

Contents

1	Introduction.....	1
1.1	Climatic Conditions and Forests of Finland	2
1.2	Early Attempts to Assess Forest Resources.....	2
1.3	The Development of the National Forest Inventories in Finland.....	5
1.4	The Use of the Forest Inventory Results in Forest Policy	8
1.5	The Use of National Forest Inventory Data in the UNFCCC and the Kyoto Protocol Reporting	10
1.6	The Role of National Forest Inventory in Assessing the Status of Biodiversity.....	11
1.7	The Content and Structure of the Book, Further Results of NFI9.....	12
	References.....	13
2	Design and Measurements.....	17
2.1	Field Sampling Design	17
2.1.1	Sampling Simulation	20
2.1.2	South Finland.....	20
2.1.3	North Finland (Excluding North Lapland)	23
2.1.4	North Lapland.....	23
2.2	Assessment Units.....	25
2.2.1	Angle Count Plots.....	25
2.2.2	Stands.....	26
2.2.3	Other Assessment Units.....	26
2.3	Locating the Field Plots	27
2.4	Administrative Information	28
2.5	Land-Use and Classification of Forestry Land	30
2.6	Site Variables	31
2.7	Soil Variables	33
2.8	Drainage Situation	35
2.9	Taxation Class.....	35

2.10	Retention Trees to Maintain Biodiversity of Forests	36
2.11	Description of the Growing Stock of the Stand.....	37
2.12	Damages	42
2.13	Silvicultural Quality of Stand	44
2.14	Accomplished and Proposed Measures	45
2.15	Key Habitat Characteristics	46
2.16	Tally Tree Measurements.....	49
2.17	Epiphytic Lichens	55
2.18	Keystone Tree Species.....	55
2.19	All Tree Species.....	56
2.20	Dead Wood Measurements	56
2.21	Equipment for Measurements.....	58
2.22	A Correction to the Height Measurements of Year 2001	60
2.22.1	The Height Correction Models for the Sample Trees not Re-measured	61
2.22.2	Models for Correcting the Height Increments	62
2.23	Training and Quality Assurance	63
2.24	The Workload and Costs.....	64
	References.....	65
3	Estimation Methods.....	69
3.1	Estimation of Areas	70
3.2	Estimation of the Current Growing Stock	71
3.2.1	Mean Values per Area Unit.....	72
3.2.2	Mean Diameters.....	74
3.2.3	Predicting Sample Tree Form Factors, Volumes and Timber Assortment Proportions.....	75
3.2.4	Predicting Form Heights for Tally Trees	78
3.3	Estimation of Volume Increment	80
3.3.1	Increment of a Sample Tree.....	81
3.3.2	Increment of Survivor Trees	82
3.3.3	Increment of Drain.....	83
3.3.4	Total Increment	84
3.4	Estimation of the Volume of Dead Wood	85
3.5	Assessment of Sampling Error	85
3.5.1	Sampling Error of Ratio Estimators	86
3.5.2	Sampling Error of Total Volumes and Aggregates	88
3.6	Thematic Maps	89
	References.....	90
4	Results.....	93
4.1	The Areas of Land-Use Classes and Their Development.....	93
4.1.1	Forestry Land.....	93
4.1.2	Forest Land	96
4.1.3	Land Classes Based on FAO Definitions	97
4.1.4	Land Use-Changes Based on the Observations on the Plot....	98
4.1.5	Ownership Information.....	99

4.2	Restrictions on Forestry and Area Available for Wood Production.....	100
4.3	Soil Classification and the Areas of Site Fertility Classes on Mineral Soils.....	101
4.4	Peatlands and Their Site Classes	104
4.4.1	Peatland Area and Its Changes	104
4.4.2	Land Classes of Peatlands	106
4.4.3	Drainage Situation of Peatlands.....	107
4.4.4	Principal Site Classes and Site Fertility Classes on Peatland Soils.....	109
4.4.5	The Thickness of the Peat Layer	111
4.5	Tree Species Dominance and Composition	113
4.5.1	The Dominant Tree Species.....	113
4.5.2	Tree Species Dominance by Site Fertility Classes	118
4.5.3	Tree Species Mixtures	119
4.6	Age and Development Classes.....	121
4.6.1	The Age Distributions of Stands and Their Changes	121
4.6.2	The Development Classes of Stands and Their Changes	124
4.7	Growing Stock	126
4.7.1	Mean Volume Estimates by Tree Species	126
4.7.2	Total Growing Stock Estimates	132
4.7.3	Volume Estimates of Saw-Timber	135
4.8	Volume Increment.....	136
4.8.1	Increment Estimates.....	136
4.8.2	Uncertainties in Increment Estimates and Comparisons with Estimates from Earlier Inventories.....	136
4.8.3	Forest Balance.....	140
4.8.4	Changes in Annual Volume Increment Estimates since the 1950s.....	143
4.9	Protected Areas	148
4.10	Forest Damage	150
4.11	Silvicultural Quality of Forests.....	154
4.11.1	Silvicultural Quality.....	154
4.11.2	Methods and Success of Regeneration	156
4.12	Management Activities	157
4.12.1	Accomplished and Proposed Cuttings	157
4.12.2	Accomplished and Proposed Silvicultural Measures	159
4.12.3	Drainage Operations	160
4.13	Biodiversity Indicators.....	162
4.13.1	Biodiversity Measurements in NFI.....	162
4.13.2	Key Habitats.....	163
4.13.3	Dead Wood	165

4.13.4	Keystone Tree Species	171
4.13.5	Retention Trees	172
	References.....	174
5	Discussion.....	179
5.1	The Development of Volume and Increment: New Estimates from NFI9	179
5.2	Estimation and Error Estimation.....	180
5.3	Comparisons of the NFI8 and NFI9 Designs.....	181
5.4	Some Experiences of the New Measurements	182
5.5	Experiences with the New Measurement Devices	182
5.6	Changes in the Design for NFI10	183
	References.....	184
	Appendix	185
	Index.....	261

<http://www.springer.com/978-94-007-1651-3>

Designing and Conducting a Forest Inventory - case:

9th National Forest Inventory of Finland

Tomppo, E.; Heikkinen, J.; Henttonen, H.M.; Ihalainen,

A.; Katila, M.; Mäkelä, H.; Tuomainen, T.; Vainikainen, N.

2011, XII, 272 p., Hardcover

ISBN: 978-94-007-1651-3