

Third Annual



Science on the Sonoita Plain

Quarterly Meeting of the Sonoita Valley Planning Partnership

June 4, 2011

At the
Appleton-Whittell Research Ranch of the National Audubon Society
Elgin, Arizona

Background

The Sonoita Valley Planning Partnership (SVPP) is a voluntary ad hoc association of agencies, user groups, conservation organizations, and individuals working together to achieve community-oriented solutions to local and national issues affecting public lands within the Sonoita Valley. The SVPP was created in 1995 in response to BLM's initiation of a collaborative planning process for Las Cienegas National Conservation Area. The SVPP meets quarterly and provides a forum for participants to share information and work together to perpetuate naturally functioning ecosystems while preserving the rural, grassland character of the Sonoita Valley for future generations. The SVPP is now administered and supported by the Cienega Watershed Partnership, a 501c(3) non-profit organization that was founded in 2007 to facilitate cooperative actions that steward the natural and cultural resources of the Sonoita Valley while enabling sustainable human use.

The Science on the Sonoita Plain symposium was established to bring together and share the results of scientific investigations that are occurring within and informing us about the unique and diverse resources of the Sonoita Plain in the upper watersheds of Cienega Creek, Sonoita Creek, and the Babocomari River.

We are pleased to share the proceedings of the third annual Science on the Sonoita Plain Symposium.

Gita Bodner, The Nature Conservancy
Linda Kennedy, National Audubon Society
Karen Simms, Bureau of Land Management
Jeff Williamson, Cienega Watershed Partnership

We gratefully acknowledge the financial support
provided by Resolution Copper Company for the
symposium and proceedings.

Photos courtesy of
Walt Anderson, Roger Cogan, Linda Kennedy, Shela McFarlin, Karen Simms

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8:30am Sign in, enjoy coffee and light refreshments, courtesy of the Cienega Watershed Partnership

9:00am Welcome - **Linda Kennedy**,
Audubon

SVPP announcements - **Netzin Steklis**

CWP announcements – **Jeff Williamson, Shela McFarlin**

9:15 - 9:45am Assessing Ecological Water Needs for Arizona, **Joanna Nadeau**, University of Arizona

9:50 - 10:20am Intermittent and Ephemeral Streams- Their “Day in the Sun”
Julie Stromberg, Arizona State University Michael Denslow, and Gabriele Katz

10:25 - 10:40am Break

10:45 - 11:15am Back Then: Enriching our understanding of the watershed through their stories. **Shela McFarlin**, Cienega Watershed Partnership; **JJ Lamb**, Vail Preservation Society, **Alison Bunting**, Empire Ranch Foundation

11:20-11:50am Desert Pupfish Reintroductions
Ross Timmons, Arizona Game and Fish Department

12:00-1:15pm Pupfish Release, followed by Lunch and Poster session

1:20 – 1:50pm 25 Years of Science and Management Cooperation – BLM and Audubon
Linda Kennedy, Director, Research Ranch
Tom Dabbs, District Manager, BLM

With special guests: **Dean Bibles, Henri Bisson and Glen Collins**

2:00-2:20pm Break with Celebratory Cake and Ice Cream

25 years of Cooperative Agreement between BLM and Audubon

2:25-3:10pm Constructing Regional Scenario Narratives to Confront Deep Uncertainty: Methods and Applications.

Holly C. Hartmann, Director, Arid Lands Information Center, Univ. of Arizona

3:15-3:45pm Bringing Back the Rio Grande/Rio Bravo in Big Bend - A Framework for River Restoration in a Changing Climate

Mark Briggs, World Wildlife Fund

3:50- 4:10pm Scenario Planning Discussion

4:15-4:30pm Wrap Up



Endangered Desert Pupfish Released!

In the late 1970s desert pupfish were released on the Research Ranch but many years later it was determined that the pupfish released were Rio Sonoyta Pupfish, not Desert Pupfish that are native to the area. Consequently, the decision was made to relocate the Rio Sonoyta Pupfish and repopulate the Research Ranch with the appropriate genetic stock.



Doug Duncan, USFWS, and Ross Timmons, AZGF, unloading Desert Pupfish at the Research Ranch.

Both groups of pupfish are listed as Federally Endangered so Audubon applied for a Certificate of Inclusion under the Safe Harbor Agreement between U.S. Fish and Wildlife Service and Arizona Game and Fish Department (AZGF). Under the auspices of the Safe Harbor Agreement Ross Timmons (AZGF) captured nearly 600 Rio Sonoyta Pupfish from the Research Ranch Headquarters Pool and transferred them to two different refuges. The Headquarters Pool was dried down, certified pupfish free, and refilled. The Headquarters Pool was constructed in 2003 with contributions in memory of Don and Emroy Kennedy and the primary source of water for the pool is a water harvesting system provided through a Wildlife Habitat Improvement Project grant from USDA-NRCS.

Attendees of the annual Science on the Sonoita Plain Symposium participated in the release of 229 desert pupfish on June 4th. Timmons brought the desert pupfish from the Robbins Butte wildlife area, described the Safe Harbor Agreement, and carefully monitored the release. Girl Scouts (see photo at left) and one Boy Scout from Sierra Vista who had come to the Symposium because of their interest in native fish conservation were thrilled to participate in the release. Other Research Ranch partners were



represented by Tom Dabbs (BLM), Gita Bodner (The Nature Conservancy) and Debbie Sebesta (USFS) who took turns releasing the new arrivals. Even Sam Salzwedel, KOLD news, who featured the release in the 6:00 p.m. newscast, put down his camera and took a turn!

Only one fish died in transport and the survivors quickly acclimated to their new home, some turning blue (breeding color) within two hours of release. It is anticipated that this population will provide “starter” populations for other appropriate sites on and off the Research Ranch, thereby moving this rare species a bit farther from extinction.



Lunch & Scientific Poster Session in the Barn

After the pupfish were released, participants adjourned to the barn where a barbeque lunch was provided courtesy of Resolution Copper Company, a landowning partner in the Research Ranch.

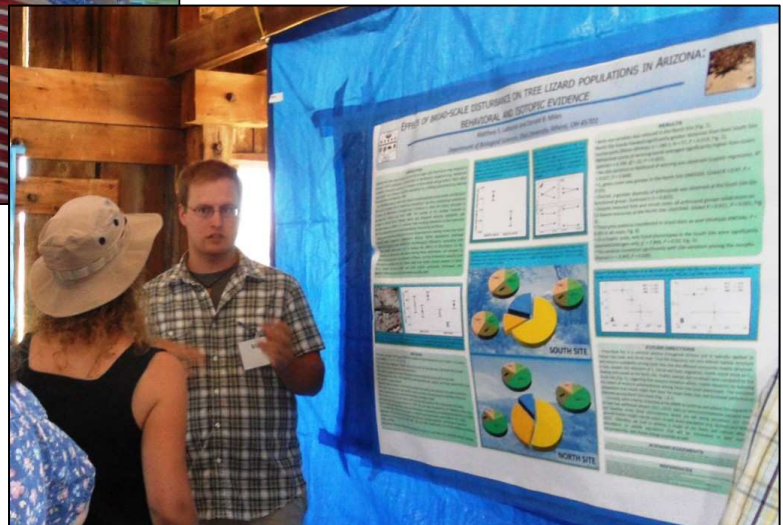
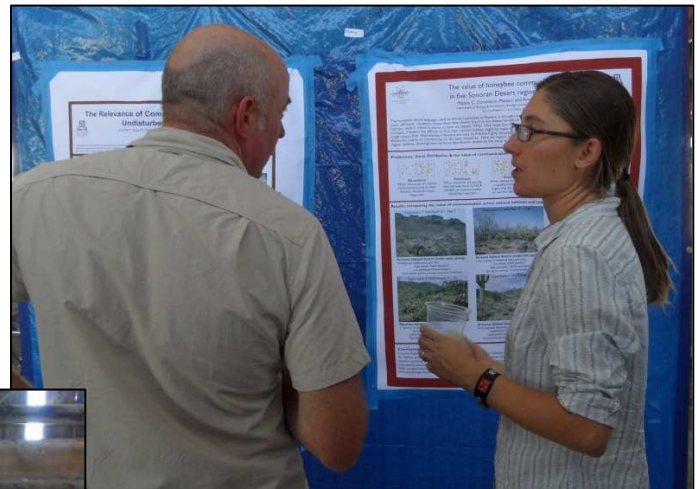




Scientific posters provide an alternative to oral presentations that give participants more opportunity to interact with the researchers. The “party” barn provided a unique setting for researchers and other participants to enjoy lunch, conversation, and the poster display.

Clockwise, from right: Matina Donaldson-Matasci (University of Arizona); Matthew Lattanzio (University of Ohio); Dan Robinett (Robinett Rangeland Resources).

Abstracts or summaries for many presentations and posters can be found on pages 9 through 21.



Celebration!

Twenty-five years have passed since the signing of the Cooperative Agreement between the Bureau of Land Management (BLM) and Audubon that outlined the collaborative effort to manage public lands administered by the BLM within the Research Ranch. Tom Dabbs, BLM Gila District Manager, introduced some of the key players that made this agreement possible, Dean Bibles and Henri Bisson, former Arizona BLM State Directors, and Glendon Collins, formerly with the Arizona State Land Department and BLM. History came alive as these men shared their memories of the challenges and rewards when land swaps between federal and state agencies were used to conserve large tracts of land. For more information, see “A History of the Lands in the National Audubon Society Research Ranch Near Elgin, in Santa Cruz County, Arizona,” by Glendon E. Collins at http://researchranch.audubon.org/PDFs/CollinsGE_AHistoryoftheLandsintheNASResearchRanch.pdf or “25 Years of Science and Management Cooperation – BLM and Audubon” on page 13 of this proceedings.

Clockwise from upper left: Tom Dabbs, Henri Bisson, Dean Bibles, Glen Collins



Scenario Planning Discussion



Holly C. Hartmann, Director of the Arid Lands Information Center, University of Arizona, and Mark Briggs, Restoration Ecologist, World Wildlife Fund led a spirited discussion on means by which to plan for conservation in the future.

Abstracts/Summaries of Posters or Presentations Alphabetically, by First Author

Islands of Fertility: An Artifact of Grazing? (Poster)

Ginger R.H. Allington, Thomas J. Valone, Katryna M. Kibler. Saint Louis University

Desertification, the conversion of arid grasslands to less productive shrublands, is occurring in arid regions worldwide. Both desertified grasslands and shrub deserts exhibit a heterogeneous fine scale distribution of vegetation, with shrub canopies separated by patches of bare ground. Soil nutrient patterns match this distribution: nutrients are concentrated under shrub canopies, creating local “islands of fertility” under shrubs.

Fertile islands under shrub canopies have been identified in desertified grasslands and historic shrub deserts and are considered a characteristic pattern of arid systems. Current dogma asserts that desertification is largely irreversible due to the assumed development and maintenance of feedback loops that perpetuate islands of fertility under shrub canopies, preventing grass recovery between shrubs. While empirical support for the fertile pattern is strong, all data come from sites grazed by livestock.

We examined soil nutrient patterns inside and outside three livestock enclosures that differ in vegetation and soils but are unified by the absence of grazing for more than

forty years. At each site we found a strong island of fertility pattern outside the grazing fence. However, we failed to detect any pattern inside the fence; soil nitrogen levels did not differ between shrub canopies and open locations.

The absence of the island of fertility pattern in long-term exclosures suggests that the pattern may be an artifact of livestock grazing rather than an inherent property of arid shrublands. This has significant implications for our understanding of the dynamics of desert vegetation and the possibility of restoration of desertified systems.

Relevance of Communication in Disturbed vs. Undisturbed Environments

(Poster)

Jennifer Chappell, Melissa Hughes, Matina Donaldson-Matasci, Anna Dornhaus.
Department of Ecology and Evolutionary Biology University of Arizona, Tucson, AZ

Comparing across disturbed vs. undisturbed environments, we examined whether following a dance significantly affected a bee's chances of successfully finding resources. Honeybee hives were placed in two dissimilar environments and observed for behaviors indicating resource collection and communication. Compared to the undisturbed environment, communication in the disturbed environment had a greater effect on overall forager success and the quality of resources found.

Herpetofauna at the Appleton-Whittell Research Ranch of the National Audubon Society

(Poster)

Roger C. Cogan, Appleton-Whittell Research Ranch, Elgin, Arizona

There is a rich diversity of amphibian and reptile species that occur or are thought to occur at the Research Ranch. Over the years there have been nine species of amphibians and thirty-nine species of reptiles identified within the preserve. Several species have not been seen in the last few years and may no longer occur within the preserve.



This poster pictures some the more commonly seen amphibians and reptiles at the Research Ranch that were observed and photographed 2010-2011. Ongoing efforts will determine presence or absence and possibly the abundance of many of the herp species within Research Ranches boundaries.

The Value of Honeybee Communication in Five Sonoran Desert Region Habitats

(Poster)

Matina C. Donaldson-Matasci, Anna Dornhaus. Department of Ecology and Evolutionary Biology University of Arizona, Tucson, AZ

The honeybee dance language, used to recruit nestmates to flowers, is thought to be adaptive because it allows the colony to collect resources more efficiently. However, researchers have shown that it is not always beneficial: the dance language only increases nectar collection in certain habitats, while in others it seems to have no impact. Why? One important factor may be the way flowers are distributed around



the hive. For example, if flowers are difficult to find, then communication might be important mainly because it allows many recruits to take advantage of a single scout's find. Alternatively, if flowers are easy to find but highly variable in quality, then communication might be important mainly because it allows the colony to concentrate on the best resources. Here we report initial results of experiments

across five different Sonoran Desert region habitats, showing how the floral distribution relates to the value of dance communication in honeybees.

Additions to the Flora of the Research Ranch

(Poster)

Erika Geiger, Linda Kennedy, Appleton-Whittell Research Ranch. Steven P. McLaughlin, University of Arizona (ret.)

The original "Flora of the Research Ranch" was published in 2001 (McLaughlin *et al.*). In 2011, we submitted a note describing additional plant species collected between 1999 - 2011 at the Appleton-Whittell Research Ranch, operated by the National Audubon Society, in northeastern Santa Cruz County, Arizona. Voucher specimens are maintained at the Research Ranch herbarium, bringing the total specimen collection number to 1264. The known vascular flora has increased by 70 species, including two new families, Amaryllidaceae and Orobanchaceae. Over a period of

approximately 11 years, the known flora increased by 11% with the contribution by exotics to the total flora holding fairly steady at 8%.

	Old	New	Total
Families	81	2	83
Genera	290	31	321
Native species	482	62	540
Exotic species	36	8	44

Constructing Regional Scenario Narratives to Confront Deep Uncertainty: Methods and Applications

(Poster and Presentation)

Holly C. Hartmann, Director, Arid Lands Information Center, Univ. of Arizona



Resource managers, including water managers, are confronting prospects for a future that is increasingly volatile, uncertain, complex, and ambiguous. Scenarios are important tools for planning under these conditions, especially where there is little ability to control the forces of change or a system's response. Where integrated climate, hydrologic, ecosystem or economic models are used in scenario studies, challenges include stakeholder skepticism of complex integrated models, communication among multidisciplinary teams, tradeoffs between considering many scenarios rather than a baseline and few variants, and downscaling global and regional possibilities to meaningful local corollaries. An alternative approach has proved to be effective at highlighting the irreducible uncertainties of local climate

change related to global patterns of economic development, societal behavior, governance, and technological advances. This approach emphasizes construction of divergent scenario narratives to plausibly push the boundaries of commonplace assumptions about the future rather than simply bracketing a moderate climate projection with higher and lower extremes. The scenario narratives have proved useful for developing insight among resource managers by considering future changes in societal priorities, governmental leadership, and other external forces, in addition to climate. Scenario narratives can be constructed using a variety of methods, including facilitated engagement with stakeholders over short sessions within workshops. Challenges of time and travel distance prompted development of an alternative methodology, which engages managers, specialists, and other participants remotely, using Internet-based tools, to elucidate a common understanding of linkages between driving forces and anticipated impacts, management and adaptation challenges, and planning processes. Face-to-face workshop sessions then focus on vetting scenarios, exploring adaptation strategies and potential shifts in management objectives, and connections to extant planning and management processes.

25 Years of Science and Management Cooperation – BLM and Audubon (Presentation)

Linda Kennedy, Appleton-Whittell Research Ranch of the National Audubon Society,
Elgin, AZ

On August 8, 1986, the Bureau of Land Management (BLM) and National Audubon Society (NAS) signed a Cooperative Agreement to formalize management of Federally-owned lands administered by BLM within the boundary of the Appleton-Whittell Research Ranch (RR). The management collaboration was further elaborated and strengthened in the Las Cienegas ROD and RMP. The objectives of the Cooperative Agreement are:

- the continuation of on-going research,
- the encouragement of future research,
- the derivation of mutual benefits from the research,
- the protection of the land and its ecological communities from disturbance.

BLM became an active partner in the Research Ranch in part by acquisition of the state trusts land within RR. BLM, thanks to its greater flexibility and authority in resource management, was better able to support long-term research than the state entity. Additional property was added to BLM holdings by direct purchase from Frank Appleton, one of the founders of the Research Ranch, bringing the total acreage of BLM land to 3141 acres.

This relationship between BLM and NAS has enabled dozens of academic, agency and independent scientists to participate in research projects that span a wide range of topics. An annotated list of selected publications (peer reviewed articles, books, theses and dissertations), resulting from this collaborative effort is available in the library at <http://researchranch.audubon.org> (Kugler and Kennedy, 2011). The annotated bibliography includes only publications that are readily available via university libraries, which means there are many agency reports that are not listed that provide excellent information and management guidance.

The bibliography includes 98 publications – an average of four per year since the Cooperative Agreement was signed. Another way to evaluate the production of scientific literature would be on an acreage basis – 1 publication per 31 acres owned by BLM. Either way, a pretty impressive record for this cooperative venture!

Effects of Broad-Scale Disturbance on Tree Lizard Populations in Arizona: Behavioral and Isotopic Evidence (Poster)

Matthew S. Lattanzio, Donald B. Miles. Ohio University

Generally, individuals faced with environmental changes may respond in three ways: 1) shift in distribution, 2) exhibit plastic or evolutionary responses (behavioral compensation, phenotypic plasticity, or response to selection), or otherwise 3) fail to adapt and go extinct. The option to disperse or track favorable niche conditions may be limited if changes occur too rapidly or there are barriers to dispersal (e.g., unfavorable environments bordering the preferred habitat). Another option in the short term is to persist and “make the best of a bad situation.” This may entail exploiting habitats that may be thermally suitable, but energetically unsuitable for individuals to successfully reproduce (i.e., an ecological trap). Here, I focus on the potential mechanisms that may contribute to the observed and measured differences within and among lizard populations in grassland areas varying in historic burn frequency. By altering the habitat structure, fire can affect aspects of behavior, survival and reproductive frequency in multiple ways. In addition, the resulting alterations in the available nutrient pools can affect diet selection (and thus energy acquisition for aspects of morphology and behavior) of lizards among the different study areas. Beginning in 2009, I initiated a long-term mark-recapture study of tree lizards among burned habitats in Arizona. My results thus far demonstrate spatial differences in the isotopic composition of vegetation among and within my study plots, as well as variation in resource availability (structural, cover, and isotopic measures) which contributes to differences in resource use by focal tree (and other) lizards (ANOSIM, Global $R = 0.47$, $P < 0.05$). The structural habitat also differed among survey regions (Friedman’s ANOVA: $\chi^2 = 217.09$, $p < 0.001$), with the North Site exhibiting proportionally greater bare-ground cover ($p < 0.013$) and proportionally

fewer rocks ($p < 0.001$) than the South Site. Resource (grass, shrub, forb) cover varied predictably; with greater grass cover in the site burned more frequently. Based on isotopic results, the three primary lizard phenotypes differ significantly in their diet selection. Furthermore, the trophic position of any one particular phenotype fluctuates depending both on frequency of prescribed fire and the frequency of the other phenotypes present in the population. These results enhance our understanding of the compound effects of disturbance on desert ecosystems and wildlife populations.

“Back Then”

Enriching our understanding of the watershed through their stories (Presentation)



Shela McFarlin
(left), Cienega
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85641 ; Alison
Bunting(right),
Empire Ranch
Foundation, P.O.
Box 842, Sonoita,
AZ 85637 ; and, JJ
Lamb (inset), Vail
Preservation
Society, P.O. Box
982, Vail, AZ 85641

In 2010, the Cienega Watershed Partnership (CWP) and its partners founded the CWP Oral History Work Group to focus on the collection, preservation, and dissemination (use) of oral history stories from Southeast Arizona. Founding members include CWP, the Amerind Foundation, Colossal Cave Mountain Park, Empire Ranch Foundation, Vail Preservation Society, Santa Cruz Valley Heritage Alliance, the Bureau of Land Management (BLM) and the Coronado National Forest (CNF). As this work group proceeded to inventory, digitize, and transcribe existing oral history tapes and to complete training session, increasingly questions arose about whether such oral histories can be tapped to understand past environmental conditions, decisions and policies, and land use. This spring the “Back Then” Work Group commenced with members who are oral historians, ecologists, biologists, historians, managers and others interested in applying oral history to past environments and current issues in the Cienega Watershed.

The Back Then Work Group is currently concentrating on developing databases which reflect the People, the Questions, and the Resources which must be considered to address both broad and specific watershed questions. That is, the work group is identifying---through working with various user segments---who has information and should be interviewed; what are the questions that scientists, managers, historians, oral historians, and others want addressed; and, where are collections of documents, maps, photographs, specimen samples, etc. that are useful?

On June 4, the goal is to identify this work group to the Science on the Sonoita Plain audience to gain input on the databases and proposed work. Two samples of the oral history programs are presented as well to provide flavor and ideas on how these stories can re-connect communities and individuals in the watershed.

The Empire Ranch Foundation and the BLM, have conducted oral histories focused on the Empire Ranch buildings and their uses, on how the ranch worked, and recollections of the people involved with the Empire Ranch. By searching the transcripts of the interviews it is possible to highlight anecdotal information on changes in the environment in the Cienega watershed. Brief excerpts from three oral histories were presented: Peter Bidegain commenting on the amount of water in the Cienega on the Babocomari Ranch; Henry Dojaquez recollecting the Cienega Creek and its crossing on the Empire Ranch; and John Donaldson commenting on the increase of mesquite on the Empire Ranch rangeland.

The Voices of Vail oral history project works to capture the stories of the greater Vail area at the northern end of the Cienega Corridor. The project is driven by the mission and strategic plan of the organization as we work to create community connections through local history. Our questionnaire seeks to document changes over time in the greater Vail area; changes in the cultural and natural landscape. We have been asking general questions relating to changes in the landscape (vegetation, wildlife), but it will be very helpful, and make the information gathered through the interview process more useful to land managers and decision makers to have a more specific set of questions.

It is a very useful process to review and discuss the many ways that oral history can support the research of historians, scientists and provide useful information to land management decision makers. In 2011 we have taken our oral history project a step further as we utilize interviews to create a documentary highlighting the history of Vail and the challenges the community faces as it grows from a rural to an urban community.

www.cienega.org; www.empireranchfoundation.org
<http://www.vailpreservationsociety.com/>

Assessing Ecological Water Needs for Arizona (Presentation)

Joanna B. Nadeau, Research Analyst; Dr. Sharon B. Megdal, Director; Water Resources Research Center; University of Arizona

Many riparian areas in Arizona have been lost or degraded in the last hundred years, and efforts to restore these places often rely on insecure or insufficient water supplies (Ohmart and Anderson, 1986; Megdal et al., 2006). The Arizona Department of Water Resources' Water Atlas is the primary resource for quantifying the state's water demands. Quantitative information for *environmental* water needs has not been compiled on a statewide level. To address this shortcoming, the University of Arizona Water Resources Research Center (WRRC) developed the Arizona Environmental Water Needs Assessment (AZEWNA).



The Arizona Environmental Water Needs Assessment provides systematically assembled technical information about the environment's water needs that can be used in water planning and policymaking statewide. The AZEWNA project is intended to inform the public, scientific communities, and policy makers about the state of the knowledge of Arizona's environmental water needs. In 2011, a number of resources were released from this project. Among these are an assessment summary report, a guidebook of existing methodologies, a decision tree for determining appropriate study strategies in a given environment, and GIS maps of the study information. The Assessment and Methodology Guidebook will increase public awareness, help policy makers understand the science, and identify the information gaps in Arizona's e-flow studies. Overall, this project helps to increase Arizona's collective ability to preserve and possibly restore important desert riparian and aquatic habitats by bringing the environment to the table when it comes to water allocation and policy decisions.

Renewable Energy in Southeastern Arizona: Decision Factors (Poster)

Wayne Eliot Porter, Arizona State University, Tempe AZ

Arizona has an abundant solar resource and technologically mature systems are available to capture it, but solar energy systems are still considered to be an innovative technology. Adoption rates for solar and wind energy systems rise and fall with the political tides, and are relatively low in most rural areas in Arizona. This thesis tests the hypothesis that a consumer profile developed to characterize the adopters of renewable energy technology (RET) systems in rural Arizona is the same

as the profile of other area residents who performed renovations, upgrades or additions to their homes. Residents of Santa Cruz and Cochise Counties who had obtained building permits to either install a solar or wind energy system or to perform a substantial renovation or upgrade to their home were surveyed to gather demographic, psychographic and behavioristic data. The data from 133 survey responses (76 from RET adopters and 57 from non-adopters) provided insights about their decisions regarding whether or not to adopt a RET system. The results, which are statistically significant at the 99% level of confidence, indicate that RET adopters had smaller households, were older and had higher education levels and greater income levels than the non-adopters. The research also provides answers to three related questions: First, are the energy conservation habits of RET adopters the same as those of non-adopters? Second, what were the sources of information consulted and the most important factors that motivated the decision to purchase a solar or wind energy system? And finally, are any of the factors which influenced the decision to live in a rural area in southeastern Arizona related to the decision to purchase a renewable energy system? The answers are provided, along with a series of recommendations that are designed to inform marketers and other promoters of RETs about how to utilize these results to help achieve their goals.

**Babacomari River Riparian
Protection Project
(Poster)**

Dan Robinett, Robinett Rangeland Resources LLC,
Elgin, AZ



The Babacomari River is a major tributary of the San Pedro River in Santa Cruz and Cochise Counties, Arizona. Most of the watershed for this river lies west of the highway bridge on State Route 90 at Huachuca City. This 140,000 acre catchment includes rolling grasslands on the Sonoita plain, oak woodlands in the Canelo Hills and the pine-oak forests of the northwestern Huachuca Mountains. The Babacomari River runs for 22 miles from its headwaters near Sonoita at 5000 feet elevation, eastward to join the San Pedro at Fairbanks at an elevation of 3850 feet. The US Geological Survey estimates that this important tributary contributes about 6000 acre feet of water annually to the San Pedro River system. The Arizona Dept. of Water Resources funded this 5 year study with a grant (09-164WPF) in 2009. Monitoring transects were installed in 2009 and 2010 and will be re-read each year through 2013. The goal of this project is to help preserve the Babacomari River System of SE Arizona.

Objectives:

- Construct 2 miles of riparian boundary fence to restrict access by livestock from the Babacomari River . The remaining 2 miles of the river with perennial

flow was fenced as a separate pasture in 1997. Grazing is managed to improve and maintain plant, soil and animal riparian resources

- Install six riparian vegetation and geomorphic monitoring transects to gather data for five years on the response of the river and tributary riparian system to climatic influences, natural disturbances and management activities
- Install six vegetation and geomorphic transects on riparian grasslands (sacaton) tributary to the Babacomari River and monitor for five years to evaluate their impact upon the river and riparian system and water resources
- Analyze and summarize data annually and present that information to the participating ranch properties and the public to be used for making management decisions.

Riparian monitoring stations were established in May of 2010 at three locations along the Babacomari River below the Babacomari Ranch headquarters. Riparian monitoring stations were established at three locations in June of 2010 on the Appleton-Whittell Research Ranch of the National Audubon Society. They have been re-read in June of 2011. Each riparian transect includes a cluster of three green-line transects along both banks. Herbaceous cover is recorded by plant species in 10 x 26 centimeter plot frame placed every two meters along the green-line (bank full) of the river. At each 2 meter station one plot is recorded submerged in the water 10 cm. and another recorded on the bank. In addition three 3 x 40 meter belt transects along each bank are employed to record canopy cover of riparian trees by species and size class (sapling, pole, mature). Three geomorphic cross sections per transect were installed and are re-surveyed annually to document erosion and/or sedimentation. At BR #1 a USGS recording stream gauge records base flow as well as flood flows just upstream of the vegetation monitoring transect.

Riparian grasslands include large bottomlands of giant sacaton (*Sporobolus Wrightii* Monro ex Scribn) on both the Babacomari Ranch (BR) and the Audubon Research Ranch (ARR). Riparian grassland monitoring stations were established in the fall of 2009 and re-read in the fall of 2010. One site is on the Babacomari Cienega. This is grassland occupied by a mixture of sacaton and grass-like plant species of wetlands (sedges and rushes). Two other sites on the Babacomari Ranch include lower Lyle canyon and just below the confluence of Hay canyon and the Babacomari channel. On the Research Ranch three locations include, just below the confluence of Post and O'Donnell canyons, just below the confluence of Turkey and O'Donnell canyons and in the O'Donnell bottom just upstream of the boundary with the Babacomari Ranch. These grasslands are vital floodplain components of the upper watershed of the Babacomari River. They are the sponge which soaks up floods flowing from the watershed and then slowly release that water to the Babacomari River as stream-

flow. They also contribute greatly to the forage supplies for livestock on BR and as critical wildlife habitat on both the BR and the ARR. Geomorphic cross sections span the entire width of the floodplain at these monitoring locations (300 to 600 meters in length). They were first installed in 1997 by Dr. Ron Tiller in his work on sacaton for his PhD dissertation. They were re-surveyed in the summer of 2009. They are re-surveyed annually beginning in the fall of 2010 using a surveyors level and metric rod from the original fixed benchmarks. Vegetation transects include ten, 50 meter lines, placed perpendicular to and along the cross section baseline with 100 points each, sampled for both basal and canopy cover by plant species. A piesometer located just downstream of TRR #2 is used to record depth to groundwater.

In addition to this monitoring effort the Babacomari Ranch has begun to protect private lands along the Babacomari River by selling development rights and placing conservation easements on the land. The money largely comes from the US Army (Fort Huachuca) which is actively looking to buffer military lands used for training and testing. The majority of lands on the Research Ranch are already protected from development.

Ephemeral Streams- their Day in the Sun

(Presentation)

Juliet C. Stromberg¹, Gabrielle L. Katz¹, Michael W. Denslow²

¹School of Life Sciences, Arizona State University,
Tempe, AZ

²Department of Geography & Planning,
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Despite being the most prevalent stream type in the American Southwest, far less is known about riparian ecosystems associated with ephemeral streams than with perennial streams (Shaw and Cooper 2008). We do know that patterns of plant composition and structure reflect complex environmental gradients, including water availability and flood intensity, which in turn are related to position in the stream network. A survey in the

Sonoran Desert near Tucson Arizona showed species composition of small ephemeral washes to be comprised largely of upland species, including large seeded shrubs such as *Acacia* spp. and *Larrea tridentata*. Small seeded disturbance adapted xerophytic shrubs, such as *Baccharis sarothroides*, *Hymenoclea monogyra*, and *Isocoma tenuisecta* were common lower in the stream network on the larger streams that have greater scouring forces (Katz et al, unpublished data).

Because ephemeral streams have multiple water sources, including deep (sometimes perched) water tables and seasonally variable rain and flood pulses, multiple plant functional types co-exist within a stream segment. Many washes support deep-rooted phreatophytic trees, including the nitrogen-fixing *Prosopis*, which are able to access not only water, but also pools of nutrients, several meters below ground (McCulley et al. 2004). In addition to the perennial plants, many opportunistic and shallow-rooted annual species establish during the bimodal wet seasons. Functionally, the phreatophytes serve to redistribute water within the soil column (Hultine et al. 2003). The wash vegetation also can stabilize channel substrates, promote accumulation of fine sediments and organic matter, and affect nutrient levels in various soil strata (Levick et al. 2008).

In addition to the many streams that are ephemeral over their length, ephemeral reaches also occupy extensive sections of interrupted perennial rivers. The differences in hydrologic conditions that occur over the length of interrupted perennial rivers influence vegetation composition, abundance and diversity, and variability in these metrics through time. In studies of three interrupted perennial rivers, patterns of herbaceous species richness varied with temporal scale of analysis, with richness being greater at perennial sites over the short-term but greater at non-perennial sites over the long-term (multiple seasons and years) (Stromberg et al. 2009; Katz et al., unpublished data). This latter pattern arose owing to the abundance of light, space, and bare ground at the drier sites, combined with a diverse soil seed bank and periodic supply of hydrochores and seasonal soil moisture sufficient to stimulate establishment of many cool-season as well as warm-season annuals. Thus, non-perennial sites contribute to river-wide riparian diversity, supporting high cumulative richness and distinct composition. Conservation of desert riparian diversity at reach and landscape scales depends the protection of consistent wet conditions at perennial flow sites (Stromberg et al. 2005), and upon the maintenance of temporal variability in moisture delivery, coupled with spatial variance in flow permanence among reach types.

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