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SPECIAL ISSUE

Forest Protection in Europe

Issue 23 September 2010

Editorial

Forests can play a critical role in the mitigation of climate change, but at the same time, climate change is threatening the health and condition of forests. Therefore their protection and adaptation is essential. The EU has adopted a green paper on "Forest protection and information in the EU: preparing forests for climate change"[1]. This special thematic issue provides current information on the dynamics and relationships between forests and climate change and insight into the role of forest management and ecosystem services in protecting EU forests.

The impacts of climate change on forests have already been observed in Europe and there is concern that tree mortality will increase due to physiological stress, insect outbreaks and wildfires driven by future climate change. Due to the long response rate of trees and forests to environmental changes there is a need for planned rather than reactive adaptation strategies. The article **Climate change may be increasing tree mortality** is a recent study that was the first to systematically track global patterns of tree mortality due to drought and heat stress. This indicated that forest mortality caused by heat stress and drought in the EU is mainly concentrated in the Mediterranean. Researchers highlighted a lack of knowledge surrounding the effects of climate change on the physiology of trees and on populations of insect pests in forests. Greater knowledge in this area could help predict future mortality and target forest protection and adaptation policies.

The finding that Europe's most vulnerable forests are located in the Mediterranean was confirmed in the article **Climate Change will hit Mediterranean forests hardest.** This indicated that, due to warmer temperatures caused by climate change, forests in Northern Europe may experience an increased period of growing but Mediterranean forests will be at risk of forest fires, pest outbreaks and desertification. The research also indicated that Mediterranean forests had the least capacity to adapt to climate change. This raises particular concerns since large areas of Mediterranean forest are currently unmanaged so there is currently little scope for intervention to protect forests against climate change impacts. This will be a challenge as profitability of forest management can be low.

As mentioned in the previous two articles, insect pests are a major concern for forests and climate change could exacerbate this threat by creating conditions for pest outbreaks. There is a need for proactive measures to counteract this but to be effective these measures require a greater understanding of the relationships between climate and insects in forests. This was the message of the article **Effects of climate change on insect pests in European forests**. It

(Continued on page 2)

Contents Page

EUROPEAN COMMISSION

environment

reported that rising temperatures could shorten the life cycles of insects so they will mature quicker and produce more offspring in a season. Their habitat ranges will also change with insect populations tending to expand northwards due to higher winter temperatures in both Central and Northern Europe. The article called for further research at both small and large scales. Since responsibility for forest policy lies primarily with Member States, research is needed at a number of levels to feed into national and local policy.

One method to protect and manage forests and their wildlife is the creation of protected areas. Natura 2000 is a network of conservation areas that aim to preserve important habitats and species across Europe, of which forests make up 50 per cent. The article **Environmental diagnosis of Natura 2000 forest areas** reported on the development of a tool to help decision-makers assess the state of forest areas within the Natura 2000 sites. According to the researchers this tool would help policy-makers target those forest areas that require greater protection against environmental changes.

Management is the key to preserving the health and productive capacity of forests as well as to maintaining their social, environmental and economic functions. The concept of remuneration of ecosystem services has been gaining popularity as a means to protect forests and to ensure that humans continue to receive benefits for services provided by their forests. These include timber production, wildlife habitat, water quantity and quality, air quality, soil protection, carbon storage and recreation. The article **Bringing the ecosystem services concept into forestry** analysed three main strategies to incorporate ecosystem services into forest management: fostering payment for ecosystem services on private land through measures such as compensation, managing ecosystem services on public land through protected areas (such as Natura 2000 sites mentioned in previous article) and raising the public awareness of ecosystem services.

The ecosystem service of carbon storage in forests was the focus of the article **Harvesting temperate forests reduces soil carbon** which reported on a study that analysed the impact of tree-felling and tree biomass removal on carbon levels in soil. It estimated that these activities remove, on average, 8 per cent of carbon from the soil in temperate forests and that most of this results from harvesting. This has important implications for the carbon sink function of forests, which can help mitigate climate change by storing carbon that would otherwise be released into the atmosphere as CO_2. If forests are storing less carbon this may exacerbate climate change, which in turn will threaten the forests' health and further reduce their ability to mitigate climate change. Adequate monitoring of carbon stocks, their dynamics and sustainable forest management indicators are essential to maintain and increase the carbon sequestration potential of European forests and forest soils.

The EU Green Paper aims to launch debate on options for an EU approach to forest protection in the light of climate change. Although the responsibility for forest policy lies with individual Member States there is a long tradition by the EU of supporting forest-related activities such as sustainable forest management in co-operation with Member States. Future forestry management practices will need to be based on adequate monitoring and information in several areas. These include tree condition and identification of risks from pests, the sustainable provision of timber and wood fuel, evaluation of forest biodiversity, adaptation of forests to climate change and the protection and enhancement of forests as carbon sinks.

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1. http://ec.europa.eu/environment/forests/pdf/green_paper.pdf

Climate change may be increasing tree mortality

Droughts and temperature rises caused by climate change may already be increasing the die-off of forests, according to a new study. To combat this threat researchers have called for greater knowledge on the status of the forests and the ways in which climate change could have an impact on forest ecosystems.

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"Drought and heat stress caused by climate change could act as triggers for death in trees that are vulnerable due to age or poor tree condition and location, which could be enhanced by other factors, such as wood-boring insects and fungal diseases."

Droughts and temperature rises caused by climate change may already be increasing the die-off of forests, according to a new study. To combat this threat researchers have called for greater knowledge on the status of the forests and the ways in which climate change could have an impact on forest ecosystems.

There is great concern that climate change will increase tree mortality through physiological stress on the trees, insect outbreaks and wildfire. However, there has been no attempt to systematically track climate-driven tree mortality. This study provided the first global assessment of recent tree mortality attributed to drought and heat stress by analysing 88 well-documented cases where this has occurred.

The study looked at the evidence on a continental scale. In Europe, forest mortality is mainly concentrated in the Mediterranean region. For example, there has been increased death of many mixed conifer and broadleaf species in Spain with up to 19 per cent of some populations dying There have also been high levels of tree mortality further north due to drought and stress from insect pests, for example, there was a loss of 111,000 m^3 of timber from English oak *(Quercus robur)* in Poland due to moths and other pests.

Although the study did not establish a direct causal link between climate change and forest die-off, it does demonstrate the concerning impact of heat stress and drought on many types of forest. It indicates that climate change is associated with increases in tree death from heat stress, drought and pest infestations.

The mortality of trees is influenced by a number of factors. Drought and heat stress caused by climate change could act as triggers for death in trees that are vulnerable due to age or poor tree condition and location, which could be enhanced by other factors, such as wood-boring insects and fungal diseases. More recently, research has indicated that climate change could affect other physiological mechanisms in addition to water regulation, such as metabolic processes. This means that even forests receiving adequate rainfall could suffer.

The researchers identified a number of gaps in our knowledge. More accurate data on global mortality patterns in forests are needed, as are detailed spatial data on environmental conditions in forests. There also needs to be a better understanding of how climate change physiologically affects trees and how it affects populations of insect pests in forests. All these uncertainties make it much more difficult to predict future forest mortality and to develop policies that effectively address the threat of climate change on forests.

Source: Allen, C.D., Macalady, A.K., Chenchouni, H. *et al.* (2010). A global overview of drought and heat-induced tree mortality reveals emerging climate change risks for forests. *Forest Ecology and Management*. 259:660-684.

Climate change will hit Mediterranean forests hardest

A new study has highlighted the regional variation in the impacts that climate change may have on European forests. In northern and western Europe there may be positive effects on forest growth, whilst increasing drought and fires in the Mediterranean could damage forests.

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"The Mediterranean is most at risk from forest fires and there may be an increased chance of desertification with rainfall dropping by up to 50 per cent in the summer in some places."

Climate change can have an impact on forests in a number of ways. Higher temperatures can extend the growing season, whilst changes in water availability can restrict productivity. It can also change the frequencies of pest outbreaks, droughts and forest fires. This EU-funded study[1] analysed previous research on the impacts of climate change on five different types of European forests: boreal, temperate continental, temperate oceanic, Mediterranean and mountainous.

Warmer temperatures and higher levels of CO_2 caused by climate change will increase the growing period for trees in the Boreal region, which includes Norway, Finland and Sweden, and is characterised mainly by coniferous forests. This will produce bigger amounts of timber in the mid- to long-term and the distribution of tree species may change, with broad-leaved deciduous trees expanding northwards.

In the Temperate Oceanic region, which includes France, Germany, the Netherlands and the UK, extreme events, such as storms, droughts, flooding and heat waves are the greatest risks for forests. Summers are likely to be dryer and hotter with temperature increases of up to 4°C which may cause outbreaks of pests, such as bark beetles and fungal diseases.

The Temperate Continental (Eastern Europe) and Mediterranean forests are the most water-limited and will suffer most from droughts. In Temperate Continental forests, increases in annual temperature of 3-4°C may trigger outbreaks of pests. The Mediterranean is most at risk from forest fires and there may be an increased chance of desertification with rainfall dropping by up to 50 per cent in the summer in some places. Tree growth is likely to decrease in Mediterranean mountain ranges where water is scarce and in the Alps and Carpathians there could be an increasing number of broadleaved species.

The study also analysed the capacity of European forests to adapt to climate change. Forests have some natural mechanisms for adaption, such as genetic changes and natural selection, but these are slow processes and natural adaptation may not be quick enough for forests to survive. Socio-economic adaptation is thus also needed, for example, through development of adaptive forest management strategies to secure sustainable wood production and provisioning of ecosystem services.

Currently there are considerable differences in socio-economic adaptive capacity across regions in Europe. The Mediterranean region has the least capacity, as large forest areas here are unmanaged and this is where the largest impacts from climate change are expected.

Source: Lindner, M., Maroschek, M., Netherer, S. *et al.* (2010). Climate change impacts, adaptive capacity, and vulnerability of European forest systems. *Forest Ecology and Management*. 259:698-709.

1 This research is based on a study commissioned by the European Directorate General for Agriculture and Rural Development: "Impacts of Climate Change on European Forests and Options for Adaptation". See http://ec.europa.eu/agriculture/analysis/external/euro_forests/full_report_en.pdf

Issue 23 | September 2010

Effects of climate change on insect pests in European forests

A recent study has assessed how climate change could affect the impact of European insect pests on forests to help develop effective forest protection strategies. Changing temperatures may cause some populations of insects to grow or move into new regions of Europe.

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"Warmer winter temperatures will allow some plant-eating insects, such as the pine processionary moth, to move further uphill and attack previously unaffected mountain pine stands."

The consequences of climate change for forest ecosystems will vary according to a number of factors: the region, the exact changes in weather patterns, the level of atmospheric carbon dioxide, levels and changes to the amount of ultraviolet radiation and sunlight falling on the forests.

This research, conducted as part of an EU commissioned study[1] and under the EU PROMOTH project[2], examined both the direct and indirect effects of climate change on insects that feed and live on forest trees. Rising temperatures will directly affect the insect life cycles which will be completed earlier and more offspring will be produced in a season. The timing of flight development and spread of insect populations will be also directly affected by increasing temperatures.

In addition, warmer conditions may directly benefit insects with low frost resistance, such as the green spruce aphid, whereas species that need a period of dormancy to complete their life cycle and survive cold winters could suffer, such as the larch budmoth. Warmer winter temperatures will allow some plant-eating insects, such as the pine processionary moth, to move further uphill and attack previously unaffected mountain pine stands.

Insects will also be indirectly affected by the impact that climate change has on trees and forest structures. Increased CO_2 levels or drought stress would change plant chemistry, and this could reduce the nutritional balance of trees. In some cases, the host plant would develop increased resistance to insect attack (for example, through tougher foliage), reducing the survival and growth rates for some chewing insect pests. In other cases, climate change could reduce plant resistance, to the benefit of other insect species, such as bark beetles.

Climate change will also affect the current ranges of different insect herbivores. Higher temperatures in the northern distribution range (the alpine region and boreal zone) are likely to result in some defoliating insects and bark beetles' range expanding further northwards. In contrast, in parts of the Mediterranean and temperate continental zones, increased temperatures and the higher chance of drought will affect heat-sensitive insects: this could force a northward expansion but also a reduced range in the south. As a heat-tolerant species, the pine processionary moth will benefit from warmer conditions.

To improve strategies to protect forests from insect pests under climate change, the researchers recommend: improving our understanding of the relationship between climate and insect species, from individuals to whole forest communities, as well as identifying, evaluating and monitoring physical (abiotic) and biological (biotic) risks.

1 This research is largely based on a study commissioned by the European Directorate General for Agriculture and Rural Development: "Impacts of Climate Change on European Forests and Options for Adaptation". See: http://ec.europa.eu/agriculture/analysis/external/euro_forests/full_report_en.pdf

2 PROMOTH (Global change and the pine processionary moth) was supported by the European Commission under the Fifth Framework Programme. See: www.daapv.unipd.it/promoth

Source: Netherer, S., Schopf, A. (2010). Potential effects of climate change on insect herbivores in European forests - General aspects and the pine processionary moth as specific example. *Forest Ecology and Management*. 259: 831–838.

Environmental diagnosis for Natura 2000 forest areas

A recent study has developed a method of diagnosing the environmental condition of wildlife habitats in forest areas. This allows biodiversity conservation to be integrated into the planning and management of the European-wide Natura 2000 nature protection areas.

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"Managers can implement suitable management and monitoring strategies for the recovery and/or conservation of biodiversity, according to the results of the environmental diagnosis."

The Natura 2000[1] network of conservation areas has been established by the EU to preserve the most important and endangered habitats and species across Europe. In this study, the researchers designed a method to evaluate the environmental condition of the different habitats found in forest ecosystems protected by the Natura 2000 network. It is based on a checklist of key factors (identified by forest experts) that indicate the overall health of the habitats.

The environmental diagnosis is intended to help decision-makers assess the conservation status of the habitats and to identify areas where targeted management interventions are needed.

The environmental diagnosis is broken down into three phases.

In the first phase, the current conservation status of the habitats is assessed. This is based on the following criteria:

- the conservation of vital functions of the habitat - determined by how much of the habitat is damaged and the vitality of the habitat (e.g. the amount of foliage loss)
- richness of plants (assessed by the percentage of plant species typical for that habitat actually found in the habitat)
- forest structure
- area of the habitat in the protected zone at local and regional scales

Each of these criteria is 'scored' by experts according to conservation status. The statuses are: 'excellent', 'good', and 'intermediate to poor'.

In the second phase of the diagnosis, the vulnerability of different habitats to environmental change is assessed. This improves understanding of how possible actions, plans or projects could affect the habitat and is based on four criteria: fire hazard, erosion hazard, the ability and speed of the habitat to recover after a man-made or natural disturbance and the habitat vulnerability to changes in vegetation.

In the third phase, the first two assessments (conservation status and vulnerability) are combined to allow the territory to be divided into distinct management areas: unfavourable areas requiring urgent management action, intermediate areas with good conservation status but requiring further recovery measures and optimal areas having excellent conservation status with no need for intervention.

The conservation status establishes where action is most needed and the vulnerability indicates the urgency of these actions. Managers can then implement suitable management and monitoring strategies for the recovery and/or conservation of biodiversity, according to the results of the environmental diagnosis.

1. See: http://ec.europa.eu/environment/nature/natura2000/index_en.htm

Source: Velázquez, J., Tejera, R., Hernando, A., Núñez, M.V. (2010). Environmental diagnosis: Integrating biodiversity conservation in management of Natura 2000 forest spaces. *Journal for Nature Conservation.* doi:10.1016/j.jnc.2010.01.004.

Issue 23 September 2010

Bringing the ecosystem services concept into forestry

Practical barriers may be hampering the application of an ecosystem services approach to forests. A new analysis has outlined three strategies to overcome these barriers: fostering private markets, managing public land and raising awareness of ecosystem services.

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"To ensure the concept of ecosystem services is used to protect forests, suitable indicators of success are needed. It is possible that revenue from ecosystem services could grow whilst actual services are declining."

Forests provide a number of ecosystem services that support human wellbeing, for example, timber production, wildlife habitat, water quantity and quality, air quality, soil protection, carbon storage and recreation. Applying the concept of ecosystem services can help to both protect forests and benefit humans. The study analysed three main strategies for doing this:

Fostering private markets and payment for ecosystem services. This works by placing an economic value on the ecosystem services of privately-owned forests. There are several ways this can be achieved. Government agencies or conservation organisations can pay landowners to retain their land as forest rather than convert it to pasture or urban development. Another option is to provide compensation to landowners for managing the forest in environmentally-friendly ways, such as planting buffer strips around streams to support biodiversity.

The value of forest products such as timber, mushrooms and berries, could also be increased, perhaps through environmental certification schemes. Finally, projects to protect forest ecosystem services could be set up with the financial support of carbon trading schemes where CO_2 emissions are offset through the creation of projects that lessen the impact of fossil fuels.

Managing public land and providing common ecosystem services. It is more difficult to involve forest ecosystem services on publicly owned or common land in an economic exchange. Due to the multiple stakeholders and multiple benefits derived from the services it can be difficult to decide on who should pay and which system to use, but this depends on the context and the management. In some cases it may be best to locate vulnerable ecosystem services so they can be overseen by designating them as protected areas or species and communicating their value to the public who use these forests for recreation or other purposes.

Raising awareness of ecosystem services. Increased public awareness of forest ecosystem services can lead to better funding and policy support. This can be achieved through understanding and improving accounting methods, such as ecological footprints and carbon calculators, which can also feed into decision making. Another way to raise awareness is through the valuation of ecosystem services. A number of tools have been designed to do this for forests, such as UFORE (the Urban Forest Effects Model)[1], in the USA, that raises awareness of the benefits of urban forests and street tree networks.

To ensure the concept of ecosystem services is used to protect forests, suitable indicators of success are needed. It is possible that revenue from ecosystem services could grow whilst actual services are declining. Care must be taken to align both of these objectives and measure their success.

Source: Patterson, T.M & Coelho, D.L. (2009). Ecosystem services: Foundations, opportunities, and challenges for the forest products sector. *Forest Ecology and Management*. 257:1637-1646.

1. See: http://www.ufore.org/

Harvesting temperate forests reduces soil carbon

A new analysis of temperate forests has estimated that, on average, tree-felling and the removal of tree biomass reduces carbon levels in the soil by 8 per cent. The reduction is greatest in the forest floor layer where about 30 per cent of carbon is lost.

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Themes: Forests, Soil

"The research indicated that these carbon losses are recovered over time and recovery may be aided by avoiding tilling, as tilling accelerates loss."

About half of the Earth's carbon is stored in forests and approximately two-thirds of this amount is stored in the soil. This is significant in the global carbon cycle and for forest productivity. Improving our understanding of factors that affect forest soil carbon storage is important in anticipating changes in ecosystem goods and services, ranging from forest products and water resources, to greenhouse gas mitigation.

The study carried out an analysis on 75 sets of data on the impact of harvesting (tree-felling and the removal of biomass) on the soil carbon of temperate forests around the world, including forests found in Denmark, France, Germany and Spain. Temperate forests are those with moderate temperatures and high rainfall. It estimated that harvesting reduced the amount of soil carbon on average by 8 per cent.

The carbon stored in the forest floor layer of soil is most vulnerable to harvesting and, on average, there is a loss of 30 per cent from this layer. The forest floor layer stores significant amounts of carbon, but the deeper mineral layers of soil, found below the forest floor, store much more. The impact of harvesting did not lead to an overall loss of carbon from the mineral soil layers. At the deepest level of the mineral soils, carbon concentration actually increased by 19 per cent after harvesting. This could be due to downward distribution of carbon after harvesting and the fact that deeper soils are not disrupted by surface tilling.

This impact of harvesting varied with forest and soil types. Hardwoods tended to lose more carbon from the forest floor (36 per cent) than coniferous or mixed forests (20 per cent). The greatest reduction tends to be from the Spodosol type of soil (often called 'podzols' in Europe) which tends to be acidic and of lower fertility than other soil types. Spodosols store large amounts of carbon in the forest floor layer and take 50 to 70 years to recover soil carbon loss from harvesting.

For mineral soils, the impact on carbon largely depended on the type of soil: there is greater loss from Inceptisols, which are poorly developed soils (13 per cent loss) and acidic Ultisols (7 per cent loss). The research indicated that these losses are recovered over time and recovery may be aided by avoiding tilling, as tilling accelerates carbon loss. Alternative management practices for preparing forest sites which do not involve tilling include burning or retaining the tree residue left after harvest.

Source: Nave, L.E., Vance, E.D., Swanston, C.W. & Curtis, P.S. (2010). Harvest impacts on soil carbon storage in temperate forests. *Forest Ecology and Management*. 259:857-866.

Good Practices Promote Sustainable Forest LIFE

The European Commission's LIFE Programme has been pioneering good practice in sustainable forestry techniques since 1992 and this critical mass of cross-sectoral knowledge provides useful demonstration value for forest managers from within the EU, as well as beyond.

Promoting good practice

Awareness raising events during the International Year of Forests shall promote good practice approaches to such sustainable forestry actions and Europe is able to boast a large collection of success stories in this field, many of which have been developed with assistance from the EU's LIFE programme.

Operational now for 18 years, the LIFE Programme has from its outset invested EU funds into project initiatives that improve the sustainability and conservation status of European forest resources. A wealth of forest management knowledge has been amassed during this time and LIFE's communication team continue to provide a regular flow of publicity material to explain the outcomes of LIFE support for EU forests. Including thematic forestry website pages and printed forestry case study brochures, the LIFE communication strategy has proved to be a successful vehicle for encouraging wider uptake of sustainable forest techniques throughout the EU.

Forest LIFE support samples

A small selection of forest LIFE projects is featured below to illustrate the extent of the Programme's scope and overall support capacity. These examples show the different types of solutions that Member States have developed to address sustainable forestry challenges and further information about the project methodologies is available on the LIFE website's project database.

The LIFE+ BOSCOS project focuses on Mediterranean forest in Menorca and is implementing management techniques that help mitigate negative impacts of climate change. A new LIFE + project run by Greece's Biotope Wetland Centre is also contributing to the EU climate action agenda by demonstrating forest management adaptations to climate change that simultaneously enhance the capacity of forest services.

Another new Greek forest LIFE project involves networking local authorities to improve coordination and strengthen existing forest fire prevention measures via guidance and local action plans.

Some 38 partners from 24 Member States are participating in LIFE's FutMon project to create a pan-European forest monitoring system. Outcomes will provide information on forestry issues for policy planning bodies and decision-makers at both national and EU levels.

Forest fire hazards are being minimised by the CALCHAS LIFE project through high tech approaches using modelling technology that simulates the evolution of forest-fire scenarios and allows emergency services to prepare advance response strategies.

(Continued on page 10)

Woodland biodiversity is the target for Finland's Boreal forests project. Here a synchronized series of LIFE funded interventions are boosting the conservation status of boreal forests and forest-covered bogs.

Wildlife habitats are also the beneficiaries of a Romanian LIFE project where high altitude nature conservation work in this forest initiative includes restoration of woodland habitats from the Pietrosul biosphere reserve.

Last but not least, LIFE funding in Ireland has been well used by the national forest agency to put in place long term support to protect 550 hectares of rare native woodland species.

LIFE is the EU's financial instrument supporting environmental and nature conservation projects throughout the EU, as well as in some candidate, acceding and neighbouring countries. Since 1992, LIFE has co-financed some 3115 projects, contributing approximately €2 billion to the protection of the environment. http://ec.europa.eu/environment/life/

A selection of articles on forests from the *Science for Environment Policy* news alert.

Deforestation driven by rural exodus and agricultural trade (6/5/10)

Deforestation in the tropics is being driven by people moving from villages to cities and the global demand for agricultural products, according to a recent study. The researchers suggest that forest conservation policies which target small landowners should be extended to also target industrial-scale, mechanised farming if such initiatives are to be effective.

REDD improves forest provision of ecosystem services (4/5/10)

Actions to reduce emissions caused by deforestation and degradation (REDD) also enhance ecosystem services, according to a new report. Using a case study from the Amazon it indicated that REDD support schemes can also help maintain water levels and quality and protect soil from erosion.

Pricing carbon insufficient to save tropical forests from deforestation (11/2/10)

Putting a price on carbon emissions from deforestation is unlikely to prevent tropical forests being cleared for palm oil production, according to a recent study. Additional measures should be included in climate policies to protect forests from increasing global demands, such as biofuels.

Forest rehabilitation: benefits for carbon and biodiversity banking (28/1/10)

According to researchers, opportunities for carbon sequestration and benefits for biodiversity offered by forest rehabilitation schemes mean they should be given greater value as a tool for carbon offsetting. A new study demonstrates the value of forest rehabilitation for rainforest birds.

Forest soils can recover from air pollutant damage (5/11/09)

New research investigates the effect of emission reductions on European forest soils under climate change. It indicates that, under current emission reduction plans, most forest soils will recover from changes in soil chemistry within a few decades.

Carbon credits for forestry management (23/7/09)

A recent study has investigated two carbon credit payment schemes which the authors say could provide incentives for forest managers to increase forest land and lengthen rotation time between harvests.

To view any of these articles in full, please visit: http://ec.europa.eu/environment/integration/research/newsalert/index_en.htm, and search according to article publication date.

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