

**BEFORE THE FLORIDA FISH AND WILDLIFE CONSERVATION
COMMISSION, DIVISION OF HABITAT & SPECIES CONSERVATION**

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**SPECIES EVALUATION REQUEST FOR THE MIAMI TIGER BEETLE
(*Cicindela floridana*)**

Name, address, and signature of persons submitting the request:

The **Center for Biological Diversity** (“Center”) is a nonprofit, public interest environmental organization dedicated to the protection of imperiled species and the habitat and climate they need to survive through science, policy, law and creative media. The Center is supported by more than 800,000 members and activists throughout the country. The Center works to secure a future for all species, great or small, hovering on the brink of extinction.

Center for Biological Diversity
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Al Sunshine is a Miami Based Investigative Reporter and Community Activist with more than 40 years of experience covering South Florida, the Caribbean and the Southeast. His work has earned him multiple awards including several Emmys, an Edward R Murrow Award for website blogging, as well as multiple Consumer Protection awards on both the national and state levels. His work covering the “Challenger Disaster” for CNN is cataloged in the Library of Congress.

Al’s News Reports during Miami’s Drug Wars in the 1970’s-80’s are chronicled in the documentary “Cocaine Cowboys”. Al’s investigations prompted more than a dozen state and local consumer protection laws. He also produced one of the first local television news series in Miami on the growing environmental challenges facing South Florida, “The Vanishing Everglades” featuring Marjorie Stoneman Douglas, Bob Graham and Bobby Jones.

Al is a long-time resident of South Miami-Dade is one of the founding members of the Miami Rocklands Preservation Coalition.

Al Sunshine
12841 SW 149 St.
Miami, Fla. 33186



Miami Pine Rocklands Coalition, Inc. fully supports adding the Miami tiger beetle and the Richmond Pine Rocklands Habitat as its home to the Florida listing of endangered species.

Request to Evaluate the Miami Tiger Beetle
Submitted June 29, 2015

The MPRC advocates for the preservation and restoration of the remaining one percent of South Florida's original pine rocklands believed to still exist outside of Everglades National Park, according to the U-S Dept. of Interior.

MPRC has engaged in a recent email and letter writing campaign to the U.S. Fish and Wildlife Service urging it to formally list the Richmond Pine Rocklands and Miami Tiger under the designation of Critically Endangered Species/Habitat.

Recent rallies over the past year have attracted more than 1,000 local supporters urging for the preservation of the Richmond pine rocklands, and members' petitions are approaching 100,000 signatures nationally.

There's already more than \$1 billion dollars in proposed development in the Richmond pine rocklands.

Without further habitat protection from the State of Florida, the Miami tiger beetle could easily be bulldozed into extinction.

Al Sunshine, President
Miami Pine Rocklands Coalition, Inc.
12841 SW 149 St.
Miami, Fla. 33186



Sandy Koi earned an MSc in Entomology in 2013 from the University of Florida under the guidance of Dr. Jaret Daniels (and will be a doctoral student ASAP). She has a BSc in Environmental Science from Nova Southeastern University; her published scientific research revolves around the object of her thesis, the Atala butterfly (*Eumaeus atala*), an imperiled South Florida species that she has been studying since 2001.

Sandy currently spearheads an assisted relocation project for the Atala butterfly *from* eruption sites *into* suitable new sites in Southeast Florida. She coordinated butterfly surveys for Florida Natural Areas Inventory (FNAI) and is an active member of the North American Butterfly Association (NABA). She is a contributing member of the Imperiled Butterfly Working Group (IBWG), under the authority of the Florida Fish and Wildlife Conservation Commission (<http://share2.myfwc.com/IBWG/default.aspx>).

Many of her photographs and plant information about South Florida butterfly host and nectar plants grace the national NABA website (www.naba.org) and she is a frequent speaker at local organizations in Florida, including Butterfly Days at Fairchild Tropical Botanic Garden and the Southern Lepidopterists' Society. She maintains a blog that highlights her research, eco-tours and children's nature programs (<http://e-atala.blogspot.com>).

Request to Evaluate the Miami Tiger Beetle
Submitted June 29, 2015

Sandy Koi
26001 SW 187 Ave.
Homestead FL 33031

/s/Sandy Koi

Chris Wirth has a bachelor of science degree and produced an honor's thesis entitled Description of the third instar larvae of *Cicindela abdominalis* F., *C. floridana* Cartwright, *C. highlandensis* Choate, and *C. scabrosa* Schaupp (Coleoptera: Carabidae: Cicindelinae). He was a field research assistant for Dr. Knisley, an expert on the Miami tiger beetle and has photographed the Miami tiger beetle and its habitat.

1830 Hillenwood Dr.
Powhatan, VA 23139

/s/Chris Wirth

Submitted this 29th day of June, 2015:

Pursuant to Chapter 68A-27.0012(2)(b) the Center for Biological Diversity, Sandy Koi, Al Sunshine, Miami Pine Rocklands Coalition, Inc., and Chris Wirth submit a request to the Florida Fish and Wildlife Conservation Commission (“Commission”) to evaluate the Miami tiger beetle for listing on the state-designated threatened species list. Similar information was submitted to the U.S. Fish and Wildlife Service (“Service”) on December 11, 2014 pursuant to Section 4(b) of the Endangered Species Act (“ESA”), 16 U.S.C. § 1533(b), Section 553(3) of the Administrative Procedures Act, 5 U.S.C. § 553(e), and 50 C.F.R. § 424.14 and 424.20, to list the Miami tiger beetle as a threatened or endangered species and to designate critical habitat concurrent with listing pursuant to 16 U.S.C. 1533(a)(3)(A) and 50 C.F.R. § 424.12.

The Miami tiger beetle was presumed extinct until recent surveys discovered individuals at three contiguous sites in the Richmond pine rocklands. It is now regarded as a species of concern by the Service, and is imminently threatened with severe habitat degradation from the construction and operation of a mixed-use shopping mall and the potential development of a theme park. Both developments would directly impact adjacent occupied habitat by limiting burns and other flora management efforts. The beetle is also threatened by vegetation encroachment which may be less imminent but is ongoing. The imperiled status of the Miami tiger beetle coupled with the impending urban development warrant immediate action by the Commission.

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I. EXECUTIVE SUMMARY

The Miami tiger beetle, a diminutive iridescent native of Florida, was first discovered and described in the 1930s. It was not seen again until 2007 in the Richmond Heights area of Miami, Florida. Today that same habitat is under threat of severe degradation and further potential habitat faces destruction from a planned mixed-use shopping mall and proposed theme park.

The best available scientific information presented in this request indicates that the Miami tiger beetle is threatened with extinction. While it may have always been rare (which is uncertain since nearly all of the pine rockland has been destroyed, except some preserved patches in Miami-Dade) to begin with, the last remaining populations, all occurring on a contiguous tract of pine rocklands, known as the Richmond pine rocklands, are now imminently threatened with complete extinction. We respectfully request that the Commission review this request to evaluate the species and take immediate action to list the Miami tiger beetle and afford it the fullest protection under Florida state law.

II. INTRODUCTION

Florida has unique and abundant biological resources and is considered a biodiversity hot spot in the United States, hosting an estimated 700 vertebrate species and over 30,000 invertebrate species.¹ There are a number of wildlife and plant species persisting in Florida, found nowhere else in the world, with 147 endemic vertebrates, 410 endemic invertebrates, and 295 endemic plants.² The Miami tiger beetle is one of those species.

The Miami tiger beetle, a diminutive iridescent native of Florida, was first discovered and described in the 1930s. It was not seen again until 2007 in the Richmond Heights area of Miami, Florida. Today that same habitat is under threat of severe degradation and adjacent potential habitat faces destruction from a planned shopping mall and proposed theme park.

Under Florida law, a state-designated threatened species is designated as such by the Commission where there has been a reduction in population size; severely fragmented geographic range; a declining population of fewer than 10,000 mature individuals; a very small or restricted population; or quantitative analysis showing the probability of extinction in the wild.³ The Miami tiger beetle has experienced population decline, has severely fragmented habitat, fewer than 10,000 individuals, and a very small and restricted range. We have assigned it Millsap score of 88.

To provide greater protection to this rare Florida ecosystem and to stave off looming extinction, the Center for Biological Diversity, Sandy Koi, Al Sunshine, Miami Pine Rocklands Coalition, Inc., and Chris Wirth hereby request that the Commission evaluate the status of the Miami tiger beetle and determine whether it should be listed as state-designated threatened species.

III. NATURAL HISTORY

The Miami tiger beetle is small, less than 10 mm long.⁴ Its shell is a shiny metallic green, with some individuals appearing copper-colored.⁵ Brzoska provides the following more detailed physical description:⁶

General habitus. Body small (6.5- 8.2 mm males, 7.4- 9.0 mm females), elytral maculation reduced to apical lunule confined to edge. Dorsal

¹ Myers, N., R. Mittermeier, C. Mittermeier, G. Fonseca, and J. Kent. Biodiversity hotspots for conservation priorities. *Nature* Vol. 403 Feb. 24, 2000 at 853.

² Florida Fish and Wildlife Commission, *Florida's Wildlife Legacy Initiative*, myfwc.com, <http://myfwc.com/conservation/specialinitiatives/fwli/> (last visited Oct. 18, 2014).

³ 68A-27.001(3).

⁴ Brzoska, D., C. Knisley, and J. Sloten. 2011. Rediscovery of *Cicindela scabrosa floridana* Cartwright (Coleoptera: Cicindelidae) and its elevation to species status. *Insecta Mundi* 0162: 1-7 at 3.

⁵ *Id.*

⁶ *Id.*

coloration shiny metallic green, with some individuals showing a cuprous wash. Ventral surface metallic blue; abdomen rufous.

Head. Labrum long, white, edentate, slightly flattened anteriorly, with usually 6, rarely 4 submarginal setae. Clypeus and gena glabrous with purple reflection. Frons glabrous (except for two pairs of supraorbital setae), faintly striated, purple reflection laterally. Mandibles with four teeth, anterior third dark brown/black, posterior two-thirds testaceous, white laterally. Antennal segments 1-4 metallic green, 5-11 testaceous. Segment 1, widened anteriorly with 1 subapical sensory seta; segment 2 small, glabrous; segments 3 and 4 thin with apical and lateral setae; segments 5-11 covered with dense tomentose setae.

Thorax. Pronotum slightly tapering to posterior, v-shaped impression anteriorly, 40-50 wide flattened setae laterally, disk smooth, ventral surface smooth with dense setae around coxal margins. Mesosternum glabrous, mesepimeron covered with dense decumbent setae. Metasternum with scattered setae on anterior margin; metepisternum with dense decumbent setae.

Abdomen. Rufous, sternites 1-3 with dense lateral decumbent setae.

Legs. Testaceous to yellow, with metallic green reflection.

Elytra. Deeply punctured throughout with subsutural foveae. Apex with microserrations and short medial spine. Maculation includes only a thin apical lunule confined to distal and lateral apex.



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Female Miami tiger beetle
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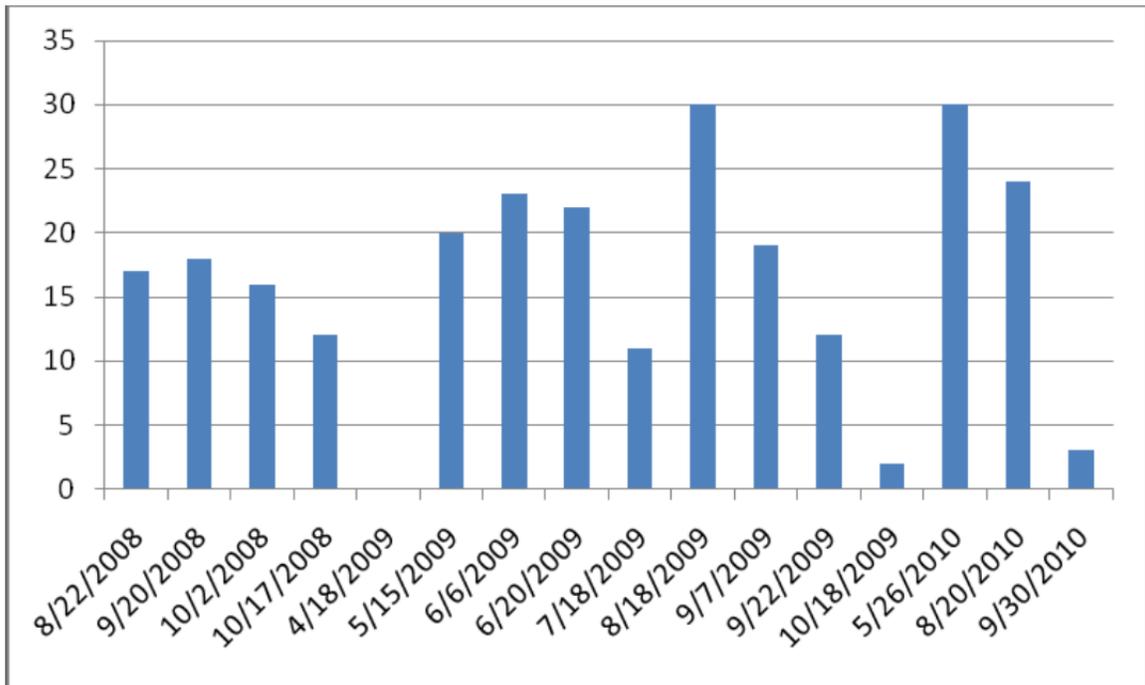


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Adults are active May through October.⁷ Tiger beetles generally have a life span of several weeks to two months, with a maximum flight period for a population three months.⁸

In terms of abundance, below is a table reflecting “[s]easonal abundance of *C. floridana* adults at the Metrozoo site. Based on counts of adults seen in 1-2 hour surveys of the same two areas.”⁹



The Service regards the Miami tiger beetle as a species of concern,¹⁰ and the Florida Fish and Wildlife Conservation Commission regards it as a species of greatest conservation need.¹¹ It has been recommended for state and federal listing by at least one expert.¹²

IV. LISTING CRITERION

Pursuant to 68A-27.0012(b)(2)(c), persons requesting the evaluation of a species for listing on the state-designated threatened species list must include sufficient information on the biology and distribution of the species to warrant investigation of its status using the criteria contained in the definition of a state-designated threatened species. Florida species are classified as threatened as determined by 68A-27.001(3)(a)-(e).

⁷ Knisley, C.B. 2011. Taxonomy, Biology, and Conservation of the Florida Tiger Beetle, *Cicindela floridana*, report to South Florida Ecological Services Office at 4.

⁸ *Id.* at 35.

⁹ *Id.* at 35.

¹⁰ <http://www.fws.gov/VeroBeach/MSRPPDFs/appendixC.PDF> at C-19.

¹¹ [http://myfwc.com/media/1487124/03_SGCN\(2\).pdf](http://myfwc.com/media/1487124/03_SGCN(2).pdf) at 29.

¹² Knisley 2011 at 46.

A. Population Size Reduction

Reduction of population size may be based on *any* of the following:

1. An observed, estimated, inferred or suspected population size reduction of at least 50% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible and understood and ceased;
2. An observed, estimated, inferred or suspected population size reduction of at least 30% over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased or may not be reversible;
3. A population size reduction of at least 30% projected or suspected to be met within the next 10 years or 3 generations, whichever is longer (up to a maximum of 100 years);
4. An observed, estimated, inferred, projected or suspected population size reduction of at least 30% over any 10 years or three generation period, whichever is longer (up to a maximum 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased or may not be understood or may not be reversible.

It is inferred and suspected that the Miami tiger beetle's population has been reduced by at least 30 percent given that locations where it historically occurred have been extensively developed and no longer support the beetle as detailed below.

Pine Rockland Decline

The Miami tiger beetle is found only in small sandy pockets of pine rockland habitat in Miami-Dade County, Florida.¹³ Oscar L. Cartwright first described the Miami tiger beetle (*Cicindela floridana*) in 1939 as a Florida variety of the eastern pinebarrens tiger beetle (*Cicindela abdominalis*) from a specimen collected by Frank N. Young in 1934.¹⁴ It appears the 1934 specimen was collected in the vicinity of Gratigny Road and North Miami St in pine rockland habitat¹⁵ where no apparent habitat currently exists.¹⁶ Field visits did not yield any specimens.¹⁷ In 2007, a Miami tiger beetle population was discovered at a pine rockland site in the Richmond Heights area of Miami, Florida.¹⁸ Recent surveys indicate populations may be declining due to vegetation encroachment.¹⁹

¹³ Knisley 2011 at 6; Knisley et al. Knisley, C., M. Kippenhan, and D. Brzoska. 2014. Conservation status of United States tiger beetles. *Terrestrial Arthropod Reviews* 7(2014) 1-53 (uncorrected proofs) at 44.

¹⁴ Brzoska at 1.

¹⁵ C. Wirth, <https://cicindela.wordpress.com/2014/12/07/type-locality-c-floridana/>.

¹⁶ Brzoska at 2.

¹⁷ Brzoska at 2.

¹⁸ Knisley 2011 at 26.

¹⁹ C. Wirth, personal communication Dec. 4, 2014.

The pine rockland habitat it depends upon is a globally endangered plant community with over 98 percent decline,²⁰ largely due to significant ecological degradation, conversion to other land uses, and outright destruction.²¹ Pine rockland with sandy patches suitable to support the Miami tiger beetle have largely been lost to urban development.²² Most remaining habitat is considered unsuitable due to dense vegetation and lack of land management via controlled burns.²³

The Miami Rock Ridge is characterized by a very diverse shrub layer dominated by hardwoods, and an equally diverse herb layer containing 35 taxa endemic to southern Florida, including several species listed by the federal government.²⁴ This area has been fragmented and degraded by past land use practices and hurricanes.²⁵ The north-south distribution of pine rocklands along the Miami Rock Ridge has already been reduced by over 12 miles.²⁶ In Miami-Dade County, the remaining pine rockland habitat is highly fragmented, with the majority of fragments being less than 50 ha in size and embedded in an urban landscape.²⁷

The Miami tiger beetle uses the Richmond tract.²⁸ Extensive surveys of most of the pine rockland sites in Miami-Dade County failed to find any additional sites for the Miami tiger beetle.²⁹ The Miami tiger beetle's total global habitat is thus limited to parts of the Richmond pine rockland habitat. The Miami tiger beetle can be found in this habitat from early May through mid-October suggesting either continual or two emergence periods.³⁰ Adults and larvae have been observed in patches of bare ground in this habitat in 2-6 square meters.³¹ Soil samples from where specimens were observed are sandy to loamy sand soil.³²

²⁰ Williams, D.A., Y. Wang, M. Borchetta, and M.S. Gaines, *Genetic diversity and spatial structure of a keystone species in fragmented pine rockland habitat*, *Biological Conservation*, April 2007, at 256, 257.

²¹ Bergh, C. and J. Wisby, *Fire History of Lower Keys Pine Rocklands*, The Nature Conservancy, Florida Keys Initiative, May 1996 at 1.

²² Knisley at 44.

²³ *Id.* at 44.

²⁴ *Id.*

²⁵ Abandoned & Little Known Airfields: Florida – Southern Miami Area. June 11, 2013; 1945 Richmond/South Dade Hurricane Presented by Robert Molleda at 2007 Florida Governor's Hurricane Conference; Macfie, D. Richmond Naval Air Station, 1942-1961, Tequesta.

²⁶ FWS, *Multi-Species Recovery Plan – Pine Rocklands*, 3-173, July 23, 2014.

²⁷ Williams, D.A., Y. Wang, M. Borchetta, and M.S. Gaines, *Genetic diversity and spatial structure of a keystone species in fragmented pine rockland habitat*, *Biological Conservation*, April 2007 at 256, 257.

²⁸ FWS LOC July 15, 2014.

²⁹ Knisley, personal communication Dec. 4, 2014.

³⁰ Knisley 2011 at 6.

³¹ *Id.* at 32.

³² *Id.*



An example of an open patch of sand in pine rockland habitat.

© Chris Wirth

*Coral Reef Commons*³³

³³ For more information on the Coral Reef Commons, please see Staletovich, J. Nov. 6, 2014, Miami-Dade County warns developer to protect forest, Miami Herald, <http://www.miamiherald.com/news/local/community/miami-dade/article3608747.html>; Harper, J. Oct. 2014, Going, going, gone, Biscayne Times, http://www.biscaynetimes.com/index.php?option=com_content&view=article&id=1915:going-going-gone&catid=70:going-green&Itemid=200; Staletovich, J., Oct. 16, 2014, Feds: Shopping center in Rare Miami-Dade forest likely to kill endangered species, Miami Herald, <http://www.miamiherald.com/news/local/environment/article2922164.html>; Staletovich, J., Sept. 12, 2014, Developer defends Wal-Mart in rare forest, Miami Herald, <http://www.miamiherald.com/news/local/environment/article2092364.html>; Stern, G., Sept. 12, 2014, Outraged Miami Residents Confront Walmart Developer in Kendall, http://www.huffingtonpost.com/grant-stern/outraged-miami-residents-b-5808574.html?utm_hp_ref=miami&ir=Miami; Bach, Trevor, Sept. 4, 2014, Two Flowers Species at Controversial Walmart Site Are Now Endangered, http://blogs.miaminewtimes.com/riptide/2014/09/joining_butterfly_two_flower_species_found_at_controversial_walmart_development_site_also_listed_as.php; Kruse, M., Sept. 4, 2014, Carter's small-flowered flax and Florida brickellbush now officially are endangered species, Tampa Bay Times,

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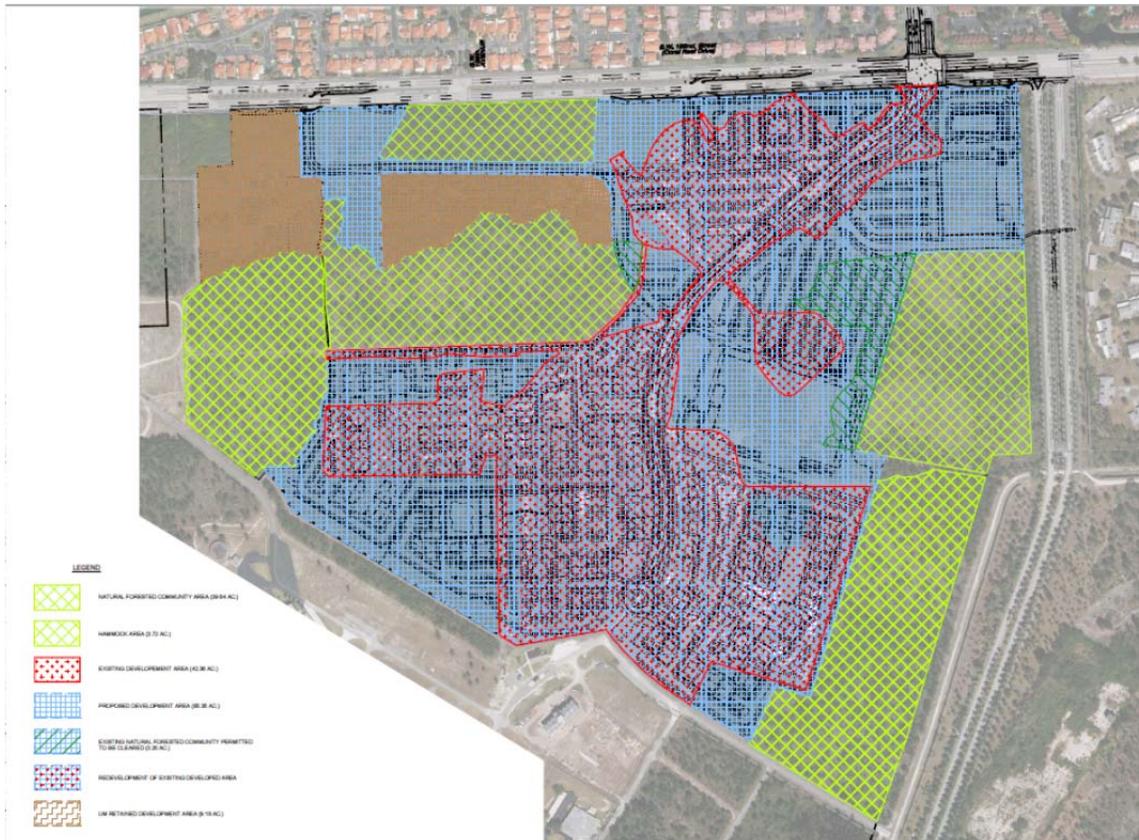
RAM is a group of companies and partnerships that acquire, develop, finance, and manage retail and multifamily properties in the Southeast.³⁴ RAM intends to construct Coral Reef Commons, a development consisting of a variety of residential and commercial buildings, within the Richmond pine rocklands in Miami-Dade County, Florida.³⁵ On July 15, 2014 the Service notified RAM that such development could result in the “take” of ESA-listed species, and thus, RAM could be liable for violating Federal law.³⁶

<http://www.tampabay.com/blogs/state/carters-small-flowered-flax-and-florida-brickellbush-now-officially-are/2196134>; Staletovich, J., Sept. 3, 2014, Two flowers growing in Miami-Dade County deemed endangered, Miami Herald <http://www.miamiherald.com/news/local/community/miami-dade/article1987767.html>; Butler, A. Aug. 26, 2014, Cutler Bay passes resolution to protest development of south Miami-Dade land, Miami Herald, <http://www.miamiherald.com/news/local/community/miami-dade/cutler-bay/article1982226.html>; Flesher, D. Aug. 11, 2014, South Florida butterflies win federal protection, Sun-Sentinel, <http://www.sun-sentinel.com/local/palm-beach/fl-endangered-butterflies-20140811-story.html>; Liston, B., Aug. 11, 2014, Endangered Florida butterflies to get federal protection, Reuters, <http://www.reuters.com/article/2014/08/11/us-usa-florida-butterflies-idUSKBN0GB1UX20140811>; Bach, T. July 29, 2014, Thousands Sign Petitions Against Walmart Development on Endangered Pine Rockland, http://blogs.miaminewtimes.com/riptide/2014/07/petition_against_rockland_forest_wal_mart_development_has_8000_signatures.php; Author unknown, July 19, 2014, Destruction Thanks to University of Miami's Sale of Pine Rocklands -- It doesn't end there, <http://eyeonmiami.blogspot.com/2014/07/destruction-thanks-to-university-of.html>; CBS Local News, July 18, 2014, Feds to Developer: Stop Planning Walmart In Rare Miami-Dade Forest, <http://miami.cbslocal.com/2014/07/18/feds-stop-work-on-walmart-in-miami-dade-land-with-rare-species/>; Staletovich, J., July 17, 2014, Feds ask developer to stop work on Walmart in rare Miami-Dade forest, Miami Herald, <http://www.miamiherald.com/news/local/community/miami-dade/article1975937.html>; Bravo, K. July 12, 2014, The Awful Reason Florida is Bulldozing One of the World's Rarest Forests, <http://www.takepart.com/article/2014/07/12/awful-reason-why-florida-bulldozing-one-worlds-rarest-forests?cmpid=tpdaily-eml-2014-07-14>; Staletovich, J., July 12, 2014, Walmart planned for endangered forest lands in South Florida, Miami Herald, <http://www.miamiherald.com/news/local/community/miami-dade/article1975284.html>; Bandell, B. July 8, 2014, University of Miami sells 80 acres to developer for mixed-use project, South Florida Business Journal, http://www.bizjournals.com/southflorida/news/2014/07/08/university-of-miami-sells-80-acres-to-developer.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+industry_22+%28Industry+Education%29&utm_content=Google+Feedfetcher; Yager, R., Zoning Approvals Sought for Coral Reef Commons Complex, <http://www.communitynewspapers.com/kendall-gazette/zoning-approvals-sought-for-coral-reef-commons-complex/>; Bolado, C. Newly Endangered Plants Stand in Wal-Mart Project's Way, Law 360, <http://www.law360.com/articles/573723/newly-listed-endangered-plants-put-hold-on-wal-mart-project>.

³⁴ RAM Realty Services, *About RAM*, ramrealestate.com, <http://www.ramrealestate.com/about-ram/> (last visited Oct. 21, 2014).

³⁵ FWS LOC July 15, 2014.

³⁶ *Id.*



RAM, July 23, 2014 Exhibit of Development Area.

On May 8, 2015, RAM allegedly submitted a Section 10 take permit and habitat conservation plan (“HCP”) application to the Vero Beach office of the Service to authorize the take of ESA-listed species, potentially including the Florida bonneted bat (*Eumops floridanus*), Florida leafwing butterfly (*Anaea troglodyta*), Bartram’s scrub-hairstreak butterfly (*Strymon acis bartrami*), Florida brickell-bush (*Brickellia mosieri*), Carter’s small-flowered flax (*Linum carteri* var. *carteri*), deltoid spurge (*Chamaesyce deltoidea* ssp. *deltoidea*), and tiny polygala (*Polygala smallii*) associated with the destruction of irreplaceable and endangered pine rockland habitat.³⁷ That application is still pending.

³⁷ Bach, T. Nov. 28, 2014, Developer to Submit Habitat Conservation Plan for Controversial Walmart Project, <http://blogs.miaminewtimes.com/riptide/2014/11/developer-to-submit-habitat-conservation-plan-in-order-to-proceed-with-cont.php>; <http://www.ramrealestate.com/ram-coral-reef-files-habitat-conservation-plan-with-usfws-for-coral-reef-commons/>; <http://www.miamiherald.com/news/local/community/miami-dade/article21183483.ece/BINARY/Habitat%20Conservation%20Plan%20for%20Coral%20Reef%20Commons>.



Phase II of the RAM Project, <http://www.ramrealestate.com/wp-content/uploads/2014/08/Coral-Reef-Site-Flyer.pdf>

The Service identifies acquiring lands that are threatened with development, such as the pine rocklands of the proposed Coral Reef Commons, as the main tool in preventing further destruction or degradation of existing pine rocklands.³⁸ The Coral Reef Commons development threatens to undo the important work the Recovery Plan has prioritized for South Florida, threatens already listed species, and could push the Miami tiger beetle to extinction.³⁹ The development of Coral Reef Commons would severely limit controlled burning of adjacent occupied habitat leading to the degradation and loss of current Miami tiger beetle habitat to vegetation encroachment.

⁴⁰
Miami Wilds

³⁸ *Id.*

³⁹ RAM, through University of Miami has already obtained an After-the-Fact Natural Forest Community permit and Covenant to clear vegetation. See DRER letter to Altshul, July 23, 2013.

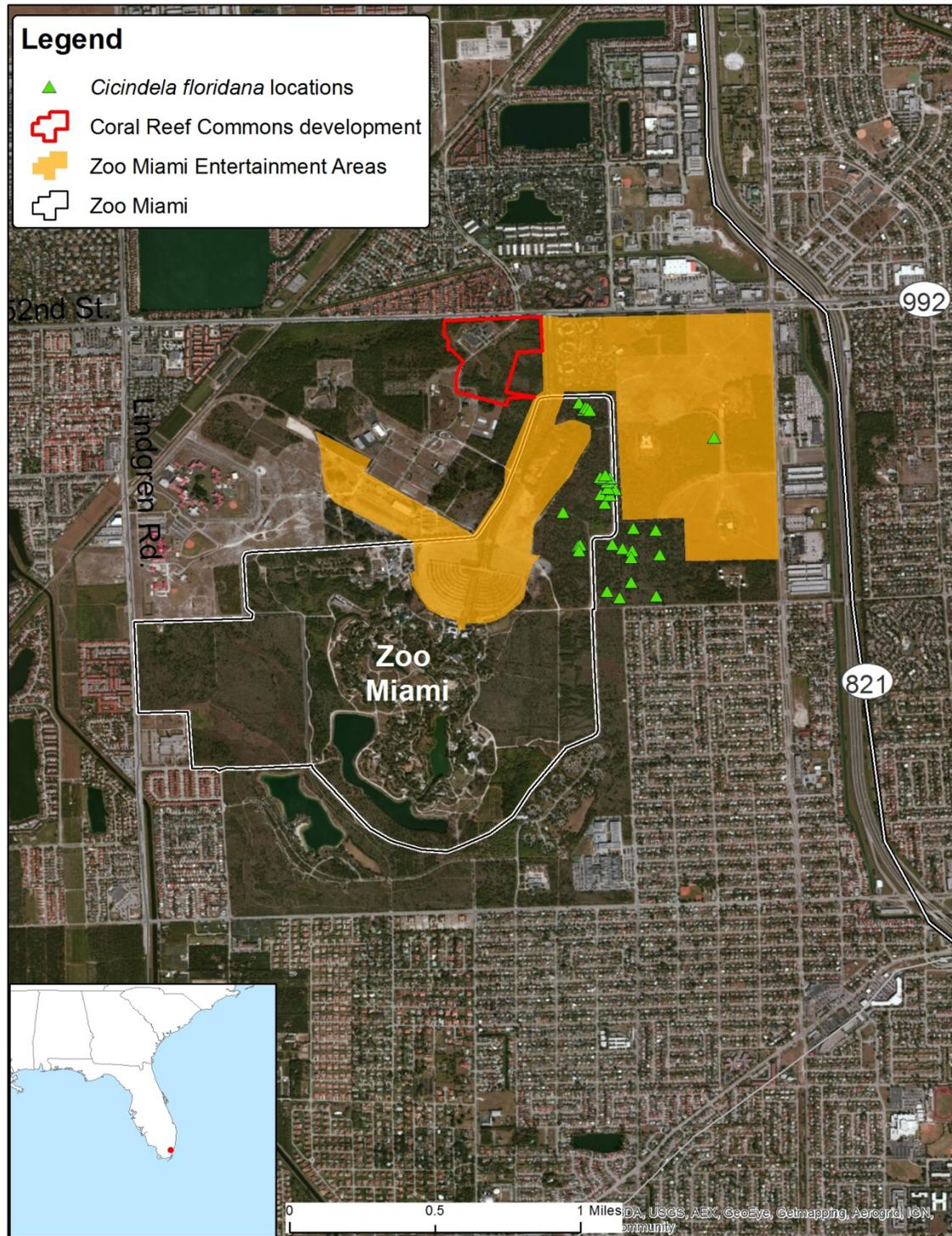
⁴⁰ For more information on Miami Wilds, please see Author unknown, Nov. 6, 2014, MIAMI WILDS: Stupid Theme Park..., <http://eyeonmiami.blogspot.com/2014/11/miami-wilds-stupid-theme-park-guest.html?pref=fb>; Vazquez, C. Nov. 6, 2014, Developer receives grant for 20th Century Fox theme park at Zoo Miami, Local 10 News, <http://www.local10.com/news/developer-receives-grant-for-20th-century-fox-theme-park-at-zoo-miami/29587044>; Hanks, D. Nov. 5, 2014, Miami Wilds gets \$14 million, Miami Herald, <http://www.miamiherald.com/news/local/community/miami-dade/article3588472.html>; Dro, Oct. 24, 2014, Miami Wilds, A Theme Park Proposed For Near Zoo Miami, Wants \$13.5 Million in County

Another principle threat to the Miami tiger beetle is the proposed development of Miami Wilds, a theme park on Miami-Dade County property, adjacent to the Coral Reef Commons and Zoo Miami. Occupied Miami tiger beetle habitat does fall within Miami Wild's footprint in its current scope and the proximity of this development threatens to severely limit controlled burns in the adjacent pine rocklands. The county recently approved \$13.5 million to 20th Century Fox, however, it is unclear how soon work would begin.⁴¹

Funds, <http://the305.com/2014/10/24/photo-miami-wilds-a-theme-park-proposed-for-near-zoo-miami-wants-13-5-million-in-county-funds/>; Bevan, S. Oct. 23, 2014, Miami Wilds LLC requests \$13M in public funding for amusement park, South Florida Business Journal, <http://www.bizjournals.com/southflorida/blog/morning-edition/2014/10/20th-century-fox-requests-13m-in-public-funding.html>; Dinkova, L. Oct. 22, 2014, Miami Wilds LLC wants \$13 million in public funding, Miami Today News, <http://www.miamitodaynews.com/2014/10/22/20th-century-fox-wants-13-million-public-funding-miami-wilds/>; Butler, A. Aug. 26, 2014, Cutler Bay passes resolution to protest development of south Miami-Dade land, Miami Herald, <http://www.miamiherald.com/news/local/community/miami-dade/cutler-bay/article1982226.html>; Kroch, K. Aug. 1, 2014, Plans for Massive Amusement Park Overlap with Endangered Florida Forest, <http://thinkprogress.org/climate/2014/08/01/3466392/amusement-park-endangered-florida-forest/>; Bravo, K. July 12, 2014, The Awful Reason Florida is Bulldozing One of the World's Rarest Forests, <http://www.takepart.com/article/2014/07/12/awful-reason-why-florida-bulldozing-one-worlds-rarest-forests?cmpid=tpdaily-eml-2014-07-14>.

⁴¹ Munzenrieder, K. Oct. 23, 2014. Fox Theme Park, Miami Wilds, Wants \$13.5 Million in County Money, <http://blogs.miaminewtimes.com/riptide/2014/10/fox-theme-park-miami-wilds-wants-135-million-in-county-money.php>; <http://www.skyscrapercity.com/showthread.php?t=1474675&page=2>.

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B. Geographic Range

Geographic range is denoted either by the extent of the occurrence <20,000 km square/7,722 mi squared, or an area of occupancy <2,000 km squared/772 mi squared and

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at least two of the following:

1. Severely fragmented or exist in 10 or fewer locations;
2. Continuing decline, observed, inferred or projected in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent, and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals; or
3. Extreme fluctuations in any of the following: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals.

The Miami tiger beetle's geographic range is less than 772 square miles, is severely fragmented in fewer than 10 locations, and has experienced significant decline. The Miami tiger beetle is currently only known from three locations, with each site supporting 2-45 adults.

C. Population Size and Trend

Population size estimate and trend is measured by a population size estimate of fewer than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% in 10 years or three generations, whichever is longer (up to a maximum of 100 years in the future); or
2. A continuing decline, observed, projected, or inferred in numbers of mature individuals and at least one of the following:
 - a. Population structure in the form of either:
 - i. No subpopulation estimated to contain more than 1,000 mature individuals; or
 - ii. All mature individuals are in one subpopulation
 - b. Extreme fluctuations in number of mature individuals

The Miami tiger beetle population is estimated to be fewer than 10,000 mature individuals and to be declining at least 10 percent, and has no subpopulation with more than 1,000 mature individuals. In 2010, surveys of larvae at the Metrozoo site produced 63 larval burrows.⁴² A 2011 repeat survey produced only 5 larvae.⁴³ Recent surveys indicate populations may be declining due to vegetation encroachment.⁴⁴ The current known range of the Miami tiger beetle consists of three sites within the Richmond Heights area of Miami – Metrozoo pineland, University of Miami CSTARS campus, and U.S. Coast Guard land.⁴⁵ The highest counts at each of the sites ranged from 2 to 45 adults.⁴⁶ These three sites should be considered a single population given tiger beetle

⁴² Knisley 2011 at 32.

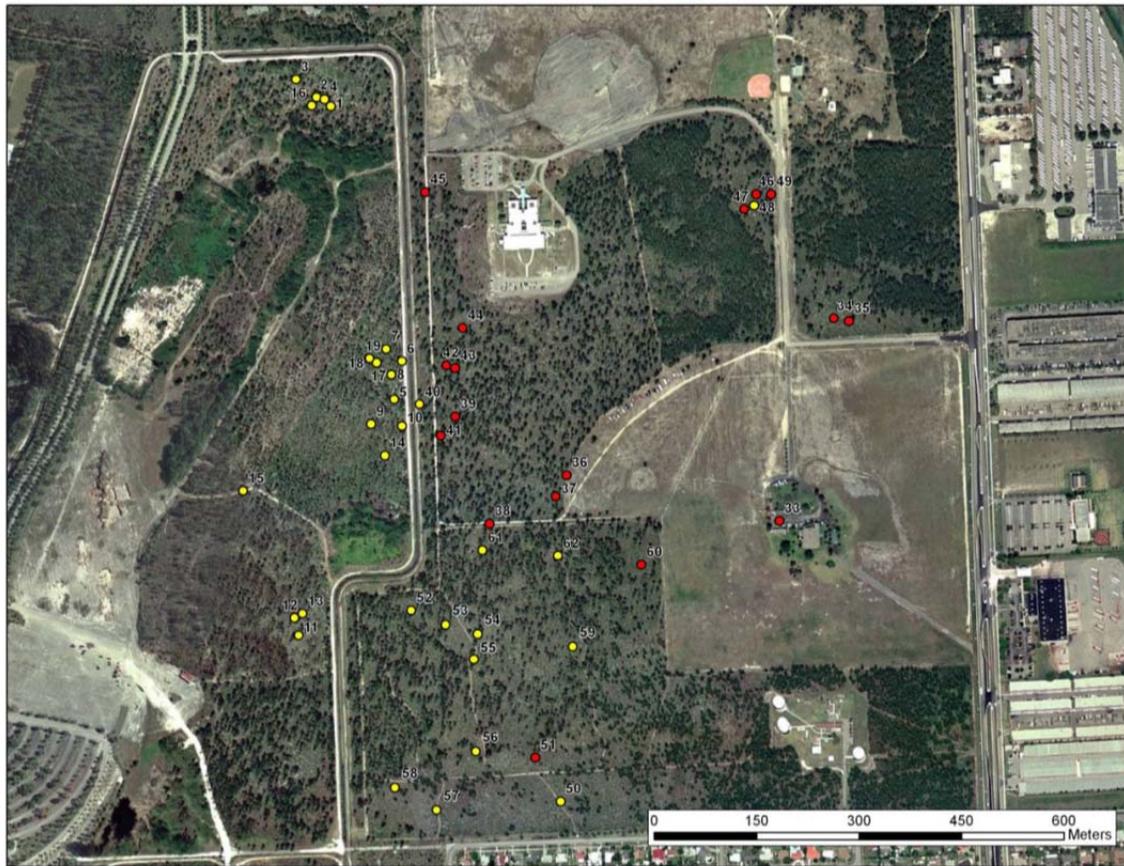
⁴³ *Id.*

⁴⁴ C. Wirth, personal communication Dec. 4, 2014.

⁴⁵ Knisley at 44; Knisley 2011 at 26.

⁴⁶ Knisley at 4.

movement and their close proximity being within dispersal range.⁴⁷

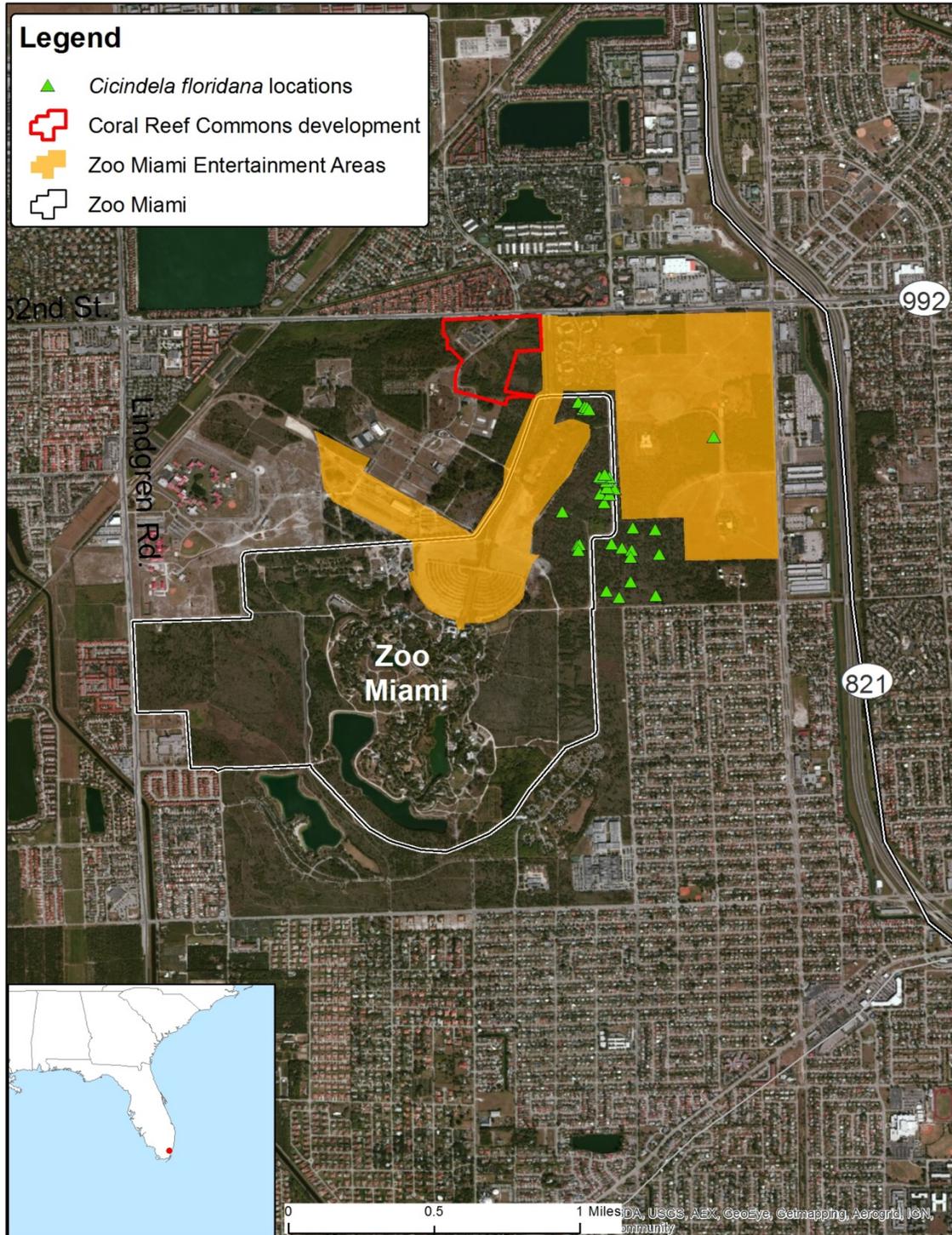


“Aerial photograph showing all three sites where *C. floridana* was found (Metrozoo is site on left; University of Miami CSTARS campus is lower right and U. S. Coast Guard site is upper right. Specific patches with *C. floridana* adults are indicated with yellow dots.” Knisley 2011 at 27.

⁴⁷ Knisley personal communication Dec. 9, 2014.



“Aerial photograph of Metrozoo pineland showing primary patches with *C. floridana* as yellow dots. In the upper northeast section, adults (and larvae) were found in additional patches beyond the mapped waypoints.” Knisley 2011 at 28.



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Other threats that could impact the population trend include disease and predation,⁴⁸ mosquito control measures,⁴⁹ global climate change, and sea-level rise.

Global Climate Change

Climate models project both continued warming in all seasons across the southeast United States, and an increase in the rate of warming.⁵⁰ The warming in air and water temperatures projected for the southeast will create heat-related stress for fish and wildlife. Climate change will alter the distribution of native plants and animals and will lead to the local loss of imperiled species and the displacement of native species by invasives.⁵¹ Concerning the effects climate change is expected to have on southeastern environments, Karl et al. (2009) state, “[e]cological thresholds are expected to be crossed throughout the region, causing major disruptions to ecosystems and to the benefits they provide to people.”

Climate change will increase the incidence and severity of both drought and major storm events in the southeast.⁵² The percentage of the southeast region experiencing moderate to severe drought has already increased over the past three decades. Since the mid-1970s, the area of moderate to severe spring and summer drought has increased by 12 percent and 14 percent, respectively. Fall precipitation tended to increase in most of the southeast, but the extent of region-wide drought still increased by nine percent.⁵³ Both drought and severe storms could threaten the Miami tiger beetle with direct mortality and with habitat alteration, altered vegetation, and altered prey base. .⁵⁴

The warming climate will likely cause ecological zones to shift upward in latitude and altitude and species’ persistence will depend upon, among other factors, their ability to

⁴⁸ Although the specific ecology of the Miami tiger beetle is unknown, numerous organisms are known to prey on larval and adult tiger beetles in general. Willis 1967.

⁴⁹ It is unknown whether mosquito-control spraying will impact populations of the Miami tiger beetle, although it is known that the chemicals that have been tested that are used in mosquito control negatively impact most insects. Bargar, T. 2012. Risk assessment for adult butterflies exposed to the mosquito control pesticide naled. *Environmental Toxicology and Chemistry*. Setac Press 31 (<http://onlinelibrary.wiley.com/>); Hoang, T.C., R.L. Pryor, G.M. Rand, and R.A. Frankes. 2011 Use of butterflies as nontarget insect test species and the acute toxicity and hazard of mosquito control insecticides. *Environmental Toxicology and Chemistry*, Vol. 30, No. 4, 997-1005; Salvato, M. 2001. Influence of mosquito control chemicals on butterflies (Nymphalidae, Lycaenidae, HesperIIDae) of the Lower Keys, *Journal of the Lepidopterist’s Society*, 55, 8-14; S. Koi (personal communication Dec. 8, 2014).

⁵⁰ Karl, T.R., J.M. Melillo, and T.C. Peterson (eds.). 2009. *Global Climate Change Impacts in the United States*. U.S. Global Change Research Program. Cambridge University Press, <http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/regional-climatechange-impacts/southeast>

⁵¹ *Id.*

⁵² *Id.*

⁵³ *Id.*

⁵⁴ Seager, R., A. Tzanova, and J. Nakamura. 2009. Drought in the Southeastern United States: causes, variability over the last millennium, and the potential for future hydroclimate change. *Journal of Climate* 22: 5021-5045.

disperse to suitable habitat.⁵⁵ Because of the tiger beetle's incredibly limited range and the high degree of development in the surrounding area, there is likely no suitable habitat where the beetle could disperse making climate change a dire threat to its survival.

Sea Level Rise

The Richmond pine rocklands are less than five miles from the Atlantic Ocean. Sea-level rise will likely imminently impact this habitat. Global average sea level rose by roughly eight inches over the past century, and sea level rise is accelerating in pace.⁵⁶ As summarized by the Third National Climate Assessment, "Since the late 1800s, tide gauges throughout the world have shown that global sea level has risen by about 8 inches. A new data set shows that this recent rise is much greater than at any time in at least the past 2000 years. Since 1992, the rate of global sea level rise measured by satellites has been roughly twice the rate observed over the last century, providing evidence of additional acceleration."⁵⁷ Many areas of the Southeast Atlantic and Gulf of Mexico coasts have experienced significantly higher rates of relative sea-level rise than the global average during the past 50 years.⁵⁸ Large regions of Florida have elevations at or below 3 to 6 feet, making these areas particularly vulnerable to sea-level rise and flooding.⁵⁹

According to the Third National Climate Assessment, global sea level is projected to rise another 1 to 4 feet by 2100, with sea-level rise of 6.6 feet possible.⁶⁰ Sea level rise could increase by another 6 inches in just the next decade.⁶¹ In its 2012 sea-level rise assessment, the National Research Council similarly estimated global sea-level rise at 8 to 23 cm by 2030, 18 to 48 cm by 2050, and 0.5 m to 1.4 m by 2100.⁶² The effects of sea-level rise will be long-lived. Scientists estimate that we lock in 8 feet of sea-level rise over the long term for every degree Celsius (1.8 degrees Fahrenheit) of warming.⁶³

Regional projections for Florida also indicate that sea level rise of three to four feet or more is highly likely within this century. The Southeast Florida Regional Climate Change Compact Counties—Monroe, Miami-Dade, Broward, and Palm Beach counties—released the Southeast Florida Regional Climate Change Action Plan in October 2012

⁵⁵ Peters, R.L. and J.D.S. Darling. 1985. The greenhouse effect and nature reserves. *Bioscience* 35(11):707-717.

⁵⁶ Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2. Available at <http://nca2014.globalchange.gov/>.

⁵⁷ Melillo et al. 2014 at 44.

⁵⁸ Karl et al. 2009 at 37.

⁵⁹ Weiss, J.L. et al. 2011. Implications of recent sea level rise science for low-elevation areas in coastal cities of the coterminous U.S.A. *Climatic Change* 105:635-645; Strauss, B.H., R. Ziemiński, J.L. Weiss, and J.T. Overpeck. 2012. Tidally adjusted estimates of topographic vulnerability to sea level rise and flooding for the contiguous United States. *Environmental Research Letters* 7: 014033.

⁶⁰ Melillo et al. 2014.

⁶¹ Melillo et al. 2014 at 45.

⁶² NRC. 2012. *Sea level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*, National Research Council of the National Academies.

⁶³ Levermann, A. et al. 2013. The multimillennial sea-level commitment of global warming. *PNAS* 110:13745-13750.

which included a detailed “Unified Sea Level Rise Projection” for south Florida. The sea level rise projections for south Florida are similar what has been estimated globally by the National Research Council: 8 to 18 cm (3 to 7 inches) by 2030, 23 to 61 cm (9 to 24 inches) by 2060, and 48 cm to 1.45 m (19 to 57 inches) by 2100.⁶⁴

Increasingly intense storms and storm surge pose additional climate threats to coastal wildlife species in Florida. Studies have found that the frequency of high-severity hurricanes is increasing in the Atlantic,⁶⁵ along with an increased frequency of hurricane-generated large surge events and wave heights.⁶⁶ The risk of extreme storm surges has already doubled as the planet warms, and these events could become 10 times more frequent in the coming decades.⁶⁷ High winds, waves, and surge from storms can cause significant damage to coastal habitat. When storm surges coincide with high tides, the chances for damage are greatly heightened.⁶⁸ As sea levels rise, storm surge will be riding on a higher sea surface which will push water further inland and create more flooding of coastal habitats.⁶⁹ For example, one study estimated that hurricane flood elevations along the Texas coast will rise by an average of 0.3 meters by the 2030s and 0.8 meters by the 2080s, with severe flood events reaching 0.5 meters and 1.8 meters by the 2030s and 2080s, respectively.⁷⁰

Coastal species face significant risks from coastal squeeze that occurs when habitat is pressed between rising sea levels and coastal development that prevents landward movement.⁷¹ Human responses to sea level rise including coastal armoring and landward

⁶⁴ Southeast Florida Regional Climate Change Compact Technical Ad hoc Work Group. 2011. Unified Sea Level Rise Projection for Southeast Florida. A document prepared for the Southeast Florida Regional Climate Change Compact Steering Committee. 27 p. Available online at <http://southeastfloridaclimatecompact.org/>.

⁶⁵ Elsner, J. B., J. P. Kossin, and T. H. Jagger. 2008. The increasing intensity of the strongest tropical cyclones. *Nature* 455:92-95; Bender, M. A., T. R. Knutson, R. E. Tuleya, J. J. Sirutis, G. A. Vecchi, S. T. Garner, and I. M. Held. 2010. Modeled impact of anthropogenic warming on the frequency of intense Atlantic hurricanes. *Science* 327:454-458; Kishtawal, C. M., N. Jaiswal, R. Singh, and D. Niyogi. 2012. Tropical cyclone intensification trends during satellite era (1986–2010). *Geophysical Research Letters* 39:L10810, 6pp.

⁶⁶ Grinsted, A., J. C. Moore, and S. Jevrejeva. 2012. Homogeneous record of Atlantic hurricane surge threat since 1923. *Proceedings of the National Academy of Sciences of the United States of America* 109:19601-19605; Komar, P. D., and J. C. Allan. 2008. Increasing hurricane-generated wave heights along the U.S. east coast and their climate controls. *Journal of Coastal Research* 24:479-488.

⁶⁷ Grinsted, A. et al. 2013. Projected hurricane surge threat from rising temperatures. *PNAS* doi:10.1073/pnas.1209980110.

⁶⁸ Cayan, D. R., P. D. Bromirski, K. Hayhoe, M. Tyree, M. D. Dettinger, and R. E. Flick. 2008. Climate change projections of sea level extremes along the California coast. *Climatic Change* 87:857-873.

⁶⁹ Tebaldi, C., B. H. Strauss, and C. E. Zervas. 2012. Modelling sea level rise impacts on storm surges along US coasts. *Environmental Research Letters* 7:014032. doi: 10.1088/1748-9326/7/1/014032.

⁷⁰ Mousavi, M. E., J. L. Irish, A. E. Frey, F. Olivera, and B. L. Edge. 2011. Global warming and hurricanes: the potential impact of hurricane intensification and sea level rise on coastal flooding. *Climatic Change* 104:575-597.

⁷¹ Scavia, D., J. C. Field, D. F. Boesch, R. W. Buddemeier, V. Burkett, D. R. Cayan, M. Fogarty, M. A. Harwell, R. W. Howarth, C. Mason, D. J. Reed, T. C. Royer, A. H. Sallenger, and J. G. Titus. 2002. Climate change impacts on US coastal and marine ecosystems. *Estuaries* 25:149-164; Fitzgerald, D. M., M. S. Fenster, B. A. Argow, and I. V. Buynevich. 2008. Coastal impacts due to sea level rise. *Annual Review of Earth and Planetary Science* 36:601-647; Defeo, O., A. McLachlan, D. S. Schoeman, T. A. Schlacher, J.

migration pose significant risks to the ability of species threatened by sea-level rise to move landward, if other suitable habitats were even available⁷² Projected human population growth and development in Florida may thus threaten the Miami tiger beetle with coastal squeeze.⁷³

D. Population Very Small or Restricted

A population is considered very small or restricted if the population is estimated to number fewer than 1,000 mature individuals; or the population has a very restricted area of occupancy (typically less than 20 square km/8 square miles, or the number of locations (typically five or fewer) such that it is prone to the effects of human activities or stochastic events within a short time period of an uncertain nature.

The Miami tiger beetle population is considered very small and restricted as it is estimated that there are fewer than 1,000 mature individuals, the population has a very restricted area of occupancy, and has fewer than five locations that are vulnerable to human activities.

In the last several months there have been a series of arson fires in the nearby Larry & Penny Thompson State Park.⁷⁴

E. Quantitative Analysis

A quantitative analysis looks at the 10% probability of extinction in the wild within 100 years. In the case of the Coral Pink Sand Dunes tiger beetle and the Puritan tiger beetle population viability assessments predicted the extinction of species with significantly larger populations.⁷⁵

V. MILLSAP SCORE

The Florida Fish and Wildlife Conservation Commission requires the use of the Millsap

Dugan, A. Jones, M. Lastra, and F. Scapini. 2009. Threats to sandy beach ecosystems: a review. *Estuarine, Coastal and Shelf Science* 81:1-12; LeDee, O. E., K. C. Nelson, and F. J. Cuthbert. 2010. The challenge of threatened and endangered species management in coastal areas. *Coastal Management* 38:337-353; Menon, S., J. Soberón, X. Li, and a. T. Peterson. 2010. Preliminary global assessment of terrestrial biodiversity consequences of sea level rise mediated by climate change. *Biodiversity and Conservation* 19:1599-1609; Noss, R. F. 2011. Between the devil and the deep blue sea: Florida's unenviable position with respect to sea level rise. *Climatic Change* 107:1-16.

⁷² Defeo et al. 2009.

⁷³ Zwick, P. D., and M. H. Carr. 2006. Florida 2060: A Population Distribution Scenario for the State of Florida; available at www.1000fof.org/PUBS/2060/Florida-2060-Report-Final.pdf.

⁷⁴ <http://www.nbcmiami.com/news/local/Crews-Fight-Another-Grass-Fire-at-Larry-and-Penny-Thompson-Park-in-Southwest-Miami-Dade-309627651.html>; <http://www.nbcmiami.com/news/local/Firefighters-Battle-Grass-Fire-in-Southwest-Miami-Dade-305577431.html>; <http://www.nbcmiami.com/news/local/Grass-Fire-Reported-at-Park-in-Southwest-Miami-Dade-304473801.html>; <http://www.local10.com/news/grass-fire-burns-in-southwest-miami-dade/33307566>; <http://miami.cbslocal.com/2015/05/30/crews-battling-south-dade-grass-fire/>.

⁷⁵ Knisley and Gowan 2008, Gowan and Knisley 2010.

score, based on Millsap's 1990 publication *Setting Priorities for the Conservation of Fish and Wildlife Species in Florida* which sought to help prioritize vertebrate conservation, in a state petition to evaluate a species' status. Information on the Millsap score is provided below, but we'd like to address the fact that perhaps the Millsap score is not a good model for assessing the status of invertebrates. For example, factor 6 assesses value to the average age of reproduction, which may not be as useful for invertebrates. In addition to the Millsap score being inappropriate for invertebrates, it is also inappropriate for as a basis for determining whether protection is warranted. Thirty of the seventy available points are based on the absence of information.⁷⁶ Therefore, for species that are well studied, yet face extinction, the Millsap score will be low.

We assign the Miami tiger beetle 88 out of 134 points.

A. Biological Variables

Scores for biological variables are based on the entire geographic range of the unit. **For biological variables, we assign 51 out of 70 points.**

1. Population Size (8 out of 10)

This variable assigns the highest weight to taxa with the lowest number of breeding adult individuals. If populations cannot be assigned to one of the categories on Table 1, the taxon is placed in category b or e (population size unknown but suspected to be small or large, respectively).⁷⁷ **For population size, we assign the Miami tiger beetle 8 points, as its population is 501-1,000 individuals, or population size is unknown but suspected to be small.**

2. Population Trend (8 out of 10)

This variable is based on whether populations are increasing or decreasing and whether the trend is documented or only suspected over the last two decades.⁷⁸ **For population trend, we assign the Miami tiger beetle 8 points, as the trend is unknown but the population size is suspected to be decreasing.**

3. Range Size (8 out of 10)

This variable gives high point value to taxa with small ranges; categories for range size were given in square kilometers and in equivalent fractions of Florida or in the continental United States.⁷⁹ **For range size, we assign the Miami tiger beetle 8 points, as the range size is <100km squared.**

⁷⁶ Action variables: knowledge of distribution in Florida; knowledge of population trend in Florida; and knowledge of Florida population limitations.

⁷⁷ Millsap at 12.

⁷⁸ Millsap at 12-13.

⁷⁹ *Id.*

4. Distribution Trend (10 out of 10)

This variable looks at whether the species range is fragmented or contracting, measuring from European settlement until the present.⁸⁰ **For distribution trend, we assign the Miami tiger beetle 10 points, as the area occupied by the beetle has declined by 90-100%.**

5. Population Concentration (2 out of 10)

This variable looks at whether the species concentrates or congregates at some time in its life cycle.⁸¹ **For population concentration, we assign the Miami tiger beetle 2 points, as the beetle concentrates at >25 locations.**

6. Reproductive Potential for Recovery (5 out of 10)

This variable consists of two parts worth five points each. **For reproductive potential for recovery, we assign the Miami tiger beetle 5 points.**

a. Average Young per Female per Year (5 out of 5)

This variable considers the number of potential offspring typically produced per breeding female per year.⁸² In captivity females Miami tiger beetle produced an average of six first instar larvae.⁸³ Members of closely related species had similar numbers, ranging from four to eight larvae per female.⁸⁴ Numbers for wild individuals are unknown. The number of larvae per female appears to be dramatically low as a study of 20 tiger beetle species found captive females produced an average of 20 to 50 larvae.⁸⁵ Body size has been found to correlate with markedly lower ovarioles and a lower number of eggs in tiger beetles and these two factors combine to equal a significantly lower fecundity in smaller species.⁸⁶ **For average young per female per year, we assign the Miami tiger beetle 5 points.**

b. Age at First Reproduction (0 out of 5)

This variable considers the minimum age at which females first reproduce. **For minimum age at which females typically first reproduce, we assign the Miami tiger beetle 0 points, as the beetles only live a maximum of two to three months in captivity, ovipositing on average within the first 3-4 weeks of captivity.**⁸⁷

⁸⁰ Millsap at 12-13.

⁸¹ *Id.*

⁸² Millsap at 12, 14.

⁸³ Knisley and Wirth 2013

⁸⁴ *Id.*

⁸⁵ Knisley and Pearson 1984

⁸⁶ *Id.*

⁸⁷ Wirth, personal communication June 25 2015.

7. Ecological Specialization (10 out of 10)⁸⁸

This variable consists of three parts, worth 3.3 each.⁸⁹ Little is known about the reproduction, diet, and behavior of the Miami tiger beetle. **For ecological specialization, we assign the Miami tiger beetle 10 points.**

a. Dietary Specialization (3.3 out of 3.3)

This variable considers the species' response to changes in the availability of its preferred food.⁹⁰ It has been observed darting after and feeding upon ants.⁹¹ In general, adult tiger beetles are swift ambush predators that use visual cues to hunt a variety of prey.⁹² **For dietary specialization, we assign the Miami tiger beetle 3.3 points as it is expected that there would not be a substantial shift in diet.**

b. Reproductive Specialization (3.3 out of 3.3)

This variable looks at how the species responds to changes in the availability of its preferred breeding sites.⁹³ **For reproductive specialization, we assign the Miami tiger beetle 3.3 points as it is expected that breeding attempts would decline and populations would not shift to other breeding sites.**

c. Other Specializations (3.3 out of 3.3)

This variable evaluates specializations that are not related to diet or reproduction, but which increase a taxon's vulnerability to changes in the environment.⁹⁴ **For other specializations, we assign the Miami tiger beetle 3.3 points as it is expected that the beetle is highly specialized.**

B. Action Variables

Action variables look at how much is known about a species within the Florida portion of its range. **For action variables, we assign 16 out of 40 points.**

1. Knowledge of Distribution in Florida (0 out of 10)

This variable awards the highest score for species whose distribution in Florida is least well known.⁹⁵ **For knowledge of distribution in Florida, we assign the Miami tiger beetle 0 points, as the distribution is well known and occurrence can be accurately**

⁸⁸ We assume it is intended that we round up.

⁸⁹ Please note, the maximum value for this section is only 9.9, not 10.

⁹⁰ Millsap at 12, 14.

⁹¹ <https://cicindela.wordpress.com/2011/02/18/floridian-tiger-beetle-rediscovered/>.

⁹² Willis 1967.

⁹³ Millsap at 12, 14.

⁹⁴ *Id.*

⁹⁵ Millsap at 15.

predicted throughout the range.

2. Knowledge of Population Trend in Florida (6 out of 10)

This variable awards the highest score for species whose numbers are not currently monitored.⁹⁶ **For knowledge of population trend in Florida, we assign the Miami tiger beetle 6 points, as it is monitored locally.**

3. Knowledge of Florida Population Limitations (0 out of 10)

This variable awards highest scores for species whose major limiting factors remain unknown.⁹⁷ **For knowledge of Florida population limitations, we assign the Miami tiger beetle 0 points, as all major factors affecting population size and distribution are known.**

4. Ongoing Management Activities in Florida (10 out of 10)

This variable assigns fewer points for species that are currently managed, and an intermediate score for those that receive mostly reactive or law enforcement.⁹⁸ **For ongoing management activities in Florida, we assign the Miami tiger beetle 10 points, as there are no ongoing management activities directed primarily at the species.**

C. Supplemental Variables

These cover information not included in biological and action variables, largely variables addressing taxonomic, biogeographic, and political concerns that should be considered. These variables are not used to rank taxa, but can be used in conjunction with biological scores to identify systematically unique taxa. **For supplemental variables, we assign 21 out of 24 points.**

1. Systematic Significance of the Taxon (3 out of 5)

This variable addresses the consideration that the more genetically unique a taxon is, the greater its value to wildlife diversity.⁹⁹ Based on differences from the closely related scabrous tiger beetle (*Cicindela scabrosa*), including morphology, distribution, habitat and seasonality, it is now considered a full species.¹⁰⁰ The beetle is recognized as a valid species in the most recent catalog of beetle taxonomy.¹⁰¹ The Integrated Taxonomic

⁹⁶ Millsap at 15.

⁹⁷ Millsap at 15-16.

⁹⁸ *Id.*

⁹⁹ Millsap at 16.

¹⁰⁰ Brzoska at 1.

¹⁰¹ Bousquet, Y. 2012. Catalogue of Geodephaga (Coleoptera, Adephaga) of America, north of Mexico. ZooKeys 245. 1722 pp.

Information System (ITIS) serial number for this species is 931870.¹⁰² **For systematic significance of the taxon, we assign the Miami tiger beetle 3 points, as Miami tiger beetle is a full species, consistently differentiated by a number of traits, its full genetic relationship to sister species is unknown.**

2. Percent of Taxon's Total Range that Occurs in Florida (5 out of 5)

This variable considers the importance of Florida to a species' status.¹⁰³ **For the percent of taxon's total range that occurs in Florida, we assign the Miami tiger beetle 5 points, as 100 percent of the total range occurs in Florida.**

3. Trend in Taxon's Florida Population (6 out of 6)

This variable considers population trends in Florida independent of trends elsewhere in the species' range.¹⁰⁴ **For trend in taxon's Florida population, we assign the Miami tiger beetle 6 points, as the Florida population is known to be decreasing.**

4. Period of Occurrence in Florida (4 out of 4)

This variable considers the amount of time a species spends in Florida.¹⁰⁵ **For period of occurrence in Florida, we assign the Miami tiger beetle 4 points, as it is a permanent resident of Florida.**

5. Harvest of the Taxon in Florida (3 out of 4)

This variable takes into account the extent to which the species is already protected under state and federal law and the extent to which it is being harvested.¹⁰⁶ **For harvest of taxon in Florida, we assign the Miami tiger beetle 3 points, as it is believed there is no substantial harvest other than accidental take and there is no legal protection.**

VI. CONCLUSION

The risk of extinction for the Miami tiger beetle is heightened by synergies between threats as most species face multiple threats and these threats interact and magnify each other. For example, as habitat availability shrinks, species become more vulnerable to threats from invasive species, pollution, climate change, disease, predation, and other factors. For example, the threat of vegetation encroachment to the tiger beetle is heightened because its habitat has already been severely limited by development, and its very limited range makes it exceedingly vulnerable to other factors such as predation,

¹⁰² Integrated Taxonomic Information System, 2014. Species Profile available at: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=931870 (last visited December 8, 2014).

¹⁰³ Millsap at 16.

¹⁰⁴ *Id.*

¹⁰⁵ Millsap at 16-17.

¹⁰⁶ Millsap at 17.

climate change, and stochastic events. Moreover, development has hampered the necessary burning of the pine rocklands.

Because of the multifaceted ecological relationships among species, the extirpation of a species can have effects that cascade throughout the community. The loss of a single species can imperil associated species, highlighting the need to protect entire communities of species simultaneously.

The Miami tiger beetle is a rare Florida gem. Once thought extinct, it now faces imminent extinction from development. It merits immediate protection to ensure its survival and recovery. The Commission should act quickly to afford the Miami tiger beetle the fullest protection under the state law.

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