Ecosystem restoration & alternative agro-pastoral resources in north-central Chile.

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Origin and context of the work

Our goal is to restore essential habitat for endangered chinchillas while deterring habitat degradation in this ecosystem. Specifically, we will focus on ecosystem restoration in *Quebrada Cuyano* utilising native vegetal species, many of which, like the fauna (see attached list), are endemic and of grave conservation concern. Our purpose is to reinstate habitat not only for wild chinchillas but also for native insect, amphibian, reptile, bird, and other mammalian species, with help from the local populace. In *Quebrada Zapallar*, we will create exclusive livestock grazing areas, thus curbing grazing of native vegetal communities that support local fauna, including chinchillas.

The use of fuel wood for ore processing and unsustainable agricultural practices in north central Chile has led to desertification. All areas visited in the project area have been severely affected due to resource exploitation. Several hill slopes have little vegetation, and hardly any native tree species can be encountered. The second major and current problem is of abandoned farms and free ranging livestock. For instance, a hectare of alfalfa field was abandoned in 1964. Since then, a perennial plant species, the only one here, has occupied the area. It covers less than an estimated 2% of the area and has less than 20 individuals most only knee high. Although there has been a dramatic decrease in livestock (9000 animals in 1983 to 1000 in 2000), and farms, no one has attempted to restore native vegetation. Firewood collection for heating and cooking, grazing by livestock etc. has been persistent. Rabbits and hares, which are introduced, consume the vestigial vegetation essential for native fauna, especially the endangered long-tailed chinchillas.

Once believed extinct, the only known wild *Chinchilla lanigera* exist in north central Chile (Jiménez 1995). This endemic species experienced dramatic decrease in its population and range because an estimated 21 million were killed in less than 60 years for the fur trade and the population has yet to recover (Albert 1901, Jimenez 1996). Chinchillas are endangered and protected by The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Glade 1988, IUCN 1972). Population estimates vary from 3000 to approximately 5000 (Jiménez 1995, Mohlis, personal communication, 1999). Over 18 years (1975-1993), a dramatic decrease in the spatial coverage of colonies occurred (Mohlis 1983 and Jiménez 1995). Previous researchers (Mohlis 1983, Jiménez 1990, 1995, Deane non-published data) identified the distribution and characterized typical habitat for chinchillas.

Making a pragmatic, substantial and lasting contribution to nature conservation

Habitat fragmentation has resulted in created isolated habitat patches of habitat for all wildlife species, including chinchillas. This has increased the possibility of extinction for species with small populations and limited mobility (Jiménez 1995). Connecting core habitat areas to other key areas of habitat will effectively aid in the stabilisation and eventual increase of plant and animal populations (Gonzales et al., 1998).

Specifically, we are repairing chinchilla habitat areas as well as corridors in between test plots. The eventual colonisation of test plots by chinchillas and other small mammals will reveal if habitat restoration assists in conservation efforts. Also, the time it takes for each patch to be colonised will be tested. It is expected that plots with corridors will be colonised sooner than areas that lack corridors. Future areas and strategies for restoration will be planned based on the outcomes of this project.

Creating habitat by growing native plant species that serve as food, cover and shelter for chinchillas, also aids in the conservation of other animal species in the community such as Degus (*Octodon degus*), the Chinchilla rat (*Abrocoma bennetti*), and Cururos (*Spalacopus cyanus*) that only occur here in central Chile. Many of the plant species are also of conservation concerns. By collecting seeds from different localities, we are ensuring genetic diversity in our nurseries.

Our Accomplishments:

Nursery and prior plot maintenance

Nursery work continues to be conducted twice weekly. Watering of the plants, cleaning of the water channel, as well as prior restoration areas were watered by staff and volunteers. Seeds were collected in the mountains and planted in nursery seedling bags and restructured used beverage bottles (donated by Coca Cola). Free ranging livestock has managed to enter the nursery three times in the last 2 years. Thus, we continue to experiment with fencing and pole ideas to keep them out. Luckily the most species re-sprout. However, these need an additional three months in nursery time before they can be transplanted.

Vegetation plots

Restoration work was focused on three drainage basins in 2003-4. In Quebrada Curico, we planted 1150 seedlings and grass tuffs into 2 restoration areas that will hopefully aid in the dispersion of chinchillas distribution via this corridor between two chinchilla colonies. In 2004, we collected seedlings in the early morning of restoration planting or the night before to further enhance this area. These seedling and grass tufts were dug from El Balcon. With permission of the land owner we were able to take about 1000 seedlings from along road cuts. These plants are great for restoration projects like ours because they are unwanted and cheap. We do not have to collect the seeds, grow them, nor do we have the cost of maintaining these plants in the nursery. Also, these seedlings are ploughed over when the dirt roads are maintained. In Quebrada Cuyano, we have created 13 restoration areas.

Ten of these areas have been planted with approximately 5300 seedlings from the nursery. As of 2004, all new seedlings are being measured and tagged so we can follow individuals and document growth rates. In some areas survival rates are as high as 85%. In fact, some of the seedlings (Carbonillo, Quebracho, Rumpiato and Atutemo) have already produced seeds. We are now also able to use these restoration areas as seed sources. However, all 3 of the wetland restoration plots were vandalized, the fencing was stolen and all the seedlings were eaten by livestock and/or wildlife before the plants establish.

Internet and correspondence
All e-mail correspondence, paperwork and Internet related work is done by the following Mr. Bharath Ganesh-Babu and Amy Deane. We updated our website to include field findings and a professional presentation:

Saving the Wild Chinchillas, Ecosystem restoration North Central Chile, American Zoo and Aquarium Association Annual meeting, 2004 (with Peter Riger)

This was accompanied by a publication:

> Saving the Wild Chinchillas, Ecosystem restoration North Central Chile, American Zoo and Aquarium Association Annual meeting, 2004 (with Peter Riger)

Another publication during the granting period:
Spotorno, A.E., C.A. Zuleta, J.P. Valladares, J.E. Jiménez and A.L. Deane. 2004. Chinchilla lanigera. *Mammalian Species*.

Education initiatives
Educational outreach initiatives include creation and distribution of educational materials that focus on chinchillas and the importance of conservation, both to educators and schools locally and worldwide. To our website, we created and added three new children's stories: Deane, A.L. and Ganesh-Babu, B. *in review*. Discovering Baby Degus., Deane, A.L. and Ganesh-Babu, B. *in review*. Tracks on the snow, Deane, A.L. and Ganesh-Babu, B. *in review*. Trash.

Two exciting new programs for children are **Chin Pals!** and **Conservation through Education.** Chin Pals! is a program that encourages children from around the world to communicate with children living near wild chinchillas. The second, Education through Conservation, encourages children that want to get involved in chinchilla conservation to send books about the environment to local schools. Detailed program descriptions can be found on the website. We also hosted a class from a local high school and taught them about chinchillas adaptations to the wild, which we will be adding this to our website. Our website continues to serves as a source of information for students and researchers.

Mapping
We continue to update our GIS/Remote Sensing database. Different researchers as well as the Chilean park service have been provided with

layers from our database. Over the last decade, 7 people have helped to create this tool for conservation management. To date, we have the following data in this database: distribution of the chinchilla colonies for 4 different time periods (1 has yet to be digitized), Topographic coverage, Roads, Water course, most of the local homesteads, Airphotos (B&W) 1:50000, Airphotos (Colour) 1:70000, Satellite images: TM 1985 wet season, 1986 wetseason,1987 wet and dry seaons, eTM+ 1990, 1992, MSS 1975

Field assistants

Our field work is carried forth with the help of both local farmers as well as international. Local residents from the Montonero, Alvarez and Pena families aided our efforts. They assisted in everything from collecting seeds to transporting seedlings. We paid 2 assistants monthly salaries and all other workers were paid a daily flat rate. Seven volunteers from UK, USA, German, Denmark aided in the project during 2003-2004. Total time spent by volunteers working on our project was just about 6 months. They helped from revamping the nursery beds to transporting seedlings. Although they did not receive monetary compensation, we did provide housing, transportation and some food. Because of this volunteer base we made great advancements without having to find the funds to pay for workers.

Financial Information

2004	**US$**	**US$**	**US$**
Donations	1057.00		
Grants	8803.00		
TOTAL	**9865.00**		
Expenses		**Program**	**General**
	A+B	A	B
Insurance	513.62	513.62	
Occupancy	1910.24	1910.24	
Supplies	2666.24	2647.31	18.93
Telephone	12.28		12.28
Postage	49.55		49.55
Printing	20.66	20.66	
Travel	990.59	34.59	956.00
Subcontracts	2740.98	2740.98	
Email-comp	159.15	159.15	
Hospitality-food	398.38	386.18	12.20
Mechanics	27.05	27.05	
Gasoline	643.69	643.69	
Corp. fees	70.00		70.00
Bank fees	12.00	12.00	
TOTAL	**10214.43**	9095.47	1118.96
2004 END	**-349.43**		

Animal species that are native to the vegetal communities that we are enhancing and creating included is their conservation status (E=Endangered, V=vulnerable, R=Rare, I=unknown status).

Name	**Common name (Chile)**	**Status**
Mammals		
Marsupials		
Marmosa elegans	Yaca	R
Carnivores		
Felis concolor	Puma	E
F. colocolo	Colo-colo	E
Pseudalopex culpaeus	Culpeo	I
P. griseus	Chilla	
Galictis cuja	Quique	V
Rodents		
Chinchilla lanigera	Chinchilla chilena	E
Abrocoma bennetti	Ratón chinchilla	I
Octodon degus	Degu común	
O. lunatus	Degu costino	V
Spalacopus cyanus	Cururo	E
Akodon longipilis	Ratoncito lanudo	I
A. olivaceus	Ratoncito oliváceo	
Phyllotis darwini	Lauchón orejudo	
Oryzomys longicaudatus	Lauchita de los espinos	
Bats		
Myotis chiloensis	Murciélago oreja de ratón	
Birds		
TINAMIFORMES		
Nothoprocta perdicaria	Perdiz chilena	
FALCONIFORMES		
Vultur gryphus	Cóndor	V
Geranoaetus melanoleucus	Aguila	
Buteo polyosoma	Aguilucho	
Parabuteo unicinctus	Peuco	
Milvago chimango	Tiuque	
Falco femoralis	Halcón perdiguero	
F. sparverius	Cernícalo	
CHARADRIIFORMES		
Vanellus chilensis	Queltehue	
GRUIFORMES		
Rallus sanguinolentus	Pidén	
COLUMBIFORMES		
Columba araucana	Torcaza	E
Zenaida auriculata	Tórtola	
Columbina picui	Tortolita cuyana	
Metriopelia melanoptera	Tórtola cordillerana	
STRIGIFORMES		
Tyto alba	Lechuza	
Bubo virginianus	Tucúquere	
Glaucidium nanum	Chuncho	
Athene cunicularia	Pequén	

CAPRIMULGIFORMES		
Caprimulgus longirostris	Gallina ciega	

Name	**Common name (Chile)**	**Status**
APODIFORMES		
Patagona gigas	Picaflor gigante	
Sephanoides galeritus	Picaflor	
PICIFORMES		
Picoides lignarius	Carpinterito	
Colaptes pitius	Pitío	
PASSERIFORMES		
Geositta rufipennis	Minero cordillerano	
Upucerthia dumetaria	Bandurrilla	
Chilia melanura	Chiricoca	
Leptasthenura aegithaloides	Tijeral	
Tripophaga modesta	Canastero chico	
Pteroptochos megapodius	Turca	
Scelorchilus albicollis	Tapaculo	
Scytalopus magellanicus	Churrín	
Agriornis livida	Mero	
Pyrope pyrope	Diucón	
Muscisaxicola macloviana	Dormilona tontita	
Elaenia albiceps	Fío-fío	
Anairetes parulus	Cachudito	
Colorhamphus parvirostris	Viudita	
Phytotoma rara	Rara	
Tachycineta leucopyga	Golondrina chilena	
Troglodytes aedon	Chercán	
Turdus falcklandii	Zorzal	
Mimus thenca	Tenca	
Zonotrichia capensis	Chincol	
Sturnella loyca	Loica	
Curaeus curaeus	Tordo	
Phrygilus gayi	Cometocino de Gay	
P. fruticeti	Yal	
P. alaudinus	Platero	
Diuca diuca	Diuca	
Carduelis barbatus	Jilguero	
Passer domesticus	Gorrión	
Reptiles		
SAURIA		
Garthia peñai	Geco	
Liolaemus nitidus	Lagarto	
L. lemniscatus	Sabandija café	V
L. fuscus	Lagartija gris	
L. monticola	Lagartija de roca	V
L. platei	Lagartija de arena	
Callopistes palluma	Iguana	V

SERPENTES		
Philodryas chamissonis	Culebra de cola larga	V
ANPHIBIA		
ANURA		
Bufo chilensis	Sapo de rulo	V

Note: some of the mammals, many of the birds, and other non-listed frog species as well as insects utilize our nursery for living, breeding, and feeding areas

PLANTS

The local area host at least 209 native species of which 125 are endemic. The following list is a sample of the vegetal species we are currently growing (*) or trying to obtain seeds (#) and figure out how to grow for restoration efforts. Their conservation status is included (E=Endangered, V=vulnerable, R=Rare).

Name	**Common name (Chile)**	**Status**
Balsamocarpon brevifolium	Algarrobilla*	E
Prosopis chilensis	Algarrobo*	V
Prosopis flexuosa	Algarrobo dulce#	E
Llagunoa glandulosa	Atutemo*	
Drimys winteri	Canelo#	E
Puya berteroniana	Cardon*	
Cordia decandra.	Carbonillo*	
Colliguaja odorifera	Colliguaja*	
Porlieria chilensis	Guayacán*	V
Maytenus boaria	Maitén*	V
Carica chilensis	Palo gordo*	V
Ephedra rupestris	Pingo-pingo#	V
Quillaja saponaria	Quillay*	V
Bridgesia incisifolia	Rumpiato*	V