SKY ISLAND ALLIANCE
Protecting our Mountain Islands and Desert Seas

Restoring Connections

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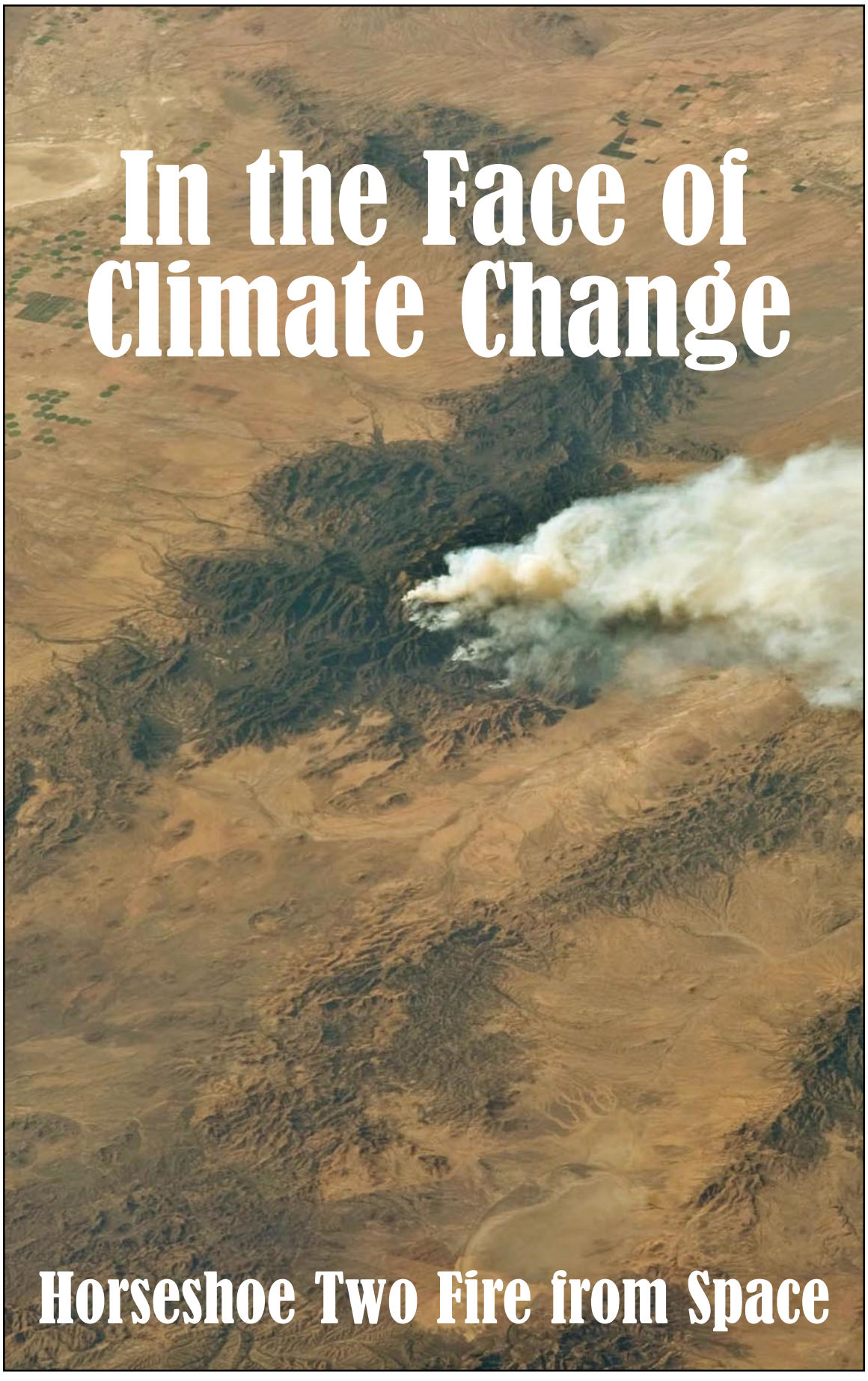

In the Face of Climate Change

Horseshoe Two Fire from Space

This photograph, taken May 15, 2011, by an astronaut on the final mission of the Endeavour Space Shuttle, illustrates the initial scope and position of the Horseshoe Two Fire within the Chiricahua Mountains as well as an extensive smoke plume extending to the east-northeast over a distance of at least 60 kilometers.

In this issue:

Plus

Through the Director's Lens *by Melanie Emerson, Executive Director*

This issue focuses on the many challenges we are facing in the Sky Island region due to the mounting impacts of climate change. Severe drought, high temperatures, erratic winds, unnaturally dense fuel loads and a range of other anthropogenic factors have resulted in an early and extreme fire season. Articles in this *Restoring Connections* explore these and many associated climate challenges, suggest integrated scientific, management and policy solutions, and reflect on how our region's complex landscapes and species assemblages will be altered, perhaps irrevocably.

We started working on this issue when the historic winter freeze was fresh in our minds. Today, only the first day of summer, the thermometer is to hit 110 degrees and close to one million acres have burned or are burning throughout Arizona and across the region. In thinking about and working to adapt our work to a changing climate, it is simultaneously essential that we additionally reflect on the very human impacts of these fires. In our efforts to protect these vast spaces and important species, we tend to acknowledge the human impacts to ecological systems, to habitat, to connectivity and to wildife. We often question our responsibilities as caretakers of wild places or, comparatively, our moral imperative to entirely extract ourselves from them.

These fires, for me, have added a deeper, personal layer to climate change. By experiencing these impacts physically close to home, the seemingly distant predictions of sea level rise, increased temperatures, megadrought, and extinct species, are, for now, superseded by a compelling, urgent and personal tone: history itself has burned, homes have been lost, 30 years of research destroyed. Quiet nooks of forested refuge are charred and forever transformed. Those places that mean so much to me—the ones I explore and the ones I am content to know exist unvisited—they have changed. Climate change directly affects each one of us.

As I read the articles for this issue I could not escape relating them to the very personal affects they have on so many of you. My thoughts are with those who are working tirelessly to contain these fires, those whose homes are threatened or have been destroyed, whose life's work has gone up in flames, and those who toil everyday to ensure resilience in our natural systems as these very personal realities of climate change have arrived at our doorstep. I thank those of you who are volunteering to help, working to provide emergency supplies and response, finding homes for lost pets, taking care of friends and neighbors. While we address the seemingly enormous challenges of climate change, I realize we must also be cognizant to care for one another.

Melanie Emerson

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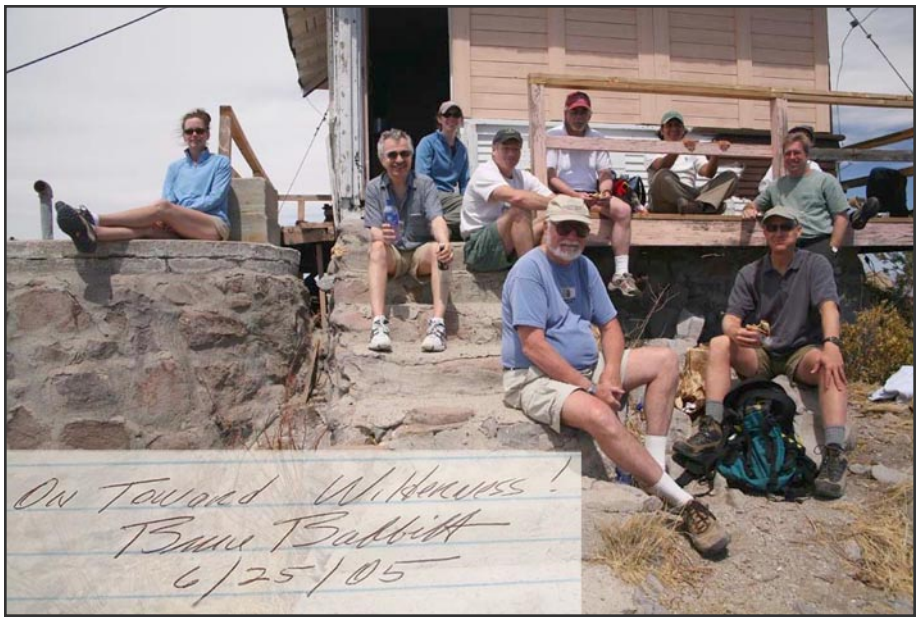
Loss of quintessential conservation landmarks in this region, like Atascosa Lookout, remind us of our fragile station and how in just a brief moment in geologic time, it can be erased…

Atascosa Memories

by Michael E. Quigley, Arizona Wildlands Campaign Coordinator, The Wilderness Society



Today, while working to protect and preserve natural wildlands in the northern Sonoran Desert west of Phoenix, I heard from Trevor and Sergio that the Atascosa Lookout had burned in the Murphy Complex Fire on the Coronado National Forest. The Lookout was lost.

The Atascosa Lookout was an old fire lookout (yes, ironic perhaps) that was no longer used in these days of GPS units, satellites, and the like. The United States Forest Service and volunteers had carefully restored it over the years. It was located in the Atascosa Mountains of south-central Arizona, in the Tumacacori Highlands.

I'd been to Atascosa Lookout many times over the recent years. It was a great hike: a well-maintained trail that climbed to the ridgeline above the desert-grassland valleys. I used to tell people that if one was able to walk a few miles and one took it slow, anyone could make it to the top. And at the top, what a reward! Panoramic, 360-degree views. One could see the Santa Catalinas north of Tucson, a beautiful view of Baboquivari Peak (as great photographer Jack Dykinga and writer Doug Kreutz remarked upon in a May 2007 *Arizona Highways* article). Some said that on a clear day one could see the glint of sunlight off the Sea of Cortez. It was a hike that had a fantastic reward-to-effort ratio.

The reward-to-effort was so great, the experience of being above it all so easy to achieve, that it was the showcase spot we took visitors. I'd joked with colleagues that I was on track to hike it 20 times one year. I hiked it so often, enjoyed it so many times, I confess I cannot recall at the moment the first time I'd hiked it. I recall many other times, though:

There were summer hikes when we would lead folks to the top for sunset and then back down under the light of a full moon — the moon so bright one didn't need a headlamp… The morning hike with a few students from the University of Wisconsin who had opted to spend their spring break as an "alt break" volunteering with us to map and restore wildlands in southern Arizona… The hike with Bruce Babbitt when I'd optimistically offered partway up the trail that we could be at the top in "oh, maybe another twenty minutes," and an hour later, Mr. Babbitt — having outpaced me, by the way — wrote "On toward Wilderness" in the notebook trail register at the Lookout… And the year I was privileged (with my friends Sergio and Jenny) to be invited on a New Years' Day hike by my new friend David and his friends — schoolteachers and others in Nogales, Arizona, who had an annual tradition of making that hike every New Years' Day. At the top, we celebrated the turning of another year on this earth with wine, smoked salmon, turkey, añejo sipping tequila, salads, and a three-foot wooden board of cheeses and other delicacies hauled up in the saddlebags of a local rancher's horse. There were about 20 people, four dogs, a horse, and a lot of "welcome the new year" hope and cheer at Atascosa Lookout that morning! To this day it reminds me that there are people who hike and there are people who KNOW HOW to hike. I aspire to the latter appellation.

So many hikes to such a special place — making memories, sharing dreams, taking photos, clearing my head, being renewed by America's great outdoors — and now it is gone. While I regret that, and while I hope for a chance to lend my money and my labor to its rebuilding, I am also very aware that Arizona is still burning today. And I hope and pray for rain.

Edward Abbey was the fire lookout at Atascosa Lookout in the summer of 1968. He wrote only a few journal entries from that time. Of those scant pages, two entries stand out for me:

> *June 5, 1968—Robert Kennedy was shot last night, as I toiled up the obscure mountain by moonlight. Alone on my mountain, feeling oh so lonely and desolate...*

and:

> *July 5, 1968—Woke up this morning on an island in the sky, surrounded by clouds. Wild swirling banks of vapor, flowing and passing to reveal brief glimpses of rocky crags, dripping trees, the golden grassy hillsides far below.*

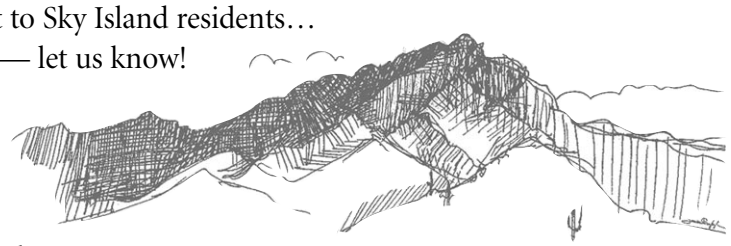
Atascosa Lookout is gone today. Like all things leave our lives, I suppose. But I have faith and I have hope that the world will renew; that by July there will be swirling banks of vapor bathing the Atascosas and other Arizona Sky Islands; that I will again hike to the top of Atascosa ridge with friends, look around the expanse of southern Arizona and northern Sonora, sip some añejo perhaps, and see a restored, *reconnected*, thriving landscape.

Welcome Keri! Introducing a new member of our staff, Keri Dixon:

Joining the Sky Island Alliance team as our first-ever Development Director, Keri is looking forward to connecting new and long-term supporters to the mission Sky Island Alliance is striving to achieve. She is also working with other staff, the board of directors and our program partners to find new funding opportunities and develop current ones. Keri is committed to making sure the native species, special places and wildlife corridors SIA has been working to protect and restore for the past 20 years are just the beginning of a great legacy. She is a native Tucsonan, has love of desert birds and a soft spot for flowering riparian plants. She enjoys growing, preparing and sharing good food with friends and family. Keri looks forward to making new friends and reconnecting with others in her new position here. Feel free to contact Keri — at 520.624.7080 x15 or keri@skyislandalliance.org — with any questions you have about your membership, to find out about ways to get more involved, or just to say, “Hello!”

Protecting Our Mountain Islands and Desert Seas…

Sky Island Alliance's dedicated staff advance the organization's goals every day — in the field with volunteers, around the map table planning strategies, in the office, at community meetings, reaching out to Sky Island residents… you name it. If it's important to the Sky Island region, we are there. We hope you're inspired — let us know!



Wildlife Linkages Program: Celebrating 10 Years! *by Jessica Lamberton*

Roseann Hanson and Janice Przybyl, with the initial help of Sue Morse of the Keeping Track Program in Vermont, started the organization working on tracking in 2001. Together they took a single wildlife tracking experience and created a long-term monitoring program, focused on science, citizen volunteers and a belief that wildlife should be able to move where they need to maintain a healthy and vibrant ecosystem.

In November 2001, we held the first tracking workshop, with the second workshop following soon after in February 2002. Of those first participants, Nick Bleser, Birdie Stabel, Patty Stern (2001); and Dyna Chin, Dave and Joan Eerkes, and Janay Brun (2002) have remained with us for the duration of these ten years. Their dedication is inspiring! We can be proud of what they started and saw through.

After 10 years and 16 workshops, Sky Island Alliance's Wildlife Linkages Program is now known from Mexico to South Africa for its success in citizen science and corridor protection, due to the 214 participants trained in tracking, like Nick, Birdie, Patty, Dyna, Dave, Joan, and Janay, who have each continued to "make tracks" as collaborators, role models, and advocates. Together, tracking volunteers have conducted 473 surveys in 42 different study areas; recorded 410 datapoints for mountain lion, bobcat, coati, and black bear; and reported the presence and abundance of 1,721 other animals that call the Sky Islands home.

Last time I shared how the information from the tracks our volunteers documented are now being used for a detailed linkage plan in Pima County, which will be completed this year with the collaboration of scientists and advocates across southern Arizona. In addition, tracking data has contributed to Sky Island Alliance's April 2011 climate change workshop, and will be used to analyze long-term wildlife movement patterns in southern Arizona related to changing climate conditions. This spring, we also met with some motivated residents of Sun City and Rancho Vistoso, to launch a citizen-empowered remote camera project. Combined with our existing tracking transects, this will create a monitoring and outreach support tool for the wildlife crossing project approved on State Route 77.

After the successful completion of our 16th Wildlife Tracking Workshop, held this May at Rancho El Aribabi, 11 new trackers joined the effort. The workshop was an excellent event, with the help of Jonathan and Roseann Hanson and Cynthia Wolf as guest tracking instructors. We discovered raccoon tracks, jaguar kills, and gray hawks everywhere we turned. This trip was culminated with the Sky Island Alliance annual banquet, held May 19th, where we celebrated 20 years of "Making Tracks" together as an organization.

We will continue protecting corridors that allow for the necessary movement of our native species. Earnest Thompson Seton, founder of the Boy Scouts of America, said to *"Never forget the trail, look ever for the track in the snow; it is the priceless, unimpeachable record of the creature's life and thought, in the oldest writing known on the earth."* The legacy of the tracks you are making today, and the tracks we will continue to make together, will leave their impression on the Sky Islands, and on all of us. Happy Tracking!

Conservation Policy Program *by Jenny Neeley*

This April, Sky Island Alliance marked a milestone by hosting *Between a Rock and a Hot Place*, a workshop where members of the natural resource management community from across the region developed key strategies for addressing climate change impacts. Federal, tribal, state, and county agency personnel, academic and agency researchers, conservation organizations, and private landowners sat down with each other to discuss solution-oriented ways we can work together to ensure that the entire Sky Island region is adequately protected.

This workshop is part of the Sky Island Alliance initiative, Adapting to a Changing Climate in the Sky Island Region, which brings together diverse professionals across political and jurisdictional boundaries to implement coordinated responses to climate change and which has become a model for other regional efforts.

We continue to monitor harmful land use activities impacting the Sky Island region, and in February we participated in a Patagonia community forum that highlighted significant concerns related to the proposed Hardshell Mine project in the Patagonia mountains. We are closely watching this troubling proposal, and will continue to work with our partners, Save the Scenic Santa Ritas and the Patagonia Area Resource Alliance, to oppose this project as it moves through the federally required environmental review process.

We are also closely watching federal legislation that has the potential to impact the Sky Island region and our work. Most potentially damaging are several proposals to permanently exempt border enforcement activities from laws and regulations specifically designed to protect wildlife, habitat and watersheds; prevent erosion; and ensure other ecological processes can continue to function properly. Waiving these laws inevitably leads to severe damage that could have otherwise been easily avoided, something we are already experiencing because of the waivers already in place along the border.

We will continue to monitor this legislation, and other proposals that threaten the health of the Sky Island region, and we will continue to provide our members the information and tools necessary to ensure your voices are heard on these issues.

Northern Mexico Conservation Program

by Sergio Avila

What a second quarter of 2011 we have had! In the last three months the Northern Mexico Conservation Program has completed several outstanding goals, and this calls for a celebration: in March the Mexican Commission of Natural Protected Areas (CONANP) announced the certification of "El Aribabi Fraction A" as a national Natural Protected Area, under the category of Voluntary Land Conservation. The certification protects 10,000 acres of private property located in northern Sonora, "for actions of ecosystem and biodiversity preservation, environmental education and ecotourism," as described in the official CONANP document. This land is the first protected corridor in the Sky Islands of both Mexico and the U.S. in 13 years!

In recent months Sky Island Alliance has concentrated research, outreach and conservation efforts on El Aribabi, identifying owner Carlos Robles as a strong conservation advocate, and realizing that the example he is setting will be a precedent which we can build on in the region. Already in 2011 SIA has led five trips to the ranch — checking our remote cameras, holding a three-

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.

day tracking workshop with a dozen new volunteers, and hosting a visit with journalists. Thanks to the help of wildlife biologist and tracker extraordinaire Cynthia Wolf (see back cover), this year we have collected additional photos and videos of jaguars and ocelots in northern Sonora!

In March SIA staff and volunteers, in collaboration with the BLM's Safford field office, removed almost two miles of barbed-wire fence along the Arizona-Sonora border in the San Bernardino Valley. In this area, the Department of Homeland Security recently installed vehicle barriers doubling the border infrastructure, and likely deterring the natural movements of large species of wildlife. This summer, as we begin Phase 2 of our "Bring Back the Cats!" Project, we will be gathering information on both the locations and types of border infrastructure in the San Bernardino Valley as well as throughout the entire Sky Island region. We welcome Caroline Patrick as our intern for this project, which will also be part of her Master's degree in Geographic Information Systems Technology at The University of Arizona.

Madrean Archipelago Biodiversity Assessment *by Tom Van Devender*

The Madrean Archipelago Biodiversity Assessment (MABA) project continues its mission to document the biodiversity of plants and animals in the Sky Island region. In February, Tom Van Devender introduced two MABA collaborators at the Arizona Botanists Meeting at the Desert Botanical Garden in Phoenix. John Palting talked about 'Spectacular insects in Sonora" and Richard Bailowitz about "Butterflies are Herbivores Too."

In March, Tom gave presentations on "Cactus Forays in the Madrean Archipelago in Sonora" to the Tucson Cactus and Succulent Society and The University of Arizona Herbarium. In the spring of 2011, 1,024 animal and 3,247 plant observations were added to the MABA database, including observations from the Northern Jaguar Preserve near Sahuaripa and the masked bobwhite quail habitats in central and southern Sonora. The database has become the most important source of biological information in Sonora.

Tom led the fourth major MABA expedition to the Ciénega de Saracachi area and the Sierra de San Antonio, both about 80 miles south of the Arizona border, from April 27 through May 3. Partners for this expedition were the Universidad de la Sierra (UNISIERRA, in Moctezuma), Universidad de Sonora (UNISON, in Hermosillo), the Reserva Forestal Nacional y Refugio de Fauna Silvestre Ajos-Bavispe (CONANP Ajos-Bavispe National Forest and Wildlife Reserve), and the Sonoran Development and Sustainable Ecology agency (CEDES). The expedition included forty scientists, students, volunteers, and photographers — about half from the U.S. (from as far away as Oklahoma) and half from Sonora, Mexico — as well as four CEDES and three CONANP staff. There were great opportunities for collaboration and interaction among the participants, and for college students to spend time with specialists in the field.

The Ciénega de Saracachi is a wetland in the channel of the Río San Miguel that supports a cottonwood-willow gallery forest. The pools of water support populations of Sonoran topminnow (*Poeciliopsis sonoriensis*), Sonoran mudturtles (*Kinosternon sonoriense*), and the northernmost Yaqui sliders (*Trachemys yaquia*) and lowland leopard frogs (*Rana yavapaiensis*). Unfortunately, two invasive species — the green sunfish (*Lepomis cyanellus*) and bigmouth bass (*Microterus salmoides*) — have been introduced to the Ciénega. The group also did extensive biotic surveys in Arroyos Quemado and Santo Domingo. This area was recently nominated as a state protected natural area by CEDES. MABA staff worked closely with Martín Padres, the owner of Rancho Agua Fría, and CEDES staff in organizing the trip.

The Sierra de San Antonio, near the historical town of Arizpe, was relatively unknown biologically. Animals and plants were observed in a range of habitats from lowland tropical thornscrub to pine-oak forest on the highest peak at 6,500 ft elevation. Arroyo Toro Muerto supports a remarkable huérigo (Sonoran cottonwood, *Populus monticola*) / bigtooth maple (*Acer grandidentatum*) / sycamore (*Platanus wrightii*) riparian gallery forest for about 15 kilometers. Biological highlights include the first record of striped plateau lizard (*Sceloporus virgatus*), a tiger rattlesnake (*Crotalus tigris*), Elegant Trogons (*Trogon elegans*), wild turkeys (*Meleagris gallopavo*), and a troop of 13 cholugos or coatimundi (*Nasua narica*). MABA staff worked closely with Jesús and Alejandro Elías, the owners of Rancho La Cieneguita

Well over a thousand observations of plants and animals made on the expedition will help document the very high biodiversity and support conservation in these areas. Jesús Sánchez, curator of the UNISON Herbarium, has been a sponsor and participant on three MABA expeditions. Plant collections made on these trips are being included in his current project with CONABIO (the Mexican biodiversity database) to provide 6,000 plant records from the Sonoran Sky Island Region.

Caroline Patrick has been helping the MABA program through trip coordination, database entry, volunteer coordination, and database entry, and was a participant on the expedition. Her enthusiasm, skills, and accomplishments are greatly appreciated. We welcome Nick Deyo who just started working for the MABA program (see page tck for more about Nick).

As always, we thank the Veolia Environment Foundation for their dedicated and generous support without which this project would not be possible.

Special Designations Program *by Rod Mondt*

On the positive side the wilderness crew continues to do outreach to residents of southeast Arizona, collecting signatures in support of the Land of Legends campaign. This effort has been focused on individuals and small businesses in the Bisbee, Sierra Vista, Portal, Benson and the southern portion of the Dragoons as well as portions of Pima County that fall within the footprint of the Whetstone Mountains. This effort has produced over 2,000 signatures to date and we are still continuing to gather more as we work our way through the rest of the year. While Jessica concentrated on a number of tracking workshops and meetings, Rod gave talks to a neighborhood association, a homeowners association, a ranching group, the Audubon Desert Ecology Institute students and local landowners. We also continue to interact with other interested individuals and organizations and pass along ideas and suggestions to the Forest Service and other agencies that manage our wild lands. We finished refining our original road surveys for the Northern Chiricahua and Dragoon Mountains, where once again a suite of our amazing volunteers stepped in and helped to make these field trips both productive and enjoyable.

continued page 18

Planning for a Resilient Sky Island Region

by Louise Misztal, Conservation Policy Program Coordinator

Climate change is happening and its effects are already visible throughout the Sky Island region. The arid southwest is among the fastest warming regions in the world; parts have already warmed more than 2 degrees Fahrenheit relative to average 20th century temperatures. Between 1991 and 2006 the mean annual temperature rose 1.9 and 1.2 degrees Fahrenheit in Arizona and New Mexico, respectively.[1] This warming has contributed to increases in wildfire activity, changes in the timing of species' lifecycle events, and ecological changes in habitats. To further complicate matters, climate changes are interacting with other stressors such as decades-long drought, human land use, habitat fragmentation, and complex ecosystem interactions to create measurable and sometimes drastic changes in the region.

This year's explosive fire season in the southwestern U.S. and Mexico is a very visible example of climate change impacts. 2011 has been the biggest fire year in Mexico in at least the last 25 years with fires burning at hundreds of sites. Here in Arizona, the Wallow Fire has grown to be the largest in modern history and its extreme severity has made it unusually destructive. The Horseshoe Two Fire has burned approximately 190,000 acres as of this writing, or about two-thirds of the total acres managed by the Coronado National Forest in the Chiricahua Mountains.

The fires of 2011 are consistent with projections based on climate change. Since the mid-1980s, the frequency of large fires and the total area burned have steadily increased in western forests and been linked with warmer earlier springs and warmer summers. There has been a four-fold increase in the annual number of major wildfires and a six-fold increase in the area of forest burned compared with the period 1970-1986. The size of fires in the southwest is greatest during intense La Niña years in which winter and spring precipitation is low.[2] This year, this short-term anomaly of La Niña is coupling with long-term climate trends to produce the large, uncharacteristic fires we are currently seeing and is representative of extreme conditions that have the potential to become far more common as available moisture throughout the region decreases. What comes next in our forested Sky Islands after a catastrophic stand-replacing fire remains a big question. Some burned areas that once supported mixed conifer or ponderosa pine forest may never return to their pre-fire condition because of changes in soil moisture coupled with increasing temperatures.

Effects of the regional warming trend can also be seen in more subtle phenological changes. Phenology is the study of the relationship between variations in climate and the triggering of lifecycle events in plants and animals (see phenology article on page 12). In southeastern Arizona, warmer spring temperatures have been associated with earlier breeding dates for Mexican Jays.[1] Phenological changes in lifecycle events can lead to food chain disruption and shifts in species locations. The spring bloom of shrubs in the Sonoran Desert of the southwestern U.S. and northwestern Mexico may have advanced by 20 to 41 days between 1892 and 2004. This could have significant impacts on migratory hummingbirds and other species that depend on the shrub blooms as a food source.[3] In Finger Rock Canyon in the Santa Catalina Mountains, Dave Bertelsen, a citizen scientist and long-time Sky Island Alliance volunteer, has built a 20-year record of the timing of flower blooms for hundreds of plant species across 4,000 vertical feet. His observations indicate more than 15 percent of the surveyed species bloom at elevations as much as 1,000 feet higher than they did in the past. There is a concurrent trend between increasing summer temperatures and the average total number of species in bloom in summer at the highest elevations.

The list of observed changes is long and growing: invasive species are able to colonize areas where cold temperatures were once a limiting factor; native species' ranges are shifting poleward and up in elevation on a global and regional scale; streamflow and groundwater availability are decreasing; and frequency of extreme precipitation events is increasing. Looking to the future, the Sky Island region can expect average temperatures and aridity to continue to increase, along with a potential decrease in winter precipitation.

Broad-billed Hummingbirds in the Sierra Azul, Sonora (Rancho El Aribabi). ***Courtesy Sky Jacobs.***

Climate change is the most significant long-term threat to ecosystems and human well-being in the region. All of these changes spell difficulty for managers, planners and conservationists working to conserve the incredible biological diversity of the Sky Island region. So, if you are a National Forest manager trying to maintain a diversity of habitats, a County planner deciding how to manage newly acquired conservation ranch lands, a wildlife biologist working to recover an endangered species, or a private landowner planning a riparian restoration project, what is to be done? We all face a great challenge in supporting resilient forests, deserts, grasslands and riparian areas that have some hope of adjusting to rapidly changing conditions.

To address this challenge, Sky Island Alliance launched *Adapting to a Changing Climate in the Sky Island Region,* a forward-thinking, solutions-oriented initiative to make the Sky Island region more resilient in the face of climate change. Building on a successful track record of working collaboratively to effect change, we're bringing together natural resource managers and planners from across the region to think innovatively about working holistically across jurisdictional and ecosystem boundaries to achieve this goal. In

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Planning for a Resilient Sky Island Region *continued*

partnership with EcoAdapt, an organization dedicated to bringing together diverse players to reshape conservation and resource management in response to rapid climate change, we're convening climate change adaptation workshops focused on the Sky Island region. Adaptation planning and management increase the resilience and resistance of natural systems to climate change through examining what we do and how we can adjust to the reality of climate change. Everything we as a natural resource management community invest time and effort in and care about — riparian restoration, forest thinning, removal of invasive species, reintroduction of native species, increasing connectivity and protected areas, improving forest management — is vulnerable to climate change in a variety of ways. Adaptation is a way for us to protect our current conservation investments and to best determine the most strategic and effective future investments.

Thus far, Sky Island Alliance has held two adaptation planning workshops, *Climate Change Adaptation in the Arid Southwest* in September 2010 and *Between a Rock and a Hot Place* in April 2011. Federal, tribal, state, and county agency personnel; academic and agency researchers; conservation organizations; and private landowners developed key strategies for addressing climate change, including solutions-oriented ways we can work together to ensure that the entire Sky Island region is adequately protected.

We need to continue incorporating climate change into long-term planning and our everyday work in order to build on the success of past conservation efforts. Success for Sky Island Alliance means protecting the immense biological diversity of this region, from lizards and frogs in desert lowlands to Mexican spotted owls in high elevation mixed conifer forests, and everything in between. Climate change is a profound threat to our region, but with collaboration and innovative strategies we can greatly increase its ability to successfully adapt.

[1] Robles, M.D. and C. Enquist. 2010. Managing changing landscapes in the Southwestern United States. The Nature Conservancy. Tucson, Arizona. 26 pp

[2] Westerling, A.L., H.G. Hidalgo, D.R. Cayan, and T.W. Swetnam. 2006. Warming and earlier spring increase western U.S. forest wildfire activity. Science, 313:940-943.

[3] Bowers, J.E. 2007. Has climatic warming altered spring flowering date of Sonoran desert shrubs? The Southwestern Naturalist, 52(3):347-355.

People, Place and History as Mediators of Climate Change

by Julia Fonseca, Environmental Planning Manager, Pima County Office of Conservation Science and Environmental Policy

The particularities of place, time and people can magnify or reduce the predicted effects of climate change. Our region can consider these factors in a more nuanced way, to lend greater understanding to predictions and more focus to the potential responses.

History matters

There's hell to pay for past decades of groundwater pumping. The effects of groundwater pumping on geographically distant sites can take hundreds of years to manifest, even after the pumping ceases. This was brought home to me by work that we commissioned on the effects of the proposed Rosemont mine (see **www.pima.gov/cmo/sdcp/reports/d51/rosemont.mine.groundwater.pdf**, for an example).

Just because your spring or stream is not surrounded by wells or pumping in your area has ceased does not mean your site will remain unaffected. It may take hundreds of years for the effects to the transmitted. The effects of climate change is added on top. This kind of delayed change is not generally evaluated in permitting process, and there are almost no social or legal mechanisms for dealing with spatially and temporally distant impacts.

People matter

How people respond to climate change is one of the most important factors to consider. In the rural areas, land managers will likely seek greater reliability of flow into stock ponds and springs. As a region, we have a poor inventory of springs and other aquatic resources. Most springs are managed in some way, and many have been boxed or dredged in ways that have compromised their habitat values. An effort focused on inventory, conservation and restoration of spring-fed waters is needed for climatic adaptation, especially in the Coronado National Forest, where the majority of these sites exist.

Place matters

Variation in habitat resulting from topographic diversity may be essential for persistence of biota in a future changing climate. Our region offers great diversity in topography and therefore microclimates.

What is often overlooked is the even greater variation in substrate that we have in the Sky Island region. Soils and other substrates are what mediate changes in climate to the root systems of plants. Coarse-textured soils, caliche layers, clayey B horizons, and fissured bedrock all offer different conditions to plants and animals, independent of slope, aspect, and elevation.

Some substrates have been recognized already as providing important thermal or moisture refugia to plants or animals. Caliche caves for tortoises, talus and other rock piles for snails and herpetofauna, limestone outcrops for a variety of plants. These features are often too small to be captured in model studies, but should be critical resources for protecting species diversity, and included in inventories of resources for land management.

The diversity of rock and soil types should be considered in modeling studies. One U. S. Geological Survey study has already produced a startling understanding of how the particulars of substrate, vegetation and climate interact to affect water supplies. Much of the landscape does not contribute meaningfully to groundwater recharge, and even in the mountains there is huge variation in rates. Some mountain watersheds don't create much excess runoff. Many of the places that do recharge the aquifer are underlain by Paleozoic limestones. This is the kind of information that can be useful in regional conservation and climatic adaptation strategies. Some places matter more, and for different functions.

Bolstering a Living System as Climate Changes

by Melanie Lenart, PhD, author of Life in the Hothouse: How a Living Planet Survives Climate Change *(www.uapress.arizona.edu)*

On this side of the Continental Divide, we have another record-breaking fire in Arizona. This year's Wallow Fire has scorched more area in northern Arizona than the record-holding Rodeo-Chediski Fire of 2002. Together, these two fires burned about 1 million acres of mostly Ponderosa pine forest in two huge patches on either side of Pinetop.

On the other side of the Continental Divide, residents in the Mississippi Basin have been dealing with deluges instead of droughts. Northeast Ohio's wettest May on record primed the pump for basement drains to become miniature geysers spewing a mixture of sewage and rainfall. Heavy rainfall caused major floods that inundated homes and low-lying land in intermittent swaths throughout the basin, from Iowa down to Louisiana.

Many factors came into play to set the stage for these opposite extremes in East and West — and climate change may well be one of them. While we can expect more of these extremes, solutions exist to dampen the problems posed by a warming climate — which include more intense droughts and floods, and bigger western wildfires.

While the potential contribution of climate change versus other factors to these specific fire and flood events has yet to be calculated, the conditions that led to them — more extreme rains, more extreme drought — fit right in line with expectations of what happens as our use of coal, gas and oil thicken the planet's atmospheric blanket of heat-trapping gases.

Here, I draw from my recent book, *Life in the Hothouse: How a Living Planet Survives Climate Change*, to put the ongoing change into the bigger picture and summarize a few things people can do to make the land and society less susceptible to fires, floods and other problems made worse by climate change.

Earth as a living system

The past 100 million years have wrought many changes on planet Earth, dubbed Gaia by James Lovelock. His Gaia theory starts from the premise that the planet is a living system that has somehow managed to survive climate swings of the past, as well as a sun that has grown slightly hotter over the eons. *Life in the Hothouse* examines the fossil record and other evidence in the context of Gaia theory to consider how Earth's responses to changing climate might have improved the living planet's ability to adapt to it.

Past climatic extremes would not work well for modern society. During past hothouses, the mostly ice-free Earth saw sea levels rise by 200 to 300 feet, burying land and bringing storm surges to new heights. During ice ages, the area now occupied by the U.S. Southwest sported large lakes and more greenery compared to what we see in today's arid climate. But much of the continent lost forest cover — and land. Glaciers and ice sheets buried the land that now hosts major cities like Chicago and New York.

Higher greenhouse gas levels during past hothouses predictably spurred on higher temperatures and melted ice sheets. The resulting rising seas covered more area, providing fodder for evaporation. And, as the laws of physics dictate, warmer air picked up more moisture.

Meanwhile, the extra carbon dioxide in the air not only warmed the planet, it also served as plant food. Plants turn carbon dioxide and water into carbohydrates, using energy from the sun to build mass out of thin air and water.

As a result, forests and wetlands tended to expand at the global scale during hothouses. The expansion of forests and wetlands, in turn, helped keep global temperatures from escalating from hellishly hot and humid to planet-roasting highs by converting carbon dioxide into wood and peat.

We've been seeing a bit of this carbon-uptake response in action in recent years. Along with the oceans, the world's remaining fragments of forest have been taking up roughly half of the carbon dioxide released by society in the burning of gas, oil and coal. In addition, forests have been taking up all of the carbon dioxide released in "land use change," a phrase that describes the transformation of forests into cities, crops and cattle ranches.

Even during big fire years, U.S. forests take up far more greenhouse gases on the whole than they release in wildfires. In a few less populated states, namely Alaska and Idaho, greenhouse-gas releases from fires can surpass society's emissions in some big-fire years. This 2007 finding by researchers Christine Wiedinmyer and Jason Neff made headlines when they reported it, using carbon-dioxide "equivalents" so they could include methane and other greenhouse gases.

Still, the nation's forests consumed 25 to 30 times more carbon-dioxide equivalent than they released in fires, based on Wiedinmyer and Neff's comparisons with five-year satellite estimates of carbon uptake by forest growth. The years they analyzed, 2002 to 2006, encompassed a large-scale drought that spurred on widespread wildfires. It included 2002, with Arizona's 468,000-acre Rodeo-Chediski Fire representing only one of several big western fires that year.

These results may be comforting at some level. Still, those of us in the Southwest would find more comfort in seeing our regional forests filled with living trees rather than charred snags.

For that to happen, we'd need to devote a reasonable budget to treating forest stands by thinning out the small trees and allowing surface fires to burn off deadwood and seedlings.

Rising temperature put our local forests at risk, there's no doubt about that. Researchers including The University of Arizona's Thomas Swetnam have linked seasons when high temperature prematurely melted mountaintop snow to years of runaway wildfires. Meanwhile, other evidence indicates that the best way to protect our ponderosa pine forests from fatal flames is to thin out some of the smaller trees.

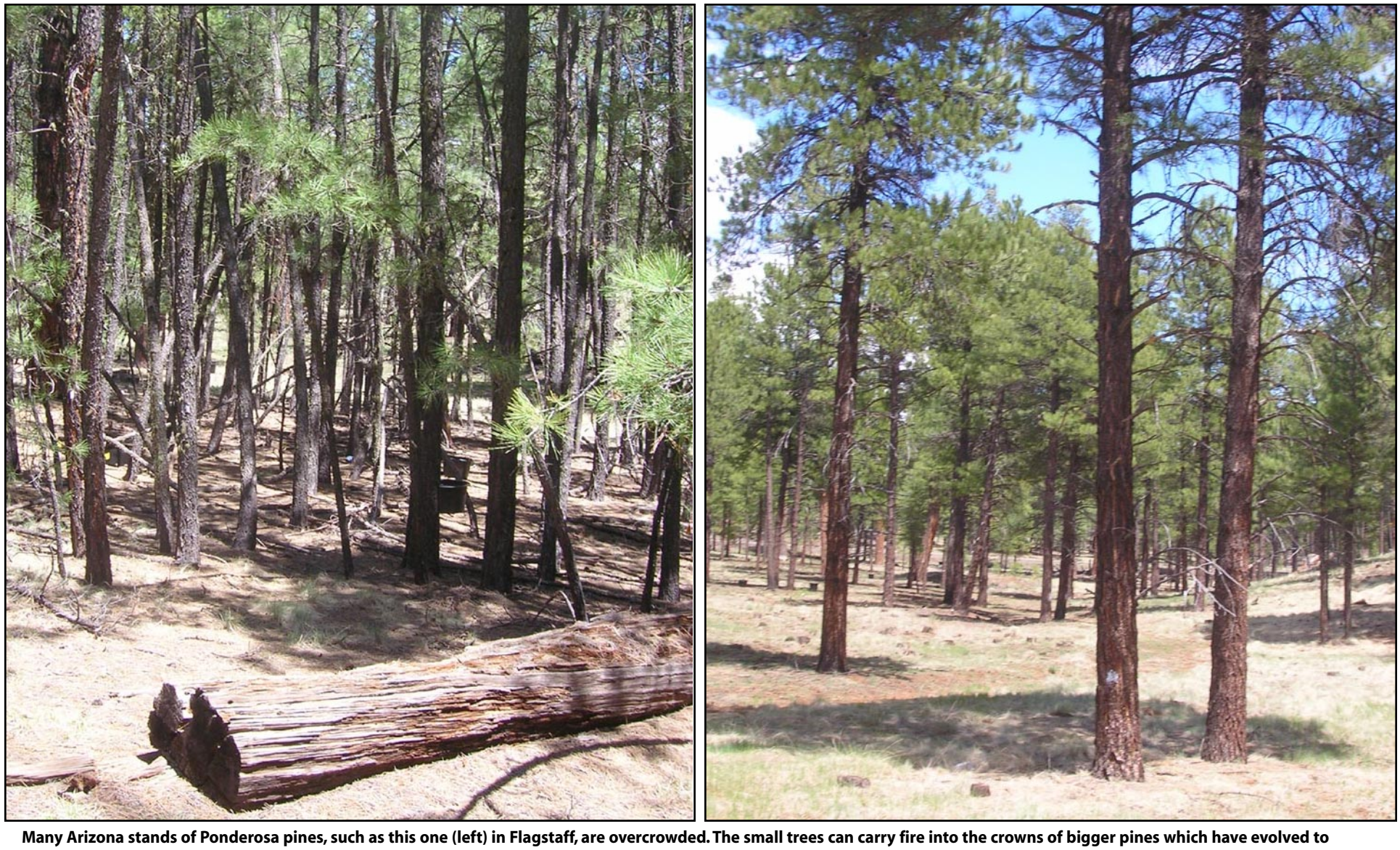
Many Arizona pine forests contain too many small trees that could torch neighboring old-growth trees — and, for that matter, homes. In many water-challenged forests, these small trees can carry fire like a candlewick up to the tops of ancient trees.

Preventing fires, as well intentioned as it is and has been, allowed the growth of saplings that would not have survived a natural fire regime. The tree-ring record documents that before fire suppression efforts began roughly a century ago, fires frequently swept across the forest floor but rarely swooped up into the crowns of old-growth ponderosa pines.

The Rodeo-Chediski Fire, which killed trees in city-sized patches, generally laid down and became a much milder surface fire in areas that had been treated by thinning and/or prescribed burns, as Northern Arizona University researchers documented. What's more, these treated stands also were less likely to degrade into oak-manzanita scrub after the fire.

"Thinning" the small trees can make existing ponderosa pine forests more resilient to drought and higher temperatures as well, because fewer trees are competing for limited water supplies.

It actually costs more to harvest the small trees than a typical business can make on them. In the White



Many Arizona stands of Ponderosa pines, such as this one (left) in Flagstaff, are overcrowded. The small trees can carry fire into the crowns of bigger pines which have evolved to tolerate surface fires, but not crown fires. After "thinning" of small trees (right), preferably followed by prescribed burns, the treated stands are easier for people to walk through and more resistant to crown fires. *Photos courtesy Melanie Lenart*.

Mountains forests hosting the Wallow and Rodeo-Chediski Fires, it can cost $1,000 an acre to get these forest stands into shape with thinning projects. But these treatments clearly can make these pine stands more resistant to the big fires that are projected to increase as the climate warms. Thus, support for such projects can help keep carbon in the woods — by reducing the odds of future forest flambé.

Keeping the landscape forested has benefits that extend far beyond carbon counting and even aesthetics. Forests moderate temperatures below their canopy, keeping the local environment far cooler during summer days and somewhat warmer during winter nights. Forests and wetlands moderate floods and drought, storing excess water in times of high flow and releasing it over time to reduce the downstream impacts of drought. And they clean the water before releasing it, collecting nitrogen and other compounds so they won't spur on algal blooms in rivers, lakes and the ocean.

More forests and wetlands in the Mississippi Basin could reduce the risk from ravaging floods such as the ones we saw this year. Their cleansing skills could help constrict the oceanic Dead Zone — an area of algal growth that makes conditions unbearable for many other life forms — that forms where the Mississippi reaches the Gulf of Mexico. As it is, with nitrogen draining off corn crops as well as record rains, the Dead Zone is expected to reach record proportions this year.

Climate change poses many problems for both East and West, but these problems are made much worse by the way we treat our forests — or don't treat them. The good news is we can tackle some of these land management issues even as we wait for national and global action to reduce the greenhouse gas emissions that warm the planet.

With that in mind, I'd like to share this excerpt from *Life in the Hothouse*. It puts the role of humans into the perspective of Lovelock's theory viewing the Earth — Gaia — as a living system:

> *Wetlands have been called the planet's kidneys, given their role of purifying a dilute toxic stew of chemicals into potable water. This function only works in a healthy system, though. The ongoing destruction of wetlands leaves our planet with the equivalent of one kidney to handle the toxic load of a meth addict who subsists on French fries and whiskey. Forests have been called the planet's lungs. Again, our hacking away at these systems equates to asking an asthmatic chain smoker to run a marathon.*
>
> *Are we asking Gaia to do too much with too little? How can we help, instead of hinder, efforts by our planet and its natural systems to control climate and support life? Gaia theory originator James Lovelock has compared humans to the planet's central nervous system, akin to Gaia's brain. It seems the warning signal about global warming has finally penetrated our thick skulls. Now let's hope we will feel an impulse to do something about it.*
>
> *Just because a system or a planet can heal from a major assault doesn't mean it will. The wrong behavior can produce a turn for the worse. A person with a fever can recover, under the right circumstances. But if that person tries to pretend nothing's wrong, smoking and drinking the nights away, she or he could turn a mere chest cold into fatal pneumonia. A similar concept applies to the planet. Anyone who imagines that we don't have to worry about our bad habits because Gaia will take care of the mess is missing the point. We are Gaia. We're the ones who must make repairs, along with the other living systems on the planet.*
>
> *"We need to begin to understand our symbiotic relationship to Earth," Justin Willie, a Diné of the Navajo Nation, reminded during a 2005 water summit held in Flagstaff, Arizona. "The problem is the solution. It's us."*

Melanie Lenart is an environmental scientist and writer based in Tucson. This excerpt is from Life in the Hothouse: How a Living Planet Survives Climate Change © 2010 Melanie Lenart. Reprinted by permission of The University of Arizona Press.

Climate Change: The Never-Ending Story

by Thomas R. Van Devender, PhD, MABA Project Manager. *Photos by author except where noted.*

If you go back just a bit in geological time anywhere on Earth, the climate and vegetation were different. The **Sonoran Desert** ① is in the lowlands of Arizona, California, Sonora, and both states on the Baja California Peninsula, but the Sonoran Desert Region includes all of the adjacent upland grasslands, woodlands, and forests, more tropical thornscrub, and tropical deciduous forest. The deep roots of the area are tropical.

The end of the Cretaceous Period 65 million years ago (mya) was a milestone. Not only did the dinosaurs become extinct, likely because of the impact of a huge asteroid, but also because it marked a transition from archaic forests of the Mesozoic Era vegetation and the beginning of the world that we know today. Rainforests flourished in North America in the Paleocene Epoch (56-65 mya) as the seed plants (angiosperms), led by the legumes, began their explosive evolutionary radiation on the path to world domination. But the key event in the evolution of deserts was the development of **tropical dry forest** ② (TDF) in the Eocene (34-56 mya). Most of the adaptations to heat, aridity, and extreme light, that allow plants and animals to survive in deserts today, evolved in response to TDF dry seasons. At this time, the mountains of North America were not high and broadleaf evergreen and tropical forests were widespread across the continent. Fossil palms, crocodiles and tortoises were found on Ellesmere Island north of the Arctic Circle in a bizarre tropical arctic environment with little frost and six months of darkness! Seasonal inactivity in plants (deciduousness) and animals (hibernation) may have evolved in response to arctic seasons, but served well to cope with fluctuations in cold and drought at lower latitudes.

In the Oligocene (23-34 mya), a drying trend opened up the tropical vegetation. Most of the modern groups of grasses were recorded in the fossil record as mammals evolved longer running legs and the high-crowned teeth needed to eat grasses with high silicon content. Vertebrate paleontologists often reconstruct Oligocene environments as 'savannah' (a vague term which focuses on grasses rather than long-lived trees and shrubs), but the plant fossil record does not record grass-dominated landscapes until much later. But the most important factor in modernizing North America was yet to come!

The formation of the **Sierra Madre Occidental** ③ (SMO) and the Rocky Mountains began in the late Oligocene-early Miocene (5-23 mya). Tens of thousands of feet of volcanic ash piled up, framing the western side of the continent. The climatic and biological consequences of this were profound, establishing the modern biogeographical provinces of North America. The Jet Stream circulation around the North Pole changed from four to five loops, with one anchored over the Rocky Mountains and descending air dried out the mid-continent. In the mountains, vegetation became arranged in zones as temperatures decreased at higher elevations. Tropical forests were limited to narrow bands along the coasts as woodlands and forests, dominated by conifers and oaks, developed for the first time on mountaintops. The formations of these great sierras resulted in complicated biotic changes. Older tropical groups remained in the lowland tropics, while plants preadapted to cold, like the pines, dominated the uplands. The daisies (Asteraceae) and grasses (Poaceae) underwent explosive evolutionary radiations. The first fossil evidence for grasslands and grasses with the now dominant C-4 photosynthesis were in the middle Miocene. The amphibian and reptile faunas were modernizing, while mammals continued to evolve rapidly.

If we considered the Sonoran Desert region as a senior citizen of 65 years — the Old Man of the Sonoran Desert (OMSD) — deserts were not present his first 55 years. About 10 million years ago in the middle Miocene, the area isolated northwest of the SMO began a drying trend — tropical deciduous forest dried into **thornscrub** ④ and then into desertscrub by about 8 mya. The Sonoran Desert was dominated mostly by species that evolved in older tropical habitats and newly evolved regional endemics. For example, the closest relatives of the Sonoran **saguaro** ⑤ (*Carnegiea gigantea*) are the *tetetzos* (*Neobuxbauma* spp.) of Puebla and Oaxaca in southcentral Mexico.

Yet climate and vegetation kept changing and in the Pliocene (2.0-5.3 mya) there was a reversal to a warmer, wetter, more tropical environment. All of these geological periods (eras, periods, epochs) were defined on faunal changes in the fossil record. But the Pleistocene Epoch was defined on a climate change. As the ice ages began about 2 mya, OMSD experienced Winter! Continental glaciers covered most of the high latitudes in Europe and North America. The top of the Rocky Mountains and the Andes in South America were covered with ice. At first, geologists thought that there were four major glaciations in North America, but studies of oxygen isotopes in deep-sea cores showed that there were 15 to 20 glacial/interglacial cycles. Moreover, glacial periods lasted 10-20 times longer than interglacials, and ice age climates similar to that of about 12,000 years ago were typical of 80-90% of the last 2 million years.

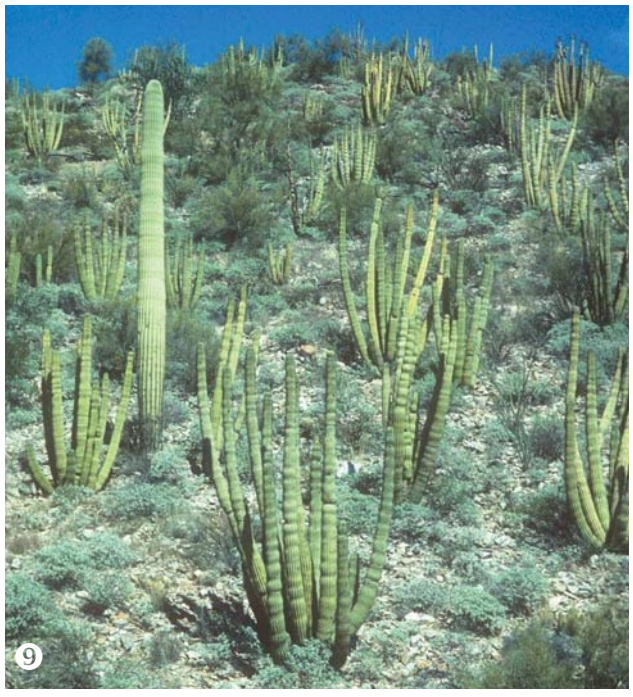
So what happened to OMSD during the ice ages? He 'weathered away' in relictual areas in central

Sonora (a Snowbird in Margaritaville?) — sort of 'hibernating'! Ice age climates with greater winter rainfall from Pacific frontal storms and reduced summer monsoonal rainfall from the tropical oceans favored woody cool-season shrubs that now grow to the north and at higher elevations, and not the summer-rainfall Sonoran Desert trees, shrubs, and cacti. Woodlands with singleleaf pinyon ⑥ (*Pinus monophylla*), junipers, and shrub live oak (*Quercus turbinella*) grew down to 1,500 feet elevation, with drier juniper woodland below that. Desertscrub was only present below about 600 feet in the Lower Colorado River Valley. Twigs and leaves of creosotebush (*Larrea divaricata*), an immigrant from South America, were dated at 18,700 years before the present (1950), establishing the presence of this South American immigrant in the Sonoran Desert during the last full-glacial period.

About 11,000 years ago, the Wisconsin glacial ended and pinyon pines disappeared from desert lowlands all across the Southwest. Geologists call the Holocene a different epoch, but it is really just another Pleistocene interglacial. For several thousand years, there was a transitional period when saguaros and brittlebush (*Encelia farinosa*) returned from their ice age relictual areas to mingle with junipers and shrub live oaks still living at low elevations. About 8,000-9,000 years ago, the Sonoran Desert was established and OMSD reinvaded long-lost northern areas in interglacial style with torches of paloverde flowers, crowns of saguaro flowers, blazing hot summers, and flashing lightning in summer monsoon storms. But the plant communities were different than today, with more mesquite (*Prosopis velutina*) and blue paloverde (*Parkinsonia florida*). Key dominant species in the modern Sonoran desertscrub communities such as foothill paloverde ⑦ (*P. microphylla*), ironwood (*Olneya tesota*), and organpipe cactus (*Stenocereus thurberi*) did not return to Arizona until about 4,500 years ago. However, climates are never really stable and fluctuate on scales from millennia to decades. For a few hundred years about 1,000 years ago, both summer and winter were wetter than today. This was the time when the Anasazi culture flourished on the Colorado Plateau and the Hohokam irrigated fields along the southern Arizona rivers.

Such a detailed reconstruction of the history of vegetation and climate of the last 40,000 years in the American Southwest is only possible because of the humble packrat or wood rat (*Neotoma* spp.). These medium-sized rodents are vegetarians that collect plant remains within a hundred feet of their houses. When they live in dens in dry rock shelters and caves, bits and pieces can be cemented into hard deposits with urine. ⑧ These 'middens' are mini-herbaria that contain seeds and twigs of 25 to 60 kinds of plants as well as remains of insects, and bones and teeth of small animals. Middens, which can be preserved as long as they are dry, have been radiocarbon-dated to over 50,000 years ago. Most of the plant and animal remains can be identified to species, allowing detailed reconstructions of past vegetation and climate at points in time.

There are several important messages in this environmental record. Although, the modern Sonoran Desert ⑨ developed about 9,000 years ago, it was first derived from older tropical biotic communities in the Miocene, and contracted and expanded with each glacial/interglacial cycles in the Pleistocene. Interglacial climates similar to today may have been present for only 5-10% of the last 2 million years. Climates are never really stable and biotic community compositions vary continuously as individual species respond to climate changes large and small. Unfortunately, this rich fossil record does not help understand future climates very well because climate predicted as a result of human activities are warmer than any recorded in the past.



The USA National Phenology Network:
A Partner for Tracking Environmental Change in the Southwest and Beyond

by Carolyn Enquist, Theresa Crimmins, and Lee Marsh

What do the number of species flowering along an elevation gradient in the Catalina Mountains, Mexican jays laying their eggs in the Chiricahuas, spring 'green-up' and timing of wildfire seasons across the West have in common? All are examples of ***phenology***, or seasonal lifecycle events in plants and animals—and all have changed significantly in recent decades. Throughout history, people have used phenology to make decisions about when to plant crops and when and where to hunt for particular animals. Now, phenological observations such as these are proving to be valuable in tracking ecological responses to changing environmental conditions in the Sky Islands and beyond.

Established in 2007, the USA National Phenology Network (USA-NPN) is a consortium of organizations and individuals that collect, share, and use data and information related to phenology. Changes in phenology are among the most sensitive ecological responses to environmental variability and climate change. For example, some butterflies are becoming out-of-sync with their host plants ('ecologically mismatched'), while the lifecycles of some pests are becoming more synchronous with their hosts (think bark beetle infestation of forests). In some cases, the species that are advancing or delaying their lifecycle events in response to climate changes (warmer spring temperatures earlier in the year, for example) are those that are increasing in abundance. In contrast, the species that are not showing such adaptability in the timing of their phenological events are declining in numbers. Not surprisingly, phenology is now widely accepted as a leading ecological indicator of the impacts of climate change on biodiversity and ecosystem processes.

The USA-NPN's mission is to cultivate a robust understanding of the natural world that can be used to support science, education, and decision making in an era of amplified environmental variation and rapid climate change. This mission meshes well with that of natural resource agencies and partnerships in the Southwest. For example, the Desert Landscape Conservation Cooperative (DLCC) aims to facilitate "informed conservation planning, effective conservation delivery, applied research and monitoring, and adaptive management." The USA-NPN can help the DLCC and others achieve this broad goal by providing solid scientific information and methods, assisting in data organization and distribution, building partnerships, and educating the public about the need for landscape-scale conservation efforts.

With off-the-shelf, scientifically-vetted and standardized monitoring protocols for nearly 500 (and counting) animal and plant species, USA-NPN serves as a resource for conservation and management partners in the Southwest. For example, phenological monitoring is essential for understanding scientific questions such as: are plants that bloom earlier more susceptible to frost damage and death? Do shifting bird migration patterns affect the availability of food resources in their spring breeding or wintering grounds? How do earlier springs affect the fire season? And what are the larger implications of changes in phenology for conservation, management, and delivery of ecosystem services for society at-large?

Moreover, phenology informs the planning of management actions. For example, phenological data can be used to map the timing of habitat use in ground-nesting birds to help managers decide when to mow or burn in occupied habitats. They can also be used to time the implementation of invasive species abatement programs. Insight gleaned from phenology monitoring and analyses can be incorporated in 'climate-smart' adaptive management processes to help managers identify and evaluate adaptation strategies that will ultimately reduce the vulnerability and increase the resilience of biodiversity to ongoing climate change.

Citizens around the nation also are beginning to make the phenology-climate connection, looking in their backyards and across the landscapes in which they live. The USA-NPN is working to enhance these connections. Inspired by a recent statement by the Intergovernmental Panel of Climate Change, "phenology ... is perhaps the simplest process in which to track changes in the ecology of species in response to climate change," the USA-NPN has developed education and public-engagement tools that cultivate hands-on scientific discovery and inquiry.

A key activity of the USA-NPN has been the creation of *Nature's Notebook*, a national plant and animal phenology observation program. Using this web-based program, participants can monitor the phenology of plants and animals in their yard, favorite landscape, park or protected area. In fact, within the Sky Island region, there are currently 64 registered users observing 138 different species that have generated a total of 8,415 observation records to date. In doing so, these individuals join thousands of other "citizen scientists" across the U.S. in providing valuable scientific data that can be used to track environmental change.

The National Park Service and U.S. Fish and Wildlife Service have partnered with the USA-NPN to take advantage of these scientific, education, and outreach opportunities. In the Southwest, we have emerging partnerships with the Coronado National Forest's Piñaleno Partnership and the Bureau of Land Management's Las Cienegas National Conservation Area. Our established partnerships within the region include the Arizona Sonoran Desert Museum and The University of Arizona's Biosphere 2, hosting a newly-established phenology trail for visitors.

Want to learn more, participate, or partner? Go to **usanpn.org** or contact Carolyn (Science Coordinator, carolyn@usanpn.org), Theresa (Partnerships Coordinator, theresa@usanpn.org), or Lee (IT Specialist, lee@usanpn.org).

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Thinking Big About Fire in the Sky Island Region

by Brooke Gebow, The Nature Conservancy

The current fire season has again stirred up public interest in how we manage our Sky Island region ecosystems. This attention catches us in transition. We have been fortunate here to have a pretty good fix on past fire regimes via the tree-ring record. We think that frequent, low- and moderate-severity fires were generally carried by light fuels near the ground (grass, shrubs, young trees) in lower elevation forests. (The story is different at high elevations, where forests are naturally denser, contain more fuel, and burn infrequently but hotter.) These frequent low- and mid-elevation fires reduced shrub densities in grasslands and opened up woodlands and forests. Then fire suppression and removal of fine fuels by grazing turned fires into infrequent events. Our landscapes grew woodier.

This audience understands that a century of little fire has produced wildfires with uncharacteristically severe effects in many Sky Island ecosystems. Over the last couple decades (not to mention the past couple months) managers have been scrambling. We know reintroducing fire is not as simple as lighting and letting fires go, because heavy fuels that can generate high-severity effects are still abundant. Protecting houses keeps growing as a priority. It is thus a worthy goal to move landscapes into a condition that allows wildfires to deliver more benefits than bad news. The "transition" mentioned above is a move from relying on the past for management guidance to another basis for desired conditions. Given predictions for a hotter and drier Southwest, we have our work cut out for us.

"FireScape" projects currently cover much of the Coronado National Forest. Each project aims to expand the scale of treatments on one or more mountains, with the ultimate goal of returning fire to its natural ecological role. In addition to the Coronado, the National Park Service, BLM, U.S. Fish & Wildlife Service, State of Arizona, counties, and ranchers are including lands in these projects. University of Arizona scientists play a role, and The Nature Conservancy has stayed at the table for these multi-mountain projects for more than 10 years.

One way to view FireScape is to think of matching the scale of analysis and planning to the potential scale of fire as a disturbance. We're seeing wildfires cover hundreds of thousands of acres, so we need to be thinking big to get ahead of them. Right now, four project sites add up to about 1.5 million acres. Each project consists of science, outreach, and compliance, and all of those functions are pointed towards stepping up needed treatments — mainly fire, thinning, and/or mechanical. These projects do not zoom along.

On the science front, we've solved, for each project area, the practical problem of neighboring jurisdictions lacking compatible ecological maps. We've calibrated a fuel model map for all of southeastern Arizona. This product allows running fire behavior and effects models over any swath of the landscape to compare current fire outcomes with future ones (such as post-treatment or under hotter drier condition). We have updated ecological departure data which describe current conditions of vegetation relative to "reference" conditions. Climate predictions spur us to examine different desired conditions and figure what treatments it will take to get us to systems that can persist through new ups and downs.

To date, FireScape's outreach arm has mainly focused on smaller audiences whose property and livelihoods are directly affected (homeowner's associations, fire departments, ranchers), or the choir (interested academic, NGO, and agency parties). Now that we have tools to boldly paint maps with modeled outcomes of alternative actions, we are much better prepared to explore future scenarios with the broader public.

A key feature of FireScape projects is getting through environmental compliance at the scale of whole mountains rather than individual projects. It is not a concept with universal popularity. It means convincing the public to "trust us—we know what we're doing" across huge areas. But it pushes our limited resources from being stuck in the planning side to getting out there to burn and thin and avoid getting toasted by wildfires. We have gotten through this process for the Huachuca area and are moving along with Chiricahua, Galiuro, and Catalina-Rincon projects. The latter three projects areas include tracts of Wilderness that risk losing the values intended for protection due to altered fire regimes, as the current fires are demonstrating all too vividly.

A huge obstacle lies ahead as resource management funds shrink in government budgets. After this season's fires, we will likely see a temporary flurry of activity aimed at making it easier to plan and execute treatments. We won't like all of the suggestions, but perhaps the discussion will include acknowledgement that we are running out of time to create landscapes that can weather the test of changing climate.

If you are not on a FireScape mailing list, please contact the Coronado National Forest districts of interest. We want your ideas as we move ahead.

Brooke Gebow is the Southeastern Arizona Preserves Manager for The Nature Conservancy, but also wears a Forest Service hat as FireScape Program Manager. She is based in the Huachucas at Ramsey Canyon Preserve, and you can find her at bgebow@tnc.org.

Applied Science

for Trevor, Sky, and Tom

by Jefferson Carter,
Sky Island Alliance's Poet Laureate

This entomologist walks

into a bar, no, he walks

into the alley behind the bar

& discovers an ornithologist,

bleeding, face down beside

a rotted carpet remnant

where termites & ants are

chewing the fat. *Formica fusca*

& *Reticulitermes tibialis* co-existing?

How interesting! Could you

move your head a little?

The Megadiversity of Moths

by Walt Anderson

THE SCENE: *The Madrean Sky Islands, an archipelago of dozens of mountain ranges that unify the spirits of the Rockies and the Sierra Madre, the Sonoran and Chihuahuan Deserts. This is a land of astonishing diversity by almost any measure. The following story is based on a visit more than a decade ago to the Ash Canyon property of Noel McFarland in the southeast part of the Huachuca Mountains, a range noted for abundant and varied birds, mammals, and reptiles.*

But birds, mammals, and herps are not why I came to see Noel McFarland. He is a collector of diversity with a twist all his own. McFarland knows moths. I follow him through several rooms where he works. Noel collects more than moths, it seems, and twenty years' accumulation of boxes, books, papers, and other memorabilia fills his spaces the way floral diversity fills a rainforest.

Butterfly aficionados have a number of guides they can use to help with identification. Watchers are proliferating. But McFarland avoids the lepidopteran crowds. His collection of butterflies is meager. There are two small boxes on a crowded shelf, almost lost in chaos; one is hand-labeled "skippers only" and the other says "misc. butts." So much for butterflies here.

In contrast, there are beautiful collection boxes, big ones with wood frames and glass covers, devoted to hundreds of species of moths Noel has collected. There are no popular, broadly inclusive moth field guides, for visual impressions can be unreliable. Many species are similar, even when unrelated. Sexes can be strikingly different, and variation within a species can trick the devil out of you. Few moths have common names, so most hide behind Latin epithets often longer than their caterpillars.

Noel goes over each box with me, as enchanted by the beauty and diversity before us as I am, though he surely has looked at them hundreds of times. They *are* beautiful: some colorful, some gaudy, but each perfect in its own way. For many, he has discovered the larval host plant, often by testing alternative plants with captives. There is abundant life history information that, at present, only he knows. Diversity only partly is reflected by the naming.

If butterflies in southeast Arizona are considered to be a diverse group with 240 species, then moths must be recognized as megadiverse. Already on these five acres, a pinprick on a map of Cochise County, he has collected and identified over 950 moth species. His property has more moth species than all the butterfly species in the United States.

ABOVE ***Rothschildia cincta*** **photographed on a MABA expedition to Rancho las Barchatas, July 2010.** ***Courtesy Scott J. Trageser.*** RIGHT **The cocoons of this silkmoth (Saturniidae) are used to make rattles in the leggings (ténaborim) by the Mayo and Yaqui Indians in southern Sonora, Mexico. Old cocoons are gathered from limberbush (*Jatropha* spp.) or *hierba de la flecha* (*Sebastiania bilocularis*) and filled with gravel from harvester ant (*Pogonomymex* spp.) nests. Long strings of cocoons are woven from maguey (*Agave angustifolia*) fiber and wrapped around the legs of pascola and deer dancers who perform in religious events.**

And McFarland is still choosy about what he will collect. He only does the "Macros," a subset of the order Lepidoptera. Actually, the usual distinctions between butterflies and moths are rather artificial. Both the butterflies and the types of moths he collects are part of the Macrolepidoptera; some other "moths" are in the Microlepidoptera, the "Micros." As a rule of thumb, there are two Micros for every Macro, so if this relationship holds for the five-acre parcel, there easily could be *a couple thousand species* there. If there are perhaps three thousand species of moths just on McFarland's place, how many species might reside in the entire Huachucas? In Southeast Arizona? In the half of the Sky Islands region that occurs in Mexico?

If the Sky Islands do indeed represent a conjunction of boreal and tropical forms, I ask, then how is that reflected in the moth fauna?

Noel's ears perk up, I swear, almost like antennae. He guides my eyes to the noctuids again and begins to speak. The specimens before us are no longer static carcasses stuck on pins. Noel's words effortlessly evoke the tropics, and within my mind I see these moths pushing north to accompany the rising heat and humidity of the summer monsoons. From July through September, sometimes October, these tropical beauties push into Arizona. Eggs are deposited on appropriate host plants. Some hatch into larvae that blend cryptically into lichens or flowers or leaves, while others display gaudy colors and ornamentation that cannot be ignored. If conditions permit, the newly hatched moths continue to push north, stopping to breed again if host plants and weather permit. It is as if there is a powerful drive pushing these pioneers.

The tropical pioneers have characteristics in common. They tend to be strong fliers, capable of feeding as they move. The sphinx moths, those hummingbird look-alikes, are fine examples, as are many of the noctuids. In contrast, the lasiocampids and saturnids have short-lived adults that lack functional mouthparts. Without mouths to feed, they lack the traits that make good pioneers. The geometrids tend to have good mouthparts but weak flight, so they rarely wander far from their larval latitudes.

I recall a fall day when I lived in Prescott Valley in central Arizona, well north of the Madrean Sky Islands. I noticed a dark creature with a five-inch wingspan pressed against the light-colored wall of the house. I approached, and it fluttered into the air, reminding me of some kind of bat. But when it landed, I saw that it was no mammal, even though it had two bold orange "irises" surrounding deep black "pupils"—false eyespots. This giant moth (a noctuid) had a velvety look, with rich purple tones overlying soft browns. It was one of the most beautiful and exotic creatures I had encountered. I delved into books and discovered I had been blessed by the visit of a Black Witch, *Ascalapha odorata*, normally a denizen of tropical and subtropical forests of Central and South America. Strong fliers, some of these moths wander north during our fall months, some even reaching Canada. The climate in the north, of course, is not presently suitable for them to persist and breed, but if global warming persists, then some day we may expect them to join the ranks of species breeding amidst the Sky Islands.

Since species diversity of so many types of organisms increases toward the tropics, then the influence of these tropical species can contribute much to local diversity. But Arizona is not the tropics, no matter how it feels along the lower San Pedro or the middle Gila in steamy August. Fall is followed by winter as inevitably as pupa follows larva. Cold snaps kill, and the range of each tropical species contracts, perhaps to the thornscrub along the lower Bavispe or the Río

Sonora, only to expand again when warm monsoonal conditions return.

The dynamism of species' ranges can best be appreciated through an exercise in creative seeing. Imagine that you could elevate yourself well above the Sky Islands so you could see each of the several dozen ranges and their parallel valleys. Assume that each moth produces a pinpoint of light that you can distinguish. Erase all the lights belonging to resident species; their minor comings and goings may have ecological significance, but it's the tropical species that interest us now.

Now speed up the action again. The photic tide surges north, then sags to the south. This goes on and on as annual cycles are repeated. But accelerate your temporal scanner again until what was an annual cycle is compressed into a decadal event, then a century event. At this scale, you can see more than mere repetition of pattern. You can see times in which the front curls around El Tigre in Sonora, right at the north end of the Sierra Madre, then retreats. For awhile, the pattern oscillates, sometimes more, sometimes less, but averaging right around the big bend of the Bavispe. After awhile, you see the average tide shift to the north. Before long, the peak surge is lapping at the bases of the Pajarito, Huachuca, and Chiricahua Mountains. It may hold there for periods we could translate to decades or centuries, but it's possible the surge could continue to push north, now lapping at the base of the Mogollon Rim. Then later the peak tides begin to slacken, the average northward push drops back to the south, perhaps leaving small populations of lights (moths) behind in refugia that continue to meet their needs.

Our exercise in informed imagination has just simulated the responses of tropical moths to climate change. Something like this must have occurred since the end of the Pleistocene: expansion of ranges to the north with warming, reaching a peak a few thousand years ago when warm moist conditions were at a maximum, then contracting as aridity and coldness pinched the moth pioneers back the way frost nips a bud.

The 1990s were an exceptionally warm decade in North America, with particularly mild winters in southern Arizona; perhaps the tide of tropical moths that Noel has been witnessing shifted north accordingly. This is something we could document, if we were aware of the need to look! If competent naturalists recorded the comings and goings of the various forms of life, if we had data that we could put into a computer for visual analysis, then someone in the future could see on a screen just the type of patterns that I described. Our understanding of the factors that generate diversity in this region, or those that threaten that diversity, would allow us to manage our lands more wisely. It goes beyond moths, for patterns of distribution of birds, mammals, butterflies, and other taxa could be noted. If instead we collect no data, if we leave the computer screens to the world of *virtual reality*, then we could lose countless evolutionary lineages, not specimens that create pretty patterns in a collector's box but complex forms of life and the stories each of them carries.

A day has now passed since my visit to see Noel McFarland. I am walking through a riparian area in pine-oak woodland in the Chiricahuas as steady rain falls. I duck beneath the boughs of small Chihuahua Pines, and bits of pale color flash erratically from the wet grasses in response to my passage. They are tiny moths, hundreds of them, disturbed by my feet, perhaps by the immensity of my size. This is their time, and for a moment I am in their world. It is a world of healthy grasses, regenerating trees, a world all too rare in this part of the continent. I think of the thousands of moth species on just five acres in Ash Canyon. I think of the subdivisions taking over land just like that, of other areas where cows have removed every blade of grass. I wonder how much diversity we have already lost, how many moths have disappeared, unknown and nameless, because there was no one like Noel McFarland there to bear witness.

AFTERWORD: *In June of 2011, a raging wildfire aided by absurdly low humidity and fierce, fickle winds roared up out of the south and engulfed Ash Canyon, destroying almost all of the homes, including that of moth expert McFarland. Buildings can be rebuilt and vegetation regrown (sooner or later depending on severity of soil sterilization), but three decades or more of insect collections and data—these are gone forever, a priceless loss of knowledge. Biotic information, ecological and genetic, is destroyed as surely as the neatly labeled boxes of moth specimens. It is obvious that the new Ash Canyon, rising from the ashes, will never be the same. There is a measure of resilience in nature, but in human lifespans, we will never see anything close to what existed there before. The loss to fire of one canyon, of course, is an event that has been repeated many times in the history of the Sky Islands, but the record fires in the Southwest in 2011 have multiplied the effects almost beyond our fears and imaginings. If we followed the metaphor of moth range expansion and contraction and applied it to many species across the vast landscape in these rapidly changing times, we would discover a new, dynamic pyrography of life. Yes, this* requires *us to bear witness.*

Welcome Nick!

Nick Deyo is the newest member of the SIA team. On June 15 he came on board as the program coordinator for the Madrean Archipelago Biodiversity Assessment (MABA). Nick is performing logistics to ensure that MABA research expeditions to the Sky Islands of Northern Mexico run smoothly and continue to be as successful as previous trips. Nick is entrusted with maintaining the MABA database of flora and fauna. This online resource is becoming increasingly valuable as a researchers and conservationists on both sides of the international border work to understand and protect the unique biodiversity and natural beauty of the Sky Island region.

Nick brings a broad background in conservation to the SIA team. He received his Master of Landscape Architecture from the School of Natural Resources and Environment at the University of Michigan; there, as a Wyss Scholar, he focused on conservation planning and ecological restoration. Nick served as a Peace Corps Volunteer on the Pacific island of Samoa. While immersing himself in Polynesian culture and language he created conservation curriculum and provided educational outreach for a newly established marine protected area. He continued to work internationally conducting field research in the Caribbean National Forest of Puerto Rico and as an instructor for Ecology Project International (EPI) in Costa Rica. With EPI he taught Costa Rican and U.S. high school students about leatherback sea turtle conservation and led students on beach patrols to protect and collect data on this fascinating species.

We are excited to have Nick as a part of the team and are confident that his unique skill set and commitment to conservation will be an asset. He is enthusiastic to learn about and protect the invaluable wildlands and incredible biodiversity of his new home in the Sonoran Desert.

Twin-spot Twilight *by Trevor Hare, Landscape Restoration Program Manager*

It was getting dark with the clouds rolling over, but the rocks were hot and the lizards were moving. Number 0818, a fully grown female twin-spot rattlesnake (*Crotalus pricei*), moved steadily across her universe, an acre of jumbled rocks and rock lizards. Thermal regulation and precipitation, or as 0818 saw it, *vida y abundancia*, was of paramount importance on this rock pile.

Number 0818 and the rest of her kind occur in relatively few spots in the Sky Island region: on our rockiest slopes at our highest elevations. The higher points of the Sierras Madre Occidental and Oriental also harbor twin-spots, but in Arizona only the Chiricahua, Huachuca, Piñaleno, and Santa Rita Mountains contain populations of these snakes. Number 0818 and her cohorts have spent the last six years in this slice of heaven in the Chiricahua Mountains on a rocky hillside where mountain spiny lizards (*Sceloporus jarrovii*) live a precarious existence within a literal stone village of venomous snakes. We don't know much about the ecology of these little snakes and no one knows exactly how they got stranded on top of our Sky Islands, nor how long it took to evolve into what they are today, but we do think they may be ancestral to other rattlesnakes. The one thing we know for sure is that global climate change will have large, negative impacts to these small habitat patches of snake paradise.

The talus slope where 0818 lives provides everything to fulfill her life-history needs — an abundance of prey; refugia from the heat, cold, and hawks; and, perhaps one hundred of her compadres from which to find a mate. The spiny lizards — her favored supper — also find the same necessary components to do their job: sit on a rock, wait for a bug to walk by, and try to avoid the SNAKES! The rocks provide a unique microcosm with water storage, bug production, fat lizards and hungry snakes, with the deep crevices providing cooling in the summer (when it rains) and the south and west exposures providing warmth in the winter. When the rains don't come, 0818 will venture into the Madrean evergreen woodland and conifer forest which surrounds her lovely rock pile, where thermoregulation is different and perhaps more difficult, and where the prey base is different and definitely more difficult.

During the dry years, it appears that when twin-spots move off their rock pile and into the woods, they travel almost twice as far to meet their life-history needs. It also means that they will be more exposed to potential mortal encounters with hawks, other snakes, and humans. And humans are definitely a problem. People have always coveted the rare and unusual and the twin-spot is one of the most highly sought-after species of rattlesnakes for collectors. In fact, a marked snake from 0818's rock pile was found by Arizona Game and Fish law enforcement for sale in Alabama. Her particular rock pile is a very famous one after being immortalized in the late 1950s in Carl Kaufield's *Snakes and Snake Hunting*. Every herpetologist knows about this rock pile as does every snake collector. And thank your lucky stars the Forest Service and Game and Fish know about it too as they try to keep an eye on it — so it tends to be a pretty well-protected place. However, we don't know how to protect it from the certain but unknown impacts of global climate change.

We can't predict exactly what is going to happen in the future but we have a pretty good idea that here in our Sky Islands and Desert Seas it will be hotter and it will be drier. Winters may even be colder, while our summer thunderstorms, *los chubascos*, may be even more violent and their flooding more pronounced. The hotter summer temperatures, less precipitation, more violent storms with faster runoff (and its greater erosive power) may damage our watershed beyond repair. Watershed function promotes habitat and habitat promotes plant and animal communities, and it works across the spectrum of biological communities from the floor of the Lower Sonoran Desert to the tops of our highest peaks. It is all connected.

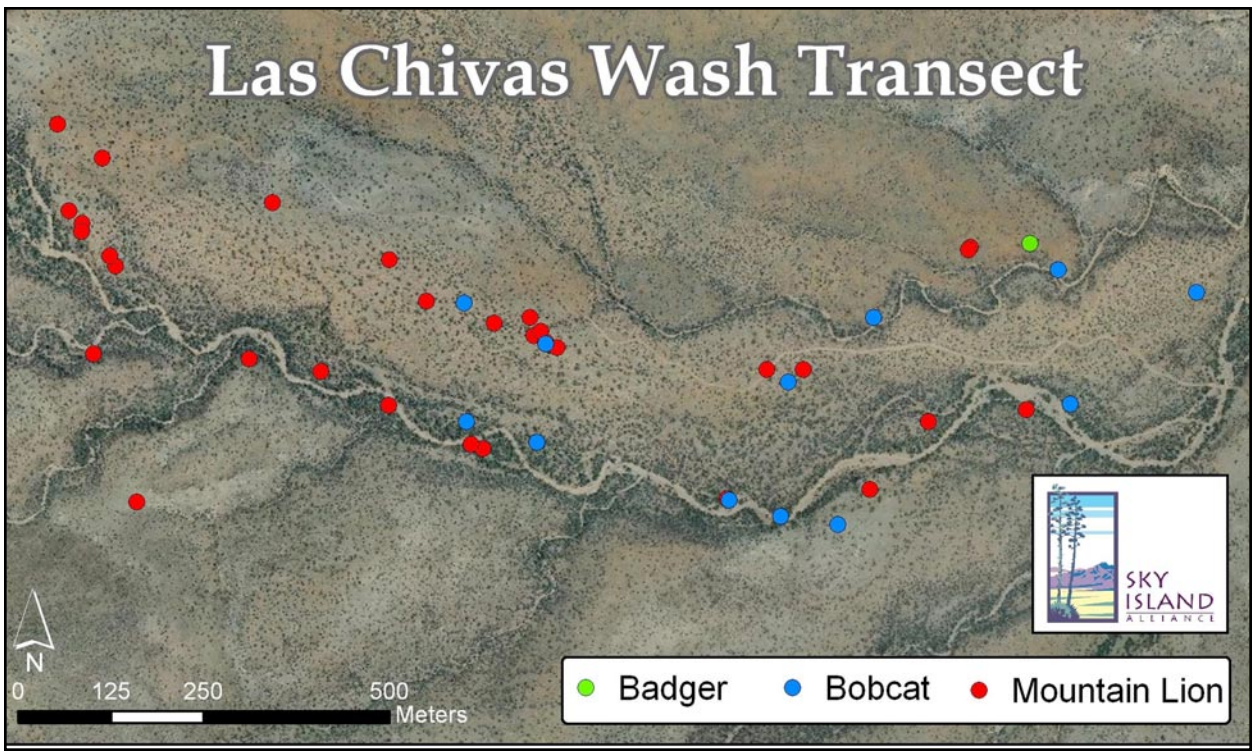
Each one of our special places will be impacted by global climate change. We are trying to understand what we can do to carry out our mission to protect and restore them, but for some of these places and for the critters who live there we may never know so we (meaning the collective of organizations, agencies and citizens) have to be ready, nimble and clever, to act. For some plants and critters, like those at our highest points, we know one thing — they have no where to go. That rock pile in the Chiricahua Mountains, that famous rock pile 0818 calls home is under siege by man and it isn't the man out collecting. In addition to the higher temperatures and lack of good rain, our mountaintops are also burning. The snakes in the rocks should be pretty safe from being burned to death, but the rocks are too hot and too dry and the forest is gone and we don't know if the twin-spot will survive.

What we *do* know — and what we *are* doing, to help the snake and its ecological community — is to eliminate non-climate-related stressors to the ecosystem. We work to remove invasive species and wildcat roads, and to restore ecosystem and watershed function. Restore soils and vegetation communities. Restore aquifers and sub-surface and surface aquatic systems. Restore animal communities. And restore a land ethic in our neighbors, friends and families… and in our leaders.

Crotalus pricei* and the good life . *Courtesy Trevor Hare.

Student Volunteers are Bridging the Gap between Knowledge and Advocacy *by Jessica Lamberton, Wildlife Linkages Program Coordinator*

Every month, Sky Island Alliance volunteers are out on the landscape, conducting road surveys, restoring riparian areas, protecting native frogs, collecting wildlife movement data through tracking, maintaining remote cameras, and surveying species records in the Sky Island region of Mexico and the U.S. And it doesn't stop there! Sky Island Alliance is more than a volunteer-driven science organization, although we are firmly founded in those principals and actions. We are also an advocacy organization — many of our volunteers are students who play an important part in helping SIA directly bridge the gap between knowledge and advocacy. Here are just a few!



Track detection of bobcat, mountain lion and badger on the Las Chivas Wash transect, 2002-2010. Map by Kenneth Morris © *Sky Island Alliance.*

Meagan Bethel is in the 8th grade, and has already made headway as a biologist in her own right. She approached us two years ago, interested in volunteering with SIA's remote cameras, and quickly began winning science awards throughout Arizona with her project titled *Caught On Camera: A Longitudinal Study and Regional Comparison of Wild Cats in Southern Arizona and Northern Mexico*. She is now taking her project to the national level, and continues to spread the word about SIA's international work with wild cats.

Kenneth Rick Morris is completing his Masters degree in Geographic Information Systems Technology (GIST) at The University of Arizona. Rick is volunteering to map and analyze tracking data collected over the last ten years of the Wildlife Linkages Program. His most recent analysis of the Las Chivas Wash tracking transect, located in the Tumacacori-Santa Rita linkage, will be published in a technical paper presented at the International Conference of Environment and Transportation in Seattle, Washington, this August. As his final Masters project, Rick plans to build an interactive online map of the Sky Islands, with clickable links showing study areas and restoration sites, data collected, GIS analysis, and photos.

Caroline Patrick has worked on staff with SIA's MABA project, and is now finishing two Masters of Science degrees — in Geographic Information Systems Technology at The University of Arizona, and Park and Resource Management out of Pennsylvania. Caroline will work with our Northern Mexico Conservation Program on her Masters project to combine aerial photography, GIS-layer information, and volunteer ground-truthing data to map the current state of our borderlands and border infrastructure. The map will show the geographic footprint created by barriers such as the border wall and associated lights, roads and disturbance on wildlife and natural processes, and will be the first publicly available map of its kind.

Ann Marie Raymondi is a graduate student from Arizona State University working with past SIA board member (and founder!) Paul Hirt for her Masters thesis, analyzing the social connections and interactions SIA's Wildlife Linkages Program makes through its volunteers and partners. We often talk about how SIA's work links people with conservation, and Ann Marie will use sophisticated social network analysis tools to show us just how effective and far-reaching our connections go.

Alex Smith has a law degree from The University of Arizona and volunteers with the Conservation Policy and Climate Change Adaptation programs. Alex also has been contributing over 10 hours a week to help transfer data from hardcopy form into a database format, making it possible to include tracking and remote camera data into the Madrean Archipelago Biological Assessment (MABA) database, a publicly accessible source of species records in the Sky Island region shared with universities in Arizona and Sonora. Alex was recently accepted to The University of Arizona's School of Natural Resources GIS Certificate program and plans to continue to contribute to SIA through GIS and policy work.

Cody Wooden is in his senior year at the University of Montana in Missoula, studying Environmental Studies with a minor in Wildlife Biology. This summer, Cody will be working with us and our Oro Valley and Sun City volunteers to compile and analyze data from remote cameras and tracking transects in the Catalina - Tortolita mountain linkage, for internship credit. His final product will be community outreach and pre-monitoring results for the State Route 77 Wildlife Crossing project.

Many thanks to all our volunteers who make advocacy possible!

The SIA store is now open!

New this summer! You can now buy Sky Island Alliance gear at our online shop through Cafe Press. Check out our store for tshirts, mugs, water bottles and canvas tote bags — all with the Sky Island Alliance logo. Approximately 10% of every purchase goes directly to SIA so you can support and represent your favorite conservation organization all in one stop!

www.cafepress.com/skyislandalliance

¡El Aribabi es una Area Natural Protegida!

In March 2011 the Mexican National Commission of Natural Protected Areas (CONANP) announced the designation of "Rancho El Aribabi" as a Natural Protected Area, under the category of Voluntary Land Conservation. The designation protects 10,000 acres of private property located in the Municipality of Imuris, Sonora, for ecosystem and biodiversity conservation, environmental education, and ecotourism.

After a long process initiated and led by landowner Carlos Robles Elias, and supported by scientists and conservation groups from Mexico and the United States, CONANP has certified that "Rancho El Aribabi" hosts a wide array of protected species of plants and animals and their habitats whose protection mitigates climate change effects in the region. Under this designation, the Robles family commits to conserve Rancho El Aribabi in its current state; carry out conservation policies, guidelines and actions established in the Ranch's management plan; allow CONANP personnel to conduct supervision and monitoring activities; continue to inventory local flora and fauna; and, develop an environmental education plan.

El Aribabi remains privately owned by the Robles family, who have progressively reduced cattle grazing on the ranch over the last decade. "Our family is proud to provide a preserve for the region's plants and animals in perpetuity," says Carlos Robles Elias, owner of Rancho El Aribabi. "For my family it means sharing our lives with all the wildlife that surrounds us."

Protecting Our Mountain Islands and Desert Seas *continued from page 5*

Recently the Coronado National Forest devolved into what some might define as a nightmare of fire and much of the Tumacacori Highlands burned in what is being called the Murphy Complex Fire. That said, I am always amazed at how fast burned landscapes respond and rebound. Even though many of the iconic places that we associate with the Tumacacori Wilderness have been impacted by the fire, the Tumacacori Highlands remain a fine example of a roadless landscape that will, with the proper management, continue to provide solace for wildlife and humans for many generations to come.

The Northern Chiricahua Mountains have also seen their share of fire over the last few weeks, but the odds are that this area will rebound too and will remain an important part of an overall landscape-level plan to protect and enhance our region. Both areas will likely become valued study areas providing an amazing opportunity to study fire and how wildlife and burned habitats respond in arid lands and under different climatic conditions. So far our other potential wilderness areas, the Whetstone and Dragoon Mountains, have been spared from the fires and in spite of the fires we have continued to meet interested stakeholders in our ongoing effort to build support for the Land of Legends campaign and to make sure the Tumacacoi Highlands effort prevails.

Forest fires are not the only fires we have been dealing with! It looks like some folks in Cochise County politics are trying to take a chapter from the county sovereignty movement and place anti-federal government and anti-wilderness language into the Cochise County Comprehensive Plan. Seeing as how the federal government is busy trying to keep the entire county from going up in flames, most people would find it an odd time to be telling the federal government that they need to mind their own business in Cochise County. This leaves Sky Island Alliance and other conservation groups having to try and derail bad policy before it is codified in the Comprehensive Plan. For several years, we have been engaged in meeting with a wide variety of interest groups regarding the Land of Legends Wilderness Campaign in Cochise County. This reflects our effort to be inclusive and to form a dialogue that will hopefully lead to a well-thought-out Wilderness bill for this region. We encourage our members who live in Cochise County to get involved by contacting our office, get informed, stay informed and contact your elected officials letting them know that this is bad policy and does not reflect what many of their constituents think is the best direction for the County and certainly not for your Comprehensive Plan.

Landscape Restoration Program

by Andy Bennett, Trevor Hare and Sarah Williams

More than 25 volunteers headed out to Las Ciénegas National Conservation Area (LCNCA) at the end of February for a windy weekend of restoration activities. Volunteers built one rock dams, zuni bowls and brush media lunas to control erosion in small tributaries in the Los Pozos area west of Cienega Creek. This work, in collaboration with the Bureau of Land Management (BLM), is part of an ongoing project to restore portions of the upper watershed of Cienega Creek by increasing water retention and promoting vegetation growth in gullied areas. Thank you to The University of Arizona landscape architecture students for their help and enthusiasm that weekend!

March saw us continuing several large-scale projects. The first weekend we conducted road and riparian surveys on the southwestern flank of the Huachuca Mountains in the Las Nutrias Headwaters Watershed, where Bear Creek flows from Bear Spring in the Miller Peak Wilderness out across the grasslands to Rancho Los Fresnos in Sonora. This work will help inform a Sky Island Alliance watershed health assessment and restoration planning project.

Later in March we revisited The Nature Conservancy's Cobra Ranch on Aravaipa's east end for two days of riparian tree-planting and a channel transformation workshop from the incomparable Van Clothier of Stream Dynamics. This work is aimed at stabilizing the uplands and lengthening surface flow in Aravaipa Creek. Next up, in cooperation with the BLM, everyone made short work of a section of barbed wire fence that was acting as a wildlife barrier along the U.S.-Mexico border near Douglas.

In April we were literally burned out of work in LCNCA planned for Earth Day, but managed to get some good work done before the fire. We joined students from Cienega High School who are studying the ecology and restoration of their backyard watershed. This class raised giant sacaton plants in their school greenhouse for restoration of this particular area of the watershed. Together we planted around 50 of the grasses and installed two nice rock and brush media lunas to slow down and soak in water coming off the nearby road. Way to go guys!

Springtime also meant native leopard frog monitoring in Southern Arizona. The network of water features dotting the landscapes of the Huachuca and Pajarito Mountains provides critical habitat for the threatened Chiricahua and Lowland Leopard Frogs. Invasive bullfrogs also thrive in some of these locations. We visited many of these sites to search for all three species and work is ongoing. We also spent a weekend in the Huachucas with the USFS installing a bullfrog and cattle exclosure fence.

With the extremely dry conditions and closed National Forest we've been unable to work in the field since June 9, but we're hoping for a great monsoon season and a return to getting some good work done. We look forward to seeing you out there soon!

We Need You… to Volunteer!

Sky Island Alliance formed in 1991 when a group of concerned citizens came together to protect the Sky Islands adjacent to Tucson. Wanting to ensure that future generations would have an opportunity to enjoy the quiet solitude of a mountain meadow and experience a landscape where native species still roamed, they worked to keep our public lands intact and wild. Today, Sky Island Alliance gathers people together to protect our rich natural heritage and restore native species and habitats. New volunteers come out all the time, whether they are seasoned backpackers or have never looked at, much less know what a topographic map is. We welcome new volunteers to join us!

There are Always Opportunities to Rejoice in / Restore our Sky Islands!

Check **www.skyislandalliance.org** for the latest calendar!

Join our Landscape Restoration Field Weekends

Habitat Restoration Weekends: These trips can be physically demanding although there are still a wide variety of tasks to suit different skills and fitness levels. Current program work focuses largely on riparian restoration. Volunteers learn hands-on restoration techniques such as building one-rock dams and other water harvesting structures that aim to control erosion, trap sediment, stabilize stream banks and retain water on the landscape. These structures combined with the planting of young riparian trees and grasses aim to increase quality habitat along vital riparian corridors and heal the sections of degraded watershed.

Riparian and Recreational Impact Surveys: Volunteers gather at a base camp and are paired up with 3 to 4 other volunteers. We provide a map, GPS unit, digital camera, and data sheets. The teams are sent out to adjacent areas to walk out a riparian area or road transect. Each team collects photo and geospatial points to document their findings. Depending on the distance to the site, volunteers drive out for the day or camp out.

Contact Andy at 520.624.7080 x23 or **andy@skyislandalliance.org**

Adopt a Transect

Monitoring the presence of mammal species in important intermountain corridors: This volunteer program involves the largest time commitment. After an extensive training in identification and documentation of wildlife sign, volunteers are teamed up with other trained trackers to monitor a transect (tracking route) every six weeks. Check **www.skyislandalliance.org** or join our eNews list for information on our next tracking workshops!

Contact Jessica at 520.624.7080 x21 or **jessica@skyislandalliance.org**

Represent SIA at Outreach Events

Volunteer to spread the mission of Sky Island Alliance! Throughout the year SIA is invited to participate at several community events throughout the Sky Island region but have limited staff resources to ensure our participation. We are seeking committed volunteers to represent SIA at tabling events, give general presentations to the public and help internally at SIA outreach events and workshops. If you enjoy interacting with public, sharing your knowledge of the region and spreading the mission of SIA, this is the job for you!

Contact Sarah at 520.624.7080 x23 or **sarah@skyislandalliance.org** *OR*
Jessica at 520.624.7080 x21 or **jessica@skyislandalliance.org**

Make a Difference

Data entry/analysis and office needs: Data collected in the field is compiled into a database so that Sky Island can put that hard-earned information to work.

Contact Sarah at 520.624.7080 x23 or **sarah@skyislandalliance.org**

The Sky Island Alliance 2010 Awardees (from left): Julia Fonseca, Nancy Young Wright, David Hodges accepting on behalf of Tim Lengerich's family, Bill Radke, Deb & Dennis Moroney and Carolyn Campbell. ***Courtesy Sky Jacobs.***

SKY ISLAND ALLIANCE
Protecting our Mountain Islands and Desert Seas

Join us!

Join or renew here OR
through our secure website:
www.skyislandalliance.org

If you received this newsletter and it's time to renew your membership, please send in your check or renew quickly online! 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) non-profit organization.

Basic membership is $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... **$100** will close one mile of road... **$500** will support one remote camera...

Fill this out, call, or donate online. It's quick, easy and secure!

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**usually the last 3-4 digits on the back of the card by the signature panel*
Card billing zip code if different: _____

Sky Island Alliance Volunteers Make a Difference! *continued from back cover*

has tapped into a great group of people who are interested not just in financially supporting conservation, but who also want to understand the issues at hand and contribute in a way that can move the issues into some kind of resolution….and they like to get out there and get dirty to get the job done. And I like that!"

Cynthia will be guiding two trips to El Aribabi Conservation Ranch, October 14-16 and October 21-23 and a HOWL-O-WEEN Mexican Wolf trip in the Gila Wilderness October 28-30. Learn more about these trips and her outfitting business, Wild By Nature, at ***www.wildbynaturetours.com****.*

SKY ISLAND ALLIANCE
Protecting our Mountain Islands and Desert Seas
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Celebrating the Future of the Sky Islands

The animal you see in this photo is an ocelot — one of those rare animals that makes this region so special — photographed on remote camera in Rancho el Aribabi early this Spring. Yes, of course we've shared many photos of ocelots with you in the last few years; but this particular one is very special. We feel, in this year of celebrating twenty years of Sky Island Conservation, that it is a symbol of the future of the Sky Islands for the next twenty years — and that is not all! Shortly after receiving this photo, as well as video footage of this kitten running, full of energy, after its mother, we got the news from Carlos Robles that the Mexican National Commission of Natural Protected Areas (CONANP) has designated "Rancho El Aribabi" as a Natural Protected Area! See page 18 for more information on this exciting development! *Photo ©2011 Sky Island Alliance/Aribabi*

Sky Island Alliance Volunteers Make a Difference! *by Sarah Williams*

Since 1998, volunteers working with Sky Island Alliance have spent more than 100,000 hours turning their concern for our surrounding environment into tangible, hands-on action. As a grassroots organization, we could not achieve the results we do without the efforts of our dedicated volunteers — the real roots in "grassroots." The purpose of this column is to celebrate our volunteers and to share a little bit about who they are.

Cynthia Wolf doesn't exactly have an average resume. A trained wildlife biologist and naturalist, her myriad of job experiences include dog sled musher, vaccinator of elk for tuberculosis, range rider for wolf recovery, and tracking instructor and volunteer extraordinaire for Sky Island Alliance. If you had to give Cynthia a title it would be Adventurer. She does what it takes to continue working in and with nature, sharing her experiences with others to foster an appreciation for all things wild. Currently she owns and operates an outfitting business, Wild By Nature, out of her home near Silver City, New Mexico. Guiding folks in the outdoors, Cynthia's goal is to "connect people and place and all that comes with the place."

Cynthia started her adventures with Sky Island Alliance back in 2003 as a participant in a wildlife tracking workshop in the Gila Mountains. Ever since then she has been an active volunteer and a guest instructor at several tracking workshops. She specializes in black bear, grizzly and wolf signs. One of the things she likes the most about helping at tracking workshops is the contagious, positive feeling she gets from witnessing others gain enthusiasm and understanding in connecting and advocating for wild places.

As a Sky Island Alliance volunteer, Cynthia has formed a special connection with the Sonoran Sky Islands, in particular the landscape surrounding Rancho El Aribabi. Over the past few years she has worked closely with Sergio in the Northern Mexico Conservation Program and with Carlos Robles, owner of the Sonoran ranch, to help initiate and maintain the remote camera program. Her work scouting locations for the cameras, hiking to retrieve film, and tracking for jaguars and other focal species in the Sierra Azul has been instrumental in ensuring that El Aribabi remains a vital corridor for large mammal movement in the region.

Cynthia refers to her volunteer work at Aribabi, interacting with the Robles family and their land, as an "incredible flow of energy." From day one on the ranch she was invited to feel at home there. Some of her favorite hours have been spent listening to Carlos and Sergio talk over the campfire about dreams for the future of the ranch and what conservation there could look like. Although her Spanish is limited, Cynthia says she always understands the language the two men are speaking — passion for protecting the land — a subject that Cynthia knows fluently.

Cynthia will continue to play a significant role as an advocate and volunteer for the wild things and places in the Sky Island region and beyond. Her rampant enthusiasm and commitment to nature brings the mission of Sky Island Alliance close to her heart and her sense of place. "This organization

continued page 19