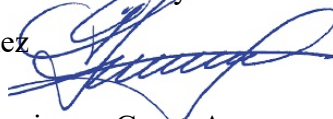


Date: July 8, 2020

To: Honorable Chairwoman Audrey M. Edmonson
and Members, Board of County Commissioners

From: Carlos A. Gimenez
Mayor



Agenda Item No. 8(L)(9)

Resolution No. R-652-20

Subject: Resolution Approving a Grant Agreement with the U.S. Department of Agriculture to fund up to \$548,625.00 for a Brazilian Pepper Tree Biological Control Project and Authorizing Execution of the Grant Agreement

Recommendation

It is recommended that the Board of County Commissioners (Board) approve the attached Grant Agreement No. 58-6032-0-001 (Agreement) with the U.S. Department of Agriculture (USDA) whereby Miami-Dade County will provide up to \$548,625.00 to the USDA for a biological control project for Brazilian pepper trees in Miami-Dade County, and authorizing execution of the Agreement. The Agreement is Attachment 1 to the resolution.

Scope

The biocontrol of the invasive Brazilian pepper tree will have countywide benefits.

Fiscal Impact/Funding Source

Under the proposed Agreement, Miami-Dade County will provide the USDA with up to \$109,725.00 per year for five years for a total of up to \$548,625.00 from the Miami-Dade County Wetlands Trust Fund. The available balance of the Wetlands Trust Fund as of December 31, 2019 is \$6,438,338.95.

Track Record/Monitor

The Senior Manager of Natural Resources in the Department of Regulatory and Economic Resources, Division of Environmental Resources Management (DERM), Michael Spinelli, will monitor the Agreement.

Background

First introduced in the late 1800s, the Brazilian pepper tree (*Schinus terebinthifolia*) has become a serious threat to the Everglades wetland ecosystem as one of the most aggressive and widespread of the exotic pest plants in the State of Florida. The Brazilian pepper tree creates a dense canopy that shades out other plants and provides poor habitat for native species.

Under the proposed Agreement, Miami-Dade County will provide the USDA Agricultural Research Service with up to \$109,725.00 per year for five years to release two biocontrol insects that feed on the stems and leaves of Brazilian pepper tree, slowing the trees' expansion and promoting the re-establishment of native wetland vegetation. The two biocontrol insects were imported from Brazil and extensively tested at the USDA's quarantine facility in Fort Lauderdale to determine that they would not harm other plants in the South Florida landscape. Funds from the Miami-Dade County Wetlands Trust Fund will be used by the USDA to grow and release the insects in multiple wetland sites throughout Miami-Dade County and the Everglades wetland ecosystem throughout South Florida. The release of these insects will be a cost-effective way to manage the Brazilian pepper tree and restore and enhance extensive acreages of wetlands managed by the Miami-Dade County Environmentally Endangered Lands Program.

Delegation

The Board authorizes the County Mayor or County Mayor's designee to execute amendments for extensions of time to the Agreement, if needed, provided that no additional funds are required.



Jack Osterholt
Deputy Mayor



MEMORANDUM

(Revised)

TO: Honorable Chairwoman Audrey M. Edmonson
and Members, Board of County Commissioners

DATE: July 8, 2020

FROM: Abigail Price-Williams
County Attorney

SUBJECT: Agenda Item No. 8(L)(9)

Please note any items checked.

- ☐ "3-Day Rule" for committees applicable if raised
- ☐ 6 weeks required between first reading and public hearing
- ☐ 4 weeks notification to municipal officials required prior to public hearing
- ☐ Decreases revenues or increases expenditures without balancing budget
- ☐ Budget required
- ☐ Statement of fiscal impact required
- ☐ Statement of social equity required
- ☐ Ordinance creating a new board requires detailed County Mayor's report for public hearing
- ☐ No committee review
- ☐ Applicable legislation requires more than a majority vote (i.e., 2/3's present ____, 2/3 membership ____, 3/5's ____, unanimous ____, CDMP 7 vote requirement per 2-116.1(3)(h) or (4)(c) ____, CDMP 2/3 vote requirement per 2-116.1(3)(h) or (4)(c) ____, or CDMP 9 vote requirement per 2-116.1(4)(c)(2) ____) to approve
- ☐ Current information regarding funding source, index code and available balance, and available capacity (if debt is contemplated) required

Approved _____ Mayor
Veto _____
Override _____

Agenda Item No. 8(L)(9)
7-8-20

RESOLUTION NO. R-652-20

RESOLUTION APPROVING A GRANT AGREEMENT BETWEEN MIAMI-DADE COUNTY AND THE UNITED STATES DEPARTMENT OF AGRICULTURE WHEREBY THE COUNTY WILL PAY UP TO \$548,625.00 FOR A BIOLOGICAL CONTROL PROJECT FOR BRAZILIAN PEPPER TREES; AUTHORIZING THE COUNTY MAYOR OR THE COUNTY MAYOR'S DESIGNEE TO EXECUTE THE AGREEMENT; AUTHORIZING THE COUNTY MAYOR OR COUNTY MAYOR'S DESIGNEE TO EXECUTE AMENDMENTS FOR EXTENSIONS OF TIME, PROVIDED THAT NO ADDITIONAL FUNDS ARE REQUIRED; AND AUTHORIZING THE COUNTY MAYOR OR COUNTY MAYOR'S DESIGNEE TO EXERCISE ALL RIGHTS CONTAINED THEREIN

WHEREAS, this Board desires to accomplish the purposes outlined in the accompanying memorandum, a copy of which is incorporated herein by reference,

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF MIAMI-DADE COUNTY, FLORIDA, that:

Section 1. This Board hereby approves a Grant Agreement between Miami-Dade County and the United States Department of Agriculture, in substantially the form attached hereto and made part hereof as Attachment 1, whereby Miami-Dade County will contribute up to \$548,625.00 from the Miami-Dade County Wetlands Trust Fund, over the five-year term of the Grant Agreement, to be used in accordance with Section 24-37 of the Code of Miami-Dade County to fund a portion of a biological control project for Brazilian pepper trees (*Schinus terebinthifolia*) being conducted by the United States Department of Agriculture.

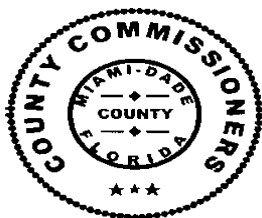
Section 2. This Board authorizes the County Mayor or County Mayor’s designee to execute the Grant Agreement for and on behalf of Miami-Dade County and to exercise the provisions contained herein.

Section 3. This Board authorizes the County Mayor or County Mayor’s designee to execute amendments for extensions of time for the Grant Agreement up to a maximum of five additional years, provided that no additional funds are required.

The foregoing resolution was offered by Commissioner **Rebeca Sosa** , who moved its adoption. The motion was seconded by Commissioner **Joe A. Martinez** and upon being put to a vote, the vote was as follows:

Audrey M. Edmonson, Chairwoman	aye
Rebeca Sosa, Vice Chairwoman	aye
Esteban L. Bovo, Jr.	aye
Jose “Pepe” Diaz	aye
Eileen Higgins	aye
Joe A. Martinez	aye
Dennis C. Moss	aye
Xavier L. Suarez	aye
Daniella Levine Cava	aye
Sally A. Heyman	aye
Barbara J. Jordan	aye
Jean Monestime	aye
Sen. Javier D. Souto	aye

The Chairperson thereupon declared this resolution duly passed and adopted this 8th day of July, 2020. This resolution shall become effective upon the earlier of (1) 10 days after the date of its adoption unless vetoed by the County Mayor, and if vetoed, shall become effective only upon an override by this Board, or (2) approval by the County Mayor of this resolution and the filing of this approval with the Clerk of the Board.



MIAMI-DADE COUNTY, FLORIDA
BY ITS BOARD OF
COUNTY COMMISSIONERS

HARVEY RUVIN, CLERK

Melissa Adames

By: _____
Deputy Clerk

Approved by County Attorney as
to form and legal sufficiency.

A handwritten signature in dark ink, appearing to read "ASR", is written over a horizontal line.

Abbie Schwaderer-Raurell

GRANT AGREEMENT NUMBER 58-6032-0-001 BETWEEN
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
FT. LAUDERDALE, FLORIDA

AND

MIAMI-DADE COUNTY, FLORIDA

This Agreement is entered into this ____ day of _____, 2020 by and between the United State Department of Agriculture, Agricultural Research Service (hereinafter referred to as the "ARS") and Miami-Dade County, a political subdivision of the State of Florida (hereinafter referred to as the "COUNTY").

ARTICLE I - BACKGROUND AND OBJECTIVES

The objective of this Agreement is to establish a reimbursable procedure and the standards, terms, and conditions under which the ARS and the COUNTY shall implement the "Biological control of *Schinus terebinthifolia* (Brazilian pepper tree) in South Florida with special reference to Miami-Dade County" (hereinafter referred to as "the plan"). The plan described in more detail in Exhibit "A" will supplement an on-going project to develop and implement biological controls for use against *Schinus terebinthifolia*. This shall permit the re-establishment of native plant communities through the reduction of exotic vegetation.

WHEREAS, the County has established the Wetlands Trust Fund (WTF) to acquire, enhance, restore manage and monitor wetlands in Miami-Dade County;

WHEREAS, the ARS has an on-going project to develop and implement biological controls for use against *Schinus terebinthifolia*;

WHEREAS, a scientifically promising means of long-term success for said enhancement project is development and application of a biological control program; and

WHEREAS, other South Florida Counties as well as regional, state and federal agencies have provided monetary contributions to said on-going project so that the wetlands under the respective jurisdictions may benefit

NOW, THEREFORE, in consideration of these premises and mutual covenants contained herein, the parties agree as follows:

ARTICLE II - AUTHORITY

The authority for this Agreement is 43 U.S.C 1473a which authorizes the USDA to accept moneys donated for purposes of the ARS.

Nothing herein shall constitute a waiver by Miami-Dade County of Section 768.28 of the Florida Statutes.

This Agreement specifies staffing resources and technical assistance the ARS will be contributing to implement the plan described in Exhibit "A".

ARTICLE III - STATEMENT OF WORK

A. ARS'S responsibilities

1. Implementation of Program. The ARS agrees to implement and shall be solely responsible for implementing a program for to develop and implement biological controls for use against *Schinus terebinthifolia* in accordance with the document entitled "Biological control of *Schinus terebinthifolia* (Brazilian pepper tree) in South Florida with special reference to Miami-Dade County" attached hereto as Exhibit "A".
2. Provision of In-Kind Services. Subject to the limitations of its fiscal budget approval process, the ARS agrees to provide \$53,200 in-kind services in the form of Principal Investigator (0.2 Full Time Employee) and Technicians (0.35 Full Time Employee) time commitment.
3. Collection of Data and Preparation of Annual Progress Reports. The ARS shall collect all information outlined in the Deliverables section of Exhibit "A".
4. Preparation and Submission of Reports. The ARS shall provide to the COUNTY documentation and reports, as specified in Article VIII of this Agreement, sufficient to verify satisfactory completion of work in accordance with Exhibit "A" for the duration of this Agreement. The ARS's reports shall be provided to the COUNTY for distribution to any parties of the COUNTY's choosing.
5. Receipt of Funds from the COUNTY. The ARS will invoice the COUNTY on an annual basis, in arrears, for allowable costs incurred. Allowable costs for expenditure of such funds shall be limited to those directly related to the biological control of *Schinus terebinthifolia*, including but not limited to transportation costs, supplies, materials, equipment, and payment of contractors and personnel directly involved in the development and implementation of the biological controls.
6. Maintenance of Records. The ARS shall keep accounting records conforming to generally accepted accounting principles which shall include, but not be limited to, a cash receipt journal, cash disbursement journal, general ledger, and all such subsidiary ledgers as reasonably necessary. All such records will be retained by the ARS for no fewer than five (5) years beyond the expiration of this Agreement.

B. COUNTY'S Responsibilities

1. Review of Project. The COUNTY shall participate in the review of the plan. The COUNTY's RER, Division of Environmental Resources Management (hereinafter

"DERM") shall be responsible for administrative oversight of the plan to ensure compliance with plan goals, procedures, and methods contained in Exhibit "A" and subsequent biocontrol releases.

2. Transfer of County funds to reimburse the ARS. Contingent upon receipt and approval by DERM of the annual report from the ARS, the County shall reimburse the ARS for its expenses for this Agreement at a minimum frequency of once a year. The maximum annual amount that may be paid by the County to the ARS pursuant to this Agreement is One Hundred Nine Thousand Seven Hundred Twenty-Five (\$109,725.00) Dollars over the five-year term of this Agreement.

All payments for work completed shall be made within thirty days following the receipt of each report and invoice(s). The cumulative amount retained shall be disbursed to the ARS upon completion of all work described under this Agreement and acceptance of the final report by DERM, but under no circumstances shall this amount be retained longer than four (4) months after the date of final acceptance of the work and the final report by DERM.

3. Maintenance of Records. The COUNTY shall keep accounting records which conform with generally accepted accounting principles which shall include, but not be limited to, a cash receipt journal, general ledger, and all such subsidiary ledgers as reasonably necessary. All such records will be retained by the COUNTY for not less than five (5) years beyond the expiration of this Agreement.

C. PUBLIC RECORDS

If the ARS has questions regarding the application of Chapter 119, Florida Statutes, to the ARS's duty to provide public records relating to this Agreement, contact the custodian of public records at 305-372-6564, DermRecords@miamidade.gov, or 701 NW 1st Court, Suite 300, Miami, FL 33136.

To the extent required by applicable law, the ARS shall:

1. Keep and maintain public records required by COUNTY in connection with this Agreement.
2. Upon request from COUNTY's custodian of public records, provide COUNTY with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided by Chapter 119 of the Florida Statutes, or as otherwise provided by law.
3. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of this Agreement and following completion or termination of this Agreement if the ARS does not transfer the records to COUNTY.
4. Upon completion or termination of this Agreement, transfer, at no cost, to COUNTY all public records in possession of the ARS or keep and maintain public records required by COUNTY in connection with this Agreement. If the ARS transfers all public records to COUNTY upon completion or termination of this Agreement, the ARS shall destroy any

duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the ARS keeps and maintains public records upon completion or termination of this Agreement, the ARS shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to COUNTY, upon request from COUNTY's custodian of public records, in a format that is compatible with the information technology systems of COUNTY.

ARTICLE IV - TERM OF AGREEMENT

This Agreement shall be for term of five (5) years, beginning on the date of execution, unless it is terminated earlier by one of the parties pursuant to Article X.

ARTICLE V - KEY OFFICIALS

A. Key officials are essential to ensure maximum coordination and communication between the parties and the work being preformed. They are:

1. For the ARS:

Jan Sasser-Moreno
Grant Management Specialist/Authorized Departmental Officer
21276 Loop Road, Andalusia, AL 36421
E-mail: Jan.Moreno@usda.gov
Telephone: 706-340-3046
Facsimile: Not Available

2. For the COUNTY:

DERM Director
701 N.W. 1st Court; 4th Floor
Miami, Florida 33136
Telephone: (305) 372-6754
Facsimile: (305) 372-6759

Michael Spinelli
Senior Manager
701 N.W. 1st Court; 4th Floor
Miami, Florida 33136
E-mail: SpineM@miamidade.gov
Telephone: (305) 372-6596
Facsimile: (305) 372-6759

3. USDA-ARS: Jan Sasser-Moreno, will provide review and approval of terms of all agreements and will exercise the authority to approve conduct of cooperative projects regarding ARS.

4. COUNTY/DERM: Michael Spinelli, Senior Manager, shall act as the authorized technical representative for the COUNTY/DERM with regard to the technical scope of this Agreement.

A. Communications - The COUNTY will address any communication regarding this Agreement to the Authorized Departmental Officer. The ARS will address any communications regarding this Agreement to the authorized technical representative for the COUNTY.

B. Changes in Key Officials- Neither the ARS nor the COUNTY may make any permanent changes in a key official without written notice to the other party reasonably in advance of the proposed change. The notice will include a justification with sufficient details to permit evaluation of the impact of such a change on the scope of work specified within this Agreement. Any permanent changes in key officials will be made only by modification to this Agreement.

ARTICLE VI – PRIOR APPROVAL N/A

ARTICLE VII – LIABILITY

It is understood and agreed that neither party to the AGREEMENT shall be responsible for any damages or injuries arising out of the conduct of activities governed by this AGREEMENT, except to the extent that such damages and/or injuries were caused by the negligent or wrongful acts or omission of its employees, agents, or officers. ARS' liability shall be limited by the Federal Tort Claims Act, 28 USC 2671, *et seq.*

ARTICLE VIII - REPORTS AND/OR OTHER DELIVERABLES

Data summaries and/or reports will be generated by the ARS and provided to the COUNTY on an annual basis to communicate progress of the program. Said reports shall include a general description of the work performed to date, maps showing the projected vs. actual treatment area, comparison of work performed to work projections, discussion of any monitoring results or general observations, and a costs statement. The costs statement will show a summary of expenditures to date and will include an expression of the average cost per acre for the project.

ARTICLE IX – PROPERTY UTILIZATION N/A

ARTICLE X – TERMINATION

This Agreement shall terminate five years after date of execution. Either the ARS or the COUNTY may terminate this Agreement early, at any time, by providing at least sixty (60) days written notice to the other party. Work performed by the ARS and approved by the COUNTY as required by this Agreement before the date of termination will still be reimbursed pursuant to this Agreement.

ARTICLE XI – STANDARD CLAUSES

A. Civil Rights

During the performance of this Agreement, the parties agree to abide by the terms of U.S. Department of the Interior – Civil Rights Assurance Certification, nondiscrimination and will not

discriminate against any person because of race, color, religion, sex or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, sexual orientation, national origin, disabilities, religion, age, or sex.

B. Promotions

The COUNTY will not publicize or otherwise circulate promotional material (such as advertisements, sales brochures, press releases, speeches, still and motion pictures, articles, manuscripts, or other publications), which states or implies Governmental, Departmental, bureau or Government employee endorsement of a product, service or position which the COUNTY represents. No release of information relating to this Agreement may state or imply that the Government approves of the COUNTY'S work product to be superior to other products or services.

ARTICLE XII – SIGNATURES

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the date(s) set forth below.

FOR THE U.S. DEPARTMENT OF AGRICULTURE:

Signature: _____

Name: Jan Sasser-Moreno

Title: Authorized Departmental Officer

Date: _____

FOR MIAMI-DADE COUNTY:

Signature: _____

Name: _____

Title: Mayor or Mayor's Designee

Date: _____

Attest:

Deputy Clerk

Exhibit "A"

**Biological control of *Schinus terebinthifolia* (Brazilian pepper tree) in South Florida with
special reference to Miami-Dade County**

A proposal submitted to:

Mr. Michael Spinelli

Senior Manager

Department of Regulatory and Economics Resources
Environmental Resource Management, Miami-Dade County, Florida

Submitted by:

Min B. Rayamajhi, PhD

and

Dale Halbritter, PhD

U. S. Department of Agriculture
Agricultural Research Service
Invasive Plant Research Laboratory
3225 College Ave.
Fort Lauderdale, Florida 33314

April 2, 2019

Background Information

Brazilian Pepper Introduction and Origin

Brazilian pepper tree (BP, henceforth) is native to South America, specifically coastal Brazil, Paraguay, Uruguay, and northeastern Argentina (Barkley 1944, 1957; McKay et al. 2009). It was thought to have been introduced to Florida as an ornamental around 1898 to 1900 (Morton 1978, Workman 1979, Mack 1991) with two introductions: one in Punta Gorda and one in Miami (Williams et al 2005). Initially, BP was largely absent from natural areas until it was discovered on Big Pine Key in the 1950s (Austin and Smith 1998). It has since erupted to plague peninsular Florida and is listed as a Category I invasive species (most severe ranking of ecological damage) by the Florida Exotic Pest Plant Council (FLEPPC 2019).

Ecological Harm

Brazilian pepper tree, *Schinus terebinthifolia* Raddi (Sapindales: Anacardiaceae) is a highly invasive weed that threatens the biodiversity of southern Florida, is a pervasive nuisance in developed areas, and can pose health risks for people with allergy sensitivities. Brazilian pepper tree can form thick monocultures that eliminate understory plant growth (Schmitz et al. 1997). Biochemicals (specifically, allelopathic compounds) are produced by BP that suppress the growth of competing plant species, including native species (Gogue et al. 1974; Morgan and Overholt 2005). Studies have shown that BP reduces biodiversity in upland and coastal habitats in its naturalized range South Florida (Mytinger and Williamson 1987; Gann et al. 2015). Additionally, chemicals released by the plants, either through contact or aerosol, can cause allergic reactions (dermatitis) and respiratory distress in people with sensitivity or those with chronic exposure (Morton 1978). Consumption of leaves and fruits can be toxic in grazing animals and birds (Campello and Marsaioli 1974; Morton 1978).

Distribution and Spread

Brazilian pepper tree has spread throughout most of peninsular Florida, to parts of coastal Alabama, Texas, and California, and is found on the Hawaiian Islands (EDDMapS 2019). In southern and central Florida, BP covers approximately 283,000 ha (Rodgers et al. 2012), and this coverage is likely much greater at present. In addition to disturbed habitats like canal shorelines and vacant lots, BP has also invaded natural communities including, but not limited to, mangrove forests, tropical hardwood hammocks, sawgrass marshes, and cypress savannas (Loope and Duneviz 1981; Ewel et al. 1982). Within the Everglades National Park, BP has invaded sawgrass marshes, muhly prairies, tropical as well as coastal hardwood hammocks, slash-pine forests and salt-marsh-mangrove ecotone (Doren and Jones 1997). Biological characteristics that make BP such a successful invader consist of a prolific reproductive output (a 150-cm tall plant produced 23,000 seeds, Halbritter unpublished data), bird-aided seed dispersal (Panetta and McKee 1997), shade tolerance (Ewel 1978), drought tolerance (Nilsen and Muller 1980), and the ability to survive in saline conditions (Ewe and Sternberg 2002). Although native and naturalized insect herbivores have been found on BP (Cassani 1986, Cassani et al. 1989), herbivory had no noticeable impact on the growth and reproductive output of

BP (Bhattari et al. 2017). The latter authors suggest BP supports the “enemy release” hypothesis, where BP is freed from its natural enemies in its invaded range.

Current BP Management Costs and Need for Biocontrol

In 2011, the South Florida Water Management District spent roughly \$1.7 million to manage BP, and between 1998 and 2006, the Florida Department of Environmental Protection spent in excess of \$10.5 million to control BP with herbicide (G. Jubinsky, FWCC, pers. comm. in Wheeler et al. 2016a; Rodgers et al. 2012). Chemical and mechanical control of BP can have short-term success but needs repeated follow-up treatments which requires long-term commitment of significant financial and human resources; therefore, permanent control management programs are necessary to prevent regrowth, especially in remote wilderness areas (Doren and Jones 1997). Any self-sustained control measure that spreads and self-propagates once introduced will be fiscally and environmentally more appropriate. The self-sustaining control method such as classical biological control that uses natural enemies such as insects and pathogens have been proposed for many invasive exotic weeds including Brazilian pepper trees in southern Florida (Doren and Jones 1997). Once established, biological control agents multiply and spread on their own, getting into areas that are otherwise difficult or impossible to access.

Proposed Biological Control Agents

After years of searching for suitable biological control agents from the native habitats (Wheeler et al. 2016a), two insect species, *Pseudophilothrips ichini* (Hood) (thrips) and *Calophya latiforceps* Burckhardt (pit-galling psyllid), have successfully passed a Technical Advisory Group’s (TAG) review process. The proposal to release the agents has been published in the Federal Registry for public comments, which closed on March 29th. We expect to receive a field release permit (from USDA-APHIS) for these biocontrol agents of BP during early summer of 2019.

During field host range tests in Brazil, the thrips, *P. ichini*, was found to be highly specific to BP and was not found on other plant species (Wheeler et al. 2016b). Further host range testing in quarantine confirmed the thrips is safe for release as its host range only included BP and one other invasive species of *Schinus* (Wheeler et al. 2016c). The thrips feed primarily on the stems of tender new growth, eventually causing stems to die back. In a greenhouse study with potted plants, thrips reduced plant growth (height) by up to 80% and caused a decrease in the number of actively growing stem tips (Wheeler et al. 2018). When released, the thrips could help manage BP by reducing its ability to produce new growth and could suppress reproductive output. The psyllid *C. latiforceps* creates abnormal growths (i.e., galls) at feeding sites on leaves. The immature psyllids feed within the pit of the gall. Leaves eventually become discolored and, in some cases, drop from the plant. Like the thrips, the psyllid was found to be highly specific to BP and was only able to complete its life cycle on BP (Diaz et al. 2015). In a greenhouse study, infested plants exhibited three times more leaf loss, a 30% reduction in height, and overall 11% less biomass accumulation than uninfested plants (Prade et al. 2016). In summary, both agents have potential to greatly reduce the BP growth and reproduction in Florida. Efforts have now shifted toward developing mass rearing techniques and strategically prioritizing field release and impact assessment methods.

Scope of Proposed Work

The USDA-ARS Invasive Plant Research Laboratory (IPRL) in Fort Lauderdale Florida has the mandate to mass produce and disperse approved biological control agents of invasive plants in 16 counties identified to be footprint of the Comprehensive Everglades Restoration Plan (CERP). Currently, we have four biological control agents for three other target weeds: **two** on *Lygodium microphyllum* (Old-World Climbing Fern), **one** on *Eichhornia crassipes*, (Waterhyacinth) and **one** on *Dioscorea bulbifera* (Air potato vine). During this summer we anticipate having **two agents** on *terebinthifolia* BP approved by APHIS for field releases. Currently, the CERP funding has been allocated among three weed species; with addition of the 4th species (BP), we will really be stretched thin in terms of funding and human resources for biocontrol agent production and releases on four weeds in CERP footprint. While our base fund supports most of our salaries, in-house research activities and host specificity testing of biocontrol agents in quarantine, we rely on our partners, affiliated with federal, state, and county agencies for soft funds for accelerated foreign exploration of biocontrol agents, mass production, dispersal and biocontrol impact assessment in the field. Our partners' collaborative efforts in terms of partial funding, technical help, and field site accessibility for biocontrol release and research has greatly enhanced our capacity to contribute to our partners' mission of invasive plant management in Florida. The USDA-IPRL highly appreciates the Miami-Dade County Regulatory Economic Resources (RER) division's past funding support for *Meleuca quinquenervia* (paperbark tree, from 1997 – 2013) and *Dioscorea bulbifera* (air potato vine from 2012 – 2014) biological control efforts in Dade County.

This current proposal for funding request from Miami-Dade County will greatly enhance (in addition to production and releases in CERP footprints) our capacity to produce and release a large number of biocontrol agents targeting BP-infested natural and recreational areas of Dade County. Once the project approved for funding, BP-infested strategic field sites to be inoculated with biocontrol agents will include BP invaded natural and manmade plant communities including, but not limited to, mangrove forests, tropical hardwood hammocks, sawgrass marshes, and cypress savannas and other types of wetland areas. When possible, the specific release areas will be selected based on accessibility to the sites and importance to Miami-Dade County as identified via consultation with biologists charged with BP management.

Overall, proposed objectives include biocontrol agent(s) releases aimed at establishing their self-sustaining populations, monitoring long-term (at least 5-yr) biocontrol impact assessment on BP plant populations and landscape level changes in species diversity over time. So far, we have developed preliminary methods for BP plant production on a small scale for use in biocontrol agent production for host range (host specificity) testing. Optimal methods for large scale production of BP plants for mass rearing of biocontrol agents outside a quarantine facility, release and monitoring (for landscape level impact evaluation), site selection, biocontrol agent dispersal dynamics, establishment of self-sustained populations, and landscape level impact (changes in BP growth, biomass and seed production) assessment activities will begin after the issuance (anticipated to be in early summer,

2019) of a field release permit by USDA/APHIS. Annual procedures to be used to accomplish our specific objectives (listed as tasks) are outlined in the following paragraphs. The major proposed tasks, milestone summaries, deliverable reports, and proposed budgets have been detailed below:

Task 1. Plant Production. Fully mature (red) BP drupes (fruits) will be collected, and their dry exocarps (outer skins) will be removed. The clean seeds will be sown in ca 3-pint plastic containers filled with commercial growth media, placed on glass/screenhouse benches, watered using a drip system and/or hand watered as needed, allowed to grow ca. 10 cm height, and transferred to 1- or 3-gallon pots filled with commercial growth media containing basal dose of fertilizer. The plants will be transferred to another screenhouse equipped with an overhead sprinkler system. Plants will be fertilized and protected from greenhouse/screenhouse pests by using mild safer soap/neem oil or other insecticides as needed to maintain pest-free plants for thrips and psyllid production. The latter biocontrol agents will only be reared on plants after the insecticide has broken down to non-toxic levels (per the manufacturer's label). As the laboratory production picks up and our production crew gains more experience in handling biocontrol agents, we will develop field nurseries by continuously trimming established plants to induce new growth followed by inoculation of biocontrol agents. Nurseries will serve as additional sources of agents and as epicenters for self-dispersal into adjacent plant populations.

Task 2. Biocontrol Agent Production (Mass Rearing). Initial efforts will focus on identifying the most effective laboratory rearing setup to improve on our current standard practice. Thrips and psyllids will be reared by using the pest-free 1- or 3-gallon potted plants placed in specially-designed, vented acrylic cylinders (current thrips standard), ventilated acrylic boxes, mesh sleeves, and/or cages made up of nylon screens fitted over a frame (current psyllid standard). The feasibility of rearing the two species in the same enclosures are still being evaluated by one of our collaborators. Initially, agents will be reared separately here in the enclosure that works best for each species. These enclosures will minimize predation (if any) and keep the breeding biocontrol populations from dispersing. Plants in the enclosures will be inoculated with adult stages of biocontrol agents (thrips or psyllids), placed either in our laboratory or on benches in partially shaded screenhouses, watered every other day as needed, and fertilized bi-weekly. Agents will be monitored for oviposition, occlusion (hatching), and life stage development. Methods to accurately estimate agent numbers will be developed (e.g., average density of agents per unit host plant material).

Task 3. Site Selection and Biocontrol Agent Dispersal. Following consultation with participating biologist(s) charged with BP management in Miami-Dade County, sites for biocontrol agent releases will be selected in Miami-Dade County natural and recreational areas as well as along the periphery of Everglades National Park. At the beginning, at least two dispersal protocols will be used. **1)** Adult thrips and psyllids will be counted and transferred to plastic vials, transported to the release sites and placed on suitable BP plants. **2)** Biocontrol agent-infested plants (1- or 3-gallon pots) will be enclosed in mesh sleeves, transported to the field sites, and placed adjacent to BP plants to be inoculated. The number of individual agents will be estimated using the method developed in Task 2. The pots will be recovered and removed from the field within a month, which will allow enough time for the transfer of the biocontrol agents to the target BP plants. An

additional dispersal protocol for the thrips will be field tested after initial success in the laboratory. Clumps of sphagnum moss infested with a known number of pupae will be placed at the bases of target BP plants in the field. With this protocol, there will be no need to revisit the target plants to collect pots. This would allow us to prioritize efforts on impact monitoring. A total of 200, 000 individuals will be dispersed during the each of the 5-year project period.

Task 4. Biocontrol Establishment and Impact Monitoring. Three release sites will be inventoried for pre-release BP biometric data: 1) basal diameter of the main trunk at the base level, 2) diameters of major stems at 1-m above the ground or lower at the point of origin from the main stem, 3) ground cover (% of total ground area), 4) vertical height of the tallest live stem and 5) the narrowest and broadest diameter of the crown in two dimensions. These measurements will be per plant (standalone) or clump (several stems arising from the same root stock at ground level) and will be gathered at a 6-mo interval, once in the early spring prior to the main flush of new stems and once in the fall when stem growth slows, and plants begin to flower. Short-term data on biocontrol agent establishment (number of plants with successful infestations and agent density), defoliation (foliage, stem, flower and fruit throughfall trapped in litterfall boxes) and whole branch/branch-tip dieback (percent of total based on visual estimation of flagged branches) will be gathered at a 6-wk interval before and after agent releases.

Proposed Milestones

Annual objectives and the procedures (listed as tasks) that will be used to accomplish them are outlined in the following table.

	Year 1	Year 2	Year 3	Year 4	Year 5
Locate and establish BC release sites	x				
Collect baseline data (release-sites)	x				
Produce BP plants for insect rearing*	x	x	x	x	x
Produce colonies of BC agents*	x	x	x	x	x
Disperse BC agents in field sites*	x	x	x	x	x
Monitor BC populations in sites*	x	x	x	x	x
Survey areas for BC self-dispersal	x	x	x	x	x
Gathering BC impact data		x	x	x	x
Submit annual report	x	x	x	x	x
Final report					x

*These activities will continue year-around during the proposed project period. During subsequent years, biocontrol agent releases will expand to new areas in the county.

Proposed Budget

It is proposed that the Miami Dade RER support the IPRL efforts related to the expedited culture and release of APHIS approved thrips and psyllids for biological control of Brazilian pepper tree in Miami-Dade County. This will also indirectly support monitoring population dynamics of the released biocontrol agents and target plants in research plots established in Miami Dade County. The level of funding requested is \$109,725/year for the next five years (2019-20 thru 2024-25). The cost of insect production listed on the table is approximate based on past experience. A full-time technician will be hired to culture Brazilian pepper plants while another technician will be hired to rear and release biological control agents. Costs for horticultural supplies (e.g. potting soils, fertilizer, culture pots, etc.), insect cage supplies (e.g. screening and metal piping for cages), and field evaluation supplies (e.g. screens, bags, tape measures, pruning saws, field safety equipment etc.) are also included in this budget. This project will be supervised by the Category I, scientist Dr. Min Rayamajhi, who in the past has planned and implemented biocontrol agent production, release and research on the impact of biocontrol agents on melaleuca and air potato vines in Miami-Dade and Broward County of southern Florida. More recently, he has been assigned to planning and implementing Brazilian pepper biocontrol field projects for the USDA/ARS Invasive Plant Research Laboratory at Fort Lauderdale, FL. Dr. Rayamajhi's 0.2 FTE salary (ca \$31,600) and Biological Science technician's 0.35 FTE salary (\$21,600) will constitute approximately 50% of the matching fund for \$109,725/year as required by the RER.

	FY2019	FY2020	FY2021	FY2022	FY2023
<u>¹Direct Costs:</u>					
*250,000 biocontrol agents x 0.35	87,500	87,500	87,500	87,500	87,500
**Supplies (for plant & insect production)	7,500	7,500	7,500	7,500	7,500
***USDA location support (5% of net)	4,750	4,750	4,750	4,750	4,750
<u>²Indirect Cost:</u>					
USDA Program Support (10% of gross)	9,975	9,975	9,975	9,975	9,975
Totals	109,725	109,725	109,725	109,725	109,725

¹This element covers costs incurred by the location as a direct result of the project. *Will cover salary (based on 2019 GSA salary table) and fringe benefits for 1.8 FTE GS 5 (step-1) level biological science technician dedicated to the plant production, biocontrol agent rearing, dispersal and helping in field-based biocontrol impact evaluations. **Supplies for plant production (soil media, fertilizer and other chemical) and other safety and data recording equipment needed to carry out the lab and field tasks outlined in the proposal. *** USDA-IPRL location support in terms of administrative support.

² This element represents indirect program support costs at the area and headquarter office level.

Deliverables (Reports). USDA-ARS will prepare and submit annual progress reports and a final comprehensive report for the proposed project period on the following items.

- a. Plant and biocontrol agent production methods and dispersal techniques and strategies.
- b. List of BP populations and numbers released in Miami-Dade/south Florida that have been inoculated with biocontrol agents (*Pseudophilothrips ichini* and *Calophya latiforceps*).
- c. List of BP sites in which biocontrol agents dispersed on their own.
- d. Short-term impact on BP plants.

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