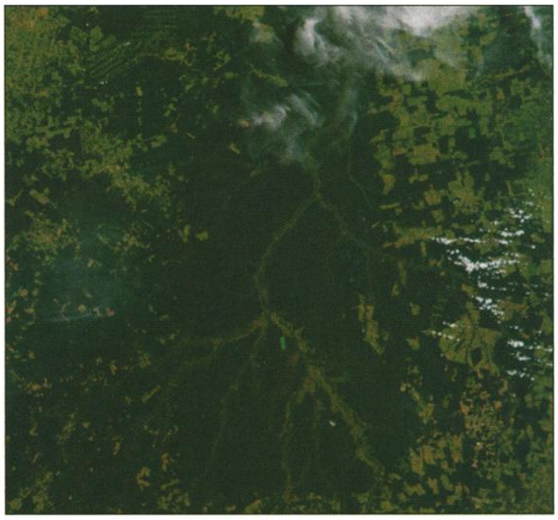
A Global Experiment Under Way

HABITAT LOSS AND FRAGMENTATION ARE THE principal drivers of biodiversity loss, notably in the tropics (*1*). One of the most immediate results of fragmentation is the loss of top predators. As early as 12 years ago, evidence was provided for top-down effects of predator removal in tropical forest mammalian communities (*2*). Now, in their report "Ecological meltdown in predator-free forest fragments" (30 Nov., p. 1923), John Terborgh and colleagues have demonstrated that these effects percolate down to taxonomically diverse groups, affecting plant-herbivore dynamics in forest islands that resulted from dam construction in Venezuela. In the accompanying Perspective "Dammed experiments!" (30 Nov., p. 1847), Jared Diamond reminds us that these represent valuable "natural" experiments. Alternatives are more carefully controlled experiments, like the Biological Dynamics of Forest Fragments Project in the Brazilian Amazon, but they are also more costly and difficult to implement beyond a few areas.

Although these localized natural experiments are useful, a "natural" fragmentation experiment on a grand scale is possible because most biologically rich tropical forests retain less than 30% of their original extent (*3*). The Major Tropical Wilderness Areas of the Amazon, Congo, and New Guinea (*4*) could serve as controls. The impediment to the full use of the global experiment is deriving baseline biological and land use information over large areas, but we believe this limitation can now be overcome.

Over the last century, many now-fragmented landscapes were surveyed before fragmentation, and these data from museum collections are starting to become accessible in electronic format. With some incremental investment in transferring collection information to databases, specimen accessibility could expand manifold (*5*). Species modeling efforts can complement such needs (*6*). Furthermore, emerging programs to undertake biological surveys and long-term ecological monitoring at unprecedented scales (*7*) are in the final stages of design or already producing needed biological information.

Other data that have become more accessible, and more affordable, are remote sensing data sets necessary to identifying changes in land cover. We now have a 30-year archive of Landsat data to conduct wall-to-wall mapping of deforestation and precise patterns of fragmentation. Complementing these are near-real-time monitoring capabilities with daily observations from sensors such as MODIS (see the figure). Longer time series can be compiled with aerial photos that are distributed throughout many institutions and government agencies.



Fragmented forest. This MODIS image, taken on 2 May 2001, shows various levels of forest fragmentation in Southern Amazon. The area is ~400 km across. Forest appears dark green, agriculture appears tan to light green, and clouds appear white. To the east (right) are isolated patches of remnant forest in an agricultural landscape. The large forest in the center of the image is the southern portion of the Kayapo Indigenous Area in Brazil.

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Applied at a pantropical scale, this framework can assist researchers in pinpointing appropriate areas to explore a wide range of questions. The grand-scale experiment is already under way, and answers to biodiversity challenges can emerge before it's too late for their application toward conservation. It's now a question of resources, scientific wit, and a collaborative global research environment.

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7. Examples of large-scale ecological monitoring projects include the Smithsonian Tropical Research Institute's field sites, the Costa Rican Inbio inventories, the expanding International Long-Term Ecological Research Program, the All Species Foundation, and the recently announced Tropical Ecology, Assessment and Monitoring (TEAM) initiative to enable about 50 field stations in the tropics to monitor biodiversity (see http://www.biodiversityscience.org).

Modeling Macroscopic Patterns in Ecology

THE GOAL OF COMMUNITY ECOLOGY AND macroecology has long been to focus on the general processes that generate macroscopic patterns associated with abundance, diversity, and distribution within and across ecological systems (*1–3*). In the review "Neutral macroecology" (*Science*'s Compass, 28 Sept., p. 2413), we disagree with Graham Bell that neutral models provide a general theory of biodiversity capable of "predicting the fundamental processes and patterns in community ecology," and "that functional interpretations of [diversity] patterns must be reevaluated" (p. 2413). A priori "statistical fits" of a neutral model to empirical patterns are qualitative and are not based on quantitative predictions from first principles. As Bell notes, by choosing "the normal configuration" for values of each parameter of a neutral model, one can create patterns asso-