

"2019, Año del Caudillo del Sur, Emiliano Zapata"

Photographic Dossier
for the
Mohamed bin Zayed Species Conservation Fund
Project 13256063



View of Socorro Island from the Mountain top.

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Quarantine, holding and breeding station

This station was built by the Mexican Navy using the design provided by numerous Socorro Dove breeders. Construction materials were obtained through a generous donation of Sterling Bunnell Jr., whose father was among the scientists who visited Socorro Island in the California Academy of Sciences expedition of 1903. The station has six rooms where doves can be received, hold and then transported to the release aviary. Its design is such that it can withstand strong hurricanes.



Figure 1. Quarantine, holding and breeding station on Socorro Island.

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Figure 2. Erika Medina and Yolotli Morales clean interior and exterior areas of one room.

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Figure 3. Above: Juan Martinez checks water containers. Below: Green house interior is shown.

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HABITAT RESTORATION

Habitat restoration is critical for a successful reintroduction of the Socorro Dove. Most of the dove's historical habitat has been damaged by sheep. Restoration efforts are required to increase the surface of appropriate habitat for the Socorro Dove and other habitat specialists.

Restoration plots

We used a technique referred to as islands of trees, where endemic and native species have been planted in 20 x 20 m plots. We have established 47 restoration plots in the historical areas of distribution of the Socorro Dove.



Figure 4. 20 m x 20 m restoration plot in an area dominated by introduced grasses.

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Área de estudio

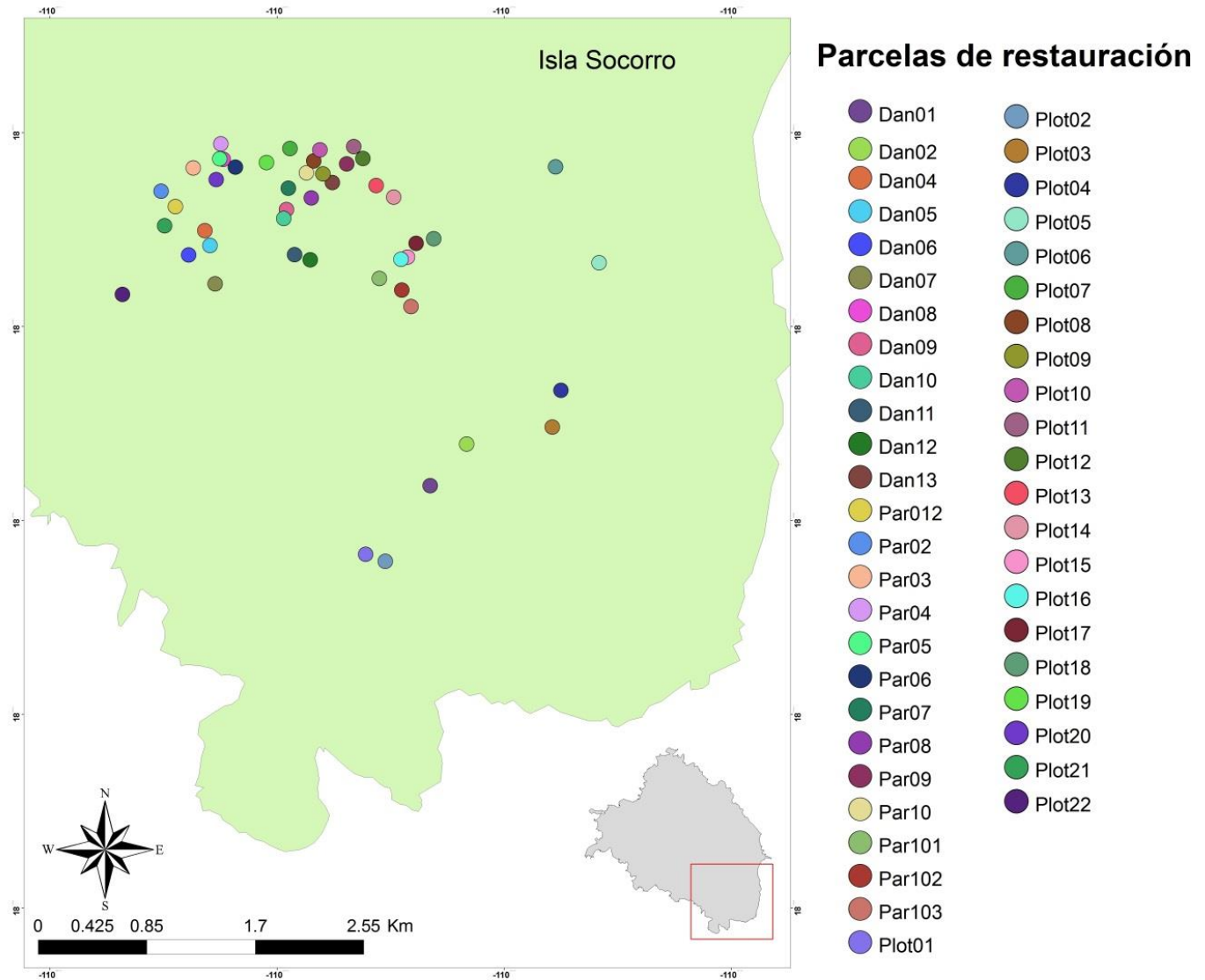


Figure 5. Location of 47 restoration plots in Southern Socorro Island.

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Table 1. Coordinates of restoration plots in the historic area of distribution of the Socorro Dove.

Parcelas existentes			Parcelas nuevas		
SITIO	PARCELA	COORDENADAS	SITIO	PARCELA	COORDENADAS
Carretera	Plot 01	N18° 44.208' W110° 56.851'	Carretera	Dan 01	N18° 44.498' W110° 56.577'
	Plot 02	N18° 44.178' W110° 56.767'		Dan 02	N18° 44.674' W110° 56.423'
	Plot 03	N18° 44.746' W110° 56.061'			
			Llano de Borregos Alto	Dan 13	N18° 45.780' W110° 56.992'
	Plot 04	N18° 44.902' W110° 56.025'			
	Plot 05	N18° 45.441' W110° 55.863'			
	Plot 06	N18° 45.846' W110° 56.047'	Cerro Rojo	Dan 04	N18° 45.577' W110° 57.530'
				Dan 05	N18° 45.514' W110° 57.508'
Llano de Borregos Alto	Plot 07	N18° 45.923' W110° 57.171'		Dan 06	N18° 45.473' W110° 57.598'
	Plot 08	N18° 45.870' W110° 57.070'		Dan 07	N18° 45.351' W110° 57.486'
	Plot 09	N18° 45.816' W110° 57.031'		Dan 08	N18° 45.878' W110° 57.452'
	Plot 10	N18° 45.918' W110° 57.043'		Dan 09	N18° 45.665' W110° 57.186'
	Plot 11	N18° 45.931' W110° 56.901'		Dan 10	N18° 45.628' W110° 57.197'
	Plot 12	N18° 45.882' W110° 56.862'		Dan 11	N18° 45.475' W110° 57.151'
	Plot 13	N18° 45.767' W110° 56.805'		Dan 12	N18° 45.453' W110° 57.085'
	Par 08	N18° 45.714' W110° 57.080'			
	Par 09	N18° 45.858' W110° 56.930'			
	Par 10	N18° 45.820' W110° 57.101'			
Llano de Borregos Bajo	Plot 14	N18° 45.718' W110° 56.732'			
	Plot 15	N18° 45.465' W110° 56.673'			
	Plot 16	N18° 45.456' W110° 56.701'			
	Plot 17	N18° 45.523' W110° 56.637'			
	Plot 18	N18° 45.542' W110° 56.562'			
	Par 101	N18° 45.374' W110° 56.793'			
	Par 102	N18° 45.325' W110° 56.698'			
	Par 103	N18° 45.255' W110° 56.658'			
Cerro Rojo	Plot 19	N18° 45.865' W110° 57.269'			
	Plot 20	N18° 45.792' W110° 57.482'			
	Plot 21	N18° 45.597' W110° 57.700'			
	Plot 22	N18° 45.306' W110° 57.879'			
	Par 01	N18° 45.678' W110° 57.655'			
	Par 02	N18° 45.743' W110° 57.715'			
	Par 03	N18° 45.841' W110° 57.579'			
	Par 04	N18° 45.943' W110° 57.463'			
	Par 05	N18° 45.880' W110° 57.467'			
	Par 06	N18° 45.845' W110° 57.400'			
	Par 07	N18° 45.756' W110° 57.178'			

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Invasive grasses



Figure 5. Removal of exotic grasses.

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Invasive grasses dominate a great section of the former distribution area of the Socorro Dove. To have a successful reintroduction, invasive grasses must be controlled or removed. We are conducting trials for a technique that first removes grasses by cutting, then the area is covered with black plastic covers to avoid further growth and a hot environment for grass seeds on the ground. Treated areas are more adequate for native vegetation.

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Figure 6. Restoration plot where plastic cover is used to suppress future grass growth.

Exposed soil

Sheep were introduced in 1869 and their continuous presence resulted in the loss of forested areas in Southern Socorro Island. The extent of the impact was described by the explorers of the California Academy of Sciences in 1903, 1905 and 1925. They observed areas with exposed red soil devoid of vegetation. These areas remain, and restoration efforts are necessary to secure soil and to facilitate the arrival of endemic trees to their former area. We established several restoration plots in areas with nude soil to start the recolonization process.

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Figure 7. Selecting the site for a restoration plot within an area with exposed soil.



Figure 8. Erosion ravines that require attention to avoid soil loss.

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Figure 9. Daniel Aguirre aligns posts of a restoration plot.



Figure 10. Daniel Aguirre fixes a post of a restoration plot.

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Figure 11. Erosion promoted by ATV vehicles. In the picture it is possible to see how the ATV road has now become connected to an existing ravine. Water movement will continue through the road.



Figure 12. Erosion ravine where dry branches have been placed to slow down water movement.

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Plants

As part of our restoration efforts young plants of *Guettarda insularis* and *Dodonaea viscosa* have been collected and planted in restoration plots and areas with nude soil in the former areas of distribution of the Socorro Dove. On average, we planted 5-6 plants of *Dodonaea viscosa* and two of *Guettarda insularis* in each plot.

Species	Common name	Number
<i>Guettarda insularis</i>	Cascarillo	100 planted
<i>Guettarda insularis</i>	Cascarillo	100 in bags
<i>Dodonaea viscosa</i>	Mangle falso	249 planted



Figure 13. A hundred young trees of *Guettarda insularis* to be planted in restoration plots and surrounding areas.

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Table 2. Number of young trees and bushes planted on restoration plots

CARRETERA	<i>Dodonaea viscosa</i>	<i>Guettarda insularis</i>	CERRO ROJO	<i>Dodonaea viscosa</i>	<i>Guettarda insularis</i>
Plot 1	4	2	Plot 19	5	2
Plot 2	6	2	Plot 20	5	2
Plot 3	6	2	Plot 21	6	2
Plot 4	5	2	Plot 22	0	0
Plot 5	0	2	Par 01	6	2
Plot 6	5	2	Par 02	6	2
DAN 01	6	2	Par 03	5	2
DAN 02	0	0	Par 04	0	2
			Par 05	5	2
LLANO ALTO	<i>Dodonaea viscosa</i>	<i>Guettarda insularis</i>	Par 06	5	2
Plot 7	6	2	Par 07	5	2
Plot 8	6	2	DAN 04	5	2
Plot 9	6	2	DAN 05	5	2
Plot 10	5	2	DAN 06	5	2
Plot 11	0	2	DAN 07	5	2
Plot 12	5	2	DAN 08	5	2
Plot 13	0	2	DAN 09	6	2
Par 8	6	2	DAN 10	6	2
Par 9	6	2	DAN 11	5	2
Par 10	6	2	DAN 12	4	2
DAN 13	6	2			
LLANO BAJO	<i>Dodonaea viscosa</i>	<i>Guettarda insularis</i>			
Plot 14	0	2			
Plot 15	0	2			
Plot 16	6	2			
Plot 17	0	2			
Plot 18	0	2			
Par 101	6	2			
Par 102	0	2			
Par 103	6	2			

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Seeds

Seeds of *Guettarda insularis*, *Ilex socorroensis* and *Psidium socorrense* have been collected to continue germination trials. It is important to continue germination experiments to improve the number of seedlings obtained. Availability of young trees of different species is required to improve the success of habitat restoration efforts.

Secies	Coordinates	Amount
<i>Guettarda insularis</i>	18.77503°, 110.95874°	356
<i>Ilex socorroensis</i>	18.77670°, 110.95769°	20
<i>Psidium socorrense</i>	18.74990°, 110.95130°	1639



Figure 14. Alejandra Domínguez is planting young bushes of *Dodonaea viscosa* in a plot dominated by invasive grasses.

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Figure 15. Graduate students plant young bushes of *Dodonaea viscosa* in a plot with exposed soil. These plants will become points from which this species will increase its surface while populating soil.



Figure 16. Young bushes of *Dodonaea viscosa* planted around hills with exposed soil. These plants will reduce the amount of erosion and loss of soil.

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REMOVAL OF INVASIVE PLANTS

Our restoration efforts consider the control and/or removal of introduced plants. During our visits we have initiated the control or removal of invasive species of concern.

Guayabas (*Psidium guajava*) and Guajes (*Leucaena leucochepala*) are tree species that require attention and their complete removal is recommended. We are attempting to control invasive grasses using black plastic covers that kills covered grasses and prevents their growth and seed germination.



Figure 17. Daniel Aguirre takes photographs of invasive grasses.

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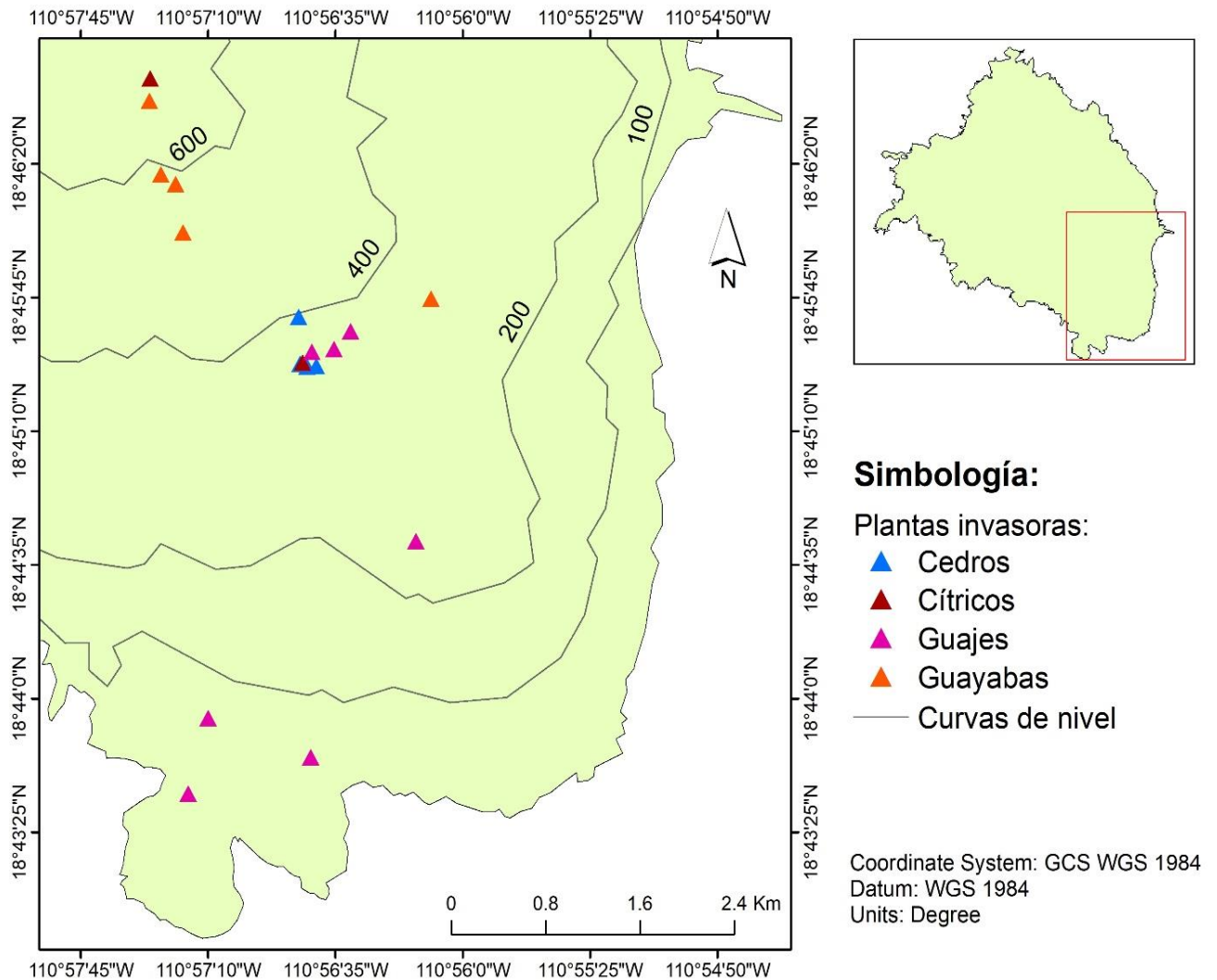


Figure 17. Locations where removal of invasive plant species was carried out.

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Figure 18. Yolotli Morales removes a root system of *Psidium guajava*.

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Figure 19. Removal of trees of *Cedrela odorata*.

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Figure 20. Trunk and branches of *Leucaena leucocephala* are piled up to be dried by the sun.



Figure 21. Yolotli Morales removes fruits of *Psidium guajava* to prevent germination of their seeds

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Figure 22. Dry trunks are used to block erosion ravines and to protect existing roads with the help of the Mexican Navy.

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Figure 23. Trunks that cannot be used are covered to facilitate their decay.

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Figure 25. Alejandra Domínguez immerses collected fruits and seeds of invasive trees to an alcoholic solution that will kill the embryos.

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Restoration in progress

Active removal of endemic plant species is already showing benefits for native vegetation. However, some invasive plants are recalcitrant, and their successful removal may require methods beyond their mechanic removal. Although recalcitrant invasive plants may take years for their complete eradication, it is important to notice that by avoiding tree growth and fruit production these invasive species will not colonize new areas on the island. Chemical methods are a viable alternative that may prove more effective.



Figure 26. Area where a root system of *Psidium guajava* has been removed.

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Figure 27. Restored area where guavas have been removed. Native and endemic plants are returning.



Figure 28. Restores area where *Citrus* sp. has been removed. This will allow the return of endemic trees.

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Figure 29. Area formerly occupied by *Citrus* spp. Endemic *Ilex socorroensis* has colonized the area.



Figure 30. *Aristolochia socorroensis* in an area where *Leucaena leucocephala* has been removed.

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Monitoring of other endemic and endangered species

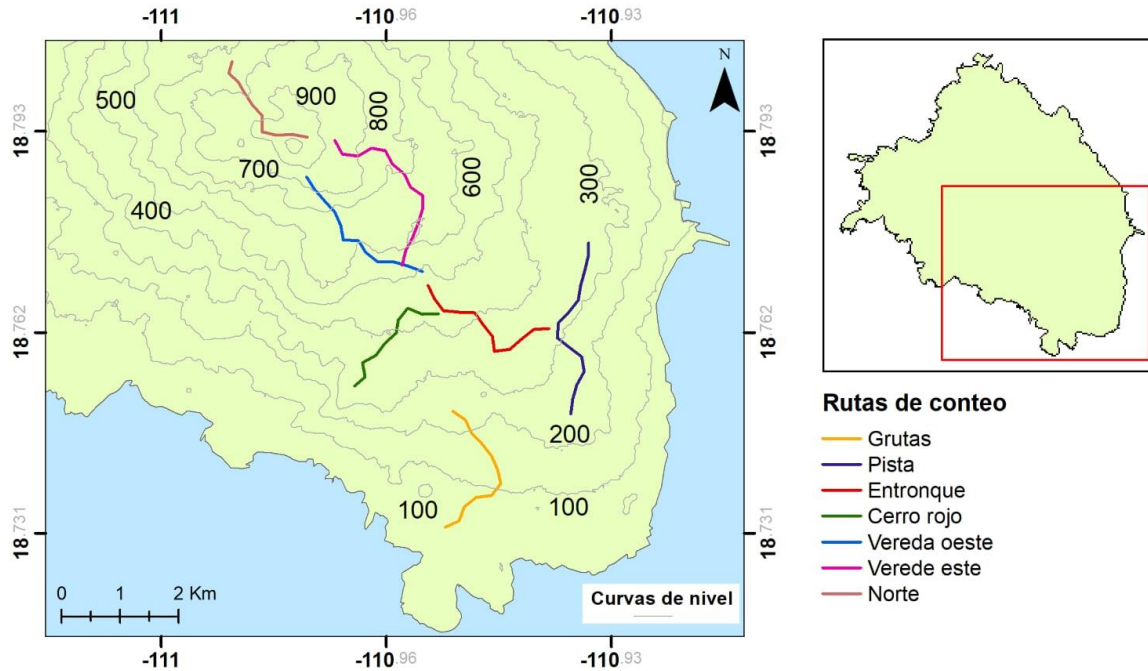


Figure 31. Point count routes used to monitor bird and reptiles.

Monitoring other endemic and endangered species on Socorro Island provides valuable information on habitat quality and potential risks for the reintroduction of Socorro Doves. We have paid attention to species that are habitat specialists such as the Socorro Mockingbird (*Mimus graysoni*), that use resources known to be important for Socorro Doves such as the Socorro Parakeet (*Aratinga brevipes*) that depends on *Syderoxylon socorrense* trees for nesting, or the endemic blue lizard (*Urosaurus auriculatus*) that is not present in extremely disturbed areas.

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Figure 32. Socorro blue lizard (*Urosaurus auriculatus*).



Figure 33. Erika Medina installs an automated recording unit to monitor birds and other vertebrates.

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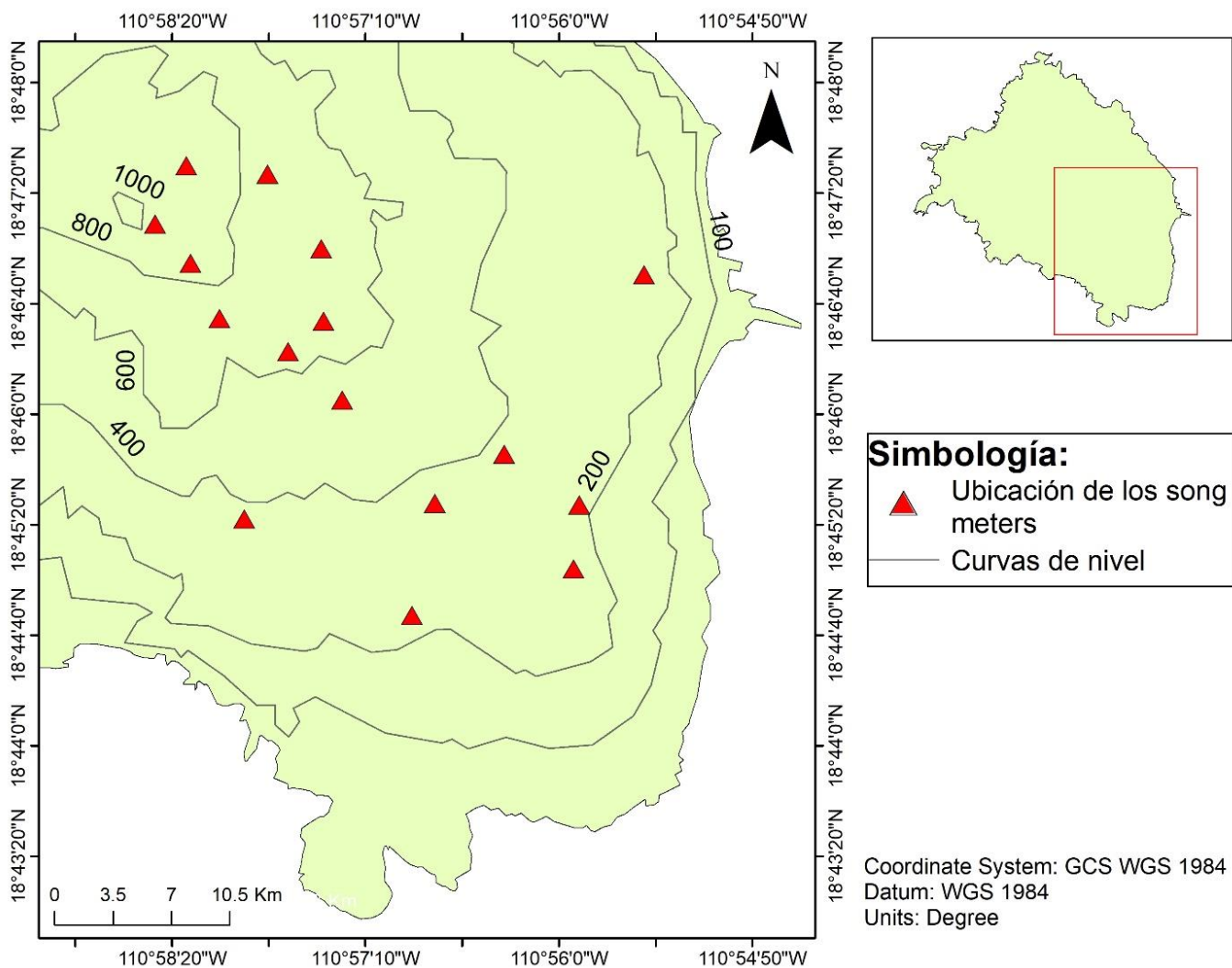


Figure 34. Location of automated recording units in Southern Socorro Island.

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Figure 35. Above: Yolotli Morales bands a Socorro Mockingbird. Below: Socorro Parakeets nesting in an artificial box provided by Africam Safari and placed on a *Sideroxylon socorrense* tree.

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Other risks



Figure 36. The use of All Terrain Vehicles (ATVs) must be restricted and regulated. Birds, lizards and dozens of land crabs are killed regularly by these vehicles in montane areas of Socorro Island.

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Figure 37. Leg hold traps with exposed tigers represent a risk for curious birds.



Figure 38. Cage traps must be properly placed to improve chances of success and to prevent teaching cats about their purpose.

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Figure 39. Conibear traps represent a risk for other species that may be attracted to them. A trap full of land crabs may attract the endemic night heron.