

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA



Twenty-seventh meeting of the Animals Committee
Veracruz (Mexico), 28 April – 3 May 2014

Interpretation and implementation of the Convention

Periodic Review of species included in Appendices I and II
[Resolution Conf. 14.8 (Rev. CoP16)]

REVIEW OF GRUS CANADENSIS PULLA

1. This document has been submitted by the United States of America*.

Review of *Grus canadensis pulla* (Aldrich 1972)
in the Periodic Review of Species included in Appendices I and II
[Resolution Conf. 11.1 and Resolution Conf. 14.8 (Rev. CoP16)]

INTRODUCTION

2. After the 25th meeting of the Animals Committee (Geneva, Switzerland, July 2011) and in response to Notification No. 2011/038, the United States of America committed to the evaluation of *Grus canadensis pulla* as part of the Periodic review of the species included in the CITES Appendices.
3. This subspecies is endemic to the United States of America and does not occur elsewhere in the wild. During our review, we consulted with representatives of the U.S. Fish and Wildlife Service in Mississippi, the States through the Association of Fish and Wildlife Agencies (AFWA) and the U.S. Geological Survey in Maryland.

* The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat or the United Nations Environment Programme concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.

DRAFT PROPOSAL TO AMEND THE APPENDICES

(in accordance with Annex 6 to Resolution Conf. 9.24 (Rev. CoP16), as amended)

Seventeenth meeting of the Conference of the Parties

Cape Town (South Africa), XX–XX --- 2016

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CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

To retain *Grus canadensis pulla* (Mississippi sandhill crane) in CITES Appendix I. The subspecies meets the biological criteria for listing in Appendix I as given in Annex 1 established in Resolution Conf. 9.24 (Rev. CoP16). The subspecies is not affected by national or international trade. Although this subspecies, endemic to the United States of America, is intensively managed and highly regulated by domestic measures, similar subspecies within the *Grus canadensis* complex are traded internationally as live specimens and sport-hunted trophies. This could result in identification and enforcement issues as non-experts would have difficulty distinguishing between the *Grus canadensis* subspecies (del Hoyo et al. 1996). In addition, most trade is reported at the species level in the UNEP-WCMC database which makes it difficult to evaluate trade in the other subspecies of *Grus canadensis*. Therefore, we recommend retention of *Grus canadensis pulla* in Appendix I.

B. Proponent

C. Supporting statement

1. Taxonomy

1.1 Class: Aves

1.2 Order: Gruiformes

1.3 Family: Gruidae

1.4 Genus, species or subspecies, including author and year: *Grus canadensis pulla* (Aldrich 1972)

1.5 *Grus canadensis pulla* is one of six recognized subspecies of the sandhill crane (*Grus canadensis*) (CITES Checklist 2014). The species (*Grus canadensis*) is assessed as Least Concern; however, there are no individual assessments for the subspecies (BirdLife International 2014). Three subspecies: lesser sandhill crane (*G. c. canadensis*), Canadian sandhill crane (*G. c. rowani*), and greater sandhill crane (*G. c. tabida*) are northern migratory forms of the species that generally nest in northern North America and the Soviet Union. In the winter, these northern subspecies migrate to the southern United States and Mexico. In the southeastern United States, migratory sandhill cranes, mostly greater sandhill cranes, are found in the winter from Texas through Florida. The Florida sandhill crane (*G. c. pratensis*) and Mississippi sandhill crane (*G. c. pulla*) races are non-migratory and nest in the southeastern United States. The Cuban sandhill crane (*G. c. nesiotetes*), another non-migratory subspecies, nests and resides in Cuba (Dickinson 2003; Johnsgard 1983).

1.6 Scientific synonyms: None

1.7 Common names: English: Mississippi sandhill crane

French: Grue canadienne du Mississippi
Spanish: Grulla cenicienta del Misisipi

1.8 Code numbers: None

2. Overview

Grus canadensis pulla has been listed in Appendix I of CITES since 1975, and is listed as Endangered under the U.S. Endangered Species Act of 1973, as amended (U.S. Fish and Wildlife Service (USFWS) 1988). The population occupies a very small geographic range in southern Mississippi (United States of America). The subspecies has been subject to a lengthy decline due largely to the loss and fragmentation of its coastal pine savanna habitat, as well as hunting during the early 1900s. The subspecies is currently being re-introduced to its native habitat in Mississippi and the wild population is supplemented and largely maintained by captive-bred birds. Reported illegal, national and international trade is non-existent, as is commercial demand for the subspecies.

Grus canadensis pulla meets the biological criteria for CITES Appendix I. Under Resolution Conf. 9.24 (Rev. CoP 16), Annex 1, the wild population is small, and is characterized by i) an observed, inferred or projected decline in the number of individuals or the area and quality of habitat; ii) each subpopulation is very small; iii) a majority of individuals are concentrated geographically during one or more life-history phases (mating, nesting, growth of juvenile cranes); and there is, v) a high vulnerability to either intrinsic or extrinsic factors. Furthermore, the wild population has a restricted area of distribution and is characterized by i) fragmentation or occurrence at very few locations (southeast Mississippi); ii) there have been relatively large fluctuations in the area of distribution (previously found in other southeastern States) or the number of subpopulations; iii) a high vulnerability to either intrinsic or extrinsic factors. These has been iv) an observed, inferred or projected decrease in the area of distribution; the area of habitat; the number of subpopulations; the number of individuals; the quality of habitat; and recruitment.

There has been a marked decline in the population size in the wild, which has been i) observed as ongoing and as having occurred in the past (but with a potential to resume); and is ii) inferred or projected on the basis of a decrease in area of habitat; a decrease in quality of habitat; a high vulnerability to intrinsic and extrinsic factors; and decreasing recruitment. The subspecies is not found in international trade. There have been no specimens reported in legal international trade since 1975 (see also Section 6.1, 6.2, and 6.4). The subspecies is highly regulated by Federal and State measures, including the regulation of importation and exportation (see Section 6.1).

However, this subspecies is one of six subspecies within the *Grus canadensis* complex (see Section 1.4). Other subspecies are subject to international trade as sport-hunted trophies, as well as live specimens for zoological display, in particular, the species *Grus canadensis* (greater sandhill crane), and the subspecies *G. c. canadensis* (lesser sandhill crane). Removal of *G. c. pulla* from Appendix I could present identification and enforcement issues. The six subspecies reportedly can be distinguished by plumage and morphological measurements by experts, but identification is difficult due to clinal variation and can be problematic to non-experts (del Hoyo et al. 1996). Therefore, we recommend the retention of *Grus canadensis pulla* in Appendix I. We have consulted with the States through the Association of Fish and Wildlife Agencies (AFWA) and they support its retention in Appendix I.

3. Species characteristics

3.1 Distribution

Grus canadensis pulla is currently restricted to an area in southern Jackson County, Mississippi, extending from the Pascagoula River west to the Jackson County line, south to Simmons Bayou, north to Vancleave; a portion of this area is located within the Mississippi Sandhill Crane National Wildlife Refuge (MSCNWR). The subspecies' main winter roosts are located in the marshes of Bluff Creek, Bayou Castelle, and Paige Bayou (Matthews and Moseley 1990). Small populations formerly occurred in widely scattered areas along the coastal plain of Louisiana, Mississippi, Alabama, and Florida; the subspecies may have bred in savannas just east of the Pascagoula River in Mississippi in the early 1900s (Matthews and Moseley 1990).

3.2 Habitat

Grus canadensis pulla requires open savannas, swamp edges, young pine plantations, and wetlands along edges of pine forests; associated trees and shrubs include longleaf pine, slash pine, bald cypress, gallberry, wax myrtle, black gum, sweet bay, and yaupon (Matthews and Moseley 1990).

3.3 Biological characteristics

3.3.1 Reproduction

Grus canadensis pulla are perennially monogamous. Breeding pairs remain together from year to year, maintaining the pair bond by performing courtship displays and remaining in close proximity while calling loudly together in unison (USFWS 1991). The age when wild Mississippi sandhill cranes attain sexual maturity is uncertain. One of the early biologists to study the subspecies, Mr. Jacob Valentine, collected breeding data indicating some Mississippi sandhill cranes first lay eggs between the ages of 3 and 6 years of age (USFWS 1991). Dr. Stephen Nesbitt reported that male Florida sandhill cranes, a similar subspecies, become sexually active when 2 years old but females mature a year or so later (USFWS 1991). Mated cranes always defend nesting territories. Territory size is likely dependent upon several factors, including age of the cranes, quality and type of habitat, and perhaps the density of cranes within the area. Only one pair of cranes has been observed to nest per season in each open savanna (USFWS 1991). Conversely, in areas such as Ben William's swamp (MSCNWR), where clearings are separated by forested areas, cranes have nested within one-half mile of each other (USFWS 1991). Nesting territories are usually used more than one year and some territories have been used for much longer periods of time.

The female lays 1 to 3 (usually 2) eggs; clutches on the MSCNWR have averaged 1.70 eggs (USFWS 1991). Eggs are oval-shaped and dull brown with reddish brown markings. First clutches generally hatch from May 1 through May 20 (USFWS 1991). Both parents participate in incubation, which lasts 29 to 32 (usually 30) days. Incubation begins with the laying of the first egg and continues until the second egg has hatched. Chicks are precocial; they hatch covered in down, with their eyes open and are able to leave the nest within 24 hours of hatching (USFWS 1991). The parents brood the chicks for up to 3 weeks after hatching, feeding the young intensively for the first few weeks, and with decreasing frequency until they reach independence at 9 or 10 months old (USFWS 1991).

The chicks remain with their parents until 1 or 2 months before the parents begin laying the next clutch of eggs the following season. After leaving their parents, the chicks form nomadic flocks with other subadults and non-breeders. They remain with these flocks until they form breeding pairs and begin breeding between the ages of 2 and 7 years old (Tacha et al. 1992).

3.3.2 Mortality

Leading causes of crane mortality are predation (61% in 2008) and trauma (27% in 2008) (Hereford and Grazia 2008). An average of 27 nests was produced from 21 pairs annually during the years 2005-2008 (Hereford and Grazia 2008). Recruitment remained extremely low with less than 3 young fledged per year. The early winter population (2008) was 110-125 cranes. Although Hurricane Katrina (in the year 2005) did not directly result in more than a loss of 5-7 cranes, 2 of the dead were breeding females that accounted for 40% of the fledged young since 1997 (Hereford and Grazia 2008). Wild sandhill cranes live about seven years.

3.3.2 Diet

Sandhill cranes are omnivorous birds that use their bills to probe for subsurface food and glean seeds and other foods. The cranes feed on land or in shallow marshes containing vegetation. Foods vary depending on what is available. Cultivated grains such as corn, wheat and sorghum are a major food source in their diet when available (Tacha et al. 1992). The diet of the Mississippi sandhill crane includes adult and larval insects, earthworms, crayfish, frogs, rodents, seeds, roots, tubers, nuts, fruits, and leafy materials (Mississippi Nongame and Endangered Species Act 2001).

3.4 Morphological characteristics

Grus canadensis pulla is a large, relatively slender, grey to brownish-grey bird with a long neck and legs. It is about 120 cm (4 ft.) tall with a wingspan of 160 cm (5.5 ft.). This subspecies has a red forehead, similar to most crane species, and, when at rest, its back feathers droop over the tail in a bustle. It flies with both its neck and legs outstretched.

3.5 Role of the species in its ecosystem

Grus canadensis pulla serves as an indicator species for the health of the coastal pine savanna ecosystem.

4. Status and trends

4.1 Habitat trends

Prior to the 1940s, the wild population of Mississippi sandhill cranes, although small, remained relatively stable. However, suitable habitat decreased from 40,470 hectares (100,000 acres) to only 10,520 hectares (26,000 acres) by 1960, due to agricultural and forestry practices as well as industrial development, in part related to World War II ship building (Archibald and Lewis 1996; Gee and Hereford 1995). The Mississippi Sandhill Crane National Wildlife Refuge was created in 1975 by land donated from The Nature Conservancy, the U. S. Department of Transportation, and the State of Mississippi (Gee and Hereford 1995). At its inception, 75% of land that was once crane habitat (savanna) within the refuge had been subject to residential, commercial or forestry development (Gee and Hereford 1995). Currently, of the 7,810 hectares (19,300 acres) that constitute the refuge, only about 5,059 hectares (12,500 acres) can be utilized by the cranes (Gee and Hereford 1995).

4.2 Population size

As early as 1938, as few as 100 Mississippi sandhill cranes may have existed in Louisiana, Mississippi, and Alabama, making the subspecies at risk of extirpation (Ellis et al. 2000). By 1975, only 10-15 breeding pairs remained in the wild (Archibald and Lewis 1996). Estimates of the Mississippi sandhill crane population in 2002 included 120 wild individuals and 20 captive pairs; 75-80% of the wild population are either captive-bred or direct descendants of captive bred birds (Miene and Archibald 1996). In 2008, the total number of *Grus canadensis pulla* individuals was approximately 110-125 (Hereford and Grazia 2008).

4.3 Population structure

There is no information available regarding the population structure of *Grus canadensis pulla*. Sexual maturity is usually attained at the age of 2-4 years of age (USFWS 1991). The Mississippi sandhill crane is a long-lived bird and can live as long as 20 years, but birds in the wild generally live 7-9 years (USFWS 1991).

4.4 Population trends

Extensive habitat alteration and human take of cranes had already occurred by the time the Mississippi sandhill cranes were first reported by Leopold (1929, as cited in USFWS 1991). The size and extent of the original crane population in extreme southeastern Mississippi is unknown. Since 1929, the estimated numbers have not exceeded 100 birds, until recently, when captive-reared birds have supplemented the wild flock (Hereford and Grazia 2008). McIlhenny (1938, as cited in USFWS 1991) did not estimate the population, but his cooperators found 11 nests in the vicinity of Fontainebleau and counted 34 birds in one flock in April 1938. Beginning in January 1983, crane censuses have been conducted semi-annually in January and October, and continue to date (Hereford and Grazia 2008; Scott G. Hereford, Senior Refuge Biologist, Mississippi Sandhill Crane National Wildlife Refuge, pers. comm.). The purpose of the counts is to estimate the minimum population and monitor population trends. Since 1983, the minimum estimated population averaged 40 cranes and estimates have ranged from 32 (October 1985) to 54 (October 1989) cranes (USFWS 1991). The most recent population estimate, since the inception of the reintroduction program is 110 cranes (Hereford and Grazia 2008), including 20-25 known breeding pairs (S. Hereford, pers. comm.).

4.5 Geographic trends

Mississippi sandhill cranes differ from other *Grus* subspecies in their maturity rate and earliest egg production, making them physiologically distinguishable from other subspecies (Gee and Hereford 1995). This subspecies is considered reproductively isolated from other sandhill cranes (Miene and Archibald 1996). While the original distribution and population numbers for this subspecies are uncertain, Mississippi sandhill cranes may have been contiguous with an extensive but widely scattered population of resident sandhill cranes along the coast of the southeastern United States (Gee and Hereford 1995; Miene and Archibald 1996). The Mississippi sandhill crane population originally occupied an area of south east Mississippi bordered by an east - west line roughly ten 10 miles North of Vanleave, in the south by Simmons Bayou, and extending east of the Pascagoula River to west of Jackson County (Gee and Hereford 1995).

5. Threats

The species (*Grus canadensis*) is assessed as Least Concern by BirdLife International; however, there are no individual assessments for the subspecies (BirdLife International 2014). The United States lists *Grus canadensis pulla* as an endangered species under the U.S. Endangered Species Act of 1973, as amended (USFWS 1988).

5.1 Habitat loss

The main cause of the decline of *Grus canadensis pulla* is the loss and fragmentation of coastal pine savanna habitat (Mississippi Nongame and Endangered Species Act 2001; USFWS 1991). Other principal threats to this subspecies include urban growth and development, human and animal incursion, and shooting. Thousands of acres of savanna are now considered to be unsuitable for the cranes, as the existing dense pine plantations and drainage canals result in unacceptable nesting and feeding habitats (Mississippi Nongame and Endangered Species Act 2001; USFWS 1991).

5.2 Predation

The recent increase in the number of coyotes (*Canis latrans*) in sandhill crane habitat is a threat, as coyotes and other predators destroy and consume both eggs and young cranes (Mississippi Nongame and Endangered Species Act 2001). Juvenile Mississippi sandhill cranes also incur substantial mortality due to predation by bobcats (*Lynx rufus*) and red tailed hawks (*Buteo jamaicensis*) (Heatley 2002). To protect cranes, nests and young, U.S. Department of Agriculture Wildlife Services has conducted anti-predator measures, including trapping, under an Interagency Agreement, resulting in the removal of 15 large predators per year (Hereford and Grazia 2008).

5.3 Genetic isolation

The above threats have affected *Grus canadensis pulla* to such an extent that populations are now small, fragmented, and susceptible to genetic isolation, predation, and disease. Genetic diversity of wild Mississippi sandhill cranes, as measured by heterozygosity levels in multiple studies, is roughly half that of other sandhill crane populations (Dessauer et al. 1992). A reduction in successful breeding of the Mississippi sandhill crane is believed to be due to this lack of genetic diversity (Johnsgard 1998).

5.4 Toxins

As well as a reduction in genetic fitness, the current limited population is now more vulnerable to extirpation than before due to high mortality rates resulting from toxins found on the refuge (Gee and Hereford 1995).

6. Utilization and trade

6.1 National utilization

National utilization of *Grus canadensis pulla* is illegal under a strict domestic measure: the U.S. Endangered Species Act of 1973, as amended (hereafter referred to as "Act"; USFWS 1988). The Act protects endangered and threatened species and their habitats by prohibiting the "take" of listed animals and the interstate or international trade in listed plants and animals, including their parts and

products, except under Federal permit. Take is defined under the Act as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct.” The term “harm” and “harass” are further defined by regulation. Current published data regarding national utilization of *Grus canadensis pulla* are not readily available, but unofficial estimates by species experts suggest that utilization is non-existent (S. Hereford, pers. comm.).

6.2 Legal trade

There have been no reported instances of legal international trade in *Grus canadensis pulla* in records dating from 1975 (UNEP-WCMC CITES trade database 2010, accessed 08 January 2014). The UNEP-WCMC database (2014) reports six exports of live specimens and 1 export of live eggs from the United States for the Florida sandhill crane (*Grus canadensis pratensis*) during the years 1983-2000. Other exports from the United States are reported at the species level (*Grus canadensis*). UNEP-WCMC (2014) reports exports from 2002-2011. These exports include trophies (4), meat (1), parts (skins, feathers, and claws; 4), and live specimens (2) (UNEP-WCMC 2014).

However, there has been significant international trade of live specimens, sport-hunted trophies, meat, and parts within the *G. canadensis* complex (UNEP-WCMC 2014, accessed 08 January 2014). Canada had a large number of exports of *Grus canadensis* during the time period 1997-2012. Beginning in 1998, more than 1,000 trophies were exported annually through 2000. A minimum of 1,500 trophies were exported annually from 2001 through 2012, with a high of 2,269 exported in 2004. Other exports included meat, bodies, and parts (skulls and feathers) (UNEP-WCMC 2014).

Mexico had minimal exports of *Grus canadensis* during the time period 1990-2012, limited to 9 hunting trophies and 10 bodies (UNEP-WCMC 2014). The UNEP-WCMC database indicates exports of 47 specimens of the Cuban sandhill crane (*Grus canadensis nesiotus*) in the years 2001 and 2002 (UNEP-WCMC 2014).

6.3 Parts and derivatives in trade

There are no data to suggest that international trade is occurring in parts or derivatives of *Grus canadensis pulla*.

6.4 Illegal trade

There are no data to suggest that the illegal international trade of *Grus canadensis pulla* is occurring.

6.5 Actual or potential trade impacts

There is no current information about trade impacts on *Grus canadensis pulla*. The subspecies is not in demand for international trade (not “affected by trade” as defined in Annex 5).

However, there has been international trade of live specimens, sport-hunted trophies, and parts within the *G. canadensis* complex (UNEP-WCMC 2014, accessed 08 January 2014). Identification and enforcement issues could arise, should there be trade in this subspecies, as identification by a non-expert would be problematic. For this reason, we recommend retention of the subspecies in Appendix I.

7. Legal instruments

7.1 National

Grus canadensis pulla was listed under the Endangered Species Preservation Act of 1966, and in 1968, as Endangered by the U.S. Fish and Wildlife Service. The Act was later incorporated into the U.S. Endangered Species Act of 1973, as amended. The U.S. Endangered Species Act prohibits (among other things) import, export, and shipment in interstate and foreign commerce of listed species without a permit. The subspecies was listed under State legislation as Endangered by the Mississippi Department of Wildlife, Fisheries, and Parks, in 1974 (Mississippi Nongame and Endangered Species Act 2001).

7.2 International

Grus canadensis pulla was listed in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1975 (CITES 2014).

8. Species management

8.1 Management measures

The Mississippi Sandhill Crane National Wildlife Refuge (NWR) is part of the Gulf Coast Refuge Complex, which includes Grand Bay NWR and Bon Secour NWR. The refuge was established in 1975, under authority of the Endangered Species Act of 1973, as amended, to protect the critically endangered Mississippi sandhill cranes and their unique, and itself endangered, wet pine savanna habitat. The refuge consists of three separate land units containing approximately 7,284 hectares (18,000 acres). Sandhill crane habitat on the refuge is being restored to savanna, as much of the refuge is on lands that were planted with pine trees in 1950. This restoration process includes land clearing, timber thinning, prescribed burning to maintain savanna vegetation, and water control (Mississippi Nongame and Endangered Species Act 2001). The crane population, at the time the Refuge was established, numbered only 30-35 birds, and now numbers about 110 individuals (<http://www.fws.gov/mississippisandhillcrane/>).

In order to protect and ensure the survival of *Grus canadensis pulla* and its habitat the U.S. Fish and Wildlife Service outlined recovery objectives in its 1991 recovery plan (USFWS 1991). These objectives include:

1. Maximize the quality and quantity of nesting habitat on and near the Refuge.
2. Increase natural recruitment in the wild population.
3. Increase the genetic viability of the subspecies.
4. Minimize human disturbance, especially to nesting cranes.
5. Stop human and animal predation.
6. Continue to restore, improve, and maintain feeding and roosting habitats.
7. Limit or negate crane contact with potential toxins.

Reducing the likelihood of extinction will require a self-sustaining population of cranes with suitable available habitat. Preliminary estimates suggest the refuge population may require a minimum of some 130 to 170 cranes, consisting of about 60 nesting cranes per breeding season, for a continuous period of at least 10 years. Long term self-sustenance and stability will require a genetically viable population, high levels of natural recruitment, and cessation of the captive- release program (USFWS 1991).

8.2 Population monitoring

Semi-annual population counts of *Grus canadensis pulla* are conducted in April and October by U.S. Fish and Wildlife Service personnel and associates (USFWS 1991).

8.3 Control measures

8.3.1 International

Other than CITES, we are not aware of any specific international control measures for *Grus canadensis pulla*. However, our domestic regulation of the subspecies prohibits (among other things) import, export, and shipment in foreign commerce by persons subject to U.S. jurisdiction of the subspecies without a permit.

8.3.2 Domestic

At the Federal level, the subspecies is listed as Endangered under the U.S. Endangered Species Act of 1973, as amended, and is also subject to the Lacey Act of 1900, as amended (USFWS 1988). Mississippi sandhill cranes are also protected by state regulations. Mississippi's Nongame and Endangered Species Act of 1974 provides "for the protection of nongame species threatened with extinction; to provide enforcement authority and penalties for violations of this Act; and for related purposes." Mississippi lists the Mississippi sandhill crane as an endangered species (Mississippi Nongame and Endangered Species Act 2001; USFWS 1991).

8.4 Captive breeding and artificial propagation

In 1981, a program was initiated to supplement the wild population of Mississippi sandhill cranes by releasing cranes on the refuge that were hatched and reared at the Patuxent Wildlife Research Center, in Laurel, Maryland (Zwank and Derrickson 1981). Annual survival rates around 70% were achieved in Patuxent's release program with Mississippi sandhill cranes (Ellis et al. 1992). From 1994-1996, Patuxent's captive flock was transferred to breeding programs at the Audubon Zoo (Audubon) in New Orleans, Louisiana and the White Oak Conservation Center (White Oak) in Yulee, Florida. These programs now produce juvenile Mississippi sandhill cranes for reintroduction on the Refuge (Jonathan Male, Biologist and Jane Chandler, Crane Flock Manager, Patuxent Wildlife Research Center, pers. comm.).

Currently, the wild population of Mississippi sandhill cranes remains dependent on Audubon's and White Oak's captive breeding programs for survival. One of the biggest threats to the subspecies, and one that could result in extinction, is the inability of the captive breeding programs to increase the number of individuals produced annually that are released and able to raise young in the wild. In spite of extensive time, labor, and money invested in captive propagation, juvenile Mississippi sandhill cranes continue to suffer substantial mortality due to predation by bobcats (*Lynx rufus*), coyotes (*Canis latrans*) and red tailed hawks (*Buteo jamaicensis*) upon reintroduction to the refuge (Heatley 2002). Recovery could occur if the problems with poor brood survival are resolved, but until this time, populations of *Grus canadensis pulla* are increasingly vulnerable to stochastic events.

ISIS records report that the current captive population of *Grus canadensis pulla* consists of 68 breeding adults with Audubon managing the largest percentage of the total captive flock (31.25.20 individuals) and White Oak managing 6.6 individuals, 4 of these being 2013 young of the year birds (www.isis.org, accessed 08 January 2014).

Although the captive breeding program has been instrumental in preventing the extinction of *Grus canadensis pulla*, it has not resulted in widespread expansion of the population. Post-release survival has been noted to vary between years. Possible reasons for variable brood survival rates are low genetic variability, physiological changes to individuals due to the captive environment, parental behavior attributable to the captive environment, disease/toxins, and predation by avian and mammalian species (Snyder et al. 1996; USFWS 1991). Successful reintroductions and ultimately the survival of the subspecies depend on a solution to these limiting factors.

8.5 Habitat conservation

The Mississippi Sandhill Crane National Wildlife Refuge is part of the Gulf Coast Refuge Complex, which includes Grand Bay NWR and Bon Secour NWR containing approximately 7,284 hectares (18,000 acres). The refuge protects and restores the last large expanses of wet pine savanna, primarily through the use of prescribed fire, land clearing, and timber thinning. The wet pine savanna is one of the most diverse ecosystems in the U.S. with more than 30 plants found in a square meter of land (<http://www.fws.gov/mississippisandhillcrane/>).

8.6 Safeguards

Regardless of any reclassification under CITES, the taxon will continue to be regulated by the U.S. Endangered Species Act of 1973, as amended, as well as by regulations of the State of Mississippi. The lead Federal agency for actions regarding this subspecies is the U.S. Fish and Wildlife Service. The subspecies is not subject to harvest in Mississippi.

9. Information on similar species

Grus canadensis pulla is a member of the *Gruidae* (crane) family and the genus *Grus*. This genus includes 10 species. There are six subspecies (Dickinson 2003) of *Grus canadensis*, including: lesser sandhill crane (*G. c. canadensis*), Canadian sandhill crane (*G. c. rowani*), greater sandhill crane (*G. c. tabida*), Florida sandhill crane (*G. c. pratensis*), Cuban sandhill crane (*G. c. nesiotetes*), and Mississippi sandhill crane *Grus canadensis pulla*.

The subspecies *G. c. canadensis* and *G. c. nesiotetes* were listed in the CITES Appendices in 1975; the remaining members of the *Gruidae* family were listed in in 1985 (www.cites.org, accessed 08 January 2014).

10. Consultations

Mr. Scott G. Hereford, Senior Wildlife Biologist, Mississippi Sandhill Crane National Wildlife Refuge (MSCNWR; U.S. Fish and Wildlife Service), Mr. Jonathan Male, Biologist, Ms. Jane Chandler, Crane Flock Manager, Patuxent Wildlife Research Center (U.S. Geological Survey) and Ms. Deborah Hahn Association of Fish and Wildlife Agencies (AFWA) were consulted for this periodic review and proposal.

11. Additional remarks

None.

12. References

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