grant 03-70-618; NorFA grant "Network for Dendrochronological Research in Northern Europe"; grant N02.444.11.71.07 from Russian Federal Agency of Science and Innovations.

REFERENCES

Da Motta, R.S. 2004. Sustainable forest management and global climate change: Selected case studies from the Americas. Environment and Development Economics 9: 272-276.

Holmes, R. Dendrochronology program library. User's manual. 1999. Tucson, Arizona, USA, Laboratory of Tree-Ring Research, University of Arizona.

Knowlton,K., Rosenzweig,C., Goldberg,R., Lynn,B., Gaffin,S., Hogrefe,C., Civerolo,K., Ku,J.Y., Solecki,W., Small,C., Oliveri,C., Cox,J., Rosenthal,J., and Kinney,P.L. 2004. Evaluating global climate change impacts on local health across a diverse urban region. Epidemiology 15: S100.

Makinen,H., Nojd,P., Kahle,H.P., Neumann,U., Tveite,B., Mielikainen,K., Rohle,H., and Spiecker,H. 2002. Radial growth variation of Norway spruce (Picea abies (L.) Karst.) across latitudinal and altitudinal gradients in central and northern Europe. Forest Ecology and Management 171: 243-259.

Makinen,H., Nojd,P., Kahle,H.P., Neumann,U., Tveite,B., Mielikainen,K., Rohle,H., and Spiecker,H. 2003. Large-scale climatic variability and radial increment variation of *Picea abies* (L.) Karst. in central and northern Europe. Trees-Structure and Function 17: 173-184.

Mauro,G. 2004. Observations on permafrost ground thermal regimes from Antarctica and the Italian Alps, and their relevance to global climate change. Global and Planetary Change 40: 159-167.

Menzel,A. and Fabian,P. 1999. Growing season extended in Europe. Nature 397: 659.

Meyneeke,J.O. 2004. Effects of global climate change on geographic distributions of vertebrates in North Queensland. Ecological Modelling 174: 347-357.

Miller,C.E. 2003. Satellite observations of global climate change. Abstracts of Papers of the American Chemical Society 226: U23.

Rees,G., Brown,I., Mikkola,K., Virtanen,T., and *Werkman,B.* 2002. How can the dynamics of the tundra-taiga boundary be remotely monitored? Ambio 56-62.

Spiecker,H. 1999. Overview of recent growth trends in European forests. Water Air and Soil Pollution 116: 33-46.

Spiecker,H. Growth of Norway Spruce (Picea abies (L.) Karst.) under changing environmental conditions in Europe. Klimo, E., Hager, H., and Kulhavy, J. Spruce Monocultures in Central Europe: Problems and Prospects. [33], 11-26. 2000. European Forest Institute. European Forest Institute Proceedings.

Wang,J., Rich,P.M., Price,K.P., and Kettle,W.D. 2004. Relations between NDVI and tree productivity in the central Great Plains. International Journal of Remote Sensing 25: 3127-3138.

LONG-TERM FOREST GROWTH TRENDS IN BARENTS REGION

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According to the World Meteorological Organization (2003) since measurements were first recorded in 1861 the global surface air temperature has increased. During the 20th century the increase was more than 0.6 °C. The rate of change for the period 1976 to present is roughly three times that of the last 100 years as a whole. Analyses of proxy data for the Northern Hemisphere indicate that this increase in air temperature during the latter part of the 20th century is unprecedented when compared to the last millennium (World Meteorological Organization, In the Northern Hemisphere, the 1990s were the warmest decade and 1998 was the warmest year during the last 1000 years. During the summer of 2003, air temperatures in many parts of Europe were consistently 5 °C warmer than average for several months. The heat waves extended to other parts of the Northern Hemisphere, including China and some parts of Russia. Borehole temperature measurements in the Komi Republic also indicate strong subsurface warming, reflecting changes in the trends of both surface air temperature and solid precipitation (Oberman & Mazhitova 2004).

In many boreal regions warming is associated with increased precipitation, increased river discharge, a longer growing season, changes in the distribution of plant species and higher net primary productivity. Recent findings clearly show that climate change is a major driving force behind growth variation, as well as differences in tree mortality (Spiecker 1995; Spiecker 1996; Spiecker 2000; Raitio 2000; Makinen et al. 2001). The understanding of growth trends in the Barents region's forests as a response to global change for both the past and the future is very important for the development of the European forest sector.

Climate change with lengthening growing season (Menzel & Fabian 1999), increasing CO_2 and nitrogen deposition and changes in management practices are assumed to cause the increased forest growth (Mäkinen et al. 2003; Spiecker 2002, 2000, 1999,). Climate change has been defined on both global and local scales (Knowlton et al. 2004; Da Motta 2004; Meyneeke 2004; Miller 2003; Mauro 2004). Previous results indicate that northern forest ecosystems are among the regions of the greatest risk from the impacts of climate change. According to the scientific community, warming trends have already started and in the future will increase (IPCC 2001). Most studies attribute the warming trends to accumulation of greenhouse gas or to sunspot activity (IPCC 2001; Vasil'ev et al. 2004; Raspopov et al. 2004).

In Europe most forests are managed except those in northwestern Russia where there is a dominance of old-growth natural forests. It is important to understand the long-term response of unmanaged natural forest to changing climate. It is possible to adapt forest management practices to changing environment, although today it is impossible to change the global climate back to its previous state. Therefore, with knowledge of tree-growth response to changing climate, forest management practices can be adapted to achieve a defined output from the forests. Dendroclimatic analysis can be used to identify the major climatic factors that influence radial growth of forest species.

Case studies in Komi Republic including Drobushev (2004) showed that latewood width of Scots pine (*Pinus sylvestris* L.) was positively correlated with air temperature in April-May and July-August of the current growing season and with the July-August precipitation of the previous year. Earlywood width was positively affected by the precipitation in May and November of the previous year (Drobushev 2004). This is in accordance with the observation which shows that the growth of conifers in the boreal zone positively correlates with growing season air temperatures (Briffa et al. 1988). Physiologically, this results from the fact that in the boreal zone the carbon gain of the trees is typically limited by the air temperature during growing season. As long as water is not a limiting factor for the radial growth, increased carbon gain in the tree ring should positively correlate with the increment. One possible hypothesis could be that increased air temperature results in more carbon being assimilated by the tree and as a result trees will grow faster. In this case there are two scenarios of possible development:

- trees will be larger as there will be changes in height, shape and thickness of stems as a result of carbon accumulation and higher production;
- trees will grow faster but the increased growth could be limited by higher rate of mortality and it would result in the same volume of growing stock and carbon accumulation.

On the European scale, an attempt to identify forest growth trends was conducted in 1993-1996 (Spiecker 1996; Spiecker 1999). The main purpose of the project was to analyze whether site productivity has changed in European forests during the last decades. It was possible to observe an increasing growth trend in most cases. However, in some studies (Mielikainen & Sennov 1996; Nojd 1996; Makinen et al. 2001) a decreasing trend was reported at specific sites. Information about forest growth in the Kola Peninsula and Russian Karelia represented Russian studies in this project.

In Northern Europe, both negative and positive trends have been found. A negative trend was found in the Kola Peninsula which can be explained by the non-ferrous smelter in the area (Nojd 1996; Makinen et al. 2001) while a positive trend was found in Saint-Petersburg region (Mielikäinen & Sennov 1996). Studies in Karelia showed that no definite conclusions can be made regarding site productivity changes in the area (Sinkevich & Lindholm 1996). These study areas represent only 17% of the forest area of North-Western Russia. Previous studies on growth trends were conducted mostly in secondary even-aged forests in Europe (Spiecker 1996). Studies of growth trends in untouched pristine uneven-aged forests may provide a better understanding of the reaction of forest ecosystems to global climate change. It is especially important for modeling of forest growth in the future. Usually the effects of forest management are well understood.

The definition of growth trend in this study is similar to previous research projects (Spiecker 1996). Growth trend can be defined as a persistent change in the average rate of growth. Growth trends within this project are indicated by long-term (more than 30 years) site-induced deviations of observed versus expected growth without taking into account site changes. Long-term trends in growth can be defined as a component of annual growth variation dominated by low-frequency variation (period = 30 years).

Komi is the east-most boreal region of European Russia where largest areas of northern European natural forest still exist. Using radial and apical growth it was possible to detect positive long-term trends of growth in Scots pine (*Pinus sylvestris* L.) and Siberian spruce (*Picea obovata* Lebed.) in the forest-tundra transition zone, the northern taiga zone, the middle taiga zone, and the southern taiga zone of boreal forests in Komi Republic. Three different approaches were used for identifying long-term trends in growth of Siberian spruce and Scots pine: chronology building, comparison of radial increment at similar cambial age, and comparison of height increment at similar cambial age. The combination of methods for estimating long-term growth trends emphasizing height increment has proven to be an adequate approach.

It is impossible in present system of forest inventory in Russia to detect forest growth trends on regional scale with decadal or annual resolution. Discs, cores and model trees were collected in 6 stands in 4 forest zones of Komi Republic: south taiga sub zone of boreal forests, middle taiga sub zone of boreal forests, northern taiga sub zone of boreal forests, forest-tundra transition zone. Mature dominant trees without visible signs of damage were randomly selected as sample trees (53 trees of Siberian spruce and 65 trees of Scots pine). Measuring of annual ring width, earlywood and latewood were done using the Windendro image analysis system. Chronologies covering period from 1774 till 2003 for Siberian spruce and from 1824 till 2003 for Scots pine were built for 3 forest zones and forest-tundra transition zone (Figure 1). Combination of stem analysis, comparing raw ring with series using cambial age approach and building chronologies using collected samples showed common increase of growth for the period after 1950 that can't be explained as a usual variability during last 200 years.

Standardized tree-ring chronologies showed higher increase in growth in high latitudes and lower in temperate zone. Response to changing environment of Siberian spruce is higher then response of Scots pine. The highest increase in growth of Siberian spruce and Scots pine was observed in the northern taiga zone and northern forest-tundra transition zone. The facts of Scots pine movement to north in northern taiga limit after 1924 were identified. Increase in area of distribution and increase in production results lead to total volume increase. But evaluation of total balance in changes of wood production in Komi due to climate change studies in relation between tree mortality, forest growth and their relation to climatic parameters needs to be done.

Positive long-term trends of Scots pine and Siberian spruce growth were discovered on the territory of Komi Republic using collected samples.

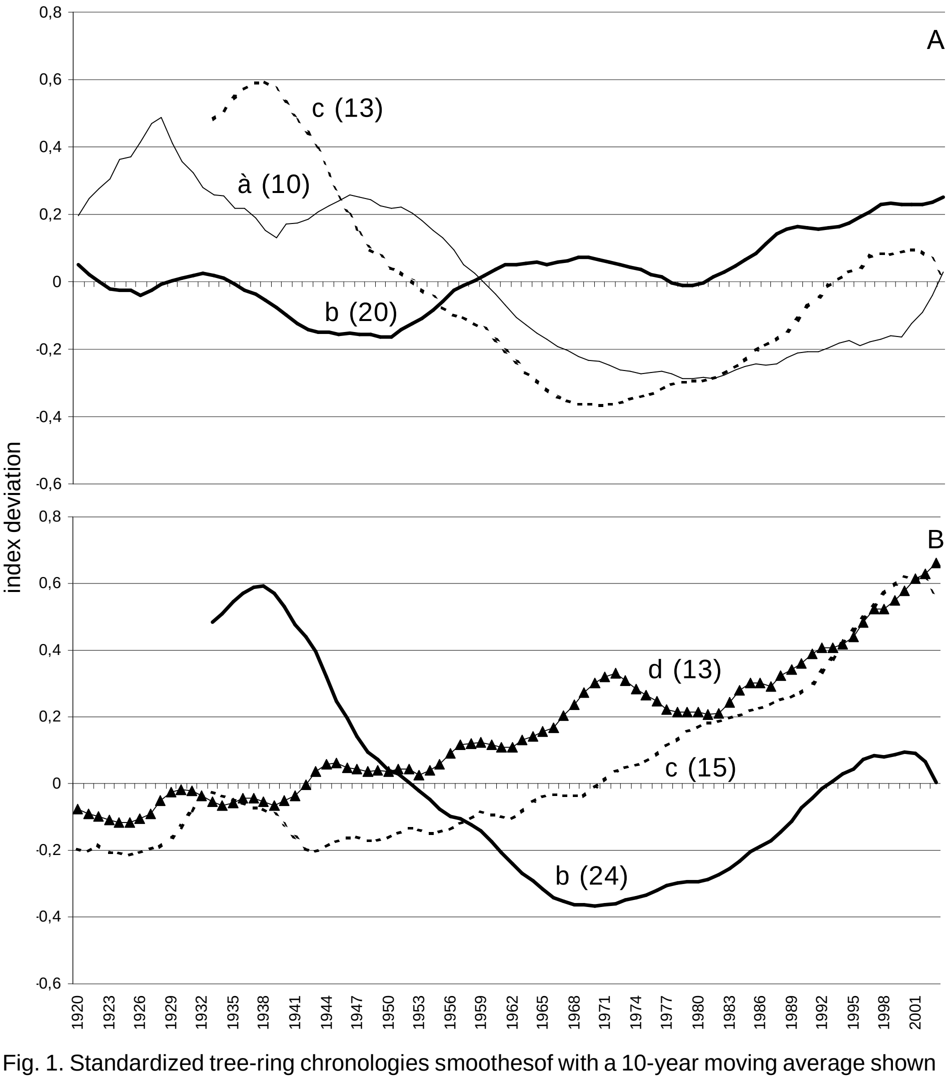

Fig. 1. Standardized tree-ring chronologies smoothesof with a 10-year moving average shown as a deviations from the mean for Scots pine (A) and Sibirian spruce (B) in forest of Komi Republic: southern (a), middle (b), northern (c) and forest-tundra transition (d) zones.

Increase in radial growth of Siberian spruce in the forest-tundra transition zone for last 70 years was 214 % comparing with long-term mean growth for the previous 118 years; in the northern taiga zone 13 % (during the last 50 years increased comparing with long-term mean growth for the previous 76 years and on 46 % during last 25 years); in the middle taiga zone 115 % (for the last 50 years, comparing with previous 178 years). Increase in radial growth of Scots pine in the northern taiga zone is 116 % (during the last 30 years comparing to long-term mean growth for the previous 47 years); in the medium taiga zone is 67 % (during the last 50 years comparing to previous 100 years); height growth has increased on 42 %. No clear conclusion could be done yet about growth trends in the Southern taiga zone at this stage of analysis.

There is a lower ability of Scots pine comparing to Siberian spruce to grow in extreme conditions; in the middle taiga zone response of Siberian spruce to changing conditions is higher then response of Scots pine. Temperature is a limiting factor for forest growth in Komi Republic.

Comparison of forest growth trends in Komi Republic with similar studies in Finland, Norway and Sweden showed difference in growth trends due to continental climate with more strong climatic conditions in Komi.

Tree-ring growth data of Scots pine (*Pinus sylvestris*) from 19 sites of Kola Peninsula above the polar circle was analyzed. The main goal of the study (Raspopov et al. 2004) was to detect regional response of biological system (forest) to the global warming during the last century. The Kola Peninsula is located between 66 and 70°N, and 32 and 41°E. The Northern timberline crosses Kola Peninsula from North-Western part at the Barents Sea coast to South-East one. The peninsula is located in the region of Atlantic cyclones activity, therefore biological systems (including forest) does not experience any lack in humidity. The precipitation is distributed nearly uniformly on the Kola peninsula area. The mean precipitation rate varies within 500-800 mm/year, and in mountain regions precipitation is up to 1200 mm/year. Under these humidity conditions the tree growth, taking into account the absence of noticeable anthropogeneous pollution, is mainly determined by air temperatures.

In Figure 2 the tree-ring growth widths (*Pinus sylvestris*) at the Northern timberline on the Kola Peninsula (Murmansk) (Raspopov et al., 2004) for about 400 years and the temperature variations at the Northern Hemisphere and in the Arctic regions are presented.

The temperature variations at the Northern Hemisphere, mean annual air temperatures in coastal region of the Kola Peninsula (Kola – Murmansk) for the last century, and also mean annual temperature in the central part of the Kola Peninsula (Kirovsk) for the last 30 years are presented as well.

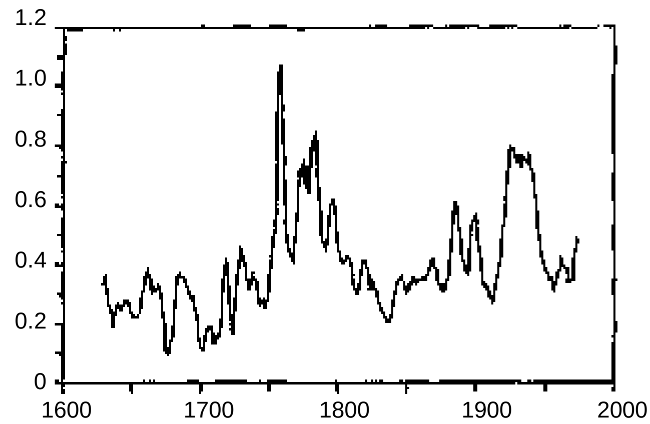

Fig. 2. Variations in the tree-ring width (*Pinus sylvestris*) at the northern timberline of the Kola Peninsula for the last 400 years (5-year running mean), (Raspopov et al. 2004).

As one can see from comparison of regional and global temperature variations the increase of global and regional temperatures took place synchronously up to middle of the last century. Than at sixties the temperature decrease was observed. However, in 1970-2000s the trend of global and regional temperatures was different. Both trends demonstrate tendencies of some temperature increase. But in the case of global temperatures the increase took place two times faster than in the first half of the last century. In the case of regional temperatures their increases were two times as much slower (~0.15°/10 years compared to ~0.25°/10 years in the beginning of the century). The analysis of mean annual temperature increase for the last 30 years demonstrates that the increase took place on account of winter temperatures. The summer temperature increase did not happen. More over in the last decade the decrease of mean summer temperatures took place.

Periodicity of climatic processes in the Barents Sea Region and along the Arctic Ocean coast during several hundred years has been studied by analyzing the tree-ring chronologies for the regions close to the northern timberline (Raspopov et al. 2004). In the Barents Sea region, the cyclicities of climatic processes with periods of around 90, 30-35, 22-23, 18, and 11-12 years have been established by spectral analysis of the data for the Kola Peninsula. The wavelet analysis of annual series of conifer tree-rings generalized for 10 regions along the northern timberline, from the Kola Peninsula to Chukotka, for the period 1458-1975 has revealed the same periodicities for the vast areas of Northern Russia. The tree-ring growth of Fitzroya (Roig et al., 2001)., similar to that of Pinus in the Barents Sea region, responds in general to summer temperatures (December-March in the Southern Hemisphere) (Villalba, 1994; Lara and Villalba, 1993). Comparison of the spectrum of climatic changes in the Barents Sea region and climatic changes in the Pacific Ocean region demonstrates a striking identity of the spectra. In all the spectra, oscillations with periods of 82-95, 45-51, 30-35 20-24, 17-18, 9-12 years are present. Such a similarity points to a global character of the forcing factor influencing the nonlinear ocean-atmosphere-ñontinental system. The source of such climate changes may be solar forcing. The distribution of the frequencies of tree-ring width variations corresponding to periodicities of solar activity (nG, nH) and their combinatory frequencies (nH – nG) and (nH + nG). Climatic cyclicity with a period of about 35 years is known as the Brückner cycle. Climatic cycles with periods of around 90, 22-23, and 11-12 years correlate well with the corresponding solar activity cycles.

Conclusions

Positive long-term trends of Pine and Spruce growth were identified in several studies in the Barents Region. Comparison of forest growth trends in Komi Republic of Russia with similar studies in Finland, Norway and Sweden showed difference in growth trends due to continental climate with more strong climatic conditions in Komi. These significant forest growth responses to the changing climate conditions in Komi Republic highlight this difference as the trees show a stronger response in extreme climatic conditions.

Spectral analysis of the dendrochronological data for the coastal zone of the Barents Sea region has revealed climatic oscillations with periods of about 90, 45, 33, 23, 18, and 11-12 years. These periodicities of climatic processes in the Barents Sea region turned out to be nearly identical to those of climatic processes in the Pacific Ocean region obtained by using dendrochronological data for Northern Patagonia (South America, Chili) (Roig et al. 2000). The same frequency characteristics were revealed in analysis of tree-ring series of conifer trees generalized for the northern timberline of Russia. Such identical characteristics demonstrate the global nature of the impact on the climatic ocean-atmosphere-continental system. Variations in solar activity seem to be a plausible source of such global forcing phenomena.

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REFERENCES

Briffa,K.R., Jones,P.D., Pilcher,J.R. and *Huges, M.K.* 1988. Reconstructing summer temperatures in Nothern Fennoscandinavia back to A.D. 1700 ysing tree-ring data from Scots pine. Arctic and Alpine Research 385-394.

Cook,E.R. and *Kairiukstis,L.A.* 1990. Methods of dendrochronology. Applications in the environmental sciences. International Institute of Applied System Analysis, Kluwer Academic Publishers, Dordrecht.

Drobushev,I. Interactions between climate, natural disturbances and regeneration in boreal and hemi-boreal forests. 2004. Department of Ecology, Lund University.

Makinen,H., Nojd,P., and *Mielikainen,K.* 2001. Climatic signal in annual growth variation in damaged and healthy stands of Norway spruce [Picea abies (L.) Karst.] in southern Finland. Trees-Structure and Function 15: 177-185.

Mann M.E., Bradley R.S., Hughes M.K. 1999. Northern hemisphere temperatures during the past millennium: inferences, uncertainities, and limitations. Geophys. Res. Lett. V. 26. 759-764.

Mielikainen,K. and *Sennov,S.* 1996. Growth trends of forests in Finland and North-Western Russia. In Growth trends in European Forests: studies from 12 countries. 5 ed. Springer, Verlag Berlin Heidelberg New York. pp. 19-27.

Nojd,P. Effects of emissions from the nickel-copper smelter in Monchegorsk, northwestern Russia, on the radial growth of Scots pine. 1996. The Finnish Forest Research Institute. Research Papers 615.

Oberman,N.G. and *Mazhitova,G.G.* 2004. Permafrost dynamics in the north-east of European Russia at the end of the 20th century. Norwegian Journal of Geography 55: 241-244.

Overpeck J., Hughen K., Hardy D., Bradley R., Case R., Douglas M., Finney B., Gajewski K., Jacoby G., Jennings A., Lamoureux S., Lasca A., MacDonald G., Moore J., Retelle M., Smith S., Wolfe A, Zielinski G. 1997. Arctic environmental change of the last four centuries. Science. V. 278. 1251-1256.

Raitio,H. 2000. Weater conditions during 1980-1995 and tree damage directly attributavle to weather. In Forest Conditions in Changing Environment – The Finnish Case. Kluwer Academic Publishers, Dordrecht, Netherlands. pp. 41-48.

Raspopov, O.M., O.I.Shumilov, E.A. Kasatkina, E. Turunen, M. Lindholm, T. Kölstrom. 2001. The nonlinear charachter of the effect of solar activity on climatic processes. Geomagnetism and Aeronomy, V. 41(3), 407-412.

Raspopov,O.M., Dergachev,V.A., and *Kolstrom,T.* 2004. Periodicity of climate conditions and solar variability derived from dendrochronological and other palaeoclimatic data in high latitudes. Palaeogeography Palaeoclimatology Palaeoecology 209: 127-139.

Roig, F.A., Le-Quesne, C., Boninsegna, J.A., Briffa, K.R., Lara, A., Grudd, H., Jones, Ph., Villagran, C. 2001. Climate variability 50,000 years ago in mid-latitude Chile as reconstructed from tree rings. Nature. 410. 567-570.

Sinkevich,S. and *Lindholm,M.* 1996. Short- and long-term natural trends of Scots pine (Pinus sylvestris, L.) radial growth in north- and mid-taiga forests in Karelia. In Growth trends in European Forests: studies from 12 countries. 5 ed. Springer, Verlag Berlin Heidelberg New York. pp. 29-40.

Spiecker,H. Growth of Norway Spruce (Picea abies (L.) Karst.) under changing environmental conditions in Europe. Klimo, E., Hager, H., and Kulhavy, J. Spruce Monocultures in Central Europe: Problems and Prospects. [33], 11-26. 2000. European Forest Institute. European Forest Institute Proceedings.

Spiecker,H. 1995. Growth Dynamics in A Changing Environment – Long-Term Observations. Plant and Soil 169: 555-561.

Spiecker,H. 1999. Overview of recent growth trends in European forests. Water Air and Soil Pollution 116: 33-46.

Spiecker,H. ed. 1996. Growth trends in European Forests: studies from 12 countries. Rep. 5.

Timonen, M. 2002. Is climate warming at the pine timberline? In: Abstracts prepared for Arctic Council, Northern Timberline Forests Workshop, Rovaniemi, Finland, May 23-25, 2002. 22.

WMO statement on the status of the global climate in 2003: global temperature in 2003 third warmest. http://www. wmo.int. 2003. World Meteorological Organisation.

NATIVE FORESTS IN KOMI REPUBLIC THEIR VALUE, PROBLEMS AND EXPERIENCE OF MANAGEMENT

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The specialists use different terms to denote the forests with minimal violations induced by human activities: “virgin forests”, “undisturbed forest territories”, “old-growth forests”. There is no term acceptable by everyone today nor will be there any in the nearest future. We use the definition given in the industrial standard OST 56-108-98 “Sylviculture. Terms and Definitions”: “Native forest is the forest that didn’t suffer any noticeable economic or anthropogenic influence, which was changing in the course of many generations of forest-forming tree species following only the natural nature processes. We can argue about the terms and debates will go on but we are loosing the original nature right now. Today there are not only virgin forests but very few old-growth forests (older than 150-200 years) in the bigger part of Europe (to the west and south of Arkhangelsk oblast and Komi republic). The value of the native forests is obvious and is generally acknowledged today. These forests are not only the banks of the natural biodiversity (25000 species of wildlife, plants, mushrooms, lichens – billions of organisms), but a refuge for endangered species and a source of restoration of the natural biological diversity on the adjacent already disturbed territories. Besides, it is the native forest that fulfils in the best way the stabilizing ecological functions: water protection, water regulation, environment-formation. With decrease of the share of native forests these functions become weak, many wildlife and plant species disappear, ecological sustainability of the forest territory is impaired.

The use by man of the laws of nature and of the natural forest dynamics in forest management can help to stop this process. But where can one learn the laws of nature? And here another indisputable value of the native forests becomes apparent: only they can provide a standard for the natural development of forest landscape and a model for implementation of ecologically responsible forest management. The problem is that very few territories on which the nature lives according to its laws, including the native forests, remain intact, and their area is constantly decreasing. Judging by the space images the last large ranges of untouched forest in Europe (areas of not less than 100 thousand hectares) are preserved only in Komi republic and in the neighboring Arkhangelsk oblast.

In Komi republic the forests cover 300 thousand km^2, or ¾ of the territory. A large part of the native forests is protected by the state. They include the wide belt of pre-tundra forests and the largest in Europe SPNTs: Pechoro-Ilychski state nature reserve and National park “Jygyd va” situated on the western slope of the Urals. Native forests are also preserved on some large nature reserves of republican importance. Nevertheless the