Deforestation of "Degraded" Rangelands: The Argentine Chaco Enters the Next Stage of the Anthropocene

Author(s): Brandon T. Bestelmeyer
Source: Rangelands, 36(4):36-39. 2014.
Published By: Society for Range Management
URL: http://www.bioone.org/doi/full/10.2111/Rangelands-D-14-00026.1

View Point

Deforestation of "Degraded" Rangelands: The Argentine Chaco Enters the Next Stage of the Anthropocene

By Brandon T. Bestelmeyer

Twenty years ago I completed my master's work in the Chaco forests of northern Argentina. The native forests are, in fact, rangelands. In addition to livestock grazing, there is timber extraction, wildlife harvest (think tegu lizard cowboy boots), and charcoal production. I took part in a project comparing biodiversity among production systems. A new system promised to reverse biodiversity loss and soil degradation. But it's a moot point now, since much of that forest has been cleared for cropland—the highest rate of tropical forest loss in the world.[1]

The Gran Chaco is a vast sedimentary plain of over 500,000 square miles in the center of South America. It is the largest continuous dry forest area on the continent. The historical vegetation of the Chaco was a parkland of grassy areas maintained by fires, interspersed with patches of hardwood trees.[2] After European settlement, uncontrolled grazing and loss of indigenous fire use led to a thickening of woody plants. The western Chaco is so thick that it is referred to as *el impenetrable*. In areas of heaviest use near to water wells of the *puestos*, or ranch dwellings, even the woody plants can't keep up with goat grazing and fuel-wood harvest, resulting in open woodland with compacted bare soil between the trees (Fig. 1). These changes are believed to have diminished biodiversity and increased poverty among indigenous peoples and "Chaco campesinos," a group with mixed European and indigenous ancestry.[3]

The project I worked on tested the effects of a new type of production system on biodiversity.[3] This system used pasture fencing combined with grazing rest and managed stocking rates in an effort to produce beef and timber products sustainably. The Salta management system (named after the province in Argentina where we worked) was compared to the traditional puesto management system in which goat and cattle grazing is centered on a water point. Puesto grazing produces a "piosphere" pattern of increasing vegetation cover with distance from the water source. I studied ant communities[4] (a common animal bioindicator), and others worked on reptiles.[5] A later study examined birds across multiple puestos.[6]

The results of these studies have been remarkably consistent across animal groups, and surprising. Areas near puestos—the so-called degraded areas—harbor substantial biodiversity. The habitats produced by heavy grazing within a few hundred meters of the puesto favored species adapted to open areas. These are not necessarily weedy species. Some may have been associated with the former open grassland patches (suggesting that it is not the grass that matters to some animal species, but the lack of trees). In addition, well-based water sources may be important for birds. Areas farther from puestos, however, harbored rare species associated with more complex vegetation and higher cover (Fig. 1). The combination of open and structurally complex vegetation, including that produced by the Salta management system, supported exceptional biodiversity at the landscape level.

Those landscapes are now disappearing. An amazing new product, the Global Forest Change dataset, was released last year.[1] The dataset documents change in forest cover globally from 2000 to 2012. It can be viewed online and the data can be downloaded for analysis. Within 50 km of my study site in Salta province, 27% of the forested area in 2000 was converted to cropland or introduced pasture by 2012 (Fig. 2). You can see the pattern of deforestation at an even broader extent by viewing an online map.[i] According to the University of Maryland group, this is the fastest rate of tropical deforestation occurring anywhere in the world. And the puestos are disappearing with the forest.[7]

[i] http://goo.gl/65wtwm

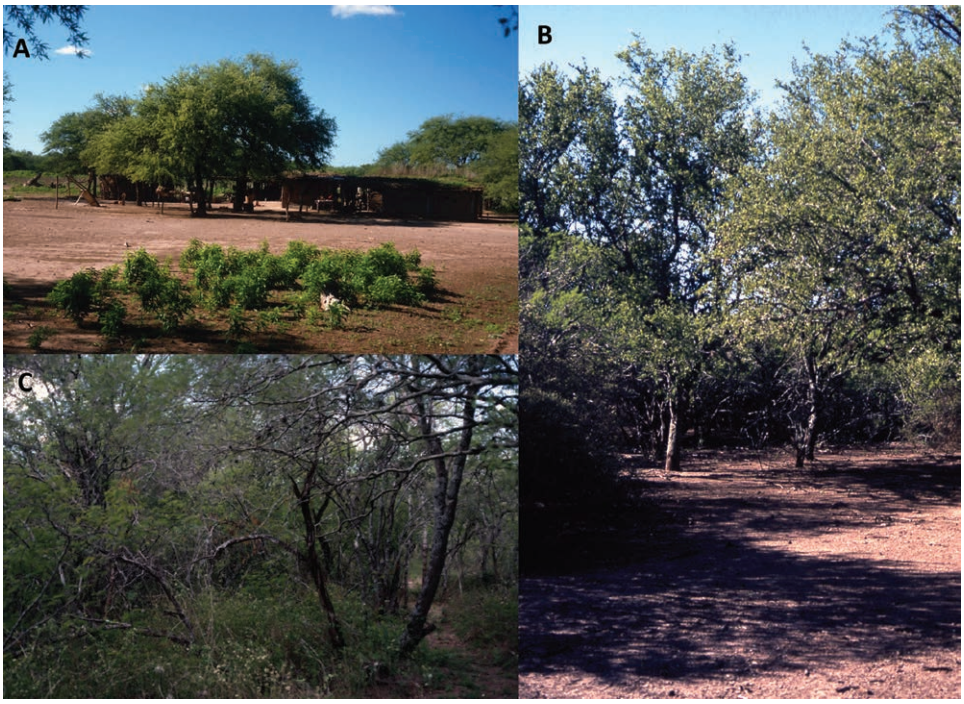

Figure 1. A, A puesto dwelling near the water source. **B,** Open woodland with little ground cover farther from the puesto. **C,** Complex vegetation within the Los Colorados Experimental Station resulting from ca. 18 years of the Salta management system. All photos are the author's and taken ca. 1991–1993.

I haven't been back to Salta, so I have no first-hand knowledge of the effects of development on the remaining forest and on the wonderful people I came to know (Fig. 3). It has been proposed that deforestation may benefit biodiversity because puesto abandonment leads to vegetation recovery in the remaining forests.[7] It is possible that poverty is being alleviated as campesinos move to cities, and regionally due to the exports of agricultural goods abroad—mostly soybeans to China for animal feed.[8] It is also reported that the campesinos are being pushed off their land, and even murdered, to make way for corporate soybean farms.[9–11] And with the campesinos, the biodiversity to which they contributed—and were a part—is at risk of being lost.

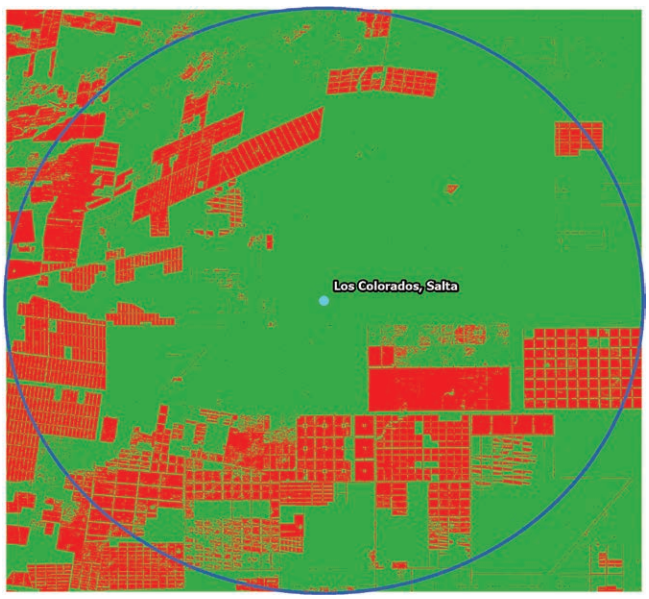

Figure 2. Forest cover change in the study area from the Global Forest Change dataset. The calculation was centered on the Los Colorados Experimental Station headquarters at lat 24°40′ 48″S; long 63°18′ 09″ W with a diameter of 50 km (blue circle). Green=no change in cover, red=forest cover loss between 2000 and 2012. Note that some conversion to cropland or planted pasture had occurred prior to 2000.

The Salta vs. puesto management system debate, along with my master's thesis, is now an anachronism. The place I studied was at the cusp of a new stage in the Earth's transformation; we could call it the "the middle Anthropocene," in which corporate agriculture replaces small-scale ranching. I hoped to produce science that promoted sustainability within the puesto landscape, but the puestos-as-degradation narrative that motivated my research simply greased the skids of land conversion.[12] I wonder if I would have framed my thesis differently if I had any inkling of what was coming. Would I have celebrated the diversity of the puesto landscape to a greater degree? As a scientist, I have learned to be as skeptical of the narratives behind the hypotheses as I am of the hypotheses themselves.

It is possible that the 2008 Native Forest Law[ii] in Salta will yield an adequate balance between pastoral, conservation, and cropland land uses, but the pressure to convert what

[ii] Ley 7.543. Ordenamiento Territorial de Bosques Nativos de la Provincia de Salta. Expte. 90-18.078/08.

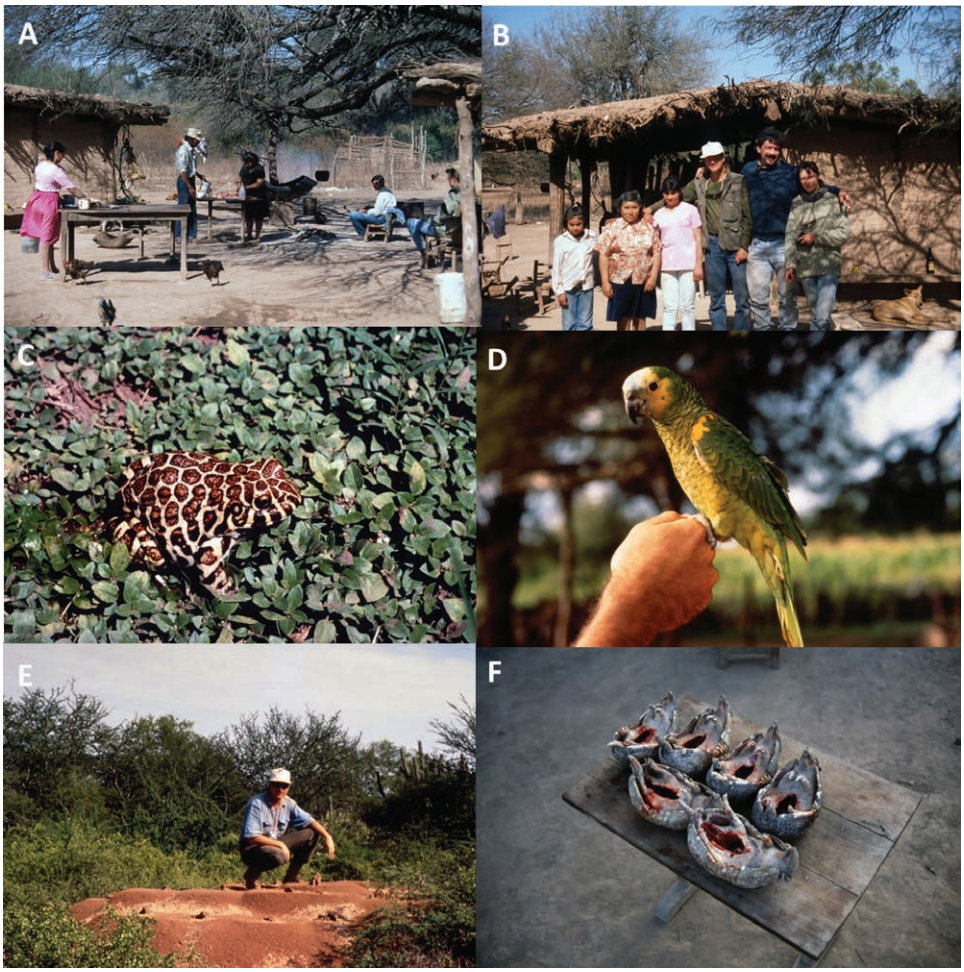

Figure 3. A, Preparing a meal at the puesto Campo Grande. **B,** The author (middle, white hat) with members of the Velaizán family (left) and colleagues Sergio Miglietta and Viviana Romero, who introduced him to this landscape (right). **C,** The coralline frog (*Leptodactylus laticeps*). **D,** Blue-fronted Amazon parrot (*Amazona aestiva*). **E,** The author on top of an ant mound of the Chaco leafcutter ant (*Atta vollenweideri*). **F,** Three-banded armadillos (*Tolypeutes matacus*), hunted locally in the winter so not to interfere with reproduction, ready for roasting on wood coals. All photos are the author's and taken ca. 1991–1993.

forest remains will only increase as we seek to feed the nine billion of us. The deforestation rate in recent years indicates that this balance will be hard to achieve.[13] I've thought about going back to Salta see what is happening, but there is no going back to the Chaco I once knew.

Acknowledgments

Thanks to Enrique Bucher and John A. Wiens for getting me started.

References

1. Hansen, M. C., P. V. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. V. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and J. R. G. Townshend. 2013. High-resolution global maps of 21st-century forest cover change. *Science* 342:850–853.
2. Bucher, E. H. 1982. Chaco and Caatinga—South American arid savannas, woodlands and thickets. *In* B. Huntley and B. Walker [eds.]. Ecology of tropical savannas. Berlin and Heidelberg, Germany: Springer. p. 48–79.
3. Bucher, E. H., and P. C. Huszar. 1999. Sustainable management of the Gran Chaco of South America: ecological promise and economic constraints. *Journal of Environmental Management* 57:99–108.
4. Bestelmeyer, B. T., and J. A. Wiens. 1996. The effects of land use on the structure of ground-foraging ant communities in the Argentine Chaco. *Ecological Applications* 6:1225–1240.
5. Leynaud, G. C., and E. H. Bucher. 2005. Restoration of degraded Chaco woodlands: effects on reptile assemblages. *Forest Ecology and Management* 213:384–390.
6. Macchi, L., and H. R. Grau. 2012. Piospheres in the dry Chaco. Contrasting effects of livestock puestos on forest vegetation and bird communities. *Journal of Arid Environments* 87:176–187.
7. Grau, H. R., N. I. Gasparri, and T. M. Aide. 2008. Balancing food production and nature conservation in the Neotropi-

cal dry forests of northern Argentina. *Global Change Biology* 14:985–997.
8. Aide, T. M., and H. R. Grau. 2004. Globalization, migration, and Latin American ecosystems. *Science* 305:1915–1916.
9. Goldfarb, L., and A. Zoomers. 2013. The drivers behind the rapid expansion of genetically modified soya production into the Chaco region of Argentina. *In* Z. Fang [ed.]. Biofuels—economy, environment and sustainability. Rijeka, Croatia: InTech. p. 73-95
10. González Arzac, R. 2012. Argentina: matar campesinos por la soja. El Puercoespin, Argentina. Available at: http://www.elpuercoespin.com.ar/2012/11/22/argentina-matar-campesinos-por-la-soja-2/. Accessed 6 May 2014.
11. Aranda, D., and N. Holland. 2011. 15 years of GM soybeans in Argentina. Brussels, Belgium: Mondiaal Nieuws. Available at: http://www.mo.be/en/article/15-years-gm-soybeans-argentina. Accessed 6 May 2014.
12. Murgida, A., M. González, and H. Tiessen. 2014. Rainfall trends, land use change and adaptation in the Chaco salteño region of Argentina. *Regional Environmental Change* (in press).
13. Gasparri, N. I., H. R. Grau, and J. Gutiérrez Angonese. 2013. Linkages between soybean and Neotropical deforestation: coupling and transient decoupling dynamics in a multi-decadal analysis. *Global Environmental Change* 23:1605–1614.

Author is Research Ecologist, US Dept of Agriculture–Agricultural Research Service Jornada Experimental Range and Jornada Basin Long Term Ecological Research, New Mexico State University, Las Cruces, NM 88003, USA, bbestelm@nmsu.edu.

Rangelands 36(4):36–39
doi: 10.2111/Rangelands-D-14-00026.1