

Dr. Tara Joy Massad

Gorongosa Master's in Conservation Biology Program Director
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Education

- 2009: PhD in the Department of Ecology and Evolutionary Biology, Tulane University
Dissertation Title: 'The efficacy and environmental controls of plant defenses and their application to tropical reforestation'
- 2004: Organization for Tropical Studies Graduate Tropical Ecology Field Course
- 1999: BS with Honors in Biology with minors in Chemistry, Spanish, and the Clark Honors College, University of Oregon, GPA 3.81
- 1998: Tropical ecology exchange program, Universidad de Costa Rica, GPA 4.0

Research, teaching, and leadership

- 2018-present: Gorongosa Master's in Conservation Biology Program Director, Gorongosa National Park
Oversee Gorongosa National Park's Master's in Conservation Biology program
Advise Mozambican master's students in thesis research
Teaching: Conservation Biology, Research Methods and Design
Research: Drivers of tropical forest diversity with a focus on community level effects of plant chemistry and plant-herbivore interactions, ecological restoration, savanna ecology
Oversee the Gorongosa National Park's BioEducation conservation internship and workshop program
- 2017-2018: Lecturer, Organization for Tropical Studies, South Africa
Teaching: Conservation, Savanna Ecology with an emphasis on field skills and data analysis
Research: Drivers of tropical forest diversity with a focus on community level effects of plant chemistry and plant-herbivore interactions, savanna community dynamics in a restoration setting
- 2015-2017: Assistant professor, Rhodes College, Memphis, TN
Teaching: Environmental Science (lecture and lab), Conservation Biology (lecture and lab), Conservation in Southern Africa (lecture and trip to Namibia), Introductory Biology (lecture and lab)
Research: Drivers of tropical forest diversity with a focus on community level effects of plant chemistry and plant-herbivore interactions, savanna community dynamics in a restoration setting, forest regeneration in urban parks
- 2014-2015: Research Manager, EO Wilson Laboratory, Gorongosa National Park
Research: Conduct studies on vegetation responses to the recovery of large animal populations, plant-insect herbivore interactions, Lepidoptera rearing, biodiversity surveys
Conservation: Develop programs for the control of invasive plants, collaborate on community conservation efforts, help obtain HHMI grant to support education programs for Mozambican students
Mentoring: Mentor Mozambican technicians in field and lab work, ecology tutoring, advise visiting scientists on research
Administration: Organize research logistics for biodiversity studies and for visiting researchers
- 2013-2014: Postdoc at the University of São Paulo; Dr. Massuo Kato, Dr. Chris Jeffrey, supervisors

Lab work: Measure plant secondary metabolite metabolomics using nuclear magnetic resonance spectroscopy, gas chromatography

Fieldwork: Measure herbivory and plant diversity in the Atlantic Rainforest

Data analysis: Community similarity measures of chemical diversity, structural equation modeling

2011-2013: Henry Chandler Cowles Lecturer in the Program on the Global Environment, University of Chicago

Teaching: Human Impact on the Global Environment, Restoration Ecology, Tropical Ecology, create and run a Tropical Conservation Field Course in Costa Rica

Research: Monitor sapling-herbivore interactions and sapling defenses in a high diversity reforestation project in Heredia, Costa Rica

2009-2011: Postdoc at the Max Planck Institute for Biogeochemistry; Dr. Sue Trumbore, supervisor

Fieldwork: Measure forest regeneration in large-scale fire experiment in Mato Grosso, Brazil (monitor seedling growth, herbivory, diversity)

Lab work: ¹³C isotope labeling of *Populus trichocarpa* seedlings to measure carbon allocation to phenolic glycoside secondary metabolites

Data analysis: Hierarchical split-split plot mixed modeling, repeated measures analyses, logistic regression, meta-analysis

2003-2009: Doctoral dissertation work on tropical reforestation and plant chemical defenses; Tulane University; Dr. Lee Dyer, advisor

Fieldwork: Initiate and monitor reforestation projects in Costa Rica and Brazil addressing the role of diversity and chemical defenses in reforestation

Lab work: Chemical analysis of saponin defenses using high performance liquid chromatography; photosynthesis measurements using a LI-COR 6400

Data analysis: Structural equation modeling, logistic regression, general linear models, meta-analysis

2003-2007: Graduate Teaching Assistant (teach general biology and ecology laboratories)

Oct.-Dec. 2005: Intern with the Conservation Science Program of World Wildlife Fund (conduct herbarium study of range-restricted plant family distributions)

Oct. 2000-Nov. 2002: Peace Corps Volunteer in Mozambique (teach high school biology and English)

Oct. 1999-Mar. 2000: Environmental Educator with AmeriCorps (teach middle school environmental education and physical science)

Jan.-Aug. 1999: Undergraduate Teaching Assistant at the University of Oregon (teach introductory biology laboratories)

1998-1999: Undergraduate honors thesis on zebrafish (*Danio rerio*) neural crest development; University of Oregon; Dr. Judith Eisen, advisor

Lab work: RNA synthesis, RNA injections, *in situ* hybridizations

Publications

Chinder, Hattas, **Massad**. Growth and functional traits of *Julbernardia globiflora* (Benth) resprouts and seedlings in response to herbivory and fire frequency in miombo woodlands. In revision at the South African Journal of Botany.

Wigley et al. (I am one of 21 authors). A handbook for the standardised sampling of plant functional traits in disturbance-prone ecosystems with a focus on savanna and grassland. In revision at the Australian Journal of Botany.

White, Stevens, Berndt, Coetzee, **Massad**, Nupen, Tye, Midgley. Conservation of the iconic Cape cedar: the benefit of a natural history approach. In press at Global Ecology and Conservation.

- Kattge et al. (I am one of over 100 authors). 2020. TRY plant trait database – Enhanced coverage and open access. *Global Change Biology* 26:119-188.
- Madera, Vanickova, Pompeiano, **Massad**, Vahalik. 2020. Terpenoid profiles of resin in the genus *Dracaena* are species specific. *Phytochemistry* 170:112197.
- Massad, Williams, Wilson, Hulsey, Deery, Bridges. 2019. Regeneration dynamics in old-growth urban forest gaps. *Urban Forestry & Urban Greening* 43:126364.
- Stalmans, **Massad**, Peel, Tarnita, Pringle. 2019. War-induced collapse and asymmetric recovery of large-mammal populations in Gorongosa National Park, Mozambique. *PLoS One*.
<https://doi.org/10.1371/journal.pone.0212864>
- Dyer LA, Philbin, Ochsenrider, Richards, **Massad**, Smilanich, Forister, Parchman, Galland, Hurtado, Espeset, Glassmire, Harrison, Mo, Yoon, Pardikes, Muchoney, Jahner, Slinn, Shelef, Dodson, Kato, Yamaguchi, Jeffrey. 2018. Modern approaches to study plant–insect interactions in chemical ecology. *Nature Reviews Chemistry* 2:50-64.
- Massad, Martins, Philbin, Oliveira, Cebrian Torrejon, Yamaguchi, Jeffrey, Dyer, Kato. 2017. Chemical community similarity and plant-herbivore interactions: Volatile similarity leads to increased herbivory and greater tropical forest diversity. *Ecology* 98:1750-1756.
- Massad, Castigo. 2016. Investigating possible effects of climate change on tree recruitment: Responses of abundant species to water stress in Gorongosa National Park. *South African Journal of Botany* 106:96-100.
- Balch, Brando, Nepstad, Coe, Silvério, **Massad**, Davidson, Lefebvre, Oliveira-Santos, Rocha, Cury, Thissella, Carvalho. 2015. The tolerance and susceptibility of southeastern Amazon forest to fire: Insights from large-scale experimental burns. *BioScience* 65:893-905.
- Massad, Balch, Lahís Mews, Marimon Jr, Porto, Mota Quintino, Vieira, Trumbore. 2015. Early responses of regenerating forest communities to interactions between frequent fires, nutrients, and herbivory in the southern Amazon. *Oecologia* 178:807-817.
- Massad, Trumbore, Ganbat, Reichelt, Unsicker, Boeckler, Gleixner, Gershenson, Ruehlow. 2014. An optimal defense strategy for phenolic glycoside production—*Populus trichocarpa* saplings simultaneously prioritize growth and defense. *New Phytologist* 203: 607-619.
- Dyer, **Massad**, Forister. 2015. The problem of scale in ecology *in* Hanley T and La Pierre K (eds) *Trophic Ecology: Bottom-Up and Top-Down Interactions across Aquatic and Terrestrial Systems*. Cambridge University Press.
- Massad, Balch, Davidson, Brando, Lahís Mews, Mota Quintino, Porto, Vieira, Marimon Jr, Trumbore. 2013. Interactions between fire, nutrients, and insect herbivores affect the recovery of diversity in the southern Amazon. *Oecologia* 172:219-229.
- Massad. 2013. Ontogenetic differences of herbivory on woody and herbaceous plants: A meta-analysis demonstrating unique effects of herbivory on the young and the old, the slow and the fast. *Oecologia* 172:1-10.
- Massad. 2013. Tropical seedling-insect interactions: Basic and applied examples of the importance of herbivory from the species to community level. Pp 309-326 *in* Busso CA (ed) *Seedlings: Ecology, Growth and Environmental Influences*. Nova Publishers, NY.
- Balch, **Massad**, Brando, Nepstad, Curran. 2012. Effects of high-frequency understory fires on woody plant regeneration in southeastern Amazonian forests. *Philosophical Transactions of the Royal Society B* 368:SI 20120157.
- Massad, Dyer, Vega. 2012. Costs of defense and a test of the predictive power of the carbon-nutrient balance and growth-differentiation balance hypotheses for saponins and phenolics in a neotropical tree. *PLoS One* 7(10): e47554. doi:10.1371/journal.pone.0047554
- Massad. 2012. Interactions in tropical reforestation—how plant defenses and polycultures can reduce growth-limiting herbivory. *Applied Vegetation Science* 15:338-348.
- Dyer, Wagner, Greeney, Smilanich, **Massad**, Robinson, Fox, Hazen, Glassmire, Pardikes, Fredrickson, Pearson, Gentry, Stireman. 2012. Novel insights into tritrophic interaction diversity and chemical ecology using 16 years of volunteer supported research. *American Entomologist* 58:15-19.
- Massad, Fincher, Smilanich, Dyer. 2011. A quantitative evaluation of major plant defense hypotheses, nature versus nurture, and chemistry versus ants. *Arthropod-Plant Interactions* 5:125-139.
- Massad, Chambers, Rolim, Jesus, Dyer. 2011. Restoration of pasture to forest in Brazil's Mata Atlântica: The roles of herbivory, seedling defenses, and plot design in reforestation. *Restoration Ecology* 19:257-267.

- Kattge J, et al. (I am one of over 100 co-authors). 2011. TRY – a global database of plant traits. *Global Change Biology* 17:2905-2935.
- Massad, Dyer. 2010. A meta-analysis of the effects of global environmental change on plant-herbivore interactions. *Arthropod-Plant Interactions* 4:181-188.
- Pearson, **Massad**, Dyer. 2008. Diversity cascades in alfalfa fields: From plant quality to agroecosystem diversity. *Environmental Entomology* 37:947-955.

Grants awarded

- 2020: Howard Hughes Medical Institute grant for the BioEducation Program at Gorongosa National Park (\$2,000,000 for five years)
I cowrote the proposal and am responsible for the programs the grant funds
- 2016: Mellon Grant Faculty Innovation Fellowship Program (\$7,500, one year)
- 2017: REU supplement to the Dimensions US-Biota São Paulo grant (below) to support two students in tropical fieldwork
- 2014: National Science Foundation and Fundação de Amparo à Pesquisa do Estado de São Paulo (São Paulo Science Foundation) Collaborative Research Grant (Dimensions US-Biota São Paulo): 'Chemically mediated multi-trophic interaction diversity across tropical gradients' (\$3.8 million, five years)
I am a collaborator on this grant and contributed to its development
- 2012: Eloise Gerry Fellowship from Graduate Women in Science (\$9,891.52, one year)
- 2007: Environmental Protection Agency Science to Achieve Results (STAR) Fellowship (\$5,000 in research funds for two years, living stipend for two years)
- 2007: Philanthropic Education Organization Scholar Award (\$10,000, one year)
- 2007: Torrey Botanical Society Research Grant (\$1,000, one year)
- 2006: Sigma Xi Research Grant (\$600, one year)
- 2005: Organization for Tropical Studies Fellowship for fieldwork (\$3,000, one year)
- 2004 & 2005: Center for Latin American Studies Summer Research Grant (travel and research stipend)
- 2004: Organization for Tropical Studies Post-Course Award for fieldwork (~\$1,500, one year)

Presentations and organized symposia

- 2017: National Conference on Undergraduate Research; Poster: 'Urban forest regeneration: Gap dynamics in Overton Park;' presented by student mentees
- 2013: Organized 'Conserving more than Carbon: Valuing biodiversity in a changing world' conference at the University of Chicago
- 2013: Gordon Research Conference on Plant-Herbivore Interactions; Poster: 'Interacting effects of fire, nutrient availability, and herbivores on the recovery of tropical forest diversity post-fire'
- 2013: Organized 'Social and biological impacts of rising seas and reduced lake levels' symposium at the Shedd Aquarium

- 2012: Ecological Society of America Annual Meeting; Talk: 'Post-fire regeneration dynamics in the southern Amazon—How early interactions between fire history, nutrient availability, and herbivory affect the recovery of diversity'
- 2012: Organized 'Wetlands, Wilderness, and Their Publics: Conservation, Policy, and Research as Problem and Practice' lecture series at the University of Chicago
- 2011: Ecological Society of America Annual Meeting; Talk: 'Recruitment diversity after fire in the southern Amazon'
- 2009: Ecological Society of America Annual Meeting; Talk: 'The chemical ecology of tropical reforestation'
- 2008: Association for Tropical Biology Annual Meeting; Poster: 'The chemical ecology of tropical reforestation'
- 2008: Participant in NSF Pan-American Advanced Studies Institute Program (PASI) on Interdisciplinary Studies in the Chemical Ecology of the Tropics, Peru
- 2006: Society for Conservation Biology Annual Meeting; Talk: 'The distribution and conservation status of restricted range vascular plant families'

Peer-review contributions

Co-editor of special volume of *Frontiers Plant Science* (<https://www.frontiersin.org/research-topics/6458/the-ecology-of-plant-chemistry-and-how-it-drives-multi-species-interactions>)

Reviews for *Ecology*, *The Journal of Applied Ecology*, *Functional Ecology*, *Oecologia*, *Oikos*, *PLoS One*, *Biotropica*, *Annals of Forest Science*, *Acta Oecologica*, *Arthropod-Plant Interactions*, *Trees-Structure and Function*, *Forest Ecology and Management*, *Forests*, and other journals

Grant reviewer for the National Science Foundation, Graduate Women in Science, The Netherlands Scientific Organization

Mentoring activities

- 2018: Mentor Mozambican students in Gorongosa National Park's Master in Conservation Biology Program
- 2017: Mentor Mozambican intern in the Gorongosa Biodiversity Science Education Program
- 2015-2017: Mentor Rhodes College students in urban forest regeneration project
- 2014: Mentor young Mozambicans in biodiversity surveys and ecological monitoring
- 2013-2014: Mentor Brazilian undergraduate students in lab and field work
- 2011-2013: Advisor for undergraduate theses in environmental studies at the University of Chicago
- 2010-2013: Co-advisor to master's student at the University of Mato Grosso, Brazil
- May and Dec. 2005-2008: Assistant leader for EarthWatch teams at La Selva and La Tirimbina Biological Stations in Costa Rica (training volunteers, coordinating and monitoring field and lab work for caterpillar and parasitoid diversity study)

Oct. 2007: Resource person on Organization for Tropical Studies Undergraduate Tropical Ecology Course at La Selva Biological Station (mentoring students and leading course field project)

June-Aug. 2005 & 2007: Mentor for Louisiana Alliance for Minority Participation (LAMP) students in summer research program (guiding students in chemical ecology lab work)

July 2005 & 2006: Assistant leader for EarthWatch teams of high school students at the Southwest Research Station in Arizona (mentoring and training volunteers, coordinating and monitoring field and lab work for caterpillar and parasitoid diversity study)

Outreach activities

May 2020-present: Red Cross volunteer

January 2019: Volunteer with Refugee for Refugees, Lesbos, Greece

July 2016, 2017: Gave 12 day workshops in conservation biology for Mozambican students at Gorongosa National Park

2017: Volunteer English as a Second Language tutor at the Refugee Empowerment Program, Memphis

2017: Career talk for the Memphis Graduate Women in Science chapter

2016-2017: Member of Rhodes College Farmers' Market steering committee

May 2016: Co-taught a short course in ecological methods for Brazilians at the University of Brasilia

2012-2013: Editor for Millennium Alliance for Humanity and the Biosphere newsletter

2012: Initiated a Graduate Women in Science chapter in Chicago

2012: Charter member of Graduate Women in Science International Chapter

2012: Reviewer for University of Chicago student Carnegie Award

2004-2008: Department representative in the Graduate School Student Association

2007-2008: President of the Ecology and Evolutionary Biology Graduate Student Club

2006-2007: Graduate Student Association Financial Officer

2006-2007: Graduate and Professional School Association Senator

Spring 2006: Tutor at New Orleans Science and Math High School

Honors and professional society memberships

2012: Graduate Women in Science lifetime member

2009: Ecological Society of America member

2006: Sigma Xi member

2005: Graduate Teaching Assistant of the Year Award from Tulane University

1999: Graduated Magna Cum Laude from University of Oregon

1998: Phi Beta Kappa member

Special skills

Fluent in Spanish and Portuguese

Advanced Conservation GIS course through the Smithsonian Institute, March 2009

References

Dr. Lee Dyer, PhD advisor, nolaclimber@gmail.com, 775-784-1360

Dr. Carolyn Jaslow, Chair of Biology Department, Rhodes College, cjaslow@rhodes.edu, 901-843-3563

Dr. Laurence Kruger, Director OTS South Africa, laurence.kruger@tropicalstudies.org, +27-82-422-6225

Dr. Sue Trumbore, Postdoc (research) supervisor, trumbore@bgc-jena.mpg.de, +49 (3641) 57-60

Dr. Chris Jeffrey, Postdoc (research) supervisor, cjeffrey@unr.edu, (775) 784-6688

Dr. Jeff Chambers, PhD co-advisor, jqchambers@berkeley.edu, 510-520-5874