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Status of the Chestnut-collared Longspur (*Calcarius ornatus*) in Alberta

Alberta Wildlife Status Report No. 67

Alberta Conservation Association

Alberta Government

Status of the Chestnut-collared Longspur (*Calcarius ornatus*) in Alberta

Prepared for:
Alberta Environment and Sustainable Resource Development (ESRD)
Alberta Conservation Association (ACA)

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PREFACE

Every five years, Alberta Environment and Sustainable Resource Development reviews the general status of wildlife species in Alberta. These overviews, which have been conducted in 1991 (*The Status of Alberta Wildlife*), 1996 (*The Status of Alberta Wildlife*), 2000 (*The General Status of Alberta Wild Species 2000*), 2005 (*The General Status of Alberta Wild Species 2005*), and 2010 (*The General Status of Alberta Wild Species 2010*), assign individual species "ranks" that reflect the perceived level of risk to populations that occur in the province. Such designations are determined from extensive consultations with professional and amateur biologists, and from a variety of readily available sources of population data. A key objective of these reviews is to identify species that may be considered for more detailed status determinations.

The Alberta Wildlife Status Report Series is an extension of the general status exercise, and provides comprehensive current summaries of the biological status of selected wildlife species in Alberta. Priority is given to species that are *At Risk* or *May Be At Risk* in the province, that are of uncertain status (*Undetermined*), or that are considered to be at risk at a national level by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Reports in this series are published and distributed by Alberta Conservation Association and Alberta Environment and Sustainable Resource Development. They are intended to provide detailed and up-to-date information that will be useful to resource professionals for managing populations of species and their habitats in the province. The reports are also designed to provide current information that will assist Alberta's Endangered Species Conservation Committee in identifying species that may be formally designated as *Endangered* or *Threatened* under Alberta's *Wildlife Act*. To achieve these goals, the reports have been authored and/or reviewed by individuals with unique local expertise in the biology and management of each species.

EXECUTIVE SUMMARY

The chestnut-collared longspur (*Calcarius ornatus*) is a small, ground-nesting passerine, named after its elongated claw (spur) of the hind toe. Breeding males have black underparts, a chestnut nape and yellow throat, a black cap with white eyebrow, mottled brown upperparts, and white outer- and under-tail feathers. Breeding females may show a chestnut nape and are mottled brown all over, blending into the surrounding prairie landscape. The chestnut-collared longspur is distinguished from other longspurs in Alberta by its small size, the white outer- and under-tail feathers, and black triangular patch in the centre of the tail; furthermore, the males perform their aerial display lower to the ground.

A prairie specialist, this species is native to the shortgrass and mixedgrass prairies throughout Canada and the United States. They breed from southern Alberta, Saskatchewan and Manitoba in the Canadian prairies, south through the northern prairies of Montana, North and South Dakota, east to Minnesota and south to Wyoming and northern Colorado. Winter habitat is located in the southern United States from Colorado and Kansas to Texas and northern Mexico.

Breeding populations in Alberta are concentrated within the Grassland Natural Region of the province, mainly throughout the Dry Mixedgrass and Mixedgrass subregions. Generally, the chestnut-collared longspur occurs west to Lethbridge and Calgary, north to the southern portion of the Parkland Natural Region, east to Saskatchewan and south to the United States border. Suitable habitat for this species includes open, scarcely vegetated grasslands and mostly grazed native pastures.

Chestnut-collared longspurs in Alberta are considered fairly common. However, their general status within this province was re-evaluated in 2010 from *Secure* to *Sensitive*. The regional trend analysis tool, available on the North American Breeding Bird Survey (BBS) website, identified a decline of 4.99% per year (2002–2012) in Alberta for this species. This is equivalent to a decline of 40.1% over that 10-year period. The same survey identifies the decline of this species in Alberta at 7.64% per year over the last 44 years (1968–2012). In 2009, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) classified this species nationally as *Threatened*, because of a decline in its population within Canada over the last decade. BBS data show that throughout their global range over the last decade (2002–2012) their population numbers are declining at 2.64% per year.

This species is known to be tolerant of some human disturbance on the landscape, such as well-managed cattle grazing that mimics the historical habitat conditions favoured by chestnut-collared longspurs. In Alberta, the major threats to this species are degradation and loss of native prairie grassland through landscape conversion to cropland or urban development, and changes to the landscape associated with the energy sector (for example, roads and pipelines that fragment the landscape and allow or accelerate invasion of non-native plants). Additional potential threats include pesticide applications for control of pest insect species, range management practices, predation, winter habitat conditions, parasites and disease, and migration challenges.

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Thanks also to Nicole Firlotte (Manitoba Conservation Data Centre) for information on the species in Manitoba, and Francois Blouin (MULTISAR) for providing information about programs currently in operation in Alberta that are working to protect and rejuvenate our native grasslands in supporting our grassland species.

We acknowledge the hundreds of skilled volunteers in Canada who have participated in the Breeding Bird Survey (BBS) over the years, and those who have served as provincial or territorial coordinators for the BBS.

Linda wishes to also thank her husband L. Jay Yanke for assisting her in obtaining several journal articles that were difficult to access. Thank-you to all those enthusiastic birders in our province for contributing to the various studies and observation counts in furthering our knowledge of our grassland species.

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INTRODUCTION

The chestnut-collared longspur (*Calcarius ornatus*) is a grassland species that is native to the North American prairies (Hill and Gould 1997). The name longspur is given to the members of this genus because of the elongated claw (spur) of the hind toe (Dick 2010). The chestnut-collared longspur is a member of the Emberizidae family and is one of four North American species in the genus *Calcarius*. The chestnut-collared longspur is the smallest longspur species at approximately 15 cm to 17 cm in length, and there are no recognized subspecies (Hill and Gould 1997).

This striking bird breeds in southern Alberta, Saskatchewan and Manitoba, south into the United States through Montana, Wyoming and northeast Colorado in the west, east to North and South Dakota, west and northcentral Nebraska, and east to western Minnesota (Sedgewick 2004). Chestnut-collared longspurs winter in southern portions of the United States in Arizona, central New Mexico, Colorado, Oklahoma and Kansas, south to central Mexico and south Texas with rare occurrences in southern California (Hill and Gould 1997, Sedgewick 2004). This species is considered locally common; however, although it is still numerous in many parts of its North American range, Breeding Bird Survey data (Sauer et al. 2014) indicate that it is declining in almost every jurisdiction in which it occurs. The current general status in Alberta for this species is *Sensitive** (Alberta Environment and Sustainable Resource Development [ESRD] 2014a), though prior to 2010 it was considered *Secure*. In addition to its provincial general status assessment, the chestnut-collared longspur was assessed nationally in 2009 as *Threatened* (Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2009) and is listed federally as *Threatened* under the *Species at Risk Act* (Species at Risk Public Registry 2014).

This report provides a synthesis of available information on the biology, ecology, population trends, and threats to chestnut-collared longspurs in Alberta, and will be used to update the current status of this species in the province.

DISTRIBUTION

1. Alberta - The provincial range of the chestnut-collared longspur has been outlined in Salt and Wilk (1972), Salt and Salt (1976), Godfrey and Crosby (1986), Semenchuk (1992) and Federation of Alberta Naturalists (FAN) (2007). More localized range information is presented in Cook (1910), Taverner (1919), Farley (1932), Soper (1949), Rand (1959), Smith (1972a), Smith (1972b), Kondla et al. (1973), Smith and Wallis (1976), and McGillivray and Steinhilber (1996). Chestnut-collared longspur abundance is highest in the southeastern portion of the province in the Dry Mixedgrass and Mixedgrass natural subregions of the Grassland Natural Region (FAN 2007, COSEWIC 2009, Alberta Conservation Information Management System [ACIMS] 2010a; see also Figure 1). Sightings of the species have also occurred in the Northern Fescue Subregion of the Grassland Natural Region, and the Central Parkland Subregion of the Parkland Natural Region (ACMIS 2010a; Figure 1).

Information from both volumes of *The Atlas of Breeding Birds of Alberta* (Semenchuk 1992, FAN 2007) identified the nesting distribution of chestnut-collared longspurs as east of Lethbridge and Calgary, north to the Parkland Natural Region, east to the Saskatchewan border and south to the Montana border. Higher breeding densities have occurred around Taber, Vauxhall and Brooks, east of Milk River, Pakowki Lake, Medicine Hat and Suffield, and near Hanna. The observed distribution has

* See Appendix 1 for definitions of selected status designations.

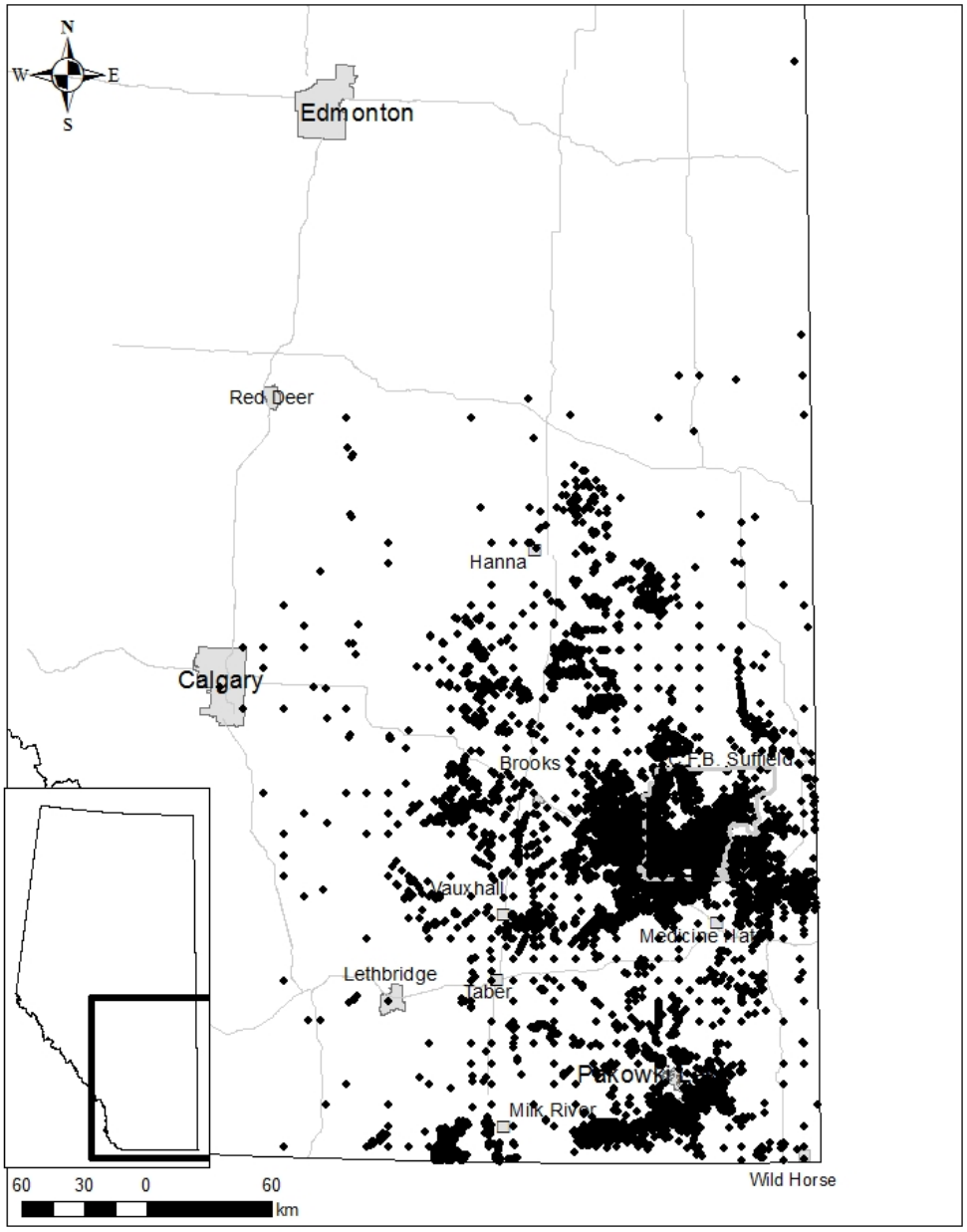

Figure 1. Distribution of chestnut-collared longspur (*Calcarius ornatus*) observations in Alberta, including exact locations from the Fisheries and Wildlife Management Information System (1994–2013; ESRD 2014b) and Canadian Wildlife Service (WILDSPACE database; 1996–2009), and centre of square (10 km^2 x 10 km^2) locations from Nature Alberta (1968–2005; see FAN 2007). Note: Observations of chestnut-collared longspurs in close proximity during the same season may not necessarily represent different birds (i.e., the same bird could be recorded several times).

contracted away from the western edge toward the east between the two atlases (1992 vs. 2007). The contraction may not be as large as it appears because some atlas squares (10 km x 10 km) were not revisited, but the species was absent from a number of squares where it was observed in the first atlas. Additionally, wetter conditions during the second atlas surveys may have created taller (and therefore less suitable; see Habitat section) vegetation. However, historical records also indicate a higher abundance of chestnut-collared longspurs from around the Calgary area (Sadler and Myers 1976, Pinel et al. 1993). Despite this apparent range contraction towards the east and fewer observations of the species, the relative abundance did not change significantly between the 1992 and 2007 breeding bird atlases (Semenchuk 1992, FAN 2007).

Extra-limital records from Alberta include Lundbreck (Fairfield 1968), Waterton (Rand 1959, Seel 1969), Banff (Salt and Wilk 1972, Salt and Salt 1976, J. Rogers pers. comm.), possibly Jasper (J. Rogers pers. comm.), Fort MacKay (Francis and Lumbis 1979), Fort McMurray (Salt and Salt 1976), and Neutral Hills (Pinel et al. 1993). Chestnut-collared longspurs have occasionally been recorded as far north as Beaverhill Lake and the Edmonton/Tofield area (Fairfield 1968, Salt and Wilk 1972, Salt and Salt 1976, Dekker 1977, McNicholl 1977, Godfrey and Crosby 1986, Pinel et al. 1993), indicating that this may have been a part of the normal historical range of the species.

Based on current available data in Alberta and using the minimum convex polygon method, the extent of occurrence is estimated at 83,579 km^2, excluding any vagrant occurrences north of the Grassland Natural Region. The area of occupancy is estimated at 11,988 km^2 (based on the area of occupied 2-km x 2-km squares) (D. Vujnovic pers. comm.; IUCN 2012). The Alberta range of chestnut-collared longspurs amounts to approximately 25% of Alberta and constitutes 42% of the Canadian range (G. Court pers. comm.). The North American Breeding Bird Survey identifies the densest population of this species as occurring in southern Alberta and in the central Dakotas in the United States (National Audubon Society, Inc. 2014).

2. Other Areas - In Canada, chestnut-collared longspurs also breed in Saskatchewan and Manitoba. In the province of Saskatchewan, the species breeds in the mixed grassland from south of Biggar, east of Saskatoon and Quill Lakes southward to the international border (Saskatchewan Wetland Conservation Corporation n.d.) (Figure 2). Davis et al. (1999) describe the species' distribution as primarily in the extreme southern portion of the province. These authors rarely recorded the species on surveys in large tracts of native grassland in the Cypress Upland ecoregion and indicated this is likely due to the tall, dense grassland native to this ecoregion, which does not suit this species' habitat preferences (see Habitat section).

The Birds of Manitoba (Holland and Taylor 2003) refers to the species as a fairly common breeder in southwestern grasslands, but rare and declining in its former range. It was common to abundant in southcentral and southwestern Manitoba in the late 19th century (Thompson 1890). More recently (1989 to 1991), there were 36 recorded sightings within the province, including Holmfield, Killarney, Sioux Valley, Underhill and Pilot Mount (Manitoba Conservation Data Centre 2010). Data collection for the Manitoba Breeding Bird Atlas is ongoing and as of late 2013, there were records from 35 atlas squares in southwestern Manitoba (Bird Studies Canada 2013).

Throughout the rest of Canada, casual records of the chestnut-collared longspur exist for Ontario (Godfrey and Crosby 1986), and British Columbia (total 6 records; Campbell et al. 2001). Accidental records exist for New Brunswick and Nova Scotia (Godfrey and Crosby 1986).

Figure 2. North American breeding and wintering range of chestnut-collared longspur (*Calcarius ornatus*). (Distribution map reprinted with permission from http://bna.birds.cornell.edu and the Cornell Lab of Ornithology, http://canadianbiodiversity.mcgill.ca/english/species/birds/birdpages/cal_orn.htm).

Within the United States, chestnut-collared longspurs are recorded breeding east of the Rocky Mountains in central and eastern Montana (Montana Natural Heritage Program 2010), south to the northeastern corner of Wyoming (Wyoming Natural Diversity Database 2010), throughout North Dakota, and in northern South Dakota (Hill and Gould 1997, NatureServe 2014a). Relict breeding populations occur in western Minnesota, eastern South Dakota, and northeastern Colorado. A larger but fragmented breeding distribution exists in southeastern Wyoming south to northeastern Colorado and east to western Nebraska. Another fragmented breeding distribution exists in southern South Dakota (Hill and Gould 1997) (Figure 2).

Wintering areas for this species are throughout southcentral and southwestern United States and northern and central Mexico. In the United States, wintering chestnut-collared longspurs can be found from central Arizona to northern New Mexico, Colorado, Oklahoma, Kansas and Texas, with rare occurrences in southern

California (Sedgewick 2004, NatureServe 2014a). The highest winter densities occur in eastern New Mexico and western Texas, though weather patterns and conditions can cause major shifts in the distribution and abundance of wintering populations (Sedgewick 2004). Some individuals may migrate and winter along the west coast (Cornell Lab of Ornithology 2013). In Mexico, chestnut-collared longspurs can be found south to the Mexican states of Sonora, Chihuahua, Zacatecas, and San Luis Potosi (Sedgewick 2004). Recent surveys conducted by the Rocky Mountain Bird Observatory in northern Mexico are helping to further define the wintering range of the chestnut-collared longspur, and have identified the grasslands of Valles Centrales, Chihuahua as a part of their core winter range (Levandoski et al. 2008, Panjabi et al. 2010).

HABITAT

1. Breeding Habitat - The chestnut-collared longspur is considered a native prairie specialist (Anstey et al. 1995). This species depends on grasslands year-round; 99% of summer breeding occurrences and 55% of winter occurrences are found in grassland habitats (Blancher 2003). The general habitats that chestnut-collared longspur prefers include open, sparsely vegetated landscapes, native grasslands of the shortgrass and dry, open mixedgrass prairies, level to rolling uplands and some moist lowlands (Owens and Myres 1973, Davis et al. 1999, Martin and Forsyth 2003, Sedgewick 2004, Alsop 2005). Historically, this species likely bred at sites that were disturbed by fire or grazed by bison (*Bison bison*). Today, they can still be found in native grassland recently burned or grazed by cattle or both, or in mowed fields, as these habitats have low to moderate cover height, minimal litter cover, and little accumulation of old cover (Maher 1973, Owens and Myres 1973, Hill and Gould 1997, Dale et al. 1999).

Longspurs use mixedgrass prairie dominated by blue grama grass *(Bouteloua gracilis)*, needle-and-thread *(Stipa comata)*, June grass *(Koeleria cristata),* yellow sweet clover *(Melilotus officinalis),* crested wheatgrass *(Agropyron cristatum)* (O'Grady et al. 1996, Martin et al. 1998), fescues *(Festuca* spp.*)* and pasture sage *(Artemisia frigida)* (Sedgewick 2004). In Manitoba, the species has been recorded using habitats with prairie sage *(Artemisia gnaphalodes)*, goldenrod *(Solidago canadensis* and *S. hispida)* and gumweed *(Grindelia squarrosa)* (Harris 1944). These birds have been found using low-lying areas, and areas with shrubs and forbs such as Canada thistle (*Cirsium arvense)*, western snowberry *(Symphoricarpos occidentalis)* and silverberry *(Eleagnus commutata*) for perching and singing (Dechant et al. 1998, Sedgewick 2004, COSEWIC 2009). According to Fairfield (1968) and Owens and Myres (1973), preferred vegetation height is less than 20 cm to 30 cm. The chestnut-collared longspur is negatively affected by woody-plant height, and decreases in occurrence as woody plants increase from brush to tall shrubs and trees, and as a result has been classified as woodland sensitive (Grant et al. 2004). In North Dakota, the strongest vegetation predictor for the presence of chestnut-collared longspurs includes increased grass cover and bare ground, and reduced litter depth and cover of low-growing shrubs (Schneider 1998 *cited in* Dechant et al. 1998). In a Saskatchewan study, Bleho (2009) found that chestnut-collared longspurs were associated with heterogeneous habitat, including uneven (patchy) areas of exposed moss and lichen cover and bare ground, and were not associated with the quantity of shrub cover. Dale (1983) found they were absent from idle native grassland, and occupied areas with shorter cover (10 cm), less litter, less standing dead grass and more bare ground than generally available.

In Alberta, there is approximately 40%–43% of the original Dry Mixedgrass and 20%–24%

of the Mixedgrass native prairie remaining (depending on the source; Saunders et al. 2006, Bradley and Neville 2010), and native grasslands cover approximately 5.2% of the province (34,600 km^2) (Bradley and Neville 2010). The Prairie Conservation Forum states that over 4 million hectares of the 9.7 million hectares composing the Grassland Natural Region remain in a native state (Alberta Prairie Conservation Forum 2014). Alberta's native grasslands have been fragmented by land conversion to agriculture, oil and gas exploration and infrastructure, transportation corridors, water diversion projects, coal mining, gravel pits, urban, suburban and exurban expansion and, increasingly, wind power activities and associated infrastructure (Bradley and Neville 2010).

Of the remaining native grasslands, the majority are owned by the crown or First Nations, while some smaller parcels are privately owned or owned by conservation organizations, or are held as conservation easements. The provincial crown lands with native grassland mostly consist of Provincial Parks and Heritage Rangelands held under grazing dispositions. Some of these provincial crown lands contain areas of suitable habitat for chestnut-collared longspur: Onefour Heritage Rangeland Natural Area, Milk River Natural Area, Kennedy Coulee Ecological Reserve, Dinosaur Provincial Park, Writing-on-Stone Provincial Park, Prairie Coulees Natural Area, Kinbrook Island Provincial Park, Twin River Heritage Rangeland Natural Area and Ross Lake Natural Area (C. Lockerbie pers. comm.). The majority of the Provincial Parks are centered on rivers and coulee systems, and may play a smaller role in the conservation of the chestnut-collared longspur (B. Downey pers. comm.), which is an upland grassland obligate species. Heritage Rangelands tend to contain appropriate habitat for this species and, though they have limited protection in the form of a no cultivation policy, they are subject to use by industrial developers and changes in the political process (J. Nicholson pers. comm.). Lands owned by conservation organizations (e.g., Ducks Unlimited Canada, Alberta Conservation Association) and held under conservation easements likely provide long-term protection of habitat for this species. A recent concern for the protection of native grasslands is the transition of provincial lands to counties/municipalities (called tax recovery lands). This may result in the loss and degradation of remaining native grasslands in Alberta.

The effect wetlands have on habitat selection of chestnut-collared longspurs is variable. Fontaine et al. (2004) evaluated the relationship between grassland songbird density and distance to water in their North Dakota study, and found no trend for the chestnut-collared longspur. This study was limited to 800 m from water developments, and the authors suggest that for this species, gradients in densities may have been more apparent at greater distances than their study allowed. In contrast, Koper and Schmiegelow (2006a) found a significant positive relationship between distance to water and chestnut-collared longspur abundance in southern Alberta. However, this study took place on lands that were only lightly grazed, resulting in high, thick vegetation near the wetlands, and these habitat characteristics are not ideal for chestnut-collared longspurs. At the Onefour Research station in southern Alberta, a four-year study found no relationship between chestnut-collared longspur occurrence and distance to wetlands or cattle water sources in a landscape with a low stocking rate (Dale and Wiens In Review). As vegetation structure is likely driving the response, further research should be done to determine the combined effects of grazing intensity and wetland distance on the habitat selection and density of chestnut-collared longspurs.

Despite being considered a native prairie specialist, there is variable evidence that chestnut-collared longspurs use other habitats. For example, some studies report that they are

equally likely to use monocultures of crested wheatgrass (Prescott and Wagner 1996, Sutter and Brigham 1998, Davis et al. 1999, Lloyd and Martin 2005; but see Davis and Duncan 1999, and Conservation Biology and Limiting Factors sections). Areas with smooth brome grass *(Bromus inermis)* in a Manitoba study were unsuitable (Wilson and Belcher 1989). Results regarding use of native fescue prairie vary and further research is required. Owens and Myres (1973) reported chestnut-collared longspurs in their two grazed plots in the fescue grasslands of the Hand Hills (34 pairs/100 ha), whereas recent wildlife surveys as part of the MULTISAR program (Multiple Species at Risk program; see Recent Management and Research in Alberta section) in Alberta did not find any occurrences of chestnut-collared longspurs in fescue grasslands (J. Landry-DeBoer pers. comm.). They were not reported in fescue fields near Saskatoon (Pylypec 1991). Cultivated lands are usually avoided (Owens and Myres 1973), with only 9.54% occurrence in crops on Grassland Bird Monitoring routes in Saskatchewan and Alberta (Dale et al. 2005); furthermore, densities of this species are higher per point count moving away from croplands (Koper and Schmiegelow 2006a) out to a distance of 1.95 km (Sliwinski and Koper 2012). They will sometimes establish territories and nest in mowed hayfields (Dale et al. 1997, McMaster and Davis 2001). In early surveys in fescue grassland in the Hand Hills, the chestnut-collared longspur was absent from four idle grasslands and four cultivated plots, but was the most common grassland bird in two mowed (25 pairs/100 ha) and two grazed fescue plots (15 pairs/100 ha; Owens and Myres 1973). Where ideal habitats are not available, they have been found in minimum-tillage summer-fallow fields and fields of spring cereals (McMaster and Davis 2001, Martin and Forsyth 2003), as well as mowed airstrips and along fencelines (Fairfield 1968, COSEWIC 2009).

2. Territory size and Nesting Habitat - There is little information available on breeding area requirements, but several estimates of male territory size have been made: 0.2 ha–0.4 ha in Manitoba (Harris 1944); 0.4 ha–0.8 ha with an increase to 4 ha in marginal habitat in Saskatchewan (Fairfield 1968 *cited in* Dechant et al. 1998); and approximately 1 ha (range 0.25 ha–4 ha) in southeastern Alberta (Hill and Gould 1997). Felske (1971; *cited in* Sedgewick 2004) suggested that chestnut-collared longspurs may have similar behaviour as McCown's longspurs with sensitivity to ground temperatures and/or ground moisture during territory selection.

Nests are placed on the ground in a depression excavated by the female (COSEWIC 2009), and are located in areas characterized by short, sparse vegetation with bare ground, little dead vegetation, and intermediate forb density (Harris 1944, Davis 2005), resulting in nests that are more exposed compared to other grassland songbirds (Jones and Dieni 2007). They may select for these areas to avoid small nest predators (e.g., voles) that themselves rely on cover to escape predation (Davis 2005). Within preferred areas of short, sparse vegetation, the chestnut-collared longspur selected taller and more dense vegetation for nest placement (Davis 2005), and grasses typically make up the cover plant that shield the nest (Harris 1944). This species uniquely associates its nests with dried-out, intact pats of cow dung (Harris 1944, Davis 2005). The reason for associating nests with cow dung is unknown, but Davis opined it may assist in concealing the nest, the attending adult or it may influence the microclimate of the nest by reducing exposure to the wind and sun.

3. Foraging Habitat - Chestnut-collared longspurs forage on the ground for insects and seeds (Salt and Wilk 1972, United States Geological Survey [USGS] 2010) throughout and adjacent to their breeding territory along dirt roads and in cultivated fields (Sedgewick

2004). Ditches, dry sloughs and rough ground are used by foraging flocks during fall migration and early spring arrival (Harris 1944, Sedgewick 2004).

4. Wintering Habitat - Canada's breeding population of chestnut-collared longspurs migrates and winters in the warmer climates of the southern United States and Mexico, including Arizona, New Mexico and Texas. On the wintering grounds, they continue to prefer short vegetation (less than 0.5 m) in a variety of native grasslands (including deserts and plateaus with low grasses and forbs) (COSEWIC 2009). Surveyors in Mexico found chestnut-collared longspurs had a strong preference for native grasslands with extensive grass cover, moderate amounts of ground cover and few shrubs (Levandoski et al. 2008, Panjabi et al. 2010). Wintering flocks have been found in fallow fields and mowed croplands and around water sources (Hill and Gould 1997, COSEWIC 2009). In central New Mexico, Kelly et al. (2006) studied non-breeding chestnut-collared longspurs and found the species using grazed and rested semi-arid grasslands. The authors suggest that this species does not rely on grazed habitats as much during winter as it does for its breeding habitat, but shrub density may be a factor in habitat selection. Large areas of desert grassland (i.e., Chihuahuan Desert) are required to support non-breeding populations of chestnut-collared longspurs (Kelly et al. 2006). Grzybowski (1982) found chestnut-collared longspurs and horned larks (*Eremophila alpestris*) in some large cultivated fields and in sandy dry areas (blowouts) in Texas.

CONSERVATION BIOLOGY

1. Species Description and Longevity - The chestnut-collared longspur is the smallest species of the longspur genus, measuring 15 cm – 17 cm in length with a wing span of approximately 25 cm – 27 cm and mass of 17 g – 19 g (Hill and Gould 1997, Sibley 2000, 2003, Alsop 2001a, 2001b, 2005). The male is distinguished by its black and white head, buffy-yellow face, the chestnut collar on the nape of its neck, and bold black breast and upper body. The male has upper parts that are streaked with black, buff and brown coloration, and has a single white wing bar on its flight feathers and short primary projection feathers. Both sexes display distinctive tail feather markings in flight, showing a white tail with a blackish triangle. The breeding female is not as vibrant, having some chestnut colour on the nape of the neck, dark crown, brown wings, mainly buff upperparts with brownish streaking and white buff underparts with some streaking, often blending into the surrounding prairie landscape (Salt and Wilk 1972, Hill and Gould 1997, Sibley 2000, Alsop 2005, Montana Field Guides 2010, USGS 2010).

Winter plumages of both sexes are similar to the female breeding plumage, although more dull in appearance. The male winter plumage is "veiled" with buffy feather tips on the black head and breast and chestnut nape; females are more muted by buffy feather tips and blurry streaks on her breast (Hill and Gould 1997, Sibley 2000). The adult female and winter plumages appear similar to those of other longspur species (USGS 2010).

The species is monotypic. Geographic variation or subspecies have not been described (Pyle 1997, Sedgewick 2004), and molecular variation between populations has not been examined (D. Hill pers. comm.). Pyle (1997) and Sibley and Pettingill (1955; *cited in* Sedgewick 2004) collected and described a hybrid male chestnut-collared-McCown's longspur.

There is limited information on the longevity of the chestnut-collared longspur. Only one study in Alberta (Hill and Gould 1997) provides an estimate of how long these birds may live. Two birds (out of a total of 53) banded as adults in 1993 and re-sighted in subsequent

years survived to at least age four (exact age at banding was unknown, but was at least one year of age) and 12 birds that were re-sighted survived to at least age three. Twenty males (out of 30) and 21 females (out of 65) banded in 1993 and 1994 lived to at least age two. No information exists on population sex ratios or the proportion of the population that will breed (i.e., effective population size) (Sedgewick 2004). It is likely that the generation time of this species is two to three years (COSEWIC 2009), though age at first breeding has not been documented (Hill and Gould 1997).

2. Breeding Biology - The chestnut-collared longspur typically arrives in Alberta in mid-April through early May (Farley 1932, Sadler and Myers 1976, Pinel et al. 1993, Hill and Gould 1997), and the males arrive first (approximately two weeks before the females) to establish territories and announce their presence to the arriving females (Hill and Gould 1997). Males will typically display above their territories in aerial song displays, rising from the ground and performing flight circles and songs, and dropping down toward the ground with rapid wing beats (Ehrlich et al. 1988, Sedgewick 2004). During this display they fly up to a height of 10 m to 15 m (Hill and Gould 1997, Sedgewick 2004) with the white tail open and visible. This series of display movements may occur several times before the male decides to land. The male will also perform ground courtship displays, which include fanning the wings and tail, holding his head upright with nape feathers erect and possibly performing head-bowing displays (Fairfield 1968 *cited in* Dechant et al. 1998). Males chase intruders and may enter neighboring territories to chase females and both sexes will leave the territory to forage (Hill and Gould 1997).

After the females arrive and pair-bonds have formed, nest building begins. The female builds the nest as a small, cup-like depression, level with the ground and lines it with grass, leaves, rootlets, and hair (cattle, horse, rabbit or hare). The female lays three to five white eggs, marked with brown, black or purple coloration, on consecutive days in the early morning hours until the clutch is completed. Clutches of six eggs have been recorded, but are rare. The most common number of eggs per clutch is four (DuBois 1935, Harris 1944, Davis 2003, Sedgewick 2004, Lloyd and Martin 2005, Environment Canada 2010). Davis (2003) found that 227 of 414 nests (54.8%) between 1995 and 2002 had a mean clutch size of 4.2 in a Saskatchewan study. In a 10-year study in Montana, the mean egg clutch size was 4.1 (n=770 nests; Jones et al. 2010).

A recent study summarizing ten years of nesting records in Montana found incubation of 567 clutches averaged 10.9 days (Jones et al. 2010). Nestlings are initially helpless and partially covered in grey down. Incubation is performed mainly by the female but males have been observed incubating during female recess periods (Kirkham and Davis 2013) and both parents will feed the nestlings. The young fledge after 8–14 days, with the male attending to the young and the female preparing for her second brood (Bailey and Niedrach 1938, Harris 1944, Hill and Gould 1997, Martin et al. 2000, Dick 2010, Montana Field Guides 2010). Nestlings in 185 nests remained in the nest for a mean of 11.1 days (Jones et al. 2010).

In Alberta, nest building begins in late April to mid-May. One of the earliest dates eggs were discovered was April 27th, with May 14th as the median first egg date; first clutches of the season were initiated over a span of 39 days (Hill and Gould 1997). In Alberta, second clutches were initiated from early June to mid-July, and the median initiation date for second clutches was June 20th (range June 8th – July 14th; Hill and Gould 1997). To date, August 9th is the latest known date for fledging. Pairs will attempt up to four clutches in a season after successive nest failures (COSEWIC 2009, Hill and Gould 1997, Sedgewick 2004).

Chestnut-collared longspurs are socially monogamous and double-brooded; genetic evidence has found that offspring resulting from extra-pair copulations occur more often in second brood nests (Hill and Gould 1997, Elphick et al. 2001). In their small genetic study, Elphick et al. (2001) found that one out of five longspur young were extra-pair offspring.

3. Diet and Foraging Behaviour - Chestnut-collared longspurs typically forage on the ground, and occasionally will catch insects that have been flushed into the air using quick, short flights (Salt and Wilk 1972). Ninety percent of chestnut-collared longspur observations in winter were more than 64 m away from shrub or tree cover (Pulliam and Mills 1977). Chestnut-collared longspurs feed on seeds, grains, and various insects and invertebrate species including spiders, crickets, butterflies, moths, leafhoppers and grasshoppers (Hill and Gould 1997, Sedgewick 2004). Young chestnut-collared longspurs feed primarily on invertebrates to provide the necessary protein to fuel their rapid growth (Harris 1944, Martin et al. 1998, 2000). Martin et al. (1998) studied the effects of grasshopper insecticides in Alberta, and found that just prior to spraying, grasshoppers (*Psoloessa delicatula*) made up a large amount of the nestling chestnut-collared longspurs' diet. However, when the grasshopper population was greatly reduced after spraying, nestling birds were supplied lepidopteran larvae, beetles, diptera and hymenoptera species by their parents. The number of food items delivered and the quality of the nestling diet with this alternative prey was not reduced. Nestling body weights were the same or higher in the sprayed plots, which appeared to have provided similar energy requirements as with the grasshopper diet from the control plot. The authors describe that in a temperate environment the extra distance flown to obtain the alternative prey was within a passerine bird's typical energy demand limit and likely would have no effect on the birds (Martin et al. 1998, 2000). In Saskatchewan, the bulk of food fed to chicks consisted of Lepidoptera, Orthoptera, and Homoptera (Maher 1979). Plant material was rarely given to nestlings. Adult diets in four states were dominated by Orthoptera, but diet varied from year to year and plants made up 23% of the adult diet in one year (Wiens and Rotenberry 1979).

The chestnut-collared longspur diet also consists of grass, grains (e.g., wheat) and seeds (e.g., sunflower *[Helianthus* sp.*]*, needle grass [*Stipa* sp.*]*, three-awn [*Aristida* sp.*]*, dropseed, pigweed [*Amaranthus* sp.*]*, western porcupine grass [*Stipa curtiseta]*), particularly for wintering flocks and during migration when insects are not as readily available (Oberholser 1974 *cited in* Sedgewick 2004). If available, they will visit water regularly to drink and bathe (Ehrlich 1988).

4. Potential Predators - It is unknown exactly which species prey upon the chestnut-collared longspur. Predators on grassland bird nests vary by locale (Jones and Dieni 2007). Video surveillance for 770 hours at 13 chestnut-collared longspur nests revealed four of them completely depredated by Richardson's ground squirrel (*Urocitellus richardsonii*), even though one or both members of the pair attacked the intruder (Kirkham and Davis 2013). Predation events took place in late morning, early afternoon and in one case the evening; all predation events were initiated while the female was in recess. In all cases, the female was observed attempting to incubate the eggs that remained after the predator left, and to later consume remains of embryos and eggs; in some cases, she was observed to carry eggshells away. No other predators were observed. Other studies have suggested that the predominant nest predators are mammalian species, including Richardson's ground squirrel, thirteen-lined ground squirrel (*Ictidomys tridecemlineatus*), striped skunk (*Mephitis mephitis*), and badger (*Taxidea taxus)* (Harris 1944, Fairfield 1968 *cited in* Sedgewick 2004, O'Grady et al. 1996, Hill and

Gould 1997, Martin et al. 2000). The American crow (*Corvus brachyrhynchos*), garter snakes (*Thamnophis* spp.), bullsnake (*Pituophis catenifer)* and deer mouse (*Peromyscus maniculatus*) are also believed to be nest predators (Harris 1944, Hill and Gould 1997, Martin et al. 2000). Northern harriers (*Circus cyaneus*), which nest on the ground and search for food during low flights over the landscape, are suspected to prey on the fledglings more than on the nestlings (O'Grady et al. 1996). Gilman (1910; *cited in* Sedgewick 2004) suggested potential predators on adult and fledgling longspurs include coyote (*Canis latrans*), red fox (*Vulpes vulpes*), northern harriers, loggerhead shrikes (*Lanius ludovicianus*), merlins (*Falco columbarius*), American kestrels (*Falco sparverius*) and burrowing owls (*Athene cunicularia*). Although not specific to the chestnut-collared longspur, both white-tailed deer and cows have been documented removing eggs and chicks from ground nests of passerines (Pietz and Grandfors 2000, Nack and Ribic 2005) and may pose an additional predation risk. On the wintering grounds, the Cooper's hawk (*Accipiter cooperii*) is another potential predator (Sedgewick 2004).

5. Nesting Success and Survival - Hatching is asynchronous (up to 49 hrs; Hussell 1972) and newly hatched young are altricial (hatched very immature, requiring much parental care), covered with buffy, grey down feathers and their eyes are closed. Adaptations of this species to improve nesting success include a high rate of re-nesting and double brooding, shortened time for nestling development, and distraction flight displays when flushed from the nest (Jones and Dieni 2007). In one Alberta study that followed the fates of 254 chestnut-collared longspur nests, hatch success (number of nestlings hatched/eggs laid; 784/1017) was 77.1%, nestling success (number of fledglings produced/nestlings hatched; 488/784) was 62.2%, fledgling success (number fledglings produced/eggs laid; 488/1017) was 48.0%, nest success (percent of nests that fledge at least 1 young; 142/254) was 55.9% and the mean number of young fledged (number of young leaving a successful nest; range 1–5), was 3.4 young (Hill and Gould 1997). The overall nest success in Hamilton's (2010) study was 69.6% (n=23) in 2007 and 57.1% (n=28) in 2008.

Predation, inclement weather, and severe ectoparasite infections (e.g., blowfly larva of Order Diptera, family Calliphoridae) have all been documented to lower nest success (Martin et al. 1998, 2000, Lloyd and Martin 2005). In a study near Barnwell, Alberta, Martin et al. (1998) found that egg and nestling mortality were more likely a result of nest predation than pesticide spraying (see Limiting Factors). O'Grady et al. (1996) and Martin et al. (1998) found that human disturbance during nest surveys did not increase predation on longspur eggs or nestlings in Alberta surveys.

Lloyd and Martin (2005) found that nest success in Montana is better in native grasslands compared to pastures planted with introduced (exotic) grasses (e.g., crested wheatgrass). Although they found the number of young per successful nest was not different (native 2.2; exotic 2.4), the odds of nests in crested wheatgrass surviving a given day were 17% lower. Thus, a lower proportion (native 47.9%; exotic 41.0%) of exotic nests were successful, which resulted in significantly fewer young fledged per nest in exotic (1 young/nest) than in native (1.6 young/nest) grasslands. They also noted that in the crested wheatgrass pastures, nestlings took longer to gain weight and fledge from the nest, and fledging mass was lower compared to those in native grasslands (12.9 g versus 14.2 g, and 9.8 days versus 8.7 days, respectively). The average number of young recorded fledging in Alberta was 3.4 young per successful nest (n = 254 nests; Hill and Gould 1997), 3.31 (2007, n=23) and 3.25 (2008, n =28) young per nest (Hamilton 2010).

Tillage regimes can also impact chestnut-collared longspur productivity. Martin and

Forsyth (2003) found that the species occurred in a small proportion of spring cereal or winter wheat fields, and compared minimum and conventional till regimes. They found that chestnut-collared longspurs were more common in summer fallow, but nested and were productive in minimum till plots; conventional till crops were avoided altogether. The authors caution that their estimates of productivity using observational scoring should not be directly compared to data from nest monitoring studies (Martin and Forsyth 2003).

Two graduate studies in southern Alberta recently found chestnut-collared longspur nest daily survival declined with increasing shallow gas well density (L. Leston and J. Yoo unpubl. data), even though there was no consistent relationship between nest daily survival and distance to wells.

6. First Year Survival and Return to Breeding Grounds - There are no records of chestnut-collared longspur nestlings returning to their natal breeding grounds. In Alberta, 325 nestlings were banded and none were re-sighted in following years at the same location (Hill and Gould 1997). Natal philopatry in this species is considered to be low. As a result, no data exist on first-year survival rates.

7. Dispersal - Chestnut-collared longspurs are usually found in flocks early and late in the breeding season (Harris 1944, Sadler and Myers 1976, Pinel et al. 1993, Dechant et al. 1998, Sibley 2003, Alsop 2005, USGS 2010). Fall departures vary from mid- to late September throughout the Canadian provinces. Juveniles will begin to gather together first after the breeding season (mid-August), and by late September the adults will have joined them and together they move south toward their wintering grounds (Hill and Gould 1997, Sedgewick 2004). Spring migration for this species begins in March. Blancher (2003) indicates that the rate of population exchange (genetic material exchanged between populations of migrating individuals) is 35% during longspurs' migratory movements between breeding and wintering grounds from Canada through the United States to Mexico. Wintering flock densities can be as high as 166 individuals/ha (Hill and Gould 1997).

8. Differential Immigration and Emigration - Breeding males (67.7%) will often return to their former breeding territories yearly (strong philopatric tendencies), whereas females (32.3%) have less site fidelity (Hill and Gould 1997). Winter site fidelity is unknown (Sedgewick 2004). Young birds appear to emigrate from their natal breeding grounds because, as identified above, there are no records of them returning to the same local area to breed (Hill and Gould 1997, Sedgewick 2004).

POPULATION SIZE AND TRENDS

1. Alberta

1.1 Population Trends - The North American Breeding Bird Survey (BBS) has identified an overall declining population of chestnut-collared longspurs in Alberta. The former BBS analysis (Estimation Equation) identified the decreasing trend from 1966–2007 at -2.46% per year (p=0.23, routes=29). The population from 1966–1979 showed a positive trend followed by a negative trend from 1980–2007 (5.2% per year, p= 0.12; -4.6% per year, p=0.07, respectively) at a rate of about 2.7% decrease per year (Sauer et al. 2008). A new Hierarchical Model Analysis for 1968–2012 identifies the trend at -7.48% per year (Credible Interval [CI] 2.5%–97.5% at -9.2% and -5.7%, routes=27; Figure 3) (Sauer et al. 2014). The regional trend analysis tool available on the BBS website allows an estimate of decline in Alberta over the most recent 10-year period for which data are available. The 10-year trend using this tool for Alberta over the period 2002–2012 shows a decline of 4.99% per year. This calculates to a decline of 40.1% over the most recent 10-year period.

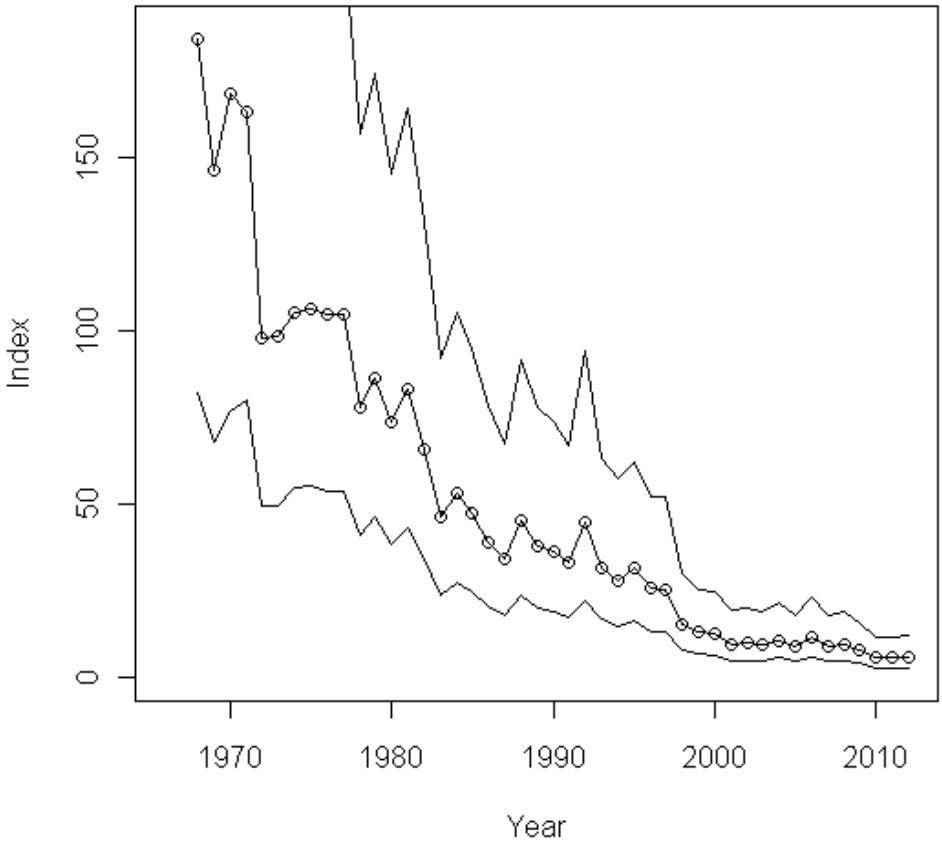

Figure 3. North American Breeding Bird Survey trend for chestnut-collared longspurs (*Calcarius ornatus*) in Alberta (1968–2012), showing approximate average decline of 7.48% per year. Graphic identifies the annual indices (°) and credible intervals (2.5%, 97.5%) on new Hierarchical Model analysis method. Obtained from Sauer et al. 2014.

Environment Canada/Canadian Wildlife Service calculates trends in a slightly different way using the same BBS data augmented with additional Grassland Bird Monitoring (GBM) routes. The GBM project in Alberta and Saskatchewan expanded survey coverage to improve the ability to detect trends and improve conservation activities for specific target grassland species, and compare trends and occurrences with the BBS data during the same timeframe (Dale et al. 2005). The survey followed a similar protocol to the BBS for selecting routes and data collection. Dale et al. (2005) suggested that combining BBS and GBM data may better identify changes to the entire population (through the five years of the GBM project). The Canadian Wildlife Service 10-year trend (2002–2012) for Alberta (i.e., the combined BBS and GBM data) is -5.57% per year (n=22 routes) (Environment Canada 2014a), which is the equivalent of a 43.6% decline over 10 years. Based on the above 10-year annual trends for Alberta, the estimated total decline over the most recent five-year period is -22.6% or -24.9% (based on annual trends of -4.99% and -5.57%, for BBS and Canadian Wildlife Service analyses, respectively).

There are several factors to consider when interpreting BBS data for chestnut-collared longspur. The BBS/GBM is currently the only survey that can provide long-term trend analysis for Alberta. BBS routes are on primary and secondary roads, but sample size for Alberta is sufficient to support statistical analysis and includes a number of routes traversing large native grassland blocks. Those extensive grasslands contain higher densities of longspurs, as demonstrated by both

MULTISAR surveys conducted away from roads (See Recent Management and Research section) and by on-road GBM surveys, which encounter chestnut-collared longspur more frequently and in greater numbers than BBS routes on average (Dale et al. 2005). On-road surveys will have fewer birds/survey than off-road surveys (Sutter et al. 2000), but trend analysis of an index simply requires that changes detected on-road are proportional to those off-road. The BBS samples birds up to 400 m on either side of the road, but BBS trends might not be representative of the population if the habitat along routes is not representative of the landscape as a whole (Thogmartin et al. 2006), or if trends in the habitat surveyed for birds during off-road surveys differ from trends in habitat surveyed for birds during on-road surveys. A North Dakota study found upland habitat (and grassland in particular) within 400 m of BBS routes was representative of the landscape (Niemuth et al. 2007), and unpublished Environment Canada data (P. Blancher *cited in* Dale et al. 2005) showed similar findings. A U.S. study found that trends in habitat on- and off-road matched (Keller and Scallan 1999). The North Dakota study did find more fragments (of all cover types) near roads as a result of farmyards and access trails, and speculated this might create a negative bias for area-sensitive species (Niemuth et al. 2007). Chestnut-collared longspurs show some area sensitivity, but their minimum area requirement is 39 ha (Davis et al. 2006).

The Atlas of Breeding Birds of Alberta: A Second Look (FAN 2007) showed that there were no significant relative abundance changes in chestnut-collared longspur numbers since the previous atlas in 1992. Although there were fewer observations of this species in the 2007 atlas compared to the 1992 atlas, it is thought that wetter conditions to the west during the second survey may have changed habitat conditions. Vegetation growth during this moist period may have limited this species from returning to some areas. It is also suggested that this decrease in observations may have resulted from differences in survey effort (i.e., survey squares not being resurveyed) (P. Penner pers. comm.).

1.2 Population Size **-** The Federation of Alberta Naturalists (now known as Nature Alberta) database contains over 26,200 observations of chestnut-collared longspurs in Alberta between 1968 and 2005 (at which time data collection for the 2nd Atlas of Breeding Birds of Alberta [FAN 2007] was completed and the database was no longer being actively managed by FAN; P. Rowell pers. comm.). Of those observations, over 1500 individuals were confirmed breeding (pair, courtship, territory, habitat, distraction display, nest with eggs, nest with young, carrying food and fledged birds) (P. Penner and V. Bijelic pers. comm.). The Fish and Wildlife Management Information System (FWMIS) of ESRD has over 41,200 individual bird observations from 1994 to 2013. In addition, FWMIS has over 1700 submissions that did not provide exact bird numbers, and indicated anywhere from 1 to over 50 birds observed (most indicated 1–20 birds). The total estimated number of birds residing in Alberta at any one time is unknown.

Mean breeding density was recorded as 1.2 breeding pairs per hectare (range: 1.1 to 1.4 breeding pairs/ha) on grazed native grassland in southeastern Alberta (Hill and Gould 1997). This site had been chosen for study because of its high density of chestnut-collared longspurs and thus may not reflect typical breeding densities (D. Hill pers. comm.). Chestnut-collared longspur territories do not overlap; however, there may be an exhibited cluster distribution, which can result in locally high population densities (Hill and Gould 1997). Partners in Flight (PIF) provides population estimates based on count data from the Breeding Bird Survey (Blancher et al. 2013), but the methodology requires a large number of assumptions and has been criticized for using a survey designed to provide trends to estimate

population size (Thogmartin et al. 2006). PIF estimates that the population for chestnut-collared longspur in Alberta, based on counts for the period 1998 to 2007, is 400,000 birds (Partners in Flight Science Committee 2013). The same database estimates that 14.2% of the global population occurs in this province. Of the Canadian population of chestnut-collared longspur, 73% is within Alberta (G. Court pers. comm.).

Most research and population surveys within Alberta (based on the FWMIS database) have occurred in the southeastern corner of Alberta, particularly at Canadian Forces Base (CFB) Suffield National Wildlife Area and along the Milk River Basin. Sightings of chestnut-collared longspurs (based on information submitted by the public to ESRD) provide estimates of minimum numbers of individuals occurring within the province, but not overall population trends (Table 1). Observations recorded in FWMIS do not represent standardized surveys or standardized effort; differences in numbers of birds observed between years are closely linked to survey effort. The highest number of chestnut-collared longspurs reported to the Fish and Wildlife Division (of ESRD) in any one year was approximately 7800 birds in 2007 (Table 1).

Many grassland bird research and inventory projects have been completed on Canadian Forces Base (CFB) Suffield. CFB Suffield National Wildlife Area (NWA) near Medicine Hat was officially designated in 2003; it has one of the largest remaining blocks of mixedgrass prairie remaining in Canada and is maintained and protected for wildlife habitat. Seventeen federally listed at-risk species having been identified there (Nature Canada 2006–2010). Canadian Wildlife Service (CWS) personnel and consultants completed bird point count surveys at Suffield in 1994/95 and annually between 2000 and 2006. Their annual bird count numbers for chestnut-collared longspur varied from 47 to 88 individual birds among the years, but their percent occurrence (49.5%) in recent times is unchanged from 1994/95 on the 97 sites sampled in both periods (B. Dale unpubl. data; Encana Corporation 2007). Dillon Consulting Ltd. (1996, 2006) completed bird surveys at the Suffield training fields in 1996 and a repeat survey in 2004, including various condition classes of vegetation with varying amounts of disturbance (military activity training, i.e., ground vehicle hits): low (little/no training occurred, minor use of tracked vehicles); medium (moderate training intensity, increased tracked and wheeled vehicle use and trench digging); high (heavy/high training intensity, battleruns, live firing and increased vehicle traffic); and oil and gas (heavy oil and gas activity with overlapping military training activity). During their breeding bird survey in 1996, they completed 223 survey sites, and chestnut-collared longspurs were the most abundant species observed (n= 410). Chestnut-collared longspurs were located in vegetation with the highest disturbance (2.344 average birds/point count). In the replicate survey of all 223 sites in 2004, the total number of birds observed decreased slightly (n=378) (2.15 average birds/point count in highest disturbance), but they found no significant changes in the proportion of birds found at the sites with differing disturbance sites from 1996. Hamilton (2010) also found that this species was the most abundant species during her study on the south block at CFB Suffield NWA. This area has been restricted since 1971 (Canada National Defence n.d.) and no military ground training has occurred subsequently. Only natural gas industry is permitted with approval (Hamilton 2010). In both years of her study, Hamilton surveyed two site classes: 159 and 108 sites located in low- and high-well-density areas (respectively) in 2007, with an average of 1.38 birds/point count; 172 and 105 survey sites in low- and high-well-density areas (respectively) in 2008, with an average of 1.24 birds/point count. Hamilton's study found that chestnut-collared longspur abundance was not related to disturbance (well density).

Table 1. Minimum number of chestnut-collared longspur (CCLO; *Calcarius ornatus*) occurrences reported yearly between 1994 and 2013 in Alberta. Chestnut-collared longspur data were obtained from the Fisheries and Wildlife Management Information System (FWMIS; ESRD 2014b) in December 2014; MULTISAR project data are a subset of the data within FWMIS, but are shown separately in this table. For data reported to FWMIS as an abundance category (a range), the lower end of the range was used to calculate totals presented in this table. Note: Data do not represent population trends, only numbers of observations of chestnut-collared longspurs submitted to the FWMIS database.

Year	CCLO Total Count	MULTISAR CCLO Counts
1994	146	n/a
1995	316	n/a
1996	6	n/a
1997	n/a	n/a
1998	n/a	n/a
1999	420	n/a
2000	302	n/a
2001	259	n/a
2002	372	n/a
2003	2305	n/a
2004	2002	n/a
2005	3264	n/a
2006	7102	1239
2007	7859	2509
2008	4330	645
2009	5663	2566
2010	2669	204
2011	2717	1561
2012	3445	1983
2013	1967	347
2014*	464	n/a

* It is possible that some 2014 data were not yet entered into FWMIS when these data were retrieved from the database.

Ongoing wildlife monitoring surveys were established in the Milk River region through the MULTISAR program and have now expanded throughout the entire grassland region (F. Blouin pers. comm.). A significant number of the Alberta observations of chestnut-collared longspurs were recorded in southern Alberta during this program (see Table 1).

2. Other Areas - According to BirdLife International (BirdLife International 2010), there is an estimated population of 5,600,000 birds in North America; the Partners in Flight Landbird Population Estimate Database (Partners in Flight Science Committee 2013) suggests that there are three million chestnut-collared longspurs in North America, and an estimated 600,000 in the Canadian population.

The trends for chestnut-collared longspur populations vary throughout its range. At some locations it is considered common and abundant, but at most others it is considered to be unstable and declining by up to 13%–58% over the most recent 10-year period for which data are available (calculated from data summarized in Sauer et al. 2014).

Between 1966 and 2007, population decreases (based on BBS Estimation Equation) were recorded across this species' entire range at a rate of -2.8% per year (Sauer et al. 2008). Using the new hierarchical model analysis method, the decrease is greater at -4.23% per year (CI= -5.10 and -3.30) survey wide (1967–2012); the decrease over the most recent 10-year period (2002–2012) was -2.64% per year (CI= -4.59 and -0.49) or equivalent to a decline of 23.5% over the entire 10-year period (calculated from data summarized in Sauer et al. 2014).

In Canada, Sauer et al.'s (2014) new hierarchical model analysis identifies the annual decline (1967–2012) of 5.76% (CI= -7.37 and -4.08) with a 10-year decline (2002–2012) of 4.30% per year (CI= -7.14 and -0.96) (equivalent to 35.6% over the 10-year period; calculated from data summarized in Sauer et al. 2014).

Chestnut-collared longspurs are one of the most abundant grassland bird species found in Saskatchewan (Saskatchewan Wetland Conservation Corporation 2002). Historical densities of breeding pairs in Saskatchewan from grazed and ungrazed plots at Matador, Saskatchewan ranged from 0.7 to 1.2 pairs per hectare and 0.0 to 0.2 pairs per hectare, respectively (Maher 1973 *cited in* Hill and Gould 1997). BBS trends analysed in Sauer et al. (2008) show a decline in this province at approximately -3% per year with the former estimating equation analysis method (1966–2007), while a loss of 4.29% per year is identified with the new hierarchical model analysis (1968–2012; Sauer et al. 2014). The most recent 10-year trend (2002–2012) for Saskatchewan shows a decline of 34.0% over the 10-year period (calculated from data summarized in Sauer et al. 2014).

The Manitoba population, according to Sauer et al. (2008), has declined steadily since 1966. Very few occurrences of this species have been recorded since 1985. The annual trend with the new model analysis is a decline of 7.51% (1967–2012) and the current 10-year trend for this species within Manitoba appears to be an ongoing loss of -57.7% over the 10-year period from 2002 to 2012 (calculated from data summarized in Sauer et al. 2014). According to Artuso et al. (2010), the species is currently confined to the westernmost areas of Manitoba (Region 1 in the Manitoba Breeding Bird Atlas) and is experiencing a range collapse in that province.

Information from the North American Breeding Bird Survey from 1966 to 2001 identifies the United States (U.S.) continent-wide population of chestnut-collared longspurs as decreasing at 2% per year (Sauer et al. 2001 *cited in* Sedgewick 2004). Sauer et al.'s (2014) new hierarchical model analysis identifies the U.S. annual decline (1967–2012) at 3.76% (CI= -4.75 and -2.74) with a 10-year decline (2002–2012) of 2.33% per year (CI= -4.57 and -0.17) (equivalent to 21.02% over the 10-year period; calculated from data summarized in Sauer et al. 2014).

In North Dakota and South Dakota from 1980 to 1996, the survey showed annual declines in both states (-2.2%; $p < 0.09$, n=35 routes and -11.1%; $p < 0.01$, n=22 routes, respectively) (NatureServe 2014a). The decreases are now at 3.24% per year (n=39; equivalent to 28.1% over the period 2002–2012) and 1.37% per year (n=36; equivalent to 12.9% over the period 2002–2012) for North Dakota and South Dakota, respectively, using the new analysis method (calculated from data summarized in Sauer et al. 2014). Montana is considered to have about 32% of the global breeding

population and 67% of the global breeding range (Montana Natural Heritage Program 2010). No significant declines appeared to be occurring over the long term in Montana according to the North American BBS (1966–2007) (0.1% per year; P=0.97, N=23) (Sauer et al. 2008) with the old analysis method. However, when applied to more recent data, over the most recent 10 years, the new analysis method is showing a declining trend at -1.87% per year (2002–2012) (equivalent to a decline of 17.2% over the 10-year period; calculated from data summarized in Sauer et al. 2014).

Breeding populations have been greatly reduced in Nebraska and Minnesota and the species no longer breeds in Kansas, where it was once abundant in the 1870s (Hill and Gould 1997). Bailey and Niedrach (1938) did not discover any nesting chestnut-collared longspurs in Colorado. Since then, there has been some evidence (low numbers) of breeding populations in northeastern Colorado (Sauer et al. 2008). The number of BBS routes in Colorado (n=7; Sauer et al. 2014) is too low to provide reliable trend information.

The results of a three-year Chihuahuan desert grassland study identify a 48% decrease in the proportion of transects on which chestnut-collared longspur was detected (from 27% occurrence in 2007 to 14% in 2008), with no significant decrease between these years in global density (Levandoski et al. 2008). However, a subsequent increase of 23% in the proportion of transects on which the species was detected occurred between 2008 and 2009, likely with the addition of two new study areas to the surveys (Panjabi et al. 2010). Chestnut-collared longspurs were very common and were the most numerous species observed in 2008 and 2009.

Christmas Bird Count data provide a population estimate of this species on its wintering grounds in the U.S. (see Figure 2). Trend information collected is based on the number of birds reported per party hour (amount of effort expended or the time spent searching for birds). The data do not show a clear trend between 2003 and 2013 (Figure 4). As with any survey, not all areas are examined and data collected by public participation can often result in small sample sizes, and yearly participation and data fluctuations (National Audubon Society, Inc. 2014).

3. Rescue Potential - Rescue potential considers the likelihood of immigration of individuals from neighbouring jurisdictions to reproduce successfully in Alberta, such that extirpation or decline of a population could be mitigated. It is possible that chestnut-collared longspurs could immigrate into Alberta from adjacent jurisdictions, such as Montana or Saskatchewan, and they would likely be adapted to survive here. However, populations are declining in most of these jurisdictions, which might limit immigration potential. There may be habitat currently available for immigrants to the Alberta population; however, the future of grassland habitat is uncertain. The rescue of Alberta's chestnut-collared longspur is dependent on the long-term availability of grassland habitats, and is therefore also uncertain.

LIMITING FACTORS

The greatest threat to the chestnut-collared longspur has been the loss and degradation of native prairie grassland (Environment Canada 2010). Various activities contribute to the loss of habitat, including the conversion of native prairie grassland to cropland and expanding urban, rural and industrial developments (e.g., energy sector: oil, gas, open-pit coal mines, wind power and water management projects). A major cause of habitat degradation is an increasing number of transportation and utility corridors. The encroachment of woody vegetation (Grant et al. 2004) and the introduction of non-native/exotic plant species can degrade habitat to the point of excluding this species or lowering

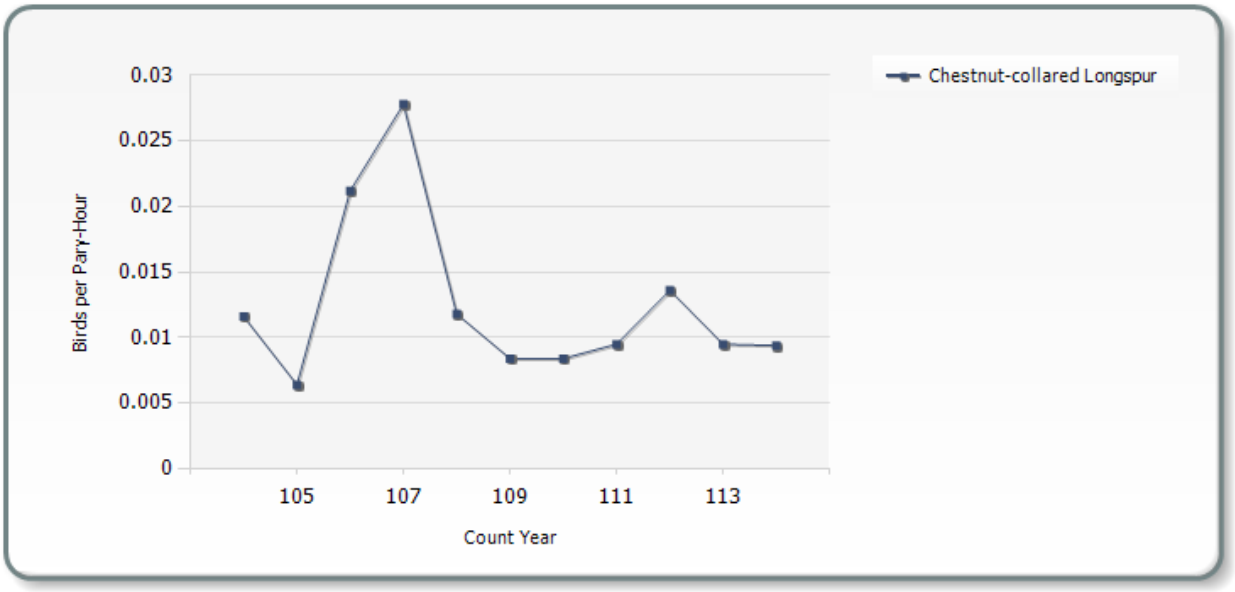

Figure 4. Christmas Bird Count data for chestnut-collared longspur on their wintering grounds in the United States (2003 [count 104]−2013[count 114]). Obtained from: National Audubon Society, Inc. (2014).

reproductive success (Lloyd and Martin 2005). Additional degradation occurs with ongoing activities such as pesticide use and certain landscape management practices (e.g., livestock overgrazing) (Sedgewick 2004).

1. Introduction of Exotic/Invasive Species - Degradation and alteration of breeding habitat can affect populations of grassland songbirds. Introduction of exotic grass is often associated with roads and traffic (seed spreading; Von der Lippe and Kowarik 2007), but has also resulted from direct planting in reclamation of disturbed habitats or for creating grazing pastures. Native prairie in CFB Suffield NWA, for example, is potentially threatened by several invasive and agronomic plant species that have been recorded there, such as crested and intermediate wheatgrass (*Agropyron* spp.), several brome species (*Bromus* spp.), Canada thistle (*Cirsium arvense*), alfalfa (*Medicago sativa*) and others (see Environment Canada 2014b for a complete list). In particular, crested wheatgrass is assumed to have adverse effects on chestnut-collared longspur; other species such as downy brome are limited to riparian and riparian slope areas where the longspur is not generally found (B. Dale pers. comm.). Chestnut-collared longspurs studied in exotic (monoculture) grassland of crested wheatgrass had 17% lower nest success than in native habitats (Lloyd and Martin 2005). Nestlings in the exotic habitat grew more slowly and had a lower fledging mass compared to those in the native grassland. However, there was no evidence that chestnut-collared longspurs preferred to nest in native habitat, despite the adverse consequences to reproductive fitness of nesting in the exotic habitat (Lloyd and Martin 2005). Hamilton (2010) found that chestnut-collared longspur territories often contained some crested wheatgrass, but the birds did not use continuous blocks of this exotic grass. These study results support the importance of maintaining native prairie lands and the potential risk for grassland birds when exotic plant species (e.g., crested wheatgrass) are used in reclamation activities (e.g., around disturbed habitat such as natural gas wells).

2. Oil and Gas Development - Activities related to the energy sector (increased road,

oil and gas development) fragment and reduce grassland habitat and, although there is some evidence that chestnut-collared longspurs avoid energy infrastructure, the reported responses to infrastructure vary among different studies. For example, Hamilton et al. (2011) found no effect of gas well density on abundance of chestnut-collared longspurs at CFB Suffield, although as part of the same study, Hamilton (2010) reported that chestnut-collared longspur abundance decreased as overall infrastructure (well sites, pipelines, pipeline junctions, roads and trails) within grassland blocks increased. Rodgers (2013) found evidence that chestnut-collared longspur abundance declined closer to gas well infrastructure; she suggested this may be because these birds are ground foragers and do not display from shrubs or other perch sites such as well infrastructure (Hill and Gould 1997). Linnen (2008) found significantly fewer longspurs within 50 m of oil wells than at distances of 150 m and higher within CFB Suffield.

3. Roads and Other Linear Features - Disturbances such as off-road trails, cattle grazing, haying, and exotic grass pastures are somewhat tolerated by chestnut-collared longspurs, but they may avoid roads (Koper and Schmiegelow 2006b), although a later nonlinear re-analysis found no response to distance to roads (Sliwinski and Koper 2012). In Saskatchewan, Sutter et al. (2000) found chestnut-collared longspurs to be 56% less abundant along roads as compared to trails, but they did not compare trail counts to those away from linear features; they suggested the birds are deterred by the dense vegetation found in ditches, increased predation risk, and vehicular disturbance.

4. Pesticide/Insecticide Applications - The effects of pesticides on this species are not fully known. In a study in Alberta, Martin et al. (1998, 2000) found that the application (at recommended rates) of insecticides (Decis 5F ™ in 1998; Decis 5F ™ and Furadan 480F ™ in 2000) to control grasshoppers, effectively reduced the grasshopper population but did not appear to reduce the quantity of food delivered to nestling chestnut-collared longspurs. They found that nestling mass and size were unaffected by insecticide application, but that adult longspurs were travelling longer distances to obtain arthropod prey for their nestlings. Furadan (a carbamate) applied at a rate of 132 g/ha, was found to have a significant effect on the age-correlated brain acetylcholinesterase (an enzyme present in the central nervous system, particularly in nervous tissue, muscle, and red cells) movements of nestlings (i.e., sickness, reduced appetite, inhibited/depressed activity because of acute toxicity), but had no apparent effect on adults (Martin et al. 2000). Adult chestnut-collared longspurs continued their typical behavioural activities around the nest. No mortalities were attributed solely to Furadan, and neither Furadan nor Decis (a pyrethroid; application rate 6.25 g/ha) had any apparent effect on reproduction (Martin et al. 1998, 2000).

McEwen et al. (1972, also *cited in* Dechant et al. 1998) studied the application of insecticides on the shortgrass range to control grasshoppers and the effects on wildlife species using this landscape vegetation in Montana. Although the pesticides they evaluated are not registered for use in Canada, it is unknown whether they are still used in the United States or may be used in Mexico, on the wintering grounds of the chestnut-collared longspur. The McEwan et al. (1972) study showed that the application of BAY 77488 (phenylglyoxylonitrile oxime O, O-diethyl phosphorothioate) (an organophosphate insecticide) did not have any measurable effect on birds when application concentrations were 175 g/ha, but population declines occurred when concentrations were increased to 322 g/ha and 651 g/ha. Similarly, population declines occurred when fenitrothion was applied at higher concentrations (441 g/ha and 672 g/ha). Applications of BAYGON (o-isopropoxyphenyl methylcarbamate) in

Wyoming and Montana did not affect birds at concentrations of 140 g/ha, but decreased numbers at higher concentrations (Dechant et al. 1998).

Though also not registered for use in Canada, BAYGON and diazinon (O, O-diethyl O-[2-isopropyl-4-menthyl-6-pyrimidinyl] phosphorothionate) caused direct mortality on adult and/or nestlings (Sedgewick 2004). It seems apparent that any insecticides or pesticides should be applied using the smallest amount necessary for insect control; exceeding the lower concentrations identified for the particular chemicals in the studies above might be harmful to chestnut-collared longspurs. Any application should be administered at strengths and in forms that are least likely to harm this species. Location and landscape features should also be considered when administering chemicals for protection of other grassland flora and fauna.

5. Conversion of Native Grassland to Cropland - With approximately 40%–43% of the original Dry Mixedgrass and 20%–24% of the Mixedgrass native prairie remaining in Alberta (Saunders et al. 2006, Bradley and Neville 2010), much of the original native grassland has been converted to and degraded by human uses, one of which is conversion to agricultural cropland (Bradley and Neville 2010). Studies of habitat use by chestnut-collared longspurs usually indicate that this species does not use cultivated lands (e.g., Owens and Myres 1973, Dale et al. 2005) and they have been reported at lower densities close to croplands compared to farther (Koper and Schmiegelow 2006a, Sliwinski and Koper 2012). However, where native grassland habitat is less available, they will use minimum-tillage summer-fallow fields and fields of spring cereals (Martin and Forsyth 2003, McMaster and Davis 2001). Chestnut-collared longspurs are frequently observed using monocultures of crested wheatgrass (Prescott and Wagner 1996, Sutter and Brigham 1998, Davis et al. 1999, Lloyd and Martin 2005; but see Davis and Duncan 1999, and Conservation Biology and Limiting Factors [1. Introduction of Exotic/ Invasive Species] sections), but they tend to have lower nest success in crested wheatgrass compared to native habitats (Lloyd and Martin 2005.

It is also important to consider habitat loss and degradation at the landscape level. Davis et al. (2006) studied responses of prairie passerine birds to habitat patch size and suggested that patch size alone has minimal effect on chestnut-collared longspur nest survival. Rather, landscape-level factors are more important for predicting nest survival; for example, in Davis et al.'s (2006) study, daily nest survival decreased with increasing distance to the edge in landscapes with greater than 50% croplands (which is attributed to an increase in grassland nest predators in the interior of patches). They also suggest that parcels of mixedgrass prairie in fair to excellent range condition, of greater or equal to 18 ha in size provide an important role in conserving declining grassland bird species populations. Likewise, Koper and Schmiegelow (2006b) also found that longspur densities were influenced by overall landscape, in addition to neighborhood and local-level influences. Most importantly, the results from these two studies suggest that maintaining native grasslands at a landscape level may be important in the conservation of chestnut-collared longspurs and other grassland birds.

6. Grazing and Mowing - Chestnut-collared longspur densities are almost 10 times greater on grazed native grasslands compared to all ungrazed habitats (Maher 1973 *cited in* Hill and Gould 1997). Nonetheless, cattle grazing regimes are unlikely to mimic the heterogeneous grazing patterns of historical primary grazers, such as bison and pronghorn (Sedgewick 2004). Grazing regimes (e.g., time of year, cattle density) that optimize breeding habitat for chestnut-collared longspurs will vary with location, precipitation patterns, and

plant productivity. Xeric, shortgrass habitats are more vulnerable to being overgrazed, which reduces vegetation available for nesting chestnut-collared longspurs (Sedgewick 2004). In moist, mixedgrass habitats, light grazing regimes or lack of grazing will deter birds from nesting, because the resulting vegetation will be too thick and tall for chestnut-collared longspurs (Maher 1973 *cited in* Hill and Gould 1997, Dechant et al. 1998).

In Alberta, chestnut-collared longspurs require moderately-grazed and heavily-grazed grasslands (Wershler et al. 1991), provided the area has received adequate precipitation. Prescott and Wagner (1996) found no significant differences in the frequency of chestnut-collared longspur occurrences between the four grazing regimes they examined: early-season tame, seeded (grazing late April–mid-June), early-season native (grazed early summer), deferred-grazed native (after July 15) and continuously grazed native. A two-year Saskatchewan study comparing season-long and rotation systems (Davis et al. 2014) and a four-year comparison of summer and fall grazing at Onefour, Alberta (B. Dale unpubl. data) found no effect of grazing system or timing on chestnut-collared longspur occurrence or abundance. However, nesting success in the different grazing regimes in these studies was not recorded. Anstey et al. (1995) found that chestnut-collared longspurs were more likely to be present in native grazing pastures with higher range-condition scores (measure of grassland community health—the site potential or climax vegetation) compared to lower range-condition scores, although a later more complex analysis found no relationship between chestnut-collared longspur and range condition (Davis et al. 2014). The range health assessment (range-condition) scores that were used by Anstey et al. (1995) were based on Wroe et al. (1988); this system has since been replaced with a new range health assessment (Adams et al. 2004). This new assessment builds on the former range-condition assessment, which includes natural processes and ecological function indicators performed by healthy rangelands, in addition to the plant community type in its relationship to the site potential. Assessment scores are produced in general categories of healthy (>65% of what would be considered normal conditions), healthy with problems (65%–35% of normal) and unhealthy (<35% of normal) (Adams et al. 2004). Range health is related to habitat heterogeneity, so range-condition assessments could be used in the management of longspur nesting habitat.

In their Alberta study, Owens and Myres (1973) found that chestnut-collared longspurs preferred mowed habitats to ungrazed habitats. However, Bollinger et al. (1990) and Frawley (1989 *cited in* Davis et al. 1999) found that mowing early in the breeding season destroys approximately 50% of ground nests and nesting cycles are not completed on sites with repeated mowing; based on these studies, mowing does not provide a stable breeding environment for grassland birds. Decreased vegetation height and density through mowing and haying (through the Permanent Cover Program in Alberta, Saskatchewan and Manitoba; McMaster and Davis 2001) can improve habitats for chestnut-collared longspurs, provided mowing does not occur during the breeding season (May to early August). Grazing of native grasslands is still preferred to mowing or haying (Sedgewick 2004).

7. Fire Management - Fire suppression is thought to have decreased the historical abundance of chestnut-collared longspurs on the landscape because of the resulting denser vegetation in the absence of fire (Sedgewick 2004). Dale et al. (1999) did bird counts in the Suffield National Wildlife Refuge over two years and divided sites into no, low, and high fire index (number of fires/years since last fire). Chestnut-collared longspurs had their highest percent occurrence in high fire areas and were similarly abundant in low fire areas and areas that did not experience burning. The

authors further evaluated the impacts of fire, grazing, both fire and grazing combined, and areas that experienced neither grazing, nor fire. Chestnut-collared longspurs were found in their highest occurrence in areas experiencing burning and grazing (most notably on morainal soil sites), and their lowest occurrence in areas experiencing only burning. Therefore, fire alone did not necessarily create the right conditions for this species (Dale et al. 1999). In Saskatchewan, after the first season of burning, grassland bird abundance was low but the following year (post burn) bird abundance increased, likely with vegetation recovery (Maher 1973).

8. Wind Energy Development - Wind power in southern Alberta is becoming an increasing concern for the survival of wildlife species, including migrating and breeding grassland songbirds, particularly those with aerial flight displays (ASRD 2011). When wind farm infrastructure is developed, small-scale local displacement of some grassland passerines occurs, likely because of habitat loss and degradation (gravel pads surrounding the turbines and associated access roads), disturbance from increased human activity (maintenance), and the noise and movement of turbine rotor blades (Leddy et al. 1999, ASRD 2011, Naugle 2011).

Habitat loss and degradation from wind farms is likely a more significant impact on grassland birds than direct mortality as a result of striking turbines (Leddy et al. 1999). Results from Buffalo Ridge (Minnesota and South Dakota) show that mortality of resident birds tends to be low (Johnson et al. 2000). During their 4-year study, Johnson et al. (2000) conducted an in-depth evaluation of avian mortality from wind turbines and found 55 avian fatalities comprised of at least 31 species that were associated with wind plant features, 76.4% of which were passerines. However, none of the carcasses found were those of the chestnut-collared longspur (Johnson et al. 2000). Shaffer and Johnson (2009) studied the displacement effects of wind developments on grassland birds in North Dakota and South Dakota. Using a Before-After Control-Impact study design to map grassland bird locations before and after wind turbine construction, they found no evidence of chestnut-collared longspurs avoiding wind turbines. They also found no difference in the density of this species per 100 ha pre- (36.38 birds/100 ha) and post- (36.92 birds/100 ha) treatment. The authors stress that these results are preliminary, as they are from only a single site (South Dakota Wind Energy Center) and for only three years post construction (Shaffer and Johnson 2009). Other wind energy grassland studies have found evidence that grassland songbirds may be affected by wind turbines. Stevens (2011) studied the effects of wind turbines on overwintering grassland birds in Texas; he found that chestnut-collared longspurs did not fly near turbines and strictly used hay fields, although he noted that his sample size was small. Though not specific to the chestnut-collared longspur, in a southwestern Minnesota study, Leddy et al. (1999) found that grassland bird species' densities were lower (58.2–128.0 males/100 ha) on transects placed within 80 m of wind turbines, and higher (261.0–312.5 males/100 ha) in areas located at 180 m or more from turbines. Their results also indicate that sites located 180 m from turbines house grassland bird densities similar to sites where there are no wind turbines at all (261.0 males/ha vs. 312.5 males/ha respectively; $P \leq 0.05$).

9. Climate Change - There are no known studies examining the potential impacts of climate change on the chestnut-collared longspur. However, the 2010 State of the Birds Report on Climate Change (North American Bird Conservation Initiative [NABCI] U.S. Committee 2010) has speculated on the potential impacts of climate change on grassland bird species, suggesting that the northern grasslands (including the breeding grounds of the chestnut-collared longspur) will become drier with

increasing temperatures, and that variability in precipitation may increase droughts, flooding and extreme storms. The chestnut-collared longspur's intolerance of woody shrubs (Grant et al. 2004) may put them at risk of habitat loss, as climate change is predicted to increase atmospheric carbon causing an invasion of woody shrubs in the grasslands (NABCI 2010). The Chihuahuan Desert grasslands are critical wintering areas for this species (Levandoski et al. 2008, Panjabi et al. 2010), and may become uninhabitable as they are expected to become drier as a result of declining precipitation and higher temperatures (NABCI 2010). Grassland birds have shown a lack of ability to relocate in response to warmer winter weather, which may be because of limited quality habitat in the north (NABCI 2010). The chestnut-collared longspur may be equally sensitive to habitat changes as a result of climate change on both its breeding and wintering grounds.

10. Predation and Nest Parasitism - Predation on nestlings is considered to be the single greatest cause of nest failure in chestnut-collared longspurs (O'Grady et al. 1996, Sedgewick 2004), and high nest predation may limit population sizes (NatureServe 2014a). Mammalian species are believed to be the main predators on longspur nests (see Conservation Biology, 4. Potential Predators). It is estimated that 89.5% of all nest failures in Alberta, and 97% and 72% of egg and nestling mortality, respectively, in Saskatchewan results from predation (research summarized by NatureServe 2014a).

In a study in southeastern Alberta, the presence of humans on foot around chestnut-collared longspur nests did not increase predation by mammals or predatory birds as identified by O'Grady et al. (1996). There was evidence that nest predation rates were negatively correlated with human activity, suggesting the predators may have been avoiding contact with humans (O'Grady et al. 1996).

Brown-headed cowbird *(Molothrus ater)* brood parasitism is not known to have a major effect on chestnut-collared longspur productivity (Hill and Gould 1997). A few studies have found evidence of the presence of cowbird eggs in longspur nests: Jones et al. (2010) reported 2% parasitism in Montana (n=770); Davis (2003) reported 16.3% (n=490) parasitism in Saskatchewan; Stewart (1975 *cited in* Sedgewick 2004) in South Dakota reported a 23% parasitism rate (n=62); and Harris (1944) in Manitoba found two cowbird eggs in one nest. Cowbird eggs are infrequently found in chestnut-collared longspur nests in Alberta; only 29 (5%) of 620 longspur nests reported in Hill and Gould (1997) contained cowbird eggs. The infrequent parasitism of longspur nests, as suggested by Davis et al. (2002), may be attributed to other anti-parasite strategies, such as nest defence behaviour. The placement of chestnut-collared longspur nests near perches may facilitate parasitism by cowbirds (Dechant et al. 1998).

11. Other Natural Phenomena - Many grassland bird species can be infected by disease or parasites. Blowfly larvae (*Protocalliphora metallica*) are one such parasite that can contribute to nestling mortality. Infestation weakens the nestling, making it more vulnerable to disease or inclement weather. Martin et al. (1998 and 2000) found individual nestlings, and in a few cases entire chestnut-collared longspur broods, dead or moribund as a result of severe blowfly larvae infestation. Another parasite found in longspur nests is the flea (*Ceratophyllus garei*) (Hill and Gould 1997). No diseases have been documented.

Severe weather events can have an effect on populations of grassland bird species. Extreme temperatures and precipitation can destroy nests, disrupt nesting and egg laying, affect nestling survival during storms (DuBois 1935, Martin et al. 1998) and cause decreased seed and arthropod productivity (i.e., lower food availability; Sedgewick 2004). Chestnut-

collared longspur nest desertion (n=38, 2.6%; O'Grady et al. 1996) and nest failures (n= 254, approx. 1.5%; Hill and Gould 1997) were found to be affected by weather in Alberta (NatureServe 2014a, Sedgewick 2004). Inclement weather conditions can affect chestnut-collared longspur populations on both their wintering and breeding grounds and during migration. Longspurs have evolved in a landscape that experiences variable climatic events and as such, these events and those listed previously (e.g., predation, brood parasitism and ectoparasites) are not considered a severe limiting factor for this species (Sedgewick 2004).

12. Mortality on, and changes to, Migration or Wintering Grounds - Declines in numbers have been observed on the wintering grounds (Christmas Bird Count data; National Audubon Society, Inc. 2014). No specific causes of mortality during migration or on the wintering grounds have been identified. The Cooper's hawk is a potential predator of chestnut-collared longspurs on the wintering grounds (Sedgewick 2004), but predation on the wintering grounds is unlikely to be driving population declines. Wintering chestnut-collared longspurs were significantly more abundant on well-managed private ranches with prairie dog colonies than on ranches without prairie dogs or on communal grazing lands with prairie dog colonies (Desmond 2004). Natural events such as sudden changes in weather including spring and early fall storms may contribute to mortality during migration of longspur species (Elphick 2007).

Changes to wintering ground habitat may be contributing to the declines being recorded on the breeding grounds (Sedgewick 2004), but no information has been identified as to specific changes. Changes in management practices on the wintering grounds (e.g., changes in grazing regimes, cultivation) and variable rainfall affecting vegetation can possibly cause population decreases (Sedgewick 2004), as is the case with changes on the breeding grounds. Distribution patterns of chestnut-collared longspurs on the wintering grounds vary yearly and are thought to be related to the distribution, abundance, and availability of seed resources (Sedgewick 2004). This adds to the challenge of surveying populations on the wintering grounds.

STATUS DESIGNATIONS*

1. Alberta - The chestnut-collared longspur has not been listed under Alberta's *Wildlife Act* and has not undergone a previous detailed status assessment in Alberta. The 2000 and 2005 *General Status of Alberta Wild Species* identified the chestnut-collared longspur as *Secure*; however, in 2010 the general status rank was changed to *Sensitive* because of the perception of declines (ESRD 2014a; G. Court pers. comm.). The current NatureServe ranking for this species within the province of Alberta is *S5B* (ACIMS 2010b).

2. Other Areas - The Committee on the Status of Endangered Wildlife in Canada identified the chestnut-collared longspur as *Threatened* in 2009 (COSEWIC 2009), a result of evidence that severe population declines have occurred since the 1960s and declines have continued, albeit at a slower rate, over the decade preceding the assessment. As such, the species has been listed as *Threatened* under the federal *Species at Risk Act* (Species at Risk Public Registry 2014). NatureServe (2014a) ranks the chestnut-collared longspur as N5B in Canada.

In the other Canadian provinces, Saskatchewan's designation for this species is *S5*, *S5B* (Pepper 2010, Saskatchewan Conservation Data Centre 2010) and Manitoba's is *S1S2B* (NatureServe 2014a). There have been only three documented sightings in Ontario (1991, 1978, and 1971), where the species is considered an accidental,

* See Appendix 1 for definitions of selected status designations.

non-breeding vagrant (Ontario Natural Heritage Information Centre 2010).

On a North American scale, the chestnut-collared longspur has been identified as a North American Grassland Priority Conservation Areas Focal Species, and is considered for the planning of prairie conservation areas (Commission for Environmental Cooperation and The Nature Conservancy 2005).

NatureServe (2014a) identifies the global status of the chestnut-collared longspur as *G5* or *Secure* (latest review July 30, 1999), and the International Union for Conservation of Nature Red List of Threatened Species (2010) identifies the species as *Near Threatened* because of its decreasing population trend. NatureServe (2014a) also identifies the species as *N5B*, *N5N* in the United States, with the status in individual states as follows: Arizona (*S3N*), California (*SNRN*), Colorado (*S1B*), Kansas (*S3N*), Louisiana (*S4N*), Minnesota (*S1B*), Montana (*S2B*), Navajo Nation (*SNA*), Nebraska (*S3*), Nevada (*SNA*), New Mexico (*S3N*), North Dakota (*SNRB*), Oklahoma (*S4N*), South Dakota (*S4B*), Texas (*S3*), Wyoming (*S1*).

RECENT MANAGEMENT AND RESEARCH IN ALBERTA

1. Habitat Securement, Protection, Enhancement and Stewardship - Currently, there are no specific management activities targeting chestnut-collared longspurs in Alberta. However, conservation of this species depends on the preservation of the shortgrass and mixedgrass prairie landscapes and there are currently a few programs within Alberta that are working with ranchers, landowners and other agencies to help protect, secure and restore Alberta's native grassland.

The *Multiple Species at Risk (MULTISAR)* program was initiated in 2002 to conserve habitat for species at risk throughout the Grassland Natural Region in Alberta. *MULTISAR* works with ranchers and farmers to conserve wildlife habitat on their properties. Two options are currently available through *MULTISAR*. The first option is a rapid, one-time habitat assessment conducted on native prairie habitats of lower priority (i.e., more common native habitats). This option is called the *Species at Risk Conservation Plan* and landholders manage the land under this plan themselves. There are no intensive species surveys completed with this plan, and landowners are asked to follow four steps: land assessment, recommendations, implementation options, and monitoring follow-up. Landholders are assisted in implementing this plan with an information report and financial assistance. The other option under *MULTISAR* is called *Habitat Conservation Strategies (HCS) and Plan,* which is applied to high priority grassland habitats. This option consists of detailed and ongoing habitat (range) assessments and species inventories. Surveys are conducted over several breeding seasons and include inventories of bird, mammal, and fish species. When the surveys are completed and the species at risk on the land have been identified, a specific management plan to maintain or increase habitat for species at risk is made. Since *MULTISAR's* inception, wildlife surveys and range health assessments have been completed for the program on 236,000 acres and 238,400 acres, respectively, in the grassland region of the province (F. Blouin pers. comm., Blouin et al. 2010, B. Downey pers. comm., MULTISAR 2010).

Additional initiatives to encourage habitat restoration and preservation involve stewardship programs, wildlife surveys, and conservation plans, which are available throughout the province. Agencies and organizations implementing these initiatives in the Grassland Natural Region include The Nature Conservancy of Canada, Eastern Irrigation District, Alberta Conservation Association, Landbird Conservation Plan, Prairie Habitat Joint Venture program of

North American Waterfowl Management Plan, Operation Grassland Community, North American Bird Conservation Initiative, and Prairie Care.

The Permanent Cover Program was implemented from the late 1980s until the early 1990s in Alberta, Saskatchewan and Manitoba. Farmers who enrolled in the program were paid to seed highly erodible land to perennial forage or tree cover. In Alberta, 220,705 ha were converted to permanent cover (Vaisey et al. 1996), and some of the resulting habitat provided nesting opportunities for chestnut-collared longspurs (McMaster and Davis 2001).

2. Research - Research specifically focused on the chestnut-collared longspur is limited. However, several studies have included this species in combination with other grassland bird species. Many former research studies have been documented throughout this report.

Several Canadian universities have past or present research programs that may contribute to the knowledge and management of grassland bird species, including chestnut-collared longspurs. The following research has been conducted (or is currently underway) at the University of Alberta: avian behaviour and movement in fragmented habitats, habitat use by grassland birds (including a Master of Science Thesis: Hamilton 2010), and avian reproduction. The University of Calgary has conducted research on the behavioural ecology of chestnut-collared longspurs and other avian species. The University of Manitoba has conducted research on the reproductive success of chestnut-collared longspur in relation to energy development, and the University of Lethbridge on avian foraging behaviour and impacts of cattle grazing on avian communities. In addition, University of Lethbridge currently holds the Canada Research Chair for Sustainable Grasslands Ecosystems. This chair position will promote environmentally sustainable grassland ecosystems by developing processes and ecological methods, including responsible management and uses of grassland ecosystems.

SYNTHESIS

Conservation of native prairie grasslands is essential to the persistence of chestnut-collared longspurs in Alberta, and large, intact tracts of native grassland are particularly beneficial for the species. This species prefers native grasslands with vegetation less than 20 cm to 30 cm in height and sparse litter accumulation for breeding. As such, grazed habitats are preferred over ungrazed habitats. Reproductive success is higher in native habitats than in tame (exotic) pastures.

This species is known to be tolerant of some human disturbance on the landscape. Well-managed cattle grazing may be able to mimic the historical habitat conditions favoured by chestnut-collared longspurs, and should be considered as a potential management tool. Grazing regimes that result in good to excellent range health (e.g., light or moderate grazing in xeric, shortgrass habitats and moderate to heavy grazing in mesic, mixedgrass habitats, depending on annual precipitation) can create preferred chestnut-collared longspur breeding habitat. Grazing is preferred over mowing as a management tool because of the large numbers of ground nests destroyed by mowing. The use of prescribed burning alone is unlikely to provide adequate habitat for this species, but in combination with grazing may be an effective management technique. Fire may create suitable habitat in subsequent years, but the timing of fire is critical as nests would be completely lost in burned areas.

Use of exotic plant species, such as crested wheatgrass, should be avoided in reclamation activities on disturbed native habitats, including reclamation by the energy sector and "improvement of pastures" by the agriculture sector. Chestnut-collared longspurs may avoid areas adjacent to roads and, although empirical

evidence is so far not conclusive, road development, pipelines and other industrial activities are thought to have negative effects on longspur local distribution and abundance and nesting success. There is some evidence that agricultural pesticides may cause internal damage to nestlings.

Natural causes of nest failure include predation, brood parasitism by brown-headed cowbirds, ectoparasites, and severe weather events. Brood parasitism is infrequent and has little impact on overall nest success. Ectoparasites and severe weather events sometimes result in nest failure. Overwhelmingly, predation is the greatest natural cause of nestling mortality, but there is no evidence that predation is connected to population declines. There is little information about predation and other causes of mortality on the wintering grounds.

There is a need for more research and information on the chestnut-collared longspur. Priority research should include studies on the effects of habitat degradation on chestnut-collared longspur reproductive success, impacts of energy sector activities (including gas exploration and the wind industry) on breeding chestnut-collared longspurs, examination of management regimes in native grasslands (e.g., different grazing, densities, controlled burns) that benefit chestnut-collared longspurs, control of exotic and invasive plant species, effects of fire suppression on chestnut-collared longspurs in CFB Suffield, and studies of marked populations of chestnut-collared longspurs to determine movement patterns, gene flow, recruitment, natal dispersal, and population-level genetic diversity, and examination of potential long-term impacts of pesticide exposure on chestnut-collared longspurs. Finally, very little is known about habitat use and population dynamics on the wintering grounds and during migration.

Chestnut-collared longspurs are declining in all North American jurisdictions with reliable trends (Sauer et al. 2011). Alberta's long-term trend is the worst on the continent (-7.6%/year [-9.4, -5.9]), but the trend has softened somewhat, such that the 10-year trend is neither the least nor the most negative of the reliable trends. Ongoing monitoring of population trends within Alberta, including additional surveys in areas with few data, is required. Conservation of this species depends on the preservation and maintenance of the native prairie grasslands. The work currently ongoing in Alberta to promote good stewardship and range practices, and to assist landowners in responsible management of these landscapes, should be continued for the benefit of this species and all grassland species.

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Appendix 1. Definitions of status ranks and legal designations.

A. General Status of Alberta Wild Species Categories (used in 2000, 2005 and 2010 General Status exercises) (Alberta Environment and Sustainable Resource Development 2011)

Rank	Definitions
At Risk	Any species known to be *At Risk* after formal detailed status assessment and legal designation as *Endangered* or *Threatened* in Alberta.
May Be At Risk	Any species that may be at risk of extinction or extirpation, and is therefore a candidate for detailed risk assessment.
Sensitive	Any species that is not at risk of extinction or extirpation but may require special attention or protection to prevent it from becoming at risk.
Secure	Any species that is not *At Risk, May Be At Risk* or *Sensitive*.
Undetermined	Any species for which insufficient information, knowledge or data is available to reliably evaluate its general status.
Not Assessed	Any species that has not been examined during this exercise.
Exotic/Alien	Any species that has been introduced as a result of human activities.
Extirpated/Extinct	Any species no longer thought to be present in Alberta (Extirpated) or no longer believed to be present anywhere in the world (Extinct).
Accidental/Vagrant	Any species occurring infrequently and unpredictably in Alberta, i.e., outside its usual range.

B. Alberta Species at Risk Formal Status Designations

Species designated as *Endangered* under Alberta's *Wildlife Act* include those listed as *Endangered* or *Threatened* in the Wildlife Regulation (in bold).

Endangered	**A species facing imminent extirpation or extinction.**
Threatened	**A species likely to become endangered if limiting factors are not reversed.**
Species of Special Concern	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Data Deficient	A species for which there is insufficient scientific information to support status designation.

C. Committee on the Status of Endangered Wildlife in Canada (after COSEWIC 2011)

Extinct	A species that no longer exists.
Extirpated	A species that no longer exists in the wild in Canada, but occurs elsewhere.
Endangered	A species facing imminent extirpation or extinction.
Threatened	A species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern	A species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
Not at Risk	A species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient	A category that applies when the available information is insufficient to (a) resolve a wildlife species' eligibility for assessment, or (b) permit an assessment of the wildlife species' risk of extinction.

D. United States Endangered Species Act (U.S. Fish & Wildlife Service 2005)

Endangered	Any species that is in danger of extinction throughout all or a significant portion of its range.
Threatened	Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Appendix 1 continued:

E. Heritage Status Ranks:

Subnational (S) ranks in Alberta (after Alberta Conservation Information Management System 2013)

S1	Known from five or fewer occurrences or especially vulnerable to extirpation because of other factors.
S2	Known from 20 or fewer occurrences or vulnerable to extirpation because of other factors.
S3	Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors, such as restricted range, relatively small population sizes, or other factors.
S4	Apparently secure. Taxon is uncommon but not rare. Potentially some cause for long-term concern because of declines or other factors.
S5	Secure. Taxon is common, widespread, and abundant.
SX	Taxon is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat. Virtually no likelihood that it will be rediscovered.
SH	Known from only historical records but still some hope of rediscovery. Evidence that the taxon may no longer be present but not enough to state this with certainty.
S?	Not yet ranked, or rank tentatively assigned.
S#S#	A numeric range rank is used to indicate any range of uncertainty about the status of the taxon. Example: S2S3 or S1S3. Ranges cannot skip more than two ranks.
SU	Taxon is currently unrankable because of a lack of information or substantially conflicting information. Example: native versus non-native status not resolved.
SNR	Not ranked. Conservation status not yet assessed.
SNA	Not applicable. A conservation status rank is not applicable because the species or ecosystem is not a suitable target for conservation activities. Example: introduced species.
S#?	Inexact numeric rank. Applied when a specific rank is most likely appropriate but for which some conflicting information or unresolved questions remain.

Global (G), National (N) and other Subnational (S) ranks (after NatureServe 2014b)

G1/N1/S1	Critically Imperiled. At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.
G2/N2/S2	Imperiled. At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
G3/N3/S3	Vulnerable. At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.
G4/N4/S4	Apparently Secure. At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.
G5/N5/S5	Secure. At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.
GX/NX/SX	Presumed Extinct/Extirpated. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood of rediscovery.
GH/NH/SH	Possibly Extinct/Extirpated. Known from only historical occurrences but some hope of rediscovery.
G?/N?/S?	Inexact Numeric Rank. Denotes inexact numeric rank.
G#G#/ N#N#/S#S#	A numeric range rank (e.g., G2G3, G1G3) is used to indicate the range of uncertainty about the exact status of a taxon or ecosystem type. Ranges cannot skip more than two ranks.
GU/NU/SU	Unrankable. Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
GNR/NNR/ SNR	Unranked. Conservation status not yet assessed.
GNA/NNA/ SNA	Not Applicable. A conservation status rank is not applicable because the species is not a suitable target for conservation activities

Appendix 2. Technical Summary

A summary of information contained within this report, and used by the Scientific Subcommittee of Alberta's Endangered Species Conservation Committee for the purpose of status assessment based on International Union for the Conservation of Nature criteria. For definitions of terms used in this technical summary, go to:
http://www.iucnredlist.org/technical-documents/categories-and-criteria
and http://www.cosepac.gc.ca/eng/sct2/sct2_6_e.cfm

Genus species: *Calcarius ornatus*
Common name: Chestnut-collared Longspur
Range of occurrence in Alberta: Locally found in southern Alberta, east from Lethbridge and Calgary, north to the Parkland Natural Region, east to the Saskatchewan border and south to the Montana border. Higher breeding densities have occurred around Taber, Vauxhall and Brooks, east of Milk River, Pakowki Lake, Medicine Hat and Suffield, and near Hanna.

Demographic Information

Generation time (usually average age of parents in the population; indicate if another method of estimating generation time as indicated in the most recent IUCN guidelines is being used). *See Conservation Biology section, p. 9*	~ 2-3 yrs
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Yes – estimated from BBS data
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations]. Based on Breeding Bird Survey there is a 4.99% annual decline over the last 10 years (equivalent to 40.1% total over the 10-year period). When BBS data are augmented by data collected through the Grassland Bird Monitoring Project, annual decline is 5.6%, equivalent to a decline of 44% over 10 years. *See Population Size and Trends section, pp. 12-14*	5% decline annually; 40% 10-year average trend, based on BBS data. (BBS augmented by Grassland Bird Monitoring data: 5.6% annual decline; 44% over 10 years)
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations]. *See Population Size and Trends section, pp. 12-14*	Approximately 40-44% decline projected over the next 10 years

Appendix 2 continued:

[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. *See Population Size and Trends section, pp. 12-14*	Approximately 40-44% decline projected over any 10-year period (including both past and future)
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations] *See Population Size and Trends section, pp. 12-14*	23-25% decline estimated over the most recent five years
Are the causes of the decline clearly reversible and understood and ceased? *See Population Size and Trends section, pg. 12-14 and Limiting Factors section, pp. 18-25*	Mostly not reversible; generally understood; not ceased but reduced
Are there extreme fluctuations in number of mature individuals? *See Population Size and Trends section, pp. 12-18*	No

Extent and Occupancy Information

Estimated extent of occurrence *See Distribution section, p. 3*	83,579 km^2
Area of occupancy (AO) (based on 2-km x 2-km grid). *See Distribution section, p. 3*	11, 988 km^2
Is the total population severely fragmented? *See Distribution section, pp. 1-3*	No
Number of locations Main concentrations appear in the central portion of the Mixedgrass Natural Subregion (CFB Suffield and area) and in the southern areas around Taber and Milk River (based on various wildlife survey information). *See Distribution section, pp. 1-3 and Figure 1, p. 2*	Unknown but likely many, based on the scale of the threats affecting this species.
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence? *See Distribution section, pp.1-3*	Unknown but possible, given population declines

Appendix 2 continued:

Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy? *See Distribution section, pp. 1-3*	Unknown but possible, given population declines
Is there an [observed, inferred, or projected] continuing decline in number of populations? *See Population Size and Trends section, pp. 12-14*	No
Is there an [observed, inferred, or projected] continuing decline in number of locations? *See Distribution section, pp. 1-3*	No
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat? *See Habitat, pp.5-8 and Limiting Factors sections, pp. 18-25*	Yes. Observed continuing decline in quality of native grassland habitat
Are there extreme fluctuations in number of populations? *See Population Size and Trends section, pp. 12-14 and Distribution section, pp. 1-3*	No
Are there extreme fluctuations in number of locations? *See Distribution section, pp. 1-3*	No
Are there extreme fluctuations in extent of occurrence? *See Distribution section, pp. 1-3*	No
Are there extreme fluctuations in index of area of occupancy? *See Distribution section, pp. 1-3*	No

Number of Mature Individuals (in each population)

Population	**N Mature Individuals**
Total: The total estimated number of birds residing in Alberta at any one time is unknown, but increasing observation and survey locations may also increase population numbers. *See Population Size and Trends section, pp. 14-18*	400,000 based on 1998–2007 BBS counts

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	No analysis completed

Appendix 2 continued:

Threats (actual or imminent, to populations or habitats)

Fragmentation and loss of native prairie grassland through landscape conversion to cropland or urban development, and changes to the landscape associated with the energy sector (i.e., road, trail and pipeline and other linear developments that fragment the landscape and allow or accelerate invasion of non-native plants). Additional potential threats include pesticide applications for control of pest insect species, range management practices, predation, winter habitat conditions, parasites and disease, and migration challenges. *See Limiting Factors section, pp. 18-25*

Rescue Effect (immigration from outside Alberta)

Status of outside population(s)? Decline over Canadian and U.S. range with Manitoba, Alberta, Saskatchewan and North Dakota appearing to be most affected. *See Population Size and Trends section, pp. 16-18*	
Is immigration known or possible?	Possible
Would immigrants be adapted to survive in Alberta?	Yes
Is there sufficient habitat for immigrants in Alberta? *See Habitat section, pp. 5-8*	Currently, yes but could become fragmented and quality of native habitat could be degraded
Is rescue from outside populations likely? However, populations are declining in all of these jurisdictions. *See Rescue Potential, p. 18*	Possible from Montana, Saskatchewan or North Dakota

Current Status

Provincial: Sensitive (Alberta Sustainable Resource Development, Fish and Wildlife Division) **National**: Threatened (COSEWIC) Elsewhere: G5- Secure (Nature Serve), Near Threatened (The International Union for Conservation of Nature) *See Status Designations section, pp. 25-26*

<u>Additional Sources of Information</u>:

COSEWIC. 2009. Assessment and Status Report on the Chestnut-collared Longspur – *Calcarius ornatus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. Vi + 36 pp. URL: www.sararegistry.gc.ca/status/status_e.cfm.

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