Large size crucial for Amazon forest reserves

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An international research team has discovered that the size of Amazon forest reserves is yet more important than previously thought. Their findings, to be published this week in the journal *Science*, underscore the importance of protecting the Amazon in large stretches of primary forest.

The article summarizes bird survey results from the world's largest and longest running experimental study of forest fragmentation – the Biological Dynamics of Forest Fragments Project, sponsored by the Smithsonian Tropical Research Institute, the Smithsonian Institution and the National Institute for Amazon Research, in Brazil.

Fragmentation shrinks the Amazon forest by thousands of square kilometers every year, leaving a trail of small forest fragments isolated by cleared land. Many species that occur in intact forest prior to destruction will not be present in a small fragment, but would they be found in an equally small plot surrounded by untouched forest? The answer to this question has profound management implications because it weights the relative importance of area and isolation in the design of forest reserves.

The team, headed by Gonçalo Ferraz from the National Institute for Amazon Research in Brazil, has been studying a 13-year data set of more than 40,000 bird captures in 23 isolated and non-isolated plots of forest, ranging from 1 to 600 hectares. Richard Bierregaard, Jr. and Philip Stouffer led the data collection as part of the experimental study founded by Thomas Lovejoy and his Brazilian colleagues. The most

striking result is that the effects of area on the occurrence of bird species are much stronger than the effects of isolation.

"It is no surprise that small isolated fragments lack many species" said Ferraz. "Many birds are so uncommon that they will rarely occur in small plots even in the middle of vast undisturbed forest." The question is, does isolation aggravate this pervasive effect of size. It does for many species, but surprisingly not for many others.

The main methodological difficulty of this study, say the authors, was that birds are hard to detect. When one samples a plot of forest it is easy to miss species that actually exist there. To distinguish real absences from detection failures, the authors used state of the art statistical methods developed by James Nichols and colleagues, at the U.S. Geological Survey's Patuxent Wildlife Research Center.

"With a handle on the detection problem it is much easier to understand real species occurrence", said Nichols, "and looking at occurrence through time, one understands the dynamics of species faced by forest destruction". Some vanish because they don't survive in a given site, others because they don't colonize new sites that become available. The two processes may also act in combination, but different species follow different ways.

The detailed treatment of the dynamics of 55 bird species allowed an unprecedented test of classical scientific hypotheses about the effects of reserve size and isolation on the local extinction and colonization of species. The species-specific estimates of effects of area and isolation on extinction and colonization processes permit prediction of effects of future fragmentation on bird communities in these Amazon landscapes.

Area is important because the forest is spatially diverse. "What might look like a vast mantle of homogeneous green is actually a multicolored

mosaic", said Lovejoy. And species that occur throughout the forest at the large scale actually may have very specific requirements at the fine scale.

Large areas of forest encompass a wide enough variety of local conditions – and species, to ensure the survival of the Amazon and its inhabitants. In December, 2006, the Brazilian government established the largest protected area ever, 15 million hectares in Northern Brazil. Sustainable conservation strategies result when policy is based on sound science. The results in this paper confirm the importance of this action and other, similar efforts to conserve forested regions.

Source: Smithsonian Tropical Research Institute