Meta-analysis models

library(here)  
library(brms)  
library(cmdstanr)  
  
options(digits = 2)  
  
# Set the Stan engine to cmdstanr  
options(brms.backend = "cmdstanr")  
set\_cmdstan\_path(path = file.path("C:", "Program Files", "R", "cmdstan-2.34.1"))  
  
# For reproducible results  
set.seed(42)

### Woodland restoration interventions meta-analysis

Here we provide examples of the two- and three-level models used in the study. All other study analyses can be reproduced by substituting the data provided for other intervention-response combinations and running the relevant model.

### Import the data

The following examples use the planting data for restored vs reference locations.

# Read in the data  
path <- here("Planting Res\_Ref data.csv")  
dat.mod <- read.csv(path, stringsAsFactors = FALSE)  
  
# Define priors for Bayesian models  
priors <- c(prior(normal(0,1), class = Intercept),  
 prior(exponential(1), class = sd))

### Two-level meta-analysis model

The two-level model was used when all studies contributed only one effect. Example: Effect of planting on litter (short model run time).

# The following example uses the litter response data  
dat.lit <- subset(dat.mod, Var\_organic == "Litter")  
  
# Two-level model  
lit\_mod <- brm(yi|se(vi) ~ 1 + (1|Study\_ID),  
 data = dat.lit,  
 backend = "cmdstanr",  
 prior = priors,  
 chains = 4,   
 iter = 12000,   
 warmup = 2000,   
 thin = 20,  
 control = list(adapt\_delta = 0.99, max\_treedepth = 15)  
 )  
  
summary(lit\_mod)   
  
pp\_check(lit\_mod, ndraws = 50)

### Three-level meta-analysis model

The three-level model was used when one or more studies contributed multiple effects. Example: Effect of planting on all plants (longer model run time).

# The following example uses the all plants response data  
dat.all <- subset(dat.mod, !is.na(Var\_total))  
  
# Three-level model  
all\_mod <- brm(yi|se(vi) ~ 1 + (1|Study\_ID/es\_id),  
 data = dat.all,  
 backend = "cmdstanr",  
 prior = priors,  
 chains = 4,   
 iter = 12000,   
 warmup = 2000,   
 thin = 20,  
 control = list(adapt\_delta = 0.999, max\_treedepth = 15)  
 )  
   
summary(all\_mod)   
  
pp\_check(all\_mod, ndraws = 50)