List of Mandatory and optional parameters for calculating critical loads using steady state and dynamic models

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Please note that the mandatory parameters required *only* for dynamic modeling are in *italics.*
Also note that, in the absence of measured data from the site, some of the mandatory parameters can be modeled or based on literature.

A. DEPOSITION

A.1 Throughfall

Mandatory	Optional
pH, conductivity	
Base cations (Na^+, K^+, Mg^{2+}, Ca^{2+})	Al^{3+}, Mn^{2+}, Fe^{3+}
NH_4^+	Heavy metals (Cu, Zn, Hg, Pb, Cd, Co, Mo)
Anions (Cl^-, NO_3^-, SO_4^{2-})	Total P, PO_4^{3-}
Total alkalinity (if annual median pH>5)	Total alkalinity (if any sample pH>5)
Total N	Total S, TOC, DOC

A.2 Wet or bulk deposition

Mandatory	Optional
pH	
Base cations (Na^+, K^+, Mg^{2+}, Ca^{2+})	Al^{3+}, Mn^{2+}, Fe^{3+}
NH_4^+	Heavy metals (Cu, Zn, Hg, Pb, Cd, Co, Mo)
Anions (Cl^-, NO_3^-, SO_4^{2-})	Total P, PO_4^{3-}
Total alkalinity (if annual median pH>5)	Total alkalinity (if any sample pH>5)
	Total S, Total N

Note: Fog, cloud and dry deposition are options

B. CLIMATE

Mandatory	Optional
Precipitation volume	Wind speed
Air temperature	Wind direction
Air humidity	Solar radiation
Annual evapotranspiration rate	UV-b radiation
	Soil temperatures
	Soil moisture (matric potential, water content)
	Stand precipitation (quantity of throughfall and stem flow)

C. ANALYSIS OF NEEDLES AND LEAVES

Mandatory	Optional
N, S, P, Ca, Mg, K	Zn, Mn, Fe, B, Pb, Cu, Cd, C

D. SOIL ANALYSIS (SOLID PHASE)
Note that soil data is required either by soil horizon or as a depth-weighted average representing the rooting zone

Mandatory	Optional
Coarse fragments	Organic layer weight
Bulk density	Carbonates
Particle size distribution	
pH ($CaCl_2$)	
Organic C	
Total N	
Extractable Ca, K, Mg, Al, Na	Extractable P, Mn, Cu, Pb, Cd, Zn, Fe, Cr, Ni, S, Hg
Exchangeable acidity	Oxalate extractable Fe, Al
Base saturation	Total elements (Ca, Mg, K, Al, Fe, Mn)
Cation exchange capacity	Full Mineralogical analysis
pH (H_2O)	
Acceptable N accumulation	
Exchange constants (lg K AlBC, lg K HBC)	
C pool in rooting zone	

E. SOIL SOLUTION ANALYSIS

Mandatory	Optional
pH	Fe, Mn, Zn, Cu, Cr, Ni, Pb, Cd, Si
Alkalinity	Electrical conductivity
DOC	total P
K, Mg, Ca, Na	
Al (total)	
Al (labile)	
NO_3-N, SO_4-S	
NH_4-N	
Cl	
pCO_2 (partial pressure of CO_2)	

F. FOREST HEALTH PARAMETERS - OPTIONAL

G. GROWTH AND YIELD

Mandatory

Species composition

If removal of biomass via harvesting or fire occurs on the site:

DBH
Biomass removed by tree compartment
(stem wood, stem bark, branches, foliage)
Nutrient content by tree compartment
(stem wood, stem bark, branches, foliage)

H. SURFACE WATER (FROM ICP WATER)

Mandatory	Optional
Alkalinity	Al (reactive)
pH, conductivity	Al (non-labile)
Base cations (Na^+, K^+, Mg^{2+}, Ca^{2+})	TOC
NH_4^+	Water temperature
Anions (Cl^-, NO_3^-, SO_4^{2-})	Flow
Al (labile)	Total or soluble reactive PO_4^{3-}
DOC or permanganate	Dissolved Oxygen
	Fe, Mn, Cd, Zn, Cu, Ni, Pb, F
	Silica (SiO_2)
	Color
	Turbidity