

2010 Request for Technology Development Proposals for Biological Control of Invasive Native and Non-Native Plants

1. Project Title:

Implementing EDDMapS to support USFS-FHP biological control programs for invasive plants in the U.S.

2. Principal Investigator:

G. Keith Douce, Co-Director, Center for Invasive Species & Ecosystem Health, University of Georgia, Tifton, GA 31794. kdouce@uga.edu Phone: 229-386-3298 FAX: 229-386-3352

3. Cooperators and Other Participating Institutions:

Charles, T. Barger, IT Director, Center for Invasive Species & Ecosystem Health, University of Georgia, Tifton, GA 31794

4. USFS-FHP Contact:

Carol Randall, Entomologist
Forest Service, FHP
Idaho Panhandle National Forests
3815 Schreiber Way
Coeur d' Alene, ID 83815-8363 Phone: 208-765-7343

5. Amount Requested: \$ 74,746 over two years: \$ 37,098 Year 1; \$ 37,648 Year 2

PROJECT LEVERAGING BY THE CENTER FOR INVASIVE SPECIES AND ECOSYSTEM HEALTH (CISEH):

Past and current US Forest Service (FS), Forest Health Protection (FHP) and Forest Health Technology Enterprise Team (FHTET) Projects including:

- Invasive Plants of the United States DVD-ROM: Identification, Biology and Control (Barger et al. 2008) available on DVD and on Invasive.org website;
- ForestryImages (www.forestryimages.org) and Invasive.org (www.invasive.org);
- Digitization and availability of Proceedings of the International Symposium on Biological Control of Weeds (initiated March 2010).

Other Projects in cooperation with:

- The Alaska Exotic Plant Information Clearinghouse (invasive weeds: funded by USFS: FHP Region 10);
- Detecting and Mapping New Invasive Species Occurrences: Implementation Plan for EDDMapS to support of Mid-Atlantic Exotic Plant Pest Councils EDRR Efforts (invasive weeds: funded by US National Park Service);
- Pilot project: Weed Biological Control Agent Early Detection and Distribution Mapping Project for US FS Regions 1 and 4 (biological control agents and invasive weeds: USDA FS FHP Coeur d'Alene, ID);
- Missouri River Water Coalition (invasive weeds: funded by Center for Invasive Plant Management at Montana State University, Bozeman, MT);

- The Florida Invasive Species Partnership (FISP) supporting 15 Florida Cooperative Invasive Species Management Areas (FL-CISMAs) including The Everglades Cooperative Invasive Species Management Area (all taxa: funded by US Fish and Wildlife Service and the National Park Service);

4. Project Goals and Supporting Objectives

Work with FHP to:

- A. identify modifications to EDDMapS [Early Detection and Distribution Mapping System. (Barger and Moorhead 2007)] needed to carry out items identified;
- B. make modifications and implement EDDMapS Biocontrol;
- C. introduce and familiarize selected cooperators with EDDMapS Biocontrol as a web-accessible reporting and display/mapping system for used with distributions of invasive plants and their natural enemies;
- D. aggregate appropriate subsets and portions of existing GIS and other database information on invasive plants and biological control projects into EDDMapS;
- E. serve EDDMapS Biocontrol to support selected invasive plant biological control projects;
- F. develop output routines/data exchange mechanisms to enable export of information from EDDMapS to other projects and datatypes; and
- H. serve EDDMapS Biocontrol for duration of project.

5. Project Justification/Urgency

The 2008-2012 National Invasive Species Management Plan identifies early detection and rapid response (EDRR) as a critical second defense against the establishment of invasive populations. Most land managers and researchers probably have a good general idea of which invasive species occur on the lands they work on, this data is not currently organized in a central database, is often not displayed on easy-to-access-and-use maps, and not available on the Internet where others can access the information.

The need to develop biological control technology to manage widespread invasive plant infestations as a central feature in Integrated Pest Management efforts has been identified in The US Forest Service National Strategy and Implementation Plan for Invasive Species Management. FHP and The Biological Control of Invasive Plants Technical Working Group (BCIP-WG) have stated that biological control is a proven target-specific strategy that has been used extensively to manage invasive plants. It is widely believed that biological control show considerable promise as a viable long-term approach to control and management of invasive plants, especially in public-owned forested, rangeland and natural areas.

However, there is a critical need to report, consolidate, cross-link, display, visualize and share infestation and survey population data on populations of invasive weed populations that have been subjected to released and managed populations of possible biological control agents. It is critical that this information be consolidated, expanded, maintained and available to users, cooperators and other public and private-sector agencies and individuals through an easy to use and access data system.

This proposal offers to implement the existing EDDMapS that was designed and implemented in 2005 by The University of Georgia's Center for Invasive Species and

Ecosystem Health to enable Southeast Exotic Pest Plant Council volunteers (see: www.se-eppc.org) to assist FHP in carrying out this critical data consolidation and display need. EDDMapS allows cooperators to directly enter and report information on invasive weed species and biological control agents associated with those infestations as well as enables aggregation of data from and exporting of data to other.

EDDMapS provides a convenient solution for the storage, display and sharing of distribution data on known and newly introduced invasive species and finds/reports for biological control agents associated with those invasive weed populations from and with other GIS systems and databases.

6. Approach

EDDMapS is a user-friendly web-based application that combines Google Maps and interactive Flash county-level species introductions to document distribution over time for selected invasive and biological control species. It is also fully integrated into the existing Bugwood Image Database system (which includes ForestryImages and Invasive.org: Barger et al. 2006, and <http://images.bugwood.org>). The system allows users to obtain visual map displays for species of concern and enables viewing of reported finds from the site to the national level, obtain the exact location and extent of the infestation, and access images for the species. EDDMapS is not intended to duplicate or replace any other well established system. EDDMapS is being used by over 1,200 users who have entered data for 1,700 species of concern (including biological control agents) across the U.S. (see www.EDDMapS.org).

CISEH is built upon the premise of utilizing partnerships and information technology to advance invasive species, forestry and agricultural education, and is comprised of experts in database management, website design, GIS, invasive species biology, forestry, agricultural systems and natural areas management. CISEH personnel have the experience and flexibility needed to manage a project that encompasses multiple states and includes large amounts of data. CISEH maintains and serves the Bugwood Image Database System that provides access to over 116,000 quality images that are available for educational applications at no cost. Having EDDMapS associated with CISEH ensures long term sustainability of the collected distribution information.

CISEH will partner with FHP to implement EDDMapS for use in reporting and mapping occurrences of selected invasive weed populations and for the release and tracking of biological control species released to control selected invasive weed populations. CISEH personnel will coordinate with FHP cooperators to identify existing datasets for aggregation into EDDMapS such as the USDA Forest Service FACTS database and treatment data, and from other appropriate and approved federal and/or state database and GIS systems.

After CISEH modifies and creates the EDDMapS technology for the biological control of invasive weed projects, they will provide on-line information for users to enter data, submit images, and other information. They will likely be some need for limited train-the-trainer workshops for participating personnel and cooperators.

Ms. Marijka Haverhals at The University of Idaho, College of Agricultural and Life Sciences will provide coordination and will serve as the within Idaho and surrounding-area local contact for this project.

Cooperators can contribute to this database via an easy-to-use, straightforward online report form. The form provides space to document descriptive information about the infestation and/or the survey findings for the biological control agents, such as the size of the area infested or in which the biological control agents are found, canopy cover, and location information.

EDDMapS allows users to upload photographs with data forms to increase the validity of data and helps insure accuracy of the identifications. FHP personnel and cooperators will, along with CISEH personnel, oversee and validate the accuracy of incoming reports.

Currently, based upon discussions with current biological control project cooperators, we anticipate that point data will be collected and reported only for invasive plant species on public lands and not for biological control agents at all. If point data is to be entered for species found on private lands, each user will be responsible for obtaining permission from the land owner prior to entering the data.

As planned, EDDMapS Biocontrol will make only a general area map and county-level data available along with the remaining descriptive information for biological control agents. EDDMapS has the ability and could be adapted to enter and report point data for biological control agents with password protected access should FHP leadership desire to do so.

EDDMapS uses the North American Weed Management Association (NAWMA) mapping standards (NAWMA 2002), which means that existing data can be easily incorporated into the database and new data is easily shared with other projects. Most invasive species management projects store their data in a format that complies with these standards to facilitate data compilation and sharing. It may be necessary for CISEH to develop, in concert with FHP cooperators, an ancillary data format for use with the biological control agents being monitored.

Viewing the data online is easy and intuitive in EDDMapS. Distribution data is graphically displayed on county-level maps or as point-data when appropriate. The project uses a Flash-based mapping server for county-level maps that users can access that is fast loading and easy to use. Google Maps web services are incorporated to allow users to overlay the point data with road maps, satellite images, and topographic maps.

7. Expected Products and Outcomes

The goal of this project is to incorporate information on the release and subsequent sampling results for biological control agents released as control treatments on selected populations of invasive weeds into EDDMapS. The biological control agent release and recovery points will be entered in a similar fashion to how invasive plant species data is now entered into EDDMapS and will be displayed in a similar fashion.

- A. The EDDMapS Biocontrol web site will contain the following information for the selected sites/projects:
 - 1. County level distribution maps for invasive plants and biological control agents;
 - 2. Point distribution maps for invasive plant species (EDDMapS has the ability to handle point distribution data for biological control agents but during the pilot biological control invasive weeds project with University of Idaho cooperators it was decided not to enter and/or report point location data for the biological control agents, hence it has not been developed or implemented for the biological control agents.);
 - 3. Species Information;
 - 4. Online Reporting Form(s) for biological control agent releases.
- B. Information from EDDMapS Biocontrol will be linked to other invasive weed resources including Invasive.org, though the USFS-CISEH Invasive Plants of the United States DVD-ROM project, to USDA Plants (<http://plants.usda.gov/>), and to BONAP (Biota of North America Program <http://www.bonap.org/index.html>).
- C. The list of the 218 U.S. invasive plant species generated in The Invasive Plants of the United States DVD-ROM project will be the weed species focused on by CISEH to collate information about the known distribution of those species and the cadre of biological control agents associated with those weed species as part of this project. Although this is not an official list of "invasive" plants throughout the United States, it includes Federal Noxious Weeds as well as those listed by state regulatory agencies, pest plant councils, and other organizations.
- D. At the end of the first year of the project, FHP cooperators and CISEH personnel will evaluate how well the project worked, shortcomings of the EDDMapS system, as well as evaluate other aspects of the project that may be limiting the project outcomes. Results of this review will be used to guide how to carry out the 2012 project.

Additional Items: 1. Vitae

G. Keith Douce, Ph.D. Entomology

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P.O. Box 748, 4601 Research Way, Tifton, GA 31794

Phone: 229-386-3298 FAX: 229-386-3352 Email: kdouce@uga.edu

2008 – present: Co-Director, Center for Invasive Species & Ecosystem Health
www.bugwood.org/center/ and Professor of Entomology (Hire-back Retired)

Co-Director and Founder, Center for Invasive Species & Ecosystem Health (CISEH)
www.bugwood.org/center/ and The Bugwood Network (www.Bugwood.org).

- Oversees the development of The Center for Invasive Species & Ecosystem Health biological, educational and information system programs. Special emphasis areas are entomology, IPM and regulatory programs related to species not-native to the US that could become invasive in US forested, agricultural and natural areas.
- Bugwood web information systems received 189 million hits and we accessed by 8.5 million unique users. CISEH currently operates and is responsible for 33 informational and educational web sites including 4 image systems. The four Bugwood Network image systems make more than 116,000 high quality photographs on more than 12,700 subjects taken by 1,600 photographers from 80 countries that can be downloaded and used at no-cost for educational uses worldwide.

Honors and awards:

- 2009. Award of Excellence: Senior Scientist- Extension. University of Georgia Tifton Campus. May.
- 2008. Awarded Honorary University Professor, University of West Hungary, Sopron, Hungary
- 2006. Distinguished Achievement Award in Extension, Southeastern Branch Entomological Society of America.
- 2005. A.D. Hopkins Award for Outstanding Service to Southern (U.S.) Forest Entomology. Awarded by The Southern Forest Insect Work Conference. (www.sfiwc.org)

Technical and other publications

A. Technical papers.

1. Douce, G.K., F. Lakatos, D.J. Moorhead, C.T. Bargerion and J. LaForest. 2008. European Collaborations of The Center for Invasive Species & Ecosystem Health. Proceedings IUFRO 7.03.10 "Methodology of Forest Insect and Disease Survey in Central Europe" Conference. Štrbské Pleso, Slovakia. Sept. 2008. In Press.
2. Bargerion, C.T., G.K. Douce, D.J. Moorhead, C.W. Evans and R.C. Reardon. 2006. Forestry Images www.forestryimages.org: Development, methodology and technology 1995-2005. USDA Forest Service, FHTET-2005-14. 141 p.

B. Other Publications:

1. Bargerion, C.T., C.W. Evans, D.J. Moorhead, G.K. Douce & R.C. Reardon. 2008. Invasive plants of the United States DVD-ROM: Identification, biology & control. USDA-FS, FHTET-07-03. Dec. 2007.

Biographical Sketch

Charles T. Bargeron IV, Information Technology Director
Center for Invasive Species & Ecosystem Health
The University of Georgia

Education:

M.S. Computer Science, Georgia Southwestern State University, Americus, GA.
B.S. Computer Science, Georgia Southern University, Statesboro, GA.

Employment and Current Position:

2008 – Present: Information Technology Director, University of Georgia, Center for Invasive Species & Ecosystem Health www.bugwood.org/center/

1999 – 2008: Technology Coordinator, University of Georgia, Bugwood Network

Honors and awards:

2009. “Genius Award” by the Mid-Atlantic Exotic Pest Plant Council
2008. Advocate of the Year, “For Extraordinary Service Furthering The Goals of The Florida Exotic Pest Plant Council” by the Florida Exotic Pest Plant Council

Organizational and Leadership Activities:

Southeast Exotic Pest Plant Council, President, 2008 – present
Southeast Exotic Pest Plant Council, Early Detection and Rapid Response Committee Chair, 2006-2008

Selected Publications:

- Bargeron, C.T., C.R. Minter, C.W. Evans, D.J. Moorhead, G.K. Douce, and R.C. Reardon (Technical Coordinators). 2008. Invasive plants of the United States: Identification, Biology and Control DVD-ROM. USDA Forest Service. Forest Health Technology Enterprise Team. Morgantown, WV.FHTET-08-11. DVD-ROM.
- Bargeron, C.T., and D.J. Moorhead. 2007. EDDMapS- Early Detection and Distribution Mapping System for the Southeast Exotic Pest Plant Council. *Wildland Weeds*. Vol. 10(4):4-8.
- Bargeron, C.T., G.K. Douce, D.J. Moorhead, C.W. Evans and R.C. Reardon. 2006. Forestry Images www.forestryimages.org: Development, methodology and technology 1995-2005. USDA Forest Service, FHTET-2005-14. 141 p.
- Evans, C.W., D.J. Moorhead, C.T. Bargeron, and G.K. Douce. 2006. Invasive plant responses to silvicultural practices in the South. The Bugwood Network, The University of Georgia. Tifton, GA. BW-2006-03. 52 p.
- Bargeron, C.T., D.J. Moorhead, G.K. Douce, R.C. Reardon and A.E. Miller. 2003. Invasive plants of the Eastern United States: Identification and control. USDA-FS, FHTET-203-08. CD-ROM.

Additional Items 2: Budget Total Direct Cost for two year project \$74,746

		FS Funds	UGA Match
Year 1	\$37,098		
I	Personnel		
	A. Salaries		
	1 PI Douce	\$3,199	\$312
	2 IT Director - Barger	5,501	
	3 Invasive Plant Coordinator	8,109	
	4 Marketing & Communications Specialist	1,248	
	5 Temporary labor	2,100	
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	<i>Salary subtotal</i>	\$20,157	\$312
	B. Benefits		
	1 1.45% FICA HI A. 1.	46	\$5
	2 IT Director @ 38% A. 2.	2,090	
	3 Invasive Plant Coordinator @ 54% A. 3.	4,379	
	4 Marketing & Communications Specialist @ 54% A. 4.	674	
	5 Temporary Labor @ 12% A. 5.	252	
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	<i>Benefit subtotal</i>	\$7,441	\$5
	Personnel Subtotal	\$27,598	\$317
II	Travel	2,000	
III	Operating and supplies	0	
IV	Contract to University of Idaho	7,500	
V	Computer costs	0	
VI	No indirect costs allowed	0	

	Year 1 Direct Costs	\$37,098	
VII	Matching		
	A. University of Georgia		
	i. Salary & Benefits - UGA		\$317
	ii. IDC - UGA		\$82
	iii. Unrecovered IDC - UGA		\$7,000

	UGA Matching Year 1		7,399
	D. University of Idaho		\$1,875
	Total Match Year 1		\$9,274

Additional Items 2: Budget Total Direct Cost for two year project \$74,746

		FS Funds	UGA Match
Year 2	\$37,648		
I	Personnel		
	A. Salaries		
	1 PI Douce	\$3,201	\$420
	2 IT Director - Barger	5,638	
	3 Invasive Plant Coordinator	8,311	
	4 Marketing & Communications Specialist	1,279	
	5 Temporary labor	2,100	
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	<i>Salary subtotal</i>	\$20,529	\$420
	B. Benefits		
	1 1.45% FICA HI A. 1.	46	\$6
	2 IT Director @ 38% A. 2.	2,142	
	3 Invasive Plant Coordinator @ 54% A. 3.	4,488	
	4 Marketing & Communications Specialist @ 54% A. 4.	691	
	5 Temporary Labor @ 12% A. 5.	252	
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	<i>Benefit subtotal</i>	\$7,619	\$6
	Personnel Subtotal	\$28,148	\$426
II	Travel	2,000	
III	Operating and supplies	0	
IV	Contract to University of Idaho	7,500	
V	Computer costs	0	
VI	No indirect costs allowed	0	

	Year 2 Direct Costs	\$37,648	
VII	Matching		
	A. University of Georgia		
	i. Salary & Benefits - UGA		\$426
	ii. IDC - UGA		\$111
	iii. Unrecovered IDC - UGA		\$7,000

	UGA Matching Year 1		7,537
	D. University of Idaho		\$1,875
	Total Match Year 1		\$9,412

Additional Items 2: Budget Total Direct Cost for two year project \$74,746

		FS Funds	UGA Match
Two Year			
Total	\$74,746		
I	Personnel		
	A. Salaries		
1	PI Douce	\$6,400	\$732
2	IT Director - Bargeron	11,139	
3	Invasive Plant Coordinator	16,420	
4	Marketing & Communications Specialist	2,527	
5	Temporary labor	4,200	
	<i>Salary subtotal</i>	----- \$40,686	----- \$732
	B. Benefits		
1	1.45% FICA HI A. 1.	92	\$11
2	IT Director @ 38% A. 2.	4,232	
3	Invasive Plant Coordinator @ 54% A. 3.	8,867	
4	Marketing & Communications Specialist @ 54% A. 4.	1,365	
5	Temporary Labor @ 12% A. 5.	504	
	<i>Benefit subtotal</i>	----- \$15,060	----- \$11
	Personnel Subtotal	----- \$55,746	----- \$743
II	Travel	4,000	
III	Operating and supplies	0	
IV	Contract to University of Idaho	15,000	
V	Computer costs	0	
VI	No indirect costs allowed	0	
	Year 1 Direct Costs	----- \$74,746	
VII	Matching		
	A. University of Georgia		
	i. Salary & Benefits - UGA		\$743
	ii. IDC - UGA		\$193
	iii. Unrecovered IDC - UGA		\$14,000
	UGA Matching Year 1		----- 14,936
	D. University of Idaho		\$3750
	Total Match Year 1		----- \$18,686

Additional Items 4. References

Barger, C.T., G.K. Douce, D.J. Moorhead, C.W. Evans and R.C. Reardon. 2006. Forestry Images www.forestryimages.org: Development, methodology and technology 1995-2005. USDA Forest Service, FHTET-2005-14. 141 p.

Barger, C.T. and D.J. Moorhead. 2007. EDDMapS- Early Detection and Distribution Mapping System for the Southeast Exotic Pest Plant Council. *Wildland Weeds*. Vol. 10(4):4-8.

Barger, C.T., C.R. Minter, C.W. Evans, D.J. Moorhead, G.K. Douce and R.C. Reardon. 2008. Invasive Plants of the United States DVD-ROM: Identification, Biology and Control. DVD-ROM. University of Georgia, Center for Invasive Species and Ecosystem Health and USDA Forest Service - Forest Health Technology Enterprise Team. FHTET-2008-11.

NAWMA. 2002. North American Weed Mapping Association, North American Invasive Plant Mapping Standards. 34 pp.

<http://www.nawma.org/documents/Mapping%20Standards/Invasive%20Plant%20Mapping%20Standards.pdf>.