TOWARDS MEASURES AIMED AT MITIGATING THE CONSEQUENCES OF CLIMATE CHANGE IN SPRUCE FOREST STANDS OF MOUNTAIN FORESTS IN THE CZECH REPUBLIC

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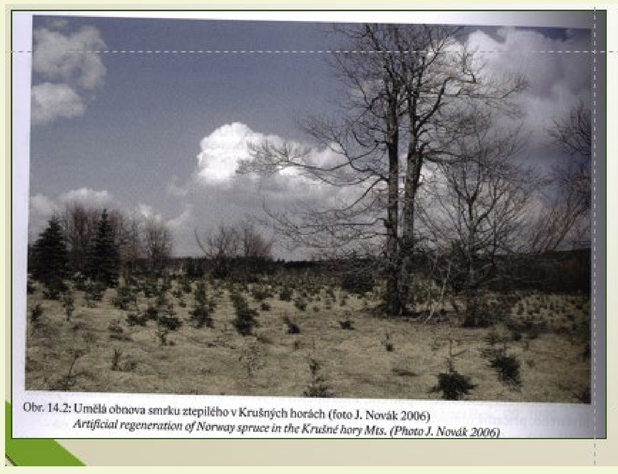
Abstract

In the Czech Republic, in conditions of Norway spruce mountain forests, there were breeding programs focused on current partial population recovery of Norway spruce, Ore Mountains ecotype; the source material was obtained from rare individuals which – thanks to their relative resistance – survived several periods of heavy immission (Sulphur oxides) load in the recent past. The implementation of such rescue programs requires, among others, the application of proven vegetative propagation technology of Norway spruce, i.e. the maintenance of their ex situ conserved clonal variants. In this information, we present a brief report about some of the current research activities of the Ore Mountains Norway spruce ecotype preservation and reproduction. These efforts are aimed at Ore Mountains´ forest restoration with this native spruce ecotype after the above mentioned periods of serious immission damage of this Czech mountain area. Nowadays, the increased efficiency of donor tree vegetative propagation is highly required, so that the material derived from older individuals, growing within spruce subpopulations, could be used successfully. These measures also represent a significant contribution to solving consequences connected with running climate change.

Key words: *Czech Republic; Norway spruce; relative resistance against immission load; ex-situ conservation; vegetative propagation measures and utilization; climate change.*

Introduction

In the mountain forests of the Ore Mountains, with a formerly predominant proportion of spruce, great attention is currently being paid to the large-scale restoration of forest stands that have been greatly devastated in recent decades as a result of pollution, insect pests, climatic conditions, etc.



Obr. 14.2: Umělá obnova smrku ztepilého v Krušných horách (foto J. Novák 2006)
Artificial regeneration of Norway spruce in the Krušné hory Mts. (Photo J. Novák 2006)

Ore Mts., illustrative photo, source: www.turistika.cz

The most significant damages caused by air pollution due to immission loads occurred in the period 1978 to 1985. After the desulfurization of most coal-fired power plants in the first half of the 1990s, there was a significant decrease in air pollution and a subsequent significant improvement in the health of forest stands. However, this positive trend was disrupted by the consequences of the inverse situation in the winter of 1995/1996 (a high increase in immission concentrations and dramatic damage to young stands).

Mechanical damage of young stands in the Ore Mountains in winter 1995/1996
(Illustration photo by P. Fabiánek, in Slodičák et al. 2008)

History and current state

Brief history of preservation and reproduction of Norway spruce genetic resources in the Ore Mountains

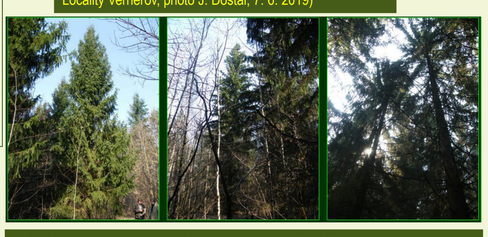
The issue of conservation of the Krušné Hory Norway spruce gene pool has been addressed since the 1960s.

In cooperation of FGMRI with the former Forest Administrations plants in the Ore Mts., as well as within the international cooperation with forest subjects on the German side (Graupa Research Station), collection of grafts from resistant Norway spruce individuals has been realized, followed by planting of verification plantings, including planting of clone archives and clonal parent tree gardens both *in situ* and *ex situ*.

Approximately since 1986, in accordance with a later published breeding program for the preservation of the Ore Mts. Norway spruce gene pool another search for resistant spruces (left) was started in 1996.

Clonal archives in situ (right up) and ex situ (right down) has been established in the following time periods (from cca 1990 years)

Forest Administration Klášterec, clonal archive *in situ* of resistant variants of Ore Mts. Norway spruce. Locality Verněřov, photo J. Dostál, 7. 6. 2019)



Clonal archive *ex situ* of resistant variants of Ore Mts. Norway spruce. Locality Jílovitě – Cukrák, photo J. Frýdl, 2015)

Municipal Forests Jirkov, research trial with cuttings *in situ*, preparation 2016 - realization 2018

Municipal Forests Klášterec, clonal parent tree gardens *in situ*, preparation (in place of damaged forest stand) 2016 - realization 2018

Current time:

In the project TA ČR č. SS01020076, there are evaluated vegetative plantings of resistant variants of Norway spruce *in situ* in selected localities of the Ore Mountains established within the project NAZV QJ1520300 (2015–2018) in the area managed by Municipal Forests (ML) Chomutov, Lesy města Jirkova, Lesy Jáchymov, ML Klášterec and *ex situ* in localities of another project participant (PEXÍDR, s. r. o), together with the rejuvenilization and reconstruction of the clone archive of Krušné hory spruce at LS LČR Klášterec.

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