

**DRAFT
ENVIRONMENTAL ASSESSMENT
FOR THE
REINTRODUCTION
OF THE
THIRD WILD POPULATION
OF THE
PUERTO RICAN PARROT
IN
PUERTO RICO**

November 21, 2013

**U.S. Fish and Wildlife Service
Caribbean Ecological Services Field Office
Puerto Rican Parrot Recovery Program Office
P.O. Box 1600
Río Grande, PR 00745
Phone: (787) 887-8769
Fax: (787) 887-7512**

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SECTION I - PURPOSE AND NEED FOR PROPOSED ACTION

1.1 PURPOSE

The US Fish and Wildlife Service (hereafter, the Service), the Puerto Rico Department of Natural and Environmental Resources (hereafter, the PRDNER) and the US Forest Service (hereafter, the USFS) formed an interagency working group for the recovery of the Puerto Rican Parrot, which is protected by the Endangered Species Act. As part of the interagency recovery effort, we are proposing to reestablish a third population of Puerto Rican Parrots in the wild. The reintroduction of Puerto Rican Parrot (hereafter referred as the PRP) into the wild is a stated recovery objective of the Recovery Plan for the PRP (USFWS 2009). It is aimed at creating a third wild population in the island to minimize the species' risk of extinction and promote its recovery and eventual delisting (USFWS 2009).

The purpose of the proposed action is to implement recovery actions that will help achieve the recovery of the PRP. Specifically, the goals are to downlist and then delist the species, and assure its long-term viability in the wild. The PRP is currently listed as endangered.

The purpose of this Draft Environmental Assessment (DEA) is to consider a range of reintroduction alternative sites that have been proposed, evaluated, and discussed among concerned agencies, and to select a preferred alternative. Alternative B has been selected as the preferred alternative, because it maximizes our ability to restore and manage the species in a portion of its historic range and manage the habitat selected for the reintroduction with minimal ecological disruption. Cost-effective reintroduction of parrots will maximize benefit to wildlife and provide the most opportunities for public in the form of environmental education and awareness.

1.2 NEED

According to the approved Recovery Plan (USFWS 2009) for the species, downlisting the PRP from endangered to threaten will be considered when:

- 1) A wild population in the Luquillo Mountains exists with a population size (yet to be determined) that exhibits vital parameters consistent with a trajectory towards population maintenance. At present, population growth in the El Yunque National Forest (EYNF) could be expected if the breeding productivity is greater than or equal to 1.56 chicks per nesting attempt (average rate for the 1990s) and their survival rates should not drop below 90 percent for adults, 85 percent for subadults, and 50 percent for juveniles. These projections assume that age of first breeding is four years old, and at least 60 percent of the adults engage in reproduction each year (Figure 6). A higher number of breeding pairs is essential for vigorous population growth and historically has been stagnant at 2-6 pairs;

2) A second wild population in the northwestern karst region exists with a population size (yet to be determined) that exhibits vital parameters consistent with a trajectory towards population maintenance;

3) The reintroduction or creation of at least a third wild population has been achieved in a suitable forested area in the island reflecting lessons and demographic expectations stemming from work with wild populations and release programs in the RAF and EYNF;

4) Nesting and foraging habitats (yet to be determined) are protected to support growing populations.

The PRP will be considered for delisting (USFWS 2009) when:

1) At least three interacting populations exist in the wild and population growth is sustained for 10 years after downlisting has occurred. This length of time will allow monitoring the recruitment of breeding birds and other population attributes in a species that has been characterized by highly variable reproductive and survival rates, at least in the YNF (Snyder et al., 1987, Muiznieks 2003, Beissinger et al. 2008). Reviews of the recovery program prior to making delisting determination will help define more explicitly the range of vital parameters values of a recovered population.

2) Long term protection of the habitat occupied by each wild population is achieved

3) The effects of disease and predation factors are controlled to allow for population viability.

This endemic species is the only native parrot in the United States and it is considered one of the ten most endangered birds in the world (Wiley et. al 2004)). Presently, 20-25 individuals survive in the wild at the EYNF in eastern Puerto Rico and 55-112 individuals at the Rio Abajo Commonwealth Forest (RAF) in the northern karst region. The two captive population facilities, the Iguaca Aviary located at EYNF and the José L. Vivaldi Aviary located at RAF, hold approximately 350 individuals.

Among the actions needed to recover the PRP as outlined in the Recovery Plan, there is a need to establish additional populations in the wild. The proposed action is a fundamental element of the PRP recovery program (Lacy et al. 1989, Muiznieks 2001, USFWS 2009). It minimizes the risks of the species' extinction because it is less likely that catastrophic events (e.g., hurricanes and disease outbreaks), and other threats (e.g., predation), will affect equally and simultaneously three spatially segregated populations. The proposed action is expected to foster the recovery of the species because parrots would be released in an environment that should result in more vigorous population growth than what has characterized the extant wild population at the EYNF over the past 40 years (Collazo et al, 2013).

Actions needed to reestablish the third population in the wild includes:

- 1) the release of captive-reared parrots at the selected site;
- 2) protect and manage the reintroduced population at the selected site;
- 3) implement improvements to the parrot habitat at the selected site; and
- 4) work with private landowners near the selected site and stakeholders to develop and implement short and long term habitat conservation programs in the lands surrounding the release area.

1.3 REQUIRED DECISIONS

In coordination and cooperation with the PRDNER and the USFS, the Service needs to determine which site is the best alternative to reestablish the third population of PRP in the wild.

In coordination and cooperation with the PRDNER and the USFS, the Service needs to determine whether and how to create the biological and physical conditions necessary to restore the PRP while protecting the ecological integrity of the selected site.

1.4 BACKGROUND

Once abundant and widespread throughout the Puerto Rican archipelago, the PRP is presently one of the most endangered birds in the world. Habitat loss together with natural enemies is considered among the major causes for the precipitous decline of the species during the 20th century. Currently, a relict wild population of 20-25 individuals survives at the EYNF in addition to a recently re-introduced population of approximately 57-112 individual at the RAF.

Intensive efforts to protect and recover the species started in 1968, a year after the species was designated as endangered by the Service, previous to the Endangered Species Act. In 1973, a captive rearing facility (Luquillo Aviary) was established to prevent the immediate extinction of the species, and later, to rear and foster chicks into wild nests to increase breeding productivity. Given the regularity of hurricane disturbance, a second aviary (José L. Vivaldi Aviary hereafter Rio Abajo Aviary) was established in 1993 in the RAF in the limestone lowlands of north-central Puerto Rico to safeguard the population (Lacy et al. 1989). Presently, the two aviaries shelter approximately 350 parrots (including the chicks produced in the 2013 breeding season). Although these aviaries are managed by different entities, all management activities and protocols are closely coordinated and integrated utilizing a single unit approach.

At present, in addition to low numbers and a limited distribution, major threats are nest competition and predation of eggs and chicks by Pearly-eyed thrashers (*Margarops fuscatus*), predation of fledglings and adults by Red-tailed hawks (*Buteo jamaicensis*), predation by rats (*Rattus rattus* and *R. norvegicus*), parasitism by warble flies (*Philornis*

pici), and the impact of hurricanes. Other threats include competition for cavities with European and Africanized honeybees (*Apis mellifera*). Many of the threats have been controlled through management strategies.

SECTION II - ALTERNATIVES

2.1 HISTORY AND PROCESS USED TO FORMULATE THE ALTERNATIVES

A Memorandum of Understanding (MOU) was established to continue the collaboration and participation among the USFWS, USFS and PRDNER to promote and support the recovery and conservation of the Puerto Rican parrot. The MOU is intended to advance collaboration between the Cooperators through the implementation of the Puerto Rican parrot recovery plan.

1. The long-term goal of the Cooperators is to undertake a cooperative effort to restore the Puerto Rican parrot to the wild.
2. To continue and enhance cooperation and improve all necessary conservation efforts, this MOU sustains the established Puerto Rican Parrot Interagency Executive Policy Committee (Policy Committee), consisting of the Service, USFS, and PRDNER.

An evaluation team comprised of staff from each of the three cooperating agencies (*i.e.*, USFWS, USFS, PRDNER) was assembled to analyze potential sites. Members of the team were selected based on their knowledge and experience regarding conservation of the PRP and/or its habitat. Additional team members were incorporated as required.

A total of six distinct forested areas located throughout Puerto Rico were selected for a preliminary “rapid assessment” evaluation. Areas were selected based on their geographic location, extent of existing forest cover, and existing legal protection status and/or willingness of landowners to provide long-term access and continued cooperation with recovery efforts. The areas selected were the following:

- 1) Casas de La Selva (Carite Commonwealth Forest area; privately owned);
- 2) Guanica Commonwealth Forest and Biosphere Reserve (PRDNER);
- 3) Maricao Commonwealth Forest (PRDNER);
- 4) Guajataca Commonwealth Forest (PRDNER);
- 5) El Tallonal Forest Reserve (Karst region; privately owned); and
- 6) Rio Encantado Forest Reserve Complex (Karst region; privately owned).

2.2 ALTERNATIVE DESIGN, EVALUATION AND SELECTION CRITERIA

The objective of the rapid assessment evaluation was to assess the suitability of each area for supporting a wild population of Puerto Rican Parrots, and to rank each area in order to select the 2 most suitable areas for further, more detailed evaluations. From March 2008 to February 2009, the evaluation team made a 3-day visit to each of the six sites to obtain data on arboreal species composition and abundance relative to potential parrot food sources, presence of cavities or potential cavities for nesting, avian predators and abundances, site accessibility, and existence of infrastructures or other support facilities for a reintroduction effort. Long-term climatological data for each area were also obtained from publicly accessible sources (*i.e.*, NOAA Southern Regional Climate Center, Baton Rouge, LA, www.sercc.com).

After visiting all sites and collecting necessary information, the team conducted a comparative evaluation of each site relative to the others. To accomplish this, a Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis based on the methodology of Trujillo (2005) was utilized. The SWOT analysis is an empirical method for assessing current strengths and weaknesses of the environmental units of interest (*e.g.*, reintroduction sites) and allows predictions for future opportunities and threats. Directly quoting Trujillo (2005): “This method pursues internal and external analyses of an environmental unit (*e.g.*, release site), examining its resources and management strategies (Martínez and Casas 2002). Internal analyses consist of evaluating strength and weakness indicators, while external analyses consist of evaluating opportunities and threats. In this context, the strengths are the inherent attributes or suitability of a habitat that justify its use as potential area for reintroduction. The weaknesses are the risks of losing these inherent attributes by natural causes such as predation by native species or natural catastrophes. Thus, weaknesses give us an indication of the vulnerability of the habitat. Threats are a measurement of the decline in inherent qualities by inadequate management or adverse surrounding conditions, while the opportunities include the sustainable use or management of the area according to its strengths, weaknesses and threats”. This analytical method has the advantages of simplicity, precision, broad applicability, and effective use of empirical data in conjunction with expert opinion. For the initial round of comparative evaluations, an abbreviated and simplified form of Trujillo’s (2005) SWOT analysis was performed. For each area, a score ranging from 1-4 (*e.g.*, 1 = poor; 4 = excellent) was assigned to each of 26 separate environmental descriptors (Trujillo 2005). The total score assigned to each area was the sum of the individual descriptor scores. Thus, the maximum possible score for any area was 104. The areas were then ranked by total score, and the 2 highest scoring areas were then chosen for further evaluation.

Following the SWOT analysis, the following scores were assigned to each of the evaluated sites:

- a) Maricao Commonwealth Forest – 90

- b) Guajataca Commonwealth Forest – 85
- c) Guanica Commonwealth Forest – 77
- d) El Tallonal Forest Reserve – 71
- e) Carite Commonwealth Forest – 64
- f) Rio Encantado Forest Reserve Complex – 55

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

The following sites were eliminated from further consideration for the reestablishment of the third population of Puerto Rican Parrot: the Guánica Commonwealth Forest, the Carite Commonwealth Forest, the Tallonal Forest Reserve, and the Rio Encantado Conservation Area.

These sites were discarded because the fundamental goal of the action would not be accomplished. Among the reasons for discarding these sites include factors such as low habitat quality, inadequate long term protection, inadequate size, poor landscape connectivity and future development plans.

2.4 ALTERNATIVES ANALYZED IN DETAIL

The alternatives under consideration for a detailed analysis were:

- (A) No action;
- (B) Reintroduction of PRP in Maricao Commonwealth Forest (MAF); and
- (C) Reintroduction of PRP in the Guajataca Commonwealth Forest (GAF).

The alternatives are presented separately to highlight salient strengths in terms of suitability and tradeoffs. Detailed site-specific assessments considered for reintroduction are summarized by Trujillo (2005) and White et. al. (2010, unpubl. final report).

2.4.1 Alternative A – No Action

Under this alternative, there would be no reintroduction of PRPs for a third population. Recovery activities would continue to be restricted to EYNF and RAF and a major action required by the species Recovery Plan (USFWS 2009) would not be achieved.

2.4.2 Alternative B – Reintroduction of the PRP in MAF

Under this alternative, PRPs would be reintroduced in MAF (Appendix I) starting in the fall of year 2015. Population and habitat management such actions such as control of predators/competitors, monitoring the size of the wild population, maximize parrot reproduction in the wild, continue release of captive-reared parrots to promote growth of the wild population using procedures developed to maximize survival, monitor all releases of PRP parrots to identify mortality factors and to reduce their impacts and assess habitat use, provide and maintain nest structures to foster successful reproduction, develop and implement plans to expand the release program would be required to foster establishment and population growth (White et al., 2005a, White and Vilella, 2004, Snyder et. al. 1987, White et al. 2010, USFWS 2009).

2.4.3 Alternative C – Reintroduction of the PRPs in the GAF Forest

Under this alternative, PRPs would be reintroduced in the GAF starting in the fall of year 2015. Population and habitat management actions such as control of predators/competitors, monitoring the size of the wild population, maximize parrot reproduction in the wild, continue release of captive-reared parrots to promote growth of the wild population using procedures developed to maximize survival, monitor all releases of Puerto Rican parrots to identify mortality factors and to reduce their impacts and assess habitat use, provide and maintain nest structures to foster successful reproduction, develop and implement plans to expand the release program would be required to foster establishment and population growth (White et al., 2005a, White and Vilella, 2004, Snyder et. al. 1987, White et al. 2010, USFWS 2009).

2.5 COMPARISON OF THE ALTERNATIVES

Since 2008, the Service and PRDNER have sponsored research to determine whether the MAF and GAF harbor suitable habitat for the` reintroduction of PRPs and to develop management strategies to foster a successful reintroduction (White et al. 2010). Assessments of MAF and GAF Commonwealth Forests included key habitat features (e.g., availability of food plant species, cavity bearing trees) as well as factors such as abundance of predators (e.g., Pearly-eyed thrasher, Red-tailed hawks; Trujillo 2005, Llerandi-Roman 2005).

Based on the rapid assessment evaluations and initial Strengths, Weaknesses, Opportunities and Threats Analysis (hereafter SWOT), the MAF and GAF Commonwealth Forests emerged as the first and second highest ranking habitats, respectively (Appendix II, Fig. 2). Accordingly, these forests were then designated for additional, more detailed evaluation.

The secondary site visits and evaluations of MAF and GAF took place in October 2009 and February 2010, respectively. Results of the first and second site visits were combined for purposes of the final SWOT analysis conducted in March 2010, and details

of the site visits are attached in Appendix II. Results of the SWOT analysis for MAF and GAF are presented in Appendix II Tables 3 and 4. The Optimal Quality index for both areas was 9.44, with MAF and GAF achieving an Actual Quality index of 7.41 and 7.09, respectively (Appendix II, Tables 3-5; Fig. 3). These indices were likewise associated with Quality Deviations (QD) of 2.03 and 2.36 for MAF and GAF, respectively. Of the 24 individual area descriptors associated with differential QDs, 13 (7 for MAF; 6 for GAF) were determined to be subject to amelioration or mitigation via management actions, thereby potentially increasing the Actual Quality index of each area by 0.656 and 0.711 for GAF and MAF, respectively (Appendix II, Tables 6,7). Of the total manageable differential QDs of each area, this would represent the annulment of 27.9% and 35% of observed deficiencies for GAF and MAF, respectively (Appendix II, Fig. 4). In other words, if all potentially manageable QDs were successfully mitigated, the Actual Quality index for GAF would be 7.74, and for MAF would be 8.12, for an overall gain in habitat quality of 9.3% and 9.6%, respectively (Appendix II, Tables 6, 7; Figs. 4, 5). Regarding the specific deficiencies of each area, some descriptors were more significant than others in terms of overall impact on habitat quality (Appendix II, Figs. 6-11). For example, at GAF the heavy use of the forest by the public, combined with the ease and numerous points by which the forest can be entered accounted for nearly 23% of the total QDs deemed potentially manageable (Appendix II, Table 6). Also, high numbers of exotic mammals (*e.g.*, dogs, cats, rats, mongooses) closely associated with human activities and settlements, accounted for another 20.1% of QD. Together these two factors – if successfully controlled or mitigated – would potentially annul 43% of the manageable deficiencies of the GAF Forest (Appendix II, Fig. 12). Accomplishing this however, would require successfully control public access to a substantial portion of the forest, particularly those areas near any potential parrot release site and/or nesting areas. Successful control of public access is important because during our evaluations we observed not only evidence of clandestine uncontrolled human entry into the GAF Forest, but also direct evidence of illegal hunting in the form of numerous spent shotgun shells at sites well within the forest boundary (Appendix II, Figs. 13, 14).

For MAF, we determined that 43.3% of the manageable QD could be annulled by the construction of an adequate trail system for post-release monitoring of PRP activities (Appendix II, Table 7; Fig. 15), particularly in the Rio MAF watershed between PR-120 and the MAF Fish Hatchery. Within this area lies what is ostensibly some of the best habitat for PRPs (Appendix II, Fig. 16), but difficulties in traversing the area make biological monitoring activities extremely challenging. A well-designed trail system and observation platform network, accessible from within the secure confines of the PRDNER Fish Hatchery, would alleviate much of this difficulty. An additional 24.6 % of manageable QD could be annulled by implementation of PRP nest management techniques to control potential honeybee and warble fly infestations (Appendix II, Table 7), similar to that currently done successfully in EYNF.

Both areas exhibited particular strengths and advantages relative to certain descriptors. For GAF, major advantages include relatively low numbers of avian predators, slightly drier overall climate, and an extensive and well-maintained trail system (Appendix II, Fig. 17). In fact, the GAF Forest has more trails (44 kms) than the EYNF National Forest

(38 kms.). However, this extensive trail system, ease of access, and presence of public camping areas also make the GAF Forest one of the most heavily used by the public in Puerto Rico. These human pressures are likely to increase, given the increasing development surrounding the GAF Forest, including a proposal to extend PR-22 expressway just north of the Forest in the future (Appendix II, Fig. 18).

Although some natural tree cavities were found in both areas, GAF, due to its karst geology (Appendix II, Fig. 19), has perhaps a slight advantage over MAF in terms of “natural cavities”, as some potential nesting sites may exist as holes in rock outcroppings. However, as in RAF, reintroduced parrots in either GAF or MAF will also require supplemental artificial nest cavities during the initial phase of population establishment. To date however, no reintroduced parrots at RAF have yet been documented using holes in rock outcroppings for nesting. Furthermore, although GAF has a generally drier climate than MAF, the temporal distribution of rainfall differs between the two areas. For example, during the peak of wild parrot fledging season (*i.e.*, May 10 – June 20), GAF exhibits a peak in daily precipitation, whereas during the same time period MAF experiences a decline in daily precipitation (Appendix II, Fig. 20). Based on 10 years of data on wild PRP fledgling survival in EYNF, parrot chicks which experience heavy rainfall (*i.e.*, > 0.5 in/day) within the first 3 days of fledging have a 3.5x greater probability of mortality (USFWS, unpubl. data). Accordingly, young parrot fledglings may potentially be exposed to more high rainfall events and attendant mortality at GAF than at MAF. Of course, this assumes the same temporal patterns in fledging between EYNF and reintroduced populations elsewhere. Thus far, preliminary evidence suggests that recently reintroduced parrots at RAF are nesting slightly later than those in EYNF (PRDNER, unpubl. data).

Major advantages of the MAF Forest include its large size, which at 4,483 ha is approximately 4.5x the size of GAF (971 ha). Adjacent to the MAF there are also an additional 268 ha of privately-owned forested lands under the PRDNER Program of Auxiliary Forests (Gobierno Municipal de Maricao 2008), as well as substantial areas of abandoned coffee plantations which have reverted back to secondary forests, providing landscape connectivity between the MAF Forest and other major forested areas, such as the Susúa Commonwealth Forest, the Guilarte Commonwealth Forest, forested regions of the Cordillera Central, and potentially even the northern Karst region (Fig. 1).

Other major advantages of the MAF area include lower human population density and associated activities, lower levels of current and proposed development projects (Gobierno Municipal de Maricao 2008), high biodiversity, broad variation in habitat types, and the highest potential food availability for parrots of any of the areas evaluated (Appendix II). Because of its geographical location, MAF also lies in an area subject to different hurricane trajectories and risks than GAF, which shares such trajectories with RAF, home to one of the two existing wild PRP populations. This is important because any hurricane that directly impacts RAF would most likely directly impact GAF (Appendix II, Fig. 23). While we recognize that any major hurricane that passes across western Puerto Rico will cause widespread damage, those areas along the eye wall trajectory would be most impacted (Boose *et al.* 2004). Thus, parrot populations in RAF

and GAF would both be subject to direct impacts from the same hurricane (see White et al. 2005b).

Based on our assessments, it appears that although both the GAF and MAF may be considered as “good” habitat for the PRP, MAF has certain unique advantages that make it the most appropriate site for initiating a third wild population of parrots. The geographic location, size, topography, habitat diversity, landscape connectivity, high biodiversity, lower human pressures, security, and existing support facilities all combine to result in an area with significant potential for successfully supporting a wild population of PRPs.

However, this is not to say that MAF is a perfect site. For example, in order to successfully establish and manage a parrot population at MAF, significant improvements must be made in the existing trail system to facilitate biological monitoring by field staff. Because the most logical and appropriate site for a training and release cage complex is within the area immediately surrounding the PRDNER Maricao Fish Hatchery, the initial priority for trail additions and improvements should be within the Rio Maricao watershed. In fact, during our site visits to MAF, we discovered the remains of an old, abandoned trail leading from the Fish Hatchery up the Rio Maricao watershed to PR-120. This trail system could most likely be enhanced with less effort and less potential environmental impact than the construction of a completely new trail system. By terminating such trail improvements some distance (*e.g.*, 100-200m) below the trail terminus at PR-120, the upper trailhead would remain unimproved and thus, less noticeable to passersby. Over time, it should be possible for the USFS to bring experienced trail construction teams from some of the National Forests in the mainland US to focus specifically on this essential task. We believe this would not only result in a safe and adequate trail system, but also allow local Recovery Program personnel (*e.g.*, PRDNER, USFWS, USFS) to focus on the biological preparations for the reintroduction.

Further, neither the MAF nor GAF Commonwealth Forests have up-to-date management plans that take into account threatened and endangered species conservation requirements relative to ongoing or planned management activities (Marelisa Rivera, USFWS, *in litt.* 14 May 2010). Joint interagency efforts to incorporate specific management needs relative to the PRP into future strategic management of MAF and GAF must be part of the overall reintroduction plan.

Finally, with respect to criterion number 1 to delist the species, given the extreme geographic isolation and current extent and rate of urbanization surrounding EYNF (Lugo et al. 2004), it is biologically unrealistic to assume any meaningful future “interaction” between the EYNF population and either the current second population in RAF or any third population to be established in western Puerto Rico. In essence, what this means in terms of stated species recovery goals is that a *minimum* of 4 wild populations (including EYNF) must exist. Given that the second of these populations has already been established in RAF, it follows that the next 2 populations must be established in such a manner as to: 1) maximize probability of successful population establishment, growth and expansion, and 2) maximize probability of interactions

between populations. This finding, taken together with criterion number 2 for delisting, indicates that both such populations (*i.e.*, third, fourth) should be established within the currently protected forest lands of western Puerto Rico. Figure 26 provides a hypothetical scenario of how and where such populations could potentially exist and interact.

In further consideration of recovery criterion number 2 for delisting, the currently projected land use changes and human population growth in MAF area suggest a slower rate of change than that in the area of GAF (Trujillo 2005, Gobierno Municipal de Maricao 2008)(Appendix II, Figs. 27, 28). In particular, the planned extension of the PR-22 Expressway, which will pass within approximately 4 km of the GAF (Appendix II, Fig. 18), will most likely contribute to increases in local urbanization and related disturbances in areas adjacent to said transportation corridor. Moreover, recent efforts by the Government of Puerto Rico to modify certain protections previously afforded to the Karst region in favor of increased development pose an ominous threat to future landscape integrity in that region.

There is now a substantial body of scientific evidence indicating that climatic changes, both globally and regionally, are occurring (*e.g.*, McCarty 2001, Marini *et al.* 2009). In Puerto Rico, the general trend is apparently towards a warmer and drier climate (Van der Molen 2002). Although the long-term effects of these changes on the PRP are impossible to predict, logic and prudence dictate that the establishment of multiple populations amongst ecologically distinct areas may prevent such changes from uniformly impacting the species as a whole (Wilson *et al.* 2005, Lawler *et al.* 2009). Thus, establishing a PRP population in MAF, an area with distinctly different ecological characteristics than both EYNF and RAF, may further serve to achieve this goal and thereby increase long-term viability of the species (McCarty 2001, Carroll *et al.* 2009).

In any reintroduction, natural interactions occur between resident and reintroduced species. In this case, there are several federally-listed species occurring within, and in areas surrounding, the MAF and GAF. The following federally-listed species occur within the MAF: the Puerto Rican Sharp-shinned Hawk (*Accipiter striatus venator*), Puerto Rican Nightjar (*Caprimulgus noctitherus*), Puerto Rican Boa (*Epicrates inornatus*), and the plant species *Cordia bellonis*, *Cranichis ricartii*, *Crescentia portoricensis*, *Gesneria pauciflora*, *Ottoschulzia rhodoxylon*, and *Zanthoxylum thomasianum*. In addition, the endemic Elfin Woods Warbler (*Setophaga angelae*) is currently being evaluated as a candidate for protection under the ESA (Marelisa Rivera, USFWS, *in litt.* 14 May 2010). In the GAF, the following federally-listed species have been reported: the Puerto Rican boa, *Calyptronoma rivalis* (palma de manaca), *Eugenia haematocarpa*, *Daphnopsis helleriana* (no common name), *Ottoschulzia rhodoxylon* (palo de rosa), *Goetzea elegans* (matabuey), *Schoepfia arenaria* (erubia), *Buxus vahlii* (diablito de tres cuernos) and *Peperomia wheelerii* (no common name). Potential interactions, both direct and indirect, between the PRP and the aforementioned species must be considered as part of any reintroduction plan in MAF and GAF. Direct interactions are those between individuals of the given species, while indirect interactions are those effects that may accrue from species-specific management actions.

Although MAF is currently the main breeding site for the Puerto Rican Sharp-shinned Hawk (USFWS 1997), management actions for the PRP are unlikely to adversely impact this species. Because both species have very similar habitat affinities (Snyder et al. 1987, USFWS 1997) any habitat management activities which benefit one species are likely to also benefit the other. Behaviorally, because both species are sensitive to disturbance at nesting sites and also nest at approximately the same times, any nest management activities for PRPs would necessarily be conducted in a manner which also minimizes disturbance to any nearby nesting Sharp-shinned hawks. Furthermore, potential predation by Sharp-shinned hawks on PRPs would be highly unlikely, based on numerous documented observations in EYNF. In contrast to Broad-winged Hawks, which can take prey the size of PRPs (and have actually done so in RAF), Sharp-shinned hawks target much smaller prey, with most (99%) being birds of less than 30 grams (Snyder et al. 1987). In fact, Sharp-shinned hawks themselves weigh at most only slightly more than half that of PRPs. Snyder et al. (1987; p187), in describing their direct observations of interactions between these 2 species stated: "The parrots do not appear to respond to sharp-shins as threats of any major significance". The Puerto Rican Sharp-shinned Hawk has not been reported breeding at the GAF.

In contrast, Broad-winged Hawks can pose a threat to parrots, based on observations in RAF (PRDNER, unpubl. data). However, nesting by Broad-wing hawks in MAF and GAF have not been documented (USFWS 1997).

Reintroducing the PRP in MAF would likely have little, if any, measurable effects on the ecology of the Puerto Rican Nightjar. In fact, there is currently no documentation of Nightjar presence within the specific area suggested (*i.e.*, Rio Maricao watershed) for the actual PRP release and artificial nest cavity installations (Vilella and Gonzalez 2009; Appendix II, Figs. 1-3). However, even if present, the marked differences in preferred habitat and nesting and foraging ecology between Nightjars and PRPs (Snyder *et al.* 1987, Vilella 2008, Vilella and Gonzalez 2009) preclude any competitive interactions. This is because the Nightjar is a ground-nesting, nocturnal/crepuscular insectivore, while the PRP is a secondary cavity-nesting, diurnal frugivore. Nevertheless, surveys to detect any nesting Nightjars will be conducted in areas targeted for specific Parrot management activities prior construction activities to avoid any potential adverse effect on Nightjars.

We do not anticipate direct adverse effects to the Elfin Woods Warbler from reintroduced PRPs in MAF. Because both of these endemic species are also sympatric and naturally-occurring in EYNF (Snyder *et al.* 1987), they represent an example of ecologically co-evolved species in montane forest habitats of Puerto Rico.

Although the Puerto Rican boa is reported as occurring within MAF and GAF, no adverse effects to the boa are anticipated. The spatial distribution and habitat-specific abundances of boas within the MAF and GAF are unknown. However, given the known habitat preference of the boa for elevations below approximately 400 meters above sea level (USFWS 1986, Wunderle et al. 2004), this species is likely most common at the lower elevations along the southern flanks of the MAF. Indeed, within the wild PRP

nesting area in EYNF (approx. 600-700 m) there have been no documented sightings of boas, nor any incidents of PRP nest predations by boas. The proposed reintroduction site in MAF is at an elevation of approximately 450 m, with most of the immediately surrounding forest area ranging from 450-600 m. Nevertheless, surveys to determine the status of the Puerto Rican Boa within the immediate environs of the proposed release site should be conducted by qualified personnel prior to the reintroduction.

Regarding impacts to listed plant species, the activities to most likely have potential impacts would be those directly associated with the construction of the training and release cage complex, and the proposed trail improvements in the Rio Maricao watershed. In such cases, a thorough botanical inventory in the target areas should be conducted by qualified personnel prior to initiate management activities to identify any listed species in the area. Some of the listed plant species however, (*e.g.*, *Ottoshulzia rhodoxylon*, *Zanthoxylum thomasianum*) are more typically found in the drier lower montane semi-evergreen forests than in the upper Rio Maricao watershed (USFWS 1988, 1994), where most of the proposed infrastructure improvement activities would occur. However, the location of proposed structures or trails will be adjusted or moved to avoid impacts to protected plants to the maximum extent possible. For unavoidable effects and wherever possible individual plants could be removed and replanted in nearby suitable sites to prevent loss, similar to that which was done in preparation for construction of the Iguaca Aviary in EYNF. As stated previously, improvements to an existing, albeit abandoned, trail system in the Rio Maricao watershed could minimize potential effects and attendant mitigation measures. At the GAF, the Service does not anticipate possible adverse effects of the construction activities on the federally-listed plants since the potential areas does not coincide with the species distribution within the Forest.

Another significant advantage at the MAF is the existing support infrastructure and security for a potential reintroduction site afforded by the PRDNER Maricao Fish Hatchery (Figs. 21, 22). Considering that the reintroduction effort will necessitate maintaining a population of captive parrots on-site for a minimum of 5 years, this advantage may substantially reduce overall costs and help to minimize potential theft problems. Given the high value of PRPs on the illicit market, and the unavoidable high profile and publicity of any future reintroduction efforts, site security must be taken as a serious concern. Finally, the presence of the nearby Monte del Estado Recreational Center presents a potential base of operations for staff working on the reintroduction effort. The Center, operated by the Puerto Rico National Parks Company (PRNPC), has numerous cabins (Appendix II, Fig. 24) with full amenities (*e.g.*, electricity, water, kitchen, etc.) which can comfortably house 4-5 personnel for extended periods. However, the GAF site lacks the benefit of a secure established facility within its premises, and the associated security for long term housing of PRPs.

2.6 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

Given recommended improvements and management actions, and the implementation of similar pre- and post-release strategies and nest management techniques currently used in

RAF and EYNF, the MAF was selected as the preferred alternative reintroduction site for a third wild population of PRPs. The GAF could be re-evaluated in the future as a potential site for yet a fourth wild population. Based on our assessments, it appears that although both the GAF and MAF may be considered as “good” habitat for the PRP’s, MAF has certain unique advantages that make it the most appropriate site for initiating a third wild population of parrots. The geographic location, size, topography, habitat diversity, landscape connectivity, high biodiversity, lower human pressures, security, and existing support facilities all combine to result in an area with significant potential for successfully supporting a wild population of PRP’s. Because of the existing support facilities at MAF and direct access to the actual release site, logistics and costs associated with construction and maintenance of the necessary large on-site training and release cage complex (Fig. 25) should also be less at MAF than at GAF.

In summary, we believe that given recommended improvements and management actions, and the implementation of similar pre- and post-release strategies and nest management techniques currently used in Rio Abajo and El Yunque, the Maricao Commonwealth Forest should be the reintroduction site for a third wild population of PRPs, with the Guajataca Forest being subject to re-evaluation in the future as a potential site for yet a fourth wild population.

SECTION III - AFFECTED ENVIRONMENT

3.1 MARICAO COMMONWEALTH FOREST

3.1.1. PHYSICAL CHARACTERISTICS

3.1.1.1. Location

The MAF is located in the west-central mountain region (Cordillera Central) of the Island, with elevations up to 774 m above sea level. The forest is bordered to the north by the Municipalities of Maricao, Las Marías and Lares, to the south by the Municipalities of Sabana Grande and San Germán, to the west by the Municipality of Mayagüez and east by Municipality of Yauco. The management responds to the public policy of the Commonwealth of Puerto Rico to promote reserve use as protection for flora and fauna, conservation of water resources and soil and provide a healthy environment for passive recreation outdoors. The PRDNER forest policy has established that "the forests are a natural resource and unique for its ability to preserve and restore the ecological balance of the environment". Forests are an essential heritage so it will remain, retain, protect and expand to achieve their full use and enjoyment of this generation and to be legacy for future generations. This responsibility has been delegated to the Secretary of the Department of Environment and Natural Resources by Act No. 133 of June 1, 1975, as amended, with respect to forest cover designated as forest. The forests were and are declared by proclamations, Executive Orders and legislation. (<http://www.drna.gobierno.pr/biblioteca/publicaciones/hojas-de-nuestro-ambiente/10-Los%20bosques.pdf>). The areas adjacent to the MAF are mostly dedicated to coffee

plantations, fruits and minor citrus fruits and the other parts remains open lands and natural forests.

3.1.1.2 Geomorphic/Physiographic

The MAF is classified within the main association heights volcanic soils. Soils within it are the western extension of the Cordillera Central and its elevation ranges up to 774 m (lower range) above sea level. Its topography is rugged and is characterized by narrow peaks, steep slopes and well defined cliffs. The MAF is located in the Cordillera Central and has an irregular topography. The area is surrounded by a mountainous area rich in vegetation, several adjacent rivers and crops. The terrain is moderately mountainous. In the mountainous terrain are found the Cerrote hills, Las Mulas and Gordo, Cuchillas de Aceituna, Cuchilla de Bucarabones, Montanas de Uroyán, Alto del Descanso and el Pico Montoso.

Within the areas adjacent to the MAF the predominating soils are Humatas and Consumo series, which are grouped in the Humatas Consumo Association and Caguabo-Múcara Association. The MAF is overlaid with serpentine rocks and shallow soils. Serpentine refer to a diverse class of ultramafic rock and their derived soils. Serpentine soils are typically very mineralized and granular, which can result in rapid drainage and periods of moisture deficiency (Cedeño-Maldonado and Breckon 1996). Serpentine outcrops are limited to the southwestern part of Puerto Rico occupying little less than 1% of the total area of the island (Cedeño-Maldonado and Breckon 1996). Serpentine-derived soils support a significant level of plant endemism. Cedeño-Maldonado and Breckon (1996) found that one third of the 40 serpentine-limited species are endemic to Puerto Rico.

3.1.1.3 Threatened, Endangered, and Candidate Species

The MAF harbors habitat for seven federally-listed threatened and endangered species, and one species considered as a candidate species under the ESA. Species include: five plants [*Cranichis ricartii* (no common name), *Gesneria pauciflora* (no common name), *Cordia (Varronia) bellonis* (no common name), *Crescentia portoricensis* (no common name) and *Ottoschulzia rhodoxylon* (palo de rosa)]; two endangered and one candidate avian species[the Puerto Rican Sharp-shinned Hawk (*Accipiter striatus venator*), Puerto Rican nightjar (*Caprimulgus noctitherus*), and Elfín-woods warbler (*Setophaga angelae*)], and one species of endangered reptile [the Puerto Rican Boa (*Epicrates inornatus*)]. These eight species are also protected by the PRDNER pursuant to Puerto Rico Law #241-1999, New Wildlife Law.

3.1.1.4 Other Species

A total of 70 resident species of birds, 15 endemics have been identified within MAF. According to Little and Wadsworth (1964) and Little et al. (1974), 845 species of vascular plants can be found in the MAF of which 278 are woody plants. Of these 278 species, 123 are endemic to Puerto Rico and 20 to Maricao (Little and Wadsworth, 1964;

DNR, 1976). In the MAF five vegetation types can be found in the three bioclimatic life zones. One of these is the dwarfed vegetation of evergreen, small-leaved species that occupy the narrow ridges, peaks and summits exposed to strong winds, which are found nowhere else in Puerto Rico (DNR, 1976). The other is an exclusive element of the forest floor formed by large cushions of the rare “reindeer moss,” a lichen of the genus *Usnea* (I. Sastre De Jesús, pers. comm), that occupy some ridges and windward slopes (DNR, 1976). Three factors may help explain the rich diversity of trees resulting in the distinctive forest types occurring in Puerto Rico only in the MAF closed nutrient cycling, adequate precipitation received on the well-aerated serpentine soils and the atypical combination of physiographic characteristics (DNR, 1976).

3.1.2 LAND USE

Agricultural lands in areas adjacent to MAF are not so threatened by uncontrolled urban development because the physical and geological characteristics of the soils. The major crops are coffee, oranges, bananas and grapefruit. The topography of the region does not facilitate urban development, but the lack of incentives limit agricultural development of the area and promote the abandonment of these lands (Plan Territorial del Municipio de Maricao 2008).

3.1.3 CULTURAL RESOURCES

During the 19th century coffee boom, Maricao and other regions surged economically. When the spurt of coffee in the island ended by the start of the 20th century, the economic conditions deteriorated again. Many of the old plantation houses have been converted in museums to stimulate the tourism industry, such as Hacienda Delicias and Hacienda Juanita. While Puerto Rico still has a niche in the gourmet coffee market, the large scale coffee growing which built Maricao is no longer economically feasible.

Other places for tourists to visit are the Bambúa Recreational Center and the Maricao Fish Nursery. Some natural spots to visit are the Monte del Estado forest reserve, the Prieto Lake and the Salto de Curet (a waterfall).

3.1.4 LOCAL SOCIO-ECONOMIC CONDITIONS

For decades, an area adjacent to MAF economy has relied in agriculture, specifically coffee plantations. Fruits and vegetables are also grown on the town. MAF is a source of income, due to the retransmitting radio and television and radio facilities in the area. In addition, this forest is also housed the Monte del Estado Centro Vacacional, an important recreational area managed by the National Parks Company.

3.2 GUAJATACA COMMONWEALTH FOREST

3.2.1 PHYSICAL CHARACTERISTICS

3.2.1.1 Location

GAF is located in the northwestern region of Puerto Rico in the municipality of Isabela. Is one of fourteen public forests that make up the State Forest System Commonwealth of Puerto Rico.. The Forest is managed and operated by the Puerto Rico Department of Natural and Environmental Resources. The management responds to the public policy of the Commonwealth of Puerto Rico to promote reserve use as protection for flora and fauna, conservation of water resources and soil and provide a healthy environment for passive recreation outdoors. The PRDNER forest policy has established that "the forests are a natural resource and unique for its ability to preserve and restore the ecological balance of the environment". Forests are an essential heritage so it will remain, retain, protect and expand to achieve their full use and enjoyment of this generation and to be legacy for future generations. This responsibility has been delegated to the Secretary of the Department of Environment and Natural Resources by Act No. 133 of June 1, 1975, as amended, with respect to forest cover designated as forest. The forests were and are declared by proclamations, Executive Orders and legislation. (<http://www.drna.gobierno.pr/biblioteca/publicaciones/hojas-de-nuestro-ambiente/10-Los%20bosques.pdf>). GAF comprises 2,357 acres at elevations ranging from 500 to 1,100 feet above the sea. It is classified as humid subtropical forest (<http://www.drna.gobierno.pr/biblioteca/publicaciones/hojas-de-nuestro-ambiente/28-guajataca.pdf>)

3.2.1.2 Geomorphic/Physiographic

In GAF there are two vegetation associations: one in the slopes of the wooded hills and valleys or other sinks. The first association, which comprises approximately 76% of the total area of forest, is dominated by calcareous and porous excessive drain on the slopes of the hills and climates that create a xerophytic environment. The second association, comprising the remaining 24%, is in protected areas between hummocks where the valleys are formed, prevailing wetter conditions. GAF is of great importance for biodiversity that has, since is located in the karst region of northwestern Puerto Rico. GAF is notable for the haystack hills, caves, sinkholes and scenery (<http://www.drna.gobierno.pr/biblioteca/publicaciones/hojas-de-nuestro-ambiente/28-guajataca.pdf>.)

3.2.1.3 Threatened, Endangered, and Candidate Species

The GAF harbors habitat for federally-listed threatened and endangered species under the ESA. Based on the information currently available to us, the following federally-listed species are currently located at the GAF: the Puerto Rican boa, *Calyptronoma rivalis* (palma de manaca), *Eugenia haematocarpa*, *Daphnopsis helleriana* (no common name), *Ottoschulzia rhodoxylon* (palo de rosa), *Goetzea elegans* (matabuey), *Schoepfia arenaria* (erubia), *Buxus vahlii* (diablito de tres cuernos) and *Peperomia wheelerii* (no common

name). These nine species are also listed by the PRDNER pursuant to Law # 241-1999, New Wildlife Law.

3.2.1.4 Other Species

GAF provide habitat for reptiles, amphibians, insects, spiders and centipedes. The common bat (*Artibeus jamaicensis*) is the most common mammal Forest. The bird life in this area is diverse and varied. It includes more than 70 species of birds of which 26 are resident, 26 are migratory and 12 endemic to Puerto Rico. More than 186 species of trees have been identified for GAF, of which 156 are native, 7 are introduced and 40 are endemic. The three largest families are represented in GAF are: Myrtaceae (12 species), Lauraceae (11 species) and Leguminosae (11 species).

(<http://www.dma.gobierno.pr/biblioteca/publicaciones/hojas-de-nuestro-ambiente/28-guajataca.pdf>.)

3.2.2 LAND USE

The early economy had been based mainly on cattle ranching, its derivative products and hogs products, but trading was limited because of many factors: its inland location and topography, the settlement was posted above a hill overlooking the river (now river *Guajataca*) and it made difficult the use of the river as a trading route as did the location's propensity to disease and outbreaks. After the transfer to the present Isabela, the economic realities that resulted from the new land and property opportunities that were readily available, the healthier environment formed due to the wide open plains and prevalent northern winds, and the proximity to the coast and the natural sea port at the bay of "Punta Sardina" prompted for the diversification of the agricultural products and an increase on trade. The cultivation of sugar cane, coffee, tobacco, cotton, yuca, coconuts and fruits was stimulated further. Since then, Isabela has continued to flourish. (http://en.wikipedia.org/wiki/Isabela,_Puerto_Rico)

3.2.3 CULTURAL RESOURCES

The town of Isabela, on Puerto Rico's northwest coast, is known as the "Garden of the Northwest" for a few reasons. One is its splendid natural beauty, with beach, forest, and surf competing for your attention. Another is its quaint culture, which includes monuments to the island's native Indian heritage, and specialties including *santeros*, the artisans who carve wooden *santos*, or saints; a local cheese called *quesito de hoja*, and elegant Paso Fino horses.

Built in 1911, the Guajataca Tunnel was a railroad tunnel that connected the towns of Isabela and Quebradillas. It was meant to transport the sugar crop in this part of Puerto Rico. The tunnel is open to the public (the railroads are long gone), and is worth the trek to reach the rugged and beautiful coastline as well as Playa El Pastillo and Playa de Guajataca. The latter has a rough surf and strong currents, and is not a safe place to swim; the former, on the other hand, is a large and beautiful beach. On the west side, take

a look at the Cara del Indio, a rock carving of a Cacique, or native chief, named Mabodomaca.

The Guajataca Forest has 25 miles of trails, with the most popular being Trail #1, leading to the Cueva del Viento ("Cave of the Wind"), and the interpretative trail. The former is a beautiful natural cave filled with bats and featuring limestone rock formations; the latter is a 2-mile circular path that makes for a light hike.

(<http://gopuertorico.about.com/od/portadelsol/tp/Five-Things-To-Do-In-Isabela-Puerto-Ricos-Garden-Of-The-Northwest.htm>)

3.2.4 LOCAL SOCIO-ECONOMIC CONDITIONS

After the transfer to the present Isabela the economic realities that resulted from the new land and property opportunities that were readily available, the healthier environment formed due to the wide open plains and prevalent northern winds, and the proximity to the coast and the natural sea port at the bay of 'Punta Sardina' prompted for the diversification of the agricultural products and an increase on trade.

(http://en.wikipedia.org/wiki/Isabela,_Puerto_Rico)

SECTION IV - IMPACTS ANALYSIS

4.1 ALTERNATIVE A – NO ACTION

Under this alternative, the Service would cease to actively pursue reintroducing the PRP at a third site. This is the only option that does not require human intervention and active management of the system. This alternative is unlikely to achieve the recovery objectives outlined in the Recovery Plan of the species, that is, downlist and delist the species by 2020 (USFWS 2009).

4.1.1 HABITAT IMPACTS

None.

4.1.2 BIOLOGICAL IMPACTS

None. Even if management for parrots were affected (e.g., enhance food resources), other members of the resident avian community would have a minor benefit from such actions (Collazo and Groom 2000, Inman 2005, Trujillo 2005).

4.1.3 LISTED SPECIES AND TRUST RESOURCES

Choosing this alternative would result in a negative impact to the PRP because the probability of extinction would not be mitigated by the creation of a third population. This option would not affect any other species.

4.1.4 PREDATOR CONTROL IMPACTS

There would be no need to implement management activities to control potential parrot predators.

4.1.5 PUBLIC USE AND LANDOWNER IMPACTS

If this alternative was chosen, opportunities to diversify public use such as environmental education and interpretation, and wildlife observation and photography would be lost.

4.2 ALTERNATIVE B – Reintroduction of PRP in the Maricao Commonwealth Forest (MAF)

Under this alternative, the Service would minimize risks of the species' extinction and promote the recovery of the species. The population and habitat would be managed to increase the likelihood of a successful reintroduction.

This alternative would require implementing many of the management activities used at EYNF and RAF (White et. al., 2005a, White and Vilella, 2004, Snyder et al. 1987). Other activities include implementing forest management practices that will promote greater availability of food resources for the PRPs. This action requires that Service, US Forest Service, and PRDNER staff monitor and manage the population and habitat throughout the year. This alternative has the greatest likelihood of success because MAF combines a number of desirable features for reintroduction including year-round food resources, presence of a secure facility and management infrastructure.

4.2.1 HABITAT IMPACTS

Provisioning artificial nest cavities is required to insure a successful reintroduction. This is a management practice commonly used at the EYNF and RAF. A training and release cage [approx. 19 x 19 m (62 x 62 ft)] will be constructed at the actual release site within the boundaries of the PRDNER Maricao Fish Hatchery. Monitoring population numbers, survival and reproduction will require maintaining (and creating) trails and constructing platforms to facilitate said activities.

Impact of these activities on forest resources is localized, being restricted to the immediate area of the action and will result in modification to approximately 10,400 square meters (2.57 ac) of vegetative cover and an additional 4,000 square meters (0.99 ac) for riparian habitat for *Crescentia portoricensis* and *Cordia alliodora* only.

4.2.2 BIOLOGICAL IMPACTS

This alternative would not significantly affect resident fauna and flora in the MAF. For example, resident avian species should not be adversely affected by this action because we will be reintroducing a native endemic species with which they have coevolved.

Indeed, Douglas et al. (2013) reported that many species of Caribbean frugivores and nectivores may benefit from the presence of native psittacines which facilitate foraging and resource acquisition by those species.

4.2.3 FEDERALLY-LISTED SPECIES/CONSERVATION MEASURES

4.2.3.1 Sharp-shinned hawk (*Accipiter striatus venator*)

Species Description and Habitat

The Puerto Rican Sharp-shinned hawk (hereafter SSHA) is a small hawk measuring approximately 28-33 cm (11-13 in). The dark slate gray upper parts and heavily barred rufous underparts of the adults are distinctive. Immature birds are brown above and heavily streaked below. In flight, the short rounded wings and long narrow tail are characteristics (Raffaele et. al, 1989). SSHA, also known as falcón de sierra and gavilán de sierra (Delannoy-Julia 2009), was first discovered in the MAF, and now it is known from the northern karst and six forests in Puerto Rico: MAF, Toro Negro Commonwealth Forest, Guilarte Commonwealth Forest, Carite Commonwealth Forest, RAF, and EYNF.

Distribution and Abundance

This species dwell in elfin woodland, sierra palm, caimitillo-granadillo, and tabonuco forest types (Ewel and Whitmore 1973; Delannoy 1997) of the MAF, Carite Commonwealth Forest, Guilarte Commonwealth Forest, and EYNF. The species was thought to be absent from the karst and secondary growth forest (Delannoy 1997), until biologists detected the species in the north karst area (I. Llerandi and D. Hengstenberg; personal communication and report). It shows a clumped distribution within their range, most evident in MAF and Carite Commonwealth forest, and less so in Toro Negro Commonwealth Forest (Delannoy 1997). The distribution pattern of this species has not been determined in EYNF and RAF. Reproductive strategy reported by Delannoy (1997) supports earlier reports that epigamic and territorial activities of SSHA are associated with certain montane habitats within the subtropical wet forest and subtropical montane forest life zones. The continued re-occupancy pattern of these habitats was seen in MAF, Toro Negro, Carite, and EYNF (Delannoy 1997). These habitats appear to provide adequate requisites for nesting and foraging, while the absence of SSHA from other montane habitats may indicate that some important requirement is missing (Delannoy 1997). At least in the MAF, nest-site habitat fidelity has been related to a pattern of nest-site selection dependent on structural features of the vegetation (Cruz and Delannoy 1986).

Current Status of the Species

According to the most recent (August 2012-February 2013) surveys conducted by Mississippi State University, no evidence of recent nesting by SSHA was found in the proposed release area, and not more than 7 individuals were observed in the surveys (J.

Gallardo pers. comm). Nevertheless, additional surveys will be conducted to further validate these findings.

Possible Effects

Based on food items, feeding behavior, and nesting preferences of PRPs and SSHAs, there would be very little, if any, niche overlap and attendant competition between these species. Also, planned trail improvement actions would not alter or disrupt natural structure of the midstory and overstory strata; thus, it would not adversely affect foraging and nesting habitat for this species. Finally, habitat management practices which benefit PRPs (e.g., maintenance of mature trees, maintenance of floristic diversity) are also practices which would benefit the SSHA (Appendix III). Should nesting activity of SSHAs be detected within the proposed impact area, parrot management activities would be temporarily adjusted and modified to accommodate the biological needs of the nesting pair(s). Furthermore, monitoring activities associated to the reintroduction of PRPs would also provide a unique and excellent opportunity to simultaneously acquire important ancillary information (e.g., nest sites, population, movement patterns) on this little-known endangered species.

Conservation Measures

The Service anticipates that possible effects would be minimized by surveying proposed access trails in advance to detect any unknown individuals and avoiding the known populations. New trails to access potential sites to establish nesting cavities would be planned in advance and the area would be evaluated for the presence of the SSHA. Furthermore, the Service and the DNER would provide training to the project personnel to ensure recognition of the species.

Conclusion

Based on the above information and analysis, we believe that the reintroduction of the PRPs in MAF may affect, but is not likely to adversely affect the SSHA.

4.2.3.2 Puerto Rican nightjar (*Caprimulgus noctitherus*)

Species Description and Habitat

The Puerto Rican nightjar is a small cryptically plumaged nocturnal caprimulgid endemic to Puerto Rico. The nightjar is a robin-sized (24 cm or 9.4 in) bird with long bristles about the bill. The fluffy plumage is mottled with dark brown, black, and gray. There is a white band across the throat and white spots at the end of the tail feather (Kepler and Kepler 1972). Original records of the species are from the northern moist karst forests of Puerto Rico. Studies on the geographic distribution of nightjars during 1985-1992 did not find relict populations of the species in the northern moist karst forest of the Island, but did find nightjar presence in three main regions of coastal dry forests of southwestern Puerto Rico (i.e., Guánica-Ensenada, Susúa-Maricao, Guayanilla-Peñuelas, La Parguera

hills, and Sierra Bermeja; Vilella and Zwank 1993).

Distribution and Abundance

Although the Puerto Rican nightjar is known to occur within the MAF, the species primarily occurs in the drier southern slopes of the mountains, and the reintroduction site is located on the northern moister region of the MAF, and the planned management activities for the reintroduction will occur primarily within a 1km (0.62 mi) radius of the release site (Appendix IV), based on experience with the reintroduction in RAF. However, should parrots utilize areas occupy by nightjars, management activities will be conducted on an ad hoc basis to minimize any potential adverse effects to the listed species in this area.

Current Status of the Species

The Puerto Rican nightjar is considered stable in its range. A study was conducted to assessed population estimates and landscape ecology of the Puerto Rican nightjar (Gonzalez 2010). Landscape models predicted considerably more suitable nightjar habitat exists than had been previously estimated, and highlighted several areas of importance for the species. The most recent density estimates available for the species are; Guánica Forest 1.93 ± 0.14 nightjar/ha, Susúa Forest 0.86 ± 0.07 nightjar/ha, and 0.99 ± 0.09 nightjar/ha at the El Convento reserve in the Guayanilla hills (Gonzalez 2010). Although no information exists on the population trends of the nightjar, information collected from Guánica and Susúa Commonwealth Forests suggests the number of nightjars has remained fairly constant. Moreover, it is suggested that ecological succession in the upland mixed forest associations at Guánica may have actually improved nightjar habitat conditions (Gonzalez 2010).

Possible Effects

Because the current range and preferred habitat of the Puerto Rican nightjar lies outside the area of the proposed action, little if any effects to the species should result from the proposed action.

Conservation Measures

Should parrots utilize areas occupied by nightjars, management activities will be conducted on an ad hoc basis to minimize any potential adverse effects to the listed species in such areas.

Conclusion

Based on the above, we conclude that the reintroduction of PRP, may affect, but not likely to adversely affect Puerto Rican nightjar.

4.2.3.3 Elfin-woods warbler (*Setophaga angelae*)

Species Description and Habitat

The Elfin-woods Warbler (*Setophaga angelae*), (hereafter the EWWA) is a small bird in the family Emberizidae about 12.5 cm (4.9 in) in length, and entirely black and white. Adults have a thin, white eyebrow stripe, white patches on ear-covers and neck, incomplete eye ring, and black crown. Immature EWWAs are similar to the adult, but black is replaced by grayish-green on the back, and yellowish-green on the head and underparts (Raffaele 1989).

Distribution and Abundance

The EWWA is endemic to Puerto Rico and has been reported in humid montane forest habitats. Initially thought to occur only in the Luquillo Mountains (EYNF), this species was later discovered in the Maricao, Toro Negro, and Carite Commonwealth forests (Gochfeld et al. 1973; Cruz and Delannoy 1984; Raffaele 1998). Kepler and Parkes (1972) described the EWWA from the high elevation Elfin Woodland forests (640 to 1,030 m (2,099 to 3,378 ft) and occasionally Palo Colorado forests in EYNF. Wiley and Bauer (1985) later reported the species from the Elfin forests and lower elevation forests (370 to 600 m (1,213 to 1,968 ft)) such as Palo Colorado and Sierra Palm forests in the EYNF. Based on surveys conducted in 1989 and 1990, Arroyo-Vázquez (1991) suggested that the species migrates vertically in elevation. In addition, the species seems to move towards the north facing valleys during the months of heaviest rainfall.

Current Status of the Species

Kepler and Parkes (1972) estimated the El Yunque EWWA population at fewer than 300 pairs. Cruz and Delannoy (1984a) reported the highest densities in the MAF at Los Viveros (20.9 individuals/ha (51.6/61.7 ac)) and significantly lower densities at Rosario Alto (3.0/25 ha (7.4/61.7 ac)), and Campamento Santana (1.2/25 ha (2.9/61.7 ac)). Waide (1995) estimated 138 pairs of EWWA in the EYNF using an area of Elfin woodland of 329 ha (813 ac), and estimated a maximum density of 20.9 individuals/ha in the MAF. Anadón-Irizarry (2006) surveyed 155.2 ha (383.5 ac) of upland woods habitat in the EYNF, and recorded 196 EWWA in seven counts for an average of 0.18 warblers /ha/count. Palo Colorado had the highest density with 0.30 warblers ha/count.

Anadón-Irizarry (2006) surveyed 102.4 ha (253 ac) of habitat in the MAF and recorded 778 EWWAs in 18 counts, for an average of 0.42 warblers/ha/count; with *Podocarpus* having the highest density (0.94/ha/count) and dry slopes with the lowest. Delannoy (2007) did not estimate the overall number of individuals in the MAF and adjacent properties, but provided an average EWWA abundance per point-count station. Of the 127 point count stations located within the MAF, 106 (83.5%) yielded positive results for presence of EWWA (Delannoy 2007). Of the 234 point count stations located in lands adjacent to the MAF, only 58 (24.8%) yielded positive results for EWWA presence. González (2008) determined the abundance of the EWWA in habitats of the MAF and adjacent areas. As with previous studies, species abundance was highest in *Podocarpus*

Forest (1.41 individuals per point count station) and lowest in dry adjacent forest (0.01 individuals per point count station). The species was not recorded in un-shaded coffee plantations. Within the MAF, González (2008) estimated 97.67 EWWAs in a 203.2 ha/count sampling area; whereas in areas adjacent to the MAF, he estimated 43.02 EWWAs in a 374.4 ha/count sampling area.

Possible Effects

MAF has the highest density of EWWAs in its distribution (Delannoy 1997, Anadon 2006). EWWA is present throughout the MAF (V. Anadon pers. comm), including the area selected for the release site. However, the site construction of the release cage would take place should this alternative be selected is located within the boundaries of the PRDNER Maricao Fish Hatchery, which is an area which has been highly disturbed and modified from its original condition for many years. Thus, we believe that any potential impacts to EWWA at such site should be limited primarily to spatial displacement.

The primary trail that would be used for future PRP radiotelemetry (Appendix V) is a currently existing trail system which traverses high-quality habitat for EWWA (Delannoy 1997) and would only be improved for personnel safety reasons. Said improvements would consist of modifying existing vegetation in an estimated total of 4,000 square meters (0.99 ac) [4 km x 1.0 m (2.5 mi x 3.3 ft)]. However, the initial 100 m (328 ft) of said trail, which begins at State Road PR 120, would be left in its current unaltered state in order not to attract unwanted attention to the existence of this trail. In addition, signage indicating restricted access would be placed within the initial 100 m (328 ft) section in order to further discourage unauthorized entrance. Along the lower portion of this trail (near release site), and also within 50 m (164 ft) of the release site, the Service would place a minimum of ten (10) artificial nest cavities similar to those used successfully in EYNF and RAF. We would also construct five (5) canopy-level observation/telemetry platforms [0.6 x 0.6 m (2 x 2 ft)] to facilitate monitoring of the reintroduced parrot population. These platforms would also be located within 50 m (164 ft) of the main telemetry trail. This would result in modification of approximately 500 square meters (0.12 ac) of habitat. There would be at least seven additional telemetry observation stations which would not require modification of habitat because they would occur in areas already impacted (e.g., adjacent to public roads) or within previously described impact areas.

In total, the area projected that would be impacted constitutes approximately 0.01% of the total available habitat for the EWWA in the MAF. This amount of habitat is not considered significant.

Conservation Measures

The Service would restrict management activities to the minimum necessary to achieve proposed action objectives, while sponsoring the acquisition of additional biological data on habitat use and nesting by *Setophaga angelae* in the impacted areas for use in

planning and implementing management activities both during and after proposed actions.

Conclusion

Based on the above, we conclude that the reintroduction of PRP, may affect, but is not likely to adversely affect *Setophaga angelae*. The amount of habitat that may be affected is minimal and site-specific conservation measures will be implemented during the operation of the project.

4.2.3.4 Puerto Rican boa (*Epicrates inornatus*)

Species Description and Habitat

The Puerto Rican boa (hereafter PR boa) is the largest native snake species within the Puerto Rico Island Shelf. It may grow to a length of approximately 6 to 7 ft (1.8 to 2 m), although there are claims of larger snakes. The color patterns of the PR boa may vary somewhat, but are generally dark colored. Rivero (1998) describes the PR boa color as varied from tan to very dark brown, some having cross bars or spots along its body. Occasionally, a young individual may be of a yellowish or reddish color. The PR boa is not poisonous and kills its prey by asphyxiation (Rivero 1998). This species seems to employ active and ambush foraging modes and has been documented to prey on rats, mice, bats, lizards, domestic fowl chicks, common ground doves, and invertebrates (Wiley 2003).

The Puerto Rico Gap Analysis Project developed an occurrence map and predicted distribution map for the PR boa (Gould *et al.* 2008). The PR boa predicted habitat model includes the following land cover types: moist and wet forest, woodland, and shrubland mangrove, *Pterocarpus*, and mature dry forest and dry forest near water bodies, at or below 1000 m (3280.84 ft) in elevation. The PR boa predicted habitat includes 46.3% [414,379 ha (1,023,952.81 ac)] of the island, of which 9% occurs in protected areas.

Distribution and Abundance

The PR boa is endemic to Puerto Rico. Its altitudinal distribution ranges from sea level to 1,050 m (3,445 ft) (Henderson and Powell 2009). Wiley (2003) collected two dead specimens on the road at higher elevations at 450 m (1,476 ft) in the Sierra de Luquillo. PR Boa seems to be distributed throughout the island, but is more abundant in the karst areas of the north, between Aguadilla (northwest) towards the east to Bayamón, and considerably less abundant in the dry region of the south (Rivero 1998). Distribution includes the northern karst region of Puerto Rico, the periphery of coastal plains and in the mountain regions (Sierra de Luquillo, Sierra de Cayey, and the Central Mountain Chain). Additional sightings have been reported from the dry limestone region in the southern part of the island including Cabo Rojo, Guánica, Guayama, Ponce, Guayanilla, Salinas and Lajas.

At present time, the population size or abundance of the PR boa is not known. The only published density estimate for the PR boa is from Ríos-López and Aide (2007). They surveyed herpetofauna within five different types of habitats (deforested valley, reforested valley, old valley, karst hilltop, karst hillside) along a 50 m (164 ft) transect for each site in the Toa Baja municipality. Ríos-López and Aide (2007) estimated a mean monthly density of 5.6 boas per ha (5.6 boas per 2.47 ac) for the reforested valley, the old valley and the karst hilltop. They did not encounter boas neither in the deforested valley nor at the karst hillside habitats.

Although island wide population estimates are not available, it is clear that the PR boa is distributed throughout the island (it has been reported in more than 50 percent of the municipalities of Puerto Rico) and it is likely that the PR boa is more abundant than generally perceived. In July 2013, the Puerto Rican boa was reported present in the island of Culebra.

Current Status of the Species

At present time, the PR boa is considered stable. Although current population estimates are not available, based on the information collected the species' distribution is broader than previously thought and seems to be more abundant than what was known. Efforts should be taken to conduct comprehensive surveys and to establish a methodology for estimating population levels. Efforts to protect the northern karst region should continue.

Possible Effects

Although the PR boa has been reported from the MAF, studies on movements and habitat use by the PR boa indicate that the species seldom uses habitat at elevations greater than 400 m (1,312 ft) above sea level (ASL) (Sheplan and Schwartz 1974, Reagan and Zucca 1982, Snyder et. al. 1987). The elevation range of the proposed reintroduction area extends from 457 m (1,499 ft) (release site) to approximately 800 m (2,625 ft) ASL. Accordingly, the proposed reintroduction area occurs just beyond the preferred elevational range of the PR boa.

Conservation Measures

In order to minimize possible effects during construction of trails and other facilities associated to the reintroduction of the PRP in MAF, the following conservation measures will be implemented:

a) Previous to any construction or habitat modification activity, personnel associated with habitat modification and construction operations will be oriented on the PR boa biology, ecology, habitat, and conservation.

b) At least few weeks or a month before any habitat modification or construction starts, that at least two field biologists conduct detailed surveys for any individuals of the PR boa at each impact area within the species habitat. In order to maximize PR boa

surveys, these should take place during nocturnal hours after sunset until midnight and ideally within the periods of highest peaks of activity for the species (March through May and August through October). Although one may still find boas outside of these times and months, the likelihood of finding the species is greatly reduced. Surveyors will focus particularly on crevices in the ground and exposed rock and trees that could be used by the species. Surveyors should have previous experience searching and handling boas and would also be permitted by DNER to handle boas

c) If PR boas are found (Appendix VI), the animal will be captured by qualified personnel and relocated within the same forest.

Conclusion

Based on the above, we believe that the proposed reintroduction of the PRP in MAF may affect, but is not likely to adversely affect the Puerto Rican boa. Any personnel handling the boas will have required training and will be covered by either a DNER permit or a USFWS permit.

4.2.3.5 Higüero de sierra (*Crescentia portoricensis*)

Species Description and Habitat

Crescentia portoricensis Britton (Bignoniaceae) or Higüero de sierra is a vine-like shrub or small tree endemic to evergreen, semi-evergreen, and deciduous forests on serpentine in the lower Cordillera region of southwestern Puerto Rico. It is an endangered shrub, endemic to the MAF and Susúa Commonwealth Forest in the western part of Puerto Rico. The simple leathery leaves occur in clusters on highly reduced short shoots along the main branches (Breckon and Kolterman 1993). The leaves grow in fascicles of two or three, are alternate but with congested internodes. Plants can reach up to 6 m (19.6 ft) in height and produce hermaphroditic, yellowish-green bell-shaped flowers that ripen into dark green fruits (Little et al. 1974). It grows as an open, sparsely-branched shrub with one to five lax, wand-like basal branches. The inflorescence is a single axillary flower, with a greenish or yellowish corolla. The species is mostly restricted to sites along permanent or intermittent watercourses.

Distribution and Abundance

The species was listed as endangered due to its extremely low population size and by indirect effects of deforestation (such as erosion or landslides caused by accelerated runoff and flash flooding (Appendix VII). At the time of listing, a total of 42 plants were known from six sites in the MAF and Susúa Commonwealth Forest. The species was restricted to sites along permanent or intermittent watercourses. The plan specifies that all populations are threatened by increased erosion by deforestation and poor management practices occurring upstream outside the forest.

Based on the most recent information, at least 163 individuals occur within MAF

boundaries (José Cancel 2010). José Cancel (2010) informed of at least 38 individuals occurring along Río Maricao just above the site of the release cage. The species further occurs along the main trail from the Maricao Fish Hatchery to Road PR 120 (O. Monsegur, pers. comm 2013).

Current Status of the Species

In 1996, Breckon and Kolterman reported 331 plants of *Crescentia portoricensis* in nine populations; compared to the 532 plants in 11 populations reported by Cancel (2010), an increase of 60% in the number of plants. Cancel highlights that his research reports a larger number of plants because the search, specifically focused on *C. portoricensis*, was more extensive than the one done by Breckon and Kolterman from 1991 to 1995. It is inferred that the previously unreported plants reported in this research may be old individuals, as no seedlings were found from 1991 to 1995 and no seedlings were found in the course of this research. This was validated by the surveys conducted by the Service during the habitat evaluations, as no seedlings were observed despite the availability of fruits (O. Monsegur, pers. comm 2013).

At the same time, no direct information is available on the growth rate of the plants. Cancel made a comparison between the data recorded by Breckon and Kolterman and data recorded in his research for the Río Maricao population, MAF. In Cancel (2010) the growth rate of *Crescentia portoricensis* was found to be very low and also quite variable. He considered the slower growth observed in the Maricao plants is unexpected, and may reflect the fact that comparative data were only available for five plants in the Río Maricao population, which was the population in which the greatest loss of individuals was observed. On the other hand, the mean numbers of stems from the base were similar in the two forests and also showed little change over time which suggests that stem production and stem loss occur at more or less the same rate.

Possible Effects

Due to the steep topography of the MAF the borders of the Río Maricao and intermittent streams would be used as access trails to access the headwaters of the river. As previously mentioned, the margins (gallery forest) along the rivers and small streams seem to be the prime habitat for *C. portoricensis*. Therefore, possible effects to the species and its habitat would be anticipated due to vegetation clearance for the construction or enhancement of walking trails. The species growth habit (vine like) makes it vulnerable to being pruned or accidentally cut during operation of the project. About 4000 square meters (0.99 ac) of riparian prime habitat and additional 10,400 square meters (2.57 ac) of suitable habitat for the species may be affected. Further impacts may occur due to disturbance of suitable habitat necessary for the recruitment of the species and seedling trampling. Invasive species may invade recently opened habitat and may outcompete *C. portoricensis*.

Conservation Measures

The Service anticipates that the above-mentioned effects will be minimized throughout the implementation of the following conservation measures:

a) New trails to access potential sites to establish nesting cavities and observation platforms would be planned in advance and the area would be evaluated to determine presence of listed plants.

b) Any identified individuals or populations would be avoided. The Service and the DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species. For example, areas along the trails that are known to harbor a population would be clearly marked with an information sign warning about the presence of the species on the area and about the need to minimize habitat disturbance.

c) The Service would promote the monitoring of current populations and searches in suitable habitat within the action area.

d) The Service would foster the establishment of a propagation program for the species using seed material from the MAF and thereby enhancing the populations along the river as an alternative to compensate for the anticipated impacts to undetected individuals. The reintroduction efforts would be accompanied by a long term monitoring program.

Conclusion

Crescentia portoricensis is a species that based on the available information is facing problems of natural recruitment. Due to the growth form and the habitat requirements of the species, the Service anticipates direct impacts to the species. Overall, the proposed actions may benefit the species by increasing the knowledge of species distribution and abundance, and promoting propagation efforts of the species within the Forest. Based on the above, we believe that the proposed reintroduction of the PRP in MAF may affect, but is likely to adversely affect *Crescentia portoricensis*. Although possible effects would be minimized by the implementation of site-specific conservation measures and propagation efforts, possible take of individuals is anticipated.

4.2.3.6 *Cordia bellonis*

Species Description and Habitat

Cordia bellonis is an arching to erect shrub of about 1 to 2 m (3.3 to 6.6 ft) high (sometimes growing like a vine or liana) with very slender twigs with short hairs. The leaves are alternate, oblong to oblong-lanceolate, 2 to 6 cm (0.8 to 2.4 in) long, usually 2.5 to 3 times longer than wide. The corolla is white with 4 subcylindric lobes. The fruits are a pointed drupe, 5 millimeter (mm) (0.2 in) in length (Proctor 1991). The white axillary flowers are unisexual and the plants are either male or female (Breckon and Kolterman 1993). The flowers have a thin, reduced corolla that is adnate at its apex to the apical rim of the calyx. Breckon and Kolterman (1993) specified that all other species of

the genus apparently have bisexual flowers. The plants remain dense and shrubby in open, exposed habitat, but in closed vegetation the branches become divaricating and form obtuse angles that hook the plant into the surrounding trees, forming a clambering, rigidly branched liana (Breckon and Kolterman 1993).

Distribution and Abundance

Cordia bellonis has been found at MAF and Susúa in serpentine soils, at roads edges, rivers margins, and on steep slopes at an elevation between 230-250 m (755 – 820 ft) in Susúa and 441 to 820m (1,447 to 2,690 ft) in MAF. In RAF, the species was found either on banks along dirt roads, growing in thickets of vegetation, or in open saddles between limestone hills. The species is threatened by habitat destruction and modification, certain forest management practices, and its restricted distribution. The rarity and restricted distribution of this species make it vulnerable to habitat destruction and modification.

Approximately 210 individuals of *Cordia bellonis* were reported within MAF when the Recovery Plan for the species was approved in 1999 (USFWS 1999). In 2006, Sánchez-Cuervo studied some aspects of the population and reproductive ecology of *Cordia bellonis* in MAF (Appendix VIII). According to Sánchez-Cuervo (2006), the highest concentration of individuals of *Cordia bellonis* was found in MAF; eighty-four (84) adults and one hundred and eight (108) seedlings were found in five main areas within the forest, in 46 locations. From these 192 individuals, approximately 158 were reported as new individuals (non-registered in previous years).

The adult population once reported along road PR-120 was also reduced by 37.8% and the population reported near the Maricao Fish Hatchery was reduced by 90.9%. In addition, 21 individuals reported from PR-362 were not found. Other areas such as the trail to “Casa de Piedra” (2 plants), and the Maricao River area (11 plants) following the same route as previously reported by Breckon and Kolterman (1993) were also visited but no individuals of *C. bellonis* were found except for one in the Rio Maricao location. Although Sánchez-Cuervo (2006) reported a population reduction in MAF, results indicated that reduction has occurred only from historical locations previously reported by Breckon and Kolterman (1993). These data differs from that previously reported by Breckon and Kolterman which reported *C. bellonis* from 17 localities in three main areas within the forest; the data presented by Sánchez-Cuervo (2006) indicates that the species is currently present in 29 additional localities in 5 main areas of the forest. This may indicate that the species is more common within MAF than previously thought. Recent surveys by the Service for populations of *C. bellonis* validated the information provided Sánchez-Cuervo (2006) and highlight the importance of the Río Maricao headwaters for the recovery of the species.

Current Status of the Species

At present time, the species is considered as a shrub species endemic to the island of Puerto Rico. It is known from only three public forests: MAF, Susúa Forest and RAF. Only 84 adult individuals of this species were reported by Sánchez-Cuervo on 2006.

Despite the decrease on the numbers of previously reported populations mentioned by Sánchez-Cuervo (2006), the species seems to be stable. The decrease on the number of individuals may be the result of poor data about the localities or problems to detect the species due to its growth form (it can be confused with other vine species). It may also be the result of natural population dynamics and its ecology, as many other related species *C. bellonis* seen to be a species adapted to gap conditions.

Possible Effects

Cordia bellonis is widely distributed throughout MAF and we would anticipate potential adverse effects due to its ubiquity. At least 36 individuals were identified along Los Viveros Trail by Service staff as part of the habitat evaluations. Additional individuals were identified along the margins of the Maricao River. Therefore, possible effects to the species and its habitat would be anticipated due to vegetation clearance for the construction or enhancement of walking trails. The species growth habit (vine like) makes it vulnerable to being pruned or accidentally cut during operation of the project. About 10,400 square meters (2.57 ac) of prime habitat and additional 4,000 square meters (0.99 ac) of suitable habitat (along river margins) for the species may be affected. Further impacts may occur due to disturbance of suitable habitat necessary for the recruitment of the species and seedling trampling. Invasive species may invade recently opened habitat and may outcompete *C. bellonis*. The impacts may be exacerbated by the fact that the species is dioiceous (showing male and female plants).

Conservation Measures

The Service anticipates that the above-mentioned effects would be minimized throughout the implementation of the following conservation measures:

- a) New trails to access potential sites to establish nesting cavities and observation platforms would be planned in advance and the area would be evaluated to determine presence of listed plants.
- b) Any identified individuals or populations would be avoided. The Service and the DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species. For example, areas along the trails that are known to harbor a population would be clearly marked with an information sign warning about the presence of the species on the area and about the need to minimize habitat disturbance.
- c) The Service would promote the monitoring of current populations and searches in suitable habitat within the action area.
- d) The Service would foster the establishment of a propagation program for the species using seed material from the MAF and thereby enhancing the populations along the Maricao River watershed as an alternative to compensate for the anticipated impacts to undetected individuals. The reintroduction efforts would be accompanied by a long

term monitoring program.

Conclusion

Based on the above, we believe that the proposed reintroduction of the PRP in MAF may affect, but is likely to adversely affect *Cordia bellonis*. Although possible effects would be minimized by the implementation of site-specific conservation measures and propagation efforts, possible take of individuals is anticipated.

4.2.3.7 *Cranichis ricartii*

Species Description and Habitat

Cranichis ricartii is an orchid endemic to the MAF. *Cranichis ricartii* may reach 27 cm. (10.6 in) in height. The roots are few, fleshy, cylindric, and villous. The several leaves are basal, erect, and about 2 to 3 cm. (0.8 to 1.2 in) long. The green, spreading blades are ovate to broadly elliptic, and 21 to 35 mm (0.8 to 1.4 in) long and 14 to 20 mm (0.55 to 0.79 in) wide. Inflorescences are terminal, scapose, spicate, and pubescent. The raceme is many flowered and may reach up to 10 cm (4 in) in length. Flowers are small, erect, non-resupinate, and green. The dorsal sepal is elliptic, obtuse and about 1.8 mm (0.07 in) long and 1.0 mm (0.04 in) wide. The lateral sepals are broadly ovate, obtuse, appressed to the lip, and about 1.9 mm (0.07 in) long and 1.1 mm (0.04 in) wide. The petals are filiform-oblongate, 1.9 mm (0.07 in) long, 0.2 mm (0.008 in) wide, reflexed and appressed along the margins of the dorsal sepal but becoming somewhat free with age. The lip is green with a white margin, simple, short-clawed, pinched near the base, deeply cucullate, fleshy, essentially glabrous, and 2.0 to 2.5 mm (0.08 to 0.1 in) long. The column is short, stout, and conspicuously winged. The fruit is an ellipsoid capsule, 5 to 7 mm (0.2 to 0.3 in) long (Ackerman 1989, Vivaldi et al. 1981).

It was listed as endangered due to its rarity, restricted distribution, and vulnerability to forest management practices, hurricane damage, and collection. The recovery plan reports that *Cranichis ricartii* is restricted in distribution to the MAF located in the western mountains of Puerto Rico, where Rubén Padrón and Juan Ricart first discovered the species in 1979. Ackerman (1989) located the type locality (the collection site from where the species was first described) between Monte Montoso and Alto del Descanso, Road 120, elevation 680-690 m (2,231 – 2,264 ft).

Distribution and Abundance

A total of 30 individual plants of *Cranichis ricartii* were reported from three localities within MAF. The species was not observed consistently in all localities every year. For example, it was not observed at the two localities along the Alto del Descanso trail during surveys conducted in 1990 where was previously reported (USFWS 1996). This rare terrestrial orchid grows on montane ridges at elevations above 680 meters (2,231 ft) in humus of moist, serpentine scrub forest.

Due to the known location of populations of this species (i.e., high elevation ridges), we do not anticipate effects of parrot management activities on the species. Furthermore, monitoring activities and infrastructure for the reintroduced parrot population would also provide a unique and excellent opportunity to simultaneously acquire life history information on the species, if found during plant surveys.

Current Status of the Species

The current status remains unknown. However, the best information indicates that the species occurs on three localities within the MAF. The species occurs on the highest peaks of the forest and two of the populations are located within the area known as Alto del Descanso trail.

Possible Effects

The known populations are located on areas outside the primary action area of the proposed project. These areas would be used occasionally for telemetry, but no habitat modification is anticipated. These areas already have scenic areas and trails that provide excellent point for telemetry. No adverse effects to the species or its habitat are anticipated.

Conservation Measures

The Service anticipates that possible effects, if any, would be minimized throughout the implementation of the following conservation measures:

a) Any identified individuals or populations would be avoided and historical site of species occurrence will be excluded from proposed actions. The Service and the DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species.

Research needs would be identified in order to work for the recovery of the species.

Conclusion

Based on the above, we believe that the proposed reintroduction of the PRP in MAF may affect, but is not likely to adversely affect *Cranichis ricartii*.

4.2.3.8 Palo de rosa (*Ottoschultzia rhodoxylon*)

Species Description and Habitat

Palo de rosa is a small evergreen tree which has been reported to reach 15 m (49 ft) in height and 41 cm (16 in) in diameter. The leaves are alternate, glabrous, and elliptic to ovate. The fruit is a one-seeded drupe with a thin pericarp. The heart wood is reddish, as is indicated by its common name (USFWS 1994).

The populations of palo de rosa in Puerto Rico occurs within the subtropical dry forest life zone and the subtropical moist forest life zone (Ewel and Whitmore 1973). These life zones are the predominant in Puerto Rico and occupy areas that were extensively deforested for agriculture. Rainfall within the subtropical dry forest range from 600 to 1,100 mm (24 – 44 in) per year and from 1,100 to 2,200 mm (44 – 88 in) per year in the subtropical moist forest. The range in altitude for the species goes from sea level in populations adjacent to the coast to 609.6 m (2,000 ft) in the population at MAF.

The reported populations are associated with serpentine and limestone derived soil. Typically, the populations located along the subtropical dry forest life zone in southern Puerto Rico occur at the bottom of moist canyons or drainages and the populations located along the subtropical moist forest life zone in northern Puerto Rico are located at the north facing slopes or close to the top of the hills. This suggests that the species require intermediate mesic conditions (Ilianet Morales, UPR, personal communication 2009). The majority of the populations are restricted to remnants of natural vegetation and to inaccessible areas with little agricultural value. The recorded evidence indicates that the species is associated to areas that were selectively logged for charcoal production, but the vegetation was not completely cleared.

Distribution and Abundance

Palo de rosa was listed as an endangered species on April 10, 1990. At that time, the species was known from a few localities on the northern coast near Bayamón, several sites within the Guánica Commonwealth Forest and from a single individual located in the MAF. It was estimated that at the time of listing, the combined size of the populations was nine individuals. The Recovery Plan for palo de rosa reports approximately 200 individuals from 16 populations in Puerto Rico (USFWS 1994).

According to the information currently available to the Service, the total number of populations in Puerto Rico is estimated on 53; the number of adult individuals is estimated on 436 plants within 31 natural populations. Furthermore, the number of seedlings has increased to 482 plants in eight populations. About 22 of the known populations require to be assessed, as there is no information regarding their size or populations status.

Current Status of the Species

The Service considers the status of the species as stable based on the increased number of currently known individuals and natural populations. The species is currently threatened by habitat destruction and modification. At least 62% of the populations currently known are located within private lands. Despite of the increase in the number of known populations, these are threatened by activities of rock quarries and the development of housing projects. Since the population dynamics of the species is unknown and we do not have enough information to determine what constitutes a viable population, we understand that the effects of a severe tropical storm could be detrimental to some populations as it may kill the few trees that are reproducing.

Possible Effects

Although the palo de rosa is known to occur within MAF, the species primarily occurs in the drier southern slopes of the mountains. The reintroduction site for the PRP would be located on the northern moister region of the MAF. Based on the experience with the reintroduction of the PRP in RAF, parrot management activities will occur primarily within a 1km (0.6 mi) radius of the release site. The palo de rosa does not currently occur within this area. Therefore, no adverse effects are anticipated.

Conservation Measures

Should PRPs utilize in the future areas where palo de rosa is found, management activities will be modified or areas realigned in order to avoid potential adverse effects to the species in this area. If parrot management activities overlap the known habitat of palo de rosa within MAF, the Service will implement the following conservation measures:

a) Any trails to access potential sites to establish nesting cavities and observation platforms would be planned in advance and the area would be evaluated to determine presence of listed plants.

b) Any identified individuals or populations would be avoided. The Service and the DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species. For example, areas along the trails that are known to harbor a population will be clearly marked with an information sign warning about the presence of the species on the area and about the need to minimize habitat disturbance.

Conclusion

Based on the above information and analysis, we believe that the proposed reintroduction of the PRP in MAF would not affect the palo de rosa in MAF.

4.2.3.9 *Gesneria pauciflora*

Species Description and Habitat

Gesneria pauciflora is an endemic small gregarious shrub/woody herb known to occur only on serpentine derived substrates with little or no soil formation and associated with wet habitats (Appendix IX). The species was listed because of an extremely limited distribution and because of habitat threats and other natural threats like landslides. Two of the three known populations are located in the MAF. The third locality lies on a Lajas River tributary outside of the MAF boundaries. Herbarium specimens indicate that the species has also been collected in the past from the Yagüez River and from “Cerro Las Mesas” in the Mayagüez municipality, but these sites have not been intensively surveyed. Landslides, storm damages, and floods are natural occurrences that may affect the steep, unstable slopes associated with this species’ habitat. The recovery plan specifies that the

largest population along the Río Maricao locality has been estimated at approximately 1000 individuals and another population at 50 (Seco River locality).

Distribution and Abundance

During the first week of November 2009, Service biologists visited a section of the Río Maricao locality for an assessment of the area. Biologists covered approximately 2.4 km (ca. 1.5 mi) along the Río Maricao including areas that had not been previously searched. They estimated a range of 780 to 1,425 individuals in 12 colonies of which 6 were within areas not previously searched (USFWS 1998). Two large colonies were found by Service biologist Omar Monsegur along Los Viveros Trail within the Río Maricao watershed. The largest colonies were the most isolated and closer to the rivers headwater and associated drainages.

Although it appears some colonies have disappeared naturally, other large colonies were found in areas that had not been searched before. Based on the information gathered and the observations in the field, the number of individuals in the Río Maricao is considered stable. Furthermore, in 2012, the Service signed a Cooperative Agreement with the University of Puerto Rico, Río Piedras campus to: 1) document general aspects of the pollination biology and breeding system of *Gesneria* under field conditions using a series of controlled pollination, natural pollination observations, and observations of natural flower visitation; 2) validate a landscape-level model of the distribution of *Gesneria* populations developed by USFWS staff by identifying and collecting locality and population status data; and 3) create and deliver to USFWS a data matrix that will be used to complement existing data on the relationship between variation in plant abundance and distribution with habitat variation. This two-year study will generate fundamental information to improve our current knowledge on the vulnerability of this species and generate appropriate restoration and conservation measures in the area.

Current Status of the Species

Gesneria pauciflora is threatened by a limited distribution. The species is only known from three localities in Maricao, Puerto Rico, where it grows in rocky streambeds on wet serpentine rock. Landslides, flood, and storm damage also affect the steep, unstable slopes associated with the species habitat. No new threats have been identified for the species.

Possible Effects

Since *Gesneria pauciflora* grows along streams and on rock faces of waterfalls the Service anticipates little or no adverse impacts to the species and its habitat. Overall, the proposed actions would benefit the species by increasing the knowledge about the distribution of the species by allowing surveying remote areas.

Conservation Measures

Should parrot management activities overlap the known habitat of *Gesneria pauciflora* within MAF, the Service would implement the following conservation measures:

a) Any trails to access potential sites to establish nesting cavities and observation platforms would be planned in advance and the area will be evaluated to determine presence of listed plants.

b) Any identified individuals or populations will be avoided. The Service and the DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species. For example, areas along the trails that are known to harbor a population will be clearly marked with an information sign warning about the presence of the species on the area and about the need to minimize habitat disturbance.

c) The Service would promote the monitoring of currently known populations within the action area.

Conclusion

Based on the above, we believe that the proposed reintroduction of the PRP in MAF may affect, but is not likely to adversely affect *Gesneria pauciflora*.

4.2.4 PREDATOR CONTROL IMPACT

To foster a successful reintroduction and reproduction the suite of predator control programs implemented at EYNF and RAF would likely be necessary in MAF. These include rat poisoning, measures to prevent thrasher predation (e.g., nest boxes), and possible Red-tailed Hawk removal. To prevent harm to non-target species, the same procedures and safety protocols used in EYNF and RAF will be adopted for the MAF. Poison application (for rats) and raptor removal would require staff time for planning, implementation and monitoring. Predator control projects may benefit other federally-listed avian species in MAF.

4.2.5 PUBLIC USE AND LANDOWNER IMPACTS

If this alternative is chosen, the use of existing recreational facilities (e.g., picnic areas, camping) should not be adversely affected. These existing facilities are located outside of areas identified for reintroduction. Once parrot nesting areas are established, use restrictions or no-use zones would be designated and posted for the public. Criteria to impose restrictions have been defined for EYNF and RAF, and can be adapted to the MAF. Forest maintenance activities (e.g., hatchery grounds maintenance) could be affected if they would take place in areas close to active nest sites of parrots. Such activities could, however, be allowed on a seasonal basis (e.g., non-breeding season). New additional power line corridors or towers would not be allowed in or in close proximity to core parrot activity areas. However, public use opportunities such as

environmental education and interpretation, and wildlife observation and photography would be maximized.

4.3 ALTERNATIVE C – Reintroduction of the PRP in the GAF Forest

Under this alternative, the Service would minimize risks of the species' extinction and promote the recovery of the species. The population and habitat would be managed to increase the likelihood of a successful reintroduction. This alternative would require implementing many of the management activities used in EYNF and RAF (Appendix X), White et. al. 2005a; White and Vilella 2004; Snyder et al. 1987). Other activities include implementing forest management practices (e.g., selective planting of food producing species) that would promote greater availability of food resources. This action requires that Service, US Forest Service, and PRDNER staff monitor and manage the population and habitat throughout the year.

4.3.1 HABITAT IMPACTS

Provisioning artificial nest cavities would be required to insure a successful reintroduction. This is a management practice commonly used in the EYNF and RAF. Monitoring population numbers, survival and reproduction will require maintaining (and creating) trails and constructing platforms to facilitate said activities. Impact of these activities on forest resources is localized, being restricted to primarily within 1 km (0.6 mi) of the action.

4.3.2 BIOLOGICAL IMPACTS

This alternative would not significantly affect resident or migratory fauna, and flora in the GAF. For example, resident avian species should not be adversely affected by this action because the reintroduction is of a native species with which they have co-evolved. Indeed, Douglas et al. (2013) reported that many species of Caribbean frugivores and nectivores may benefit from the presence of native psittacines which facilitate foraging and resource acquisition by those species.

4.3.3 LISTED SPECIES AND TRUST RESOURCES

Based on the information currently available to us, the following federally-listed species are currently located at the GAF: the Puerto Rican boa, *Calyptronoma rivalis* (palma de manaca), *Eugenia haematocarpa* (no common name), *Daphnopsis helleriana* (no common name), *Ottoschulzia rhodoxylon* (palo de rosa), *Goetzea elegans* (matabuey), *Schoepfia arenaria* (erubia), *Buxus vahlii* (diablito de tres cuernos) and *Peperomia wheelerii* (no common name).

4.3.3.1 Puerto Rican Boa (*Epicrates inornatus*)

Species Description and Habitat

The PR boa is the largest native snake species within the Puerto Rico Island Shelf. It may grow to a length of approximately 6 to 7 ft (1.8 to 2 m), although there are claims of larger snakes. The color patterns of the PR boa may vary somewhat, but are generally dark colored. Rivero (1998) describes the PR boa color as varied from tan to very dark brown, some having cross bars or spots along its body. Occasionally, a young individual may be of a yellowish or reddish color. The PR boa is not poisonous and kills its prey by asphyxiation (Rivero 1998). This species seems to employ active and ambush foraging modes and has been documented to prey on rats, mice, bats, lizards, domestic fowl chicks, common ground doves, and invertebrates (Wiley 2003).

The Puerto Rico Gap Analysis Project developed an occurrence map and predicted distribution map for the PR boa (Gould *et al.* 2008). The PR boa predicted habitat model includes the following land cover types: moist and wet forest, woodland, and shrubland mangrove, *Pterocarpus*, and mature dry forest and dry forest near water bodies, at or below 1000 m (3280.84 ft) in elevation. The PR boa predicted habitat includes 46.3% [414,379 ha (1,023,952.81 ac)] of the island, of which 9% occurs in protected areas.

Distribution and Abundance

The Service also has information from species experts, site visits and personal communications about PR boa occurrence. For example, we know that boas have been sighted in several caves within the karst areas of the island. We also have reports from several state and private forests as mentioned above (Figure 1; Río Abajo, Guajataca, Camabalache, and Vega Commonwealth Forests, Mata de Plátano Nature Reserve in Arecibo, and El Convento Caves in Guayanilla). Previous elevation distribution for the PR boa has been characterized as from sea level to less than 400m (1,312 ft). However, Grant (1932, 1933) reported boas at 450 m (1,476 ft) and near the headwaters of the Luquillo mountains, which Reagan (1984) noted would be at an elevation of 700 m (2,296 ft). This last report is based on Reagan's interpretation of Grant's habitat description. This report in elevation is considerably higher than any previously known boa locality. Schwartz and Henderson (1991), and Henderson and Powell (2009) described the PR boa's elevation range from sea level to 1,050 m (3,445 ft). The highest elevation Wiley (2003) encountered was 480 m (1,575 ft) in the Sierra de Luquillo. Mean elevation in the Sierra de Luquillo, where most individuals were found, was 250.8 m (823 ft). The PR boa predicted habitat includes 46.3% [414,379 ha (1,023,952.81 ac)] of the Island, of which 9% occurs within protected areas. However, this does not exclude PR boa occurrence outside of the predicted habitat. In fact, based on a strong likelihood, GAP illustrates the entire island of Puerto Rico as having a probable occurrence of boas (Gould *et al.* 2008)

Current Status of the Species

More recent publications concur with previous studies (Schwartz and Thomas 1975), indicating that although the PR boa was considered rare since the beginning of the 20th

century, as reported by Grant (1932; 1933), the Puerto Rican boa is widespread in Puerto Rico.

Possible Effects

The Puerto Rican boa occurs in GAF. Boas are predators of parrot nestlings in Jamaica and Dominica (J. Wunderle, USFS, pers. comm, 2004)). The Puerto Rican boa is very abundant in the karst region which includes GAF (USFWS 1986). Although vines are used by boas to access tree cavities (Wunderle et al. 2004), there have been no documented deaths of parrots caused by boas in either the EYNF or RAF, although boas has been encountered in nest cavities of parrots in the Iguaca Aviary in the EYNF. Primary impacts anticipated to the boa in GAF would be from the construction of the training and release cage which would affect approximately 0.06 ha (1.5 ac).

Conservation Measures

In order to minimize possible effects during construction of trails and other facilities associated to the reintroduction of the PRP in GAF, the following conservation measures will be implemented:

a) Previous to any construction or habitat modification activity, personnel associated with habitat modification and construction operations will be oriented on the PR boa biology, ecology, habitat, and conservation.

b) At least few weeks or a month before any habitat modification or construction starts, that at least two field biologists conduct detailed surveys for any individuals of the PR boa at each impact area within the species habitat. In order to maximize PR boa surveys, these should take place during nocturnal hours after sunset until midnight and ideally within the periods of highest peaks of activity for the species (March through May and August through October). Although one may still find boas outside of these times and months, the likelihood of finding the species is greatly reduced. Surveyors will focus particularly on crevices in the ground and exposed rock and trees that could be used by the species. Surveyors should have previous experience searching and handling boas and would also be permitted by DNER to handle boas

c) If PR boas are found (Appendix VI), the animal will be captured by qualified personnel and relocated within the same forest.

Conclusion

Based on the above, we believe that the proposed reintroduction of the PRP in GAF may affect, but is not likely to adversely affect the PR boa. Any personnel handling the boas will have required training and will be covered by either a DNER permit or a USFWS permit.

4.3.3.2 Palma de manaca (*Calyptronoma rivalis*)

Species Description and Habitat

Palma de manaca is an arborescent palm which may reach up to 12 m (40 ft) in height. The species is riparian and it is found in the northwest limestone region of Puerto Rico. The natural populations of palma de manaca are located within the mature and young moist limestone evergreen and semideciduous forest, and the montane wet evergreen forest (Gould et al. 2008). Observations made by Santiago-Valentín and Rojas-Vázquez (2000) identify that early stages of palma de manaca appear to need more moisture and shade to survive than mature palms which can tolerate more sun exposure.

Distribution and Abundance

Historically, palma de manaca was thought to be endemic to Puerto Rico. However, Zona (1995) recognized *Calyptronoma quisqueyana* and *Calyptrogyne quisqueyana* as synonymous with *Calyptronoma rivalis*, extending the species range to Hispaniola where the species occurs throughout a wide area.

Palma de manaca in Puerto Rico occurs in three natural localities: Quebrada Collazo, Río Camuy and Río Guajataca. In addition, DNER is propagating this threatened species and has introduced populations in the Río Abajo, Guajataca Commonwealth Forests and the Guajataca Lake. The Service has also introduced this species to El Tallonal farm in Arcibo.

When listed, 44 palma de manaca individuals persisted along the bank of Quebrada Collazo in San Sebastian; approximately 200 individuals were located along Río Camuy and about 10-15 individuals were located along the Río Guajataca (USFWS 1992). Santiago-Valentín and Rojas-Vázquez (2000) surveyed these three areas and reported 554 individuals and about 1300 seedlings.

There has been an effort to introduce the species into other suitable areas. Four populations of about 50-100 individuals of palma de manaca were introduced in RAF. Another population of about 150 individuals was introduced in GAF.

Current Status of the Species

The Service considers this species status as improving. The species is present in three natural populations in the municipalities of San Sebastian, Quebradillas and Camuy. In addition, there are five introduced populations in various Commonwealth Forests. The Service does not have additional information regarding palma de manaca in Hispaniola. Based on the analysis of the 5-listing factors in the species 5-year review (USFWS 2009), the species continues to be threatened by habitat modification for residential development and possible expansion of roads and or highways.

Possible Effects

Only one introduced population of palma de manaca is currently known in GAF. The location of this population is known from both personnel from the Service and DNER. The proposed reintroduction activities of the PRP would be outside the species habitat. Thus, no adverse effects to the species would be anticipated.

Conservation Measures

The Service anticipates that possible effects would be minimized by surveying proposed access trails in advance to detect any unknown individuals and avoiding the known populations. New trails to access potential sites to establish nesting cavities would be planned in advance and the area will be evaluated for the presence of listed plants. Furthermore, the Service and the DNER would provide training to the project personnel to ensure recognition of the species.

Conclusion

Based on the above, we believe that the proposed reintroduction of the PRP in GAF would not affect the palma de manaca.

4.3.3.3 Uvillo (*Eugenia haematocarpa*)

Species Description and Habitat

Eugenia haematocarpa (Uvillo) is a small evergreen tree reaching 6 m (19.6 ft) tall that was originally known from the Sierra de Luquillo (El Yunque National Forest) and from the Sierra de Cayey. At the time of listing (1998) the species was known to have about 134 individuals; approximately 119 individuals in six populations in El Yunque National Forest, and one population of about 15 individuals on a private property adjacent to the Carite Commonwealth Forest. The specific number of individuals per populations at El Yunque National Forest was not specified on the Final Rule, neither on the Recovery Plan. During the latest surveys (2011), USFS employees visited the Río Gurabo population reporting 12 individuals and the road 186 km 12.3 population reporting 27 individuals (Luis Rivera 2011, USFS pers. comm). Forest Service personnel were not able to visit the remaining populations of Uvillo within El Yunque National Forest. At least two additional populations occur within the boundaries of the GAF (José Román 2012, PRDNER pers. comm). Mr. Román indicates that one of the populations comprises over 30 individuals of different size classes with evident natural recruitment. Another locality within the GAF is composed of a single individual.

Distribution and Abundance

Uvillo occurs primarily within the subtropical moist forest and the subtropical wet forest life zones (Ewel and Whitmore 1973). Both life zones occupy areas that also were extensively deforested for agriculture and charcoal production. New information indicates that the range of this species now extends to the northwestern corner of Puerto Rico, and it grows in moist limestone forest. The northern karst region of Puerto Rico

harbor several protected areas (i.e., Río Abajo Commonwealth Forest and Cambalache Commonwealth Forest) that include mature secondary forest and remnants of native forest that may include suitable habitat for Uvillo, and probably undetected populations. Areas in which agricultural practices have been abandoned and forest regeneration has occurred may provide possible sites for the establishment of new populations of Uvillo.

The case of Uvillo is noteworthy as the distribution of the species has expanded to the northwestern corner of Puerto Rico (Quebradillas and Isabela). One of the recently reported populations lies within the GAF and shows evidence of natural recruitment. Furthermore, four new localities have been reported for the Cayey area, one comprised by over one hundred individuals and with clear evidence of natural recruitment. The Service considers that the number of known individuals has doubled the number of wild individuals known at the time of listing. The evidence of abundant fruit production and the occurrence of populations within at least four natural areas managed for conservation highlight the recovery potential of the species as well as the need to revise the species recovery plan and the possibility of reclassify the species to threaten.

Current Status of the Species

The species distribution has expanded to the northwestern corner of Puerto Rico (Quebradillas and Isabela). One of the recently reported populations lies within the GAF and shows evidence of natural recruitment. Furthermore, four new localities have been reported for the Cayey area, one comprised by over one hundred individuals and with clear evidence of natural recruitment. The Service considers that the number of known individuals has doubled the number of wild individuals known at the time of listing. The evidence of abundant fruit production and the occurrence of populations within at least four natural areas managed for conservation highlight the recovery potential of the species as well as the need to revise the species recovery plan and the possibility of reclassify the species to threaten.

Possible Effects

The Service anticipates that possible effects would be minimized by surveying proposed access trails in advance to detect any unknown individuals and avoiding the known populations. New trails to access potential sites to establish nesting cavities would be planned in advance and the area will be evaluated for the presence of listed plants. Furthermore, the Service and the DNER would provide training to the project personnel to ensure recognition of the species.

Conservation Measures

The Service anticipates that the above-mentioned effects would be minimized throughout the implementation of the following conservation measures:

a) New trails to access potential sites to establish nesting cavities would be planned in advance and the area would be evaluated to determine presence of listed plants.

b) Any identified individuals or populations would be avoided. The Service and the DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species.

Conclusion

Based on the above, we believe that the proposed reintroduction of the PRP in GAF may affect, but is not likely to adversely affect *Eugenia haematocarpa*.

4.3.3.4 *Daphnopsis helleriana*

Species Description and Habitat

Daphnopsis helleriana is a dioecious small tree or shrub which may reach 6 m (19.6 ft) in height and 5 cm (2 in) in diameter. The leaves are simple, alternate, elliptic to obovate in shape, and blunt or rounded at the apex. The leaves may reach 3 to 13 cm (1.2 to 5 in) in length and 1.5 to 6 cm (0.6 to 2.4 in) in width. Side veins are prominent and curved. The upper surface of the leaves is hairless and green but dries to a reddish-brown color. Both leaves and twigs are golden hairy when young. Flower clusters are borne at the ends of young branches. The fruit is an elliptic, one-seeded, white berry that is less than 2 cm (0.8 in) long (Vivaldi and Woodbury 1981; USFWS 1992).

The species is currently known from the northwestern limestone hills of Puerto Rico.

Distribution and Abundance

It belongs to the Tymelaeaceae family and is endemic to Puerto Rico. The recovery plan reported approximately 125 individuals of *D. helleriana* in four populations. These are the limestone hills near Isabela/Quebradillas, the Río Lajas hills in Dorado, the Nevarez limestone hills and near the Caribbean Primate Research Center in Toa Baja.

Current Status of the Species

At one time, the northern karst had approximately 3,076 individuals of *D. helleriana* in six localities (Guajataca Gorge, GAF, along the route of Highway PR-10, the mitigation area of Highway PR-10, in the Productora de Agregados, Inc., and in Sabana Seca Ward area. All these localities are within the municipalities of Isabela/Quebradillas, Arecibo, Vega Baja, Dorado and Toa Baja, Puerto Rico. At present time, approximately 2047 individuals of *D. helleriana* have been affected by two projects, and only 1,029 individuals (33%) remain undisturbed in their natural localities.

Possible Effects

The Service anticipates that possible effects will be minimized by surveying proposed access trails in advance to detect any unknown individuals and avoiding the known

populations. New trails to access potential sites to establish nesting cavities will be planned in advance and the area will be evaluated for the presence of listed plants. Furthermore, the Service and the DNER will provide training to the project personnel to ensure recognition of the species.

Conservation Measures

The Service anticipates that the above-mentioned effects would be minimized throughout the implementation of the following conservation measures:

a) New trails to access potential sites to establish nesting cavities would be planned in advance and the area would be evaluated to determine presence of listed plants.

b) Any identified individuals or populations would be avoided. The Service and the DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species.

Conclusion

Based on the above, we believe that the proposed reintroduction of the PRP in GAF may affect, but is not likely to adversely affect *Daphnopsis helleriana*.

4.3.3.5 Palo de rosa (*Ottoschultzia rhodoxylon*)

Species Description and Habitat

The populations of palo de rosa in Puerto Rico occurs within the subtropical dry forest life zone and the subtropical moist forest life zone (Ewel and Whitmore 1973). These life zones are the predominant in Puerto Rico and occupy areas that were extensively deforested for agriculture. Rainfall within the subtropical dry forest range from 600 to 1,100 mm (24 – 44 in) per year and from 1,100 to 2,200 mm (44 – 88 in) per year in the subtropical moist forest.

The reported populations are associated with serpentine and limestone derived soil. Typically, the populations located along the subtropical dry forest life zone in southern Puerto Rico occur at the bottom of moist canyons or drainages and the populations located along the subtropical moist forest life zone in northern Puerto Rico are located at the north facing slopes or close to the top of the hills. This suggests that the species require intermediate mesic conditions (Ilianet Morales, UPR, personal communication 2009). The majority of the populations are restricted to remnants of natural vegetation and to inaccessible areas with little agricultural value. The recorded evidence indicates that the species is associated to areas that were selectively logged for charcoal production, but the vegetation was not completely cleared.

Distribution and Abundance

Palo de rosa was listed as an endangered species on April 10, 1990. At that time, the species was known from nine individuals on a few localities. However, the distribution of palo de rosa has expanded and natural populations are now scattered throughout the northern karst belt of Puerto Rico. The number of adult individuals is estimated at 436 plants within 31 natural populations and 482 seedlings in 8 populations. About 22 of the known populations remain to be assessed, as there is no information regarding their size or populations status.

Current Status of the Species

At the time of listing, the species was considered endemic to the Dominican Republic and Puerto Rico. The information about the distribution in the Dominican Republic has not change and the species still considered as rare at this country. However, the number of reported populations in Puerto Rico has increased to at least 53 populations. Originally, the species was described as more common and abundant in the southwestern of Puerto Rico with the majority of the populations located within the Guánica Forest. Nevertheless, the majority of the currently known populations are located along the northern karst belt from Aguadilla to Guaynabo. Based on the above the distribution of palo de rosa has expanded and natural populations are now scattered throughout the northern karst belt of Puerto Rico.

The species is currently threatened by habitat destruction and modification. At least 62% of the populations currently known are located within private lands. Despite of the increase in the number of known populations, these are threatened by activities of rock quarries and the development of housing projects. The inadequacy of existing regulatory mechanisms is no longer considered as a threat to the species. Because the population dynamics of the species are unknown and we do not have enough information to determine what constitutes a viable population, we understand that the effects of a severe tropical storm could be detrimental to some populations as it may kill the few trees that are reproducing.

Possible Effects

At present time, two individuals of palo de rosa have been reported from GAF (Monsegur, USFWS, 2009). We anticipate no effect for this species in GAF.

Conservation Measures

In order to minimize possible effects of the re-introduction activities on the species, the following conservation measures would be implemented:

- a) New trails to access potential sites to establish nesting cavities would be planned in advance and the area would be evaluated to determine presence of listed plants.
- b) Any identified individuals or populations would be avoided. The Service and the

DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species.

Conclusion

Based on the above information and analysis, we believe that the reintroduction of the PRPs in GAF would not affect the palo de rosa.

4.3.3.6 Matabuey (*Goetzea elegans*)

Species Description and Habitat

Matabuey is a member of the nightshade family Solanaceae. Heinrich Wydler first described it based on material he collected in Puerto Rico in 1827 (USFWS 1987). Vivaldi et al. (1981) mentioned that there exists controversy as to the placement of the genus *Goetzea* within the Solanaceae and to its affinities. He argued that although traditionally it has been placed in the Solanaceae, the genus *Goetzea* differs from the typical elements of the family, and together with four genera it was placed into a family of its own, the Goetzeaceae.

Santiago-Valentín (1995) also treated the genus *Goetzea*, together with three other genera of the Greater Antilles, as a distinct family, the Goetzeaceae. He mentioned that the four genera of this group differ from the Solanaceae in pollen, embryo, and cotyledon morphology. Santiago-Valentín and Olmstead (2003) conducted a phylogenetic analysis to elucidate the evolutionary relationship among four Antillean genera (endemic to the Greater Antilles) and with other major lineages of the Solanaceae. They studied the Hispaniolan genus *Coeloneurum*, the Cuban genera *Espadaea* and *Henoonia*, and the genus *Goetzea* that comprises two species, one endemic to Hispaniola and the other endemic to Puerto Rico. The first three genera are monotypic. None occurs in Jamaica, the other island in the Greater Antilles.

Distribution and Abundance

Matabuey is a species of mesic-forested habitats, currently associated to ravines and creeks both in Puerto Rico and Vieques. At the time of listing, the matabuey was believed to be restricted to Quebradillas and Isabela, and its abundance estimated in 50 individuals. Populations from Canovanas, Rio Grande and Arecibo were extirpated. Currently, in the wild, there are more than 600 individuals in 15 populations in Quebradillas, Isabela, and the Island of Vieques. Propagation efforts have produced over 500 plants that were introduced to eight municipalities. Still there is a disjoint distribution on both ends of the mainland Puerto Rico.

Current Status of the Species

Santiago-Valentín (1995) researched the species, particularly on aspects of the reproductive ecology, distribution and population structure. He visited the historic sites

and searched for new localities of the species, mainly in Quebradillas and Isabela. The author found one hundred seventy-six (176) individuals of matabuey in eight localities in the northern karst region in the municipalities of Isabela and Quebradillas. However, Santiago-Valentín (1995) could not find the species in the historic localities in northeastern Puerto Rico nor at the Cambalache Commonwealth Forest.

Possible Effects

At present time, the occurrence of the species in GAF is limited to individuals planted by DNER personnel (O, Monsegur, USFWS pers. comm). Natural occurrence of the species is outside the boundaries of the forest and proposed action areas. Thus, no effects to the species are anticipated.

Conclusion

Based on the above information and analysis, we believe that the reintroduction of the PRP in GAF would not affect matabuey.

4.3.3.7 *Schoepfia arenaria*

Species Description and Habitat

Schoepfia arenaria is an endemic evergreen shrub or small tree known to occur in low elevation evergreen and semi-evergreen forests of the limestone hills (“mogotes”) of northern Puerto Rico (56 FR 16022). Historical records indicate that the species was distributed throughout the limestone hills and coastal forests in the northern part of the island (USFWS 1998). The species was listed because of limited distribution and because of habitat threats. Its present range and abundance are reduced from its historical range. Deforestation and limestone hill destruction for urban, industrial and tourism development have restricted this species to its current locations. At the time of listing and when the recovery plan was signed, *S. arenaria* was known from four sites: Isabela municipality, Loíza municipality (“Punta Maldonado”, Piñones), Fajardo municipality and the Río Abajo Commonwealth Forest (RAF) (USFWS 1998). Less than 200 individuals of *S. arenaria* are known, with the Isabela population being the largest (ca. 100). Only one individual is known from the Río Abajo Commonwealth Forest (USFWS 1998). A fifth location is also mentioned in the recovery plan from the Tortuguero Lagoon Natural Reserve (TLNR).

Distribution and Abundance

When the recovery plan was signed, less than 200 individuals of *S. arenaria* were known within five areas: (A) Isabela municipality; (B) RAF and the Tortuguero Lagoon Natural Reserve (C) Loíza municipality (“Punta Maldonado”, Piñones); and (D) Fajardo municipality (El Convento). The recovery plan (USFWS 1992) reports the following population estimates: (a) Isabela- approximately 100 individuals of all size classes; (b) Piñones- about 30 mature plants and numerous saplings and seedlings; (c) Fajardo-

approximately 50 individuals; (d) RAF- one individual is known.

Current Status of the Species

During 1995-1996, Santiago and Rojas (2001) conducted field research to locate *S. arenaria* in different regions. They found 125 individuals within four localities (two in Isabela, one in Fajardo, and one in Quebradillas) and most plants were labeled with a metal tag around their main stem. The Isabela and Fajardo municipality localities are within previously known areas for *S. arenaria*. At the Isabela municipality, the investigators found 44 individuals at the “Cerro Alto” locality, 24 individuals at the eastern portion and 20 individuals on the northern slopes. They also found 36 individuals at the “mogote Gómez” locality. The third locality occurred within “El Convento” in the Fajardo municipality, where the authors also report 44 individuals. A fourth locality with a single individual of *S. arenaria* was observed on the edge of a cliff in the Quebradillas municipality. Santiago and Rojas 2001 conducted additional field explorations within the RAF and GAF but did not find any *S. arenaria* individuals, although it has been collected before in GAF (University of Puerto Rico Herbarium 1983).

Possible Effects

Since the species has not been recently detected within the proposed action area, we believe that the proposed reintroduction of the PRP would not affect the species. The proposed actions may lead to discovery of additional but yet unknown individuals or populations.

Conservation Measures

The Service anticipates that possible effects would be minimized throughout the implementation of the following conservation measures:

a) New trails to access potential sites to establish nesting cavities would be planned in advance and the area will be evaluated to determine presence of listed plants.

b) Any identified individuals or populations would be avoided. The Service and the DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species.

Conclusion

Based on the above information and analysis, we believe that the reintroduction of the PRP in GAF would not affect *Schoeefia arenaria*

4.3.3.8 *Buxus vahlii*

Species Description and Habitat

Buxus vahlii is an evergreen shrub or small tree endemic to the island of Puerto Rico, where it is known from only two locations within the karst region on the northern side of the island. Since historical records of the species include only these populations in Puerto Rico, the reasons for its extreme rarity are obscure, but can probably be attributed to the extensive deforestation and human development that have occurred throughout the lowland areas of the island. Approximately 85 plants are known to survive in the two populations, one of which is on private land, the other on land owned by the Commonwealth of Puerto Rico.

Distribution and Abundance

Carrero (2001) studied the population and reproductive biology of *B. vahlii*. Six populations were identified: one in Rincón, one in Isabela, two in Bayamón, Puerto Rico, and two on St. Croix, US Virgin Islands. The information provided a rough estimate of the population size as part of her study: Rincón (700 individuals), Isabela (1,000 individuals.), Bayamon - “Parque de las Ciencias” (21 individuals.), St. Croix - “Frederiksted” (1,000 individuals.), and St. Croix - “Christiansted” (undetermined or number of individuals unknown). The population at Hato Tejas Ward in the municipality of Bayamon was estimated on at least 1,280 individuals by Lebrón and Associates (1992). Since then, an additional population was discovered on St. Croix (Rudy O’Reilly, NRCS; pers. comm 2011; approximately 10 individuals). Also, there is a new site for the species between the municipalities of Peñuelas and Ponce in southern Puerto Rico (former Gasoducto Sur alignment; CSA Group 2007). The estimated number of individuals at this site is about 370 plants of different size classes. Since this study was limited to the area corresponding to the propose gas pipeline, it is expected that further individuals or populations may occur on adjacent areas. There is further information about a new population composed of at least 100 individuals by Encarnación Ward in the municipality of Peñuelas (José Sustache, PRDNER; pers. comm 2011.). This population is located within the boundaries of a rock quarry (Cantera Valdivieso). Based on the above information, the estimated number of individuals of *B. vahlii* is about 4,500 individuals (including seedlings) in nine natural populations.

Current Status of the Species

Vahl’s boxwood is as an endangered species. Based on the information gathered, an estimated number of individuals for *B. vahlii* is about 4,500 individuals in nine natural populations in Puerto Rico and St. Croix, USVI. In addition, there have been two reintroductions of the species; in the north karst- GAF and in the south area of Puerto Rico at El Convento (property owned by the Puerto Rico Conservation Trust).

Possible Effects

The Service anticipates that possible effects would be minimized by surveying proposed access trails in advance to detect any unknown individuals and avoiding the known populations. New trails to access potential sites to establish nesting cavities would be planned in advance and the area will be evaluated for the presence of listed plants.

Furthermore, the Service and the DNER would provide training to the project personnel to ensure recognition of the species.

Conservation measures

The Service anticipates that the above-mentioned effects would be minimized throughout the implementation of the following conservation measures:

a) New trails to access potential sites to establish nesting cavities would be planned in advance and the area will be evaluated to determine presence of listed plants.

b) Any identified individuals or populations would be avoided. The Service and the DNER would provide training to the project personnel to ensure they recognize the species and develop a signage program with information about the species

Conclusion

Based on the above information and analysis, we believe that the reintroduction of the PRP in GAF may affect, but not likely to adversely affect *Buxus vahlii*

4.3.3.9 *Peperomia wheeleri*

Species Description and Habitat

Peperomia wheeleri is an evergreen, glabrous, erect herb which may reach one meter in height. The stems root only at the base and may be up to 1cm in diameter. The opposite leaves are entire, fleshy, and elliptic to elliptic-obovate, with 3 or 5 main veins ascending from the base. They may be 5 to 7 cm. (2 to 2.8 in) long and 2 to 3cm (0.8 to 1.2 in) wide with the base tapered to a 1 cm. (0.4 in) petiole. The lower side of the leaf is inconspicuously black punctate. Inflorescences are spikes, 10 to 16 cm (4 to 6.2 in) long and 5 mm (0.2 in) in diameter, which are borne solitary and opposite the leaves or at the leaf axils. Flowers are minute, approximately 0.5 mm (0.02 in) in diameter. *Peperomia wheeleri* is endemic to Culebra, a small island approximately 3,116 ha (7,700 ac) in size, located only 27 km. (17 mi.) to the east of Puerto Rico. Apparently never a widely distributed species, it is now restricted to the large granodiorite boulders of Monte Resaca and Flamenco on this island. Because of its growth form, the number of remaining individuals of *Peperomia wheeleri* is difficult to estimate. The majority are located within the 151 ha (375ac) Monte Resaca Unit of the Culebra National Wildlife Refuge. Deforestation and grazing, both of which have substantially altered the vegetation, have restricted *Peperomia wheeleri* to its present location. Within the remaining forested area, foraging by domestic fowl and grazing continue to threaten the species's necessary microhabitat.

Distribution and Abundance

The plant *Peperomia wheeleri* (Family Piperaceae) was discovered and collected in 1906 by Nathaniel L. Britton and William M. Wheeler at Signal Hill, an indeterminate location

on Culebra Island, Puerto Rico (Sastre and Santiago-Valentín, 1997). In this locality, the species only grows in humus accumulated on granodiorite boulders, within a seasonal semi-evergreen open forest (USFWS 1990). Although the species abundance was not estimated in the listing package, the Recovery Plan estimated its abundance in several hundred plants in an area of 0.2 ha (0.5 ac) at a Culebra Island site (USFWS 1990). The Plan identifies habitat destruction and modification as the most significant factors affecting the abundance and distribution of the species in Culebra Island. When the plant was listed in 1987, the Service determined that designation of critical habitat was not prudent due to potential increase for taking and the lack of additional protection under Section 7 of the Act.

In 1991, George R. Proctor found *Peperomia wheeleri* at El Costillar in the municipality of Isabela, Puerto Rico (PRDNER unpublished data, 1991). Santiago and Vives, in 1995, visited this new location for the species estimating its population in 50 plants (Santiago and Vives, 1997).

Current Status of the Species

The Service considered the status of *Peperomia wheeleri* as unknown. The species was known from two localities in Puerto Rico, one in Culebra Island and other in the municipality of Isabela. Vivaldi and Woodburry (1981) conducted a survey in the Culebra Island, and estimated its population in several hundred plants. In 1995, Santiago and Vives visited El Costillar Hill site, area where the species occur in the municipality of Isabela, estimating 50 plants. In 2009 the Service and DNER established two experimental populations in GAF. Currently, these populations are stable but total numbers are unknown.

Possible Effects

At present time, the occurrence of the species in GAF is limited to individuals planted by DNER personnel (O, Monsegur, USFWS pers. comm). Natural occurrence of the species is outside the boundaries of the forest and proposed action areas. Thus, the Service does not anticipate possible adverse effects to the species.

Conclusion

Based on the above information and analysis, we believe that the reintroduction of the PRP in GAF would not affect *Peperomia wheeleri*.

4.2.4 PREDATOR CONTROL IMPACT

To foster a successful reintroduction and reproduction the range of predator control programs in use at EYNF and RAF needs would be implemented in GAF. These include rat poisoning, measures to prevent thrasher predation (e.g., nest boxes), and Red-tailed Hawk removal. To prevent harm to non-target species, the same procedures and safety protocols used in EYNF and RAF should be adopted for GAF. Poison application (for

rats) and raptor removal will require staff time for planning and implementation.

4.2.5 PUBLIC USE AND LANDOWNER IMPACTS

If this alternative is chosen, recreational activities (e.g., picnic areas, camping, hiking) would likely be restricted or prohibited in areas near parrot activity areas, or nesting areas. Restrictions and no-use zones would be designated and posted for the public, and should be based on the same criteria used in EYNF and RAF. Public use opportunities such as environmental education and interpretation, and wildlife observation and photography could be maximized.

SECTION V - SCOPING

On August 2011 the Service initiated the scoping process by sending scoping letters to interested parties and announced the preparation of the Draft Environmental Assessment (EA). The letters sent mentioned the intent of the Service, the PRDNER and the USFS to reintroduce PRP's at a third site in Puerto Rico. To select a site and meet the NEPA requirements for this proposed action, this EA was prepared considering site alternatives proposed, evaluated, and discussed among concerned agencies. At the time, MAF, which extends to the municipalities of Maricao, San Germán and Sabana Grande, is the preferred alternative for releasing parrots. In that letters we mentioned that the EA process would take approximately one year to complete as we gather the necessary additional data to fully understand the potential for species interaction and management activities that would be needed to at the selected third location. We also mentioned that we needed to establish additional populations in the wild as part of the recovery action outlined in the Recovery Plan for the Puerto Rican Parrot. With a third wild population in Puerto Rico, we will minimize the species' risk of extinction and foster its recovery because it is unlikely that catastrophic events (e.g., hurricanes, disease outbreaks), and other threats (e.g., predation), will affect equally all three locations.

The comment period concluded on September 16, 2011. We received comments from the public via email (4), and letters from State and Federal Agencies (7), Academia (2) and Municipalities (2).

SECTION VI - LIST OF PREPARERS

The following U.S. Fish and Wildlife Service employees worked in the preparation of this Draft EA:

Marisel López-Flores
Puerto Rican Parrot Recovery Program Office
Calle García de la Noceda Local 38
Rio Grande, Puerto Rico, 00745

P.O. Box 1600
Río Grande, Puerto Rico 00745

Thomas H. White, Jr., Ph. D.
Puerto Rican Parrot Recovery Program Office
Calle García de la Noceda Local 38
Río Grande, Puerto Rico, 00745

P.O. Box 1600
Río Grande, Puerto Rico 00745

Jesús Ríos-Cruz
Puerto Rican Parrot Recovery Program Office
Calle García de la Noceda Local 38
Río Grande, Puerto Rico, 00745

P.O. Box 1600
Río Grande, Puerto Rico 00745

Omar Monsegur
Caribbean Ecological Services Field Office
Carr. 301 Km. 5.1, Corozo Ward
Boquerón, Puerto Rico, 00622

P.O. Box 491
Boquerón, Puerto Rico, 00622

Rafael González
Caribbean Ecological Services Field Office
Carr. 301 Km. 5.1, Corozo Ward
Boquerón, Puerto Rico, 00622

P.O. Box 491
Boquerón, Puerto Rico, 00622

Maritza Vargas
Caribbean Ecological Services Field Office
Carr. 301 Km. 5.1, Corozo Ward
Boquerón, Puerto Rico, 00622

P.O. Box 491
Boquerón, Puerto Rico, 00622

Marelisa Rivera
Caribbean Ecological Services Field Office
Carr. 301 Km. 5.1, Corozo Ward
Boquerón, Puerto Rico, 00622

P.O. Box 491

Boquerón, Puerto Rico, 00622

Edwin E. Muñiz
Caribbean Ecological Services Field Office
Carr. 301 Km. 5.1, Corozo Ward
Boquerón, Puerto Rico, 00622

P.O. Box 491
Boquerón, Puerto Rico, 00622

SECTION VII - CONSULTATION AND COORDINATION

This Environmental Assessment was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA). It is consistent with the NEPA-compliance procedures contained in the Service's manual (550 FW 1-3), and employs a systematic, interdisciplinary approach.

An Intra-Service Section 7 consultation will be completed in compliance with the Endangered Species Act (ESA) upon completion of the EA.

Pursuant to Executive Order 12898 (Environmental Justice for Minority Populations), the Service has determined that the Preferred Alternative will not result in disproportionately high and adverse human health or environmental impacts on minority and low-income populations.

Other Federal and state issues reviewed for compliance for the proposed action include, but are not limited to Archeological and Historic Preservation Act of 1974; Executive Order 13186 (Protection of Migratory Birds).

This environmental assessment will be available at the following locations:

a. In the web at the following address:

<http://www.fws.gov/caribbean/es/Parrot.html>

b. US Fish and Wildlife Service, Puerto Rican Parrot Recovery Program Office, Calle Garcia de la Noceda #38, Río Grande Puerto Rico 00745.

c. US Fish and Wildlife Service, Caribbean ES Field Office, Km. 5.1, Carr. 301, Boquerón, Puerto Rico 00622.

d. Department of Natural and Environmental Resources, Terrestrial Resources Division, Carretera 8838, km. 6.3, Sector El Cinco, Río Piedras, 00936

e. US Forest Service, El Yunque National Forest, Carr. 191 Int. 988, Km 4.4, Bo. Barcelona, Palmer, Puerto Rico 00721

SECTION VIII – LIST OF AGENCIES, INDIVIDUALS AND ORGANIZATIONS CONSULTED

Miguel A. García, Ph.D.
Dept. of Natural and Environmental Resources
Terrestrial Resources Division
Road # 8838, Km 6.3, Sector El Cinco
Rio Piedras, PR 00926

Pedro Ríos
US Forest Service
El Yunque National Forest
HC-01 Box 13490
Rio Grande, Puerto Rico 00745

Astrid Green (Scoping)
Dept. of Natural and Environmental Resources
Road # 8838, Km 6.3, Sector El Cinco
Rio Piedras, PR 00926

Dr. Antonio Rivera D.V.M.
1582 Cavalier St.
Urb. Caribe
Rio Piedras, Puerto Rico 00921

University of Puerto Rico
PO Box 140885
Arecibo, Puerto Rico 00614-0885

Ciudadanos Del Karso
Urb. La Cumbre
497 Ave. E. Pol. PMB 230
San Juan, PR 00926-5636
Ph. (787) 755-0410

The Puerto Rico Conservation Trust
PO Box 9023554
San Juan Puerto Rico 00902-3554
Ph: (787) 722-5834

Sociedad Ornitológica Puertorriqueña (SOPI)
PO Box 195166
San Juan, PR
00919-5166

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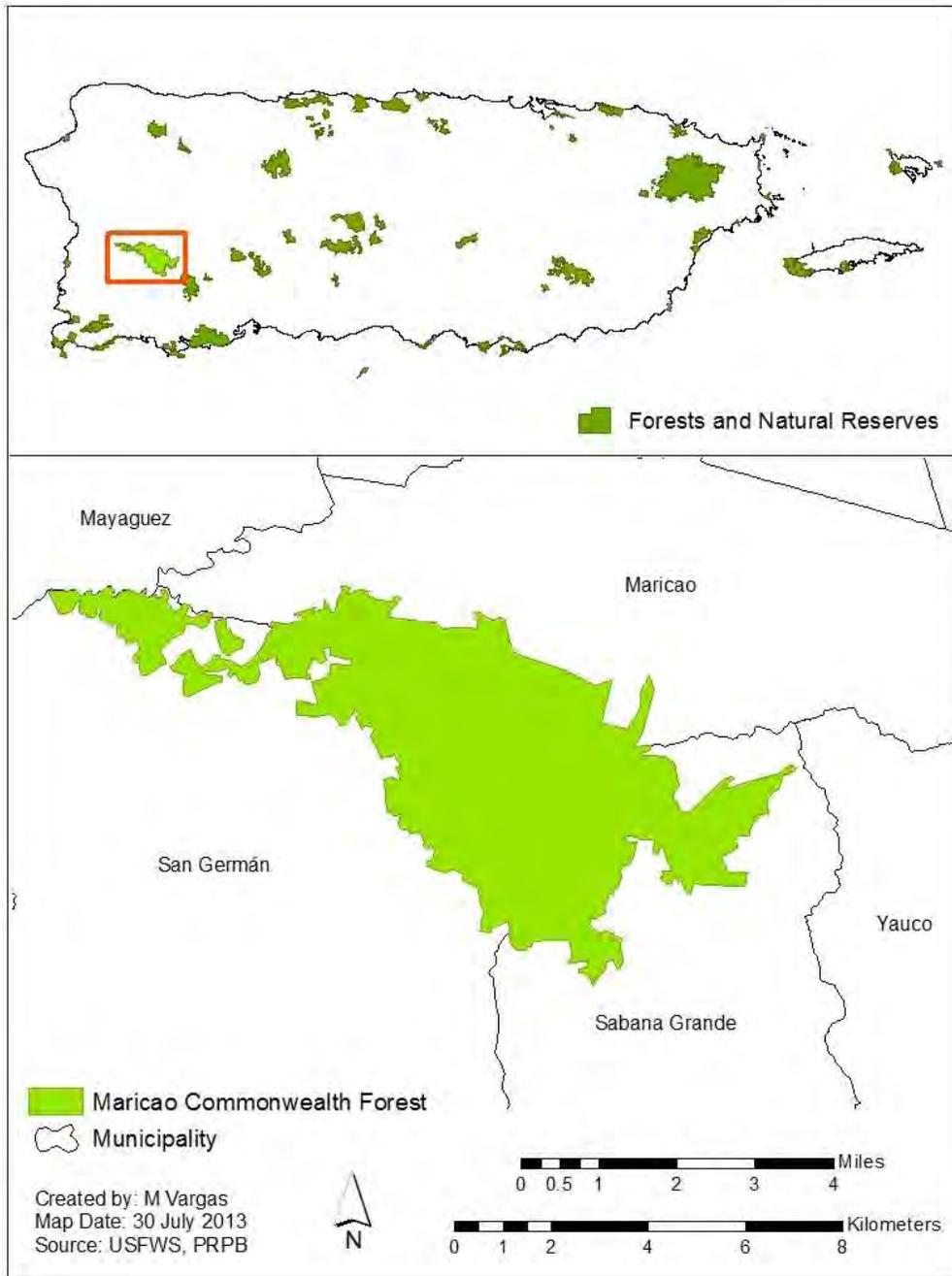
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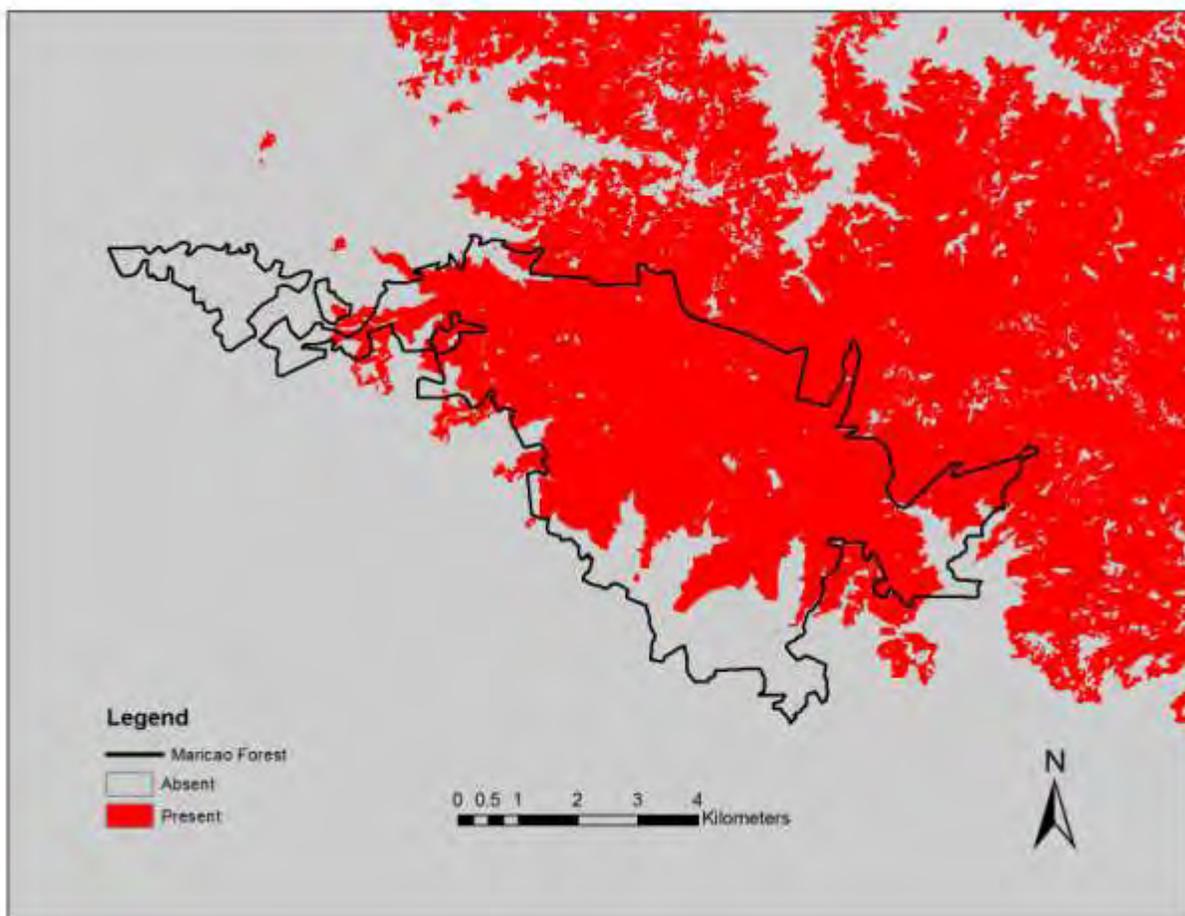
APPENDIX I. Map of Puerto Rico showing the location of the Maricao State Forest.



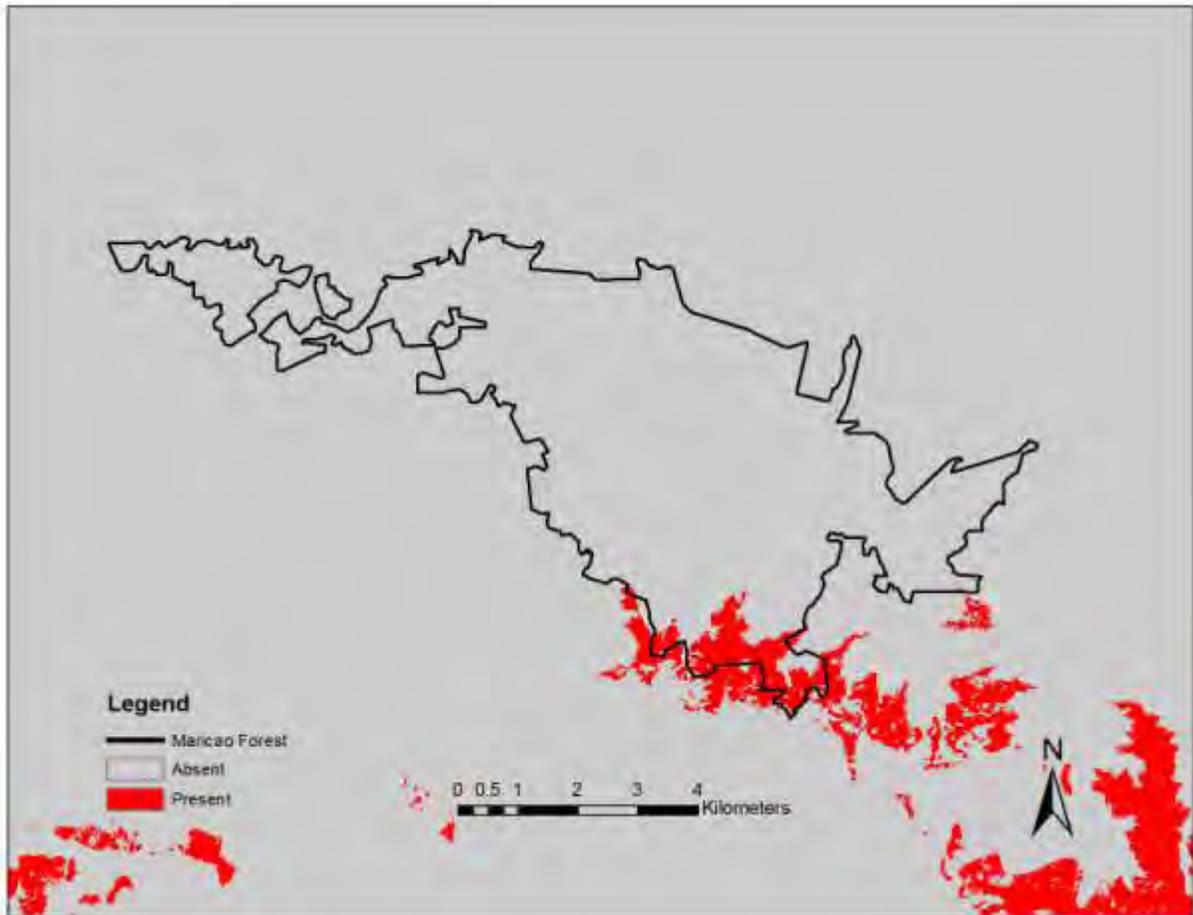
APPENDIX II. Puerto Rican Parrot Recovery Program Third Population Reintroduction Site Evaluation

On the web at the following address: www.fws.gov/caribbean/ES/3rd-Pop-PRparrot.html

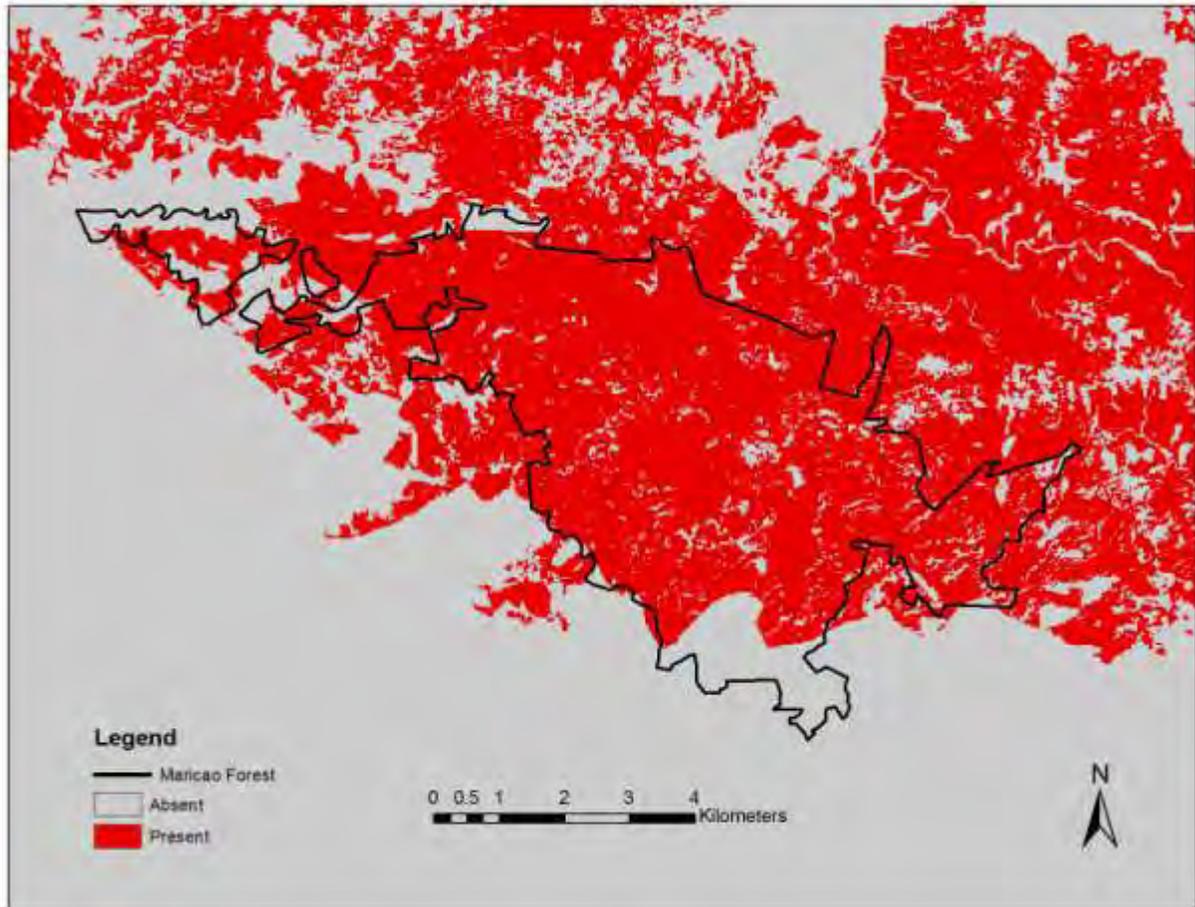
APPENDIX III: Predicted Habitat Analysis for the Sharp-shinned hawk in MAF (PR GAP Analysis, 2009).



APPENDIX IV: Predicted Habitat Analysis for the Puerto Rican Nightjar in MAF (PR Gap Analysis, 2009).



APPENDIX V: Predicted Habitat Analysis for the Elfin Wood Warbler in MAF (R. Colón 2013).



APPENDIX VI: Conservation Measures for Puerto Rican Boas

The following recommendations were developed to protect the Puerto Rican boa. These conditions should be incorporated as part of project proposals:

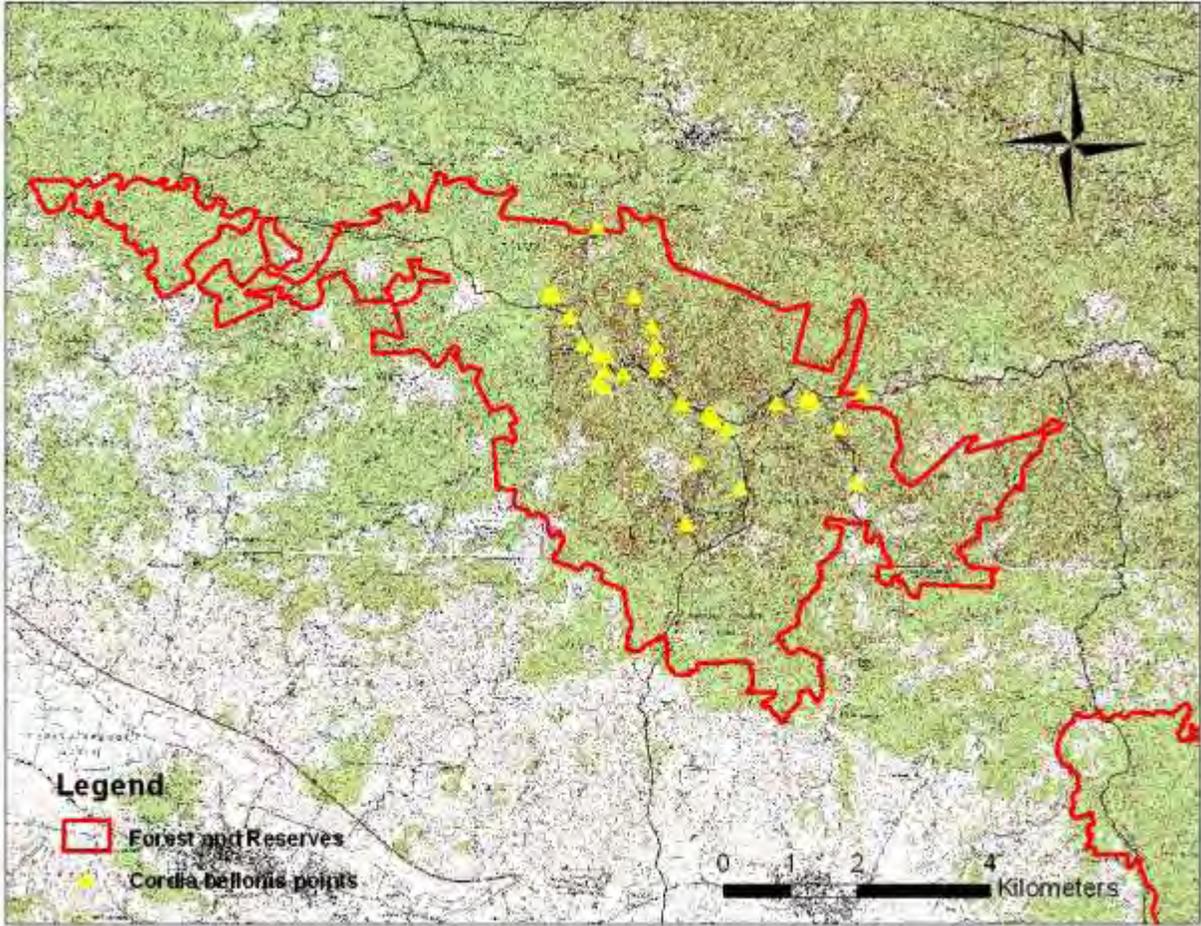
- A. Prior to any earth movements, the boundaries of the construction area, and any staging areas, should be clearly marked in the field. Project plans, specifications, and construction contracts should clearly indicate the project layout, the boundaries, staging areas, buffer areas (10-meter), and areas to be protected. These areas should be clearly marked in the field. The Service should be provided with copies of such plans and specifications for review, prior to the beginning of construction. The Service and the Applicant should make a visit to site prior to construction to review fencing, signing, or other mechanisms used to mark limits of such areas, as well as ensuring that staging areas are located away from sensitive areas. The Applicant should contact the Service at least two weeks prior of the projected date for initiation of any earth movement to coordinate the visit. An agreement between the Service and the Applicant on the location of staging areas and construction boundaries must be reached (in situ or thereafter) before earth movement activities begin.
- B. A biologist with experience identifying and locating the Puerto Rican boas should conduct a survey of all areas to be affected by the proposed project at the start of each extraction event, to ensure that no boas are present or impacted. Before operating or moving equipment and vehicles in staging areas or near potential boa habitats during the construction phase, these should be thoroughly inspected by the biologist to ensure that no boas are lodged in the standing equipment or vehicles. If boas are found within vehicles or equipment, the biologist must be notified immediately for proper handling and relocation. Any relocated boas should be transferred to appropriate habitat within the project site.
- C. Before activities commence each workday during the construction phase, the biologist should survey the areas to be cleared that day, to ensure that boas are not found within the construction/work area. If boas are found within the construction area, no earth movement activities should begin at the site where the boas are found until the boas move out of the area on their own. Construction and activities at other work sites, where no boas have been found after surveying the area, may continue.
- D. A complete protocol on actions to be followed when boas are encountered (including handling, notification procedures, and disposition of specimens) by construction personnel, residents, and visitors to the project site, should be submitted to the Service for review and approval.
- E. Security personnel should be instructed to be aware of poaching events within the property, and actions to be followed if poaching is detected. A protocol should be developed concerning the actions to be followed by security personnel if illegal capture of boas within the property is detected. This protocol should be reviewed and approved by the Service.

- F. Strict measures should be established to minimize boa casualties by motor vehicles, including the implementation of speed regulations and installation of “boa caution” road signs wherever a road borders potential boa habitat.
- G. An outreach/education plan should be implemented to inform residents, guests, employees, and the general public about the conservation of protected species, as well as penalties for harassing or harming such species.

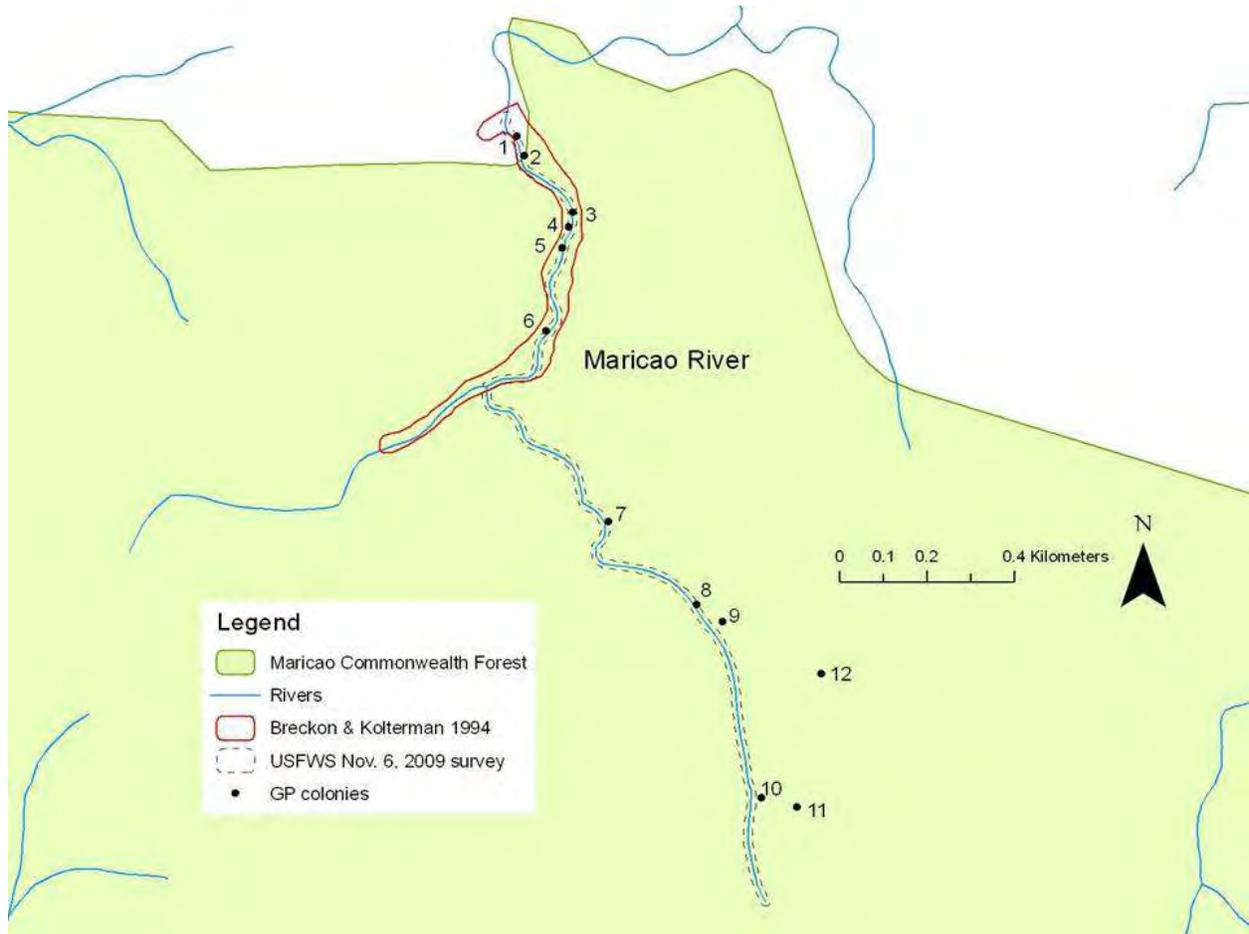
APPENDIX VII: *Crescentia portoricensis* populations and current distribution within MAF.



APPENDIX VIII: *Cordia bellonis* populations and current distribution within MAF.



APPENDIX IX: *Gesneria pauciflora* populations and current distribution within MAF.



APPENDIX X: Map of Puerto Rico showing the location of the Guajataca State Forest.

