

WILDLIFE PREMIUM MARKET+REDD:

**Creating a financial incentive for conservation and recovery of
endangered species and habitats**



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Executive Summary- A contributor to continued biodiversity loss is the absence of market mechanisms to finance the recovery and protection of globally important species and habitats. In this, the Year of Biodiversity and the Year of the Tiger, we propose a change in the status quo of undervaluing wildlife through a new model in which conservation of endangered species and habitats becomes financially attractive to investors. We describe the start-up and operation of a wildlife premium market+REDD, a market that will add value to proposed carbon payments, established under international mechanisms and located in globally important areas for biodiversity. The initial example focuses on one critical target: recovering endangered wide-ranging mammal species, specifically tigers. We explain the type of monitoring, reporting, and verification required to make such a market credible based on the best science available. The wildlife premium concept can also be applied to conserving a global portfolio of biodiversity priorities and we offer such a framework. We believe this new market mechanism has the potential to: 1) arrest the continued loss of species and erosion of global biodiversity in tropical forests; 2) create payment schemes to improve livelihoods for the rural poor who live near areas of high biodiversity value; and 3) serve as a dividend, an additive to carbon offsets to better value functional ecosystems with intact wildlife resources. The failure of moral arguments alone to persuade governments and local stakeholders to conserve endangered wildlife calls for bold new approaches to avert the great extinction crisis that looms on the horizon.

The Crisis

The planet's biodiversity is under siege, especially in the tropics, and the expanding human footprint threatens to crush the natural world. Despite intensive efforts by national governments, NGOs, and multi-lateral institutions, critical wildlife habitats continue to be converted or degraded and many species have been pushed to the brink of extinction. Major infrastructure projects and land conversion to produce commodities such as oil palm, pulpwood, soy, sugar cane, and beef cattle have made great inroads into valuable wildlife habitats. A few positive examples of wildlife recovery exist, but many of the most charismatic and wide-ranging wildlife species that dwell in tropical forests—tigers, jaguars, forest elephants, gorillas—are still worth more dead than alive. Moreover, most species on the IUCN Red List of Threatened Species lack the charismatic appeal of these megavertebrates and will never receive adequate protection unless our conservation models change. The greatest gap in protection and financial support is in tropical rainforests, home to more than 50% of all species

on Earth. Benefits from ecotourism and payment for ecosystem service schemes may help recover some populations or protect some reserves, but a financial mechanism to value wildlife and their habitats at a vast scale in tropical developing countries is sorely lacking.

In the future, carbon emissions, and as a result tropical forests, will eventually fall under a compliance market in which the value of standing trees will be captured by new agreements like REDD-Plus. At present, there is a voluntary market for carbon emissions that values forests; this market is earmarked for a few countries. However, no comparable market exists for endangered species that can reduce the opportunity costs of conservation for developing countries and local communities. Therefore, the decline and disappearance of species will continue unless a mechanism can be put in place to provide financial benefits for their conservation.

This concept paper proposes such a financial mechanism: a wildlife premium market linked to the emerging carbon market. The paper addresses five issues central to creating this market. The first section covers the opportunity at hand, the rationale for linking emerging carbon markets to a wildlife premium, and the key role the World Bank could play to advance a Wildlife Premium Market Initiative (WPMI). The second section outlines how the market could operate for forested landscapes critical to the



Figure 1. An endangered Sumatran tiger in a peat swamp forest, Sumatra. For Sumatran tigers, the REDD/REDD+ mechanism could become a vital component of habitat conservation and recovery. Forested areas that go unprotected without such schemes will be rapidly converted to oil palm or pulp and paper plantations. In the conversion process, tigers will be extirpated and potentially catastrophic amounts of emissions will be released from the deep peat bogs common in this swamp forest.

conservation of tigers and other area-sensitive, wide-ranging vertebrates that serve as umbrellas for many other smaller species and ecological processes. The third section illustrates the types of monitoring, reporting, and verification required for a wildlife premium market to work, using as an example efforts to finance the recovery of tigers and prey in one of Asia's premier Tiger Conservation Landscapes. The fourth section outlines how local communities will stand to benefit from wildlife recovery via premium market payments. The final section outlines how a global portfolio of biodiversity targets could be protected through a wildlife premium market built around a subset of forest-dwelling, flagship species that serve as umbrellas for other less prominent biodiversity components.

I. The Opportunity

Recent studies show that as much as 15% of global greenhouse gas emissions are released from forest conversion and degradation in the tropics (Asner et al., 2010). Proposed solutions to stem these emissions, through instruments such as REDD and REDD+, offer conservationists, developing nations, and concerned citizens the greatest opportunity of our lifetimes to secure tropical forests, sequester the carbon they contain, and protect their unique biodiversity. REDD and REDD+, through a system of carbon payments to tropical developing countries, have the potential to offer financial incentives at the scale necessary to protect forests from conversion to other uses (Figure 1). However, such a system could lead to the conservation of glorious tropical forests that are structurally intact, at least for the next few decades, but devoid of charismatic megavertebrates, and possibly most vertebrates of any size, because REDD and REDD+ do not incentivize maintaining forests *and* their native wildlife.

The Wildlife Premium Market Initiative would assiduously avoid complicating the application and evolution of REDD and REDD+, which many view as already complex. Rather, wildlife premiums would only be available to countries, districts, community forest groups, and other participants once either a formal global compliance market for carbon trading becomes operational or a significant voluntary fund for forest carbon conservation arises in an area of global biodiversity importance. Norway has already created such a voluntary fund for Indonesia, Tanzania, and Brazil. The wildlife premium market would require such mechanisms to be in place, and countries or large provinces to be abiding by carbon emissions baselines before any premium payments are available. Without this linkage to a carbon payment, the wildlife premium would represent business-as-usual in conservation. But linking REDD mechanisms to a wildlife premium would be a magnificent opportunity to both reverse the current extinction crisis and provide more financial support to impoverished communities who will ultimately determine the future of those forests and the wildlife they contain.

Premium markets can result in higher carbon prices than regular markets because they tend to attract socially or environmentally responsible investors (environmentally conscious travelers and shareholders of companies, private citizens, etc.) who would be willing to pay higher prices for carbon credits from projects that create co-benefits. For example, because Clean Development Mechanism (CDM) hydropower projects are not accepted under the European Trading System, credits are traded at lower prices, whereas CDM projects under the Gold Standard – which certifies projects that fulfill the additional requirements for sustainability and environmental impact – achieve significantly higher prices. The higher prices can compensate for the higher costs of producing carbon credits that also create co-benefits, such as wildlife conservation, and could incentivize project designers from tropical countries to focus on such

projects. The challenge, however, is to create the demand for premium carbon credits and establish a market for monetizing the additional value of wildlife conservation.

Creating the Wildlife Premium Market Initiative: The Pivotal Role of the World Bank

The World Bank has experience with catalyzing new carbon markets and attracting public and private investors. In April 2000—before compliance markets existed and five years before the Kyoto Protocol entered into force—the World Bank operationalized the Prototype Carbon Fund with an initial capitalization of US\$ 135 million. Today, the World Bank’s Forest Carbon Partnership Facility (FCPF): a) assists developing countries in their efforts to prepare for REDD+ projects; b) helps to establish a large-scale system of incentives for reducing emissions from deforestation and forest degradation; and c) provides a financing source for the sustainable use of forest resources. It does not, however, explicitly target the co-benefit of biodiversity conservation or endangered species conservation. A similar World Bank-catalyzed Wildlife Carbon Fund would be an excellent mechanism to properly value wildlife species and their habitats and create a premium carbon-related market for wildlife conservation.

The Wildlife Carbon Fund (WCF) would invest in carbon-reduction projects, primarily REDD+ projects, that create co-benefits for wildlife. These projects would be developed with a particular emphasis on their contribution to protecting a subset of tropical forest-dwelling species whose combined ranges encompass the most important regions of the world for global biodiversity conservation. This subset is referred to as flagship umbrella species¹ in this concept (see section 5). The WCF would operate like other carbon funds that the Bank operates; i.e., the OECD governments and companies will provide money to the WCF, and the World Bank will use the money on behalf of the contributors to purchase project-based reductions in greenhouse gas emission in developing countries and countries with economies in transition. Thus, the World Bank will act as an intermediary and will not lend or grant resources to projects, but rather will contract to purchase emission reductions. Payments to organized local community groups, or state or provincial governments that are involved in the design, implementation, and monitoring of the payment schemes will be made periodically (annually or at another appropriate interval) after verification by a third-party auditor that emissions reductions have been achieved and wildlife targets met. Adding the additional revenue stream in hard currency

¹ Flagship species are those that have broad popular appeal either globally or in the countries where they occur and can become the focus of conservation efforts. Typically, they range widely or are what biologists term "area-sensitive," meaning that they need large areas to maintain viable populations over the long term. Umbrella species are those that require large spatial areas and conservation of these species will also provide conservation cover for many other species. In most cases umbrella species are also charismatic species with public appeal. Keystone species are vital for maintaining the health and integrity of ecosystems and their conservation will also help to conserve ecosystems. Endemic species are confined to small spatial areas in the global context and the conservation opportunities are limited

also reduces the risks of commercial lending or grant finance, and increases the ‘bankability’ of projects to sell emission reductions.

Once it is globally known that a demand for premium wildlife credits exists, developing country governments that are designing their national REDD+ strategies (at least 38 with the help of the World Bank) could add this new co-benefit to their proposals. They will also have an incentive to enact relevant legislation and provide guidance to non-governmental project developers who wish to design wildlife-focused projects that also generate forestry and ecosystem benefits. The advantage of creating a Wildlife Carbon Fund is that funds would be available from the outset, creating incentives for governments and project developers to develop projects specifically geared toward wildlife. A disadvantage, however, is that the fund most likely would attract only a limited number of large public and private investors. The fund would also need replenishment as the money is paid out.

Thus, a complementary strategy for creating a premium wildlife market would be to establish a Wildlife Standard for carbon credits, built on existing compliance or voluntary standards, to screen projects for co-benefits for wildlife. The advantage of creating a Wildlife Standard is the greater likelihood of establishing a sustainable market open to all types of investors. Project investors would know that their projects could be certified and potentially could achieve higher prices but would face the risk of investing in projects without knowing demand.

Creating both a Wildlife Carbon Fund and a Wildlife Standard would help to provide early funding to create demand and then to establish a long-term sustainable market. This two-pronged approach would have the advantages of both the Fund and the Standard. It would provide funding from the outset, thereby serving as a catalyst for immediate start up, and would establish a sustainable market mechanism in the long run. A third, complementary activity would be to issue wildlife premium bonds to help support this initiative. These mechanisms could all be developed and refined during the pilot phase of the initiative.

II. Tiger Premium Market+REDD: A First Application of a Wildlife Premium Market Approach to Conservation of a Wide-ranging, Area-Sensitive Species

A wildlife premium market would have an immediate impact on reversing the now-rapid decline of the wild tiger population. In large part due to loss and degradation of their forest habitats in Asia, tigers are on the brink of extinction throughout much of their range, even though we know how to recover tigers and have witnessed episodes of recovery in the past. The challenge is that government agencies fail to sustain recovery efforts, often due to the shortage of funds required to meet the recurrent costs of conservation. An effective wildlife premium market scheme could change that scenario. At the Global Tiger Summit—to be hosted

in St. Petersburg, Russia in November, 2010—the announcement of a wildlife premium market for tigers would be hailed as a great contribution to recovering tigers.

Tigers are a prime target for the wildlife premium market because:

1. Asian forests are rich in carbon. Tiger conservation landscapes (TCLs), on average, store carbon (above ground) at 3.5 times higher density than do forests outside TCLs (but within the historic range of the tiger). Coincidentally, the government of Norway has granted US \$1 billion to Indonesia for the conservation of forest carbon, part of which will be allocated to Sumatra, home to the Sumatran tiger. Discussions are underway to finance similar large-scale voluntary funds for the rest of the tiger range countries in the tropics. Having such significant voluntary funds in place or in development creates the financial underpinning for the wildlife premium to have an add-on effect.

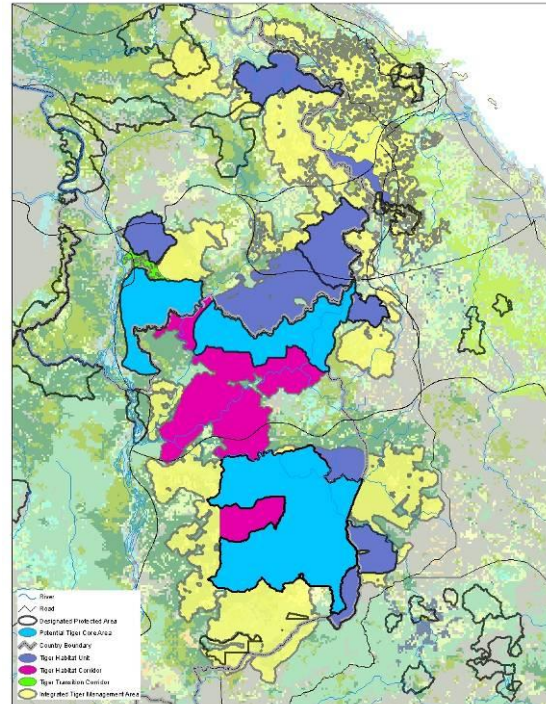


Figure 2. A possible scenario to protect one of Asia’s largest wilderness areas in the Eastern Plains of Cambodia is to finance forest protection of protected areas like Mondilkiri and Phnom Prich (in blue) under REDD+ and the forested corridors that link them to the north through REDD funding support.

2. Most of mainland Asia's areas of highest endemism for vertebrates and richest ecoregions for vascular plants fall within the tiger range. Thus, tigers serve as umbrellas for many other species in their range.
3. Tiger conservation landscapes are home to hundreds of millions of more rural poor than are equal-sized areas in the Brazilian Amazon, the Congo Basin, the island of New Guinea, and other carbon-rich forests where the densities of people living below the poverty line are orders of magnitude lower.
4. Thus, donors who wish to see benefits or co-benefits reach as many of the rural poor as possible would be attracted to support a wildlife premium that will protect the biodiversity that poor, rural people depend on for food, medicine, fodder, and other essentials; maintain intact forests above and adjacent to agricultural areas to prevent

soil erosion and increase water flow during the dry season; and provide many other goods and services. See section 4 for more details on direct payments to communities.

Why a Wildlife Premium Could Turn the Tide for Tigers

Within the current tiger range, none of the 380 protected areas is large enough to support a viable population of tigers. However, by linking tiger protected areas together through forest corridors to manage as one unit—as a landscape—populations become viable. Scientists have identified 76 such Tiger Conservation Landscapes. Taken together they cover about 1.1 million km² of natural habitat, or about two times the size of Thailand. The goal of the 13 tiger range countries is to double the number of wild tigers

within 12 years, from an estimated 3500 to 7000 animals. A mechanism to incentivize the recovery of tigers in these landscapes will make achieving this target possible. The Tiger Premium+REDD initiative is a mechanism to add value to existing reserves, buffer zone forests, and corridors that store large amounts of carbon or sequester carbon as they recover from degradation and can support breeding tiger populations. Recovery of tiger habitat in the larger landscapes, where wildlife corridors lie outside of protected areas and are degraded or threatened by development (Figure 2), could be financed through REDD while REDD+ payments could underpin the protection of reserves where tigers are breeding. Again, we emphasize that the REDD mechanisms target protecting or restoring the physical (structural) habitat used by tigers, their prey, and other biodiversity, but not the biodiversity itself.

A pilot program, known as "Carbonated Tigers," is already underway in Nepal's Terai Arc Landscape (Figure 3). This project links recovery of tigers and tiger prey and restored riverine forests to annual payments to adjacent communities who are guardians of the regenerating

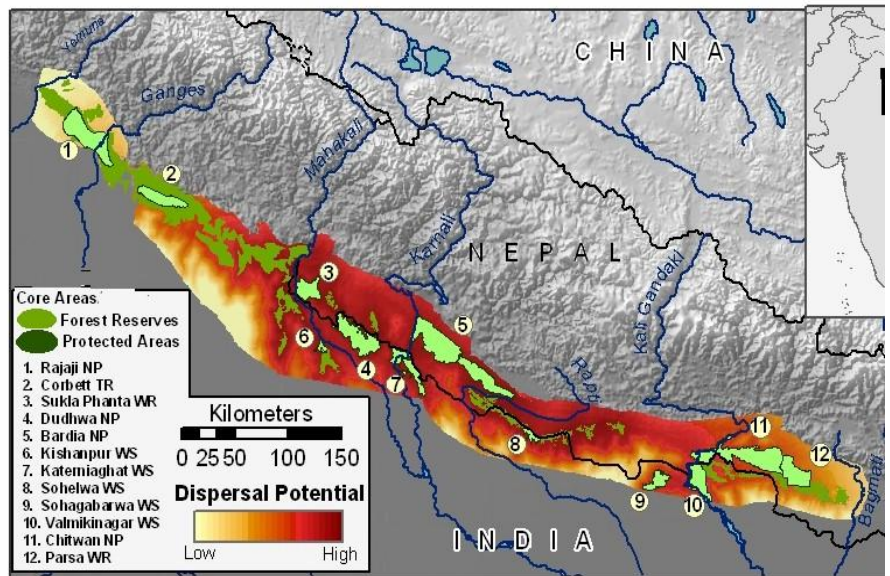


Figure 3. The future of tiger conservation is to manage this endangered species as what biologists call a metapopulation—a population linked by dispersal. In the lowlands of Nepal and northern India, tigers found in 12 reserves can be managed as a single genetic population if adequate funding exists to pay for conservation and restoration of core reserves and forested corridors that link them. Between the forest reserves and protected areas, the darker red dispersal areas are often community-managed forests and forest restoration areas, where incentives to recover habitat could connect this entire 1,000-km long landscape.

forest that is sequestering carbon. Payments are guaranteed by a bank in Germany. The challenge is to scale such project-level activities to the provincial or national level and expand this initiative rangewide. Simply put, forests that have retained their tiger populations, or where such populations are rebounding, will likely prove to be worth more than forests where tigers and most wildlife have disappeared.

Tiger range country ministers and other government officials have clearly recognized and articulated the links between forest conservation, forest carbon stocks, and tiger conservation. Moreover, the data from a Tier I analysis by WWF on the distribution of forest carbon suggest that carbon values are lower where forests have lost their tigers, perhaps because these forests are much less valued and have probably been exploited more than forests with tigers.

The best example of the potential for a multiple-win effect of linking climate stabilization, REDD, and tigers comes from Sumatra. The RIMBA TCL contains the highest levels of combined above and below ground carbon in the world because much of sits on peat. Forests on mineral soils, adjacent to the peat forests, are among the most diverse tropical forests on Earth and also of global conservation value. This landscape is a high priority for tiger conservation. Areas undervalued as natural forest and tiger habitat are swiftly converted to oil palm or pulp and paper plantations, resulting in extirpation of tigers and dramatic pulses in greenhouse gas emissions from forests and soils. REDD and REDD+ offer the most powerful mechanisms to date to stop the destruction of tiger habitat. However, linking tigers to REDD in creative new ways, such as a tiger (or wildlife) premium market, and making tigers the face of REDD/REDD+ in Asia, could help incentivize the recovery of tigers in carbon-rich forests.

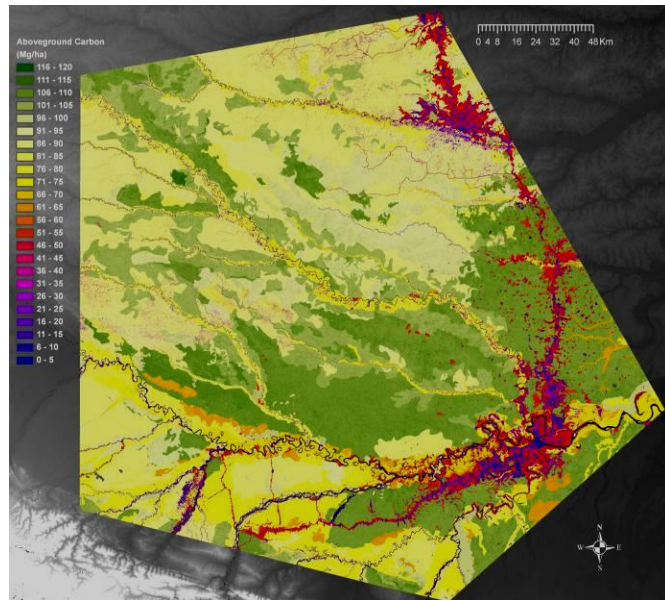


Figure 4. The first high-resolution Tier III-compliant map of forest carbon at a regional scale, Madre de Dios municipality in southeastern Peru (Asner et al. 2010). This map was created using airborne LiDAR to compute forest biomass. The technique was invented by Dr. Greg Asner of the Carnegie Institute for Science and is now spreading to other tropical countries through a Carnegie-WWF partnership. These maps are created at relatively low cost (\$0.05/ha); are efficient (sampling at an average rate of 4,000 ha/hr); and accurate (<10% uncertainty). Such highly accurate maps will remove the discount rate placed on coarse Tier I estimates of carbon and yield a higher price/ton.

III. Ensuring Investor Confidence: Accounting and Monitoring Protocols for the REDD/REDD+ Co-benefit from Carbon Wildlife (Tigers) Premium+REDD

A compliance or voluntary market in wildlife premiums or carbon cannot exist unless the resource being traded can be accurately counted, monitored, reported and verified (MRV) in a transparent system. Many steps are required for a country to complete its "REDD readiness" plan. As stated earlier, the wildlife premium initiative can be triggered only when many of the essential steps are completed and the compliance market is created or a stable, large voluntary fund is operational. We would expect such funds to be operational within a year for some pilot landscapes in the tiger range.

Assuming that, at a minimum, a large voluntary fund is available for a potential carbon financing scheme, we see four steps to MRV in the design of the wildlife premium.

The first step is to create an accurate, cost-effective, Tier III map of forest carbon across all TCLs. The scientific breakthrough of airborne LiDAR enables tiger range countries to accurately, cheaply, and efficiently create Tier III-compliant national baselines (Figure 4) (Asner et al., 2010). Such high-resolution maps (created at 1 m² resolution and scaled up to 30 m² to create regional maps of carbon) have less than 10% uncertainty, thereby removing the discounting of carbon and potentially commanding a much higher price for carbon.

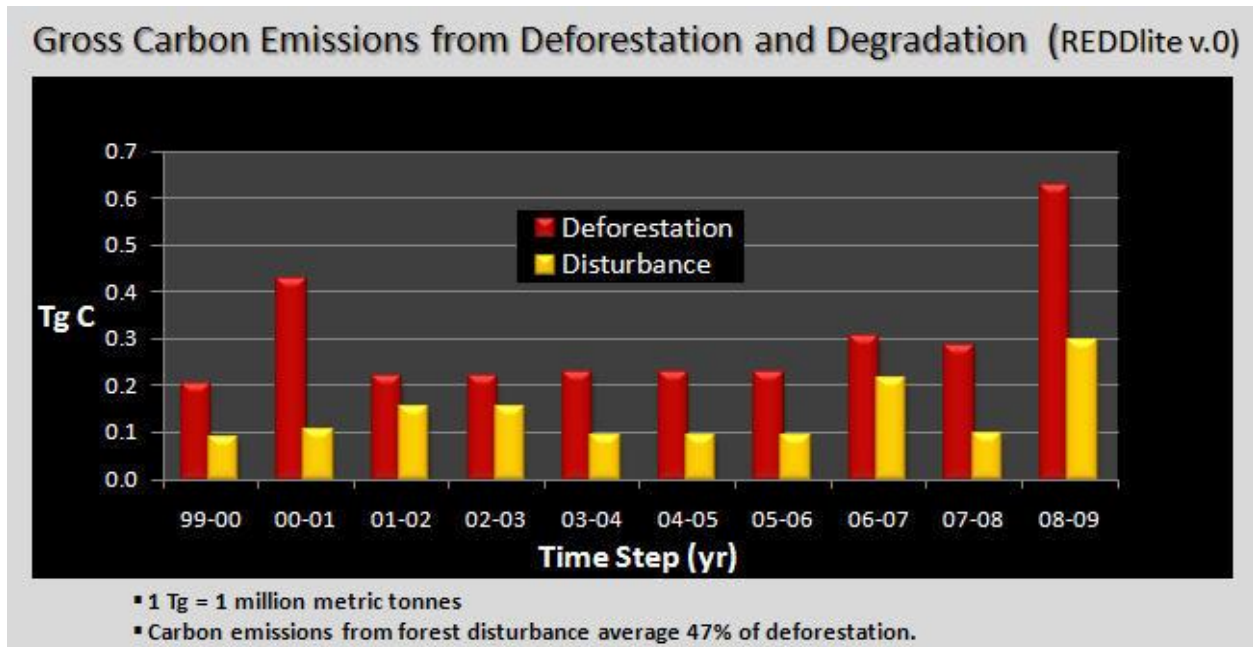


Figure 5. Carbon emissions from the same area in Madre de Dios, over a 10-year period, derived using the CLASlite software soon to be hosted by Google Earth. Note that if the emissions baseline were set at 2005-6 levels (@0.3 TgC emitted) that no wildlife premium payments would be available in the following three years as emissions levels exceeded the baseline.

Once carbon stocks are accurately estimated and a base map is in place, the next step is to monitor carbon flux under accepted protocols. In January 2011, another breakthrough—a software program called CLASlite—will be hosted by Google Earth Engine and available for free. WWF is developing the capacity-building mechanisms to put this essential tool in the hands of civil society and local and federal governments to create transparent monitoring of carbon flux (Figure 5). These two technologies help to ensure that the amount of carbon attached as a co-benefit in the tiger (wildlife) premium market is counted accurately (LiDAR mapping and REDDlite) and monitored at high resolution (CLASlite).

To summarize, before a wildlife premium can be calculated, an accurate account of carbon stocks and a free, easy-to-use method to ensure greater transparency in monitoring carbon flux must be in place. These steps could be completed by the end of year 1 in most tiger range states.

Below, we provide an illustrative example of how a MRV system might work for a tiger premium+REDD market. Assume a given Tiger Conservation Landscape has had its forest cover mapped by LiDAR in 2010, a carbon base map has been created and a baseline set, and CLASlite analysis is employed to create an annual assessment of carbon flux. The country in which the TCL is located has decreased emissions below the baseline and would qualify for the wildlife premium payments if the country met its emissions targets. To become part of the Tigers+REDD premium market program, the tiger range country would have to agree to a gold-standard methodology for monitoring tigers and prey. These methodologies are available and could be tailored to the particular conditions within a TCL.

Accounting and Monitoring Protocols for the Wildlife (Tiger) Premium

To reach the goal of 7,000 individuals by 2022, set by heads-of government of the 13 tiger range states at the Global Tiger Summit, requires 1) recovering the prey base for tigers in core reserves and across the TCLs and eliminating poaching, which will result in an increase in the size of the breeding population of tigers in core reserves, and 2) increased occupancy or “re-occupancy” of tigers in the larger landscape outside of reserves. Thus, monitoring tiger occupancy and prey density in the larger landscape would give investors the data they need to scale their investments.

Modeling the Wildlife Premium Concept in the Terai Arc Landscape

We present a model from the Terai Arc Landscape, one of the 25 highest priority TCLs in the tiger range, to illustrate the concept of Wildlife Premium payments as the conservation component of REDD+ payments. In this model, a project developer would design a tiger-based REDD+project whose purpose is to maintain or increase the numbers of tigers and their prey by

a certain year. Avoided deforestation will be included in the form of maintaining corridors, recreating buffer zones, and reducing illegal logging. The project would generate an appropriate quantity of carbon credits to trade in the compliance market (or where a large voluntary fund is operational) and qualify under REDD-Plus. The project would also supply numbers periodically (yearly or at another appropriate interval) to the Premium Market about the status of tigers and prey and the benefits for communities (see Section 4 below), which would then trigger payments by a certain donor with whom (with the World Bank acting as intermediary) the developer has signed a contract.

The Wildlife Premium payments are based on the presence of tigers and prey species across the landscape. The surveys for tigers and prey will be conducted using a grid-based system, employing sign-based occupancy

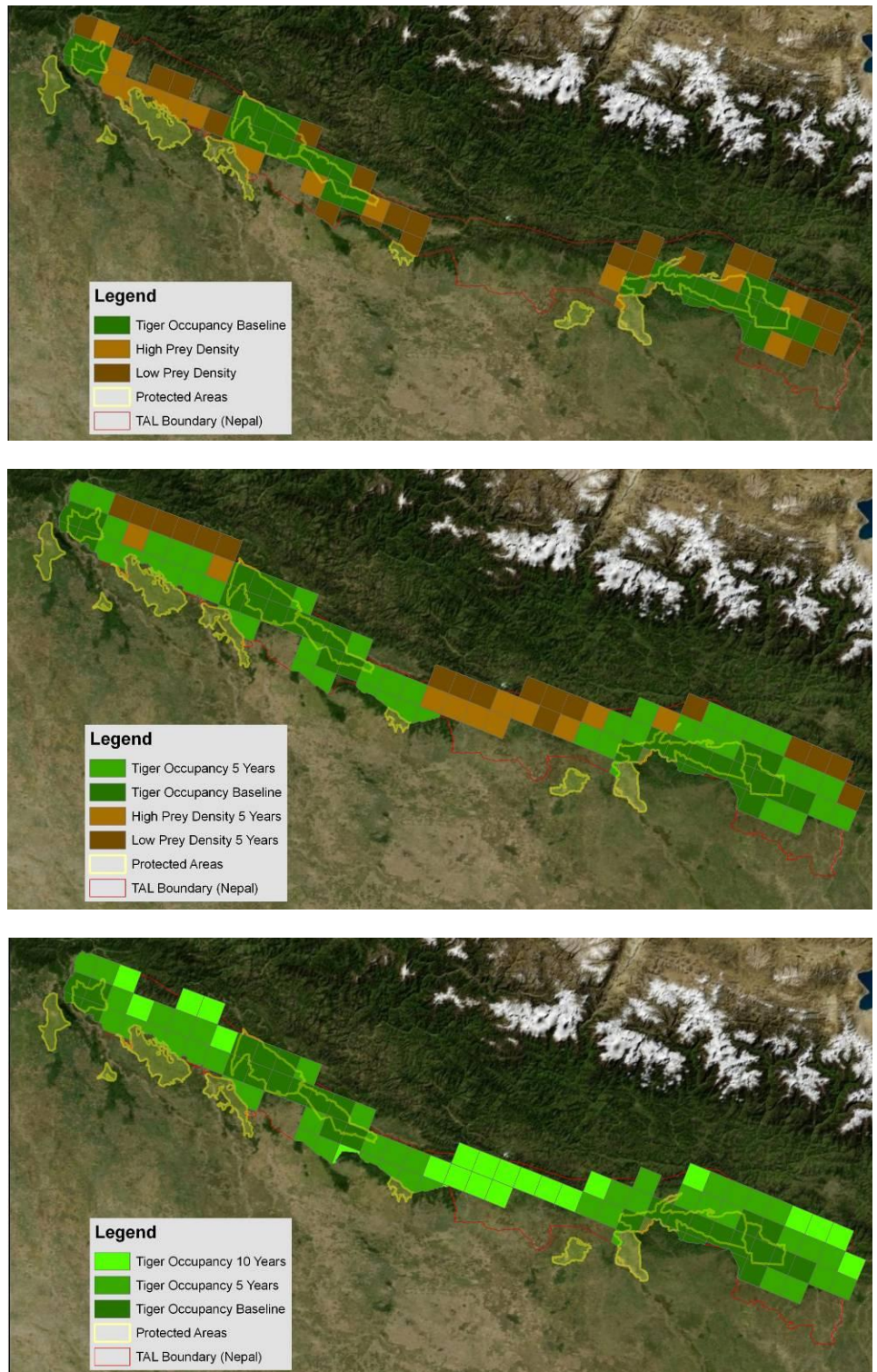


Figure 6. Tiger and prey survey grid occupancy patterns in the Terai Arc Landscape. The baseline surveys (top map) indicate that resident tigers are limited to the protected areas (PAs-outlined in yellow) and some corridors. A few grids, especially those close to the PAs, support high prey densities, and a few other grids support low prey densities. After habitat restoration, protection, and management of corridors, in 5 years the prey densities can increase to occupy grids further from the PAs (middle map). Tigers also expand their range further from PAs. After 10 years, most grids in the landscape are occupied by tigers and high prey densities (bottom map).

surveys for tigers and transect counts, pellet counts, or other scientifically valid survey methods for prey species. Surveys will occur at 2- 3- or 5-year intervals, depending on resource availability and other criteria.

Studies show that breeding female tigers in South Asia, where this example is drawn from, require at least 50 prey items/km²/year to support themselves and their cubs. (Note: The density of prey items/km² would be different for TCLs in other bioregions and forest types.) Thus, to encourage "re-occupancy" by tigers of grid cells (Figure 6), we first need to restore the prey base. The accompanying figure (Figure 6) shows how the tiger and prey species population expansion

across the landscape is being monitored by the Nepal government and NGOs using a survey grid system. The grids from a baseline survey indicate that tigers occupy protected areas and some corridors, and prey species occur at high densities (i.e., >50 prey items/km²) close to protected areas, whereas there could be some prey populations at lower densities (30-50 prey items/km²) in forest patches further away (Figure 6, top map). With habitat restoration, management, and protection, prey species populations can increase and also can recover in other areas, as indicated by subsequent surveys (Figure 6, middle map which shows status after 5 years of

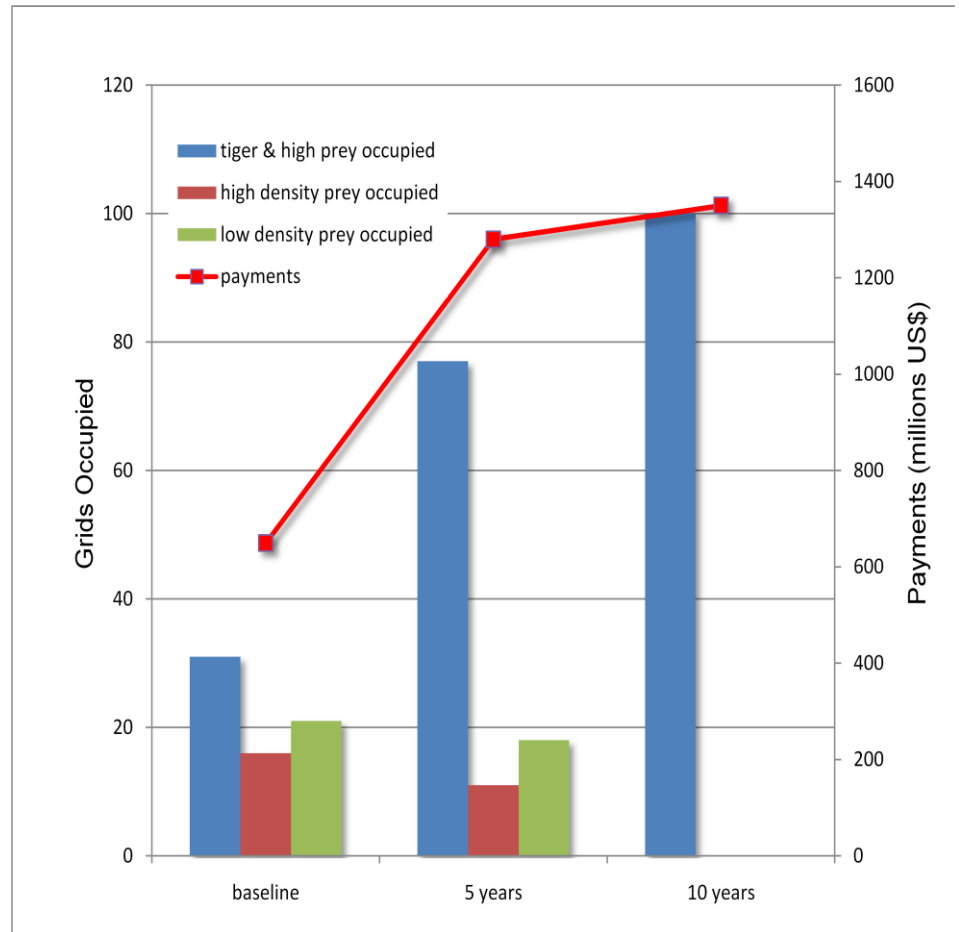


Figure 7. Trends in Wildlife Premium+REDD payments based on tiger occupancy and prey density in the Terai Arc Landscape. *The payment amounts are shown to illustrate the concept and model only, and are not based on accurate costings.* The data are derived from the following: 1) the area of a survey grid is 22,500 ha; 2) assume 100 tonnes of CO₂ equivalent/ha of Terai forest; 3) assume payments of US\$ 6/tons/ha. Wildlife premium payments will be structured based on tiger and prey recovery and occupancy. For grid cells with low density prey, project developers will receive 50% of the premium payments, while for with high prey densities (50 prey items/km²), they will receive 80% of premium payments. When tigers occupy a grid cell with high prey densities, the cells will qualify implementers of conservation programs with jurisdiction over those grid cell areas for 100% premium payments.

recovery). As prey recovery progresses and population densities exceed the thresholds required to support breeding resident tigers, these areas will be occupied by tigers, as indicated by the survey grids (Figure 6, middle map). The overall goal is to ensure that habitat, prey, and tiger recovery will result in tiger occupancy across the entire landscape (Figure 6 bottom map).

To create a graded incentive structure, we use three points on the recovery curve to trigger Wildlife Premium payments (Figure 7). The first payment or dividend occurs when prey densities reach 30 prey items/km² in the respective survey grids; payments will be pro-rated at 50% of Premium. The second premium pays out when prey densities exceed 50 prey items/km² in the respective grids; here, the payments will be pro-rated at 80% of Premium. The full Wildlife Premium becomes available when the respective grids have tiger occupancy and >50 prey items/km².

The total payment for the landscape will be the sum of payments for cells with low density prey, high density prey, and tiger occupancy. As prey species populations expand to occupy other grid cells and as populations increase, and as tigers begin to occupy and expand their range (to include other grids) because of available habitat and prey, the total premium payments will increase until the available habitat is saturated, at which point tigers and prey can be considered recovered. Payments would still continue after the targets are achieved because tigers are considered a conservation-dependent species, requiring protection from poachers, until demand for their body parts becomes negligible.

IV. The Wildlife Premium Market Concept Links Conservation to Improving Rural Livelihoods

Ultimately, the recovery of tigers—or any wide-ranging, area-sensitive species—rests upon that species being worth more alive than dead to poor local communities that live in the same region. Virtually all protected areas established to conserve endangered wide-ranging species, like tigers, are too small to maintain genetically viable populations over the long term. The involvement of local communities is especially important for those species that disperse widely and require corridors of natural habitat to move between populations. There are some positive examples where locals have become guardians of endangered species, allowing them to recover in areas under community management, in countries ranging from Papua New Guinea, to Nepal, Namibia, and Costa Rica.

The Terai Arc of Nepal offers of the best examples to use as a potential model for other areas where the wildlife premium could be introduced (. Here, communities have organized and the government has handed over forest management to user groups if they establish a sound forest management plan that includes recovery of wildlife in areas under their jurisdiction. In one Terai Arc wildlife corridor with community forestry in place—the Khata corridor linking Bardia

National Park to a tiger reserve on the Indian side of the border—tigers now occur in higher densities than within the park proper. The prosperity of these communities has also grown.

Any system to develop REDD payments will likely include payment streams to local communities, as advocated by a number of development and indigenous rights NGOs. The wildlife premium payments can use the same distribution systems as REDD payments to ensure that funds are monitored and equitably distributed to participating communities. During the pilot phase of the wildlife premium market, several approaches to the design and monitoring of payment schemes will be tested and compared. Regardless of which proves to be most effective, a top priority of the premium market will be for funds to reinforce the forest conservation efforts of REDD, by piggy-backing on them, while simultaneously helping to improve livelihoods of rural communities with another annual income stream to offset the opportunity costs of maintaining carbon-rich forests replete with their megafauna.

V. The Use of Forest-Dwelling Umbrella Species as Flagships to Conserve a Portfolio of Global Conservation Targets

The tiger range overlaps with many areas of global conservation importance in Asia. These areas are known for their levels of endemism (species restricted to a localized area of ecoregion) and richness in vascular plants (an excellent proxy for invertebrates and other groups). In Asia, a few other species either overlap with tigers or complement their range by including other Asian forests that are rich in carbon and biodiversity: Asiatic elephants, giant pandas, orangutans, gibbons, tree kangaroos. Besides mammals, forest-dwelling hornbills and birds-of-paradise cover forests in the archipelagoes. Other forest-dwelling wildlife species range widely across the carbon-rich tropical forests in Latin America, Africa, and Madagascar. It should be possible to create wildlife premium markets around a short list of carefully selected flagship species that overlap the regions of highest global biodiversity within these other biogeographic realms.

A roster of a subset of charismatic mammals and birds serves us quite well in covering other important forested regions important for biodiversity. The criteria we used to generate this lists are:

1. species or a related group of species (e.g., gibbons), is a tropical, forest-dwelling vertebrate.
2. The species is or at least some members of the group range widely or are considered area-sensitive.
3. The general public in that locale has a familiarity with that species as a flagship for conservation enabling the Premium market to use it locally and globally as a face for REDD+ and forest carbon projects.

The list of flagship umbrella species is presented in Appendix A.

The three global targets for terrestrial tropical diversity for which we tested the efficacy of flagship umbrella species as proxies include:

1. **Forest-dwelling species listed as critically endangered or endangered by the IUCN whose entire global distribution is limited to a single site.**

This cluster of about 900 species distributed among approximately 600 sites was mapped by the Alliance for Zero Extinction (Figure 8) in an attempt to pinpoint those vertebrate species most likely to go extinct unless these populations and their habitats received increased protection. Most of these sites are on tropical mountains, so protecting them would protect a species from going extinct, conserve watershed services for downstream users, as well as capture carbon.

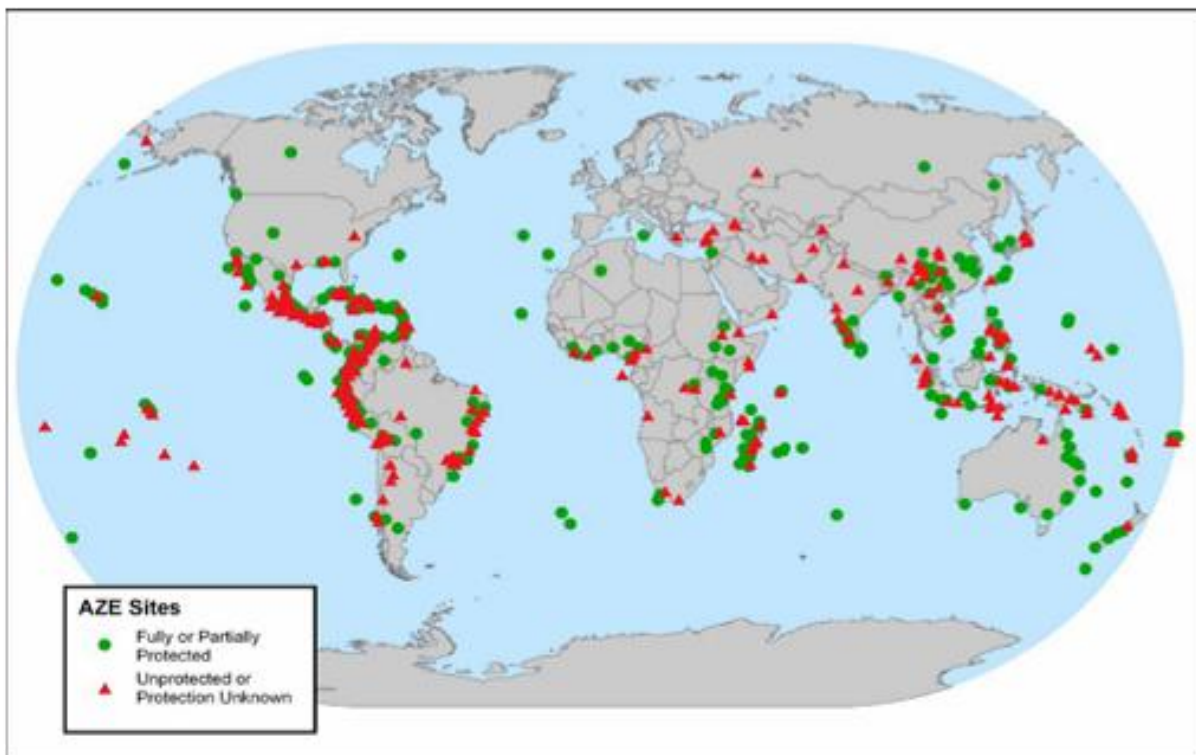


Figure 8. A global map of endangered vertebrates and conifer species ranked as critically endangered or endangered by the IUCN Red List whose entire global distribution centers on a single site. Most of these sites are in tropical upland forests. Almost half of these sites (marked in red) have no formal protection, obvious targets for a Wildlife Premium+REDD mechanism.

2. **Forested ecoregions supporting the highest levels of vertebrate endemism.** Areas of high endemism represent a clear conservation target. Tropical forest ecoregions are highest in vertebrate endemism (birds, mammals, reptiles, and amphibians) and have been mapped (Figure 9).

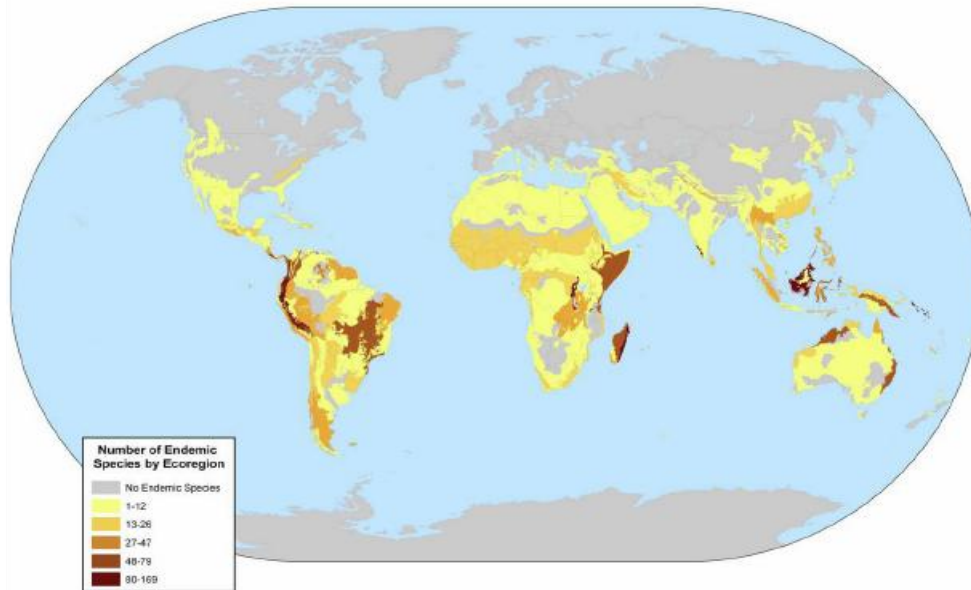


Figure 9. The number of endemic birds, mammals, reptiles, and amphibians peaks in tropical moist forest ecoregions. These ecoregions are based on studies comparing the entire 825 terrestrial ecoregions of the world.

3. Terrestrial ecoregions supporting the most botanically diverse tropical forests. Among the 825 terrestrial ecoregions of the world, botanical diversity is concentrated in about 50 ecoregions in the tropical belt (Figure 10). Ninety percent of these are forest ecoregions. Canopy trees create the three-dimensional structure of tropical forests and are likely good proxies for diversity and endemism among the richest of all tropical taxa—invertebrates. The identification and mapping of High Conservation Value Forests within forested ecoregions, including their canopy tree species, will be available over the next few years through a new technique called spectranomics.

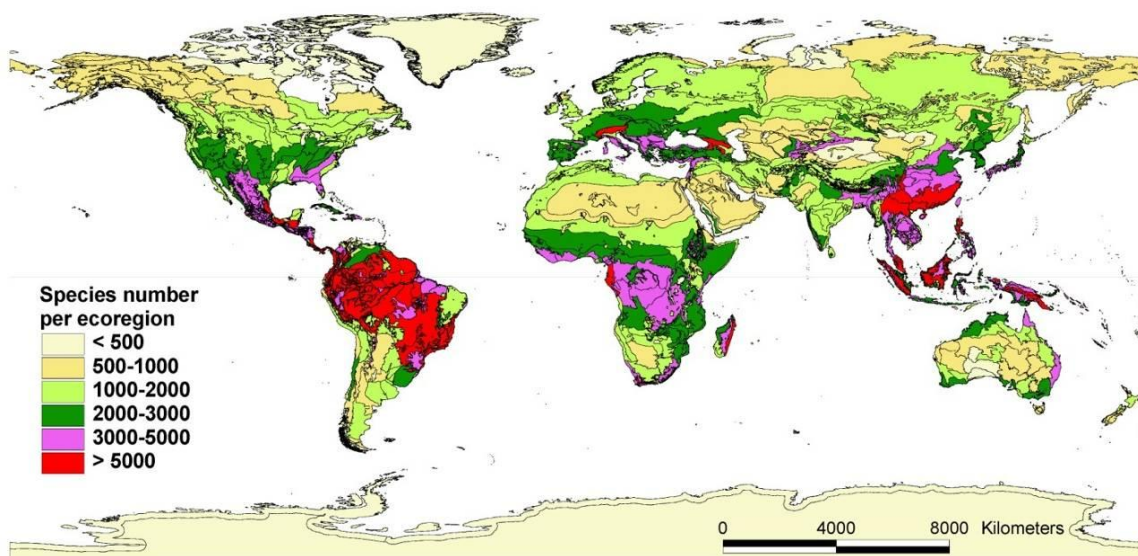
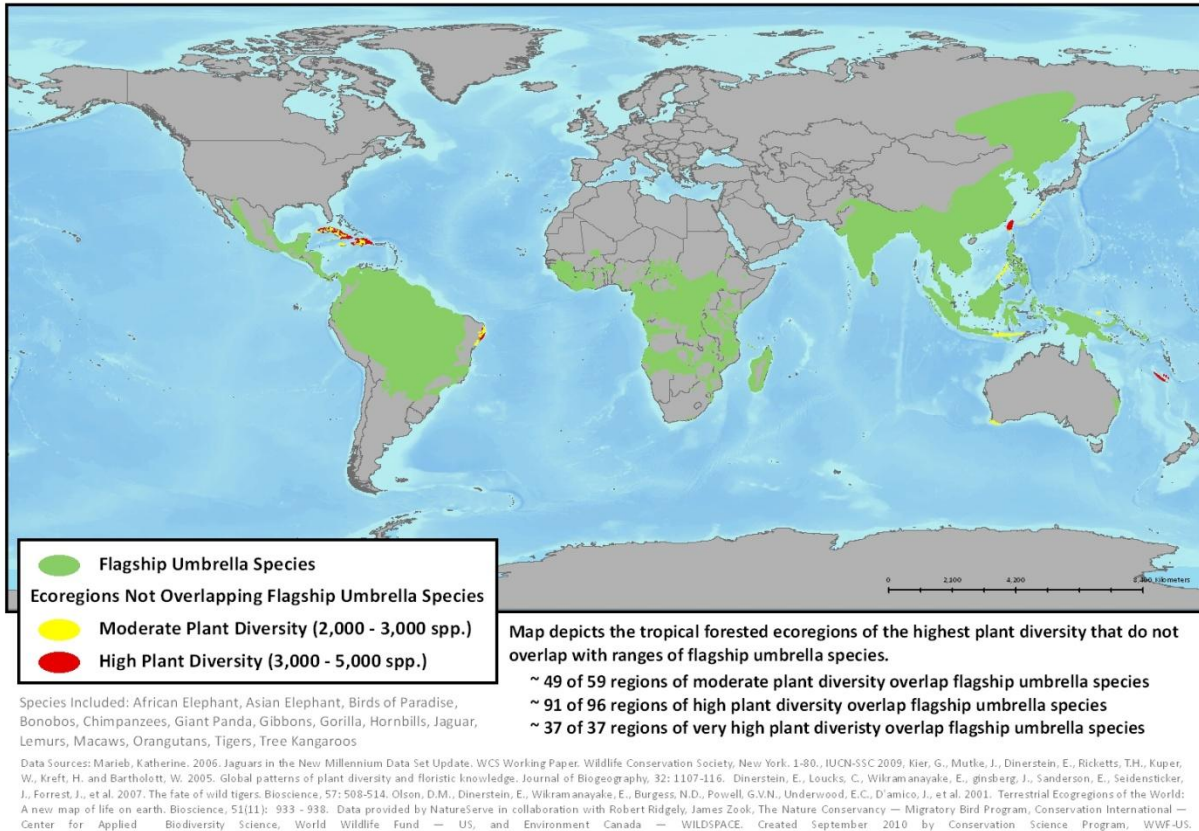


Figure 10. Fifty ecoregions contain more than 5,000 vascular species of plants; 90% of these occur in the tropical rainforest biome.

Virtually all areas of moderate to high plant diversity are encompassed by only 12 groups of flagship umbrella species that are forest dwellers and range widely (Figure 11, Appendix A and B). Similarly, the same flagship umbrellas serve as excellent proxies for the ecoregions richest in endemic vertebrates (Appendix B). The distribution of all flagship umbrella species are mapped in sufficient detail to consider developing a wildlife premium market around each as the initiative takes shape.

Plant Diversity in Forested Tropical Ecoregions and Flagship Umbrella Species



Conclusion

A Wildlife Premium Market+REDD, beginning with a focus on wild tigers and then expanding to other flagship umbrella species captures the high-value conservation targets of tropical carbon-rich forests. This proposed initiative has the potential to make a profound difference to the future of our Earth. Only such a mechanism can ensure a livable planet in which people, forests and other natural habitats, and wildlife thrive together.

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Appendix A. List of flagship umbrella species used to create coverage.

Species Name	<i>Pongo abelii</i>	<i>Pteridophora alberti</i>
<i>Ailuropoda melanoleuca</i>	<i>Pongo pygmaeus</i>	<i>Ptiloris magnificus</i>
<i>Ara ambiguus</i>	<i>Symphalangus syndactylus</i>	<i>Ptiloris paradiseus</i>
<i>Ara ararauna</i>	Birds of Paradise:	<i>Ptiloris victoriae</i>
<i>Ara chloropterus</i>	<i>Astrapia mayeri</i>	<i>Seleucidis melanoleuca</i>
<i>Ara macao</i>	<i>Astrapia nigra</i>	<i>Semioptera wallacii</i>
<i>Dendrolagus dorianus</i>	<i>Astrapia rothschildi</i>	Hornbills:
<i>Dendrolagus inustus</i>	<i>Astrapia splendidissima</i>	<i>Aceros cassidix</i>
<i>Dendrolagus matschiei</i>	<i>Astrapia stephaniae</i>	<i>Aceros corrugatus</i>
<i>Dendrolagus mbaiso</i>	<i>Cicinnurus magnificus</i>	<i>Aceros leucocephalus</i>
<i>Dendrolagus pulcherrimus</i>	<i>Cicinnurus regius</i>	<i>Aceros nipalensis</i>
<i>Dendrolagus scottae</i>	<i>Cicinnurus respublica</i>	<i>Aceros waldeni</i>
<i>Dendrolagus spadix</i>	<i>Drepanornis albertisi</i>	<i>Anorrhinus austeni</i>
<i>Dendrolagus stellarum</i>	<i>Drepanornis bruijnii</i>	<i>Anorrhinus galeritus</i>
<i>Dendrolagus ursinus</i>	<i>Epimachus fastuosus</i>	<i>Anthracoceros albirostris</i>
<i>Dengrolagus goodfellowi</i>	<i>Epimachus meyeri</i>	<i>Anthracoceros coronatus</i>
<i>Elephas maximus</i>	<i>Lophorina superba</i>	<i>Anthracoceros malayanus</i>
<i>Gorilla beringei</i>	<i>Lycocorax pyrrhopterus</i>	<i>Anthracoceros marchei</i>
<i>Gorilla gorilla</i>	<i>Manucodia atra</i>	<i>Anthracoceros montani</i>
<i>Hoolock hoolock</i>	<i>Manucodia chalybata</i>	<i>Bucernos hydrocorax</i>
<i>Hoolock leuconedys</i>	<i>Manucodia comrii</i>	<i>Buceros bicornis</i>
<i>Hylobates agilis</i>	<i>Manucodia jobiensis</i>	<i>Buceros rhinoceros</i>
<i>Hylobates klossii</i>	<i>Manucodia keraudrenii</i>	<i>Ocyceros biotris</i>
<i>Hylobates lar</i>	<i>Paradigalla brevicauda</i>	<i>Ocyceros gingalensis</i>
<i>Hylobates moloch</i>	<i>Paradigalla carunculata</i>	<i>Ocyceros griseus</i>
<i>Hylobates muelleri</i>	<i>Paradisaea apoda</i>	<i>Penelopides aexarhatus</i>
<i>Hylobates pileatus</i>	<i>Paradisaea decora</i>	<i>Penelopides affinis</i>
<i>Loxodonta africana</i>	<i>Paradisaea guilielmi</i>	<i>Penelopides manillae</i>
<i>Nomascus concolor</i>	<i>Paradisaea minor</i>	<i>Penelopides mindorensis</i>
<i>Nomascus gabriellae</i>	<i>Paradisaea raggiana</i>	<i>Penelopides Panini</i>
<i>Nomascus hainanus</i>	<i>Paradisaea rubra</i>	<i>Penelopides samarensis</i>
<i>Nomascus leucogenys</i>	<i>Paradisaea rudolphi</i>	<i>Rhinoplax vigil</i>
<i>Nomascus nasutus</i>	<i>Parotia berlepschi</i>	<i>Rhyticeros everetti</i>
<i>Nomascus siki</i>	<i>Parotia carolae</i>	<i>Rhyticeros narcondami</i>
<i>Pan Paniscus</i>	<i>Parotia helenae</i>	<i>Rhyticeros plicatus</i>
<i>Pan troglodytes</i>	<i>Parotia sefilata</i>	<i>Rhyticeros subruficollis</i>
<i>Panthera onca</i>	<i>Parotia wahnesi</i>	<i>Rhyticeros undulates</i>
<i>Panthera tigris</i>	<i>Perotia lawesii</i>	

Appendix B. Ecoregions of High Vascular Plant Species Richness Overlapping with Focal Umbrella Species Ranges and Endemic Vertebrates by Ecoregion Captured in Range of Flagship Umbrella Species

Species	Ecoregions of High Vascular Plant Species Richness Overlapping with Focal Umbrella Species Range			Vertebrate Endemism within Ecoregions Overlapping with Focal Umbrella Species Range		
	Number of Ecoregions	# New	Running Total	Number Endemics	# New	Running Total
Asia & Pacific						
Tiger	33	33	33	167	167	167
Hornbill*	61	28	61	409	242	409
Giant Panda	4	4	65	7	7	416
Gibbon*	35	1	66	133	0	416
Birds of Paradise*	12	3	69	77	35	451
Asian Elephant	38	2	71	205	31	482
Tree Kangaroos	9	0	71	37	0	482
Orangutan	5	0	71	16	0	482
Totals:			71			482
Africa						
African Elephant	28	28	28	234	234	234
Lemurs*	3	3	31	135	135	369
Chimpanzees	18	0	31	144	0	369
Gorillas*	9	0	31	79	0	369
Bonobos	5	0	31	9	0	369
Totals:			31			369
South & Central America						
Jaguar	70	70	70	872	872	872
Blue and Yellow Macaw	41	1	71	612	1	873
Scarlet Macaw	53	0	71	711	0	873
Red and Green Macaw	39	0	71	609	0	873
Great Green Macaw	10	0	71	246	0	873
Totals:			71			873