TRIM.FaTE USER'S GUIDE
MODULE 16: TABLES OF TRIM.FaTE INPUT PARAMETERS

This module contains the following sets of tables listing and describing the input parameters used in the current TRIM.FaTE libraries:

- chemical-independent parameters for abiotic compartment types;
- chemical-dependent parameters for abiotic compartment types;
- chemical-independent parameters for biotic compartment types;
- chemical-dependent parameters for biotic compartment types;
- chemical-dependent (i.e., value varies by chemical) parameters independent of compartment type; and
- source, meteorological, and other input parameters.

For each parameter listed, the parameter name and symbol, current name of property in TRIM.FaTE library, input units, and a brief description are given; for chemical-specific parameters, the applicable chemicals (e.g., all, organics, mercury) also are given. Values for parameters are not listed here, but the values used should be documented for individual model applications.[1]

Within the framework of the TRIM.FaTE computer model, several different kinds of "properties" are defined and used. The input parameters described in this module fall into the following categories of TRIM.FaTE properties:

- compartment properties (includes by far the largest number of input parameters);
- volume element (VE) properties;
- link properties;
- chemical properties;
- source properties; and
- scenario properties.

In the following tables, the type of object (e.g., volume element, link, etc.) for which the property is defined is identified for all input parameters that are **not** compartment properties.

This module is intended to document only those properties in the July 2005 TRIM.FaTE Public Reference library for which a user needs to supply a value (or confirm that an existing TRIM.FaTE library value is appropriate) in order to apply TRIM.FaTE. There are many other properties in the library, described in the TRIM.FaTE TSD Volume II (EPA 2002), that are calculated from these inputs. These formula properties are not listed in the following tables.

[1]See Volume II of the TRIM.FaTE Evaluation Report (U.S. EPA, 2005) for an example of documentation of input parameter values used in an application.

In addition to the input parameters listed here, the transfer factor algorithms and other equations described in TSD Volume II also include some parameters for which the user may want to set different values (e.g., gill assimilation efficiency in fish, or "overall K_{ow}" (D_{ow}) in surface water). Although these parameters are considered part of the TRIM.FaTE algorithms/equations, rather than TRIM.FaTE properties, they and the algorithms/equations themselves are available to the user to modify as appropriate and scientifically defensible for the application at hand. These parameters are described along with the transfer factor algorithms and other equations in TSD Volume II, and are not listed in this module.

Finally, for a TRIM.FaTE application, "off-line" calculations generally are needed to develop some of the input parameters listed in these tables (e.g., meteorological data preprocessing, calculation of surface water flows, calculation of runoff fractions for overland flow). Inputs for such "off-line" calculations, which may vary considerably across model applications, are not listed in this module.

Note that the units listed in these tables are the units in which model input values need to be expressed for the algorithms in the current library. In a few cases, these computer model input units do not match the units used for the same parameter in equations and derivations in TSD Volume II. In such cases, there are internal units conversions in the computer model that account for the differences.

For most of the input parameters listed in the following tables, the symbol used in TSD Volume II is included. For a few input parameters (e.g., initial concentration of a chemical, boundary concentration of a chemical), no symbol is included because no symbol is used in the TSD.

[Note: An earlier, similar version of the following tables is included as Appendix D of EPA's TRIM.FaTE TSD Volume II, September 2002.]

REFERENCES

U.S. EPA. 2002. U.S. Environmental Protection Agency. TRIM.FaTE Technical Support Document Volume II: Description of Chemical Transport and Transformation Algorithms. EPA 453/R-02-011b. Office of Air Quality Planning and Standards.

Chemical-Independent -- Abiotic

Air Compartment Type

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Atmospheric dust particle load (D_L)	DustLoad	kg[dust particles]/m^3[air compartment]	Concentration of atmospheric dust particles in the air compartment
Density of air (ρ_a)	AirDensity_g_cm3	g/cm^3	Mass of air per unit volume of air
Density of dust particles (ρ_p)	DustDensity	kg[dust particles]/m^3[dust particles]	Mass of atmospheric particulate per unit volume of atmospheric particulate
Fraction organic matter on particulates (f_{om})	FractionOrganicMatteronParticulates	unitless (wet wt)	Mass fraction of air particulates that is organic material
Height [VE Property][a]	top, bottom[a]	m	Height (i.e., vertical dimension) of the air volume element
Particulate washout ratio (w_r)	WashoutRatio	m^3[air]/m^3[rain]	Precipitation scavenging ratio for particles in air (ratio of concentration of particles in rain to concentration of particles in air); used in estimating wet deposition of particles

[a]Height of air volume elements is set in TRIM.FaTE using two properties named "top" and "bottom."

Chemical-Dependent -- Abiotic

Air Compartment Type

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Boundary concentration [VE property][a]	boundaryConcentration_g_per_m3	g/m^3	Air concentration at the outer boundary of the modeling region (i.e., concentration in air flowing into the modeling region)	all
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_m3_UserSupplied	g/m^3	Bulk air concentration at beginning of modeling period	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Particle dry deposition velocity (V_{dry})	vdep	m/day	Speed at which chemical in particle form in air moves downward; used in estimating dry deposition of particles	all
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Washout ratio	WashoutRatio	N/A	Precipitation scavenging ratio for particles in air (ratio of concentration of particles in rain to concentration of particles in air); used in estimating wet deposition of particles	all

[a]Only used in model runs specified as including non-zero air boundary contributions. Only applicable for air volume elements with at least one boundary on the outer edge of the modeling region (zero boundary contribution for all internal air compartments).

Chemical-Independent -- Abiotic

Soil Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Surface Soil Compartment Type			
Air content (ϵ_{Ss})[a]	VolumeFraction_vapor	volume[air]/volume[compartment]	Volumetric pore space occupied by air in surface soil compartment (fraction of total volume that is air)
Average vertical velocity of water (percolation) (V_i)[b]	AverageVerticalVelocity	m^3[water]/m^2[surface area]-day (or m/day)	Average speed of water movement in downward vertical direction through soil column
Boundary layer thickness above surface soil (δ_{Ss})	AirSoilBoundaryThickness	m	Thickness of air above surface soil within which molecular diffusion between media can be significant (defines boundary between the well-mixed portion, where turbulent mixing is rapid and continuous, and the stable portion at the very edge of the interface)
Density of soil solids (dry weight) (ρ)[a]	rho	kg[soil]/m^3[soil]	Dry soil density (or dry weight of surface soil particles per unit volume of surface soil particles)
Depth [VE Property] (d_{Ss})[c]	top, bottom[c]	m	Depth (i.e., vertical dimension) of the surface soil volume element
Erosion fraction ($f_{erosion}$(Ssi → Ssj)) [Link property]	FractionofTotalErosion	unitless	Fraction of total eroded soil mass moving from a given sending compartment to a given receiving compartment or sink
Fraction of area available for erosion ($f_{avail\_erosion}$)	Fractionofareaavailableforerosion	m^2[area available]/m^2[total]	Fraction of the total surface area for which erosion can occur
Fraction of area available for runoff (f_{avail_runoff})	FractionofAreaAvailableforRunoff	m^2[area available]/m^2[total]	Fraction of the total surface area for which runoff can occur
Fraction of area available for vertical diffusion (f_A)	Fractionofareaavailableforverticaldiffusion	m^2[area available]/m^2[total]	Fraction of the total surface area for which vertical diffusion can occur
Organic carbon fraction (f_{oc})	OrganicCarbonContent	kg [organic carbon]/kg[soil wet wt]	Mass fraction of surface soil solids that consists of organic carbon
Runoff fraction (f_{runoff}(Ssi → Ssj)) [Link property]	FractionofTotalRunoff	unitless	Fraction of total runoff volume moving from a given sending compartment to a given receiving compartment or sink

Chemical-Independent -- Abiotic

Soil Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Total erosion rate *(erosion)* [b]	TotalErosionRate_kg_m2_day	kg[soil solids]/m^2[surface soil]-day	Total mass of eroded surface soil particles per unit surface area per day
Total runoff rate *(runoff)* [b]	TotalRunoffRate_m3_m2_day	m^3[water]/m^2[surface soil]-day	Total volume of liquid runoff from surface soil per unit surface area per day
Water content (θ_{Ss})[a]	VolumeFraction_Liquid	volume[water]/volume[compartment]	Volumetric pore space occupied by water in surface soil compartment (fraction of total volume that is water)
Root Zone Soil Compartment Type			
Air content ($Є_{Sr}$)[a]	VolumeFraction_vapor	volume[air]/volume[compartment]	Volumetric pore space occupied by air in root zone soil compartment (fraction of total volume that is air)
Average vertical velocity of water (percolation) (V_i)[b]	AverageVerticalVelocity	m^3[water]/m^2[surface area]-day (or m/day)	Average speed of water movement in vertical direction through soil column (downward)
Density of soil solids (dry weight) (ρ)[a]	rho	kg[soil]/m^3[soil]	Dry soil density (or dry weight of root zone soil particles per unit volume of root zone soil particles)
Depth [VE Property] (d_{Sr})[c]	top, bottom[c]	m	Depth (i.e., vertical dimension) of the root zone soil volume element
Organic carbon fraction (f_{oc})	OrganicCarbonContent	kg [organic carbon]/kg [soil wet wt]	Mass fraction of root zone soil solids that consists of organic carbon
Water content (θ_{Sr})[a]	VolumeFraction_Liquid	volume[water]/volume[compartment]	Volumetric pore space occupied by water in root zone soil compartment (fraction of total volume that is water)
Vadose Zone Soil Compartment Type			
Air content ($Є_{Sv}$)[a]	VolumeFraction_vapor	volume[air]/volume[compartment]	Volumetric pore space occupied by air in vadose zone soil compartment (fraction of total volume that is air)
Average vertical velocity of water (percolation) (V_i)[b]	AverageVerticalVelocity	m^3[water]/m^2[surface area]-day (or m/day)	Average speed of water movement in vertical direction through soil column (downward)

Chemical-Independent -- Abiotic

Soil Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Density of soil solids (dry weight) (ρ)[a]	rho	kg[soil]/m^3[soil]	Dry soil density (or dry weight of vadose zone soil particles per unit volume of vadose zone soil particles)
Depth [VE Property] (d_{Sv})[c]	top, bottom[c]	m	Depth (i.e., vertical dimension) of the vadose zone soil volume element
Organic carbon fraction (f_{oc})	OrganicCarbonContent	kg [organic carbon]/kg [soil wet wt]	Mass fraction of vadose zone soil solids that consists of organic carbon
Water content (θ_{Sv})[a]	VolumeFraction_Liquid	volume[water]/volume[compartment]	Volumetric pore space occupied by water in vadose zone soil compartment (fraction of total volume that is water)
Ground Water Compartment Type			
Depth [VE Property][c]	top, bottom[c]	m	Depth (i.e., vertical dimension) of the ground water volume element
Organic carbon fraction (f_{oc})	OrganicCarbonContent	kg [organic carbon]/kg [soil wet wt]	Mass fraction of ground water soil solids that consists of organic carbon
Porosity (Φ)	Porosity	volume[total pore space]/volume[compartment]	Ratio of pore space volume to total ground water compartment volume
Recharge rate to surface water *(recharge)* [Link property]	RechargeRate	m^3[water]/m^2[area]-day	Volume of ground water moving into surface water per unit interfacial area per day
Solid material density in aquifer (ρ)	rho	kg[soil]/m^3[soil]	Dry particle density (or dry weight of solid material in ground water compartment per unit volume of solid material in ground water compartment)

[a]Interdependent parameters - user is responsible for making sure input values are consistent (also interdependent with soil bulk density, which is not an input parameter in TRIM.FaTE but for which data are often available).

[b]Interdependent parameters with precipitation - user is responsible for making sure input values are consistent.

[c]Set using the volume element properties named "top" and "bottom."

Chemical-Dependent -- Abiotic

Soil Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Surface Soil Compartment Type				
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_m3_User Supplied	g/m^3	Bulk surface soil concentration at beginning of modeling period	all
Input characteristic depth (user supplied) (X*)	InputCharacteristicDepth_m	m	Distance from top of the soil compartment at which soil concentration has dropped to 36.79% (1/e * 100%) of the concentration at top of compartment (input used only if option selected - otherwise calculated)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Soil/water partition coefficient (K_d)	Kd	L[water]/kg[soil wet wt]	Equilibrium ratio of concentration sorbed to solids and concentration dissolved	Hg species
Use input characteristic depth (boolean)	UseInputCharacteristicDepth_0_MeansNo_ElseYes	0 = no, Else = yes	Switch used to allow option of user-supplied value or model calculations for characteristic depth	all
Vapor dry deposition velocity (v_{vapor})	VaporDryDepositionVelocity_m_day	m/day	Speed at which chemical in vapor form in air moves downward; used in estimating diffusion between air and soil (for Hg0 and MHg), and dry deposition of vapors to soil and plants (for Hg2)	Hg species
Root Zone Soil Compartment Type				
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics

Chemical-Dependent -- Abiotic

Soil Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Initial concentration	initialConcentration_g_per_m3_User Supplied	g/m^3	Bulk root zone soil concentration at beginning of modeling period	all
Input characteristic depth (user supplied) (X*)	InputCharacteristicDepth_m	m	Distance from top of the soil compartment at which soil concentration has dropped to 36.79% (1/e * 100%) of the concentration at top of compartment (input used only if option selected - otherwise calculated)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Soil-water partition coefficient (K_d)	Kd	L[water]/kg[soil wet wt]	Equilibrium ratio of concentration sorbed to solids and concentration dissolved	Hg species
Use input characteristic depth (boolean)	UseInputCharacteristicDepth_0_MeansNo_ElseYes	0 = no, Else = yes	Switch used to allow option of user-supplied value or model calculations for characteristic depth	all
Vadose Zone Soil Compartment Type				
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_m3_User Supplied	g/m^3	Bulk vadose zone soil concentration at beginning of modeling period	all
Input characteristic depth (user supplied) (X*)	InputCharacteristicDepth_m	m	Distance from top of the soil compartment at which soil concentration has dropped to 36.79% (1/e * 100%) of the concentration at top of compartment (input used only if option selected - otherwise calculated)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0

Chemical-Dependent -- Abiotic

Soil Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Soil-water partition coefficient (K_d)	Kd	L[water]/kg[soil wet wt]	Equilibrium ratio of concentration sorbed to solids and concentration dissolved	Hg species
Use input characteristic depth (boolean)	UseInputCharacteristicDepth_0_MeansNo_ElseYes	0 = no, Else = yes	Switch used to allow option of user-supplied value or model calculations for characteristic depth	all
Ground Water Compartment Type				
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_L_UserSupplied	g/L	Ground water concentration at beginning of modeling period	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Soil-water partition coefficient (K_d)	Kd	L[water]/kg[soil wet wt]	Equilibrium ratio of concentration sorbed to solids and concentration dissolved	Hg species

Chemical-Independent -- Abiotic

Surface Water Compartment Type

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Algae carbon content (fraction) (AI_{TOC})	AlgaeCarbonContentDryWt	g[carbon]/g[algae dry wt]	Mass fraction of algae that is carbon (dry wt basis)
Algae density in water column (AC)	AlgaeDensityinWaterColumn_g_L	g[algae wet wt]/L[water]	Mass of algae per unit volume of surface water
Algae growth rate constant (μ)	AlgaeGrowthRate	1/day	First-order rate constant for increase of algae mass
Algae radius (R)	AlgaeRadius	um	Average radius of algae cell
Algae water content (fraction) (fW_{Algae})	AlgaeWaterContent	unitless	Mass fraction of algae that is water
Average algae cell density (per vol cell, not water) (ρ_{Algae})	AlgaeDensity_g_m3	g[algae]/m^3[algae]	Mass of algae per unit volume of algae cells
Boundary layer thickness above sediment (δ_{Sed})	BoundaryLayerThicknessAboveSediment	m	Thickness of surface water above sediment within which molecular diffusion between media can be significant (defines boundary between the well mixed portion, where turbulent mixing is rapid and continuous, and the stable portion at the very edge of the interface)
Bulk water flow (flow) [Link property][a,b,c]	BulkWaterFlowRate_Volumetric	m^3[water]/day	Volume of water movement per unit time across a link (i.e., at a compartment-compartment interface)
Chloride concentration	ChlorideConcentration_mg_L	mg[chloride]/L[water]	Concentration of chloride ion in surface water compartment
Chlorophyll concentration (CC)	ChlorophyllConcentration_mg_L	mg[chlorophyll]/L[water]	Concentration of chlorophyll in surface water compartment
Current velocity (μ)[c,d]	CurrentVelocity	m/s	Average speed of moving water in flowing surface water compartments
Depth (d_W) [VE property][c,e]	top, bottom[e]	m	Depth (i.e., vertical dimension) of the surface water volume element
Dispersion coefficient for exchange between surface water compartments (DSPij) [Link property][a]	DiffusiveExchangeCoefficient	m^2/day	Coefficient used to calculate dispersive transport between two horizontally adjacent surface water compartments
Dimensionless viscous sublayer thickness (λ_2)	DimensionlessViscousSublayerThickness	unitless	Parameter used in calculating gas and liquid phase transfer coefficients, which are used in calculating diffusion/volatilization transfers between surface water and air

Chemical-Independent -- Abiotic

Surface Water Compartment Type

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Distance between midpoints (L_{ij}) [Link property][a]	DistanceBetweenMidpoints	m	Linear distance between the midpoints of two connected surface water compartments; used as characteristic mixing length for dispersion calculations
Drag coefficient for water body (C_d)	DragCoefficient	unitless	Coefficient used to calculate the shear velocity of wind, which is used in calculating volatilization transfers between surface water and air
Flush rate *(flushes/yr)* [f]	Flushes_per_year	1/year	Number of times surface water compartment volume is completely turned over (flushed) in a year
Organic carbon fraction in suspended sediments (f_{oc})	OrganicCarbonContent	unitless	Mass fraction of suspended sediment solids that consists of organic carbon
pH	pH	unitless	Negative logarithm (base 10) of concentration of hydrogen ion in surface water
Suspended sediment density (ρ_{Sed})	rho	kg[sediment particles]/m^3[sediment particles]	Dry suspended sediment density (or dry weight of suspended sediment particles per unit volume of suspended sediment particles)
Suspended sediment deposition velocity (v_{dep})	SedimentDepositionVelocity	m/day	Speed that suspended sediment moves downward through the water column to the sediment bed
Total suspended sediment concentration (TSS)	SuspendedSedimentconcentration	kg[suspended sediment particles]/m^3[water]	Mass of suspended sediment particles per unit volume of water
Water temperature (T) [VE property]	WaterTemperature_K	degrees K	Average water temperature of the surface water compartment

[a]Applies to all surface water compartments connected to other surface water compartments.

[b]Interdependent parameters with precipitation - user is responsible for making sure input values are consistent.

[c]Interdependent parameters - user is responsible for making sure input values are consistent.

[d]Applies to flowing water bodies only (i.e., rivers, streams).

[e]Set using the volume element properties named "top" and "bottom."

[f]Applies to all surface water compartments connected to a flush rate sink (i.e., all or part of discharge modeled to a sink).

Chemical-Dependent -- Abiotic

Surface Water Compartment Type

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Algal surface area-specific uptake rate constant (U)	AlgaeUptakeRate	nmol/[μm^2-day-nmol]	Surface area-specific rate constant for uptake into algae of a chemical in water	Hg species
BCF-algae	RatioOfConcinAlgaeToConcDissolvedinWater	L[water]/kg[algae wet wt]	Ratio of concentration in algae to concentration dissolved in surface water (bioconcentration factor)	organics
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Dow ("overall Kow") (D_{ow})	D_ow	L[water]/kg[octanol]	Weighted (by mass fraction) sum of individual Kow values for all chemical species present	Hg species[a]
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_L_User Supplied	g/L	Surface water concentration at beginning of modeling period	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Solids-water partition coefficient (K_d)	Kd	L[water]/kg[solids wet wt]	Equilibrium ratio of concentration sorbed to solids and concentration dissolved	Hg species
Vapor dry deposition velocity (v_{vapor})	VaporDryDepositionVelocity_m_day	m/day	Speed at which chemical in vapor form in air moves downward; used in estimating dry deposition of vapors to surface water	Hg2

[a]For Hg2 and MHg, Dow is included in TRIM.FaTE as a Formula Property (calculated within TRIM.FaTE) rather than a Constant Property (supplied as an input) because the value is dependent on surface water pH and chloride concentration. However, the relationships between Dow and pH and chloride are a user input.

Chemical-Independent -- Abiotic

Sediment Compartment Type

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Depth (d_{Sed}) [VE Property][a]	top, bottom[a]	m	Depth (i.e., vertical dimension) of the sediment volume element
Organic carbon fraction (f_{oc})	OrganicCarbonContent	kg[organic carbon]/kg[soil wet wt]	Mass fraction of bottom sediment solids that consists of organic carbon
Porosity of the sediment zone (Φ)[b]	Porosity	m^3[pore water]/m^3[sediment compartment]	Ratio of pore space volume to total sediment compartment volume
Solid material density in sediment (ρ_{Sed})[b]	rho	kg[sediment particles]/m^3[sediment particles]	Dry sediment density (or dry weight of bottom sediment per unit volume of bottom sediment)

[a]Set using the volume element properties named "top" and "bottom."

[b]Interdependent parameters with benthic solids concentration (kg[sediment]/m^3[sediment compartment]; not a TRIM.FaTE input parameter) - user is responsible for making sure input values are consistent.

Chemical-Dependent -- Abiotic

Sediment Compartment Type

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	days	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_m3_UserSupplied	g/m^3	Bulk sediment concentration at beginning of modeling period	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Solids-water partition coefficient (K_d)	Kd	L[water]/kg[solids wet wt]	Equilibrium ratio of concentration sorbed to solids and concentration dissolved	Hg species

Terrestrial Plant Compartment Types[a]

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Leaf Compartment Type			
Allow exchange[b]	AllowExchange	1=yes, 0=no	1 if exchange can occur with another compartment, 0 if not (can be made seasonal by setting allow exchange start and stop dates) (can be set to a fraction between 0 and 1 for steady-state modeling)
Average leaf area index (LAI)[c]	AverageLeafAreaIndex_No_Time_Dependence	m^2[total leaf area]/m^2[underlying soil area]	Average surface area of leaf per unit surface soil area (no time dependence)
Calculate wet dep interception fraction (boolean)	CalculateWetDepInterceptionFraction_1_Means_Yes_Else_No	1=yes, 0=no	Switch used to allow option of user-supplied value or model calculations for wet deposition interception fraction
Correction exponent, octanol to lipid (b)	CorrectionExponent	unitless	Correction exponent for the differences between octanol and lipids
Degree stomatal opening (α_s)	DegreeStomatalOpening	unitless	Mean degree of opening of stomatal pores, value ≥ 0 and ≤ 1
Density of wet leaf (ρ_{Leaf})[c]	WetDensity	kg[leaf wet wt]/m^3[leaf]	Density of wet plant leaf
Leaf wetting factor (S)	LeafWettingFactor	m	Vegetation-dependent leaf-wetting factor (retention coefficient)
Length of leaf (l)	LengthofLeaf	m	Average length of flat leaf
Lipid content of leaf ($\mathit{f}L_{Leaf}$)	LipidContent	kg[lipid]/kg[leaf wet wt]	Mass fraction of leaf that is lipid (wet wt basis)
Litter fall rate (K_L)[b]	LitterFallRate	1/day	First-order rate constant for fall of plant leaves (and particles on leaves) to soil (can be made seasonal by setting litter fall start and stop dates)
Stomatal area, normalized for effective diffusion path length (S_N)	StomatalAreaNormalizedEffectiveDiffusionPathLength	1/m	Portion of total leaf surface area comprised of stomatal pores divided by the effective path length for a diffusing molecule through a pore; value is relatively similar across plant species
Vegetation attenuation factor (α_{VAF})	AttenuationFactor	m^2/kg	Effective attenuation by plant leaves of dry depositing particles per unit dry weight of the plant species; used to calculate interception fraction

Chemical-Independent -- Biotic

Terrestrial Plant Compartment Types[a]

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Water content (fW_{Leaf})	WaterContent	kg[water]/kg[leaf wet wt]	Mass fraction of leaf that is water (wet wt basis)
Wet dep interception fraction (user supplied) (I_{wet})	WetDepInterceptionFraction_UserSupplied	unitless	Fraction of wet deposition intercepted by leaves (input used only if option selected - otherwise calculated)
Wet mass of leaf per unit area ($\rho area_{Leaf}$)[c]	WetMassperArea	kg[leaf wet wt]/m^2[surface soil]	Freshweight mass of leaf per unit surface soil area
Particle-on-Leaf Compartment Type			
Allow exchange[b]	AllowExchange	1=yes, 0=no	1 if exchange can occur with another compartment, 0 if not (can be made seasonal by setting allow exchange start and stop dates) (can be set to a fraction between 0 and 1 for steady-state modeling)
Volume particle per area leaf	VolumeParticlePerAreaLeaf	m3 [leaf particles]/m2 [leaf]	Volume of leaf particles per unit area of leaf; used to calculate compartment volume
Root Compartment Type - Nonwoody Plants Only[d]			
Allow exchange[b]	AllowExchange	1=yes, 0=no	1 if exchange can occur with another compartment, 0 if not (can be made seasonal by setting allow exchange start and stop dates) (can be set to a fraction between 0 and 1 for steady-state modeling)
Correction exponent, octanol to lipid (b)	CorrectionExponent	unitless	Correction exponent for the differences between octanol and lipids
Lipid content of root (fL_{Root})	LipidContent	kg[lipid]/kg [root wet wt]	Mass fraction of root that is lipid (wet wt basis)
Water content of root (fW_{Root})	WaterContent	kg[water]/kg[root wet wt])	Mass fraction of root that is water (wet wt basis)
Wet density of root (ρ_{Root})	WetDensity	kg[root wet wt]/m^3[root]	Density of wet plant root
Wet mass per area ($\rho area_{Root}$)	WetMassperArea	kg[root wet wt]/m^2[surface soil]	Freshweight mass of root per unit surface soil area

Terrestrial Plant Compartment Types[a]

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Stem Compartment Type - Nonwoody Plants Only[d]			
Allow exchange[b]	AllowExchange	1=yes, 0=no	1 if exchange can occur with another compartment, 0 if not (can be made seasonal by setting allow exchange start and stop dates) (can be set to a fraction between 0 and 1 for steady-state modeling)
Correction exponent, octanol to lipid (b)	CorrectionExponent	unitless	Correction exponent for the differences between octanol and lipids
Density of phloem fluid (ρ_{Ph})	PhloemDensity	kg[phloem]/m^3[phloem]	Density of phloem fluid
Density of xylem fluid (ρ_{Xy})	XylemDensity	kg[xylem]/m^3[xylem]	Density of xylem fluid
Flow rate of transpired water per leaf area	FlowRateofTranspiredWaterperAreaofLeafSurface	m^3[water]/m^2 [leaf]-day	Empirical factor used to estimate total flow of transpired water based on leaf surface area
Fraction of transpiration flow rate that is phloem rate	FractionPhloemRatewithTranspirationFlowRate	unitless	Fraction of total transpiration flow rate that is the phloem rate
Lipid content of stem (fL_{Stem})	LipidContent	kg[lipid]/kg [stem wet wt]	Mass fraction of stem that is lipid (wet wt basis)
Water content of stem (fW_{Stem})	WaterContent	kg[water]/kg[stem wet wt]	Mass fraction of stem that is water (wet wt basis)
Wet density of stem (ρ_{Stem})	WetDensity	kg[stem wet wt]/m^3[stem]	Density of wet plant stem
Wet mass per area ($\rho area_{Stem}$)	WetMassperArea	kg[stem wet wt]/m^2[surface soil]	Freshweight mass of stem per unit surface soil area

[a]TRIM.FaTE currently includes four kinds of terrestrial plants: deciduous forest, coniferous forest, grasses/herbs, and agricultural.

[b]If modeled as seasonal processes, on/off dates are interdependent - user is responsible for making sure input values are consistent.

[c]Interdependent parameters - user is responsible for making sure input values are consistent.

[d]Roots and stems are not modeled for deciduous or coniferous forest in the current version of TRIM.FaTE.

Chemical-Dependent -- Biotic

Terrestrial Plant Compartment Types[a]

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Leaf Compartment Type				
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Leaf concentration at beginning of modeling period (wet wt basis)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Transfer factor to leaf particle ($T_{Leaf \rightarrow LeafP}$)	TransferFactortoLeafParticle	1/day	First-order rate constant for transfer from leaf to leaf particle	all
Particle-on-Leaf Compartment Type				
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Particle on leaf concentration at beginning of modeling period (dry wt basis)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Transfer factor to leaf ($T_{LeafP \rightarrow Leaf}$)	TransferFactortoLeaf	1/day	First-order rate constant for transfer from leaf particle to leaf	all
Root Compartment Type - Nonwoody Plants Only[b]				
Alpha for root-root zone bulk soil (α)	Root_RootZonePartitioningBulkSoil_AlphaofSteadyState	unitless	Proportion of equilibrium value reached	Hg species
Alpha for root-soil water interaction (α)	RootSoilWaterInteraction_Alpha	unitless	Proportion of equilibrium value reached	all
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics

Chemical-Dependent -- Biotic

Terrestrial Plant Compartment Types[a]

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Root concentration at beginning of modeling period (wet wt basis)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Root/root-zone-soil-water partition coefficient ($K_{Root\text{-}SrW}$)	Root_RootZonePartitioningBulkSoil_PartitionCoefficient	m^3[bulk root soil]/m^3[root]	Equilibrium ratio of chemical concentration in root to concentration in bulk (wet) root zone soil	Hg species
talpha for root-root zone bulk soil (t_α)	Root_RootZonePartitioningBulkSoil_TimetoReachAlphaofSteadyState	day	Time to reach 100α percent of equilibrium	Hg species
Stem Compartment Type - Nonwoody Plants Only[b]				
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Stem concentration at beginning of modeling period (wet wt basis)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Transpiration stream concentration factor (TSCF)	TSCF	m^3[soil pore water]/m^3[xylem fluid]	Ratio of concentration dissolved in xylem fluid to concentration dissolved in soil pore water	Hg species

[a]TRIM.FaTE currently includes four kinds of terrestrial plants: deciduous forest, coniferous forest, grasses/herbs, and agricultural.

[b]Roots and stems are not modeled for deciduous or coniferous forest in the current version of TRIM.FaTE.

Chemical-Independent -- Biotic

Aquatic Plant Compartment Type

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Macrophyte Compartment Type			
Biomass per water area	BiomassPerArea_kg_m2	kg/m^2	Mass of macrophytes per unit surface water area (wet wt basis)
Density of macrophytes (ρ_{Mp})	Density	kg/L	Mass of macrophytes per unit volume of macrophytes (wet wt basis)

Chemical-Dependent -- Biotic

Aquatic Plant Compartment Type

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Macrophyte Compartment Type				
Alpha for macrophyte (α)	WaterColumnDissolvedPartitioning_AlphaofEquilibrium	unitless	Proportion of equilibrium value reached	Hg species
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Macrophyte concentration at beginning of modeling period (wet wt basis)	all
Macrophyte/water partition coefficient ($K_{Mp\text{-}W}$)	WaterColumnDissolvedPartitioning_PartitionCoefficient	L[water]/kg[macrophyte wet wt]	Equilibrium ratio of concentration in macrophyte to concentration dissolved in water	Hg species
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
talpha (t_α)	WaterColumnDissolvedPartitioning_TimeToReachAlphaofEquilibrium	day	Time to reach 100α percent of equilibrium	Hg species

Terrestrial Animal Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Soil Detritivore Compartment Type - Earthworm			
Density	Density_Freshweight	kg[worm]/L[worm]	Density of worm (wet wt basis); used to calculate compartment volume
Density per soil area ($\rho area_{Worm}$)	ArealDensity_Freshweight	kg[worm wet wt]/m^2[soil]	Mass of worm per unit surface area of soil
Water content of worm (fW_{worm})	Water_content	unitless	Mass fraction of worm that is water
Soil Detritivore Compartment Type - Soil Arthropod			
Biomass per soil area ($\rho area_{Arth}$)	BiomassPerArea_kg_m2	kg[arthropod wet wt]/m^2[soil]	Mass of soil arthropods per unit surface area of soil
Body weight (BW)	BW	kg	Mass of individual animal (wet wt)
Fraction Partitioning Worm-Surface Soil	FractionPartitionwithSurfSoil	unitless	Fraction of total partitioning between arthropod and soil that occurs with surface soil (remainder with root zone soil)
All Other Terrestrial Animal Compartment Types[a]			
Body weight (BW)	BW	kg	Mass of individual animal (wet wt)
Food ingestion rate (IN_D)	FoodIngestionRate	kg[diet wet wt]/kg[body wt wt]-day	Total amount of food eaten per day, scaled to body weight
Fraction diet - american robin ($P^{American\ robin}$)	FractionDietAmericanRobin	unitless	Fraction of food diet comprised of american robin
Fraction diet - black-capped chickadee ($P^{Chickadee}$)	FractionDietChickadee	unitless	Fraction of food diet comprised of black-capped chickadee
Fraction diet - bobwhite quail ($P^{Bobwhite\ quail}$)	FractionDietBobwhiteQuail	unitless	Fraction of food diet comprised of bobwhite quail
Fraction diet - mallard ($P^{Mallard}$)	FractionDietMallard	unitless	Fraction of food diet comprised of mallard
Fraction diet - mouse (P^{Mouse})	FractionDietMouse	unitless	Fraction of food diet comprised of mouse
Fraction diet - terrestrial plants (P^{Plants})	FractionDietPlant	unitless	Fraction of food diet comprised of terrestrial plant
Fraction diet - short-tailed shrew ($P^{Short-tailed\ shrew}$)	FractionDietshorttailedshrew	unitless	Fraction of food diet comprised of short-tailed shrew

Terrestrial Animal Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Fraction diet - soil (f_{intake_soil})	SoilFractionofDryDiet	unitless, dry wt basis	Fraction of total dry weight intake comprised of soil (used to calculate soil ingestion rate, when necessary)
Fraction diet - soil arthropod (P^{Arth})	FractionDietSoilArthropod	unitless	Fraction of food diet comprised of soil arthropod
Fraction diet - vole (P^{Vole})	FractionDietvole	unitless	Fraction of food diet comprised of vole
Fraction diet - worm (P^{Worm})	FractionDietWorm	unitless	Fraction of food diet comprised of worm
Fraction excretion to soil (f_{uSs})	FractionExcretiontoSoil	unitless	Fraction of total wildlife elimination in urine and feces that goes to surface soil
Fraction excretion to water (f_{uSW})	FractionExcretiontoWater	unitless	Fraction of total wildlife elimination in urine and feces that goes to surface water
Fraction specific compartment diet [Link property]	FractionSpecificCompartmentDiet	unitless	Fraction of food diet originating from a specific compartment; for a given compartment, must sum to 1.0 across all links
Population per soil area (PN_{area})	NumberofIndividualsPerSquareMeter	$\#/m^2$	Number of individuals per unit surface area
Scaling constant A - inhalation rate	InhalationProps_A	unitless	Allometric scaling constant used to calculate inhalation rate based on body weight
Scaling constant B - inhalation rate	InhalationProps_B	unitless	Allometric scaling constant used to calculate inhalation rate based on body weight
Scaling constant A - water ingestion rate	WaterIngProps_A	unitless	Allometric scaling constant used to calculate water ingestion rate based on body weight
Scaling constant B - water ingestion rate	WaterIngProps_B	unitless	Allometric scaling constant used to calculate water ingestion rate based on body weight
Soil ingestion rate (user supplied) (IN_{Ss})	SoilIngestionRate_UserSupplied	kg[soil dry wt]/kg[body wet wt]-day	Total amount of soil eaten per day, scaled to body weight (input used only if option selected - otherwise calculated from fraction diet-soil and food ingestion rate)
Use calculated soil ingestion rate (boolean)	UseSoilFractionofDryDietToCalculate SoilIngestionRate	true = yes, false = no	Switch used to allow option of user-supplied value or model calculations for soil ingestion rate

[a]TRIM.FaTE Public Reference Library currently includes the following terrestrial animal compartment types: Terrestrial Ground-invertebrate Feeder - Short-tailed Shrew, Terrestrial Ground-invertebrate Feeder - Trowbridge Shrew, Terrestrial Herbivore - Long-tailed Vole, Terrestrial Herbivore - Meadow Vole, Terrestrial Herbivore - Mule Deer/Black-tailed Deer, Terrestrial Herbivore - White-tailed Deer, Terrestrial Insectivore - Black-capped Chickadee, Terrestrial Omnivore - Mouse, Terrestrial Predator/Scavenger - Long-tailed Weasel, and Terrestrial Predator/Scavenger - Red-tailed hawk.

Chemical-Dependent -- Biotic

Terrestrial Animal Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Soil Detritivore - Earthworm				
Alpha for earthworm-soil pore water (α)	WormSoilWaterInteraction_alpha	unitless	Proportion of equilibrium value reached for earthworn to soil pore water transfer	PAHs
Alpha for worm-bulk soil (α)	WormSoilInteraction_alpha	unitless	Proportion of equilibrium value reached for earthworn to bulk soil transfer	Hg species, dioxins/furans
Earthworm/dry-soil partition coefficient ($K_{dworm\text{-}Sr\text{-}dry}$)	WormSoilPartitionCoefficient_dryweight	kg [soil dry wt]/kg[worm dry wt]	Equilibrium ratio of chemical concentration in earthworm to concentration in bulk soil (dry weight basis)	Hg species, dioxins/furans
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Earthworm concentration at beginning of modeling period (wet wt basis)	all
talpha for earthworm-soil pore water (t_α)	WormSoilWaterInteraction_t_alpha	day	Time to reach 100α percent of equilibrium for earthworn to soil pore water transfer	PAHs
talpha for worm-bulk soil (t_α)	WormSoilInteraction_t_alpha	day	Time to reach 100α percent of equilibrium for earthworn to bulk soil transfer	Hg species, dioxins/furans
Soil Detritivore - Soil Arthropod				
Alpha for arthropod-soil (α)	ArthropodSoilPartitioning_AlphaofEquilibrium	unitless	Proportion of equilibrium value reached	all
Arthropod/bulk-soil partition coefficient ($K_{Arth\text{-}Sr}$)	Arthropod_SoilPartitionCoefficient	kg[soil wet wt]/kg[arthropod wet wt])	Equilibrium ratio of chemical concentration in arthropod to concentration in soil (wet wt basis)	all
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Soil arthropod concentration at beginning of modeling period (wet wt basis)	all
talpha for arthropod-soil (t_α)	ArthropodSoilPartitioning_TimetoReachAlphaofEquilibrium	day	Time to reach 100α percent of equilibrium	all
All Other Terrestrial Animal Compartment Types[a]				
Assimilation efficiency for inhalation (AE_{Air})	InhalationAssimilationEfficiency	unitless	Fraction of amount of chemical breathed that is actually absorbed by the animal	all
Assimilation efficiency from arthropods (AE_{Arth})	AssimilationEfficiencyFromArthropods	unitless	Fraction of amount of chemical in arthropods eaten that is actually absorbed by the animal	all
Assimilation efficiency from food (AE_{Twl})	AssimilationEfficiencyFromFood	unitless	Fraction of amount of chemical in food eaten that is actually absorbed by the animal	all

Chemical-Dependent -- Biotic

Terrestrial Animal Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Assimilation efficiency from soils (AE_S)	AssimilationEfficiencyFromSoils	unitless	Fraction of amount of chemical in soils eaten that is actually absorbed by the animal	all
Assimilation efficiency from terrestrial plants (AE_{Plant})	AssimilationEfficiencyFromPlants	unitless	Fraction of amount of chemical in terrestrial plants eaten that is actually absorbed by the animal	all
Assimilation efficiency from water (AE_W)	AssimilationEfficiencyFromWater	unitless	Fraction of amount of chemical in drinking water that is actually absorbed by the animal	all
Assimilation efficiency from worms (AE_{Worm})	AssimilationEfficiencyFromWorms	unitless	Fraction of amount of chemical in worms eaten that is actually absorbed by the animal	all
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Initial concentration	initialConcentration_g_per_kg_User Supplied	g/kg	Terrestrial animal concentration at beginning of modeling period (wet wt basis)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Total elimination rate (k_{ET})	TotalExcretionRate	1/day	First-order rate constant for elimination of chemical from the body (in urine, feces, feathers, fur)	Hg species

[a]TRIM.FaTE Public Reference Library currently includes the following terrestrial animal compartment types: Terrestrial Ground-invertebrate Feeder - Short-tailed Shrew, Terrestrial Ground-invertebrate Feeder - Trowbridge Shrew, Terrestrial Herbivore - Long-tailed Vole, Terrestrial Herbivore - Meadow Vole, Terrestrial Herbivore - Mule Deer/Black-tailed Deer, Terrestrial Herbivore - White-tailed Deer, Terrestrial Insectivore - Black-capped Chickadee, Terrestrial Omnivore - Mouse, Terrestrial Predator/Scavenger - Long-tailed Weasel, and Terrestrial Predator/Scavenger - Red-tailed hawk.

Semi-aquatic Animal Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
All Compartment Types[a]			
Body weight (BW)	BW	kg	Mass of individual animal (wet wt)
Food ingestion rate (IN_D)	FoodIngestionRate	(kg[diet wet wt]/kg[body wet wt]-day)	Total amount of food eaten per day, scaled to body weight
Fraction diet - benthic carnivores (P^{Fbc})	FractionDietFishbenthiccarnivore	unitless	Fraction of food diet comprised of benthic carnivore
Fraction diet - benthic invertebrates (P^{BI})	FractionDietBenthicInvertebrate	unitless	Fraction of food diet comprised of benthic invertebrate
Fraction diet - benthic omnivores (P^{Fbo})	FractionDietFishbenthicomnivore	unitless	Fraction of food diet comprised of benthic omnivore
Fraction diet - black-capped chickadee ($P^{Chickadee}$)	FractionDietChickadee	unitless	Fraction of food diet comprised of black-capped chickadee
Fraction diet - emerging benthic insect (benthic invertebrate) (P^{EBI})	FractionDietEmergingBenthicInsect	unitless	Fraction of food diet comprised of emerging benthic insect
Fraction diet - macrophyte (P^{Mp})	FractionDietMacrophyte	unitless	Fraction of food diet comprised of macrophyte
Fraction diet - mouse (P^{Mouse})	FractionDietMouse	unitless	Fraction of food diet comprised of mouse
Fraction diet - terrestrial plants (P^{Plants})	FractionDietPlant	unitless	Fraction of food diet comprised of terrestrial plant
Fraction diet - soil (f_{intake_soil})	SoilFractionofDryDiet	unitless, dry wt basis	Fraction of total dry weight intake comprised of soil (used to calculate soil ingestion rate, when necessary)
Fraction diet - soil arthropod (P^{Arth})	FractionDietSoilArthropod	unitless	Fraction of food diet comprised of soil arthropod
Fraction diet - vole (P^{Vole})	FractionDietvole	unitless	Fraction of food diet comprised of vole
Fraction diet - water-column carnivores (P^{Fwcc})	FractionDietFishcarnivore	unitless	Fraction of food diet comprised of water-column carnivore
Fraction diet - water-column herbivores (P^{Fwch})	FractionDietFishherbivore	unitless	Fraction of food diet comprised of water-column herbivore
Fraction diet - water-column omnivores (P^{Fwco})	FractionDietFishomnivore	unitless	Fraction of food diet comprised of water-column omnivore
Fraction diet - worm (P^{Worm})	FractionDietWorm	unitless	Fraction of food diet comprised of worm

Chemical-Independent -- Biotic

Semi-aquatic Animal Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Fraction excretion to soil (f_{uSW})	FractionExcretiontoSoil	unitless	Fraction of total wildlife elimination in urine and feces that goes to soil
Fraction excretion to water (f_{uSs})	FractionExcretiontoWater	unitless	Fraction of total wildlife elimination in urine and feces that goes to surface water
Fraction specific compartment diet [Link property]	FractionSpecificCompartmentDiet	unitless	Fraction of food diet originating from a specific compartment; for a given compartment, must sum to 1.0 across all links
Population per soil area (PN_{area})	NumberofIndividualsPerSquareMeter	$\#/m^2$	Number of individuals per unit surface area
Scaling constant A - inhalation rate	InhalationProps_A	unitless	Allometric scaling constant used to calculate inhalation rate based on body weight
Scaling constant B - inhalation rate	InhalationProps_B	unitless	Allometric scaling constant used to calculate inhalation rate based on body weight
Scaling constant A - water ingestion rate	WaterIngProps_A	unitless	Allometric scaling constant used to calculate water ingestion rate based on body weight
Scaling constant B - water ingestion rate	WaterIngProps_B	unitless	Allometric scaling constant used to calculate water ingestion rate based on body weight
Soil ingestion rate (user supplied) (IN_{Ss})	SoilIngestionRate_UserSupplied	kg[soil dry wt]/kg[body wet wt]-day	Total amount of soil eaten per day, scaled to body weight (input used only if option selected - otherwise calculated from fraction diet-soil and food ingestion rate)
Use calculated soil ingestion rate (boolean)	UseSoilFractionofDryDietToCalculateSoilIngestionRate	true = yes, false = no	Switch used to allow option of user-supplied value or model calculations for soil ingestion rate

[a]TRIM.FaTE Public Reference Library currently includes the following semi-aquatic animal compartment types: Semi-aquatic Insectivore - Tree Swallow, Semi-aquatic Omnivore - Mallard, Semi-aquatic Omnivore - Mink, Semi-aquatic Omnivore - Raccoon, Semi-aquatic Piscivore - Common Loon, Semi-aquatic Piscivore - Kingfisher, and Semi-aquatic Predator/Scavenger - Bald Eagle.

Chemical-Dependent -- Biotic

Semi-aquatic Animal Compartment Types[a]

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Assimilation efficiency for inhalation (AE_{Air})	InhalationAssimilationEfficiency	unitless	Fraction of amount of chemical breathed that is actually absorbed by the animal	all
Assimilation efficiency from arthropods (AE_{Arth})	AssimilationEfficiencyFromArthropods	unitless	Fraction of amount of chemical in arthropods eaten that is actually absorbed by the animal	all
Assimilation efficiency from food (AE_{Twl})(AE_{Fish})[b]	AssimilationEfficiencyFromFood	unitless	Fraction of amount of chemical in food eaten that is actually absorbed by the animal	all
Assimilation efficiency from soils (AE_S)	AssimilationEfficiencyFromSoils	unitless	Fraction of amount of chemical in soils eaten that is actually absorbed by the animal	all
Assimilation efficiency from terrestrial plants (AE_{Plant})	AssimilationEfficiencyFromPlants	unitless	Fraction of amount of chemical in terrestrial plants eaten that is actually absorbed by the animal	all
Assimilation efficiency from water (AE_W)	AssimilationEfficiencyFromWater	unitless	Fraction of amount of chemical in drinking water that is actually absorbed by the animal	all
Assimilation efficiency from worms (AE_{Worm})	AssimilationEfficiencyFromWorms	unitless	Fraction of amount of chemical in worms eaten that is actually absorbed by the animal	all
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Semiaquatic animal concentration at beginning of modeling period (wet wt basis)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2
Total elimination rate (k_{ET})	TotalExcretionRate	1/day	First-order rate constant for elimination of chemical from the body (in urine, feces, feathers, fur)	Hg species

[a]TRIM.FaTE currently includes the following semi-aquatic animal compartment types: Semi-aquatic Insectivore - Tree Swallow, Semi-aquatic Omnivore - Mallard, Semi-aquatic Omnivore - Mink, Semi-aquatic Omnivore - Raccoon, Semi-aquatic Piscivore - Common Loon, Semi-aquatic Piscivore - Kingfisher, and Semi-aquatic Predator/Scavenger - Bald Eagle.

[b]TSD uses two symbols, one for terrestrial wildlife and one for fish.

Chemical-Independent -- Biotic

Aquatic Animal Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Benthic Invertebrate Compartment Type			
Biomass per water area	BiomassPerArea_kg_m2	kg/m^2	Mass of benthic invertebrates per unit surface water area
Body weight (BW) or (m_{BI})	BW	kg[inv wet wt]	Mass of individual organisms comprising the benthic invertebrate compartment (wet wt)
All Fish Compartment Types[a]			
Body weight (BW) or (m_f)	BW	kg[fish wet wt]	Mass of individual fish (wet wt)
Fraction diet - algae (P^{Algae})	FractionDietAlgae	unitless	Fraction of food diet comprised of algae
Fraction diet - benthic carnivores (P^{Fbc})	FractionDietFishbenthiccarnivore	unitless	Fraction of food diet comprised of benthic carnivore
Fraction diet - benthic invertebrates (P^{BI})	FractionDietBenthicInvertebrate	unitless	Fraction of food diet comprised of benthic invertebrate
Fraction diet - benthic omnivores (P^{Fbo})	FractionDietFishbenthicomnivore	unitless	Fraction of food diet comprised of benthic omnivore
Fraction diet - macrophyte (P^{Mp})	FractionDietMacrophyte	unitless	Fraction of food diet comprised of macrophyte
Fraction diet - water-column herbivores (P^{Fwch})	FractionDietFishherbivore	unitless	Fraction of food diet comprised of water-column herbivore
Fraction diet - water-column omnivores (P^{Fwco})	FractionDietFishomnivore	unitless	Fraction of food diet comprised of water-column omnivore
Fraction lipid weight (f_{lipid})	FishLipidFraction	kg[lipid]/kg[fish wet wt]	Mass fraction of fish that is lipid (wet wt basis)
Fraction specific compartment diet [Link property]	FractionSpecificCompartmentDiet	unitless	Fraction of food diet originating from a specific compartment; for a given compartment, must sum to 1.0 across all links
Population per water area	NumberofFishperSquareMeter	$\#/m^2$	Number of fish per unit surface water area

[a]TRIM.FaTE Public Reference Library currently includes the following fish compartment types: Benthic Carnivore, Benthic Omnivore, Water-column Carnivore, Water-column Herbivore, and Water-column Omnivore.

Chemical-Dependent -- Biotic

Aquatic Animal Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Benthic Invertebrate Compartment Type				
Alpha (α)	SedimentPartitioning_AlphaofEquilibrium	unitless	Proportion of equilibrium value reached	all
Benthic invertebrate-bulk sediment partition coefficient ($K_{BI\text{-}Sed}$)	SedimentPartitioning_PartitionCoefficient	kg[bulk sediment]/kg[invert wet wt] or L[sediment pore water]/kg[invert wet wt]	Equilibrium ratio of concentration in benthic invertebrate to concentration in either bulk (wet wt) sediment or sediment pore water, depending on whether the partition coefficient is based on bulk sediment or sediment pore water (user must select corresponding algorithm)	Hg species, dioxins/furans
Clearance constant (CL_u)	ClearanceConstant	L[water cleared]/kg[invert wet wt]-hr	Rate of water passing over respiratory surface scaled to benthic invertebrate mass	PAHs
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Benthic invertebrate concentration at beginning of modeling period (wet wt basis)	all
Proportionality constant (p_c)	V_d	L[water]/kg[invert wet wt]	Ratio of concentration in benthic invertebrate to concentration in water	PAHs
talpha (t_α)	SedimentPartitioning_TimeToReachAlphaofEquilibrium	day	Time to reach 100α percent of equilibrium	all
All Fish Compartment Types[a]				
Assimilation efficiency from diet (food) (AE_D)	AssimilationEfficiencyFromFood	unitless	Fraction of amount of chemical in food eaten that is actually absorbed by the fish	all
Assimilation efficiency from diet (plants) (AE_D)	AssimilationEfficiencyFromPlants	unitless	Fraction of amount of chemical in terrestrial plants eaten that is actually absorbed by the fish	all
Demethylation rate (k_{Dm})	DemethylationRate	1/day	First-order rate constant for demethylation (MHg→Hg2)	MHg

Chemical-Dependent -- Biotic

Aquatic Animal Compartment Types

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
Elimination adjustment factor	HowMuchFasterHgEliminationIsThanForMHg	unitless	Factor used to adjust experimental data on elimination rate for MHg to estimate elimination rates for Hg0 and Hg2	Hg species
Fish Chemical Uptake Rate via Gill	FishChemicalUptake RateviaGill	L[water]/kg[fish wet wt]-day	Fish uptake rate of chemical via gill (equivalent to fish ventilation rate)	dioxins
Gamma_fish (γ_{ASF})	Gamma_fish	unitless	Allometric scaling factor used in estimating gill uptake	organics
Gill Elimination Rate	GillEliminationRate	1/day	Rate constant for chemical elimination from fish to water via gills	TCDD
Half-life *(half-life)*	Halflife	day	Length of time for chemical amount to be reduced by one-half by degradation reactions	organics
Initial concentration	initialConcentration_g_per_kg_UserSupplied	g/kg	Fish concentration at beginning of modeling period (wet wt basis)	all
Methylation rate (k_M)	MethylationRate	1/day	First-order rate constant for methylation (Hg2→MHg)	Hg2
Oxidation rate (k_O)	OxidationRate	1/day	First-order rate constant for oxidation (Hg0→Hg2)	Hg0
Reduction rate (k_R)	ReductionRate	1/day	First-order rate constant for reduction (Hg2→Hg0)	Hg2

[a]TRIM.FaTE currently includes the following fish compartment types: Benthic Carnivore, Benthic Omnivore, Water-column Carnivore, Water-column Herbivore, and Water-column Omnivore.

Chemical-Dependent -- Independent of Compartment Type[a]

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description	Applicable Chemicals
CAS number	CAS	n/a	Unique Chemical Abstract Service (CAS) number for a chemical; used in "downstream" TRIM modules	all
Diffusion coefficient in pure air (D_{air})	D_pureair	m^2[air]/day	Coefficient that (when combined with chemical concentration) predicts how quickly a chemical spreads out in gas phase due to diffusion	all
Diffusion coefficient in pure water (D_{water})	D_purewater	m^2[water]/day	Coefficient that (when combined with chemical concentration) predicts how quickly a chemical spreads out in aqueous phase due to diffusion	all
Henry's Law constant (H)	HenryLawConstant	Pa-m^3 /mol	Ratio of the aqueous-phase concentration of a chemical to its equilibrium partial pressure in the gas phase	all
Melting point (T_m)	MeltingPoint	degrees K	Temperature at which a solid becomes a liquid at standard atmospheric pressure	all
Molecular weight (M_w)	molecularWeight	g/mol	Weight of 1 mole of the chemical	all
Octanol-water partition coefficient (K_{OW})	K_ow	L[water]/kg[octanol]	Equilibrium ratio of concentration dissolved in octanol to concentration dissolved in water	all
Reference bird body weight (BW(Ref))	ReferenceBird_BodyWeight	kg	Mass of individual reference bird used for allometric scaling of degradation rate	organics
Reference bird chemical degradation rate($k_{degradation}$)	ReferenceBird_GeneralDegradation Rate	1/day	First-order rate constant for chemical degradation in reference bird used for allometric scaling of degradation rate	organics
Reference bird elimination rate	ReferenceBird_EliminationRate	1/day	First-order rate constant for elimination of chemical from the body (terrestrial birds)	organics
Reference mammal body weight (BW(Ref))	ReferenceMammal_BodyWeight	kg	Mass of individual reference mammal used for allometric scaling of degradation rate	organics
Reference mammal chemical degradation rate ($k_{degradation}$)	ReferenceMammal_GeneralDegradationRate	1/day	First-order rate constant for chemical degradation in reference mammal used for allometric scaling of degradation rate	organics
Reference mammal elimination rate	ReferenceMammal_EliminationRate	1/day	First-order rate constant for elimination of chemical from the body (terrestrial mammals)	organics
Vapor washout ratio (w_{rV})	VaporWashoutRatio	m^3[air]/m^3[rain]	Precipitation scavenging ratio for vapors (ratio of concentration in rain to concentration in vapor form in air); used in estimating wet deposition of vapors	Hg species

[a]All parameters in this table are TRIM.FaTE chemical properties.

Source, Meteorological, and Other Input Data and Settings

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Source Inputs (all TRIM.FaTE source properties)[a]			
Emission rate (needed for each chemical emitted)	emissionRate	g/day	Quantity of chemical emitted from the source per unit time
Source location	X, Y	x and y spatial coordinates	X-and Y-coordinates of the source (can be designated as UTM or latitude/longitude)
Source height	elevation	m	Height of the emission point(s) above ground level
Meteorological Inputs (all TRIM.FaTE scenario properties)[b]			
Air temperature (T)	AirTemperature_K	degrees K	Temperature of the air
Horizontal wind speed (v or μ)[c]	horizontalWindSpeed	m/sec	Wind speed horizontally between volume elements
Wind direction (ϑ)	windDirection	degrees clockwise from N (blowing from)	Direction from which the wind is blowing (degrees clockwise from due north)
Rainfall rate (rain)	Rain	m^3[rain]/m^2[surface area]-day	Amount of precipitation per unit surface area and unit time
Day/night (IsDay)	isDay	1=day, 0=night	Day/night switch; used for certain plant algorithms (can be set to a fraction between 0 and 1 for steady-state modeling)
Other Settings (all TRIM.FaTE scenario properties)			
Start of simulation	simulationBeginDateTime	date/time	The starting date and time for the modeling period
End of simulation	simulationEndDateTime	date/time	The inclusive ending date and time for the modeling period
Fraction of initial concentrations	FractionInitialConcentrations	unitless	Fraction of initial concentration in each compartment to be included in model simulation; typically set to 0 or 1.0 (used as a convenient way to turn all initial concentrations on or off)
Simulation time step	simulationTimeStep	hr	The duration (hours) of each time increment at which the model calculates and stores a new moles/mass distribution; must be an integer value

Parameter Name (TSD Symbol)	TRIM FaTE Code Name	Input Units	Description
Output time step[d]	N/A	hr	The time increment at which the model reports a new moles/mass distribution (based on distributions calculated at simulation time steps); must be an integer value and evenly divisible by the selected simulation time step

[a]Separate source inputs are needed for each source modeled.

[b]The meteorological parameter “mixing height” is not required for any algorithms, but can be used to set the vertical boundary (top) of a layer of air volume elements. The meteorological parameter “stability class” is not currently used in any algorithms, but may be in the future and is a required model input (named stabilityClass, input as an integer value of 1 through 6, representing stability classes A through F, respectively). (Because it is not currently used in any algorithms, dummy values may be used as inputs, if desired).

[c]When multiple layers of air compartments are modeled, vertical wind speed (m/sec, positive for up and negative for down) is also an input parameter. To date, the modeling of multiple air layers in TRIM.FaTE has not been fully implemented and tested.

[d]Not a direct model input, but set using the scenario property, simulationStepsPerOutput (simulationStepsPerOutput is determined by dividing the desired output time step by the selected simulation time step).

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