REVISED ACTION PLAN
FOR THE GREAT BUSTARD IN ASIA

GOVERNMENT OF MONGOLIA
MINISTRY OF ENVIRONMENT AND TOURISM

CMS

Eurasian Bustard Alliance
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Wildlife Science and Conservation Center of Mongolia

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Convention on the Conservation of Migratory Species of Wild Animals (CMS)

REVISED ACTION PLAN FOR THE GREAT BUSTARD IN ASIA

Otis tarda

Produced by
Eurasian Bustard Alliance
Wildlife Science and Conservation Center of Mongolia
Ministry of Environment and Tourism of Mongolia

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Male Western Great Bustard in full display in Central Europe
Photo: F. J. Kovacs

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Displaying male Eastern Great Bustards, eastern Mongolia. *Photo: L. Jargal.*

Section 1
Executive summary

Although the Great Bustard was once common and widespread in Asia, today likely only approximately 500-1000 Western Great Bustards (*Otis tarda tarda*) and 1300-2200 Eastern Great Bustards (*Otis tarda dybowskii*) remain on the continent. The Western Great Bustard persists in larger numbers in the Iberian Peninsula, Central Europe, and the Lower Volga River Region of the Russian Federation. The presence of these European populations justifies the global evaluation of the Great Bustard as Vulnerable (A3cd+4cd) by IUCN (BirdLife International 2019), though recent studies find the Volga population to also be suffering acute declines (Oparin & Oparina 2020). However, the Eastern Great Bustard, which exhibits genetic and morphological differentiation from the Western (Kessler et al. 2018), is distributed only within the area covered by this Action Plan.

Today, the Asian range of the Great Bustard is highly fragmented. To put Great Bustard population sizes in Asia into context, approximately 30% fewer Western Great Bustards persist in Asia as in Hungary, however they are scattered across an expanse of formerly occupied habitat approximately 30 times the area of Hungary (Alonso & Palacín 2022). Many leks in Asia are so small and isolated that the loss of a few adults will deal a lethal blow to the subpopulations to which they belong. Regional subpopulations near extinction include those in the Islamic Republic of Iran, Western Siberia, and the Uvs Lake Depression.

The perilous status of the Great Bustard in Asia is recognized in national and provincial red listing statuses, and in strict prohibitions on hunting across the entire range. The issue of the conservation of the Great Bustard in Asia has been elevated at the international level, with uplisting to Appendix I of the Convention on Migratory Species in 2014 and establishment of a Concerted Action for Great Bustards in Asia in 2017. And yet, action and funding commitments for this species have trailed behind that of species of similar or lower conservation concern. Little progress has been made in either research or implementation of management measures since the first Action Plan for Great Bustards in Asia in 1998 (Chan & Goroshko 1998), and Great Bustard numbers are reported as decreasing in 60% of the populations which were reported to this Action Plan.

Meanwhile, threats to the Great Bustard in Asia are significant and growing. Most urgent among them are poaching and intentional poisoning, while collisions with powerlines are likely to increase considerably in coming years as green energy developments sprawl across the species' typically open and dry habitats. Predation by free-roaming dogs represents an additional source of adult mortality. Challenges to reproduction include destruction of clutches by agricultural machinery, overgrazing of habitat, and steppe wildfires. Without urgent action, a combination of high anthropogenic mortality and low reproduction is likely to drive further declines.

Conservation activities must be pursued urgently and vigorously if populations of the Great Bustard are to be retained in Asia. While recommended conservation actions differ from region to region, there are some common priorities. Most urgently, poaching must be brought under control in all range states. Lek sites need to be catalogued and safeguarded, and causes of reproductive failure researched and managed. Media campaigns should be undertaken to engender pride and concern for this charismatic species. Outreach may have the additional effect of inspiring volunteer activity, which has played a key role in addressing poaching in China. Essential to all of these activities: governments of Asian range states must increase funding and resources for Great Bustard conservation to a level commensurate with the degree of endangerment of these populations. Due to the species' low rate of reproduction, these commitments to conservation must be sustained over the long-term to achieve population increases. Finally, Asian populations of the Great Bustard will benefit greatly from coordination and information-sharing between range states. Great Bustards exhibit annual, long-distance migration in Asia crossing international borders. Additionally, almost one-half of key sites identified by contributors to this plan are located within 100 km of an international border.

This Action Plan consolidates information to facilitate the conservation of the Great Bustard in Asia. In section 3, we summarize our current understanding of the biology and ecology of the Great Bustard in Asia using research findings from across Asia. In section 4, we describe the current range of the Great Bustard in Asia and present a detailed population estimate for both the Central Asian population of the Western Great Bustard and the entire extant population of the Eastern Great Bustard using data shared by over thirty contributors from ten Asian range states. We draw from discussions undertaken at the 2017 conference "Advancing the Conservation of the Great Bustard in Asia," that was held in Mongolia as well as published literature and information from contributors, to summarize current threats to the Great Bustard in Asia in section 5, and the extent of conservation measures already undertaken in section 6. Conservation measures and prioritization for each range state are presented in section 7. A key resource for conservation can be found in the appendices, where we have catalogued the most important contemporary sites for this species in Asia.

Section 2

Relevance and scope of the Action Plan

Eastern Great Bustard nest in northern Mongolia. *Photo: M. Toomey.*

2.1 – Relevance of the Action Plan

While the Great Bustard (*Otis tarda*) is classified as Vulnerable (A3cd+4cd) worldwide, populations in Asia are at higher risk (BirdLife International 2017; Kessler 2022). These eastern populations regularly migrate long distances, requiring international coordination for their conservation.

In 1998, the first international Action Plan was created to address the conservation of these populations of Great Bustard (Chan & Goroshko 1998). In 2014, the Government of Mongolia successfully proposed an uplisting of the global status of Great Bustards to Appendix I of the Convention on Migratory Species at the 11th meeting of the Conference of Parties (Government of Mongolia et al. 2014). In 2017, the conference "Advancing the Conservation of the Great Bustard in Asia" was held in Ulaanbaatar, hosted by the Government of Mongolia and organized by the Eurasian Bustard Alliance and Wildlife Science and Conservation Center of Mongolia. This conference brought together participants from nine countries, who shared current information on the distribution and threats to this species. A proposal for a Concerted Action for Great Bustards in Asia was produced with input of participating researchers, and received unanimous support at the 12th meeting of the Conference of Parties to the Convention on Migratory Species (Government of Mongolia et al. 2017).

An updated Action Plan for Great Bustards in Asia is a primary goal of the first triennial period of the Concerted Action. The aim of this Action Plan is to serve as a primary resource for the conservation of remaining populations of Great Bustard in Asia by assembling up-to-date information on population estimates, key sites for the species, current threats and recommendations for action, alongside a summary of current scientific consensus regarding the ecology of the species in Asia.

2.2 – Method of development of the Action Plan

Development of the Action Plan has been spearheaded by the Eurasian Bustard Alliance and the Wildlife Science and Conservation Center of Mongolia. Material was gathered from approximately 30 regional experts, listed above as co-authors, through the means of two questionnaires. Information from presentations and group discussions regarding threats and recommendations for remedial action at the 2017 conference "Advancing the Conservation of the Great Bustard in Asia" are also included.

The complete first draft was distributed to all contributors and 15 additional experts on conservation in this region for feedback. All comments were considered and incorporated as appropriate. The subsequent draft was distributed to range state governments by the Mongolian Focal Point to CMS for review and comment before submission to the Scientific Council of the Convention on Migratory Species.

2.3 – Geographical scope of the Action Plan

This Action Plan encompasses the territory covered by the Concerted Action for Great Bustards in Asia: the Islamic Republic of Iran (IRI), Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan, People's Republic of China (China; PRC), and adjacent areas of the Russian Federation (RF) from Orenburg Province in the west to the Russian Far East. In order to provide the first detailed population estimate for the Eastern Great Bustard, we also include information from the Korean Peninsula, including the Democratic People's Republic of Korea (DPRK) and Republic of Korea (ROK).

This Plan synthesizes contributions from 30 researchers in 10 countries across this Asian range. This work represents the first detailed population estimates for both the Eastern subspecies, and for the species across the entirety of Asia.

Section 3

Biology and ecology of the Great Bustard in Asia

3.1 – Taxonomy

Class: Aves

Order: Otidiformes

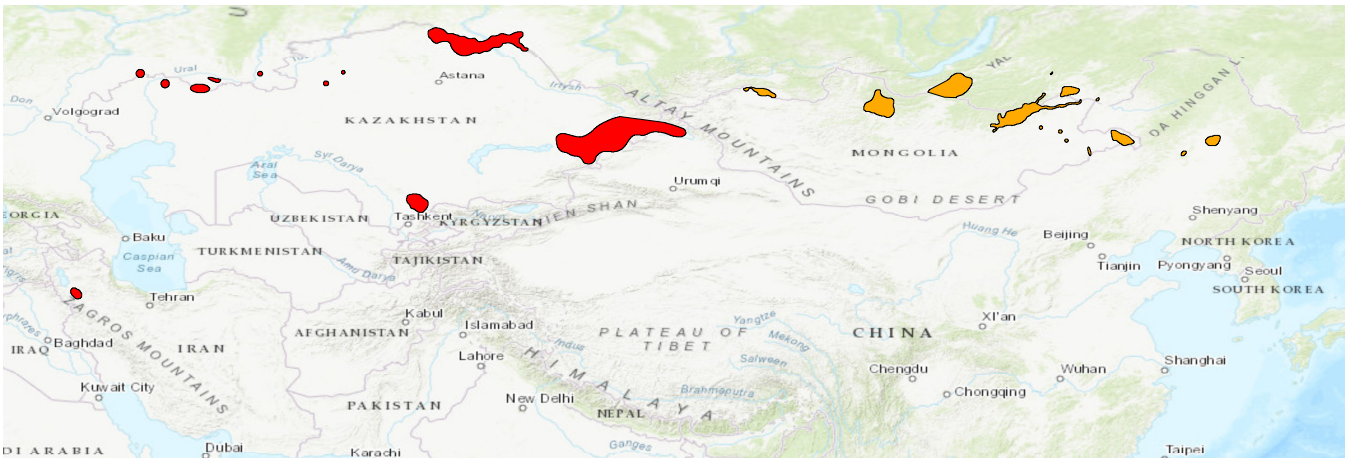
Family: Otididae

Species: *Otis tarda*

Subspecies: Currently two subspecies of Great Bustard are recognized. The western subspecies *Otis tarda tarda* (hereafter "Western Great Bustard") breeds from Portugal eastwards across the southern steppe regions of the Russian Federation into the western foothills of the Altai Mountains (review in Kessler & Smith 2014). The eastern subspecies, *O. t. dybowskii* (hereafter "Eastern Great Bustard") breeds in Mongolia, northeastern China, and adjacent areas of the Russian Federation from the Republic of Tuva to Zabaikal'skii Krai (Map 3-1). Despite extensive inquiry and literature review, we are not aware of any observation of either subspecies within the range of the other.

The two subspecies were described on the basis of plumage characteristics, specifically: 1) pearl-grey wing coverts form a conspicuous pale wing panel in the Eastern Great Bustard, in contrast to the black-barred rufous coverts of the Western Great Bustard; 2) five or more pairs of white outer rectrices are present in the Eastern Great Bustard as compared to primarily rufous rectrices in the Western Great Bustard; 3) the Eastern Great Bustard exhibits coarser black barring on the mantle; and 4) long display plumes near the base of the bill form two tufts, or "moustaches," as well as a bushy "beard" descending the throat in breeding Eastern Great Bustard males, however, breeding Western Great Bustard males exhibit only the moustaches (Taczanowski 1874; Ivanov et al. 1951; Spangenberg 1951; Vaurie 1965; Etchécopar 1978; Cramp et al. 1980; Wang & Yan 2002). No comparative analysis of the breeding displays of the two subspecies has been published. A recent study of variation in the mitochondrial genome across the Eurasian range of the Great Bustard found that the two subspecies have been isolated for 1.4 million years and exchange much less than one female migrant per generation, suggesting that they may constitute distinct species (Kessler et al. 2018).

Common names: 大鸨 (Chinese); Great Bustard (English); Дуадақ (Kazakh); түйеқұс (Kazakh oralman); 느시(Korean); چێرگ (Kurdish); Чоң тоодак (Kyrgyz); Хонин тоодог (Mongolian); میش مرغ (Persian); Большая дрофа (Russian); Дуғдоғ (Tajik); Токлутай (Turkmen); Тогдук (Tuvan); Тухта тувалоқ (Uzbek).



Map 3-1. Contemporary Asian breeding ranges of the two Great Bustard subspecies. The range of the Western Great Bustard (*Otis tarda tarda*) is shown in red, and the Eastern Great Bustard (*Otis tarda dybowskii*) in orange. The ranges of the two subspecies are divided by the Altai Mountains. Data to inform the map were provided by Action Plan contributors.

3.2 – Habitat

Western Great Bustard

In Asia, the Western Great Bustard is described as breeding in *Artemisia* and *Stipa* steppes, and mountain foothills, with some incursion into semi-desert areas (Gubin 2007). It also formerly bred on the mountainous plateaus of the Tian Shan at considerable elevations (Gubin 2007; Nefedov 2013a).

As steppe regions of Central Asia have been converted to agriculture, Great Bustards have adopted low-intensity crop agriculture as habitat. A quantitative field study in the mid-twentieth century found Great Bustards in Kostanai Province of Kazakhstan to prefer fallows to unplowed steppe (Ryabov 1949). However, in northern Kazakhstan and western Siberia, Great Bustards remained on those lands which were unsuitable for plowing, and thus also retained low human population densities (Nefedov 2018).

During and after the economic transition following the dissolution of the USSR, Great Bustards in this region also used abandoned lands in various stages of succession to secondary grassland steppe. Many leks and wintering sites are located in extensive agricultural mosaics incorporating fallow rotations, with foothill pastures also playing an important role (Kessler & Smith 2014). The establishment of soybean fields has been reported as enabling the overwintering of Great Bustards at sites in East Kazakhstan where overwintering was previously uncommon (Berezovikov 2016).

Eastern Great Bustard

The Eastern Great Bustard is described as regularly using a wider variety of breeding habitats. While the Western Great Bustard is occasionally observed using trees for shade or as food sources (Raab et al. 2014), the Eastern Great Bustard may be regularly found at the forest edge (Sushkin 1938). In earlier times, when Great Bustards were more abundant, it was not uncommon for Eastern Great Bustards to breed in small forest openings a considerable distance from open steppe (Mel'nikov & Popov 2000).

Some leks are still found in such locations today, particularly in northern Mongolia, and a telemetry study in the Selenge-Orkhon forest steppe found the majority of nests of a tagged cohort of Great Bustards to be placed near a forest edge (Kessler 2015). Eastern Great Bustards are also described as more tolerant of wet landscapes than Western Great Bustards. These habitats include islands in large rivers, river and lake valleys, and moist meadows (Kozlova 1975; Ponomareva 1986; Goroshko 2002, 2008).

Similarly to the Western Great Bustard, the Eastern Great Bustard has adopted low-intensity agricultural mosaics as habitat. A telemetry study in northern Mongolia found female Great Bustards to spend equal amounts of time in agricultural fields and unplowed pasture during the breeding season, though the availability of pasture was greater (Kessler 2015). Goroshko (2009) found 60% of females in the Daurian steppe to nest in cropland, and Batsaikhan (2002) observed Great Bustards in agricultural lands three times as frequently as in unplowed steppe, across Mongolia. Great Bustards also use agriculture heavily in the non-breeding season, with 74% of wintering areas in China consisting of cropland (Mi et al. 2016). Great Bustards that remain to overwinter at breeding sites in Mongolia are observed almost exclusively on wheat stubble (Batsaikhan 2002), and the establishment of soy fields has attracted additional Great Bustards to overwinter at breeding sites in Manchuria (Liu et al. 2008).

3.3 – Diet

Great Bustards consume the green and reproductive parts of plants, herbaceous and terrestrial invertebrates and less often small vertebrates. Studies in Europe have found invertebrates, particularly Coleopterans, Orthopterans, and Lepidopteran larvae, to play a dominant role in the summer diets of adults and especially chicks (Lane et al. 1999). Seeds and plant parts become the dominant food source during the winter season (Rocha et al. 2005; Bravo et al. 2012). Diet analyses of Great Bustards in Asia have generally similar findings (Liu et al. 2018).

Western Great Bustard

The most extensive research on Great Bustard diet in Central Asia analyzed the spring and summer stomach contents of 37 Great Bustards in northern Kazakhstan (Ryabov 1949). This study identified a significant and diverse vertebrate component, with approximately 1/3 of stomachs containing small mammals, birds, reptiles or amphibians. As the stomachs also contained large numbers of agricultural pests, the authors categorized the Great Bustard as a species beneficial for agricultural production. An analysis of stomach contents and feces of Great Bustards in the Islamic Republic of Iran found insects to constitute the largest component of the birds' summer diet, with material from cultivated crops in a secondary role (Amini-Tareh 2000). Afanas'ev and Sludskii (1947) found stomach contents and excrement of chicks in Central Kazakhstan in June to contain exclusively beetles, whereas adult birds also consumed caterpillars, plant shoots and seeds. Less information is available on winter diet of Great Bustards in Central Asia, though their consumption of seeds in soy fields has been noted (see "Habitat"). In Central Europe, Western Great Bustards are observed to preferentially use fields of oil-seed rape, alfalfa, and cabbage varieties in winter (Lóránt et al. 2023).

Eastern Great Bustard

The most comprehensive analysis of the diet of the Eastern Great Bustard examined stomach contents of adult birds in agricultural fields in Zabaikal'skii Krai, Russian Federation,) in summer, and observations of adult birds in the Eastern Mongolian steppe in early autumn (Goroshko et al. 2003). In both cases, the diet consisted of approximately 75% weedy plants and 25% insects, with Orthopterans and Coleopterans predominant. A similar ratio was found in the stomach of a young chick in northern Mongolia (Batsuuri 2011). An analysis of the stomach contents of an adult Great Bustard in Central Mongolia in May found somewhat less animal matter (Namkhaidorj 2002). During the breeding season, 29 invertebrate species were identified from the fecal samples of Great Bustards in Tumuji Nature Reserve in Inner Mongolia, China (Li et al. 2021).

During the non-breeding season, Great Bustards in Russian Zabaikal'e are known to feed on fallen grain (Goroshko et al. 2003), and those in Inner Mongolia, China, on soybean (Liu et al. 2008). A meta-barcoding study of the plant composition of winter diet of Great Bustards at three major wintering sites in China found cultivated plants to play the dominant role (Liu et al. 2018). Great Bustards wintering in Jinzhou, Liaoning Province, fed on fallen peanuts and rice after the autumn harvest (Li et al. 2021).

3.4 – Reproduction

Great Bustards exhibit the largest sexual size dimorphism among birds, and the sexes exhibit distinct reproductive behaviors (Alonso et al. 2009). Great Bustards are lekking birds which gather each spring at traditional sites where males perform elaborate breeding displays for females. After copulation, females choose a nest location, create a simple scrape in the ground, incubate eggs and raise their precocial chicks alone. Incubation lasts approximately 25 days, and chicks are flightless for 6-8 weeks, after which they begin to fly short distances. Males facing competition at a lek first breed at about 4-5 years of age, and females at 2 (Alonso et al. 1997). Great Bustards raise one brood per season, but lost clutches are sometimes replaced. They have a low reproductive rate, and eggs and chicks are frequently lost to predators, mechanical destruction by farm machinery, irrigation or flooding, steppe fires, and other causes. There is regional variation in the timing of reproduction, clutch size, and reproductive success, which is described below.

Western Great Bustard

Egg-laying occurs in southeastern Kazakhstan from mid-April through late May, with an average clutch size of 2.5 eggs (average of 11 nests described in both Gubin 2007 and Gubin 2015). At higher latitudes, and at sites at greater elevation, breeding begins later. In northern Kazakhstan, egg-laying begins in early May, with an average clutch size of 2.1 eggs (average of 10 nests described in Ryabov 1949). In northern Xinjiang, Great Bustards are reported to display in the middle of April (M. Wang in litt.) and breed from May through July (Ma Ming 2016). There, 60% of nests contain two eggs, and 40% contain three to four eggs (Gao Xingyi in Chan & Goroshko 1998). Conclusions that can be drawn from reports on the reproductive success of the Western Great Bustard in Asia are limited by low sample sizes and difficult to interpret due to protocols which involve repeated researcher visitation of the nest. In comparison, clutches of Western Great Bustards in Europe may be smaller. Average clutch size in Portugal was found to be 2.1-2.6 eggs (Morgado & Moreira 2000; Rocha et al. 2013), in Hungary 1.9 eggs (Faragó 1992), and in southwestern Russia 2.2 eggs (Watzke 2007).

Eastern Great Bustard

Male Eastern Great Bustards begin to arrive on the breeding grounds in Mongolia and northeastern China in late March and early April (Natsagdorj 2001). However, the onset of egg-laying is later in East Asia than in Central Asia. Egg-laying occurs from the beginning of May to mid-June in eastern Mongolia and northeastern China, but begins only at the very end of May in colder areas of Mongolia (Natsagdorj 2001; Zhao 2001; Kessler 2015). A survey of 53 nests over two years in Inner Mongolia, China, found 2.5 eggs per clutch, with a 38% nest success rate, and 38% nestling survival rate (Zhao et al. 2006). Average clutch size in China is cited as 2.8 eggs by Gong and Lu (2003). Goroshko (Chan & Goroshko 1998) estimated that in Zabaikal'skii Krai, Russian Federation, 90% of Great Bustard nests contain 2 eggs, but occasionally three or four are noted. A study of ten nests in northern Mongolia found average clutch size to be 2.6 eggs, and described a low recruitment rate (Batsaikhan 2002).

Eastern Great Bustard nest in wheat field, northern Mongolia. *Photo: M. Kessler.*

Eastern Great Bustard chicks in northern Mongolia. *Photo: M. Toomey.*

3.5 – Migration

In contrast to Great Bustards in Western Europe, which are largely sedentary, Great Bustards in Asia migrate every year, although the distances involved may vary. Wintering sites were previously located considerable distances from breeding sites. In recent decades the areas used by Great Bustards for overwintering in Asia have contracted and, in many cases, shifted northward.

Western Great Bustard

Turkmenistan previously served as the main overwintering grounds for Great Bustards in Central Asia, with additional sites located in the northeast of the Islamic Republic of Iran, Kyrgyzstan, and Tajikistan (Gavrin 1962b; Meklenburtsev 1990; Gubin 2007). Since the 1970s, Great Bustards have been noted only rarely and in small numbers in these regions (Saparmuradov 2003; Rabiei & Moghaddas 2008). During the early 2000s, Great Bustards began to use overwintering sites in southern Kazakhstan and adjacent territories in Uzbekistan to a greater degree (Kreitsberg-Mukhina 2003; Sklyarenko & Vagner 2005). Declines in overwintering in Turkmenistan and the Islamic Republic of Iran may be due to dramatic declines in Western Great Bustard breeding populations across western and central Kazakhstan and adjacent areas of the Russian Federation (Map 3.1). Changes in climate conditions, food availability, and disturbance (including hunting) may have also played a role in these declines, and the shifts observed in Kyrgyzstan, Tajikistan, and southern Kazakhstan.

Between the 1990s and early 2000s, Great Bustards also ceased to overwinter in Qapqal, Xinjiang, China (Wang et al. 2018). At approximately the same time, an increase in the number of Great Bustards overwintering at sites in Kazakhstan 250 km to the north-northeast was observed (Berezovikov 2016). This shift occurred after the establishment of soybean (*Glycine max*) fields in Kazakhstan, upon which the overwintering birds feed extensively. Great Bustards remain at these sites despite sometimes heavy snow and temperatures as low as -35^{0}C, so long as the fields are accessible for feeding.

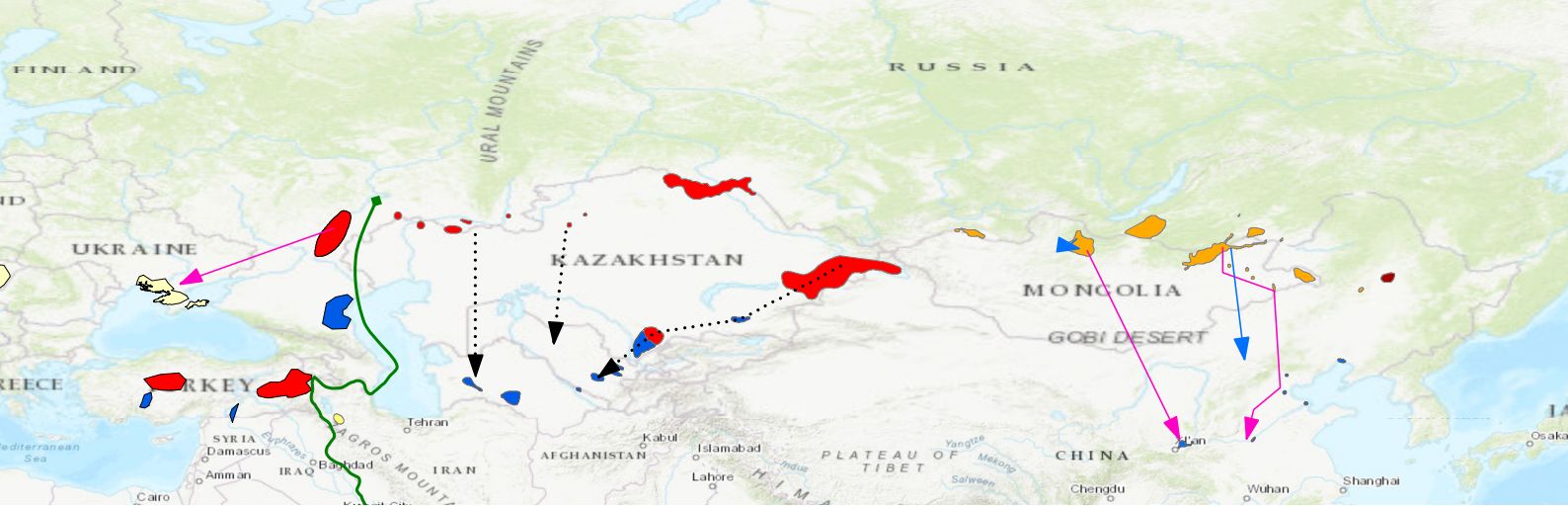
No telemetry has been carried out on Great Bustards in Central Asia. Based on location and flight direction of the species during the migratory period, ornithologists have inferred that its migration occurs in a largely north-south direction throughout most of Central Asia, and a northeast-southwesterly direction along the northern foothills of the Tien Shan (Kessler & Smith 2014). The data we have collected in Map 4-2 support this conclusion.

Males begin to arrive at breeding grounds in southern Kazakhstan in February, with the majority arriving from March through April (Gubin 2007). The first Great Bustards are noticed in Xinjiang in mid-March (Ma Ming 2016), and in northern Kazakhstan in mid-April (Ryabov 1949, Kessler & Bidashko personal observation).

Great Bustards gather in larger pre-migratory flocks in late summer and early fall. The size of these flocks is capped by the number of bustards breeding nearby, with additions of bustards breeding to the north of the site (reference Table 4-2). Zaisan Lake in Eastern Kazakhstan previously served as one such staging spot (Berezovikov 1986), though after 2000 Great Bustards in Eastern Kazakhstan tend rather to gather in the southern foothills of the Tarbagatai, in flocks of 10-30 individuals (Krason 2022). Their departure from breeding regions and stopovers is dependent on weather conditions, particularly snow cover. In northern Kazakhstan, Great Bustards begin to depart in September and continue through mid-October. Great Bustards begin to leave Xinjiang in mid-October (Ma Ming 2016). Migration continues into November at sites in southeastern Kazakhstan (Ryabov 1949; Gubin 2007).

Contemporary migratory stopover and overwintering sites in southern and southeastern Kazakhstan include portions of the Alakol' Basin (Almaty and East Kazakhstan Provinces), Plato Karaoi (Almaty Province), and the fields surrounding Chu (Jambyl Province) (Berezovikov 2016). Because migration dates vary according to seasonal weather, timing of overwintering also varies from year to year. Arrival at overwintering spots in southern Kazakhstan may begin in October, with birds departing in late February (Sklyarenko 2004). Wintering flocks form in southeastern Kazakhstan in late November, and remain through mid-March (Berezovikov & Levinskii 2012). In years during which Great Bustards overwinter in Uzbekistan, they are typically present from November through January (Kreitsberg-Mukhina 2003). These overwintering accumulations can be considerably larger than flocks observed at other times of year, and must contain birds from multiple breeding sites (Sklyarenko 2006).

Eastern Great Bustards in flight in eastern Mongolia. *Photo: Ts.Natsagdorj.*



Map 3-2. Fall migratory routes of the Great Bustard in Asia. Solid lines represent generalized routes established by satellite telemetry, with the movements of females displayed in pink and males in blue (Kessler et al. 2013, 13 females and 1 male in north-central Mongolia; Wang et al. 2022, 5 males and 1 female in eastern Mongolia). Dotted lines represent routes inferred by visual observations (Gavrin, 1962b; Sushkin, 1908; Plan contributors). Breeding areas are shown in red (Western Great Bustard) and orange (Eastern Great Bustard). Contemporary overwintering areas are shown in cobalt blue. The dark green line represents the western boundary of this Action Plan. Great Bustard populations in the Russian Volga River Region lie outside the scope of this Plan, but satellite telemetry data for this population is shown for the purpose of comparison (Oparina et al., 2001; 3 females).

Eastern Great Bustard

Historically, the major overwintering sites for the Eastern Great Bustard have been sites in eastern China between the Yellow and Yangtze Rivers, and the Korean Peninsula (Collar et al. 2001). There are also both historic and contemporary observations of small numbers of Great Bustards overwintering at or near breeding sites in north and eastern Mongolia, Inner Mongolia, Zabaikal'skii Krai, and Buryatia, as well as in the southern Gobi (Chan & Goroshko 1998). Great Bustards remaining at these sites are most often males. They can tolerate temperatures to -30 °C, so long as snow cover does not preclude foraging.

Today, the Great Bustard is rarely observed overwintering on the Korean Peninsula and more southerly sites along the Yangtze River in China, where they were once regularly found. Greater numbers of Great Bustards are now observed to overwinter at breeding sites in northeastern China (Liu, Hu, et al. 2018). A coordinated, nationwide survey in 2019 found 35% of overwintering Great Bustards in China to be in Shaanxi, 26% in Shanxi, and 17% each in Hebei and Henan (Rosefinch China Birdwatching Association & Alashan SEE Foundation 2019). The Yellow River wetland in Shaanxi is now considered to be one of the most important remaining wintering spots (Wu 2012).

Satellite telemetry of female Great Bustards breeding in Khovsgol Province of northern Mongolia linked these populations to overwintering sites along the Yellow River in Shaanxi Province of China (Kessler et al. 2013). Ongoing satellite telemetry has tracked four male Great Bustards breeding in Dornod Province of Mongolia to Shanxi, China, and a female to Henan Province (Wang et al. 2022). A rehabilitated Great Bustard released in Xilingol, Inner Mongolia, traveled to the border between Dornod, Mongolia and Zabaikal'e, Russia to breed (Chinese Wildlife Conservation Association 2018). These studies, and the data we have collected in Map 4-4, indicate a general southeastern direction of migration for Eastern Great Bustards.

Female Great Bustards tagged in a network of adjacent leks in northern Mongolia gathered at the southernmost lek to stage for migration in early autumn (Kessler et al. 2013). This southernmost lek also tends to be the location at which any non-migrating males will overwinter. The Torey depression serves a similar function for Great Bustards in Zabaikal'skii Krai, Russian Federation (Chan & Goroshko 1998).

Great Bustards largely depart Mongolia and northeastern China by the end of October (Natsagdorj 2001; Zhao 2001). Southbound movements of tagged female Great Bustards were correlated with an increase in southerly winds (Kessler 2015). Though some individuals traveled much faster in some years, in general these birds took approximately two months to accomplish their 2000 km migratory journey (Kessler 2015). They used multiple stopovers which were, for the most part, not repeated from year to year, or even between individuals breeding at the same lek. However, the 150 km-wide Bayanur agricultural oasis in Inner Mongol was used by multiple birds, and sometimes for long (e.g. one-month duration) stopovers (Kessler et al. 2013).

Great Bustards arrive in Henan by early to mid-November (Zhu et al. 2018). Female Great Bustards fitted with satellite telemetry units arrived on wintering grounds in Shaanxi in late November to mid-December (Kessler et al. 2013). These females ranged over relatively large areas during the winter months. Individuals returned to the same general vicinity, though not the same exact territory each winter. They remained in Shaanxi through mid-March to early April (Kessler et al. 2013). Great Bustards overwintering in Henan depart by mid-March, and those overwintering in Cangzhou, Hebei, depart by April (Mi et al. 2014; Zhu et al. 2018).

Section 4

Status and distribution of the Great Bustard in Asia

4.1 – Status of the Western Great Bustard (*Otis tarda tarda*)

The Western Great Bustard is distributed across a broad range in Europe, North Africa, the Middle East, Central Asia, and western Siberia. Approximately 42000-52000 individuals of the Western Great Bustard are estimated to remain in the western Palearctic (i.e. Europe, northern Africa, and the Middle East), with approximately 70% of that population contained within Iberia (Alonso 2014). Outside of Iberia, populations are highly fragmented, and the Great Bustard has been extirpated from several European and North African countries. Action Plans have been developed and updated for European (Kollar 1996), Middle-European (Convention on Migratory Species 2013) and Western Palearctic populations of *Otis tarda tarda* (Nagy 2018).

In this section, we describe the distribution and population size of the Western Great Bustard within the area covered by the Concerted Action for Great Bustards in Asia. This includes the territories in Orenburg Province of the Russian Federation, West Kazakhstan Province, and the Islamic Republic of Iran eastward to the terminus of the subspecies' range in Altai Krai of the Russian Federation and Xinjiang, China.

4.1.1 – Islamic Republic of Iran

Great Bustards are now found only in West Azerbaijan Province in the northwest of the Islamic Republic of Iran. Wintering of Great Bustards in northeastern Islamic Republic of Iran is no longer a regular occurrence, though a vagrant was observed in January 2008 (Rabiei & Moghaddas 2008). *Information provided by Dr. R. Abdulkarimi.*

Breeding: Great Bustards currently only breed in the northwest of the Islamic Republic of Iran, in the Sootav Plain, Seekanian Plain, and Boga Basi Plain.

Migration: During migratory periods, Great Bustards gather on the Qazlian Plain, and Yangija-Albolaq Plain.

Wintering: Current overwintering spots include the Sootav Plain, and the Yangija-Albolaq Plain.

4.1.2 – Russian Federation

ORENBURG PROVINCE

This species now occurs only sporadically and in low numbers, but it appears that the small population has stabilized. *Information provided by Dr. A. Davygora.*

Breeding: Data are limited, but indicate sporadic contemporary nesting in southwestern (Pervomaiskii), central (Orenburg, Sol'-Iletskii, Akbulakskii and Belyaevskii) and eastern (Novoorskii) districts of Orenburg Province, both within the Orenburg Zapovednik and on agricultural fields (Kornev & Gavlyuk 2014).

Migration: Premigratory staging points are known in the central portion of Orenburg Province (Orenburg District). Some migratory observations have been made near Lake Shalkar.

Wintering: There is sporadic overwintering of Great Bustards in the central portion of Orenburg Province (Orenburg District).

Map 4-1. Current distribution of Western Great Bustard in Asia. The range of a resident population is shown in yellow. For migratory populations, breeding areas are shown in red, and wintering areas in blue.

SOUTHERN URAL REGION

Includes Chelyabinsk Provinces and Republic of Bashkortostan. Information gathered from recent literature. There have been very few sightings of the Great Bustard in this region since the 1970s.

Breeding: There are reports of 2-4 birds nesting in Kartalinskii District of Chelyabinsk Province (Zakharov & Ryabitsev 2014). Breeding was previously observed along the western border of Bashkortostan but the species is only sporadically sighted now (Il'ichev 2007).

Wintering: Overwintering is not observed.

WESTERN SIBERIA

Includes Asian portions of the Western Great Bustard's range, including Kurgan, Tyumen, Omsk, Tomsk (where species is vagrant), and Novosibirsk Provinces, and Altai Krai. *Information provided by Dr. A. Nefedov.*

Breeding: On the basis of breeding season sightings from 2000-2019, the key breeding area for the Western Great Bustard in western Siberia and northern Kazakhstan since the 2010s has been the border zone between the Pavlodar and North Kazakhstan Provinces of Kazakhstan and Omsk Province of Russia. On the left bank of the Irtysh, this is the Kurumbel' steppe in Omsk, Novosibirsk and Pavlodar Provinces. On the right bank of the Irtysh, these are steppes in the border zone between Pavlodar and North Kazakhstan Provinces of Kazakhstan and Omsk Province of the Russian Federation (Nefedov 2013a, 2018). For the past ten years there has been only one recorded instance of a Great Bustard nesting. This occurred in Isil'kul'skii District of Omsk Province, in June 2012, when a female Great Bustard was observed with a brood of four chicks the size of adult Woodpigeons (*Columba palumbus*).

Migration: For the past ten years there have not been more than two Great Bustards observed in the region over the migration period.

Wintering: There have been no observations of Great Bustards overwintering in this region for the past ten years.

4.1.3 – Kazakhstan

NORTHERN KAZAKHSTAN

Including North Kazakhstan Province and Pavlodar Province. *Information provided by Dr. A. Nefedov.*

All seasons: There have been no observations of Great Bustards in this region for the past ten years.

WESTERN KAZAKHSTAN

As defined here, western Kazakhstan includes West Kazakhstan, Aktobe, Atyrau, and Mangystau Provinces. *Information provided by Dr. M. Kessler. Dr. F. Bidashko, who passed away in 2019, contributed much to research in this region.*

There have been very few sightings of the Great Bustard in the 21st century, despite targeted searches carried out by F. Bidashko and M. Kessler in both spring and fall, and active field work by the Ural'sk Anti-Plague Station. Most sightings occur in the Terekti and Borili (Burlinskii) Districts in northeastern West Kazakhstan Province. In 2006, a ranger estimated 20 Great Bustards to breed in Borili District.

Breeding: One active lek site was confirmed in the vicinity of Prirechnoe, Terekti District, West Kazakhstan Province in 2017, with two males and one female observed (Kessler and Bidashko, personal observation). There was a reliable report of five Great Bustards in Taldybulak in Syrymskii District of West Kazakhstan Province in summer 2003. A lone bird was sighted in Qaratobe District of West Kazakhstan Province (near the border with Aktobe) in May 2015. A small lek has been confirmed by air surveys and local surveys at the south of Aktobe Province, in desert steppe (T. Kisebaev in litt.).

Migration: The most significant area for Great Bustard migratory stopovers are fields within a 30 km radius south of the Prirechnoe lek. M. Kessler and F. Bidashko observed 5 Great Bustards near the lek in Prirechnoe, and 13 near Tikhonovka, in the Burlinskii and Terekti regions of West Kazakhstan Province in October 2006. According to local residents, small numbers of Great Bustards (from 3-5, or occasionally 15-20 individuals) stop over for migration in fields between the towns of Araltobe, Algabas, Pugachevo, and Tnaly in West Kazakhstan Province in November.

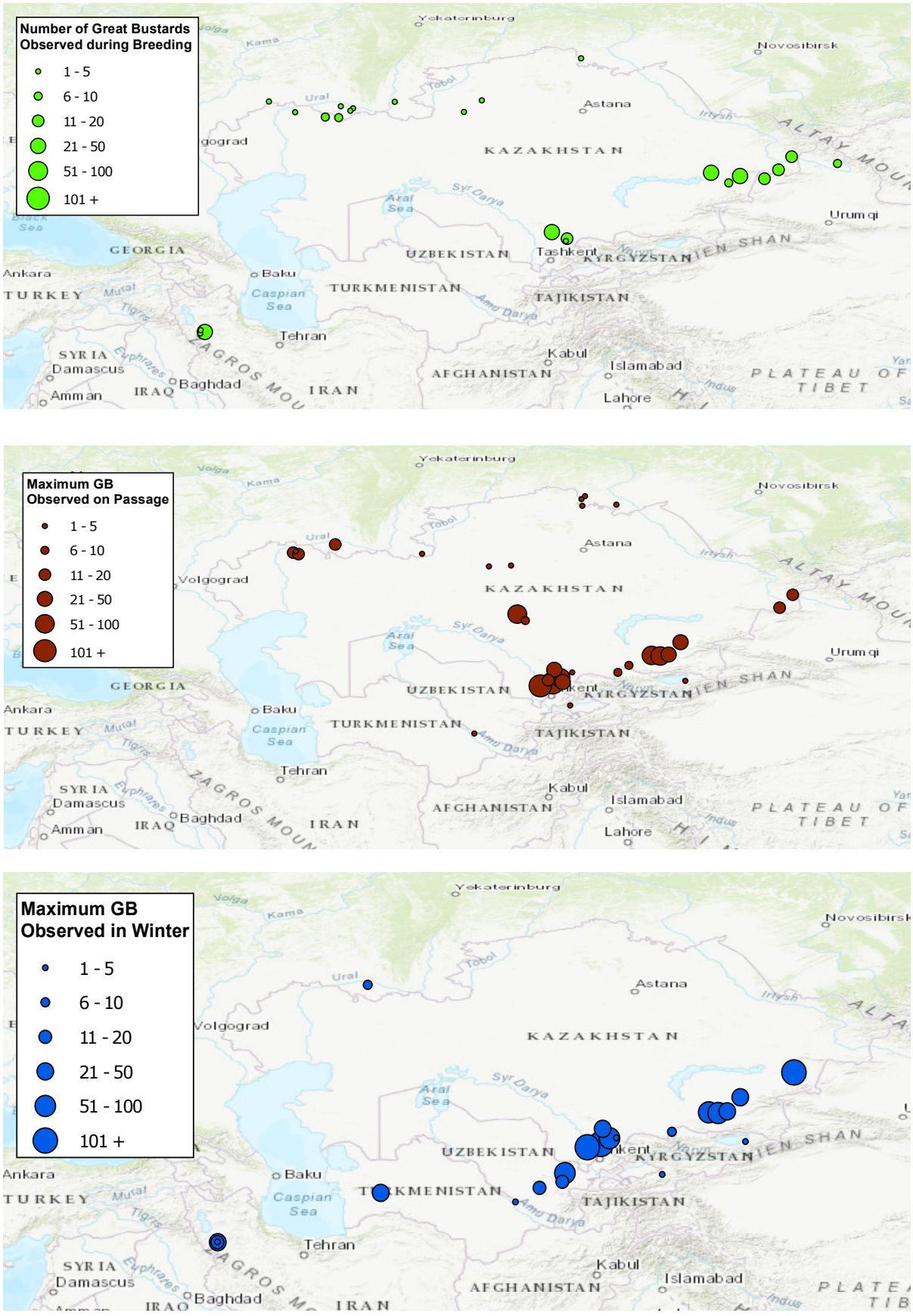
Since the turn of the century, migrating individuals have rarely been observed in the sands west of the Ural River (e.g., Zhanakala District of West Kazakhstan Province (Parfenov 2009, and F. Bidashko pers. obs.). Three Great Bustards were observed migrating in May over the Tyulenii Islands in the northern Caspian, Mangystau Province (Kovalenko 2003).

Wintering: Not reported.

CENTRAL KAZAKHSTAN

As defined here, central Kazakhstan includes Kostanay, Karaganda, and Akmola Provinces. *Information provided by Dr. M. Koshkin.*

Breeding: Although there are no recent observations of nests, chicks, or displaying males in the territory, if one considers observations of adult Great Bustards in spring to be a sign of breeding, the most likely places of nesting in this region are the outskirts of Kazakskoe and Burevestnik Villages (Naurzum District, Kostanay Province). At these sites adult Great Bustards have been observed more or less regularly in recent years. The species likely no longer nests in Akmola Province (there are no recent observations), and there have been only two recent observations of single adult Great Bustards in spring in Karaganda Province.



Map 4-2. Key sites used by Western Great Bustards in Asia. Top: Breeding; Middle: Migration; Bottom: Overwintering. Size of circle is representative of maximum number of Great Bustards reported at a site within the past ten years. See Appendix 1 for more information about these sites.

Migration: the villages of Amangel'dy and Ashutasty in Kostanay Province may be the site of premigratory gatherings, but this needs confirmation with more recent data. The largest number of Great Bustards observed in this region during the migratory period was 80 individuals in Ulytau District of Karaganda Province on 3 October 2009. There was a second observation nearby of 6 individuals. Insofar as is known, there are no regular migratory stopovers in this region.

Overwintering: None reported.

SOUTHERN KAZAKHSTAN

As defined here, southern Kazakhstan includes Turkestan and Jambyl Provinces. *Information provided by G. Shakula and S. Baskakova.*

Breeding: The most well-studied lek contains up to 17 Great Bustards and is located on the outskirts of Ertai town (Zhuvalinskii District of Jambyl Province). Lekking has also been observed on the outskirts of Kulan and Sastyube villages (Tyul'kubasskii District of Turkistan Province) and in the "Arystandy" Important Bird and Biodiversity Area (IBA)(Baidibekskii District of Turkistan Province). All of these sites are located in agricultural mosaics which include wheat and hay fields, with the exception of Arystandy, which consists of dry foothill steppes (Shakula et al. 2016).

Migration: There is a well-defined autumn migration along the entire western foothill zone of the Syrdarinskii Karatau, from Chokpak Pass and Red Hill (Krasnaya Gorka) and up to villages of Kulan and Sastyube. This continues further through Chayan Reservoir up to the "Arystandy" IBA. In fall Great Bustards are also noted in the foothill portion of the Aksu River valley (Sairamskii District) and in Kazygurt District, on the outskirts of Shanak village (Shakula et al. 2018).

Spring migration tends to be near Sastyube village (Tyul'kubasskii District), the Chayan Reservoir (Baidibekskii District) and the vast steppe bottomlands on the outskirts of Arys city (Arysskii and Badamskii Districts).

Wintering: In Tyul'kubasskii District of Turkistan Province, overwintering is observed at Krasnaya Gorka and the outskirts of Sastyube town. Here Great Bustards are encountered in winter on wheat and hay fields, and also at topographic low points and near disconnected elm (*Ulmus pumila*) windbreaks. In Baidibekskii District of Turkistan Province, Great Bustards are regularly observed in the winter on the "Arystandy" IBA and on adjacent dry, piedmont steppe to Chayan Reservoir, which is used as sheep pasture (Shakula & Baskakova 2019).

ALMATY PROVINCE

Because of their location along the province boundary, Great Bustards breeding at the northeastern corner of Lake Balkhash are included here. *Information provided by Dr. B. Gubin.*

Breeding: Rare nesting species in the Tentek Delta and along the right bank of the Ayaguz River, south of Aktogay. A lek is also located northeast of Lake Balkhash, northeast of Aktogay near the river Ai (Gubin 2015).

Migration: The Great Bustard gathers in the Alakol' depression and territory of the Alakol' Zapovednik, and the Tentek delta. Migration occurs from March to April and October to November. Approximately 200 individuals pass through. Also observed along the left bank of the Ili River from Kapchagai to the southern edge of the Taukum sands. Some 5-20 individuals gather along the edge of the Chu-Ili Mountains and the Anarkhai massif. Up to ten individuals are observed near Taldykorgan city.

Wintering: Wintering occurs in the southern edge of the Taukum sands, the Chu-Ili Mountain foothills, and the southern portion of the Alakol' Zapovednik.

EAST KAZAKHSTAN PROVINCE

Information provided by Dr. K. Prokopov.

Breeding: The Great Bustard breeds in the Zaisan and Alakol' Depressions, and Chiliktinskaya Valley.

Migration: The Great Bustard appears on migration in the Alakol' Depression (which is split between Almaty and East Kazakhstan Provinces).

Wintering: Wintering is not observed.

4.1.4 – Uzbekistan

Information provided by Dr. R. Kashkarov.

Breeding: Breeding is not observed in Uzbekistan.

Overwintering: Great Bustards are attracted to open plains planted with winter wheat. The current distribution of the Great Bustard in Uzbekistan depends on winter temperatures. In harsh winters, Great Bustards move southward out of Kazakhstan into adjacent areas of Uzbekistan. They most frequently overwinter in the Hungry Steppe (south of Lake Tuzkan), the vast expanses of piedmont plains at the southern terminus of the Zeravshan Range (Agalyk), and the Karnabchul steppe (where there have been several mentions of encounters which require confirmation).

4.1.5 – Turkmenistan

Information provided by Dr. E. Rustamov.

Breeding: Breeding is not observed in Turkmenistan

Migration: On migration the Great Bustard gathers in small groups in the foothills of the Kopetdag Mountains. Individuals are also observed in the northwest: Zauzboiskii District, in the Karakum, in the Pri-Sarykamysh area in the north of the country, and in valleys of the Amudarya River in the east. **Overwintering:** The Great Bustard overwinters in a wide foothill belt of the Kopetdag Mountains, predominantly in the northwest of the range. Over the past five years, relatively large gatherings have been observed twice: 49 individuals in the beginning of December in 2014, and

40 individuals in January of 2018. However, flocks of this size do not persist for long. They are broken into smaller groups as a result of the activities of poachers. For this reason, the remaining observations during censuses consist of small groups and even single birds (see table below). The Great Bustard is observed in winter also in the foothills of the Central Kopetdag, where there are fields and fallows, and even in the extreme southwest of the country, in the Meshet-Messirianskii flatlands, and at other sites, but only sporadically.

4.1.6 – Kyrgyzstan

Information provided by Dr. S. Kulagin.

Breeding: The Great Bustard has not been observed nesting in recent times.

Migration: During migration periods, 5-8 Great Bustards are observed on fields in the west of Chui Province and in the east of Isyk-Kul' Province.

Wintering: Small numbers of Great Bustard (3-5 individuals) are noted in fields in Jalalabad and Isyk-Kul' Provinces.

4.1.7 – Tajikistan

Information provided by Dr. R. Muratov.

Breeding Breeding of the Great Bustard has not been observed in Tajikistan in the past 70 years.

Migration: During the migratory period, there are rare observations of single or pairs of Great Bustards in Ashtskii and Pendzhikent Districts of Sogdiiskii Province, and Dangarinskii District of Khatlon Province. Most recently, one Great Bustard and one pair of Great Bustards were recorded in spring 2018. The fresh feathers of one Great Bustard were also found in October 2018, as the apparent result of a raptor attack.

Overwintering: Occasionally the overwintering of small numbers of Great Bustards has been observed in Dangarinskii District of Khatlon Province.

4.1.8 – Xinjiang, People's Republic of China

Information provided by Dr. M. Wang.

Breeding: Breeding of the Great Bustard is currently observed only in Tacheng Prefecture, north of Altay city.

Migratory stopover: Great Bustards are observed on migratory stopover in extreme northwestern Xinjiang, specifically in Tacheng, Altay, Burqin, Jeminay, and Fuhai.

Overwintering: In Xinjiang only one site has been recorded as an overwintering spot for the Great Bustard: Qapqal County, of Ili Kazakh Autonomous Prefecture. However, no bustards were located during the last two winter field surveys, so we believe that the Great Bustard no longer overwinters in this area.

4.1.9 – Population summary: Western Great Bustard

Accounts from the 19th and early 20th centuries describe Great Bustards as "numerous" and "abundant" across their Central Asian breeding grounds (Kessler & Smith 2014). Taking both summer and winter counts into consideration, as well as weaknesses in survey coverage and the potential pitfalls of summing non-synchronized survey results, our population estimate for the Western Great Bustard in Asia is approximately 500-1000 individuals. There has been some cautious optimism registered in scientific literature regarding a rebound in the number of Western Great Bustards after the collapse of the Soviet Union. However, increases in breeding numbers are recorded in only 2 of 17 reporting regions, both in the south of Kazakhstan, while decreases are reported in 11 (Table 4-1). Similarly, increases in numbers of overwintering birds are reported only at 2 of 9 sites, and decreases are reported at 6 (Table 4-3).

In 1972, 2800 Great Bustards were estimated in this region, not including the Islamic Republic of Iran (Isakov 1972). Near the turn of the 21st century, the previous Action Plan for Great Bustards in Asia estimated 2100 to 3500 individuals in Central Asia (Chan & Goroshko 1998). Unfortunately, a direct comparison of our estimate to this value is not informative, as data on the Western Great Bustard in the 1998 Action Plan were limited to Kazakhstan, and this document contained an overestimate of the number of Great Bustards in Xinjiang (refer to Gao et al. 2008 for a clear account of the survey results from 1994).

Contributors to this updated Action Plan report knowledge of only approximately 300-500 Western Great Bustards on breeding grounds across all Asian range states (Table 4-1). It is likely that this represents an underestimate, as breeding groups are smaller in size and more difficult to locate than wintering groups, and there have been few to no targeted searches in most regions. Experts evaluated the quality of their estimates relatively low (average 2.1 out of 5). Furthermore, the observation, for example, of at least 300 Great Bustards at pre-migratory staging grounds in Xinjiang (Table 4-2; surveys conducted from 2014-2018) is difficult to reconcile with the few birds recorded breeding in northeastern Kazakhstan and adjacent regions of the Russian Federation (from 60-140).

Because the distance migrated by Western Great Bustards and the timing of migration vary annually (see 3.5 - "Migration"), and the population estimates presented here do not represent time-coordinated surveys, it is likely that winter totals of 500-1100 individuals (Table 4-3) are an overestimate (i.e., Great Bustards tallied in Uzbekistan have passed through and thus also been counted in South Kazakhstan). Our winter estimate is less than that presented in 2006 (1000-1500 Great Bustards; Sklyarenko & Vagner 2005), which also summed counts from various districts and regions without temporal coordination of surveys. More recently, a series of surveys coordinated by the Eurasian Bustard Alliance across all documented overwintering spots in Kazakhstan, as well as adjacent regions of Uzbekistan and Kyrgyzstan, and contemporary overwintering spots in Turkmenistan,

located only approximately 200 Western Great Bustards over the entire 2018-2019 winter (M. Kessler, in prep).

Kazakhstan is a keystone country for the conservation of the Western Great Bustard in Asia, containing over 50% of the known breeding individuals and hosting up to 80% of wintering individuals, though in colder years these birds move into Uzbekistan (Table 4-7). Turkistan Province of Kazakhstan emerges as a year-round stronghold for the Western Great Bustard in Asia, containing significant populations of both breeding and wintering Great Bustards.

Outside of southeastern and southern Kazakhstan, breeding populations of the Western Great Bustard are small and highly isolated. A 22-year study of population dynamics of Great Bustard leks in Portugal found that the probability of extinction of a lek increases quickly when the population is less than 30 individuals (Pinto et al. 2005). All leks of which we are aware fall beneath this bar, excepting those in East Kazakhstan and Almaty Provinces of Kazakhstan (Map 5-3). Long-term observations in Iberia suggest that the growth of large leks may result from the concentration of Great Bustards at high-quality sites and the extinction of lower-quality sites (Alonso, Palacín, et al. 2003). A similar dynamic may be at play in Central Asia, where declines are reported across the region, with the exception of southern and southeastern Kazakhstan. As most migratory pathways used by Great Bustards in contemporary times lead through southern Kazakhstan, leks here may be readily discoverable and adopted by Great Bustards arriving from other regions. This core of the remaining Great Bustard population in South Kazakhstan, Almaty and East Kazakhstan Provinces, and adjacent areas of Uzbekistan, will clearly play an important role in the conservation of the species in the near term. It would be useful to produce models to evaluate the suitability of these regions as habitat under longer-term, climate change conditions.

It is striking that Western Great Bustards are now virtually absent from the northern steppe zone of Central Asia, for which they were described as "typical inhabitants" as recently as fifty years ago (Kozlova 1975). That most of the few remaining Great Bustard sites in the northern steppe lie close to the militarized international border between Kazakhstan and the Russian Federation – yet far from official border crossings – may indicate the role that human traffic (which is limited to official crossing zones) plays in the species' declines. These transboundary areas also offer opportunities for the species' conservation in coming years.

The information we have gathered confirms that the Western Great Bustard's overwintering areas in Asia have contracted northwards. While Turkmenistan once hosted the majority of overwintering Great Bustards in this region, with additional birds found in the northeast of the Islamic Republic of Iran, southwestern Tajikistan and Kyrgyzstan, now fewer than 50 individuals are observed annually in these areas.

Male Western Great Bustard in full display in Central Europe. *Photo: F. J. Kovacs.*

Tables

Breeding population size & trends of Western Great Bustards in Asia

Table 4-1

Country	Region	Number of Great Bustards	Quality of Estimate (low=1; high=5)	Trend	Source of Estimate
Islamic Republic of Iran	Northeastern	NA	NA	NA	R. Abdulkarimi
Islamic Republic of Iran	Northwestern	32-36	4	Decreasing	R. Abdulkarimi
Russian Federation	Orenburg Province	50-100	2	Stable	A. Davygora
Russian Federation	Chelyabinsk Province and Republic of Bashkortostan	2-4	1	Declining	Il'ichev, 2007; Zakharov and Ryabitsev, 2014
Russian Federation	Kurgan Province	2-6	1	Stable	A. Nefedov
Russian Federation	Tyumen Province	2-4	2	Decreasing	A. Nefedov
Russian Federation	Omsk Province	10-20	3	2007-2012: Strong increase to 100 individuals After 2014: Strong decrease 2015-Present: Stable at 20 individuals	A. Nefedov
Russian Federation	Novosibirsk Province	2-6	1	Decreasing	A. Nefedov
Russian Federation	Altai Krai	2-6	2	Decreasing	A. Nefedov
Kazakhstan	Western Kazakhstan (West-Kazakhstan and Aktobe Provinces)	5-26	2	Decreasing	M. Kessler, F. Bidashko†
Kazakhstan	North-Kazakhstan Province	4-10	2	Decreasing	A. Nefedov
Kazakhstan	Pavlodar Province	4-10	1	Stable	A. Nefedov
Kazakhstan	Central Kazakhstan (Kostanai, Karaganda and Akmola Provinces)	20-30	2	Slightly decreasing	M. Koshkin
Kazakhstan	Southern Kazakhstan (Kyzylorda, Turkestan and Jambyl Provinces)	50-70	4	Increasing	G. Shakula, S. Baskakova
Kazakhstan	East-Kazakhstan Province	14-50	3	Stable	K. Prokopov
Kazakhstan	Almaty Province	50-60	1	Slightly increasing	B. Gubin
Kyrgyzstan	In entirety	1-2	1	No longer observed, strong historical decrease	S. Kulagin
Tajikistan	In entirety	0	2	No longer observed, strong historical decrease	R. Muratov, K. Talbonov
Uzbekistan	In entirety	Breeding not noted for over 70 years	NA	NA	R. Kashkarov
Turkmenistan	In entirety	NA	NA	NA	E. Rustamov
PRC	Xinjiang	17	4	Strongly decreasing	M. Wang, W. Yang
Total Asian Breeding Population of *Otis tarda tarda*		267-457	Average=2.1	Decreasing – 11 Increasing – 2 Stable – 5	

Note. Breeding population size and trend of the Western Great Bustard (*Otis tarda tarda*) within the Central Asian flyway, according to evaluation of experts in each region. "NA" is marked for regions where the Great Bustard has not historically bred.

Number of Western Great Bustards observed on migratory stopover in Asia

Table 4-2

Country	Region	Number of Great Bustards	Quality of Estimate (low=1; high=5)	Trend	Source of Estimate
Islamic Republic of Iran	Northeastern	0	NA	NA	R. Abdulkarimi
Islamic Republic of Iran	Northwestern	27	4	Decreasing	R. Abdulkarimi
Russian Federation	Orenburg Province	0-12	2	Insufficient information	A. Davygora
Russian Federation	Chelyabinsk Province and Republic of Bashkortostan	0	1	NA	Il'ichev, 2007; Zakharov and Ryabitsev, 2014
Russian Federation	Kurgan Province	3-5	1	Stable	A. Nefedov
Russian Federation	Tyumen Province	1-3	2	Decreasing	A. Nefedov
Russian Federation	Omsk Province	5-7	2	2007-2012: Strong increase 2014: Strong decrease 2015-Present: Stable	A. Nefedov
Russian Federation	Novosibirsk Province	3-5	1	Decreasing	A. Nefedov
Russian Federation	Altai Krai	3-7	2	Decreasing	A. Nefedov
Kazakhstan	Western Kazakhstan (West-Kazakhstan and Aktobe Provinces)	20-40	2	Decreasing	M. Kessler, F. Bidashko†
Kazakhstan	North-Kazakhstan Province	3-5	1	Decreasing	A. Nefedov
Kazakhstan	Pavlodar Province	5-7	1	Stable	A. Nefedov
Kazakhstan	Central Kazakhstan (Kostanai, Karagandy and Akmola Provinces)	88	3	Slightly decreasing	M. Koshkin
Kazakhstan	Southern Kazakhstan (Kyzylorda, Turkistan and Jambyl Provinces)	180-200	2	Increasing (but variable between years)	G. Shakula, S. Baskakova
Kazakhstan	East-Kazakhstan Province	45 - 66	3	Stable	K. Prokopov
Kazakhstan	Almaty Province	200 in groups of 3-60	1-2	Stable	B. Gubin
Kyrgyzstan	In entirety	4-10	3	Stable	S. Kulagin
Tajikistan	In entirety	1 - 5	3	Decreasing	R. Muratov, K. Talbonov
Uzbekistan	In entirety	10-30	1	Stable	R. Kashkarov
Turkmenistan	In entirety	Up to 75	3	Strongly decreasing	E. Rustamov
PRC	Xinjiang	317-444	5	Decreasing	M. Wang, W. Yang

Note. Number of Western Great Bustards (*Otis tarda tarda*) observed on migratory stopovers within the Central Asian flyway, according to evaluation of experts in each region. Estimates for migratory stopovers are not summed because individuals may be counted at multiple sites.

Wintering population size & trends of Western Great Bustards in Asia

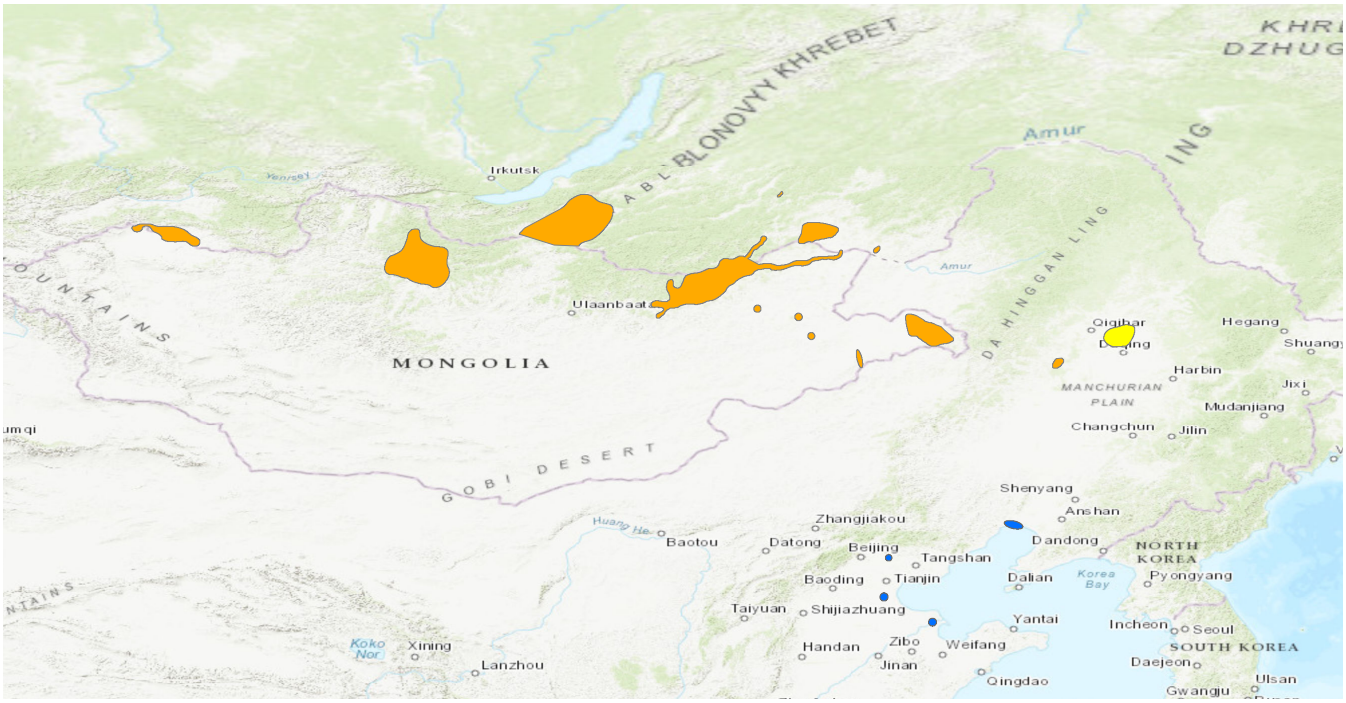
Table 4-3

Country	Region	Number of Great Bustards	Quality of Estimate (low=1; high=5)	Trend	Source of Estimate
Islamic Republic of Iran	Northeastern	0	4	No longer observed, strong historical decrease	R. Abdulkarimi
Islamic Republic of Iran	Northwestern	25	4	Decreasing	R. Abdulkarimi
Russian Federation	Orenburg Province	0-10	2	Insufficient information	A. Davygora
Russian Federation	Chelyabinsk Province and Republic of Bashkortostan	0	1	NA	Il'ichev, 2007; Zakharov and Ryabitsev, 2014
Russian Federation	Kurgan Province	0	1	NA	A. Nefedov
Russian Federation	Tyumen Province	0	1	NA	A. Nefedov
Russian Federation	Omsk Province	0	1	NA	A. Nefedov
Russian Federation	Novosibirsk Province	0	1	NA	A. Nefedov
Russian Federation	Altai Krai	0	1	NA	A. Nefedov
Kazakhstan	Western Kazakhstan (West-Kazakhstan and Aktobe Provinces)	0	2	NA	M. Kessler, F. Bidashko†
Kazakhstan	North-Kazakhstan Province	0	1	NA	A. Nefedov
Kazakhstan	Pavlodar Province	0	1	NA	A. Nefedov
Kazakhstan	Central Kazakhstan (Kostanai, Karagandy and Akmola Provinces)	0	5	NA	M. Koshkin
Kazakhstan	Southern Kazakhstan (Kyzylorda, Turkistan and Jambyl Provinces)	400-500	4	Increasing	G. Shakula, S. Baskakova
Kazakhstan	East-Kazakhstan Province	0	NA	NA	K. Prokopov
Kazakhstan	Almaty Province	10-30	1-2	Slightly increasing	B. Gubin
Kyrgyzstan	In entirety	2-5	3	Decreasing	S.Kulagin
Tajikistan	In entirety	1 - 2	2	Decreasing	R. Muratov, K. Talbonov
Uzbekistan	In entirety	50-70 (mild winters) 200-500 (severe winters)	3	Stable	R. Kashkarov
Turkmenistan	In entirety	25-45	4	Strongly decreasing	E. Rustamov
PRC	Xinjiang	0	2-4	Strongly decreasing	M. Wang, W. Yang
Total Asian Wintering Population of *Otis tarda tarda*		513-1117	Average=2.3	Decreasing – 6 Increasing – 2 Stable – 1	

Note. Overwintering population size and trend of the Western Great Bustard (*Otis tarda tarda*) within the Central Asian flyway, according to evaluation of experts in each region.

4.2 – Status of the Eastern Great Bustard (*Otis tarda dybowskii*)

The Eastern Great Bustard is distributed only within East Asia, with breeding populations in Mongolia, northeastern China, and in the Russian Federation east of the Altai Mountain Range. While some individuals remain to overwinter at breeding sites, the most important overwintering sites for the Eastern Great Bustard are located in China, and a few vagrant birds still reach the Korean Peninsula. This Action Plan covers the entire range of the Eastern Great Bustard, such that population estimates tabulated here represent our best estimate of the total current population of this subspecies.



Map 4-3. Current distribution of Eastern Great Bustard. Breeding areas are shown in orange, and wintering areas in blue. A breeding site at which many of the birds have begun to overwinter during the past decade is shown in yellow.

4.2.1 – Russian Federation

PRI-ENISEY REGION

As defined here, the Pri-Enisey Region includes the Altai Republic, Krasnoyarsk Krai, and the Republic of Khakassia. *Information gathered from recent literature.*

In the Altai Republic, the Great Bustard was not observed after the 1980s, except for a lone report by a college teacher of four birds in 2010. The Great Bustard is listed as Critically Endangered (Irisova 2017).

In Krasnoyarsk Krai, the Great Bustard was listed as Critically Endangered in 1995, Extinct in 2000 and 2004, and in the most recent edition of the Krasnoyarsk Krai Red Data Book, is considered an "occasional vagrant" (Savchenko et al. 2012). The last sightings reported were in the 1980s.

In the Republic of Khakassia, the Great Bustard is listed as Extinct, with the last sighting in 1998 (Savchenko & Baranov 2014).

REPUBLIC OF TUVA

Information provided by Dr. T. Archimaeva.

Breeding: Currently, groups of Great Bustards are encountered in spring in dry piedmont and desert steppes to the south of the Tannu-Ola Range, and also near the southern base of the Agar-Dag-Taiga Range in the vicinity of Lake Shara-Nur. Great Bustards have been using these sites for the past twenty years.

Migration: The gathering places of Great Bustards before migration are located each year in the same locations: along the right bank of the Tes-Khem River, in steppe with bushes along the dry beds of the tributaries of the Tes-Khem, the Terektig-Khem, Shivelig-Khem, and Kholu Rivers.

Wintering: Wintering of Great Bustards is not observed in Tuva.

REPUBLIC OF BURYATIA AND IRKUTSK PROVINCE

Information provided by Dr. Je. Elaev.

Breeding: Great Bustard breeding is noted in southern regions of the Buryat Republic up to the Mongolian border, including Dzhidinskii, Mukhorshibirskii, Bichurskii and partially Selenginskii Districts. Occasionally reaches the latitude of Ulan-Ude city. The Great Bustard no longer nests in Irkutsk Province, where only occasional vagrants are noted.

Migration: Though large flocks are not formed, Great Bustards are observed in Dzhidinskii and Mukhorshibirskii Districts during the migration period.

Wintering: Most Great Bustards move out of this region to overwinter further south, though a portion remains to overwinter in Buryatia.

ZABAIKAL'SKII KRAI

Information provided by Dr. O. Goroshko and Dr. E. Malkov.

Breeding: Southeastern Zabaikal'skii Krai serves as the most important breeding grounds for the Eastern Great Bustard within the Russian Federation. Eastern Great Bustard breeding sites are dispersed across the entire steppe and forest steppe territory of this region. Until the end of the 2000s the major breeding sites were located in the expansive Torei Depression, Urulungui Depression (Argun' River basin), and the middle stretches of the Onon River basin, especially in areas adjacent to Mongolia, with the most important sites in Kyrinskii District between villages Ul'khun-Partiya and Tyrin. The Torei Depression includes the Torei Lakes (a system of two connected lakes, "Zun" and "Barun") and steppe meadowlands surrounding the lakes for about 100 km. This area contains a large number of small lakes and the rivers Imalka and Ulz.

There was a prolonged period of population decline from the 1940s to the 2010s. By the 2010s, the Great Bustard had practically disappeared from the Urulungui Depression. The species is now observed only rarely in the middle stretches of the Onon River and even in the Torei Depression. However, over the past three years (2015-2019), there is a tendency towards increase in population size. Breeding in Kyrinskii District is associated with the steppe valley of the Onon River and its connecting wide steppe intermontane and tributary valleys. There is a direct connection between the populations here and those along the Onon River in neighboring areas of Mongolia (Khentii Province).

Migration: In the past (until the 1990s), up to 300 Eastern Great Bustards gathered at pre-migratory staging points along the Onon River region near the southern border of the Tsasucheiskii Bor Zakaznik in southeastern Zabaikal'skii Krai. The site where the Onon River passes into Mongolia in Kyrinskii District in southwestern Zabaikal'skii Krai was used by a few dozen Great Bustards. However, since the 2000s, large pre-migratory flocks have not been observed. Instead, sites in the Kyrinskii District are used only by a few scattered family groups (broods). There are small groups (up to 30 Great Bustards) located along the southern border of Tsasucheiskii Bor, the middle stretches of the Onon adjacent to Mongolia between Ul'khun-Partiya and Tyrin villages, and in the Aginskaya Steppe near Gunei village.

Overwintering: In the 1990s, individual Eastern Great Bustards or groups of up to 7 individuals overwintered almost every year in the Torei Depression. In the 2000s and 2010s, they overwintered only in groups of 1-3 individuals in both the Torei Depression and Aginskaya Steppe. Currently, a small number of birds overwinters in the Torei Depression, on harvested farmland (Goroshko 2008). Overwintering is not observed in Kyrinskii District. Single birds overwinter in Daurskii Zapovednik.

A small number of birds overwinters in the Torei Depression, on harvested farmland (Goroshko 2008). Overwintering is not observed in Kyrinskii District. Single birds overwinter in Daurskii Zapovednik.

FAR EASTERN RUSSIAN FEDERATION

This region includes Amur Province and Primorskii Krai. *Information gathered from recent literature.*

In Amur Province, the Great Bustard has not bred since the 1990s and only twice birds were reported in the 2000s. It is listed as Critically Endangered (Goroshko & Andronov 2009). The Great Bustard has not been observed in Primorskii Krai since the 1990s, where it is also listed as Critically Endangered (Nechaev 2005)

4.2.2 – Mongolia

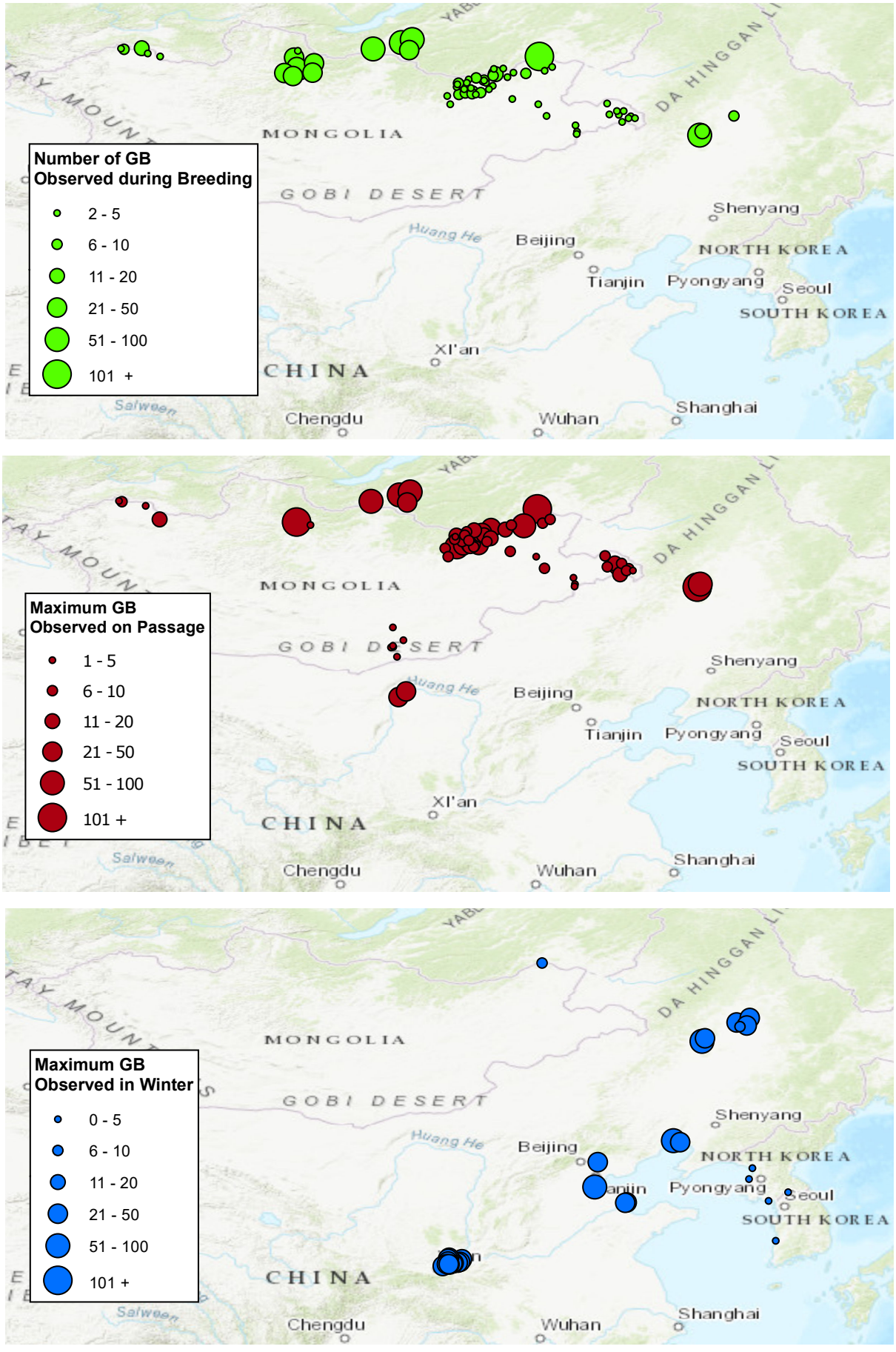
UVS PROVINCE

Small numbers of Great Bustards remain in areas of the province adjacent to the border with Republic of Tuva, Russian Federation. *Information provided by Dr. M. Kessler and a report by D. Togtokhbayar.*

Breeding: A few broods are reported in fields west of the Torkhilog River, and in abandoned fields in the area known as Sistem in Davst District. They are also reported in the steppe between Tes and Nariin Rivers, east of the Tes District center.

Migration: Observations of migrating Great Bustards in Uvs Province are mostly in fall. The largest staging grounds for Great Bustards in this region are wheat fields in Baruunturuun District. There is some conflict between farmers in this area and large flocks of geese, and hunting takes place. About ten years ago, there was also a report of a flock of 40-50 Great Bustards by guards at Handagaity border zone in Davst District. Great Bustards also gather for migration at the sites where breeding is reported.

Wintering: Overwintering is not reported.



Map 4-4. Key sites used by Eastern Great Bustards. Top: Breeding; Middle: Migration; Bottom: Overwintering. Size of circle is representative of maximum number of Great Bustards reported at a site within the past ten years. See Appendix 2 for more information about these sites.

NORTHERN MONGOLIA

The northern Mongolian population of Great Bustard includes breeding sites in Khovsgol and Bulgan Provinces. *Information provided by Dr. M. Kessler.*

Breeding: Northern Mongolia is one of the most important breeding sites for the Eastern Great Bustard, containing a number of leks in adjacent districts. The primary leks for the Great Bustard in this region are large agricultural mosaics consisting of wheat fields, fallows, and discarded fields in Erdenebulgan, Tarialan, Tosontsengel and Rashaant Districts of Khovsgol Province, and Teshig District of Bulgan Province. A lek in Khutag-Ondor District, Bulgan Province, is located in steppe/abandoned fields, and smaller gathering sites are also in natural steppe or in small openings in the forest.

Migration: Great Bustards gather before autumn migration at the southernmost leks, most notably in Uylt region of Tarialan District.

Overwintering: Almost all Great Bustards migrate out of this region. A small number (up to 5) may overwinter in Tarialan, Erdenebulgan.

EASTERN MONGOLIA

Information provided by Dr. N. Batbayar and Dr. Ts. Natsagdorj.

The eastern Mongolia population of Great Bustard includes subpopulations in Dornod and Khentii Provinces. This is one of the key strongholds for the Great Bustard's survival in Mongolia. Vast expanses of grassland steppe provide a natural habitat for the species, and it is also found in agricultural fields in all seasons.

Breeding: Nesting sites for the Great Bustard in eastern Mongolia are irregularly and widely spaced. The birds nest from the Khurkh Valley in Khentii Province eastward along the Ulz River basin into northeastern Mongolia. Currently Great Bustards regularly breed in Khurkh, Onon, and Ulz River valleys, Menen Tal, and Tashgain Tal. Display and nesting sites are located in the Onon River valley (from the international border to the confluence with Balj River) and Balj River basin (from the mouth of the Balj River to the Dadal airport). In this area, Great Bustard sites tend to be located in dry steppe biotopes. There are also leks in the Ulz River basin near Norovlin and Bayan-Adarga Districts.

The breeding range of the species in eastern Mongolia has shifted to the northern part of eastern Mongolia due to overgrazing and prolonged drought. Over the past decade, Great Bustards have disappeared from some areas such as the grassland valley between Omnodelger and Jargaltkhaan in Khentii Province, after it was overgrazed and transformed into agricultural fields. It is possible that they have also stopped breeding in areas of Dornod Province along Kherlen River basin and grassland steppe in Menen Tal and south of Buir Lake due to overgrazing and associated disturbance and perhaps hunting pressure.

Migration: Great Bustards tend to gather in wheat fields before migration. The largest gatherings of Great Bustards in Khentii Province occur in Khurkh, near the mouth of Agatsyn River (Nikhru River) and in the vicinity of the Dadal airport. Flocks also occur in crop fields in the Ulz River valley, near Norovlin town. Earlier they also gathered near the mouth of Balj River.

In Dornod Province, Great Bustards gather in wheat fields in north and northeast Dornod Province and Tashgain Tavan Lake area in eastern Dornod. They are also seen in small flocks in wheat fields along the Kherlen River.

Wintering: There are a few sites where Great Bustards overwinter in the Onon, Ulz and Khalkh River basins in eastern Mongolia. However, these sites seem to change depending on snow cover and disturbance. There is a need to study their winter habits and habitat use in the near future.

Overwintering: Not observed.

OTHER BREEDING SITES IN MONGOLIA

Great Bustards were once common across Arkhangai Province for both breeding and migratory stopovers. There have not been many observations reported in the past decade and current population numbers are expected to be limited. Great Bustards monitored via satellite telemetry in this part of the country have been poached *(unpublished data, M. Kessler).*

Great Bustards are reported to breed in Selenge Province, specifically in Shaamar, Huder, Mandal, Baruunburen and Orkhontuul Districts. However, records from these provinces are scarce and we are not aware of researchers who can report on the Great Bustard's presence in this region.

OMNOGOVI PROVINCE

Information provided by D. Batsuuri.

Breeding: Breeding of the Great Bustard is not observed in Omnogovi Province.

Migration: The Great Bustard is observed on migration.

Overwintering: The Great Bustard is not observed to overwinter in Omnogovi Province.

4.2.3 – People's Republic of China

BREEDING SITES IN NORTHEASTERN CHINA

NORTHEAST CHINA – TUMUJI

Information provided by Dr. G. Liu and J. Zhou.

Breeding: Great Bustards nest in two core grassland regions of Tumuji Nature Reserve, Maanshan and Kaoshan, located in the saddle mountain area. Maanshan is the key breeding region for 80% of the Great Bustards, involving about 150 individuals, while Kaoshan supports 30 individuals.

Migration: Tumuji Nature Reserve is the most important place for Great Bustard stopovers in northeastern China. Every migration season, many groups of Great Bustards stop and refuel before continuing migration. Also, the regions close to Tumuji Nature Reserve play an important role for migratory stopover, including Dagang Forest Farm in Jilin Province, Momoge Nature Reserve in Jilin Province, and Tailai Nature Reserve in Heilongjiang Province.

Overwintering: Overwintering occurs in the grassland and farmland in Tumuji, as well as farmland in the mountain saddles and grasslands. The main overwintering places are distributed in three provinces. Tumuji Nature Reserve in northeastern Inner Mongolia, China, covers approximately 76,210 ha. More than 100 individuals were observed in Tumuji and the regions close to Tumuji in the wintering season.

Some overwintering is also observed in the Bayangol region of Inner Mongolia, China, which is also used as a stopover site (Kessler et al. 2013; Chinese Wildlife Conservation Association 2018).

OVERWINTERING SITES IN CENTRAL AND EASTERN CHINA

BEIJING

Information provided by G. Liu.

Breeding: Breeding is not observed.

Migration and wintering: Beijing is historically an important stopover site. Great Bustards have been observed feeding in Yeyahu Nature Reserve and Hanshiqiao Nature Reserve almost every year, but the population consists of no more than 10 individuals.

TIANJIN

Information provided by B. Zhu.

Breeding: A small number of Great Bustards breed in Tianjin.

Migration and overwintering: Baodi and Jixian Districts in Tianjin are important overwintering sites.

HEBEI

Breeding: Breeding is not observed.

Migration: Cangzhou is located in the western coastal plain of Bohai Bay and is an important stopover site.

Wintering: Approximately 300 Eastern Great Bustards overwinter each year in Cangzhou.

LIAONING

Information provided by L. Yu.

Breeding: Breeding is not observed.

Migration and Overwintering: Great Bustard wintering places in Jinzhou are relatively concentrated in farmland near Xiaoling River Estuary, in fields of peanuts, corn and rice. There are also Great Bustards overwintering on the banks of the Daling River in Jinzhou, also in farmland.

HENAN

Information provided by K. Song and Y. Wang.

Breeding: not observed

Migration: This is the last major stop for migration through Xing'an League in Inner Mongolia, after migration along Bohai Bay, through Cangzhou and Tianjin.

Overwintering: The Great Bustard winters in the Yellow River wetland in Changyuan County, Henan Province, from October to mid-March. They are largely gathered in and around the Yellow River wetlands in Changyuan, Fengqiu and Zhongmou Counties. They use both sides of the Yellow River, feeding on wheat seedlings and weeds. Great Bustards also visit Shangqiu.

SHANXI AND SHAANXI

Information provided by G. Liu.

Breeding: Breeding is not observed

Wintering: Weinan is an important wintering ground for Eastern Great Bustards. It consists largely of agricultural fields near the confluence of the Wei and Yellow Rivers (Kessler et al. 2013; Wu & Xu 2013). More than 200 individuals have been observed wintering in Weinan. The Great Bustard is observed to overwinter along the banks of the Yellow River in Yuncheng, Shanxi, near to Weinan, Shaanxi.

Coordinated winter surveys: China Bird Watching Association and Henan Wild Bird Association conducted a series of three winter surveys with the aid of over 200 volunteers in ten provinces of China, with each survey lasting from one to two weeks in February 2019, November 2019, and January 2020 (China Bird Watching Association & Henan Wild Bird Association 2020). These surveys found from 954 to 1655 overwintering Great Bustards.

4.2.4 – Democratic People's Republic of Korea

Information provided by Dr. N. Moores.

Breeding: None

Migration: No stopovers known. However, based on the pattern of previous records and on the migration strategies of other bird species, it seems likely that birds migrating south into the Korean Peninsula (either intentionally or unintentionally) will be forced to move along the west coast, then southwest along the Hwanghaenam Peninsula. This potentially includes the concentration of 17 Great Bustards observed from 18-26 March 1994 in Mundok County listed in the 2002 Red Data Book.

Overwintering: The Red Data Book (DPRK 2016) states that there have been no observations since 2000. Seven

historic locations for the species were identified in the 2018 DPRK Wetlands Inventory, all concentrated in the western lowlands; with one additional record in the Red Data Book (2002) of 4 in Kumya County on the east coast in the winter of 1991-1992. All records consisted of groups of 2-4 birds, with the exception of an observation in 1994 of 17 individuals. Officials in DPRK confirmed in 2019 that no Great Bustard had been seen at their most important site for 30 years.

4.2.5 – Republic of Korea

Information provided by Dr. N. Moores.

Breeding: None

Migration: No stopovers known.

Overwintering: Based on limited literature, the Great Bustard was formerly found in large flocks in winter throughout the Republic of Korea (ROK) (of up to 100 individuals in the 1880s – perhaps mostly in northern provinces within present-day DPRK). Smaller flocks appear to have been encountered with some frequency until at least the 1940s, especially close to Seoul. The species became much rarer in the second half of the twentieth century, with only one flock reported after the separation of Korea in 1953 (a flock of seven on 29 November 1970, on Ganghwa Island, close to the border with the DPRK).

In the 21st century, there have been perhaps only four mid-winter records: 1-3 in c. 2005; one male in 2016/2017; one female in early 2020, and one male in early 2023.

Most potentially suitable areas for the species in the ROK are probably visited at least occasionally by researchers and/or birdwatchers. Therefore, the paucity of records is an honest indication of the species' current status. The only areas where birds might occur regularly undetected are those within the Demilitarized Zone (4 km wide at maximum, half in the ROK, half in the DPRK); and also "new" reclamation areas without much infrastructure close to extensive agricultural areas. The most suitable such area currently is Saemangeum, where one Great Bustard was present in January 2020.

4.2.6 – Japan

Great Bustards were historically irregularly observed in Japan. The last documented occurrence was in March 1994, in Aichi (Collar et al. 2001).

4.2.7 – Population summary: Eastern Great Bustard

As recently as the first half of the 20th century, the Eastern Great Bustard was described as abundant at breeding grounds along the southeastern border of the Russian Federation, the central and northern steppes of Mongolia, and northeastern China, as well as at overwintering spots in much of eastern and central China and the Korean Peninsula (Andrews 1932; Bannikov & Skalon 1948; Collar et al. 2001; Caldwell & Caldwell 1931). In the Russian Federation alone, the Eastern Great Bustard population was estimated at greater than 50,000 individuals (Chan & Goroshko 1998). This number had dropped rapidly by the publication of the 1998 Action Plan for Conservation of the Great Bustard in Asia, which estimated 1200-1500 Eastern Great Bustards to remain (Chan & Goroshko 1998).

In comparison, researchers today estimate a total population of 1300 to 2200 Eastern Great Bustards (Table 4-4 and 4-6). Though this estimate is slightly higher than reported in 1998, it includes Great Bustards overwintering in Mongolia which were not enumerated in the older Action Plan. However, data are missing from some breeding and wintering grounds in China. More contributors to this Action Plan reported declines (54% of regions for which data were reported) than increases (13%; Tables 4-4 and 4-6).

The number of Eastern Great Bustards estimated on wintering grounds is very close to the number estimated on breeding grounds (Table 4-6). Though stability and mild increases in population are reported at some wintering grounds, it is worth noting that Table 4-6 does not include the more southerly wintering grounds in Anhui, Hubei, and Jiangxi Provinces which are no longer used by Great Bustards. Therefore, apparent increases on some wintering grounds may represent a shift in the location of overwintering to more northerly sites, rather than an increase in the overall number of Eastern Great Bustards.

It is also instructive to compare the population estimate presented here to other recent counts. A nine-day census of overwintering Eastern Great Bustards in China carried out from 23 February to 2 March 2019 located 1674 individuals. These were distributed in Shaanxi (587 individuals), Shanxi (441), Hebei (285), Henan (285) provinces, with additional sightings in Beijing, Liaoning, Ningxia, Tianjin, and Shandong (Rosefinch China Birdwatching Association & Alashan SEE Foundation 2019). This count falls precisely in the middle of our estimate of the number of Eastern Great Bustards overwintering in China. Representing an additional line of evidence, a recent study of the mitochondrial genome of the Eastern Great Bustard projected a total population size of approximately 1456-2187 individuals (Liu et al. 2017), a range which is quite similar to ours.

Mongolia holds approximately half of the breeding population of Eastern Great Bustards, including three important areas which contain multiple viable leks (defined as containing greater than 30 individuals, Pinto et al., 2005; Map 4-4). Almost all remaining breeding sites of the Eastern Great Bustard are located near the international borders between Mongolia and the Russian Federation, sites that are generally difficult to access due to distance from large population centers, poor road conditions, and militarized border zones. An expansion of the transboundary protected area network already existing along this border could play an important role in protecting these remaining Great Bustard populations.

Over 90% of the global population of Eastern Great Bustards overwinters in China. As appears to be the case with the Western Great Bustard, overwintering sites of the Eastern Great Bustard have shifted northwards. Wintering sites in Anhui, Hubei, and Jiangxi Provinces where Great Bustards were observed as recently as the 1980s and 1990s are no longer used (Chan & Goroshko 1998; Collar et al. 2001). The most significant areas for overwintering are now located within Henan, Shanxi, and Shaanxi Provinces (Table 4-6). Overwintering at a breeding site is now observed to a considerable degree in at least one site (Tumuji, in Inner Mongolia; Liu et al., 2018b).

Western Great Bustards in flight in Uzbekistan. *Photo: A. Khan.*

Table 4-4

Country	Province	Region	Number of Great Bustards	Quality of Estimate (low=1; high=5)	Trend	Source of Estimate
Russian Federation	Tuva Republic	Uvs Depression and northern Tuva	10-15	3	Stable	T. Archimaeva
Russian Federation	Buryatia and Irkutsk	All sites	150-300	3	Stable	E. Elaev
Russian Federation	Zabaikal'skii Krai	Kyrinskii District (incl. Sokhondinskii Zapovednik)	4-10	3	Declining	E. Malkov
Russian Federation	Zabaikal'skii Krai	Daurskii Zapovednik and remaining sites	300-370	3	Increasing	O. Goroshko
Mongolia	Uvs	Baruunturuun fields and Uvs Depression	0-15	2	Declining	M. Kessler
Mongolia	Khovsgol	All sites	130-210	4	Declining	M. Kessler
Mongolia	Bulgan	All sites	80	3	Declining	M. Kessler
Mongolia	Selenge	All sites	Unknown	0	Unknown	--
Mongolia	Arkhangai	All sites	Unknown	0	Unknown	--
Mongolia	Khentii and Dornod	Northern Khentii including Onon-Balj National Park and Bayan-uul, Dornod	8-16	3	Stable	E. Malkov
Mongolia	Khentii and Dornod	Remaining Khentii and Dornod Provinces	400-800	3	Strongly decreasing	N. Batbayar, Ts. Natsagdorj
Mongolia	Omnogobi	All sites	NA	NA	NA	D. Batsuuri
PRC	Inner Mongolia	Tumuji Nature Reserve	100-150	4	Declining	G. Liu, J. Zhou
PRC	Inner Mongolia	Dali Nur Nature Reserve, Chifeng	"very low"	Unknown	Unknown	S. Liu
PRC	Inner Mongolia	Huihe Nature Reserve	Unknown	Unknown	Unknown	--
PRC	Inner Mongolia	Gaogstai Hana National Nature Reserve	40	Unknown	Unknown	Zhang, 2016
PRC	Inner Mongolia	Xilingol Meng, including Daulun, Baiyinkulan	20	Unknown	Unknown	Y. Jia
PRC	Inner Mongolia	Hulunbeier Meng, including Hulun Lake Nature Reserve	20	4	Decreasing	G. Liu
PRC	Jilin	Momoge Nature Reserve	Unknown	Unknown	Unknown	--
PRC	Jilin	Dagang Linchang	50	4	Decreasing	G. Liu
PRC	Heilongjiang	Daqing, Lin Dian Wetland	8-10	4	Unknown	J. Fu
PRC	Heilongjiang	Mingshui and Zhaodong, Suihua	40	3	Increasing	G. Liu
PRC	Tianjin	All sites	NA	NA	NA	B. Zhu
PRC	Hebei	Cangzhou	NA	NA	NA	B. Zhu
PRC	Henan	Changyuan and Fengqiu	NA	NA	NA	K. Song
PRC	Liaoning	Jinzhou	NA	NA	NA	L. Yu
DPR Korea	In entirety	-	NA	NA	NA	N. Moores
RO Korea	In entirety	-	NA	NA	NA	N. Moores
Total Breeding Population of *Otis tarda dybowskii*			1360-2146	Average=3.2	Decreasing – 7 Stable – 3 Increasing – 2	

Note. Breeding population size and trend of the Eastern Great Bustard (*Otis tarda dybowskii*) according to evaluation of experts in each region. "NA" is used for sites where the Great Bustard has not historically bred.

Number of Eastern Great Bustards observed on migratory stopover in Asia

Table 4-5

Country	Province	Region	Number of Great Bustards	Quality of Estimate (low=1; high=5)	Trend	Source of Estimate
Russian Federation	Tuva Republic	Uvs Depression and northern Tuva	25-35	3	Stable	T. Archimaeva
Russian Federation	Buryatiya and Irkutsk	All sites	150-200	3	Stable	E. Elaev
Russian Federation	Zabaikal'skii Krai	Kyrinskii District (incl. Sokhondinskii Zapovednik)	3	1	Declining	E. Malkov
Russian Federation	Zabaikal'skii Krai	Daurskii Zapovednik and remaining sites	10-32	4	Increasing	O. Goroshko
Mongolia	Uvs	Baruunturuun fields and Uvs Depression	20-30	2	Declining	D. Togtokhbayar, M. Kessler
Mongolia	Khovsgol	All sites	100-200	4	Decreasing	M. Kessler
Mongolia	Bulgan	All sites	0-50	3	Decreasing	M. Kessler
Mongolia	Selenge	All sites	Unknown	Unknown	Unknown	-
Mongolia	Arkhangai	All sites	Unknown	Unknown	Unknown	-
Mongolia	Eastern Mongolia	Khentii and Dornod Provinces	5-100	3	Strongly decreasing	N. Batbayar, Ts. Natsagdorj
Mongolia	Omnogobi	All sites	5-10	4	Stable	D. Batsuuri
PRC	Inner Mongolia	Tumuji Nature Reserve	150-250	4	Stable	G. Liu, J. Zhou
PRC	Inner Mongolia	Dali Nur Nature Reserve, Chifeng	Unknown	Unknown	Unknown	S. Liu
PRC	Inner Mongolia	Huihe Nature Reserve	Unknown	Unknown	Unknown	-
PRC	Inner Mongolia	Gaogstai Hana National Nature Reserve	Unknown	Unknown	Unknown	-
PRC	Inner Mongolia	Xilingol Meng, including Daulun, Baiyinkulan	200	Unknown	Unknown	-
PRC	Jilin	Momoge Nature Reserve	40	3	Decreasing	G. Liu
PRC	Heilongjiang	Daqing, Lin Dian Wetland	5-30	4	Unknown	J. Fu
PRC	Heilongjiang	Mingshui and Zhaodong, Suihua	Unknown	Unknown	Unknown	-
PRC	Tianjin	Jixian, Jinghai, Baodi	16-70	2	Decreasing	B. Zhu
PRC	Hebei	Cangzhou	Unknown	Unknown	Unknown	B. Zhu
PRC	Hebei	Hengshui	Unknown	2	Unknown	G. Liu
PRC	Hebei	Baoding, including Baiyangdian	40	4	Decreasing	G. Liu
PRC	Henan	Changyuan and Fengqiu	300	-	Decreasing	K. Song
PRC	Henan	Sanmenxia	15-40	Unknown	Unknown	Conference participants
PRC	Liaoning	Jinzhou	44-52	5	Slightly increasing	L. Yu
DPR Korea	In entirety	-	0	1	NA	N. Moores
RO Korea	In entirety	-	0	4	NA	N. Moores

Note. Number of Eastern Great Bustards (*Otis tarda dybowskii*) observed on migratory stopovers within the Central Asian flyway, according to evaluation of experts in each region. Estimates for migratory stopovers are not summed because individuals may be counted at multiple sites.

Wintering population size and trends of Eastern Great Bustards

Table 4-6

Country	Province	Region	Number of Great Bustards	Quality of Estimate (low=1; high=5)	Trend	Source of Estimate
Russian Federation	Tuva Republic	Uvs Depression and northern Tuva	NA	NA	NA	T. Archimaeva
Russian Federation	Buryatiya and Irkutsk	All sites	Unknown	1	Decreasing	E. Elaev
Russian Federation	Zabaikal'skii Krai	Kyrinskii District (incl. Sokhondinskii Zapovednik)	NA	NA	NA	E. Malkov
Russian Federation	Zabaikal'skii Krai	Daurskii Zapovednik and remaining sites	2	4	Stable	O. Goroshko
Mongolia	Uvs	Baruunturuun fields and Uvs Depression	NA	NA	NA	D. Togtokhbayar, M. Kessler
Mongolia	Khovsgol	All sites	0-10	4	Stable	M. Kessler
Mongolia	Bulgan	All sites	0-10	2	Stable	M. Kessler
Mongolia	Selenge	All sites	Unknown	Unknown	Unknown	-
Mongolia	Arkhangai	All sites	Unknown	Unknown	Unknown	-
Mongolia	Eastern Mongolia	Khentii and Dornod Provinces	50-100	3	Strongly decreasing	N. Batbayar, Ts. Natsagdorj
Mongolia	Omnogobi	All sites	NA	NA	NA	D. Batsuuri
PRC	Inner Mongolia	Tumuji Nature Reserve	60-120	3	Stable	G. Liu, J. Zhou
PRC	Inner Mongolia	Dalai Nur Reserve, Chifeng	21	2	Unknown	Wong and CBCGDF, 2018
PRC	Inner Mongolia	Huihe Nature Reserve	Unknown	Unknown	Unknown	-
PRC	Inner Mongolia	Gaogstai Hana National Nature Reserve	Unknown	Unknown	Unknown	-
PRC	Inner Mongolia	Xilingol Meng, including Daulun, Baiyinkulan	20-30	Unknown	Increasing	X. Li
PRC	Jilin	Momoge Nature Reserve	0-60	Unknown	Declining	X. Li
PRC	Jilin	Xianghai National Nature Reserve	0-10	Unknown	Unknown	X. Li
PRC	Heilongjiang	Daqing, Lin Dian Wetland	3	3	Unknown	G. Liu
PRC	Heilongjiang	Mingshui and Zhaodong, Suihua	Unknown	Unknown	Unknown	-
PRC	Tianjin	Jixian, Jinghai, Baodi	16-70	2	Decreasing	B. Zhu
PRC	Hebei	Cangzhou	14-78	Unknown	Unknown	B. Zhu
PRC	Henan	Changyuan and Fengqiu	20-320	5	Stable	K. Song, Y. Wang Zhao et al., 2018

PRC	Henan	Sanmenxia	15-40	Unknown	Unknown	Conference participants
PRC	Henan	Xinxiang, area between Kaifeng and Zhengzhou	10-197	Unknown	Declining	Zhao et al., 2018; Zhu et al., 2018
PRC	Shandong	Dongying and Yellow River Delta National Nature Reserve	32	Unknown	Unknown	Zhu et al., 2016
PRC	Shanxi	Yanhu and Datong in north, Yuncheng in south	441 (for all sites)	Unknown	Unknown	Rosefinch China Birdwatching Association and Alashan SEE Foundation, 2019
PRC	Shaanxi	Weinan and Yellow River	587	Unknown	Unknown	Rosefinch China Birdwatching Association and Alashan SEE Foundation, 2019
PRC	Shaanxi	Dingbian, Hancheng	Unknown	Unknown	Unknown	-
PRC	Liaoning	Jinzhou	44-52	5	Slightly increasing	L. Yu
DPR Korea	In entirety	-	0-50	2	Strong decline last century	N. Moores
RO Korea	In entirety	-	0	1	Strong decline last century	N. Moores
Total Wintering Population of *Otis tarda dybowskii*			1335-2233	Average = 3.1	Decreasing – 7 Stable – 5 Increasing – 2	

Note. Overwintering population size and trend of the Eastern Great Bustard (*Otis tarda dybowskii*) according to evaluation of experts in each region. "NA" is used for sites where the Great Bustard has never been recorded in winter.

4.3 – Summary of the Great Bustard's status in Asia

The populations of both Western and Eastern Great Bustards have reached critically low levels, with between 500-1000 Western Great Bustards and 1300-2100 Eastern Great Bustards persisting across Asia. Less than a century ago, tens of thousands of these birds were observed across this region. And even those tens of thousands represented a notable decline from historical levels: already in the mid-19th century records indicate the disappearance of Great Bustard from areas near human habitation (Aksakov 1852; Menzbir 1895).

The most recently published global population estimate for the Great Bustard is 29000-32500 individuals, using sources from the previous five years (Kessler 2022). Using some earlier sources, Alonso and Palacín (2022) estimate 31000-35000 individuals worldwide. Our accounting identifies 500-1000 Western Great Bustards and 1300-2100 Eastern Great Bustards remaining in Asia. Though Asia represents the historical heart of the distribution of the Great Bustard and the preponderance of its suitable habitat, numerically Great Bustards in Asia now represent only 6-10% of the global total. Declines are described at 60% of breeding sites in Asia for which reporting was available, and 57% of overwintering sites.

Similar geographic trends are observed in the distribution of both subspecies. The overwintering range of both subspecies has shifted northwards. This may be attributable to both a warming climate (Mi et al. 2016) and the greater risk of encountering anthropogenic causes of mortality on journeys involving multiple migratory stopovers (Section 5.1). Breeding sites of both subspecies have persisted largely near international borders, which may offer them some protection in terms of reduced human traffic.

Table 4-7. Population summary of Great Bustard populations by country.

Country	Western Great Bustard		Eastern Great Bustard	
	Breeding	Wintering	Breeding	Wintering
Democratic Republic of Korea	-	-	0	0-50
Islamic Republic of Iran	32-36	25	-	-
Kazakhstan	147-256	410-530	-	-
Kyrgyzstan	1-2	2-5	-	-
Mongolia	-	-	618-1121	50-120
People's Republic of China	17	0	278-330	1283-2061
Russian Federation	70-146	0-10	464-695	2
Tajikistan	0	1-2	-	-
Turkmenistan	0	25-45	-	-
Uzbekistan	0	50-500	-	-
Total	267-467	513-1117	1360-2146	1335-2233

Note. Population summary of Great Bustard populations by country.

Eastern Great Bustard nest, in wheat field in northern Mongolia. *Photo: M. Kessler.*

Male Eastern Great Bustard in full display,
Republic of Tuva, Russian Federation
Photo: M. Vershinin.

Section 5

Threats to the Great Bustard in Asia

5.1 – Adult mortality

The Great Bustard is a long-lived bird with a low rate of reproduction. Population viability analyses completed for Great Bustard populations in various regions of Europe have found that, for a population to remain stable, even small increases in adult mortality require large increases in productivity (Nagy 2018). Great Bustards have naturally low reproductive rates that are further decreased by human activities, and older female Great Bustards have twice the reproductive success of younger individuals (Morales et al. 2002). Thus, controlling anthropogenic causes of mortality is key to the survival of Great Bustard populations. Great Bustards in Asia may be at elevated risk of mortality threats, due to their tendency to undertake long-distance migratory journeys with multiple stopovers (Kessler et al. 2013), thereby increasing the chances that they will encounter an unsafe environment.

5.1.1 – Poaching

Hunting of the Great Bustard is prohibited across all Asian range states (see 6-1, "Legislation," below). Nevertheless, poaching was rated most frequently as a high-impact threat, as well as the threat most frequently mentioned as the largest challenge for the species' conservation (see "Urgent Threats," below and Table 5-1). Scientific publications also document poaching as a major factor in modern-day Great Bustard declines in Kazakhstan (Sklyarenko 2004), Uzbekistan (Kreitsberg-Mukhina 2003), Turkmenistan (Saparmuradov 2003), Mongolia (Batdelger 1998; Badarch et al. 2009), the Tuva Republic (Sokolov et al. 2013; Archimaeva et al. 2015) and Zabaikal'skii Krai (Goroshko 2003) of the Russian Federation. Although fines and imprisonment are widely indicated punishments for poaching, few poachers have faced these sanctions (see 6.1.3, "Enforcement").

The ecology of the Great Bustard makes the species susceptible to large-scale poaching. Great Bustards gather each spring at discrete spots in the landscape to breed – sites to which hunters can return year after year. Additionally, in Asia, Great Bustards assemble in larger flocks on wintering grounds. These aggregations are more readily noticed and provide attractive targets. In this context, large numbers of Great Bustards are sometimes killed at a single site. For example, over the course of the first decade of this century, poachers recurrently eliminated approximately 30% of individuals in wintering flocks in East Kazakhstan (Berezovikov & Levinskii 2012). In Uzbekistan, an entire flock of 200 Great Bustards in Uzbekistan was destroyed by poachers (Kreitsberg-Mukhina 2003). This scale of poaching is particularly alarming given the low number of Great Bustards remaining in Central Asia.

Poaching of Great Bustards is carried out with firearms in most locations, although in China it has also been conducted with snares (Liu 1997), hunting dogs (Luan 2019) and poison (discussed separately in the next section). Poaching is carried out by people from a variety of socioeconomic strata. A survey of rural residents in Uvs Province, Mongolia, found that approximately half of groups surveyed had either poached Great Bustards

Male Eastern Great Bustard, dead after collision with powerline. *Photo: Y. Dong.*

themselves, or witnessed poaching by others (Kessler et al. 2016). Questioning elucidated that the impetus to poach was typically either curiosity, or supplemental food. Alarmingly, this transboundary region of the Ubsunur Basin now likely has less than 20 breeding Great Bustards remaining.

Ongoing, informal questioning of urban residents of Ulaanbaatar, Mongolia, and Almaty, Kazakhstan, finds that a number of middle-class men travel to the countryside to hunt Great Bustards for sport and meat (M. Kessler, unpublished data). The impact of hunting by urban residents can be seen in the elimination of Great Bustards from areas closer to cities and major roads.

While lower- and middle-class people may occasionally take a single Great Bustard, the most extensive damage to Great Bustard flocks is attributed to hunting parties of wealthy and well-connected individuals. These groups are able to cause greater harm through the use of superior hunting equipment and little fear of legal consequences. For example, rich urban hunters including businessmen and government bureaucrats are reported to travel to East Kazakhstan to poach wintering groups of Great Bustards, using high-clearance vehicles or snowmobiles and expensive optics and rifles (Berezovikov & Levinskii 2005; Berezovikov 2016; Berezovikov & Filimonov 2017). Law enforcement officials have reportedly been involved in poaching in southern Kazakhstan (Gubin & Vagner 2005) and highly-placed government officials in Republic of Tuva (Archimaeva et al. 2013). Additionally, tour guides facilitate the hunting of Great Bustards by local and foreign tourists in northern Mongolia (M. Kessler, pers. obs.)

In China, Great Bustards are described as at risk of poaching even within protected areas (Wan et al. 2010). The death of a GPS-tagged Great Bustard within a protected area in Mongolia was also found to be due to poaching (M. Kessler, unpublished data).

Individual poaching events can have a large cumulative impact. In a study of the cause of mortality of 12 tagged female Great Bustards breeding in northern Mongolia, at least one-third died due to poaching within Mongolia, and at least one additional death was attributable to poisoning in China (M. Kessler, unpublished data).

The consequences of poaching extend beyond direct effects on population size. Disturbance from poaching causes large flocks to fragment into smaller ones. A study in Xinjiang found that in smaller flocks, individuals spend more time scanning for threats, which reduces the amount of time available for feeding and resting (Wang et al. 2015). In larger flocks, there is also a larger amount of time during which at least one individual is vigilant for threats, and the risk of falling prey to a poacher or predator is "diluted" by group size (Ydenberg & Dill 1986). Disturbance from poaching can also result in increased flight distance from human approach (Berezovikov, 2016; Kessler and Berezovikov, 2019; E. Rustamov in litt.), which impacts individual birds' energy balance.

Although numbers of Great Bustards have been falling dramatically in Asia, opportunities for poaching are still increasing in some areas of the range. In Mongolia, expansion of the paved road network is facilitating urban access to previously remote Great Bustard populations. In other areas, increased wealth is allowing greater access to vehicles and firearms which improve hunting ability.

5.1.2 – Poisoning

Death of Great Bustards due to poisoning occurs both accidentally and intentionally. The use of zinc phosphide, now banned, to control rodents was implicated in Great Bustard declines in regions of the Russian Federation (Belik 1998). There have also been concerns related to the embryotoxic effects of the fungicide granosan (Oparin et al. 2013). More recently, accidental death due to poisoning by the rodenticide bromadiolone, which is used to reduce populations of a vole considered to degrade pasture quality, has been considered a serious threat to the Great Bustard in Mongolia (Sokolov et al. 1996 Gombobaatar & Monks 2011). Accidental poisoning of Great Bustards through the consumption of grain treated with rodenticides has also been documented in Tuva and Zabaikal'skii Krai in the Russian Federation (Puzanskii 2000; Kel'berg & Smirnov 1988), and Shaanxi, China (Liu et al. 2013). Most recently, risk of accidental poisoning with chemical pesticides used against three species of locust (Moroccan Locust *Dociostaurus maroccanus*, Italian Locust *Calliptamus italicu*s and Migratory Locust *Locusta migratoria*) has been raised as a concern in Arys and Keles Districts of Turkistan Region of southern Kazakhstan, where the area treated covered 83,800 ha (Shakula 2019). In Jambyl Province in 2019, 184,500 ha were treated. 554,000 ha were planned for treatment in spring 2020 (inbusiness.kz).

While the use of agricultural chemicals declined across the former Soviet Union and Mongolia during the last decades of the 20th century and the early 21st century due to economic crises (Belik 1997), since around 2007 there has been a tendency towards increase (Food and Agriculture Organization of the United Nations 2019). The People's Republic of China has seen steady increases in pesticide use throughout the 21st century (Food and Agriculture Organization of the United Nations 2019).

In addition to accidental poisoning, poison baits are intentionally deployed in China to harvest game birds for meat. This practice has been documented annually in Changyuan County of Henan Province (CBCGDF 2018), Jinzhou in Liaoning Province, and Shaanxi Province, where the deaths of three out of eight Great Bustards examined were due to poisoning (Cheng et al. 2011; Wu et al. 2013).

5.1.3 – Collisions with overhead cabling

Great Bustards are at high risk of collision with overhead cabling (powerlines, railway cables, telephone cables, etc.) due to their low flight altitude, poor maneuverability (high

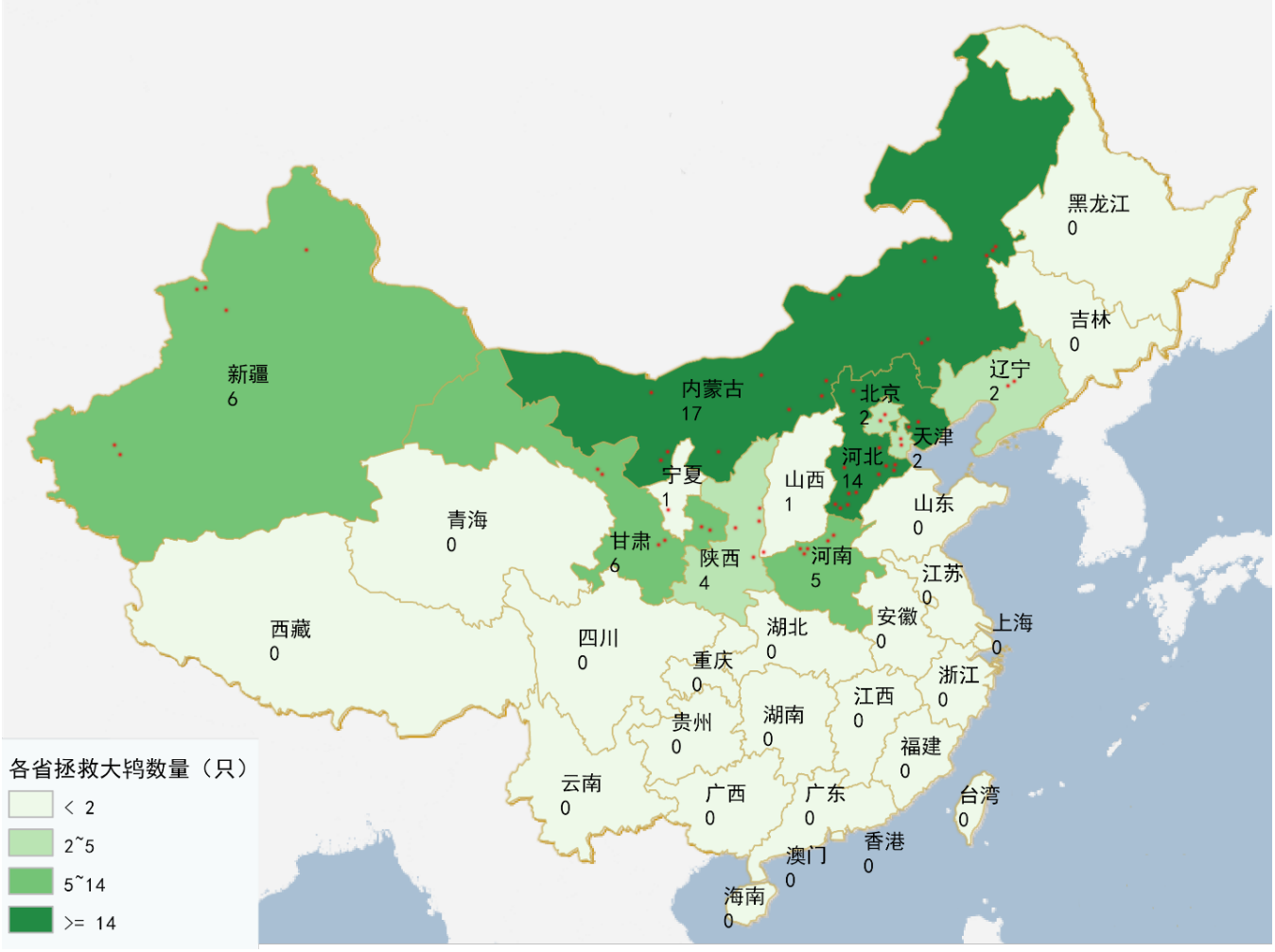
wing-loading), and peripheral (rather than binocular) vision (Janss 2000; D'Amico et al. 2019; Silva et al. 2023). Great Bustards tend to collide with cabling at 1–10 m height when making short-distance flights, and with cabling higher than 10m during longer-distance flights (Raab et al. 2013).

In Europe, powerline collisions are considered to be the most significant cause of mortality to adult Great Bustards, causing mortality rates of up to 13% (Alonso 2014). In Hungary, powerline collisions represent 32% of all mortalities (Vadász & Lóránt 2014), and in Spain, they are the cause of 55% of deaths of second-year birds (Martín et al. 2007). At a lek in Spain, all males but one were killed by powerlines crossing the breeding site; these lines caused a total of 29 mortalities over seven years (Alonso et al. 2003).

In comparison, only more recently has powerline infrastructure expanded across the Asian portion of the Great Bustard's range. This threat is likely to grow in coming years, particularly on Great Bustard wintering grounds, where human density is higher. Many contributors to this Action Plan have observed one or more cases of Great Bustard mortality due to powerline collision. The scientific literature from this region also records collisions in East Kazakhstan and Orenburg Province, Russian Federation (Kornev & Gavlyuk 2014; Prokopov 2017). However, for the most part, collisions have not been collated and analyzed.

An exception is a series of powerline surveys carried out in Mongolia. A survey in May 2019 recorded four incidents of Great Bustard collision with high-voltage powerlines in Dornod and Khentii Provinces (N. Batbayar in litt.). At Oyu Tolgoi mine in Omnogovi, Mongolia, powerline surveys have been undertaken once a month along 6, 35 and 220 kV powerlines. Over a five-year monitoring period, five Eastern Great Bustard mortalities were detected (Batsuuri 2017). All took place along the 220 kV powerline, and were concentrated during periods of migration (3 in April, 1 in November, 1 in December). Since that time, an additional mortality was registered (D. Batsuuri in litt.).

A review of Chinese media identified articles describing rescues of 59 Great Bustards between 2012 and 2017, a rate of 8.5/year, distributed across the species' distribution in China (Map 5-1; Q. Sha, CBCGDF); 48 of these rescues were due to "injuries." Powerlines are explicitly mentioned as the cause of injuries in some cases, and are likely responsible for some of the unknown injuries as well.



Map 5-1. Sites of injury to Great Bustards in China between 2012-2017. Rehabilitation was attempted for these birds (Q. Sha, CBCGDF).

In Shaanxi, China, over eight years, ten of twelve Great Bustards recovered were injured or killed by powerlines (Liu et al. 2013). A power line collision in China caused one of twelve mortalities in a cohort of female Great Bustards tagged in northern Mongolia (M. Kessler unpublished data). At Tumuji Nature Reserve, several Great Bustards were taken into captivity after injuries due to collision with powerlines in the vicinity (Liu in litt.). Repeat collisions have also occurred near the China Conservation Area in Tianjin. In 2014 in Teiling, Liaoning Province, a Great Bustard fatally collided with the insulator of an electric pole during a period of low visibility due to smog and smoke. Collisions were also reported in Baotou, Inner Mongolia, in November 2018 and in Weinan, Shaanxi, in January 2020 (G. Liu, news reports).

5.1.4 – Predation of adult birds

There is concern about the role of free-ranging dogs as predators of adult Great Bustards, with researchers from two countries considering them to be a medium-level threat, and researchers from the Russian Federation, Mongolia, and the Islamic Republic of Iran considering them to be a high-level threat (see "Threat Ranking," below). These are typically herders' dogs which roam freely and hunt for their own food. In Omsk Province, Russian Federation, a breeding population of Great Bustards which was tentatively re-establishing itself was destroyed by such dogs, which are estimated to number over 300 in each of seven steppe districts of the province (Nefedov 2013a).

Natural predators of adult Great Bustards in Kazakhstan include the Eastern Imperial Eagle *Aquila heliaca*, which preys upon younger individuals and females; and the Red Fox *Vulpes vulpes*, which hunts at night (Ryabov 1940; Voloshin 1949). Discussion at the 2017 conference on Great Bustards in Asia also brought to light the role of Golden Jackals *Canis aureus* as a predator of this species. There has been little contemporary study of the impact of these wild predators on Great Bustard populations in Asia, though it was noted that Red Fox dens were located within 20 m of the roosting site of wintering Great Bustards. The flock size decreased from 25 to 20 individuals over the course of the winter, and feathers of Great Bustard were identified at the fox dens (G. Liu, unpublished data).

5.2 – Reproductive failure

Even under favorable conditions, the reproductive rate of Great Bustards is low. An eleven-year study of the reproductive success of Great Bustards in a wildlife reserve in Spain found an average of just 0.14 chicks reared per mature female per year, with a high degree of inter-annual variation (Morales et al. 2002). A 23-year study including individuals from 350 leks in Spain yielded similar results, revealing an average of 0.15 chicks per mature female per year (Alvarez-Martínez et al. 2015). Reproductive success may be further reduced in regions that have not implemented agri-environmental legislation to improve breeding conditions for farmland birds.

Few datasets quantifying reproductive success of Great Bustards in Asia are available. In the 1980s, it was estimated that 70–80% of Great Bustard nests in agricultural fields were destroyed, although it is unclear which region of the former USSR these data were from (Isakov & Flint 1987). In northern Mongolia, 11 of 19 eggs monitored were lost to predators or machinery (Batsaikhan 2002). Another study in northern Mongolia observed no successful reproduction in a cohort of 12 females monitored by satellite telemetry (Kessler et al. 2016). Very few young birds are observed staging for migration in this region. In natural grassland at Maanshan at Tumuji, a study of 21 nests found the hatching rate to be 25% and reproductive success 24%, with reproductive failure attributed to human disturbance and overgrazing (Zhao 2002).

5.2.1 – Agricultural intensification

Over half of the breeding sites of Western Great Bustards, containing 28-41% of the population recorded at breeding sites in Asia, and one-quarter of the breeding sites of Eastern Great Bustards, representing 15-24% of the breeding population of this subspecies, are located within agricultural mosaics consisting primarily of interspersed cereal and fallow fields (Map 5-2; Appendices 1-2). Some studies in Asia have found that females prefer to nest in crops rather than in nearby pasture (see "Ecology," above). Although the impacts of agricultural production on reproductive success have not been well studied in Asia, they likely have a significant detrimental effect.

Agricultural intensification adversely affects Great Bustard reproductive success in a number of ways. First, farm machinery can directly crush eggs and chicks. Clutches and broods located in crops that are harvested, or in fallow that is plowed during incubation or before fledging, are likely to be destroyed. Machinery applying pesticides or fertilizers presents additional risk. The destruction of clutches during summer plowing of fallow fields has been documented in northern Mongolia, where it continues to be an annual threat (Kessler 2015). In Zabaikal'skii Krai, approximately one-third of nests in agricultural land were destroyed by plowing; the situation improved only during the agricultural collapse associated with economic transition in the Russian Federation (Goroshko 2002). In Jambyl Province in southern Kazakhstan, nests are destroyed during the harvest of Alfalfa *Medicago sativa* (Nukusbekov 2016). Because the timing of both Great Bustard reproduction and agricultural work are dependent on local climate conditions, the field type presenting the most danger to reproduction may differ from region to region.

Second, irrigation systems may flood nests in agricultural fields. Irrigation is described as a major driver of the Great Bustard population decline in the northwest of the Islamic Republic of Iran (Abdulkarimi et al. 2010; Naderi 2017), and is also noted to affect Great Bustard nests in Xinjiang (Gao et al. 2007).

Third, agricultural activities may increase the already considerable risk of nest predation (see "Nest predation," below). When female Great Bustards are flushed due to disturbance, corvids and mammalian predators may take advantage of the opportunity to predate a clutch or brood (Gavrin 1962b; Bankovics 2005). In Zabaikal'skii Krai, tractor operators report that the majority of nests from which female Great Bustards are flushed are destroyed by crows (Chan & Goroshko 1998). Furthermore, human settlements, agricultural activity, and the planting of windbreaks have facilitated the range expansion and density of predators. In Zabaikal'skii Krai, Russian Federation, and Kostanay, Kazakhstan, an expansion of crows into the steppe zone was observed alongside the expansion of agriculture (Goroshko 1999; Bragin 2017). In the Islamic Republic of Iran, increased Great Bustard predator density has been attributed to improper waste disposal (Naderi 2017).

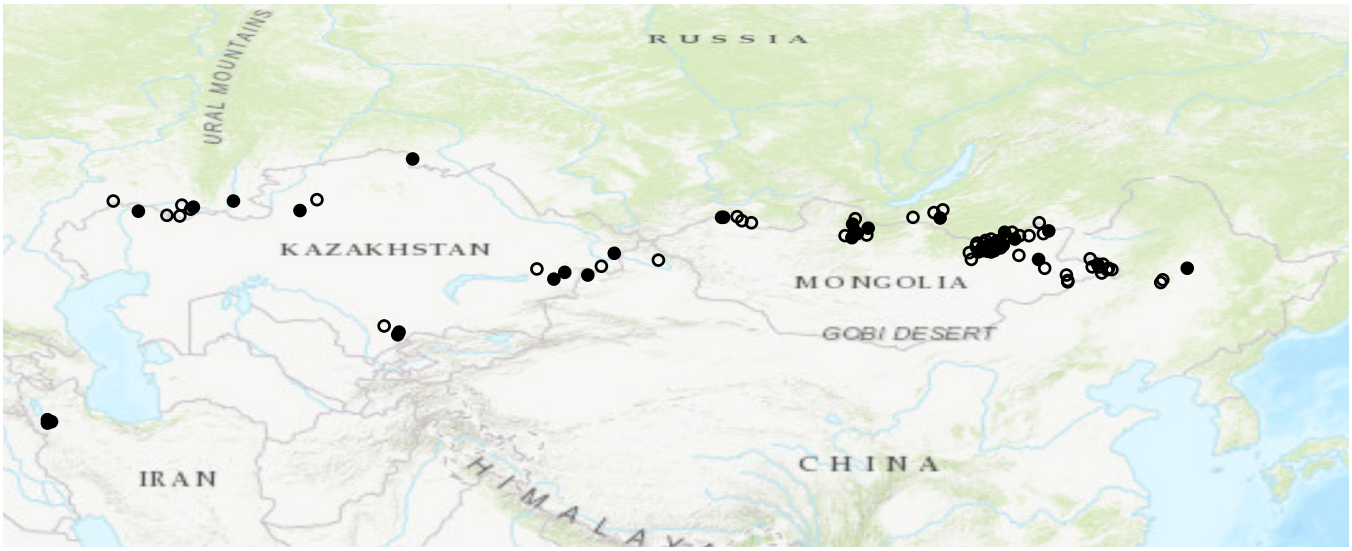
Finally, the use of pesticides reduces the protein-rich insect food base that is important to the Great Bustard summer diet, and particularly to chicks (Ryabov & Ivanova 1971; Hellmich 1992; Tian et al. 2004; Alonso et al. 2009; Bravo et al. 2012). The need for rapid growth in young chicks is even greater in Asia, where Great Bustards breed later in the spring, and yet chicks must be capable of long-distance migration in the fall (Kessler 2015). Because of their larger size, male chicks may be at higher risk of starvation (Alonso et al. 2009).

While a period of agricultural decline was observed in the countries of the Former Soviet Union and Mongolia after their economic transition, most regions in Asia have observed an increase in agricultural activity after reaching a nadir around the turn of the century (Meyfroidt et al. 2016; Lerman & Sedik 2018; Tokbergenova et al. 2018). Over the past decade, economic conditions and government policies (e.g., "Kazakhstan 2030" and "Tselina-3" in Mongolia) have promoted land reclamation and agricultural intensification, including increased use of chemical inputs (Food and Agriculture Organization of the United Nations 2019). Negative impacts on Great Bustard reproduction are inevitable unless appropriate safeguards are instituted in key areas for the species.

The area under cultivation is also increasing as a result of binational agreements which lease land to foreign countries or companies. Some of these agreements have resulted in the conversion of previously unplowed areas into farmland. For example, in Tajikistan, the buffer zone of the Tigrovaya Balka Protected Area, a semi-desert which previously served as breeding grounds for both Great and Houbara Bustards *Chlamydotis macqueenii*, was plowed up to develop a joint Tajikistan-China agribusiness. In Mongolia, the Korea-Mongolia Agricultural Development Initiative leases land in northern and eastern Mongolia, which are strongholds for the breeding of the Eastern Great Bustard.

5.2.2 – Overgrazing

Overgrazing was listed by researchers as a medium- to high-impact threat to Great Bustards across a wide swath of Asia. In Kazakhstan, Kyrgyzstan, Mongolia, and Turkmenistan in particular, the livestock sector has grown considerably since the turn of the century, surpassing pre-transition production of most livestock types (Food and Agriculture Organization of the United Nations 2019). Overgrazing presents an increased risk of crushing of eggs and chicks, as well as post-disturbance predation of clutches and broods. Few data are available to quantify the magnitude of this threat. In a study in Inner Mongolia, China, two of eight nests monitored were trampled by livestock (Chan & Goroshko 1998). A study on breeding and protection measures for Great Bustard in 18 districts of China found vegetation cover decreased from 85% to 60% due to overgrazing, and density of invertebrates decreased from 32 to 11 invertebrates per square meter (G. Yu oral presentation, 2008). Overgrazing is considered to be one of the main factors causing declines in the Great Bustard in northern Kazakhstan and western Siberia, until the decline of this economic sector during the agricultural transition of the 1990s (A. Nefedov in litt.).



Map 5-2. Great Bustard use of agricultural fields as breeding habitat. Black dots represent breeding sites at which habitat includes crop fields (excluding abandoned fields). Hollow dots represent breeding sites that do not contain crop fields.

5.2.3 – Nest predation

Corvids, particularly Rooks *Corvus frugilegus* but also Hooded *C. cornix* and Carrion Crows *C. corone*, have long been recognized as important nest predators of the Great Bustard (Gewalt 1959). Their predation is typically facilitated by human disturbance. A study in northern Mongolia found 27% of Great Bustard egg losses to be attributable to corvids (Batsaikhan 2002), some of which may have been associated with researcher activity. Where elevated perches are available, corvids have been observed monitoring and harassing female Great Bustards accompanying small young. This may continue for many hours, until the female is distracted and an opportunity for attack arises (M. Kessler pers. obs.).

White-tailed Eagles *Haliaeetus albicilla*, Steppe Eagles *Aquila nipalensis*, Long-legged Buzzards *Buteo rufinus*, and Eurasian Marsh Harriers *Circus aeruginosus* may also prey on broods and clutches (Voloshin 1949; Gubin 2007). Among mammals, free-ranging dogs, foxes (*Vulpes vulpes* and *Vulpes corsac*), wolves *Canis lupus* and jackals *Canis aureus* predate Great Bustard clutches and young. The densities of some of these predators may be increased in agricultural environments. Leopard Cat *Prionailurus bengalensis* and Hog-badger *Arctonyx albogularis* are also noted as predators at Tumuji (G. Liu).

In rural areas of northern Mongolia such as the Onon and Ul'dza River basins, as well as the adjacent areas of the Russian Federation, from five to six dogs are kept by each household. As described in 5.1.4, these dogs forage for their own feed in steppe areas around their household, consuming clutches of Great Bustards as well as those of cranes, waterfowl and shorebirds. As the number of households grows, this threat is increasing.

5.2.4 – Egg collecting

In the Islamic Republic of Iran, collection of Great Bustard eggs by farmers and shepherds is considered a major threat to the species (Naderi 2017). Collection of eggs for consumption has also been listed as a problem at Great Bustard breeding sites in northeastern China (Liu 1997).

5.2.5 – Steppe wildfire

Steppe fires are ranked as a considerable threat to Great Bustards by researchers in four countries, with concern highest in the Russian Federation and Mongolia. Fires which occur during the breeding season destroy nests and resources for successful reproduction (Bold 2003; Malkov 2012).

In Mongolia, the frequency of fires has increased in the steppe region due to climate factors and overgrazing (Liu et al. 2013). In a study from 2001–2007, fires occurred every year in Khentii and Dornod Provinces, which are important breeding areas for Great Bustards, and were concentrated in spring (Farukh et al. 2009). In the Russian Federation, the frequency and area burnt by steppe fires has increased over the past 15–20 years (Smelyanskii et al. 2015). In the steppe Orenburg Zapovednik, the area burnt from 2000–2009 was equivalent to 83% of the terrestrial territory of the protected area. For Daurskii Zapovednik, the area was 115% (Smelyanskii et al. 2015).

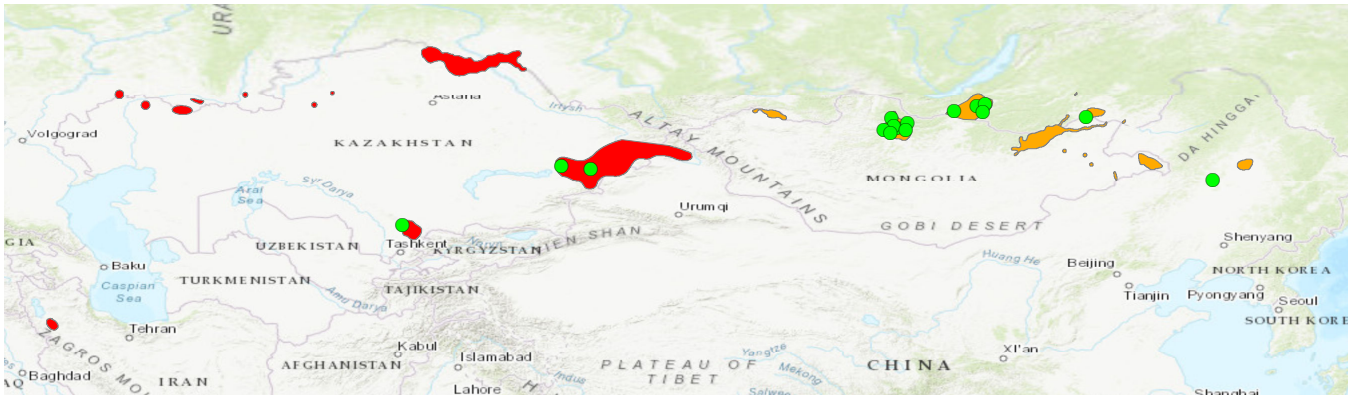
5.3 – Habitat loss

Habitat loss is ranked as a medium- to high-level threat across much of the Great Bustard's Asian range. Conversion of steppe into croplands represents one type of habitat loss. While Great Bustards often continue to use agricultural lands, they present a significant set of negative impacts, detailed in 5.2.1.

Other land use conversions represent a complete loss of habitat to Great Bustards. In China, loss of wetlands is considered a high-impact threat. For example, Poyang Lake, which was previously an important wintering habitat for Great Bustards, has exhibited increased episodes of shrinking and drying due to a drought and the construction of a dam. Conversion of cereal fields to higher-value fruit orchards have occurred over multiple decades in the historic wintering range of the Great Bustard in China. Most recently, corn and wheatfields previously used for overwintering by Great Bustards in Weinan, Shaanxi Province, have been converted to orchards for high-value fruit (G. Liu). Similarly, wet grasslands in Weinan, Shaanxi and Cangzhou, Hebei, have been transformed into fish and lotus root ponds.

In the Republic of Korea, the Civilian Control Zone is being opened to a wider variety of economic and tourist activities. The conversion of rice fields to covered fields and greenhouses removes habitat in northern parts of the country, where the Great Bustard previously overwintered. Transportation infrastructure is rapidly developing across Asia as a result of China's Belt and Road Initiative. Expansion of transportation networks necessarily constitutes loss of habitat for Great Bustards, which are sensitive to vehicle disturbance (Lane et al. 2001; Malo et al. 2017; Torres et al. 2011), and which can be more easily exploited by poachers using improved road networks (Berezovikov 1986; Kel'berg & Smirnov 1988).

Construction of energy infrastructure also leads to habitat loss. Oil extraction eliminated breeding grounds for Great Bustards in the Songnen Plain of northeastern China (Liu 1997). In Central Europe, the establishment of a windfarm resulted in the complete displacement of a Great Bustard lek (Raab et al. 2013). Pressure to establish wind farms in the typically open habitats preferred by Great Bustards has increased in Asia in recent years. High-voltage transmission lines for a windfarm in Inner Mongolia have impacted populations of Great Bustard. Several such installations pose threats to Great Bustards overwintering in Cangzhou, Hebei, where the total installed capacity is 333,000 kWh and power generation is 403 million kWh. There is discussion of a windfarm near an important wintering site in Changyuan, Henan Province, China, and at major wintering sites for *O. t. tarda* in Uzbekistan.



Map 5-3. Breeding sites containing more than 30 Great Bustards are shown as green dots. The contemporary breeding range of the Western Great Bustard is shown in red, and that of the Eastern Great Bustard in orange.

5.4 – Population fragmentation

Great Bustards breed at discrete sites known as leks. The extinction of leks, whether due to habitat loss, adult mortality, reproductive failure, or a combination of these factors, can lead to metapopulation fragmentation and genetic isolation. In Asia, considerable range fragmentation has already occurred, with some leks located hundreds of kilometers from other leks (Map 4-1). The few genetic analyses conducted thus far indicate low genetic diversity in Asian populations of Great Bustards, with several sites in Central Asia fixed for a single mitochondrial haplotype (Liu et al. 2017; Kessler et al. 2018). A microsatellite study of eight loci also found low levels of diversity, suggesting fragmentation and historic bottlenecks (Tian et al. 2006).

Some distant leks may share migratory connectivity, which provides a mechanism for long-distance dispersal. However, there is heightened concern for peripheral populations such as the Uvs Depression population of the Eastern Great Bustard, and the Iranian population of the Western Great Bustard, both of which contain less than 30 individuals and are located 500 km from the nearest neighboring lek. Geographic isolation also increases the risk that a catastrophic event may eliminate a population.

The probability of local extinction of a Great Bustard population increases quickly once the number of Great Bustards is below 30 (Pinto et al. 2005). Currently, only three breeding sites for the Western Great Bustard and thirteen sites for the Eastern Great Bustard have populations of 30 or more individuals (Map 5-3; Appendices 1-2). The extirpation of additional leks will further exacerbate existing issues of population connectivity and genetic isolation.

5.5 – Climate change

Climate change is expected to shift the breeding and wintering ranges of the Great Bustard, as well as present challenges to successful breeding, migration, and overwintering. Owing to their size, male Great Bustards are particularly sensitive to heat (Ryabov 1940; Alonso et al. 2016). On breeding grounds, heat, desiccation, and extreme precipitation events may present further challenges to successful Great Bustard reproduction. In northern Mongolia, summer snowstorms and heavy rainfall events represent threats to clutch and brood survival (Dagvadorj et al. 2009). In Inner Mongolia, China, prolonged drought and aridization are attributed to climate change (Liu et al. 2014), and in the Daurian region, the dry phase of 30-year climate cycles is intensified by the rising temperatures of climate change, creating conditions detrimental to Great Bustard populations (Kirilyuk et al. 2012). No studies have yet been published regarding shifts in the breeding range of the Great Bustard in Asia under climate change conditions.

The further drying and widening of the Gobi Desert, and a decrease in the strength of the Siberian Anticyclone expected with climate change, may present increased energetic challenges to the migration of Eastern Great Bustards (Kessler et al. 2013; Gong & Ho 2002; Badarch et al. 2009).

Over the late 20th century and early 21st century, a northward shift in the location of overwintering spots has been observed for both Western and Eastern Great Bustards, which may be due to both climate warming and higher mortality experienced by longer-distance migrants (Kessler & Smith 2014; Mi, Huettmann, et al. 2016). As the climate continues to warm, Great Bustards breeding in northeastern China are predicted to overwinter largely at their breeding sites (Mi, Huettmann, et al. 2016). Extreme winter weather events and earlier onset of snow will further challenge Great Bustard health and survival during the winter, impacting the species as prolonged stressors and suppressing immune function (Batima et al. 2005; Dagvadorj et al. 2009; Liu, Hu, et al. 2018).

The only sedentary population of Great Bustards in Asia is located in Iran, where the species endures both cold winters (to -20°C) and hot summers (to +40°C). It is unclear how this tolerant population will respond to climate change.

5.6 – Other disturbance

Disturbance of Great Bustards due to the close approach of photographers is described by contributors to the plan as a growing problem in eastern and western PRC, as well northern Kazakhstan and Western Siberia. “Severe

harassment" of the first Great Bustard to visit the Republic of Korea in ten years was reported.

5.7 – Threat ranking

Participants of the 2017 conference "Advancing the Conservation of the Great Bustard in Asia," and contributors to this Action Plan were asked to work in groups to list threats to Great Bustards in their region and rate the impact of those threats (Figure 5-1). We also asked contributors to describe the threats that they consider to be increasing, as well as those which present the greatest barrier to the conservation of the Great Bustard in their region. These are presented in the box below. And additionally, during development of this Action Plan, a detailed questionnaire was sent to species experts across the Asian range of the Great Bustard to prioritize threats in each region, and gather input on recommended approaches to tackle those threats. These responses are collated in Appendix 3 and 4.

In all three methods of assessment, poaching is perceived as a critical or high priority across most of the species' range in Asia. Powerline collisions are also ranked as a concern across a wide geographic area, and written accounts describe them as a growing threat particularly in the range of the Eastern Great Bustard. Predation and disturbance by free-roaming dogs are widely reported as critical problems. Written accounts attest to the severity of the situation in some areas.

Among challenges to successful reproduction, overgrazing, destruction of nests by agricultural machinery, and steppe fires were ranked as most serious. Mongolia and Russian Federation – the countries holding the most significant breeding populations of the Eastern Great Bustard – report a medium to high level of threat for all three of these factors, while two key countries for breeding of the Western Great Bustard in Asia (Kazakhstan and the Islamic Republic of Iran) medium to high risks from two of these factors have been reported.

Habitat destruction and degradation are ranked as pressing concerns across much of the Great Bustard's Asian range. This is reflected in contributors' accounts of threats emerging from increasing economic activity across the region. Climate change is broadly recognized as a threat; as is disturbance, though the sources and degree of disturbance vary widely by country.

In written accounts, lack of human capacity and governmental support are described as major impediments to the Great Bustard's conservation. The failure of governments to reduce poaching and control free-roaming dogs are described. Contributors also note that infrastructure development is undertaken without consideration of the Great Bustard, and that a protected area important to the species was dissolved.

Difficulty locating funding for conservation and research focused on the Great Bustard is also discussed. Furthermore, the increasing rarity of the species has increased the time and financing required for these activities. For example, contributors describe the challenges of locating and protecting small numbers of highly mobile and wary Great Bustards across the vast extent of its former territory. The number of birds is so small in some regions that the chances of successfully locating sufficient birds to complete a planned project and meet commitments to funders is diminished, making reliance on competitive conservation grants unworkable.

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Here we paraphrase the responses of contributors to the

Great Bustard National Monument marker in North Korea.
Photo: N. Batbayar.

Figure 5-1. Ranking of threats to Great Bustard by country. "H" represents "High Threat;" "M" – "Medium;" "L" – "Low;" and "U" – "Unknown." Threats were evaluated by regional experts via group discussion during the 2017 conference on the Conservation of the Great Bustard in Asia, as well as in written table form by contributors to this Action Plan who were not present at the conference. In cases where consensus could not be reached, or where there was geographic variation in the level of a risk across a country, both levels of the threat are displayed (e.g., "M-H" - "Medium to High"). Threat ranking is not available for Democratic People's Republic of Korea.

		Islamic Republic of Iran	Russian Federation	Kazakhstan	Uzbekistan	Turkmenistan	Kyrgyzstan	Tajikistan	Mongolia	People's Republic of China	Republic of Korea
Adult Mortality	Poaching - Firearms	M	H	L-H	H	H	H	H	M-H		
	Poaching-Poison									H	
	Poaching-Use of dogs									H	
	Poaching-Electric fence									H	
	Poaching-Nets									M	
	Poaching-Foothold trap									M	
	Powerline Collision		M	L		L			M-H	L-M	H
	Predation - Dogs	H	H			M	M		H		
	Predation - Natural Predators	M		L		L			M		
	Disease							L			
	Poisoning - Accidental		M	U		L					M
Habitat	Chemical use	M								H	
	Habitat Destruction	H	H		H	L	M		L-H	H	H
	Habitat Degradation		H					H		H	H
	Change in landuse									L	
	Disturbance - Medicinal herb collection	M								M	
	Disturbance - Tourism									L	
	Disturbance - Bird photography									L	H
	Disturbance - Farming	H	H								
	Disturbance - General		H	L-M	M	H					
	Disturbance - Dogs		M	L					M		
	Climate change	L	M			L		M	H		
Reproduction	Irrigation	M									
	Steppe fire	M	H			L			H		
	Overgrazing	H	M	M-H		M	H		M		
	Destruction of nests by machinery		H	M					H		
	Egg collection	M	M								
Other	Low public awareness				M		M				

Urgent and challenging threats

Action Plan, asked to identify threats to Great Bustards that are increasing in their region, and those that present the most challenging barriers to conservation of the species.

Western Great Bustard

ISLAMIC REPUBLIC OF IRAN

- All suitable habitat is under cultivation, and farming activity presents a threat throughout the year.

RUSSIAN FEDERATION

- The main barrier is the lack of financial support to identify the current distribution, population numbers and threats to this species, which are necessary to develop effective conservation measures.
- The Stepnoi Federal Nature Reserve was liquidated in 2015 and there is no legal basis for its current status. As a result, there are no remaining federal-level steppe protected areas in western Siberia. We need to preserve the only virgin steppe remaining in western Siberia, "Kurumbel'skaya" to protect the Great Bustard and other steppe species. Kurumbel'skaya is unsurpassed in size, containing more than 400 thousand hectares of virgin steppe, is a unique natural zone within the Russian Federation, and deserves the status of a zapovednik.
- Bird photography has become an important source of disturbance, particularly during for rare birds during the breeding center. This requires enactment of new and strict regulation.

KAZAKHSTAN

- Weak anti-poaching enforcement. Large areas of unprotected territory, in which it is difficult to control poaching of the Great Bustard. (3 contributors)
- Poaching has increased because the cellular phone network has made it easier for information about Great Bustard observations to spread.
- No publicity for this species in major media. Insufficient communication of the importance of conservation with local populations. (2 contributors)
- Human encroachment.
- Intensification of farming practices.
- The lack of information about this species, and lack of targeted research, particularly concerning nesting, does not allow us to understand the number of remaining birds, population trends, or threats to the species. Undertaking such studies is expensive due to difficulties finding the low numbers of remaining birds in the large territory of this region.
- The existing network of protected areas in the country partially covers the migration corridors for Great Bustards which nest in northern Kazakhstan and onward into western Siberia, but needs to be expanded.

UZBEKISTAN

- It is necessary to strictly enforce existing laws and punish poachers.
- A new threat is that farmers have found that excavating ditches around their fields is the most cost-effective way to protect their crops from cows and sheep. These ditches are then used as "hides" which facilitate poaching at a major Great Bustard overwintering area.

TURKMENISTAN

- Poaching is increasing in seriousness, and there is no official action to decrease it.

KYRGYZSTAN

- It is critical to carry out educational programs focused on the conservation of the Great Bustard among farmers, herders, and hunters, which include information about the punishment for poaching.
- Disturbance by herders with dogs, particularly in autumn, is one of the most serious threats to this species.

TAJIKISTAN

- The disappearance of appropriate nesting, migratory stopover, and overwintering habitat is a serious threat to this species.
- Poaching must be controlled.

XINJIANG, PEOPLE'S REPUBLIC OF CHINA

- Lack of public awareness about the species and habitat protection.
- Lack of information about the species' population size and distribution in Xinjiang which is needed to inform conservation decisions.
- Insufficient governmental funding and attention towards this species, despite its status as a Class One protected species.

Eastern Great Bustard

RUSSIAN FEDERATION

- Poaching is the most significant barrier to conservation of this species. (3 contributors)
- Poaching is a major threat. Our district is large and sparsely settled and has only one staff game manager, and poaching is episodic in character. This makes it difficult to control poachers, especially as hunting

Great Bustards was traditional in the region earlier when it was still legal. It is particularly difficult to control poaching at haymaking sites in autumn, when pre-migratory gathering spots of Great Bustards coincide with the locations of temporary camps of those engage in haymaking. Hunting inspectors of the zapovednik are only authorized to work on the territories assigned to them.

- The climate is getting drier, which is decreasing the food base and contributing to steppe fires.
- Anthropogenic influence has only deepened since the formulation of the last Action Plan in 1998 and will continue to increase in the foreseeable future due to economic development. Human disturbances include wildfire, and to some degree, habitat change. Great Bustards are now displaced from natural habitats into human-altered habitats, such as fallows, cultivated and abandoned fields.
- The damage done by free-roaming dogs to Great Bustards is significant, continuous, and increasing alongside the growth in farm enterprises. It is difficult to control the predation by these dogs. There are no government agencies which take responsibility for this issue. (2 contributors)
- Great Bustards are poisoned with agricultural chemicals.
- There is discussion of creation of a breeding facility at the Chita Zoo, which would remove Eastern Great Bustards from the wild.

MONGOLIA

- Finding funding to conserve the Great Bustard is the biggest challenge.
- Poaching is widespread and no action is taken to curtail it. The expansion of the road network now makes previously remote populations of Great Bustards accessible to middle- and upper-class urban hunters.
- A large number of Great Bustard clutches are destroyed by incompatible agricultural schedules (crushing by machinery).
- Predation by free-ranging dogs is increasing.
- We need to do research to better understand the cause of fluctuations in numbers of Great Bustards we observe at the sites, but lack resources.
- A major threat along the migration route is collision with power lines. This threat may be increasing due to a new power plant project that will likely be realized in the coming years. Though collisions take a toll on the Great Bustard population the government and mining companies are not concerned with the species' conservation because it only passes through on migration.
- The vast amount of suitable habitat in the east of the country and small number of remaining birds make it difficult for us to pinpoint lek locations. Simply mapping them will take several years of effort.

NORTHEASTERN CHINA

- Collisions with powerlines are a new threat that has been emerging over the course of the past several years.
- Disturbance due to hay harvest, grazing, herb-collecting, and photography affect nesting and breeding of Great Bustards.
- Foxes have a large negative influence on the reproduction of Great Bustards in the Nature Reserve. Rain also has an effect.

CENTRAL AND EASTERN CHINA

- Great Bustards gather in large flocks during winter and become more vulnerable to poaching and poisoning. They range widely and it is difficult to protect them. Law enforcement is weak due to shortage of personnel, inadequate prioritization of this work, and lack of targeted efforts. There are fewer law enforcement officers and more volunteers.
- Anthropogenic pressure is increasing on the Yellow River Wetland due to local agriculture using large amounts of chemical fertilizers and pesticides, animal husbandry, water projects, new road and home construction, and expansion of economic activity. Climate change is also negatively affecting the wetland. This is the most important wintering site for Great Bustards.
- New telephone poles have been erected on important wintering fields, and there are plans for wind power generation.
- Government departments plan development projects that are not allowed in nature reserves.
- Serious illegal hunting of overwintering flocks.
- Reduction of crop farming in rural areas decreases habitat for this species.
- We lack funds, equipment and volunteers to cope with these threats.

REPUBLIC OF KOREA

- The issue of disturbance caused by bird photographers is likely worsening. There was severe harassment of the last recorded Great Bustard here.
- Rampant infrastructural development (roads, overhead wires, wind turbines, etc.) is likely to make reaching any potential areas which could be used by the species very hazardous.
- The Civilian Zone is being opened up to more economic activity, leading to disturbance and habitat loss in areas that might have been attractive and well-positioned for Great Bustards arriving to overwinter.

Section 6
Conservation measures enacted

Western Great Bustard in Boukan, Iran
Photo: C.R.S. Babak Musavi

6.1. – Legislation relevant to the Great Bustard in Asia

The information here is intended to provide a general understanding of the current legal protections of the Great Bustard, as understood by contributors to the Action Plan. It should not be construed as an authoritative legal reference.

6.1.1 – International legislation protecting the Great Bustard

The Great Bustard was uplisted to Appendix I of the Convention on Migratory Species in 2014 (Government of Mongolia et al. 2014). A Concerted Action for the species was established among Asian range states in 2017 (Government of Mongolia et al. 2017). The proposals for both the uplisting and the Concerted Action were proposed by the Government of Mongolia and adopted unanimously at CMS COP11 and COP12, respectively. The Great Bustard is listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

6.1.2 – National legislation protecting the Great Bustard in Asia

Western Great Bustard

ISLAMIC REPUBLIC OF IRAN

The Great Bustard is listed as "EN – In danger of extinction" by the Department of Environment, in a categorization system consisting of four levels (Endangered, Protected, Pest and Non-endangered/Common). The Department declared the Great Bustard a protected species in 1967 and banned hunting (Laws and Parliamentary Affairs Office, Department of Environment, 1997).

RUSSIAN FEDERATION

Nationally, the Western Great Bustard is listed as Category III (Vulnerable) due to a population stronghold in the Volga River region (Gabuzov 2001), which is located within Europe and not considered in this Action Plan. At the provincial level, within the range considered here, the Great Bustard is listed as Category II (Endangered) in Orenburg Province (Kornev & Gavlyuk 2014). In all other provinces along the southern border of the Russian Federation from Bashkortostan to Altai Krai, the Great Bustard is now listed as either Category I (Critically Endangered: Bashkortostan, Chelyabinsk Province, Altai Krai), or Category 0 (Extinct: Tyumen, Omsk, and Novosibirsk Provinces) (summary in Kessler 2016). Hunting is forbidden. According to decree Number 107 of the Ministry of Natural Resources from 28 April 2008 entitled "On the sanctioning of the methodology for calculation of damage incurred on animals listed in the Red Data Book of the Russian Federation," the fine for poaching a Western Great Bustard is 25,600 rubles plus 2500 rubles in administrative fees, or approximately US$400.

KAZAKHSTAN

The Great Bustard is listed as Category I in the Red Data Book of Kazakhstan (Endangered; Berezovikov and Gubin, 2010). It is protected by the Law on Protection and Use of the Animal World of the Republic of Kazakhstan. Hunting is forbidden, as is destruction of nests and keeping young or adult Great Bustards in captivity. The fine for poaching is 700 MRP (a price calculation index), which at the time of writing is equivalent to 1,944,600 tenge or approximately US$4680.

UZBEKISTAN

The Great Bustard is listed as Category I (Critically Endangered) in Uzbekistan (Lanovenko & Kreitsberg 2019). The Great Bustard is protected by Act Number 290 of the Cabinet Secretaries of the Republic of Uzbekistan, from 20 October 2014, "Regulation of use of biological resources and order of permitting procedures relating to use of natural resources." Hunting is forbidden (Law of the Republic of Uzbekistan 2020).

TURKMENISTAN

The Great Bustard is listed in the Red Data Book of Turkmenistan as a Category I species (Critically Endangered; Saparmuradov, 2011). Illegal take of a Great Bustard incurs a fine.

KYRGYZSTAN

The Great Bustard is listed in the Red Data Book of the Kyrgyz Republic as Category III (Critically Endangered; Kasybekov 2006). After 2017, the fine for poaching was increased to 200,000 som (approximately US$2,600) (Government of the Kyrgyz Republic 2017).

TAJIKISTAN

The Great Bustard is listed as Critically Endangered in the Republic of Tajikistan (Muratov 2015). The Law on Protection of Nature prohibits harm to redlisted species. The Law on Conservation and Use of the Natural World limits the use of rare species to scientific purposes and captive breeding programs, prohibits the collection of their eggs, and provides for the protection of their habitat. The fine for poaching of a Great Bustard is US$2000.

PEOPLE'S REPUBLIC OF CHINA

The Great Bustard is listed as Vulnerable in the Red Data Book of China (Ding & He 2009), within which the Western and Eastern subspecies are not treated separately. Both taxa are listed as Class I Protected Species on the National List of Protected Wild Animals of China (State Forestry and Grassland Administration of China 1988; 2021). According to the Wildlife Protection Law, any illegal capture, injury, hunting, raising or selling of protected taxa may be punished by fine or prison term. A case of "general circumstances" is punished by imprisonment of less than five years, while "serious circumstances" are punished through imprisonment for between five and ten years. However, according to the Wildlife Law, there are no cases of "general circumstances" for the Great Bustard; all are considered "serious." Great Bustards located in national protected areas (for example, Tumuji National Nature Reserve) are further protected by the Wildlife Reserve Law and Nature Reserve Regulations.

Eastern Great Bustard

RUSSIAN FEDERATION

The Eastern Great Bustard is listed nationally as Category II (Endangered; Gabuzov, 2001). At the provincial level, the Great Bustard is listed as Category III (Near Threatened) in Republic of Buryatia;
Category I (Critically Endangered) in Altai and Tuva Republics, Zabaikal'skii and Primorskii Krai and Amur Province; Category 0 (Extinct) in Republic of Khakassia and Irkutsk Province; and as a vagrant in Krasnoyarskii Krai (summary in Collar et al. 2017). Killing a Great Bustard is a criminal offence. According to decree number 107 of the Ministry of Natural Resources from 28 April 2008 entitled "On the sanctioning of the methodology for calculation of damage incurred on animals listed in the Red Data Book of the Russian Federation," the fine for killing an Eastern Great Bustard adult, chick or egg is currently approximately 50,000 rubles, plus 2500 rubles in administrative fees, or approximately US$800.

MONGOLIA

The Eastern Great Bustard is categorized as Endangered in the Mongolian Red Data Book, and Vulnerable in the Mongolian Red List of Birds (Gombobaatar & Monks 2011; Ministry of Environment and Green Development 2014). It is listed as "very rare" in the Mongolian Law on Fauna. Hunting of Great Bustard was limited in 1926, and forbidden in 1979 (Bold 2003). The Government of Mongolia proposed both the uplisting of global Great Bustard populations to Appendix I of the Convention on Migratory Species (Government of Mongolia et al. 2014), and the implementation of a Coordinated Action for Great Bustards in Asia (Government of Mongolia et al. 2017).

PEOPLE'S REPUBLIC OF CHINA

See above, as Eastern and Western Great Bustard are not addressed separately.

DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA

The Great Bustard is listed as nationally Vulnerable in the 2018 DPRK Wetlands Inventory (previously listed as "Rare" in 2002 Red Data Book) (Democratic People's Republic of Korea 2018, 2002). At least one area is designated as a Great Bustard National Monument Area. It is not legal to hunt the species.

REPUBLIC OF KOREA

The Great Bustard is classed as Critically Endangered in the 2018 National Red List, and has been designated as a National Natural Monument by the Cultural Heritage Administration since 1968 (NIBR 2018a,b).

6.1.3 – Enforcement of hunting restrictions

Although legislation in all Asian range states prohibits the hunting of Great Bustards, and poaching is a major threat to the species across most of Asia, with the exception of the Korean Peninsula (see "5.1.1 - Poaching"), there has been little enforcement of these laws. Outside of the People's Republic of China, we are aware of only two cases in which poachers were disciplined: one case was brought against two poachers in East Kazakhstan Province in 2017 (Berezovikov & Filimonov 2017), and a Great Bustard poacher was detained by employees of Daurskii Zapovednik (O. Goroshko in litt.). A division of Okhotzooprom (a government agency tasked with conservation and monitoring of rare species) in Kazakhstan previously had a subdivision devoted to the conservation of bustard species, particularly the Asian Houbara Bustard *Chlamydotis macqueenii*. However, this was liquidated some years ago.
Inside the People's Republic of China, a case of Great

Bustard poaching in Changyuan, Henan Province, in 2006 resulted in the conviction of three individuals and their imprisonment for 2–3 years (K. Song in litt.). Poachers are reported to be turned over to police by citizen patrol groups in Henan each winter (Y. Wang in litt.). A case of legal action against Great Bustard poaching also occurred in Xing'an Meng, Inner Mongolia, China, in 2017 (G. Liu in litt.).

In China, the Forestry Public Security Bureau and Forestry Bureau perform anti-poaching monitoring. In Jinzhou, Liaoning Province, employees of this service were assigned to develop 24-hour patrols to protect overwintering Great Bustards (CBCGDF 2019). Volunteer patrols in Changyuan, Henan, and Jinzhou, Liaoning also perform a significant amount of anti-poaching work, including daily monitoring of Great Bustard flocks, removing poison baits, and reporting poaching to officials (Lin 2017). Patrol members consist of individuals participating in China Conservation Area volunteer groups, and sometimes villagers organized by the government. Additionally, monitoring equipment was installed in a China Conservation Area (see 6.2) in Changyuan, Henan. At Tumuji National Nature Reserve, daily surveillance of Great Bustards is carried out by staff. Local non-governmental conservation organizations in Henan Province have submitted proposals to the local government concerning strengthening protection for Great Bustards in their habitats in the Yellow River Wetland, which have been approved by the local government.

6.2 – Protected sites used by the Great Bustard in Asia

Protected area coverage is important because it has benefits for lowering species extinction risk (Butchart et al. 2012). To the best of our knowledge, Tumuji National Nature Reserve in People's Republic of China and the Great Bustard National Monument in the Democratic People's Republic of Korea are the only governmental protected areas in Asia explicitly focused on the conservation of Great Bustards. Other protected areas containing significant populations of Great Bustards include:

WESTERN GREAT BUSTARD

- Sootav Wildlife Refuge, West Azerbaijan Province, Islamic Republic of Iran

EASTERN GREAT BUSTARD

- Ubsunur, Republic of Tuva, Russian Federation
- Federal Zakaznik "Altacheiskii", Republic of Buryatia, Russian Federation
- Regional Zakaznik "Tugnuiskii", Republic of Buryatia, Russian Federation
- Regional Zakaznik "Borgoiskii", Republic of Buryatia, Russian Federation
- Zapovednik "Sokhondinskii", Zabaikal'skii Krai, Russian Federation
- Zapovednik "Daurskii", Zabaikal'skii Krai, Russian Federation
- Yellow River Wetland National Bird Sanctuary, Henan, PRC

In addition, several transboundary protected areas and paired national reserves along international borders play important roles in conserving Great Bustards. These include:

- Ubsunur Biosphere Reserve (Republic of Tuva, Russian Federation and Uvs Province, Mongolia)
- Onon-Balj National Park and Sokhondinskii Zapovednik (Khentii Province, Mongolia and Zabaikal'skii Krai, Russian Federation)
- Dauria International Protected Area, which unites Daurskii Zapovednik (Zabaikal'skii Krai, Russian Federation), Dalai Lake National Nature Preserve (Inner Mongolia, PRC), and Mongol Daguur Strictly Protected Area (Dornod Province, Mongolia).

Appendices 1 and 2 list sites identified by researchers and conservation workers as important for the conservation of Great Bustards in their regions. As the remaining number of Great Bustards in most Asian countries is critically low, participants were asked to list any known breeding, overwintering, or migratory stopover site in their region that is used repeatedly by Great Bustards. Of the key sites we have recorded, 63% have no protection and 17% have only partial protection (i.e., only part of the territory used by Great Bustards lies within a protected area, or the site has been established as an Important Bird and Biodiversity Area) (Map 6-1; Appendices 1-2). This is probably because a high proportion (49%) of key sites are used wholly or in part for crop agriculture. Approximately one quarter of breeding sites are protected.

Within the Asian range of the Western Great Bustard, the countries with the highest percentage of key sites which are fully protected are the Russian Federation (27%) and Uzbekistan (33%). We do not have records of any key sites for the Western Great Bustard in Xinjiang, China, and in Kazakhstan only 7% of sites are fully protected. Within the range of the Eastern Great Bustard, we did not register any sites with full protection in the Russian Federation, but data are lacking for sites important to the Great Bustard in Zabaikal'skii Krai. 20% of sites in China, and 27% of sites in Mongolia are currently fully protected (Appendices 1-2).

19% of these key sites (29 sites) are included fully or partially within Important Bird and Biodiversity Areas, with the majority within Mongolia. The protection level of these sites varies: half of those sites which fall within IBAs are not contained wholly or partially within protected areas. In contrast, at a global level, only 35% of Key Biodiversity Areas are not contained within a protected area system (UNEP-WCMC et al. 2018). In Uzbekistan, the significance of IBAs is growing, and some of these sites have been used as the foundation for the establishment of new protected areas. Thus, as the protected area network grows, the percentage of key

sites in Uzbekistan which have full protection is likely to increase. Even if not included in the protected area system, the IBAs of some countries are given legal protection, as described above for Kazakhstan, which is bound by law to manage IBAs as protected areas, though these have not yet been furnished with guards and other infrastructure to do so. However, in other range countries IBAs are not protected in law.

While not nationally established protected areas, the NGO China Biodiversity Conservation and Green Development Foundation has established Community Conservation Areas (or "China Conservation Areas," CCAfa) for Great Bustards. CCAfa's focused specifically on Great Bustards are located in Changyuan, Henan Province; and Hulunbuir and Tumuji, Inner Mongolia, which contains five Great Bustard leks. Although focused primarily on other species, the CCAfa's at Jizhou in Tianjin city, Cangzhou in Hebei, Jinzhao in Liaoning Province, and Fengqiu in Henan host Great Bustards on migratory stopover or overwintering (CBCGDF 2017).

6.3 – In situ conservation activities already undertaken for the Great Bustard in Asia

Here we summarize conservation efforts and programs that have been undertaken in recent years by governments, research groups, and conservation organizations. Survey efforts are described separately, in Section 6-5.

Western Great Bustard

ISLAMIC REPUBLIC OF IRAN

An Action Plan for the Great Bustard in the Islamic Republic of Iran was developed by the country's Department of Environment (Naderi 2017), but the actions listed have not been implemented. In autumn 2019, the Center of Iran Eco-Tourism received a small grant from the Global Environment Facility to undertake community conservation of the Great Bustard in the Boukan region. This followed an earlier similar GEF grant to Naghadeh NGOs. A small grant from the IUCN currently supports an initiative to develop alternative livelihoods (carpet weaving, featuring a new Great Bustard design) in communities living near Great Bustard breeding grounds.

RUSSIAN FEDERATION

We are not aware of any special protective measures undertaken for the Western Great Bustard in Russia, within the scope of this Action Plan (from Orenburg Oblast' eastwards to Altai Republic), beyond inclusion of the species in regional red books.

KAZAKHSTAN

In 2019, the Great Bustard was elected "Bird of the Year" by membership of Association for the Conservation of Biodiversity of Kazakhstan and the Union for Conservation of Birds of Kazakhstan. In conjunction, educational calendars and posters were designed and distributed by Eurasian Bustard Alliance and Association for Conservation of Biodiversity of Kazakhstan.
In Jambyl Province, a private citizen has taken on the role of "caretaker" of a Great Bustard lek for several years. He observes the lek and carries out discussions with local farmers to avoid destruction of nests.

UZBEKISTAN

We are not aware of any actions undertaken.

TURKMENISTAN

We are not aware of any actions undertaken.

KYRGYZSTAN

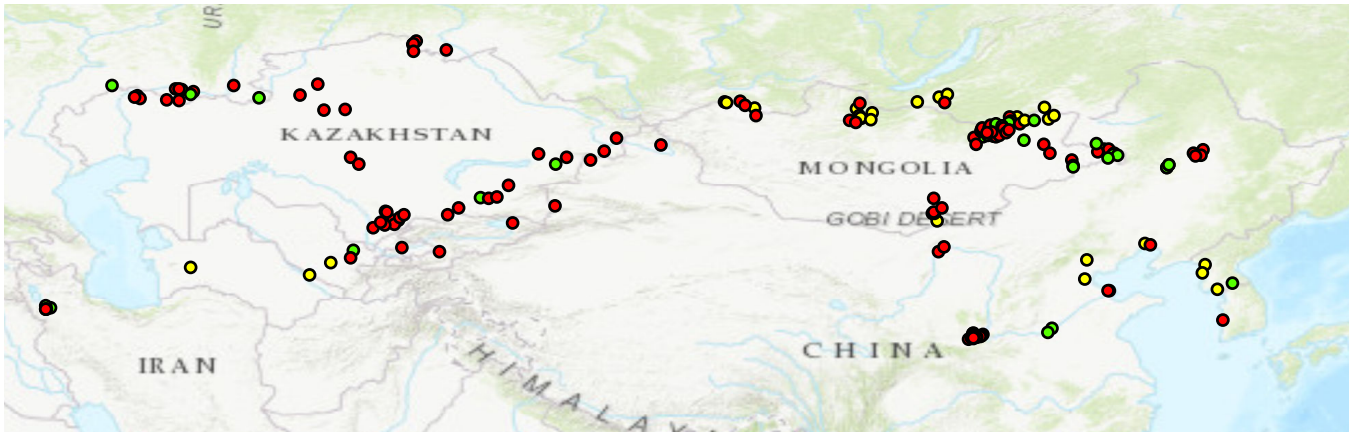
We are not aware of any actions undertaken.

TAJIKISTAN

We are not aware of any actions undertaken.

XINJIANG, PEOPLE'S REPUBLIC OF CHINA

We are not aware of any actions undertaken.



Map 6-1. Protection status of key Great Bustard sites in Asia. Sites are defined by regional experts and listed in Appendices 1 and 2. Sites with no protection under national law are displayed in red, sites with partial protection in yellow, and sites with full protection in green.

Eastern Great Bustard

RUSSIAN FEDERATION

At Daurskii Zapovednik in Zabaikal'skii Krai, there are plans to provide fields with Great Bustard food plants in the near future.

MONGOLIA

In Omnogovi Province, Oyu Tolgoi Mine attached two types of flight diverters to major powerlines. This work was intended to reduce collisions of Asian Houbara Bustards, but it may have benefits for the Great Bustard, which also collides with these powerlines (Batsuuri 2017). Unfortunately, high malfunction rates have been observed for one of the flight diverter types (flappers; Batsuuri et al. 2016).

CENTRAL AND EASTERN CHINA

At Tumuji National Nature Reserve, new road construction through Great Bustard wintering habitat was halted due to concerns about impacts on Great Bustards (CBCGDF 2019). Supplemental winter feeding is carried out at the CCAfa in Tianjin and Tumuji, where volunteers provide peanuts, corn, and beans during periods of prolonged snow cover.

In Daqing, Heilongjiang, the Daqing Lindian Wildlife Conservation Society patrols territory used by Great Bustards for poachers. This group rented some land used by Great Bustards, consisting of steppe and wetland, for two years to prevent its plowing for agricultural use (Lin 2018).

CBCGDF organizes citizen-led anti-poaching patrols and the collection of poisoned grains in Hulunbuir, Inner Mongolia, Changyuan, Henan, and Tianjin. Government agencies including the Forestry Bureau and local township government have participated in poison bait clean-up events. Rewards have been offered for information leading to the arrest of those responsible for spreading poison grains. A 150-day action by CBCGDF, Green Future Protection Association and Let Migratory Birds Fly Fund in Changyuan, Henan, during winter 2015–2016 resulted in the collection of 2.5 kg of poisoned grains (CBCGDF 2017). Thirty poaching groups consisting of 150 poachers were stopped. Eighteen vehicles, 5000 m of mist nests, and 26 hunting dogs were seized. Ten "wild meat" restaurants serving protected species were fined. In 2016, similar actions were carried out. At the CCA for Great Bustards in Tianjin, public education regarding conservation law is carried out jointly with local government, and via distribution of leaflets.

In China there are widespread efforts to rescue and rehabilitate injured Great Bustards after poisoning and injury. A review of media articles found that 59 Great Bustards were rescued from 2012 to 2017, with 83% of birds brought for help by private citizens. At least 34 rescue centers in 11 provinces have been engaged in these efforts (Q. Sha, CBCGDF). The non-governmental conservation organization CBCGDF has established a Great Bustard Rescue Working Group to inform rescuers about best practices.

Tumuji National Nature Reserve carries out an annual "Great Bustard Festival" to inform the public about the importance of protecting this species and its habitat. Information and activities related to Great Bustards are also included in "Bird Preservation Week," "World Wetlands Day," and "World Environment Day" festivals. Information is shared concerning the importance of maintaining a clean environment for both wildlife and human health. Public outreach and education have been carried out by CBCGDF at their Conservation Areas. These have involved installing exhibition boards, banners, loudspeakers, brochures in public areas and schools. There have also been lecture series and publicity by the media. In 2018, a documentary about Eastern Great Bustards, produced in 2011 by Eurasian Bustard Alliance and Wildlife Science and Conservation Center of Mongolia, was translated into Chinese and distributed across Chinese social networks by CBCGDF. CBCGDF also develops and distributes informational material to inform citizens near Great Bustard sites about the species and its protected status.

6.4 – Ex situ conservation projects already undertaken for the Great Bustard in Asia

We summarize the experience of institutions in Asia in captive breeding and artificial incubation, with mention of work in adjacent territories of the Russian Federation and Ukraine.

Western Great Bustard

Few Great Bustards are kept in captivity within the Asian range of the Western Great Bustard. The Karasuk Facility of the Siberian Academy of Sciences in Novosibirsk, Russian Federation, has kept Great Bustards since 1989 (Klimova et al. 2018). As of 2018, eight Great Bustards were held at the facility, all of which ultimately originated from the Great Bustard population in the Volga River region of th e European portion of the Russian Federation. Three chicks were produced from this facility in 2018, and young were also produced in 2015 and 2016 (Shilo & Klimova 2019). We are not aware of the release of any captive-reared Western Great Bustards into the Asian range. Due to the differing migratory behaviors of Great Bustards in the Volga Region and western Siberia, any such release may result in mortalities due to mismatched phenology and orientation.

The Novosibirsk facility participates in the comprehensive international research program "Conservation of bustard species of Eurasia" alongside zoos and facilities in Eastern Europe associated with the Eurasian Regional Association of Zoos and Aquariums (EARAZA). As part of this program, 12 additional Great Bustards were kept at three facilities in the European part of the Russian Federation and Ukraine (Spitsin & Akulova 2019). However, in

2007, holdings consisted of 40 Great Bustards at seven institutions (Ostapenko 2008). The decline over the past decade occurred as a result of limited breeding and the death of adults. Great Bustards in the Moscow Zoo first produced a clutch in 2008, which was infertile (Rozhkov & Rozhkova 2008).

In Saratov Province in the lower Volga River region of the European part of the Russian Federation, the Great Bustard hatchery of the Institute of Ecology and Evolution of the Russian Academy of Sciences gathered eggs and chicks from agricultural fields for artificial incubation beginning in 1982 (Ponomareva 1983). Approximately 50 eggs are incubated each year (Ostapenko 2008), with over 1200 eggs harvested by 2004 (Saratov Department of the Society for Protection of Birds 2004). Hatching rates were reported at 19-90% per year from 2004-2008 (Khrustov 2009). A captive-reared chick was first released into the wild in 1985 (Mishchenko & Zaguzov 1986), but by 2004 there were no successful cases of release (Saratov Department of the Society for Protection of Birds 2004). From 2003-2008, during which time approximately 300 eggs were collected, a total of 17 Great Bustards were released, ten of which died within the first two months due to predation (Khrustov 2009). The fate of the remaining birds is unknown. Despite long-term investment of funds and skilled professionals, this program has not yielded benefits to the wild population of Great Bustards, and egg removal at scale is considered to have contributed to the serious, ongoing declines of the species in this region (Oparin et al. 2003).

By 2000, approximately 60 Great Bustards reared in the Saratov hatchery had been transferred to a private breeding facility in Ukraine (Flint et al. 2000), despite the absence of the species across huge portions of its former range in the Russian Federation. This facility experimented with artificial insemination of Great Bustards in 2001. By 2003 the facility had closed and the flock of Great Bustards was dispersed. This experience was recounted as a cautionary tale regarding the dangers of relying on private business to achieve conservation results for Great Bustards, in which case the continuation of efforts is dependent on economic interests and the whims of owners (Ostapenko 2008).

As regards areas covered by this Plan outside of the Russian Federation, two Great Bustard chicks were rescued and hand-reared after their nest was destroyed in the Islamic Republic of Iran in 2012.

Eastern Great Bustard

We are not aware of any Eastern Great Bustards held at zoos in the Russian Federation or Mongolia. Ten years ago, approximately 100 Great Bustards were kept at zoos and rescue centers across the People's Republic of China (G. Liu in litt.). However, as captive breeding has been largely unsuccessful, today fewer than 50 are held. Two Great Bustards are maintained at Harbin Zoo, 12 at Changchun Zoo, 3 at the Beijing Zoo, and 8 at Tumuji National Nature Reserve (6 males and 2 females). In the case of Tumuji, all captive Great Bustards were rescued from the wild after injury.

In 1997 the first artificial incubation of Eastern Great Bustards was undertaken at Harbin Zoo, and in 2001 captive breeding was achieved (Tian et al. 2015). Tumuji Reserve invested in a captive breeding program, and produced offspring in 2016 and 2017. In 2017, two chicks hatched, but both died before reaching one-half year in age. Changchun Animal and Plant Park in Jilin Province has artificially incubated wild eggs, the products of which subsequently bred to produce three chicks in captivity (Yao et al. 2011). We are not aware of the release of any captive-reared Great Bustards into the Asian range.

Summary of ex situ efforts in Asia

Though documentation is sparse, the ex situ efforts described here appear to have had little if any impact in supplementing wild Great Bustard populations. They also appear to have been unsuccessful in maintaining captive populations. It is difficult to evaluate the future prospects for these projects, as we are not aware of comprehensive accounts which detail the total numbers of eggs collected, young birds hatched, the survival and reproductive rates of released birds (in the case of artificial incubation programs), or the average number of years and adult birds maintained to produce a chick through captive breeding or artificial insemination.

There has been concern regarding the injury rate of Great Bustards in captivity among the programs described here. In Novosibirsk, mortalities of captive-held Great Bustards were overwhelmingly due to injury (five of six deaths, with the sixth death due to cardiac deficiency: Klimova & Shilo 2009). Authors reflecting on the low life expectancy of Great Bustards in captivity in Ukraine concluded that focus would be better placed on protection of the birds in the wild and education of the public (Tsekhanskaya et al. 2008).

6.5 – Research undertaken on the Great Bustard in Asia

Here we summarize recent research efforts on the Great Bustard in Asia, including the work of government agencies, research groups, and conservation organizations.

Western Great Bustard

ISLAMIC REPUBLIC OF IRAN

Since 2008, remaining Great Bustards in West Azerbaijan Province have been censused annually by the Department of Environment, and breeding behavior studied (Abdulkarimi et al. 2010; Abdulkarimi & Admadi Sani 2012; Barati et al. 2015). Habitat suitability modeling was carried out at Islamic Asad University (Sani 2015).

RUSSIAN FEDERATION

There was an expert evaluation of the status of the Great Bustard for the new edition of the Red Book of

Orenburg Province. Great Bustards are noted during general ornithological surveys in Orenburg Zapovednik (Barbazyuk 2015). Research was planned for 2020 with financial support from local and federal budgets.

KAZAKHSTAN

A number of groups have carried out annual observations of Great Bustards in Kazakhstan, both as targeted surveys of the species, and in the course of general ornithological monitoring. In winter 2018–2019, the Eurasian Bustard Alliance coordinated winter surveys in Kazakhstan, Kyrgyzstan, Uzbekistan and Turkmenistan, along with the Association for the Conservation of Biodiversity of Kazakhstan, Wild Nature NGO, and independent ornithologists. The Government of Kazakhstan confirmed permission to capture Great Bustards for attachment of satellite transmitters. However, this activity was not feasible due to the low number of bustards located. The project also involved surveys of local residents and the distribution of outreach materials.

In the Alakol' Zapovednik, annual surveys were carried out from 2002–2020. In the Alakol' Depression, annual winter surveys are carried out by researchers from the Institute of Zoology of the Academy of Sciences (Filimonov et al. 2018). Since 2010, Wild Nature NGO has carried out yearly monitoring of the population and distribution of the Great Bustard in Kyzylorda, Turkistan and Jambyl Provinces of Kazakhstan, with financial support of the Ornithological Society of the Middle East, Caucasus and Central Asia, and the Eurasian Bustard Alliance (Shakula & Baskakova 2019). The program of work includes autumn-winter censuses and searches for migratory groups in spring. It also incorporates exploratory expeditions in search of Great Bustards during the summer and fall, and the gathering of survey data from local people. In 2017, the Eurasian Bustard Alliance, Association for the Conservation of Biodiversity of Kazakhstan, and Wild Nature NGO carried out surveys of breeding Great Bustards in Almaty, Aktobe, East Kazakhstan, Jambyl, Turkistan and West Kazakhstan Provinces. From 2009-2011, surveys of Great Bustards breeding between Balkhash and Alakol' Lakes were carried out (Gubin 2015). In Kostanay Province, Great Bustards have been observed during annual ornithological monitoring carried out by researchers at Kostanay State Pedagogical University (Bragin 2019).

UZBEKISTAN

In January 2019 a survey of overwintering Great Bustards near Lake Tuzkan was conducted by Uzbekistan Society for the Protection of Birds and the Eurasian Bustard Alliance.

TURKMENISTAN

In January–February 2019, a census targeting the Great Bustard was conducted at overwintering sites in the foothills of the Western Kopetdag and the southwest of the country (Meshet–Messirianskaya flatland) in conjunction with the Eurasian Bustard Alliance. Surveys of local residents were also conducted. Great Bustards are also observed during general avian surveys, conducted in various seasons and regions in Turkmenistan, as part of the program "Improvement of the conservation status of birds and all biodiversity in Turkmenistan."

KYRGYZSTAN

We are not aware of any surveys or research, other than a brief survey organized by the Eurasian Bustard Alliance in search of wintering Great Bustards in northern Chui Province in winter 2018–2019.

TAJIKISTAN

No targeted surveys have been undertaken for Great Bustards. Recent observations of Great Bustards have occurred during general research on the migration and overwintering of birds in Tajikistan, and research programs in Important Bird and Biodiversity Areas.

XINJIANG, PEOPLE'S REPUBLIC OF CHINA

Over the past years, research has been funded by the Chinese Academy of Sciences and National Natural Science Foundation of China and implemented by the Xinjiang Institute of Ecology and Geography, Chinese Academy of Sciences. This research has focused on population surveys and distribution, as well as behavioral adaptation to human disturbance and habitat assessment (Wang et al. 2015, 2018).

Eastern Great Bustard

RUSSIAN FEDERATION

In spring 2016, Great Bustard surveys were carried out in Ubsunur Zapovednik in coordination with surveys in Uvs Province, Mongolia. In May 2019, an intensive search for Asian Houbara Bustards was carried out in the Ubsunur Depression in the Republic of Tuva. In the course of this work, observations of Great Bustards were also made by the staff of the Ubsunur State Natural Biosphere Reserve. Great Bustards have also been observed during other bird surveys in the region. In spring and fall 2012, targeted surveys were carried out at traditional Great Bustard sites (Archimaeva et al. 2015).

In the Republic of Buryatia there were no targeted surveys or ecological research, but Great Bustards were observed during general bird surveys in fall 2011, 2012 and 2013.

In Zabaikal'skii Krai, there is an annual survey of Great Bustards at Sokhondinskii Zapovednik (Onon River valley in Kyrinskii District), in line with the reserve's scientific program "Rare species of Sokhondinskii Zapovednik, its buffer zone, and transboundary area." At Daurskii Zapovednik, monitoring has been carried out since the 1990s, including Great Bustard censuses in 1999–2000, 2010–2012, and 2019–2020. Research is conducted into

Great Bustard ecology, including the relationship of Great Bustards to agricultural lands (Goroshko 2018).

MONGOLIA

In 2017, the Government of Mongolia, Eurasian Bustard Alliance, and Wildlife Science and Conservation Center hosted a conference in Ulaanbaatar, Mongolia, "Advancing the Conservation of the Great Bustard in Asia," which brought together specialists from nine countries.

Yearly surveys are carried out in Onon-Balj National Park as part of an agreement on cooperative actions with Sokhondinskii Zapovednik in the Russian Federation. In 2016, the Eurasian Bustard Alliance in conjunction with the Wildlife Conservation and Science Center of Mongolia carried out surveys for Great Bustards in Uvs Province, in coordination with researchers from Tuva (Kessler et al. 2016). Surveys for mortalities along major powerlines at the Oyu Tolgoi Mine are conducted once a month. These surveys report Great Bustard mortalities (Batsuuri 2017).

In 2018 the Mongolian Bird Conservation Center, in conjunction with Beijing Forestry University and the Eastern Mongolian Protected Areas Administration, captured seven Great Bustards breeding in eastern Mongolia for satellite tagging for a migration study. A longitudinal telemetry study of Great Bustards breeding in northern Mongolia, conducted by the Eurasian Bustard Alliance and Wildlife Science and Conservation Center of Mongolia, continued to track Great Bustards tagged from 2007–2011, for studies of habitat use, diet, and migration (Batsuuri et al. 2014; Kessler 2015).

PEOPLE'S REPUBLIC OF CHINA

Research focusing on physiology, diet, and distribution modeling have been published in China in recent years. In Tumuji Nature Reserve, the Chinese Academy of Forest Research, Institute of Wetlands, in collaboration with the Nature Reserve itself and the Eurasian Bustard Alliance, has led research into the impact of winter weather on stress hormones of overwintering Great Bustards (Liu et al. 2018), used genetic barcoding to compare the dietary niche of migratory and non-migratory populations of Eastern Great Bustard (Liu et al. 2018), used next-generation sequencing to analyze diet composition (Gong et al. 2017), and used genomic mitochondrial DNA to assess genetic diversity and population structure (Liu et al. 2016). Distribution modeling was used to predict the wintering distribution of the Eastern Great Bustard under climate change conditions (Mi et al. 2016).

Surveys are carried out at a number of sites. In Henan Province, from 2018–2019 CBCGDF and the Alxa Henan Project Center censused Great Bustards at the Yellow River Wetlands. Annual censuses and phenological observations are taken at CCAfa's in Jinzhou, Liaoning and Tianjin. Research involving collection of feces and feathers was carried out at these cities in collaboration with researchers from Beijing Forestry University.

Population surveys are carried out every month at Tumuji Nature Reserve, and population censuses twice every year. In winter 2018–2019, two winter censuses were carried out by citizen enthusiasts with NGO support; one by the China Birdwatching Association "Rosefinch" with support of Alashan SEE Foundation, and the second by NGO China Biodiversity Conservation and Green Development Foundation. SEE Foundation plans an additional 2 surveys in winter 2019-2020. An additional winter census was carried out in January 2018 by CBCGDF.

Multi-Nation Research

Two research projects in recent years have involved collaboration between experts from multiple countries. An analysis of the degree of genetic divergence between the Eastern and Western Great Bustard used new samples from a 4500 km swath of the birds' Asian range, involving researchers from Kazakhstan, Mongolia, People's Republic of China, the Russian Federation, and the USA (Kessler et al. 2018). In winters 2018–2019 and 2019–2020, surveys of wintering Western Great Bustards were coordinated within its Central Asian range by the Eurasian Bustard Alliance.

6.6 – Summary

Although the conservation of the Great Bustard in Asia is enshrined in both national and international legislation, and poaching is ranked as the most critical threat to the Great Bustard in Asian range states outside of the Korean Peninsula, little has been done to address poaching in terms of enforcement or environmental education programs. The exception is China, where citizens and non-governmental organizations have shown considerable initiative in confronting poachers, and involve local authorities in these efforts.

Transboundary protected areas along the border of Mongolia and the Russian Federation contain many sites important for the Great Bustard. However, in other regions of the species' Asian range the protected area system provides almost no coverage for Great Bustards. Generally, there is insufficient coverage of sites that contain crop fields. Community Conservation Areas have been introduced in China as an approach to encompass these human-modified habitats.

Conservation efforts for the Great Bustard in the wild have been quite limited. Notably, we are not aware of any measures taken to improve the breeding success of the species in the wild, though several serious threats to reproduction are recognized (Section 5.2). Ex situ efforts in Asia have neither supplemented wild populations nor maintained stable captive populations. And outside of protected areas in China, environmental education efforts have been limited and local in scope.

Research across much of the Great Bustard's Asian range has primarily consisted of surveys, many of which are annual ornithological expeditions that are not focused specifically on the Great Bustard and thus less effective in censusing this species. The implementation of coordinated regional surveys on wintering grounds in Central Asia and People's Republic of China has been a beneficial recent development. Additionally, researchers from People's Republic of China have spearheaded a wide variety of ecological research on the species. There is also ongoing telemetry research in several areas, but the results have largely not been publicly disseminated, limiting their conservation value.

Here we present recommended conservation actions that stem from threats outlined in Section 5. Many recommendations were sourced from Action Plan contributors and participants in the 2017 conference "Advancing the conservation of the Great Bustard in Asia." Others are activities that have borne benefits to the conservation of the Great Bustard in Europe and are likely to yield benefits in the Asian context.

Social media post displaying poached Western Great Bustard at wintering site.

Section 7
Recommended conservation actions

7.1 – Reduce adult mortality

7.1.1 – Reduce poaching and intentional poisoning

Reduce mortality of Great Bustards due to poaching. Recommended actions include:

a) Increase level of priority for Great Bustard conservation in government anti-poaching agencies and educate employees about the species.

b) Improve funding and resources (e.g., petrol, vehicles) for anti-poaching enforcement, with dedicated funding for work related to Great Bustards.

c) Establish seasonal enforcement zones to flexibly deploy governmental anti-poaching personnel and resources. In spring, attention should be given to increased enforcement at breeding sites, at which Great Bustards traditionally gather each spring. Although Great Bustard flocks may be larger during fall and winter, the timing and precise location of their movements may vary depending on weather conditions and food resources. Protecting these flocks will require communication between observers (potentially including local wildlife rangers, hunting organizations, and birdwatchers) and anti-poaching authorities, as well as the quick allocation of resources. International communication about the movement of Great Bustard flocks should be facilitated at Great Bustard gathering sites that span international borders. Such sites include (but are not limited to) adjacent overwintering areas in Turkistan Province of Kazakhstan and Jizzakh Province of Uzbekistan, and breeding areas in Zabaikal'skii Krai, Russian Federation and Khentii and Dornod Provinces of Mongolia.

d) Improve effectiveness of governmental anti-poaching forces through monitoring programs (e.g., SMART program), outside monitoring, or financial incentives.

e) Develop focused outreach programs aimed at rich and urban hunters, and improve mechanisms for holding wealthy and well-connected poachers accountable. These may include:

- Scaling fines for poaching to the poacher's income.
- Mandatory loss of office for government officials convicted of poaching, including ineligibility for future appointment to government service.
- Developing mechanisms for anonymous citizen reporting of poaching.
- Developing a public portal which tracks citizen complaints against government officials, with mandatory time period within which the government must investigate and publicly respond to the complaint. Experience may be learned from recent implementation of such a system in Kazakhstan.

f) Engage the public in anti-poaching efforts. This may include:

- Educational outreach to increase awareness and concern for this species, including communication and collaboration with hunting organizations, non-governmental conservation organizations, and religious congregations.
- Organization of citizen patrols to identify flock location, monitor for poaching activities, and remove poison baits and nets, in communication with government enforcement agencies. Initiatives can draw on experience from current efforts in People's Republic of China.
- Facilitate the efforts of "community caretakers" and encourage such initiatives (see 7.3).

g) Creation of protected areas or local reserves at key sites for Great Bustards, with sufficient staffing and funding to ensure improved anti-poaching enforcement at the site.

h) Classify sites important to Great Bustards as no-hunting areas during the periods the sites are used by this species to reduce opportunistic poaching as well as disturbance.

i) Ban or limit access to chemicals used to create baits to poison birds.

7.1.2 – Reduce mortalities due to powerline collisions

Reduce current mortality rates due to collisions with powerlines, and prevent future collisions through careful siting of new infrastructure. Recommended actions include:

a) Research to determine the most dangerous collision sites for Great Bustards. Activities include: regular surveys of existing powerlines to detect mortalities, establish a register of known mortality locations, and use telemetry to determine migration routes.

b) Reduce mortality at existing powerlines. The most effective method is to bury powerlines (Raab et al. 2012; Bernardino et al. 2018; Silva et al. 2023). Alternatively, install powerline diverters at sites dangerous to Great Bustards, consulting published best practices (e.g., Raab et al. 2014) and researchers in Central Europe and South Africa who are conducting studies of the effectiveness of a variety of diverters for bustards.

c) Prohibit the construction of new powerlines at and near key Great Bustard sites (Appendices 1-2).

d) Require consideration of Great Bustard mortality and migration routes during the siting of new powerline infrastructure. Involve bustard researchers in the planning process.

e) Establish a network to rehabilitate injured Great Bustards. Develop and distribute best veterinary practices for rehabilitation and transport of birds. Register location and cause of injury. Establish facilities (e.g., zoos) capable of long-term care for Great Bustards that cannot be released.

7.1.3 Reduce harm from dogs

Control free-ranging dogs near sites important to Great Bustards, and provide resources for enforcement of regulations about dogs. Establish seasonal or year-round prohibition on the free-roaming of dogs. Require licenses to be worn by all dogs. Fine owners of dogs roaming during restricted time periods. Remove uncollared dogs. Limit number of dogs permitted per family.

7.2 – Improve reproduction rates

7.2.1 – Identify breeding sites and dates

The greater number of Great Bustards censused on wintering grounds than breeding grounds (Tables 4-1 through 4-6), and low number of lek sites identified (Appendices 1-2) indicate that the locations of some breeding populations remain unknown. Targeted research expeditions to identify lek locations should be funded and carried out during the breeding season (see 3.4 "Reproduction"). A regularly updated register of breeding sites should be kept at the national level (Raab et al. 2009).

7.2.2 – Research reproduction and causes of reproductive failure

There have been few studies in Asia concerning the degree to which agriculture, predation, and other forces impact reproductive success of Great Bustards, and little data on reproductive success generally. At some sites, there is a clear incompatibility between the timing of use of agricultural machinery and the Great Bustard breeding season. However, at others, research may be necessary to clarify the dates of breeding, and determine the most effective policies to increase reproductive success. Research should limit or avoid human visitation of the nest site as much as possible, considering: (1) corvids take advantage of a female Great Bustard's distraction to predate eggs; (2) canids may later follow a human scent trail to a nest; and (3) human disturbance may cause a female to abandon a clutch. Telemetry of female Great Bustards can provide detailed information about reproductive success, but Great Bustards are difficult to capture and there is a risk of death due to capture myopathy. The rehabilitation and release of Great Bustards that have collided with power lines provides an opportunity to fit transmitters. Identification and repeat observation of nests and clutches through spotting scopes is time-consuming but involves the least disturbance.

7.2.3 – Establish protected status for breeding sites

To reduce human disturbance and facilitate regulation of agricultural practices and new infrastructure development, as well as anti-poaching enforcement, protected area status should be established for breeding sites.

7.2.4 – Increase communication with rural communities near breeding sites

Provide information to rural communities located near breeding sites about the importance of protecting the Great Bustard, emphasizing their role in safeguarding the species' breeding grounds. Engage in dialogue with farming and herding communities to determine the most effective ways to harmonize agricultural activities with the Great Bustard breeding season. Provide recognition for the efforts of rural people and agricultural businesses in Great Bustard conservation.

7.2.5 – Establish compatible farming practices at breeding sites in crop agriculture

a) Identify and realize the most effective methods to eliminate the use of farm machinery during months in which Great Bustards incubate and fledge young, through dialogue with the local farming community and study of practices employed in the European portion of the Great Bustard range. Methods may include:

- Provision of additional units of farm machinery so that mechanical work can be accomplished during a compressed time period, before or after Great Bustard reproduction;
- Research, education and if necessary, subsidies to promote cultivation of alternative crops including perennial crops that do not require mechanical work during the breeding season.

b) Prohibit or limit the use of pesticides to increase the food base for chicks, and reduce mortality due to mechanical destruction of clutches and broods.

c) Prohibit flood irrigation at breeding sites during the breeding season.

d) Encourage cultivation of a variety of crops at breeding sites to improve habitat heterogeneity. This provides diverse habitats appropriate for display, incubation, feeding, and hiding (Martín et al. 2012; Faragó et al. 2014; Kessler 2015), as well as the varying diets of males, females and chicks (Bravo et al. 2016).

e) Research the effectiveness of leaving an "island" of unplowed area around a Great Bustard nest. This method requires the training of machinery operators, and that nests be relatively easy to spot. While some researchers have reported that the method facilitates

successful reproduction (Goroshko 1999), others have observed that it leads to abandonment of the nest or predation within one to two days (Waters 2008). Use of this technique should be accompanied by monitoring of reproductive success through repeat observations.

f) Encourage organic farming and consider development of wildlife-friendly certification for producers using methods compatible with Great Bustard reproduction (e.g., Ibis-friendly rice in Cambodia, Clements et al. 2010).

7.2.6 – Regulate use of pasture at breeding sites

Eliminate grazing at breeding sites during the Great Bustard breeding season, to avoid the trampling of eggs and potential predation of nests and chicks by herders' dogs. Limit the grazing of these pastures during the non-breeding season to ensure an adequate food supply for breeding Great Bustards. Permit haymaking at breeding sites only after young Great Bustards are fledged.

7.2.7 – Reduce predation of eggs and chicks

If predation is found to be a large contributor to clutch and brood loss (7.2.2), recommended actions include:

a) Prohibitions on dogs (see 7.1.2).

b) Measures to reduce densities of corvids and wild canids, including trapping, hunting, proper disposal of waste in local communities, and removal of artificially planted tree breaks that facilitate colonies of nest predators (i.e. Rooks) near Great Bustard breeding sites.

c) Fencing around nesting areas to create predator exclusion zones. This is effective only for terrestrial predators, and requires detailed knowledge about the areas preferred for females for nesting (Raab et al. 2013).

7.2.8 – Reduce egg collection by humans

Establish legislation to protect nests, with appropriate penalties. Provide resources for enforcement of these laws particularly near breeding sites. Implement local education schemes and information campaigns to change human attitudes.

7.2.9 – Reduce loss of eggs and broods to wildfires

Improve wildfire prevention through the creation and maintenance of fire breaks. However, ditches should not be used for this purpose in the vicinity of sites frequented by Great Bustards as they provide cover for poachers. Maintain early warning systems for wildfires to facilitate the response of firefighting groups. Communicate with rural communities about behaviors important to prevent wildfires.

7.3 – Increase public awareness of and involvement in the conservation of the Great Bustard

Both rural and urban citizens often lack information about the Great Bustard and its conservation needs. It is possible to increase pride in this charismatic species and interest in its conservation through educational campaigns. This may have impacts in terms of increasing compliance with conservation efforts and be particularly useful near breeding and overwintering sites.
Methods may include:

a) Publicity campaigns at a national or provincial level utilizing mass and social media

b) Development of curricula about Great Bustards for use in public schools

c) Communication with hunting organizations

d) Development of a network of "Bustard caretakers". Caretakers are concerned local citizens who monitor flocks of Great Bustards, recognize emerging threats, and communicate with other citizens to resolve threats to Great Bustards.

e) Engage the public in anti-poaching patrols (See 7.1.1)

7.4 – Habitat improvement

Actions aimed at improving agricultural breeding habitat for the Great Bustard are described in 7.2.5 and 7.2.6. Additionally, we recommend:

7.4.1 – Improve protected area coverage and quality at key Great Bustard sites

Only 22% of sites important to Great Bustards are fully covered by the existing protected area network (Appendices 1-2). Additionally, some protected areas that host Great Bustard populations lack resources to establish favorable conditions for these birds. Expansions and improvements to protected area systems should prioritize actions based on: (1) size of the Great Bustard population in the area (see Appendices 1-2); (2) importance of the population in maintaining genetic connectivity and diversity (e.g., Kessler et al. 2018) ; (3) in the case of range states where remaining populations are extremely small, preservation of historically important sites for the Great Bustard for potential recolonization; and (4) consideration of the importance of the site to transboundary partnership (7.6.2). We recommend the following actions:

a) Establish protected areas at sites important to Great Bustards (Appendices 1-2).

b) Expand the borders of existing protected areas to encompass adjacent territory used by Great Bustards.

c) Elevate the status of existing protected areas hosting Great Bustards to provide additional resources in terms of funding and staffing.

d) Develop "Agricultural Protected Areas," or "Integrated Farming and Biodiversity Areas" in the case that the presence of crop agriculture at a site does not permit its designation as a traditional protected area. These sites should facilitate the regulation of use of farm machinery, crop choice, and chemical use, while providing additional resources for anti-poaching enforcement and benefits to farm communities within the area.

7.4.2 – Improve habitat quality at Great Bustard overwintering sites

Improving winter habitat quality may: (1) Reduce winter mortality, particularly during severe winter weather (Nagy 2018); and (2) retain Great Bustards within a more limited winter range that can be more effectively protected. There is also evidence from other avian taxa that the quality of winter habitat has carry-over effects for spring reproduction (e.g., Saino et al. 2004). Great Bustard winter habitat can be improved as follows:

a) Reduce human disturbance at key overwintering sites.

b) Cultivate crops preferred by Great Bustards at key overwintering sites (see 3.2, "Habitat"), particularly in areas far from roads (Raab et al. 2015).

c) In case of heavy snowfall, remove snow from a small portion of the foraging area. This is most helpful at places Great Bustards gather in late winter, when they are less likely to make further southbound movements (Lóránt et al. 2018).

7.4.3 – Reduce human disturbance at key Great Bustard sites

Limit human activity at sites important to Great Bustards and carry out outreach to inform relevant communities (e.g., birdwatchers, tour operators) about the importance of maintaining a distance from Great Bustards. Activities of concern identified in the Action Plan include:

a) Tourism

b) Bird photography

c) Medicinal herb collection

7.4.4 – Encourage sustainable development

The Great Bustard serves as an indicator of healthy grassland ecosystems and sustainable cereal agriculture. Develop channels of communication with major funding bodies and organizations supporting rural development in key range states to share the species' significance to sustainability targets.

7.5 – Fill knowledge gaps in conservation needs of Great Bustards in Asia

As described above in Sections 2 "Ecology" and 6.4 "Research undertaken," there are gaps in our understanding of the conservation needs of Great Bustards in Asia. We recommend focusing research on the species' conservation needs, particularly:

a) Targeted surveys of Great Bustard populations and threats to the species, particularly in areas where quality of existing population estimates is rated poorly (Tables 4-1 through 4-6). Ideally, censuses will be coordinated between adjacent regions. It is particularly important to identify breeding locations (see 7.1.1). Aerial surveys may be effective in covering large territories and there is a possibility of integrating these with existing surveys for ungulates.

b) Quantification of causes of reproductive failure, in order to better prioritize conservation actions (see 7.2.2).

c) Collating and publishing results of multiple existing small-scale telemetry efforts on Great Bustards in Asia (e.g., data from trackers on rehabilitated and released individuals), to provide insight into migratory movements.

d) Quantification of cause and location of adult mortalities. This should include development of registries for injuries and mortalities, to collect information about location, season and cause. Mortality surveys along powerlines near sites used by Great Bustards can help to identify the stretches of line most dangerous to Great Bustards for amelioration (7.1.2).

e) Analysis of genetic connectivity between remnant Great Bustard populations, ideally using non-invasive sampling techniques and samples from Great Bustards in zoos.

f) Forecasts of habitat suitability of both breeding and wintering grounds under climate change scenarios, for use in conservation planning.

All research should be undertaken with the lowest possible disturbance to Great Bustards, recognizing that nest visits may lead to clutch loss and capture may result in death due to capture myopathy.

7.6 – Increase international cooperation

The long-distance migration undertaken by Great Bustards in Asia, and transboundary location of many surviving populations necessitate cooperation between range states for the species' conservation.

7.6.1 – Coordinate population censuses

Regular censuses at wintering and breeding sites should be synchronized between neighboring regions in order to obtain more accurate population estimates. Regular communication of monitoring between adjacent territories may help to identify the occurrence of an international movement of a flock, and thus inform an agency of the need for increased patrols.

7.6.2 – Establish transboundary protected areas

28% of the key sites identified by contributors are located within 50 km of an international border, and 46% within

100 km. Recommendations have already been published regarding the development of new transboundary protected areas, including Kurumbel'skii Steppe Preserve, which would cover 300,000 ha spanning Omsk and Novosibirsk Provinces of the Russian Federation and Pavlodar Province of Kazakhstan, and would represent the only steppe reserve in this region (Nefedov 2013b), and Selenginskaya Dauria Reserve, which would unite protected areas in the Republic of Buryatia, Russian Federation, and Selenge Province of Mongolia (Shagzhiev et al. 2015). Additional productive partnerships could assist conservation of Great Bustards in transboundary regions of East Kazakhstan Province and Xinjiang, People's Republic of China; and Nomrog Protected Area of Mongolia and Tumuji National Nature Reserve in People's Republic of China.

7.6.3 – Establish resources to facilitate continued international collaboration

Conservation of the Great Bustard will require long-term cooperation and communication across its vast, fragmented Asian range. The Concerted Action for Great Bustards under the Convention on Migratory Species provides an umbrella for increased cooperation and communication between range states. However, it does not yet provide financial or logistical mechanisms for coordination of the Action, and activities such as conference organization and joint document preparation are undertaken only on an ad hoc and unfunded basis. These conditions are not sustainable and likely to break down with time unless a regular structure for planning and funding is developed. We recommend:

a) Establishment of a regular schedule of biannual conferences to bring together researchers and conservation actors from Asian range states, with responsibility for hosting and funding rotating between range states.

b) Establish an appropriate funding mechanism to provide for the coordination of the Concerted Action, e.g., for the translation of shared documents for implementation of the Concerted Action, and for an international coordinator to communicate effectively between range states, facilitate information-sharing and transfer of best practices across the region, and develop consensus on regional work plans while maintaining a range-wide view.

c) Development of a small grants fund to finance conservation-oriented research and activities for the Great Bustard in Asia, to be administered by the coordinator with assistance from a panel of reviewers.

7.7 – Ex situ approaches

Despite some advances, captive breeding methods for the Great Bustard are considered to be not well-enough developed for application in large-scale conservation efforts (Langgemach 2018). Most organizations once pursuing captive breeding of Great Bustards have abandoned this work in favor of artificial incubation of eggs collected from the wild (e.g., in Saratov, Russian Federation). Artificial incubation is currently carried out in Germany, Hungary, and the Lower Volga Region of the Russian Federation (Alonso 2014). However, there are barriers to implementing such programs in Asia at the current time. Chief among them, the widespread persistence of poaching (Section 5.1.1) threatens to eliminate any gains made through artificial incubation and the subsequent release of relatively tame young birds.

Additional barriers to artificial incubation programs (and, in some cases, captive breeding) in Asia at this time include:

- Insufficient knowledge about the location of breeding sites of Great Bustards across most of Asia to serve as sources of eggs for artificial incubation programs.
- Insufficient baseline knowledge concerning rates of reproductive success and threats to reproduction in the wild to justify egg removal (see 7.2.2 above; IUCN Species Survival Commission, 2013).
- Lack of suitable donor populations for translocation of eggs. Remaining leks of both the Eastern Great Bustard and Western Great Bustard in Asia are of insufficient size (Tables 4-1 and 4-4). While the Iberian Peninsula hosts the largest remaining population of Great Bustards globally, there are significant ecological differences between these birds, which experience mild temperatures and make only short movements (e.g., less than 20 km; Alonso et al., 2000) and Western Great Bustards in Asia, which inhabit extreme continental climates and undertake long migrations. The second largest reservoir of Western Great Bustards exists in the Volga River of the Russian Federation, and has undergone recent rapid declines (Oparina et al. 2016; Oparin & Oparina 2020).
- Challenges in identifying stable financing. Implementation of ex situ programs requires commitment to long-term support by the host country, whereas thus far funding for conservation of the Great Bustard in many parts of Asia has been weak. Abandonment of an incubation program after removal of eggs from wild populations would result in a net loss to wild populations.
- Concern that artificial incubation programs in Asia could be less successful than those in Europe, due to the need of this species to learn to navigate threats across a long-distance migratory route in Asia (Martín et al. 1996).
- The considerable labor required to locate Great Bustard nests. Care must be taken to develop collection methodologies which avoid incentivizing collection of non-threatened clutches, and eggs of non-target species.
- The likelihood that ex situ measures such as conservation breeding might be used as a form of

mitigation, so permitting further habitat degradation and inaction to conserve Great Bustards in the wild.

Because of these barriers, we currently recommend a focus on the in situ conservation activities for Great Bustards in Asia described above, with limited ex situ-related activities identified below:

a) Maintenance of Great Bustards that have been injured and are not able to be repatriated to the wild at zoos that are successful in minimizing injuries and deaths of captive Great Bustards.

b) Research into the location of breeding sites and their reproductive success (7.2.1 and 7.2.2), to fill knowledge gaps currently presenting barriers to the establishment of artificial incubation programs.

c) Improve understanding of best practices and tradeoffs involved in Great Bustard artificial incubation programs. Collect and synthesize data from past and present Great Bustard artificial incubation programs globally. Calculate the effectiveness of these programs in terms of: (1) number of birds released to the wild per number of eggs collected; (2) cost per bird released; (3) survival rate of released birds; and (4) reproductive rate of released birds. Carry out demographic modeling to evaluate chance of success (as in Dolman et al., 2015), and potential impacts of establishing such a program in Asia. Calculate cost of activities required to achieve various levels of results and compare to costs of alternate conservation methods. Consult the IUCN/SSC Guidelines on the Use of Ex Situ Management for Species Conservation (2014) to evaluate the appropriateness of ex-situ intervention.

7.8 – Recommended actions

During the development of this Action Plan, experts responded to a detailed questionnaire regarding their perceptions of the urgency of threats in their region and the conservation actions they consider most effective to address them. These responses are collated in Appendices 3 and 4. Geographic variation in the specific actions recommended to tackle a common threat brings into relief highly divergent socioeconomic, ecological, and political considerations across the Great Bustard's Asian range. Nevertheless, some common threads can be summarized.

As regards methods for reducing adult mortality, poaching is widely recognized as an urgent threat. Respondents generally prefer conservation actions to strengthen the capacity and interest of existing anti-poaching forces to protect the Great Bustard. Though this is evaluated as a lower-cost approach, it is also perceived by some to have higher barriers to success. While new powerline installation was less intensive at the time of the conference and survey than at the time of Plan publication, respondents perceived even at that time that strengthening Environmental and Social Impact Assessment (ESIA) safeguards for new powerline infrastructure was a preferable approach to confront this threat.

Recommendations for methods to increase reproductive success vary across respondents and regions, and few are marked at the highest priority level. This is likely a reflection of a lack of data on the causes of low productivity. Respondents agree that research to quantify causes of reproductive failure is important, but also express concern about the time commitment required and limited human capacity to undertake this research.

Across Asia, developing public awareness is ranked as a relatively high priority, with low barriers to success and generally low cost.

In contrast, habitat improvement, while frequently rated as a critical priority, is evaluated as costly and likely to encounter barriers. The wide-scale transformation of the original steppe habitat of Great Bustards to farmland lies at the root of this conundrum. While agriculture presents obstacles to successful reproduction of Great Bustards, it also increases the economic value of the land. Incorporation of these lands into protected areas is politically challenging and less compelling to the public.

Despite the dire status of the Great Bustard in Asia, there is a general lack of enthusiasm for ex situ approaches among respondents (though with a couple of strong exceptions!). Some respondents specifically provided extra text to explain that they would advocate against ex situ actions. This is likely related to the failure of previous attempts at captive breeding and artificial incubation of Great Bustards in the Action Plan countries to yield positive results, despite long-term investments (Section 7.7).

Across all conservation actions, the obstacle most frequently mentioned is insufficient human capacity to conduct conservation work. There is a strong need for an increase in basic overhead funding to provide conservation staff salaries, as well as to support students pursuing conservation science studies.

Section 8
References

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Appendix 1

Important sites for Western Great Bustards in Asia. Researchers and conservation organizations were asked to identify the most important sites for Great Bustard conservation in their region, particularly breeding sites, overwintering sites and migratory stopovers used over multiple years.

Because of concern about poaching of Great Bustards, specific site information will be provided to government actors, and to researchers and conservation actors upon request on a case-by-case basis.

Country	Region	District	Number of Great Bustards observed	Seasonal presence of Great Bustards	Land use	Protection status
Islamic Republic of Iran	West Azerbaijan	Bukan	23-25	Breeding and nesting site	Crops: wheat, barley, pea	Wildlife refuge
Islamic Republic of Iran	West Azerbaijan	Bukan	4-6	Breeding and nesting site	Crops: wheat, barley, pea	No hunting area
Islamic Republic of Iran	West Azerbaijan	Bukan	5	Breeding and nesting site, overwintering site	Crops: wheat, barley, pea	None
Islamic Republic of Iran	West Azerbaijan	Bukan	23	Pre migratory gathering, overwintering	Crops: alfalfa, rapeseed	None
Islamic Republic of Iran	West Azerbaijan	Bukan	19	Overwintering	Crops: wheat, barley, pea, alfalfa	None
Russian Federation	Orenburg	Sol'-Iletsky	3	Nesting	Pasture	Regional Natural Monument
Russian Federation	Orenburg	Novoorskii	4	Nesting	Pasture and wheat fields	None
Russian Federation	Orenburg	Pervomaiskii	3-4	Nesting	Steppe, not used as pasture	Orenburg Federal Nature Reserve "Orenburgskii"
Russian Federation	Orenburg	Akbulakskii	6	Nesting	Pasture	None
Russian Federation	Orenburg	Belyaevskii	1-2	Nesting	Wheat fields	None
Russian Federation	Orenburg	Belyaevskii	1-2	Nesting	Pasture	Orenburg Federal Nature Reserve "Orenburgskii"
Russian Federation	Orenburg	Sol'-Iletskii	4-6	Nesting	Abandoned fields	None
Russian Federation	Orenburg	Orenburgskii	12	Fall gathering place	Pasture	None
Russian Federation	Orenburg	Orenburgskii	8-10	Wintering	Pasture	None
Russian Federation	Orenburg	Svetlinskii	2	Migratory	Pasture	Biological Reserve "Svetlinskii"
Russian Federation	Omsk	Isil'kul'skii	1-2	Spring and autumn observations	Wheat fields	None

Russian Federation	Omsk	Isil'kul'skii	1	Spring and autumn observations	Wheat fields	None
Russian Federation	Omsk	Isil'kul'skii	5	Nesting	Abandoned fields and wheat fields	None
Russian Federation	Omsk	Okone-shnikovskii	2	Spring	Steppe, pasture	Former Federal Zakaznik "Stepnoi"
Russian Federation	Omsk	Russko-Polyanskii	1	Spring	Wheat fields	None
Kazakhstan	West Kazakhstan	Terekti	5	Lekking, fall migration	Wheat fields	None
Kazakhstan	West Kazakhstan	Borili	13	Fall migration	Wheat fields	None
Kazakhstan	West Kazakhstan	Terekti	5-20	Fall migration	Hay field, steppe	None
Kazakhstan	Kostanai	Naurzum	3-5	Possible nesting	Unknown	None
Kazakhstan	Kostanai	Naurzum	1-5	Possible lek	Wheat fields	None
Kazakhstan	Kostanai	Arkalyk	"Regularly observed"	Summer and fall pre-migratory gathering?	Unknown	None
Kazakhstan	Kostanai	Amangel'dy	"Regularly observed"	Summering	Pasture	None
Kazakhstan	Karaganda	Ulytau	80	Fall pre-migratory gathering	Unknown	None
Kazakhstan	Karaganda	Ulytau	6	Fall pre-migratory gathering	Unknown	None
Kazakhstan	Turkistan	Tyul'kubasskii	2	Lekking, nesting, overwintering	Predominantly wheat fields, hay fields, unused lowlands, disjunct elm tree belts	None
Kazakhstan	Turkistan	Tyul'kubasskii	2-100	Overwintering and spring migration	Predominantly wheat fields, hay fields, unused lowlands, disjunct elm tree belts	None
Kazakhstan	Turkistan	Sairamskii	6-27	Fall pre-migratory gathering and migratory stopover	Predominantly wheat fields, hay fields, unused topographic lowlands, disjunct elm tree belts	None
Kazakhstan	Turkistan	Baidibekskii	2-100	Lekking, nesting, overwintering	Dry foothill steppes used as sheep pasture	IBA
Kazakhstan	Turkistan	Baidibekskii	6-50	Overwintering, spring migration	Dry foothill steppes used as sheep pasture	None
Kazakhstan	Turkistan	Arysskii	12-150	Overwintering, spring migration	Dry foothill steppes used as sheep pasture	None
Kazakhstan	Turkistan	Kazygurtskii	2-200	Fall movements, overwintering	Predominantly wheat fields, hay fields, unused lowlands, disjunct elm tree belts	None
Kazakhstan	Turkistan	Ordabasinskii	12	Spring migration	Predominantly wheat fields, occasional farms, and steppe used for sheep pasture	None

Kazakhstan	Jambyl	Zhuvalinskii	2-17	Lekking, nesting, summer flocks	Predominantly wheat fields, hay fields, unused lowlands, disjunct elm tree belts	None
Kazakhstan	Jambyl	Zhuvalinskii	3	Summer gatherings of molting birds	Dry foothill steppes and lowlands	None
Kazakhstan	Jambyl	Kordai	Up to 8	Migration	Steppe used as pasture, abandoned fields, and active fields of wheat and barley	
Kazakhstan	Almaty	Alakol	10 during breeding season, up to 200 in non-breeding season	Nesting, migration, overwintering	Soy and sunflower fields	Alakol' National Zapovednik
Kazakhstan	Almaty	Ili	Up to 100	Migration, overwintering	Artemisia steppe	Zhusandala National Wildlife Area
Kazakhstan	Almaty	Ili	Up to 100	Migration, overwintering	Abandoned fields	None
Kazakhstan	Almaty	Koksu	Up to 40	Migration, overwintering	Semi-desert, sandy soil	None
Kazakhstan	Almaty	Talgar	Up to 50	Migration, overwintering	Pasture, abandoned fields	None
Kazakhstan	East Kazakhstan	Ayagoz	40	Lekking, nesting	Artemisia steppe	None
Kazakhstan	East Kazakhstan	Kurchumskii	10-12	Nesting, autumn pre-migratory gathering	Wheat fields, including harvested wheat fields in fall; sunflower and corn fields, meadows	None
Kazakhstan	East Kazakhstan	Zaisan and Tarbagatai	15-20	Nesting, autumn pre-migratory gathering	Pasture	None
Kazakhstan	East Kazakhstan	Kurchumskii and Urdzharskii	30-50	Nesting	Wheat, sunflower and corn fields, meadows, melon cultivation	None
Uzbekistan	Jizzakh	Zafarabadskii and Pakhtakorskii	2-96	Overwintering	Winter wheat fields	Protected Natural Area "Arnasaiskii Ornithological Reserve", and IBA UZ035 "Lake Tuzkan"
Uzbekistan	Jizzakh & Samarkand	Bakhmal & Dustlik; Bulungur, Jomboy & Payariq	1-20	Overwintering	Pasture, winter wheat fields	None
Uzbekistan	Samarkand	Nurobod	1-20	Overwintering	Dry steppe, pasture, winter wheat fields	IBA "Karnabchul' Steppe"

Turkmenistan	Balkan	Foothills of the northwestern Kopetdag Mountain range	1-49	Overwintering	Alternating pasture and winter crops	IBA
Turkmenistan	Lebap	Right bank of the Amudarya River	1-2	End of fall migration, wintering, spring migration	Pasture	Edge of IBA
Kyrgyzstan	Isyk-Kul'	Tyupskii	2-5	Fall, occasionally overwintering during years with little snow	Wheat fields, clover	None
Kyrgyzstan	Chui	Panfilovskii	3-8	Fall, occasionally overwintering in years with little snow	Wheat fields, clover, safflower	None
Kyrgyzstan	Jalabadskii	Karasuiskii	2-3	Overwintering in years with little snow	Wheat fields, clover, safflower	None
Tajikistan	Sogd	Ashtskii	1-2	Migration	Pasture	None
PRC	Xinjiang	Ili	16-19 in breeding season; 444 individuals maximum during pre-migratory gathering season	Breeding site, pre-migratory gathering	Mostly crops: winter wheat fields, harvested stubble from wheat and corn, fields plowed in fall, alfalfa, and oilseed rape fields	None
PRC	Xinjiang	Ili	0	Previous overwintering site, need to monitor and maintain for future use	Mostly crops: winter wheat fields, harvested stubble from wheat and corn	None
PRC	Xinjiang	Altay	7	Suspected breeding site	Pasture	None

Appendix 2

Important sites for Eastern Great Bustards. Researchers and conservation organizations were asked to identify the most important sites for Great Bustard conservation in their region, particularly breeding sites, overwintering sites and migratory stopovers used over multiple years. Specific site information will be provided to government actors, and to researchers and conservation actors upon request on a case-by-case basis.

Country	Region	District	Number of Great Bustards observed	Seasonal presence of Great Bustards	Land use	Protection status
Russian Federation	Republic of Tuva	Tes-Khemskii	11	Spring gathering, likely lek	Pasture	No
Russian Federation	Republic of Tuva	Tes-Khemskii	5	Females and young birds in the period after nesting	Pasture	Portion of Protected Area "Ubsunur Depression"
Russian Federation	Republic of Buryatia	Dzhidinskii	50-80	Nesting, fall pre-migratory gathering	Abandoned fields, small copses in the steppe, meadow, forest-steppe	IBA, Protected Area
Russian Federation	Republic of Buryatia	Mukhorshibirskii	50-100	Nesting, fall pre-migratory gathering	Abandoned fields, small copses in the steppe, meadow, forest-steppe	IBA, Protected Area
Russian Federation	Republic of Buryatia	Mukhoshibirskii	50-80	Nesting, fall pre-migratory gathering	Abandoned fields, small copses in the steppe, meadow, forest-steppe	IBA, Protected Area
Russian Federation	Republic of Buryatia	Bichurskii	30-50	Nesting, fall pre-migratory gathering	Fallow fields, abandoned land, pasture, forest-steppe	None
Russian Federation	Zabaikal'skii Krai	Kyrinskii	1-4	Nesting	Pasture	Border zone of Sokhondinskii Zapovednik
Russian Federation	Zabaikal'skii Krai	Kyrinskii	4	Lek	Crop fields	None
Russian Federation	Zabaikal'skii Krai	Ononskii	100-150	Lekking, nesting, pre-migratory gathering spot, overwintering	Pasture, abandoned fields	Partial inclusion in IBA "Bain-Tsaganskii Lake Belt," but the IBA does not have a protected status
Mongolia	Uvs	Baruunturuun	10-14	Fall migration	Wheat fields	None
Mongolia	Uvs	Davst	2-5	Nesting, fall migration	Wheat fieldst	Partial Uvs Nuur Protected Area
Mongolia	Uvs	Davst	4-6	Nesting, fall migration	Abandoned fields	Partial Uvs Nuur Protected Area
Mongolia	Uvs	Tes	2-5	Nesting, fall migration, spring migration	Steppe used as pasture	None

Mongolia	Khovsgol	Erdenebulgan	30-40	Lek and nesting	Wheat, fallow and abandoned fields in forest-steppe	IBA "Bulgan Tal"
Mongolia	Khovsgol	Tsagaan-Uur	3-5	Lek	Small opening in forest-steppe with long-abandoned fields	None
Mongolia	Khovsgol	Tarialan	30-40	Lek, nesting	Wide valley containing alternating wheat and fallow fields	IBA "Tarialan"
Mongolia	Khovsgol	Tarialan	30-40	Lek, nesting	Narrow valley containing alternating wheat and fallow fields	IBA "Tarialan"
Mongolia	Khovsgol	Tarialan	40-150	Migratory gathering place	Moist river valley used as pasture	IBA "Tarialan"
Mongolia	Khovsgol	Tosontsengel	25-35	Lek, nesting	Narrow valley used as pasture, containing long-abandoned fields	None
Mongolia	Khovsgol	Rashaant	25-35	Lek, nesting	Wheat, fallow and pasture	None
Mongolia	Bulgan	Teshig	5-30	Lek	Wheat, fallow and discarded fields, pasture	IBA "Teshigiin Olon Lakes"
Mongolia	Bulgan	Khutag Ondor	5-30	Lek, nesting, migratory stopover	Dry steppe used as pasture	IBA "Selenge – Teel"
Mongolia	Umnugobi	Khanbogd	1	migratory stopover	Pasture	None
Mongolia	Umnugobi	Khanbogd	2	migratory stopover	Pasture	IBA
Mongolia	Umnugobi	Manlai	3	migratory stopover	Pasture	None
Mongolia	Umnugobi	Khanbogd	3	migratory stopover	Pasture	None
Mongolia	Umnugobi	Khanbogd	1	migratory stopover	Pasture	None
Mongolia	Umnugobi	Khanbogd	2	migratory stopover	Pasture	None
Mongolia	Khentii	Dadal	16	Lek	Pasture	Onon-Balj National Park
Mongolia	Khentii	Dadal	8	Lek	Pasture	Onon-Balj National Park
Mongolia	Khentii	Umnudelger, Batshireet, Binder	Breeding – 6-10; Pre-migratory gathering-50-80	Breeding and pre-migratory staging	Pasture and wheat fields	IBA "Valleys of Khurkh-Khuiten Rivers," Ramsar site
Mongolia	Khentii	Umnudelger	Breeding – 2-4; Pre-migratory gathering- 4-10	Breeding and pre-migratory staging	Pasture	None
Mongolia	Khentii	Umnudelger	Breeding – 1-2; migratory stopover – 4-6	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Binder	Breeding – 2-6; Pre-migratory gathering- 10-26	Breeding and pre-migratory staging	Pasture and wheat fields	IBA "Valleys of Khurkh-Khuiten Rivers," Ramsar site
Mongolia	Khentii	Bayan-Adarga	Breeding – 2-6; Pre-migratory gathering- 8-24	Breeding and pre-migratory staging	Pasture	None
Mongolia	Khentii	Binder, Bayan-Adarga	Breeding – 2-6; Pre-migratory gathering- 8-14	Breeding and pre-migratory staging	Pasture	IBA "Valleys of Khurkh-Khuiten Rivers," Ramsar site

Mongolia	Khentii	Bayan-Adarga	Breeding – 2-4; migratory stopover – 6-10	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Bayan-Adarga	Breeding – 4-6; migratory stopover – 14-47	Breeding and migratory stopover	Pasture and wheat fields	None
Mongolia	Khentii	Batshireet	Breeding – 1-2; migratory stopover – 2-6	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Batshireet	Breeding – 1-2; migratory stopover – 2-4	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Batshireet	Breeding – 3-6; migratory stopover – 6-15	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Binder	Breeding – 1-2; migratory stopover – 4-6	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Binder	Breeding – 2-4; migratory stopover – 4-10	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Dadal	Breeding – 2-6; migratory stopover – 4-12	Breeding and migratory stopover	Pasture	IBA “Onon-Balj” and Onon Balj National Park
Mongolia	Khentii	Dadal	Breeding – 4-6; migratory stopover – 8-26	Breeding and migratory stopover	Pasture	IBA “Onon-Balj” and Onon Balj National Park
Mongolia	Khentii	Dadal	Breeding – 2-3; migratory stopover – 6-22	Breeding and migratory stopover	Pasture	IBA “Onon-Balj” and Onon Balj National Park
Mongolia	Khentii	Dadal	Breeding – 2-4; migratory stopover – 6-16	Breeding and migratory stopover	Pasture and wheat fields	None
Mongolia	Khentii	Binder	Breeding – 1-2; migratory stopover – 4-6	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Binder	Breeding – 1-2; migratory stopover – 4-8	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Norovlin	Breeding – 1-2; migratory stopover – 4-6	Breeding and migratory stopover	Pasture	None
Mongolia	Khentii	Norovlin	Breeding – 2-4; migratory stopover – 6-14	Breeding and migratory stopover	Pasture and wheat fields	None
Mongolia	Dornod	Bayan-Uul	Breeding – 2-4; migratory stopover – 6-16	Breeding and migratory stopover	Pasture and wheat fields	None
Mongolia	Dornod	Bayandun	Breeding – 2-3; migratory stopover – 4-8	Breeding and migratory stopover	Pasture	IBA “Ulz River and Turgen Tsagaan Lakes”
Mongolia	Dornod	Bayandun	Breeding – 4-6; migratory stopover – 12-56	Breeding and migratory stopover	Pasture	Ugtam Mountain Reserve and IBA
Mongolia	Dornod	Dashbalbar	Breeding – 2-3; migratory stopover – 4-8	Breeding and migratory stopover	Pasture	IBA “Mongol Daguur”
Mongolia	Dornod	Chuluunkhoroot	Breeding – 2-3; migratory stopover – 4-8	Breeding and migratory stopover	Pasture and wheat fields	IBA “Mongol Daguur” and Mongol Daguur Strictly Protected Area Part B, Ramsar site

Mongolia	Dornod	Khulunbuir	Breeding – 1-2; migratory stopover – 2-6	Breeding and migratory stopover	Pasture	Toson Khulstain Nature Reserve
Mongolia	Dornod	Bulgan	Breeding – 1-2; migratory stopover – 2-4	Breeding and migratory stopover	Pasture and wheat fields	None
Mongolia	Dornod	Khalkhgol	Breeding – 2-3; migratory stopover – 4-12	Breeding and migratory stopover	Pasture	None
Mongolia	Dornod	Khalkhgol	Breeding – 2-3; migratory stopover – 4-12	Breeding and migratory stopover	Pasture and wheat fields	IBA "Tashgain Taan Lake"
Mongolia	Dornod	Khalkhgol	Breeding – 1-3; migratory stopover – 4-6	Breeding and migratory stopover	Pasture	None
Mongolia	Dornod	Khalkhgol	Breeding – 1-3; migratory stopover – 4-10	Breeding and migratory stopover	Pasture	IBA "Nomrog" and Nomrog Strictly Protected Area
Mongolia	Dornod	Khalkhgol	Breeding – 1-2; migratory stopover – 2-6	Breeding and migratory stopover	Pasture	IBA "Nomrog" and Nomrog Strictly Protected Area
Mongolia	Dornod	Khalkhgol	Breeding – 1-2; migratory stopover – 2-4	Breeding and migratory stopover	Pasture	IBA "Nomrog" and Nomrog Strictly Protected Area
Mongolia	Dornod	Khalkhgol	Breeding – 1-4; migratory stopover – 4-12	Breeding and migratory stopover	Pasture	IBA "Nomrog" and Nomrog Strictly Protected Area
Mongolia	Dornod	Khalkhgol	Breeding – 1-2; migratory stopover – 4-8	Breeding and migratory stopover	Pasture	None
Mongolia	Dornod	Khalkhgol	Breeding – 1-2; migratory stopover – 2-6	Breeding and migratory stopover	Pasture	IBA "Buir" and Ramsar site
Mongolia	Dornod	Matad	Breeding – 1-2; migratory stopover – 2-6	Breeding and migratory stopover	Pasture	None
Mongolia	Dornod	Matad	Breeding – 1-2; migratory stopover – 2-4	Breeding and migratory stopover	Pasture	None
Mongolia	Sukhbaatar	Erdenetsagaan	Breeding – 1-2; migratory stopover – 2-5	Breeding and migratory stopover	Pasture	Dornod Mongol Strictly Protected Area
Mongolia	Sukhbaatar	Erdenetsagaan	Breeding – 1-2; migratory stopover – 2-4	Breeding and migratory stopover	Pasture	Dornod Mongol Strictly Protected Area
PRC	Inner Mongolia	Xing'an Meng	100	Breeding site	Pasture	Tumuji National Reserve
PRC	Inner Mongolia	Xing'an Meng	20	Breeding site	Pasture	Tumuji National Reserve
PRC	Inner Mongolia	Xing'an Meng	120-180 stopover, 50-100 overwintering	Stopover and overwintering	Pasture, soy, mungbeans, and occasionally corn fields	Tumuji National Reserve
PRC	Inner Mongolia	Xing'an Meng	30-70 on stopover, 30-50 overwintering	Stopover and overwintering	Pasture, soy, mungbeans, and occasionally corn fields	Tumuji National Reserve

PRC	Inner Mongolia	Bayan Nur	Unknown, at least 10	Stopover	Agricultural fields and wetland	None
PRC	Inner Mongolia	Bayan Nur	Unknown, at least 10	Stopover	Agricultural fields and wetland	None
PRC	Heilongjiang	Daqing	5-30 in winter, 8-10 breeding	Overwintering and some breeding	Steppe surrounded by agricultural fields	None
PRC	Heilongjiang	Daqing	5-30	Overwintering	Steppe, wetland, soybean and corn fields	None
PRC	Heilongjiang	Daqing	5-30	Overwintering	Steppe surrounded by agricultural fields	None
PRC	Heilongjiang	Daqing	8-10	Overwintering	Steppe surrounded by agricultural fields	None
PRC	Tianjin	Jixian	16-36	Overwintering	Wheat, soy and rice fields	China Conservation area for Great Bustards at Jixian County
PRC	Hebei	Cangzhou	14-78	Overwintering	Wheat, soy and rice fields	China Conservation Area for Great Bustards at Cangzhou
PRC	Shaanxi	Weinan	Up to 578 in total at the 12 sites listed for Shaanxi	Overwintering	Agricultural fields and wetland	None
PRC	Shandong	Dongying	Up to 32	Overwintering	Wheat, corn, rice and soy fields adjacent to experimental area of protected area	Just outside of Shandong Yellow River National Nature Reserve
PRC	Shandong	Dongying	Up to 32	Overwintering	Wheat, corn, rice and soy fields adjacent to experimental area of protected area	Just outside of Shandong Yellow River National Nature Reserve
PRC	Henan	Xinxiang, Changyuan	300	Migratory stopover, overwintering	Wheat and corn fields, wetland	Xinxiang, Yellow River Wetland National Bird Sanctuary
PRC	Henan	Xinxiang, Fengqiu	20-320	Migratory stopover, overwintering	Wheat, soy, and corn fields	Xinxiang City National Bird Nature Reserve
PRC	Liaoning	Jinzhou	20-52	Overwintering	Corn and peanut fields	China Conservation Area for Great Bustards at Jinzhou
PRC	Liaoning	Jinzhou	20-40	Overwintering	Corn and peanut fields	None
DPR Korea	North Pyongan & South Pyongan	Mundok and Pakchon	No known recent records	Wintering	Extensive estuarine system, with rice fields in hinterland. Includes some saltmarsh and river islands	Some of the area is within a Ramsar site

DPR Korea	South Pyongan	Onchon County, near Nampo City. Includes Unha Ri: Natural Monument area for wintering Great Bustard	No known recent records	Wintering	Rice fields and salt-works	Part of the area has been designated as a National Monument for Great Bustards.
DPR Korea	South Hwanghae	Border of Paechon and Yonan Counties, near Haeju	No known recent records	Wintering	*Suaeda* saltmarsh, salt-pans, rice fields	Part of the area has been designated as Paechon-Yokgudo Migratory Bird Reserve, and includes a National Monument Area for White-naped Crane
RO Korea	Gangwon	Cheorwon	1 (in one winter since 2000)	Wintering	Rice fields	Restricted area
RO Korea	Jeollabuk	Saemangeum	1	Wintering	20,000 ha of uncultivated land within a massive reclamation area, interspersed with hay fields, and adjacent to extensive rice fields. In addition to plains within the DMZ, this area currently likely provides the best potential habitat for the species within the ROK	No

Appendix 3

Priority actions for conservation of the Western Great Bustard in Asia by region, as evaluated by experts. Ratings were contributed via a questionnaire shared with Action Plan contributors and species experts. Activities are numbered in correspondence with the section of this Action Plan in which they are discussed. The importance of an activity in a specific region is indicated by the color and first number in a cell (1=critical priority, red; 2=high priority, orange; 3=medium priority, yellow;

		7.1 Decrease adult mortality			7.2 Improve reproductive rates								
Country	Region	7.1.1 Reduce poaching	7.1.2 Prevent powerline collisions	7.1.3 Reduce predation by dogs	7.2.1 Identify breeding sites	7.2.2 Research causes of failure	7.2.3 Establish PAs at breeding sites	7.2.4 Rural outreach	7.2.5 Compatible farming practices	7.2.6 Regulate pasture use	7.2.7 Reduce nest predation	7.2.8 Reduce egg collection	7.2.9 Reduce wildfires
Iran	Entirety	3-b-0-1	3-b-0-1	2-n-0-2	2-n-0-2	2-n-3-2	1-n-5-3	1-n-2-1	2-a-5-2	2-n-0-2	2-a-0-3	2-n-0-2	2-n-3-3
Russia	Orenburg	1-x-x-5	0	4-n-x-4	3-n-2-3.5	2-n-2-3.5	2-n-2.5-4.5	3-n-2-2	2-x-x-2.5	3-n-x-2.5	4-x-0-0	5-n	3-n-x-2.5
Kazakhstan	Southern and Eastern	2	x	2-n	x	2-n	2-n	x	x	2-n	x	x	x
Kazakhstan	Western + Southern	1-abce-2-4	3-cd-1-4	3-n-2-2	2-n-3-3	2-n-4-3	1-n-3-4	3-n-1-1	1-abc-3-4	5-n	2-c-2-3	5-n	5-n
Kazakhstan	Central	2-eab-0-3	x	x	2-n-4-2	x	x	2-n-2-2	x	x	x	x	x
Kazakhstan	Southern	1-a-0-5	4-c-0-1	0-n-0-2	1-n-2-4	2-n-2-4	4-n-5-4	2-n-2-1	2-x-5-5	x-n-4-5	x-x-0-2	5-n-0-1	5-n-5-1
Kazakhstan	Eastern	2-x-3-5	2-x-3-1	4-n-2-1	2-n-0-1	2-n-0-5	2-n-5-5	3-n-2-1	2-x-3-5	2-n-0-1	3-x-0-5	3-n-0-1	2-n-3-5
Uzbekistan	Entirety	1-x-2-4	5-x-0-2	3-n-2-3	5-n	5-n	5-n	5-n	5-x	5-n	5-x	5-n	5-n
Turkmenistan	Entirety	1-a-2-3	2-c-5-4	2-n-1-2	5-n	5-n	5-n	5-n	5-x	5-n	5-x	5-n	5-n
Kyrgyzstan	Entirety	2-a-3-5	0	3-n-1-3	2-n-3-3	2-n-3-3	2-n-3-4	1-n-3-2	0	1-n-2-4	3-x-2-3	0	0
Tajikistan	Entirety	1-x-3-3	5-x	5-n	5-n	5-n	5-n	1-n-2-1	5-x	5-n	5-x	5-n	5-n
China	Xinjiang	1-x-1-3	4-x-2-3	3-n-0-1	2-n-3-3	2-n-3-5	1-n-0-3	1-n-0-2	1-x-0-3	1-n-0-2	2-x-0-4	1-n-0-3	3-n-0-1

Critical Priority	1	High Priority	2	Medium Priority	3

4=low priority, green; 5=not relevant, blue; 0=unknown, strong blue). The letter within a cell recommends a specific approach to this action, as enumerated in the corresponding section of the Action Plan, "n" indicates that there was no option for selection, and "x" that the respondent did not select one of the approaches. The second number estimates the relative cost of the recommended action from 1 (low cost) to 5 (high cost). The third number ranks the expected difficulty in undertaking the action, independent of budgetary issues, from 1 (easy) to 5 (difficult). Only regions for which questionnaire responses were received are included in the table.

7.3 Public awareness	7.4 Habitat improvement			7.5 Fill knowledge gaps	7.6 International cooperation			7.7 Ex situ	Challenges
7.3 Improve public awareness and involvement	7.4.1 Improve PA network	7.4.2 Improve winter habitat	7.4.3 Reduce human disturbance	7.5 Undertake research	7.6.1 Coordinate censuses	7.6.2 Transboundary PAs	7.6.3 Funding for intl collaboration	7.7 Ex situ approaches	Anticipated challenges
2-a-2-2	1-a-5-4	2-a-5-4	1-a-5-4	1-a-4-4	2-n-3-2	5-n	2-a-5-4	3-x-x-x	Insufficient human capacity; political challenges
x	2-a-2.5-4.5	4-a-x-2.5	2-x-x-2.5	x	2-n-2-2.5	3-n-4-4.5	2-x-x-x	3-x-x-4.5	Insufficient human capacity; political challenges; public perceptions; difficulties related to large territory
x	2-x	x	2-x	x	2-n	x	x	5-x	Insufficient human capacity and financing
2-acd-2-1	1-d-4-5	3-bc-3-3	5-x	2-bd-4-3	3-n-3-2	5-n	2-abc-3-1	5-ac-4-3	Large territory containing few birds; insufficient trained personnel; agricultural zoning and profits
2-abc-0-2	x	x	2-a-2-3	2-ad-3.5-4	x	x	x	x	Insufficient human capacity; corruption within judicial system
2-a-5-1	2-a-5-5	2-c-3-3	2-b-5-5	2-a-5-1	2-n-5-1	5-n-0-5	2-a-5-2	5-a-5-5	Bureaucracy; insufficient trained personnel; private land ownership and profit motive
x	2-x-3-5	4-x-3-5	3-x-0-1	x	2-n-3-5	2-n-4-5	2-x-4-5	x-x-x-5	Insufficient trained personnel
1-x-2-3	1-x-3-4	1-x-2-3	1-x-x-x	3-x-2-2	2-n-2-2	2-n-0-3	2-x-x-x	0	Insufficient trained personnel and technical equipment; disinterest; insufficient information about sites; bureaucracy
1-a-2-2	1-a-5-5	3-c-4-3	1-b-4-2	1-x-x-2	1-n-2-1	3-n-5-5	3-b-3-3	3-x-5-3	Administrative and political causes; insufficient capacity
x	2-c-4-4	2-a-3-4	1-a-2-3	1-x-4-2	1-n-4-3	2-n-5-4	1-a-5-4	0	Irregular nature of sightings due to declines; low level of public awareness; private land ownership; weak enforcement
1-a-2-1	1-c-4-4	1-a-3-3	2-x-1-3	2-a-2-1	2-n-2-1	1-n-2-1	2-b-x-x	1-x-5-1	Insufficient trained personnel and NGOs; process of changing existing law
1-x-0-3	2-x-x-4	5-x	1-x-0-4	1-x-0-3	1-n-4-5	2-n-4-5	2-x-3-4	0	Insufficient trained personnel; lack of conservation work in agricultural lands; political barriers

Low Priority	4	Not Relevant	5	Not Known	0

Appendix 4

Priority actions for conservation of the Eastern Great Bustard by region, as evaluated by experts. Ratings were contributed via a questionnaire shared with Action Plan contributors and species experts. Activities are numbered in correspondence with the section of this Action Plan in which they are discussed. The importance of an activity in a specific region is indicated by the color and first number in a cell (1=critical priority, red; 2=high priority, orange;

		7.1 Decrease adult mortality			7.2 Improve reproductive rates								
Country	Region	7.1.1 Reduce poaching	7.1.2 Prevent powerline collisions	7.1.3 Reduce predation by dogs	7.2.1 Identify breeding sites	7.2.2 Research causes of failure	7.2.3 Establish PAs at breeding sites	7.2.4 Rural outreach	7.2.5 Compatible farming practices	7.2.6 Regulate pasture use	7.2.7 Reduce nest predation	7.2.8 Reduce egg collection	7.2.9 Reduce wildfires
Russia	Eastern Siberia	2-a-0-3	5-x	1-n-0-4	3-n-x-3	3-n-3-3	3-n-x-3	2-n-3-3	4-x-x-x	0	3-x-x-x	5-n	1-n-3-3
Russia	Eastern Siberia	3-(abg)+(cf)-x-x	4-c-x-x	4-n-x-x	2-n-2-3	3-n-2-3	1-n-5-5	3-n-x-x	4-x-x-x	4-x-x-x	5-x	5-n	3-n-1-1
Mongolia	North-central and Western	1-cfg-3-4	3-cd-1-4	3-n-2-2	3-n-3-3	2-n-4-3	1-n-4-5	3-n-2-2	1-abf-4-5	3-n-1-3	2-bc-3-3	5-n	5-n
Mongolia	Eastern Mongolia	2-acfg-3-3	3-acd-2-x	3-n-2-2	2-n-3-3	3-n-3-3	2-n-3-4	2-n-3-3	2-n-4-4	3-n-3-3	2-ab-3-3	5-x-x-x	1-n-3-4
Mongolia	Southern	0	3-ad-5-5	0	5-n	5-n	5-n	5-n	5-x	5-n	5-x	5-n	5-n
China	Northeastern	1-a-3-3	1-a-5-5	3-n-0-1	3-n-5-5	3-n-5-5	2-n-2-1	2-n-2-2	3-x-4-3	3-n-1-5	4-x-0-5	3-n-0-3	4-n-0-5
China	Tianjin and Henan	1-a-3-5	4-x-x-x	1-n-x-x	4-n-x-x	5-n	5-n	3-n-x-x	4-x-x-x	4-n-x-x	5-x	5-n	5-n
South Korea	Entirety	5-x	4-x-x-x	5-n	5-n	5-n	5-n	5-n	5-x	5-n	5-x	5-n	5-n

Critical Priority	1	High Priority	2	Medium Priority	3

3=medium priority, yellow; 4=low priority, green; 5=not relevant, blue; 0=unknown, strong blue). The letter within a cell recommends a specific approach to this action, as enumerated in the corresponding section of the Action Plan, "n" indicates that there was no option for selection, and "x" that the respondent did not select one of the approaches. The second number estimates the relative cost of the recommended action from 1 (low cost) to 5 (high cost). The third number ranks the expected difficulty in undertaking the action, independent of budgetary issues, from 1 (easy) to 5 (difficult). Only regions for which questionnaire responses were received are included in the table.

7.3 Public awareness	7.4 Habitat improvement			7.5 Fill knowledge gaps	7.6 International cooperation			7.7 Ex situ	Challenges
7.3 Improve public awareness and involvement	7.4.1 Improve PA network	7.4.2 Improve winter habitat	7.4.3 Reduce human disturbance	7.5 Undertake research	7.6.1 Coordinate censuses	7.6.2 Transboundary PAs	7.6.3 Funding for intl collaboration	7.7 Ex situ approaches	Anticipated challenges
x	1-x-3-3	3-x-x-x	3-x-3-3	x	1-n-3-3	1-n-3-3	1-x-x-x	5	Vast territories to be covered; insufficient personnel; weak connections between private and government sectors
3-ab-1-1	1-abc-5-5	4-a-2-2	3-c-x-x	1-a-3-1	2-n-3-3	1-n-5-5	3-c-x-x	3-c-5-3	Political barriers
2-ad-3-2	1-dba-4-5	5-c-2-1	5-x	2-bd-4-2	2-n-2-2	2-n-5-5	3-ab-4-2	5-a	Land zoning & profitability of agricultural lands; insufficient personnel; large territories
3-n-3-3	1-n-4-5	5-n-2-2	3-n-2-2	1-n-4-4	2-n-3-3	2-n-3-3	2-n-4-2	5-x-x-x	Lack of government support, insufficient personnel; large territories; weak connections between private agricultral companies and government sectors
2-a-1-1	3-x-x-x	5-x	0	2-c-2-3	3-n-3-3	0	3-a-5-2	x	Lack of nature-friendly industrial standards
2-a-4-4	1-a-4-4	2-b-3-3	3-a-2-3	3-a-2-3	2-n-4-4	3-n-3-4	3-x-3-3	3-b-2-4	Insufficient personnel; agricultural economy; administrative issues
1-a -x-x	1-a-x-x	1-x-x-x	1-x-x-x	1-x-x-x	2-n-x-x	5-n	2-x-x-x	x	Lack of support; lack of personnel; low public awareness
x	4-x-1-5	4-x-x-x	4-x-x-x	x	4-n-x-x	4-n-x-x	5-x	5-x	Lack of materials in Korean language; low national conservation priority;

Low Priority	4	Not Relevant	5	Not Known	0

Female Great Bustard in eastern Mongolia. *Photo: L.Jargal.*

Upper: Displaying male Western Great Bustard in Central Europe. *Photo: F. J. Kovacs.*
Lower: Eastern Great Bustard chick in Mongolia. *Photo: M. Kessler.*

Eurasian Bustard Alliance brings together people across northern Eurasia to work towards the conservation of bustard species. We aim to expand scientific knowledge of poorly understood populations of these birds with an emphasis on gathering information with conservation implications and engaging local people in the research and conservation process. We also promote awareness of these species and advance conservation policy.

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