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The IUCN Species Survival Commission Lagomorph Specialist Group (LSG) and the World Lagomorph Society (WLS) are pleased to present this comprehensive compendium of all the lagomorphs in the world. This work is designed to expand coverage of the world’s lagomorphs and update the 1990 LSG Lagomorph Action Plan (Rabbits, Hares and Pikas: Status Survey and Conservation Action Plan, compiled and edited by Joseph A. Chapman and John E. C. Flux). The Action Plan has served as the most thorough single source of information on lagomorphs for biologists, but it was never widely available to the public and it has become outdated. In this book we present updated range maps of all lagomorph species, high-quality images of most species, as well as current information on identification, systematics, ecology, behavior, reproduction, genetics, physiology, and conservation and management of the pikas, rabbits, and hares of the world. The book also summarizes key components of topics of broad interest across all lagomorph species: evolution, systematics, lagomorph diseases, introduced lagomorphs, and conservation and management. Despite several ongoing controversies in lagomorph taxonomy, we have maintained a conservative systematic approach. Nevertheless, we highlight relevant taxonomic issues that require attention.

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increasingly intensive chemical farming, pest control, and removal of all native cover may limit populations. There is concern about low encounter rates of the species during thousands of kilometers of roadside surveys in western Oregon. Rates of sightings along dirt roads across Nevada during 1995–2015 crepuscular and nocturnal surveys were two-thirds to one-sixth of those reported in field notes from the 1930s to 1950s.

Research and monitoring are needed to address the long-term status and trend of the black-tailed jackrabbit, including its relationship with management objectives and broad-scale drivers of population dynamics, genetics (e.g., more-resolved subspecies definitions), and gaps in distribution and synecological relationships between the black-tailed jackrabbit and other sympatric jackrabbits.

ACCOUNT AUTHORS: Erik A. Beever, David E. Brown, and Consuelo Lorenzo


**Lepus callotis** Wagler, 1830

**White-sided Jackrabbit**

OTHER COMMON NAMES: Antelope rabbit, Beautiful-eared jackrabbit, Gaillard’s jackrabbit, Snowsides; Liebre torda, Liebre pinta (Spanish)

DESCRIPTION: The white-sided jackrabbit is a medium to large hare with a buffy cinnamon brown dorsum merging to iron gray on the rump and hips, with distinctive white sides and underparts below the median line. The ears, while large, are not exaggerated and are tipped with a white fringe and sport dusky patches along the posterior edges. A nape patch ranges from brown to black, and the limbs are white with buff on the upper surfaces. The gular area is cinnamon to ochraceous with much white on the head. The tail is moderately short with a black upper surface and white underparts. The eye-shine at night is reddish. The white-sided jackrabbit undergoes one molt a year during early summer from front to rear. Except for the shorter pelage in summer, there is little difference between the summer and winter coats. Females are larger than males.

The skull is similar to that of the more common black-tailed jackrabbit (*L. californicus*), but with a higher nasal aperture, a smaller and more inclined supraorbital surface, and a lesser breadth across the auditory bullae.

SIZE: Head and body 432–598 mm; Tail 47–90 mm; Hind foot 113–145 mm; Ear 137–180; Greatest length of skull 85–93 mm; Weight 1,500–3,200 g
PALEONTOLOGY: No fossil remains of this hare have been reported, a situation probably influenced by the difficulty in differentiating the bones of the white-sided jackrabbit from those of the black-tailed jackrabbit. One hare from outside the present range of the white-sided jackrabbit in Burnet Cave in Eddy County, New Mexico (age, 7,432 ± 300 years), and attributed to the antelope jackrabbit (L. allenii), may be this species.

CURRENT DISTRIBUTION: Two subspecies: L. c. callotis and L. c. gaillardi. These forms are separated along parallel 25° N, the Nazas River being a significant geographical barrier. L. c. callotis occurs in grassland and savanna habitats south of the Nazas River from C Durango southward through the northwestern half of Oaxaca and northern half of Guerrero at elevations ranging from ~750 to 2,550 m asl. North of the Nazas River, L. c. gaillardi is found in N Durango and W Chihuahua northward to less than 120 km² of habitat in the “boothheel” region of extreme SW New Mexico in the United States at elevations from 1,350 to 2,100 m asl.

TAXONOMY AND GEOGRAPHIC VARIATION: Lepus callotis gaillardi differs from L. c. callotis in having plainer and buffer pelage including a paler rump and less ochraceous throat patch. The white flanks of L. c. gaillardi also show less contrast with the upper body fur, while the skulls are typically larger and have a more elevated supraorbital process. L. c. gaillardi also has a brown rather than black nape and has larger body, foot, and ear measurements.

Similar species include the smaller sympatric black-tailed jackrabbit and the larger and disjunct antelope jackrabbit and the Tehuantepec jackrabbit (L. flavigularis).

ECOLOGY: Despite having been described as early as 1830 and being a popular game animal in much of Mexico, this hare’s natural history and ecological requirements remain largely undocumented. L. c. gaillardi is affiliated with warm temperate grasslands having from 75 to 100 mean days with temperatures below 0°C per annum, while L. c. callotis inhabits tropic-subtropic grasslands with less than 35 mean nights a year with temperatures below 0°C. With mean annual temperatures ranging from 3.6°C to 33.8°C, the grassland habitats of L. c. gaillardi are subject to encroachment by honey mesquites (Prosopis glandulosa), woody plants, and stiff-stemmed shrubs, and those of L. c. callotis to rapid and pronounced successional changes to thorny vegetation and cacti due to grazing pressures, fire suppression, and climate change.

Most accounts describe white-sided jackrabbits as preferring level or gentle terrain clothed in herbaceous vegetation such as blue grama (Bouteloua gracilis) and tobosa (Pleuraphis mutica) grasslands. Their highest densities occur in a dense cover of grasses and herbs, and most collections of this species have been from open grasslands. Hills and brushy terrain are avoided, as are dense woodlands and forests. Precipitation values near white-sided jackrabbit collection sites range from 340 to 530 mm for L. c. gaillardi and from 430 to 1,050 mm for L. c. callotis. From 71% to 90% of this precipitation falls between April and September.

Significant predators include bobcats (Lynx rufus), coyotes (Canis latrans), kit foxes (Vulpes macrotis), red-tailed hawks (Buteo jamaicensis), Swainson’s hawks (B. swainsoni), and possibly golden eagles (Aquila chrysaetos).

HABITAT AND DIET: One of the few habitat studies conducted in Mexico describes L. c. gaillardi occurring in open plains grasslands dominated by blue grama grass. In New Mexico, L. c. gaillardi depends on level well-developed grasslands with a low density of shrubs, and occurrences are positively correlated with buffalo grass (B. dactyloides) and negatively correlated with shrub cover. Open patches of semi-desert grassland are important to the animal’s persistence, and from Jalisco to Puebla, white-sided jackrabbits occur in valleys and basins containing grasslands while avoiding pine-oak forests, thorn-scrub, and desert scrub.

Unlike L. c. gaillardi, L. c. callotis in Guerrero and possibly other areas where black-tailed jackrabbits are missing appears to also use cultivated lands and heavily grazed grasslands populated by thorny shrubs.

Few diet studies have been conducted, but white-sided jackrabbits are reported to feed primarily on green grass and forbs and to subsist without free water. They usually forage by cutting and pulling up grass blades, feeding on the leaves, roots, and nodes. Grass and forbs particles are chewed while sitting upright and watching for predators. Discarded grass stems are not retrieved. The forepaws are used to dig and excavate nutgrass (Cyperus rotundus) tubers and grass rhizomes, resulting in oval feeding pits or depressions 7–19 cm long, 5–15 cm wide, and 1–3 cm deep. Fecal pellets are commonly found in and around these pits.

BEHAVIOR: The white-sided jackrabbit is primarily nocturnal in its activities and typically occurs in pairs. In New Mexico, most activity takes place from 2200 to 0500 h, with less activity during the early morning and in the late evening. Less movement occurs on nights having cloud cover, precipitation, or wind. Temperature appears to have little effect on movements.

Animals flushed from dense stands of tobosa or other...
grass flee to other grassland sites that are usually out of sight of the pursuer. Hares hunted with dogs are reported to go to ground in dense grass when pursued. When flushed, white-sided jackrabbits alternately flash their white sides while running and employ an escape behavior of leaping straight upward, extending the hind legs, and flashing its white flanks. Pairs flushed in front of observers at distances from 5 to 25 m will run together for distances up to 0.5 km.

Male-female pairs of white-sided jackrabbits are commonly observed, and these pair bonds are strongest in the April through October breeding season. During this time the male guards the female from intruding males, the pair-mates usually remaining within 5 m of each other.

The white-sided jackrabbit employs more elaborate forms (depressions) than most hares. Form shelters average 37 cm in length, 18.3 cm in width, and 6.3 cm in depth. Dense stands of grass usually surround the form, which can extend beneath the soil surface. These sites are frequently characterized by concentrations of jackrabbit fecal pellets.

These hares are generally silent except for the high-pitched screams of a stressed individual or the huffs and grunts of interacting animals during the breeding season.

**PHYSIOLOGY AND GENETICS:** Diploid chromosome number = 48. A member of the white-sided clade, *L. callotis* is closely related to *L. flavigularis* and *L. alleni*. The genetic relationship between *L. callotis* and *L. californicus* is in need of further investigation. The form *altimirea*, formerly identified as being in the white-sided clade, has been assigned subspecific status under *L. californicus* based on morphological criteria, although this classification is open to interpretation.

**REPRODUCTION AND DEVELOPMENT:** Little is known about the breeding habits of this seemingly monogamous hare. The presence of embryos and lactating females in collections of white-sided jackrabbits indicates a breeding season from mid-March to mid-August. Mean litter size is no more than 2.2, and probably less. All indications are that recruitment rates are low.

**PARASITES AND DISEASES:** Unlike other western jackrabbits, this low-density animal does not appear prone to heavy parasite loads of botfly larva (*Cuterebra* spp.) and tapeworm cysts. Ectoparasites and possible disease vectors include a flea (*Pulex simulans*) and a tick (*Dermacentor parumapertus*). Microorganisms from a limited sample of *L. c. gaillardi* in New Mexico include a coccidian, *Staphylococcus aureus*, *Pneumococcus* spp., *Streptococcus* spp., *Bacillus* spp., *Pseudomonas pseudomallei*, *Alcaligenes denitrificans*, *Pantoea agglomerans*, *Klebsiella ozaenae*, *Escherichia coli*, and *Yersinia pseudotuberculosis*.

**CONSERVATION STATUS:**

IUCN Red List Classification: Near Threatened (NT); decreasing

**MANAGEMENT:** Most of the information available on white-sided jackrabbits comes from anecdotal observations made by museum collectors and scientists conducting general zoological inventories. Although a few life history studies of *L. c. gaillardi* have been conducted, only one study has investigated the status of *L. c. callotis*. Nonetheless, available information suggests that *L. c. gaillardi* is in serious decline due to environmental changes resulting from overgrazing, shrub invasion, and other habitat changes. The declining remnant population in New Mexico is also subject to road kills from significant U.S. Border Patrol activities.

The status of *L. c. callotis* is less clear, but the limited information available indicates that it may also be in trouble due to habitat alteration, localized hunting activity, disturbance by dogs, and vehicle collisions. Additionally, a study that modeled the effects of climate change on grassland mammals in Mexico predicted an 80% reduction in range and habitat of *L. callotis* by 2050.

Several investigators have reported the white-sided jackrabbit to be uncommon in both New Mexico and Mexico (Chihuahua, Guanajuato, Guerrero, Michoacán, SE Morelos, San Luis Potosi, and Zacatecas). Populations of white-sided jackrabbits in many areas have been diminishing for years, and in some areas this species is now said to be rare where it was formerly common. In other areas white-sided jackrabbits are reported to have been replaced by the highly adaptable black-tailed jackrabbit.

In the United States *L. callotis* has been classified as “Threatened” by the state of New Mexico since 1975; however, it is not afforded any protection by the U.S. Endangered Species Act (ESA). In 2009, the U.S. Fish and Wildlife Service was petitioned to list the species under the ESA, but it was rejected after a 12-month review due to a lack of information on the status of the species in Mexico, where neither *L. c. gaillardi* nor *L. c. callotis* is considered a mammal “at risk.” This decision runs counter to the overwhelming number of publications and proceedings that have recommended the species be considered as endangered throughout its entire range and in need of research and protection.

The white-sided jackrabbit is hunted for subsistence and sport in Mexico. The preferred method is with dogs such as beagles, and the species is reported to be sus-
ceptible to this kind of take. Nonetheless, no systematic surveys or harvest estimates have been conducted on Mexican jackrabbits.

Research and monitoring are needed to address the long-term status and trends of the white-sided jackrabbit, including its relationship to broad-scale drivers of population dynamics, genetics (e.g., more-resolved subspecies definitions), and gaps in distribution and synecological relationships between subspecies of the black-tailed jackrabbit.

Although vehicle collisions can constitute significant local sources of mortality, as can forest fires, drought, disease outbreaks, and possibly extremely cold weather, the principal factors of concern with this species are habitat alteration and condition. Because the species appears to favor open grasslands devoid of woody vegetation, it is increasingly prone to intensive grazing, chemical farming, pest control, and removal of native cover. Most important, the white-sided jackrabbit is in much need of study so that its limiting factors can be identified and addressed.

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**Key References:** Anderson and Gaunt 1962; Bednarz and Cook 1984; Bello-Sánchez 2010; Bogan and Jones 1975; Cook 1986; Dalquest 1953; Davis and Lukens 1958; Davis and Russell 1954; Delgadillo-Quezada 2011; Desmond 2004; Hall and Villa 1949; Leopold 1972; Matson and Baker 1986; Mearns 1895; Nelson 1909; SEMARNAT 2010; Traphagen 2011.

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**Lepus capensis** Linnaeus, 1758

**Cape Hare**

**Other Common Names:** Arabian hare, Brown hare, Desert hare

**Description:** The Cape hare is a middle-sized hare with smooth and straight fur. The dorsal pelage and head are silvery-gray grizzled with black. The hairs are white at the base with a wide black sub-terminal band, a whitish terminal band, and a black or white tip. The underfur is white or grayish white. The ventral fur is pure white and long. The lower flanks are pale buff. The lateral profile of the head is markedly angular. The Cape hare has white eye rings and frequently Rufous marks above and below the eye-rings. The upper lips are pale Rufous, and the chin and throat are white. Typically, the hares have a buffy-white collar. The ears are comparatively long with the inner fringe lined with long white hairs. The ear tips are rounded and lined with short black hairs, particularly on the external surface. The nuchal patch is brownish pink. The forelimbs are pale Rufous above and white below, whereas the hind limbs are pale Rufous. The soles of all feet have a buffy-brown fur. The tail is relatively long, downy, black above, and white on the sides and below. Both morphological characteristics and pelage color vary widely throughout the species’ geographical range. The specimens from arid and semi-arid areas are paler colored than those from more temperate areas. The ear tips in des-

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*Lepus capensis*. Photo courtesy David E. Brown