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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R4–ES–2013–0103; 4500030113]

RIN 1018–AZ10

Endangered and Threatened Wildlife and Plants; Endangered Status for *Agave eggersiana* and *Gonocalyx concolor*, and Threatened Status for *Varronia rupicola*

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list *Agave eggersiana* (no common name) and *Gonocalyx concolor* (no common name) as endangered species, and *Varronia rupicola* (no common name) as a threatened species under the Endangered Species Act of 1973, as amended (Act). These three plants are

endemic to the Caribbean. The effect of this regulation, if finalized, would be to conserve *A. eggersiana*, *G. concolor*, and *V. rupicola* under the Act.

DATES: We will accept comments received or postmarked on or before [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES** section, below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for public hearings, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal:

<http://www.regulations.gov>. In the Search box, enter FWS–R4–ES–2013–0103, which is the docket number for this rulemaking. Then, in the Search panel on the left side of the screen, under the Document Type heading, click on the Proposed Rules link to locate this document. You may submit a comment by clicking on “Comment Now!”

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R4–ES–2013–0103; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We request that you send comments **only** by the methods described above. We will post all comments on <http://www.regulations.gov>. This generally means that we will

post any personal information you provide us (see the **Information Requested** section below for more information).

FOR FURTHER INFORMATION CONTACT: Marelisa Rivera, Deputy Field Supervisor, U.S. Fish and Wildlife Service, Caribbean Ecological Services Field Office, P.O. Box 491, Road 301 Km. 5.1, Boquerón, PR 00622; by telephone 787-851-7297; or by facsimile 787-851-7440. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800-877-8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, if we intend to list a species as endangered or threatened throughout all or a significant portion of its range, we are required to promptly publish a proposal in the **Federal Register** and make a final determination on our proposal within 1 year. Listing a species as an endangered or threatened species can only be completed by issuing a rule. *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola* are candidate species for which we have on file sufficient information on biological vulnerability and threats to support preparation of a listing proposal, but for which development of a listing proposal has until now been precluded by other higher priority listing activities.

*This rule consists of a proposed rule to list *Agave eggersiana* and *Gonocalyx concolor* as endangered, and *Varronia rupicola* as threatened. This proposed rule reassesses all available information regarding the status of and threats to *A. eggersiana*, *G. concolor*, and *V. rupicola*. Elsewhere in today's **Federal Register**, we propose to designate critical habitat for *A. eggersiana*, *G. concolor*, and *V. rupicola* under the Act.*

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species based on any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.

We have determined that listing is warranted for these species, which are currently at risk throughout all of their respective ranges due to threats related to:

- *A. eggersiana*—potential future development for residential, urban, and tourist use; agriculture use; dropping of debris; competing nonnative plants; fires; predation; and disease cause by insects (weevils).
- *G. concolor*—installation or expansion of telecommunication towers, road improvement, vegetation management, and small number of individuals and populations.
- *V. rupicola*—loss of habitat due to urban development, right-of-way development and maintenance, deforestation, and hurricanes; and inadequate existing regulatory mechanisms (lack of enforcement).

We will seek peer review. We are seeking comments from knowledgeable individuals with scientific expertise to review our analysis of the best available science and application of that science and to provide any additional information to improve this proposed rule. Because we will consider all comments and information we receive during the comment period, our final determinations may differ from this proposal.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from other concerned governmental agencies, Native American tribes, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

- (1) The biology, range, and population trends of *A. eggersiana*, *G. concolor*, and *V. rupicola*, including:
 - (a) Habitat requirements for feeding, reproducing, and sheltering;
 - (b) Genetics and taxonomy;
 - (c) Historical and current range, including distribution patterns;
 - (d) Historical and current population levels, and current and projected trends; and

(e) Past and ongoing conservation measures for these species, their habitat, or both.

(2) The factors that are the basis for making a listing determination for these species under section 4(a) of the Act, which are:

(a) The present or threatened destruction, modification, or curtailment of their habitat or range;

(b) Overutilization for commercial, recreational, scientific, or educational purposes;

(c) Disease or predation;

(d) The inadequacy of existing regulatory mechanisms; or

(e) Other natural or manmade factors affecting their continued existence.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to these species and existing regulations that may be addressing those threats.

(4) Additional information concerning the historical and current status, range, distribution, and population size of these species, including the locations of any additional populations of these species.

(5) Any information on the biological or ecological requirements of the species and ongoing conservation measures for the species and their habitats.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or threatened species must be made “solely on the basis of the best scientific and commercial data available.”

You may submit your comments and materials concerning this proposed rule by one of the methods listed in the **ADDRESSES** section. We request that you send comments only by the methods described in the **ADDRESSES** section.

If you submit information via <http://www.regulations.gov>, your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on <http://www.regulations.gov>. Please include sufficient information with your comments to allow us to verify any scientific or commercial information you include.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on <http://www.regulations.gov>, or by appointment, during normal business hours, at the U.S.

Fish and Wildlife Service, Caribbean Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Previous Federal Actions

Through February 1996

On December 15, 1980, *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola* (as *Cordia rupicola*) were identified as Category 2 candidate species in the candidate notice of review (CNOR) published in the **Federal Register** (45 FR 82480). A Category 2 species was one for which the Service had information that proposing as endangered or threatened may be appropriate but for which sufficient information was not currently available to support a proposed rule. None of the three species was mentioned in the November 28, 1983, CNOR (48 FR 53640), but all three again were named as Category 2 candidate species in the September 27, 1985, CNOR (50 FR 39526). They all remained Category 2 candidate species in the February 21, 1990 (55 FR 6184), and September 30, 1993 (58 FR 51144), CNORs. Designation of Category 2 species was discontinued in the February 28, 1996, CNOR (61 FR 7596). The 1996 CNOR redefined candidates to include only species for which we have information needed to propose them for listing, and as a result, *A. eggersiana*, *G. concolor*, and *V. rupicola* were removed from the candidate list.

After February 1996: Agave eggersiana

On November 21, 1996, we received a petition from the U.S. Virgin Islands Department of Planning and Natural Resources (DPNR) requesting that we list *Agave eggersiana* as endangered. On November 16, 1998, we published in the **Federal Register** (63 FR 63659) our finding that the petition to list *A. eggersiana* presented substantial information indicating that the requested action may be warranted, and we initiated a status review on the plant.

On September 1, 2004, the Center for Biological Diversity (CBD) filed a lawsuit against the Department of the Interior and the Service alleging that the Service failed to publish a 12-month finding for *Agave eggersiana* (*Center for Biological Diversity v. Norton*, Civil Action No. 1:04-CV-2553 CAP). In a stipulated settlement agreement resolving that case, signed April 27, 2005, we agreed to submit our 12-month finding for *A. eggersiana* to the **Federal Register** by February 28, 2006. On March 7, 2006, we published our 12-month finding (71 FR 11367) that listing of *A. eggersiana* was not warranted. On September 9, 2008, CBD filed a complaint that challenged our 12-month finding (*Center for Biological Diversity v. Hamilton*, Case No. 1:08-cv-02830 -CAP). In a settlement agreement approved by the Court on August 21, 2009, the Service agreed to submit to the **Federal Register** a new 12-month finding for *A. eggersiana*. On September 22, 2010, we published in the **Federal Register** (75 FR 57720) a finding that listing *A. eggersiana* was warranted, but precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants.

Agave eggersiana was named a candidate species with a listing priority number (LPN) of 8 in the CNORs published on November 10, 2010 (75 FR 69222), October 26, 2011 (76 FR 66370), and November 21, 2012 (77 FR 69993). An LPN of 8 was assigned

to *Agave eggersiana* because the species faced threats of moderate magnitude that were imminent.

After February 1996: Gonocalyx concolor and Varronia rupicola

On October 25, 1999, we published in the **Federal Register** a CNOR (64 FR 57535) that added *Gonocalyx concolor* and *Varronia rupicola* (as *Cordia rupicola*) to the list of candidate species with LPNs of 5 and 2, respectively. *Gonocalyx concolor* was assigned an LPN of 5 because it faced threats that were high in magnitude but nonimminent. *Varronia rupicola* (as *Cordia rupicola*) was assigned an LPN of 2 because it faced threats of a high magnitude that were imminent. These two plants retained their respective LPN assignments in the CNORs published on October 30, 2001 (66 FR 54808), June 13, 2002 (67 FR 40657), May 4, 2004 (69 FR 24876), May 11, 2005 (70 FR 24870), and September 12, 2006 (71 FR 53756).

In the CNOR published on December 6, 2007 (72 FR 69034), *Varronia rupicola* (as *Cordia rupicola*) was assigned an LPN of 5, because its threats were determined to be nonimminent. In the 2007 CNOR, *Gonocalyx concolor* retained its LPN of 5. Both plants retained an LPN of 5 in the CNORs published on December 10, 2008 (73 FR 75176), November 9, 2009 (74 FR 57804), November 10, 2010 (75 FR 69222), October 26, 2011 (76 FR 66370), and November 21, 2012 (77 FR 69993).

On May 11, 2004, we received a petition from the CBD (CBD 2004, pp. 66-69) requesting that *G. concolor* and *V. rupicola* be listed as an endangered species under the Act. No new information was provided in the petition.

Species Information

Taxonomy and Description

Agave eggersiana

Agave eggersiana is a flowering plant of the family Agavaceae (century plant family) endemic to the island of St. Croix in the U.S. Virgin Islands (USVI). This species was originally described in 1913, by William Trelease from material collected on St. Croix, and is distinguished from other members of the Agavaceae family by its acaulescent (without an evident leafy stem), non-suckering growth habit (vegetative reproduction that does not form offshoots around its base), and its fleshy, nearly straight leaves with small marginal prickles of 0.04 inches (in) (0.1 centimeters (cm)) long that are nearly straight (Britton and Wilson 1923, p. 156; Proctor and Acevedo-Rodríguez 2005, p. 118). Its flowers are deep yellow and 2.0 to 2.34 in (5 to 6 cm) long. After flowering, the panicles (inflorescence) produce numerous small vegetative bulbs (bulbils), from which the species can be propagated (Proctor and Acevedo-Rodríguez 2005, p. 118). *Agave eggersiana* is not known to produce fruit, and like other *Agave* species, is monocarpic, meaning the plant dies after producing the spike or inflorescence. Furthermore, based on observations of cultivated plants, *A. eggersiana* requires at least

10 to 15 years to develop as a mature individual and to produce an inflorescence (David Hamada, St. George Village Botanical Garden, pers. comm., 2010).

Gonocalyx concolor

Gonocalyx concolor was described in 1970, as a new species of the genus *Gonocalyx*, family Ericaceae, for Puerto Rico (Nevling 1970, p. 221). *Gonocalyx* is a neotropical genus comprised of 10 species, ranging from Costa Rica to North Colombia, and the Caribbean (Dominican Republic, Puerto Rico, Dominica, and Guadalupe) (Luteyn and Pedraza-Peñalosa 2011, p. 1). Two of the species are considered endemic to Puerto Rico: *G. concolor* and *G. portoricensis* (Lioger and Martorell 2000, p. 151). These two species are derived from common ancestral stock; hence there is great similarity in many details and in aspect, as well as geographic proximity (Nevling 1970, p. 223).

Although *G. concolor* is similar to *G. portoricensis*, differences in distribution and flower morphology indicate that they are well-differentiated species (Nevling 1970, p. 224). The flower of *G. portoricensis* is pendent with light green calyx, and the corolla tube is whitish to pinkish; *G. portoricensis* is insect-pollinated flower (Proctor 1992, p. 3). *Gonocalyx concolor* differs from *G. portoricensis* in its vivid red, semipendent flowers, which apparently are hummingbird pollinated, and in its range (Nevling 1970, p. 224). *Gonocalyx concolor* is a small evergreen shrub, mainly epiphytic (grow on the trunks of trees) or clambering (use other vegetation as support), which may reach 15 feet (ft) (4.7 meters (m)) in length (Acevedo 2005, p. 227). The leaves are simple, alternate,

entire, and coriaceous (leathery). The leaf blade is ovate, broadly elliptic, or nearly orbicular; 0.5 to 1.2 in (1.5 to 3 cm) long; and 0.5 to 0.9 in (1.3 to 2.3 cm) broad. The leaf base is apiculate (ending in a short sharp point) and obtuse to acute at the apex, and is rounded at the base; the leaf's upper surface is glabrous (smooth or hairless) above, with scattered large trichomes (papilliform hairs) beneath. The leaf venation is 5-plex (the leaf venation is 1 central vein and 4 secondary veins bending toward apex) from the base (secondary veins bending toward apex), outer set marginal, inner set submarginal and better developed. The mid-vein is immersed above and emerged beneath, and lateral venation is inconspicuous. The leaf margin is entire or flat, except for few inconspicuous, rounded projections toward the apex. The leaf lower surface is pale green and shiny. The petiole (the stalk attaching the leaf blade to the stem) is approximately 0.07 to 0.09 in (0.18 to 0.21 cm) long. The stems are highly branched, slender, cylindrical, and dark brown in color. The twigs are pubescent (covered with fine short hairs). Young leaves and branches are brilliantly rose-colored, but become green with age.

Flowers are bisexual, 5-merous (floral part in multiples of 5 in each whorl), regular, and uniformly vivid red. Flowers are borne solitary on axillary brachyblast (short shoot), and are semipendent (hanging or suspended). Pedicel is terete (cylindrical and tapering), 0.35 to 0.43 in (0.89 to 1.1 cm) long, red, fringed with trichomes at the summit, bibracteolate (2 bracts subtending the flower within an inflorescence) near the base, and articulate with calyx. The corolla (the part of a flower that consists of the separate or fused petals and constitutes the inner whorl of the perianth) tube is carnosose (of a fleshy consistence), campanulate (shape like a bell), and about 0.5 to 0.6 in (1.3 to 1.5

cm) in length and 0.2 to 0.3 in (0.5 cm to 0.8 cm) in diameter.

Fruit is a bright red berry with many seeds inside (Lioger 1995, p. 105). No additional information regarding fruit production is available.

Varronia rupicola

Varronia was traditionally lumped into the genus *Cordia*, a group of about 250 or more species of trees and shrubs of tropical and subtropical regions. *Varronia* was recently recognized as a monophyletic genera based on vegetative, floral, and pollen morphology (Miller and Gottschling 2007, p. 163). *Varronia* comprises multi-stemmed shrubs with condensed inflorescence and evenly serrate leaves (Sánchez de Stapf 2010, p. 133). *Varronia* is currently represented in the West Indies by about 66 valid species (Acevedo-Rodríguez and Strong 2012, p. 170). Axelrod (2011, p. 427) recognized seven species found in Puerto Rico, with *V. bellonis* and *V. wagnerorum* being endemic to the island, and *V. rupicola* extending to the island of Anegada, British Virgin Islands.

Varronia rupicola is a large shrub reaching up to 16 ft (5 m) in height. The alternate leaves are ovate to elliptic, 0.8 to 3.5 in (2 to 9 cm) long with an acute apex, rounded to obtuse at the base, and chartaceous (papery). Leaves margins are whole or crenate (scalloped or notched). The upper surface of the leaf is rigidly scabrous (having a rough surface) and puberulous (densely covered by hairs) underneath, with strigose (having straight hairs) petioles ranging from 0.1 to 0.4 in (0.2 to 1.0 cm) long. Flowers are in solitary globular heads of 20 (grouped into a globose terminal structure), and about 0.4 in (1.0 cm) in diameter. The corolla is white and 0.3 in (0.8 cm) long, and the fruit is

a one-seeded, red drupe about 0.2 in (0.5 cm) long (Proctor 1991, p. 65; Lioger 1995, p. 313).

Habitat

Agave eggersiana

Agave eggersiana is currently known from coastal cliffs with sparse vegetation and dry coastal shrubland vegetation communities within the subtropical dry forest life zone of St. Croix, USVI (Ewel and Whitmore 1973, p. 72). In St. Croix, the average rainfall is about 30 in (76 cm) and 40 in (102 cm) in the east and west sides of the island, respectively (Ewel and Whitmore 1973 p. 8; Mac *et al.* 1998, p. 315). The wettest and hottest months are from July to October. The average mid island temperature is 78.8 degrees Fahrenheit (°F) (26 degrees Celsius (°C), with a variation of only 5 to 9 °F (3 to 5 °C) between the warmest and coolest months (Mac *et al.* 1998, p. 316).

The coastal cliffs where *Agave eggersiana* occurs are dominated by rocky formations and areas with less than 10 percent vegetative cover. These coastal cliffs are exposed to extremes of wind, salt spray, and low moisture, and they are usually sparsely vegetated with a canopy less than 1 meter in height (Gibney *et al.* 2000, p. 7; Moser *et al.* 2010, Appendix A-11). Dry coastal shrubland vegetation is common to the drier parts of the island of St. Croix: east and south shores, and low-elevation locations. In some places, dry coastal shrubland vegetation may extend as far up as 902 ft (275 m) on south-facing slopes. Cacti and agave are common though scattered, while vegetation height can

range from 3.2 to 32.8 ft (1 to 10 m). The taller forms may consist of a canopy layer of larger individuals under slightly more moist conditions. The shorter forms are common to very exposed locations such as the east sides of headlands on the south shores in the island (Gibney *et al.* 2000, p. 6; Moser *et al.* 2010, Appendix A-8). Other species of vegetation associated with these areas are: *Sesuvium portulacastrum* (sea purslane), *Laguncularia racemosa* (white mangrove), *Bucida buceras* (black olive), *Hippomane mancinella* (manchineel), *Jacquinia arborea* (barbasco), *Opuntia stricta* (prickly pear), *Pilosocereus royerii* (Royer's tree), *Suriana maritima* (bay cedar), *Bursera simaruba* (gumbo limbo), *Canavalia rosea* (seaside bean), *Caesalpinia bonduc* (gray nicker), *Capparis flexuosa* (falseteeth), *Scaevola plumieri* (ink berry), *Oplonia spinosa* (prickly bush), *Capparis indica* (linguam), *Adelia ricinella* (wild lime), *Crossopetalum rhacoma* (maidenberry), *Heteropterys purpurea* (bull withe), *Pisonia subcordata* (mampoo), *Exostema caribaeum* (Caribbean princewood), *Cordia dentata* (white manjack), and *Coccoloba uvifera* (seagrape) (O. Monsegur and M. Vargas, Service, unpubl. data 2013; Lioger and Martorell 2000, pp. 50-205).

The natural populations of *Agave eggesiana* grow on top of various soil classifications, including Cramer, Glynn, Hasselberg, Southgate, and Victory. The Cramer and Southgate series consists of shallow, well-drained soils on summits and side slopes of volcanic hills and mountains. These soils formed in material weathered from extrusive igneous bedrock or only from igneous bedrock. The Hasselberg series consists of shallow, well-drained soils on marine terraces. These soils formed in alkaline, clay sediments. The Glynn series consists of very deep, well-drained soils on alluvial fans and terraces. These soils formed in stratified alluvial sediments weathered from basic

igneous rock. The Victory series consists of moderately deep, well-drained soils on summits and side slopes of volcanic hills and mountains. These soils formed in material weathered from extrusive igneous bedrock (USDA-NRCS 2013, <http://websoilsurvey.nrcs.usda.gov>)

Gonocalyx concolor

Gonocalyx concolor has been described as endemic from the elfin forest type at Cerro La Santa and from the ausubo (*Manilkara bidentata*) forest type at Charco Azul, both within the lower montane (an altitudinal zone in mountainous region characterized by distinctive flora and forest structure) very wet forest life zone in the Carite Commonwealth Forest (Ewel and Whitmore 1973, p. 41). The Carite Commonwealth Forest comprises approximately 6,694.9 acres (ac) (2,709.3 hectares (ha)), and the elevation ranges from 2,030 to 3,950 ft (620 to 900 m) (DNR 1976, p. 169). This forest has been managed for conservation since 1975 (DNER 2008, p. 1). The mean annual precipitation at the Carite Commonwealth Forest is 88.7 in (225 cm), with February to April the drier months (NOAA 2013, http://www.srh.noaa.gov/sju/?n=climo_cayey).

The mean temperature is 22.7 °C (72.3 °F), varying from 20 °C (68 °F) in January to 24

°C (73.4 °F) in July (Silander *et al.* 1986, p. 183).

Both the elfin and ausubo forests have similar climate conditions (Ewel and

Whitmore 1973, p. 32). The elfin forest, also referred to as dwarf or cloud-forest, is found on exposed peaks and ridges of Cerro La Santa, above 2,890 ft (880 m) in elevation from sea level, occupying approximately 10.1 ha (24.9 ac) in the Carite Commonwealth Forest (Silander *et al.* 1986, p. 178). The elfin forest vegetation is characterized by gnarled trees less than 7 meters tall, high basal area, small diameters, a large number of stems per unit area, and extremely slow growth rates (Ewel and Whitmore 1973, p. 45). The vegetation is commonly saturated with moisture and frequently enveloped in clouds, and both aerial and superficial roots are common (Weaver *et al.* 1986, p. 79). The plant association in this area is generally comprised by few species of native trees, native ferns and dense covered with epiphytes including bromeliads and mosses (Weaver *et al.* 1986, p. 79). The native tree composition includes: *Tabebuia schumanniana* (roble colorado), *Tabebuia rigida* (roble de sierra), *Ocotea spathulata* (nemoca cimarrona), *Eugenia borinquensis* (guayabota), *Clusia minor* (cupey de monte), and *Prestoea acuminata* var. *montana* (sierra palm) (Weaver *et al.* 1986, p. 80; Silander *et al.* 1986, p. 191). Additionally, some areas were planted with *Eucalyptus robusta* (swamp mahogany) (O. Monsegur, UPRM, unpubl. report, 2006, p. 1).

The ausubo forest is only found along the Río Grande de Patillas River basin and intermittent streams between 2,034 ft (620 m) and 2,329.4 ft (720 m) of elevation (DNR 1976, p. 169), and occupying approximately 72.5 ha (179.2 ac) in the Charco Azul area (Silander *et al.* 1986, p.190). The ausubo forest is characterized by evergreen vegetation, high species richness, rapid growth rate of successional trees, epiphytic ferns, bromeliads, and orchids (Ewel and Whitmore 1973, p. 32). The vegetation in this area is generally

comprised of native trees (i.e., *Manilkara bidentata* (ausubo), *Dacryodes excelsa* (tabonuco), *Guarea guidonia* (guaraguao), and *Cyrilla racemiflora* (swamp titi) (Francis and Lowe 2000, p. 345; DNER 2008, p. 2). *Gonocalyx concolor* grows epiphytic and clambering on dead and live stand trees within this type of forest (O. Monsegur, UPRM, unpubl. report, 2006, p. 2).

Varronia rupicola

Varronia rupicola has been described from southwestern Puerto Rico, Vieques Island, and Anegada Island. All these sites lie within the subtropical dry forest life zone overlying a limestone substrate (Ewel and Whitmore 1973, p. 72). Subtropical dry forest life zones receive a mean annual rainfall ranging from 24 to 40 in (61 to 101 cm). The vegetation in this life zone is deciduous on most soils, with tree species dropping leaves during the dry season. The vegetation usually consists of a nearly continuous, single-layered canopy, with little ground cover. The leaves of dry forest species are succulent or coriaceous, and species with spines and thorns are common. Tree heights usually do not exceed 49 ft (15 m), and crowns are typically broad, spreading, and flattened (Ewel and Whitmore 1973, p. 72).

Varronia rupicola has been recorded in forested hills with open to relatively dense shrublands and scrublands 6.5 to 9.8 ft (2 to 3 m) in height; in low forest with canopy from 8 to 15 ft (3 to 5 m) high; and at the edge of a dense, low coastal shrubland forest. On the island of Anegada, *V. rupicola* was found in open limestone pavement and sand dunes. Woody species associated to *V. rupicola*'s prime habitat in southern Puerto

Rico (Guánica Commonwealth Forest) include: *Gymnanthes lucida* (shiny oysterwood, or yaití), *Exostema caribaeum* (princewood, or albarillo), *Pisonia albida* (corcho), *Pictetia aculeata* (fustic, or tachuelo), *Thouinia portoricensis* (ceboruquillo, or serrazuela), *Coccoloba krugii* (whitewood), *Pilosocereus royenii* (Royen's tree cactus, or sebucán), *Bursera simaruba* (gumbo limbo, or almacigo), *Erithalis fruticosa* (black torch), *Guettarda krugii* (frogwood, or cucubano), *Tabebuia heterophylla* (pink trumpet tree, or roble), *Hypelate trifoliata* (inkwood), *Coccoloba diversifolia* (pigeonplum, or uvilla), *Cassine xylocarpa* (marbletree, or coscorrón), *Krugiodendron ferreum* (black ironwood, or palo de hierro), *Jacquinia berterii* (barkwood), *Bourreria succulenta* (strongbark, or palo de vaca), *Crossopetalum rhacoma* (maidenberry, or pico de paloma), *Antirhea acutata* (placa chiquitu, or quina), and *Amyris elemifera* (torchwood) (Murphy and Lugo 1986, p. 91). The populations of *V. rupicola* in Puerto Rico are also found in close proximity to populations of the endangered plants *Eugenia woodburyana* (no common name) and *Trichilia triacantha* (bariaco), and other rare plants such as *Myrtus bellonis* (no common name), *Passiflora bilobata* (twolobe passionflower), and *Nashia inaguensis* (pineapple verbena) (Breckon and Kolterman 1996, p. 4; Monsegur and Breckon 2007, p. 1). On Anegada, the species is located in open limestone pavement and sand dunes. In a comprehensive study of the vegetation of Anegada, *V. rupicola* was found in higher abundance (based on percentage occurrence across plots) on limestone but also widespread within the sand dunes (Clubbe *et al.* 2004, p. 344). Occurrence of the species on sand dunes on Anegada may explain the new record of the species in the northern coast (Tortuguero Lagoon) of Puerto Rico within an area that is characterized by the presence of white sands soils (O. Monsegur, Service, pers. obs., 2013).

Life History

Agave eggersiana

Based on the information currently available to us, there is no published information describing the ecology and genetics of *Agave eggersiana*. Although samples from individuals in the Gallows Bay area have been collected for genetic analysis (Ray, VFR, pers. comm., 2010), the Service is unaware if the samples were analyzed and results have been published. No further information is available regarding the ecology of the species beyond the demographic trends discussed above.

Gonocalyx concolor

Gonocalyx concolor has been observed flowering in December, January, February, and April (Nevling 1970, p. 224). Preliminary studies of the species' reproductive biology indicate that the plant is predominantly outcrossed, and that outcrossed flowers produce twice the number of seeds than self-pollinated flowers (S. Flores, Universidad del Turabo, pers. comm. 1996). The low number of individuals per population may suggest that *Gonocalyx concolor* has highly specialized ecological requirements to grow and that production of viable seeds rarely occurs (C. Pacheco, Service, pers. obs., 2013). Although a number of authors have reported the species on flower and fruit, no one has observed recruitment. Currently, no information about reproductive capacity, dispersion, or habitat requirements is available for *G. concolor*.

Varronia rupicola

Studies on the distribution, abundance, and reproductive biology of *Varronia rupicola* have been conducted by scientists from the University of Puerto Rico, Mayagüez Campus (Breckon and Kolterman 1996, p. 6; Monsegur and Breckon 2007, p. 13). These authors reported the species flowering and fruiting in December through January (Breckon and Kolterman 1996, p. 4), and in June through July (Monsegur and Breckon 2007, p. 1). From February to April, all plants observed were sterile. Fruit production in the populations from the Guánica Commonwealth Forest and the municipality of Ponce seem to be high, and there is evidence of recruitment associated to the majority of the clusters of individuals (O. Monsegur, Service, pers. obs., 2013). Under greenhouse conditions, seed germination has been reported as not less than 67 percent (Wenger *et al.* 2010). Germination in the wild has also been observed to be high (O. Monsegur, Service, pers. obs., 2013). However, apparently there is also a high mortality of seedlings, and only few individuals make the transition (natural thinning) to sapling stages (O. Monsegur, Service, pers. obs., 2013). Monsegur and Breckon (2007, p. 2) reported numerous seedlings (>140) and various saplings in the Guánica Commonwealth Forest. However, seedling recruitment on Vieques Island seems to be low, as it has not been recorded during recent assessments (Monsegur and Breckon 2007, p. 7; Hamilton, KEW, pers. comm., 2013). Despite the showy red fruits of *Varronia rupicola*, its dispersion seems to be almost limited by gravity, as the majority of the seedlings lie under the parent tree or downslope (O. Monsegur, Service, pers. obs. 2013).

The wide range of the species suggests a former animal disperser (probably a bird). Patterns of plant-animal interactions were probably altered due to the previous extensive deforestation of the island of Puerto Rico. Some observations of seed dispersal by an undetermined vector have been reported from Anegada (Hamilton, KEW, pers. comm., 2013). If not extinct, possible dispersers may have altered their foraging behavior and now do not feed on the fruits of *V. rupicola*. Recent observations in Puerto Rico indicate that flowers of *V. rupicola* are visited by several insect species, including *Apis mellifera* (honey bee) and *Electrostrymon angelia* (fulvous hairstreak, a butterfly) (O. Monsegur, Service, pers. obs. 2013).

Varronia rupicola material germinated in the greenhouse at Cabo Rojo National Wildlife Refuge in Cabo Rojo were flowering and producing fruits in about 1 year after germination (O. Monsegur, Service, pers. obs., 2013). The rapid reproductive development of the species and the finding of individuals along recently disturbed sites (new dirt roads) and natural forest gaps (openings) may indicate that *V. rupicola* is an early colonizer or pioneer species.

Historical Range

Agave eggersiana

Historically, *Agave eggersiana* was reported from the north coast in Christiansted, St. Croix, and along the south coast of the island (Proctor and Acevedo-Rodriguez 2005, p. 118). Britton and Wilson (1923, p. 156) reported the species from hillsides and plains

in the eastern dry districts of St. Croix, but did not provide population estimates. In addition, it was reported that *A. eggersiana* was cultivated on St. Croix and St. Thomas for ornament (Trelease 1913, p. 28; Britton and Wilson 1923, p. 156; Proctor and Acevedo-Rodríguez 2005, p. 118). Information provided (Kojis and Boulon, DPNR, pers. comm., 1996) specified that the species was last observed growing in the wild around 1984 to 1986 on St. Croix. In 2003, DPNR stated that the species was believed to be extinct (Plaskett, DPNR, pers. comm. 2003; Dalmida-Smith, DPNR, pers. comm., 2010). Proctor and Acevedo-Rodríguez (2005, p. 118) provided a general description of *A. eggersiana* and state that the species appeared to be extinct in the wild. However, no citations or survey information were provided to support this statement. Subsequently, in 2010, DPNR provided information based on field visits and reported the existence of several populations of *A. eggersiana* on St. Croix (Dalmida-Smith, DPNR, pers. comm., 2010).

Historically, land use intensity increased by colonial exploitation since the 15th century (Chakroff 2010, p. 6). Sugarcane was the main crop on the island and dominated the economy for nearly 200 years (Shaw 1933, p. 414). Apparently, the former land use of the areas used for sugar cane cultivation resulted in degradation of the species' habitat and nearly extirpated the species from the wild. Sugarcane is no longer cultivated commercially on the island, the majority of the areas formerly used for sugarcane plantations are currently grasslands, and early secondary forests are dominated by the nonnative tree *Leucaena leucocephala* (white leadtree).

Gonocalyx concolor

Gonocalyx concolor was first discovered on Cerro La Santa at an elevation of approximately 2,962 ft (903 m) in the Carite Commonwealth Forest, east-central Puerto Rico (Nevling 1970, p. 221). In 1993, Dr. Frank Axelrod found a second population of this species close to the Charco Azul recreational area, also in the Carite Commonwealth Forest (Axelrod 1993, UPR herbarium voucher 6643). This population is located at an approximate elevation of 2,070 ft (630 m) in the ausubo forest, which lies within the basin of the Río Grande de Patillas, approximately 2 mi (3.2 km) southeast from Cerro La Santa. Later, in December 2006, Omar Monsegur (former student from the University of Puerto Rico) visited the known localities describing three populations of *Gonocalyx concolor* in the Carite Commonwealth Forest: two at Cerro La Santa, and another at Charco Azul (O. Monsegur, UPRM, unpubl. report, 2006, p.1). Dr. Samuel Flores (pers. comm., 1996), professor at the Turabo University in Puerto Rico, anecdotally reported the species from El Yunque National Forest in the Luquillo Mountains, northeastern Puerto Rico. Despite of Service efforts to locate the species in El Yunque National Forest, it has not been found. Therefore, this record has not been confirmed.

Varronia rupicola

Varronia rupicola was first discovered by the German botanical collector Paul Sintenis in July 1886, in the Los Indios Ward, located between the Barinas ward in Yauco and the municipality of Guayanilla, Puerto Rico. It was later found in Guánica, Puerto Rico, in 1887, and again in 1943 and 1959 (Proctor 1991, p. 66). The species was

thought to be endemic to Puerto Rico, until it was collected by George Proctor in May 1987, at the west end of the island of Anegada, British Virgin Islands (Proctor 1991, p. 66). Proctor (1994, p. 54) also reported a specimen from Punta Jálova on Vieques Island, Puerto Rico. This report was based on a specimen collected by Woodbury, possibly around 1978. Surveys conducted by Breckon and Kolterman in 1995 located the species at a site called El Peñón in the municipality of Peñuelas (Breckon and Kolterman 1996, p. 6). In 2003, three individuals of *V. rupicola* were found adjacent to the entrance of El Fuerte Trail within the Guánica Commonwealth Forest (M. Canals, DNER, pers. comm., 2004). In 2005, an individual of *V. rupicola* was found on Lighthouse Peninsula, Vieques Island (Breckon and Kolterman 2005, p. 1). This area is located within the Vieques Island National Wildlife Refuge.

Current Range

Agave eggersiana

Agave eggersiana is currently found on the north and south coasts of St. Croix, USVI. Seven populations support approximately 313 adult plants and more than 316 juveniles. It is uncertain if these populations are natural (individuals that come from wild populations) or if these populations consist of individuals that escaped from landscaping. However, characteristics, such as growing mixed with native vegetation, evidence of natural recruitment, and the presence of different size classes, suggest these are remnants of wild populations.

The current distribution of populations of *Agave eggersiana* on St. Croix that are presumed to be wild is as follows:

a. North coast—(1) Gallows Bay with an estimate of 2 individuals; and (2)

Protestant Cay with an estimated 40 individuals.

b. South coast—(3) Manchenil Bay with an estimated 8 individuals; (4) West side of Vagthus point with a single individual; (5) Great Pond with approximately 65 individuals; (6) South Shore with an estimate of 182 individuals; and (7) Cane Garden Bay with 15 individuals.

Most of the sites have juvenile individuals except for Gallows Bay and Vagthus Point (Table 1).

Table 1. (Presumed) Wild Populations of *Agave eggersiana*.

Population	Area/ Location	Estate	Ownership	Number of Individuals (Adults/Juveniles)
South Shore	South Coast	Cane Garden	Private	182/231
Cane Garden Bay	South Coast	Cane Garden	Private	15/27
Manchenil Bay	South Coast	Granard	Private	8/58
Protestant Cay	North Coast	Protestant Cay	Government but leased to private party	40/Undetermined
Gallows Bay	North Coast	Mount Welcome	Private	2/0
West Vagthus Point	South Coast	Peters Minde	Private	1/0

Great Pond	South Coast	Great Pond	Government	65/Undetermined
Total				313/316+

Sources: O. Monsegur and M. Vargas, Service, unpubl. data, 2010 and 2013; Dalmida-Smith, DPNR, pers. comm., 2010; David Hamada, SGVBG, pers. comm., 2010; Plaskett, DPNR, pers. comm., 2003.

In addition, there are introduced individuals located at Salt River National Park and Ecological Preserve (SARI) with an estimate of 90 individuals (mostly juveniles); Buck Island National Monument with an estimate of 11 individuals; and Ruth Island with 1 individual (O. Monsegur and M. Vargas, Service, pers. obs., 2010 and 2013; Dalmida-Smith, DPNR, pers. comm., 2010).

Gonocalyx concolor

Currently, *Gonocalyx concolor* is known from three populations: two at Cerro La Santa and another at Charco Azul, both in the Carite Commonwealth Forest (Pacheco and Monsegur, Service, unpubl. report, 2013, p. 2). The species shows a limited distribution in its habitat, occupying only 0.75 ac (0.3 ha) at Cerro La Santa (Pacheco and Monsegur Service, unpubl. report, 2013, p. 3) and approximately 0.12 ac (0.05 ha) at Charco Azul (O. Monsegur, UPRM, unpubl. report, 2006, p.2). The individuals reported from El Yunque National Forest are apparently no longer extant. According to Luis Rivera, Tropical Vegetation Specialist, the U.S. Forest Service does not have records of the species in El Yunque National Forest (L. Rivera, USFS, pers. comm., 2013). Despite the availability of habitat, the Service considers that the report from El Yunque National

Forest may be a misidentification of material from *G. portoricensis*.

In 1992, Dr. George R. Proctor conducted a status review of the species estimating its population at Cerro La Santa at around 35 individuals (Proctor 1992, p. 4). Later, Dr. Samuel Flores (professor from the Turabo University) visited the same area and estimated its population at around 172 individuals (S. Flores, pers. comm., 2009). In December 2006, Omar Monsegur (graduate student from the University of Puerto Rico, Mayagüez Campus) estimated approximately 25 individuals at Cerro La Santa and 4 individuals at Charco Azul (O. Monsegur, UPRM, unpubl. report, 2006, p. 1). In 2013, Service biologists, Carlos Pacheco and Omar Monsegur, visited the population at Cerro La Santa and estimated the *G. concolor* population at around 27 individuals (Pacheco and Monsegur, USFWS, unpubl. report, 2013, p. 3).

Varronia rupicola

Varronia rupicola is currently known from at least seven main localities in Puerto Rico (Table 2) and several localities from the island of Anegada. Monsegur and Breckon (2007, p. 1) visited the historical localities in Puerto Rico and provided updated information about the status and distribution of the species. The distribution of *V. rupicola* in the Guánica Commonwealth Forest extends to at least six small populations or subpopulations within the east section of the forest. Another population was located on the west unit of the Guánica Commonwealth Forest by Alcides Morales (Sociedad Ornitológica Puertorriqueña, Inc., pers. comm., 2012). This is the westernmost recorded distribution for the species.

From the municipality of Peñuelas, Monsegur and Breckon (2007, p. 6) found a single individual in a ravine area on the west side of El Peñón site. This seems to be part of the same population identified by Breckon and Kolterman in 1995. In addition, the Service confirmed the presence of about eight clusters of the species in an area just north of the Ponce Holiday Inn in the municipality of Ponce (O. Monsegur, Service, and J. Sustache, DNER, unpubl. Data, 2013).

Table 2. Status of Currently Known Populations of *Varronia rupicola*.

Localities	Number of reproductive individuals	Number of saplings	Number of seedlings	Total of plants
El Peñón (Peñuelas)	16	0	0	16
Guánica Commonwealth Forest (East)	34	30	142	206
Guánica Commonwealth Forest (West) (Montalva)	1	0	0	1
Puerto Ferro (Vieques NWR)	6	0	0	6
Yauco (Montes de Barina)	2	0	0	2
Ponce (Holiday Inn)	17	4	120	141
Tortuguero Lagoon (DNER)	1	0	0	1
Total	77	34	262	373

Another recorded site for *Varronia rupicola* lies within a privately owned property located at Montes de Barinas in the municipality of Yauco (C. Pacheco, Service,

pers. comm., 2011). The species was also reported by Alcides Morales (Sociedad Ornitológica Puertorriqueña, Inc., pers. comm., 2012) from a nearby property known as Finca Catalá. This property is adjacent to the locality reported by Pacheco on 2011. These reports overlap with the general area where this specimen was collected by Paul Sintenis in 1886.

There is new information suggesting the existence of one population within the Tortuguero Lagoon in northern Puerto Rico (Beverly Yoshioka, Service, pers. comm., 2013). This will be the first record for the species in the northern coast of Puerto Rico. The finding of this new locality is supported by the existence of the species on a similar habitat in the Island of Anegada (British Virgin Islands). *Varronia rupicola* is also found in the northwest section of Anegada, where it is reported as common (Clubbe *et al.*, 2004, p. 344; McGowan *et al.*, 2006, p. 5).

Summary of Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B)

overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination. Each of these factors is discussed below.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Agave eggersiana

The *Agave eggersiana* population found in Great Pond is the only one located in a conservation area. The remaining populations occur within privately owned lands and are threatened by development, or are growing in areas that are already developed and managed as tourism and residential projects and that will not support the continued existence of the plants. Based on information reported by the University of the Virgin Islands' Conservation Data Center (USVI-CLWUP 2004), at least three of the populations (i.e., Protestant Cay, Gallows Bay, and Manchenil Bay) lie within areas identified by DPNR as high-density land use areas, and thus have a higher susceptibility to development in the near future. The coastal areas that harbor suitable habitat for the species are currently subject to urban and tourist development (O. Monsegur and M. Vargas, Service, pers. obs., 2010 and 2013). At least two proposed development projects have been identified within suitable habitat for the species (i.e., C&R Robin, LLC, and

Seven Hills Beach Resort and Casino) (Weiss, CBD, pers. comm., 2010). Current information regarding the status of these development projects is not available to the Service.

The population at Protestant Cay has been affected by construction and management activities associated with the current use of the area, i.e., the disposal of garden debris from a hotel in the species' known habitat (O. Monsegur and M. Vargas, Service, pers. obs., 2010). As *Agave eggersiana* relies on asexual reproduction, the species depends on the bulbils becoming established. Covering the bulbils with debris may result in subsequent mortality of the bulbils and lack of natural recruitment, thus affecting the long-term survival of this population. Moreover, individuals located on the edges of the population are pruned as part of the gardens' maintenance. This practice may result in mortality or mutilation of individuals because the species is monopodial (single growth axis). The population at Protestant Cay is also threatened by competition with nonnative plant species. In this case, habitat modifications from urban development (e.g., road) and garden maintenance have created conditions for the establishment of invasive, nonnative species. Also, the undeveloped habitat on the cay is being rapidly colonized by nonnative species (see Factor E discussion, below). *A. eggersiana* plants also seem to be stressed by competition with nonnative plants.

Another modification of habitat in the area was a sand ramp constructed in 2011, on the northeast side of the cay (T. Cummins and W. Coles, DPNR, pers comm., 2011; R. Platenberg and T. Cummins, DPNR, pers. comm., 2012; Zegarra, Service, pers. comm., 2012). It was documented that at least five individuals of *Agave eggersiana* were crushed

or otherwise impacted by the excavation work (R. Platenberg and T. Cummins, DPNR, pers. comm., 2012).

The individuals located at Gallows Bay are within a developed residential complex that has the potential for future expansion, and thus may affect *Agave eggersiana* (O. Monsegur and M. Vargas, Service, pers. obs., 2010 and 2013). Moreover, the Gallows Bay area does not contain additional habitat to allow for population expansion. Remaining forested areas surrounding this location are characterized by an abundance of nonnative species. The small pockets that could be colonized by bulbils are occupied by *Sansevieria cylindrica* (African spear), a nonnative plant species that tends to form a complete cover of the understory (see Factor E discussion, below).

The area from Cane Garden Bay to Manchenil Bay on the south coast of St. Croix harbors four of the known natural populations of *Agave eggersiana* (Manchenil Bay, Vagthus Point, Cane Garden, and South Shore). According to DPNR personnel (Valiulis, pers. comm., 2010), these areas are advertised by realtors for tourism and residential development. Furthermore, the areas along the south coast that have not been developed are used for cattle or hay production, minimizing the recovery of native vegetation and, therefore, the habitat for *A. eggersiana* (O. Monsegur and M. Vargas, Service, pers. obs., 2010 and 2013). The development of tourist and residential projects in these coastal areas may result in the extirpation of some populations or, at the least, will reduce the chances of the populations to expand or to colonize other areas. The effects of development projects are exacerbated by the low potential for natural recruitment due to the small number of populations and individuals.

The population of Great Pond is located between the entrance road of the East End Marine Park office and a private property currently advertised for sale. The population seems to be healthy based on the presence of different size plants and evidence of recent flowering events. However, the area near the population is mowed, and the access road limits the expansion of the population. Furthermore, the property adjacent to the population is privately owned and currently for sale (O. Monsegur and M. Vargas, Service, pers. obs., 2010 and 2013). The possible use of the area for additional residential or tourist development may affect the *Agave eggersiana* population. Owners will likely manage their properties as landscapes, which could lead to land clearing, additional mowing, other maintenance activities, and the introduction of nonnative plants. Moreover, the abundance of grasslands and the dominance of the nonnative plant *Megathyrsus maximus* (guinea grass) make the population of *A. eggersiana* susceptible to human-induced fires (addressed under Factor E, below).

Gonocalyx concolor

Habitat destruction and modification have been identified by species expert as the main threat to *Gonocalyx concolor* (Proctor 1992, p. 3; O. Monsegur, UPRM, unpubl. data, 2006; C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). In 1974, the Commonwealth of Puerto Rico granted special use permits for the construction of telecommunications facilities, and governmental and recreational facilities, within *G. concolor* habitat, affecting approximately 107 ac (43.5 ha) of lower montane very wet forest (Silander *et al.* 1986, p. 178). Currently known populations of *G. concolor* at

Cerro La Santa are found in remnants of elfin forest vegetation located adjacent (less than 246 ft (75 m)) from telecommunication facilities, and at the edges (less than 9.8 ft (3 m)) of the road that provide access to the telecommunication facilities (C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Below we discuss the three factors that may affect the current habitat or range of *G. concolor*: (1) Installation of telecommunication towers; (2) road improvement; and (3) vegetation management.

Land-use history of Cerro La Santa has shown that installation of telecommunication facilities for television, radio, and cellular communication, and for military and governmental purposes, has adversely impacted *Gonocalyx concolor* habitat (Silander *et al.*, 1986, p. 178), and although not documented, presumably has directly affected individuals of the species. George Proctor (1992, p. 3) stated that the construction of a paved road and gigantic telecommunication towers on the summit ridge of Cerro La Santa destroyed much of the natural population of this species. Currently, the telecommunication tower and its associated facilities (i.e., access roads, security fences, guy wires) occupy approximately 6.1 ac (2.5 ha) of the elfin forest in Cerro La Santa; this is habitat that the species may have occupied in the past (C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Although the populations at Cerro La Santa are located within a Commonwealth forest, this area is subjected to development for expansion of telecommunication infrastructure because permits to build new communication facilities or expand currently existing ones within or near Commonwealth forests are prevalent (DNER 2004a, p. 2). Expansion of the existing telecommunication facilities may result in loss of 27 individuals of *G. concolor* and their habitat. In Puerto Rico, towers for cellular communication, radio, television, and military and governmental

purposes have represented a threat to those plant species that happen to occur only on mountaintops. The proliferation of these antennas has increased with the advent of cellular phone and related technologies. While the towers themselves may not occupy a very large area, construction activities, access roads, and other facilities have a much wider impact, resulting in the elimination of potential habitat for the species.

For the above reasons, we determined that installation of additional communications towers or expansion of the existing one at Cerro La Santa is a threat to *Gonocalyx concolor* by direct mortality and due to permanent loss, fragmentation, or alteration of its habitat.

Construction of a new access road and improvement of the existing access road to the existing communication facilities have been identified as a factor that could directly (destruction of individuals) or indirectly (slope instability and habitat degradation) reduce the number *Gonocalyx concolor* and its habitat at Cerro La Santa (Proctor 1992, p. 3; C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Further, expanding the road that provides access to the telecommunication facilities may negatively affect the species' habitat and could result in loss of 11 mature individuals of *G. concolor* (C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Additionally, clearing the native vegetation along the road may facilitate and accelerate colonization of invasive vegetation towards *G. concolor* habitat (see Factor E discussion, below). Destruction or modification of this kind of habitat may be irreversible. Therefore, the microhabitat conditions necessary for the recovery of the species may be lost if the habitat is modified for the expansion of the existing telecommunications facilities or construction of new communication facilities.

Vegetation management around the existing telecommunication towers and associated facilities and along the existing power lines that energize these facilities is a threat to *Gonocalyx concolor* and its habitat (C. Pacheco and O. Monsegur, Service, unpubl. report, 2013, p. 3). Telecommunication companies periodically remove vegetation along the access roads, around the security fences, and under the guy wires (tensors) that are anchored in the forest. Additionally, maintenance staff of the Puerto Rico Energy and Power Authority (PREPA) periodically trim and clear the vegetation under the existing power lines that provide energy to the telecommunication facilities and adjacent communities. Presently, the Puerto Rico Department of Natural and Environmental Resources (DNER) is aware of the presence of *G. concolor* and the need to implement conservation measures for the species in Cerro La Santa. The existing telecommunication facilities and PREPA usually have a restricted perimeter delimiting the area that can be mowed and trimmed. However, maintenance activities outside of the perimeter have been conducted without the coordination with the forest manager, affecting the forest vegetation and *G. concolor* habitat (Hecsor Serrano-Delgado, DNER, pers. comm., 2013; O. Monsegur, UPRM, unpubl. report, 2006, p.1). In 2006, Omar Monsegur documented damages to an individual of *G. concolor* caused by vegetation removal activities outside of the fences (O. Monsegur, UPRM, unpubl. report, 2006, p.1). Additionally, clearing the native vegetation along the access roads, around the telecommunication facilities, and under the power lines may facilitate and accelerate colonization of invasive vegetation in *G. concolor* habitat. See Factor E, below, for further discussion on invasive species.

Even though the population dynamics of the species are poorly known, we understand that the impacts discussed above could be detrimental to the species as a whole. Clearing of vegetation may result in direct impacts (cutting of individuals) or indirect impacts (by opening forest gaps that can serve as corridors for invasive species) to the species. Vegetation management and maintenance of communication towers and facilities are a threat to *Gonocalyx concolor* due to changes in microclimate (a local atmospheric zone where the climate differs from the surrounding area) and plant species composition. Also, vegetation management around the existing facilities and along the access roads may be a direct and indirect threat to the *G. concolor* because it may alter the habitat condition, allowing invasive plants to colonize the area, and may result in direct physical damage to the species.

Varronia rupicola

The species' rarity and restricted distribution make it vulnerable to habitat destruction and modification. About 50 percent of known *Varronia rupicola* individuals in Puerto Rico occur on private lands (i.e., Yauco, Peñuelas, and Ponce) in areas subject to urban development. Moreover, the habitat at Peñuelas and Ponce may remain underestimated in relation to the presence of the species as the area has not been extensively explored. The habitat in the municipalities of Peñuelas and Ponce has been severely fragmented for urban development (i.e., housing projects, hotels, jails, landfills, rock quarries, and Puerto Rico Highway Number 2 (PR 2)). The habitat has been further fragmented by the use of these forested areas by PREPA as a right-of-way for power

lines, and additional habitat was impacted for a former proposed gas pipeline (Gasoducto Sur). At least 1,200 ac (485 ha) of prime dry forest habitat from Guánica to Ponce are currently proposed for urban and industrial developments, which are evaluated by the Puerto Rico planning board (<http://www.jp.gobierno.pr>). These include the areas where the Ponce populations were recently located by Service staff. Future projects may threaten these populations with fragmentation, and possibly extirpate currently known individuals. Despite the species' biology suggesting its ability to colonize disturbed areas, it is very likely that once the habitat is fragmented, *V. rupicola* will be outcompeted by nonnative plant species (see Factor E discussion).

In Peñuelas, the species is found in an area that is currently under urban development. Breckon and Kolterman (1996) reported a healthy population of *Varronia rupicola* in this area located at El Peñón de Ponce (Municipality of Peñuelas), which is part of a residential development called “Urbanización El Peñón.” At this site, *V. rupicola* plants grows within residential lots, and although the lots are large in size, current and ongoing construction and deforestation (some lots have been completely cleared for house construction) threaten this population. In 2007, Monsegur and Breckon (2007, p. 6) reported that one individual plant adjacent to “Urbanización El Peñón” was eliminated by the improvement of PR 2. The authors reported that vegetation was removed and the area was bulldozed, apparently as part of a project to control run-off from the ravine.

In Yauco, the species occurs within private properties that may be subject to urban development (<http://www.jp.gobierno.pr>). In fact, urban development has encroached remnants of native dry forest areas, resulting in the isolation or disjunction of

populations of rare plants, hence, reducing suitable habitat for the species. These areas are also threatened by deforestation for agricultural practices such as raising cattle, cattle grazing, and for the extraction of fence posts (O. Monsegur, Service, pers. obs., 2005). The known population at Yauco was observed at the edge of an existing dirt road. Therefore, any road expansion may result in the extirpation of individuals, habitat modification, and intrusion of nonnative plants.

In the Guánica Commonwealth Forest and the Vieques Island National Wildlife Refuge (NWR), *Varronia rupicola* is found at the edge of trails and roads, making the species prone to be affected by management activities (e.g., widening of trails, road repairs). Additionally, several individuals of *V. rupicola* are found underneath power lines of PREPA at the Guánica Commonwealth Forest, where they are threatened by maintenance activities such as cutting or the use of herbicides. PREPA has the right to access the power lines for maintenance and service in case of emergencies. Damage to individual plants caused by maintenance activities has been observed in the past (O. Monsegur, Service, pers. obs., 2009). This makes a significant part of the Guánica populations prone to extirpation despite the existence of regulatory mechanisms (see Factor D discussion, below).

Furthermore, despite being a National Wildlife Refuge, the Vieques site (Puerto Ferro) is considered as an active ammunition site due to the previous use of Vieques Island as a bombing range by the U.S. Navy (<http://public.lantopside.org/sites/public/vieques/default.aspx>). Although there are no current plans to conduct vegetation removal to investigate the ammunitions in Puerto Ferro (F. Lopez, Service, pers. comm., 2013), the investigation process at Vieques has proved to be dynamic and

there is a possibility that clearing of native vegetation will be required to conduct removal of ammunitions in the future.

Varronia rupicola is also found in the western half of Anegada Island, and the population appears to be healthy. However, despite efforts to maintain biodiversity and promote conservation on Anegada, *V. rupicola*, along with other rare plant species and their preferred limestone habitat, faces threats of future habitat fragmentation, habitat modification, and invasive species (Pollard and Clubbe 2003, p. 5; McGowan *et al.*, 2006, p. 4). Anegada is under heavy pressure for residential and tourism development (McGowan *et al.*, 2006, p. 4), resulting in improvement and construction of roads, which increase habitat loss and fragmentation.

About half of known populations and suitable habitat are within privately owned land, which is being modified or proposed to be modified for urban development. These activities are expected to continue.

Conservation Efforts to Reduce the Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Agave eggersiana

Efforts to re-establish locally endangered plant species to the wild are occurring within properties managed by the National Park Service (NPS) (SARI and Buck Island Reef National Monument) on St. Croix. The intent of NPS is to increase production of the species' progeny around the island, which started in 2007, by planting seven individuals of *Agave eggersiana* (NPS, unpubl. data, 2007). Also, an intra-agency

agreement between the Service and NPS, in cooperation with the Florida and Caribbean Exotic Plant Management Team, was established in 2007, to control nonnative, invasive plants and restore coastal landscape. The agreement was to restore approximately 15 acres (6.1 ha) of SARI coastal wetlands and uplands. The agreement also included planting *A. eggersiana* among other native flora. Currently, there are more than 100 juvenile plants on NPS lands. However, there is the need to continue monitoring these plants to document their long-term survival and recruitment, and to adaptively manage the population.

Other efforts include the evaluation of the status of the natural populations by Service staff. In 2010 and 2013, Service biologists visited St. Croix and found *Agave eggersiana* planted at the Lagoon Picnic Area, a public beach that seems to be under a reforestation effort funded by the Antilitter and Beautification Commission. The site harbors about 220 plants that are part of the landscape. Although the Service has no information on the reforestation project, it seems to be a good effort for the protection of coastal habitat and as an outreach effort towards the protection of the species.

Gonocalyx concolor

Gonocalyx concolor populations occur on public lands managed for conservation by the Puerto Rico DNER. The DNER develop a management plan for all Commonwealth Forests in 1976; however, specific measures to protect this species are not included in the plan (DNR 1976, pp. 168-181). Currently, activities to be conducted within Commonwealth Forest are generally scrutinized, and measures to minimize or

avoid impacts to species protected by DNER and Federal agencies are recommended and implemented (see Factor D discussion). However, authorized activities, such as vegetation clearing around communication towers, under power lines, and along roads, have been documented, resulting in loss of individuals and the species' habitat.

Varronia rupicola

The Service's Caribbean Ecological Service Field Office (CESFO) has evaluated federally funded projects or federally related projects requiring federal permits that lie within the species' range. As part of the evaluation, the Service recommends surveys to identify populations and recommends conservation measures to protect the species. However, residential projects without Federal nexuses are not submitted to the Service for evaluation.

Summary of Factor A

Agave eggersiana

The threats of possible construction and developments, and the current management of the habitat of the populations, may further limit the species. Direct consequences can be expected as impacting (harming) the individuals (e.g., cutting or mowing), while indirect consequences can be expected to create a habitat disturbance

where nonnative plants can overpower *Agave eggersiana*. Currently, there continue to be impacts on various populations that are expected to continue into the future.

Gonocalyx concolor

The species' rarity and restricted distribution makes it vulnerable to habitat destruction and modification. The scope of these factors is exacerbated because the most significant portion of the known population occurs adjacent to telecommunication facilities and at the edge of the existing access road. The activities related to these facilities are expected to continue into the future. Therefore, they are likely to have significant impact on *Gonocalyx concolor*.

Varronia rupicola

Degradation of habitat represents a threat to *Varronia rupicola*. About half of the known populations of *V. rupicola* and its suitable habitat are within privately owned land, which is being modified or is proposed to be modified for urban development. In addition, habitat fragmentation by clearing of vegetation, road constructions, and right-of-way maintenance (cutting plants and used of herbicides) can limit the species' survivability where these activities create the conditions for nonnative plants to outcompete *V. rupicola*. We expect that this threat would continue into the future.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Agave eggersiana

Agave eggersiana has been reported as a cultivar since it was described as a species in 1913 (Trelease 1913, p. 28). Historically, the majority of *A. eggersiana* found on St. Croix and St. Thomas were from landscaped areas (Britton and Wilson 1923, p. 156; Plaskett, DPNR, pers. comm., 2003; Kojis and Boulon, DPNR, pers. comm., 1996; Proctor and Acevedo-Rodríguez 2005, p. 118; Acevedo-Rodríguez, pers. comm., 2005). Currently, the species is distributed by the St. George Botanical Garden and the St. Croix Environmental Association for conservation and private landscaping purposes. In fact, it is an ornamental species commonly used on the island of St. Croix. Recent declines in the number of individuals at one population along the coast of Manchenil Bay are thought to be due to collection for ornamental purposes (Dalmida-Smith, DPNR, pers. comm., 2010; Valiulis, DPNR, pers. comm., 2010). At present, we do not have evidence to confirm this threat. However, when Service biologists visited the island in 2010 and 2013, they observed that *A. eggersiana* continues to be used as a landscape species.

Current evidence suggests that the wild and cultivated populations of *Agave eggersiana* have minimum genetic variation. Data suggest that cultivated individuals could be used as genetic stock to aid in the long-term survival of this species. However, most cultivated populations are groomed and do not allow natural recruitment. Therefore, we are concerned about possible collection of individuals from natural populations for landscaping. The rarity and low numbers of individuals for this agave may result in a high ornamental value. The limited reproduction of the plant, which

reproduces only once every 10 to 15 years (D. Hamada, SGVBG, pers. comm., 2010), may lead people to collect individuals from the wild and thus lower the recruitment of those limited populations and risk the continued survival of the species.

Gonocalyx concolor

Gonocalyx concolor is not a commercially valuable species or a species sought after for recreational or educational purposes. However, the species is recognized by its rarity and restricted range, making it more attractive to collectors and scientists. Collection could be a significant threat to the species due to the few remaining populations, small population size, restricted range, remoteness of occupied habitat, and the potential for collection to occur at any time. Because little is known about *G. concolor* (i.e., abundance, distribution, habitat requirement, and phenology), any collection of seedlings, saplings, flowers, fruits, or parts of the individual without appropriated evaluation of its effect on the species could adversely affect the status of the population. Even limited collection from the remaining population could have deleterious effects on reproductive and genetic viability of the species and could contribute to its extinction (José Sustache, DNER, pers. comm., 2013). Although we consider collection to be a potential threat to this species, we do not have information indicating that the species is being collected for commercial, recreational, scientific or educational purposes.

Varronia rupicola

There is scientific interest in *Varronia rupicola* from local and external botanists. In fact, there is ongoing research by personnel from the Royal Botanic Gardens (KEW) related to the reproductive biology, propagation, and genetics of this species, including the populations from United States and British territories (entire Puerto Rican platform). However, the current available information on the species does not suggest that overutilization for commercial, recreational, scientific, or educational purposes has contributed to a decline of *V. rupicola*. This research is the only known use of the species, and it is strictly for scientific purposes. Therefore, despite its rarity, we do not have any evidence that suggests this threat is negatively impacting *V. rupicola*.

Conservation Efforts to Reduce Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Agave eggersiana

At present, the Service is unaware of any conservation efforts to reduce overutilization for commercial, recreational, scientific, or educational purposes of *Agave eggersiana*, except for the existing regulatory mechanisms that protect the species. However, although *A. eggersiana* is protected by Act No. 5665, the USVI law that provides protection to indigenous, endangered, and threatened fish, wildlife, and plants in the Territory, the use of the species for landscaping continues to be a practice. This law prohibits the collection of endangered species. However, we do not have information

about enforcement mechanisms to avoid the use of this plant for landscaping (see Factor D discussion, below).

Gonocalyx concolor and *Varronia rupicola*

The Carite and Guánica Commonwealth Forests are managed for conservation by the Puerto Rico DNER, and collection of any plant in these lands is regulated by Commonwealth Law No. 133. Currently, there are permits to collect plants in the Carite and Guánica Commonwealth Forests. However, such permits are issued by DNER after determining that proposed actions will not negatively affect the species (José Sustache, DNER, pers. comm., 2013; see Factor D discussion, below). If this proposed rule is adopted, collection of *Varronia rupicola* at the Vieques National Wildlife Refuge will require a special use permit and section 7 consultation (see Factor D discussion, below).

Summary of Factor B

Agave eggersiana is recognized as an ornamental plant, and is locally distributed by botanical gardens (St. George Village Botanical Garden) and the St. Croix Environmental Association to residents for use in private gardens. Therefore, we consider collection to be a threat to the species due to the few remaining natural populations. Overcollection from natural populations may compromise the natural recruitment and the recovery of *Agave eggersiana*. We do not believe that overcollection is a threat to *Gonocalyx concolor* or *Varronia rupicola*.

Factor C. Disease or Predation

Agave eggersiana

The genus *Agave* is widely affected by the agave snout weevil (*Scyphophorus acupunctatus*). This weevil has a wide distribution that includes the Greater Antilles (i.e., Cuba, Jamaica, Hispaniola, and Puerto Rico) (Vaurie 1971, p. 4; Setliff and Anderson 2011, p. 1). The larvae of this weevil feed on the starchy base of the plant, increasing the risk of infestation by pathogens such as a virus or fungus, later resulting in the death of the plant (Vaurie 1971, p. 4). At this time, there is no information about the occurrence of the agave snout weevil within St. Croix. However, it has been documented to be found on adjacent islands such as St. Thomas and Water Island (USVI-
<http://www.uvi.edu/community/cooperative-extension-service/agriculture-and-natural-resources/integrated-pest-management.aspx>).

Although we do not have evidence on the agave snout weevil's presence on St. Croix, due to the low number of natural populations of *Agave eggersiana* and the abundance of vectors (i.e., nonnative agaves planted in gardens), we consider that the weevil's arrival to this island is forthcoming. The agave snout weevil's presence on nearby islands is a concern especially where there is constant traffic (commuting) among islands with local and international trade. This could potentially increase the risk of this weevil to arrive and infest the island at any time. Moreover, the island of St. Croix

harbors other types of *Agave*, which could potentially become stepping stones for the weevil to spread around and affect the few and limited populations of *A. eggersiana*.

Service biologists documented that a small number of individuals of *Agave eggersiana* were observed with scarring along the borders of some leaves (O. Monsegur and M. Vargas, Service, pers. obs., 2010). It appears that an insect or arthropod larva may feed on these leaves. However, the exact cause and the consequences of the scarring remain unknown. Nevertheless, this is important and should be monitored, as it might be an indicator of a recently arrived pest to St. Croix.

On Mona Island, Puerto Rico, feral pigs are known to uproot juveniles and destroy the root system of *Agave sisalana* (sisal) to feed on the root system or to use them as a water source (J. Saliva, Service, pers. obs, 1983 and 1996.). As introduced pigs, donkeys, and goats have been reported on St. Croix, we cannot disregard the possible predation of *Agave eggersiana*, particularly young plants, by these feral animals. The absence of evidence of predation by these species might be the result of the low number of individuals of *A. eggersiana*, their isolation, and the proximity of some of these populations to human-inhabited areas. Nonetheless, at this time there is no evidence that donkeys, pigs, or goats constitute a direct threat to *A. eggersiana*.

Gonocalyx concolor and Varronia rupicola

No insect pest or predation of individuals of *Gonocalyx concolor* or *Varronia rupicola* has been documented in the wild. Minor to moderate infestation by glasshouse whitefly (*Trialeurodes vaporariorum*) was observed on cultivated material of *V. rupicola*

at the Royal Botanical Garden, KEW (Wenger *et al.* 2010). However, this was suspected to be the result of the proximity of the *V. rupicola* material to a species that is highly susceptible to this insect pest.

Due to the low number of individuals and populations of these species, disease and predation could certainly be threats. However, we have no further information indicating that disease or predation are a current threat to *Gonocalyx concolor* or *Varronia rupicola*. We do not consider disease or predation to be a threat to either of the two species.

Conservation Efforts to Reduce Disease or Predation

Agave eggersiana, *Gonocalyx concolor*, and *Varronia rupicola*

Based on the information available, we have no evidence of conservation efforts to prevent or reduce adverse effects due to disease or predation. So far, the only species that could be potentially affected by an insect pest is *Agave eggersiana*. However, to our knowledge, no conservation measure has been implemented in this regard.

Summary of Factor C

Predation (scaring) has been observed in some individuals of *Agave eggersiana*, but there is no direct evidence that the severity of this stressor has affected the species. However, disease caused by the agave snout weevil could potentially affect *A. eggersiana*

at a population level. Thus, based on our analysis of the best available scientific and commercial available data, we find that disease may be a significant stressor to the overall status of *A. eggersiana* by affecting the long-term survival of the species.

We have no information indicating that disease or predation is a current threat to *Gonocalyx concolor* or *Varronia rupicola*.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

Under this factor, we examine whether existing regulatory mechanisms are inadequate to address the threats to *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola* discussed under other factors. Section 4(b)(1)(A) of the Act requires the Service to take into account, “those efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species....”. In relation to Factor D under the Act, we interpret this language to require the Service to consider relevant Federal, State, and Tribal laws and regulations, and other such mechanisms that may minimize any of the threats we describe in threat analyses under the other four factors, or otherwise enhance conservation of the species. We give strongest weight to statutes and their implementing regulations and to management direction that stems from those laws and regulations. An example would be State governmental actions enforced under a State statute or constitution, or Federal action under statute.

Having evaluated the significance of the threat as mitigated by any such conservation efforts, we analyze under Factor D the extent to which existing regulatory

mechanisms are inadequate to address the specific threats to the species. Regulatory mechanisms, if they exist, may reduce or eliminate the impacts from one or more identified threats. In this section, we review existing State and Federal regulatory mechanisms to determine whether they effectively reduce or remove threats to *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola*.

Agave eggersiana

Territory

The Territory of the U.S. Virgin Islands currently considers *Agave eggersiana* as endangered under the Virgin Islands Indigenous and Endangered Species Act (Law No. 5665) (V.I. Code, Title 12, Chapter 2). This law, signed in 1990, amended an existing regulation (Bill No. 18-0403) to provide for the protection of endangered and threatened wildlife and plants by prohibiting the take, injury, or possession of indigenous plants. As we mentioned above, *A. eggersiana* is currently being used for private landscaping on St. Croix. At present, we do not have information about the sources of the individuals used for such purposes. However, we are concerned about the removal of individuals from natural populations for landscaping. Based on the number of individuals currently used for private gardens and the landscape practices in private areas, such as pruning and mowing of populations, we believe that protection provisions under local regulation may not be appropriately enforced. Rothenberger *et al.* (2008, p. 68) indicated that the lack of management and enforcement capacity continues to be a significant challenge for the

USVI, because enforcement agencies are chronically understaffed and territorial resource management offices experience significant staff turnover, particularly during administration changes.

Based on the above, although there is a regulatory mechanism that protects *Agave eggersiana* on St. Croix, we consider that the enforcement of the mechanism is inadequate.

Gonocalyx concolor and *Varronia rupicola*

Federal

One of the currently known populations of *Varronia rupicola* lies within the Vieques NWR (Puerto Ferro population). Collecting and managing plant material (including seeds) within a national wildlife refuge are regulated and require a permit from the refuge manager (FWS Form 3-1383-R). The National Wildlife Refuge System Administration Act of 1966 (16 U.S.C. 668dd-668ee, as amended by the National Wildlife Refuge System Improvement Act of 1997) provides guidance for management and public use of the refuge system.

Commonwealth

In 1999, the Commonwealth of Puerto Rico approved the Law No. 241, also known as New Wildlife Law of Puerto Rico (“Nueva Ley de Vida Silvestre de Puerto

Rico”). The purpose of this law is to protect, conserve, and enhance both native and migratory wildlife species, including plants; declare all wildlife species within its jurisdiction as property of Puerto Rico; and regulate permits, hunting activities, and nonnative species, among others. However, as we mentioned above under the Factor A discussion, some individuals of *Gonocalyx concolor* and *Varronia rupicola* have been pruned, and in some cases eliminated, as result of unauthorized activities such as vegetation removal within the Commonwealth Forest (O. Monsegur, UPRM, unpubl. report, 2006, p. 1) and within privately owned lands (Monsegur and Breckon 2007, p. 6). Therefore, we believe that protection provisions under the Law No. 241 are not being appropriately enforced.

In 1998, the Commonwealth of Puerto Rico approved the Commonwealth Law No. 150, known as Puerto Rico Natural Heritage Law (Ley del Programa de Patrimonio Natural de Puerto Rico). The purpose of the Law No. 150 is to create the DNER Natural Heritage Program. This program has the responsibility to identify and designate as critical elements some rare, threatened, or endangered species that should be considered for conservation, because of their contribution to biodiversity and because of their importance to the natural heritage (DNR 1988, p.1). Currently, *Gonocalyx concolor* and *Varronia rupicola* are considered as critical elements by the DNER Natural Heritage Program. The Law No. 150 does not provide penalties for actions that may adversely affect critical elements; however, the law triggers other Commonwealth laws and regulations, such as Law No. 133 and Regulation No. 6769 (see below), that provide protection to critical elements.

The Carite and Guánica Commonwealth Forests are protected by Law No. 133 (12 L.P.R.A. sec. 191), 1975, as amended, known as the Puerto Rico Forest Law (“Ley de Bosques de Puerto Rico”), as amended in 2000. Section 8(A) of Law No. 133 prohibits cutting, killing, destroying, uprooting, extracting, or in any way damaging any tree or vegetation within a Commonwealth forest without authorization of the Secretary of the DNER. Although management plans for Commonwealth forests include the protection and conservation of species classified under DNER regulations as critical element, endangered, or threatened, on occasions the location of such species in the forests makes enforcement of these regulations a difficult task. As previously mentioned, *Gonocalyx concolor* and *Varronia rupicola* are located adjacent to trails, near access roads, and below power lines, where they are susceptible to maintenance practices. According to DNER forest managers, on several occasions, coordination between forest personnel and field staff from PREPA has not been effective to avoid damaging species protected by Commonwealth laws, including *V. rupicola* and *G. concolor* (M. Canals, DNER, pers. comm. 2008; H. Serrano-Delgado, DNER, pers. comm. 2013).

In 2004, the Commonwealth of Puerto Rico adopted Regulation No. 6769, Regulation of Special Permits for the Use of Communications and Buildings Associated to Electronic Systems of Communication within Commonwealth Forests in Puerto Rico (“Reglamento de Permisos Especiales para Uso de Comunicaciones y Edificaciones Asociadas a Sistemas Electrónicos de comunicación en los Bosques Estatales”), which provides guidance for the installation and maintenance of telecommunication facilities within Commonwealth forests and for the protection of natural resources. Article 7(d) of this regulation states that during installation, operation, and maintenance of

telecommunication facilities, conservation measures should be taken to avoid or minimize impacts on species protected by DNER and Federal agencies (DNER 2004a, p. 13). However, individuals of *Gonocalyx concolor* have been affected by maintenance activities of existing communication facilities, making implementation of this regulation a challenging task (see discussion under Factor A, above, and Factor E, below).

In 2004, DNER approved Regulation 6766 to regulate the management of threatened and endangered species in the Commonwealth of Puerto Rico (“Reglamento para Regir el Manejo de las Especies Vulnerables y en Peligro de Extinción en el Estado Libre Asociado de Puerto Rico”). Article 2.06 of Regulation 6766 prohibits collecting, cutting, and removing, among other activities, listed plants within the jurisdiction of Puerto Rico. *Gonocalyx concolor* and *Varronia rupicola* are not included in the list of protected species under Regulation 6766. However, as indicated above, Law No. 241 provides protection to all wildlife species (including plants) under Commonwealth jurisdiction, even those on private lands.

Local Ordinances

On the island of Anegada, there are various conservation and education efforts taking place for the protection of rare plant and animal species (Wenger *et al.* 2010, p. 8). However, we are unaware of any formal regulatory mechanism for protecting *Varronia rupicola*. On November 3, 1999, a portion of western Anegada (2,646 ac (1,071 ha)) was designated as a Ramsar site and added to the List of Wetlands of International Importance (Western Salt Ponds of Anegada). A portion of the preferred limestone habitat of *V.*

rupicola lies within this site, which is owned by the British government. Although this designation does not necessarily provide legal protection status, the purpose of Ramsar sites is to ensure the perpetuation of ecological functions of those sites by means of a wise-use approach.

Summary of Factor D

Agave eggersiana, *Gonocalyx concolor*, and *Varronia rupicola* and their habitats are partially protected by Federal, Commonwealth, Territory, and local regulations. However, after evaluating the information available on the implementation of the existing laws, we determined those regulatory mechanisms do not provide adequate protection to the species. The enforcement of existing laws has not been effective, because harming or injuring (mowing or pruning) *Agave eggersiana* has been reported. In addition, the implementation and enforcement of effective measures to protect individuals of *V. rupicola* located adjacent to existing trails and below power lines within Commonwealth forests have not been effective. The same problem has occurred with *G. concolor* during maintenance of communication towers. Additionally, it is important to note that enforcement on private lands continues to be a challenge, as accidental damage or extirpation of individuals has occurred due to lack of knowledge of the species by private landowners.

Factor E. Other Natural or Manmade Factors Affecting Their Continued Existence

Invasive Species

Invasive plant species can affect native ecosystems at three levels: the genetic level, where the number of individuals of native species can be reduced below the minimum necessary for persistence; the species diversity level, where the number of species present and their distribution can be reduced; and the ecosystem level, where the functioning of the ecosystem can be changed (Rippey *et al.* 2002, p. 170). Nonnative species can be very aggressive and compete with native species for sunlight, nutrients, water, and ground cover. Once established, these nonnative species typically dominate the landscape, and the novel forest is characterized by a decrease in the number of endemics (Lugo and Helmer 2003, p. 145). The impacts of invasive species are among the greatest threat to the persistence of native rare species and their habitats (Thomson 2005, p. 615).

Varronia rupicola and *Agave eggersiana*

Although invasive plant species have not been documented as a current threat to *Varronia rupicola*, they may become so in the future. Studies conducted within the Guánica Commonwealth Forest indicate that some nonnative tree species (e.g., *Leucaena leucocephala*) can persist as a dominant canopy species for at least 80 years (Wolfe 2009, p. 2). The same is expected to occur with nonnative grass species (e.g., *Megathyrsus maximus*). These invasive species may invade recently disturbed (naturally or by human impacts) areas and occupy the suitable habitat of *V. rupicola*. Despite the quality and overall diversity of the habitat that harbors *V. rupicola* populations in the southern coast of Puerto Rico, recent developments and habitat fragmentation have served as corridor

for invasive species (e.g., right-of-way for the former Gasoducto Sur; O. Monsegur, Service, pers. obs., 2013). On the island of Anegada, numerous invasive plants have been documented in the town of The Settlement, three of which have been observed moving towards natural habitats (McGowan *et al.* 2006, p. 4), further promoting the risk of wildfires that can affect *V. rupicola*.

With respect to *Agave eggersiana*, the populations at Protestant Cay, Gallows Bay, and Great Pond are surrounded by dense stands of different species of *Sansevieria*, an herb native to Africa. This invasive species seems to be occupying the ecological niche adjacent to known populations of *A. eggersiana* (O. Monsegur, Service, pers. obs., 2013). This invasive species can constrain the number of individuals of *A. eggersiana* and reduce the species' limited populations even more.

Gonocalyx concolor

Invasive, native plants, such as the ferns *Gleichenella pectinata* and *Sticherus bifidus*, may invade and alter diverse native communities, often resulting in plant monocultures that support few wildlife species (Walker *et al.* 2010, p. 627). These ferns can colonize disturbed areas faster than other native plants and may grow into dense mats, thereby excluding native plants (Walker *et al.* 2010, p. 634). Additionally, the mats formed by these species serve as fuel for fires and, in fact, seems to be fire-tolerant. The invasive, nonnative grass *Pennisetum purpureum* (elephant grass) is a fire-adapted species that, in dense growth, can suppress most grasses, herbs, and tree seedlings (J. K. Francis, ITF, internet data, 2013).

These invasive ferns and grass are currently found occupying areas disturbed by fire, landslides, and road construction in Cerro La Santa, and have the potential to affect *Gonocalyx concolor* by increasing fire incidences, microclimate, and nutrient cycling of the habitat on which this species depends. At present, we have no information about the competitive abilities of *G. concolor* in such a situation. Therefore, the effect of invasive species within the *G. concolor* habitat should be considered a threat to the species.

Human-induced Fires

Fire is not a natural event in subtropical dry or moist forests in Puerto Rico and the U. S. Virgin Islands. The vegetation in the Caribbean is not adapted to fires, because this disturbance does not naturally occur on these islands (Brandeis and Woodall 2008, p. 557; Santiago-García *et al.* 2008, p. 604). Human-induced fires could modify the landscape by promoting nonnative trees and grasses, and by diminishing the seed bank of native species (Brandeis and Woodall 2008, p. 557). In some cases, fires may maintain extensive areas of young forest and grasslands, slowing the recovery of ecosystems and, therefore, impairing the delivery of ecosystem services (Brandeis and Woodall 2008, p. 557). For example, the nonnative *Megathyrsus maximus* is well adapted to fires and typically colonizes areas that were previously covered by native vegetation. Furthermore, the presence of this species increases the amount of fuel and the intensity of fires. Therefore, damage caused by fires to the ecosystems, particularly to juvenile plants, might be irreversible.

Varronia rupicola and *Agave eggersiana*

Human-induced fires may lead to destruction of the native vegetation seed bank and may create conditions favorable for the establishment of nonnative plant species adapted to fires (e.g., *Leucaena leucocephala* and *Megathyrsus maximus*) that may outcompete *Varronia rupicola* and *Agave eggersiana*. Furthermore, the presence of *M. maximus* and other grass species increases the amount of fuel and the intensity of fires that may affect endemic populations. Seedling mortality after fires is related to the differences on fuel loads and the different fire intensities (Santiago-García *et al.* 2008, p. 607). The *V. rupicola* populations that occur along the municipalities of Yauco, Peñuelas, and Ponce are susceptible to forest fires, particularly on private lands where fires are accidentally or deliberately ignited. Evidence of recent fires within the habitat and adjacent to known populations of *V. rupicola* in Peñuelas and Ponce have been observed by Service biologist Omar Monsegur (2011 and 2013). *Varronia rupicola* populations within the Guánica Commonwealth Forest may be protected, as this conservation area has an active fire control program (M. Canals, DNER, pers. comm. 2008). Nonetheless, Miguel Canals, Guánica Commonwealth Forest Manager, indicates that fires still occur in the forest, particularly on the periphery along roads (Canals, DNER, pers. comm. 2008). Moreover, accidental fires have been reported below the PREPA power lines adjacent to known populations of *V. rupicola*.

On the island of St. Croix, human-induced fires are also frequently reported, and most of them appear to have been originated close to existing roads (Chakroff 2010, p. 41). Estate Granard, Estate Jack's Bay, and Estate Isaacs Bay are among the areas

identified as fire hotspots (Chakroff 2010, p. 42). One of the extant populations of *Agave eggersiana* is found on Estate Granard, and Jack's Bay and Isaacs Bay Estates are within the historical range for the species. In fact, from 2006 to 2009, there were between 1 and 6 fires in these estates (Chakroff 2010, p. 42). Human-induced fires particularly threaten the *A. eggersiana* population at Great Pond due to the abundance of nonnative grasses in this area. Service's personnel in St. Croix just documented a wild fire affecting the population of *Catesbaea melanocarpa* (Claudia Lombard, Service, pers. comm. 2013). This population is located less than 0.3 mi (0.5 km) from the *A. eggersiana* population at Manchenil Bay.

Gonocalyx concolor

Human-induced fire is also a current threat to *Gonocalyx concolor* at Cerro La Santa. Areas adjacent to (less than 33 ft (10 m) from) a population of this species have been affected by such fires (O. Monsegur, UPRM, unpubl. data, 2006). Fire effects could accelerate the colonization of invasive plants and change the vegetation composition of Cerro La Santa (see discussion under Factor A, above). Currently, *Pennisetum purpureum*, a nonnative grass, is occupying these areas, making them vulnerable to human-induced fires. During the dry season (March through May), the fern *Gleichenella pectinata*, and other fern species that have colonized landslides and roadsides, form dense mats of dry material that serve as fuel for fires. Although Cerro La Santa is located in the wet forest, fires still occur in the area, particularly along roads, during the dry season (C. Pacheco, USFWS, pers. obs. 2013). Due to the small size of *G. concolor* populations and

their proximity to areas susceptible to human-induced fires, the Service considers habitat modification by fires as a threat to the species.

Hurricanes and Climate Change

The islands of the Caribbean are frequently affected by hurricanes. The U.S. Virgin Islands have been hit by five major hurricanes in recent years: Hugo (1989), Luis and Marilyn (1995), Lenny (1999), and Omar (2008). Examples of the visible effects of hurricanes on the ecosystem include massive defoliation, snapped and wind-thrown trees, large debris accumulations, landslides, debris flows, altered stream channels, and transformed beaches (Lugo 2008, p. 368). Successional responses to hurricanes can influence the structure and composition of plant communities in the Caribbean islands (Van Bloem *et al.* 2003, p. 137; Van Bloem *et al.* 2005, p. 572; Van Bloem *et al.* 2006, p. 517; Lugo 2000, p. 245). Hurricanes can produce sudden and massive tree mortality, which is variable among species (Lugo 2000, p. 245). As endemics to the Caribbean, *Varronia rupicola*, *Agave eggersiana*, and *Gonocalyx concolor* would be expected to be well adapted to tropical storms and the prevailing environmental conditions in this geographical area. However, the resilience of rare and endangered native species populations may be limited or constricted by the reduced number of populations and individuals, making the populations vulnerable to stochastic events.

Varronia rupicola and Agave eggersiana

The reduced number and small size of *Varronia rupicola* and *Agave eggersiana* populations in Puerto Rico and St. Croix, respectively, make these species susceptible to hurricanes impacts (e.g., extirpation). In the case of *A. eggersiana*, the impacts may be exacerbated by the reproductive biology of the species (i.e., the species depends on asexual reproduction, plants dying after flowering, and limited dispersal of bulbils). Therefore, impacts to a population may compromise its natural recruitment. In addition, for *V. rupicola*, a severe hurricane could result in extensive defoliation and could cause stem damage.

Populations of *Varronia rupicola* may be threatened by climate change, which is predicted to increase the frequency and strength of tropical storms and can cause severe droughts (Hopkinson *et al.* 2008, p. 260). Rather than assessing climate change as a single threat, we examined the potential consequences to species and their habitats that arise from changes in environmental conditions associated with various aspects of climate change. For example, climate-related changes to habitats or conditions that exceed the physiological tolerances of a species, occurring individually or in combination, may affect the status of a species. In fact, vulnerability to climate change impacts is a function of sensitivity, exposure, and adaptive capacity of species (IPCC 2007, p. 89; Glick and Stein 2010, p. 19). For instance, severe droughts may compromise seedling recruitment, as they may result in deaths of small plants, or may compromise the viability of seeds. Despite the wide distribution of *V. rupicola* and the number of populations, the number of individuals per population may be too low to sustain a positive recruitment of individuals. This may explain the low number of intermediate-sized, nonreproductive individuals of *V. rupicola* observed in Guánica and Ponce, when

compared to the high numbers of young seedlings (Omar A. Monsegur, Service, pers. obs. 2013).

On the island of Anegada, climate-induced sea-level rise could lead to the extirpation of *Varronia rupicola*. The preferred habitat of this species on that island is in lower elevations, and more than 40 percent of the island is less than 9.8 ft (3 m) above sea level (Wenger *et al.* 2010, p. 8). Similarly, *Agave eggersiana* occurs very close to beach areas in coastal areas. At least two *A. eggersiana* populations are located on a coastal cliff, susceptible to coastal erosion and landslides. Therefore, we believe that cyclonic surges and coastal erosion associated with hurricanes may significantly affect the populations located along the coastal areas of St. Croix (i.e., Manchenil Bay, South Shore, Cane Garden, Vagthus Point, and Protestant Cay), due to their proximity to cliffs and the shoreline.

Gonocalyx concolor

The limited distribution and low number of populations (3) and individuals (172 historically reported) of this species may exacerbate its vulnerability to natural events such as hurricanes and landslides, and compromise its continued existence. Damage to higher elevation forested habitat is usually greater during hurricane events (Weaver 2008, p. 150). *Gonocalyx concolor* is extremely vulnerable due to its habitat requirements and the fact that it is usually found growing on the canopy of the tallest trees in Cerro La Santa and Charco Azul. The species is usually associated to old trees with abundant vines and epiphytes that provide horizontal structure for the colonization of the species

(probably a habitat requirement for the germination of seeds). Hurricane winds often lead to tree defoliation, loss of small and large branches, and uprooting, resulting in damage to adjacent trees and understory vegetation. As a result, gaps are produced in the vegetation, causing temporary changes in the understory microclimate due to high light levels and temperature (Walker *et al.* 2010, p. 626). Therefore, damage to the forest canopy may result in a direct impact to individuals of *G. concolor* that may fall to the ground and probably be outcompeted by pioneer plant species that get established during early successional stages after hurricanes.

The recovery of elfin forest vegetation after hurricanes is usually slow, and the early regeneration process is dominated by a few species (Weaver 2008, p. 150). Furthermore, in the absence of knowledge of the reproductive capacity and ecological requirements of *Gonocalyx concolor*, it is difficult to predict its recovery after natural events such as hurricanes and tropical storms, particularly when the frequency and intensity of these weather events is expected to increase with climate change.

The habitat where *Gonocalyx concolor* occurs is susceptible to landslides during rain events mostly associated with tropical storms and hurricanes. Sometimes rainfall reaches 24 in (60 cm) in a single storm event, causing floods and interacting with topography and geologic substrate to induce mass wasting events (e.g., landslides; Lugo 2000, p. 246). In 1998, during Hurricane Georges, a landslide adversely affected approximately 2 ac (0.8 ha) of elfin forest at Cerro La Santa (Hector Serrano-Delgado, DNER, pers. comm. 2013). A massive landslide in the area where the species occurs would not only take out individuals of *G. concolor*, but would also modify the habitat necessary for the species and lead to conditions favoring the establishment of invasive

and weedy vegetation that may permanently modify the habitat and outcompete *G. concolor* (see invasive species discussion under Factor E, above). As documented during Hurricane Georges, and based on the current conditions of the habitat at Cerro La Santa and Charco Azul, landslides are a current threat to this species. As with *Agave eggersiana* and *Varronia rupicola* (see discussion above), overall impact and the cumulative effects of climate change are also expected to have long-term adverse effects on *G. concolor*. *Gonocalyx concolor* is considered a species with very specific ecological requirements and that occupies biological islands (i.e., dwarf forests on high elevations of Puerto Rico). Thus, predicted changes on the structure of the vegetation due to climate change may result in the irreversible extirpation of the prime habitat for the species.

Low Reproductive Capacity, Highly Specialized Ecological Requirements, and Genetic Variation

Gonocalyx concolor and *Agave eggersiana*

Small and isolated populations of rare plants often display reduced fitness as reduced reproductive output, seedling performance, or pollen viability (Holmes *et al.* 2008, p. 1031). In the case of *Gonocalyx concolor*, little is known about its reproductive capacity, recruitment, and genetic variation. The low number of individuals per population of a monoecious species (both sexes in the same flower), like *G. concolor*, suggests it has highly specialized ecological requirements, production of viable seeds rarely occurs, or there is a pollinator limitation. Despite the ongoing monitoring of the

known population of *G. concolor*, no seedling recruitment has been observed in the wild. Knowing the phenology of a plant showing limited distribution is important in understanding the species' biology and ecology, such as the timing of flowering, fruiting, germination and subsequent growth, and accumulation of biomass in the field (Ruml and Vulic 2005, p. 218). Additionally, given the extremely limited geographic distribution of *G. concolor*, it is likely that its genetic variability is low.

In the case of *Agave eggersiana*, its reproductive biology is characterized by its dependence on asexual reproduction (i.e., bulbils). Current evidence suggests that the wild and cultivated populations of *A. eggersiana* have minimum genetic variation. This would result in the loss of alleles by random genetic drift, which would limit the species' ability to respond to changes in the environment (Honnay and Jacquemyn, 2007, p. 824).

Conservation Efforts to Reduce Other Natural or Manmade Factors Affecting Their Continued Existence

Varronia rupicola

The staff from the Royal Botanical Garden (KEW) has developed a germination and cultivation protocol for *Varronia rupicola*. KEW is also conducting studies to determine the genetic variation within and among known populations, and the species' reproductive biology and population ecology, to develop a management plan for the species (Hamilton, KEW, pers. comm. 2012). Further preliminary germination experiments have been conducted in Puerto Rico at the nurseries of the Guánica

Commonwealth Forest and the Cabo Rojo National Wildlife Refuge. The Service is not aware of any conservation measure for *Agave eggersiana* or *Gonocalyx concolor*.

Summary of Factor E

Agave eggersiana

Based on the above information and due to the reduced number of populations and individuals, we believe that *Agave eggersiana* is currently threatened by natural or manmade factors, including hurricanes, fires, and competition with nonnative species. Climate change may exacerbate these habitat threats by increasing the frequency of fires, droughts, and hurricanes, but to an unknown extent.

Gonocalyx concolor

The primary threats to *Gonocalyx concolor* are its limited distribution and highly specialized ecological requirements. Other potential threats include low reproductive capacity, possible low genetic variation, effects of vegetation management, hurricanes and landslides, human-induced fire, and climate change. *G. concolor* is susceptible to hurricanes, landslides, and human-induced fire because it is confined to geographically small areas. Invasive species and climate change are potential threats that may be expected in the future. *G. concolor* could be negatively affected by the increasing intensity and frequency of hurricanes and tropical storms, environmental effects resulting from changing climatic patterns. Any disturbance of vegetation along the road and

around the telecommunication facilities (including landslides) where the species is found may directly impact individuals and create conditions favorable for the establishment of invasive species that may alter (modify) *G. concolor* habitat.

Varronia rupicola

Varronia rupicola is threatened primarily by human-induced fires within its prime habitat. Habitat modification by urban development has promoted the invasion of its habitat by nonnative plant species (e.g., grasses) that are typically fire-adapted and, therefore, increase the chances of fires by providing a higher fuel load in the ecosystem. Evidence of recent fires has been documented within the municipalities of Peñuelas and Ponce in areas close to *V. rupicola*, threatening these natural populations. Overall, nonnative plants and fires may result in extirpation of populations of *V. rupicola* by killing individuals, limiting natural recruitment, or permanently modifying habitat and conditions necessary for the species' establishment. Furthermore, due to the species' limited numbers and distribution, hurricanes may extirpate entire populations, and in the case of a highly fragmented habitat, hurricanes may further promote the invasion of forest gaps by nonnative plant species rather than native pioneers. Similarly, severe droughts resulting from climate change may compromise the survival of seedlings and diminish natural recruitment within wild populations.

Cumulative Effects: Factors A through E

Agave eggersiana

The limited distributions and small population sizes of *Agave eggersiana* make this species very susceptible to further habitat loss (Factor A), diseases (Factor C), and competition with nonnative species (Factor E). Hurricanes, human-induced fires, and climate changes (Factor E) exacerbate current threats to the species. Furthermore, although the species is protected by territorial law, enforcement still is a challenge (Factor D), risking the continued survival of the species. While these threats may act in isolation, it is very likely that two or more of these stressors (e.g., habitat loss and diseases) act simultaneously or in combination, resulting in cumulative impacts to populations of *A. eggersiana*.

Gonocalyx concolor

The rarity and specialized ecological requirements of *Gonocalyx concolor* (Factor E) make this species extremely vulnerable to habitat destruction or modification (Factor A), and to other natural or manmade factors, such as low reproductive capacity, possible low genetic variation, invasive species, hurricanes, landslides, human-induced fires, and climate change, particularly because it is confined to small geographical areas (Factor E). Furthermore, implementation and enforcement of effective measures to protect *G. concolor* have not prevented impacts to the species (Factor D). Although the above mentioned threats may act in isolation, it is very likely that two or more of these stressors act simultaneously or in combination (e.g., hurricanes and landslides; fires and invasion

of nonnative plant species), resulting in cumulative impacts to populations of *G. concolor*, challenging its recovery.

Varronia rupicola

Varronia rupicola has a somewhat extended distribution in southern Puerto Rico. However, the species is represented by small and fragmented populations, and about half of them occur within private lands subject to urban development, making the species prone to destruction, modification, or curtailment of its habitat (Factor A). Moreover, other natural or manmade factors such as invasive species, human-induced fires, hurricanes, and climate change (Factor E) also pose threats to *V. rupicola*. Furthermore, implementation and enforcement of regulatory mechanisms to protect the species have not been effective, particularly because enforcement on private lands continues to be a challenge (Factor D). Therefore, it is very likely that cumulative effects of these threats (e.g., poorly implemented regulatory mechanisms and habitat destruction) result in limitation, or even local extirpation, of *V. rupicola* populations.

Proposed Determination

Agave eggersiana

Agave eggersiana is highly threatened by limited habitat and habitat loss (e.g., construction of roads, and residential and tourist developments and landscaping (Factor

A)) and the potential for a disease to wipe out the limited populations (Factor C). In addition, agave is threatened by a high possibility of commercial collection for ornamental uses (Factor B), and competition with invasive, nonnative plants, as well as hurricanes and human-induced fires, which are further exacerbated by climate change (Factor E). Due to lack of enforcement, existing regulatory mechanisms are not adequately reducing these threats (Factor D). All of these threats currently occur rangewide and are likely to continue into the foreseeable future at a medium to high intensity.

Based on our evaluation of the best available scientific and commercial information on the species, the significant threats affecting *Agave eggersiana* and its habitat, as well as future potential threats, we have determined the species is in danger of extinction throughout all of its range. As a result, we find that *A. eggersiana* meets the definition of an endangered species. We find that a threatened species status is not appropriate for *A. eggersiana* because the species is very limited in numbers and in populations, and because threats are current and ongoing, occurring rangewide, and expected to continue into the future.

Gonocalyx concolor

Gonocalyx concolor has a very limited distribution. According to our assessment, this species is threatened by habitat destruction or modification (Factor A) associated with maintenance and potential expansion of telecommunication facilities, and to other natural or manmade factors (i.e., low reproductive capacity, possible low genetic

variation, invasive species, hurricanes, landslides, human-induced fires, and climate change (Factor E)). Due ineffective implementation and enforcement, existing regulatory mechanisms are not adequately reducing these threats (Factor D). All of these threats currently occur rangewide and are likely to continue into the foreseeable future at a medium to high intensity.

Based on our evaluation of the best available scientific and commercial information on the species, the significant threats affecting *Gonocalyx concolor* and its habitat, as well as future potential threats, we have determined the species is currently in danger of extinction throughout all of its range. As a result, we find that *G. concolor* meets the definition of an endangered species. We find that a threatened species status is not appropriate for *G. concolor* because the species is already very limited in numbers and distribution (i.e., it has a contracted range), and the threats are current and ongoing, occurring rangewide, and expected to continue into the future.

Varronia rupicola

Current evidence indicates that the majority of suitable habitat and known populations of *Varronia rupicola* lie within private lands in southern Puerto Rico (i.e., Yauco, Peñuelas, and Ponce). These lands are subject to habitat destruction or modification where impacts to habitat and populations have been documented. Furthermore, populations located within the Guánica Commonwealth Forest have been affected by management practices, such as trail and power lines maintenance (Factor A). Habitat destruction further results in the intrusion of nonnative plant species that have the

potential to outcompete *V. rupicola* and create favorable conditions for fire (Factor E). Furthermore, implementation and enforcement of regulatory mechanisms to protect the species have not been effective in reducing these threats, particularly because enforcement on private lands continues to be a challenge (Factor D). Some of these threats are occurring presently at a moderate level, and are likely to increase in the foreseeable future to a high intensity.

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to *Varronia rupicola*, and have determined that the species meets the definition of a threatened species throughout all of its range. We find that an endangered species status is not appropriate for *V. rupicola* because the species is not currently in danger of extinction, but likely will be in the future. It has a wide distribution throughout the Puerto Rican bank (geographical unit that includes the main island of Puerto Rico, Vieques, Culebra, the USVI (excluding St. Croix) and the island of Anegada)), has no germination problems, develops as reproductive individuals in a relatively short time period (1 to 2 years under nursery conditions), and is the subject of propagation and conservation protocols in development by the staff of the Royal Botanical Garden (KEW). Therefore, the Service considers that *V. rupicola* is a species with a high recovery potential that meets the definition of a threatened species.

Significant Portion of the Range

The Act defines an endangered species as any species that is “in danger of extinction throughout all or a significant portion of its range” and a threatened species as any species “that is likely to become endangered throughout all or a significant portion of its range within the foreseeable future.” A major part of the analysis of “significant portion of the range” requires considering whether the threats to the species are geographically concentrated in any way. If the threats are essentially uniform throughout the species’ range, then no portion is likely to warrant further consideration.

Based on the threats to *Agave eggersiana* and *Gonocalyx concolor* throughout their entire known ranges, we find that these species currently are in danger of extinction throughout all of their ranges, based on the severity and scope of the threats described above. As previously discussed, *A. eggersiana* and *G. concolor* are proposed for listing as endangered species, rather than threatened species, because the major threats are occurring now, and additional threats will impact them in the near term. The potential impacts to the species would be severe given their limited known distribution, the small population sizes at the remaining sites, and the small area occupied by most of the populations. Because the threats acting over the three species extend throughout their entire ranges, it is unnecessary to determine if the species are in danger of extinction throughout a significant portion of their ranges. We find that the threats to *Varronia rupicola* are a result of future development and lack of regulatory mechanisms. These impacts are not occurring now. Therefore, on the basis of the best available scientific and commercial information, we propose listing *A. eggersiana* and *G. concolor* as endangered species, and *V. rupicola* as threatened species, throughout their ranges in accordance with sections 3(6) (endangered), 3(20) (threatened), and 4(a)(1) of the Act.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing the species, results in public awareness and conservation by Federal, State, Tribal, and local agencies; private organizations; and individuals. The Act encourages cooperation with the States and requires that recovery actions be carried out for all listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Subsection 4(f) of the Act requires the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning includes the development of a recovery outline shortly after a species is listed and preparation of a draft and final recovery plan. The recovery outline guides the immediate implementation of urgent recovery actions and describes the

process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan identifies site-specific management actions that set a trigger for review of the five factors that control whether a species remains endangered or may be downlisted or delisted, and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our website (<http://www.fws.gov/endangered>), or from our Caribbean Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private and Commonwealth and Territory lands.

If these species are listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost share grants for non-Federal landowners, the academic community, and nongovernmental organizations.

In addition, pursuant to section 6 of the Act, the Territory of the U.S. Virgin Islands and the Commonwealth of Puerto Rico would be eligible for Federal funds to implement management actions that promote the protection or recovery of *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola*. Information on our grant programs that are available to aid species recovery can be found at: <http://www.fws.gov/grants>.

Although *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola* are only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402.

Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

Federal agency actions within the species' habitat that may require conference or consultation or both as described in the preceding paragraph include management and any other landscape-altering activities on Federal lands administered by the U.S. Fish and Wildlife Service (Vieques National Wildlife Refuge), and National Park Service (SARI and Buck Islands Monument); issuance of section 404 Clean Water Act (33 U.S.C. 1251 *et seq.*) permits by the U.S. Army Corps of Engineers; and construction and maintenance of roads or highways by the Federal Highway Administration.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered and threatened plants. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.61, apply to endangered plants. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to import or export, transport in interstate or foreign commerce in the course of a commercial activity, sell or offer for sale in interstate or foreign commerce, or remove and reduce the species to possession from areas under Federal jurisdiction. In addition, for plants listed as endangered, the Act prohibits the malicious damage or destruction on areas under Federal jurisdiction and the removal, cutting, digging up, or damaging or destroying of such plants in knowing violation of any State law or regulation, including State criminal trespass law. It is also unlawful to violate any regulation pertaining to plant species listed as endangered or threatened (section 9(a)(2)(E) of the Act).

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.62 for endangered plants, and at 17.72 for threatened

plants. With regard to endangered plants, a permit must be issued for the following purposes: for scientific purposes or to enhance the propagation or survival of the species.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of species proposed for listing. The following activities could potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of *Agave eggersiana*, *Gonocalyx concolor*, or *Varronia rupicola*, including import or export across State lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act;

(2) Introduction of nonnative species that compete with or prey upon *Agave eggersiana*, such as the introduction of the nonnative agave snout weevil to the island of St. Croix, USVI; and

(3) The unauthorized release of biological control agents that attack any life stage of *Agave eggersiana*, *Gonocalyx concolor*, or *Varronia rupicola*.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Caribbean Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our listing determination is based on scientifically sound data, assumptions, and analyses. We have invited these peer reviewers to comment during this public comment period.

We will consider all comments and information we receive during the comment period on this proposed rule during our preparation of a final determination. Accordingly, the final decision may differ from this proposal.

Public Hearings

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received within 45 days after the date of publication of this proposed rule in the **Federal Register**. Such requests must be sent to the address shown in the **FOR FURTHER INFORMATION CONTACT** section. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Required Determinations

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

- (1) Be logically organized;
- (2) Use the active voice to address readers directly;
- (3) Use clear language rather than jargon;
- (4) Be divided into short sections and sentences; and
- (5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in the **ADDRESSES** section. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (NEPA), need not be prepared in connection with listing a species as an endangered or threatened species under the Endangered Species Act. We published a notice outlining

our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A complete list of references cited in this rulemaking is available on the Internet at <http://www.regulations.gov> and upon request from the Caribbean Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this proposed rule are the staff members of the Caribbean Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 1531-1544; 4201-4245, unless otherwise noted.

2. Amend § 17.12(h) by adding entries for *Agave eggersiana*, *Gonocalyx concolor*, and *Varronia rupicola*, in alphabetical order under FLOWERING PLANTS, to the List of Endangered and Threatened Plants to read as follows:

§ 17.12 Endangered and threatened plants.

* * * * *

(h) * * *

Species		Historic range	Family	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						

FLOWERING PLANTS

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<i>Agave eggersiana</i>	None	U.S.A. (VI)	Agavaceae	E		NA	NA
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<i>Gonocalyx concolor</i>	None	U.S.A. (PR)	Ericaceae	E		NA	NA
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<i>Varronia rupicola</i>	None	U.S.A. (PR); British VI	Boraginaceae	T		NA	NA
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Dated: September 3, 2013

Signed: Rowan W. Gould

Acting Director, U.S. Fish and Wildlife Service

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<FRDOC> [FR Doc. 2013-22742 Filed 10-23-13; 8:45 am]

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