Draft Recovery Plan
for
The Puerto Rican Harlequin Butterfly (*Atlantea tulita*)

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DISCLAIMER

Recovery plans delineate reasonable actions that are believed necessary to recover and/or protect the species. These plans are prepared by the U.S. Fish and Wildlife Service (Service), sometimes with the assistance of the State agencies, species experts and others. Plans are reviewed by the public and subject to additional peer review before they are adopted by the Service. Objectives will only be attained, and funds expended contingent upon appropriations, priorities, and other budgetary constraints. Recovery plans do not obligate other parties to undertake specifics tasks. Recovery plans do not necessarily represent the view nor the official position or approval of any individuals or agencies involved in the plan formulation, other than the Service. Recovery plans represent the official position of the Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subjected to modification as dictated by new findings, changes in species status, and the completion of recovery tasks. By approving this document, the Regional Director certifies that the information used in its development represent the most current scientific and commercial data available at the time it was written. Copies of all documents reviewed in development of the plan are available in the administrative record, located at the U.S. Fish and Wildlife Service's Southeast Regional Office, Atlanta, Georgia.

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This recovery plan describes criteria for determining when the Puerto Rican harlequin butterfly should be considered for delisting. It also lists site-specific actions necessary to meet those criteria and estimates the cost for implementing recovery actions over a 5-year period. Additionally, information on the species' biology and status is included, along with a brief discussion of factors limiting its population. The Recovery Plan for the Puerto Rican harlequin butterfly was informed by the 2019 Species Status Assessment (SSA) (Service 2019), the Final Rule listing the species as a threatened species and designating its critical habitat (87 FR 73655), and the updated SSA (Service 2025). These documents provide updated information on the species' status, distribution, biology, and threats. A more detailed accounting of these topics can be found in supplemental material available at https://www.fws.gov/office/caribbean-ecological-services. The supplemental documents, Recovery Implementation Strategy and SSA, will be updated on a routine basis.

CURRENT SPECIES' STATUS:

The Puerto Rican harlequin butterfly (*Atlantea tulita*; Family Nymphalidae) is endemic to Puerto Rico, occurring only in the western portion of the island. Throughout its range, the species is known to occur in six areas: (1) Isabela, Quebradillas, and Camuy (hereafter referred to as IQC population); (2) Guajataca Commonwealth Forest (Guajataca); (3) Río Abajo Commonwealth Forest (Río Abajo); (4) Río Encantado; (5) Maricao Commonwealth Forest (Maricao); and (6) Susúa Commonwealth Forest (Susúa) (Figure 1). All areas are considered extant populations because at least two of the four life stages (egg, caterpillar, chrysalis, and adult butterfly) are often observed. The IQC, Guajataca, Río Abajo and Río Encantado populations occur in the northwestern portion of Puerto Rico, in the Northern Karst physiographic region. The Maricao and Susúa populations occur in the west-central Volcanic-serpentine physiographic region.

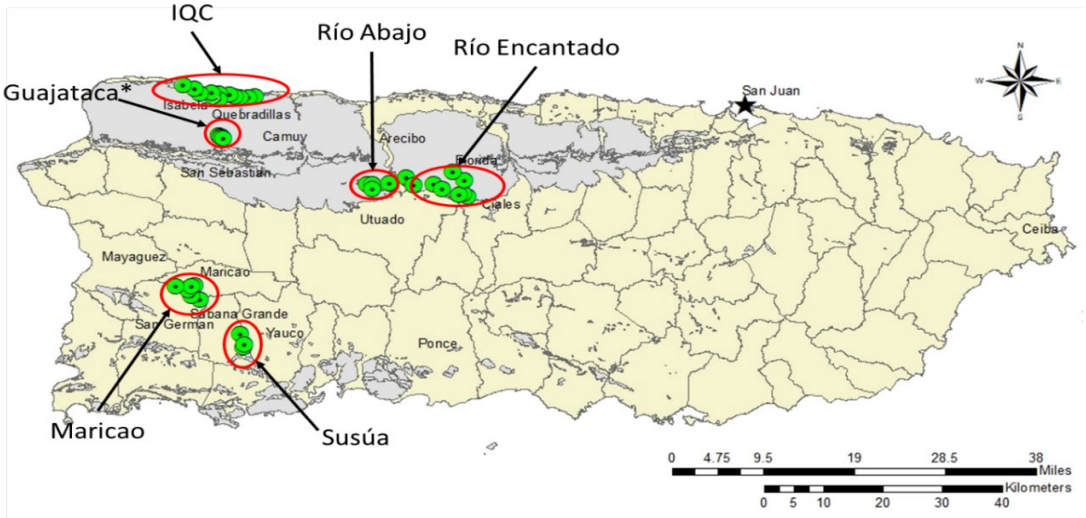

Figure 1. Map showing the current distribution and populations (red circles) of the Puerto Rican harlequin butterfly in Puerto Rico. Green dots are locations where the host plant *Oplonia spinosa* and more than one stage (egg, caterpillar, chrysalis, or imago) are frequently observed. The color gray represents the Karst physiographic region in Puerto Rico.

The overall abundance of the Puerto Rican harlequin butterfly is unknown. Statically derived population estimates for the species are not available and current estimates depend on the number of individuals opportunistically observed. Currently, the Puerto Rican harlequin butterfly is characterized by less than 100 adult individuals observed per year (Service 2025).

The Puerto Rican harlequin butterfly was federally listed as threatened on January 3, 2023 (87 FR 73655) with 41,266 acres (16,699.81 hectares) designated as critical habitat. This species is threatened by habitat modification (vegetation clearing), fragmentation and loss caused by urban development and agriculture, human-induced fires, misuse of pesticides (insecticides and herbicides), and inadequate enforcement of existing regulatory mechanisms. The small population size and interrelated effects of changes in environmental conditions and an increase in hurricanes, may also negatively affect the Puerto Rican harlequin butterfly within the foreseeable future (Service 2025). In addition, the species' highly specialized ecological requirements (e.g., laying eggs and feeding only on its host plant, prickly bush (*Oplonia spinosa)* exacerbate the potential threats. A detailed evaluation of factors affecting the species can be found in the listing determination (87 FR 73655) and the SSA (Service 2025). The Puerto Rican harlequin butterfly is considered by the Service as a species with moderate resilience, low redundancy, and low representation, making it more difficult for the species to withstand and recover from stochastic or catastrophic events (87 FR 73655; SSA 2025).

HABITAT REQUIREMENTS AND LIMITING FACTORS:

The Puerto Rican harlequin butterfly persists in four life zones: subtropical moist forest on limestone-derived soil, in the northern coastal cliff in Quebradillas; subtropical moist forest on limestone-derived soil in the northern karst region in Río Abajo Commonwealth Forest, Río Encantado and Guajataca; subtropical wet forest on serpentine-derived soil in the Maricao Commonwealth Forest; and subtropical dry/moist forest on serpentine-derived soil in the Susúa Commonwealth Forest (87 FR 73655, Service 2025). Although the habitat requirements have not been well studied, the climate and vegetation structure in these types of forests appear to support the normal behavior, population growth, and viability of the Puerto Rican harlequin butterfly during most of its life stages (Service 2025). An essential habitat feature for the Puerto Rican harlequin butterfly is the host plant prickly bush. In addition to the host plant, other primary constituent elements should be present in suitable habitat for the Puerto Rican harlequin butterfly (87 FR 73655; Service 2025). The primary constituent elements are:

(A) *Forest habitat types in the Northern Karst region in Puerto Rico:* Mature secondary moist limestone evergreen and semi-deciduous forest, or young secondary moist limestone evergreen and semi-deciduous forest, or both forest types, in subtropical moist forest or subtropical wet forest life zones.

(B) *Forest habitat types in the West-central Volcanic-serpentine region in Puerto Rico:* Mature secondary dry and moist serpentine semi-deciduous forest, or young secondary dry and moist serpentine semi-deciduous forest, or both forest types, in subtropical moist forest or subtropical wet forest life zones.

(C) *Components of the forest habitat types.* The forest habitat types described in 1. and 2., above, contain: (1) Forest area greater than 0.4 ha (1 ac) that is within 1 km (0.6 mi) of a water source (stream, pond, puddle, etc.) and other forested area; (2) Canopy cover between 50 to 85 percent and canopy height ranging from 4 to 8 m (13.1 to 26.2 ft); (3) Prickly bush covering more than 30 percent of the understory.

The Puerto Rican harlequin butterfly was reported to occur in the subtropical dry forest in the southern karst region, but the species has not been detected for many years in this region. The subtropical dry forest in the southern karst region could be considered as potentially suitable habitat for the species because it harbors prickly bush and some of the plant species that the butterfly stage feeds upon (Service 2019).

RECOVERY PRIORITY NUMBER with RATIONALE:

The Puerto Rican harlequin butterfly was assigned a recovery priority number of 11c, which indicates the species faces a moderate degree of threat, but a low recovery potential with conflict (48 FR 43098). Recovery potential is considered low for the Puerto Rican harlequin butterfly because the species has a low number of individuals per metapopulation (less than 100 adult butterflies), and due to the lack of information on its biology and ecological requirements the success of management actions with the species is uncertain. Additionally, the recovery of the Puerto Rican harlequin butterfly is, or may be, in conflict with the maintenance or expansion of the State Road PR 120 in Maricao, and development in the cliff along the northern coast of the municipalities of Isabela, Quebradillas and Camuy; therefore, the letter **"c"** was added to the recovery priority.

RECOVERY STRATEGY:

The goal of this recovery plan is to perpetuate viable metapopulations of the Puerto Rican harlequin butterfly throughout its geographic range. The recovery plan includes actions for the protection and management of occupied habitat, unoccupied suitable habitat for potential future introduction of the species, and additional conservation measures to reduce the immediate threats affecting the species.

Currently, the Puerto Rican harlequin butterfly persists in six disjunctive populations in four ecological regions, each with known variations in physiography, climate, and vegetation, resulting in potential geographic genetic variation among the species' populations.

For purposes of recovery planning, a metapopulation is defined as a "discrete population composed of local populations (subpopulations)." No single theoretical metapopulation structure is promoted for the Puerto Rican harlequin butterfly, rather, the broad definition focuses on those factors that would restore healthy metapopulations including sufficient suitable habitat, connectivity of subpopulations, and effective management. The persistence of metapopulations is governed by the balance between extirpation of subpopulations and recolonization of unoccupied suitable habitat sites. A useful strategy is to manage the population structure like a core-satellite or patchy metapopulation structure, like what occurs naturally, thereby reducing management cost. Considering the species only lays eggs and feeds on its host plant, prickly bush), when a subpopulation is extirpated, the future recolonization or establishment of a new subpopulation

depends on the availability of suitable habitat that includes the presence of prickly bush. Thus, conserving and protecting the species suitable habitat is necessary for recovery of the species.

The viability of a metapopulation should be determined by the number and distribution of its subpopulations and the need to enhance existing subpopulations. Best available information suggests that a metapopulation with 600 individuals could be considered large enough to persist over time. Conservation management and monitoring must buffer the metapopulation against adverse disturbances and threats to the species' survival, maintain suitable habitat over time in an appropriate spatial distribution, and identify adequate responses to potential declines in the metapopulation.

The species' geographical range should be expanded by increasing the number of the Puerto Rican harlequin butterfly metapopulations in Puerto Rico. This strategy seeks to safeguard the species in case of any other metapopulation does not withstand or recover from a stochastic or catastrophic event. In addition, this recovery strategy would increase the species representation, resiliency, and redundancy to sustain populations. The Service will work closely with other Federal agencies, local governments, universities, non-government organizations, private sector, and others to reduce threats to the species, increase understanding of its biology and ecology, develop and implement captive breeding and introduction program, identify new areas suitable for establishing new populations, ensure protection to currently occupied habitat and species from human activities, and educate the public about this species and the importance of its conservation. This strategy would allow for the improvement of the Puerto Rican harlequin butterfly status.

RECOVERY CRITERIA:

Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that the protection afforded by the Act is no longer necessary and the species may be delisted. Delisting is the removal of a species from the Federal List of Endangered and Threatened Wildlife and Plants. Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Recovery plans provide important guidance to the Service, States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species' status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

Criteria for Delisting

The Puerto Rican harlequin butterfly could be considered for delisting when the following criteria are met:

(1) Threats have been eliminated or reduced to the degree that the species remains viable into the foreseeable future (addresses Factor A, Factor D and Factor E).
(2) The six existing natural metapopulations of the Puerto Rican harlequin butterfly reach at least 600 adult individuals per metapopulation[1] and show a stable or increasing trend for 10 consecutive years, supported by evidence of sufficient number of other life stages [2] to ensure self-perpetuation (addresses Factor E). The minimum number of 600 individuals per metapopulation may be reached because of natural recruitment or by introduction of controlled propagated individuals: and
(3) At least two new viable metapopulations[3] are established or discovered within protected suitable habitat and maintain and demonstrate natural recruitment over 5 years with multiple generations (address Factor A and E). The minimum number of individuals per new metapopulation should also be at least 600 adult individuals.

[1] The total current number of Puerto Rican harlequin butterfly adult individuals is less than 100 per metapopulation, and the maximum number of individuals ever recorded in one metapopulation is 200. The best available information indicates that a metapopulation with 600 individuals could be considered large enough to persist over time.
[2] We define "life stages" as adult individual (butterflies able to mate and produce egg broods), egg, caterpillar (larva) and chrysalid.
[3] We define a viable population as 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 reproductive rate, without the addition of individuals of the species produced by controlled propagation or translocated from another population. Viable populations should consist of multiple life stages and generations of the species. In addition, the Puerto Rican harlequin butterfly population should be supported by forested habitat with 50 to 85 percent canopy cover that has healthy population of the host plant *Oplonia spinosa* covering more than 30 percent of the forest understory (87 FR 73655).

These criteria should be considered a minimum requirement and should be expanded or modified if the number of adult individuals and the survivorship potential of natural and introduced metapopulations prove to be different. If new populations of the species are discovered, it may be preferable to place greater emphasis on protection, rather than on propagation, to achieve a minimum number of butterflies.

Rationale for Recovery Criteria

The recovery criteria for the Puerto Rican harlequin butterfly include criteria for delisting the species that incorporate conservation biology principles of representation, resiliency, and redundancy, along with the current threats to the species (Smith et al. 2018). The recovery criteria reflect the best available and most up-to-date information on the biology of the Puerto Rican harlequin butterfly, its status, and threats.

The Service has identified the destruction and modification of habitat due to urban and agricultural developments, misuse of pesticides (herbicides and insecticides), the improvement and maintenance of trails and roads (Factor A), inadequacy of existing regulatory mechanisms (Factor D), and other natural and manmade factors (Factor E) as the primary threats affecting the current and future viability of the Puerto Rican harlequin butterfly (87 FR 73655). Our first recovery approach is to minimize or eliminate current threats to the species through site-specific conservation measures.

Threats discussed under Factor D in the Puerto Rican harlequin butterfly Species Status Assessment (Service 2019, 2025) have been partially addressed for the species because additional legal protection to the species was granted since it was listed in 2023. However, although the Puerto Rican harlequin butterfly is protected by Federal and Commonwealth laws and regulations, the private lands where the species occurs continue to be threatened by habitat modification and loss caused by vegetation clearance from unaware or poorly designed urban development and road improvement (Factor A). Additionally, the Service has identified the natural and manmade factors (Factor E) that are affecting the continued existence of the species. The six known populations of the Puerto Rican harlequin butterfly are restricted to different geographical areas and are vulnerable to natural and anthropogenic events such as hurricanes, vegetation clearance, human induced fires, severe droughts, and genetic erosion (Service 2019, 87 FR 73655, Service 2025).

The criteria presented for the Puerto Rican harlequin butterfly are based on the reduction of threats, consistent with the recovery strategy recommended in the listing process for the species (Service 2019). The recovery strategy includes the development of long-term conservation mechanisms to conserve and protect the Puerto Rican harlequin butterflies throughout the range and the controlled propagation of the species to augment existing populations and secure the species genetic diversity (representation). Management and protection of existing populations is needed to ensure these populations show stable or increasing trends, evidenced by natural recruitment and multiple life stages. In addition, establishing two (2) new viable populations on protected suitable habitat would address Factors A and E; and would increase species resilience and redundancy during stochastic events. To determine when the species populations are viable, a monitoring program should be initiated throughout the species' range. Additionally, research in the areas of species behavior, genetics, reproductive biology and habitat use are necessary for the establishment of a captive breeding and introduction program.

RECOVERY ACTION

Based on the best available science, we believe the following actions (Table 1) are necessary to recover the Puerto Rican harlequin butterfly. We have included an estimated cost and a priority number[4]. Further details of these recovery actions are provided in the Recovery Implementation Strategy.

Table 1. Recovery actions with estimated cost (over a 5-year period) and priority number.

Recovery Action	Estimated Cost	Priority
1. Prevent further habitat loss (including habitat protection, improvement, and restoration) and population decline.	$467,500.00	1
2. Continue gathering information on the biology, ecology, distribution and abundance of the Puerto Rican harlequin butterfly. Increase knowledge about responses of the species to threats.	$156,600.00	1
3. Assess and inventory suitable habitat for establishment of additional populations or future augmentation of the species in Puerto Rico.	$104,400	1
4. Develop and validate a habitat suitability model to predict spatial distribution of the species.	$23,000.00	2
5. Develop and implement propagation techniques and protocols to augment extant and low resiliency populations or establishing new populations within the range of the species.	$81,000.00	2
6. Facilitate recovery and protection of the Puerto Rican harlequin butterfly through public awareness and education.	$75,000.00	2
Total Estimated Cost:	**$907,500.00**	

[4]Recovery actions are assigned numerical priorities to highlight the relative contribution they may make toward species recovery (48 FR 43098):

Priority 1 - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.

Priority 2 – An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

Priority 3 – All other actions necessary to provide for full recovery of the species.

ESTIMATED COST OF DELISTING: The estimated cost to implement recovery actions is approximately $907,500.00.

DATE OF DELISTING: If all actions are fully funded and implemented as outlined, including full cooperation of all partners needed to achieve recovery, delisting is expected to be initiated in 2045.

LITERATURE CITED

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