# Reclaiming contaminated land through biodiversity

**How can we develop efficient ways to reclaim contaminated lands?** *Ecological Solutions and Evidence* **Editor-in-Chief, Marc Cadotte shares his** [**recent work with Jia et al.,**](#)**published in** *Journal of Applied Ecology***.**

A version of this post is available in Chinese.

According to the [IPBES report on land degradation](#), the degradation of productive lands and intact habitats is a major threat to sustainability, biodiversity and ecosystem functioning globally, which reduces the resiliency of ecological and economic systems. In many emerging economy countries, environmentally harmful practices that result in contamination render lands and habitats seriously degraded. In many circumstances, the restoration of contaminated habitats to original conditions is not an option because the capacity for these habitats to harbor intact native ecosystems is greatly compromised. In these cases, we need management options that allow us to [reclaim contaminated and degraded lands](#) , and preferably ones that [increase biodiversity and ecosystem function](#).

While the ecological literature on the linkages between biodiversity and ecosystem function is [vast and rich](#), the application of this field of research to reclaiming contaminated lands has been strangely depauperate, and so there's little guidance on whether we should be planting diverse plant assemblages on contaminated lands, or if we ought to simply plant the most productive species or those that provide efficient phyto-removal of contaminants. This question is of fundamental importance to places like China, where rapid development and industrialization through the 1970s-1990s resulted in [severe contamination of lands near mining and mineral processing facilities](#), and now with China's commitment to improving its environmental health, biodiversity research has the ability to impact policy and management at a national scale.

[We evaluated whether more diverse plantings increased reclamation and ecosystem functioning](#) of a mine wasteland in Hunan Province, China, which had been severely contaminated with cadmium and zinc over decades. We sowed plots with 1-16 species, and these were selected from the herbaceous species that grew around contaminated sites in the region, and more diverse assemblages produced more biomass and were more stable over time. Further, there was less heavy metal contamination of leaf tissues in the more diverse plantings, which reduces the impact on herbivores.

Importantly though, plant diversity spurred plant-soil feedbacks (PSFs) that appeared to drive the increased ecosystem functioning. Higher plant diversity supported higher soil bacterial and fungal diversity. Importantly, higher plant diversity was accompanied with more soil cellulolytic bacteria that exude enzymes that degrade cellulose and so drive decomposition and nutrient cycling, which are essential components of a functioning ecosystem. Furthermore, the multi-species assemblages also performed better because these high diversity treatments harboured fewer soil fungal pathogens (and by extension more beneficial soil fungi). This appeared to be driven by the fact that high plant diversity supported a greater diversity of soil chitinolytic bacteria that produce anti-fungal enzymes that degrade the chitin in cell walls of soil-borne plant-pathogenic fungi.

In the search for efficient ways to reclaim contaminated lands, sowing high-diversity plant assemblages appears to be an effective tool. The key for reclamation is to ensure that soil processes like

decomposition and nutrient cycling are able to support a self-sustaining ecosystem, and higher plant diversity can ensure this.

*Originally posted on [The Applied Ecologist](#)*

# Metadata