



Invasive Species Program

GeoResources Institute, Mississippi State University



Invasive species are a significant problem for terrestrial and aquatic ecosystems in the United States, degrading their biodiversity and the ecosystem services they provide to our society. Despite this, little attention has been directed to this significant problem until the last decade, when federal and state governments and nongovernmental organizations alike have suddenly become painfully aware of this burgeoning problem.

While the awareness of the problem has been widespread, the reaction to this threat has not been uniform, and tools to deal with these problems are restricted. In particular, response within the Mid-South states lags behind that of other regions where more resources have been allocated towards dealing with invasive species.

Mississippi State University is developing and implementing a program of planned research, extension, and regional coordination to address these needs. Our approach is multidisciplinary, and involves biologists, ecologists, computer scientists, economists, engineers, and others acting together as a research team.



General Project Areas

Aquatic Invasive Plants

We are pursuing research in four areas of aquatic invasive plant early detection and management: remote sensing, modeling, assessment, and integrated management techniques. The major species of concern include waterhyacinth (*Eichhornia crassipes*), giant salvinia (*Salvinia molesta*), hydrilla (*Hydrilla verticillata*), and water primrose (*Ludwigia hexapetala*).

Terrestrial Invasive Plants

We are conducting research in three areas of invasive plant early detection and management: remote sensing, modeling, and assessment. Initial research efforts will be directed towards the highly aggressive cogongrass (*Imperata cylindrica*).

Invasive Invertebrates

The cactus moth *Cactoblastis cactorum* has migrated from introduction sites in the Caribbean to the Florida peninsula. If this species were able to migrate from Florida to the southwestern United States, which is dominated by *Opuntia* species, the community effects would be nothing short of catastrophic. We will be developing techniques for early detection of cactus moth and a national network for monitoring native cactus populations.

Extension and Outreach

We are developing instructional information, educational materials, outreach media, and advanced short courses and workshops on invasive plant ecology and management in support of efforts to manage invasive species in a coordinated fashion. The distribution and impact of these materials will be maximized by utilizing our connection to the national Extension Service system and system of Land Grant universities.

Regional Coordination

We are developing and implementing a task force of federal, state, and local government agencies, nongovernmental organizations and concerned citizens focused on the early detection and management of invasive noxious species in mid-southern states, which will initially be named the Mid-South Invasive Species Alliance (MISA). The organization will be tiered, with coordination at both the state and regional level. Our target states include Alabama, Arkansas, Louisiana, Mississippi, and Tennessee. The MISA will coordinate the sharing of data, act as a clearing house for locations of invasive species in the region, facilitate information exchange at the appropriate federal level, and act to coordinate funding of regional management efforts.

Mississippi State University Investigators, Areas of Expertise, and Topics

Richard Brown, Entomology & Plant Pathology: (moth@ra.msstate.edu) **Expertise:** Lepidoptera Ecology and Systematics **Topics:** Early detection of cactus moth, Distribution of *Opuntia* in the region, Cactus and cactus moth extension information

Lori Bruce, Electrical & Computer Engineering: (bruce@ece.msstate.edu) **Expertise:** Remote Sensing, Pattern Recognition, Digital Image Processing **Topics:** Remote sensing of aquatic and terrestrial invasive plants

John Byrd, Plant & Soil Sciences: (jbyrd@pss.msstate.edu) **Expertise:** Extension Weed Professor, Management of Invasive Weeds **Topics:** Remote sensing, Habitat invasibility models, Virtual plant models, Assessment, Cultivation intensity for cogongrass eradication, Terrestrial grass extension information, Cactus and cactus moth extension information, Web-based database of invasive species locations, Regional coordination

Eric Dibble, Wildlife & Fisheries: (edibble@cfr.msstate.edu) **Expertise:** Aquatic Food-Web Dynamics, Management of Aquatic Plants and Fish Habitat **Topics:** Environmental impact of invasive aquatic plants, Aquatic plant management extension information

Gary Ervin, Biological Sciences: (gervin@biology.msstate.edu) **Expertise:** Plant Ecology, Wetlands Ecology **Topics:** Habitat invasibility models for aquatic and terrestrial plants, Distribution of *Opuntia* in the region

John Madsen, GeoResources Institute and Plant & Soil Sciences: (jmadsen@gri.msstate.edu) **Expertise:** Aquatic Plant Ecology and Management **Topics:** Remote sensing, Habitat invasibility models, Virtual plant models, Growth of Giant Salvinia, Assessment of aquatic plant populations, Environmental impact of invasive aquatic plants, Invasive aquatic plant US database, Early detection of cactus moth, Distribution of *Opuntia* in the region, Aquatic plant extension information, Cactus and cactus moth extension information, Web-based database of invasive species locations, Regional coordination

David Shaw, GeoResources Institute and Plant & Soil Sciences: (dshaw@gri.msstate.edu) **Expertise:** Institute Director, Geospatial distribution of weeds **Topics:** Web-based database of invasive species locations, Regional coordination

Collaborators: We are collaborating with investigators from a number of federal and state agencies, including the following:

National Aeronautics and Space Administration

US Army Corps of Engineers

US Department of Agriculture – Agricultural Research Service

US Geological Survey, Biological Resources Discipline

Individuals:

Kurt Getsinger, USACE (ERDC) Vicksburg, MS: Integrated aquatic plant management, Aquatic plant extension information

James Grace, USGS NWRC: Habitat invasibility models

Annie Simpson, USGS: Cactus and cactus moth extension information, Web-based database of invasive species locations

David Spencer, USDA-ARS, Davis, CA: Virtual plant models

Tom Stohlgren, USGS: Invasive aquatic plant US database

Randy Westbrooks, USGS: Assessment of aquatic plant populations, Early detection of cactus moth, Distribution of *Opuntia* in the region, Cactus and cactus moth extension information, Web-based database of invasive species locations

Student Participation

Graduate and summer student opportunities are available. Students interested in educational opportunities should either contact the principal investigator listed above by their e-mail address, or send a general inquiry to: Dr. John D. Madsen, GeoResources Institute, Box 9652, Mississippi State, MS 39762-9652, Ph: 662-325-2428, Fax: 662-325-7692, E-mail: jmadsen@gri.msstate.edu

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