

Invasive Plant Grant Program  
2014 Grant Application-ASFD

FOR OFFICIAL USE ONLY	
Dollar Amount Requested:	\$20,000
Matching Share:	\$20,758
Percent (%) Matching	51%%

Applicant Information	
1	<b>Applicant:</b> Appleton-Whittell Research Ranch of the National Audubon Society, Inc.
	<b>Contact Person:</b> Linda Kennedy, Ph.D., Director
	<b>Address:</b> 366 Research Ranch Road
	<b>City/Zip Code:</b> Elgin, AZ 85611
	<b>Phone (Work/Cell):</b> 520 455 5522
	<b>Email:</b> lkennedy@audubon.org
	<b>Fax:</b> 520 455 9201

Project Information				
2	<b>Name of Project:</b>	Protect Native Grassland Ecosystems		
	<b>Community Name:</b>	Sonoita Plain		
	<b>County:</b>	Santa Cruz	<b>Congressional District:</b>	3
	<b>Latitude (decimal degrees):</b>	31.590	<b>Longitude (decimal degrees):</b>	110.506

Grant Contributors (Matching Share)							
(Federal dollars DO NOT qualify)							
Please specify each match contributor and the dollar amount of each contribution.							
Please DO NOT show grant requested funds in this table. This is for matching share only.							
3	<b>Contributors:</b> (Please specify)	Research Ranch					<b>TOTAL</b>
	<b>Dollars (Hard Match):</b>	\$20,758	\$0	\$0	\$0	\$0	<b>\$20,758</b>
	<b>In-Kind (Soft Match):</b>	\$0	\$0	\$0	\$0	\$0	<b>\$ 0</b>
	<b>TOTAL:</b>	<b>\$20,758</b>	<b>\$ 0</b>				

Total Project Expense (break down matching share totals from block three)					
4		Grant Share (\$ Amount Requested)	Match (from block three)		TOTAL
			Dollars	In-Kind	
	<b>Personnel / Labor:</b>	\$20,000	\$16,630	\$0	<b>\$36,630</b>
	<b>Operating / Supplies:</b>	0	\$3,680	\$0	<b>\$3,680</b>
	<b>Travel:</b>	\$0	\$448	\$0	<b>\$ 448</b>
	<b>Contractual Services:</b>	\$0	\$0	\$0	<b>\$ 0</b>
	<b>Equipment:</b>	\$0	\$0	\$0	<b>\$ 0</b>
	<b>Indirect Costs:</b>	\$0	\$0	\$0	<b>\$ 0</b>
	<b>TOTAL:</b>	<b>\$20,000</b>	<b>\$20,758</b>	<b>\$ 0</b>	<b>\$40,758</b>

<b>Project Summary</b> (check all that apply and answer related questions in appropriate box)	
5	Is this a new project? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
	What is the duration of this project? (24 month maximum) 24 months
	Number of acres to be treated: 350 Estimated cost per acre:
	Are the acres to be treated contiguous (adjacent to each other)? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If no, please describe their layout in block six (6).
	Does this project have a current invasive/noxious plant management plan? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If yes, please attach the plan to this application.
	Is this project managed by a professional land manager? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Please provide qualifications in block six (6).
	Number of communities directly affected by this project: 20
	Number of citizens to be reached: 3,000
	Number of residences affected: 1,000

<b>Project Area Description</b>	
All information for the project should fit into the allotted character space provided below. Addendum may be submitted if more space is needed.	
6	<p><b>Provide an overview of the project and the project area.</b> 2500 characters</p> <p>The Appleton-Whittell Research Ranch is an 8000 acre sanctuary for native biota and an ecological field station in Santa Cruz Co., AZ. Audubon owns several parcels and manages the remainder under various contractual agreements with partners, including the USFS. Floristically, the Research Ranch is primarily Madrean Mixed Grass Prairies and Madrean Evergreen Woodland. One of the most critical issues facing grasslands and related ecosystems is invasion by non-native species. This proposal addresses 3-7 species on the 2014 Coronado NF Invasive Exotic Plant List: Whitetop (<i>Cardaria draba</i>), Lehmann (<i>Eragrostis lehmanniana</i>) and Boer lovegrass (<i>E. curvula</i> v. <i>conferta</i> [<i>E. chloromelas</i>]), and potentially: Johnsongrass (<i>Sorghum halapense</i>), Natal grass (<i>Melinis repens</i>), Yellow bluestem (<i>Bothriochloa ischaemum</i>), and Weeping lovegrass (<i>Eragrostis curvula</i>). The project area is Audubon property and is within ½ - 1 mile of the Coronado NF. Research Ranch Road bisects the project area and has been both the historical distribution corridor of unwanted plant propagules and the staging area from which we have launched our efforts to re-claim the native uplands from invasive grasses.</p> <p>As seen in the attached invasive plant management plan, Audubon uses an integrated weed management approach that is tailored to the target species. One cultural tool has been in place since 1968 – elimination of grazing by domestic livestock; grazing has been shown to hasten the spread of several species, notably the exotic lovegrasses.</p> <p>The 5 parts of this project are:</p> <ol style="list-style-type: none"> <li>1) Survey for and treat Whitetop if found. If not found during the period of this grant, effort will be shifted towards control of Johnsongrass.</li> <li>2) Maintain approximately 200 acres of sandy loam upland and loamy uplands invaded by Lehmann and Boer lovegrasses that have been treated previously.</li> <li>3) Expand the treated area around the area described in (2) an additional 50 acres.</li> <li>4) Remove Natal Grass, Weeping Lovegrass, and Yellow Bluestem wherever found in the project area.</li> <li>5) Explore the expansion of the existing Southeastern Arizona WMA into Santa Cruz County and strengthen outreach efforts.</li> </ol> <p>One aspect that is part of this project in an "unofficial" way (we are not asking for financial support at this time) is our role as a source of science based management information. We believe strongly that what we learn here on the Research Ranch can and should be leveraged throughout the broader scope of arid grasslands.</p>
	<p><b>Briefly describe the qualifications of the person(s) managing this project.</b> 500 characters</p> <p>Linda Kennedy holds a Ph.D. in Botany /Plant Ecology. She has been the Director of the Research Ranch since 2006 and was the Assistant Director from 1999. Publication topics include effects of fire and grazing in grasslands of the Southwest. She is a certified instructor for community colleges in Arizona and has written and administered numerous grants.</p>

	<b>Project Goals and Objectives</b> All information for the project should fit into the allotted character space provided below. Addendum may be submitted if more space is needed.
7	<p><b>Provide a brief description of how this project meets the grant objectives and goals. 1500 characters</b></p> <p>1) Whitetop - Goal: All populations of Whitetop within the project area (100 acres) will be discovered, gps locations noted, and treated with herbicide. Objective: Whitetop will not expand north of Research Ranch Road.</p> <p>2) Maintain 200 acres of sandy loam upland and loamy uplands - Goal: Lehmann lovegrass and Boer lovegrass plants will be discovered and treated with herbicide. Objective: Frequency of combined occurrence will be 1% or less.</p> <p>3) Expand the treated area around the area described in (2) an additional 50 acres. Goal: Lehmann lovegrass and Boer lovegrass plants will be discovered and treated with herbicide. Objective: Frequency of combined occurrence will be reduced 50% each year.</p> <p>4) Eliminate Natal Grass, Weeping Lovegrass, and Yellow Bluestem if found in the entire project area (350 acres). Goal: All members of these species will be manually removed or chemically treated. Objective: Recruitment (reproduction) will not take place.</p> <p>5) Certified Weed Management Area and outreach/education activities. Goal: Reduce impact of invasive plant species both on the Research Ranch and throughout grasslands of the Southwest. Objectives: a) Determine if participation in SEAZWMA or development of a new WMA is feasible. b) Share what we've learned about treatment of invasive plant species.</p>

	<b>Scope of Work / Project Timeline</b> All information for the project should fit into the allotted character space provided below. Addendum may be submitted if more space is needed.
8	<p><b>Provide a brief scope of work which clearly describes how grant funds will be spent: Types of treatments proposed, invasive/noxious plant of concern and any information and education activities. (This should be more specific than the project description) 1500 characters</b></p> <p>Skilled labor is the greatest expense: the Research Ranch is remote, treatment schedules vary due to weather conditions and identification of the plants can be difficult.</p> <p>1) Survey approx. 100 acres of sacaton for infestations of Whitetop. If found, treat with herbicide specific to broadleaves. Whitetop has been found and treated in this area previously. It is important to stop the advance of this species before it reaches the Babacomari Cienega, just downstream. Whitetop remains dormant if winters/springs are dry. If that happens during the term of this grant, that year's effort will be directed towards treating Johnsongrass with 3% glyphosate.</p> <p>2) Maintain approximately 200 acres of sandy loam upland and loamy uplands invaded by Lehmann and Boer lovegrasses that have been treated previously. Exotic plants are interspersed within native grassland communities, thus much time will be spent walking through the grasslands. Individual exotic plants will be sprayed with 3% glyphosate plus surfactant and colorant. Each area must be revisited repeatedly throughout the growing seasons.</p> <p>3) Expand treated area an additional 50 acres using technique outlined in (2).</p> <p>4) Use glyphosate or manual methods to remove Natal Grass, Weeping Lovegrass, and Yellow Bluestem if found in the project area.</p> <p>5) Explore expansion of the existing SE Arizona WMA into Santa Cruz Co., with focus on future development of outreach materials to appeal to owners of small parcels (1-75 acres).</p>
	<p><b>Provide a timeline for the project. 1000 characters</b></p> <p>8 Quarterly reports/reimbursement requests. Est. 4 hrs/report: 32 hrs</p> <p>Fall 2014: Conduct pace frequency transect on loamy upland expansion (baseline): 8 hrs; Maintain 200 acres of sandy loam upland/loamy upland by discovering and treating exotic plants. Est.: 100 hrs, 100 gal herbicide.; Monitor existing transect using Pace Frequency: 8 hrs; Treat 50 additional acres. Est.: 150 hrs, 300 gal herbicide; Monitor effectiveness of #4: 8 hrs; Attend SEAZWMA meeting. 10 hrs w/travel. Est. 200 miles</p> <p>Spring 2015: Survey for Whitetop. Spray if found. If none found, spray Johnsongrass. Est.: 30 hrs, 5-20 gal herbicide; Survey 250 acres for exotic plants; treat. Est.:150 hrs, 175 gal herbicide; SEAZWMA meeting. 10 hrs. Est. 200 mi</p> <p>Fall 2015: Maintain 250 acres. Est. 125 hrs, 125 gal herbicide; Monitor both sites: 16 hrs; SEAZWMA meeting. 10 hrs 200 miles</p> <p>Spring 2016: Same as Spring 2015 except est hrs=125</p>

## Collaborative Elements and Partners

All information for the project should fit into the allotted character space provided below.  
Addendum may be submitted if more space is needed.

- 9 **Specify the CWMA, private, local, tribal, county, state, federal, and non-governmental 501(c) 3 organizations that will contribute to or participate in the completion of this project. Describe briefly the contributions each partner will make (i.e. – donating time/equipment, funding, etc.).** **2000 characters**

The Appleton-Whittell Research Ranch is an 8000 acre ecological field station and sanctuary for native biota in Santa Cruz Co., Az. The facility is a department of National Audubon Society, a 501c3 charity organized in New York, and is administered through Audubon Arizona, the state representative of the national organization. The mission of the Research Ranch is: 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. Our mission is supported through conservation, research, outreach and education efforts.

The Research Ranch is a collaborative effort among three non-profits (Audubon, TNC, The Research Ranch Foundation), Resolution Copper Mining, the Bureau of Land Management, and the US Forest Service. However, Audubon is the managing entity and owns the parcels on which the treatment of invasive species will be undertaken. Consequently, Audubon will be responsible for the match and administration of this grant. Expenses on this part of the grant will be for labor, equipment, and herbicide supplies (herbicide, surfactant, colorant).

Linda Searle (Coronado RC & D Inc.) and Kim McReynolds (U of A Extension) are re-invigorating the SEAZ Weed Management Area so they and other attendees of the meetings and events they organize will participate in this project, but again Audubon will be responsible for matching funds. Expenses will be for time and travel to meetings.

## Project Longevity / Maintenance

All information for the project should fit into the allotted character space provided below.  
Addendum may be submitted if more space is needed.

- 10 **Clearly demonstrate how this project will remain effective over time.** **2000 characters**
- Audubon has a long-standing commitment to protect native ecosystems on the hemispheric level and the Research Ranch is dedicated to protection and preservation of grassland related ecosystems, as is evidenced by the attached invasive plant management plan that is derived directly from the Directors Guide to Management of the Research Ranch.

One of the real challenges to dealing with non-native species is maintenance: it's like housework – it never stays done! We acknowledge this and that premise forms a large part of our conservation effort. Reducing the impacts of non-native species has been part of the management of the Research Ranch since 1968, when the cattle were removed from private lands and grazing was suspended on state and federal grazing leases. We have been actively and aggressively addressing invasive plant species since 1995, not always successfully. Many techniques have been tested in addition to cessation of grazing. The methods listed in the scope of work have been shown to be the most effective for the target species.

Repeated treatments are necessary to stop the exotics from reclaiming acreage – but much less effort is needed to maintain acreage than to address new areas. We started work close to Research Ranch Road and each year we work in the area treated in prior years and then expand outward. We have established an area in which the frequency of exotic lovegrasses can be held at less than 1%, barring disturbance such as wildfire. We know, however, that even this low frequency can explode in a matter of years if neglected. Other species mentioned in this grant are treated as found.

A significant portion of the Research Ranch's annual operating budget will continue to be directed to combating invasive species and we will continue to seek outside funding to augment internal funding to maintain and hopefully expand the areas treated. Future participation in a CWMA may be limited to telecommunications if funding is not available.

# **Invasive Plant Species Management Plan**

From: Directors' Guide to the Research Ranch, Version 2014.3 February 27, 2014

Prepared by: Linda Kennedy, Ph.D., Director

*Please Note: The Research Ranch did not have a separate "Invasive Plant Management Plan" but the topic was covered within a larger document, the "Directors' Guide." Included here are portions of the Guide that are relevant to our grant proposal and that show Audubon's commitment to treatment of invasive, non-native species.*

- 1. Rationale**
- 2. Mission of the Research Ranch**
  - 3.1.1. Land Stewardship Goal
  - 3.1.2. Research Goal
  - 3.1.3. Outreach Goal
  - 3.2.3. Partnerships
- 4. Vision**
- 6. Geography and Physical Characteristics**
  - 6.1. Location
  - 6.2. Resource Area Designation, Soils and Ecological Sites
  - 6.3. Floristic Classification
  - 6.4. Biogeographic Region
  - 6.5. Elevation
  - 6.6. Precipitation
  - 6.7. Temperature
- 7. Administration and Operation**
  - 7.1. National Audubon Society
  - 7.2. Audubon Arizona
  - 7.3. Research Ranch Partners (Land Ownership/Management)
    - 7.3.1. The Research Ranch Foundation
    - 7.3.4. U.S. Forest Service
    - 7.3.5. Bureau of Land Management
    - 7.3.6. The Nature Conservancy of Arizona
    - 7.3.7. Resolution Copper Company dba Swift Current Land and Cattle Co.
- 8. Conservation**
  - 8.1. Facilities
    - 8.1.4.8. Invasive, Non-native Species
      - 8.1.4.8.1. Plants
        - 8.1.4.8.1.1. Lehmann Lovegrass
        - 8.1.4.8.1.2. Boer Lovegrass
        - 8.1.4.8.1.3. Johnsongrass
        - 8.1.4.8.1.4. Natal Grass
        - 8.1.4.8.1.5. Bermudagrass
        - 8.1.4.8.1.6. Salt Cedar
        - 8.1.4.8.1.7. Whitetop/Hoary Cress
        - 8.1.4.8.1.8. Himalayan Blackberry
        - 8.1.4.8.1.9. Onionweed
        - 8.1.4.8.1.10. Yellow Bluestem
  - 10.2.2. Vegetation Monitoring Projects

- 10.2.2.1. Upland Vegetation
- 10.2.2.2. Invasive species/Road

## 11. Outreach and Education

- 11.1.1. Living Gently on the Land
  - 11.1.1.1. Potlucks and Presentations
    - 11.1.1.2.1. Research Ranch Website
- 11.1.2. Field Trips

11.2. Off-site Outreach and Education Efforts

11.3. Professional Affiliations

11.4.1. Rural Living in Santa Cruz County

## References

### Abbreviations/Acronyms used

**Appendix 6:** Ownership Map

**Appendix 7:** Place Names and Roads

**1. Rationale:** The Directors' Guide is meant to assist future administrative personnel in the management of the Research Ranch: a mechanism for capturing the institutional memory and knowledge of directors in order to assist future administrators.

**2. Mission of the Research Ranch:** To be a living laboratory to determine and demonstrate methods to safeguard and restore 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.

**3.1.1. Land Stewardship Goal:** To be a premier semi-arid grassland that fosters a natural diversity of native species. Supporting Statement: In 100 years, the Research Ranch may be the only remaining example of a large native semi-arid grassland in the southwest and must be safeguarded to insure that natural processes are not compromised by human activities. To this end, we are restoring fire to historic levels, combating exotics, and keeping cows, poachers, and off-roaders out.

**3.1.2. Research Goal:** To understand how grasslands and related ecosystems function, and to recognize the key elements that safeguard these ecosystems. Supporting Statement: To take full advantage of the Research Ranch as a control (comparative) site, we must effectively monitor environmental trends (weather, plant succession, animal communities, etc.), and carefully archive all findings. A majority of our research must focus on application that is toward guiding human stewardship of native semi-arid grasslands.

**3.1.3. Outreach Goal:** To advocate for grassland ecosystems by encouraging citizens and policy makers to safeguard and restore native ecosystems throughout the region. Supporting Statement: We must use the knowledge gained through our land management and research to help citizens and decision-makers safeguard our natural communities. We must foster communication among professionals, officials, and citizens.

**3.2.3. Partnerships:** Advance the Research Ranch's mission by nurturing effective relationships. Supporting Statement : By promoting the synergistic energy of partnerships among like-minded individuals and organizations, we will have a greater impact.

**4. Vision:** The Appleton-Whittell Research Ranch of the National Audubon Society is an outstanding example of semi-arid grassland and grassland ecosystems, and is recognized as the premier research facility to study those ecosystems. Supporting Statement: The Research Ranch will achieve the mission and realize the vision by:

Protecting the land within ARR's boundaries from untoward human disturbance,  
Facilitating the highest quality study and living environment for scientists to pursue research,  
Promoting biological and environmental understanding in members of the public and decision-makers,  
Working with partners in land management, research and education,  
Conducting all activities with highest integrity.

## **6. Geography and Physical Characteristics:**

**6.1. Location:** The Research Ranch is in southeastern Arizona and is located in the northeastern part of Santa Cruz County (31° 35' N, 110° 30' W) (various parcels in Township 21S, Range 18E). Appendix 7 is a topo map of the Research Ranch with place names.

**6.2. Resource Area Designation, Soils and Ecological Sites:** The Research Ranch is primarily in Major Land Resource Area 41-1 (16-20" precipitation zone). Soils and ecological sites are described in "Soil and Range Resource Inventory" by Breckenfeld and Robinett (2001), which is available on the Research Ranch website (<http://researchranch.audubon.org>).

**6.3. Floristic Classification:** When the cattle were removed in 1968 and through the 1980s, the Ranch was considered to be primarily short-grass prairie, but that was an artifact of the cattle grazing. According to Brown and Lowe (1992) grasslands of the Research Ranch are classified as Plains and Great Basin Grassland or Semidesert Grassland and the southern portion of the Research Ranch as Madrean Evergreen Woodland. More recent studies by Bock and Bock (2000) and McLaughlin *et al.*, (2001) indicate the Research Ranch has closer floristic affinities with Mexico, and classify the grasslands of the Ranch as Madrean Mixed Grass Prairie.

**6.4. Biogeographic Region:** The Research Ranch is found in the area often described as the Sky Islands, in which relatively discreet mountain ranges such as the Huachucas, Santa Ritas, and Mustangs jut up from surrounding grassland or deserts. This is a subsection of the Basin and Range province.

**6.5. Elevation:** Elevation above sea level ranges from 1417 m (4649 ft) in O'Donnell Canyon on the northern boundary, to 1541 m (5056 ft) on Bald Hill, up to 1570 m (5151 ft) in the southernmost part of the Research Ranch. Elevation at the Headquarters is 1465 m (4761 ft).

**6.6. Precipitation:** The Research Ranch historically experienced a bi-modal precipitation pattern with two relatively wet seasons, July-August and Dec-Feb (60% and 40% of annual mean, respectively) separated by dry periods. Long-term records show an annual mean of 17 - 17.5". In the past decade this pattern has shifted towards even dryer winters. The annual mean for 2002-2011 is 14.7" with an accumulated shortfall during this time period of nearly 2 feet. The Ranch is considered to be a semi-arid, or semi-desert ecosystem based on the annual mean of 17.5" and annual evapotranspiration of 17". Over the past decade we've shifted closer to a true desert ecosystem, in which evapotranspiration exceeds precipitation. Snowfall occurs some winters with accumulation of up to 8" but quickly melts.

**6.7. Temperature:** A general rule of thumb is 10°F cooler than Tucson, 20°F cooler than Phoenix. June is usually the only month that nighttime temperatures may not cool down to pleasant sleeping conditions. Frost free dates are approximately mid-May through September.

## **7. Administration and Operation**

**7.1. National Audubon Society:** Incorporated as a non-profit (EIN 13-1624102) in the state of New York, the headquarters are at 225 Varick St., 7th Floor, New York, NY 10014.

**7.2. Audubon Arizona:** This is the state-level representation of National Audubon Society. The address is 3131 South Central Avenue, Phoenix, Arizona 85040. The phone number is 602 458 6470 and web address is <http://az.audubon.org/>.

**7.3. Research Ranch Partners (Land Ownership/Management):** Each of the following have contractual agreements with Audubon regarding land ownership/management. See map (Appendix 6) for approximate location of properties.

**7.3.1. The Research Ranch Foundation (TRRF):** The original managers of the Research Ranch. Points of contact include TRRF president and chair of their Science Advisory Committee.

**7.3.4. U.S. Forest Service (USFS):** The USFS land within the Research Ranch is in one contiguous block comprising the southernmost portion of the Research Ranch. It is part of the Coronado National Forest and administered from the Hereford office.

**7.3.5. Bureau of Land Management (BLM):** BLM land managed by Audubon is included in the Las Cienegas National Conservation Area, administered out of the Tucson BLM Field Office. The Research Ranch is designated as an ACEC: Area of Critical Environmental Concern.

**7.3.6. The Nature Conservancy of Arizona (TNC):** Our contact point is the Southeast Area Preserves Manager, based at the Ramsey Canyon Preserve, Hereford AZ.

**7.3.7. Resolution Copper Mining dba Swift Current Land and Cattle Co. (RCM):** RCM, a subsidiary of Rio Tinto, purchased this land and several other properties that were identified by conservation organizations as having great conservation value. The point of contact is the RCM office in Superior, AZ.

**8. Conservation:** We believe that conservation includes preservation and care of natural resources; this section includes building facilities/infrastructure and more traditional conservation actions.

**8.1.4.8. Invasive, non-native species:** Commercial grazing by domestic livestock has been prohibited since 1968 which appears to have slowed the spread of many non-natives, but not stopped it entirely. Along with our policy of having a light touch on the land, we do not take active management steps to eliminate native species that have invasive capabilities (i.e. mesquite, mimosa).

**8.1.4.8.1. Plants:** We cannot treat invasive, non-native plants on the USFS and a staff member must have a Certified Pesticide Applicator's permit to use herbicides on the BLM. An EA was developed to accommodate treatment on BLM. We can treat invasive plants on the other parcels.

**8.1.4.8.1.1. Lehmann Lovegrass:** *Eragrostis lehmanniana* was planted on approximately 200 acres in/around 1949. At the time that cattle were removed (1968), it was hoped that native plants, in the absence of grazing, would be able to resist invasion. Research and monitoring efforts have now shown that this species and Boer lovegrass (see 8.1.4.8.1.2.) spread more rapidly in grazed areas (adjacent cattle ranches), but continue to spread on the Research Ranch. These two species now impact more than 2000 acres. The decision to use active management, in addition to removal of livestock, was based on the following: invasion has deleterious effects on native biota and natural processes such as fire; areas without invasive species can be used as control or reference areas to evaluate the impacts of invasion; areas without invasive species may serve as sources of uncontaminated seed.

Efforts to control this grass, in addition to elimination of domestic grazing, have included burning, mowing, altering the C-N ratio, and digging/pulling, but the only thing that has been shown effective is glyphosate (Round-up). In order for the herbicide to be effective, the plant must be actively metabolizing. The plant is somewhat difficult to identify unless actively flowering. These two factors mean that there are only two windows per year in which the plants can be sprayed, spring and again after monsoon, before frost. In addition, if the wind is blowing it's too risky to spray and risk collateral damage to native plants. The job is physically demanding and only those who are conscientious can be trusted. A 3% Roundup solution to which we have added a surfactant and colorant is effective. The plants are sprayed individually – no broadcast spraying. Repeated passes per growing season are necessary to pick up newly germinated plants; they can mature very quickly and produce seed the first year. Area of focus is the sandy loam upland and loamy upland alongside Research Ranch Road between the Headquarters (Clark Ranch) and bunkhouse (Swinging H) (SE ¼ of S22, T21S, R18E).

**8.1.4.8.1.2. Boer Lovegrass:** *Eragrostis curvulus* v *confertus* [*E. chloromelas*] was planted at the same time that Lehmann Lovegrass was and we are currently treating this species as noted in 8.1.4.8.1.1. Boer Lovegrass forms a dense monoculture if untreated.

**8.1.4.8.1.3. Johnsongrass:** *Sorghum halapense* probably escaped from hay for livestock and is mostly found in moist conditions (riparian areas, swales). There has been no concerted effort to eradicate this species but when treatment is done on a site specific basis (i.e. water bars), the most effective is to wipe the leaves with 3% Roundup or to spray plants as they emerge in the spring.

**8.1.4.8.1.4. Natal Grass:** Three plants of *Melinis repens* have been found on the Research Ranch and each was pulled up before viable seed was produced.

**8.1.4.8.1.5. Bermudagrass:** Plugs of a hybrid cultivar of *Cynodon dactylon* were planted by the Appletons on many of the impoundments in the hopes that it would stabilize the soil and not spread (it's not supposed to produce viable seed). Unfortunately it did spread and has overgrown many acres of floodplain, especially in Post and O'Donnell Canyon. We are re-establishing sacaton (*Sporobolus wrightii*) by transplanting plugs directly into the Bermudagrass. We think that the sacaton will ultimately shade out much of the Bermuda.

**8.1.4.8.1.6. Salt Cedar:** We have found two individual *Tamarix* trees growing on the Research Ranch, one east of Finley Tank and another in O'Donnell canyon northeast of the bunkhouse. Both were cut down and the stumps treated with glyphosate. No reproduction has been noted.

**8.1.4.8.1.7 Whitetop/Hoary Cress:** This plant, *Cardaria draba*, was either introduced in gravel brought in to armor the road in O'Donnell Canyon or has spread from the Diamond C where there is an established population. There are several established populations in O'Donnell Canyon. We are working hard to prevent the spread into the Babacomari Cienega. The plant is a perennial that only emerges in the early-mid spring when there is sufficient moisture to bring it out of quiescent/dormancy. We use Escort herbicide, as this is specific to broadleaf plants and does not harm the sacaton.

**8.1.4.8.1.8. Himalayan Blackberry:** The only place this species (*Rubus armeniacus*) has been found on the Research Ranch is in the springs at Finley Tank. Plants were, perhaps, introduced during the ranching era. They threaten the continued viability of the endangered Huachuca Water Umbel and consequently are cut back by Audubon staff when time permits. The most effective treatment is to cut the wands and immediately paint the stump with glyphosate.

**8.1.4.8.1.9. Onionweed:** This species (*Asphodelus fistulosus*) was evidently brought to the Research Ranch in landscaping gravel used within the courtyard of the Ranch House in the mid-1990s. The plant is perennial and must be dug up or sprayed with herbicide to kill it. The seed bank must be very persistent as all adult plants have been cleared for years but occasional plants emerge (3 in 2013).

**8.1.4.8.1.10. Yellow Bluestem:** *Bothriochloa ischaemum* appears to be spreading from public roadways, and is especially pronounced near Elgin. In 2013 we found quite a bit associated with a waterbar off Research Ranch Road and in a few other scattered locations. Staff clipped each plant, bagged the seed heads, and immediately sprayed each plant with glyphosate solution. We'll need to revisit each site for years to come to treat any seedlings or adult plants that were not killed.

## **10.2.2. Vegetation Monitoring Projects**

**10.2.2.1. Upland vegetation:** This project is based on the Ecological Site Mapping done by NRCS (Breckenfeld and Robinett 2001) and some documentation refers to the monitoring as ESM. In consultation with Dan Robinett, a subset of their sites was chosen for establishment of permanent plots. Specific sites were selected because they were either representative of that ecological site or because they appeared to be vulnerable to change (i.e. invasion by non-native species.) Each plot is marked with an ARR tag and most are associated with simple rain gages. The transects are read using the pace frequency method and 5 photos are taken at each site: the direction of the transect and the four cardinal directions. Due to time/financial constraints, not all transects are read each year.

**10.2.2.2. Invasive species/Road:** These transects were established randomly around the loop (Research Ranch Road and East Corrals Road) to document changes associated with herbicide treatment (USFWS grant 2002). The line intercept method was used. The transects have not been read since the grant was concluded, but the transects are marked and could be reexamined if time/funding permits.

**11. Outreach and Education:** Although very important, currently activities associated with this goal receive the least financial and administrative support.

**11.1.1. Living Gently on the Land:** This is our educational program that grew from a grant to Audubon from NRCS loosely called the Ranchette program. The funding is gone, but we are doing what we can.

**11.1.1.1. Potlucks and Presentations:** This has been our single most long-running and effective educational effort. The series of events takes place once a month from Sept-Nov and Jan-May.

**11.1.1.2.1. Research Ranch Website:** The Education and Outreach tab at <http://researchranch.audubon.org> houses information associated with educational events held at the Research Ranch.

**11.1.2. Field Trips:** Agencies, academic institutions, conservation and other organizations can arrange for a field trip at the Ranch.

**11.2. Off site:** Research Ranch staff participates in conservation oriented events as time and finances allow.

**11.3. Relevant Professional Affiliations:** Membership in professional organizations poses opportunities for continuing education for staff and for staff to share information about the Research Ranch. Current staff members belong to the following relevant organizations : Society for Range Management, Arizona Native Plant Society, Arizona-Nevada Academy of Sciences.

**11.4.1. Rural Living in Santa Cruz County:** This booklet was compiled to provide a guide to resources and regulations for country living. The first edition was printed in 2009; Kennedy was one of the contributors and compilers.

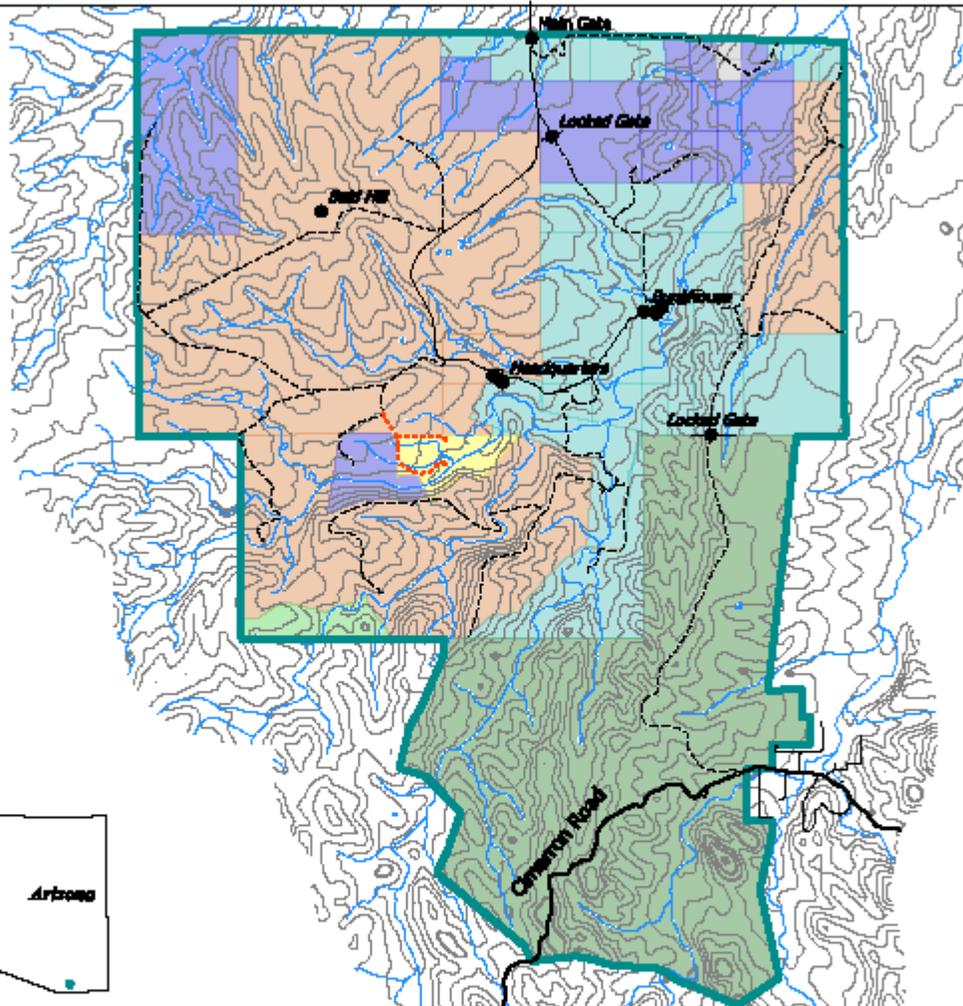
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#### **Abbreviations/Acronyms Used:**

- ARR: Audubon Research Ranch (a.k.a. Appleton-Whittell Research Ranch of the National Audubon Society)
- BLM: Bureau of Land Management
- EA: Environmental Assessment
- FS: Forest Service
- NRCS: Natural Resource Conservation Service
- RCC: Resolution Copper Company
- TNC: The Nature Conservancy
- TRRF: The Research Ranch Foundation
- USFS: United States Forest Service

# Appleton-Whittell Research Ranch Land Ownership



Legend	
	Land Ownership: Audubon
	Bureau of Land Management
	U.S. Forest Service
	Smith-Corcoran Land & Cattle
	The Nature Conservancy
	The Research Ranch Foundation
	Not under Audubon Management
	Lines: AWRM Boundary
	Paved Road
	Dirt Road
	Trail
	Private road
	Contour lines
	Stream beds

**Audubon**  
 Appleton-Whittell Research Ranch  
 EC 1 Box 44  
 Elgin, AZ 89611  
 320-455-8522  
[researchranch.audubon.org](http://researchranch.audubon.org)

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

# Appendix 7: Place Names and Roads

