

Sky Island Alliance

Wildlife Linkages Program



10 Year Report

Citizen Science and Sky Island Corridor Conservation 2001–2011

inquiry ♦ engagement ♦ advocacy in action



Courtesy Bob Van Deven archive.

In just a short ten years amazing things can happen.

From 17 wildlife tracking workshops training 233 citizen scientists, to the contribution of scientific data and vision to support the planning and construction of a multi-million dollar wildlife crossing, Sky Island Alliance's Wildlife Linkages Program is dedicated to ensuring permeable landscapes for wildlife and connecting people to conservation. This core SIA program has elevated the need to plan for connectivity from a good idea to a critical component of conservation, transportation, infrastructure and natural resource management discussions and decision-making. Significant challenges still exist and likely will increase. Drought, fire, rising temperatures, new roads, mining, border infrastructure, and the like, will continue to threaten species' ability to move throughout and thrive in these wildlands. It is incumbent upon the Wildlife Linkages Program, the 17 trained cohorts of wildlife trackers, up-and-coming scientists and advocates, and YOU—Sky Island Alliance members, volunteers and donors—to build on the hard work and hard-won progress of these last ten years and to redouble our collective efforts in order to realize the fundamental goal of the Wildlife Linkages Program: *To protect and restore movement and dispersal of native animals and plants, and reduce threats and barriers to landscape permeability.* Will you join me for another ten years of helping wildlife thrive and connecting people to one another and this treasured landscape we call home?

I look forward to connecting with each and every one of you. Please enjoy reading about our collective ten years of successes!

Onward,

Nelanie Emerson

Tarantula

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Tracking
Training**
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Box turtle

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**The Next
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Dagoon Mountain wildlife linkage. *Courtesy Charlie Ohrel, The Nature Conservancy.*

Linkage Design Defined:

“The land that should—if conserved—maintain or restore the ability of wildlife to move between wildland blocks. The linkage design is produced by joining the proposed corridors for individual focal species, and then modifying this area to delete redundant strands, avoid urban areas, include parcels of conservation interest, and minimize edge effects. A linkage design serves many species, whereas a corridor design serves only one species.”

—corridordesign.org

Sky Island Alliance’s Wildlife Linkages Program

The Wildlife Linkages Program strives to protect and restore the movement and dispersal of native plants and animals, and to reduce threats and barriers to landscape permeability, using education, science and advocacy to achieve conservation action.

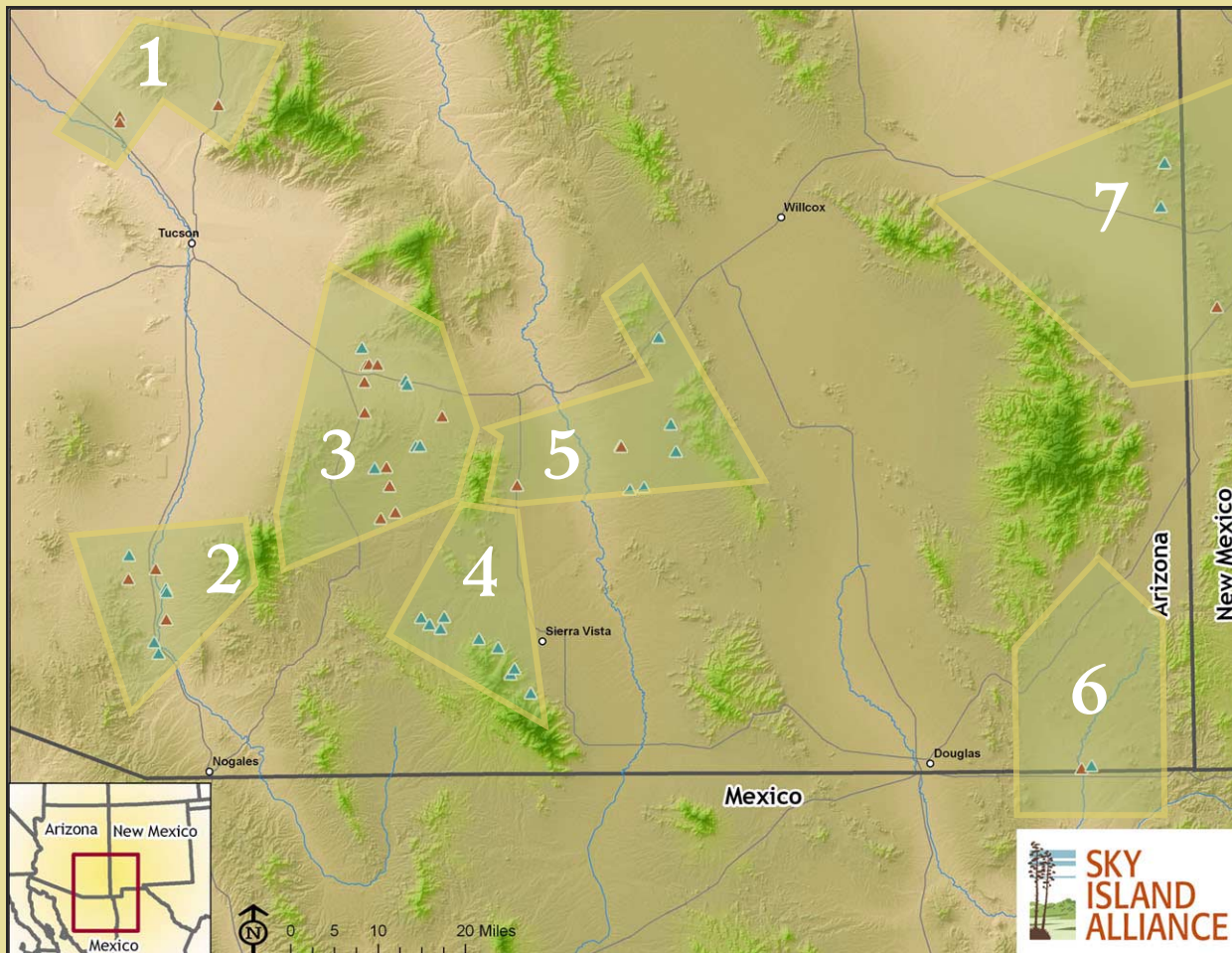
In 2001, Sky Island Alliance developed a citizen science project that uses animal track and sign identification surveys to monitor at-risk wildlife linkages throughout southeastern Arizona and southwestern New Mexico. This effort became the Wildlife Linkages Program, which aims to protect and advocate for an interconnected landscape where wildlife, based on their ecological needs, can move easily between core habitats, the Sky Island mountain ranges.

To date we have trained and engaged volunteers in the monitoring of 50 transects (1.5 mile-long routes) within seven priority linkage areas; the majority of these study areas are located on public lands (see map, next page). We have conducted over 1,000 track count surveys and documented over 4,000 records for more than 40 different animal species in the region (see list, page 9). Sky Island Alliance has successfully applied the resulting species presence data to land-use policy and permanent land conservation, incorporating wildlife data and linkage priorities into the Sonoran Desert Conservation Plan, the Santa Cruz County Comprehensive Plan, the Pima County Wildlife Connectivity Assessment and the Arizona Wildlife Linkages Assessment.

Protected wildlife linkages are the future of sustainable wildlife conservation and rural landscape protection. Dedicated citizens collecting information and advocating for our wildlife will continue to sustain this vision. We have found success in a model that does not limit “Linkages” to wildlife movement corridors; our Wildlife Linkages Program links people with wildlife with conservation.



Above: Documenting bear tracks.



- MAP LEGEND**
The small triangles represent current (red) and former (blue) transects:
1. Catalina – Tortolita Mountains
 2. Santa Rita – Santa Cruz River – Tumacacori Mountains
 3. Las Ciénegas watershed corridor
 4. Huachuca – Whetstone Mountains
 5. Whetstone – San Pedro River – Dagoon Mountains
 6. San Bernardino corridor
 7. Chiricahua – Dos Cabezas – Pinaleno Mountains

Where black bear and jaguar meet

In the 70,000-square-mile swath encompassing southeastern Arizona, the bootheel of New Mexico, and northern Mexico, there exists a unique topography — forested mountain “islands” surrounded by desert and grassland “seas” — which provides critical linkages and one-of-a-kind habitats for temperate and tropical species alike. A world-class biodiversity hotspot, these Sky Islands harbor well over half the bird species of North America, over 4,000 species of plants, and 120 species of mammals, including 29 bat species.

Within this region, preserving, restoring, and bolstering connected ecosystems has ever greater urgency.



Beginnings *by Roseann Hanson, Executive Director 2000–2002*

In 1996, I attended an informal wildlife tracking workshop with Sue Morse and Harley Shaw, in conjunction with the Huachuca Track Count. We found bear tracks in the San Pedro River, heading up a muddy side wash, and it was very exciting for us all. It was such a beautiful set of perfect tracks, and validation that bears were using the San Pedro for moving between mountain ranges. At the time, Jonathan and I had just moved to Brown Canyon on the Buenos Aires National Wildlife Refuge, as the first caretakers there, and had met David and Christine Koblenz, who were getting involved with wildlife tracking as a conservation tool with Paul Beier. They invited us to the track count.

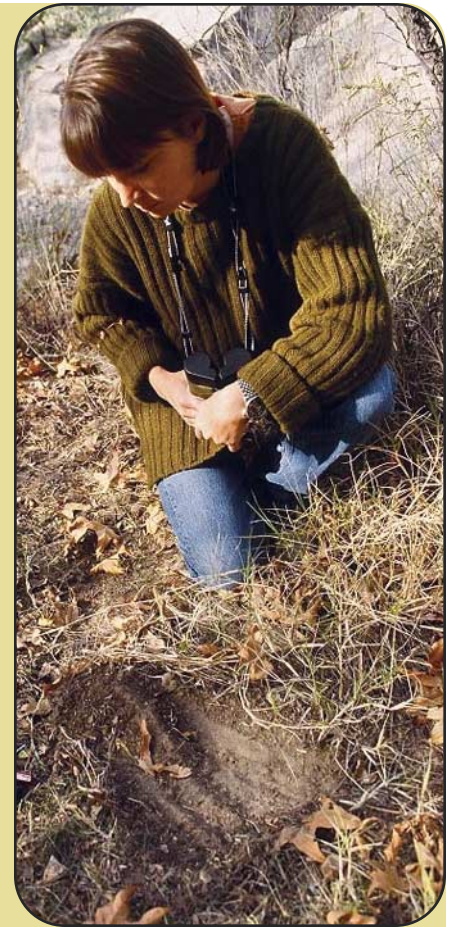
We learned tracking over the next few years from David and Christine, and from Sue and Harley as we attended more track counts. Our skills grew in Brown Canyon, where our home was at the center of a female lion's range. We tracked her (and saw her) regularly; one evening after we took a photo of a very active scrape area (with multiple cats scraping and depositing both urine and scat), we heard her screaming in the hills above us as we walked the road—it was a mating call. The next morning we saw her with a male. **After that we were hooked for life on tracking.**

Fast-forward to 2000: I was hired as the first executive director of Sky Island Alliance. We had just two staff, myself and the field coordinator (Matt Skroch). The tracking program was in its infancy, without a dedicated coordinator, and without funding. Because of our involvement with the Sky Islands Wildlands Network, and the need for field verification of wildlife linkages, we decided to ramp up the tracking program. Janice Przybyl had been one of our first and most dedicated volunteers, spending many hours helping in the office, and looking for an opportunity for her masters thesis. We hired Janice as the first Wildlife Monitoring Program coordinator, secured a grant to get it started, and worked with Sue and Paul to develop scientific protocol.

At that time there was still almost no support in any agency for the concept of wildlife movement corridors. I remember a meeting with the Arizona Department of Transportation (ADOT) in which the liaison was openly hostile and ridiculed our concept to verify—and subsequently protect—wildlife corridors. Today, after much work by Janice, hundreds of volunteers, and SIA's policy staff, agencies not only accept the concept, it's now part of their land-use planning and they actively partner with SIA.

Turning field verification, with volunteer “citizen science” data, into land-use policy and permanent land conservation is one of the most significant successes SIA can claim. Corridors identified by SIA were incorporated into the Sonoran Desert Conservation Plan (SDCP) and the Santa Cruz County Comprehensive Plan, to name a few. The Cienega Corridor is something we determined at SIA very early on as an important area, despite it being identified as a “developable” region of “mostly creosote flats and hills” and largely ignored or written off by mainstream conservation groups (at the time). SIA's tracking program helped move it to the top of the list in the SDCP and as an important focal point for ADOT's conservation program.

This legacy will always be one of the things I'm most proud to have been a part of, with SIA.



From top: Roseann Hanson observes a mountain lion scrape in Brown Canyon, 1997. A perfect set of bear tracks, 1996. Courtesy Roseann Hanson.



This page and next: From 2001 to 2011, Sky Island Alliance has held 17 workshops (photos numbered by workshop) and trained 233 citizen scientists.

Tracks that tell a story

FIELD NOTES: NOVEMBER 23, 2009

"An old friend, the tracks of a solitary male coati, found us. Although most were double registered, several individual prints had the characteristic little knob on the back of the front paw. We are certain it's the regular visitor because the prints are always the same size and because we find them in the same place

year after year—as if he prefers this path to get from wherever to wherever, to opportunistically find his harem in the late-winter breeding season, to avoid them and his frolicsome progeny the rest of the year, and to deliberately give us the thrill of discovery."

— Eugene Isaacs,
North Davidson
Canyon transect
volunteer 2005-2010



The key to the success of the tracking program lies with the volunteers

by Janice Przybyl, Wildlife Linkages Program Coordinator 2001–2009

In the late 1990s Sky Island Alliance initiated a wildlife tracking program that would monitor the region's far-ranging predators. Andy Holdsworth, SIA's then director of field programs, engaged the help of Sue Morse and Keeping Track, Inc., to run a tracking workshop in the Blue Range for a small group of volunteers, staff and board members. With the help of wildlife biologists such as Harley Shaw, two projects emerged to test whether such monitoring was possible: the Fort Huachuca Annual Mountain Lion Track Count and a program on the Appleton-Whittell Research Ranch near Sonoita, Arizona.

Through the years, the emergence of new technologies, such as the availability of cheaper and better digital cameras, has helped make documentation easier and more precise. But all the fancy gadgetry does not substitute for what we learned early on: that the key to the success of the tracking program lies with the volunteers. Their enthusiasm for on-the-ground conservation work and our confidence in their abilities as "citizen-scientists" is what will sustain the Wildlife Linkages Program through the next decades.

Yes, I am proud to have been part of something so grand.



Above: Gene and Bernice Isaacs and their granddaughter discover bear tracks!



Wildlife Tracking Training: Creating a network of citizen scientists

The importance of citizen involvement and its connection to conservation action directly contributes to the program's success. Sky Island Alliance developed a protocol for a wildlife monitoring program, requiring volunteers to participate in a five-day wildlife tracking workshop and make a year-long commitment. Each workshop is held in the field to provide an outdoor classroom experience and foster a greater connection to the region and between volunteers.

Participants in the Wildlife Tracking workshops complete approximately fifty hours of hands-on field instruction and theory in a variety of skills and techniques, including track and sign identification in the field, natural history and conservation of regional Sky Island mammal species; track morphology, structure and terminology; the use of global positioning systems (GPS); remote camera monitoring; photo documentation; track casting and tracing techniques; and animal gaits and movement. In 2010 Sky Island Alliance began offering refresher training for volunteers several times a year, through weekend tracking expeditions and mini-workshops on topics ranging from scat (feces) identification to field photography.



"Every trip down South Davidson Canyon is a learning experience. Sometimes the learning comes too late to be of use on that track but knowledge gained can always be applied later. And there will always be a later." — *Kathy Cooper, South Davidson Canyon volunteer 2004–present*



Species Documented by Track Counts: All Study Sites, 2001-2011

Focal species indicated in **bold** text

Common Name	Scientific Name
Badger*	<i>Taxidea taxus</i>
Bighorn sheep	<i>Ovis canadensis</i>
Black bear †‡	<i>Ursus americanus</i>
Bobcat *†‡	<i>Lynx rufus</i>
Coyote*†‡	<i>Canis latrans</i>
Desert cottontail*†‡	<i>Sylvilagus audubonii</i>
Domestic cat†	<i>Felis catus</i>
Domestic cow*†‡	<i>Bos taurus</i>
Domestic dog*†‡	<i>Canis familiaris</i>
Domestic horse†‡	<i>Equus caballus</i>
Gambel's quail	<i>Callipepla gambelii</i>
Gila monster	<i>Heloderma suspectum</i>
Golden eagle	<i>Aquila chrysaetos</i>
Gray fox*†‡	<i>Urocyon cinereoargenteus</i>
Great blue heron	<i>Ardea herodias</i>
Hooded skunk†‡	<i>Mephitis mephitis</i>
Human*†‡	<i>Homo sapiens</i>
Jackrabbit*†‡	<i>Lepus</i> sp.
Jaguar	<i>Panthera onca</i>
Javelina*†‡	<i>Pecari tajacu</i>
Kangaroo rat	<i>Dipodomys</i> sp.
Montezuma quail	<i>Cyrtonyx montezumae</i>
Mountain lion *†‡	<i>Puma concolor</i>
Mourning dove	<i>Zenaidura macroura</i>
Mule deer*†‡	<i>Odocoileus hemionus</i>
Ocelot	<i>Leopardus pardalis</i>
Opossum	<i>Didelphis virginiana</i>
Ornate box turtle	<i>Terrapene ornata</i>
Pronghorn antelope	<i>Antilocapra americana</i>
Raccoon*†‡	<i>Procyon lotor</i>
Rattlesnake†‡	<i>Crotalus</i> sp.
Ringtail†‡	<i>Bassariscus astutus</i>
Roadrunner†	<i>Geococcyx californianus</i>
Sonoran desert tortoise†	<i>Gopherus agassizii</i>
Striped skunk*†‡	<i>Mephitis mephitis</i>
Western hognose skunk‡	<i>Conepatus mesoleucus</i>
Western spotted skunk‡	<i>Spilogale gracilis</i>
White-nosed coati *†‡	<i>Nasua narica</i>
White-tailed deer	<i>Odocoileus virginianus</i>
Wild turkey	<i>Meleagris gallopavo</i>

(*Las Chivas Wash; †North Davidson Canyon; ‡South Davidson Canyon)

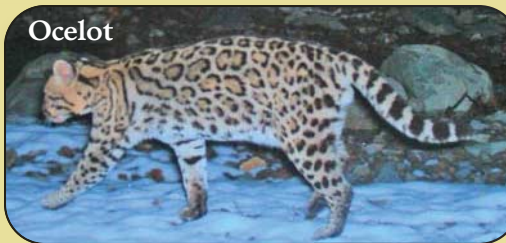
Jaguar



Bobcat



Ocelot



Mountain lion



White-nosed coati



Black bear



Ornate box turtle



Mexican gray wolf



Focal Species

Sky Island Alliance's Wildlife Linkages Program intentionally includes both habitat generalists and specialists as focal species in order to collect data that will result in a robust wildlife linkage design. In order to restore and maintain the role that top predators play in maintaining ecological resiliency of an ecosystem, we are pro-active on issues relating to the conservation of top predator populations in the Sky Island region, both in the U.S. and Mexico. Additionally, the study and protection of large carnivore habitat benefit smaller, less charismatic species.



Case Study 1: North a

The Cienega Creek Linkage, which connects the Rincon Mountains to the Empire, Whetstone, and Santa Rita Mountains, has been identified by Sky Island Alliance as a high-priority wildlife linkage (see map on page 4, area 3). Davidson Canyon, an ephemeral stream that runs south to north, provides wildlife habitat and water recharge in the Cienega-Rincon watershed. Its relationship to the perennial Cienega Creek and endangered species such as the leopard frog and gila topminnow has led to concern over proposed mining projects in the Santa Rita mountains.

Tracks that tell a story

The canyon is usually rich with sign but in 2009–2010 our team had lots of uneventful Sunday walks. The several seeps dried up and we rarely saw even ungulate tracks. However, there was never a lack of tracks from cows, horses, domestic dogs or off-road vehicles. Then, suddenly last fall, after a rain, wildlife returned to the canyon. On one Sunday we followed a bear almost the entire length of the transect. The substrate had a thin dry layer on top and the damp sand underneath was revealed in our footprints. The bear tracks were also still wet so we knew it was only a few minutes ahead of us. We were torn between wanting to catch up and not wanting to catch up. Discretion being the better part of valor, we chose the latter.

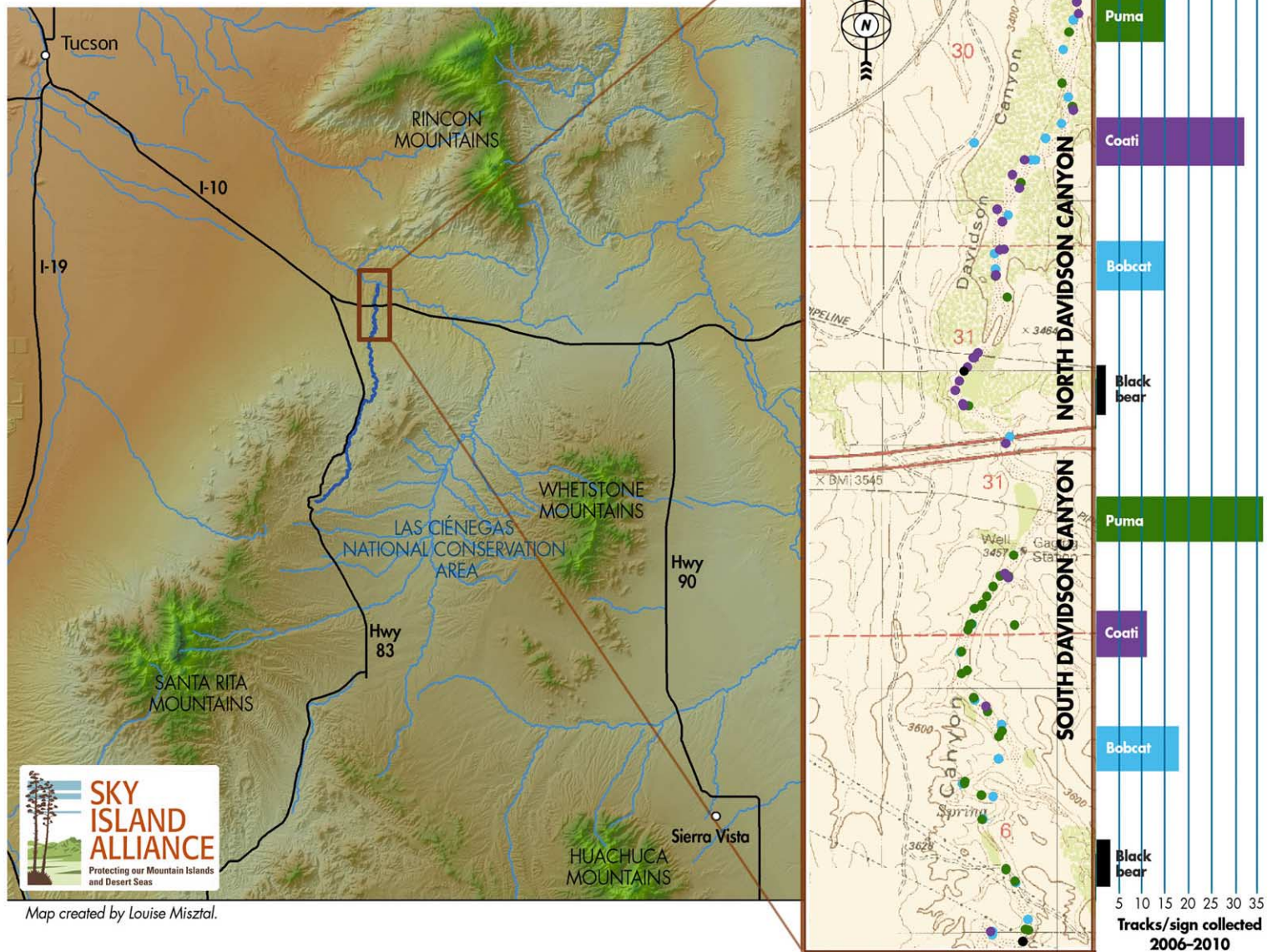
As every tracker knows, tracks tell a story and it is easy to run with a wild fictional tale. Axel Muñoz, Mary Ann Marazzi and I picked up lion tracks near the north end of the transect. The lion, moving south, seemed to travel on the floor for a while then leave the canyon on one side or the other and return a few hundred yards later. Intermittently we documented tracks of a different lion traveling in the same direction. Eventually we were following two sets of lion tracks, traveling together. Axel began spinning a tale of lovers meeting by chance, separating and going each their own way only to be drawn together again and again until they surrendered to the powerful attraction that bound them. We had fun with our lion romance and attempted to get photos of the two sets of tracks side by side. We can see them in the images because we know they are there but I doubt anyone else can.

— Kathy Cooper, South Davidson Canyon transect volunteer 2004–present



This page from top: Davidson Creek, bobcat track found in South Davidson Canyon.

North and South Davidson Canyon Transects



Above: The North and South Davidson Canyon transects in the Cienega Creek Linkage have been monitored since 2002 and 2006, respectively. The high and expansive bridge that spans the canyon at Interstate-10 enhances the importance of Davidson Canyon as a wildlife corridor, which is one of the few drainages in the Cienega Corridor that facilitates safe passage of wildlife under the Interstate. Volunteers document the presence of wildlife tracks as well as changes to the landscape from cattle grazing and all-terrain vehicle use.

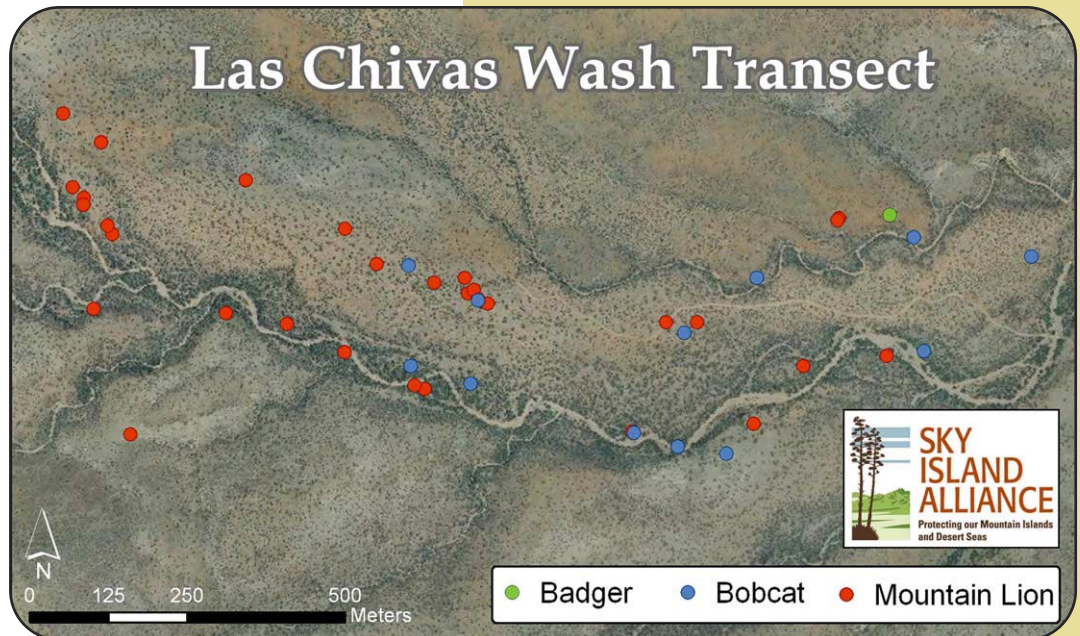
Case Study 2: Las Chivas Wash Transect

Sky Island Alliance's work in the Cienega Creek Corridor began when we were contacted by the Sonoran Institute to conduct a four-month rapid assessment on ten transects located throughout the area. Our data was included in Sonoran Institute's 18-month assessment of the "Missing Link" — now referred to as the Cienega Corridor — and presented to the Bureau of Land Management in 2002. Pima County's Sonoran Desert Conservation Plan also recognized the ecological importance of this area and designated the linkage as a Critical Landscape Connection in 2004.

Actively monitored since April 2002, this ephemeral drainage runs west to east — from the eastern foothills of Diablo Mountain, under Interstate 19, to the Santa Cruz River — providing an excellent wildlife corridor for species moving between the Santa Rita Mountains and the Tumacacori Highlands. To the south, the Tumacacori Highlands are connected to the Cibola Mountain complex in Sonora, Mexico, making this a small piece of a larger wildlife corridor.

Two volunteer trackers have remained actively involved in monitoring this transect for the last nine years. Three of the eight focal species have been recorded on this transect, and the tracks of white-nosed coati were documented for the first time in this location in February 2011.

"I became involved with the [Wildlife Linkages] program because of my love of hiking and being out in the desert, but after many hikes and wanderings I decided I needed more and if I could do some good for all that I love... then so much the better. Meeting like-minded people was an extra added perk!" — Dyna Chin, Las Chivas Wash volunteer 2002–present



Above: Track detection of bobcat, mountain lion and badger on Las Chivas Wash, 2002–2010. Map by Kenneth Morris © Sky Island Alliance.

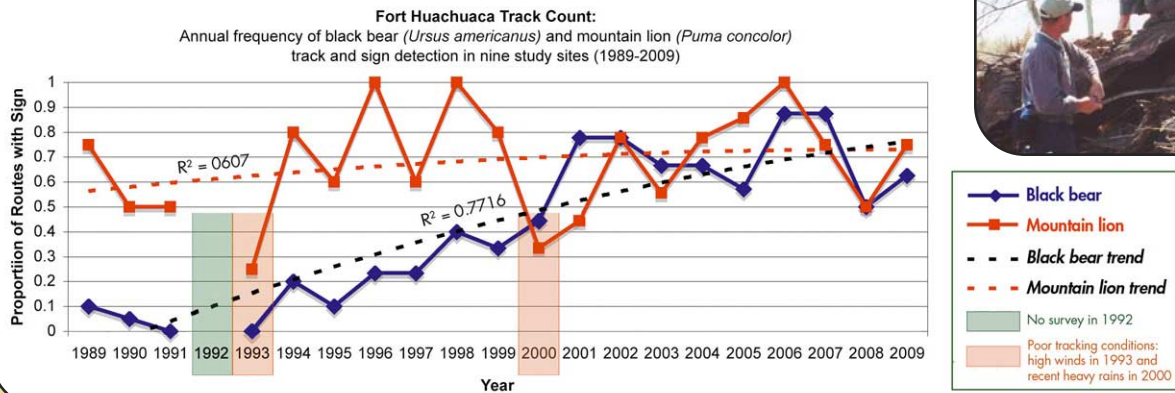


Tracks that tell a story

Bobcat and mountain lion track measurements recorded in Las Chivas Wash over nine years were each averaged and the extremes fall well within the averages established for these species in

North America. These measurements can be used to provide evidence of recruitment — in December 2003, the Las Chivas Wash volunteer trackers noted the presence of a female mountain lion with a single cub: "The female's track measured length 7.0 cm, width 7.0 cm, with a plantar pad width of 4.8 cm. The cub's track length was 5.0 cm, width 4.9 cm, plantar pad width 2.2 cm [...] excellent findings of a resident family."

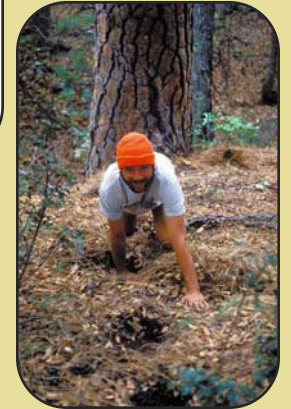
Case Study 3: Fort Huachuca Track Count



Above: This data influenced the Army to reduce vehicle traffic near Split Rock Canyon Spring, where kitten sign and the use of a mountain lion “babysitter tree” was documented from year to year.



Above: Sue Morse and tracking volunteers investigate a lion scrape, 2001.



Above: Following the bear path. © Susan C. Morse.

Beyond our wildest imaginings

by Susan Morse, Founder and Director of Keeping Track, Inc.

Though it was over 20 years ago, I vividly remember our first field outing at Fort Huachuca. It was the first of 20 years of volunteer monitoring. I can still recall the early morning light in Split Rock Canyon. I can hear scrub jays and canyon wrens, and I remember the exact moment we all found our first cougar track in the dust. We were endeavoring to document tracks and sign of cougar, black bear and other species of research interest, including coati and bobcat. Army personnel joined us that first year and there was palpable excitement that these enlisted soldiers would valuably contribute to the logistics of checking various transects and searching for evidence of such interesting yet elusive wild mammals. As the years passed, the purpose and impact of the Fort Huachuca Track Count grew beyond Sheridan’s, Harley’s and my wildest imaginings! Citizen volunteers joined us each year. Some enduring volunteers came every year: Phoenix Zoo staff members, Nancy “Z” and other local environmental leaders, biologists, ranchers, educators, naturalists, houndsmen, students from as far away as Germany and Florida — all joined for the common purpose of finding cougar sign and sharing and learning. For my part, as the track count’s unofficial teacher of tracking, our annual gathering was a marvelous and ongoing testimony to the dedication that a number of very different folks can feel for cougars, all wildlife and the extraordinary biodiversity of the Sky Island region.

Bravo to Sky Island Alliance for not only stepping in when you did and providing organizational leadership for running the track count, but thanks too for the great service in collecting the data and now compiling this report. One fourth of all the world’s mammal species, one in ten of all the bird species and countless other species including amphibians, bees and bats, are in grave danger — these realities should motivate us now more than ever. The involvement and empowerment of people are the only ways we can hope to reverse this trend.

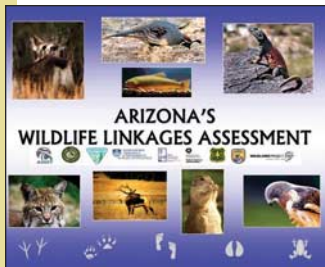
“The more people understand Fort Huachuca’s landscape, the more they want to help conserve it. These are people who might not normally cross paths or sit down at the table on the fort to discuss conservation, but during the track count they all gather in camp to discuss a common interest.” — Sheridan Stone, Fort Huachuca Wildlife Biologist, from “Fort Huachuca Surveys Big Cats” in *Army Environmental News, Volume 15, Number 4, Fall 2003*.

Advocacy: Bridging Science and Conservation Action

The ultimate goal of Sky Island Alliance's Wildlife Linkages Program is to achieve an interconnected landscape where wildlife, based on their ecological needs, can move easily between Sky Island mountain ranges. Advocacy — our active support of this vision — is how we get there. Engaging a community of volunteers, getting out on the ground and collecting data are only the beginning of a larger effort: using new information to inform policy, start a collaborative conversation, and build a groundswell of local, knowledgeable people who share a desire to protect the region, its wildlife, and its habitats. This has led Sky Island Alliance to become recognized and trusted as the region's leader in conservation planning through truly collaborative processes. We create strong relationships with key leaders, agencies, organizations and communities, to join forces on crucial wildlife linkage projects and issues. In the last ten years, the Wildlife Linkages Program has achieved tremendous success, including:

Linkage Priority Setting

Sky Island Alliance successfully incorporated wildlife data and corridor priorities into the 2004 Pima County Sonoran Desert Conservation Plan — including the designation of the Las Cienegas Corridor as a Critical Landscape Connection — after



presenting a comprehensive wildlife monitoring report on this “Missing Link” to the Sonoran Institute and Bureau of Land Management in 2002. Specific wildlife corridor priorities were written into the 2005 Santa Cruz County Comprehensive Plan. We were invited to join the Arizona Wildlife Linkages

Workgroup and completed the *Arizona Wildlife Linkages Assessment* in 2006. **With partnering state agencies and organizations, we focused this broadly crafted planning tool to a finer scale with site-specific recommendations at the county level — the recently finalized Pima County Wildlife Connectivity Assessment — which has now become a model for wildlife habitat connectivity efforts in New Mexico.** In addition, Sky Island Alliance's Wildlife Linkages Program is currently partnering as a lead coordinator for Cochise County linkage planning.

Permanent Land Conservation

In addition to the protection of lands through the Sonoran Desert Conservation Plan and other initiatives, we also seek to protect critical blocks of core habitat that make up a functional wildlife linkage network. In the United States, the highest level of land protection a wildland block can acquire is the designation of Wilderness. Wildlife linkages between the Sky Island mountain ranges strengthen the value of Wilderness, for without secure wildlife linkages, the ecological health of a designated wilderness is compromised, just as a wildlife linkage becomes moot without the protected wildland blocks it connects. **Wildlife monitoring data and volunteer advocacy have been instrumental in documenting Wilderness-quality lands and providing momentum to our efforts in introducing legislation to permanently protect the Tumacacori Highlands and the Land of Legends (Chiricahua, Dragoon and Whetstone Mountains) as designated Wilderness.**

Large Predator Protection

Carnivores are critically important to balanced, functioning ecosystems, yet their need for large home ranges and long-range dispersal distances, their low population densities and slow reproduction, and an outdated human view that predators are dangerous and disposable, make them vulnerable to the impacts of human growth and increased urbanization. **We have worked to protect healthy and thriving populations of predators and their prey, and to safeguard their success through protected core and open movement corridors between them.** Each year, we have given public presentations on the value of wild cats and other predators on the landscape, to groups of 20 to 200 or more. We actively opposed new, unscientific state wildlife management decisions regarding bag-limits and method of take for carnivores and their prey. We have collected a decade of wildlife presence and movement data for mountain lion, bobcat, ocelot, jaguar, Mexican gray wolf and black bear, and promoted forward thinking conservation strategies. Using remote cameras, we provided the first photograph of a live ocelot in Arizona, confirming the presence of the Sonoran subspecies in the U.S., and requiring the U.S. Fish and Wildlife Service to include this new data and habitat in their ocelot Recovery Planning.

Building New Bridges

One of the most impressive successes out of the decade of wildlife linkage work at Sky Island Alliance is the shift in perception about wildlife corridors and landscape level planning by partnering agencies and stakeholders. Wildlife linkages, corridors, connectivity, landscape permeability... these are all terms that are now common and familiar at the table and appear in regional strategic long-range plans. Where we once had to explain these concepts and argue their effects on ecological health, road safety, sustainable growth and quality of life, now collaborative workgroups have sprung up all over the region on this very issue, bridging the gap between state and county agency personnel, academics, conservationists, transportation planners, engineers, biologists, land owners and local community members. Only four years after we began in 2001, we were working alongside the Arizona Department of Transportation (ADOT) to conduct a wildlife monitoring project in Cochise County — *Using remote sensing cameras and track surveys to assess wildlife movement through a probable wildlife linkage bisected by two major highways: An ongoing collaborative project between Sky Island Alliance and Arizona Department of Transportation* — which we jointly presented at the 2005 International Conference on Ecology and Transportation.

We serve on the Pima County Regional Transportation Authority (RTA) Wildlife Connectivity Workgroup, helping to direct dedicated funds for transportation-related critical wildlife linkages as part of the environmental and economic vitality element of the RTA plan, supported by the data and recommendations we contributed to the Arizona Wildlife Linkages Assessment. Three wildlife crossing structures, including the second wildlife overpass to be constructed in Arizona (see rendering, above), have been approved for funding as part of a needed expansion of State Route 77 / Oracle Road in Oro Valley. Sky Island Alliance continued to watchdog the process, assuring funding agreements met deadlines and the project was fully approved through the design phase. Working with residents, we encouraged local volunteers in Sun City and Rancho Vistoso to monitor wildlife in the backyards and in the footprint the proposed wildlife crossings, providing baseline monitoring pre-construction; documenting black bear tracks in golf course sand traps, photographing badgers and bobcat kittens (see photo, above) on remote cameras, and effectively engaging neighbors in the process.



Above: Remote cameras are valuable in documenting wildlife movement before, during and after construction of the wildlife crossings. *Rendering courtesy Sonoran Desert Protection Coalition for Sonoran Desert Protection, photo courtesy Sun City/Rancho Vistoso Wildlife Camera Project.*

In December 2011, ten years after tracking volunteers first put feet to the ground, a new project proposed by the Tohono O'odham Nation and supported by data from the Arizona Wildlife Linkages Assessment gained final approval for RTA funding on State Route 86 near Kitt Peak. This project will also include two wildlife underpasses and a vegetated wildlife overpass, and is the first indication that the SR77 wildlife crossing project, scheduled to break ground in 2013, is serving as a model for other, similar projects in Pima County, and hopefully for the rest of the region. As population and transportation needs increase, these critical wildlife connections will become more and more necessary.

Ecosystem Defense

Our wildlife monitoring data and efforts have been integral to providing strong, accurate responses to emerging issues. Our detailed recommendations on scoping comments for proposed Arizona Department of Transportation and Federal Highway Administration projects have led to many recommendations being implemented where wildlife movement could be facilitated by culvert improvements and other wildlife-friendly practices. In addition, we have remained actively informed and engaged on transportation infrastructure, mining and new energy development projects, working to oppose the proposed Rosemont and Patagonia mines that would devastate a key wildlife block and adversely affect its associated wildlife linkages, inform decision making for the proposed SunZia transmission line routes, and mitigate and increase knowledge on the impacts to wildlife and habitats from border infrastructure and border-related activities.

A Hero Among Us: Janay Brun



in-teg-ri-ty (n): adherence to moral and ethical principles; soundness of moral character; honesty.

cour-age (n): the power or quality of dealing with or facing danger, fear, or pain; the confidence to act in accordance with one's beliefs.

Sky Island Alliance recognizes an inspirational volunteer, advocate and friend, who risked it all — and lost much — to shine light on the truth. Janay Brun attended our Wildlife Tracking Workshop in the spring of 2002, and for the next eight years volunteered with the Las Chivas Wash transect team in the Tumacacori—Santa Rita

Mountain corridor and also as an SIA guest tracking instructor. It didn't take long for Janay's passion and self-taught expertise to lead her to a volunteer Research Technician position with a local jaguar monitoring project.

Janay's decision to voice the truth about the circumstances resulting in the death of the jaguar Macho B was one of integrity as well as courage. She took a difficult path to uphold scientific responsibility. We salute a hero among us, and dedicate ourselves to insuring the same honorable spirit will always follow the mountain ridges and rugged side-canyons where jaguar still roam free.



A Bright Future for Wildlife

Even at age thirteen, Meagan Bethel had already made headway as a biologist in her own right. She approached us in 2009 after attending our Introduction to Wildlife Tracking workshop, interested in volunteering on our work on wild cats for her science fair project, and quickly began winning science awards throughout Arizona with her study titled *Caught On Camera: A Longitudinal Study and Regional Comparison of Wild Cats in Southern Arizona and Northern Mexico*. Her impressive project continued to the national level as one of 30 finalists in the 2011 MASTERS (Math, Applied Science, Technology and Engineering for Rising Stars), and received a Certificate of Special Congressional Recognition presented by U.S. Rep. Gabrielle Gifford's office (see photo, above). Her interest and support for wildlife conservation expand beyond her own backyard — after the Gulf of Mexico oil spill in 2010, Meagan started a program called Coins for the Coast to collect money for the rehabilitation of birds, marine animals and other wildlife affected by the spill. She distributed the \$4,000 she raised between the Audubon Society, World Wildlife Federation, Tri-state Rescue & Research and Sky Island Alliance. She has also raised money to buy soft pet food for animals with teeth problems at the Humane Society of Southern Arizona.

Now in high school, Meagan is working with us as a student intern, analyzing wildlife response to fire using our wildlife monitoring data. Meagan continues to help bridge the gap between knowledge and advocacy. We are very proud to know Meagan for her big heart and scientific mind, and look forward to the bright future lying in store for her.

The Next Ten Years

by Jessica Lamberton, Wildlife Linkages Program Coordinator, 2010–present

My first official day as Sky Island Alliance's Wildlife Linkages Program Coordinator launched the beginning of a great journey. That was the day we discovered "Cochise" — the first ocelot documented in Arizona in over three decades — and I knew I was part of an adventure and an organization that would come to define who I am. I had a sudden awareness of the potential that the Sky Islands held, with all its myriad inhabitants, quiet canyons, and patient secrets. I see that same potential in a program, ten years in the making, that brings positive change for this region.

There is much more to connecting landscapes than the science of memorizing shapes and patterns of mountain lion or coati tracks. Tracking is about learning to use all your senses, it is about knowing the animal, and it is about becoming a part of the landscape. Tracking is a connection between people and the natural world, and it is a connection between awareness and action. Towards that end, I see the potential for this program to:

Increase our volunteer force by twenty to thirty new trackers each year, highlight experienced trackers as mentors and Sky Island Stewards, and offer regular opportunities for volunteers to share their knowledge and experiences with each other.

Attract international tracking experts to the Sky Islands, give our volunteers recognition for their skill and further validate the accuracy of Sky Island Alliance's tracking data by providing wildlife tracking certification to volunteers through an accredited evaluation process.

Stay on the forefront of identifying areas of conflict for wildlife movement with an interactive online database, where people using iPhone applications or the internet can contribute wildlife observations and view maps and spatial modeling of tracking data, remote camera photos, wildlife sightings and road kill records.

Map wildlife linkages throughout the entire Sky Island region, incorporating current GIS modeling techniques, stakeholder input and local scientific knowledge into a cross-jurisdiction, eco-regional resource that extends from the Sierra Madre to the Colorado Plateau.

Become a leading expert in regional wildlife monitoring and expand how and where we collect information, by placing remote

cameras on every tracking transect, expanding our study sites into new areas within every key linkage and mountain range in the region, and varying our study designs to achieve both long-term monitoring as well as project-specific, short-term goals.

Facilitate a future where wildlife overpasses, state-of-the-art wildlife crossings and protected corridors lace urban and rural development, and are commonly integrated with the goals of landscape architecture, transportation planning and economic growth.

Pass legislation for the protection of core wildland blocks as Wilderness; successfully advocate for an ecologically secure border region; and facilitate a change in how carnivores are valued and managed in both the U.S. and in Mexico.

For the next 10 years we will continue to protect corridors that allow for the necessary movement of species. I need only to look up into the mountains lit by evening light, or walk in a shaded canyon where the tracks of a ringtail or bobcat lead me, and I become rededicated to our vision. Barriers, physical, economic or political, come and go, but our dedication and our passion for this region will endure. There is no limit to the landscapes we can connect and the bridges we can build.

I sincerely thank each and every one of you for all we have accomplished, and all we will achieve, together, for our region's wildlife.

Happy tracking,



Courtesy Lorrie Prothero.

Acknowledgements

The Wildlife Linkages Program continues to grow and succeed, largely due to our dedicated grassroots base, our landscape-level planning, and our ability to forge partnerships with diverse stakeholders. This success has proven that we can turn a citizen effort into conservation action, applying science and direct engagement. Our program continues to see increased use of improved technological tools, from specialized tracking rulers and interactive listservs to online volunteer feedback and data upload capabilities, improved handheld GPS units and iPhone applications... but nothing can replace the volunteers themselves. Without our citizen scientist volunteers, building a land ethic, gathering data, and advocating for wildlife linkage protection would not be possible.

Sky Island Alliance's Wildlife Linkages Program would not be possible without the dedication of our citizen scientists, who participated in our training workshops and went on to monitor transects in key wildlife corridors every six weeks. Between 2001 and 2011 Sky Island Alliance has held 17 workshops, trained 233 citizen scientists, and has 81 active volunteers on the ground, walking their transects. Half a dozen volunteers trained in 2001 and 2002 remain active volunteer trackers for Sky Island Alliance today and have consistently and persistently surveyed tracking transects over these years.

We would also like to thank our tracking instructors: Susan Morse (KeepingTrack.org), Jack Childs, Harley Shaw, Christine Hass, Cynthia Wolf (WildByNatureTours.com), Jonathan and Roseann Hansen (ConserVentures.org), Aletris Neils, Lisa Haynes (UAWildCatResearch.org), Sheridan Stone, Steve Bless, and Janay Brun. Alex Smith dedicated many fruitful hours assisting with data management and research. Sergio Avila, Louise Misztal, Sky Jacobs, Cory Jones, Jefferson Carter, Christine St. Onge, Melissa Lamberton and Jill Kelleman assisted with data synthesis and editing. Our data collection protocol is based on the Keeping Track® project and data management protocol, with modifications to accommodate the Sky Island region and Sky Island Alliance's requirements. We appreciate Susan Morse for her assistance in the establishment of our monitoring and training protocol, and Janice Przybyl and Roseann Hansen who were instrumental in the long-term development of the Wildlife Linkages Program. We would also like to thank our funders: anonymous donors, The Kresge Foundation, MET Foundation, Nina Mason Pulliam Charitable Trust, Summerlee Foundation, and TransWild Alliance.

Wildlife Linkages Program Volunteers, 2001-2011

Names in **bold** are tracking volunteers active in 2011; volunteers who later returned as tracking instructors are indicated with an (*).

Spring 2001

Nick Bleser
Carolyn Gorman
Jeanmaire Haney
Mike Huckaby
Mike Iorio
Cory Jones
Doug Newton
Steve Pavlik
Judy Reed
Nancy Seever
Alyssa Shiel
Birdie Stabel
Patty Stern
Mary Vint-Moore
Cathy Waterman
Barbara Wellman
Bill Wellman

Spring 2002

Lori Andersen
Gita Bodner
Janay Brun *
Dyna Chin
Neva Connolly
Dave Eerkes
Joan Eerkes
Wade Goyetche
Jennifer Katcher
Ken Langton
Lainie Levick
Robert Mann
Aletris Neils*
Penny Pederson
Randy Smith
Miranda Thornton
Natasha Winnik

Fall 2002

Joan Calcagno
Marybeth Dawson
Roy Dawson
Mike Headrick
Carl Herzog
Susan Hess
Ron Hummel
Renee Janaway
Jane Kroesen
Bill Kurtz
Ellie Kurtz
Judith Soward
Carol Powell
Renell Stewart
Ron Stewart
Christina Tonelli

Spring 2003

Laurel Clarke
Lisa Collis
Serena Coons
Dana Hook
Keith Hughes
Albert Lannon
Beth Long
Kaitlin Meadows
John Rawlins
Iris E. Rodden
Leslie Sellgren
Michael Terrio
Sara Venturini
Jennifer Wolfson

Fall 2003

George Carlisle
Jo Ann Caruthers
Josh Ferris
Carol Fugagli

Mike Fugagli
Tom Gibbons
April Green
Richard Griffiths
Matilde Holzwarth
Billie Hughes
Jean Ossorio
Peter Ossorio
Donna Stevens
Cynthia Wolf *

Spring 2004

Kristen Abner
Howard "Chip" Arnberg
Betty Bengtson
Peter Bengtson
Mick Chvala
Ralph Copp
Dennis Hardy
Jeanne Horsmann
Jean Paul Jorquera
Norma Miller
John Pachuta
Linda Pachuta
Bill Phinney
Deni Phinney
Leslie Schupp

Fall 2004

Caroline Fraser
Daniela Holmes
Rob Horsmann
Andrea Marafino
Rinda Metz
Jill Meyerhofer
Vince Pinto
Andrew Rademacher

**We sincerely thank each and every one
of our volunteers for all we have
accomplished, and all we will achieve.**

David Ruben
Natalie Shapiro

Spring 2005

Isabel Amorous
Brad Cooper
Virginia Dean
Don DeMeritt
Joanna Fitzjarrald
Gabby Hebert
Bernice Isaacs
Eugene Isaacs
Regina Mueller
Georgy Naimoli
Linda Pejchar
Sandy Zetlan

Fall 2005

Sarah Forrester
Kate Fournier
Linda Jakse
Gayle Jandrey
Barbara Miller
Beth Morgan
Axhel Muñoz
Pat Phelan
Mike Quigley (SIA
staff)
Shawn Sargent
Keith Shallcross
Nick Van Kleeck

Fall 2006

Tina Baker
Margaret Beaty
Michelle Caprari
Liliana Debarbieri
Kim Etherington
Debbie Friesen
Ryan Isaac
Steve Johnston
Carlene Jones

Glenda Laird
Guillermo Ley
Jennifer Oliver
Dieter Schaefer
Marjanne Schnarr
Brendan Thomas

Fall 2007

Richard Callahan
Paul Condon
Kathy Cooper
Dagmar Cushing
Dana Deeds
April Dennard
Conor Flynn
Carol Keck
Darin Kelly
Cynthia
Prendergast
Stephen
Prendergast
Sande Rego-Ross
Kelly Robertson
Graciela Robinson
Kristina Stramler

Fall 2008

Humberto Arriola
Frank Baker
Wynne Brown
David Bygott
Kerry Caruthers
Marcia Devere
Jennifer Feltner
Warren Forrey
Roberto Fuentes
Jeannette Hanby
Brent Kober
Karen Lowery
Susan Mast
Ron Serviss
Sarah Williams

Fall 2009

Celia Adams
Susan Buchan
Elizabeth
Buchroeder-Webb
Charlotte Cook
Chelsea Jones
Arlene Kellman
Cecilia McNicoll
Kim Rego
Stormy Rose
Stephanie Rozzo
David Stratton
Nely Stratton
Norm Watson

Spring 2010

Junardi Armstrong
Michael Bissontz
Cheri Boucher
Aida Castillo-Flores
Gail Dawkins
Frances Emerick
George Farmer
Ken Fields
Glenn Furnier
Tom Gibbons
Edward Haley
Mike Ingram
Felicia Lowery
Jacques Mauger
Richard Maxwell
Malcolm McGregor
Tom Skinner
Christine St. Onge

Fall 2010

Mike Burman
Shane Clark
Sandy Dumas
Jennifer Dreyer

Phil Hotep
Jack Lasseter
Dave Malutich
Mary Ann Marazzi-
Hassan
James Martinez
Pat Merrill
Laurie Van Vliet

Spring 2011

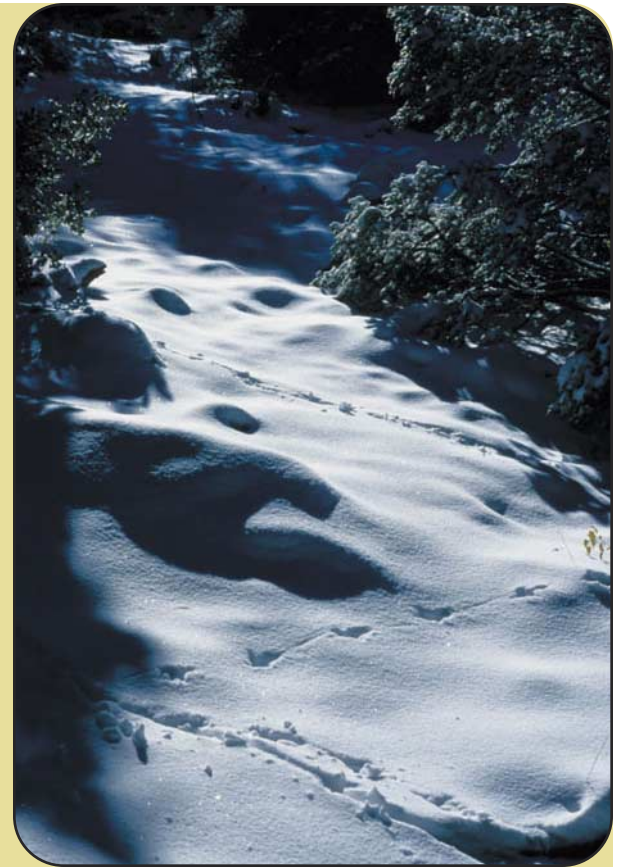
Erandi Bonillas
Kacey Carleton
Tim Cook
Mary Ellen Hanibal
Dick Krueger (SIA
board)
Pat McGowan
Dawn Sellers
Randy Serraglio
Michael Torres
Martin Turner
Carlos Manuel Valdez
Coronel

Fall 2011

Alex Smith
Bill Azevedo
Jim Chumbley
Samantha Hammer

Workshop Volunteers

Kathy Cooper
Richard & Joanne
Griffiths
Ken & Karen
Lamberton
Christine St. Onge



Courtesy Bob Van Deven archive.

Many thanks to our Track Count hosts, Fort Huachuca and the Appleton-Whittell Research Ranch, and to these workshop locations:

Amerind Museum, AZ | Appleton-Whittell Research
Ranch, AZ | Black Range Lodge, NM | Brown Canyon
Center, Buenos Aires National Wildlife Refuge, AZ |
Empire Ranch Headquarters, Las Cienegas National
Conservation Area, AZ | Fort Huachuca, AZ | Gardner
Canyon, AZ | Half Moon Cabin, East Cochise Stronghold,
AZ | Kent Springs Cabin, Madera Canyon, AZ | Lyons
Lodge, NM | McClure Springs, AZ | Rancho El Aribabi,
Sonora, Mexico | Rancho San Bernardino, Sonora, Mexico
| Red Barn at Gila Hot Springs Ranch, NM | San Pedro
House, AZ | Santa Rita Experimental Range, AZ | Shaw
Cabin, East Cochise Stronghold, AZ | The Nature
Conservancy Lichty Center, NM | Triangle L Ranch, AZ

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.



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All photos and maps © Sky Island Alliance unless otherwise indicated.

Front cover:

Courtesy Sky Jacobs (center and bottom right), Paul Condon (top middle), and Roseann Hanson (left center).

This page:

Mexican gray wolf track in the Blue Range. *Courtesy Sky Jacobs.*

