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Lama guanicoe, Guanaco

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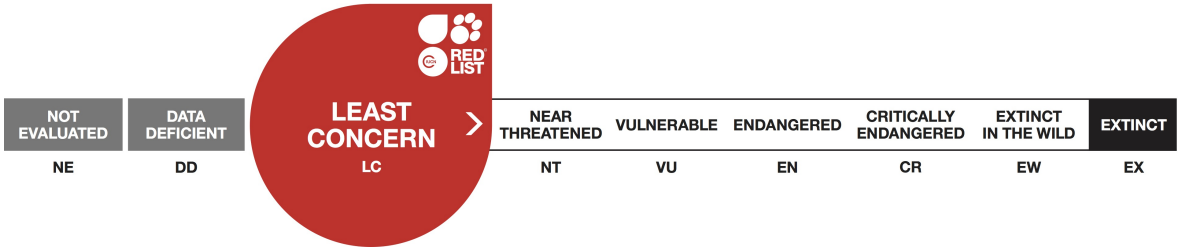

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Cetartiodactyla	Camelidae

Taxon Name: *Lama guanicoe* (P.L.S. Müller, 1776)

Synonym(s):

- *Lama glama* ssp. *guanicoe* (Müller, 1776)

Common Name(s):

- English: Guanaco

Taxonomic Notes:

There is strong morphological, chromosomal, molecular, and archaeological evidence demonstrating that the Llama originally began with the domestication of the Guanaco in the Central Andes (Wheeler *et al.* 2006, Marín *et al.* 2007), as indicated in the name *Lama glama* first suggested by Linneaus (1758) for designating the Guanaco species (Grubb 2005). Today, the endorsement is clear that *Lama guanicoe* is a valid species for the wild form (Gentry *et al.* 2004).

Throughout the first half of the 20th Century four morphological Guanaco subspecies (*L. g. cacsilensis*, *L. g. voglii*, *L. g. huanacus*, and *L. g. guanicoe*) were described based upon subtle differences in cranium biometrics, pelage colour, and body size (Wheeler 1995, González *et al.* 2006). However, analysis of Guanaco mitochondrial-DNA markers failed to clearly differentiate four subspecies throughout the wide geographic range of the species. Yet, genetic analysis did distinguish populations found in Peru and northern Chile, compared to other populations in Argentina, Bolivia, and remainder of Chile (Marín *et al.* 2008). Additional analysis with DNA-nuclear genes demonstrated the valid existence of two subspecies (*L. g. cacsilensis* and *L. g. guanicoe*) with the presence of a geographical zone of hybrid populations between both subspecies (Marín *et al.* 2013).

The Northwestern or *cacsilensis* subspecies is distributed on the western side of the Andes throughout Perú to the northern extreme of Chile, whereas the Southeastern subspecies or *guanicoe* is found throughout all of Patagonia to the extreme Austral end of the continent. Both lineages apparently formed due to the presence of the Andean altiplano (plateau) that served as a biogeographical and ecological barrier separating the populations to east and west of the Andean continental divide. The hybrid zone came about through genetic flow between the two subspecies where a geographic contact zone existed in the region south of the altiplano in Central Chile, in far northwestern Patagonia, and with an extension northeast into northwestern Argentina and southern Bolivia (Marín *et al.* 2013). An alternative to the classification of two subspecies is the possibility they could be considered Evolutionary Significant Units (sensu Moritz 1994, Marín *et al.* 2013).

At the current population level at least eight, independent genetic and demographic or Management Units (MUs, according to Moritz 1994 definition) have been identified that should be managed separately in order to maintain their local genetic adaptiveness (Marín *et al.* 2013): 1) Peruvian Hyper-Arid Desert, 2) Chilean Pre-Andean Altiplano, 3) Chilean Arid Zone and Pre-Puna, 4) Bolivian Chaco, 5)

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North and Central Patagonia, 6) Patagonia Occidental, 7) Patagonia Austral, and 8) Fueguian Zone. Guanaco populations in northeast and northcentral Argentina that were not included in Marín *et al.* (2013) have yet to be assessed for MU classification.

Although previous taxonomic classification was based upon phenotypic characteristics (Wheeler 1995, González *et al.* 2006), there have been no wide-scale studies dealing with morphological variations in the species. Preliminary examination of Guanaco skulls at museums indicates a differentiation between individuals across the continent in Bolivia, Chile, Patagonia, and Tierra del Fuego (Groves and Grubb 2011).

Identification Information:

Assessment Information

Red List Category & Criteria: Least Concern ver 3.1

Year Published: 2016

Date Assessed: February 3, 2016

Justification:

The species status is considered to be of Least Concern based upon its wide continental distribution (around one million km^2), its presumed total population size (around one million adults), and the presence of numerous protected areas across its range of distribution (56 protected areas covering around 146,000 km^2). However, Guanaco actual conservation measures continue to be primarily based upon recurring emergencies, specifically, severe local poaching, which do not fulfill the greater holistic threats faced by the species. This is a result of its wide distribution existing in small-fragmented and isolated populations, in contrast to some abundant populations that are locally and widely distributed.

Of grave concern at the national level is that Guanacos are likely to become extinct in three out of the five countries where they were historically found and currently classified as Endangered: Paraguay, Bolivia, and Peru. For this reason it is important to emphasize that future Guanaco management not only address the poaching problem, but also focus upon the implementation of measures orientated to the protection and conservation of those depressed populations, as well as, simultaneously expand the sustained utilization of those recovered and abundant populations for benefit of local residents and landowners. Accordingly, a more accurate classification of Guanaco, such as a Regional Assessment is needed in order to reflect the actual heterogeneity of populations across its multi-country distribution.

Habitat degradation due to overgrazing, competition with introduced herbivores, and habitat degradation due to extractive industries are the main threats to Guanaco (Wildlife Conservation Society 2012). Nevertheless, persistent illegal hunting is one of the historical threats to the species, independent of population size that is strongly impacting small and low-density populations (González 2010a, Wildlife Conservation Society 2012). Equally important is the continued hunting of numerically recovered populations (Lambertucci and Speziale 2011) based upon antagonism towards the species by livestock and landowners who have put pressure on governments to control Guanaco numbers. Examples of this situation occur in the Patagonia of Chile and Argentina, and populations in the Andes of Central Chile.

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Human activities such as hunting, mining, oil exploration and extraction, livestock fencing, development of infrastructure, and habitat loss, often impose barriers to migration and movement between populations. The loss of connectivity has resulted in small, closed and isolated populations under increasing risk of collapse due to the loss of genetic variation and environmental or demographic stochasticity – the latter being highly relevant to inordinately small populations. Recent research, however, on a small island population of Guanacos indicates that such isolation may not be the problem of genetic-diversity loss in the short-term (70 years) as previously envisioned, yet long-term consequences are inevitable (González *et al.* 2014).

Live-shearing of captured Guanacos is currently under development in Patagonia with Argentine-government funding. If properly managed, these programmes can offer an alternative to local economies and re-evaluation of negative attitudes by landowners towards the species (Franklin *et al.* 1997, Lichtenstein and Carmanchahi 2012, Lichtenstein 2013). More than 11,000 Guanacos had been shorn between 2004-2008, yet today only a very small percentage of the total Guanaco population is under such management (Lichtenstein 2013). The effects of sustained-fibre utilization are being assessed and monitored, especially where Guanacos are concentrated in scattered high-density populations (Ovejero *et al.* 2013, Carmanchahi *et al.* 2015). To encourage the marketing of Guanaco products, Argentina is developing and promoting Guanaco yarn and thread.

Guanacos have been legally hunted in Chile since 2003, with pressure for similar management in the Argentinean Patagonia in order to reduce density and conflicts with livestock production and forestry. However, a recent study revealed that hunting adult Guanacos by itself does not reduce browsing damage to *Nothofagus* regeneration in Tierra del Fuego, Chile (Martinez-Pastur *et al.* 2016). Still, government sanctioned and organized harvesting of Guanacos has resulted in the exportation of meat, contributed to the value of the species, and begun to reduce traditional conflict with sheep ranchers and foresters.

Previously Published Red List Assessments

2008 – Least Concern (LC) – http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T11186A3260654.en

1996 – Lower Risk/least concern (LR/lc)

Geographic Range

Range Description:

The Guanaco is a widespread species with an extensive, although discontinuous, range from the northern Peru (8°30’ S) to Navarino Island (55°S) in southern Chile, from the Pacific Ocean in the northwest to the Atlantic Ocean in the southeast, and from the sea level to 5,000 meters elevation in the Andean Mountains (Franklin 1982, González *et al.* 2006, González in prep.).

However, its distribution has been severely impacted by human beings. Constant hunting, human occupation and fragmentation of habitat, competition with livestock, and the installation of fences (Torres 1992, Franklin *et al.* 1997, González *et al.* 2006) have reduced the Guanaco’s distribution to only 26% of its original distribution (calculated by Ceballos and Ehrlich 2002, based upon Franklin 1982). Clearly numerous local populations have become extirpated generating a distribution highly fragmented

in many regions (Housse 1930, MacDonagh 1949, Mann *et al.* 1953, Cunazza *et al.* 1995, Torres 1992, González *et al.* 2006, Baigún *et al.* 2007).

In Peru the northernmost population of Guanacos in South America occurs at 8°30'S (Franklin 1975, Linares *et al.* 2010) in the Calipuy National Reserve in the La Libertad Department. To the south, populations reach the Salinas Aguada Blanca National Reserve in the departments of Arequipa and Moquegua (16°10'S), and a Guanaco population has been recorded in the Nevado Salcantay area in the Anta District (Wheeler 2006, Veliz and Hoces 2007).

In Bolivia, a relict population of Guanaco persists in the Chaco region (Cuéllar and Fuentes 2000) and recent sightings have been reported in the southern highlands between Potosi and Chuquisaca (Nuñez 2008). Although Pinaya (1990) reported the presence of Guanacos in southeastern Tarija, these records are in need of confirmation.

In Paraguay, a small relict population has been reported in the northwestern Chaco (Villalba 2004).

In Chile Guanacos occur from near Putre village at the northern border with Peru to Navarino Island in the far southern Fueguian zone (González *et al.* 2013). The largest Guanaco populations in Chile are concentrated in the Magallanes and Aysén regions in the far south. In the remainder of the country, small and fragmented Guanaco populations occur in the Andean foothills of the extreme north, scattered small pockets along the coast, the north-central zone in the lower Andes, and central Chile exclusively in the Andes (González 2010a, González *et al.* 2013).

In Argentina most of the world's remaining Guanacos are found. Although its range covers nearly all of the Argentine Patagonia, Guanaco populations appear to be more scattered towards the northern provinces of the country (Chubut, Río Negro, Neuquén, and Mendoza) compared to the southern region (Santa Cruz and Tierra del Fuego; Baigun *et al.* 2007, Wildlife Conservation Society 2012). Throughout northern Patagonia, distribution is highly fragmented in relict populations in the La Pampa and southwestern Buenos Aires Provinces. In central and northern Argentina, Guanaco distribution is restricted to the western half of the country along the pre-Andean and Andean mountains up to the border with Bolivia (Baigún *et al.* 2007). Recently a relict population has been reported in the arid Chaco of northwestern Córdoba (Schneider *et al*. unpublished data) and in Córdoba Guanacos have been reintroduced (Barri and Cufré 2014).

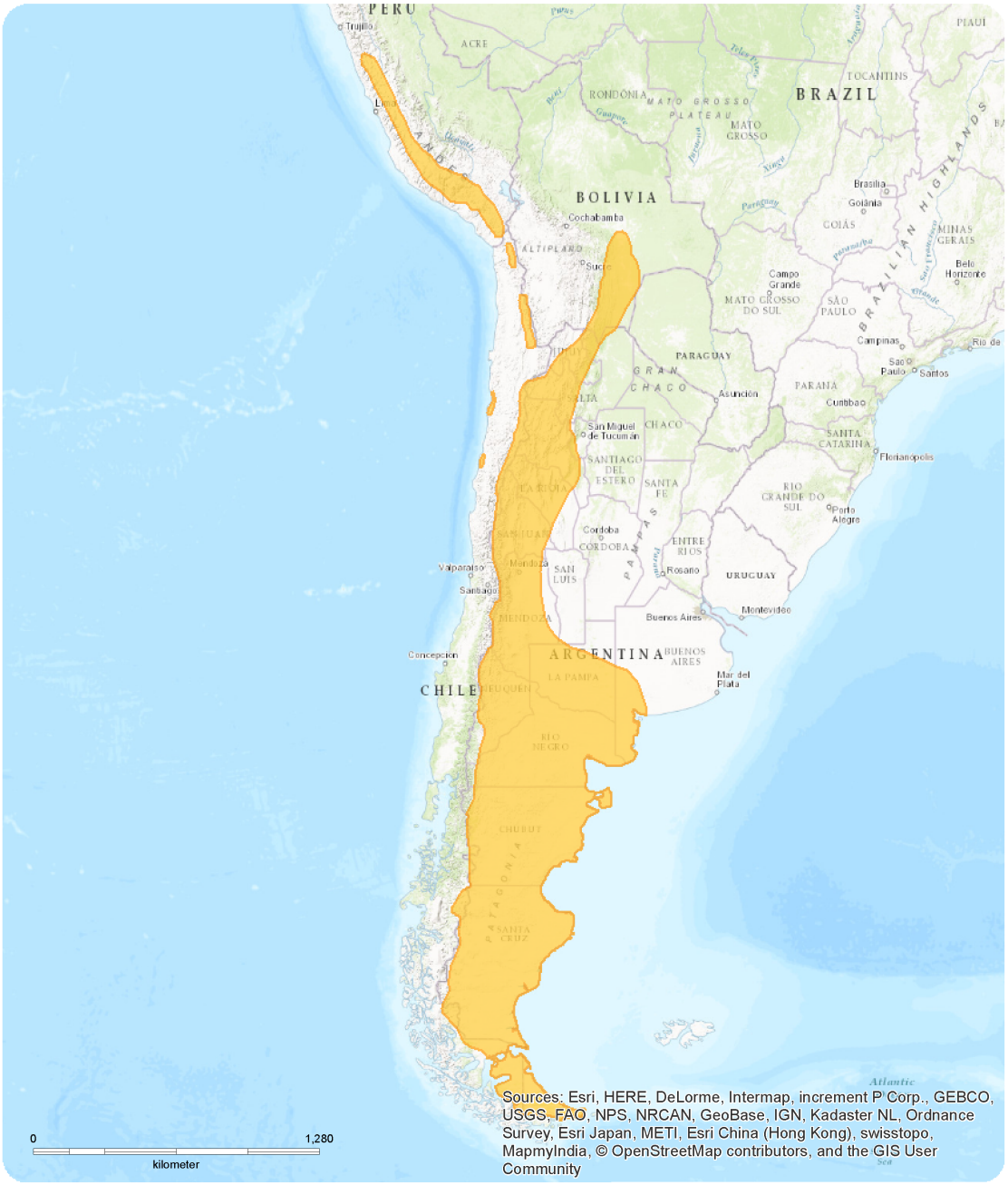
Country Occurrence:

Native: Argentina; Bolivia, Plurinational States of; Chile; Paraguay; Peru

Introduced: Falkland Islands (Malvinas)

Distribution Map

Lama guanicoe

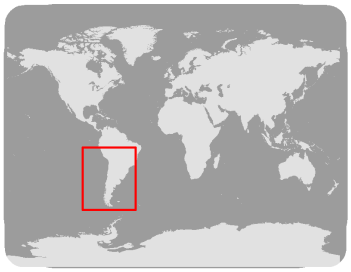


NE | DD | LC LEAST CONCERN | NT | VU | EN | CR | EW | EX

Range

Extant (resident)

Compiled by:
IUCN (International Union for Conservation of Nature)



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

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Population

It is estimated that Guanaco abundance has been reduced to only 3-7% of their original numbers when Europeans arrived to South America and the total Guanaco population was between 30-50 million animals (Raedeke 1979). Today, the total continental population of Guanacos is between 1,500,000-2,200,000 with the estimated number of adults between 1,000,000-1,500,000 (calculated from life-tables of Raedeke 1979; Fritz and Franklin 1994), two to three times greater than previously assessed (Baldi *et al.* 2008). That number would be reduced if effective population size (N_e) is applied (Sarno *et al.* 2015). Some 81-86% of the Guanaco population is found in Argentina followed by Chile at 14-18%. The total numbers in Peru, Bolivia, and Paraguay are less than 1% of the total. Differences in survey methodologies and effort across such a vast area make it necessary to be cautious about population numbers and should be taken only as references. Specifically, what is needed is a more reliable estimate for the entire Argentine Patagonia (Schroeder *et al.* 2014, Travaini *et al.* 2015). For Chile the total estimate is rather speculative as these numbers come from scattered information instead of planned surveys. More accurate surveys will hopefully come from new methods applicable for population estimation designed for large areas (González 2010a) or application of standard methodologies at broad scale (Soto 2010). For Peru, Bolivia and Paraguay, most assessments have been based mainly on animal counts because of the large and remote areas involved, possibly underestimating total population size.

Although Guanaco distribution in the Argentine Patagonia is rather continuous, densities are typically low (<5 Guanacos/km^2) and even very low in many parts of Chubut, Rio Negro and Neuquén Provinces (<2 Guanacos/km^2). High-density populations are actually scarce in the Patagonia of Argentina (Baldi *et al.* 2001, 2010; Novaro *et al.* 2007; Puig *et al.* 1997, 2003). A recent estimate for Patagonia was reported by Gavuzzo *et al.* (2015) applying aerial censuses techniques, but the numbers must be used for reference because of problematic assumptions, and used with caution if management decisions are at the local level (Schiavini and Rey 2015). Nevertheless, aerial surveys can agree with population estimation by modelling, for example those from the Santa Cruz Province (Travaini *et al.* 2015). For the rest of Argentina, population densities are below one Guanaco/km² and highly fragmented (Baigún *et al.* 2007, Puig and Videla 2007) with some relict populations in La Pampa, Córdoba and Buenos Aires Provinces (Sosa and Sarasola 2005, Barri and Cufré 2014). Some high-density populations occur in southern Chile reaching up to 43 Guanacos/km^2 at Torres del Paine National Park (Sarno and Franklin 1999), but in the rest of Chile populations are small and widely scattered.

As a general rule, it is recommended to use the distance sampling methods either for ground or aerial surveys for open and flat environments, as they are based upon more realistic assumptions than total counts or fixed-width strip transect methods that tend to underestimate population numbers (Buckland *et al*. 1993). However, where numbers are very low as in relict populations, total counts or less systematic methods are appropriate as a first approach. Also, extrapolation of local densities to larger areas must be cautiously applied according to sampling effort and based upon proper statistical design. Some large-scale surveys are currently being conducted in Argentinean Patagonia, including modelling (Schroeder *et al.* 2014) and aerial surveys using systematic, digital photographs taken along flight transects. In Chilean mountainous environments survey techniques are in the experimental phase using Monte-Carlo modelling and geostatistical-based estimates.

Guanaco population:

- Peru: 3,000

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• Bolivia: 150-200
• Paraguay: 20-100
• Chile: 270,000-299,000
• Argentina: 1,225,000-1,890,000

Total Guanaco population: 1,498,170-2,192,300Trend: Increasing. Although the global population estimate is higher than previous assessments, current approaches take into account new information and methods of estimation (Schroeder *et al.* 2014, Zubillaga *et al.* 2014, Travaini *et al.* 2015). Under-estimates and over-estimates have occurred in the past because of incomplete and inaccurate population-survey methodologies, especially in low population densities over the vast areas involved. Also, some large areas previously unknown have been recently surveyed. At the same time, high-numbered populations in the Argentine and Chilean Patagonia have experienced significant growth in the past number of years (Zubillaga *et al*. 2014). However, caution should be noted that although numbers have seemingly increased in the far southern cone of South America, in the balance of the Guanaco's distribution, populations are small and in real decline or at best tenuously stable, such as in Peru, Bolivia, Paraguay, northern Chile, and Nnrthern Argentina (Wildlife Conservation Society 2012).

Current Population Trend: Increasing

Habitat and Ecology **(see Appendix for additional information)**

The Guanaco is a wild ungulate found from sea level to over 5,000 meters elevation (González *et al.* 2006, González in prep.). At the continental and country levels, climate has mainly driven distributional range of the species (González *et al.* 2013). Guanaco habitat is characterized by highly seasonal climates, dry winters or snow covered, cold temperatures including below zero, winds from moderate to high intensity and low precipitation combined with high evapotranspiration create arid conditions that in general result in low plant productivity (Franklin, 1982, 1983; Wheeler 1995). In the sub-region of Patagonia (Hershkovitz 1972) Guanacos inhabit four of the ten major environments described for South America (González *et al.* 2006): 1) Desert and Xeric Shrublands, 2) Montane Grasslands, 3) Grasslands, Savannas and Shrublands, and 4) Temperate Forests (Dinerstein *et al.* 1995). Phytogeographically, Guanacos inhabit the provinces of the Monte and Patagonia, arid and semi-arid shrublands, and grasslands comprising around 1,000,000 km² (Wildlife Conservation Society 2012). On a smaller scale, the presence or absence of this species can be explained by altitude, vegetation, topography, and the occurrence of livestock (Travaini *et al.* 2007, Acebes *et al.* 2010, Iranzo *et al.* 2013, González *et al.* 2013).

Both migratory and sedentary populations exist across the Guanaco range. Migration is mainly driven by winter forage supply and snow depth as observed for Andean and some Patagonian population before and after the reproductive season (Ortega and Franklin 1995). A minimal annual home range reported for the species is 2-9 km^2 in sedentary animals (Marino and Baldi 2008), whereas in migratory populations they can reach up to 900 km^2 in the Andes (González *et al.* 2008) and around 40 km^2 in Tierra del Fuego during winter (Moraga *et al.* 2015).

The Guanaco's primary natural predator is the Puma (*Puma concolor*; Franklin *et al.* 1999) and secondarily the Andean Fox (*Lycalopex culpaeus*; Novaro *et al.* 2009). Its distribution overlaps marginally with other native ungulates such as Huemul (*Hippocamelus bisulcus*) in Patagonia, Taruka (*Hippocamelus anticensis*) in mountains of the central Andes, and the Vicuña (*Vicugna vicugna*) in some parts of the altiplano (Luccherini 1996, Díaz and Smith-Flueck 2000, Rundel and Palma 2000).

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Adult Guanacos weigh 80-120 kg (Wheeler 1995, González *et al.* 2006) and their breeding system is based upon resource defence polygyny, i.e. an adult male defends a territory where birthing and mating occur and a group of females and their offspring (chulengos) feed freely from the intrusion of other males (Franklin 1982, 1983). The Family Group is the basic social unit that occupies a Feeding Territory defended by the resident adult male. Other units found during the reproductive season, include Solo Males that defends a territory without females, and non-territorial Male Groups composed of males of various ages (Franklin 2011). In migratory populations outside the reproductive season, large Mixed Groups can be observed composed of both sexes of all ages (Ortega and Franklin 1995).

Vigilance and foraging accounted for almost 90% of the diurnal time budget for male and female Guanacos in Family Groups, where animals benefited from living in groups as individual foraging time increased with group size, as well as, collective vigilance against predators (Marino and Baldi 2008). Territoriality apparently limits population density, reaching lower K (equilibrium density) when contrasted with models based on individual forage intake (Marino *et al.* 2015). Empirical field data has also shown that Family Group size is positively correlated with forage production within Feeding Territories (Franklin *et al.* in press).

Guanacos are generalist herbivores of intermediate selectivity, i.e. their diets include large proportions of both grasses and shrubs (Raedeke and Simmoneti 1988; Fraser 1998; Puig *et al.* 1997, 2011, 2014; Baldi *et al.* 2004). Domestic sheep was the main ungulate introduced across the Guanaco's range, reaching 22 million within 50 years after its introduction in the Argentine Patagonia in the late 1800s. Guanacos and sheep largely overlap in their forage preferences as much as 80% in some areas (Puig *et al.* 2001). Although both species can include some 100 plant species in their diets, only 17 species make up 80% of the diets, and in Patagonia two grass species represent 40% for both Guanaco and sheep diets (Baldi *et al.* 2004). Other introduced ungulates found in Guanaco habitat are goats, cattle, donkeys, and horses, but few studies have assessed their diet overlap with the Guanaco. A preliminary study in the Bolivian Chaco showed that the Guanaco is a generalist feeder, responding to the seasonal availability of fruits, flowers and leaves, including a variety of cacti (Cuéllar, unpublished data). In that same region Guanacos mainly compete for forage and spatial resources with cattle and horses.

Competition with livestock, hunting, and habitat modification has often resulted in Guanacos occupying marginal, low quality lands in terms of vegetation cover and the availability of preferred plant species caused by sheep monopolizing the most productive areas (Baldi *et al.* 2001, Iranzo *et al.* 2013). A spatial segregation has been found in northern Chile between Guanacos and Donkeys *Equus asinus* (Malo *et al.* 2016).

Systems: Terrestrial

Use and Trade

The call for the management and wise use of Guanaco products (fine undercoat/fiber and meat) put forth over the past several decades as an alternative approach to traditional conservation and strict protection (Franklin and Fritz 1991, Franklin *et al.* 1997) is now in the pioneering stages trying to establish itself as a wildlife production system (Hudson 1989). Research and application of meat harvest programs have been conducted on Tierra del Fuego, Chile, after monitoring population (Skewes *et al.* 1999, Skewes *et al.* 2000, Soto 2010). Nearly 23,000 animals have been harvested for meat between 2003 and 2015 in Chilean Tierra del Fuego with products primarily exported or used in the local market

(N. Soto, pers. com. 2016). Fiber utilization was achieved initially from Guanaco farm individuals captured in the wild as newborns and raised in captivity during the 1980s and 1990s (Bas and González *et al.* 2000), but this approach has largely been discontinued because of high husbandry costs and world instability in the specialty-fiber market. Another approach, as mentioned above, holds more long-term promise from capturing, shearing and releasing of individuals in wild populations in programs being developed in Argentina. Finally, non-consumptive use, such as tourism, has also helped promote the aesthetic value of the species, especially in wild protected areas (Franklin *et al.* 1997).

A major management program funded by the government is currently being developed in the Patagonia of Argentina for fine-fiber utilization of wild-live captured animals on protected areas. This type of management was at its height during the last decade between 2004-2008 when some 11,000 Guanacos were shorn (Baldi *et al.* 2010, Lichtenstein 2013). Since then the number of animals has decreased due to international price variations for crude fiber. As a result, there has been a strong incentive to generate Guanaco fiber products as the local level, including yarn and thread (Lichtenstein pers. comm.).

Ecosystem Services and Values

The importance of the Guanaco is based upon a multiple set of values (González 2010b). The most basic is its ecocentric or intrinsic value, that is, as a species its right to live, to exist, independent of the importance of the species to humans. This is an ethical base tangentially related to different groups and non-government organizations within the protective laws of each country.

There are a myriad of anthropocentric values that refer to the importance of a species to humans. The species provides multiple benefits to society, or ecosystem services (Millennium Ecosystem Assessment 2005) that are imparted to different segments of human society (Ojasti 2000). Guanacos provide regulating, supporting, provisioning and cultural services at different time and space scales. The benefits of the Guanaco to humans can be assessed by a number of values:

• **Existence Value** that can be achieved through investment or payment to insure the existence of Guanaco populations without assumptions for its later use, is still in the beginning stages for this species. Nevertheless, the work of private organizations like Wildlife Foundation, Patagonia Conservation, and the Wildlife Conservation Society have indirectly assured the Guanaco's future by acquiring large-land holdings for the conservation of ecosystems that include the species.

• **Evolutionary Value,** through the Guanaco's heritage of nearly 40 million years of evolution from its ancestors in North American (Franklin 1982, in press) and its anatomical and physiological adaptations (González *et al.* 2006), its adaptiveness has enabled the species to become the dominate-wild mammal in Patagonia and parts of the Andean mountains of South America (Franklin 2011). This value is important when management is planned and its use is assessed, especially when contrasted with introduced-exotic animals.

• **Ecological Value,** the Guanaco has a major role and broad component in the trophic and ecological network of the South American Andean, Patagonia, and aridland ecosystems. It has been observed that in the absence of this large herbivore, the Puma will consume other prey that are of importance to humans, namely domestic sheep (Novaro *et al.* 2000, Laguna *et al.* 2015). The Guanaco modifies plant growth in such a way that reduces dry matter prone to fire (Fuentes and Muñoz 1995) and disseminates seeds through the use of dung piles that promotes the recycling of nutrients and colonization of degraded soils (Cortés *et al.* 2003, Henríquez 2004, Cavieres and Fajardo 2005). In addition, the padded feet of Guanacos do far less damage to soft soils compared to cloven hoofed livestock (König *et al.* 2003, König *et al*. 2015). They are also an important prey of predators and their remains are significant to

scavenging animals, all of which contribute to ecosystem health and cycles.

• **Productive Value,** applies to a number managed Guanaco populations for the important production of fibre (hair) and meat (see section on Use and Trade). Guanaco fibre is extremely fine (14-16 microns) and potentially economically valuable, as currently being obtained from live capture and release programs in the Patagonia of Argentina. Also, the value of its meat is being harvested from populations in Tierra del Fuego, Chile.

• **Ethnic Value** of the Guanaco is high as an invaluable species that has permitted the existence of humans in a variety of remote and dry environments of South America (Franklin 1982). All indigenous cultures associated with the deserts, Andean mountains, and the Patagonian and Fuegian zones utilized the Guanaco, and in some cases depended upon the species for food, clothing, shelter, and artistic and spiritual inspiration (Miller 1982). Its ethnic value was paramount, thanks to the process of domestication in the Central Andes, in the creation of the domestic Llama (Wheeler 1995). The Guanaco has also been seen to have local aesthetic value (Barkmann *et al*. 2005, Cerda *et al.* 2014).

• **Conservation Value** of the Guanaco has been successfully used as an indicator, sentry, flag, and charismatic species (Noss 1990) in several parts of its distribution (Chehebar *et al.* 2013). It has also been used to justify the creation of wild areas and for environmental variations as a "sensitive species" for monitoring changes in land use (González *et al.* 2008).

• **Restoration Value** is the examination of costs for preventing the Guanaco's disappearance and/or the costs of re-establishing extirpated populations, as was the case in Argentina (Barri and Cufré 2014).

• **Option Value** is the costs of determining the attitudes of people or society to pay for Guanaco conservation as a potential resource for future use, of which, has not yet been assessed.

• **Recreational-Tourism Value**, whereas the Guanaco is an animal of large-showy size in open ecosystems, with its gregarious habits, tolerance and habituation to people when not under persecution makes the species an important attraction for tourists who visit wild-protected national parks and refuges (Franklin *et al.* 1997, Cerda and De la Maza 2015).

• **Historic Value**, for having been recognized in stories of early arriving Europeans, historians, and naturalists, such as Charles Darwin who was surprised by the large numbers of Guanacos, its habits, and widespread occurrence across different areas of South America, the species is historically important.

• **Artistic and Literary Value**, because the Guanaco has been mentioned by historical and contemporary writers, for example Gabriel Garcia Marquez who at the time of receiving the Nobel prize of Literature in 1982, used the description done by A. Pigaffeta of the Guanaco in 1521 as an example of Magical Realism. Also, Pablo Neruda in his work "Canto General" (*General Song* in English) of 1950, dedicated words to the Guanaco in several of his poems. In addition, the Guanaco has been featured in major popular magazine articles and a number of television specials and documentaries by Nova, Nature, Discovery and National Geographic seen by multi-millions of people (see for details http://www.camelidosgecs.com.ar/pdf/listado_guanaco_2014.pdf).

Threats (see Appendix for additional information)

Guanacos are still numerous and widely distributed but continue their decline initiated in the 19th century in Peru, Bolivia, Paraguay, and major parts of Chile. Over-hunting, range degradation from livestock overgrazing, and interspecific competition for forage have all played significant and long-time roles in the demise of Guanacos all across their distributional range (Raedeke 1979; Franklin 1982; Miller *et al.* 1983; Cunazza *et al.* 1995; Cuellar and Fuentes 2000; Puig *et al.* 2001; Baldi *et al.* 2001, 2004). Currently, the main threats are still widespread, but mining and energy projects are also becoming a factor. Of special concern is the recent and rapid development of unconventional oil and gas exploration across large areas of the Guanaco's distribution.

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In Peru Guanacos are seriously affected by poaching and subsistence hunting. Habitat degradation due to extractive industries and livestock overgrazing has been identified as major threats for the few remaining subpopulations (Wildlife Conservation Society 2012).

In Bolivia the current major threat is habitat loss due to overgrazing by livestock. Although sport hunting was halted in 2001 (Cuéllar, unpublished data), poaching is still common.

In Chile and Argentina, recreational hunting and poaching are major threats. In northern Chile at the local level, feral dogs are reducing Guanaco populations within and outside protected areas, and hybridism with Llamas is common in areas with low Guanaco densities. Mining and oil extraction along with photovoltaic and wind parks have expanded with the demand for increased production, resulting in habitat loss and fragmentation of populations in both countries. In addition, in northern Chile and the Argentine Patagonia infrastructure development has caused road kills and entrapment within barriers lining highways causing local isolation and limiting population movements (Rey *et al.* 2012). Finally, in Chile and Argentina where numbers have recovered due to government sponsored management programs and Guanaco populations coexist with ranching and forestry practices, there has been a return to public resentment towards Guanacos as occurred in historical times. Demonstrated-sustained programs of Guanacos utilization that benefit the local economy and lower population numbers are needed if Guanaco are to be maintained.

Health studies conducted in mainland Patagonia have shown that Guanaco populations are relatively disease-free, but susceptible to common diseases from domestic sheep, cattle, and horses (Karesh *et al.* 1998, Beldomenico *et al.* 2003, Uhart *et al.* unpub. data). Castillo (2006) came to a similar conclusion based upon studies of parasite load in free ranging Peruvian Guanacos. Recently, scabies has been reported to affect Guanacos in northern Chile causing mortality in low-density populations. It is also a common disease in Guanacos inhabiting Tierra del Fuego, Chile (Skewes pers. comm.).

Today the Guanaco occupies only 26% of its original range (calculated by Ceballos and Ehrlich 2002, based upon Franklin 1982). Specifically, range distribution has been reduced by 58% in Argentina, 75% in Chile, and over 90% in Perú, Bolivia, and Paraguay (Cunazza *et al.* 1995, Ceballos and Ehrlich 2002). Moreover, distribution has become fragmented into smaller, relatively isolated populations. Although the species is not threatened with demographic extinction at a continental scale, it is predicted that the northern subspecies *L. guanicoe cacsilensis* will become extinct in Peru within 30 years if current-hunting mortality rates are not curtailed (www.conopa.org). Guanacos are ecologically extinct in most of their remaining range (Novaro *et al.* 2000), with some southern populations at serious risk of local or even regional extirpation (Cunazza *et al.* 1995). Spatial fragmentation in general is a threat to Guanaco populations (Wildlife Conservation Society 2012). Recent findings suggest that inbreeding or aberrant mutations may lead to reproductive failure and congenital malformations (Franklin and Grigione 2005, Zapata *et al.* 2008, González *et al.* 2014).

Increasing pressure from private landowners in Patagonian rangelands may result in a threat to the remaining high-density Guanaco populations if management is not properly planned and implemented. Live-shearing and subsequent release of wild Guanacos could contribute to their conservation only if the effects of this activity are properly assessed and management is applied accordingly. If not ecologically sustainable, the viability of the most important Guanaco populations will be at risk. Careful evaluation of

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current management practices involving live shearing is currently in progress, but a long-term assessment is necessary. For Guanaco populations under a hunting strategy of use, information about habitat preferences, flight distance, individual and population movement, group composition, and the effect on neighbouring populations are urgently needed for proper assessment of this kind of productive system.

Land desertification due to overgrazing coupled with more severe and frequent droughts caused by climate change/variation are potential threats of great concern to Guanaco abundance throughout its range. Severe droughts can have drastic effects on local Guanaco populations as documented in eastern Patagonia (Baldi *et al.* 2010). In addition, models on climate change predict a sharp decrease in rain precipitation within the next 50 years in arid-southern South America (Nohara *et al.* 2006). Therefore, it is crucial to favor the ecological functionality of Guanaco populations through adequate management as a step to mitigate additional effects of climate change.

Conservation Actions **(see Appendix for additional information)**

The Guanaco occurs in a number of protected areas and is included in Appendix II of CITES, thus regulating its international commerce of meat and fine-fiber products to insure that such trade does not threaten the Guanaco's survival. In selected areas the sale of Guanaco products in local and international markets has contributed to its "species value" in recovered populations that can be used for reducing human-Guanaco conflict with ranchers and forestry production. Precaution needs to keep in mind for numerically depressed populations where consumptive and commerce use could irreversibly affect population stability; because of such potential problems, national legislation and international control via CITIES and other programs are relevant and important.

• Peru. Recent legislation ratifies the alarming status of the Guanaco in Peru classifying it as Critically Endangered (Ministerio de Agricultura y Riego 2014). Governmental management of populations has been changed from CONACS (Consejo Nacional de Camélidos Sudamericanos = National Council for South American Camelids) to SERFOR (Servicio Forestal = Forestry Service) and local communities.

• Bolivia. The government is working with local NGOs and authorities to strengthen the management of protected areas for the species. The government has issued an official notice to law enforcement offices in relevant regions concerning the protection of the Guanaco. The main conservation aim has been achieved thanks to the permanent presence of trained indigenous parabiologists and park rangers in the remaining range of the species (Cuéllar unpub. data). The situation is similar in Paraguay were the population is very small and the local NGOs and governmental institutions are working to maintain and protect the last remaining populations of Guanacos in the country.

• Chile. The species is protected by the National Hunting Law (Ley de Caza) that regulates hunting, breeding, and in situ use. However, personnel for law enforcement are insufficient. Only 4% of the country's Guanaco habitat has effective protection (8,354 km^2 in 8 National Parks and 4 Reserves). Additionally, there are fiscal and private areas where hunting is prohibited, either with relict populations (7,750 km^2) or that directly protect the species (1,212 km^2). A National Management Plan does not exist, but regionally a Conservation Plan has been developed for northern and central Chile (Grimberg 2010). Finally, Guanacos have been classified as Vulnerable in northern and central Chile and Least Concern in southernmost Chile by the Environmental Ministry (Ministerio del Medio Ambiente 2012), where the Guanaco is included in environmental assessment of investment projects such as mining, energy, infrastructure, and others.

• Argentina. A National Management Plan (Plan Nacional de Manejo del Guanaco, Baldi *et al.* 2006) was prepared in 2006 and endorsed by the provinces with the highest Guanaco densities. The plan was

coordinated by the Federal Wildlife Agency (Dirección de Fauna Silvestre) involving local institutions with its main focus on the Patagonia. The Federal Wildlife Conservation Law (Ley Nacional de Conservación de la Fauna) and various provincial acts provide a legal basis for the protection and use of the species. In Patagonia, Guanaco conservation measures include sustainable use of the species in the wild, regulation of hunting, and closing of some access routes and oil trails. Nevertheless, law enforcement capacity is low since most provinces lack sufficient personnel and equipment to control vast areas. Protected areas in the Patagonian steppe would encompass 10% of the Guanaco population if effective, but most protected areas are rather nominal as they contain livestock, lack wildlife guards, and poaching is common. The percentage of the area under effective protection in the Patagonian steppe is estimated at a disconcerting level of less than 1% (Walker *et al.* 2004). In the central provinces there are eleven protected areas (national, provincial and private). In general, progress has been made in legislation and management tools, but implementation is needed.

Credits

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Bibliography

Acebes, P., Traba, J., Malo, J.E., Ovejero, R. and Borghi, C.E. 2010. Density and habitat use at different spatial scales of a guanaco population (*Lama guanicoe*) in the Monte desert of Argentina. *Mammalia* 74(1): 57 – 62.

Amaya, J.N., von Thüngen, J. and Delamo, D.A. 2001. Relevamiento y distribución de guanacos en la patagonia. Informe final. Comunicación Técnica Nº 111. Área Recursos Naturales, EEA-Bariloche/ GTZ. INTA EEA Bariloche – C.C. Nº 277 (8400), Bariloche, Río Negro, Argentina.

Baigún, R., Bolkovic, M.L., Aued, M B., Li Puma, M.C., Scandalo, R., Nugent, P. and Ramadori D. 2007. *Censo de Camélidos Silvestres al Norte del Río Colorado. Dirección de Fauna Silvestre*. Secretaría de Ambiente y Desarrollo Sustentable, Buenos Aires, Argentina.

Baldi, B., Lichtenstein G., González, B., Funes, M., Cuéllar, E., Villalba, L., Hoces, D. and S. Puig. 2008. *Lama guanicoe*. Available at: http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T11186A3260654.en. (Accessed: 29 February 2016).

Baldi, R., Albon, S.D. and Elston, D.A. 2001. Guanacos and sheep: evidence for continuing competition in arid Patagonia. *Oecologia* 129: 561-570.

Baldi, R., De Lamo, D., Failla, M., Ferrando, P., Funes, M., Nugent, P., Puig, S., Rivero, S. and J. von Thüngen. 2006. Anexo I: Plan Nacional de Manejo del Guanaco. Dirección de Fauna Silvestre. Secretaría de Ambiente y Desarrollo Sustentable., Buenos Aires.

Baldi, R., Novaro, A., Funes, M., Walker, S., Ferrando, P., Failla, M. and Carmanchahi, P. In press. Guanaco management in Patagonian rangelands. In: J. du Toit, R .Kock and J. Deutsch (eds), *Conservation Science and Practice: Conserving Rangelands*, Blackwell Publishing.

Baldi, R., Pelliza-Sbriller, A., Elston, D. and Albon, S. D. 2004. High potential for competition between guanacos and sheep in Patagonia. *Journal of Wildlife Management* 68(4): 924-938.

Bas, F., and González, B. 2000. Current advances in research and management of the guanaco (*Lama guanicoe*) in Chile. *Ciencia e Investigación Agraria* 27(1): 51-65.

Beldoménico, P.M., Uhart, M., Bono, M.F., Marull, C, Baldi, R. and Peralta, J.L. 2003. Internal parasites of free-ranging guanacos from Patagonia. *Veterinary Parasitology* 118: 71-77.

Buckland, S.T., Anderson, D.R. Burnham, K.P. and Laake, J.L. 1993. *Distance Sampling: Estimating Abundance of Biological Populations*. Chapman and Hall, London, UK.

Carmanchahi, P.D., Schroeder, N.M., Bolgeri, M.J., Walker, R.S., Funes, M., Berg, J., Taraborelli, P., Ovejero, R., Gregorio, P., Moreno., P. and Novaro, A.J. 2015. Effects of live-shearing on population parameters and movement in sedentary and migratory populations of guanacos *Lama guanicoe*. *Oryx* 49: 51-59.

Castillo, V.H. 2006. Contribución al estudio del parasitismo gastrointestinal en guanacos (*Lama guanicoe cacsilensis*) silvestres del Perú. Resúmenes y Trabajos del IV Congreso Mundial sobre Camélidos.

Cavieres, L.A. and Fajardo, A. 2005. Browsing by guanaco (*Lama guanicoe*) on Nothofagus pumilio forest gaps in Tierra del Fuego, Chile. *Forest Ecology and Management* 204: 237-248.

Ceballos, G. and Ehrlich, P.R. 2002. Mammal population losses and the extinction crisis. *Science* 296(5569): 904-907.

Cerda, C. and De La Maza, C.L. 2015. Evaluación de Servicios Ecosistémicos proporcionados por Áreas

Protegidas, Aproximaciones a Áreas Protegidas Chilenas. CFCN, MINAGRI, CONAF.

Cerda, C., Barkmann, J and Marggraf, R. 2014. Non-market economic valuation of the benefits provided by temperate ecosystems at the extreme south of the Americas. *Regional Environmental Change* 14: 1517-1531.

Chehebar,C., Novaro, A., Iglesias, G., Walker, S., Funes, M., Tammone, M. and K. Didier. 2013. Identificación de áreas de importancia para la biodiversidad en la estepa y el monte de Patagonia. Administración de Parques Nacionales, Wildlife Conservation Society and The Nature Conservancy. 112 pp.

Cortés, A., Miranda, E., Rau, J.R. and Jiménez, J.E. 2003. Feeding habits of guanacos *Lama guanicoe* in the high Andes of north-central Chile. *Acta Theriologica* 48: 229-237.

Cuéllar, E. and Fuentes, A. 2000. Censo aéreo de guanacos Lama guanicoe en el Chaco cruceño. *Revista Boliviana de Ecología y Conservación Ambiental* 8: 83-90.

Cuéllar, E., Noss, A. and Cuéllar, R. L. 2001. *Imminent Infamy?* Wildlife Conservation Magazine, USA.

Cunazza, C., Puig, S. and Villalba, L. 1995. Situación actual del guanaco y su ambiente. In: S. Puig (ed.), Técnicas para el Manejo del Guanaco. IUCN, Gland, Switzerland.

Franklin, W.L. 1982. Biology, ecology, and relationship to man of the South American camelids. In: M. Mares and H. Genoways (eds), *Mammalian biology in Soth America. Special publication series Pymatuning laboratory of ecology*, pp. 457-489. University of Pittsburgh.

Franklin, W.L. 1983. Contrasting socioecologies of South America's wild camelids: The vicuña and the guanaco. In: J.F. Eisemberg and D.G Kleiman (eds), *Advances in the Study of Mammalian Behavior*, pp. 573-629. The American Society of Mammalogists.

Franklin, W. L. and Grigione, M. M. 2005. The enigma of guanacos in the Falkland Islands: the legacy of John Hamilton. *Journal of Biogeography* 32: 661-675.

Franklin, W. L, Bas F., Bonacic, C. F., Cunazza, C. and Soto, N. 1997. Striving to manage Patagonia guanacos for sustained use in the grazing agroecosystems of southern Chile. *Wildlife Society Bulletin* 25(1): 65-73.

Fraser, M.D. 1998. Diet composition of guanacos (*Lama guanicoe*) and sheep (*Ovis aries*) grazing in grasslands communities typical of UK uplands. *Small Ruminant Research* 29: 201-212.

González, B.A., Palma, R.E., Zapata, B. and Marín, J. C. 2006. Taxonomic and biogeographical status of guanaco *Lama guanicoe* (Artiodactyla, Camelidae). *Mammal Review* 36(2): 157-178.

IUCN. 2016. The IUCN Red List of Threatened Species. Version 2016-1. Available at: www.iucnredlist.org. (Accessed: 30 June 2016).

Kadwell, M., Fernandez, M., Stanley, H., Baldi, R., Wheeler, J. C., Rosadio, R. and Bruford, M. 2001. Genetic analysis reveals the wild ancestors of the llama and alpaca. *Proceedings of the Royal Society of London B Biological Sciences* 268: 2575-2584.

Karesh, W., Uhart, M., Dierenfeld, E., Braselton, W., Torres, A., House, C., Puche, H. and Cook, R. 1998. Health evaluation of free-ranging guanaco (*Lama guanicoe*). *Journal of Zoo and Wildlife Medicine* 29: 134–141.

Krumbiegel, I. 1944. Die neuweltlichen Tylopoden. *Zoologischer Anzeiger* 145: 45–70.

Laguna, M.F., Abramson, G., Kuperman, M.N, Lanata, J.L. and Monjeau, J.A. 2015. Mathematical model

of livestock and wildlife: Predation and competition under environmental disturbances. *Ecological Modelling* 309-310: 110-117.

Lichtenstein, G. 2013. Guanaco Management in Argentina: Taking a Commons Perspective. *Journal of Latin American Geography* 12(1): 187-213.

Lichtenstein, G. and Carmanchahi, P.D. 2012. Guanaco management by pastoralists in the Southern Andes. *Pastoralism: Research, Policy and Practice* 2: 16.

Lönnberg, E. 1913. *Notes on guanacos*.

Luccherini, M. 1996. Group size, spatial segregation and activity of sympatric vicuñas *Vicugna vicugna* and guanacos *Lama guanicoe*. *Small Ruminant Research* 20: 193-198.

Marín, J.C., Spotorno, A. and Wheeler, J. 2006. Sistemática molecular y filogeografía de camélidos Sudamericanos: implicancias para su conservacion y manejo. In: B. Vilá (ed.), *Investigacion, conservacion y manejo de vicuñas*, pp. 85–100. Proyecto MACS Manejo Sostenible de Camélidos, Buenos Aires, Argentina.

Marín J.C., Spotorno, A.E., González, B.A., Bonacic, C., Wheeler, J. C., Casey, C.S., Bruford, M.W., Palma, R.E. and Poulin, E. 2008. Mitochondrial DNA variation and systematics of the guanaco (*Lama guanicoe*, ARTIODACTYLA: CAMELIDAE). *Journal of Mammalogy* 89(2): 172-184.

Marino, A. and Baldi, R. 2008. *Vigilance patterns of territorial guanacos (*Lama guanicoe*): the role of reproductive interests and predation risk*.

Miller, S.D., Rottmann, J., Raedeke, K.J. and Taber, R.D. 1983. Endangered mammals of Chile: status and conservation. *Biological Conservation* 25: 335-352.

Molina, G.I. 1782. *Saggio Sulla Storia Naturale del Chili*. Tomasso d'Aquino, Bologna, Italy.

Müller, P.L.S. 1776. Erste Classe, Säugende Thiere. *Des Ritters Carl von Linné vollständiges Naturalsystem nach der zwölften Lateinischen Ausgabe, 1773–1776* 36: 1–62.

Nohara, D., Kitoh, A., Osaka, M. and Oki, T. 2006. Impact of climate change on river discharge projected by multimodel ensemble. *Journal of Hydrometeorology* 7: 1076-1089.

Novaro, A. J., Funes, M. C. and Walker, R. S. 2000. Ecological extinction of native prey of a carnivore assemblage in Argentine Patagonia. *Biological Conservation* 92: 25-33.

Novaro, A., Walker, S., Funes, M., Radovani, N., Bolgeri, M., Puig, S. and Videla, F. 2007. *Estrategia de conservación de guanacos en Patagonia norte, basada en la conectividad del paisaje. III*. Reunión Binacional de Ecologia, La Serena, Chile.

Pinaya, I. 1990. Informe inspección ocular proyecto de Decreto Supremo, creación Reserva Biológica Cordillera de Sama. DVSPN y C. CDF, M.A.C.A. Marzo de 1990.

Puig, S. 1995. Abundancia y distribución de las poblaciones de guanacos. In: S. Puig (ed.), *Técnicas para el Manejo del Guanaco*, pp. 57-70. IUCN, Gland, Switzerland.

Puig, S. and Videla, F. 2007. Distribución, densidades y estado de conservación de los camélidos. In: E. Martínez Carretero (ed.), *Diversidad Biológica y Cultural de los Altos Andes Centrales de Argentina. Línea de Base de la Reserva de Biósfera San Guillermo*, pp. 199-223. Univ Nac San Juan, San Juan.

Puig, S., Ferraris, G., Superina, M. and Videla, F. 2003. Distribución de densidades de guanacos (*Lama guanicoe*) en el norte de la Reserva La Payunia y su área de influencia (Mendoza, Argentina). *Multequina (Latin American Journal of Natural Resources)* 12: 37-48.

Puig S., Videla, F. and Cona, M. 1997. Diet and abundance of the guanaco (*Lama guanicoe* Müller 1776) in four habitats of Northern Patagonia, Argentina. *Journal of Arid Environments* 36: 343-357.

Puig, S., Videla, F., Cona, M.I. and Monge, A. 2001. Use of food availability by guanacos (*Lama guanicoe*) and livestock in northern Patagonia (Mendoza, Argentina). *Journal of Arid Environments* 47: 291-308.

Raedeke, K. and Simonetti, J. 1988. Food habits of *Lama guanicoe* in Atacama desert of northern Chile. *Journal of Mammalogy* 69: 198–201.

Raedeke, K.J. 1979. Population dynamics and socioecology of the guanaco (*Lama guanicoe*) of Magallanes, Chile. Ph.D. Thesis, University of Washington.

Sarno, R. and Franklin, W.L. 1999. Population density and annual variation in birth mass of guanacos in southern Chile. *Journal of Mammalogy* 80: 1158-1162.

South American Camelid Specialist Group/Grupo Especialista en Camélidos Sudamericanos. Available at: http://www.iucn.org/themes/ssc/sgs/gecs.

Torres, H. 1992. *South American Camelids: An Action Plan for their Conservation*. IUCN/SSC South American Camelids Specialist Group, Gland, Switzerland.

Véliz, C. and Hoces, D. 2007. Distribución potencial del guanaco y de la vicuña en el Perú. XII Reunión del Seminario Permanente de investigación Agraria SEPIA. Tarapoto, Perú.

Villalba, L. 2004. Monitoreo de la población de *Lama guanicoe voglii*. Technical Report. DesdelChaco Foundation, Loma Plata, Paraguay.

Villalba, L. 2008. Informe Proyecto Guanacos. DesdelChaco Foundation, Loma Plata, Paraguay.

Walker, S., Novaro, A., Funes, M., Baldi, R., Chehebar, C., Ramilo, E., Ayesa, J., Bran, D., Vila, A. and Bonino, N. 2004. Rewilding Patagonia. *Wild Earth* 15: 32-37.

Wheeler, J.C. 1995. Evolution and Present Situation of the South-American Camelidae. *Biological Journal of the Linnean Society* 52: 271–295.

Wheeler, J.C. 2006. Guanaco 1: Working to Save Peru's Endangered Guanacos. *Camelid Quarterly* 5(1): 39-42.

Zapata, B., González, B.A., Marin, J.C., Cabello, J.L., Johnson, W. and Skewes, O. 2008. Finding of polydactyly in a free-ranging guanaco (*Lama guanicoe*). *Small Ruminant Research* 76: 220-222.

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External Resources

For Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
3. Shrubland -> 3.5. Shrubland - Subtropical/Tropical Dry	-	Suitable	Yes
3. Shrubland -> 3.7. Shrubland - Subtropical/Tropical High Altitude	-	Suitable	Yes
4. Grassland -> 4.5. Grassland - Subtropical/Tropical Dry	-	Marginal	-
4. Grassland -> 4.7. Grassland - Subtropical/Tropical High Altitude	-	Suitable	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
10. Geological events -> 10.1. Volcanoes	Past, unlikely to return	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
11. Climate change & severe weather -> 11.2. Droughts	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
11. Climate change & severe weather -> 11.3. Temperature extremes	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
11. Climate change & severe weather -> 11.4. Storms & flooding	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.2. Small-holder farming	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.1. Annual & perennial non-timber crops -> 2.1.3. Agro-industry farming	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		

2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.1. Nomadic grazing	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.2. Small-holder grazing, ranching or farming	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
2. Agriculture & aquaculture -> 2.3. Livestock farming & ranching -> 2.3.3. Agro-industry grazing, ranching or farming	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
3. Energy production & mining -> 3.2. Mining & quarrying	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
4. Transportation & service corridors -> 4.1. Roads & railroads	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.1. Intentional use (species is the target)	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.2. Unintentional effects (species is not the target)	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
5. Biological resource use -> 5.1. Hunting & trapping terrestrial animals -> 5.1.3. Persecution/control	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		
6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.2. Species disturbance		
6. Human intrusions & disturbance -> 6.3. Work & other activities	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.2. Species disturbance		
7. Natural system modifications -> 7.1. Fire & fire suppression -> 7.1.3. Trend Unknown/Unrecorded	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
7. Natural system modifications -> 7.2. Dams & water management/use -> 7.2.11. Dams (size unknown)	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation		
7. Natural system modifications -> 7.3. Other ecosystem modifications	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		

8. Invasive and other problematic species, genes & diseases -> 8.1. Invasive non-native/alien species/diseases -> 8.1.1. Unspecified species	Ongoing	-	-	-
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation		
8. Invasive and other problematic species, genes & diseases -> 8.2. Problematic native species/diseases -> 8.2.1. Unspecified species	Ongoing	-	-	-
	Stresses:	2. Species Stresses -> 2.1. Species mortality		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Research, Monitoring and Planning
Action Recovery plan: Yes
Systematic monitoring scheme: No
In-Place Land/Water Protection and Management
Conservation sites identified: Yes, over entire range
Occur in at least one PA: Yes
Percentage of population protected by PAs (0-100): 11-20
Area based regional management plan: No
Invasive species control or prevention: No
In-Place Species Management
Harvest management plan: Yes
Successfully reintroduced or introduced beningly: Yes
Subject to ex-situ conservation: No
In-Place Education
Subject to recent education and awareness programmes: Yes
Included in international legislation: Yes
Subject to any international management/trade controls: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
1. Land/water protection -> 1.2. Resource & habitat protection

Conservation Actions Needed
2. Land/water management -> 2.1. Site/area management
2. Land/water management -> 2.3. Habitat & natural process restoration
3. Species management -> 3.1. Species management -> 3.1.1. Harvest management
3. Species management -> 3.1. Species management -> 3.1.2. Trade management
3. Species management -> 3.2. Species recovery
4. Education & awareness -> 4.1. Formal education
4. Education & awareness -> 4.2. Training
4. Education & awareness -> 4.3. Awareness & communications
5. Law & policy -> 5.1. Legislation -> 5.1.3. Sub-national level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.3. Sub-national level

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.5. Threats
1. Research -> 1.6. Actions
2. Conservation Planning -> 2.1. Species Action/Recovery Plan
3. Monitoring -> 3.1. Population trends

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km^2): 1000000
Continuing decline in area of occupancy (AOO): No
Extreme fluctuations in area of occupancy (AOO): No
Estimated extent of occurrence (EOO) (km^2): 1000000
Continuing decline in extent of occurrence (EOO): No
Extreme fluctuations in extent of occurrence (EOO): No
Number of Locations: 40

http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T11186A18540211.en

Distribution
Continuing decline in number of locations: No
Extreme fluctuations in the number of locations: No
Lower elevation limit (m): 0
Upper elevation limit (m): 5000
Population
Number of mature individuals: 1000000
Continuing decline of mature individuals: No
Extreme fluctuations: No
Population severely fragmented: Yes
No. of subpopulations: 7
Continuing decline in subpopulations: Yes
Extreme fluctuations in subpopulations: Yes
All individuals in one subpopulation: Yes
Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 4-5
Movement patterns: Altitudinal Migrant
Congregatory: Congregatory (and dispersive)

http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T11186A18540211.en

The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership.

The IUCN Red List Partners are: BirdLife International; Botanic Gardens Conservation International; Conservation International; Microsoft; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; Wildscreen; and Zoological Society of London.