Abstracts
(Abstract # and Session)

#1003   **IV**   Ranwala, Sudheera M. W.
A risk assessment methodology for prioritizing forest biosphere reserves for control of forest plant invaders in Sri Lanka

In Sri Lanka, selection of sites for control of forest invasive plant species (FIPS) often has been a species target approach, thus, at most times the population of a single species was controlled. As many plant invaders do not exhibit mono-specific stands within forests, an alternative methodology for prioritizing sites for FIPS control is proposed. The study combines risk of FIPS with invasibility of 18 forest biosphere reserves in Sri Lanka. In order to assess the risk posed by FIPS, a protocol was developed with 24 questions based on invasiveness of the species and ecological and socio-economical consequences of their invasions. Answers for each question were quantified by 0-4 scores assigned according to severity. Risk Scores (RS) were determined for each species. The threat from FIPS per unit area (TT) was determined for each site by [TT= ($\sum$RS of FIPS recorded in site)/extent]. Udawattakele and Badagamuwa reserves exhibited significant higher values for TT. Determination of invasibility of forests was based on the Viability Index (VI), a multi-criteria evaluation (habitat health, edge effects, degree of isolation and outside disturbances) developed by the Protected Area Gap Analysis Programme in Sri Lanka. The present study assigned twofold Status Scores (SS) ranging 0.5-8 to the five different degrees of VI and an overall Viability Value (VV) was determined for each forest biosphere reserve, i.e VV= [$\sum$(SS x respective percentage of habitat patches)/8] and expressed on a scale 0-1. Invisibility of the reserves was considered as 1-VV. Higher values for invisibility (>0.5) were reported by Udawattakele, Badagamuwa, Kikilimana, Hurulu and Anaolundewa reserves in which higher proportion of degraded habitat patches had been identified. Selection of priority sites for control of plant invaders was calculated by TT x (1-VV) and Udawattakele and Badagamuwa reserves ranked high among the others. As these reserves are located in a highly urbanized environment, controlling FIPS in these sites would help to minimize further degradation of habitat quality and strengthen stainability of the reserve.

#1005   **VI**   **Kohli, Ravinder K.**; Batish, Daizy; Singh, Haminder
Biodiversity Risks from some major Invasive Alien Plants in India with special reference to Western Lower Indian Himalayas

India, one of the mega centers of origin of plants housing 4 biodiversity hot-spots has experienced enormous introductions and natural invasion of many exotic plants. However, for the last three decades, such invasions have adversely affected her native vegetation and threatened the rich biodiversity. Multiple factors such as increasing inter/intra continental links, import/export activities and climatic changes are responsible for their fast spread. Perhaps because of climatic similarities and commercial activities, many of the tropical American plants like *Parthenium hysterophorus, Ageratum conyzoides* and *Lantana camara* have not only dominated their area of occurrence in India but also in replacing the native species, thereby disrupting the ecological operations. The Shiwalik range Indian Himalayas is losing native vegetation due to the impact of these weeds. Their effective biochemical machinery giving them a competitive edge over the natives makes them better colonizers. Use of this property assumes a better strategy and potential in weed management. The dimensions of loss are so serious that it has invited urgent national attention. Evaluation of the impact of Invasive Alien Plants on alpha diversity of terrestrial plants in the state was undertaken on direction by the Ministry of Environment and Forests, New Delhi.

RISKANALYSIS

IUFRO

Abstracts
(Abstract # and Session)

#1001 **V** Gray, David R.
Hitchhikers on international trade routes: a phenology model estimates the effects of shipping schedules and routes on the probabilities of invasive introduction and establishment

As global trade rises so too does the probability of introduction of alien species to new locations. Estimating the probability of an alien species introduction, and establishment following introduction, is a necessary step in risk estimation (probability of an event times the consequences, in the currency of choice, of the event should it occur); and risk estimation is a valuable tool for reducing the risk of biological invasion with limited resources. The Asian gypsy moth (*Lymantria dispar* (L.)) is a pest species whose consequence of introduction and establishment in North America and New Zealand warrants over $US 2 mil yr^{-1} in surveillance expenditure. This work describes the development of a two dimensional phenology model (*GLS-2d*) that simulates insect development from source to destination, and estimates: (1) the probability of introduction from the proportion of the source population that would achieve the next developmental stage at the destination, and (2) the probability of establishment from the proportion of the introduced population that survives until a stable life cycle is reached at the destination. The effect of shipping schedule on the probabilities of introduction and establishment was examined by varying the departure date from 1 January to 25 December by weekly increments. The effect of port efficiency was examined by varying the length of time that invasion vectors (shipping containers and ship) were available for infection. The application of *GLS-2d* is demonstrated using three common marine trade routes (to Auckland, New Zealand from Kobe, Japan and to Vancouver, Canada from Kobe and from Vladivostok, Russia).

#1002 **IV** Fleming, Richard A.
An analysis of risk analysis: black swans, pink elephants, invaders of the green, and Donald Rumsfeld

This talk is an exploration of the concept of risk analysis in the context of forest disturbances, including invasive insects. Risk is commonly considered to be the probability of the occurrence of a particular type of event times the impact of that event if it does occur. This framework tends to work well for common events. We can use empirical observation to estimate both the probability of occurrence and the likely immediate impact. But often the immediate impact has unaccounted for repercussions.

Rare events can pose problems. There are not enough empirical observations to estimate either the probability of occurrence, nor the likely impact of the event. In a few, select cases (e.g., gambling in cards or dice) there is a solid theoretical understanding of the situation which can be used to estimate the probability of occurrence (odds) of that event (winning or losing the bet), its impact (the monetary gain or loss), and hence the risk.

Then there the `unknown unknowns', events which happen so rarely that we don't even consider them in our analyses. This includes events which have never occurred before - the pink elephants - and the extremely rare events which can have enormous impacts - the black swans. Using examples from work on forest disturbances, I argue that globalization and climate change are making risk analysis in the context of forest health an increasingly difficult task.