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BIODIVERSITY and SCIENTIFIC CONSERVATION

Quantitatively defining the conservation status of Natura 2000 forest habitats and improving management options for enhancing biodiversity. The main goal of Natura 2000 network is to guarantee the favourable conservation status of habitats and species ensuring European biodiversity. As a result, certain forest areas have been included in this network listed as 9230-*Quercus pyrenaica* habitat and 9340-*Quercus ilex* subsp. *rotundifolia* forest habitat. These areas were previously used for firewood extraction or livestock grazing and browsing. Nowadays these habitats are coppice forests with asexual regeneration, which is far from the desired conservation status. Traditional timber harvesting plans do not take account of the new objectives required for these Natura sites, which attempt to ensure biodiversity and recreational uses instead of simply focusing on timber production. This paper proposes a flexible methodology (applied to the study area "Dehesa Boyal" in Avila, Spain) for managing Natura 2000 forest sites by stands for sustainable forest management and the new requirements. The methodology has two phases. The first, "Division of the forest area into stands", defines homogeneous patches of vegetation distinct in species composition, physiognomic structure and future management. The second, "Conservation status assessment of stands", quantifies the conservation status of each previously classified stand considering a series of factors such as: functional health, restoration, floral richness and structure. A total value integrating the conservation status of stands is then calculated for the habitat. Both phases use Geographic Information System tools for managing information and visualizing results. The proposed methodology provides forest managers with a good knowledge of the territory and subsequently enables them to take appropriate conservation measures to maintain biodiversity.

A. Hernando, R. Tejera, J. Velazquez, M.V. Nunez, **BIODIVERSITY AND CONSERVATION**, 19, 8, 2221-2233, JUL 2010

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New Particle Formation of Marine Biological Origin. Large increases in concentration of particles smaller than 20 nm diameter are relatively common over the central Arctic Ocean in summer and have occasionally been observed over lower latitude oceans. These events often do not readily fit theoretical models of homogeneous nucleation from known precursor gases. It is shown that aggregates and gels of marine biological origin are often common over remote oceans and have a partially granular structure. Previous work in the central Arctic Ocean in summer has shown evidence of release of particles of the order of 40 nm diameter in the presence of evaporating fogs. It is suggested here that under some circumstances disintegration of the primary particles may be more complete, releasing particles smaller than 5 nm that would then be mistaken for recently nucleated particles. Examination of particles present during an apparent nucleation event at Cape Grim, Tasmania supports this interpretation. Correlation coefficients of concentrations of particles of different sizes during the period before apparent nucleation events suggests a distinct difference between vigorous true nucleation events and those over the central Arctic Ocean in summer where little subsequent growth is observed.

C. Leck, E.K. Bigg, **AEROSOL SCIENCE AND TECHNOLOGY**, 44, 7, 570-577, 2010

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Human-Induced Particle Re-Suspension in a Room. A large-eddy simulation/immersed boundary method for particulate flows in an Eulerian framework is utilized to investigate short-term particle re-suspension due to human motion. The simulations involve a human walking through a room, stopping, and then walking in place, causing particles to be re-suspended from a carpet. The carpet layer is modeled as the porous medium and a classical adhesive force model is applied to model the resistance of the carpet-bound material to hydrodynamic forcing. The effects of parameters such as the foot penetration depth and adhesive force coefficient on mass re-suspended during the foot stamping events are examined. Simulations of particulate re-suspension experiments conducted in a room within a U. S. Environmental Protection Agency test house are also described. The simulations vary the type of human motion (stamping in place versus stamping in place with rotation). The results indicate that significant amounts of particulate material are re-suspended from the carpet layer due to the impingement of the feet during the motion event. The net mass re-suspended for human motion with rotation is two times greater than that for the motion without rotation, while the mass of re-suspended small particles is slightly greater than that of large particles. The re-suspension rates are estimated based on several time scales, and the predicted total particle number concentrations at several locations in the room show good agreement with experimental data. The present CFD model can be utilized to predict particle re-suspension rates as induced by human motion, but further work in modeling the fine-scale details of the re-suspension process is needed.

R.C. Oberoi, J.I. Choi, J.R. Edwards, J.A. Rosati, J. Thornburg, C.E. Rodes, **AEROSOL SCIENCE AND TECHNOLOGY**, 44, 3, 216-229,

Relative contribution of agroforestry, rainforest and openland to local and regional bee diversity. Due to increasing human modification of tropical landscapes, the relative importance of natural habitats and agricultural systems has become a major conservation topic to counteract global species loss. We investigated the contribution of tropical primary forest, cacao agroforestry systems of varying management practices and openland to the temporal and spatial variation of diversity of native bee communities in the herb layer (Apidae, Hymenoptera) in Sulawesi (Indonesia). Local bee density and diversity were highest in openland, followed by agroforestry systems and were lowest in primary forests, revealing the importance of herbaceous food resources in the understorey. In contrast, highest regional bee richness was found in agroforestry systems, because of high community dissimilarity. Multidimensional scaling supported these findings with openland habitats showing more compactly clustered bee species communities than agroforestry habitats. In conclusion, the herb associated bee community profited from the opening of the landscape as a result of agricultural activities, while agroforestry systems increased bee species richness especially on a regional scale due to high management diversity.

P. Hoehn, I. Steffan-Dewenter, T. Tscharntke, **BIODIVERSITY AND CONSERVATION**,
19, 8, 2189-2200, JUL 2010

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Leather waste-Potential threat to human health, and a new technology of its treatment. In this paper, the authors deal with the problem of processing various types of waste generated by leather industry, with special emphasis to chrome-tanned waste. The agent that makes this waste potentially hazardous is hexavalent chromium. Its compounds can have negative effects on human health and some CrVI salts are considered carcinogens. The authors present the risks of spontaneous oxidization of CrIII to CrVI in the open-air dumps as well as the possible risks of wearing bad quality shoes, in which the chromium content is not controlled. There are several ways of handling primary leather waste. but no satisfactory technology has been developed for the secondary waste (manipulation waste, e.g. leather scraps and used leather products). In this contribution, a new three-step hybrid technology of processing manipulation waste is presented and tested under laboratory, pilot-scale and industrial conditions. The filtrate can be used as a good quality NPK fertilizer. The solid product, titanium-chromium sludge, can serve as an inorganic pigment in glass and ceramic industry. Further, the authors propose selective collection of used leather products (e.g. old shoes), the hydrolysable parts of which can be also processed by the new hybrid technology.

K. Kolomaznik, M. Adamek, I. Andel, M. Uhlirova, **JOURNAL OF HAZARDOUS MATERIALS**, 160,
2-3, 514-520, DEC 2008

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New approaches for establishing conservation priorities for socio-economically important plant species. The establishment of priorities among species is a crucial step in any conservation strategy since financial resources are generally limited. Traditionally, priorities for conservation of plant species have been focused on endemism, rarity and particularly on their threatened status. Crop wild relatives (CWR) and wild harvested plants (WHP) are important elements of biodiversity with actual or potential socio-economic value. In this study, eight prioritisation criteria were used along with different prioritisation systems and applied to the Portuguese CWR and WHP. The top 50 species obtained by each of these methods were identified. The final top CWR were those that occurred as a priority in most methods. Twenty CWR were identified as the highest priorities for conservation in Portugal and they include wild relatives of the crop genera *Allium*, *Daucus*, *Dianthus*, *Epilobium*, *Festuca*, *Hemiaria*, *Narcissus*, *Quercus*, *Plantago*, *Trifolium*, and *Vicia*. Eighteen WHP were recognised as priorities for conservation and include several *Narcissus* and *Thymus* species, among others. The advantages, limitations and level of subjectivity of each of the methods used in this exercise are discussed.

J.M. Brehm, N. Maxted, M.A. Martins-Loucao, B.V. Ford-Lloyd, **BIODIVERSITY AND CONSERVATION**, 19, 9,
2715-2740, AUG 2010

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Recycling of solid wastes in the synthesis of Co-bearing calcium hexaluminate pigment. Cobalt doped calcium hexaluminate was firstly synthesized using pure reagents; subsequently, the pure reagents were substituted with industrial wastes, the composition of which had been characterized using X-Ray diffraction and X-Ray fluorescence namely, Al-anodising sludge replaced pure aluminium whilst marble cutting rejects and foundry sand were employed as sources of calcite and silica, respectively. As expected, cobalt doped hibonite was the major phase present in calcined powders and displayed an intense blue coloration due to the incorporation of cobalt in tetrahedral positions, as confirmed by transitions from (4)A(2)(F) to the excited T-4(1)(F) and T-4(1)(P) states observed from UV-Vis-NIR absorption spectra. The novel waste-derived hibonite pigment showed strong and stable colouring potential when applied in different ceramic supports. (C) 2009 Elsevier Ltd. All rights reserved.

W. Hajjaji, M.P. Seabra, J.A. Labrincha, **DYES AND PIGMENTS**, 83, 3, 385-390, DEC 2009

Dendrochronological investigation of the high Andean tree species *Polylepis besseri* and implications for management and conservation. High-altitude *Polylepis besseri* woodlands in Bolivia are under increasing threat from human use and disturbance. Currently, there is no information regarding *P. besseri* growth rates, age structures or the relationship between environmental variables and growth. Such information would be useful for effective management and conservation of the remaining woodlands. We used standard dendrochronological techniques to determine the age and radial growth rates for 23 trees from two *Polylepis besseri* populations in Sacha Loma (mountains Uypa and Chutu Senega), and investigated the relationship between climate and radial growth. Wood samples exhibited semicircular porosity and visible tree-ring boundaries. The sample trees were young (mean age 40 years, max age 63 years) and growing slowly (< 1 mm/year). Trees at Chutu Senega were older and growing more slowly than those at Uypa. The strong linearity of cumulated radial increments suggest that *P. besseri* may maintain consistent growth rates beyond 60 years. Our results indicate that radial growth is limited by the accumulation of reserves the year before ring formation, and that a warm period before the growing season (humid period) can increase *P. besseri*'s growth in the Bolivian-Tucuman biogeographic Province. It seems that local factors are more important than regional factors in these high Andean woodlands. This study improves our understanding of the biology of *Polylepis* and demonstrates the usefulness of dendrochronology for investigating the biotic, abiotic and anthropogenic effects on woodlands in areas lacking long term historical data.

E.E. Gareca, M. Fernandez, S. Stanton, **BIODIVERSITY AND CONSERVATION**, 19, 7, 1839-1851, JUN 2010

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Global Spatial Indexing of the Human Impact on Al, Cu, Fe, and Zn Mobilization. With increasing consumption of material by human activity, the extent of human influence relative to nature in the mobilization of metals and other elements on Earth continues to grow. Recognizing people as modern geomorphic agents, I produced global data layers at 1 degrees x 1 degrees of human-mediated mass flows (coal combustion, biomass burning, and mining) and nature-mediated mass flows (net primary productivity, sea salt aerosol emission, and denudation to the oceans) for the industrial metals of aluminum, iron, copper, and zinc for the year 2000. The major mobilization processes are denudation (natural) and mining (anthropic), though net primary productivity for Zn and Cu and coal combustion for Al are nearly as significant. All flows are subsequently combined into an index representing human versus nature flow dominance. As the first maps of mobilization flows of metals widely used by modern technology, they reveal that similar to 1-5% (depending upon the metal) of Earth's land surface now has metal flow dominated by human activity.

J.N. Rauch, **ENVIRONMENTAL SCIENCE & TECHNOLOGY**, 44, 15, 5728-5734, AUG 2010

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Monitoring Microbial Community Structure and Dynamics during in situ U(VI) Bioremediation with a Field-Portable Microarray Analysis System. The objective of this study was to develop and validate a simple, field-portable, microarray system for monitoring microbial community structure and dynamics in groundwater and subsurface environments, using samples representing site status before acetate injection, during Fe-reduction, in the transition from Fe- to SO₄²⁻-reduction, and into the SO₄²⁻-reduction phase. Limits of detection for the array are approximately 10(2)-10(3) cell equivalents of DNA per reaction. Sample-to-answer results for the field deployment were obtained in 4 h. Retrospective analysis of 50 samples showed the expected progression of microbial signatures from Fe- to SO₄²⁻-reducers with changes in acetate amendment and in situ field conditions. The microarray response for *Geobacter* was highly correlated with qPCR for the same target gene ($R^2 = 0.84$). Microarray results were in concordance with quantitative PCR data, aqueous chemistry, site lithology, and the expected microbial community response, indicating that the field-portable microarray is an accurate indicator of microbial presence and response to in situ remediation of a uranium-contaminated site.

D.P. Chandler, A. Kukhtin, R. Mokhiber, C. Knickerbocker, D. Ogles, G. Rudy, J. Golova, P. Long, A. Peacock, **ENVIRONMENTAL SCIENCE & TECHNOLOGY**, 44, 14, 5516-5522, JUL 2010

Characterization of a chromium-rich tannery waste and its potential use in ceramics. Leather industries which promote hide stabilization by the conventional chrome-tanning process are a major source of pollution because of the resultant chromium-rich wastes. In this work, an extensive characterization of such a chromium-rich waste sludge is presented, regarding its chemical composition (XRF), crystalline phase contents (XRD), organic carbon content (TOC), thermal behavior by thermogravimetry (TG) and differential scanning calorimetry (DSC), as well as its stability under chemical attack (the concentration of important ions in the leachates being determined by capillary electrophoresis) and when submitted to temperatures as high as 1100 degrees C, in air. The material showed the tendency to produce some undesirable, and previously non-detected hexavalent chromium when exposed to high temperatures, but after washing off the soluble salts and the elimination of the organic matter by firing, the resultant material was successfully tested as a ceramic pigment in a conventional glaze composition usually employed in the ceramic the industry.

M.A. Abreu, S.M. Toffoli, **CERAMICS INTERNATIONAL**, 35, 6, 2225-2234, AUG 2009

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Rapid biodiversity assessment of arthropods for monitoring average local species richness and related ecosystem services. Rapid biodiversity assessment (RBA) is proposed as an affordable indicator for monitoring local species richness of arthropods and sustainability of related ecosystem services. The indicator is based on strictly standardised sampling procedures and the identification of parataxonomic units (morphospecies) instead of species identification. The collection of arthropods was optimized with regard to trap types, time and length of collecting period, selection of four out of seven weekly samples, and choice of counted taxa and trophic guilds. By measuring arthropod activity, RBA is an indicator for functional diversity. Over a period of 8 years, average yearly numbers of morphospecies were assessed in Switzerland in 15 agricultural habitats, 15 managed forests, and in 12 unmanaged habitats ranging from protected lowland wetlands to Alpine meadows. The yearly RBA-trend in unmanaged habitats is used for assessing the influence of climate and weather on biodiversity, and as a reference for measuring the relative influences of recent management changes in agriculture and forestry. The average number of morphospecies per sampling station per year depends on temperature, and was only marginally significantly increasing over time in agriculture, but not in forestry or unmanaged areas. Three RBA indices considered to be relevant for maintaining ecosystem services were calculated from the average number of morphospecies per location per year: (1) indicator for ecological resilience and sustainability (all morphospecies); (2) indicator for pollinator diversity (taxa with a majority of pollinators) and (3) indicator for biocontrol diversity (ratio between carnivore and herbivore guilds).

M.K. Obrist, P. Duelli, **BIODIVERSITY AND CONSERVATION**, 19, 8, 2201-2220, JUL 2010

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DGT/DET Gel Partition Features of Humic Acid/Metal Species. Gel layer based sensors are increasingly employed for dynamic trace metal speciation analysis in aquatic and soil media, in which humic and fulvic acid species are generally known to be relevant. In DGT (diffusive gradient in thin film), polyacrylamide hydrogels are commonly used for the diffusive gel layer. Various effects of the presence of humic species on the amount of metal detected by DGT have been observed, but the role of the different metal/humic species is still unknown. Recently it was shown that in the absence of metal, humic acid accumulates significantly in the polyacrylamide hydrogel. Here we analyze the extent of this accumulation in the presence of cadmium under various conditions of ionic strength and total humic and fulvic acid concentrations. At millimolar ionic strength level, DET data show significant accumulation of cadmium(II) in the gel phase, on top of some Donnan enrichment. The results are essential for the interpretation of DGT/DET data on metals in the presence of humics, especially in freshwaters.

P.L.R. van der Veeken, H.P. van Leeuwen HP, **ENVIRONMENTAL SCIENCE & TECHNOLOGY**, 44, 14, 5523-5527, JUL 2010