



## EOSDIS Earth Observing System Data and Information System

Published on *EOSDIS - Earth Data Website* (<https://earthdata.nasa.gov>)

[Home](#) > [User Resources](#) > [Sensing Our Planet](#) > Checking Earth's Vital Signs

### Checking Earth's Vital Signs [1]

by Amanda Leigh Haag  
October 12, 2005

Mention to someone that a little known species such as the 'Alerce' -- a large tree native to Chile and Argentina -- is endangered, and they're likely to not bat an eyelash. But then drop the name of a more relatable endangered species such as, say, the Slender Loris from Sri Lanka -- a fuzzy little primate with brown eyes that would give any teddy bear a run for its money -- and it's likely to elicit more compassion.

Both are endangered, due in large part to habitat fragmentation from logging and other human activities. And both are evidence of the Earth's dwindling natural resources, according to the Millennium Ecosystem Assessment (MA), the first-ever global effort to take stock of the planet's ecosystem health. And the vital signs aren't looking good. Of the 24 categories of ecosystem health that were evaluated, 15 are being seriously degraded at a rate that cannot be sustained, said Walt Reid, director of the MA, an international, multimillion dollar undertaking. "If we think of the planet's ecosystem services as a bank account that could last indefinitely if managed wisely, we are instead spending the principal. That does provide short-term benefits, but the long-term costs will be significant," said Reid. By altering the planet, be it through deforestation, over-fishing, or degradation of land and climate change, "we're depleting a capital asset," he said.

The Millennium Ecosystem Assessment is the first-ever attempt to take stock of the health of the planet as a whole.

- [About Socioeconomic Data and Applications Center \(SEDAC\)](#) [2]

Feedback



The Slender Loris (*Loris tardigradus*) from Sri Lanka is assessed as endangered and is on the World Conservation Union's 2004 Red List of Threatened Species. Habitat fragmentation over the years has seriously reduced the area available for this species. Between 1956 and 1993, Sri Lanka lost more than 50% of its forest cover to human activities, followed by a similar rate of decline in the remaining forest cover between 1994 and 2003. (Image copyright K.A.I. Nekaris)

The assessment represents scientists' first global-scale attempt at putting a price tag on the benefits that humans get from natural systems, a concept dubbed 'ecosystem services.' Some of the services studied include things that can be traded in markets, such as food and fibers. Others have less tangible, yet equally important, values, such as the flood control and prevention of erosion that forests provide. The summary of the MA findings, released on March 30, 2005, was the result of four years of work by 1,300 scientists from 95 countries.

"We looked at ecosystems through this lens of the services they provide to people," said Reid. "For example, we weren't looking at tropical forests as just a nice thing society ought to protect. Instead, the researchers examined the economic and health benefits that people obtain from the forest." And what they found is cause for grave concern. "In these utilitarian terms, the degradation of ecosystem services represents a substantial cost," said Reid. "We're losing in economic terms, and we're losing in terms of human health." The study showed that not only have ecosystems been dramatically altered, but they've been changed more in the last 50 years than in any comparable time period in human history.

By analyzing data from the NASA Socioeconomic Data and Applications Center (SEDAC) at Columbia University, scientists determined that in dryland ecosystems, such as sub-Saharan Africa and Central Asia, land degradation through agricultural use and climate change is closely linked to growing poverty. Drylands cover 41 percent of the Earth's land surface and are home to more than 2 billion people -- a third of the human population. Desertification, or the expansion of drylands unsuitable for crop production, is one of the greatest threats to human well-being, according to the report. "Drylands, which are among the most fragile ecosystems, are now the areas with the highest rate of population growth," said Reid. "Many dryland regions have become poverty traps, where a spiral of growing poverty and environmental degradation feed on one another."

People living in drylands depend primarily on the productivity of their land for their livelihoods. Crop and dairy production, livestock, and growth of fuel and construction materials all depend upon plant productivity, which is inextricably linked to water availability. Overgrazing and intensive cultivation in areas that do not have adequate levels of nutrients and water supply can lead to greater soil loss through erosion, reduced water quality, and less vegetation to sustain life.



People living in dryland regions depend heavily on crop production and livestock for their livelihoods. Overgrazing and intensive cultivation in areas that do not have adequate levels of nutrients and water supply can lead to greater soil loss through erosion, reduced water quality, and less vegetation to sustain life. (Image from Photos.com)

In addition, climate change has led to more extreme drought cycles, according to the MA report. At least 90 percent of dryland populations live in the developing world, making them far less technologically able to adapt to these vulnerabilities. As a result of the MA findings, the link between environmental degradation and poverty is becoming the focus of considerable attention in high-level international circles, said Reid.

Other 'costs' to human well-being, according to the MA study, include soil degradation and loss of pollinating insects, loss of water purification services, and decreased flood control, to name a few. In addition, scientists were able to put a specific number -- 2 degrees Celsius (3.6 degrees Fahrenheit) -- on the amount of warming that the planet can sustain before ecosystems begin to deteriorate. While some northern latitude countries might actually benefit from a warmer climate due to longer growing seasons, "once you get beyond two degrees Celsius, there's really no region of the world where the benefits outweigh the costs," said Reid.

The study also determined that degradation of fisheries resources warrants immediate action. In most cases,

both marine and freshwater fisheries have either peaked or are being seriously over-harvested, according to the report. The concept of over-fishing is certainly not a new one. But by studying population data from SEDAC, scientists participating in the MA were able to determine where fisheries-dependent populations live and estimate the potential cost to their livelihoods.



Deforestation in the Amazon rainforest threatens many species of tree frogs, which are extremely sensitive to environmental changes. (Image from Photos.com)

### Feedback

"A handful of earlier reports awakened people to the threats of biodiversity loss and habitat loss, but for the most part, they have not generated a groundswell of concern or action," said Marc Levy, who co-authored one of the chapters of the assessment and coordinated the use of SEDAC data in the MA study. "But directly relating the ecosystem well-being to human well-being can make a difference, because it gives people a better sense of what's at stake."

Before the MA study, scientists had to "engage in fairly idle guesswork" in order to determine where people live with respect to vulnerable ecosystems, said Levy. "You can look through the literature and find these numbers that people just pulled out of thin air." So researchers applied the highest-quality population data set available known as the "Gridded Population of the World" (GPW) and superimposed it on the countries that the MA was studying, yielding much more precise estimates.

One challenge faced by the MA in trying to reconcile ecosystem services with their value to human welfare was the potential for conflict of interest, according to Levy. "The conservation folks suspect that the poverty reduction people want to go in and build roads to connect markets and subsidize fertilizers to help farmers grow higher yields," said Levy. "At the same time, the poverty reduction people think the conservationists just don't care about people. But the MA brought together a lot of people who overcame those tensions in order to work together in a framework that was equally fair to both sides."



Feedback

Loss of pollinating insects is among the many "costs" associated with deteriorating ecosystem health, according to the Millennium Ecosystem Assessment. (Image from Photos.com)

Another challenge that scientists faced over the course of the study is that until now, almost all environmental monitoring has taken place at the national level. There is simply no method in place to survey environmental variables on a global scale, said Anthony Janetos, a coordinating lead author of the study from The H. John Heinz III Center for Science, Economics and the Environment. In some cases, countries don't have the financial resources to do large-scale surveys; in other cases, it is difficult to measure resources that no one country owns, such as fish in the ocean, said Janetos. "It's not like weather data, where every nation understands that in order to do a good job understanding weather and climate, you really need a global observation system," said Janetos. "That's still a new concept for looking at ecosystems."

But the scientists stress that the upside of the MA findings is that many of the trends that are occurring can be reversed. The findings weren't the "traditional doom and gloom, 'we're destroying the world and there's nothing we can do about it,'" said Reid. "Three of the four scenarios that we developed in this assessment actually showed that in the next 50 years, it is possible to turn this situation around and protect many of the ecosystem services."

Reid noted that one exception to this is the loss of biodiversity. The MA concluded that due to habitat loss from human activities, a 10-15 percent extinction rate of species is expected by the year 2050. "We've got to feed another 3 billion people on the planet, so there's going to be more loss of habitat," said Reid. "The end result is you still end up with a substantial amount of species committed to extinction. It would be very hard to end the crisis of species extinction over the next 50 years."

## Related Link(s)

- [Socioeconomic Data and Applications Center \(SEDAC\)](#) [3]
- [Center for International Earth Science Information Network](#) [4]
- [Millennium Ecosystem Assessment](#) [5]

**Source URL:** <https://earthdata.nasa.gov/featured-stories/featured-research/checking-earths-vital-signs>

**Links:**

- [1] <https://earthdata.nasa.gov/featured-stories/featured-research/checking-earths-vital-signs>
- [2] <https://earthdata.nasa.gov/data/data-centers/sedac>
- [3] <http://sedac.ciesin.columbia.edu/>
- [4] <http://www.ciesin.columbia.edu/>
- [5] <http://www.millenniumassessment.org/en/index.aspx>

