

Golden Coquí
(Eleutherodactylus jasperi)

5-Year Review:
Summary and Evaluation



U.S. Fish and Wildlife Service
Southeast Region
Caribbean Ecological Services Field Office
Boquerón, Puerto Rico

5-YEAR REVIEW
Golden Coquí (*Eleutherodactylus jasperi*)

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 distribution, life history, habitat, and potential threats of this species. We announced initiation of this review and requested information concerning the biology and status of the species in a published *Federal Register* notice with a 60-day comment period (71 FR 56545). We received no new information on golden coquí from the public.

A Service biologist prepared the 5-year review that summarizes new information that was gathered in the species file since it was listed. Specific sources included the final rule listing this species under the Endangered Species Act; the Recovery Plan; peer reviewed scientific publications; unpublished field observations by the U.S. Fish and Wildlife Service, state and other experienced biologists; and notes and communications from other qualified individuals. There is no new information regarding the historical distribution of the species. We found no new information about the species' status.

B. Reviewers

Lead Region: Southeast Region, Kelly Bibb, (404) 679-7132

Lead Field Office: Caribbean Ecological Services Field Office, Jan P. Zegarra, (787) 851-7297, ext. 220

C. Background:

- 1. Federal Register Notice citation announcing initiation of this review:**
September 27, 2006. 71 FR 56545.
- 2. Species status:** Unknown (2013). All the information known about the species suggests possible extinction and emphasizes the need for comprehensive surveys within and outside the historical distribution of the species. Although some areas within the historical range of the species have been affected by deforestation and fires, suitable habitat for the species remains in the Carite Commonwealth Forest and surrounding areas.
- 3. Recovery achieved:** 1 (1 = 0-25% species' recovery objectives achieved)
- 4. Listing history**
Original Listing
FR notice: 42 FR 58756

Date listed: November 11, 1977
Entity listed: species
Classification: threatened

5. Associated rulemakings: None.

6. Review History:

The final rule to list the golden coquí (*Eleutherodactylus jasperi*), the species recovery plan (hereafter the Plan, USFWS 1984) and information provided in Joglar (1998), are the most comprehensive analyses of the species' status and are used as the reference point documents for this 5-year review.

At the time of listing, limited information was available regarding the status of the golden coquí population in Puerto Rico. There was an estimated population of less than 10 individuals for Cerro Avispa, 500-1000 for Monte El Gato, and 1000-2000 for all Sierra de Cayey. These estimates were based on personal communication with G.E. Drewry who conducted field surveys between May 1973 and August 1974 (USFWS 1984). These three locations are considered the historical range of the species and are designated critical habitat for the species.

Although there is no causal evidence of the threatened status of the species, it is presumed that loss of habitat (deforestation and fires), its obligate bromeliad dwelling mode of existence, its presumed low reproductive rate, the potential for over-collection, and an extremely low dispersal capability, may have contributed to the species status as a threatened species (USFWS 1984, Joglar 1998).

Five Year Review: November 6, 1991.

In this review (56 FR 56882), different species were simultaneously evaluated with no species-specific, in-depth assessment of the five factors as they pertained to the different species' recovery. In particular, no changes were proposed for the status of this frog in the review.

Recovery Data Call: 2000- 2013

7. Species' Recovery Priority Number at start of review (48 FR 43098): 5c. At the time of listing, the golden coquí was recognized as a species with high degree of threat and low recovery potential. "C" refers to those species that are, or may be, in conflict with construction or other development projects or other forms of economic activity.

8. Recovery Plan

Name of Plan: Golden coquí Recovery Plan

Date Issued: April 19, 1984

II. REVIEW ANALYSIS

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

1. **Is the species under review listed as a DPS?** No.
2. **Is there relevant new information that would lead you to consider listing this species as a DPS in accordance with 1996 policy?** No.

B. Recovery Criteria

1. **Does the species have a final, approved recovery plan containing objective, measurable criteria?** Yes. The golden coquí has a final recovery plan with measurable criteria and the plan establishes delisting as the recovery objective. However, the recovery goal was presented as an “interim recovery goal” since it was based on limited information on population levels and trends.
2. **Adequacy of recovery criteria**
 - a. **Do the recovery criteria reflect the best available (most up-to-date) information on the biology of the species and its habitat?** No. At the time the plan was approved, information regarding species’ biology, distribution, habitat requirements and life history was limited.
 - b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?** No.
3. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information.**

The objective of this recovery plan is to bring the population to levels at which it can be delisted. Since little information was available on present population levels and trends at the time the Plan was written, we defined an interim recovery goal in terms of the following criteria:

1. The three known populations be stable or expanding, each having a minimum of 1,000 individuals;
2. Long-term habitat protection has been insured for essential habitat of the three known populations through appropriate means as determined by an evaluation of all available options; and
3. Habitat management plans for essential habitat in 2 above are completed and provide a basis for long-term management of golden coquí habitat to insure sustained availability of required habitat conditions and reduce the likelihood of catastrophic losses from fires or hurricanes.

The population objective of 1000 individuals can be changed if warranted by new information. To attain the objectives, the Service considered the 1973-74 population data and the need for sufficient genetic diversity and population size

that would provide a measure of protection against catastrophic events from eliminating the population.

None of these criteria have been met. In spite of several status reviews and searches, no living individual has been located since the plan was developed.

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance, population trends (e.g., increasing, decreasing, stable), demographic features, or demographic trends:

Population trends, demographic features and trends are not possible to define due to the limited information available at the time of listing and development of the Plan. The species was first located in 1973, described as a new species in 1976 and just five years later, in 1981 disappeared and has not been heard or found since (Joglar 1998). Surveys made by Drewry in May 1973 and August 1974 estimated that there were 10 individuals in Cerro Avispa, 500-1000 for Monte El Gato, and 1000-2000 for all of Sierra de Cayey (USFWS 1984). We feel that the original populations may have been overestimated considering that in just 7 years the estimated population had gone from an estimated 1500-3000 individuals down to only 1 individual. There have been no confirmed sightings since 1981.

b. Genetics, genetic variation, or trends in genetic variation:

No information exists regarding genetics for this species.

c. Taxonomic classification or changes in nomenclature:

The species was first described as *E. jasper* by Drewry and Jones (1976). Joglar (1998) mentions that in 1986 A. Dubois placed the golden coquí in another genera altogether because of its different reproductive strategy. He proposed that *Ladailadne jasper* be considered the new taxonomic name. This name has not been well accepted by other authors believing that a new reproductive strategy is not enough to justify a new genera. Joglar (1998) used the genera *Eleutherodactylus* for the 16 species in Puerto Rico.

d. Spatial distribution, trends in spatial distribution, or historic range:

The golden coquí has not been detected since 1981. However, numerous efforts have been conducted to search for the species. Drewry (1986) conducted surveys of golden coquí during June and early July of 1986. He conducted taped automobile acoustic surveys of calls at night and direct microhabitat searches by day and by night. The surveys were conducted in all known former localities and nearby areas for the Sierra de Cayey in

southeastern Puerto Rico. Surveys totaled 47 site visits to 11 areas, but did not yield observation of a single golden coquí. He recommended that additional surveys be undertaken specifically at other times of the year.

Moreno (1991a) searched for the golden coquí during July and August of 1987. He conducted automobile acoustic surveys during peak calling hours, except for one site in Carite Commonwealth Forest that was searched on foot. The searches yielded no callbacks of a golden coquí. Moreno reported a personal communication from José Colón regarding what could have been the call of a single golden coquí on the night of August 6, 1987. However, they were unable to detect the source of the call on subsequent visits (Moreno 1991b). The author stated that potentially important areas to search include the Sierra de Jájome and the Jájome Bajo area of Cayey. The author considered it was premature to state that the species is extinct given the lack of temporally and geographically spaced searches. However, he considers that the golden coquí population as dramatically reduced in numbers and merits endangered status.

Moreno (1991a, 1991b) recommended surveying additional areas more thoroughly and emphasized the need to search the Carite Commonwealth Forest and surrounding areas. The author also recommended conducting searches for the golden coquí at different times of the year, specifically between September and early June. He also suggested developing a quantitative assessment of golden coquí habitat.

Between the dates of February 1989 to July 2001, Burrowes and Joglar (1991, 2004) carried out a long term acoustic and active searches for the golden coquí and two other species also possibly extinct (*Eleutherodactylus karlschmidti* and *Eleutherodactylus eneida*). They spent approximately 3,400 person-hours, 138 samples of water, and examined 1,671 bromeliads. They mentioned that only 32% bromeliads examined were above 5.0 m. Although no golden coquí were located during the searches, the authors stated that there is the possibility that due to the species being ovoviviparous and having no need to descend to the forest floor to lay eggs, it may be located in bromeliads in the high canopy. High canopy bromeliads constituted the minority of the area surveyed by the authors. They suggest that in a disturbed habitat, the golden coquí may choose to remain high in the tree canopy where bromeliads have a greater likelihood of capturing rainwater. The study sites included the elfin forest site in El Yunque National Forest (previously known as the Caribbean National Forest) at an altitude of 850 m near the Mount Britton tower, the palo colorado forest of El Yunque at 661 m near the field station of the University of Puerto Rico, and the Carite-Guavate Commonwealth forests at 400-750 m.

Joglar (1998) discusses the distribution of the golden coquí, and updated information regarding the biology, habitat characteristics, previous research

and surveys, and evaluated possible threats to the species.

Dr. Fernando Bird from the University of Puerto Rico, Mayagüez Campus, and his students conducted sporadic acoustic surveys for the golden coquí and other *Eleutherodactylus* species in the known historical range of the golden coquí. The species has not yet been detected (F. Bird, pers. comm. 2007).

Dr. Neftalí Ríos from the University of Puerto Rico, Humacao Campus, searched for the species in the summers of 2007, 2010, and 2011 in all of the historic sites, without any positive results (N. Ríos, pers. comm. 2013).

Most post 1981 surveys have been limited to the historic locations and along roads where the species occurred. As recommended by some researchers, there are still areas with potential habitat for the species that have not been searched. Searching these areas would require considerable effort as the access to them is more difficult. Future surveys need to include new areas with potential habitat. Habitat suitability models should be developed to identify those areas that are best for the species, then, use acoustic recording systems to search for the species in those areas.

e. Habitat or ecosystem conditions:

The critical habitat for the golden coquí lies within the subtropical moist forest life zone of Puerto Rico. This life zone covers approximately 58% of the land mass of Puerto Rico and the US Virgin Islands (Ewel and Whitmore 1973). This life zone receives a mean annual rainfall ranging 39 to 87 inches (100 to 220 centimeters). Most of the subtropical moist forest life zone has been deforested at one time or another with the exception of scattered remnants of zonal association vegetation (such as El Yunque National Forest) that may have trees up to 66 ft. (20 m) in height. The rest of the vegetation in this life zone consists mainly of grasses in both natural and improved pastures. Of the woody species still present in these areas, many are deciduous during the dry season and epiphytes are common, but seldom completely cover branches and trunks (Ewel and Whitmore 1973).

Currently, the dominant vegetation types found in the Sierra de Cayey portion of the golden coquí's designated critical habitat (Figure 1) mainly consists of mature secondary lowland moist noncalcareous evergreen forest, mature secondary montane wet noncalcareous evergreen forest, and montane wet evergreen abandoned and active coffee plantations (Figure 2). In the Monte El Gato and Cerro Avispa portion of the golden coquí's habitat, the dominant vegetation types consist of mature secondary lowland moist noncalcareous evergreen forest and young secondary lowland moist noncalcareous evergreen forest (Figure 3).

2. Five Factor Analysis

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

At the time of listing and when the Plan (USFWS 1984) was approved, deforestation for development projects was considered an imminent threat to the survival of the species. Additionally, three years prior to the approval of the Plan, the type locality burned (USFWS 1984). Burrowes and Joglar (1991) stated that deforestation was the largest factor for the decline of the species, followed by urban development, and over collection. Hedges and Thomas (1991) stated that factors such as deforestation and development as being the largest factors in the decline of amphibian and reptile species in Puerto Rico.

Secondary forest areas in Puerto Rico (including Vieques and Culebra islands) have increased 147% from 1951 to 2000, due to the economic shift away from agriculture on the island (Kennaway and Helmer 2007). However, unprotected forests remain vulnerable to development especially those forests which are in close proximity to urbanized areas (Kennaway and Helmer 2007). Critical habitat for the species is located on private lands in the southeastern portion of the island, which is currently under pressure for development projects. Habitat modification related to these projects can possibly affect the habitat characteristics necessary for the species survival, if any individuals remain extant.

Based on the above discussion, potential suitable habitat for the golden coquí does remain in protected areas in Puerto Rico. However, the designated critical habitat for the species is located on private lands and remains under pressure for development. Therefore, we believe that habitat modification remains a threat to this species, if it still exists.

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

In the final rule, over collection for scientific purposes was considered a factor in the decline of the species. Burrowes and Joglar (1991) stated that this was a significant cause for the decline of the species, secondary only to deforestation and urban development. Joglar (1998) does mention that over 90 individuals of golden coquí are present in collections.

Hedges and Thomas (1991) refuted Burrowes and Joglar (1991) claim that over-collection was a contributing factor to the decline of the golden coquí and other coquí species. Hedges and Thomas (1991) stressed the importance of collecting specimens in understanding and determining biology as well as

population considerations. Additionally, the authors stressed the importance of continued monitoring and searching outside of historical sites because of the possibility of dispersal of the species. They mentioned that nearly every species that they examined has been found to exhibit some geographic variation throughout its range. The authors believe that the golden coquí probably survives in other habitats (i.e., Carite Commonwealth Forest and surrounding areas). Joglar does mention that small habitat (16 km), small size, specialized reproductive strategy and specialized habitat (bromeliads) may render this species with limited dispersal abilities.

Hedges and Thomas (1991) recommended that a vigorous collecting effort should be conducted over a wide area both on the ground and in the high tree canopy before the species is considered extinct. The authors stated that that due to the very small size of the species it would be easy to miss an individual during a regular survey.

When evaluating this threat it is important to consider that for such a specialized frog, quite a few specimens were collected from the historical collections. Thus, overutilization for commercial, scientific, or educational purposes may have constituted a limiting factor for the species, although the magnitude is unknown. If the species is found, collecting efforts would probably be needed for captive breeding and would need to be assessed. Therefore, we believe that the overutilization for commercial, recreational, scientific, or educational purposes should remain as a threat to this species, given it still exists.

c. Disease or predation:

Burrowes and Joglar (1991) indicated that the introduction of exotic mammals such as feral cats, the Indian mongoose (*Herpestes auropunctatus*), and rats as possibly having had a detrimental effect on this species. However, there is no evidence that would indicate that the golden coquí was significantly affected by those exotic mammals. However, field observations demonstrate that when in danger, the species retreats and submerges within the water held by the bromeliad (Joglar 1998), thus making it difficult for those species to predate on a small sized frog. If predation by exotic mammals affected the golden coquí, we suspect that it occurred as a low threat and of low magnitude. Therefore, we believe that predation is not a significant threat to the species, if it still exists.

Burrowes and Joglar (2004) postulated that climate change and disease may have been a contributing factor for the decline of various *Eleutherodactylus* species including the golden coquí. They specifically referred to the discovery of chytrid fungus, *Batrachochytrium dendrobatidis* (Bd), in samples of other species (not the golden coquí) collected as early as 1976. This is the first report of chytrid fungus in the Caribbean. In addition, the authors

described significant warming trends and extended periods of drought during the 1970's and 1990's and correlated these factors with the decline of amphibians in Puerto Rico. The authors suggest a possible synergistic interaction between drought and the pathological effect of Bd on amphibian populations (Burrowes and Joglar 2004). Although Burrowes and Joglar (2004) addressed possible causes of amphibian mortality in Puerto Rico, the authors mentioned the lack of accurate updated population data for the golden coquí.

Based on the above discussion, we believe that Bd remains as a threat for the species, given it still exists.

d. Inadequacy of existing regulatory mechanisms:

Currently, the golden coquí is protected both under Federal and Commonwealth laws. In 1999, the Commonwealth of Puerto Rico approved the Law # 241 known as the "Nueva Ley de Vida Silvestre de Puerto Rico" (New Wildlife Law of Puerto Rico). The purpose of this law is to protect, conserve and enhance both native and migratory wildlife species, declare property of Puerto Rico all wildlife species within its jurisdiction, regulate permits, regulate hunting activities, and regulate exotic species among others. In 2004, DNER approved Regulation 6766, "to regulate the management of threatened and endangered species in the Commonwealth of Puerto Rico. The golden coquí is listed as a protected species and designated as "critically endangered". Article 2.06 of this regulation prohibits collecting, harassing, hunting, removing, among other activities, of listed animals within the jurisdiction of Puerto Rico. Under this article, golden coquí habitat is also protected because habitat is deemed as essential to the survival of the species.

The species, although not recently observed, continues to be protected by Federal and Commonwealth laws and regulations. Therefore, we believe that inadequacy of existing regulatory mechanisms should no longer be considered a threat.

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

Due to the unknown status of the species, it cannot be determined conclusively the effect that natural or manmade factors may have had on the species. However, as the type locality burned about 4 years after listing, it can be inferred that some loss occurred (USFW 1984). In addition, due to the species limited distribution, its obligate bromeliad dwelling existence and its low dispersal capabilities (USFW 1984), the species is more vulnerable to localized impacts and extirpation (e.g., pesticide use, trampling). Furthermore, due to the synergistic effects of disease and warming trends, climatic factors can also be considered a threat to the species' continued survival. As the species depends on a very specialized bromeliad habitat with

a limited dispersion (between 700-850 meters in elevation), we can infer, that the golden coquí would be vulnerable to either natural or manmade catastrophic events. Catastrophic natural events, such as hurricanes, may dramatically affect forest species composition and structure, felling large trees and creating numerous canopy gaps and changes in microclimatic conditions. Fire is not a natural component of subtropical moist forest life zone in Puerto Rico and Virgin Islands. Species found in this type of forest are not fire adapted. Human-induced fire may threaten the species and its habitat.

Burrowes and Joglar (1991) suggested that acid rain was a possible contributing factor to the decline of the species, but stated that there is not enough evidence to prove that conclusively.

If this frog still exists, we feel that natural and manmade factors remain a threat to the species.

D. Synthesis

The golden coquí is the only frog species belonging to the New World family of Leptodactylidae that is known to be ovoviviparous. It is small, has a very specialized habitat requirement (bromeliads), and was found in an area of 16 km². The species was collected in 1973, described in 1976, listed in 1977, and by 1981, it was no longer found. Several effects could have worked together to bring this species to extinction. Habitat destruction and modification, fire, climate changes and disease (chytrid fungus) could all be relevant threats for its believed extinction.

A significant amount of effort has been invested in search of the species since it was first listed. All researchers that have searched for the species after 1981, have not been able to detect the golden coquí. However, most research has been limited to historical locations and along roads. In order to have definitive evidence that the species is in fact extinct, surveys are needed in new areas with potential habitat. We believe that once these surveys are completed, then the Service would have the best available information for delisting due to extinction.

III. RESULTS

A. Recommended Classification:

- Downlist to Threatened.**
- Uplist to Endangered.**
- Delist.**
- No change is needed.**

B. New Recovery Priority Number: N/A

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

Within the next 5 years, the Service recommends gathering expert opinion to develop a habitat suitability model, choose the best areas to search for the species and use acoustic recording systems to maximize species detection.

V. REFERENCES

- Burrowes, P. and Joglar, R. 1991. A survey of the population status and an ecological evaluation of three Puerto Rican frogs. In Status y distribución de los reptiles y Anfibios de la region de Puerto Rico. Jorge A. Moreno (Editor). Publicación Científica Miscelánea No. 1. Departamento de Recursos Naturales de Puerto Rico, San Juan, Puerto Rico. 67pp.
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VI. LIST OF EXPERTS

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Figure 1. *Eleutherodactylus jasperi* designated critical habitat.

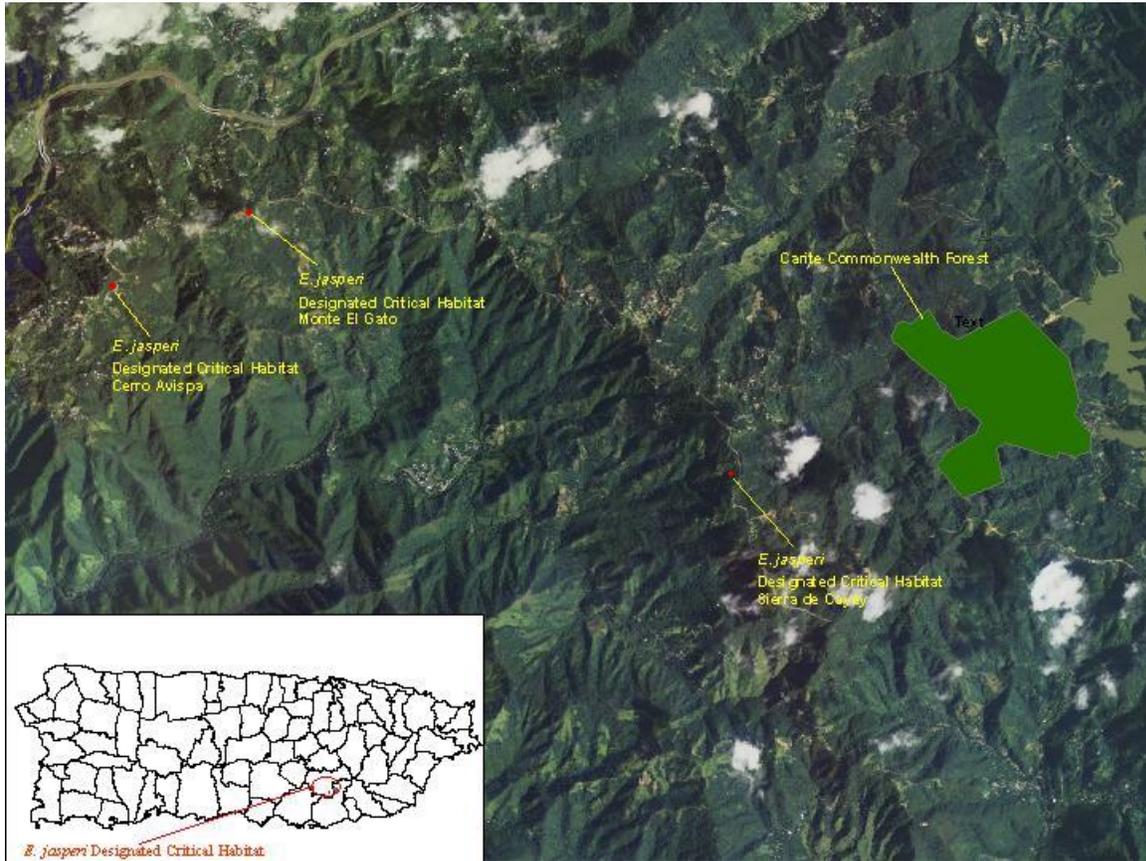


Figure 2. Vegetation types within *Eleutherodactylus jasper* Sierra de Cayey critical habitat.

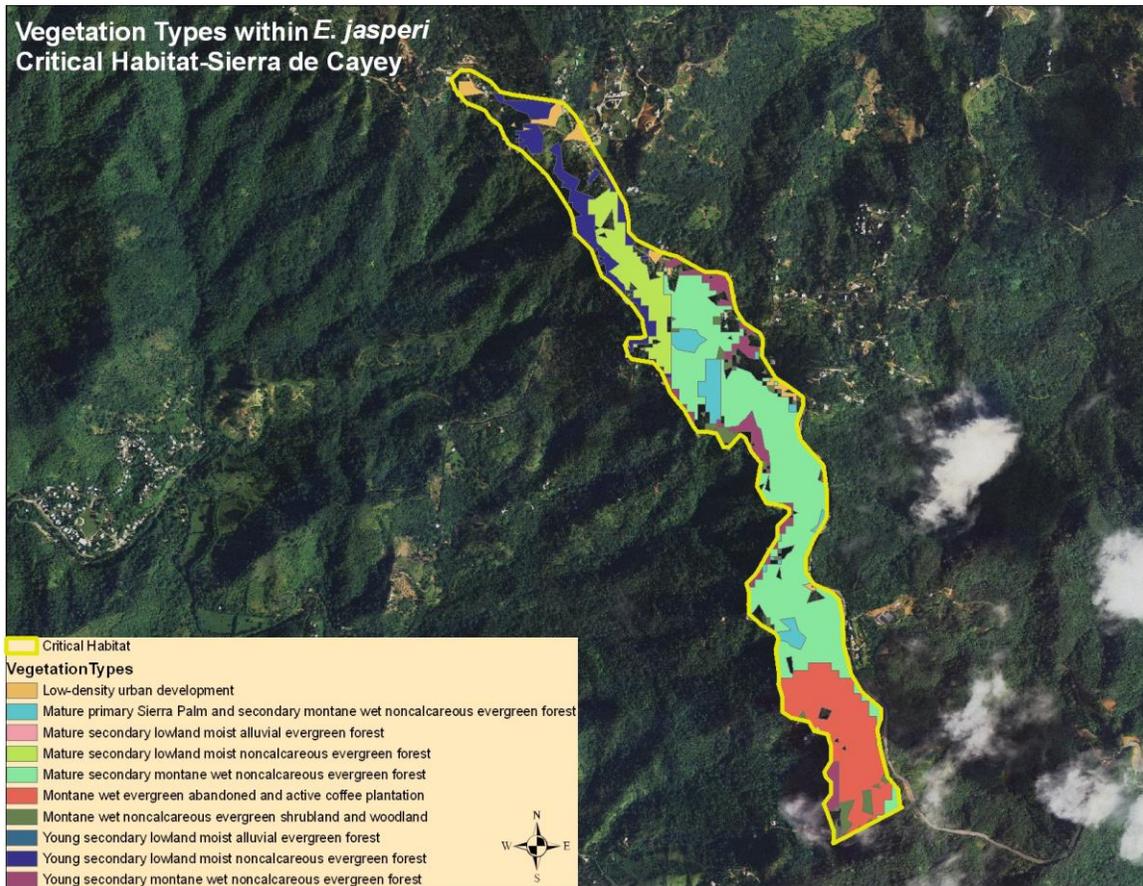
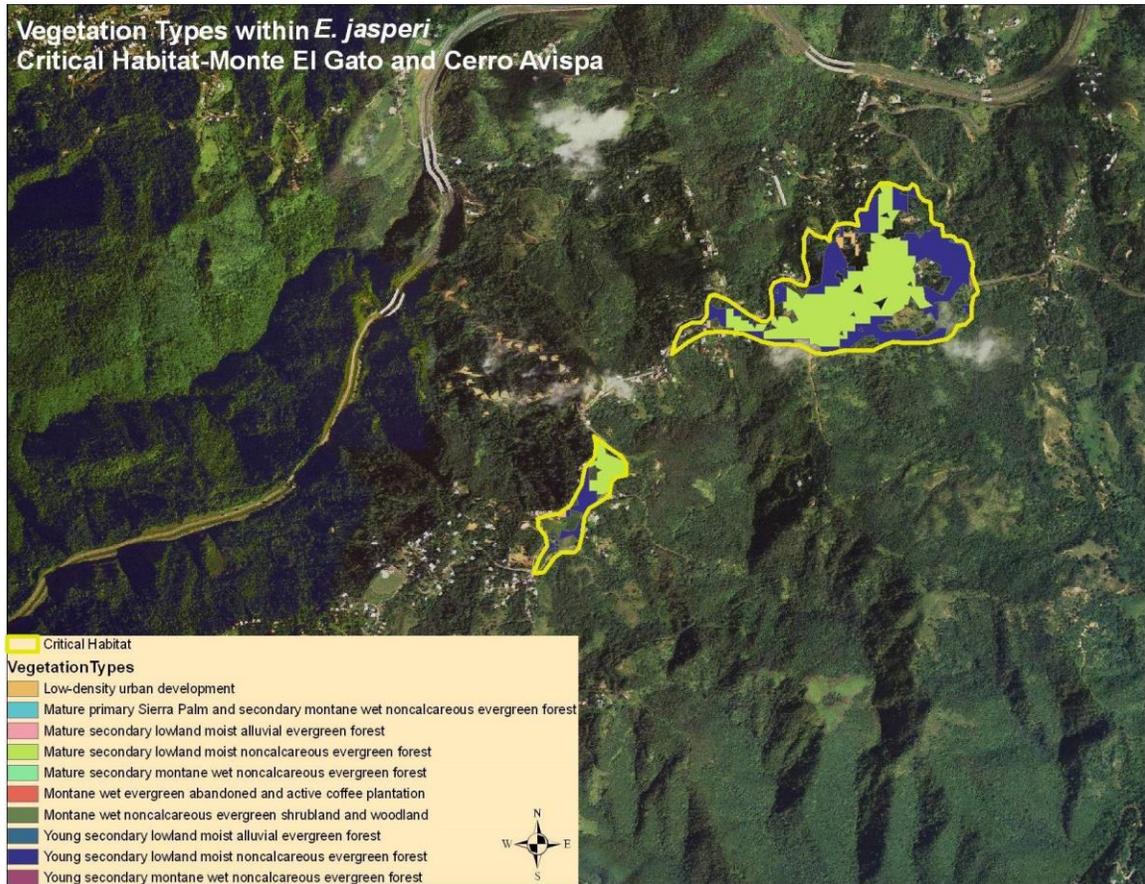


Figure 3: Vegetation types within *Eleutherodactylus jasperi* Monte del Gato and Cerro Avispa critical habitat.



FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of the golden coquí (*Eleutherodactylus jasperi*)

Current Classification Threatened

Recommendation resulting from the 5-Year Review

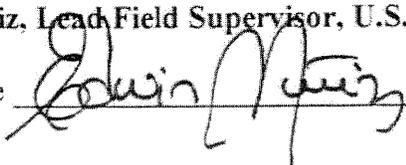
- Downlist to Threatened
 Uplist to Endangered
 Delist
 No change is needed

Review Conducted By: Bryann J. Ybarra-Weckmann and Jan P. Zegarra, Caribbean Ecological Services Field Office

FIELD OFFICE APPROVAL:

Edwin E. Muñiz, Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve



Date

Sept 12, 2013

REGIONAL OFFICE APPROVAL:

^{for}
Lead Regional Director, Fish and Wildlife Service

Approve



Date

9-30-13