

APPLETON-WHITTELL RESEARCH RANCH

of the

NATIONAL AUDUBON SOCIETY



ANNUAL REPORT

2012



MISSION of the RESEARCH RANCH: To be a living laboratory to determine and demonstrate methods to safeguard and rehabilitate southwestern grasslands, and to assist policy makers and other citizens in the care and protection of our native ecosystems, natural resources, and quality of life.

GOALS

- Conservation– to be a premier semi-arid grassland that fosters a natural diversity of native species.
- Research – to understand how grasslands and related ecosystems function, and to recognize the key elements that safeguard these ecosystems.
- Outreach and Education– to advocate for grassland ecosystems by encouraging citizens and policy makers to safeguard and rehabilitate native ecosystems throughout the region.

The Appleton-Whittell Research Ranch of the National Audubon Society is a collaborative effort among Audubon, Bureau of Land Management, Swift Current Land & Cattle Company, The Nature Conservancy, The Research Ranch Foundation, and U.S. Forest Service. The 8,000 acre sanctuary for native plants and animals and ecological research facility is located in southeastern Arizona.

From the Director

I fell in love with the Research Ranch the first time I saw it back in 1995 as a graduate student searching for a study site. The Research Ranch is more than just the landscape, the plants, the animals. It's a reflection of the vision and generosity of the Appletons, the contributions by volunteers and donors, the enthusiasm of scientists and students, and the support by neighbors. It is a special place, and we're happy to share with you some of the highlights of 2012 – 44 years since the Research Ranch began.

~Linda Kennedy

Audubon Staff on the Research Ranch
Roger Cogan, Conservation Coordinator
Linda Kennedy, Ph.D., Director
Pat Kugler, Office Manager

Audubon Staff in Phoenix:
Sarah Porter, V.P. and Executive Director
Becky Gilbreath, Finance & Office Manager
Steve Prager, Teacher/Naturalist
Valerie Ramos, Development Associate
Randy Harper, Custodian
Tice Supplee, Director of Bird Conservation
Chris Tulumello, Director of Development
Cathy Wise, Education Director

<http://researchranch.audubon.org> & <http://az.audubon.org>



This, the 2012 Annual Report, is dedicated to the memory of Virginia Dean, friend, neighbor and volunteer who passed away early this year after a short but courageous battle with cancer. In her final e-mail to us she shared:

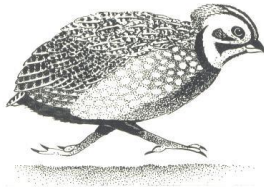
“Twice a day I repeat the 5 Reike principles to myself, which, strangely is a big help to me:

‘Just for today,
I will not be angry,
I will not worry,
I will be grateful,
I will work hard,
I will be kind to others.’”



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CONSERVATION

Lightning! After a dry winter and spring the Research Ranch and surrounding area was poised for wildfire – and we weren't disappointed. Lightning started two fires (the O'Donnell and Mesquite fires) here on July 9 and each was quickly attended by fire crews from the Sonoita Elgin Fire District and Forest Service or BLM. Unfortunately, this was during a time when the agencies were



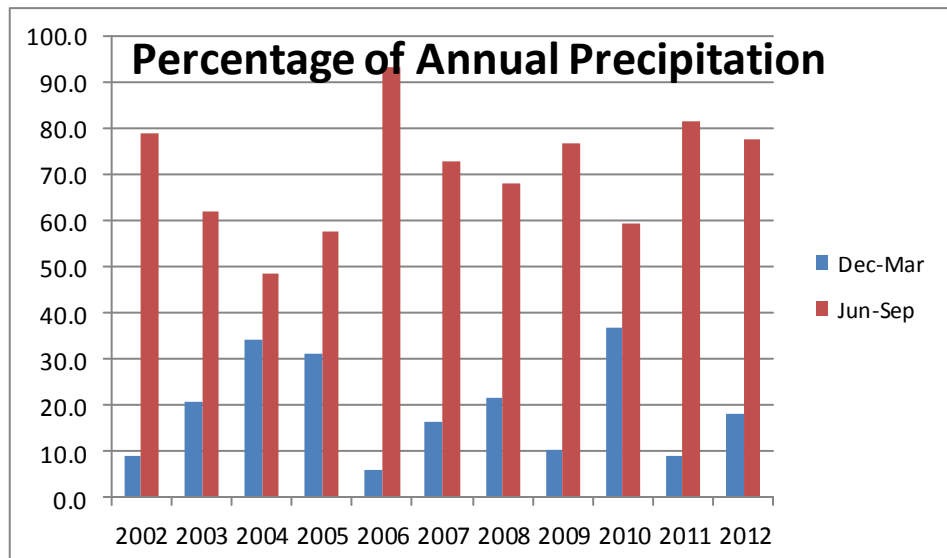
instructed to extinguish fires promptly so the fires burned only a few acres.

This ornate box turtle, photographed just a few hours after the O'Donnell fire, reminded us that fire is one of nature's processes and is not necessarily a danger to all species. We reported this sighting to AZGF through their Ornate Box Turtle Watch project.



View of the Mustang Mountains from East Mesa after the Rains Began – August, 2012

Precipitation: We had an AVERAGE year!!! Finally!!! The average annual precipitation for the Research Ranch has long been considered to be 17.5", but there's been a lot of variation around the mean (average). At headquarters this year we received 17.47" – close enough to be called average! However, the timing of the precipitation was unusual– we received 10.78" in July, resulting in some nice flood events (see photo of Post Canyon, below).



The Research Ranch receives precipitation in a bi-modal pattern, historically 60% during the summer (monsoon) period and 40% as winter rains. However, since 2002 over 70% of the precipitation received has been during the monsoon season. This trend could have significant impacts on the vegetation communities, as well as on resident and migrating wildlife.

The Research Ranch is participating in a large scale precipitation monitoring effort organized by SAHRA and the Arizona Cooperative Extension. You, too, can help by contributing your precipitation data – check out <http://rainlog.org>.

Conservation Practices

Arizona is a fence-out state – so it’s our responsibility to build and maintain fences that will exclude domestic livestock to protect our position as an ungrazed reference area. However, fences can pose hazards to wildlife. Resolution Copper Company, one of our land-owning partners, contracted with Leo Gonzalez (photo at left), formerly our Maintenance Foreman, to take care of several fencing projects on their property. A final ½ mile of substandard fence around the perimeter of the Ranch has been replaced with new fencing that meets the standards for wildlife friendly fence established by Arizona Department of Game and Fish. The tortoise paddocks on the Appleton home parcel have been removed, making this area much safer for wildlife.



Many individuals, students from the University of Kansas Alternative Break association, Dr. Jeff Fehmi’s Vegetation Management Class (University of Arizona) and participants of Sierra Club Service Tours helped with various projects including fencing maintenance, painting, repairing buildings, and erosion control.



Generous financial support from the RIESTER Conservation Foundation enabled us to upgrade the irrigation system to our sacaton floodplain rehabilitation project and continue transplanting efforts.

The solar pump system at Finley tank has been rehabilitated by Resolution Copper and is pumping out 3 times the flow that it was previously. We believe that this will again allow open water to build up in the tank.

Cogan and Kennedy spent several hours most mornings in the fall treating non-native grasses (Lehmann and Boer lovegrass) in the sandy loam upland ecological site south of the Research Complex.

This year we found no bullfrogs in the waters of the Research Ranch. We will keep monitoring all potential sites for this invasive, non-native predator that is so devastating to native fish, reptiles and amphibians. We are able to use any method to remove bullfrogs under the auspices of a Scientific Collecting Permit issued by Arizona Game and Fish Department.

On another bright note, the desert pupfish (a federally listed endangered species) released last year into the pond south of Headquarters are doing well and there are enough fish to transfer some to other sites, according to Doug Duncan, U.S. Fish and Wildlife Service. We are working with Arizona Game and Fish Department to affect this expansion. The photo at right shows some of these tiny fish during a monitoring effort.



Facilities: The Swinging H Ranch House is the oldest building on the Ranch and this year we launched into the next step in our renovation efforts by removing metal kitchen cabinets and truly nasty carpet. During the remodeling we discovered a small western diamondback had taken up residence in a wall. Cogan removed him safely and transferred him to the sacaton grassland. We closed up the snake access, installed some new kitchen cabinets and

refinished the floor to make the ranch house an even nicer place for our researchers and volunteers.



RESEARCH & MONITORING

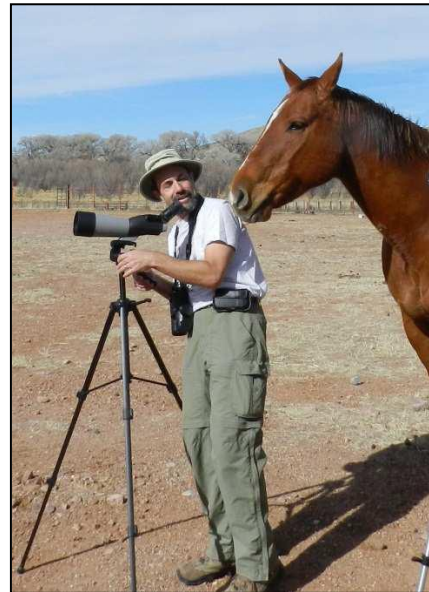
Pedro Mazier Chavarria (Texas A & M) successfully defended his dissertation, *Ecology of*



Montezuma Quail in Southeast Arizona! Pedro began working on the Research Ranch in 2008 thanks to a suggestion by research staff of Arizona Game and Fish Department. He needed a site to study the species where results were not compounded by pressure from hunting. His project was a textbook case in how difficult ecological research can be and how a determined scientist can succeed despite these difficulties. Two separate, major sources of funding were cut due to the economic downturn – he sought out additional funding and received fellowships from The Research Ranch Foundation and our Apacheria program. Part of his study area burned in a wildfire – he learned (and published) new information about how this species copes with fire. A severe winter storm killed many of the birds he was studying – he published the result. His dog and major field assistant, Blanca, developed cancer – Pedro borrowed another dog.

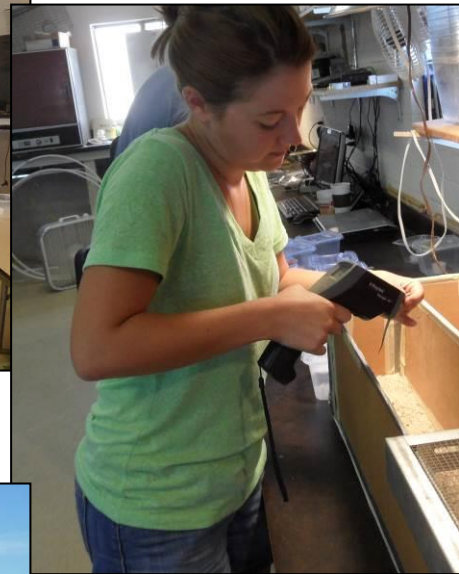
Congratulations, Pedro, you've earned it!

For many of the early years of the Research Ranch it was thought that research projects would supply the data necessary to make management decisions based on sound science. We learned that the limitations of research projects, which are usually short term (1-3 years, depending on funding availability) and hypothesis driven (seeking the answer to a specific question or set of questions) are not necessarily the best way to capture long-term trends. Consequently we have established a number of monitoring efforts, including upland vegetation, woody species, depth-to-groundwater, reptiles, amphibians, small mammals, and birds, including participation in Audubon's Christmas Bird Count. However, due to the strange scheduling of the count, there was no Appleton-Whittell CBC in 2012. The 2011 count was held on 12/31/11 and yielded 3850 birds of 94 species (see photo at right, of Robert Weissler, compiler and an interested spectator). The 2012 count was held on 1/5/13 and tallied 3642 individuals of 100 species in the 15 mile diameter CBC.



Researchers made good use of the Research Ranch housing facilities this summer and fall. The Swinging H Ranch house, Bunkhouse and Casita were all booked to near capacity for most of the summer and the lab was full of researchers studying the physiology and behavior of lizards. Field crews that stayed in Ranch facilities included:

- Bunchgrass Lizard study by Christian d'Orgeix (Virginia State) (4-6 researchers),
- Ornate Tree Lizard work by Matthew Lattanzio (Ohio University) (2-7 researchers),
- Grasshopper Sparrow project by Janet Ruth (USGS) (2-4 researchers),
- Drought Stress of Oaks, examined by Russell Lackey of Texas Tech (2 researchers),
- A study of exotic grasses first started in 2002, revisited this fall by Miguel Villarreal (USGS) (3-6 researchers).



One of the interesting discoveries this year was by Dr. Christian d’Orgeix and his field crew from Virginia State. Although the focus of his work is the ecology of Slevin’s bunchgrass lizard, he is also very interested in Mexican Garter snakes and has permission to study this very rare species as well. This monsoon season they discovered several in an ephemeral pool quite a distance from any known populations. This species has always been thought to be tied expressly to the food sources found only in perennial waters, consequently more study is needed!



To see a complete list of active research and monitoring projects and publications associated with the Research Ranch, see pages 16 through 24 of this report.

EDUCATION & OUTREACH:

Friends and neighbors are really enjoying our “Living Gently on the Land” education effort – especially the (almost) monthly potlucks and presentations organized by Pat Kugler, Office Manager. In January, Leslie Schupp presented the results of her work on the “Archaeology on the Research Ranch.” The National Phenology Network was the topic in February, and Jake Weltzin, Director, added several area participants to this nation-wide program. Local author and horticulturalist, Jim Koweek, shared his expertise on “What to plant and how to plant it,” in March. Mark Heitlinger, Range Manager of the Santa Rita Experimental Range, shared the long history and many accomplishments of that facility in April. Research on pronghorn was the subject of the May event, presented by Scott Sprague of the Arizona Game and Fish Department. After a hiatus during the summer John Hoffmann shared his experiences and expertise on “Photographing the wildlife of the Sonoita Plain” during the September event. The



weather cooperated with us in October when Robert Gent, President of the Huachuca Astronomy Club, gave a presentation on "Preservation and Appreciation of the Magnificent Night Sky" then shared that night sky through several telescopes set up on the patio. Melissa Amarello (left) returned to share additional results from her work on “Parental care, helping and other things snakes aren’t supposed to do” at our November event.

Field Trips and Training Sessions at the Research Ranch included Dr. Rick Paradis’

Southwestern Ecology Class from the University of Vermont, Dr. Jeff Fehmi’s Vegetation Management Class from the University of Arizona, a grass identification and grassland ecology workshop for BLM staff (photo at right), a 7th grade science class from Elgin, and a week-long training exercise by the Rocky Mountain Bird Observatory for their field crew.



Kennedy and Cogan were invited to the Council on Environmental Concern’s inaugural “Grassland Experts and Partners” meeting in Tucson and the Research Ranch was featured on the field day.

National Audubon Society board members and staff visited the Research Ranch as part of the September board meeting held in Tucson. This was the first trip to the Research Ranch for many participants and we took the opportunity to share the ways the Ranch is addressing the priority projects of the new national strategic plan. We made an impression – here’s a smartphone message from Susan Lunden, Chief Operating Officer and acting Chief Financial Officer:



“Hi

We are returning from our AWESOME field trip to Research Ranch.

This is a photo of Linda Kennedy holding up the strategic plan explaining the numerous ways Research Ranch fits into our priority projects.

Cool, very cool.

Susan”

The fourth “**Science on the Sonoita Plain**” symposium was held on June 9th at the Research Ranch with over 70 participants attending. This annual event is a meeting of the Sonoita Valley Planning Partnership and is a full day’s worth of activities focusing on research and monitoring. Birds were the central topic of this year’s meeting but the poster session and updates section of the meeting were open to all aspects of relevant research and science. The proceedings are posted on the Research Ranch website. Everyone enjoyed lunch (courtesy of Resolution Copper) and the poster session in the party barn!



Presentations included:

- Sparrows of the Sonoita Plains: a model system for understanding and managing biodiversity by H. Ronald Pulliam, Regents Professor Emeritus, Odum School of Ecology, Univ. of Georgia.
- The Ecology of Montezuma Quail in Southeast Arizona by Pedro Chavarria , Texas A & M
- Christmas Bird Count: Fun or Functional? By Linda Kennedy, Appleton-Whittell Research Ranch of the National Audubon Society
- Hummingbirds by Susan Wethington, Director, Hummingbird Monitoring Network
- Responses of songbirds to restoration of shrub-invaded grasslands by Robert J. Steidl, School of Natural Resources and the Environment, University of Arizona
- Conservation of North America’s Grassland Birds in the Chihuahuan Desert by Dr. Alberto Macías-Duarte, Mountain Bird Observatory-Centro de Estudios Superiores del Estado de Sonora
- Yellow-billed cuckoo habitat selection in Arizona is influenced by monsoon-related riparian phenology by Cynthia Wallace, U.S. Geological Survey

Updates on new and continuing research

- Go big, go far, or go home: A tree lizards' guide to surviving environmental change by Matt Lattanzio, University of Ohio
- Mapping and characterizing the cienegas of LCNCA by Andrew Salywon, Desert Botanical Garden
- Slevin’s bunchgrass lizard, *Sceloporus slevini* by Ivan Monagan, Jr. , Virginia State
- Compiling aerial photography on Cienega Creek and Sonoita Plain by Matthew King, Desert Botanical Garden.

Research Ranch staff also promote the mission of the Research Ranch with off-site activities such as the following.

- “The Value of Herps” was presented by Roger Cogan at the Southwest Wings Birding Festival; he has been asked to return in 2013. The Research Ranch will be one of the “Boutique” tour sites for the 2013 festival.
- Kennedy shared “An 8,000 Acre Exclosure – What Fun for a Botanist,” at the Arizona Botanist’s Annual Meeting in Tucson.
- A presentation entitled “Appleton-Whittell Research Ranch of the National Audubon Society” was given by Kennedy at the Santa Rita Experimental Range, Florida Station.
- Kennedy attended the Society for Range Management annual meeting in Spokane, WA, and presented a poster “Vegetation Monitoring in an 8000 acre Exclosure.”
- The Research Ranch was well represented at the poster session of the Madrean Archipelago Conference in Tucson in May:
 - Third Annual Science on the Sonoita Plain, by Gita Bodner, Linda Kennedy, Karen Simms and Jeff Williamson,
 - Biodiversity of the Research Ranch by Virginia Dean,
 - Herpetofauna of the Research Ranch by Roger Cogan,
 - Rattlesnake Wintering Sites at the Appleton-Whittell Research Ranch by Roger Cogan,
 - Vegetation Monitoring in an 8000 acre Exclosure by Linda Kennedy and Dan Robinett,
 - Babacomari River Protection by Dan Robinett and Linda Kennedy.
- A presentation by Kennedy at the morning muster of the Border Patrol based in Sonoita about the Research Ranch led to a field trip by one of the agents who brought his daughter, Hailee (left, below) and her friend Emily. Hailee loves science and may want to be a doctor or a biologist. Emily loves to write – perhaps she’ll write about meeting a caterpillar on the Research Ranch!



We received a Miller/Saylor Publication Grant from the Tucson Chapter of the Arizona Native Plant Society and a contribution from the Friends of Sonoita Creek in support of our “Pocket Guide to Plants for Hummingbirds.” This small booklet was compiled by a volunteer, Lois Albrecht, in cooperation with the Hummingbird Monitoring Network and the Borderlands Habitat Initiative. Hummingbird populations are at risk, in part because of habitat loss, and scientists believe that homeowners can provide vital assistance to these tiny avian travelers by planting native plants that provide nectar. This booklet, due to go to press in late summer, 2013, includes photos and descriptions of 60 native plants.



ADMINISTRATION

As predicted, the fiscal situation for the year ending June 30, 2012 looked bright – we closed out with a surplus of over \$40,000 (see statement on following page). This surplus was due primarily to generosity – contributions and bequests. We were able to do some badly needed maintenance that we’d been deferring and begin to upgrade the Swinging H Ranchhouse. Even more important, we were able to carry over this surplus for the next year (FY 12/13). The distribution from the endowment will be even less the coming year than it was in the past. It is anticipated to be around \$190,000, compared to \$204,839 in FY 11/12 and \$215,316 in FY 10/11.



**Statement of Activities
National Audubon Society
Appleton-Whittell Research Ranch
Fiscal year 2011/2012**

Revenue		
Contributions	11980	
Grants	6311	
Bequests	65569	
Rental	8130	
Pooled Investment Income	204839	
Other	416	
Total Revenue		297245
Expenses		
Salaries and Fringe	156325	
Vehicle Operations	1122	
Staff Training	110	
Postage	528	
Professional and Consultant	3000	
Gas and Electricity	4300	
Building & Office Maintenance	14330	
Telephone	4622	
Insurance	6408	
Other Maintenance	10105	
Office & Household Supplies	7777	
Education Materials	947	
Furniture & Fixtures	3577	
Computer Equipment	110	
Research Equipment	41	
Farm Supplies	3233	
Printing	1285	
Licenses, Registrations	530	
Dues & Subscriptions	325	
Support Service Allocations	36629	
Other	11	
Depreciation	1708	
Total Expenses		257023
Surplus		40222

Reports and Publications associated with the Research Ranch Received in 2012

- Bailowitz, R. A. (1988 (89)). "Census of the Butterflies of the National Audubon Society's Appleton-Whittell Research Ranch, Elgin, Arizona." *Journal of Research on the Lepidoptera* 27(2): 120-128.
- Biedenbender, S. (2012). Agave Monitoring Nine Year Report (2003-2011). Sierra Vista, USFS, Coronado National Forest: 1-7.
- Bodner, G., L. Kennedy, et al. (2012). 4th Annual Science on the Sonoita Plain. Proceedings. Quarterly Meeting of the Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ.
- Bodner, G., L. Kennedy, et al. (2012). Science on the Sonoita Plain. *In Biodiversity and Management of the Madrean Archipelago III and 7th Conference on Research and Resource Management in the Southwestern Deserts*. Tucson, AZ. Pg. 24.
- Chavarria, P.M., A.R.Kocek, et al. (2012). Use of portable infrared cameras to facilitate detection and capture success of Montezuma quail. *Proceedings of the National Quail Symposium*. Allen Press. 7: In press.
- Chavarria, P. M., R. R. Lopez, et al. (2012). Ecology of Montezuma quail in Southeast Arizona. *In 4th Annual Science on the Sonoita Plain*. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ. Pg. 8-9.
- Chavarria, P.M., A. Montoya, et al. (2012). Impact of inclement weather on overwinter mortality of Montezuma quail in southeast Arizona. *Proceedings of the National Quail Symposium*. Allen Press. 7: In press.
- Chavarria, P.M., N.J. Silvy, et al. (2012). Post-fire succession and Montezuma quail in a semi-desert grassland of southeast Arizona. *Proceedings of the National Quail Symposium*. Allen Press. 7: In press.
- Cogan, R. C. (2012). Herpetofauna at the Appleton-Whittell Research Ranch. *In 4th Annual Science on the Sonoita Plain*. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg. 24-26.
- Cogan, R. C. (2012). Herpetofauna at the Appleton-Whittell Research Ranch. *In Biodiversity and Management of the Madrean Archipelago III and 7th Conference on Research and Resource Management in the Southwestern Deserts Merging Science and Management in a Rapidly Changing World*. Tucson, AZ. Pg. 31.
- Cogan, R. C. (2012). Rattlesnake Wintering Sites at the Appleton-Whittell Research Ranch. *In 4th Annual Science on the Sonoita Plain*. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg 27, 28.
- Cogan, R. C. (2012). Rattlesnake Wintering Sites at the Appleton-Whittell Research Ranch. *In Biodiversity and Management of the Madrean Archipelago III and 7th Conference on Research and Resource Management in the southwestern Deserts Merging Science and Management in a Rapidly Changing World*. Tucson, AZ. Pg. 30.
- Dean, V. (2012). Biodiversity Database at the Appleton-Whittell Research Ranch. *In 4th Annual Science on the Sonoita Plain*. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg. 28.
- Dean, V. (2012). Biodiversity database at the Appleton-Whittell Research Ranch. *In Biodiversity and Management of the Madrean Archipelago III and 7th Conference on Research and Resource*

- Management in the Southwestern Deserts Merging Science and Management in a Rapidly Changing World. Tucson, AZ. Pg. 35.
- Duncan, D. (2012). Endangered Desert Pupfish Update. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg.16.
- Finke, D. L. and L. H. Williams (2012). 2011 Annual Report-Pollination ecology of the grassland shrub *Krameria erecta* (littleleaf ratany). Columbia, MO, Division of Plant Sciences, University of Missouri: 11.
- Gebow, B., D. A. Falk, et al. (2012). FireScope: A Program for Whole-Mountain Fire Management in the Sky Island Region. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg. 30-32.
- Kennedy, L. (2012). The Christmas Bird Count - Fun or Functional? *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg. 10-11.
- Kennedy, L. and D. Robinett (2012). Vegetation monitoring on semi-arid grasslands ungrazed by domestic livestock. Biodiversity and Management of the Madrean Archipelago III and 7th Conference on Research and Resource Management in the Southwestern Deserts. Tucson, AZ: Pg. 67.
- Kennedy, L. J. and D. G. Robinett (2012). Vegetation Monitoring on an 8000 acre Exclosure. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ. Pg. 32-34.
- King, M., R. Tiller, et al. (2012). Compiling Aerial Photography on Cienega Creek and Sonoita Plain. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg 20-21.
- Krishnan, P., T. P. Meyers, et al. (2012). Interannual variability in energy exchange and evapotranspiration over two semi-arid grasslands in Arizona. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg. 34-35.
- Krishnan, P., T. P. Meyers, et al. (2012). "Energy exchange and evapotranspiration over two temperate semi-arid grasslands in North America." *Agricultural and Forest Meteorology* 153: 31-44.
- Lattanzio, M. and K. Jaworski (2012). Go Big, Go Far, or Go Home: A Tree Lizard's Guide to Surviving Environmental Change. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg.17-18.
- Macias-Duarte, A., A. Panjabi, et al. (2012). Conservation of North America's Grassland Birds in the Chihuahuan Desert. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg.12-14.
- Monagan, I. and D.C. d'Orgeix (2012). Answering Questions with Bunchgrass Lizards. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg.19.
- Nichols, C. T. (2010). The Effects of Fire and Grazing on Avian Abundance and Diversity in an Arizona Oak Savanna. Eastern New Mexico University Biology, Eastern New Mexico University. Master of Science Thesis. 49 pages.
- O'Dea, M., D. P. Guertin, et al. (2000). Arbuscule Mycorrhizae: A Linkage Between Erosion and Plant Processes in a Southwest Grassland. USDA Forest Service Proceedings RMRS-P-13. 2000. Tucson, AZ, School of Renewable Natural Resources, University of Arizona: 257-260.

- Pulliam, H. R. (2012). The Ecology and Conservation of Grassland Sparrow Populations. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg 5-8.
- Qi, J. (2000). Utilization of Vegetation Data to Extract Effective Surface Parameters. A report to the VEGETATION Programme. East Lansing, MI, Michigan State University: 16.
- Saito, M., S. Maksyutov, et al. (2009). "An empirical model simulating diurnal and seasonal CO₂ flux for diverse vegetation types and climate conditions." *Biogeosciences* 6: 585-599.
- Salywon, A., R. Tiller, et al. (2012). Mapping and Characterizing Cienegas at Las Cienegas National Conservation Area. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ Pg. 21-23.
- Sisk, T. D., T. E. Crews, et al. (1999). Assessing Impacts of Alternative Livestock Management Practices: Raging Debates and a Role for Science. Proceedings of the Fourth Biennial Conference of Research on the Colorado Plateau, U.S. Geological Survey: 89-103.
- Supplee, V. T. and J. MacFarland (2012). Important Bird Areas of the Madrean Archipelago: a Conservation Strategy for Avian Communities. *In* 4th Annual Science on the Sonoita Plain. Sonoita Valley Planning Partnership. Appleton-Whittell Research Ranch of the National Audubon Society, Elgin, AZ. Pg. 35-42.
- Titus, J. H. and P. J. Titus (2008). "Assessing the Reintroduction Potential of the Endangered Huachuca Water Umbel in Southeastern Arizona." *Ecological Restoration* 26(No. 4): 311-321.
- Vinukolu, R., C. R. Ferguson, et al. (2009). Algorithm Theoretical Basis Document, Version 1.0 Chapter 3. Evapotranspiration from Remote Sensing. Princeton, NJ, Princeton University: 34-71.
- Woods, C. P. and R. M. Brigham (2004). The Avian Enigma: "Hibernation" by Common Poorwills (*Phalaenoptilus nuttalli*). *Life in the Cold: Evolution, Mechanisms, Adaptation, and Application*. Twelfth International Hibernation Symposium. B. M. Barnes and H. V. Cary. Fairbanks, Alaska, University of Alaska. 27: 231-240.
- Woods, C. P. and R. M. Brigham (2008). "Common Poorwill Activity and Calling Behavior in Relation to Moonlight and Predation." *The Wilson Journal of Ornithology* 120(3): 505-512.
- Zhang, X. (2010). Simulation Study on Ground Surface Water and Energy Balance in Arid and Semiarid Areas. American Geophysical Union, Fall Meeting 2010.



Science on the Research Ranch

Summary of Active Research/Baseline Projects - 2012

Active: One or more of following: Proposal approved but project not commenced; Field work/research within past two years; Publication received within past two years; Publications pending; Publications in demand within past two years; Projects with return intervals >1 year; Collaborative, long term efforts. Audubon staff is based on the Research Ranch unless otherwise noted.

- Denotes projects with field work conducted at the Research Ranch during 2012
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Investigating the effect of livestock on the physical properties of soil in an arid grassland

Allington, Ginger; Thomas J. Valone; Saint Louis University. St. Louis, Mo 63116

Subject: Collect water infiltration and soil compaction data on grazed and ungrazed land

Application: Evidence of impacts of livestock on physical properties may assist restoration efforts at desertified sites.

Fish Surveys

Arizona Game and Fish Department.

Subject: Conduct periodic surveys of the riparian systems of the Research Ranch and neighboring properties

Application: Evaluate stability of populations of native species, recommend management actions

***Pupfish**

Arizona Game & Fish Dept. (AZGF): Ross Timmons (2011)

Subject: Monitor and protect population of pupfish introduced into ranch stockponds and wildlife waters

Application: Conserve native, endangered species

***Survey of Gould's Turkeys near Huachuca Mountains**

Arizona Game & Fish Department

Project: Estimate populations

Application: Track success of re-introduction effort

***Avian Monitoring for Research Ranch IBA**

Audubon staff: Tice Supplee, Director of Bird Conservation, Audubon Arizona, Phoenix, AZ

Project: Monitor bird species on AWRR

Application: Support IBA nomination (see also Wonkka), examine longterm trends

***Bullfrogs, Monitoring and Treatment on the Research Ranch**

Audubon staff: Linda Kennedy, Roger Cogan

Subject: Discover and eradicate individuals within boundary of Research Ranch

Application: Protect native fish, reptiles and amphibians from predatory, non-native species

Christmas Bird Count – Appleton Whittell Circle

Audubon staff & Robert Wessler, Huachuca Audubon Society, compiler

Subject: Conduct bird count as per Audubon standards.

Application: Pooled data yield important information re avian populations, movement and trends.

***Depth to groundwater on Research Ranch**

Audubon staff & Sandy and Betsy Kunzer

Project: Monitor the depth to groundwater of the wells on Research Ranch.

Application: This study helps establish a water consumption baseline for the Sonoita Valley.

***Ecological Site Monitoring (ESM)**

Audubon staff: Linda Kennedy

Project: Establish permanent points to monitor vegetation change

Application: Identify trends in vegetation change

Effects of fire and climate change on cacti

Audubon Staff: Kennedy Linda,

Project: Monitor the effects fire and climate change on native cacti

Application: Baseline information for future research

Effects of fire and climate change on mesquite

Audubon Staff: Linda Kennedy

Project: Monitor the effects of fire and climate change on mesquite.

Application: Baseline information for future research and identify trends

***Geographic Information System**

Audubon staff: Linda Kennedy

Project: Document location of significant geographical features, events, and research locations

Application: Archive information and avoid conflict between research projects.

***Gould's Turkeys on the Research Ranch**

Audubon Staff: Linda Kennedy, Roger Cogan, Pat Kugler

Project: Record sightings of wild turkeys.

Application: Document spread of sub-species reintroduced in Huachuca Mtns.

***Photo-herbarium for the Research Ranch**

Audubon staff: Linda Kennedy

Project: Document life stages of plant species found on the Research Ranch.

Application: Baseline information for future research; Aids identification.

***Precipitation at Ecological Sites**

Audubon Staff: Linda Kennedy

Project: Establish range gages to correspond with ESM.

Application: Correlate precipitation with changes in vegetation.

***Recording Precipitation with Data Loggers**

Audubon Staff: Linda Kennedy

Project: Install tipping gages equipped with dataloggers in key areas.

Application: Provide detailed information relevant to stream flows and changes in vegetation

***Small mammal populations on the Appleton-Whittell Research Ranch**

Audubon Staff: Linda Kennedy

Project: Develop long-term monitoring program based on Jones, Bock and Kennedy

Applicability: Indicate trends in small mammal populations

***Agave Monitoring on the Coronado National Forest**

Biedenbender, Sharon, Ph.D., USFS. sbiedenbender@fs.fed.us.

Project: Monitor impacts of livestock grazing on florivory of agave

Application: Management of food source for lesser long-nosed bat

***Survivorship of Riparian Trees in the Southwest**

Bock, Carl & Jane Bock. University of Colorado (retired)

Project: Resurvey the riparian trees tagged in the 1980s.

Application: Determine the survivorship of native trees after fires, flood and drought

Response of rodents, birds, and vegetation to the Ryan Fire, Sonoita Valley, AZ -a unique opportunity to examine the ecological consequences of fire in grassland/savannas of the Arizona Borderlands

Bock, Carl, E., University of Colorado; Linda J. Kennedy, Audubon

Subject: Quantify effects of wildfire on assemblages of small mammals, birds and vegetation.

Application: Help land managers predict response of species to large scale rangeland fire

Soil inventory update

Breckenfeld, Donald J. (retired), Daniel Robinett (retired); U.S.D.A. N.R.C.S., Tucson, AZ

Project: A soil inventory update that coincides with soil surveys that have been done elsewhere in southern Arizona – updating the old soil survey to the new soil series and map units used in MLRA 41-1.

Application: Baseline information needed by other research projects.

***Population dynamics and habitat characteristics of Montezuma (Mearn's) Quail in southeastern Arizona**

Chavarria, Pedro Mazier; Texas A & M University; Louis Harveston, Ph.D., Sul Ross State University.

Subject: Monitoring movement of quail.

Application: Fill knowledge gaps about life history and determine how behavior and genetic viability is affected in areas where hunting is, and is not, allowed.

A History of the Lands in the National Audubon Society's Research Ranch Near Elgin, in Santa Cruz County, Arizona

Collins, Glendon E., Bureau of Land Management (retired), Arizona State Trust Lands (retired). Phoenix.

Subject: Compile and document history of land transactions involving federal and state lands.

Application: Background.

Honeybee communication and the ecological context

Donaldson-Matasci, Matina. Dept. of Ecology & Evolutionary Biology, University of Arizona

Project: Explore relationship between resource distribution and value of communication.

Application: Basic science on species

***Current Distribution and Status of Slevin's Bunchgrass Lizard, *Sceloporus slevini*, in southeastern Arizona**

d'Orgeix, Christian, Ph.D., Virginia State University.

Project: Survey for bunchgrass lizard. Collect tissue for DNA analysis (tip of tail – no take) to compare intrapopulation and interpopulation genetic variance.

Application: foundation for determining genetic relatedness of different populations and effects of bottlenecks on populations

***Survey of Appleton-Whittell Research Ranch Drainages and Ponds for the Mexican Garter Snake**

d'Orgeix, Christian, Ph.D., Virginia State University

Project: Survey for presence of Mexican garter snakes (Telles tank, O'Donnell Canyon, Post Canyon), and conduct long-term study of population at Finley tank.

Application: Management implications for species of special concern (AZGF)

Annotated bibliography of selected reports, publications and theses

Dyson Ruth E., Mason, MI.

Project: Prepare annotated list/bibliography of publications of particular interest to AWRR.

Application: Facilitate information exchange and document publications

***Finding effective strategies for adding native diversity into heavily invaded grasslands**

Fehmi, J.S., Rachel Gallery, Craig Rasmussen. University of Arizona

Project: Re-introduce native plants into areas dominated by naturalized, non-native plants

Application: Increase proportion of palatable native plants

***Genetic approach for using pollen to determine plant resources used by nectarivorous bats.**

Ferguson, George, University of Arizona

Project: Collect tissue samples from *Agave parryii* v *huachucaensis*

Application: Determine usage of this species by Lesser Long Nosed Bats (Endangered Species)

***Using soil moisture to assess ecosystem function following exotic lovegrass invasion in semiarid grasslands of southeastern Arizona**

Fernald, Alexander G. (Sam), Ph.D., New Mexico State University; Cross Anne F., Ph.D., Tulsa OK

Project: Measure soil moisture under Plains lovegrass (*Eragrostis intermedia*), a native species, and Lehmann lovegrass (*E. lehmanniana*), an exotic species.

Application: Determine whether a semiarid grassland retains its functional integrity following the invasion of an introduced, exotic grass.

***Research Ranch boundary surveying and mapping**

Greene, Dale and Kristen L. Greene. TerraData AZ. LLC. Sonoita, AZ.

Project: Survey and map Audubon property boundary and certain water catchments.

Application: 1) The exact perimeters of property owned by Audubon will be determined with up-to-date equipment and marked for posterity. 2) Location and physical characteristics of artificial water catchments will be determined and compared to existing records.

Survey of high desert grasslands Hymenoptera

Grissell, Eric, Sonoita, AZ

Project: Study insect diversity in southwest

Application: Significant contribution to state of knowledge

Monitoring wildlife in and near the Appleton-Whittell Research Ranch using trail cameras

Hass, C.C., Borderland Carnivore Studies, Vail, AZ.

Project: Use trail cameras to identify and monitor various species of terrestrial wildlife.
Application: Identify habitat specific wildlife use and develop index for long-term trends.

Ecology of hooded skunks in southeastern Arizona

Hass Christine C., Ph.D., Borderland Carnivore Studies, Vail, AZ. H. Sheridan Stone, USAIC & Fort Huachuca

Keywords: hooded skunks, *Mephitis macroura*, striped skunks, *M. mephitis*, density, space use, rabies

Project: Examine resource partitioning of hooded and striped skunks; determine densities of skunks at four sites in southeastern Arizona; review the current and historical distribution of hooded skunks from published and unpublished reports and museum collections; examine the prevalence of rabies antibodies among live-trapped skunks and other carnivores, and determine the variants of rabies virus among sick animals and fresh mortalities.

Application: Examine epidemiology of rabies in SE Arizona

Introduction of Species Diversity into Boer Lovegrass Monocultures

Hershdorfer, Mary and Ramona Gardner, Ph.D., USDA-NRCS Plant Materials Center. Tucson, AZ

Project: Determine effectiveness of various methods to increase native biodiversity into monoculture created by non-native lovegrass.

Application: Protect native grasslands

***Meteorological Station**

Keefer Tim, Hydrologist, USDA-ARS; Southwest Watershed Research Center; Tucson, AZ

Project: Station jointly owned by ARR & USDA

Application: Baseline information on climate available to researchers and land managers of region

***Sacaton Rehabilitation**

Kennedy Linda, Ph.D. Research Ranch

Project: Re-establish *Sporobolus wrightii* in appropriate degraded sites.

Application: Improve wildlife habitat, bioremediation of sites dominated by exotic, invasive Bermudagrass.

***Oak (*Quercus*) water use strategies in Sky Island Systems**

Lackey, Russell; Texas Tech University

Project: Determine physiological drought tolerance of native oak species

Application: Explain current patterns in community composition and distribution in relation to water balance.

***Modeling impacts of habitat alterations on habitat use and diet selection of desert reptile communities**

Lattanzio, Matthew S., Ohio University

Project: Determine how management practices and climatic variability affect resource availability and use by grassland reptiles

Application: Management practices may be altered to enhance habitat and use

***Flora of the Appleton-Whittell Research Ranch**

McLaughlin Steven P., Ph.D., University of Arizona, (Ret.), Erika L. Geiger; University of Arizona, (Graduated) ; Janice E. Bowers; U.S. Geological Survey (Ret) Tucson; Linda Kennedy

Project: Compile a flora –a complete list of all flowering plants, ferns, and conifers on the Research Ranch.

Application: Baseline for ongoing and future research

***Natural Resources Inventory – Primary Site Unit**

Natural Resources Conservation Service-USDA. Tucson. Emilio Carrillo (2004), Christine Egen (1992), Steve Barker (1982)

Project: Repeated measures: vegetation and soil. Transects established in 1982; resampled on approximately decadal basis.

Application: Identification of trends – reference area for MLRa-41

***Long-term meteorological, evaporation and carbon flux measurements**

National Oceanic & Atmospheric Administration (NOAA); Tilden P. Meyers, Ph.D. Meteorologist; NOAA, Oceanic and Atmospheric Research, Air resources Laboratory, Atmospheric Turbulence and Diffusion Division, Oak Ridge, TN; John Hughes, NOAA.

Subject: Establish a Climate Reference Network site to characterize the water and carbon balance for typical ecosystem for arid southwest grasslands.

Application: Improve the current land use models for climate change.

The Effects of Fire and Grazing on Grassland Bird Diversity and Abundance in an Arizona Oak-Savanna

Nichols, Clay. Eastern New Mexico University

Project: Re-survey bird diversity on oak transects established by Bock & Bishop after Ryan fire.

Application: Provide information, long-term, on effect of wildfire on avian diversity and abundance

Pre-monsoon post-fire sediment survey

Nichols Mary, Hydraulic Engineer, USDA-ARS, Tucson, AZ

Subject: Survey several stock tanks on ARR to determine level of sediment movement after monsoon.

Ground cover lost due to Ryan Wildfire.

Application: Predict one factor in rangeland health post fires.

Impacts of grazing, fire and precipitation variability on woody plant cover in Chihuahuan Desert grasslands, USA

O'Neal, Kelley, University of Maryland

Project: Quantify changes in woody plant cover, map occurrence of grazing, fire and precipitation using (in part) Landsat and MODIS satellite data

Application: Identify trends, develop methodology

TogetherGreen Apacheria renewable energy analysis

Porter, Wayne. Arizona State University School of Sustainability, Tempe, AZ

Project: Develop a replicable methodology for characterizing, and also disseminating information about the available renewable energy resources.

Applicability: Analyze methodologies by which to reduce carbon emissions

Inventory of ecological sites, their present day condition, trend and rangeland health

Robinett Dan, Don Breckenfeld, (both retired) U.S.D.A. –N.R.C.S., Tucson, AZ

Project: Mapped the ecological sites on ARR and compared present day plant communities to what our site guides show as potential for MLRA 41.

Application: Baseline information for future research and land management. Reference area for comparison by ranch managers.

***Babocomari River Protection**

Robinett, Daniel G., Robinett Rangeland Resources, Elgin, AZ; Coronado RD & D., Inc. Willcox, AZ.

Project: Establish transects and monitor streamside conditions of Babocomari River, O'Donnell and Turkey Creek for 5 years .

Application: Results will enable sound management decisions to maintain and/or improve vegetation conditions on Babocomari watershed. Will have application to other desert rivers.

Effects of the Ryan Wildfire (April 2002) on Wintering Grassland Birds in the Sonoita Valley, Arizona

Ruth, Janet M. Ph.D., USGS Arid Lands Field Station, Fort Collins Science Center, Department of Biology, University of New Mexico, Albuquerque, NM

Project: Compare pre-fire data collected on the Appleton-Whittell Research Ranch in 1999-2001 with post-fire data collected on the same transects and plots.

Application: Evaluate the effect of wild fire on wintering avian abundance/densities and vegetation structure/composition in desert grassland habitats.

***Wintering habitat use by priority grassland birds**

Ruth, Janet M. Ph.D., Research Ecologist, USGS Fort Collins Science Center, Arid Lands Field Station, Department of Biology, University of New Mexico, Albuquerque, NM

Keywords: wintering grassland birds; habitat use; effects of grazing, Baird's sparrow, Grasshopper sparrow, Cassin's sparrow, McCown's longspur, vegetative structure and composition

Project: How do high priority grassland birds use habitats during the winter season? How is winter habitat use affected by land use practices such as grazing?

Application: Aid in land management decisions to provide habitat.

***Distribution and abundance of breeding Arizona Grasshopper Sparrow (*Ammodramus savannarum amolegus*), and associated priority grassland species, throughout its known range in the Southwest U.S.**

Ruth, Janet M. Ph.D., Research Ecologist, USGS Fort Collins Science Center, Arid Lands Field Station, Department of Biology, University of New Mexico, Albuquerque, NM

Project: Document current distribution and abundance of Arizona Grasshopper Sparrows and associated priority grassland bird species. Test methodologies.

Application: Understanding status and distribution, population trends, ecology and habitat relationships is essential for conservation of avian species of concern.

Preliminary mapping of archaeological sites revealed after Ryan Wildfire

Schupp Leslie, Patagonia AZ

Project: Map archaeological sites between headquarters and research housing post Ryan fire.

Application: Establish permanent record.

***Assessing condition of O'Donnell Creek**

Simms, Jeffrey, BLM Fish Biologist, Tucson Field Office, Nate Dietrich, BLM Hydrologist.

Project: Use Proper Functioning Condition Standards to evaluate the condition of a portion of O'Donnell Creek

Application: Environmental Assessment

The herpetofauna of the Research Ranch

Smith Hobart, Ph.D., University of Colorado; David Chiszar, Ph.D., University of Colorado

Key words: Herpetofauna, Research Ranch

Project: Develop a checklist of reptiles and amphibians known or thought to occur on the Research Ranch.

Application: Baseline information

Quantifying runoff and erosion after the Ryan Fire at The Research Ranch, southeastern Arizona

Stone, Jeffrey and Ginger Paige, USDA-ARS, Tucson, AZ

Subject: To develop a methodology which will provide framework for future experiments

Application: predict the effects of management on the amount of runoff and erosion from ecological sites within MLRA 41-3.

***San Pedro wet-dry mapping**

Killeen, Matt, The Nature Conservancy, Patagonia-Sonoita Creek Preserve, Patagonia

Project: Annual survey of extent of surface water in San Pedro River watershed.

Application: Examine changes over long-term.

Research and reintroduction effort for Huachuca Water Umbel (*Lillaeopsis schaffneriana* ssp. *recurva*)

Titus Jonathan H., Ph.D., SUNY-Fredonia, Priscilla Titus, Fredonia NY

Project: Transplant plugs and monitor success

Application: Protect listed species, aid in development of recovery plan for species

***Examining long-term effects of drought and fire on vegetation using high-resolution satellite phenometrics**

Villarreal, Miquel. U.S.G.S. Tucson, AZ

Project: Field truth satellite imagery.

Application: Estimate changes on cover and phenology related to climate and fire

Chiricahua Leopard Frog reintroduction to the Research Ranch, a conservation strategy

Volentine, Sandy. (Intern) Prescott College, Prescott AZ

Project: Explore opportunities and suitability for reintroduction effort of *Lithobates [Rana] chiricahuensis* to historic habitat

Application: Protect endangered species

Inventory of native plant-feeding insects Arizona

Wheeler, Alfred G., Clemson University

Project: Collect insects that feed on *Eragrostis* spp. and other plants to identify species, and compare species composition with collections from NM, OK and TX.

Application: Baseline information on species occurrence and host plants

Comparison of the soil ecology and nutrient cycling in adjacent viticulture and native grassland habitats

Wyant, Karl. Arizona State University, Tempe, AZ

Project: Compare soil characteristics and fauna between ungrazed grassland and vineyards

Application: Elucidate the detrital food web associated with desert grasslands and adjacent viticulture operations.