Mississippi Sandhill Crane
(*Grus canadensis pulla*)

5-Year Status Review:
Summary and Evaluation

Photo by Lauren McLaurin, USFWS volunteer

U.S. Fish and Wildlife Service
Southeast Region
Mississippi Ecological Services Field Office
Jackson, Mississippi

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5-YEAR STATUS REVIEW
Mississippi Sandhill Crane (*Grus canadensis pulla*)

GENERAL INFORMATION

Current Classification: Endangered

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Date of original listing: 38 FR 14678; June 4, 1973

Critical Habitat Final Rule: 42 FR 39985; August 8, 1977

Methodology used to complete the review:

In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants (50 CFR 424.11). The U.S. Fish and Wildlife Service (Service) evaluated the best available information about the Mississippi sandhill crane biology, habitat, and threats to inform this status review.

We announced initiation of this review in the Federal Register on May 11, 2023 (88 FR 30324) with a 60-day comment period and received no public comments. The primary sources of information used in this analysis were the 1973 final listing rule (38 FR 14678), the 1991 recovery plan (Service 1991b), peer-reviewed reports, agency reports, unpublished survey data and reports, and personal communication with recognized experts. This review was completed by the U.S. Fish and Wildlife Service, Mississippi Ecological Services Field Office, Jackson, Mississippi. All literature and documents used for this review are on file at the Mississippi Ecological Services Field Office. All recommendations resulting from this review are the result of thoroughly reviewing the best available information on the Mississippi sandhill crane.

FR Notice citation announcing the species is under active review: May 11, 2023 (88 FR 30324)

Species' Recovery Priority Number at start of 5-year review (48 FR 43098): 6C. The Mississippi sandhill crane is a subspecies with a high degree of threat and a low recovery potential. The "C" indicates a species that is, or may be, in conflict with construction or other development projects or other forms of economic activity.

Review History: Two previous 5-year reviews recommending no change in status were published on November 6, 1991 (Service 1991a) and August 30, 2019 (Service 2019).

REVIEW ANALYSIS

LISTED ENTITY

Taxonomy and nomenclature

We are not aware of any changes to the taxonomy of this entity, and it is still considered valid by the Service. *Grus* (syn. *Antigone*) *canadensis pulla* (Aldrich) is recognized as a valid subspecies in family Gruidae (see Integrated Taxonomic Information System [https://www.itis.gov, accessed March 1, 2024]).

Distinct Population Segment (DPS) (61 FR 4722)

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This subspecies was not listed as a DPS, and we have no new information that would indicate the subspecies should be listed as a DPS under the Service's 1996 DPS Policy.

RECOVERY CRITERIA

Recovery Plan or Outline

Mississippi sandhill crane (*Grus canadensis pulla*) Recovery Plan, third revision. September 6, 1991.

Recovery plans are not regulatory documents and intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act (84 FR 45020).

"The recovery objective is to maintain a genetically viable, stable, self-sustaining, free-living Mississippi sandhill crane population. Criteria for attaining the objective are: (1) cessation of the need for captive-raised cranes, (2) attaining a free-living, stable, and self-sustaining standing population which demonstrates stability and self-sustenance for at least 10 continuous years, and (3) providing the habitat required to support the crane population. The estimated required standing population (total free-living crane population of all ages of cranes) will be determined from continually updated population dynamics and minimum viable population models. A stable and self-sustaining population must be genetically viable. Genetic viability requires that captive-raised cranes represent the full range of genetic heterozygosity remaining in the Mississippi sandhill crane gene pool. Some level of continual intergradation with other southeastern crane populations also may be required." (Service 1991b, p. 17)

We have determined that these criteria are appropriate and relevant and continue to work to augment the population, improve recruitment, and improve suitable habitat for the crane; however, no recovery criteria have been fully met.

Status: Criterion 1 is not met. Currently, the number of fledged chicks is insufficient to maintain the Mississippi sandhill crane population at the recovery population goal of 130 to 150 birds (IUCN/SSC Captive Breeding Specialist Group [CBSG] 1992). The current population of Mississippi sandhill cranes exceeds the recovery population target (174 cranes). However,

annual recruitment rates (expressed as fledged young per adult in the preseason population) remain low, although the annual recruitment rates between 2015–2019 have been increasing (Service 2019). This increase in recruitment moves recovery towards the goal of achieving population stability without population augmentation of captive-raised juvenile cranes.

Criterion 2 is not met. As discussed under Criterion 1, the Mississippi sandhill crane population is not yet self-sustaining and captive-raised juveniles are needed to sustain the population. However, over the past five years, the average number of chicks fledged has increased since the 2019 5-year review. Adult mortality rates over this period increased to 9.5%, which is beyond the identified threshold of a 7.7% adult mortality rate needed to support a stable population given an annual fledging rate of 10–15 juvenile cranes. Overall, the current level of juvenile recruitment, while increasing, is still below the level needed for population replacement (15%, Arnold et al. 2016).

Additionally, both the Recovery Plan and the population and habitat viability analysis (PHVA) indicated that Mississippi sandhill cranes should be established at a second site in the lower Gulf Coastal Plain to support survival and recovery of the subspecies (Service 1991b; CBSG 1992). Appropriate habitat for the crane is very restricted, but habitat restoration at the nearby Grand Bay National Wildlife Refuge/National Estuarine Research Reserve (Grand Bay) may result in an area suitable for establishing a small number of breeding pairs (see Criterion 3).

Criterion 3 has been partially met. The Mississippi Sandhill Crane National Wildlife Refuge (Refuge) was established in 1975 to protect habitat for the non-migratory Mississippi sandhill cranes. The Refuge conducts ongoing habitat management through prescribed burning and other techniques to restore habitat for the sandhill crane including longleaf wet pine savannas, thereby increasing the number of available nesting territories. Managing nearby Grand Bay National Wildlife Refuge (Grand Bay) for reestablishment of cranes at the site is included as a task in the recovery plan (Service 1991b). As restoration efforts for Grand Bay are completed, planning will begin to identify specific sites for future releases of captive-bred juveniles and establishment of Mississippi sandhill crane nesting pairs.

BIOLOGY AND HABITAT SUMMARY

Detailed reviews of the subspecies' biology and life history can be found in the Mississippi sandhill crane Recovery Plan (Service 1991b) and the 2019 5-year status review (Service 2019). Below is a summary of the current information of the subspecies' biology and life history.

Population dynamics

Mississippi sandhill cranes are a monogamous long-lived subspecies with low annual reproductive potential and provide extended parent care. As an endemic subspecies, the Mississippi sandhill crane (*Grus canadensis pulla*) home range is limited to the 19,300 acre (ac) (7,810 ha) Refuge and the immediate surrounding area (Figure 1). The current estimate of the wild Mississippi sandhill crane population is 174 birds: 67 males, 72 females, and 35 cranes of unknown sex (Table 1) (Hereford 2024). This is the highest population estimate of the subspecies observed in the wild since 1993, when an estimate of 135 individuals followed robust releases of captive-reared birds (Gee and Hereford 1995). Currently, the Refuge population has exceeded the carrying capacity identified in the PHVA of 150 cranes, with a range of 130 to 170 birds (CBSG 1992). However, recruitment remains low and annual mortality remains high (Hereford 2024). Subspecies recovery may include expansion to additional areas of suitable

habitat within the historical range of the subspecies and the development of a reintroduction strategy to determine the feasibility and means to reestablish a population at Grand Bay.

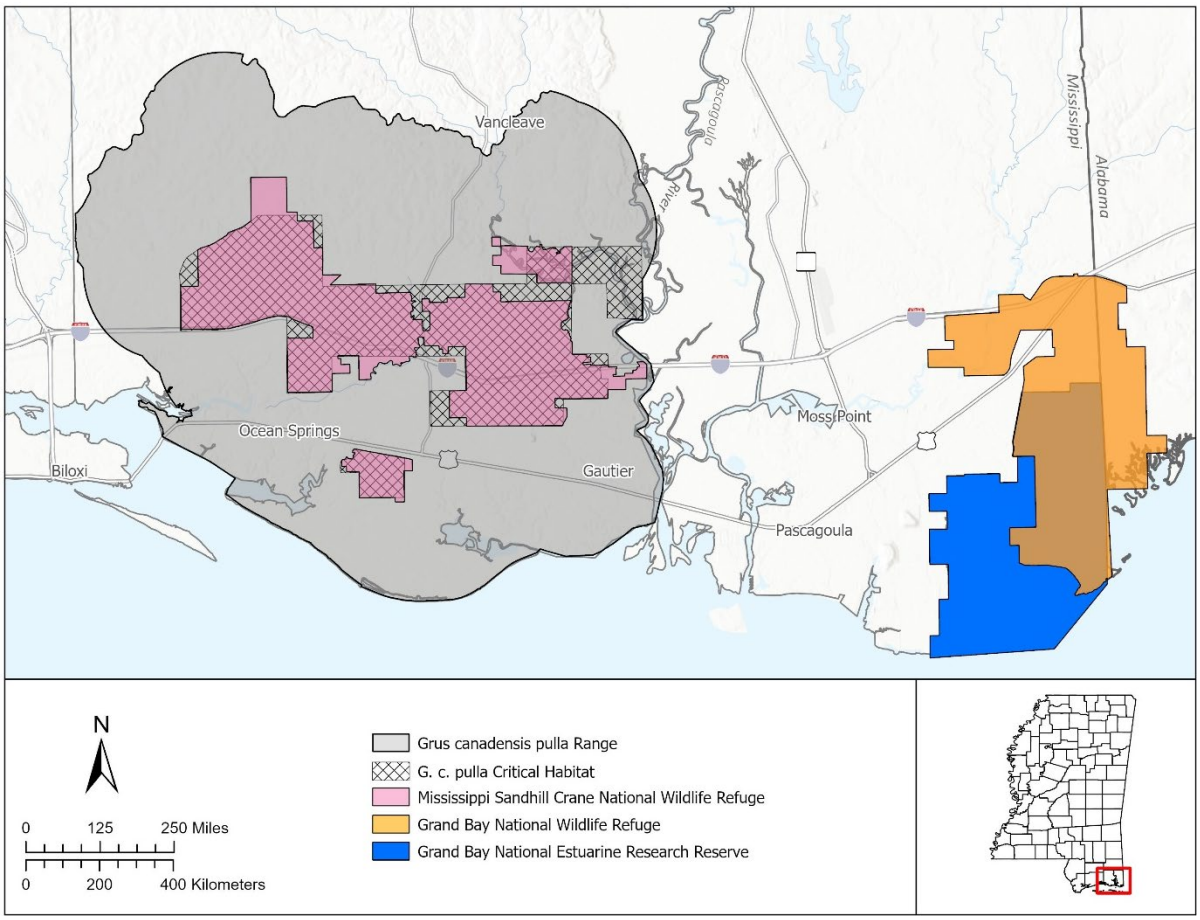

Figure 1. Spatial distribution of the Mississippi sandhill crane.

Table 1. Mississippi sandhill crane population metrics, 2019 to 2023 (Hereford 2019–2024).

Year	Population	Breeding pairs	Wild-fledged cranes	Captive-reared juveniles released	Mortality (% of population)	Average annual recruitment
2019	138	40	15	9	19 (13.8%)	11.6
2020	143	41	5	12	17 (11.9%)	3.6
2021	150	43	5	11	13 (8.7%)	3.5
2022	161	43	10	12	12 (7.5%)	6.6
2023	174	44	13	10	10 (5.8%)	8.1

On average, the Mississippi sandhill crane breeding season begins in late February and extends through mid-June (Hereford and Dedrickson 2019). In the last five years, the average breeding season has increased in duration (Hereford 2019, 2020, 2021, 2022, 2023, 2024). The longest recorded breeding season occurred in 2023, lasting from February 8 to September 22.

Wild nesting crane pairs have continued to increase since the last status review (40 to 44) (Table 1) (Hereford 2019, 2020, 2021, 2022, 2023, 2024). Average clutch size has remained at approximately 1.8 eggs per nest, with some double clutches (Service 2019; Hereford 2019, 2020, 2021, 2022, 2023, 2024). The total number of eggs hatched and the number of fledged chicks from the wild population have continued to increase since the last status review as well

(Hereford and Dedrickson 2016). From 2019 through 2023, wild Mississippi sandhill cranes fledged 48 chicks, with 10 or more chicks fledged in 3 years (Table 1). On average, 9.6 cranes fledged annually, a 65% increase from the 2019 5-year review (Service 2019; Hereford 2019, 2020, 2021, 2022, 2023, 2024). This increase in fledgling success continues a trend of improved survival higher than any period in the Refuge's history and can be attributed to a combination of habitat improvements, focused predator removal, and increasing experience of breeding pairs (Service 2019; Hereford 2019, 2020, 2021, 2022, 2023, 2024).

As part of the Mississippi sandhill crane captive propagation program, 28 cranes are currently housed at the Freeport McMoran Audubon Species Survival Center (New Orleans, Louisiana) and 6 are housed at White Oak Conservation Center (Yulee, Florida). As of December 2023, 591 captive-bred juvenile Mississippi sandhill cranes have been released at the Refuge over a period of 44 years (Hereford 2024). From 2019 to 2023 a total of 55 juvenile cranes in captive-reared cohorts were released in three areas on the Refuge (Table 1).

Five-year maximum counts provide the most robust minimum estimates to assess population trends for sandhill cranes (Caven et al. 2020, entire). From 2019 to 2023 the Mississippi sandhill crane population increased at a rate of 5.7%, an increase from the 2013 to 2018 population trend of 2.0% (Service 2019; Caven 2023). However, analysis of the subspecies' population trends demonstrates that population gains are a product of supplementation by captive-reared crane cohort releases (Woolley et al. 2022; Caven 2023). When captive-reared individuals are removed from population totals during this timeframe, we find the population is relatively stable (-0.8%). Currently, the Mississippi sandhill crane population is still below natural replacement, considering natural recruitment (6.8%) is lower than adult mortality rate (9.5%). As such, the population is not yet capable of sustaining itself without continued intervention (e.g., captive-rearing).

Overall, population size, number of breeding pairs, number of nests, and number of chicks fledged annually have continued to increase since the previous 5-year review (Service 2019). These demographics indicate improvement in the subspecies' condition, as the number of wild-reared chicks fledged has a stronger relationship to population size than number of captive-reared chicks released into the population (Woolley et al. 2022).

Spatial distribution

The Mississippi sandhill crane is spatially distributed within the Refuge and its immediate environs in Jackson County, Mississippi, between the cities of Ocean Springs and Gautier (Figure 1) (Service 1991b; Hereford and Dedrickson 2019). The crane's home range has increased from the 2018 estimate of 69,760 ac (Hereford and Dedrickson 2018b). Using visual and radio transmitter locations, the 2020–2023 home range was estimated at 86,242 ac (Hereford and Dedrickson, in press). Habitat classification based on satellite imagery (National Agriculture Imagery Program) indicates 60% of crane locations were in herbaceous habitat, 12% in swamp, 5.9% in developed, 1.2% in forest, 1.2% in road, and 0.1% in open water (Woolley and Hereford 2023; Hereford and Dedrickson, in press). Some longer distance movements have been recorded, including the farthest locations north, west, and east recorded since monitoring began in 1981.

Habitat management

Restoration and maintenance of the wet pine savanna is a primary objective of the Refuge management plan. Refuge improvements of upland habitat continue, primarily through

reductions in stocking of pine, control of invasive species, mechanical habitat treatments (e.g., bush-hog, mulching machine, gyro-track, chain saw), mowing of working fields for foraging habitat, and the use of prescribed burning at 2 to 3-year return intervals. From 2019 to 2023, a total of 26,732 ac of Refuge lands were managed using prescribed fire. Additionally, 2,873 ac were managed using mechanical treatments; 850 ac were treated for invasive species (spraying, hand removal); and 1,733 ac of working fields were mowed to provide crane foraging habitat.

Population and habitat viability analysis identified that with additional habitat management actions, the Refuge could support up to 53 nesting territories (CBSG 1992). As of 2023, the current population supports 44 nesting territories (Hereford 2024), with approximately 30 located on the Refuge. The percentage of young cranes fledged from the Refuge has been decreasing: 80% of cranes fledged from sites on the Refuge before 2010, decreasing to 60% after 2019. From 2021–2024, most successful pairs are nesting off-Refuge, indicating the importance of suitable habitat outside the Refuge boundaries. One Refuge goal is to provide 13,000 acres of wet coastal prairie and savanna. Approximately 6,900 ac of prairie/savanna has been identified as in need of restoration as well as development of additional ponds for crane roosting and nesting needs. It is possible that all 13,000 acres are available to accommodate the 55 territories in the PHVA.

Predator management

Predation continues to be the primary cause of mortality in all age classes of cranes (Woolley et al. 2021). As part of ongoing predator management actions, a total of 566 predators were removed from the Refuge from 2019–2023 (Hereford 2019, 2020, 2021, 2022, 2023, 2024).

Widespread lack of predator recognition and antipredator behavior among captive-reared and wild-hatched birds is a major contributor to low recruitment rates in Mississippi sandhill cranes (Butler 2009; Howard et al. 2016). As such, captive-breeding facilities emphasize parent-rearing of chicks to increase the likelihood of chicks developing predator-defensive skills from their parents. Captive-breeding facilities and Refuge staff continue to monitor antipredator behaviors and vigilance in the subspecies to determine if these rearing techniques improve survivorship in these individuals.

THREATS (FIVE-FACTOR ANALYSIS) SUMMARY

A detailed review of the threats to the subspecies can be found in the 2019 Mississippi sandhill crane 5-year review (Service 2019). The status of a species is determined from an assessment of factors specified in section 4(a)(1) of the Act.

Factor A. Present or threatened destruction, modification, or curtailment of its habitat or range

Habitat loss/conversion/degradation outside of the Refuge is an ongoing threat, including in areas designated as critical habitat (Figure 1). From 2020–2023, Jackson County had the fourth highest growth rate among counties in Mississippi (U.S. Census Bureau 2024). Loss of off-Refuge habitat affects the crane population as approximately 30% of the Mississippi sandhill crane population forage and roost in off-Refuge habitats (Hereford and Dedrickson 2019; Service 2019). Loss of foraging habitat is of particular concern because suitable crane habitat is limited on the Refuge. In addition, increased development results in an increase in roads and vehicular traffic that increases the likelihood of crane injury and mortalities (see Factor E). Areas of

development also create edge habitat that provides ideal conditions for predators that are found in association with humans, including coyotes, domestic dogs, and racoons.

Increasing development surrounding the Refuge continues to limit the timing and frequency of prescribed burning as a management tool. The number of "burn days" (the number of days when it is possible to burn) is expected to decrease due to climate change in the future (see discussion under Factor E).

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes

This activity is not currently considered a threat to the Mississippi sandhill crane nor was it considered a threat at the time of listing.

Factor C. Disease or predation

Predation is the most common cause of death for the subspecies and remains the leading cause of egg and chick mortality (Butler 2009; Hereford and Dedrickson 2019; Service 2019). Over the past 35 years, predators have been removed from the Refuge, with a focus on the two most vulnerable periods for recruitment: the nesting season and annual release of captive-reared juveniles (Hereford 2014). Target species include all animals documented as taking crane eggs, chicks, juveniles, or adults (Hereford and Dedrickson 2018a). Stable water levels within nesting habitat, which may be affected by climate change, improve nesting success by reducing access to nests by some predators (see Factor E),). The increase in predators on the Refuge is likely tied to the increased development pressure along the boundaries of the Refuge, which provides more edge habitat for "human-subsidized" predators (see Factor A).

Predation may have a greater impact on the subspecies as a result of learned predator-defense behaviors in captive-bred populations. Some behaviors may have been lost during the genetic bottleneck during the period when chicks were hand-reared. Behavioral deficiencies critical to post-release survival have been observed in several ex-situ breeding programs and are likely caused by reduced opportunities for social learning in captivity (Griffin et al. 2000; Griffin 2004). Between 1991 and 2018 mean lifespan of wild-reared birds was 60% greater (6.7 years) than captive-reared birds (Woolley 2021). Additionally, captive-reared cranes exhibit lower levels of antipredator defense behavior than wild-reared birds (Howard et al. 2016). While captive-reared cranes can acquire behaviors that promote survival throughout their long lifespan, many of these individuals are lost before they gain the necessary experience (Woolley 2021).

Due to low wild recruitment rates on the Refuge (Hereford and Leaf 2018), the focus at the captive-breeding facilities has switched from hand-rearing to parent-rearing of chicks for release. Predator aversion learning opportunities are provided during the birds' initial confinement on the Refuge prior to becoming free-flying.

Tracking diseases in the wild Mississippi sandhill crane population is made difficult by the limited funding available to monitor cranes and locate dead birds. There is limited information available regarding the current effects of disease on the existing crane population.

Factor D. Inadequacy of existing regulatory mechanisms

On August 29, 2023, the U.S. Environmental Protection Agency and the U.S. Army Corps of Engineers issued a final rule that amends the "Revised Definition of 'Waters of the United States'" to conform key aspects of the regulatory text to the U.S. Supreme Court's May 25, 2023, decision in the case of Sackett *v.* Environmental Protection Agency. The conforming rule,

"Revised Definition of 'Waters of the United States'; Conforming," published in the Federal Register and became effective on September 8, 2023. A major component of the Mississippi sandhill crane's life history relies on emergent wetland habitats for roosting and nesting. Without these protections, off-Refuge roosting habitats are at risk of modification and destruction without a federal nexus to protect crane roosting habitats. Additionally, violations of the Clean Water Act will no longer include discharge into wetlands used by cranes if they were previously considered jurisdictional wetlands (connected to navigable waterways) and are no longer considered jurisdictional. Reduction in roosting habitat is an imminent threat as these habitats are already limited on the landscape. Existing regulatory mechanisms have not reduced or eliminated threats to the subspecies and threats are expected to continue to affect the subspecies.

Factor E. Other natural or manmade factors affecting its continued existence

Low recruitment

As a long-lived bird with low productivity (two eggs per nest) and low natural recruitment (approximately 6.7%), recruitment to the Mississippi sandhill crane population has been primarily through population augmentation with captive-bred juveniles. Natural recruitment has continued to increase over the years, and accounts for just under 50% of the current population. Despite increases in natural recruitment, the lack of learned predator-defense behaviors remains the primary factor in the low natural recruitment in the population (see discussion under Factor C). An average annual sandhill crane recruitment rate of 15% is needed to achieve a stable population (Arnold et al. 2016).

Climate Change

Changing climatic conditions in the Southeast, including increasing drought, timing variations in seasonal precipitation, and heavy rain events (U.S. Environmental Protection Agency 2014; U.S. Global Change Research Program 2017), are expected to influence breeding behavior and impact crane recruitment. Extended droughts can lead to lower annual productivity and recruitment by reducing the quality and quantity of flooded and ponded sites used for nesting, thus increasing accessibility to predators (Hereford and Billodeaux 2010). Alterations in the seasonal timing of precipitation may result in flooded conditions appropriate for nesting occurring outside of the typical crane breeding season. Heavy downpours may flood active nests and require re-nesting. Although the crane has a prolonged nesting season and can re-nest, climate change may exacerbate the impact of other threats.

The number of chicks fledged annually is negatively related to the annual number of extreme heat days (where daily high temperatures are ≥97°F) (Woolley et al. 2022). However, in 2023, despite 23 days categorized as extreme heat days, Mississippi sandhill cranes fledged 13 chicks in a historically long nesting season (February 8–September 22). The number of extreme heat days are expected to increase in the future and the impact of the effects of climate change are expected to increase in the future.

As a result of climate change, wildfire severity and limitations on the use of prescribed fire continue to increase (Abatzoglou and Williams 2016; Williams et al. 2019; Burke et al. 2021). The application of prescribed fire is restricted to safe "burn windows", or ranges of suitable weather and fuel conditions that facilitate manageable fire behavior. Increasing maximum temperatures and alterations in the seasonal timing of precipitation are expected to reduce burn windows, especially in the Southeast. Future climate projections indicate the percentage of

suitable days for burning will decrease substantially during the summer months (Kupfer et al. 2020; Jonko et al. 2024). Compared to current conditions, suitable burn days are projected to decrease by 50% throughout the Southeast by 2051–2060 (Jonko et al. 2024). This decrease in projected burn days during the growing season, which accounts for a large percentage of burned area in the region (Nowell et al. 2018), presents a significant challenge to land managers' ability to achieve ecological objectives.

SYNTHESIS

The Mississippi sandhill crane, a subspecies of the sandhill crane (*Grus canadensis*), is a long necked, compact, grayish-brown bird that stands about 4 ft (1.2 m) tall. This subspecies is a small-range endemic, spatially distributed within the 19,300 ac (7,810 ha) of the Refuge and its immediate environs in Jackson County, Mississippi. This subpopulation accounts for only 0.01% of the global population of sandhill cranes with a current population of 174 individuals: 67 males, 72 females, and 35 cranes of unknown sex (Craven 2023; Hereford 2024; Hereford and Dedrickson, in press). Following decades of habitat restoration work and release of captive-bred juveniles, the status of the Mississippi sandhill crane population has stabilized; however, to achieve recovery, the population must become self-sustaining without the need for augmentation of captive-bred chicks. This goal has not been achieved. Currently, high levels of predation are ongoing and the current level of juvenile recruitment, while increasing, remains below the rate needed to maintain or increase the population.

Increased development outside the Refuge and the associated increase in vehicular traffic, roads, powerlines, towers, and fences will likely grow in importance as threats to individual cranes as off-Refuge habitat use continues to increase. Climate change is expected to increase pressure on breeding cranes and negatively impact the already low natural recruitment. Climate change is also expected to reduce the frequency and timing of the use of prescribed fire for habitat management and restoration.

In summary, the best available information indicates threats currently affecting the Mississippi sandhill crane are expected to continue. To improve long-term viability of the subspecies, conservation actions to benefit the subspecies should continue, including reducing the number of captive-bred juveniles as appropriate as parent-reared chicks increase. Population augmentation should continue until the low natural juvenile survival rates increase to a self-sustaining rate. Although there has been progress towards achieving recovery goals for the Mississippi sandhill crane, especially in habitat restoration, recovery criteria have not been met and this subspecies continues to meet the definition of an endangered species under the Act.

RECOMMENDED FUTURE ACTIVITIES

A detailed discussion of recovery actions and criteria are presented in the Recovery Plan (Service 1991b). During this status review new and/or targeted potential recovery activities were identified and are included below. These actions are recommended to support and promote recovery of the Mississippi sandhill crane. Use of a numbered list for these recommendations is for convenient reference only and does not necessarily imply prioritization of any activity over others.

Recovery Activities

1. Conduct a new PHVA using current data for the Refuge and for potential reintroduction at Grand Bay.
2. Assess the genetic relationship of Mississippi sandhill cranes to other North American sandhill cranes and determine if restoring gene flow with other populations of cranes would be beneficial to Mississippi sandhill crane recovery (e.g., Florida sandhill crane).
3. Maximize quality and quantity of habitat on and near the Refuge by continuing to restore, improve, and maintain nesting, feeding, and roosting habitats. Control the spread of invasive plants onto the Refuge.
4. Continue the captive propagation program. Determine the number of releases necessary to maintain a stable population and to create new populations elsewhere.
5. Continue predator management and antipredator behavior training and possible translocation of cranes with antipredator behavior.
6. Introduce Mississippi sandhill cranes onto Grand Bay and look for appropriate prairie/savanna habitat in other parts of Mississippi, Louisiana and Alabama that could potentially support additional Mississippi sandhill crane populations.

Monitoring and Research Activities

1. Continue to monitor the Mississippi sandhill crane population, including mortality, survival, nesting, juvenile recruitment, post-release dispersal and habitat use including movements and use of roosting, nesting, foraging, and loafing areas.
2. Develop capability to use unmanned aerial system, artificial intelligence, and other technology to detect eggs and chicks to locate and remotely monitor nests/chicks and enable burning around eggs and chicks, preferably with trained staff UAS pilot and FWS platforms and sensors. Increase ability to find chicks in real-time.
3. Continue to capture cranes to band and/or equip with GPS GSM transmitters, prioritizing unbanded individuals, young pairs, and breeding pairs with unknown core nesting areas. Continue to test best capture methodologies.
4. Determine feasibility and develop reintroduction plan for the reestablishment of a population at Grand Bay.
5. Determine measures to increase natural recruitment in the wild population.
6. Explore ways to mitigate crane mortality due to increased development outside the refuge and increased density of roads (i.e., mortality from vehicle, powerline trauma).
7. Explore the need and feasibility of using sandhill cranes from other populations outside Mississippi for cross-fostering Mississippi sandhill chicks at the Refuge to increase exposure of chicks to appropriate parenting skills. Test translocation of cranes with likely or known predator defense behavior and determine if they have different fledging success than native Mississippi sandhill cranes.

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RESULTS / SIGNATURES

U.S. Fish and Wildlife Service
Status Review of the Mississippi Sandhill Crane (*Grus canadensis pulla*)

STATUS RECOMMENDATION:

On the basis of this review, we recommend the following status for this species. A 5-year review presents a recommendation of the species status. Any change to the status requires a separate rulemaking process that includes public review and comment, as defined in the Act.

- ☐ Downlist to Threatened
- ☐ Delist:
  - ☐ *The species is extinct*
  - ☐ *The species does not meet the definition of an endangered or threatened species*
  - ☐ *The listed entity does not meet the statutory definition of a species*
- ☒ No change needed

FIELD OFFICE APPROVAL:

Field Supervisor, Mississippi Ecological Services Field Office, Fish and Wildlife Service

JAMES AUSTIN Digitally signed by JAMES AUSTIN Date: 2024.07.03 15:32:33 -05'00'

Approve _____