

**Table 2.** Monitoring program descriptions – Part 3

Prog. No.	No. of Sampling Points	Spatial Variability Sampling Pts	Sampling Interval of Soil	Sampling Method	Project Costs	Data	Data Trends	References
<b>NORTH AMERICA</b>								
1	42 sites 126 sample points	landform transect sampling (upper, mid, lower slope) site <0.65 km <sup>2</sup>	annual	0-15 cm 15-30 cm	\$154,000 (Cdn) establishment cost \$25,000 per year (Cdn)	- data used internally for modeling, trend determination and to monitor land use management		14,15,16
2	74 (additional 1 reclaimed site per 100 ha established each yr)	10 m * 40 m plot on upland sites	- reclaimed-5 years - natural-10 years	- principle horizons to 100 cm - composite of 10 subsamples	\$5000 (Cdn) per plot to startup	- database used by companies and researchers to guide future reclamation practices		51
3	23 sites 60-100 sample points	25 m * 25 m grid or 5-8 transects per 5-10 ha site (upper, mid, lower slope)	1-10 years	- loose sample of Ap horizon - loose sample of sub-surface horizons	\$2.4 million (Cdn) from 1990-1993			140,141,142,143
4	4000	27 km * 27 km grid -4 subplots each 7.32 m in radius	5 years	litter samples 0-10 cm 10-20 cm in mineral soil and forest floor		- stored by a central database - data reported to States annually and complete report every 5 years	-erosion not an issue - pine health decreases with low organic matter - low pH increases birch/beech/maple dieback	12,57,82,99,108,129,130
<b>EUROPE</b>								
5			- chemical-5 years - physical-10 years			- stored by the Soil Science Institute - used for erosion control and tillage/fertilization systems		85

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6	514	8.7 km * 8.7 km grid	no scheme	0-30 cm at 10 cm increments and 30-50 cm			-moderate soil acidification, widespread heavy metal pollution, accumulation of nitrogen	10,35,144
7	3		annual	0-5 cm 5-20 cm			-heavy metal concentrations are lower than background standards	49,66
8	303	nation wide						20,49,65
9	240 plots; 200 agr and 40 protected areas	1000 m <sup>2</sup> plot	6 years	-four samples from each genetic horizon			- Cr, Cd Cu, Hg,Pb, Zn contamination	8,19, 27,89,90,145
10	393	country-wide gridnet 50 m <sup>2</sup> plot	10 years	0-25 cm			- heavy metals in arable soils and natural areas don't constitute a serious ecological risk	2,22
11	5692 original samples taken - 904 resampled	5 km * 5 km grid samples taken at 4 m intervals in 400 m <sup>2</sup> plot	15 years	0-15 cm ( 25 cores per site)		- stored in LandIS database	- decrease in organic carbon and copper, increase in available P, K	35,64,78,96,122,126,131
12	180 farms/year 900 sampling sites		5 years				- mean pH, P and K in grasslands has decreased - average OM has remained constant	35,96,126
13	3000 permanent plots 7000 temporary plots	country-wide	variable		800,000 Euros/year (field work)	- used in forest management planning, policy decisions and forest inventory planning		26,132
14	150		5 years					25,35

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15	11 sites 52 sampling points per site	sites approx. 1 ha each in size - country-wide	5 years	- plough layer in agr. soils -pedogenic horizons in forest soils		- data base managed by ORACLE - soil descriptions stored in DONESOL data base		8,11,35,45,59,60
16	102	2 ha plots	10 years	0-10 cm 10-20 cm 20-40 cm	1990-1995 28.5 million Francs	- stored by Coordination Centre for the Technical Research Dept of the National Forest Office		11,45,77,121
17	794	across 16 provinces	periodic				- most important soil changes occur in the organic layers and those changes can be expected within 5-10 years	35,46,91
18	17							35,46
19	276 sample squares, 5 soil samples per square	1 km <sup>2</sup> plots	6-8 years	bulk topsoil sample			- increase in pH -abnormal heavy metal concentrations	4,5,9,35,54,63,123,124,125
20	865		1-6 years					36,37,138,139
21	183		1-6 years					36,37,138,139
22	189		1-6 years					36,138,139
23	7142 over 5 million ha	12 ha site	3 years	0-30 cm 30-60 cm			- soil acidification had increased 6% and calcareous soils decreased 3%	76,138,139
24	6000 over 5 million ha		3 years	0-30 cm 30-60 cm 60-90 cm				138,139
25	202 points		1-6 years		funded by State Land Service	- stored by State Land Service, reported in annual report	- acidification is increasing	43,118

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26	75 plots - pesticides and heavy metals  600 - other parameters	400 m <sup>2</sup> fixed plots for heavy metals and pesticides  3-3.5 ha site for other parameters  - each site is 200 ha in size	5 years	humic layer 0-20 cm 20-40 cm 40-60 cm	40,000 lita in 2000	- reported annually - detect and track changes in soil indicators, heavy metals and pesticides - assess soil sensitivity to anthropogenic loads and possible impact of contamination on human health	- content of lead is below background levels in most soils - heavy metal accumulations only in humic layer	42,52,61,62,67
27	235	4 km * 4 km plot - distributed 8 km *8 km apart	2-3 years for soil parameters 5 years for heavy metals and pollution	0-5 cm 5-10 cm 10-20 cm 20-40 cm 40-80 cm		- reported annually - identify forest damage, assess background heavy metal concentrations, pathways of accumulation and impact on forests	- least amounts of trace metals found in podzolic and marshy soils - most soils are not heavily contaminated with trace metals	42,52,67,135,136
28	1	13.65 km <sup>2</sup> watershed	2-5 years		5000 lita in 2000	- data reported once per year by the Lithuanian Water Management Institute		42,52,67,94
29	100 (35- 40 yearly)	400 m <sup>2</sup> site	annual	0-10 cm 30-50 cm		- stored by RIVM	- accumulation of heavy metals in arable and cattle farms	30,31,32,33,35,73,74,137
30	1683 samples	based on size of homogenous area 10,000 m <sup>2</sup> site	10-15 years	topsoil			- agricultural areas have higher concentrations of zinc and copper and have higher pH levels	13,35,73,74,137
31			5 years			- stored by RIVM		74,137

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32		15 catchments <10 km <sup>2</sup> site					- processes are primarily driven by weather events leading to largely variable seasonal and annual nutrient loss rates	22,80,133,134
33	227 (45,000 samples)	100 m <sup>2</sup> plot	5 years 10 years in forests	0-20 cm or 0-10 cm in (grasslands)			- natural content of heavy metals and sulphate	107,109,116,117
34	151 samples	218 000 km <sup>2</sup>		0-20 cm			- PAH levels low	55,107
35	1461	1 plot per 60 km <sup>2</sup>	4 years			- published in full in Environmental Monitoring Library	- decreasing concentrations of SO <sub>2</sub> and NO <sub>2</sub> in air pollutants	17,18
36	20-22 areas		4-5 years		6,788,000 Estonian crowns in 1994	- data is stored in a meta-database	- lowest biodiversity on lands abandoned less than 4 years ago	81,87,88,92,93
37	942; 670 agr. and 272 forested	16 km <sup>2</sup> grid 400 m <sup>2</sup> plot at each node point	4 years					23,72,86,120
38	650; 312 agr. and 338 forested	314 m <sup>2</sup> site	5 years	0-10 cm 20-30 cm 35-45 cm 10-30 cm in agric soils		- stored in Information System of Monitoring - results reported in State of the Environment Report	- 98.6% of soils are not contaminated - trace elements are not high	47,48,68,69,70,71, 97,98,100
39	300		5 years				- highest organic matter found in mountain soils such as rendzina and podzols	3,47

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40	4 sites  1 or 2 plots per watershed	50 m * 50 m plot / watershed  1 km <sup>2</sup> watershed	2-10 years	0-5 cm 5-10 cm 10-20 cm 20-30 cm 30-60 cm	109 million SEK for entire program	- data hosts have been established to store and distribute quality assured environmental data	- soils predominantly podzols	7,111,114
41	23,500	circular plots ( 7-10 m radius)	10 years	- samples taken up to 1m deep	10 814 thousand SEK in 2001	-data stored in the SK-BAS database - annual publication		8,110,111,112,113
42	40 sites	2-15 km <sup>2</sup> site		0-20 cm 40-60 cm	6580 thousand SEK in 2001			110,111
43	107; 74 agr., 31 forested and 2 urban p arks	100 m <sup>2</sup>	5 years	0-20 cm, 4 composite samples from 25 sample locations in a square grid pattern		- data is included in the NABO- database	- after five years, 87 of 100 sites showed a change in one measured pollutant - the main inorganic pollutants are a consequence of anthropogenic contamination	115
<b>NEW ZEALAND</b>								
44	511	10 regions  40 m transect with five 25 m <sup>2</sup> plots at 1 m spacings  20 cores per plot	anticipated to be 5-10 years	0-10 cm 0-7.5 cm for BD and macro porosity		- data used for State of Environment reporting	- soil quality is within acceptable levels - structural degradation on half of arable cropping and market garden sites	56,79,101,102,103, 104,105,106

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<b>ICP</b>								
45	70 sites	40 m * 40 m plot 10-1000 ha sites	5 years	0-5 cm 5-10 cm 10-20 cm 20-40 cm 40-80 cm		- data submitted to National Focal Point and then to Programme Centre		8,40,83,127
46	6000 (5300 soil)	16 km * 16 km grid	10 years	0-10 cm 10-20 cm				8,38,39,84,128
47	860	0.25 ha plot surrounded by 10 m buffer zone	10 years	0-10 cm 10-20 cm 20-40 cm 40-80 cm		- stored at the Forest Intensive Monitoring Coordinating Institute	- depositions of nitrogen, acidity and heavy metals exceed critical loads over a large portion of plots	8,38,39,84,128
<b>NETWORKS</b>								
48	12 terrestrial sites 37 freshwater sites	9 ha site - soil sampled on 1 ha on 50 m and 25 m grids	5 years / 20 years	0-5 cm, 5-10 cm, 10-20 cm, 20-30 cm and by horizons for first 30 cm	50,000 British pounds/year/site			6,8,24,34,119,126
49	1700 sites	120 countries						28
50		25 countries						41
51								50,95
52		16 km * 16 km grid	possibly 5, 10 -20 years					35,75