Dusky Gopher Frog (*Rana sevosa*)

5-Year Review:
Summary and Evaluation

Photo credit: John Tupy, U.S. Fish and Wildlife Service

U.S. Fish and Wildlife Service
South Atlantic-Gulf Region
Mississippi Ecological Services Field Office
Jackson, Mississippi

May 2021

5-YEAR REVIEW
Dusky gopher frog (*Rana sevosa*)

I. GENERAL INFORMATION

A. Methodology used to complete the review:

In conducting this 5-year review, we relied on the best available information pertaining to historical and current distributions, life history, habitats, and potential threats to this species. We announced initiation of this review and requested information in a published *Federal Register* notice with a 60-day comment period on March 25, 2020 (85 FR 16951). We did not receive any public comments during this comment period. In an effort to acquire the most current information available, we solicited various experts, including State conservation agencies and heritage programs, and knowledgeable individuals associated with Federal and State agencies, academia, and non-governmental conservation organizations. Specific sources used to inform this 5-year review included the previous 5-year review (U.S. Fish and Wildlife Service (USFWS) 2015b), the final rule listing this species under the Endangered Species Act (Act); peer reviewed scientific publications; State and other experienced biologists; unpublished studies and survey reports; and notes and communications from other qualified biologists or experts. The completed draft review was sent to the Alabama and Louisiana Ecological Services Field Offices for their review and comments, which were incorporated where appropriate into this final document. No part of this review was contracted to an outside party.

B. Reviewers

Lead Region – Atlanta Regional Office, South Atlantic-Gulf Region and Mississippi Basin Regions: Carrie Straight, 404-679-7226

Lead Field Office – Jackson, Mississippi, Ecological Services Field Office: John Tupy, 601-321-1126

Cooperating Field Office – Daphne, Alabama, Ecological Services Field Office: Evan Collins, 251 441-5837; Lafayette, Louisiana, Ecological Services Field Office: Brigette Firmin, 337-291-3108.

C. Background

1. **Federal Register Notice citation announcing initiation of this review:**
   March 25, 2020 (85 FR 16951)

2. **Listing history**
   Original Listing
   Federal Register Notice: 66 FR 62993
   Date listed: December 4, 2001
   Original entity listed: DPS

Classification: Endangered

Entity changed to a full species in 2012 (77 FR 35118)

3. **Associated rulemakings**
   Critical Habitat
   Federal Register Notice: 77 FR 35118
   Federal Register Notice date: June 12, 2012
   Consent Decree vacating Unit 1of critical habitat: July 3, 2019

4. **Review History**
   Five Year Review:
   September 9, 2015: No change in status

5. **Species' Recovery Priority Number at start of review (85 FR 16952):**
   5 – Species with high degree of threat and low recovery potential

6. **Recovery Plan**
   Name of original plan: Dusky Gopher Frog (*Rana sevosa*) Recovery Plan
   Date issued: September 9, 2015

   Amendment 1 to original plan dated: September 26, 2019

   Captive Propagation Plan. The Dusky Gopher Frog Controlled Propagation and Reintroduction Plan (USFWS 2017) provides guidelines for dusky gopher frog captive propagation and population restoration efforts in accordance with the Policy Regarding Controlled Propagation of Species Listed Under the Act (65 FR 56916). Our partners within the Association of Zoos and Aquariums (AZA), led by the Memphis Zoo, have developed successful techniques to breed dusky gopher frogs through in-vitro fertilization (Hinkson and Poo 2019), and most recently through unassisted breeding in outdoor enclosures (Reichling *et al*. 2021). Personnel at Memphis Zoo and their AZA partners have made progress in the cryopreservation of dusky gopher frog sperm with the goal of increasing genetic diversity in the captive population (Poo and Hinkson 2019).

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

1. **Is the species under review listed as a DPS?**
   When the dusky gopher frog was originally listed in 2001 (66 FR 62993), it was listed as a DPS. In our final rule designating critical habitat (77 FR 35118), we described taxonomic changes that warrant the dusky gopher frog's acceptance as a full species and changed the listed entity as a full species. Therefore, the species is no longer

listed as a DPS.

2. **Is there relevant new information that would lead you to re-consider the classification of this species with regard to designation of DPSs?** No

B. Recovery Criteria

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?**
   Yes.

2. **Adequacy of recovery criteria.**
   a. **Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?** Yes.

   b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?** Yes.

3. **List the recovery criteria as they appear in the recovery plan and discuss how each criterion has or has not been achieved.**

   The original recovery plan for the dusky gopher frog (USFWS 2015a) has as its stated recovery objective preventing the extinction of the dusky gopher frog and it only includes downlisting criteria. These criteria remain in effect and are unchanged. However, Amendment 1 to the recovery plan (USFWS 2019) added criteria for delisting the dusky gopher frog. None of the downlisting or delisting criteria have been met at this time. We have only included downlisting criteria below since the species is currently listed as endangered, and the expected next step would be an improvement of species condition resulting in downlisting.

   Downlisting Recovery Criteria (USFWS 2015a)

   The original Dusky Gopher Frog Recovery Plan (USFWS 2015a) sets forth criteria which, when met, will increase the range of extant dusky gopher frog populations; will increase the number of individuals and populations; and will reduce threats to the species' existence. Downlisting may be considered when the following criteria are met:

   1) Six **viable metapopulations*** are documented within blocks of recovery focus areas (described in Section II of this recovery plan) and are widely distributed across the range of the species. The six metapopulations would include a minimum of 12 breeding ponds distributed within the species historic range:

      a) One metapopulation in Block #1 (Louisiana: Portions of St. Tammany, Tangipahoa, and Washington Parishes, west to the Tangipahoa River);

b) Two metapopulations each in Block #2 (South-Central Mississippi: North of State Hwy. 26, between the Pearl and Pascagoula Rivers; Forrest County and portions of George, Greene, Jones, Lamar, Marion, Pearl River, Perry, Stone, and Wayne Counties) and Block #3 (South Mississippi: South of Hwy. 26, between the Pearl and Pascagoula Rivers; Hancock and Harrison Counties, and portions of Jackson, George, Pearl River, and Stone Counties); and

c) One metapopulation in either Block #4 (Eastern Mississippi: East of Pascagoula/Leaf Rivers; portions of George, Greene, Jackson, Perry, and Wayne Counties) or Block #5 (Alabama: West of the Mobile River Delta; Mobile and Washington Counties, and a small portion of Choctaw County).

2) Long-term monitoring (at least 10 years) of each metapopulation documents population viability (viability standard to be defined through a recovery task). The 10-year timeframe will allow monitoring recruitment events and other population attributes in a species that has been characterized by highly variable reproductive and survival rates. In each of at least two annual breeding events within a three-year period, a total of 30 egg masses per metapopulation must be documented and natural recruitment must be verified.

3) Breeding and adjacent upland habitats within the six metapopulations are protected long-term through management agreements, public ownership, or other means, in sufficient quantity and quality (to be determined by recovery task) to support growing populations.

4) Studies of the dusky gopher frog's biological and ecological requirements have been completed and measures necessary for recovery discovered during these studies are being implemented and are showing progress.

* A **viable** population is one that is large enough to maintain sufficient genetic variation to enable it to evolve and respond to natural habitat and environmental changes, and exhibits parameters consistent with a stable or increasing reproductive rate, without the addition of frogs raised in artificial environments or introduced from other populations. Viable populations generally consist of multiple age classes of individuals, including newly recruited juveniles. In addition, a dusky gopher frog population should be supported by habitat containing breeding ponds and their surrounding uplands. To be a viable population, a dusky gopher frog population must be a **metapopulation**. Two or more breeding ponds within dispersal distance of one another function as a metapopulation; if breeding conditions for the species are not met by certain ponds in one or more years, the species may persist by breeding at other nearby ponds. For the purposes of this recovery plan, a dusky gopher frog metapopulation will be defined as two or more occupied breeding ponds, individually separated from each other by a mile (1.6 kilometer) or less, within a contiguous area of suitable habitat with no major barriers to dispersal (e.g., major highways, rivers, developed areas, etc.) between ponds.

C. Updated Information and Current Species Status

1. Biology and Habitat

Data on abundance, population trends, demographics, distribution, habitat, taxonomic classification, genetics and translocations were summarized in the 2015 5-year review (USFWS 2015b). At the time of the last 5-year review there was one known wild population and two reintroduced populations of the dusky gopher frog. Currently there is one known wild population, and seven reintroduced populations. Details of new information are summarized below.

Population trends, translocations, and releases

Recovery Block #1. This area is in the western portion of the dusky gopher frog range in Louisiana. Discussions are ongoing with the Louisiana Department of Wildlife and Fisheries concerning potential translocation sites; however, no extant dusky gopher frog populations have been found in the state and no reintroductions have occurred. Designated Critical Habitat in the state of Louisiana was vacated by Consent Decree dated July 3, 2019 (U.S. District Court for the Eastern District of Louisiana 2019).

Recovery Block #2. This block includes areas of the DeSoto National Forest (DNF) in South-Central Mississippi. In conjunction with DNF, habitat improvements have occurred at four potential DNF breeding ponds. Translocations have begun at three: Ashe Pond South in Forrest County (2016), Upper Mars Hill Pond (2015), and Steve's Pond (December of 2019) in Perry County. Translocations of metamorphic frogs to these sites are continuing (Lee 2015, 2016, 2017, 2018, 2019, 2020; Pechmann and Smith 2017, Pechmann *et al*. 2018, 2020a, 2020b; Pechmann *et al.* 2019), while the fourth: Scaphiopus Pond is considered ready for translocations. The source of metamorphic frogs, head-started from tadpoles in tanks, for these and all other sites are primarily from the Glen's Pond population. Natural breeding occurred for the first time at Ashe Pond South in November of 2018 and at Upper Mars Hill Pond in February 2018, and breeding at both sites has continued annually through 2020 (Lee 2018, 2019, 2020b; Pechmann *et al*. 2019, Pechmann *et al*. 2020a, 2020b). Adult recruitment from natural breeding events at each translocation site is unknown because we have been unable to establish and run drift fences, required for demographic monitoring. However, the hydroperiods at each site appeared to be adequate after all documented breeding events to allow tadpoles enough time to reach metamorphosis.

Recovery Block #3. This area has been the primary focus of dusky gopher frog recovery efforts to establish multiple metapopulations. It includes parts of the DNF in Southern Mississippi located in Harrison County.

The first metapopulation consists of a population of frogs that occurs in an area supported by three breeding ponds on the DNF: Glen's Pond, Pony Ranch Pond,

and New Pond. Presently, we estimate that a minimum of 249 adult dusky gopher frogs survive in the wild, the vast majority of which occur within this metapopulation (Pechmann 2021). Since the last five-year review, dusky gopher frog breeding has been observed at Glen's Pond (the primary breeding site for the species) in each of the five breeding seasons from 2015/2016 through 2019/2020 (Pechmann *et al*. 2016, Pechmann and Smith 2017, Pechmann *et al*. 2018, 2020a, 2020b; Pechmann *et al*. 2019). However, drought conditions have limited natural recruitment as the timing and quantity of rainfall in three of these seasons was insufficient to support tadpoles achieving metamorphosis. In the remaining two breeding seasons, where hydroperiod was adequate (2015/2016 and 2017/2018), an unnamed disease (protist-parasite: *Dermomycoides* sp. or *Perkinsea*-like) likely caused mass mortality of tadpoles in Glen's Pond; only 11 and 2 metamorphic frogs were observed each season, respectively (Pechmann *et al.* 2016, Pechmann and Smith 2017, Pechmann *et al*. 2018). Because of these impacts, the last time natural recruitment was substantial was during the 2014/2015 breeding season (N=932 metamorphosed frogs; Pechmann *et al*. 2016).

Breeding has been observed at Pony Ranch Pond since 2015; however, natural recruitment has likely been limited by the same unnamed disease found at Glen's Pond because hydroperiod has been sufficient in the majority of the last five years (Pechmann *et al*. 2016, Pechmann and Smith 2017, Pechmann *et al*. 2018, 2020a, 2020b; Pechmann *et al*. 2019). New Pond was created (2003) for the dusky gopher frog in an area of DNF east of Pony Ranch Pond and a limited number of tadpoles have been released there, but survival was unlikely. Breeding activity was observed at this pond in 2016, 2017, and 2018, which was likely the result of dusky gopher frogs migrating from Glen's or Pony Ranch Pond (Pechmann *et al*. 2016, Pechmann and Smith 2017, Pechmann *et al*. 2018). Natural recruitment at New Pond is unknown because continuous monitoring has not been performed.

The second potential metapopulation in Jackson County, Mississippi encompasses a population of dusky gopher frogs that occur on Old Fort Bayou Mitigation Bank (OFBMB) owned by The Nature Conservancy (TNC), and the Mississippi Sandhill Crane National Wildlife Refuge (MSCNWR). During each season from 2015/2016 to 2019/2020, breeding has occurred at TNC Pond 1 at OFMB (Lee 2015, 2016, 2017, 2018, 2019, 2020b). The first dusky gopher frog introductions occurred at TNC Pond 1 in 2004; however, the viability of these translocated individuals has yet to be determined (Lee 2020b). Annual releases of metamorphic dusky gopher frogs began at Justin's Pond (previously Sawdust Pond) on MSCNWR in 2015 (Dedrickson and Hereford 2016). Breeding has been documented at Justin's Pond in 2018, 2019, and 2020 (Dedrickson and Hereford 2017, 2018, 2019, 2020).

Efforts are underway to **establish a third metapopulation** at the Ward Bayou Wildlife Management Area (WBWMA) in Jackson County, Mississippi, which

contains two potential dusky gopher frog breeding ponds: Mayhaw Pond and Gil's Pond. Releases of captive-bred frogs began in 2017 at Mayhaw Pond and Gil's Pond, and continued in 2018-2020 (Reichling and Lance 2018, Reichling *et al.* 2019, Reichling and Marcec-Greaves 2019, 2021). Calling male dusky gopher frogs were first heard at both ponds in 2020 (Lee 2020b, Reichling *et al.* 2021). Survival of released frogs has been documented through observations of adult frogs in gopher tortoise burrows and other underground sites on WBWMA (Reichling *et al*. 2019, Reichling and Marcec-Greaves 2019, Lee 2020a, pers. comm.) and through a radio-telemetry study of frogs post-release that documented their movements in the uplands to burrows, stumpholes, and other below ground refugia (Roznik and Reichling 2021).

The **potential for a fourth metapopulation** exists at the Mike's Pond property owned by TNC in Jackson County, Mississippi. A naturally occurring dusky gopher frog population was discovered in 2004 at Mike's Pond. At its discovery, it was likely the population was in decline and no dusky gopher frogs have been observed there since 2013 (Lee 2015, 2016, 2017, 2018, 2019). Powerline Pond, which is an additional pond on this TNC property located within dusky gopher frog migratory distance of Mike's Pond, has been improved to create another potential breeding site. Beginning in 2018, TNC translocated metamorphic frogs to Powerline Pond (Lee 2018, 2019, 2020b). In 2020, dusky gopher frog breeding occurred for the first time at Powerline Pond and for the first time in a decade at Mike's Pond (Lee 2020b). Future monitoring will be needed to determine the viability of this population.

Recovery Block #4. This recovery block occurs in Eastern Mississippi east of the Pascagoula River drainage. A dusky gopher frog was observed in 2004 at McCoy's Pond in Jackson County, Mississippi; however, no breeding has been observed since its discovery and this population is assumed to be extirpated. No other recovery actions have been implemented in Block #4.

Recovery Block #5. This area is in Mobile and Washington counties, Alabama, in the easternmost portion of the dusky gopher frog's range. To date no wild populations have been discovered. A project is ongoing with the Alabama Department of Conservation and Natural Resources, Auburn University, and other partners to identify potential translocation sites; however, no specific location has been chosen.

Genetics

Dr. Stephen Richter at Eastern Kentucky University and K.M Hinkson at the Memphis Zoo collaborated on genetic analysis of the AZA's captive dusky gopher frog population. Their study results indicate that the genetics of the captive population reflect the wild population; additionally, many captive individuals are unrelated based on relatedness measures (Richter 2012, Hinkson and Richter 2016, Hinkson *et al.* 2016).

Hinkson (2019) conducted a genetic comparison among the three breeding populations that comprise the Glen's Pond metapopulation. Despite the small size of the satellite populations at Pony Ranch Pond and New Pond, these populations have similar levels of genetic variation as Glen's Pond frogs (Hinkson 2019). Genetic variation within the metapopulation has remained stable since the last assessment in 2014 indicating that there appears to be no current inbreeding depression and sufficient gene exchange (Hinkson *et al.* 2016). In addition, New Pond has seven unique alleles not represented in samples from Glen's Pond or Pony Ranch Pond and this result could indicate increased evolutionary potential in the New Pond population (Hinkson 2019); however, more investigation is needed.

2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms):

Available information on threats, conservation measures, and regulatory mechanisms are described in the 2015 dusky gopher frog 5-year review (USFWS 2015b). All of the threats discussed in the past review are still valid and considered current threats for the species. Destruction and habitat modification remain significant threats to the species and have resulted in the small, isolated populations we see today. These small populations continue to be threatened by disease and drought that have limited much of the potential recruitment each year since the last review and are expected to remain limiting factors to future recruitment. As discussed in the past review, current regulatory mechanisms are inadequate to completely protect this species and its habitat.

New information is discussed below:

Disease or predation:

The lethal unnamed disease (protist parasite: *Dermomycoides* sp. or "*Perkinsus*-like") which caused a mass die-off of gopher frog tadpoles in 2003 was once again thought to be responsible for the low natural metamorphic recruitment at Glen's Pond, the main breeding site, and also Pony Ranch Pond, an additional breeding site located within the Glen's Pond metapopulation from 2015-2018. Despite adequate hydroperiods in both the 2015/2016 and 2017/2018 breeding seasons, only 11 and 2 metamorphosed gopher frogs (respectively) were observed emerging from Glen's Pond (Pechmann *et al*. 2016, Pechmann *et al*. 2018). Survival to metamorphosis has been low at Pony Ranch Pond despite adequate hydroperiod, since breeding was first observed, and the unnamed disease is thought to be responsible (Pechmann *et al*. 2017, Pechmann and Smith 2017, Pechmann *et al*. 2018, Smith 2020). The disease does not appear to negatively affect adult dusky gopher frogs and multiple years of high juvenile recruitment have occurred at Glen's Pond between the initial documented disease outbreak in 2003 and the two recent outbreaks (Pechmann *et al.* 2017). However, it is unknown what effect the disease will ultimately have on the maintenance of the metapopulation. Glen's Pond has had very little (≤ 11) or zero natural recruitment in the last five years due to a combination of insufficient hydroperiod and disease (Pechmann and Smith 2017, Pechmann *et al*. 2018, 2020a 2020b; Pechmann *et al*. 2019). When breeding has occurred at Glen's Pond, tadpoles

have been head-started and some of the resulting metamorphic frogs have been released there to supplement the population.

Other natural or manmade factors affecting its continued existence:

Between the 2016/2017 season and the last breeding season 2019/2020, natural recruitment did not occur at Glen's Pond due, in part, to insufficient rainfall (Pechmann and Smith 2017, Pechmann *et al*. 2018, 2020a, 2020b; Pechmann *et al*. 2019). Although rainfall variability is a result of natural processes, extreme weather events such as drought may increase because of global climate change. When rainfall variability is combined with other threats such as disease, population isolation, small population size, and low reproductive potential, dusky gopher frog populations may be threatened to the point that they cannot recover.

The potential for new population establishment has been limited because only the Glen's Pond population has had breeding with enough egg masses to supply frogs needed for translocation. The loss of the Glen's Pond population would severely limit the potential for recovery of the dusky gopher frog.

D. Synthesis

Since the last 5-year review, dusky gopher frogs have been translocated to five new sites and breeding has been documented at three of them. In addition, breeding has been documented at two sites where releases began in 2015 (as described in the previous 5-year review) and at Mike's Pond where the wild population was considered extirpated and subsequently used as a translocation site. Although documented breeding is promising for the species, limited recruitment of young into the adult population at all these sites remains a concern for the species and needs to be monitored.

The Glen's Pond metapopulation, supported by the Glen's Pond, Pony Ranch Pond, and New Pond breeding sites, remains the only metapopulation considered viable at this time due to the number of adult frogs that breed at these sites. Breeding activity during the last five seasons at these sites has resulted in limited recruitment; however, egg masses laid have supported a head-starting program that has provided metamorphic frogs for this population and translocations at new sites. Inadequate hydroperiod and disease have been the primary drivers of the limited natural metamorphic recruitment the last five years.

In addition to translocations using head-started metamorphic frogs from the wild population, the Memphis Zoo and AZA partners are breeding dusky gopher frogs in captivity and have released them at WBWMA since 2017. Although breeding at WBWMA has not yet been documented, calling males were heard at both ponds in 2020 and this represents an initial benchmark of success for the releases.

It is estimated that 249 adult dusky gopher frogs breeding in the wild, with the majority at Glen's Pond. When rainfall variability is combined with other threats such as disease, population isolation, small population size, low genetic variability,

and low reproductive potential, we believe the dusky gopher frog continues to meet the definition of an endangered species.

III. RESULTS

A. Recommended Classification: No change is needed.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- Protect existing wild dusky gopher frog populations through habitat restoration, management, and other conservation techniques.
- Monitor dusky gopher frog populations and their habitat.
- Head-start dusky gopher frog tadpoles in cattle tanks as a hedge against breeding pond drying and as a source of frogs for translocation projects.
- Continue searches for additional dusky gopher frog populations.
- Continue translocation projects to establish additional dusky gopher frog breeding populations consisting of multiple breeding ponds within dispersal distance of each other (metapopulations).
- Conduct a population and habitat viability analysis (PHVA) and develop the necessary supporting research.
- Implement the Dusky Gopher Frog Controlled Propagation and Reintroduction Plan to facilitate use of captive-bred dusky gopher frogs in new population establishment efforts.
- Continue to conduct research on the ecological needs and natural history of the dusky gopher frog.
- Study the unnamed protist: *Dermomycoides* sp., also known as "*Perkinsus*-like" disease, which was the causative agent in the 2003, 2016, and 2018 massive dusky gopher frog tadpole die-offs in Glen's Pond.
- Continue to work with Federal, state, local government, and non-governmental agency partners on recovery efforts for the dusky gopher frog.

V. REFERENCES

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

of

Dusky Gopher Frog (*Rana sevosa*)

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

_____ Downlist to Threatened
_____ Uplist to Endangered
_____ Delist
__X__ No change needed

Review Conducted By: John Tupy, Mississippi Ecological Services Field Office

FIELD OFFICE APPROVAL:

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

STEPHEN RICKS Digitally signed by STEPHEN RICKS Date: 2021.07.26 15:04:11 -05'00'

Approve _____ Date _____

***** Since 2014, Southeast Region Field Supervisors have been delegated authority to approve 5-year reviews that do not recommend a status change.