

# News from the Mountain Invasion Research Network

May 2019



## MIREN Core Projects

### MIREN road survey

We have been continually compiling species records and environmental data recorded using the protocol developed by MIREN to monitor plant biodiversity along elevation gradients and at different distances to roads. As of spring 2019, there are over 80,000 records of species from around the world. Records are from sixteen distinct mountain regions and in some of these regions the survey has been repeated every five years since 2007. As the size of data set increases, its value as biodiversity monitoring is increasing, and an aim of MIREN is continue to repeat the surveys to monitor changes in biodiversity in mountains.



Please submit your MIREN road survey data, if you haven't done yet! For data submission or questions, please contact the data managers: [sylvia.haider@botanik.uni-halle.de](mailto:sylvia.haider@botanik.uni-halle.de) or [timothy.seipel@montana.edu](mailto:timothy.seipel@montana.edu).

### MIREN trails

*Jonas Lembrechts & Agustina Barros*

The MIREN trail project is also approaching exciting months. Data collection for our rapid trail survey has been finished, and PhD student Ronja Wedegärtner (NTNU Norway, supervised by Bente Graae, Jonas Lembrechts and René van der Wal) is currently diving into the data analysis, with contributions from all continents except Antarctica turning this into a promising **global study of the role of climate versus vectors as key drivers of range distributions of non-native species** along trails.



For the T-trail survey, we currently have data submitted from 8 regions, and dedicated master- and/or PhD-students in Chile, Argentina (Mendoza) and Scandinavia (Dovre, Norway and Abisko, Sweden) working hard on regional papers and additional projects (e.g. our Mendoza team got funded to study disturbances and cushion plants using drones and to investigate visitor perception of non-native species). Data analysis of the **first T-trail global paper** will start shortly, lead by Agustina Barros.

You are still welcome to join the T-trail surveys, we are hoping to turn this into long-term surveys with a ~5 year resurvey rate as well.

## MIREN trait study

*Sylvia Haider & Amanda Ratier*

The MIREN trait project is developing nicely and we already have leaf samples from Australia, Montana, Norway, Southern Chile, Argentina-Patagonia and Argentina-Mendoza, Czech Republic and Tenerife. Currently, Colombia is doing the MIREN road survey and also collecting leaves. **You can still join the project!** However, we need your leaf samples by **September 2019**.



Our main objectives are to figure out how community traits and functional diversity of plant communities change with elevation, if the response to elevation differs between roadside and interior plots, and how non-native species change these patterns. For some regions we have some preliminary results. Interestingly, some traits (e.g. SLA) respond rather similar in all regions (decrease with elevation), while other traits (e.g. leaf nutrient concentrations) show region-specific responses. This highlights the importance of multi-region studies to better understand drivers of functional characteristics of plant communities and finally the mechanisms behind community assembly in mountain ecosystems. If you want to participate in the MIREN trait project, please contact [sylvia.haider@botanik.uni-halle.de](mailto:sylvia.haider@botanik.uni-halle.de).

## MIREN microclimate

*Jonas Lembrechts, Jonathan Lenoir & Ivan Nijs*

The MIREN microclimate project has been gathering speed! We currently received soil temperature data submissions from along MIREN roads and trails from 8 regions, with some more on the way, making us hopeful to top 10 regions before the summer. Currently, Jonas is focusing on database processing, and implementing the MIREN microclimate database into the larger SoilTemp-project (<https://soiltemp.weebly.com>), a database with data from already over 5000 soil temperature loggers. **A first regional paper** – using the MIREN soil temperature data from Norway and Sweden – is currently under review at GEB, proving the importance of soil temperature for species distributions. Next up (and the main focus of Jonas' work during the 2.5 remaining years in his postdoc) will be a first **global paper on the drivers of microclimate along macroclimatic gradients** (with the SoilTemp-database), and **a paper on the effect of disturbance on microclimate** (with the MIREN microclimate data specifically). Later on, the link between microclimate and species distributions will be modelled across all regions, and many more questions are waiting to be answered.

There are still possibilities to join with the MIREN microclimate (and the SoilTemp) project! If you have soil temperature data that you didn't submit yet, get in touch with [Jonas.lembrechts@uantwerpen.be](mailto:Jonas.lembrechts@uantwerpen.be). If you don't have microclimate loggers yet in your monitoring plots, we strongly recommend installing some! We will now experiment with TOMST TMS4 plant simulators (see picture), which also measure long-term soil moisture, surface and air temperature.



## MIREN Add-on network projects

### Whole-community transplant experiment

*Jake Alexander & Chelsea Chisholm*

We are working with data from the MIREN whole-community transplant experiment to ask questions about patterns of community turnover following climate warming (transplant to lower elevations), and in particular about the colonisation of novel species into the plant and soil communities (i.e species from the low-elevation transplant sites). The data from the MIREN sites are being merged with a larger dataset of similar whole-community transplant experiments from around the world (the TransPlant Network), led by postdocs Chelsea Chisholm (ETH Zurich), Dagmar Egelkraut (Uni Bergen) and Tom Walker (ETH Zurich). Currently, Chelsea, Dagmar and Tom are working hard on collating data from across the TransPlant Network. Last summer Tom and Chelsea were able to process soil samples from 12 gradients in order to characterise how transplantation into warmer elevations has influenced major soil processes and the below-ground soil community. They are still waiting on the results from their lab work, and hope to begin these analyses this summer once the data are in. Dagmar and Chelsea have also started to collate data on plant communities in these transplanted turfs in 16 regions from 9 countries and 3 continents. They are making great progress with this, and aim to have a complete dataset in later this spring. If you know of any other colleagues who may have transplanted-turf experiments along elevational gradients, please get in touch ([mtntransplant@gmail.com](mailto:mtntransplant@gmail.com)). We would love to add a few more sites at this stage, particularly from South America or Africa to decrease our geographical bias.

The website is:

<https://thetransplantnetwork.w.uib.no/>



### MIREN mycorrhizae

*Jan Clavel, Jonas Lembrechts & Ivan Nijs*

We have been successful with MIREN-related project applications with Ivan Nijs and Jonas Lembrechts in Belgium, with funded projects opening up a new topic in the direction of above- and belowground interactions, with a strong focus on mycorrhizae. We currently have a dedicated PhD-student (Jan Clavel, supervised by Ivan Nijs, Jonas Lembrechts and Erik Verbruggen, all UAntwerp), who will use the coming four year to develop this further. He is currently working **on a first regional (Scandinavian) paper** on the role of mycorrhiza as drivers of inhibitors of expansion for non-native species and will soon dive into the MIREN-database to explore patterns in mycorrhizal status of species along environmental gradients, which should result in **a global paper using the full MIREN road and trail database**.



At the same time, lab work is ongoing for a **multiregional analysis of above- and belowground interactions** as drivers of species distributions, in the framework of Jonas' postdoc and Jan's PhD. Soil and root samples are already collected in 4 MIREN-regions, and DNA-analyses are running smoothly in the belowground diversity lab at the University of Antwerp. If interested, it is still possible to join by collecting root- and soil samples in MIREN road or trails this summer (contact Jonas for more details).

Finally, Jan is setting up seed-addition experiments, focusing on Scandinavia, to test the role of seed viability and mycorrhizae as drivers of upward expansion. Again, it is still possible to join, with 2 levels of commitment: 1) harvest seeds of focal non-natives along elevation gradient and test viability in the lab, 2) set up seed addition experiment along elevation gradients (including disturbance, nutrient and mycorrhizal treatment). Contact Jonas for more information.

## Role of soil biota on treeline expansion

*Martin Nuñez*

Six regions (Argentina, Australia, Canarias, China, Montana and Kashmir) are currently participating and have tree seedling that will be harvested this year. Some regions are done with the experiment and others are just starting. Results so far have very interesting and sometimes unexpected, so more participants are very welcome to have a more global understanding. Interested parties should contact MARTIN NUÑEZ: [nunezm@gmail.com](mailto:nunezm@gmail.com).

## MIREN-associated individual projects

### Species movements along roads in the Australian Alps

*Keith McDougall, John Morgan, James Shannon, Neville Walsh & Gen Wright*

The MIREN survey plots in Australia occur in Victoria and NSW (3 roads and adjoining vegetation in both States). In addition to these plots, which are measured every five years, we have sampled from other roads in the mountains (but then only the road verge plot). In total there are 290 road plots, spread over 11 road networks. Next summer two further roads may be sampled in Victoria and another series may be established in the Australian Capital Territory.

We are currently investigating the patterns detected in non-native species and comparing the elevational distribution of native species along roads with that from floristic plot data to see whether they occur where expected. For any that don't we will model their future distribution to assess whether they are early climate change movers. We have 3376 floristic plots (recorded in natural vegetation) in and within 50 km of the Australian Alps for comparison with our 290 road plots (to compare local distribution) and > 10,000 beyond for broader comparisons.

We recorded 153 non-native species and 393 native species in the road plots. Preliminary analyses indicate that the area of disturbance on the road (verge width) dictates how many species colonise; with increasing disturbance you get more non-natives and fewer natives - this effect weakens with increasing elevation for non-natives but strengthens for native species. Some native species do appear to be moving to higher elevations; many are C4 grasses.

For more information, contact: [keith.mcdougall@environment.nsw.gov.au](mailto:keith.mcdougall@environment.nsw.gov.au)

## Effects of *Leucanthemum vulgare* on subalpine grassland

*Keith McDougall & Jackie Miles*

This project was set up in 2013 in Australia to assess the effect of the presence of *Leucanthemum vulgare*, a non-native daisy, on subalpine grassland. The initial treatments were 1) addition of *L. vulgare* seed to assess the effect of the presence of this species on native species richness and cover and 2) the effect of removing it using herbicide (a single application in 2014). Since more treatments have been added: disturbance (using slashing), grazing by large herbivores (fenced and unfenced) and *L. vulgare* mulching (stems spread onto plots to assess allelopathic effects). Plots are measured annually in January.

Herbicide reduced native species richness (as well as *L. vulgare*) and that has only recently returned to control levels. An effect of *L. vulgare* presence on native species richness (a reduction) was first detected in 2018, five years after adding seed. The experiment will run for at least another 3 years.

We also hope to establish studies on differences in pollinators and soil fauna between dense infestations and uninvaded areas. Biological control agents will probably be released in a few years – they are currently being tested for off-target effects.



For more information, contact: [keith.mcdougall@environment.nsw.gov.au](mailto:keith.mcdougall@environment.nsw.gov.au)