!Dababase for NGBGC
!plant group

```
→ cpool(p)  !psnsun_to_cpool
→ cpool(p)  !psnshade_to_cpool
cpool(p) →  leafc(p)  !cpool_to_leafc
cpool(p) →  leafc_storage(p)  !cpool_to_leafc_storage
cpool(p) →  frootc(p)  !cpool_to_frootc
cpool(p) →  frootc_storage(p)  !cpool_to_frootc_storage
cpool(p) →  livestemc(p)  !cpool_to_livestemc woody&generic
cpool(p) →  livestemc_storage(p)  !cpool_to_livestemc_storage woody&generic
cpool(p) →  grainc(p)  !cpool_to_grainc generic
cpool(p) →  grainc_storage(p)  !cpool_to_grainc_storage generic
cpool(p) →  deadstemc(p)  !cpool_to_deadstemc woody
cpool(p) →  deadstemc_storage(p)  !cpool_to_deadstemc_storage woody
cpool(p) →  livecrootc(p)  !cpool_to_livecrootc woody
cpool(p) →  livecrootc_storage(p)  !cpool_to_livecrootc_storage woody
cpool(p) →  deadcrootc(p)  !cpool_to_deadcrootc woody
cpool(p) →  deadcrootc_storage(p)  !cpool_to_deadcrootc_storage woody
cpool(p) → !cpool_leaf_gr
cpool(p) → !cpool_froot_gr
cpool(p) → !cpool_livestem_gr woody&generic
cpool(p) → !cpool_deadstem_gr woody
cpool(p) → !cpool_livecroot_gr woody
cpool(p) → !cpool_deadcroot_gr woody
cpool(p) → !cpool_grain_gr generic
cpool(p) → !leaf_curmr
cpool(p) → !froot_curmr
cpool(p) → !livestem_curmr woody&generic
cpool(p) → !livecroot_curmr woody
cpool(p) → xsmrpool(p)  !cpool_to_xsmrpool
cpool(p) → !cpool_leaf_storage_gr
cpool(p) → !cpool_froot_storage_gr
cpool(p) → !cpool_livestem_storage_gr woody&generic
cpool(p) → !cpool_deadstem_storage_gr woody
cpool(p) → !cpool_livecroot_storage_gr woody
cpool(p) → !cpool_deadcroot_storage_gr woody
cpool(p) → !cpool_grain_storage_gr generic
cpool(p) →  gresp_storage(p)   !cpool_to_gresp_storage
leafc_xfer(p) →  leafc(p)  !leafc_xfer_to_leafc
frootc_xfer(p) →  frootc(p)  !frootc_xfer_to_frootc
livestemc_xfer(p) → livestemc(p)  !livestemc_xfer_to_livestemc woody
deadstemc_xfer(p) → deadstemc(p)  !deadstemc_xfer_to_deadstemc woody
livecrootc_xfer(p) → livecrootc(p)  !livecrootc_xfer_to_livecrootc woody
deadcrootc_xfer(p) → deadcrootc(p)  !deadcrootc_xfer_to_deadcrootc woody
grainc(p) → grainc_xfer(p)  !grainc_xfer_to_grainc generic
livestemc(p) → deadstemc(p)  !livestemc_to_deadstemc woody
livecrootc(p) → deadcrootc(p)  !livecrootc_to_deadcrootc woody
xsmrpool(p) → !leaf_xsmr
xsmrpool(p) → !froot_xsmr
xsmrpool(p) → !livestem_xsmr woody&generic
xsmrpool(p) → !livecroot_xsmr woody
xsmrpool(p) → !grain_xsmr generic
xsmrpool(p) → !xsmrpool_to_atm generic
gresp_xfer(p) → !transfer_leaf_gr
gresp_xfer(p) → !transfer_froot_gr
gresp_xfer(p) → !transfer_livestem_gr woody&generic
```

```
gresp_xfer(p) → !transfer_deadstem_gr woody
gresp_xfer(p) → !transfer_livecroot_gr woody
gresp_xfer(p) → !transfer_deadcroot_gr woody
gresp_xfer(p) → !transfer_grain_gr generic
leafc_storage(p) → leafc_xfer(p)  !leafc_storage_to_xfer
frootc_storage(p) → frootc_xfer(p)  !frootc_storage_to_xfer
livestemc_storage(p) → livestemc_xfer(p)  !livestemc_storage_to_xfer
woody&generic
deadstemc_storage(p) → deadstemc_xfer(p)  !deadstemc_storage_to_xfer woody
livecrootc_storage(p) → livecrootc_xfer(p) !livecrootc_storage_to_xfer woody
deadcrootc_storage(p) → deadcrootc_xfer(p) !deadcrootc_storage_to_xfer woody
gresp_storage(p) → gresp_xfer(p)  !gresp_storage_to_xfer woody
grainc_storage(p) → grainc_xfer(p)  !grainc_storage_to_xfer generic
```

!plant to soil group

```
leafc(p) → litr_met_c(c)  !leafc_to_litr_met_c linkto leafc_to_litter
leafc(p) → litr_cel_c(c)  !leafc_to_litr_cel_c  inactivate
leafc(p) → litr_lig_c(c)  !leafc_to_litr_lig_c  inactivate
frootc(p) → litr_met_c(c)  !frootc_to_litr_met_c linkto frootc_to_litter
frootc(p) → litr_cel_c(c)  !frootc_to_litr_cel_c inactivate
frootc(p) → litr_lig_c(c)  !frootc_to_litr_lig_c inactivate
livestemc(p) → litr_met_c(c)  !livestemc_to_litr_met_c linkto
livestemc_to_litter crop_prog
livestemc(p) → litr_cel_c(c)  !livestemc_to_litr_cel_c inactivate crop_prog
livestemc(p) → litr_lig_c(c)  !livestemc_to_litr_lig_c inactivate crop_prog
grainc(p) → litr_met_c(c)  !grainc_to_litr_met_c linkto grainc_to_food crop_prog
grainc(p) → litr_cel_c(c)  !grainc_to_litr_cel_c inactivate crop_prog
grainc(p) → litr_lig_c(c)  !grainc_to_litr_lig_c inactivate crop_prog
```

!soil group

```
seedc(c) → !dwt_seedc_to_leaf
seedc(c) → !dwt_seedc_to_deadstem
→ litr_met_c(c)  !dwt_frootc_to_litr_met_c
→ litr_cel_c(c)  !dwt_frootc_to_litr_cel_c
→ litr_lig_c(c)  !dwt_frootc_to_litr_lig_c
→ cwdc(c)  !dwt_livecrootc_to_cwdc
→ cwdc(c)  !dwt_deadcrootc_to_cwdc
litr_met_c(c) + litr_met_n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr1 BGC
litr_cel_c(c) + litr_cel_n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr2 BGC
litr_lig_c(c) + litr_lig_n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr3 BGC
soil1c(c) + soil1n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr4 BGC
soil2c(c) + soil2n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr5 BGC
soil3c(c) + soil3n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr6 BGC
soil4c(c) + soil4n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr7 BGC
cwdc(c) + cwdn(c) → litr_cel_c(c) + litr_cel_n(c)  !decomp_cascade_ctransfer_vr8
BGC
cwdc(c) + cwdn(c) → litr_lig_c(c) + litr_lig_n(c)  !decomp_cascade_ctransfer_vr9
BGC
smin_n(c) + litr_met_c(c) + litr_met_n(c) → soil1c(c) + soil1n(c)
!decomp_cascade_ctransfer_vr1 BGC
smin_n(c) + litr_cel_c(c) + litr_cel_n(c) → soil2c(c) + soil2n(c)
!decomp_cascade_ctransfer_vr2 BGC
smin_n(c) + litr_lig_c(c) + litr_lig_n(c) → soil3c(c) + soil3n(c)
!decomp_cascade_ctransfer_vr3 BGC
smin_n(c) + soil1c(c) + soil1n(c) → soil2c(c) + soil2n(c)
!decomp_cascade_ctransfer_vr4 BGC
smin_n(c) + soil2c(c) + soil2n(c) → soil3c(c) + soil3n(c)
!decomp_cascade_ctransfer_vr5 BGC
```

```
smin_n(c) + soil3c(c) + soil3n(c) → soil4c(c) + soil4n(c)
!decomp_cascade_ctransfer_vr6 BGC
litr_met_c(c) + litr_met_n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr1
century
litr_cel_c(c) + litr_cel_n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr2
century
litr_lig_c(c) + litr_lig_n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr3
century
soil1c(c) + soil1n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr13 century
soil1c(c) + soil1n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr14 century
soil2c(c) + soil2n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr15 century
soil2c(c) + soil2n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr16 century
soil3c(c) + soil3n(c) → smin_n(c) + co2(c)  !decomp_cascade_hr_vr17 century
cwdc(c) + cwdn(c) → litr_cel_c(c) + litr_cel_n(c)  !decomp_cascade_ctransfer_vr8
century
cwdc(c) + cwdn(c) → litr_lig_c(c) + litr_lig_n(c)  !decomp_cascade_ctransfer_vr9
century
smin_n(c) + litr_met_c(c) + litr_met_n(c) → soil1c(c) + soil1n(c)
!decomp_cascade_ctransfer_vr1 century
smin_n(c) + litr_cel_c(c) + litr_cel_n(c) → soil2c(c) + soil2n(c)
!decomp_cascade_ctransfer_vr2 century
smin_n(c) + litr_lig_c(c) + litr_lig_n(c) → soil3c(c) + soil3n(c)
!decomp_cascade_ctransfer_vr3 century
smin_n(c) + soil1c(c) + soil1n(c) → soil2c(c) + soil2n(c)
!decomp_cascade_ctransfer_vr13 century
smin_n(c) + soil1c(c) + soil1n(c) → soil3c(c) + soil3n(c)
!decomp_cascade_ctransfer_vr14 century
smin_n(c) + soil2c(c) + soil2n(c) → soil3c(c) + soil3n(c)
!decomp_cascade_ctransfer_vr15 century
smin_n(c) + soil2c(c) + soil2n(c) → soil1c(c) + soil1n(c)
!decomp_cascade_ctransfer_vr16 century
smin_n(c) + soil3c(c) + soil3n(c) → soil1c(c) + soil1n(c)
!decomp_cascade_ctransfer_vr17 century
```

!plant group - gap-phase mortality

```
livestemc(p) → !m_livestemc_to_litter
deadstemc(p) → !m_deadstemc_to_litter
livecrootc(p) → !m_livecrootc_to_litter
deadcrootc(p) → !m_deadcrootc_to_litter
leafc_storage(p) → !m_leafc_storage_to_litter
frootc_storage(p) → !m_frootc_storage_to_litter
livestemc_storage(p) →  !m_livestemc_storage_to_litter
deadstemc_storage(p) → !m_deadstemc_storage_to_litter
livecrootc_storage(p) → !m_livecrootc_storage_to_litter
deadcrootc_storage(p) → !m_deadcrootc_storage_to_litter
gresp_storage(p) → !m_gresp_storage_to_litter
leafc_xfer(p) → !m_leafc_xfer_to_litter
frootc_xfer(p) → !m_frootc_xfer_to_litter
livestemc_xfer(p) → !m_livestemc_xfer_to_litter
deadstemc_xfer(p) → !m_deadstemc_xfer_to_litter
livecrootc_xfer(p) → !m_livecrootc_xfer_to_litter
deadcrootc_xfer(p) → !m_deadcrootc_xfer_to_litter
gresp_xfer(p) → !m_gresp_xfer_to_litter
```

!plant to soil group – gap-phase mortality

```
leafc(p) → litr_met_c(c)  !m_leafc_to_litr_met_c linkto m_leafc_to_litter
leafc(p) → litr_cel_c(c)  !m_leafc_to_litr_cel_c inactivate
leafc(p) → litr_lig_c(c)  !m_leafc_to_litr_lig_c inactivate
```

```
frootc(p) → litr_met_c(c)  !m_frootc_to_litr_met_c linkto m_frootc_to_litter
frootc(p) → litr_cel_c(c)  !m_frootc_to_litr_cel_c inactivate
frootc(p) → litr_lig_c(c)  !m_frootc_to_litr_lig_c inactivate
```

!soil group - gap-phase mortality

```
→ cwdc(c)  !m_livestemc_to_cwdc
→ cwdc(c)  !m_deadstemc_to_cwdc
→ cwdc(c)  !m_livecrootc_to_cwdc
→ cwdc(c)  !m_deadcrootc_to_cwdc
→ litr_met_c(c)  !m_leafc_storage_to_litr_met_c
→ litr_met_c(c)  !m_frootc_storage_to_litr_met_c
→ litr_met_c(c)  !m_livestemc_storage_to_litr_met_c
→ litr_met_c(c)  !m_deadstemc_storage_to_litr_met_c
→ litr_met_c(c)  !m_livecrootc_storage_to_litr_met_c
→ litr_met_c(c)  !m_deadcrootc_storage_to_litr_met_c
→ litr_met_c(c)  !m_gresp_storage_to_litr_met_c
→ litr_met_c(c)  !m_leafc_xfer_to_litr_met_c
→ litr_met_c(c)  !m_frootc_xfer_to_litr_met_c
→ litr_met_c(c)  !m_livestemc_xfer_to_litr_met_c
→ litr_met_c(c)  !m_deadstemc_xfer_to_litr_met_c
→ litr_met_c(c)  !m_livecrootc_xfer_to_litr_met_c
→ litr_met_c(c)  !m_deadcrootc_xfer_to_litr_met_c
→ litr_met_c(c)  !m_gresp_xfer_to_litr_met_c
```

!plant group - harvest mortality

```
livestemc(p) → !hrv_livestemc_to_litter
deadstemc(p) → !hrv_deadstemc_to_prod10c
deadstemc(p) → !hrv_deadstemc_to_prod100c
livecrootc(p) → !hrv_livecrootc_to_litter
deadcrootc(p) → !hrv_deadcrootc_to_litter
xsmrpool(p) → !hrv_xsmrpool_to_atm
leafc_storage(p) → !hrv_leafc_storage_to_litter
frootc_storage(p) → !hrv_frootc_storage_to_litter
livestemc_storage(p) → !hrv_livestemc_storage_to_litter
deadstemc_storage(p) → !hrv_deadstemc_storage_to_litter
livecrootc_storage(p) → !hrv_livecrootc_storage_to_litter
deadcrootc_storage(p) → !hrv_deadcrootc_storage_to_litter
gresp_storage(p) → !hrv_gresp_storage_to_litter
leafc_xfer(p) → !hrv_leafc_xfer_to_litter
frootc_xfer(p) → !hrv_frootc_xfer_to_litter
livestemc_xfer(p) → !hrv_livestemc_xfer_to_litter
deadstemc_xfer(p) → !hrv_deadstemc_xfer_to_litter
livecrootc_xfer(p) → !hrv_livecrootc_xfer_to_litter
deadcrootc_xfer(p) → !hrv_deadcrootc_xfer_to_litter
gresp_xfer(p) → !hrv_gresp_xfer_to_litter
```

!plant to soil group - harvest mortality

```
leafc(p) → litr_met_c(c)  !hrv_leafc_to_litr_met_c linkto hrv_leafc_to_litter
leafc(p) → litr_cel_c(c)  !hrv_leafc_to_litr_cel_c inactivate
leafc(p) → litr_lig_c(c)  !hrv_leafc_to_litr_lig_c inactivate
frootc(p) → litr_met_c(c)  !hrv_frootc_to_litr_met_c linkto hrv_frootc_to_litter
frootc(p) → litr_cel_c(c)  !hrv_frootc_to_litr_cel_c inactivate
frootc(p) → litr_lig_c(c)  !hrv_frootc_to_litr_lig_c inactivate
```

!soil group - harvest mortality

```
→ cwdc(c)  !hrv_livestemc_to_cwdc
→ cwdc(c)  !hrv_livecrootc_to_cwdc
→ cwdc(c)  !hrv_deadcrootc_to_cwdc
→ litr_met_c(c)  !hrv_leafc_storage_to_litr_met_c
→ litr_met_c(c)  !hrv_frootc_storage_to_litr_met_c
```

```
→ litr_met_c(c)  !hrv_livestemc_storage_to_litr_met_c
→ litr_met_c(c)  !hrv_deadstemc_storage_to_litr_met_c
→ litr_met_c(c)  !hrv_livecrootc_storage_to_litr_met_c
→ litr_met_c(c)  !hrv_deadcrootc_storage_to_litr_met_c
→ litr_met_c(c)  !hrv_gresp_storage_to_litr_met_c
→ litr_met_c(c)  !hrv_leafc_xfer_to_litr_met_c
→ litr_met_c(c)  !hrv_frootc_xfer_to_litr_met_c
→ litr_met_c(c)  !hrv_livestemc_xfer_to_litr_met_c
→ litr_met_c(c)  !hrv_deadstemc_xfer_to_litr_met_c
→ litr_met_c(c)  !hrv_livecrootc_xfer_to_litr_met_c
→ litr_met_c(c)  !hrv_deadcrootc_xfer_to_litr_met_c
→ litr_met_c(c)  !hrv_gresp_xfer_to_litr_met_c
```

!plant group - fire mortality

```
leafc(p) → !m_leafc_to_fire mortality
frootc(p) → !m_frootc_to_fire mortality
livestemc(p) → !m_livestemc_to_fire mortality
deadstemc(p) → !m_deadstemc_to_fire mortality
livecrootc(p) → !m_livecrootc_to_fire mortality
deadcrootc(p) → !m_deadcrootc_to_fire mortality
deadcrootc(p) → !m_deadcrootc_to_litter_fire mortality
leafc_storage(p) → !m_leafc_storage_to_fire mortality
frootc_storage(p) → !m_frootc_storage_to_fire mortality
livestemc_storage(p) → !m_livestemc_storage_to_fire mortality
deadstemc_storage(p) → !m_deadstemc_storage_to_fire mortality
livecrootc_storage(p) → !m_livecrootc_storage_to_fire mortality
deadcrootc_storage(p) → !m_deadcrootc_storage_to_fire mortality
gresp_storage(p) → !m_gresp_storage_to_fire mortality
leafc_xfer(p) → !m_leafc_xfer_to_fire mortality
frootc_xfer(p) → !m_frootc_xfer_to_fire mortality
livestemc_xfer(p) → !m_livestemc_xfer_to_fire mortality
deadstemc_xfer(p) → !m_deadstemc_xfer_to_fire mortality
livecrootc_xfer(p) → !m_livecrootc_xfer_to_fire mortality
deadcrootc_xfer(p) → !m_deadcrootc_xfer_to_fire mortality
gresp_xfer(p) → !m_gresp_xfer_to_fire mortality
```

!soil group - fire mortality mortality

```
→ cwdc(c)  !m_deadstemc_to_cwdc_fire mortality
→ cwdc(c)  !m_deadcrootc_to_cwdc_fire mortality
litr_met_c(c) → !m_decomp_cpools_to_fire mortality_vr1
litr_cel_c(c) → !m_decomp_cpools_to_fire mortality_vr2
litr_lig_c(c) → !m_decomp_cpools_to_fire mortality_vr3
cwdc(c) → !m_decomp_cpools_to_fire mortality_vr4
!
```

!nitrogen pathways

!

!plant group

```
→ npool(p)  !sminn_to_npool
npool(p) → leafn(p)  !npool_to_leafn
npool(p) → leafn_storage(p)  !npool_to_leafn_storage
npool(p) → frootn(p)  !npool_to_frootn
npool(p) → frootn_storage(p)  !npool_to_frootn_storage
npool(p) → livestemn(p)  !npool_to_livestemn woody&generic
npool(p) → livestemn_storage(p)  !npool_to_livestemn_storage woody&generic
npool(p) → deadstemn(p)  !npool_to_deadstemn woody
npool(p) → deadstemn_storage(p)  !npool_to_deadstemn_storage woody
npool(p) → livecrootn(p)  !npool_to_livecrootn woody
npool(p) → livecrootn_storage(p)  !npool_to_livecrootn_storage woody
```

```
npool(p) → deadcrootn(p)  !npool_to_deadcrootn woody
npool(p) → deadcrootn_storage(p)  !npool_to_deadcrootn_storage woody
npool(p) → grainn(p)  !npool_to_grainn generic
npool(p) → grainn_storage(p)  !npool_to_grainn_storage generic
leafn_xfer(p) → leafn(p)  !leafn_xfer_to_leafn
frootn_xfer(p) → frootn(p)  !frootn_xfer_to_frootn
livestemn_xfer(p) → livestemn(p)  !livestemn_xfer_to_livestemn woody&generic
deadstemn_xfer(p) → deadstemn(p)  !deadstemn_xfer_to_deadstemn woody&generic
livecrootn_xfer(p) → livecrootn(p)  !livecrootn_xfer_to_livecrootn
deadcrootn_xfer(p) → deadcrootn(p)  !deadcrootn_xfer_to_deadcrootn
grainn_xfer(p) → grainn(p)  !grainn_xfer_to_grainn generic
leafn(p) → retransn(p)  !leafn_to_retransn
livestemn(p) → deadstemn(p)  !livestemn_to_deadstemn woody
livestemn(p) → retransn(p)  !livestemn_to_retransn woody&generic
livecrootn(p) → deadcrootn(p)  !livecrootn_to_deadcrootn woody
livecrootn(p) → retransn(p)  !livecrootn_to_retransn woody
grainn(p) → !grainn_to_food
retransn(p) → npool(p)  !retransn_to_npool
leafn_storage(p) → leafn_xfer(p)  !leafn_storage_to_xfer
frootn_storage(p) → frootn_xfer(p)  !frootn_storage_to_xfer
livestemn_storage(p) → livestemn_xfer(p)  !livestemn_storage_to_xfer
woody&generic
deadstemn_storage(p) → deadstemn_xfer(p)  !deadstemn_storage_to_xfer woody
livecrootn_storage(p) → livecrootn_xfer(p)  !livecrootn_storage_to_xfer woody
deadcrootn_storage(p) → deadcrootn_xfer(p)  !deadcrootn_storage_to_xfer woody
grainn_storage(p) → grainn_xfer(p)  !grainn_storage_to_xfer generic
```

!plant to soil group

```
leafn(p) → litr_met_n(c)  !leafn_to_litr_met_n linkto leafn_to_litter
leafn(p) → litr_cel_n(c)  !leafn_to_litr_cel_n inactivate
leafn(p) → litr_lig_n(c)  !leafn_to_litr_lig_n inactivate
frootn(p) → litr_met_n(c)  !frootn_to_litr_met_n linkto frootn_to_litter
frootn(p) → litr_cel_n(c)  !frootn_to_litr_cel_n inactivate
frootn(p) → litr_lig_n(c)  !frootn_to_litr_lig_n inactivate
livestemn(p) → litr_met_n(c)  !livestemn_to_litr_met_n linkto
livestemn_to_litter crop_prog
livestemn(p) → litr_cel_n(c)  !livestemn_to_litr_cel_n inactivate crop_prog
livestemn(p) → litr_lig_n(c)  !livestemn_to_litr_lig_n inactivate crop_prog
grainn(p) → litr_met_n(c)  !grainn_to_litr_met_n linkto grainn_to_food crop_prog
grainn(p) → litr_cel_n(c)  !grainn_to_litr_cel_n inactivate crop_prog
grainn(p) → litr_lig_n(c)  !grainn_to_litr_lig_n inactivate crop_prog
```

!soil group

```
→ smin_n(c)  !ndep_to_sminn_vr non_nitrification
→ smin_n(c)  !nfix_to_sminn_vr non_nitrification
→ smin_nh4_vr(c)  !ndep_to_sminn_vr nitrif_denitrif
→ smin_nh4_vr(c)  !nfix_to_sminn_vr nitrif_denitrif
→ smin_n(c) !fert_to_sminn_vr crop_prog non_nitrification
→ smin_n(c) !soyfixn_to_sminn_vr crop_prog non_nitrification
→ smin_nh4_vr(c) !fert_to_sminn_vr crop_prog nitrif_denitrif
→ smin_nh4_vr(c) !soyfixn_to_sminn_vr crop_prog nitrif_denitrif
seedn(c) → !dwt_seedn_to_leaf
seedn(c) → !dwt_seedn_to_deadstem
→ litr_met_n(c)  !dwt_frootn_to_litr_met_n
→ litr_cel_n(c)  !dwt_frootn_to_litr_cel_n
→ litr_lig_n(c)  !dwt_frootn_to_litr_lig_n
→ cwdn(c)  !dwt_livecrootn_to_cwdn
→ cwdn(c)  !dwt_deadcrootn_to_cwdn
```

```
smin_n(c) → !sminn_to_denit_decomp_cascade_vr1 non_nitrification BGC
smin_n(c) → !sminn_to_denit_decomp_cascade_vr2 non_nitrification BGC
smin_n(c) → !sminn_to_denit_decomp_cascade_vr3 non_nitrification BGC
smin_n(c) → !sminn_to_denit_decomp_cascade_vr4 non_nitrification BGC
smin_n(c) → !sminn_to_denit_decomp_cascade_vr5 non_nitrification BGC
smin_n(c) → !sminn_to_denit_decomp_cascade_vr6 non_nitrification BGC
smin_n(c) → !sminn_to_denit_decomp_cascade_vr7 non_nitrification BGC
smin_n(c) → !sminn_to_denit_decomp_cascade_vr1 non_nitrification century
smin_n(c) → !sminn_to_denit_decomp_cascade_vr2 non_nitrification century
smin_n(c) → !sminn_to_denit_decomp_cascade_vr3 non_nitrification century
smin_n(c) → !sminn_to_denit_decomp_cascade_vr13 non_nitrification century
smin_n(c) → !sminn_to_denit_decomp_cascade_vr14 non_nitrification century
smin_n(c) → !sminn_to_denit_decomp_cascade_vr15 non_nitrification century
smin_n(c) → !sminn_to_denit_decomp_cascade_vr16 non_nitrification century
smin_n(c) → !sminn_to_denit_decomp_cascade_vr17 non_nitrification century
smin_n(c) → !sminn_to_denit_excess_vr non_nitrification
smin_n(c) → !sminn_to_plant_vr non_nitrification
smin_n(c) → !sminn_leached_vr non_nitrification
→ smin_n(c)  !supplement_to_sminn_vr non_nitrification
```

!plant group - gap-phase mortality

```
livestemn(p) → !m_livestemn_to_litter
deadstemn(p) → !m_deadstemn_to_litter
livecrootn(p) →  !m_livecrootn_to_litter
deadcrootn(p) → !m_deadcrootn_to_litter
retransn(p) → !m_retransn_to_litter
leafn_storage(p) →  !m_leafn_storage_to_litter
frootn_storage(p) → !m_frootn_storage_to_litter
livestemn_storage(p) →  !m_livestemn_storage_to_litter
deadstemn_storage(p) → !m_deadstemn_storage_to_litter
livecrootn_storage(p) →  !m_livecrootn_storage_to_litter
deadcrootn_storage(p) → !m_deadcrootn_storage_to_litter
leafn_xfer(p) → !m_leafn_xfer_to_litter
frootn_xfer(p) → !m_frootn_xfer_to_litter
livestemn_xfer(p) → !m_livestemn_xfer_to_litter
deadstemn_xfer(p) → !m_deadstemn_xfer_to_litter
livecrootn_xfer(p) →  !m_livecrootn_xfer_to_litter
deadcrootn_xfer(p) →  !m_deadcrootn_xfer_to_litter
```

!plant to soil group - gap-phase mortality

```
leafn(p) → litr_met_n(c)  !m_leafn_to_litr_met_n linkto m_leafn_to_litter
activate
leafn(p) → litr_cel_n(c)  !m_leafn_to_litr_cel_n inactivate
leafn(p) → litr_lig_n(c)  !m_leafn_to_litr_lig_n inactivate
frootn(p) → litr_met_n(c)  !m_frootn_to_litr_met_n linkto m_frootn_to_litter
frootn(p) → litr_cel_n(c)  !m_frootn_to_litr_cel_n inactivate
frootn(p) → litr_lig_n(c)  !m_frootn_to_litr_lig_n inactivate
```

!soil group – gap-phase mortality

```
→ cwdn(c)  !m_livestemn_to_cwdn
→ cwdn(c)  !m_deadstemn_to_cwdn
→ cwdn(c)  !m_livecrootn_to_cwdn
→ cwdn(c)  !m_deadcrootn_to_cwdn
→ litr_met_n(c)  !m_retransn_to_litr_met_n
→ litr_met_n(c)  !m_leafn_storage_to_litr_met_n
→ litr_met_n(c)  !m_frootn_storage_to_litr_met_n
→ litr_met_n(c)  !m_livestemn_storage_to_litr_met_n
→ litr_met_n(c)  !m_deadstemn_storage_to_litr_met_n
→ litr_met_n(c)  !m_livecrootn_storage_to_litr_met_n
```

```
→ litr_met_n(c)  !m_deadcrootn_storage_to_litr_met_n
→ litr_met_n(c)  !m_leafn_xfer_to_litr_met_n
→ litr_met_n(c)  !m_frootn_xfer_to_litr_met_n
→ litr_met_n(c)  !m_livestemn_xfer_to_litr_met_n
→ litr_met_n(c)  !m_deadstemn_xfer_to_litr_met_n
→ litr_met_n(c)  !m_livecrootn_xfer_to_litr_met_n
→ litr_met_n(c)  !m_deadcrootn_xfer_to_litr_met_n
```

!plant group - harvest mortality

```
livestemn(p) → !hrv_livestemn_to_litter
deadstemn(p) → !hrv_deadstemn_to_prod10n
deadstemn(p) → !hrv_deadstemn_to_prod100n
livecrootn(p) → !hrv_livecrootn_to_litter
deadcrootn(p) → !hrv_deadcrootn_to_litter
retransn(p) → !hrv_retransn_to_litter
leafn_storage(p) → !hrv_leafn_storage_to_litter
frootn_storage(p) → !hrv_frootn_storage_to_litter
livestemn_storage(p) → !hrv_livestemn_storage_to_litter
deadstemn_storage(p) → !hrv_deadstemn_storage_to_litter
livecrootn_storage(p) → !hrv_livecrootn_storage_to_litter
deadcrootn_storage(p) → !hrv_deadcrootn_storage_to_litter
leafn_xfer(p) → !hrv_leafn_xfer_to_litter
frootn_xfer(p) → !hrv_frootn_xfer_to_litter
livestemn_xfer(p) → !hrv_livestemn_xfer_to_litter
deadstemn_xfer(p) → !hrv_deadstemn_xfer_to_litter
livecrootn_xfer(p) → !hrv_livecrootn_xfer_to_litter
deadcrootn_xfer(p) → !hrv_deadcrootn_xfer_to_litter
```

!plant to soil group - harvest mortality

```
leafn(p) → litr_met_n(c)  !hrv_leafn_to_litr_met_n linkto hrv_leafn_to_litter
activate
leafn(p) → litr_cel_n(c)  !hrv_leafn_to_litr_cel_n inactivate
leafn(p) → litr_lig_n(c)  !hrv_leafn_to_litr_lig_n inactivate
frootn(p) → litr_met_n(c)  !hrv_frootn_to_litr_met_n linkto hrv_frootn_to_litter
frootn(p) → litr_cel_n(c)  !hrv_frootn_to_litr_cel_n inactivate
frootn(p) → litr_lig_n(c)  !hrv_frootn_to_litr_lig_n inactivate
```

!soil group - harvest mortality

```
→ cwdn(c)  !hrv_livestemn_to_cwdn
→ cwdn(c)  !hrv_livecrootn_to_cwdn
→ cwdn(c)  !hrv_deadcrootn_to_cwdn
→ litr_met_n(c)  !hrv_retransn_to_litr_met_n
→ litr_met_n(c)  !hrv_leafn_storage_to_litr_met_n
→ litr_met_n(c)  !hrv_frootn_storage_to_litr_met_n
→ litr_met_n(c)  !hrv_livestemn_storage_to_litr_met_n
→ litr_met_n(c)  !hrv_deadstemn_storage_to_litr_met_n
→ litr_met_n(c)  !hrv_livecrootn_storage_to_litr_met_n
→ litr_met_n(c)  !hrv_deadcrootn_storage_to_litr_met_n
→ litr_met_n(c)  !hrv_leafn_xfer_to_litr_met_n
→ litr_met_n(c)  !hrv_frootn_xfer_to_litr_met_n
→ litr_met_n(c)  !hrv_livestemn_xfer_to_litr_met_n
→ litr_met_n(c)  !hrv_deadstemn_xfer_to_litr_met_n
→ litr_met_n(c)  !hrv_livecrootn_xfer_to_litr_met_n
→ litr_met_n(c)  !hrv_deadcrootn_xfer_to_litr_met_n
```

!plant group - fire mortality

```
leafn(p) → !m_leafn_to_fire mortality
frootn(p) → !m_frootn_to_fire mortality
livestemn(p) → !m_livestemn_to_fire mortality
deadstemn(p) → !m_deadstemn_to_fire mortality
```

livecrootn(p) → !m_livecrootn_to_fire mortality
deadcrootn(p) → !m_deadcrootn_to_fire mortality
deadcrootn(p) → !m_deadcrootn_to_litter_fire mortality
leafn_storage(p) → !m_leafn_storage_to_fire mortality
frootn_storage(p) → !m_frootn_storage_to_fire mortality
livestemn_storage(p) → !m_livestemn_storage_to_fire mortality
deadstemn_storage(p) → !m_deadstemn_storage_to_fire mortality
livecrootn_storage(p) → !m_livecrootn_storage_to_fire mortality
deadcrootn_storage(p) → !m_deadcrootn_storage_to_fire mortality
leafn_xfer(p) → !m_leafn_xfer_to_fire mortality
frootn_xfer(p) → !m_frootn_xfer_to_fire mortality
livestemn_xfer(p) → !m_livestemn_xfer_to_fire mortality
deadstemn_xfer(p) → !m_deadstemn_xfer_to_fire mortality
livecrootn_xfer(p) → !m_livecrootn_xfer_to_fire mortality
deadcrootn_xfer(p) → !m_deadcrootn_xfer_to_fire mortality
retransn(p) → !m_retransn_to_fire mortality

!soil group -fire mortality

→ cwdn(c) !m_deadstemn_to_cwdn_fire mortality
→ cwdn(c) !m_deadcrootn_to_cwdn_fire mortality
litr_met_n(c) → !m_decomp_npools_to_fire mortality_vr1
litr_cel_n(c) → !m_decomp_npools_to_fire mortality_vr2
litr_lig_n(c) → !m_decomp_npools_to_fire mortality_vr3
cwdn(c) → !m_decomp_npools_to_fire mortality_vr4