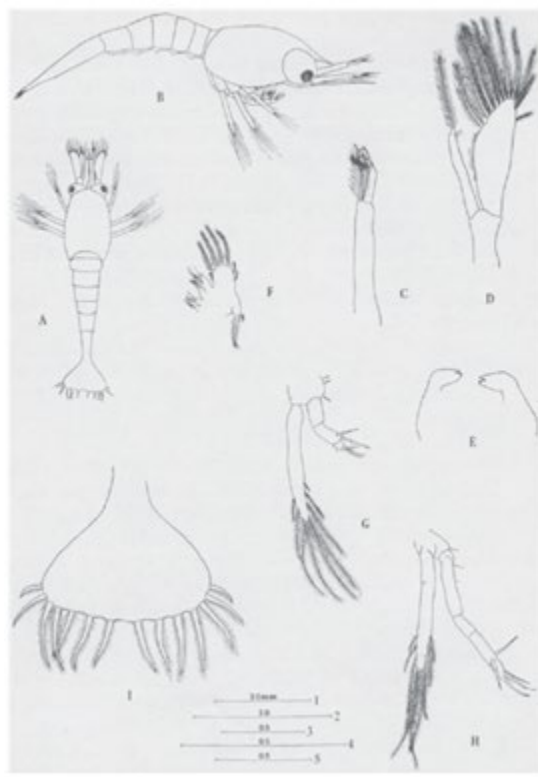


## **Squirrel Chimney Cave Shrimp (*Palaemonetes cummingi*)**

### **5-Year Review: Summary and Evaluation**



Source: Dobkin (1971) *Crustaceana*, Vol. 20, No. 3, p. 288.

**September 2021**

**U.S. Fish and Wildlife Service  
Southeast Region  
Jacksonville Ecological Services Field Office  
Jacksonville, Florida**

## **5-YEAR REVIEW**

### **Squirrel Chimney Cave Shrimp (*Palaemonetes cummingi*)**

#### **I. GENERAL INFORMATION**

##### **A. Methodology used to complete the review:**

The U.S. Fish and Wildlife Service’s North Florida Ecological Services Office completed this review of the Squirrel Chimney cave shrimp (*Palaemonetes cummingi*) (SCCS). All literature and documents used for this review are on file at the Jacksonville Field Office and are cited in the References section. We used published literature; technical reports; data and information on the Internet; unpublished data; and personal communications with biologists and researchers. Public notice of this review was given in the Federal Register on September 23, 2014, with a 60-day public comment period (79 FR 56821). No public comments were received for this review. None of this review was contracted to outside parties. The draft of this document was distributed for peer review (see Appendix A) and comments received were addressed.

##### **B. Reviewers**

**Lead Region:** South Atlantic-Gulf Region, Carrie Straight, (404) 679-7226

**Lead Field Office:** FESFO, Jacksonville, Bill Brooks, (904) 731-3136

##### **C. Background**

**1. Federal Register Notice citation announcing initiation of this review:** September 23, 2014, 79 FR 56821.

**2. Listing history**

Original Listing

Federal Register Notice: 55 FR 25588

Federal Register Notice date: June 21, 1990

Effective listing date: August 20, 1990

Entity listed: Species

Classification: Threatened

**3. Associated rulemakings**

None

**4. Review History**

Each year, the Service reviews and updates listed species information for inclusion in the required Recovery Report to Congress. Through 2013, we did a recovery data call that included status recommendations as “Unknown” for this shrimp. We continue to show

that species status recommendation as part of our 5-year reviews. The most recent evaluation for this shrimp was completed in 2021.

**5. Species' Recovery Priority Number at start of review**

5c (the 5 indicates a high degree of threat and low recovery potential; the "c" reflects a high degree of conflict).

Degree of Threat: *High*

Recovery Potential: *Low*

Taxonomy: *Species*

**6. Recovery Plan**

Recovery Plan: Exempted. On August 4, 1993, the Jacksonville Field Office determined that a recovery plan for the SCCS would not further the conservation of the species for the following reason: This species is only known from the Squirrel Chimney, a small sinkhole near Gainesville, Alachua County, Florida; and the site is privately owned. Preparation of a recovery plan would not further the conservation of the species.

Recovery Outline: On March 3, 2004, the Jacksonville Field Office drafted a Recovery Outline for the SCCS species file.

Name of plan: *N/A*

Date issued: *N/A*

Dates of previous revisions: *N/A*

**II. REVIEW ANALYSIS**

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

- 1. Is the species under review listed as a DPS?** No. The ESA defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing DPS to only vertebrate species of fish and wildlife. Because the species under review is a plant, the DPS policy is not applicable.

**B. Recovery Criteria**

- 1. Does the species have a final, approved recovery plan containing objective, measurable criteria?** No. On August 4, 1993, the Jacksonville Field Office determined that a recovery plan for the SCCS would not further the conservation of the species. Exempted

**C. Updated Information and Current Species Status**

## 1. Biology and Habitat

### a. Summary of new information of species biology and life history:

No new information is available pertaining to the species biology and life history of the SCCS since the last 5-year review was prepared.

### b. Abundance, population trends, demography:

The SCCS was discovered in 1953 and described in 1954 (Chace 1954). It measures about 30 mm (1.2 inches) in total length and is transparent. The body and eyes are unpigmented and the eyes are reduced in size in comparison to surface dwelling species of *Polaemonetes*. The rostrum is long and serrated and the first and second pairs of legs are of nearly equal length. This species is only known from the Squirrel Chimney near Gainesville, Alachua County, and is the only cave shrimp in Florida. Walsh (2001) notes that nearly one third of the endemic stygobitic fauna found in Florida karst habitat are only known from one cave system.

No more than a dozen collections of the SCCS have been made since its discovery in 1953; its last observation was in 1973 (Franz 1982). The most recent status surveys were conducted between 1994 and 1996 (Doonan 2001). The Squirrel Chimney was surveyed eight times. Potentially occupied sites including nearby Cherry Pits Cave, Herzog Cave, and Hog Sink were each surveyed twice; and Bat Cave was surveyed once. No SCCS or evidence (e.g., shed exoskeletons) were collected or observed during these surveys. Other potentially occupied sites were identified but were not surveyed because the landowner would not allow access, sites had become degraded and ephemeral, or sites could not be located (Doonan 2001). As of July 2021, no additional surveys have been conducted for the species. Resiliency is the ability to sustain populations through the natural range of favorable and unfavorable conditions (Redford et al. 2011). If future surveys are conducted of Squirrel Chimney and other identified suitable areas, and SCCS are found, then resilience should be reassessed. Opportunistic surveys of nearby cave systems have not documented the presence or evidence of SCCS (Paul Moler, Florida Fish and Wildlife Conservation Commission-retired, personal communication, 2007).

Based upon the findings from the 1994-1996 surveys, no documentation of SCCS in recent years, and the discovery of a predatory fish species within the Squirrel Chimney, the redeye chub (*Notropis harperi*, a small predatory fish) (Morris and Butt 1992). The Florida Game and Freshwater Fish Commission, one of the predecessors to the Florida Fish and Wildlife Conservation Commission, petitioned the Service in 1997 to reconsider the federal listing of the SCCS due to its potential extinction. The Service found that the petition did not present substantial information indicating that delisting this species due to extinction was warranted. The Service based its finding on the inadequacy of the existing information. The status surveys did not include a number of sink and cave systems within 8.1 km (5 miles) that were ecologically similar to the Squirrel

Chimney. These caves and sinks are all part of the Newberry Limestone Plain and characteristic of the karst (limestone) topography of this area and are likely interconnected through underground features (Williams et al. 1997, Doonan 2001). Such passageways may provide shelter and travel corridors for dispersal of the SCCS (USFWS 1998).

**c. Genetics:**

No information is available regarding SCCS genetics.

**d. Taxonomic classification or changes in nomenclature:**

The Integrated Taxonomic Information System (2016) was checked while conducting this review. There are no proposed changes in the taxonomic classification or in nomenclature.

According to Hobbs and Lodge (2010) in *Ecology and Classification of North American Freshwater Invertebrates* edited by Thorp and Covich, the Squirrel Chimney cave shrimp belongs to the family *Palaemonidae* and is a strictly freshwater inhabitant. Cave shrimp that are palaemonids in the U.S. are:

1. *Calathaemon holthuisi* (Streth) (Purgatory cave shrimp) found in a cave in Hays County, TX.
2. *Palaemonetes antrorum* Benedict (Balcones cave shrimp) found in wells and caves in Hays and Uvalde counties, TX. These are federally endangered cave shrimp.
3. *Palaemonetes cummingi* Chace (Squirrel Chimney cave shrimp) found in a cave in Alachua County, FL. This is currently listed as vulnerable (threatened) on the 1996 IUCN Red List of Threatened Animals.

**e. Distribution and trends in spatial distribution:**

Redundancy is the ability of a species to withstand catastrophes by possessing numerous populations distributed in space (Mangel and Tier 1993). The SCCS has a very low redundancy as it's only known location is Squirrel Chimney. Any catastrophic disaster would render the only known existence of this species extinct.

This small, deep sinkhole leads to a flooded cave system formed within the Crystal River Formation of the Ocala Group limestone. This formation underlies the Newberry Limestone Plain and is characteristic of karst topography. This relatively flat karst plain has numerous caves and sinks and connections between underground features do occur. Caves in this area support a variety of terrestrial and aquatic habitats (Franz 1994b). Several of the sink and cave systems within 5 miles are ecologically similar to Squirrel Chimney. There are similar assemblages of cavern dwelling species in these nearby underground sites, but no SCCS have been documented. The discovery of the redeye chub (a small predatory fish capable of eating crustaceans the size of SCCS larvae) within the Squirrel Chimney system (Morris and Butt 1992) and its presence at other nearby underground sites indicate that fissures found at Squirrel Chimney may represent

underwater connections to these other sites (Doonan 2001). The presence of the redeye chub may be one factor responsible for the apparent absence of the SCCS from the Squirrel Chimney system. However, this same evidence suggests that passageways to nearby cave systems could shelter SCCS and provide for their dispersal. As noted above in a. Abundance, population trends, demographic features, or demographic trend Walsh (2001) indicates that nearly one third of the endemic stygobite (aquatic) fauna of Florida karst habitat are only known from one cave system and two thirds of the taxa are reported from ten or less localized aquatic caves, which indicate connectivity between sites.

It is interesting to note that Hobbs and Lodge (2010) cited three other species of palaemonids that have become naturalized in the U.S. after escaping from aquaculture. All these escapes have occurred on the U.S. West Coast, not on the East Coast where the SCCS is located. These species include:

1. *Palaemon macrodactylus* Rathbun (Asian oriental shrimp). This species is now found in coastal drainages along the Pacific coast from CA to OR.
2. *Exopalaemon carinicauda* (Holthuis) (Ridgetail prawn). This species was introduced into the Sacramento River Delta system in CA and is thought to be from China or Korea.
3. *Exopalaemon modestus* (Heller) (Asian Siberian prawn). This species is now found in coastal drainages in CA, OR, and WA.

There have been other species of palaemonids which have been found on the U.S. East Coast that are likely the result of escapes from aquaculture or intentional release but are not cave shrimp and were not described as naturalized. These include:

1. *Litopenaeus vannamei* (Boone) (penaeid Pacific white shrimp) in SC, TX, AZ, IL, IN, and MI.
2. *Macrobrachium rosenbergii* (de Man) (giant Malaysian prawn) in FL, MS, and SC.

**f. Habitat or ecosystem conditions:**

The entrance to the Squirrel Chimney cave system is a steep to vertical sloped sink that leads to a shaft that is 0.9-1.8 m (3-6 ft) wide and extends 14 m (45.9 ft) down to the water surface in the main cave (Doonan 2001). It is a typical vertical solution tube or shaft and thus referred to as a “chimney.” The main cave is approximately 22 m (72.2 ft) wide and 34 m (111.6 ft) long with 15 m (49.2 ft) of water at the deepest point. Below the water’s surface are bedding plane tunnels, ledges, a debris cone and an opening to an air chamber. Morris and Butt (1994) and Doonan (2001) provide a complete description of the Squirrel Chimney cave system. During the 1995 surveys of Squirrel Chimney, Doonan (2001) found that the water temperature remained constant at approximately 20°C; the water level was stable at approximately the same level recorded in 1992; and that the water chemistry/quality was good (met Florida standards for drinking water; and was similar to samples collected in 1992). As described above, the Squirrel Chimney

and other nearby cave systems support a variety of rare cave dwelling terrestrial and aquatic wildlife.

Representation is the ability of a species to adapt to both near-term and long-term changes in its physical (climate conditions, habitat conditions, habitat structure, etc.) and biological (pathogens, competitors, predators, etc.) environments (Nicotra et al. 2015). With the absence of genetic data, use of variability in habitat or ecosystem conditions is often used as a proxy for representation. The SCCS has only has one representative unit present in one formation being Squirrel Chimney. If in the future the SCCS is found in other formations, then there could potentially be two or more units.

The SCCS is found in the number four hydrologic subregion, known as the Aucilla-Suwannee subregion. According to the report by Walsh (2001), Subregion 4 is characterized by a unique combination of hydrological, geological, and ecological features that is known as Ocala Fauna. Walsh described this area as, “six geographically- and faunistically-distinct assemblages occurring in mature and riverine karst areas associated with the Ocala Group limestones from the Suwannee River drainage southward to Pasco County.”

The Squirrel Chimney remains in private ownership and continues to be maintained as an oak hammock and pine plantation. The landscape immediately surrounding Squirrel Chimney appears to be stable and remains as a rural mixed-use area of pasture, agriculture, and planted pine plantation. However, with its close proximity to the City of Gainesville and Interstate 75, the landscape appears to be changing with planned neighborhood developments increasing to the east of Squirrel Chimney. There are also several industrial mineral extraction pit mines within 3 miles. Other than an apparent drop in water levels between the 1970 surveys and 1990 surveys (Franz 1994a), there were no indications of any significant change in the physical environment at Squirrel Chimney (Doonan 2001).

Florida Wildlife Action Plan (2012) indicates that Florida’s aquatic caves are in poor and declining condition. The plan ranks the threats to aquatic cave habitat as medium with the following as threats: habitat destruction or conversion; habitat degradation/disturbance; altered species composition/dominance; altered hydrologic regime; keystone species missing or lacking in abundance; erosion/sedimentation; altered water quality or surface water or aquifer contaminants; and altered community structure. Recommended conservation actions for aquatic caves are intended to prevent harm to cave and other ecosystems influenced by groundwater through the development of numeric nutrient criteria specific to cave systems. These conservation actions are also to prevent physical destruction or degradation of cave habitat from recreational activities (e.g., diving) and to upgrade or retrofit cave entrances and infrastructure for access (Florida Wildlife Action Plan 2012).

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

The purpose of a 5-Year Review is to recommend whether a listed taxon continues to warrant protection under the ESA and, if so, whether it should be reclassified (from threatened to endangered or from endangered to threatened). This task requires that the analysis of the threats to the species be performed while assuming that the species is not receiving the regulatory protections, funding, recognition, and other benefits of ESA listing. Summaries of ongoing applications of ESA protections may shed light on some future activities that constitute threats to the species. However, the analysis under Factor D (Inadequacy of Existing Regulatory Mechanisms) focuses on the adequacy of existing alternative (i.e., non-ESA) mechanisms to address the continuing and foreseeable threats.

**a. Present or threatened destruction, modification or curtailment of its habitat or range:**

The SCCS listing rule noted that potential residential development and changes in land use were the primary threats. As this species is known from only Squirrel Chimney, a small sinkhole that leads to a flooded cave system, any detrimental change to the sinkhole or the underlying aquifer has the potential to adversely affect or cause the extinction of the species. These factors continue as the primary threats to the SCCS.

A map of future land use in Alachua County, FL is shown in the Figure 1 below (Alachua County, 2012). There are additional maps describing future land use for the Alachua County including environmental and other future land use maps (Alachua County, 2012).

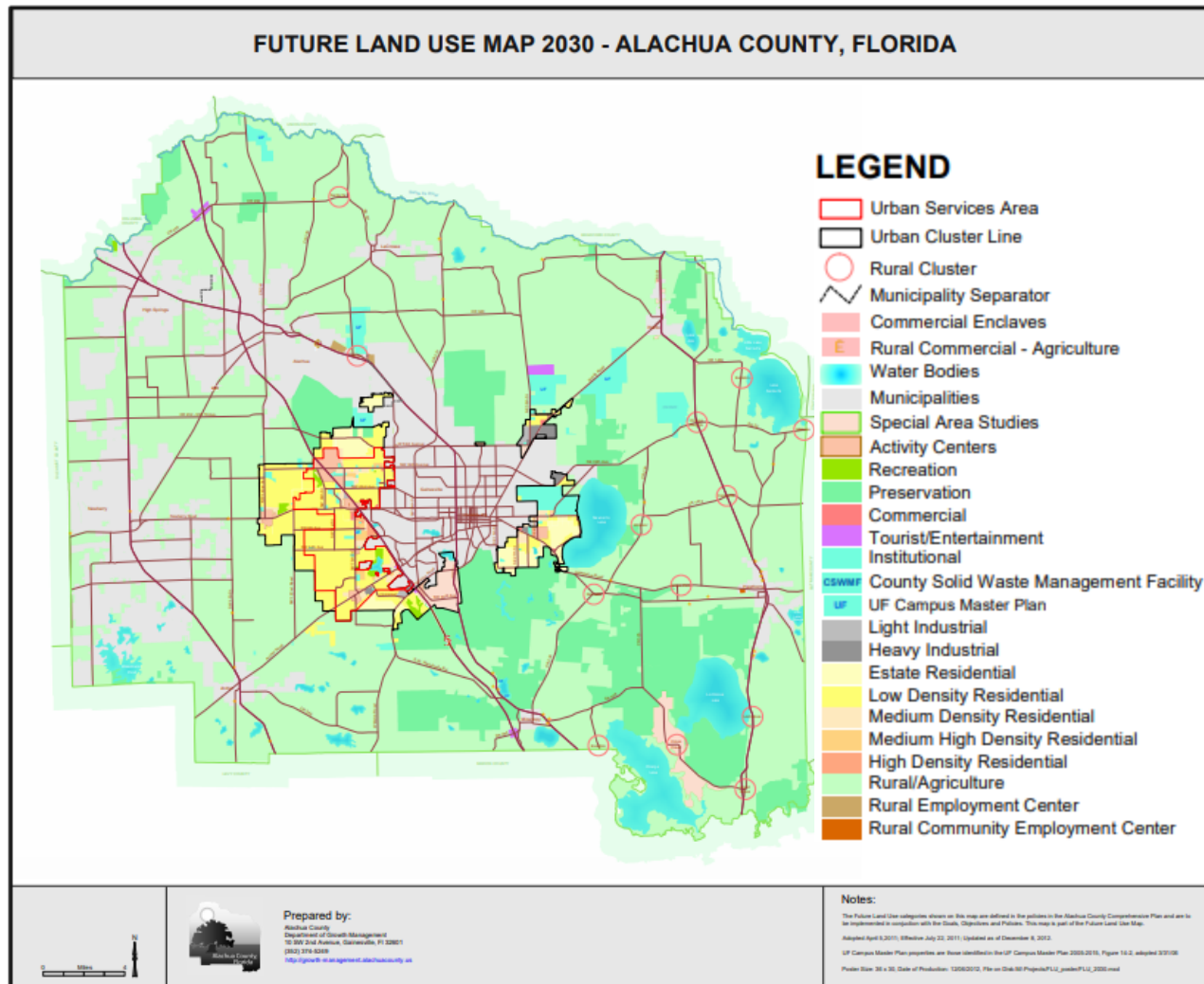


Figure 1. From [Alachua County \(2012\)](#) future land use map 2030.

According to a report by Streater (2009), when cave groundwater hydrology is threatened, the source of the threat is primarily from surface activity. Streater (2009) also noted that, “karst aquifers are particularly vulnerable to surface pollution,” due to the hard rock making these systems easy to pollute.

The three (3) industrial mineral extraction pit mines within three miles of SCCS shown in Figure 2 are: 1) Newberry Plant; Florida Rock Industries having the commodity of cement; 2) Newberry Pit; Limerock Industries, Inc. having the commodity of crushed stone; and 3) Limestone Quarry; Limestone Products, Inc. having the commodity of crushed stone. According to the EPA (2019), cement plants are the third largest industrial source of pollution by serving as a significant source of sulfur dioxide, nitrogen oxide, and carbon monoxide. Nitrogen oxide has been known to lead to adverse environmental impacts including acid rain and water quality deterioration. Sulfur dioxide also contributes to acid rain.

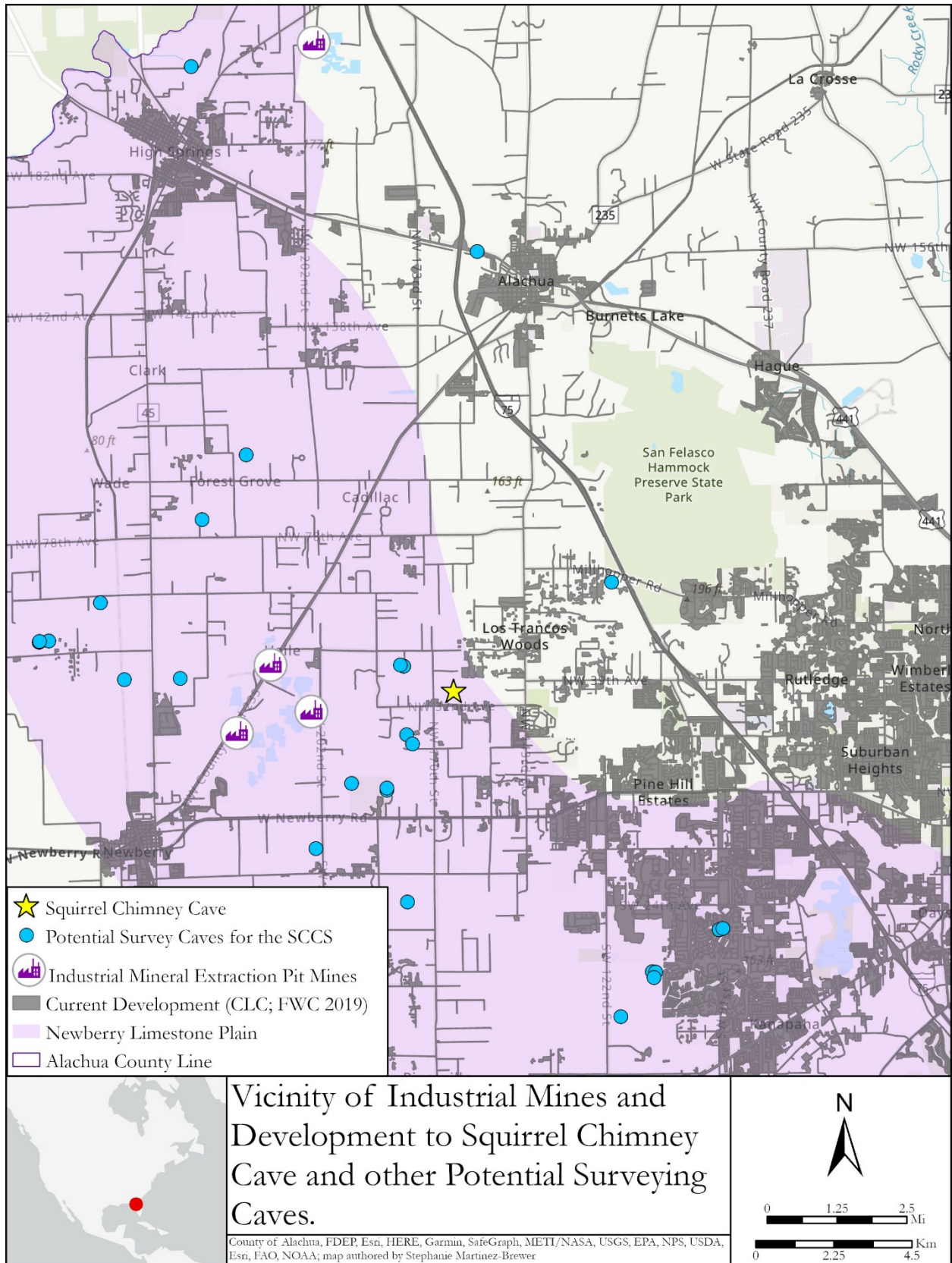


Figure 2. Industrial mineral extraction pit mines located near SCCS.

**b. Overutilization for commercial, recreational, scientific, or educational purposes:**

The SCCS listing rule stated that this species is known from one site that could be seriously damaged by a single act of vandalism. This is still a threat today; however, we have included it under Factor E below. The population size of the SCCS is unknown but is likely very small and vulnerable to impacts from scientific or other collecting.

**c. Disease or predation:**

The 1990 listing noted that disease and predation were not known to be affecting the SCCS. However, Morris and Butt (1992) documented the presence of a new endemic fish species within the Squirrel Chimney, the redeye chub, a small predatory fish capable of eating crustaceans the size of SCCS larvae. In the 1997 petition to delist the SCCS due to extinction, the presence of the redeye chub was identified as a plausible explanation for the apparent absence and possible extinction of the SCCS from Squirrel Chimney. Therefore, predation has been identified as a threat since listing.

In a study conducted in southwestern GA (Davis, Freeman, and Golladay, 2020), the redeye chub (*Pteronotropis harperi*) was found to be a species strongly associated with intermittent streams. An evaluation of the gastrointestinal tract from redeye chub collected from isolated pools showed this species to primarily consume aquatic items and was somewhat omnivorous, with freshwater sponges (Porifera) and midge larvae (Chironomidae) dominating the diet.

Yellow bullheads (*Ictalurus natalis*) are a similar fish to redeye chub that feed on a different cave shrimp in the same county. Relyea and Sutton (1973) suggested that juvenile bullheads in two caves in Alachua County that are 10 miles from the nearest above ground drainage, indicates possible spawning in the cave system. This fish is normally not a cave species, but some have adapted to subterranean use at some point in their lifecycle.

**d. Inadequacy of existing regulatory mechanisms:**

The listing rule noted that no existing regulatory mechanisms apply to the SCCS. Since there is no information on the SCCS's sensitivity to common pollutants, Federal water quality laws (e.g., Clean Water Act) and those laws administered by the State, may or may not be protective of the SCCS, especially since limitations and monitoring of groundwater are not common regulatory practices.

The SCCS is listed by the State of Florida as a threatened species. Florida State Law (Chapter 68A-27.004, Florida Administrative Code) prohibits taking of individuals of state-listed threatened species, or parts thereof, except as authorized; however, the statute does not prohibit destruction or modification of habitat occupied by threatened species. Because the SCCS is listed by the State of Florida, these protective regulations apply to this species on State properties and private properties.

**e. Other natural or manmade factors affecting its continued existence:**

The listing rule noted that other natural or manmade factors were not known to be affecting the SCCS at the time of listing. However, natural droughts, as well as water withdrawals for human use, can impact cave water levels. Predicted increases in drought frequency, intensity, and duration could be a threat. Prolonged drought conditions could impact water levels and chemistry. Water in aquatic caves is generally high in mineral content depending on the source. Species like the SCCS may have adapted to specific water chemistry endemic to that aquatic cave system. Changes in land use in the recharge area can accelerate pollutant delivery to the aquifer system associated with the Squirrel Chimney system. Other potential threats include contaminant spills in the recharge area. Also, a single act of vandalism could seriously damage the only known site of occurrence.

**D. Synthesis:**

The Squirrel Chimney cave shrimp, Florida's only cave shrimp, is known from one location, the Squirrel Chimney near Gainesville, Alachua County. There are no more than 12 records of this species dating from its discovery in 1953 to and its last collection in 1973. The last status survey of the Squirrel Chimney and several nearby cave systems (1994-1996) did not document the SCCS or find evidence of the SCCS. A 1992 survey documented the presence of a new fish species within the Squirrel Chimney, the redeye chub. This fish is a small predator capable of eating crustaceans the size of SCCS larvae and may explain the apparent absence of the SCCS from the Squirrel Chimney. In 1997, the Service was petitioned to reconsider the federal listing of the SCCS due to its potential extinction. The Service found that the petition did not present substantial information indicating that delisting this species due to extinction was warranted. The Service based its finding on the inadequacy of the existing information, as the status surveys did not include a number of sink and cave systems within 5 miles that are ecologically similar to the Squirrel Chimney. These caves and sinks are all characteristic of the karst topography of this area and are likely interconnected through underground features. These features likely provided the travel corridors that allowed the redeye chub to establish a population within the Squirrel Chimney. Such passageways could also provide shelter and travel corridors for dispersal of the SCCS (USFWS 1998).

The current status of the SCCS remains unknown. Until additional surveys of the Squirrel Chimney cave and nearby ecologically similar cave systems is conducted, we will not know if the SCCS still occurs within this system of connected caves and underground passageways. Therefore, the Service recommends that the SCCS remain classified as threatened until such a survey can be conducted and its status reevaluated.

### III. RESULTS

#### A. Recommended Classification:

  X   No change is needed

### IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Work with private landowners regarding the protection and conservation of the Squirrel Chimney and other nearby ecologically similar caves and sink systems.

Acquire or obtain a conservation easement on Squirrel Chimney and other nearby ecologically similar caves and sink systems.

Conduct a survey to determine the status of the SCCS. *See Appendix B for prioritization table and GIS map pertaining to most suitable areas.*

Evaluate and consider establishing a captive breeding program for the SCCS as a recovery tool if deemed appropriate after the recommended survey.

Monitor groundwater quality and water levels of Squirrel Chimney and other nearby ecologically similar caves and sink systems.

Determine the origin (age, source and recharge area) of the Squirrel Chimney and other nearby ecologically similar caves and sink systems.

Use existing regulatory mechanisms to protect the SCCS and its groundwater habitat.

Develop and distribute educational and technical information materials essential for cave, sink, and recharge area stewardship.

Evaluate potential use of eDNA to detect the presence of SCCS at the Squirrel Chimney and other nearby similar caves. Environmental DNA (eDNA) is a surveillance tool used to monitor for the genetic presence of an aquatic species.

Provide best management practices for the conservation of aquatic caves and the species dependent upon them to public and private land owners. Provide assistance, funding and conservation easements to landowners who participate. Per Walsh (2001), all counties with aquatic caves should be targeted with a priority on Alachua (47 caves), Suwannee (43), Jackson (34) and Marion (27) (Walsh 2001).

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**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of Squirrel Chimney Cave Shrimp**  
**(*Palaemonetes cummingi*)**

**Current Classification:** Threatened

**Recommendation resulting from the 5-Year Review:**

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change needed

**Review Conducted By:** Annie Dziergowski, Florida Ecological Services Field Office,  
Jacksonville, FL

**FIELD OFFICE APPROVAL:**

**Lourdes Mena , Division Manager, Classification and Recovery, Florida Ecological  
Services Field Office, Fish and Wildlife Service**

Approve: \_\_\_\_\_

\* In 2021, the Classification and Recovery Division Manager in the Florida Ecological Services Field Office was delegated authority to approve 5-year reviews that do not recommend a status change.

## **APPENDIX A: Future Survey Prioritization Schema**

The SCCS is only known from one location, the Squirrel Chimney near Gainesville, Alachua County, with the last observation occurring in 1973 (Franz 1982). The current status of the species remains unknown. Until additional surveys of the Squirrel Chimney cave and nearby ecologically similar cave systems is conducted, we will not know if the SCCS still occurs within this system of connected caves and underground passageways. Previous status surveys did not include a number of sink and cave systems within 5 miles that are ecologically similar to the Squirrel Chimney. These caves and sinks are all characteristic of the karst topography of this area and are likely interconnected through underground features. These features likely provided the travel corridors that allowed the redeye chub to establish a population within the Squirrel Chimney. Such passageways could also provide shelter and travel corridors for dispersal of the SCCS (USFWS 1998).

To aid in future surveys, a prioritization table (see below) was developed to assess the most suitable locations, from 27 nearby caves and sinks, to locate potential SCCS in the vicinity. This table will aid in identifying locations within the nearby vicinity of Squirrel Chimney Cave and are illustrated in the map below. To create these prioritization tools, several biologically relevant metrics were used, including distance from squirrel chimney cave, physiographic zones, location of conservation lands, and adjacent land use/land classes.

A description of each metric used, and its justification is provided below:

### Physiographic Zones (e.g. Within Newberry Plain):

- Y (yes)- green (indicating higher probability)
- N (no)- yellow (indicating moderate probability)

Justification: Doonan (2001) only surveyed caves in the Newberry Plain and put emphasis that potential surveying caves would be within this boundary, bound to Alachua County; however, these caves should not be completely overlooked because they fall outside of the Newberry Plain, but are still in the county. Caves falling outside of the Newberry Plain are marked as moderate.

### Distance from SCC:

- <3 mi- green (indicating higher probability)
- 3-5 mi- yellow (indicating moderate probability)
- 5-7 mi-light red (indicating low probability)
- >7 mi- dark red (indicating very low probability)

Justification: This ranking system was used by Doonan (2001) who ranked survey cave vicinity (<3; 3-5; >5).

### Land Class (Immediate surrounding habitat):

- Forested habitats that likely have a canopy cover as described in the Dudley Farm Historic State Park Management Plan -green (indicating higher probability)

- Shrubby or pine habitats that may offer canopy cover -yellow (indicating moderate probability)
- Agricultural land -light red (indicating low probability)
- Development/urban- dark red (indicating very low probability)

Justification: Dudley Farm Historic State Park Management Plan (State of Florida 2017) describes desired conditions for these types of aquatic caves as being within a well-developed forest.

Land Use (Closet threat):

All caves are less than a mile from development therefore ranking was not conducted.

Conservation lands:

- Y (yes)
- N (no)

Justification: Caves not found on conservation lands should not be overlooked if a survey is conducted in the future therefore ranking was not conducted.

Cave name	Priority #	Within Newberry Limestone Plain?	Distance from SCC (km/mi)	Immediate surrounding habitat (CLC, 2019)	Closest threat (threat/distance in mi)	Conservation lands?
<b>Squirrel Chimney</b>	1	Y	NA	<b>Upland Hardwood Forest</b>	<b>Development/0.22</b>	N
Goat Sink	2	Y	1.61/1	Mixed Hardwood-Coniferous	Development/0.02	N
Unnamed #7	3	Y	1.71/1.06	Mixed Hardwood-Coniferous	Development/0.07	N
Unnamed #8	4	Y	3.45/2.15	Mixed Hardwood-Coniferous	Development/0.13	Y/State
Cherry Pits Cave	5	Y	3.97/2.47	Barren and Outcrop Communities*	Development/0.33	Y/State
Palisade Sink (township)	6	Y	1.85/1.15	Improved Pasture	Development/0.13	N
Palisade Sink?	7	Y	1.93/1.2	Improved Pasture	Development/0.09	N
Unnamed #9	8	Y	3.4/2.11	Improved Pasture	Development/0.17	Y/State
Mole Sewers Cave	9	Y	6.03/3.75	Improved Pasture	Development/0.11	N
Zamia Sink (township)	10	Y	6.23/3.87	Upland Hardwood Forest	Development/0.50	N

<b>Cave name</b>	<b>Priority #</b>	<b>Within Newberry Limestone Plain?</b>	<b>Distance from SCC (km/mi)</b>	<b>Immediate surrounding habitat (CLC, 2019)</b>	<b>Closest threat (threat/distance in mi)</b>	<b>Conservation lands?</b>
Jeremy Sink (township)	11	Y	7.89/4.9	Upland Hardwood Forest	Development/0.42	N
Unnamed #3	12	Y	8.77/5.45	Improved Pasture	Development/0.04	N
Unnamed #2	13	Y	9.06/5.63	Field Crops	Development/0.23	N
Cow Sink (township)	14	Y	9.49/5.9	Irrigated Row Crops	Development/0.51	N
Hog Sink	15	Y	9.9/6.15	Shrub and Brushland	Development/0.20	N
Unnamed #11	16	Y	9.98/6.2	Shrub and Brushland	Development/0.13	N
Unnamed #12	17	Y	10.07/6.26	Shrub and Brushland	Development/0.17	N
Herzog Cave	18	Y	10.29/6.39	Mixed Hardwood-Coniferous	Development/0.02	N
Unnamed #10	19	Y	10.35/6.43	Mixed Hardwood-Coniferous	Development/<0.01	N
Unnamed #4	20	Y	10.49/6.52	Coniferous Plantations	Development/0.11	N
Unnamed #13	21	Y	10.54/6.55	Shrub and Brushland	Development/0.24	N
Unnamed #5	22	Y	11.76/7.31	Improved Pasture	Development/0.19	N
Bat Cave	23	Y	12.03/7.47	High Pine and Scrub	Development/0.23	N
Unnamed #6	24	Y	19.34/12.02	High Pine and Scrub	Development/0.25	N
Unnamed #1	25	Y	19.5/12.12	High Intensity Urban	Development/0.11	N
Unnamed #14	26	N	5.49/3.43	Shrub and Brushland	Development/0.07	N
Unnamed #15	27	N	20.39/12.67	Transportation/Upland Hardwood	Development/<0.01	N

