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Satellite Survey Links Tropical Park Fires with Poverty and Corruption

According to the first global assessment of forest fire control effectiveness in tropical parks, poverty and corruption correlate closely with lack of fire protection in tropical moist forests. A better understanding of the links between corruption, poverty and park management will help conservationists and policy makers create sophisticated strategies to conserve tropical ecosystems.

The survey is published in the July issue of *Ecological Applications*, reported by lead author S. Joseph Wright, staff scientist at the Smithsonian Tropical Research Institute; Arturo Sanchez-Azofeifa and Carlos Portillo-Quintero from the University of Alberta; and Diane Davies from the University of Maryland.

“Satellite data on fire frequency provides a measure of park effectiveness across countries,” Wright said. “It is strikingly clear from our study that poverty and corruption limit the effectiveness of parks set up to protect tropical forests.”

The survey indicates that parks were most effective at reducing fire incidence in Costa Rica, Jamaica, Malaysia and Taiwan; whereas parks failed to prevent fires in Cambodia, Guatemala and Sierra Leone.

“Current integration of state-of-the-art remote sensing databases with Geographic Information Systems is allowing us to better evaluate the effectiveness of conservation efforts in tropical environments,” Sanchez-Azofeifa said.

While nearly all tropical countries have established parks to protect rainforests, not all have the political and economic means to enforce park boundaries and prevent illegal extraction of park resources.

To better distinguish functional parks from “paper” parks and to characterize the relationship between social factors and park protection worldwide, the team created an index comparing fire frequency inside and outside of 823 tropical and subtropical parks.

Low fire frequency within parks was chosen as an indicator of park effectiveness because the background level of fire in tropical moist forests is low, so the presence of fire often indicates that humans are engaged in timber extraction, clearing land for agriculture or other land-use conversion.

The frequency was based on fire detection data from NASA’s satellite-based Moderate Resolution Imaging Spectroradiometer (MODIS). “The MODIS fire products enable us to monitor global fires and

see how fire regimes are changing,” said Chris Justice of the NASA MODIS fire team. He noted that information from the NASA Fire Information for Resource Management Information System Project provides a prototype to provide future long-term fire information from space tailored to the needs of resource managers.

Wright added that satellite data has limitations. “The satellite data must be carefully screened. Perhaps the clearest examples of this system’s limitations were a park in Costa Rica and two parks in Indonesia where active volcanoes triggered the MODIS fire detection algorithm,” he said.

With fire frequency data in hand, researchers developed a set of social and economic indicators reflecting the level of poverty and corruption in each country. The Corruption Protection Index was provided by Transparency International; other information came from United Nations files and the CIA-World Fact Book.

As part of this publication, fire frequency data from 3,964 tropical reserves will be posted online. The authors hope that other investigators more familiar with reserves in particular countries or regions will use these data to better understand the causes of fires in parks and their management implications.

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The Smithsonian Tropical Research Institute, a unit of the Smithsonian Institution, headquartered in Panama City, Panama, furthers the understanding of tropical nature and its importance to human welfare; trains students to conduct research in the tropics; and promotes conservation by increasing public awareness of the beauty and importance of tropical ecosystems. Each year, nearly 1000 visiting scientists from around the world join STRI’s 35 staff scientists in collaborative research projects at sites in 40 tropical countries. For more information, see www.stri.org.

Panama fire.jpg

Caption: Fire near Soberania National Park, Panama. March, 2007.

Credit: Christian Ziegler, Smithsonian Tropical Research Institute

MODIS firemap.jpg

Caption: Global fire map for the period 02/20/07–03/01/07 (2007051-2007060), based on MODIS satellite data

Credit: NASA <http://rapidfire.sci.gsfc.nasa.gov/firemaps/?2007051-2007060>