



Abstract

# Natural and Anthropogenic Risks Hindering Successful Natural Reforestation in Former *Polygraphus proximus* Blandford Outbreak Areas <sup>†</sup>

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**Abstract:** *Polygraphus proximus* Blandford is a bark beetle that has recently invaded the dark coniferous forests of Southern Siberia. Over the last decade, this four-eyed fir bark beetle has destroyed *Abies sibirica* Ledeb stands on more than 500 thousand hectares. This study considers the initial stages of natural reforestation, which can define the restorative succession scenario for completely dead forest stands after the outbreak fades. Areas disturbed by outbreaks have a strong potential for natural coniferous regeneration when the young generation of *Abies sibirica* dominates in species composition. As early as 5 years after the outbreak, a successful, sufficient for the future forest formation, young generation density (13,000 trees/ha) is observed. Intensive undergrowth development is noted. The high density of young stands in some areas ensures the canopy closure and forms a shady ground cover vegetation type. At the same time, in some disturbed areas there are threats to undergrowth. In open places with thin undergrowth, a considerable amount of forest fuels represented by large wood residues and dead grass accumulates and can cause high-intensity fire emergence and development. Another risk is human activity. In former outbreak foci, where clear-cutting was implemented, healthy trees were cut down and the existing young coniferous generation was destroyed. To date, clearings have been overgrown with secondary species (*Betula pendula* Roth., *Populus tremula* L.). Ground cover communities have transformed into open-type phytocenosis where cereal grasses prevail. This has led to turfing and significant litter and dry grass accumulation. To sum up, in faded *Polygraphus proximus* outbreak areas, strong young forest generation ensures reforestation without dominant species change. To reduce risks of species change and conserve valuable *Abies sibirica* species, it is necessary to strengthen wildfire protection.

**Keywords:** Siberia; dark coniferous forests; natural reforestation; secondary succession; insect outbreak; *Polygraphus proximus*; *Abies sibirica*



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