Gaining Ground on *Lygodium microphyllum*

E.M. Call¹, S. Duke-Sylvester², A.G. Snow¹, L.A. Brandt¹, D.L. DeAngelis⁴, and I.J. Gross⁵.

¹U.S. Geological Survey ²University of Tennessee ³U.S. Fish and Wildlife Service ⁴U.S. Geological Survey, Department of Biology, University of Miami

**Background:**
The Everglades ecosystem is under threat from invading species. One species that is spreading at an alarming rate is Old World Climbing Fern (*Lygodium microphyllum*). This native to Africa, Australia, Asia, and Melanesia was discovered as a naturalized population in 1965 in South Florida. The rapidity of this exotic’s invasion can be explained by its efficient reproductive strategies. Spores are released from fern fronds in the tree canopy and dispersed by wind. Each fertile leaf has the potential to produce 20,000 spores. To address *L. microphyllum* infestation within A.R.M. Loxahatchee National Wildlife Refuge, an optimal control model is being developed. The model incorporates information relating to spore dispersal patterns, levels of infestation, treatment costs, and effectiveness. This model will serve as a tool to aid managers in identifying the most efficient way to treat *L. microphyllum*.

**Study Objective:**
- Provide a method to collect all available data and suggest additional requirements.
- Provide a means to assess the impacts of alternative possible control schemes.
- Provide guidance to managers regarding the economics of control.

**What are our management goals?**
- Stop the spread of *L. microphyllum*.
- Keep infestation levels where plants are unable to reproduce.
- No new infestations over X number of years.
- Obtain maintenance control by 2017.

**Significance of results:**
The Optimal Control Model will serve as a tool that will allow managers to answer important questions such as:
- What is the most optimal control strategy, given treatment must occur in X amount of time?
- What is the best treatment strategy to attain maintenance control by 2017?
- How often do we have to treat to maintain maintenance control?
- Given a number of different treatment scenarios, what is the level of infestation for each for 5, 10, 15, 20 years post treatment?
- Which areas are best to treat to avoid spread?
- Given X amount of funding, what is the best treatment strategy?

**Acknowledgements:**
- The National Science Foundation funded model development and analysis through grant (DMS-0010920) to the University of Tennessee.
- Ken Runkle, INCOIS classification.
- U.S.FWS Science Support Project funded field work.

**Citations:**