

Brush Problems in Argentina's Rangelands: I. Chañar [*Geoffroea decorticans*] in Northwestern Santa Fe Province

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Resumen

El chañar (*Geoffroea decorticans*) es una especie leñosa originaria de Argentina. Aparece en pasturas y campos abandonados en distintas regiones del país. En este trabajo, se presenta una descripción del problema en el noroeste de la provincia de Santa Fe. Las aradas discontinuas y el mal manejo de las pasturas parecieran ser los factores antropógenos más importantes que determinan la invasión del chañar. Se sugieren algunos métodos de control.

The Argentina Republic is located in South America, between the south parallels 21° 46' and 55° 3' and the meridians 53° 38' and 79° 55' W of Greenwich.

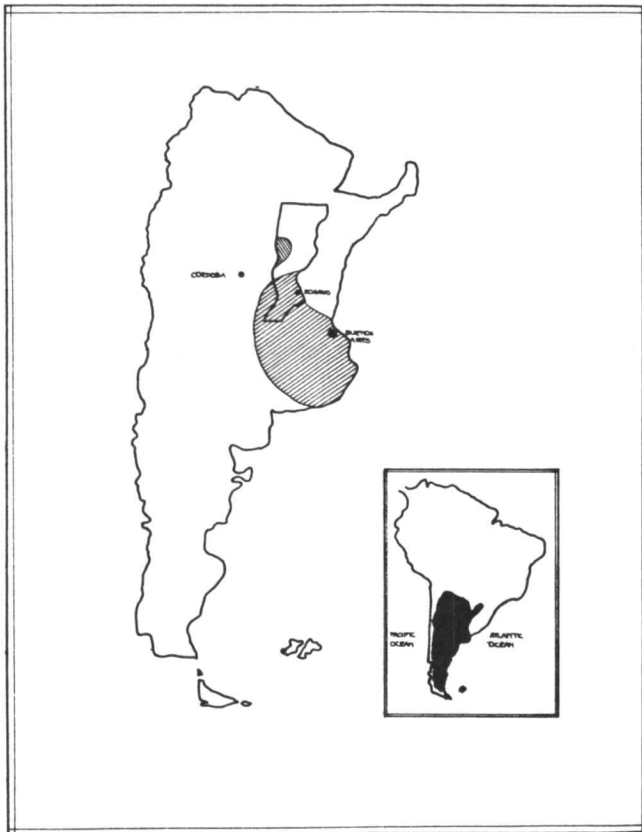
Beef cattle raising is one of the most important economic activities in most of the country. Much of this activity, espe-

cially the beef fattening, is concentrated in the region named "Humid Pampa" on cultivated pastures. Surrounding the Humid Pampa there is an extensive area with very different soils and climates, ranging from humid to arid conditions. Calf production is the main activity in this area and most of the pastures are rangelands. Brush invasion is a common problem of these rangelands.

Brush, which in Argentina is generally named "monte", is an ancient problem. Argentine shrubland ecosystems are much the same as those in other countries, (Scifres et al. 1985; Walker et al. 1981). The shrublands originate from different situations: (1) grasslands where the flux of naturally occurring fires and floodings has been altered; (2) forests which were selectively exploited and abandoned—in these cases the cattle's selective grazing had an important role in the establishment of shrublands; (3) fields first dedicated to agriculture or cultivated pastures that were later not plowed anymore, letting the spontaneous vegetation reappear under cattle grazing. This is the case of the shrub chañar (*Geoffroea decorticans*), that will be considered here.

Chañar

Chañar (*Geoffroea decorticans*) (Gill ex H. et A. Bur), a *Dalbergia leguminosae* is a woody species (Burkhart 1949, 1952). It grows as a shrub type plant or a tree, which can reach up to 10 meters height. It is more common as a shrub, not very spiny, ranging between 4 to 5 meters height. It has compound deciduous leaves and on the stem and principal

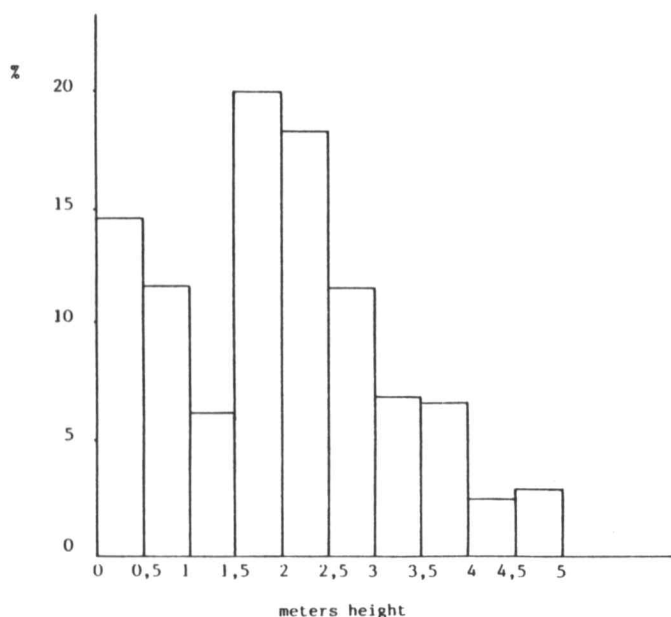


Ubication of the Argentina Republic. The Humid Pampa Region (//////) and the area under study (~~~~).

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General view of a rangeland. New chañar sproutings in the background. A dense 30-year-old chañar islet at the left. Northwestern Santa Fe province, Argentina.



Height distribution (in meters) of chañar plants of a field that hasn't been cultivated for 20 years. Data from five 10 × 10-m plots expressed as percentage values.

branches it has strips of dead bark, which fall down leaving behind the new green bark. The fruit is a drupe eaten by local inhabitants and cattle.

Burkart (1949) pointed out that there could be 2 varieties: (1) *subtropicalis* is a tall tree that may reach 10 meters height, not very spiny, which is only reproduced by seeds and is a common component from the subtropical woodlands in the northern part of the country; (2) *typica* is more a shrub-like plant which appeared originally in almost pure stands in a patch distribution surrounded by grasslands and may be propagated by seeds but mostly by sprouting roots. Some features of the root buds sprouting were analyzed under laboratory conditions (Feldman and Feldman 1985).

Chañar can be found growing in different soils and climatic conditions. It is a xerophytic species and when it grows in humid climates it appears mostly in typical natracualf soils. It grows on sandy soils in the southern part of the country and on typical natracuals and natralbols in the northcentral part. Due to these different ecological situations in which chañar appears, there is a firm assumption that there must be many ecotypes.

The first botanist who visited the country, Grisebach, 1879, mentioned chañar as a natural component of different vegetation types. Frenguelli (1941) named a region "Parque del Chañar", considering it corresponded to part of the area which Grisebach had previously designated "Chañar-Stepe". The vegetation of these area was recently surveyed by D'Angelo et al. (1985). This region is placed between 29° 30' and 31° 30' south latitude and 60° 32' and 62° west of Greenwich.

Chañar in Northwestern Santa Fe Province

In this region there is a warm temperature, humid or sub-humid climate, with rainfalls mostly in summer and a dry period at the end of winter. It rains from 800 to 950 mm per year, with a great variability with droughts or flooding peri-



Chañar sproutings in a field where plowing was quit 4 years ago. Northwestern Santa Fe, province, Argentina.

ods. Mean temperature is 18.8° C, mean maximum and minimum are 26° C and 13° C respectively and maximum and minimum values are 42.6° C and -4.7° C respectively. There is a frost-free period of 286 days (Burgos 1970).

The landscape is generally plain, with a slight slope towards north and east. The soils are typical natracuals and natralbols, and in less proportion in swampy areas, typical natracualfs (Mosconi et al. 1981).

There is no reference on the original vegetation of this area. Oral tradition, and some written information (Frenguelli 1941) coincide in mentioning that the general vegetation was a savanna with scattered *Prosopis* spp. in the grassland, and some chañar islets. The brushland where chañar is dominant is locally called "chañaral". It appears in islets scattered in the grasslands and very seldom associated with very few *Prosopis* spp. Low shrubs like *Grabowskia duplicata*, *Celtis* spp., *Schinus molle*, and *Acacia aroma* appear in the upper layer. There could be lianas like *Muelenbeckia sagittifolia*, *Mikania* spp., *Arauja* spp., *Clematis montevidensis*, etc. In the herbaceous layer, below the brush and in the surrounding grasslands, there is dense turf with abundant grasses like *Trichloris crinita*, *Chloris polidactyla*, *Setaria* spp., *Bothriochloa laguroides*, *Panicum bergii*, *Eragrostis* spp., *Cynodon pleistotachyum* etc. In some cases *Iresine difusa*, *Holmbergia tweedii*, *Pterocaulon subvirgatum*, and *Bacharis pingraea* appear. In extreme overgrazing *Bacharis choridifolia* appears, which is a toxic species.

Following Jenny's (1941) concept of soil formation the authors (1985) suggested that the vegetation at a given place and time is a function of multivariate factors:

$$V = f(\text{cl, s, p, f, fl, m, t, a, ...})$$

where:	V: vegetation	fl: flora
	cl: climate	m: microorganisms
	s: soil	t: time
	p: propagules	a: anthropogeneous
	f: fauna	

In chañar the main factor determining the new vegetation type was anthropogeneous (man). At the end of the last century, there began an intensive occupation of this area by



Chañar sproutings 4 years old. Northwestern Santa Fe province, Argentina.

farmers who cultivated wheat, flax, and corn. Most of the area was plowed drastically, destroying the native grasses.

Most of the woods disappeared because the plants were dug out. The normal extraction of chañar plants eliminated the principal roots, but part of the secondary roots remained in the soil. These roots have sprouting buds that were cut and dispersed by agricultural labors. As a result, new plants of chañar increased. While there was frequent agricultural work, chañar was not a problem because the new plants were eliminated by mechanical labor.

Nowadays agriculture is not a frequent alternative. Fields are generally plowed for sowing pastures, but only a small proportion of farms and ranches is dedicated to cultivated *Melilotus alba*, sorghums, oats, rye, and barley for direct grazing. Most cattle graze on spontaneous pastures. These grasslands, as it was pointed out, are composed mainly of *Chloris* spp., *Eragrostis* spp., *Setaria* spp., *Trichloris* spp., and *Stipa* spp. *Cynodon dactylon* is also a very common species, being in some cases dominant.

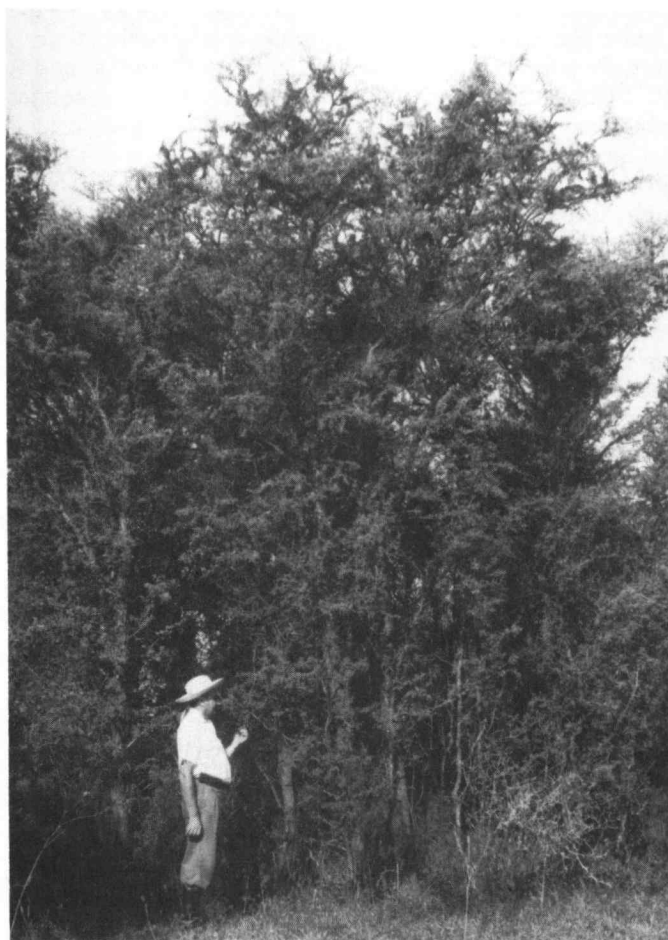
Since plowing is no more an annual occurrence, native grasses reappear. At the same time, the chañar roots sprout.

After 2 years without cultivating the soil, a count of resprouted chañar ranged from 8,500 to 30,000 plants per hectare. These counts were done on pastures. Only 60 to 70% of the total field was covered with islets of chañar.

Without soil alteration, this vegetation type does not let



General view of chañar brushland 40 years old. On the right side the field was under cultivation until 4 years ago. Northwestern Santa Fe province, Argentina.



Detail of chañar, 40 years old. Northwestern Santa Fe province, Argentina.

grassland return unless man takes direct action. Under a continuous grazing system, the brush community will evolve, reaching more stable conditions. In a field that hasn't been cultivated for 20 years, 5,400 chañar plants per hectare were counted, ranging from 0.5 to 23 cm in diameter and

from 2 to 5 meters high.

Due to the high plant density most of the plants are concentrated in the lowest stem diameter classes. The height data show wide variability—40% of the plants are located between 1 and 2.5 meters. In these conditions, it is very difficult to walk through the brush. In some cases it forms a pure stand of chañar in the upper layer and in other cases a few low shrubs appear associated to chañar: *Grabowskia duplicata*, *Celtis* spp., *Schinus* sp., *Acacia aroma*. These shrubs are branchy and spiny and their presence restricts even more the traffic of man and cattle.

Management Suggestions

Once the chañar ecosystem is established, it enters a dynamic-steady-state. Changes are almost imperceptible. Only direct and dramatic human intervention may reverse the situation; for instance, manual extraction, root plowing at the first stages, bulldozing, etc.

Reinfestation is almost sure, even under more rational grazing. Plowing and seeding *Grama rhodes* is a good method to avoid reinfestation, but at least every 3 years the grama shouldn't be grazed to allow the accumulation of sufficient material to start and develop fire. The dense sod of *G. rhodes*, combined with fire action will avoid chañar reinfestation.

Chemical individual treatment is a very effective method of eliminating chañar invasion at the first stages. The recommended base treatment, is spraying with a 2% solution of "Togar"¹ in gasoil.

¹Togar is the commercial trade mark for a mixture of picolinic acid and trichlofyr acid.

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The Grasses in Literature—Addendum II

Alan A. Beetle

In 1963 Morgan W. Evans cited in his "The Grasses of Literature" (see Vol. 16: pages 98 and 99 of the *Journal of Range Management*)

- (1) the Bible
- (2) Ralph Waldo Emerson
- (3) John Greenleaf Whittier
- (5) Rudolph Ruse
- (6) John James Ingals.

That same article initiated a response from E.J. Dyksterhuis. With the same title he made an "Addendum" (see Vol. 16: pages 225 and 226, *Journal of Range Management*) and suggested the following:

- (1) Julian Stearns Cutler
- (2) Robinson Jeffers
- (3) Carl Sandberg
- (4) W.A. Silveus
- (5) Donald Culross Peattie
- (6) L.H. Pammel
- (7) W.J. Showalter
- (8) William Elsey Connelly
- (9) and an anonymous poet of the 1930s.

Now I would like to propose a second addendum and to start with Walt Whitman, specifically his "Leaves of Grass" first published in 1885 and in particular his poem "A song for occupations" which says in part: Flour-works, grinding of wheat, rye, maize, rice, the barrels and the half and quarter barrels -----.

- (2) Kirschner's "Nature's Healing Grasses" wherein he says in part in recommending grasses and herbs as a therapeutic agency, the emphasis should be placed upon their intelligent use but what are the grasses mentioned? Alfalfa! Comfrey! Kelp! Watercress! Parsley! Celery! Licorice!
- (3) Killeffer's "Two Ears of Corn, Two Blades of Grass"

The wonders of modern chemistry that can now produce all the necessities of life.

- (4) Buell and Brigman in 1968 "The Grass Roots"

"In Kansas, a farmer complained that Johnson grass was spreading to his field from the neighboring county road right-of-way, and ultimately was successful in persuading the county commissioners to declare that grass a noxious weed, thus bringing it within the scope of the public weed eradication program. Here, by the way, is an excellent illustration of the way by which a function long considered private comes to be taken over by government. Here was no

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