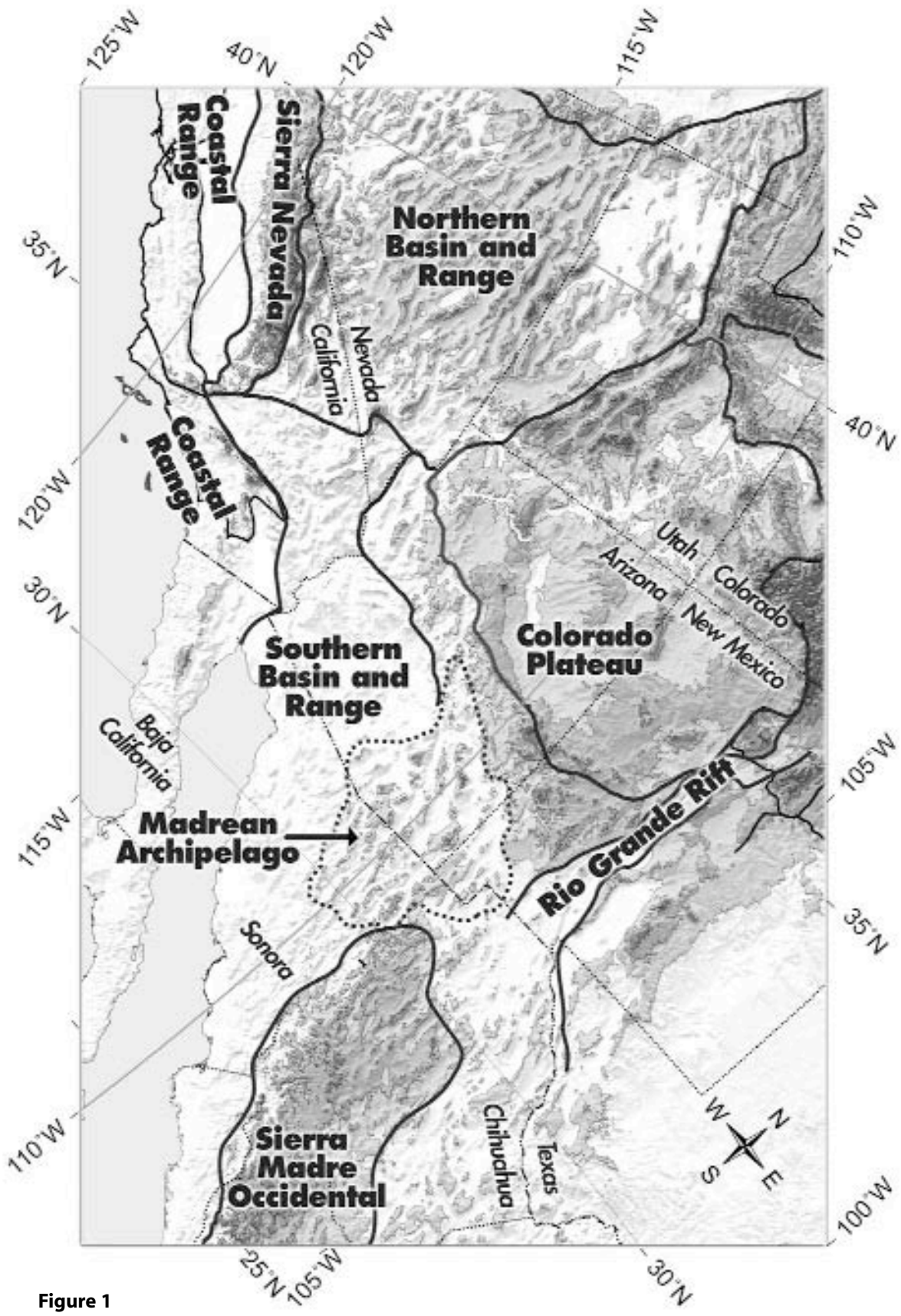


Figure 1

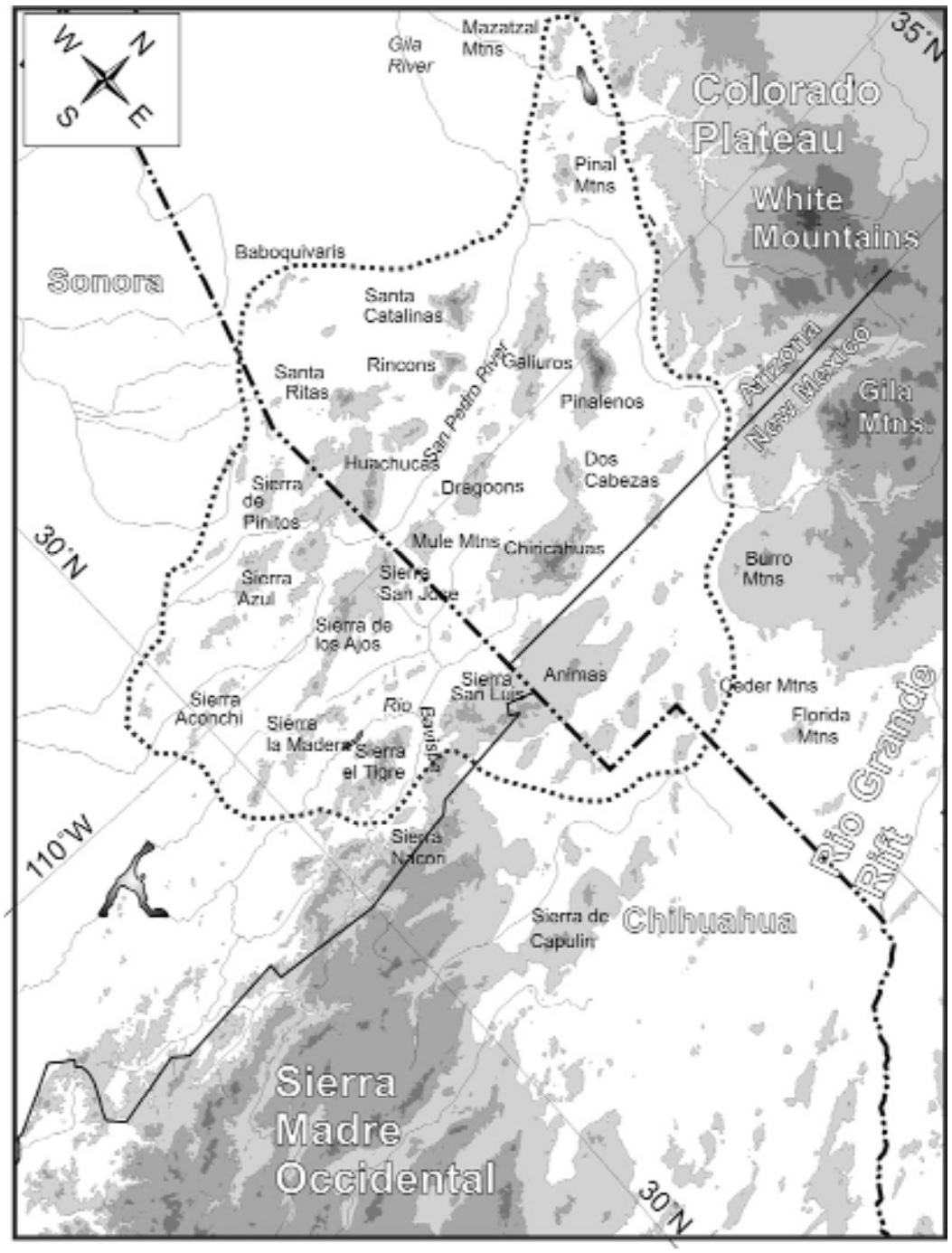


Figure 2

(the upper 100 km of the Earth, derived from the Greek *lithos* meaning stone) was sufficiently weak. This first type produced north-south trending mountains between 150 million and 70 million years ago. Examples of these formations can be seen in the Canelo Hills of Arizona and the mountains near Juarez, Mexico. As this crustal squeezing progressed further east between about 70 and 50 million years ago into stronger areas of the North American plate, deeper parts of the crust were uplifted. This second deformational phase is known as the Laramide Orogeny. The copper ores mined in and around the sky island region (e.g., in Morenci and Silver City) were produced in this event. Laramide structures are preserved in many of the sky islands including the Santa Rita, Whetstone, Dragoon, Huachuca, and Mule Mountains.

Between about 30 million and 10 million years ago tectonic processes associated with the subduction of the Farallon Plate produced widespread volcanism throughout Western North America. Huge quantities of volcanic rock were produced in these eruptions and formed the Chiricahuas, Peloncillos, and the high plateau of the Sierra Madre Occidental. The Chiricahuas are in fact a collapsed caldera, whose eruptions about 25 million years ago spread igneous rock throughout the area, including a solidified hot ash flow called tuff. The fantastic rock spires and hoodoos of Chiricahua National Monument formed from the erosion of this welded tuff.

Over time the central part of the Farallon Plate completely subducted under the southwestern part of the North American Plate leaving only small remnants to the north (the Juan de Fuca plate which continues to subduct beneath the Cascades) and south (the Cocos Plate which is presently subducting under Central America). About 20 million years ago the Pacific plate came into contact with North America and the boundary changed from a subduction zone to the strike-slip margin characterized by the San Andreas fault system that runs along the west coast of California today. Over the past 10 million years this change in the plate boundary caused the east-west compressional forces acting across western North America to relax and the high topography created during the previous mountain building to collapse. The pulling-apart of the Earth's crust during this period is responsible for the Basin and Range geography present throughout Arizona and Nevada. The Rincon, Santa Catalina, and Pinaleños were formed during this time and are called "metamorphic core complexes" since the rocks of these mountains are composed of mid-crustal metamorphic rocks exhumed from deep in the Earth's crust.

In light of how important the tectonic motion between the Pacific and North American plates has been for the geologic evolution of Western North America, a map that somehow emphasizes the relative motion between these plates could help us gain a new perspective on the landscape. Maps of the world using a Mercator projection are familiar to us all — north points to the top of the map, lines of latitude and longitude are parallel, and Greenland is the size of South America (an unfortunate distortion since South America is actually eight times larger than Greenland). Maps using a Mercator projection gained popularity during the Age of Discovery [sic] since straight lines on a Mercator map are *loxodromes* or *rhumb lines* and define lines of constant compass bearing. These maps were very useful for sailing, say, from Spain to the West Indies, since a navigator needed only to draw a line between two points on the map and follow that compass direction to reach the destination. However, since very few geologists sail the "waters" of the Madrean Archipelago, what other projections are available?

The Oblique Mercator projection (shown in Figure 1) is perhaps most useful for a geologist seeking a new way of looking at the sky islands. While vertical lines in a standard Mercator projection point north, on this map the lines indicate how the Pacific plate is moving with respect to North America — roughly northwest. From this perspective, geographic features that have been produced by this plate motion are aligned vertically and are easy to pick out visually — for example, the Sierra Nevada, the California coastal ranges, Baja California, and the high plateau of the Sierra Madre. On this new map (shown with more detail in Figure 2) the U.S.-Mexico border crosses at an awkward angle emphasizing how political boundaries are often artificial and prevent us from seeing continuity in topographical features like the Madrean Archipelago. Following the vertical lines, one can see that the topographic orientation of the sky islands is remarkably constant from the Sierra Madre to the Colorado Plateau. This fabric can be traced through Sierra de los Ajos, Sierra Azul and Sierra de Pinitos south of the border, through Huachucas, Galiuros and Pinaleños in the central Sky Island region, and northward through the Pinal, Mazatzal, Bradshaw and Sierra Ancha mountains of Central Arizona. During periods of climatic change, flora and fauna are able to migrate along "flow lines" following this topographic grain. One can well imagine Saguaros at the end of the last Ice Age marching through the landscape from their subtropical origins in the Sierra Madre to the Tucson Mountains.

It is clear that the topography of the sky islands has been profoundly influenced by tectonic forces acting along the western margin of North America. By acknowledging the important role topography plays in the sky island region, we are inspired to change the way we view the landscape and "look locally but think globally."

— David Coblentz is a long-time friend of Sky Island Alliance, and a few years back, logged in many hours (hot hours, it was May) at the Fort Huachuca Mountain Lion Count. He and his family now live in New Mexico.

Limestone and its Relationships to Sky Island Biodiversity

by Julia Fonseca

I once sat in a deep, shady overhang watching water seep through rock. A tiny drip would run down a stalactite and slowly bulge into a drop. The drop would hang poised for 12 seconds, as it was buffeted by ever so slight winds. The result of that struggle, after hundreds of years, was a small lump of rock on the floor, next to a precious puddle of water in a dry landscape. The shelter had once been the lair of a jaguar. Even now bats used its dark crevices.

Limestone contributes to the biodiversity of the Sky Island region. In its Sonoran Desert Conservation Plan, Pima County specifically recognized limestone outcrops as worthy of conservation. This article explores special characteristics of limestone that deserve our attention as people concerned about the region.

Also known as calcium carbonate ($CaCO_3$), limestone is typically found in small amounts around the periphery of the higher mountains of southern Arizona (Catalina-Rincons, Santa Ritas, Pinaleños, Huachucas, Chiricahuas). Some smaller ranges such as the Whetstone, Empire and Mustang Mountains are comprised almost entirely of limestone. As one moves eastward into southern New Mexico and west Texas, limestone becomes the dominant rock-type in an area of ancient inland seas known as the Permian Basin.

Worldwide, limestone is known to harbor species with restricted distribution, such as cave invertebrates, bats and rare plants. This is no less true in the Sky Islands. For instance, researchers Cecil Schwalbe and Caren Goldberg found the elusive Barking Frog used primarily limestone outcrops in their Huachuca Mountains Study site, even though other rock types were more common. This rare species is at the northern edge of its North American distribution and must rely on rain-soaked crevices for shelter and reproduction. *Sonorella*, a genus of land snails, are mostly restricted to limy slopes where they obtain calcium carbonate to construct their shells. They also use calcium carbonate to buffer the acids created by their respiration during the long periods of being sealed up in their shells, waiting for rain. Recently, a local group of researchers found new cave invertebrates in the Sky Islands, and more will be found in the future.

Limestone is not just habitat for endemic or rare species. More importantly, it is a place where more common species find a niche in otherwise inhospitable locations. This allows some plant populations to persist far outside the rest of a species range, contributing to the richness of species in the area. For instance, a thicket of *Ceonothus-Cercocarpus* may be found on limestone-derived soils, where it provides cover and browse for deer seeking refuge in what is otherwise a sparse grassland. Or a big, flowering hillside of ocotillo may offer a stop-over to hummingbirds heading north through a landscape that may have few other nectar sources. McAuliffe (1995) noted that the topographic diversity offered by limestone bedrock is high, and contributes to species richness. For example, soil-filled solution pockets eroded in limestone bedrock are relatively moist environments, while un-fractured bedrock presents a very xeric microenvironment. Bedding planes and movement-derived fractures and faults are common to limestone strata and provide reservoirs that store moisture for woody plants with deep roots.

One of the most important functions that limestone outcrops provide to common species of wildlife is shelter. Weathered limestone has an abundance of nooks and crannies that provides countless dens for rodents, snakes, Gila monsters, tortoises, lizards, foxes, skunks, coatimundis, coyotes, and other creatures (see box on next page). The physical characteristics of limestone may provide thermal amelioration during episodes of extreme cold, which allows some plants and ground-dwelling insects to extend their distributional limits on limestone outcrops.

Packrats like to stuff limy crevices with vegetation gathered from nearby hillsides, and so become "librarians" documenting climate change. Scientists have studied their urine-cemented (indurated) middens of vegetation to reconstruct much of what we know about the last 40,000 years of climate change in our region. From this record, we have learned that there has never been a unified "Chihuahuan desert" plant community with a fixed assemblage of species (Van Devender, 1990). Individual species have shown different tolerances to changing climate. One likely implication is that as global warming continues, plant communities will not shift up the sky island gradient as a group. Rather, the plant associations we know will disaggregate, as they have before. Caves are also libraries of past biodiversity. We know from cave deposits that ground sloths, horse, bison, vampire bats and giant short-faced bears once populated this area.

Limestone outcrops are important sources of water, particularly during droughts. Discharges of water sustain reliable supplies of water to springs and streams, making limestone areas important ecological refugia during drier climates. In some places, such as the Huachuca Mountains, limestone strata yield large amounts of water used for residences. Outcrops of limestone are places where the aquifer becomes recharged as water moves through fractured and porous rock. Aquifers within limestone strata are more easily contaminated because there is no soil to capture or filter pollutants, and the transit time to the aquifer is short due to fractures and faults.

In our region, most limestone was deposited between 200 and 400 million years ago, when much of the North American tectonic plate was covered by a shallow, marine environment, the same one that laid down the famous Redwall Limestone of northern Arizona. Today, Sky Island hikers may find some limestones expose nifty animal fossils, clues to their marine origin. But many limestone layers, deeply

Uncommon Species using Limestone and Limy Soils

Lesser long-nosed bat
Leptonycteris curasoae yerbabuenae

Long-tongued bat
Choeronycteris mexicana

Mexican free-tailed bat
Tadarida brasiliensis

Barking frog
Eleutherodactylus augusti

Tiger salamander
Ambystoma tigrinum

Talus snails
Genus *Sonorella*

Micro-whip scorpion
Koenenia n. sp.

Arkenstone Cave blind agelenid spider
Neocryphoeca n. sp.

Cave harvestman (laniatore #1)
Sitalcina n. sp. 1

Cave harvestman (laniatore #2)
Sitalcina n. sp. 2

Arkenstone Cave pseudoscorpion
Albiorix anophthalmus

Sphinx (Spinx) Cave pseudoscorpion
Chitrellina chiricahuae

Sphinx Cave isopod
Brackenridgia sphinxensis

Cave isopods
Brackenridgia/ Amerigoniscus? n. spp.

Arkenstone Cave springtail
Seira n. sp.

Arkenstone Cave nicoletiid
Nicoletia n. sp.

Cave crickets
Ceuthophilus spp.

Flightless tiger beetle
Amblycheila baroni

Cave beetles
Genus *Rhadine*

Spider wasp
Ageniella evansi

Spider wasp
Auplopus mexicana

Saiya
Amoreuxia gonzalezii

Cochise pincushion cactus
Coryphantha robbinsiorum

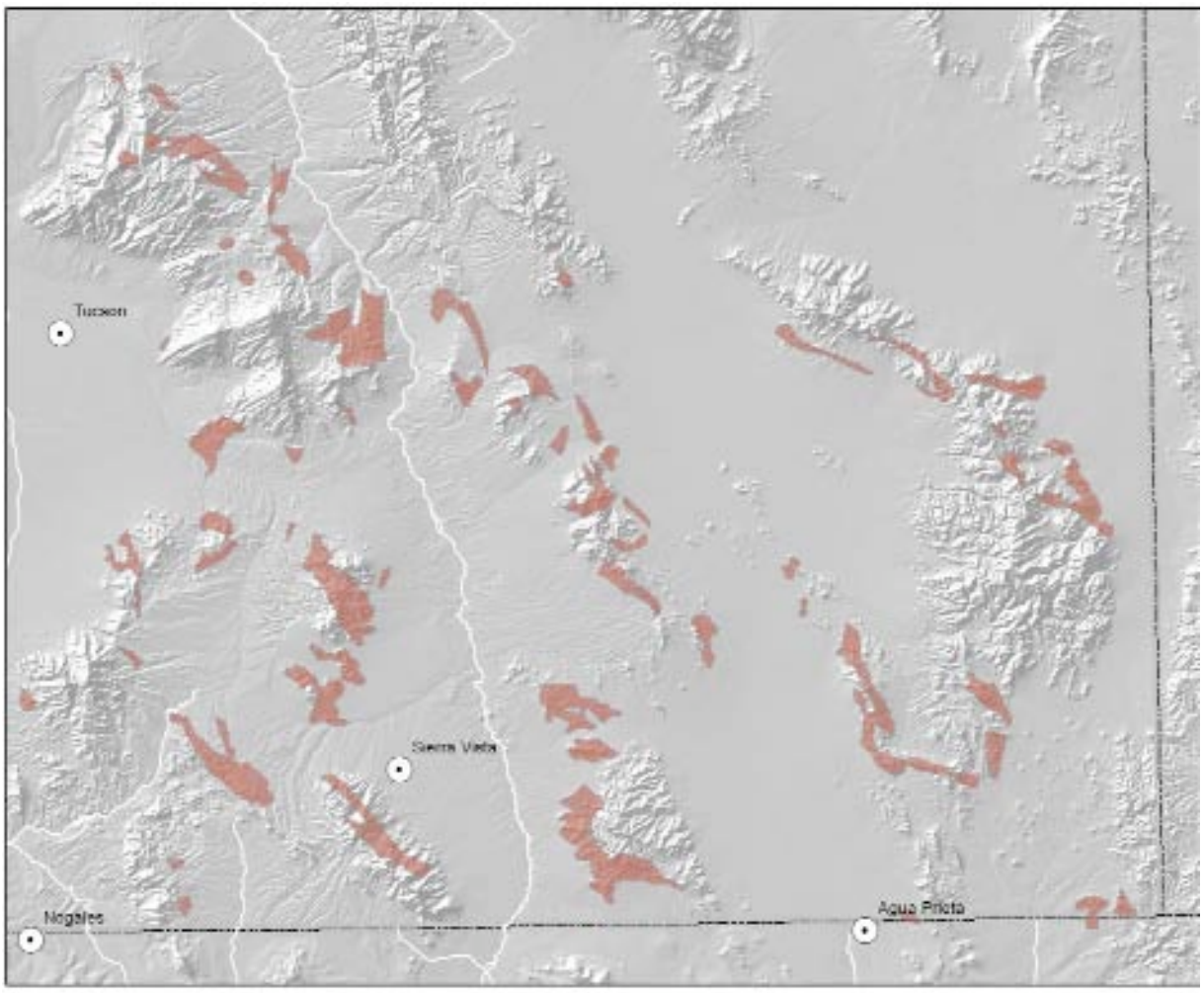
Nichol Turk's head cactus
Echinocactus horizonthalonius var. *nicholii*

Needle-spined pineapple cactus
Echinomastus erectocentrus var. *erectocentrus*

Arizona manihot
Manihot davisiae

Yellow bells
Tecoma stans

Barking frog *courtesy the author.*



The distribution of limestone in our region *courtesy Dale Turner.*

buried beneath subsequently placed strata, have been heavily altered by heat and hot geothermal fluids at depth, resulting in what mining geologists call *skarns.* Even later, as the rock strata were exposed by erosion, they began to dissolve and break apart even further.

Losses of limestone outcrops are ongoing — to mining for marble, for aggregate in cement production (the Mount Fagan area of the Santa Rita Mountains, the small hill west of the Tucson Mountains removed for the Portland cement plant at Rillito, and various locations in Sonora), for copper, silver and tungsten (Huachucas); and to suburban development (Vail and Empire Mountains).

Copper deposits in the Sky Island region are often associated with limy skarns intruded by volcanic magma. During the late Cretaceous and Tertiary (50 to 80 million years ago), magmas brought up fluids which added large amounts of silica, iron, magnesium and trace amounts of copper, zinc, silver, molybdenum and tungsten. Skarn deposits are often riddled with adits (horizontal mine tunnels), vertical shafts and prospect pits. Abandoned adits and shafts offer bats sheltered locations suitable for roosting or even places where young bats may be reared.

Recommendations:

An assessment of the biological conservation value of limestone should occur as part of the Forest and BLM planning process. A similar assessment is needed in Sonora.

County governments should consider protecting limestone outcrops in watersheds located upgradient from existing and projected development. Land-use activities that might contaminate the aquifer include septic tanks, heap leaching, underground storage tanks, new wells (portals to the aquifer), open pits and shafts, animal feedlots, agriculture, and construction-related spills.

We all have a responsibility to practice what we preach, through judicious selection of building locations, methods and materials to minimize our impacts upon the earth.

References:

AGFD, no date. Heritage Data Management System Invertebrate Abstract. Sonorella allynsmithi.

Goldberg and Schwalbe, Habitat use and spatial structure of a barking frog (*Eleutherodactylus augusti*) Population in Southeastern Arizona. Journal of Herpetology, Vol 38, No. 3, pp. 305-312.

McAuliffe, J. R. and T. L. Burgess, 1995. Landscape complexity, soil development and vegetational diversity within a Sky Island piedmont. In DeBano, L. F., et al., editors. Biodiversity and Management of the Madrean Archipelago: The Sky Islands of Southwestern United States and Northwestern Mexico. U. S. D. A. Forest Service General Technical Report RM-GTR-264.

Muchmore, William B. and Robert B. Pape. 1999. "Description of an Eyeless, Cavernicolous *Albiorix* (Pseudoscorpionida: Ideoroncidae) in Arizona, with Observation on its Biology and Ecology." *Southwestern Naturalist.* Vol. 44, No.2. Pp.138-147.

Van Devender, T. R, 1990. Late Quaternary Vegetation and Climate of the Chihuahuan Desert, United States and Mexico in Packrat Middens: The Last 40,000 Years of Biotic Changes. Edited by J. L. Betancourt, T. R. Van Devender, and P.S. Martin. University of Arizona Press.

— Julia Fonseca is a long-time advocate for the ecological well-being of the Sky Islands. She thanks Dale Turner, Robert Pape, Bill Peachey, and David Stone for their review of earlier drafts.

Limestone and Global Warming

by Julia Fonseca

Locked inside the structure of limestone ($CaCO_3$) is one of the gases responsible for regulating the temperature of the earth: carbon dioxide gas (otherwise known as CO_2). The gas was captured by living organisms in ancient seas, which used the gas, in combination with calcium ions floating about, to form their body parts. Less commonly, limestone can precipitate directly out of solution. The slowly accumulating deposits eventually became the rocks we see today.

The amount of carbon in rock form far exceeds the amount of free carbon in the water, air and soil of the living earth. Limestone is the single largest repository of carbon dioxide on earth.

This geological repository of carbon dioxide is released to the soil, oceans and atmosphere by natural processes. What has excited attention recently is the rapid rise in CO_2 in the atmosphere. The concentrations are far higher now than in any other time during the last 600,000 years.

One of the main ways that humans release CO_2 from limestone is through the manufacturing process for cement. Cement production involves driving off the CO_2 in kilns. Globally, cement production contributes around 6% of the total anthropogenic CO_2 production. Some cement companies are actively developing ways to reduce the release of CO_2 to the atmosphere (Slagstar, Ecoment, Cemstar are tradenames for some of the new cements). Other ways to approach this problem include reducing the proportion of cement in concrete, or using other binding materials to give strength to concrete.

Most of the people in the world still use non-cement based technology, for instance adobe, stone and rammed earth. These types of structures can fail catastrophically in seismically active areas. Steel-reinforced concrete structures are much better able to provide protection from seismic action, and are critical in areas where this is an issue. For most other areas, it would be possible to reduce the quantity of cement used in construction.

For more information see **www.ipcc.ch/** and **www.propubs.com/climate/climate.html.com**

Jaguars of the Sonoran Sky Islands:
Taking little steps towards grrreat results!

by Sergio Avila, M.S., Conservation Biologist

A year has passed since the Wildlife Monitoring program did the "big jump" into working in Mexico, and as we say "*el tiempo pasa volando!*" The Jaguars of the Sonoran Sky Islands project has taken slowly-but-steady steps towards jaguar habitat research while establishing landowner collaboration, and we look forward to 2007's challenges and opportunities.

We first introduced this project in the Spring issue of *Restoring Connections* ("On the Ground in Sonora", 2006, Vol.9, Issue 1) when the initial purpose of the study was to evaluate the feasibility of conducting research on the presence and movement of jaguars in northern Sonora, Mexico. Sky Island Alliance is committed to securing jaguar recovery in the region and promoting conservation throughout the borderlands; today we have new and exciting advances to report, and stronger goals have been set. This project's long-term goal is to build cooperative relationships with landowners in Sonora in order to encourage jaguar conservation and facilitate ongoing scientific research in the region, and to strengthen collaboration with our partners in both sides of the border, like the Northern Jaguar Project, whose work focuses on preserving viable habitat for the last remaining breeding populations of endangered jaguars in northern Mexico.

During the course of 2006 we experienced a region that features species, climate, and ecological processes typical of the Sky Island region. We learned that similar to other rural areas in the region, whose economies are based on the livestock industry, local culture and customs are divergent and diverse giving the use, management and preservation of natural resources a different approach and presenting different challenges. In May 2006, we successfully explored Sierra El Pinito (please read the complete account by herpetologist Robert Villa, in *Restoring Connections*, Vol. 9, Issue 2, Summer 2006). In July and December we visited Sierra Azul, and met the Robles: a hard-working, environmentally conscious family and wildlife conservation advocate who decided to "let ecological processes happen" and allows wildlife species to re-colonize areas that were used for grazing before excluding cattle. Mr. Robles' words described perfectly his family's approach to conservation: "cattle grazing is not worth the damage to the land".

Sky Island Alliance also participated in the development of a standardized protocol for utilization of camera traps to validate presence/absence and population densities of jaguars, published by Mexican researchers Chavez and Ceballos (2006; Chapter III: *Census and Monitoring*).

The Jaguars of the Sonoran Sky Islands project aims to "ground proof" the results of Geographic Information System habitat modeling studies. Two of those studies focused on potential habitat in Arizona (Hatten *et al.*, 2003) and New Mexico (Menke and Hayes, 2003), while the other two focused on the borderlands region, presenting jaguar distribution maps that include the Sonoran Sky Islands and strongly suggesting this region as potential jaguar habitat (Boydston and Lopez-Gonzalez, 2005; Grigione *et al.*, unpublished).

Threats to jaguar conservation remain on both sides of the international border, from habitat degradation to poaching to loss of wildlife linkages. These threats compromise the ecological integrity of the landscape and have the potential to jeopardize jaguar survival. Border security and law enforcement activities result in environmental degradation and threaten the movement or establishment of individual jaguars in the border region. These activities will disrupt, section and isolate wildlife populations in both sides of the border, the linkages animals use to disperse and the jaguar's opportunities to colonize northern areas. The lack of permeability in the border also threatens ecological processes like gene flow and genetic variability, control of prey populations by predators, seed dispersal, and pollination.

Additional research in some areas needs to be undertaken to fill gaps in knowledge (Menke, 2004). By maintaining landscape connectivity across subtropical and temperate zones, conservation of jaguars would help conserve a number of other species and preserve the biological integrity of the unique Madrean region (Boydston and Lopez-Gonzalez, 2005). In 2006, we cultivated relationships with landowners and ejidos from different mountain ranges and ranches; in 2007 we will continue our efforts on outreach to landowners, collection of scientific data through non-invasive methods using remote camera traps and track counts, and collaborative work with our conservation partners and allies, within this unstudied area of the Mexican Sky Islands.

To learn more about organizations working on jaguar conservation in Sonora, please visit:

Northern Jaguar Project at
www.northernjaguarproject.org

and Naturalia at
www.naturalia.org.mx/eljaguar.html

Literature cited:

Boydston, E. and C. Lopez-Gonzalez. 2005. Sexual differentiation in the distribution potential of the northern Jaguars (*Panthera onca*). USDA Forest Service Proceedings RMRS-P-36.

Chavez, C., and G. Ceballos. 2006. *Memorias del Primer Simposio. El Jaguar Mexicano en el Siglo XXI: Situación Actual y Manejo*". CONABIO-Alianza WWF Telcel-Universidad Nacional Autónoma de México. México, D.F.

Grigione, M.M., Menke, K., Lopez-Gonzalez, C., List, R., Banda, A., Carrera, J., Carrera, R., Morrison, J., Sternberg, M., Thomas, R., and B. Van Pelt. (Unpublished). Identifying priority conservation areas in the U.S.-Mexico border region for Neotropical cats, the jaguar, jaguarundi and ocelot. Dept of Env Science & Policy, University of South Florida, Tampa, FL.

Hatten, J. R., Averill-Murray, A., and Van Pelt, W. E. 2003. Characterizing and mapping potential jaguar habitat in Arizona. Arizona Game and Fish Department. 203, 1-28.

Menke, K. A. and Hayes, C. L. 2003. Evaluation of relative suitability of potential jaguar habitat in New Mexico. New Mexico Game and Fish Department. 1-30.

Menke, K. 2004. Priority Conservation Areas in the U.S.-Mexico Border Region for North American Tropical Cats: the Jaguar, Jaguarundi, and Ocelot. University of New Mexico. In: Vacariu, K., and J. Neeley. 2005. Ecological Considerations for Border Security Operations: Outcomes and Recommendations of the Border Ecological Symposium. Tucson, AZ.

Want to support this project? Adopt a Camera!
And support on-the-ground jaguar research and conservation

$150 provides: Film camera purchase and setup*
$250 provides: Film camera purchase, setup and checkup** for 6 months (4 times)
$500 provides: Film camera purchase, setup and checkup for a year (7 times)
$1000 provides: Digital camera purchase, setup and checkup for 3 months (2 times)

All donors receive:

An update on the status of camera after every checkup (site, species present) including a photo-index
Favorite wildlife photos printed on 8"x10" paper (3 photos per film)
An 8"x10" print of camera site
Membership to Sky Island Alliance for one year
Acknowledgements on this project's reports, presentations, etc.

* Camera purchase, setup and checkups are conducted by Sky Island Alliance
** All photos will retain Sky Island Alliance's copyright

Hardrock Mining in the Sky Islands!

Spike in mining proposals throughout the region call for modern oversight and environmental compliance

Last year, the final touches to the Dos Pobres mine — Arizona's newest open-pit copper mine and the largest open pit operation in the United States to go online since the mid-1970s — were completed and soon the blasting and excavation will begin. Dos Pobres now joins a dozen other open-pit copper mines in varying stages of operation in the Sky Island region, which has one of the highest densities of copper production in the world. Unfortunately in the United States, hardrock mining — including open-pit copper mines — is regulated by a law that is 135 years old, contains no environmental protections, and gives minerals on public lands — like the Gila and Coronado National Forests — away for free. Perhaps you'll wince next time you pay $5 just to go hiking.

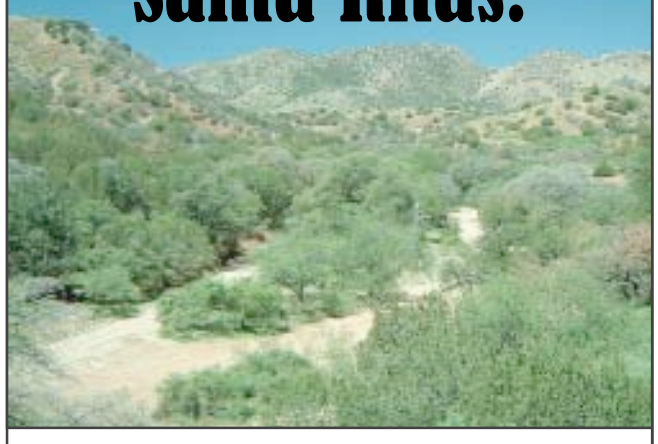
With China and India paying a premium for copper and other raw materials to fuel their explosive growth, combined with an American society that depends heavily on resource consumption, the world's natural resources are being depleted at an alarming rate. This is nowhere more apparent than in the Sky Islands. The Dragoon, Patagonia, Gila, Santa Rita, and Empire Mountains all have significant proposals or prospecting in the works.

How do these operations, governed by archaic law, match up with the pressing needs of a world-renowned Biodiversity Hotspot? The Sky Islands have done their fair share of providing raw materials to the rest of the world, and they still do — contributing over 60% of the copper produced in the U.S. It's time to get serious about bringing our laws and values up to date with the 21st Century.

Our position: Revise the 1872 Mining Law. Recycle. Conserve Energy. Let's create a new paradigm for renewable energy — not get stuck in outdated exploitation. We have enough of that already.

SKY ISLAND ALLIANCE
Protecting our Mountain Islands and Desert Seas

Save the Scenic Santa Ritas!



"…With a strong and diversified economy, Pima County no longer needs to be dependent on the boom and bust cycles of mining. Furthermore, the amount of revenue from mining contributed to Pima County's tax base, and thus to local residents in the form of services, has declined drastically. From 1977 to 2007, mine contributions to the Pima County tax base declined from 15% to 1%. The first step towards recognizing this is the withdrawal from mining of the Santa Rita Mountains within the Coronado National Forest in Pima County…"
— Chuck Huckelberry, Pima County Administrator

www.scenicsantaritas.org

Protect the Empire-Fagan Valley!

The Arizona State Land Department is currently reviewing two sets of mineral lease renewal applications for sites located in the Empire-Fagan Valley. If approved, these leases would likely result in the development of new open-pit marble quarries… and increased truck traffic, dust, pollution, bright lights, noise from blasting, water table depletion and health concerns.

www.empirefagan.org

Recent Developments

The **Patagonia Mountains** are facing three mining proposals for copper and silver on Forest Service land under active consideration !

Mining giant BHP has been approaching landowners in the **San Rafael** for permission to enter their private land to search for porphyry copper deposits, the prelude to another open pit mine.

Watch **www.earthworksaction.org** for the latest information…

Defend the Dragoons!

One Dragoon-area resident called it a siege — first the threat of a marble mine in 2000, and then landowners received letters from Australian-based mining and petroleum giant BHP Billiton informing them of its intentions to conduct surface explorations of their land for porphyry copper. The mining companies are taking advantage of the Stock Raising Homestead Act (1916), designed to promote westward expansion by giving homesteaders surface rights for cattle grazing while Congress retained the mineral rights. "No one ever anticipated that people would come here to live and retire," explains Rick Bishop, head of the Dragoon Conservation Alliance. He says the problem is the 1872 Mining Law: "We need to get the law changed."

www.savedragoonmountains.com

What is the 1872 Mining Law?

The original intent of the 1872 Mining Law was to promote mineral exploration and development on federal lands in the western United States, offer an opportunity to obtain a clear title to mines already being worked, and help settle the west. The Mining Law granted free access to individuals and corporations to prospect for minerals on public lands, and allowed them, upon making a discovery, to stake (or "locate") a claim on the deposit, entitling the holder to develop the minerals. The Mining Law originally applied to all minerals except coal.

The 1872 Mining Law gives anyone the right to enter, stake a claim and prospect for minerals on public lands (Forest Service or BLM), no matter what other values may exist there, such as wildlife habitat, recreation, scenic beauty, or water resources. The BLM and other federal agencies regulating "multiple use" public lands often give mining highest priority because of the Mining Law. Unfortunately, once mined, the land is no longer useful for any other purposes. Under the Mining Law there are no provisions for environmental protection and no requirements for reclaiming and restoring the land when the miners are through. Federal environmental laws provide for minimal anti-degradation protection and some states have strong mine reclamation laws, although Arizona's is not very strong. Arizona's reclamation act deals primarily with public safety, and only nominally with environmental protection; most other western states have better and stronger reclamation requirements than Arizona's. You can read the Arizona Mined Land Reclamation Act at **www.asmi.state.az.us/documents/rec.pdf**.

A primary force behind the development of mineral resources in the West, its ancillary industries and services also wielded considerable influence on western economies. Major hardrock minerals developed in the West include copper, silver, gold, lead, molybdenum, and uranium. During the 19th century, major mining districts for silver and gold were developed under the Mining Law in Colorado, California, and Nevada. Early in the 20th century, there were major developments of porphyry copper in Arizona. Large molybdenum and tungsten deposits in Colorado were also developed. The Mining Law continues to provide the structure for much of the Western mineral development on public domain lands.

Mining from Space:

"Our actions as a society leave a legacy for the future. Do we want Arizona's legacy to be a continuation of landscape devastation? A number of years ago, an astronaut took pictures of Tucson from the space shuttle (Jones, STS059) and sent one to my husband, Jonathan. …It's ironic that the most visible evidence of Tucson is the mine complex. When I spoke with Tom (now retired from NASA) on the 20th of February, he told me that the Great Wall of China, one of the world's largest man-made structures, is not visible to the naked eye from space as many people believe, but these mine sites are. What are we leaving for future generations to see of our work on the planet?

— Written testimony by Ms. Cynthia Lunine, Private Land Owner at the Joint Subcommittee Oversight Field Hearing: "Our National Forests at Risk: The 1872 Mining Law and its Impact on the Santa Rita Mountains of Arizona," 24 February 2007 (see link on page 3).

And why does it need to be reformed?

The Mining Law contains *no environmental provisions,* which means taxpayers are often left to clean up the mess that companies leave behind. Just miles away from the proposed Rosemont mine at the Mansfield Gulch Superfund site, *we* are footing the bill to clean up gold and silver leach containments from abandoned tailing piles.

It will take *$32 to 72 billion* to clean up the hundreds of thousands of abandoned hardrock mines littering the American West.
Yet the 1872 Mining Law forces the government to give away $1 billion in publicly-owned minerals every year.

The federal law governing coal mine operations includes a special program for abandoned mine cleanup funded by a tonnage fee on coal.
It also includes federal reclamation standards.

No similar cleanup provisions exist in the 1872 Mining Law.

We believe the Coronado National Forest and its Sky Island mountain ranges provide more value for our nation than an open-pit copper mine ever could.

The Rosemont Mine

by Lainie Levick, Save the Scenic Santa Ritas

The Threat

The Rosemont Mine is a new proposal for an open pit copper/molybdenum mine at Rosemont Ranch in the Santa Rita Mountains — 2960 deeded acres along with 18,000 acres of grazing leases within the Coronado National Forest and adjoining state lands, for about 20,960 acres in total. Augusta plans to use their mining claims on Forest Service lands to dump their waste and not for mineral extraction (the ore body is on their private land). Pima County has recently requested that the Forest Service investigate the validity of Augusta's claims — under the Mining Law, all mining claims must, in order to be valid, be supported by the "discovery" of a mineral deposit that can be "extracted, removed and marketed at a profit." If the claims are not valid, Augusta will have difficulty proceeding with their proposal because they will not be able to use the Forest Service lands, which they need for the project.

What YOU can do:

Contact the Forest Service to be notified of public comment opportunities on this project: Beverly Everson, **beverson@fs.fed.us**.

Get informed, Get involved:

www.ScenicSantaRitas.org

Join our email alert list:

send an email to **info@scenicsantaritas.org**.

Highway 83's much beloved and endangered Scenic View *courtesy the author.*

Why It's A Bad Idea

This area is important to all of us in Southern Arizona.

It is used extensively for various types of recreation including hiking, mountain biking, off-road vehicle and dirt bike riding, hunting, camping, horse back riding and wildlife viewing. Situated almost entirely within the designated biological core area of the Sonoran Desert Conservation Plan's Multiple Species Conservation Plan. it provides valuable wildlife habitat and is a crucial migration corridor that links the Santa Ritas, Davidson Canyon, Cienega Creek and Rincon Mountains. The proposed mine site is within the watershed of Pima County's Davidson Canyon Natural Preserve, proposed in the Sonoran Desert Conservation Plan.

Water use for the mine would be 5,000-8,000 acre feet per year for approximately 20 years, enough for a city the size of Santa Fe, New Mexico. Millions of tons of waste rock and tailings from the mine would fill Barrel Canyon, one of the main tributaries to Davidson Canyon. Although the mining company claims they will be environmentally responsible, the risk of unintended leaks or spills, or surface and ground-water contamination is high. Augusta has not divulged their water source, but wherever the water comes from, an aquifer will be depleted, springs will dry up, and wildlife will be deprived of water resources.

In addition, mined land reclamation in semi-arid climates is rarely successful, requiring additional topsoil, and years of irrigation and monitoring. Arizona's reclamation act requires minimal site restoration, and does not require back-filling of the open pit, which Augusta estimates would be a mile wide by about 1,200 feet deep.

Mining in Dragoon & Northern Cochise County

By Richard Bishop, Chairman, Dragoon Conservation Alliance

The year 2006 was eventful for the Dragoon Conservation Alliance. Our group includes residents from Dragoon and other small communities in Cochise County. At the beginning of the year, we were monitoring a mine drilling and exploration operation in the Northern Dragoon Mountains (in the Coronado National Forest). The German company involved got permission to drill in several locations to seek marble deposits for the chemical industry. Then, early in January, local residents began receiving notices from an Australian company that planned to begin exploration for copper on private property as well as public lands in our area. Although the marble mine project lingers as a possible future project, the copper project — involving mostly private and State lands — has been dropped.

Later that summer we learned that Phelps-Dodge was starting a drilling and exploration project near Black Diamond Peak (photo) in the Southern Dragoon Mountains. That project included test holes in a remote area that required a helicopter to bring in materials and manpower. We were surprised to see that this project was not included in the U.S. Forest Service's Schedule of Proposed Actions. Drilling results were not favorable for Phelps-Dodge, so this project is not proceeding.

More recently, we learned that an off-shore company was trying to reopen the Johnson Camp Mine in the Little Dragoon Mountains (near Texas Canyon). This project is uncertain, but as long as copper prices remain high, it is a possibility.

Now we know that the West, in particular Arizona, is far more than just mining and range land. While the mining and cattle industries will continue to be economically important, there is also recognition that the beauty and uniqueness of the Sky Islands and the Sonoran Desert are part of an industry that depends on conservation. That industry includes international tourists, "snowbirds," retirees, photographers, bird-watchers, hikers, hunters and many other interest groups. When our antiquated mining laws were written, these activities were minor, if not non-existent, in the West.

This May we will be celebrating the Centennial of Dragoon National Forest (now part of the Coronado National Forest). We owe this legacy to President Theodore Roosevelt and other far-sighted leaders. At that time, there was considerable controversy (which continues today) about the government saving public land and protecting it. We believe that most people would like to see the spectacular Sky Islands and surrounding Sonoran Desert protected for future generations to enjoy.

The challenge for groups like ours is to help draw a line in the sand and say no to some of the many projects that threaten the foundation of the "new economy" of the Southwest. Our group believes that we should have a continuing dialogue that cuts across interest groups, political affiliations and "labels" to help define how we leave this country. We hope that when the Dragoon National Forest's Bicentennial comes along in 2107, people will think we were just as farsighted as President Roosevelt was in 1907.

What YOU can do:

Write Cochise County's reps in DC and tell them it's time to reform mining laws and preserve the Dragoons and other important Federal lands:

http://giffords.house.gov/
http://mccain.senate.gov/
http://kyl.senate.gov/

Get informed, Get involved:

www.savedragoonmountains.com

LEFT: **Mine in Globe-Miami** *courtesy Lainie Levick.*
ABOVE: **Hikers at rest** *courtesy Trevor Hare.*

In 5 Minutes…

You can help these groups by visiting their websites and joining their email alerts lists.

In 10 Minutes…

You can send an email to your local newspaper — please be brief and remember to include your name, address, and daytime phone number.

In Just a Little Longer…

You can send your comments to land management agencies, the Governor, and Congressional representatives.

You CAN make a difference:

Urge these key members of Congress to bring the Law up-to-date with today's needs:

Rep. Nick Rahall, D, WV-3
Chair, Natural Resources Committee
2307 Rayburn HOB
Washington, DC 20515-4803
Phone: (202) 225-3452
http://rahall.house.gov/

Rep. Raúl Grijalva, D, AZ-7
1440 Longworth HOB
Washington, DC 20515-0307
Phone: (202) 225-2435
http://grijalva.house.gov/

Rep. Steve Pearce, R, NM-2
1607 Longworth HOB
Washington, DC 20515-3102
Phone: (202) 225-2365
http://pearce.house.gov/

Rep. Gabrielle Giffords, D, AZ-8
502 Cannon HOB
Washington, DC 20515-0308
Phone: (202) 225-2542
http://giffords.house.gov/

Demand Real Reform of the Law!

Comprehensive reform of hardrock mining law in the United States must include provisions that protect special places from irresponsible mining. Reform of the mining law must give land managers the ability to deny a mine proposal if there are other important resource values that could be damaged by a mining operation.

Comprehensive reform should balance the demands for minerals with the public's demand for the long-term use of the land by: Preventing significant, permanent and irreparable damage to our public lands … Ensuring adequate reclamation … Safeguarding surface and groundwater during and after mining.

Comprehensive reform needs to protect the American taxpayer. The 1872 Mining Law still allows multinational mining companies to buy (patent) mineral bearing public land for less than $5 an acre — although the annually renewed patenting moratorium has stopped new patents since 1995. *It is important to note that the private land on Rosemont Ranch where Augusta would like to dig its open pit at one time was public land, but was sold by the federal government for $5 an acre under the Mining Law.*

Under the 1872 Mining Law, mining interests have been able to patent an area roughly equivalent in size to the state of Connecticut containing mineral values exceeding $245 billion! **Reform of the 1872 Mining Law needs to bring an end to this practice and keep these resources in the public domain.**

Current law also allows extraction of public minerals from federal public lands without payment to taxpayers — BLM estimates that $982 million in hardrock minerals were taken from public lands in 2000… *yet industry paid no royalty for those minerals.* **A royalty system must be established on the removal of minerals from public lands.** Coal, oil and natural gas extractors pay between 8% and 12.5%. A similar return to the American public for minerals taken from public lands is reasonable for hardrock mining companies to pay as well.

While the Interior Department mining regulations contain provisions enacted in 2003 that require mining companies to post bonds to cover the full costs of mine cleanups, *the regulation no longer provides cleanup standards.* Without such standards, it is unclear exactly what such reclamation bonds will pay for, and taxpayers may still be exposed to liability in the future. **Reclamation bonds should be paid in cash, up front and in an amount that would fully cover third-party reclamation costs.** The recent bankruptcy of ASARCO is a painful reminder of the danger of not having adequate and liquid reclamation bonds.

Comprehensive reform needs to recognize the ongoing social and environmental costs of abandoned mines and create a mechanism to clean up the mining industry's historic messes. Priorities should be set to ensure public health and safety from surface and groundwater pollution; general public health and safety; and the restoration of land, water, fish and wildlife resources.

Finally, comprehensive mining law reform requires substantially better industry oversight, including the following concepts: The Secretary of the Interior should use all legal powers available to prevent mining in protected areas … Failure of a mining company to address a violation should require the Secretary of the Interior to stop operations causing the violation … Regular inspections should be permitted without advance notice. They should occur at least once per quarter, and the public should be allowed to request an inspection … Violators should be fined an amount that would deter large international corporations from further violations … Citizen suits should be permitted … Operators that currently violate laws should not receive new permits; past law-breakers should only receive a permit if their past violations are not part of a willful pattern of abuses.

Proposed Mining Activity Threatens the Empire-Fagan Valley southeast of Tucson

by Mary Kidwell, Empire-Fagan Coalition

The abandoned Andrada Quarry *courtesy Mike Carson.*

The Empire-Fagan Valley faces imminent threats of open pit mining on Arizona State Trust Lands that could result in the establishment of new open pit limestone quarries. The establishment of such quarries could be devastating to this environmentally sensitive and scenic area that provides a gateway to the region's rich tourist resources. Located just 25 minutes southeast of downtown Tucson in Pima County, Arizona, the Empire-Fagan Valley encompasses the area south of the junction of I-10 and Highway 83 from the northern Empire Mountains to the east, south to Hilton Ranch Road, west to Mount Fagan (in the Santa Rita Mountain range), and northwest to Houghton Road.

This still-rural area is very complex and rich from many perspectives: historical, cultural, geologic and environmental. The Empire-Fagan Valley lies within the ecologically-significant Cienega Creek watershed, which has been designated by the state as one of its eighteen "Unique Waters" because of its ecological importance. It features strongly within Pima County's Sonoran Desert Conservation plan and includes parts of the proposed Davidson Canyon Natural Preserve, the Santa Rita Mountain Park, the Las Cienegas Natural Conservation Area and the Scenic Sonoita Highway. It is a significant wildlife corridor, providing prime habitat — a home for abundant plant and animal species including deer, javelina, bats, mountain lions, quail, hawks, vultures, golden eagles, and songbirds. The historic Andrada Ranch and the Bar V Ranch are located in close proximity to the proposed mining areas. The Bar V was recently acquired by Pima County under the Sonoran Desert Conservation Plan. This area is a part of the Cienega Valley Reserve, which recently received national recognition as one of seven "Endangered Cultural Landscapes" in America.

The Empire-Fagan Coalition was formed in 2004 by a group of concerned citizens wishing to protect the quality of life in the Empire-Fagan Valley. Over the course of the last few years, the Empire-Fagan Coalition has evolved into an organization with 12 board members, many volunteers, and literally hundreds of supporters. The group represents the concerns about mining in the Empire-Fagan Valley for an important cross-section of informed citizens. Since its inception, the Coalition has hosted three public meetings and worked with Pima County officials and the County Board of Supervisors who unanimously approved a Resolution opposing the opening of these new mines. A petition containing over 1,200 petition signatures was recently submitted to Governor Janet Napolitano and State Land Commissioner Mark Winkleman. In addition, the Coalition has spearheaded several letter-writing campaigns, enlisted the help of other organizations, and worked to get media attention to inform people about the issues.

Areas at Risk and Current Status

The Arizona State Land Department is currently considering the renewal of two sets of mineral lease applications on State Trust lands in the Empire-Fagan Valley and has given preliminary approval to the California Portland Cement Company for a set of four mineral leases in Davidson Canyon. These leases cover approximately 70 acres within the Empire Mountains just off Old Sonoita Highway and are located near the historic Andrada Ranch and a number of residences. Portland Cement's proposal includes the development of two new pits on either side of Davidson Canyon in the County's proposed Davidson Canyon Natural Preserve as well as a haul road across the canyon and another to create a more direct route connecting Old Sonoita Highway with Highway 83. Pima County is pursuing an appeal of the approval of these leases by the State Land Commissioner. In addition, California Portland Cement recently submitted an application for additional mineral extraction of mineral rights owned by the Federal government on other State-leased property just adjacent to the approved Davidson leases.

A second set of mineral leases located in the Empire-Fagan Valley is held by the W.R. Henderson Company. These leases are located in the foothills of the Santa Rita Mountains in the County's proposed Santa Rita Mountain Park south of the intersection of Wentworth and Sahuarita Roads. They are on split-estate land, which means that the State of Arizona owns the land and the Bureau of Land Management owns the mineral rights. W.R. Henderson owns adjacent land, including the abandoned Andrada Quarry with its processing facilities and a very large extraction pit. This site has been completely neglected and has become an area for target practice and vandalism.

Finally, the Seel leases are located in the northern Empire Mountains to the east of Sonoita Highway within a watershed that drains into Davidson Canyon immediately adjacent to the Las Cienegas National Conservation Area. These leases cover a total of 240 acres, which are quite pristine and have never been mined. The mineral rights leaseholder is Charles Seel of Bozeman, Montana. His preliminary Plan of Operations includes the development of a large, new open pit marble quarry as well as a possible new haul road through the Empire Mountains and across Davidson Canyon exiting onto Old Sonoita Highway.

Empire-Fagan Coalition Position

The increase in residential development in the area as well as the many current efforts to preserve sensitive and scenic open spaces in Pima County provide ever-increasing evidence of the incompatibility of community interests with those wishing to start, restart or continue mineral extraction processes.

Members of the Empire-Fagan Coalition do not believe that any proposed mineral exploration or possible future mining activities described above would be the highest or best use of these State Trust Lands. Once the non-renewable mineral resources are excavated, there will be minimal further value to be gained from these lands, leaving just ugly scars on the landscape. In addition, the value and income potential of surrounding Trust Lands near all of the above-referenced mining leases will be adversely affected and the long-term value (both economic and otherwise) of all trust lands in the area will be greatly diminished. Thus, the approval of these lease applications would ultimately provide a long-term hardship on the schools and taxpayers of Arizona.

By significantly diminishing the value of the region for all other valuable uses including tourism, recreational opportunities, residential development, environmental protection and ranching, any proposed exploration or possible future mining activities will create a liability to the State greater than the income that would be generated from the proposed operations. Potential costs resulting from these mining activities, such as cleanup or reclamation, could also add to the state's liability.

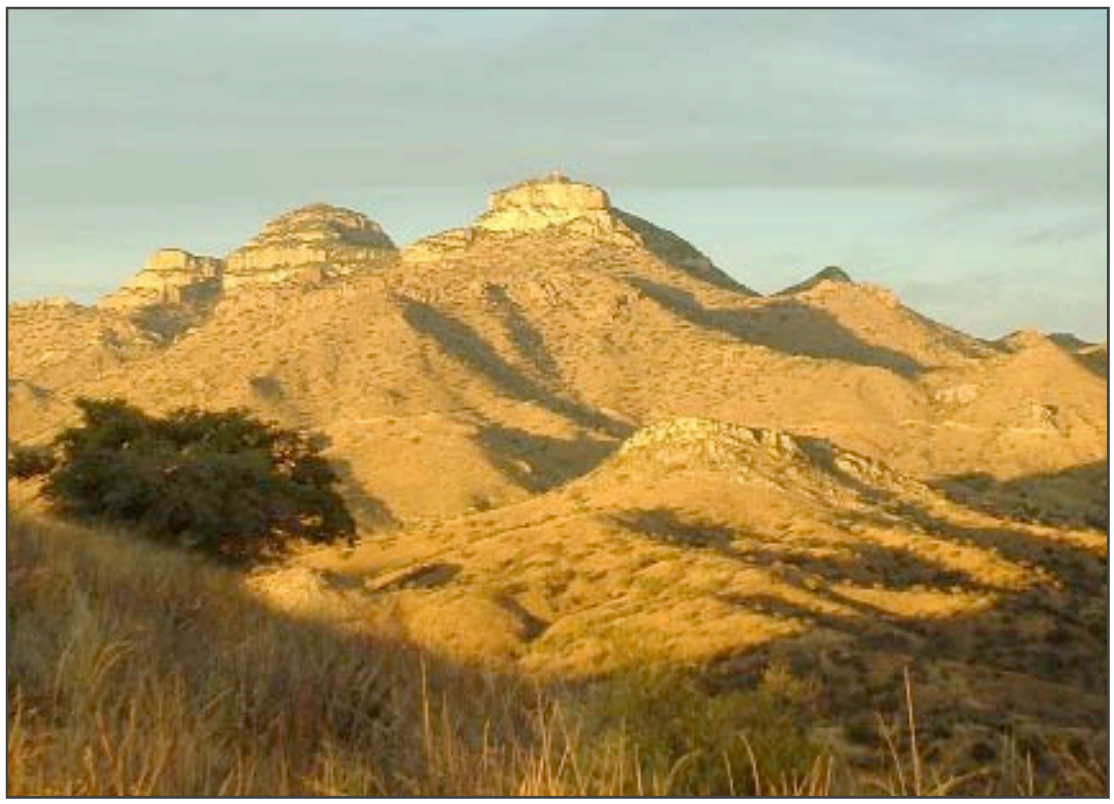
The targeted areas are close to many homes and areas of accelerating residential development. Potential negative impacts of mining include irreparable damage to the water table, reduced air quality from fine dust, noise, vibration and flying rocks from blasting, danger to school children from heavy trucks, and lower property values. It is feared that the devastating cumulative impact of new mining activities will result in a severely reduced quality of life for people both living in and visiting the area.

The Empire-Fagan Coalition stands strongly opposed to the renewal of each of these three mineral lease renewal applications by the Arizona State Land Department.

What YOU can do:

Write the State Lands Department (see sample letter at **www.empirefagan.org/open_ltr.htm**)

Get informed, Get involved: **www.empirefagan.org** or **info@empirefagan.org**



2007 is the year of Tumacacori Highlands Wilderness!

Legislation in Congress this Spring

by Mike Quigley, Wilderness Campaign Coordinator

Watch for some big news soon! Look for some exciting events in the Tumacacori Highlands and throughout southern Arizona. Help us make 2007 the year the Tumacacori Highlands are designated as Wilderness!

As Sky Island Alliance members, and *Restoring Connections* readers, you know that we have been working hard on behalf of some amazing intact habitat northwest of Nogales. The Tumacacori Highlands, about 80,000 acres of rolling grassland hills, deep rugged canyons, soaring lichen-drenched cliffs, offer intact habitat for species such as white-tailed deer, elegant trogon, Chiricahua leopard frog, and, yes, American jaguar. The Highlands protect the watershed of the famous Sycamore Canyon; offer stunning scenic beauty and sweeping panoramas; provide first-class opportunities for quiet recreation and spiritual reflection; and are still Arizona as Arizona used to be.

With the rapid population growth and consequent urbanization of the Santa Cruz River valley, the integrity of our natural landscape is threatened. Large intact areas like the Tumacacori Highlands are essential as core preserves in maintaining the ecological health of the landscape and the biodiversity of the region. By restricting motorized and mechanized uses, Wilderness designation is the single most effective tool in preventing habitat fragmentation on land like the Tumacacori Highlands.

Congressman Grijalva, recently selected as Chairman of the National Parks, Forests and Public Lands Subcommittee of the House Natural Resources Committee, has been a champion for the Tumacacori Highlands since his election to Congress. Now, the time has come to introduce legislation in the U.S. House of Representatives. We anticipate that very shortly, perhaps by the time you read this, the necessary legislation to designate the Tumacacori Highlands will be under discussion in the United States Congress.

This is an historic event. It's been 17 years since Wilderness was designated in Arizona. Why so long? Did we run out of Wilderness? No. We ran out of political interest, will, and leadership. That's changed; and it's time for us to encourage that change and ask our elected officials to do the right thing.

Please write a letter or make a phone call to your elected Representative and Senators and encourage them to support Congressman Grijalva's bill to designate the Tumacacori Highlands as Wilderness.

The single most important thing you can do to help is to contact Senators McCain and Kyl and ask them to introduce companion legislation in the U.S. Senate. Please do it today, and next week, and the week after that. They need to understand that Arizonans want this to happen and we want it to happen now.

And please join us at an event, or on a hike, or learn more by visiting our website: **www.tumacacoriwild.org**. 2007 — the Year of the Tumacacori Highlands Wilderness!

1,000 Friends of Sky Island Alliance

The Sky Island Region is growing and to keep up with all of the challenges we face, Sky Island Alliance is growing, too. The resources our wonderful members bring to Sky Island Alliance are invaluable for two reasons. One, you give us flexibility in our approaches to conservation, allowing us to be dynamic and effective in this ever-changing environment. Two, our members give us the credibility we need to create real change. We represent our members, and when 1,300 people stand together to give a voice to conservation, policymakers listen. For these reasons, we are committed to adding 1,000 new members to the organization with our new campaign *1,000 Friends of Sky Island Alliance.* The added support and resources will enable us to make an even greater impact throughout the region, while engaging more people from the community, providing opportunities for them to get involved, and amplifying all our voices.

You can help us reach our goals! Do you have friends or family members who would like to join Sky Island Alliance? Many of us know people who value this beautiful region — now is the time to get them involved! Here are some of the things you can do:

Host a Membership House Party — we bring the food, you invite your friends!

Member-get-a-Member — recruit one of your friends/family to join Sky Island Alliance by giving them our brochure or newsletter and talking to them about our programs. You can also send us a list of people you think we should send information to about Sky Island Alliance.

Bring a friend to one of our events.

Buy your friends/family **gift memberships** for birthdays or other celebrations.

Talk to other groups you are involved with about Sky Island Alliance or let us know when we can come give a presentation.

If you would like more information about how you can get involved in our *1,000 Friends of Sky Island Alliance* campaign, or if you have other ideas about how we can reach our goals, please contact Nicole Urban-Lopez at 520.624.7080 x17 or **nicole@skyislandalliance.org**.

What's in a name?
The Wildlife Monitoring Program now the Wildlife Linkages Project

by Janice Przybyl, Project Coordinator

The Wildlife Monitoring Program is undergoing a subtle name change to reflect a refinement of our mission. Since 2001 we've been engaging citizen scientists from southern Arizona to record and analyze wildlife movement within landscape linkages. Since 2001 we've trained 142 volunteers in the ways and means of animal tracking and documenting signs left by wildlife. Eighty of those volunteers remain active volunteers, dutifully going into the field every six weeks to survey their adopted tracking transects. We have 20 transects located throughout the region in four different project areas, in addition to ongoing efforts in Sonora, Mexico with our Jaguars of the Sonoran Sky Islands (see page 8).

We are committed to continuing the "wildlife monitoring" component of our program, collecting the very important data that defines our conservation strategies. Volunteers are integral to the program. We could not do the good work we do with out them; therefore we remain committed to enlarging and enhancing our pool of trained volunteers. In fact we are in the beginning stages of organizing our eleventh tracking workshop; and for current volunteers we will continue to offer "refresher" classes.

Since 2001, we've placed volunteers within landscape patches that we and others considered vitally important to the movement of wildlife between our Sky Island mountain ranges. For example we continue to document the presence of mountain lions, black bears, bobcats, and coatis in the Cienega Creek Watershed. We are doing the same between the Tumacacori and Santa Rita Mountains, between the Dragoons and the San Pedro River, between the Tortolita and Tucson Mountains and along the spine of the Peloncillo Mountains.

Since 2001, we've been informing land management agencies and county governments about the importance of maintaining and promoting land-use designations and policies that protect open space and preserve landscape permeability for wildlife. Now, we are focusing some of our energy specifically on the physical obstacles to wildlife movement: transportation infrastructure – roads and highways. The Wildlife Linkages Project contains both scientific and social elements that, together, can propel conservation of wildlife linkages forward with community support and informed decision making.

There are exciting large-scale plans and funding mechanisms underway in southern Arizona that recognize wildlife linkages as a key component of conservation planning. These include comprehensive plans in several counties, the Sonoran Desert Conservation Plan, and the $43 million, Pima County voter-approved Regional Transportation Authority's (RTA) monies earmarked specifically for incorporating wildlife structures into transportation planning. The Wildlife Linkages Project aims to arm decision makers with the necessary tools to identify and protect existing road and highway infrastructures that facilitate wildlife movement. What types of crossing structures does wildlife use? Is there variation in preference of structures among different species?

We are now participating as the non-governmental committee member on the RTA Wildlife Linkage Committee. The Committee's purpose is to incorporate wildlife connectivity into transportation planning and design and to provide better integration between land use, roadways and wildlife areas. As Committee members we will review and recommend candidate wildlife crossing projects for inclusion into highway planning.

At Sky Island Alliance we believe in the power of community involvement therefore, the Wildlife Linkages Project seeks to inform public and private stakeholders about the ecological importance of wildlife linkages in region. We plan a series of public presentations that convey the ecological need for landscape permeability and that emphasize how individuals can provide input on transportation planning.

Whatever our name, as always, we strive to connect conservation action with public awareness and education. We aim to shed light on how resources can be best maximized to preserve landscape permeability for the region's wildlife, while building public support and engaging citizens in conservation research.

Never Cry
by David Seaborg

Your eyes, still shining mustard-
  moon yellow,
still able to awaken the walking dead,
are going out like two candles
melting their last bits of wax;
a bullet hole in your head
as wide as a dry desert river bed;
your head in my arms;
and a gun,
smoking like an extinguished
  campfire,
carried away by a running
marksman, manicured and
  masculine in his cowboy boots,
with bloody hands,
and an excuse of one dead sheep
(killed by disease).

Scapedog, we project our nature onto
  you,
create myths that misrepresent you:
when a man comes salivating on a
  virgin's breasts,
with schemes to suck on her
  Romulus-and-Remus-like,
and penetrate her,
thoughtless of love,
we raise our snouts,
dangle our tongues,
and howl, " !"
When we tell our children fairy tales
of villainous, deceitful
predators of hairy-chinned little
  piggies,
grandmothers, and
little girls, red and innocent in their
  riding hoods,
we lick our chops,
bear our teeth,
and huff and puff, " !"
When our sheep and cattle die
from brutal conditions leaving
stress, starvation, and disease in their
  wake,
or when buffalo, elk, deer, antelope
  disappear
in silver gun smoke,
we lower our heads,
raise our lips,
and growl, " !"
When someone sucks
food straight into the stomach
like a vacuum cleaner
at relativistic speed,
we chomp on our teeth,
swallow our saliva,
and yelp that this is to " " it down.

Without predators to offer us the
  possibility of death,
without the primal howl of
  evolution's night,
where is the wild in wilderness?
How will we awaken to our nature's
  connection to nature?
Or to the strands of spider-silk that
  tether us to the Universe?
Domesticated dogs can't awaken
  domesticated minds.

My wish for your race
is a
backward spell
on the
evil flow
of progress!

I could tear flesh,
rage like a mad dog
in anger about this bloody killing,
and howl madly
at the moon
about the need
to protect your species.
But that would be
taken as another excuse to kill
your brothers and sisters.
No: to defend your race,
I'll have to be
as gentle as a wolf.

— David Seaborg is an evolutionary biologist and founder of the World Rainforest Fund. "Never Cry" *is included in his forthcoming book of poetry,* Honor Thy Sow Bug, *which will be published later this Spring.*

The Indifference of Geology

by Ken Lamberton, kjlamb@mindspring.com

Karen and I drive over Canelo Pass and suddenly the San Rafael valley drops away to the southwest. Before us opens a broad rolling plain, crisscrossed with ropes of green where oak and juniper line wrinkled drainages. The wind cuts northeast, stroking knee-deep grasses as blond as my wife's hair, the bent stems rushing like water. Mountains shoulder the valley—the Huachucas on the east, Patagonias on the west—their peaks blue-gray above tan-flecked flanks. Clouds of multiple configurations lay stains across the rangeland.

On my topo map, the headwaters of the Santa Cruz River lie across the upper San Rafael like a giant cottonwood leaf. Its veins are tributaries flowing into the leaf's petiole where the gathering river spills south into Mexico before changing course and returning to Arizona. We're seventy-four miles from our home in Tucson, the place we last crossed this dry desert river on its way north. At a waterless, rock-cobbled drainage, a weathered sign reads: Santa Cruz River.

We both look "upstream," and Karen says, "Let's follow it from here." But I know from the map that it still must be half a dozen miles to the headwaters, so I drive on.

^^^

Near Saddle Mountain, northwest of the valley, the two-track I'm negotiating slips under a fence and vanishes in the grass. We get out to walk. Somewhere I've read that the "official" source of the Santa Cruz River lies beneath this 5800-foot granite outcrop, but I'm not sure where, and I haven't bothered to ask anyone. The river should be on my right, but the whole landscape drops sharply away on my left forming a canyon country whose ridges and drainages corrugate the southern flank of Saddle Mountain and sweep southward into the Patagonias. We keep to the high plain, swishing through the grass or taking one of beaten paths used by Mexican immigrants.

Humans probably first trickled into the San Rafael valley at the end of the Pleistocene between 10,000 and 12,000 years ago when groups of hunters called Clovis people stalked now-extinct megafauna across this landscape. Only thirty miles to the east of here, erosion has exposed a butchering camp where Clovis hunters killed an adult female mammoth and a dozen bison.

I've heard that the valley hasn't changed much in 12,000 years and I believe it. Looking southward from the head of this valley, I see a broad swath of tumbling hills, creased and folded upon each other then smoothed over with a furring of sallow grasses. An emerald line of cottonwoods traces the course of the Santa Cruz River the whole length of the blanched valley, the only other green being the isolated smudges of oak that my mind keeps turning into dark lumbering mammoths. The scene is both stark and beautiful, a combination that dilates pupils and scorches retinas.

I imagine nomadic bands of Paleo-Indians following the folded-grass trails of fattened mammals. As the Ice Age drew to a close and the land relaxed under warmer skies, these interconnected valleys like the San Rafael with their high stalks of grain may have helped them settle into a more hunter-gatherer lifestyle, and possibly even form large communities that shared the same social and religious customs.

In the southern foothills of the Huachuca Mountains near here, a gerrymander of oak woodlands and grasslands drapes hills cut by riparian drainages with names like Joaquin Creek, Bear Creek, and Cave Creek, ephemeral streams reduced in the dry season to chains of stagnant pools. The place is museum display-case of prehistoric artifacts: Boulders show etchings of human figures, lizards, double helixes, and spirals. Fire-cracked rocks circle roasting pits. Smooth fists of stone and grinding metates litter the ground among flakes of chert and obsidian, decorated pottery shards, and small, triangular projectile points.

This place holds a near continuous presence of humans since the Clovis first arrived in the valley. Ten thousand years ago, people of the Cochise Culture shared the grasslands with fantastic animals like lions and camels and 110-pound, long-fanged dire wolves, camping here to harvest wild grains and parch them in hearths of incandescent coals. Three thousand years ago, the area had been a home to people who painted red crosshatches and parallel lightning bolts onto their smoky brown pottery and roasted agaves in the ground to feast on their dark and sweet, molasses-like cores. These people probably traded with Hohokam in the north, Mogollon in the east, and Trinchera tribes to the south and may have been Hohokam themselves. Later, during the first millennium A.D., a hamlet of brush-and-mud "pit houses" was home to a community of farmers.

For millennia, this place has drawn people, the latest being a cattle ranch that dates to the 19th century. What all these people have in common is their connection to the valley, to the resources it provides, and to the river that sustains them. In fact, the entire Santa Cruz River, from the headwaters in this valley to the Tucson basin and beyond, braids together the footpaths of humans dating from prehistory forward. It's as if the river allowed for people to find their way in this world, to find a way of being in this world.

And it still does today.

On the windowsill above my desk, a rough pentagon of broken pottery rests beside other accumulations—a devil's claw, coral bean seeds, pieces of rhyolite, a dried papery slip of desert spoon—from the desert outside our home. Karen's mother found the shard in the backyard arroyo. It is thin and slightly curved, like a piece of eggshell, and across its convex surface runs a tracery of dark parallel lines. Black-on-white. It looks like Hohokam.

This arroyo bisects five acres of desert that Karen has lived on since her birth. Called the San Juan Wash, it runs east into the mesquite-clotted West Branch of the Santa Cruz River just over a mile away. Her whole life has been connected to the river. (Her father still talks about fishing in the Santa Cruz from the Ajo Way bridge when he was a teenager in the 1940s, a bridge we take on our daily trips to and from the city that now spans only sand. So she's a second-generation Santa Cruz aficionado.) For more than forty years, Karen has lived and played in this drainage, hiking its dry course through burgeoning volcanic hills stabbed with saguaros or soaking her feet in chocolate runoff after a monsoon thunderstorm. Her cells, along with the soil and rock and shards of Hohokam pottery, have tumbled down the San Juan Wash and poured into the Santa Cruz River, churning and foaming with the essence of this place and its people as water becomes life. Karen *is* this river.

Today, we live together on the land of her beginning, having raised three girls on the same desert gouged by an arroyo named Saint John the Baptist that empties into the river of the Holy Cross. Our daughters have laid their hands on Spanish missions whose mud walls rose out of the banks of the Santa Cruz River hundreds of years ago. They have tasted ancient dust. History collects in their pores.

We may walk on this earth one layer at a time, but there are places where all the layers rise to the surface and we share the same elements with those long dead and those yet to come. This desert of exposed geology, of earth stretched so thin its insides have burst out, of stones in mid-pause before being swept to the sea, reinforces in me the truth that we are part of our landscape *for the time being.* "Why do we find it supremely pertinent," asks Annie Dillard, "during any moment of any century on earth, which among us is topside? Why do we concern ourselves over which side of the membrane of soil our feet poke?"

What I want to ask is: Are we more good above or below the membrane?

^^^

Against her better judgment, I lead Karen into the western canyons beneath Saddle Mountain. I'm thinking that this wild canyonland must drain the headwaters, collecting the young Santa Cruz before directing the waters eastward into one of the blue-lined squiggles on my map.

Saddle Mountain is a 65-million-year-old granite intrusion that formed after magma cooled slowly beneath the surface and later rose skyward as the adjacent terrain slumped into canyons and valleys. As wrinkles betray a person's age, canyons reveal the history of the earth, in this case seams of sedimentary deposits and lava flows laid down eons before more recent tectonic events wracked the region and exposed the buried rocks. About 17 million years ago, these new forces began stretching the western United States, breaking the crust into huge sections that shifted like an unbalanced teeter-totter, tilting up whole mountain ranges and dropping wide valleys in parallel trackways. During the interim quiescent periods, the basins filled with mountain debris, creating a far-reaching landscape we see today: the Basin and Range Province.

Author John McPhee says this recent mountain-building has unearthed the "chaotic, concatenated shards of time." "In the Basin and Range," he writes in his book of the same title, "are the well-washed limestones of clear and sparkling shallow Devonian seas. There are dark, hard, cherty siltstones from some deep ocean trench full of rapidly accumulating Pennsylvanian guck. There are Triassic sediments rich in fossils, scattered pods of Cretaceous granite,

Oligocene welded tuffs. There is not much layer-cake geology. The layers have too often been tortured by successive convulsive events."

Unlike most mountains ranges, which form due to pressures that compress and bend and fold the earth's surface, the mountains of the Basin and Range Province result from an expansion of the crust, a northeast to southwest spreading that rips and tears on a northwest to southeast line. Here, the world is coming apart at the seams. Hundreds of long, narrow "fault block" mountains separated by wide basins slash obliquely across the West between the Sierras and Rockies from southern Oregon and Idaho through Nevada and Utah into southern Arizona and northern Mexico. These are the stretch marks of our present layer of earth, a pulled-apart and fractured, lifted and sunken region that lays bare the landscapes of eons before it as the planet's crust explores fantastic rhythms to accompany the mantle's fluid harmonics in what is truly music of the spheres.

^^^

During the early Pleistocene between one and two million years ago, shallow runoff poured into the intermountain basins, charging aquifers and depositing gravel and sand alluvium from the eroded aprons of the mountains. This was the time of the great lakes that made islands of some mountains: Lake Manlius of today's Death Valley, Lake Lahontan of the Humbolt and Carson sinks, and Lake Bonneville, progenitor of Great Salt Lake. Farther south, our own Lake Cochise (now Willcox Playa) periodically inundated the Sulphur Springs Valley. These pluvial lakes repeatedly filled and evaporated according to climatic pulses, like those which spurred on the wax and wane of northern glaciers. Then, sometime during the middle Pleistocene about 500,000 years ago, wetter pulses resulted in the movement of sediments between previously isolated basins and, beginning here in this valley, the formation of a "proto" Santa Cruz River, which probably flowed only south. Millennia of river and lake flex and flux joined basin after basin, raising terraces in one place only to later redistribute them elsewhere. But eventually the river began to surge across the landscape, connecting basins like threading beads on a string until finally the beads slipped the necklace to join a young Gila River on its way to the ocean. Ebb and flow, the recurrent pattern of life, from the blood in our veins to the tides to planetary glaciation, gave birth to the Santa Cruz River.

^^^

We rest in a dry cut under the southeastern flank of Saddle Mountain, where I'm still thinking we might locate the headwaters of the Santa Cruz River. Finding cover from the chilling wind beneath two large netleaf oaks, Karen pools herself between boulders while I scribble notes about how lime-skin lichens mottle Saddle Mountain's exposed face, about how the grassland slips into several near-gorges like the one we're hunkered down in.

Farther down-canyon, ankle-twisting knobs of rock stud the slopes among flourishes of sotol and yucca and ocotillo. Dark outcrops, some smudged with a spectrum of lichens, rim the channel slot. Below us, in the direction we're headed, oaks choke the canyon floor. I'm beginning to suspect that this is all wrong.

When we're a mile into the drainage, late afternoon shadows cling to the steep walls rising on either side of us. We follow a narrow passage to a small seep that pools above a thirty-foot pour-off. Our first water. The sand amasses the tracks of deer, like dozens of empty parentheses. I think about what someone once said, that in the desert, water is always holy. Karen looks at the algae-rimed scarf of liquid and says: "This place holds only the memory of water."

At the bottom of the canyon, there's no doubt left in my mind. The drainage flows to the west. This can't be the headwaters of the Santa Cruz.

^^^

Seven months later, Karen and I return to the San Rafael valley to renew our search for the source our the Santa Cruz River. Only this time I listen to my wife, and we drive straight to it as if she had known its place all along. Under the eastern (rather than western) flanks of juniper-speckled Saddle Mountain, the road pitches downward into a wide seam of cottonwoods. This must be it, I think. Cottonwoods mean water, even if we can't see the water.

The trees are the first, the highest, in the drainage, which spills from paired creases below Saddle Mountain, gathers itself before crossing the road and tearing out a gully beneath the stand of trees. The gully is dry, its grassy margins pinned open with boulders. But I'm convinced this is where the Santa Cruz River begins.

I park where the gully cuts across the road. Immediately downstream, reddish-gray boulders, like grazing mastodons, lift their swollen haunches above sun-bleached grasses. The rocks are an outcrop of worn andesite, testimony to the lava that blanketed the region more than 50 million years ago. Here, at the head of the San Rafael valley, these ancient feldspar-rich rocks rise near the surface, and the overlying sandy mountain alluvium is shallower, holding water in some places above the ground in springs and bogs.

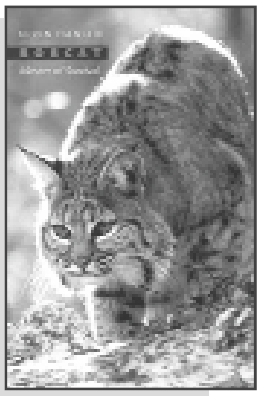
We change into hiking boots and fill water bottles, Saddle Mountain's bright thumb at our backs. The grasses are tall, and their seedheads flag with each gust of wind. We follow the gully down toward the line of green. Fifteen minutes later our socks have filled with grass seeds, which drive their hard, stiff bristles into tender flesh. Picking at them only breaks off the bristles and pulls threads from cotton weave. Beneath the cottonwoods, we disturb a community of cicadas, one hidden insect screaming a solo until one after another a whole deafening chorus has joined its single note song. There is no harmony among male cicadas (to my ears anyway), just a competition of monotone.

The trees are small and thin but cluster closely together, their canopies locking overhead. They outline three channels that join at a central point before continuing on, the arrangement appearing like a giant heron's foot. Along the first phalange of the right toe, a depression of short grasses carpets what looks like a marsh, only absent of water. Flowering goldeneye ring the depression, and an occasional milkweed lifts its now ruptured pods into the wind. Where Karen and I sit quietly in the warm grass, grasshoppers ratchet, flies buzz, sparrows cheet.

I think about leaving something here, some personal trinket that water will carry from this beginning, bearing it through the unmovable landforms of this desert I cherish, until it comes to some quiet, sedimentary end. I imagine that this river might represent my life's course. Although I have little care to repeat my days, seeing my mistakes, experiencing again the path appointed to me by gravity and the indifference of geology, part of me deeply believes what Socrates said about the unexamined life. I want a life worth living. I decide that I won't leave something at these headwaters. Instead, I will take something with me. A desire, perhaps. To follow the river. To find in its bold and shining meanders a sense of redemption.

— Ken Lamberton, a writer and author, recently received a Soros Justice Fellowship and has a book coming out this Fall.

BOOK REVIEW:
Bobcat: Master of Survival *by Kevin Hansen*



Reviewed by Sergio Avila

It's not an easy task to find, understand and summarize the broad amount of information on a wide-ranging, variable predator like the bobcat. Kevin Hansen knows how to do this and he has done it again — *Bobcat: Master of Survival* is an impressive array of synthesized information on *Lynx rufus*, from varied regions and sources, put in an enjoyable still informative read with Kevin's easy, poetic narrative.

Bobcat: Master of Survival — a perfect title as the reader will learn — is an exhaustive and scientific-oriented insight into the bobcat's biology and ecology, and an eye-opening source on bobcat politics and conservation issues. This cleanly-put book by Oxford University Press, unfolds the secrets and beauty of one of those common creatures we only think to *know about*. Extensive bibliography (34 pages!) supports Kevin's research, and comparisons with other felines as the Canada Lynx, add useful information for the reader.

The book, which is a hardcover edition, starts each chapter with beautiful art and a short story on the work with bobcats and bobcat experts. It has beautiful photos, though I wished there were less *handling* photos and more of tracks and other sign. The book is missing the author's photo on the jacket. More importantly, *the track photo without a ruler for comparison is a BIG sin.* Sky Island Alliance's board member Nancy Z and newsletter editor Julie St. John are acknowledged, and there's a description of our Wildlife Monitoring Program (with quotes from Matt Skroch and Janice Przybyl.

This book is a great source of serious information for scientists, wildlife management agencies, students, wildlife aficionados and many more. Thank you, Kevin, the wait was worth it.

Hansen, Kevin. *Bobcat: Master of Survival.* Oxford University Press. 2006. 212 pp.

The Geology of My Hard Head:
The Basin & Range Brain of a Field Biologist

by Trevor Hare

An ATV approaches the end of a road to a stock tank and keeps going. The old ranch road was built by somebody who knows how to make a road last. Beyond the mostly silted-in stock tank, a new road has been created — all it does is go another 300 meters up the drainage to a giant old oak. Beer cans litter the ground, toilet paper flutters on a shrub; the old oak has had a rough time of it since the road was cut. The ground around its base has been compacted and denuded; a large area of vegetation is gone along with the soil critters, a campfire ring is full of melted plastic and broken glass. The lower branches have been violently assaulted. The road up the drainage to the old oak is eroding, a small stand of young willows and an ancient oak are uprooted at an eroded spot most likely due to traffic and last year's violent chubascos.

What does the highly-compacted soil around the oak tree, the plastic and trash, the eroding drainage have in common? What does this do to the microcosm of life in and around the oak? What do they do to this old desert rat's brain? I know that no organism is distant from another, top-predators are only a couple of links from the primary-producers, and humans have direct links to both. When humans act we cause large perturbations over large areas and we can't see them. We don't know what our actions will do, both in the short term and the long. As I get older and human impacts continue to produce negative consequences for ecosystems and landscapes, my basin and range brain struggles to adapt but in my gut I know that these impacts at the scale of soil and leaf litter and my soul have consequences far beyond what we can control or comprehend.

To steal from Johnny Cash: "I'd rather drink muddy water, sleep down in a hollow log, than to be in [*any city*] …" and from Ed Abbey "Art, science, philosophy, religion — each offers at best a crude simplification of actual living experience." The wild places and wild faces out there in the great deserts and mountains of the basin and range province of North America have shaped my brain, much as the great savannas of Africa shaped the brains of our ancestors millions of years ago. People who wander these great places see primeval force in rock and vegetation, in animal sign and atmospheric phenomena. The connection between abiotic and biotic nature is close and it is robust. Landscape filters communities and populations, and dirt it structures life. From geology arise ecosystems with energy derived from the sun and into a complex association of will and ascent.

Ecosystems are complex, more complex than humans are capable of understanding. The simple act of that old beaten oak taking seed and living the last 100 years or of a jaguar moving across that stupid bright line from the Sierra San Luis into the Peloncillo Mountains is predicated on an amazing web of interactions that flow up from the geology, are fueled by the sun and the climate, and are tempered by organisms. From rock and soil and microscopic organisms underfoot driving vegetation composition to microscopic genes and environmental forces driving behavior, a sprout or a step across represents millions of linkages. Humans, mostly a simple-minded lot, think they know all about it. Well we don't, we know just enough to get ourselves in to trouble. Big trouble.

So as I ask every time — what do we do? We go outside, go out there and feed the brain and feed the soul with landscapes and ecosystems, with rock and soil, with vegetation and turtles, with clean air and dark dark nights, with campfires and bacanora. We go out there and try to understand and teach, to advocate and procreate, to sweat and holler, to swim and to bake. Data collected and compiled and entered into a database, makes maps and policy recommendation but only goes so far. People, people with basin and range brains make it go. Conservation often takes place around a table, not a camp table but a conference room table. Maps are spread out, notes are taken, jokes and stories are told. Success means agreement and means money. Out there it means wilderness and finding native critters, and no snake-bite and no sucking-chest wounds. Everyday is a success when SIA volunteers and friends are out in the field.

Since last I wrote we have had many excellent adventures chasing critters, throwing rocks, hiking drainages and closing roads. In May we visited Los Picos in the Sierra Los Pinitos just south and east of Nogales, Sonora where we documented the farthest west ridge-nosed rattlesnake known and birded the Rio Santa Cruz and tried and failed to cross back into the US via Lochiel. In June we visited Sawmill Canyon in the Santa Rita Mountains to close a redundant road and restore more than a mile and a half of a riparian area that had been experiencing erosion from more than twelve road crossings and numerous campsites. We hiked this Canyon again in October to check the integrity of the closure, and even though we could see one or two ATVs had breached the canyon, it was amazing — the eroding stream crossing had cut back into a real channel and the water had promoted growth of deer grass, tanglehead and many annuals, and there were no ATVs disturbing the peace!

Another amazing spot visited in the height of our unusual chubasco season was the Peloncillos where there was water everywhere, every small drainage was flowing, the invertebrates were biting in enormous numbers, the ground was spongy and the grass and the annuals and the frogs were having a field day! Visiting the Dragoons in September and camping in

Cochise Stronghold, meeting the locals, breaking a leg, and hearing of the mining exploration going on in the area was quite the learning experience. In the last 3 months of 2006 we visited the eastern Santa Rita Mountains where we closed a road up a beautiful canyon protecting the amazing oak savannas only to find it reopened, then receiving permission to close and restore another mile and a half of the adjacent road, re-close the busted-open road and protect a square mile of roadless area! In late January our trip to the Peloncillo Mountains was canceled due to snow, I was already down there and the place was white, the soil was even spongier than in August, and the roads were all but impassable!

The Santa Teresa Mountains looking for solitude and wildness; the wilds of Sonora searching for frogs, snakes and jaguars; the Winchester Mountains looking for high grass, pronghorn, and water: the Gila River for a wet restoration work weekend; and more restoration work along Cienega creek are all in store this spring. And spring has sprung, the scar is fading and bone and muscle and tendon are healing, allergens are rampant, temps are temperate, rain is gently dropping, my cabin fever is itchy, the Gila monsters will awaken soon, annuals are popping, the boots are oiled and old summer bags are airing.

So off we go, out there!

Field Schedule: Spring into Summer 2007

13-15 April. Tres Allianzas Restoration Weekend in New Mexico. We will meet the New Mexico Wilderness Alliance and Upper Gila Watershed Alliance folks somewhere along the Arizona/New Mexico Border for a service project to benefit wildlife and wildlands! 2-4 hours from Tucson.

27-29 April. Mexico Exploratory Volunteer Fun Weekend! Recent volunteers can join us as we explore the wilds of Sonora. 4-6 hrs from Tucson. Space is limited. Contact Trevor for more information.

18-20 May. Winchester Mountains Roads Inventory. Join the Sky Island Alliance in another of the most gorgeous and least visited islands in Arizona! Great Wilderness! 2 hours from Tucson.

8-10 June. Peloncillo Mountains Riparian Inventory. Visit the beautiful and remote Peloncillos in a project to assess restoration potential of historic ciénegas and degraded streams. 3.5 hours from Tucson. Must RSVP and be able to leave Tucson at noon Friday.

22-24 June. Road Closure and Restoration Weekend. Get your hands dirty and play a direct role in improving the ecological health of your public lands!

For more information contact Trevor at **trevor@skyislandalliance.org** or at 520.624.7080 x14

Wishlist: GPS units and digital cameras …Shade shelter … Volunteers!! Contact Trevor!

Sky Island Alliance News Extra!

ALL THE FOOLS THAT'S FIT TO PRINT

Department of Homeland Security to Put Kitty Doors in Border Wall

Move to Preserve Jaguars in Arizona

Enviros' concerns that the 700-mile long 50-foot high wall along the U.S.–Mexico border will disrupt the movement of animals through their habitat were relieved yesterday when DHS announced plans to install kitty doors in the wall every half-mile. "This will assure the jaguar is able to continue repopulating Arizona" said an engineer associated with the project. "They'll love it. We're putting jagnip and scratching poles by every door." With the Arizona border requiring several hundred kitty doors, PetDepot stock in closed up 20 percent today…

The Center Sues the Alliance; Counter Suit Filed

Who Does Most for the Environment?

When local enviro group the Center sued another local enviro group, the Alliance, a counter suit was promptly filed. Each group charging that the other was not doing enough to protect the environment. "They just go camping in the woods on the weekends," Center Director said, "the real Wilderness is in the courtroom." "One has to wear long pants in court, right?" retorted Alliance Policy Chief…

State Trust Land Future Resolved

No Land, No Problem

In a bold move, voters approved a ballot initiative disposing of all remaining State Trust Land by creating a special lottery. The lottery will choose one lucky winner to receive title to all remaining State Trust Land. "We just got tired of all of these competing visions and arguing over State Trust Land," said Rusty Puncture, a state legislator from MariPinaPima county, "no more land, no more controversy." As for the fate of public education funding? Puncture says, "well, it never really made sense to fund an ongoing cost by selling off non-renewable assets." Don't buy your ballot—er, ticket—yet, voters also approved 23 other competing initiatives concerning State Trust Land and experts say it may take decades to unravel the mess…

Cactus Ferruginous Pygmy Owl May Cure Cancer

PharmMex Stock Up Sharply

Scientists today announced that exposure to the call of the cactus ferruginous pygmy owl is shown to cure cancer, lower cholesterol, and elevate intelligence. Unfortunately, the little owl, a former Arizona native, was driven to extinction here. But don't fret, there are plenty of the owls in Mexico. Owl proximity tours are currently being offered by PharmMex and lines at the port of entry are long…

Reclaimed Mine First New National Forest in Years

Mesa Cobre NF Maps Available Soon

In an all-too common move, the government today announced yet another new National Forest on the site of a former copper mine. The latest in a series of successful, company-financed mine closure and reclamation projects, the old copper mine south of Tucson is now an idyllic haven for nonnative species. "All those enviros who fought this project, where are they now?" asked a Pillage-and-Profit Co. spokesperson…

Arctic Region Named Ted Stevens Natural Area

Former Wildlife Refuge Off-Limits to Drilling

In an amazing victory for the environment, the former Arctic National Wildlife Refuge has been rechristened the Ted Stevens Natural Area, placing it forever off-limits to oil drilling. "This is a great day", said Stevens, who is three steps into his 12-step recovery from oil addiction program. "This place is just too special to be ruined just to provide a few more months of subsidized SUV gas." With this long-time threat removed, environmental groups are shifting their focus to Ohio…

Sky Islands—Literally

New Global Warming Data Promising for Economic Future

A recent computer supermodel for global warming predicts a sea level rise of 4500 feet in the next decade. Such a rise would make the southwest's "Sky Island" region a real island community. "We are the next Galapagos" said Ed, from a local environmental group. Shortly after the announcement, Sapphire Venture, a real estate developer, announced the new "Chiricahua Dunes" development, a 2-million unit timeshare project outside what used to be Benson. "Every unit will have either a mountain or a beachfront view." City of Tucson officials are redesigning the Rio Nuevo project for Summerhaven…

Environmentalists Listed as Endangered Species

Lack of habitat blamed

Environmentalists were listed as an endangered species today and habitat loss was cited as a contributing factor. "It's clear that the demise of independent bookstores has something to do with this" said Tom Bureaucrat. "And when was the last time you learned anything about the environment?" Hope is not lost, however; as scientists say it may be possible to use DNA from E. O. Wilson to resurrect environmentalism in the future…

Mexico to Build Border Fence

Need to Stem Flow of Unruly Americans

The Mexican government today announced a plan to construct a 100-foot high wall along the length of the border with the United States. Spurred by an increasing flood of unruly American tourists, the wall is a last-ditch attempt to retain cultural purity. "When you look at all of the drunk college kids, these Rocky Point Condo People, and all of the old Americans looking to score affordable Viagra or Lipitor, we're just being over-run," said Jose, an Hombreminuto taking siesta outside Agua Prieta. When asked why a 100-foot wall was necessary, Mexican officials pointed to the existing 50-foot wall built by the United States several years ago, "obviously, THAT wasn't effective"…

New Planet Found Outside Orbit of Pluto

Scientists Say "Second Chance"

Scientists using the Hubble Space Telescope have discovered a new planet in our solar system, just beyond the orbit of recently-demoted Pluto. "It's inconceivable how we missed it before," said Eve Eden, an astrobiologist with NASA, "we were so fixated on Pluto we just weren't looking clearly." Scientists say the new planet is approximately the same size as the Earth and has an atmosphere and composition similar to Earth's. Miraculously, the new planet has a mean temperature of 72-degrees F and a 24-hour periodicity. "We think it is some very unusual optical physics, perhaps gravitational lensing from Jupiter, that makes a planet so far from the Sun habitable for humans." Indeed, images of the planet show a pristine environment of oceans, lakes, grasslands, and forests. Abundant animal life has also been recorded; however, it appears there are no humanoid inhabitants. Spectral imaging has revealed enormous oil and mineral deposits. Earth environmental scientists and advocates are calling for the planet to be named "Second Chance" and for environmental safeguards to be put in place prior to any manned exploration. Government and business leaders are calling for a "Manhattan Project" to colonize and exploit the new world. Exxon-Mobil is said to be constructing the first interstellar single-hulled space tanker; a move derided by a newly formed environmental organization calling themselves "Second Chance First!"

This just in . . . Mexican Federal Judge Reverses Gadsden Purchase Agreement . . .

This is no April Fools: Please support Sky Island Alliance!

If you received this newsletter and it's time to renew your membership, please send in your check! If you are reading a friend's newsletter, consider joining us. We rely on members for our basic operations. Contributions are tax-deductible; we are a 501(c)(3) organization. Basic membership is only $35, but if you add a little to that, here's a sampling of what your dollars can do:

$50 will help us survey 30 miles of roads … **$75** will sponsor volunteer training workshops … **$100** will close one mile of road.

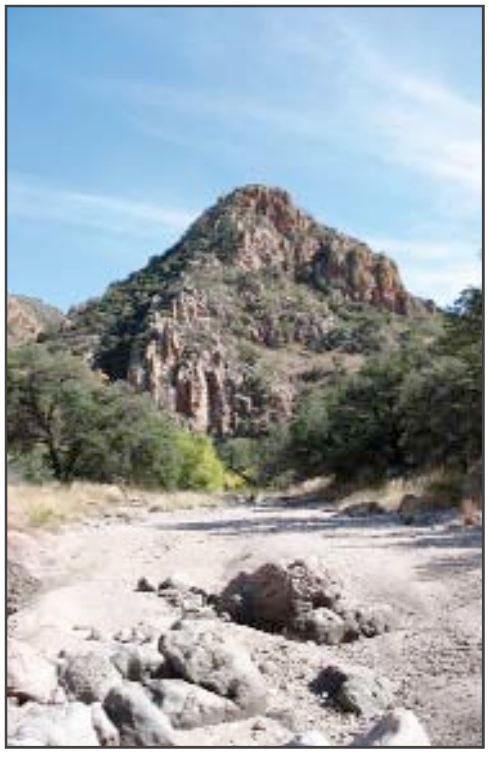
You can donate online at **www.skyislandalliance.org** — it's quick, easy and safe!

SKY ISLAND ALLIANCE
Protecting our Mountain Islands and Desert Seas

SAVE THE DATE: Sunday, April 15 !

Join Sky Island Alliance for a
Celebration of the People and Places of the Sky Island Region

The Stones



from *Selected Poems, 1969–1981,* by Richard Shelton, ©1982. Reprinted by permission of the University of Pittsburgh Press.

PHOTO **Peck's Canyon** *courtesy Jen Schmidt.*

I love to go out on summer nights and watch the stones grow. I think they grow better here in the desert, where it is warm and dry, than almost anywhere. Or perhaps it is only that the young ones are more active here.

Young stones tend to move about more than their elders consider good for them. Most young stones have a secret desire which their parents had before them but have forgotten ages ago. And because this desire involves water, it is never mentioned. The older stones disapprove of water and say, "Water is a gadfly who never stays in one place long enough to learn anything." But the young stones try to work themselves into a position, slowly and without their elders noticing it, in which a sizable stream of water during a summer storm might catch them broadside and unknowing, so to speak, and push them along over a slope or down an arroyo. In spite of the danger this involves, they want to travel and see something of the world and settle in a new place, far from home, where they can raise their own dynasties away from the domination of their parents.

And although family ties are very strong among stones, many of the more daring young ones have succeeded; and they carry scars to prove to their children that they once went on a journey, helter–skelter and high water, and traveled perhaps fifteen feet, an incredible distance. As they grow older, they cease to brag about such clandestine adventures.

It is true that old stones get to be very conservative. They consider all movement either dangerous or downright sinful. They remain comfortable where they are and often get fat. Fatness as a matter of fact, is a mark of distinction.

And on summer nights, after the young stones are asleep, the elders turn to a serious and frightening subject—the moon, which is always spoken of in whispers. "See how it glows and whips across the sky, always changing its shape," one says. And another says, "Feel how it pulls at us, urging us to follow." And a third whispers, "It is a stone gone mad."