

Post-doctoral position:
High-resolution predictive mapping of soil pH and temperature:
modelling and performance assessment at different scales

Working activities:

Predictive maps of abiotic factors related to climate or soil (Ninyerola *et al.*, 2000, McBratney *et al.*, 2003) are used to evaluate the spatial distribution of trees, their potential growth, and their fitness (Guisan and Zimmermann, 2000; Bontemps *et al.*, 2009). Current (low) resolution of global abiotic digital maps contrast with the resolutions typically perceived by organisms and relevant for management (e.g. tree species management, or climate change vulnerability assessment, Rorison *et al.*, 1986; Piedallu *et al.*, 2011). The successful candidate will lead the “*rescale project*”. *Rescale* aims at assessing the power of digital maps calculated at national or regional scale to describe local spatial variations. This work will focus on two key parameters in ecological analysis: soil nutrition (pH) and climate (mean monthly temperature). This ongoing project makes use of several ready-to-use databases and initial modeling efforts, including the national forest inventory program of the French National Geographic Agency (IGN), pH bioindication techniques (Gegout *et al.*, 2003), and several hundred homogenized temperature series from Météo France for climate (Gibelin *et al.*, 2014).

Tasks and expectations:

- Using existing data and experience acquired by the EcoSILVA team (Gegout *et al.*, 1998; Piedallu *et al.*, 2016), build pH and temperature digital maps at different spatial scales using variables related to geology, topography and past land use for pH, and topography, land use, or distance to the sea for temperatures.
- Model validation at different scales using ground survey data (temperature and pH data at regional and local scale, most of them being already collected).
- Lead at least 2 papers.
- Collaborate to master students interns training and supervision, who will develop project tasks.

Working environment:

The EcoSILVA team (“Ecology of Forests and semi-natural Ecosystems”) belong to the SILVA laboratory (https://www6.nancy.inra.fr/silva_eng/UMR-Silva). The EcoSILVA team analyses the mechanisms linking environmental factors (mostly climate and soil) to the evolution of semi-natural ecosystems, mainly forested but also including grasslands. We study vulnerability, adaptation and resilience of trees and ecosystems to disturbances as climatic accidents, biotic hazards and long term evolutions of climate, fertility and management practices, at time scales varying from the season to the century. Research is focused (i) on changes in tree growth and tree health, and mechanisms that can lead either to their mortality or resiliency, and (ii) on changes in herbaceous communities, in relation with climate change, nitrogen deposition, land use or management change, changes in density of wild ungulates. The aim of this research is to detect and quantify the relative impact of

environment changes on ecosystems, and also to identify tree and herbaceous species or communities that are particularly sensitive to these changes, as well as the mechanisms and functional traits driving their vulnerability.

Keywords :

Plant ecology, statistical modelling, soil and climate data, geographic information systems, database management, forest.

Training and skills required:

We are seeking a highly motivated Postdoctoral Research Fellow with a PhD in **forest science, ecology, geomatics, environmental science, climate science, or soil science** qualified with **one or two first authored publications** in an internationally recognised peer-reviewed journal. Statistical modelling and computer programming experience with software such as R are mandatory, GIS-based model development, experience or strong interest in climate or soil science, plant ecology, database management would be an asset.

Application deadline and requirements:

To be considered for this position, applications must address the selection criteria above, and attach:

- a CV (including a list of publications)
- a motivation letter sent separately (up to 2 p.) with a statement of research interests and achievements, describing its qualifications for the proposed work (including a list of 2 referees).

Please send your application by Email at: christian.piedallu@agroparistech.fr

Duration and starting date: 16,5 months position beginning October, 1st 2018.

Salary: gross salary: 2200 € net salary: 1800 €, per month.

Deadline for application : August 20th , 2018

Research Unit and Location:

Agroparistech, EcoSILVA Team, 14 rue girardet, Nancy, France
<http://www2.agroparistech.fr/Centre-de-Nancy-733.html>

Contact:

Contact : Christian Piedallu, Email christian.piedallu@agroparistech.fr
https://www.researchgate.net/profile/Christian_Piedallu

References:

Bontemps, J.D., Hervé, J.C., Dhôte, J.F., 2009. Long-Term Changes in Forest Productivity: A Consistent Assessment in Even-Aged Stands. *Forest Science* 55, 549-564.

Gegout, J.C., Herve, J.C., Houllier, F., Pierrat, J.C., 2003. Prediction of forest soil nutrient status using vegetation. *Journal of Vegetation Science* 14, 55-62.

Gegout, J.C., Hervé, J.C., Houllier, F., Pierrat, J.C., 1998. Using vegetation to predict PH in the Vosges mountains Forests. p. 17.

Gibelin, A., Dubuisson, B., Corre, D., Deaux, N., Jourdain, S., Laval, L., Piquemal, J., Mestre, O., Dennetière, D., Desmidt, S., Tamburini, A., 2014. Évolution de la température en France depuis les années 1950. Constitution d'un nouveau jeu de séries homogénéisées de référence. *La météorologie* 87, 45-53.

Guisan, A., Zimmermann, N.E., 2000. Predictive habitat distribution models in ecology. *Ecological Modelling* 135, 147-186.

McBratney, A.B., Mendonca Santos, M.L., Minasny, B., 2003. On digital soil mapping. *geoderma* 117, 3-52.

Ninyerola, M., Pons, X., Roure, J.M., 2000. A methodological approach of climatological modelling of air temperature and precipitation through GIS techniques. *International Journal of Climatology* 20, 1823-1841.

Piedallu, C., Gégout, J.-C., Bruand, A., Seynave, I., 2011. Mapping soil water holding capacity over large areas to predict potential production of forest stands. *Geoderma* 160, 355-366.

Piedallu, C., Gegout, J.C., Lebourgeois, F., Seynave, I., 2016. Soil aeration, water deficit, nitrogen availability, acidity and temperature all contribute to shaping tree species distribution in temperate forests. *Journal of Vegetation Science* 27, 387-399.

Rorison, I.H., Sutton, F., Hunt, R., 1986. Local climate, topography and plant-growth in Latkill-Dale NNR. A 12 year summary of solar radiation and temperature. *Plant Cell and Environment* 9, 49-56.