

# WHAT'S UP?

THE NEWSLETTER OF THE INTERNATIONAL CANOPY NETWORK

NALINI NADKARNI, EDITOR

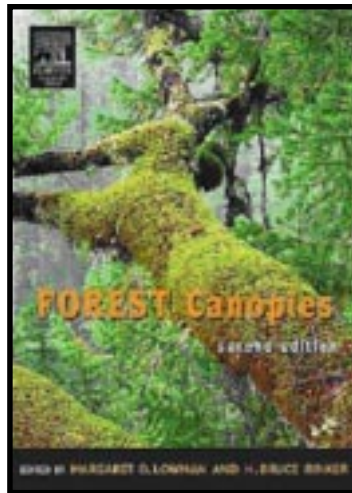
DAVID FRANKLIN, EDITORIAL ASSISTANT

## Forest Canopies, 2nd Edition, is here!

Margaret D. Lowman, New College of Florida, Sarasota,  
U.S.A.

Dr. H. Bruce Rinker, Marie Selby Botanical Gardens,  
Sarasota, Florida, U.S.A.

This book represents an authoritative synthesis of data, anecdotes, case studies, observations, and recommendations from researchers and educators who have studied "The High Frontier". With innovative rope techniques, cranes, walkways, dirigibles, and towers, they finally gained access to the rich biodiversity that lives far above the forest floor and the emerging science of canopy ecology. In this new edition of *Forest Canopies*, nearly 60 scientists and educators from around the world look at the biodiversity, ecology, evolution, and conservation of forest canopy ecosystems.



### FEATURES

- Comprehensive literature list
- State-of-the-art results and data sets from current field work
- Foremost scientists in the field of canopy ecology
- Expanded collaboration of researchers and international projects
- User-friendly format with sidebars and case studies
- Keywords and outlines for each chapter

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# BEYOND THE TREETOPS: SYMPOSIUM ON CANOPIES WITHIN ECOSYSTEMS AND LANDSCAPES

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Nalini M. Nadkarni, The Evergreen State College

One of the primary missions of the International Canopy Network is to facilitate canopy research communication among scientists. Staging a symposium at a major scientific meeting is an efficient way to implement this part of our mission, as it allows canopy researchers to speak to a larger and more broad-based audience than at our own canopy conferences.

Following the precedent of other canopy symposia we have sponsored in the past, two of our ICAN Board members – Nalini Nadkarni and David Shaw – co-organized an international roster of scientists who are carrying out cutting-edge research on forest canopies in a diverse set of locations, forest types, and subjects. The venue was the annual meeting of the Ecological Society of America, which was held on August 4, 2004, in Portland, Oregon. There were over 4,000 participants in this large and exciting meeting, with disciplines ranging from agronomy to zoology.

The purpose of our symposium was to highlight the multiple ways in which forest canopy organisms and processes interact with ecosystems and landscapes in a variety of forest types.

## **SYMPOSIUM SYNOPSIS:**

### **FOREST CANOPIES AS PARTICIPANTS IN ECOSYSTEM AND LANDSCAPE ECOLOGY**

The emerging field of forest canopies has matured to produce insights into some of our most pressing ecological and environmental issues. A recent summary article (2003) on canopy research in the journal *Science* (301:183-187) described results and upcoming efforts that are critical to understand global climate change, maintenance of biodiversity, and sustainable use of forest resources. With greater access from tools such as canopy cranes, as well as long-term and large-scale data sets derived from remote sensing, nanotechnology, and permanent canopy study sites, canopy researchers are now able to place their research on forest canopy microenvironments, biota, and processes into the context of whole ecosystems and landscapes. Speakers drew upon research in tropical, temperate, and forest as a whole, from the atmosphere to the soil. They discussed the role of canopy flora and fauna in issues such as maintaining forest biodiversity, atmospheric deposition, nutrient interception, hydrology, carbon seques-

tration, and creation of wildlife habitat. Each speaker suggested research questions and approaches for the future.

Below are the abstracts of the papers that were presented.

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### **A HISTORY OF TEMPERATE ZONE CANOPY PHYSIOLOGICAL ECOLOGY**

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**T. Hinckley & R. Walker. University of Washington**

The earliest research publications on whole tree physiology were by Hales (1727), Hartig (1878), Büsgen (1897) and Huber (1927). Although these works are critical to our current understanding of tree form and function, they are not foundational from the perspective of canopy physiological ecology. If one assumes that canopy physiological ecology focuses on the intensive study of trees and not saplings or seedlings, then the first reports from Europe (Austria and East Germany) date from the early 1950s. In the mid-1960s, there was increasing activity in both Europe and North America. We focus on the interactive role of scientific curiosity, the state-of-knowledge, technology and place on the development and expansion of research in canopy physiological ecology. We critically examine where knowledge was conceptually or practically advanced as a result of tree canopy studies vs. those studies solely depending upon the novelty of being in a canopy. In some cases, questions posed as early as 1727 have yet to be clearly answered.

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### **EVOLUTIONARY ECOLOGY OF HAWAIIAN CANOPY ARTHROPODS**

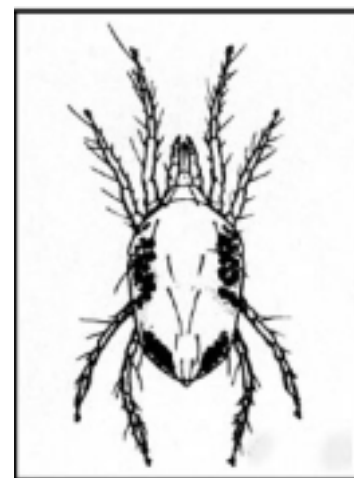
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**D. S. Gruner, Department of Zoology, University of  
Hawaii**

Canopy arthropod biology has surged in popularity in the last decade, following a high profile debate concerning the number of species in tropical tree canopies on earth. The work that followed was largely descriptive and exploratory, but canopy arthropod communities also are excellent model systems for testing ecological hypotheses. Community ecology has historically focused on mechanisms that limit the diversity and structure at local scales, while neglecting macroevolutionary and biogeographical processes (e.g., speciation, his-

torical accident) that add species over larger scales. In a two-pronged approach, I first used quantitative surveys of canopy arthropods from the dominant Hawaiian tree *Metrosideros polymorpha* (Myrtaceae) on a well-characterized geological chronosequence across the Hawaiian archipelago. I partitioned diversity into local and regional components and found strong correlations of arthropod variables with site-level ecosystem properties. I investigated local species interactions at a single site, where small stature trees and severe nutrient limitation allowed a long-term factorial manipulation of both bird predators (top-down) and resources (bottom-up). The experiments revealed a complex interaction milieu where the relative influence of birds and resources depended on the trophic position of arthropods. Fertilization increased densities and species richness of detritivores and herbivores, and altered overall species composition. However, generalist bird predators influenced invertebrate predators, and prevented the outbreak of a previously rare, invasive spider species. Experimental studies corroborated general findings from the gradient, and the interplay from the two approaches strengthened mechanistic interpretations from correlative data while expanding the scale of inference from a single site. Although species composition is constrained fundamentally by regional processes, community structure and diversity of this arthropod system are sensitive to local ecosystem properties and species interactions, primarily from the bottom-up. Tree canopy arthropod communities are underutilized systems for examining fundamental questions in ecology.

nificantly between ground and canopy at both the family- and species-level. Seventy-seven species were entirely restricted to either ground or canopy litter bags, but many of these species were rare ( $n < 5$ ). Canonical correspondence analysis indicated that mite community structure on the ground and in the canopy varied significantly with time available for colonization. There was high species turnover through time and a high degree of specialization for early-, mid- and late-successional stages of litter decomposition in both ground and canopy mites. Distinct assemblages of ground-specialist mites dominated each elevational zone (800-1000-1200 masl), however this was not evident with the canopy-specialist mites. Mites finely divide resource utilization during the successional process, suggesting that even short-term microarthropod conditioning of suspended litter may have a large impact on terrestrial nutrient cycling following subsequent litter throughfall to the ground. We suggest that arboreal habitats act as reservoirs for mite biodiversity present and microhabitat features that are important for long term residency of some canopy species that are only found in ancient rainforest canopies.



Two-spotted spider mite

#### MITE COLONIZATION AND SUCCESSION IN TERRESTRIAL AND ARBOREAL SUSPENDED LITTER: AN EXPERIMENTAL STUDY

N.N. Winchester, L.L. Fagan, R.K. Didha, V Behan-Pelletier, M. Clayton, E. Lindquist, and R.A. Ring.  
University of Victoria, Canada

Forest canopies support diverse assemblages of free-living mites. The degree of mite species' complementarity between suspended soils and terrestrial soils below the same trees may be as high as 70%. Arboreal specificity may be due to intrinsic variation in habitat quality, habitat architecture, patchiness, and resource availability. We measured colonization and successional dynamics of 129 mite species colonizing 507 experimental litterbags on the ground and in the canopy of *Abies amabilis* trees in a temperate montane forest, British Columbia, Canada. Mite abundance and species richness in experimental litterbags were two times greater on the ground than in the canopy. Species composition differed sig-

#### NUTRIENT STATUS OF VASCULAR EPIPHYTES ALONG AN ELEVATION GRADIENT IN COSTA RICA

C. Cardelús, L. M. C. Mack, E.G. Schuur, and J.E. Watkins, Jr. University of Florida

To better understand nutrient dynamics in canopy systems and to obtain a baseline for the nutrient composition of epiphytes along a large altitudinal gradient, we examined foliar carbon (%C), nitrogen (%N), phosphorous (%P) and natural abundance ( $^{15}\text{N}$  and  $^{13}\text{C}$ ) isotopes of 393 individuals, in over 70 species, of epiphytic ferns, bromeliads and orchids collected at four elevations in Braulio Carrillo National Park, Costa Rica (500 m, 1000 m, 1600 m, and 2000 m). There were significant effects of elevation on all variables measured. The 1600 m site stood apart from the other elevations with the highest %N content, lowest C:N ratio and the lowest

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N:P ratio, indicating relatively high N and P content compared to the other sites. The 1600 m also had the lowest delta  $^{13}\text{C}$  signatures (-31.9 – -30.8 per mil) for all families. Foliar N content differed significantly across groups. Percent N was lowest in bromeliads (0.87 %N) and highest in the ferns (1.3 %N). Ferns had the lowest C:N ratio (-37.5), and bromeliads the highest (-59.4). N:P ratios were significantly higher for ferns than orchids. Bromeliads had significantly higher natural abundance delta  $^{15}\text{N}$  values than orchids



Braulio National Park, Brazil

and ferns, suggesting access to different N sources. Although nutrient availability in the canopy appears to be affected by elevation along this gradient, these data suggest that the canopy is a nutrient poor habitat and that epiphytes of different evolutionary lineages possess unique functional strategies that may allow for coexistence in similar habitats.

## CANOPY PROCESSES: NEW INSIGHTS FROM LONG-TERM HERBIVORY DATA SETS IN OLD AND NEW WORLD FORESTS

M.D. Lowman, New College of Florida

For over 25 years, I have compiled data sets on herbivory levels in the canopies of different forest types, using a variety of methods including both long-term and short-term (“discrete”) measurements of annual leaf area losses. Forest regions included: Australia (cool temperate, warm temperate, subtropical, tropical, and dry sclerophyllous forests); Africa (lowland tropical rain forests); Central America (tropical rain forests in Panama, Belize); South America (tropical rain forests in Amazonian Peru); and



Dove Creek Hammocks, Florida

North America (temperate deciduous forest in Massachusetts; hammocks in Florida; and coniferous forests in Oregon). With the long-term method (i.e. the most accurate technique) that involved monitoring leaves throughout their entire lifespans, canopy herbivory ranged from 15% up to 300% annual leaf area losses. However, this method is not feasible for many studies where shorter time durations are required. I compared my short-term and long-term data sets at several sites, to interpret the limitations of short-term herbivory measurements, and extrapolate to a higher level of accuracy. I discuss the applicability of these results to quantify links between the green and brown food webs within a forest ecosystem.

## DWARF MISTLETOES AS MODEL CANOPY ORGANISMS FOR ECOSYSTEM AND LANDSCAPE STUDIES IN WESTERN CONIFER FORESTS

D.C. Shaw, Wind River Canopy Crane Research Facility, Washington

Dwarf mistletoes (DM) (*Arceuthobium* species, Viscaceae) are obligate, hemi-parasitic, canopy plants that are generally host specific, and most common in western N. America coniferous forests. Unique among the mistletoes, DM species disperse by explosive seed discharge. Stand composition, density, structure, and historical disturbance pat-



Dwarf mistletoe on Western Hemlock

terns that affect where infected trees are located largely determine epidemiology. Spread ecology results in spatial patterns that are patchy over the landscape with large trees being most heavily infected. Many DMs cause deformation of infected branches on the host tree, creating large structures called witches brooms, which are important for wildlife nesting and roosting, and may profoundly change the structure of a forest stand. Whole tree water, carbon, and nutrient dynamics are affected on heavily infected trees. Reduced water use in heavily infected trees has been reported for western hemlock (55 kg/day vs. 90 kg/day), whereas increased water use or no difference has been reported for heavily infected trees in western larch and Douglas-fir. Many studies indi-

cate lower nitrogen content in needles at or distal to infections as well as more negative foliar  $\delta^{13}\text{C}$ . Reduced wood production has been estimated at 11.3 million  $\text{m}^3\text{yr}^{-1}$  in the western US due to DMs. Fire suppression has changed the nature of DM epidemiology in western North America, probably causing a large increase in dwarf mistletoe populations. DMs are excellent model organisms in ecosystem and landscape ecological studies in western coniferous forests because they are keystone species that influence tree structure and function, forest biodiversity, fire ecology, and ecological processes such as carbon sequestration.

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### SURVIVAL OF EPIPHYTE COMMUNITIES IN FRAGMENTED CANOPIES

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**P. Heitz, University of Natural Resources and Applied Life Sciences, Vienna Austria**

Vascular epiphytes are sensitive indicators of climate. In a pristine landscape their distribution and diversity reflects their microclimatic preferences. What happens to the canopy-dependent flora in a landscape dominated by secondary vegetation with few forest fragments?

The distance to potential seed sources and the size of host trees are important factors for epiphyte diversity on isolated remnant trees and forest plantations. In some



Coffee plantation in Mexico

Neotropical montane areas, coffee plantations with shade trees represent the most important arboreal vegetation. In Veracruz, Mexico, the number of epiphytic species in traditional coffee plantations with old shade trees was about as high as than in forests, but plantations with mainly small trees hosted fewer epiphytes than those with large trees. Epiphyte communities were more homogeneous in coffee plantations than in forests, and also differed between isolated remnant trees and forest trees. Most species limited to forests probably require high humidity, but other factors (dispersal, pollination) may be of importance in some species. Implications for managing canopies to conserve the diversity of epiphyte and other canopy-dependent biota on a landscape scale are discussed.

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### LONG-TERM COMMUNITY DYNAMICS IN VASCULAR EPIPHYTES - DESCRIBING THE PAST, PREDICTING THE FUTURE

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**G. Zotz, University of Basel, Switzerland**

Tropical epiphytes face large-scale habitat destruction and deterioration, but also global climate change, which may lead to prolonged dry seasons or more frequent El Niño-events in the seasonal tropics. Vascular epiphytes are particularly vulnerable to global change because of their growth at the interface of atmosphere and forest canopy. To predict future changes in epiphyte populations and communities, we need: 1) records of the responses of populations and communities to current annual climate variability, and 2) experiments with selected taxa to reach a mechanistic understanding of underlying mechanisms. In contrast to other tropical life forms such as trees, our knowledge of long-term community processes in epiphytes is largely speculative. I review the few published results, and present data from on-going long-term studies in lowland Panama. Two 6-yr demographic studies indicate no increase in mortality with severity of the dry season (even in small seedlings), but a significant impact of drought on relative growth rates in all size classes. This observation is consistent with the results from a long-term community study with several thousand vascular epiphytes growing in hundreds of *Annona glabra* trees: in spite of a very strong El Niño drought in 1997, we noted a 40 % increase in the number of epiphyte individuals and a 5 % increase in the number of species in the 1995 - 2002 period. I suggest that most epiphyte species in this seasonal tropical lowland forest will be little affected by a moderate decrease in precipitation. Results of accompanying experiments on drought resistance with a number of species agree with this conclusion. However, altered precipitation patterns may have dramatically different consequences on epiphyte communities in less seasonal tropical forests.

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### CATEGORIZING FOREST STRUCTURE: A CONCEPTUAL APPROACH

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**N. Nadkarni, J. Cushing, and A. Fiala. The Evergreen State College, Washington**

Ecological data are inherently spatial at the ecosystem and landscape levels. In particular, the complex structure of for-  
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est ecosystems - the arrangement and amount of their constituent components of leaves, stems, and air - determines many of their critical functions and composition, such as forest-atmosphere interactions and physiology. However, no single system for classifying forest structure has been developed. We present an ecological synthesis of canopy spatial relationships based on a populated set of categories of forest space that will help organize empirical data on forest structure, and may serve as a model for other ecological disciplines. This conceptual model for forest structure includes forests of different composition, age, and location. We draw upon 118 studies of forest structure and forest structure/function relationships that have appeared in the literature since 1964. From these, we abstracted the core structural entities that were measured or estimated, and the overall elements of forest structure that were described, analyzed, or represented. We present an exhaustive multidimensional scheme to categorize forest structure, related to "representations" (components, networks, or media), dimensionality, spatial referencing, and reactivity. We populate these categories by assigning existing forest structure structures to unique "addresses" within the overall conceptual structure. We suggest applications of this to better understand forest ecology, including the generation of "join points", common visualization tools, and shared statistical methods.

Note: If you are interested in organizing a canopy symposium or organized oral session, check the ESA website <<<http://www.esa.org>>> for deadlines and instructions. ICAN can help with identifying potential participants as well as communication among them.

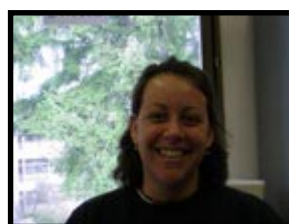
## CONTRIBUTE TO WHAT'S UP?

The International Canopy Network (ICAN) is currently seeking articles and information for the upcoming issue of *What's Up?*, set for publication in December, 2004. ICAN accepts articles, meeting and workshop announcements, related website addresses, and citations. Contributions can be sent via e-mail attachment, fax, or snail mail. Articles up to 1500 words are accepted (WORD format preferred) and graphics are welcomed. The deadline for submissions is November 15, 2004. For further information or to send contributions, please contact the ICAN office:

Hannah Anderson, Outreach Coordinator/Editorial Assistant;  
2103 Harrison Avenue NW, PMB 612, Olympia, WA 98502;  
(360) 866-6788; <[canopy@evergreen.edu](mailto:canopy@evergreen.edu)>.

## Falling leaves, new roots



After four years of managing the ICAN office, we are sorry to announce that David Franklin will be leaving ICAN. In addition to serving as the Assistant Editor for *What's Up?*, he has designed ICAN's many websites, handled all things membership-related, created publications such as our annual reports, brochures, and reports, helped coordinate conferences, events, and projects, and contributed many other skills and talents towards ICAN. He will be leaving to start his own



businesses in teaching personal growth workshops, performing guitar, and writing (you can learn more at <<<http://www.DavidFranklin.org>>> and <<<http://www.EvolvingCulture.com>>>).


Taking over the ropes is Hannah Anderson, a graduate student at The Evergreen State College in Environmental Studies. Her academic and professional focus has been in ecology and animal behavior. She has been working with ICAN throughout this year and is excited to become more involved.

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# GLOBAL CANOPY PROGRAMME UPDATE

## Canopy studies in Brazil

### CANOPY TRAINING GETS OFF THE GROUND IN BRAZIL

In 2002, Dr. Talita Fontoura, ICAN country representative in Brazil and a member of the GCP Steering Committee, voiced her desire to set up a canopy training program in Brazil. In November 2002, with funds from the Rufford Maurice Laing Foundation, the GCP funded a pilot course in collaboration with the Universidade Estadual de Campinas and the Universidade Estadual de Santa Cruz. On the basis of its previous success, we secured three-years' funding from the UK Foreign and Commonwealth Office for a three-week course in collaboration with the Universidade Federal de Ouro Preto in Minas Gerais State, as well as the aforementioned universities.

The first three-week course in November 2003, led by Sérgio Ribiero and Talita Fontoura, trained nine post-graduates and seven undergraduates in canopy access and scientific methods. Professor Roger Kitching, Chair of Ecology at Griffith University, Brisbane, Australia, provided training in arthropod diversity assessment and techniques. Rope-access methods were taught by a team of professional Brazilian climbing experts led by Ivan Soler and Benjamin da Luz of Soluções Verticias. Using their new skills, participants undertook a series of scientific projects in the canopy of Rio Doce Reserve close to the university town of Belo Horizonte.

### WHAT IS THE FUTURE FOR CANOPY SCIENCE AND TRAINING IN BRAZIL?

A midterm workshop addressing this issue was convened in July 2004 at the University of Ouro Preto. 150 students, professors, and government officials from Eastern Brazil attended. Students presented results of research carried out during and since their field course.



Student on the 2003 Brazilian Canopy Field Course, Parque Estadual do Rio Doce, Minas Gerais State, Brazil.

The meeting concluded that greater resources for canopy science are needed in Brazil, as the importance of this habitat in regulating environmental conditions in Brazil and the surrounding region is poorly known. Links were forged with Dr. Antonio Nobre (Large Scale Biosphere-Atmosphere Experiment (LBA) program in the Amazon) and Professor Francisco Barbosa, Chair of the PELD and the Brazilian Long-Term Ecological Research Programme (LTER). Both expressed a desire to include canopy ecology components in their research programs. The meeting concluded with the signing of the "Ouro Preto Declaration on Brazilian Forest Canopies: Climate Change and Biodiversity", which calls on the Brazilian government and other donors to support the expansion of canopy science and training in Brazil. The declaration will soon be forwarded to the Secretariat of the Convention on Biological Diversity in Montreal.

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### A "WHOLE FOREST OBSERVATORY" FOR BRAZIL?

With support from the Brazilian and British Governments, Andrew Mitchell and Nell Baker from the GCP visited a potential site for a new canopy crane near Manaus in the company of Dr Antonio Nobre of INPA, the Institute of Research in the Amazon. The proposed site is in the Cueiras Reserve, at the site of an LBA flux tower project managed by Dr Nobre. This provides the opportunity to integrate studies of climate change with those of biodiversity and ecosystem function in the whole forest – from canopy to soil. This is a key goal of the GCP "Whole Forest Observatory" project. Further progress on support for this project will be made at a workshop to be hosted by the GCP, Smithsonian Tropical Research Institute (STRI) and the United Nations Environment Programme (UNEP) in Panama within the next six months, subject to approval from UNEP/GEF.

Andrew Mitchell, Katherine Secoy

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## ANNOUNCEMENTS

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### Ecological Science for a Crowded Planet

The Ecological Society of America unveils action plan for 21st century

The Ecological Society of America's (ESA) has released the action plan, "Ecological Science and Sustainability for a Crowded Planet." Prepared by a 20-member ESA committee at the request of the Society's Governing Board, the report states that ecologists must take their science in bold new directions if humans and the natural systems on which they depend are to coexist in the future. The report calls for greater use of ecological science in decision-making, research targeted at sustainability of a human-dominated Earth, and cultural changes within ecology. To view the report, visit <<<http://www.esa.org/ecovisions/ppfiles/EcologicalVisionsReport.pdf>>>. For more information about the Society visit <<<http://www.esa.org>>>.

### VI Symposium of Zoology, November 15-20, 2004.

The Institute of Ecology and Systematic jointly with the Cuban Zoological Society and other entities involved in the study and preservation of the biodiversity, are pleased to announce the VI Symposium of Zoology that will take place in

Topes de Collantes, Sancti Spiritus, Cuba, from November 15-20, 2004. Topics for discussion and presentation include: Ecology, Monitoring Biodiversity, Conservation Biology, Protected Areas, Animal Behavior, Evolution, Molecular Biology, Biogeography, Genetics, Invasive Species, Education, Bioinformatics, Paleontology, and many more. Presentation formats include lectures, round table discussions, workshops, posters, and a photo and painting exposition.

More information available at: <<<http://www.geocities.com/zoologiacubana/meeting.htm>>>. Contact: *Daysi Rodríguez Batista, Executive Secretary; <zoologia.ies@ama.cu>*

### National Network of Forest Practitioner's (NNFP) Annual Meeting

Responsibility, Collaboration, and Restoration

October 13-16, 2004

Ouray, Colorado

The mission of the NNFP is to promote the mutual well-being of workers, rural communities, and forests by supporting individuals and groups that build sustainable relationships between forests and people. The goals of the meeting are 1) to strengthen the linkages between the ecological, social, and economic elements of community forestry, 2) connect with and learn about people, organizations, and businesses working in the world of community forestry, and 3) build skills and connections that will help you in your work and in your community.

Scholarships are available. For more details, check out the NNFP website: <<<http://www.nnfp.org>>>, or contact: *Mark Vander Meer, NNFP, Northern Rockies Regional Coordinator, Missoula, Montana; Phone: (406) 541-2565.*

### Ecological Society of American (ESA) awarded new SEEDS grant

The Strategies for Ecology, Education, Development and Sustainability (SEEDS) program began in 1996 as a collaborative effort to work towards increasing the number of minorities in the field of ecology. SEEDS has stimulated interest among minorities in pursuing ecology, provided professional development to aid science faculty in creating new ecology offerings, and taken new steps to increase cultural diversity within the Ecological Society of America.

Thanks to a new two-year grant from the Andrew W. Mellon Foundation, the Ecological Society of America will be able to continue the program and add new components to the program's structure. Specifically, this new phase of SEEDS will expand existing activities designed to reach out to African American, Latino, and Native American students.

The SEEDS undergraduate research fellowship program will be expanded under the new grant to include a series of workshops on the essentials of conducting ecological research.

SEEDS student field trips will also continue into the next phase of the program. New aspects of the program will include post-graduate work opportunities and the addition of a SEEDS Coordinator to the ESA-managed program.

For more information on the SEEDS program visit: <<<http://www.esa.org/seeds/>>>.

### **Canopy Operation Permanent Access System (COPAS) update from Dr. Pierre Charles-Dominique**

Some news from French Guiana, where I have been living since September 2003.

I am currently busy building COPAS, which is more complicated to do in the forest than on paper! After some lost time at the beginning of the last dry season, we started building the fundamentals and assembling steel boxes. We dismantled a small mechanical shovel to transport the pieces of the engine by helicopter, then to later reassemble it in the forest. As we have 70 tons of material to carry by helicopter/pirogue and to transport in the forest, the work and logistics are long and complicated.

During the last two months we had to stop working due to heavy rains completely soaking the soil. During our absence, we were visited by clandestine *garimpeiros* who stole much of our equipment (fortunately not the specific parts of COPAS). Presently, the *Gendarmerie* is chasing these people and "securing" the area, and the work will resume in mid July - August. I expect to finish building the pylons in November-December, and after that we'll assemble the cables and finish up, maybe by early 2005.

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## **WEBSITES**

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### **The Pacific Tree Climbing Institute (PTCI)**

The PTCI, a new tree-climbing organization in Oregon, aims to provide the experience of "snorkeling through the treetops" by taking tourists up into the crowns of immense, old-growth trees. Their main goal is to increase awareness of the old-growth forests while maintaining protection. For more information, visit: <<<http://www.pacifictreeclimbing.com/>>>.

### **Regional Community Forestry Training Center for Asia and the Pacific (RECOFTC)**

RECOFTC's vision, mission and objectives are guided by the potential of community forestry management regimes to contribute both to sustainable forest management and to the needs of more than a billion rural people in Asia who depend on forest resources for their livelihoods. Their website features a web-based Community Forestry database, as well as jobs, glossary, grant and funding opportunities, news, events, and more. Visit <<<http://www.recoftc.org/>>>.

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## **PUBLICATIONS**

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### **Studying Forest Canopies from Above: The International Canopy Crane Network**

The International Canopy Crane Network is an organization designed to promote collaborative research on the forest canopy and to exchange students and scientists among the sites. The end product of the network is envisioned as a standardized, long-term monitoring of forest canopies, which should supply a wealth of data on the structure, biodiversity and function of forest canopies. The United Nations Environment Programme (UNEP) publication, *Studying Forest Canopies from Above: The International Canopy Crane Network*, is now available online in PDF format at: <<[www.stri.org/english/research/facilities/terrestrial/cranes/canopy\\_crane\\_network.php](http://www.stri.org/english/research/facilities/terrestrial/cranes/canopy_crane_network.php)>>.

### **The Fire Chronicle**

The Forest Guild's e-publication, *The Fire Chronicle*, is published roughly every month with one short article about progress to implement the National Fire Plan. The e-publication was started in 2001 to disseminate information about how the National Fire Plan is impacting forests and communities. Many of the issues have focused on private lands and community issues. We have also covered issues about treatments on public forests and the policies that guide the National Fire Plan.

If you are interested in subscribing to *The Fire Chronicle*, please visit <<<http://www.topica.com/lists/firechronicles>>> to subscribe. You may also subscribe by sending an e-mail message directly to <<[laura@theforesttrust.org](mailto:laura@theforesttrust.org)>>.

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## **JOBS**

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The USDA Forest Service is seeking nominations for five positions on the National Urban and Community Forestry Advisory Council (NUCFAC). The terms begin January 1, 2005 and members serve a three-year term. NUCFAC members serve without compensation but are reimbursed for travel expenses to attend the Council's three meetings in February, June, and October, annually. If applicable, potential members must have the support of their employer to attend all the meetings.

The Request for Nomination Letter and all necessary documents to submit a nominee are located at <<<http://www.treelink.org/nucfac>>>.

## RECENT CITATIONS IN CANOPY SCIENCE

[Ed. note: Since there is no central journal on canopy science, it is useful to publish citations on canopy studies in the recent literature. Some of the papers listed below were obtained from ICAN subscribers sending in reprints; most were discovered through weekly literature searches on Current Contents on Diskette (CCOD).

### CANOPY STRUCTURE

- Godfree, R. C., R. O. Tinnin, and R. B. Forbes. 2003. Relationships between dwarf mistletoe and the canopy structure of an old-growth lodgepole pine forest in central Oregon. *Canadian Journal of Forest Research* 33:997-1009.
- Ishii, H., M. Oishi, Y. Maruyama, and T. Koike. 2003. Acclimation of shoot and needle morphology and photosynthesis of two *Picea* species to differences in soil nutrient availability. *Tree Physiology* 23:453-461.
- Kozlov, M. V. 2003. Are fast growing birch leaves more asymmetrical? *Oikos* 101:654-658.
- Yin, X. Y., E. A. Lantinga, A. H. C. M. Schapendonk, and X. H. Zhong. 2003. Some quantitative relationships between leaf area index and canopy nitrogen content and distribution. *Annals of Botany* 91:893-903.

### ECOSYSTEM PROCESSES

- Leclerc, M. Y., A. Karipot, T. Prabha, G. Allwine, B. Lamb, and H. L. Gholz. 2003. Impact of non-local advection on flux footprints over a tall forest canopy: a tracer flux experiment. *Agricultural and Forest Meteorology* 115:19-30.
- Valentini, R., G. Matteucci, A. J. Dolman, and E. D. Schulze. 2003. Fluxes of carbon; water and energy of European forests - Conclusions: The role of canopy flux measurements in global c-cycle research. Pages 255-266 in R. Valentini, editor. *Fluxes of Carbon, Water and Energy of European Forests*. Springer-Verlag Berlin, Heidelberg Platz 3/D-14197 Berlin/Germany.

### FOREST-ATMOSPHERE INTERACTIONS

- Coxson, D. S., and M. Coyle. 2003. Niche partitioning and photosynthetic response of alectorioid lichens from subalpine spruce-fir forest in north-central British Columbia, Canada: the role of canopy microclimate gradients. *Lichenologist* 35:157-175.
- Erismann, J. W., and G. Draaijers. 2003. Deposition to forests in Europe: most important factors influencing dry deposition and models used for generalisation. *Environmental Pollution* 124:379-388.
- Hauck, M. 2003. Epiphytic lichen diversity and forest dieback: The role of chemical site factors. *Bryologist* 106:257-269.
- Teti, P. 2003. Relations between peak snow accumulation and canopy density. *Forestry Chronicle* 79:307-312.
- van der Tol, C., J. H. C. Gash, S. J. Grant, D. D. McNeil, and M. Robinson. 2003. Average wet canopy evaporation for a Sitka spruce forest derived using the eddy correlation-energy balance technique. *Journal of Hydrology* 276:12-19.

### FOREST MANAGEMENT

- Coxson, D., S. Stevenson, and J. Campbell. 2003. Short-term impacts of partial cutting on lichen retention and canopy microclimate in an Engelmann spruce - subalpine fir forest in north-central British Columbia. *Canadian Journal of Forest Research - Revue Canadienne de Recherche Forestiere* 33:830-841.

- Jamir, S. A., and H. N. Pandey. 2003. Vascular plant diversity in the sacred groves of Jaintia Hills in northeast India. *Biodiversity and Conservation* 12:1497-1510.
- Ozanne, C. M. P., D. Anhuf, S. L. Boulter, M. Keller, R. L. Kitching, C. Körner, F. C. Meinzer, A. W. Mitchell, T. Nakashizuka, P. L. Silva Dias, N. E. Stork, S. J. Wright, and M. Yoshimura. 2003. Biodiversity meets the atmosphere: A global view of forest canopies. *Science* 301:183-187.
- Zartman, C. E. 2003. Habitat fragmentation impacts on epiphyllous bryophyte communities in central Amazonia. *Ecology* 84:948-954.

### FOREST STRUCTURE

- Gaydarova, P. N. 2003. Deciduous forest communities in the Black Sea coastal Strandzha region: temporal and spatial characteristics of leaf area index and density. *Trees - Structure and Function* 17:237-243.
- VanGemerden, B. S., G. N. Shu, and H. Olf. 2003. Recovery of conservation values in Central African rain forest after logging and shifting cultivation. *Biodiversity and Conservation* 12:1553-1570.

### HYDROLOGY

- Keim, R. F., and A. E. Skaugset. 2003. Modelling effects of forest canopies on slope stability. *Hydrological Processes* 17:1457-1467.

### INVERTEBRATES

- Dejean, A., S. Durou, I. Olmsted, R. R. Snelling, and M. Orivel. 2003. Nest site selection by ants in a flooded Mexican mangrove, with special reference to the epiphytic orchid *Myrmecophila christinae*. *Journal of Tropical Ecology* 19:325-331.
- Skirvin, D., and J. Fenlon. 2003. Of mites and movement: the effects of plant connectedness and temperature on movement of *Phytosciulus persimilis*. *Biological Control* 27:242-250.

### LIGHT TRANSMISSION

- Falster, D. S., and M. Westoby. 2003. Leaf size and angle vary widely across species: what consequences for light interception? *New Phytologist* 158:509-525.
- Niinimets, U., and A. Lukjanova. 2003. Needle longevity, shoot growth and branching frequency in relation to site fertility and within-canopy light conditions in *Pinus sylvestris*. *Annals of Forest Science* 60:195-208.

### MICROMETEOROLOGY

- Bowling, D. R., D. E. Pataki, and J. R. Ehleringer. 2003. Critical evaluation of micrometeorological methods for measuring ecosystem-atmosphere isotopic exchange of CO<sub>2</sub>. *Agricultural and Forest Meteorology* 116:159-179.

### MODELING

- Mackaya, D. S., S. Samanta, R. R. Nemani, and L. E. Band. 2003. Multi-objective parameter estimation for simulating canopy transpiration in forested watersheds. *Journal of Hydrology* 277:230-247.
- Nordmark, U. 2003. Models of knots and log geometry of young *Pinus sylvestris* sawlogs extracted from computed tomographic images. *Scandinavian Journal of Forest Research* 18:168-175.

## NUTRIENT CYCLING

- Langusch, J. J., W. Borcken, M. Armbruster, N. B. Dise, and E. Matzner. 2003. Canopy leaching of cations in Central European forest ecosystems - a regional assessment. *Journal of Plant Nutrition and Soil Science* 166:168-174.
- Levia, D. F. 2003. Winter stemflow leaching of nutrient ions from deciduous canopy trees in relation to meteorological conditions. *Agricultural and Forest Meteorology* 117:39-51.
- Schmull, M., and M. Hauck. 2003. Extraction methods for assessing the availability of cations for epiphytic lichens from bark. *Environmental and Experimental Botany* 49:273-283.

## PLANTS

- Acebey, A., S. R. Gradstein, and T. Kromer. 2003. Species richness and habitat diversification of bryophytes in submontane rain forest and fallows of Bolivia. *Journal of Tropical Ecology* 19:9-18.
- Aptroot, A., and H. J. M. Sipman. 2003. Diagnostic chemistry of foliicolous *Enterographa*. *Bryologist* 106:278-279.
- Dzerefos, C. M., E. T. F. Witkowski, and C. M. Shackleton. 2003. Host-preference and density of woodrose-forming mistletoes (Loranthaceae) on savanna vegetation, South Africa. *Plant Ecology* 167:163-177.
- Li, C. R., X. B. Zhang, and C. S. Hew. 2003. Cloning, characterization and expression analysis of a sucrose synthase gene from tropical epiphytic orchid *Oncidium goldiana*. *Physiologia Plantarum* 118:352-360.
- Muhanguzi, H. D. R., J. Obua, H. OryemOriga, and O. R. Vetaas. 2003. Tree fruiting phenology in Kalinzu Forest, Uganda. *African Journal of Ecology* 41:171-178.
- Xiao, Y. 2003. Variation in needle longevity of *Pinus tabulaeformis* forests at different geographic scales. *Tree Physiology* 23:463-471.
- Wood, B. W., P. J. Conner, and R. E. Worley. 2003. Relationship of alternate bearing intensity in pecan to fruit and canopy characteristics. *HortScience* 38:361-366.
- Zotz, G., and B. Vollrath. 2003. The epiphyte vegetation of the palm *Socratea exorrhiza* - correlations with tree size, tree age and bryophyte cover. *Journal of Tropical Ecology* 19:81-90.

## PLANT PHYSIOLOGY

- Barbour, M. M., and D. Whitehead. 2003. A demonstration of the theoretical prediction that sap velocity is related to wood density in the conifer *Dacrydium cupressinum*. *New Phytologist* 158:477-488.
- Dungan, R. J., D. Whitehead, M. McGlone, R. P. Duncan, and R. B. Allen. 2003. Cold-induced photoinhibition and winter leaf-loss in the broad-leaved tree *Aristotelia serrata* (Elaeocarpaceae). *Functional Plant Biology* 30:543-550.
- Giambelluca, T. W., A. D. Ziegler, M. A. Nullet, D. M. Truong, and L. T. Tran. 2003. Transpiration in a small tropical forest patch. *Agricultural and Forest Meteorology* 117:1-22.
- Hietz, P., and W. Wanek. 2003. Size-dependent variation of carbon and nitrogen isotope abundances in epiphytic bromeliads. *Plant Biology* 5:137-142.
- Ishizaki, S., K. Hikosaka, and T. Hirose. 2003. Increase in leaf mass per area benefits plant growth at elevated CO<sub>2</sub> concentration. *Annals of Botany* 91:905-914.
- Jansen, S., T. Watanabe, S. Desein, E. Smets, and E. Robbrecht. 2003. A comparative study of metal levels in leaves of some Al-accumulating *Rubiaceae*. *Annals of Botany* 91:657-663.

- Kitajima, K., S. S. Mulkey, M. Samaniego, and S. J. Wright. 2002. Decline of photosynthetic capacity with leaf age and position in two tropical pioneer tree species. *American Journal of Botany* 89:1925-1932.

## REMOTE SENSING

- Czaplewski, R. L., and P. L. Patterson. 2003. Classification accuracy for stratification with remotely sensed data. *Forest Science* 49:402-408.
- Foody, G. M., R. G. Jackson, and C. P. Quine. 2003. Potential improvements in the characterization of forest canopy gaps caused by windthrow using fine spatial resolution multispectral data: Comparing hard and soft classification techniques. *Forest Science* 49:444-454.
- McDougall, K. L. 2003. Aerial photographic interpretation of vegetation changes on the Bogong High Plains, Victoria, between 1936 and 1980. *Australian Journal of Botany* 51:251-256.
- Sader, S. A., M. Bertrand, and E. H. Wilson. 2003. Satellite change detection of forest harvest patterns on an industrial forest landscape. *Forest Science* 49:341-353.
- Zhu, Z. L., and E. Waller. 2003. Global forest cover mapping for the United Nations Food and Agriculture Organization Forest Resources Assessment 2000 program. *Forest Science* 49:369-380.

## RESEARCH EQUIPMENT AND METHODOLOGY

- Sandmann, H., and K. P. Lertzman. 2003. Combining high-resolution aerial photography with gradient-directed transects to guide field sampling and forest mapping in mountainous terrain. *Forest Science* 49:429-443.
- Takafumi, T., P. Hotaek, and H. Shigeaki. 2003. Distinguishing foliage from branches in the non-destructive measurement of the three-dimensional structure of mountain forest canopies. *Forestry Chronicle* 79:313-317.

## TREE ARCHITECTURE

- Archibald, S., and W. J. Bond. 2003. Growing tall vs growing wide: tree architecture and allometry of *Acacia karroo* in forest, savanna, and arid environments. *Oikos* 102:3-14.
- Remphrey, W. R., and L. P. Pearn. 2003. Crown development of a clone of *Populus tremuloides* exhibiting "crooked" architecture and a comparison with wild-type trees. *Canadian Journal of Botany - Revue Canadienne de Botanique* 81:345-359.

## VERTEBRATES

- Cochrane, C. H., D. A. Norton, C. J. Miller, and R. B. Allen. 2003. Brushtail possum (*Trichosurus vulpecula*) diet in a north Westland mixed-beech (*Nothofagus*) forest. *New Zealand Journal of Ecology* 27:61-65.
- Muller, R., C. Nowicki, W. Barthlott, and P. L. Ibsch. 2003. Biodiversity and endemism mapping as a tool for regional conservation planning - case study of the Pleurothallidinae (Orchidaceae) of the Andean rain forests in Bolivia. *Biodiversity and Conservation* 12:2005-2024.
- Mauffrey, J. F., and F. Catzefflis. 2003. Ecological and isotopic discrimination of syntopic rodents in a neotropical rain forest of French Guiana. *Journal of Tropical Ecology* 19:209-214.
- Murphy, D. J., and D. Kelly. 2003. Seasonal variation in the honeydew, invertebrate, fruit and nectar resource for bellbirds in a New Zealand mountain beech forest. *New Zealand Journal of Ecology* 27:11-23.
- Petit, L. J., and D. R. Petit. 2003. Evaluating the importance of human-modified lands for neotropical bird conservation. *Conservation Biology* 17:687-694.

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