



APPLETON-WHITTELL RESEARCH RANCH  
of the  
NATIONAL AUDUBON SOCIETY



## ANNUAL REPORT - 2014

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.

**MISSION of the RESEARCH RANCH:** To be a living laboratory to determine and demonstrate methods to safeguard and rehabilitate grasslands and related ecosystems, 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.

**From the Director**

In this segment of the annual report I usually write about some of the challenges and achievements of the year or a bit of the history and philosophy of the Research Ranch. But this year I'm going to focus more on the reasons for preparing an annual report – why take the time and effort from “real” conservation activities?

We've all heard it somewhere, “The job's not over until the paperwork's done.” Activities associated with the Research Ranch are documented fully – in scientific publications, agency reports, newsletters, databases and spreadsheets, images, and sometimes just as notes filed away in electronic or hard copy. Our annual reports don't capture ALL that goes on here; developing that report would take a full time, year-round position! Rather, we hope to include some of highlights or unusual events, share some large-scale issues and concerns, and give direction to those who wish to delve more deeply. Our annual reports are a mechanism to illustrate and archive the scope of activities associated with the Research Ranch, and our goal is to convey that scope in an interesting, readable format. We hope that we've succeeded!

~Linda Kennedy, Ph.D., Director

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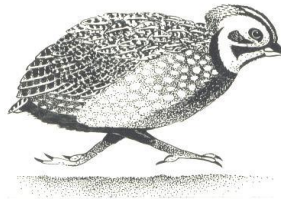
**Audubon Staff on the Research Ranch**

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  
Randy Harper, Facilities Maintenance Coordinator  
Amber Huston, Teacher/Naturalist  
Emily Macklin, Teacher/Naturalist  
Alex Molitor, Development Associate  
Zee Peters, Director of Development  
Steve Prager, Teacher/Naturalist  
Tice Supplee, Director of Bird Conservation  
Cathy Wise, Education Program Coordinator

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



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# History

The history of the Research Ranch was brought to life during a gathering organized by Borderlands Habitat Restoration to discuss past conservation activities on the property. Attendees included Bill Piper, ranch manager of the Elgin Hereford Ranch (now the Research Ranch) 1959-1966 and son, Ted; Phil Ogden (retired U of A range professor); Joe Quiroga (neighboring cattle rancher); Ron Pulliam (researcher from 1970s-current and founding director of Borderlands); Dan Robinett (retired NRCS Rangeland Management Specialist), and others – quite a brain trust!

Bill Piper (left) and Dr. Ogden shared decades of conservation and research experience on the Research Ranch.



Mr. Piper brought an extensive collection of photos and newspaper clippings, which have now been digitized and added to our archives.

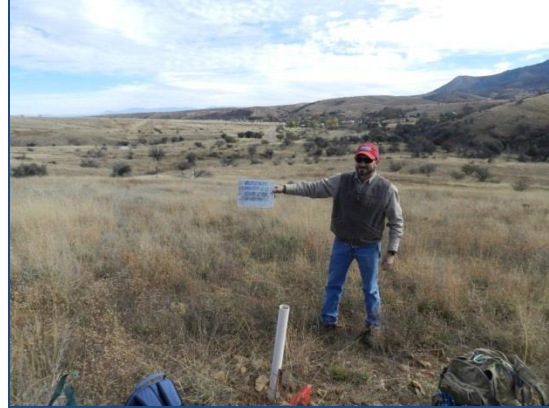
The group examined the spreader dam installed under the direction of Bill Piper more than 40 years ago that has protected the sacaton floodplain from erosion and headcutting.



Dr. Pulliam took the opportunity to examine the flora and fauna found in O'Donnell Canyon.

## CONSERVATION

The first **Coordinated Resource Management Plan (CRMP)** is being developed for the Research Ranch! All land owning partners (see map, page 19) have agreed to participate in this planning effort and the USDA-Natural Resources Conservation Service has taken the lead. A CRMP: "...provides the mechanism for agencies with resource management responsibilities in Arizona to work together, share resource information, and develop complimentary policies, procedures, and methodologies where possible. It is intended to foster cooperation and coordination in development and implementation of sound resource management and conservation programs where objectives are of mutual concern."



Kristen Egen (District Conservationist) team leader, Emilio Carrillo (Area Rangeland Management Specialist), Katie Cline (Rangeland Management Specialist) and Alisha Phipps (Rangeland Management Specialist) make up the NRCS team. Others are assisting with data collection including James Heitholt and Ed Holloway (USFS), Jim Koweek (AZ Monitoring), Dan Robinett (Robinett Rangeland Resources), and staff members Cogan and Kennedy. This effort will generate a living document that will

pull existing data together, develop baselines to address relevant data gaps, and identify what these experts consider to be resource concerns. New information will be incorporated and evaluated annually. We anticipate a completion date of the initial document in the fall of 2016.

**Fire:** Another year slipped by with no fires reported on the Research Ranch – this is a mixed blessing. Fire is dangerous and can destroy infrastructure, but is a natural, necessary part of the ecology of grassland/prairie ecosystems. The Research Ranch deals with the threats from fire by actively practicing “Firewise” principles. We were pleased when another neighbor, Kyle and Suzanne Wilcox, joined the Audubon-Babacomari Ranch Firewise Community.

Entities charged with fire management (federal, state and local) are under constraints that make it hard to allow naturally ignited fires to burn; suppression is still the standard action. Consequently, for the health of the ecosystem we rely on prescribed (ecological) burning. We have made little progress this year in our efforts to update our burn plan; hopefully we’ll make more progress in 2015.

**Climate:** Total precipitation in 2014 was above average, by whatever timeframe of recorded history we use. However, the overall picture is far from cheerful. Per the chart, following, it's evident that 9 out of 12 months experienced lower than average (2000-2014) precipitation.

Precipitation at Research Ranch Headquarters (Inches)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
<b>2000</b>	0.01	0.28	0.41	0.02	0.00	3.60	1.45	3.80	1.05	10.50	0.60	0.00	<b>21.72</b>
<b>2001</b>	1.40	1.80	0.00	1.81	0.00	1.11	3.50	3.10	2.53	0.00	0.09	0.22	<b>15.56</b>
<b>2002</b>	0.45	0.00	0.02	0.00	0.00	0.00	3.03	0.40	2.77	0.58	0.38	0.98	<b>8.61</b>
<b>2003</b>	0.00	2.02	0.20	0.00	0.00	0.00	3.49	4.58	1.50	1.75	0.95	0.32	<b>14.81</b>
<b>2004</b>	1.58	1.01	0.63	1.03	0.00	0.22	2.26	1.81	0.71	0.17	0.58	1.13	<b>11.13</b>
<b>2005</b>	2.08	1.21	0.25	0.24	0.87	0.09	2.02	4.51	2.07	0.61	0.00	0.09	<b>14.04</b>
<b>2006</b>	0.03	0.00	1.01	0.00	0.00	1.79	6.96	5.81	2.98	0.09	0.00	0.44	<b>19.11</b>
<b>2007</b>	1.29	0.00	0.80	0.27	0.00	0.17	7.05	2.27	1.73	0.59	0.74	2.16	<b>17.07</b>
<b>2008</b>	0.65	0.72	0.05	0.00	0.35	1.78	4.82	3.77	0.91	0.53	0.85	0.12	<b>14.55</b>
<b>2009</b>	0.35	0.35	0.26	0.13	0.32	0.62	3.01	2.40	2.01	0.64	0.26	0.62	<b>10.97</b>
<b>2010</b>	4.57	2.05	0.62	0.57	0.00	0.04	6.05	5.83	0.75	0.17	0.04	0.73	<b>21.42</b>
<b>2011</b>	0.00	0.26	0.03	0.12	0.00	0.00	4.44	2.53	2.23	0.23	0.69	2.42	<b>12.95</b>
<b>2012</b>	0.16	0.26	0.42	0.00	0.50	0.13	10.78	1.87	1.18	0.00	0.20	1.97	<b>17.47</b>
<b>2013</b>	1.01	0.44	0.23	0.04	0.00	0.36	3.92	3.03	3.07	0.00	1.38	0.77	<b>14.25</b>
<b>2014</b>	<b>0.00</b>	<b>0.12</b>	2.02	<b>0.11</b>	<b>0.00</b>	<b>0.00</b>	<b>3.24</b>	5.49	7.17	<b>1.07</b>	<b>0.00</b>	<b>0.71</b>	<b>19.93</b>
<b>Mean 00-14</b>	<b>0.91</b>	<b>0.70</b>	<b>0.46</b>	<b>0.29</b>	<b>0.14</b>	<b>0.66</b>	<b>4.40</b>	<b>3.41</b>	<b>2.18</b>	<b>1.13</b>	<b>0.45</b>	<b>0.85</b>	<b>15.57</b>

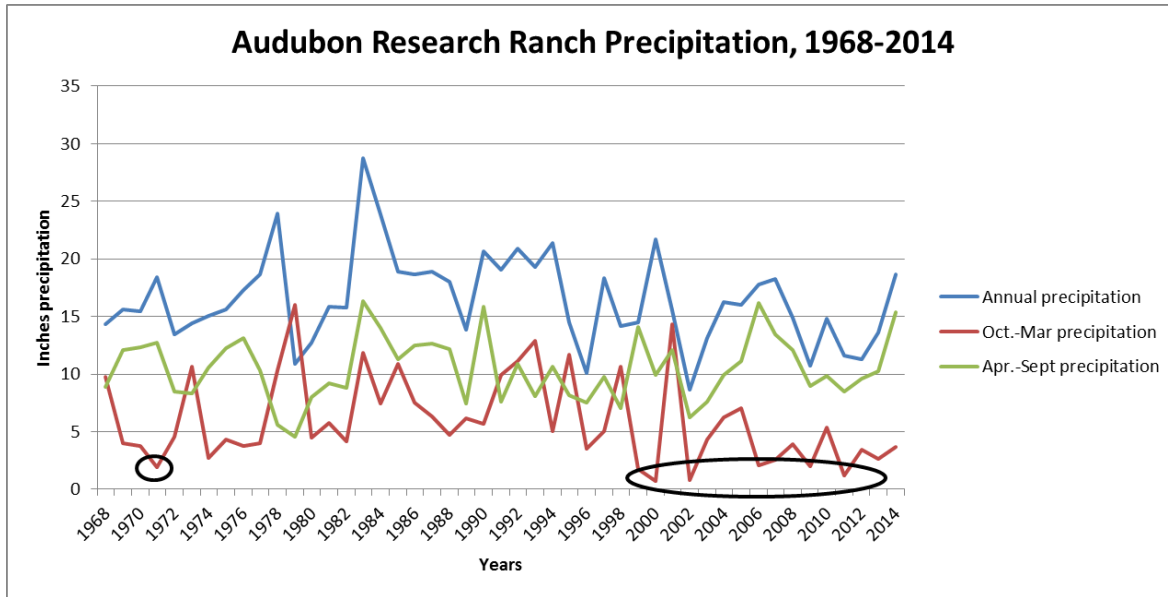
Examination of a longer record shows a developing pattern over overall reduced precipitation, primarily due to a decrease in “winter” moisture.



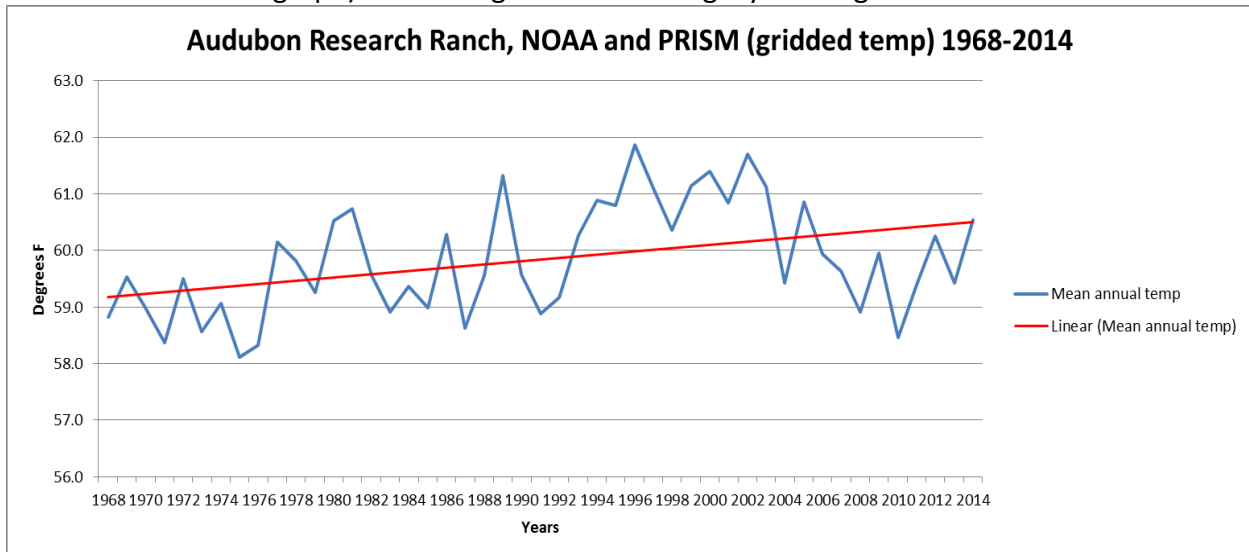
Virga and Double Rainbows







The above graph, Audubon Research Ranch Precipitation, shows the mean annual precipitation for the period 1968-2014 to be 16.5” whereas the mean annual precipitation for the period 1998-2014 is 14.8.” The warm season (April-Sept) mean for both periods is stable at 10.5”, but the average amount received in the winter (Oct-Mar) is quite different: 5.9” (1968-2014) vs 4.3” (1998-2014). Although warm season precipitation is necessary for above-ground biomass production, seed set and storage of photosynthates to carry the plant through the long dormant period, soil moisture during the cool season is critical to enable the plant to survive the dormant period as respiration still continues even if the plant is dormant. Winter droughts can increase plant mortality, and the frequency with which these droughts are occurring (see black ovals in above graph) is stressing the native integrity of the grasslands.



In addition, the mean annual temperature (1968-2014) shows a small but steady linear increase which may compound the impacts of reduced precipitation. (Graphs prepared by Dan Robinett for presentation to Arizona Chapter of the Society for Range Management and used with permission).



Monsoon rains on grasslands that had recently burned on the Babacomari Ranch, our neighbor to the north, reduced access to Research Ranch for several weeks. Tony Leonardini, who volunteers at the Research Ranch, is shown standing in a ditch cut by the precipitation events.



**Threatened or Endangered Species:** The **Northern Mexican Gartersnake** was listed as a Threatened species under the Endangered Species Act per the Federal Register of July 8, 2014. This species has been under study by Roger Cogan as a volunteer for the Arizona Game and Fish Department. He found this young snake (above) near an ephemeral pool, gorging on toads! Since this species is now federally listed, we will apply for the appropriate federal permit to continue monitoring this species on the Research Ranch.

The Federal Register (Oct 3, 2014) formally included the **Yellow-billed Cuckoo** as Threatened under the Endangered Species Act. Madrean Oak Savannah and riparian Sycamore/Oak drainages within the Research Ranch may be included in the designation of critical habitat for this species. Tony Leonardini is conducting a multi-year survey of birds on the Research Ranch and his work was instrumental in the inclusion of this habitat in the comments submitted to USFWS jointly from Audubon AZ, Audubon NM and Audubon Rockies.



**Invasive Species:** Work under a grant from AZ State Forestry Invasive Species Program began this fall and John Richardson AZSF project coordinator (right) came out to evaluate the site. Audubon staff are protecting and rehabilitating native grasslands by treating non-native species that are known to be invasive: Lehmann and Boer lovegrasses, Johnsongrass, Natal grass, Yellow-bluestem, and others. Vegetation transects in the areas treated will help evaluate success. In a site that has



been treated previously and is in “maintenance” mode the frequency of Lehmann lovegrass is 1% and frequency of blue grama is 74.5%. In a previously untreated site within the project area the frequency of Lehmann is 71% and blue grama, 51%. We hope that treatment will reduce the frequency of Lehmann and allow blue grama and other native species to express their natural abundance.

Lehmann, Boer and Johnsongrass have been recognized as invasive, non-native species for some time, but recent range extensions by yellow bluestem (above, left) and natal grass (right) have prompted many queries about identification from other land managers.



Ralph Dinsman (below) volunteered to assist with treatment of Himalayan blackberries: cut the wands, then immediately treat cut stump with herbicide. This was one of many projects that Ralph worked on – almost certainly the most



tedious and painful one!

Waters of the Research Ranch are continually monitored for the presence of non-native, predatory bullfrogs - Cogan removed four in 2014. Another problematic species, green sunfish, was the focus of a project by Sean Carter, recipient of a 2014 Apacheria Fellowship for Undergraduates. Carter eradicated 427 and observed the impact this removal had on native Sonoran mud turtles. His paper can be found in the library of the Research Ranch website. Collection of both species possible under

the auspices of Arizona Scientific Collection Permit SP666113 (Kennedy).

**Sacaton Grassland/Floodplain Rehabilitation:** The RIESTER Conservation Foundation continued their financial support again this year for our effort to rehabilitate a floodplain dominated by non-native Bermudagrass. Sierra Club Service Tour volunteers (left) helped by transplanting sacaton salvaged from roads or too close to buildings. Transplanting is a big effort, but only the start. Plants must be irrigated through dry seasons for at least 2 years to enhance survivorship.



## RESEARCH & MONITORING

### 2014 Apacheria Fellowship Recipients Kortney Jaworski, Sean Carter



Kortney Jaworski, a M.S. student at John Carroll University, earned her fellowship to investigate the relationship between lizard traits, population structure, and fitness using Yarrow's spiny lizards (*Sceloporus jarrovi*) as a study organism.

Sean Carter is pursuing a Bachelor's degree at Colorado College. He was awarded a fellowship to gain field experience in a broad range of ecological applications and to develop and pursue a specific research project. He chose to examine the effects of invasive Green Sunfish on native Sonora Mud Turtles.



### Updates on Research & Monitoring Activities:

**Christmas Bird Count:** The 2013 Appleton-Whittell Christmas Bird Count was held on January 4, 2014 and tallied 4579 individual birds of 106 species. On the Research Ranch portion of the



larger circle, 1156 individual birds were recorded representing 59 species. The 2014 AWCBC will be held on January 3, 2015. Robert Weissler, Huachuca Audubon Society, organizes this event and submits the results to Audubon to be incorporated into this nation-wide effort.



Erik Andersen (photo at left) continued his work determining the effects of mesquite encroachment on avian diversity, density and reproductive success. Erik is a Ph.D. student at the University of Arizona and a 2013 Apacheria Fellow.

Anthony Gilbert, Ph.D. student at Ohio University, initiated his dissertation work by investigating the thermal physiology of the ornate tree lizard (*Urosaurus ornatus*). Anthony spent much time in the Research Ranch laboratory (right).



Justin Zweck, Ph.D. student from Saint Louis University, (photo at left) began his study of the pollination biology of *Dalea* species with "closed" and "open" floral forms.

Biologists from the Bureau of Land Management established 3 long-term monitoring plots to evaluate the health and longevity of *Agave palmeri* (photo at right). Of particular interest is the number of plants in which the flowering stalks are eaten before they have a chance to flower. The flowers of this species provides nectar for the lesser long-nosed bat (Federally listed as an endangered species). Results from these control plots will be compared to sites that are grazed by domestic livestock.



To see a complete list of active research/ monitoring projects and also publications associated with the Research Ranch, see pages 20-27 of this report.



## EDUCATION & OUTREACH:

### Living Gently on the Land



**Potlucks & Presentations** are held during the fall, winter and spring on a wide range of topics – some presentations are fun, some are weighty, all are informative – and the food is always great!

- January - Arizona Land & Water Trust —Sharma Hammon Torrens (photo at left)
- February - Climate Change and Southeast Arizona: Past, Present, and Future by Michael Crimmins
- March - 19th and Early 20th Century Anthropogenic Influences on the Vegetation of Southeastern Arizona by Conrad Bahre (photo, above)
- April—Butterflies Beautiful and Bright by Pamela Mowbray-Graeme
- May— Deserts of the U.S. by Betsy Kunzer
- September— Monarch Migrations, by Gail Morris
- October—Student Scientists from Elgin Middle School: Bryan Gutierrez, Ruby Kay & Marin Tomlinson (photo at right)
- November—Mesquites in the Grasslands, by Greg Barron-Gafford



**Science on the Sonoita Plain:** Back in 2009 it was decided that one of the quarterly meetings of the Sonoita Valley Planning Partnership should be dedicated to science and held at the Research Ranch. Since that time SoSP (the Science on the Sonoita Plain symposium) has almost taken on a life of its own, with a coordinating committee, request for proposals, proceedings, on-line registration, etc. The Society for Range Management approves the event for 6 CEUs for Certified Professionals in Rangeland Management.

The 6<sup>th</sup> annual event was held here on a warm June 7<sup>th</sup> and dedicated to the memory of Grant Drennan, a BLM range conservationist who passed away in 2013.



The morning sessions were devoted to issues associated with mesquite management and moderated by Dr. Phil Heilman, USDA-Agricultural Research Service. Presentations included:

- General overview of brush management issues: Phil Heilman (USDA-ARS)
- Mesquite Bosque Functions—Loss and Renewal: Julia Fonseca (Pima County)
- Hydrologic aspects of mesquite encroachment: Russ Scott (USDA-ARS)
- Wildlife and mesquite: how birds respond to woody plant gradients: Ron Pulliam (Borderlands Habitat Restoration)
- A history of mesquite management in southern Arizona: Dan Robinett (Robinett Rangeland Resources)
- Current management considerations and recent efforts: Dan Quintana (BLM)
- Panel discussion, Q and A – all speakers

The afternoon session covered a broad range of topics and was moderated by Gita Bodger, The Nature Conservancy:

- Delineation and screening of recharge sites for installation of rock detention structures in the Babocomari River, a tributary of the San Pedro River: Laura M. Norman, Laurel Lacher, David Seibert, H. Ron Pulliam, Trevor Hare, Valer Austin, Miguel Villarreal, Floyd Gray, and James Callegary
- Land management practices under climate extremes: Implications for soil loss and dust production: Jason Field

- The Cienegas of Las Cienegas National Conservation Area - It is All About the Water: Andrew Salywon and Ron Tiller
- Cretaceous Paleontological Resources of the Sonoita Valley, Revisited: Robert McCord
- Crotalid Assessment at the Appleton-Whittell Research Ranch: Use of Coverboards and Nail Polish to Study Rattlesnake Populations: Roger Cogan
- The Cienega Timeline Project: An Update: Shela McFarlin and Annamarie Schaecher
- Update: Recent developments in the Las Cienegas National Conservation Area – Karen Simms, Amy Markstein, Vi Hillman

Scientific Posters were displayed all day:

- Could Repeated Fires be used to Manage Mesquite?: Linda Kennedy, Carl Bock, Jane Bock, and Zach Jones
- Temporal Study of Cienegas at Cienega Creek using Multispectral Satellite Imagery and Aerial Photography: Natalie R. Wilson, Laura M. Norman, Ron Tiller, Andrew Salywon, Leila Gass, and Miguel Villarreal
- Black-tailed Prairie Dog Release Efforts on the Empire Ranch: Sarah Hale
- Response of Ornate Tree Lizards to Disturbance: Matthew Lattanzio

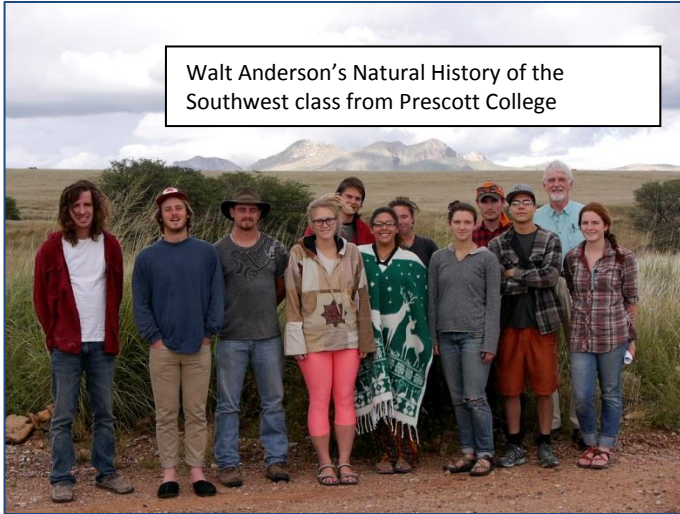
The proceedings for the symposium was compiled by Amanda Webb and is available on the Research Ranch and the Cienega Watershed websites.



Doug Duncan, USFWS, conducted the annual monitoring of the endangered Desert Pupfish population while other participants of the Science on the Sonoita Plain supervise!



**Field Trips to the Research Ranch Included:**



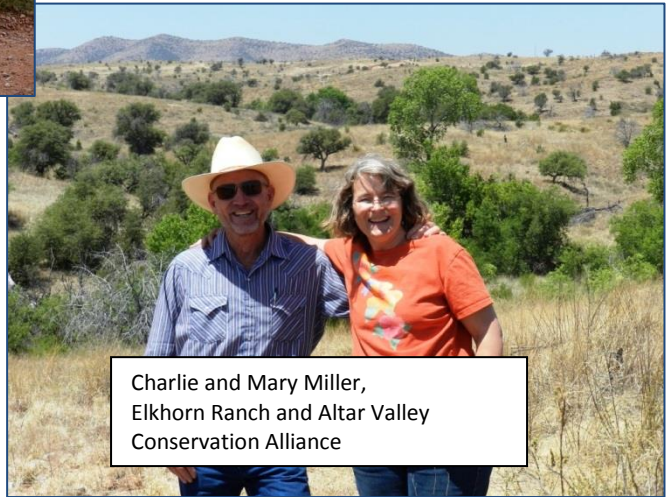
Walt Anderson's Natural History of the Southwest class from Prescott College



Don and Joanne Wuori, members of a group from Audubon South Carolina



Discovery Days – Santa Rita Experimental Range (photo by Mark Heitlinger)



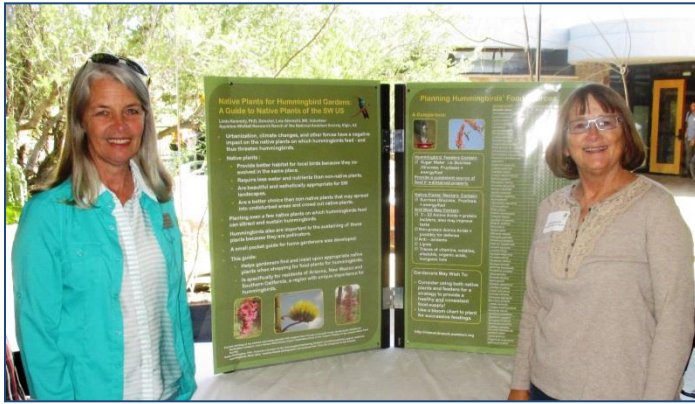
Charlie and Mary Miller, Elkhorn Ranch and Altar Valley Conservation Alliance



And Mrs. Koweek's 7<sup>th</sup> Grade Science class from Elgin School







A “Native Plant for Hummingbird Gardens” poster was presented by Linda Kennedy and Lois Albrecht at the Arizona Botanists Meeting at the Arizona-Sonora Desert Museum.

Kennedy led a field tour at Borderland Restoration’s “Let’s Get Grassed” event held at Deep Dirt Farms in Patagonia (right, photo by Kate Tirion) and held the



first “Intro to Grassland Ecology” event at the Research Ranch specifically for student scientists conducting research in the area.

Opportunities to share the mission of the Research Ranch off site included presentations by Cogan to the Elgin Cowbells and to Southwest Wings Birding Festival. “Watching Grass Grow at Appleton-Whittell” was the title of an article by Lisa Harris that was included in the Desert Leaf, The Catalina Foothills Magazine.

## FACILITIES

Thanks to Ruth Dyson (right) the Swinging H Ranch House (the oldest building on the Research Ranch) will soon be usable year-round! Ruth, who began volunteering at the Ranch back in 1994, offered a challenge that would help us install a heating system in that building. She would match contributions up to \$5,000! All we had to do was raise another \$5,000!



Kennedy decided to add even more incentive with a "Bucket Challenge" – Cogan and Kugler would get to pour a 5-gallon bucket of water on her head: WARM if we met our goal and ICE COLD if we fell short.

### *The Water Was Warm!*

Altogether almost \$13,000 was donated by friends and supporters. By next year a new mini-split (installed by Elgin Energy [who is giving us a really great deal]) will allow year-round use. In addition, additional ceiling fans will be installed, wiring brought up to code and other electrical improvements will be made.





## ADMINISTRATION

The market value of the endowment fund on July 1, 2013 equaled \$4,452,922 and had grown to \$ 4,838,902 by June 30, 2014. However, distributions from the endowment fund to the Research Ranch operating account totaled \$190,821, which is \$7,626 less than the prior fiscal year. At fiscal year-end (June 30, 2014), the Research Ranch showed an operating deficit of \$4,535. The fiscal report from our auditors is below.

### NATIONAL AUDUBON SOCIETY, INC.

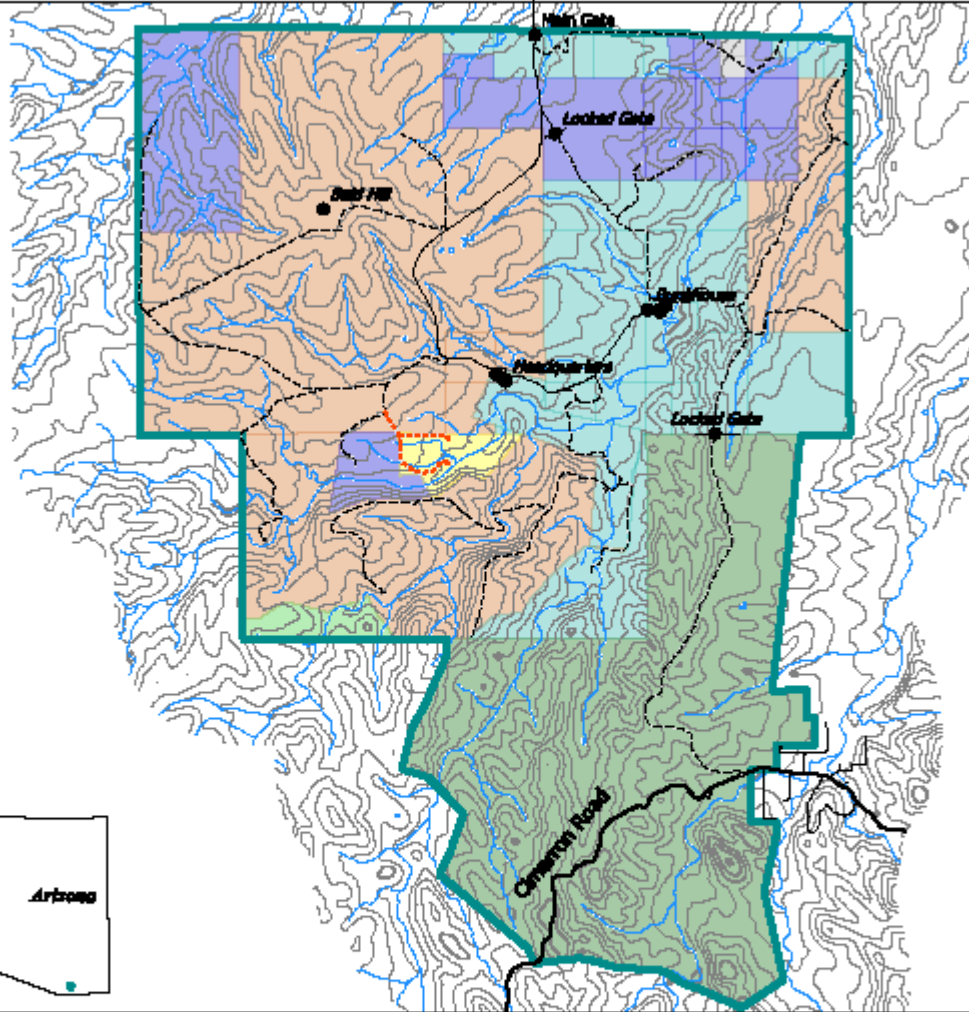
#### Research Ranch

#### Schedules of Activities - Research Ranch

For the years ended June 30, 2014 and 2013

	2014	2013
<b>REVENUE</b>		
Contributions	\$ 15,501	\$ 9,940
Rentals	4,455	8,630
Pooled investment income - appropriated	190,821	198,444
Other income	10,147	4,140
Assets released from restrictions	945	10,424
Total revenue	<u>221,869</u>	<u>231,578</u>
<b>EXPENSES</b>		
Salaries and fringe benefits	157,306	158,979
Travel	937	75
Staff training	-	35
Postage - general	522	328
Grants	1,000	-
Gas and electricity	1,893	2,493
Building and office maintenance	594	1,700
Telephone	5,055	4,756
Insurance	7,024	7,210
Maintenance - general, road and vehicles	4,357	7,727
Office and household supplies	2,603	1,820
Education materials	179	153
Furniture and fixtures	-	2,187
Computer equipment and software	441	897
Farm supplies	1,482	1,105
Printing	2,593	770
Advertising	-	25
Licenses, permits and registrations	422	165
Dues and subscriptions	20	165
Support services allocation	38,253	38,134
Other	15	12
Depreciation	1,708	1,708
Total expenses	<u>326,404</u>	<u>229,934</u>
(Deficit) excess of revenues over expenses	<u>\$ (4,535)</u>	<u>\$ 1,644</u>

# Appleton-Whittell Research Ranch Land Ownership



Legend	
	<b>Land Ownership</b> Audubon
	Bureau of Land Management
	U.S. Forest Service
	South Coast Land & Cattle
	The Nature Conservancy
	The Research Ranch Foundation
	Not under Audubon Management
	<b>Lines</b> AWER Boundary
	Paved Road
	Dirt Road
	Trail
	Private road
	Contour lines
	Stream beds

Appleton-Whittell Research Ranch  
 EC 1 Box 44  
 Higley, AZ 85611  
 520-453-5522  
[researchranch.audubon.org](http://researchranch.audubon.org)

**Land ownership within AWER**  
 Map prepared by C. Hess, AWRM, April 2010.  
 Scale: 1:45000



**Reports and Publications associated with the Research Ranch  
Received since 2013 annual report**

- Aiello, C., L. Duriancik, D. Goodrich, D. Smith, P. Heilman, J. Frankenberger, L. Morton. 2014. USDA Agency Priority Goal for Water Pilot Projects Final Report. 34 pgs.
- Beal, M.S., M.S. Lattanzio & D.B. Miles. 2014. Differences in the thermal physiology of adult Yarrow's spiny lizards (*Sceloporus jarrovi*) in relation to sex and body size. Ecology and Evolution. Published by John Wiley & Sons Ltd. Doi: 10.1002/ece3.1297
- Bock, C. E., and J. H. Bock. In Press. Effects of wildfire on riparian trees in southeastern Arizona. The Southwestern Naturalist. Anticipate publication in 2015.
- Borders, B., A. Casey, J. M. Row, R. Wynia et al. 2013. Pollinator Plants of the Central United States Native Milkweeds (*Asclepias* spp.). Portland OR, The Xerces Society for Invertebrate Conservation. 19 pgs.
- Borders, B., E. Eldredge, E. Mader, and C. Burns. 2012. Great Basin Pollinator Plants: Native Milkweeds (*Asclepias* spp.) The Xerces Society for Invertebrate Conservation, Portland OR, in collaboration with USFA-NRCS Great Basin Plant Materials Center, Fallow NV. NVPMP Technical Note No. 56. 12 pgs.
- Brown, T. et al. 2014. Xylem vulnerability to drought greater in post fire resprout oaks than in adults in a Chihuahuan desert sky-island. Poster Presentation. Ecological Society of America Annual meeting. Sacramento, CA
- Brunson, V., V. Klimkowski, et al. 2014. Agonistic Displays in the "Non-displaying" Slevin's Bunchgrass Lizard, *Sceloporus slevini*, in Arizona. Abstract. Princeton University 51st Annual Animal Behavior Meeting. Petersburg, VA
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## Science on Audubon's Appleton-Whittell Research Ranch

### Summary and Status of Active Research/Baseline Projects - 2014

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**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.

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#### **Investigating the effect of livestock on the physical properties of soil in an arid grassland**

Allington, Ginger. Michigan Univ. and Thomas J. Valone; Saint Louis University.

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.

#### **Effect of mesquite cover on avian diversity, density and reproductive success in desert grasslands**

Andersen, Erik and Dr. Robert Steidl. SNRE, University of Arizona.

Subject: Sites on Research Ranch to be used as control/reference compared to grazed grasslands

Application: Better understanding of ecological processes driving grassland ecosystems and aid development of sound management practices.

#### **Northern Mexican Gartersnake Management**

Arizona Game & Fish Dept. (AZGF): Tom Jones, Roger Cogan & Linda Kennedy, Volunteers, covered under AZGF Section 6 authority to manage federally threatened species.

Subject: Capture, mark, process and release Mexican Gartersnakes

Application: Document recruitment and recaptures of federally threatened species.

#### **Pupfish**

Arizona Game & Fish Dept. (AZGF): Ross Timmons (2010).

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

Application: Conserve native species

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

AZGF. John Millican (ret); Arizona Game & Fish Department; 555 North Greasewood; Tucson, AZ 85745

Project: Estimate populations

Application: Track success of re-introduction effort

#### **Avian Monitoring for Research Ranch IBA**

Audubon staff: Tice Supplee, L Kennedy,

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: L. Kennedy, R. Cogan

Subject: Discover and eradicate individuals within boundary of ARR

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

Filename: ARR Bullfrogs 2008

#### **Christmas Bird Count – Appleton Whittell Circle**

Audubon staff; Robert Wessler (Huachuca Audubon Society) – organizer and 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 & Volunteers

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. Based on Ecological Site Map (Robinett & Breckenfeld)

Application: Identify trends in vegetation change

#### **Precipitation at Ecological Sites**

Audubon Staff – Linda Kennedy

Project: Establish range gages to correspond with ESM. Based on Ecological Site Map (Robinett & Breckenfeld)  
Application: Correlate precipitation with changes in vegetation.

**Wild Turkeys on the Research Ranch**

Audubon Staff; Linda Kennedy, Assistant Director  
Project: Record sightings of wild turkeys.  
Application: Document spread of sub-species reintroduced in Huachuca Mtns.

**Effects of fire and climate change on mesquite**

Audubon Staff: Kennedy, Linda  
Project: Monitor the effects of fire and climate change on mesquite.

**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

**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

**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

**Agave Site Monitoring**

BLM (Tucson Field office) and University of Arizona (Cochise Co. Extension). Maria Williams (U of A, BLM), Kristen Duarte (BLM)  
Project: Establish permanent transects to monitor agave numbers, class and herbivory.  
Application: Ungrazed land to function as control.

**Assessing condition of O'Donnell Creek**

BLM. 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

**Minimizing the effects of Green Sunfish (*Lepomis cyanellus*) on native competition.**

Carter, Sean. Colorado College.  
Project: Remove predatory, non-native sunfish from South Post Canyon pools  
Application: Study changes in behavior of Sonora mud turtle when experiencing levels of competitive release.

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

Chavarria, Pedro Mazier, Northern New Mexico College and 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.

**Annotated Bibliography of Lehmann Lovegrass**

Chasey, Richard Adam. San Francisco State University  
Project: Gather all known publications associated with non-native, invasive *Eragrostis Lehmanniana*  
Application: Aid to research and management

**Survey of herpetofauna (reptiles and amphibians) of the Research Ranch**

Cogan, Roger C., Conservation Coordinator, AWRR.  
Project: Document sightings of herps  
Application: Determine whether new species are on AWRR and if species earlier recorded are extant.

**Use of Cover Boards to Locate and Monitor Reptile Species**

Cogan, Roger C., Conservation Coordinator, AWRR,  
Project: Distribute coverboards in specific locations across AWRR  
Application: Evaluate technique to further baseline knowledge about reptiles.

**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. Assistant Professor. Harvey Mudd College  
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. .

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 Threatened species

**Annotated bibliography of selected reports, publications and theses**

Dyson Ruth E, Mason, Mi.

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

Application: Facilitate information exchange and document publications

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

Ferguson, George, University of Arizona, Tucson 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

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.

**Merging functional ecology and phylogenetics to predict the response of grasslands to global change**

Forrestel, Elisabeth, Melinda Smith, Ph.D., Yale University.

Project: Compare natural grassland sites across broad precipitation gradients in North America, Australia and South Africa.

Application: Provide evolutionary history and functional biology of ecologically and economically important grass species here.

**Ecological and evolutionary responses of lizards to resource limitation**

Gilbert, Anthony. Ohio University

Project: Quantify how resource limitation impacts lizard performance, fitness and social dominance.

Application: Furthering knowledge of how lizards may respond to anthropogenic disturbances such as climate change

**Research Ranch boundary surveying and mapping**

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

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

**Linking individual behavior, microhabitat use, and spatial population structure with fitness**

Jaworski, Kortney. John Carrol University

Project: Study behavior of adult male mountain spiny lizards (*Sceloporus jarrovi*)

Application: Insight onto the relationship between individual traits and population spatial structure and influence upon fitness.

**Camera-trap Network**

Joder, Greg., Tucson, AZ

Project: Collect photographic or video for archival purposes.

Application: Augmentation of research, ecosystem conservation and education/outreach goals of AWRR.

**Photo-herbarium for the Research Ranch**

Kennedy Linda, Director, Research Ranch

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

Application: Baseline information for future research; Aids identification.

**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, Dylan Schwillk. 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.. Christopher Newport University, Newport News, VA.

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

**Avian Survey/Monitoring on the Research Ranch**

Leonardini, Tony. Volunteer, Appleton-Whittell Research Ranch

Project: Document avian species composition and population size.

Application: Baseline information and trends. Develop database to track and archive data.

**Evaluating Avian Use of Restored Desert Grasslands**

Levandoski, Greg. Rocky Mountain Bird Observatory

Project: Determine wintering abundance, distribution and habitat needs of grassland birds.

Application: Enable conservation of grassland birds by establishing baseline (control) response to restoration.

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

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

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

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

National Oceanic & Atmospheric Administration (NOAA); Tilden P. Meyers, Ph.D. Meteorologist; NOAA, Oceanic and Atmospheric Research, Oak Ridge, TN; John Hughes, NOAA, National Data Climatic Center, U.S. Climate Reference Network, Asheville, NC

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

Application: Data will be used to 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, Portales, New Mexico

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

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

O'Neal, Kelley. Department of Geography, 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

**The Babacomari Restoration Project**

H. Ron Pulliam. Borderlands Restoration, L3C

Subject: Re-establish avian plots from 1970s & 1980s to serve as control/reference areas.

Applicability: Evaluate effectiveness of rehabilitation efforts on Babacomari Cattle Ranch.

**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 Audubon 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., USGS Arid Lands Field Station, University of New Mexico, Albuquerque, NM

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?

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

Ruth, Janet M. Ph.D., USGS Arid Lands Field Station, 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.

**Locate Native *Pectis imberbis***

Schmalzel, Robert (Bob). Sonoran BioQuest, LLC.

Project: Relocate historic sites of rare plant. Document habitat.

Application: Information may be used in support of or against federal listing.

**Biomass of grassland in proximity to Thomas study plots and inspection of dead cactus carcasses for evidence of insect**

Schmalzel, Robert (Bob). Sonoran BioQuest, LLC.

Project: Determine above-ground biomass and examine cacti for weevils

Application: comparison of biomass associated with Thomas study plots to Altar Valley grasslands

**The Nature Conservancy Wet-Dry Mapping**

TNC. Miller, J.B., Canelo Hills Cienega Preserve

Project: Map extent of open water in O'Donnell Canyon

Application: Track the health of the San Pedro river by monitoring surface water during driest time of year.

**Research and reintroduction effort for Huachuca Water Umbel**

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

Project: Transplant plugs and monitor success

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

**Meteorological Station**

USDA-ARS. Keefer Tim, Hydrologist; 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

**Pre-monsoon post-fire sediment survey**

USDA-ARS. Nichols Mary, Hydraulic Engineer, 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.

**Conservation Effects Assessment Project on the Cienega Creek Watershed**

USDA-ARS. Goodrich, David C. and Haiyan Wei. Southwest Watershed Research Center, Tucson, AZ

Project: Use data from the Research Ranch as a control to judge vegetation cover and condition for a non-grazed condition for a number of years.

Application: Quantify the benefits of conservation management and practices.

**Soil inventory update**

USDA-NRCS. Breckenfeld, Donald J., Daniel Robinett; 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.

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

USDA-NRCS: Robinett Dan, Don Breckenfeld, 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. Control area for comparison by ranch managers.

**Natural Resources Inventory – Primary Site Unit**

USDA-NRCS. Tucson, AZ. Emilio Carrillo (2004), Christine Egen (1992), Steve Barker (1982)

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



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

**Rangeland Health Reference Areas**

USDA-NRCS (Natural Resources Conservation Service). Wilma Renken, Ecological Site Inventory Specialist.

Tucson Soil Survey Office. Tucson, AZ

Project: Determine reference areas for Ecological Sites Descriptions in MLRA-41 (high functioning rangelands with minimal human and livestock impacts)

Application: Reference areas used to support rangeland health descriptions in 2-3 million acres of SW.

**National Soil Health & Sustainability**

USDA-NRCS Dial, Heather. Tucson Plant Materials Center.

Project: Haney Soil Test on loamy upland, sacaton bottom, Boer monoculture

Application: Reference for comparison through time and against other land uses.

**Agave Monitoring on the Coronado National Forest**

USFS. Biedenbender, Sharon, Ph.D., James Heitholt

Project: Monitor impacts of livestock grazing on florivory of agave

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

***Pectis imberbis* surveys**

USFWS. Julie Crawford. Tucson, AZ.

Project: Survey reported sites

Application: Information on species that may become federally listed.

**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. 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., Department of Entomology, Clemson University, Clemson, SC

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.

**Pollination without a keel: an investigation of floral form change in the genus *Dalea* (Fabaceae)**

Zweck, Justin. Saint Louis Univ. St. Louis MO

Project: Compare pollination biology of *Dalea* species with “closed” and “open” floral forms

Application: May encourage planting of specific *Dalea* species to serve as host plants for pollinators that are important for legume crops.

