

Proposal for the Establishment of the

Center for Invasive Species and Ecosystem Health

Revised January 15, 2008

As per modifications requested during Nov. 15, 2007

University Council Executive Committee Meeting

**APPROVAL PAGE
COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES
CURRICULUM PROPOSALS**

Proposal: Center of Invasive Species and Ecosystem Health

Department Head

Date

William K. Vencill
Faculty Council Curriculum Committee Chair

27 Sept 2007
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John R. Roben
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Associate Dean for Academic Affairs

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Dean
Warnell School of Forest Resources

Oct. 1, 2007
Date

Center for Invasive Species & Ecosystem Health

Invasive plants, insects, plant pathogens, aquatic species and terrestrial wildlife cost the United States economy more than \$100 billion each year. Agricultural and forested systems have been coming under increased stress due to problems caused by both non-native invasive species and native pest organisms. Solutions to these problems require collaborations that transcend traditional disciplinary, college, institutional and agency approaches, as well as state and national borders.

The Bugwood Network, developed through faculty cooperation between the College of Agricultural and Environmental Sciences (CAES) and the Warnell School of Forestry and Natural Resources (Warnell School), has become an internationally recognized entity addressing issues on invasive species and ecosystem (agricultural, forested and natural system) health. By formalizing this existing structure, we propose to become the Center for Invasive Species & Ecosystem Health. The Center formation will allow expansion of current Bugwood Network programs to attract emerging funding opportunities and to better serve the College, School, University and its partners.

Mission Statement

The mission of the Center for Invasive Species & Ecosystem Health (here after the Center) is to serve a lead role in development, consolidation and dissemination of information and programs focused on invasive species, forest health, natural resource and agricultural management through technology development, program implementation, training, applied research and public awareness at the state, regional, national and international levels.

The goals of the Center are:

- To become a preeminent national and international public service and outreach center for invasive species and ecosystem health
- To develop collaboration between UGA and state, university, federal and international partners in these areas
- To integrate and develop information and programs in these areas
- To produce web sites, publications, posters and presentations in these areas
- To serve as a clearing house for information, applied research and training in these areas
- To promote public awareness, education and applied research in these areas

Background

Over the last 12 years, Drs Douce and Moorhead have developed programs in entomology, forest health, integrated pest management, silviculture, and forest management through the Bugwood Network. The Bugwood Network consists of the following faculty and staff:

University Funded:

G. Keith Douce, Ph.D. Entomology
Professor, CAES

David J. Moorhead, Ph.D. Forest Ecophysiology
Professor, Warnell School

Salina C. McAllister, Dipl. Business and Office Technology/Accounting
Administrative Assistant II, Warnell School

Grant Funded (Department of Entomology, CAES):

Charles T. Barger, M.S. Computer Science
Information Technology Application Support Professional
Christopher W. Evans, M.S. Forest Biology
Public Service Professional – Invasive Species and Natural Resources
Joseph H. LaForest, M.S. Entomology and M.S. Plant Pathology
Research Professional – Forest Health and IPM
Walter B. Sikora, PhD Entomology
Laboratory Technician (Part-time) – Insect Taxonomy and Photography

The Bugwood Network personnel work throughout the state, region, nation and internationally in forestry, entomology and invasive species to:

- Develop educational resources on emerging issues including bulletins, publications, posters, CD-ROMs and presentations
- Provide training and support for landowners, natural resource professionals and managers, as well as the general public
- Develop and administer fifteen educational web systems
- Seek and archive digital images in four topic-based web systems to support educational activities
- Support activities of professional organizations such as Exotic Pest Plant Councils, Entomology Societies, Forestry Organizations, etc.
- Manage the Georgia Cooperative Agricultural Pest Survey Program and Georgia Invasive Species Task Force
- Develop and implement policy and protocols for early detection and rapid response of invasive species
- Develop and administer the Southeastern U.S. Invasive Plant Mapping program
- Develop web versions of USDA Forest Service Forest Health Protection and Forest Health Technology Enterprise Team publications
- Provide image support for the Southern Plant Diagnostic Network, Exotic Forest Pest Information System, Global Pest and Disease Database and National Invasive Species Information Center
- Facilitate and extend program development and Maymester courses in Europe

During 2007, the Bugwood Web Sites:

- Received over 140 million hits (up from 118 million hits in 2006);
- Served more than 61 million pages of information (up from 49 million in 2006)
- Served over 21 million users (up from 13 million users in 2006).

The Bugwood image sites contain more than 68,500 high quality images on more than 10,000 subjects from over 1,200 photographers. For a complete list of Bugwood Network web sites, statistics, and other background information see the Appendix.

Support

From 1999 through 2005 we have received \$1,556,762 in extramural grants to fund the Bugwood staff positions and activities. On average we generate over \$200,000 each fiscal year. In 2006, we generated grant awards totaling \$135,791 with another \$176,552 pending. We continue to attract funding from the USDA Forest Service, USDA Animal and Plant Health Inspection Service (APHIS), and USDA Cooperative State Research, Education and Extension Service (CSREES).

Facilities and Equipment

Located at the University of Georgia – Tifton Campus in the old Administration Building of the Coastal Plain Experiment Station, the Bugwood Network personnel utilize eight offices (with one assigned to USDA APHIS PPQ personnel), a 575 sq. foot computer laboratory, and a climate controlled fire resistant computer server room. Supporting equipment includes 11 desktop computers, 4 laptops, 10 web/database/file/image servers, 3 computer projectors, 4 print/film scanners, 2 laser printers, a large format plotter, a copier and high speed internet access (for more information see Appendix)

Center Operating Structure, Faculty and Staff

The Center will initially consist of two directors, IT director, two program specialists and associated technicians.

Center Directors (Douce and Moorhead) will provide overall direction, coordination and administration of the Center. They will identify and pursue programs and opportunities relevant to the Center's mission. Directors Douce and Moorhead will report to their administrators within CAES and the Warnell School.

Information Technology Director (Barger) will provide direction, development and implementation of Center's computer and information technology applications. He is the senior staff member of the Center and provides day-to-day administrative operations.

Program Specialists (Evans and LaForest) will work with Center faculty and collaborators to develop programs and educational materials in their areas. Additional responsibilities will include: data entry and verification, image acquisition and classification, information management, taxonomic verification and support and regulatory pest survey support.

Support staff will maintain Center computers and servers, support development of web applications and databases, as well as format and layout publications and posters. The image archive technician handles, scans, edits and color corrects images to be integrated into image archive systems.

Administrative Assistant (McAllister) provides Center faculty and staff support to: handle payroll and budgets, handle grant paperwork, receive and return images and provide standard secretarial support.

Other project technicians will be hired as needed to support specific projects. Currently the Center includes an insect taxonomist (Sikora) that is working to verify and update the taxonomic database and photograph museum specimens.

Other University faculty collaborators will be encouraged to participate in the Center for specific projects utilizing Center resources. These faculty collaborators will be a member with no formal budgetary assignment to the Center. In the future, new positions such as a faculty member in Forest Health or Invasive Species could be assigned directly to the Center. The process for appointment and reappointment will be at the discretion of the CAES and Warnell School Deans.

The participating units in the Center are the College of Agricultural and Environmental Sciences and the Warnell School of Forestry and Natural Resources. These units currently, and will continue to provide the two faculty positions, administrative assistant position, office space and administrative support.

To develop the Center, we propose two UGA funded positions that are integral to the Center. The first position is the IT Director which is currently grant-funded. Grant funds released from UGA support of this position will allow filling of the IT support positions. The second position would be split between the Forest Health/IPM Specialist and the Invasive Species Specialist to support the basic infrastructure of the Center. Operating and travel funds to support these positions are also needed. The remaining portion of these positions will be covered with grant funds to support specific projects. UGA funding of these positions will allow Center staff to provide support for other UGA faculty and projects, as they will not be restricted by grant funding obligations.

The advisory committee will be made up of individuals from federal, state, NGO and industry working in invasives and ecosystem health on regional and national level. They will provide program focus and guidance for the Center. Advisory committee members will serve 2 year terms. Members of the advisory committee could be selected from:

U.S. Department of Agriculture

Forest Service

Cooperative State Research, Education and Extension Service

Animal and Plant Health Inspection Service

Natural Resource Conservation Service

Agricultural Research Service

U.S. Department of Interior

Fish & Wildlife Service

National Park Service

Geological Survey

State Agencies, Universities, Industries, and Non-governmental Agencies

Appendix

Bugwood Network Collaboration

University of Georgia (Current and perspective faculty collaborators)

College of Agricultural and Environmental Sciences

Crop and Soil Sciences

Stanley Culpepper, Associate Professor and Extension Weed Scientist, Tifton Campus

J. Michael Moore, Professor and Extension Agronomist – Tobacco, Tifton Campus

Tim R. Murphy, Professor Weed Science – Griffin Campus

Donn Shilling, Professor and Department Head, Athens Campus

Entomology

John All, Professor of Entomology, Athens Campus

Wayne Berisford, Professor of Entomology, Athens Campus

Kristine Braman, Professor of Entomology, Griffin Campus

Steve Brown, Interim Assistant Dean - Tifton Campus & Professor of Entomology

David Buntin, Professor of Entomology, Griffin Campus

James Dutcher, Professor of Entomology, Tifton Campus

Wayne Gardner, Professor of Entomology, REI Coordinator, Griffin Campus

Paul Guillebeau, Professor of Entomology, Athens Campus

William Hudson, Professor of Entomology, Tifton Campus

Tracie Jenkins, Assistant Professor of Entomology, Griffin Campus

Joseph McHugh, Professor of Entomology, Athens Campus

Robert McPherson, Professor of Entomology, Tifton Campus

David Riley, Associate Professor of Entomology, Tifton Campus

Phillip Roberts, Associate Professor of Entomology, Tifton Campus

Kenneth Ross, Professor of Entomology, Athens Campus

John Ruberson, Associate Professor of Entomology, Tifton Campus

Alton Sparks, Jr., Associate Professor of Entomology, Tifton Campus

Daniel Suiter, Associate Professor of Entomology, Griffin Campus

Horticulture

John M. Ruter, Professor, Tifton Campus

Gary L. Wade, Professor, Athens Campus

Plant Pathology

Bob Kemerait, Assistant Professor, Tifton Campus

David Langston, Assistant Professor, Tifton Campus

Jean L. Williams-Woodward, Assistant Professor, Athens Campus

County Extension Faculty:

Paul Pugliese, County Extension Agent - Cherokee County

Mickey P. Cummings, County Coordinator - Union County

J. Michael Harris, County Coordinator - White County

Gregory A. Sheppard, County Coordinator - Lumpkin County

Edward L. Ayers, County Coordinator - Fannin County

Michael J. Wheeler, County Extension Agent - Gilmer County

Robert N. Brewer, Jr., County Coordinator - Towns County

Jacob G. Price, County Extension Agent - Lowndes County

Tim Varnedore, County Coordinator - Jeff Davis County
R. Terry Thigpen, County Coordinator - Charlton County
W. Jerome Ethredge, County Coordinator - Seminole County
Tucker Price, County Extension Agent - Crisp County
P. Mark Crosby, County Coordinator - Emanuel County
Ronnie M. Barentine, County Coordinator - Pulaski County
William G. Tyson, County Coordinator - Effingham County
Donald W. Clark, County Coordinator - Thomas County
Charlie E. Ellis, III, County Coordinator - Dooly County
D. Eddie McGriff, County Coordinator - Coffee County
Ken L. Lewis, Program Development Coordinator - ANR Southwest District

Warnell School of Forestry and Natural Resources

Kim D. Coder, Professor of Forest Ecology
Sarah F. Covert, Associate Professor of Forest Biotechnology
E. David Dickens, Associate Professor of Forest Productivity
William G. Hubbard, Southern Regional Ext. Forester
Kris Irwin, Public Service Assistant – K-12 Education
Ben Jackson, Professor of Timber Harvesting and Intensive Forest Management
John Maerz, Assistant Professor of Wildlife
Michael T. Mengak, Associate Professor and Wildlife Specialist
Karl Miller, Professor of Wildlife Ecology and Management
Sara H. Schweitzer, Associate Professor of Wildlife Ecology and Management

Other Cooperating Organizations

United States

USDA Forest Service
Forest Health Protection, Forest Health Technology Enterprise Team (FHTET)
Forest Health Protection national and regional-levels
National Invasive Species program
Encyclopedia of the Appalachians – Forest Health
USDA Animal and Plant Health Inspection Service (APHIS) Plant Protection Quarantine (PPQ)
Cooperative Agricultural Pest Survey (CAPS)
Global Pest and Disease Database (GPDD)
The Center for Plant Health Science and Technology
Eastern Region Office
State Plant Health Director – Georgia
USDA Cooperative State Research, Education, and Extension Service
USDA Agricultural Research Service
USDA Natural Resource Conservation Service, PLANTS Database
U.S. Department of the Interior - Geological Survey
U.S. Department of the Interior - National Park Service
National Plant Diagnostics Network, Southern Region (SPDN)
NSF Center for Integrated Pest Management (CIPM)
The Nature Conservancy (TNC)
Exotic Pest Plant Councils (EPPCs)
Georgia Forestry Commission
Georgia Department of Agriculture, Plant Health Division
Joseph W. Jones Ecological Research Center
Maryland Invasive Species Council
Other Land-grant Universities

International

Australia

Pest and Disease Image Library (PaDIL), Museum Victoria

Croatia

University of Zagreb

Ministry of Agriculture, Forestry and Water Management

Czech Republic

Forestry and Game Management Research Institute, Praha

Europe, Mediterranean & Western Asia

European and Mediterranean Plant Protection Organization (EPPO), Paris, France

France

Department of Forest Health, Ministry of Agriculture and Food, Paris

Germany

Sächsische Forestry Institute, Pirna

Bavarian Forestry Institute, Freising

Technical University Munich, Freising

Great Britain

Commonwealth Agricultural Bureau, International (CABI)

Hungary

Forest Research Institute, Mátrafüred

University of West Hungary, Sopron

North America – U.S., Canada & Mexico

North American Forest Commission Exotic Forest Pest Information System

Poland

Forest Research Institute, Forest Protection Department, Sekocin

Slovak Republic

Forest Research Institute

Slovenia

Slovenia Forest Service, Ljubljana

Slovenia Forest Research Institute, Ljubljana

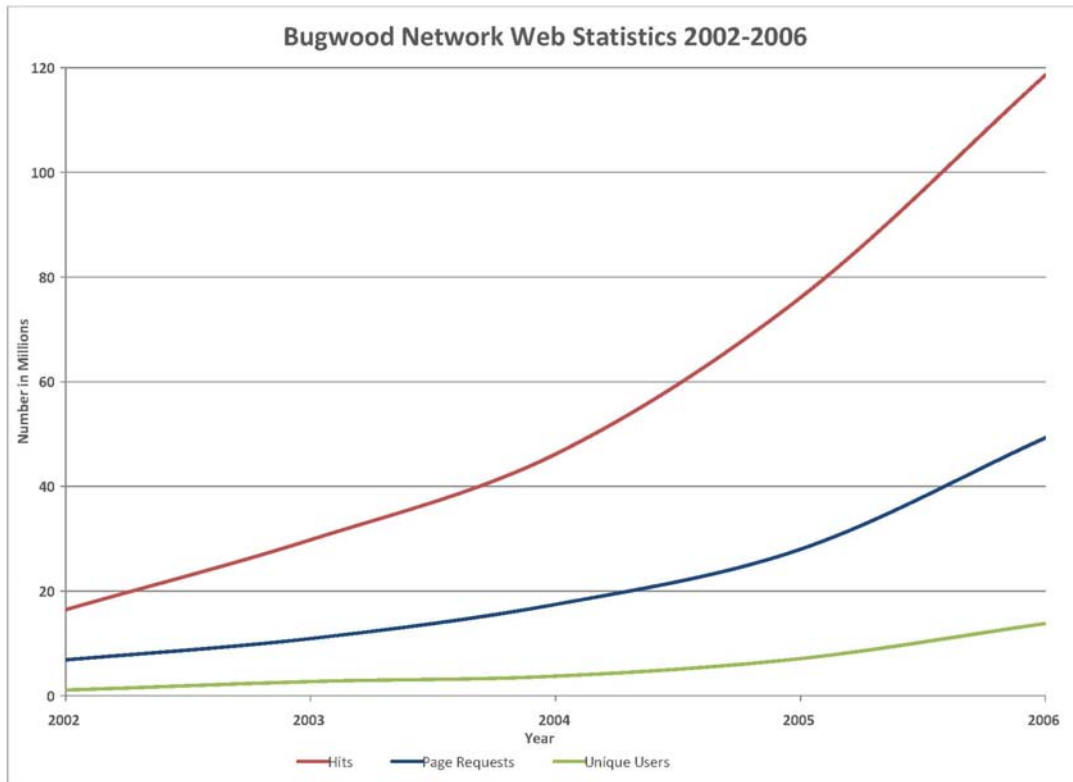
University of Ljubljana, Ljubljana

Bugwood Network Web Sites:

- Bugwood, www.bugwood.org
- Forestry Images, www.forestryimages.org
- Invasive and Exotic Species, www.invasive.org
- Insect Images, www.insectimages.org
- IPM Images, www.ipmimages.org
- Forest Pests of North America, www.forestpests.org
- Bark and Wood Boring Beetles of the World, www.barkbeetles.org
- Georgia Integrated Pest Management, www.gaipm.org
- Georgia Invasive Species Task Force, www.gainvasive.org
- Georgia Exotic Pest Plant Council, www.gaeppc.org
- Southeast Exotic Pest Plant Council, www.se-eppc.org
- Southern Forest Insect Work Conference, www.sfiwc.org
- Eastern Arc Mountains Information Source, www.easternarc.org
- Cogongrass in the Southeast U.S., www.cogongrass.org
- Regional Tropical Soda Apple Task Force, www.tropicalsodaapple.org

Bugwood Network Statistics 2002 – 2006

Year	Hits	Page Requests	Unique Users
2002	16,460,391	6,855,422	1,074,462
2003	29,815,932	10,939,191	2,700,267
2004	46,192,562	17,457,868	3,756,927
2005	76,112,321	28,029,233	7,129,119
2006	<u>118,620,844</u>	<u>49,302,906</u>	<u>13,834,540</u>
Total	287,202,050	113,075,659	28,529,315



Bugwood Network Funding - Grants and Cooperative Agreements

2006: \$135,791

- 2006 Georgia Cooperative Agricultural Pest Survey Program. USDA-APHIS-PPQ. \$63,839.
- Image support for Eastern Region Cooperative Agricultural Pest Survey Programs. \$15,000. USDA-APHIS-PPQ, Eastern Region.
- Forest-A-Syst USDA CSREES. \$35,152
- Cogongrass Initiative. USDA Forest Service-Georgia Forestry Commission. \$12,000
- Warnell Forest Education Center Southern Pine Beetle Demonstration. USDA Forest Service-Georgia Forestry Commission. \$9,800

2005: \$264,561

- Building an educational, training and outreach image support system for the Southern Plant Diagnostic Network. USDA-CSREES. \$60,000.
- Developing and extending through public awareness and outreach FHP Healthy Forest/Invasive Species information and programs using The Bugwood Network. USDA Forest Service, Northeast Region, Forest Health Technology Enterprise Team, FHP. \$76,261.
- Assisting USDA/FS, S&PF, Northeast Region, St. Paul Field Office implement programs using the ForestryImages system. USDA Forest Service, Northeast Region. \$5,000.
- Cooperative Agricultural Pest Survey Program. USDA APHIS PPQ. \$113,300.
- Image support for the Global Pest and Disease Database (GPDD). USDA APHIS-PPQ. \$10,000.

2004: \$327,665

- World Wide Web Access to US-wide Forest Health Digital Image Archive. USDA Forest Service. \$75,000.
- IPMImages: The Southeastern US Integrated Pest Management Image Archive and Database System. National Center for Integrated Pest Management, North Carolina State University. \$15,000.
- Travel support - International Union of Forest Research Organizations (IUFRO) meeting in Budapest, Hungary. University of Georgia Research Foundation Inc. \$1,425.
- University of Georgia Research Foundation Inc. The Office of International Agriculture, University of Georgia, University of Georgia Research Foundation Inc.. \$1000.
- Travel support - IUFRO Silviculture Meeting and University of Zagreb, Croatia. University of Georgia Research Foundation Inc. \$3,000.
- Cooperative Agricultural Pest Survey Program. USDA APHIS PPQ. \$111,440.
- Exotic Forest Pest Information System. USFS-FHP. \$20,000.
- Operation, upgrading and expansion of The Bugwood Network Forest Health Image Archive. USDA Forest Service Region 8. \$30,000.
- Linking Bugwood and USDA Digitop. USDA APHIS. \$10,000.
- Development of a digital archive of images to support the Global Pest and Disease Database (GPDD). USDA APHIS-PPQ. \$10,000.
- Invasive Plants & Silvicultural Guidelines for Integrated Vegetation Management in the South. USDA-Forest Service, Region 8. \$50,800 (two years).

2003: Eight Awards totaling \$170,450

2002: Five Awards totaling \$168,749

2001: Eight Awards totaling \$184,223

2000: Six Awards totaling \$161,188.

1999: Nine Awards totaling \$279,926

Bugwood Network Publications

2006

- Bargeron, C.T., G.K. Douce, D.J. Moorhead, C.W. Evans and R.C. Reardon. 2006. Forestry Images Development Methodology and Technology 1995-2005. FHTET-2005-14. U.S. Department of Agriculture, Forest Service, Forest Health Technology Enterprise Team. Morgantown, West Virginia, USA. 137 p.
- Douce, G.K., C.W. Evans, C.T. Bargeron and D.J. Moorhead. 2006. Georgia Plant Nursery Inspectors Pest Guide. The University of Georgia - Bugwood Network for the Georgia Department of Agriculture, March 2006. 4 p.
- Evans, C.W., D.J. Moorhead, C.T. Bargeron, K. Douce. 2006. Invasive plants reduce productivity and value of Georgia's forests. The University of Georgia - Bugwood Network, Georgia Forestry Commission and USDA Forest Service.
- Evans, C.W., D.J. Moorhead, C.T. Bargeron and G.K. Douce. 2006. Cogongrass *Imperata cylindrica*: One of the World's Worst Weeds Invades Georgia's Forests. The University of Georgia - Bugwood Network, the Georgia Forestry Commission, USDA Forest Service, USDA APHIS PPQ, Georgia Dept. of Agriculture, Georgia Dept. of Natural Resources and the Georgia Exotic Pest Plant Council.
- Evans, C.W., C.T. Bargeron, D.J. Moorhead and G.K. Douce. 2006. Invasive plants of Georgia's forests: Identification and control. Georgia Invasive Species Task Force, Georgia Forestry Commission, USDA Forest Service & The Bugwood Network, The University of Georgia. Tifton, GA, BW-2006-02. 12 p.
- Evans, C.W. and D.J. Moorhead. 2006. Invasive plants of Georgia's Coastal Plain. Georgia Forestry Today 2(4).
- Evans, C.W. and C.T. Bargeron. 2006. The Southeast EPPC Invasive Plant Mapping Project. Wildland Weeds. Fall 2006. p.30.
- Evans, C.W. and D.J. Moorhead. 2006. Incorporating invasive species management into your wildlife management plan. Wildlife Trends 6(3):28-33.
- Evans, C.W. and D.J. Moorhead. 2006. Invasive plants of the Piedmont. Georgia Forestry Today 2(2):42-45.
- Evans, C.W. and D.J. Moorhead. 2006. Invasive plants of Georgia's mountains. Georgia Forestry Today 2(3):20-21.
- Evans, C.W. and D.J. Moorhead. 2006. Invasive plants of the Southeast. Wildlife Trends 6(1):23-27.
- Evans, C.W. 2006. Field identification of cogongrass with comparisons to other commonly found grass species. The Bugwood Network, The University of Georgia. Tifton, GA. BW-2006-04. 24 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.

2005

- Bugwood Network. 2005. The hemlock wooly adelgid in Georgia. USDA Forest Service, Georgia Forestry Commission. CD-ROM
- Evans, C.W., C.T. Bargeron, D.J. Moorhead and G.K. Douce. 2005. Invasive weeds in Georgia: You can stop their spread. Georgia Invasive Species Task Force & The Bugwood Network, The University of Georgia. Tifton, GA, BW-2005-01. 23 p.
- Evans, C.W., D.J. Moorhead, C.T. Bargeron and G.K. Douce. 2005. Cogongrass: A new threat to Georgia. The Bugwood Network, The University of Georgia. Tifton, GA, BW-2005-02. 1 p.
- Evans, C.W., D.J. Moorhead, C.T. Bargeron and G.K. Douce. 2005. Cogongrass: One of the world's worst weeds invades Georgia. The Bugwood Network, The University of Georgia, Tifton, GA, BW-2005-03. 1 p.

- Evans, C.W., D.J. Moorhead, C.T. Bargeron and G.K. Douce. 2005. Identifying and controlling cogongrass in Georgia. The Bugwood Network, The University of Georgia. Tifton, GA, BW-2005-04. 4 p.
- Evans, C.W., C.T. Bargeron, D.J. Moorhead and G.K. Douce. 2005. Aquatic pests introduced from aquariums and water gardens. Georgia Invasive Species Task Force & The Bugwood Network, The University of Georgia. Tifton, GA, BW-2005-06. 7 p.
- Evans, C.W. and D.J. Moorhead. 2005. Pathways and prevention: Reducing the risk of invasive species on your land. Georgia Forestry Today November/December 2005:27-29.
- Evans, C.W. 2005. Cogongrass: An increasing threat to South Georgia. Wildland Weeds Spring 2005:17.
- Evans, C.W and D.J. Moorhead. 2005. Georgia EPPC events highlight emerging threats. Wildland Weeds Fall 2005:4-5.

2004

- Moorhead, D.J. G.K. Douce, and C. Evans. 2004. Forest Health: In Encyclopedia of Southern Appalachian Forest Ecosystems. USDA Forest Service Forest Encyclopedia Network. <http://forestencyclopedia.net/Encyclopedia/Appalachian>

2003

- Bargeron, C.T., D.J. Moorhead, G.K. Douce, R.C. Reardon, and A.E. Miller (Technical coordinators). 2003. Invasive plants of the eastern United States: Identification and control. CD ROM. USDA Forest Service Forest Health Technology Enterprise Team. FHTET-2003-08
- Moorhead, D.J., G.K. Douce, and C. Bargeron. 2003. Developing and delivering forest health information using the Bugwood Network and the ForestryImages archive. Pp. 127-131. In Proceedings: Society of American Foresters 2002 National Convention "Forests at Work" Winston-Salem, NC.

2002

- Douce, G.K., D.J. Moorhead, and C.T. Bargeron, IV. 2002. ForestryImages.org High resolution image archive and web-available image system. Journal of Forest Science. (Special Issue No. 2):77-79.
- Douce, G.K., D.J. Moorhead, and C.T. Bargeron. 2002. Forest Pest Control. CD-ROM. The Bugwood Network. Cooperative Extension Service, College of Agricultural and Environmental Sciences and The Warnell School of Forest Resources,. The University of Georgia. Special Bulletin 16.

2001

- Douce, G.K., D.J. Moorhead, and C.T. Bargeron. 2001. Forest insects and their damage: Bark beetles of North America - Volume III Conifer & hardwood beetles. SERA-IEG-12. Southern Cooperative Series Bulletin No. 386. CD-ROM
- Douce, G.K., D.J. Moorhead, and C.T. Bargeron. 2001. Forest insects and their damage: Bark beetles of North America - Volume IV. Southern pine beetles and associates. SERA-IEG-12. Southern Cooperative Series Bulletin No. 386. CD-ROM
- Douce, G.K., D.J. Moorhead, and C.T. Bargeron, IV. 2001. ForestryImages.org: High resolution image archive and web-available image system. In Proceedings: IUFRO Working Party 7.03-10 Methodology of forest insect and disease survey in Central Europe symposium. Czechia Pruhonice Praha. September 17 - 20. J. For. Sci. 47, Special Issue No. 2:77-79.
- Douce, G.K., D.J. Moorhead, and C.T. Bargeron, IV. 2001. The Bugwood Network: Information technology support for extension forestry programs in Georgia, USA. Pp. 179-188. In D. Race and R. Reid, eds. Proceedings: 5th IUFRO Extension Working Party S6.06-03 Symposium - Forestry extension: Assisting forest owner, farmer, and stakeholder decision making. October 2001 Lorne, Australia. Forestry Department - University of Melbourne.

2000

Douce, G.K., D.J. Moorhead, J.D. Ward, J. Mwangi, G.D. Hertel, and C.T. Barger, IV. 2000. Bugwood Africa: Using information technologies to address informational needs of forest and agroforestry integrated pest management in East Africa. Pp. 156-173. In J. Begus, J. Anderson, and R.L. Beck, eds. Proceedings: 4 th IUFRO Extension Working Party S6.06-03 Symposium - Working under a dynamic framework - forest ownership structures and extension. October 1999. Bled, Slovenia. Zavod za gozdove Slovenije - Slovenia Forest Service, 2000 -04-03.

1999

Douce, G.K., D.J. Moorhead, B.T. Watson, and C.T. Barger, IV. 1999. Forest pests of North America. Integrated Pest Management Photo CD Series. Special Bulletin 26. Three volume Photo CD-ROM set. The University of Georgia College of Agricultural & Environmental Sciences. Athens, GA.

1998

Douce, G. K., D. J. Moorhead, B. T. Watson and J. D. Ward. 1998. Supporting forest integrated pest management and sustainable forestry practices with Information Technology. pp. 21-31. (IN) R. Beck, ed.. Proceedings: Forestry Extension: Science and Practice for the 21st Century - International Union of Forestry Research Organizations (IUFRO) Working Party S6.06-03 Extension, Symposium 07.09 - 12.09.1997, Nairobi, Kenya. Publ. No. 2. December 1998. 162 pp.

Douce, G. K., J. D. Ward, J. Mwangi and D. J. Moorhead. 1998. Utilizing emerging information technologies to improve communication and meet the IPM information needs of forestry/agroforestry practitioners in Africa. pp. 148-154. (IN) Workshop Proceedings: IPM Communications and Information Workshop for Eastern and Southern Africa (ICWESA). Organized by the IPM Information Partnership. International Centre for Insect Physiology and Ecology (ICIPE), Nairobi, Kenya. March 1998. 165 pp.

1997

Cunfer, B. M., G. K. Douce, G. B. Padgett and A. E. Miller. 1997. Karnal Bunt *Tilletia (Neovossia) indica*. GACAPS 0297-1. 4 p.

Douce, G. K., A. E. Miller and B. T. Watson. 1997. Gypsy Moth: Stop The Spread. GACAPS 0697-1. Poster

Miller, A. E., G. K. Douce, T. R. Murphy, B. T. Watson and T. J. English. 1997. Small Broomrape, *Orobanche minor*. GACAPS 0497-1. 4 p.

Moorhead, D.J. and G. K. Douce. 1997. Mississippi forest pesticide training manual. Mississippi Department of Agriculture. 49 p.

1996

Douce, G.K., D.J. Moorhead, and B.T. Watson. 1996. Collection, development and delivery of forest integrated pest management images via CD ROM. Pp. 678-687. In F.S. Zazueta, ed. Sixth International Conference on Computers in Agriculture, Cancun, Mexico. American Society of Agricultural Engineers Publ. No. 701P0396.

Douce, G.K, D.J. Moorhead and B.T. Watson. 1996. Use of CD-ROMs to provide a repertoire of forest IPM digital information to clientele and user groups. Pp. 219-229. In R. Beck, ed. Proceedings: Approaches to Extension in Forestry - Experience and Future Developments, Freising, Germany. International Union of Forestry Research Organizations Extension Working Party (S6.06-03) Publ. No. 1.

Douce, G. K., T. R. Murphy and B. Watson. 1996. Wanted: Stop The Spread: Tropical Soda Apple *Solanum viarum* Dunal. GACAPS 0996-1. Poster

Moorhead, D.J., G.K. Douce. 1996. Development and application of CD ROM based forest management information for training private forest landowners and professional resource managers. Pp. 395-400.

In R. Beck, ed. Proceedings: Approaches to Extension in Forestry - Experience and Future Developments, Freising, Germany. International Union of Forestry Research Organizations Extension Working Party (S6.06-03) Publ. No. 1.

1995

Douce, G.K., G.J. Lenhard, B.T. Watson, and D.J. Moorhead. 1995. Forest insects and their damage. Southern Forest Insect Work Conference: SERA-IEG-12 Photo CDS: Vol I and II. Southern Cooperative Series Bulletin No. 383.

Facilities and Equipment

Eight Offices (with one assigned to USDA APHIS PPQ personnel), a 575 sq. foot computer laboratory, and a climate controlled fire resistant computer server room located at the University of Georgia – Tifton Campus in the old Administration Building of the Coastal Plain Experiment Station

Five Web Servers (14 web sites): Dell PowerEdge 1655, Intel Pentium III 1.4 Ghz, 1 GB RAM, 80 GB Mirrored Harddrives, Window 2003 Server, Macromedia ColdFusion 7

Forestry Images Web Server: Dell PowerEdge 2850, Intel Xeon 2.4 Ghz, 2 GB RAM, 136 GB Harddrives, Windows 2003 Server

Database Server: Dell PowerEdge 2850, Intel Xeon 3.0 Ghz, 2 GB RAM, 80 GB Mirrored Harddrives, Windows 2003 Server, Microsoft SQL Server 2000, Tape Backup

Image Server (jpegs): Dell PowerVault 725N, Intel Pentium 4, 2.4 Ghz, 2GB RAM, 750 gigabytes harddrive spaces in RAID5, MicrosoftWindows 2000 server

File Server: Dell PowerVault 725N, Intel Pentium 4, 2.4 Ghz, 2GB RAM, 750 gigabytes harddrive spaces in RAID5, MicrosoftWindows 2000 server

Image Server (tiffs): Dell PowerEdge 2800, Intel Xeon, 2.8 Ghz, 1GB RAM, 1 Terabyte harddrive space in RAID5, Microsoft Windows 2003 Server

Seven Personal Computers: Intel Pentium IV or AMD Athlon 64 computers with at least 1 gigabyte of RAM and at least 80 gigabytes of harddrive space running Microsoft Windows XP Service Pack 2, Microsoft Office 2003, Adobe Creative Suite 2 and/or Macromedia Studio 8.

Four Lab Computers: Intel Pentium IV or AMD Athlon 64 computers with at least 1 gigabyte of RAM and at least 80 gigabytes of harddrive space running Microsoft Windows XP Service Pack 2, Microsoft Office 2003, and Adobe Creative Suite 2

Four Laptop Computers: Intel Pentium IV or AMD Athlon 64 computers with at least 1 gigabyte of RAM and at least 80 gigabytes of harddrive space running Microsoft Windows XP Service Pack 2, Microsoft Office 2003

Scanners: UMAX Powerlook III flatbed scanner, Minolta Dimage Scan Multi Medium format Scanner, Sony UY S90 Film Scanner, Nikon Super Coolscan 4000 ED filmscanner

Printers: HP LaserJet 4050 Printer, HP Color LaserJet 4600 Printer, HP DesignJet 800 42" Plotter, Savin 2522 copier/printer/scanner

Other Equipment: Three 1000+ lumens computer projectors, Two Digital SLR cameras, and Three Digital Cameras

Bandwidth: Three T1 lines with five megabyte pipeline

BUDGET OUTLINE

PROJECT TITLE: Center for Invasive Species and Ecosystem Health
PROJECT PERIOD: 2007-2012

Section 1 - University of Georgia Funds - WSFNR/CAES

DESCRIPTION		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Moorhead - Co-Director		\$85,976	\$88,555	\$91,212	\$93,948	\$96,767	\$456,458
Douce - Co-Director		\$81,149	\$83,583	\$86,091	\$88,674	\$91,334	\$430,831
McAllister - Administrative Assistant		\$23,657	\$24,367	\$25,098	\$25,851	\$26,626	\$125,598
TOTAL SALARIES		\$190,782	\$196,505	\$202,401	\$208,473	\$214,727	\$1,012,888
FRINGE BENEFITS - Moorhead	26.00%	\$22,354	\$23,024	\$23,715	\$24,427	\$25,159	\$118,679
FRINGE BENEFITS - Douce	26.00%	\$21,099	\$21,732	\$22,384	\$23,055	\$23,747	\$112,016
FRINGE BENEFITS - McAllister	38.00%	\$8,990	\$9,259	\$9,537	\$9,823	\$10,118	\$47,727
TOTAL FRINGE BENEFITS		\$52,442	\$54,015	\$55,636	\$57,305	\$59,024	\$278,423
TOTAL PERSONNEL		\$243,224	\$250,521	\$258,037	\$265,778	\$273,751	\$1,291,310
Travel and Operating		\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$25,000
TOTAL COSTS		\$248,224	\$255,521	\$263,037	\$270,778	\$278,751	\$1,316,310

Section 2 - Extramural Grant Funds

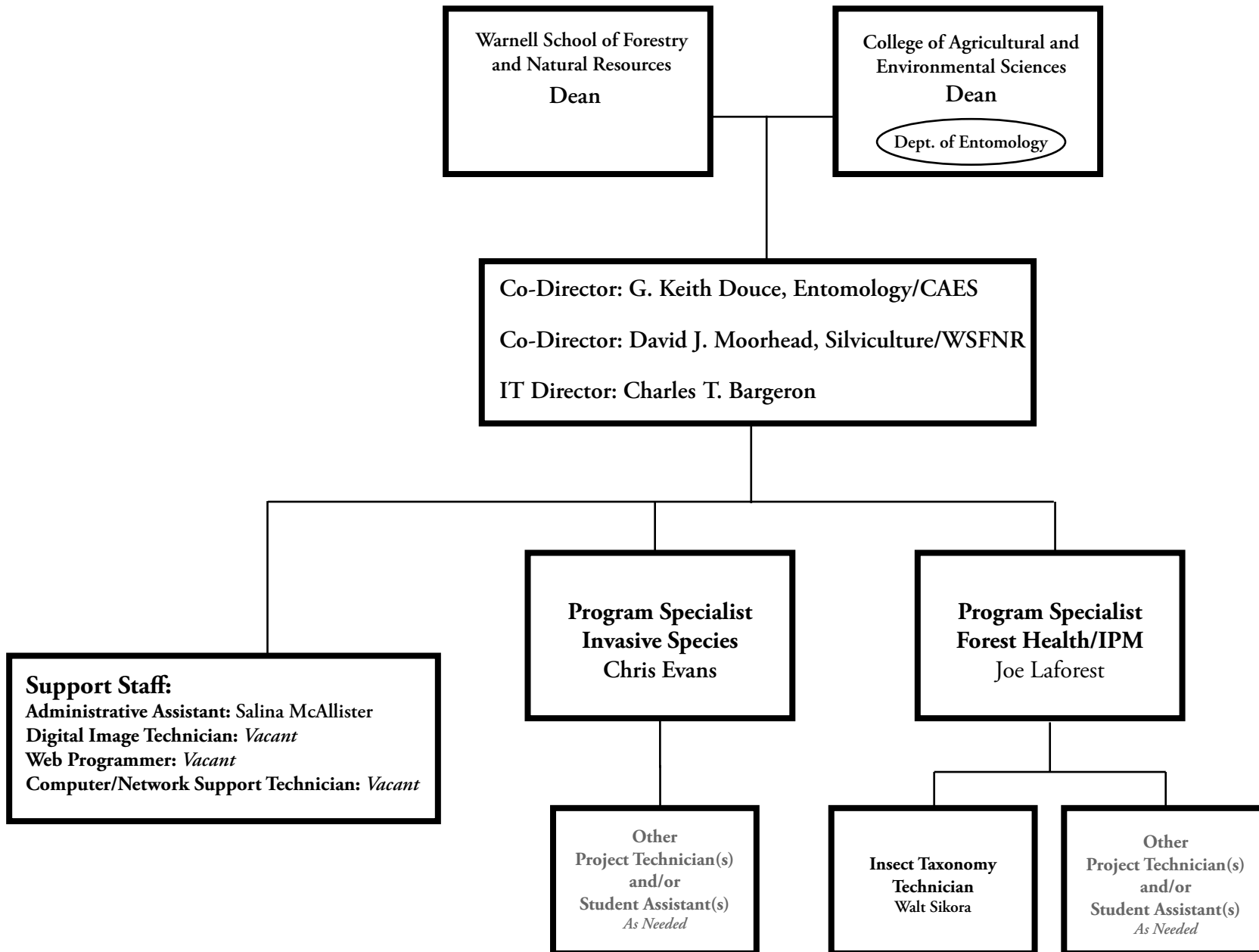
DESCRIPTION		YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Bargerion - IT Director		\$51,102	\$52,635	\$54,214	\$55,841	\$57,516	\$271,307
Evans - Program Specialist		\$38,663	\$39,823	\$41,018	\$42,248	\$43,516	\$205,267
LaForest - Program Specialist		\$32,375	\$33,346	\$34,347	\$35,377	\$36,438	\$171,883
Sikora - Technician		\$8,073	\$8,234	\$8,399	\$8,567	\$8,738	\$42,012
TOTAL SALARIES		\$130,213	\$134,039	\$137,977	\$142,033	\$146,208	\$690,470
FRINGE BENEFITS - Bargerion	26.00%	\$13,287	\$13,685	\$14,096	\$14,519	\$14,954	\$70,540
FRINGE BENEFITS - Evans	26.00%	\$10,052	\$10,354	\$10,665	\$10,985	\$11,314	\$70,540
FRINGE BENEFITS - LaForest	38.00%	\$12,303	\$12,672	\$13,052	\$13,443	\$13,847	\$53,369
FRINGE BENEFITS - Sikora	10.00%	\$807	\$823	\$840	\$857	\$874	\$15,965
TOTAL FRINGE BENEFITS		\$36,449	\$37,534	\$38,652	\$39,803	\$40,989	\$210,414
TOTAL PERSONNEL		\$166,662	\$171,573	\$176,629	\$181,836	\$187,197	\$900,884
Travel and Operating		\$32,000	\$32,000	\$32,000	\$32,000	\$32,000	\$160,000
TOTAL COSTS		\$198,662	\$203,573	\$208,629	\$213,836	\$219,197	\$1,060,884

Current and Anticipated Yearly Extramural Funds

CSREES Southern Region IPM (multi-year)	\$60,000
USDA Forest Service (multi-year)	\$76,261
Georgia Forestry Commission	\$21,800
USDA APHIS PPQ / Georgia Dept. of Ag.	\$63,840
USDA APHIS	\$15,000
Others	\$35,152
Total	\$272,053

Center for Invasive Species and Ecosystem Health

Proposed Organizational Chart - January 2007



Current Threats



hemlock woolly adelgid
Adelges tsugae^{4, 20}
250,000 acres of hemlock in GA
Provide shade and soil stabilization for trout streams (4000 miles in GA)
100,000 + trout fishermen
Kills trees in 2 to 4 years
\$9 million for research & suppression in eastern U.S. to date



gypsy moth
Lymantria dispar^{5, 20}
Attacks most hardwood trees
Causes widespread defoliation and reduces aesthetic, recreational, and wildlife values.
Recreation (hiking, fishing, camping, bird watching, etc) is \$1.7 Billion annually in GA
\$75,000 annually for detection surveys in GA
10,000 acres treated in GA over last 15 years



boll weevil
*Anthonomus grandis*⁶
First observed in 1915, eradicated 1991
Decreased cotton yields from 2.8 million bales annually to 112,000 bales annually
Eradication cost was \$99.3 million in GA
Continues to cost \$5.4 million annually in GA



tropical spiderwort
Commelina benghalensis^{7,8,9}
Tolerant to Roundup
90% of GA cotton is Roundup Ready
competes for water and nutrients and smothers the crops (cotton and peanuts)
20 - 40% yield reduction in cotton
40% + yield reduction in peanuts
195,000 acres in GA infested in 35 counties
\$1.2 million extra herbicide cost annually in cotton

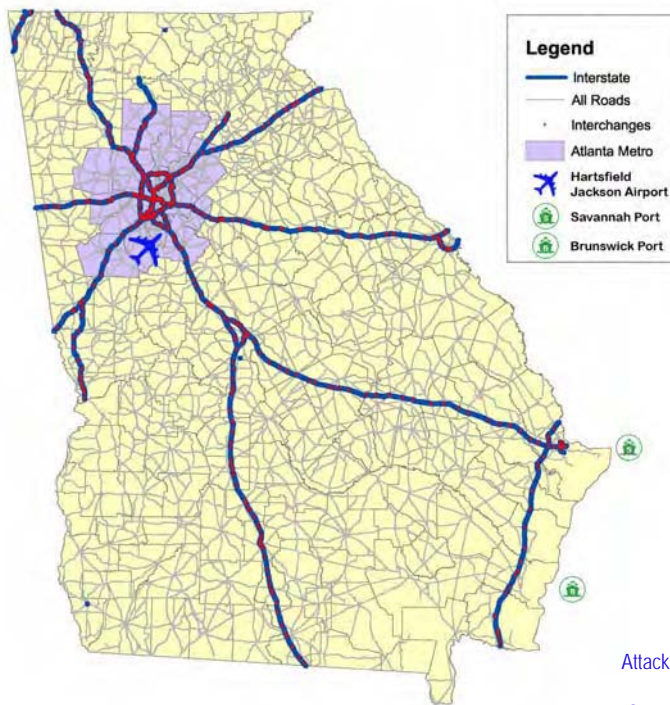


cogon grass
Imperata cylindrica^{10,11}
Has infested nearly 1 million acres in the Southeast U.S.
26 known locations in GA, mostly pine plantations
Burns hot and readily - wildfire/safety hazard
Spreading via contaminated equipment and road work
Forestry is a \$20.2 billion/year industry in GA



sudden oak death
Phytophthora ramorum^{12,13}
9.8 million acres of oak forests in GA, 15.6% of GA trees
Valued at \$33 billion for timber, wildlife, tourism & urban forests
Introduced by nursery trade - a \$1.31 billion/year industry
Currently positive only in some nursery plants in GA
Alternate hosts include - camellia, rhododendron, azalea & viburnum
Could devastate GA oaks if spreads to forests

Examples of Georgia's Invasive Species of Concern



Pathways

1244 miles of interstate highways¹

18.3 million tons of cargo handled annually through Georgia Ports²

767,897 metric tons of cargo handled annually through Hartsfield-Jackson Airport³

Potential Threats

Asian longhorned beetle
*Anoplophora glabripennis*¹⁴
Introduced in New York & Chicago
Destroyed 10,000 trees,
spent \$180 million to eradicate
Could kill 1/3 of urban trees nationwide
a compensatory value of \$669 billion



sirex woodwasp
Sirex noctilio^{15,16}
80% mortality of pines in Australia
Killed 1.75 million trees in one year
Slash and Loblolly pine both susceptible



garlic mustard
*Alliaria petiolata*¹⁷
Dominates hardwood understories
Restricts desired regeneration
Displaces native vegetation and wildlife forages



giant salvinia
*Salvinia molesta*¹⁸
Introduced as ornamental garden plant
Produces thick mats that disrupt aquatic food chain
Interferes with recreation, hydroelectric production, drinking water supplies, irrigation and aquaculture



old world bollworm
*Helicoverpa armigera*¹⁹
Attacks cotton, peanuts, tobacco, bermudagrass and pines
Reduced cotton yields 50-60% annually in China
Consumed half of foliage off 60% of pines in New Zealand
Developed resistance to insecticides
Introduction would restrict international trade



References

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- 2 - <http://www.gaports.com/>
- 3 - http://www.atlanta-airport.com/sublevels/airport_info/pdfs/Traffic/200512.pdf
- 4 - <http://www.georgiainvasives.org/hwa/hwpublic.pdf>
- 5 - <http://www.fs.fed.us/r8/foresthealth/idois/insects/gm.html>
- 6 - <http://pubs.caes.uga.edu/caespubs/pubs/PDF/RB428.pdf>
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- 9 - personal conversation Ted Webster, USDA ARS
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- 11 - <http://www.gfc.state.ga.us/Resources/Publications/ForestMarketing/GAForestProductsFacts.pdf>
- 12 - <http://www.georgiainvasives.org/sod/>
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- 19 - <http://www.aphis.usda.gov/ppq/ep/pestdetection/pr/harmigerapra.pdf>
- 20 - personal conversation James Johnson, GFC



BUGWOOD NETWORK

www.bugwood.org

information sources supporting forestry, natural resources and agriculture



Photo by David Cappert
USA2100048



Photo by James Miller, USFS
USA0016288

The University of Georgia

Daniel B. Warnell School of Forestry and Natural Resources and

Department of Entomology - College of Agricultural and Environmental Sciences

Funding and Support from:

USDA Forest Service - Forest Health Protection
USDA Forest Service - Forest Health Technology Enterprise Team
USDA APHIS PPQ, USDA CSREES and
NSF Center for Integrated Pest Management

The Bugwood Networks' mission is:

To gather, create, maintain, promote the use of, and distribute digital information as tools to enhance and complement information exchange and educational activities.



Interactive CD-ROMs



Web Sites

Expanding Extension, Service and Outreach to a global audience through use of the World Wide Web.

Web Sites include:

- Bugwood Network, www.bugwood.org
- Forestry Images, www.forestryimages.org
- Invasive and Exotic Species, www.invasive.org
- Insect Images, www.insectimages.org
- IPM Images, www.ipmimages.org
- Forest Pests of North America, www.forestpests.org
- Bark Beetles of North America, www.barkbeetles.org
- Georgia Integrated Pest Management, www.gaipm.org
- Georgia Invasive Species Task Force, www.gaimvasive.org
- Georgia Exotic Pest Plant Council, www.gaepc.org
- Southeast Exotic Pest Plant Council, www.se-epc.org
- Southern Forest Insect Work Conference, www.sfiwc.org
- Eastern Arc Mountains Information Source, www.easternarc.org
- Cogongrass in the Southeast US, www.cogongrass.org
- Regional Tropical Soda Apple Task Force, www.tropicalsodaapple.org

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- Text Books



Photo by Chris Evans, GSA
USA1264035

Forest Health



Forest Insects



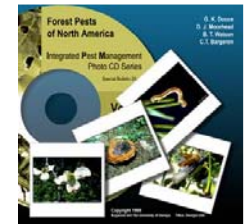
Forest Diseases

www.forestpests.org
Featuring USDA Forest Service
Forest Health Protection Publications



www.barkbeetles.org

Content available on 2-disc CD-ROM set with 192 high resolution images along with major publications on identification, distribution and management



Forest Pests of North America PhotoCD

- 300 high resolution images
- 150 insect images
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- Kodak PhotoCD format
- Full scientific descriptions
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Host and Develop the Southern Forest Insect Work Conference Website
www.sfiwc.org

Invasive Species



Insects



Diseases



Plants



Other Invasives

www.invasive.org

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Invasive Plants of the Eastern United States CD

- 97 species
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www.cogongrass.org



www.tropicalsodaapple.org



www.se-eppc.org

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- European & Mediterranean Plant Protection Organization
- Forestry and Game Management Research Institute - Czech Republic
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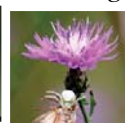
Clemson University - USDA Cooperative Extension Slide Series



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Submission Guidelines for Images

The Bugwood Network Image Archive is actively accepting image submissions. Your images will make the archive more useful. The Forestry Images website contains guidelines for submission of images (<http://www.forestryimages.org/contribute.cfm>) including details for submitting slides, digital images, negatives and line art, as well as editing and image handling guidelines. A summary follows.

Quantity - The Bugwood Network can work with any number of images, but receiving groups of 50-100 images or image files promotes efficient processing and does not burden the photographer with an extreme amount of documentation.

Quality - Original slides should be submitted whenever possible, as they provide better color and detail than slide copies. Digital scans and image files should be submitted at the highest quality and resolution possible to maximize the usefulness of the image.

Image Formats

Slides: Submit original slides in protective sleeves or boxes or digitized photographic slides on a compact disc (CD). Received slides will be scanned and then returned to the contributor.

Scan slides at a high resolution (2000 PPI or greater). Scanned image files typically should be 10 megabytes or larger. The file format should be uncompressed TIFF. The received TIFF files will be archived in their original state. Crop and rotate images as required prior to submission.

Digital camera image files: Submit high-resolution image files taken with a good-quality digital camera. Use at least a 4-megapixel digital camera if possible. Images should be taken at the largest size and best quality settings that the camera is able to produce. If sending JPEG files, please submit the best quality JPEG photos your camera can produce. Very good quality can be obtained in high-resolution JPEG files. However, if TIFF or RAW files are available, please send those, as they are the highest quality images. Send the least-edited, least compressed file available.

Package all submissions as securely as possible. Digital submissions can be sent on CD or DVD. We request e-mail notification that the materials are underway and the date that they were sent so that we can anticipate their arrival and can schedule image processing. We will do everything possible to ensure that the items are processed and returned expeditiously.

Regardless of how images are submitted, subject identification and descriptive information for each image must be provided.

Photographers are asked to join the Forestry Images system at <http://www.forestryimages.org/join/> to ensure current and correct affiliation and contact information.

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