

Fig S1. Tree growth and survival association curves with nitrogen and sulfur deposition by species. Each curve represents the annual growth (top graphs) or 10 year survival (bottom graphs) associations with nitrogen (N; left panels) or sulfur (S, right panels) deposition across the conterminous United States. Sample sizes and Pearson's correlation coefficient between N and S deposition for growth and survival analyses are given above the upper and lower panel respectively. Shaded areas represent the 2 factor support interval for the response curves.

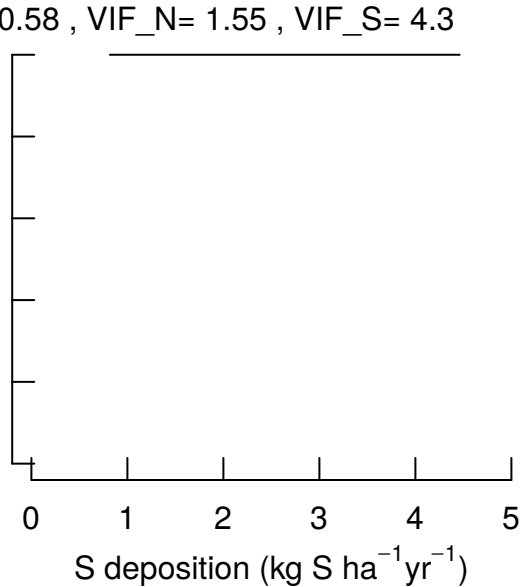
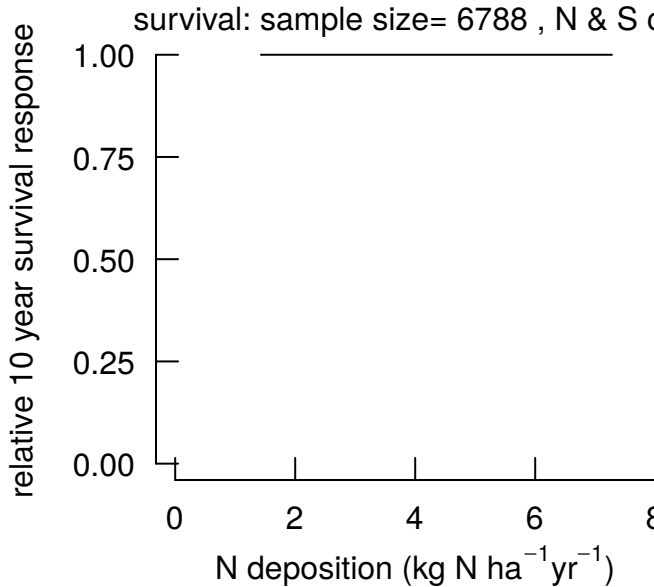
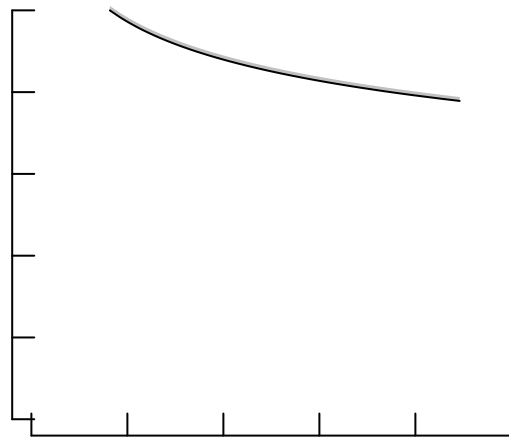
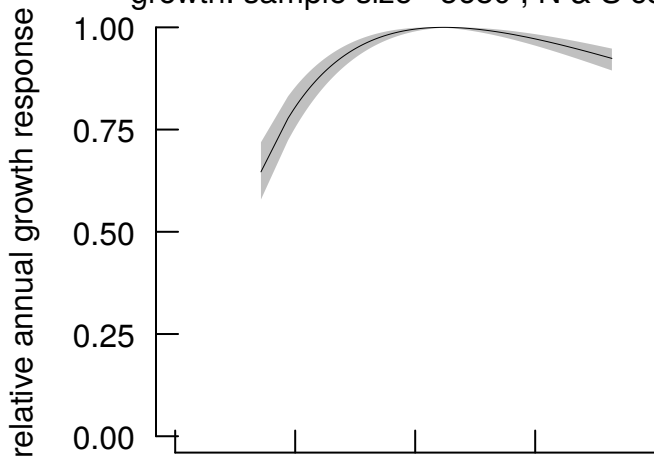
Pacific silver fir

Abies amabilis

N deposition

S deposition

growth: sample size= 5680 , N & S corr.= 0.63 , VIF_N= 1.73 , VIF_S= 4.39



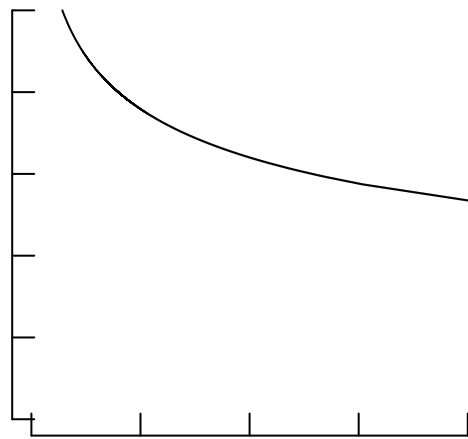
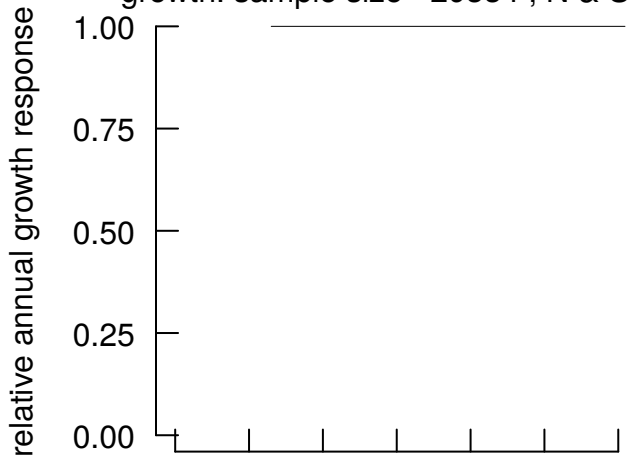
survival: sample size= 6788 , N & S corr.= 0.58 , VIF_N= 1.55 , VIF_S= 4.3

balsam fir
Abies balsamea

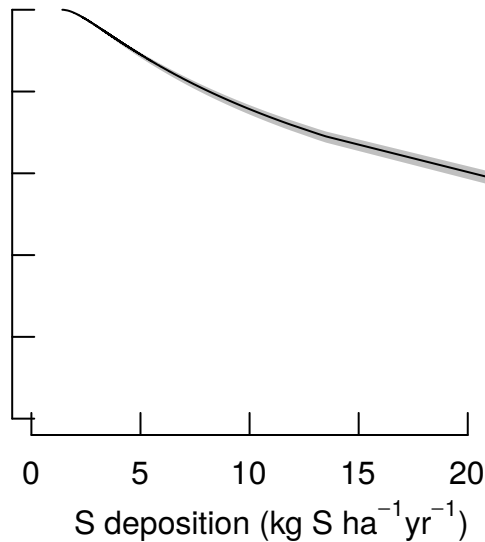
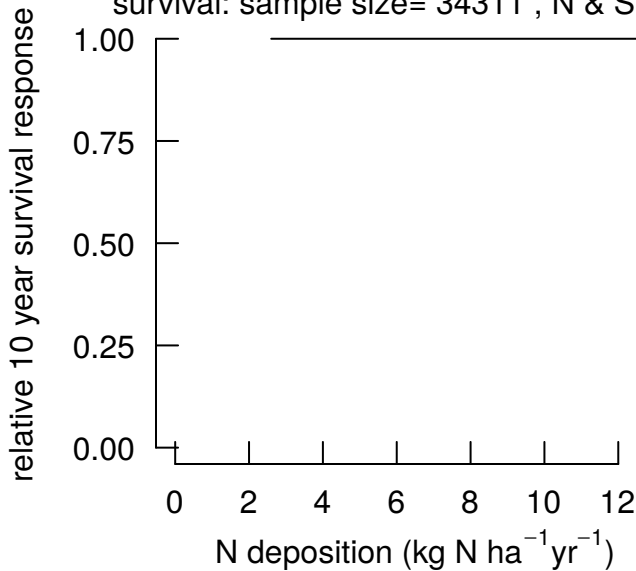
N deposition

S deposition

growth: sample size= 29334 , N & S corr.= 0.48 , VIF_N= 2.33 , VIF_S= 3.23



survival: sample size= 34311 , N & S corr.= 0.47 , VIF_N= 2.29 , VIF_S= 3.25

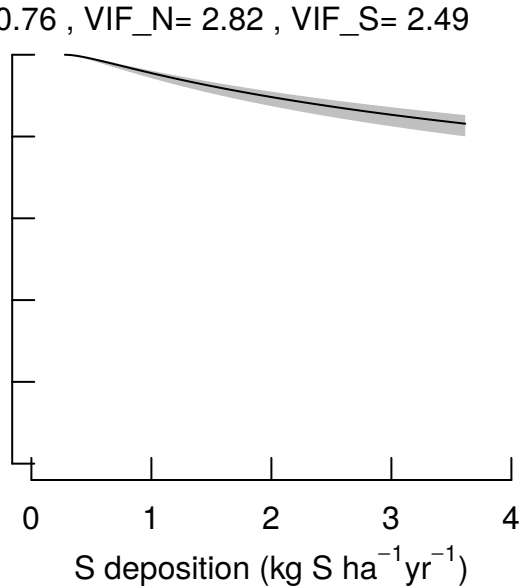
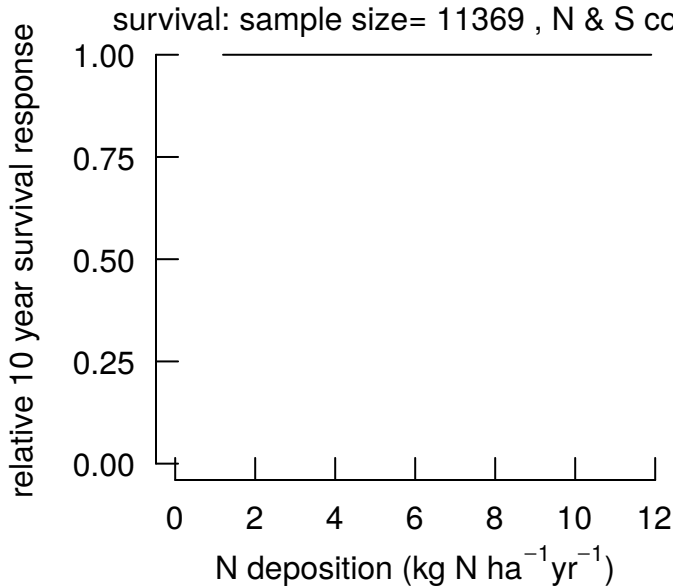
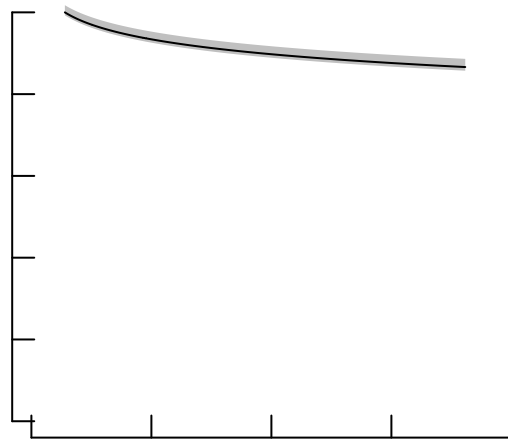
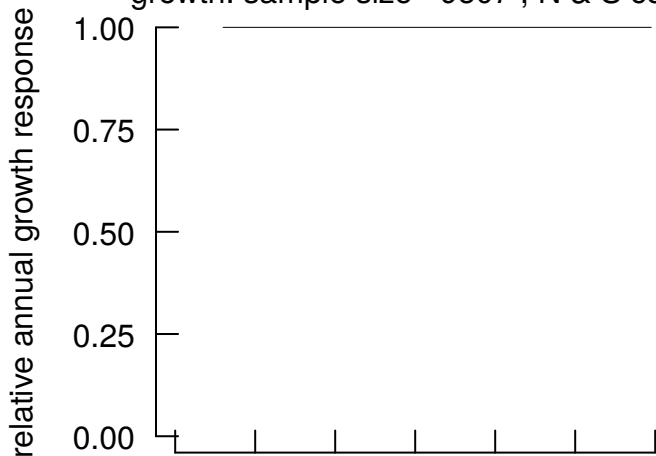


white fir
Abies concolor

N deposition

S deposition

growth: sample size= 9507 , N & S corr.= 0.78 , VIF_N= 3.04 , VIF_S= 2.71



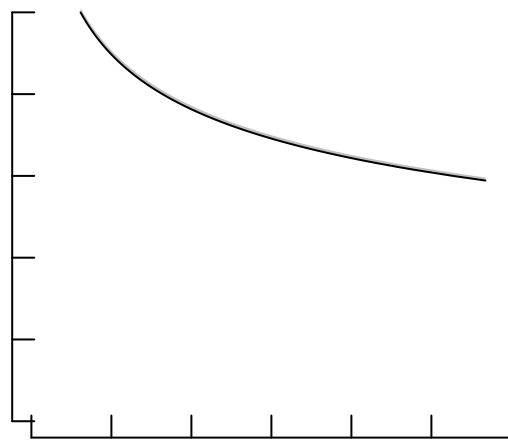
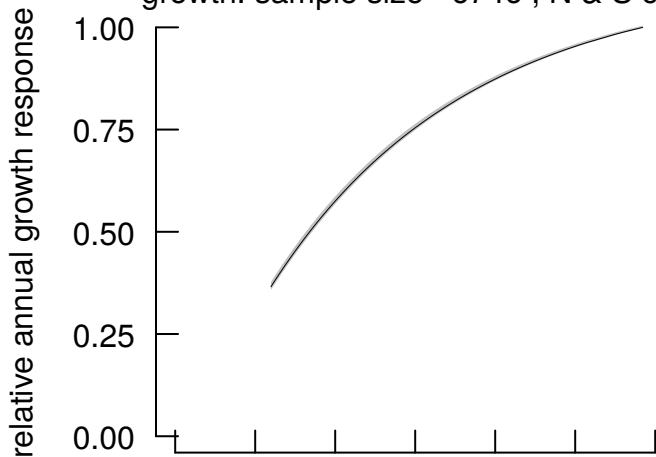
survival: sample size= 11369 , N & S corr.= 0.76 , VIF_N= 2.82 , VIF_S= 2.49

grand fir
Abies grandis

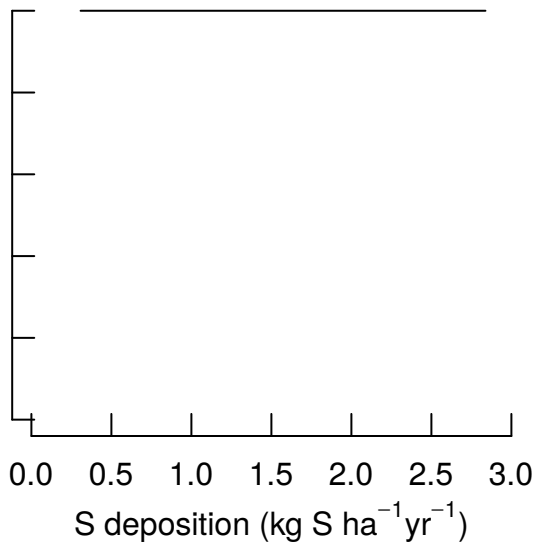
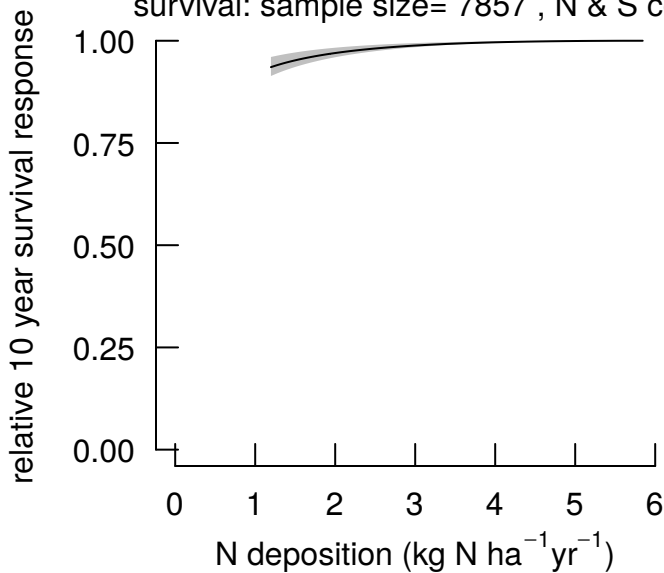
N deposition

S deposition

growth: sample size= 6746 , N & S corr.= 0.86 , VIF_N= 3.88 , VIF_S= 6.6



survival: sample size= 7857 , N & S corr.= 0.84 , VIF_N= 3.5 , VIF_S= 6.35

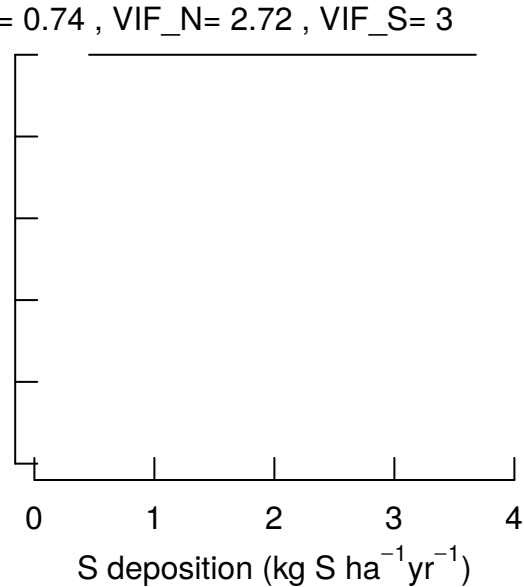
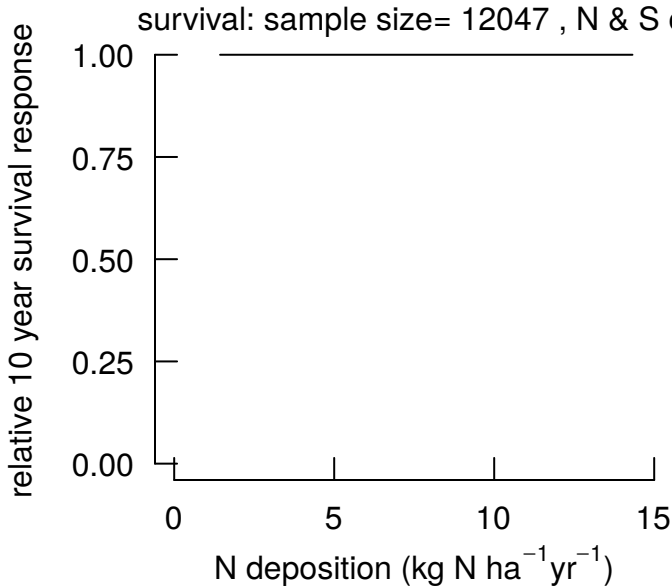
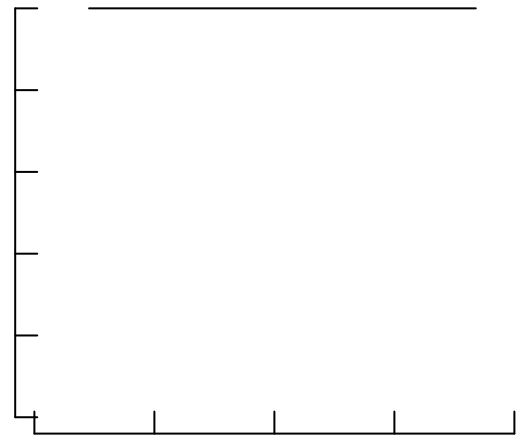
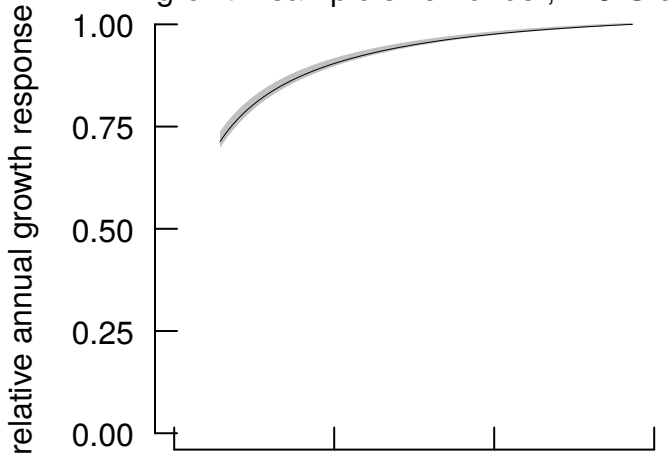


subalpine fir
Abies lasiocarpa

N deposition

S deposition

growth: sample size= 9293 , N & S corr.= 0.74 , VIF_N= 2.74 , VIF_S= 3



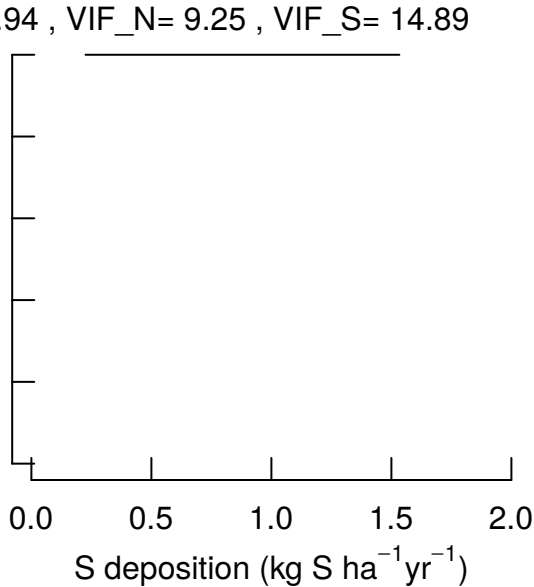
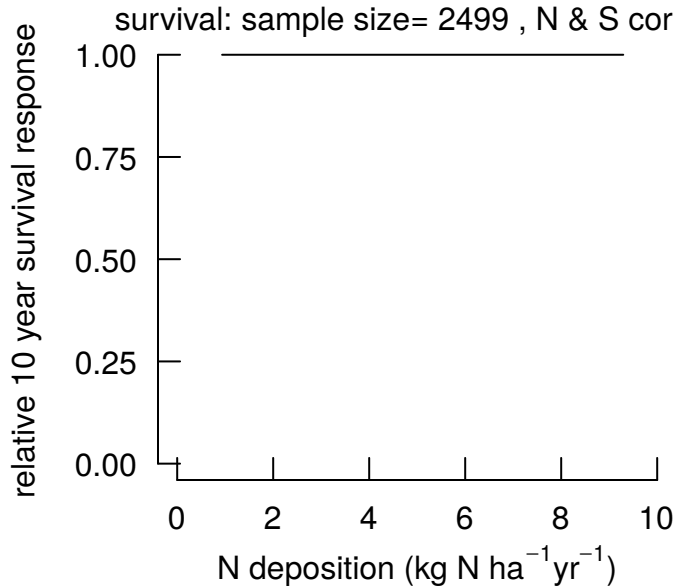
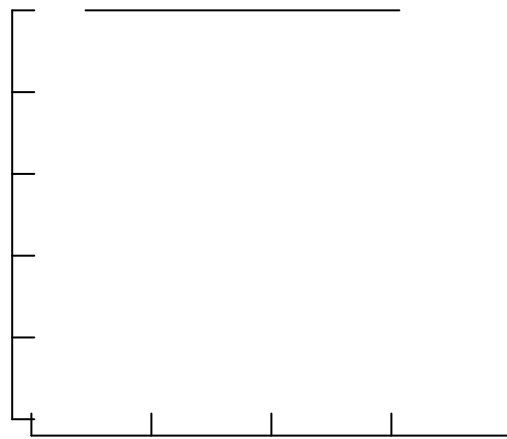
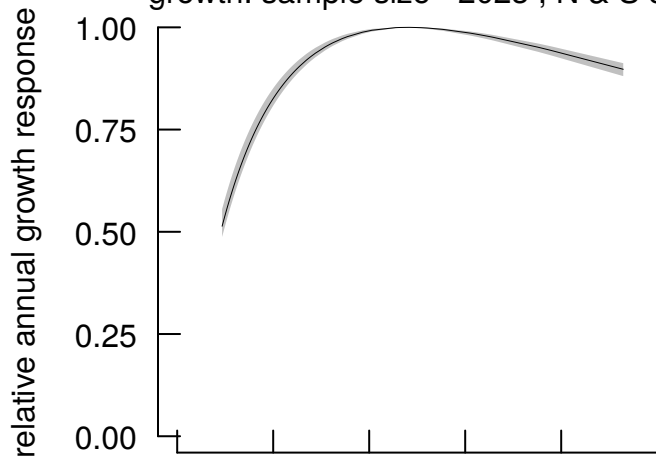
survival: sample size= 12047 , N & S corr.= 0.74 , VIF_N= 2.72 , VIF_S= 3

western juniper
Juniperus occidentalis

N deposition

S deposition

growth: sample size= 2023 , N & S corr.= 0.93 , VIF_N= 8 , VIF_S= 12.21



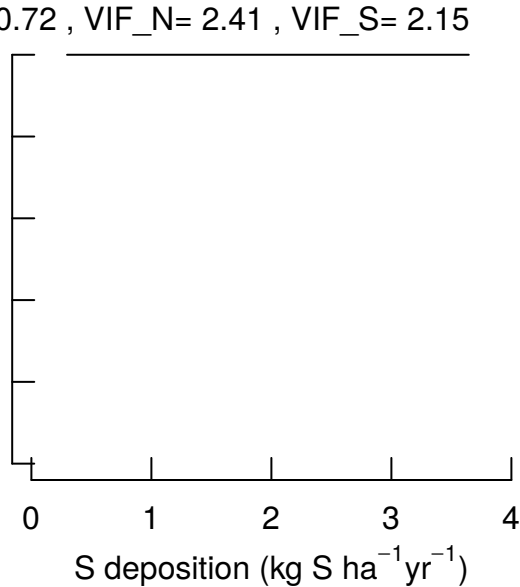
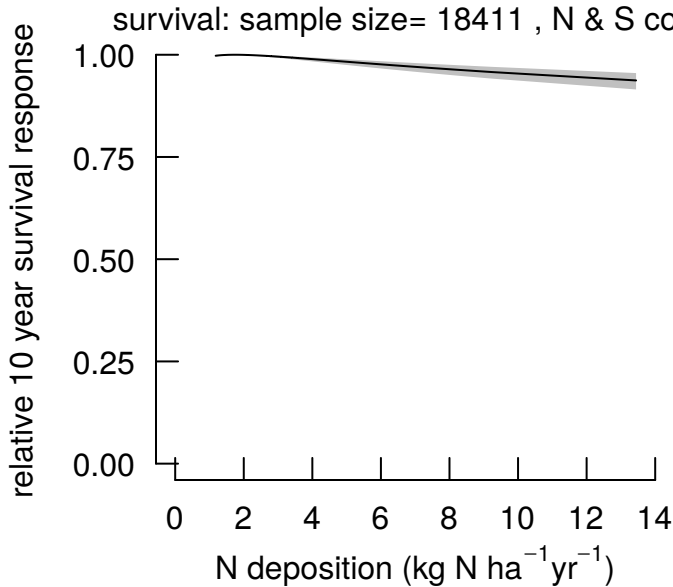
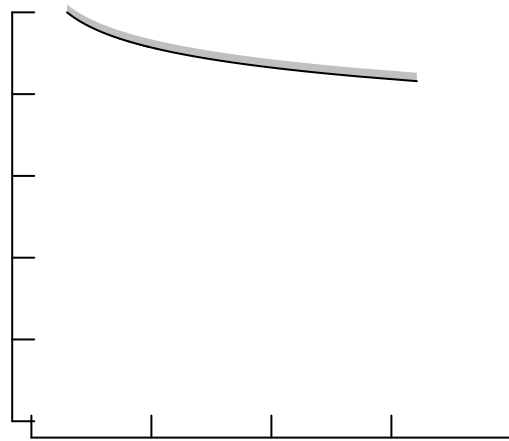
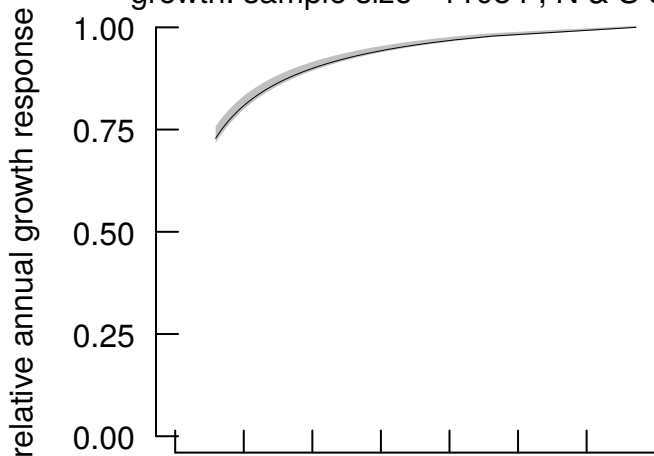
survival: sample size= 2499 , N & S corr.= 0.94 , VIF_N= 9.25 , VIF_S= 14.89

Utah juniper
Juniperus osteosperma

N deposition

S deposition

growth: sample size= 11084 , N & S corr.= 0.71 , VIF_N= 2.35 , VIF_S= 2.1



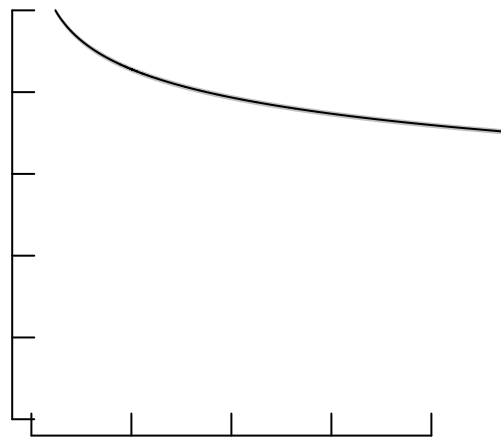
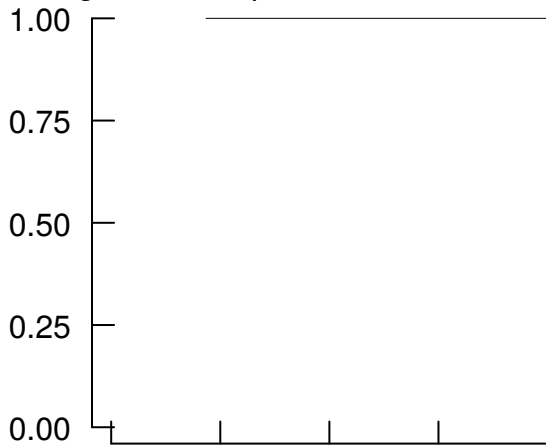
eastern redcedar
Juniperus virginiana

N deposition

S deposition

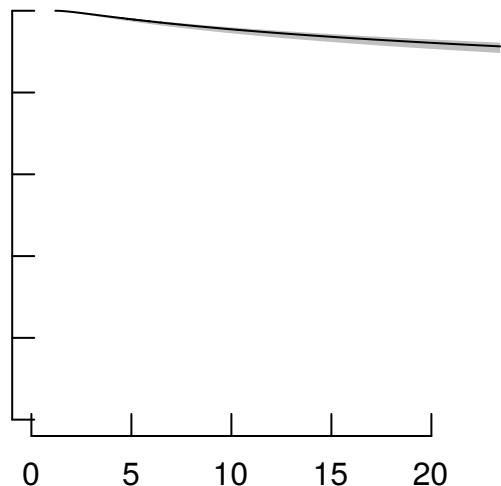
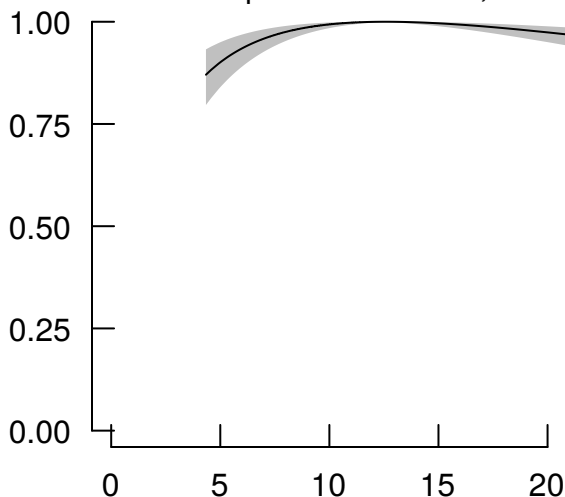
growth: sample size= 14382 , N & S corr.= 0.3 , VIF_N= 1.27 , VIF_S= 1.4

relative annual growth response



relative 10 year survival response

survival: sample size= 17111 , N & S corr.= 0.3 , VIF_N= 1.27 , VIF_S= 1.39



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

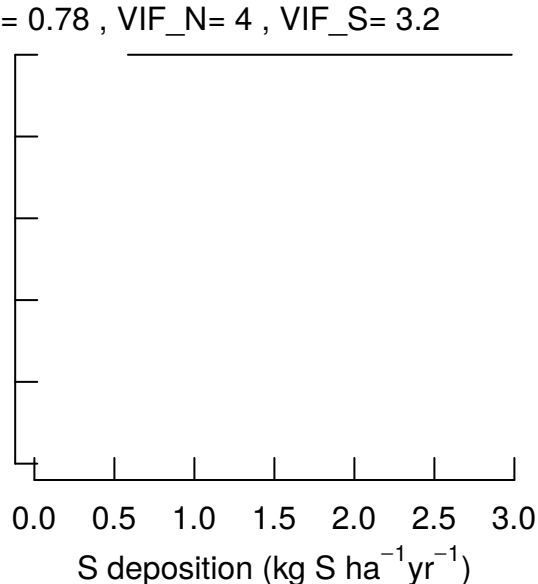
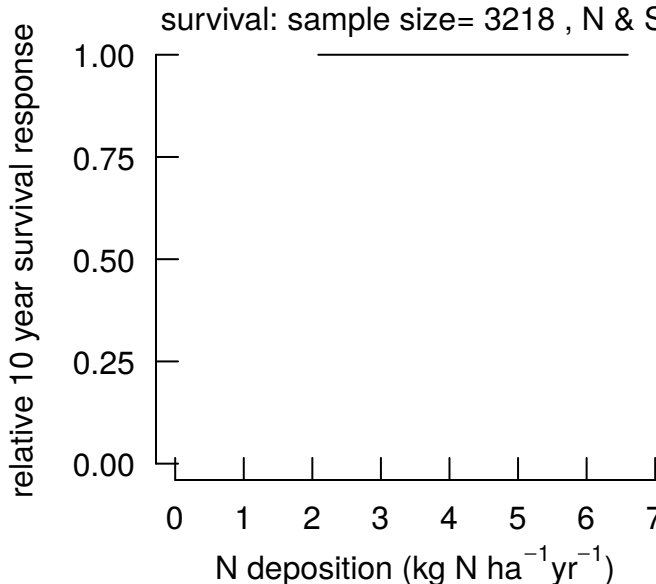
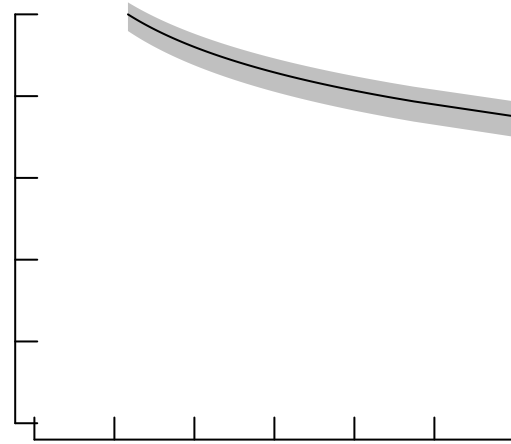
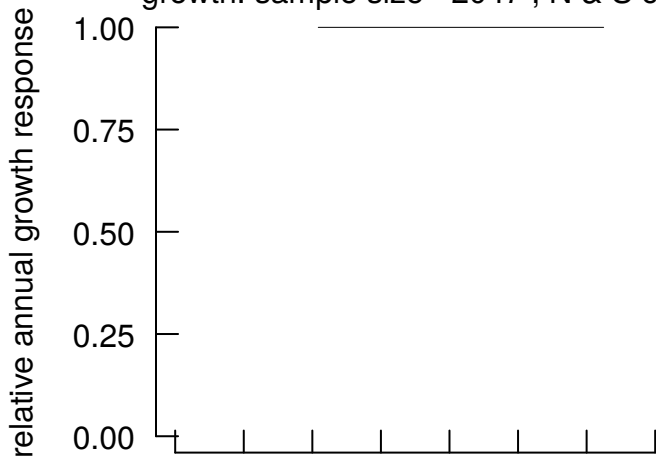
oneseed juniper

Juniperus monosperma

N deposition

S deposition

growth: sample size= 2047 , N & S corr.= 0.78 , VIF_N= 4.18 , VIF_S= 3.4



survival: sample size= 3218 , N & S corr.= 0.78 , VIF_N= 4 , VIF_S= 3.2

tamarack (native)

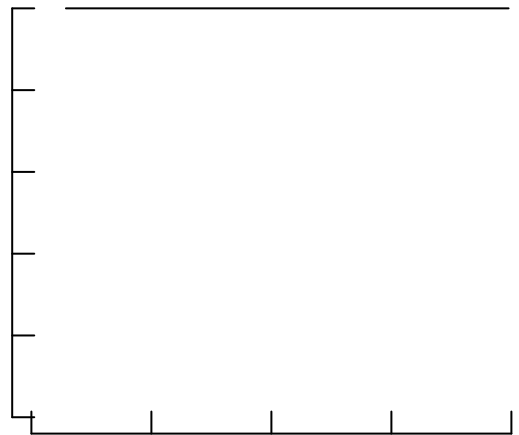
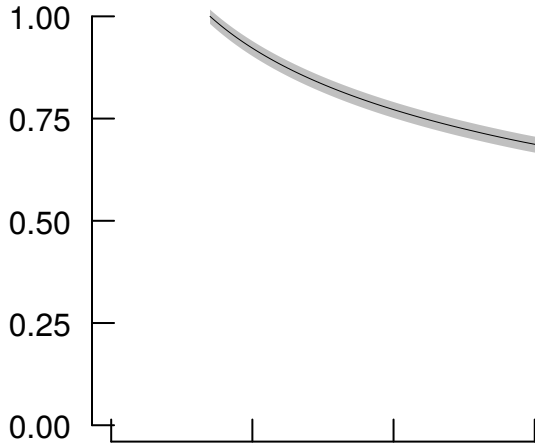
Larix laricina

N deposition

S deposition

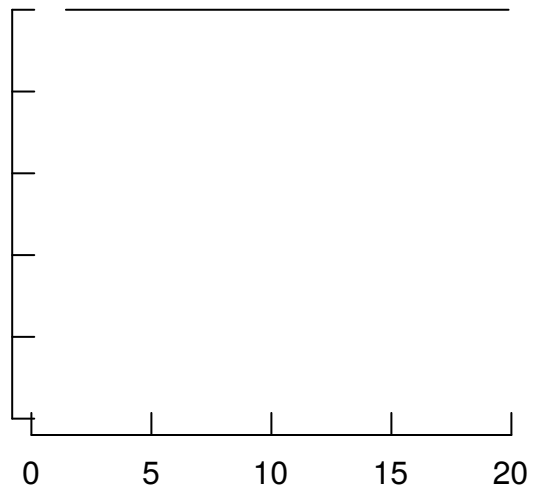
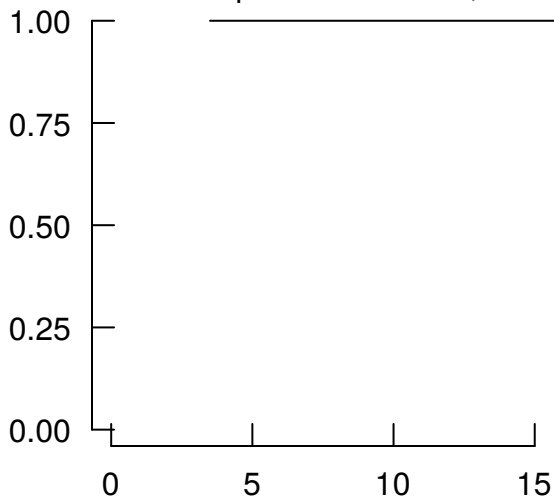
growth: sample size= 8612 , N & S corr.= 0.66 , VIF_N= 2.72 , VIF_S= 3.75

relative annual growth response



relative 10 year survival response

survival: sample size= 10208 , N & S corr.= 0.66 , VIF_N= 2.82 , VIF_S= 3.83



N deposition (kg N ha⁻¹ yr⁻¹)

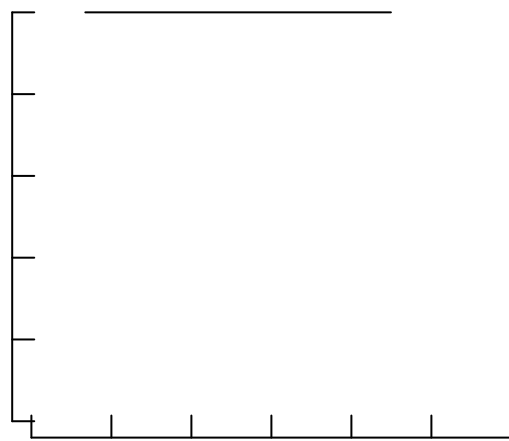
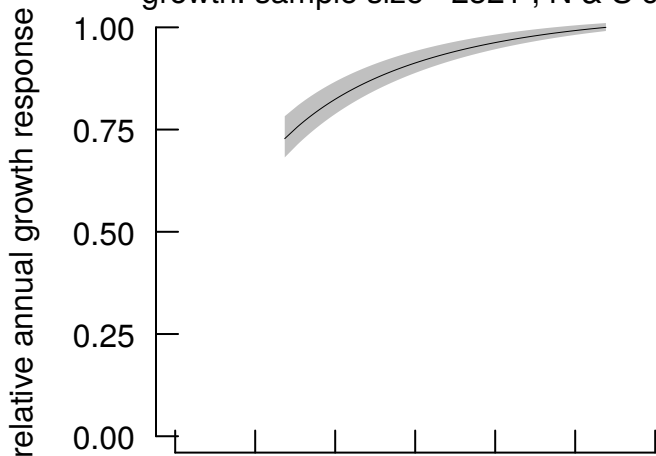
S deposition (kg S ha⁻¹ yr⁻¹)

western larch
Larix occidentalis

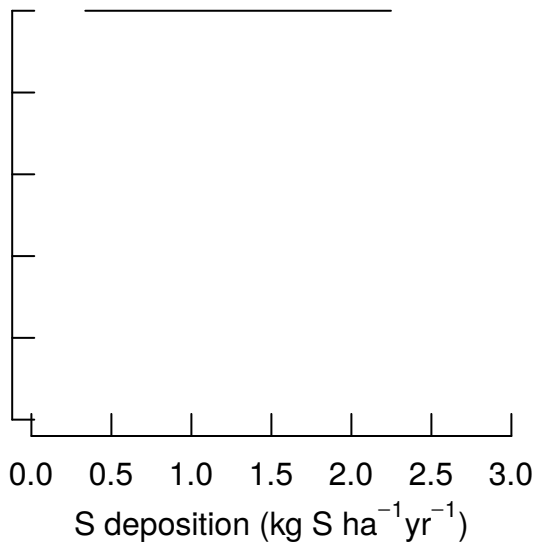
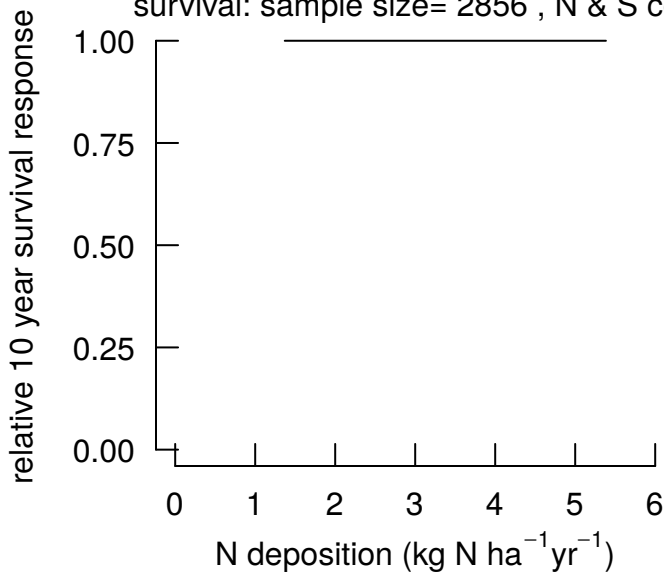
N deposition

S deposition

growth: sample size= 2321 , N & S corr.= 0.9 , VIF_N= 6.21 , VIF_S= 6.21



survival: sample size= 2856 , N & S corr.= 0.9 , VIF_N= 5.89 , VIF_S= 5.93

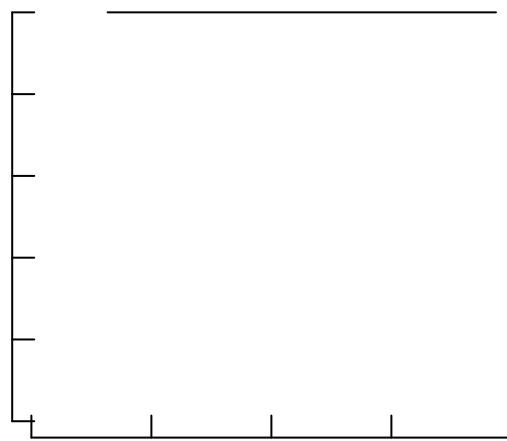
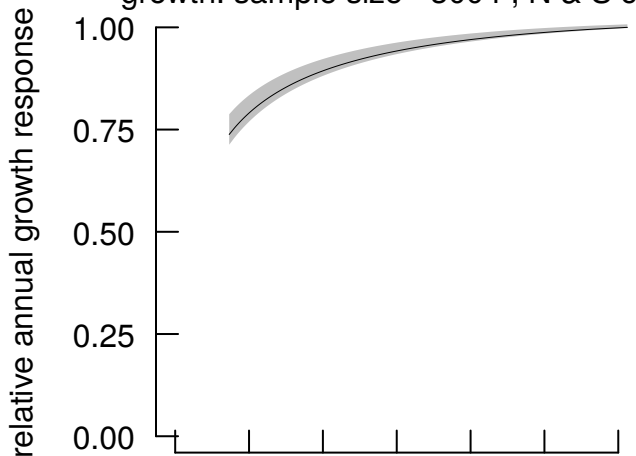


incense-cedar
Calocedrus decurrens

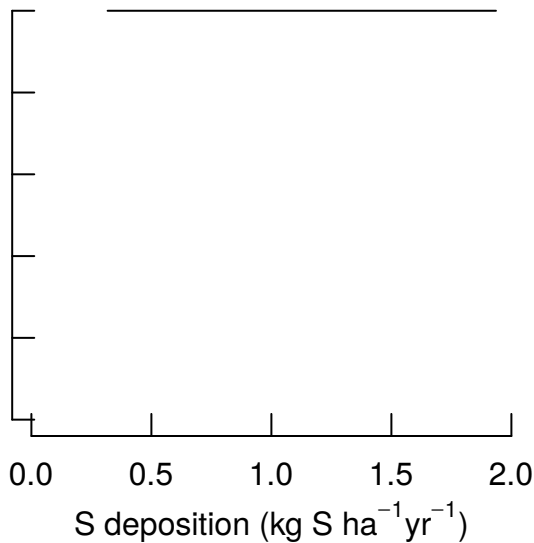
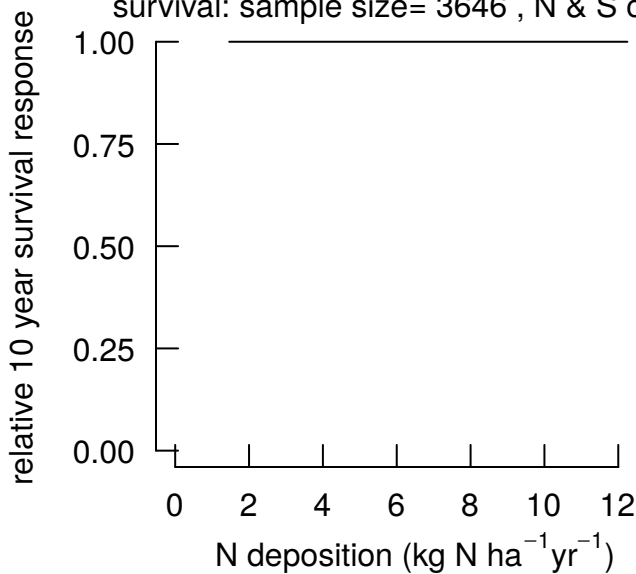
N deposition

S deposition

growth: sample size= 3004 , N & S corr.= 0.83 , VIF_N= 7.49 , VIF_S= 10.29



survival: sample size= 3646 , N & S corr.= 0.82 , VIF_N= 7.28 , VIF_S= 10.08



Engelmann spruce

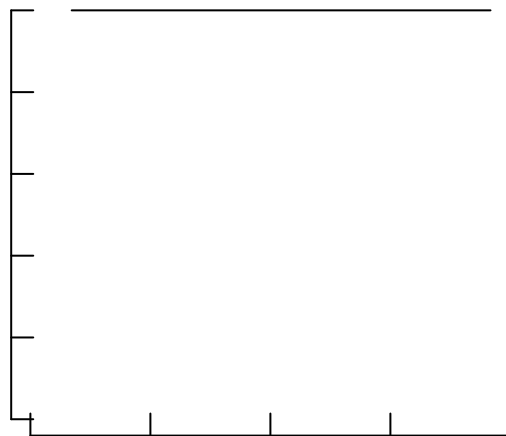
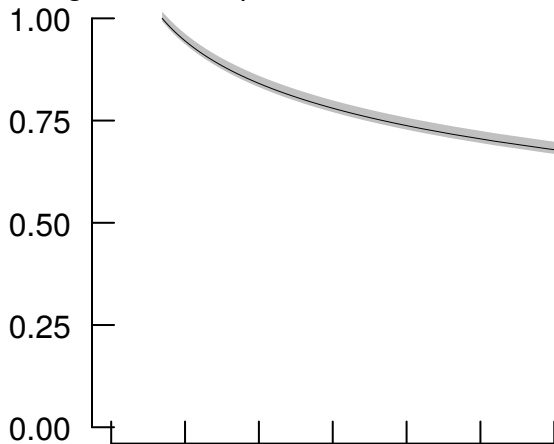
Picea engelmannii

N deposition

S deposition

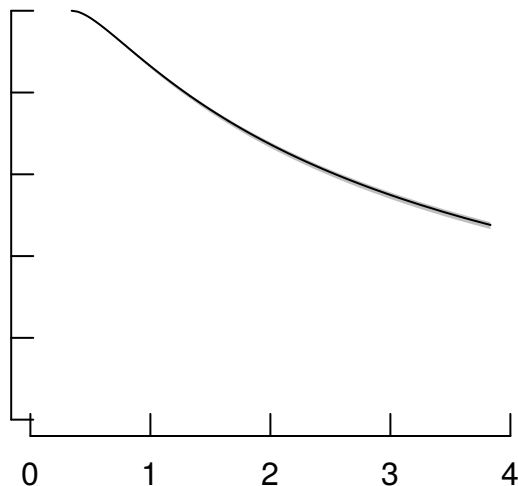
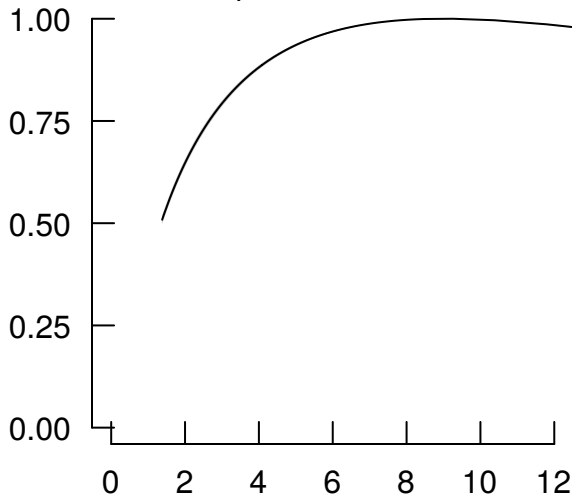
growth: sample size= 8670 , N & S corr.= 0.84 , VIF_N= 3.38 , VIF_S= 3.54

relative annual growth response



relative 10 year survival response

survival: sample size= 11779 , N & S corr.= 0.83 , VIF_N= 3.29 , VIF_S= 3.42



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

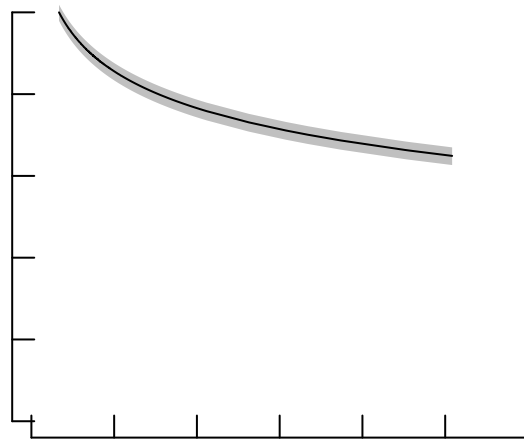
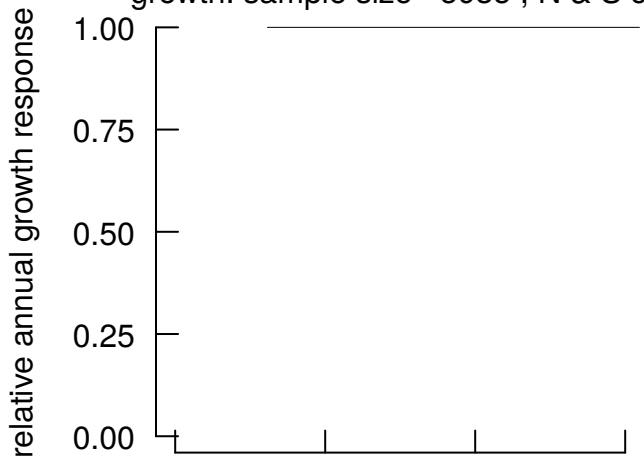
white spruce

Picea glauca

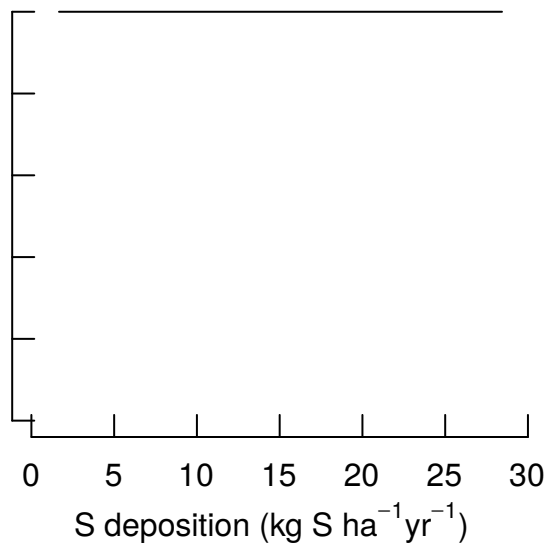
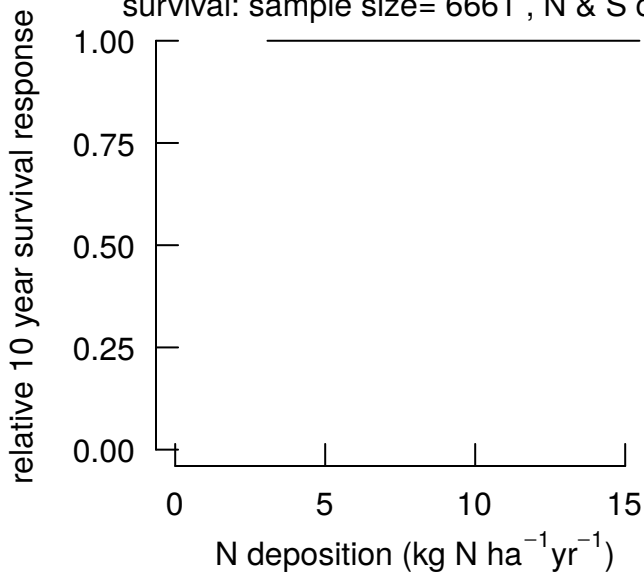
N deposition

S deposition

growth: sample size= 5935 , N & S corr.= 0.43 , VIF_N= 1.99 , VIF_S= 1.81



survival: sample size= 6661 , N & S corr.= 0.43 , VIF_N= 1.97 , VIF_S= 1.78



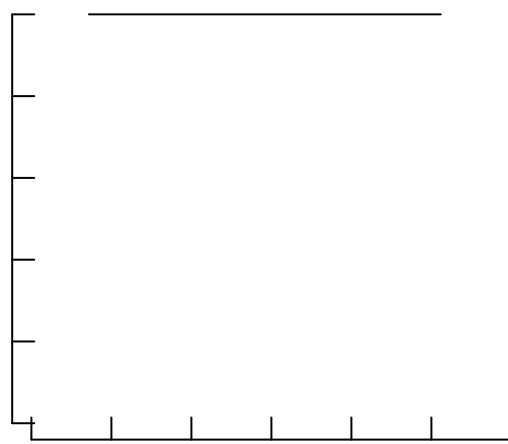
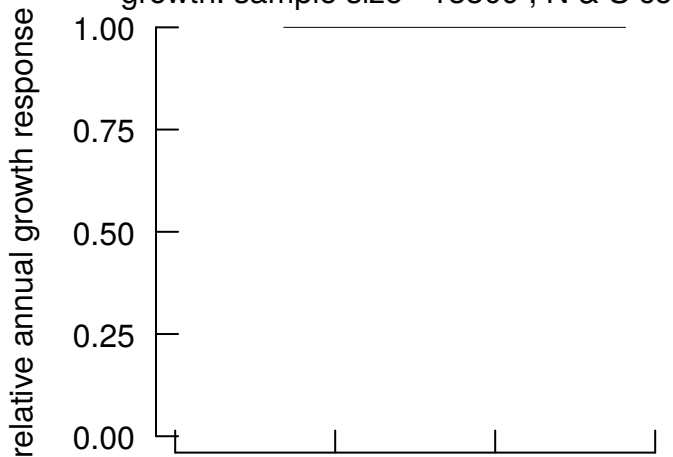
black spruce

Picea mariana

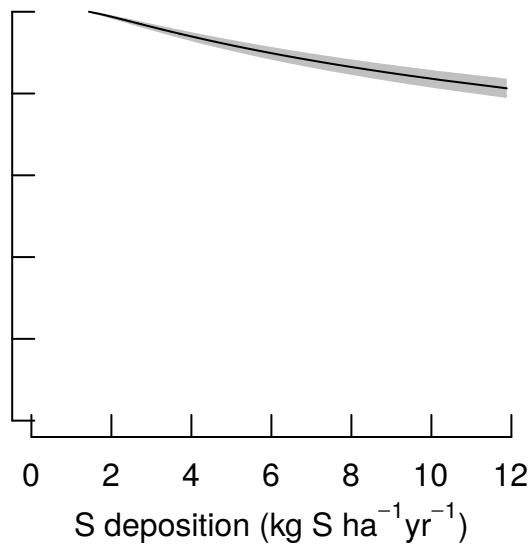
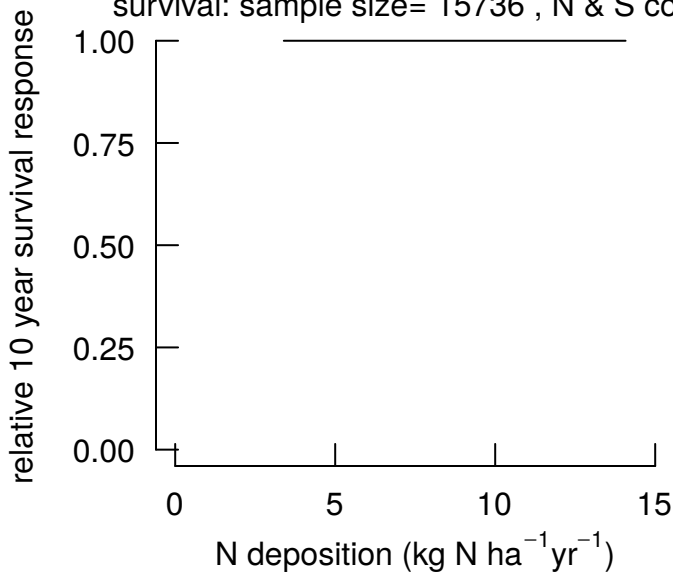
N deposition

S deposition

growth: sample size= 13309 , N & S corr.= 0.55 , VIF_N= 2.73 , VIF_S= 4.01



survival: sample size= 15736 , N & S corr.= 0.56 , VIF_N= 2.79 , VIF_S= 4.12

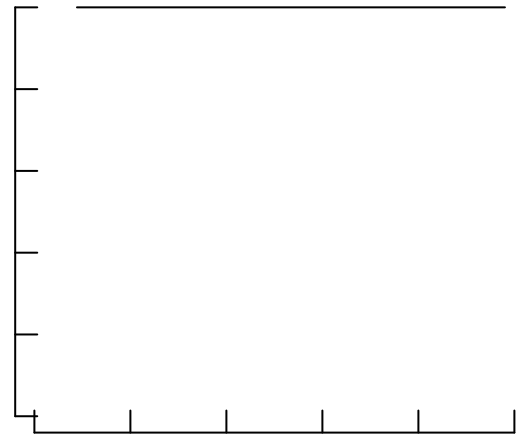
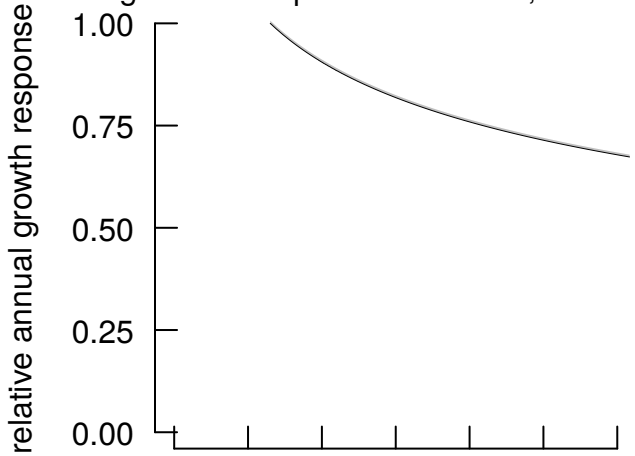


red spruce
Picea rubens

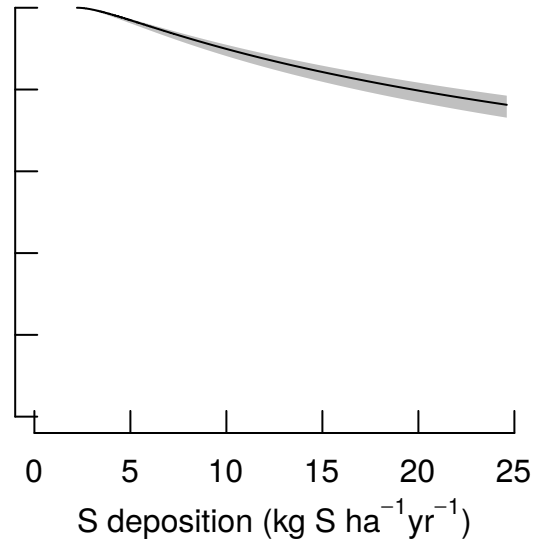
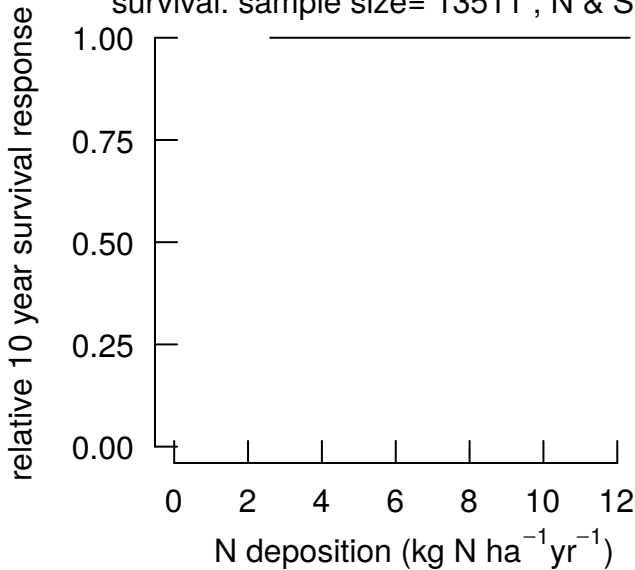
N deposition

S deposition

growth: sample size= 12001 , N & S corr.= 0.84 , VIF_N= 3.77 , VIF_S= 3.62



survival: sample size= 13511 , N & S corr.= 0.84 , VIF_N= 3.86 , VIF_S= 3.66

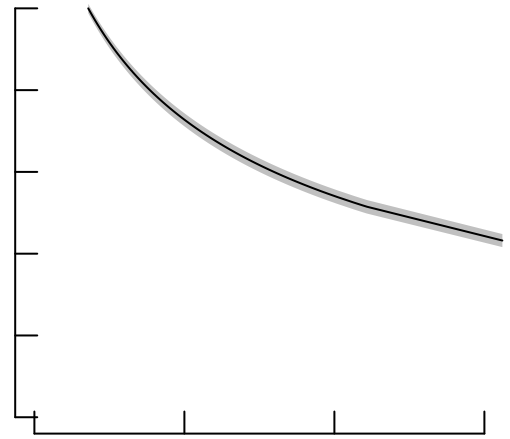
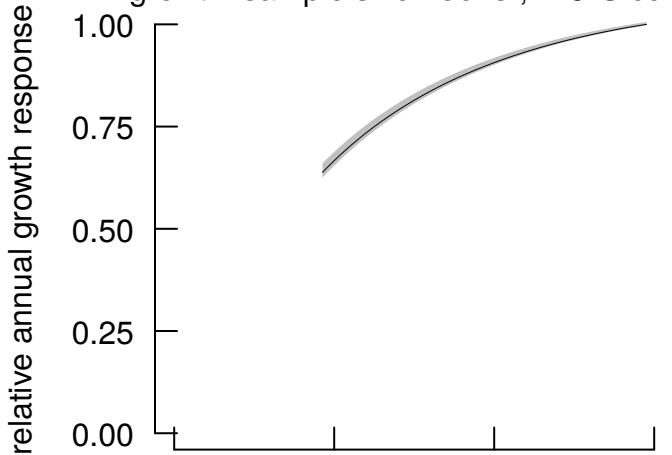


jack pine
Pinus banksiana

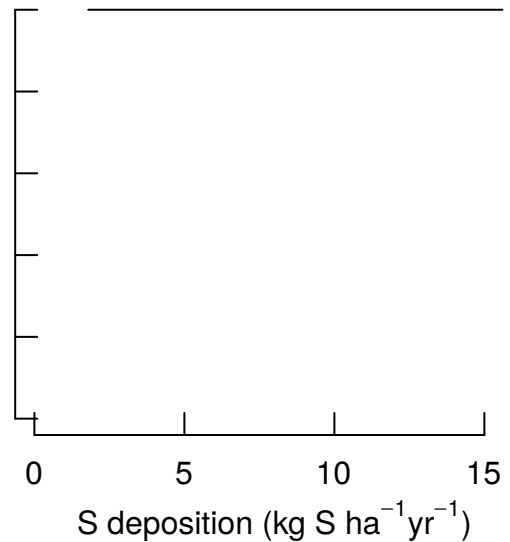
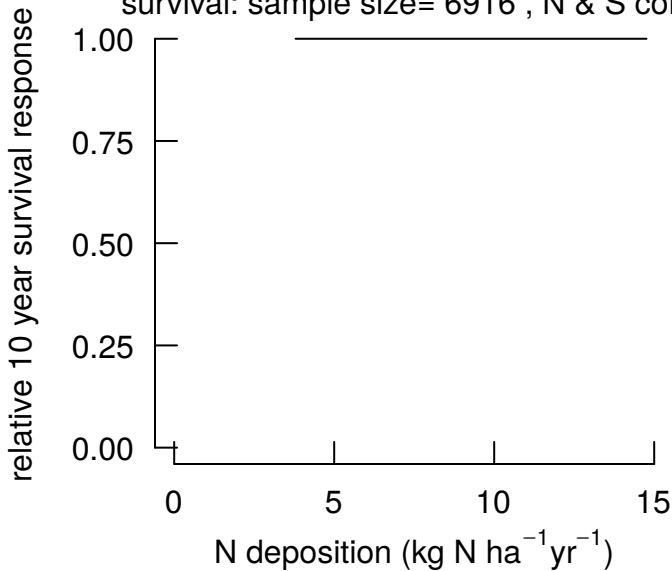
N deposition

S deposition

growth: sample size= 5613 , N & S corr.= 0.61 , VIF_N= 3.45 , VIF_S= 2.51



survival: sample size= 6916 , N & S corr.= 0.61 , VIF_N= 3.43 , VIF_S= 2.58



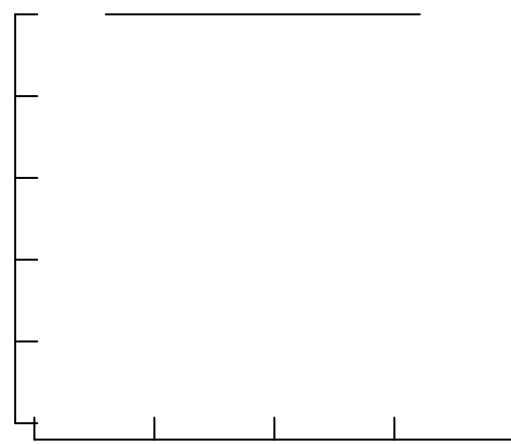
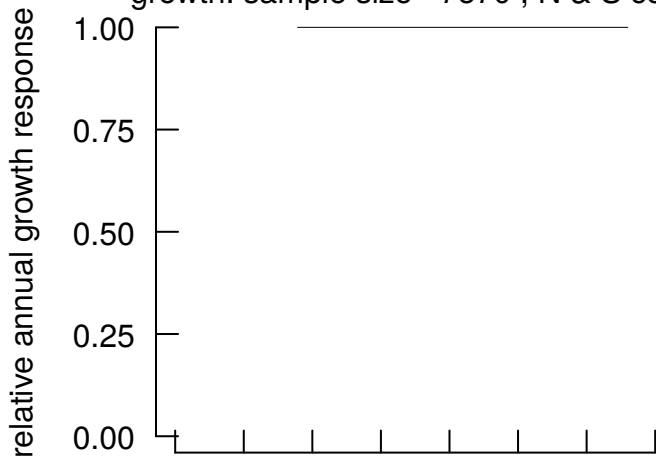
common or two-needle pinyon

Pinus edulis

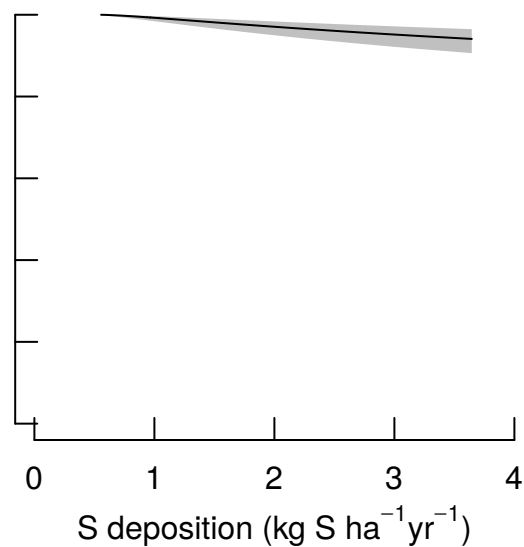
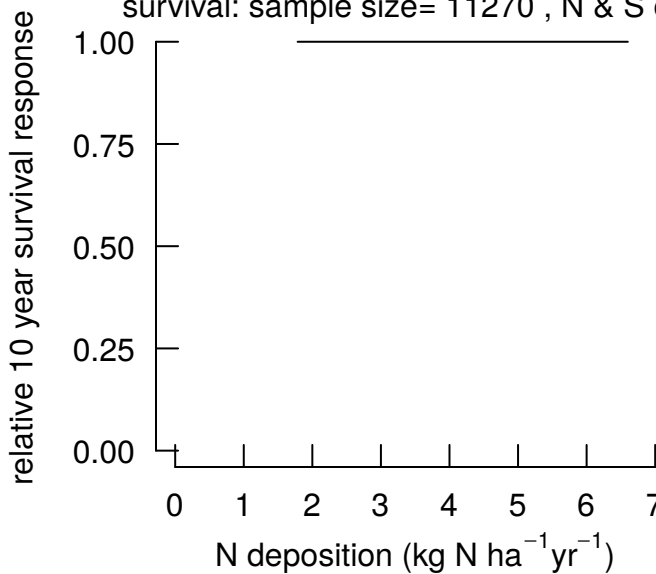
N deposition

S deposition

growth: sample size= 7570 , N & S corr.= 0.78 , VIF_N= 3.16 , VIF_S= 2.63



survival: sample size= 11270 , N & S corr.= 0.8 , VIF_N= 3.33 , VIF_S= 2.78



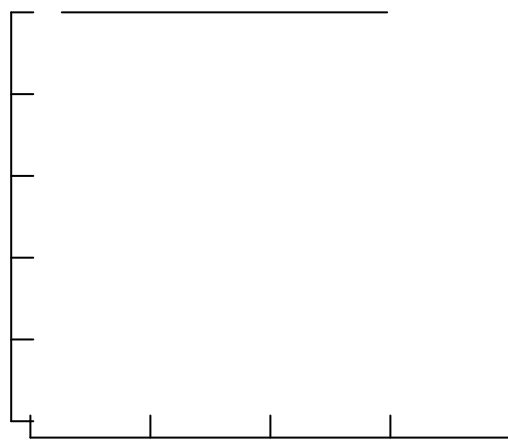
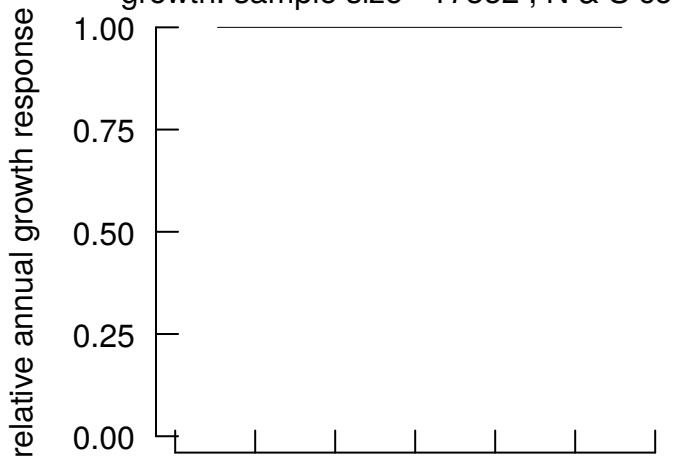
lodgepole pine

Pinus contorta

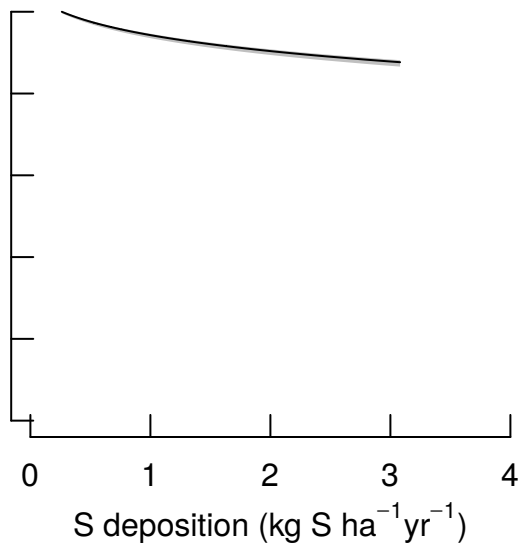
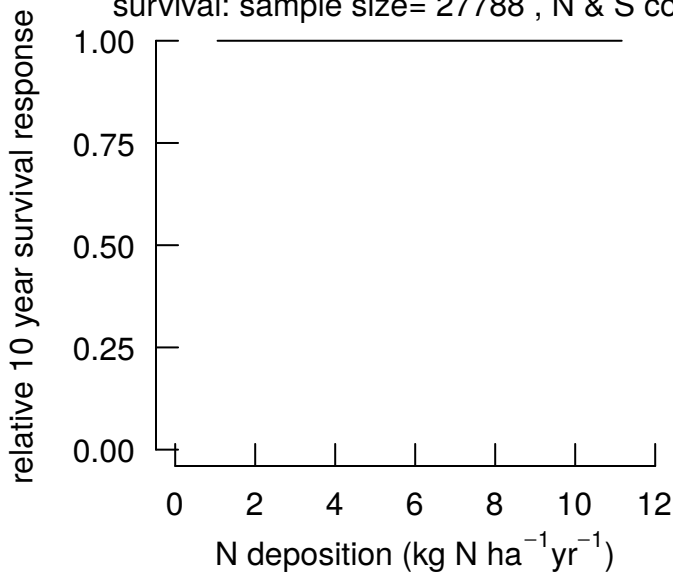
N deposition

S deposition

growth: sample size= 17352 , N & S corr.= 0.76 , VIF_N= 2.42 , VIF_S= 3.22



survival: sample size= 27788 , N & S corr.= 0.75 , VIF_N= 2.38 , VIF_S= 3.09



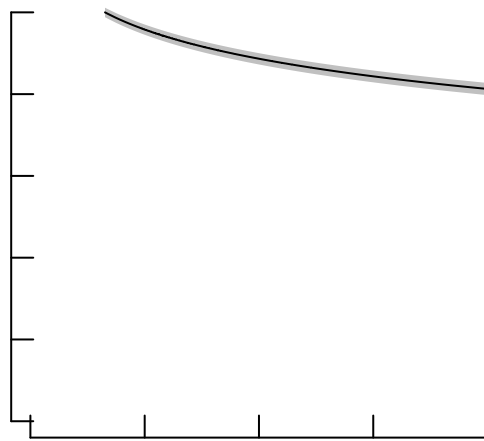
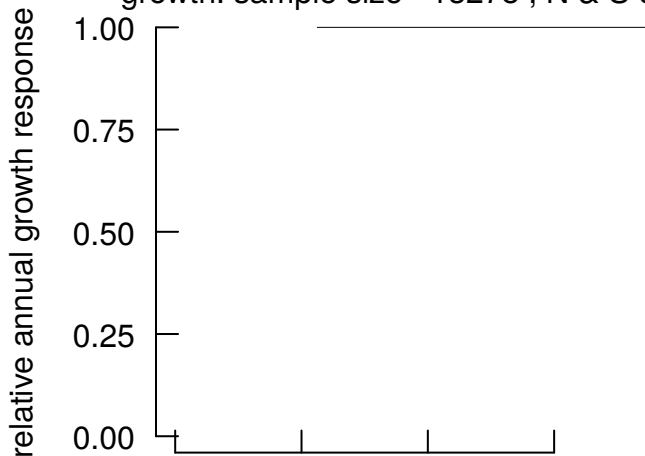
shortleaf pine

Pinus echinata

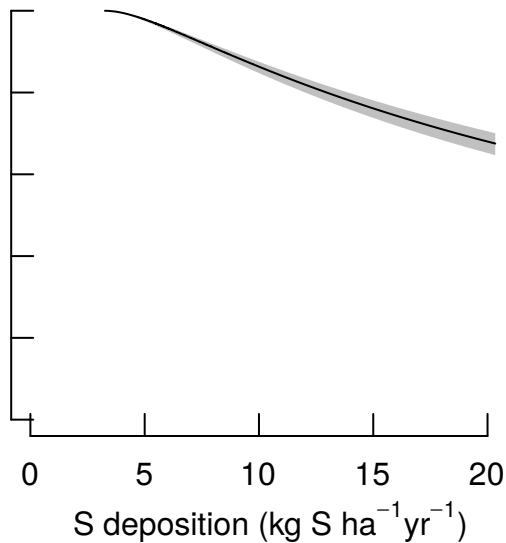
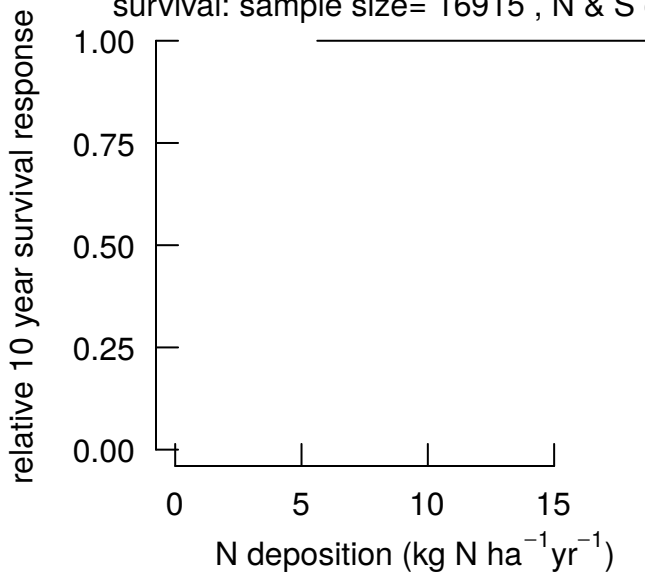
N deposition

S deposition

growth: sample size= 13278 , N & S corr.= 0.16 , VIF_N= 1.15 , VIF_S= 1.04



survival: sample size= 16915 , N & S corr.= 0.18 , VIF_N= 1.16 , VIF_S= 1.06



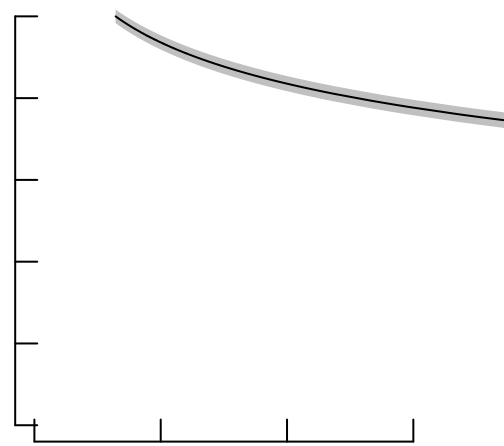
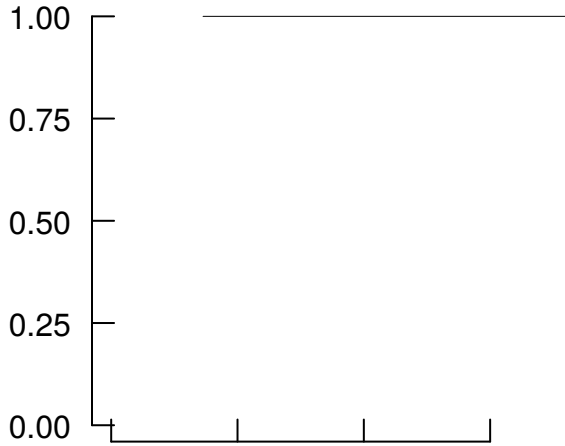
slash pine
Pinus elliottii

N deposition

S deposition

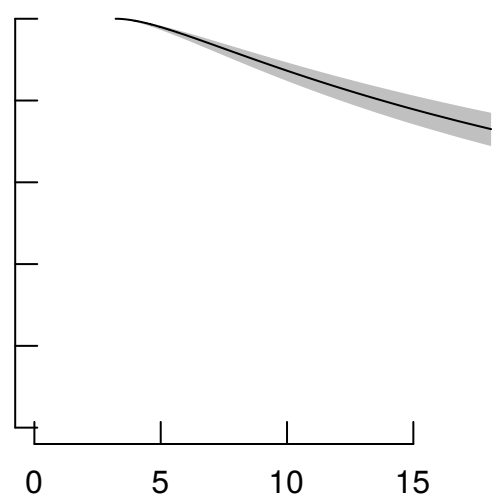
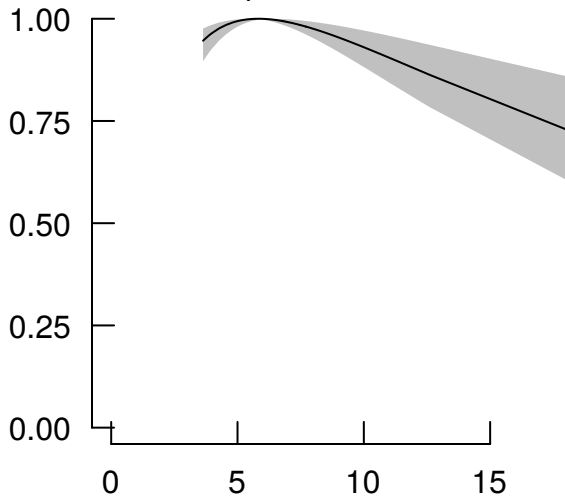
growth: sample size= 9945 , N & S corr.= 0.46 , VIF_N= 1.39 , VIF_S= 1.83

relative annual growth response



relative 10 year survival response

survival: sample size= 11857 , N & S corr.= 0.44 , VIF_N= 1.35 , VIF_S= 1.8



N deposition (kg N ha⁻¹yr⁻¹)

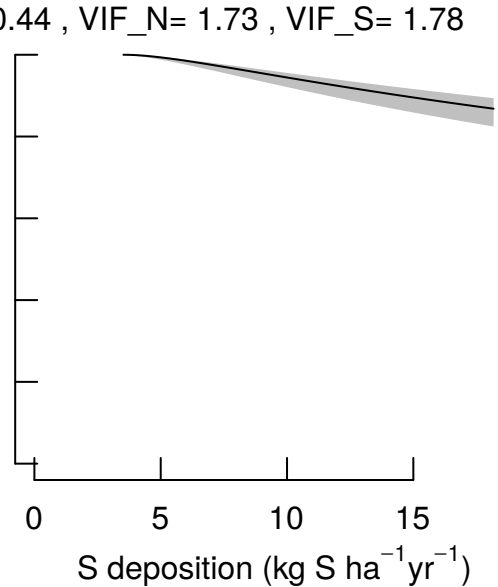
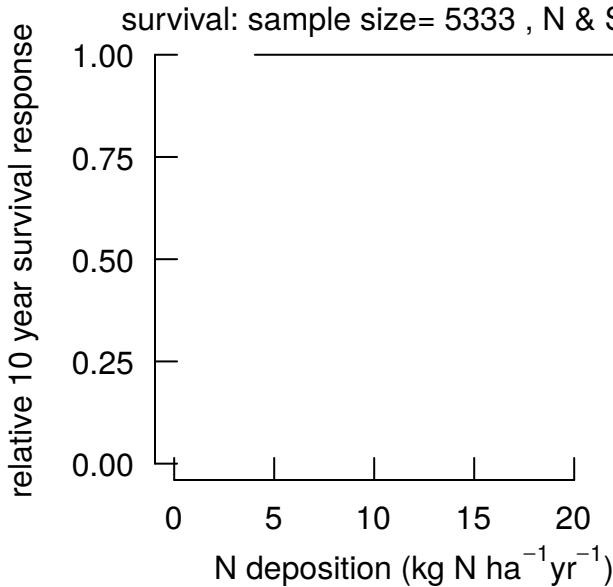
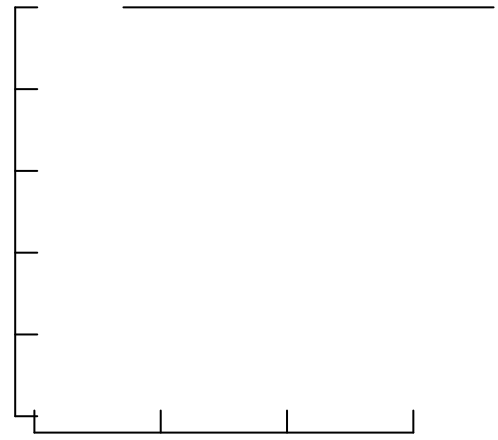
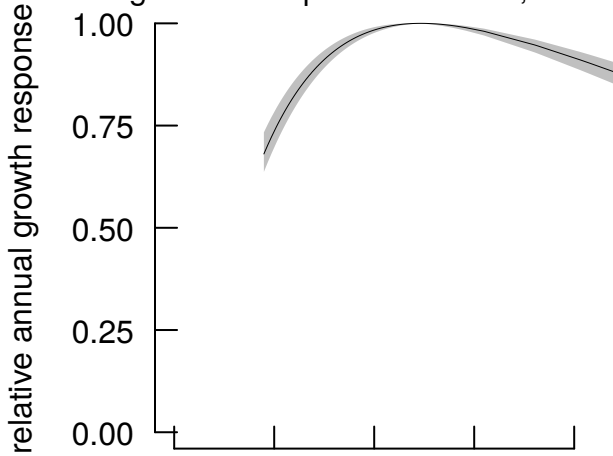
S deposition (kg S ha⁻¹yr⁻¹)

longleaf pine
Pinus palustris

N deposition

S deposition

growth: sample size= 4635 , N & S corr.= 0.45 , VIF_N= 1.79 , VIF_S= 1.81



survival: sample size= 5333 , N & S corr.= 0.44 , VIF_N= 1.73 , VIF_S= 1.78

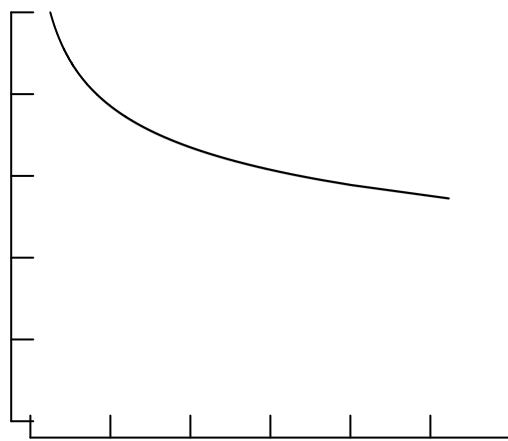
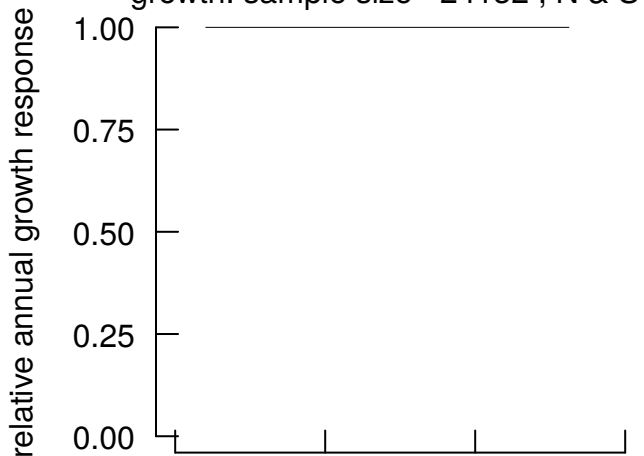
ponderosa pine

Pinus ponderosa

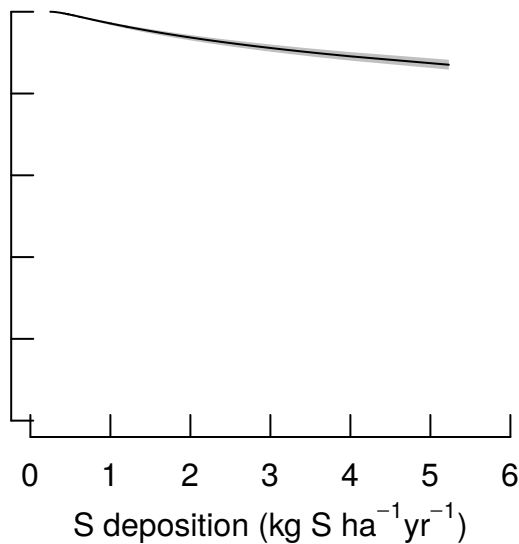
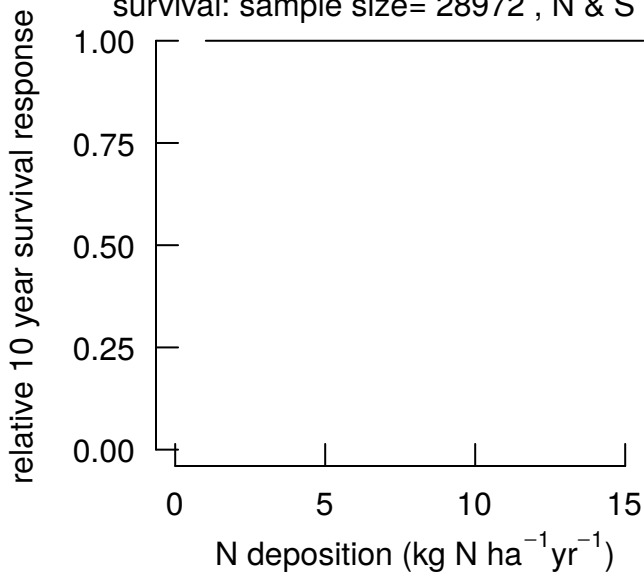
N deposition

S deposition

growth: sample size= 24132 , N & S corr.= 0.9 , VIF_N= 6.51 , VIF_S= 5.89



survival: sample size= 28972 , N & S corr.= 0.88 , VIF_N= 5.83 , VIF_S= 5.19



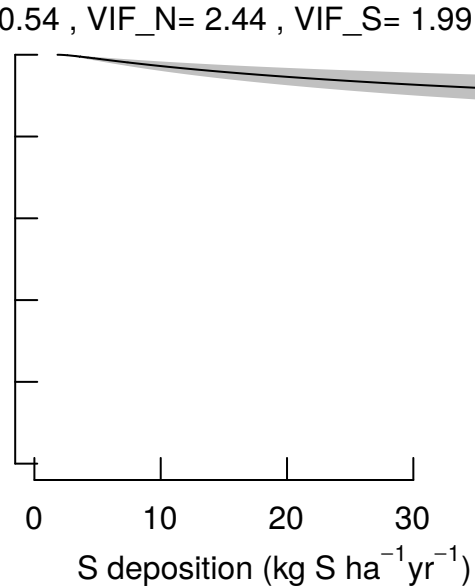
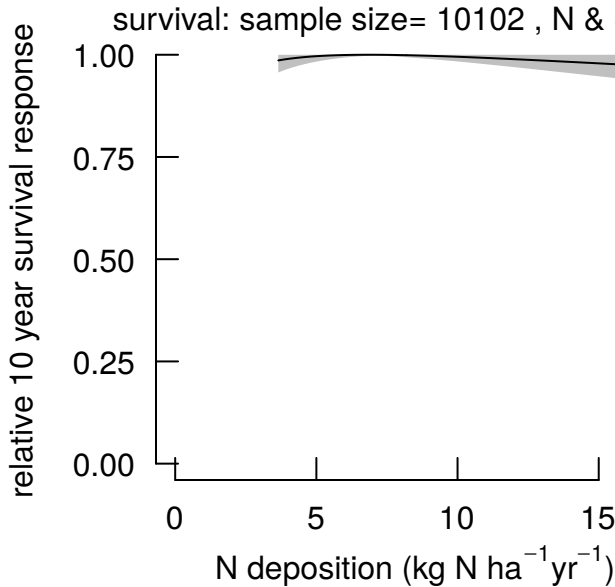
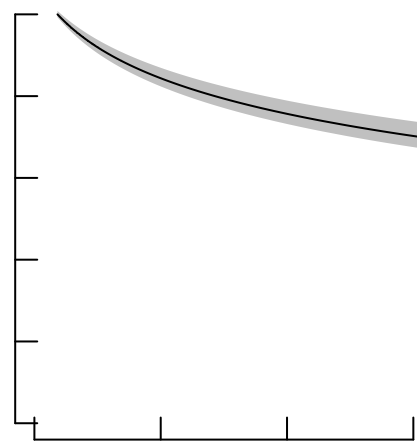
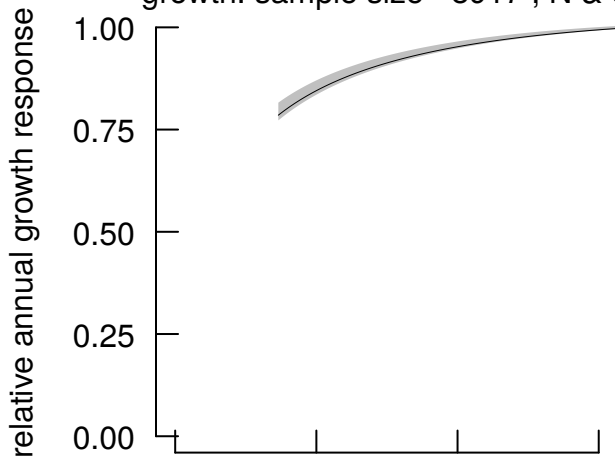
red pine

Pinus resinosa

N deposition

S deposition

growth: sample size= 8917 , N & S corr.= 0.53 , VIF_N= 2.4 , VIF_S= 1.97



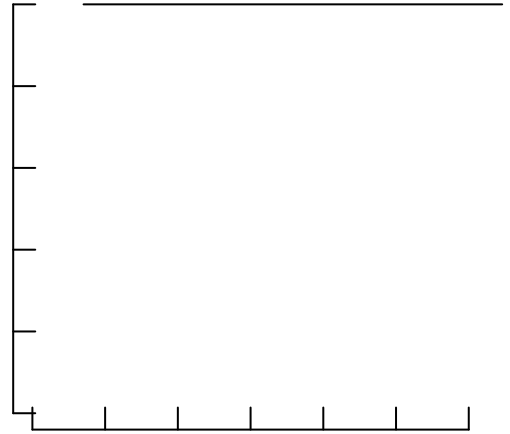
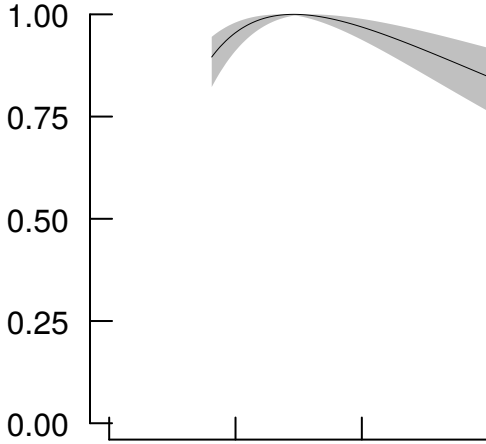
pitch pine
Pinus rigida

N deposition

S deposition

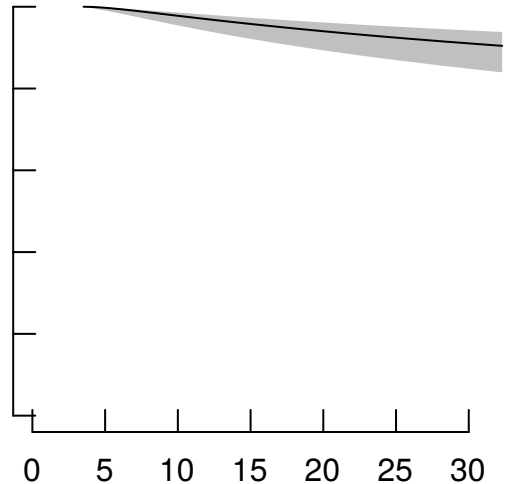
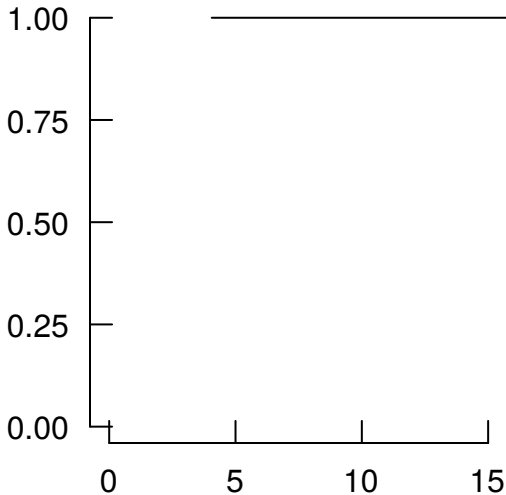
growth: sample size= 2578 , N & S corr.= 0.66 , VIF_N= 2.27 , VIF_S= 2.21

relative annual growth response



relative 10 year survival response

survival: sample size= 3149 , N & S corr.= 0.65 , VIF_N= 2.16 , VIF_S= 2.15



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

eastern white pine

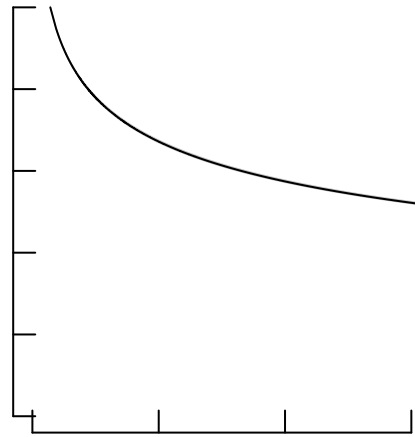
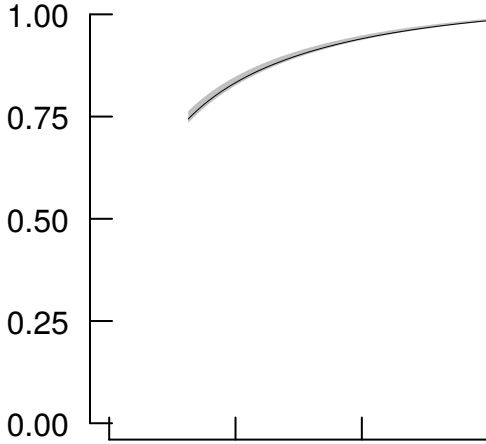
Pinus strobus

N deposition

S deposition

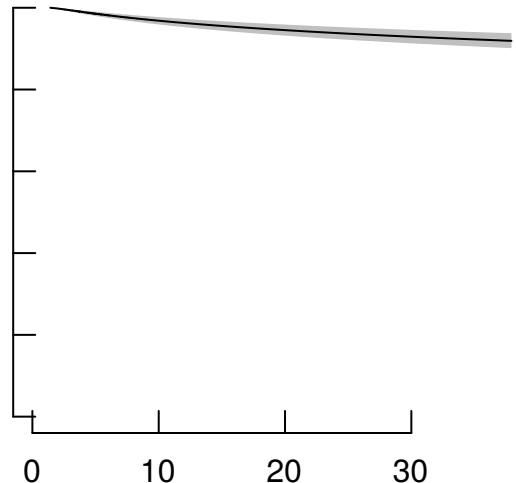
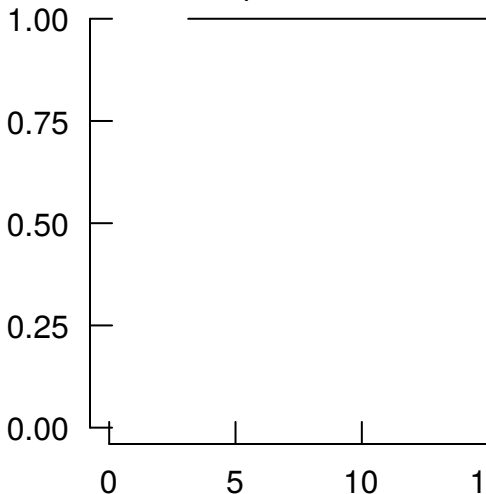
growth: sample size= 20474 , N & S corr.= 0.59 , VIF_N= 2.17 , VIF_S= 1.81

relative annual growth response



relative 10 year survival response

survival: sample size= 23371 , N & S corr.= 0.6 , VIF_N= 2.15 , VIF_S= 1.81



N deposition (kg N ha⁻¹yr⁻¹)

S deposition (kg S ha⁻¹yr⁻¹)

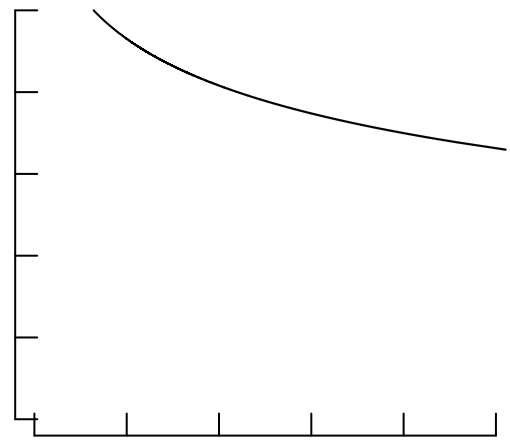
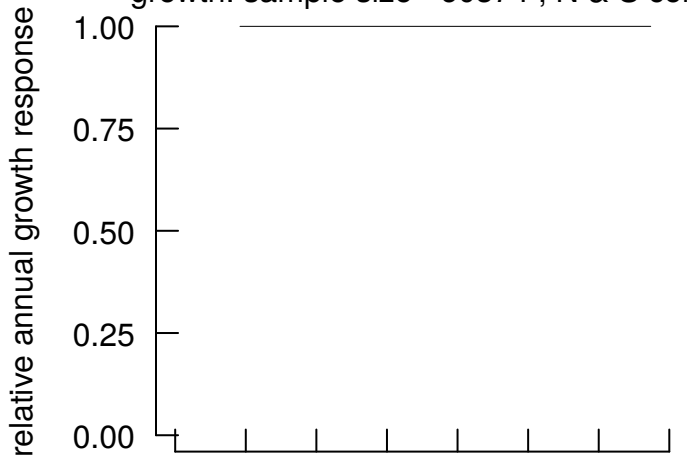
loblolly pine

Pinus taeda

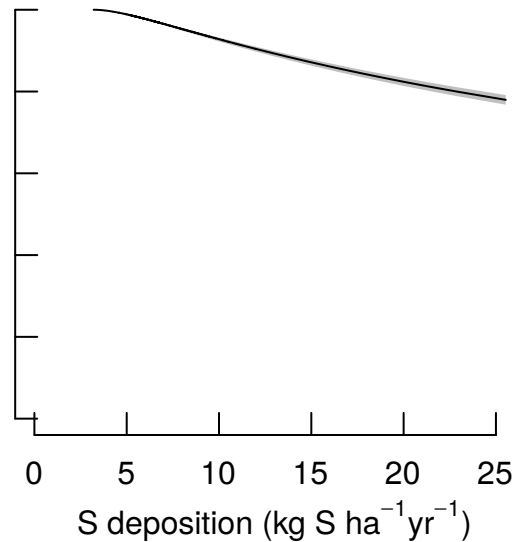
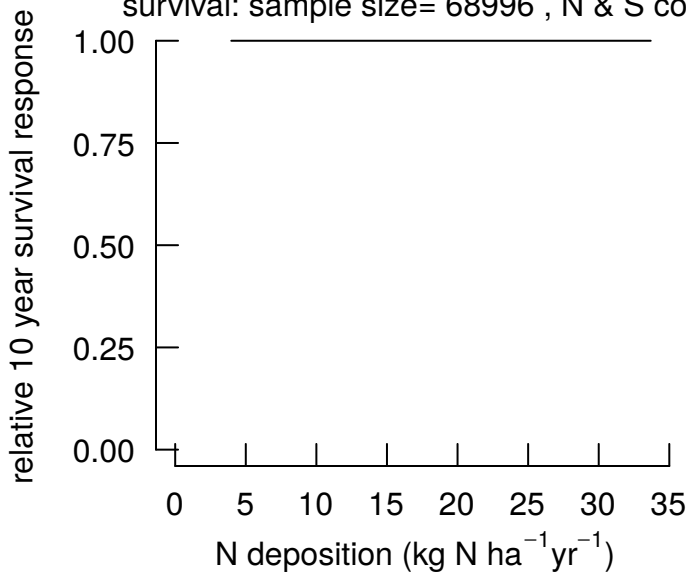
N deposition

S deposition

growth: sample size= 60374 , N & S corr.= 0.32 , VIF_N= 1.2 , VIF_S= 1.29



survival: sample size= 68996 , N & S corr.= 0.32 , VIF_N= 1.2 , VIF_S= 1.29



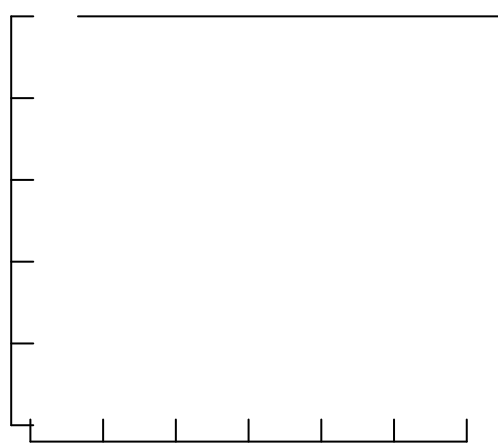
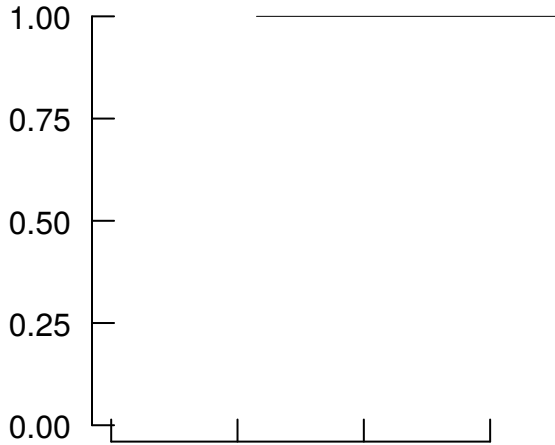
Virginia pine
Pinus virginiana

N deposition

S deposition

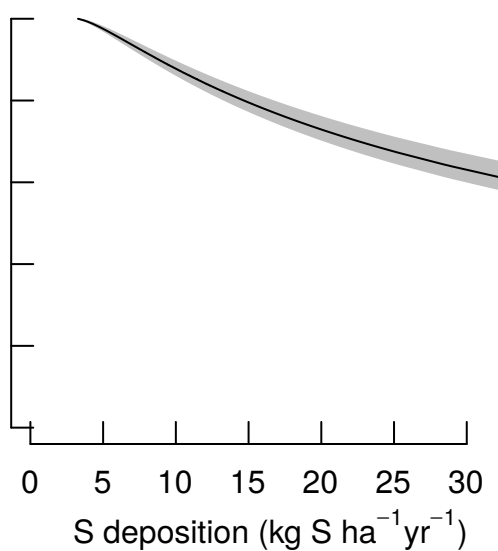
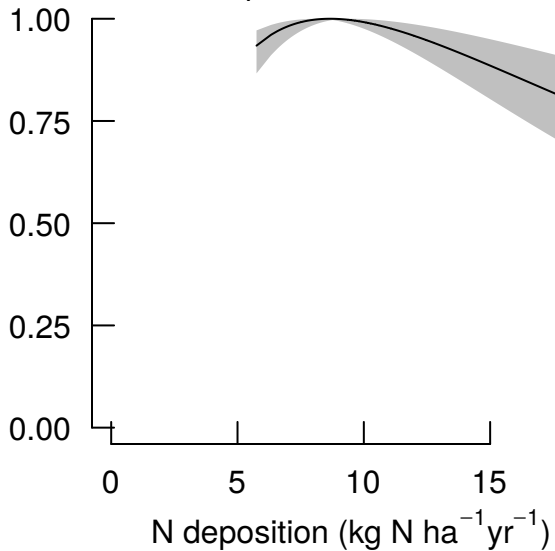
growth: sample size= 6937 , N & S corr.= 0.44 , VIF_N= 1.44 , VIF_S= 1.64

relative annual growth response



survival: sample size= 9236 , N & S corr.= 0.44 , VIF_N= 1.44 , VIF_S= 1.64

relative 10 year survival response



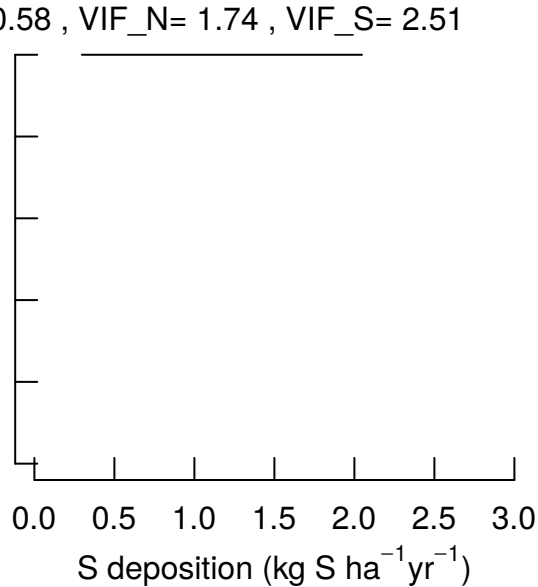
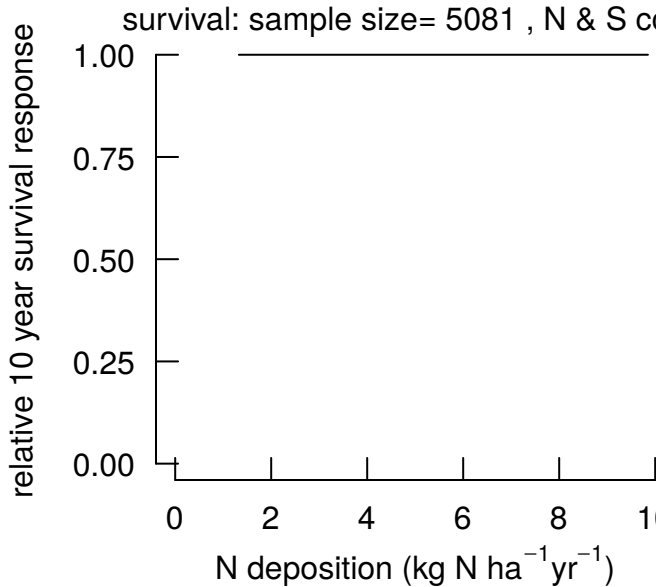
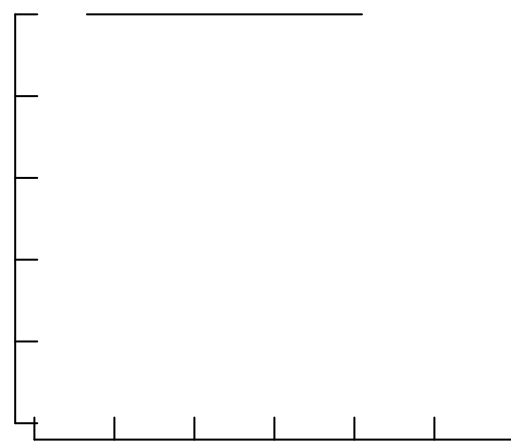
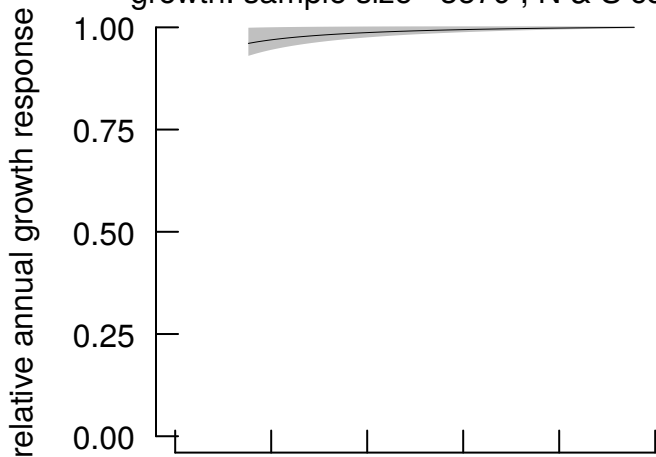
singleleaf pinyon

Pinus monophylla

N deposition

S deposition

growth: sample size= 3579 , N & S corr.= 0.58 , VIF_N= 1.77 , VIF_S= 2.82



survival: sample size= 5081 , N & S corr.= 0.58 , VIF_N= 1.74 , VIF_S= 2.51

Douglas-fir

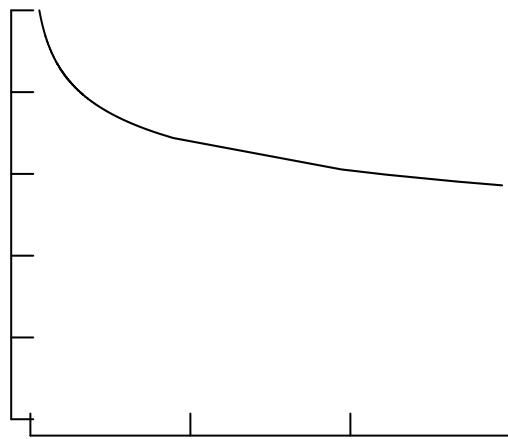
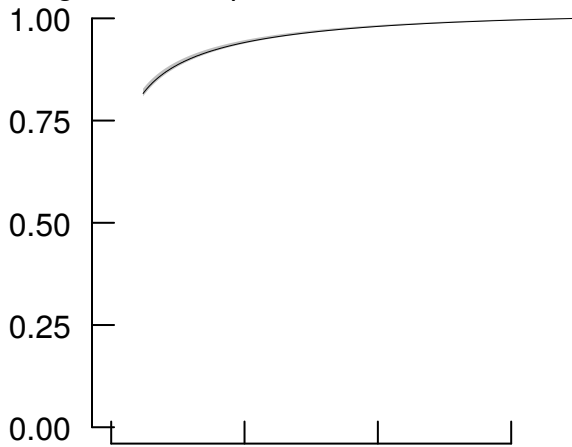
Pseudotsuga menziesii

N deposition

S deposition

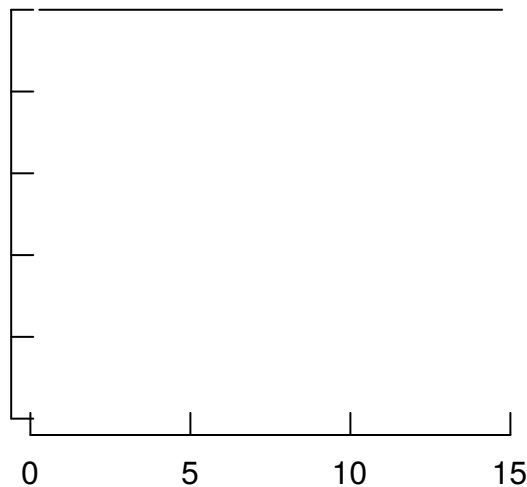
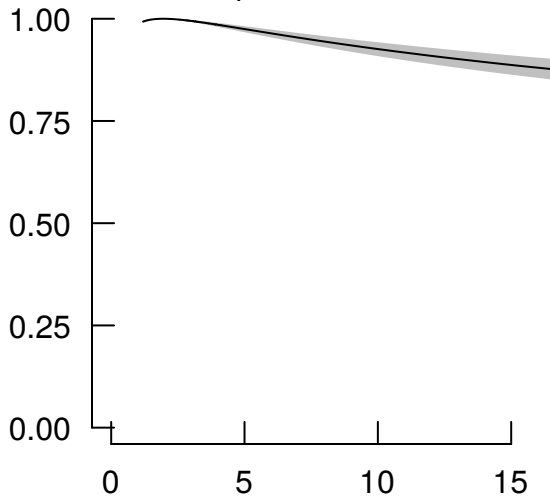
growth: sample size= 39373 , N & S corr.= 0.65 , VIF_N= 1.93 , VIF_S= 2.98

relative annual growth response



relative 10 year survival response

survival: sample size= 46496 , N & S corr.= 0.65 , VIF_N= 1.91 , VIF_S= 2.78



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

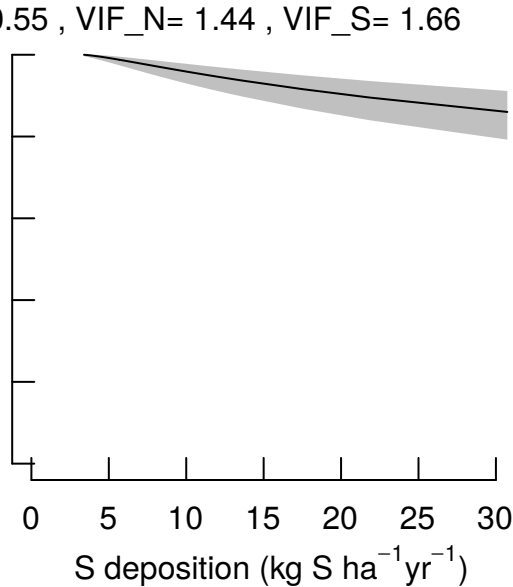
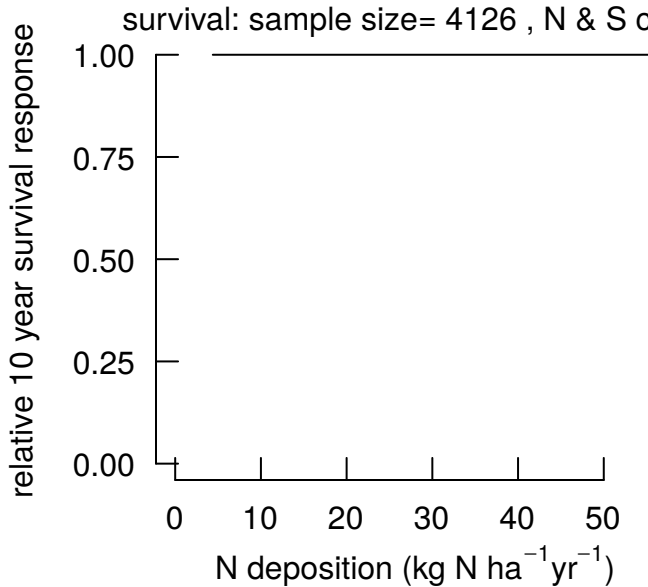
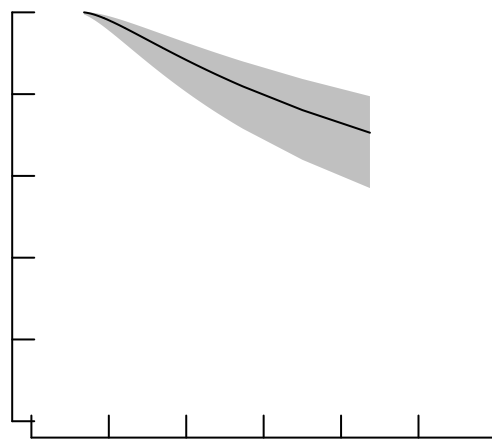
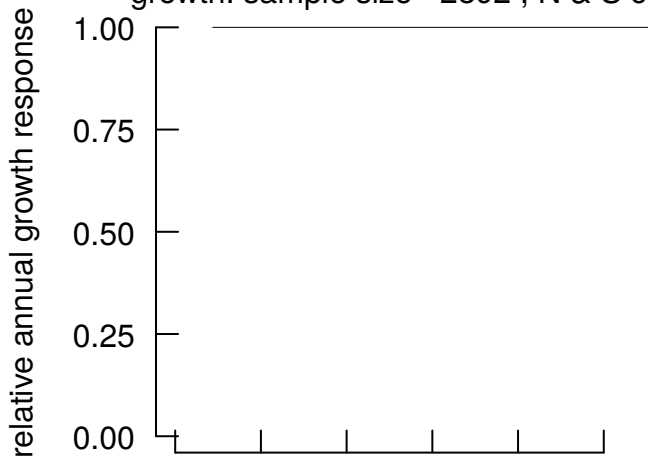
baldcypress

Taxodium distichum

N deposition

S deposition

growth: sample size= 2892 , N & S corr.= 0.54 , VIF_N= 1.41 , VIF_S= 1.64



survival: sample size= 4126 , N & S corr.= 0.55 , VIF_N= 1.44 , VIF_S= 1.66

pondcypress

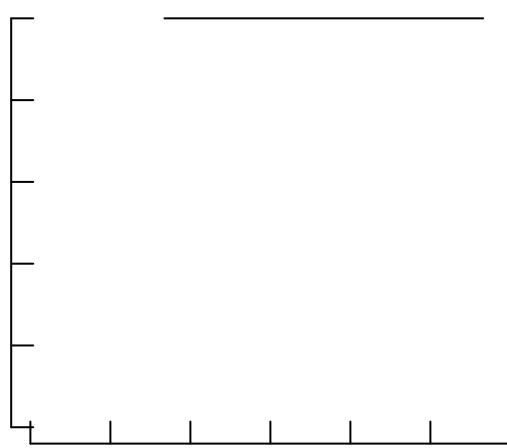
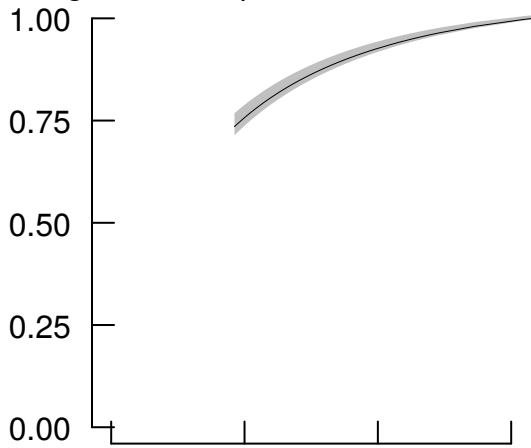
Taxodium ascendens

N deposition

S deposition

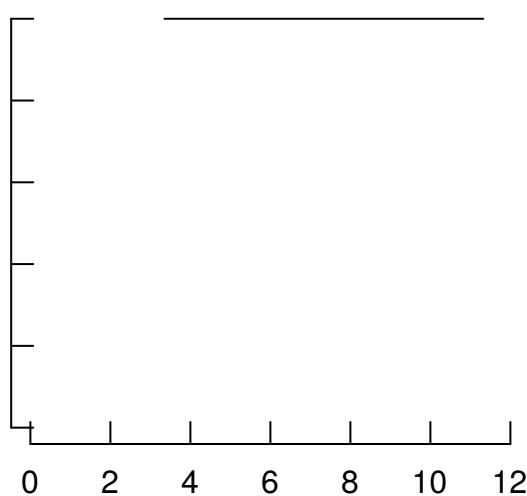
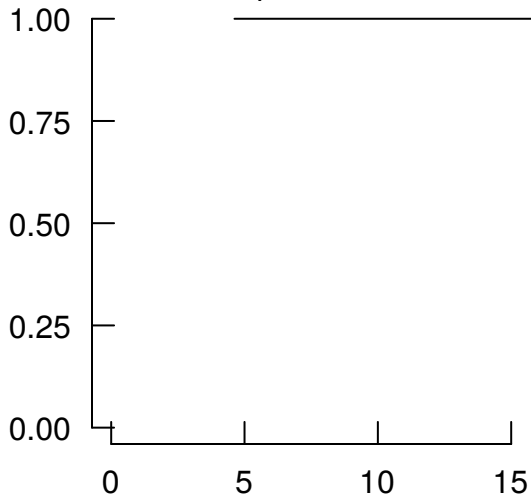
growth: sample size= 3459 , N & S corr.= 0.71 , VIF_N= 2.06 , VIF_S= 2.12

relative annual growth response



relative 10 year survival response

survival: sample size= 5064 , N & S corr.= 0.7 , VIF_N= 2.06 , VIF_S= 2.13



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

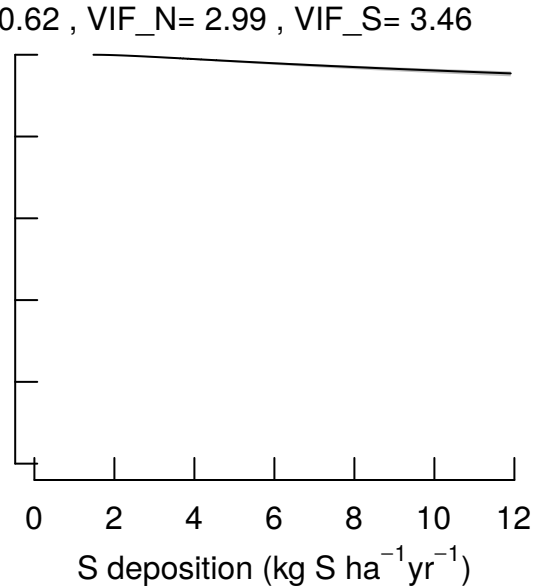
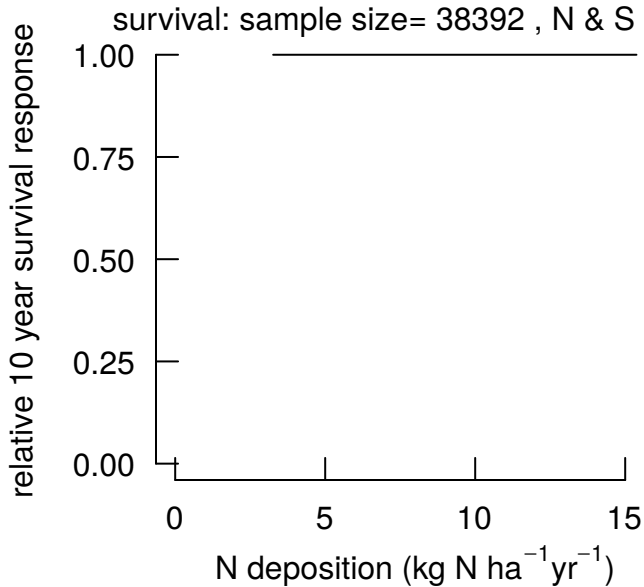
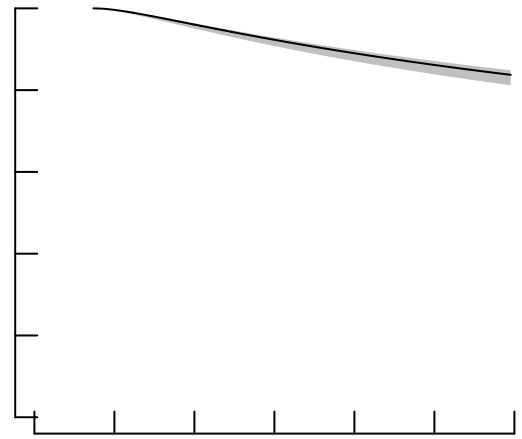
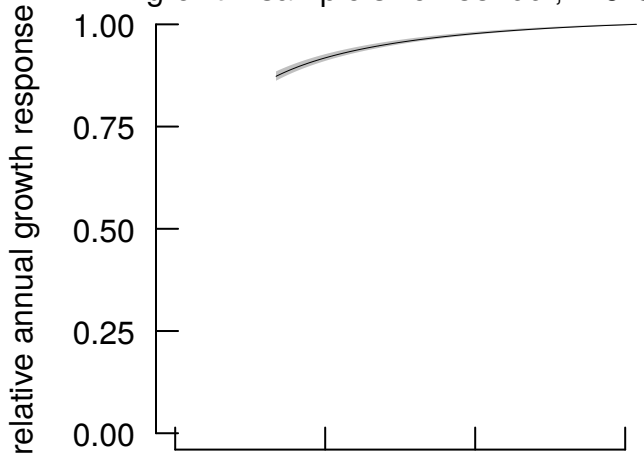
northern white-cedar

Thuja occidentalis

N deposition

S deposition

growth: sample size= 33299 , N & S corr.= 0.61 , VIF_N= 3 , VIF_S= 3.43



survival: sample size= 38392 , N & S corr.= 0.62 , VIF_N= 2.99 , VIF_S= 3.46

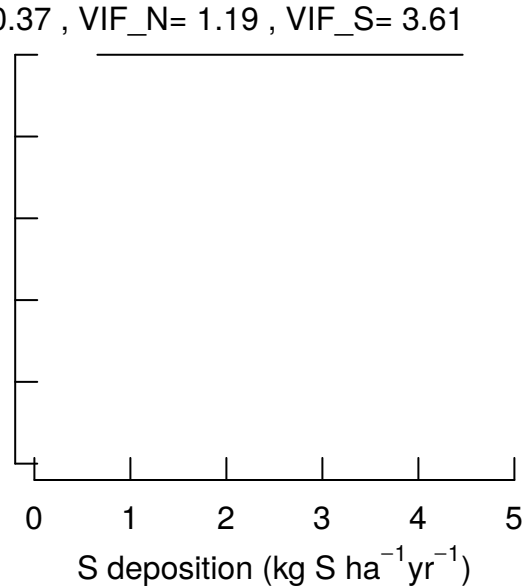
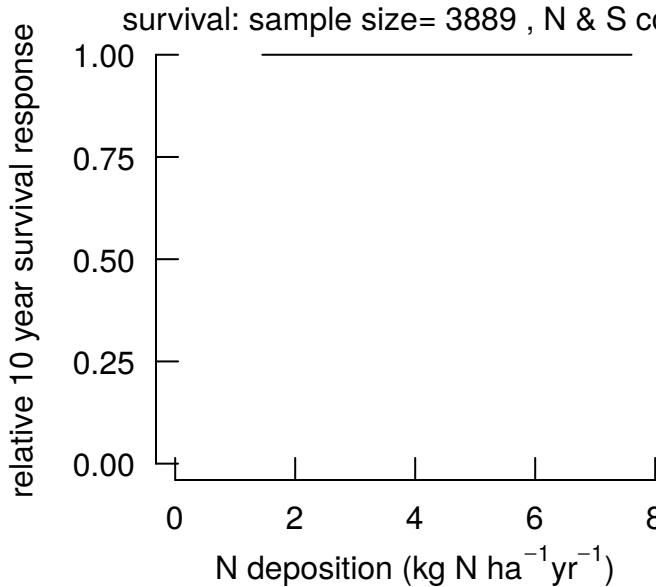
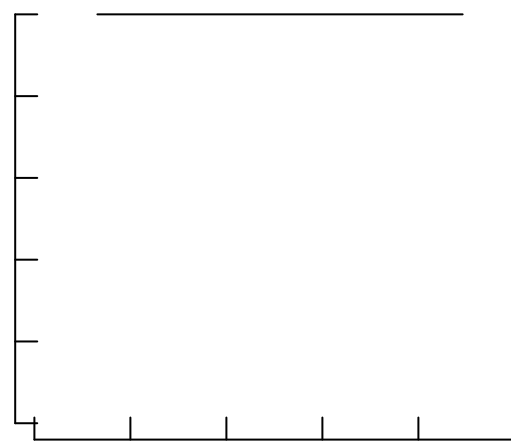
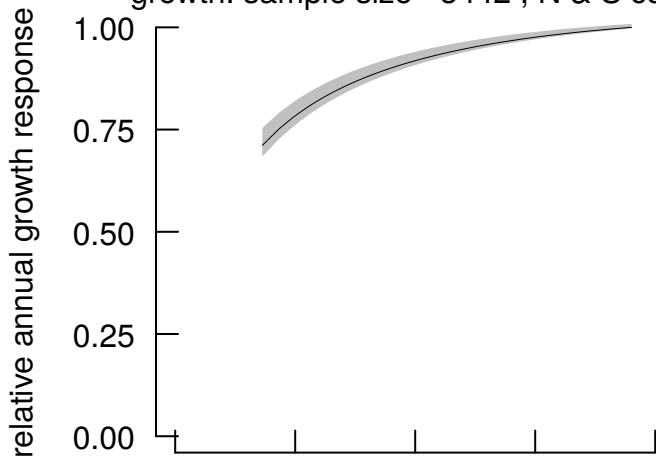
western redcedar

Thuja plicata

N deposition

S deposition

growth: sample size= 3442 , N & S corr.= 0.41 , VIF_N= 1.24 , VIF_S= 3.84



eastern hemlock

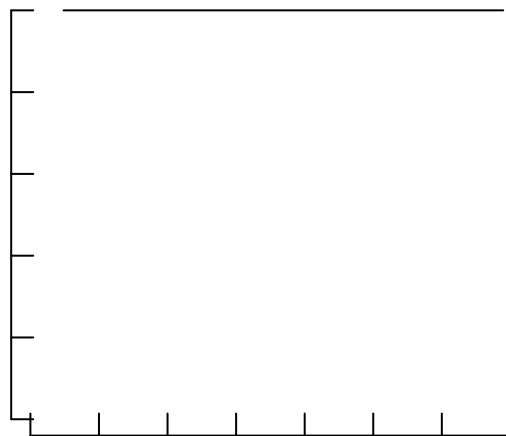
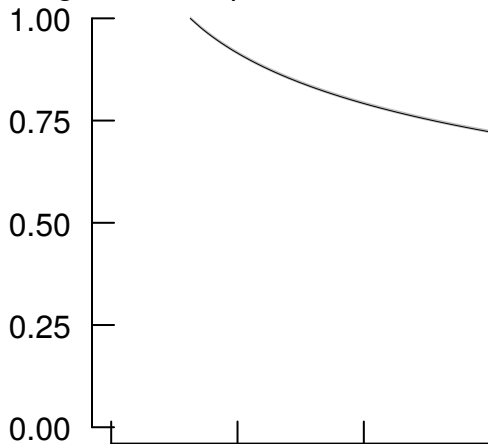
Tsuga canadensis

N deposition

S deposition

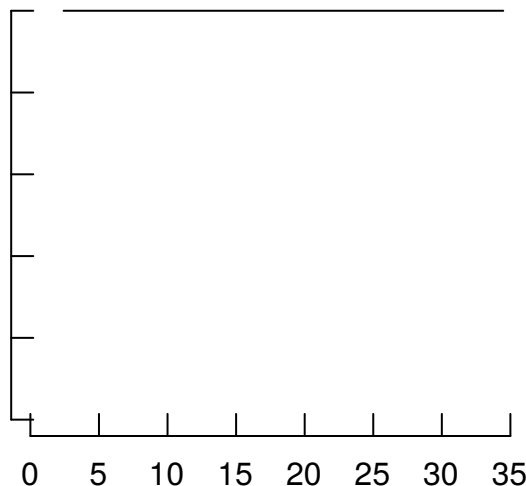
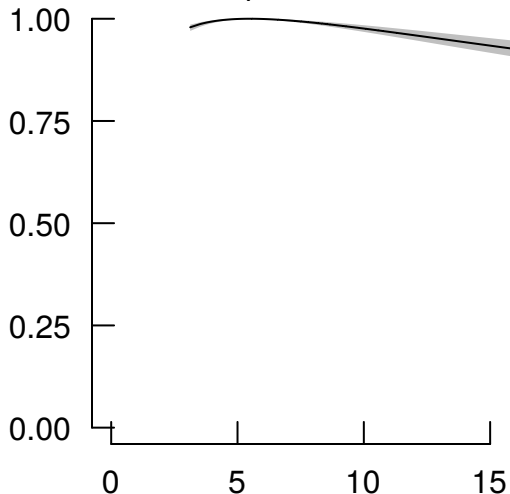
growth: sample size= 22864 , N & S corr.= 0.78 , VIF_N= 2.86 , VIF_S= 2.63

relative annual growth response



relative 10 year survival response

survival: sample size= 25485 , N & S corr.= 0.78 , VIF_N= 2.83 , VIF_S= 2.6



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

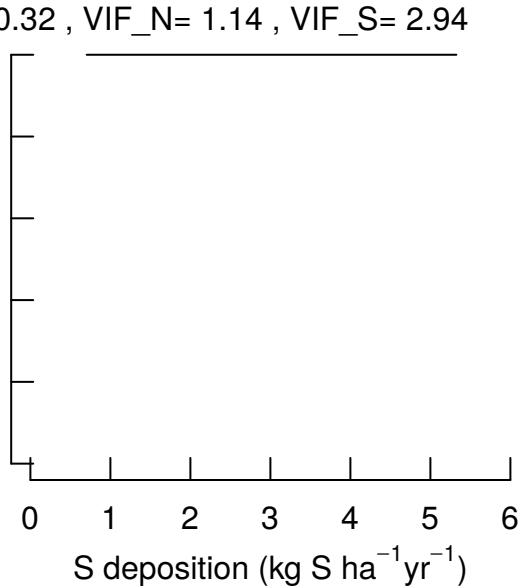
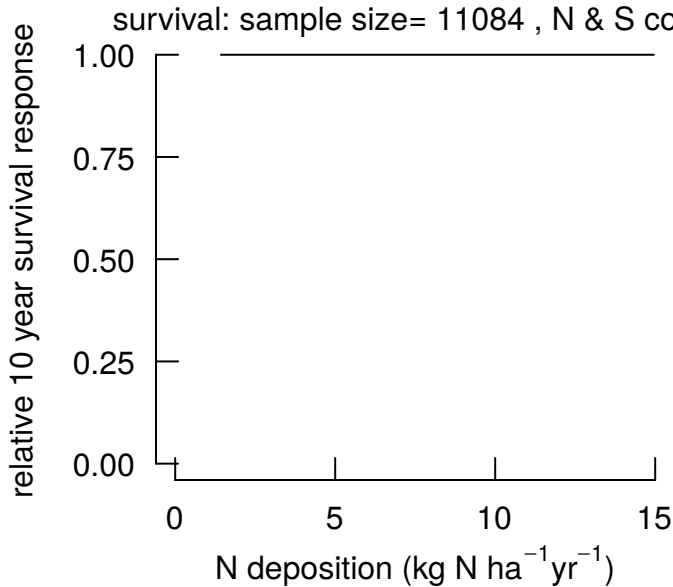
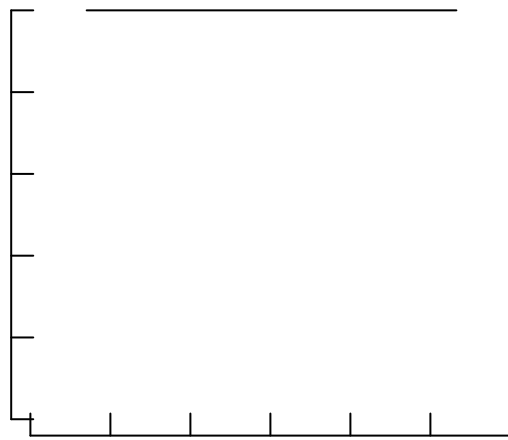
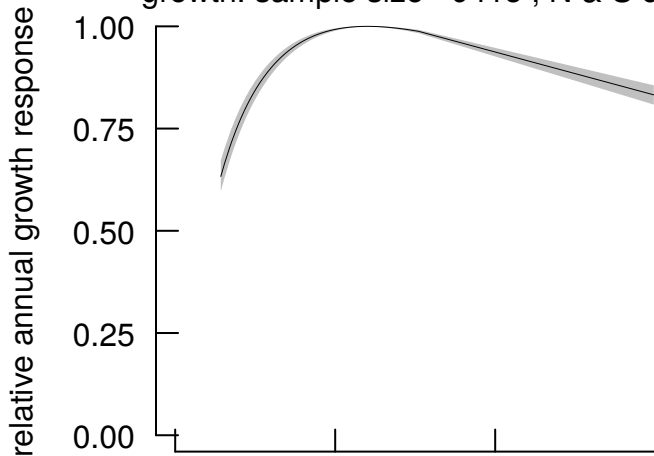
western hemlock

Tsuga heterophylla

N deposition

S deposition

growth: sample size= 9415 , N & S corr.= 0.34 , VIF_N= 1.16 , VIF_S= 2.9



survival: sample size= 11084 , N & S corr.= 0.32 , VIF_N= 1.14 , VIF_S= 2.94

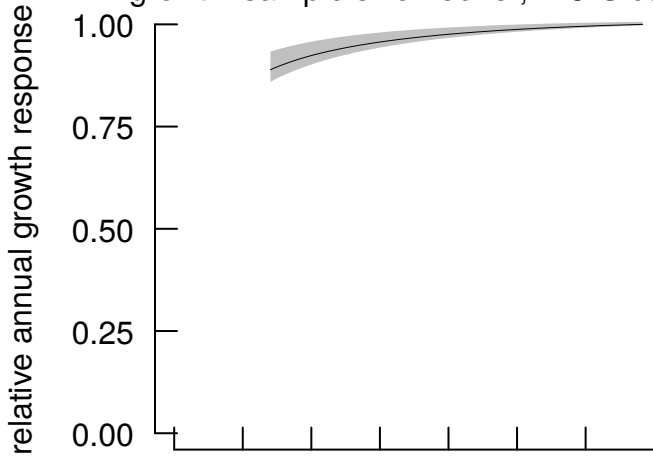
mountain hemlock

Tsuga mertensiana

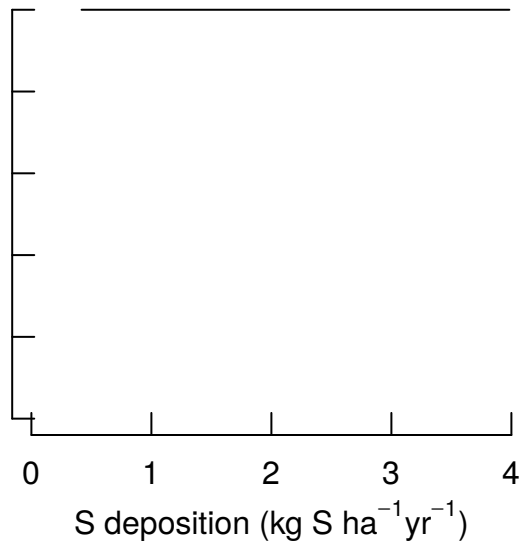
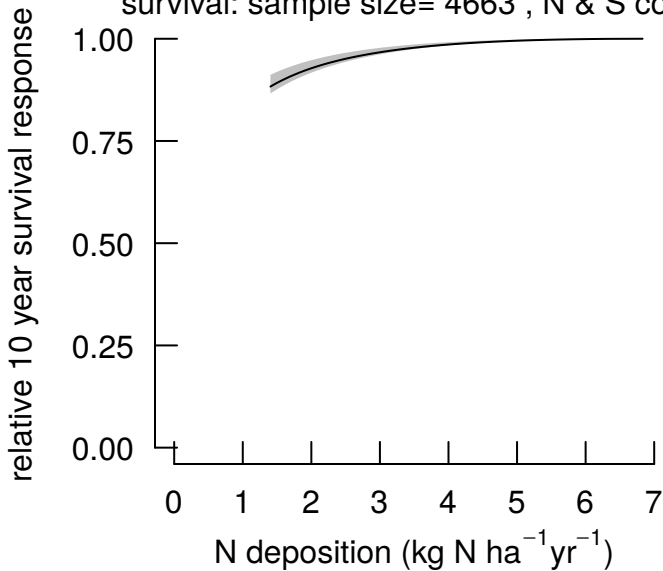
N deposition

S deposition

growth: sample size= 3913 , N & S corr.= 0.58 , VIF_N= 2.57 , VIF_S= 7.01



survival: sample size= 4663 , N & S corr.= 0.59 , VIF_N= 2.53 , VIF_S= 7.04

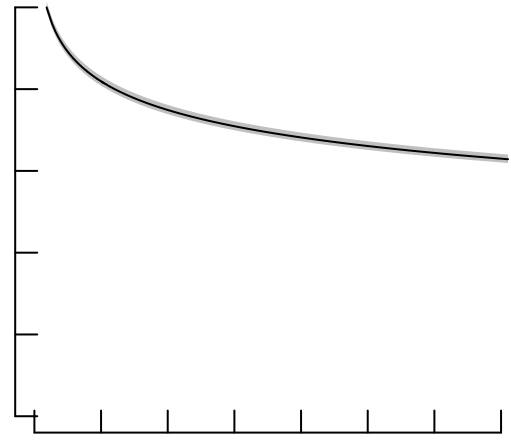
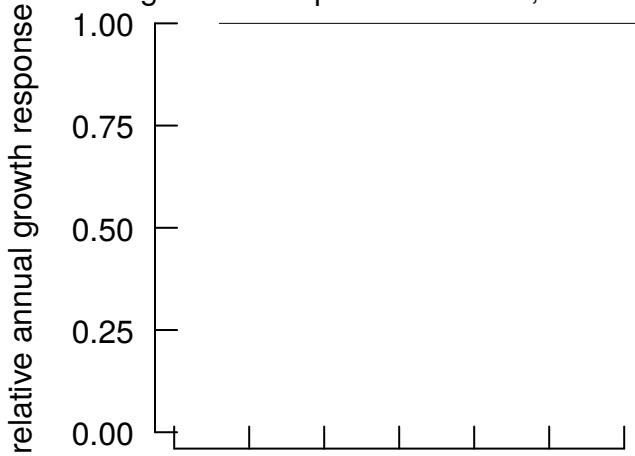


boxelder
Acer negundo

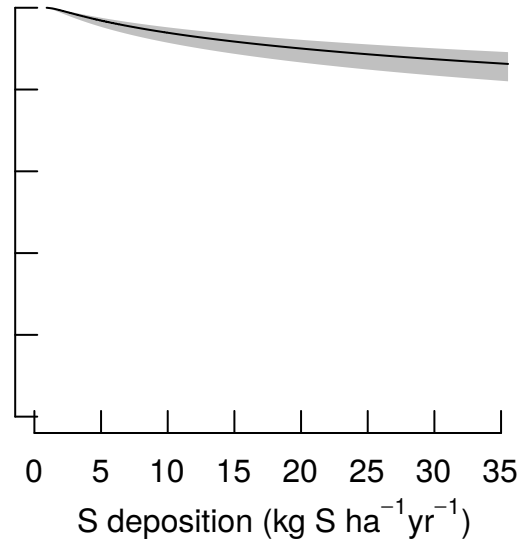
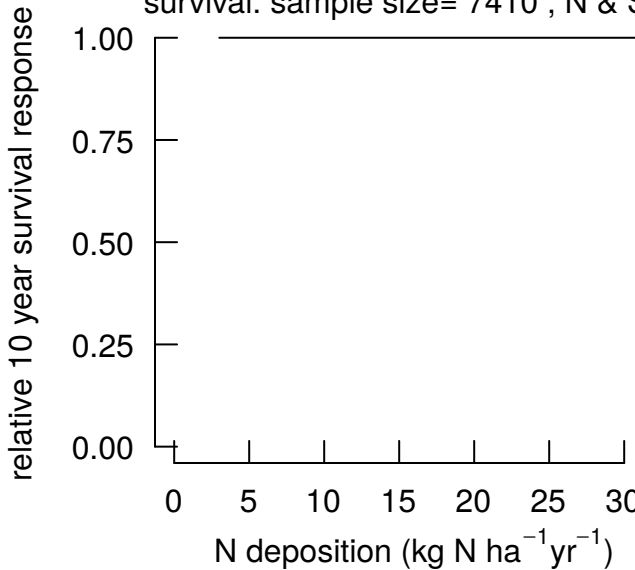
N deposition

S deposition

growth: sample size= 6070 , N & S corr.= 0.14 , VIF_N= 1.1 , VIF_S= 1.44



survival: sample size= 7410 , N & S corr.= 0.13 , VIF_N= 1.1 , VIF_S= 1.4

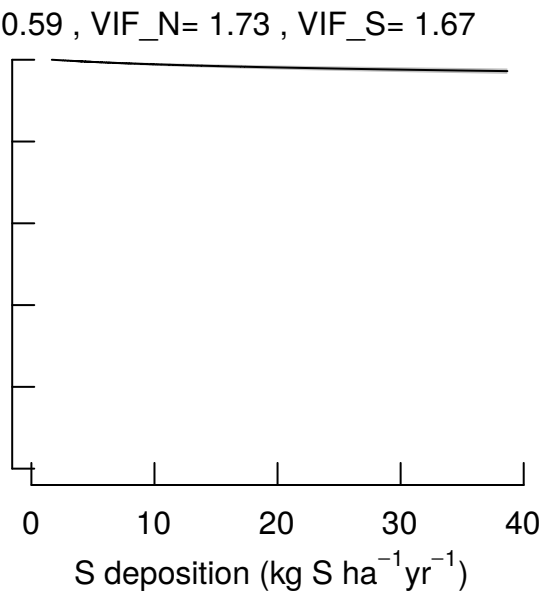
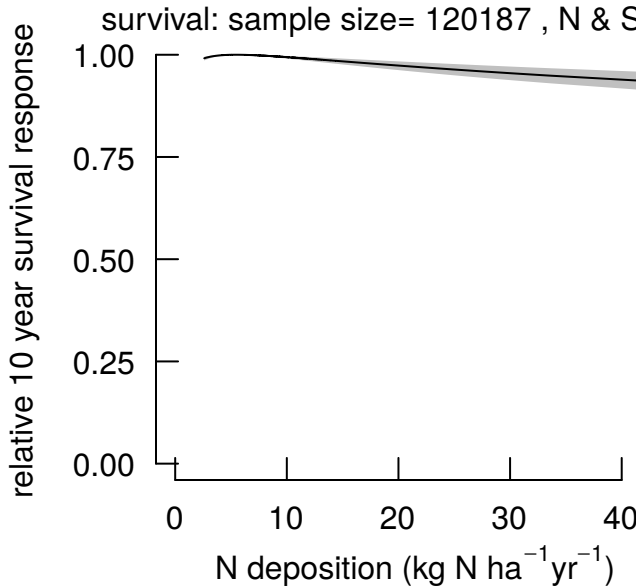
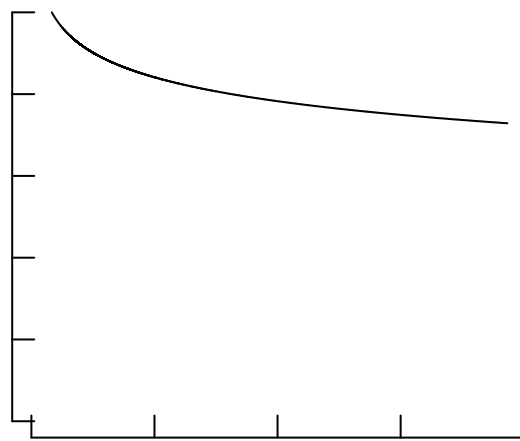
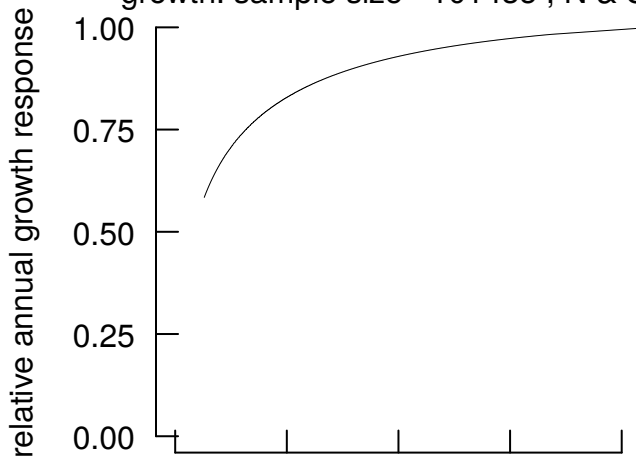


red maple
Acer rubrum

N deposition

S deposition

growth: sample size= 101435 , N & S corr.= 0.6 , VIF_N= 1.78 , VIF_S= 1.71

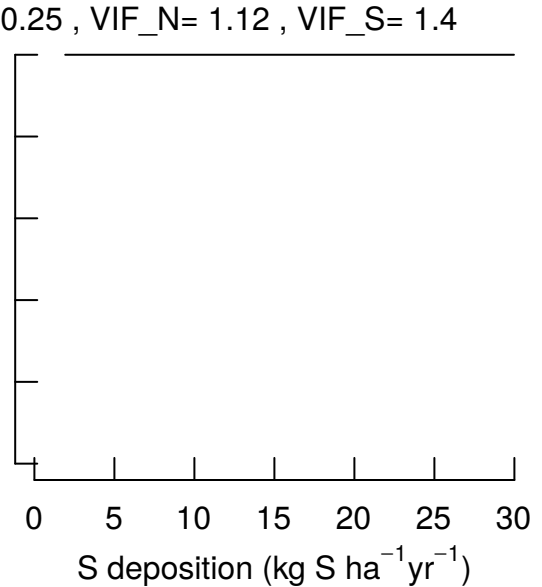
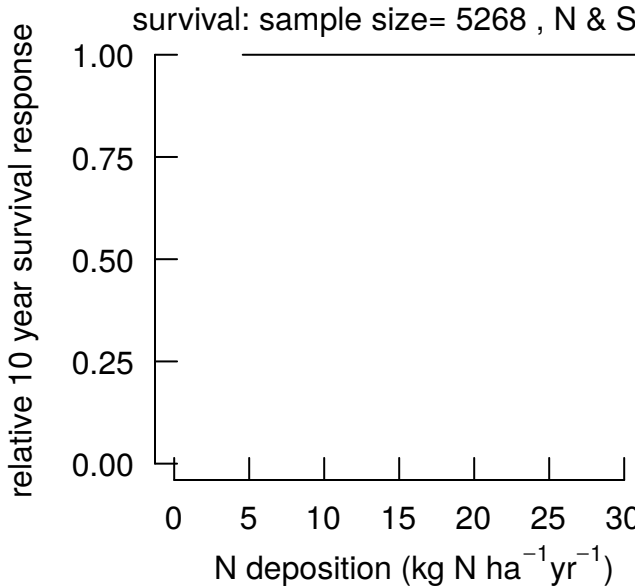
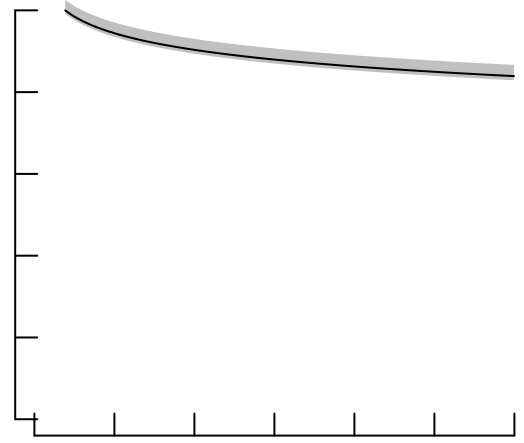
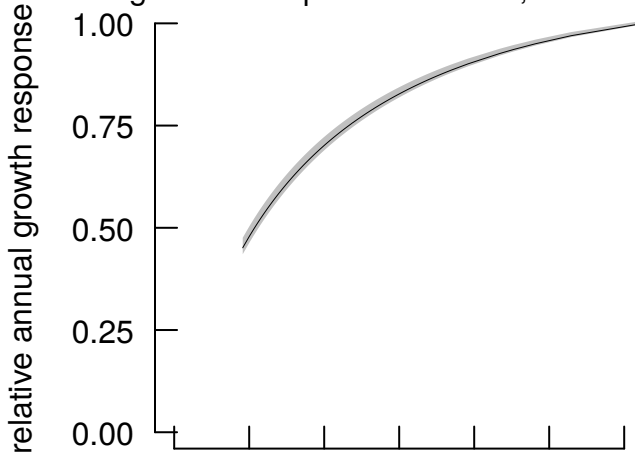


silver maple
Acer saccharinum

N deposition

S deposition

growth: sample size= 4561 , N & S corr.= 0.27 , VIF_N= 1.13 , VIF_S= 1.41



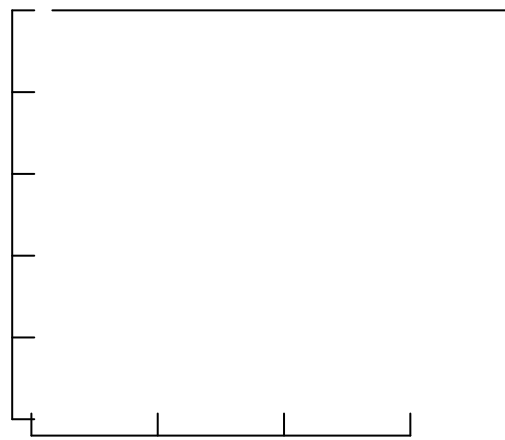
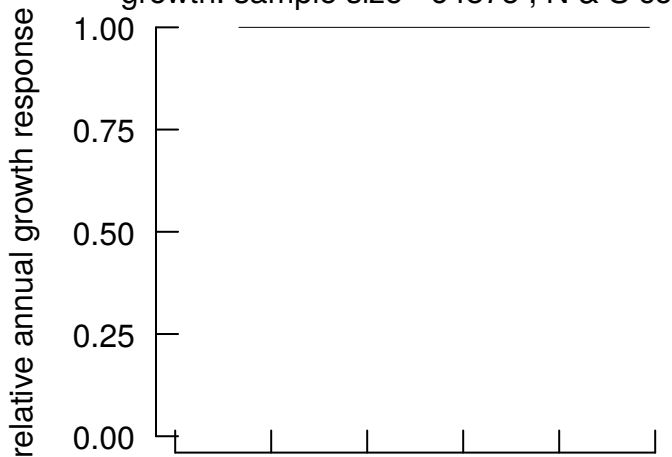
survival: sample size= 5268 , N & S corr.= 0.25 , VIF_N= 1.12 , VIF_S= 1.4

sugar maple
Acer saccharum

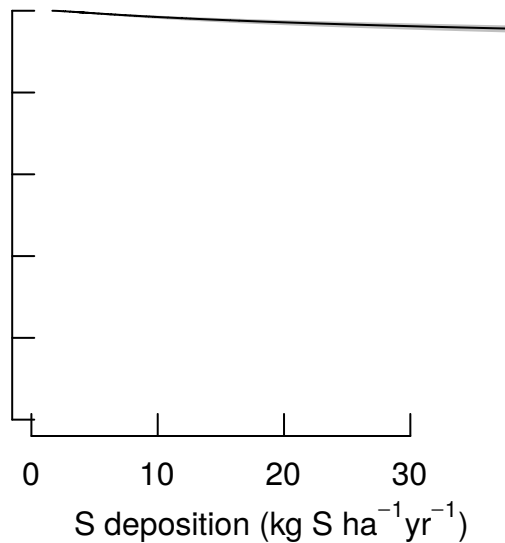
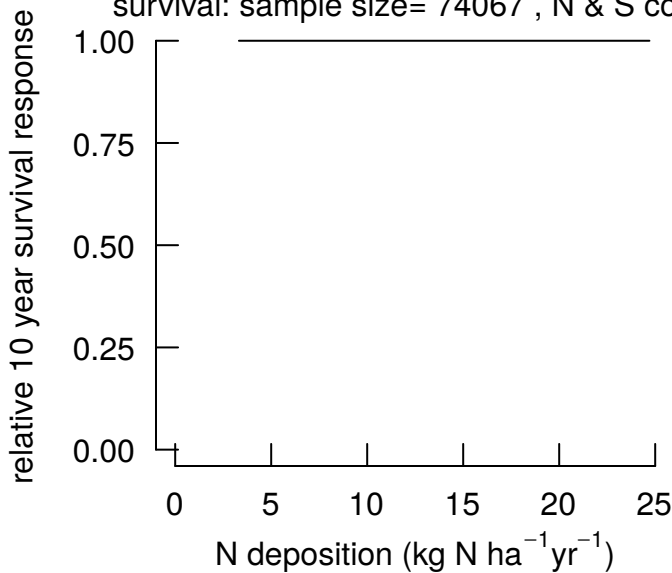
N deposition

S deposition

growth: sample size= 64875 , N & S corr.= 0.67 , VIF_N= 2.39 , VIF_S= 2.26



survival: sample size= 74067 , N & S corr.= 0.67 , VIF_N= 2.39 , VIF_S= 2.24



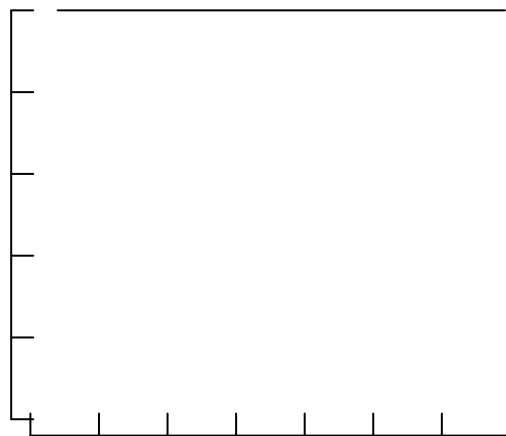
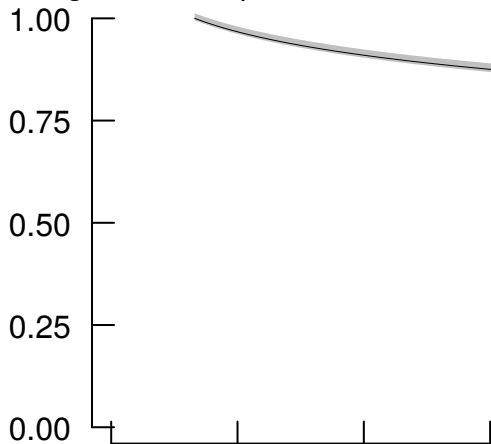
yellow birch
Betula alleghaniensis

N deposition

S deposition

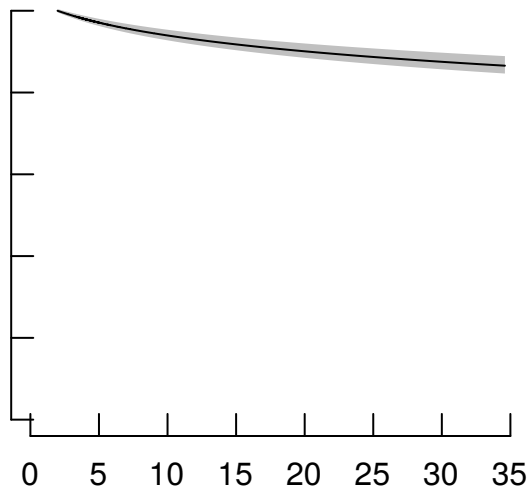
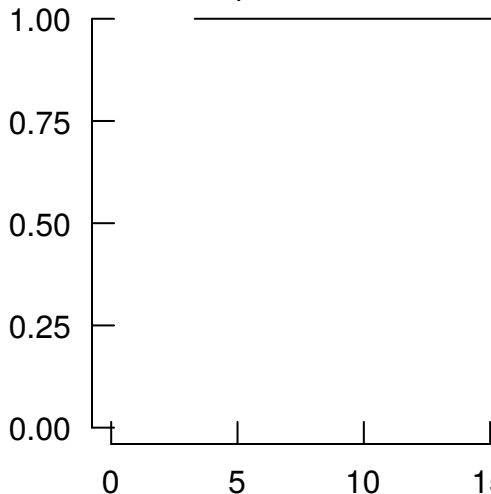
growth: sample size= 13733 , N & S corr.= 0.7 , VIF_N= 2.35 , VIF_S= 2.45

relative annual growth response



relative 10 year survival response

survival: sample size= 16019 , N & S corr.= 0.71 , VIF_N= 2.37 , VIF_S= 2.47



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

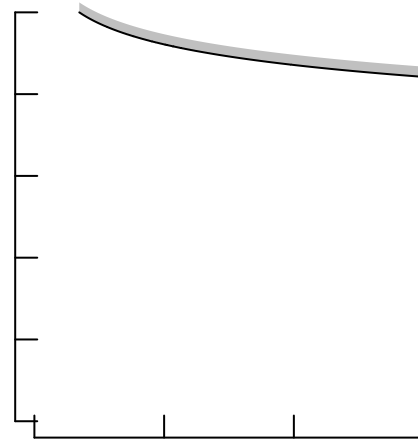
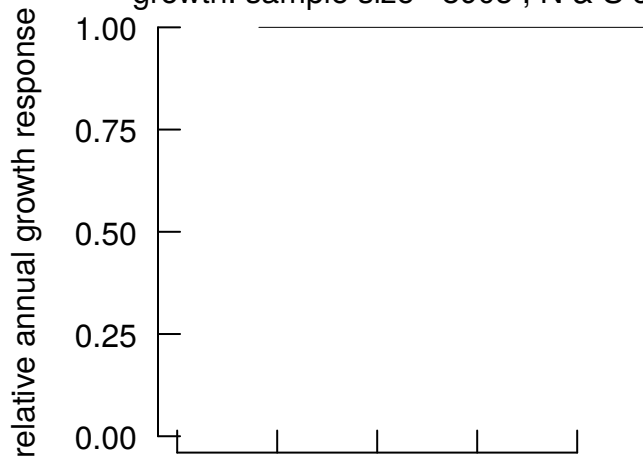
sweet birch

Betula lenta

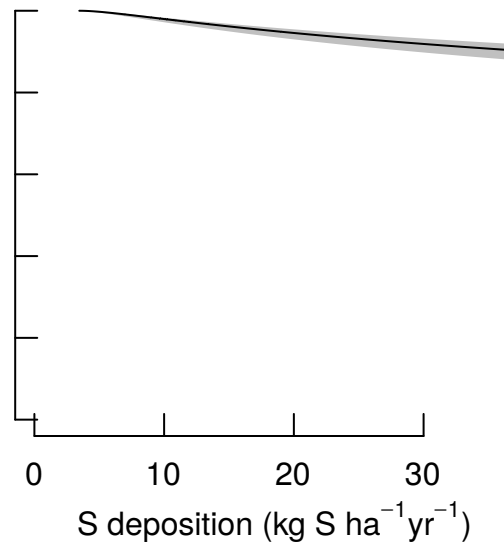
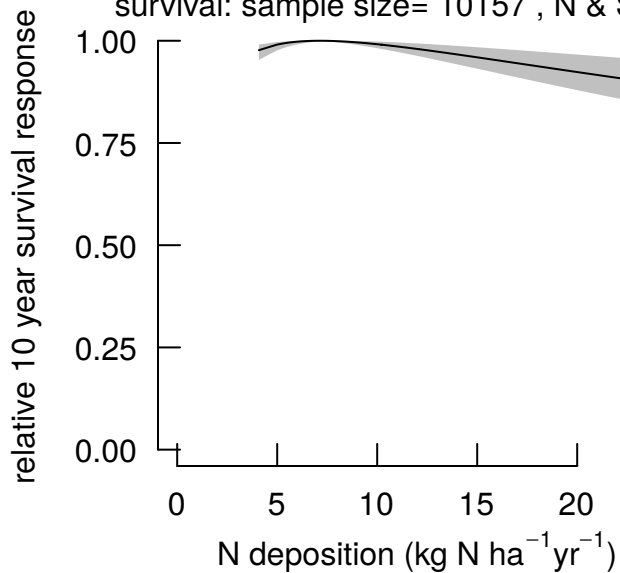
N deposition

S deposition

growth: sample size= 8905 , N & S corr.= 0.58 , VIF_N= 1.61 , VIF_S= 2.01



survival: sample size= 10157 , N & S corr.= 0.57 , VIF_N= 1.59 , VIF_S= 1.99



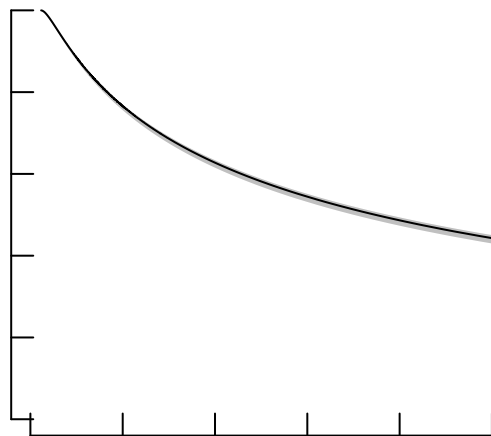
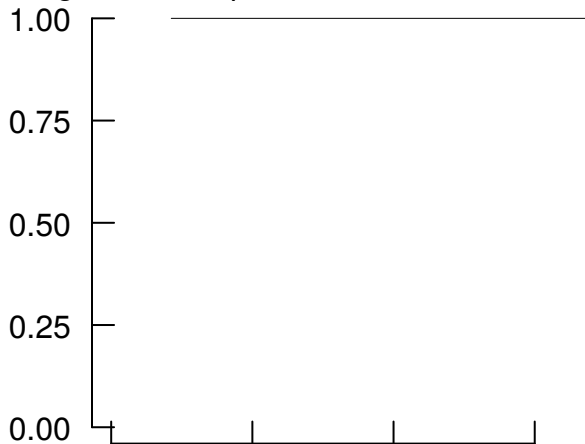
paper birch
Betula papyrifera

N deposition

S deposition

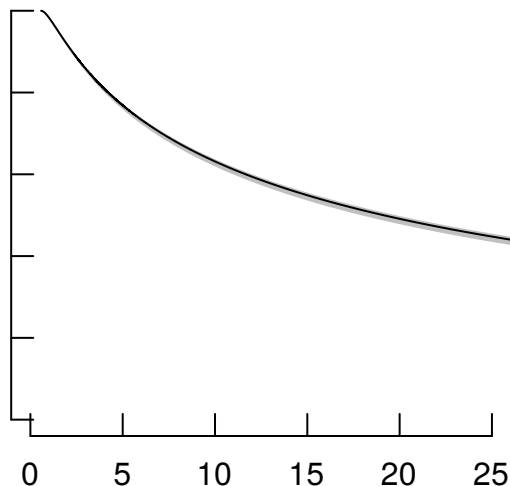
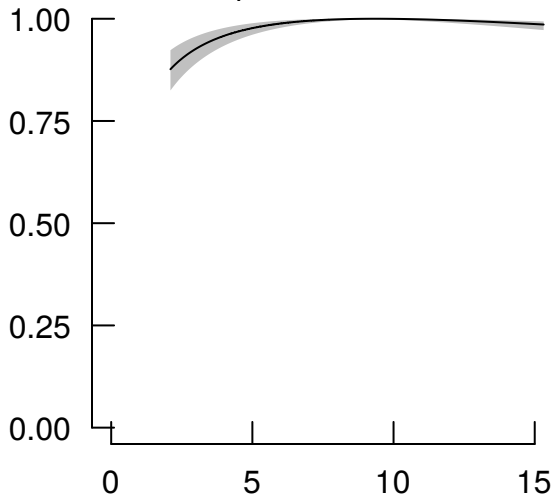
growth: sample size= 18476 , N & S corr.= 0.42 , VIF_N= 1.75 , VIF_S= 1.99

relative annual growth response



relative 10 year survival response

survival: sample size= 24432 , N & S corr.= 0.42 , VIF_N= 1.71 , VIF_S= 2.02



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

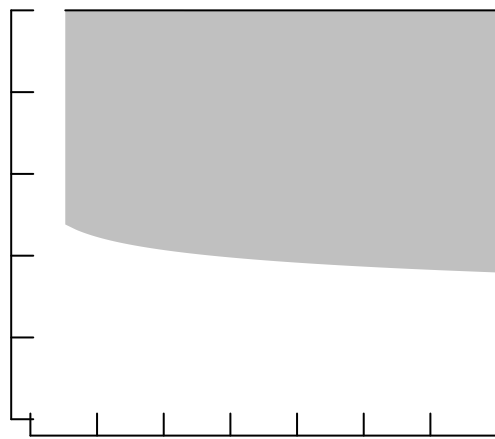
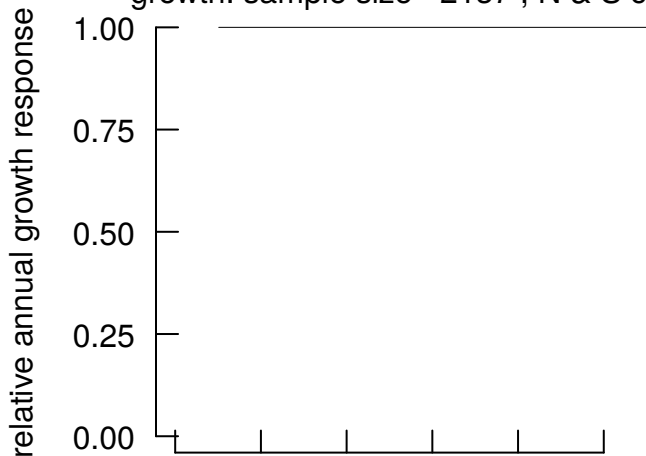
American hornbeam, musclewood

Carpinus caroliniana

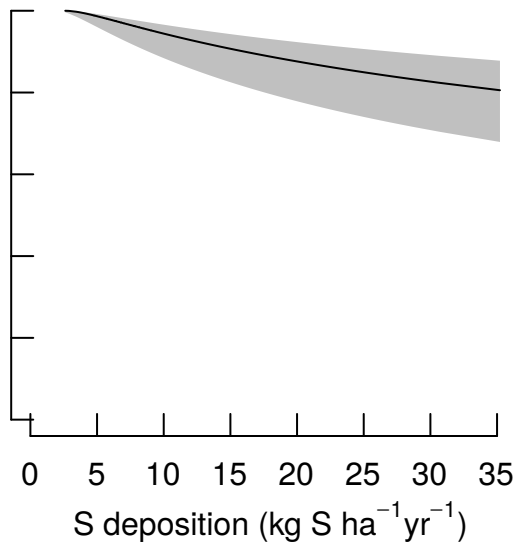
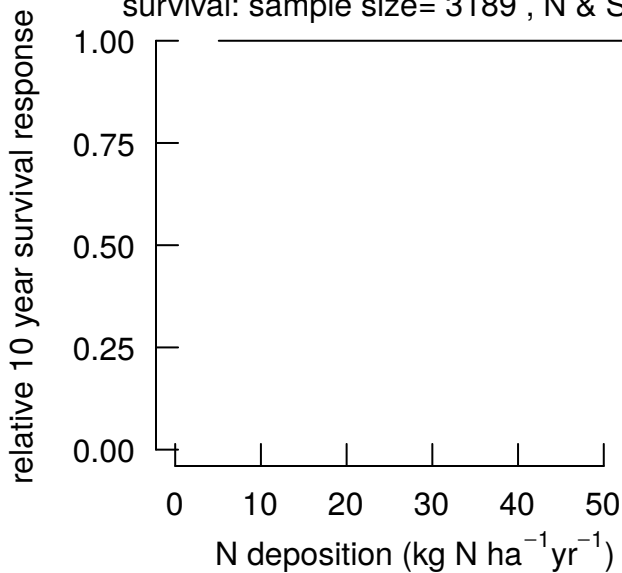
N deposition

S deposition

growth: sample size= 2137 , N & S corr.= 0.23 , VIF_N= 1.05 , VIF_S= 1.84



survival: sample size= 3189 , N & S corr.= 0.26 , VIF_N= 1.07 , VIF_S= 1.77



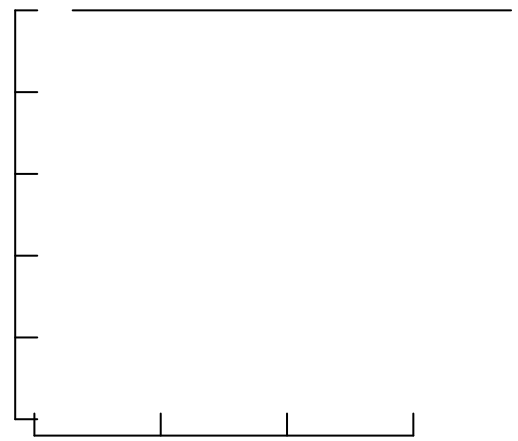
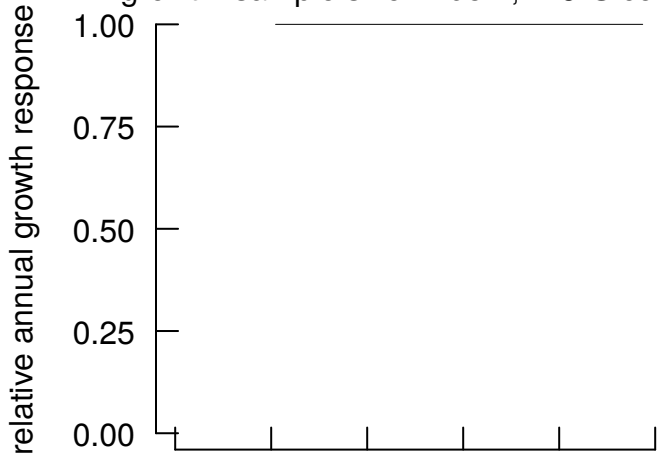
bitternut hickory

Carya cordiformis

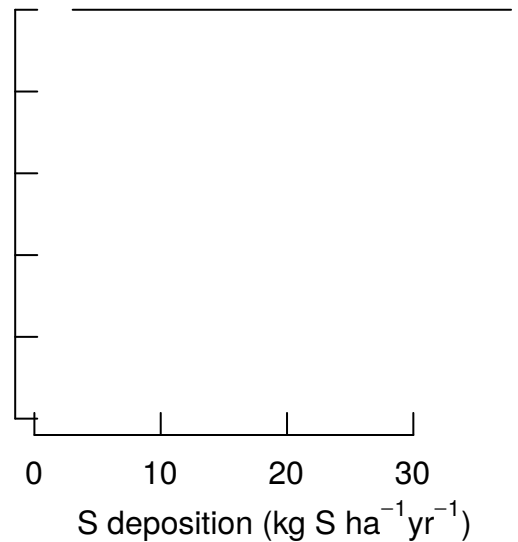
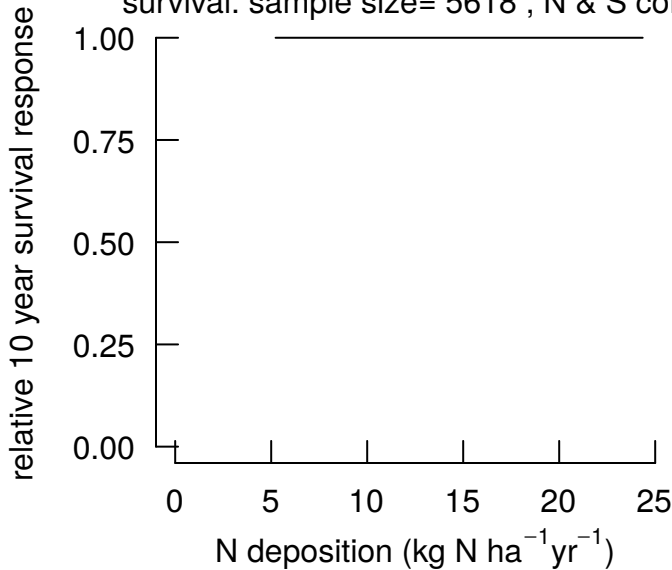
N deposition

S deposition

growth: sample size= 4987 , N & S corr.= 0.061 , VIF_N= 1.11 , VIF_S= 1.17



survival: sample size= 5618 , N & S corr.= 0.082 , VIF_N= 1.1 , VIF_S= 1.18



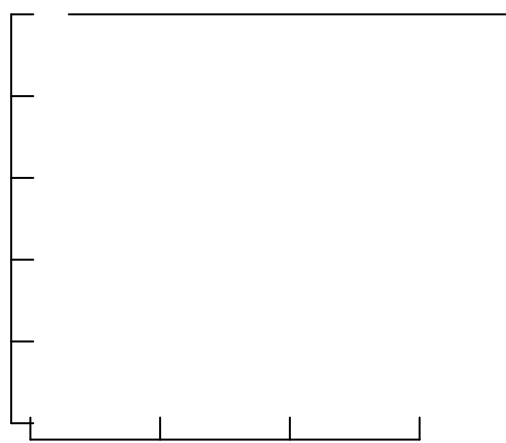
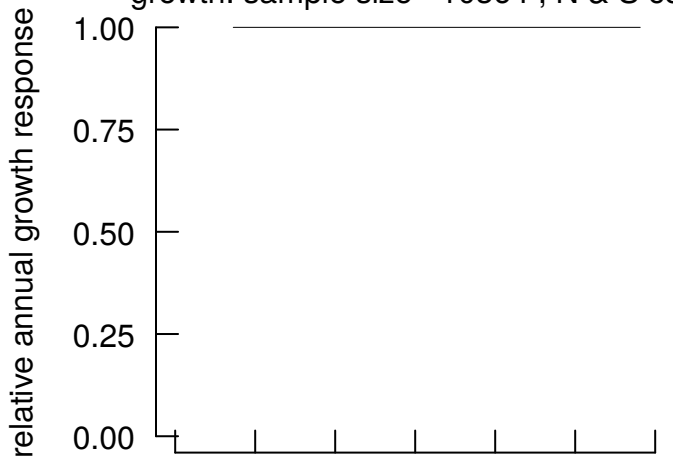
pignut hickory

Carya glabra

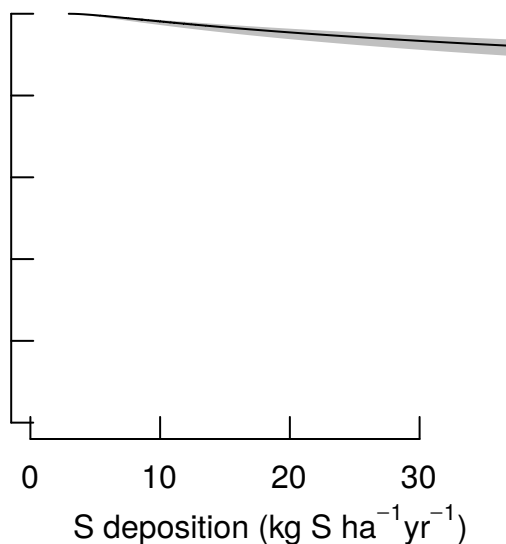
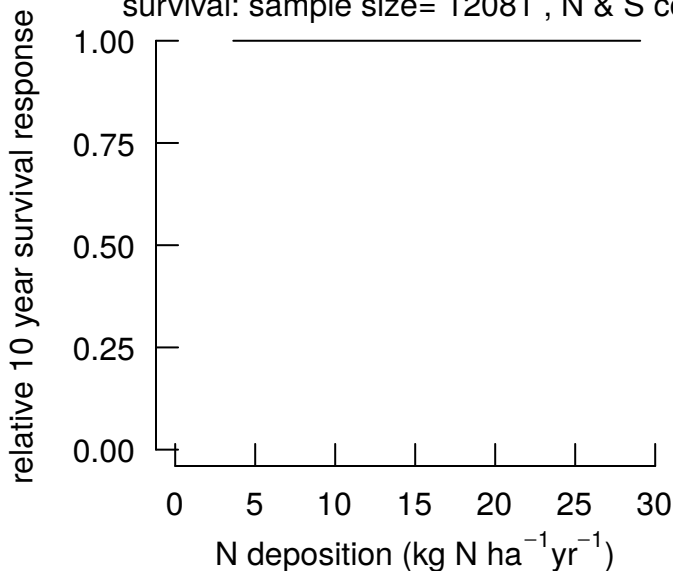
N deposition

S deposition

growth: sample size= 10364 , N & S corr.= 0.4 , VIF_N= 1.19 , VIF_S= 1.53



survival: sample size= 12081 , N & S corr.= 0.4 , VIF_N= 1.19 , VIF_S= 1.53



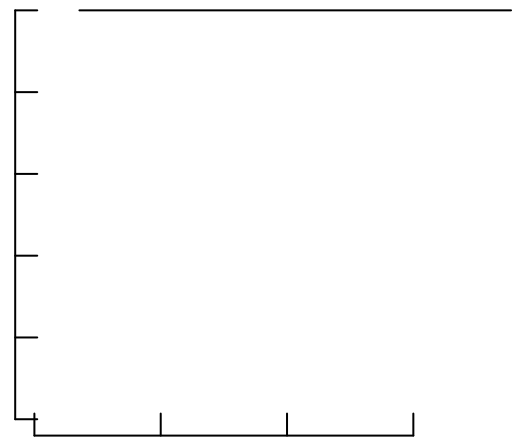
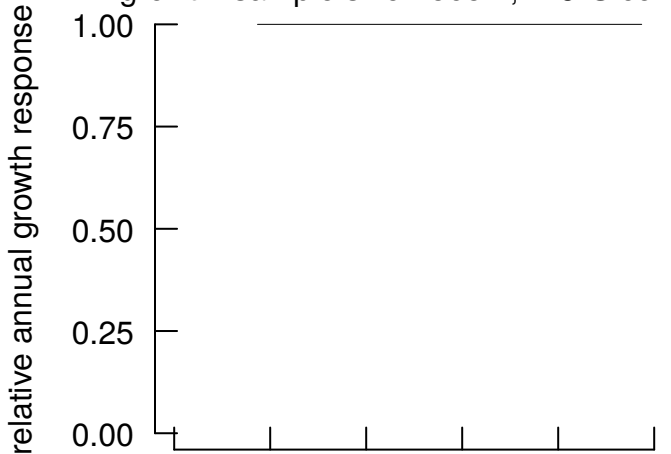
shagbark hickory

Carya ovata

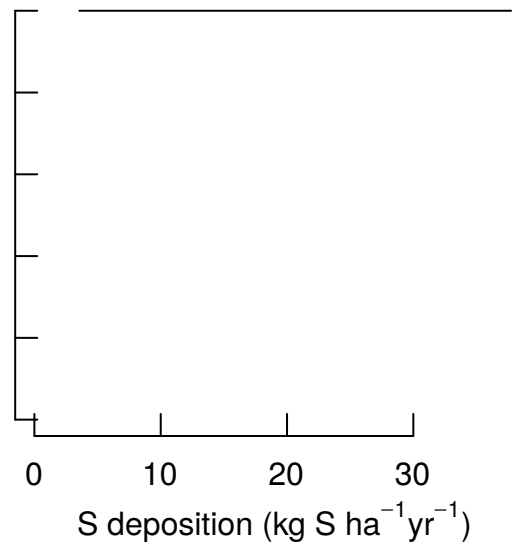
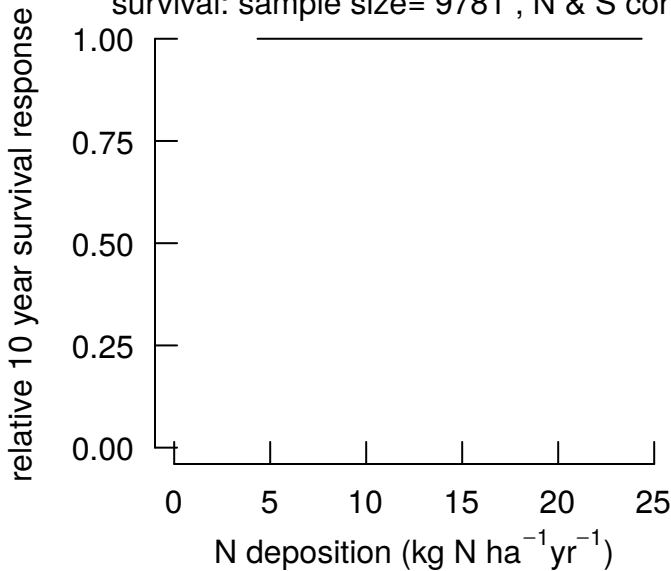
N deposition

S deposition

growth: sample size= 8684 , N & S corr.= 0.071 , VIF_N= 1.18 , VIF_S= 1.14



survival: sample size= 9781 , N & S corr.= 0.082 , VIF_N= 1.18 , VIF_S= 1.14



black hickory

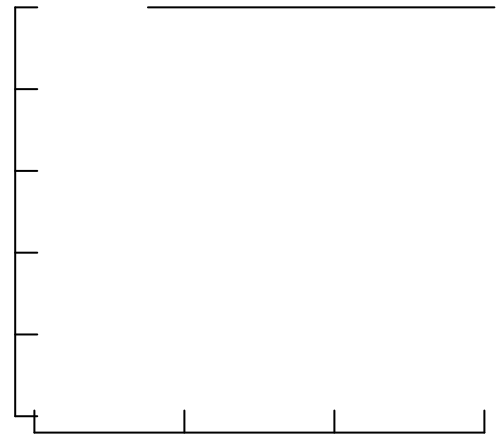
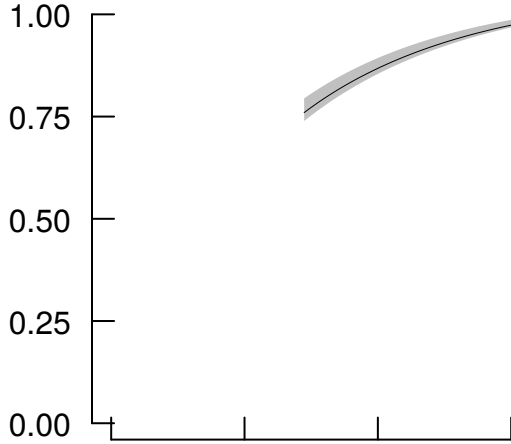
Carya texana

N deposition

S deposition

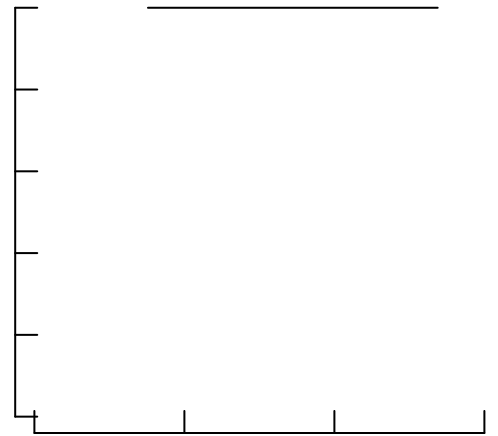
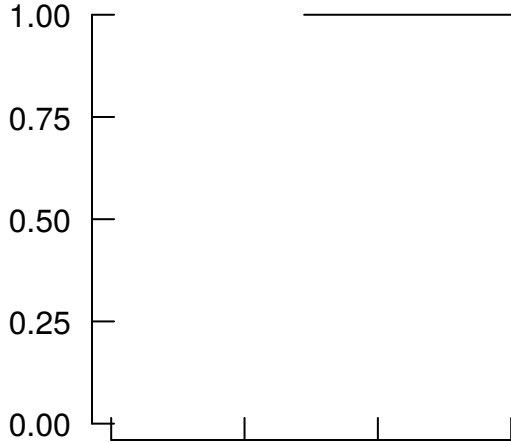
growth: sample size= 3997 , N & S corr.= 0.17 , VIF_N= 1.08 , VIF_S= 1.15

relative annual growth response



relative 10 year survival response

survival: sample size= 4868 , N & S corr.= 0.19 , VIF_N= 1.1 , VIF_S= 1.15



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

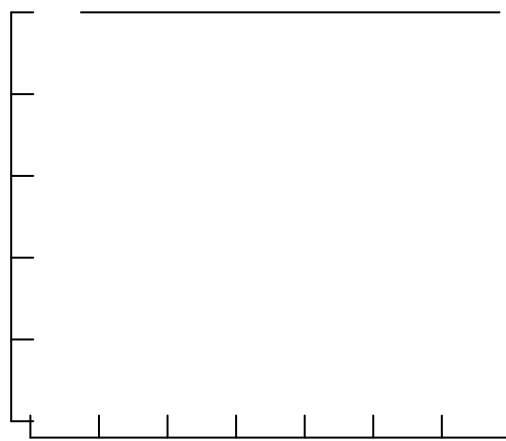
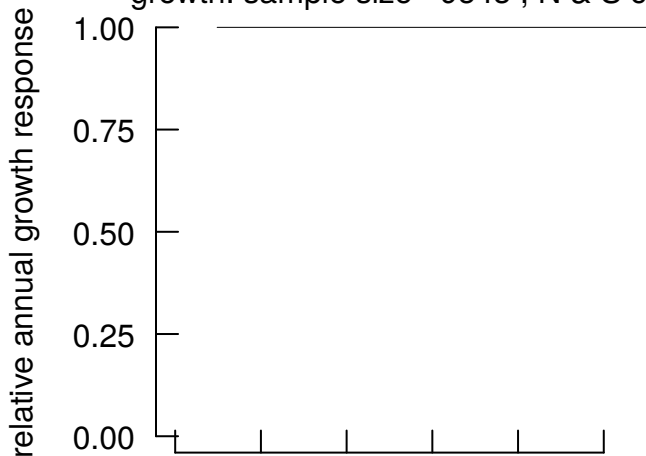
mockernut hickory

Carya alba

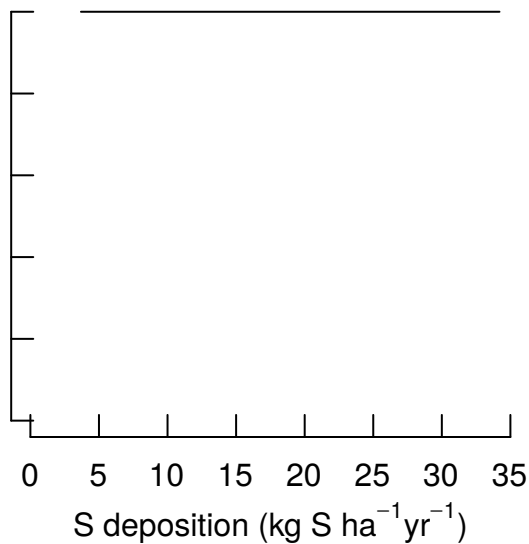
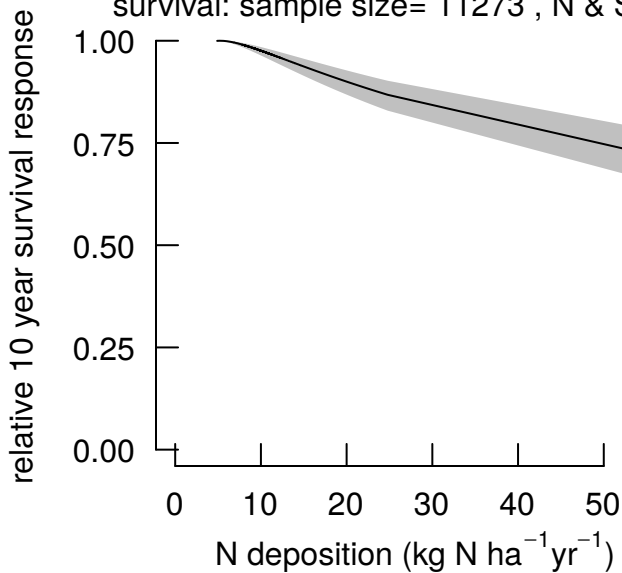
N deposition

S deposition

growth: sample size= 9543 , N & S corr.= 0.14 , VIF_N= 1.03 , VIF_S= 1.36



survival: sample size= 11273 , N & S corr.= 0.15 , VIF_N= 1.03 , VIF_S= 1.37



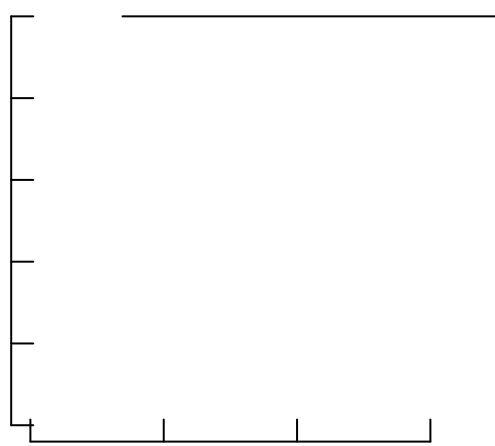
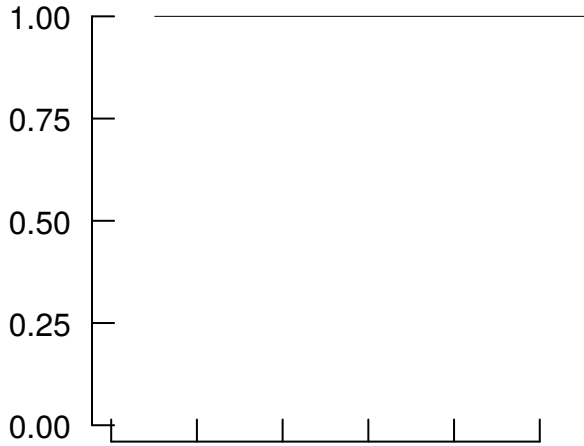
sugarberry
Celtis laevigata

N deposition

S deposition

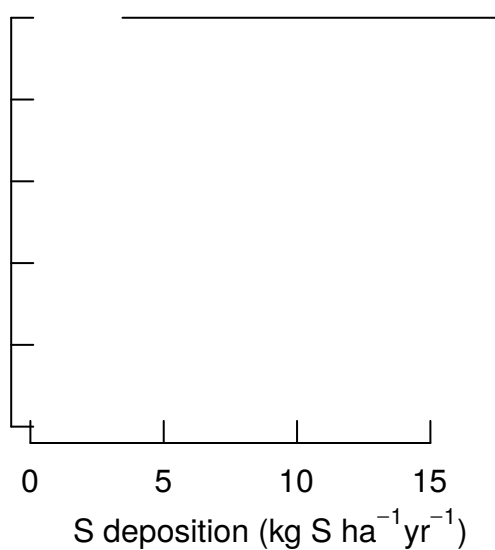
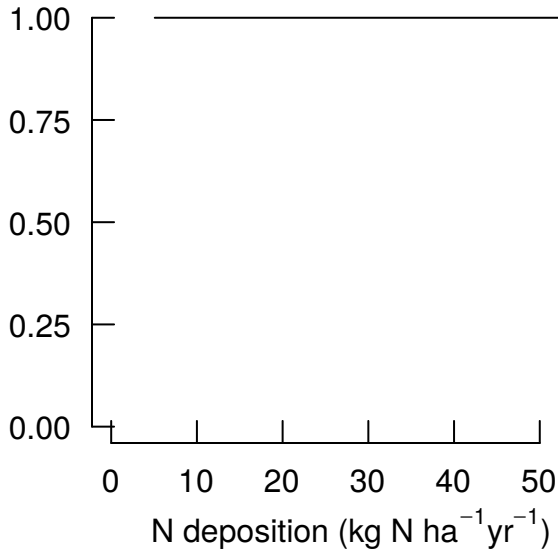
growth: sample size= 2862 , N & S corr.= 0.38 , VIF_N= 1.16 , VIF_S= 1.24

relative annual growth response



relative 10 year survival response

survival: sample size= 3602 , N & S corr.= 0.37 , VIF_N= 1.15 , VIF_S= 1.25

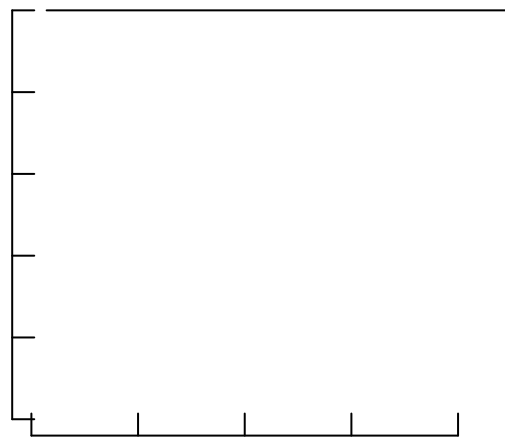
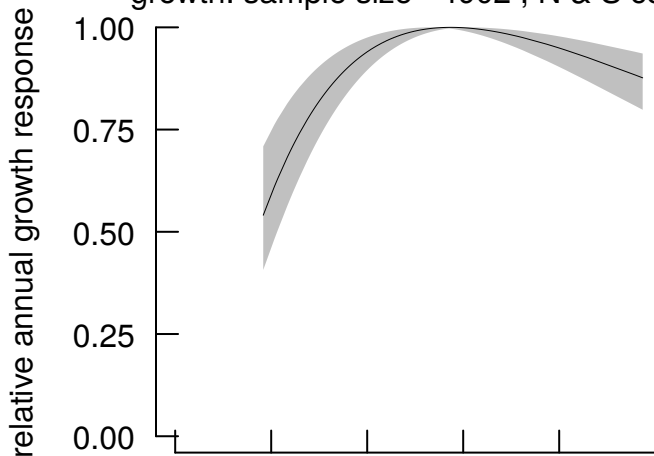


hackberry
Celtis occidentalis

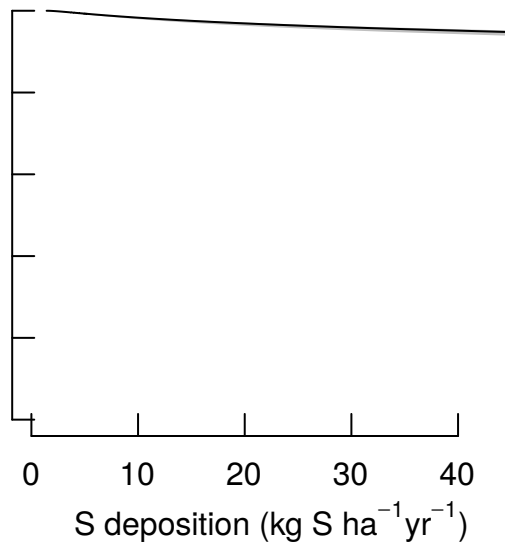
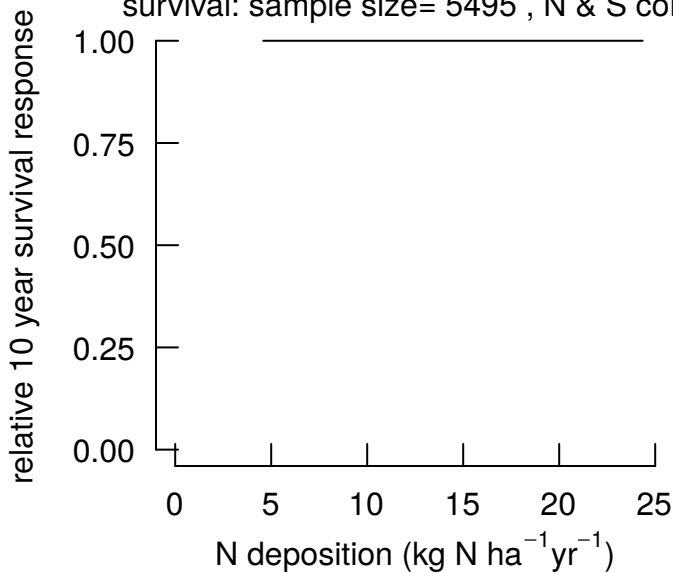
N deposition

S deposition

growth: sample size= 4902 , N & S corr.= 0.17 , VIF_N= 1.45 , VIF_S= 1.58



survival: sample size= 5495 , N & S corr.= 0.18 , VIF_N= 1.46 , VIF_S= 1.58



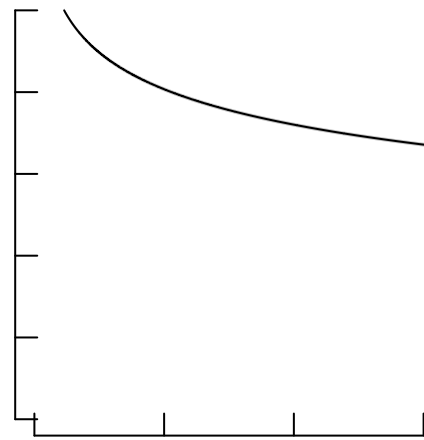
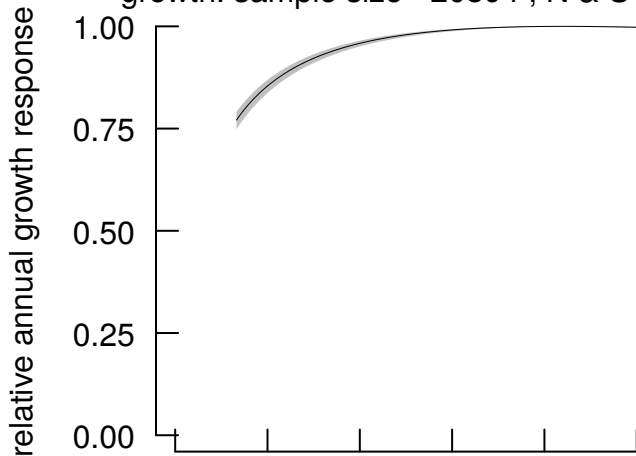
American beech

Fagus grandifolia

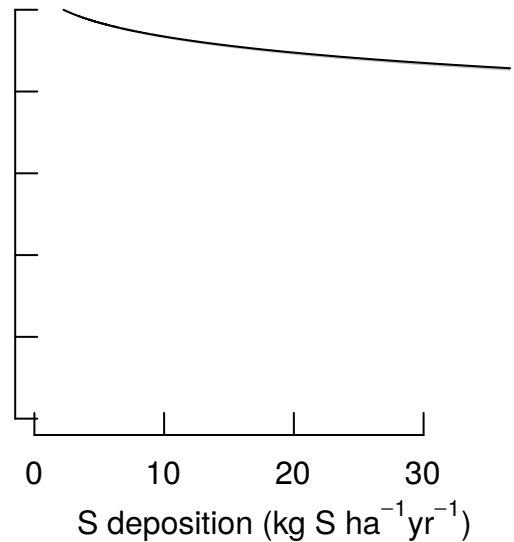
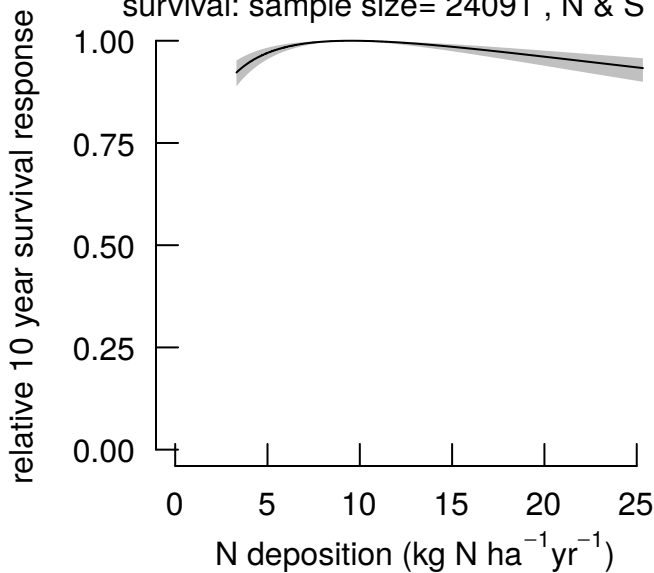
N deposition

S deposition

growth: sample size= 20894 , N & S corr.= 0.76 , VIF_N= 2.96 , VIF_S= 2.41



survival: sample size= 24091 , N & S corr.= 0.76 , VIF_N= 2.97 , VIF_S= 2.4

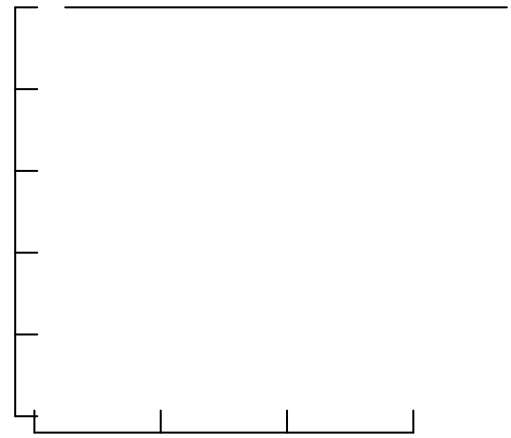
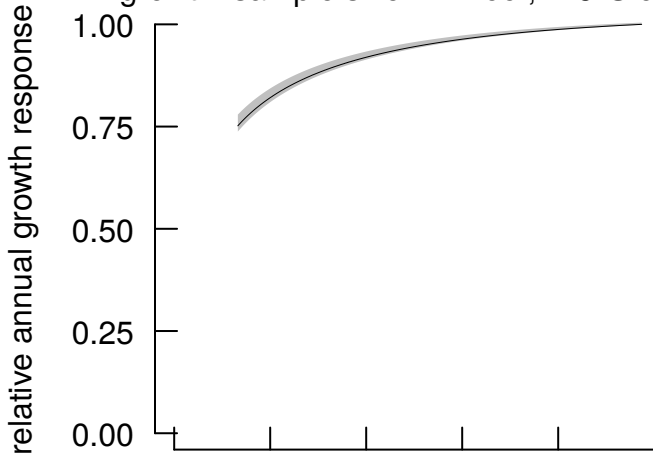


white ash
Fraxinus americana

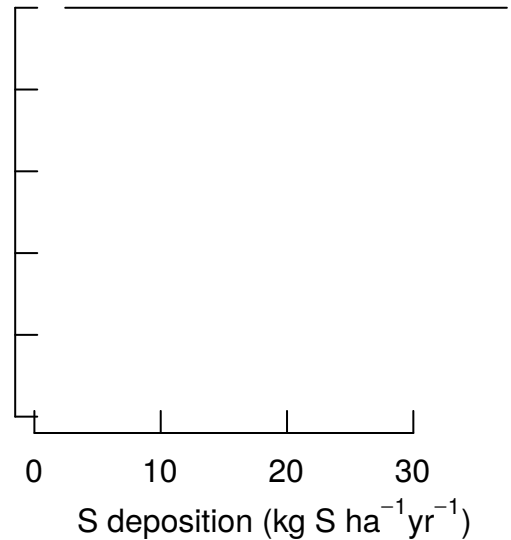
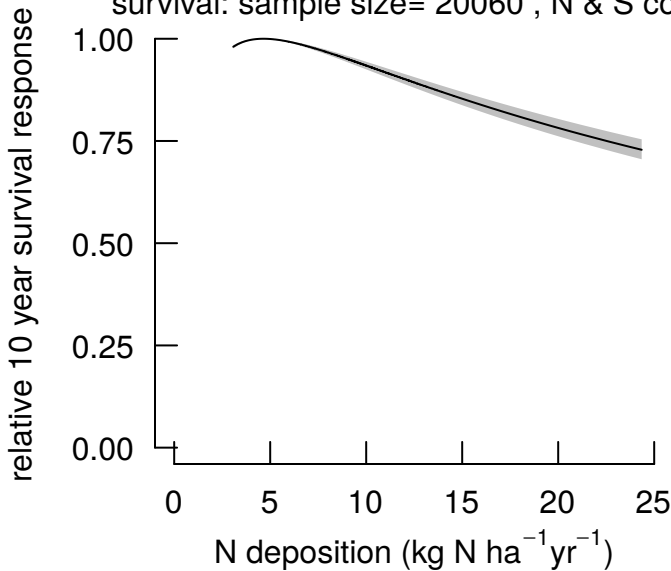
N deposition

S deposition

growth: sample size= 17266 , N & S corr.= 0.54 , VIF_N= 1.82 , VIF_S= 1.48



survival: sample size= 20060 , N & S corr.= 0.53 , VIF_N= 1.78 , VIF_S= 1.45

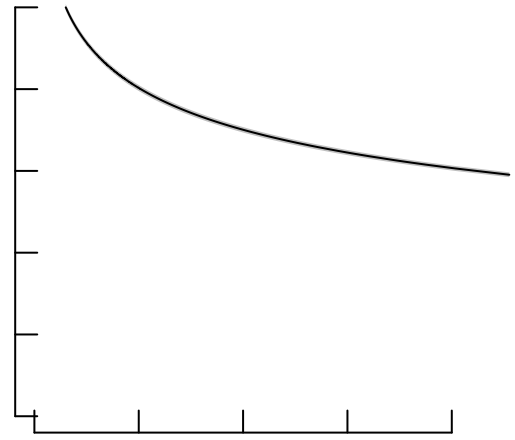
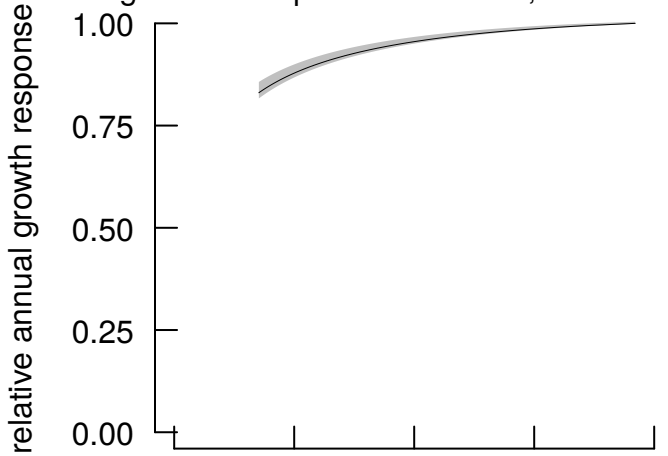


black ash
Fraxinus nigra

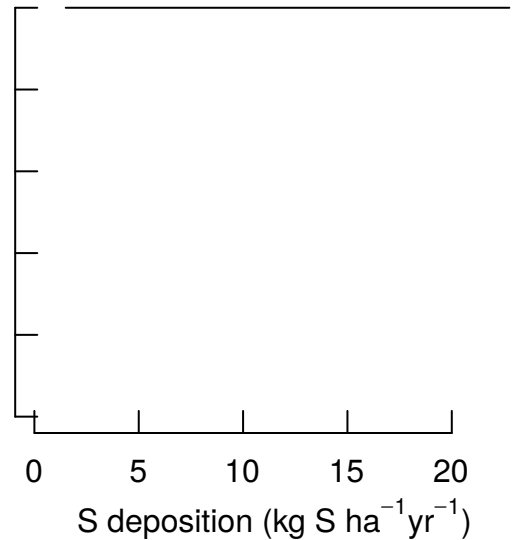
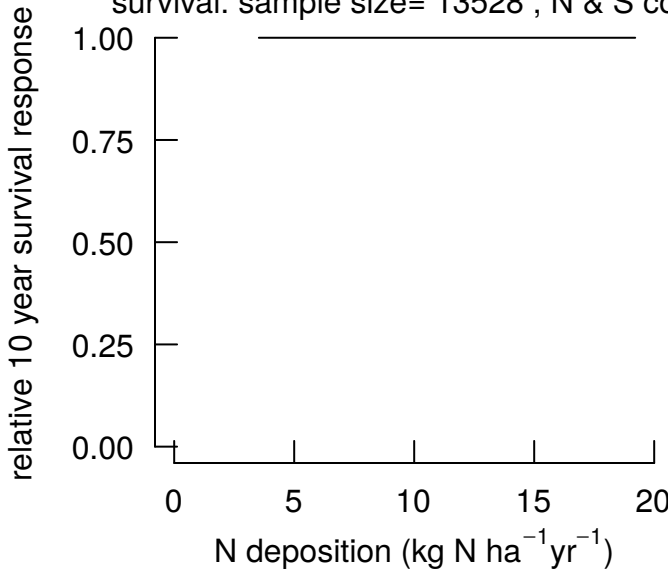
N deposition

S deposition

growth: sample size= 11873 , N & S corr.= 0.62 , VIF_N= 2.22 , VIF_S= 3.01



survival: sample size= 13528 , N & S corr.= 0.62 , VIF_N= 2.26 , VIF_S= 2.99



green ash

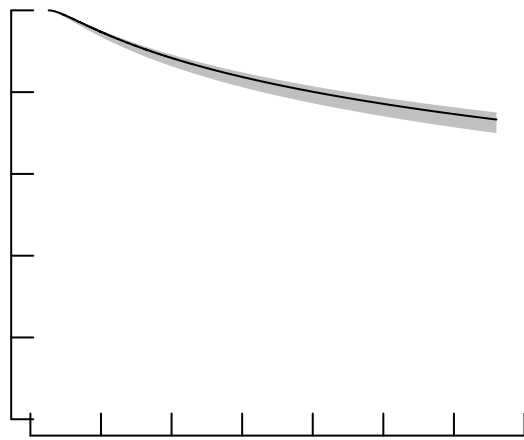
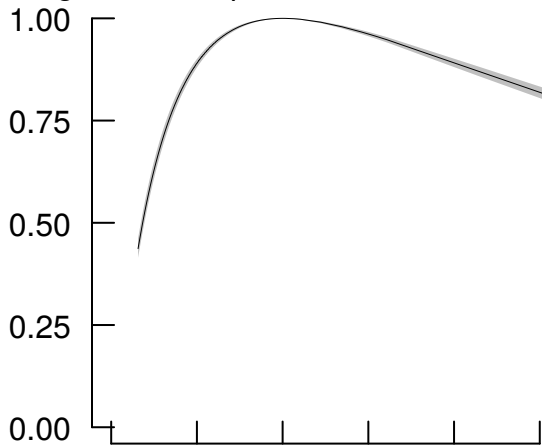
Fraxinus pennsylvanica

N deposition

S deposition

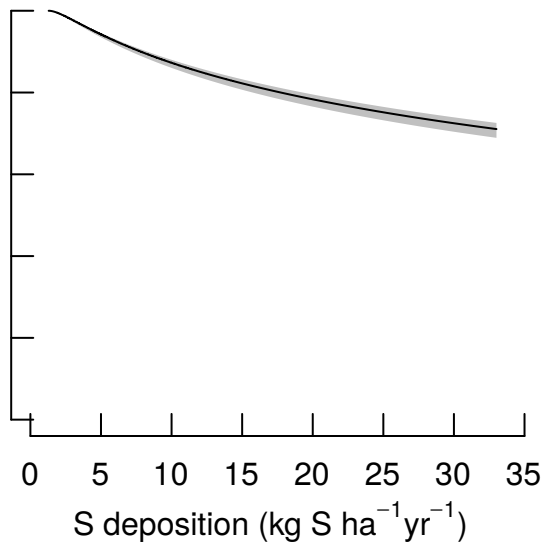
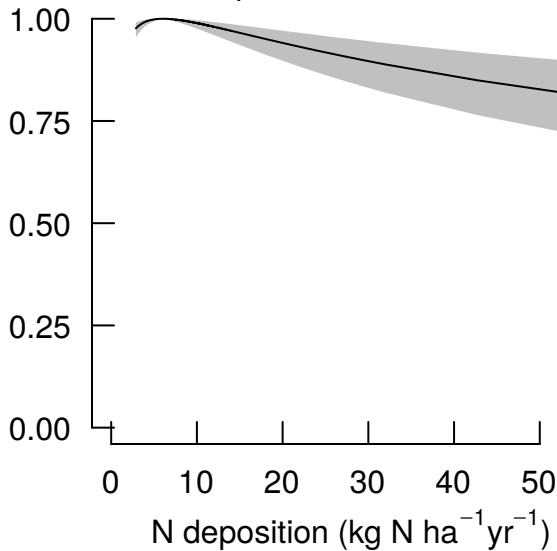
growth: sample size= 15573 , N & S corr.= 0.45 , VIF_N= 1.26 , VIF_S= 1.61

relative annual growth response



relative 10 year survival response

survival: sample size= 18623 , N & S corr.= 0.45 , VIF_N= 1.27 , VIF_S= 1.62

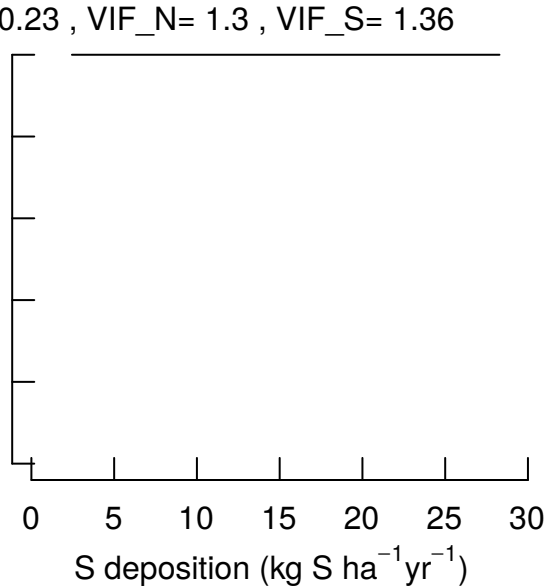
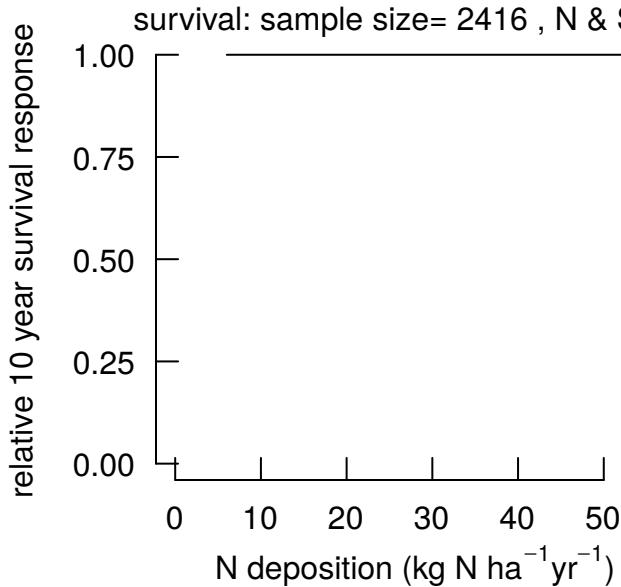
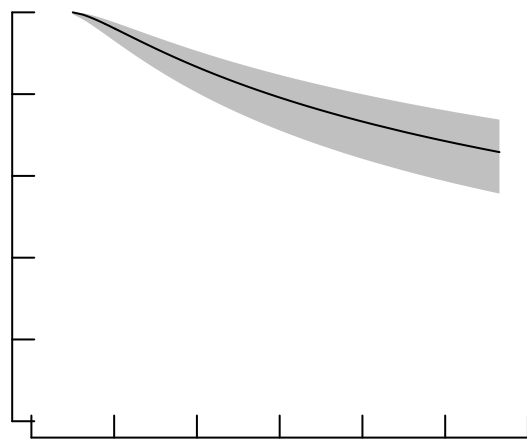
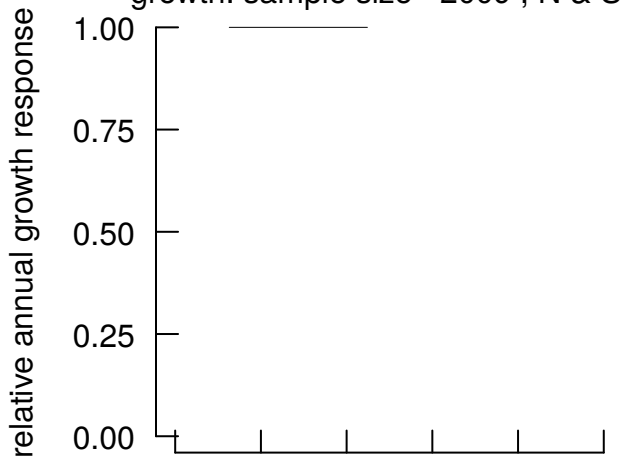


honeylocust
Gleditsia triacanthos

N deposition

S deposition

growth: sample size= 2009 , N & S corr.= 0.27 , VIF_N= 2.13 , VIF_S= 1.43



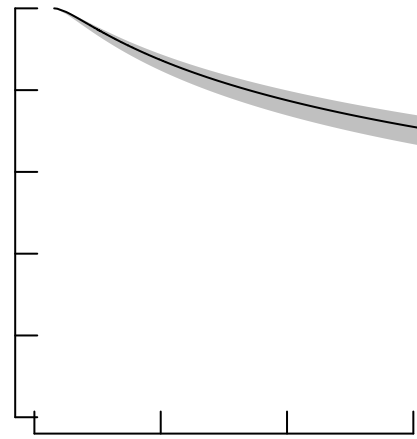
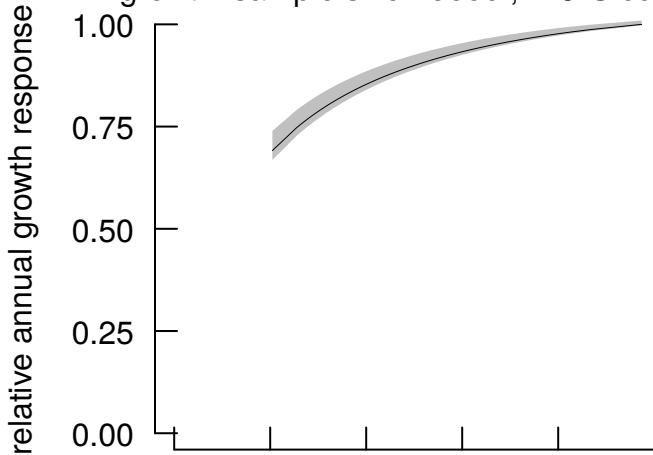
black walnut

Juglans nigra

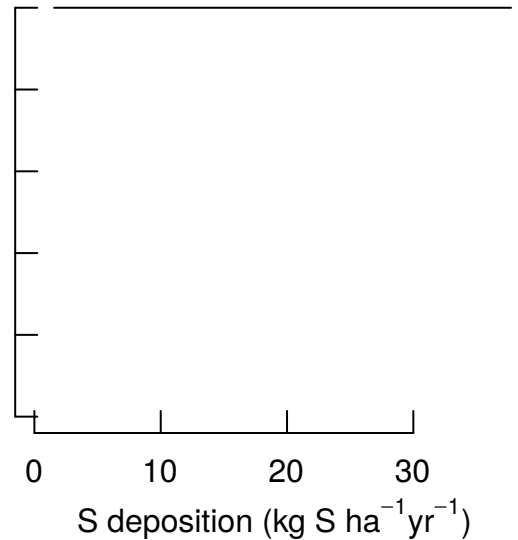
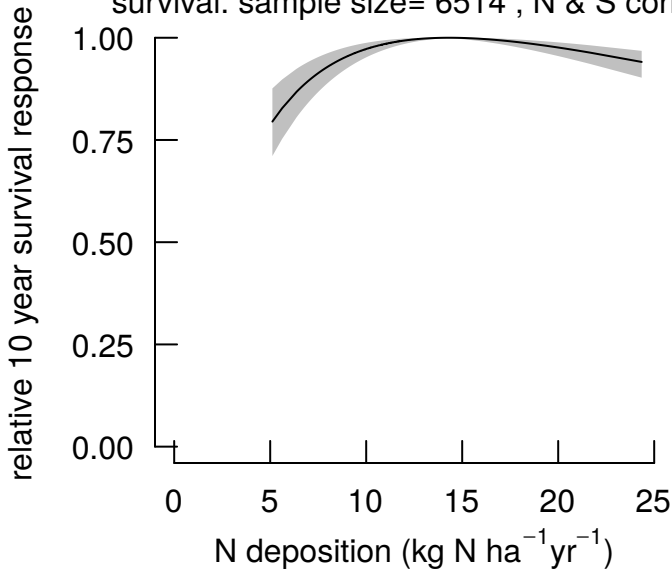
N deposition

S deposition

growth: sample size= 5666 , N & S corr.= 0.076 , VIF_N= 1.25 , VIF_S= 1.24



survival: sample size= 6514 , N & S corr.= 0.081 , VIF_N= 1.22 , VIF_S= 1.24



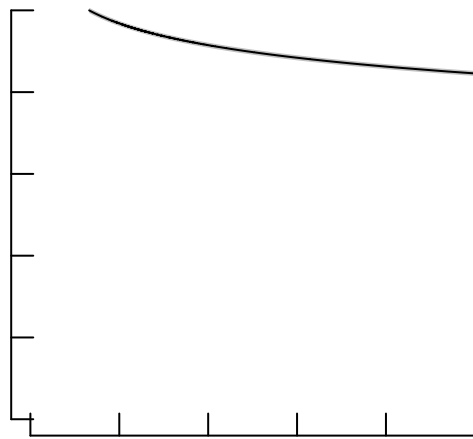
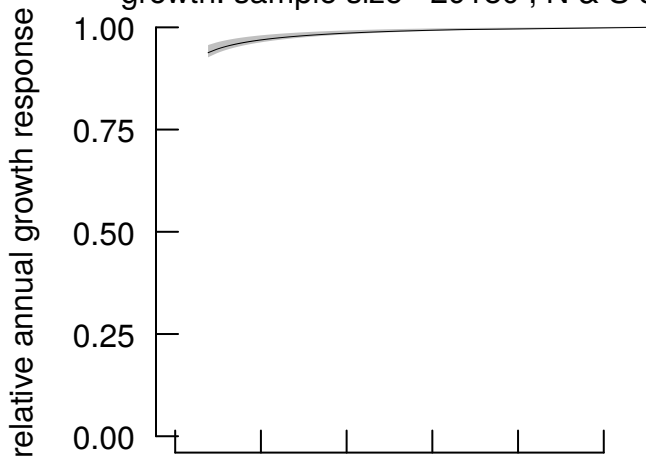
sweetgum

Liquidambar styraciflua

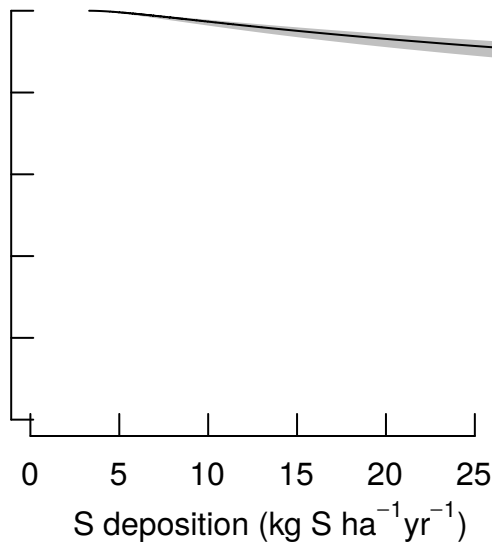
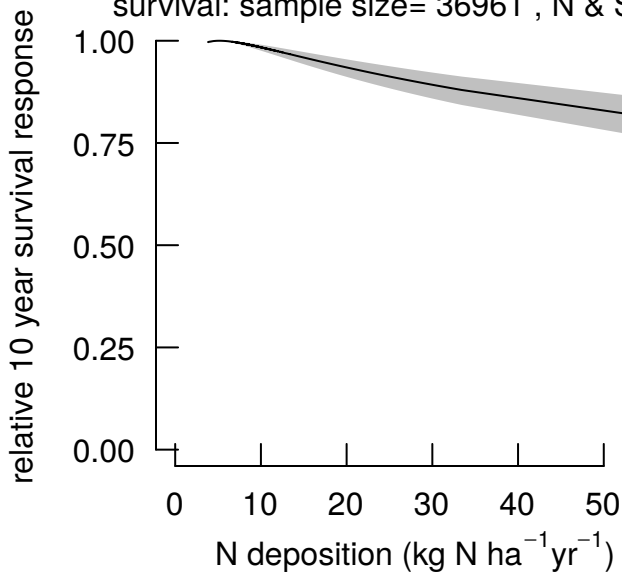
N deposition

S deposition

growth: sample size= 29180 , N & S corr.= 0.37 , VIF_N= 1.25 , VIF_S= 1.41



survival: sample size= 36961 , N & S corr.= 0.37 , VIF_N= 1.24 , VIF_S= 1.42

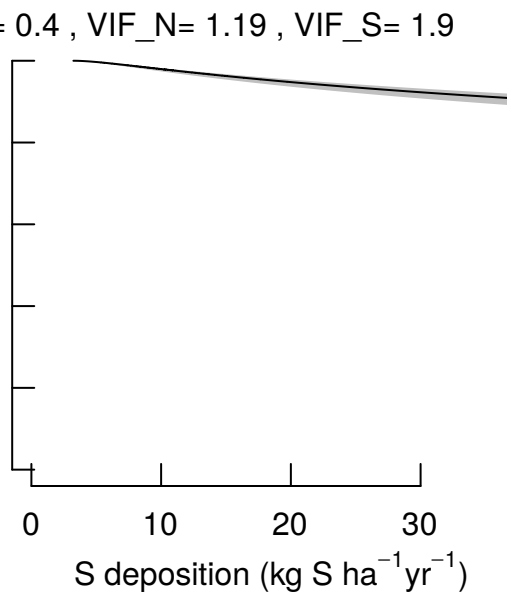
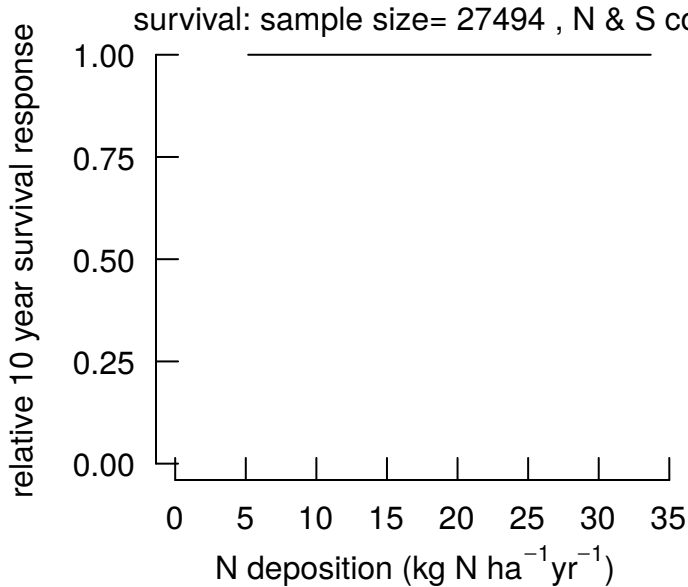
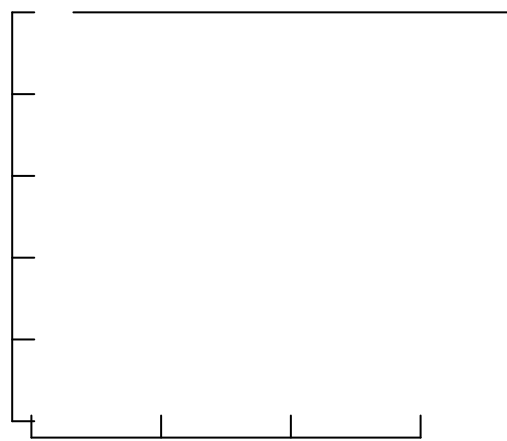
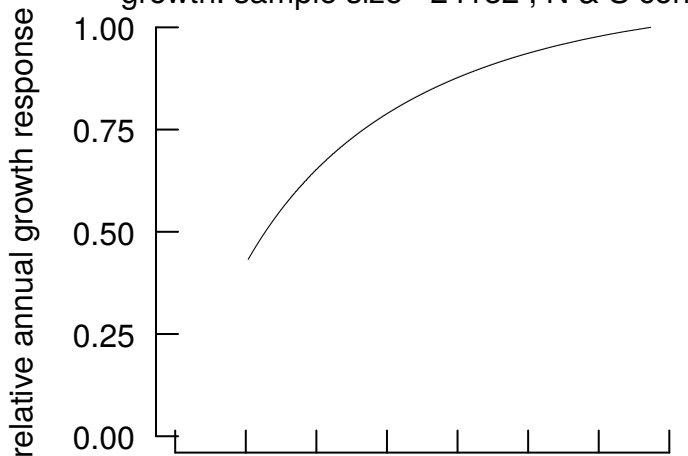


yellow-poplar
Liriodendron tulipifera

N deposition

S deposition

growth: sample size= 24182 , N & S corr.= 0.41 , VIF_N= 1.21 , VIF_S= 1.93



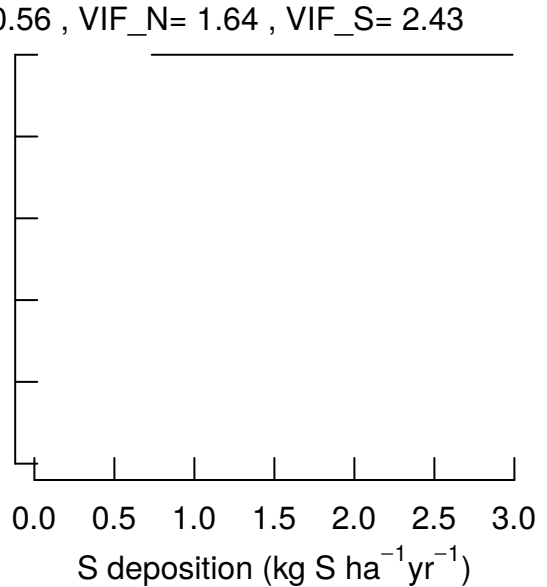
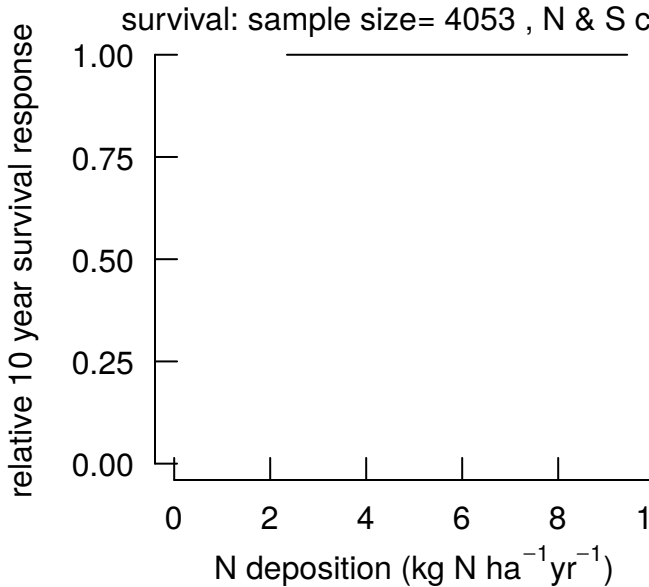
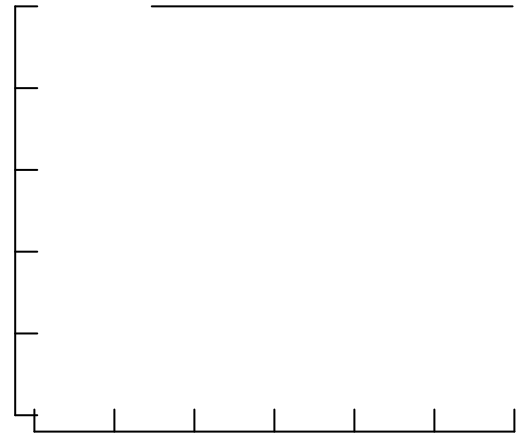
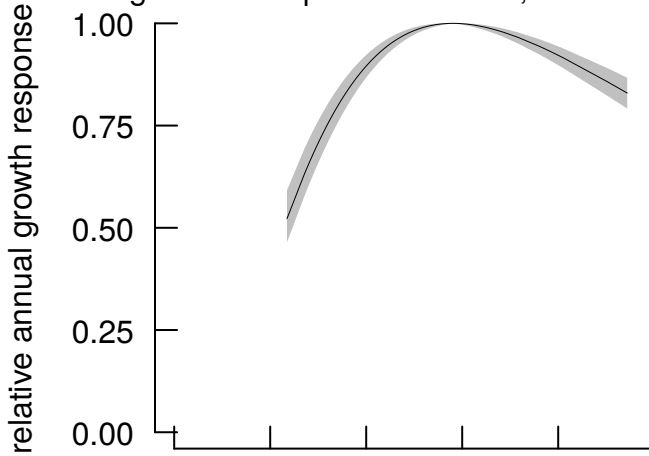
tanoak

Lithocarpus densiflorus

N deposition

S deposition

growth: sample size= 3009 , N & S corr.= 0.57 , VIF_N= 1.68 , VIF_S= 2.55



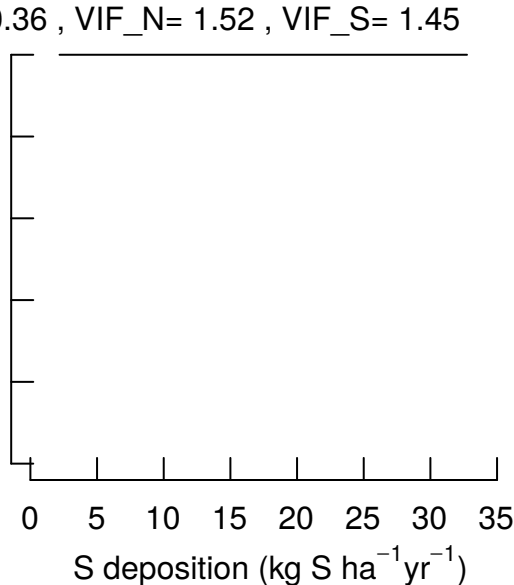
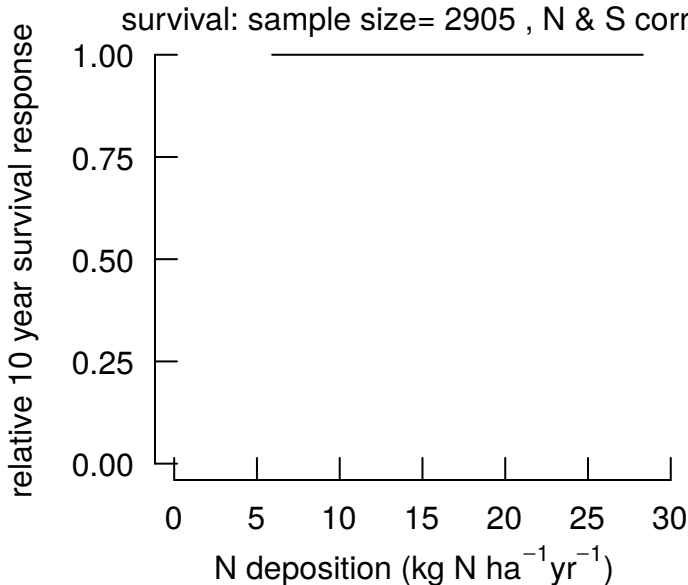
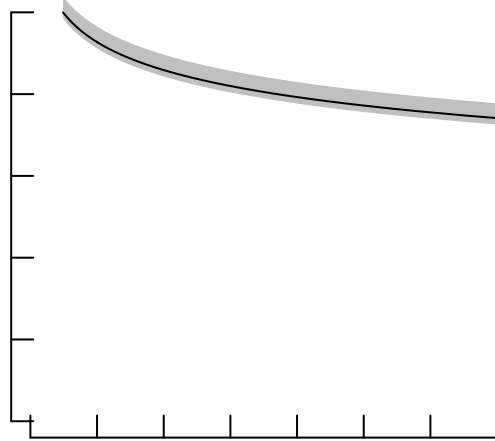
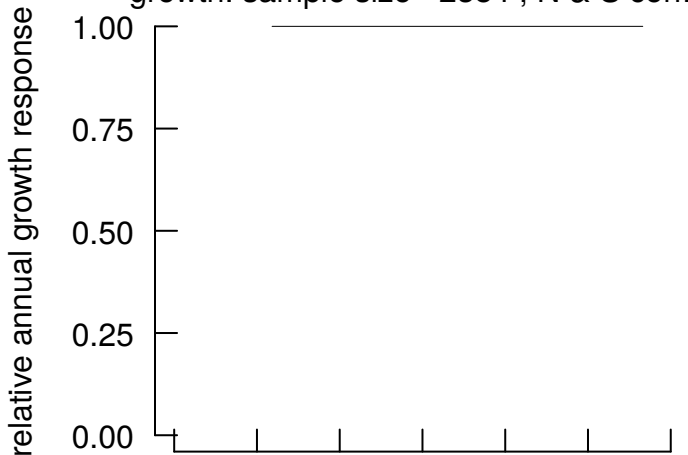
survival: sample size= 4053 , N & S corr.= 0.56 , VIF_N= 1.64 , VIF_S= 2.43

Osage-orange
Maclura pomifera

N deposition

S deposition

growth: sample size= 2384 , N & S corr.= 0.36 , VIF_N= 1.52 , VIF_S= 1.45

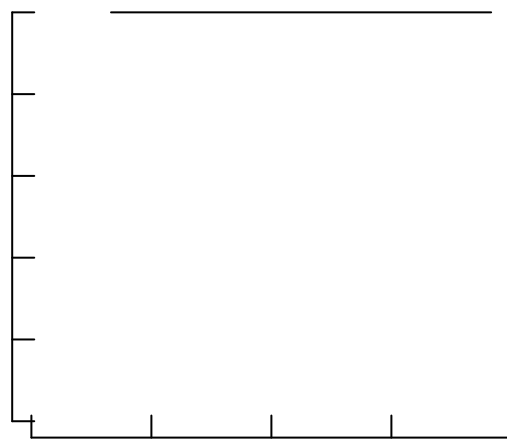
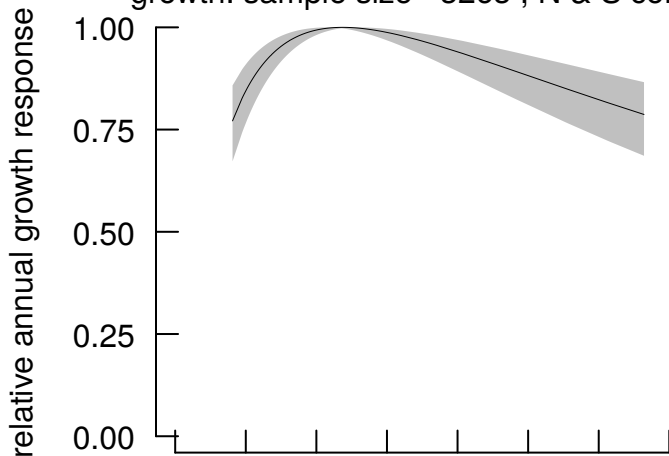


sweetbay
Magnolia virginiana

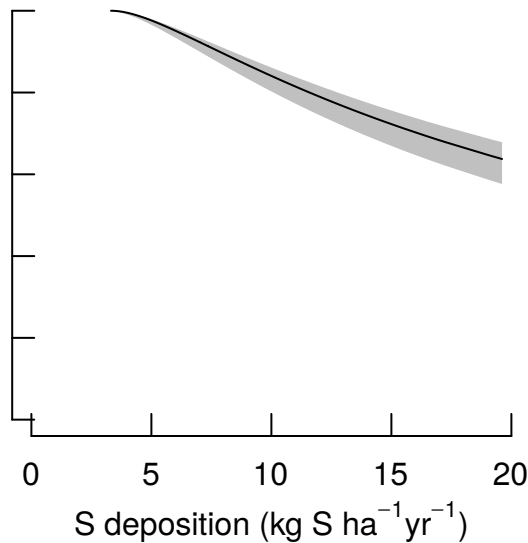
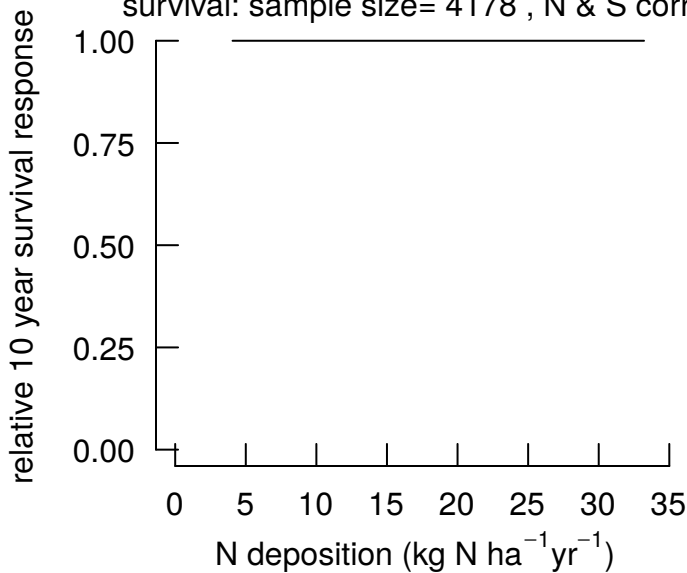
N deposition

S deposition

growth: sample size= 3263 , N & S corr.= 0.34 , VIF_N= 1.37 , VIF_S= 1.56



survival: sample size= 4178 , N & S corr.= 0.35 , VIF_N= 1.38 , VIF_S= 1.59

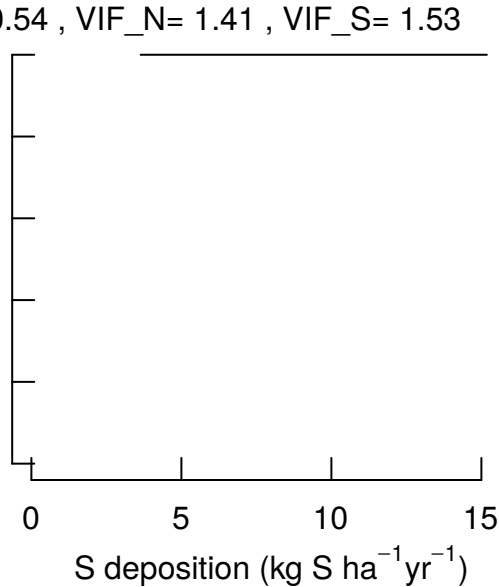
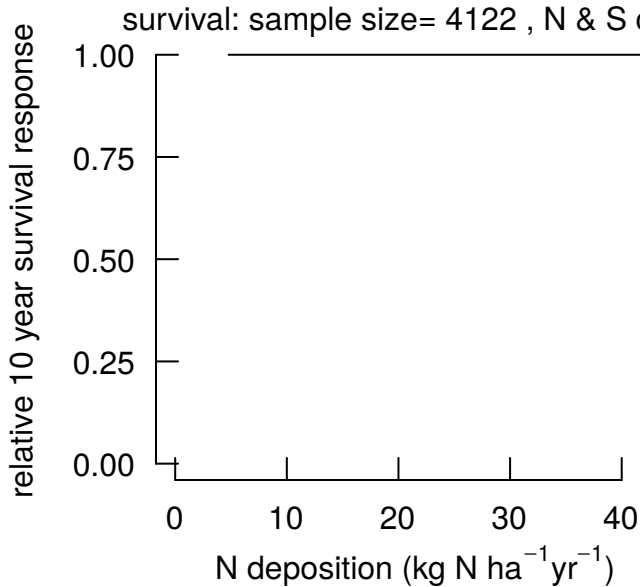
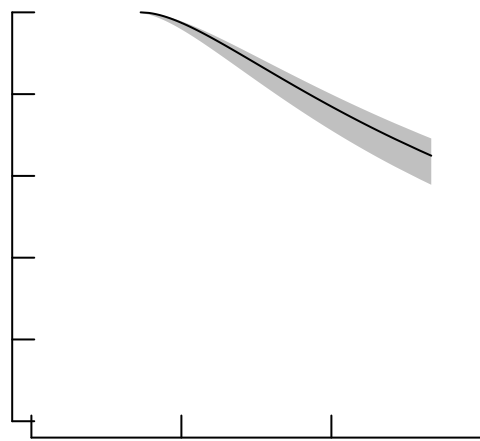
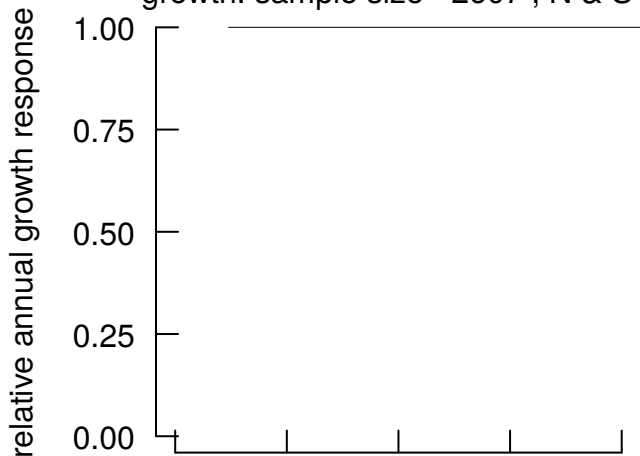


water tupelo
Nyssa aquatica

N deposition

S deposition

growth: sample size= 2607 , N & S corr.= 0.5 , VIF_N= 1.34 , VIF_S= 1.48



survival: sample size= 4122 , N & S corr.= 0.54 , VIF_N= 1.41 , VIF_S= 1.53

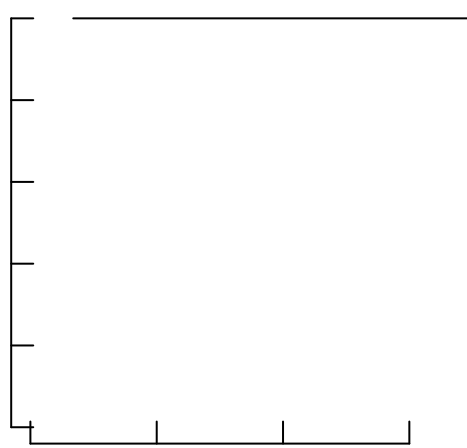
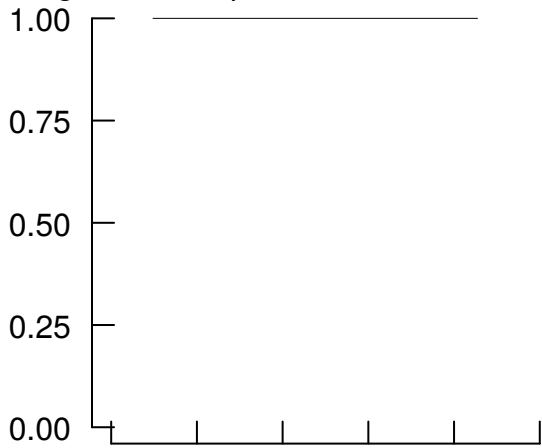
blackgum
Nyssa sylvatica

N deposition

S deposition

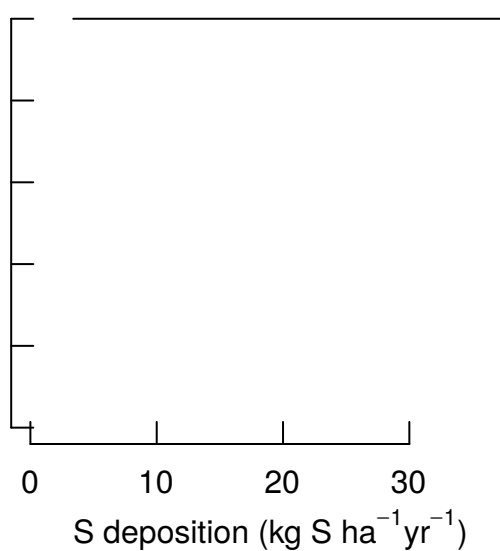
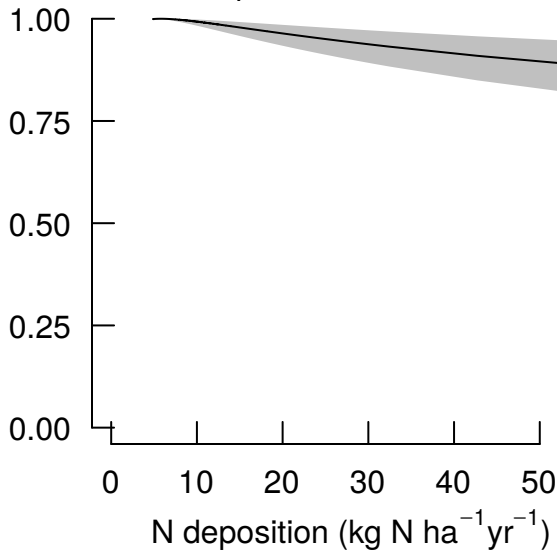
growth: sample size= 10524 , N & S corr.= 0.43 , VIF_N= 1.28 , VIF_S= 1.85

relative annual growth response



relative 10 year survival response

survival: sample size= 13364 , N & S corr.= 0.42 , VIF_N= 1.26 , VIF_S= 1.83



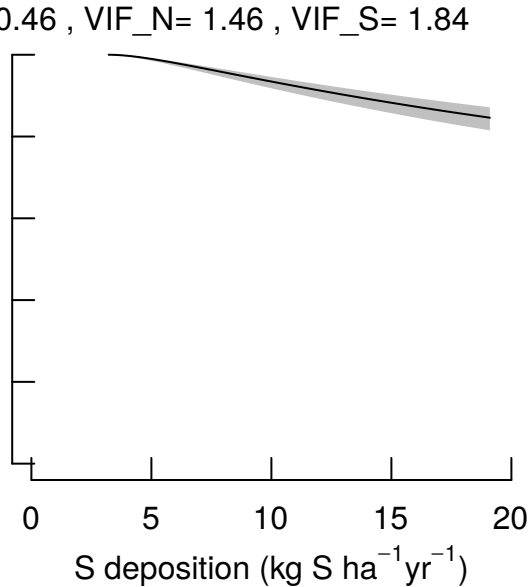
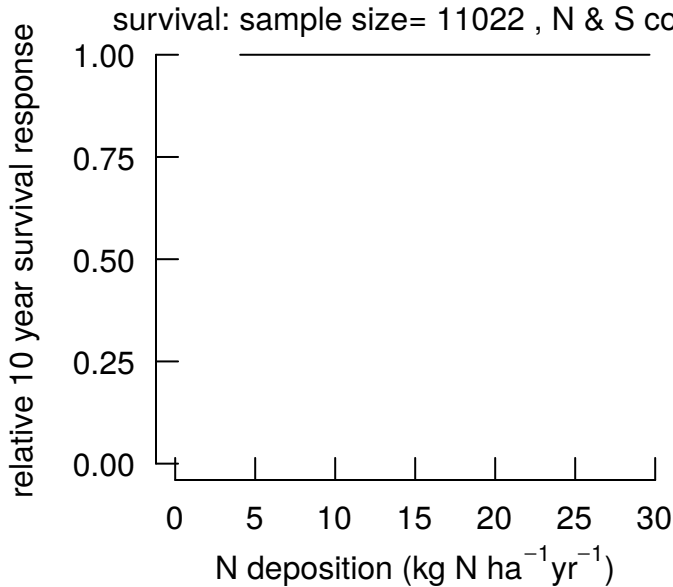
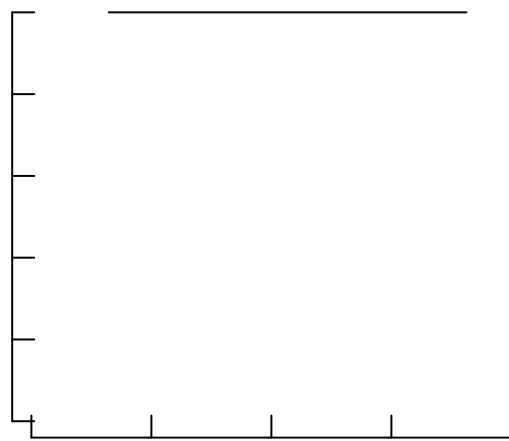
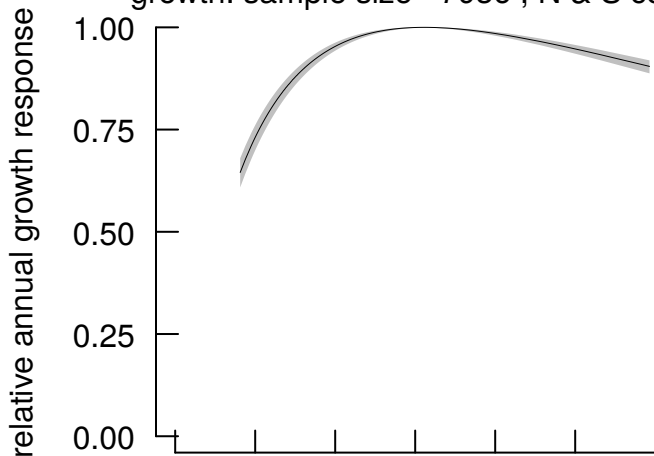
swamp tupelo

Nyssa biflora

N deposition

S deposition

growth: sample size= 7936 , N & S corr.= 0.47 , VIF_N= 1.49 , VIF_S= 1.85



eastern hophornbeam

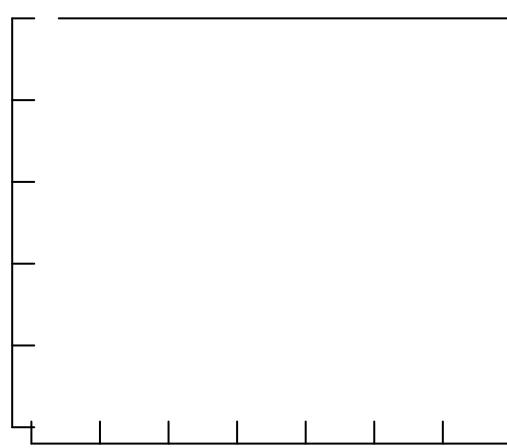
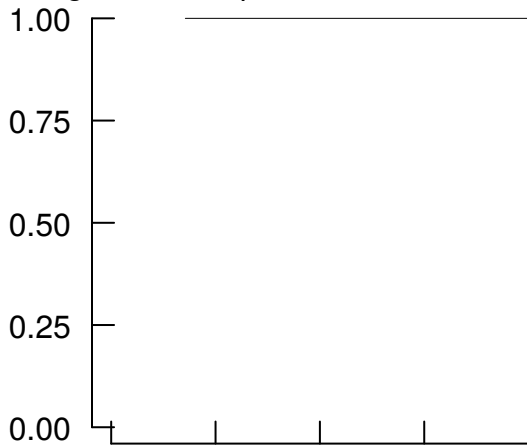
Ostrya virginiana

N deposition

S deposition

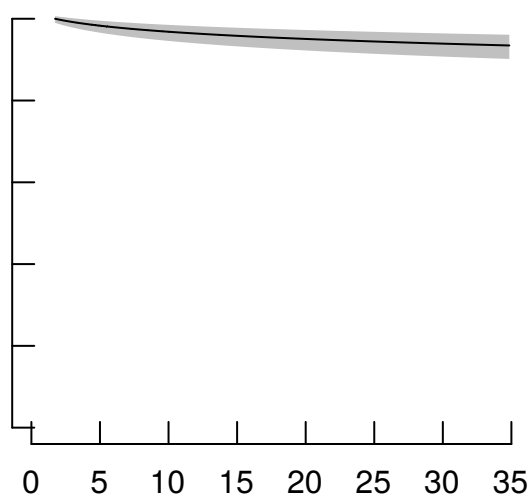
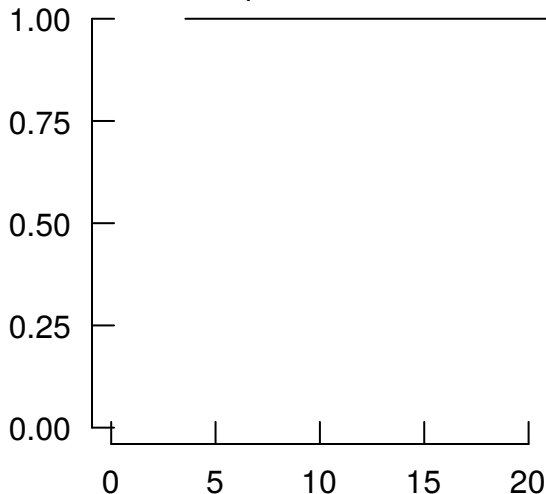
growth: sample size= 4227 , N & S corr.= 0.36 , VIF_N= 1.48 , VIF_S= 1.38

relative annual growth response



relative 10 year survival response

survival: sample size= 5881 , N & S corr.= 0.36 , VIF_N= 1.44 , VIF_S= 1.37



N deposition ($\text{kg N ha}^{-1}\text{yr}^{-1}$)

S deposition ($\text{kg S ha}^{-1}\text{yr}^{-1}$)

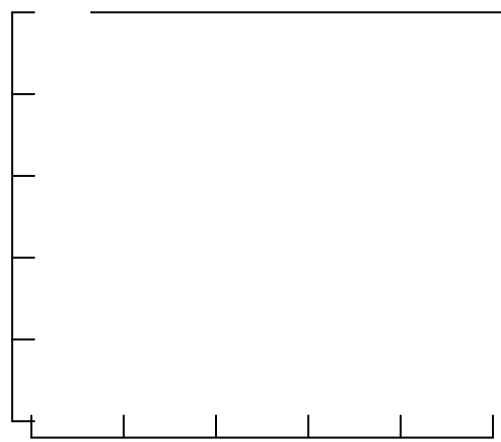
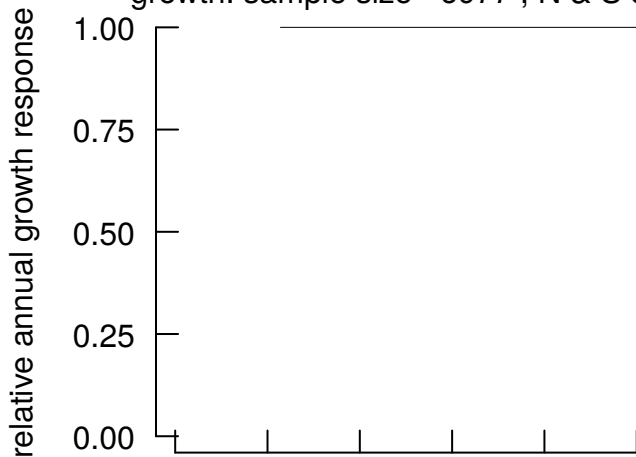
sourwood

Oxydendrum arboreum

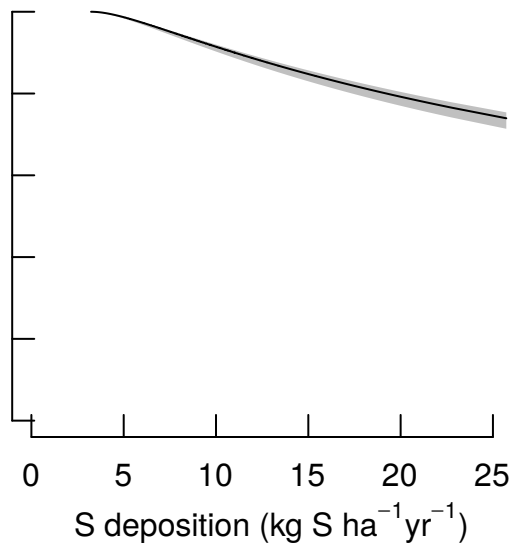
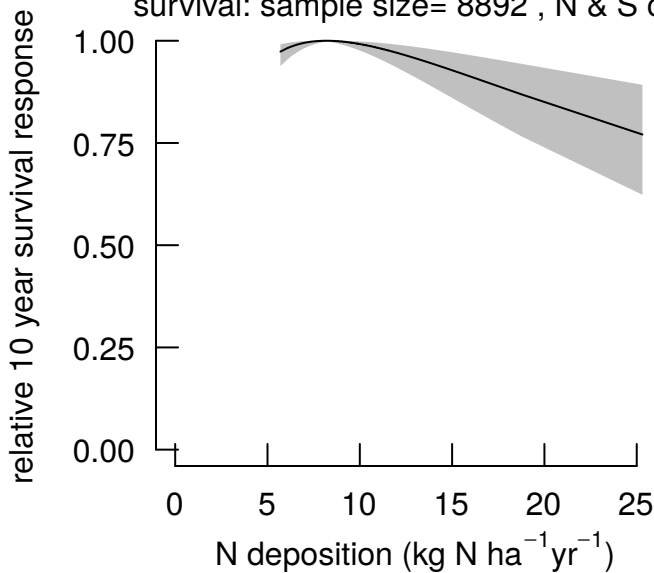
N deposition

S deposition

growth: sample size= 6977 , N & S corr.= 0.28 , VIF_N= 1.25 , VIF_S= 1.51



survival: sample size= 8892 , N & S corr.= 0.3 , VIF_N= 1.27 , VIF_S= 1.54



American sycamore

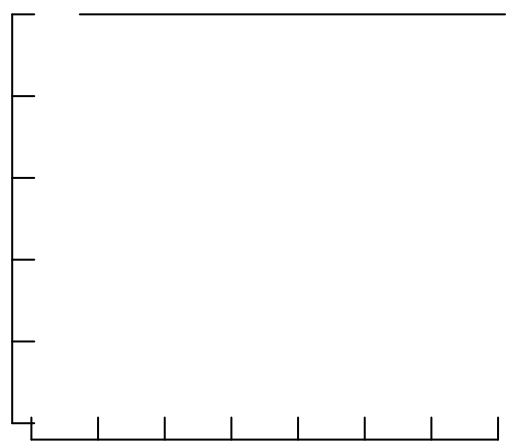
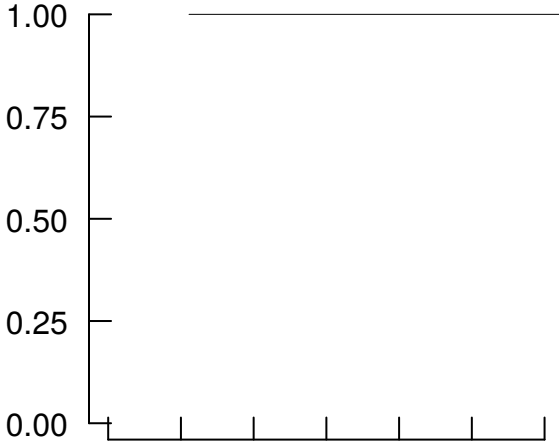
Platanus occidentalis

N deposition

S deposition

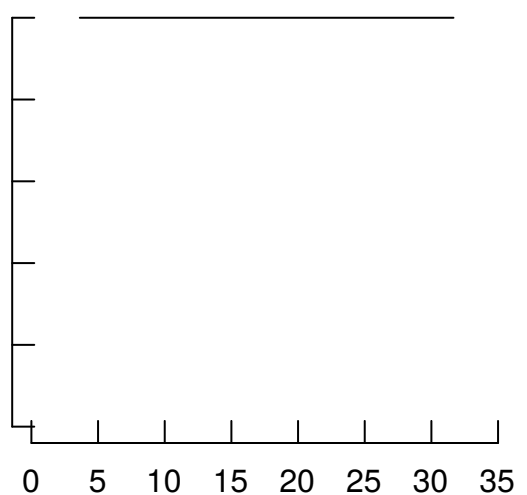
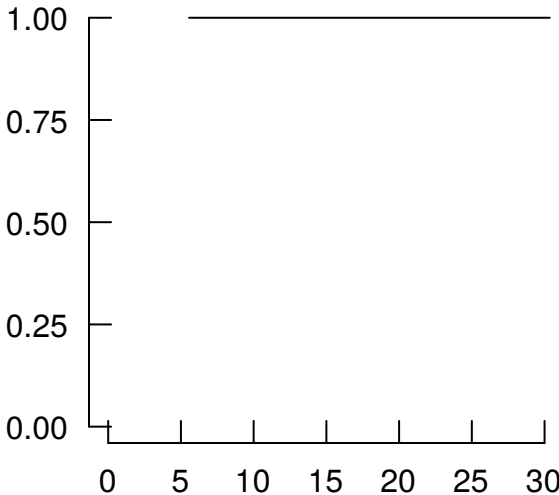
growth: sample size= 2593 , N & S corr.= 0.38 , VIF_N= 1.25 , VIF_S= 1.68

relative annual growth response



survival: sample size= 3033 , N & S corr.= 0.39 , VIF_N= 1.29 , VIF_S= 1.68

relative 10 year survival response



N deposition (kg N ha⁻¹yr⁻¹)

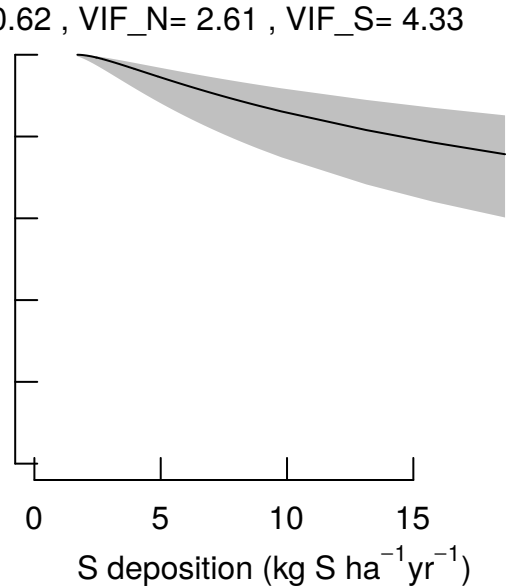
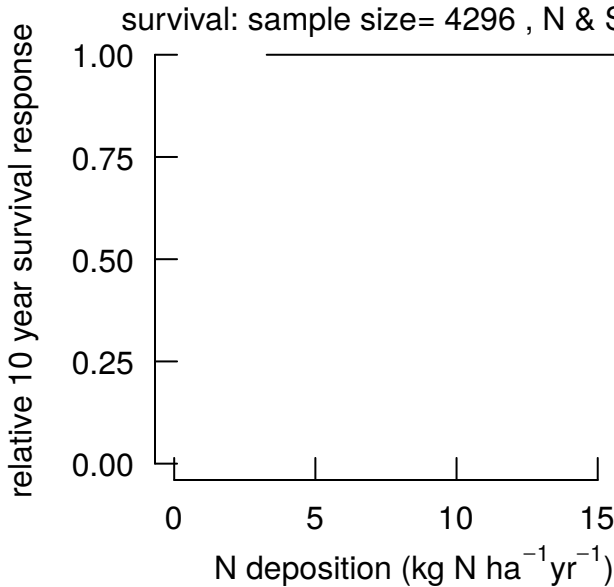
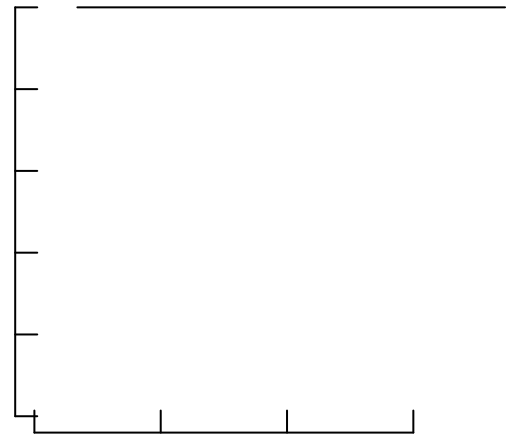
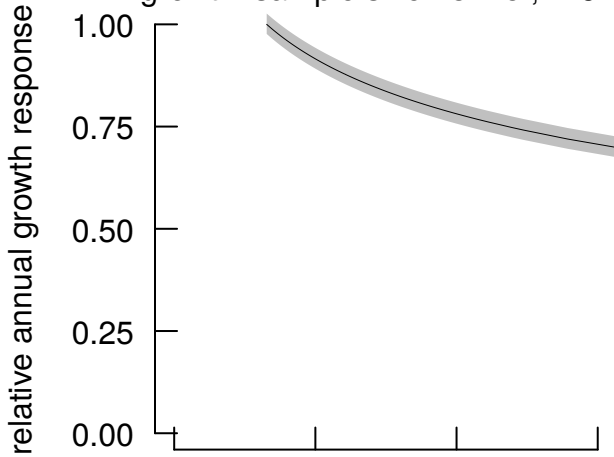
S deposition (kg S ha⁻¹yr⁻¹)

balsam poplar
Populus balsamifera

N deposition

S deposition

growth: sample size= 3428 , N & S corr.= 0.62 , VIF_N= 2.6 , VIF_S= 4.34



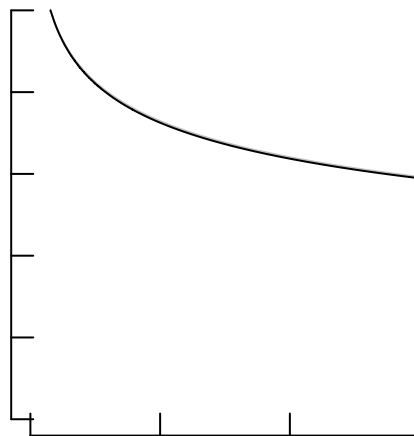
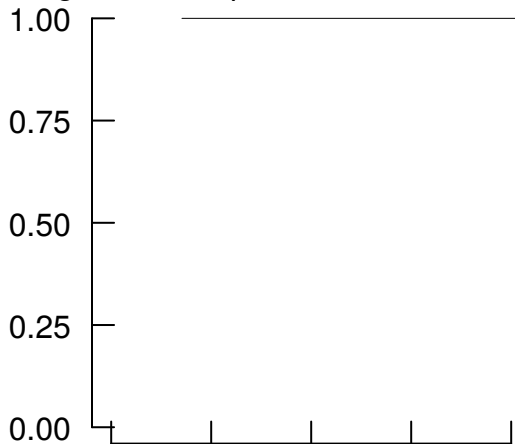
bigtooth aspen
Populus grandidentata

N deposition

S deposition

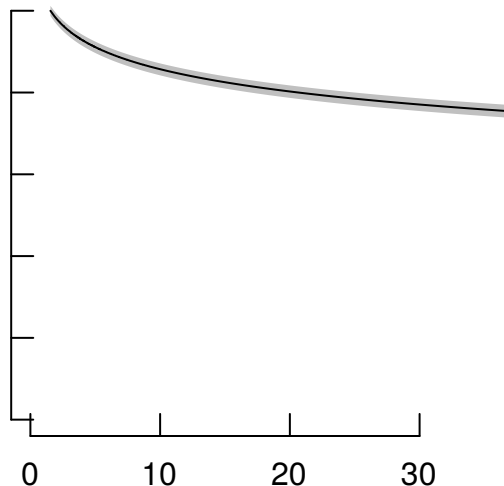
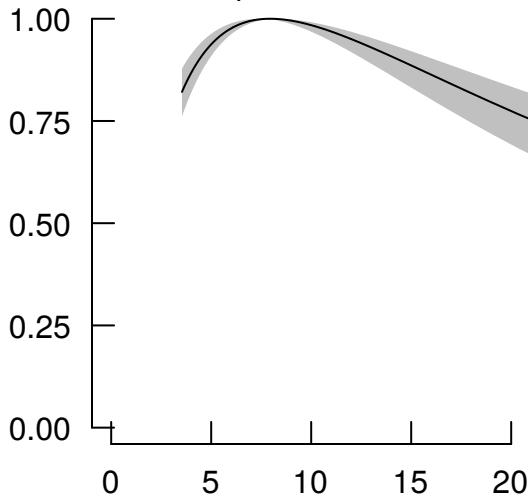
growth: sample size= 10041 , N & S corr.= 0.57 , VIF_N= 2.31 , VIF_S= 2.37

relative annual growth response



relative 10 year survival response

survival: sample size= 11473 , N & S corr.= 0.57 , VIF_N= 2.31 , VIF_S= 2.35



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

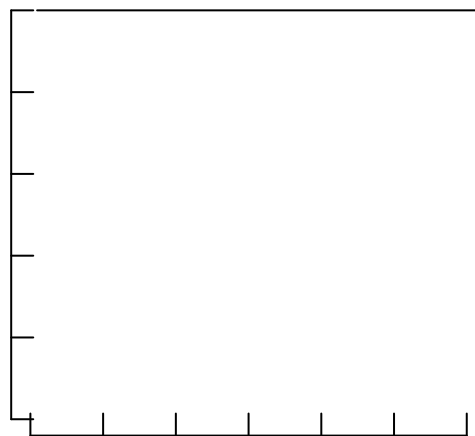
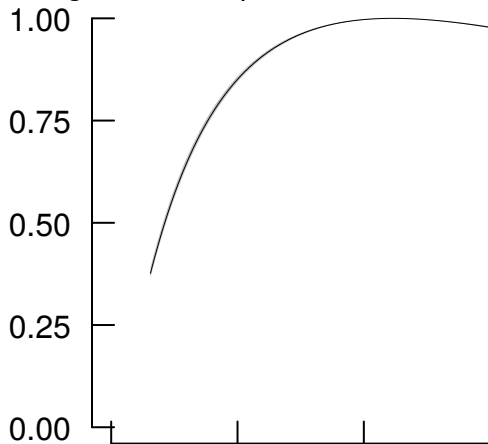
quaking aspen
Populus tremuloides

N deposition

S deposition

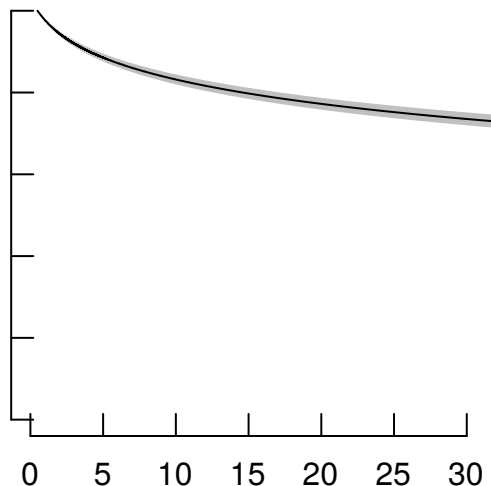
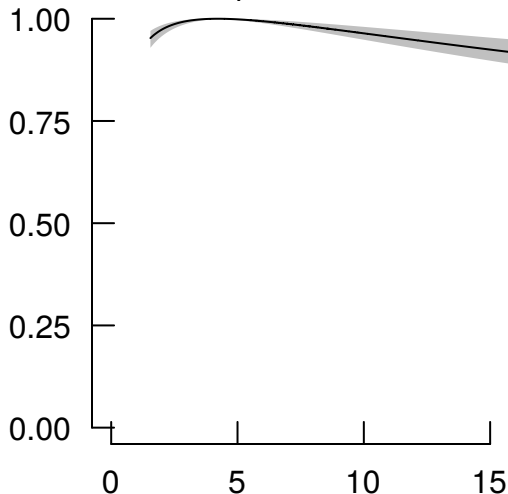
growth: sample size= 41748 , N & S corr.= 0.6 , VIF_N= 1.78 , VIF_S= 2.23

relative annual growth response



relative 10 year survival response

survival: sample size= 51305 , N & S corr.= 0.61 , VIF_N= 1.78 , VIF_S= 2.26



N deposition (kg N ha⁻¹ yr⁻¹)

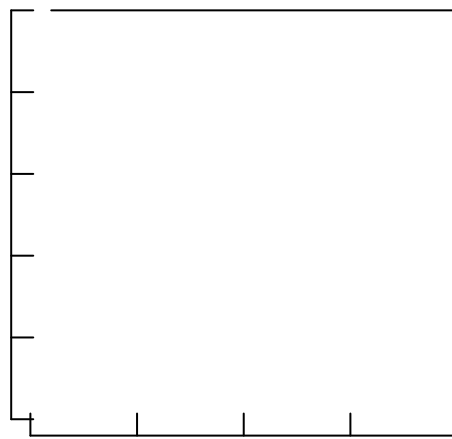
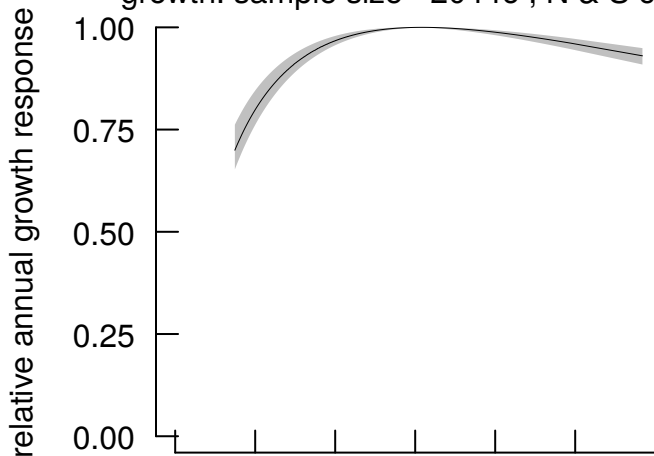
S deposition (kg S ha⁻¹ yr⁻¹)

black cherry
Prunus serotina

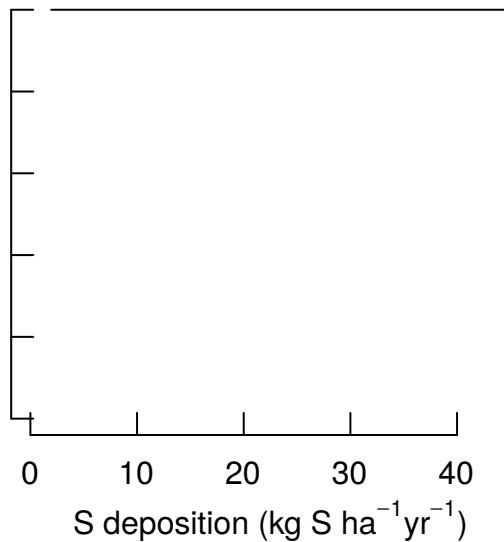
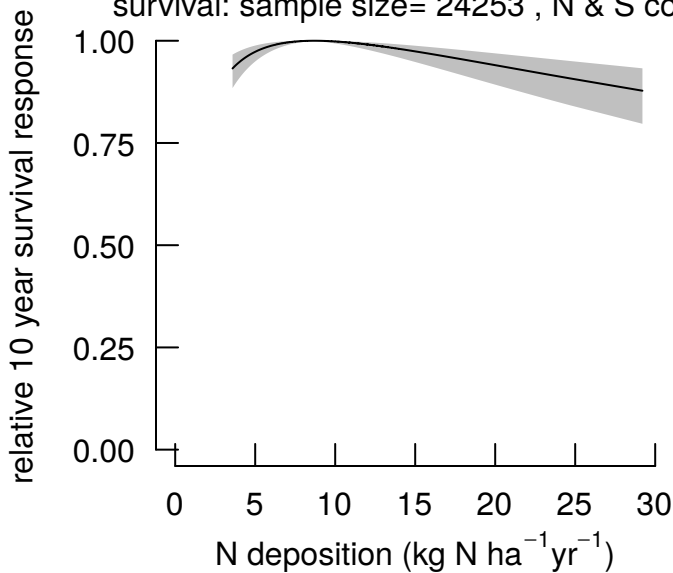
N deposition

S deposition

growth: sample size= 20446 , N & S corr.= 0.33 , VIF_N= 1.21 , VIF_S= 1.26



survival: sample size= 24253 , N & S corr.= 0.33 , VIF_N= 1.21 , VIF_S= 1.26

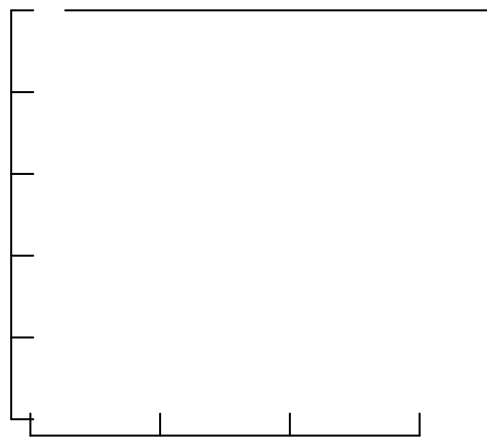
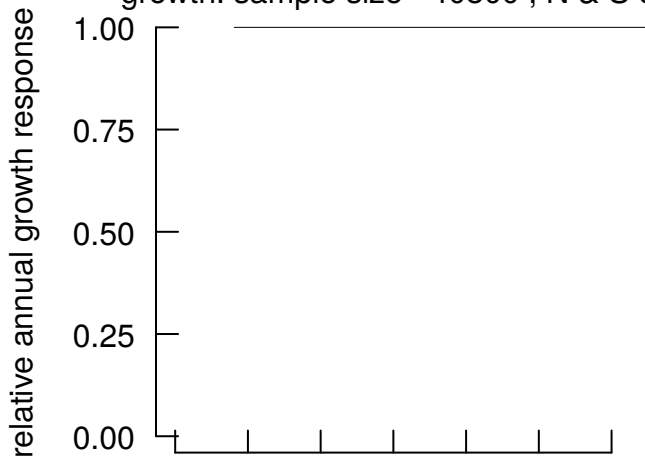


white oak
Quercus alba

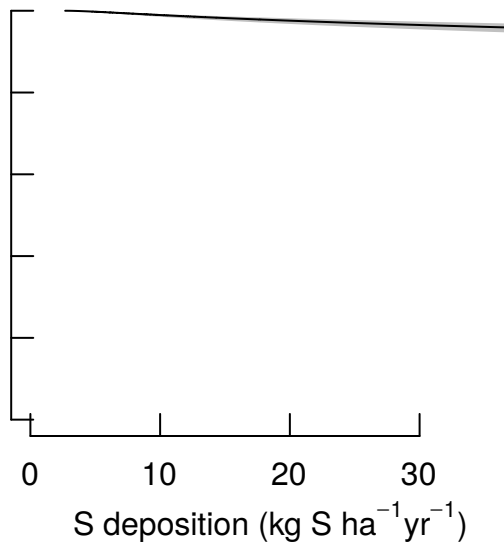
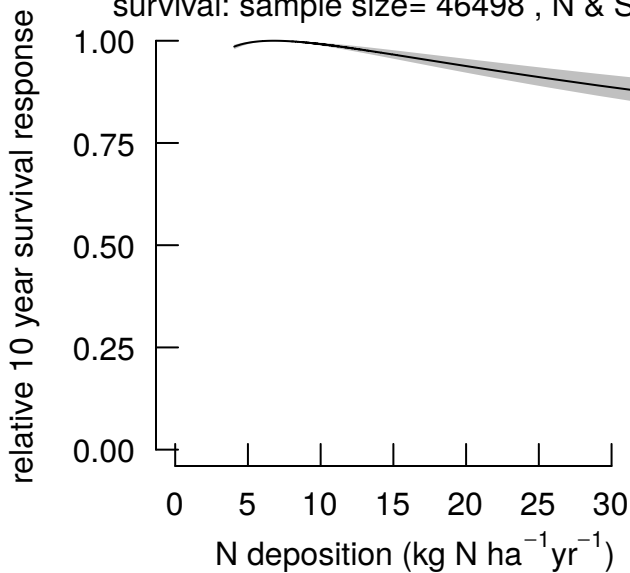
N deposition

S deposition

growth: sample size= 40800 , N & S corr.= 0.16 , VIF_N= 1.03 , VIF_S= 1.12



survival: sample size= 46498 , N & S corr.= 0.17 , VIF_N= 1.04 , VIF_S= 1.13

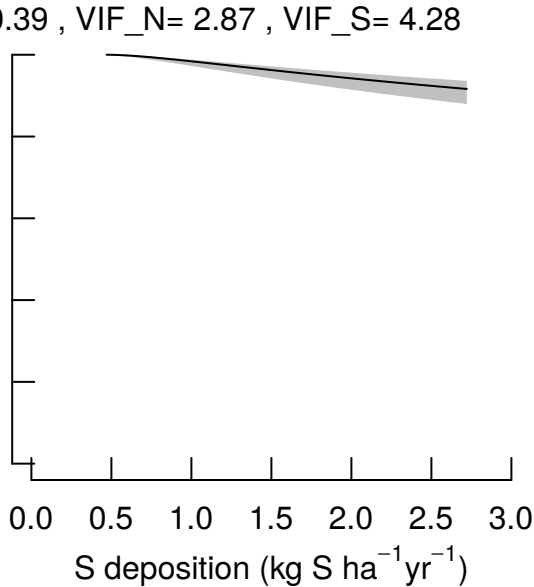
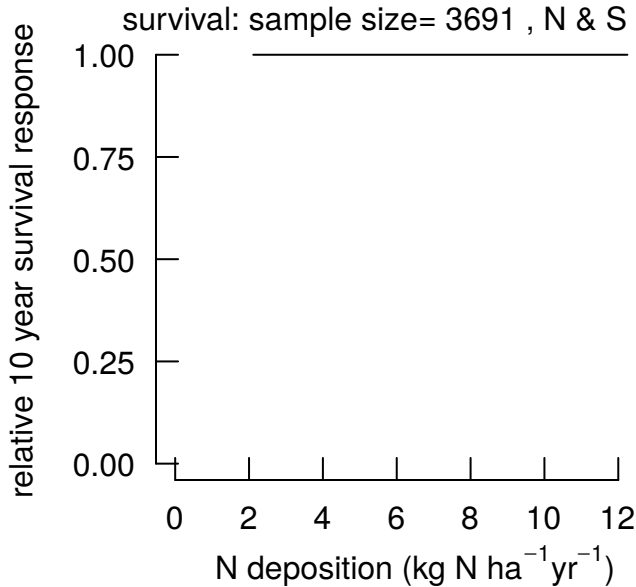
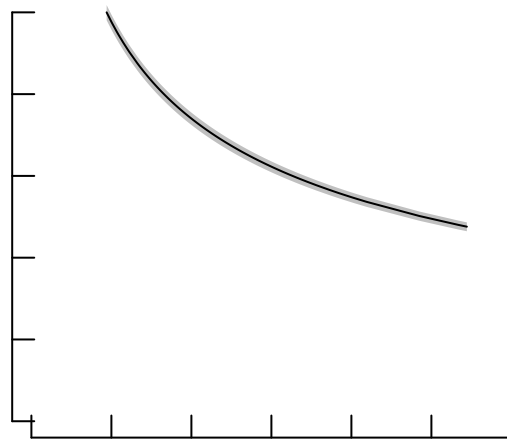
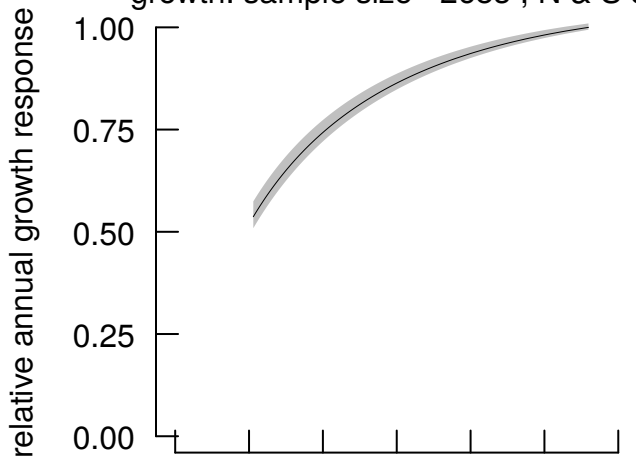


canyon live oak
Quercus chrysolepis

N deposition

S deposition

growth: sample size= 2683 , N & S corr.= 0.41 , VIF_N= 2.95 , VIF_S= 4.32



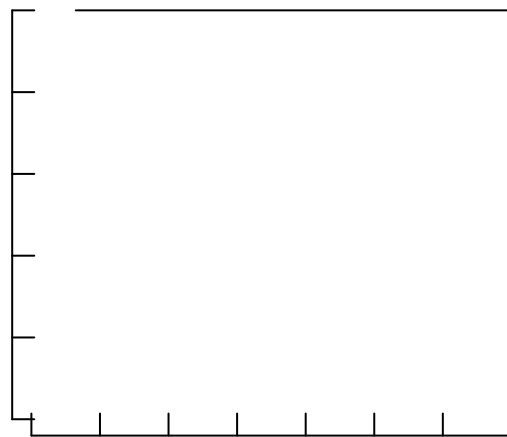
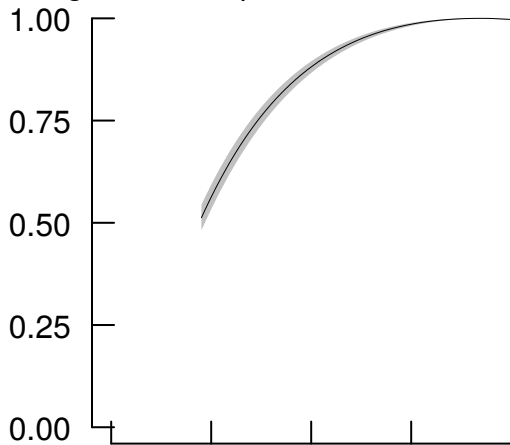
scarlet oak
Quercus coccinea

N deposition

S deposition

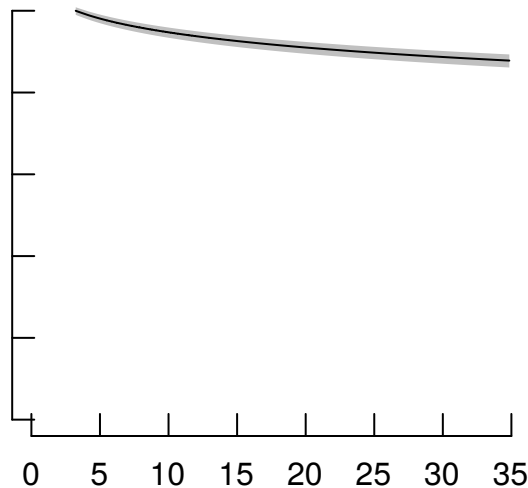
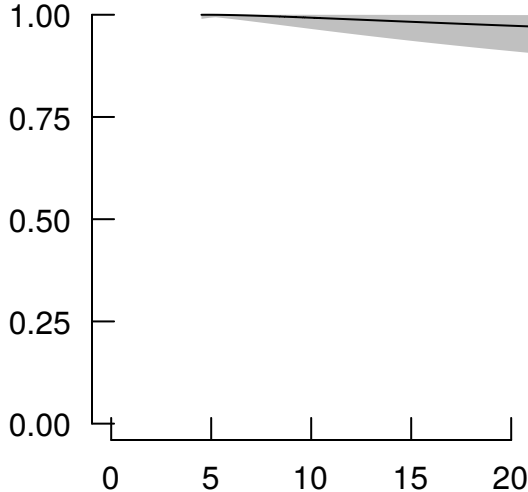
growth: sample size= 9167 , N & S corr.= 0.37 , VIF_N= 1.28 , VIF_S= 1.62

relative annual growth response



relative 10 year survival response

survival: sample size= 10509 , N & S corr.= 0.37 , VIF_N= 1.27 , VIF_S= 1.6



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

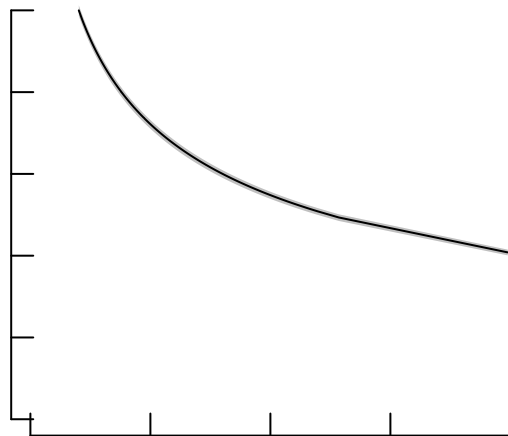
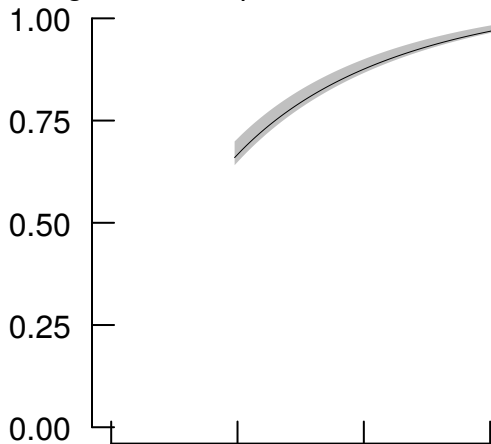
northern pin oak
Quercus ellipsoidalis

N deposition

S deposition

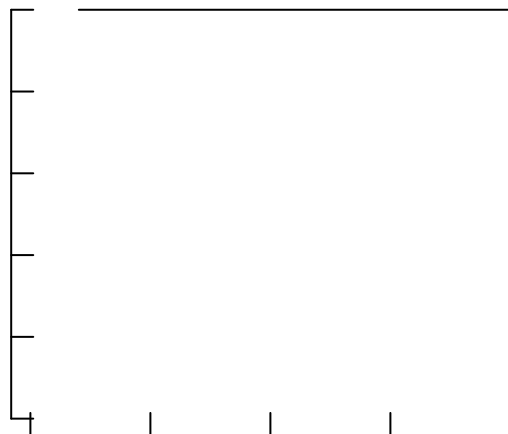
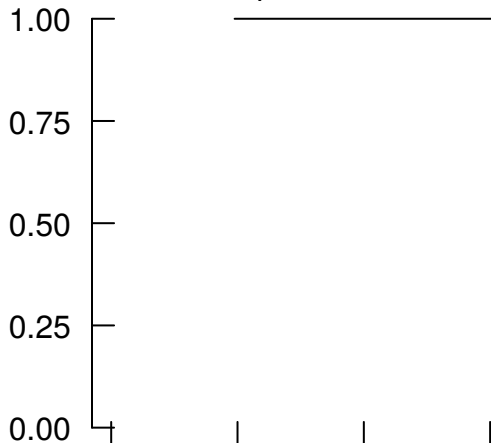
growth: sample size= 3616 , N & S corr.= 0.41 , VIF_N= 2.08 , VIF_S= 2.46

relative annual growth response



relative 10 year survival response

survival: sample size= 4187 , N & S corr.= 0.4 , VIF_N= 2.11 , VIF_S= 2.43



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

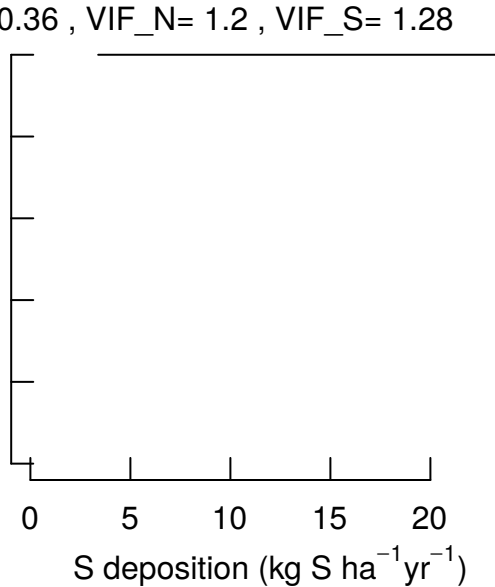
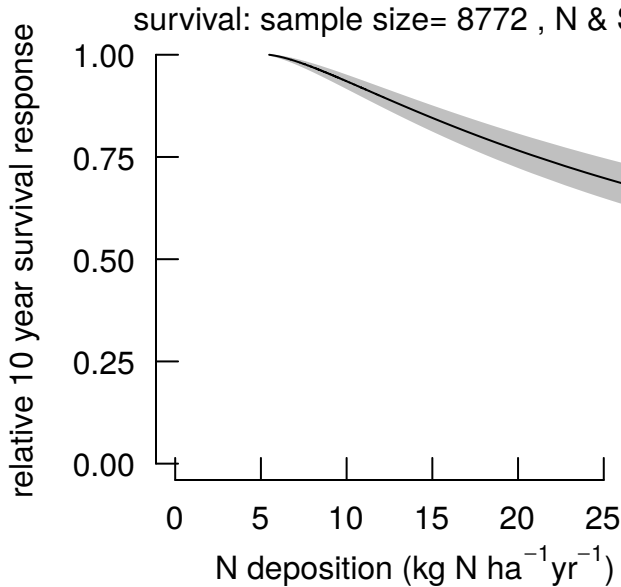
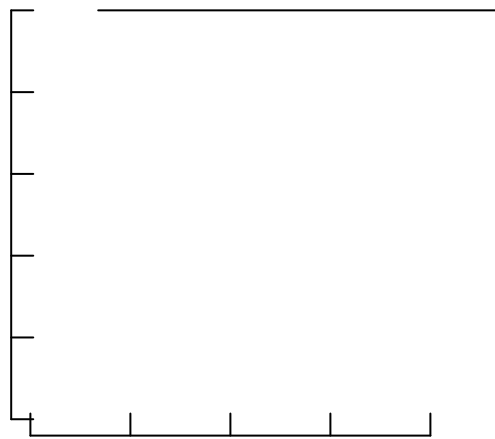
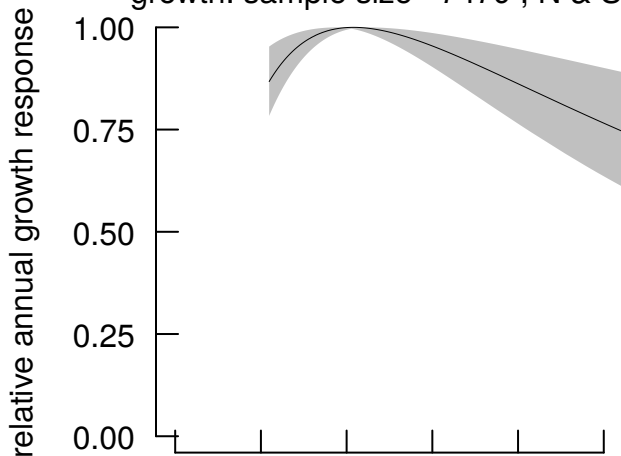
southern red oak

Quercus falcata

N deposition

S deposition

growth: sample size= 7479 , N & S corr.= 0.36 , VIF_N= 1.19 , VIF_S= 1.26



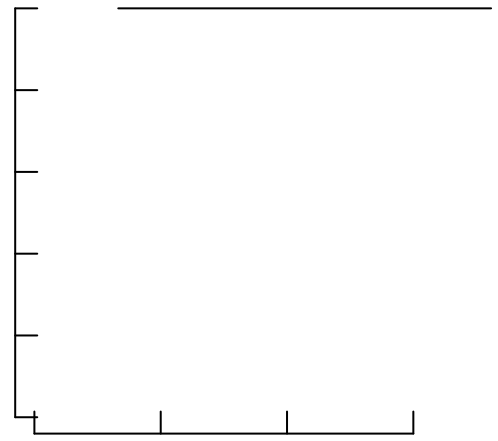
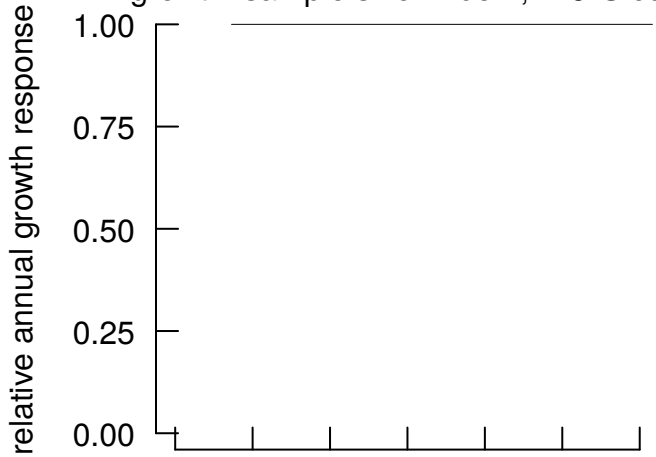
survival: sample size= 8772 , N & S corr.= 0.36 , VIF_N= 1.2 , VIF_S= 1.28

laurel oak
Quercus laurifolia

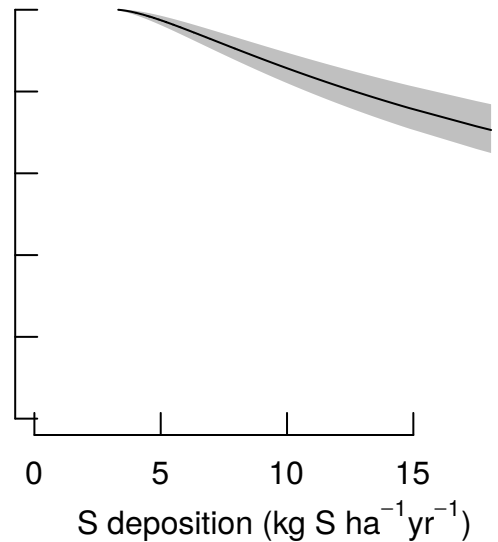
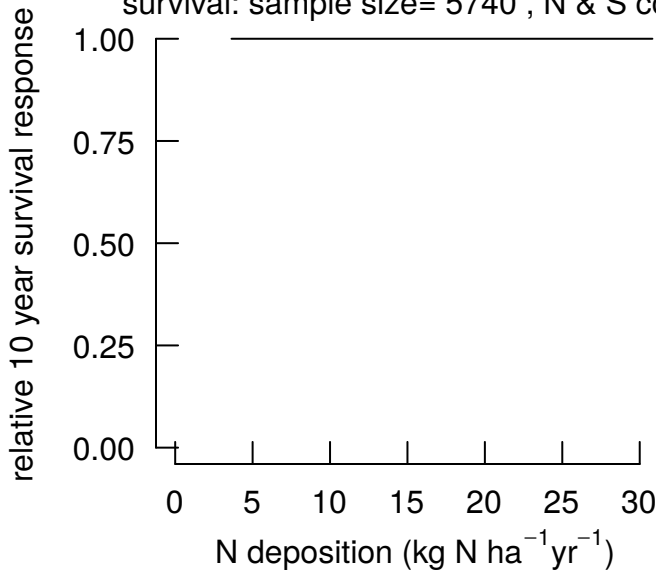
N deposition

S deposition

growth: sample size= 4957 , N & S corr.= 0.41 , VIF_N= 1.23 , VIF_S= 1.41



survival: sample size= 5740 , N & S corr.= 0.41 , VIF_N= 1.24 , VIF_S= 1.42



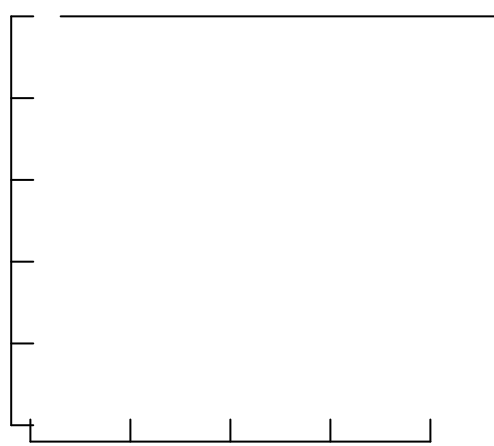
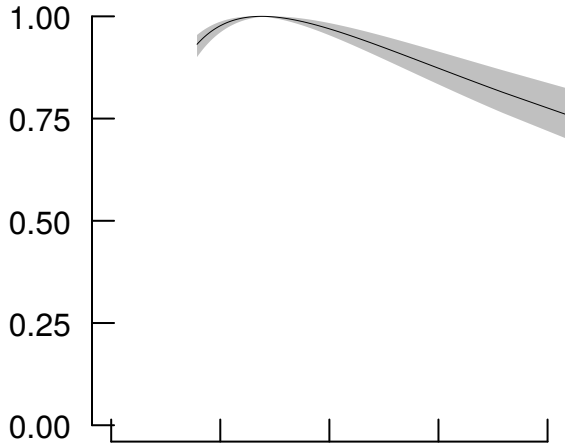
bur oak
Quercus macrocarpa

N deposition

S deposition

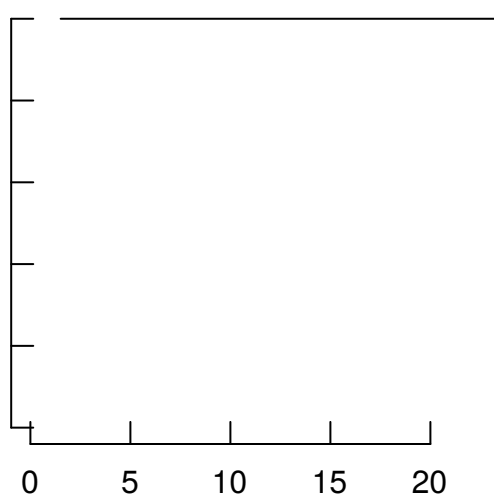
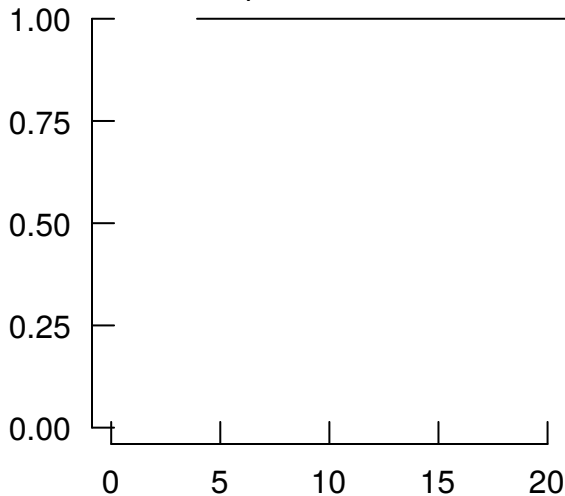
growth: sample size= 7180 , N & S corr.= 0.59 , VIF_N= 2.23 , VIF_S= 2.27

relative annual growth response



relative 10 year survival response

survival: sample size= 8123 , N & S corr.= 0.58 , VIF_N= 2.17 , VIF_S= 2.26



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

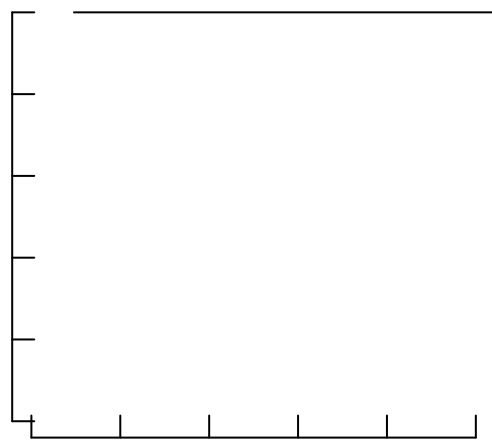
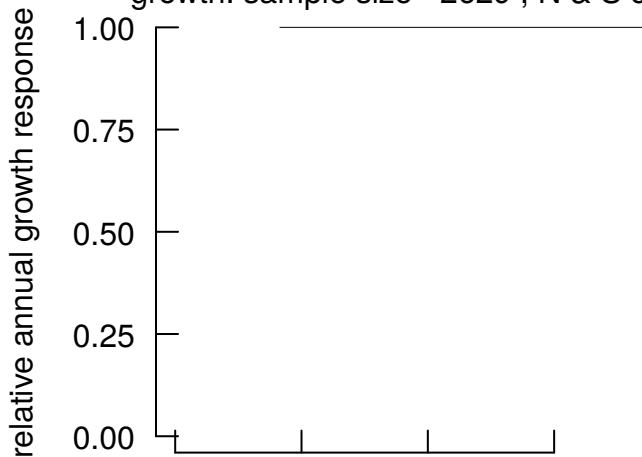
chinkapin oak

Quercus muehlenbergii

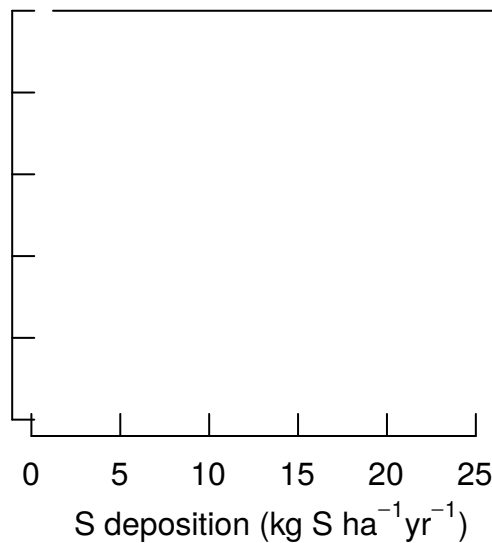
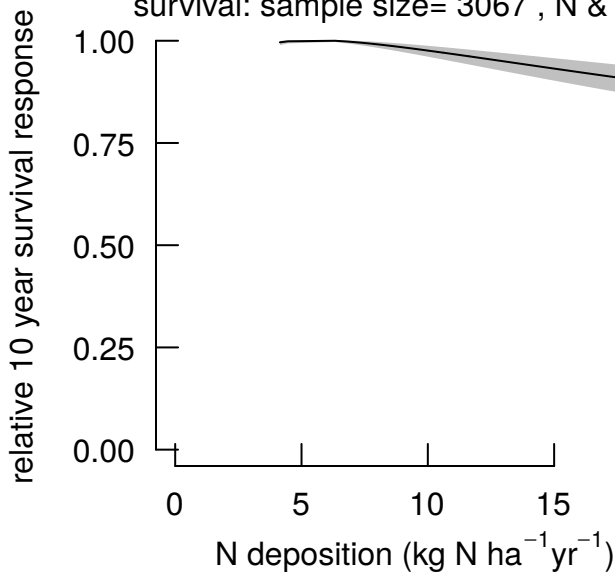
N deposition

S deposition

growth: sample size= 2629 , N & S corr.= 0.31 , VIF_N= 1.14 , VIF_S= 1.62



survival: sample size= 3067 , N & S corr.= 0.31 , VIF_N= 1.15 , VIF_S= 1.6

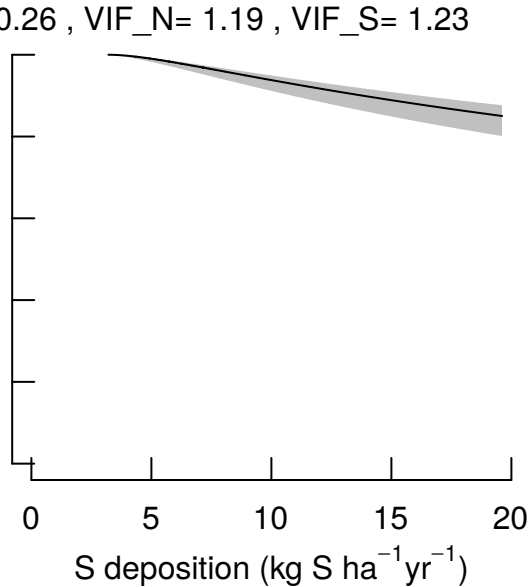
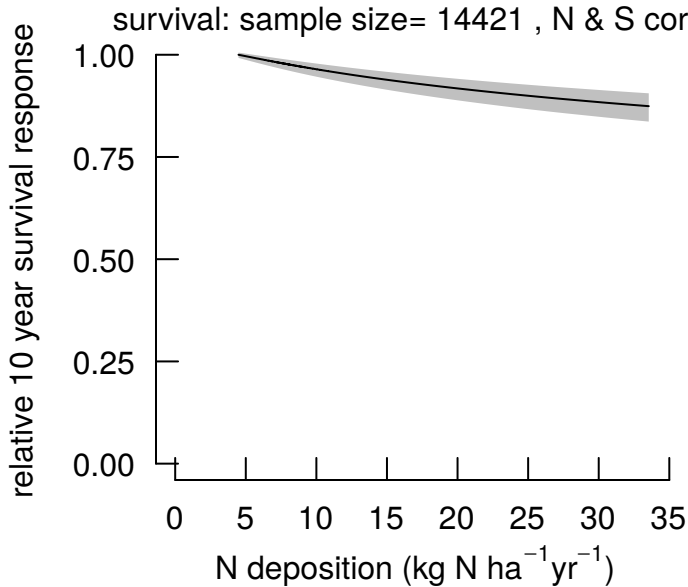
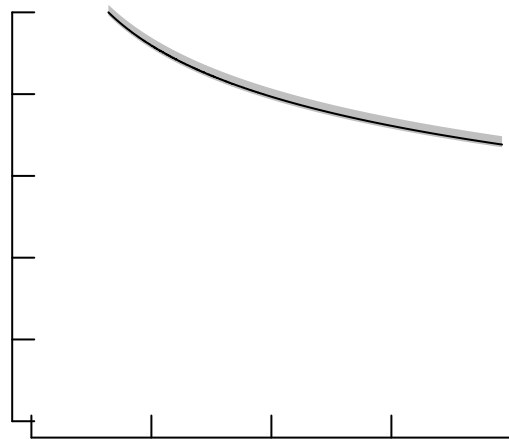
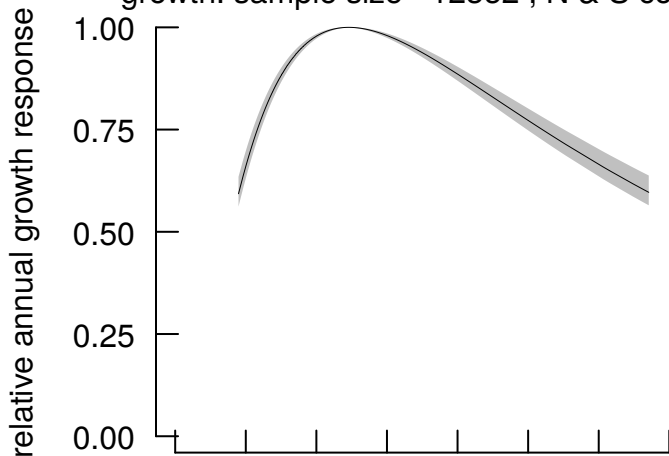


water oak
Quercus nigra

N deposition

S deposition

growth: sample size= 12352 , N & S corr.= 0.26 , VIF_N= 1.19 , VIF_S= 1.23

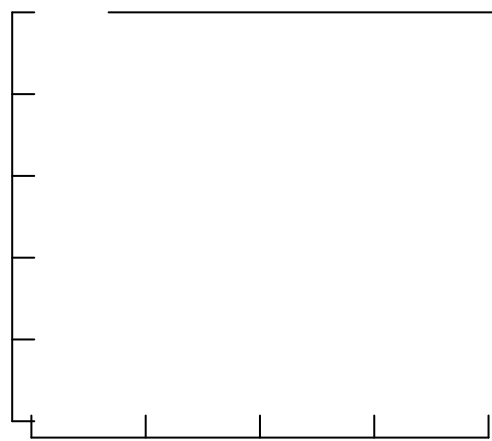
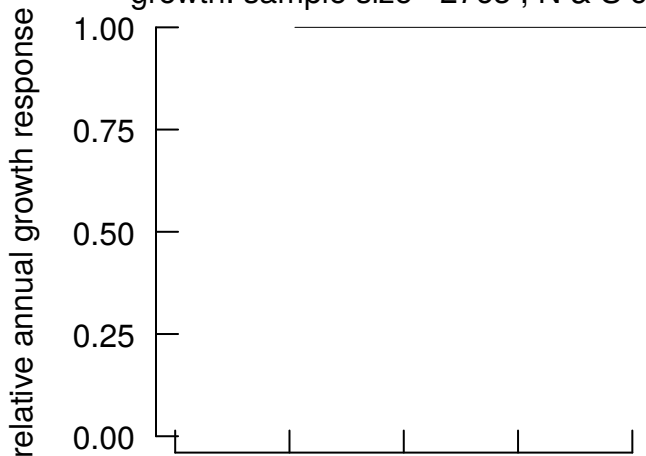


willow oak
Quercus phellos

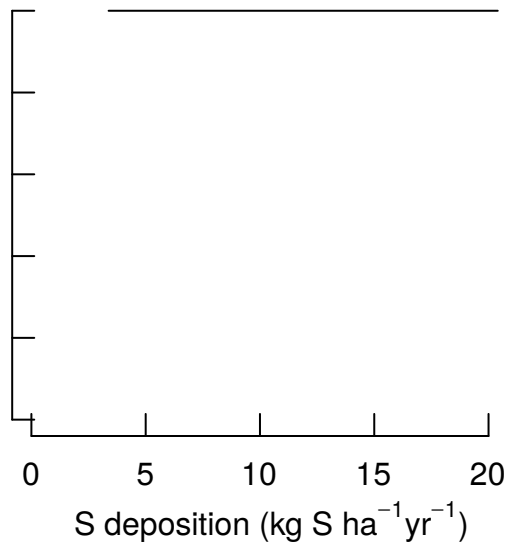
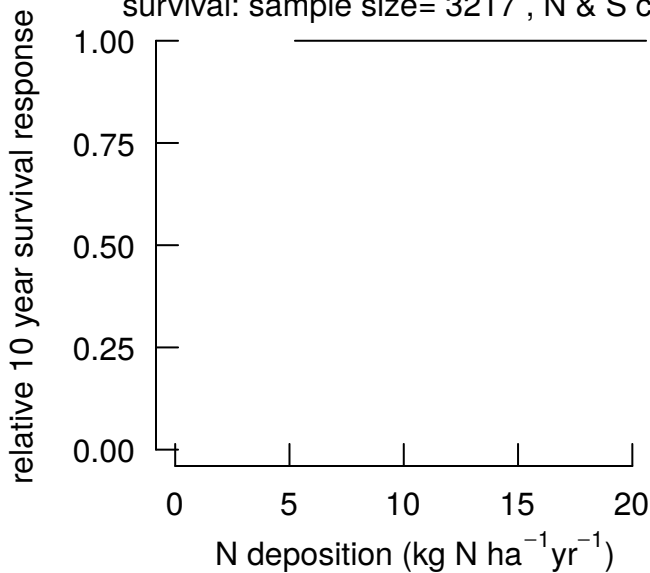
N deposition

S deposition

growth: sample size= 2763 , N & S corr.= 0.37 , VIF_N= 1.21 , VIF_S= 1.27



survival: sample size= 3217 , N & S corr.= 0.37 , VIF_N= 1.22 , VIF_S= 1.27



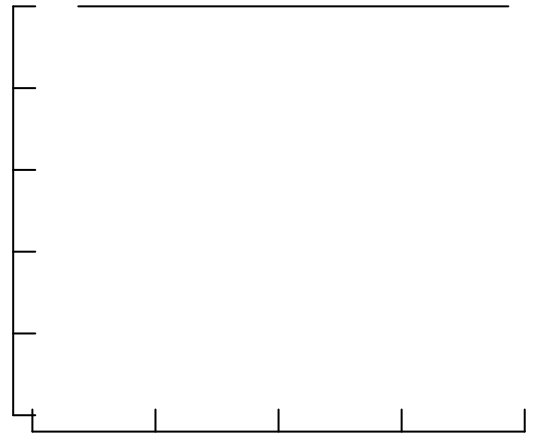
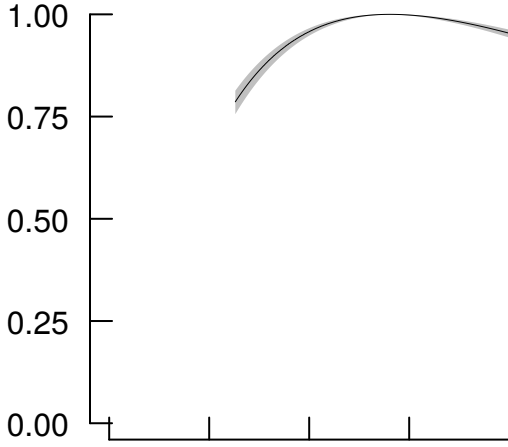
chestnut oak
Quercus prinus

N deposition

S deposition

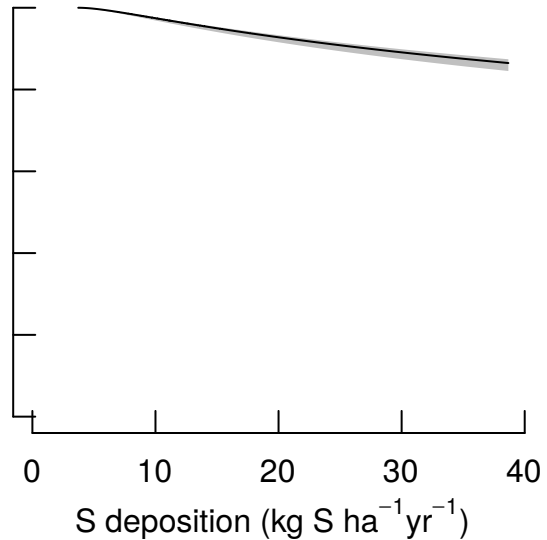
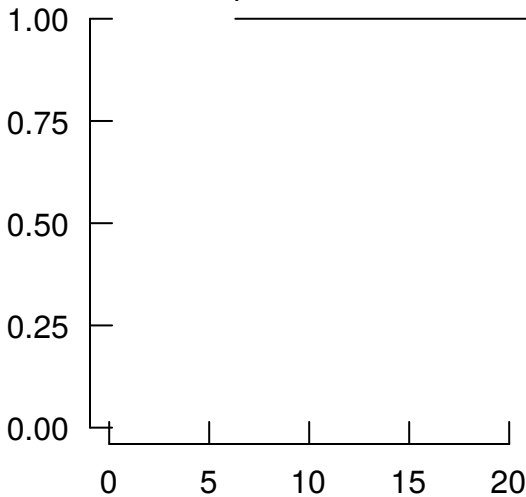
growth: sample size= 20711 , N & S corr.= 0.45 , VIF_N= 1.34 , VIF_S= 1.93

relative annual growth response



relative 10 year survival response

survival: sample size= 23211 , N & S corr.= 0.44 , VIF_N= 1.34 , VIF_S= 1.92



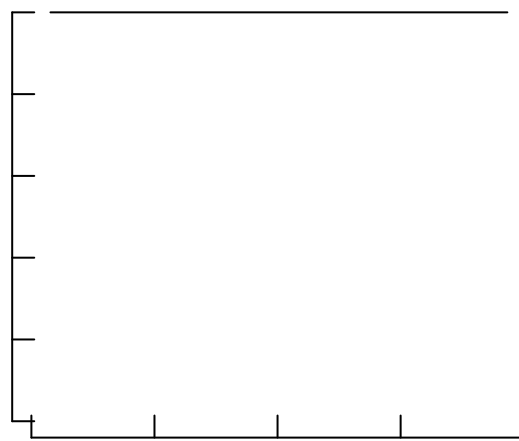
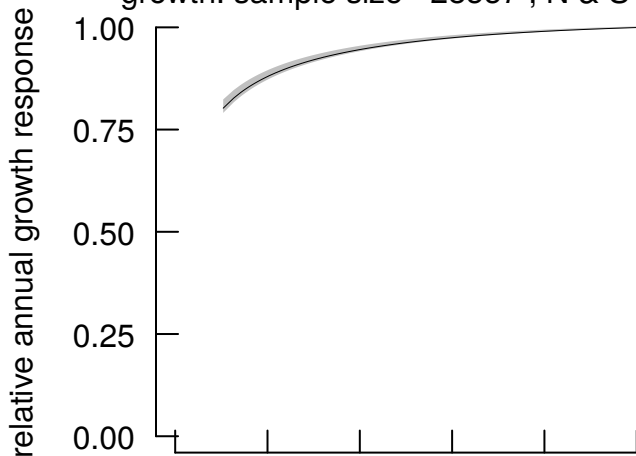
northern red oak

Quercus rubra

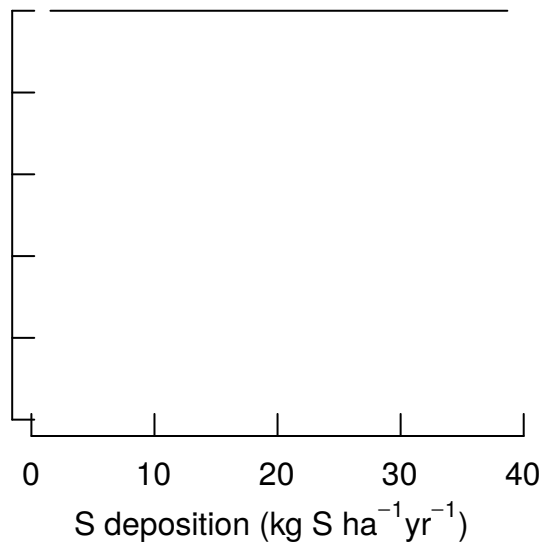
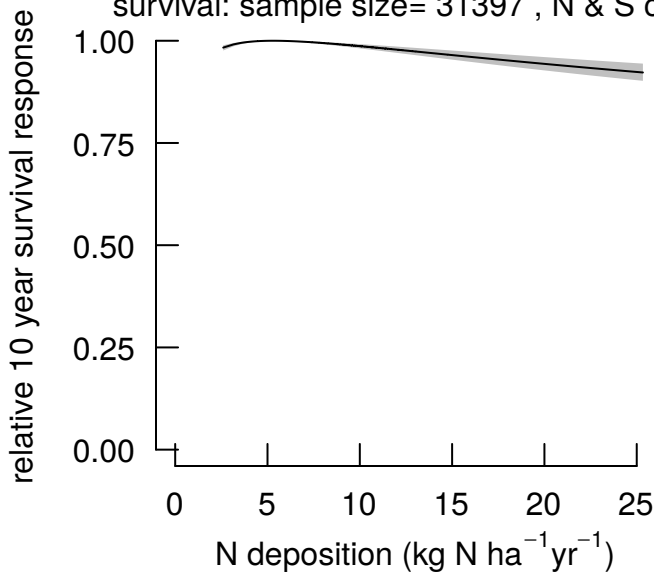
N deposition

S deposition

growth: sample size= 28557 , N & S corr.= 0.42 , VIF_N= 1.57 , VIF_S= 1.35



survival: sample size= 31397 , N & S corr.= 0.41 , VIF_N= 1.54 , VIF_S= 1.34

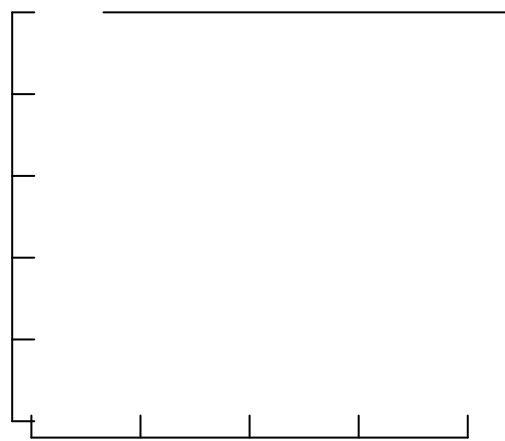
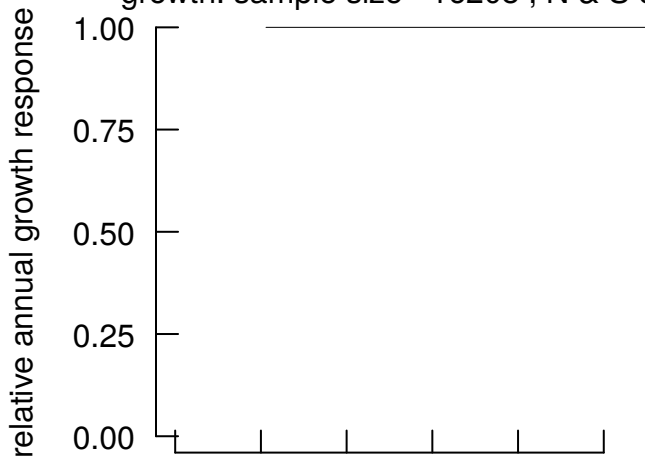


post oak
Quercus stellata

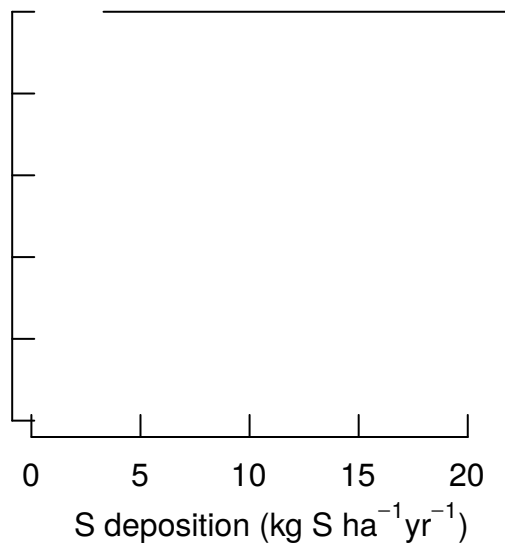
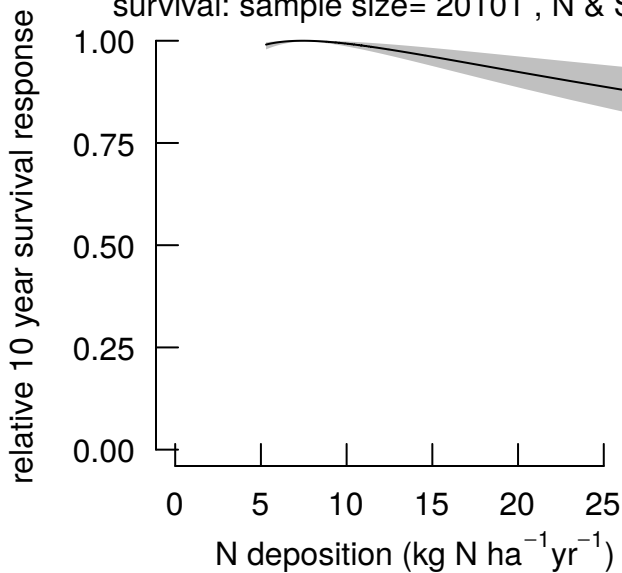
N deposition

S deposition

growth: sample size= 16208 , N & S corr.= 0.13 , VIF_N= 1.23 , VIF_S= 1.11



survival: sample size= 20101 , N & S corr.= 0.14 , VIF_N= 1.23 , VIF_S= 1.12

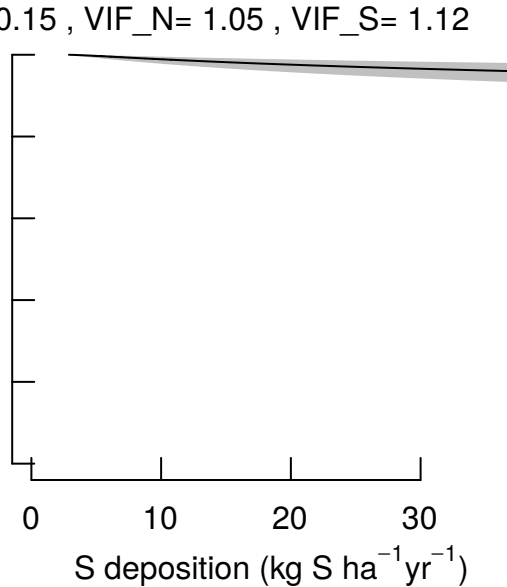
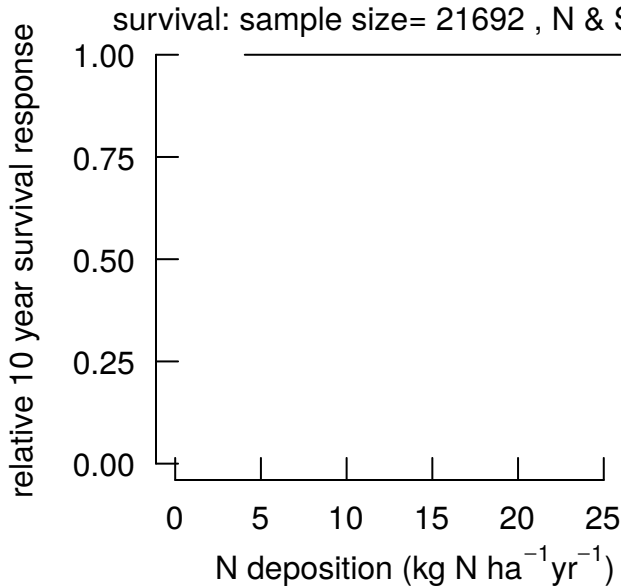
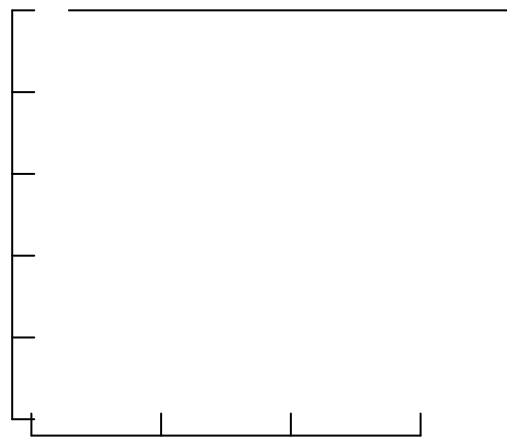
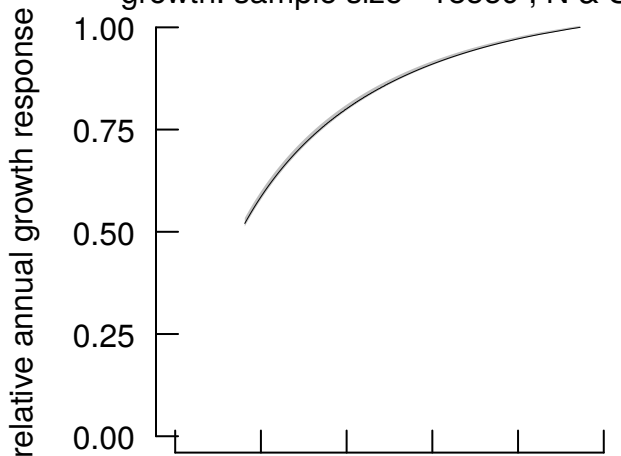


black oak
Quercus velutina

N deposition

S deposition

growth: sample size= 18559 , N & S corr.= 0.13 , VIF_N= 1.05 , VIF_S= 1.11



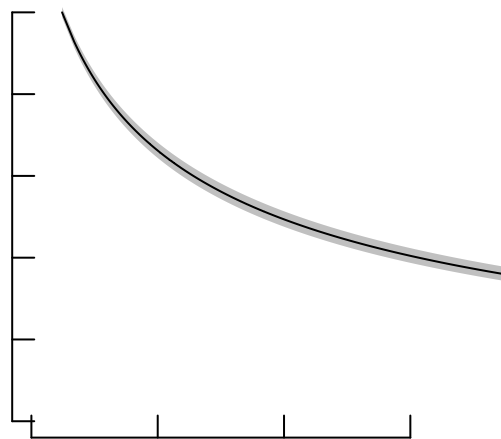
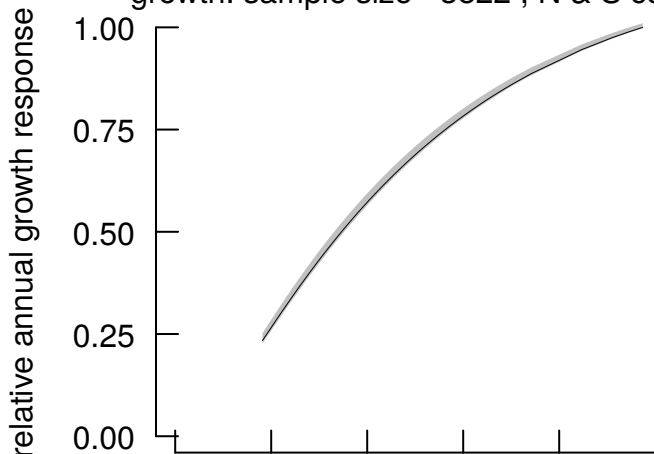
black locust

Robinia pseudoacacia

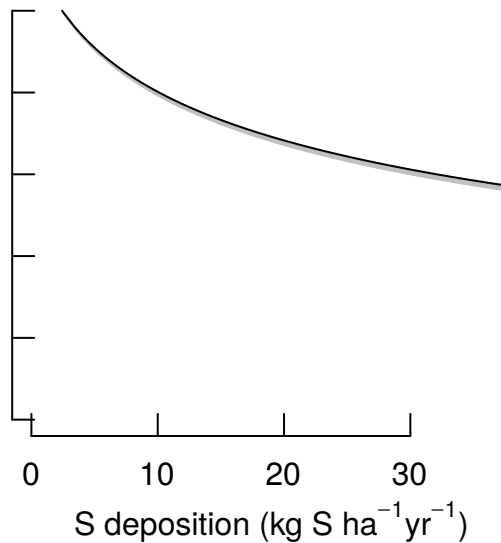
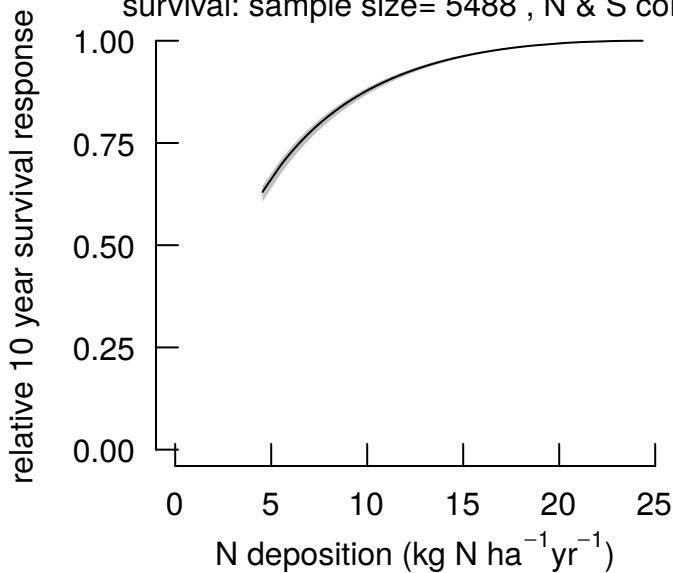
N deposition

S deposition

growth: sample size= 3822 , N & S corr.= 0.18 , VIF_N= 1.05 , VIF_S= 1.08



survival: sample size= 5488 , N & S corr.= 0.19 , VIF_N= 1.06 , VIF_S= 1.08

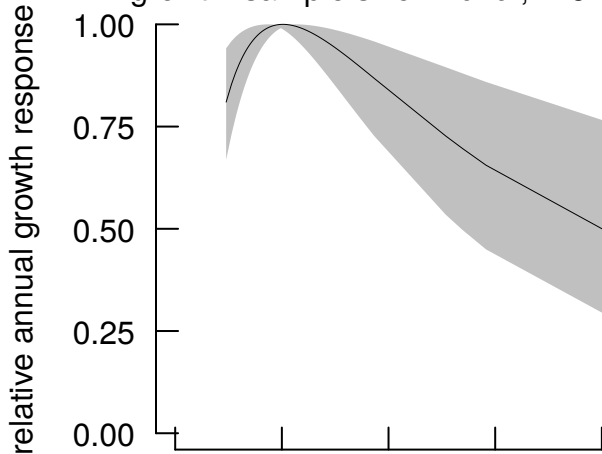


black willow

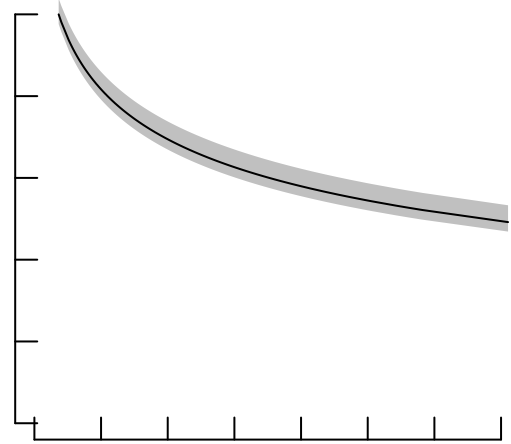
Salix nigra

N deposition

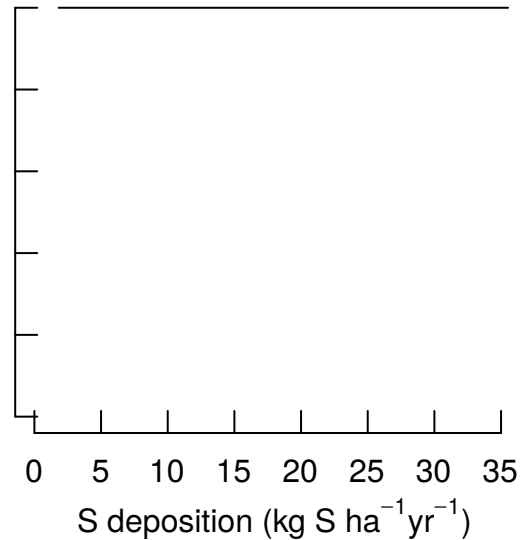
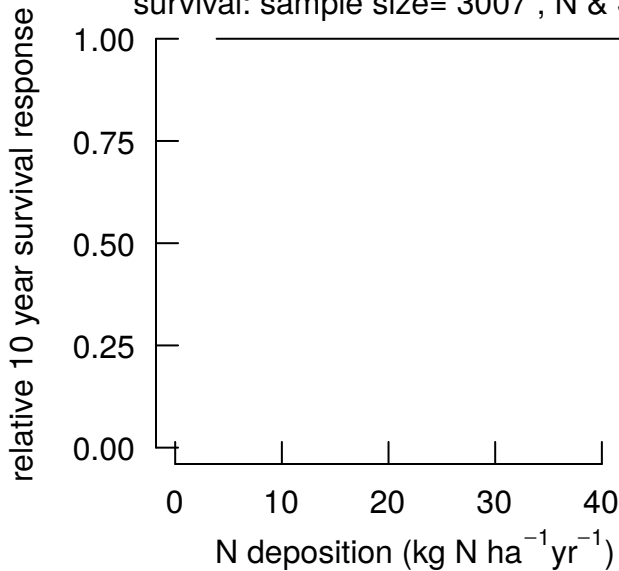
growth: sample size= 2049 , N & S corr.= 0.29 , VIF_N= 1.33 , VIF_S= 1.33



S deposition



survival: sample size= 3007 , N & S corr.= 0.29 , VIF_N= 1.3 , VIF_S= 1.32



sassafras

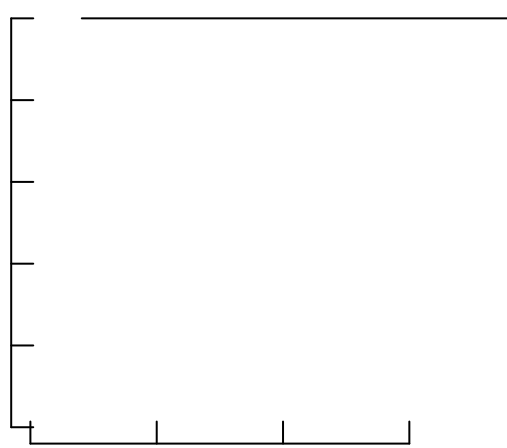
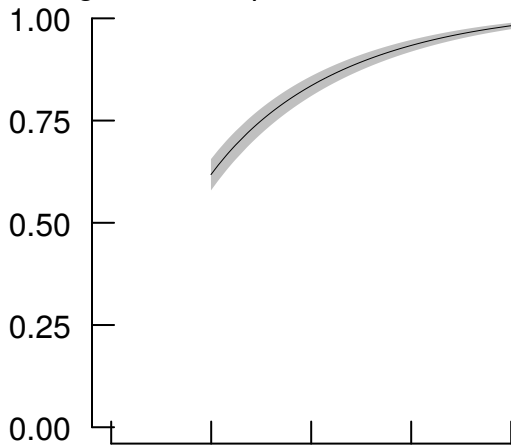
Sassafras albidum

N deposition

S deposition

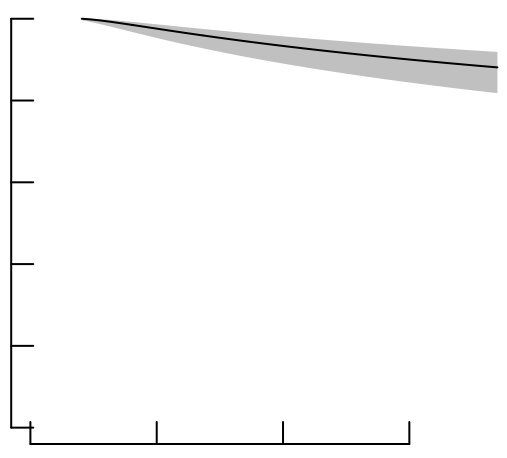
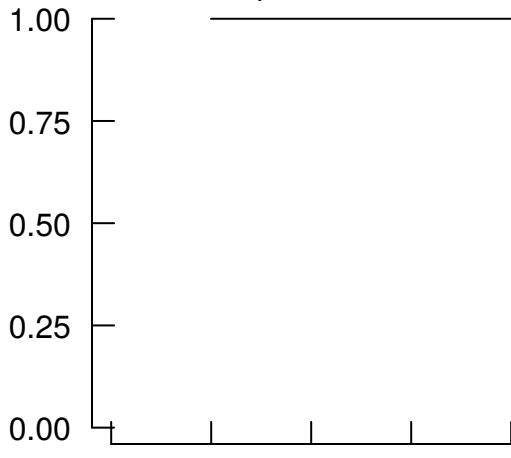
growth: sample size= 4971 , N & S corr.= 0.28 , VIF_N= 1.12 , VIF_S= 1.4

relative annual growth response



relative 10 year survival response

survival: sample size= 6227 , N & S corr.= 0.3 , VIF_N= 1.12 , VIF_S= 1.42



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

American basswood

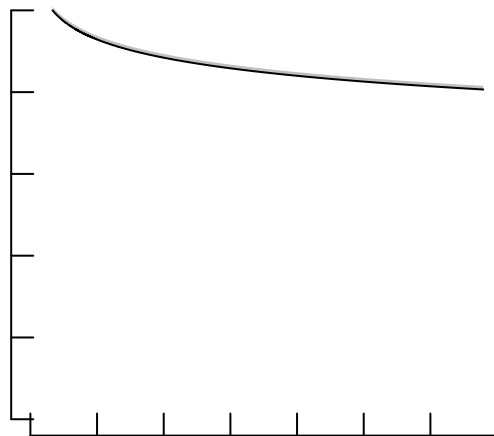
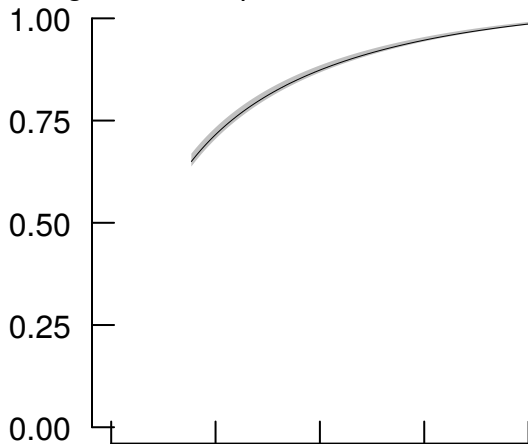
Tilia americana

N deposition

S deposition

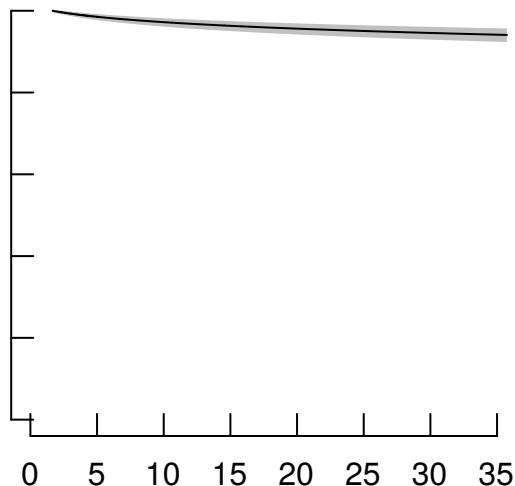
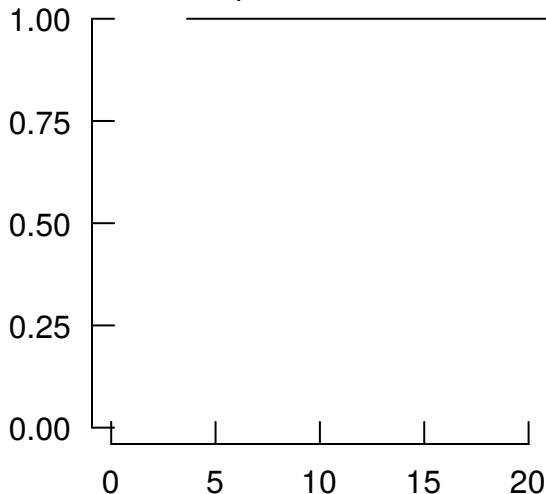
growth: sample size= 12587 , N & S corr.= 0.4 , VIF_N= 1.44 , VIF_S= 2.08

relative annual growth response



relative 10 year survival response

survival: sample size= 15093 , N & S corr.= 0.39 , VIF_N= 1.41 , VIF_S= 2.08



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

winged elm

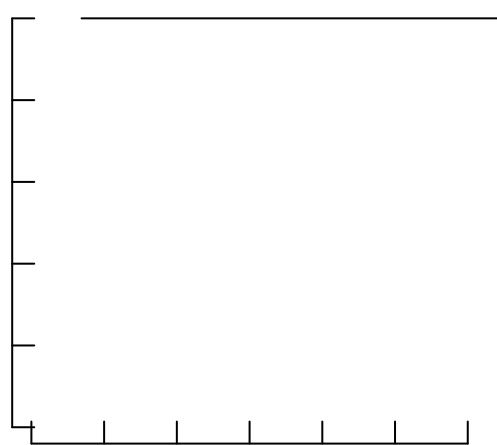
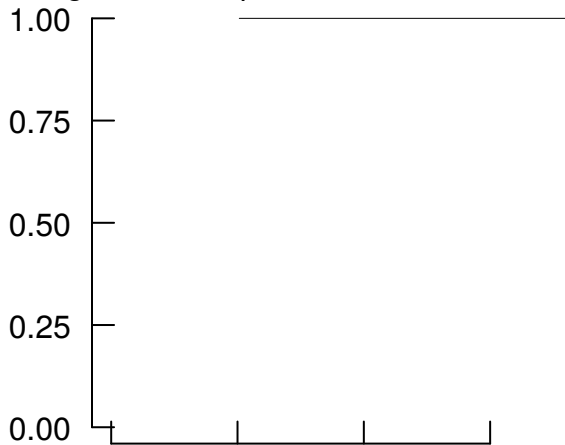
Ulmus alata

N deposition

S deposition

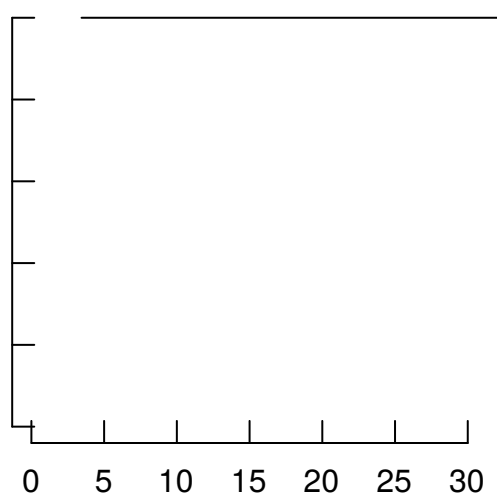
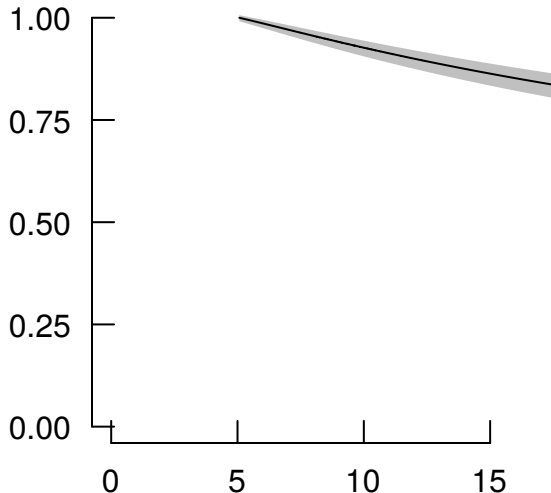
growth: sample size= 5198 , N & S corr.= 0.38 , VIF_N= 1.34 , VIF_S= 1.33

relative annual growth response



survival: sample size= 6682 , N & S corr.= 0.37 , VIF_N= 1.35 , VIF_S= 1.31

relative 10 year survival response



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

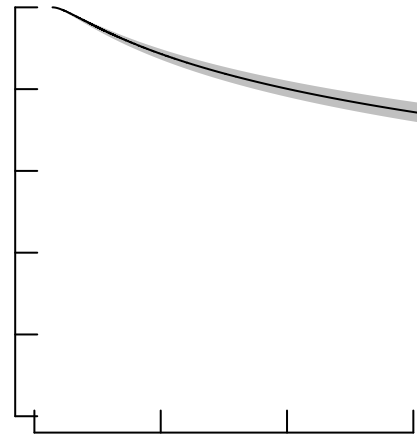
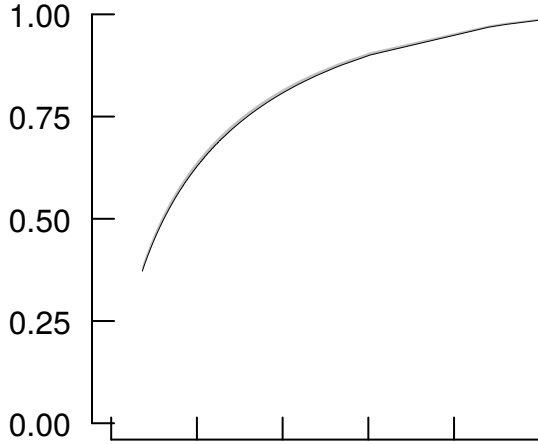
American elm
Ulmus americana

N deposition

S deposition

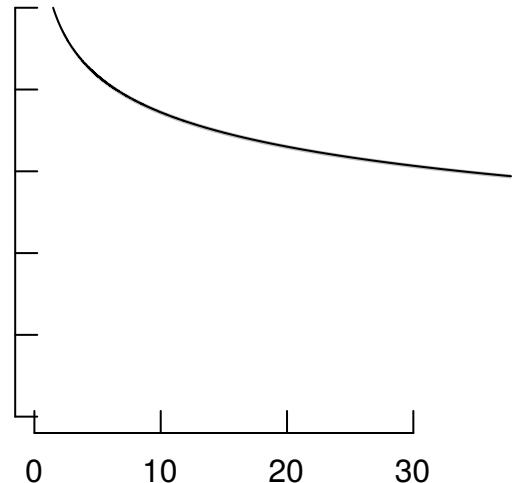
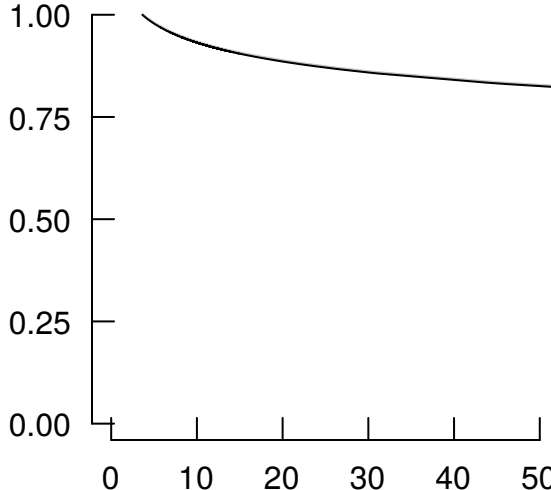
growth: sample size= 14210 , N & S corr.= 0.25 , VIF_N= 1.07 , VIF_S= 1.27

relative annual growth response



survival: sample size= 18811 , N & S corr.= 0.24 , VIF_N= 1.07 , VIF_S= 1.27

relative 10 year survival response



N deposition (kg N ha⁻¹ yr⁻¹)

S deposition (kg S ha⁻¹ yr⁻¹)

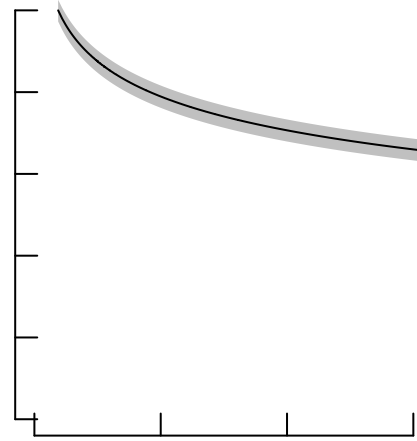
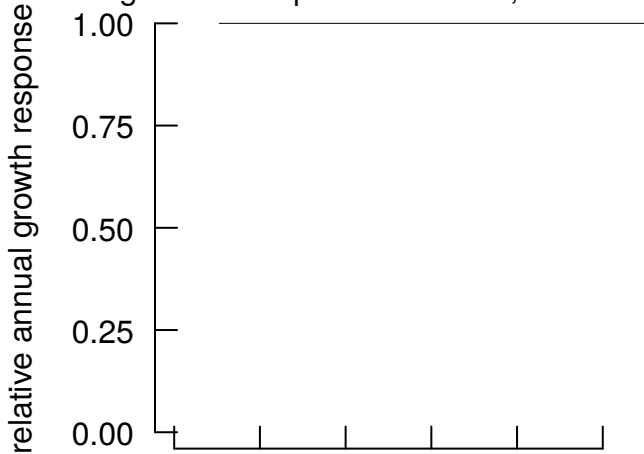
slippery elm

Ulmus rubra

N deposition

S deposition

growth: sample size= 4087 , N & S corr.= 0.085 , VIF_N= 1.26 , VIF_S= 1.19



survival: sample size= 5431 , N & S corr.= 0.07 , VIF_N= 1.3 , VIF_S= 1.21

