

SPECIES REVIEW:

WATTLED CRANE (*Bugeranus carunculatus*)

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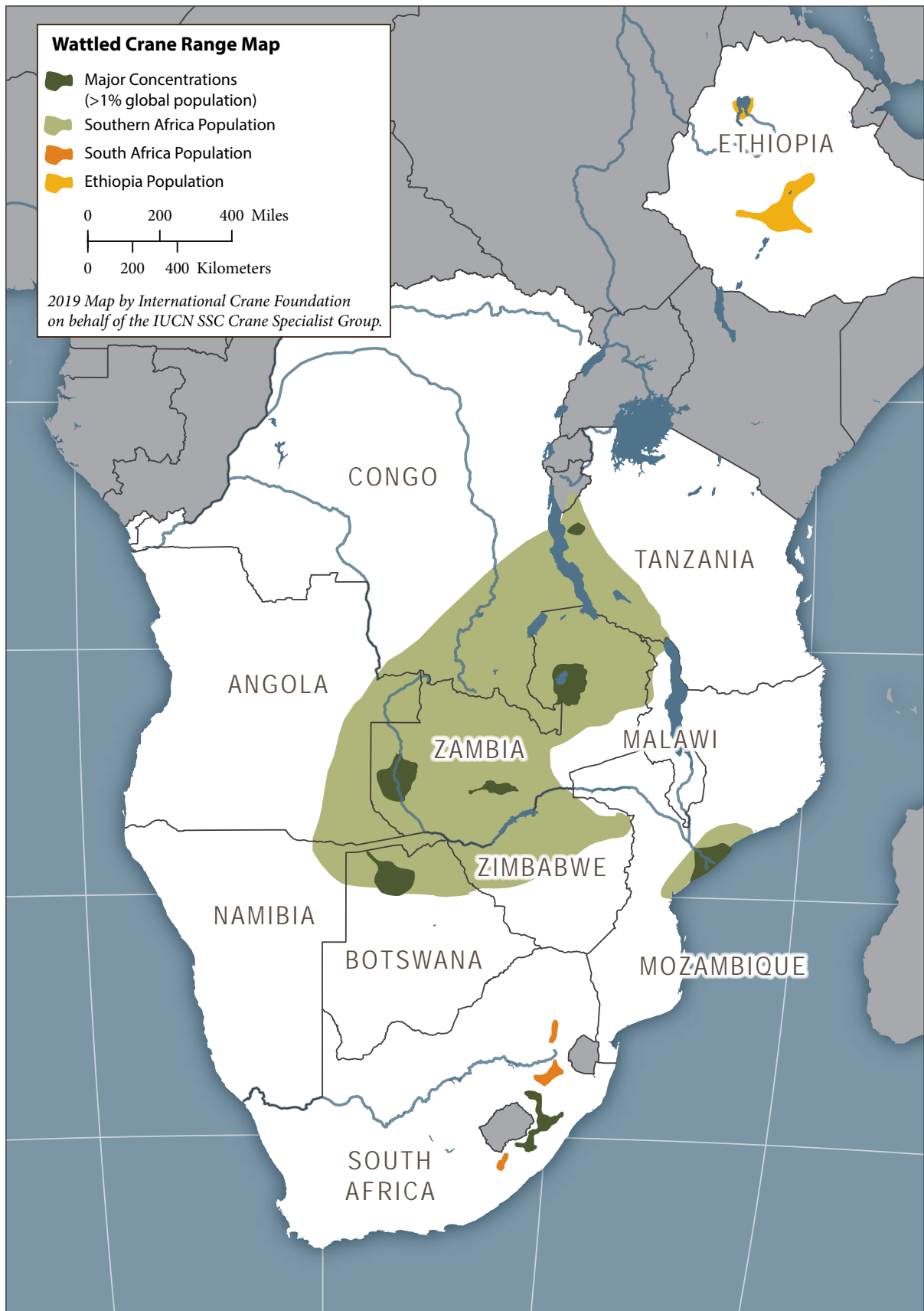
Wattled Crane with chick at nesting South Africa (Photographer: Daniel Dolpire)

Red List Category: Vulnerable

Population Size: >9,600

Population Trend: Probably decreasing

Distribution: Eastern and southern Africa



Mirande CM, Harris JT, editors. 2019. Crane Conservation Strategy. Baraboo, Wisconsin, USA: International Crane Foundation.

DISTRIBUTION AND STATUS OF KEY SITES

Three isolated populations of Wattled Crane are recognized: two small isolated populations in South Africa and Ethiopia, and a larger, widespread, floodplain population in south-central Africa. Although no subspecies of Wattled Crane are recognized, evidence suggests that the South African population could be genetically distinct from those farther north (Jones et al. 2006). Despite the current lack of evidence, it is also possible that the Ethiopian population is genetically distinct due to its isolated nature (Burke 1996). As a result, both the South African and Ethiopian populations should be managed as distinct and separate populations from the larger south-central African population.

South-central Africa Population

Almost 95% of the world's population of Wattled Cranes is found in the south-central population. Around 75% of the south-central population is distributed across five key flood plains, namely the Okavango Delta in Botswana, the Kafue Flats, Barotse Floodplains, and Bangweulu Swamps in Zambia, and the Zambezi Delta in Mozambique (Beilfuss et al. 2007). Although each of these sites is legally protected to some degree, the level to which this protection is enacted differs among each of the regions.

- The Kafue Flats (~2,900 Wattled Cranes; Shanungu et al. 2015) in the southern region of Zambia occur on the lower Kafue River, a tributary of the Zambezi River. It is recognized as a Wetland of International Importance under the Ramsar Convention and is protected in part by two national parks, Lochinvar on the south bank and Blue Lagoon on the north bank, and by the Kafue Flats Game Management Area that surrounds both parks. About 60% of Blue Lagoon and 50% of Lochinvar National Parks are located on the floodplain and are inundated by annual floodwaters. The greatest threats to the Kafue Flats for Wattled Cranes at this time are the invasion of the alien invasive plant, *Mimosa pigra*, and the disruption of hydrological flows as a result of the hydroelectric dam at the start of the Flats.
- The Liuwa Plain National Park, a protected area on the Barotse Floodplain (~1,600 Wattled Cranes; Viljoen 2015), is located in the western part of Zambia along the upper Zambezi River basin between the Luanginga and Luambimba Rivers. The core floodplain area is almost completely protected by the Liuwa Plain National Park and the Upper Zambezi Game Management Area on the Park's northern and western boundaries.
- The Okavango Delta (~1,200 Wattled Cranes; Hancock 2008), a Wetland of International Importance under the Ramsar Convention, was declared a World Heritage Site in 2014 and comprises a mosaic of protected lands. Around 40% of the Delta is protected by the Moremi Game Reserve and the remaining area is protected under 18 Wildlife Management Areas and Controlled Hunting Areas. The biggest threat to the Okavango Delta for Wattled Cranes at this time is the proposed development of dams upstream in the Okavango River, and the resultant changes in hydrological flows.
- The Bangweulu Swamps (~1,000 Wattled Cranes; African Parks Foundation, personal comm. 2015), located in the northern reaches of Zambia, form part of the upper Congo River Basin. They are protected in part by Isangano National Park covering the areas northeast of Lake Bangweulu, and the Bangweulu and Chambeshi Game Management Areas to the south and southwest of the lake.
- The Zambezi Delta and the adjacent Cheringoma Escarpment in central Mozambique are known as the Marromeu Complex (~400 Wattled Cranes, with historic counts exceeding 2,500; Bento et al. 2007). Designated as a Wetland of International Importance under the Ramsar Convention, this area is protected by the Marromeu Buffalo Reserve and four hunting concessions (Coutadas).

In addition to these key sites, the vast Makgadikgadi Pan in Botswana occasionally serves as a major flocking ground for Wattled Cranes, with as many as 2,000 individuals reported. This irruptive population of Wattled Cranes is likely drawn from the Okavango Delta population and other surrounding wetlands when water conditions on the pan are optimal (Beilfuss et al. 2007).

The remaining 25% of the south-central population is distributed across smaller wetland systems in Angola, Democratic Republic of Congo, Malawi, Mozambique, Namibia, Tanzania, Zambia, and Zimbabwe. More specifically, more than 1% of the south-central population (>73), can be found in the Busanga Plains in Zambia, Moyowosi Swamps in Tanzania, Upemba Swamps in the Democratic Republic of Congo, Driefontein Grasslands in Zimbabwe, and Nyae Nyae in Namibia (76–95 birds, 1990–2006; Namibia Crane Working Group, unpublished data). Up to three birds have been recorded in the company of Blue Crane within the Etosha National Park since 2013, which is a new distribution record (Ann Scott, personal comm. 2015).

South African Population

Wattled Cranes are distributed across the eastern temperate grasslands of South Africa. More than 90% of this population is distributed across the Midlands (around 65%) and the Southern Drakensberg (around 35%) of the KwaZulu-Natal Province. The vast majority of cranes are on private land, with a few protected areas scattered across this region, supporting between one and six breeding pairs each. These sites include the uKhahlamba World Heritage Site (two pairs), Karkloof Nature Reserve (four pairs), Umgeni Vlei Nature Reserve (which is also a Wetland of National Importance under the Ramsar Convention; up to six pairs), Ntsikeni Vlei Nature Reserve (which is also a Wetland of International Importance under the Ramsar Convention, four pairs), Impendle Nature Reserve (one pair), and Umvoti Vlei (three pairs) (Tanya Smith, personal comm. 2015).

The remaining pairs and individuals are scattered across the northern, southern, and western parts of the temperate grasslands in the country, spanning the Eastern Cape, Free State, and Mpumalanga Provinces. Wattled Cranes are only protected in this area through the Verloren Valei Nature Reserve in Mpumalanga, also a Wetland of International Importance under the Ramsar Convention (one pair).

Additionally, South Africa has national legislation that allows for the proclamation of protected areas on private or communally owned land. By entering into voluntary legally binding agreements with government, landowners can enter their properties into the protected area network as either Protected Environments or Nature Reserves. Under the auspices of the Biodiversity Stewardship Programme, management plans for the properties are developed and implemented that consider both biodiversity and water resource management. There are a number of sites under this program that have been legally gazetted or are in process, which will secure either Wattled Cranes and/or suitable habitat.

Ethiopian Population

Wattled Cranes in Ethiopia are distributed across the Rift Valley wetlands of Archuma, Boyo, Chuche, and Wachinco, the Bale Mountains, and in the Jimma and Kefa Zones, all south of Addis Ababa, and alongside Lake Tana in the north west of the country (Tadele 2015). The only protected area for Wattled Cranes in the country is the Bale Mountain National Park, located 400 km southeast of Addis Ababa. This national park, though, is under significant pressure from livestock grazing and associated human disturbances in the wet season when Wattled Cranes breed. Lake Tana is registered as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site and also is under significant human and livestock pressure. The remaining sites are within densely human populated areas under extreme pressure from subsistence agriculture, industrial development and human disturbance.

ECOLOGY

Of Africa's crane species, the Wattled Crane is the most wetland dependent. The majority of cranes are on the large riparian wetlands and floodplains of southern Africa's large river basins, especially the Zambezi and Okavango, but they will utilize smaller upland wetlands throughout their range. Though Wattled Cranes are non-migratory, they will make irregular local movements based on water availability (Archibald and Meine 1996, del Hoyo et al. 1996, Ellis et al. 1996).

They feed primarily on aquatic vegetation (Bento 2002) but in drier habitats they will also eat waste grain, seeds, and insects (Hancock et al. 2003). Wattled Cranes will also take animals, including small aquatic snails, fish, and frogs (Hockey et al. 2005). There is a significant relationship between the presence of Wattled Cranes and *Eleocharis* and floodplain grasslands in many of the systems in the south-central population (Bento et al. 2007, Ndirima 2007). This link is largely because *Eleocharis* produces tubers while some of the grasses produce rhizomes as a result of the seasonal inundation that occurs on floodplains, providing a nutritious food source for Wattled Cranes. It has been speculated that a similar process of tuber and rhizome formation could occur in higher-altitude wetlands as a result of seasonal changes in temperature rather than water levels, for example in South Africa (Damian Walters, personal comm. 2014).

Wattled Crane flocks, comprised of non-breeding adults and immature birds in the breeding season, are joined by adult pairs and family groups in the non-breeding season. Although flocks become larger and denser when food density is at its highest, food intake is reduced due to the increased aggressive behavior and interactions (Kamweneshe 2004). Flock size is influenced by environmental factors (food, predators, and temperature), individual condition, and individual behavior. Most specifically, Kamweneshe (2004) noted that flocks provide for security, the opportunity for pair formation, and feeding optimization.

Similar to other cranes, Wattled Crane pairs are highly territorial during the breeding season, defending an area greater than 1 km² (Konrad 1981), usually in shallow wetlands with little human disturbance (Archibald and Meine 1996, Ellis et al. 1996, Morrison and Bothma 1998). Home ranges though are much bigger, and in South Africa average 16.64 km², with the core breeding area only 2.3% of the home range (McCann and Benn 2006). Although home ranges in South Africa were dominated by open natural grasslands, wetlands made up at least 7.1% of the home range and wooded areas, temporarily irrigated and dryland cultivated agriculture the remainder (Coverdale 2006, McCann and Benn 2006). Although the cranes are tolerant to a degree of disturbance and habitat transformation in South Africa, Coverdale (2006), McCann and Benn (2006), and Wojtaszekova (2008) found that there was a higher probability of breeding when the land cover matrix within a 1,000-m radius of the nest was predominantly natural grassland and wetland habitat, and when disturbances associated with agricultural activities in the area were kept to a minimum.

Nests are usually within short wetland vegetation (Morrison and Bothma 1998, John et al. 2012), dominated by long-stamen rice (*Oryza longistaminata*), Chinese water chestnut (*Eleocharis dulcis*), southern cutgrass (*Leersia hexandra*), and cape bulrush (*Typha capensis*) (John et al. 2012). Breeding productivity also significantly improved if soil penetrability around a nest was good and if the water depth was significant (Wojtaszekova 2008, Wojtaszekova et al. 2009). In Tanzania, John et al. (2012) recorded good breeding success if the water level was less than 100 cm but still significant.

Coverdale and McCann (2003) recorded the age of first successful breeding as seven years. Wattled Cranes start nesting as floodwaters or wetland water levels begin receding after peak flooding (Penry 1994, Kamweneshe and Beilfuss 2002). Wattled Cranes lay one or two eggs (Couto and Couto 2000, Hancock et al. 2003, Brown et al. 2015) with only one precocial chick ever being raised and the other

egg abandoned in clutches of two (Pittman 2007). This clutch size is the lowest average for any species of crane. The incubation period is 33–36 days, the longest of any crane species (Hancock et al. 2003). The fledging period is 90–130 days (Hockey et al. 2005), also the longest of any crane species, with fledged chicks typically continuing to follow their parents through their first year (Hancock et al. 2003).

NUMBERS AND TRENDS

The Wattled Crane population was estimated at between 13,000 and 15,000 in 1985 (Urban 1988) and less than 7,700 in 2004 (Beilfuss et al. 2007). Although it is acknowledged that the species has declined over this period, the extent is questionable due to improved accuracy in population estimates since the early 2000s (Beilfuss et al. 2007). Using the recent numbers outlined below, the current global Wattled Crane population is >9,600 individuals. Although a significant increase from the estimates in 2007 (Beilfuss et al. 2007), it is doubtful that the current figure is a true increase in numbers, and further research is required to better understand the movements among the five large flood-plain systems in south-central Africa, and the seasonal movements cranes undertake, coming together at key sites in the non-breeding season.

South-central Population

Synchronized surveys conducted in the early 2000s over the five large flood plain systems in south-central Africa concluded that the Okavango Delta in Botswana held the single largest population of Wattled Cranes, estimated at 1,300 individual birds (Kamweneshe et al. 2003b, Motsumi et al. 2007, Hancock 2008); the Kafue Flats in Zambia was estimated to contain 1,000 individuals (Kamweneshe and Beilfuss 2002); the Bangweulu Swamps in Zambia held approximately 1,000 individuals (Kamweneshe et al. 2003a); Liuwa Plains in Zambia had around 700 Wattled Cranes (Kamweneshe et al. 2003b); and the Zambezi Delta in Mozambique had 120 breeding pairs (Bento et al. 2007). In addition, smaller groups of Wattled Cranes were scattered across other wetland systems and *dambos* in Zambia, including the Lukanga and Busanga Swamps (Kamweneshe et al. 2003a).

However, recent surveys suggest the current population in the Kafue Flats (~2,900 Wattled Cranes; Shanungu et al. 2015), Liuwa Plain (~1,600 Wattled Cranes; Viljoen 2015), and Bangweulu (~1,000; African Parks Foundation, personal comm. 2015) are much higher than previously reported. The most recent figures for the Okavango Delta (~1,200; Hancock 2008) and the Marrromeu Complex (~400; Bento et al. 2007), however, are older and numbers likely have changed over the past eight years. We can estimate, though, based on these figures, that around 7,100 Wattled Cranes are distributed across the five large floodplain systems in south-central Africa. Further research though is underway to determine whether these higher counts represent an overall population increase or reflect shifts in population distribution.

The Moyowosi Swamps in Tanzania and Upemba Swamps in the Democratic Republic of Congo formerly supported substantial numbers of Wattled Cranes, but recent counts suggest fewer than 200 and 300 individuals respectively (Beilfuss et al. 2007). The Driefontein Grasslands population in Zimbabwe, holding 75% of the country's Wattled Crane population, has declined from 127 individuals in 1996 (Couto and Couto 2000) to 35 in 2010 (Fakarayi 2010). The Namibian population, which was estimated at 60 individuals in 2004 (Beilfuss et al. 2007), is estimated now to be between 100 and 150 (Ann Scott, personal comm. 2015). Although Nyika Plateau of Malawi used to hold a few pairs of Wattled Cranes, it appears now that no pairs are resident, although pairs are periodically seen moving through. If we assume that 25% of the south-central population is found outside of the five large flood-plain systems (Beilfuss et al. 2007), we can estimate between 2,000 and 2,500 Wattled Cranes in these areas in south-central Africa.

The Wattled Crane population in south-central Africa is therefore >9,100 individuals.

South African Population

In 2004, the Wattled Crane population in South Africa was estimated at 250 individuals (Beilfuss et al. 2007). This population low was reached in 2000, a 38% decline from its 1980 estimated population size of 380 individuals (McCann 2000). Standardized annual aerial surveys in KwaZulu-Natal, the species' stronghold in South Africa, have been carried out since 1994. The next 12 years showed a slowly increasing population, with the 2014 survey recording 311 individuals and 76 active Wattled Crane nesting sites (Smith and Craigie 2014), the highest number recorded in 21 years and a real increase in the population. A further increase was found in the November 2018 aerial surveys, with 380 Wattled Cranes and 80 active Wattled Crane nesting sites in KwaZulu-Natal (Rennie et al. 2018). Although the KwaZulu-Natal population is increasing, the species has continued to decline across the rest of its range in South Africa and now numbers between 16 and 25 individuals.

Ethiopian Population

Beilfuss et al. (2007) estimated the Ethiopian population at less than 200 in 2004. More recent estimates though suggest there are 250–300 individuals in the country (Wetlands International 2012; Tariku Mekonnen, personal comm. 2015; Yilma Abebe, personal comm. 2015). This number represents a more accurate estimate rather than a realized increase. Furthermore, Tadele (personal comm. 2015) suggests that coordinated efforts to survey Ethiopia could identify new sites for Wattled Cranes.

THREATS

General (Harris and Mirande 2013):

- Habitat loss through changes to hydrology, dams and water diversions, the conversion of wetlands and grasslands for agriculture and other land development, and changes in agricultural land use;
- Human poverty and lack of livelihood alternatives is the key ultimate or indirect threat; and
- Spread of the invasive shrub, *Mimosa pigra*, that destroys habitat of major population in Kafue Flats, Zambia; also a problem in Ethiopia and perhaps some other areas.

South-central Population

- Large dams and diversions of water that alter the timing, magnitude, and extent of water availability on the large floodplains (very significant for floodplain population, and likely to have more serious impacts in the next 20 years, especially water diversions) (Archibald and Meine 1996, Bento 2002, Kamweneshe and Beilfuss 2002, Beilfuss and Browne 2010);
- Destruction of nests, eggs and chicks due to wildfires;
- Loss of large mammal grazing systems that maintain good foraging conditions on feeding grounds (Kamweneshe and Beilfuss 2002);
- Spread of invasive plant species, such as *Mimosa pigra* in the Kafue Flats (Kamweneshe and Beilfuss 2002, Shanungu 2009);
- Reduced productivity of breeding pairs on the pans in the Liuwa Plains National Park in Zambia due to increased human disturbance and the collection of eggs and chicks for food as local fishermen exercise their rights to fish each of the pans according to local tradition (Rob Reid, personal comm. 2015);
- Live capture for commercial trade in Tanzania, where the level of exports is believed to exceed known legal exports (Morrison and van der Spuy 2006);

- Live capture, especially through snaring for consumption in Zambia, is known to occur. Eggs of Wattled Cranes are also collected for consumption, further reducing the breeding success of the birds; and
- Mining and large-scale commercial agriculture, particularly for sugarcane (*Saccharum*), in wetlands pose a threat.

South African Population

- The primary threat to the species in South Africa is the widespread degradation and loss of breeding habitats, most often caused by the draining or damming of wetlands (McCann 2000);
- In the future, open-cast coal mining will most likely significantly impact the habitat availability within the Mpumalanga Province's grasslands;
- Power lines pose a collision hazard to young inexperienced birds and adults on misty days;
- Because Wattled Cranes are winter (dry season) breeders, the threat of fire to both eggs and chicks is high;
- Human disturbance and trampling by livestock cause destruction of nests, eggs, and chicks (Morrison and Bothma 1998, McCann and Benn 2006, Morrison and van der Spuy 2006);
- Other threats include disturbance at nesting areas and uncontrolled hunting with dogs (McCann 2000);
- Reduced breeding productivity due to human disturbance can result in adults spending more time off the nest or away from the chick, especially in cold temperatures; and
- Mercury levels in egg shells exceed the average which may negatively affect productivity (Daso et al. 2015). This situation is likely not from a point-source contamination.

Ethiopian Population

- Destruction of breeding and foraging habitats due to the conversion of wetlands for agriculture and grazing, overgrazing, and over-harvesting of wetland resources (Aynalem et al. 2011);
- Spread of the invasive *Mimosa pigra* shrub at wetlands in the Rift Valley (George Archibald, personal comm. 2015; Tadele 2015);
- Destruction of nests, eggs, and chicks by wildfires; and
- Killing of chicks and juveniles by children (Aynalem et al. 2011).

CONSERVATION AND RESEARCH EFFORTS UNDERWAY

South-central Population

- The International Crane Foundation (ICF) / Endangered Wildlife Trust (EWT) Partnership, in partnership with the Zambian Department of National Parks and Wildlife, coordinate the Zambian Crane and Wetland Conservation Project. This project is aimed at better understanding the status and distribution of Wattled Cranes and their relationship to hydrology and to herbivores, and at improving the management of and reducing threats to their key ecosystems;
- The Zambezi River Basin Environmental Flows Partnership (WWF; ICF; Zambezi River Authority; Zambezi Electrical Power Supply Company; Ministries of Water Affairs in Zambia, Zimbabwe, and Mozambique; and national universities of Zambia, Zimbabwe, and Mozambique) is working

with operators and government authorities responsible for all large dams in the Zambezi River basin to improve water management for downstream species and water users. Project goals include incorporating environmental flows into the operational rules for the dams on a basin-wide basis, reviewing and modifying new dam developments to minimize downstream impacts, and improving the management of key floodplains in the system;

- ICF, the Mozambique Museum of Natural History, and other partners are working with hunting concession operators, agribusinesses, local communities, government agencies, and other non-government organizations to conserve biodiversity and improve human livelihoods through the provision of ecosystem services in the Zambezi Delta, as a model for managing large floodplains in the Zambezi River system and elsewhere;
- BirdLife Zimbabwe is monitoring Wattled Cranes and working with local communities for the conservation of Wattled Crane's highland breeding grounds in the Driefontein grasslands in Zimbabwe;
- The Namibia Crane Working Group promotes the conservation of three crane species in Namibia, including the Wattled Crane, collating data and promoting awareness/education; and
- The African Parks Foundation provides logistical support for research and monitoring of Wattled Cranes in the Liuwa Plain National Park and Bangweulu Swamps, with specific focus on the effects of fishing communities on Wattled Cranes and other waterbirds.

South African Population

- The ICF/EWT Partnership has a long-term project in the Drakensberg region of South Africa, focused on monitoring Wattled Cranes, understanding and improving their wetland habitats, and securing critical areas in collaboration with local landowners and users under South African legislation;
- A monitoring plan has been adopted by the provincial conservation authority, Ezemvelo KwaZulu-Natal Wildlife, for Wattled Cranes in the KwaZulu-Natal Province, which is implemented in partnership with the EWT;
- A Wattled Crane Recovery Programme (WCRP) was established in 2000 as a result of workshop led by the IUCN Conservation Breeding Specialist Group, which led to the development of a Population and Habitat Viability Assessment and conservation plan. The WCRP aimed to establish a viable captive population of Wattled Cranes of South African origin and to supplement the wild population to prevent further decline. The program was driven by five partner organizations: the Johannesburg City Parks and Zoo, Ezemvelo KwaZulu-Natal Wildlife, EWT, KwaZulu-Natal Crane Foundation, and the African Association of Zoos and Aquaria. Due to the gradual increase in the wild population, a decision was made in 2015 not to release birds in a supplementation program. The captive population is managed under the African Association of Zoos and Aquaria's (PAAZA) Wattled Crane African Preservation Programme and now aims to develop a sustainable captive population. This captive population serves as an insurance policy for the wild population should it be struck by a catastrophe or in the event that the species declines again; and
- The KwaZulu-Natal Crane Foundation has an active school education and awareness program in the KwaZulu-Natal Midlands, aimed at increasing awareness of cranes and their habitats.

Ethiopian Population

- Faculty and graduate students at Bahir Dar, Addis Ababa, and Jimma Universities, with help from

the German Crane Working Group, Nature and Biodiversity Union, and ICF, are undertaking status surveys and field research towards the conservation of Wattled Cranes in Ethiopia;

- A research project on Wattled Cranes in Boyo Wetland and Bale Mountains National Park is being undertaken by the Addis Ababa University, which will include an investigation into the genetic differences between the Ethiopian and south-central populations; and
- Studies of Wattled Cranes in southeastern Ethiopia by researchers at Jimma University have resulted in an environmental education program to protect wetlands where these cranes breed.

CHANGES SINCE 1996

Although we know that the South African population is slowly increasing, the status of the south-central and Ethiopian populations is unclear, with evidence to support both increasing and decreasing population trends.

Mimosa pigra, an alien invasive plant species, is expanding its range across the Kafue Flats in Zambia and the Rift Valley wetlands in Ethiopia, contributing further to habitat loss and degradation. In the Kafue Flats, more than 800 ha of invasive *Mimosa pigra* was eradicated through aerial spraying and community-involvement in manual cutting during 2007–2009 (Shanungu 2009), but these efforts were discontinued and the plant reestablished. In areas where it was reduced or eradicated, displaced wildlife including Wattled Cranes showed increased use. However, after the discontinuation of the program *Mimosa* has been rapidly reclaiming areas from which it had been eradicated. Continued eradication efforts are needed to keep *Mimosa pigra* from spreading. In Ethiopia, *Mimosa pigra* has been planted in the wetlands to provide fuel for local people.

Collision with overhead electrical wires (power lines) has been a threat to cranes in South Africa for many years. As Africa moves forward with its plans to provide power to the majority of people to reduce poverty and encourage economic growth, the power line network in Africa has started expanding significantly and will escalate over time. There is a need to learn from the South African experience and to proactively minimize this threat in other countries.

The extractive mining industry for energy generation is increasing significantly across Africa. These activities include open-cast coal mining, gas extraction, and geothermal development, all of which result in further habitat loss and degradation.

PRIORITY RESEARCH AND CONSERVATION ACTIONS

General

- Develop and implement an International Single Species Action Plan, under the African Eurasian Migratory Waterbird Agreement, with a key focus on international collaboration and multi-stakeholder implementation; and
- Understand and reduce the potential impact of the energy sector on Wattled Cranes and their habitats across their range. This effort will include minimizing the effects of power lines, open-cast coal mining, gas extraction, and wind farms.

South-central Population

- Focus on direct threats to Wattled Cranes by developing and implementing ecological management practices (environmental flows, invasive species control, and fire management) that support cranes, biodiversity, fisheries, agriculture, and other livelihoods in the five floodplain systems that support 75% or more of the global Wattled Crane population, namely Kafue Flats, Barotse Floodplain, and

Bangweulu Swamps (and associated breeding grounds) in Zambia, the Okavango Delta in Botswana, and the Zambezi Delta in Mozambique;

- Maintain current efforts and funding to implement environmental flows for key floodplains;
- Anticipate the impact of climate change on water availability in the region, the demand for water resource development, and the role both of African governments and Chinese investment in this future;
- Develop and implement a long-term management plan to control *Mimosa pigra* and other emerging threats and monitor wildlife recovery;
- Adapt a permitting system for traditional fishing in the Liuwa Plain National Park in Zambia to reduce the negative effect on Wattled Crane breeding productivity; and
- Understand the local community perceptions and cultural significance and attitudes towards cranes as a way of leveraging their conservation support. This effort will help prevent deaths from poisoning and capture for consumption.

South African Population

- Improve our understanding of the habitat requirements for Wattled Cranes, address key threats, and improve the ecological integrity of key wetland habitats;
- Consider appropriate management of Wattled Crane home ranges to reduce disturbance around nesting sites;
- Secure key habitats using the Biodiversity Stewardship Programme, a protocol set up to implement national legislation aimed at increasing the Protected Area network in the country through voluntary collaboration with local landowners;
- Continued engagement with landowners on whose property the birds occur in order to ensure that the appropriate management actions are implemented; and
- Management of the captive flock as a reservoir for future supplementation in the event of a catastrophic decline in the wild population.

Ethiopian Population

- Effective outreach will be the key for limiting the impact of human activity on nesting sites as the population grows and settlement starts in crane areas in Ethiopia; and
- Improve our understanding of the distribution, threats to, and status of Wattled Cranes and their habitat for the development and implementation of effective conservation projects aimed at securing Wattled Cranes and improving the ecological integrity of their habitats.

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