

## INTER-RELATIONSHIPS BETWEEN WILDLIFE AND FOREST RESTORATION

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Implicit in the workshop's title was the assumption that restoring tropical forests benefits wildlife. However, in SE Asia, this assumption has not been tested in restored forests. The purpose of this session was to consider all possible interactions between wildlife and forest restoration programmes; both benefits and potential disadvantages.

### POSITIVE EFFECTS OF FOREST RESTORATION ON WILDLIFE

There is no doubt that forests support more wildlife species than deforested areas and that deforestation reduces biodiversity. To illustrate the magnitude of this effect, evergreen forest higher than 1,000 m elevation in Doi Suthep-Pui National Park in northern Thailand supports five times more vascular plant species than deforested areas at the same elevation. Deforested areas contain a greater percentage of herb species than evergreen forest. Herbs comprise 66% of the plant species in deforested areas, compared with only 59% in evergreen forest. Furthermore, most of the species in deforested areas are common or abundant (66%), whereas in forest 52% of the species are ranked as rare (CMU herbarium database).

Therefore, deforestation not only substantially reduces biodiversity, but deforested areas support mostly abundant, ubiquitous weeds, many of which are widely distributed throughout the tropics. Rare species of high conservation value are the first to disappear when deforestation occurs. The main questions to examine are to what extent can species loss be reversed by forest restoration? How fast can wildlife species return to restored areas? To what extent will the species composition of restored forests resemble that of the original forest and what might limit the return of species to restored areas? Once these questions have been answered, better forest restoration techniques can be devised to counteract any processes that might limit the return of wildlife to restored areas.

In this part of the proceedings, Nigel Tucker provides an encouraging account of the return of wildlife to restored forests in Queensland, Australia. Such effects can only be identified through regular wildlife surveys in restored areas. However, to quote from Nigel Tucker's paper: "monitoring is a badly neglected facet of restoration but is crucial to the survival of target species and the long term development of the science of tropical restoration for wildlife habitat". This deficiency was acknowledged by workshop participants and subsequently incorporated into the research agenda presented in Part 7 (proposal 1.4).

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Bharat Lal's paper presents a clear example of how focussing attention on a charismatic endangered species, the Asiatic Lion, can help to generate broad public support for forest restoration and conserve lesser-known species that benefit from increased forest cover. In this case, forest restoration may have prevented the imminent extinction of a large mammal with wide appeal. Crucial to gaining the support of local people for forest restoration is the provision of resources, such as a reliable water supply. By complementing forest restoration with the development of water resources, the project described by Bharat Lal demonstrates how forest restoration benefits both human and wildlife populations.

#### NEGATIVE EFFECTS OF FOREST RESTORATION ON WILDLIFE

Forest restoration converts a habitat dominated by herbaceous weeds into one dominated by a diverse community of trees. Weeding is essential to this process. Weeding immediately removes a large part of the biomass of the herbaceous ground flora, whereas the provision of many wildlife resources by the planted trees e.g. pollen, nectar, fruits and seeds, happens only after the trees reach maturity and for some tree species this can take many years. Is this an important phenomenon? If it is, what research is needed to generate knowledge to help forest managers minimise any potential negative effects of tree planting programmes and associated management activities?

Initial evidence from forest restoration plots in Doi Suthep-Pui National Park, northern Thailand suggests that bird species diversity was reduced for 1-2 years after tree planting. This was possibly due to lack of food resources for birds that are characteristic of open areas dominated by herbaceous weeds. Colonisation of the restored sites by forest birds will take time, but how long? And is there anything that can be done to encourage forest birds to colonise restored forests with less delay? Rebecca Scott *et al.* suggest that simple provision of artificial bird perches can encourage birds to visit restored forest sites and might reduce the negative effects of weeding.

#### POSITIVE EFFECTS OF WILDLIFE ON FOREST RESTORATION

Seed dispersal is one of the most important ecological services carried out by wildlife in restored areas. In this part of the proceedings, the paper by Richard Corlett and Billy Hau provides a thorough review of the subject, whilst Rebecca Scott *et al.* present clear evidence that seed dispersal into restored forest sites can be significantly enhanced through the provision of bird perches.

In addition to seed dispersal, wildlife carries out many other ecological functions that help the process of forest restoration. Birds and bats pollinate flowers, soil invertebrates improve soil texture and help recycle nutrients and a diverse range of wildlife species are involved in biological control of pests. What research needs to be done to monitor these positive effects and enhance them? Nigel Tucker suggests several ways to hasten colonisation of restored forest sites by plants and animals and encourage the ecological services they perform.

The positive effects of wildlife on forest restoration are threatened by extirpation of certain wildlife species over very large parts of SE Asia. For example, very large seeds can only be dispersed from forest into deforested areas by large animals. The extirpation of elephants, rhinos and wild cattle species over most of SE Asia has left many large-seeded tree species without a dispersal mechanism. Is this an important problem? If so, how should we solve it? Is it feasible to re-introduce these large animals into key conservation areas? If not, how should forest restoration programmes be designed to duplicate the crucial seed-dispersing functions of these animals?

#### NEGATIVE EFFECTS OF WILDLIFE ON FOREST RESTORATION

If direct seeding is being considered as a preferred restoration technique, seed predators, especially small mammals, can be a serious constraint. Planted trees, in their early stages of growth, are vulnerable to a wide range of potential pests, both large and small. In FORRU's experimental plots, moles and Siamese hares have increased. Both these animals attack the planted trees, but so far only very few trees have been affected. Larger animals might trample young trees and there is a wide range of insect pests that might cause significant damage to planted trees. What research is needed to monitor these effects? If they turn out to be serious constraints, what further research is needed to devise effective measures to protect planted trees until they are large enough to fend for themselves?

#### CONCLUSION

One of the prerequisites of managing forest restoration programmes for wildlife conservation is to know what interactions are taking place between the trees being planted and the wildlife using those trees as habitat. Therefore, serious consideration must be given to establishing effective monitoring programmes. Secondly, once monitoring has identified the interactions between wildlife and forest restoration activities, research programmes are needed to devise management strategies to enhance the positive interactions and reduce the negative ones. Not all the questions posed above were answered at the workshop, but participants did propose research to encourage wildlife to colonise forest restoration sites (Part 7: 1.3, 2.2, 2.3 and 4.1) and responded to the need for better wildlife monitoring (see Part 7: 1.1, 1.2, 1.3 and 1.4).

#### COMMENT

##### *Jens Granhoff*

In Sumatra, improving habitat for tigers involved strategic planning which promoted the whole food chain, providing open grasslands for deer as well as closed forest. The same situation exists in Khao Yai National Park here in Thailand, where the abandoned golf course now provides grassland for deer.