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## 1. CRITICAL HABITAT ASSESSMENT

### 1.1 Introduction

In the Gap Assessment undertaken by "Wood Group" against IFC standards one of the gaps was the insufficient biodiversity assessment, both in baseline description as well as in terms of habitat analysis using the IFC PS 6 requirements. It was also considered necessary to update the Impact Assessment with the new/updated windfarm project layout against the updated baseline survey and analysis. The following section closes the identified gap and complement the findings of the local EIA in terms of the habitat analysis using the IFC PS 6 requirements.

### 1.2 Critical Habitat Screening and Preliminary Assessment

#### 1.2.1 IFC Performance Standard 6 Criteria and Definitions

- The term «critical habitat» is defined in Paragraph 16 of IFC Performance Standard 6, 2012 (PS6) as areas with high biodiversity value. This includes areas that meet one or more of the following criteria (Guidance Note [GN] 52; November 2018<sup>1</sup> version):
- Criterion 1: Critically Endangered (CR) and/or Endangered (EN) species;
- Criterion 2: Endemic and/or restricted-range species;
- Criterion 3: Migratory and/or congregatory species;
- Criterion 4: Highly threatened and/or unique ecosystems; and
- Criterion 5: Key evolutionary processes.

Also, as specified by paragraph GN65 of IFC/WB Guidance Note 6 (2018), the determination of critical habitat can include other recognized high biodiversity values which are to be evaluated on a case-by-case basis.

#### 1.2.2 Critical Habitat Thresholds

IFC Guidance Notes GN68 through GN89 (November 2018) detail the guidance by criterion; indicating for each one the «thresholds» of critical habitat, based on relative vulnerability (degree of threat) and irreplaceability (rarity or uniqueness).

Table 1-1 details the relevant thresholds. Criteria 1 through 3 are focused on species level, whilst Criteria 4 and 5 focus on ecosystem and landscape levels.

These thresholds rely on the availability of estimates of species global/local population (either from published sources or obtainable by reasonable means through an in-field assessment in the case of the local population). Should this type of information not be available for any of the species under consideration, the Project Proponent is expected to use expert opinion to determine the significance of the unit of analysis for critical habitat (CH) determination with respect to the global population. Surrogates of population size (e.g., extent of occurrence, estimates of total area of known sites, estimates of area of occupied habitat) can aid in this process.

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<sup>1</sup> A recent revision of the IFC PS6 Guidance notes is available, dated February 6, 2019. This version is currently not available for download from the IFC site and thus the official November 2018 version is used. The report nonetheless is aligned to the Performance Standard 6 2012 revision.

**Table 1-1 Quantitative/qualitative thresholds for Critical Habitat Criteria 1 to 4**

Criteria	Thresholds
1. Critically Endangered (CR) / Endangered (EN) Species	(a) areas that support globally-important concentrations of an IUCN Red-listed EN or CR species ( $\geq 0.5\%$ of the global population AND $\geq 5$ reproductive units of a CR or EN species); (b) Areas that support globally-important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in (a). (c) As appropriate, areas containing nationally/regionally-important concentrations of an IUCN Red-listed EN or CR species.
2. Endemic / Restricted Range Species <sup>2</sup>	(a) Areas that regularly hold $\geq 10\%$ of the global population size AND $\geq 10$ reproductive units of a species.
3. Migratory / Congregatory Species	(a) areas known to sustain, on a cyclical or otherwise regular basis, $\geq 1$ percent of the global population of a migratory or congregatory species at any point of the species' lifecycle. (b) Areas that predictably support $\geq 10$ percent of the global population of a species during periods of environmental stress.
4. Highly Threatened or Unique Ecosystems	(a) Areas representing $\geq 5\%$ of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. (b) Other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning.

Source: IFC, 2018

Criterion 4 is triggered by ecosystems that are threatened, house unique assemblages of biome-restricted species, or are recognized for high conservation value, including protected areas. No quantitative thresholds are indicated by the PS6 Guidance notes; nonetheless, quantitative categories and criteria from Rodriguez et al. (2011) may be applied to evaluate ecosystem status if data allows it. Rodriguez et al. (2011) propose a categorization of habitats following IUCN Red list species categories in: CR: Critically Endangered; EN: Endangered and VU: Vulnerable; based on a set of four criteria (and sub criteria) over which the analysis is conducted.

These are:

- A. Short-term decline in distribution or function (over 50 years);
- B. Long-term decline in distribution or function (over 500 years);
- C. Small current distribution and decline (in distribution or ecological function) or very few locations; and
- D. Very small current distribution.

Considering that there is insufficient information with regards to evidences of recent or historical declines, Criterion A and B have not been assessed. Only criteria C and D have been used as qualitative aids for the assessment of critical habitat, since criteria and sub criteria require quantitative estimations as a minimum.

Criterion 5 is based on “Evolutionary processes” are often strongly influenced by structural attributes of a region, such as its topography, geology, soil and climate over a period of time. Guidance Note GN96 provides the following examples of spatial features that are associated with evolutionary processes:

<sup>2</sup> For purposes of the PS6 Guidance Note (2018), GN72 indicates that the term endemic is defined as restricted-range.

Restricted range refers to a limited extent of occurrence (EOO); which for terrestrial vertebrates and plants, a restricted-range species is defined as those species that have an EOO less than 50,000 km<sup>2</sup>.

- Level of isolation (e.g., islands, mountaintops, lakes are associated with populations that are phylogenetically distinct);
- Extent of endemism (areas of high endemism often contain flora and/or fauna with unique evolutionary histories);
- Spatial heterogeneity
- Presence of environmental gradients (ecotones produce transitional habitat which has been associated with the process of speciation and high species and genetic diversity);
- Edaphic interfaces; and
- Connectivity between habitats (e.g. biological corridors).

Criterion 5 is usually considered to be heavily reliant on scientific knowledge, and thus would be triggered in areas that have already been investigated or where significant research results are available to indicate the potential or existence of unique evolutionary processes.

### 1.2.3 General Methodology

The following section outlines the basic steps in defining the biodiversity features within an “ecologically appropriate area of analysis” GN58 that have the potential to trigger critical habitat status.

The IFC PS6 recognizes critical habitats to be based on either modified or natural habitats. The process of recognizing critical habitats therefore follows an approach that can be summarized in three key steps (Paragraph 59, GN6; IFC 2018).

1. Stakeholder Consultation and Initial Literature Review.
  - Limited stakeholder consultation has taken place in regards to identification of biodiversity; this screening is based primarily on specific IFC Integrated Biodiversity Assessment Tool (IBAT) reports, the Cañadon Leon EIA and other EIA reports developed in vicinity of the site.
2. Field-survey data collection and verification of existing information.
  - The Cañadon Leon windfarm site has been subject to specific monthly bird/bat monitoring surveys since December 2018, the latest in May 2019 (in addition to the original survey to develop the baseline); which has provided important information on: absence of bats and evolution of bird diversity/abundance indices.
  - Bird monitoring methodologies are in compliance with local guidelines corresponding to the Chubut Province Resolution N° 37/17 which provides a standard methodology for monitoring birds/bats for windfarm environmental impact assessments and operations monitoring purposes. Such guidelines are largely based on Atienza et al. (2011) “Guidelines for assessing the impact of wind farms on birds and bats”; which is the recommended guideline made by the Spanish Ornithological Society (SEO) and Birdlife local representation. Methodologies proposed in such guidelines are similar to that of other international/best practice guidelines for bird monitoring (e.g. Scottish Natural Heritage 2014. “Guidance Note-Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms” and the U.S. Fish and Wildlife Service 2012 “Land-Based Wind Energy Guidelines”) and have been tailored to the specific environmental conditions found in southern Argentina.
  - Monitoring methodologies employed are based on monthly survey of fixed point transects, spread over three survey areas (e.g. windfarm area, electric line area and control area to the south of the Cañadon Leon site) and adding up to 100 points approximately (ultimately dependent on weather conditions). Other observations made during the survey are of searches of nests to verify if nesting occurs within/outside the site, observations on use of space by raptors and analysis of flight heights of observed bird species. The overall monthly effort is of approximately 6.25 hours of effective survey, totaling some 75 hrs/year.

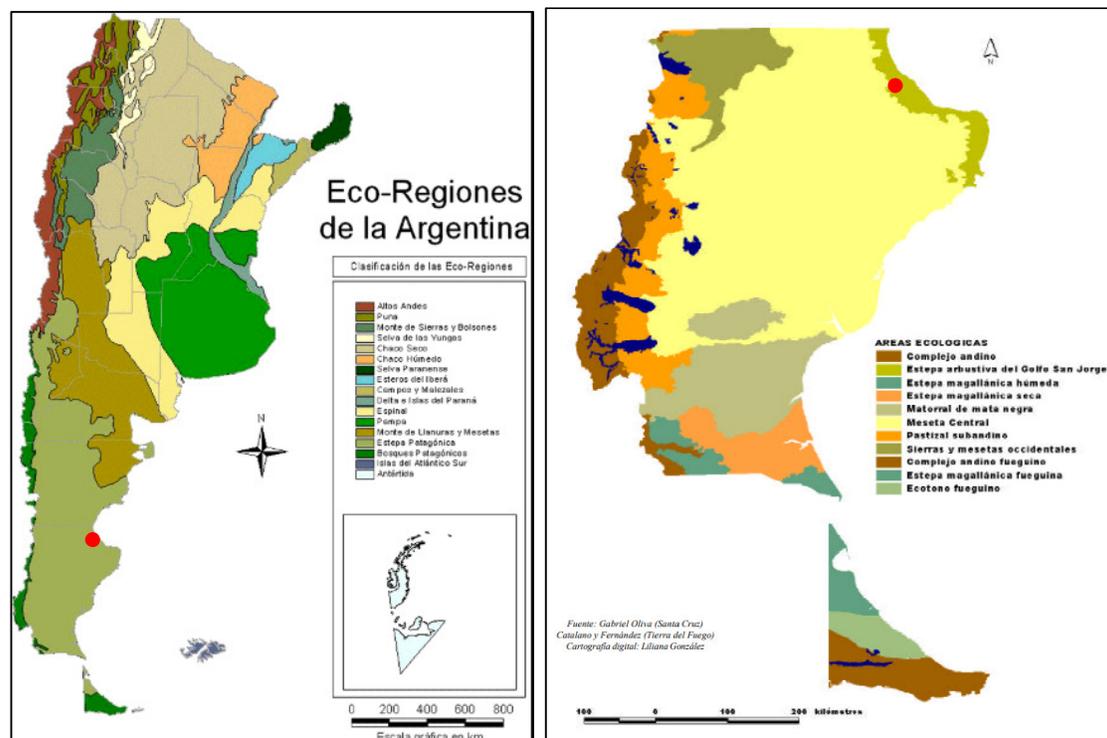
- Critical Habitat determination. The scale at which a critical habitat determination takes place depends on underlying ecological processes for the habitat in question and is not limited to the footprint of the project. IFC/WB PS6 Guidance Note GN58 states that the project should identify an ecologically appropriate area of analysis to determine the presence of critical habitat for each species with regular occurrence in the project’s area of influence, or ecosystem, covered by Criteria 1-4. The boundaries of this area should be defined taking into account the distribution of species or ecosystems (within and sometimes extending beyond the project’s area of influence) and the ecological patterns, processes, features and functions that are necessary for maintaining them. These boundaries may include catchments, large rivers or geological features. This area of analysis is to be used in order to assess applicability of the critical habitat criteria and thresholds (see paras GN69 – GN82) in order to determine critical habitat for the species and/or ecosystems concerned.

The present report provides a high level screening of potential critical habitat triggers that may be found within the Cañadon Leon Project site and its wider environs, depending on the final assessment of potential triggers, specific recommendations are made (e.g. focused field surveys, development of biodiversity action plans, etc.).

### 1.2.4 Habitat Definition in the Project Area

The Cañadon Leon windfarm location lies within an ecological unit being the Patagonian steppe, which extends within a radius of hundreds of km from the site; a further refinement allows separating it between the “Central Plateau” and “Shrubby Steppe of the Gulf of San Jorge” ecological areas (Figure 1.1).

**Figure 1.1 Eco regions of Argentina (left) and broad ecological areas of the Santa Cruz Province (right)**

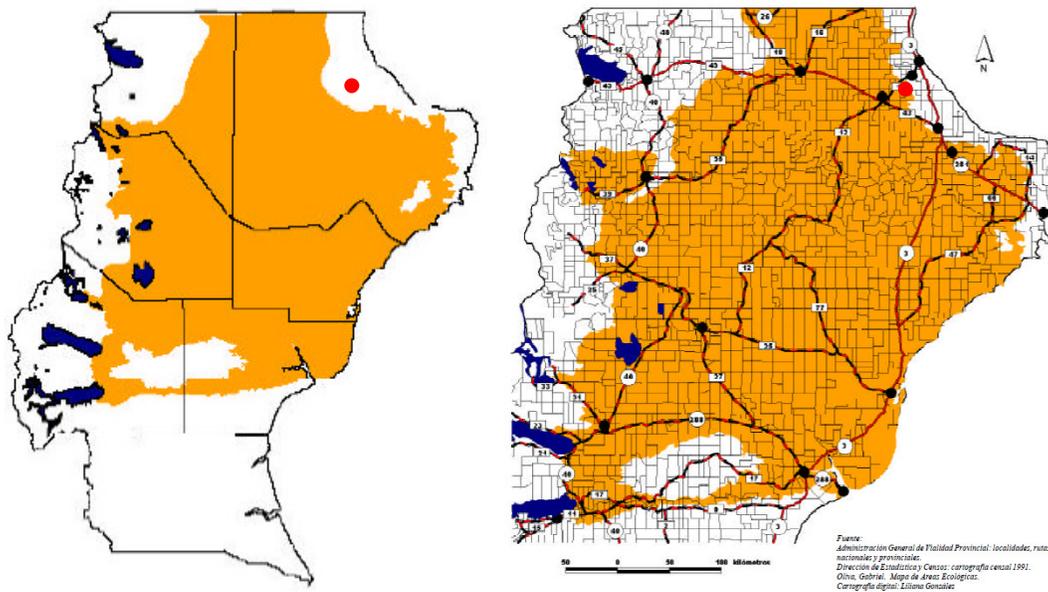


Source: Cabrera, 1976 (left); Olivia, 2001 (right). Approximate location of Cañadon Leon site shown with red dot.

The steppes and semi-deserts of Patagonia occupy most of the vast plains, plateaus and mountain ranges of the southernmost part of the American continent, and cover an area of more than 800,000 km<sup>2</sup>. It has many endemisms, particularly in species associated with waterbodies such as fish and amphibians. Many of the bird species that breed in the steppe are migratory and, during the cold months, winter in areas of the center/north of Argentina, or in coastal environments.

The “Central Plateau” is an extense and diverse region of north-central Santa Cruz, which is generally a steppe of dwarf bushes of very low vegetation cover (20-30%) with bushes of greater size following the main river runoff lines and large areas covered by erosive pavement over a flat relief of alluvial plains (Figure 1.2). The colapiche (*Nassauvia glomerulosa*) is a small shrub that is dominant and characteristic of this sub-brush steppe. The coiron species *Stipa speciosa* and *S. neai* are important in non-degraded areas. Canyon areas have bushes of mata amarilla (*Anartrophyllum rigidum*), molle (*Schinus polygamus*) and calafate (*Berberis heterophylla*).

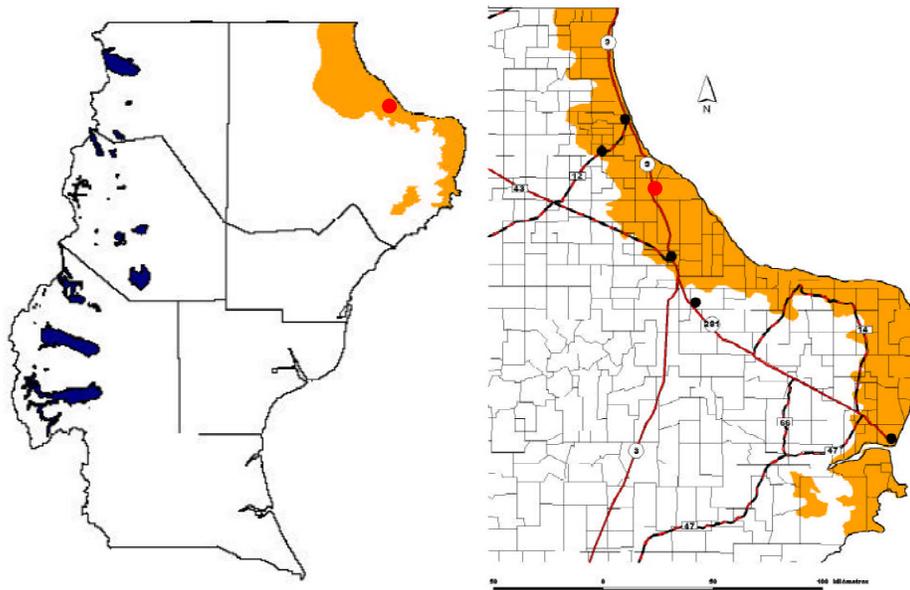
**Figure 1.2 Central Plateau ecological area of the Santa Cruz Province**



Source: Oliva, 2001. Approximate location of Cañadon Leon site shown with red dot.

The “Shrubby Steppe of the Gulf of San Jorge” is an area of high bush species that develops along the coasts of the Gulf within and undulating landscape ridged by canyons and valleys that flow towards the sea (Figure 1.3). Dominant plant species are the bushes of Malaspina (*Trevoa patagonica*), duraznillo (*Coloquaja intergerrima*; found to be the most abundant in the area), neneo (*Mulinum spinosum*); *Verbena alatocarpa*, *Ephedra ochreatea*, yaoyin (*Lycium chilense*) and mata amarilla (*Anartrophyllum rigidum*). Amongst grass species that stand out these are *Stipa humilis* and *Festuca argentina*. This type of vegetation is considered it differ markedly from a physiognomic/floristic point of view form that of the Central plateau (Oliva, 2001).

**Figure 1.3** Shrubby Steppe of the Gulf of San Jorge ecological area of the Santa Cruz Province

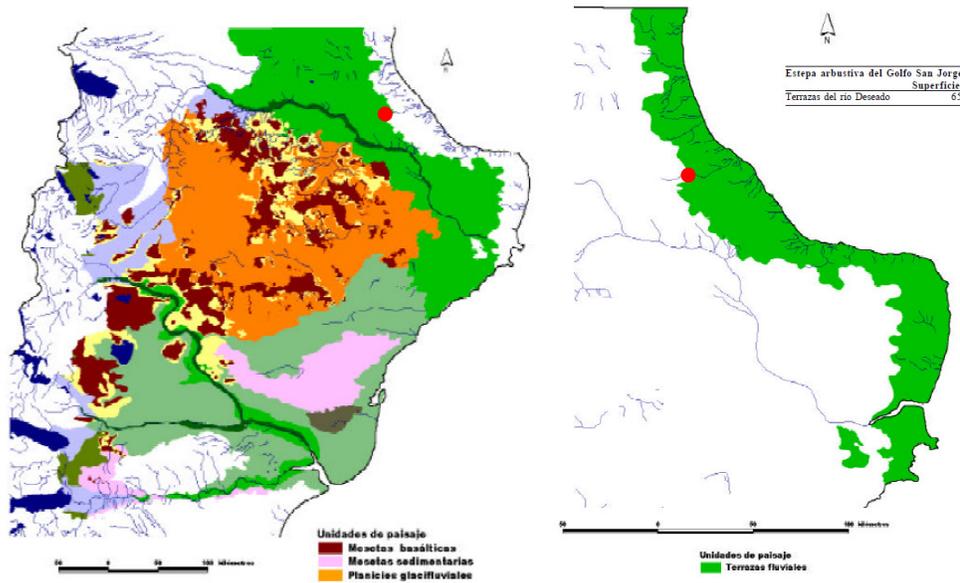


Source: Oliva, 2001. Approximate location of Cañadon Leon site shown with red dot.

The windfarm Cañadon Leon is believed to be broadly located at the edge of these two ecological areas; concomitant with the main relief features of the canyon areas where the site is located, with more flat relief terrain to the west of the site and thus plant species present in the area as identified during field surveys have been found to include species from both ecological areas.

Using an additional distinction in regards to the landscape units, for both of these ecological areas there is a “river terraces” landscape unit (Figure 1.4); it is a single landscape unit in the Shrubby Steppe of the Gulf of San Jorge area and one of fourteen for the Central Plateau area; the river terrace landscape unit of both of these areas form an homogeneous landscape unit along the these two ecological areas and are thus used as the area of analysis for the screening exercise; in order to screen out biodiversity features that are exclusively associated to littoral habitats (e.g. seabirds) these are not considered as part of the area of analysis.

**Figure 1.4 River terrace landscape unit of the Santa Cruz Province**



Source: Olivia, 2001. Approximate location of Cañadon Leon site shown with red dot.

The Cañadon Leon site has been subject to extensive/intensive anthropic activity, especially O&G operations in the recent decades as can be seen from aerial/satellite imagery on the high amount of old drilling wellpads, some of them with active pumping systems still functioning to date and an extensive road access network connecting these (Figure 1.5).

**Figure 1.5 Photos of northern Cañadon Leon site showing existing oilfield equipment and access roads**



Source: ERM, 2019.

Considering that, these activities have a highly localized nature, the footprint of past/existing O&G activities together with areas that retain their original vegetation form a heterogeneous matrix of patches of habitats that have been modified along with patches of natural habitat.

Based on the original ETIA baseline survey results coupled with the recent bird surveys and information from other sources relevant to the wider project area, it is assessed that to a broad extent, the Project site may still retain part of its original natural ecological functioning; nonetheless ongoing activities, especially human presence may cause that terrestrial megafauna (e.g. large mammals and birds) not be generally found; with smaller sized fauna likely of being observed.

## 1.2.5 Critical Habitat Screening

### 1.2.5.1 Application of Criteria 1 and 2

Species that are classified as Critically Endangered or Endangered according to IUCN designations (i.e. globally threatened), as well as their endemism/range restriction are shown in Table 1-2. Endemic species to Argentina where screened in order to verify if: i) their distribution overlapped with the area of analysis and ii) whether their known distribution had an Extent of Occurrence of less than 50,000 km<sup>2</sup> in order to define them as “range-restricted”.

**Table 1-2 Terrestrial species identified within the Projects Aol that have an Endangered/Critically Endangered status on the IUCN Red list, are considered endemic to Argentina and/or are range restricted**

Class - species	Common name	Red List Status	Country Endemic	Range Restricted
<b>Plants</b>				
<i>Mulguraea ligustrina</i>	n.a.	Cat 4* (local)	Yes	No
<b>Reptiles</b>				
<i>Liolaemus kingii</i>	King's Tree Iguana	LC (global)	Yes	No
<i>Liolaemus bibroni</i>	Bibron's Tree Iguana	LC (global)	Yes	No
<i>Liolaemus fitzingeri</i>	Fitzinger's Tree Iguana	LC (global)	Yes	No
<b>Aves (Birds)</b>				
<i>Chloephaga rubidiceps</i>	Ruddy-headed goose	LC (global) / <b>EN (local)</b>	Yes	No
<i>Rhea pennata</i>	Lesser Rhea	LC (global) / <b>VU (local)</b>	Yes	No
<i>Pluvianellus socialis</i>	Magellanic Plover	NT (global) / <b>EN (local)</b>	Yes	No
<b>Insects</b>				
<i>Bombus dahlbomii</i>	Moscardon	<b>EN (global)</b>	No	No
<b>Mammals</b>				
<i>Ctenomys colburni</i>	Colburn's Tuco-tuco	DD (global) / DD (local)	Yes	No
<i>Dolichotis patagonum</i>	Patagonian Mara	NT (global) / <b>VU (local)</b>	Yes	No
<i>Lestodelphys halli</i>	Patagonian opossum	LC (global) / NT (local)	Yes	No

Source: IUCN Red List of Threatened Species, 2019; SAREM, 2012 and Aves Argentinas, 2017. Note: \* Preliminary Red List of Endemic Plants of Argentina PLANEAR, Category 4: Plants restricted to a single political province, or with small areas shared by two or more contiguous political provinces. Note: LC: Least Concern; EN: Endangered; VU: Vulnerable; NT: Near Threatened; DD: Data Deficient.

From the screening, the main results has been that there are no endemic/range restricted species expected to be present in the area of analysis, thus discussion on species is centered on Criterion 1.

#### ***Chloephaga rubidiceps***

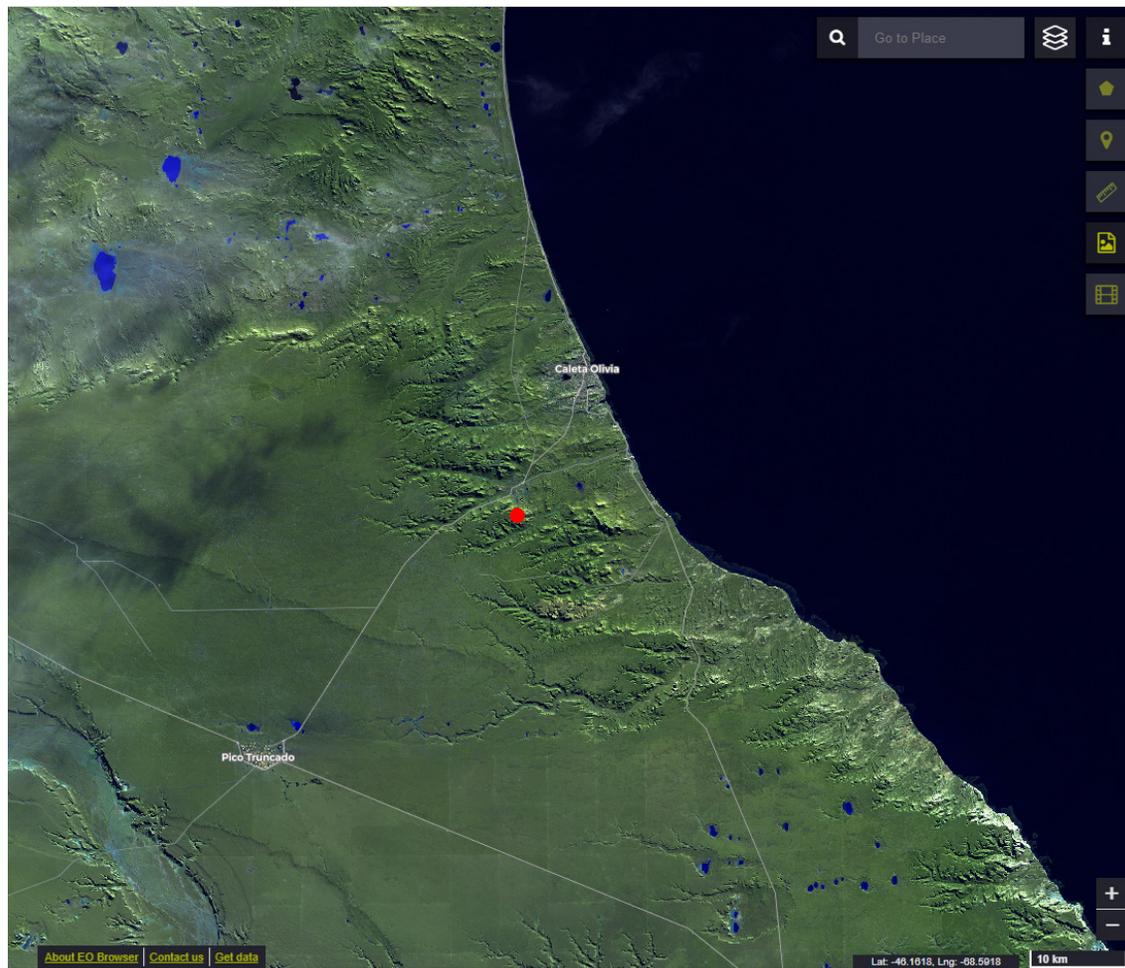
According to Imberti et al. (2007), the continental population of this species is under serious threat, as derived from several surveys in Tierra del Fuego (i.e. breeding areas) and wintering sites in Buenos Aires province. They estimated that the Santa Cruz Province may harbor approximately some 70-100 individuals, which correspond to an approximate 10% increase of continental population numbers (estimated in 900-1178 individuals (Madsen et al., 2003; Blanco et al., 2006)), being a zone where the species is known to nest regularly.

The Ruddy-headed Goose mainland population is migratory, has a small population size and very restricted distribution. Breeding areas are located in mainland Chile along the Straits of Magellan and in the northern portion of Tierra del Fuego Island (Madsen et al. 2003). Brood-rearing sites, such as San Gregorio and San Juan, are characterized by swamps and/or open water offering retreat in case of predation attempts by foxes (Madsen et al. 2003). After the breeding season, the Ruddy-headed Goose migrates north to Buenos Aires Province, Argentina. The migration route is largely unknown, but twice a year geese fly across Patagonia, which separates the breeding and wintering quarters, covering around 1,500 km. Three uncertain records suggest the use of an inland corridor close to the coast (Wetlands International unpubl. data); which Pedrana et al. (2018a) confirmed from the satellite tracking of six adults that they effectively used the Atlantic coast migration route.

During the non-breeding season, the species concentrates in San Cayetano and Tres Arroyos districts, in southern Buenos Aires province (Blanco et al. 2003). This region, where they share the habitat with other *Chloephaga* geese (*Ch. picta* Upland Goose and *Ch. poliocephala* Ashy-headed Goose), is predominantly agricultural with a mosaic of crops, mainly wheat and planted pastures.

This specie has not been directly identified in the project area, but its presence may probably be only occasional (e.g. during migration) considering the relative proximity of the site to the coast (< 15 km) as well as a small network of wetland areas along the coastal Santa Cruz Province; which may constitute stop over sites (Figure 1.6).

**Figure 1.6 False color satellite image of northern Santa Cruz Province showing wetland areas to north and south of Caleta Olivia (in bluish hues)**



Source: EOBrowser, 2019. Approximate location of Cañadon Leon site shown with red dot.

Imberti et al. (2007) research on southern Santa Cruz Province found that many observed individuals seemingly did not migrate and stayed in undetermined areas of the Santa Cruz Province throughout the year. The species has not been identified from over a 2 year monitoring at the Manantiales Behr windfarm which is located 100 km north of the Cañadon Leon site, in an environmental setting largely similar to it and along the potential migratory corridor.

Considering the low numbers of the continental population, under a conservative approach the species may potentially trigger Criterion 1 (as well as Criterion 3 for migratory species; considering the >1% population threshold) for Critical habitat for the area of analysis. Ongoing monitoring efforts at the Cañadon Leon site (and Manantiales Behr) have not observed it to date; it is recommended that should it be positively identified by the ongoing monitoring efforts, the Project undertake specific biodiversity management measures for the species in consultation with local avifauna experts.

### ***Rhea pennata***

The Lesser Rhea is a large, flightless bird endemic to South America. The species inhabits steppe, shrubland, shrub-steppe and mallines (successional wetlands with bog, meadows and ponds) (Bellis et al. 2006), up to 1,500 m, generally breeding in upland areas with bunch-grass. Typically found in groups of 5-30, with a male always accompanied by several females. Pedrana et al. (2011) investigated the main factors influencing the distribution of Lesser Rheas in the Santa Cruz Province, finding that the occurrence of Lesser Rheas was positively associated with mean primary productivity and distance to the nearest wet meadow, in a regional context dominated by dry steppe habitat. Preference for wetlands has been observed in other populations of Lesser Rheas, presumably because wetlands provide the best quality forage for adults and their chicks (Bellis et al. 2006).

The occurrence of Lesser Rheas strongly increased with distance from the nearest city or oil camp; thus, areas with low probability of Lesser Rhea occurrence were especially common in northern Santa Cruz, where oil exploitation currently concentrates. Oil extraction is preceded by the development of a large number of roads in otherwise inaccessible areas. This activity not only affects wildlife by increasing traffic casualties and habitat degradation, but also by increasing access for poachers. A modelled distribution map for Lesser Rheas show that in overall terms the project site and area of analysis has a low probability of encountering this species.

The species has not been directly identified in the project area, though its presence is probable. , there is a low likelihood of encountering it in significant numbers. The area is not expected to sustain globally- important concentrations of the species; thus do not trigger Criterion 1.

### ***Pluvianellus socialis***

*P. socialis* is local and partially resident in the extreme south of Chile and south Argentina, with part of the population wintering north to the Valdés peninsula, south-central Argentina, and sometimes as far as Buenos Aires province (Birdlife, 2019). The population is estimated to number fewer than 10,000 birds (R. Schlatter in litt. 2002 to Wetlands International), and other estimates suggest it may be considerably smaller. Ferrari et al (2008) estimated its population in less than 1,500 individuals. Significant concentrations of non-breeding birds have included an estimated 15% of the global population on the Gallego and Chico river estuaries in 1999 (Ferrari et al. 2003). The latter authors also observed that this species is significantly more common in the Southern Santa Cruz Province (with a relatively higher presence of wetlands areas) compared to the North, where the area of analysis is located. The species has not been identified from over a 2 year monitoring at the Manantiales Behr windfarm which is located 100 km north of the Cañadon Leon site, in an environmental setting largely similar to it.

The species has not been directly identified in the project area, though its presence is probable from known distribution data. Considering the low numbers of the global population, under a conservative approach the species may potentially trigger Criterion 1 (as well as Criterion 3 for migratory species; considering the >1% population threshold) for Critical habitat for the area of analysis. Ongoing monitoring efforts at the Cañadon Leon site (and Manantiales Behr) have not observed it to date. It is

recommended that should it be positively identified as a result of continued monitoring effort, the Project undertake specific biodiversity management measures for the species in consultation with local avifauna experts.

### ***Bombus dahlbomii***

In Argentina, the genus *Bombus* is represented by eight Neotropical species; one of them being *B. dahlbomii*. The distribution of these bees is wide, with this particular species reaching Tierra del Fuego, at the southernmost point of South America (Abrahamovich et al. 2007). It is the typical species found in Patagonia, extending from the western foothills of the Andes towards the coastal region to the East, being most abundant in the former.

Toward the North it reaches the province of Mendoza, and penetrates to the East within the province of Buenos Aires; towards the South it extends to the Strait of Magellan and most likely reaches Tierra del Fuego, being the only species that occupies the southern Patagonian sector. It is distributed in the provinces of Buenos Aires, Chubut, Mendoza, Neuquén, Río Negro and Santa Cruz, registering its greatest abundance in Neuquén, Chubut and Santa Cruz (Abrahamovich & Díaz, 2001)

The species has not been directly identified in the project area, but its presence is probable given its known distribution. Population number is unclear, but it is not likely that it may trigger Critical Habitat under Criterion 1.

### ***Dolichotis patagonum***

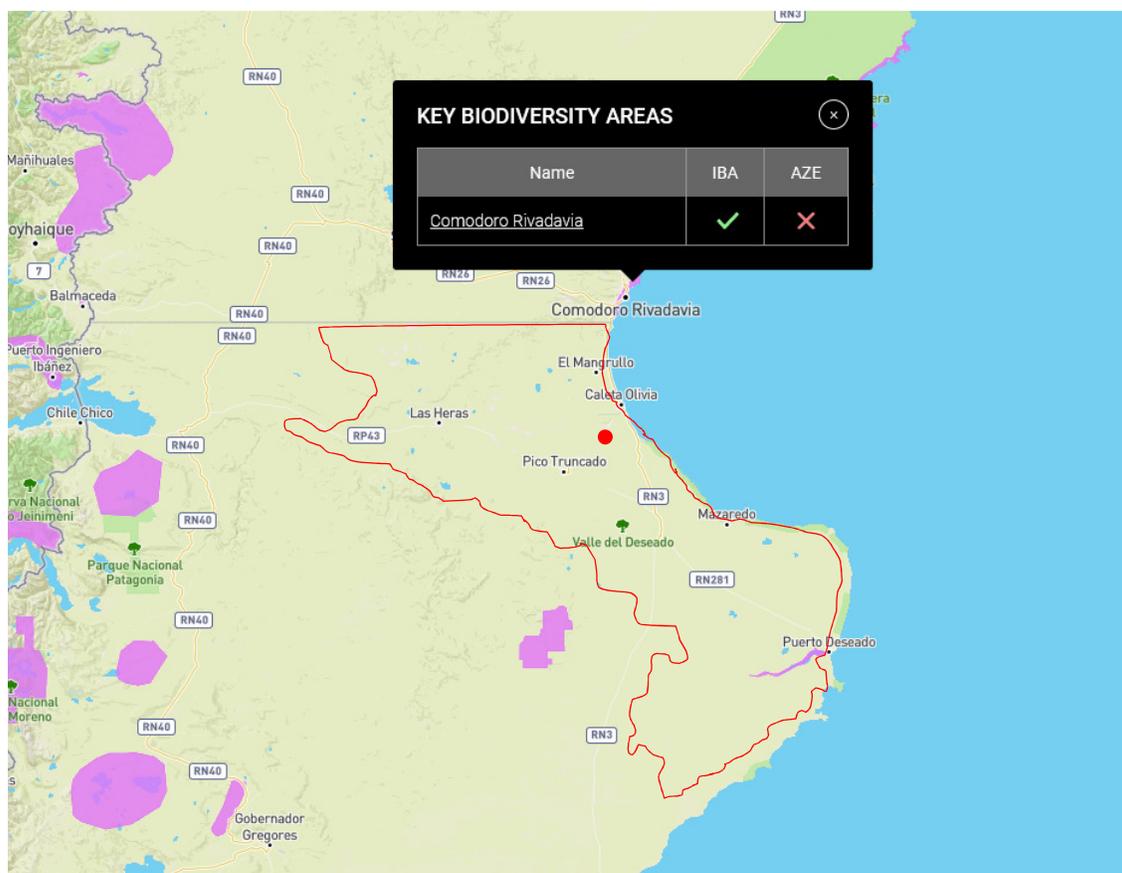
*D. patagonum* only inhabits Argentina and is distributed from 28°S to 50°S. A subspecies (*D. p. patagonum*) occurs in the central area of Buenos Aires Province, the south of Cordoba Province, San Luis and Mendoza Provinces, and to the south of Argentina to Santa Cruz Province (Campos et al, 2001). The species occurs in lowland habitats, including forest and creosote bush (*Larrea* spp.) flats in northwestern Argentina. Preferred habitats have good cover of shrubs, but overgrazed and bared soils are also used. They are well adapted for terrestrial life in open grasslands and shrubland steppe (Olrog and Lucero, 1981) and occupy the ecological niche of terrestrial mammals in the Patagonian steppe. No population information is available for this species.

The species has not been directly identified in the project area, though its presence is probable, with a low likelihood of encountering it in significant numbers. The area is not expected to sustain globally-important concentrations of the species; thus do not trigger Criterion 1.

### **1.2.5.2 Application of Criterion 3**

Species that are of migratory/congregatory nature other than birds have been screened and they are not present. The nearest Important Bird and Biodiversity Area (IBA) is that of "Comodoro Rivadavia", which is a coastal area (Figure 1.7) located 5 km north from the area of analysis, and approximately 60 km from the Cañadon Seco town. The IBA consists of a coastal strip that runs from Caleta Cordoba to 13 km north of the city of Comodoro Rivadavia to Punta del Marqués, 15 km south of it. It has cliffs of different heights, sandy/pebble beaches. IBA trigger species are: Crested ducks (*Lophonetta specularioides*); Chilean Flamingo (*Phoenicopterus chilensis*); Red-legged Cormorant (*Poikilocarbo gaimardi*); Kelp gulls (*Larus dominicanus*) and Southern oystercatchers (*Haematopus leucopodus*).

**Figure 1.7** Location of Key Biodiversity Areas in relation to area of analysis



Source: IBAT, 2019. Approximate location of Cañadon Leon site shown with red dot.

Relevant species that are most likely to inhabit or use as passage the area of analysis are shown in Table 1-3.

**Table 1-3** Migratory bird species identified within the Projects Aol from survey/desktop sources

Class - species	Common name	Red List Status	Migratory status	Congregatory
<b>Aves (Birds)</b>				
<i>Chloephaga rubidiceps</i>	Ruddy-headed goose	LC (global) / EN (local)	Full migrant	Congregatory (and dispersive)
<i>Chloephaga picta</i>	Upland goose	LC (global) / NT (local)	Full migrant	Congregatory (and dispersive)
<i>Pluvianellus socialis</i>	Magellanic Plover	NT (global) / EN (local)	Full migrant	Congregatory (and dispersive)
<i>Neoxolmis rufiventris</i>	Chocolate-vented Tyrant	LC (global) / NA (local)	Full migrant	-
<i>Asthenes pyrrholeuca</i>	Sharp-billed Canastero	LC (global) / NA (local)	Full migrant	-
<i>Lessonia rufa</i>	Patagonian Negrito	LC (global) / NA (local)	Full migrant	-
<i>Phrygilus carbonarius</i>	Carbon Sierra-finch	LC (global) / NA (local)	Full migrant	-

Class - species	Common name	Red List Status	Migratory status	Congregatory
<i>Mimus patagonicus</i>	Patagonian Mockingbird	LC (global) / NA (local)	Full Migrant	-
<i>Upucerthia dumetaria</i>	Scale-throated Earthcreeper	LC (global) / NA (local)	Full Migrant	-
<i>Agriornis micropterus</i>	Grey-bellied Shrike-tyrant	LC (global) / NA (local)	Full Migrant	-
<i>Agriornis murinus</i>	Lesser Shrike-tyrant	LC (global) / NA (local)	Full Migrant	-
<i>Progne elegans</i>	Southern Martin	LC (global) / NA (local)	Full Migrant	-
<i>Theristicus melanopis</i>	Black-faced Ibis	LC (global) / NA (local)	Full Migrant	-
<i>Oreopholus ruficollis</i>	Tawny-throated Dotterel	LC (global) / NA (local)	Full Migrant	Congregatory (and dispersive)

Source: IUCN Red List of Threatened Species, 2019; Aves Argentinas, 2017. Note: LC: Least Concern; EN: Endangered; NT: Near Threatened; NA: No Amenazada.

Many of the bird species that breed in the region are migratory and, during the cold months, their wintering grounds are located in environments of the center or north of Argentina, or in coastal environments; distribution of relevant species is shown in Table 1-4.

**Table 1-4 Migratory bird species distribution**

Permanet resident	Breeding Area
Migration Area	Migratory Passage
	Introduced



***Neoxolmis rufiventris***



***Asthenes pyrrholeuca***



*Lessonia rufa*



*Phrygilus carbonarius*



*Mimus patagonicus*



*Upucerthia dumetaria*



*Chloephaga rubidiceps*



*Pluvianellus socialis*



*Chloephaga picta*



*Progne elegans*



***Agriornis micropterus***



***Agriornis murinus***



***Theristicus melanopsis***



***Oreopholus ruficollis***

Source: ArgentAvis, 2012. Note: approximate area of analysis shown in red outline.

*Chloephaga rubidiceps* and *Pluvianellus socialis* have been discussed in the previous subsection considering their local conservation status and migratory habits.

### ***Chloephaga picta***

The Upland Goose is a migratory species of South America, which breeds from September to April in Patagonia (Argentina and Chile) and winters from May to September in the southern Pampas in Argentina (Pedrana et al. 2018b). It inhabits aquatic steppe environments (even frozen); lakes, lagoons (brackish/freshwater), and rivers; as well as valley bottoms. Wetlands International (2019) estimate its population size within a range of 50,000-150,000 individuals. It has been identified in the Manantiales Behr windfarm monitoring.

### ***Neoxolmis rufiventris***

It inhabits the arid herbaceous steppes of Coirón (*Festuca* and *Stipa*) and Colapiche (*Nassauvia*) where it nests during summer, it can be found almost always perched on the ground, on the coirones or other low bushes. In autumn, it migrates to the north forming flocks and there it can be observed in a slightly larger variety of habitats (Aves del Golfo de San Jorge, 2017). The global population size has not been quantified, but this species is described as 'uncommon and patchily distributed' (Stotz et al. 1996). It has been identified in the Cañadon Leon and Manantiales Behr windfarm monitoring.

### ***Asthenes pyrrholeuca***

This species nests in southern Argentina and Chile. Migrates in winter to Northern provinces in Argentina, reaching Uruguay, Paraguay, and Bolivia (ArgentAvis, 2012). Two subspecies are distributed in Argentina and Chile nesting sites, migrating in the winter some populations to the Northern provinces, Uruguay, Paraguay and Bolivia; it inhabits bush steppes and also marsh vegetation. In Argentina, *Asthenes pyrrholeuca sordida* extends through San Juan, Mendoza, Neuquén and west of Río Negro, migrating in autumn west to Jujuy; *A. pyrrholeuca* covers from Córdoba and SE of Buenos Aires to E of Río Negro, Chubut and Santa Cruz, including San Luis (Veneciano and Veneciano, 2016). The global population size has not been quantified, but this species is described as 'common' (Stotz et al. 1996). It has been identified in the Cañadon Leon windfarm monitoring.

### ***Lessonia rufa***

The Austral Negrito or Patagonian Negrito is a species of bird in the Tyrannidae family. It breeds in Argentina and Chile, migrating north as far as Bolivia, southern Brazil, Paraguay and Uruguay. It is a vagrant to the Falkland Islands. Its natural habitats are freshwater lakes and saline marshes. It nests in southern Chile and Argentina. In autumn, it migrates to Northern provinces of Argentina, Uruguay, southern Brazil, Paraguay and Bolivia. It is commonly found associated to water bodies, even along the coastline. It also inhabits steppes as well as high Andean lagoons in the northwest (ArgentAvis, 2012). The global population size has not been quantified, but this species is described as 'fairly common' (Stotz et al. (1996). It has been identified in the Cañadon Leon and Manantiales Behr windfarm monitoring.

### ***Phrygilus carbonarius***

Endemic species of Argentina nesting in the entire central area reaching Santa Cruz in the east. In winter, it migrates northwards to Chaco and Monte environments (Areta et al. 2014). It is found in the central-southern portion of Argentina during the summer period (towards the west in the center and to the east in the south). During the winter, the distribution is displaced towards the north, although this pattern is not clear since in the central part of the distribution the species is present all year round. This could imply that in this species there are populations or individuals that perform partial migratory movements, a common pattern of displacement among the southern Neotropical migrants (Cueto et al. 2011). The global population size has not been quantified, but this species is described as 'fairly common' (Stotz et al. (1996).

### ***Mimus patagonicus***

Common species in the south where it resides and nests in the shrub steppes; during the winter, it migrates to the Pampas and northern Patagonia, preferring open areas. Its natural habitat is subtropical dry scrub and degraded forests, although it also inhabits sclerophyllous and deciduous forests during winter (ArgentAvis, 2012). The global population size has not been quantified, but this species is described as 'fairly common' (Stotz et al. (1996). It has been identified in the Cañadon Leon and Manantiales Behr windfarm monitoring.

### ***Upucerthia dumetaria***

Distributed from Peru, Bolivia, Chile to Argentina to Tierra del Fuego with different subspecies that occupy different habitats. In the northern half of Argentina in the west, in the southern part it occupies the whole territory. In winter it migrates to the provinces of northeast Argentina and Uruguay (ArgentAvis, 2012). The global population size has not been quantified, but this species is described as 'fairly common' (Stotz et al. (1996). It has been identified in the Cañadon Leon and Manantiales Behr windfarm monitoring.

### ***Agriornis micropterus***

Two separate populations are identified, one that is resident in the high Andean plains of Peru, Bolivia, Chile and northwest Argentina and the other inhabiting the Patagonian steppe of Argentina and migrates north during the austral winter reaching Paraguay and Uruguay (ArgentAvis, 2012). The global population size has not been quantified, but this species is described as 'uncommon' (Stotz et al. 1996). It has been identified in the Cañadon Leon and Manantiales Behr windfarm monitoring.

### ***Agriornis murinus***

A species of bird in the Tyrannidae family. It is found in Argentina, Bolivia, Paraguay, and Uruguay. It inhabits shrub steppes and xerophilous thickets of the northern portion of the Patagonian steppe (endemic to this bioregion) and Patagonian monte, migrates to the north of Argentina in winter arriving in western Paraguay and southeastern Bolivia (ArgentAvis, 2012). The global population size has not been quantified, but this species is described as 'fairly common' (Stotz et al. 1996). It has been identified in the Cañadon Leon and Manantiales Behr windfarm monitoring.

### ***Progne elegans***

It nests in Bolivia, northwest, central and southern Argentina. In the austral winter, it migrates to northeastern Argentina, Uruguay, Paraguay and Bolivia, travelling as far to Brazil, Peru, Ecuador, Colombia (ArgentAvis, 2012). The global population size has not been quantified, but it is believed to be large as the species is described as common in at least parts of its range (del Hoyo et al. 2004). It has been identified in the Cañadon Leon and Manantiales Behr windfarm monitoring.

### ***Theristicus melanopis***

There is a subspecies (*T. m. branickii*) population in coastal Peru which is considered resident, while southern populations (*T. m. melanopis*) of Chile and Argentina migrate to the northern steppes in Argentina. Found in open country in meadows, pastures and cultivated fields as well as marshy valleys, arid rangeland, upland bunch-grass heaths and along lake and river margins. Colonial breeder in association to Black-crowned Night-heron or cormorants; colonies of 10-30 pairs have been found in Chile and over 50 pairs at a site in Tierra del Fuego. The population is estimated to number 25,000-100,000 individuals (Wetlands International, 2019). It has been identified in the Cañadon Leon windfarm monitoring.

### ***Oreopholus ruficollis***

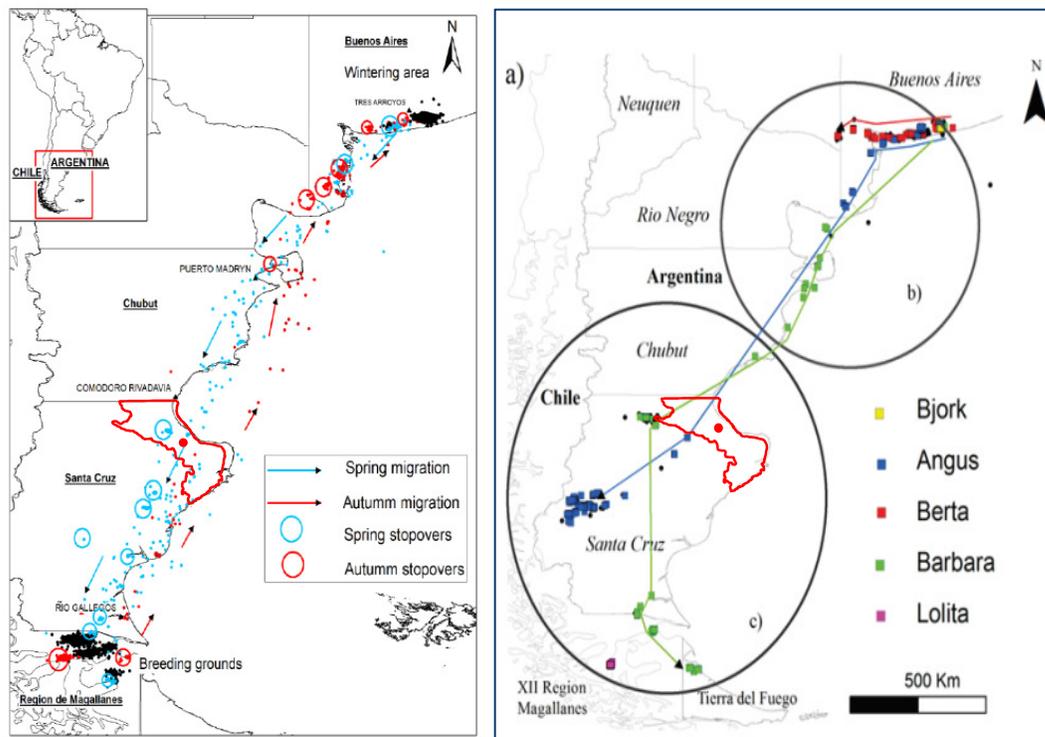
It has a distribution range that includes: Ecuador, Peru, Bolivia, Brazil; Chile; Argentina, Uruguay. There are two separate subspecies; the northern *O. r. pallidus* that nests in the arid coasts of Ecuador and northern Peru and is considered a resident. The southern subspecies, *O. r. ruficollis* nests in southern Peru, Bolivia, Chile and across western Argentina along the Andean foothills. It also nests in

the Patagonian steppe to Tierra del Fuego from where it migrates in the austral winter to the center of Argentina, Uruguay and southeastern of Brazil (ArgentAvis, 2012). The population is estimated to number 1,000-10,000 individuals, roughly equating to 670-6,700 mature individuals. It has been identified in the Cañadon Leon windfarm monitoring.

Most of the species discussed before have been directly identified in the project area, but their abundance have been overall described as rare/scarce during the bird monitoring at both Cañadon Leon (6 month long pre-construction monitoring) and Manantiales Behr (over two years operations monitoring) sites. Data suggest that Cañadon Leon area is not deemed to represent an area where important aggregations may occur (neither nesting/breeding behavior has been identified in the area from the monitorings at any part of their lifecycle

In consultation with local avifauna experts from Aves Argentinas, the findings of Pedrana et al. (2018a, b) have been discussed considering their relevance in regards to *Chloephaga* species migratory behavior. Satellite tracks of tagged individuals of *Ch. rubidiceps* and *Ch. picta* indicate that they may effectively fly over the Cañadon Leon site and area of analysis (Figure 1.8); as well as suggest that there may be stop over sites (to the eastern margin of the area of analysis, not in the project area). Nonetheless, this data is based on only a small number of individuals (i.e. six in each study).

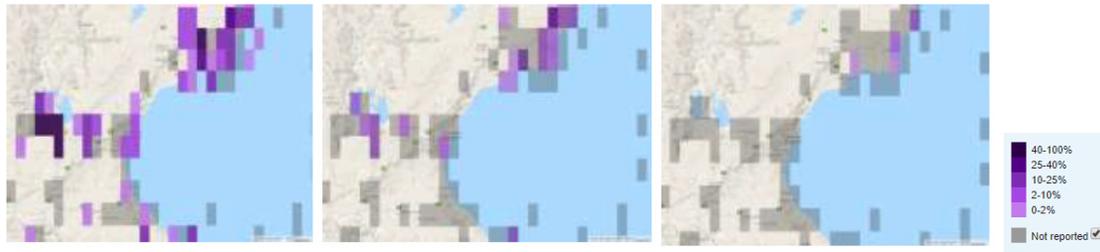
**Figure 1.8** Satellite tracks of tagged *Chloephaga rubidiceps* (left) and *Ch. picta* individuals detailing their migrating movements



Source: Pedrana et al. 2018a (left) and 2018b (right). Approximate location of Cañadon Leon site shown with red dot.

Local experts performed a brief analysis on the seasonality of migratory *Chloephaga* spp. records in the wider area from the project site using the information of “eBird” (<https://ebird.org/>). Figure 1.9 shows the location of the records of three geese species (the two species described beforehand and *Ch. poliocephala*). Data further suggest about the Cañadon Leon site/area of analysis not being particularly important in regards to species accumulations.

**Figure 1.9 Location of eBird records (violet rectangles) of the three species of migratory geese, in the extreme north of the coast of Santa Cruz and the coast of Chubut**



Source: eBird, 2019. *Ch. picta* (left); *Ch. poliocephala* (middle) and *Ch. rubidiceps* (right). Note: gray rectangle *sindictae* no

Population estimates for most species are unavailable, with only data availability for *Chloephaga* species; *T. melanopis* and *O. ruficollis*.

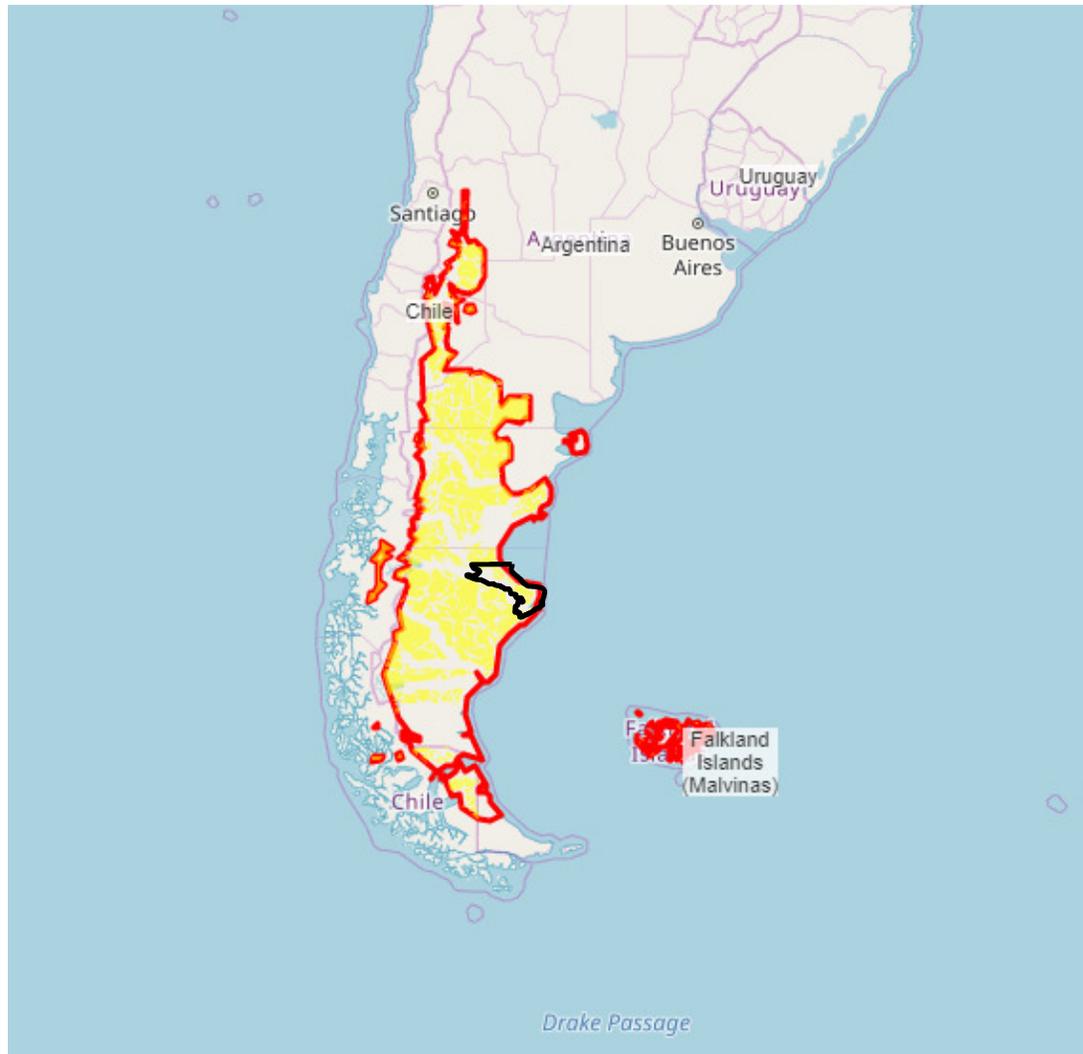
Based on the analyzed data, it is not clear whether any of the species may be capable of triggering Criterion 3 for migratory species. As in the case for endangered (as well as migratory) birds assessed in Criterion 1; it is recommended that the Project undertake specific biodiversity management measures for migratory species in consultation with local avifauna experts.

#### 1.2.5.3 Application of Criterion 4

According to WWF, the project site/area of analysis is within the Patagonian steppe ecoregion (Figure 1.10), which extends along the eastern face and foothills of the southern Andes all the way to the Atlantic Ocean, spanning much of southern Argentina and its border with Chile. Thick patches of low shrubs and scattered grasses dot the characteristic bare soil, sand, and rock here. Rising nearly 2,000 m in some places, this cold desert scrub ecoregion extends from near the Straits of Magellan northward to the Valdés Peninsula. To the west, thorn thickets and shrublands give way to the Argentine Monte temperate grasslands and the semi-forested slopes of the Andes (WWF, 2001).

In general, the vegetation of this steppe ecoregion is xerophytic and highly adapted for protection against drought, wind and herbivores. The vegetation is considered strongly related to Andean flora. There are three main types of vegetative communities. The most densely covered is semi-desert (45%), shrub-steppe (30%) and grass-steppe (20%). Desert like areas also exist with little to no vegetative cover as well as wet meadow areas, which have close to 100% cover (WWF, 2001).

**Figure 1.10 Patagonian steppe terrestrial ecoregion**



Source: WWF / Olson et al, 2001. Note: approximate area of analysis shown in black outline.

Despite the low density of the human population, this ecoregion has been seriously affected due to the fragility of the environment, and thus its threat status is considered Critical/Endangered by WWF (2001). The major problem is desertification due to over-grazing primarily by sheep, damaging the limited plant coverage and exposing the soil to erosion (Soriano and Movia, 1986). Buzzi et al. (2019) studied the influence of oil activity and sheep ranching on plant cover in the arid and semi-arid region of Patagonia, Argentina; analyzing oil and livestock activity in the coastal canyons, plateaus and western valleys landscape units (largely similar to what is the area of analysis). Their results indicated an increase in bare soil in the plateaus and in the western valleys, with a regression of the dominant plant communities.

As described earlier in Section 1.2.4, the whole of the project site/area of analysis is contained within the Patagonian steppe ecoregion. The particular habitats as defined by the Central Plateau and Shrubby Steppe of the Gulf of San Jorge ecological areas, within the river terrace landscape unit, is well represented within the ecoregion. Although there is very limited information to properly describe the Criterion 4 descriptors, it is probable that the area of analysis by itself does not trigger Critical Habitat under Criterion 4 (Table 1-5).

**Table 1-5 Criterion 4 summary table**

Habitat type	At risk of significantly decreasing in area or quality	Small spatial extent	Presence of unique assemblages of species
Patagonian steppe Ecoregion – Central Plateau	Probable	No	Unknown
Patagonian steppe Ecoregion – Shrubby Steppe of the Gulf of San Jorge	Probable	No	Unknown

Source: ERM, 2019

### 1.2.5.4 Application of Criterion 5

As mentioned for Criterion 4, the area is considered a Global 200/hotspot WWF sites<sup>3</sup>. The Table below compares the project area of analysis with the descriptors, which help to interpret Criterion 5. Though the area of analysis is but a fraction of the whole Patagonian steppe ecoregion, the overall area is known for high endemism (understood as country endemics; e.g. those listed in Table 1-2 as country endemics); the area is not considered highly heterogeneous in terms of favoring evolutionary processes; being a single landscape unit, though with distinct geomorphological features e.g. plains versus valleys; with these geomorphology features constituting potential environmental gradients. Considering the latter, the area is not deemed to trigger Critical Habitat under Criterion 5 (Table 1-6).

**Table 1-6 Criterion 5 summary table**

	Isolation	High endemism /flora and/or fauna with unique evolutionary histories	Spatial heterogeneity	Presence of environmental gradients	Connectivity between habitats (e.g. biological corridors)
Project Area of analysis	No	Probable	No	Probable	No

### 1.2.5.5 Other Criteria

Guidance note GN53 indicates that in general, internationally recognized areas of high biodiversity value will often qualify as critical habitat; for example areas that meet the criteria of the IUCN's Protected Area Management categories Ia, Ib and II (e.g. national parks) as well as the majority of Key Biodiversity Areas (KBAs), which encompass, among others, Important Bird and Biodiversity Areas (IBAs). KBAs have been discussed previously in Section 1.2.5.2 considering that IBAs are related to avian biodiversity, much of them being migratory. Most relevant IBA identified ("Comodoro Rivadavia") is not deemed to trigger critical habitat.

In regards to nationally protected areas; the two closest areas are the "Barco Hundido" Provincial Reserve; aimed mainly towards the conservation of coastal biodiversity; and the Meseta Espinosa y El Cordon Natural, Natural Reserve, which is intended as a hydrogeological reserve (Figure 1.11); neither deemed to trigger critical habitat.

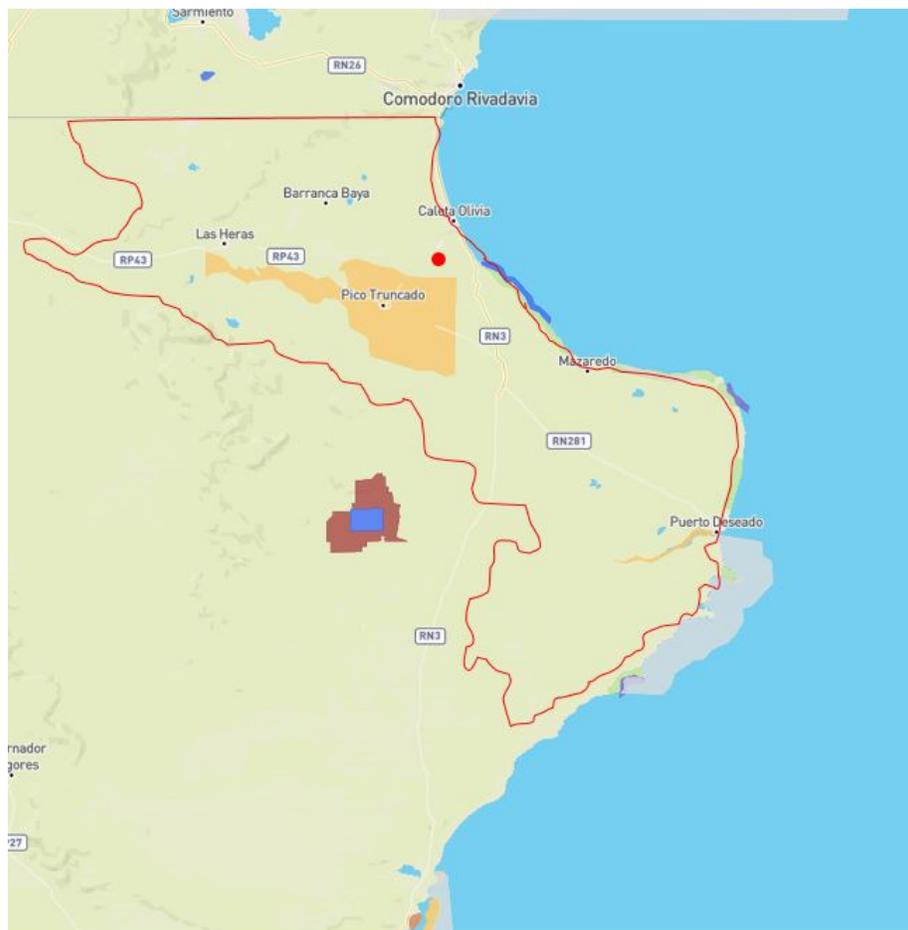
<sup>3</sup> WWF's Global 200/hotspots is a first attempt to identify a set of ecoregions whose conservation would achieve the goal of saving a broad diversity of the Earth's ecosystems. These ecoregions include those with exceptional levels of biodiversity, such as high species richness or endemism, or those with unusual ecological or evolutionary phenomena (<https://databasin.org/datasets/a5b34649cc69417ba52ac8e2dce34c3b>).

### 1.2.5.6 Summary of Critical Habitat Criterion Screening

As a summary and conclusion of the previous individual criteria assessment discussed in the previous sections, the area of analysis does not clearly qualify as a Critical Habitat for any of the criteria assessed. Extensive oil and gas activity, ongoing for several decades, mean that parts of the habitat is already modified, interspersed with expanses of Patagonian steppe habitat. Available data on biodiversity features derived from bird monitoring further suggest that the Cañadon Leon site and its wider environs do not constitute an area where significant concentrations of an endangered/migratory bird species may be found, nonetheless the area of analysis is significantly larger than the Cañadon Leon site, thus it may potentially be considered a critical habitat, but currently no data supports it.

The potential triggers for critical habitat are all migratory birds, specifically austral migrants, which travel from southern Patagonia towards the north during winter, and backward migration during spring. The Cañadon Leon site as well as the area of analysis in many cases is found between the breeding/wintering sites, thus the main concern would be the “passageway”, where birds may either fly directly over or rest at stop over sites (the Cañadon Leon site is not considered to be a recognized stop over site). It is expected that the current bird monitoring efforts taking place on a monthly basis since December 2018 by local avifauna experts shall provide data that would decrease the degree of uncertainty in regards to migrating birds (either of conservation concern or not) in order to further understand the flight features during migration of relevant species discussed in this report, and thus the developers be able to make informed decisions in regards to the Project’s biodiversity management.

**Figure 1.11** Location of national protected areas in relation to area of analysis



Source: IBAT, 2019. Approximate location of Cañadon Leon site shown with red dot.

### **1.2.6 Implications of the Modified, Natural and Critical Habitat Classification on the Cañadon Leon Windfarm Project**

The IFC Performance Standard 6 (PS6) provides various mitigation requirements for proposed projects located within modified, natural and critical habitats. These requirements should be addressed either through:

- The EIA's biodiversity management plan (BMP) or general project's Environmental and Social Management Plan (ESMP);
- If critical habitats appear to be impacted by the Project, a Biodiversity Action Plan (BAP) focused on specific species or habitats.

The contents of the EIA documents reviewed shows that the Project's Environmental Management Plan provides appropriate general measures for the protection of biodiversity. The project developers have currently commissioned local avifauna experts from Aves Argentinas and Universidad Nacional de La Plata (full details available in the existing bird monitoring reports) to undertake periodical comprehensive bird monitoring surveys that are expected to continue throughout the early life of the windfarm project (i.e. construction and first years of operation) in the Cañadon Leon project area. The surveys are focused on gaining a better understanding of seasonal presence and abundance of avifauna; and developing management measures should effects on avifauna of special interest be observed.

#### **Based on the latter, the following recommendations are made:**

- The results of birds monitoring surveys should be reviewed based on the known upcoming backward spring migration season (expected August).
- Given the current knowledge the developer has in regards to avian monitoring during operations (i.e. Manantiales Behr windfarm), develop a Biodiversity Management Plan to be implemented at the start of the Cañadon Leon windfarm operation that shall include: protocols on fatality monitoring/ carcass searches, bias correction trials, calculating fatality rate estimates, migratory bird monitoring, adaptive management and a shutdown on-demand (or active turbine management) as a mitigation if determined necessary based on the current/continued pre-construction surveys and post-construction monitoring.
- Should operational surveys (e.g. based on carcass searches) undertaken by local avifauna specialists identify endangered and/or significant numbers of migrating bird species (e.g. derived from monitoring data analysis) a specific BAP be developed under an adaptive management scheme for the Project.

## 2. REFERENCES

- Abrahamovich, A.H. & N.B. Díaz. 2001. Distribución geográfica de las especies del género *Bombus* Latreille (Hymenoptera, Apidae) en Argentina. *Revista Brasileira de Entomología* 45(1): 23-36
- Abrahamovich H, N. B. Diaz & M. Lucia. 2007. Identificación de las “abejas sociales” del género *Bombus* (Hymenoptera, Apidae) presentes en la Argentina: clave pictórica, diagnosis, distribución geográfica y asociaciones florales A *Revista de la Facultad de Agronomía, La Plata* 106 (2), 2007 165
- Areta, J. Emilio Jordan, Horacio Luna & Martín Manassero. 2014. REGISTROS DOCUMENTADOS DE AVES A ORILLAS DEL RÍO PARANÁ Y DE VISITANTES INVERNALES EN SANTA FE, ARGENTINA *Nuestras Aves* 59: 18-21, 2014
- ArgentAvis. 2012. <http://argentavis.org/2012/>Fichas de especies
- Atienza, J.C., I. Martín Fierro, O. Infante, J.Valls y J. Domínguez. 2011. Directrices para la evaluación del impacto de los parques eólicos en aves y murciélagos (versión 3.0). SEO/BirdLife, Madrid.
- parques eólicos en aves y murciélagos (versión 3.0). SEO/BirdLife, Madrid.
- Aves Argentinas. 2017 Categorización de las Aves de la Argentina. Informe del Ministerio de Medio Ambiente y Desarrollo Sustentable y de Aves Argentinas.
- Aves del Golfo de San Jorge. 2017. <http://avesgolfosanjorge.blogspot.com/2017/10/monjita-chocolate-neoxolmis-rufiventris.html>
- Bellis, L. M.; Navarro, J. L.; Vignolo, P. E.; Martella, M. B. 2006. Habitat preferences of Lesser Rheas in Argentine Patagonia. *Biodiversity and Conservation* 15(9): 3065-3075.
- BirdLife International (2019) Species factsheet: *Pluvianellus socialis*. Downloaded from <http://www.birdlife.org> on 04/06/2019. Recommended citation for factsheets for more than one species: BirdLife International (2019) IUCN Red List for birds.
- Blanco, D.E., Zalba, S.M., Belenguer, C.J., Pugnali, G. & Rodríguez Goñi, H. 2003. Status and conservation of the ruddy-headed goose *Chloephaga rubidiceps* Sclater (Aves, Anatidae) in its wintering grounds (Province of Buenos Aires, Argentina). *Revista Chilena de Historia Natural* 76(1): 47-55
- Buzzi, M.A., Rueter, B.L., Ghermandi, L., Maldonado, F. 2019. Influencia de la actividad petrolera y la ganadería ovina en la cubierta del suelo en una región árida y semiárida de la Patagonia Argentina. *Cuadernos de Investigación Geográfica* 45, <http://doi.org/10.18172/cig.3632>.
- Campos, Claudia & Tognelli, Marcelo & Ojeda, Ricardo. (2001). *Dolichotis patagonum*. Mammalian species. 652. 1-5. 10.1644/1545-1410(2001)6522.0.CO;2.
- Cueto, V., Fernando A. Milesi, M. Cecilia agario, Javier Lopez de Casenave, & Luis Marone. 2011. DISTRIBUCIÓN GEOGRÁFICA Y PATRONES DE MOVIMIENTO DE LA MONTERITA CANELA (*POOSPIZA ORNATA*) Y EL YAL CARBONERO (*PHRYGILUS CARBONARIUS*) EN ARGENTINA *ORNITOLOGIA NEOTROPICAL* 22: 483–494, 2011.
- del Hoyo, J., Elliott, A. and Christie, D. 2004. *Handbook of the Birds of the World, Vol. 9: Cotingas to Pipits and Wagtails*. Lynx Edicions, Barcelona, Spain
- Ferrari, S.; Imberti, S.; Albrieu, C. 2003. Magellanic Plovers *Pluvianellus socialis* in southern Santa Cruz Province, Argentina. *Wader Study Group Bulletin* 101/102: 70-76.
- Ferrari, S. Carlos Albrieu<sup>1,2</sup>, Santiago Imberti, & Carmen Lishman. 2008. ESTADO ACTUAL DEL CONOCIMIENTO DE UN CHORLO ENDÉMICO DE LA PATAGONIA AUSTRAL, EL CHORLITO CENICIENTO (*PLUVIANELLUS SOCIALIS*): REUNIENDO LAS PIEZAS DE UN ROMPECABEZAS *ORNITOLOGIA NEOTROPICAL* 19 (Suppl.): 433–443, 2008

- IFC. 2012. Performance Standard 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources January 1, 2012
- IFC, 2018. Guidance Note 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources.
- Imberti, S; Amoros, D and S. Cadieron. 2007. Presencia y nidificación del Cauquen Colorado *Chloephaga rubidiceps* en la provincia de Santa Cruz, Argentina. *Hornero* 22(1): 17-22
- Madsen, J., Matus, R., Blank, O.M., Benegas, L., Mateazzi, G. & Blanco, D.E. 2003. Population status of the Ruddy-headed Goose (*Chloephaga rubidiceps*) in Tierra del Fuego and mainland Patagonia (Chile and Argentina). *Ornitología Neotropical* 14(1): 15-28
- Oliva, G; Gonzalez, L and P. Rial. 2001. El Ambiente en la Patagonia Austral. Cap 2. Pp 17-80 in *Ganadería Sustentable en la Patagonia Austral*. Borrelli, P & G. Oliva. Ed INTA Reg. Pat. Sur. 269.pp
- Olrog, C. C., and M. Lucero. 1981. Guía de los mamíferos argentinos. Fundación Miguel Lillo, Tucuman, Argentina
- Olson, D.M., E. Dinerstein, E.D. Wikramanayake, N.D. Burgess, G.V.N. Powell, E.C. Underwood, J.A. D'Amico, H.E. Strand, J.C. Morrison, C.J. Loucks, T.F. Allnutt, J.F. Lamoreux, T.H. Ricketts, I. Itoua, W.W. Wettengel, Y. Kura, P. Hedao, and K. Kassem. 2001. Terrestrial ecoregions of the world: A new map of life on Earth. *BioScience* 51(11):933-938.
- Pedrana, Julieta & Bernad, Lucia & Pütz, Klemens & Gorosábel, Antonella & D. Muñoz, Sebastián. (2018a). El seguimiento satelital en Sud América: conociendo las rutas migratorias del cauquén colorado (*Chloephaga rubidiceps*). Poster presentation.
- Pedrana, J, K. Pütz, L. Bernad, J. P. Seco Pond, A. Gorosabel, S. D. Muñoz, J. P. Isacch, R. Matus, O. Blank, B. Lüthi, M. Lunardelli & P. Rojas. 2018b. MIGRATION ROUTES AND STOPOVER SITES OF UPLAND GEESE *CHLOEPHAGA PICTA* IN SOUTH AMERICA. *AVIAN BIOLOGY RESEARCH* 11: 2018 89–99.
- SAREM, 2012. Libro Rojo de Mamíferos Amenazados de la Argentina.
- Soriano. A y C. P. Movia, 1986. Erosión y desertización en la Patagonia. *INTERCIENCIA* V, 11 (2): 77-83.
- Stotz, D.F., Fitzpatrick, J.W., Parker, T.A. and Moskovits, D.K. 1996. *Neotropical Birds: Ecology and Conservation*. University of Chicago Press, Chicago.
- Veneciano, Jorge Hugo *Aves de San Luis: una riqueza poco valorada* / Jorge Hugo Veneciano; Valeria Susana Veneciano; compilado por Jorge Hugo Veneciano; Valeria Susana Veneciano. - 1a ed. - Villa Mercedes: Jorge Hugo Veneciano, 2016. Libro digital, PD
- Wetlands International (2019). "Waterbird Population Estimates" Retrieved from [wpe.wetlands.org](http://wpe.wetlands.org) on Friday 7 Jun 2019.