Western Australia's natural 'museums of biodiversity' at risk

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Up to three quarters of the biodiversity living on Western Australia's iconic ironstone mountains in the State's Mid West (known as Banded Iron Formations) could be difficult or impossible to return quickly to its

previous state after the landscape has been mined, a Curtin University study has found.

The research published in *Ecology and Evolution*, discovered that the plant ecosystems are well-adapted to the characteristics of the region's ancient and nutrient-poor soils—and that the very different features of mined landscapes mean many native species are unlikely to be returned by rehabilitation.

Lead researcher Dr. Adam Cross from Curtin's School of Molecular and Life Sciences said the elevation and different habitats offered by Banded Iron Formations (BIF) in an otherwise dry, mostly flat landscape, make them a sponge for biodiversity—but that their iron-rich rock made them increasingly attractive to iron-ore miners.

"Unfortunately, the chemical characteristics of some tailings and other by-products produced by mines can be more similar to material on the moon than to the ancient, highly-weathered soils of BIF, and this presents a really challenging, hostile environment for many native plant species," Dr. Cross said.

The Mid West region is known for its BIF ranges, which Dr. Cross describes as stunning natural 'museums," that host much of the regional florist biodiversity. He said almost every plant species from the surrounding landscape can be found on them—as well as some unique species found nowhere else.

"These collections of species have accumulated over very long periods of time, and the increased pressure to mine BIF is putting the biodiversity at risk. Once BIF are gone, that's it—we cannot recreate these iconic landforms, and our study suggests that, even if we could, the post-mining environment likely wouldn't support many of the species that used to call them home."

"BIF harbour such biodiversity because in periods where the climate has been hotter and drier, their rocky, complex soils offered a cooler, wetter refuge for many species that were unable to survive in the surrounding landscape.

"With climate change suggesting a hotter, drier outlook for the Mid West region in future decades, it is increasingly important that we preserve and conserve remaining BIF habitats and the species growing on them."

The research team looked at 538 plant species in an 82,000 hectare area in WA's Mid West, assessing their growth on different soil types across the region and examining their potential tolerance to the chemical characteristics of mined materials.

Although many species were adapted to the acidic, nutrient-poor soils of BIF, the team found at least some were tolerant of a wide range of soil types and might be used as 'pioneers' to help kick-start vegetation recovery in rehabilitation.

Dr. Cross said more studies were needed to find ways to rapidly change the chemical characteristics of post-mining soils to speed up rehabilitation, and preserve the area's biodiversity.

"The mining industry needs to consider the soil properties of landforms requiring rehabilitation or ecological restoration, and the implications for vegetation establishment and plant community development, at the very earliest stages of planning or environmental impact assessment," Dr. Cross said.

"Ecosystems are extremely complex; we need to recognise, appreciate and learn from this complexity when we are attempting to return biodiversity to areas that have been impacted by mining.

"We need to reach a happy medium between development and conservation to effectively continue mining in these areas, while preserving our incredible natural resources."

The research was funded by The Centre for Mine Site Restoration at Curtin University.

The paper is titled "Calcicole–calcifuge plant strategies limit restoration potential in a regional semi-arid Flora."

More information: Adam T. Cross et al, Calcicole–calcifuge plant strategies limit restoration potential in a regional semi-arid flora, *Ecology and Evolution* (2021). DOI: 10.1002/ece3.7544

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