

A transboundary conservation experiment in the Sonoran desert ecosystem

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Transboundary Conservation Areas (TBCA):

There are several models of cross-border ecological management and the World Conservation Union (IUCN) use the following definition:

“Transboundary conservation and development areas are areas of land and/or sea that straddle one or more borders between states, sub-national units such as provinces and regions, autonomous areas and/or areas beyond the limit of national sovereignty or jurisdiction, whose constituent parts form a matrix that contributes to the protection and maintenance of biological diversity, and of natural and associated cultural resources, as well as the promotion of social and economic development, and which are managed co-operatively through legal or other effective means.”

This definition is useful because it includes those complexes which cross boundaries and also includes non-protected areas with ecological value, such as low density agriculture or unmanaged land.

One ecological advantage to these schemes can be increased home-range and territory for some species, facilitated by the reduction of border impediments - such as security infrastructure.

These benefits have in part led to TBCA growth on a global scale. According to IUCN, since 1987 the number of TBCA complexes has risen from 56 to over 220 today, covering an area the size of India (IUCN 2009).

This is not matched by a commensurate growth in research papers. On the Web of Science in October 2009, only thirteen papers include Transfrontier Conservation or Transboundary Conservation in their titles and twelve of these appeared since 2003, while over half had an African focus. Only two of these papers addressed generic advantages of such schemes and none addressed possible disadvantages, such as an increase in illegal human and invasive activity across the border. While some unpublished studies exist, the overall number of peer reviewed papers is low.

Aims: This is important because resources are required to maintain the existing managed complexes

and further resources might be required to develop a further 104 potential TBCA sites (Gomez, A. et al 2006). The goal of this project is to investigate some of the ecological advantages and disadvantages of TBCA through comparing TBCA connected habitat usage by carnivores, humans and invasive mammals with similar unconnected habitat.

Location: The Sonoran Desert Biosphere Reserve Network (SDBRN) in the NW of Mexico and SW of the USA is an IUCN classified TBCA complex (Lysenko et al 2007). It contains the largest sand sea in North America along with the Colorado river and delta. The Eastern end is home to the Sky Islands - a chain of forested mountain peaks that rise from a sea of cactus scrub plains. This biogeographical combination confer exceptional biodiversity on the region.

The US Government has built over 60 miles of non-porous border fencing through this ecosystem, with another 150 miles of porous fencing. This intermittent infrastructure is designed to exclude illegal migrants and drug smugglers crossing into the United States. However it also provides an opportunity to compare native carnivores, invasive and human activity in a single habitat, both in a TBCA and non-TBCA state simultaneously.

Materials: Camera traps are useful in many mammal studies (Rowcliffe and Carbone 2008) and can

also cover large spatial scales. The majority of the preliminary study was carried out with Reconyx Rapidfire Covert RXCR60 color infrared Trail Camera (Reconyx Inc. 3828 Creekside Lane, Suite 2, Holmen, Wisconsin 54636).

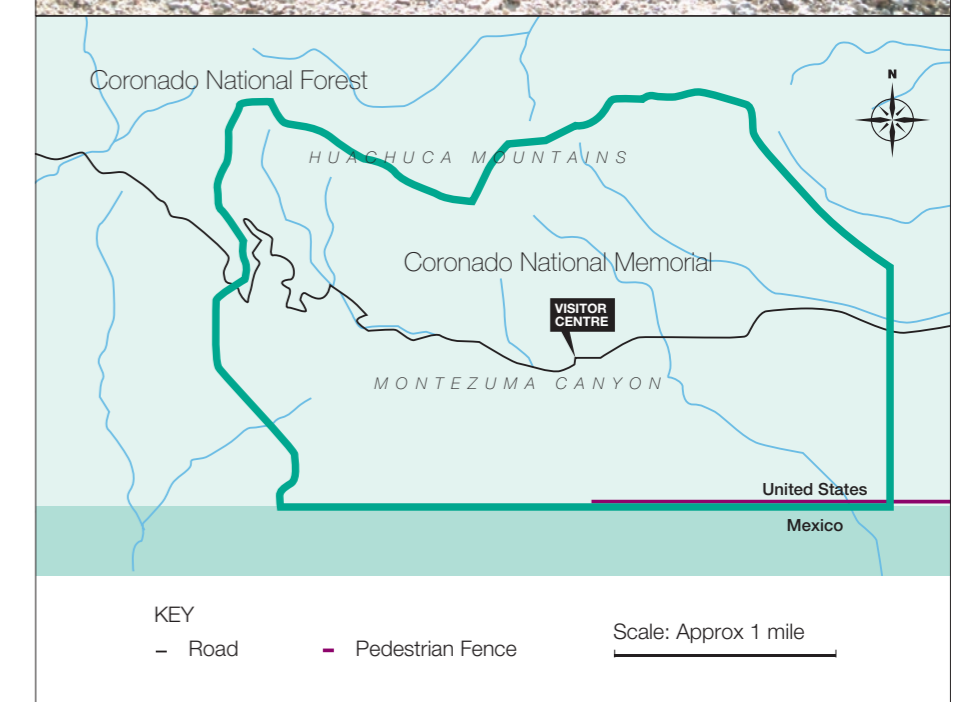
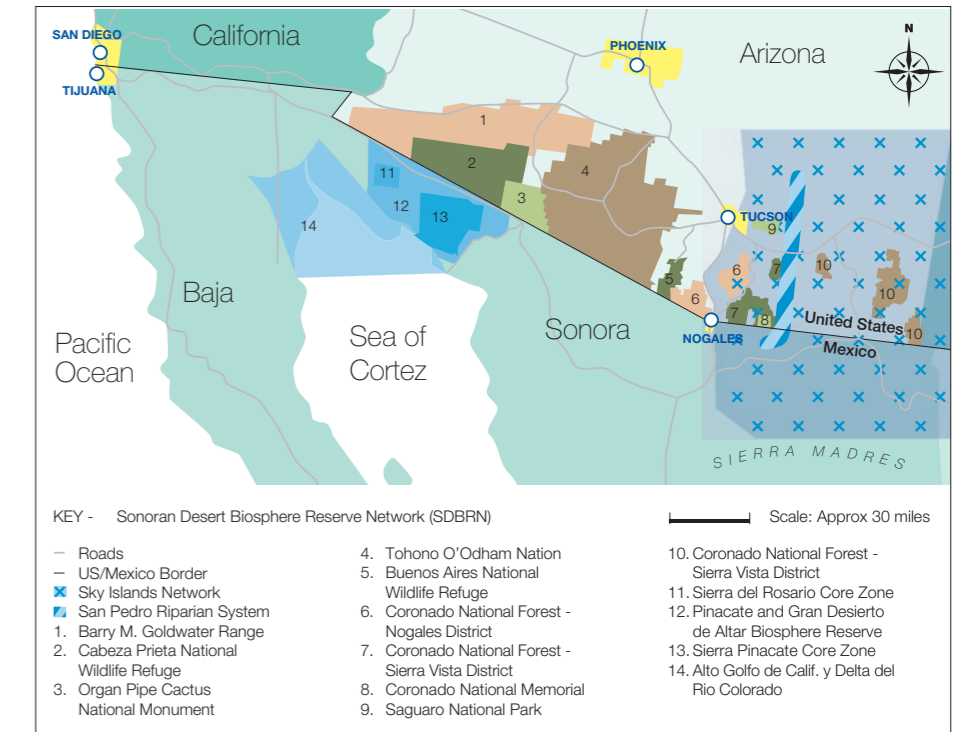
Digital photographs are triggered by passive infrared systems. At night subjects are lit up by infrared illumination beams. The cameras can be left for 3-4 weeks at a time, recording images to a data card. After this period, batteries are replaced and images are downloaded for evaluation and classification.

Material Testing – Organ Pipe Cactus National Monument:

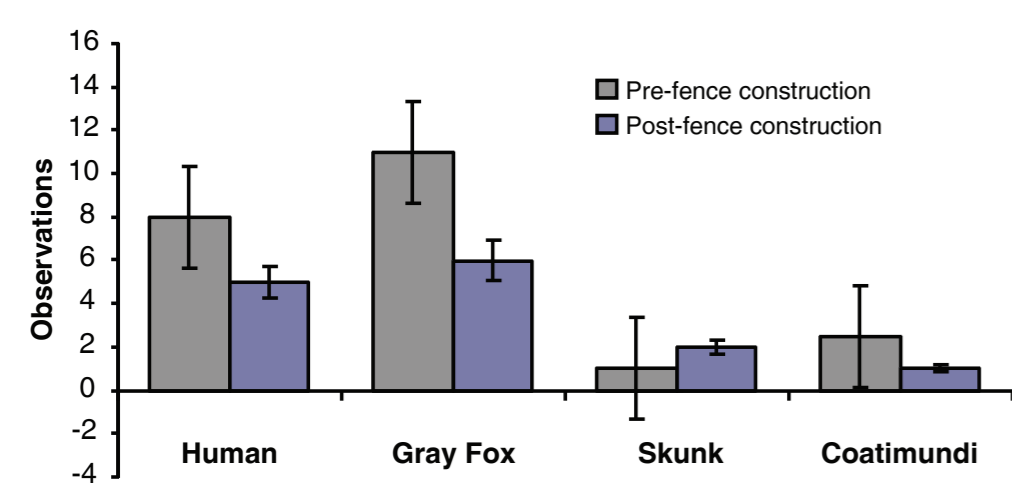
Six camera traps were successfully deployed over 800 survey days with increasing efficiency throughout 2008 and 2009. Native carnivores including bobcat (*Lynx rufus*) and coyote (*Canis latrans*), invasive feral dogs (*Canis familiaris*) and humans were observed pre and post fence construction, demonstrating that each of the target groups were present in the sample location.

Pilot – Coronado National Memorial: Armed with this knowledge, a more detailed survey was carried out at Coronado National Memorial (CNM). A 14ft pedestrian fence was constructed in the latter part of 2008 and early 2009. Non-porous and porous zones, as well as fence-end zones (within 500m of the Western end of the fence) were all surveyed pre and post fence construction. Data was normalised to total 90 survey days for each treatment - as logistical and security issues meant that each camera operated for a different number of survey days.

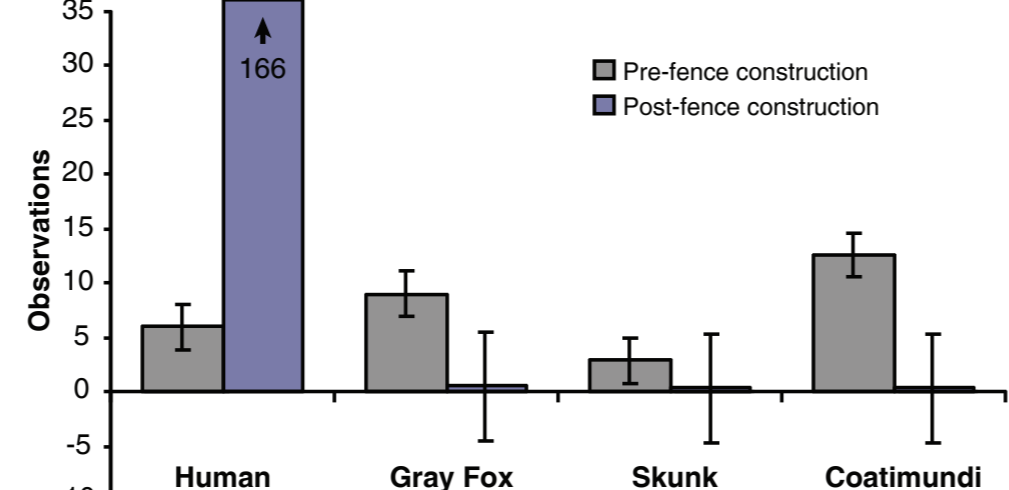
Pilot Results: Bobcat, black bear (*Ursus americanus*) and cougar (*Puma concolor*) were not observed in enough numbers to infer anything about their habitat use, suggesting that a greater number of survey days are required for such species. However those species which were observed more frequently appear below, and include gray fox (*Urocyon cinereoargenteus*), selected skunk species (*Mustelidae*) and coatiundi (*Nasua nasua*) categorized by treatment zone.



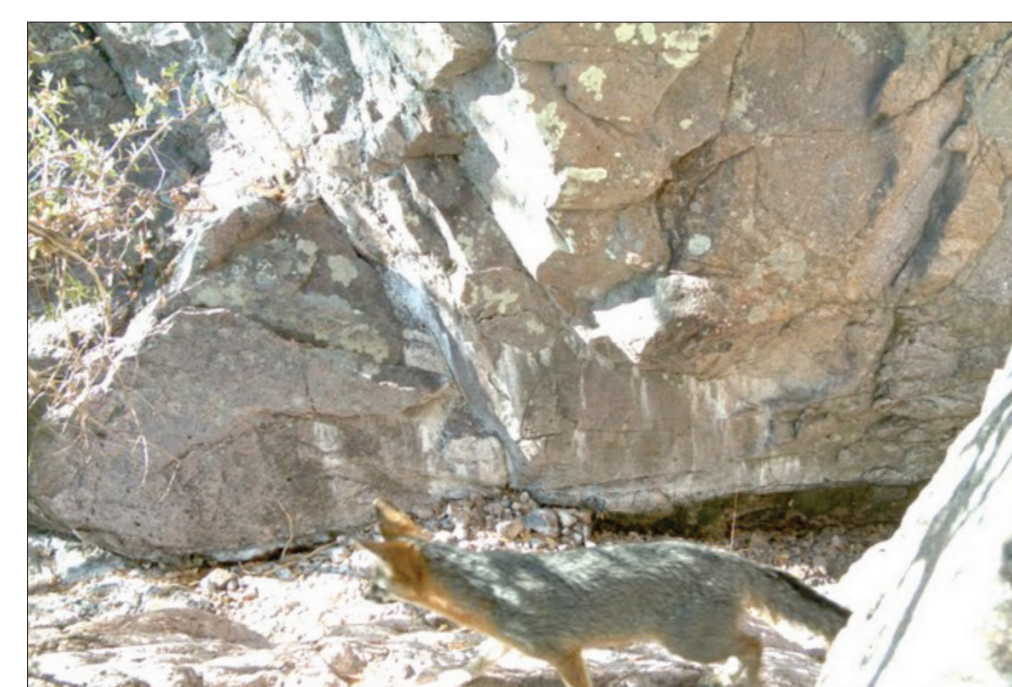
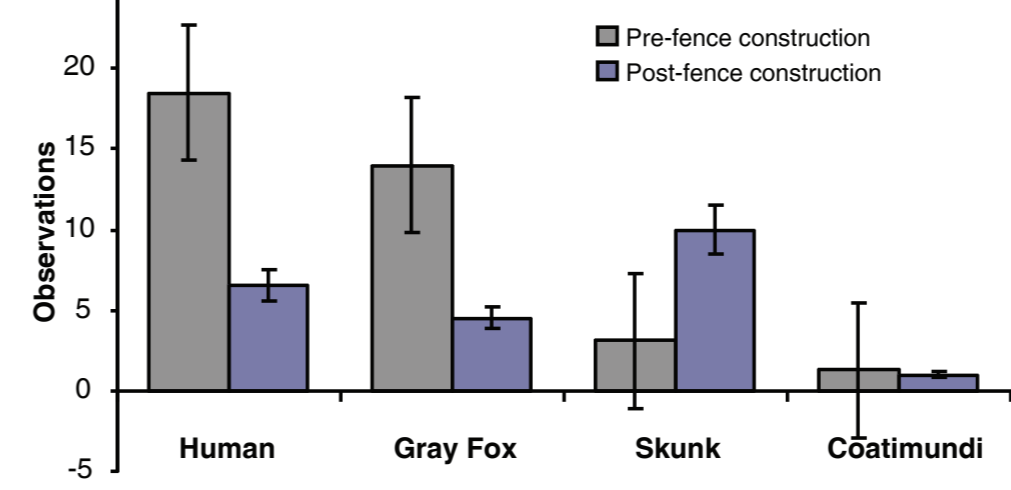
Observations pre & post fence for selected species **porous zone** (over 90 days)



Observations pre & post fence for selected species - **fence end zone** (over 90 days)



Observations pre/post fence for selected species - **non-porous zone** (over 90 days)



Tentative Conclusions:

- Higher number of carnivore species observed in porous zone
- Low variation in carnivore species observations in porous zone
- Rise in human observations in fence end zone
- Drop in coatiundi and gray fox observations in fence end zone
- Drop in human observations in non-porous zone
- Drop in gray fox observations in non-porous zone

- These results tentatively suggest that the open TBCA zones are advantageous to mid-sized carnivores, but they do also encourage increased human activity which in turn appears to negatively impact observations of these species
- However carnivore observations did not provide enough statistical power to make these suggestions more than conjecture
- As a result, a longer study period, with more cameras situated in more places is to be carried out in 2010

Further Research:

- In 2010, four different study sites within the SDBRN will be surveyed
- Each of these sites is representative of the species, habitat and topography present in the SDBRN
- Within each site, three cameras will be placed in each of the porous, fence end and non-porous zones - a total of 36 cameras. Porous and non-porous zones will be situated a minimum of 4km apart - to take account of the homerange of target species and minimise the risk of pseudo-replication
- The next phase will attempt to identify if the implied effects apparent at CNM are relevant elsewhere and to understand better whether the connected TBCA areas have the same habitat usage from the same number of native carnivores, invasives and humans than the non-porous areas and the fence end areas in order make a broader inference about TBCA as a whole
- This information will be disseminated by means of papers, lectures and through the IUCN TBPA Specialist Study Group

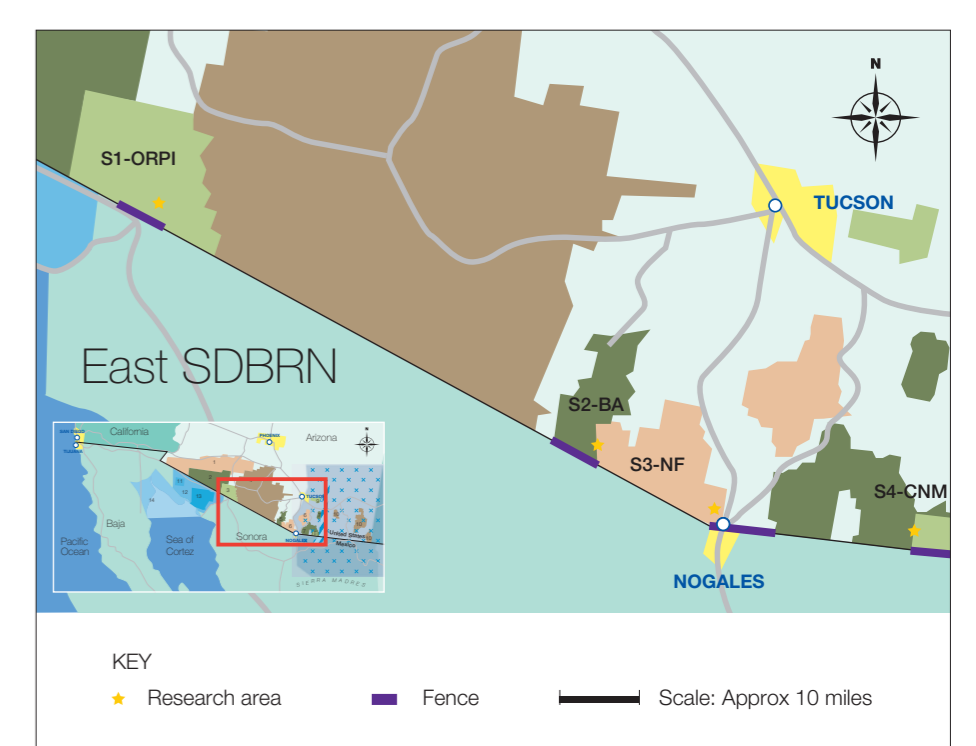
References:

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