Policy*briefs*
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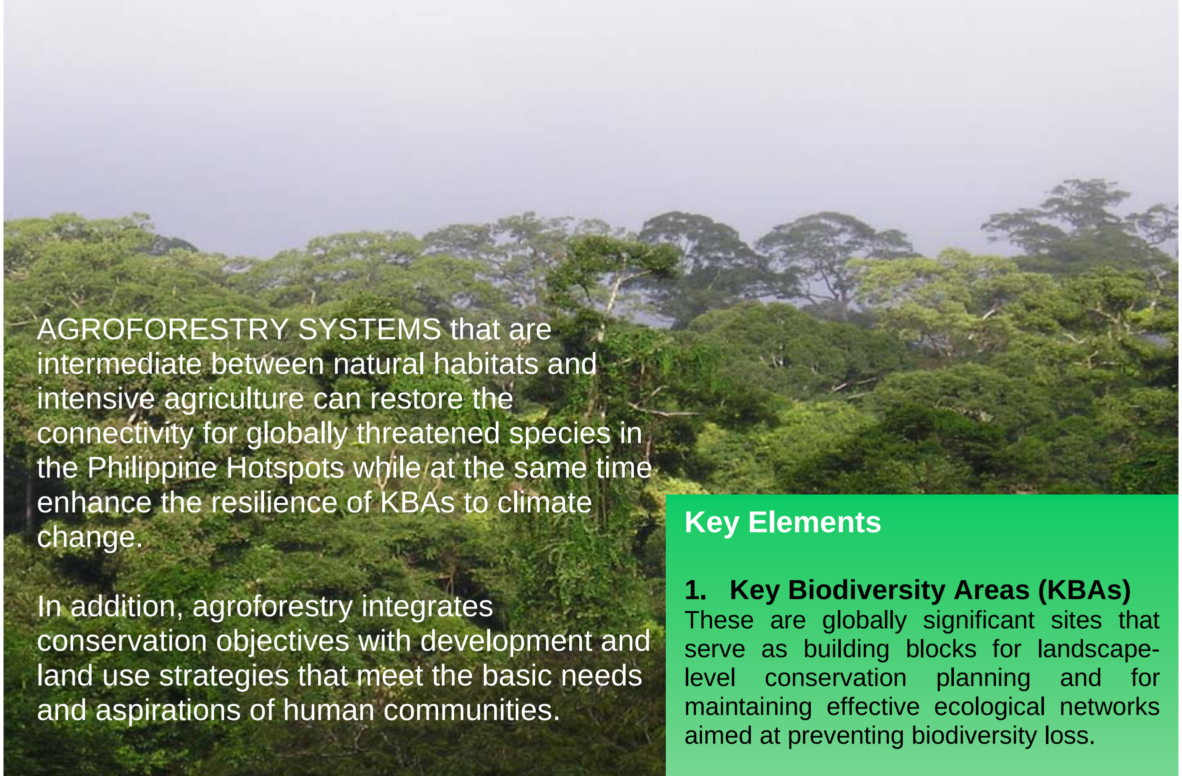
Biodiversity and Climate Change

Restoring the Connectivity for Globally Threatened Species requiring landscape level conservation



AGROFORESTRY SYSTEMS that are intermediate between natural habitats and intensive agriculture can restore the connectivity for globally threatened species in the Philippine Hotspots while at the same time enhance the resilience of KBAs to climate change.

In addition, agroforestry integrates conservation objectives with development and land use strategies that meet the basic needs and aspirations of human communities.

Key Elements

1. **Key Biodiversity Areas (KBAs)**
These are globally significant sites that serve as building blocks for landscape-level conservation planning and for maintaining effective ecological networks aimed at preventing biodiversity loss.

2. **Climate Change – a threat to biodiversity**
The rise in average global temperatures is anticipated and many species will simply unable to adapt quickly enough to this new condition or to move to regions more suitable for their survival.

3. **Agroforestry in the Matrix**
Biodiversity-friendly land uses such as agroforestry systems may provide habitat for many species, increasing the chance of movement through matrix when climate change alters habitat in KBAs.

4. **Technique for Area Demanding Species Requirements**
Methods to target landscape corridor conservation for area demanding threatened species and important ecological processes that are being in the process of development and testing.

1. Key Biodiversity Areas

Key biodiversity areas (KBAs) are sites of global significance for biodiversity conservation that support important populations of threatened or endemic species.

In the Philippines, a total of 128 KBAs were identified for 209 threatened and 419 endemic species of freshwater fishes, amphibians, reptiles, birds and mammals (CI-Philippines, et al, 2006). These KBAs cover approximately 20 percent of the total land cover of the country (6,008,813ha). All the species protected through the Wildlife Act (Republic Act 9147) are represented within at least one KBA.

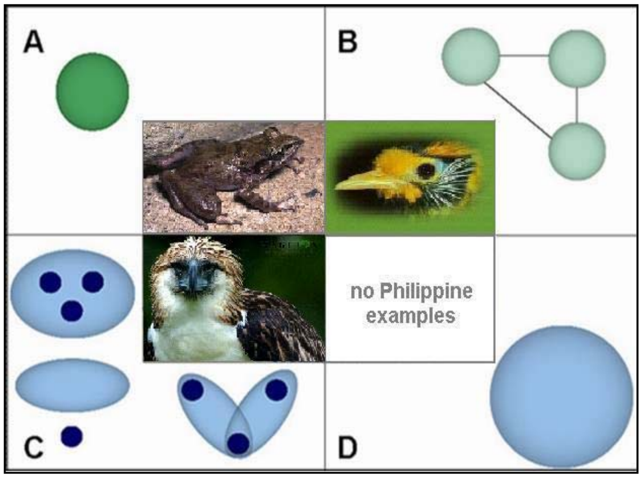


Fig. 1. Scales of conservation necessary for threatened species (Boyd et al., *In press*) e.g. (A) the frog *Platymantis insulata* which can only be conserved at the sole site where it occurs, on Gigantes Island (Brown and Alcala, 1970); (B) the bird *Dasycrotapha speciosa*, which requires conservation through safeguarding the sites to which it is restricted on Negros and Panay (Brooks et al., 1992), and (C) the Philippine eagle (*Pithecophaga jefferyi*) which needs conservation of a network of sites owing to its large area requirements (Villegas et al., in prep).

Identifying and safeguarding KBAs is an effective way to prevent species extinction, however, the conservation of KBAs is insufficient for some threatened Philippine species, which require landscape-scale conservation measures beyond the protection of the KBAs where they occur (Fig. 1c). Some such species, like the Philippine Eagle (*Pithecophaga jefferyi*), are area-demanding in that they either regularly move between sites or naturally occur at low population densities during part or all of their life cycle such that it is difficult to safeguard sites of adequate size (Villegas *et al*, in prep). There are no Philippine examples of threatened species that require only landscape-scale conservation without depending on site-level action (Fig. 1d).

2. Climate Change – a threat to biodiversity

Climate change is already a reality. It is anticipated that over the next century, the rise in average global temperatures will be faster than what has been experienced by the planet for the last 10,000 years. Many species will simply be unable to adapt quickly enough to this changing condition or to move to regions more suitable for their survival.

The Millennium Ecosystem Assessment identifies climate change among the principal direct drivers affecting ecosystems. At the species level, climate change affects biodiversity by (CBD, 2007):

- changes in distribution,
- increased extinction rates,
- changes in reproduction timings, and
- changes in length of growing seasons for plants

3. Agroforestry in the Matrix

Agroforestry when appropriately designed may contribute to the conservation of biodiversity by increasing the connectivity of populations, communities and ecological processes in fragmented landscapes, thus increasing the resilience of globally threatened species to climate change.

It may provide habitat for many species, increasing the chance of movement through the matrix when climate change alters habitat in KBAs. Connections such as biological corridors provide continuity between habitat fragments and can help maintain viable populations in multiple-use landscapes.

Promoting and maintaining tree cover (especially indigenous species) will specifically provide the following:

- ***Serves as transition or alternative habitat***

Shaded coffee agroecosystems are widely known to harbor a diverse and abundant avifauna (Somarriba, et al 2004). If the ranges of the bird species shift due to climate change, shade coffee plantations provide semipermeable matrix land use that may facilitate natural bird movement (Hanna, et al 2004).

- ***Creates suitable microclimate***

A landscape with agroforestry systems in connection with major protected areas under natural forest cover may help moderate rainfall disruptions and regional drying (Hannah, 2004). Loss of tree cover over large areas may result in reduced moisture recycling and regional drying, which may affect species' ranges and abundance through changes in food availability, reproductive timing and survival during events of drought and fire.

- ***Provides food source outside KBAs***

When food becomes less plentiful in KBAs especially for populations of large seed-dispersing birds and mammals, agroforestry provides food sources. In times of rapidly changing climate, species such as Hornbills are moving hundreds of kilometers in search of off-season food and agroforestry in the matrix facilitate long-distance foraging with newly suitable climates.

4. Technique for Area Demanding Species Requirements

Conservation International (CI) and World Agroforestry Centre (ICRAF) have joined forces to develop methods to target landscape corridor conservation for area-demanding threatened species such as the Philippine Eagle (*P. jefferyi*).

The technique was established based on the IUCN Red List and on GIS analysis of environmental parameters to derive targets for landscape "corridor" conservation, focusing on spatially explicit population, area and connectivity requirements. The technique was then tested using data from the Philippines to derive landscape conservation targets for an area-demanding species (*P. jefferyi*). Of the two largest known subpopulations – Eastern Mindanao and Sierra Madre, tests showed that beyond KBAs, additional 5,360 km^2 and 5,904 km^2 respectively of area of occupancy (AOO) are known to hold the species. The spatially explicit configuration of these area targets is mapped in Fig 2. Adding to already existing KBAs, this yields to 11,346 km^2 and 13,786 km^2 of AOO respectively.

Results reveal that land management modifications to allow the recovery of the species' populations to maximum population density and occupancy throughout suitable habitat in Eastern Mindanao (11,346 km^2) or the Sierra Madre (13,786 km^2) would – just – be sufficient for it to be downlisted from the IUCN Red List (Villegas *et al*, in prep).

With these additional identified sites, it is a challenge to design an agroforestry system that will complement to the habitat requirements of this threatened species. Features such as habitat quality, structure and natural dynamics of different agroforestry systems must be considered.

Greater value is achieved if indigenous or native trees are used.

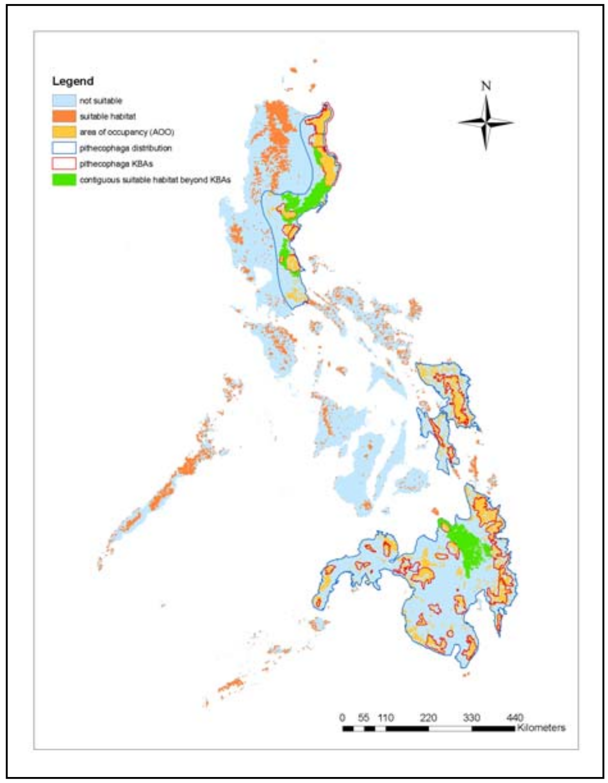


Fig 2. Configuration targets defined by the contiguous suitable habitat beyond KBAs but within the area of occupancy for P. jefferyi, shown in green. This along with the orange shaded portions of the map show the suitable habitat for the species. The species' range is shown with a thick blue line, and the KBAs where it is known to occur (Mallari et al. 2001, Conservation International - Philippines et al. 2006) are outlined in red (Villegas et al, in prep).

Future Implications:

In these areas beyond KBAs, human population densities are high and the livelihoods of the poor are highly dependent on natural resources. Therefore, as far as possible, landscape-scale conservation planning must seek opportunities to integrate conservation objectives with development and land use strategies that meet the basic needs of human communities.

Identifying and adopting appropriately designed agroforestry systems as biological corridors could facilitate compensations or incentives (e.g. carbon credits, ecotourism, payments for watershed services) to be economically viable for farmers.

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