Forest Condition in Latvia[1]

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Abstract

*Systematic assessment and observation (survey, inventory) of forests in Latvia has been underway since the 1700's. Latvia's forests are in the boreal/temperate forest zone and cover 44 percent of the country. Forest growing conditions are subdivided into five site class types: forests on dry mineral, wet mineral, wet peat, drained mineral, drained peat soils. The dominant tree species in Latvia are Scots pine (*Pinus sylvestris *L.), 39.7 percent; Norway spruce (*Picea abies *Karst.), 20.6 percent; and common birch (*Betula pendula *Roth.), 28.4 percent. Systematic assessment of air pollution impacts on forest health in Latvia was started in 1990 by the International Cooperative Program on Assessment and Monitoring of Air Pollution Effects on Forests - ICP Forests. Assessment methods were changed to the USDA Forest Service's Forest Health Monitoring Program in 1994. Assessments of forest ecosystems in Latvia show the alteration and disappearance of stand structure of typical, common forest ecosystems (especially Scots pine stands) , and the invasion of plant species non-typical to these forests, which has been caused by human activities and air pollution (sinantropization). It has also been found that Norway spruce stands will be endangered in the near future because of their sensitivity to environmental factors, and that currently forest stand health is mainly affected by localized entomological damage (insect and fungal diseases). In addition, environmental pollution has caused biological destabilization in forest ecosystems.*

Introduction

Latvia is one of three small Baltic countries transitioning to a free market economy. Latvia occupies 64,000 km^2, and 44 percent is covered by forests, which are of great importance for the stability of the economy, landscape, environment, and flora and fauna of Latvia. The first forest inventory in Latvia was carried out in 1788 for the Lencu estate. Inventories of all the biggest estate forests were done until the beginning of the 1900's. Then the process was periodically repeated after intervals of 10 to 15 years, including measurement and assessment of a forest stand and its health condition. On this basis long-term forest changes, even for 100 years, were assessed.

During the late 1900's, when environmental pollution significantly increased, there was a necessity for more comprehensive forest assessment methods. In 1990 the European program, "International Cooperative Program on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)," was implemented all over the territory of Latvia. In 1994 establishment of sample plots for the Forest Health Monitoring (FHM) program was started. This program is a component of the United States' Environmental Monitoring and Assessment Program (EMAP).

This paper discusses the current status of forests in Latvia as determined by the newly implemented Forest Health Monitoring Program.

Forest Composition

The forests in Latvia are in the boreal / temperate forest zone. The total area covered by forests has changed substantially over time. Agriculture lands freed from forests have been reforested as a result of various events such as wars or plague. The productive forest area has changed from 25 percent in 1923 to 27 percent in 1949, 38 percent in 1973, and 44 percent 1995 *(fig. 1)*.

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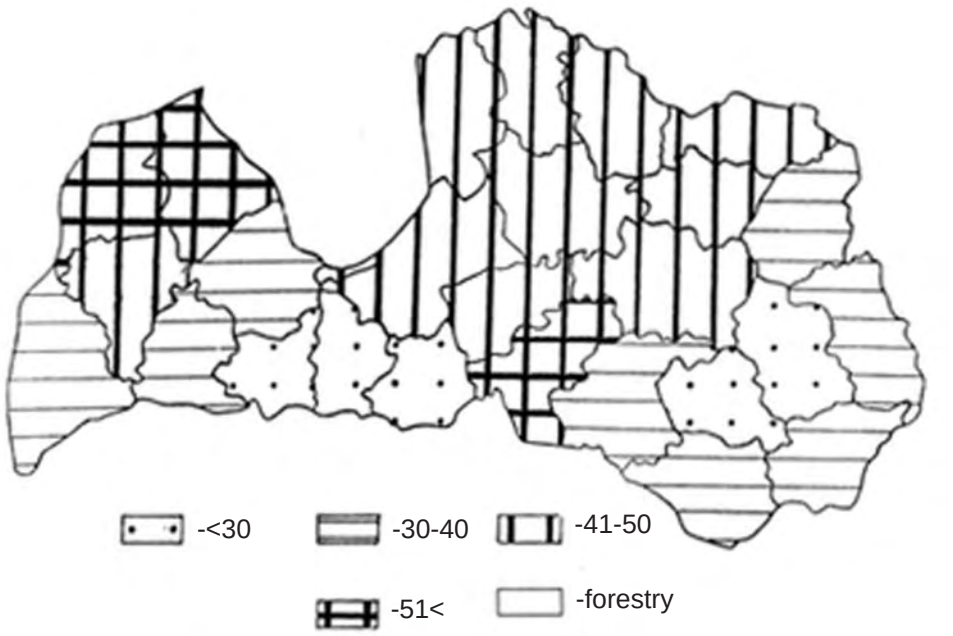

Figure 1 — Forest cover in Latvia by percent.

Forest growing conditions in Latvia are varied and include dry mineral soils (58 percent), wet mineral (10.4 percent), wet peat (12.0 percent), drained mineral (9.6 percent), and drained peat (10 percent). The main tree species in Latvia are Scots pine (*Pinus sylvestris*) (39.7 percent), Norway spruce (*Picea abies*) (20.6 percent), common birch (28.4 percent), common alder (2.4 percent), aspen (2.5 percent), and grey alder (5.5 percent) (*fig. 2*). All forests are divided into three categories according to their functions and importance (ecological, economical, etc.):

- **Protected forests — (9.6 percent)**
  - Nature reserves — 38,700 ha
  - National park forests — 51,600 ha
  - Nature park forests — 15,000 ha
  - Nature protected forests — 87,600 ha
  - Soil protected forests — 72,200 ha
- **Restricted management forests — (16.3 percent)**
  - Landscape forests — 55,100 ha
  - Green zone forests — 244,000 ha
  - Environment protection forests — 225,700 ha
- **Commercial forests — (74.1 percent).**

Scots pine occupies the greatest part of the forests in all three categories. Scots pine is also widely represented through all soil types — from sandy to fertile soils, as well as in peat soils. Scots pine is a biologically stable tree species, stable in windstorms, and relatively less damaged by insects and fungi diseases. Compared with Norway spruce, Scots pine is more resistant against various stresses and often reaches 150 to 300 years. However, for the last 20 years the condition of pine stands have been deteriorating. When the European system of forest monitoring was carried out from 1990 to 1995, Scots pine had a high level of defoliation for all age classes — 30.0 percent in 1990, 33.2 percent in 1992, and 24.1 percent in 1995 (*table 1*).

Forest Damage

The methodology of the FHM system is different from the previous systems and uses more detailed condition indicators. About 40 percent of the planned sample plots are established. The first results of this research show that the crown density

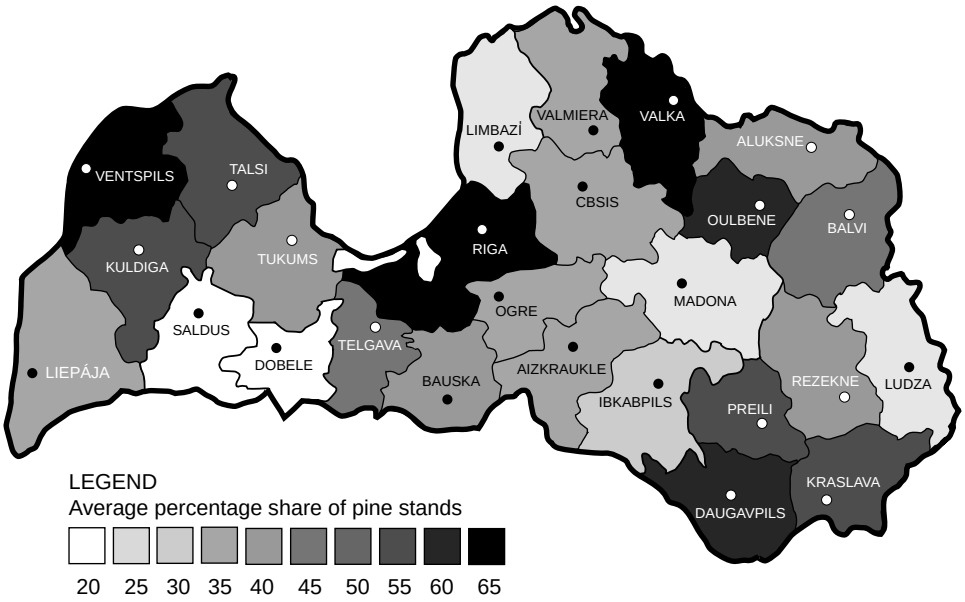

Figure 2 — Distribution of Scots pine (*Pinus sylvestris* L.) in Latvia.

Table 1— *Changes in defoliation by most represented tree species (1990-1995).*

Tree species	Percentages of defoliation by mean age classes (years)											
	1990		1991		1992		1993		1994		1995	
	<60	>60	<60	>60	<60	>60	<60	>60	<60	>60	<60	>60
Scots pine	27.0	32.2	28.9	33.0	31.6	34.1	29.1	30.4	27.1	27.2	24.1	24.1
Norway spruce	12.9	23.8	14.8	20.5	15.6	21.1	15.3	20.3	14.3	19.4	13.6	18.3
Common birch	16.3	17.9	18.7	18.8	19.5	21.1	18.1	19.5	14.5	18.3	13.1	16.3
Common alder	10.6	7.7	14.1	9.0	14.3	11.5	14.1	12.2	11.6	10.3	13.4	9.6
Aspen	13.2	15.1	15.0	18.2	18.3	20.3	18.3	18.4	17.5	16.5	14.5	15.0

of conifers on average is less than the broadleaved species (*figs. 3,4*). Usually crown damages are associated with different insects. For example, in 1995 high levels of defoliation of Scots pine in the vicinity of Riga was associated with *Gilpinia pallida* Kl. and *Lymantria monacha* L. The total damaged area there was about 10,000 ha. In 1992/93 *Pissodes piniphilus* Herbst caused serious crown damage on Scots pine.

At the same time invasion of new uncommon plant species in the forests on dry sandy soils have been observed during the last 10 years. At several levels these new species have become dominant. Scots pine stands undergo the process of sinantropization, and the natural characteristics of these forests have changed and disappeared.

The second most important tree species is Norway spruce, which is biologically unstable and very sensitive towards secondary factors such as insect damage and fungus diseases. Currently, Norway spruce is seriously endangered. ICP Forests monitoring data from 1995 shows that 8 percent of all observed spruce are damaged, and 70 percent are damaged by *Ips typographus* L.

Forest health is closely related to environmental changes (air pollution, climate, urbanization, etc.). An important environmental quality indicator is the national emission of SO_x, NO_x, CO, particulate pollution, and other substances. The total emission amount of gases and particulate matter from 1991 to 1995 has decreased. In 1991 the total emission of gases and solid substances was 144,100 tons/year; in 1992 — 92,310 tons/year; in 1993 — 87,130 tons/year; in 1994 — 103,840 tons/year; and in 1995 — 86,440 tons/year (*fig. 5*).

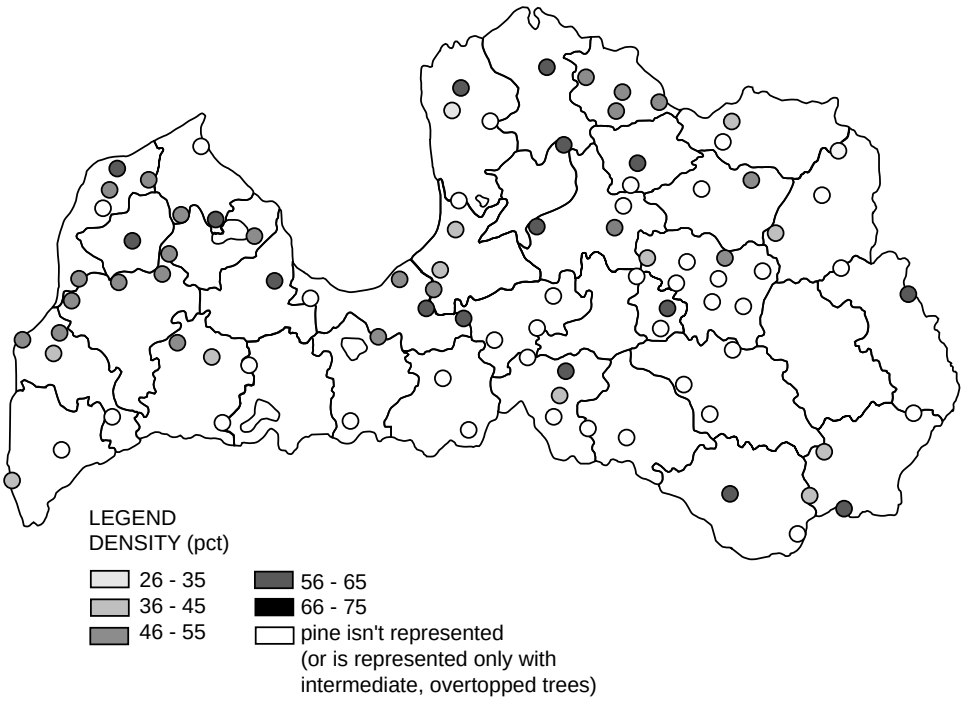

Figure 3 — Crown density of Scots pine in Latvian forests (FHM plots established in 1994, 1995).

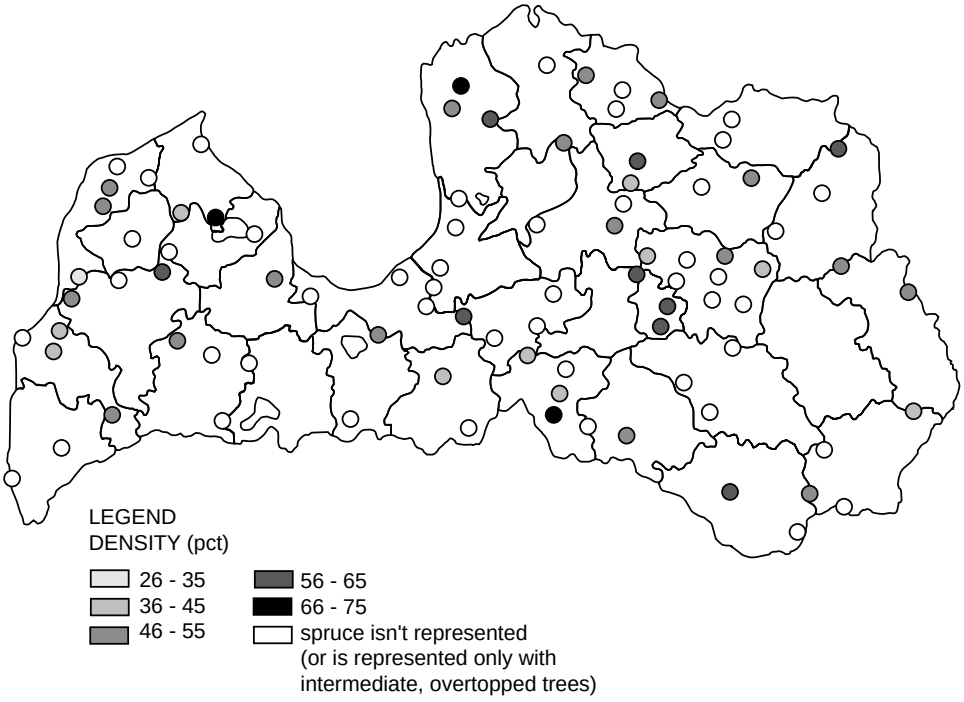

Figure 4 — Crown density of Norway spruce in Latvian forests (FHM plots established in 1994, 1995).

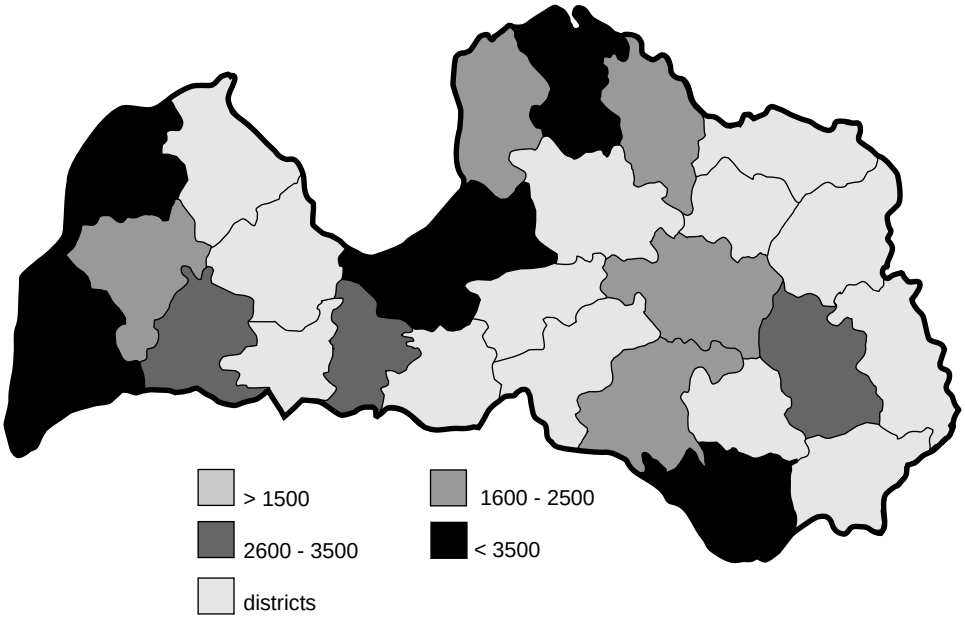

Figure 5 — Total emissions of gases, solids, and other substances (tons/year) in Latvia in 1995.

Summary

The area covered by forests in Latvia has increased in recent years. Health of trees is mainly affected by local entomological damages including cyclical repetition of insect damages. During recent years intensity of insect damage has not reached the catastrophic levels observed in earlier years. Environmental pollution impact on ecosystems has also changed forest stand structure (especially in Scots pine stands) and a process of biological destabilization has been observed

Acknowledgments

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