




Renée Marchin Prokopavicius

Postdoctoral Research Fellow

Plant ecophysiologicalist who studies the effects of warming and drought on terrestrial plants at the leaf, species, and ecosystem scale. My research aims to determine which species or genotypes succeed in changing environments by measuring plant functional traits related to growth and survival – leaf gas exchange, phenology, high temperature tolerance, drought tolerance.

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Education

Ph.D., Plant Biology, 2013
North Carolina State University, USA

Dissertation: Using a physiological approach to improve predictions of climate change effects on temperate forests

M.A., Botany, 2006
University of Kansas, USA

Thesis: Population variation in *Fraxinus americana* L. (white ash) in a common garden at the edge of the species range

B.S., Environmental Science, 2003
Texas Christian University, USA

Magna cum laude, with Departmental Honors

Academic & Professional Career

ARC DECRA Fellow, 2020–present
Western Sydney University, Australia

Investigating how Australian tree species respond to extreme heat by tracking dynamic changes in water use during both natural and experimental heatwaves.

Postdoctoral Research Fellow, 2017–2020
Western Sydney University, Australia

Executed a series of glasshouse experiments for the Which Plant Where project to screen over 100 plant species for heat and drought tolerance. Results contributed to an online tool for helping urban practitioners select the right plant species for Australia's urban spaces as climate changes in the future.

Postdoctoral Research Fellow, 2014–2016
University of Sydney, Australia

Determined the effects of climate change on the phenology and carbon fluxes of a subalpine grassland in the Snowy Mountains.

EPA STAR Fellow, 2010–2013
North Carolina State University, USA

Examined responses of a temperate mixed forest to experimental warming, quantifying changes in transpiration, photosynthesis, phenology, and reproduction in understory plants.

Research Specialist III, 2006–2009
North Carolina State University, USA

Research technician and lab manager for Professor William Hoffmann, a tropical plant ecophysiologicalist. Duties included collection of ecophysiology data in North Carolina and Brazil, maintaining lab safety plan and lab equipment, purchasing lab supplies, and training students in lab procedures.

Conservation and Land Management Intern, 2006
Bureau of Land Management, USA

Monitored the effectiveness of efforts to restore degraded aspen stands to public lands throughout northern California.

Research/Teaching Assistant, 2004–2006

University of Kansas, USA

Analyzed differences in physiological traits, including water relations, photosynthetic capacity, and phenology, among 44 populations of *Fraxinus americana* (white ash) in a common garden in northeastern Kansas.

Field Technician/Organics Laboratory Technician, 2003–2004

Pace Analytical Services, USA

Collected wastewater, groundwater, soil and material waste samples from the field. Extracted semi-volatile organics such as PCBs, pesticides, and PAHs from soil and water samples for analytical testing at this environmental laboratory.

Grants

2020	NSW Department of Planning, Industry and Environment Greening our City Grant <i>Title:</i> Mitigating climate change in Western Sydney by maintaining green tree canopies <i>Co-researchers:</i> Paul Rymer (WSU), Mark Tjoelker (WSU), Western Sydney Regional Organisation of Councils Ltd (WSROC)	\$275,000 AUD
2020	Discovery Early Career Researcher Award (DECRA) , Australian Research Council <i>Title:</i> Green or crispy: Which plants use transpiration to survive heatwaves?	\$415,416 AUD
2010	STAR Graduate Fellowship , Environmental Protection Agency <i>Title:</i> Assessing the hydrological costs of carbon sequestration in managed forests and biofuel plantations	\$111,000 USD
2005	KSR Small Grants Program from University of Kansas Field Station	\$340 USD

Awards and Honors

2013	Kenneth R. Keller Award for excellence in Ph.D. research from North Carolina State University	\$2000 USD
2011	Africana Studies Project Scholarship from North Carolina State University	\$750 USD
2005	Benjamin Hall and Margaret Hall Foundation Scholarship from University of Kansas	\$2500 USD

Publications

2020

- 1 **Marchin RM**, Backes D, Ossola A, Leishman MR, Tjoelker MG, Ellsworth DS. 2021. Extreme heat increases stomatal conductance and drought-induced mortality risk in vulnerable plant species. *Global Change Biology*, 28: 1133-1146. DOI: 10.1111/gcb.15976.
- 2 Esperon-Rodriguez M, Power SA, Tjoelker MG, **Marchin RM**, Rymer PD. 2021. Contrasting heat tolerance of urban trees to extreme temperatures during heatwaves. *Urban Forestry & Urban Greening*, 66: 127387. DOI: 10.1016/j.ufug.2021.127387.
- 3 Tabassum S, Ossola A, **Marchin RM**, Ellsworth DS, Leishman MR. 2021. Assessing the relationship between trait-based and horticultural classifications of plant responses to drought. *Urban Forestry & Urban Greening*, 61: 127109. DOI: 10.1016/j.ufug.2021.127109.
- 4 Esperon-Rodriguez M, Rymer PD, Power SA, Challis A, **Marchin RM**, Tjoelker MG. 2020. Functional adaptations and trait plasticity of urban trees along a climatic gradient. *Urban Forestry & Urban Greening*, 54: 126771. DOI: 10.1016/j.ufug.2020.126771.
- 5 **Marchin RM**, Ossola A, Leishman MR, Ellsworth DS. 2020. A simple method for simulating drought effects on plants. *Frontiers in Plant Science*, 10: 1715. DOI: 10.3389/fpls.2019.01715.
- 6 **Marchin RM**, McHugh I, Simpson RR, Ingram LJ, Balas DS, Evans BJ, Adams MA. 2018. Productivity of an Australian mountain grassland is limited by temperature and dryness despite long growing seasons. *Agricultural and Forest Meteorology*, 256-257: 116-124. DOI 10.1016/j.agrformet.2018.02.030.
- 7 **Marchin RM**, Turnbull TL, Deheinzelin AI, Adams MA. 2017. Does triacylglycerol (TAG) serve a photoprotective function in plant leaves? An examination of leaf lipids under shading and drought. *Physiologia Plantarum*, 161: 400-413. DOI 10.1111/ppl.12601.
- 8 Carter JM, Orive ME, Gerhart LM, Stern JH, **Marchin RM**, Nagel J, Ward JK. 2017. Warmest extreme year in U.S. history alters thermal requirements for tree phenology. *Oecologia*, 183: 1197-1210. DOI 10.1007/s00442-017-3838-z.
- 9 **Marchin RM**, Stout AT, Davis AA, King JS. 2017. Transgenically altered lignin biosynthesis affects photosynthesis and water relations of field-grown *Populus trichocarpa*. *Biomass and Bioenergy*, 98: 15-25. DOI 10.1016/j.biombioe.2017.01.013.
- 10 **Marchin RM**, Broadhead AA, Bostic LE, Dunn RR, Hoffmann WA. 2016. Stomatal acclimation to vapor pressure deficit doubles transpiration of small tree seedlings with warming. *Plant Cell and Environment*, 39: 2221-2234. DOI 10.1111/pce.12790.
- 11 **Marchin RM**, Salk CF, Hoffmann WA, Dunn RR. 2015. Temperature alone does not explain phenological variation of diverse temperate plants under experimental warming. *Global Change Biology*, 21: 3138-3151. DOI 10.1111/gcb.12919.
- 12 **Marchin RM**, Dunn RR, Hoffmann WA. 2014. Are winter-active species vulnerable to climate warming? A case study with the wintergreen terrestrial orchid, *Tipularia discolor*. *Oecologia*, 176:1161-1172. DOI 10.1007/s00442-014-3074-8.
- 13 Hoffmann WA, **Marchin RM**, Abit PP, Lau OL. 2011. Hydraulic failure and tree dieback are associated with high wood density in a temperate forest under extreme drought. *Global Change Biology*, 17: 2731-2742. DOI 10.1111/j.1365-2486.2011.02401.x.

2015

2010

- 14 **Marchin RM**, Zeng H, Hoffmann WA. 2010. Drought-deciduous behavior reduces nutrient losses from temperate deciduous trees under severe drought. *Oecologia*, 163: 845-854. DOI 10.1007/s00442-010-1614-4.
- 15 **Marchin RM**, Bhandari RK, Wall WA, Hohmann MG, Gray JB, Hoffmann WA. 2009. Are rare species less shade tolerant than common species in fire-prone environments? A test with seven *Amorpha* (Fabaceae) species. *Plant Ecology*, 205, 249-260. DOI 10.1007/s11258-009-9614-3.
- 16 **Marchin RM**, Sage EL, Ward JK. 2008. Population-level variation of *Fraxinus americana* (white ash) is influenced by precipitation differences across the native range. *Tree Physiology*, 28, 151-159. DOI 10.1093/treephys/28.1.151.

Invited Presentations

2020

- 1 **Marchin RM**. 2021. Urban green infrastructure at 50 °C – Will street trees planted today survive the extreme temperatures of tomorrow? 3rd Street-scale greening for cooling and clean air in cities (SCAN) webinar (co-chaired by University of Surrey and University of Wollongong): Virtual Meeting.
- 2 **Marchin RM**, Backes D, Ossola A, Leishman MR, Tjoelker MG, Ellsworth DS. 2021. Surviving 50 °C – How hot is too hot for plant function? Australian Society of Plant Scientists: Virtual Meeting.
- 3 **Marchin RM**, Esperon-Rodriguez M, Tjoelker MG, Ellsworth DS. 2020. Urban tree responses to heat and drought: which species can survive future climate conditions? Ecological Society of Australia (Temperature Extremes Symposium): Virtual Meeting.
- 4 **Marchin RM**, Backes D, Tabassum S, Ossola A, Leishman MR, Tjoelker MG, Ellsworth DS. 2020. Plant responses to heat and drought: which species can survive future extreme climates? Ecological Society of America: Virtual Meeting.
- 5 **Marchin RM**. 2020. Plant responses to heat and drought: which species can survive future extreme climates? Department of Biological Sciences: Macquarie University, Sydney, NSW, Australia.
- 6 **Marchin RM**. 2020. Plant responses to heat and drought: which species can survive future extreme climates? Sydney Plant Ecophysiology Group: University of Technology, Sydney, NSW, Australia.
- 7 **Marchin RM**, Backes D, Burley H, Ossola A, Leishman M, Ellsworth DS. 2018. Finding species that can tolerate heat and drought in Australian cities. Ecological Society of America: New Orleans, LA, USA.
- 8 **Marchin RM**, McHugh I, Simpson RR, Ingram LJ, Balas DS, Evans BJ, Adams MA. 2017. Productivity of an Australian mountain grassland is limited by temperature and dryness despite long growing seasons. Sydney Plant Ecophysiology Group: University of Sydney, Sydney, NSW, Australia.
- 9 **Marchin RM**. 2016. Improving predictions of plant responses to climate change: Insights from plant ecophysiology. Barton Lab Group: University of Hawai'i at Mānoa, Honolulu, Hawaii, USA.
- 10 **Marchin RM**, Broadhead AA, Bostic LE, Dunn RR, Hoffmann WA. 2016. When predicting future trends in carbon and water cycles, should plant physiologists incorporate stomatal

2015

acclimation to vapor pressure deficit? Sydney Plant Ecophysiology Group: University of Technology, Sydney, NSW, Australia.

11 **Marchin RM**, Dunn RR, Hoffmann WA. 2015. Seeing the forest for the trees: Why species differences are important in predicting plant responses to warming. Grassland Sciences Group: ETH, Zürich, Switzerland.

12 **Marchin RM**, Salk CF, Hoffmann WA, Dunn RR. 2014. Heating up the forest: Effects of warming on a temperate forest understory in eastern North America. Sydney Plant Ecophysiology Group: Macquarie University, Sydney, NSW, Australia.

2010

13 **Marchin RM**, Ward JK. 2010. Population-level variation of *Fraxinus americana* is influenced by climate differences across the native range. Symposium on Ash in North America: Purdue University, West Lafayette, IN, USA.

Contributed Presentations

Oral Presentations:

1 **Marchin RM**, Backes D, Burley H, Ossola A, Leishman M, Ellsworth DS. 2018. Finding plant species that can tolerate heat and drought in Australian cities. Ecological Society of Australia: Brisbane, QLD, Australia.

2 **Marchin RM**, McHugh I, Simpson RR, Ingram LJ, Balas DS, Evans BJ, Adams MA. 2017. Productivity of an Australian mountain grassland is limited by temperature and dryness despite long growing seasons. OzFlux Annual Conference: Richmond, NSW, Australia.

3 **Marchin RM**, McHugh I, Simpson R, Evans B, Adams M. 2016. Climate effects on carbon and water fluxes of subalpine grasslands in the Snowy Mountains, Australia. Centre for Carbon, Water and Food Seminar: Camden, NSW, Australia.

4 **Marchin RM**, Broadhead AA, Bostic LE, Dunn RR, Hoffmann WA. 2016. Heating Up the Forest: How will stomatal acclimation to vapor pressure deficit affect plant transpiration in the future? Centre for Carbon, Water and Food Seminar: Sydney, NSW, Australia.

5 **Marchin RM**, Salk CF, Hoffmann WA, Dunn RR. 2014. Phenological responses of a temperate forest understory to experimental warming. Ecological Society of America: Sacramento, CA.

6 **Marchin RM**, Bostic LE, Wines AA, Dunn RR, Hoffmann WA. 2011. Experimental warming alters vapor pressure deficit: Quantifying the direct and indirect effects of warming on trees. Ecological Society of America: Austin, TX, USA.

7 **Marchin RM**, Bhandari RK, Wall WA, Hohmann MG, Gray JB, Hoffmann WA. 2009. Comparison of shade tolerance among common and rare *Amorpha* (Fabaceae) species. Fort Bragg Endangered Species Branch: Weymouth Woods, NC, USA.

8 Hoffmann WA, **Marchin RM**, Abit PP, Lau OL. 2008. High levels of embolism observed in temperate deciduous forest trees during extreme drought. Association of Southeastern Biologists: Spartanburg SC.

9 **Marchin RM**, Ward JK. 2006. Population variation in *Fraxinus americana* L. (white ash) in a common garden at the edge of the species range. KU Ecology and Evolutionary Biology Departmental Seminar: Lawrence, KS, USA.

10 **Marchin RM**, Ward JK. 2005. Physiological responses of *Fraxinus americana* (white ash) from different regions during wet and dry years in a common garden in Kansas. Ecological Society of America: Montréal, Canada.

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2005

- 11 **Marchin RM**, Ward JK. 2005. Physiological responses of white ash during wet and dry years in a common garden in Kansas. University of Kansas Field Station & Ecological Reserves luncheon: Lawrence, KS, USA.

Poster Presentations:

- 12 **Marchin RM**, Dunn RR, Hoffmann WA. 2012. Some like it hot? Growth responses to warming in a wintergreen understory orchid. Ecological Society of America: Portland, OR, USA.
- 13 **Marchin RM**. 2011. Water vs. Carbon: Quantifying resource trade-offs to maximize carbon uptake of tree species without stressing local water supplies. Environmental Protection Agency STAR Graduate Fellowship Conference: Washington DC, USA.
- 14 Hoffmann WA, **Marchin RM**, Abit PP, Lau OL. 2011. Hydraulic failure and tree dieback are associated with high wood density in a temperate forest under extreme drought. INTERFACE meeting, "How do we improve earth system models? Integrating earth system models, ecosystem models, experiments, and long-term data": Captiva Island, FL, USA.
- 15 **Marchin RM**, Ward JK. 2005. Growth and physiological responses of white ash from different regions in a common garden in Kansas. Ecological Genomics Symposium: Kansas City, KS, USA.

Teaching

- 2020–2021 **Which Species Can Survive Future Extreme Climates?**, Macquarie University
Guest Lecturer for Biological Sciences S1 Assessment (Masters)
- Plant Responses to Heat and Drought**, Macquarie University
Guest Lecturer for Plant Biology (Undergraduate)
- Keeping Cities Green in a 50°C World**, Western Sydney University
Guest Lecturer for Green Urbanscapes – Bio-physical functions and Services (Masters)
- 2014–2015 **Climate Change: Process, History, Issues** (AFNR 5801), University of Sydney (Masters)
- 2009 **Plant Life Laboratory** (PB 200), North Carolina State University
Evaluation Scores: 4.5 and 3.9 (out of 5.0)
- 2005–2006 **Plant Physiology Laboratory** (BIOL 409), University of Kansas
Evaluation Scores: 4.93, 4.88, 4.88, 4.72, and 4.47 (out of 5.0)
- 2004 **Introductory Biology Laboratory** (BIOL 102), University of Kansas
Evaluation Scores: 4.97, 4.76, and 4.75 (out of 5.0)

Leadership and Community Engagement

- 24 Jan. 2022 **Interview: ABC Radio Sydney, 702 AM**
Discussed which plant species are at risk, which species are tolerant, and implications for the future of urban planning in Sydney.
- 24 Jan. 2022 **Interview: ABC Illawarra, 97.3 FM**
Discussed which plant species are at risk, which species are tolerant, and implications for the future of urban planning in Sydney.
- 17 Jan. 2022 **Interview: Community Radio Show, 2SER 107.3 FM**
Discussed which plant species are at risk, which species are tolerant, and implications for the future of urban planning in Sydney.

- 20 Aug. 2021 **Interview: Live & Local Radio Show, 2BS 95.1 FM**
Discussed the Talks & Ideas Big Green program describing the importance of green places in cities.
- 19 Aug. 2021 **Q Theatre's Talks & Ideas: Big Green**
Keynote speaker and panel discussion about green spaces that were, are and could be within the changing landscapes of Penrith and beyond. Free community event open to the general public.
- 10 June 2020 **Webinar: Which Plant Where Opportunity Species**
Shared results of tolerant plant species that are not commonly sold or planted in Australia. Audience included Australian plant growers and practitioners.
- 2020 **Factsheet: Which Plant Where Environmental Suitability of Horticultural Plants**
This PDF describes results from glasshouse experiments, detailing which species are tolerant and vulnerable to heat and drought stress. Available for project stakeholders, including Australian plant growers and practitioners.
- 27 April 2018 **Interview: ABC Pacific Mornings Radio Show**
Discussed the importance of green places for our cities. For more information, see:
<https://www.whichplantwhere.com.au/blog/radio-interview-on-abc-radio-pacific-mornings-green-cities-with-dr-renee-prokopavicius/>
- 2017–2020 **Organizer: Sydney Plant Ecophysiology Group**
This group is comprised of ~60 academics from five major universities in the Sydney area, serving to foster collaboration, exchange of ideas, and social interactions among local plant ecophysiologicalists. Meetings typically have two speakers and are held six times per year.
- 2012–2013 **Publicity Committee Chair: NCSU Graduate Student Association**
Attended monthly meetings with other NCSU graduate student representatives.
- 2012–2013 **Coordinator: B.W. Wells Seminars in Plant Biology, NCSU**
Graduate students nominate, vote, and invite one speaker to give the departmental Plant Biology seminar each semester.
- 2011–2013 **Vice President: NCSU Plant Biology Graduate Student Association**
Leader for graduate students in Plant Biology. Designed a T-shirt and calendar to help raise funds.
- 2011 **NCSU Plant Biology Graduate Admissions Committee, Graduate Student Representative**
Attended meetings with faculty to discuss selection and acceptance of graduate students at NCSU.
- 2011 **Organizer: 6th Annual NCSU Plant Biology Graduate Research Symposium**
Ten students orally present their research at this whole-day research symposium.
- 27 April 2012 **Teaching: Fred Olds Elementary, Raleigh, NC, USA**
Gave a lesson on plant DNA to 5th grade class.
- 3 Feb. 2012 **Teaching: Hilburn Academy, Raleigh, NC, USA**
Gave a lesson on plant defenses to 3rd grade class.
- 7 Nov. 2011 **Teaching: Central Park School for Children, Durham, NC, USA**
Gave a tour and described research at the Duke Forest experimental warming site to 1st grade class.

For more information...

Media coverage:

- 29 Jan. 2022 **The Age**, As Melbourne heats up, the city's trees are changing
<https://www.theage.com.au/politics/victoria/as-melbourne-heats-up-the-city-s-trees-are-changing-20220127-p59rlh.html>
- 24 Jan. 2022 **The Sydney Morning Herald**, In a hotter Sydney, some trees will thrive while others will wither

<https://www.smh.com.au/national/nsw/in-a-hotter-sydney-some-trees-will-thrive-others-will-wither-20220119-p59pe5.html>

14 Jan. 2022 **Science News for Students**, In blazing heat, some plants open leaf pores — and risk death
<https://www.sciencenewsforstudents.org/article/heat-wave-plants-leaf-pores-death>

11 Jan. 2022 **The Conversation**, Without urgent action, these are the street trees unlikely to survive climate change
<https://theconversation.com/without-urgent-action-these-are-the-street-trees-unlikely-to-survive-climate-change-172758>

Nov. 2019 **HIE News**, DECRA funding success for research into the survival of plants in heatwaves
https://www.westernsydney.edu.au/hie/stories/hie_decra_2019

15 Feb. 2019 **ABC Gardening Australia**, Series 30 Episode 3
The Which Plant Where glasshouse experiments (designed and executed by R. Marchin Prokopavicius) were featured in this episode. For more information, see:
<https://www.whichplantwhere.com.au/blog/finding-the-limits-of-gardens-as-summers-intensify/>

Oct. 2018 **TERN Newsletter**, People using TERN: Renée Marchin
<https://www.tern.org.au/people-using-tern-renee-marchin/>

Personal References:

Professor William A. Hoffmann, Ph.D. Advisor
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