**The assessment of forest disturbance and vulnerability from 2000-2015 year in Kao Ping River Basin of Taiwan**

*Ya-Li Huang[1], Chaur-Tzuhn Chen[1], Jan-Chang Chen[1]*
*[1]Forestry department, National Pingtung University of Science and Technology, Pingtung, Taiwan (goodrinoa93@gmail.com; goodrinoa93@gmail.com; goodrinoa93@gmail.com)*

Taiwan is located on the Pacific seismic belt where the geological structure is more complex, and cause frequent landslides, debris flows and other sediment disasters. Chishan and Lennon river working circle lays in the national forest land of Kaoping river basin, and was greatly damaged by 2009 Morakot typhoon, thus, the understanding of land cover change before and after typhoon were important tasks in watershed management. In this study, the variation of forest disturbance index (DI) from 2000-2015 was obtained through Tasseled Cap Transformation. Moreover, estimating the distribution of environmental vulnerability through Principal Components Analysis, reduces the number of environmental variables and determines the weight of principal components. The results shows that Landslides has indeed disturbed Chishan and Lennon river working circle. The Integrated of Disturbance Index (IDI) of Chishan were 2.128, 2.751 and 2.670, respectively, which represents that some areas were damaged by Morakot typhoon were partially recovered after 2015. There were no significant change in the annual IDI of Lennon river working circle; however, differences between each DI level of sample plot was found. The environment vulnerability in Chishan and Lennon River were classified as heavy and extreme level of environmental vulnerability accounts for 38% and 31% of the area, mostly are located in relatively high altitude and steep terrain, where vegetation renewal and restoration is unlikely to happen. Facing extreme climate challenges, the forest watershed management must be based on the principle of ecological management and forest structure, in order to maintain the balance of the ecosystem.

**The Weakest Link: assessing vulnerabilities, risks, and tree adaptive capacity of temperate forests to global changes**

*Rita Sousa-Silva[1], Frédérik Doyon[2], Philippe Nolet[2]*
*[1]UQAM, Montreal, Canada; [2]ISFORT, Ripon, Canada (anarita.silva@kuleuven.be; frederik.doyon@uqo.ca; philippe.nolet@uqo.ca)*

Forests are shaped by disturbances – for better or worse. Disturbances can be analysed individually, but it is their interactions that are likely to lead to megadisturbances regimes – such as hotter droughts and more extensive and severe wildfires – challenging the main objectives of forest management, which are to provide ecosystem services sustainably to society and to restore or maintain its resilience. Applying resilience concepts in forest management is especially relevant in a context of climate variability because the stochastic nature of disturbances often makes them difficult to predict. The resistance of a forest to disturbance depends largely on the species composition of the canopy trees that currently dominate the forest; yet its adaptive capacity may reside primarily in future canopy replacement by trees of the same or other species. Therefore, we focused on (i) the effect of disturbances on a subset of biological characteristics (e.g., dispersal, shade tolerance) of 30 tree species of temperate forests; and (ii) their tolerance to a wide range of disturbances (e.g., drought, insects) for both the overstory and regeneration strata. While recognizing that ecosystem collapse will likely manifest itself differently depending on landscape context, we provide a systematic approach that can be applied to any forest to evaluate the risk of collapsing, as a result of loss of ecosystem resistance and resilience. We argue that, given the complexities and uncertainties related to increasingly frequent and severe disturbances, management should aim at increasing diversity thus keeping more options open for the future if conditions or responses change.

**Changes in land use and ground coverage from 1985 to 2017 in the production of sediments in the Taquari River Basin /** *Variação das mudanças no uso e cobertura da terra entre 1985 e 2017 na produção de sedimentos da Bacia do Rio Taquari*

*Rafael Mingoti[1], Isabelle Caroline Ribeiro Sais[2], Carlos Roberto Padovani[3], Marcia Divina Oliveira[3], Debora Fernandes Calheiros[3]*
*[1]Embrapa Territorial, Campinas, Brasil; [2]Universidade Estadual de Campinas, Campinas, SP, Brasil; [3]Embrapa Pantanal, Corumbá, Brasil (rafael.mingoti@embrapa.br; isabellersais@gmail.com; carlos.padovani@embrapa.br; marcia.divina@embrapa.br; debora.calheiros@embrapa.br)*

O objetivo desse trabalho é comparar o efeito da alteração do uso e cobertura da terra, entre os anos de 1985 e 2017, na produção de sedimentos da sub-bacia do Rio Taquari. Essa bacia possui área de drenagem de 26.924 km² e está localizada na Bacia do Alto Paraguai, na região do Planalto do Pantanal brasileiro. Foram utilizados mapeamentos de uso e cobertura da terra, elaborados com imagens do satélite Landsat, por meio dos quais verificou-se a supressão de 48,4% na vegetação nativa no período analisado, sendo substituída predominantemente por pastagem. Em 1985 a cobertura vegetal nativa ocupava 18.000 km² da área da sub-bacia e em 2017 passou a ocupar 9.280 km². A estimativa da produção de sedimentos foi realizada por meio do modelo hidrológico SWAT, aplicativo ArcGIS, mapa pedológico, dados de atributos de solos e de uso da terra e dados meteorológicos diários. Verificou-se que as alterações de uso e cobertura da terra promoveram aumento médio de 30,5% na produção de sedimentos, sendo que em algumas microbacias o aumento na produção de sedimentos foi de 157%. As regiões em que a mudança no uso e ocupação acarretou maior aumento na produção de sedimentos estão localizadas nos municípios de Alcinópolis/MS, Camapuã/MS, São Gabriel do Oeste/MS, Figueirão/MS, Coxim/MS e Alto Araguaia/MS. Os resultados gerados poderão subsidiar os diferentes órgãos públicos na tomada de decisão para o planejamento de ações prioritárias de conservação do solo.

**Economic value of ecosystem service losses due to disturbances in Western United States forests**

*Jose J. Sanchez[1], Lorie Srivastava[2], Raymundo Marcos-Martinez[3]*
*[1]USDA Forest Service, Pacific Southwest Research Station, Riverside, USA; [2]University of California, Davis, Davis, USA; [3]National Research Collections Australia Canberra, Australia (jsanchez@fs.fed.us; lsrivastava@ucdavis.edu; raymundo.marcosmartinez@csiro.au)*

The increasing severity and frequency of environmental climate-driven forest disturbances challenge the sustainable management and protection of forests in the United States (U.S.), and the benefits they provide to individuals and communities. Between 1985 and 2015, about 9 million acres of U*.S. forest* land was disturbed annually across the country. In the western U.S., wildfires, droughts, timber harvesting, and bark beetle outbreaks are the main drivers of tree mortality, loss of recreation opportunities, and water quantity. An understanding of the environmental and socioeconomic consequences of forest disturbances could improve the management and protection of public lands. This study provides monetised estimates of forest disturbances for two key areas of value: recreation and carbon storage. We estimate the monetary value of these ecosystem services and how they are affected by fire, drought or disease due to climate change. We employ benefit function transfer to estimate the economic value of forest ecosystem services – both market and non-market values. This information may improve stakeholders' understanding of how heterogeneous forests disturbances affect economic and environmental processes at different temporal and spatial scales. The results could also inform the design of spatially targeted forest conservation, pest control, or fire suppression strategies to generate greater benefits to society.