Building on our knowledge of the Earth's soils

June 5 2019

Credit: AI-generated image (disclaimer)

Claire Guenat, a researcher at EPFL, has just published a book—the first of its kind—about the soils of Switzerland and Europe with Jean-Michel Gobat, an honorary professor at the University of Neuchâtel. The book reminds readers of the essential role soils play in the ecosystem and the potential for innovation they contain.

For the layman, soil is just soil. But for Claire Guenat, a pedologist and researcher at EPFL's Laboratory of Ecological Systems (ECOS), it is a subject worthy of a 576-page book. The work is titled *Sols et paysages. Types de sols, fonctions et usages en Europe moyenne* (*Soils and landscapes: Soil types, functions and uses in Central Europe*). Written over five years in partnership with pedologist and biologist Jean-Michel Gobat, an honorary professor at the University of Neuchâtel, this 2.5 kg tome has just been published by Presses Polytechniques et Universitaires Romandes (PPUR). The book summarizes recent scientific research and will be of interest to pedologists, biologists, geographers, forestry specialists, town planners and nature-lovers alike.

The soils analyzed in the book are located in familiar landscapes, from the plateau to the Alps. With regard to Western Switzerland, it looks at 54 soil types, providing insight into the huge variety that exist in the ground on which we walk every day. The book also shows us that, because of its broad range of climates, topography and geology, Western Switzerland alone plays host to 44 percent of the world's soil types and two-thirds of Europe's soil types.

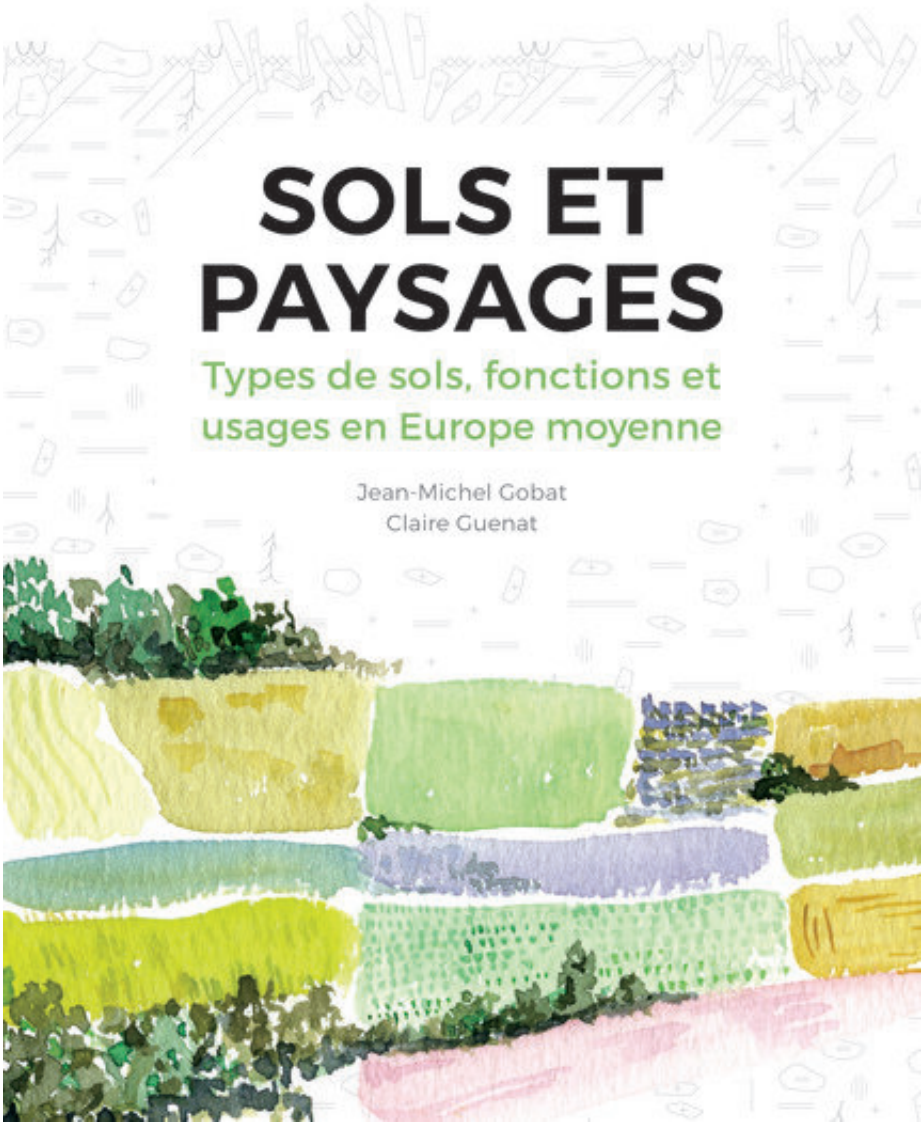
According to the authors, these soils—like the bottom of the oceans—represent an unexplored world, forgotten by science, invisible under our feet. However, the potential for innovation contained within soils and the urgent need to protect them should encourage researchers to take an interest in them. We spoke to Claire Guenat to find out more.

Why does soil still represent an unknown world?

Firstly because soil is not something we really see ordinarily, unlike vegetation for example. It also has negative connotations in our society. For example, when we're young, we learn that earth is dirty, we shouldn't touch it or eat it. But it's an environment that's full of life, full of organisms that carry out vital functions and are crucial for our well-

being. People tend more to talk about protecting the quality of air and water than the quality of soil. Soil is taken for granted: people aren't aware that it's a finite resource and a valuable one at that, at a time when the surface area of soil is decreasing rapidly, particularly in Switzerland, where around 1 m2 of arable land is disappearing every second. There is some research being done in this area and laws are being enacted to improve soil protection, but the scientific community and the general public are mostly unaware of the wealth and importance that soils represent.

In your book, you say that today's laws protect landscapes, but rarely soils. Is that why your book describes Western Switzerland's soils within 12 different landscapes?



Yes, that's a way of raising readers' awareness of this paradox. We have laws protecting the Lavaux region, the Aletsch Glacier and prehistoric pile dwelling sites, but there are no laws protecting the unique nature of certain rare soil types, even though their heritage value is on a par with that of the landscapes I mentioned. So we wanted to point out that fact, without putting forward any poetic, political or ideological vision, but

relying on scientific research, observations and statistics.

How does your book help readers to understand the value of soil?

Soils have various functions. Switzerland's Federal Office for the Environment recognizes several of these: providing raw materials, support for buildings and infrastructure, resources for forestry and agricultural production and habitats, helping with climate and water regulation and acting as a record of past climates and civilizations. But currently, the only value estimated with respect to a plot of land, and indirectly the soil within it, is its monetary value as a real-estate asset. The value of the soil resulting from its other functions has yet to be established. It's worth emphasizing that each soil type can fulfill different functions depending on its composition and how it functions in physical, chemical and biological terms. For example, soil helps to sequester CO_2, but the value of that function is not quantified either. When peat soils are used in farming, the organic material in them is mineralized and in the space of a few decades, they end up releasing all the CO_2 that they have captured over several millennia. As a result, there is a discussion to be had about balancing the various interests involved. To gain a better understanding of what we gain and lose when we alter soil, we tried to show the attributes and the services that each soil type presented provides to nature and to humans, along with ways in which we can sustainably protect and restore them.

In your opinion, which type of soil deserves the most attention?

All soils deserve attention, but soil management in cities is now a crucial issue for our increasingly urban societies. Urban soils are the soils in parks, flower beds and gardens, but also the soils underneath buildings

and roads. Those soils have important roles to play in the regulation of water and heat as our climate changes, resulting in increasingly frequent heavy rain, flooding and heat waves. This is a major public health issue. The urban gardening trend is also one that needs closer inspection, because some soils need to be remediated or decontaminated before they are used, as our research shows.

What's left to discover about soil?

Soils contain millions of types of fungus and bacteria that remain undiscovered. We don't yet know what they are or what their purpose is, but such organisms could have therapeutic benefits and be a source of innovation, particularly in the pharmaceutical industry. So we need to explore them urgently, before it's too late. Finally, some researchers are trying to reconstitute soils and recreate environments, but we are still a long way from mastering this technique. Our message is that the priority should be on protecting soils and restoring their primary functions—even if that means removing structures from some land that is more suited to agriculture than buildings—rather than on creating artificial soils. In practical terms, we also need to quantify how the various types of soil are distributed spatially in Switzerland: detailed soil maps are a basic tool for any protection effort, and they are still lacking in large areas of the country.

More information: Jean-Michel Gobat, Claire Guenat, "Sols et paysages. Types de sols, fonctions et usages en Europe moyenne", Presses polytechniques et universitaires romandes (PPUR), May 2019. www.ppur.org/produit/936/9782889152957/Sols%20et%20paysages%20

Provided by Ecole Polytechnique Federale de Lausanne