

Earthwatch Institute Research Project Summary:

Maintaining rainforest biodiversity, ecosystem functioning and conservation value in the face of climate and land use change.

There is mounting evidence that the combined effects of forest loss, fragmentation, degradation and El Niño Southern Oscillation events may be adversely affecting the recruitment and regeneration in the most important group of tree species of the South-east Asian rainforests, the dipterocarps (Curran *et al.* 1999; Brook *et al.* 2003; Kohler & Huth, 2004; Curran *et al.* 2004; Bischoff *et al.* 2005; Stoll and Newbery 2005). If this is the case, it is likely that the most degraded forests and smaller forest fragments will require some form of rehabilitation if they are to survive. However, the science underlying the ecological restoration of tropical rainforests is woefully inadequate.

To address these issues Earthwatch and the Royal Society South-east Asian Regional Research Program (SEARRP) have begun an integrated programme of research that aims to assess and understand biodiversity, ecosystem functioning, regenerative capacity and restoration requirements in degraded and fragmented rainforests – and therefore contribute to their resilience, conservation and long-term survival.

This program is a five year collaboration led by Dr Glen Reynolds, involves a number of Universities and is supported by Shell. Research will (1) assess the regenerative capacity of rainforests at various levels of disturbance and degrees of fragmentation (i.e. the size of forest patch), (2) the extent to which ecosystem functioning (focussing on decomposition) and biodiversity (focussing on groups with key ecosystem functions) is affected by these factors and (3) integrate these data with soil moisture, erosion and climatic measurements along the disturbance/fragmentation gradient.

There are four project objectives:

- Objective 1:** To establish the regeneration status and restoration requirements of degraded and fragmented forest and how restoration can best be achieved.
- Objective 2:** To assess biodiversity and vegetation structure in pristine and degraded rainforest, forest under active restoration and in rainforest fragments.
- Objective 3:** To assess the ability of degraded and fragmented forest to maintain ecosystem functioning (focussing on decomposition).
- Objective 4:** To establish the comparative resilience of forest fragments and degraded/restored rainforest to predicted increases in drought intensity and heavy rainfall frequency associated with climate change.

Research sites will include the pristine rainforest of the Danum Valley Conservation Area, in Sabah, Malaysia, the degraded lowland forests of the adjacent Malua and Ulu Segama Forest Reserves, forest under active restoration by enrichment planting (the Sabah Biodiversity Experiment and a major forest restoration project located close to Danum) and various forest fragments embedded within the extensive oil palm plantations of central/eastern Sabah.

Alongside a programme of research this project has an extensive learning and engagement component. Approximately 60 individuals per year visit the project for a two week period acting as research assistants and helping scientists to collect, input and analyse the vast amounts of data required to achieve the four project objectives. As well as being involved in the research, the volunteers gain the knowledge, skills and motivation needed to be more environmentally responsible.

In addition to engaging members of the public, the programme also involves a number of other stakeholders. Employees of Shell and other corporates participate in a programme which has an extra emphasis on looking at their company's environmental and sustainability performance and inspires them to take action in these areas when they return to work. Young scientists from the region are invited to join the project to learn research skills and techniques which will be of value as they advance their careers. There are also tailored "skill transfer teams", led by Shell employees, which deliver business planning training to those responsible for managing natural World Heritage Sites.

Literature Cited

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