

EOE PAGES

- + Home
- + About the EoE
- + Editorial Board
- + International Advisory Board
- + FAQs
- + EoE for Educators
- + Contribute to the EoE
- + Support the EoE
- + Contact the EoE
- + Find Us Here
- + RSS
- + Reviews
- + Awards and Honors



SOLUTIONS JOURNAL



Directly from the experts:  
**the world's most promising solutions.**  
BECOME PART OF THE SOLUTION >>

BROWSE THE EOE

- + Titles (A-Z)
- + Authors
- + Topics
- + Topic Editors
- + Content Partners
- + Content Sources
- + eBooks
- + Classics
- + Collections

OIL SPILL



Deepwater Horizon Oil Spill

Discover >

Donate to the Earth Portal



Subscribe to the Newsletter



Contribute Your Expertise  
Join the 1000+ experts from 60 countries who have written and edited more than 4000 articles.

GET INVOLVED >>

Article Tools:

## Anthropogenic biomes

**Lead Authors:** [Erle Ellis \(other articles\)](#) and [Navin Ramankutty \(other articles\)](#)  
**Article Topics:** [Agriculture and food](#), [Biodiversity](#), [Anthropogenic ecosystems](#), [Ecology](#), [Urban ecology](#), [Sustainable development](#), [Population](#), [Land-use and land-cover change](#), [Human ecology](#), [Globalization](#) and [Geography](#)  
**This article has been reviewed and approved by the following Topic Editor:** [Mark McGinley \(other articles\)](#)  
**Last Updated:** March 20, 2009

### Introduction

Anthropogenic **biomes** describe globally-significant ecological patterns within the terrestrial **biosphere** caused by sustained direct human interaction with **ecosystems**, including **agriculture**, urbanization, **forestry** and other land uses. Conventional **biomes**, such as tropical rainforests or **grasslands**, are based on global vegetation patterns related to climate. Now that humans have fundamentally altered global patterns of **ecosystem** form, process, and **biodiversity**, anthropogenic biomes provide a contemporary view of the terrestrial biosphere in its human-altered form. Anthropogenic biomes may also be termed "anthromes" to distinguish them from conventional biome systems, or "human biomes" (a simpler but less precise term).

Table of Contents

- 1 Introduction
- 2 Humans and ecosystems
- 3 Anthropogenic biomes: a global view
- 4 Education and Research
- 5 More about Anthropogenic Biomes
- 6 Further Reading

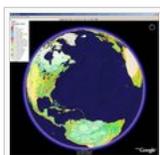


Cropland mosaic near Pokhara, Nepal, 1999.

### Humans and ecosystems

Humans are the ultimate **ecosystem engineers**, routinely reshaping ecosystem form and process using tools and technologies, such as fire, that are beyond the capacity of any other organism. This exceptional capacity for ecosystem engineering, expressed in the form of **agriculture**, **forestry**, industry and other activities, has helped to sustain **unprecedented population growth**, such that humans now consume about one third of all terrestrial net primary production, move more earth and produce more reactive nitrogen than all other terrestrial processes combined, and are causing global extinctions and changes in climate that are comparable to any observed in the natural record. Clearly, humans are now a force of nature rivaling climate and geology in shaping the terrestrial biosphere and its processes. As a result, the vegetation forms predicted by conventional **biome** systems are now rarely observed across large areas of Earth's land surface.

### Anthropogenic biomes: a global view



View Anthropogenic Biome Maps.

Viewing a global map of anthropogenic biomes shows clearly the inextricable intermingling of human and natural systems almost everywhere on Earth's terrestrial surface, demonstrating that interactions between these systems can no longer be avoided in any significant way.

**View the biomes in Google Earth, Google Maps, and Microsoft Virtual Earth**

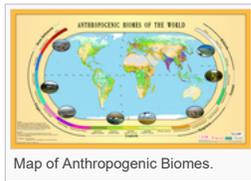
Recent analyses<sup>[1]</sup> have demonstrated that more than three quarters of Earth's land surface has been **reshaped** by human activity. Less than a quarter of Earth's ice-free land is wild, and only 20% of this is **forests**; >36% is barren, such that Earth's remaining wildlands account for only about 10% of global net primary production. More than 80% of all people live in the densely populated urban and village biomes that cover approximately 8% of global ice-free land. Agricultural villages are the most extensive of all densely populated biomes; one in four people lives within them.

Anthropogenic biomes are not simple vegetation categories, and are best characterized as heterogeneous landscape mosaics combining a variety of different land uses and land covers. Urban areas are embedded within **agricultural** land, trees are interspersed with croplands and housing, and managed vegetation is mixed with semi-natural vegetation (e.g. croplands are embedded within rangelands and forests). For example, Croplands biomes are mostly mosaics of cultivated land mixed with trees and pastures, and therefore possess just slightly more than half of the world's total crop-covered area (8 of 15 million km<sup>2</sup>), with

- Major Types of Anthropogenic Biomes
- **Dense Settlements**, built environments, very high populations
  - **Villages**, agricultural settlements (>100 persons km<sup>2</sup>)
  - **Croplands**, crops mixed with other land uses
  - **Rangelands**, grazin, minimal crops & forests
  - **Forested**, forests with humans & agriculture
  - **Wildlands**, without humans or agriculture

most of the remaining cultivated area found in Village (~25%) and Rangeland (~15%) biomes. While Forested biomes are host to a greater extent of Earth's tree-covered land, about a quarter of Earth's tree cover was found in Croplands biomes, a greater extent than that found in Wild forests (~20%).

## Education and Research



Map of Anthropogenic Biomes.

**Biomes** are fundamental units of the biosphere and are found in almost every introductory biology and earth science textbook. While not a replacement for existing **biome** systems based on vegetation and climate, anthropogenic biomes offer a new view of the terrestrial biosphere based on the irreversible coupling of human and ecological systems at global scales. This new model of the biosphere moves us away from an outdated view of the world as "natural ecosystems with humans disturbing them" and towards a vision of "human systems

with natural **ecosystems** embedded within them". This is a major change in perspective but it is critical for sustainable management of our biosphere in the 21st century.

Sustainable ecosystem management must develop and maintain beneficial interactions between managed and natural systems: avoiding these interactions is no longer a practical strategy. Though still at an early stage of development, anthropogenic biomes offer a framework for incorporating humans directly into models and investigations of the terrestrial biosphere and its changes, providing an essential foundation for ecological research in the 21st century.

- [PowerPoint Slideshow](#) (includes animation; intended for higher education).
- [Printable Wall Map](#) (30" x 50"; Adobe Acrobat file for large format printers (>30 inch); **large download! ~80MB**)<sup>[2]</sup>.

## More about Anthropogenic Biomes

- [Anthromes Project web site](#)
- [Discovery Channel news feature on Anthropogenic biomes, including interview with Erle Ellis](#)
- ES&T Online News. [Putting people on the map](#). Includes interview with authors Erle Ellis and Navin Ramankutty. January 16, 2008.
- <sup>^</sup>Ellis, E. C., and N. Ramankutty. 2008. [Putting people in the map: anthropogenic biomes of the world](#). *Frontiers in Ecology and the Environment* 6, doi:10.1890/070062.
- *Science* Magazine feature on Anthropogenic biomes: [Random Samples: Humankind's Global Footprint](#). *Science*, Volume 318, December 21, 2007.
- See the author's [Environment in Focus](#) feature, which includes a timeline, FAQs, supplemental reading, websites, and news stories related to anthropogenic biomes.
- See the author's *Earth Forum* blog: [Conserving Nature in an Anthropogenic Biosphere](#)
- *Wired* News Blog: [Mapping the humanized world](#)
- WorldChanging.com. [A Global View of Peopled Nature](#), by Chad Monfreda. January 29, 2008.

## Further Reading

- DeFries, R. S., G. P. Asner, and R. A. Houghton, editors. 2004. *Ecosystems and Land Use Change*. American Geophysical Union, Washington, DC.
- Foley, J. A., R. DeFries, G. P. Asner, C. Barford, G. Bonan, S. R. Carpenter, F. S. Chapin, M. T. Coe, G. C. Daily, H. K. Gibbs, J. H. Helkowski, T. Holloway, E. A. Howard, C. J. Kucharik, C. Monfreda, J. A. Patz, I. C. Prentice, N. Ramankutty, and P. K. Snyder. 2005. Global consequences of land use. *Science* 309:570-574.
- Kareiva, P., Watts, S., McDonald, R., & Boucher, T. 2007. Domesticated Nature: Shaping Landscapes and Ecosystems for Human Welfare. *Science*, 316, 1866-1869
- Turner II, B. L., W. C. Clark, R. W. Kates, J. F. Richards, J. T. Mathews, and W. B. Meyer. 1990. *The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere Over the Past 300 Years*. Cambridge University Press with Clark University, Cambridge; New York.
- Vitousek, P. M. 1994. Beyond Global Warming: Ecology and Global Change. *Ecology* 75(7):1861-1876.

<sup>^</sup>If you have trouble printing the [wall map](#): 1) Rotate page to vertical using the rotate button in the Acrobat menu bar, 2) turn off "autorotate and center" and other scaling options, 3) set print size to 51" x 31" paper size.

## Citation

Erle Ellis and Navin Ramankutty (Lead Author); Mark McGinley (Topic Editor). 2009. "Anthropogenic biomes." In: Encyclopedia of Earth. Eds. Cutler J. Cleveland (Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment). [First published in the Encyclopedia of Earth November 26, 2007; Last revised March 20, 2009; Retrieved July 10, 2010]  
<[http://www.eoearth.org/article/Anthropogenic\\_biomes](http://www.eoearth.org/article/Anthropogenic_biomes)>

## Editing this Article

[EoE Authors can click here to access this article within the editor wiki](#)

[If you are an expert, but not yet an Author, click here](#)



Unless otherwise noted, all text is available under the terms of the [Creative Commons Attribution-Share Alike license](#).  
[Privacy Policy](#) | [Terms of Use](#) | [Neutrality Policy](#)

Supported by the [Environmental Information Coalition](#) and the [National Council for Science and the Environment](#).

