

even where soil fertility was very low. And then abandoned many plantation stands lacking of man power and management budget. Therefore, concerning the restoration policy of the affected forests by forest fire either for timber production or for specific landscape creation, afforestation areas should be limited on productive areas within management limitation so that the planted areas should be managed intensively. Also, planting trees at erosive and/or unfertile soil areas should be reconsidered, considering that clear-cutting progress on improper areas sometimes makes sites worse. In a long term basis, a plan for effective land use should be discussed.

**SL503**

**Forest Fire Impacts in Thailand**

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In Thailand, 25.28% of total land area which are equivalent to 12.97 million hectares are covered by forests. The Deciduous forests share 53.46% of total forested areas, while the rest are 46.54% of evergreen forests. Fires have long been a man-caused component in various forest ecosystems. They occur annually during the dry season from December to May with the peak period in February and March. In normal year, the most common surface fires mainly take place in Dry Dipterocarp forest, and Mixed Deciduous forest. While in the El nino year, fires spread, to a certain extent, in to Dry Evergreen, Hill evergreen or event

in some parts of the Tropical Rain forest. Although other types of fire are not typical to the forest of Thailand, in the recent El nino year of 1997-1998, a notable numbers of crown fire took place in Pine plantation. While ground fires occurred in Peat Swamp forest.

Fire impacts are tremendous. However the degree of damage caused by fire depends on the type of fire as well as the type of forest burnt. The Deciduous forests are prone to fire and have long been subjected to annual burn by surface fire. Therefore these forests are well-adapted to fire and are fire-resistant. Surface fire is usually not lethal to mature tree. However, too frequent burn impedes and retards natural regeneration, and alters forest structure. The repeated-burnt forests will gradually deteriorated, change into more arid community and eventually into grassland dominated by *Imperata cylindrica*. In contrary, fires cause abruptly severe damages in evergreen forests. Fires kill more than 50% of mature trees, and completely destroy all sapling and undergrowth. In addition, fires drastically increase soil erosion as well as surface runoff, destroy food and habitat of wildlife, hence jeopardize the whole forest ecosystem.

**SL504**

**The Influence of Fire in Japanese Landscapes**

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The forest fire as well as typhoon in

Japan is one of the representative forest disturbances. Fires cause not only the fatal destruction of the vegetation and bio-community, but also they deteriorate the function of environmental conservation of forests, and eventually bring about the secondary disaster in which the environment of lower reaches be changed for the worse. Most of the forest fires caused in Japan are man-made, and the incidents tend to appear concentrating in the early spring when frequencies of artificial fire control and access to the forest areas are higher. Early spring is also the time when the air is rather dry and the litter for fuel accumulates. Forest fires occur approximately 5000 times annually and destroy 2000-5000 ha of the forest areas in Japan. In the Seto Inland Sea region of the southwestern Japan, the Japanese red pine forest is widely distributed and dominated as the regenerated forest by human activities in which include fires. Plants are at the initial growing stage and aboveground parts are yet to grow, thus the affect of fires to the undergrowth vegetation is little in comparison with the case of *Pinus densiflora*. Therefore, revegetation process after the fires is facilitated promptly. It shows a cyclic regeneration of the pine forest by fire.

Under this regime, three important questions concerning forest disturbances are, 1) Which component of the forest ecosystem is directly affected? 2) How does it affect the subsequent succession? and 3) How long does a disturbance have effect; would it be acute or chronic? Fire disturbances were classified into two processes: primary and secondary.

According to the changes of micro-climate, erosion processes and community dynamics, the process of secondary succession was divided into four stages: primary disturbance, degrading, recovering, and regenerated pine stages.

Reforestation works, especially terrace planting works, affected this successional pattern and species composition of post-fire vegetation. Twelve years after reforestation, the woody biomass in natural-slope-planted sites was larger than that of the terrace-planted sites. Though the vegetation recovery at the natural-slope-planted sites was progressed by both planted species and naturally recovered species, the recovery at the terrace-planted sites was mainly progressed by the planted species. The amount of eroded soil at the natural-slope-planted sites was less than that of the terrace-planted sites and the abandoned sites. There was no significant difference of the eroded soil amount between the terrace-planted sites and abandoned sites.

This paper discusses the post-fire recovery process, reforestation works and forest management at the post-fire stand.

#### **SL505**

### **Forest Fires in Indonesia: Their Causes, Impacts and Management**

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Fire is an important environmental factor in many terrestrial ecosystems. Fire can act as a destructive agent and