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International Institute for Applied Systems Analysis • A-2361 Laxenburg • Austria
Tel: +43 2236 807 • Fax: +43 2236 71313 • E-mail: info@iiasa.ac.at • Web: www.iiasa.ac.at

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Russian Team: G. Korovin, E. Karpov, A. Isaev, V. Nefedjev, D. Efremov, V. Sedych, V. Sokolov,

International Team:
T. Schmidt, K. Blauberg, O. Ljusk Eriksson, S. Nilsson, G. Raile, O. Sallnäs, A. Shvidenko

Approved by
Gordon J. MacDonald (macdon@iiasa.ac.at)
Director, IIASA

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Foreword

Siberia's forest sector has recently gained considerable international interest.

The International Institute for Applied Systems Analysis (IIASA), the Russian Academy of Sciences, and the Russian Federal Forest Service, in agreement with the Russian Ministry of the Environment and Natural Resources, signed agreements in 1992 and 1994 to carry out a large-scale study of the Siberian forest sector. The overall objective of the study is to focus on policy options that would encourage sustainable development of the sector. The goals are to assess Siberia's forest resources, forest industries, and infrastructure; to examine the forests' economic, social, and biospheric functions; with these functions in mind, to identify possible pathways for their sustainable development; and to translate these pathways into policy options for Russian and international agencies.

The first phase of the study concentrated on the generation of extensive and consistent databases for the total forest sector of Siberia and Russia.

The second phase of the study encompasses assessment studies of the greenhouse gas balances, forest resources and forest utilization, biodiversity and landscapes, non-wood products and functions, environmental status, transportation infrastructure, forest industry and markets, and socioeconomic problems.

This report is a contribution to the analyses of sustainable wood supply from the Siberian forests. The analyses have been carried out as an international effort. Drs. G. Korovin, E. Karpov, V. Nefedjev, and Academician A. Isaev, from the Center for the Problems of Ecology and Productivity of Forests, Moscow, developed the model used and executed the runs with the model. Professors O. Ljusk Eriksson and O. Sallnäs, from the Swedish University of Agricultural Sciences, guided and evaluated the different development steps of the model. The study used the IIASA Forest Study database as the major source of information, but substantial additional regional data on the transition of ecological and management processes were collected in the regions of Asian Russia. Drs. D. Efremov, from the Far East Forestry Research Institute, Khabarovsk, Russia; V. Sokolov, from the V.N. Sukachev Institute of Forest, Krasnoyarsk, Russia; and V. Sedych, from Novosibirsk Forestry Branch of the Institute of Forest, Novosibirsk, managed regional teams for this data collection. Messrs. K. Blauberg, IIASA, and G. Raile, USDA Forest Service, completed substantial work in compiling the results in an aggregated and readable form. Dr. T. Schmidt, USDA Forest Service, carried out the bulk of work in drafting this report. Profs. S. Nilsson and A. Shvidenko coordinated the study.

We would also like to thank International Forestry, USDA Forest Service, which made it possible to have secondments from the USDA Forest Service for this work.

Siberia and Far East Russia's Future Wood Supply: An Analysis

Executive Summary

This study focuses on Siberia and Far East Russia, considered to be the Asian part of the Russian Federation. Because of the enormous size and contributions of the forest resources in this area, their future status is of utmost importance.

The objective of this report is to project the future wood supply and dynamics of the forest resources of Siberia and Far East Russia. This projection involves evaluating management scenarios of varying levels of ecological protection and reservation from harvesting, increasing fire and pest prevention and protection efforts, and increasing regeneration efforts. Analyses are conducted that portray the impact of these scenarios on the future wood supply and resulting dynamics of the growing stock of Siberia and Far East Russia.

The data presented in this study are based on projections of a 1988 inventory of the forest resources of Siberia and Far East Russia using a model that considers numerous future management and harvesting activities. As a result of these projections, we quantify a biologically sustainable harvesting level, based on analyses of individual Ecoregions, which does not threaten long-term development of the forest resources from an ecological and sustainability point of view. Results of these projections are analyzed from both tabular and GIS/mapped formats. Additional information beyond that presented in this text is available through IIASA's Forest Resources Project.

The forests of Siberia and Far East Russia are generally classified as boreal forests and are dominated by coniferous forest types. The historical fate of forests in Siberia and Far East Russia has been closely tied to the transportation infrastructure. While removals have historically been considerably lower than growth, distribution of the growth and removals has been a concern. Many accessible areas have been harvested, but many remote areas have never been managed or harvested.

In 1988, there were an estimated 557.3 million hectares of forested areas in Siberia and Far East Russia. These forested areas were comprised of 251.6 million hectares of exploitable forest and 305.7 million hectares of nonexploitable forest. They contained 30.3 billion cubic meters of growing-stock volume in exploitable forests, and 30.7 billion cubic meters of growing-stock volume in nonexploitable forests for a total growing-stock volume of 61.0 billion cubic meters.

Decisions about which management scenario to recommend were based on numerous factors beyond which provided the greatest harvestable volumes. Total exploitable volumes are perhaps not as important as the species groups in which the greater volumes occur. Often, lower total volumes of higher value species are preferred over larger volumes of lower value species. Additionally, different species play different ecological roles. Increased management efforts that result in overall lower volumes but greater environmental benefits are also considered.

In an analysis of the impacts of the various management scenarios, results indicate that the Environmental Restrictions management scenario is projected to result in the most exploitable growing-stock volume by year 2168 due to additional restrictions being placed on the species and amount that can be harvested. While this option has the greatest levels of end volumes, it comes at the cost of lower harvest levels. The management scenario that is projected to result in the least exploitable growing-stock volume by year 2168 is the No Change in Management option.

In our opinion, the optimum scenario is the combination of both increased regeneration efforts and increased protection efforts. Although there are some variations between species groups, this management scenario results in the best distribution of the more desired species over the long-term. From a management implementation viewpoint, it is logical to increase efforts for both protection and regeneration at the same time. Increasing management directed at regeneration and protection will require improving access to the stands. Once access is available, its use should be optimized through both management activities.

If this management program is implemented, the nonexploitable forest resource is projected to remain static in area and experience slight increases in growing-stock volume between 1988 and 2168. The total area of exploitable forest land is projected to decrease by about 9 million hectares between 1988 and 2168. During the same time period, total growing-stock volumes in the exploitable forests are projected to decrease by about 2.9 billion cubic meters.

By the year 2168, it is projected that there will be 27.4 billion cubic meters of growing-stock volume on 242.5 million hectares of exploitable forests in this region. In addition, by the year 2168, we project there will be 33.9 billion cubic meters of volume on 305.7 million hectares of nonexploitable forests.

A decrease in total exploitable growing-stock volume is projected, but our recommended management scenario is projected to result in increases in total exploitable growing-stock volume for the spruce, fir, and cedar species groups by the year 2168. These species groups represent the later seral stages of forest succession for Siberia and Far East Russia, demonstrating the successional processes that are projected to occur in the next 180 years. The cedar species group is expected to experience the largest increase in exploitable growing-stock volume, rising by almost 50 percent.

Decreases in total exploitable growing-stock volume are projected for the pine, larch, birch, aspen, and other deciduous species groups by the year 2168.

With implementation of our recommendations, Siberia and Far East Russia will have the potential to provide 244 million cubic meters of wood fiber per year on a long-term, ecologically sustainable basis. In addition, we highly recommend strongly accelerating the harvesting schedules for the next 40 years beyond this projected level. Our projected future wood supply from Siberia and Far East Russia will result in an accelerated harvest potential of 341 million cubic meters annually for the next 40 years.

Our recommendation to accelerate levels of harvest in the short term is based on the need to lower the risk of uncontrolled wildfires and pest outbreaks; the potential to improve the current growth rates; a long-term accumulation of wood fiber; the potential to increase employment, safeguarding the social welfare of forest based communities; the need to further develop the economic potential of the countries' forest resources and provide a much needed additional source of outside income and technological/ managerial investments and training; the potential to improve biological diversity; the potential to improve the effectiveness of forest management; and the potential to improve wildlife habitat.

We also recognize that mature and overmature forests offer a wide variety of ecological benefits that cannot be provided by younger, more recently established forests. An important consideration in our recommendations is that more than 305 million hectares of the total 557 million hectares (55 percent) are classified as being nonexploitable. By designating these forests as being environmentally critical and thus not available for harvesting, we are ensuring the provision of the ecological benefits associated with these old growth forests.

Realistically, less potentially harvestable volume will be economically accessible with the existing infrastructure. Therefore, if additional management efforts are made to increase forest regeneration and protection, we estimate the potential annual economically accessible wood supply for Siberia and Far East Russia will be 187 million cubic meters in 2008, 199 million cubic meters in 2028, and 164 million cubic meters by the year 2168.

1. Introduction

This study focuses on Siberia and Far East Russia, considered to be the Asian part of the Russian Federation (Fig. A). This vast region covers roughly the land area from the Ural Mountains in the west to the Pacific Ocean in the east (from 60^0 to 170^0 east of Greenwich longitude - about 8,000 km) and from the Chinese/Mongolian border in the south to the Arctic Islands in the north (from 48^0 to about 80^0 north latitude - about

3,500 km). Within this region, there are an estimated 557 million hectares of forested areas with approximately 61 billion cubic meters of growing-stock volume. Because of the enormous size and contributions of the region's forest resources, their future status is of utmost importance.

Figure A. *Study area by Economic Region.*

The forest resources of Siberia and Far East Russia are important globally because they consist of about 20 percent of the world's forested areas; consist of about 50 percent of the world's coniferous forests; consist of about 15 to 20 percent of the world's forest growing stocks (FSFMR, 1994; FAO, 1995; and Nilsson and Shvidenko, 1997); currently sequester about 30,000 million tons of carbon; annually have a net carbon sink of 200 million tons of carbon (Shvidenko, 1997); and have an excellent potential opportunity to increase the quantity and quality of this resource (World Bank, 1997). Although this importance has been consistent over time, international recognition of the vital role this resource plays has recently grown.

Numerous studies have described this resource in-depth, including its environmental, economic, and social contributions (for more information, as a beginning, see Isaev, 1991; Nilsson *et al*., 1994; Krankina and Ethington, 1995; Linden, 1995; Nilsson, 1996; Pisarenko and Strakhov, 1996; World Bank, 1997; Nilsson 1997b). The Siberian and Far East Russia forest resources have been sporadically monitored through different inventory and assessment efforts for almost 50 years (Shvidenko and Nilsson, 1997; Kukuev *et al*. 1997). Unfortunately, many of these efforts differ in scale, intensity, methodology, and accuracy.

There are concerns about the future of this vital resource based on uncertainties related to localized deforestation and a wide distribution of disturbances (estimated to be as high as 10 million hectares annually – Nilsson, 1997b), safeguarding of the social welfare of forest based communities, protection of ecologically important areas and their susceptibility to potential harvest during the transition to a market economy, the recent decrease in production from the forest sector and related changes in the management of these forest resources, long-term sustainability for economic prosperity and social stability, and other related uncertainties. While some of these concerns appear to be opposite in their impact on the resource, their unknown future makes them a high priority due to the global significance of the overall forest resource.

To date, no attempt has been made to project the future of this resource. The objective of this study is to project the future wood supply and dynamics of the forest resources of Siberia and Far East Russia. This projection involves evaluating scenarios of varying levels of ecological protection and reservation from harvesting, of increased fire prevention and protection efforts, and of increased regeneration efforts. Analyses are conducted that portray the impact of these scenarios on the future wood supply and resulting dynamics of the growing stock of Siberia and Far East Russia. Impacts evaluated are focused on the paths of harvesting, the resulting wood supply, and the structure of the resulting forest resources.

2. Russian Wood Supply Analysis

The Annual Allowable Cut (AAC) is calculated and regulated by the Russian authorities (ARICFR, 1997; Gosleskhos SSSR, 1987). The AAC calculations consider only final harvests (clear cuts) and are expressed in so-called commercial wood, which includes industrial wood and fuelwood. A sustainable harvest level is the guiding principle for the AAC calculations. Other factors considered in the calculations are:

- Ecological constraints,
- Allowable harvesting age (which is regulated),
- Harvesting methods
- Forest management regimes, and
- Timing.

These constraints on the harvest possibilities, indicated in the current Forest Code, are expressed in a division of the forests into so-called groups (three groups) and protective categories. For example, there are 20 protective categories of Group I forests, in which industrial harvest is completely prohibited in 15 categories, as well as in all cedar (*Pinus sibirica* and *Pinus karajensis*) forests. The harvesting rules (or regimes), taking the above constraints into account, are also developed and approved at the regional level in "Rules for Final Harvests."

The methods to be used for the AAC calculations are described in official instructions (Gosleskhoz, 1987). Different versions of the AAC within a forest enterprise are calculated. The most important versions used in the calculations are defined in the following way:

- AAC calculated for mature forests:
  $L_m = A_m / C$

- AAC calculated for mature and immature forests:
  $L_{1A} = (A_m + A_{im}) / (2K)$

- AAC calculated for mature, immature, and middle-aged forests:
  $L_{2A} = (A_m + A_{im} + A_{ma}) / (3K)$

- AAC calculated for even harvest or a rotation period:
  $L_{RP} = A_{FA} / (A + N)$

- AAC calculated for forests with certain conditions:
  $L_C = A_C / N$

A_m, A_{im}, A_{ma}, A_{FA} are mature and overmature, immature, middle-aged, and forested areas, respectively; A_C is the area of forests that ought to be harvested because the forests are in poor condition (burnt stands, insect damage, etc.).

A = harvesting age

C = 10 or 20 years depending on road availability

N = length of regeneration period

K = width of age class

Similar AACs can be calculated by using the growing stock instead of areas as the driving parameter. The final selection of the AAC is based on the calculations, resulting age structure, demand for wood, available harvesting capacities, and resulting general structure of the forests. The methodology described above obviously has significant shortcomings (e.g., Moshkalev, 1990; Synitsin, 1990). The approach does not:

- include the real impact of forest management on the forest development and the harvesting level,
- take any economic considerations into account in any explicit form, or
- select the final AAC level in an objective way.

Usually, the selected and recommended AAC level is taken as an average of the calculated level for the first and second period in the calculations (30 to 50 years ahead). This means that the sustainability aspects are largely neglected.

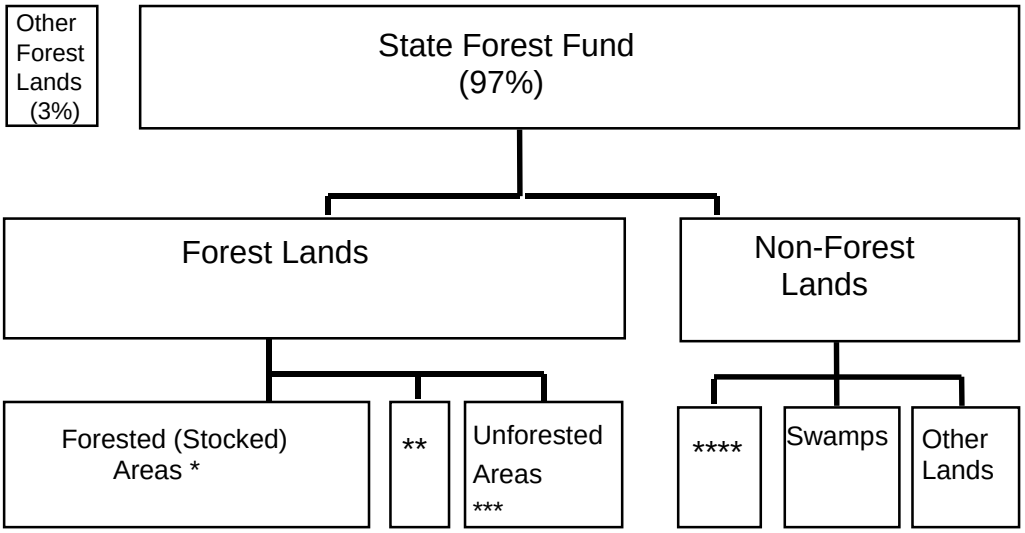
During 1950-1990, several ideas were developed to achieve sustainable AAC calculations in Russia (e.g., Antanaitis, 1977; Komkov and Moiseev, 1987). Both of these examples are based on the classical theory of "normal forests", taking into account different objectives and necessary improvement of qualitative and quantitative structures of the Russian forests.

Several models have been developed to implement the approach above (the VNIILM-model – Moiseev, 1974, 1980; the UkrSKhA-model – Nikitin *et al.*, 1978; and the OPTINA-model – Djalturas *et al.*, 1986). There have also been attempts to include the economic dimension in this model development (Moshkalev, 1985) and a multiple-use forestry concept (Kashpoor, 1995).

However, none of these model developments have been implemented in forest practice or in the official AAC calculations in Russia.

3. Study Methodology

All forest lands in Siberia and Far East Russia were nationalized in 1918, and despite the recent political and social changes, are still owned by the State (ARICFR, 1997; Kukuev *et al*. 1997). Forest lands are primarily administered by the federal government and are referred to as the State Forest Fund. These federal lands represented approximately 97 percent of the stocked forested areas in 1988 and, in general, include all land that is suitable for forest production or relevant to forest management. The remaining 3 percent of the forest lands of Siberia and Far East Russia are managed through either federal, regional, or local authorities. Generally, data presented for Siberia and Far East Russia related to ecological concerns, inventory, and production are only for State Forest Fund lands. As a result, the data presented in this study are related to only State Forest Fund lands (Fig. B).



* Includes closed plantations

** Free-growing plantations & nurseries

*** Sparse forests, burned and dead stands, cutover areas, grassy glades

**** Croplands, grasslands, water, orchards & vineyards, roads, estates, sands, barrens, glaciers

Source: The Federal Forest Service of Russia.

Figure B. *Classification of forest land in Siberia and Far East Russia*.

State Forest Fund lands are subdivided into forest and nonforest lands. Forest lands include forested areas (closed forests) and unforested areas. The forested areas are designated as: 1) stocked forested areas (equivalent to "forests" as defined globally) that meet minimum levels of stocking by live trees, and 2) free-growing plantations and nurseries. Unforested areas include sparse forests, burned and dead stands, unregenerated cutover forests, and grassy glades.

Nonforest lands within the State Forest Fund classification include croplands, grasslands and pastures, water, orchards and vineyards, roads and other developments, sand barrens, rocks, glaciers, swamps, and other miscellaneous classifications of lands without trees. These lands are not expected to ever become forested and are generally not included in any analyses of the future forest status and condition.

The data presented in this study are based on the results of the 1988 State Forest Account of the forest resources of Siberia and Far East Russia, administered through the State Forest Fund. The International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria, obtained this data set from the Federal Service of Forest Management of the Russian Federation, in conjunction with the Russian Academy of Sciences.

The 1988 inventory results are projected using a model developed by scientists from Russia, under guidance by scientists from IIASA, Sweden, Finland, and the United States. The model considers numerous future activities and projects these impacts in several categories of forest resources; the overall objective is to quantify a biological harvesting level that does not threaten long-term development of the forest resources from an ecological and sustainability point of view. In addition, the quality of the potential harvest is projected.

The model describes two primary categories of forests, differentiated by protection from harvest or availability for harvest. For the protected category, the model makes no additional differentiations. For the harvestable category, additional differences are made related to type of harvests and site physiology. These additional data are generated by the model but are not included in this analysis.

The impact of different levels and types of management over time are projected for each of these categories of forest (protected and harvestable) as ten different scenarios. Of the ten scenarios projected by the model, two are for the protected forests and eight are for the harvestable forests. This analysis focuses on six of the ten different management scenarios:

1. No exploitation. This management scenario reflects the protection from harvest projection and considers no additional management efforts. If this scenario is implemented, no harvesting will occur in either the nonexploitable or exploitable forests in Siberia and Far East Russia.

2. No change in management. This management scenario provides the baseline projection and considers no additional efforts related to fire protection and regeneration and no additional environmental restrictions placed on harvest. This scenario does include the ongoing management activities, such as harvesting, fire protection, and planting that have historically occurred. Other management scenarios are compared to this projection to describe the impact of changes in management.

3. Increased regeneration. This management scenario considers increasing regeneration through both natural and artificial methods beyond the historical level. Management activities directed at improving regeneration include silvicultural activities as well as increased levels of planting. This scenario assumes no additional efforts directed at fire protection and prevention beyond the historical level, and no additional environmental restrictions related to harvesting being implemented.

4. Environmental restrictions. This management scenario considers the impact of additional environmental restrictions on the harvest beyond the current level. Environmental restrictions are based on a desired end-state of the resource and consider biodiversity aspects such as maintenance of species diversity and minimum

levels of threatened species, ecological sensitivity such as protection of permafrost, and other considerations such as sustainability. Additional forest management directed at increased regeneration is also included. This management scenario should be compared to the increased regeneration management scenario to separate out the results of environmental restrictions from the impacts of additional regeneration efforts.

5. Increased protection. This management scenario considers the impact of increased levels of fire prevention and protection beyond the current-historical level. This scenario assumes no additional efforts directed at improving regeneration beyond the historical level, and no additional environmental restrictions related to harvesting being implemented.

6. Increased regeneration and fire protection. This management scenario considers the impact of additional forest management directed at increasing regeneration and increasing fire protection, and no additional environmental restrictions placed on harvesting.

The four management scenarios not considered in this analysis are variations on the six primary scenarios: (1) No exploitation of either the nonexploitable and exploitable forests but additional levels of fire protection (a variation of the no exploitation scenario); (2) Additional regeneration efforts with modified environmental restrictions on harvesting (a variation of the increased regeneration scenario); (3) Additional regeneration and fire protection efforts with modified (greater than historical levels but less than those modeled for the environmental restrictions scenario) environmental restrictions on harvesting (a variation of the increased regeneration and fire protection scenario); and (4) Additional regeneration and fire protection with environmental restrictions on harvesting (a second variation of the increased regeneration and fire protection scenario).

The six primary scenarios are projected for 180 years into the future in 20-year increments. Time period one describes what existed as of 1988, thus all data presented in the various scenarios for the initial time period are the same since this is the beginning point and each scenario is based on future activities. Time period two is what is projected to exist as of 2008, depending on the level of management or environmental restrictions. This sequence is carried through until the end of the projection in the year 2168. Because of the long-term nature of forest management and to improve the utility of the data base, results are presented, and analyzed, only for time periods 1988, 2008, 2028, 2068, and 2168. These analysis years reflect what the authors considered to be time frames from which to analyze management impacts in the “short-term” and in the “long-term” future.

The model created numerous data elements. In the Russian forest inventory system, minimum relative stocking levels of 20 percent are required to qualify as forested area (30 percent for young stands). Growing-stock volume is defined as the total amount of

stemwood over bark of living trees. From a utilization point of view, growing-stock volume is commercial wood plus waste wood. Commercial wood is considered industrial wood plus fuelwood. Waste wood is bark of industrial wood; wood fiber that due to low quality can not be utilized as industrial or fuelwood; and, tops and stems ≤ 3 centimeters in diameter.

Industrial wood is wood that is designated for wood processing, construction, etc. Minimum requirements for industrial wood are based on both size and physical quality. These requirements are regulated by "The State Standards" (GOST 9462-86, and 9463-86); two sets of standards are recognized, one for coniferous species and one for deciduous species. Inside of these two broad standards, standards exist for individual species, similar to log grades and tree grades as used in the United States. To be classified as industrial wood for most species, minimum log length is 4.5 meters. For high value species and veneer logs (referred to as sortiments in Russia), a minimum of 3.0 meters length is normally used.

Minimum small-end, inside-bark diameter limits for large logs are ≥ 25 centimeters, medium logs 13 to 25 centimeters, and small logs ≥ 7.5 to 13 centimeters. Minimal levels of decay, crook, sweep, etc. are established for individual species to qualify as industrial wood. On average, fuelwood is considered stemwood from 3 centimeters over bark to 7.5 centimeters inside bark and trees that had up to 50 percent of the total log volume classified as rot or decay.

Data elements include:

1. Projected total area of forest land by forest type for both exploitable and nonexploitable use classifications;

2. Projected total growing-stock volume by species group for both exploitable and nonexploitable use classifications;

3. Projected area of forest land annually harvested by forest type for the exploitable use classification;

4. Projected growing-stock volume annually harvested by species group for the exploitable use classification;

5. Projected classes of annually harvested growing-stock volume that focus on diameter and length size classifications, and end use of the harvested volume.

Each of these data elements is evaluated on a regional and total area basis for the six primary management scenarios for the five time periods. The only exception to this is that the classes of projected harvested growing-stock volume related data are projected for only two time periods - 2008 and 2028.

The geographical delineation of Siberia and Far East Russia is based on three Economic Regions - West Siberia, East Siberia, and Far East Russia. Analyses related to projections of the total area and growing-stock volume, area and growing-stock volume harvested, and utilization classes of the harvested growing-stock volume are conducted for the total study area and the three Economic Regions. In addition, projections of potential future harvests of growing-stock volume are analyzed by the 18 Administrative Regions (subdivisions below the Economic Region level). In addition to the data presented in this text, data are available for each of the 63 Ecoregions (subdivisions below the Administrative Region level) that make up the 18 Administrative Regions that are combined into the three Economic Regions.

Results of these projections are analyzed from both tabular and GIS/mapped formats. Additional GIS related data are available on the Internet through IIASA's Forest Resources Project home page.

http://www.iiasa.ac.at/Research/FOR/~blauberg/wsa

Additional information generated by the model related to age class, the impacts of type of harvest and/or site physiology, the other four management scenarios not included in this analysis, and the 20-year increments between the time periods presented in this analysis are available at the Ecoregion, Administrative Region, and Economic Region level. For additional information about any of these additional data, readers are encouraged to contact IIASA in Laxenburg, Austria.

In the appendix, samples of the maps generated through the GIS analysis are presented. In total, more than 170 different types of maps were generated. Data analyzed through the GIS format include changes in total area of forest land and growing-stock volume over time and the impacts of the various management scenarios, comparisons between projected harvest levels and total growing-stock volume over time and the impacts of the various management scenarios, projected differences in harvest classifications between management scenarios and over time, the role of the transportation infrastructure and industry locations, and other related data analyses. The samples presented in the appendix are intended to provide only examples of the types of analyses that can be completed using the data in a GIS format. The reader is encouraged to visit the Internet address listed for additional information.

4. Model Description

The model used for the analysis in this work is described in detail by Korovoin *et al.* (1996).

The model used for the analysis can be classified as an area matrix model and a discrete optimization model. In its present version, it is a biological model without explicit economic content. The state of the forests is given as the distribution of land on different land types (forest management units, so-called hozsections) and age classes. The development of the forest ecosystem is represented by transitions of areas from one hozsection/age class to another. These transitions are, in turn, governed by variables and fixed parameters in the model. The fixed parameters of the model can be grouped into two categories. One category encompasses parameters that describe ecological processes such as natural succession and species distribution after natural regeneration. The second category holds parameters coding the management principles, such as minimum harvest age and intensity of gradual cutting.

The variables describe the area harvested of each hozsection/age class, the area regenerated naturally and artificially, respectively, and the species regenerated in the artificially regenerated area. Technically, the state description, i.e., the distribution of the area on different classes, is also represented by variables in the model.

The variables represent the choices for regulating the development of the forest as it is represented in the model. As such, they are closely related to the objectives and constraints. The fixed parameters, on the other hand, are descriptive in nature, describing ecological processes or management principles. As such, the discussion of the model is divided into two parts: the global objective and constraints of the model, and fixed parameters of the model.

Objectives and Constraints

The following objective and constraints are used in the analysis:

- Maximize a non-declining total harvest level subject to the constraints
  1. a reasonable distribution of the harvest on different species
  2. a reasonable species composition at the end of the time horizon (180 years)
  3. a reasonable proportion of artificial and natural regeneration.

Fixed parameters of ecological processes

Natural succession: The transition between different species.

Mortality due to disturbances: The transition of areas to bare land due to natural disturbances.

Natural regeneration: The time lag of the species composition after natural regeneration.

Fixed parameters of management practices

Periodicity of selective cutting: The time interval for hozsections with respect to selective cutting.

Time and intensity of gradual cutting: The time interval between the first and final harvest, and the intensity of the first harvest for hozsections of gradual cut.

Minimum age for final felling: The minimum age for the final harvest.

Proportion of final harvest with protection of the undergrowth: The proportion to be harvested with undergrowth left. The remaining part of the harvest is regenerated naturally or artificially.

Volume: The standing volume per hectare for each hozsection.

The number of time periods

The analyses are carried out for 10-year periods encompassing a total of 180 years.

For the detailed mathematical description of the model, we refer to Korovin *et al.* (1996).

5. Results and Discussion

We describe the forest resources of Siberia and Far East Russia, the status of the resource as of 1988, and the projected impacts of various management strategies analyzed.

5.1 Background

The forests of Siberia and Far East Russia are generally classified as boreal forests and are dominated by coniferous forest types. Boreal conifer forests in this region are classified as being either dark or light coniferous forests. Dark coniferous forests are primarily comprised of spruce (*Picea obovata* and *Picea ajanensis*), fir (*Abies sibirica, Abies nephrolepis,* and *Abies sakhalinensis*), and Russian cedar pine (*Pinus sibirica* and *Pinus karajensis*). Siberian and Korean pines are commonly referred to as cedar in Russia and in this analysis. Light coniferous forests are primarily comprised of Scotch pine (*Pinus sylvestris*) and Siberian larch (some eight different species, of which *Larix sibirica, Larix daharcia, Larix gmelinii,* and *Larix cajanderi* are the dominating ones). In addition to the coniferous forests, birch (*Betula pendula*) and aspen (*Populus tremula*), are widely distributed. Birch and aspen forests are primarily found in the forest-steppe transition zone and in areas that have been recently disturbed. So-called hard deciduous species (e.g., beech and oak) cover small areas in Russian Asia, mainly in the southern part of the Far East.

More than half of all forests in Siberia and Far East Russia are growing on low-productivity soils with permafrost. While soil restrictions and short growing seasons could indicate low grow rates, the long day during the growing season and species adaptability to the conditions in Siberia result in growth rates that can exceed 4 cubic meters per hectare per year.

A major part of the forests in this region is ecologically classified as pretundra, northern taiga, sparse taiga, middle taiga, and southern taiga (Kurnaev, 1973). In addition to these forest land classifications, other ecologically important nonforest communities include the steppe and tundra regions.

Pretundra forests represent the latitudinal transition between tundra and taiga forests and are roughly from 100 to 150 kilometers in width. Pretundra forests are generally dominated by a few species and are rarely dense. As one moves north and east, forest canopies become more open with fewer species, average tree diameters decrease, and stem deformities increase. Most are dominated by larch, spruce, birch, and dwarf Siberian pine. The majority of these forests are not accessible for harvesting and make their most significant contributions in the form of watershed protection and wildlife habitat.

Pretundra forests represent the only soil-forming factor in the extreme northern regions (World Bank, 1997) and are rich in fresh water reserves. In addition, they serve as habitat for many wildlife species. For example, all the reindeer pastures in Siberia and Far East Russia are found in the tundra and pretundra forest zones.

In the northern taiga forests, pine and birch are found throughout the area with larch, dwarf Siberian pine, and Siberian spruce becoming more common as one progresses eastward. Like the pretundra forests, the primary role of northern taiga forests is related to ecological functions. Stocking levels in this region rarely exceed 50 cubic meters per hectare.

Sparse taiga forests cover huge areas in basically the Asian part of Russia. The major dominating species is larch. The average growing stock is low, between 40 and 80 cubic meters per hectare. Vast areas of this forest zone are currently unmanaged.

Middle taiga forests are dominated by larch, Siberian spruce, Siberian fir, birch, and aspen. Many of these forests have been subjected to exploitation, mainly through clearcutting. Middle taiga forests commonly have stocking levels of between 80 and 150 cubic meters per hectare.

Southern taiga forests are often comprised of high quality stands of common spruce, Siberian spruce, pine, birch, and aspen. The most productive forests of Siberia and Far East Russia are located in the southern taiga region. Many of these forests can attain stocking levels of more than 250 cubic meters per hectare.

While the forests in Siberian and Far East Russia tend to be dominated by a few overstory species, there is a surprising level of diversity for a boreal forest area. More than 140 different tree species have been identified in Far East Russia alone (Ageenko, 1995; Krankina and Ethington, 1995). Krankina and Ethington present an excellent discussion of the distribution and characteristics of the major commercial tree species in Siberia and Far East Russia.

The historical fate of forests in Siberia and Far East Russia, from an extraction perspective, has been closely tied to the infrastructure system of roads and rails and proximity to rivers. For example, construction of the Baikal-Amur Mainline Railroad brought a wave of settlers into this region and harvest levels dramatically increased. Before the construction of this railway, minimal harvesting occurred due to the extremely low population levels. Those forests within a reasonable distance of this transportation system have been extensively harvested unless protected by legislative or administrative statue. Forests well beyond the transportation system remain relatively untouched, although they are constantly impacted by recurrent fires, and some large regions are under increased pressure of industrial development (e.g., oil and gas exploitation).

Harvesting levels generally increased through the 1980s, began to decline in the early 1990s, and have continued to decline since the recent change in the social and political structure of Russia (for further detail on the historical harvesting, see Appendix Table 11). Even during the periods of high harvesting levels, less than 50 percent of the

annual allowable cut (from a long-term sustainability viewpoint) was actually harvested. The majority of the growth has remained unharvested.

While removals have been considerably lower than growth, distribution of the growth and removals has been a concern. As noted, harvesting has been focused on accessible areas. Forest resources have been depleted in traditional harvesting areas, but other, more remote, areas have never been harvested.

Clearcutting has been the most frequently used harvesting technique in Siberia and Far East Russia. Although this method has served early successional species well, it has not been the optimum harvesting technique for the regeneration of later successional species such as cedar.

Age class distribution is of concern from a harvesting perspective. More than 50 percent of the closed canopy forests of Russia east of the Ural Mountains are classified as mature or overmature forests. For example, in West Siberia, more than 50 percent of the total area of forest land had an average stand age of more than 100 years in 1988 (Fig. C). As these stands continue to mature, concerns will rise about the increased potential for pest outbreaks and wildfires commonly associated with overmature forest stands.

The economic potential of forests declines once an overmature stage is attained. To maintain a sustainable forest industry, an even spread between the age classes is desired. Natural disturbances, such as fire and pest infestations, can move an overmature forest back to a younger age class. But, the degree of disturbances in many areas of Siberia and Far East Russia has not been sufficient to make significant impacts on a large landscape level.

Until the late 1700s to early 1800s, the number of wildfires in Siberia and Far East Russia was relatively low. However, with increased human inhabitation, the number of wildfires increased. For example, Krasnoyarsk Kray experienced an average of about 4 wildfires per year in the early 1800s, but this had increased to an average of 25 wildfires per year by the 1900s (Ivanova *et al.*, 1997).

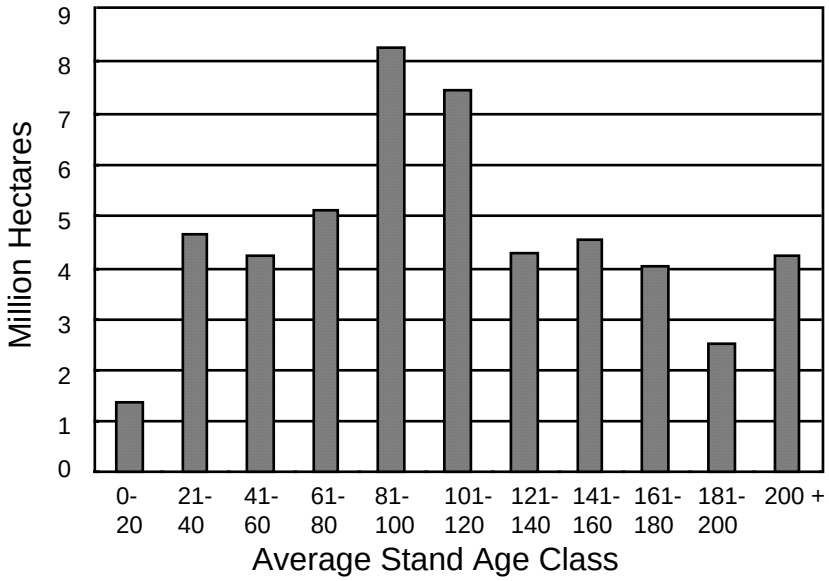


Figure C. *Average stand age for forest land in West Siberia in 1988.*

On a regional or local level, commercial losses due to these natural disturbances can be significant and can destroy the local economic base of a community. In addition, the environmental degradation on a local level is of serious concern. For example, an outbreak of Siberian silkworm (*Dendrolimus sibiricus*) in East Siberia (mainly Krasnoyarsk Kray) in 1994-1996 damaged 783,000 hectares of coniferous forest with an estimated loss of more than 40 million cubic meters of wood (Isaev, 1997). This volume is equal to more than 3 times the annual allowable cut for Krasnoyarsk Kray and more than 17 times its actual conifer harvest in 1994 (World Bank, 1997).

Throughout the results and discussion section, data presented are based on the appendix tables. Where tables are presented within the text, they are summaries of the in-depth appendix tables. To minimize the difficulty in understanding the broad trends presented, percentages and comparisons are generally used in lieu of specific data elements.

5.2 Initial Situation

In 1988, there was an estimated total forest area of 557 million hectares with a growing-stock volume of 61 billion cubic meters.

In 1988, there was an estimated 251.6 million hectares of exploitable and 305.7 million hectares of nonexploitable forest in the entire region for an estimated total forest area of 557.3 million hectares (Table A). The current role of protection from harvest (nonexploitable) varies as one moves from west to east across the region. In West Siberia, only one-third of the forest area is under protection from harvest compared to 57 percent in East Siberia and 59 percent in Far East Russia.

Table A. *Area, growing-stock volume, and growing-stock volume per hectare of forest by Economic Region and exploitability for harvest, Siberia and Far East Russia, 1988.*

Economic Region	Exploitable Forest	Nonexploitable Forest	Total
Area of forest land		(Million hectares)	
West Siberia	50.7	24.1	74.8
East Siberia	95.0	127.4	222.4
Far East Russia	105.9	154.2	260.1
Total	251.6	305.7	557.3
Growing-stock volume		(Million cubic meters)	
West Siberia	6,718.5	3,758.3	10,476.8
East Siberia	13,347.9	16,344.9	29,692.8
Far East Russia	10,249.2	10,565.4	20,814.6
Total	30,315.6	30,668.6	60,984.2
Growing-stock volume/ha		(Cubic meters)	
West Siberia	132.5	155.9	140.1
East Siberia	140.5	128.3	133.5
Far East Russia	96.8	68.5	80.0
Total	120.5	100.3	109.4

This increasing level of protection from harvest primarily reflects site restrictions associated with the permafrost and mountainous zones. In addition to the protected forest area, a significant level of other nonforest lands is also under protection due to ecological considerations. For example, vast stretches in the northern portions of the Yakutia Republic and Chucha Administrative Regions are classified as tundra without trees. These areas are also protected for ecological reasons. Where forest is protected from harvest due to ecological concerns related to protecting the permafrost, those forests generally represent the southern most extremes of the permafrost zone. As one moves northward, the climate becomes increasingly hostile for trees and they correspondingly respond with lower sizes, growth rates, and stocking levels until trees eventually disappear from the landscape.

In 1988, these forest areas contained 30.3 billion cubic meters of growing-stock volume in exploitable forests, and 30.7 billion cubic meters of growing-stock volume in nonexploitable forests from a total growing-stock volume of 61.0 billion cubic meters. As the protected area of forest increased from west to east, so did the percentage of growing-stock volume protected from harvest. West Siberia had 36 percent, East Siberia 55 percent, and Far East Russia 51 percent of their total growing-stock volume protected from harvest. While, in total, 55 percent of the area of forest is protected from harvest, about 50 percent of the total growing-stock volume is protected from harvest.

6. Projections

Model projections are analyzed and described for nonexploitable forest area and volume, and exploitable forest area and volume.

6.1 Nonexploitable Forest – Total Area and Growing-Stock Volume

The nonexploitable resource is projected to remain static in area and experience slight increases in growing-stock volume for all management scenarios across the region through 2168 (Appendix Table 1). By that time, growing-stock volumes on nonexploitable forests are projected to increase from 6 percent in East Siberia to 7 percent in the Far East and 9 percent in West Siberia. This projected scenario is based on the concept that area designated as being reserved from harvesting will continue to be protected. Thus, the area protected is projected to remain relatively static. On these protected areas, fires, pest outbreaks, and natural mortality (from succession, competition, etc.) will occur, resulting in a loss of existing vegetation. However, growth will also continue to occur. The projected overall increases in net growing-stock volumes are based on growth being projected to exceed mortality in the nonexploitable forests of Siberia and Far East Russia. Thus, the stated projected growing-stock volumes are net totals.

The total projected net growth results are comprised of all forest types across all sites within the protected reserved (nonexploitable) lands. To help explain the role of succession in the growth to mortality relationship, forest types are compared for West Siberia. The total net change in growing-stock volume in West Siberia between 1988 and 2168 for the nonexploitable forests is a projected increase of 327 million cubic meters. However, as one narrows the focus to comparing forest types, the picture changes. The nonexploitable cedar forest type in West Siberia is projected to increase by 188 million cubic meters by the year 2168, an increase of 20 percent (Fig. D). During this same time period, the birch forest type is projected to decrease by 18 million cubic meters, a decrease of 5 percent.

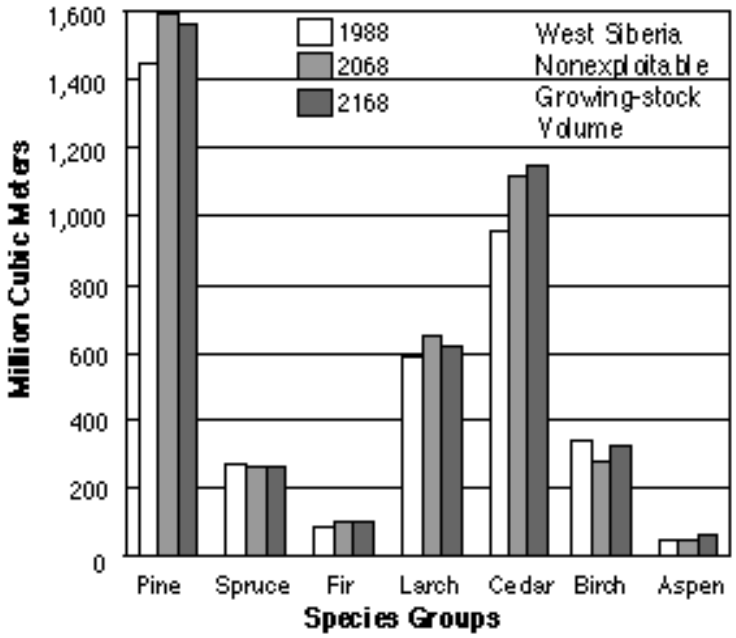


Figure D. *Projected potential nonexploitable growing-stock volume in West Siberia by species group and selected years.*

This projection reflects the role of succession built into the model. Birch is considered an early successional forest type while cedar is considered a mid- to late-successional forest type. As time progresses, stands currently classified as birch are projected to be overtaken by other species that are more shade-tolerant, such as cedar. If events that alter the natural successional process, such as fire and pest outbreaks, occur in birch stands, they can result in regeneration of the birch. However, these disturbances are not expected to be of sufficient magnitude to maintain the levels of birch found in the 1988 inventory. Stands of birch that are not disturbed will succeed to other forest types, resulting in the same total area of protected forest but in dramatically different species compositions, forest types, and growing-stock volumes. The above description of the future nonexploitable cedar and birch forests of West Siberia is projected to occur across the entire region of Siberia and Far East Russia.

In the entire region of Russia east of the Ural Mountains, the nonexploitable forest resource is projected to be dominated by larch throughout the study period (Fig. E). Despite the dominance of larch, the total nonexploitable larch growing-stock volume is projected to slightly decline over time. While the larch resource will slightly decline, increases are expected in the total nonexploitable volume for pine, spruce, fir, and birch with static levels of cedar, dwarf pine, and aspen. In relation to the conifer resource, the deciduous resource is expected to be relatively small (Fig. E) in the nonexploitable forests.

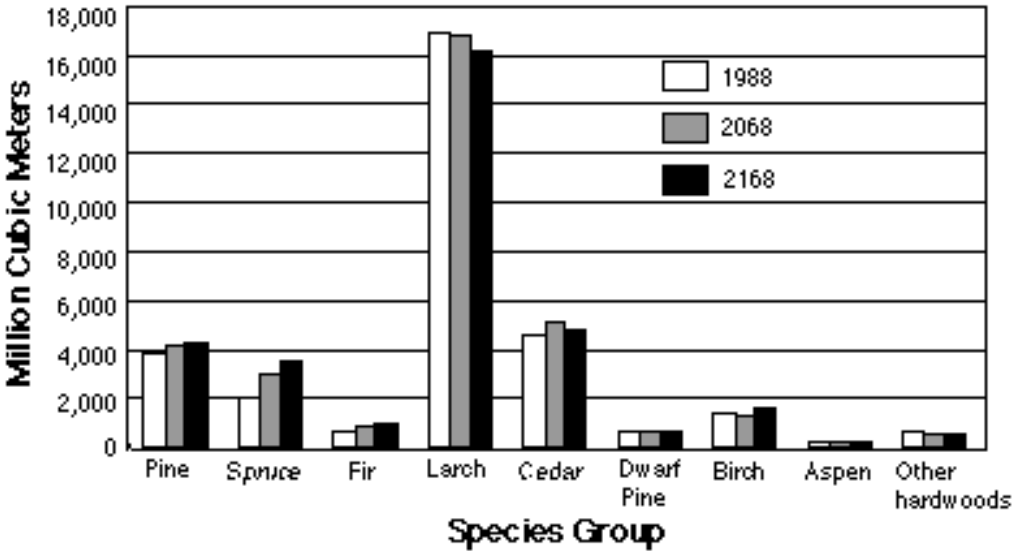


Figure E. *Projected potential nonexploitable growing-stock volume for Siberia and Far East Russia by species group and selected years.*

Thus, while it appears that the total area of nonexploitable forest will be relatively stable with slight increases in total volume expected, there will be significant changes in the forest types/species groups within this resource.

6.2 Exploitable Forest – Total Area and Growing-Stock Volume

Although there are minor variations between the different management options, the total area of exploitable forest land is projected to decrease by about 2 million hectares in West Siberia, about 3.5 million hectares in East Siberia, and about 2.8 million hectares in Far East Russia between 1988 and 2168 (Appendix Table 1). These decreases represent from 2 to 4 percent of the total area, depending on the management scenario and the Economic Region.

During the same time period, total growing-stock volumes in the exploitable forests are projected to decrease by about 1.25 billion cubic meters in West Siberia (about 18 percent), by 1.67 billion cubic meters in East Siberia (13 percent), and by 784 million cubic meters in the Far East (8 percent). Depending on the management scenario analyzed, these percentages slightly increase or decrease but, in general, they represent the average among all the management options (Appendix Table 2).

The most accurate and reliable data from the 1988 Russian forest inventory are determined to be related to growing-stock volumes. As a result, trends between Economic Regions, management scenarios, and species groups are analyzed for

growing-stock volumes. Trends established for volume will generally hold true for area due to the strong relationship between volume and area in the study region.

In 1988, there were an estimated 30.3 billion cubic meters of exploitable growing-stock volume in Siberia and Far East Russia. By the year 2168, it is projected that there will be between 26.7 and 28.3 billion cubic meters of exploitable growing-stock volume in this region, depending on the management scenario implemented (Fig. F). The management scenario that results in the most exploitable growing-stock volume in 2168 is the Environmental Restrictions option (28.3 billion cubic meters). The No Change in Management option is projected to result in the lowest level of exploitable growing-stock volume in 2168 (26.7 billion cubic meters).

In addition to the various management scenarios, we projected the expected total exploitable growing-stock volume if no harvesting occurred. This option of no exploitation shows an increase in the total expected growing-stock volume of from 30 billion cubic meters in 1988 to almost 38 billion cubic meters in 2168 (Fig. F). The difference between the no exploitation scenario and the other scenarios reflects the expected harvesting levels.

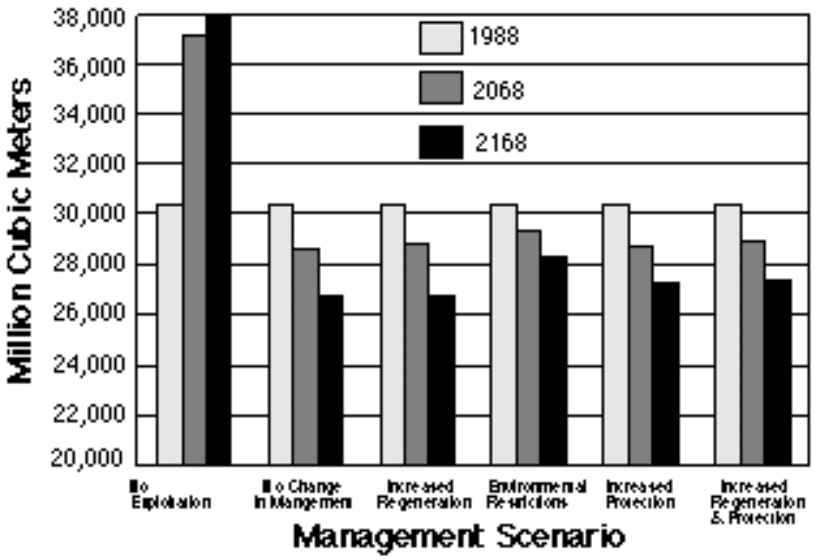


Figure F. *Projected potential exploitable growing-stock volume for Siberia and Far East Russia by management option and selected years*.

Although a decrease in total exploitable growing-stock volume is projected, all management scenarios result in increases in total exploitable growing-stock volume for the spruce, fir, and cedar species groups by the year 2168. These species groups represent the later seral stages of forest succession for Siberia and Far East Russia, demonstrating the successional processes that are projected to occur in the next 180 years. The cedar species group is expected to experience the largest increase in

exploitable growing-stock volume, rising by almost 50 percent. Decreases in total exploitable growing-stock volume are projected for the pine, larch, birch, aspen, and other deciduous species groups by the year 2168.

The management scenarios No Change in Management and Increased Regeneration and Protection are compared (Fig. G) over selected time periods. During the next 80 years, the No Change in Management scenario is expected to result in more growing-stock volume available for harvest for all species groups. However, by the year 2168, the increased efforts directed at regeneration and protection are expected to result in more volume available for harvest. This exhibits the long-term nature of most forest management practices.

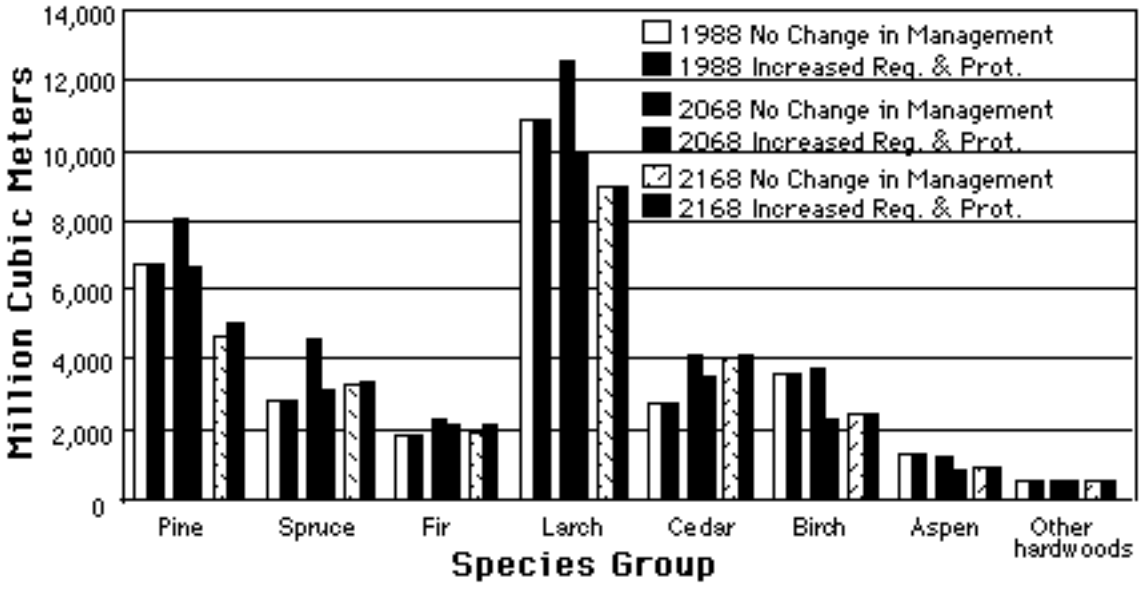


Figure G. *Projected potential exploitable growing-stock volume for Siberia and Far East Russia by No Change in Management and Increased Regeneration and Protection by species group and selected years*.

Analyzing the expected impact of the different management scenarios on total volume for the entire Siberian and Far East Russia region shows that while trends of increases or decreases are similar, individual species groups fluctuate within these trends. The Environmental Restrictions management scenario is projected to result in the most exploitable growing stock for pine and larch, and the least exploitable growing stock for aspen and birch. This reflects the protection associated with the projected restrictions on harvesting. Aspen and birch rely on disturbances, such as harvesting, to regenerate. If the harvesting levels are restricted, aspen and birch stands will progress to later successional stages, hence the decrease in these species groups and the increases in the pine and larch species groups. The Increased Protection management scenario is

projected to result in the most exploitable growing-stock volume for the spruce, cedar, and other deciduous species groups.

The No Change in Management scenario is projected to result in the lowest levels of exploitable growing-stock volume for the pine and fir species groups. The Increased Regeneration management scenario is projected to result in the lowest levels of exploitable growing-stock volume for the spruce, larch, cedar, and other deciduous (hardwoods) species groups.

While succession is projected to be the driving force causing change in forests across the landscape, the impact of management activities (increased fire prevention and regeneration efforts) and harvesting restrictions makes significant contributions to the projected differences between management scenarios. Increased efforts at either regeneration or fire protection are projected to be not as effective as individual treatments when compared to a combination of both types of treatments.

When we analyze the implications of these levels of exploitable growing-stock volumes, total volumes might not be as important as the species groups in which the greater volumes occur. For example, depending on markets, lower volumes of higher value species might be preferred over larger volumes of lower value species. Additionally, different species groups play different ecological roles. Increased management efforts that result in overall lower volumes but greater environmental benefits might be preferred.

The management scenario to implement should be selected at the Economic Region level because of expected differences between regions. As an example, the expected end results of the No Change in Management and Increased Regeneration and Protection scenarios are portrayed for West Siberia in Figure H as a comparison for Figure G. The analysis of expected growing-stock volumes for all of Siberia and Far East Russia (Fig. G) showed that initially the No Change scenario resulted in greater levels of total volume. However, if only West Siberia is analyzed, the increased regeneration and protection efforts are projected to result in greater volumes (Fig. H). The reader is encouraged to compare these two figures to see these regional differences. Thus, while overall policy must be national in scope, implementation should be regional due to the regional differences.

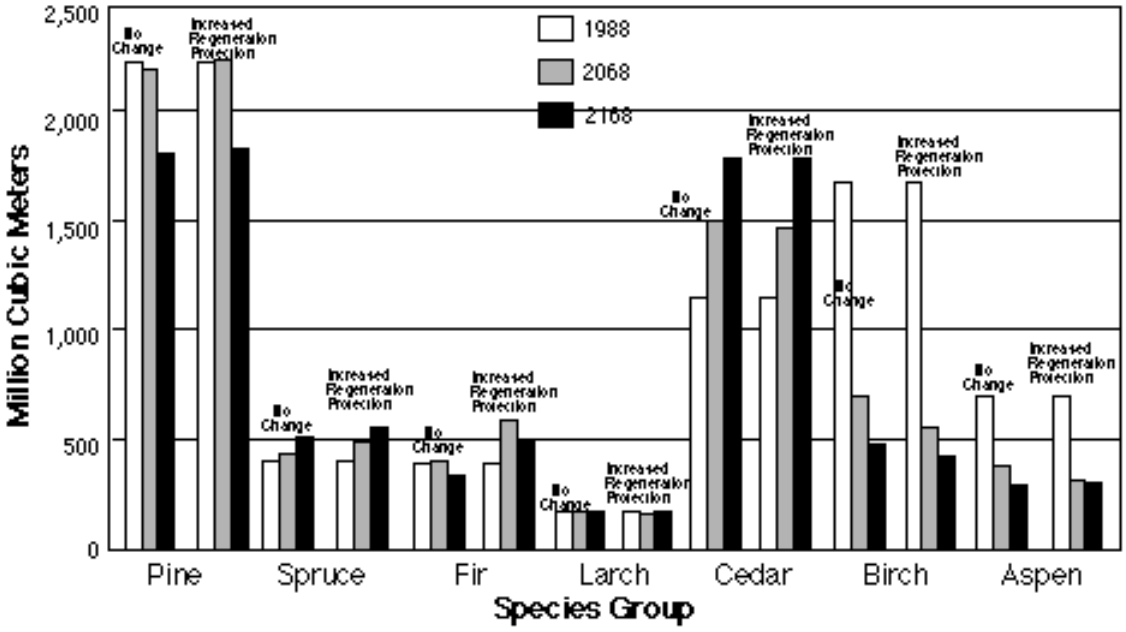


Figure H. *Projected growing-stock volume in West Siberia by year and species group for selected management options*.

On a regional basis, the Increased Regeneration and Protection option is projected to result in the most exploitable growing-stock volume for West Siberia (Fig. I). For both East Siberia and Far East Russia, the Environmental Restrictions option results in the most exploitable growing-stock volume. Depending on the final objectives, this projection implies that the selection and implementation of management options might vary by region.

In 2168, exploitable growing-stock available for harvest in West Siberia is projected to approach 5.5 billion cubic meters for all management scenarios. Total exploitable growing-stock volumes in 2168 are projected to range from 11.8 to 12.7 billion cubic meters for East Siberia and from 9.5 to 10.2 billion cubic meters in Far East Russia, depending on the management scenario implemented. In total, depending on the management scenario, growing-stock volumes are projected to range from 26.7 to 28.3 billion cubic meters in 2168 in Siberia and Far East Russia.

6.2.1 Impact of Increased Regeneration

To determine the impact of increasing regeneration efforts, the No Change in Management and Increased Regeneration management scenarios are compared for the exploitable forest resource. Both of these scenarios assume equal levels of fire prevention and protection and harvest restrictions. Under the Increased Regeneration management scenario, by the year 2168, it is expected that there will be an additional

106 million cubic meters of exploitable growing-stock volume in West Siberia when compared to expected growing-stock volumes under the No Changes in Management scenario. Pine, spruce, larch, and cedar forest types are projected to differ in total growing-stock volume between the two management options by no more than 3 percent after 180 years. However, growing-stock volumes in the fir forest types are projected to be about 57 percent greater in the Increased Regeneration scenario. Thus, increased regeneration efforts are projected to be directed at increasing the fir resource while maintaining as much of the other conifer resource as possible.

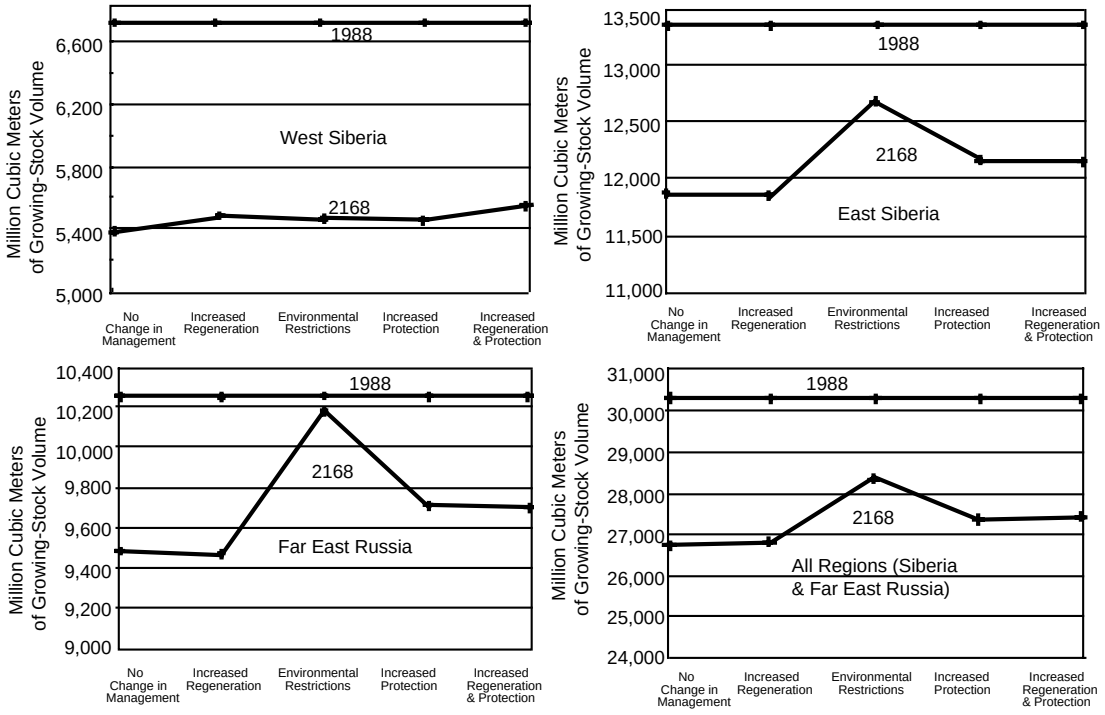


Figure I. *Projected potential exploitable growing-stock volume by Economic Unit and Management Scenario.*

In both East Siberia and Far East Russia, projections through 2168 show no major differences in total growing-stock volume between the No Changes in Management and Increased Regeneration management scenarios (Fig. I). However, differences are expected in the composition of the growing-stock volume. Increased management directed at improved regeneration is expected to result in greater volumes of the more preferred conifer species when compared to the No Changes in Management scenario.

6.2.2 Impact of Increased Protection

To determine the impact of increased fire prevention and protection, projected volumes of exploitable growing stock in 2168 are compared between the No Change in Management and the Increased Protection scenarios for the exploitable forest resources. These two different scenarios vary only by the degree of fire protection provided. By the year 2168 in West Siberia, the Increased Protection scenario is projected to have about 85 million cubic meters more growing-stock volume than the No Change in Management option. By the year 2168, increasing fire protection is projected to result in an additional 306 million cubic meters of exploitable growing-stock volume in East Siberia, and 225 million cubic meters in Far East Russia, when compared to the no changes option. In total, for all of Siberia and Far East Russia, increasing fire protection is projected to result in 616 additional million cubic meters of exploitable growing-stock volume.

Increasing the level of fire protection results in increases in total projected growing-stock volumes of 194 million cubic meters for cedar, 184 million cubic meters for larch, 107 million cubic meters for spruce, 80 million cubic meters for pine, 62 million cubic meters for fir, and 9 million cubic meters for other deciduous species by the year 2168 in all of Siberia and Far East Russia. At the same time, it is expected that birch and aspen will decrease in total exploitable growing-stock volume by 14 and 9 million cubic meters, respectively. Thus, increasing fire protection efforts is projected to favor the conifer resource through enabling the normal successional processes to occur, which result in birch and aspen being succeeded by conifers; lowering the mortality rate for conifers from wildfires; and allowing the natural regeneration of shade-tolerant conifer species to establish and succeed the overmature overstory.

Decisions about implementing the policy of increasing fire protection efforts should consider the value of 616 million additional cubic meters of exploitable growing-stock volume; the higher value of both the existing and additional wood fiber due to better quality on higher value species; and the improved environmental conditions associated with protected stands. For example, water quality, permafrost protection, and carbon sequestration all are enhanced with fire protection.

6.2.3 Comparing Increased Regeneration with Increased Protection

The Increased Regeneration management option is expected to result in about 22 million more cubic meters of growing-stock volume than the Increased Protection option in West Siberia by the year 2168. However, Increased Protection is projected to result in 317 million cubic meters more in East Siberia and 243 million more cubic meters in Far East Russia by the year 2168 than the increased Regeneration option. Thus, for the entire region, protection efforts are expected to result in an additional 538 million cubic meters of exploitable growing-stock volume by the year 2168.

The selection of which management option to implement will depend on the costs of implementation and the overall management objectives. Compared to increased protection efforts, increased regeneration efforts are expected to result in more exploitable pine, fir, and aspen and less spruce, larch, cedar, birch, and other deciduous species.

If sufficient levels of funding and desire exist, perhaps the optimum scenario is the combination of both increased regeneration and protection efforts. Although there are some variations between species groups, this management option results in the best distribution of the more desired species over the long term. Combining increased efforts for both regeneration and protection is projected to result in the greatest levels of exploitable growing stock for pine, fir, and total volume.

From a management implementation viewpoint, it is logical to increase efforts for both protection and regeneration at the same time. For example, if only regeneration efforts are implemented and the improved stands burn before they can make ecological contributions, or before they are harvested, then the costs and efforts associated with the improved regeneration will have been wasted. Improving regeneration and/or protection will require improving access to the stands. Once access is available, the use of this access should be optimized through both management activities.

6.2.4 Impact of Additional Environmental Restrictions

Additional environmental restrictions are based on a desired end-state of the resource and consider biodiversity aspects such as maintenance of species diversity and minimum levels of threatened species, ecological sensitivity such as protection of permafrost, and other considerations such as sustainability. To determine the impact of environmental restrictions, projected volumes of exploitable growing stock in 2168 are compared between the Increased Regeneration and the Environmental Restrictions scenarios. These two scenarios project existing levels of fire protection, increased regeneration efforts, and different levels of environmental restrictions. We use these two scenarios to determine the impact of environmental restrictions because no management scenarios are projected solely with additional environmental restrictions and no increased levels of regeneration or fire protection. Comparing the Increased Regeneration scenario with the Environmental Restrictions scenario is based on the assumption that overall, increased efforts directed at regeneration had less of a total impact on exploitable growing-stock volume than additional fire protection.

Compared to the Increased Regeneration scenario, the Environmental Restrictions scenario is projected to result in 10 million fewer cubic meters of exploitable growing-stock volume for West Siberia, 832 million more cubic meters for East Siberia, and 714 million more cubic meters in Far East Russia by the year 2168. For the entire region,

additional environmental restrictions are projected to result in an additional 1,537 million cubic meters of exploitable growing-stock volume when compared to the Increased Regeneration scenario.

For East Siberia, Far East Russia, and the total region, the Environmental Restrictions management scenario is projected to result in the most exploitable growing-stock volume by the year 2168 when compared to all other management scenarios. This is due to restrictions being placed on what species can be harvested and at what level. Additional environmental restrictions are projected to result in the greatest levels of exploitable growing stock for pine and larch and nearly the greatest levels of spruce when compared to all of the other management options. Although this option has the greatest levels of end volumes, it comes at the cost of lower harvest levels. Policy decisions about the implementation of this scenario will need to consider the potential negative economic impacts of restricted harvest with the positive environmental impacts of greater levels of selected species.

6.3 Exploitable Forest -- Annual Harvested Area and Volume

When analyzing the projected harvest available, we consider only the exploitable resource because the nonexploitable resource is not projected to be available for harvest. This section contains one of the primary focuses of the overall study -- future wood supply available for harvest. Data presented to this point about area and volume represent the total standing resource. However, analyses for area and volumes available for harvest are based on annual averages.

6.3.1 Area Annually Available for Harvest

In all management scenarios for West Siberia, the area projected to be annually harvested decreases from the established 1988 levels through 2068 (Appendix Table 3). From 2068 forward, the area available for harvest increases as the impacts of current management decisions from the various scenarios pay off in terms of increased areas and volumes available for harvest. In East Siberia and Far East Russia, the total area projected to be annually harvested increases from 1988 through 2168 for all management scenarios.

By the year 2168, the Increased Regeneration and Protection scenario results in the most area of forest land annually available for harvest in Siberia and Far East Russia, with more than 3 million hectares per year. These results reflect the impact of management because this scenario is least restrictive for environmental constraints and most proactive for improving regeneration and fire protection. The No Change in

Management scenario results in the least area of forest land available for harvest, about 2.8 million hectares per year.

While there are periodic decreases and increases in the total area of forest land available for harvest between the various management scenarios, area available generally increases with time for all species groups across Siberia and Far East Russia.

6.3.2 Volume Annually Available for Harvest

6.3.2.1 Siberia and Far East Russia

As previously mentioned, the Russian Forest Inventory System provided the most accurate and reliable data for growing stock when compared to area. Based on this, the majority of the analyses conducted pertain to growing-stock volume projected to be annually available for harvest. The trends established for volume hold true for area and, as a result, can be applied to both volume and area.

The Increased Regeneration and Protection management scenario provides the greatest projected volume available for harvest

From the perspective of growing-stock volume annually available for harvest, the Increased Regeneration and Protection management scenario provides the greatest projected volume available for harvest by the year 2168 in Siberia and Far East Russia (Appendix Table 4). This correlates with the findings for area of forest land available for harvest. There is only a 16-percent difference between the scenarios in the amount of wood volume annually available for harvest. The projected volume annually available for harvest by the year 2168 ranges from 314 million cubic meters per year (Increased Regeneration and Protection) to 269 million cubic meters per year (Environmental Restrictions). This level of projected volume annually available for harvest is a tremendous amount of wood fiber, representing a stack of wood a meter high and a meter wide that would circle the earth almost 8 times.

Under all management scenarios, the growing-stock volume annually available for harvest in Siberia and Far East Russia is projected to continually increase. On a species group basis, total growing-stock volume annually available for harvest is projected to increase through all time periods for all conifers and deciduous species for all management scenarios. The degree of increase varies by scenario, but all have a positive upward trend. The birch and aspen growing-stock volume annually available

for harvest resource is projected to increase between 1988 and 2028, decrease between 2028 and 2068, and then increase again from 2068 onward.

Initially, there is a relatively small difference between management scenarios because most forest management practices take time to reflect their economic impact. For example, additional regeneration efforts might take more than 100 years to result in increased income from the increase in potential wood products. However, environmental benefits arrive at a faster rate. For example, environmental benefits from improved fire protection can be realized within one year if a large-scale fire is prevented. At the end of the projection, the gap between management scenarios grows, exhibiting the impact of the additional efforts.

As with total area and growing-stock volume, there are smaller differences between management scenarios in the total area and volume annually available for harvest are smaller than differences between individual forest types. The variation between management scenarios in growing-stock volume annually available for harvest by the year 2168 ranged from pine differing by 22 percent, spruce 25 percent, fir 28 percent, larch 10 percent, cedar 15 percent, birch 81 percent, and aspen 32 percent. The low variation between management options for the conifer resource compared to the birch and aspen resource shows the stability of the conifers and their economic and environmental preference built into the model.

The No Changes in Management scenario ranked next to last in terms of total volume annually available for harvest in Siberia and Far East Russia. If conifer production is the most desired outcome for forest management in this region, this management scenario might be the least preferred

At the end of the study period (2168), the No Change in Management scenario ranks next to last in terms of total growing-stock volume annually available for harvest in Siberia and Far East Russia, but it provides nearly the most potential harvestable volume for the birch and aspen species groups. Thus, the decision on which management scenario to select will depend on the demand for wood products and other considerations. If it is projected that the most viable wood product to supply is aspen-birch, no changes in management might be the most desired option despite its overall low production. However, if conifer production is the most desired outcome, then this management scenario might be the least preferred.

In addition, other considerations such as wildlife habitat might favor one management scenario over another. For example, some management scenarios are projected to provide more disturbance, resulting in greater area and volumes of early successional forest types, the preferred habitat for many wildlife species. If it is decided that wildlife

habitat for species that rely on disturbance is of high importance, perhaps these disturbance-oriented management scenarios might be selected despite their low total production of wood fiber. At the same time, other wildlife species that rely on later successional stages for their habitat will be negatively impacted by the higher disturbance rate. The decision on which management scenario to recommend will need to consider a wide range of variables beyond simply which produces the most wood fiber.

We project that by the year 2168, about one-third of the total volume annually available for harvest will be from larch (Fig. J). Other species availability for harvest by the year 2168 include about 20 to 23 percent from pine, 10 to 14 percent from spruce, 8 to 13 percent from birch, 8 to 9 percent from fir, and 6 percent from cedar and aspen, depending on the selected management scenario.

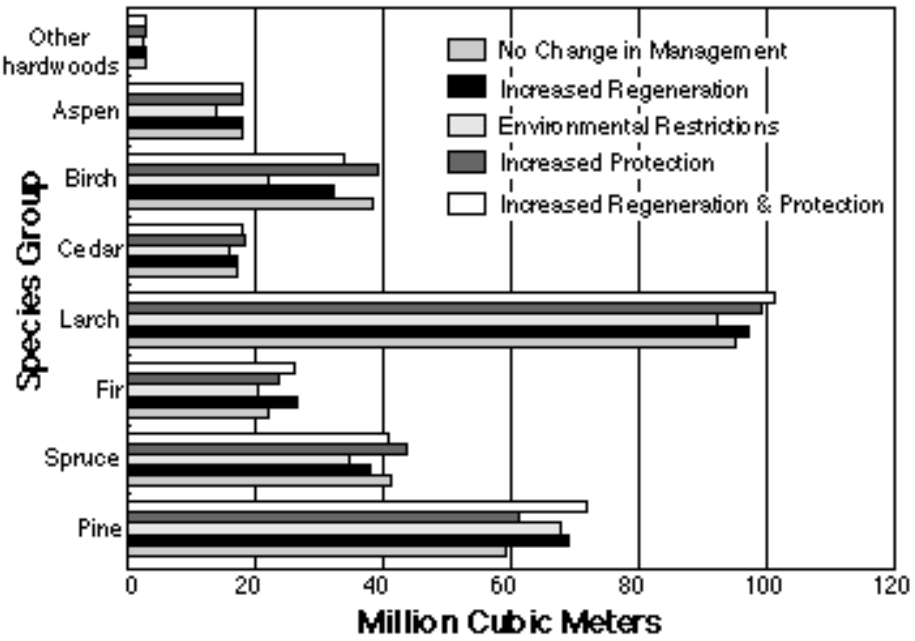


Figure J. *Growing-stock volume projected to be annually available for harvest in Siberia and Far East Russia in 2168 by species group and management scenario.*

6.3.2.2 Economic Regions

The trends established for all of Siberia and Far East Russia hold true on an Economic Region level for total volume annually available for harvest. However, these trends vary from the total on a species availability level among Economic Regions. Readers

are encouraged to review the appendix tables for their particular arena of interest. As an example, in West Siberia it is projected that through the next 20 to 40 years, birch and aspen are projected to account for more than half of all of the wood fiber available for harvest in this region for all management scenarios. This dominance by birch and aspen is projected to continue through 2068 and then begin a relatively steep decline. As a comparison, in the next 20 to 40 years, birch and aspen are projected to represent about one-fourth of the total wood fiber available for harvest each year from all of Siberia and Far East Russia and, by the year 2168, only one-sixth of the total is expected to come from these two species.

Projected volumes annually available for harvest on a per hectare basis show that the greatest levels of harvestable volumes are expected to be found in West and East Siberia (Appendix Table 5). In total, both Economic Regions are expected to have about 123 to 128 cubic meters per hectare available for harvest. There are no statistical differences among management scenarios in total volume per hectare available for harvest. However, there are important differences between the two regions in terms of species composition. In West Siberia, aspen, birch, spruce, and fir are all expected to have above average production rates on a per hectare basis. Comparatively, in East Siberia, aspen, pine, birch, and fir are expected to have the highest levels of production on a per hectare basis. For example, in West Siberia, the annual harvest of spruce is expected to average about 170 cubic meters per hectare for all management scenarios by the year 2168, while in East Siberia, spruce is expected to average about 124 cubic meters per hectare. Conversely, pine in West Siberia is expected to average about 124 cubic meters per hectare while pine in East Siberia is projected to average about 177 cubic meter per hectare.

6.3.2.3 Administrative Regions

Analyses of volume available for harvest each year by Administrative Regions show the localized nature of the Siberia and Far East Russia forest resource. For example, while larch is present in all Economic Regions totals, several Administrative Regions are projected to have no larch available for harvest throughout the study period. Due to the vastness and magnitude of the total resource, most analyses conducted in this study focus on information at the Economic Region level. However, many interesting trends and projections occur at the Administrative Region level, and readers are encouraged to further investigate the data presented at the Administrative level in the appendix tables (Appendix Table 6).

6.3.2.3.1 West Siberia

In West Siberia, most of the forest land and growing-stock volume is found in the Tomsk and Tyumen Oblasts (according to the administrative division of 1988). Correspondingly, most of the projected volume available for potential harvest is also

found in these two oblasts. Both are projected to annually have between 19.5 and 29.2 million cubic meters of volume available for harvest, depending on the management scenario and time period. The other Administrative Regions are projected to have between 1.5 and 5.7 million cubic meters of volume annually available for harvest.

In the Tomsk Oblast, we project a decided change in the species composition harvested during the next 180 years for all management options. Through the next 40 years (through 2028), more than 60 percent of the total harvest is projected to come from the birch and aspen resource. Between 1988 and 2028, the spruce, fir, and cedar species groups are projected to account for only 17 percent of the total available harvest from the Tomsk Oblast. However, by the year 2168, we expect that most of the volume available for harvest will be from the pine, fir, cedar, and spruce species groups.

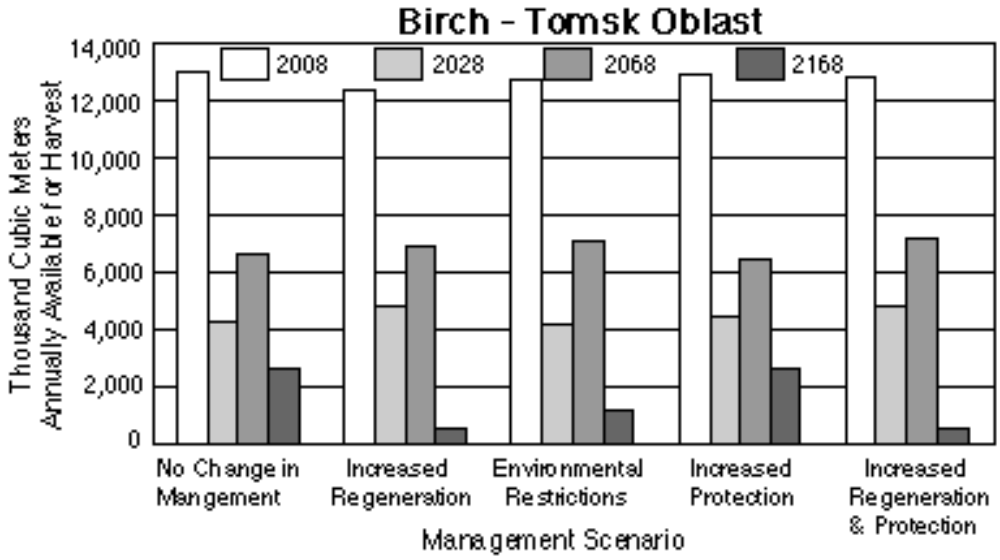
To demonstrate the impact of the various management scenarios in the Tomsk Oblast, we present the projected growing-stock volumes available for harvest for selected years for fir and birch (Figs. K and L). By the end of the projection period, the impact of management on birch is obvious, and the greatest amounts of birch is provided by the No Change in Management and Increased Protection scenarios. At the same time, the Increased Regeneration and Increased Regeneration and Protection scenarios result in the most fir volume being annually available for harvest in the Tomsk Oblast.

The birch resource is projected to decrease over time in terms of volume available for harvest due to an expected continuation of succession, which favors conifers over deciduous species such as birch. The aspen resource is also projected to decline over time in not only the Tomsk Oblast but also in all the other Administrative Regions.

The conifer volume available for harvest is projected to increase but at differing rates, depending on species and management scenario. In most Administrative Regions in West Siberia, the greatest increases in growing-stock volume available for harvest are expected to occur in the pine and cedar species groups.

All management scenarios for this region have similar trends by species, but the magnitude of the trend and the end-state vary between scenario. Similar analyses can be conducted for other Administrative Regions, for other species, and for other years, but the primary lesson is that selection of management scenarios will depend heavily on the desired end-state for the various species.

Figure K. *Birch growing-stock volume projected to be annually available for harvest in the Tomsk Oblast by management scenario for selected years.*



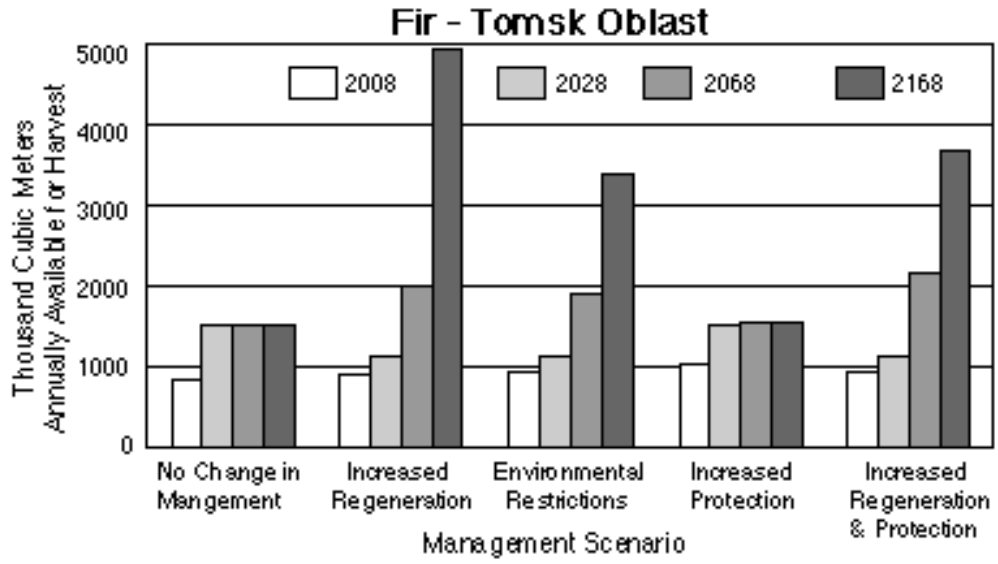


Figure L. *Fir growing-stock volume projected to be annually available for harvest in the Tomsk Oblast by management scenario for selected years.*

6.3.2.3.2 East Siberia

In East Siberia, the Chita and Irkutsk Oblasts and Krasnoyarsk Kray are the primary Administrative Regions in terms of annual supply of volume available for harvest. In

all Administrative Regions, the Increased Regeneration and Protection scenario results in the greatest levels of volume available for harvest on an annual basis.

The total volume available for harvest is projected to increase over time for all Administrative Regions and all management scenarios. As in West Siberia, deciduous species are projected to decline in importance while conifers are expected to increase in availability. To demonstrate the impact of the various management scenarios in East Siberia, we selected Krasnoyarsk Kray and projected volumes available for harvest for larch and pine (Figs. M and N).

The volume of larch available for harvest in this region is projected to increase in all management scenarios. The Increased Regeneration and Protection and Increased Regeneration management scenarios are expected to result in the greatest volumes of larch by the year 2168. This shows the impact of additional regeneration efforts on larch compared to other management scenarios.

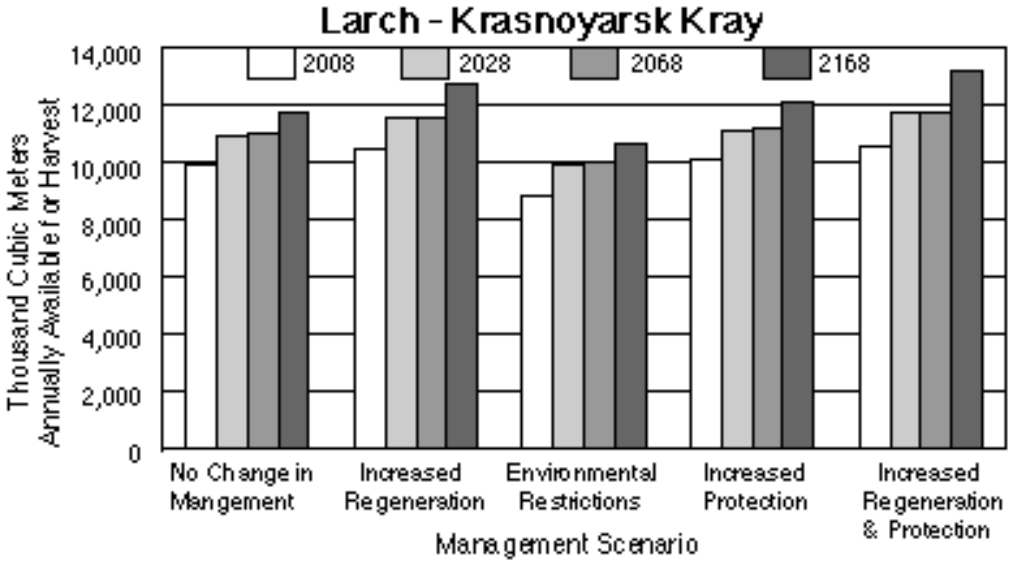
As with larch, the amount of pine available for harvest is expected to continue to increase across time for all management scenarios in Krasnoyarsk Kray. The greatest amounts of pine are expected to be available from the Environmental Restrictions scenario. Compared to increased protection efforts, additional regeneration efforts are expected to lead to more volume available for harvest, similar to that found for larch in the same region.

However, by the year 2168, additional protection efforts are expected to lead to more harvestable volume for spruce, fir, cedar, and birch in Krasnoyarsk Kray, compared to additional regeneration efforts. In addition, the Increased Protection scenario is projected to result in almost 2 million cubic meters more of total volume available for harvest by the year 2168 than the Increased Regeneration scenario in this kray.

6.3.2.3.3 Far East Russia

In Far East Russia, the Yakutia Republic, Khabarovsk Kray, Amur Oblast, and Sakhalin are projected to be the primary sources of wood for future harvests. Some of these Administrative Regions represent some of the most productive forests of the entire Siberia and Far East Russia region. With increased efforts in regeneration and protection, we project that by the year 2068, almost 31 million cubic meters of wood in the Yakutia Republic, more than 26 million cubic meters in Khabarovsk Kray, more than 18 million cubic meters in the Amur Oblast, and almost 9 million cubic meters in Primorski Kray will be annually available for harvest. These harvestable volumes are projected to continue to increase through the end of the study period, 2168.

Figure M. *Larch growing-stock volume projected to be annually available for harvest in Krasnoyarsk Kray by management scenario for selected years.*



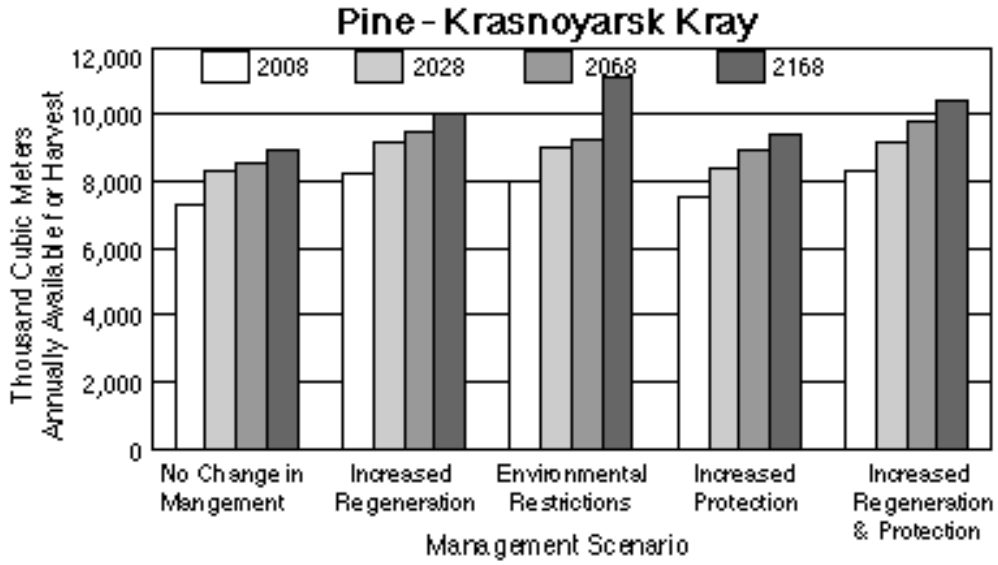


Figure N. *Pine growing-stock volume projected to be annually available for harvest in Krasnoyarsk Kray by management scenario for selected years.*

Although some of the most productive forests are found in Far East Russia, some of the least hospitable, and most climatically challenging, lands that still contain trees are also found in this Economic Region. For example, even with increased management efforts, by the year 2168, barely 2 million cubic meters of wood are projected to be annually available for harvest in the Kamchatka and Magadan Oblasts combined.

As with the other Economic Regions, all Administrative Regions are projected to continue to increase in total volume of wood available for harvest over time. In Far East Russia, larch is by far the dominant species, and in some Administrative Regions, it is the only commercial species. As a result, no in-depth analyses are conducted here on the impact of the various management scenarios on individual species availability for harvest.

Due to the dominance of larch, the vast majority of the decisions about which management scenario to implement should be based on the scenario's impact on larch from a fiber production viewpoint. However, from an ecological perspective, the existence of other less dominant species is sometimes more important than slight changes in the dominant species. Thus, if ecological considerations drive the decisionmaking process, selecting which management scenario to implement should be based on the scenario's impact on other species.

6.4 Harvest as a Percent of Total Volume

In the next 20 years, the projected annual harvested volume is expected to range from 0.83 to 0.89 percent of the projected total growing-stock volume for all of Siberia and Far East Russia, depending on which management scenario is implemented (Appendix Table 7). Of the management options, the Increased Regeneration and Increased Regeneration and Protection scenarios are expected to allow for the greatest percentages of volume to be harvested.

By 2008, the aspen resource is expected to receive the greatest relative harvesting pressure (2.0 percent of the total volume annually harvested) and birch is expected to receive the second greatest harvesting pressure (1.3 percent of the total volume annually harvested). Cedar is expected to receive the least harvesting pressure (0.32 percent of the total volume annually harvested) in Siberia and Far East Russia.

In both 2068 and 2168, birch and aspen are projected to still be heavily harvested with cedar receiving the least harvesting pressure. Harvesting pressure, measured as a percent of total volume available for harvest, on the other conifers is expected to remain static through 2068 and then steadily increase through 2168. From 2008 to 2068, conifer volume harvested is projected to increase but at the same time the total conifer volume is projected to increase at a similar rate, resulting in similar harvesting percentages.

These totals are for all forest types on all sites with different potential productivity. Each site offers different levels of productivity and each forest type grows differently. The projected harvest of about 1 percent of the total growing-stock volume implies an

average "rotation" of about 100 years for the exploitable forest lands of Siberia and Far East Russia. However, forest types such as aspen and birch have rotation lengths of considerably less than 100 years, and other forest types, such as cedar and spruce, have rotation lengths of considerably more than 100 years.

Due to these differences, analyses of the future impact of harvesting on total growing-stock volume need to be conducted by individual forest types. The percentages of total growing-stock volume annually available for harvest reflect the growth rate and longevity of each forest type. Cedar is perhaps the longest lived forest type and correspondingly has the lowest percentage of total volume available for annual harvest -- less than 0.5 percent or an implied "rotation length" of about 200 years. Aspen is perhaps the shortest lived forest type and correspondingly has the highest percentage of total volume available for annual harvest -- up to 3.0 percent or an implied "rotation length" of about 33 years.

By the year 2168, the Environmental Restrictions scenario is projected to provide the lowest percentages of total volume harvested at 0.95 percent of total volume. This management scenario is projected to result in the greatest levels of total growing-stock volume and the lowest levels of harvesting, when compared to all other management scenarios.

Interestingly, the Increased Regeneration and Increased Protection scenarios both result in 1.12 percent of total volume being annually available for harvest, but when combined, they result in 1.14 percent of total volume being harvestable. In addition, this management scenario provides for what we consider to be the optimum mix of species available for harvest and for environmental contributions.

6.4.1.1.1 West Siberia

Comparing total growing-stock volume to the volume annually available for harvest in West Siberia over time shows a slight increase in the percentage of total volume to be harvested. All management scenarios expect between 0.9 and 1.0 percent of the total growing-stock volume to be annually harvested in the near future and about 1.1 percent of the total growing-stock volume to be annually harvested by the year 2168.

Comparisons of projected harvested volume to total growing-stock volume by forest type for all management scenarios in West Siberia show that:

> pine dominated forest lands will experience annual harvest rates of from 0.6 to 0.7 percent of the total growing-stock volume in the near future with long-term increases to about 1.3 percent of the total;

spruce dominated forest lands will experience annual harvest rates of about 0.7 to 0.8 percent in the near future and increase to about 1.3 percent of the total volume;

fir dominated forest lands are projected to be annually harvested at a rate of about 1.2 percent in the near future and increase to about 1.8 to 2.1 percent of the total volume by the year 2168;

larch dominated forest types could be annually harvested at a rate of about 0.8 to 1.0 percent of the total volume in the near future and slightly increase to 1.2 percent;

cedar dominated forests are projected to be able to provide annual harvests of 0.4 percent of the total growing-stock volume in the near future and increase up to 0.5 percent of the total volume by the year 2168;

birch is projected to be able to be annually harvested at a rate of about 1.5 percent of the total growing-stock volume in the next 20 to 40 years and remain steady or decrease to 0.9 percent of the total in the next 180 years, depending on the management scenario implemented; and,

aspen is projected to be harvested at a rate of about 2.2 to 2.6 percent in the near future and remain at that level through the year 2168.

The potential harvest levels of fir as a percentage of total volume are the highest in West Siberia, compared to the other Economic Regions. Most of the other species groups in West Siberia have projected harvest levels similar to those of other regions.

6.4.1.1.2 East Siberia

Comparing total growing-stock volume to the volume annually available for harvest in East Siberia over time shows a slight increase in the percentage of total volume to be harvested. All management scenarios expect between 0.8 and 0.9 percent of the total growing-stock volume to be annually harvested in the near future and from 0.9 to 1.2 percent of the total growing-stock volume to be annually harvested by the year 2168.

Comparisons of projected harvested volume to total growing-stock volume by forest type for all management scenarios in East Siberia show that:

pine dominated forest lands will experience annual harvest rates of from 0.8 to 0.9 percent of the total growing-stock volume in the near future with long-term increases to from 1.1 to 1.6 percent of the total (these harvest levels are higher than that expected for West Siberia for both time periods);

spruce dominated forest lands will experience annual harvest rates of about 1.0 to 1.2 percent in the near future and increase to about 1.0 to 1.3 percent of the total volume (these harvest levels are higher than that expected for West Siberia for both time periods);

fir dominated forest lands are projected to be annually harvested at a rate of about 0.8 percent in the near future and increase to up to 1.1 percent of the total volume by the year 2168 (these harvest levels are lower than that expected for West Siberia for both time periods);

larch dominated forest types could be annually harvested at a rate of about 0.8 to 0.9 percent of the total volume in the near future and are expected to remain at the same level or slightly increase to 1.1 percent by the year 2168 (similar harvest levels as for West Siberia);

cedar dominated forests are projected to be able to provide annual harvests of 0.3 percent of the total growing-stock volume in the near future and only slightly increase by the year 2168 (similar to slightly lower harvest levels as for West Siberia);

birch is projected to be able to be annually harvested at a rate of about 1.2 percent of the total growing-stock volume in the next 20 to 40 years and increase to up to 1.7 percent of the total in the next 180 years, depending on the management scenario implemented (lower levels of harvest initially but higher levels of harvest over time when compared to West Siberia); and,

aspen is projected to be harvested at a rate of about 1.7 to 1.9 percent in the near future and increase to over 2.0 percent by the year 2168 (these harvest levels are lower than those expected for West Siberia for both time periods).

6.4.1.1.3 Far East Russia

Comparing total growing-stock volume to the volume annually available for harvest in Far East Russia over time also shows a slight increase in the percentage of total volume to be harvested, similar to the other Economic Regions. All management scenarios expect between 0.7 and 0.8 percent of the total growing-stock volume to be annually harvested in the near future and from 0.9 to 1.1 percent of the total growing-stock volume to be annually harvested by the year 2168.

Comparisons of projected harvested volume to total growing-stock volume by forest type for all management scenarios in Far East Russia show that:

pine dominated forest lands will experience annual harvest rates of from 0.8 to 0.9 percent of the total growing-stock volume in the near future with long-term increases to from 1.0 to 1.1 percent of the total (these harvest levels are higher than those expected for West Siberia and lower than those expected for East Siberia for both time periods);

spruce dominated forest lands will experience annual harvest rates of about 1.0 to 1.1 percent in the near future and about 0.9 to 1.3 percent of the total volume (initially higher than West and East Siberia and then similar harvest levels);

fir dominated forest lands are projected to be annually harvested at a rate of about 0.6 percent in the near future and increase to 0.8 percent of the total volume by the year 2168 (these harvest levels are lower than those expected for West and East Siberia for both time periods);

larch dominated forest types could be annually harvested at a rate of about 0.8 percent of the total volume in the near future and are expected to slightly increase to about 1.1 percent by the year 2168 (lower harvest levels than for West and East Siberia);

cedar dominated forests are projected to be able to provide annual harvests of 0.3 percent of the total growing-stock volume in the near future and increase to 0.6 percent by the year 2168 (in the long term, these are the highest harvest levels expected for cedar in all the Economic Regions);

birch is projected to be able to be annually harvested initially at a rate of about 0.9 percent of the total growing-stock volume and increase to as much as 1.5 percent of the total in the next 180 years (except for the Environmental Restrictions scenario, which projects a decrease to 0.8 percent by the year 2168), depending on the

management scenario implemented (lower levels of harvest than in West and East Siberia); and,

aspen is projected to be harvested at a rate of about 1.4 to 1.6 percent in the near future and increase to as much as 1.7 percent by the year 2168 (except for the Environmental Restrictions scenario, which projects a decrease to 1.2 percent by the year 2168). These harvest levels are lower than those expected for West and East Siberia for both time periods.

The variability expressed in both the near future and long term reflects the differences among management scenarios. The management scenarios that provide for more intensive management of the conifer resource obviously result in greater opportunities for harvesting these species in the future.

6.5 Size and Quality of Wood Fiber Available for Harvest

Of the total wood fiber supply from Siberia and Far East Russia, we project that about two-thirds will be of sufficient quality to be considered for use as industrial wood. The remaining one-third will be either fuelwood or harvesting residues.

In total, it is projected that between 228 and 244 million cubic meters of volume could be available each year for harvest from throughout Siberia and Far East Russia by the year 2008, depending on the management scenario. The lower projected production is based on the No Change in Management scenario for West Siberia and the Environmental Restrictions management scenario for East Siberia and Far East Russia. The higher projected production is based on the Increased Regeneration and Protection management scenario for all three Economic Regions. Of this total, about two-thirds could be of sufficient quality to be utilized as industrial wood fiber (148 to 160 million cubic meters per year), and about one-fifth could be utilized as fuelwood (44 to 47 million cubic meters per year). Based on the projections, about 85 percent of the total wood fiber supply from Siberia and Far East Russia in the next 20 to 40 years could be considered commercial with associated economic value (Appendix Table 8). The remaining 15 percent of the wood fiber supply is projected to be harvesting residues (33 to 36 million cubic meters per year).

Although, the percentages of potential utilization remain somewhat constant over time, the total wood fiber supply from Siberia and Far East Russia is projected to be able to reach a level of between 245 and 261 million cubic meters per year by 2028 (Table B). While this is an impressive level of potential wood fiber, it represents less than one

percent of the total growing-stock volume projected to be standing in Siberia and Far East Russia in 2028.

Table B. *Projected quality of annual harvest from Siberia and Far East Russia by the year 2028 by management scenario.*

	Commercial wood							
	Industrial wood							
Management Scenario	Large	Medium	Small	Total Industrial	Fuelwood	Total commercial	Residue	Total harvest
	(Thousand cubic meters)							
No Change in Management	41,745	90,045	33,300	165,090	46,835	211,925	37,664	249,589
Increased Regeneration	43,055	93,915	34,534	171,504	47,592	219,096	38,581	257,677
Environmental Restrictions	41,679	89,026	32,430	163,135	45,770	208,905	36,759	245,664
Increased Protection	42,389	91,515	33,807	167,711	47,382	215,093	38,218	253,311
Increased Regeneration & Protection	43,639	95,129	34,913	173,681	48,115	221,796	39,095	260,891

In both time periods studied, larch is projected to be the dominant species group, representing about one-third of the total annual wood fiber supply from Siberia and Far East Russia. Other species groups (and their projected percentages of total projected wood fiber harvest) include: birch (20 percent), pine (18 percent), spruce (8 percent), aspen (8 percent), fir (6 percent), cedar (5 percent), and other deciduous species (2 percent). Although some species groups appear to have a smaller impact on the total wood fiber supply, their economic importance should also be considered. For example, cedar is projected to represent only 5 percent of the total wood fiber supply, but it is also one of the most highly valued species. The economic impact of the cedar resource could rival that of other species groups with significantly higher total production levels.

There are many regional differences in Siberia and Far East Russia forests in terms of species composition and age class distribution. For example, larch is projected to account for only 3 percent of the total industrial wood fiber supply annually produced in West Siberia in the next 40 years. However, larch is projected to account for more than 50 percent of the total industrial wood fiber supply in Far East Russia during the same time.

The classification of the annual industrial wood fiber supply is based on three log size classes: large, medium, and small. Although there are differences in individual species groups, overall about one-fourth of the industrial wood fiber supply is projected to be in the large log size class. This class represents the most suitable size for processing with the greatest range of potential products. Predicted log size is important because larger

logs are primarily used for sawlogs for lumber production. Generally, the larger the log the greater the potential economic value on a per unit basis.

For all management scenarios and time periods, cedar, fir, and "other deciduous species" all are expected to have about 40 percent of their total expected industrial wood classified as being of the highest quality (Table C). About one-third of the spruce, one-fourth of the pine, and one-fifth of the larch industrial wood are projected to be of the highest quality. The birch and aspen resource is projected to have the smallest amounts of higher quality industrial wood.

Table C. *Projected quality of annual harvest from Siberia and Far East Russia in 2028 by selected management scenario and species groups.*

Species Group	Commercial wood							
	Industrial wood							
	Large	Medium	Small	Total industrial	Fuelwood	Total commercial	Residue	Total harvest
No Change in Management (Baseline)								
Pine	9,237	18,380	5,609	33,226	4,341	37,567	4,465	42,032
Spruce	5,902	8,752	2,902	17,556	2,603	20,159	3,109	23,268
Fir	4,753	5,819	1,034	11,606	1,651	13,257	1,670	14,927
Larch	11,682	34,306	10,341	56,329	8,179	64,508	16,743	81,251
Cedar	5,261	5,100	1,580	11,941	1,400	13,341	2,052	15,393
Birch	2,635	12,507	9,168	24,310	16,580	40,890	5,770	46,660
Aspen	1,417	4,373	2,439	8,229	8,243	16,472	3,037	19,509
Other deciduous	859	805	226	1,890	3,840	5,730	819	6,549
Total	41,745	90,045	33,301	165,090	46,835	211,925	37,664	249,589
Increased Regeneration & Protection								
Pine	10,340	20,992	6,403	37,735	4,945	42,680	5,078	47,758
Spruce	5,916	8,809	2,906	17,631	2,617	20,248	3,121	23,369
Fir	4,806	5,909	1,052	11,767	1,689	13,456	1,696	15,152
Larch	12,109	35,927	10,874	58,909	8,501	67,409	17,378	84,787
Cedar	5,450	5,320	1,641	12,411	1,462	13,873	2,129	16,002
Birch	2,756	12,948	9,244	24,948	17,153	42,101	5,925	48,026
Aspen	1,375	4,390	2,557	8,322	7,770	16,092	2,918	19,010
Other deciduous	889	833	232	1,954	3,984	5,938	849	6,787
Total	43,639	95,129	34,913	173,681	48,115	221,796	39,095	260,891

The different management scenarios are not expected to differ noticeably in the quality aspects of the projected wood supply from Siberia and Far East Russia by 2008. In addition, all management scenarios project only slight increases in quality by 2028. The primary reason for this is the long-term nature of wood fiber quality. We modeled the quality aspects of the wood fiber supply from Siberia and Far East Russia for only 2008 and 2028. If the classification of quality is modeled for 2068 and 2168, the impacts of management on quality would be more dramatic. For example, preventing wildfires has a positive impact not only on volume available for harvest but also on the quality of the volume. Thus, while we anticipate that implementing additional management for the forests of Siberia and Far East Russia will improve the quality of the wood fiber available for harvest, it will take some time for these impacts to be quantifiable. As a

result, the analyses of the quality of the potential wood fiber supply on an Economic Region level do not focus on the different management options.

6.5.1.1.1 West Siberia

In West Siberia, approximately 56 percent of the wood fiber available for harvest in the next 40 years is considered industrial wood and 33 percent is considered available for fuelwood use. Thus, in total, about 89 percent of the total wood fiber available can be used for commercial purposes. The remaining 11 percent is considered residue. These percentages of utilization remain relatively constant across the different management scenarios and through time.

The percentage of the projected total annual wood fiber supply represented by fuelwood in West Siberia is considerably greater than in East Siberia and Far East Russia. This ratio of fuelwood (lower quality than industrial wood fiber) to total wood fiber has implications related to quality of the resource. However, the percentage of total wood fiber projected to be available annually for harvest that is projected to become residue is lowest in West Siberia, primarily due to the species composition of the forests in this region. Birch and aspen are generally used for non-lumber products such as paper and paperboard. As a result, these species will typically have lower levels of residues because smaller trees and tops can be used. For example, logs with small end diameters as small as 10 centimeters can be used in pulping but would be left in the woods in lumber production.

While the percentages of wood fiber available in the different utilization classes remain relatively constant across the different management scenarios in West Siberia, there are important differences in the total volume available in the different classes. The No Change in Management and Increased Regeneration and Protection scenarios represent the lowest and highest extremes of the range in potential annual industrial output among the various management scenarios. The potential annual industrial output, if there are no changes made in the current management strategy, is projected to be 32.9 million cubic meters in 2008 and 34.1 million cubic meters in 2028. However, if additional efforts are made in improving regeneration and fire protection levels, we estimate that up to 35.2 million cubic meters in 2008 and 36.3 million cubic meters per year in 2028 could be available for industrial wood utilization.

The projected annual industrial wood fiber supply from West Siberia is predicted to be composed of about 23 percent from large-size logs, 59 percent from medium logs, and 18 percent from small logs in the next 20 years (by 2008). In West Siberia, these percentages of annual industrial wood supply are not predicted to change between 2008 and 2028. Total predicted annual output will rise over time, and the increase will occur across all three log size class.

Because the predicted percentages by size class and utilization category are relatively constant within each management scenario, the analysis of the availability by species group is presented for only the No Change in Management and the Increased Regeneration and Protection scenarios. In West Siberia for the next 40 years, birch is the dominant species, representing about one-third of the total industrial wood fiber supply in 2008 and about one-fourth in 2028. Aspen is projected to account for an additional 10 percent in 2008 and 8 percent in 2028 of the total harvested industrial wood fiber. Together, birch and aspen will represent more than 40 percent of the annual wood fiber harvested for industrial purposes in 2008 and about 36 percent in 2028. Most species are projected to increase in total volume harvested between 2008 and 2028 in not only West Siberia but also in the other Economic Regions as well. However, in West Siberia, the harvest of industrial quality birch and aspen is projected to decrease between the two time periods. Because of the age structure of the forests currently dominated by birch and aspen.

Birch and aspen have rapid growth rates and are short-lived, which can result in rotation lengths of as few as 40 to 60 years. Generally, birch and aspen stands are even-aged due to their reliance on disturbance for regeneration. Fortunately for the birch and aspen, almost all harvesting in this region is done by clearcuts. As a result, most of the stands currently dominated by birch and aspen will regenerate naturally back to these same species after the harvesting-related disturbances.

Thus, projecting that the total harvest of industrial quality aspen and birch will decline assumes two main points. First, many of the existing aspen and birch stands are currently (as of 1988) either near or past their midpoint in average age. In the next 40 years, these stands will begin to decline and succeed to other forest types if they are not harvested. These stands will continue to be forested but with a different species composition and different stand size structure. Secondly, the projections assume that the harvesting levels in the past 40 years are lower than what we project for the ensuing 40 years. A long-term goal for maintaining these species as well as for maintaining harvesting and manufacturing capabilities is to have some form of even-age class distribution across the region, which can help ensure a relatively consistent flow of fiber.

Pine, with almost 30 percent, and cedar, with 15 percent, will be the other important species groups from an industrial wood fiber supply perspective in West Siberia for the next 40 years. Cedar is an important species for Russia due to its high economic value and its wide variety of potential products. Well over half of the total projected harvest of industrial quality cedar from all of Siberia and Far East Russia is expected to come from West Siberia.

6.5.1.1.2 East Siberia

In East Siberia, we project that approximately 75 percent of the wood fiber available for harvest in the next 40 years will be industrial quality wood. During the same time period, we expect an additional 10 percent of the total volume of wood fiber available for harvest in East Siberia will be of sufficient quality to be available for fuelwood use. Thus, in total, about 85 percent of the total wood fiber available can be used for commercial purposes. The remaining 15 percent is considered residue, which is not expected to be used.

The Increased Regeneration and Protection management scenario is expected to provide the greatest volume of industrial wood fiber available for harvest in both time periods, 78.7 million cubic meters per year by 2008 and 85.9 million cubic meters per year by 2028. The Environmental Restrictions Management scenario is projected to supply the lowest total volume of wood fiber available for industrial harvest in both time periods in East Siberia (note that in West Siberia, the No Change in Management scenario is projected to supply the lowest total annual wood fiber supply). By 2008, we anticipate that by implementing additional environmental restrictions, about 73.0 million cubic meters in 2008 and 80.1 million cubic meters in 2028 will be available for industrial utilization.

Of the total wood fiber predicted to be available for harvest for industrial purposes in East Siberia, it is projected that about one-fourth will be classified as large size, one-half will be classified as medium, and one-fourth will be classified as small. We predict that between 2008 and 2028, the quantity of industrial wood fiber in the better/larger classes will slightly increase with a correspondingly slight decrease in the small classification.

Most of the total industrial wood fiber available for harvest in both time periods in East Siberia is projected to come from the larch, pine, and birch species groups. Combined, these three species groups represent 75 percent of the total industrial wood fiber available from East Siberia (larch 33 to 36 percent, pine 25 to 26 percent, and birch 13 to 15 percent of the projected total wood fiber available for industrial production). All of the other species groups combined account for only 25 percent of the predicted wood fiber supply from East Siberia.

Considering the size class distribution within species groups reveals that about 30 to 33 percent of the pine and spruce, 42 to 45 percent of the fir, 17 to 18 percent of the larch, 54 to 60 percent of the cedar, and less than one percent of the aspen and birch species groups are projected to be classified as large industrial wood available in the next 40 years in East Siberia. Thus, while overall about one-fourth of the total wood fiber is projected to be classified in the large category, there are important differences in how this wood fiber is distributed among species groups.

6.5.1.1.3 Far East Russia

In Far East Russia, approximately 62 percent of the wood fiber available for harvest in the next 40 years is projected to qualify as industrial wood with an additional 21 percent classified as available for fuelwood use. Thus, in total, about 83 percent of the expected total harvestable wood fiber from Far East Russia could be used for commercial purposes.

The percentage of the projected total annual wood fiber supply represented by fuelwood in Far East Russia is considerably greater than in East Siberia (21 percent compared to 10 percent). This implies an overall lower quality of trees in Far East Russia than in East Siberia because fuelwood is the lowest value end use for commercial trees in Siberia and Far East Russia.

The percentage of residue, compared to the total wood fiber supply, is expected to be higher in Far East Russia (18 percent) than in either East Siberia (15 percent) or West Siberia (11 percent). This also implies an overall lower quality of trees in Far East Russia compared to East Siberia because poorer quality trees generate more harvesting residue.

The lower quality currently found in Far East Russia is perhaps due more to previous harvesting than to site quality. This region has historically received significant harvesting pressure on its large, high-quality trees. However, of the entire study area, the Far East Russia Economic Region has some of the best quality sites with the greatest potential for producing high-quality industrial wood. Khabarovsk Kray, Yakutia Republic, and Amur Oblast are some examples of local areas with excellent potential to produce high-quality, high-value wood products. As a result, in the long term with proper forest management, this region is expected to have quality classifications that are equal to, or perhaps even better than, the West and East Siberia Economic Regions.

As in East Siberia, the Environmental Restrictions and Increased Regeneration and Protection management scenarios in Far East Russia represent the extremes of the range in potential annual industrial output. The potential annual industrial output if additional environmental restrictions are implemented is projected to be 42.5 million cubic meters in 2008 with an increase to 47.2 million cubic meters by 2028. If additional efforts are made in improving regeneration and protection, we project that 46.6 million cubic meters per year by 2008 and 51.4 million cubic meters per year by 2028 could be available for industrial utilization.

The projected annual industrial wood fiber supply from Far East Russia is predicted to be composed of about 26 percent from large-size logs, 58 percent from medium logs, and 15 percent from small logs by 2008. By the end of 2028, the percentage of large-size logs is projected to increase to 29 percent with slight decreases in the percentage of output for the medium and small logs. Total predicted annual output would rise over

time, and most of this increase would occur in the large log size class. For most species, larger logs have more value than smaller logs due to their wider range of potential products, and they typically command higher market prices.

The species distribution of the projected annual industrial production in Far East Russia is considerably different than those of the other Economic Regions. Larch, with well over 50 percent of the total, dominates the projected annual industrial wood fiber supply in Far East Russia. Other species of importance in this region are spruce (an estimated 20 percent) and pine (an estimated 8 to 10 percent). All the other species groups together barely account for 10 percent of the total projected annual industrial wood fiber production. As a comparison, birch, pine, and aspen are the dominant species groups in West Siberia.

There are considerable differences in the size class distribution of industrial wood by species groups between Far East Russia and the other regions. In the next 40 years, it is projected that about 18 percent of the pine, 18 to 25 percent of the birch, 23 percent of the larch, 27 to 32 percent of the fir, 27 to 33 percent of the aspen, 33 to 36 percent of the spruce, and 67 percent of the cedar species groups industrial wood available will be in the large size classification in Far East Russia. Thus, although slightly more than one-fourth of the total wood fiber is projected to be classified in the large size category, there are important differences in how this wood fiber is distributed among species groups.

Of interest in the size class distribution is the greater percentage of aspen and birch in the large size class in Far East Russia. In the other Economic Regions, these species are predominately classified in the smaller size classes. Although this situation will perhaps provide an economic advantage in the near future, it has other future implications. Because both aspen and birch are relatively short-lived and many of these stands are currently either mature or overmature (based on their larger average size class), these species will greatly diminish in magnitude through forest succession in the near future unless active management is undertaken to ensure their regeneration.

7. Discussion and Recommendations

We present our management recommendations; present several harvesting strategies; compare our recommended harvesting levels to historical levels; and present the impacts of transportation, industry, and markets.

Overall, the forested lands of Siberia and Far East Russia will play a critical role in the world's future. The magnitude of this resource requires that the decision on which

management scenario to implement should be based on sound economic and ecological principles. Realistically, all the different management scenarios are expected to provide more volume available for harvest than what will probably be harvested. Thus, policy decisions should also include factors such as environmental impact, maintenance of local economies, and social considerations.

Growth rates in Siberia and Far East Russia's boreal forests are sometimes low compared to those in many temperate and tropical forested regions. To a large extent, this is explained by a wide distribution of stand replacing and non-stand replacing disturbances. The average relative stocking of forests of main forest species ranges from 0.51 and 0.57 in the Asian Economic Regions. The current productivity of the forests does not exceed 55 percent of the theoretically achievable productivity (Shvidenko and Nilsson, 1997). However, these boreal forests can have acceptable growth rates due to longer days during the growing season and the tree species adaptability to the colder climatic growing conditions. As a result, management activities can be justified from a potential productivity standpoint. In addition, the many ecological contributions from boreal forests weigh in favor of implementing intensive forest management.

We recommend that the Increased Regeneration and Protection management scenario be implemented.

The Increased Regeneration and Protection management scenario is recommended for implementation. Although the other management scenarios also have positive aspects, this scenario is projected to provide the best mix of benefits. In addition, this scenario provides for the greatest levels of the more highly desired species from an environmental perspective.

8. Management Recommendations

8.1 Increased Regeneration Efforts

Increasing regeneration efforts will help ensure that the forested areas that have been harvested will maintain their productivity. In many cases, natural regeneration following harvest has not been sufficient to ensure the future provision not only of wood fiber but also of desired noncommodity benefits. In addition, these harvested areas have an existing infrastructure (i.e., roads, processing industries, and skilled labor). The creation of new infrastructure will be perhaps the most limiting factor for future use of

the region's forest areas. If future utilization, based on the existing infrastructure system, can be increased, then both management and harvesting costs can be lowered.

Currently, many logged-over and fire-damaged forest lands are without sufficient regeneration. The State Forest Account of 1988 estimated that for lands under state forest management in Asian Russia, 57.7 million hectares are sparse forests, and 90.2 million hectares are unforested areas (of which 23.6 million hectares are in the form of burnt areas, 5.3 million hectares are non-regenerated harvested areas, and 3.6 million hectares are grassy glades). In addition, the reliance on clearcutting as the primary harvesting practice has been inconsistent with natural regeneration of some desired species. Clearcutting generally will result in sufficient natural regeneration for birch, aspen, and sometimes for the major conifer species. However, for these major conifer species (i.e., spruce, fir, larch, and cedar), clearcutting of large areas is perhaps not the best harvesting method from a regeneration perspective. If clearcutting is expected to be the primary method of harvest in the future, providing for seed trees, scarifying the soil, tending young seedlings, and other management practices should be prescribed in an effort to improve regeneration. If these practices to encourage natural regeneration fall short, artificial regeneration should be implemented on a larger scale than what is currently being done.

These degraded forest areas should receive increased management attention if the Increased Regeneration and Protection scenario is selected. Degraded forest lands should be prioritized from both a potential economic productivity and potential environmental productivity viewpoint. Regeneration efforts should be directed at those lands with the greatest potential.

Individual species regeneration, as well as degraded areas, should be prioritized. For example, cedar has been seriously exploited in many local areas. In the absence of sufficient seed trees and planting, this species is becoming increasingly scarce, as supported by the recent degeneration of the cedar forests in the Russian Far East. Where appropriate, additional regeneration efforts should be directed at high priority species on high priority sites.

Historically, plantings have been single species. Although this is perhaps the most efficient method, it leaves the stand vulnerable to potential pest infestations and lowers the environmental potential of the stand. We recommend that additional artificial regeneration efforts consider a mix of species adaptable to the particular site.

Increased regeneration efforts should include a mix of improved management activities to encourage natural regeneration and artificial regeneration efforts. Harvesting practices need to be regulated so they are consistent with desired regeneration methods, consider long-term sustainability, and incorporate ecosystem management concepts. Frequently, current harvesting practices such as the use of heavy logging equipment cause soil compaction and erosion, which results in poor rates of natural regeneration survival.

8.2 Increased Protection Efforts

Currently, two of the primary causes of deforestation in Siberia and Far East Russia are wildfires and pest outbreaks. Although harvesting obviously plays an important role, wildfires and pest outbreaks annually cause more environmental degradation from a forestry perspective. Between 1975 and 1988, wildfire, pests, and other natural events caused the deforestation of more than a million hectares each year (IIASA, 1995). Wildfires alone destroyed more than 30 million hectares during this time period in Siberia and Far East Russia. We recommend that policy be directed to improve the efficiency and effectiveness of forest resource protection. To accomplish this, additional efforts need to be directed not only at protection but also at prevention. Comprehensive forest health monitoring, environmental education, public awareness, technology transfer, and improved infrastructure strategies should be developed.

Although fire is a natural part of the boreal forest ecosystem, the recent dramatic increase in the number of humans in remote areas has led to dramatic increases in the number of wildfires (Sheshukov *et al.*, 1992; Furayev, 1996; Ivanova *et al*. 1997). As previously mentioned, the number of wildfires in Siberia and Far East Russia has historically been relatively low. The increase in human inhabitation of remote areas is expected to continue as Russia's population expands. If this occurs, resource protection must become a major initiative. While natural wildfires will continue to occur, their severity should be monitored and control measures should be implemented when appropriate.

The primary obstruction to control of wildfires and pest outbreaks is access. However, as access is provided, human inhabitation is also expected to increase, potentially resulting in increased numbers of fires (Telizin, 1984) and increased harvesting levels. Although we are recommending increased protection efforts with ensuing increased access, fire and pest prevention efforts need to receive high priority. Development of integrated approaches to fire and pest management should be the highest priority with emphasis on the early detection and rapid mobilization of resources. Wildfires provide the dramatic event, but pest outbreaks can often be more destructive.

Wildfires and pests are interrelated. As naturally occurring wildfires are suppressed, the potential for pest outbreaks increases. As stands mature, they become more susceptible to pests. As pest outbreaks increase, the stands become more susceptible to wildfires. This cycle can be destructive with severe environmental and economic consequences.

As noted, Siberia and Far East Russia already have a skewed stand-age distribution toward being mature and overmature. The optimum solution is to increase the harvesting levels in these stands in the short term to improve the stand-age distribution, improve access for protection efforts, and lower the potential for wildfires and pest outbreaks. A major key to this strategy is to harvest with future regeneration as a primary objective.

Providing increased efforts at resource protection will help ensure that the forested lands that have been regenerated will maintain their productivity. If only additional regeneration efforts are recommended, their susceptibility to wildfires would put these additional regeneration costs and efforts at risk. Additional efforts also must be made to increase protection.

So, although there is not a significant difference overall in the total production of wood fiber among the management scenarios, there are significant differences in where that wood fiber will be produced, what species will provide most of the wood fiber, what the potential stocking and species composition of the remnant stands are, and how noncommodity benefits will be provided. For example, if the No Change in Management scenario is selected, many of the currently degraded forest lands would probably remain in that condition for many years, there would probably continue to be low natural regeneration rates, and single species plantations would continue to be the primary method of artificial regeneration. However, if the decision is made to implement the recommended Increased Regeneration and Protection scenario, many of the degraded stands will be regenerated, stocking rates will improve, and greater numbers of higher value species will occur.

Although the commodity benefits of additional protection efforts are critical from an economic perspective, additional protection efforts in the nonexploitable forest will provide critical environmental/ noncommodity benefits. Increased protection efforts are projected to result in greater numbers of pine, spruce, fir, larch, and cedar trees. These species tend to be longer lived with greater potential for improving environmental conditions. Obstacles for attaining increased protection in nonexploitable forests are similar to those in exploitable forests, namely access. Despite access problems, providing improved protection in nonexploitable forests will help ensure improved environmental conditions ranging from water quality enhancement to soil erosion protection to permafrost protection.

Results presented from the model projections for area, volume, and volume annually available for harvest are based on what we consider a biologically sustainable level. In addition, improved management and accelerated harvesting can increase the potential volume available for harvest each year. However, all forest lands are not economically accessible. Therefore, the following conclusions and recommendations are presented from three perspectives:

1. ***The projected volume annually available for harvest from a biologically sustainable perspective (Table D),***

2. ***The projected volume annually available with an accelerated harvest schedule (Table E), and***

3. The projected economically accessible volume annually available for harvest based on an accelerated harvest schedule (Table F).

9. Biologically Sustainable Harvest

Marketing wood fiber provides financial means to continue proper forest management as well as financial support for other social and political concerns. If our recommendations to implement the Increased Regeneration and Protection are followed, there is the potential to have 244 million cubic meters of wood fiber available for harvest each year by the year 2008 and 314 million cubic meters per year by the year 2168 (Table D). This harvest level is termed the biologically sustainable harvest.

Table D. *Projected area of forest areas and volume annually available for harvest on a biologically sustainable basis from implementation of the Increased Regeneration and Protection management scenario by selected years for Siberia and Far East Russia.*

Year of harvest	Forest type / Species Group								
	Total	Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
	(Thousand hectares)								
2008	2,151.8	359.9	218.4	131.9	835.8	92.6	350.8	101.5	61.0
2028	2,141.7	368.5	222.9	132.1	833.9	149.3	276.0	95.7	63.3
2068	2,363.8	374.4	237.7	146.4	911.6	154.0	370.6	86.4	82.6
2168	3,016.5	526.5	320.0	193.1	1,236.8	202.7	318.0	120.5	99.1
	(Thousand cubic meters)								
2008	243,624	49,312	26,258	16,081	78,200	5,990	48,502	17,271	2,012
2028	260,889	53,534	29,628	17,649	86,042	10,859	41,528	19,538	2,109
2068	278,081	60,155	30,996	19,863	89,731	12,319	47,581	14,947	2,489
2168	313,560	71,792	40,933	26,392	101,399	17,967	34,035	18,196	2,845

Compared to the No Changes in Management scenario, this management option will result in more forested area and volume available for harvest on a biologically sustainable basis by the year 2008 for all species groups, except for a slight decrease for spruce and aspen. The largest impacts from management are expected to occur in the pine and fir species groups. If our recommendations are implemented, we project an increase in the volume available for harvest of 22 percent for pine and 19 percent for fir by the year 2168.

In addition to the increases in volume available for harvest, we project that implementing additional regeneration and protection efforts will result in improved stocking, improved overall forest health, and improved quality of the resource from a

utilization perspective. For more details about the biologically sustainable harvest, see the description of the Increased Regeneration and Protection management scenario in the Projections section of this text and Appendix Tables 3, 4, 5, and 6.

10. Accelerated Harvest Potential

We highly recommend accelerating the annual harvesting schedules for the next 40 years. If harvesting is accelerated, we project a potential harvest of 341 million cubic meters by the year 2008 and 365 million cubic meters by the year 2028.

In addition to recommending increased management efforts with the ensuing biologically sustainable harvest schedules, we highly recommend strongly accelerating the harvesting schedules for the next 20 to 40 years beyond the projected levels. Further increasing the recommended harvest levels would result in a harvesting level of up to 341 million cubic meters per year by 2008 with an increase to 365 million cubic meters per year by the year 2028 (Appendix Table 9). Our recommendation to accelerate levels of harvest in the short term is based on the following considerations.

The need to **lower the risk** of uncontrolled wildfires and pest outbreaks. As previously stated, it has been estimated that more than half of the forest stands in Siberia and Far East Russia are in the mature to overmature age class. This skewed age-class distribution (due to the lack of infrastructural development) places the stands in higher risk categories for susceptibility to both pest and wildfire outbreaks.

The potential to **improve the current growth rates**. With the current age-class distribution and species composition, current growth rates are well below potential productivity (Nilsson and Shvidenko, 1997). Young, recently established forests typically have more vigorous growth rates than older mature forests and are more efficient at optimizing their growth potential.

Harvesting in many regions of Siberia and Far East Russia has either never occurred or **has been significantly lower than growth, resulting in the accumulation of wood fiber** in these stands to the point where it is now feasible to harvest beyond the above stated levels of 244 million cubic meters in 2008. Reducing the accumulated growth, exhibited as standing volume, will also help reduce the fuel loads in many overmature stands from a wildfire prevention perspective.

Increased harvesting levels will offer increased employment and economic potential not only for the local communities but also for the country as a whole. **Safeguarding the social welfare of forest-based communities**, especially the indigenous population, is vitally important.

Forests can be an important potential source of economical benefits during the social/political transition in Siberia and Far East Russia. As forests become overmature, their economic potential can decrease. With the region's recognized need for economic opportunities, accelerated harvesting will help to **further develop the economic potential** of their forest resources.

The current economic climate in this region could be greatly improved with increased incomes from the sale of wood fiber. Increased harvesting levels would provide a much needed **additional source of** outside income, additional jobs, and outside investments into the regional economy. These outside investments include not only financial but also **technological and managerial investments and training**.

Accelerating the harvesting level (correctly managed) may also serve to **increase the biological diversity**. In many areas of Siberia and Far East Russia, forests are predominantly mature to overmature (especially in areas without access). Although we recognize that these types of forests offer critical biological diversity, changing the overall age-class distribution to include some younger stands will improve diversity by re-establishing tree species associated with those stands.

Accelerating the harvest level will **improve the effectiveness of forest management**. Younger forests respond better to management activity than do older forests. Forest management activities, such as thinning, have better response rates in younger stands. Once trees growth rates slow due to competition, it is very difficult to re-invigorate them. However, in young stands, removing the competition through thinning has been proven to effectively increase the growth rate for the remaining stand. Sites have a limited potential productivity, and forest management activities are generally designed to optimize that growth. In addition, other factors, such as form, are more easily altered at an early life stage.

Accelerating harvesting will **improve wildlife habitat** for species that rely on forests in early successional stages. We recognize that other wildlife species that rely on later successional stages for their habitat will be negatively impacted by the higher disturbance rate. However, even with the accelerated harvest level, the vast majority of the forests in Siberia and Far East Russia will still be in these later successional stages.

By analyzing the regional Russian "Rules for Final Harvest" with the distribution of forested area by forest type, expected harvesting/environmental restrictions, and levels of productivity, we conclude that the spatial distribution of existing forests will allow for our projected accelerated harvesting schedule. This increase in harvesting would fully correspond with the existing and expected future ecological considerations/ restrictions and with existing Russian forest management regulations and manuals.

We recognize that mature and overmature forests offer a wide variety of ecological benefits that cannot be provided by younger, more recently established forests. It is vitally important that the benefits provided by old growth stands be ensured for the future. An important consideration in our recommendations is that more than 305 million hectares of the total 557 million hectares (55 percent) that existed in Siberia and Far East Russia in 1988 are classified as being nonexploitable. By designating these forests as being environmentally critical and thus not available for harvesting, we are ensuring the provision of the ecological benefits associated with these old growth forests. It is important to note that the accelerated harvest rates will occur only on those forest lands that are classified as being exploitable.

Nilsson *et al.* (1992) investigated the potential impact of accelerating the harvest level in mature and overmature boreal forest stands in the European North region of the former USSR. In that study, the consistent level of harvesting applied by the former USSR was compared to an accelerated/rapid harvesting schedule and to a consistently increasing harvest schedule. The consistent level of harvesting was approximately 82.5 million cubic meters per year and was estimated to be consistently carried out for the ensuing 200 years. The accelerated/rapid harvesting level was estimated at 240 million cubic meters per year initially with slight annual decreases for the first 100 years and then steady increases again for the second 100 years. The consistently increasing harvest schedule began at 82.5 million cubic meters per year, increased each year for the first 50 years to a high of 180 million cubic meters per year, and then slowly decreased until a steady harvesting level of about 70 million cubic meters per year was reached.

Results of Nilsson *et al*. (1992) indicate that in the long term, the greatest levels of total standing growing-stock volume and potential harvest were attained by the accelerated/rapid harvest schedule. This was concluded based on assumptions similar to those we stated above about the advantages of accelerating the harvest level in mature and overmature boreal forest stands.

As a result of accelerating the harvest schedule, the availability of each species for harvest proportionally increases. As with the biological sustainability harvest, the majority of the volume available for harvest is projected to be in the larch, pine, and spruce species groups (Table E). Note that the accelerated harvesting schedule is only for the first 40 years. After the accelerated harvesting period (through 2028), projected harvest levels are predicted to drop below the potential biological wood supply level for an estimated 50 to 75 years. This projected drop is due to the time lag necessary for the forests to respond to the accelerated harvesting and management activities. However, after the forests have responded with increased growth rates and forest management,

harvest levels are projected to once again equal and possibly exceed the potential biological wood supply level.

Table E. *Projected volume annually available from an accelerated harvest schedule on a biologically sustainable basis from implementation of the Increased Regeneration and Protection management scenario by selected years for Siberia and Far East Russia.*

Year of harvest	Forest type / Species Group								
	Total	Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
	(Thousand cubic meters)								
2008	341,074	69,034	36,761	22,511	109,480	8,386	67,901	24,182	2,818
2028	365,243	74,949	41,481	24,709	120,459	15,204	58,138	27,352	2,953
2068	278,080	60,156	30,995	19,863	89,731	12,318	47,581	14,947	2,489
2168	313,563	71,793	40,933	26,393	101,401	17,967	34,034	18,196	2,846

11. Economically Accessible Harvest

The transportation and industry infrastructure of Siberia and Far East Russia is a critical component of any analysis of the forest resources of this region. These facilities have historically impacted resource-based harvesting, management activities, and fire protection as well as the locations of communities, jobs, and support systems. Transportation related to forest industries has historically been based on roads, railroads, navigable rivers, and permanent streams. The use of waterways for transporting and rafting logs has been banned by recent environmental legislation due to the high losses and environmental degradation associated with logs being sunk, caught upstream by existing vegetation, and other negative impacts.

Construction of transportation systems is the primary cost associated with harvesting. As a result, harvesting has been concentrated along existing roads, railroads, and navigable rivers, generally to the point of overharvesting. At the same time, underutilization has occurred on most of the forests removed from the existing transportation systems. A map of the forest areas that have been harvested would be very similar to the map of the transportation infrastructure in Siberia and Far East Russia (see Transportation Infrastructure Appendix Map). In addition to enabling harvesting, the transportation system allows for forest management activities such as artificial regeneration, fire protection, treatment for major pest outbreaks, marketing of nonforest-related products, and travel.

Locations of forest industry enterprises are directly related to the transportation infrastructure due to their need to move raw materials in and products out. Communities have been developed around existing forest industries in many of these communities, and the forest industries are the only major employer (Nilsson, 1997a).

Consideration of future forest management activities will have to address the existing transportation infrastructure, existing forest industries, and impacts of changes in these infrastructures on existing communities. To adequately implement our recommended management scenario and accelerated harvesting levels, new roads/railways and potentially new processing facilities will need to be built. If new processing facilities are constructed, questions about what happens to the old facility and the surrounding community will need to be addressed.

Increased forest management will be labor intensive and will offer the opportunity for employment. Job responsibilities will switch from being processing-oriented to being resource management-oriented, but the economic opportunities will still exist for these existing forest industry-based communities.

While we have suggested that more than 341 million cubic meters can be harvested per year in Siberia and Far East Russia by 2008 with implementation of our management recommendations and accelerated harvesting, realistically less than this will be economically accessible with the existing infrastructure. We have not carried out a formal economic supply analysis, but by analyzing the transportation infrastructure density and industry locations, we can get an idea of the percentages of the biological wood supply that will be economically accessible. We assume in this analysis that the existing transportation system will remain, that new road and railroad construction will occur but that it will not provide accessibility throughout the study area, and that transportation infrastructure will not be developed for harvesting in forested areas with average total growing-stock stocking rates of less than 50 cubic meters per hectare. This minimum stocking level is based on Nilsson *et al.* (1992) establishing 50 cubic meters of stocking per hectare as the minimum limit of accessibility from low levels of growing stock for Siberia and Far East Russia.

The Yamalo-Nenets, Khanty-Mansi, Taymyr, Evenk, and Chukchi Administrative Regions were not included in our original analysis due to the absence or minimal levels of forested areas in these units. Forested areas that might be in these units are not included in either the biologically sustainable or accelerated harvest wood supply analyses.

Recent analyses conducted by Backman and Zausaev (1998) suggest that the absence of infrastructure and harvesting technology can limit the economically accessible harvest to about 40 percent of the biologically sustainable harvest in the near future for Far East Russia. We expect that as one moves from the Far East Russian region to more populated and accessible regions to the south and west, the percentage of economically accessible volume compared to total volume will increase.

Most of the Yakutia Republic, Buryat Republic, Chita Oblast, Khabarovsk Kray, and Magadan Oblast has a density of less than 0.03 kilometers of developed transportation

per square kilometer. In addition, stocking levels in some forests in these Administrative Regions are below the level necessary to economically justify a harvest. Based on this lack of transportation infrastructure and sometimes low stocking rates, we estimate that approximately 25 percent of the total biological wood supply would qualify as economic wood supply in these Administrative Regions. We had projected that these five units, with accelerated harvesting, would have about 99.1 million cubic meters available in 2008, 106.9 million cubic meters in 2028, and 101.5 million cubic meters in 2168. Taking the transportation network into consideration reduces these projected harvest levels to 24.8 million cubic meters in 2008, 26.7 million cubic meters in 2028, and 25.4 million cubic meters in 2168.

The northern portions of Krasnoyarsk Kray, Irkutsk Oblast, Amur Oblast, and Kamchatka Oblast also have limited transportation networks. These Administrative Regions have a density of less than 0.08 kilometers of developed transportation per square kilometer overall and the undeveloped northern portions have significantly less than that. In addition, in the northern portions of these Administrative Regions, stocking is sometimes below the 50 cubic meters per hectare level desired for harvest. Based on this lack of transportation infrastructure and sometimes low stocking rates, we estimate that approximately 50 percent of the total biological wood supply would qualify as economic wood supply in these Administrative Regions. We had projected that these four units, with accelerated harvesting, would have about 138.3 million cubic meters available in 2008, 150.7 million cubic meters in 2028, and 130.8 million cubic meters in 2168. Taking the transportation network into consideration reduces these projected harvest levels to 69.2 million cubic meters in 2008, 75.4 million cubic meters in 2028, and 65.4 million cubic meters in 2168.

The other Administrative Regions will also have some restrictions on potential harvest due to transportation limitations, but it is difficult to make sound estimates of the degree of the impact. Thus, our economic wood supply analysis will assume that the economically potential wood supply is equal to approximately 90 percent of the biologically potential wood supply in these Administrative Regions. We had projected that these remaining Administrative Regions, with accelerated harvesting, would have about 104.4 million cubic meters available in 2008, 107.7 million cubic meters in 2028, and 81.3 million cubic meters in 2168. Taking the transportation network into consideration reduces these projected harvest levels to 93.3 million cubic meters in 2008, 96.9 million cubic meters in 2028, and 73.2 million cubic meters in 2168.

Based on these assumptions, we estimate the total potential annual economically accessible harvest for Siberia and Far East Russia to be 187 million cubic meters in 2008, 199 million cubic meters in 2028, and 164 million cubic meters by the year 2168 (Table F and Appendix Table 10).

Table F. *Projected volume annually available for harvest from an economically accessible basis from implementation of the Increased Regeneration and Protection management scenario with accelerated harvest by selected years for Siberia and Far East Russia.*

Year of harvest	Forest type / Species Group								
	Total	Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
	(Thousand cubic meters)								
2008	187,277	39,701	18,914	14,018	42,147	6,694	47,017	16,956	1,829
2028	198,991	43,497	21,738	15,499	46,711	10,923	38,943	19,750	1,931
2068	149,703	36,362	16,657	12,913	34,665	8,952	28,955	9,523	1,676
2168	163,943	42,098	22,601	17,534	39,012	12,678	16,702	11,387	1,931

These results can be compared with analyses on the economic accessibility carried out by Backman (1997). Backman used a simple economic gap-model to estimate the economic wood supply during the next 30 years and found an average yearly economic accessibility for the studied period of about 100 million cubic meters under the current economic and infrastructure conditions. If the relative prices for forest products would be increased by 10 percent (forest products are currently underpriced in relation to the development of the general price index in Russia, Nilsson and Shvidenko, 1997), the economic accessible harvest in Siberia and Far East Russia would increase to some 135 million cubic meters per year. In a similar way, if investments were made in the existing transportation infrastructure (with no relative price increases for forest products), the economic accessible harvest would increase to some 155 million cubic meters per year. A combination of relative price increases for forest products and investments in the transportation infrastructure would generate an average yearly economic accessibility of some 235 million cubic meters during the study period. These estimates do not account for an accelerated harvest as recommended in this paper and presented in Table G.

Table G. *Comparison of the biologically sustainable, accelerated, and economically accessible harvest levels for selected years for Siberia and Far East Russia.*

Harvest level	2008	2028	2168
	(Million Cubic Meters)		
Projected harvest	243.6	260.9	313.6
Accelerated harvest	341.1	365.3	313.6
Transportation limitation	-153.8	-166.3	-149.6
Economically accessible harvest	187.3	199.0	164.0

12. Historical Harvest Level Comparisons

Related to our study of Siberia and Far East Russia, accelerating the harvest levels would result in a harvesting level of up to 341 million cubic meters per year by 2008, approximately the level established as the current annual allowable cut. The estimated

current annual allowable cut in 1997, established by the Russian Federal Forest Service for Siberia and Far East Russia (Kukuev, 1997), is 325 million cubic meters (Table H).

Table H. *Current annual allowable cut for Siberia and Far East Russia (Kukuev, 1997).*

Economic Region	Commercial Wood Supply			Industrial Wood Supply		
	Total	Coniferous	Deciduous	Total	Coniferous	Deciduous
	(Million Cubic Meters)					
West Siberia	84.9	31.8	53.1	53.1	24.6	28.5
East Siberia	143.0	98.9	44.1	103.2	77.7	25.5
Far East Russia	97.2	81.0	16.2	62.6	57.0	5.6
Total	325.1	211.7	113.4	218.9	159.3	59.6

To conceptualize our recommendations, comparisons to historical harvest levels are necessary (Appendix Table 11). Acceleration of the harvesting level, potential future market impacts, existing and future transportation and industry interactions and impacts, and an increase in the levels of forest management and investment all are important considerations in the future wood supply from Siberia and Far East Russia.

As a historical comparison to the biologically sustainable, accelerated harvest, and economically accessible potential harvest estimates, the entire area of Siberia and Far East Russia averaged 77.5 million cubic meters harvested (according to official statistics) between 1948 and 1957, 110.1 million cubic meters harvested between 1958 and 1967, 133.7 million cubic meters between 1968 and 1977, 144.2 million cubic meters harvested between 1978 and 1987, and 161.4 million cubic meters in 1988 (Table I). The year 1988 represents the greatest actual harvest level ever recorded for the Siberia and Far East Russia region. The harvesting trend in Siberia and Far East Russia was a steady increase through 1988, slight decreases in the late 1980s through 1992, and then a dramatic decrease between 1992 and 1996.

The potential biologically sustainable wood supply that we estimate will be available by 2008 in Siberia and Far East Russia, 244 million cubic meters per year, is about 150 percent greater than the 1988 harvest level. By the year 2168, our estimated biologically sustainable wood supply of 314 million cubic meters per year will be almost double the 1988 actual harvest level.

The biologically sustainable accelerated harvest is projected to be 341.1 million cubic meters per year by 2008, about 210 percent greater than the actual 1988 harvest level. By the year 2168, our estimated accelerated harvest schedule will be the biologically sustainable level since the accelerated harvesting is projected to last for only 40 years. After the 40 years of accelerated harvesting, we project a decline in total harvest with an eventual rebound back to the biologically sustainable harvest level.

Table I. *Historical harvest levels for Siberia and Far East Russia.*

Economic Region	10 year average harvest			Annual harvest			
	1948 to 1957	1958 to 1967	1968 to 1977	1978 to 1987	1988	1992	1996
	(Million Cubic Meters)						
West Siberia	21.3	28.1	33.1	35.6	42.0	30.8	9.5
East Siberia	33.9	55.7	65.7	70.1	79.1	56.1	24.8
Far East Russia	22.3	26.3	34.9	38.5	40.3	26.9	12.8
Total	77.5	110.1	133.7	144.2	161.4	113.8	47.1

The economically accessible harvest schedule, factored from the accelerated harvest schedule, is projected to be 187.3 million cubic meters per year by 2008, about 16 percent greater than the actual 1988 harvest level. By the year 2168, the economically accessible harvest is projected to be almost equal with the 1988 actual harvest level.

13. Market Impacts

Markets will exist for wood fiber, but the question is where the fiber will be supplied from and what types of fiber will be in demand.

The world's demand for industrial wood fiber was estimated to be about 1.5 billion cubic meters in the year 1993; it is expected to increase to about 2.5 billion cubic meters by the year 2020 and to approach 3.0 billion cubic meters by the year 2030 (Nilsson, 1997a; Hagler, 1997). This total world fiber demand will be supplied by both virgin and recycled wood fiber. By 2020, the supply of wood fiber is projected to be less than the demand. By the year 2020, Nilsson (1997a) projects a demand of about 2.5 billion cubic meters and a supply of about 2.1 billion cubic meters; thus, a "shortage" is projected. In 2008, Siberia and Far East Russia will have the biological potential to supply up to 341 million cubic meters and the economically accessible potential to supply 187 million cubic meters, with accelerated harvesting efforts and implementation of our management recommendations. Thus, this region will have the potential to supply from 7 to 12 percent of the world's fiber demand beginning in 2008.

Although it appears that wood fiber will be in short supply in the world by 2020, realistically, these shortages will probably not occur to that degree. Changes in technology, increased use of recycled fiber, increased forest management in developing countries, and many other factors will impact the world's future wood fiber supply. Worldwide markets are in the process of shifting from being dominantly based on virgin fiber to having a strong reliance on recycled fiber. In developed countries, sawnwood

and wood panel consumption per capita has begun to decrease (Nilsson, 1997a). As the population ages in these developed countries, future markets for these types of products are expected to remain, at best, stagnant. Non-traditional markets in developing countries are currently incapable of absorbing the difference in consumption, especially in the sawnwood/lumber sectors (Nilsson, 1997a). The decline in these markets will have a significant impact on the potential future marketing of Siberian forest products.

The world's consumption of paper and paperboard has increased, but this increase has been somewhat offset by the increase in use of wastepaper. It has been estimated that between the years 1994 and 2010, wastepaper consumption will increase by almost 50 percent in developed countries and by 32 percent in developing countries (Nilsson, 1997a). Consumption of paper and paperboard is expected to continue increasing but with less dependence on virgin fiber.

These trends in the world's demand for wood fiber pose serious consequences for increasing the harvest levels from Siberia and Far East Russia forests. Most of the industry in this region is based on producing either sawnwood or, to some extent, chips for pulp production from virgin fiber. Currently, harvesting levels are more than 50 percent lower than harvest levels from the mid- to late-1980s (Appendix Table 9). While the current lower harvest levels are partially due to the current political and economic conditions, they are also due to changes in worldwide market conditions. When availability of wood fiber from the former Soviet Republics decreased during the early 1990s, outside markets for this fiber moved on to other sources. Regaining markets can be slow and may result in initially lower than expected prices. Therefore, the development of value added products and/or markets for wood fiber from the forests of Siberia and Far East Russia is highly recommended.

Future development of the Siberia and Far East Russia harvesting potential is directly related to several factors including: realized prices, capital requirements, manufacturing capacity, accessibility of the forest, and domestic demand (Backman and Zausaev, 1998). Projected prices for both domestic and export markets will influence capital investments toward improved accessibility and increased manufacturing capacity. Long-term stability lies with increased reliance on domestic markets and increased levels of processed roundwood for export markets. Recent decreases in the Asian/Pacific Rim markets for Russian supplied wood, related to their 1997-98 financial crisis, exhibits the need to develop improved domestic markets and processing capabilities.

14. Future Research Needs

Although age class data are available, they have not been included in this analysis. Future efforts need to include detailed information on the spatial distribution of age

classes in economically accessible forests that are environmentally suitable for exploitation.

We did not complete an in-depth analysis of the potential social implications from these recommendations. However, we do feel that if our recommendations are implemented, the local communities will reap many social benefits. To develop a sound policy statement, additional efforts must be made to incorporate environmental, economic, and social analyses into an overall analysis.

One feature of the current model is that it does not function very dynamically and is not very responsive to management interventions. The growth level achieved by the model is rather low, probably because the yield information used in the model is based on historical State Forest Account data and not on relevant yield tables. The IIASA study has developed yield tables, which should be used in this type of analysis (e.g., Shvidenko *et al.*, 1995 and 1996). But unfortunately these yield tables were unavailable when the model was developed. There are uncertainties in the transition probabilities (see Fixed parameters in the Model Description section). The growth prediction, together with the transitions between hozsections, is the core of the model and will drive the results generated by the model. Further improvement of the dynamic part of the model is also required with respect to: 1) successional dynamics, 2) uneven-aged stand dynamics, and 3) disturbance regimes. Therefore, there is a need to further develop the model by incorporating relevant forest dynamics for an appropriate growth prediction, and to revise the transition probabilities used in order to achieve a more dynamic and more responsive model. A further step of the model development would be to endogenize the economic analysis to estimate the possible economic wood supply.

An important next step in the long road of implementing increased management activity is to complete a benefit/ cost economic analysis for the major recommendations. With the emerging market-based economy, investments in forest management should be located on those sites that have the greatest potential for returns. However, we caution policy makers to also include environmental factors in their final decisionmaking process.

15. Conclusion

In conclusion, Siberia and Far East Russia have a tremendous potential to impact the world's future wood supply. These forests will continue to have the biological potential to produce tremendous quantities of wood fiber. However, the availability of this fiber will be directly related to market and environmental restrictions. The management and protection of this resource is of importance not only for the Russian sector but also for the entire world. In addition to our conservative estimates that it is economically feasible to expect that this region could supply more than 187 million cubic meters of wood each year to the world marketplace by 2008, the region's forests will have many

important environmental impacts. Worldwide concerns about carbon sequestration, threatened and endangered wildlife and plants, water quality, and other critical ecological concerns will have to consider the forests of Siberia and Far East Russia in their decisionmaking process. This study represents a start, providing a look at what the future forest resource could be and what it could supply. In-depth additional scientific analyses need to be conducted to further increase our knowledge of this enormously critical resource.

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Appendix A. Tables

Table 1. Projected area of forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia.

West Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
1988 Exploitable				(Thousand Hectares)			
	Pine	18,488	18,488	18,488	18,488	18,488	18,488
	Spruce	2,748	2,748	2,748	2,748	2,748	2,748
	Fir	3,246	3,246	3,246	3,246	3,246	3,246
	Larch	1,440	1,440	1,440	1,440	1,440	1,440
	Cedar	6,309	6,309	6,309	6,309	6,309	6,309
	Birch	13,918	13,918	13,918	13,918	13,918	13,918
	Aspen	4,510	4,510	4,510	4,510	4,510	4,510
	Subtotal	50,659	50,659	50,659	50,659	50,659	50,659
1988 Nonexploitable							
	Pine	8,560	8,560	8,560	8,560	8,560	8,560
	Spruce	2,152	2,152	2,152	2,152	2,152	2,152
	Fir	554	554	554	554	554	554
	Larch	3,978	3,978	3,978	3,978	3,978	3,978
	Cedar	5,527	5,527	5,527	5,527	5,527	5,527
	Birch	3,065	3,065	3,065	3,065	3,065	3,065
	Aspen	298	298	298	298	298	298
West	Subtotal	24,134	24,134	24,134	24,134	24,134	24,134
Siberia	**1988 total**	74,793	74,793	74,793	74,793	74,793	74,793
2008 Exploitable							
	Pine	19,097	18,496	18,694	18,745	18,490	18,668
	Spruce	2,874	3,003	3,096	3,333	3,000	3,265
	Fir	3,389	3,372	4,212	3,866	3,360	4,051
	Larch	1,494	1,494	1,496	1,509	1,491	1,495
	Cedar	7,075	7,631	7,675	7,672	7,635	7,677
	Birch	12,772	11,777	10,816	10,871	11,768	10,800
	Aspen	3,958	3,703	3,488	3,480	3,717	3,504
	Subtotal	50,659	49,476	49,476	49,476	49,459	49,459
2008 Nonexploitable							
	Pine	8,636	8,636	8,636	8,636	8,636	8,636
	Spruce	2,102	2,102	2,102	2,102	2,102	2,102
	Fir	562	562	562	562	562	562
	Larch	4,034	4,034	4,034	4,034	4,034	4,034
	Cedar	5,555	5,555	5,555	5,555	5,555	5,555
	Birch	2,964	2,964	2,964	2,964	2,964	2,964
	Aspen	282	282	282	282	282	282
West	Subtotal	24,134	24,134	24,134	24,134	24,134	24,134
Siberia	**2008 total**	74,793	73,610	73,610	73,610	73,593	73,593
2028 Exploitable							
	Pine	19,333	18,158	18,497	18,568	18,133	18,431
	Spruce	2,899	3,320	3,364	3,848	3,314	3,690
	Fir	3,551	3,516	5,107	4,446	3,505	4,782
	Larch	1,616	1,532	1,489	1,507	1,533	1,490
	Cedar	7,454	8,599	8,487	8,537	8,617	8,486
	Birch	12,027	10,341	8,960	9,089	10,313	8,969
	Aspen	3,780	3,399	2,961	2,869	3,422	2,989
	Subtotal	50,659	48,864	48,864	48,864	48,837	48,837
2028 Nonexploitable							
	Pine	8,734	8,734	8,734	8,734	8,736	8,736
	Spruce	2,020	2,020	2,020	2,020	2,021	2,021
	Fir	586	586	586	586	586	586
	Larch	4,279	4,279	4,279	4,279	4,280	4,280
	Cedar	5,835	5,835	5,835	5,835	5,837	5,837
	Birch	2,404	2,404	2,404	2,404	2,400	2,400
	Aspen	275	275	275	275	274	274
West	Subtotal	24,134	24,134	24,134	24,134	24,134	24,134
Siberia	**2028 total**	74,793	72,998	72,998	72,998	72,971	72,971

Table 1. Projected area of forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

West Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2068 Exploitable				(Thousand Hectares)			
	Pine	19,289	18,676	19,305	19,368	18,773	19,315
	Spruce	2,933	3,914	3,851	4,708	3,929	4,483
	Fir	3,709	3,711	6,559	5,285	3,705	5,914
	Larch	1,754	1,627	1,557	1,554	1,623	1,543
	Cedar	7,782	9,984	9,591	9,625	10,013	9,604
	Birch	11,573	7,981	5,741	6,103	7,890	5,798
	Aspen	3,618	3,082	2,370	2,332	3,092	2,369
	Subtotal	50,659	48,975	48,975	48,975	49,025	49,025
2068 Nonexploitable							
	Pine	8,444	8,444	8,444	8,444	8,457	8,457
	Spruce	1,978	1,978	1,978	1,978	1,981	1,981
	Fir	613	613	613	613	615	615
	Larch	4,167	4,167	4,167	4,167	4,172	4,172
	Cedar	6,267	6,267	6,267	6,267	6,289	6,289
	Birch	2,376	2,376	2,376	2,376	2,335	2,335
	Aspen	288	288	288	288	284	284
West	Subtotal	24,134	24,134	24,134	24,134	24,134	24,134
Siberia	**2068 total**	74,793	73,109	73,109	73,109	73,159	73,159
2168 Exploitable							
	Pine	19,060	17,112	16,385	17,274	17,123	16,442
	Spruce	3,028	4,993	4,772	5,337	5,050	5,296
	Fir	3,621	3,312	5,014	4,200	3,325	4,600
	Larch	1,783	1,761	1,775	1,863	1,779	1,785
	Cedar	7,697	12,198	12,089	11,978	12,359	12,193
	Birch	11,778	6,409	5,314	5,665	6,155	5,245
	Aspen	3,691	2,750	3,185	2,217	2,711	2,942
	Subtotal	50,659	48,534	48,534	48,534	48,503	48,503
2168 Nonexploitable							
	Pine	8,258	8,258	8,258	8,258	8,331	8,331
	Spruce	1,955	1,955	1,955	1,955	1,971	1,971
	Fir	613	613	613	613	623	623
	Larch	4,012	4,012	4,012	4,012	4,042	4,042
	Cedar	6,254	6,254	6,254	6,254	6,413	6,413
	Birch	2,696	2,696	2,696	2,696	2,435	2,435
	Aspen	345	345	345	345	319	319
West	Subtotal	24,134	24,134	24,134	24,134	24,134	24,134
Siberia	**2168 total**	74,793	72,668	72,668	72,668	72,637	72,637

East Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
1988 Exploitable				(Thousand Hectares)			
	Pine	23,892	23,892	23,892	23,892	23,892	23,892
	Spruce	4,726	4,726	4,726	4,726	4,726	4,726
	Fir	6,893	6,893	6,893	6,893	6,893	6,893
	Larch	34,099	34,099	34,099	34,099	34,099	34,099
	Cedar	6,014	6,014	6,014	6,014	6,014	6,014
	Birch	15,310	15,310	15,310	15,310	15,310	15,310
	Aspen	4,026	4,026	4,026	4,026	4,026	4,026
	Other deciduous	7	7	7	7	7	7
	Subtotal	94,968	94,968	94,968	94,968	94,968	94,968
1988 Nonexploitable							
	Pine	10,586	10,586	10,586	10,586	10,586	10,586
	Spruce	8,376	8,376	8,376	8,376	8,376	8,376
	Fir	2,807	2,807	2,807	2,807	2,807	2,807
	Larch	74,961	74,961	74,961	74,961	74,961	74,961
	Cedar	18,103	18,103	18,103	18,103	18,103	18,103
	Birch	11,690	11,690	11,690	11,690	11,690	11,690
	Aspen	855	855	855	855	855	855
	Other deciduous	18	18	18	18	18	18
East	Subtotal	127,397	127,397	127,397	127,397	127,397	127,397
Siberia	**1988 Total**	222,365	222,365	222,365	222,365	222,365	222,365

Table 1. Projected area of forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

East Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2008 Exploitable				(Thousand Hectares)			
	Pine	22,815	21,007	21,947	21,900	20,972	21,715
	Spruce	5,766	5,682	5,660	5,665	5,679	5,647
	Fir	7,431	7,346	7,336	7,418	7,341	7,340
	Larch	33,821	32,087	32,076	32,430	32,054	32,063
	Cedar	7,078	7,607	7,616	7,564	7,611	7,620
	Birch	14,774	15,337	14,567	14,326	15,340	14,765
	Aspen	3,276	3,475	3,340	3,239	3,502	3,350
	Other deciduous	7	7	6	7	7	7
	Subtotal	94,968	92,548	92,548	92,548	92,508	92,508
2008 Nonexploitable							
	Pine	10,333	10,333	10,333	10,333	10,333	10,333
	Spruce	9,420	9,420	9,420	9,420	9,420	9,420
	Fir	3,162	3,162	3,162	3,162	3,162	3,162
	Larch	73,537	73,537	73,537	73,537	73,537	73,537
	Cedar	18,630	18,630	18,630	18,630	18,630	18,630
	Birch	11,520	11,520	11,520	11,520	11,520	11,520
	Aspen	778	778	778	778	778	778
	Other deciduous	18	18	18	18	18	18
East	Subtotal	127,397	127,397	127,397	127,397	127,397	127,397
Siberia	**2008 total**	222,365	219,244	219,244	219,244	219,217	219,217
2028 Exploitable							
	Pine	22,470	19,428	21,270	21,645	19,393	21,003
	Spruce	6,763	6,090	5,991	5,897	6,108	5,943
	Fir	7,635	7,456	7,435	7,517	7,476	7,431
	Larch	34,017	31,453	31,633	31,883	31,352	31,678
	Cedar	8,042	8,181	8,167	8,173	8,208	8,160
	Birch	13,185	15,592	14,019	13,614	15,635	14,263
	Aspen	2,849	3,641	3,330	3,115	3,642	3,340
	Other deciduous	7	7	2	4	7	2
	Subtotal	94,968	91,847	91,847	91,847	91,820	91,820
2028 Nonexploitable							
	Pine	10,361	10,361	10,361	10,361	10,363	10,363
	Spruce	10,663	10,663	10,663	10,663	10,667	10,667
	Fir	3,661	3,661	3,661	3,661	3,661	3,661
	Larch	72,182	72,182	72,182	72,182	72,191	72,191
	Cedar	19,392	19,392	19,392	19,392	19,408	19,408
	Birch	10,383	10,383	10,383	10,383	10,357	10,357
	Aspen	737	737	737	737	733	733
	Other deciduous	18	18	18	18	18	18
East	Subtotal	127,397	127,397	127,397	127,397	127,397	127,397
Siberia	**2028 total**	222,365	219,244	219,244	219,244	219,217	219,217
2068 Exploitable							
	Pine	21,608	18,368	22,635	23,931	18,336	22,428
	Spruce	7,903	6,912	6,720	6,377	6,920	6,614
	Fir	7,788	7,751	7,819	7,696	7,749	7,773
	Larch	34,649	31,581	32,223	32,283	31,567	32,370
	Cedar	9,483	9,185	9,134	9,136	9,235	9,150
	Birch	11,091	15,564	11,574	10,936	15,551	11,764
	Aspen	2,439	3,669	2,929	2,675	3,690	2,952
	Other deciduous	7	7	2	2	7	2
	Subtotal	94,968	93,036	93,036	93,036	93,054	93,054
2068 Nonexploitable							
	Pine	10,447	10,447	10,447	10,447	10,452	10,452
	Spruce	11,397	11,397	11,397	11,397	11,424	11,424
	Fir	4,293	4,293	4,293	4,293	4,293	4,293
	Larch	70,464	70,464	70,464	70,464	70,567	70,567
	Cedar	19,933	19,933	19,933	19,933	20,084	20,084
	Birch	10,074	10,074	10,074	10,074	9,818	9,818
	Aspen	770	770	770	770	742	742
	Other deciduous	18	18	18	18	18	18
East	Subtotal	127,397	127,397	127,397	127,397	127,397	127,397
Siberia	**2068 total**	222,365	220,433	220,433	220,433	220,451	220,451

Table 1. Projected area of forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

East Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2168 Exploitable				(Thousand Hectares)			
	Pine	19,194	13,733	15,442	21,451	13,591	15,310
	Spruce	9,149	8,179	7,628	6,699	8,270	7,637
	Fir	7,834	8,136	7,975	7,878	8,169	7,997
	Larch	34,488	31,013	30,737	31,899	30,730	30,502
	Cedar	10,879	11,153	10,813	10,662	11,513	11,055
	Birch	10,845	15,390	15,091	10,457	15,123	14,965
	Aspen	2,572	3,814	3,736	2,377	3,667	3,601
	Other deciduous	7	5	2	1	5	2
	Subtotal	94,968	91,424	91,424	91,424	91,068	91,068
2168 Nonexploitable							
	Pine	10,543	10,543	10,543	10,543	10,499	10,499
	Spruce	12,570	12,570	12,570	12,570	12,736	12,736
	Fir	5,212	5,212	5,212	5,212	5,206	5,206
	Larch	68,377	68,377	68,377	68,377	69,011	69,011
	Cedar	18,622	18,622	18,622	18,622	19,595	19,595
	Birch	11,153	11,153	11,153	11,153	9,568	9,568
	Aspen	904	904	904	904	764	764
	Other deciduous	17	17	17	17	17	17
East	Subtotal	127,397	127,397	127,397	127,397	127,397	127,397
Siberia	**2168 total**	222,365	218,821	218,821	218,821	218,465	218,465

Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
1988 Exploitable				(Thousand Hectares)			
	Pine	6,813	6,813	6,813	6,813	6,813	6,813
	Spruce	10,574	10,574	10,574	10,574	10,574	10,574
	Fir	1,514	1,514	1,514	1,514	1,514	1,514
	Larch	68,991	68,991	68,991	68,991	68,991	68,991
	Cedar	2,055	2,055	2,055	2,055	2,055	2,055
	Birch	9,452	9,452	9,452	9,452	9,452	9,452
	Aspen	868	868	868	868	868	868
	Other deciduous	5,640	5,640	5,640	5,640	5,640	5,640
	Subtotal	105,907	105,907	105,907	105,907	105,907	105,907
1988 Nonexploitable							
	Pine	4,917	4,917	4,917	4,917	4,917	4,917
	Spruce	3,790	3,790	3,790	3,790	3,790	3,790
	Fir	429	429	429	429	429	429
	Larch	100,661	100,661	100,661	100,661	100,661	100,661
	Cedar	1,341	1,341	1,341	1,341	1,341	1,341
	Dwarf Pine	24,671	24,671	24,671	24,671	24,671	24,671
	Birch	2,353	2,353	2,353	2,353	2,353	2,353
	Aspen	169	169	169	169	169	169
	Other deciduous	15,835	15,835	15,835	15,835	15,835	15,835
Far East	Subtotal	154,166	154,166	154,166	154,166	154,166	154,166
Russia	**1988 total**	260,073	260,073	260,073	260,073	260,073	260,073
2008 Exploitable							
	Pine	7,016	6,983	7,493	7,422	6,984	7,502
	Spruce	11,280	10,847	10,961	10,893	10,847	10,956
	Fir	1,622	1,720	1,756	1,731	1,720	1,770
	Larch	68,426	66,905	66,729	66,858	66,879	66,700
	Cedar	2,108	2,117	2,157	2,148	2,118	2,159
	Birch	8,896	9,226	8,822	8,875	9,234	8,810
	Aspen	1,002	1,078	1,005	993	1,079	1,013
	Other deciduous	5,558	5,548	5,493	5,497	5,548	5,489
	Subtotal	105,907	104,424	104,415	104,415	104,408	104,399

Table 1. Projected area of forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2008 Nonexploitable				(Thousand Hectares)			
	Pine	5,531	5,531	5,531	5,531	5,531	5,531
	Spruce	4,212	4,212	4,212	4,212	4,212	4,212
	Fir	469	469	469	469	469	469
	Larch	99,122	99,122	99,122	99,122	99,122	99,122
	Cedar	1,427	1,427	1,427	1,427	1,427	1,427
	Dwarf Pine	24,676	24,676	24,676	24,676	24,676	24,676
	Birch	2,666	2,666	2,666	2,666	2,666	2,666
	Aspen	294	294	294	294	294	294
	Other deciduous	15,769	15,769	15,769	15,769	15,769	15,769
Far East	Subtotal	154,166	154,166	154,166	154,166	154,166	154,166
Russia	**2008 total**	260,073	258,589	258,581	258,581	258,574	258,565
2028 Exploitable							
	Pine	7,245	7,163	8,408	7,877	7,182	8,420
	Spruce	12,634	11,377	11,576	11,337	11,345	11,569
	Fir	1,627	1,828	1,920	1,847	1,837	1,953
	Larch	67,739	65,524	65,261	66,309	65,510	65,251
	Cedar	2,298	2,129	2,155	2,142	2,131	2,173
	Birch	8,108	9,690	8,738	8,577	9,717	8,736
	Aspen	963	1,371	1,150	1,113	1,372	1,146
	Other deciduous	5,294	5,505	5,389	5,396	5,505	5,363
	Subtotal	105,907	104,586	104,598	104,598	104,599	104,611
2028 Nonexploitable							
	Pine	6,396	6,396	6,396	6,396	6,399	6,399
	Spruce	5,021	5,021	5,021	5,021	5,024	5,024
	Fir	482	482	482	482	482	482
	Larch	97,145	97,145	97,145	97,145	97,144	97,144
	Cedar	1,532	1,532	1,532	1,532	1,533	1,533
	Dwarf Pine	24,624	24,624	24,624	24,624	24,624	24,624
	Birch	2,997	2,997	2,997	2,997	2,995	2,995
	Aspen	356	356	356	356	354	354
	Other deciduous	15,612	15,612	15,612	15,612	15,611	15,611
Far East	Subtotal	154,166	154,166	154,166	154,166	154,166	154,166
Russia	**2028 total**	260,073	258,752	258,763	258,763	258,764	258,777
2068 Exploitable							
	Pine	7,295	7,451	9,545	8,392	7,480	9,520
	Spruce	15,233	12,480	12,937	12,347	12,457	12,956
	Fir	1,328	1,918	2,044	1,878	1,924	2,110
	Larch	67,256	63,367	63,493	66,102	63,365	63,525
	Cedar	2,597	2,065	2,082	2,084	2,076	2,112
	Birch	6,367	10,015	7,937	7,263	10,037	7,888
	Aspen	976	1,788	1,304	1,218	1,767	1,295
	Other deciduous	4,854	5,530	5,272	5,332	5,522	5,222
	Subtotal	105,907	104,615	104,616	104,616	104,627	104,629
2068 Nonexploitable							
	Pine	6,778	6,778	6,778	6,778	6,795	6,795
	Spruce	6,674	6,674	6,674	6,674	6,716	6,716
	Fir	551	551	551	551	553	553
	Larch	95,574	95,574	95,574	95,574	95,573	95,573
	Cedar	1,579	1,579	1,579	1,579	1,587	1,587
	Dwarf Pine	24,471	24,471	24,471	24,471	24,473	24,473
	Birch	2,950	2,950	2,950	2,950	2,912	2,912
	Aspen	417	417	417	417	400	400
	Other deciduous	15,171	15,171	15,171	15,171	15,156	15,156
Far East	Subtotal	154,166	154,166	154,166	154,166	154,166	154,166
Russia	**2068 total**	260,073	258,780	258,781	258,781	258,793	258,794

Table 1. Projected area of forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2168 Exploitable				(Thousand Hectares)			
	Pine	7,392	6,802	8,272	7,291	6,879	8,359
	Spruce	18,440	13,406	13,363	13,393	13,708	13,736
	Fir	1,197	2,000	1,997	1,621	2,048	2,055
	Larch	64,888	60,486	59,728	65,287	60,232	59,456
	Cedar	2,817	1,816	1,849	1,956	1,903	1,930
	Birch	5,808	10,706	10,272	6,824	10,490	10,038
	Aspen	974	2,349	2,191	1,369	2,211	2,058
	Other deciduous	4,393	5,572	5,405	5,335	5,470	5,269
	Subtotal	105,907	103,137	103,078	103,078	102,941	102,900
2168 Nonexploitable							
	Pine	7,233	7,233	7,233	7,233	7,414	7,414
	Spruce	8,346	8,346	8,346	8,346	8,697	8,697
	Fir	597	597	597	597	596	596
	Larch	92,385	92,385	92,385	92,385	92,172	92,172
	Cedar	1,477	1,477	1,477	1,477	1,544	1,544
	Dwarf Pine	24,335	24,335	24,335	24,335	24,366	24,366
	Birch	4,113	4,113	4,113	4,113	3,891	3,891
	Aspen	430	430	430	430	335	335
	Other deciduous	15,250	15,250	15,250	15,250	15,153	15,153
Far East	Subtotal	154,166	154,166	154,166	154,166	154,166	154,166
Russia	**2168 total**	260,073	257,303	257,243	257,243	257,107	257,066

Siberia & Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
1988 Exploitable				(Thousand Hectares)			
	Pine	49,194	49,194	49,194	49,194	49,194	49,194
	Spruce	18,049	18,049	18,049	18,049	18,049	18,049
	Fir	11,653	11,653	11,653	11,653	11,653	11,653
	Larch	104,530	104,530	104,530	104,530	104,530	104,530
	Cedar	14,377	14,377	14,377	14,377	14,377	14,377
	Birch	38,680	38,680	38,680	38,680	38,680	38,680
	Aspen	9,403	9,403	9,403	9,403	9,403	9,403
	Other deciduous	5,647	5,647	5,647	5,647	5,647	5,647
	Subtotal	251,534	251,534	251,534	251,534	251,534	251,534
1988 Nonexploitable							
	Pine	24,063	24,063	24,063	24,063	24,063	24,063
	Spruce	14,319	14,319	14,319	14,319	14,319	14,319
	Fir	3,791	3,791	3,791	3,791	3,791	3,791
	Larch	179,599	179,599	179,599	179,599	179,599	179,599
	Cedar	24,971	24,971	24,971	24,971	24,971	24,971
	Dwarf Pine	24,671	24,671	24,671	24,671	24,671	24,671
	Birch	17,108	17,108	17,108	17,108	17,108	17,108
	Aspen	1,323	1,323	1,323	1,323	1,323	1,323
	Other deciduous	15,853	15,853	15,853	15,853	15,853	15,853
Siberia &	Subtotal	305,697	305,697	305,697	305,697	305,697	305,697
Far East	**1988 total**	557,231	557,231	557,231	557,231	557,231	557,231
Russia							
2008 Exploitable							
	Pine	48,927	46,486	48,134	48,067	46,446	47,886
	Spruce	19,921	19,533	19,716	19,890	19,526	19,868
	Fir	12,442	12,438	13,304	13,015	12,421	13,162
	Larch	103,741	100,486	100,301	100,796	100,424	100,258
	Cedar	16,260	17,355	17,447	17,384	17,364	17,456
	Birch	36,442	36,339	34,205	34,071	36,341	34,375
	Aspen	8,236	8,256	7,832	7,712	8,299	7,866
	Other deciduous	5,565	5,556	5,499	5,504	5,555	5,496
	Subtotal	251,534	246,448	246,439	246,439	246,375	246,366

Table 1. Projected area of forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

Siberia & Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2008 Nonexploitable				(Thousand Hectares)			
	Pine	24,500	24,500	24,500	24,500	24,500	24,500
	Spruce	15,734	15,734	15,734	15,734	15,734	15,734
	Fir	4,192	4,192	4,192	4,192	4,192	4,192
	Larch	176,692	176,692	176,692	176,692	176,692	176,692
	Cedar	25,612	25,612	25,612	25,612	25,612	25,612
	Dwarf Pine	24,676	24,676	24,676	24,676	24,676	24,676
	Birch	17,149	17,149	17,149	17,149	17,149	17,149
	Aspen	1,354	1,354	1,354	1,354	1,354	1,354
	Other deciduous	15,787	15,787	15,787	15,787	15,787	15,787
Siberia &	Subtotal	305,697	305,697	305,697	305,697	305,697	305,697
Far East	**2008 total**	557,231	552,145	552,136	552,136	552,072	552,063
Russia							
2028 Exploitable							
	Pine	49,048	44,750	48,175	48,091	44,708	47,853
	Spruce	22,295	20,786	20,931	21,083	20,768	21,202
	Fir	12,813	12,799	14,462	13,810	12,818	14,166
	Larch	103,372	98,509	98,383	99,698	98,395	98,419
	Cedar	17,794	18,908	18,809	18,851	18,955	18,820
	Birch	33,319	35,623	31,717	31,280	35,664	31,967
	Aspen	7,591	8,411	7,441	7,097	8,437	7,475
	Other deciduous	5,301	5,511	5,391	5,399	5,511	5,366
	Subtotal	251,534	245,298	245,309	245,309	245,256	245,269
2028 Nonexploitable							
	Pine	25,492	25,492	25,492	25,492	25,497	25,497
	Spruce	17,705	17,705	17,705	17,705	17,712	17,712
	Fir	4,729	4,729	4,729	4,729	4,729	4,729
	Larch	173,606	173,606	173,606	173,606	173,614	173,614
	Cedar	26,759	26,759	26,759	26,759	26,778	26,778
	Dwarf Pine	24,624	24,624	24,624	24,624	24,624	24,624
	Birch	15,785	15,785	15,785	15,785	15,751	15,751
	Aspen	1,367	1,367	1,367	1,367	1,362	1,362
	Other deciduous	15,630	15,630	15,630	15,630	15,629	15,629
Siberia &	Subtotal	305,697	305,697	305,697	305,697	305,697	305,697
Far East	**2028 total**	557,231	550,994	551,005	551,005	550,953	550,965
Russia							
2068 Exploitable							
	Pine	48,193	44,494	51,485	51,691	44,589	51,263
	Spruce	26,069	23,305	23,508	23,431	23,305	24,053
	Fir	12,824	13,380	16,422	14,859	13,377	15,797
	Larch	103,658	96,574	97,274	99,939	96,555	97,438
	Cedar	19,863	21,235	20,807	20,845	21,324	20,866
	Birch	29,031	33,560	25,253	24,302	33,479	25,451
	Aspen	7,034	8,540	6,604	6,224	8,550	6,616
	Other deciduous	4,861	5,536	5,274	5,334	5,529	5,224
	Subtotal	251,534	246,625	246,626	246,626	246,707	246,708
2068 Nonexploitable							
	Pine	25,669	25,669	25,669	25,669	25,704	25,704
	Spruce	20,050	20,050	20,050	20,050	20,122	20,122
	Fir	5,457	5,457	5,457	5,457	5,460	5,460
	Larch	170,205	170,205	170,205	170,205	170,312	170,312
	Cedar	27,779	27,779	27,779	27,779	27,960	27,960
	Dwarf Pine	24,471	24,471	24,471	24,471	24,473	24,473
	Birch	15,400	15,400	15,400	15,400	15,065	15,065
	Aspen	1,475	1,475	1,475	1,475	1,426	1,426
	Other deciduous	15,189	15,189	15,189	15,189	15,174	15,174
Siberia &	Subtotal	305,697	305,697	305,697	305,697	305,697	305,697
Far East	**2068 total**	557,230	552,322	552,323	552,322	552,404	552,405
Russia							

Table 1. Projected area of forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

Siberia & Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2168 Exploitable				(Thousand Hectares)			
	Pine	45,646	37,648	40,099	46,015	37,594	40,111
	Spruce	30,617	26,577	25,764	25,430	27,028	26,668
	Fir	12,653	13,448	14,985	13,700	13,542	14,652
	Larch	101,158	93,260	92,240	99,049	92,741	91,742
	Cedar	21,393	25,167	24,751	24,596	25,775	25,177
	Birch	28,431	32,506	30,678	22,946	31,769	30,248
	Aspen	7,237	8,912	9,112	5,963	8,589	8,601
	Other deciduous	4,399	5,577	5,407	5,336	5,476	5,271
	Subtotal	251,534	243,096	243,036	243,036	242,512	242,471
2168 Nonexploitable							
	Pine	26,034	26,034	26,034	26,034	26,244	26,244
	Spruce	22,872	22,872	22,872	22,872	23,404	23,404
	Fir	6,422	6,422	6,422	6,422	6,425	6,425
	Larch	164,774	164,774	164,774	164,774	165,225	165,225
	Cedar	26,353	26,353	26,353	26,353	27,552	27,552
	Dwarf Pine	24,335	24,335	24,335	24,335	24,366	24,366
	Birch	17,962	17,962	17,962	17,962	15,893	15,893
	Aspen	1,679	1,679	1,679	1,679	1,418	1,418
	Other deciduous	15,266	15,266	15,266	15,266	15,169	15,169
Siberia & Far East Russia	Subtotal	305,697	305,697	305,697	305,697	305,697	305,697
	2168 total	557,231	548,792	548,733	548,732	548,209	548,168

Table 2. Projected growing-stock volume on forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia.

West Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
1988 Exploitable				(Thousand Cubic Meters)			
	Pine	2,217,967	2,217,967	2,217,967	2,217,967	2,217,967	2,217,967
	Spruce	408,100	408,100	408,100	408,100	408,100	408,100
	Fir	395,777	395,777	395,777	395,777	395,777	395,777
	Larch	175,286	175,286	175,286	175,286	175,286	175,286
	Cedar	1,144,824	1,144,824	1,144,824	1,144,824	1,144,824	1,144,824
	Birch	1,679,276	1,679,276	1,679,276	1,679,276	1,679,276	1,679,276
	Aspen	697,230	697,230	697,230	697,230	697,230	697,230
	Subtotal	6,718,462	6,718,462	6,718,462	6,718,462	6,718,462	6,718,462
1988 Nonexploitable							
	Pine	1,451,910	1,451,910	1,451,910	1,451,910	1,451,910	1,451,910
	Spruce	274,190	274,190	274,190	274,190	274,190	274,190
	Fir	86,359	86,359	86,359	86,359	86,359	86,359
	Larch	591,785	591,785	591,785	591,785	591,785	591,785
	Cedar	960,895	960,895	960,895	960,895	960,895	960,895
	Birch	341,891	341,891	341,891	341,891	341,891	341,891
	Aspen	51,264	51,264	51,264	51,264	51,264	51,264
West	Subtotal	3,758,294	3,758,294	3,758,294	3,758,294	3,758,294	3,758,294
Siberia	**1988 total**	10,476,755	10,476,755	10,476,755	10,476,755	10,476,755	10,476,755
2008 Exploitable							
	Pine	2,561,854	2,297,676	2,262,131	2,265,610	2,295,572	2,258,554
	Spruce	443,950	394,304	396,279	405,635	393,054	397,848
	Fir	480,941	406,887	414,668	408,859	402,323	410,538
	Larch	196,302	170,766	172,673	173,241	169,216	172,274
	Cedar	1,325,346	1,340,867	1,342,004	1,341,883	1,340,902	1,342,076
	Birch	1,838,179	1,307,998	1,289,160	1,289,185	1,298,676	1,282,204
	Aspen	717,173	515,130	525,121	522,065	521,424	528,171
	Subtotal	7,563,745	6,433,629	6,402,036	6,406,479	6,421,167	6,391,666
2008 Nonexploitable							
	Pine	1,550,035	1,550,035	1,550,035	1,550,035	1,550,035	1,550,035
	Spruce	273,080	273,080	273,080	273,080	273,080	273,080
	Fir	91,161	91,161	91,161	91,161	91,161	91,161
	Larch	615,093	615,093	615,093	615,093	615,093	615,093
	Cedar	987,232	987,232	987,232	987,232	987,232	987,232
	Birch	352,169	352,169	352,169	352,169	352,169	352,169
	Aspen	49,889	49,889	49,889	49,889	49,889	49,889
West	Subtotal	3,918,659	3,918,659	3,918,659	3,918,659	3,918,659	3,918,659
Siberia	**2008 total**	11,482,404	10,352,288	10,320,696	10,325,138	10,339,827	10,310,325
2028 Exploitable							
	Pine	2,795,297	2,281,445	2,242,022	2,243,413	2,272,140	2,233,934
	Spruce	477,831	397,671	403,759	427,289	394,883	408,922
	Fir	562,124	409,229	463,495	442,518	404,713	450,209
	Larch	222,835	164,990	162,264	164,037	164,780	161,854
	Cedar	1,448,644	1,421,626	1,409,023	1,418,183	1,423,550	1,406,955
	Birch	1,861,312	1,093,549	1,034,858	1,047,352	1,084,969	1,032,505
	Aspen	726,299	365,575	389,875	364,667	371,433	394,286
	Subtotal	8,094,342	6,134,085	6,105,295	6,107,459	6,116,468	6,088,665
2028 Nonexploitable							
	Pine	1,612,847	1,612,847	1,612,847	1,612,847	1,614,410	1,614,410
	Spruce	263,777	263,777	263,777	263,777	264,081	264,081
	Fir	96,541	96,541	96,541	96,541	96,636	96,636
	Larch	665,254	665,254	665,254	665,254	666,033	666,033
	Cedar	1,041,825	1,041,825	1,041,825	1,041,825	1,042,893	1,042,893
	Birch	282,482	282,482	282,482	282,482	282,656	282,656
	Aspen	47,916	47,916	47,916	47,916	47,935	47,935
West	Subtotal	4,010,642	4,010,642	4,010,642	4,010,642	4,014,644	4,014,644
Siberia	**2028 total**	12,104,984	10,144,727	10,115,937	10,118,101	10,131,111	10,103,309

Table 2. Projected growing-stock volume on forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

West Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2068 Exploitable				(Thousand Cubic Meters)			
	Pine	2,962,728	2,194,768	2,219,411	2,223,089	2,209,498	2,228,621
	Spruce	513,121	434,308	441,804	511,882	435,379	488,654
	Fir	633,228	404,343	644,578	536,338	400,944	586,924
	Larch	254,639	171,609	168,529	172,376	170,308	164,309
	Cedar	1,588,155	1,498,447	1,466,733	1,473,702	1,501,725	1,466,860
	Birch	1,886,611	698,169	541,657	573,596	681,546	549,920
	Aspen	720,437	380,645	308,017	301,349	382,184	310,963
	Subtotal	8,558,918	5,782,289	5,790,728	5,792,333	5,781,584	5,796,252
2068 Nonexploitable							
	Pine	1,593,782	1,593,782	1,593,782	1,593,782	1,602,856	1,602,856
	Spruce	260,587	260,587	260,587	260,587	262,278	262,278
	Fir	101,800	101,800	101,800	101,800	102,446	102,446
	Larch	652,845	652,845	652,845	652,845	657,228	657,228
	Cedar	1,118,407	1,118,407	1,118,407	1,118,407	1,125,555	1,125,555
	Birch	277,632	277,632	277,632	277,632	277,828	277,828
	Aspen	50,195	50,195	50,195	50,195	50,097	50,097
West	Subtotal	4,055,248	4,055,248	4,055,248	4,055,248	4,078,289	4,078,289
Siberia	**2068 total**	12,614,166	9,837,537	9,845,976	9,847,581	9,859,873	9,874,541
2168 Exploitable							
	Pine	3,024,565	1,811,835	1,796,340	1,845,374	1,836,825	1,828,389
	Spruce	549,569	514,324	494,436	578,966	525,000	553,092
	Fir	637,148	338,071	529,686	458,607	342,557	485,716
	Larch	251,628	173,116	173,126	181,326	176,895	175,814
	Cedar	1,660,006	1,782,205	1,747,436	1,734,733	1,830,624	1,788,900
	Birch	1,924,352	471,590	419,774	445,316	463,141	421,432
	Aspen	736,479	284,920	321,261	227,531	285,453	298,891
	Subtotal	8,783,747	5,376,060	5,482,060	5,471,852	5,460,495	5,552,235
2168 Nonexploitable							
	Pine	1,561,554	1,561,554	1,561,554	1,561,554	1,603,423	1,603,423
	Spruce	266,213	266,213	266,213	266,213	273,477	273,477
	Fir	102,228	102,228	102,228	102,228	105,422	105,422
	Larch	619,611	619,611	619,611	619,611	639,056	639,056
	Cedar	1,149,084	1,149,084	1,149,084	1,149,084	1,191,139	1,191,139
	Birch	323,834	323,834	323,834	323,834	313,307	313,307
	Aspen	62,757	62,757	62,757	62,757	60,023	60,023
West	Subtotal	4,085,280	4,085,280	4,085,280	4,085,280	4,185,847	4,185,847
Siberia	**2168 total**	12,869,027	9,461,340	9,567,340	9,557,132	9,646,343	9,738,082

East Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
1988 Exploitable				(Thousand Cubic Meters)			
	Pine	3,775,728	3,775,728	3,775,728	3,775,728	3,775,728	3,775,728
	Spruce	704,760	704,760	704,760	704,760	704,760	704,760
	Fir	1,178,979	1,178,979	1,178,979	1,178,979	1,178,979	1,178,979
	Larch	4,713,171	4,713,171	4,713,171	4,713,171	4,713,171	4,713,171
	Cedar	1,154,975	1,154,975	1,154,975	1,154,975	1,154,975	1,154,975
	Birch	1,286,873	1,286,873	1,286,873	1,286,873	1,286,873	1,286,873
	Aspen	532,504	532,504	532,504	532,504	532,504	532,504
	Other deciduous	952	952	952	952	952	952
	Subtotal	13,347,942	13,347,942	13,347,942	13,347,942	13,347,942	13,347,942
1988 Nonexploitable							
	Pine	1,796,345	1,796,345	1,796,345	1,796,345	1,796,345	1,796,345
	Spruce	1,015,037	1,015,037	1,015,037	1,015,037	1,015,037	1,015,037
	Fir	466,495	466,495	466,495	466,495	466,495	466,495
	Larch	8,850,885	8,850,885	8,850,885	8,850,885	8,850,885	8,850,885
	Cedar	3,294,952	3,294,952	3,294,952	3,294,952	3,294,952	3,294,952
	Birch	791,692	791,692	791,692	791,692	791,692	791,692
	Aspen	127,091	127,091	127,091	127,091	127,091	127,091
	Other deciduous	2,409	2,409	2,409	2,409	2,409	2,409
East	Subtotal	16,344,907	16,344,907	16,344,907	16,344,907	16,344,907	16,344,907
Siberia	**1988 Total**	29,692,850	29,692,850	29,692,850	29,692,850	29,692,850	29,692,850

Table 2. Projected growing-stock volume on forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

East Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2008 Exploitable				(Thousand Cubic Meters)			
	Pine	3,930,139	3,423,581	3,388,316	3,385,783	3,408,718	3,374,712
	Spruce	884,240	755,939	759,233	775,945	754,478	762,282
	Fir	1,316,091	1,211,545	1,213,443	1,236,664	1,209,168	1,212,864
	Larch	4,883,602	4,307,889	4,300,848	4,375,383	4,296,806	4,284,519
	Cedar	1,396,361	1,413,970	1,414,359	1,411,747	1,414,213	1,414,439
	Birch	1,496,935	1,264,101	1,243,484	1,234,181	1,254,826	1,246,871
	Aspen	471,462	359,858	363,834	364,437	369,472	363,218
	Other deciduous	1,017	1,017	784	816	922	1,016
	Subtotal	14,379,846	12,737,899	12,684,300	12,784,955	12,708,603	12,659,920
2008 Nonexploitable							
	Pine	1,783,773	1,783,773	1,783,773	1,783,773	1,783,773	1,783,773
	Spruce	1,136,303	1,136,303	1,136,303	1,136,303	1,136,303	1,136,303
	Fir	504,752	504,752	504,752	504,752	504,752	504,752
	Larch	8,906,268	8,906,268	8,906,268	8,906,268	8,906,268	8,906,268
	Cedar	3,408,486	3,408,486	3,408,486	3,408,486	3,408,486	3,408,486
	Birch	807,280	807,280	807,280	807,280	807,280	807,280
	Aspen	118,757	118,757	118,757	118,757	118,757	118,757
	Other deciduous	2,542	2,542	2,542	2,542	2,542	2,542
East	Subtotal	16,668,162	16,668,162	16,668,162	16,668,162	16,668,162	16,668,162
Siberia	**2008 total**	31,048,009	29,406,062	29,352,462	29,453,118	29,376,766	29,328,082
2028 Exploitable							
	Pine	4,130,242	3,242,307	3,258,026	3,274,690	3,231,484	3,240,031
	Spruce	1,046,290	746,825	751,583	761,015	749,211	746,335
	Fir	1,367,707	1,208,842	1,211,767	1,245,390	1,212,407	1,214,192
	Larch	5,068,555	4,117,393	4,118,222	4,258,245	4,094,417	4,122,779
	Cedar	1,618,273	1,463,056	1,463,594	1,479,724	1,468,143	1,461,133
	Birch	1,423,173	1,328,454	1,277,809	1,250,801	1,335,724	1,291,431
	Aspen	440,772	418,263	399,140	385,326	414,575	400,191
	Other deciduous	1,030	340	185	292	375	164
	Subtotal	15,096,042	12,525,480	12,480,326	12,655,482	12,506,336	12,476,257
2028 Nonexploitable							
	Pine	1,803,808	1,803,808	1,803,808	1,803,808	1,807,375	1,807,375
	Spruce	1,285,602	1,285,602	1,285,602	1,285,602	1,287,476	1,287,476
	Fir	562,884	562,884	562,884	562,884	564,019	564,019
	Larch	8,852,910	8,852,910	8,852,910	8,852,910	8,865,660	8,865,660
	Cedar	3,512,390	3,512,390	3,512,390	3,512,390	3,519,841	3,519,841
	Birch	747,589	747,589	747,589	747,589	748,308	748,308
	Aspen	109,161	109,161	109,161	109,161	109,270	109,270
	Other deciduous	2,587	2,587	2,587	2,587	2,589	2,589
East	Subtotal	16,876,931	16,876,931	16,876,931	16,876,931	16,904,541	16,904,541
Siberia	**2028 total**	31,972,973	29,402,411	29,357,257	29,532,414	29,410,877	29,380,798
2068 Exploitable							
	Pine	4,181,988	3,092,649	3,415,843	3,557,290	3,097,125	3,405,768
	Spruce	1,247,040	813,171	800,220	795,909	819,690	793,499
	Fir	1,400,266	1,262,868	1,260,641	1,295,937	1,273,367	1,267,057
	Larch	5,305,070	4,083,191	4,163,664	4,326,437	4,102,796	4,219,670
	Cedar	1,981,288	1,604,480	1,599,652	1,625,852	1,624,768	1,610,162
	Birch	1,209,930	1,357,742	1,072,990	1,014,526	1,360,595	1,089,176
	Aspen	391,593	417,385	340,250	324,757	429,585	345,300
	Other deciduous	1,017	768	227	201	783	222
	Subtotal	15,718,194	12,632,255	12,653,488	12,940,909	12,708,710	12,730,854
2068 Nonexploitable							
	Pine	1,842,309	1,842,309	1,842,309	1,842,309	1,862,871	1,862,871
	Spruce	1,385,027	1,385,027	1,385,027	1,385,027	1,397,386	1,397,386
	Fir	645,077	645,077	645,077	645,077	652,013	652,013
	Larch	8,813,993	8,813,993	8,813,993	8,813,993	8,887,767	8,887,767
	Cedar	3,605,795	3,605,795	3,605,795	3,605,795	3,652,806	3,652,806
	Birch	758,345	758,345	758,345	758,345	755,530	755,530
	Aspen	117,892	117,892	117,892	117,892	117,003	117,003
	Other deciduous	2,556	2,556	2,556	2,556	2,567	2,567
East	Subtotal	17,170,994	17,170,994	17,170,994	17,170,994	17,327,942	17,327,942
Siberia	**2068 total**	32,889,188	29,803,249	29,824,482	30,111,903	30,036,653	30,058,796

Table 2. Projected growing-stock volume on forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

East Siberia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2168 Exploitable				(Thousand Cubic Meters)			
	Pine	3,724,640	2,104,540	2,321,197	3,188,259	2,136,451	2,354,094
	Spruce	1,468,693	951,725	878,030	838,274	986,871	903,194
	Fir	1,387,505	1,304,823	1,272,703	1,289,640	1,352,055	1,317,646
	Larch	5,339,244	3,906,470	3,867,681	4,214,661	3,979,016	3,956,372
	Cedar	2,394,206	1,954,737	1,883,505	1,900,581	2,079,588	1,989,552
	Birch	1,181,337	1,211,018	1,210,475	950,323	1,212,576	1,224,001
	Aspen	428,573	415,726	404,981	289,122	408,684	399,131
	Other deciduous	960	475	142	47	471	175
	Subtotal	15,925,159	11,849,514	11,838,714	12,670,907	12,155,711	12,144,166
2168 Nonexploitable							
	Pine	1,873,947	1,873,947	1,873,947	1,873,947	1,951,892	1,951,892
	Spruce	1,562,485	1,562,485	1,562,485	1,562,485	1,625,490	1,625,490
	Fir	804,848	804,848	804,848	804,848	832,790	832,790
	Larch	8,711,604	8,711,604	8,711,604	8,711,604	9,044,109	9,044,109
	Cedar	3,359,461	3,359,461	3,359,461	3,359,461	3,602,969	3,602,969
	Birch	864,278	864,278	864,278	864,278	791,814	791,814
	Aspen	147,844	147,844	147,844	147,844	134,997	134,997
	Other deciduous	2,426	2,426	2,426	2,426	2,481	2,481
East	Subtotal	17,326,892	17,326,892	17,326,892	17,326,892	17,986,542	17,986,542
Siberia	**2168 total**	33,252,051	29,176,406	29,165,606	29,997,799	30,142,254	30,130,709

Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
1988 Exploitable				(Thousand Cubic Meters)			
	Pine	725,767	725,767	725,767	725,767	725,767	725,767
	Spruce	1,685,972	1,685,972	1,685,972	1,685,972	1,685,972	1,685,972
	Fir	212,643	212,643	212,643	212,643	212,643	212,643
	Larch	5,965,862	5,965,862	5,965,862	5,965,862	5,965,862	5,965,862
	Cedar	425,679	425,679	425,679	425,679	425,679	425,679
	Birch	634,337	634,337	634,337	634,337	634,337	634,337
	Aspen	82,275	82,275	82,275	82,275	82,275	82,275
	Other deciduous	516,686	516,686	516,686	516,686	516,686	516,686
	Subtotal	10,249,221	10,249,221	10,249,221	10,249,221	10,249,221	10,249,221
1988 Nonexploitable							
	Pine	553,430	553,430	553,430	553,430	553,430	553,430
	Spruce	718,903	718,903	718,903	718,903	718,903	718,903
	Fir	83,261	83,261	83,261	83,261	83,261	83,261
	Larch	7,517,212	7,517,212	7,517,212	7,517,212	7,517,212	7,517,212
	Cedar	287,023	287,023	287,023	287,023	287,023	287,023
	Dwarf Pine	592,645	592,645	592,645	592,645	592,645	592,645
	Birch	193,407	193,407	193,407	193,407	193,407	193,407
	Aspen	22,143	22,143	22,143	22,143	22,143	22,143
	Other deciduous	597,408	597,408	597,408	597,408	597,408	597,408
Far East	Subtotal	10,565,430	10,565,430	10,565,430	10,565,430	10,565,430	10,565,430
Russia	**1988 total**	20,814,651	20,814,651	20,814,651	20,814,651	20,814,651	20,814,651
2008 Exploitable							
	Pine	823,794	764,723	764,874	792,057	763,853	765,038
	Spruce	1,919,532	1,625,174	1,634,138	1,649,400	1,622,757	1,631,908
	Fir	251,505	237,364	236,570	240,456	236,921	236,389
	Larch	6,436,890	5,757,005	5,758,220	5,758,613	5,741,204	5,743,186
	Cedar	440,198	425,856	425,052	424,510	425,323	426,175
	Birch	798,387	687,353	680,482	715,210	687,495	680,628
	Aspen	103,323	77,774	73,799	77,140	77,870	73,690
	Other deciduous	533,379	503,618	502,666	505,986	503,429	501,578
	Subtotal	11,307,008	10,078,866	10,075,801	10,163,372	10,058,851	10,058,593

Table 2. Projected growing-stock volume on forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2008 Nonexploitable				(Thousand Cubic Meters)			
	Pine	645,324	645,324	645,324	645,324	645,324	645,324
	Spruce	825,340	825,340	825,340	825,340	825,340	825,340
	Fir	91,296	91,296	91,296	91,296	91,296	91,296
	Larch	7,552,932	7,552,932	7,552,932	7,552,932	7,552,932	7,552,932
	Cedar	303,152	303,152	303,152	303,152	303,152	303,152
	Dwarf Pine	609,898	609,898	609,898	609,898	609,898	609,898
	Birch	234,459	234,459	234,459	234,459	234,459	234,459
	Aspen	27,821	27,821	27,821	27,821	27,821	27,821
	Other deciduous	603,177	603,177	603,177	603,177	603,177	603,177
Far East	Subtotal	10,893,400	10,893,400	10,893,400	10,893,400	10,893,400	10,893,400
Russia	**2008 total**	22,200,408	20,972,266	20,969,200	21,056,772	20,952,251	20,951,993
2028 Exploitable							
	Pine	892,473	799,147	853,676	859,348	800,810	854,131
	Spruce	2,249,287	1,655,824	1,664,040	1,675,389	1,647,251	1,663,020
	Fir	266,262	256,042	262,053	262,484	257,149	263,092
	Larch	6,723,498	5,633,428	5,648,774	5,744,975	5,620,361	5,637,932
	Cedar	480,997	429,523	429,912	429,132	429,459	432,766
	Birch	824,374	778,215	751,494	782,036	781,056	753,043
	Aspen	104,374	110,399	99,651	100,432	110,283	98,256
	Other deciduous	517,457	498,831	496,556	502,206	497,882	493,805
	Subtotal	12,058,722	10,161,409	10,206,156	10,356,003	10,144,252	10,196,045
2028 Nonexploitable							
	Pine	754,889	754,889	754,889	754,889	755,973	755,973
	Spruce	1,000,529	1,000,529	1,000,529	1,000,529	1,002,207	1,002,207
	Fir	95,851	95,851	95,851	95,851	95,966	95,966
	Larch	7,394,614	7,394,614	7,394,614	7,394,614	7,406,865	7,406,865
	Cedar	326,799	326,799	326,799	326,799	327,244	327,244
	Dwarf Pine	614,508	614,508	614,508	614,508	615,459	615,459
	Birch	275,941	275,941	275,941	275,941	276,262	276,262
	Aspen	34,144	34,144	34,144	34,144	34,146	34,146
	Other deciduous	584,244	584,244	584,244	584,244	584,973	584,973
Far East	Subtotal	11,081,517	11,081,517	11,081,517	11,081,517	11,099,095	11,099,095
Russia	**2028 total**	23,140,240	21,242,927	21,287,674	21,437,520	21,243,347	21,295,140
2068 Exploitable							
	Pine	916,540	841,988	1,000,320	936,547	848,684	1,000,897
	Spruce	2,830,698	1,789,153	1,805,800	1,823,074	1,786,494	1,814,457
	Fir	225,412	276,151	289,746	277,349	276,597	294,512
	Larch	7,047,081	5,365,074	5,507,902	5,767,508	5,382,575	5,537,601
	Cedar	551,541	416,554	422,772	426,192	419,102	427,169
	Birch	667,734	798,278	662,352	669,140	805,395	660,051
	Aspen	117,215	165,088	128,411	127,796	161,948	129,287
	Other deciduous	479,758	509,034	498,086	505,865	512,055	498,068
	Subtotal	12,835,978	10,161,320	10,315,390	10,533,473	10,192,851	10,362,043
2068 Nonexploitable							
	Pine	775,541	775,541	775,541	775,541	782,108	782,108
	Spruce	1,333,529	1,333,529	1,333,529	1,333,529	1,347,953	1,347,953
	Fir	103,340	103,340	103,340	103,340	104,162	104,162
	Larch	7,313,693	7,313,693	7,313,693	7,313,693	7,381,631	7,381,631
	Cedar	344,222	344,222	344,222	344,222	347,439	347,439
	Dwarf Pine	630,625	630,625	630,625	630,625	636,120	636,120
	Birch	244,923	244,923	244,923	244,923	245,149	245,149
	Aspen	45,481	45,481	45,481	45,481	44,858	44,858
	Other deciduous	544,735	544,735	544,735	544,735	548,306	548,306
Far East	Subtotal	11,336,088	11,336,088	11,336,088	11,336,088	11,437,727	11,437,727
Russia	**2068 total**	24,172,065	21,497,407	21,651,478	21,869,560	21,630,578	21,799,770

Table 2. Projected growing-stock volume on forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2168 Exploitable				(Thousand Cubic Meters)			
	Pine	886,796	734,034	855,887	843,547	757,007	881,116
	Spruce	3,550,035	1,813,998	1,802,396	1,968,867	1,874,983	1,874,989
	Fir	208,600	268,107	271,689	246,063	278,538	284,189
	Larch	6,796,294	4,829,428	4,749,386	5,453,983	4,937,433	4,855,661
	Cedar	625,753	356,741	362,215	384,186	377,725	382,370
	Birch	577,329	760,350	740,985	634,700	760,922	740,808
	Aspen	125,545	207,353	191,080	150,732	199,266	182,866
	Other deciduous	426,283	512,937	492,047	498,382	522,319	497,578
	Subtotal	13,196,636	9,482,947	9,465,683	10,180,460	9,708,193	9,699,576
2168 Nonexploitable							
	Pine	785,340	785,340	785,340	785,340	820,028	820,028
	Spruce	1,679,312	1,679,312	1,679,312	1,679,312	1,777,745	1,777,745
	Fir	113,303	113,303	113,303	113,303	115,542	115,542
	Larch	6,827,595	6,827,595	6,827,595	6,827,595	7,069,610	7,069,610
	Cedar	331,686	331,686	331,686	331,686	350,533	350,533
	Dwarf Pine	641,279	641,279	641,279	641,279	666,088	666,088
	Birch	342,349	342,349	342,349	342,349	333,956	333,956
	Aspen	52,145	52,145	52,145	52,145	43,758	43,758
	Other deciduous	526,153	526,153	526,153	526,153	536,311	536,311
Far East	Subtotal	11,299,162	11,299,162	11,299,162	11,299,162	11,713,570	11,713,570
Russia	**2168 total**	24,495,797	20,782,109	20,764,845	21,479,622	21,421,764	21,413,146

Siberia & Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
1988 Exploitable				(Thousand Cubic Meters)			
	Pine	6,719,462	6,719,462	6,719,462	6,719,462	6,719,462	6,719,462
	Spruce	2,798,832	2,798,832	2,798,832	2,798,832	2,798,832	2,798,832
	Fir	1,787,399	1,787,399	1,787,399	1,787,399	1,787,399	1,787,399
	Larch	10,854,319	10,854,319	10,854,319	10,854,319	10,854,319	10,854,319
	Cedar	2,725,478	2,725,478	2,725,478	2,725,478	2,725,478	2,725,478
	Birch	3,600,486	3,600,486	3,600,486	3,600,486	3,600,486	3,600,486
	Aspen	1,312,009	1,312,009	1,312,009	1,312,009	1,312,009	1,312,009
	Other deciduous	517,638	517,638	517,638	517,638	517,638	517,638
	Subtotal	30,315,623	30,315,623	30,315,623	30,315,623	30,315,623	30,315,623
1988 Nonexploitable							
	Pine	3,801,685	3,801,685	3,801,685	3,801,685	3,801,685	3,801,685
	Spruce	2,008,130	2,008,130	2,008,130	2,008,130	2,008,130	2,008,130
	Fir	636,115	636,115	636,115	636,115	636,115	636,115
	Larch	16,959,882	16,959,882	16,959,882	16,959,882	16,959,882	16,959,882
	Cedar	4,542,870	4,542,870	4,542,870	4,542,870	4,542,870	4,542,870
	Dwarf Pine	592,645	592,645	592,645	592,645	592,645	592,645
	Birch	1,326,990	1,326,990	1,326,990	1,326,990	1,326,990	1,326,990
	Aspen	200,498	200,498	200,498	200,498	200,498	200,498
	Other deciduous	599,817	599,817	599,817	599,817	599,817	599,817
Siberia &	Subtotal	30,668,632	30,668,632	30,668,632	30,668,632	30,668,632	30,668,632
Far East	**1988 total**	60,984,255	60,984,255	60,984,255	60,984,255	60,984,255	60,984,255
Russia							
2008 Exploitable							
	Pine	7,063,349	6,799,171	6,763,626	6,767,105	6,797,067	6,760,049
	Spruce	2,834,682	2,785,036	2,787,011	2,796,367	2,783,786	2,788,580
	Fir	1,872,563	1,798,509	1,806,290	1,800,481	1,793,945	1,802,160
	Larch	10,875,335	10,849,799	10,851,706	10,852,274	10,848,249	10,851,307
	Cedar	2,906,000	2,921,521	2,922,658	2,922,537	2,921,556	2,922,730
	Birch	3,759,389	3,229,208	3,210,370	3,210,395	3,219,886	3,203,414
	Aspen	1,331,952	1,129,909	1,139,900	1,136,844	1,136,203	1,142,950
	Other deciduous	534,396	504,635	503,450	506,802	504,351	502,594
	Subtotal	31,177,666	30,017,788	29,985,011	29,992,805	30,005,043	29,973,784

Table 2. Projected growing-stock volume on forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

Siberia & Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2008 Nonexploitable				(Thousand Cubic Meters)			
	Pine	3,979,132	3,979,132	3,979,132	3,979,132	3,979,132	3,979,132
	Spruce	2,234,723	2,234,723	2,234,723	2,234,723	2,234,723	2,234,723
	Fir	687,209	687,209	687,209	687,209	687,209	687,209
	Larch	17,074,293	17,074,293	17,074,293	17,074,293	17,074,293	17,074,293
	Cedar	4,698,870	4,698,870	4,698,870	4,698,870	4,698,870	4,698,870
	Dwarf Pine	609,898	609,898	609,898	609,898	609,898	609,898
	Birch	1,393,908	1,393,908	1,393,908	1,393,908	1,393,908	1,393,908
	Aspen	196,467	196,467	196,467	196,467	196,467	196,467
	Other deciduous	605,719	605,719	605,719	605,719	605,719	605,719
Siberia & Far East Russia	Subtotal	31,480,219	31,480,219	31,480,219	31,480,219	31,480,219	31,480,219
	2008 total	62,657,885	61,498,007	61,465,230	61,473,024	61,485,262	61,454,003
2028 Exploitable							
	Pine	7,818,012	6,322,899	6,353,724	6,377,451	6,304,434	6,328,096
	Spruce	3,773,408	2,800,320	2,819,382	2,863,693	2,791,345	2,818,277
	Fir	2,196,093	1,874,113	1,937,315	1,950,392	1,874,269	1,927,493
	Larch	12,014,888	9,915,811	9,929,260	10,167,257	9,879,558	9,922,565
	Cedar	3,547,914	3,314,205	3,302,529	3,327,039	3,321,152	3,300,854
	Birch	4,108,859	3,200,218	3,064,161	3,080,189	3,201,749	3,076,979
	Aspen	1,271,445	894,237	888,666	850,425	896,291	892,733
	Other deciduous	518,487	499,171	496,741	502,498	498,257	493,969
	Subtotal	35,249,106	28,820,974	28,791,778	29,118,944	28,767,055	28,760,966
2028 Nonexploitable							
	Pine	4,171,544	4,171,544	4,171,544	4,171,544	4,177,758	4,177,758
	Spruce	2,549,908	2,549,908	2,549,908	2,549,908	2,553,764	2,553,764
	Fir	755,276	755,276	755,276	755,276	756,621	756,621
	Larch	16,912,778	16,912,778	16,912,778	16,912,778	16,938,558	16,938,558
	Cedar	4,881,014	4,881,014	4,881,014	4,881,014	4,889,978	4,889,978
	Dwarf Pine	614,508	614,508	614,508	614,508	615,459	615,459
	Birch	1,306,012	1,306,012	1,306,012	1,306,012	1,307,226	1,307,226
	Aspen	191,221	191,221	191,221	191,221	191,351	191,351
	Other deciduous	586,831	586,831	586,831	586,831	587,562	587,562
Siberia & Far East Russia	Subtotal	31,969,092	31,969,092	31,969,092	31,969,092	32,018,277	32,018,277
	2028 total	67,218,198	60,790,066	60,760,870	61,088,036	60,785,332	60,779,243
2068 Exploitable							
	Pine	8,061,256	6,129,405	6,635,574	6,716,926	6,155,307	6,635,286
	Spruce	4,590,859	3,036,632	3,047,824	3,130,865	3,041,563	3,096,610
	Fir	2,258,906	1,943,362	2,194,965	2,109,624	1,950,908	2,148,493
	Larch	12,606,790	9,619,874	9,840,095	10,266,321	9,655,679	9,921,580
	Cedar	4,120,984	3,519,481	3,489,157	3,525,746	3,545,595	3,504,191
	Birch	3,764,275	2,854,189	2,276,999	2,257,262	2,847,536	2,299,147
	Aspen	1,229,245	963,118	776,678	753,902	973,717	785,550
	Other deciduous	480,775	509,802	498,313	506,066	512,838	498,290
	Subtotal	37,113,090	28,575,863	28,759,605	29,266,712	28,683,143	28,889,147
2068 Nonexploitable							
	Pine	4,211,632	4,211,632	4,211,632	4,211,632	4,247,835	4,247,835
	Spruce	2,979,143	2,979,143	2,979,143	2,979,143	3,007,617	3,007,617
	Fir	850,217	850,217	850,217	850,217	858,621	858,621
	Larch	16,780,531	16,780,531	16,780,531	16,780,531	16,926,626	16,926,626
	Cedar	5,068,424	5,068,424	5,068,424	5,068,424	5,125,800	5,125,800
	Dwarf Pine	630,625	630,625	630,625	630,625	636,120	636,120
	Birch	1,280,900	1,280,900	1,280,900	1,280,900	1,278,507	1,278,507
	Aspen	213,568	213,568	213,568	213,568	211,958	211,958
	Other deciduous	547,291	547,291	547,291	547,291	550,873	550,873
Siberia & Far East Russia	Subtotal	32,562,331	32,562,331	32,562,331	32,562,331	32,843,957	32,843,957
	2068 total	69,675,421	61,138,194	61,321,936	61,829,043	61,527,100	61,733,104

Table 2. Projected growing-stock volume on forest land by exploitation class, all management scenarios analyzed, and year for Siberia and Far East Russia, continued.

Siberia & Far East Russia	Forest type	No Exploitation	No Change in Mangement (Baseline)	Increased Regeneration	Environmental Restrictions	Increased Protection	Increased Regeneration & Protection
2168 Exploitable				(Thousand Cubic Meters)			
	Pine	7,636,001	4,650,409	4,973,424	5,877,180	4,730,283	5,063,599
	Spruce	5,568,297	3,280,047	3,174,862	3,386,107	3,386,854	3,331,275
	Fir	2,233,253	1,911,001	2,074,078	1,994,310	1,973,150	2,087,551
	Larch	12,387,166	8,909,014	8,790,193	9,849,970	9,093,344	8,987,847
	Cedar	4,679,965	4,093,683	3,993,156	4,019,500	4,287,937	4,160,822
	Birch	3,683,018	2,442,958	2,371,234	2,030,339	2,436,639	2,386,241
	Aspen	1,290,597	907,999	917,322	667,385	893,403	880,888
	Other deciduous	427,243	513,412	492,189	498,429	522,790	497,753
	Subtotal	37,905,540	26,708,523	26,786,458	28,323,220	27,324,400	27,395,976
2168 Nonexploitable							
	Pine	4,220,841	4,220,841	4,220,841	4,220,841	4,375,343	4,375,343
	Spruce	3,508,010	3,508,010	3,508,010	3,508,010	3,676,712	3,676,712
	Fir	1,020,379	1,020,379	1,020,379	1,020,379	1,053,754	1,053,754
	Larch	16,158,810	16,158,810	16,158,810	16,158,810	16,752,775	16,752,775
	Cedar	4,840,231	4,840,231	4,840,231	4,840,231	5,144,641	5,144,641
	Dwarf Pine	641,279	641,279	641,279	641,279	666,088	666,088
	Birch	1,530,461	1,530,461	1,530,461	1,530,461	1,439,077	1,439,077
	Aspen	262,746	262,746	262,746	262,746	238,778	238,778
	Other deciduous	528,579	528,579	528,579	528,579	538,792	538,792
Siberia &	Subtotal	32,711,336	32,711,336	32,711,336	32,711,336	33,885,960	33,885,960
Far East	**2168 total**	70,616,876	59,419,859	59,497,794	61,034,556	61,210,360	61,281,936
Russia							

Table 3. Projected biologically sustainable area of forest land annually available for harvest by all management scenarios analyzed, forest type, and year of harvest in Siberia and Far East Russia.

Year of harvest	Total	Forest type							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand hectares)							
West Siberia		**No Change in Management (Baseline)**							
2008	436.3	109.8	16.9	28.0	12.9	60.3	153.5	55.0	-
2028	416.6	117.5	17.6	29.7	13.5	77.1	100.7	60.5	-
2068	414.3	139.6	21.3	32.6	14.0	83.8	93.2	29.8	-
2168	477.3	184.5	35.7	40.4	17.9	105.6	55.9	37.3	-
West Siberia		**Increased Regeneration**							
2008	455.6	122.9	17.6	31.5	12.6	60.3	159.6	51.1	-
2028	430.9	132.2	17.9	30.5	12.7	78.0	108.7	51.0	-
2068	432.4	144.2	20.6	38.9	13.1	82.2	102.3	31.0	-
2168	494.3	192.1	34.1	72.6	17.5	104.4	32.1	41.5	-
West Siberia		**Environmental Restrictions**							
2008	452.9	122.0	16.7	31.1	12.6	60.3	159.2	51.1	-
2028	432.3	133.3	16.9	30.2	12.6	77.8	105.5	56.0	-
2068	430.1	143.5	21.3	38.9	13.2	82.5	98.8	31.9	-
2168	491.9	192.1	43.5	56.8	17.1	104.7	42.2	35.5	-
West Siberia		**Increased Protection**							
2008	441.3	110.8	17.3	29.5	13.4	61.1	155.8	53.4	-
2028	423.4	119.8	18.2	30.0	13.8	79.6	100.7	61.3	-
2068	419.0	140.2	21.1	33.1	14.2	85.4	94.7	30.3	-
2168	490.3	192.0	37.0	41.6	18.5	109.4	55.0	36.9	-
West Siberia		**Increased Regeneration & Protection**							
2008	460.3	124.8	18.1	32.0	12.8	61.1	161.2	50.4	-
2028	436.9	133.5	18.8	31.1	12.8	81.1	108.3	51.2	-
2068	436.8	145.7	20.7	40.3	13.3	83.6	104.0	29.3	-
2168	508.7	199.6	42.3	66.7	18.1	108.4	34.0	39.6	-

Year of harvest	Total	Forest type							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand hectares)							
East Siberia		**No Change in Management (Baseline)**							
2008	794.7	141.9	66.7	86.1	323.6	11.3	126.2	38.9	-
2028	814.0	143.8	67.7	86.9	325.8	49.9	108.6	31.1	0.3
2068	844.4	127.3	69.6	88.4	346.4	52.7	122.2	37.8	-
2168	1,047.3	164.3	91.3	103.3	424.0	69.2	149.6	45.5	0.1
East Siberia		**Increased Regeneration**							
2008	810.9	153.9	65.5	85.8	326.9	11.4	128.5	38.7	0.1
2028	828.3	156.1	66.7	86.6	329.7	49.8	105.3	33.8	0.2
2068	877.4	140.1	68.6	88.2	350.3	52.2	138.9	39.1	-
2168	1,053.9	191.9	82.3	99.2	425.5	68.6	142.2	44.2	0.0
East Siberia		**Environmental Restrictions**							
2008	771.7	154.1	58.9	79.2	301.7	11.6	128.9	37.2	0.1
2028	790.7	156.8	60.6	80.5	304.0	49.1	109.3	30.2	0.2
2068	831.5	140.2	62.1	82.2	324.8	51.1	138.5	32.4	0.1
2168	930.5	195.1	71.2	87.0	395.9	64.3	82.9	34.0	0.0
East Siberia		**Increased Protection**							
2008	805.0	145.3	67.2	87.8	327.2	11.3	129.3	36.8	0.0
2028	823.5	146.3	67.9	88.6	328.7	51.5	105.6	34.6	0.3
2068	861.7	131.3	69.7	91.4	350.1	54.2	128.3	36.7	-
2168	1,116.8	173.6	99.5	111.3	455.1	75.0	155.6	46.6	0.1
East Siberia		**Increased Regeneration & Protection**							
2008	818.4	156.2	64.5	87.1	331.7	11.5	128.3	39.1	-
2028	835.7	157.9	65.3	87.9	333.5	51.8	104.7	34.2	0.3
2068	897.4	142.9	67.4	90.8	355.0	53.9	147.9	39.5	-
2168	1,125.7	205.7	87.3	106.1	456.6	74.3	150.3	45.4	0.0

Table 3. Projected biologically sustainable area of forest land annually available for harvest by all management scenarios analyzed, forest type, and year of harvest in Siberia and Far East Russia, continued.

Year of harvest	Total	Forest type							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand hectares)							
Far East Russia		**No Change in Management (Baseline)**							
2008	845.3	71.9	136.6	12.1	475.6	19.1	60.0	11.3	58.7
2028	844.4	69.9	138.4	12.9	474.1	15.9	62.1	9.7	61.4
2068	979.8	78.5	148.5	14.5	527.5	15.8	100.4	17.3	77.4
2168	1,294.8	92.9	188.9	19.2	704.4	19.4	137.3	38.4	94.1
Far East Russia		**Increased Regeneration**							
2008	863.0	79.1	135.2	12.6	483.5	19.6	61.3	11.9	59.8
2028	860.9	77.1	138.0	12.9	482.0	15.9	63.0	9.9	62.2
2068	1,013.3	85.5	148.6	14.8	535.9	16.1	114.1	17.4	80.8
2168	1,312.4	115.4	182.0	18.6	720.7	19.5	126.7	35.2	94.3
Far East Russia		**Environmental Restrictions**							
2008	820.4	65.5	129.3	11.0	478.0	19.7	47.6	11.0	58.3
2028	819.2	64.0	131.5	11.4	476.9	15.9	50.0	8.9	60.7
2068	975.1	73.8	141.8	13.2	540.0	15.5	97.0	14.6	79.1
2168	1,207.0	99.2	161.0	15.4	709.5	18.6	85.9	24.6	92.9
Far East Russia		**Increased Protection**							
2008	856.4	72.5	137.3	12.3	482.8	19.5	60.1	11.3	60.6
2028	853.1	70.5	139.2	13.0	479.7	16.3	62.0	9.8	62.6
2068	999.3	79.4	149.9	15.1	534.4	16.3	103.9	19.4	80.9
2168	1,366.4	96.7	196.2	20.5	748.6	20.5	145.2	38.9	99.8
Far East Russia		**Increased Regeneration & Protection**							
2008	873.1	78.9	135.9	12.8	491.2	20.0	61.3	12.0	61.0
2028	869.1	77.0	138.8	13.1	487.6	16.3	63.0	10.3	63.0
2068	1,029.6	85.8	149.6	15.4	543.3	16.5	118.8	17.6	82.6
2168	1,382.1	121.1	190.4	20.3	762.1	20.0	133.7	35.5	99.1

Year of harvest	Total	Forest type							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand hectares)							
Siberia & Far East Russia		**No Change in Management (Baseline)**							
2008	2,076.3	323.6	220.2	126.3	812.1	90.7	339.6	105.2	58.7
2028	2,074.9	331.1	223.6	129.4	813.4	142.9	271.4	101.3	61.8
2068	2,238.6	345.4	239.4	135.5	888.0	152.2	315.7	84.8	77.4
2168	2,819.4	441.8	315.9	163.0	1,146.3	194.2	342.9	121.2	94.3
Siberia & Far East Russia		**Increased Regeneration**							
2008	2,129.4	355.8	218.3	130.0	823.0	91.3	349.4	101.8	59.9
2028	2,120.2	365.4	222.5	130.0	824.4	143.7	277.1	94.7	62.4
2068	2,323.2	369.9	237.8	141.9	899.3	150.6	355.4	87.5	80.8
2168	2,860.5	499.3	298.4	190.4	1,163.8	192.5	301.1	120.8	94.3
Siberia & Far East Russia		**Environmental Restrictions**							
2008	2,044.9	341.6	205.0	121.3	792.2	91.5	335.7	99.3	58.4
2028	2,042.2	354.0	209.1	122.1	793.5	142.7	264.8	95.1	60.9
2068	2,236.7	357.5	225.2	134.3	878.0	149.2	334.3	79.0	79.2
2168	2,629.4	486.4	275.7	159.2	1,122.5	187.6	211.0	94.1	92.9
Siberia & Far East Russia		**Increased Protection**							
2008	2,102.6	328.7	221.7	129.5	823.3	91.9	345.3	101.6	60.6
2028	2,100.0	336.6	225.3	131.6	822.2	147.3	268.4	105.7	62.9
2068	2,280.0	350.9	240.6	139.7	898.7	155.9	326.9	86.3	80.9
2168	2,973.6	462.2	332.7	173.5	1,222.1	204.9	355.7	122.4	100.0
Siberia & Far East Russia		**Increased Regeneration & Protection**							
2008	2,151.8	359.9	218.4	131.9	835.8	92.6	350.8	101.5	61.0
2028	2,141.7	368.5	222.9	132.1	833.9	149.3	276.0	95.7	63.3
2068	2,363.8	374.4	237.7	146.4	911.6	154.0	370.6	86.4	82.6
2168	3,016.5	526.5	320.0	193.1	1,236.8	202.7	318.0	120.5	99.1

Table 4. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, and year of harvest in Siberia and Far East Russia.

Year of harvest	Total	Species group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
West Siberia		**No Change in Management (Baseline)**							
2008	59,432	12,833	2,716	3,842	1,498	3,871	24,907	9,765	-
2028	60,619	14,401	3,088	5,044	1,633	4,767	18,244	13,441	-
2068	61,141	21,175	4,232	5,554	1,763	6,651	15,999	5,768	-
2168	59,952	23,025	6,100	6,226	2,157	8,722	7,562	6,160	-
West Siberia		**Increased Regeneration**							
2008	61,908	15,100	2,813	4,426	1,439	3,870	25,229	9,031	-
2028	62,626	16,903	3,022	4,958	1,461	4,999	19,880	11,404	-
2068	64,442	22,073	4,128	6,592	1,569	6,278	17,588	6,214	-
2168	63,403	24,864	5,834	11,549	2,076	8,451	3,705	6,923	-
West Siberia		**Environmental Restrictions**							
2008	61,793	14,995	2,579	4,355	1,429	3,870	25,393	9,172	-
2028	62,725	17,061	2,783	4,893	1,451	4,945	19,163	12,430	-
2068	64,132	21,962	4,293	6,613	1,583	6,339	17,104	6,240	-
2168	62,433	24,566	7,551	8,782	2,018	8,522	5,150	5,844	-
West Siberia		**Increased Protection**							
2008	60,118	12,919	2,773	4,073	1,580	3,922	25,371	9,480	-
2028	61,324	14,690	3,199	5,085	1,666	4,939	18,255	13,490	-
2068	61,896	21,429	4,195	5,635	1,774	6,748	16,207	5,907	-
2168	60,692	23,273	6,306	6,362	2,225	9,008	7,396	6,121	-
West Siberia		**Increased Regeneration & Protection**							
2008	62,456	15,246	2,903	4,474	1,457	3,922	25,524	8,930	-
2028	63,311	17,091	3,189	5,065	1,478	5,318	19,707	11,461	-
2068	64,918	22,354	4,162	6,859	1,586	6,319	17,856	5,783	-
2168	64,357	25,173	7,207	10,446	2,138	8,773	4,018	6,602	-

Year of harvest	Total	Species group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
East Siberia		**No Change in Management (Baseline)**							
2008	100,445	23,734	8,437	10,207	33,423	754	16,573	7,318	-
2028	109,658	26,070	9,052	10,961	37,510	3,953	15,920	6,147	46
2068	114,005	26,649	9,208	11,155	39,085	4,318	16,470	7,121	-
2168	132,495	28,883	11,767	13,779	43,352	6,653	19,679	8,365	18
East Siberia		**Increased Regeneration**							
2008	104,152	26,764	8,270	10,139	34,188	759	17,046	6,973	12
2028	113,304	29,048	8,882	10,894	38,343	3,932	15,361	6,811	34
2068	119,954	29,808	9,015	11,087	39,915	4,211	18,606	7,312	-
2168	134,768	34,338	10,226	12,890	43,822	6,537	18,829	8,123	3
East Siberia		**Environmental Restrictions**							
2008	97,629	26,866	7,331	8,737	30,258	769	16,903	6,752	13
2028	107,016	29,250	7,944	9,587	34,333	3,769	15,937	6,164	33
2068	112,446	29,921	8,011	9,781	36,007	3,963	18,678	6,076	10
2168	117,819	35,597	8,657	10,314	39,497	5,555	11,917	6,282	-
East Siberia		**Increased Protection**							
2008	102,091	24,452	8,508	10,371	34,015	754	17,152	6,833	6
2028	111,478	26,651	9,125	11,161	38,132	4,069	15,371	6,930	40
2068	116,786	27,579	9,212	11,471	39,792	4,431	17,436	6,866	-
2168	139,778	30,321	12,818	14,906	45,492	7,217	20,441	8,564	20
East Siberia		**Increased Regeneration & Protection**							
2008	105,441	27,230	8,097	10,216	35,047	763	17,053	7,035	-
2028	114,766	29,458	8,714	11,006	39,226	4,148	15,285	6,883	46
2068	123,038	30,467	8,779	11,316	40,873	4,350	19,880	7,372	-
2168	142,425	36,563	10,722	13,766	46,058	7,055	19,916	8,343	1

Table 4. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, and year of harvest in Siberia and Far East Russia, continued.

Year of harvest	Total	Species group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
Far East Russia		**No Change in Management (Baseline)**							
2008	72,210	5,785	15,398	1,288	39,616	1,246	5,768	1,191	1,918
2028	79,313	5,935	17,641	1,533	43,298	1,400	6,407	1,102	1,998
2068	84,751	6,326	17,903	1,609	45,083	1,578	8,039	1,829	2,385
2168	101,370	7,167	23,264	2,165	49,504	1,978	11,072	3,491	2,728
Far East Russia		**Increased Regeneration**							
2008	74,687	6,853	15,131	1,367	40,867	1,278	5,928	1,299	1,965
2028	81,756	7,002	17,601	1,553	44,563	1,363	6,531	1,120	2,025
2068	88,534	7,340	17,875	1,642	46,407	1,608	9,424	1,804	2,435
2168	102,618	9,729	21,940	2,065	51,255	2,010	9,678	3,235	2,705
Far East Russia		**Environmental Restrictions**							
2008	68,876	4,932	13,987	1,066	40,462	1,285	4,245	1,128	1,772
2028	75,932	5,081	16,243	1,253	44,194	1,355	4,988	984	1,837
2068	81,853	5,418	16,503	1,342	46,193	1,463	7,267	1,439	2,228
2168	89,075	7,640	18,602	1,467	50,521	1,823	4,761	1,744	2,516
Far East Russia		**Increased Protection**							
2008	73,397	5,872	15,528	1,319	40,475	1,275	5,775	1,189	1,964
2028	80,509	6,023	17,799	1,567	44,123	1,425	6,404	1,121	2,048
2068	86,547	6,426	18,079	1,666	45,981	1,623	8,294	2,009	2,470
2168	105,473	7,386	24,335	2,292	51,396	2,105	11,571	3,509	2,878
Far East Russia		**Increased Regeneration & Protection**							
2008	75,727	6,836	15,258	1,391	41,696	1,305	5,925	1,306	2,012
2028	82,812	6,985	17,725	1,578	45,338	1,393	6,536	1,194	2,063
2068	90,125	7,334	18,055	1,688	47,272	1,650	9,845	1,792	2,489
2168	106,778	10,056	23,004	2,180	53,203	2,139	10,101	3,251	2,844

Year of harvest	Total	Species group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
Siberia & Far East Russia		**No Change in Management (Baseline)**							
2008	232,087	42,352	26,551	15,337	74,537	5,871	47,248	18,274	1,918
2028	249,590	46,406	29,781	17,538	82,441	10,120	40,571	20,690	2,044
2068	259,897	54,150	31,343	18,318	85,931	12,547	40,508	14,718	2,385
2168	293,817	59,075	41,131	22,170	95,013	17,353	38,313	18,016	2,746
Siberia & Far East Russia		**Increased Regeneration**							
2008	240,747	48,717	26,214	15,932	76,494	5,907	48,203	17,303	1,977
2028	257,686	52,953	29,505	17,405	84,367	10,294	41,772	19,335	2,059
2068	272,930	59,221	31,018	19,321	87,891	12,097	45,618	15,330	2,435
2168	300,789	68,931	38,000	26,504	97,153	16,998	32,212	18,281	2,708
Siberia & Far East Russia		**Environmental Restrictions**							
2008	228,298	46,793	23,897	14,158	72,149	5,924	46,541	17,052	1,785
2028	245,673	51,392	26,970	15,733	79,978	10,069	40,088	19,578	1,870
2068	258,431	57,301	28,807	17,736	83,783	11,765	43,049	13,755	2,238
2168	269,327	67,803	34,810	20,563	92,036	15,900	21,828	13,870	2,516
Siberia & Far East Russia		**Increased Protection**							
2008	235,606	43,243	26,809	15,763	76,070	5,951	48,298	17,502	1,970
2028	253,311	47,364	30,123	17,813	83,921	10,433	40,030	21,541	2,088
2068	265,229	55,434	31,486	18,772	87,547	12,802	41,937	14,782	2,470
2168	305,943	60,980	43,459	23,560	99,113	18,330	39,408	18,194	2,898
Siberia & Far East Russia		**Increased Regeneration & Protection**							
2008	243,624	49,312	26,258	16,081	78,200	5,990	48,502	17,271	2,012
2028	260,889	53,534	29,628	17,649	86,042	10,859	41,528	19,538	2,109
2068	278,081	60,155	30,996	19,863	89,731	12,319	47,581	14,947	2,489
2168	313,560	71,792	40,933	26,392	101,399	17,967	34,035	18,196	2,845

Table 5. Projected biologically sustainable volume per hectare annually available for harvest by all management scenarios analyzed, species group, and year of harvest in Siberia and Far East Russia.

Year of harvest	Total	Species group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Cubic meters per hectare)							
West Siberia		**No Change in Management (Baseline)**							
2008	136.2	116.8	160.9	137.1	116.1	64.2	162.3	177.7	-
2028	145.5	122.6	175.8	169.7	120.9	61.8	181.3	222.0	-
2068	147.6	151.7	198.5	170.3	125.7	79.4	171.7	193.8	-
2168	125.6	124.8	171.0	154.1	120.8	82.6	135.2	165.2	-
West Siberia		**Increased Regeneration**							
2008	135.9	122.9	159.9	140.5	114.0	64.2	158.1	176.6	-
2028	145.3	127.8	168.9	162.6	115.4	64.1	182.9	223.7	-
2068	149.0	153.1	200.4	169.5	119.8	76.3	171.8	200.4	-
2168	128.3	129.5	171.0	159.2	118.6	81.0	115.2	167.0	-
West Siberia		**Environmental Restrictions**							
2008	136.4	122.9	154.7	140.1	113.6	64.2	159.5	179.5	-
2028	145.1	128.0	164.3	162.1	115.1	63.6	181.6	221.9	-
2068	149.1	153.1	201.4	170.0	120.3	76.8	173.1	195.5	-
2168	126.9	127.9	173.5	154.6	117.7	81.4	122.1	164.4	-
West Siberia		**Increased Protection**							
2008	136.2	116.5	160.7	138.3	118.2	64.2	162.8	177.4	-
2028	144.8	122.6	175.8	169.3	121.1	62.1	181.2	220.1	-
2068	147.7	152.9	199.0	170.1	125.0	79.0	171.1	194.9	-
2168	123.8	121.2	170.3	152.8	120.5	82.3	134.5	165.9	-
West Siberia		**Increased Regeneration & Protection**							
2008	135.7	122.2	160.7	139.9	113.7	64.2	158.4	177.1	-
2028	144.9	128.0	169.5	163.1	115.1	65.6	182.0	223.8	-
2068	148.6	153.5	201.3	170.2	119.1	75.6	171.7	197.6	-
2168	126.5	126.1	170.2	156.7	118.3	81.0	118.2	166.7	-

Year of harvest	Total	Species group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Cubic meters per hectare)							
East Siberia		**No Change in Management (Baseline)**							
2008	126.4	167.3	126.5	118.5	103.3	66.5	131.4	188.1	-
2028	134.7	181.3	133.8	126.2	115.1	79.2	146.6	197.7	143.3
2068	135.0	209.3	132.2	126.1	112.8	82.0	134.8	188.6	-
2168	126.5	175.8	128.9	133.4	102.2	96.2	131.6	183.9	135.3
East Siberia		**Increased Regeneration**							
2008	128.4	173.9	126.3	118.1	104.6	66.4	132.6	180.0	142.9
2028	136.8	186.1	133.2	125.8	116.3	79.0	145.8	201.3	142.9
2068	136.7	212.7	131.4	125.7	113.9	80.7	133.9	187.2	-
2168	127.9	179.0	124.3	129.9	103.0	95.2	132.4	183.8	130.4
East Siberia		**Environmental Restrictions**							
2008	126.5	174.4	124.4	110.4	100.3	66.4	131.1	181.3	136.8
2028	135.3	186.6	131.1	119.0	113.0	76.8	145.9	203.9	144.7
2068	135.2	213.4	128.9	119.0	110.9	77.5	134.9	187.5	123.5
2168	126.6	182.4	121.6	118.5	99.8	86.3	143.8	184.8	-
East Siberia		**Increased Protection**							
2008	126.8	168.3	126.6	118.2	104.0	66.5	132.7	185.5	139.5
2028	135.4	182.2	134.4	126.0	116.0	79.0	145.5	200.4	143.4
2068	135.5	210.1	132.2	125.5	113.7	81.7	135.9	187.3	-
2168	125.2	174.7	128.8	133.9	100.0	96.2	131.4	183.8	137.0
East Siberia		**Increased Regeneration & Protection**							
2008	128.8	174.4	125.6	117.2	105.6	66.3	132.9	180.1	-
2028	137.3	186.6	133.5	125.2	117.6	80.0	145.9	201.4	143.3
2068	137.1	213.2	130.2	124.6	115.1	80.8	134.4	186.7	-
2168	126.5	177.7	122.8	129.8	100.9	94.9	132.5	183.8	125.0

Table 5. Projected biologically sustainable volume per hectare annually available for harvest by all management scenarios analyzed, species group, and year of harvest in Siberia and Far East Russia, continued.

Year of harvest	Total	Species group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Cubic meters per hectare)							
Far East Russia		**No Change in Management (Baseline)**							
2008	85.4	80.5	112.7	106.1	83.3	65.4	96.1	105.4	32.7
2028	93.9	85.0	127.5	119.3	91.3	88.0	103.1	113.4	32.5
2068	86.5	80.6	120.6	111.2	85.5	100.0	80.1	105.8	30.8
2168	78.3	77.1	123.2	112.5	70.3	101.8	80.6	90.9	29.0
Far East Russia		**Increased Regeneration**							
2008	86.5	86.7	111.9	108.3	84.5	65.3	96.8	108.9	32.8
2028	95.0	90.8	127.6	120.0	92.5	85.8	103.6	113.7	32.6
2068	87.4	85.8	120.3	111.1	86.6	99.7	82.6	103.4	30.1
2168	78.2	84.3	120.6	110.9	71.1	103.3	76.4	92.0	28.7
Far East Russia		**Environmental Restrictions**							
2008	84.0	75.3	108.1	96.6	84.7	65.2	89.2	103.0	30.4
2028	92.7	79.4	123.5	110.4	92.7	85.5	99.7	110.8	30.3
2068	83.9	73.4	116.4	102.0	85.5	94.3	74.9	98.3	28.2
2168	73.8	77.0	115.5	95.5	71.2	98.0	55.4	71.0	27.1
Far East Russia		**Increased Protection**							
2008	85.7	81.0	113.1	107.2	83.8	65.3	96.0	105.3	32.4
2028	94.4	85.5	127.9	120.3	92.0	87.6	103.2	113.9	32.7
2068	86.6	81.0	120.6	110.0	86.0	99.8	79.8	103.8	30.5
2168	77.2	76.4	124.1	111.7	68.7	102.5	79.7	90.2	28.8
Far East Russia		**Increased Regeneration & Protection**							
2008	86.7	86.6	112.3	109.0	84.9	65.3	96.6	109.0	33.0
2028	95.3	90.7	127.7	120.7	93.0	85.3	103.8	115.6	32.7
2068	87.5	85.4	120.7	109.9	87.0	99.9	82.9	101.6	30.1
2168	77.3	83.0	120.8	107.2	69.8	107.0	75.5	91.7	28.7

Table 6. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia.

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
					(Thousand cubic meters)				
West Siberia		**Altai Kray**			**No Change in Management (Baseline)**				
2008	3,810	310	31	721	485	144	1,001	1,118	-
2028	4,178	429	41	871	507	197	953	1,180	-
2068	4,492	764	44	918	529	203	717	1,318	-
2168	4,389	1,019	161	1,002	538	264	662	745	-
West Siberia		**Altai Kray**			**Increased Regeneration**				
2008	3,923	311	21	754	549	144	1,004	1,139	-
2028	4,296	428	44	913	571	188	880	1,272	-
2068	4,539	769	46	970	593	220	888	1,053	-
2168	4,719	1,353	192	1,035	602	260	488	789	-
West Siberia		**Altai Kray**			**Environmental Restrictions**				
2008	3,813	313	30	691	529	144	968	1,138	-
2028	4,206	427	41	848	551	188	937	1,214	-
2068	4,472	773	44	907	573	211	766	1,199	-
2168	4,434	1,033	185	972	582	245	604	813	-
West Siberia		**Altai Kray**			**Increased Protection**				
2008	3,827	310	31	734	490	145	1,006	1,111	-
2028	4,211	429	42	878	511	199	958	1,194	-
2068	4,528	766	44	926	531	205	736	1,321	-
2168	4,410	1,033	168	1,032	547	272	671	687	-
West Siberia		**Altai Kray**			**Increased Regeneration & Protection**				
2008	3,934	313	23	771	553	145	1,000	1,129	-
2028	4,325	428	45	920	574	190	887	1,282	-
2068	4,586	769	46	979	594	211	925	1,062	-
2168	4,751	1,370	196	1,060	610	269	492	755	-
West Siberia		**Kemerovo Oblast**			**No Change in Management (Baseline)**				
2008	5,339	12	10	2,243	-	7	598	2,468	-
2028	5,535	44	19	2,563	-	20	1,018	1,871	-
2068	5,580	116	121	2,656	-	26	992	1,669	-
2168	5,276	143	529	2,697	-	92	520	1,294	-
West Siberia		**Kemerovo Oblast**			**Increased Regeneration**				
2008	5,546	1	23	2,704	-	7	1,147	1,664	-
2028	5,806	58	34	2,868	-	19	1,144	1,683	-
2068	5,870	113	58	3,137	-	20	725	1,817	-
2168	5,634	418	405	3,167	-	129	366	1,150	-
West Siberia		**Kemerovo Oblast**			**Environmental Restrictions**				
2008	5,547	1	18	2,695	-	7	1,151	1,674	-
2028	5,801	58	36	2,866	-	19	1,144	1,678	-
2068	5,876	94	72	3,133	-	20	725	1,833	-
2168	5,594	438	406	3,163	-	128	243	1,215	-
West Siberia		**Kemerovo Oblast**			**Increased Protection**				
2008	5,419	13	13	2,276	-	7	578	2,531	-
2028	5,569	50	58	2,609	-	20	990	1,842	-
2068	5,664	118	113	2,707	-	26	1,008	1,692	-
2168	5,339	146	555	2,760	-	94	513	1,272	-
West Siberia		**Kemerovo Oblast**			**Increased Regeneration & Protection**				
2008	5,624	1	9	2,715	-	7	989	1,902	-
2028	5,832	56	38	2,945	-	20	1,285	1,487	-
2068	5,845	136	117	3,184	-	21	824	1,564	-
2168	5,714	401	435	3,224	-	135	375	1,143	-
West Siberia		**Novosibirsk Oblast**			**No Change in Management (Baseline)**				
2008	1,455	125	7	8	-	2	936	377	-
2028	1,554	157	7	24	-	3	1,041	321	-
2068	1,613	318	9	112	-	3	645	526	-
2168	1,594	621	19	112	-	9	501	332	-
West Siberia		**Novosibirsk Oblast**			**Increased Regeneration**				
2008	1,501	127	7	8	-	2	965	392	-
2028	1,628	159	7	24	-	3	765	670	-
2068	1,618	318	9	183	-	3	754	351	-
2168	1,545	580	20	358	-	9	266	311	-

Table 6. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
					(Thousand cubic meters)				
West Siberia		**Novosibirsk Oblast**			**Environmental Restrictions**				
2008	1,475	125	7	8	-	2	964	369	-
2028	1,588	158	7	24	-	3	994	402	-
2068	1,622	318	9	136	-	3	710	445	-
2168	1,587	631	20	136	-	9	448	343	-
West Siberia		**Novosibirsk Oblast**			**Increased Protection**				
2008	1,464	125	7	8	-	2	941	380	-
2028	1,562	157	7	24	-	3	1,051	320	-
2068	1,623	319	9	112	-	3	657	523	-
2168	1,609	627	20	112	-	10	508	333	-
West Siberia		**Novosibirsk Oblast**			**Increased Regeneration & Protection**				
2008	1,505	127	7	8	-	2	967	395	-
2028	1,632	159	7	24	-	3	772	667	-
2068	1,624	320	9	184	-	3	756	351	-
2168	1,556	586	21	354	-	10	271	315	-
West Siberia		**Omsk Oblast**			**No Change in Management (Baseline)**				
2008	3,649	134	23	19	-	8	3,038	427	-
2028	3,778	458	31	19	-	14	2,015	1,241	-
2068	3,727	827	88	54	-	55	1,922	781	-
2168	3,316	1,248	204	601	-	98	609	555	-
West Siberia		**Omsk Oblast**			**Increased Regeneration**				
2008	3,878	186	42	26	-	8	3,064	553	-
2028	3,882	459	49	26	-	17	2,386	945	-
2068	3,706	927	91	171	-	53	2,108	356	-
2168	3,353	1,856	213	400	-	97	393	394	-
West Siberia		**Omsk Oblast**			**Environmental Restrictions**				
2008	3,878	186	42	24	-	8	3,064	554	-
2028	3,876	456	49	24	-	17	2,406	923	-
2068	3,690	940	91	189	-	53	2,064	353	-
2168	3,287	1,660	221	509	-	97	425	375	-
West Siberia		**Omsk Oblast**			**Increased Protection**				
2008	3,712	130	24	19	-	8	3,038	493	-
2028	3,681	483	31	19	-	14	2,258	875	-
2068	3,819	794	81	54	-	55	1,966	868	-
2168	3,337	1,266	205	620	-	104	600	541	-
West Siberia		**Omsk Oblast**			**Increased Regeneration & Protection**				
2008	3,908	187	47	28	-	8	3,064	574	-
2028	3,955	452	54	28	-	18	2,323	1,080	-
2068	3,712	971	88	166	-	54	2,068	364	-
2168	3,410	1,885	220	415	-	102	392	395	-
West Siberia		**Tomsk Oblast**			**No Change in Management (Baseline)**				
2008	19,485	3,183	541	850	-	1,911	12,943	57	-
2028	20,604	3,918	667	1,536	-	1,945	4,283	8,255	-
2068	19,428	6,661	681	1,542	-	3,283	6,630	630	-
2168	18,959	7,391	1,804	1,543	-	3,684	2,631	1,906	-
West Siberia		**Tomsk Oblast**			**Increased Regeneration**				
2008	20,297	4,064	474	933	-	1,911	12,345	570	-
2028	20,848	4,979	642	1,127	-	2,518	4,798	6,785	-
2068	20,710	6,611	751	2,005	-	2,950	6,916	1,477	-
2168	19,825	6,817	1,426	4,956	-	3,387	584	2,654	-
West Siberia		**Tomsk Oblast**			**Environmental Restrictions**				
2008	20,198	4,046	474	936	-	1,911	12,674	156	-
2028	21,069	4,980	642	1,130	-	2,463	4,204	7,650	-
2068	20,716	6,595	750	1,898	-	3,006	7,047	1,420	-
2168	19,581	6,784	2,728	3,382	-	3,441	1,159	2,088	-
West Siberia		**Tomsk Oblast**			**Increased Protection**				
2008	19,769	3,211	536	1,034	-	1,960	12,926	101	-
2028	20,927	3,961	663	1,545	-	2,026	4,450	8,282	-
2068	19,569	6,901	678	1,551	-	3,344	6,465	629	-
2168	19,194	7,430	1,858	1,552	-	3,810	2,602	1,941	-

Table 6. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
					(Thousand cubic meters)				
West Siberia		**Tomsk Oblast**			**Increased Regeneration & Protection**				
2008	20,583	3,919	476	951	-	1,960	12,805	472	-
2028	21,116	5,020	704	1,148	-	2,564	4,866	6,813	-
2068	20,776	6,676	712	2,184	-	3,010	7,236	957	-
2168	19,729	6,895	2,667	3,680	-	3,512	589	2,386	-
West Siberia		**Tyumen Oblast**			**No Change in Management (Baseline)**				
2008	25,693	9,068	2,105	-	1,013	1,798	6,391	5,318	-
2028	24,969	9,394	2,324	31	1,127	2,588	8,934	572	-
2068	26,299	12,488	3,288	272	1,234	3,081	5,092	844	-
2168	26,418	12,603	3,382	272	1,619	4,575	2,639	1,328	-
West Siberia		**Tyumen Oblast**			**Increased Regeneration**				
2008	26,764	10,410	2,246	-	890	1,798	6,704	4,714	-
2028	26,166	10,820	2,246	-	890	2,253	9,907	49	-
2068	27,999	13,334	3,172	127	976	3,033	6,197	1,159	-
2168	28,327	13,841	3,578	1,633	1,474	4,569	1,607	1,625	-
West Siberia		**Tyumen Oblast**			**Environmental Restrictions**				
2008	26,882	10,323	2,008	-	900	1,798	6,571	5,281	-
2028	26,185	10,982	2,008	-	900	2,254	9,478	563	-
2068	27,757	13,242	3,325	350	1,010	3,047	5,792	991	-
2168	27,949	14,020	3,990	620	1,437	4,601	2,271	1,010	-
West Siberia		**Tyumen Oblast**			**Increased Protection**				
2008	25,927	9,130	2,162	-	1,091	1,800	6,881	4,863	-
2028	25,375	9,609	2,397	9	1,155	2,677	8,549	978	-
2068	26,693	12,531	3,270	285	1,243	3,115	5,375	874	-
2168	26,803	12,773	3,500	285	1,679	4,718	2,501	1,347	-
West Siberia		**Tyumen Oblast**			**Increased Regeneration & Protection**				
2008	26,901	10,698	2,341	-	904	1,800	6,699	4,459	-
2028	26,450	10,976	2,341	-	904	2,524	9,574	132	-
2068	28,376	13,483	3,189	162	992	3,020	6,046	1,485	-
2168	29,197	14,036	3,668	1,713	1,528	4,745	1,899	1,608	-
West Siberia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	59,432	12,833	2,716	3,842	1,498	3,871	24,907	9,765	*
2028	60,619	14,401	3,088	5,044	1,633	4,767	18,244	13,441	*
2068	61,141	21,175	4,232	5,554	1,763	6,651	15,999	5,768	*
2168	59,952	23,025	6,100	6,226	2,157	8,722	7,562	6,160	*
West Siberia		**All Administrative Regions**			**Increased Regeneration**				
2008	61,908	15,100	2,813	4,426	1,439	3,870	25,229	9,031	*
2028	62,626	16,903	3,022	4,958	1,461	4,999	19,880	11,404	*
2068	64,442	22,073	4,128	6,592	1,569	6,278	17,588	6,214	*
2168	63,403	24,864	5,834	11,549	2,076	8,451	3,705	6,923	*
West Siberia		**All Administrative Regions**			**Environmental Restrictions**				
2008	61,793	14,995	2,579	4,355	1,429	3,870	25,393	9,172	*
2028	62,725	17,061	2,783	4,893	1,451	4,945	19,163	12,430	*
2068	64,132	21,962	4,293	6,613	1,583	6,339	17,104	6,240	*
2168	62,433	24,566	7,551	8,782	2,018	8,522	5,150	5,844	*
West Siberia		**All Administrative Regions**			**Increased Protection**				
2008	60,118	12,919	2,773	4,073	1,580	3,922	25,371	9,480	*
2028	61,324	14,690	3,199	5,085	1,666	4,939	18,255	13,490	*
2068	61,896	21,429	4,195	5,635	1,774	6,748	16,207	5,907	*
2168	60,692	23,273	6,306	6,362	2,225	9,008	7,396	6,121	*
West Siberia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	62,456	15,246	2,903	4,474	1,457	3,922	25,524	8,930	*
2028	63,311	17,091	3,189	5,065	1,478	5,318	19,707	11,461	*
2068	64,918	22,354	4,162	6,859	1,586	6,319	17,856	5,783	*
2168	64,357	25,173	7,207	10,446	2,138	8,773	4,018	6,602	*

Table 6. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group: Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
					(Thousand cubic meters)				
East Siberia		**Buryat Republic**			**No Change in Management (Baseline)**				
2008	5,498	1,307	117	149	3,211	5	474	235	-
2028	6,197	1,524	132	163	3,719	18	338	303	-
2068	6,658	1,645	132	167	3,897	76	419	321	-
2168	8,703	2,607	242	264	4,178	103	1,077	232	-
East Siberia		**Buryat Republic**			**Increased Regeneration**				
2008	5,515	1,308	81	115	3,293	5	478	235	-
2028	6,213	1,531	96	129	3,801	18	334	303	-
2068	6,772	1,652	96	133	3,979	57	495	360	-
2168	8,610	2,558	177	211	4,248	84	1,083	248	-
East Siberia		**Buryat Republic**			**Environmental Restrictions**				
2008	4,610	1,315	185	205	2,199	5	466	235	-
2028	5,315	1,524	201	219	2,705	18	345	303	-
2068	5,629	1,728	201	223	2,883	31	299	265	-
2168	6,373	2,347	211	232	3,121	43	93	326	-
East Siberia		**Buryat Republic**			**Increased Protection**				
2008	5,557	1,323	86	120	3,320	5	466	236	-
2028	6,264	1,525	105	137	3,829	18	346	304	-
2068	6,932	1,648	105	142	4,021	60	626	329	-
2168	9,173	2,652	229	248	4,459	90	1,226	269	-
East Siberia		**Buryat Republic**			**Increased Regeneration & Protection**				
2008	5,561	1,327	86	120	3,320	5	466	236	-
2028	6,268	1,529	105	137	3,829	18	346	304	-
2068	6,992	1,652	105	142	4,021	61	647	364	-
2168	9,142	2,748	175	208	4,435	90	1,220	265	-
East Siberia		**Chita Oblast**			**No Change in Management (Baseline)**				
2008	14,219	1,736	-	-	10,464	4	1,890	126	-
2028	16,193	2,086	-	-	12,126	35	1,439	507	-
2068	19,030	2,190	-	-	13,216	37	3,389	199	-
2168	21,825	2,374	-	-	15,721	37	3,383	310	-
East Siberia		**Chita Oblast**			**Increased Regeneration**				
2008	14,284	1,841	-	-	10,423	4	1,890	126	-
2028	16,258	2,192	-	-	12,085	35	1,439	507	-
2068	19,546	2,295	-	-	13,175	39	3,860	177	-
2168	22,333	4,265	-	-	14,932	39	2,842	256	-
East Siberia		**Chita Oblast**			**Environmental Restrictions**				
2008	14,087	1,838	-	-	10,359	4	1,791	95	-
2028	16,071	2,188	-	-	11,982	35	1,480	386	-
2068	18,993	2,295	-	-	13,072	39	3,433	154	-
2168	20,147	3,856	-	-	15,020	39	1,025	208	-
East Siberia		**Chita Oblast**			**Increased Protection**				
2008	14,321	1,795	-	-	10,506	4	1,890	126	-
2028	16,282	2,137	-	-	12,154	37	1,438	516	-
2068	19,355	2,246	-	-	13,289	41	3,470	309	-
2168	22,944	2,477	-	-	16,585	41	3,522	320	-
East Siberia		**Chita Oblast**			**Increased Regeneration & Protection**				
2008	14,367	1,854	-	-	10,493	4	1,890	126	-
2028	16,328	2,196	-	-	12,141	37	1,438	516	-
2068	19,888	2,305	-	-	13,276	41	4,088	178	-
2168	24,110	5,165	-	-	15,662	41	2,978	264	-
East Siberia		**Irkutsk Oblast**			**No Change in Management (Baseline)**				
2008	36,199	13,333	2,989	2,445	8,819	340	5,171	3,102	-
2028	38,853	14,079	3,143	2,526	9,553	1,658	4,953	2,940	-
2068	39,406	14,221	3,185	2,623	9,762	1,767	4,222	3,626	-
2168	48,388	14,829	4,674	4,569	10,473	2,994	6,784	4,065	-
East Siberia		**Irkutsk Oblast**			**Increased Regeneration**				
2008	38,371	15,376	2,957	2,464	8,945	345	5,171	3,114	-
2028	41,021	16,156	3,110	2,544	9,679	1,643	4,952	2,937	-
2068	42,731	16,298	3,153	2,641	9,888	1,711	5,909	3,132	-
2168	49,355	17,395	3,713	3,908	10,551	3,023	6,975	3,793	-

Table 6. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
East Siberia		**Irkutsk Oblast**			**Environmental Restrictions**				
2008	36,705	15,673	2,749	1,748	8,052	352	5,664	2,467	-
2028	39,515	16,454	2,904	1,829	8,786	1,575	4,786	3,181	-
2068	40,827	16,596	2,946	1,925	8,995	1,632	6,413	2,320	-
2168	43,284	18,201	3,153	2,185	9,632	2,090	5,230	2,794	-
East Siberia		**Irkutsk Oblast**			**Increased Protection**				
2008	36,886	13,776	2,958	2,423	9,104	340	5,168	3,118	-
2028	39,590	14,563	3,105	2,506	9,835	1,674	4,970	2,936	-
2068	40,413	14,712	3,158	2,619	10,063	1,787	4,349	3,725	-
2168	51,243	15,653	5,003	5,066	11,039	3,278	7,045	4,159	-
East Siberia		**Irkutsk Oblast**			**Increased Regeneration & Protection**				
2008	38,921	15,692	2,688	2,331	9,556	350	5,129	3,174	-
2028	41,615	16,511	2,836	2,414	10,288	1,671	4,978	2,916	-
2068	43,693	16,660	2,888	2,527	10,515	1,750	6,174	3,179	-
2168	52,229	18,197	3,930	4,254	11,384	3,262	7,315	3,888	-
East Siberia		**Krasnoyarsk Kray**			**No Change in Management (Baseline)**				
2008	43,238	7,320	5,298	7,613	9,917	397	8,839	3,855	-
2028	46,863	8,334	5,740	8,272	10,907	2,140	9,074	2,396	-
2068	47,337	8,539	5,853	8,365	10,979	2,329	8,297	2,974	-
2168	51,685	8,975	6,777	8,945	11,712	3,384	8,132	3,759	-
East Siberia		**Krasnoyarsk Kray**			**Increased Regeneration**				
2008	44,605	8,199	5,200	7,561	10,429	397	9,321	3,498	-
2028	48,175	9,124	5,638	8,221	11,487	2,135	8,507	3,064	-
2068	49,236	9,508	5,728	8,313	11,557	2,296	8,192	3,643	-
2168	52,555	10,039	6,265	8,771	12,739	3,262	7,652	3,827	-
East Siberia		**Krasnoyarsk Kray**			**Environmental Restrictions**				
2008	41,137	8,005	4,376	6,785	8,829	400	8,788	3,955	-
2028	44,767	9,035	4,815	7,540	9,847	2,040	9,198	2,294	-
2068	45,623	9,252	4,838	7,633	10,018	2,149	8,397	3,337	-
2168	46,596	11,098	5,266	7,897	10,649	3,232	5,498	2,954	-
East Siberia		**Krasnoyarsk Kray**			**Increased Protection**				
2008	44,018	7,518	5,431	7,828	10,057	396	9,434	3,354	-
2028	47,771	8,379	5,877	8,518	11,090	2,238	8,495	3,174	-
2068	48,492	8,919	5,910	8,710	11,169	2,434	8,847	2,502	-
2168	54,464	9,436	7,508	9,592	12,106	3,666	8,340	3,816	-
East Siberia		**Krasnoyarsk Kray**			**Increased Regeneration & Protection**				
2008	45,202	8,317	5,290	7,765	10,565	396	9,370	3,500	-
2028	48,900	9,177	5,737	8,455	11,661	2,320	8,405	3,147	-
2068	50,762	9,797	5,748	8,647	11,727	2,391	8,800	3,651	-
2168	54,973	10,367	6,543	9,305	13,190	3,525	8,115	3,927	-
East Siberia		**Tuva Republic**			**No Change in Management (Baseline)**				
2008	1,291	39	33	-	1,012	8	199	-	-
2028	1,553	47	37	-	1,205	101	116	-	46
2068	1,574	54	38	-	1,230	109	142	-	-
2168	1,894	98	74	-	1,268	134	303	-	18
East Siberia		**Tuva Republic**			**Increased Regeneration**				
2008	1,376	40	32	-	1,097	8	186	-	12
2028	1,637	45	37	-	1,291	101	129	-	34
2068	1,668	55	38	-	1,316	110	150	-	-
2168	1,914	81	71	-	1,353	129	277	-	3
East Siberia		**Tuva Republic**			**Environmental Restrictions**				
2008	1,090	36	20	-	820	8	193	-	13
2028	1,349	49	25	-	1,013	101	128	-	33
2068	1,373	51	26	-	1,038	112	137	-	10
2168	1,419	94	27	-	1,075	150	72	-	-
East Siberia		**Tuva Republic**			**Increased Protection**				
2008	1,309	39	33	-	1,029	8	194	-	6
2028	1,572	47	37	-	1,224	102	122	-	40
2068	1,595	54	38	-	1,250	109	143	-	-
2168	1,954	103	78	-	1,304	142	307	-	20

Table 6. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group: Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
					(Thousand cubic meters)				
East Siberia		**Tuva Republic**			**Increased Regeneration & Protection**				
2008	1,391	40	32	-	1,113	8	198	-	-
2028	1,656	46	37	-	1,307	102	118	-	46
2068	1,703	54	38	-	1,333	107	171	-	-
2168	1,973	86	74	-	1,388	137	287	-	1
East Siberia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	100,445	23,734	8,437	10,207	33,423	754	16,573	7,318	*
2028	109,658	26,070	9,052	10,961	37,510	3,953	15,920	6,147	46
2068	114,005	26,649	9,208	11,155	39,085	4,318	16,470	7,121	*
2168	132,495	28,883	11,767	13,779	43,352	6,653	19,679	8,365	18
East Siberia		**All Administrative Regions**			**Increased Regeneration**				
2008	104,152	26,764	8,270	10,139	34,188	759	17,046	6,973	12
2028	113,304	29,048	8,882	10,894	38,343	3,932	15,361	6,811	34
2068	119,954	29,808	9,015	11,087	39,915	4,211	18,606	7,312	*
2168	134,768	34,338	10,226	12,890	43,822	6,537	18,829	8,123	3
East Siberia		**All Administrative Regions**			**Environmental Restrictions**				
2008	97,629	26,866	7,331	8,737	30,258	769	16,903	6,752	13
2028	107,016	29,250	7,944	9,587	34,333	3,769	15,937	6,164	33
2068	112,446	29,921	8,011	9,781	36,007	3,963	18,678	6,076	10
2168	117,819	35,597	8,657	10,314	39,497	5,555	11,917	6,282	*
East Siberia		**All Administrative Regions**			**Increased Protection**				
2008	102,091	24,452	8,508	10,371	34,015	754	17,152	6,833	6
2028	111,478	26,651	9,125	11,161	38,132	4,069	15,371	6,930	40
2068	116,786	27,579	9,212	11,471	39,792	4,431	17,436	6,866	*
2168	139,778	30,321	12,818	14,906	45,492	7,217	20,441	8,564	20
East Siberia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	105,441	27,230	8,097	10,216	35,047	763	17,053	7,035	*
2028	114,766	29,458	8,714	11,006	39,226	4,148	15,285	6,883	46
2068	123,038	30,467	8,779	11,316	40,873	4,350	19,880	7,372	*
2168	142,425	36,563	10,722	13,766	46,058	7,055	19,916	8,343	1

Year of harvest	Total	Species Group: Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
					(Thousand cubic meters)				
Far East Russia		**Amur Oblast**			**No Change in Management (Baseline)**				
2008	12,657	363	500	15	9,452	-	2,021	270	37
2028	15,041	490	545	19	11,308	-	2,321	294	64
2068	17,127	614	569	20	11,592	-	3,840	386	106
2168	21,126	1,015	2,248	21	12,127	-	4,415	1,130	169
Far East Russia		**Amur Oblast**			**Increased Regeneration**				
2008	13,212	368	495	17	10,004	-	2,021	270	37
2028	15,578	495	540	22	11,843	-	2,321	294	64
2068	18,195	565	564	24	12,127	-	4,449	361	105
2168	21,732	2,048	2,064	25	12,757	-	3,651	1,028	161
Far East Russia		**Amur Oblast**			**Environmental Restrictions**				
2008	11,982	299	453	17	9,536	-	1,369	272	37
2028	14,349	424	498	22	11,374	-	1,674	291	64
2068	16,820	495	522	24	11,658	-	3,667	348	105
2168	17,645	2,083	926	25	12,288	-	1,602	562	161
Far East Russia		**Amur Oblast**			**Increased Protection**				
2008	12,838	368	502	15	9,625	-	2,022	270	37
2028	15,208	495	546	19	11,467	-	2,323	293	64
2068	17,392	621	572	20	11,757	-	3,926	389	106
2168	21,651	1,042	2,387	22	12,368	-	4,545	1,111	175
Far East Russia		**Amur Oblast**			**Increased Regeneration & Protection**				
2008	13,373	373	499	17	10,155	-	2,022	270	37
2028	15,726	500	544	23	11,980	-	2,322	293	64
2068	18,402	571	568	24	12,270	-	4,498	364	106
2168	22,179	2,160	2,081	25	12,993	-	3,733	1,021	166

Table 6. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group: Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
					(Thousand cubic meters)				
Far East Russia		**Kamchatka Oblast**			**No Change in Management (Baseline)**				
2008	1,141	-	252	-	279	-	211	10	390
2028	1,307	-	262	-	371	-	185	64	425
2068	1,306	-	279	-	374	-	147	58	448
2168	1,333	-	285	-	393	-	179	54	422
Far East Russia		**Kamchatka Oblast**			**Increased Regeneration**				
2008	1,239	-	275	-	224	-	265	68	407
2028	1,352	-	292	-	372	-	246	18	424
2068	1,338	-	310	-	397	-	127	77	426
2168	1,366	-	315	-	418	-	162	57	414
Far East Russia		**Kamchatka Oblast**			**Environmental Restrictions**				
2008	1,232	-	273	-	236	-	248	68	407
2028	1,351	-	289	-	372	-	248	18	423
2068	1,338	-	309	-	398	-	139	64	428
2168	1,356	-	313	-	425	-	166	36	415
Far East Russia		**Kamchatka Oblast**			**Increased Protection**				
2008	1,173	-	253	-	287	-	215	10	407
2028	1,341	-	264	-	380	-	187	64	446
2068	1,340	-	281	-	383	-	141	65	470
2168	1,379	-	291	-	406	-	188	54	441
Far East Russia		**Kamchatka Oblast**			**Increased Regeneration & Protection**				
2008	1,266	-	277	-	235	-	255	68	432
2028	1,387	-	294	-	369	-	260	21	444
2068	1,369	-	312	-	405	-	149	58	446
2168	1,413	-	323	-	431	-	167	57	435
Far East Russia		**Khabarovsk Kray**			**No Change in Management (Baseline)**				
2008	20,649	1	10,128	498	7,224	464	1,294	617	423
2028	23,415	1	11,256	547	8,567	526	1,489	605	424
2068	24,232	1	11,339	561	8,830	630	1,410	1,005	456
2168	30,358	6	13,647	1,030	9,596	981	2,864	1,720	515
Far East Russia		**Khabarovsk Kray**			**Increased Regeneration**				
2008	21,320	1	10,056	503	7,930	471	1,294	599	466
2028	24,144	1	11,186	553	9,258	519	1,556	604	467
2068	25,605	1	11,270	572	9,524	623	2,090	1,018	505
2168	30,030	5	12,846	908	10,612	975	2,476	1,644	564
Far East Russia		**Khabarovsk Kray**			**Environmental Restrictions**				
2008	18,798	1	9,338	234	6,424	466	1,198	713	423
2028	21,522	1	10,467	285	7,754	524	1,556	511	424
2068	22,446	1	10,550	304	8,020	628	1,754	727	463
2168	24,453	3	11,336	357	8,997	956	1,405	877	521
Far East Russia		**Khabarovsk Kray**			**Increased Protection**				
2008	21,010	1	10,185	522	7,480	464	1,294	621	443
2028	23,762	1	11,327	571	8,804	528	1,480	606	444
2068	24,936	1	11,416	605	9,084	639	1,537	1,172	482
2168	32,075	7	14,360	1,117	10,088	1,066	3,116	1,766	555
Far East Russia		**Khabarovsk Kray**			**Increased Regeneration & Protection**				
2008	21,562	1	10,084	515	8,116	470	1,295	606	476
2028	24,369	1	11,226	565	9,420	523	1,553	604	477
2068	26,225	1	11,313	603	9,703	633	2,410	1,040	522
2168	31,847	9	13,645	1,001	11,170	1,065	2,696	1,674	588
Far East Russia		**Magadan Oblast**			**No Change in Management (Baseline)**				
2008	208	-	-	-	195	-	-	-	13
2028	209	-	-	-	200	-	-	-	9
2068	363	-	-	-	358	-	-	-	5
2168	649	-	-	-	638	-	-	-	11
Far East Russia		**Magadan Oblast**			**Increased Regeneration**				
2008	208	-	-	-	195	-	-	-	13
2028	209	-	-	-	200	-	-	-	9
2068	363	-	-	-	358	-	-	-	5
2168	668	-	-	-	657	-	-	-	11

Table 6. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
					(Thousand cubic meters)				
Far East Russia		**Magadan Oblast**			**Environmental Restrictions**				
2008	208	-	-	-	195	-	-	-	13
2028	209	-	-	-	200	-	-	-	9
2068	363	-	-	-	358	-	-	-	5
2168	668	-	-	-	657	-	-	-	11
Far East Russia		**Magadan Oblast**			**Increased Protection**				
2008	209	-	-	-	196	-	-	-	13
2028	210	-	-	-	201	-	-	-	9
2068	369	-	-	-	363	-	-	-	6
2168	706	-	-	-	694	-	-	-	12
Far East Russia		**Magadan Oblast**			**Increased Regeneration & Protection**				
2008	209	-	-	-	196	-	-	-	13
2028	210	-	-	-	201	-	-	-	9
2068	369	-	-	-	363	-	-	-	6
2168	724	-	-	-	712	-	-	-	12
Far East Russia		**Primorski Kray**			**No Change in Management (Baseline)**				
2008	6,603	-	2,938	190	719	782	698	295	982
2028	7,805	-	3,747	313	908	874	836	139	988
2068	8,227	-	3,801	321	964	948	525	381	1287
2168	9,023	-	3,833	370	1,040	997	735	587	1462
Far East Russia		**Primorski Kray**			**Increased Regeneration**				
2008	6,919	-	2,725	257	995	807	804	362	969
2028	8,092	-	3,741	314	1,185	844	831	204	972
2068	8,591	-	3,809	324	1,245	985	610	348	1271
2168	9,175	-	3,819	348	1,374	1,036	694	507	1399
Far East Russia		**Primorski Kray**			**Environmental Restrictions**				
2008	5,937	-	2,342	225	860	820	793	75	823
2028	7,192	-	3,146	281	1,096	830	841	163	834
2068	7,642	-	3,199	291	1,310	835	596	300	1110
2168	8,037	-	3,209	315	1,510	867	613	269	1254
Far East Russia		**Primorski Kray**			**Increased Protection**				
2008	6,728	-	3,006	190	745	811	699	289	989
2028	7,961	-	3,821	314	936	898	838	158	995
2068	8,409	-	3,888	323	993	984	533	383	1305
2168	9,314	-	3,944	388	1,088	1,039	744	578	1534
Far East Russia		**Primorski Kray**			**Increased Regeneration & Protection**				
2008	7,050	-	2,813	265	987	835	807	362	981
2028	8,261	-	3,811	321	1,178	870	823	275	981
2068	8,766	-	3,929	333	1,245	1,016	622	330	1291
2168	9,466	-	3,944	360	1,403	1,074	709	498	1478
Far East Russia		**Sakhalin Oblast**			**No Change in Management (Baseline)**				
2008	3,177	-	1,565	586	920	-	31	-	74
2028	3,660	-	1,815	654	1,069	-	34	-	88
2068	3,901	-	1,899	708	1,174	-	38	-	82
2168	5,628	70	3,140	744	1,347	-	178	-	149
Far East Russia		**Sakhalin Oblast**			**Increased Regeneration**				
2008	3,199	-	1,564	590	939	-	31	-	74
2028	3,691	-	1,826	664	1,079	-	34	-	88
2068	4,002	-	1,906	722	1,212	-	40	-	122
2168	5,315	72	2,774	784	1,388	-	140	-	157
Far East Russia		**Sakhalin Oblast**			**Environmental Restrictions**				
2008	3,195	-	1,566	590	939	-	31	-	69
2028	3,687	-	1,828	664	1,079	-	34	-	82
2068	4,004	-	1,908	722	1,212	-	46	-	116
2168	5,343	72	2,800	770	1,426	-	120	-	155
Far East Russia		**Sakhalin Oblast**			**Increased Protection**				
2008	3,199	-	1,567	592	934	-	31	-	74
2028	3,686	-	1,825	662	1,078	-	33	-	88
2068	3,954	-	1,907	717	1,190	-	39	-	101
2168	5,816	73	3,235	765	1,405	-	175	-	163

Table 6. Projected biologically sustainable volume annually available for harvest by all management scenarios analyzed, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
					(Thousand cubic meters)				
Far East Russia		**Sakhalin Oblast**			**Increased Regeneration & Protection**				
2008	3,217	-	1,571	593	947	-	31	-	74
2028	3,709	-	1,835	669	1,083	-	34	-	88
2068	4,039	-	1,917	728	1,225	-	51	-	118
2168	5,517	78	2,849	794	1,475	-	156	-	166
Far East Russia		**Yakutia Republic**			**No Change in Management (Baseline)**				
2008	27,775	5,420	14	-	20,827	-	1,514	-	-
2028	27,876	5,444	15	-	20,875	-	1,543	-	-
2068	29,596	5,711	15	-	21,791	-	2,079	-	-
2168	33,252	6,076	111	-	24,363	-	2,702	-	-
Far East Russia		**Yakutia Republic**			**Increased Regeneration**				
2008	28,590	6,483	15	-	20,578	-	1,514	-	-
2028	28,690	6,506	15	-	20,626	-	1,543	-	-
2068	30,439	6,773	15	-	21,542	-	2,108	-	-
2168	34,332	7,604	122	-	24,050	-	2,557	-	-
Far East Russia		**Yakutia Republic**			**Environmental Restrictions**				
2008	27,523	4,632	14	-	22,272	-	605	-	-
2028	27,623	4,655	15	-	22,319	-	634	-	-
2068	29,239	4,922	15	-	23,236	-	1,066	-	-
2168	31,573	5,483	18	-	25,217	-	855	-	-
Far East Russia		**Yakutia Republic**			**Increased Protection**				
2008	28,240	5,503	15	-	21,208	-	1,514	-	-
2028	28,341	5,527	15	-	21,256	-	1,543	-	-
2068	30,146	5,804	15	-	22,210	-	2,117	-	-
2168	34,533	6,265	118	-	25,346	-	2,804	-	-
Far East Russia		**Yakutia Republic**			**Increased Regeneration & Protection**				
2008	29,050	6,461	15	-	21,060	-	1,514	-	-
2028	29,150	6,484	15	-	21,107	-	1,543	-	-
2068	30,954	6,761	16	-	22,062	-	2,116	-	-
2168	35,632	7,810	162	-	25,020	-	2,640	-	-
Far East Russia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	72,210	5,785	15,398	1,288	39,616	1,246	5,768	1,191	1,918
2028	79,313	5,935	17,641	1,533	43,298	1,400	6,407	1,102	1,998
2068	84,751	6,326	17,903	1,609	45,083	1,578	8,039	1,829	2,385
2168	101,370	7,167	23,264	2,165	49,504	1,978	11,072	3,491	2,728
Far East Russia		**All Administrative Regions**			**Increased Regeneration**				
2008	74,687	6,853	15,131	1,367	40,867	1,278	5,928	1,299	1,965
2028	81,756	7,002	17,601	1,553	44,563	1,363	6,531	1,120	2,025
2068	88,534	7,340	17,875	1,642	46,407	1,608	9,424	1,804	2,435
2168	102,618	9,729	21,940	2,065	51,255	2,010	9,678	3,235	2,705
Far East Russia		**All Administrative Regions**			**Environmental Restrictions**				
2008	68,876	4,932	13,987	1,066	40,462	1,285	4,245	1,128	1,772
2028	75,932	5,081	16,243	1,253	44,194	1,355	4,988	984	1,837
2068	81,853	5,418	16,503	1,342	46,193	1,463	7,267	1,439	2,228
2168	89,075	7,640	18,602	1,467	50,521	1,823	4,761	1,744	2,516
Far East Russia		**All Administrative Regions**			**Increased Protection**				
2008	73,397	5,872	15,528	1,319	40,475	1,275	5,775	1,189	1,964
2028	80,509	6,023	17,799	1,567	44,123	1,425	6,404	1,121	2,048
2068	86,547	6,426	18,079	1,666	45,981	1,623	8,294	2,009	2,470
2168	105,473	7,386	24,335	2,292	51,396	2,105	11,571	3,509	2,878
Far East Russia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	75,727	6,836	15,258	1,391	41,696	1,305	5,925	1,306	2,012
2028	82,812	6,985	17,725	1,578	45,338	1,393	6,536	1,194	2,063
2068	90,125	7,334	18,055	1,688	47,272	1,650	9,845	1,792	2,489
2168	106,778	10,056	23,004	2,180	53,203	2,139	10,101	3,251	2,844

Table 7. Projected biologically sustainable volume annually available for harvest in relation to total growing-stock volume by all management scenarios analyzed and selected year of harvest in Siberia and Far East Russia.

Forest type	Non-Exploitable growing stock volume 2008	Exploitable growing stock volume 2008	Projected harvest 2008	Percentage of harvest to total exploitable 2008	Non-Exploitable growing stock volume 2068	Exploitable growing stock volume 2068	Projected harvest 2068	Percentage of harvest to total exploitable 2068	Non-Exploitable growing stock volume 2168	Exploitable growing stock volume 2168	Projected harvest 2168	Percentage of harvest to total exploitable 2168
West Siberia		**No Change in Management (Baseline)**				(Thousand cubic meters)						
Pine	1,550,035	2,297,676	14,386	0.63	1,593,782	2,194,768	21,175	0.96	1,561,554	1,811,835	23,025	1.27
Spruce	273,080	394,304	3,078	0.78	260,587	434,308	4,232	0.97	266,213	514,324	6,100	1.19
Fir	91,161	406,887	4,985	1.23	101,800	404,343	5,554	1.37	102,228	338,071	6,226	1.84
Larch	615,093	170,766	1,633	0.96	652,845	171,609	1,763	1.03	619,611	173,116	2,157	1.25
Cedar	987,232	1,340,867	4,767	0.36	1,118,407	1,498,447	6,651	0.44	1,149,084	1,782,205	8,722	0.49
Birch	352,169	1,307,998	17,895	1.37	277,632	698,169	15,999	2.29	323,834	471,590	7,562	1.60
Aspen	49,889	515,130	13,344	2.59	50,195	380,645	5,768	1.52	62,757	284,920	6,160	2.16
Total	3,918,659	6,433,629	60,088	0.93	4,055,248	5,782,289	61,142	1.06	4,085,280	5,376,060	59,952	1.12
West Siberia		**Increased Regeneration**										
Pine	1,550,035	2,262,131	16,888	0.75	1,593,782	2,219,411	22,073	0.99	1,561,554	1,796,340	24,864	1.38
Spruce	273,080	396,279	3,012	0.76	260,587	441,804	4,128	0.93	266,213	494,436	5,834	1.18
Fir	91,161	414,668	4,898	1.18	101,800	644,578	6,592	1.02	102,228	529,686	11,549	2.18
Larch	615,093	172,673	1,461	0.85	652,845	168,529	1,569	0.93	619,611	173,126	2,076	1.20
Cedar	987,232	1,342,004	4,999	0.37	1,118,407	1,466,733	6,278	0.43	1,149,084	1,747,436	8,451	0.48
Birch	352,169	1,289,160	19,532	1.52	277,632	541,657	17,588	3.25	323,834	419,774	3,705	0.88
Aspen	49,889	525,121	11,307	2.15	50,195	308,017	6,214	2.02	62,757	321,261	6,923	2.15
Total	3,918,659	6,402,036	62,096	0.97	4,055,248	5,790,728	64,442	1.11	4,085,280	5,482,060	63,403	1.16
West Siberia		**Environmental Restrictions**										
Pine	1,550,035	2,265,610	17,046	0.75	1,593,782	2,223,089	21,962	0.99	1,561,554	1,845,374	24,566	1.33
Spruce	273,080	405,635	2,773	0.68	260,587	511,882	4,293	0.84	266,213	578,966	7,551	1.30
Fir	91,161	408,859	4,833	1.18	101,800	536,338	6,613	1.23	102,228	458,607	8,782	1.91
Larch	615,093	173,241	1,451	0.84	652,845	172,376	1,583	0.92	619,611	181,326	2,018	1.11
Cedar	987,232	1,341,883	4,945	0.37	1,118,407	1,473,702	6,339	0.43	1,149,084	1,734,733	8,522	0.49
Birch	352,169	1,289,185	18,815	1.46	277,632	573,596	17,104	2.98	323,834	445,316	5,150	1.16
Aspen	49,889	522,065	12,332	2.36	50,195	301,349	6,240	2.07	62,757	227,531	5,844	2.57
Total	3,918,659	6,406,479	62,195	0.97	4,055,248	5,792,333	64,134	1.11	4,085,280	5,471,852	62,433	1.14
West Siberia		**Increased Protection**										
Pine	1,550,035	2,295,572	14,675	0.64	1,602,856	2,209,498	21,429	0.97	1,603,423	1,836,825	23,273	1.27
Spruce	273,080	393,054	3,189	0.81	262,278	435,379	4,195	0.96	273,477	525,000	6,306	1.20
Fir	91,161	402,323	5,026	1.25	102,446	400,944	5,635	1.41	105,422	342,557	6,362	1.86
Larch	615,093	169,216	1,666	0.98	657,228	170,308	1,774	1.04	639,056	176,895	2,225	1.26
Cedar	987,232	1,340,902	4,939	0.37	1,125,555	1,501,725	6,748	0.45	1,191,139	1,830,624	9,008	0.49
Birch	352,169	1,298,676	17,907	1.38	277,828	681,546	16,207	2.38	313,307	463,141	7,396	1.60
Aspen	49,889	521,424	13,392	2.57	50,097	382,184	5,907	1.55	60,023	285,453	6,121	2.14
Total	3,918,659	6,421,167	60,794	0.95	4,078,289	5,781,584	61,895	1.07	4,185,847	5,460,495	60,692	1.11

Table 7. Projected biologically sustainable volume annually available for harvest in relation to total growing-stock volume by all management scenarios analyzed and selected year of harvest in Siberia and Far East Russia, continued.

Forest type	Non-Exploitable growing stock volume 2008	Exploitable growing stock volume 2008	Projected harvest 2008	Percentage of harvest to total exploitable 2008	Non-Exploitable growing stock volume 2068	Exploitable growing stock volume 2068	Projected harvest 2068	Percentage of harvest to total exploitable 2068	Non-Exploitable growing stock volume 2168	Exploitable growing stock volume 2168	Projected harvest 2168	Percentage of harvest to total exploitable 2168
West Siberia		**Increased Regeneration & Protection**				(Thousand cubic meters)						
Pine	1,550,035	2,258,554	17,076	0.76	1,602,856	2,228,621	22,354	1.00	1,603,423	1,828,389	25,173	1.38
Spruce	273,080	397,848	3,179	0.80	262,278	488,654	4,162	0.85	273,477	553,092	7,207	1.30
Fir	91,161	410,538	5,006	1.22	102,446	586,924	6,859	1.17	105,422	485,716	10,446	2.15
Larch	615,093	172,274	1,478	0.86	657,228	164,309	1,586	0.97	639,056	175,814	2,138	1.22
Cedar	987,232	1,342,076	5,318	0.40	1,125,555	1,466,860	6,319	0.43	1,191,139	1,788,900	8,773	0.49
Birch	352,169	1,282,204	19,359	1.51	277,828	549,920	17,856	3.25	313,307	421,432	4,018	0.95
Aspen	49,889	528,171	11,364	2.15	50,097	310,963	5,783	1.86	60,023	298,891	6,602	2.21
Total	3,918,659	6,391,666	62,781	0.98	4,078,289	5,796,252	64,919	1.12	4,185,847	5,552,235	64,357	1.16

Forest type	Non-Exploitable growing stock volume 2008	Exploitable growing stock volume 2008	Projected harvest 2008	Percentage of harvest to total exploitable 2008	Non-Exploitable growing stock volume 2068	Exploitable growing stock volume 2068	Projected harvest 2068	Percentage of harvest to total exploitable 2068	Non-Exploitable growing stock volume 2168	Exploitable growing stock volume 2168	Projected harvest 2168	Percentage of harvest to total exploitable 2168
East Siberia		**No Change in Management (Baseline)**				(Thousand cubic meters)						
Pine	1,783,773	3,423,581	25,835	0.75	1,842,309	3,092,649	26,649	0.86	1,873,947	2,104,540	28,883	1.37
Spruce	1,136,303	755,939	8,688	1.15	1,385,027	813,171	9,208	1.13	1,562,485	951,725	11,767	1.24
Fir	504,752	1,211,545	10,944	0.90	645,077	1,262,868	11,155	0.88	804,848	1,304,823	13,779	1.06
Larch	8,906,268	4,307,889	37,149	0.86	8,813,993	4,083,191	39,085	0.96	8,711,604	3,906,470	43,352	1.11
Cedar	3,408,486	1,413,970	3,953	0.28	3,605,795	1,604,480	4,318	0.27	3,359,461	1,954,737	6,653	0.34
Birch	807,280	1,264,101	15,857	1.25	758,345	1,357,742	16,470	1.21	864,278	1,211,018	19,679	1.62
Aspen	118,757	359,858	6,036	1.68	117,892	417,385	7,121	1.71	147,844	415,726	8,365	2.01
Other deciduous	2,542	1,017	46	4.52	2,556	768	-	-	2,426	475	18	3.79
Total	16,668,162	12,737,899	108,509	0.85	17,170,994	12,632,255	114,006	0.90	17,326,892	11,849,514	132,495	1.12
East Siberia		**Increased Regeneration**										
Pine	1,783,773	3,388,316	28,813	0.85	1,842,309	3,415,843	29,808	0.87	1,873,947	2,321,197	34,338	1.48
Spruce	1,136,303	759,233	8,521	1.12	1,385,027	800,220	9,015	1.13	1,562,485	878,030	10,226	1.16
Fir	504,752	1,213,443	10,877	0.90	645,077	1,260,641	11,087	0.88	804,848	1,272,703	12,890	1.01
Larch	8,906,268	4,300,848	37,981	0.88	8,813,993	4,163,664	39,915	0.96	8,711,604	3,867,681	43,822	1.13
Cedar	3,408,486	1,414,359	3,932	0.28	3,605,795	1,599,652	4,211	0.26	3,359,461	1,883,505	6,537	0.35
Birch	807,280	1,243,484	15,298	1.23	758,345	1,072,990	18,606	1.73	864,278	1,210,475	18,829	1.56
Aspen	118,757	363,834	6,701	1.84	117,892	340,250	7,312	2.15	147,844	404,981	8,123	2.01
Other deciduous	2,542	784	34	4.29	2,556	227	-	-	2,426	142	3	2.11
Total	16,668,162	12,684,300	112,157	0.88	17,170,994	12,653,488	119,954	0.95	17,326,892	11,838,714	134,768	1.14

Table 7. Projected biologically sustainable volume annually available for harvest in relation to total growing-stock volume by all management scenarios analyzed and selected year of harvest in Siberia and Far East Russia, continued.

Forest type	Non-Exploitable growing stock volume 2008	Exploitable growing stock volume 2008	Projected harvest 2008	Percentage of harvest to total exploitable 2008	Non-Exploitable growing stock volume 2068	Exploitable growing stock volume 2068	Projected harvest 2068	Percentage of harvest to total exploitable 2068	Non-Exploitable growing stock volume 2168	Exploitable growing stock volume 2168	Projected harvest 2168	Percentage of harvest to total exploitable 2168
East Siberia		**Environmental Restrictions**				(Thousand cubic meters)						
Pine	1,783,773	3,385,783	29,015	0.86	1,842,309	3,557,290	29,921	0.84	1,873,947	3,188,259	35,597	1.12
Spruce	1,136,303	775,945	7,681	0.99	1,385,027	795,909	8,011	1.01	1,562,485	838,274	8,657	1.03
Fir	504,752	1,236,664	9,570	0.77	645,077	1,295,937	9,781	0.75	804,848	1,289,640	10,314	0.80
Larch	8,906,268	4,375,383	34,010	0.78	8,813,993	4,326,437	36,007	0.83	8,711,604	4,214,661	39,497	0.94
Cedar	3,408,486	1,411,747	3,769	0.27	3,605,795	1,625,852	3,963	0.24	3,359,461	1,900,581	5,555	0.29
Birch	807,280	1,234,181	15,874	1.29	758,345	1,014,526	18,678	1.84	864,278	950,323	11,917	1.25
Aspen	118,757	364,437	6,053	1.66	117,892	324,757	6,076	1.87	147,844	289,122	6,282	2.17
Other deciduous	2,542	816	33	3.99	2,556	201	10	4.98	2,426	47	-	-
Total	16,668,162	12,784,955	106,005	0.83	17,170,994	12,940,909	112,447	0.87	17,326,892	12,670,907	117,819	0.93
East Siberia		**Increased Protection**										
Pine	1,783,773	3,408,718	26,408	0.77	1,862,871	3,097,125	27,579	0.89	1,951,892	2,136,451	30,321	1.42
Spruce	1,136,303	754,478	8,757	1.16	1,397,386	819,690	9,212	1.12	1,625,490	986,871	12,818	1.30
Fir	504,752	1,209,168	11,144	0.92	652,013	1,273,367	11,471	0.90	832,790	1,352,055	14,906	1.10
Larch	8,906,268	4,296,806	37,756	0.88	8,887,767	4,102,796	39,792	0.97	9,044,109	3,979,016	45,492	1.14
Cedar	3,408,486	1,414,213	4,069	0.29	3,652,806	1,624,768	4,431	0.27	3,602,969	2,079,588	7,217	0.35
Birch	807,280	1,254,826	15,308	1.22	755,530	1,360,595	17,436	1.28	791,814	1,212,576	20,441	1.69
Aspen	118,757	369,472	6,820	1.85	117,003	429,585	6,866	1.60	134,997	408,684	8,564	2.10
Other deciduous	2,542	922	40	4.31	2,567	783	-	-	2,481	471	20	4.25
Total	16,668,162	12,708,603	110,301	0.87	17,327,942	12,708,710	116,787	0.92	17,986,542	12,155,711	139,778	1.15
East Siberia		**Increased Regeneration & Protection**										
Pine	1,783,773	3,374,712	29,215	0.87	1,862,871	3,405,768	30,467	0.89	1,951,892	2,354,094	36,563	1.55
Spruce	1,136,303	762,282	8,349	1.10	1,397,386	793,499	8,779	1.11	1,625,490	903,194	10,722	1.19
Fir	504,752	1,212,864	10,989	0.91	652,013	1,267,057	11,316	0.89	832,790	1,317,646	13,766	1.04
Larch	8,906,268	4,284,519	38,849	0.91	8,887,767	4,219,670	40,873	0.97	9,044,109	3,956,372	46,058	1.16
Cedar	3,408,486	1,414,439	4,148	0.29	3,652,806	1,610,162	4,350	0.27	3,602,969	1,989,552	7,055	0.35
Birch	807,280	1,246,871	15,222	1.22	755,530	1,089,176	19,880	1.83	791,814	1,224,001	19,916	1.63
Aspen	118,757	363,218	6,773	1.86	117,003	345,300	7,372	2.13	134,997	399,131	8,343	2.09
Other deciduous	2,542	1,016	46	4.53	2,567	222	-	-	2,481	175	1	0.57
Total	16,668,162	12,659,920	113,591	0.90	17,327,942	12,730,854	123,037	0.97	17,986,542	12,144,166	142,425	1.17

Table 7. Projected biologically sustainable volume annually available for harvest in relation to total growing-stock volume by all management scenarios analyzed and selected year of harvest in Siberia and Far East Russia, continued.

Forest type	Non-Exploitable growing stock volume 2008	Exploitable growing stock volume 2008	Projected harvest 2008	Percentage of harvest to total exploitable 2008	Non-Exploitable growing stock volume 2068	Exploitable growing stock volume 2068	Projected harvest 2068	Percentage of harvest to total exploitable 2068	Non-Exploitable growing stock volume 2168	Exploitable growing stock volume 2168	Projected harvest 2168	Percentage of harvest to total exploitable 2168
Far East Russia		**No Change in Management (Baseline)**				(Thousand cubic meters)						
Pine	645,324	764,723	5,925	0.77	775,541	841,988	6,326	0.75	785,340	734,034	7,167	0.98
Spruce	825,340	1,625,174	17,633	1.09	1,333,529	1,789,153	17,903	1.00	1,679,312	1,813,998	23,264	1.28
Fir	91,296	237,364	1,410	0.59	103,340	276,151	1,609	0.58	113,303	268,107	2,165	0.81
Larch	7,552,932	5,757,005	43,027	0.75	7,313,693	5,365,074	45,083	0.84	6,827,595	4,829,428	49,504	1.03
Cedar	303,152	425,856	1,400	0.33	344,222	416,554	1,578	0.38	331,686	356,741	1,978	0.55
Birch	234,459	687,353	6,352	0.92	244,923	798,278	8,039	1.01	641,279	760,350	11,072	1.46
Aspen	27,821	77,774	1,072	1.38	45,481	165,088	1,829	1.11	342,349	207,353	3,491	1.68
Other deciduous	603,177	503,618	1,998	0.40	544,735	509,034	2,385	0.47	52,145	512,937	2,728	0.53
Dwarf Pine	609,898	-	-	-	630,625	-	-	-	526,153	-	-	-
Total	10,893,400	10,078,866	78,817	0.78	11,336,088	10,161,320	84,752	0.83	11,299,162	9,482,947	101,370	1.07
Far East Russia		**Increased Regeneration**										
Pine	645,324	764,874	6,991	0.91	775,541	1,000,320	7,340	0.73	785,340	855,887	9,729	1.14
Spruce	825,340	1,634,138	17,593	1.08	1,333,529	1,805,800	17,875	0.99	1,679,312	1,802,396	21,940	1.22
Fir	91,296	236,570	1,450	0.61	103,340	289,746	1,642	0.57	113,303	271,689	2,065	0.76
Larch	7,552,932	5,758,220	44,300	0.77	7,313,693	5,507,902	46,407	0.84	6,827,595	4,749,386	51,255	1.08
Cedar	303,152	425,052	1,363	0.32	344,222	422,772	1,608	0.38	331,686	362,215	2,010	0.55
Birch	234,459	680,482	6,476	0.95	244,923	662,352	9,424	1.42	641,279	740,985	9,678	1.31
Aspen	27,821	73,799	1,090	1.48	45,481	128,411	1,804	1.40	342,349	191,080	3,235	1.69
Other deciduous	603,177	502,666	2,024	0.40	544,735	498,086	2,435	0.49	52,145	492,047	2,705	0.55
Dwarf Pine	609,898	-	-	-	630,625	-	-	-	526,153	-	-	-
Total	10,893,400	10,075,801	81,287	0.81	11,336,088	10,315,390	88,535	0.86	11,299,162	9,465,683	102,618	1.08
Far East Russia		**Environmental Restrictions**										
Pine	645,324	792,057	5,070	0.64	775,541	936,547	5,418	0.58	785,340	843,547	7,640	0.91
Spruce	825,340	1,649,400	16,235	0.98	1,333,529	1,823,074	16,503	0.91	1,679,312	1,968,867	18,602	0.94
Fir	91,296	240,456	1,220	0.51	103,340	277,349	1,342	0.48	113,303	246,063	1,467	0.60
Larch	7,552,932	5,758,613	43,930	0.76	7,313,693	5,767,508	46,193	0.80	6,827,595	5,453,983	50,521	0.93
Cedar	303,152	424,510	1,355	0.32	344,222	426,192	1,463	0.34	331,686	384,186	1,823	0.47
Birch	234,459	715,210	4,933	0.69	244,923	669,140	7,267	1.09	641,279	634,700	4,761	0.75
Aspen	27,821	77,140	954	1.24	45,481	127,796	1,439	1.13	342,349	150,732	1,744	1.16
Other deciduous	603,177	505,986	1,836	0.36	544,735	505,865	2,228	0.44	52,145	498,382	2,516	0.50
Dwarf Pine	609,898	-	-	-	630,625	-	-	-	526,153	-	-	-
Total	10,893,400	10,163,372	75,534	0.74	11,336,088	10,533,473	81,853	0.78	11,299,162	10,180,460	89,075	0.87

Table 7. Projected biologically sustainable volume annually available for harvest in relation to total growing-stock volume by all management scenarios analyzed and selected year of harvest in Siberia and Far East Russia, continued.

Forest type	Non-Exploitable growing stock volume 2008	Exploitable growing stock volume 2008	Projected harvest 2008	Percentage of harvest to total exploitable 2008	Non-Exploitable growing stock volume 2068	Exploitable growing stock volume 2068	Projected harvest 2068	Percentage of harvest to total exploitable 2068	Non-Exploitable growing stock volume 2168	Exploitable growing stock volume 2168	Projected harvest 2168	Percentage of harvest to total exploitable 2168
Far East Russia	**Increased Protection**				(Thousand cubic meters)							
Pine	645,324	763,853	6,012	0.79	782,108	848,684	6,426	0.76	820,028	757,007	7,386	0.98
Spruce	825,340	1,622,757	17,792	1.10	1,347,953	1,786,494	18,079	1.01	1,777,745	1,874,983	24,335	1.30
Fir	91,296	236,921	1,436	0.61	104,162	276,597	1,666	0.60	115,542	278,538	2,292	0.82
Larch	7,552,932	5,741,204	43,853	0.76	7,381,631	5,382,575	45,981	0.85	7,069,610	4,937,433	51,396	1.04
Cedar	303,152	425,323	1,425	0.34	347,439	419,102	1,623	0.39	350,533	377,725	2,105	0.56
Birch	234,459	687,495	6,349	0.92	245,149	805,395	8,294	1.03	666,088	760,922	11,571	1.52
Aspen	27,821	77,870	1,091	1.40	44,858	161,948	2,009	1.24	333,956	199,266	3,509	1.76
Other deciduous	603,177	503,429	2,047	0.41	548,306	512,055	2,470	0.48	43,758	522,319	2,878	0.55
Dwarf Pine	609,898	-	-	-	636,120	-	-	-	536,311	-	-	-
Total	10,893,400	10,058,851	80,006	0.80	11,437,727	10,192,851	86,548	0.85	11,713,570	9,708,193	105,473	1.09
Far East Russia	**Increased Regeneration & Protection**											
Pine	645,324	765,038	6,974	0.91	782,108	1,000,897	7,334	0.73	820,028	881,116	10,056	1.14
Spruce	825,340	1,631,908	17,717	1.09	1,347,953	1,814,457	18,055	1.00	1,777,745	1,874,989	23,004	1.23
Fir	91,296	236,389	1,448	0.61	104,162	294,512	1,688	0.57	115,542	284,189	2,180	0.77
Larch	7,552,932	5,743,186	45,077	0.78	7,381,631	5,537,601	47,272	0.85	7,069,610	4,855,661	53,203	1.10
Cedar	303,152	426,175	1,393	0.33	347,439	427,169	1,650	0.39	350,533	382,370	2,139	0.56
Birch	234,459	680,628	6,482	0.95	245,149	660,051	9,845	1.49	666,088	740,808	10,101	1.36
Aspen	27,821	73,690	1,164	1.58	44,858	129,287	1,792	1.39	333,956	182,866	3,251	1.78
Other deciduous	603,177	501,578	2,063	0.41	548,306	498,068	2,489	0.50	43,758	497,578	2,844	0.57
Dwarf Pine	609,898	-	-	-	636,120	-	-	-	536,311	-	-	-
Total	10,893,400	10,058,593	82,317	0.82	11,437,727	10,362,043	90,125	0.87	11,713,570	9,699,576	106,778	1.10

Table 7. Projected biologically sustainable volume annually available for harvest in relation to total growing-stock volume by all management scenarios analyzed and selected year of harvest in Siberia and Far East Russia, continued.

Forest type	Non-Exploitable growing stock volume 2008	Exploitable growing stock volume 2008	Projected harvest 2008	Percentage of harvest to total exploitable 2008	Non-Exploitable growing stock volume 2068	Exploitable growing stock volume 2068	Projected harvest 2068	Percentage of harvest to total exploitable 2068	Non-Exploitable growing stock volume 2168	Exploitable growing stock volume 2168	Projected harvest 2168	Percentage of harvest to total exploitable 2168
Siberia & Far East Russia	**No Change in Management (Baseline)**				(Thousand cubic meters)							
Pine	3,979,132	6,485,980	46,146	0.71	4,211,632	6,129,405	54,150	0.88	4,220,841	4,650,409	59,075	1.27
Spruce	2,234,723	2,775,417	29,399	1.06	2,979,143	3,036,632	31,343	1.03	3,508,010	3,280,047	41,131	1.25
Fir	687,209	1,855,796	17,339	0.93	850,217	1,943,362	18,318	0.94	1,020,379	1,911,001	22,170	1.16
Larch	17,074,293	10,235,660	81,809	0.80	16,780,531	9,619,874	85,931	0.89	16,158,810	8,909,014	95,013	1.07
Cedar	4,698,870	3,180,693	10,120	0.32	5,068,424	3,519,481	12,547	0.36	4,840,231	4,093,683	17,353	0.42
Birch	1,393,908	3,259,452	40,104	1.23	1,280,900	2,854,189	40,508	1.42	641,279	2,442,958	38,313	1.57
Aspen	196,467	952,762	20,452	2.15	213,568	963,118	14,718	1.53	1,530,461	907,999	18,016	1.98
Other Hardwoods	605,719	504,635	2,044	0.41	547,291	509,802	2,385	0.47	262,746	513,412	2,746	0.53
Dwarf Pine	609,898	-	-	-	630,625	-	-	-	528,579	-	-	-
Total	31,480,219	29,250,395	247,413	0.85	32,562,331	28,575,863	259,900	0.91	32,711,336	26,708,523	293,817	1.10
Siberia & Far East Russia	**Increased Regeneration**											
Pine	3,979,132	6,415,321	52,692	0.82	4,211,632	6,635,574	59,221	0.89	4,220,841	4,973,424	68,931	1.39
Spruce	2,234,723	2,789,650	29,126	1.04	2,979,143	3,047,824	31,018	1.02	3,508,010	3,174,862	38,000	1.20
Fir	687,209	1,864,681	17,225	0.92	850,217	2,194,965	19,321	0.88	1,020,379	2,074,078	26,504	1.28
Larch	17,074,293	10,231,741	83,742	0.82	16,780,531	9,840,095	87,891	0.89	16,158,810	8,790,193	97,153	1.11
Cedar	4,698,870	3,181,415	10,294	0.32	5,068,424	3,489,157	12,097	0.35	4,840,231	3,993,156	16,998	0.43
Birch	1,393,908	3,213,126	41,306	1.29	1,280,900	2,276,999	45,618	2.00	641,279	2,371,234	32,212	1.36
Aspen	196,467	962,754	19,098	1.98	213,568	776,678	15,330	1.97	1,530,461	917,322	18,281	1.99
Other Hardwoods	605,719	503,450	2,058	0.41	547,291	498,313	2,435	0.49	262,746	492,189	2,708	0.55
Dwarf Pine	609,898	-	-	-	630,625	-	-	-	528,579	-	-	-
Total	31,480,219	29,162,138	255,541	0.88	32,562,331	28,759,605	272,931	0.95	32,711,336	26,786,458	300,789	1.12
Siberia & Far East Russia	**Environmental Restrictions**											
Pine	3,979,132	6,443,450	51,131	0.79	4,211,632	6,716,926	57,301	0.85	4,220,841	5,877,180	67,803	1.15
Spruce	2,234,723	2,830,980	26,689	0.94	2,979,143	3,130,865	28,807	0.92	3,508,010	3,386,107	34,810	1.03
Fir	687,209	1,885,979	15,623	0.83	850,217	2,109,624	17,736	0.84	1,020,379	1,994,310	20,563	1.03
Larch	17,074,293	10,307,237	79,391	0.77	16,780,531	10,266,321	83,783	0.82	16,158,810	9,849,970	92,036	0.93
Cedar	4,698,870	3,178,140	10,069	0.32	5,068,424	3,525,746	11,765	0.33	4,840,231	4,019,500	15,900	0.40
Birch	1,393,908	3,238,576	39,622	1.22	1,280,900	2,257,262	43,049	1.91	641,279	2,030,339	21,828	1.08
Aspen	196,467	963,642	19,339	2.01	213,568	753,902	13,755	1.82	1,530,461	667,385	13,870	2.08
Other Hardwoods	605,719	506,802	1,869	0.37	547,291	506,066	2,238	0.44	262,746	498,429	2,516	0.50
Dwarf Pine	609,898	-	-	-	630,625	-	-	-	528,579	-	-	-
Total	31,480,219	29,354,806	243,733	0.83	32,562,331	29,266,712	258,434	0.88	32,711,336	28,323,220	269,327	0.95

Table 7. Projected biologically sustainable volume annually available for harvest in relation to total growing-stock volume by all management scenarios analyzed and selected year of harvest in Siberia and Far East Russia, continued.

Forest type	Non-Exploitable growing stock volume 2008	Exploitable growing stock volume 2008	Projected harvest 2008	Percentage of harvest to total exploitable 2008	Non-Exploitable growing stock volume 2068	Exploitable growing stock volume 2068	Projected harvest 2068	Percentage of harvest to total exploitable 2068	Non-Exploitable growing stock volume 2168	Exploitable growing stock volume 2168	Projected harvest 2168	Percentage of harvest to total exploitable 2168
Siberia & Far East Russia	**Increased Protection**				(Thousand cubic meters)							
Pine	3,979,132	6,468,143	47,095	0.73	4,247,835	6,155,307	55,434	0.90	4,375,343	4,730,283	60,980	1.29
Spruce	2,234,723	2,770,289	29,738	1.07	3,007,617	3,041,563	31,486	1.04	3,676,712	3,386,854	43,459	1.28
Fir	687,209	1,848,412	17,606	0.95	858,621	1,950,908	18,772	0.96	1,053,754	1,973,150	23,560	1.19
Larch	17,074,293	10,207,226	83,275	0.82	16,926,626	9,655,679	87,547	0.91	16,752,775	9,093,344	99,113	1.09
Cedar	4,698,870	3,180,438	10,433	0.33	5,125,800	3,545,595	12,802	0.36	5,144,641	4,287,937	18,330	0.43
Birch	1,393,908	3,240,997	39,564	1.22	1,278,507	2,847,536	41,937	1.47	666,088	2,436,639	39,408	1.62
Aspen	196,467	968,766	21,303	2.20	211,958	973,717	14,782	1.52	1,439,077	893,403	18,194	2.04
Other Hardwoods	605,719	504,351	2,087	0.41	550,873	512,838	2,470	0.48	238,778	522,790	2,898	0.55
Dwarf Pine	609,898	-	-	-	636,120	-	-	-	538,792	-	-	-
Total	31,480,219	29,188,622	251,101	0.86	32,843,957	28,683,143	265,230	0.92	33,885,960	27,324,400	305,943	1.12
Siberia & Far East Russia	**Increased Regeneration & Protection**											
Pine	3,979,132	6,398,304	53,265	0.83	4,247,835	6,635,286	60,155	0.91	4,375,343	5,063,599	71,792	1.42
Spruce	2,234,723	2,792,038	29,245	1.05	3,007,617	3,096,610	30,996	1.00	3,676,712	3,331,275	40,933	1.23
Fir	687,209	1,859,791	17,443	0.94	858,621	2,148,493	19,863	0.92	1,053,754	2,087,551	26,392	1.26
Larch	17,074,293	10,199,979	85,404	0.84	16,926,626	9,921,580	89,731	0.90	16,752,775	8,987,847	101,399	1.13
Cedar	4,698,870	3,182,690	10,859	0.34	5,125,800	3,504,191	12,319	0.35	5,144,641	4,160,822	17,967	0.43
Birch	1,393,908	3,209,703	41,063	1.28	1,278,507	2,299,147	47,581	2.07	666,088	2,386,241	34,035	1.43
Aspen	196,467	965,079	19,301	2.00	211,958	785,550	14,947	1.90	1,439,077	880,888	18,196	2.07
Other Hardwoods	605,719	502,594	2,109	0.42	550,873	498,290	2,489	0.50	238,778	497,753	2,845	0.57
Dwarf Pine	609,898	-	-	-	636,120	-	-	-	538,792	-	-	-
Total	31,480,219	29,110,178	258,689	0.89	32,843,957	28,889,147	278,081	0.96	33,885,960	27,395,976	313,560	1.14

Table 8. Projected classes of biologically sustainable volume annually available for harvest by all management scenarios analyzed and species group, for the years 2008 and 2028 in Siberia and Far East Russia.

	Commercial wood							
	Industrial wood			Total		Total		Total
Species Group	Large	Medium	Small	industrial	Fuelwood	commercial	Residue	harvest
	(Thousand cubic meters)							
West Siberia	**No Change in Management (Baseline)**					**2008**		
Pine	1,753	5,205	1,794	8,752	1,592	10,344	1,159	11,503
Spruce	620	998	286	1,904	313	2,217	303	2,520
Fir	786	923	107	1,817	411	2,228	326	2,553
Larch	151	621	244	1,016	380	1,395	295	1,690
Cedar	1,253	2,790	1,060	5,103	801	5,904	749	6,653
Birch	2,225	6,885	1,938	11,048	11,091	22,139	2,106	24,244
Aspen	862	1,830	394	3,085	5,027	8,112	1,504	9,617
Other deciduous	30	142	50	222	349	571	79	650
Total	7,681	19,393	5,873	32,947	19,963	52,910	6,520	59,430
West Siberia	**No Change in Management (Baseline)**					**2028**		
Pine	2,089	5,870	1,940	9,899	1,728	11,627	1,312	12,939
Spruce	706	1,116	306	2,128	337	2,466	339	2,805
Fir	1,000	1,128	130	2,259	490	2,749	400	3,149
Larch	177	670	255	1,102	404	1,506	317	1,823
Cedar	1,365	3,005	1,132	5,502	860	6,362	809	7,171
Birch	1,759	5,844	1,768	9,371	9,117	18,487	1,830	20,317
Aspen	1,152	2,051	308	3,511	6,079	9,590	1,978	11,567
Other deciduous	37	196	73	306	439	745	101	847
Total	8,285	19,881	5,913	34,078	19,454	53,532	7,086	60,618
West Siberia	**Increased Regeneration**					**2008**		
Pine	2,061	6,050	2,052	10,163	1,764	11,927	1,332	13,259
Spruce	659	1,069	299	2,026	326	2,352	323	2,675
Fir	858	1,010	117	1,984	442	2,426	354	2,780
Larch	140	612	237	990	368	1,358	283	1,642
Cedar	1,294	2,851	1,080	5,224	823	6,047	768	6,815
Birch	2,246	6,982	2,006	11,234	11,334	22,568	2,145	24,713
Aspen	837	1,761	377	2,975	4,923	7,898	1,475	9,373
Other deciduous	30	142	50	222	349	571	79	649
Total	8,125	20,477	6,216	34,818	20,329	55,147	6,759	61,906
West Siberia	**Increased Regeneration**					**2028**		
Pine	2,389	6,739	2,222	11,350	1,915	13,265	1,490	14,755
Spruce	687	1,110	306	2,103	337	2,440	336	2,776
Fir	972	1,130	131	2,233	498	2,731	398	3,129
Larch	155	657	251	1,063	391	1,454	302	1,756
Cedar	1,418	3,091	1,146	5,655	883	6,539	832	7,371
Birch	1,849	6,235	1,887	9,970	9,556	19,526	1,952	21,478
Aspen	1,114	1,898	273	3,285	5,431	8,716	1,782	10,498
Other deciduous	42	184	63	289	469	758	105	863
Total	8,626	21,044	6,278	35,948	19,480	55,428	7,198	62,626
West Siberia	**Environmental Restrictions**					**2008**		
Pine	2,050	5,988	2,026	10,065	1,751	11,815	1,320	13,135
Spruce	630	1,030	293	1,953	315	2,268	312	2,580
Fir	830	980	113	1,923	427	2,350	344	2,694
Larch	139	604	236	979	367	1,346	281	1,627
Cedar	1,290	2,847	1,082	5,219	821	6,040	767	6,807
Birch	2,254	7,032	2,009	11,295	11,382	22,677	2,149	24,825
Aspen	836	1,797	395	3,027	4,965	7,993	1,481	9,474
Other deciduous	30	142	50	222	349	571	79	649
Total	8,059	20,420	6,204	34,683	20,377	55,060	6,732	61,792
West Siberia	**Environmental Restrictions**					**2028**		
Pine	2,425	6,827	2,233	11,485	1,934	13,419	1,510	14,930
Spruce	652	1,059	297	2,008	324	2,332	323	2,654
Fir	945	1,099	127	2,171	484	2,655	388	3,043
Larch	151	645	250	1,046	388	1,435	298	1,733
Cedar	1,417	3,088	1,146	5,651	883	6,534	832	7,366
Birch	1,821	6,105	1,859	9,785	9,418	19,204	1,916	21,120
Aspen	1,128	1,963	290	3,381	5,759	9,140	1,878	11,018
Other deciduous	42	184	63	289	469	758	105	863
Total	8,581	20,971	6,265	35,817	19,660	55,477	7,249	62,726

Table 8. Projected classes of biologically sustainable volume annually available for harvest by all management scenarios analyzed and species group, for the years 2008 and 2028 in Siberia and Far East Russia, continued.

	Commercial wood							
	Industrial wood			Total		Total		Total
Species Group	Large	Medium	Small	industrial	Fuelwood	commercial	Residue	harvest
	(Thousand cubic meters)							
West Siberia	**Increased Protection**					**2008**		
Pine	1,762	5,229	1,808	8,799	1,610	10,409	1,165	11,573
Spruce	637	1,027	293	1,957	322	2,279	312	2,591
Fir	825	958	111	1,894	425	2,319	340	2,659
Larch	161	645	252	1,058	394	1,452	308	1,759
Cedar	1,270	2,822	1,069	5,161	810	5,971	757	6,728
Birch	2,250	6,995	1,967	11,213	11,240	22,453	2,134	24,587
Aspen	866	1,826	390	3,082	4,981	8,063	1,500	9,563
Other deciduous	31	143	50	224	354	578	80	657
Total	7,802	19,646	5,940	33,387	20,136	53,523	6,594	60,117
West Siberia	**Increased Protection**					**2028**		
Pine	2,124	5,999	1,980	10,103	1,760	11,863	1,340	13,203
Spruce	723	1,143	313	2,179	346	2,525	347	2,872
Fir	1,011	1,143	132	2,287	498	2,785	405	3,190
Larch	179	684	261	1,124	413	1,537	324	1,861
Cedar	1,396	3,069	1,154	5,619	880	6,499	826	7,325
Birch	1,774	5,852	1,769	9,395	9,148	18,543	1,837	20,380
Aspen	1,158	2,054	310	3,521	6,106	9,627	1,984	11,612
Other deciduous	38	203	76	318	458	776	105	881
Total	8,403	20,148	5,995	34,546	19,608	54,154	7,170	61,324
West Siberia	**Increased Regeneration & Protection**					**2008**		
Pine	2,089	6,108	2,079	10,276	1,792	12,068	1,346	13,413
Spruce	663	1,074	300	2,037	329	2,367	325	2,692
Fir	875	1,031	119	2,025	451	2,476	362	2,837
Larch	139	622	242	1,004	375	1,379	288	1,666
Cedar	1,317	2,898	1,093	5,308	835	6,142	781	6,923
Birch	2,264	7,047	2,031	11,342	11,421	22,762	2,166	24,929
Aspen	861	1,752	362	2,975	4,882	7,857	1,480	9,337
Other deciduous	31	143	50	224	354	578	80	657
Total	8,239	20,675	6,276	35,190	20,439	55,629	6,826	62,455
West Siberia	**Increased Regeneration & Protection**					**2028**		
Pine	2,401	6,790	2,244	11,435	1,937	13,372	1,502	14,873
Spruce	713	1,155	316	2,184	347	2,532	349	2,881
Fir	994	1,156	134	2,284	507	2,791	406	3,197
Larch	154	668	256	1,078	398	1,476	306	1,782
Cedar	1,455	3,176	1,182	5,813	908	6,720	856	7,576
Birch	1,860	6,213	1,872	9,945	9,587	19,532	1,948	21,479
Aspen	1,104	1,907	278	3,290	5,502	8,791	1,793	10,584
Other deciduous	44	204	72	320	504	824	114	938
Total	8,726	21,268	6,354	36,348	19,690	56,037	7,273	63,311

	Commercial wood							
	Industrial wood			Total		Total		Total
Species Group	Large	Medium	Small	industrial	Fuelwood	commercial	Residue	harvest
	(Thousand cubic meters)							
East Siberia	**No Change in Management (Baseline)**					**2008**		
Pine	5,697	8,972	2,620	17,289	1,484	18,772	2,235	21,008
Spruce	1,384	2,219	1,308	4,912	575	5,487	817	6,304
Fir	2,962	3,527	612	7,100	784	7,884	840	8,725
Larch	4,528	15,972	5,671	26,171	1,460	27,631	7,143	34,774
Cedar	1,934	1,364	250	3,548	189	3,738	768	4,505
Birch	57	4,328	6,837	11,222	4,460	15,682	2,518	18,200
Aspen	60	2,213	2,213	4,486	1,419	5,905	954	6,859
Other deciduous	11	17	3	31	22	54	20	73
Total	16,633	38,612	19,514	74,759	10,393	85,152	15,295	100,447
East Siberia	**No Change in Management (Baseline)**					**2028**		
Pine	6,351	9,831	2,858	19,040	1,635	20,675	2,446	23,121
Spruce	1,618	2,480	1,422	5,521	639	6,160	913	7,073
Fir	3,134	3,548	594	7,275	792	8,067	861	8,928
Larch	5,101	18,015	6,161	29,276	1,609	30,886	7,996	38,881
Cedar	3,047	1,840	327	5,214	317	5,531	1,091	6,622
Birch	59	4,456	6,823	11,339	4,445	15,784	2,523	18,308
Aspen	58	1,977	2,046	4,081	1,377	5,458	886	6,345
Other deciduous	54	81	22	156	120	276	104	380
Total	19,422	42,229	20,253	81,904	10,933	92,837	16,822	109,659

Table 8. Projected classes of biologically sustainable volume annually available for harvest by all management scenarios analyzed and species group, for the years 2008 and 2028 in Siberia and Far East Russia, continued.

	Commercial wood							
	Industrial wood			Total		Total		Total
Species Group	Large	Medium	Small	industrial	Fuelwood	commercial	Residue	harvest
	(Thousand cubic meters)							
East Siberia	**Increased Regeneration**					**2008**		
Pine	6,313	10,097	2,926	19,337	1,665	21,001	2,503	23,505
Spruce	1,378	2,198	1,294	4,870	570	5,440	810	6,250
Fir	2,940	3,470	605	7,015	775	7,790	831	8,621
Larch	4,664	16,521	5,887	27,072	1,520	28,592	7,376	35,968
Cedar	1,935	1,374	253	3,562	190	3,752	771	4,523
Birch	57	4,411	6,981	11,449	4,544	15,993	2,568	18,561
Aspen	60	2,123	2,137	4,321	1,400	5,721	924	6,645
Other deciduous	11	18	5	34	24	57	22	79
Total	17,359	40,212	20,087	77,659	10,687	88,346	15,806	104,152
East Siberia	**Increased Regeneration**					**2028**		
Pine	6,919	10,896	3,153	20,967	1,809	22,776	2,700	25,477
Spruce	1,612	2,460	1,411	5,483	634	6,118	907	7,025
Fir	3,135	3,559	597	7,291	794	8,085	864	8,949
Larch	5,224	18,532	6,370	30,126	1,668	31,795	8,214	40,008
Cedar	3,046	1,839	327	5,212	317	5,529	1,091	6,620
Birch	59	4,419	6,752	11,230	4,403	15,634	2,499	18,132
Aspen	59	2,102	2,180	4,341	1,441	5,782	939	6,722
Other deciduous	53	80	20	153	117	271	102	373
Total	20,109	43,888	20,809	84,805	11,185	95,990	17,316	113,306
East Siberia	**Environmental Restrictions**					**2008**		
Pine	6,348	10,093	2,898	19,339	1,673	21,012	2,507	23,518
Spruce	1,260	1,945	1,119	4,323	500	4,823	709	5,532
Fir	2,760	3,021	539	6,319	704	7,023	748	7,771
Larch	4,510	14,955	4,946	24,411	1,312	25,723	6,566	32,288
Cedar	1,785	1,209	220	3,214	180	3,394	690	4,084
Birch	57	4,306	6,804	11,167	4,431	15,598	2,505	18,103
Aspen	60	2,054	2,057	4,171	1,206	5,377	876	6,253
Other deciduous	11	18	5	34	24	58	22	80
Total	16,792	37,601	18,586	72,979	10,029	83,008	14,622	97,630
East Siberia	**Environmental Restrictions**					**2028**		
Pine	6,987	10,923	3,128	21,039	1,818	22,857	2,709	25,566
Spruce	1,491	2,201	1,234	4,925	563	5,489	805	6,293
Fir	2,946	3,074	525	6,545	716	7,261	776	8,037
Larch	5,074	16,970	5,430	27,475	1,456	28,931	7,410	36,341
Cedar	2,897	1,673	294	4,864	307	5,170	1,010	6,180
Birch	59	4,379	6,709	11,147	4,391	15,538	2,484	18,022
Aspen	57	1,943	1,980	3,980	1,369	5,349	865	6,214
Other deciduous	51	78	21	151	114	265	99	364
Total	19,563	41,242	19,321	80,125	10,734	90,859	16,158	107,017
East Siberia	**Increased Protection**					**2008**		
Pine	5,850	9,264	2,708	17,821	1,530	19,351	2,304	21,656
Spruce	1,397	2,237	1,315	4,949	579	5,528	824	6,352
Fir	2,998	3,545	615	7,158	790	7,948	847	8,795
Larch	4,607	16,283	5,790	26,679	1,487	28,166	7,283	35,449
Cedar	1,965	1,384	253	3,602	192	3,794	779	4,574
Birch	58	4,425	6,992	11,475	4,554	16,029	2,573	18,602
Aspen	61	2,126	2,112	4,298	1,375	5,673	916	6,589
Other deciduous	11	17	4	32	23	55	21	76
Total	16,946	39,280	19,789	76,015	10,530	86,545	15,547	102,092
East Siberia	**Increased Protection**					**2028**		
Pine	6,442	10,026	2,923	19,391	1,671	21,062	2,494	23,556
Spruce	1,635	2,499	1,429	5,563	643	6,206	920	7,126
Fir	3,211	3,650	609	7,471	812	8,282	884	9,166
Larch	5,167	18,291	6,273	29,731	1,636	31,367	8,120	39,486
Cedar	3,136	1,874	331	5,342	329	5,670	1,117	6,787
Birch	60	4,428	6,757	11,245	4,406	15,651	2,501	18,152
Aspen	61	2,131	2,209	4,401	1,458	5,859	952	6,810
Other deciduous	56	87	23	166	123	288	106	395
Total	19,768	42,986	20,555	83,309	11,078	94,386	17,094	111,480

Table 8. Projected classes of biologically sustainable volume annually available for harvest by all management scenarios analyzed and species group, for the years 2008 and 2028 in Siberia and Far East Russia, continued.

	Commercial wood							
	Industrial wood			Total		Total		Total
Species Group	Large	Medium	Small	industrial	Fuelwood	commercial	Residue	harvest
	(Thousand cubic meters)							
East Siberia	**Increased Regeneration & Protection**					**2008**		
Pine	6,418	10,289	2,982	19,688	1,697	21,385	2,551	23,936
Spruce	1,363	2,166	1,271	4,799	559	5,359	796	6,155
Fir	2,963	3,472	606	7,040	778	7,819	834	8,652
Larch	4,754	16,867	6,015	27,636	1,545	29,181	7,531	36,712
Cedar	1,961	1,387	255	3,604	193	3,797	780	4,576
Birch	58	4,437	7,010	11,505	4,564	16,069	2,580	18,649
Aspen	61	2,136	2,149	4,346	1,410	5,757	930	6,687
Other deciduous	11	17	3	32	23	55	20	75
Total	17,588	40,771	20,291	78,651	10,770	89,421	16,021	105,442
East Siberia	**Increased Regeneration & Protection**					**2028**		
Pine	7,017	11,068	3,203	21,288	1,841	23,129	2,745	25,874
Spruce	1,602	2,434	1,390	5,426	625	6,051	895	6,947
Fir	3,175	3,578	601	7,353	800	8,154	871	9,024
Larch	5,322	18,897	6,506	30,725	1,697	32,421	8,377	40,798
Cedar	3,136	1,883	334	5,352	330	5,682	1,119	6,801
Birch	60	4,435	6,767	11,262	4,406	15,668	2,504	18,172
Aspen	61	2,121	2,187	4,368	1,439	5,807	943	6,751
Other deciduous	56	88	25	169	124	293	108	401
Total	20,428	44,503	21,014	85,944	11,262	97,206	17,562	114,768

	Commercial wood							
	Industrial wood			Total		Total		Total
Species Group	Large	Medium	Small	industrial	Fuelwood	commercial	Residue	harvest
	(Thousand cubic meters)							
Far East Russia	**No Change in Management (Baseline)**					**2008**		
Pine	765	2,621	797	4,183	966	5,149	692	5,841
Spruce	2,844	4,706	1,095	8,645	1,479	10,124	1,603	11,728
Fir	478	990	281	1,748	321	2,069	352	2,421
Larch	5,432	14,541	3,734	23,706	5,868	29,574	7,893	37,467
Cedar	715	238	115	1,067	180	1,247	133	1,380
Birch	574	2,011	539	3,124	2,698	5,822	1,248	7,071
Aspen	165	351	98	614	788	1,402	167	1,569
Other deciduous	694	465	117	1,275	2,911	4,186	547	4,733
Total	11,664	25,923	6,776	44,363	15,210	59,573	12,636	72,209
Far East Russia	**No Change in Management (Baseline)**					**2028**		
Pine	797	2,679	811	4,287	978	5,265	707	5,972
Spruce	3,578	5,156	1,174	9,907	1,626	11,533	1,857	13,390
Fir	619	1,143	310	2,072	369	2,441	409	2,850
Larch	6,404	15,623	3,925	25,951	6,166	32,117	8,431	40,547
Cedar	849	255	121	1,225	224	1,448	151	1,600
Birch	817	2,207	577	3,601	3,018	6,618	1,417	8,035
Aspen	207	345	85	637	787	1,424	172	1,597
Other deciduous	768	528	133	1,428	3,282	4,709	613	5,322
Total	14,038	27,935	7,135	49,108	16,448	65,556	13,756	79,312
Far East Russia	**Increased Regeneration**					**2008**		
Pine	892	3,085	945	4,922	1,158	6,080	820	6,900
Spruce	2,816	4,689	1,102	8,607	1,473	10,080	1,591	11,671
Fir	483	1,002	285	1,770	326	2,095	355	2,450
Larch	5,568	14,986	3,845	24,398	5,982	30,380	7,999	38,379
Cedar	728	243	118	1,090	183	1,272	136	1,408
Birch	592	2,091	564	3,247	2,821	6,068	1,298	7,365
Aspen	177	373	103	653	846	1,499	179	1,678
Other deciduous	710	479	120	1,308	2,970	4,278	561	4,839
Total	11,966	26,948	7,081	45,994	15,758	61,752	12,937	74,689

Table 8. Projected classes of biologically sustainable volume annually available for harvest by all management scenarios analyzed and species group, for the years 2008 and 2028 in Siberia and Far East Russia, continued.

	Commercial wood							
	Industrial wood			Total		Total		Total
Species Group	Large	Medium	Small	industrial	Fuelwood	commercial	Residue	harvest
	(Thousand cubic meters)							
Far East Russia	**Increased Regeneration**					**2028**		
Pine	924	3,142	959	5,025	1,170	6,195	835	7,030
Spruce	3,577	5,184	1,191	9,951	1,632	11,583	1,862	13,446
Fir	631	1,163	315	2,109	376	2,485	416	2,901
Larch	6,530	16,068	4,037	26,635	6,283	32,918	8,546	41,464
Cedar	844	258	123	1,225	221	1,445	151	1,597
Birch	832	2,285	602	3,719	3,138	6,857	1,465	8,321
Aspen	205	352	89	646	802	1,448	176	1,623
Other deciduous	776	532	133	1,442	3,305	4,747	618	5,365
Total	14,320	28,983	7,448	50,751	16,927	67,678	14,067	81,746
Far East Russia	**Environmental Restrictions**					**2008**		
Pine	653	2,211	666	3,531	805	4,335	568	4,904
Spruce	2,639	4,333	1,020	7,992	1,373	9,365	1,485	10,849
Fir	446	862	240	1,548	272	1,820	301	2,121
Larch	5,483	14,789	3,827	24,099	5,971	30,070	8,032	38,102
Cedar	691	235	114	1,039	172	1,211	130	1,341
Birch	505	1,622	420	2,547	2,223	4,770	1,065	5,835
Aspen	151	309	79	540	694	1,234	146	1,380
Other deciduous	639	423	109	1,171	2,674	3,846	501	4,346
Total	11,207	24,783	6,476	42,466	14,185	56,651	12,227	68,878
Far East Russia	**Environmental Restrictions**					**2028**		
Pine	685	2,268	680	3,633	817	4,450	583	5,033
Spruce	3,378	4,790	1,101	9,268	1,520	10,789	1,739	12,528
Fir	591	1,008	267	1,865	317	2,182	358	2,540
Larch	6,454	15,892	4,024	26,369	6,276	32,645	8,580	41,225
Cedar	788	249	119	1,156	203	1,359	143	1,503
Birch	749	1,836	463	3,048	2,568	5,616	1,244	6,859
Aspen	183	295	69	548	680	1,227	150	1,377
Other deciduous	708	476	123	1,306	2,996	4,302	555	4,857
Total	13,535	26,813	6,844	47,193	15,376	62,569	13,352	75,922
Far East Russia	**Increased Protection**					**2008**		
Pine	775	2,660	809	4,244	981	5,225	702	5,927
Spruce	2,866	4,758	1,111	8,734	1,496	10,230	1,619	11,850
Fir	484	1,007	286	1,776	327	2,103	358	2,460
Larch	5,539	14,851	3,814	24,204	5,990	30,194	8,034	38,228
Cedar	732	243	118	1,092	184	1,277	136	1,413
Birch	578	2,028	544	3,150	2,723	5,873	1,259	7,131
Aspen	165	351	98	614	788	1,402	167	1,569
Other deciduous	705	474	119	1,299	2,962	4,260	557	4,818
Total	11,843	26,370	6,898	45,112	15,450	60,562	12,834	73,396
Far East Russia	**Increased Protection**					**2028**		
Pine	808	2,718	823	4,348	993	5,342	717	6,059
Spruce	3,607	5,210	1,190	10,007	1,643	11,650	1,874	13,524
Fir	627	1,161	316	2,104	375	2,479	415	2,895
Larch	6,503	15,923	4,003	26,428	6,286	32,714	8,569	41,284
Cedar	866	261	124	1,250	228	1,478	154	1,632
Birch	820	2,222	582	3,623	3,040	6,664	1,426	8,090
Aspen	207	348	86	641	794	1,435	174	1,609
Other deciduous	781	537	135	1,454	3,337	4,791	623	5,415
Total	14,218	28,381	7,258	49,856	16,697	66,553	13,954	80,507
Far East Russia	**Increased Regeneration & Protection**					**2008**		
Pine	890	3,077	943	4,909	1,154	6,064	818	6,882
Spruce	2,838	4,729	1,112	8,679	1,485	10,164	1,605	11,769
Fir	488	1,016	288	1,792	331	2,123	360	2,482
Larch	5,677	15,290	3,922	24,889	6,108	30,997	8,151	39,148
Cedar	743	248	120	1,110	187	1,297	138	1,435
Birch	596	2,102	567	3,264	2,838	6,102	1,305	7,407
Aspen	178	374	103	655	849	1,504	179	1,683
Other deciduous	721	487	123	1,332	3,020	4,351	570	4,922
Total	12,128	27,323	7,178	46,630	15,971	62,601	13,127	75,728

Table 8. Projected classes of biologically sustainable volume annually available for harvest by all management scenarios analyzed and species group, for the years 2008 and 2028 in Siberia and Far East Russia, continued.

	Commercial wood							
	Industrial wood			Total		Total		Total
Species Group	Large	Medium	Small	industrial	Fuelwood	commercial	Residue	harvest
	(Thousand cubic meters)							
Far East Russia	**Increased Regeneration & Protection**					**2028**		
Pine	922	3,134	956	5,012	1,167	6,179	832	7,011
Spruce	3,601	5,220	1,200	10,021	1,644	11,665	1,876	13,541
Fir	637	1,175	319	2,130	380	2,511	420	2,931
Larch	6,633	16,362	4,112	27,107	6,406	33,512	8,695	42,207
Cedar	859	263	125	1,246	224	1,471	154	1,625
Birch	836	2,300	606	3,741	3,160	6,901	1,474	8,375
Aspen	210	363	92	664	829	1,494	181	1,675
Other deciduous	789	541	136	1,465	3,354	4,821	627	5,448
Total	14,485	29,358	7,546	51,389	17,164	68,553	14,260	82,812
Siberia & Far East Russia	**No Change in Management (Baseline)**					**2008**		
Pine	8,215	16,798	5,211	30,224	4,042	34,265	4,086	38,352
Spruce	4,848	7,923	2,689	15,461	2,367	17,828	2,723	20,552
Fir	4,226	5,440	1,000	10,665	1,516	12,181	1,518	13,699
Larch	10,111	31,134	9,649	50,893	7,708	58,600	15,331	73,931
Cedar	3,902	4,392	1,425	9,718	1,170	10,889	1,650	12,538
Birch	2,856	13,224	9,314	25,394	18,249	43,643	5,872	49,515
Aspen	1,087	4,394	2,705	8,185	7,234	15,419	2,625	18,045
Other deciduous	735	624	170	1,528	3,282	4,811	646	5,456
Total	35,978	83,928	32,163	152,069	45,566	197,635	34,451	232,086
Siberia & Far East Russia	**No Change in Management (Baseline)**					**2028**		
Pine	9,237	18,380	5,609	33,226	4,341	37,567	4,465	42,032
Spruce	5,902	8,752	2,902	17,556	2,602	20,159	3,109	23,268
Fir	4,753	5,819	1,034	11,606	1,651	13,257	1,670	14,927
Larch	11,682	34,308	10,341	56,329	8,179	64,509	16,744	81,251
Cedar	5,261	5,100	1,580	11,941	1,401	13,341	2,051	15,393
Birch	2,635	12,507	9,168	24,311	16,580	40,889	5,770	46,660
Aspen	1,417	4,373	2,439	8,229	8,243	16,472	3,036	19,509
Other deciduous	859	805	228	1,890	3,841	5,730	818	6,549
Total	41,745	90,045	33,301	165,090	46,835	211,925	37,664	249,589
Siberia & Far East Russia	**Increased Regeneration**					**2008**		
Pine	9,266	19,232	5,923	34,422	4,587	39,008	4,655	43,664
Spruce	4,853	7,956	2,695	15,503	2,369	17,872	2,724	20,596
Fir	4,281	5,482	1,007	10,769	1,543	12,311	1,540	13,851
Larch	10,372	32,119	9,969	52,460	7,870	60,330	15,658	75,989
Cedar	3,957	4,468	1,451	9,876	1,196	11,071	1,675	12,746
Birch	2,895	13,484	9,551	25,930	18,699	44,629	6,011	50,639
Aspen	1,074	4,257	2,617	7,949	7,169	15,118	2,578	17,696
Other deciduous	751	639	175	1,564	3,343	4,906	662	5,567
Total	37,450	87,637	33,384	158,471	46,774	205,245	35,502	240,747
Siberia & Far East Russia	**Increased Regeneration**					**2028**		
Pine	10,232	20,777	6,334	37,342	4,894	42,236	5,025	47,262
Spruce	5,876	8,754	2,908	17,537	2,603	20,141	3,105	23,247
Fir	4,738	5,852	1,043	11,633	1,668	13,301	1,678	14,979
Larch	11,909	35,257	10,658	57,824	8,342	66,167	17,062	83,228
Cedar	5,308	5,188	1,596	12,092	1,421	13,513	2,074	15,588
Birch	2,740	12,939	9,241	24,919	17,097	42,017	5,916	47,931
Aspen	1,378	4,352	2,542	8,272	7,674	15,946	2,897	18,843
Other deciduous	871	796	216	1,884	3,891	5,776	825	6,601
Total	43,055	93,915	34,535	171,504	47,592	219,096	38,581	257,678
Siberia & Far East Russia	**Environmental Restrictions**					**2008**		
Pine	9,051	18,292	5,590	32,935	4,229	37,162	4,395	41,557
Spruce	4,529	7,308	2,432	14,268	2,188	16,456	2,506	18,961
Fir	4,036	4,863	892	9,790	1,403	11,193	1,393	12,586
Larch	10,132	30,348	9,009	49,489	7,650	57,139	14,879	72,017
Cedar	3,766	4,291	1,416	9,472	1,173	10,645	1,587	12,232
Birch	2,816	12,960	9,233	25,009	18,036	43,045	5,719	48,763
Aspen	1,047	4,160	2,531	7,738	6,865	14,604	2,503	17,107
Other deciduous	680	583	164	1,427	3,047	4,475	602	5,075
Total	36,058	82,804	31,266	150,128	44,591	194,719	33,581	228,300

Table 8. Projected classes of biologically sustainable volume annually available for harvest by all management scenarios analyzed and species group, for the years 2008 and 2028 in Siberia and Far East Russia, continued.

	Commercial wood							
	Industrial wood			Total		Total		Total
Species Group	Large	Medium	Small	industrial	Fuelwood	commercial	Residue	harvest
	(Thousand cubic meters)							
Siberia & Far East Russia	**Environmental Restrictions**					**2028**		
Pine	10,097	20,018	6,041	36,157	4,569	40,726	4,802	45,529
Spruce	5,521	8,050	2,632	16,201	2,407	18,610	2,867	21,475
Fir	4,482	5,181	919	10,581	1,517	12,098	1,522	13,620
Larch	11,679	33,507	9,704	54,890	8,120	63,011	16,288	79,299
Cedar	5,102	5,010	1,559	11,671	1,393	13,063	1,985	15,049
Birch	2,629	12,320	9,031	23,980	16,377	40,358	5,644	46,001
Aspen	1,368	4,201	2,339	7,909	7,808	15,716	2,893	18,609
Other deciduous	801	738	207	1,746	3,579	5,325	759	6,084
Total	41,679	89,026	32,430	163,135	45,770	208,905	36,759	245,665
Siberia & Far East Russia	**Increased Protection**					**2008**		
Pine	8,387	17,153	5,325	30,864	4,121	34,985	4,171	39,156
Spruce	4,900	8,022	2,719	15,640	2,397	18,037	2,755	20,793
Fir	4,307	5,510	1,012	10,828	1,542	12,370	1,545	13,914
Larch	10,307	31,779	9,856	51,941	7,871	59,812	15,625	75,436
Cedar	3,967	4,449	1,440	9,855	1,186	11,042	1,672	12,715
Birch	2,886	13,448	9,503	25,838	18,517	44,355	5,966	50,320
Aspen	1,092	4,303	2,600	7,994	7,144	15,138	2,583	17,721
Other deciduous	747	634	173	1,555	3,339	4,893	658	5,551
Total	36,591	85,296	32,627	154,514	46,116	200,630	34,975	235,605
Siberia & Far East Russia	**Increased Protection**					**2028**		
Pine	9,374	18,743	5,726	33,842	4,424	38,267	4,551	42,818
Spruce	5,965	8,852	2,932	17,749	2,632	20,381	3,141	23,522
Fir	4,849	5,954	1,057	11,862	1,685	13,546	1,704	15,251
Larch	11,849	34,898	10,537	57,283	8,335	65,618	17,013	82,631
Cedar	5,398	5,204	1,609	12,211	1,437	13,647	2,097	15,744
Birch	2,654	12,502	9,108	24,263	16,594	40,858	5,764	46,622
Aspen	1,426	4,533	2,605	8,563	8,358	16,921	3,110	20,031
Other deciduous	875	827	234	1,938	3,918	5,855	834	6,691
Total	42,389	91,515	33,808	167,711	47,383	215,093	38,218	253,311
Siberia & Far East Russia	**Increased Regeneration & Protection**					**2008**		
Pine	9,397	19,474	6,004	34,873	4,643	39,517	4,715	44,231
Spruce	4,864	7,969	2,683	15,515	2,373	17,890	2,726	20,616
Fir	4,326	5,519	1,013	10,857	1,560	12,418	1,556	13,971
Larch	10,570	32,779	10,179	53,529	8,028	61,557	15,970	77,526
Cedar	4,021	4,533	1,468	10,022	1,215	11,236	1,699	12,934
Birch	2,918	13,586	9,608	26,111	18,823	44,933	6,051	50,985
Aspen	1,100	4,262	2,614	7,976	7,141	15,118	2,589	17,707
Other deciduous	763	647	176	1,588	3,397	4,984	670	5,654
Total	37,955	88,769	33,745	160,471	47,180	207,651	35,974	243,625
Siberia & Far East Russia	**Increased Regeneration & Protection**					**2028**		
Pine	10,340	20,992	6,403	37,735	4,945	42,680	5,079	47,758
Spruce	5,916	8,809	2,906	17,631	2,616	20,248	3,120	23,369
Fir	4,806	5,909	1,054	11,767	1,687	13,456	1,697	15,152
Larch	12,109	35,927	10,874	58,910	8,501	67,409	17,378	84,787
Cedar	5,450	5,322	1,641	12,411	1,462	13,873	2,129	16,002
Birch	2,756	12,948	9,245	24,948	17,153	42,101	5,926	48,026
Aspen	1,375	4,391	2,557	8,322	7,770	16,092	2,917	19,010
Other deciduous	889	833	233	1,954	3,982	5,938	849	6,787
Total	43,639	95,129	34,914	173,681	48,116	221,796	39,095	260,891

Table 9. Projected volume annually available with an accelerated harvest schedule by selected management scenario, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia.

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
West Siberia		**Altai Kray**			**No Change in Management (Baseline)**				
2008	5,334	434	43	1,009	679	202	1,401	1,565	-
2028	5,849	601	57	1,219	710	276	1,334	1,652	-
2068	4,492	764	44	918	529	203	717	1,318	-
2168	4,389	1,019	161	1,002	538	264	662	745	-
West Siberia		**Altai Kray**			**Increased Regeneration & Protection**				
2008	5,508	438	32	1,079	774	203	1,400	1,581	-
2028	6,056	599	63	1,288	804	266	1,242	1,795	-
2068	4,586	769	46	979	594	211	925	1,062	-
2168	4,751	1,370	196	1,060	610	269	492	755	-
West Siberia		**Kemerovo Oblast**			**No Change in Management (Baseline)**				
2008	7,473	17	14	3,140	-	10	837	3,455	-
2028	7,749	62	27	3,588	-	28	1,425	2,619	-
2068	5,580	116	121	2,656	-	26	992	1,669	-
2168	5,275	143	529	2,697	-	92	520	1,294	-
West Siberia		**Kemerovo Oblast**			**Increased Regeneration & Protection**				
2008	7,872	1	13	3,801	-	10	1,385	2,663	-
2028	8,163	78	53	4,123	-	28	1,799	2,082	-
2068	5,846	136	117	3,184	-	21	824	1,564	-
2168	5,713	401	435	3,224	-	135	375	1,143	-
West Siberia		**Novosibirsk Oblast**			**No Change in Management (Baseline)**				
2008	2,037	175	10	11	-	3	1,310	528	-
2028	2,174	220	10	34	-	4	1,457	449	-
2068	1,613	318	9	112	-	3	645	526	-
2168	1,594	621	19	112	-	9	501	332	-
West Siberia		**Novosibirsk Oblast**			**Increased Regeneration & Protection**				
2008	2,108	178	10	11	-	3	1,354	553	-
2028	2,285	223	10	34	-	4	1,081	934	-
2068	1,623	320	9	184	-	3	756	351	-
2168	1,557	586	21	354	-	10	271	315	-
West Siberia		**Omsk Oblast**			**No Change in Management (Baseline)**				
2008	5,109	188	32	27	-	11	4,253	598	-
2028	5,289	641	43	27	-	20	2,821	1,737	-
2068	3,727	827	88	54	-	55	1,922	781	-
2168	3,315	1,248	204	601	-	98	609	555	-
West Siberia		**Omsk Oblast**			**Increased Regeneration & Protection**				
2008	5,471	262	66	39	-	11	4,290	804	-
2028	5,537	633	76	39	-	25	3,252	1,512	-
2068	3,711	971	88	166	-	54	2,068	364	-
2168	3,409	1,885	220	415	-	102	392	395	-
West Siberia		**Tomsk Oblast**			**No Change in Management (Baseline)**				
2008	27,279	4,456	757	1,190	-	2,675	18,120	80	-
2028	28,846	5,485	934	2,150	-	2,723	5,996	11,557	-
2068	19,427	6,661	681	1,542	-	3,283	6,630	630	-
2168	18,959	7,391	1,804	1,543	-	3,684	2,631	1,906	-
West Siberia		**Tomsk Oblast**			**Increased Regeneration & Protection**				
2008	28,816	5,487	666	1,331	-	2,744	17,927	661	-
2028	29,561	7,028	986	1,607	-	3,590	6,812	9,538	-
2068	20,775	6,676	712	2,184	-	3,010	7,236	957	-
2168	19,729	6,895	2,667	3,680	-	3,512	589	2,386	-
West Siberia		**Tyumen Oblast**			**No Change in Management (Baseline)**				
2008	35,970	12,695	2,947	-	1,418	2,517	8,947	7,445	-
2028	34,958	13,152	3,254	43	1,578	3,623	12,508	801	-
2068	26,299	12,488	3,288	272	1,234	3,081	5,092	844	-
2168	26,418	12,603	3,382	272	1,619	4,575	2,639	1,328	-
West Siberia		**Tyumen Oblast**			**Increased Regeneration & Protection**				
2008	37,661	14,977	3,277	-	1,266	2,520	9,379	6,243	-
2028	37,031	15,366	3,277	-	1,266	3,534	13,404	185	-
2068	28,377	13,483	3,189	162	992	3,020	6,046	1,485	-
2168	29,197	14,036	3,668	1,713	1,528	4,745	1,899	1,608	-

Table 9. Projected volume annually available with an accelerated harvest schedule by selected management scenario, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group: Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
				(Thousand cubic meters)					
West Siberia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	83,202	17,965	3,804	5,377	2,097	5,418	34,870	13,671	-
2028	84,865	20,160	4,325	7,062	2,288	6,674	25,542	18,816	-
2068	61,139	21,174	4,231	5,554	1,763	6,651	15,998	5,768	-
2168	59,952	23,025	6,099	6,227	2,157	8,722	7,562	6,160	-
West Siberia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	87,437	21,343	4,064	6,262	2,040	5,491	35,734	12,503	-
2028	88,634	23,927	4,465	7,091	2,069	7,447	27,590	16,045	-
2068	64,918	22,355	4,161	6,859	1,586	6,319	17,855	5,783	-
2168	64,357	25,173	7,207	10,446	2,138	8,773	4,018	6,602	-

Year of harvest	Total	Species Group: Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
				(Thousand cubic meters)					
East Siberia		**Buryat Republic**			**No Change in Management (Baseline)**				
2008	7,697	1,830	164	209	4,495	7	664	329	-
2028	8,676	2,134	185	228	5,207	25	473	424	-
2068	6,657	1,645	132	167	3,897	76	419	321	-
2168	8,703	2,607	242	264	4,178	103	1,077	232	-
East Siberia		**Buryat Republic**			**Increased Regeneration & Protection**				
2008	7,784	1,858	120	168	4,648	7	652	330	-
2028	8,775	2,141	147	192	5,361	25	484	426	-
2068	6,992	1,652	105	142	4,021	61	647	364	-
2168	9,141	2,748	175	208	4,435	90	1,220	265	-
East Siberia		**Chita Oblast**			**No Change in Management (Baseline)**				
2008	19,908	2,430	-	-	14,650	6	2,646	176	-
2028	22,670	2,920	-	-	16,976	49	2,015	710	-
2068	19,031	2,190	-	-	13,216	37	3,389	199	-
2168	21,825	2,374	-	-	15,721	37	3,383	310	-
East Siberia		**Chita Oblast**			**Increased Regeneration & Protection**				
2008	20,114	2,596	-	-	14,690	6	2,646	176	-
2028	22,859	3,074	-	-	16,997	52	2,013	722	-
2068	19,888	2,305	-	-	13,276	41	4,088	178	-
2168	24,110	5,165	-	-	15,662	41	2,978	264	-
East Siberia		**Irkutsk Oblast**			**No Change in Management (Baseline)**				
2008	50,679	18,666	4,185	3,423	12,347	476	7,239	4,343	-
2028	54,393	19,711	4,400	3,536	13,374	2,321	6,934	4,116	-
2068	39,406	14,221	3,185	2,623	9,762	1,767	4,222	3,626	-
2168	48,388	14,829	4,674	4,569	10,473	2,994	6,784	4,065	-
East Siberia		**Irkutsk Oblast**			**Increased Regeneration & Protection**				
2008	54,488	21,969	3,763	3,263	13,378	490	7,181	4,444	-
2028	58,260	23,115	3,970	3,380	14,403	2,339	6,969	4,082	-
2068	43,693	16,660	2,888	2,527	10,515	1,750	6,174	3,179	-
2168	52,230	18,197	3,930	4,254	11,384	3,262	7,315	3,888	-
East Siberia		**Krasnoyarsk Kray**			**No Change in Management (Baseline)**				
2008	60,535	10,248	7,417	10,658	13,884	556	12,375	5,397	-
2028	65,608	11,668	8,036	11,581	15,270	2,996	12,704	3,354	-
2068	47,336	8,539	5,853	8,365	10,979	2,329	8,297	2,974	-
2168	51,684	8,975	6,777	8,945	11,712	3,384	8,132	3,759	-
East Siberia		**Krasnoyarsk Kray**			**Increased Regeneration & Protection**				
2008	63,284	11,644	7,406	10,871	14,791	554	13,118	4,900	-
2028	68,463	12,848	8,032	11,837	16,325	3,248	11,767	4,406	-
2068	50,761	9,797	5,748	8,647	11,727	2,391	8,800	3,651	-
2168	54,972	10,367	6,543	9,305	13,190	3,525	8,115	3,927	-
East Siberia		**Tuva Republic**			**No Change in Management (Baseline)**				
2008	1,807	55	46	-	1,417	11	279	-	-
2028	2,173	66	52	-	1,687	141	162	-	64
2068	1,573	54	38	-	1,230	109	142	-	-
2168	1,895	98	74	-	1,268	134	303	-	18

Table 9. Projected volume annually available with an accelerated harvest schedule by selected management scenario, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
East Siberia		**Tuva Republic**			**Increased Regeneration & Protection**				
2008	1,947	56	45	-	1,558	11	277	-	-
2028	2,318	64	52	-	1,830	143	165	-	64
2068	1,703	54	38	-	1,333	107	171	-	-
2168	1,973	86	74	-	1,388	137	287	-	1
East Siberia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	140,626	33,229	11,812	14,290	46,792	1,056	23,202	10,245	-
2028	153,520	36,498	12,673	15,345	52,514	5,533	22,288	8,604	64
2068	114,003	26,649	9,208	11,155	39,084	4,318	16,469	7,120	-
2168	132,495	28,883	11,767	13,778	43,352	6,652	19,679	8,366	18
East Siberia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	147,617	38,122	11,334	14,302	49,066	1,068	23,874	9,850	-
2028	160,675	41,243	12,201	15,408	54,916	5,807	21,399	9,636	64
2068	123,037	30,468	8,779	11,316	40,872	4,350	19,880	7,372	-
2168	142,426	36,563	10,722	13,767	46,059	7,055	19,915	8,344	1

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
Far East Russia		**Amur Oblast**			**No Change in Management (Baseline)**				
2008	17,721	508	700	21	13,233	-	2,829	378	52
2028	21,057	686	763	27	15,831	-	3,249	412	90
2068	17,127	614	569	20	11,592	-	3,840	386	106
2168	21,125	1,015	2,248	21	12,127	-	4,415	1,130	169
Far East Russia		**Amur Oblast**			**Increased Regeneration & Protection**				
2008	18,722	522	699	24	14,217	-	2,831	378	52
2028	22,016	700	762	32	16,772	-	3,251	410	90
2068	18,401	571	568	24	12,270	-	4,498	364	106
2168	22,179	2,160	2,081	25	12,993	-	3,733	1,021	166
Far East Russia		**Kamchatka Oblast**			**No Change in Management (Baseline)**				
2008	1,599	-	353	-	391	-	295	14	546
2028	1,830	-	367	-	519	-	259	90	595
2068	1,306	-	279	-	374	-	147	58	448
2168	1,333	-	285	-	393	-	179	54	422
Far East Russia		**Kamchatka Oblast**			**Increased Regeneration & Protection**				
2008	1,774	-	388	-	329	-	357	95	605
2028	1,943	-	412	-	517	-	364	29	622
2068	1,370	-	312	-	405	-	149	58	446
2168	1,413	-	323	-	431	-	167	57	435
Far East Russia		**Khabarovsk Kray**			**No Change in Management (Baseline)**				
2008	28,909	1	14,179	697	10,114	650	1,812	864	592
2028	32,781	1	15,758	766	11,994	736	2,085	847	594
2068	24,232	1	11,339	561	8,830	630	1,410	1,005	456
2168	30,359	6	13,647	1,030	9,596	981	2,864	1,720	515
Far East Russia		**Khabarovsk Kray**			**Increased Regeneration & Protection**				
2008	30,188	1	14,118	721	11,362	658	1,813	848	666
2028	34,117	1	15,716	791	13,188	732	2,174	846	668
2068	26,225	1	11,313	603	9,703	633	2,410	1,040	522
2168	31,848	9	13,645	1,001	11,170	1,065	2,696	1,674	588
Far East Russia		**Magadan Oblast**			**No Change in Management (Baseline)**				
2008	291	-	-	-	273	-	-	-	18
2028	293	-	-	-	280	-	-	-	13
2068	363	-	-	-	358	-	-	-	5
2168	649	-	-	-	638	-	-	-	11
Far East Russia		**Magadan Oblast**			**Increased Regeneration & Protection**				
2008	293	-	-	-	274	-	-	-	18
2028	294	-	-	-	281	-	-	-	13
2068	369	-	-	-	363	-	-	-	6
2168	724	-	-	-	712	-	-	-	12

Table 9. Projected volume annually available with an accelerated harvest schedule by selected management scenario, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
Far East Russia		**Primorski Kray**			**No Change in Management (Baseline)**				
2008	9,246	-	4,113	266	1,007	1,095	977	413	1,375
2028	10,927	-	5,246	438	1,271	1,224	1,170	195	1,383
2068	8,227	-	3,801	321	964	948	525	381	1,287
2168	9,024	-	3,833	370	1,040	997	735	587	1,462
Far East Russia		**Primorski Kray**			**Increased Regeneration & Protection**				
2008	9,870	-	3,938	371	1,382	1,169	1,130	507	1,373
2028	11,563	-	5,335	449	1,649	1,218	1,152	385	1,373
2068	8,766	-	3,929	333	1,245	1,016	622	330	1,291
2168	9,466	-	3,944	360	1,403	1,074	709	498	1,478
Far East Russia		**Sakhalin Oblast**			**No Change in Management (Baseline)**				
2008	4,446	-	2,191	820	1,288	-	43	-	104
2028	5,124	-	2,541	916	1,497	-	48	-	123
2068	3,901	-	1,899	708	1,174	-	38	-	82
2168	5,628	70	3,140	744	1,347	-	178	-	149
Far East Russia		**Sakhalin Oblast**			**Increased Regeneration & Protection**				
2008	4,502	-	2,199	830	1,326	-	43	-	104
2028	5,193	-	2,569	937	1,516	-	48	-	123
2068	4,039	-	1,917	728	1,225	-	51	-	118
2168	5,518	78	2,849	794	1,475	-	156	-	166
Far East Russia		**Yakutia Republic**			**No Change in Management (Baseline)**				
2008	38,885	7,588	20	-	29,158	-	2,120	-	-
2028	39,028	7,622	21	-	29,225	-	2,160	-	-
2068	29,596	5,711	15	-	21,791	-	2,079	-	-
2168	33,252	6,076	111	-	24,363	-	2,702	-	-
Far East Russia		**Yakutia Republic**			**Increased Regeneration & Protection**				
2008	40,670	9,045	21	-	29,484	-	2,120	-	-
2028	40,809	9,078	21	-	29,550	-	2,160	-	-
2068	30,955	6,761	16	-	22,062	-	2,116	-	-
2168	35,632	7,810	162	-	25,020	-	2,640	-	-
Far East Russia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	101,097	8,098	21,556	1,805	55,462	1,744	8,077	1,669	2,687
2028	111,040	8,309	24,696	2,146	60,617	1,960	8,971	1,543	2,797
2068	84,752	6,326	17,902	1,610	45,083	1,578	8,039	1,830	2,384
2168	101,370	7,167	23,264	2,165	49,504	1,978	11,073	3,491	2,728
Far East Russia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	106,019	9,569	21,363	1,946	58,374	1,827	8,294	1,828	2,818
2028	115,934	9,779	24,815	2,209	63,473	1,950	9,149	1,670	2,888
2068	90,125	7,333	18,055	1,688	47,273	1,649	9,846	1,792	2,489
2168	106,780	10,057	23,004	2,180	53,204	2,139	10,101	3,250	2,845
Siberia & Far East Russia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	324,925	59,291	37,171	21,472	104,352	8,218	66,149	25,585	2,687
2028	349,425	64,967	41,693	24,553	115,419	14,167	56,801	28,963	2,862
2068	259,894	54,149	31,341	18,319	85,930	12,547	40,506	14,718	2,384
2168	293,817	59,075	41,130	22,170	95,013	17,352	38,314	18,017	2,746
Siberia & Far East Russia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	341,074	69,034	36,761	22,511	109,480	8,386	67,901	24,182	2,818
2028	365,243	74,949	41,481	24,709	120,459	15,204	58,138	27,352	2,953
2068	278,080	60,156	30,995	19,863	89,731	12,318	47,581	14,947	2,489
2168	313,563	71,793	40,933	26,393	101,401	17,967	34,034	18,196	2,846

Table 10. Projected economically accessible volume annually available for harvest based on accelerated harvest scheudle, by selected management scenario, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia.

Year of harvest	Total	Species Group: Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
				(Thousand cubic meters)					
West Siberia		**Altai Kray**			**No Change in Management (Baseline)**				
2008	4,801	391	39	908	611	181	1,261	1,409	-
2028	5,264	541	52	1,097	639	248	1,201	1,487	-
2068	4,044	688	40	826	476	183	645	1,186	-
2168	3,952	917	145	902	484	238	596	671	-
West Siberia		**Altai Kray**			**Increased Regeneration & Protection**				
2008	4,957	394	29	971	697	183	1,260	1,423	-
2028	5,451	539	57	1,159	723	239	1,118	1,615	-
2068	4,127	692	41	881	535	190	833	956	-
2168	4,277	1,233	176	954	549	242	443	680	-
West Siberia		**Kemerovo Oblast**			**No Change in Management (Baseline)**				
2008	6,726	15	13	2,826	-	9	753	3,110	-
2028	6,974	55	24	3,229	-	25	1,283	2,357	-
2068	5,022	104	109	2,390	-	23	893	1,502	-
2168	4,748	129	476	2,427	-	83	468	1,165	-
West Siberia		**Kemerovo Oblast**			**Increased Regeneration & Protection**				
2008	7,085	1	11	3,421	-	9	1,246	2,397	-
2028	7,347	71	48	3,711	-	25	1,619	1,874	-
2068	5,261	122	105	2,866	-	19	742	1,408	-
2168	5,142	361	392	2,902	-	122	338	1,029	-
West Siberia		**Novosibirsk Oblast**			**No Change in Management (Baseline)**				
2008	1,833	158	9	10	-	3	1,179	475	-
2028	1,957	198	9	30	-	4	1,312	404	-
2068	1,452	286	8	101	-	3	581	473	-
2168	1,435	559	17	101	-	8	451	299	-
West Siberia		**Novosibirsk Oblast**			**Increased Regeneration & Protection**				
2008	1,898	160	9	10	-	3	1,218	498	-
2028	2,056	200	9	30	-	4	973	840	-
2068	1,461	288	8	166	-	3	680	316	-
2168	1,401	527	19	319	-	9	244	284	-
West Siberia		**Omsk Oblast**			**No Change in Management (Baseline)**				
2008	4,598	169	29	24	-	10	3,828	538	-
2028	4,760	577	39	24	-	18	2,539	1,564	-
2068	3,354	744	79	49	-	50	1,730	703	-
2168	2,984	1,123	184	541	-	88	548	500	-
West Siberia		**Omsk Oblast**			**Increased Regeneration & Protection**				
2008	4,924	236	59	35	-	10	3,861	723	-
2028	4,983	570	68	35	-	23	2,927	1,361	-
2068	3,340	874	79	149	-	49	1,861	328	-
2168	3,068	1,697	198	374	-	92	353	356	-
West Siberia		**Tomsk Oblast**			**No Change in Management (Baseline)**				
2008	24,551	4,011	682	1,071	-	2,408	16,308	72	-
2028	25,961	4,937	840	1,935	-	2,451	5,397	10,401	-
2068	17,484	5,995	613	1,388	-	2,955	5,967	567	-
2168	17,063	6,652	1,624	1,389	-	3,316	2,368	1,715	-
West Siberia		**Tomsk Oblast**			**Increased Regeneration & Protection**				
2008	25,935	4,938	600	1,198	-	2,470	16,134	595	-
2028	26,605	6,325	887	1,446	-	3,231	6,131	8,584	-
2068	18,698	6,008	641	1,966	-	2,709	6,512	861	-
2168	17,756	6,206	2,400	3,312	-	3,161	530	2,147	-
West Siberia		**Tyumen Oblast**			**No Change in Management (Baseline)**				
2008	32,373	11,426	2,652	-	1,276	2,265	8,053	6,701	-
2028	31,462	11,836	2,928	39	1,420	3,261	11,257	721	-
2068	23,669	11,239	2,959	245	1,111	2,773	4,583	760	-
2168	23,776	11,343	3,044	245	1,457	4,118	2,375	1,195	-
West Siberia		**Tyumen Oblast**			**Increased Regeneration & Protection**				
2008	33,895	13,479	2,950	-	1,139	2,268	8,441	5,618	-
2028	33,328	13,830	2,950	-	1,139	3,180	12,063	166	-
2068	25,539	12,135	2,870	146	893	2,718	5,441	1,337	-
2168	26,277	12,632	3,301	1,542	1,375	4,271	1,709	1,447	-

Table 10. Projected economically accessible volume annually available for harvest based on accelerated harvest scheudle, by selected management scenario, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group: Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
				(Thousand cubic meters)					
West Siberia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	74,882	16,168	3,423	4,840	1,887	4,876	31,383	12,304	-
2028	76,379	18,144	3,892	6,355	2,059	6,006	22,987	16,934	-
2068	55,025	19,057	3,808	4,999	1,587	5,986	14,398	5,191	-
2168	53,957	20,723	5,489	5,604	1,941	7,850	6,806	5,544	-
West Siberia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	78,693	19,209	3,658	5,636	1,836	4,942	32,160	11,253	-
2028	79,771	21,535	4,018	6,382	1,862	6,702	24,831	14,441	-
2068	58,426	20,120	3,745	6,173	1,427	5,687	16,070	5,205	-
2168	57,921	22,656	6,486	9,401	1,924	7,896	3,616	5,942	-

Year of harvest	Total	Species Group: Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
				(Thousand cubic meters)					
East Siberia		**Buryat Republic**			**No Change in Management (Baseline)**				
2008	1,924	457	41	52	1,124	2	166	82	-
2028	2,169	533	46	57	1,302	6	118	106	-
2068	1,664	411	33	42	974	19	105	80	-
2168	2,176	652	61	66	1,045	26	269	58	-
East Siberia		**Buryat Republic**			**Increased Regeneration & Protection**				
2008	1,946	464	30	42	1,162	2	163	83	-
2028	2,194	535	37	48	1,340	6	121	106	-
2068	1,748	413	26	36	1,005	15	162	91	-
2168	2,285	687	44	52	1,109	23	305	66	-
East Siberia		**Chita Oblast**			**No Change in Management (Baseline)**				
2008	4,977	608	-	-	3,662	1	662	44	-
2028	5,668	730	-	-	4,244	12	504	177	-
2068	4,758	548	-	-	3,304	9	847	50	-
2168	5,456	594	-	-	3,930	9	846	78	-
East Siberia		**Chita Oblast**			**Increased Regeneration & Protection**				
2008	5,028	649	-	-	3,673	1	662	44	-
2028	5,715	769	-	-	4,249	13	503	181	-
2068	4,972	576	-	-	3,319	10	1,022	45	-
2168	6,028	1,291	-	-	3,916	10	745	66	-
East Siberia		**Irkutsk Oblast**			**No Change in Management (Baseline)**				
2008	25,339	9,333	2,092	1,712	6,173	238	3,620	2,171	-
2028	27,196	9,855	2,200	1,768	6,687	1,161	3,467	2,058	-
2068	19,703	7,111	1,593	1,312	4,881	884	2,111	1,813	-
2168	24,194	7,415	2,337	2,285	5,237	1,497	3,392	2,033	-
East Siberia		**Irkutsk Oblast**			**Increased Regeneration & Protection**				
2008	27,244	10,984	1,882	1,632	6,689	245	3,590	2,222	-
2028	29,130	11,558	1,985	1,690	7,202	1,170	3,485	2,041	-
2068	21,847	8,330	1,444	1,264	5,258	875	3,087	1,590	-
2168	26,115	9,099	1,965	2,127	5,692	1,631	3,658	1,944	-
East Siberia		**Krasnoyarsk Kray**			**No Change in Management (Baseline)**				
2008	30,267	5,124	3,709	5,329	6,942	278	6,187	2,699	-
2028	32,804	5,834	4,018	5,790	7,635	1,498	6,352	1,677	-
2068	23,668	4,270	2,927	4,183	5,490	1,165	4,149	1,487	-
2168	25,842	4,488	3,389	4,473	5,856	1,692	4,066	1,880	-
East Siberia		**Krasnoyarsk Kray**			**Increased Regeneration & Protection**				
2008	31,642	5,822	3,703	5,436	7,396	277	6,559	2,450	-
2028	34,231	6,424	4,016	5,919	8,163	1,624	5,884	2,203	-
2068	25,381	4,899	2,874	4,324	5,864	1,196	4,400	1,826	-
2168	27,486	5,184	3,272	4,653	6,595	1,763	4,058	1,964	-
East Siberia		**Tuva Republic**			**No Change in Management (Baseline)**				
2008	1,627	49	42	-	1,275	10	251	-	-
2028	1,956	59	47	-	1,518	127	146	-	58
2068	1,416	49	34	-	1,107	98	128	-	-
2168	1,706	88	67	-	1,141	121	273	-	16

Table 10. Projected economically accessible volume annually available for harvest based on accelerated harvest scheudle, by selected management scenario, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
East Siberia	**Tuva Republic**				**Increased Regeneration & Protection**				
2008	1,753	50	40	-	1,402	10	249	-	-
2028	2,087	58	47	-	1,647	129	149	-	58
2068	1,533	49	34	-	1,200	96	154	-	-
2168	1,776	77	67	-	1,249	123	258	-	1
East Siberia	**All Administrative Regions**				**No Change in Management (Baseline)**				
2008	64,135	15,571	5,883	7,093	19,177	529	10,885	4,996	-
2028	69,793	17,012	6,311	7,616	21,386	2,804	10,587	4,019	58
2068	51,209	12,387	4,586	5,536	15,756	2,174	7,339	3,430	-
2168	59,374	13,235	5,853	6,823	17,208	3,345	8,846	4,048	16
East Siberia	**All Administrative Regions**				**Increased Regeneration & Protection**				
2008	67,613	17,970	5,655	7,109	20,322	535	11,223	4,799	-
2028	73,356	19,343	6,084	7,656	22,601	2,941	10,141	4,531	58
2068	55,480	14,266	4,378	5,623	16,645	2,192	8,825	3,551	-
2168	63,689	16,338	5,347	6,832	18,560	3,550	9,023	4,040	1

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
Far East Russia	**Amur Oblast**				**No Change in Management (Baseline)**				
2008	8,861	254	350	11	6,616	-	1,415	189	26
2028	10,529	343	382	13	7,916	-	1,625	206	45
2068	8,564	307	285	10	5,796	-	1,920	193	53
2168	10,563	508	1,124	11	6,064	-	2,208	565	85
Far East Russia	**Amur Oblast**				**Increased Regeneration & Protection**				
2008	9,361	261	349	12	7,109	-	1,415	189	26
2028	11,008	350	381	16	8,386	-	1,625	205	45
2068	9,201	286	284	12	6,135	-	2,249	182	53
2168	11,090	1,080	1,041	13	6,497	-	1,867	511	83
Far East Russia	**Kamchatka Oblast**				**No Change in Management (Baseline)**				
2008	799	-	176	-	195	-	148	7	273
2028	915	-	183	-	260	-	130	45	298
2068	653	-	140	-	187	-	74	29	224
2168	667	-	143	-	197	-	90	27	211
Far East Russia	**Kamchatka Oblast**				**Increased Regeneration & Protection**				
2008	887	-	194	-	165	-	179	48	302
2028	972	-	206	-	258	-	182	15	311
2068	685	-	156	-	203	-	75	29	223
2168	707	-	162	-	216	-	84	29	218
Far East Russia	**Khabarovsk Kray**				**No Change in Management (Baseline)**				
2008	7,227	-	3,545	174	2,528	162	453	216	148
2028	8,195	-	3,940	191	2,998	184	521	212	148
2068	6,058	-	2,835	140	2,208	158	353	251	114
2168	7,590	2	3,412	258	2,399	245	716	430	129
Far East Russia	**Khabarovsk Kray**				**Increased Regeneration & Protection**				
2008	7,547	-	3,529	180	2,841	165	453	212	167
2028	8,529	-	3,929	198	3,297	183	544	211	167
2068	6,556	-	2,828	151	2,426	158	603	260	131
2168	7,962	2	3,411	250	2,793	266	674	419	147
Far East Russia	**Magadan Oblast**				**No Change in Management (Baseline)**				
2008	73	-	-	-	68	-	-	-	5
2028	73	-	-	-	70	-	-	-	3
2068	91	-	-	-	90	-	-	-	1
2168	162	-	-	-	160	-	-	-	3
Far East Russia	**Magadan Oblast**				**Increased Regeneration & Protection**				
2008	73	-	-	-	69	-	-	-	5
2028	74	-	-	-	70	-	-	-	3
2068	92	-	-	-	91	-	-	-	2
2168	181	-	-	-	178	-	-	-	3

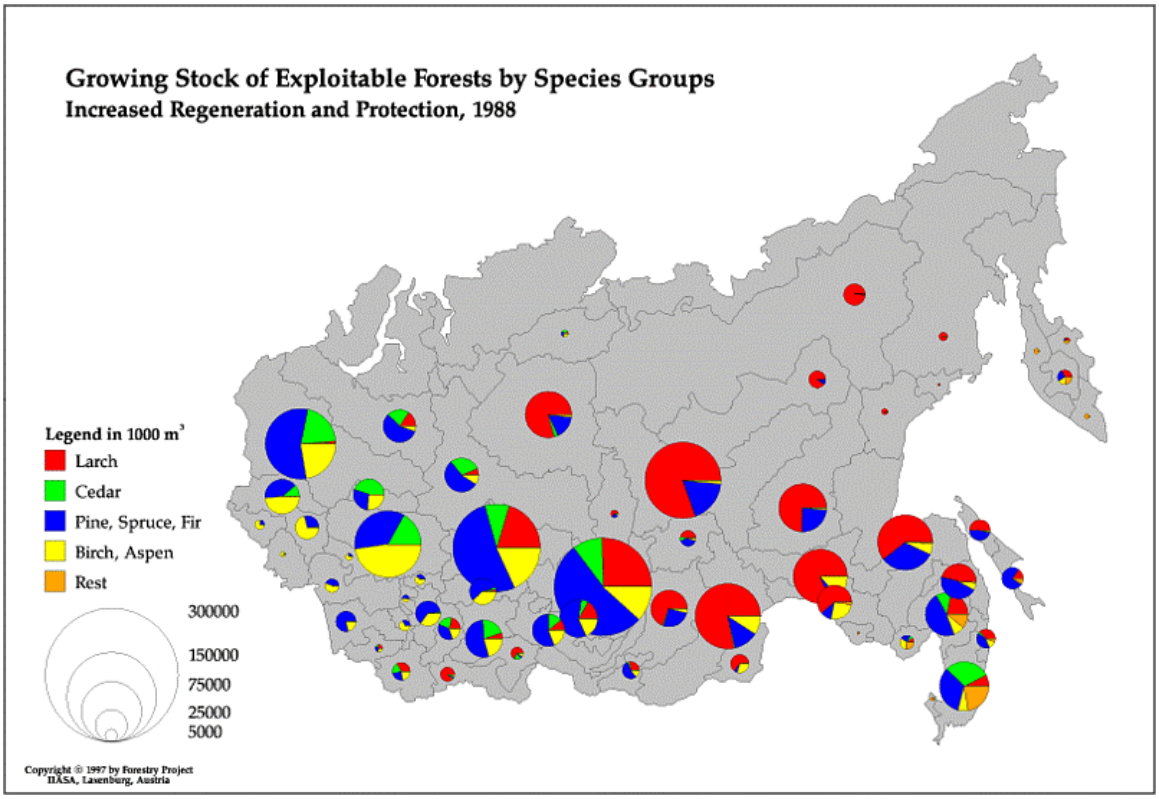
Table 10. Projected economically accessible volume annually available for harvest based on accelerated harvest scheudle, by selected management scenario, species group, year of harvest, and Administrative Unit in Siberia and Far East Russia, continued.

Year of harvest	Total	Species Group							
		Pine	Spruce	Fir	Larch	Cedar	Birch	Aspen	Other deciduous
		(Thousand cubic meters)							
Far East Russia		**Primorski Kray**			**No Change in Management (Baseline)**				
2008	8,321	-	3,702	239	906	985	879	372	1,237
2028	9,834	-	4,721	394	1,144	1,101	1,053	175	1,245
2068	7,404	-	3,421	289	868	853	473	343	1,158
2168	8,122	-	3,450	333	936	897	662	528	1,316
Far East Russia		**Primorski Kray**			**Increased Regeneration & Protection**				
2008	8,883	-	3,544	334	1,244	1,052	1,017	456	1,236
2028	10,406	-	4,802	404	1,484	1,096	1,037	347	1,236
2068	7,889	-	3,536	300	1,121	914	560	297	1,162
2168	8,519	-	3,550	324	1,263	967	638	448	1,330
Far East Russia		**Sakhalin Oblast**			**No Change in Management (Baseline)**				
2008	4,002	-	1,972	738	1,159	-	39	-	93
2028	4,612	-	2,287	824	1,347	-	43	-	111
2068	3,511	-	1,709	637	1,057	-	34	-	74
2168	5,065	63	2,826	670	1,212	-	160	-	134
Far East Russia		**Sakhalin Oblast**			**Increased Regeneration & Protection**				
2008	4,052	-	1,979	747	1,193	-	39	-	93
2028	4,673	-	2,312	843	1,365	-	43	-	111
2068	3,635	-	1,725	655	1,103	-	46	-	106
2168	4,966	70	2,564	715	1,328	-	140	-	149
Far East Russia		**Yakutia Republic**			**No Change in Management (Baseline)**				
2008	9,721	1,897	5	-	7,289	-	530	-	-
2028	9,757	1,905	5	-	7,306	-	540	-	-
2068	7,399	1,428	4	-	5,448	-	520	-	-
2168	8,313	1,519	28	-	6,091	-	676	-	-
Far East Russia		**Yakutia Republic**			**Increased Regeneration & Protection**				
2008	10,168	2,261	5	-	7,371	-	530	-	-
2028	10,202	2,269	5	-	7,387	-	540	-	-
2068	7,739	1,690	4	-	5,516	-	529	-	-
2168	8,908	1,953	41	-	6,255	-	660	-	-
Far East Russia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	39,004	2,151	9,750	1,163	18,763	1,148	3,464	784	1,782
2028	43,915	2,248	11,518	1,423	21,041	1,285	3,912	637	1,850
2068	33,679	1,735	8,393	1,076	15,652	1,011	3,372	816	1,624
2168	40,481	2,091	10,982	1,271	17,058	1,143	4,510	1,550	1,877
Far East Russia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	40,971	2,522	9,602	1,273	19,990	1,217	3,633	905	1,829
2028	45,864	2,619	11,635	1,461	22,248	1,279	3,971	778	1,873
2068	35,797	1,976	8,534	1,118	16,593	1,073	4,061	768	1,676
2168	42,333	3,105	10,767	1,301	18,528	1,233	4,063	1,406	1,930
Siberia & Far East Russia		**All Administrative Regions**			**No Change in Management (Baseline)**				
2008	178,020	33,891	19,057	13,095	39,827	6,553	45,732	18,084	1,782
2028	190,086	37,404	21,721	15,394	44,486	10,096	37,486	21,591	1,908
2068	139,913	33,179	16,787	11,611	32,994	9,171	25,110	9,437	1,624
2168	153,811	36,049	22,323	13,698	36,207	12,337	20,162	11,142	1,893
Siberia & Far East Russia		**All Administrative Regions**			**Increased Regeneration & Protection**				
2008	187,277	39,701	18,914	14,018	42,147	6,694	47,017	16,956	1,829
2028	198,991	43,497	21,738	15,499	46,711	10,923	38,943	19,750	1,931
2068	149,703	36,362	16,657	12,913	34,665	8,952	28,955	9,523	1,676
2168	163,943	42,098	22,601	17,534	39,012	12,678	16,702	11,387	1,931

Table 11. Average growing-stock volume harvested by type of harvest and selected years and projected harvest levels for Siberia and Far East Russia.

	Actual Harvest													Projected Harvest							
	10 year average				Annual harvest									Accelerated Biologically Sustainable Annual Harvest				Economically Accessible Annual Harvest			
Harvest type	1948 to 1957	1958 to 1967	1968 to 1977	1978 to 1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	2008	2028	2068	2168	2008	2028	2068	2168
West Siberia	(Thousand cubic meters)				(Thousand cubic meters)									(Thousand cubic meters)				(Thousand cubic meters)			
Final	18,786	24,650	27,925	28,371	32,363	31,087	27,948	24,986	22,126	17,159	10,659	8,693	6,636								
Regeneration	271	703	926	951	1,014	964	947	960	1,135	0	0	0	0								
Thinning/Selective	1,084	1,289	1,908	2,170	2,335	2,328	2,418	2,083	1,985	1,676	1,345	1,676	1,659								
Other	1,138	1,411	2,296	4,140	6,239	6,844	6,418	5,739	5,550	2,749	1,836	924	1,167								
Total harvest	21,278	28,053	33,055	35,631	41,951	41,223	37,731	33,768	30,796	21,584	13,840	11,293	9,462	87,437	88,634	64,918	64,357	78,693	79,771	58,426	57,921
East Siberia																					
Final	32,783	52,040	59,838	61,830	69,389	68,506	62,491	54,264	48,633	35,371	24,501	26,803	21,568								
Regeneration	32	255	1,689	2,450	1,667	1,602	1,343	1,295	1,188	0	0	0	0								
Thinning/Selective	554	805	1,649	2,396	2,778	2,771	2,900	2,303	2,169	1,791	1,344	1,541	1,970								
Other	581	2,637	2,556	3,460	5,304	5,017	5,255	5,253	4,096	2,333	2,190	2,045	1,299								
Total harvest	33,951	55,737	65,731	70,136	79,138	77,896	71,989	63,115	56,086	39,495	28,035	30,389	24,837	147,617	160,675	123,037	142,426	67,613	73,356	55,480	63,689
Far East Russia																					
Final	21,322	24,854	32,662	34,882	35,992	34,951	32,647	28,380	24,224	19,242	13,571	13,095	11,247								
Regeneration	9	115	204	247	276	371	212	190	211	0	0	0	0								
Thinning/Selective	575	469	906	1,336	1,488	1,403	1,427	1,328	1,285	918	873	794	850								
Other	374	884	1,140	1,978	2,545	2,009	2,122	2,047	1,223	1,216	931	644	677								
Total harvest	22,281	26,322	34,912	38,443	40,301	38,734	36,408	31,945	26,943	21,376	15,375	14,533	12,774	106,019	115,934	90,125	106,780	40,971	45,864	35,797	42,333
Siberia and Far East Russia																					
Final	72,891	101,544	120,425	125,082	137,744	134,544	123,086	107,630	94,983	71,772	48,731	48,591	39,451								
Regeneration	312	1,073	2,820	3,648	2,957	2,937	2,502	2,445	2,534	0	0	0	0								
Thinning/Selective	2,213	2,563	4,463	5,902	6,601	6,502	6,745	5,714	5,439	4,385	3,562	4,011	4,479								
Other	2,093	4,931	5,991	9,578	14,088	13,870	13,795	13,039	10,869	6,298	4,957	3,613	3,143								
Total harvest	77,510	110,112	133,698	144,210	161,390	157,853	146,128	128,828	113,825	82,455	57,250	56,215	47,073	341,074	365,243	278,080	313,563	187,277	198,991	149,703	163,943

Appendix B. Maps


Growing Stock of Exploitable Forests by Species Groups
Increased Regeneration and Protection, 1988
Legend in 1000 m³
Larch
Cedar
Pine, Spruce, Fir
Birch, Aspen
Rest
300000
150000
75000
25000
5000
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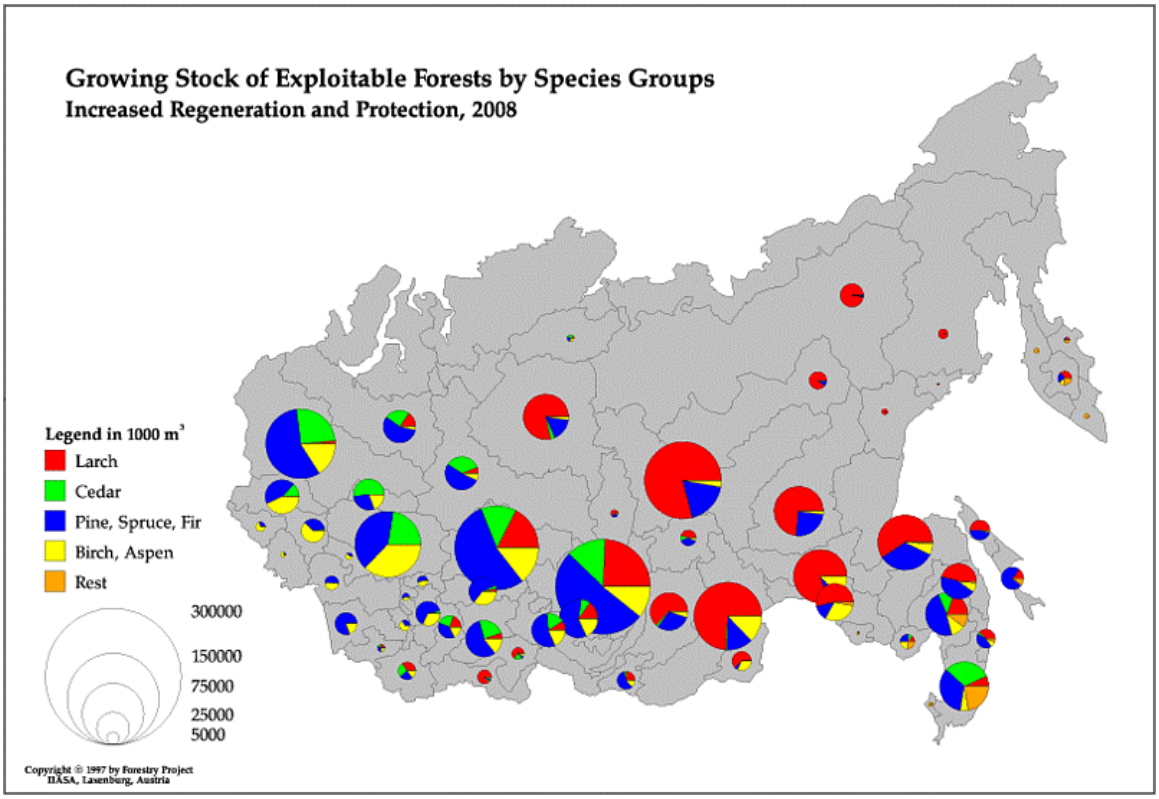
Growing Stock of Exploitable Forests by Species Groups
Increased Regeneration and Protection, 2008
Legend in 1000 m³
Larch
Cedar
Pine, Spruce, Fir
Birch, Aspen
Rest
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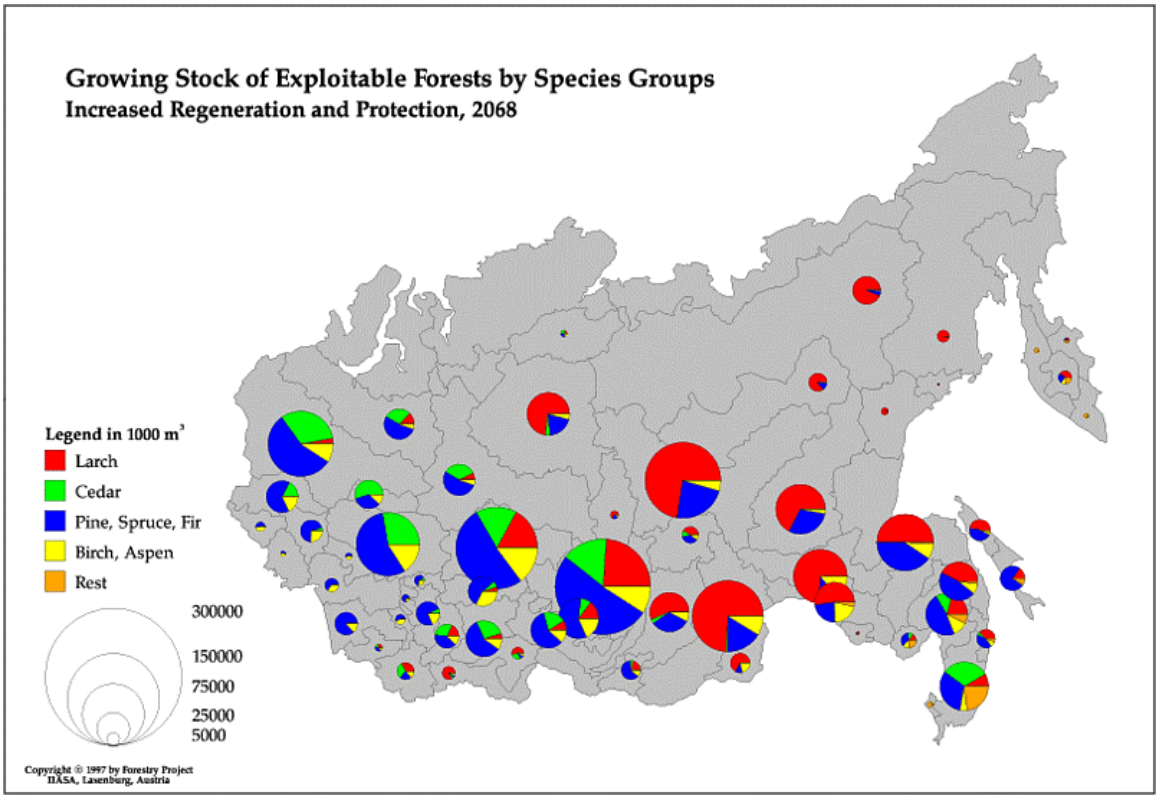
Growing Stock of Exploitable Forests by Species Groups
Increased Regeneration and Protection, 2068
Legend in 1000 m³
Larch
Cedar
Pine, Spruce, Fir
Birch, Aspen
Rest
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75000
25000
5000
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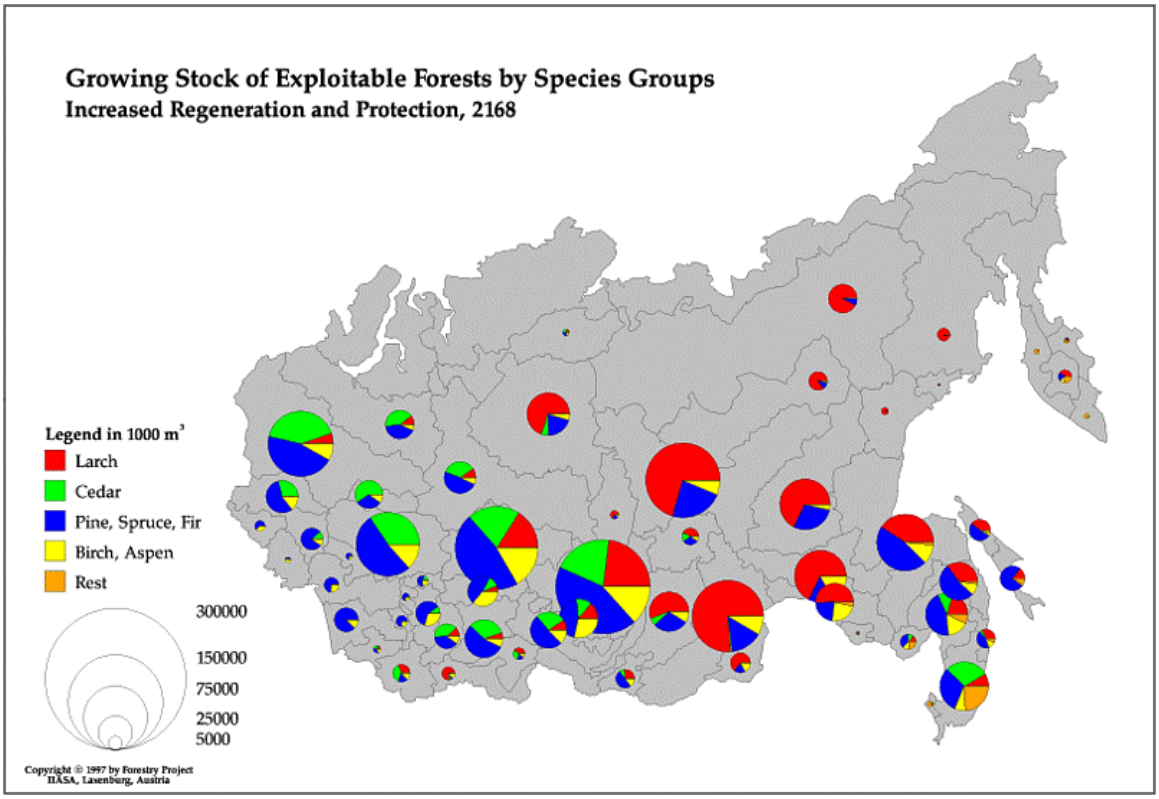
Growing Stock of Exploitable Forests by Species Groups
Increased Regeneration and Protection, 2168
Legend in 1000 m³
Larch
Cedar
Pine, Spruce, Fir
Birch, Aspen
Rest
300000
150000
75000
25000
5000
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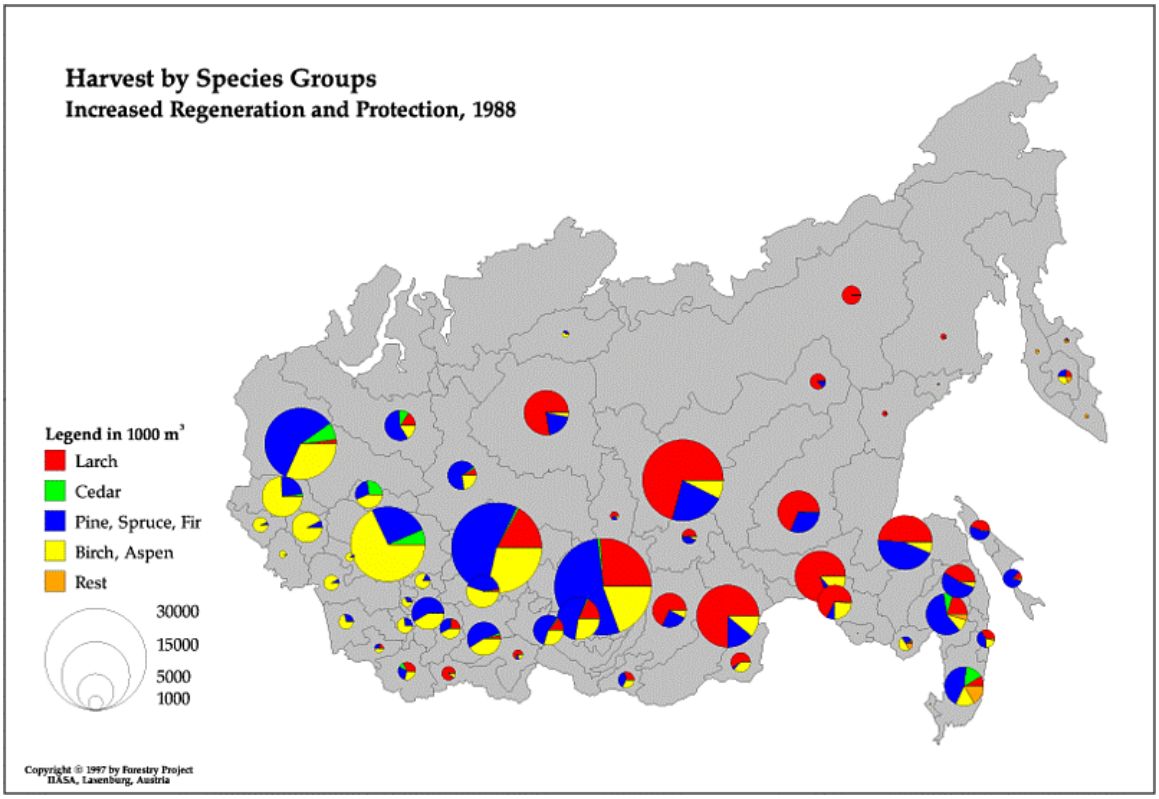
Harvest by Species Groups
Increased Regeneration and Protection, 1988
Legend in 1000 m³
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Cedar
Pine, Spruce, Fir
Birch, Aspen
Rest
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5000
1000
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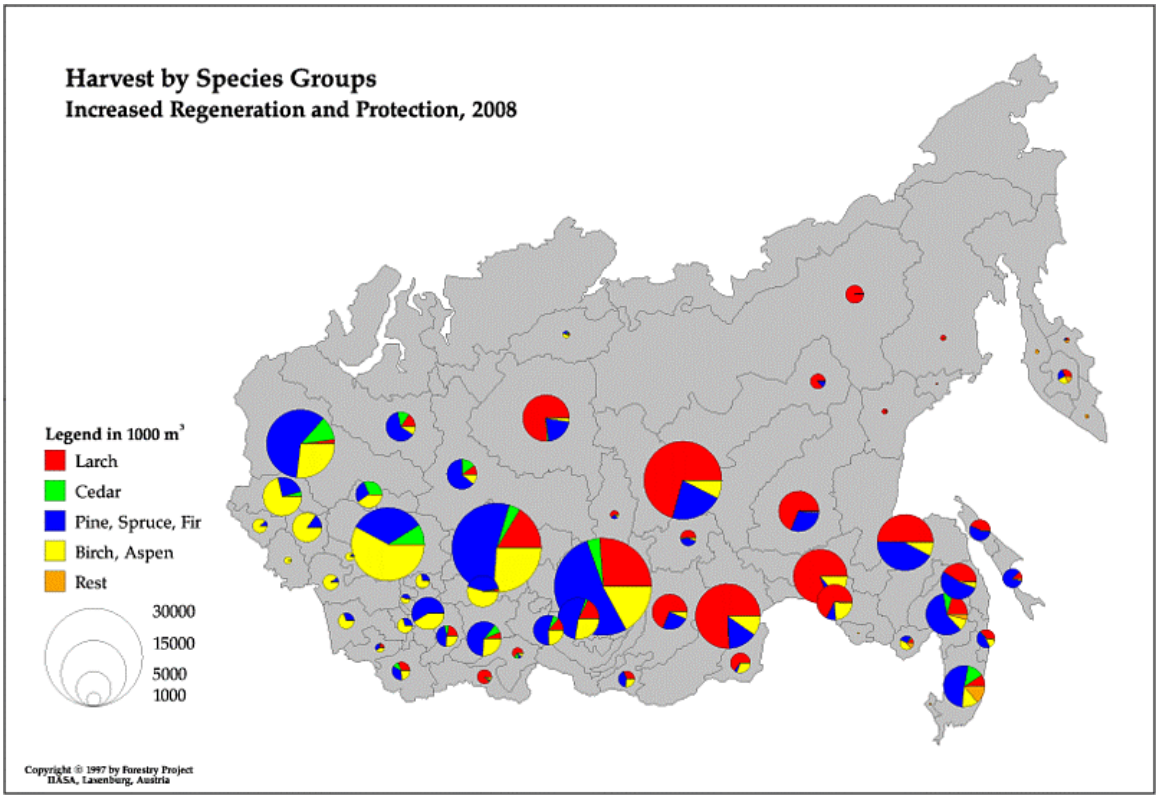
Harvest by Species Groups
Increased Regeneration and Protection, 2008
Legend in 1000 m³
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Cedar
Pine, Spruce, Fir
Birch, Aspen
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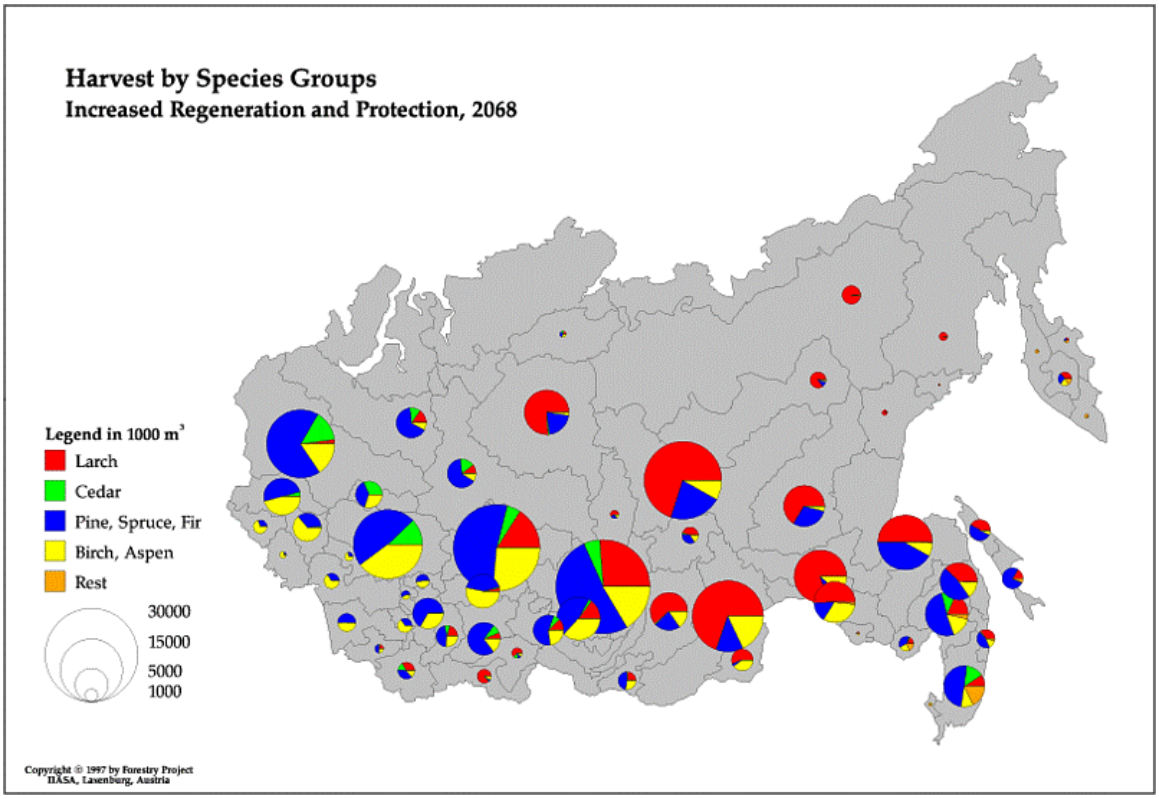
Harvest by Species Groups
Increased Regeneration and Protection, 2068
Legend in 1000 m³
Larch
Cedar
Pine, Spruce, Fir
Birch, Aspen
Rest
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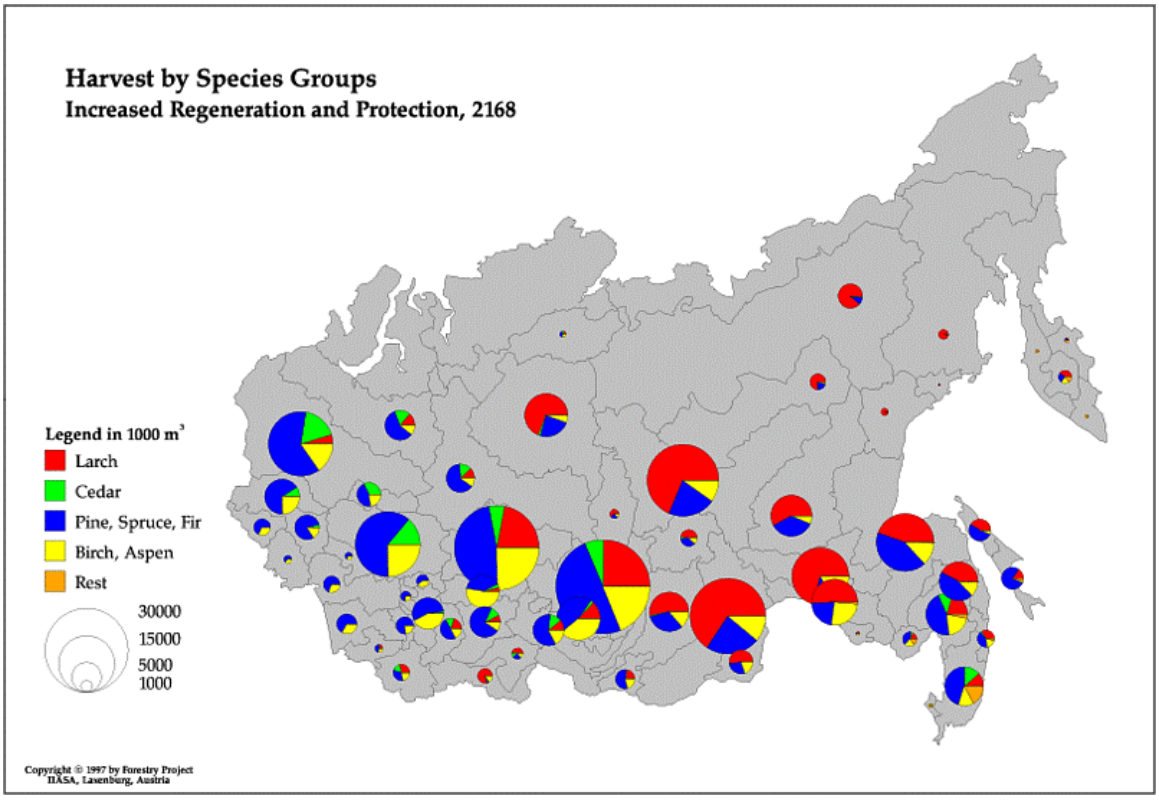
Harvest by Species Groups
Increased Regeneration and Protection, 2168
Legend in 1000 m³
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Cedar
Pine, Spruce, Fir
Birch, Aspen
Rest
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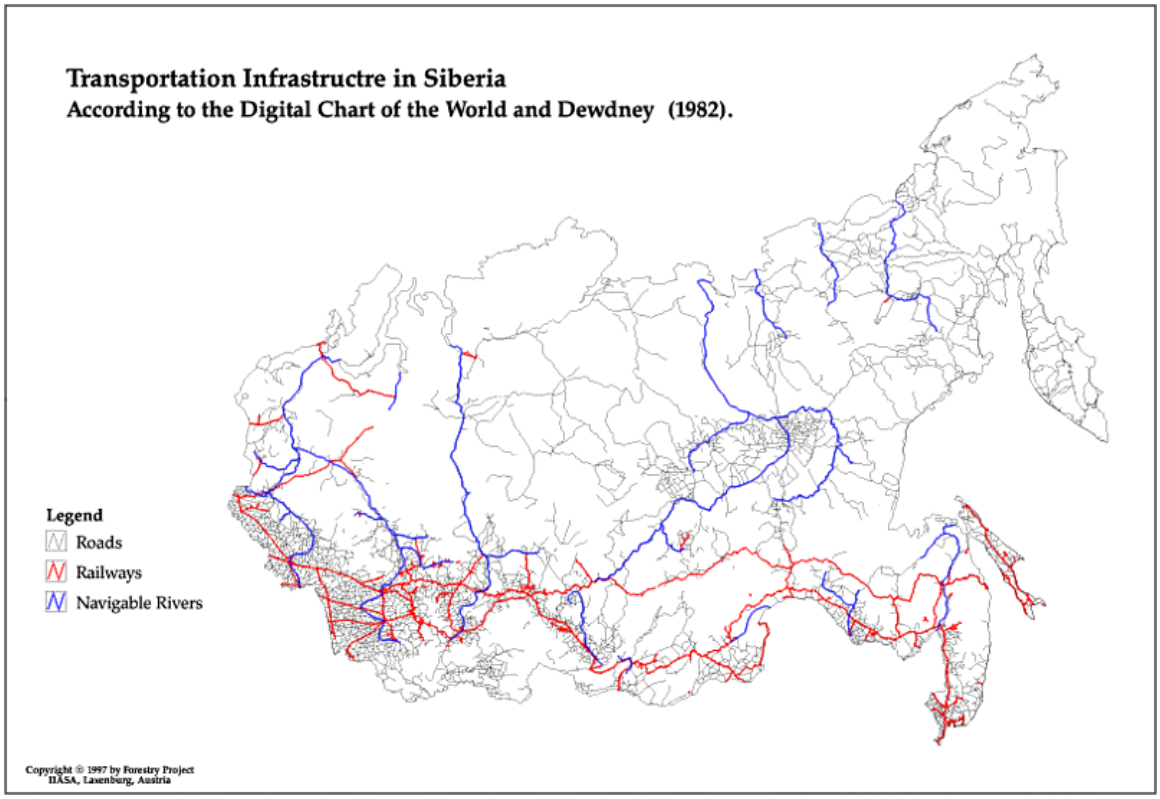
Transportation Infrastructre in Siberia
According to the Digital Chart of the World and Dewdney (1982).
Legend
Roads
Railways
Navigable Rivers
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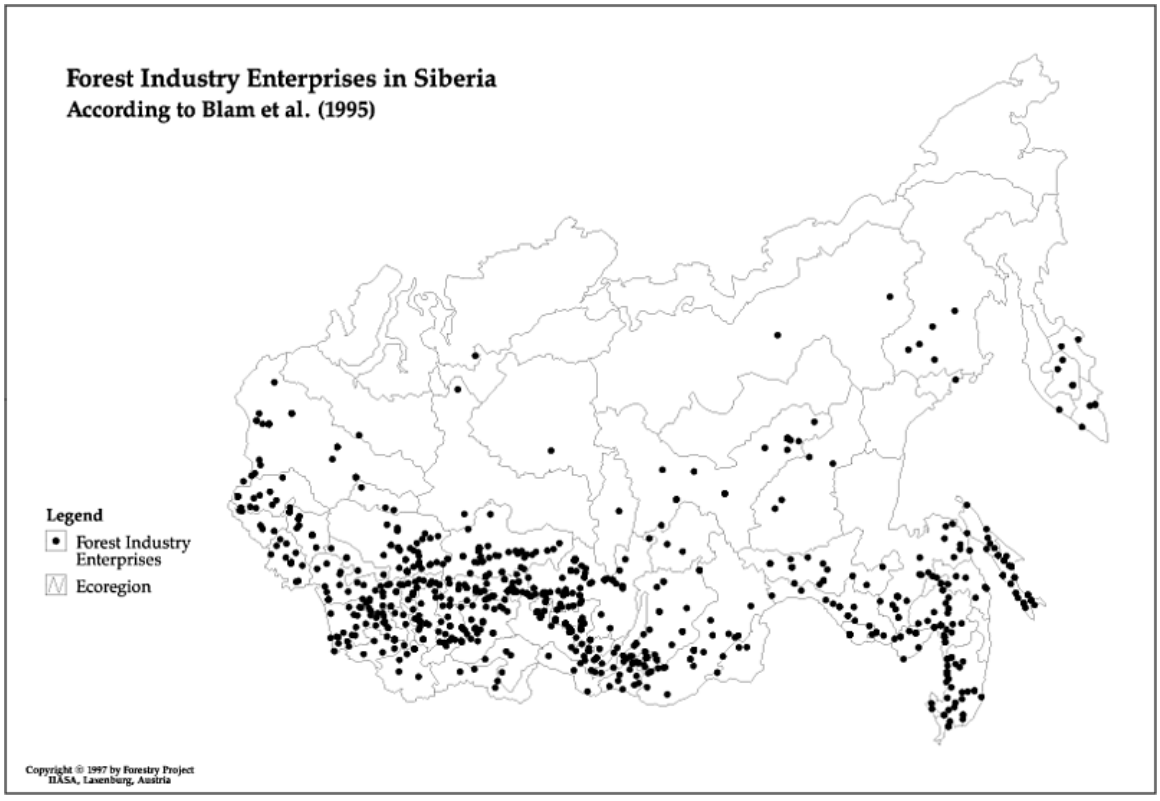
Forest Industry Enterprises in Siberia
According to Blam et al. (1995)
Legend
Forest Industry Enterprises
Ecoregion
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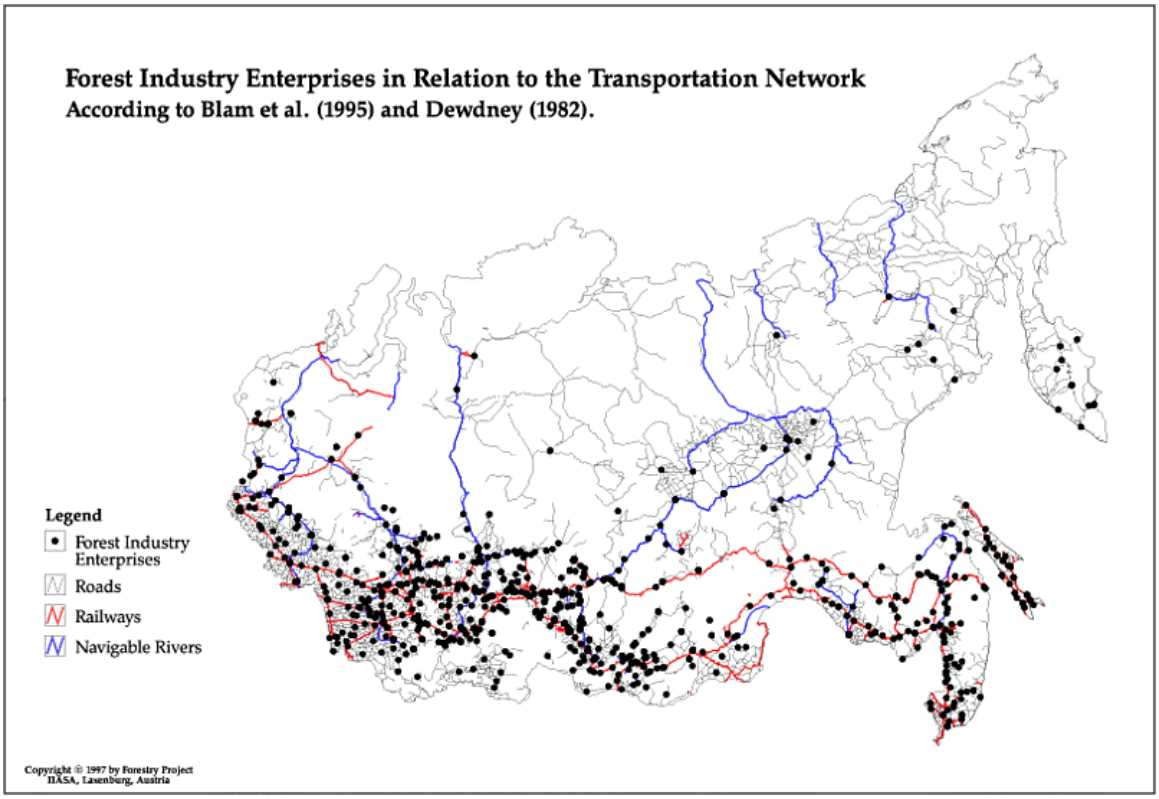
Forest Industry Enterprises in Relation to the Transportation Network
According to Blam et al. (1995) and Dewdney (1982).
Legend
Forest Industry Enterprises
Roads
Railways
Navigable Rivers
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