

Table 3. Soil, site and management parameters measured by monitoring programs¹

Prog No.	Soil Test Analysis (Fertility)	Soil Chemical Properties	Soil Physical Properties	Soil Biological	Soil Biochemical	Micro-nutrients	Pollutants	Mgt	Site Description	Climate Data
NORTH AMERICA										
1	N, P, K, S, NH ₄	pH, EC, CaCO ₃ , TOC, Total N, CEC (at site establishment)	Db, PSA (at site establishment), soil water characteristics in 2003	hot KCl-NH ₄	LFC, LFN	B, Cl, Co, Cu, Fe, Mg, Mn, Mo, Ni, Se, Si, V, Zn (once in 2003)	2,4-D sorption (once) Ag, Al, As, Ba, Be, Bi, Cd, Cr, Li, Pb, Sb, Sn, Sr, Ti, Tl (once in 2003)	yes	yes	yes
2	N, P, K, S, Ca, Mg	pH, EC, CEC, CaCO ₃	Db, PSA			trace metals	trace metals, hydrocarbons		yes	
3	P, K	pH, EC, CEC, CaCO ₃ , TOC, Total N, Total K, Total Na, Total Mg, Total Ca	Db, hydraulic conductivity, soil moisture, PSA, aggregate stability, ¹³⁷ Cs	mesofauna		Co, Cu, Fe, Ni, Zn	Al, Cr, Li, Pb	yes	yes	yes
4	P, S	pH, CEC, Total inorganic C, Total C, TOC, Total N, CaCO ₃	Db, soil moisture, PSA, aggregate stability, penetration resistance			Mn, Ni, Cu, Zn	Ba, Cd, Pb, Sr		yes	
EUROPE										
5		pH, hydrolytic acidity, CEC, CaCO ₃ , Total N, Total P, P fractions, soil greenhouse analysis, sorptive capacity	Db, porosity, soil water characteristics, PSA, aggregate stability	Nmin	organic humus, humus fractions	Cu, Fe, Mn, Zn	Ba			
6	yes	pH, CEC, CaCO ₃ , TOC, Total N	PSA				As, Cd, Pb		yes	
7		pH, EC				Co, Cu, Ni, Zn	Cd, Pb			yes
8	SO ₄					Cu, Zn	As, Cd, Pb			

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9	P, K, Ca, Mg	pH, exchangeable acidity, CEC, TOC, Total P, Total K, Total Ca, Total Mg	Db, specific gravity, porosity, FC, PSA	Nmin, micro-biological, enzyme activity, mesofauna		B, Co, Cu, Fe, Mn, Mo, Ni, V, Zn	As, Be, Cd, Cr, Hg, Pb, Tl, pesticides, PCB, radionuclides	yes		
10						Cu, Ni, Zn	As, Cd, Cr, Hg, Pb			
11	P, K, Mg	pH, TOC, Total Na, Total Ca, Total P, Total K,	PSA, soil water characteristics			Co, Cu, Fe, Mg, Mn, Mo, Ni, Se, V, Zn	Al, Ar, Ba, Cd, Cr, F, Hg, Pb, Sr	yes	yes	
12	P, K, Mg	pH, TOC						yes		
13										
14	yes					yes	yes			
15	PO ₄ , Ca, Mg, K	pH, TOC, Total N, CEC, CaCO ₃	PSA, Db	Nmin, Cmin, mesofauna, micro-biological, enzyme activity	LFC, LFN	Co, Cu, Ni, Zn	Cd, Cr, Pb radionuclides	yes	yes	
16	yes	TOC, Total N						yes	yes	yes
17	Ca, K, Mg, Na	pH		yes	humus	Zn	Al, Cd, Pb, Sb, Tl	yes		
18							heavy metals, hydrocarbons			
19		pH, TOC		micro-biological, macrofauna, enzyme activity		Cu, Ni, V, Zn	Cd, Pb, PCB, hydrocarbons, pesticides		yes	

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20	N, P, K, S, Ca, Mg, NO ₂	pH, EC, CEC, TOC, Total N, CaCO ₃	hydraulic conductivity, soil water characteristics, PSA	micro-biological, respiration	humus content	B, Cl, Cu, Co, Fe, Mn, Mo, Ni, Se, Zn	Al, As, Cd, Cr, Hg, Pb, organic micropollutants, pesticides, radionuclides		yes	
21	N, P, K, S, Ca, Mg, NO ₂	pH, EC, CEC, TOC, Total N, CaCO ₃	hydraulic conductivity, soil water characteristics, PSA	micro-biological, respiration	humus content	B, Cl, Cu, Co, Fe, Mn, Mo, Ni, Se, Zn	Al, As, Cd, Cr, Hg, Pb, organic micropollutants, pesticides, radionuclides		yes	
22	N, P, K, S, Ca, Mg, NO ₂	pH, EC, CEC, TOC, Total N, CaCO ₃	hydraulic conductivity, soil water characteristics, PSA	micro-biological, respiration	humus content	B, Cl, Cu, Co, Fe, Mn, Mo, Ni, Se, Zn	Al, As, Cd, Cr, Hg, Pb, organic micropollutants, pesticides, radionuclides		yes	
23	N, P, K, S, Ca, Mg	pH, EC, CaCO ₃ , TOC, Total N	soil water characteristic			Cu, Mn, Zn		yes	yes	yes
24		Total P, Total K, Total S, Total Na, Total Mg, Total Ca				B, Co, Cu, Fe, Mn, Mo, Ni, Se, Zn	Al, Cd, Cr, Hg, Pb			
25	N, P, K	pH, TOC	Db, porosity, WP, WHC	mesofauna		Cu, Ni, Mn, Zn	Cd, Cr, Pb, pesticides, radionuclides	yes		
26	P, K, Ca, Mg	pH, EC, TOC, Total S			organic humus, sulfur content of humus fractions	Cu, Fe, Ni, Zn	Cd, Cr, Pb, pesticides			

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27	Na, S	pH, CEC, exchangeable acidity, TOC, CaCO ₃ , Total C, Total N, Total P, Total K, Total Mg, Total Ca			humus fractions	Cu, Fe, Ni, Mn, Zn	Al, Cd, Cr, Pb			
28	NH ₄ , NO ₃ , SO ₄ , K, Ca, Mg, Na	pH, EC, CEC, TOC, Total N, Total C, Total P, exchangeable acidity, Total S, sorptive capacity	Db, PSA	Nmin, enzyme activity	litter/cellulose decomposition	Cl, Cu, Fe, Mn, Ni, Zn	Al, Cd, Cr, Pb, pesticides, radionuclides	yes	yes	
29	PO ₄ , NH ₄ , NO ₃ , SO ₄	pH, EC, TOC, Total K				Cu, Cl, Mg, Zn	Cd, Pb, PAH, hydrocarbons, pesticides			
30	NH ₄ , NO ₃ , PO ₄ , K, Ca	pH, TOC	PSA			Cu, Fe, Ni, Zn	Al, Cr, Pb, PAH, hydrocarbons			
31	NO ₃ , P						Cd, pesticides			
32	yes	yes	yes			yes	pesticides	yes	yes	
33	PO ₄ , K, S, Ca, Mg, Na	pH, CEC, CaCO ₃ , Total C, Total N, TOC, sorptive capacity	Db, PSA		humus fractions	B, Cu, Mn, Ni, Se, V, Zn	Al, As, Be, Cd, Cr, F, Hg, Pb	yes	yes	
34		pH, TOC	PSA				PAH			
35	P, K, SO ₄ , Ca, Mg, Na, NH ₃ , NH ₄ , NO ₃					Cl, Cu, Fe, Mn, Zn	Al, Cd, Pb			
36	P, K	TOC, Total N	soil moisture	mesofauna, micro-biological						
37		yes	yes				organochlorine pesticides		yes	

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38	P, K, Mg, Ca	pH, EC, CEC, TOC, Total N, Total P, Total K, Total Mg, Total C, KCl	Db, porosity, infiltration rate, PSA		organic humus, humus fractions, oxidizable C	Co, Cu, Ni, Se, Zn	Al, As, Cd, Cr, F, Hg, Pb, organic pollutants, radionuclides, halogenated compounds, PAH			
39		TOC, Total N			humus fractions					
40	PO ₄ , K, Ca, Mg, Na, NH ₄ , NO ₃	pH, CEC, Total C, Total N, Total P, Total S, exchangeable acidity				Cl, Cu, Fe, Mn, Zn	Al, Cd, Hg, Pb			
41		pH, CEC, Total C, Total N	PSA		litter/cellulose decomposition	yes	yes	yes	yes	
42	yes	yes			humus	yes	heavy metals, organochlorine pesticides			
43	P, Ca	pH, CEC, aluminum oxide	Db, PSA		humus fractions	Co, Cu, Fe, Ni, Zn	Cd, Cr, F, Hg, Pb, halogenated compounds, PAH			
NEW ZEALAND										
44	P	pH, CEC, Total C, Total N	Db, porosity, soil water characteristics, PSA, aggregate stability	Nmin, respiration, microbial biomass		Fe			yes	

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ICP										
45	K, Ca, Mg, Na	pH, CEC, TOC, Total N, Total P, Total S	Db, PSA	Nmin, enzyme activity, respiration	litter/cellulose decomposition	Cu, Fe, Mn, Mo, Ni, Zn	Al, As, Cd, Cr, Hg, Pb			
46	Na	pH, CEC, CaCO ₃ , TOC, Total N, Total P, Total K, Total Mg, Total Ca				Cu, Fe, Mn, Ni, Zn	Al, Cd, Cr, Pb		yes	
47	P, K, S, Ca, Mg, Na	pH, EC, CEC, TOC, CaCO ₃ , Total N, Total K, Total Na, Total Ca, Total Mg				Cu, Fe, Mn, Ni, Zn	Al, Cd, Cr, Hg, Pb		yes	
NETWORKS										
48	N, P, NH ₄ -N, S	pH, CEC, exchangeable acidity, CaCO ₃ , TOC, Total inorganic carbon, Total N, Total P, Total S	Db, PSA, soil water characteristics	micro-biological		Co, Cu, Fe, Mo, Ni, Zn	Al, As, Cd, Cr, Hg, Pb	yes	yes	yes
49	P	pH, CEC, TOC, CaCO ₃ , Total N, Total C, Total P, exchangeable acidity	Db, PSA, infiltration, soil water characteristics	macrofauna, microfauna, microflora, respiration		B, Cl, Co, Cu, Fe, Mn, Mo, Ni, Zn	Cd, Cr, Hg, Pb		yes	
50										
51										

Prog No.	Soil Test Analysis (Fertility)	Soil Chemical Properties	Soil Physical Properties	Soil Biological	Soil Biochemical	Micro-nutrients	Pollutants	Mgt	Site Description	Climate Data
52	N, P, K, S, Mg	pH, EC, CEC, Total C, Total N, Total P	Db, hydraulic conductivity, infiltration rate, PSA, soil water characteristics, aggregate stability, shrinkage/swelling tests, plastic/liquid limit	Nmin, Cmin, micro-biological, enzyme activity, respiration	humus fractions, particulate organic matter	Cu, Mo, Mn, Ni, Se, V, Zn	Al, As, Cd, Cr, F, Hg, Pb, pesticides, radionuclides, surfactants, halogenated compounds, PAH, PCB	yes	yes	

¹NOTES:

SOIL TEST ANALYSIS (fertility): can include measurements of N, P, K, S, Ca, Mg, Na, NH₄, NH₃, NO₂, NO₃, PO₄, SO₄

SOIL CHEMICAL: can include TOC, Total inorganic carbon, soil greenhouse analysis, sorptive capacity, pH, EC, CaCO₃, CEC, base saturation, acid and base cations, soluble cations, exchangeable cations, exchangeable acidity, hydrolytic acidity, sodicity, Total N, Total P, Total K, Total S, Total Mg, Total Ca, Total Na, SAR

SOIL PHYSICAL: can include Db, compaction, penetration resistance, total porosity, macroporosity, infiltration rate, shrinkage/swelling tests, plastic/liquid limits, saturated and near-saturated hydraulic conductivity, aggregate stability, texture, PSA, specific gravity and soil water characteristics

SOIL BIOLOGICAL: can include Nmin, Cmin, respiration, microbiology, microfauna, mesofauna, macrofauna, microflora, microbial biomass activity, enzyme activity and earthworms

SOIL BIOCHEMICAL: can include measurements of LFC, LFN, organic humus, humus fractions, litter/cellulose decomposition, oxidizable C, particulate organic matter

MICRONUTRIENTS: can include measurements such as B, Cl, Co, Cu, Fe, Mg, Mn, Mo, Ni, Se, Si, V, Zn

POLLUTANTS: can include measurements of Ag, Al, As, Ba, Be, Bi, Cd, Cr, F, Hg, Li, Pb, Sb, Sn, Sr, Ti, Tl, PCBs, PAH, halogenated compounds, surfactants, tricyclic aromatic hydrocarbons, organochlorine pesticides, herbicide residues, chlororganic insecticides, radionuclides

MANAGEMENT: can include land use history, site history, crop residues, cultivation, vegetation composition, plant yield, plant quality, manure application, manure storage, fertilization

SITE DESCRIPTION: can include morphology, soil profile description, soil type, soil series, soil classification, mass of forest litter, type/depth of humus horizon, landscape attributes, slope, aspect, relief, soil parent material, erosion/deposition, weathering, mineralogy/rock type, hydrological conditions, phases/stages of soil development

Soil Water Characteristics: can include water holding capacity, field water capacity, total available water, readily available water, soil moisture, hygroscopic moisture content, soil water release, soil moisture retention, wilting point, saturation point

FC: field capacity; the content of water, on a mass or volume basis, remaining in a soil 2 or 3 days after having been wetted with water and after free drainage is negligible

WP: wilting point; the percentage by weight of water remaining in the soil when the plant wilts permanently

WHC: water holding capacity

pH: the degree of acidity or alkalinity of a soil, expressed as a measure of free hydrogen ion activity in the soil on a scale from 1-14

EC: electrical conductivity or a measure of soluble salt content of soil

CEC: cation exchange capacity; the total amount of exchangeable cations that a soil can adsorb. It is sometimes called "total exchange capacity", "base exchange capacity" or "cation adsorption capacity"

TOC: total organic carbon, includes measures of organic matter

Db: bulk density; the mass of dry soil per unit bulk volume; includes measures of compaction and resistance

PSA: particle size analysis; determination of the various amounts of the different soil separates in a soil sample, usually by sedimentation, sieving, micrometry, or combinations of these methods

LFC: light fraction carbon, amount of carbon in the proportion of soil which is less than 2.0 g cm^{-3}

LFN: light fraction nitrogen, amount of nitrogen in the proportion of soil which is less than 2.0 g cm^{-3}

Nmin: mineralizable nitrogen

Cmin: mineralizable carbon

PCB: polychlorinated biphenyls

PAH: polycyclic aromatic hydrocarbons