

# Invasive Species and Ecosystem Ecology

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## Education

B.A. 1991. Department of Human Biology, Stanford University  
M.S. 1992. Department of Biological Sciences, Stanford University  
Ph.D. 1997. Department of Forest Science, Oregon State University

## Research Interests/Duties

Dr. Hughes interests lie in ecosystem-scale impacts of invasive species and land cover/land use change, fire ecology, carbon and nutrient storage and cycling, primary and secondary forest succession.

## Current Emphases, Studies, Projects

- Impacts of the fast-growing, N-fixing tree, *Falcataria moluccana*, on the function and structure of early successional lowland wet forests of Hawaii. Results indicate that *Falcataria* increases inputs of N and P via litterfall, increases rates of decomposition, and increases soil N and P availability relative to uninvaded, native-dominated stands. Such functional changes coincide with substantial alteration of forest structure as well. *Falcataria* hastens the loss of dominant native species and facilitates the invasion of other non-native species. Such N-fixing trees have the potential to alter nutrient status and cycling of streams and coastal zones in Hawaii and elsewhere in the Pacific. In collaboration with UH and Hawaii Department of Health scientists, we are conducting NOAA-funded research to determine how *Falcataria* alters stream chemistry and biology in watersheds of East Hawai'i.
- Effects *Falcataria* on densities of the invasive coqui frog. Invasive species also may have impacts across trophic levels. With UHH colleagues we are conducting NSF-funded research on the effects of increased resource availability from *Falcataria* trees on densities and rates of spread of the coqui frog.
- Use of remote sensing to investigate impacts of invasive species on ecosystem processes. We are collaborating with scientists from the Carnegie Institute of Washington and Stanford University to use state-of-the-art remote-sensing tools to quantify ecosystem characteristics (e.g., canopy N and P, forest structure, total aboveground water) and to evaluate the impacts of invasive species at scales from forests to landscapes and regions,
- Composition and structure of native lowland wet forests. With UH-PIPES interns we are studying the few remaining stands of native-dominated lowland wet forests in Hawaii to determine how they vary with regard to substrate age and type and how susceptible they are to invasion. Other studies include impacts of woody plant encroachment on C and N storage and cycling in temperate savannas of North Texas, and quantification of aboveground and soil C pools in Costa Rican forests along gradients of temperature, precipitation, and land use.

## Selected Publications

Allison, S.D., C. Nielson and R.F. Hughes. in press. Elevated enzyme activities in soils under the invasive nitrogen-fixing tree *Falcataria moluccana*. *Soil Biology & Biochemistry*.  
Aplet, G.H., R.F. Hughes and P.M. Vitousek. 1998. Ecosystem development on Hawaiian lava flows: biomass and species composition. *Journal of Vegetation Science* 9: 17-26.

- Asner, G.P., Steve Archer, R.F. Hughes, R. James Ansley and Carol A. Wessman. 2003. Net changes in regional woody vegetation cover and carbon storage in Texas Drylands, 1937-1999. *Global Change Biology* 9:316-335.
- Asner, G.P., A.J. Elmore, R.F. Hughes, A.S. Warner and P.M. Vitousek. 2005. Ecosystem structure along bioclimatic gradients in Hawai'i from imaging spectroscopy. *Remote Sensing of Environment* 96: 497-508.
- Cummings, D.L., J.B. Kauffman, D.A. Perry and R.F. Hughes. 2002. Aboveground biomass and structure of Amazonian Rainforests in Northern Rondônia, Brazil. *Forest Ecology and Management* 163: 293-307.
- D'Antonio, C.M., R.F. Hughes, M.C. Mack, D. Hitchcock and P.M. Vitousek. 1998. The response of native species to removal of invasive exotic grasses in a seasonally dry Hawaiian woodland. *Journal of Vegetation Science* 9: 699-712.
- D'Antonio, C.M., R.F. Hughes, and P.M. Vitousek. 2001. Factors influencing dynamics of two invasive C4 grasses in seasonally dry Hawaiian woodlands. *Ecology* 82:89-104.
- Denslow, J.S., A. Uowolo and R.F. Hughes. in press. Limitations to seedling establishment in a mesic Hawaiian forest. *Oecologia*.
- Denslow, J.S., and R.F. Hughes. 2004. Exotic Plants as Ecosystem Dominants. *Weed Technology* 18: 1283-1287.
- Elmore, A.J., G.P. Asner and R.F. Hughes. 2005. Satellite monitoring of vegetation phenology and fire fuel conditions in Hawaiian drylands. *Earth Interactions* 9:1-21.
- Hughes, R.F., S. Archer, G.P. Archer, C. A. Wessman, C. McMurtry, J. Nelson and R.J. Ansley. in review. Changes in primary production and carbon and nitrogen pools accompanying woody encroachment in a north Texas savanna. *Global Change Biology*.
- Hughes, R.F., and J.S. Denslow. 2005. Invasion by a N<sub>2</sub>-fixing tree alters function and structure in wet lowland forests of Hawaii. *Ecological Applications* 15: 1615-1628.
- Hughes, R.F., J.B. Kauffman and V.J. Jaramillo-Luque. 1999. Biomass, carbon, and nutrient dynamics of secondary forests in a humid tropical region of Mexico. *Ecology* 80:1892-1907.
- Hughes, R.F., J.B. Kauffman and V.J. Jaramillo-Luque. 2000. Ecosystem-scale impacts of deforestation and land use in a humid tropical region of Mexico. *Ecological Applications* 10:515-527.
- Hughes, R.F., J.B. Kauffman and D.L. Cummings. 2000. Fire in the Brazilian Amazon: 3. biomass, carbon, and nutrient dynamics in slashed second- and third-growth forests. *Oecologia* 124:574-588.
- Hughes, R.F., J.B. Kauffman and D.L. Cummings. 2002. Dynamics of aboveground and soil C and N pools and cycling of available N along a land use gradient in Rondônia, Brazil. *Ecosystems* 5:244-259.
- Hughes, R.F., and A.L. Uowolo. in review. Impacts of *Falcataria moluccana* invasion on decomposition in Hawaiian lowland wet forests: The importance of stand-level controls. *Ecosystems*
- Hughes, F., P.M. Vitousek, and T. Tunison. 1991. Alien grass invasion and fire in the seasonal submontane zone of Hawai'i. *Ecology* 72:743-746.
- Hughes, F., and P.M. Vitousek. 1993. Barriers to shrub re-establishment following fire in the seasonal submontane zone of Hawai'i. *Oecologia* 93:557-563.
- Kauffman, J.B., D.L. Cummings and R.F. Hughes. 1998. Biomass decline in Amazon forest fragments. *Science* 282: 1611.
- Kauffman, J.B., R.F. Hughes and C. Heider. in press. Dynamics of C and nutrient pools associated with land conversion and abandonment in Neotropical landscapes. *Ecological Applications*
- Kerr, S., S. Liu, A.S.P. Pfaff, R.F. Hughes. 2003. Carbon dynamics and land-use choices: building a regional-scale multidisciplinary model. *Journal of Environmental Management* 69: 25-37.
- Pfaff, A.S.P., S. Kerr, R.F. Hughes, S. Liu, G.A. Sanchez-Azofeifa, D. Schimel, J. Tosi and V. Watson. 2000. The Kyoto Protocol & Payments for Tropical Forest: An Interdisciplinary Method for

Estimating Carbon-Offset Supply and Increasing the Feasibility of a Carbon Market under the CDM. *Ecological Economics* 35: 203-221.

Woodward, S.A., P.M. Vitousek, K. Matson, F. Hughes, K. Benvenuto and P.A. Matson. 1990. Use of the exotic tree *Myrica faya* by native and exotic birds in Hawai'i Volcanoes National Park. *Pacific Science* 44:88-93.