



Photo: Alan Orling

A World Without Life?



“Successfully addressing the issues of sustainable development requires a strong, interdisciplinary approach. As a leader in research and education in this field, Columbia has both an opportunity and an obligation to tackle some of the most pressing and practical challenges facing Earth.”

ROBERT DENNING, *whose family endowed the Denning Family Professorship in Sustainable Development*

“Without life, Earth would become a planet that’s halfway between Venus and Mars,” says Columbia professor Shahid Naeem. Oxygen, so important to the world as we know it, is a very reactive gas that would rapidly combine with other elements and become only a trace gas in the absence of biological processes. Carbon dioxide would become the dominant gas in the atmosphere, and the temperature would rise to 290 degrees Celsius by some estimates.

“Earth wants to be something else, but life is doing its darnedest to keep it the way it is,” says Naeem. But are Earth’s ecosystems doing the job they used to do? With so much conversion of natural habitats for agriculture, housing and other human activities, there’s a lot less than there used to be. Although 60 percent of natural habitats remain, humans have taken a lot of the good parts for themselves. Earth Institute scientists are studying the nature of this change and ways to maintain ecological diversity, even in converted landscapes.

Ruth DeFries, Denning Family Professor of Sustainable Development, is looking at the world from space to understand the large-scale impacts that humans are having on natural ecosystems. “Land is what we need to grow food and live in cities,” she says, “but it’s important to get a full picture of the tradeoffs of putting land to use for our purposes versus leaving it in its natural state.”

“I don’t think of ecosystems as little furry creatures; I think of them as the basis of all life, in terms of the ecosystem services they provide and what humanity needs to survive,” says DeFries. These critical services provided by ecosystems range from the filtration of water by wetlands to the absorption of atmospheric carbon dioxide, the key driver of man-made climate change, by forests.

DeFries focuses her work on tropical forests of places like Brazil and India, and her students have worked all over the world, from Jamaica to Myanmar, Kalimantan and other parts of Southeast Asia. Deforestation continues to be a significant part of human-driven ecosystem change, though the forces behind it are shifting. As the human population grows and cities swell, more food is needed and land must be converted to produce it. “People think of the subsistence farmer as being the main driver of forest clearing,” says DeFries. “But we’re seeing this new driver, intensive production of agricultural commodities, in some areas.”

Finding ways to support ecological diversity in man-made landscapes is becoming increasingly important as natural landscapes are converted for agriculture and other purposes. “Whether in crops, or forage for animals, or in fallow fields, and in what remains of natural systems ... the more diverse an ecological system, the more robust, resilient and productive it is, with lower needs for inputs like fertilizer and irrigation,” says Naeem.

Naeem has teamed up with other researchers in the Millennium Villages of Africa and the grasslands of China to study the importance of ecological diversity in managed landscapes. “We’re working to achieve the synergy between the social and the natural world that is the foundation for a healthy, stable and productive planet,” he says. ■



Denning Family Professor of Sustainable Development Ruth DeFries (opposite page) and others study patterns of ecosystem change, like deforestation, to help find ways to balance the needs of a growing population and the natural world.

