

EarthTrends: Featured Topic

Title: **Fragmenting Forests: The Loss of Large Frontier Forests**

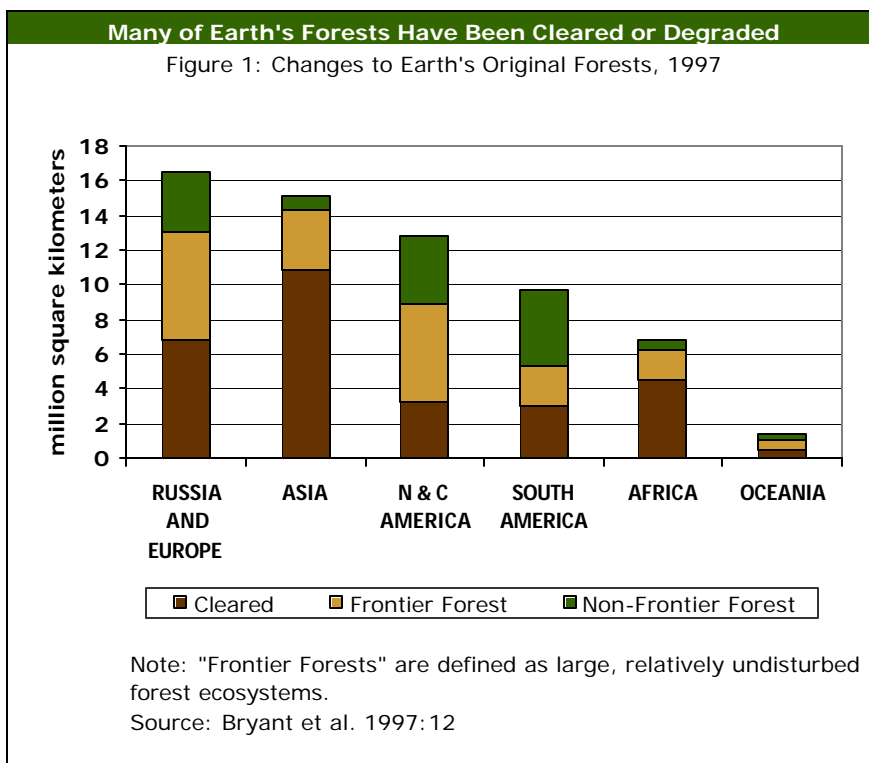
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Over the past 8,000 years, nearly one half of the forests that once covered the Earth have been converted to farms, pastures, and other uses. But the human impact on forests did not stop there. Most of the forests that are left have been heavily altered by humans, often rendered into a patchwork of smaller forested areas. According to a 1997 World Resources Institute (WRI) assessment, just one fifth of the Earth's original forest remains in large, relatively natural ecosystems—what are known as frontier forests (Bryant et al. 1997:1). (See Figure 1.)

This fragmentation process is one of the most serious consequences of the current deforestation and degradation of world forests. Frontier forests differ significantly from the dissected, human-modified forests that dominate the planet today. For one thing, frontier forests are large and natural enough to ensure the long-term survival of their plant and animal species, including the biggest mammals with the most extensive home ranges. As secure habitats for native species, frontier



forests are invaluable refuges for global biodiversity. Forests are home to between 50 and 90 percent of the world's terrestrial species—plants and animals that have provided much of the food and other basics that humans need to survive (Reid and Miller 1989:15).

Frontier forests also contribute a large portion of the ecological services that make the planet habitable. They take up tremendous amounts of carbon dioxide (CO₂), for example, and are therefore an important

factor in regulating Earth's climate. Recent calculations suggest that frontier forests store approximately 430 billion metric tons of carbon (from CO₂)—more carbon than is likely to be released by fossil fuel burning and cement manufacture over the next 70 years or so (Dixon et al. 1994)¹.

Remaining frontier forests occur either in far northern climes or in the tropics: 48 percent of frontier forests are boreal forests (a broad belt of primarily coniferous trees

Frontier Forests Suffer a Variety of Threats

Figure 2: Threats to Frontier Forests, 1997

Region	% of Frontier Forest Under Moderate or High Threat	% of Threatened Forests at Risk From:				
		Logging	Mining, Roads, and Other Infrastructure	Agricultural Clearing	Excessive Vegetation Removal	Other ^b
Africa	77	79	12	17	8	41
Asia	60	50	10	20	9	24
N. & C. America	29	83	27	3	1	14
N. America	87	54	17	23	29	13
C. America	26	84	27	2	0	14
S. America	54	69	53	32	14	5
Russia & Europe	19	86	51	4	29	18
Europe	100	80	0	0	20	0
Russia	19	86	51	4	29	18
Oceania	76	42	25	15	38	27
World	39	72	38	20	14	13

Notes: a. Frontier forests considered under immediate threat, as a percentage of all frontier forests assessed for threat. Threatened frontier forests are places where ongoing or planned human activities are likely, if continued over the coming decades, to result in the significant loss of natural qualities associated with all or part of these areas. b. "Other" includes such activities as overhunting, introduction of harmful exotic species, isolation of smaller frontier

Source: UNESCO 1997; Table 2.2, pp. 2-9

located between Arctic tundra and the temperate zone), while 44 percent are tropical forests. By contrast, only a tiny fraction of Earth's frontier forests are in the temperate zone.

A country-by-country breakdown shows that 76 countries have lost all of their frontier forest. Another 11 nations are close to losing their last remaining frontier forests, having fewer than 5 percent of these forests left, all of which are threatened. More

than three-quarters of all frontier forests fall within three large tracts that cover parts of seven countries: two blocks of boreal forest (one blanketing much of Canada and Alaska and the other in Russia), and one large tropical forest covering South America's northwestern Amazon Basin and Guyana Shield. Three countries alone—Brazil, Canada, and Russia—contain nearly 70 percent of all frontier

forests (Bryant et al. 1997: 19, 21).

A significant number of frontier forests that have survived into the 20th century are threatened today. WRI's assessment found that 39 percent of Earth's remaining frontier forests are endangered by human activities. One surprising result was that logging represents by far the greatest danger to frontier forests (Bryant et al. 1997:17). (See Figure 2.)

The assessment found good news in a few parts of the world. Seven nations (Brazil, Canada, Colombia, Guyana, Russia, Suriname, and Venezuela) and one Overseas Department of France (French Guiana) have kept a large number of their frontier forests, and many of these ecosystems do not face imminent risk. However, these currently unthreatened forests remain vulnerable—particularly in the tropics—because they contain high-value resources such as timber and gold and other minerals (Bryant et al. 1997:19, 25).

The majority of frontier forests that are not threatened today lie within boreal regions, inhospitable to most developers. Outside of boreal forests, however, 75 percent of the world's frontier forests—including all temperate frontier forests—are endangered by human activity (Bryant et al. 1997:15).

REFERENCES

Bryant, D., D. Nielsen, and L. Tangle. 1997. *The Last Frontier Forests: Ecosystems and Economies on the Edge*. Washington, D.C.: World Resources Institute.

Dixon, R.K., S. Brown, and R.A. Houghton. 1994. Carbon pools and flux of global forest ecosystems. *Science*, 263(5144):185-190.

Reid, W. and K. Miller. 1989. *Keeping Options Alive: The Scientific Basis for Conserving Biodiversity*. Washington, D.C.: World Resources Institute.

NOTES:

1. Carbon mass is calculated by multiplying regional frontier forest area by per hectare carbon estimates for forest areas, presented in R.K. Dixon et al., "Carbon Pools and Flux of Global Forest Ecosystems," *Science*, Vol. 263; pp. 185-190. Dixon et al.'s estimates are for closed and open forests for both soil and above-ground vegetation. For this reason, and because these averages include degraded forest (which contains less carbon than intact forest), the text figure on total carbon stored in frontier forest is likely an underestimate. Soil carbon figures include peat. We used averaged per hectare carbon figures in estimating carbon stored in frontier forests that contain more than one dominant forest type (e.g., temperate and boreal forest).