Friends of the Santa Cruz River

The Flow

September 2013 Friends of the Santa Cruz River Newsletter

President's Message:

Living in a Changing EcoSystem

By Scott Vandervoet
FOSCR President

This issue of *The Flow* marks the closing of another summer drought/monsoon season. With the closure of the rains (which appear to have been somewhat more isolated than hoped) the Board of Directors of FOSCR will also be saying good bye to one of our steadfast members. Jeremy Moss will be leaving his position at Tumacacori National Historical Park for new opportunities at Pecos National Historical Park just east of Santa Fe, New Mexico.

Jeremy has been a crucial member of the FOSCR Board of Directors since 2011, but had been collaborating on river-related issues with FOSCR since 2007. His experiences at Tumacacori NHP have helped provide important insight to the behavior of the river in that section, as well as documenting local ecology. One of Jeremy's strongest assets has been his ability to keep in mind larger issues (both in time and space) when discussing the river. He has been an invaluable voice in the discussion on open-range cattle, and has worked tirelessly on promoting the importance of the mesquite-willow-cottonwood complex of riparian vegetation. We wish him the best of luck at Pecos NHP.

Since the introduction of wastewater from the treatment plant in 1972, the riparian forests and woodlands such as cottonwood (left) and willow (right) increased. Will we now be seeing a decrease with less water flow?

Back to the rains—anecdotal evidence suggests that while we have seen some good down-pours this summer, overall there have been a variety of locations within our valley that have not received their normal precipitation for these warmer months. Whether this is a one-off, or can be linked to our more long-term drought conditions remains to be seen, but it reminds us of the value of rain in our semi-arid landscape. In respect to such, FOSCR has supported and partnered with other local groups to promote both direct and indirect rainwater harvesting techniques. Whether as simple as getting out a shovel and building a small berm to insure that rainwater soaks in around landscape vegetation at your house, or designing a more complex set-up of gutters, cisterns, and valves, it is crucial for us to not let water go to waste.

Another issue FOSCR has continued to support has been that of eco-toilets, primarily in Nogales, Sonora. Dr. Diane Austin from the University of Arizona has been working on a variety of ecologically-sound technologies for under-developed areas in Nogales, Sonora and composting toilets is just one of the initiatives. FOSCR has supported this particular project monetarily as we consider it to be of both social and ecological benefit to our binational watershed. Human waste that normally may not enter sewer lines is sanitized while at the

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same time reducing the need for water consumption at the household level.

In closing I would like to urge all readers to focus on the other articles in this edition of *The Flow*. It is crucial to have a discussion on climate change and the local effects of such that we may experience here in southern Arizona. The Santa Cruz River, as we know it, will quite certainly see some change in form due to evolving weather trends. At the same time, potential mining developments in the Patagonia Mountains, as well as the proposed El Pilar mine in Sonora may affect both the quality and quantity of water we currently observe in the Santa Cruz River watershed.

Note: Dr. Diane Austin will be the keynote speaker at the 2013 Earth Harmony Festival taking place on October 5-6, 2013 at Avalon Organic Gardens and EcoVillage.

The Flow is published by Friends of the Santa Cruz River (FOSCR), a nonprofit, volunteer organization dedicated to insuring the continued flow of the Santa Cruz River, the life-sustaining quality of its waters, and the protection of the riparian biological community that it supports.

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Amigos del Rio Honored at Annual Members Meeting

FOSCR President Scott Vandervoet (left) presents plaques to Raymond Frey and Bill Cox. Read honoree write-ups below.

Raymond Frey

Raymond Frey, Course Superintendent at Tubac Golf Resort, has been a crucial collaborator with Friends of the Santa Cruz River working on projects related to soil erosion near the river and Anza Trail.

Raymond has worked in conjunction with FOSCR board members to assess and remediate erosion by supplying materials and labor. He has installed pipe and rip-rap to control run-off following precipitation.

He is a wealth of ideas related to how best manage land and insure the health of the riparian ecosystem along the Santa Cruz River.

FOSCR is grateful to the Tubac Golf Resort and Raymond for the stewardship of their riparian holdings.

Bill Cox

Last year Tumacacori National Historical Park sent out a letter to people and organizations who might be interested in helping the Mission stop trespass livestock from grazing in the Park. Bill Cox stepped up, putting together a group of concerned stakeholders.

The group is trying to solve the problems caused by livestock wandering the Rio Rico area. They are addressing safety issues on the roads and the severe ecological damage cattle can cause, especially to sensitive riparian habitats.

While the problem has been around for a long time and may be difficult to resolve, progress has been made thanks to Bill's hard work and commitment to seeing it through.

The Vanishing Santa Cruz River

Information brief from the Sonoran Desert Network
Contributed by Jeremy Moss

Background

The Santa Cruz River flows through Tumacacori National Historical Park (NHP) on its way north after curving south into Mexico not far from its headwaters in the U.S. In the past, the Santa Cruz was sometimes known as "the lessening stream," as its flow has historically varied widely with changes in natural conditions and human use. Since 1951, however, the Santa Cruz has been bolstered by a steady flow of treated effluent from the Nogales International Wastewater Treatment Plant (NIWTP), located 10 miles upstream of the park. As a result, the river supports a rare southwest cottonwood-willow riparian environment, one of the most endangered systems in the U.S., as it flows through the park.

The Issue

Recent changes to the river's effluent inputs have reduced its flow; in fact, at Tumacacori NHP, the Santa Cruz stopped flowing in mid-April 2013 and remained dry into July. [Update: The river began flowing again once the Monsoon seasons started.] A no-flow period of this length has not previously occurred during the record for the stream gage; it marks a change in system hydro-dynamics and ecology. The current lack of flow in the river eliminates localized habitat for many aquatic taxa, including native fish, such as longfin dace (*Agosia chrysogaster*), and benthic macroinvertebrates, such as dragonfly (*Odanata*) larvae.

The reduction of water levels in the river and its adjoining soils has put stress on riparian trees and plants. The cottonwood-willow forest managed by Tumacacori NHP represents one of the last vestiges of this plant association in the western U.S. In order to thrive, the dominant trees of the park's riparian gallery forest, Fremont cottonwoods (*Populus fremontii*), need groundwater to remain at a level around 2 meters below the surface (Stromberg et al. 1996). If groundwater falls below the roots of the cottonwoods and other vegetation, then the plants begin to get stressed and, in response, drop their leaves to conserve water. If the plants continue to have limited access to groundwater, extensive vegetation mortality can result.

The dry riverbed of the Santa Cruz River and dropping cottonwood leaves.

Why is this Occuring?

The Santa Cruz River is an effluent-driven system, with most of its surface water provided by the NIWTP, in Arizona. In 1951, the plant discharged around 1.6 million gallons/day (mgd). Over the decades, that amount increased steadily as the international population it serves expanded. The NIWTP currently dischatges ~13-15 mgd into the Santa Cruz River; of that, approximately 9-12 mgd originates in the state of Sonora, Mexico.

An international treaty governs the dispensation and treatment of the wastewater originating in Sonora, but does not apply to approximately 3mgd of those 9-12 mgd—meaning that to date, Mexico has effectively been giving the U.S. up to 3 mgd of "free" water. This "extra" water was previously pumped out of the Los Alisos watershed, used by the municipal water supply in Nogales, Sonora, then piped to the NIWTP and, ultimately, into the Santa Cruz watershed. However, in 2012, construction was completed on a

Vanishing Santa Cruz, con't.

new Mexican treatment plant that now treats approximately half of that 3 mgd and sends it back into Sonora for agriculture and aquifer recharge (Prichard and Scott 2013), preventing it from ever reaching the Santa Cruz River.

The Los Alisos treatment plant accounts for approximately 1.5 mgd of an estimated 2.4 mgd total decrease in aquatic input being seen in the Santa Cruz River. The cause for the loss of the remaining ~0.9 mgd is uncertain. Similar decreases in flow the the Santa Cruz River have occurred in the past, but none has lasted longer than 30 consecutive days.

At Tumacacori NHP, streamflow has ceased and ground water levels are dropping as a result of the overall reduction in flow. Maintaining and replenishing the groundwater adjacent to the river requires a constant flow of river water; without it, evaporation, transpiration (both of which increase in extreme summer temperatures), and loss to surrounding deeper groundwater all combine to lower the surface-water level below the roots of riparian vegetation.

An additional factor contributing to the lack of streamflow at Tumacacori NHP is drought. The Southwest has been in a drought for more than 10 years. Reduced precipitation has reduced the amount of surface flow in regional rivers, as well as groundwater levels. Increased temperatures also put more stress on plants and increase the rate of evaporation.

Conclusions

In and along the Santa Cruz River, water levels are decreasing due to reduced inputs to the effluent-driven Santa Cruz River, coupled with more than 10 years of drought. Negative impacts to the biota directly dependent on water, such as fish and the magnificent riparian gallery forests at Tumacacori NHP, are resulting. In addition, the amount of water discharged by the NIWTP will likely be further reduced in the near future, as Mexico is expected to repatriate up to the full mgd of "free" water that previously flowed into the Santa Cruz. This reduction, combined with the ongoing drought and changes to the stream water-groundwater interaction, will mean further changes in the ecology of the aquatic and riparian systems of Tumacacori NHP.

Ecologists can't predict what those changes will look like, but with a continued reduction in river flow, the system may eventually resemble the pre-1951 river, with new animal and plant communities responding to the less-reliable availability of surface and groundwater. Intermittent flow, dependent on precipitation events, may create microhabitats for a number of fish and other taxa. Depending on the tendency of underlying geology to force groundwater either to or near the surface, the cottonwood gallery forest may become interspersed with mesquite woodland or vegetation communities more typical of the drier adjoining uplands. What does seem certain is that the natural systems of Tumacacori NHP are about the enter a new phase of anthropogenic change.

A healthy flow in the Santa Cruz River before April of this year.

Contact: Ewan Gwilliam, eval_gwilliam@hps.gov

Works Cited

Prichard, H.A., and C.A. Scott, 2013. Interbasin water transfers at the U.S.-Mexico border city of Nogales, Sonara: Implications for aquifers and water security. International Journal of water Resources Development, February 20, http://www.tandfonline.com/doi/abs/10.1080/07900627.2012,755597.

Stromberg, J.C., R. Tiller, and B. Richter, 1996. Effects of groundwater decline on riparian vegetation of semiarid regions: The San Pedro, Arizona. Ecological Applications 6(1):113-131.

CLIMATE CHANGE AND THE RIVER

By Sherry Sass
FOSCR Board Member

As you may have noticed, the Santa Cruz River no longer flows as far north as it had just a few years ago. Chavez Siding crossing in Tubac is now dry most of the time. Willows and cottonwoods along the stream bank are dying in many places. Fish and other aquatic life are finding less room in which to live. Why is this happening? Will we lose the river's surface flow altogether?

For some answers to the first question, see the excellent National Park article above in this edition of the *FLOW.*

Since groundwater pumping has continued unabated along the river for many decades, the Santa Cruz River has become "effluent dependent"—that is, its surface flow depends on the addition of treated wastewater (effluent) which is discharged into the river bed in Rio Rico.

But besides suffering from recent reductions in effluent flows, the river may also be showing drought effects. Water that collects under the ground from mountain rains slowly seeps downhill through washes and eventually adds to river flow, sometimes years after the rain events themselves started the process.

So think about the reverse as well: less water heading slowly through sands and soils means less water leaking out of the ground at the bottom of the watershed and contributing to the surface flow of the river.

Drought has long been a part of the southwest's climate. But our summers are predicted to be drier in the future. In addition, the predicted 3˚F+ rise in average temperature—more in summer than in winter—will make drought effects much worse. (See the Water Resource Research Center's report for more info: https://wrrc.arizona.edu/GCASE). The hotter it is, the faster water evaporates from rain events, so less lingers to sink into the ground. Less water in the ground, less groundwater to keep the river flowing.

For many years, our part of the Santa Cruz River has benefited from shallow groundwater tables, which not only support surface flow but also account for the very wide riparian forest zone that flanks the streambed. This broad area of shallow groundwater is where dense mesquite bosques (forests) shelter so many animals, including the great variety and number of birds that draw birdwatchers from all over the country. As drought and rising temperatures draw this groundwater down below the level of tree roots, we will see the lush, biologically diverse riparian zone shrink and die back. This will be a tremendous loss to our ecology, our wildlife, our tourism and recreation economy, as well as to the beauty of our community.

So what can we do? We can all help curb greenhouse gas emissions. You can change your own behavior: keep your thermostat higher (78˚F) in summer, lower (68˚F) in winter; make sure your home is well-insulated; keep your car tires properly inflated; recycle.

But you can also act on a national level: call or email your State and Federal representatives and let them know you want to see them make reducing greenhouse gas emissions a priority. Let them know you care about the future not only you, but the next generation will have to live in. We can turn this developing environmental disaster around, but we all need to work to keep our planet working for us. *For more information, check out websites 350.org, edf.org/climate, ipcc.ch.*

TAKE NOTE

Since about 1900, when the number of weather stations became sufficient to depict regional and global trends, temperatures have increased by about 1.5 degrees Fahrenheit (Figure 1). More recently, temperature increases have accelerated to the tune of about 0.35 degrees F per decade in the last 30 years. (Source: www.climas.arizona.edu/sw-climate/climate-change)

Catclaw Acacia

Renown Local Artist Roy Purcell Captures the Alluring Magic of the Santa Cruz River

Local artist Roy Purcell responded to FOSCR's request to help us replenish our financial aquifer in the way that artists do best—creatively.

One beautiful summer day, Roy and FOSCR board member Sherry Sass took a walk-about along the Santa Cruz River and discussed the various plants, animals, riparian area, and the evolution of the river while speculating on its future.

With the beauty of the river in his mind, Roy went back to his studio and got to work.

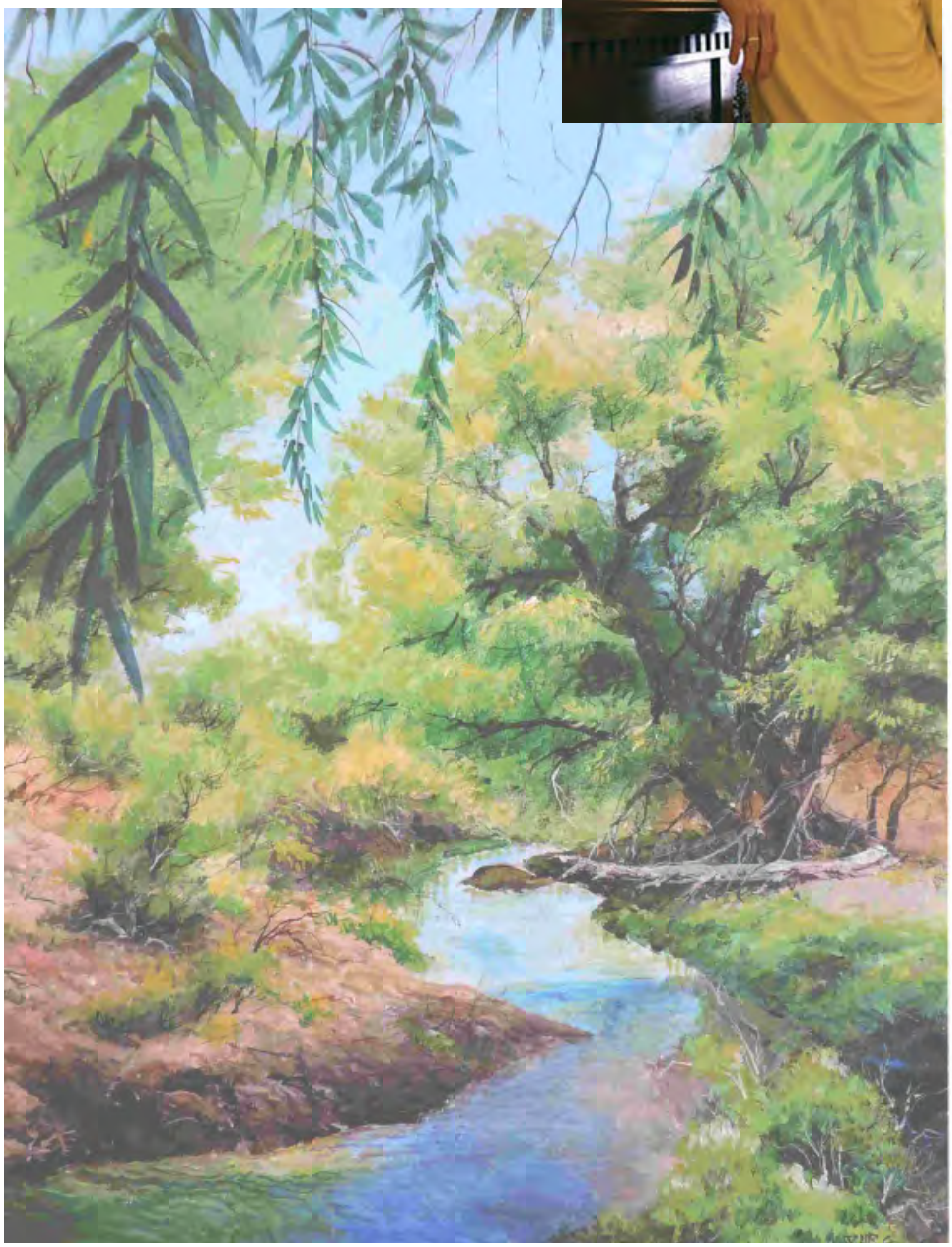
Roy created a beautiful scenic painting of the Santa Cruz River. He has donated the right for FOSCR to make prints and offer them for sale.

FOSCR thanks Roy for generously donating his time and talent to create an interpretation of his love and appreciation of the beauty of the Santa Cruz River and the Southwest.

The original painting can be viewed at Roy Purcell's Gallery at 19 Tubac Rd., Tubac, Arizona where you can also take in and enjoy his many and varied works of art.

The prints are created using the Giclee method which are images generated from high resolution digital scans and then printed with archival quality inks. The giclee printing process provides better color accuracy than other means of reproduction.

The scene of the Santa Cruz River print can be purchased through FOSCR. Email FOSCR at friendsofsantacruzriver@gmail.com. The print will also be available at the upcoming Celebrate the River event (see flyer opposite page) and all future FOSCR booths.



CELEBRATE THE RIVER COMMUNITY PICNIC

Sunday October 20, 2013
12 pm to 5 pm

HOSTED BY FRIENDS OF THE SANTA CRUZ RIVER
Sponsored by Global Community Communications Alliance and The Hilltop Gallery

Bring your family, a picnic, blankets, and chairs and celebrate our river. Guided river walks will be ongoing throughout the afternoon.

Enter our youth art contest (theme *"Calling All Critters; Flora & Fauna of the Santa Cruz River"*). All art forms accepted including visual arts, photography, sculpture, poetry, music, and theater (adult contributors OK). Awards will be given to youth during the picnic.

held at the **Guy Tobin Memorial Anza Trailhead**
Rio Rico Drive just east of I-19 Rio Rico, AZ

Contact: Blue Evening Star (520) 403-2823 or Nanette (520) 761-4001

The Menace of Mining Dishonorably

Blue Evening Star
FOSCR Board Member

The Santa Rita Mountains are a visual part of my home bioregion in the Santa Cruz River watershed, where I live northeast of Tumacácori Arizona at Avalon Organic Gardens & EcoVillage. To the southeast we have the beautiful Patagonia Mountains, where five mining proposals are in the beginning stages of obtaining permits to mine on public lands. Three of these proposals are for large-scale mining operations, and two are smaller "placer" mines. The larger three mining proposals are backed by Canadian companies, as is the Rosemont Mine/Augusta Resources. The reason for this is that the Canadian stock exchange allows for more speculation than the American stock exchange. A company in Canada can receive a great deal of money from investors while the project is in the planning stages, whereas in the U.S. there are limits to how much money they can rake in before they do what they say they are going to do.

There are about 60,000 abandoned mines in Arizona today. (Photo by 16-year-old award-wining photographer Ellanora DesManae DellErba.)

Mine Causing Poisoning In Patagonia

View the DVD Cyanide Beach to see how the executives of Augusta Resources used a mine in Sardinia, Italy as a lure for investors: http://www.investigativemedia.com/online-digital-release-of-cyanide-beach/).

There are sobering accounts of causes set into motion long ago and far away that are causing health problems for all living things here and now. An example of this is a mine southeast of Patagonia, Arizona which was shut down in 1940 and continues to pollute to this day.

We learned the story when we attended the fifth annual Researcher Days on April 15–16, 2013, in Tucson, Arizona. This event—hosted by the Sonoran Institute and Friends of the Santa Cruz River— showcases research done each year on the Santa Cruz River watershed.

One of the presentations at Researcher Days was titled, "Acid mining drainage impacts to invertebrate communities & food webs & bioaccumulation of inorganic contaminants from post mining activity in the Patagonia Mountains" and was presented by Jessica Gwinn and Peter Reinthal. These two scientists are studying and comparing the World's Fair Mine (Southeast of Patagonia) at Alum Creek (shut down since 1940) and the surrounding watershed with Humbolt and Harshaw Creeks. They assess the health of the creeks by counting aquatic invertebrates. When the water quality is good, they find many happy little mayflies and caddisflies, which thrive only in healthy streams.

Humbolt and Harshaw Creeks are full of mayflies and caddisflies. Alum Creek is severely polluted. They only found blood worms and cannibalistic beetles along its stinky banks. Seventy years after the closing of the World's Fair Mine at Alum Creek, this waterway continues to pollute all that is downstream.

Gwinn and Reinthal shared with us that day that there are 60,000 abandoned mines in Arizona today. The usual practice is for mining companies to cap the mine to stop the harmful chemi-

Green Streets for Southwestern Communities

By Tory Syracuse,
Associate Director,
Watershed Management Group

The City of Tucson is the first city in the Southwest to adopt a "Green Streets" policy requiring that new roadway projects be designed to capture stormwater to grow shade trees and other vegetation.

Watershed Management Group, a Tucson-based non-profit organization, led the development of the policy in collaboration with the Mayor's Office and the Tucson Department of Transportation. The policy, which was unanimously approved by Tucson's Mayor and City Council on August 6, 2013, requires that stormwater harvesting be designed into all new roadway development and redevelopment projects, ensuring that this innovative practice – also called green infrastructure or low-impact development – will be implemented across the city.

Green infrastructure takes a practical approach to handling stormwater as a resource for achieving multiple community and environmental benefits. Practices can be easily adapted to benefit both rural and urban landscapes.

Grow More Shade Trees

The recommended canopy cover for arid communities like Tucson is between 25-30%; The Green Streets policy will require 25% canopy coverage along new roadways.

The goal of the Green Streets policy is to address numerous environmental, economic, and quality-of-life issues related to water scarcity and Tucson's urban forest. The City's canopy cover is currently estimated at between 2% and 10% - far less than the 25-30% which is generally recommended for a Southwestern city. A healthy urban forest serves many functions, including shading streets and sidewalks, reducing the health impacts of urban heat island effect, providing urban wildlife habitat and beautification, and even raising real estate values along well-vegetated streets.

While increasing Tucson's canopy cover and enhancing the urban forest is essential for public health, the policy also addresses the issue of scarce water resources by providing a free water source – stormwater – for irrigation of new trees and other vegetation. Roadway projects built under the new policy would be designed

Menace of Mining, Co't.

cals from leaking out, but it is likely (although not proven) that dust continues to carry these chemicals, so capping is perhaps not sufficient. The only way to prove if the chemicals are spreading via dust in the air would be to set up dust filters to determine the quantity and types of heavy metals being distributed in the dust in the air. It costs 3 million dollars to cap a big mine.

Gwinn and Reinthal have found airborne deposition of lead and mercury throughout the entire Patagonia area. They highly recommended not eating fish from Pena Blanca Lake because they found a very high mercury content in Pena Blanca Lake fish. They also found lead and mercury in fish from Lake Patagonia, although in lower amounts than the fish of Pena Blanca Lake. They don't recommend eating fish from Lake Patagonia either.

In this study, geologists and biologists are working together to find sources and destinations of heavy metal pollution. This data should be incorporated in all mining proposals for new mines.

The greatest polluters in Arizona are:

- Mining (Note: mining companies are beginning to target more mining proposals in the lowland areas which will be even more polluting than the mines located in the highlands)
- Ranching
- Industry
- Insufficient Waste Water Treatment

The conclusion from their research is that mines closed for many decades continue to pollute. Government agencies are working to clean-up all these messes but they are not able to do enough. (For more details on this presentation see sonoraninstitute.org/images/stories/pdfs/Presentations/SCRResearchDays/2013/scrrd2013_reinthal_presentation.pdf)

The Alum Creek scenario would never have taken place in a cultural system with a worldview that understands interdependency and cares about a wider circle than its own immediate project.

Green Streets, Con't.

so that vegetation, once established, could survive on captured stormwater alone, significantly reducing Tucson's irrigation costs.

An additional benefit of green infrastructure features is the treatment of non-point source pollution, such as motor oil, picked up as stormwater travels across the urban environment. EPA strongly supports implementation of green infrastructure as a strategy for managing stormwater and providing many other benefits, including flood mitigation, air quality management, and more.

WMG develops and implements community-based solutions to ensure the long-term prosperity of people and health of the environment by providing the knowledge, skills and resources for sustainable livelihoods. WMG has been implementing green infrastructure projects throughout Arizona for the past six years including Rio Rico and Sierra Vista. The Green Streets policy represents WMG's efforts to help institutionalize green infrastructure practices so that they can be applied at a large scale and adopted by other southwestern communities.

Green Infrastructure Can:

- Cool our streets
  - o Trees and shade reduce urban heat island effect by shading and cooling streets and buildings. Streets, buildings, parking lots, and other impervious surfaces absorb heat during the day and then radiate it back into the environment at night. Urban heat island effect has numerous negative impacts on public health and quality of life.
- Conserve water
  - o While it's critical that we plant trees, it's also critical that those trees don't cause additional stress on our scarce potable water resources. That's why stormwater harvesting is so important – the policy requires that vegetation planted be able to survive on stormwater capture alone. It also reduces flooding along streets because water is captured close to where it falls.
- Support wildlife
  - o Trees and other vegetation provide habitat for many native species. Wildlife provides a sense of place, a connection to nature, and attracts tourists.
- Clean our air and water
  - o Green infrastructure treats stormwater pollution naturally by filtering pollutants, like motor oil to pet waste. Trees enhance air quality by filtering pollution.
- Beautify our community
  - o Trees increase real estate value, enhance community pride, and provide beautification and sense of place rooted in our Sonoran Desert environment. Shaded roads and sidewalks are much more appealing for bicyclists and pedestrians.

Jacaranda Mimosafolia

Board members Cynthia Shoemaker (left) and Blue Evening Star (right) visit with U.S. Representative Raul Grijalva at the Water Festival on Earth Day, April 21, 2013 in Reid Park.

Support the Friends of the Santa Cruz River

Thanks to all who donated this past spring. You can still be a member for the 2013 season. Just fill out and mail the membership/donation form below or use PayPal.

PayPal can be accessed by visiting our website at friendsofsantacruzriver.org. With a couple clicks you can select your level of support and pay with your credit card. Using PayPal allows you to donate annually—reminding you when it's time to renew your contribution. You can also offer a one-time donation—or donate as often as you like.

Thanks for helping us replenish our financial aquifer!

FRIENDS OF THE SANTA CRUZ RIVER

Membership/Donation Form

Joining for the first time? GREAT!

Already a member? Want to Renew your membership?

Inspired to Donate?

Date _____ New ___ Renewal ___ Donation ____

Name _____

Address_____

City _____ State _____ Zip _____

Telephone #_____

E-mail _____

Have you received "A Rambler's Guide to the Santa Cruz River?" (Free with membership!) Yes___ No ___

___$5 Student Membership ___$15 Single Membership

___$25 Family Membership ___$50 Supporting Member

___$100 Sustaining Member ___$500 Life Member ____ $ Other: _____ (Amount)

___Please contact me for volunteering opportunities.

Please enclose a check made out to FOSCR

P.O. Box 4275, Tubac, AZ 85646

Would you be interested in supporting efforts of other organizations on issues that FOSCR believes are important to the health of the river and the life that depends on it? If so, check the box below and we will forward you action items that you may choose to respond to.

☐ **Yes, please send me links to take action!**

Friends of the Santa Cruz River
P.O. Box 4275, Tubac, AZ 85646

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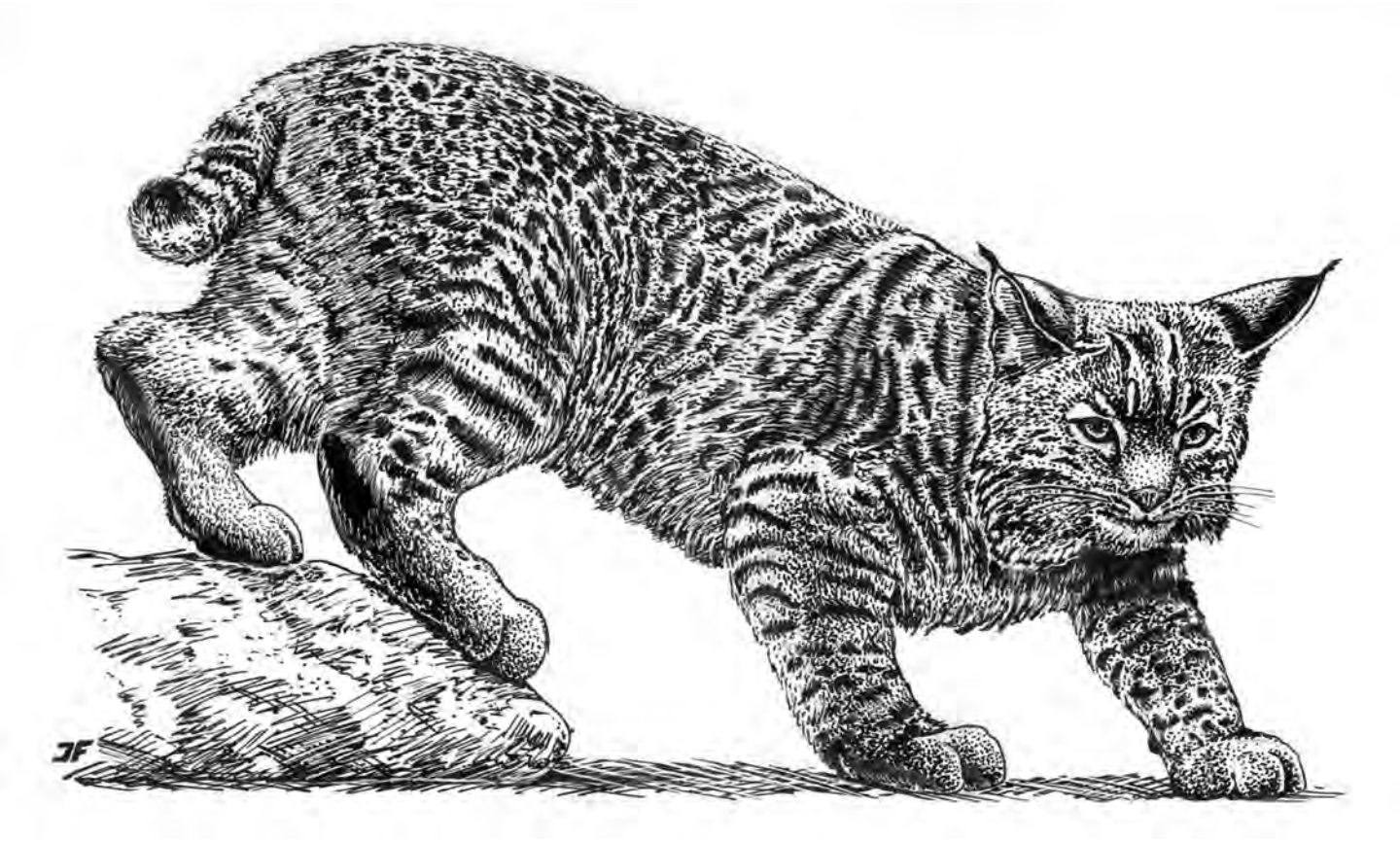

Bobcat