

COSEWIC
Assessment and Status Report

on the

Chestnut-collared Longspur
Calcarius ornatus

in Canada



THREATENED
2009

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

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COSEWIC Assessment Summary

Assessment Summary – November 2009

Common name

Chestnut-collared Longspur

Scientific name

Calcarius ornatus

Status

Threatened

Reason for designation

This species is a native prairie grassland specialist that occurs in Alberta, Saskatchewan and Manitoba. The species has suffered severe population declines since the late 1960s, and the results of several surveys suggest that the declines have continued over the last decades albeit at a slower rate. The species is threatened by habitat loss and fragmentation from road development associated with the energy sector.

Occurrence

Alberta, Saskatchewan, Manitoba

Status history

Designated Threatened in November 2009.



COSEWIC
Executive Summary

Chestnut-collared Longspur
Calcarius ornatus

Species information

The Chestnut-collared Longspur is a medium-sized songbird. It is the smaller of two breeding prairie grassland longspur species and can be distinguished by the black triangular patch in the centre of the tail, white lesser coverts and extensive white on the outer tail coverts. Chestnut-collared Longspurs have a sweet warbling song, which is initially high and clear but ends in lower, buzzy notes. Males have a distinctive aerial display, which occurs lower to the ground than is the case in the McCown's Longspur.

Distribution

Chestnut-collared Longspurs breed in the short- and mixed-grass prairie regions of the northern Great Plains (prairies) of Canada and the United States. During the non-breeding season, they occur in the southern United States (western Oklahoma to southeastern Arizona) and northern Mexico.

Habitat

A native prairie grassland specialist, the Chestnut-collared Longspur typically breeds in recently grazed or mowed, arid, short- or mixed-grass prairie. The species prefers short vegetation (< 20-30 cm high), but will breed in tall-grass prairie if it is grazed or mowed. Areas with low sward densities and minimal litter depth are preferred. The topography preferred by this species is level to rolling uplands (mixed-grass and short-grass) and moist lowlands. Optimal grassland habitat in Canada for the Chestnut-collared Longspur is being fragmented by energy sector activity and other development and is being converted to agricultural use. The remaining fragmented grassland is often ungrazed (idle) and therefore unsuitable for breeding.

Biology

Chestnut-collared Longspurs are monogamous and have small, often clumped territories. Following arrival on the breeding areas, males (which arrive before females) establish breeding territories generally by early to mid-May (Alberta). Females excavate and build a nest in the ground and lay 3-5 eggs which are then incubated for 10-12.5

days by the female; the male guards the nest and is active in predator defence. Both parents feed the young, which fledge after 10 days, following which they are fed by the male for a further two weeks; immature birds form flocks by late June. Generation time is likely two to three years. Nest predation accounts for a high degree of egg and nestling mortality.

Population sizes and trends

Nearly one-quarter of the continental Chestnut-collared Longspur population occurs in Canada, where the population is estimated at 600,000 birds. Over the long-term, analyses using data from Breeding Bird Surveys (BBS, 1968-2008) and Christmas Bird Counts (CBC, 1967-2008) show losses of 90% and 93% of the population, respectively. On the short-term, analyses from a variety of surveys indicate population losses ranging from 35% to 63% over the last 10 years, although surveys in high quality habitat (Grassland Bird Monitoring (GBM) program) suggest a population increase. Analysis of the variance surrounding the best trend estimate (combined BBS/GBM analysis) suggests that the probability that the Chestnut-collared Longspur population in Canada has declined by at least 30% or more over the last 10 years is 81%.

Limiting factors and threats

The greatest threat to the Chestnut-collared Longspur has been the loss and fragmentation of native prairie grassland. The remaining patches may offer suboptimal breeding conditions for the longspurs. Given their area sensitivity, grassland patches of a few hectares are likely too small for the species to persist. Additionally, idling of pastureland and habitat fragmentation and disturbance from oil and gas developments may impact Chestnut-collared Longspur populations.

Special significance of the species

The Chestnut-collared Longspur is symbolic of native prairie grasslands in the Great Plains of the United States and southern Prairies of Canada. Elders from the Blackfoot First Nation (Nitsitapii) called the Chestnut-collared Longspur *Aapinakoisistsii* (little morning bird); other sources suggest the Chestnut-collared Longspur is called *Iskiokae* (black breast).

Existing protection

The Chestnut-collared Longspur and its eggs and young are protected under the 1994 *Migratory Birds Convention Act*. In 2008, the species was listed as Near Threatened by IUCN because of its moderately rapid population decline. Breeding populations in South Dakota, Alberta and Saskatchewan and non-breeding populations in Louisiana and Oklahoma are ranked as 'apparently secure' or 'secure' by NatureServe. All other provincial and national rankings in Canada list breeding and non-breeding populations of the Chestnut-sided Longspur as 'vulnerable', 'imperiled' or 'critically imperiled'.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2009)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

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SPECIES INFORMATION

Name and classification

Scientific name: *Calcarius ornatus* (Townsend, 1837)
English name: Chestnut-collared Longspur
French name: Bruant à ventre noir
Classification: Class Aves, Order Passeriformes, Family Emberizidae

Morphological description

The Chestnut-collared Longspur is a medium-sized songbird, 13-16.5 cm in length. It is the smallest longspur, and can generally be distinguished from other longspurs in flight by the black triangular patch in the centre of the tail, white lesser coverts and extensive white on the outer tail feathers. Compared with other longspurs, the wings tend to be shorter and more rounded (Sibley 2000).

Males in breeding plumage have a black crown and breast, yellowish-buff cheeks and upper throat (sometimes white), a deep chestnut (rufous) collar or hindneck and black shoulders with white trim. Females in breeding plumage are greyish-buff in overall colour, with dusky stripes, sometimes with an obscure chestnut collar and dark feathers on their breast and belly. In winter, males and females have similar colouration, except that the winter female has buffy feather tips and the black on the head and chest and the chestnut on the nape are veiled by buffy feather tips (Hill and Gould 1997).

Their song is a sweet warble “*seet sidee tidee zeek zeerdi*”, beginning high and clear and ending lower and buzzy. The call of the Chestnut-collared Longspur is a distinctive “til-lip” or “kidd-le”. It also makes a soft rattle and a buzzing sound similar to other longspurs. Male Chestnut-collared Longspurs sing as part of an aerial display or while perched on shrubs, rocks or fences. During the aerial display, the male flies upwards, circles and undulates, and then descends while singing, with the tail spread. This display generally takes place within 15 m of the ground, whereas the McCown’s Longspur *Calcarius mccownii* usually displays more than 20 m above the ground (Hill and Gould 1997).

Genetic description

There has been no genetic work conducted on this species.

Designatable units

There is no geographic variation described for this species nor are there recognized subspecies. This report is, therefore, based on a single designatable unit, *Calcarius ornatus*.

DISTRIBUTION

Global range

The breeding range of the Chestnut-collared Longspur is restricted to short- and mixed-grass prairie regions of the Great Plains and Canadian Prairie provinces (Hill and Gould 1997). It winters in western Oklahoma to southeastern Arizona and down to northern Mexico (Figure 1). One of the main concentrations for wintering grassland birds from the North American Great Plains is the Chihuahuan Desert in Northern Mexico. Recent monitoring efforts suggest that Chestnut-collared Longspurs are the most abundant grassland bird species recorded in this region (Levandoski *et al.* 2008).

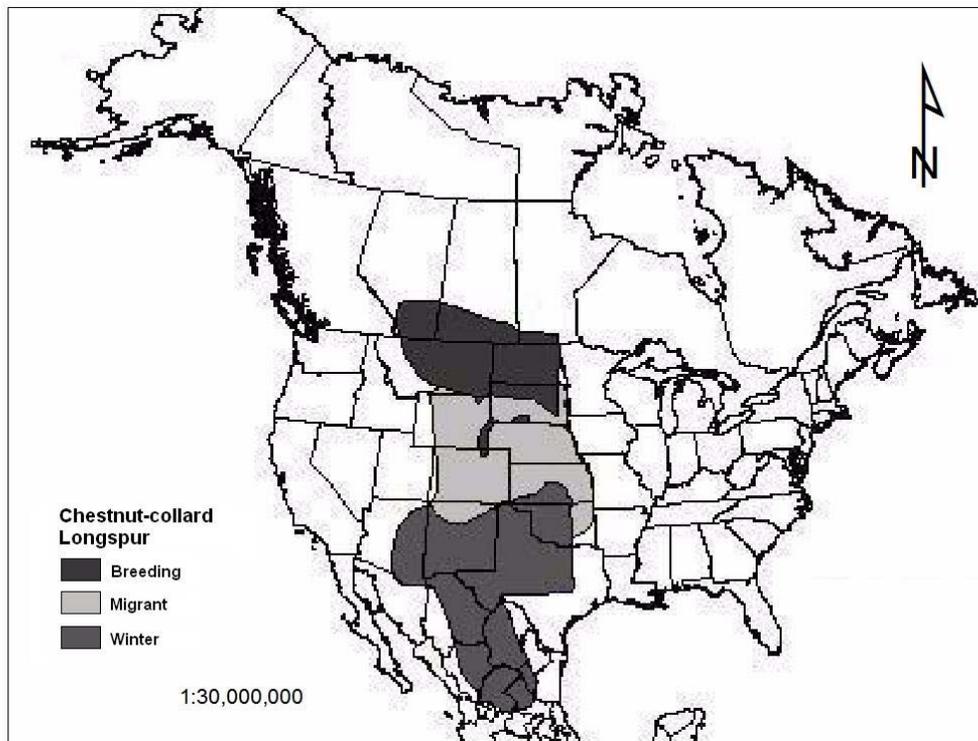


Figure 1. Distribution of the Chestnut-collared Longspur in the breeding and non-breeding season (PIF Landbird Population Estimates Database accessed 2009 (http://rmbo.org/pif_db/laped/default.aspx)).

Canadian range

The Chestnut-collared Longspur occurs in the short- and mixed-grass prairie regions of Alberta, Saskatchewan and Manitoba (see Figures 1 and 2).

Alberta

In Alberta, the Chestnut-collared Longspur is almost entirely restricted to the Grassland Natural Region; it occurs north to Camrose and Beaverhill Lake west to about Lethbridge and Calgary (Semenchuk 1992). During the second Alberta Breeding Bird Atlas (Federation of Alberta Naturalists 2007), the species was detected most often in the centre of the Grassland Natural Region.

Saskatchewan

The Chestnut-collared Longspur occurs in the grasslands of southern Saskatchewan as far north as Grill Lake, Saskatoon, Quill Lakes and Moosomin (Smith 1996). Very rarely it occurs further north to Turtle Lake in the southern boreal region (Smith 1996). The current distribution is changing dramatically and many previously occupied grassland areas have been vacated (A. Smith, pers. comm.), while many others have experienced large population declines (Leighton *et al.* 2002, Houston and Anaka 2003, Wapple and Renaud 2008). Preliminary predictive modelling results from Saskatchewan indicate that the range of the Chestnut-collared Longspur has retracted to the south (S. K. Davis, pers. comm.).

Manitoba

In Manitoba, the Chestnut-collared Longspur has been described as a “Fairly common breeder in southwestern grasslands; rare and declining in much of its former nesting range” (Manitoba Avian Research Committee 2003, p. 367). The species is now mostly restricted to vestiges of unbroken prairie south and west of Carberry, extending northwards along the Assiniboine River to St. Lazare. It has not been found in the Winnipeg area (International Airport, Rosser and Oak Hammock Marsh) for about 15-20 years (R. Koes, pers. comm.), where until the 1980s it was a common sight in areas of close-cropped grassland. Today, it is likely that the Chestnut-collared Longspur has been largely or completely extirpated in south-central Manitoba (K. De Smet, pers. comm.).

The Extent of Occurrence (EO) for the species in Canada is estimated at 292,000 km² measured as a minimum convex polygon based on the NatureServe range map (A. Filion, pers. comm. 2009). The Index of Area of Occupancy (IAO) based on a 2X2 grid is greater than 2,000 km² (A. Filion, pers. comm.).

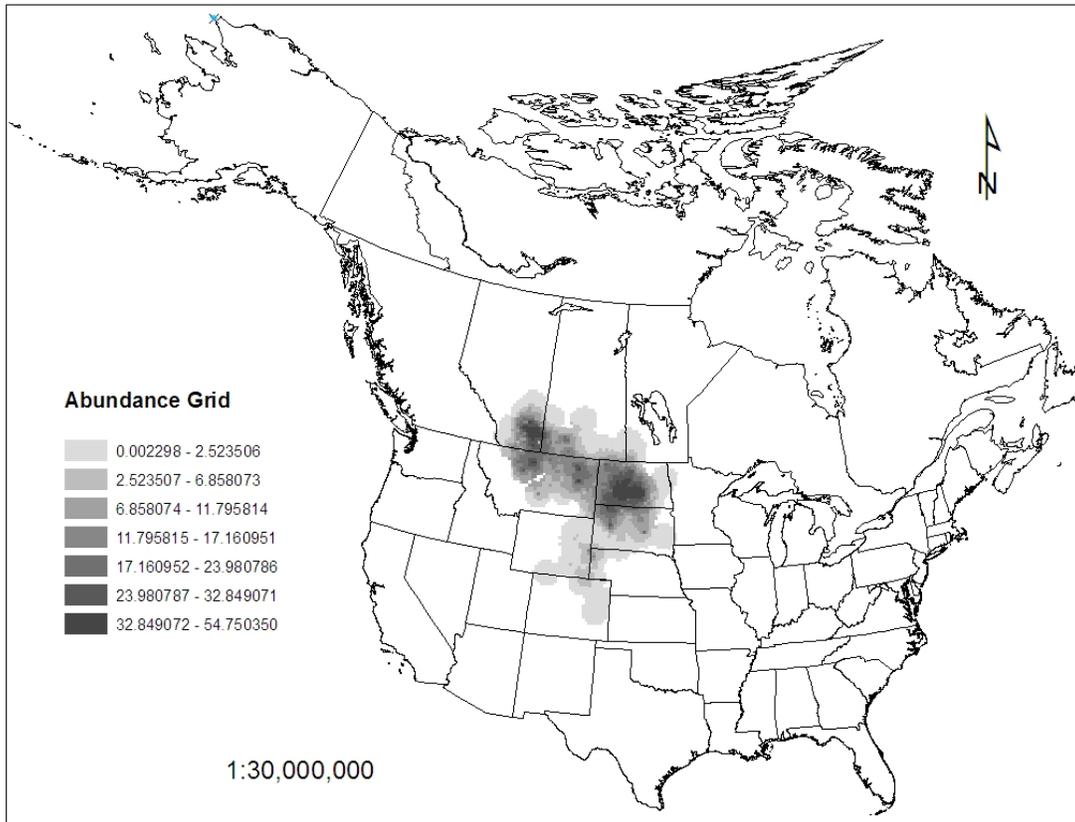


Figure 2. Summer distribution based on the number of birds/route of the Chestnut-collared Longspur from the North American Breeding Bird Survey (1994-2003; Sauer *et al.* 2008)

HABITAT

Habitat requirements

Breeding habitat

Vegetation structure

The Chestnut-collared Longspur is a native prairie grassland specialist, typically breeding in recently grazed or mowed, arid, short- or mixed-grass prairie (Hill and Gould 1997). Tall-grass prairie may also be used for breeding, but only if it is mowed or grazed (Wyckoff 1986). Usually the height of the vegetation in the grasslands preferred by the Chestnut-collared Longspur for nesting is less than 20-30 cm (Fairfield 1968, Owens and Myres 1973, Davis 2005; see Table 1). Chestnut-collared Longspurs also avoid grasslands with dense accumulations of litter (Renken 1983, Berkey *et al.* 1993, Hill and Gould 1997, Davis *et al.* 1999). In native prairie in Saskatchewan, areas with minimal litter depth and low sward densities are preferred.

While native pasture is preferred for nesting, Chestnut-collared Longspurs have been known to nest in pastures seeded to domesticated grasses (Lloyd and Martin 2005), mowed areas such as airstrips (Stewart 1975) or along fence lines (DuBois 1935, Fairfield 1968, Stewart 1975). The Chestnut-collared Longspur is associated with grass species such as needlegrass and crested wheatgrass (*Agropyron cristatum*) (Baldwin and Creighton 1972). Where the vegetation is of suitable height and density, small numbers of Chestnut-collared Longspurs may also occur in cultivated fields, fallow fields, stubble and dense, ungrazed areas, though usually these are avoided (Fairfield 1968, Owens and Myres 1973, Stewart 1975, Davis *et al.* 1999; Hill and Gould 1997).

Although open prairie is the favoured habitat and shrubby areas are largely avoided (Arnold and Higgins 1986), in some areas Chestnut-collared Longspurs may use scattered shrubs and forbs, such as the introduced Canada thistle (*Cirsium arvense*), as song perches (Harris 1944, Fairfield 1968, Creighton 1974, Creighton and Baldwin 1974).

Topography

The preferred topography for the Chestnut-collared Longspur is level to rolling uplands (mixed-grass and short-grass) as well as drier habitats within moist lowlands (DuBois 1935, Fairfield 1968, Owens and Myres 1973, Stewart 1975, Wiens and Dyer 1975, Kantrud and Kologiski 1982). In Saskatchewan, preferred areas are in flat lowlands (most of which have been converted to cropland) whereas the remaining native prairie is mostly in the hilly upland areas not suitable for cultivation (Roy 1996).

Moisture

The response of Chestnut-collared Longspurs to moisture varies depending on whether the habitat is mixed-grass or short-grass prairie. In moister, more thickly vegetated mixed-grass habitat, Chestnut-collared Longspurs avoid tall, dense vegetation, preferring sparser upland grasslands with more bare ground (Renken 1983, Renken and Dinsmore 1987, Berkey *et al.* 1993, Johnson and Schwartz 1993, Anstey *et al.* 1995). Conversely, within drier short-grass habitats, Chestnut-collared Longspurs prefer wetter, taller, and more densely vegetated areas (DuBois 1937, Strong 1971, Creighton 1974, Creighton and Baldwin 1974, Kantrud and Kologiski 1982, Wershler *et al.* 1991). Low, moist areas and wet-meadow zones around wetlands provide suitable habitat in these areas (DuBois 1937, Rand 1948, Giezentanner 1970, Stewart 1975).

Area and edge effects

The Chestnut-collared Longspur is an area sensitive species. In a recent study of area sensitivity in nine grassland songbirds, Chestnut-collared Longspurs were more common in pastures greater than 39 ha (Davis 2004). The ratio of edge to interior habitat rather than patch size *per se*, seemed to be important (Davis 2004). This is possibly because of the well-known effects of increased predation in patches with large amounts of edge. The implications of this finding are that even smaller patches of native prairie (<18 ha) with low amounts of edge could be important for the conservation of Chestnut-collared Longspurs.

Grazing

Originally, intense grazing by native herbivores (combined with fire) produced a heterogeneous, uneven sward, which provided suitable breeding habitat for Chestnut-collared Longspurs (Pylypec 1991, White and Koper 2008). Today Chestnut-collared Longspurs breed in native pastures grazed by cattle. Areas of grassland that are ungrazed (idled) do not provide suitable habitat for Chestnut-collared Longspurs (Dale 1984).

Appendix I provides a summary of habitat use by the Chestnut-collared Longspur (adapted from Dechant *et al.* 2003).

Migration habitat

Little information is available on habitat occupied during spring and fall migration, though native grasslands are preferred in central Kansas (Thompson and Ely 1992).

Winter habitat

During the winter Chestnut-collared Longspurs use grasslands, deserts and plateaus dominated by short grasses and forbs (< 0.5 m high – see Rait and Pimm 1976, Grzybowski 1982, Hill and Gould 1997). In contrast to their breeding areas in short-grass prairie their abundance is not closely tied to grazing in the winter range (Kelly *et al.* 2006). Cultivated fields are used in winter in Texas (Oberholser 1974). Flocks also gather around isolated water sources throughout the winter range (Heerman in Coues 1874).

Recent monitoring efforts suggest that Chestnut-collared Longspurs prefer native grassland over halophytic grassland on their wintering range in the Chihuahuan Desert in Mexico (Levandoski *et al.* 2008).

Habitat trends

Dramatic decreases have occurred in the extent of short- and mixed-grass prairie in both Canada and the United States, with most losses occurring 50-150 years ago (Stewart 1975). During the 1970s, ploughing of pastures for grain crops and urban development resulted in extensive destruction of native grassland habitat (Houston and Schmutz 1999). It is estimated that 72% to 99% of mixed-grass prairie was converted to cropland in North Dakota, Nebraska, Alberta, Saskatchewan and Manitoba over this time period (Samson and Knopf 1994). Approximately 60% of all rangeland in Canada has been replaced with cropland (Agriculture and Agri-food Canada 2001). Systematic monitoring of North American breeding grassland birds did not commence until 1968 in Canada and thus, the full impact of this massive habitat loss on Chestnut-collared Longspur populations is not known.

Habitat loss has continued with the removal of small remnants of native grassland (2 ha to a maximum of 64 ha) within the predominantly cultivated landscape matrix (Watmough and Schmoll 2007). In the Prairie Habitat Joint Venture (PHJV) area in Canada (the Prairie Pothole Region in the provinces of Manitoba, Saskatchewan and Alberta) natural grassland declined by 10% (2,479 ha) between 1985 and 2001 (Watmough and Schmoll 2007) based on a sampled area of 235,710 ha (0.41% of the total PHJV area). The remaining grassland patches may be too small for species persistence. Furthermore, fire suppression over large areas has resulted in denser vegetation cover and encroachment of woody shrub species, thus reducing available nesting habitat for longspurs and other grassland birds (Grant *et al.* 2004).

Habitat protection/ownership

Protected areas require active management such as grazing or prescribed burns or they will not provide optimal habitat for Chestnut-collared Longspurs. Thus simply increasing the number of areas protected, without active management, will not in itself secure the long-term future of the species.

Much of the range inhabited by the Chestnut-collared Longspur is within privately managed land. However, about half (23,606 km²) of the approximately 40,000 km² of native grassland remaining in Alberta is owned by the Crown. Within the Grassland Natural Region in Alberta, Crown Land covers 24% of the area, but holds 56% of the remaining native grasslands, most of which are leased for grazing or are community pastures. Only 2% of native grasslands in Alberta, however, have official protection. Examples of protected areas where Chestnut-collared Longspurs occur in Alberta include the Canadian Forces Base Suffield National Wildlife Area (458.7 km²), and Onefour Heritage Rangeland Natural Area (92 km²) (B. Dale, pers. comm.).

A variety of conservation areas in Saskatchewan offer protection for remaining Chestnut-collared Longspur grassland habitat, among them national and provincial parks, Migratory Bird Sanctuaries and National Wildlife Refuges, Ramsar sites, ecological reserves, Wildlife Habitat Protection Act lands and Prairie Farm

Rehabilitation Administration (PFRA) community pastures. These areas comprise just over 9.4% (22,636 km²) of the Prairie Ecozone in Saskatchewan (Gauthier *et al.* 2002). Examples of protected areas where Chestnut-collared Longspurs occur are Grasslands National Park, the Matador Grasslands Protected Area, “Old Man on His Back” Prairie and Heritage Conservation Area, and PFRA pastures such as Big Stick, Bitter Lake PFRA and pastures south of the Trans-Canada highway.

Over the last two decades in Manitoba, the Manitoba Habitat Heritage Corporation has entered into lease agreements with landowners who own land inhabited by species at risk (K. De Smet pers. comm.). To date, 103 grassland Conservation Agreements are held on private land protecting 10,455 ha of grassland habitat in perpetuity (M. Neumann pers. comm.). One federally protected site harbouring considerable numbers of Chestnut-collared Longspurs in west central Manitoba is a community pasture (Ellis-Archie community pasture); it is likely that the Shilo Military Range also may hold a few pairs.

BIOLOGY

Unless otherwise indicated, the information provided here has been summarized from Hill and Gould (1997).

Life cycle and reproduction

Chestnut-collared Longspurs are socially monogamous and pair bonds apparently form after males have established territories. Territories in southeast Alberta are approximately 1 ha in size (range 0.25-4 ha) while in Saskatchewan they are approximately 0.4-0.8 ha. In Alberta, all pairs are usually established by early to mid-May. At least four of eight pairs observed across years in Alberta bred together between years.

Females build the nest, which is lined with grasses and located on the ground in an excavated depression. They lay 3-5 eggs sometime between May and July (57 Nest Record files; Manitoba Avian Research Committee 2003). Incubation generally lasts 10-13 days, with all incubation done by the female, while the male acts as sentry driving predators away from the nest (Lynn and Wingfield 2003).

Females do 95% of the brooding and both parents feed the young. In Manitoba, nestlings occur between June and August (often in early June in the southwest) (Manitoba Avian Research Committee 2003). Young leave the nest after 10 days (range 9-14) and are fed by the male for a further 14 days. Immature birds remain in or near the natal territory until late in the breeding season when they begin to form flocks.

The species is double brooded and pairs will attempt as many as four clutches in a single breeding season after successive nest failures.

Information on annual reproductive success of females is available from Alberta and Manitoba (Table 1). In southeast Alberta females raise on average 1.3 broods per season. There is no information on age at first breeding or the proportion of birds breeding in any given year.

Table 1. Annual reproductive success in three Canadian populations of the Chestnut-collared Longspur (Hill and Gould 1997).

Annual reproductive success	Definition	Alberta (254 nests)	S-central Manitoba (8 nests)	SW Manitoba (57 nests)
Hatching success	Number nestlings hatched/eggs laid	77.1% (784/1017)	79.5% (35/44)	-----
Nestling success	Number fledglings produced/nestlings hatched	62.2% (488/784)	91.4% (32/35)	-----
Fledgling success	Number fledglings produced/eggs laid	48.0% (488/1017)	72.7% (32/44)	-----
Nest success	% nests fledging at least one young	55.9% (142/254)	-----	45% (26/57)
Young produced	Number young leaving successful nest	Mean 3.4, range 1-5	-----	Mean 3.5, range 3.4-4

Breeding densities

Chestnut-collared Longspur territories can be aggregated and so local breeding densities cannot be extrapolated over larger areas. In southeast Alberta, densities ranged in grazed habitat from 1.1-1.4 pairs/ha. At Matador in Saskatchewan densities ranged from 0.7-1.2 pairs/ha in grazed plots and 0.0-0.2 pairs/ha in ungrazed plots.

Survival and site fidelity

One male and one female banded as adults returned for three subsequent breeding seasons after first capture (Hill and Gould 1997). Of 30 males banded as adults, 67% returned to breed in the subsequent year, 5 of 18 males banded in a single year returned for two subsequent breeding seasons. Of 65 females banded as adults, 32.3% returned in a following year and 7 of 35 females banded in a single year returned for two subsequent years. It is not clear whether survivorship is lower for females, or whether they have lower site fidelity than males. These studies also provide some information on age span, suggesting that the species can live for at least four years. The generation time is likely 2 to 3 years.

Predation

Nest predation accounted for 97% and 72% of egg and nestling mortality, respectively, at Matador, Saskatchewan (Maher 1973), and for 89% of all nest failures in Alberta (O'Grady *et al.* 1996). In Alberta, 82% of all nest predation occurred during the nestling stage (n=38). Predation on incubating females is low (5.3% mortalities). Suspected nest predators include small mammals such as weasels and ground squirrels, snakes and the American Crow (*Corvus brachyrhynchos*). Larger mammals such as coyotes (*Canis latrans*) and the red fox (*Vulpes vulpes*) and birds of prey are suspected predators of fledgling birds and adults.

Dispersal/migration

Birds begin flocking in mid-July to mid-August; juveniles flock first, followed by adults (Harris 1944). The departure dates for fall migration are between September and October, but vary depending on geographic location. Birds breeding in Canada generally depart the breeding areas from mid- to late September (Maher 1973, Salt and Salt 1976, Janssen 1987, Cleveland *et al.* 1988). Chestnut-collared Longspurs arrive in the wintering areas from October to December, with peak numbers occurring from mid-October to early November (Hill and Gould 1997). In late February or March, Chestnut-collared Longspurs leave their wintering areas and arrive on the breeding grounds between April and May (Maher 1973, Cleveland *et al.* 1988, Semenchuk 1992).

Interspecific interactions

Chestnut-collared Longspur nests are parasitized by Brown-headed Cowbirds (*Molothrus ater*), but rates of parasitism and egg depredation by cowbirds are low (Hill and Gould 1997, Lynn and Hayward 2003).

Chestnut-collared Longspurs (individuals and pairs) have been observed mobbing Northern Harriers (*Circus cyaneus*), Loggerhead Shrikes (*Lanius ludovicianus*), and Burrowing Owls (*Athene cunicularia*) near their nests.

Adaptability

Chestnut-collared Longspurs appear to tolerate some human disturbance in the nest area. Hill and Gould (1997) suggest that if an observer leaves the area within five minutes, Chestnut-collared Longspurs typically will not desert the nest.

Chestnut-collared Longspurs are less likely, however, to be observed along roads when foraging (Sutter *et al.* 2000) and near oil and gas wells (Linnen 2008), which may be because of vehicle disturbance and traffic noise levels. This sensitivity to human disturbance effectively renders large areas of remaining grassland unsuitable for Chestnut-collared Longspurs (B. Dale, pers. comm.).

POPULATION SIZES AND TRENDS

Search effort

Three main survey methods are used to collect population size and trend information for the Chestnut-collared Longspur. Each of these methods is described below, with a brief discussion of its limitations in monitoring Chestnut-collared Longspur populations.

Breeding Bird Surveys (BBS)

The Breeding Bird Survey is an annual roadside survey conducted in mid-June since 1966 throughout Canada and the United States. Volunteers travel randomly selected roadside routes, recording all birds seen or heard at listening stations at intervals along the route (Sauer *et al.* 2008). Although the BBS covers the range of the Chestnut-collared Longspur in Canada, detection rates are relatively low because Chestnut-collared Longspurs are less likely to be detected near roads (Sutter *et al.* 2000). Additionally, few routes occur in native grassland and more than 80% of the grasslands that do occur along BBS routes are fragmented. Despite these limitations, analyses over a large spatial area have the advantage of a relatively high number of routes, so more confidence can be placed in these trend estimates.

Grassland Bird Monitoring (GBM)

The Grassland Bird Monitoring program was initiated in 1996 to better sample grassland species in Canada (Dale *et al.* 2005). Methodology is identical to that of the BBS, with the following two exceptions: 1) GBM routes were placed only within the 19 lat/long degree blocks where grassland birds and remaining grassland habitats are most concentrated, whereas BBS samples all degree blocks; and 2) the nearest passable road to the randomly selected survey location was used for the route, rather than the nearest secondary or better road used in the BBS. The GBM surveys may be more effective than the BBS in detecting species such as Chestnut-collared Longspurs because routes are away from larger roads and they also sample the birds in the degree blocks with the most high quality habitat.

The best trend information, however, comes from analyses that combine BBS and GBM routes. This is because the combined analysis has a larger sample size than the individual BBS and GBM analyses and because it combines surveys from routes in both high and low quality habitat (P. Blancher, pers. comm.).

Christmas Bird Count (CBC)

The Christmas Bird Count is an annual survey conducted in Canada, the United States and northern Mexico. Volunteers count all bird species heard or seen within a 24 km diameter circle on a pre-selected day between 14 December and 5 January (National Audubon Society 2009). CBC data provide information on the global population of the Chestnut-collared Longspur on wintering grounds in the United States.

Abundance

Based on calculations from the 1990s from the BBS (Blancher *et al.* 2007), the North American population of the Chestnut-collared Longspur was estimated at 5,600,000 birds and the Canadian population at approximately 1,350,000 birds, or 24% of the North American population (Blancher *et al.* 2007). Given declines since that time, the population size is below this estimate; current estimates based on BBS data from 1998-2007 give population sizes about 50% lower, at roughly 2.7 million for North America, with 22% in Canada (roughly 600,000; P. Blancher, pers. comm.).

Fluctuations and trends

Breeding Bird Surveys

Long-term BBS data from Bird Conservation Region 11, which includes all of the species range in Canada, show an annual rate of decline of 5.7%/ year ($n = 65$ routes, 95% CI: -11.6, 0.60, $0.05 < P < 0.10$) between 1968 and 2008 (Figure 3). At this rate, the population could have decreased by approximately 90% since the late 1960s. Data from the most recent 12 year period (1996–2008; selected to match moisture conditions, which can affect bird numbers, at the beginning and end of the trend series), show a non-significant decline of 9.5%/year ($n = 36$ routes, 95% CI: -19.8, 2.1). Using the 12 year rate of decline, the population could have decreased by 63% over the last 10 years or approximately three generations.

The BBS-wide data, which come from routes across the entire range of the species in both Canada and the U.S., show a significant annual rate of decline of 5.75%/year ($n = 103$ routes, $P = 0.002$) between 1996 and 2007. At this rate, the population will have decreased by 45% over the last 10 years.

Grassland Bird Monitoring

Data from GBM surveys, which are conducted in lat/long degree blocks with most remaining native grassland habitat, show a non-significant annual rate of increase of 4.5%/year ($n = 10$ routes, 95% CI: -62.9, 194.9) between 1996 and 2008 (B. Collins, pers. comm.).

An analysis combining BBS and GBM routes shows a non-significant annual rate of decline of 8.5%/year ($n = 42$ routes, 95% CI: -19.0, 3.5) between 1996 and 2008 (Figure 4). At this 12 year rate of decline, the population could have decreased by 59% over 10 years or approximately three generations. Given the imprecision of the estimate of population change, the trend values and the variance of those trends (SE 6.3%), were used to calculate the probability that the observed decline was at least 30% or at least 50% over a 10 year period. The results of these calculations indicated that there was an 81% chance that the decline was at least 30% or more and a 62% chance that the decline was at least 50% or more.

Christmas Bird Count

Long-term data from the CBC show a significant annual rate of decline for Chestnut-collared Longspurs of 6.2%/year ($n=147$, 95% CI: -10.8, -1.6; G. Butcher, National Audubon Society, pers. comm.) between 1967 and 2008 (Figure 5). At this rate of decline, the population will have decreased by 93% during this period. During the latest 10-year period (1995-2005), the rate of decline was 4.3%/year, or a population decline of 35% during the decade.

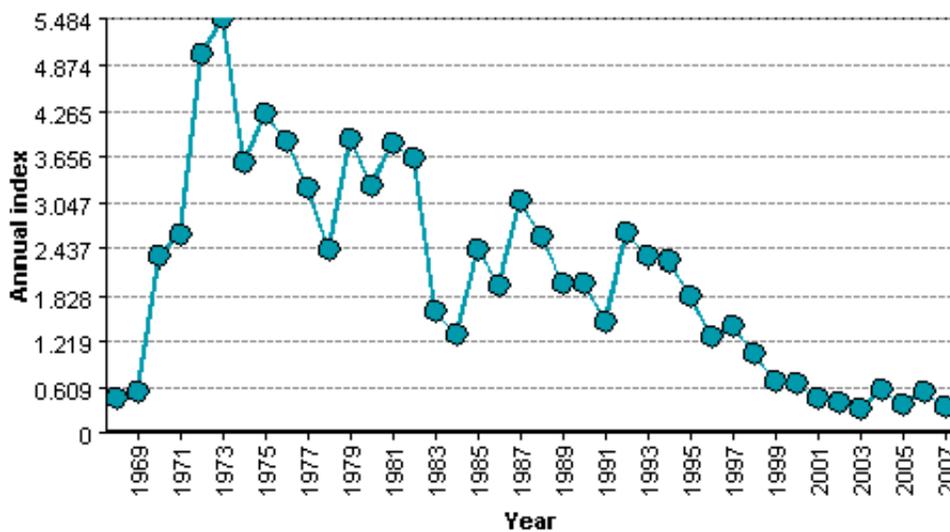


Figure 3. Annual indices (adjusted mean number of birds/route) of relative abundance based on Breeding Bird Surveys for the Chestnut-collared Longspur in Canada in Bird Conservation Region 11 (Downes and Collins 2008) between 1968 and 2007.

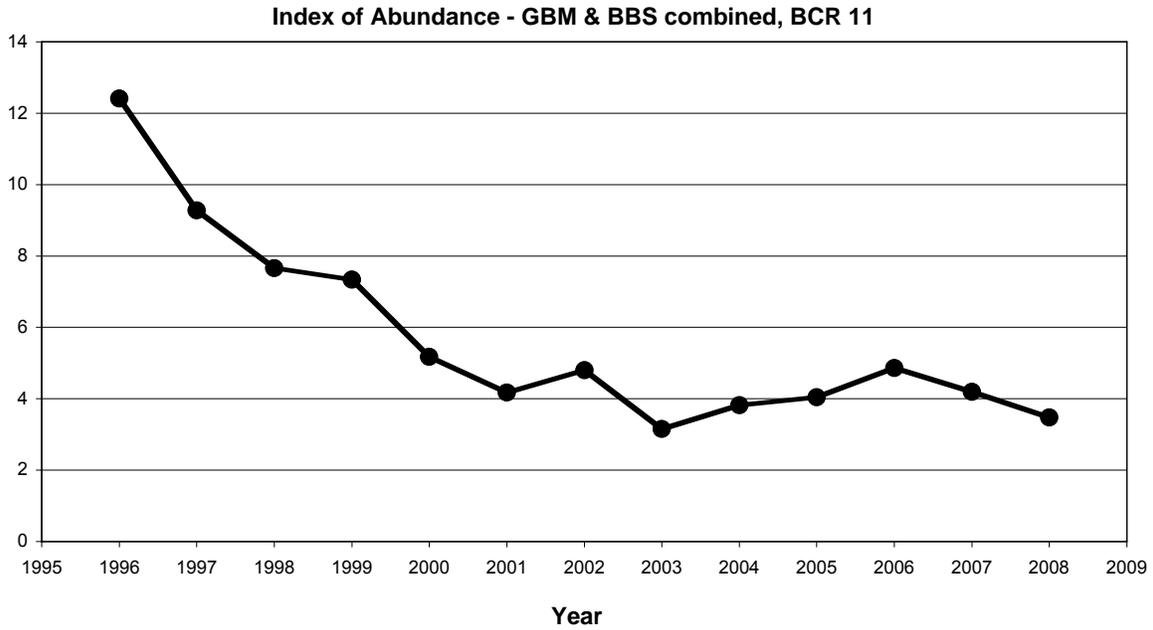


Figure 4. Annual indices (adjusted mean number of birds/route) of relative abundance based on Breeding Bird Surveys for the Chestnut-collared Longspur in Canada in Bird Conservation Region 11 (Brian Collins pers. comm.) between 1996 and 2008.

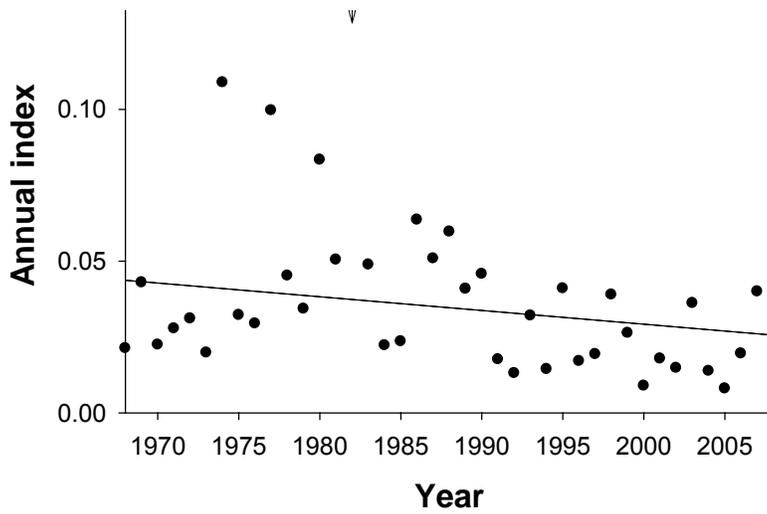


Figure 5. Number of birds/party hour from the North American Christmas Bird Count between 1967 and 2008 (National Audubon Society 2008).

Summary

In summary, long-term analyses using data from the Breeding Bird Survey (1968-2008) and Christmas Bird Counts (1967-2008) show severe population losses for this species over the long-term. Over the last 10 years, with the exception of the Grassland Bird Monitoring Program, the results from several surveys show population losses ranging from 35% to 63%. This, in addition to the probability of declines associated with the combined BBS/GBM analyses (see above), suggest that population losses for this species over the last decade are at least 30% or more.

Rescue effect

Long-term data from the BBS show that Chestnut-collared Longspurs in the U.S., a potential source of rescue for this species in Canada, have declined at a rate of 2.5%/year ($n = 106$ routes, $P = 0.02$) between 1966 and 2007, which amounts to a loss of 65% of the population over this period, and at a rate of 5.6%/year ($n = 69$ routes, $P = 0.001$) between 1996 and 2007, which amounts to a loss of 44% over 10 years. Although rescue from the U.S. is possible, the probability of it occurring is likely reduced given the significant ongoing declines shown in that portion of the range.

LIMITING FACTORS AND THREATS

Habitat loss and degradation

The main threat to Chestnut-collared Longspur populations has been grassland habitat loss and degradation. Grasslands have been converted to croplands as well as urban and industrial developments. The remaining grasslands may be simply too small because the species is area sensitive and because these patches are susceptible to invasion by woody scrub, exotic plant species, and soil erosion (Madden *et al.* 1999, Grant *et al.* 2004, Brennan and Kuvlesky 2005). Additionally, the increasing density of roads, oil and gas wells, and other anthropogenic features in the landscape to which the species may be sensitive, combined with the fact that many of the remaining grassland patches are idle, has also reduced the suitability of remaining grassland.

Agricultural practices

Agricultural practices such as mowing, haying and tillage may affect Chestnut-collared Longspur occupancy (Dale *et al.* 1997, Martin and Forsyth 2003). For example, hayfields cut every three years were not used by longspurs in south central Saskatchewan, but those fields mowed annually were used (Dale *et al.* 1997). In Martin and Forsyth's (2003) study, Chestnut-collared Longspurs occurred predominantly in minimum till summer fallow and spring cereal habitat and showed almost no productivity in conventionally managed plots.

Grazing densities may also affect longspur numbers. In short-grass prairie, overgrazing (i.e., where grazing increases the amount of bare ground exposed) is associated with reduced numbers of Chestnut-collared Longspur (Hill and Gould 1997). In mixed-grass prairie, however, Davis *et al.* (1999) found no difference in Chestnut-collared Longspur numbers between native pastures that were lightly, moderately or heavily grazed.

Increased demand for ethanol could exacerbate conversion of grasslands, including Permanent Cover Program (PCP) lands in Canada.

Agricultural pesticides may also threaten Chestnut-collared Longspurs. Martin *et al.* (1998) found that hatching success was reduced from 87% to 67% when the birds were exposed to pyrethroid insecticides used to control grasshoppers (Decis 5FTM containing xylene and deltamethrin). In another study, total arthropod biomass fed to nestlings, nestling weight and size, rate of prey delivery, clutch size and egg and nestling success were unaffected by spraying with Decis 5FTM (Martin *et al.* 2000); however, adults foraged twice as far from their nests in sprayed plots as they did in control plots, two weeks after spraying. This could affect adult survival or nestling growth rates and therefore affect productivity in the species. Nestlings exposed to another insecticide, Furadan 480FTM (carbofuran as the active ingredient), showed signs of poisoning, and one case of insecticide-induced mortality was detected. However, nest success in sprayed plots was higher than in control plots (Martin *et al.* 2000) suggesting that factors other than pesticide use must have played a role.

Natural weather patterns and effects of human-induced climate change

Dry and wet cycles in the prairies are part of the natural cycle of weather. However, human-induced climate change could affect the periodicity of these cycles or their temporal and spatial patterns of occurrence. Historically, Chestnut-collared Longspurs may have always found suitable habitat despite wet and dry cycles in prairie grasslands. They may have moved locally to find such suitable habitat; however, previously there was always alternative suitable habitat that could be occupied. Now, their alternative options are likely reduced and the cumulative effect of other threats means that habitat of the appropriate size, quality and configuration may not be available if the birds have to abandon currently used habitat during a drought or other such event.

Parts of the Great Plains are currently (mid- to late-2000s) experiencing a drought period, although some areas have experienced wetter conditions than usual. For example, in Manitoba, increased moisture levels in the 1990s may have allowed vegetation to grow too dense at some sites for Chestnut-collared Longspurs. Since 1993, wet summers may have forced the species to retract into drier parts of its range (K. De. Smet, pers. comm.). Moreover, Conservation Reserve Program (CRP) fields in four states had low Chestnut-collared Longspur numbers during the wet years of 1995-1996 (Johnson 2005, see also Niemuth *et al.* 2008).

Oil/gas development

Chestnut-collared Longspurs appear to be sensitive to oil and gas developments. Recent research suggests that longspurs do not use habitat near minimal disturbance shallow gas well developments and are not detected within 100 m of traditional oil developments (Linnen 2008). Additional work also shows a weak positive relationship between Chestnut-collared Longspur abundance and distance to gas wells (S. Davis, pers. comm.). Increased human activity and vehicle traffic, changes in vegetation structure, and/or noise may be disturbing the birds at these developments.

Wind energy

One study found lower densities of grasslands birds nesting within 80 m of wind turbines compared to areas without wind turbines or areas more than 180 m away from wind turbines (Leddy *et al.* 1999). The noise and movement of the wind turbines, as well as increased human activity, were suggested as possible reasons for these results.

SPECIAL SIGNIFICANCE OF THE SPECIES

The Chestnut-collared Longspur may have once been one of the most common grassland birds on flat level plains of the Great Plains of Canada and the United States.

Males in breeding plumage are one of the most striking songbirds in the Canadian prairies and thus a symbol of native grassland for the Canadian public. There is apparently little Aboriginal Traditional Knowledge documented in the literature for this species. Elders from the Blackfoot First Nation (Nitsitapii) called the Chestnut-collared Longspur *Aapinakoisisttsii* (little morning bird; see Hill and Gould 1997). However, some sources suggest that this is the name for Snow Bunting (*Plectrophenax nivalis*) and that the Chestnut-collared Longspur is called *Iskiokae* (black breast; D. Hill, pers. comm.).

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

Chestnut-collared Longspurs (and their nests) are protected under the *Migratory Birds Convention Act* 1994. The species is not listed under the *US Endangered Species Act*, or the Convention on International Trade in Endangered Species of Wildlife Fauna and Flora (CITES). The Chestnut-collared Longspur was listed in 2008 as Near Threatened by the IUCN because of a moderately rapid population decline (BirdLife International 2008).

NatureServe lists the Chestnut-collared Longspur as “secure” globally, and “secure” in both the United States and Canada. In Canada, the species is ranked as “secure” in Alberta and Saskatchewan, but “imperiled to vulnerable” (S2S3) in Manitoba. No rank is available for the adjacent state of North Dakota, but Chestnut-collared Longspurs in Montana are ranked as “vulnerable”.

The Chestnut-collared Longspur is a continental stewardship species in the Prairies and Potholes and Badlands and Prairies Bird Conservation Regions (BCRs). Chestnut-collared Longspur is also listed as of regional concern in all BCRs where it occurs during the breeding season – Northern Rockies, Prairies and Potholes, Badlands and Prairies and Shortgrass Prairie (RMBO 2009). Moreover, it is currently listed by Partners in Flight and the US Fish and Wildlife Service as a priority species in its wintering areas in BCRs 34 and 35.

TECHNICAL SUMMARY

Chestnut-collared Longspur
Calcarius ornatus

Bruant à ventre noir

Range of Occurrence in Canada : AB, SK, MB

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines(2008) is being used)	Likely 2-3 Yrs
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Yes
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations]. 59% decline over 10 years, based on combined survey analysis from the Breeding Bird Survey and Grassland Bird Monitoring program. The trend estimate from this analysis is relatively imprecise, but analyses suggest there is a high probability that the decline is more than 30% over the last 10 years. This is supported by declines from other surveys that range from 35% to 63% over the same period.	59% reduction (see notes)
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Unknown
Are the causes of the decline clearly reversible and understood and ceased?	Mostly not reversible, generally understood and not ceased
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence	292,000 km ²
Index of area of occupancy (IAO)	> 2000 km ²
Is the total population severely fragmented?	No
Number of "locations*"	N/A
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	No - Stable
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	Yes
Is there an [observed, inferred, or projected] continuing decline in number of populations?	N/A
Is there an [observed, inferred, or projected] continuing decline in number of locations?	N/A
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat?	Yes - Decline in extent and quality of native grassland

* See definition of location.

Are there extreme fluctuations in number of populations?	N/A
Are there extreme fluctuations in number of locations*?	N/A
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each population)

Population	N Mature Individuals
Total:	600,000

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Not done
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Threats (actual or imminent, to populations or habitats)

<ul style="list-style-type: none"> - Conversion of native prairie to cropland or urbanization - Fragmentation of native grassland from roads and energy sector development - Idling of pastureland - Disturbance from energy sector developments
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Rescue Effect (immigration from outside Canada)

Status of outside population(s)? Decline over much of U.S. range	
Is immigration known or possible?	Possible
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Apparently, but may not be optimal quality and largely fragmented
Is rescue from outside populations likely?	Possible, but the species is declining in its US range

Current Status

COSEWIC: Threatened (November 2009)

Status and Reasons for Designation

Status: Threatened	Alpha-numeric code: A2b
<p>Reasons for designation: This species is a native prairie grassland specialist that occurs in Alberta, Saskatchewan and Manitoba. The species has suffered severe population declines since the late 1960s and the results of several surveys suggest that the declines have continued over the last decades, albeit at a slower rate. The species is threatened by habitat loss and fragmentation from road development associated with the energy sector.</p>	

* See definition of location.

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Meets Threatened A2b because there is a high probability that the population has declined by more than 30% over the last three generations based on an appropriate index of abundance (b).
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. Does not meet criterion, range exceeds thresholds.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. Does not meet criterion, population size exceeds thresholds.
Criterion D (Very Small Population or Restricted Distribution): Not applicable. Does not meet criterion, both population and distribution exceed thresholds.
Criterion E (Quantitative Analysis): None conducted.

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BIOGRAPHICAL SUMMARY OF REPORT WRITERS

Born in the United Kingdom, Dr. David Anthony Kirk has been working for almost 20 years with the federal and provincial governments of Canada as well as non-government organizations (e.g., Bird Studies Canada, World Wildlife Fund and the Yellowstone to Yukon Conservation Initiative). He has a wide range of ecological and land use experience in different ecosystems from tropical to boreal. His company (Aquila Conservation & Environment Consulting) specializes in the use of multi-species and single species distribution models for use in conservation planning (integrating human resource use and biodiversity conservation), as well as literature reviews and objective analysis of a variety of human disturbance influences on biodiversity in anthropogenic landscapes. David is particularly interested in the spatial mapping of biodiversity and also works extensively on the status, recovery and management of species at risk. He has written or co-authored 19 COSEWIC status reports and updates, as well as 8 recovery plans, 2 action plans and a management plan for species at risk. Aquila's emphasis is on peer-reviewed scientific articles in ecological and conservation journals as a forum for changing policy and management practices and David has co-authored 27+ papers in peer-reviewed scientific journals in the last 17 years.

Dr Jennie L. Pearce was born in Australia and immigrated to Canada in 1999. In both countries her research has focused on spatial modelling of the distribution and abundance of biodiversity; her PhD was on the endangered Helmeted Honeyeater *Lichenostomus melanops cassidix*. She is particularly interested in testing the accuracy of spatial models and how these can be used for solving landscape management concerns, such as conservation of endangered species, managing forests in an ecologically sustainable framework and allocating resource extraction industries over landscapes. She is also interested in the use of bio-indicators for sustainable forest management, particularly for birds, large and small mammals, amphibians, carabid beetle and spider communities. She has published more than 35 scientific papers in this area, as well as participated in numerous workshops and conference proceedings.

Together, David and Jennie have co-authored three previous COSEWIC reports as well as a paper on priority areas for birds in the Yellowstone to Yukon Region.

COLLECTIONS EXAMINED

No collections were examined during the preparation of this report.

Appendix 1. Summary of habitat used by Chestnut-collared Longspurs (taken from Dechant *et al.* 2003)

Author(s)	Location(s)	Habitat(s) Studied*	Species-specific Habitat Characteristics
Anstey <i>et al.</i> 1995	Saskatchewan	Cropland, mixed-grass pasture, tame hayland, tame pasture	Used open areas of low cover and low litter; preferred grazed native prairie
Creighton 1974, Creighton and Baldwin 1974	Colorado	Mixed-grass pasture, shortgrass pasture	Used areas with mix of mid-grasses, shortgrasses, sedges, and shrubs; average vegetation measurements were 15 cm vegetation height, 300 plants/m ² , and percent cover as follows: 45% shortgrass, 22% mid-grass, 11% sedge (<i>Carex</i> spp.), 6% forb, 2% cactus (<i>Opuntia</i> spp.), 0.2% shrub, 12% bare ground, 0.5% rock
Dale 1983, 1984	Saskatchewan	Idle mixed-grass, mixed-grass pasture	Used open, level grasslands with little residual cover; used areas with lower forb height, litter cover, dead cover, vertical density, dwarf shrub cover, distance to forb, and grass cover, and higher bare ground cover, than unoccupied areas; mean vegetation values for used areas were: 2.9 cm forb height, 83.3% litter cover, 78.1% dead cover, 4.2 contacts (vertical density), 3.1% dwarfshrub cover, 38.5% grass cover, and 11.5% bare ground cover; occurred only on grazed plots
Davis <i>et al.</i> 1999	Saskatchewan	Aspen parkland, cropland, mixed-grass pasture, tame hayland, tame pasture	Occurred as frequently in native pasture as in tame pasture but more frequently in pasture than in hayland or cropland; occurred more frequently in mixed grassland, followed by moist-mixed grassland, aspen parkland, and cypress upland; grazing did not affect occurrence of Chestnut-collared Longspurs on native pasture; occurrence on native pastures was positively associated with mixed grassland and negatively associated with litter depth and density of narrow-leaved grasses <10 cm tall
Davis and Duncan 1999	Saskatchewan	Mixed-grass pasture, tame pasture	Preferred native pasture to tame pasture; abundance was positively associated with Junegrass (<i>Koeleria pyramidata</i>) and clubmoss (<i>Selaginella densa</i>)
DuBois 1935, 1937	Montana	Cropland, idle shortgrass, short grass pasture	Used moist, low areas with taller, thicker grasses compared with surrounding shortgrass habitat
Faanes 1983	North Dakota	Idle mixed-grass, mixed-grass pasture, woodland	Used moderately to heavily grazed upland native prairie, avoided wooded vegetation
Fairfield 1968	Saskatchewan	Idle mixed-grass	Nested in uncultivated grasslands, particularly moderately dense, short (<20-30 cm), ungrazed fields; used flat or gently sloping prairie; more abundant on overgrazed pasture than on a lightly grazed adjacent pasture with taller grass
Giezentanner 1970	Colorado	Idle, cropland, hayland, shortgrass pasture	Were most common in low areas with denser, taller grass; nested on short to mid-grass pasture with low forb and shrub density, with light to moderate summer grazing (removal of 20-40% of the annual plant growth)

Author(s)	Location(s)	Habitat(s) Studied*	Species-specific Habitat Characteristics
Harris 1944	Manitoba	Pasture	Nested in light to moderately dense grass; nested on the ground, often in short, sparse cover, sometimes among scattered shrubs
Huber and Steuter 1984	South Dakota	Burned mixed-grass pasture, mixed-grass pasture	Preferred short, open habitat during the first month after burning, and decreased as vegetation recovered; avoided unburned area
Johnson and Schwartz 1993	Minnesota, Montana, North Dakota, South Dakota	CRP (idle seeded-native, idle tame), cropland	Preferred bare, sparse cover; densities were highest in already established grass, intermediate in wildlife habitat and introduced grasses and legumes, and lowest in native grasses; abundance was negatively associated with legumes
Kantrud 1981	North Dakota	Mixed-grass hayland, mixed-grass pasture	Preferred heavily grazed areas, followed by moderately grazed, lightly grazed, and hayland
Kantrud and Kologiski 1982, 1983	Colorado, Montana, Nebraska, North Dakota, South Dakota, Wyoming	Mixed-grass pasture, shortgrass pasture, shrubsteppe	Preferred heavily grazed areas with typic soils, moderately grazed areas with aridic boroll soils, and lightly grazed areas with aridic ustoll soils; vegetation heights in these areas ranged from 17 to 23 cm, with 8-15% bare ground
Maher 1973	Saskatchewan	Burned mixed-grass, idle mixed-grass, mixed-grass hayland, mixed-grass pasture	Strongly preferred grazed prairie to ungrazed prairie; high densities were present in burned prairie 2 yr postburn
Martin and Forsyth 2003	Alberta	Cropland, idle	Preferred and had higher productivity in minimum-till fields than in conventional-till fields
McMaster and Davis 1998	Alberta, Manitoba, Saskatchewan	Cropland, Permanent Cover Program (PCP; idle tame, tame hayland, tame pasture)	Were more common in PCP than in cropland; frequency of occurrence was higher in grazed PCP than in hayed PCP
Messmer 1990	North Dakota	Idle mixed-grass/tame, mixed-grass/tame hayland, mixed-grass/tame pasture, wet-meadow pasture	Highest densities were on pastures grazed with twice-over rotation system; densities decreased with vegetation regrowth on season-long and short-duration grazed pastures
Owens and Myres 1973	Alberta	Cropland, idle mixed-grass, mixed-grass hayland, mixed-grass pasture	Preferred grazed areas; mowing and grazing were both beneficial; avoided plowed, fallow, seeded, cultivated, and idle lands
Rand 1948	Alberta	Cropland, idle shortgrass, shortgrass pasture	Were common in open plains, in grassy areas near irrigation ditches, and on sagebrush (<i>Artemisia</i>) flats
Renken 1983, Renken and Dinsmore 1987	North Dakota	DNC (idle tame), idle mixed-grass, mixed-grass pasture	Exclusively used grazed areas with sparser vegetation, more bare ground, and less litter than unused areas; mean vegetation values for used areas were: 53.9% grass cover, 17.7% forb cover, 97.1% litter cover, 0% shrub cover, 1.3% bare ground, 6 cm effective height, 1.5 cm litter depth

Author(s)	Location(s)	Habitat(s) Studied*	Species-specific Habitat Characteristics
Schneider 1998	North Dakota	Mixed-grass pasture, tame pasture, wet-meadow pasture	Abundance was positively associated with percent clubmoss cover, percent bare ground, and plant communities dominated solely by native grass (<i>Stipa</i> , <i>Bouteloua</i> , <i>Koeleria</i> , and <i>Schizachyrium</i>); abundance was negatively associated with percent grass cover, visual obstruction (vegetation height/density), vegetation density, litter depth, density of low-growing shrubs (western snowberry [<i>Symphoricarpos occidentalis</i>] and silverberry [<i>Elaeagnus commutata</i>]), plant communities dominated by Kentucky bluegrass (<i>Poa pratensis</i>) and native grass, and plant communities dominated by shrubs and introduced grass (smooth brome [<i>Bromus inermis</i>], Kentucky bluegrass, and quackgrass [<i>Agropyron repens</i>]); strongest vegetational predictors of the presence of Chestnut-collared Longspur were increasing grass cover, increasing bare ground, decreasing litter depth, and decreasing cover of low-growing shrubs
Smith and Smith 1966	Saskatchewan	Mixed-grass pasture	Of 38 nests, all but one were well concealed in grasses, rose (<i>Rosa</i>), sage (<i>Artemisia</i>), or western snowberry; remaining nest was situated in sparse grass 10.2 cm tall
Stewart 1975	North Dakota	Cropland, idle mixed-grass, idle shortgrass, mixed-grass hayland, shortgrass hayland, tame hayland	Preferred grazed or hayed mixed-grass prairie; also used shortgrass prairie, grazed, brackish wet-meadow zones, mowed hayland, and heavily grazed pastures; occasionally used stubble fields or fallow fields
Strong 1971	Colorado	Idle, shortgrass pasture	Nested in lightly to moderately grazed grassland; used lower, wetter areas with taller, denser vegetation than surrounding shortgrass pasture
Sutter and Brigham 1998	Saskatchewan	Mixed-grass pasture, tame pasture	No significant difference in abundance was found between lightly grazed mixed-grass prairie and lightly grazed stands of crested wheatgrass (<i>Agropyron cristatum</i>)
Sutter <i>et al.</i> 2000	Saskatchewan	Mixed-grass pasture	Abundance in mixed-grass prairie 53% lower along roadsides than along trailsides
Wershler <i>et al.</i> 1991	Alberta	Cropland, idle mixed-grass, idle tame, mixed-grass pasture, parkland, wet meadow	Used moderate to heavily grazed mixed-grass