News from the Mountain Invasion Research Network

June 2022

MIREN has many ongoing projects, new publications, and has and will participate in upcoming conferences. Many regions are repeating the MIREN road survey for the fourth time. To keep up with all the happenings check out the website www.mountaininvasions.org to read the new blog posts and MIREN findings.

If you haven't done it yet: Follow MIREN on Twitter @MIREN_mountains for all the latest news. You are also welcome to follow and discuss MIREN project updates in our newly minted Slack environment.

Update from the core project – the MIREN road survey

The long-anticipated paper describing the MIREN protocol that monitors plant species along elevation gradients near roads has been published in Ecology and Evolution. Plans for the paper started during our discussions at the last MIREN meeting at the Furka Pass in Switzerland in autumn 2019. This paper will be your go-to resource to cite the MIREN methodology and survey design in any upcoming global or regional publication (link to the paper, link to the blogpost).

As the size of the data set grows, its value for biodiversity monitoring is increasing, and an aim of MIREN is to continue to repeat the surveys to monitor changes in biodiversity in mountains, add new regions, and increase access to the data. Please submit your MIREN road survey data, if you haven't yet! For data submission or questions, please contact the data managers: miren.data@gmail.com.

MIREN survey in Tenerife (top) and Argentina (bottom)

Road survey data published in Zenodo

The data collected during the MIREN road surveys until 2016 and presented in multiple papers beginning in 2007 were published in one place Zenodo doi:10.5281/zenodo.5529072. The data are free for download and can be used for research, meta-analyses, and teaching.

Call for proposals: Analyze the MIREN road survey data and join us in Chile!

Are you interested in plant ecology, community ecology, mountains, global change research, biodiversity patterns, microclimate effects on vegetation, trait-based ecology, macroecology, distribution modelling and/or invasion ecology?

The Mountain Invasion Research Network (MIREN) is inviting one interested PhD candidate, postdoc or researcher to its upcoming Steering Committee meeting from 20 to 25 November 2022 in Malalcahuello, Chile. The candidate is expected to propose and lead an analysis with the global MIREN road survey database as described in Haider, Lembrechts et al. 2022 Ecol Evol.

More information via this link.

Further updates from new and ongoing MIREN projects

MIREN microclimate

Jonas Lembrechts

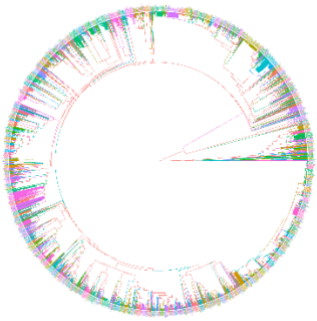
It has taken me (= Jonas) an awfully long time, but I'm finally picking up on the MIREN microclimate paper again. Based on the paired (road versus natural) soil temperature sensor data from Montana, Southern Chile, Southern Argentina, Canary Islands and Norway from 2018-2019, we aim to show the impact of road disturbance on mountain microclimate.

In the framework of the BiodivERsA-projects ASICS and RangeX (https://rangex.w.uib.no/ and https://www.coldregioninvasives.com) we are now also greatly expanding our monitoring of microclimate data in several MIREN-regions, with the latest package just starting its travels to the Kashmir team in the Himalayas. All this data will feed into the SoilTemp database, the global microclimate project led by Jonas, where it will help answer several important microclimate questions.

One of the main important projects in this regard is led by Rémy Beugnon (iDiv, Germany & CNRS, France), who is looking at the impact of plant diversity on microclimate buffering, a question that can uniquely well be answered by large-scale databases of both microclimate and plant community observations like MIREN has.

The DANCE continues

Andrea Galmán & Sylvia Haider



Phylogeny with all species recorded in the MIREN road survey

We reached a milestone and compiled a phylogeny including the >5'000 species from all MIREN road survey regions. With this, together with Jake Alexander, Lohengrin Cavieres, Curtis Daehler and Tim Seipel, and our iDiv project collaborator Marten Winter we now aim to solve Darwin's Naturalization Conundrum: are non-native species, which are phylogenetically closely related to the native plant community, *more* likely or *less* likely to establish? Elevation gradients seem to provide the answer! Stay tuned for the results and the publication!

Project: "DArwin's Naturalization Conundrum rEvisited (DANCE)" (PI: Sylvia Haider, Halle University, Germany), funded by the German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig.

MIREN mycorrhizae

Jan Clavel, Dajana Radujkovic, Jonas Lembrechts, Ivan Nijs

We are finishing-up two important papers on the role of plant-fungal interactions along mountain roads. Jan has explored the influence of roads and elevation gradients on the dominant mycorrhizal types in plant communities, using the MIREN road survey database, while Dajana is emerging from a deep-dive into interaction networks based on the DNA-analysis of the root samples in a selection of the MIREN roads.

MIREN @conferences

Southern African Mountain Conference

Back in March, several MIREN members participated in the first Southern African Mountain Conference (SAMC 2022) in the Maloti-Drakensberg mountains of South Africa, organized by the Afromontane Research Unit [https://www.ufs.ac.za/aru], the African Mountain Research Foundation and the Global Mountain Safeguard Programme. This interdisciplinary conference brought together researchers and practitioners from across southern Africa and the world and focused on a broad range of topics related to the sustainable future of the unique southern African mountains. Invasive species - including range expansions of several native woody species - are a major issue of concern in southern African mountains, and SAMC2022 featured a double session on this topic, with fascinating talks from across the region. We learnt how invasive plants can drain water resources and impact native biodiversity, and that invasions in mountains are expected to continue to expand in the future. But we also saw examples of how these species can sometimes be important resources for fuel, thatch and food, complicating the development of policies for their management. SAMC2022 was a huge success, not least for bringing together a community of scientists, practitioners and policy makers working on mountain invasions in southern Africa and spurring new research and collaborations into this topic.

Focus sessions at the International Mountain Conference

MIREN is organizing a focus session about range-expanding native and non-native species in mountains at the International Mountain Conference (IMC) taking place in Innsbruck, Austria, from September 11-15 2022. https://www.imc2022.info/portfolio/id45-native-and-non-native-species-range-expansions-in-mountains/

MIREN members also contribute to the focus session "Species trait changes under global environmental change"

https://www.imc2022.info/portfolio/id65-species-trait-changes-under-global-environmental-change/

Don't miss the exciting talks and posters!

News from MIREN regions

Chile

Chilean MIREN member Eduardo Fuentes defended his PhD at both the University of Concepcíon and the University of Antwerp, in a joint collaboration between the labs of Aníbal Pauchard, Lohen Cavieres, Ivan Nijs and Jonas Lembrechts. His PhD was about patterns and drivers of plant invasions in the Andes, and hammers on the need of slowing down or reducing anthropogenic disturbances in the region.

See for example the recent paper: Fuentes-Lillo, E., Lembrechts, J.J., Cavieres, L.A., Jiménez, A., Haider, S., Barros, A. & Pauchard, A. (2021): Anthropogenic factors overrule local abiotic variables in determining non-native plant invasions in mountains. Biological Invasions, 23, 3671-3686. https://doi.org/10.1007/s10530-021-02602-8

Australia

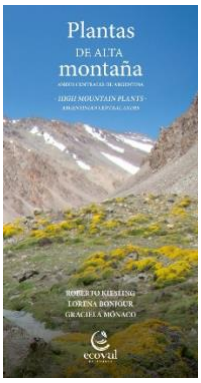
Genevieve Wright, Neville Walsh and Keith McDougall set out in early December to commence the resurvey of MIREN road transects. This was the fourth survey of the permanently marked plots, the first being in 2006-2007. Keith McDougall wrote a great blogpost on the MIREN website.

Argentina

Agustina Barros, Valeria Aschero, Alisa Alvarez, Lorena Bonjour

Argentinean MIREN members have completed the second MIREN road survey in Mendoza region (first survey in 2016) including three mountain roads in protected areas in the Andes. They have also participated in the RangeX and ASICS BiodivERrsA research projects (https://rangex.w.uib.no/ and https://www.coldregioninvasives.com). For this they have installed and surveyed permanent plots along the mountain road in Cordon del Plata Park following standardized protocols so to contribute in the global assessment of the impacts of range-expanding plants on soils and nutrients (RangeX) and the tolerance limits of native and non-native plants on mountain regions (ASICS).

Left: Re-survey along Villavicencio Mountain Road in Mendoza.
Right: Collecting soil samples for the RangeX BiodivERrsA research project.



Lorena Bonjour together with Roberto Kiesling and Graciela Monaco have published a book about the high mountain flora of the Argentinean Central Andes. Many of the pictures and descriptions of the species were collected during MIREN detailed road surveys. A total of 141 vascular plant species, mainly occurring in the alpine zone, are described. Book details are found here.

As part of a joint project between MIREN members in Mendoza and SUMA NATIVAS - a community collaborative research project to conserve native plant biodiversity in degraded lands - a native nursery has been built in a mountain village and permanent experimental plots have been installed during 2020-2021 to monitor the effectiveness of active restoration and the removal of the invasive woody shrub *Rosa rubiginosa* (sweet briar Rose). The project can be followed at IG @sumanativas

Experimental plots with active restoration and removal of the non-native *Rosa rubiginosa*

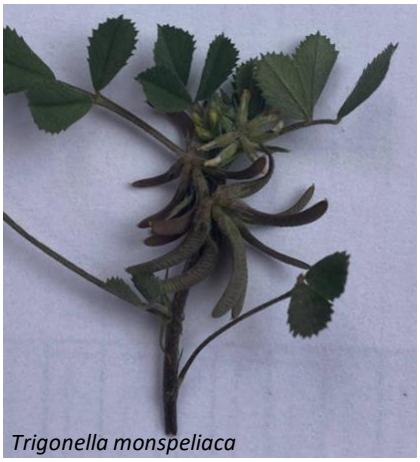
Native community nursery

Tenerife, Canary Islands

Amanda Ratier Backes, Meike Buhaly, Andrea Galmán & Sylvia Haider

This spring, Tenerife MIREN members completed the third MIREN road survey along three roads leading up to the Teide. They also installed equipment and completed soil sampling for the RangeX and ASICS BiodivERrsA projects.

During the MIREN road survey, a new species for the island of Tenerife was discovered! The small, unsuspecting plant was found in a middle elevation plot and was identified as *Trigonella monspeliaca*, a species found on other Canary Islands but never seen on Tenerife. This finding will likely be published in coordination with collaborators at the University of La Laguna.



Trigonella monspeliaca

Montana USA

Have you seen *Puccinia punctiformis* living in *Cirsium arvense*?

Cirsium arvense is a cosmopolitan weed found in many of the MIREN regions. Tim Seipel, Chris Larson, Dan Chichinsky, and Kara Hettinger are working on better management strategies for all elevations in Montana, USA. Part of the project will be to understand the distribution of genotypes and the primary mode of reproductive spread. This includes measuring populations in organic crop fields, pasture, forests, and roadsides. In addition, we are assessing its removal from plant communities as part of a larger RangeX project, and are using the species to help refine and define monitoring protocols for land managers in the Northern Rocky Mountains.

One aspect of the research is to explore how an obligate fungal pathogen infects and impacts *C. arvense* performance and competitive ability. If you have seen fungal rust pathogens on *Cirsium arvense,* especially *Puccinia punctiformis*, or are interested in a collaboration, snap a photo and send it to Tim Seipel timothy.seipel@montana.edu. Stay tuned for more updates, but in the meantime check out our blog post on the MIREN website and on our website.

Cirsium arvense infected with a rust *Puccinia punctiformis* in the urediniospore stage.

Chris Larson monitoring populations of *Cirsium arvense* in montane meadows in southwest Montana.

MIREN publications

Clavel, J., Lembrechts, J., Alexander, J., Haider, S., Lenoir, J., Milbau, A., ... & Verbruggen, E. (2021). The role of arbuscular mycorrhizal fungi in nonnative plant invasion along mountain roads. New Phytologist, 230(3), 1156-1168.

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