CFA Newsletter

No.83 December 2018 ISSN 1750-6417

Contents:

CFA Newsletter
is the newsletter of the Commonwealth Forestry Association

Editor: Alan Pottinger

Contact: The Crib, Dinchope, Craven Arms, Shropshire SY7 9JJ, UK

Tel: + 44 (0) 1588 672868

Email: cfa@cfa-international.org

Web: www.cfa-international.org

The views expressed are not necessarily those of the CFA.

How swampwood is making waves in rock music: the Chiquibul Forest, Belize

Misty morning over the Chiquibul Forest (Photo: Tony Rath)

I have flown into Belize, many times over the last 25 years, but I still get a thrill when I strain against my airplane seat-belt to glimpse the mosaic of verdant and azure landscapes that cover this small country located on the north-east coast of Central America.

On this occasion I am returning deep into the Chiquibul Forest and National Park Reserve, to the Las Cuevas Research Station, a cluster of wooded stilted buildings that provide accommodation, food and peaceful tranquility to foresters, scientists and students studying the forest. It is a place I know well having been fortunate enough to manage it for many years on behalf of the Natural History Museum, London (NHM) and the Belize Forest Department (BFD) in the 1990's.

The Chiquibul Forest Reserve and National Park borders Guatemala and provides a buffer for two other protected areas, namely the Bladen Nature Reserve and the Cockscomb Wildlife Sanctuary, known collectively, as Chiquibul Maya Mountains Key Biodiversity Area (CMMKBA). It is an area the size of Cornwall, in the UK, and constitutes part of the wider 5M ha forest known as *La Selva Maya* or *The Maya Forest*. Classified as lowland tropical broad-leafed rainforest, the forest boasts approximately 375 plant species found nowhere else on earth, it provides refuge for countless rare and endangered species, such as the white lipped peccary, Bairds tapir, harpy eagle and howler monkey. You can often hear the rasping squawk of Scarlet Macaws as they fly freely overhead and it is one of the few places on Earth where the five large neo-tropical cat species (jaguar, puma, ocelot, jaguarondi and margay) co-exist. Due to extensive deforestation throughout much of Central America, the

CMMKBA is now one of the few remaining sanctuaries for many of these endangered species and it is therefore vital that we help all the local NGO's working to conserve it.

I am returning this time as a representative of the Maya 2020 Project, (www.maya2020.co.uk), a UK based consortium of forest experts who have partnered with the local NGO Friends of Conservation and Development (www.fcdbelize.org), who are now responsible for managing the station and park.

I was joined on the trip by expert guitar maker, or luthier, Kit French who is helping raise funds to support the replanting of mahogany trees along the degraded border with Guatemala. He is doing this by making guitars from salvaged ancient trees that sank to the bottom of the Belize River some 200 years ago when Belize was known as British Honduras, whilst being floated to Belize City prior to export to Britain.

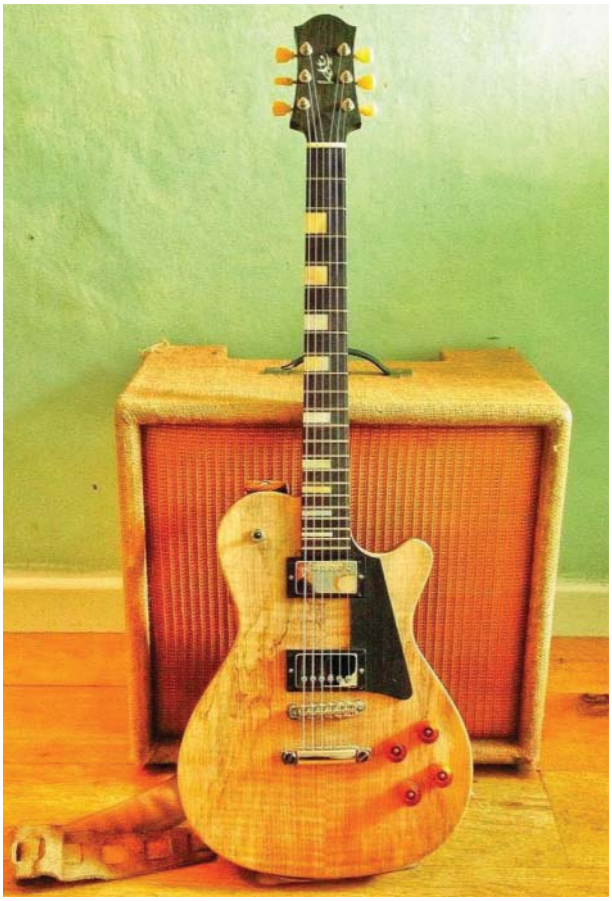
The majestic big leaf mahogany (*Swietenia macrophylla*) is a tall tree that towers above the forest canopy and can be found throughout the Chiquibul Forest. As its name suggests, it bears large leaves and has a bark that emits a sweet odor. However, the species of mahogany that Kit French uses cannot be obtained now as it is critically threatened throughout Central America due to illegal logging and over exploitation over many centuries, and thereby protected.

In 1721 the British Parliament removed all import duties for timber from British Honduras which immediately stimulated trade of the timber with over 15,000 tons per annum being exported to England by 1820. Although initially regarded as a joinery wood, mahogany rapidly became the timber of choice for makers of high-quality furniture and for wall paneling throughout the British Isles. The result is that many of Britain's

Floating log raft on Belize River c1920 (Photo: Angelus Press)

Recovering a sunken Mahogany Tree (Photo: J Shaw)

Salvaged hardwood logs from the river (Photo: C D Minty)



Finished Music Tree guitar (Photo: K French)

most famous and elaborate stately homes, including the seat of British democracy the House of Commons, contain mahogany throughout.

The logs were originally cut by colonial foresters and then floated down rivers for export. However, some of these sawn logs never made it to the ports as they sank to the bottom of rivers and lagoons.

The timber has been preserved incredibly well due to the anaerobic conditions in which it has been embedded and has unbelievable acoustic properties making it the perfect wood for acoustic and electric mahogany guitars.

The Maya 2020 Project will provide expert training to local luthiers, giving them the skills to make high quality guitars from the salvaged timber. Profits from the sale of each guitar will go to supporting a Mahogany replanting project in the Chiquibul along its border with Guatemala.

Sadly, like so many of the world's majestic rainforest, the Maya Forest has been under attack from deforestation for many years, sustaining around 40% loss of its former self. However, as this loss has been historically more pronounced in Guatemala and Mexico, we still have a chance in Belize to do something positive!

If you wish to support this work please donate to the Rainforest Concern, Heart of Belize Fund and help us save this precious jewel in Central America.

Please Contact: Chris Minty on cminty@selvana.org for further information.

Christopher Minty MBE

Association news

2018 Regional Award of Excellence, South East Asia and the Pacific Region, awarded to Dr Chris Harwood

Michael Bleby, Bob Newman and Chris Harwood (L to R).

Dr Chris Harwood's work has advanced understanding of the science that underpins breeding of Eucalyptus, Acacia and Grevillea robusta, promoted strategies and techniques for developing and deploying improved germplasm to tree growers, particularly in Asia and Africa, and substantially strengthened the scientific capacity in these countries. His significant, long-term research and its applications span the evaluation of tree genetic resources, breeding, deployment and wood utilization of Australian tree species.

Dr Harwood's work has advanced our understanding of the science that underpins successful tree breeding especially of Acacia and Eucalyptus for tropical environments, established breeding programs for key species and ensured delivery and deployment of improved germplasm to tree growers in tropical countries. He has made a commitment to capacity building in partnering countries as a core component of his international work and led a project which provided the first comprehensive examination of the sustainability of Acacia and Eucalypt plantations in SE Asia.

In Australia, he has shown leadership, integrity and capacity to bring together partners with diverse interests and organisational cultures into a cohesive program with shared goals. The research program he led in the Cooperative Research Centre for Forestry undertook major research on genetics, plantation management and wood processing to improve the value of plantation-grown eucalypts for solid and engineered wood products. He also led multi-agency research for dryland forestry.

He has published extensively, been a mentor to younger scientists and supported colleagues to deliver strong science outcomes. Feedback from beneficiaries in Africa, India and SE Asia attest to his outstanding support. His life-long work has delivered substantial benefits for forest science and society in tropical developing countries where plantation forestry and wood processing are improving the livelihoods of many.

Chris Harwood exemplifies the values and spirit of Commonwealth Forestry by reaching out, to support forest science, scientists and application of research for sustainable forestry in SE Asia, India and Africa as well as Australia.

The Award was presented on 3rd Sept. at a joint Conference of the Institute of Foresters of Australia and the Australian Forest Growers organisation by Michael H. Bleby B.Sc For. (ANU) FIFA, RPF, CFA Regional Coordinator, SE Asia and Pacific, and Robert L.Newman OAM B.Sc For. FCFA, FIFA, RPF, CFA Vice President, Governing Council.

Forest Scenes

Urban forests in the global agenda

View of Rio de Janeiro, Brazil (Photo: Sophie Laliberté)

The twentieth century was characterized by increasing urbanization rates, with cities expanding in response to growing populations. The urban population worldwide has increased from 746 million in 1950 to reach an estimated 3.9 billion in 2014. This growth is expected to continue, with lower and middle income countries projected to double and triple, respectively, their urban populations by 2050.

Increasing demands for food and basic services in cities are critical barriers to equitability and sustainability. Urbanization has too often translated into unplanned expansion with unsustainable production and consumption patterns, leading to food insecurity, overexploitation of natural resources and decreased resilience to natural disasters and climate change. While urban forests and trees cannot solve all urbanization problems, if used wisely, they could help local administrations address some of these issues.

In 2015, the 2030 Agenda for Sustainable Development launched a set of Sustainable Development Goals (SDGs). SDG 11 urges *Making cities and human settlements inclusive, safe, resilient and sustainable*. In 2016, the Habitat III Conference specifically addressed unprecedented urban development challenges, adopting the New Urban Agenda (NUA). In many places, the NUA echoes wording from the SDGs, as countries commit to creating safe, inclusive, accessible, green and quality public spaces (SDG 11) that provide urban dwellers with multifunctional areas for social interaction, human health and well-being (SDG 3), promote economic exchange, and ensure human development while building peaceful, inclusive and participatory societies (SDGs 10 and 16).

The NUA and SDGs highlight the importance of green spaces and urban forests to improve living standards and increase community cohesion, wellness and happiness while progressing on sustainable development.

Here's an example: a Baltimore study showed a strong inverse relationship between crime rates and tree canopy cover regarding both public and private land, although the relationship is stronger for accessible, public land. A study on *collective efficacy*[1] of various urban features found that parks are

[1] "Collective efficacy," (Sampson *et al.*, 1997) A form of social capital, is a standardized and well-tested aggregate measure of individual perceptions of "social cohesion among neighbors combined with the willingness to intervene on behalf of the common good".

considered community assets where people are more likely to be receptive to others, as they relax together and share space. A Netherlands study found that less green space coincided with feelings of loneliness and a perceived lack of social support.

Overall, people living with more green space feel healthier, and have a lower self-rated propensity for psychiatric morbidity. This relationship between green space and health was shown to be stronger with a higher percentage of green space in a 1 km radius around subjects' homes.

In the NUA, green spaces aren't simply aesthetic landscape features but are drivers of social and economic development, generating increased value, including property value, facilitating business, public and private investments, plus livelihood opportunities (SDG 8 and SDG 10).

Contingent valuation methods used in another survey showed that consumers were willing to pay nine to 12 percent more in shopping districts with trees, versus comparable districts without trees. Hedonic models determined the effects of green space and urban forests on home sale prices and found that green space within 100 m of a home increased its price by seven percent.

The NUA doesn't focus solely on socio-economic aspects. It considers SDG 13 (climate action) and SDG 15 (life on earth) in urging sustainable natural resource management in cities and settlements to protect and improve urban ecosystems and environmental services, reduce greenhouse gas emissions and air pollution, and promote disaster-risk management.

Urban forests and trees help cities adapt to climate-change effects on temperature patterns and weather events. Urban areas are generally warmer than their surroundings (about one to two degrees C typically, potentially reaching 10 degrees C under certain climatic conditions). Urban forests help control this "heat island" effect by providing shade, reducing urban albedo, and through cooling evapotranspiration. Urban forests and trees mitigate climate change by capturing and storing atmospheric carbon dioxide during photosynthesis. Shade and reduced wind speed can indirectly cut carbon emissions by lowering air conditioning and heating demand and, in turn, emissions from power plants. Shaded surfaces may be 11 to 25 degrees C cooler than unshaded materials, so shading can also extend the useful life of street pavement by as much as ten years, lowering emissions associated with petroleum-intensive materials and heavy equipment required to repave roads.

Urban dwellers face many potential climate-related risks such as storms and flooding but urban trees can contribute to stormwater management: runoff can be reduced by the evaporation of rainfall caught in the canopy and transpiration losses, while stormwater quality can be improved by retaining

Boston Commons Park, Boston, USA (Photo: Simone Borelli)

pollutants. Reducing stormwater flow also reduces stress on urban sewer systems by limiting the risk of overflows.

Finally, urban forests provide important social and cultural benefits that can improve community resilience to climate change. Communities with forested urban areas appear stronger and more stable — an essential component of effective, long-term sustainable strategies for addressing climate change. For example, the death rate during 1995's severe Chicago heatwave varied greatly between neighborhoods because of differences in factors such as housing quality and community cohesion.

Achieving global goals and targets requires joint efforts. Cities can lead implementation of urban forestry and greening solutions towards a healthier environment. City administrators must take action, involving key stakeholders in urban forest governance, developing policy and legal frameworks supporting integration of green spaces and urban forests in "green-cities" policies, and committing to invest in nature-based solutions. Networking and exchanges of experience and knowledge among cities and disciplines dealing with these issues are instrumental to achieving global goals.

A key ingredient of sustainable urban forest management is inclusive governance, particularly amid increasing evidence that public institutions are no longer the only important actors in decision-making. Civil society, intergovernmental organizations such as FAO, UN Habitat, UNEP; and international non-governmental organizations including The Nature Conservancy, World Wildlife Fund for Nature (WWF), International Union for Conservation of Nature (IUCN) and Conservation International are increasingly recognized as important partners in policy discussions and in promoting the importance and potential benefits of urban and peri-urban forests.

Numerous city networks have developed to accelerate action at all levels. Local Governments for Sustainability (ICLEI), C40. URBACT and the Carbon Neutral Cities Alliance (CNCA) are some of these national, regional and global networks that actively share experiences, work for increased sustainability of urban development, and contribute to raising awareness of the key role urban forests and green spaces can play in the challenge of urbanization worldwide.

Increasing interest demonstrates it's time for a global process of enhanced communication and networking among practitioners, scientists, and decision-makers concerning the environmental aspects of urban and peri-urban landscapes, supporting the New Urban Agenda and optimizing the potential of urban forests in contributing to the SDGs.

Simone Borelli and Michela Conigliaro
Forestry Department, FAO

The views expressed in this article are those of the authors and do not necessarily reflect the views of the Food and Agriculture Organization of the United Nations (FAO).

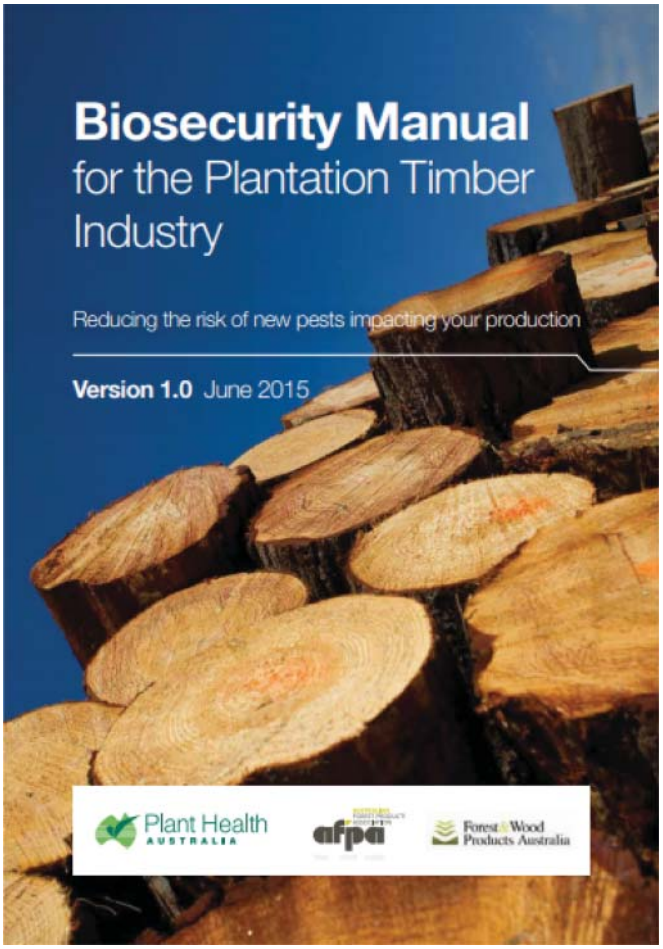
Current status of forest biosecurity in Australia

Australia is taking the phrase 'Forest biosecurity is a shared responsibility' seriously and is implementing a suite of strategies to reduce the risk of forest pest and disease incursions. While Australia is free from many known forest pests and diseases, increasing levels of trade, movement of people and commodities as well as climate change are all contributing to an increased risk from exotic pests and diseases. Adding to these challenges, reductions in staffing levels and structural changes of infrastructure and financial resources across many forest stakeholders have resulted in capacity and capability gaps in the forest sector and Australia's biosecurity arrangements (Department of Agriculture and Water Resources 2018). The importance of forest biosecurity for Australia was quantified in six papers on benefit:cost analyses which illustrated the impact of forest pests and their control on economic returns from timber production (Australian Forestry 2018, Volume 81:Issue 1).

In response to these challenges, the Australian Commonwealth and state governments have been collaborating with the commercial forestry sector to establish a coordinated strategic and administrative framework that will strengthen Australia's capacity to detect and respond to exotic incursions. Contributing towards this process has been the recent establishment of the national Forest Health and Biosecurity Subcommittee (FHaB) which is a technical subcommittee under the Australian Forest Products Association (AFPA) Growers Chamber. It comprises both technical experts in forest health and biosecurity as well as key industry representatives with experience and knowledge in this area and provides the forum for industry to have input into forest biosecurity policy.

Implementation of the Emergency Plant Pest Response Deed, which was signed by AFPA in 2012 on behalf of the plantation growers (https://www.planthealthaustralia.com) (Stone & Carnegie 2018), was an important initial achievement in promoting the concept of a 'shared responsibility' between government and the forestry industry. This was followed by a series of consultative workshops attended by representatives of the major forest growers, state and Federal government agencies, and forest health and biosecurity experts which resulted in the production of a national Plantation Forest Biosecurity Plan (Plant Health Australia 2013), a Biosecurity Manual for the Plantation Timber Industry (Plant Health Australia 2015) and more recently, a National Forest Biosecurity Surveillance Strategy (NFBSS) (Department of Agriculture and Water Resources (DAWR) 2018a). The objectives of the NFBSS include: 1) improved forest pest surveillance coordination, capacity and capability across stakeholders; 2) maximise resource efficiency through stakeholder partnerships and 3) optimise forest surveillance efforts across the biosecurity continuum using a risk-based approach. In addition, the associated Implementation Plan 2018–2023 (DAWR 2018b) presents a series of actions and tasks necessary to achieve the objectives, goals and outcomes set out in the NFPSS.

An early deliverable of the NFBSS has been the establishment of a National Forest Biosecurity Coordinator, funded by the forest industry and the Commonwealth Department of



Agriculture and Water Resources for two years. This role will facilitate the NFBSS and Implementation Plan which includes identifying sustainable funding mechanisms for the long-term implementation of a risk-based forest biosecurity program in which all major stakeholders contribute equitably. In conclusion, although long-term funding solutions are still required, both government and forest industry have demonstrated a willingness to contribute towards a 'shared responsibility' in the management of forest biosecurity for Australia.

REFERENCES

DEPARTMENT OF AGRICULTURE AND WATER RESOURCES 2018a. *National Forest Biosecurity Surveillance Strategy 2018–2023*, Plant Health Australia, Canberra

DEPARTMENT OFAGRICULTURE AND WATER RESOURCES 2018b. National Forest Biosecurity Surveillance Implementation Plan 2018–2023, Plant Health Australia, Canberra

PLANT HEALTH AUSTRALIA 2013. *Plantation forest biosecurity plan* (Version 2.0) Plant Health Australia, Canberra.

PLANT HEALTH AUSTRALIA 2015. *Biosecurity manual for the plantation timber industry*. Plant Health Australia, Canberra.

STONE, C. & CARNEGIE, A. 2018. The Australian forest industry takes a lead role in reducing the risk from exotic pests and pathogens. *Australian Forestry* 81(1): 1–2.

Christine Stone and Angus Carnegie
NSW Department of Primary Industries, Forest Science, Parramatta, Australia
christine.stone@dpi.nsw.gov.au
angus.carnegie@dpi.nsw.gov.au

Conflicting data: how fast is the world losing its forests?

The world is losing trees faster than ever. An area the size of Italy disappeared last year. Or did it? New research suggests three-quarters of those lost forests may already be regrowing. That hardly means we are out of the woods. Fighting climate change and protecting biodiversity still needs a global campaign to reforest the planet. But it does suggest that, given the chance, nature will do much of the work.

This week, a special report of the UN's Intergovernmental Panel on Climate Change (IPCC) confirmed the vital role that ending deforestation can play in holding global warming to 1.5 degrees Celsius. To underline the point, the UN's environment, development, and agriculture chiefs issued a joint statement declaring that "forests are a major, requisite front of action in the global fight against catastrophic climate change – thanks to their unparalleled capacity to absorb and store carbon. Stopping deforestation and restoring damaged forests could provide up to 30 percent of the climate solution."

But behind the challenging words lies a yawning data gap. For we still know remarkably little for sure about the true extent of deforestation and its contribution to carbon emissions and climate change. As Peter Holmgren, then director-general of the Center for International Forestry Research in Indonesia, put it last year, the existing deforestation data is of "low quality," relying either on satellite imaging that is "shallow, ambiguous, and generally incomparable" or on government data that may "under-report deforestation for political reasons."

Researchers say we urgently need a way out of the statistical quagmire. And this year the first tentative steps at resolving the data crisis have been taken.

There are two main data sources for tree loss, and they are increasingly contradictory. One, the Global Forest Watch (GFW), is compiled from satellite images by the World Resources Institute, a Washington think tank. It paints a gloomy picture, putting the decline in tree cover last year at 72.6 million acres, almost 50 percent more than in 2015. That analysis is supported by on-the-ground observations, especially in Southeast Asia, where forest continues to be converted to oil palm.

The other main source for deforestation data, the Global Forest Resources Assessment (FRA), which is compiled from government inventories by the Rome-based UN Food and Agriculture Organization, is less bleak. It estimates the annual net loss, once forest regrowth is taken into account, at barely a tenth as much: just 8.2 million acres. And it says deforestation rates have declined by more than 50 percent in the past decade.

The drastic difference extends to data from individual countries. In the United States, China, Australia, Canada, Russia and several other countries, the FRA shows forests gains while the GFW shows big losses, says Holmgren.

The two datasets were more or less in agreement 20 years ago, but have been diverging ever since. So how have such huge differences arisen? And which, if either, is right?

On the face of it, the satellite-based GFW is more rigorous. It asks a simple question of the Landsat images it analyzes: What area of tree cover has disappeared since last year? It does not ask how or why, just how much. The FRA data, on the other hand, is largely a measure of registered land use rather than actual tree cover. For instance, its definition of a forest includes areas that may be treeless as a result of logging, but where governments still classify the land as productive forest that is expected to regrow and be logged again.

Both the FRA and GFW databases come in for heavy criticism. Most obviously, the FRA relies on governments owning up to forest loss. But while the GFW does not suffer from political interference, critics such as Holmgren say it has a potentially even bigger blind spot. It cannot see forest regrowth.

The problem is that while deforestation is sudden, complete, and easy to spot when comparing satellite images from one year to the next, forest regrowth is slow, incremental, and much harder to identify from year to year. Moreover, because the GFW does not assess what happens to the land after the forest is lost – whether it is cultivated or simply left alone – it can give no indication of whether the loss is likely to be permanent, or whether the forests could indeed regrow.

And while both databases address the extent of tree cover, neither claims to address key changes in either biodiversity or the carbon uptake of those forests.

The authors of the two analyses recognize the limitations. The two datasets are "complementary rather than contradictory," says the World Resource Institute's Nancy Harris. But the problem is that they give out very different and irreconcilable messages about the state of the world's forests. One is highly pessimistic; the other guardedly optimistic.

So how are we to decide what progress, if any, is being made to end the loss of the world's forests, and whether promises by governments and corporations to end deforestation are on target? Forest researchers are belatedly coming to grips with the problem. Two studies published in recent weeks stand out.

Philip Curtis of the University of Arkansas and colleagues, writing in *Science* in September, used high-resolution Google Earth imagery to devise a model that could predict the causes of tree loss in the GFW's global satellite images. The aim was to distinguish between places where the trees are replaced by some other land use and those where the forest loss is likely to be temporary, since the land remains available for nature to recover.

He and his colleagues found that only 27 percent of forest loss between 2001 and 2015 met their definition of permanent, with the land taken mainly for commercial "commodity" agriculture such as growing palm oil, but also for mining, oil and gas production, and urban expansion. That loss, of around 12.4 million acres of trees a year, had barely changed over the period, they reported, with a sharp decline in forest cover in the Brazilian Amazon matched by rises elsewhere.

Of the remaining tree loss, they found that wildfires were responsible for 23 percent, shifting cultivation (where forest is cleared and cultivated for a few years, before the farmers move on and the forest hopefully regrows) was responsible for 24 percent, and forestry for 26 percent — in each case suggesting only temporary loss.

This is the first time forest loss has been broken down in this way, says Harris, who was a coauthor on the study. It creates a new geography of deforestation. In North America and Russia, the loss is overwhelmingly temporary, mostly from wildfires but also from logging, according to the study. In the tropics, however, the picture is more mixed. Temporary losses from shifting cultivation make up 93 percent of forest cover loss in Africa, the study found, while permanent deforestation from agricultural expansion is responsible for 61 percent of the loss in Southeast Asia and 64 percent in Latin America.

Curtis and his coauthors acknowledge shortcomings in their data. The model "performed more poorly in Africa," says Christy Slay, the study's director of technical alignment. "Confusion occurred between large-scale conversion [to commercial agriculture] and shifting cultivation," she told *Yale Environment 360*.

But for logged land to fall into the category of temporary deforestation, it had to show "evidence of forest regrowth in subsequent years." Most met that test. "All forms of forestry were characterized by a dominant forest regrowth signal in the years following loss," Curtis says.

Nonetheless, the analysis fails to distinguish between different types of tree cover. So when logged natural forests are replaced by commercial plantations, the change is simply recorded as regrowth, even though most of the former biodiversity may be lost.

Another detailed study, published in August, looked at woodlands across seven countries of southern Africa. Iain McNicol, of the University of Edinburgh, used novel radar imagery to estimate both forest cover and how much wood the forests contain. He found that both forest loss and regrowth were much more widespread than previously supposed.

The balance between loss and gain varied from place to place. Losses were greatest near cities and roads, where demand for firewood and charcoal was high, while gains were greatest in more remote areas. But overall, the amount of wood biomass — and hence the carbon it contains — was stable in the woodlands, which cover about half of the region.

What came through, McNicol told *e360*, was the "highly dynamic" nature of the change going on and the "large regrowth potential" of temporarily deforested areas.

The findings confirm other recent studies in Africa that have found strong forest regrowth in woodlands outside the rainforest belt of central Africa, often after farmers abandon their land and head for the cities. "Africa's woodlands and savannahs are reforesting," says Ed Mitchard of the University of Edinburgh, a coauthor on the McNicol paper. His own field research in central Cameroon found "the forest is coming back really fast… If deforestation and degradation could be reduced, Africa could quickly become a significant carbon sink," he said.

Of course, forest regrowth does not necessarily bring with it full ecosystem and biodiversity recovery, as a paper from 28 leading forest ecologists warned in February. Richard Houghton of the Woods Hole Research Center in Massachusetts, William Laurance of James Cook University in Cairns, Australia, and others described growing evidence that intact forests, which make up less than a fifth of the world's total forest cover, "support an exceptional confluence of globally significant environmental values relative to degraded forests." Many large carnivores "are now found only… in remaining intact tropical forests."

Contradicting Curtis, they suggested that logging cannot be seen as merely temporary deforestation, because recovery will

always be incomplete. "Logging is the most pervasive threat facing species inhabiting intact forests," they concluded.

But some forest scientists take a longer view. They argue that almost all forests — including those regarded today as intact — are actually in recovery from degradation by human activity, often over thousands of years, including from widespread shifting cultivation. Today's forest loss may be no different, although the scale is certainly far greater. As Kathy Willis, science director at Kew Gardens in London has argued, such forest ecosystems "are not as fragile as often portrayed" and that "given sufficient time, tropical rainforests disturbed by modern human activities may be able to regenerate."

That debate remains unresolved. But regardless, a new picture of deforestation is emerging that is very different from the conventional image of forest loss as a one-way street. The situation is much more fluid, it seems, with rapid forest loss sometimes counterbalanced by equally rapid recovery, at least in forest cover. "Over the last decade, we have realized just how fast all these forests, woodlands, and savannas are changing, and how poorly we are able to quantify this change," says Mitchard.

Curtis says the idea, implicit in data from the GFW, that "any tree cover loss shown on the map represents deforestation" is a "misperception" that needs to be dispelled.

McNicol says this new picture suggests that existing international policy for reducing carbon emissions from forests, which concentrates on protecting intact forests, may not always be the best course. In many areas, ensuring that degraded or temporarily deforested areas can regrow may be more effective.

None of this means that the deforestation crisis is close to being resolved. Curtis estimates that some 12.4 million acres of forests are permanently converted to growing commodity crops such as palm oil each year. And, despite numerous corporate and government promises to the contrary, there is no sign of that figure declining.

The new findings underline the urgency of the need to halt the advance into the world's forested areas of permanent agriculture to supply commodity markets. But they offer hope, too. If we could stop the onslaught of agriculture into tropical woodlands, we could see not just an end to deforestation but a massive and rapid natural resurgence of tree cover — and a huge surge in the carbon that those forests contain. Halting climate change requires nothing less.

Fred Pearce
published on e360.yale.edu on October 9th 2018

Forest gardens find a renewed role in British forestry

Kilmun in the autumn

The last century saw a considerable expansion of the forest area in Great Britain, particularly in upland areas of the north and west of the country. This expansion was unusual for being based primarily on the use of non-native species, most of which had been introduced in the nineteenth century. A classic Forestry Commission Bulletin written in 1957 by James Macdonald and colleagues described the results from an extensive programme of screening 'exotic' species for use in British forestry, most of which occurred during the early part of the last century. They proposed several stages should be involved in the process of evaluating the suitability of non-native tree species for forestry. First, trees are planted as individual specimens in arboreta in different parts of a country. Second, those which show good form and/or vigour in arboreta are selected for further screening. This often takes the form of planting the selected species in pure plots in a 'Forest Garden' where the comparative survival and growth of a wide range of species can be monitored. These plots should be large enough (e.g. a minimum of 100 trees) to allow a range of long-term assessments (e.g. volume production, timber properties, etc.). The forest garden should include examples of the major species used in commercial forestry in a particular country (i.e. 'standards') to inform the comparison. Only those candidate species which outperform the standards would be considered for further testing (e.g. replicated provenance experiments), operational trials and wider deployment in production forestry. This evaluation process has been particularly important in countries such as Great Britain where a combination of historic deforestation and a limited range of productive native species resulted in the desire to evaluate a wide range of non-native species for use in forestry. One result of this programme was to provide convincing evidence of the good potential of Sitka spruce (*Picea sitchensis*) for forestry across a wide range of sites in upland Britain. Part of the evidence was provided by plots of this species planted in Forest Gardens scattered throughout upland Britain including Brechfa and Vivod in Wales, Kirroughtree, Crarae and Kilmun in Scotland. These results led to the widespread use of Sitka spruce in afforestation during the second half of the last century, so that it is now the major tree species found in British forests and will provide over half the softwood timber resource to be harvested in the next 25 years.

As foresters gained more confidence in the silviculture and use of Sitka spruce, interest in the potential and use of other species declined. As a result, the attention given to forest gardens and other species trials decreased with little funding provided for the upkeep of existing trials or for the establishment of new plots. Some sites were largely abandoned (e.g. Crarae) while others were regarded as historic curios and subject to a regime of benign neglect. However, in the last 20 years, there has been increasing awareness of the desirability of diversifying British planted forests because of the risks from climate change and from new pests and diseases. The recognition of the potential vulnerability of the single species planted forests created during the twentieth century has resulted in recommendations to plant a wider range of species and to use species mixtures to increase forest resilience to these new threats. For example, coast redwood, red cedar, Japanese red cedar and a number of silver fir species have been proposed for diversifying Scottish planted forests (Wilson 2016). Implementing these recommendations can be challenging for the current generation of foresters, since they have little practical experience of growing the alternative species and lack knowledge of important aspects such as possible growth rates, potential timber volumes and likely timber properties. Given such uncertainty, the existence of surviving plots in forest gardens and records of their growth can provide both a visual demonstration of and quantitative data on the performance of alternative tree species.

Autumn colours

The history of Kilmun Forest Garden, located near Dunoon in Argyll in west Scotland exemplifies the changing fortunes of forest gardens over the last century. Planting at Kilmun started in 1930 when a 50 ha site above the Holy Loch was acquired by the Forestry Commission as part of an afforestation scheme in the Cowal peninsula. This location has an oceanic climate with annual rainfall in excess of 2000 mm, and with a mean annual temperature of about 9^{0}C. The site had previously been used for sheep grazing, and was typical of many afforestation sites in upland Britain. The local forest managers decided to use Kilmun to establish comparative plots of a range of tree species to assess their potential in western Scotland. The first decade saw the planting of over 160 plots comprising some 85 species, and some of these plots still survive. Following an interruption during the second world war, management of the site was given to Forest Research (the research agency of the Forestry Commission) and further planting carried on throughout the period from 1950–1970. By the beginning of the 1980s over 400 plots had been planted made up of over 200 tree species (some species were planted more than once). During this period, Kilmun became well known for the good growth of a range of hardier Eucalyptus species, indicating the potential of some

of these species in the milder regions of western Britain (e.g. Evans, 1980), as well as having vigorous plots of wide range of conifer species. However, the collection was badly damaged by severe storms in 1968 and by cold winters in 1981 and 1982, which resulted in the loss of a substantial number of plots and declining vitality of others. Thus, by the late 1980s, the plots at Kilmun had lost some of their visual impact and there was little contemporary interest in finding out more about alternative species to Sitka spruce. As a result, the collection was 'mothballed' with management given back to the local Forest District who developed the site as a recreation facility while research interest was confined to some 40 plots of more 'unusual' species.

Interest in the Kilmun Forest Garden began to revive towards the end of the century and a paper was published summarising results achieved during the first 70 years (Mason *et al.*, 1999). Path and signage infrastructure was upgraded as part of an EU funded regional development project that supported renewed investment in recreational facilities in forests in the Cowal peninsula. The first new species plots for twenty years were planted in 2004, and a small number (2–4) of plots have been established annually since then. These have included examples of endangered conifers which form part of the Royal Botanic Gardens Edinburgh's (RBGE) International Conifer Conservation Programme (Gardner, 2014). In 2015 a further review of the collection was carried out, showing that there were now some 263 plots containing 198 species, including a number of conifers that were threatened in the wild. Assessment of older plots established between 1930 and 1970 indicated that there were at least eight conifers where long-term productivity was similar to that of Sitka spruce at Kilmun (Mason *et al.*, 2018). Timber samples were taken from some of these plots to provide information on the wood quality and other properties of some of these lesser known species. Over the last decade, there have been regular visits to Kilmun by forestry and industry groups who value the chance to see some of the alternative species proposed for Scottish forests growing under forest conditions. The collection inevitably suffers losses from abiotic (e.g. windthrow) and biotic causes (e.g. pathogens such as *Phytophthora ramorum*), but this exemplifies that a tree collection is a dynamic entity, not something frozen in time and space.

Looking back the history of Kilmun is typical of many long-term forest trials and experiments. In the early years of a new project there is considerable enthusiasm and interest in development, but this is often followed by a period of neglect, when the results show little difference from those of the early years, or the subject of the trial ceases to be of current interest. Then the wider agenda changes and the topic of the trial becomes of renewed interest. What experience at Kilmun shows is the importance of maintaining a portfolio of long-term species trials and experiments to provide a visual and quantitative information source for foresters on alternative options should a preferred species prove vulnerable to climate change or disease.

REFERENCES

EVANS, J. (1980) Prospects for eucalypts as forest trees in Great Britain. *Forestry*, 53, 129–143.

GARDNER, M. (2014). Conifers under threat. *Chartered Forester*, winter 2014/15, 16–18.

MACDONALD, J., WOOD, R.F., EDWARDS, M.V. and ALDHOUS, J.R. (1957). Exotic forest trees in Great.

Britain. *Forestry Commission Bulletin* No. 30, HMSO, London, 167pp.

MASON, W.L., CAIRNS, P., and TRACY, D.R. (1999) Kilmun Forest Garden – a review. *Scottish Forestry*, **53**, 247–258.

MASON, W.L., MACDONALD, F., PARRATT, M., and MCLEAN, J.P. (2018) What alternative tree species can we grow in western Britain? 85 years of evidence from the Kilmun Forest Garden. *Scottish Forestry*, 72(1), 24–33.

WILSON S McG (2016) Selection of tree species for future forestry in Scotland: nativeness, diversity and resilience. *Scottish Forestry* 70, 5–14.

W.L.(Bill) Mason

Senior Silviculturist (Emeritus), Forest Research, Northern Research Station, UK

Promoting the added value of wood in small businesses in Peru

Citeindigena worker, assembles a wooden vase with turned legs (Photo: E. Sangama/CNF)

From October 2012 to November 2016, the National Forestry Chamber (CNF) of Peru, with the technical and financial support of the International Tropical Timber Organization (ITTO) and the collaboration of the National Forest and Wildlife Service (SERFOR) of the country, implemented the project PD 540/09 Rev. 2 (I) *Support to improve the productivity of the Peruvian lumber industry to produce products with greater added value*. The project was aimed at raising the levels of competitiveness of timber products in the central and southern part of the country, mainly from the Amazonian departments of Ucayali and Madre de Dios, as well as from Arequipa (Sierra Sur of Peru), through the development of products with greater added value, in order to achieve better market access. The following table shows the main timber species and products processed by the beneficiary companies of the project.

Scientific name	Common names	Products
Aspidosperma macrocarpon	Pumaquiro	Decking and floorboards; Dimensioned timber; Doors
Calycophyllum spruceanum	Capirona	Decking and floorboards; Dimensioned timber; Furniture Doors; Beds
Cedrela odorata	Cedro	Furniture; Ceilings
Cedrelinga cateniformis	Tornillo	Furniture; Doors; Ceilings; Pallets
Copaifera spp.	Copaiba	Furniture; Doors; Pallets
Apuleia molaris	Ana caspi	Decking and floorboards
Dipteryx spp.	Shihuahuaco	
Hymenaea spp.	Azúcar huayo	
Tabebuia serratifolia	Tahuarí	
Jacaranda copaia	Achihua	Wood-cement panels
Lecythidaceae	Cachimbo, cachimbo rojo, misa	Dimensioned timber; Furniture; Doors; Ceilings; Pallets; Blockboard
Manilkara bidentata	Quinilla	Decking and floorboards; Dimensioned timber; Furniture; Ceilings; Beams; Prefab houses
Meliaceae	Requia	Doors
Myroxylon balsamum	Estoraque	Decking and floorboards; Dimensioned timber; Doors; Sleepers
Paramachaerium ormosioides	Aguano masha	
Ormosia spp.	Huayruro	Furniture beams
Sapotaceae	Caimitillo, quina quina	Dimensioned timber; Beams; Pallets
Septotheca tessmannii	Utucuro	Dimensioned timber
Sloanea spp.	Huangana	
Terminalia spp.	Yacushapana	Dimensioned timber; Furniture; Doors; Beds

The main timber species and products processed by the beneficiary companies of the project.

The objective of the project was achieved through intensive training in technical, environmental and business management aspects, which allowed small and medium-sized producers to develop and market wood products with quality levels, quantity and cost demanded by the market.

Small businesses helped through the project

The project helped logging companies, both individually, as well as those organized in guilds, such as the "Association of Carpenters and Cabinet makers El Triunfo", which brings together 29 small businessmen; The "Association of Peruvian Carpenters", consisting of 25 small businessmen; and the "Association of Industrialists the New Triumph", formed by 26 small entrepreneurs. The workshops of these associations are in the area of Puerto Maldonado, Department of Mother of God. Other companies benefiting from the project in Madre de Dios include the Iñapari Forestry Corporation, Forestry Landek, G and G negotiations, Logging Channels Tahuamanu (CATAHUA), Industrial lumber South East, Forestry Services Madre de Dios, General Services Málaga, Germany SAC and Industrial White Lumber.

In Ucayali there were 10 companies that benefited from the project located in the city of Pucallpa, the main timber center of the country: Industries Groove Daniella, Lumber Marañón, Woods Mathews, Industria Montes, Wech Constructions and General Services, Lumber Los Cinco Brothers, Carpentry Llaiqui, Services La Trail, Inversiones Rodrigo Denis and Marthita Resawmill.

In Arequipa there were 18 companies that benefited: San Antonio Wood Center, Santa Fe Lumber of JJ the island, Forestal AQP, Prysmas, MADESERVIS, SLM General Services, Timber Corporation Without Borders, Universal Logging, Industrial Logging ENESCA, Wood Transformed ORION, Logging J&A Los Pinos, Logging Sofia, YEMESU Logging Company, IMAFEG Logging Company, Kintaro Trade, United Sawmills, Ochoa Multiple Services and YOSECHRIS Lumber.

Activities of the project

Training: The project provided training to more than 150 small timber entrepreneurs in technological innovation, wood sorting and drying, furniture manufacturing, waste management, certification, chain of custody, financing, costs, Health and Safety, business management, good environmental practices, forestry management, etc.

Pilot export: Entrepreneurs had the opportunity to achieve greater understanding of international trade through a pilot export of high value-added timber products. The selected company exported 69.6 m^3 to France of a decking product from Shihuahuaco species.

Technical assistance: The management capacity of 15 companies was strengthened through the participatory development of business plans related to timber products.

Project results

The main results of the project include:

Pallets of timber floorboards produced by Pietra Forestal Peru SAC in Puerto Maldonado, Peru, are prepared for dispatch to markets. (Photo: W. Chipana)

- 30 companies made new investments and increased their sales.
- 156 entrepreneurs developed capacities in business management, environmental, technology and financing.
- 16 Technical documents: price booklets, facilitation of workshops on "5s", Chain of Custody procedures, health and safety at work, industrial safety, wood drying, pre-fabricated houses and manufacture of stretchers produced.
- Virtual publication: "Business diagnosis and evaluation of the wood forestry sector of Ucayali and Madre de Dios" published.
- A pilot export experience of high value-added timber products produced.

This finished dining-room set was produced by Asociación de Carpinteros Señor de Coyllority in Puerto Maldonado, Peru. Photo: W. Chipana

- 15 business plans developed.
- 5 informative campaigns on the sustainable management of forests, forest industries and timber trade launched.
- 2 videos and broadcast spots produced.
- Poster, bulletin, diptych and triptych on forestry activities produced.
- A profile for the construction of the "techno-ecological" industrial park in Arequipa developed.
- 50 officials trained in forestry administration.

Project sustainability

CNF maintains constant contact with the beneficiary companies and local forestry organizations, providing them with support for business management. It continues with support for the implementation of the industrial park of Arequipa. In addition, a close relationship with SERFOR representatives, regional authorities and other public and private bodies continues to be maintained. CNF and SERFOR are active participants of forest discussion groups that constitute important spaces of dialogue and contribution for forestry development.

Walter Nalvarte Armas (Director del proyecto. w.nalvarte.a@gmail.com), **Willy Echevarria Shardin** (Asistente profesional del proyecto. willy.echevarriashardin@gmail.com), **Edinson Sangama** Barbarán (Coordinador Regional del Proyecto – Ucayali. edinsonsangama@yahoo.es), **William Chipana Curiñaupa** (Coordinador Regional del Proyecto – Madre de Dios. willforest.wc@gmail.com) and **César Acurio Zavala** (Coordinador Regional del Proyecto – Arequipa. acuriocesar12@gmail.com)

This is a summary of the article published in Tropical Forest Update, Volume 27 number 1, 2018, published by ITTO.

How women and togetherness are re-robing Mount Kenya in green

From 1976 to 1982, large influxes of landless and impoverished people settled in Mount Kenya's fertile foot zone, causing the population to increase from 50,000 to over half a million people[1]. Since then, an increased demand for wood for local domestic and industrial uses, as well as space for land development, settlements, and cultivation, have put Mount Kenya under serious forest cover loss. The continuous belt of montane rainforest, which used to encompass Mount Kenya's foot zone between 2,000 to 3,000 meters, has been breached in the North. Most of the natural forest in Lower Imenti has been destroyed and is now under crop cultivation. Large cleared areas speckle the montane rainforest belt as they have not been re-planted yet due to several attempts at an ineffective sylviculture shifting cultivation scheme[2]. Ultimately, Mount Kenya's aquifers are depleting, due to the increased demand of water combined with the effects of deforestation.

Where the Samburu and Maasai pastoralists probably never experienced water shortage due to their nomadic way of life, Kenyans are beginning to experience water scarcity. Several of Mount Kenya's once perennial rivers now have prolonged periods with no flow since the 1980s. The Tana river which supplies about 40% of Kenya's population with electricity and about 95% of Nairobi's water[3], is experiencing increasingly critical low flows. One of Mount Kenya's glaciers, Lewis Glacier, is already completely lost. And yet, glaciers are important as a water supply for the population which lives downstream. The problem is exacerbated by global warming that is possibly boosted by a higher frequency of El Nino events. The El Nino-related

Remaining degraded montane forest belt and soil erosion at Mount Kenya's foot (© TreeSisters)
Without its montane rain forests, perennial ice and snow, Kenya which is a country with low natural water endowment would become a desert.

[1] FAO (2002). "Mount Kenya: Inappropriate Settlement of Highlands by Lowlanders". In Highland – Lowland Interactive Systems – Jack D. Ives, Ottawa, Canada. Food and Agriculture Organization of the United Nations. Available from: http://www.fao.org/forestry/webview/media?mediaId=12408&langId=1 [accessed Sep 16 2018].

[2] Kagombe, J.K. Gitong, J. (2005). Plantation establishment in Kenya: The Shamba System Case Study. Kenya Forest Working Group, Nairobi. Available from: https://www.researchgate.net/publication/242119374/download [accessed Sep 16 2018].

2016–2017 drought led to over 3 million people in need of food aid, it affected "the big five" animals in the parks and numerous herds in the plains, as well as fostered conflicts over water.

Even though these issues persist, Mount Kenya's montane rainforest plays a critical role in water catchment functions. It

[3] Matiku, P., Gacheru, P., Waswa, G. (2017). Management and conservation of Mt. Kenya forest. Business case for sustainable restoration. Nature Kenya (The East Africa Natural History Society).

Planting work at Irangi site (© TreeSisters)

has a special ability to capture atmospheric moisture making it one of the five "water towers" in Kenya. The rainforest in the highest mountain in Kenya intercepts fog and cloud droplets, as well as the rains provoked by the humid air mass hitting Mount Kenya releasing precipitation when the air elevates and pressure reduces.

Recognizing the importance of Mount Kenya's ecosystem and the environmental and socio-economic challenges, the KFS started to put forest-adjacent farming communities at the heart of the reforestation effort. As explained in Grace Laird's blog to reforest Mount Kenya's Forest Reserve, one solution found was to "move the forest to the farm"; the women who heavily depend on trees for firewood to feed their family would no longer have to walk long distances to collect and carry back home heavy loads of wood from the Forest Reserve, crossing the path of elephants. Another solution that was initially tested and proved successful was to involve the forest-adjacent dwellers, organized in community groups, in the reforestation.

A project funded by the UK-based Charity TreeSisters, held and coordinated by the UK non-profit organization International Tree Foundation, aims to restore Mount Kenya's montane rainforest. The project is interconnected and benefits from ITF's multi-faceted initiative "20 Million Trees for Kenya's Forests" – a Queen's Commonwealth Canopy project. It also forms part of a wider strategy by the Kenyan government to meet reforestation targets under the COP21 Paris Climate Summit and the UN's Sustainable Development Goals. The project is mainly funded through TreeSisters by a participatory financing at the grassroots level, through a global network of women.

The project aims to rehabilitate areas of destroyed Afromontane rainforests. The goal here is to plant semi-natural forests with a variety of native trees, which would eventually become with time natural forests. Forest restoration will help replenish and maintain watersheds, while reducing soil erosion by restoring the natural forest ecosystem. This will also positively benefit the livelihood of the local communities, stabilising water flows for household use and irrigated farming for communities around the forest and further downstream.

Forest restoration is taking place in the Mount Kenya Forest Reserve[4] managed by the Kenya Forest Service (KFS). The area is under Natural World Heritage Site designation, on areas designated for regeneration of degraded forest. TreeSisters is currently funding the restoration of 2,827 hectares within 3 different sites – equivalent to 4,000 soccer fields or the size of Amsterdam Airport Schiphol. We fund forest restoration in:

1. Magaca (Irangi Forest) located in South-East Mount Kenya representing our most humid sites;
2. Kahuri (Ontulili Forest) our highest (almost 3,000m) and driest site on the Northern slopes of Mount Kenya as it falls within the rain-shadow of the mountain;
3. Lower Imenti (1,300m) in a highly populated and cultivated region, which is also a corridor for elephants migrating from the drylands to the Mount Kenya forests.

Forest restoration is done through the work of community members, either in the form of Self-Help Groups or groups affiliated with Community Forest Associations. Their work is supported by local non-governmental organizations – Mount

[4] Forest Reserve comprises the forest belt encircling the Mount Kenya National Park from 2,000–3,000m of altitude and connected Lower Imenti Forest Reserve via a 'neck' of remaining forest.

Women Self Help group in Irangi (© TreeSisters)

Kenya Environmental Conservation (MKEC) at the Magaca and Mount Kenya Trust (MKT) at Lower Imenti and Kahuri. Specifically, MKT supports members of Community Forest Associations in Kahuri to plant indigenous trees through the "Tree Establishment and Livelihood Improvement Scheme", which enables them to plant trees along crops in designated areas until the tree canopy closes up. The farmers plant and take care of the indigenous trees, under important support and monitoring from MKT.

The project especially places the women at the heart of the effort as the "green agents of change". At least 80% of the community members involved in the project are women. They are deeply involved in seeds collection, running tree nurseries and planting out the grown seedlings. For this, MKT and MCEK provide women with the necessary training and support. Women also receive seeds, tools, and small equipment to run individual small tree nurseries aimed at fostering income generating activities. MCEK has started female empowerment groups and trains women on new business development skills and forest friendly income generating activities, like beekeeping aimed at conservation of the forest and creation of stable income streams. MKEC makes sure that women's voices are effectively heard in the Irangi Community Forest Association decision and activities.

Indeed, women are particularly interested in community-based projects and play a key role in environmental stewardship. Hard working and increasingly living alone with their children, they need money to meet their livelihood needs. They are able to earn an income from the projects; some of it is also lended for a low-interest rate through "table banking" groups primarily to fund school fees, cottage enterprise set up, the purchase of farming animals. But most importantly what motivates them is the opportunity for social networking and mutual aid. We report on how the project is assisting women, such as Anastasia, in our blog.

Lauriane Cayet-Boisrobert
TreeSisters Reforestation Director
edited by **Wanda Kurzweg-Swaffield**

Why should we worry about Białowiesch Region and Białowieża Forest?

Summary

The reality of on-going Global Climate Change (GCC) is proven and already noticeable. More knowledge about the adaptive potentials of trees, forests and landscapes is needed. Natural pristine forest communities *(Urwald)* could supply such knowledge at species and community levels. The Białowieża Forest is claimed to be pristine and considered to be the only patch of pristine Lowland Cool-Temperate Broadleaf-Conifer Mixed Forest which survived human activities. If this is so, it is a singularly valuable World Heritage as understood in the Unesco-MAB programme. Results of a search in literature give evidence that Białowieża Forest is indeed most probably pristine "*Urwald*". It qualifies for inclusion in a global network of sample sites to study and monitor

adaptive responses of flora, fauna and forest ecosystems to GCC. The maintenance of Białowieża Forest as a unique source of important data and information requires the integration of conservation and sustainable land-use in the surrounding Białowiesch Region.

Białowiesch Region and Białowieża forest: people and environ

As a totally protected forest, the Białowieża forest was reported to cover 125 km² in the 19th century (Meyers Handlexicon, 1888: 169), 495 km² in the early 19th century (Paczoski, 1928 and 1930) and today 105 km². It is part of the nearly 1,300 km² surrounding the Białowiesch region of forests, woodlands and fields on diluvial flat lowland. The region acts as shelter against polluting invasions. After a diverse natural and political history, it is now part of the cool-temperate zone in northeastern Poland. The region straddles the watershed between the north and south. The Narev-Vistula flows to the Baltic sea and the Neman-Pripet (famous for its vast swamps)—Dniester to the Black sea. Only lightly glaciated during the latest ice-age (*Würm*, 144,000 –20,000 B.C.) of the Pleistocene, the easy terrain attracted hunters of two human species the short-legged, stout *Homo neanderthalensis* with low forehead and the modern, long-legged, tall and slender, and high-browed *H. sapiens* entered, met and probably joint forces initially to hunt the formidable mammoth, but most likely mixed their genes, later. Since then, the region has been a crossroad of biological, economic, cultural invasions and transits. With the opportunities the metal age offered and the increase of population densities, human relations in society became less friendly and fair, social and ethnic leaders less responsible and more aggressive, egocentric and greedy for power and wealth. The results changed the landscapes of the whole, including the cool-temperate climate zone, of Eurasia (Hesmer, 1988). But the back-wood Białowieża forest and its native herd of European Woodland Bison (*Auerochs)* survived unscathed. The extensive swamps and the habit of the natives to build walls of strip-felled trees across the forests to deter greedy invaders may have helped. The new threats of Global Climate Change (GCC) and commercial logging are not so easily deterred. GCC is accelerating as the rapid increase of ice-flow speed in the Greenland's glaciers, of sea levels, of tropical storms (typhoons) and currently of heat and drought in Europe and elsewhere demonstrate. GCC has changed, worldwide, from disputed threat to harsh reality. The admission by the national Polish government of commercial logging in the Białowiesch region threatens the pristine integrity of a world heritage of outstanding inspirational status, scientific value and strategic anti-GCC importance.

The problem: GCC control needs global monitoring networks of "*Urwald*"

Intact pristine and near-natural manipulated forest ecosystems may possess high degrees of robustness through acquired and epigenetically transmitted anti-fragility and other adaptation potentials. To detect, watch and understand them are crucial as GCC intensifies. It is essential for designing rational strategies and effective tactics to counter GCC by Close-to-Nature-Forestry (CNF) in production and protection forests. Demand for wood and timber is expected to rise sharply when substitution of environmentally unfavourable raw materials (oil, aluminium, iron, limestone, coal etc.) is achieved. This supply must come from all-round sustainable forests. "Urwald" is an example of sustainability, but also of risks and uncertainties. The environmentally turbulent Pleistocene and Holocene made "*Urwald'* robustly adapted to perturbation, disturbances, fluctuations and changes. Its meso- and micro-heterogeneity and dynamics of sites and vegetation control biodiversity. Apparently, it also acquired assumed anti-fragility properties which plantation forests do not have (Bruenig, 2017). That single-dominant *'Urwald"* canopies are fragile under stress from nature or greedy humans, the *Alan* peatswamp forests of Borneo and Sumatra demonstrate this convincingly (sources cited in Bruenig, 2017). To adapt our CNF principles, strategies and tactics for use in production forests of the future, we need more data and information from monitoring and researching in "*Urwald"* in all climates.

One problem is that the rapid progress of GCC does not give us much time to find out how plants and animals have adapted and will adapt and how ecosystem anti-fragility functions. The Białowieża forest is the only existing Lowland Cool Temperate Broadleaf-Conifer Mixed *"Urwald"* on flat terrain in the lowlands worldwide. Its declaration as an "International Monitoring and Research Site" could secure an important source of information on naturally developed adaptation and anti-fragility capabilities for designing anti-GCC policies, strategies and tactics in Poland, the EU and globally. This requires that the forest must be pristine and as forest ecosystem representative for Cool-Temperate Lowland Broadleaf-Conifer Mixed Forest. If its structural, functional and dynamic properties are comparable with those of Equatorial Lowland Mixed Forest, it would even qualify for direct transfer of scientific and practical knowledge. My experience of 70 years' involvement in the art and practice of forestry in temperate and tropical forests and World Forestry have convinced me that this is principally possible. A first hint of suitability of Białowieża as transfer partner would come from a search in literature.

Method and Material: I had no other option but to decide to search in my library and recent literature for information on Białowieża forest and compare it with my own data stock from the Tropical Rainforest (TRF).

Results: The monumental works by Heinrich Walter (1974) and Heinz Ellenberg (2nd ed. 1978) contain an unexpected wealth of relevant information on Białowieża. H. Walter (1974) based his more plant-sociological (Braun-Blanquet period) interpretations on the thorough study by J. Paczoski (1928 and 1930) of the "*Urwaldgebiet von Białowiesch*". He mentions the micro-mosaic structure of the forest which it shares with all "*Urwälder"* and which is caused by changing light conditions (*wechselnde Lichtverhältnisse)* caused by dynamic changes of the patterns in the canopies of the A- to D-storeys. There is plenty of fallen dead wood in all stages of rotting. Tree seed germinates on it and form an above-soil rooting. Shallow roots in the A- and upper B-horizon of the soil push the topsoil up to form a micro-relief of the soil surface. Heterogenity of the parent material, which contributes to the patterns of species richness, diversity and growth, are not mentioned. The described ecological features of Pleistocene moraines of Białowiesch appear to me to be very similar to their Amazonian and Bornean equivalents. Paczoski's data on tree numbers and diameter distributions (Walter, 1974, data on p.110–113, Tab.10, and p.112) show similarities to my data from equivalent site types in the tropics in Borneo and Amazonia, and along site gradients north and south from Sarawak (ref. cited in Bruenig, 2017). Exceptions are: the diameter range of the 5 broadleaf and 2 conifer tree species ends with 90 cm dbh in Białowieża Forest (BF) in Mixed Dipterocarp forest (MDF in TRF) in Sarawak around 150 cm. In TRF, the aerodynamic roughness and top

height of the canopy are much greater, just as the live and dead biomass stocking are much greater (Bruenig, 2017). According to Sokolowski (1966b) Norway spruce is in Białowiesch autochtone and forms pure stands on acid riparian peatswamps in Białowieża. Its ability to regenerate at low light intensity enables it to invade the broadleaf forest associations. It survives in the gaps and may become dominant in larger areas if there is a sequence of climatically favourable growing seasons. Scots pine requires more light than broadleaf forest gaps can offer.

Ellenberg (1978) bases his descriptions and ecological assessments of the various associations of Lime- Hornbeam - Oak - "*Urwälder"* on the results of extensive research published by A. & W. Matuszkiewicz (1954, p. 42–43), A. Matuszkiewicz (1958, pp. 210, 210 ff., 228, 249, 285, 328,) and Sokolowski, A.W. (1966a und b; 1968). Reading the quoted evidence and Ellenberg's (1978) conclusions confirmed my own impression that:

- Białowieża forest is an intact mature *"Urwald"* after primary succession on the barren moraines after the ice had melted at the end of the Pleistocene;
- It is the only known surviving example of canopy-rough Mixed Broadleaf Forest with a rotationaly fluctuating conifer component on flat to undulating lowland sites in the cool-temperate zone in Europe and, as far as it is known, in the world;
- Geomorphological processes enhanced the original site heterogeneity of the moraine landscape and soils by eroding and depositing material;
- The aerodynamically rough (z_o) canopy and the gap-cycle regeneration enhanced floral and faunal biodiversity;
- The micro- and meso-heterogeneity of site and soil, the continuous dynamic changes in the canopy, mostly at gap-size (not excluding uncertain and unpredictable large die-backs and catastrophes) creates the pattern of dynamic structural diversity of vegetation which is similar to that which regulates diversity of structure and flora in the zonal Tropical Rainforest (TRF);
- The structural adaptations of tree form (crown pattern and stem form) and canopy architecture resemble those in the taller stands of TRF on comparable edaphic and physiographic sites;
- Species richness and biodiversity are dynamic, controlled by soil and canopy configuration, as they are in TRF where they, in principle, reflect the dynamic patterns of micro- to meso-heterogeneity (Bruenig, 2017).

Conclusions: The Białowieża forest is most probably genuinely pristine. It somehow has escaped human modifying interventions which in the region sometimes have been severe, as in the cool-temperate and temperate forest zones of Eurasia generally (Hesmer, 1988). It is the only true "*Urwald*" on almost flat to undulating lowland with mineral soils in these climatic zones in Europe and most probably in the world. This rarity and its scientific value make it compulsory that Białowieża forest Nature Park must be made a legally protected Preservation Area from where any logging or any other form of utilisation must be strictly excluded. It must never be subjected to logging or to any other physical or chemical anthropogenic intervention. The forests in the Białowiesch Region are an essential protective wall around the core preservation area shielding it against the effects of exposure and isolation. These forests and woodlands must also be protected, but can be managed as permanent production forests according to the principles of Close-to-Nature Forestry and native customs. They may be logged by Selective Single Tree Harvest systems. Highly mechanised commercial logging in the forests in the Białowiesch Region is inadmissible and should be made illegal by legal instruments.

An urgent priority is the establishment of a global GCC-monitoring network of "*Urwald*" where response to GCC-stresses and epigenetic adaptation to it can be studied. The science-based results are reliable and badly needed for the formulation of rational anti-GCC strategies. The material and spiritual loss of the unique functional and scientific values of the only forest area in the Cool Northern Temperate Zone which is ecologically (site, habitat, vegetation structure, processes, flora and fauna, forest functions) indigenous "*Urwald"* would be a disaster for Europe and for the Polish nation. In addition, socially aware and sophisticated Europeans will have to wake up to their individual responsibility to try and restore the spirit of peaceful and fair cooperation and coexistence in our modern society which obviously has prevailed and made survival possible for our ancestors in the Pleistocene.

REFERENCES

BRUENIG, E.F. 2017. Conservation and Management of Tropical Rainforest. An Integrated Approach to Sustainability. 2nd ed. pp., CABI, Wallingford, UK. ISBN-13: 978 1 78064 140 9

ELLENBERG, H., 1978. *Vegetation Mitteleuropas mit den Alpen in ökologischer Sicht*. 2nd. ed., 981 p., 499 fig., 130 tab., E. Ulmer, Stuttgart. ISBN 3 8001-3418-7

GRAYSON, A. J. (ed.) (1995) The World's Forests: International Initiatives Since Rio. Commonwealth Forestry Association. Oxford UK. ISBN-13-978 1 78064140 9

HART-DAVIS, A. ed. Science, 2009: pp.512. DK Publisher, London, N.Y., Melbourne, Munich, Delhi. ISBN 978 1 4053 5063 1

HESMER, H. 1988. *Einwirkungen der Menschen auf die Wälder der borealen kühlen Zonen der Alten Welt – Island, Norwegen, Schweden, Finnland, Sowjetunion* (Effects of humanity on the forests of the cool-boreal zone in the Old World-...). Westdeutscher Verlag, 1986: vii + 298 (msc. posthumously edited by E. F. Bruenig and J. Poker)

Meyers Hand-Lexikon des Allgemeinen Wissens. 4. Aufl. 1888. Bibliograhic Institut, Leipzig, p. 169.

MATUSZKIEWICZ, A. 1958. *Zur Systematik der Fagion-Gesellschaften in Polen*. Acta Soc. Botan. Polon. 27: 675–725.

MATUSZKIEWICZ, A. and W. 1954. *Die Verbreitug der Waldassociationen des Nationalparks von Białowicża*. Polska Akad, Nauk. Kom. Ekol. 2: 33–60.

PACZOSKI, J. 1928, *La flore de la Forêt de Białowicża*. 87 p., V-me Excurs. Pflanzengeogr. Internat. (V.I.P.E. 1928) Varsovie.

PACZOSKI, J. 1930, *Die Waldtypen von Białowiecża*. In: Paczoski, J., *Lazy Białowieży,* p. 552–575.

SOKOLOWSKI, A.W. (1962) *L'epaisseur de la couverturede neige et la profondeur de lacongé du sol dans les associations forestières du parc national de Białowicża. Ochrony Przyrody* 28: 111–135.

SOKOLOWSKI, A.W. (1966a) Phytosociological characteristic of coniferous woods of Dicrano-Pinion alliance of Białowiecża forest. Prace Inst. Badaw. Leśn. (Warsawa) 305: 72–105.

SOKOLOWSKI, A.W. (1966b) Phytosociological character of spruce woods of Białowiecża forest. Prace Inst. Badaw. Leśn. (Warsawa) 304: 46–49.

SOKOLOWSKI, A.W. (1968) Forest associations at the territory of head-forestry Zwierzyniec in Białowiecża forest. Prace Inst. Badaw. Leśn. (Warsawa) 354, pp. 130.

VOGEL, G. and ANGERMANN, H. (1968). *dtv-Atlas zur Biologie- Tafeln und Texte*. Band 2, Deutscher Taschenbuch Verlag, dtv, pp. 576, 114 fig., ISBN 3.423-03012-7

WALTER, H. 1974. *Die Vegetation Osteuropas, Nord- und Zentraasiens*, 452 p., 363 Abb., Gustav Fischer, Stuttgart, ISBN 3-437-20133-6

E.F. Bruenig

Professor em. Chair of World Forestry, University of Hamburg

Email: ebruenig@yahoo.de

Marcus Wallenberg Prize: awarded for the discovery of sustainable fertilizers

Professor Torgny Näsholm, The Swedish University of Agricultural Sciences, Umeå, Sweden, has examined the role of amino acids in supplying the nitrogen required for the growth of forest trees. His work has caused a paradigm shift in explaining the nutrition of plants.For his discoveries Torgny Näsholm is awarded the 2018 Marcus Wallenberg Prize of SEK 2 million. Monday 24 September he will receive his diploma from the hands of King Carl XVI Gustaf at a ceremony in Stockholm, Sweden.

With a little help of amino acids

The ability of boreal forests to take up atmospheric carbon dioxide and produce wood depends on the availability of nitrogen in the soil. The growth of most forests is however limited by a low supply of nitrogen.

Some species have developed symbioses with bacteria that can process nitrogen gas into amino acids.More than a century ago some plants were demonstrated to have the capability of taking up amino acids directly. The process was not considered important until the isotopic methods were further developed and could simplify chemical analyses of different elements.

Torgny Näsholm has in different studies since 1998 investigated the nutrition of forest trees – particularly Scots pine and Norway spruce. He found that nitrogen from amino acids was taken up by tree seedlings and discovered that the amino acid concentrations in forest soils are high enough to provide a substantial supply for tree uptake. He could also testify that the major nitrogen source of pine and spruce in boreal forests is amino acids rather than ammonium ions or nitrate.

Environmentally friendly

The new insights inspired Torgny Näsholm to develop fertilizers based on amino acids. Field studies revealed the improvement of shoot and root growth when seedlings were grown on this organic nitrogen source. Leaching of nitrogen during seedling cultivation in nurseries was also reduced significantly compared to conventional inorganic fertilizers.

The findings have had an impact on nursery and forestry practices in coniferous forests in the Nordic countries.

The first patent for this approach was issued in 2000 and a fertilizer called Argrow, based on the amino acid arginine, was introduced on the market. Arginine is a nitrogen rich amino acid that is rapidly absorbed by plants. The fertilizer is mainly used in forest nurseries in Sweden, and tests have been performed in Finland, USA, Canada, Uruguay, China, New Zealand and Australia. It is also being tested on other commercial crops and garden plants.

The innovation has been further developed and a new category of patented, slow release fertilizer based on arginine is currently being tested in large scale field trials in Finland and Sweden.

Seedpad is an example of another new technology for improved germination of pine and spruce seeds, that Arevo AB, Umeå, Sweden recently developed. Torgny Näsholm is the CEO for this company.

Groundbreaking innovations

The Prize Selection Committee of the Marcus Wallenberg Foundation states in its motivation that Torgny Näsholm has made innovative discoveries with substantial practical importance to a sustainable management of forests. He has managed to translate and transfer his groundbreaking scientific discoveries into useful applications.

Erik Normark, forestry specialist at the Swedish Forest Agency, is also impressed by the ability to combine research with practical problem solving.

– Fertilizers based on amino acid and nitrogen has lifted Swedish forest seedling production to a higher level of quality. Early results from field studies of fertilizing after seeding indicate a progress in survival and growth of great importance to the forest production in our country, Erik Normark says.

The Marcus Wallenberg Prize 2018 will be presented by King Carl XVI Gustaf to Torgny Näsholm at a ceremony in Stockholm.

The Laureate

Torgny Näsholm was born in Nora, the municipality of Kramfors, Sweden, in 1959. He defended his PhD thesis in Plant Physiology in 1991 at the Swedish University of Agricultural Sciences in Umeå, Sweden. In 2000 he was appointed Professor in Plant Physiology at the Faculty of Forestry, and in 2007 Professor in Tree Ecophysiology at the same university.

Between 2007 and 2010 Torgny Näsholm was engaged in SweTree Technologies AB, where he still holds a position as Scientific Advisor and board member. He is also the leading scientist and CEO of Arevo AB. Both companies are focused on plant and forest biotechnology and situated in Umeå.Since 2007 Torgny Näsholm has published 64 scientific articles, many of them in the highest ranked journals of his area of research. He is also the lead scientist on ten patents issued for work on applications of amino acid nutrition for plants.

Encouraging research in forestry

The purpose of the Marcus Wallenberg Prize is to recognize, encourage and stimulate path breaking scientific achievements, which contribute significantly to broadening knowledge and to technical development within the fields of importance to forestry and forest industries.

Further information

For further information please contact Professor Kaj Rosén, Executive Secretary of the Marcus Wallenberg Foundation, kaj.rosen@mwp.org Tel +46 (0) 70 6697088 The official citation and prize motivation is published on www.mwp.org

Managing forests and their wildfires

President Trump's comments linking forest management to the tragic fires in California generated a firestorm of their own, partly because of a lack of nuance. Forest management is a complex subject — public and private owners usually have very different management objectives and operate in very different regulatory environments.

From a social perspective, all of us have an interest in how forests are managed to provide us with forest products, watershed protection, wildlife habitat, carbon sequestration, recreation and a host of other ecosystem services. Sometimes these competing demands on forests are in competition, sometimes they are complementary, and sometimes it isn't clear how they relate to each other. California's experience in the last decade has highlighted that balancing competing management priorities requires us to pay attention to the importance of ecological and social resilience.

Drought, insects and fire are all integral elements of forest ecology, and good forest management acknowledges their place while seeking to avoid widespread tree mortality and the problems that follow on its heels. The communities in and adjacent to forests vary in demographics and economic well-being, but more often than not include households for which fires can have devastating economic and health outcomes.

Unfortunately, the public discourse on forest management in America has often been polarized along both philosophical and political lines. Disagreements over clearcutting, the use of herbicides, or reforestation failures condition current discussions on watercourse protection, stocking, and the use of prescribed fire have never really been resolved in the minds of many stakeholders.

In my role as chair of the California Board of Forestry and Fire Protection, I am acutely aware of these past conflicts every time we meet to discuss forest policy issues. Trust and a willingness to experiment with new ideas is sometimes in short supply relative to the often-shared feeling that action is needed in the face of a changing climate. But ecological boundaries are being redrawn on the landscape whether we like it or not. Our approach to forest management needs to be as dynamic as the forest's response will certainly be to changes in rainfall, temperature and growing season. The need for science-based, adaptive management has never been more evident.

Research does give us some directions for how our forest management might need to change. Data from California's forests make it clear that the probability of any given acre burning is strongly influenced by whether it is actively or passively managed. Our forests can become overstocked with trees in the absence of fire or fire surrogates like biomass or timber harvesting. When fires occur in overstocked forests, we can experience losses of lives and homes, as well as ecological outcomes such as conversion of forests to shrub lands that most of us are not comfortable with.

When we discuss issues like stocking or reforestation requirements and the scientific basis for regulation, the complexity can be daunting. The right recipe for resiliency depends on the purposes for which any acre is being managed, its proximity to homes, utility corridors, watercourses, and critical wildlife habitat, and the desired landscape outcome. But complexity doesn't require us to oversimplify the situation with uniform stocking requirements or fire return intervals, nor does it require us to put more fire on the landscape where this isn't going to be socially acceptable or consistent with other legislative mandates like the Clean Air Act and its treatment of the particulates emissions from fires, cars and other activities.

Ultimately, characterizing forest management as "good" or "bad" isn't very useful from either an operational or regulatory perspective, and doesn't help us find places where consensus can be reached. Research has shown that how we incorporate the risk from natural hazards into our decision-making is strongly conditioned by our personal experiences, and by the timing of those experiences.

Unlike devastating earthquakes, tsunamis, floods or hurricanes, residents of California and the American West have experienced losses from wildfires in recent years on a frequency that may allow us to avoid the rapid loss of focus on natural hazards as we realize the cost and effort needed to adapt our building codes, transportation and utility networks, zoning, and disaster planning and response. In so doing, they may point the way for the nation. Regulatory agencies at all levels of government need to cooperate to harmonize their policies and prevent the cost of managing forests from dis-incentivizing forest management, particularly for small landowners. Insurance markets will need to both recognize risks and reward actions that mitigate those risks.

Both the California Legislature and Congress seem to understand the urgency of the situation, with the former dedicating significant, ongoing funding for forest management in its last legislative session, and the later adopting a new budgeting framework for the U.S. Forest Service to avoid the problem of rising fire suppression costs crowding out other critical programs. There is reason for hope that we can and will do better.

• J. Keith Gilless, a professor at The University of California, Berkeley, specializes in forest economics and management.

washingtontimes.com

Publications

Trees' benefits promoted in TEDx talk

"Money talks so let's talk about trees' economic benefits" said John Parker MICFor at a TEDx talk in July. Ted X events, a screening of Ted talks, videos online (or combination of live presenters and the videos), aim to spark deep conversation and connections at a local level.

In his TEDx talk John outlined the many benefits of urban trees and said that the economic ones are often the most useful for tree managers to deploy. The former London Tree Officers Association Chairman said "With property sales, well maintained green infrastructure around new houses can increase the amount of money they sell for and decrease the amount of time they will be sat on the market."

"For us as tree managers that's useful for when we have developers saying 'We have to cut down the trees because we want to put in more units and make more money', we can say 'Hang on. If you keep the trees and work around them that will bring you in more money'".

And he pointed out "People will spend more time in shops that have trees or green infrastructure outside and around them, and they will spend more money in those shops than they would elsewhere". He added "The economic arguments for trees aren't my favourite ones but they are useful because money talks and trees deliver economic benefits all over the place."

John also explained that other benefits of urban forests and green spaces range from better social cohesion to improved child development. Watch John at http://bit.do/Parker-TEDx

Chartered Forester (magazine of the UK Institute of Chartered Foresters)

Around the World

Global: Half the planet should be set aside for wildlife – to save ourselves

To avoid mass extinctions of plants and animals, governments should protect a third of the oceans and land by 2030 and half by 2050, with a focus on areas of high biodiversity. So say leading biologists in an editorial in the journal *Science*.

This isn't just about saving biodiverse areas, says Jonathan Baillie of the National Geographic Society, one of the authors. It is also about saving ourselves by protecting wider natural systems, or ecosystems, and their benefits to us, known as ecosystem services. "We are learning that the large areas that remain are important for providing services for all life. The forests, for example, are critical for absorbing and storing carbon," says Baillie.

At present, just 3.6 per cent of the planet's oceans and 14.7 per cent of land is protected by law. At the 2010 Nagoya Conference of the Convention on Biological Diversity, governments agreed to protect 10 per cent of the oceans and 17 per cent of land by 2020.

But this isn't nearly enough, says Baillie. In the editorial, he and his coauthor, Ya-Ping Zhang of the Chinese Academy of Sciences, want governments to set much bigger targets at the next major conference on biodiversity in 2020 (*Science*, doi.org/cttj).

"We have to drastically increase our ambition if we want to avoid an extinction crisis and if we want to maintain the ecosystem services that we currently benefit from," says Baillie. "The trends are in a positive direction, it's just we have to move much faster."

It is hard to work out how much space is needed to preserve biodiversity and ecosystem benefits, the pair say, because there is so much we don't know about life on Earth – like how many species there are. However, most estimates suggest between 25 and 75 per cent of high-biodiversity regions or major ecosystems must be protected. And we should err on the side of caution when setting targets.

"There is no doubt we need far more land and sea secured for conserving and retaining nature," says James Watson at the University of Queensland in Australia. "Targets like 50 per cent are in the right ball park when it comes to the minimal amount of area needed to conserve biodiversity."

But Watson and others stress that which areas get protected is even more important than the overall percentage. "The key thing is to protect the right areas," says Jose Montoya of the Station for Theoretical and Experimental Ecology in Moulis, France. "If we merely protect a proportion of the territory, governments will likely protect what's easy, and that's usually areas of low biodiversity and ecosystem service provision."

What's more, a third of the 3.6 per cent of land that is already meant to be protected is actually being exploited, Watson's team reported last month. So merely declaring areas to be protected isn't enough.

newscientist.com

Global: It's not trails that disturb forest birds, but the people on them

Forest trails that are used more frequently for human recreation have fewer birds and not as many bird species – even when the trails have been used for decades.

The first study to disentangle the effect of forest trails from the presence of humans shows the number of birds, as well as bird species, is lower when trails are used on a more regular basis. This is also the case when trails have been used for many years, suggesting that forest birds do not get used to this recreational activity. Published in *Frontiers in Ecology and Evolution*, the finding suggests the physical presence of trails has less of an impact on forest birds than how frequently these recreational paths are used by people. To minimize the impact on these forest creatures, people should avoid roaming from designated pathways.

"We show that forest birds are quite distinctly affected by people and that this avoidance behavior did not disappear even after years of use by humans. This suggests not all birds habituate to humans and that a long-lasting effect remains," says Dr Yves Bötsch, lead author of this study, based at the Swiss Ornithological Institute, Sempach, Switzerland and affiliated with Institute of Evolutionary Biology and Environmental Studies, University Zurich, Switzerland. "This is important to show because pressure on natural habitats and nature protection areas is getting stronger and access bans are often ignored."

Many outdoor activities rely on infrastructure, with roads and trails being most common. Previous research has shown that trails cause habitat loss and fragmentation, where larger areas of habitat are dissected into smaller pieces thereby separating wildlife populations. However it has been difficult to say for certain whether it is the presence of trails or humans that have the most impact on forest birds.

Bötsch explains, "Previous studies provide conflicting results about the effects of trails on birds, with some studies showing negative effects while others do not. We thought differences in the intensity of human use may cause this discrepancy, which motivated us to disentangle the effect of trails from the presence of humans."

The researchers visited four forests with a similar habitat, such as the types of trees, but which differed in the levels of recreation. They recorded all birds heard and seen at points near to the trails, as well as within the forest itself, and found that a lower number of birds were recorded in the forests used more frequently by humans. In addition, they noticed certain species were more affected than others.

"Species with a high sensitivity, measured by flight initiation distance (the distance at which a bird exposed to an approaching human flies away), showed stronger trail avoidance, even in rarely frequented forests. These sensitive species were raptors, such as the common buzzard and Eurasian sparrowhawk, as well as pigeons and woodpeckers," says Bötsch.

He continues, "Generally it is assumed that hiking in nature does not harm wildlife. But our study shows even in forests that have been used recreationally for decades, birds have not habituated to people enough to outweigh the negative impact of human disturbance."

Bötsch concludes with some advice, which may help to minimize the adverse effects on forest birds by people who use forests recreationally.

"We believe protected areas with forbidden access are necessary and important, and that new trails into remote forest areas should not be promoted. Visitors to existing forest trails should be encouraged to adhere to a "stay on trail" rule and refrain from roaming from designated pathways."

frontiersin.org

Global: IPCC report discredits the burning of forests – NGOs outline the alternative

From the UN's Intergovernmental Panel on Climate Change's (IPCC) landmark report showing that we have just 12 years to keep global warming to a maximum of 1.5°C, to the devastating heat wave that gripped the Northern Hemisphere this summer, the message is the same: the need for action has never been starker.

Scientists agree that rapid carbon dioxide emission cuts will not be enough: we must also remove them from the atmosphere. They disagree about Bioenergy with Carbon Capture and Storage (BECCS), the "saviour technology" that proposes to achieve cuts by capturing carbon emissions from burning trees and vegetable oils and burying them underground (FW 238).

Putting our faith in BECCS – especially on a large-scale – is loaded with dangers and uncertainties for people and nature. At worst BECCS could even accelerate climate change for instance, given the vast land area that would be required to grow dedicated crops (1 or 2 times the size of India), the emissions released all along the BECCS production chain, and the scientifically flawed notion that burning wood is carbon neutral.

The IPCC report gives short shrift to the idea that we can geo-engineer our way out of the climate crisis, and thankfully, a move away from the false hope of BECCS appears near.

So, what could work? The surprisingly simple answer builds on one of the great recent success stories in forest conservation: recognition that strengthening community land tenure is the best way to protect forests, and the carbon they hold.

A new scientific report commissioned by a group of NGOs including Fern underlines that we can limit warming to 1.5°C by combining deep emissions cuts with efforts to end deforestation, reduce meat consumption, improve agricultural practices, and restore natural forests.

And those best placed to protect and restore the forests on which the future of the planet depends are the Indigenous Peoples and local communities who live in and survive off them.

fern.org

New Caledonia: The tree that bleeds... metal?

Heavy metals like nickel and zinc are usually the last thing that plants want to grow next to in high concentrations. But a specialised group, known as hyperaccumulators, have evolved to take up the normally toxic metals into their stems, leaves and even seeds.

Researchers have been studying *Pycnandra acuminata* in particular – a tree that grows on the island of New Caledonia in the south Pacific. They think it may use the nickel to defend against insects. Its latex has an unusual blue-green colour as it contains up to 25% nickel.

"Pycnandra acuminata is a large (up to 20m tall) rare rainforest tree, restricted to remaining patches of rainforest in New Caledonia," says Dr Antony van der Ent, a researcher at the University of Queensland who has been studying the tree.

"As a test-subject it is challenging because it grows very slowly, and it takes decades to get it to produce flowers and seeds. It is threatened by deforestation as a result of mining activities and bush fires," he told the BBC. The tree's unusual affinity for nickel first came to light in the 1970s, and research into other hyperaccumulator plants has increased since then.

So how do you tell what's going on inside these plants? Pycnandra and other hyperaccumulators have been analysed at the DESY synchrotron in Hamburg, using an X-ray technique. "If you use a conventional microscope you can see structures, but you can't actually tell what it's made out of," explains Dr Kathryn Spiers, who has also been studying Pycnandra.

Dr Spiers used a technique that allows a sample to be imaged and rotated very quickly before it is destroyed by the X-ray beam. "At the synchrotron the light source is very bright and our detector is very fast, so that means you can [scan it] before you've killed your sample. You see the [samples]; you've literally got a hole burnt across them."

Researchers can then piece together a full image of the plant sample, with its different element components visible. Researchers are still working out exactly why these particular plants have evolved in this way to cope in such harsh soils. But it's likely not down to human interference with the environment.

"The evolution of hyperaccumulation has evolved many times over in very different families, and likely has taken millions of years. These plants are found on naturally metal-enriched soils," says Dr van der Ent. However, some scientists are hopeful that hyperaccumulators could be used to "clean" soil where there has been a build-up of toxic material due to human activity. Other potential applications include phytomining – growing hyperaccumulator plants on nutrient-poor but metal-rich soils to extract the elements they take up.

bbc.co.uk

Europe: How we can get more out of our forests

The main objective of forestry in Europe is normally timber production. That is why our forests mostly consist of a few economically valuable tree species growing in uniform stands, in which the trees are all roughly the same age. Other forests are managed for values such as habitat conservation or recreation. All of these forests have something in common: they fulfil their main purpose but could also perform many other services much better. For example, forests also regulate our climate and store carbon. Previously, it was not clear which kind of forest management would provide the most benefits. In order to see how forestry can be improved, so that the forest can perform several ecosystem services, an international research group under the direction of the University of Bern examined how different forest features affected 14 ecosystem services in Central European forests. The research consortium includes a total of 21 research institutions from Germany, Switzerland, and Austria. The study was published in **Nature Communications**.

Earlier studies led by the University of Bern show that there is lot of opportunity for forests to supply multiple ecosystem services. However, it was not evident what characterized these forest areas. This new study looked at many different forest attributes: such as the number of tree and shrub species the forest contained, how variable its structure was and how old the trees were. The researchers then identified which of these attributes promote specific services. The study shows that forests with old trees, many different shrub species, and a heterogeneous structure, including gaps, are best able to perform many different – but not all possible – services.

This study has practical management implications for foresters and could support the recent move towards promoting more multifunctional forests. The lead author of the study, María Felipe-Lucia from the Institute of Plant Sciences (IPS) of the University of Bern, says: "We were able to show that diverse and old forests were generally the best. Depending on which services they want to promote, foresters should, however, concentrate on specific forest attributes."

The study also examined how different forest services related to each other. "In our study we used a new approach to identify some of the factors responsible for driving trade-offs and synergies between the services", explains María Felipe-Lucia. For example, one useful synergy occurs as the trees get older: this increases the carbon storage and the potential for birdwatching. Some compromises between the functions are unavoidable, however: "Conifer forests, for example, produce a lot of timber. On the other hand, they are not so good at carbon storage, and fewer plants of cultural value grow in conifer forests." The study's senior author, Eric Allan from the IPS, adds: "Our results show that promoting certain forest attributes is good for a lot of services but there is no forest type that can deliver all of the service we might want. We therefore probably want a mixed management system where we design diverse forest landscapes which contain a mix of patches with different attributes."

phys.org

Scotland: Vertical forests and urban rivers can transform city life

Scotland should take inspiration from places like Milan, where two residential tower blocks contain 900 trees and 5,000 shrubs, and Seoul, where a traffic-choked motorway was removed and a river corridor was restored, writes Jonny Hughes.

Achieving truly sustainable cities is one of the great global challenges of the 21st century. The United Nations expects the proportion of people living in cities will increase from about 54 per cent in 2017 to an estimated 66 per cent by 2050.

During that time the world population is expected to increase from 7.5 billion to 9.5 billion people. The scale of urban growth needed to accommodate such an increase is the equivalent of more than 250 times the size of London or about the size of Mongolia. Most of this growth will occur in developing countries, but many developed nations will also experience expansion, particularly in larger cities.

The way in which this expansion takes place will determine not only the physical character of towns and cities, but also our ability to live healthy, peaceful and prosperous lives.

Urban areas are where many of the impacts arising from environmental change will be felt most acutely. Climate change-induced flooding and severe heatwaves already disproportionately affect towns and cities. Anticipating change now and making design decisions that build resilience in urban environments could help us cope better with climate shocks. For these design solutions to be successful, a fundamental rethink about how we perceive cities is required. This means seeing them as ecosystems in their own right rather than separate and distinct from the geology, soils, water and natural habitats they are built upon. Such natural features are often still evident even in the most intensely urbanised areas – Arthur's Seat in Edinburgh and Glasgow's Cuningar Loop are two examples close to home.

In a new publication, the Scottish Wildlife Trust has proposed a new design approach called 'ecological urbanism', which seeks to enhance cities' underlying natural foundations to help create great places where people and nature can co-exist to mutual benefit. A compelling body of evidence has emerged that has revealed the many benefits to be gained from conserving and enhancing nature in cities. These include improved physical health and well-being, reduced flood risk, cleaner air and water, enhanced inward economic investment and even longer life expectancy. Ecological urbanism seeks to fully realise these benefits by blending green areas – parks, gardens, rivers, street trees and green roofs and walls – with grey urban infrastructure. But ecological urbanism is not simply about more greenspaces. It is about the densification of built-up areas to reduce sub-urban sprawl and the artful integration of green infrastructure in, on and around buildings and streets.

In Scotland, we could draw inspiration from innovative urban greening projects around the world. Seoul removed a traffic-choked elevated motorway from the city centre and restored a 3.6-mile river corridor that now attracts over 60,000 visitors daily and has catalysed economic development. Milan has built a vertical forest in the heart of the city in the form of two residential towers with an incredible 900 trees and 5,000 shrubs. It would be great to see such flagship projects in Scotland but what could be even more transformational is if every city dweller here took one simple step to re-wild their neighbourhood. Thousands of small actions from scattering wildflower seeds to growing vegetables in window boxes could, when taken together, have even greater benefits for people and nature than Milan's famous Bosco Verticale.

www.scotsman.com

Global: Mangrove forests' resilience could help save us from climate change

Humans have become adept at destroying natural habitats. Indeed, we're so good at it we've changed the very makeup and climate of our planet. But there may be signs the natural world is fighting back by protecting itself against rising temperatures and changing weather patterns, and we face the tantalising prospect of helping this process.

A recent study found that mangrove forests could be adapting to climate change by growing beyond their usual range. The risk of several days of continuous frost, which previously kept these trees in tropical and subtropical areas near the equator, is continuously shifting towards the poles.

As average global temperatures rise, mangroves are able to increase their growth and expand their range beyond the equator.

Mangrove forests are coastal wetlands made up of a dense jumble of trees and shrubs capable of living in salt or brackish water. Famous for their tangle of roots sticking up from the ground and dropping down from branches, mangrove forests can grow out into the sea and create almost impenetrable mazes of narrow channels along shorelines.

Mangroves protect coastlines, treat polluted waters, provide livelihoods and resources for some of the world's poorest people and are home to an impressive number of species – many of which are commercially important. It's been suggested that the majority of the global fish catch relies, either directly or indirectly, on mangroves.

Despite their value, humans have also done an impressive job over the last century of destroying them to make way for coastal developments, aquaculture and by logging them for timber and fuel production. Not to mention destroying their natural watercourses and polluting the ground they grow in.

So the possibility that climate change could be benefiting these habitats is promising indeed. In the long run, this could

help society adapt to climate change and even reduce the concentration of greenhouse gases in the atmosphere.

One feature of mangroves that we've long benefited from is the protection they offer to our coastlines. Waves lose their power passing through dense mangrove forests, and they can offer protection from storms, typhoons, hurricanes and tsunamis.

Their mass of roots –- both above and below ground – help to bind and build sediments, meaning mangrove areas can grow vertically, which is a clear asset in the face of rising sea levels. Expanding mangrove forests could therefore help protect us from the devastating effects of extreme weather that become more likely with climate change.

Mangrove forests are also incredibly productive ecosystems, which means that lots of carbon dioxide is taken in and used by the trees and shrubs as they grow. When this organic matter dies, a proportion of it forms the sediment underneath the mangrove forest. As a result, carbon remains trapped as semi-decomposed plant matter, and is unable to re-enter the atmosphere as a greenhouse gas. This ensures mangroves can actually act as giant stores – or sinks – of carbon.

Research suggests that mangroves could be better carbon stores than the coastal habitats they are encroaching on – opening the possibility for mangroves to combat the very causes of global warming. In this way, mangroves act as Earth's natural defences to climate change –- protecting the planet by striking at the very cause of the problem.

Around the world, some mangrove forests are being given legal protection and large-scale restoration works are taking place with varying degrees of success, as one study in Sri Lanka found.

In America and Australia work is being undertaken to restore areas of mangrove dieback following ill-considered developments and the use of herbicides. Conservationists and academics are researching where mangrove restoration would be most beneficial, and developing the best methods for these projects around the world.

The knowledge that mangroves could both benefit from a changing climate and protect us from some of its worst effects demands a renewed vigour in promoting these wetlands. It also raises a question. Should resources be ploughed into maintaining ecosystems where regional changes in the climate are unlikely to help them prosper? Or should we concentrate our efforts on helping expand habitats that are not only resilient to climate change but can help mitigate climate change itself?

Perhaps it is time to move towards the latter and act as ecosystem physicians, giving healing and healable habitats like mangroves every opportunity to do what they do best.

asiancorrespondent.com

Solomon Islands: Alarm bells sound for China's trade reputation, as new report reveals destructive logging of rainforests risks illegality

New evidence released by anti-corruption NGO Global Witness shows that hugely unsustainable rates of logging and the high risk of illegal practices on the once pristine paradise of the Solomon Islands are putting China's reputation as a global trading partner at risk.

Using satellite imagery and drone photography, the *Paradise Lost* report highlights how the Solomon Islands' tropical forests – often portrayed in travel magazines as 'untouched' – are being logged at nearly *twenty times the sustainable rate*, with Chinese companies alone importing *twelve times more than is sustainable*. If this continues, the Solomon Islands' natural forests are predicted to be commercially exhausted by 2036.

Despite being the largest importer of logs from the Solomon Islands, China requires no checks to ensure timber coming from the Islands or elsewhere is not illegally or unsustainably logged.

In 2017 alone, the Solomon Islands exported enough timber to fill Beijing's Olympic stadium even though the entire country is less than twice the size of the Beijing municipality [1]. The small country is smothered in 12,613 km of logging roads: twice the length of the Yangtze River, one of the world's longest rivers.

This small group of islands is China's second biggest source of tropical logs, after Papua New Guinea (PNG) [2]. Together, Solomon Islands and PNG supply an astonishing 50% of China's tropical log imports and we found widespread risk of illegality in both countries' forest sectors.

Timber from the Solomon Islands is at high risk of being illegal under its domestic laws. This makes purchasing it a commercial risk for Chinese companies and China's major wood trading partners – including the US, UK, Japan, South Korea, Canada, Australia and the EU – all of which have laws in place that require companies to check that timber is legally harvested at source. The impact of this was seen in a recent $13 million fine of criminal charges to giant American flooring retailer, Lumber Liquidators, in relation to imports of flooring made in China using illegal wood.

The report reveals a high risk of illegal and exploitative practices by logging companies on the ground in the Solomon Islands.

The findings show that:

- There is a *high risk* that logging companies do not get the permission of local landowners to log in the way required by law;
- There is a *high risk* that companies log in prohibited places and harvest protected species;
- There is a *high risk* that companies do not pay the taxes they owe to the people of the Islands.

Global Witness is calling on China to put in place regulations requiring companies to carry out due diligence to check that timber is, at a minimum, legal in its country of harvest. It warns that if the practice carries on unchecked and this major carbon sink is lost, it will have disastrous and irreparable impacts on biodiversity and the global climate already being pushed to danger point.

Beibei Yin, Campaign Leader, Global Witness said: "While the Solomon Islands are marketed as a pristine tropical idyll, our

investigation shows that the reality is very different. The hugely unsustainable rate of logging, the high risks of illegality and the fact that the industry does little to benefit local people all create a bleak picture of islands far from unspoiled or unexploited."

"While China is taking serious and positive steps to address environmental degradation and to reduce pollution and carbon emissions at home, it is overlooking an important aspect of its ecological footprint: the raw materials that it sources from abroad. If China continues to buy its wood with 'no questions asked' from the Solomon Islands it jeopardises its own business interests as well as efforts by its trading partners to improve governance, prevent environmental degradation, and mitigate climate change. It has the power and chance to make this change."

globalwitness.org

Mediterranean: 'At risk' forests make 'vital contributions' to development

The State of Mediterranean Forests 2018, from the Food and Agriculture Organization (FAO) and environment agency UNEP, analyzes a wide range of political, economic, social and environmental issues in the region, which consists of 31 countries.

"Mediterranean forests and other wooded lands in the region make vital contributions to rural development, poverty alleviation and food security, as well as to the agriculture, water, tourism, and energy sectors," Hiroto Mitsugi of FAO's Forestry Department and Elen Lemaître-Curri, of UNEP's Mediterranean Action Plan, said in the foreword.

But forest degradation in the northern Mediterranean is being driven mostly by a lack of land management and wildfires, while forests in the south-east suffer from overexploitation for firewood, overgrazing and population pressure – potentially triggering a range of economic, social and environmental problems.

For example, as trees try to withstand droughts, they deplete their carbon stores and produce less carbohydrates and resins, which are essential to their health. This has already led to a decline of oak, fir, spruce, beech and pine trees in Spain, France, Italy and Greece, and Atlas cedar trees in Algeria.

"Mediterranean forests have long been adapting to pressures caused by human development," said Mr. Mitsugi. "But never have these pressures been so extreme as they are now."

The region includes more than 25 million hectares of forests and about 50 million hectares of other wooded lands, encompassing urban, rural and agricultural terrain. Forests also play a significant role in the Sustainable Development Goals (SDGs).

The report observes that forest-based livelihoods not only benefit local villagers but also contribute to national tax bases, and overall well-being.

And while the Mediterranean diet and agricultural products are world-renowned, their survival depend on rural landscapes, resources and decent working conditions. Moreover, Mediterranean coastlines host 30 per cent of all international tourists, with budding cities and megacities that continue to push population growth and economic activity, putting a strain on the area.

As such, it is crucial that national and regional strategies better emphasize the role of forests and agroforestry.

"In a context of rapid climatic, societal and lifestyle changes in the Mediterranean, forest and tree-based solutions are critical to the region overall sustainability, with an expected impact well beyond forested areas," asserted Ms. Lemaitre-Curri of UNEP.

The report covers 27 countries: Albania, Algeria, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Jordan, Lebanon, Libya, the former Yugoslav Republic of Macedonia, Malta, Monaco, Montenegro, Morocco, Palestine, Portugal, Serbia, Slovenia, Spain, Syrian Arab Republic, Tunisia and Turkey.

news.un.org

California wildfires: Finland bemused by Trump raking comment

Finns have been baffled by US President Donald Trump's comments praising the country for managing its vast forests by raking. Citing a conversation with his Finnish counterpart, Mr Trump said they spend "a lot of time on raking and cleaning".

But President Sauli Niinisto told a Finnish daily he could not remember talking about raking when the two met.

Surveying the damage on Saturday, Mr Trump revisited his claim that poor forest management was to blame. "You look at other countries where they do it differently, and it's a whole different story," he said. "I was with the president of Finland, and he said: 'We have a much different [sic]. . ., we're a forest nation.' And they spent a lot of time on raking and cleaning and doing things, and they don't have any problem," he added.

But Sauli Niinisto told the Ilta-Sanomat newspaper raking had not come up when they talked. "I mentioned [to] him that Finland is a land covered by forests and we also have a good monitoring system and network," he said.

The forestry director of the Finnish Forest Association, Heikki Savolainen, told the newspaper that raking was not usually a forest-management measure. "Those statements were very interesting. I see raking only in my own yard. It belongs to yards and parks," he said.

Finns have been posting pictures of themselves online raking local forests, joking about "raking America great again".

bbc.co.uk

England: £60m 'greenery drive' to plant 10m trees in England

Conservationists say money is step in the right direction in tackling climate change

More than 10m trees will be planted across England with the injection of £60m of new funding over five years, as part of what the government billed as its "drive to preserve the country's greenery".

The bulk of the money, £50m, will pay landowners for planting trees that lock up carbon, which observers said raised questions over how accessible those woodlands would be to the public. That fund, the Woodland Carbon Guarantee scheme, should pay for 10m trees.

The other £10m will be targeted at planting in cities and towns and should fund at least 100,000 more trees.

The Woodland Trust, a conservation charity, said the money was a step in the right direction in terms of tackling climate change and wildlife losses, but not enough in total. "The problem is greater than just having the funds to deliver increased tree-planting," said Abi Bunker, the group's director of conservation.

The government said it would also back a study into the possibility of creating a new "Great Thames Park" in the Thames estuary, which experts have said could be ready by 2020. Ministers have pledged to plant 11m trees between 2017 and 2022, approximately the same number that were planted under the five years of the coalition.

England's tree-planting record is poor compared with other European countries. About 1.6m trees were planted in England with government support in the 2017–18 financial year, covering 895 hectares. By comparison, Scotland planted 7,100 hectares in the same period.

Conservationists have pointed out that because England's 120m ash trees are threatened by ash dieback, a deadly fungus that arrived in 2012, the country is on track to suffer a net loss of trees over the next five years. The mix of species to be planted under the government's new funding announcement will be decided at a later date.

theguardian.com

Africa's forests at risk if indigenous 'rebels' excluded – experts

Initiatives to restore African forests, decimated by loggers and land-hungry farmers, must include indigenous people if they are to succeed, experts said on Wednesday.

Analysis shows that forest-dwelling communities often sabotage efforts to plant or safeguard trees when they are excluded from them, whereas they can prove valuable allies if they are brought on board, they said.

"When you don't give a chance to forest people like the Ogiek to own their ancestral land, they feel like they are rebels," said Daniel Kobei, head of the Ogiek Peoples' Development Program, which promotes his community in Kenya.

"They feel they are neglected and their rights are not protected, yet this is their ancestral home," he said at the Global Landscapes Forum, a conference on sustainable land use.

Tensions are rife around the world between conservationists, who believe the best way to protect forests is by creating reserves where humans do not live, and millions of indigenous people who have been expelled from their traditional lands.

With Africa's population expected to nearly double by 2050, demands are increasing on already scarce land, pushing people to invade forests for agriculture.

Dozens of countries have committed to restore 100 million hectares (247 million acres) of degraded forest lands by 2030 under the African Restoration Initiative aiming to conserve water, boost harvests and combat climate change.

The Ogiek won a landmark case against the Kenyan government in Africa's highest human rights court in 2017 over their eviction from the Mau forest – Kenya's largest water catchment area – in the Rift Valley.

Since then, the community has restored over 100 acres of the forest, with the support of the government, by replanting and guarding forests in areas where they live, Kobei said.

The Ogiek are optimistic of returning to their ancestral forests as the government has pledged to honour the ruling by the African Court on Human and Peoples' Rights.

The world's indigenous people and local communities have historically used and owned half of the land globally, but they only have rights to less than one-fifth of it, according to analysis by the development charity Oxfam.

After the eviction of the Baka people from the Ngoyla-Mintom forest in Cameroon in 2012, widespread logging took place said Israel Bionyi, a spokesman for the International Land Coalition advocacy group.

"The presence of indigenous people in these spaces makes it difficult for logging companies to take advantage of the forest," he said.

sowetanlive.co.za