Boreal small mammal, fungi, and insect communities as a function of variation in downed woody debris quantity and quality

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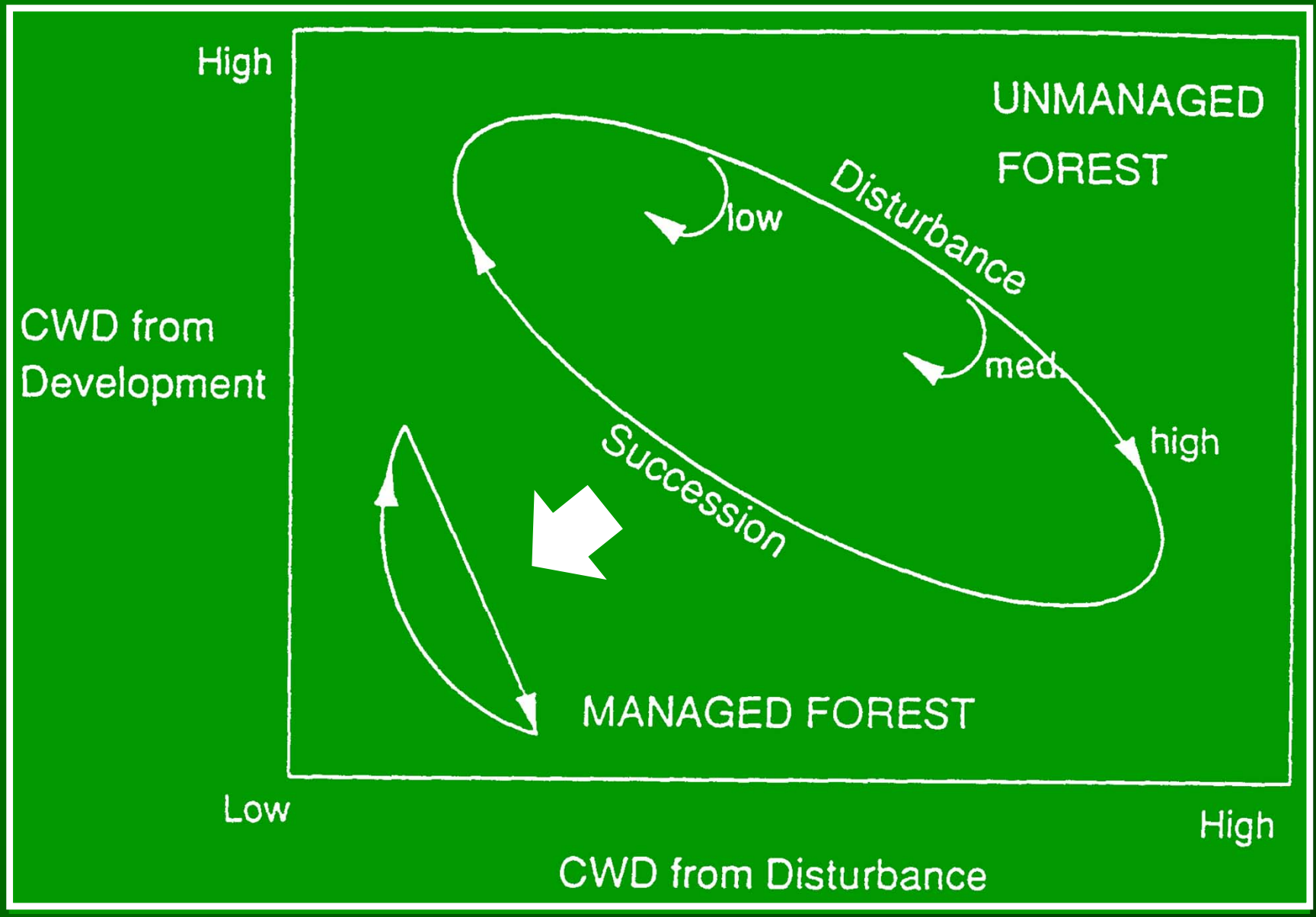


From: Hansen et al. 1991

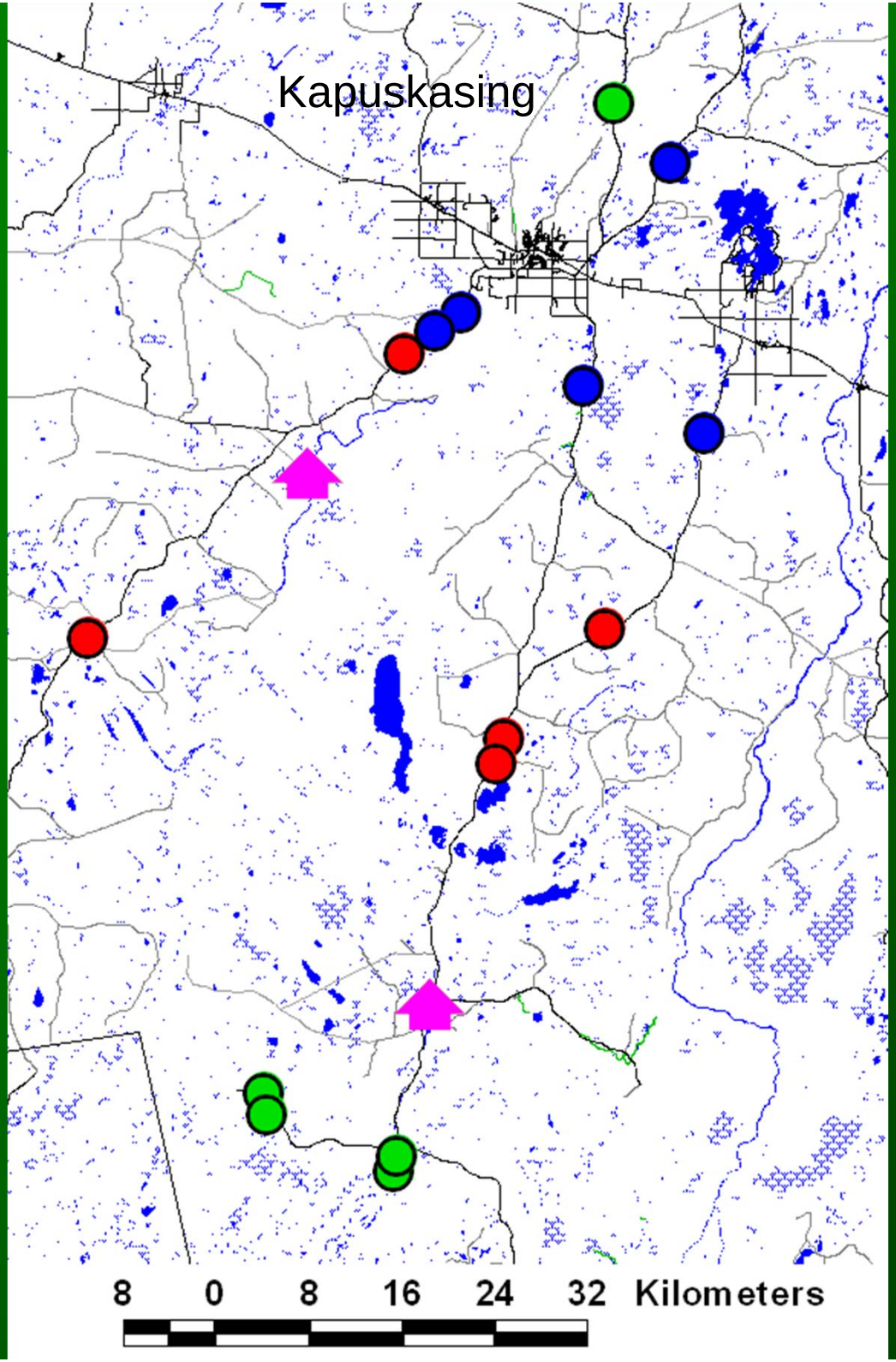
Table 2. The number of species threatened primarily by forest managament practices (Rassi et al. 1992). I = vertebrates, II = invertebrates, III = vascular plants, IV = bryophytes, lichens and fungi.

	I	II	III	IV	Total
Forest management, in general	7	274	35	376	692
Undefined forest management	-	14	21	123	158
Changes in tree species composition	3	74	12	129	218
Changes in age structure of forests	2	32	2	63	99
Decrease of decaying trees	2	154	-	61	217

Objectives:

1) Examine effects of variation in DWD quality and quantity among boreal mixedwood sites in NE Ontario

2) Examine effects of a DWD removal experiment at the same sites

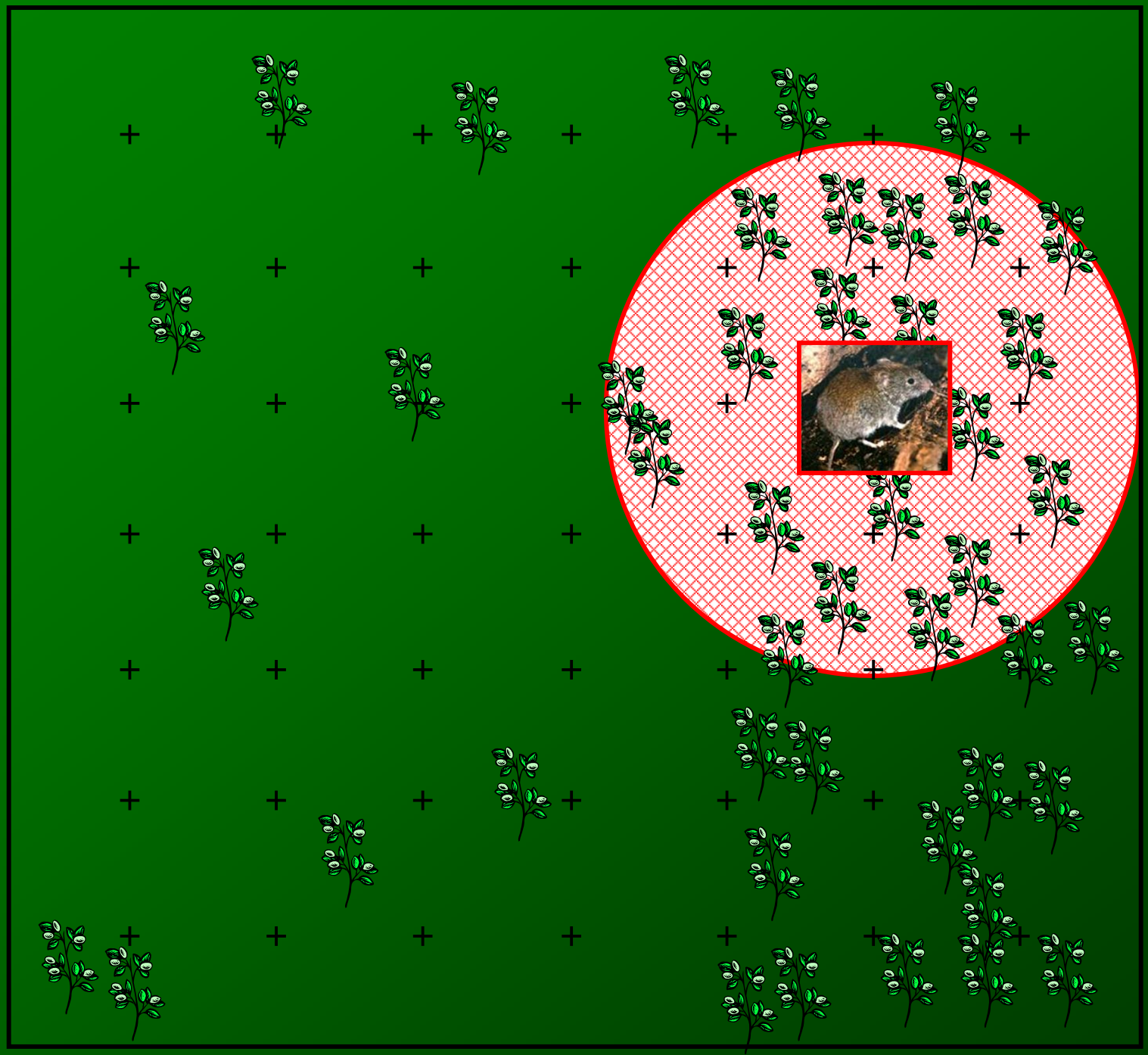


Mech. clearcut
-36-44 years old
-25-115 m^3/ha DWD

Horse clearcut
-52-68 years old
-18-75 m^3/ha DWD

Old growth
-87-160 years old
-25-130 m^3/ha DWD

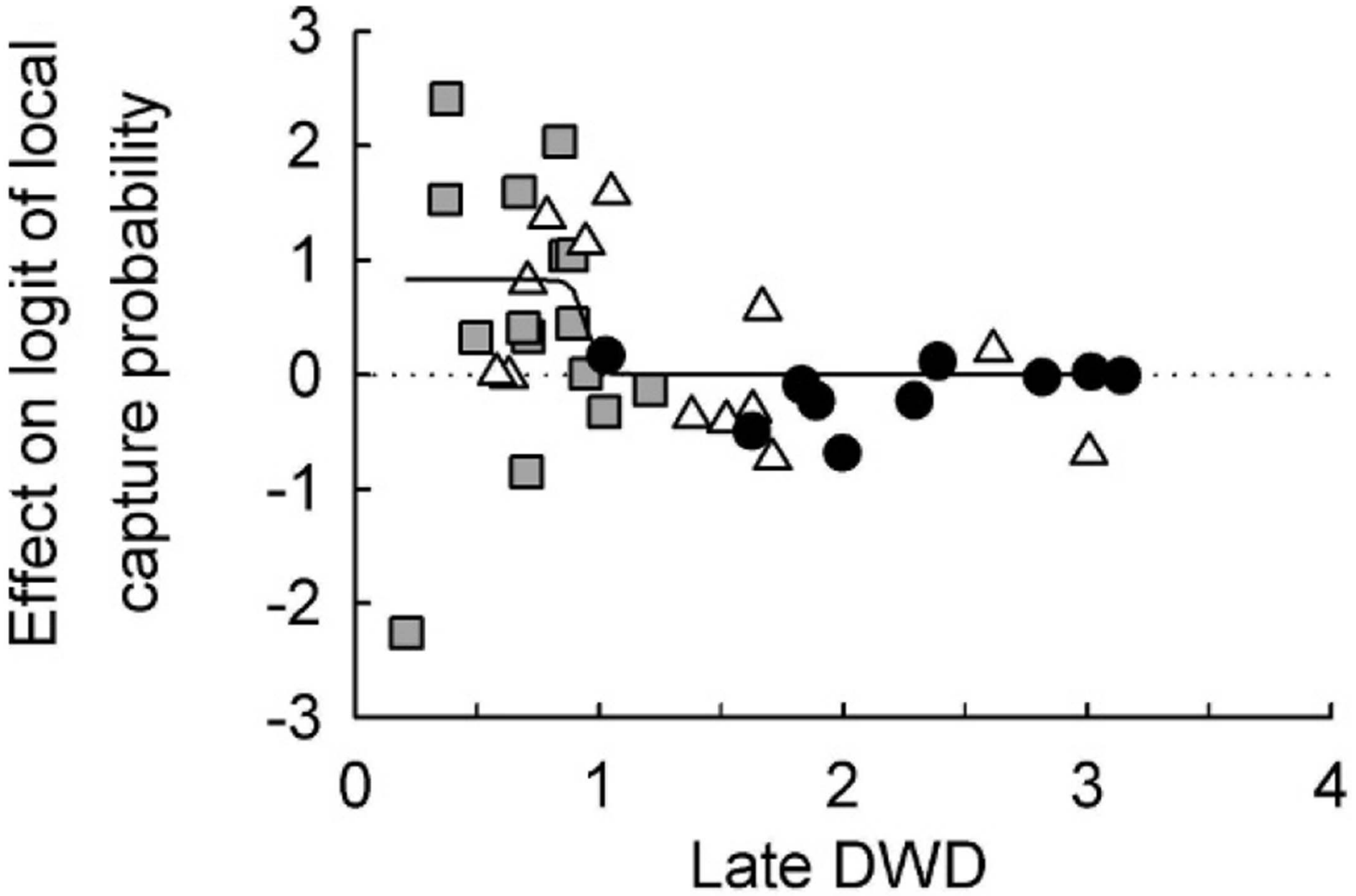
Small mammal – red-backed vole



Variable set	**$\sum w_i$ (72 candidate models)**
Late-decay-stage DWD	1.00
Shrub cover (esp. short and hardwood)	1.00
Substrate (esp. needle and FWD)	0.82
Shade tolerant shrubs	0.72
Soil moisture (inferred from shrubs)	0.57
Early-decay-stage DWD	0.32

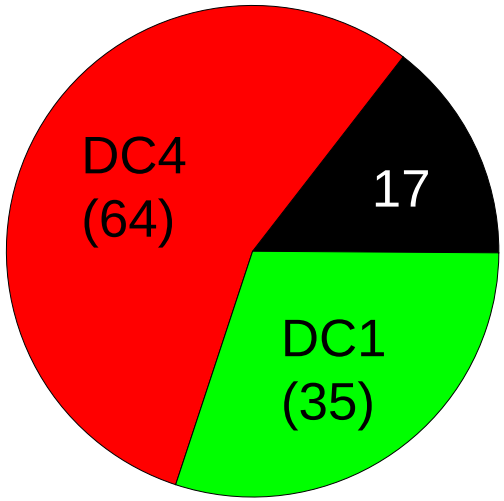
Highest ranking spring candidate models

Model	Δ_{AIC}
$SHR_C + DWD_W + SHA + SUB$	0.0
$SHR_C + DWD_W + MOI + SHA + SUB$	1.6
$SHR_C + DWD_W(MOI) + MOI + SUB$	2.2
$SHR_C + DWD_C + DWD_W + SHA + SUB$	2.4
$SHR_C + DWD_W + SUB$	3.1
$SHR_C + DWD_W + MOI + SHA$	3.3
NULL	30.6


Effect on logit of local capture probability
3
2
1
0
-1
-2
-3
0
1
2
3
4
Late DWD

Fruiting bodies

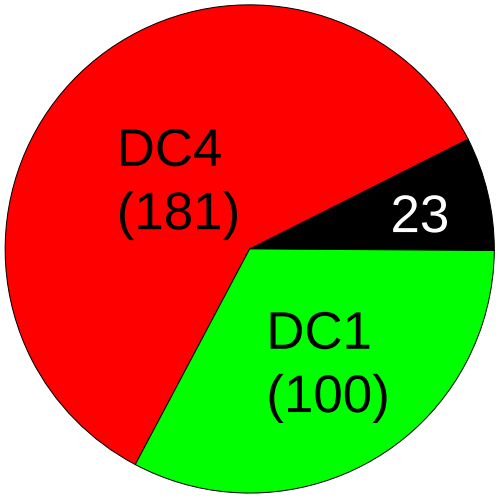
150 logs

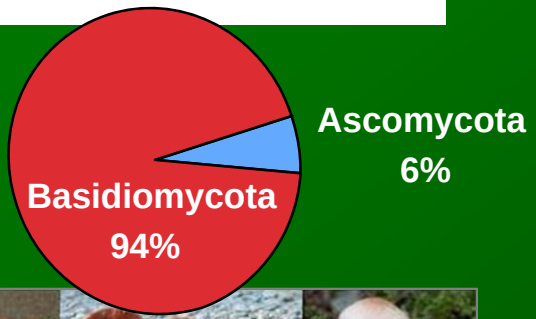


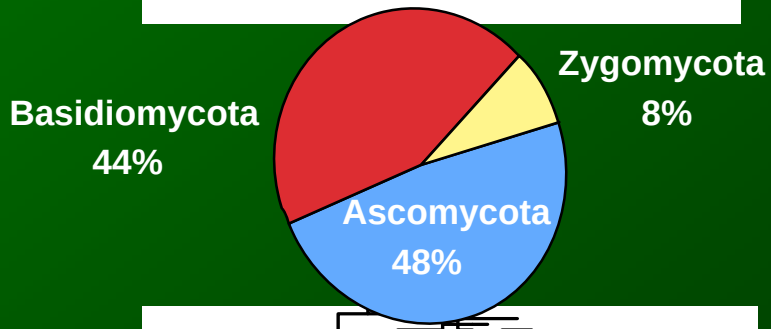
14

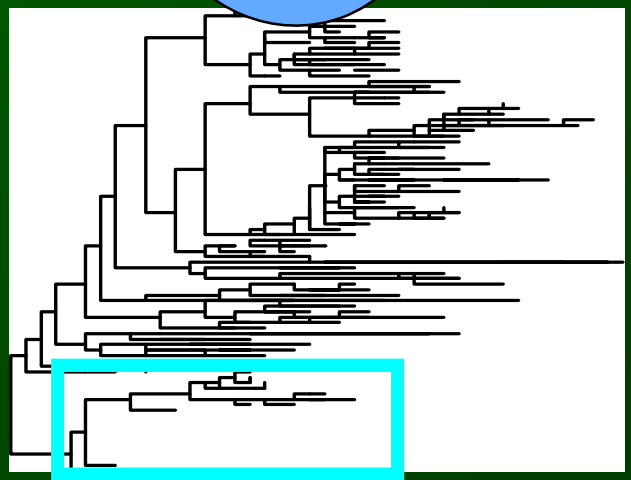
OTUs (from sequencing)

cores from 60 logs





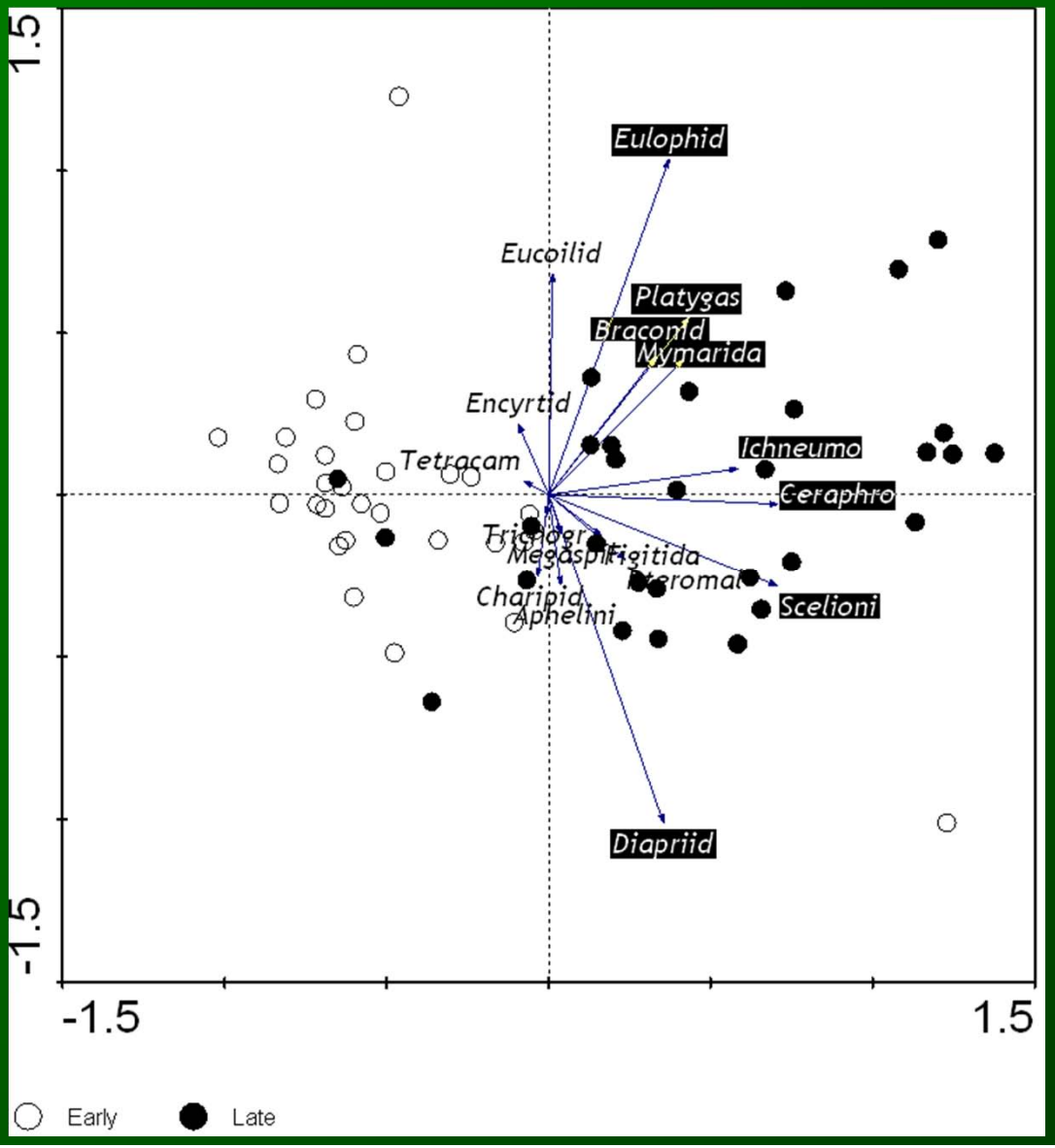




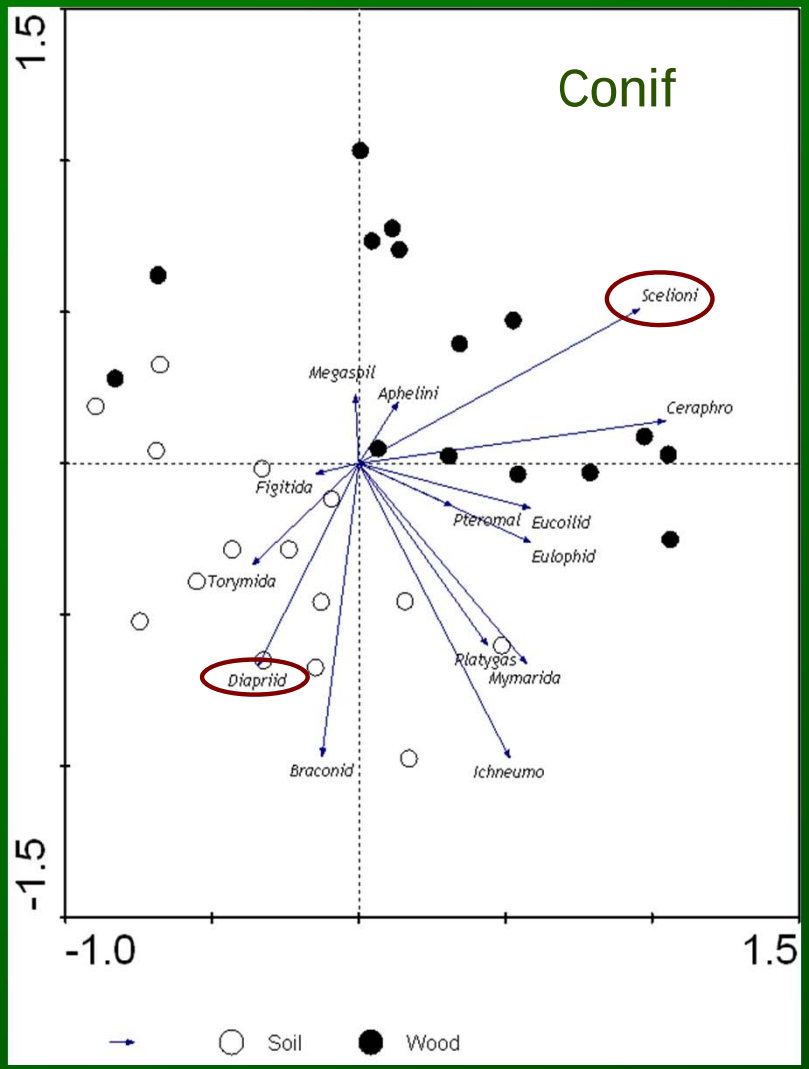
Fischer, 2007

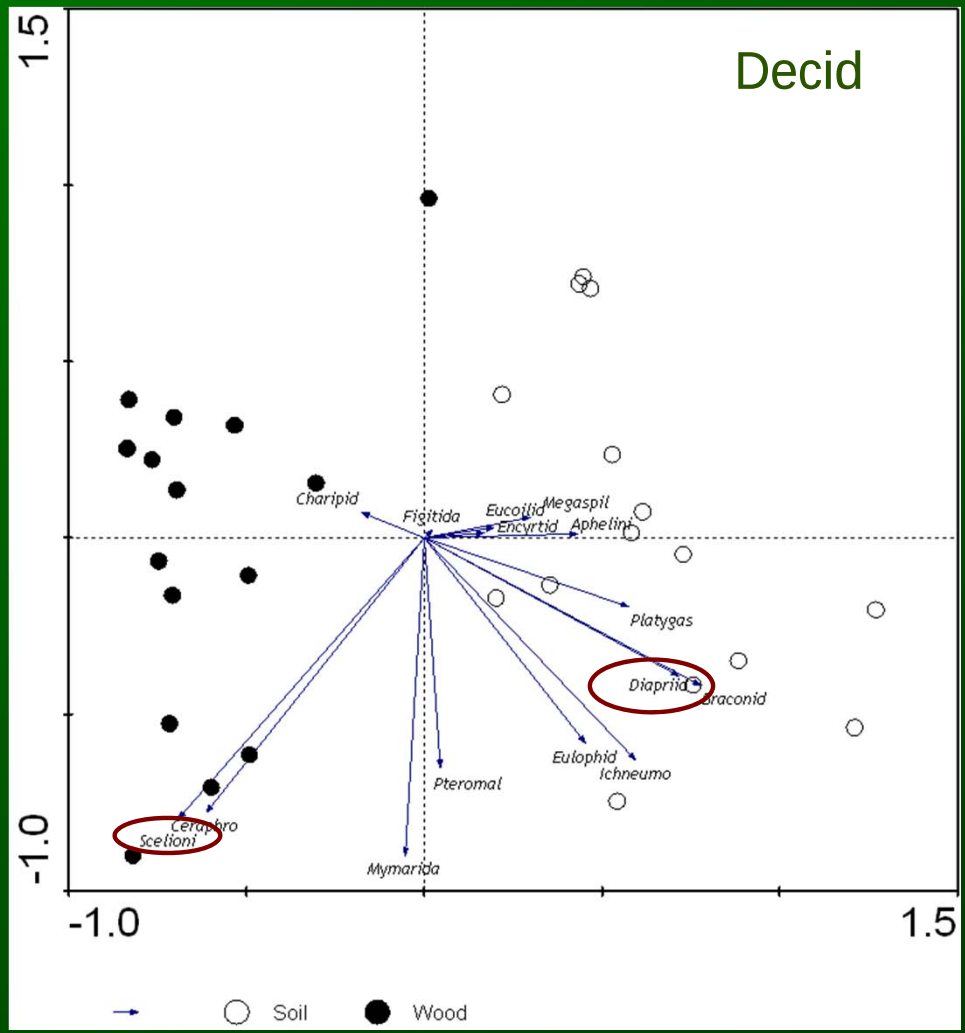
Little evidence of community variation as a function of plot-level DWD quantity, but significantly more *Fomitopsis rosea* at unlogged sites

Parasitoid hymenoptera families by DWD DC (“early” and “late”)

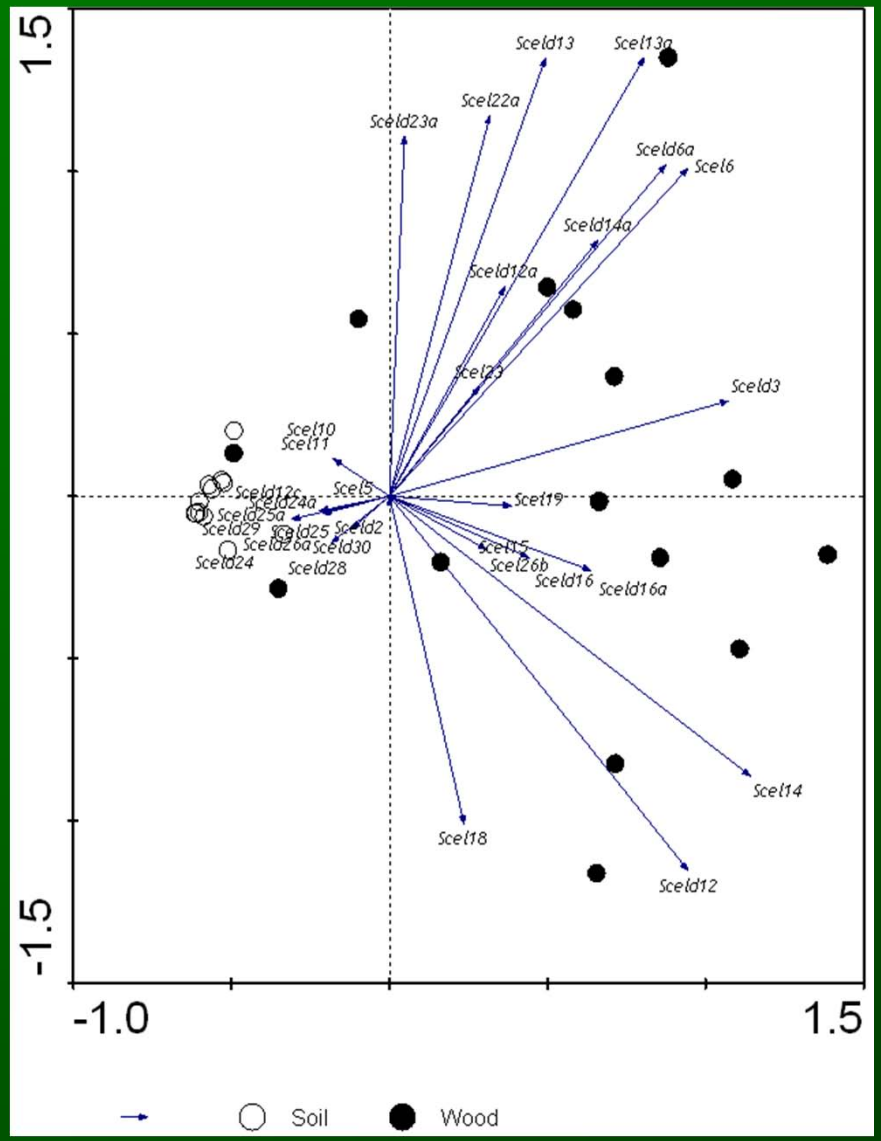


Parasitoid hymenoptera families in soil and DC=4 wood:

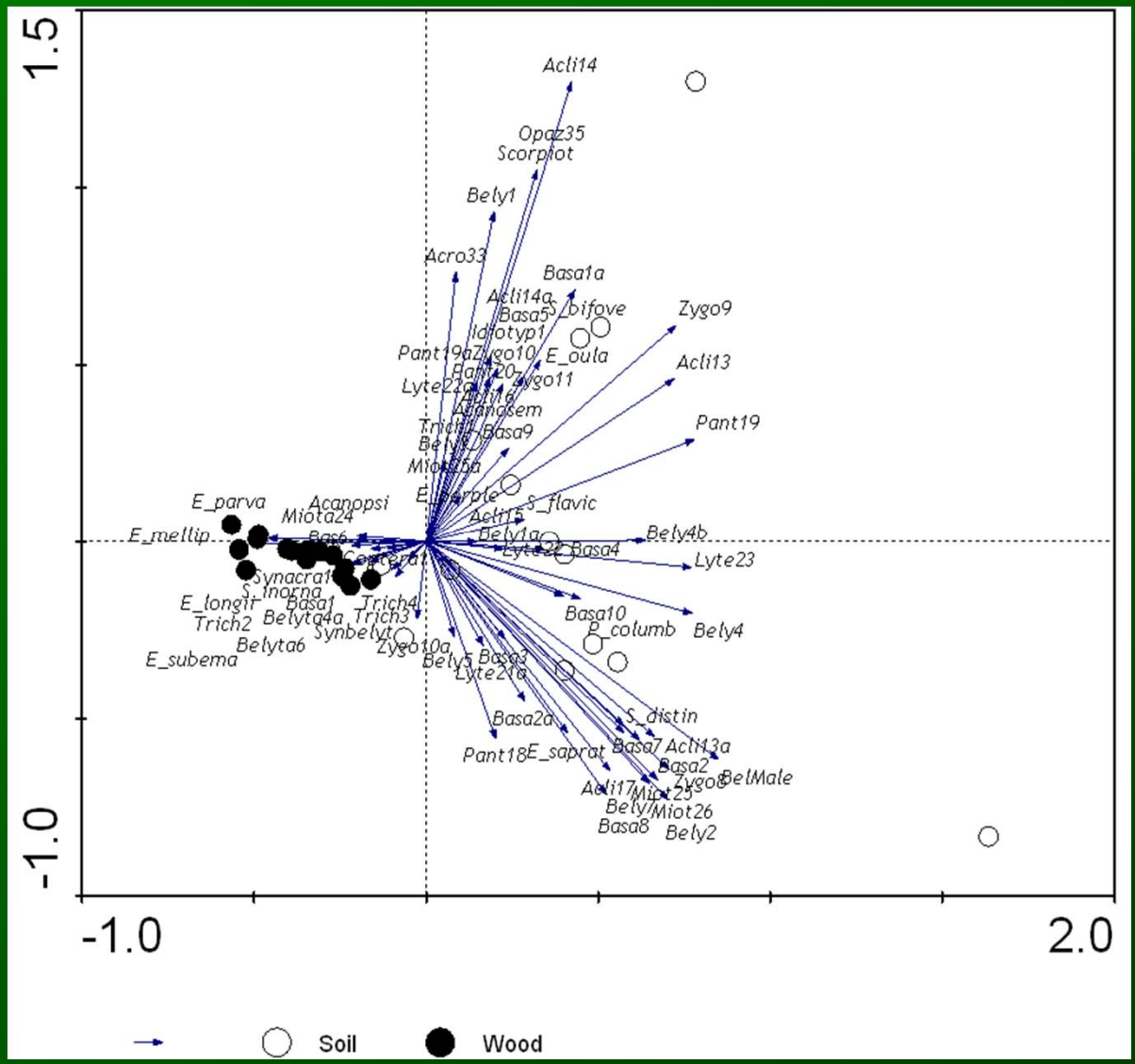




Scelionidae
- wood loving



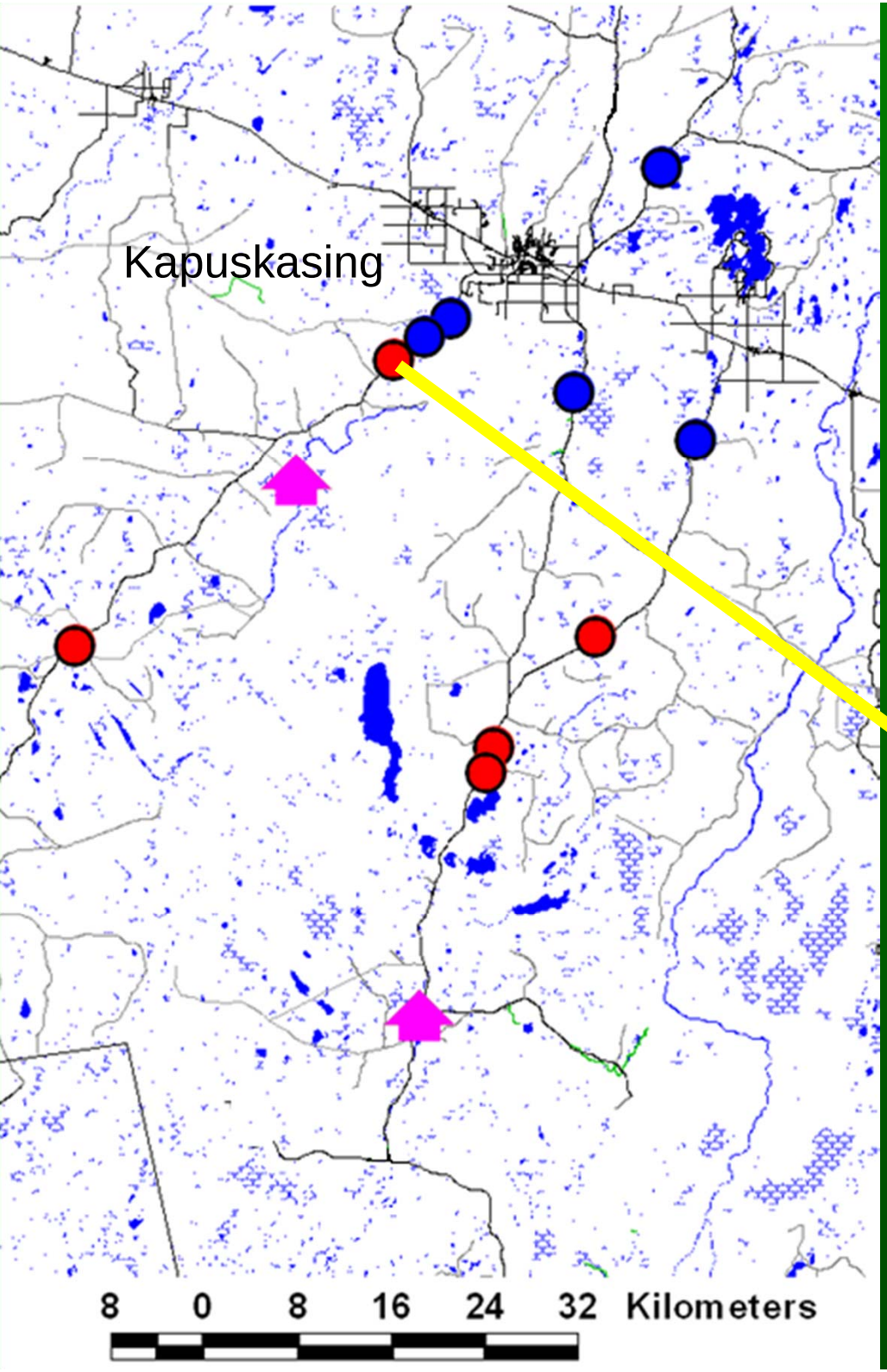
Diapriidae
-soil loving except for *Entomacis* spp.



Again, little evidence of community variation as a function of plot-level DWD quantity, although there were some interactions between DWD quantity and forest type

In conclusion, much evidence of importance of DWD as habitat and of the importance of different decay classes

Relatively little evidence of the importance of variation in DWD quantity, presumably because of overall high quantities (but, vole example)



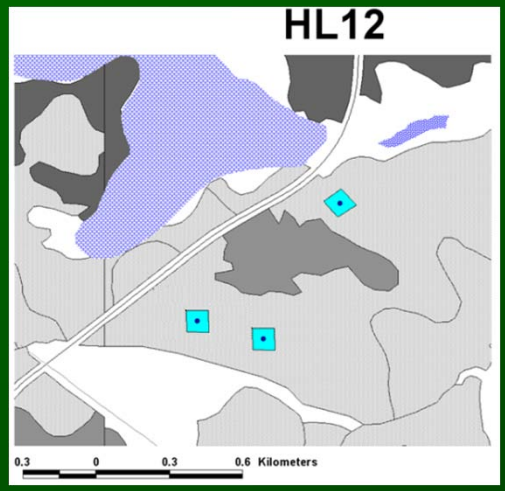
Split-plot design

Whole-plot factor

-mechanized-logged 36-42 years ago (red)

-horse-logged 54-65 years ago (blue)

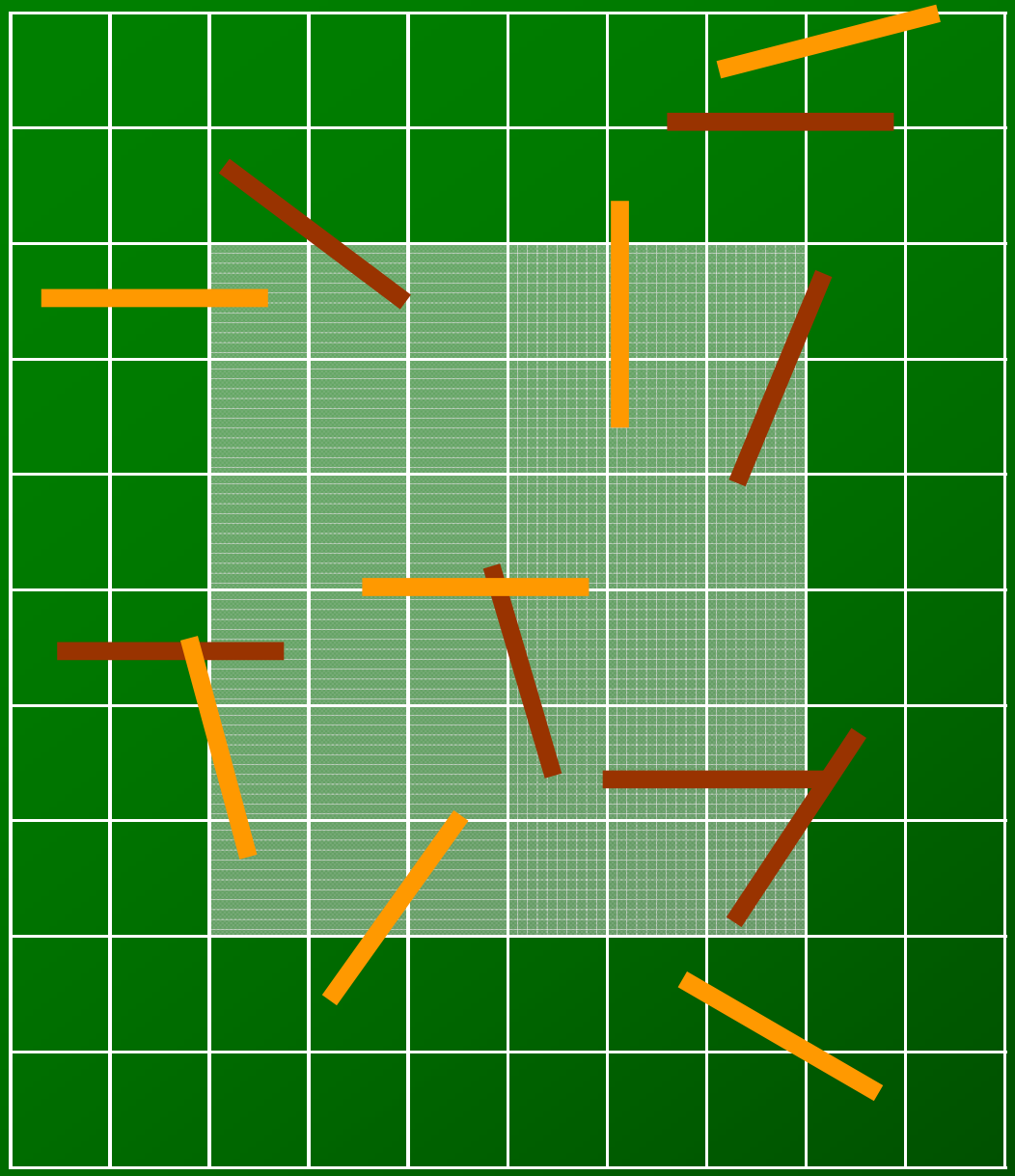
Within-plot factor



-all wood >7 cm diam. removed

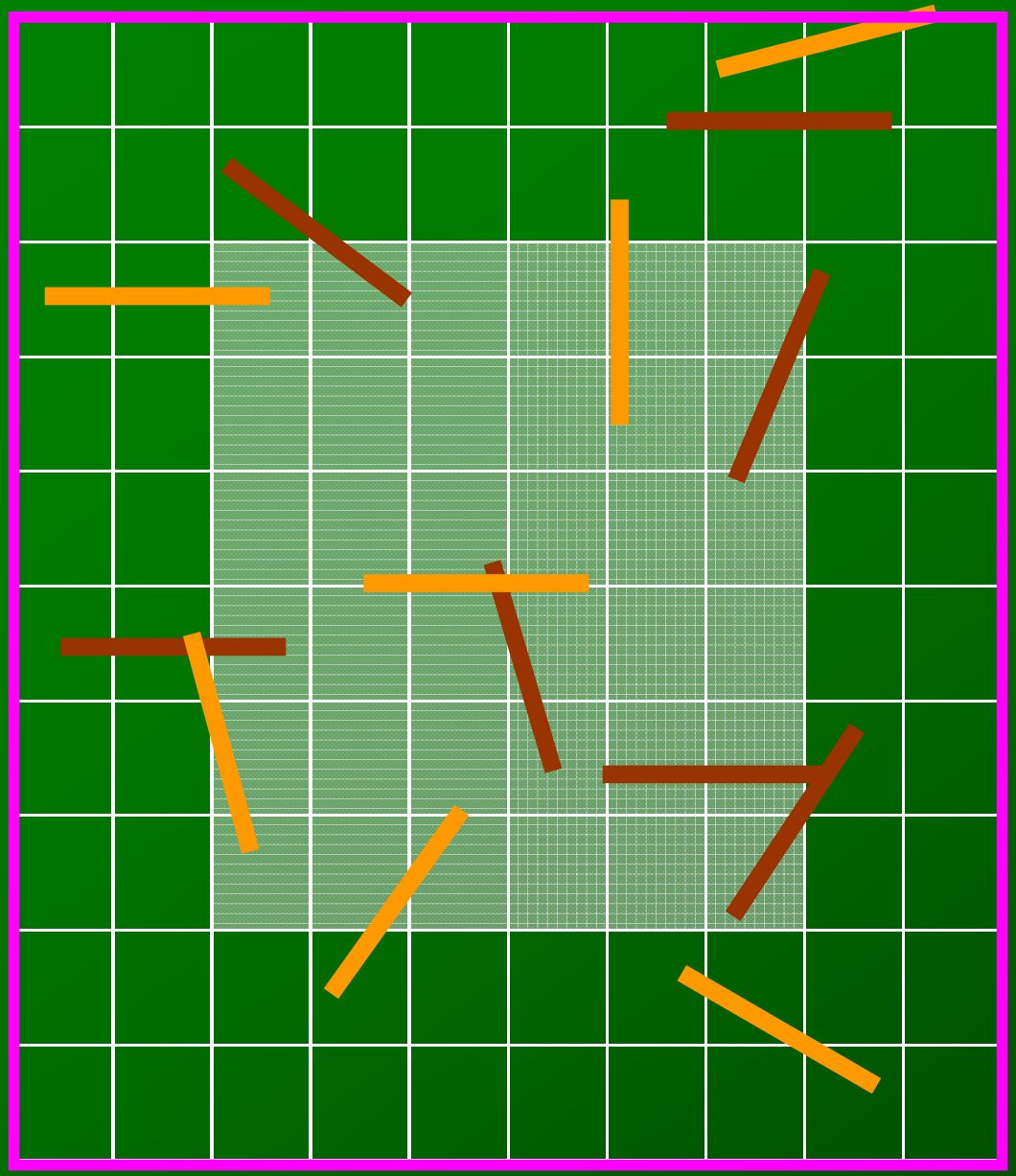
-one-half wood >7 cm diam. removed

-no wood removed



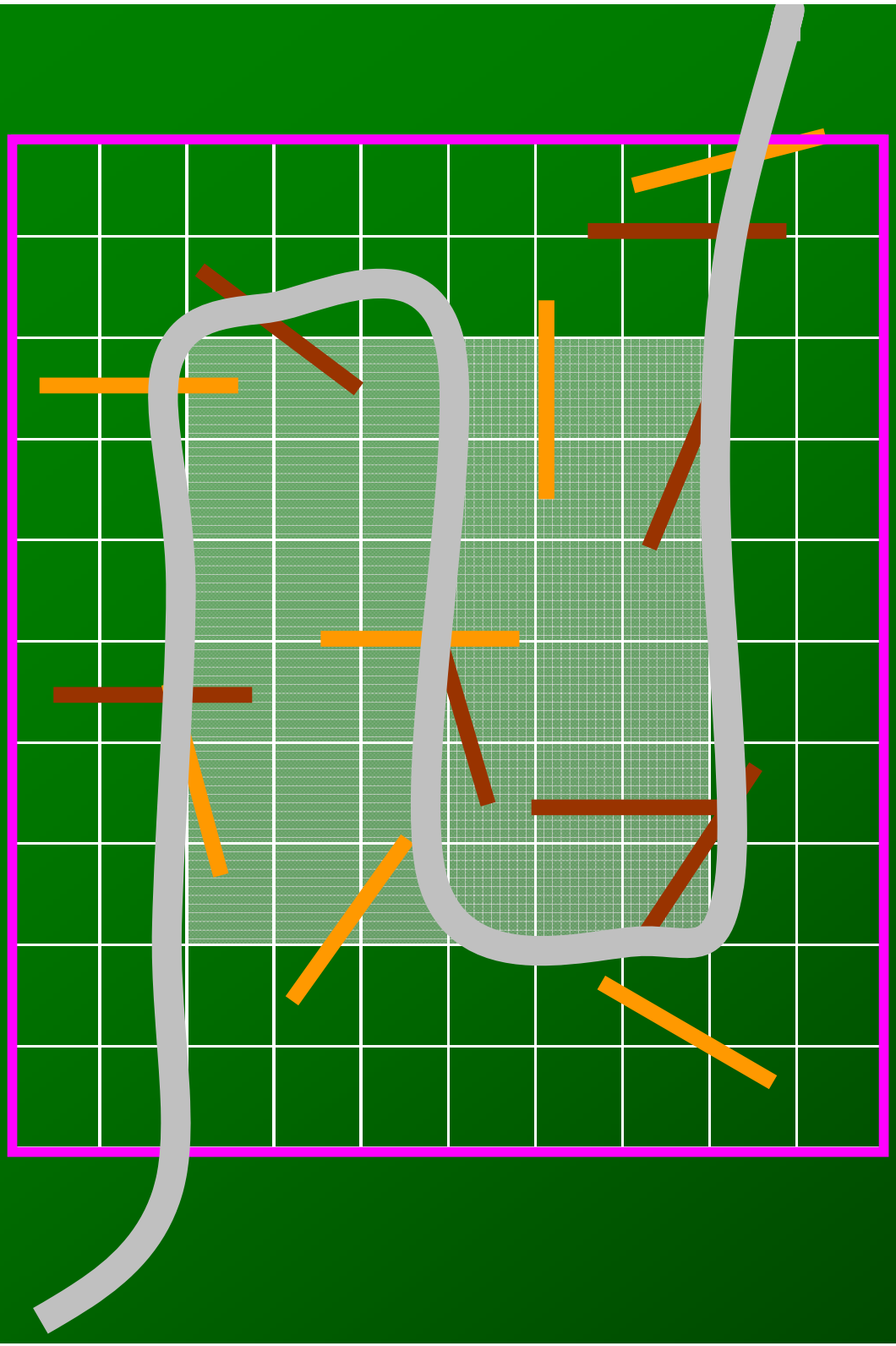
150 by 150-m grids

(2.25 ha total)



90 by 90 m grid (0.81 ha) with 30-m buffer (2.25 ha total)

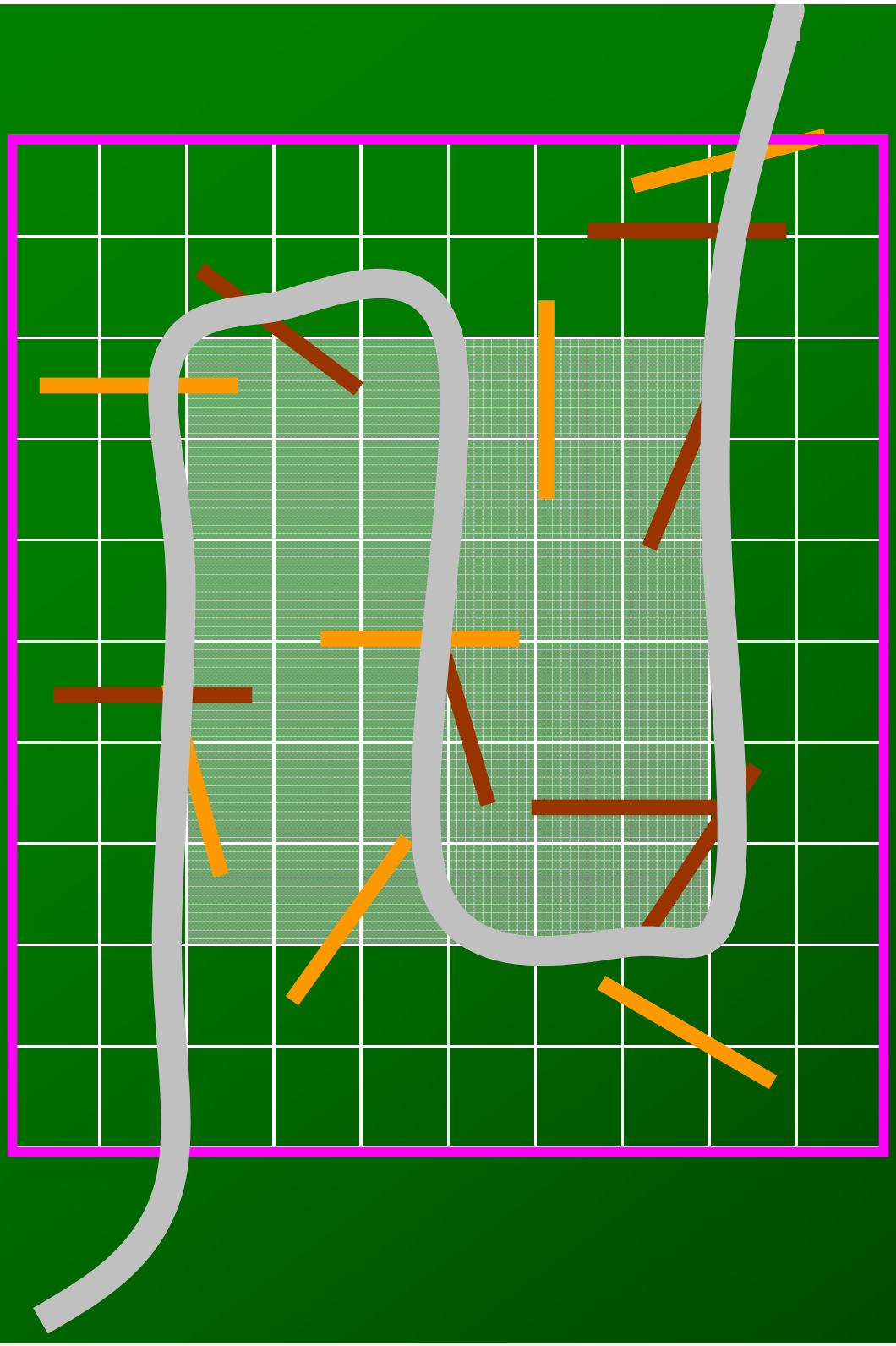
1) mark edge (for orientation)



90 by 90 m grid (0.81 ha) with 30-m buffer (2.25 ha total)

1) mark edge (for orientation)

2) mark and clear skid trails (minimize cutting) (controls too)

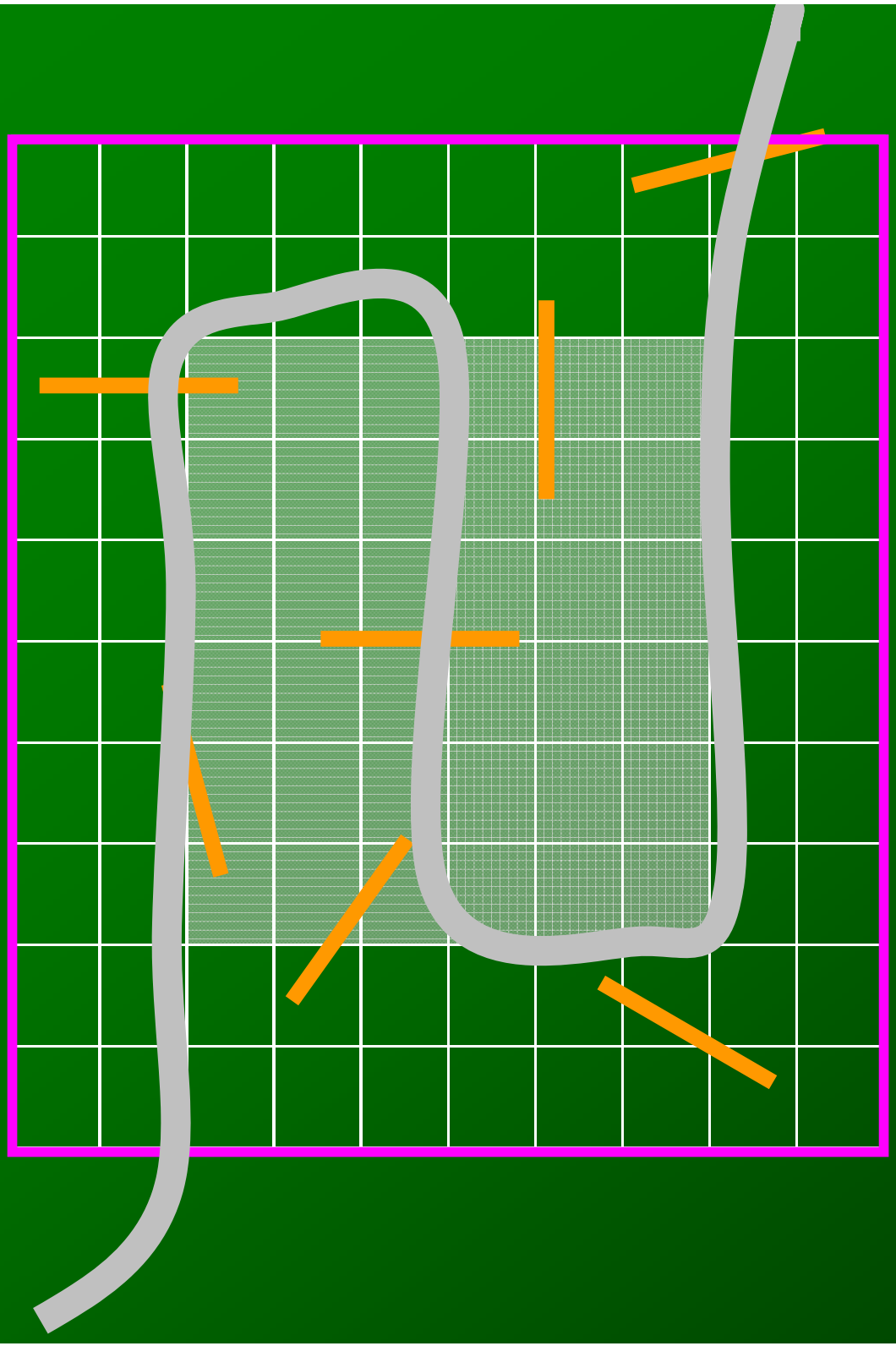


90 by 90 m grid (0.81 ha) with 30-m buffer (2.25 ha total)

1) mark edge (for orientation)

2) mark and clear skid trails (minimize cutting) (controls too)

3) skid out anything that can be skidded (or ½ of it) (7 cm-dbh cutoff)



90 by 90 m grid (0.81 ha) with 30-m buffer (2.25 ha total)

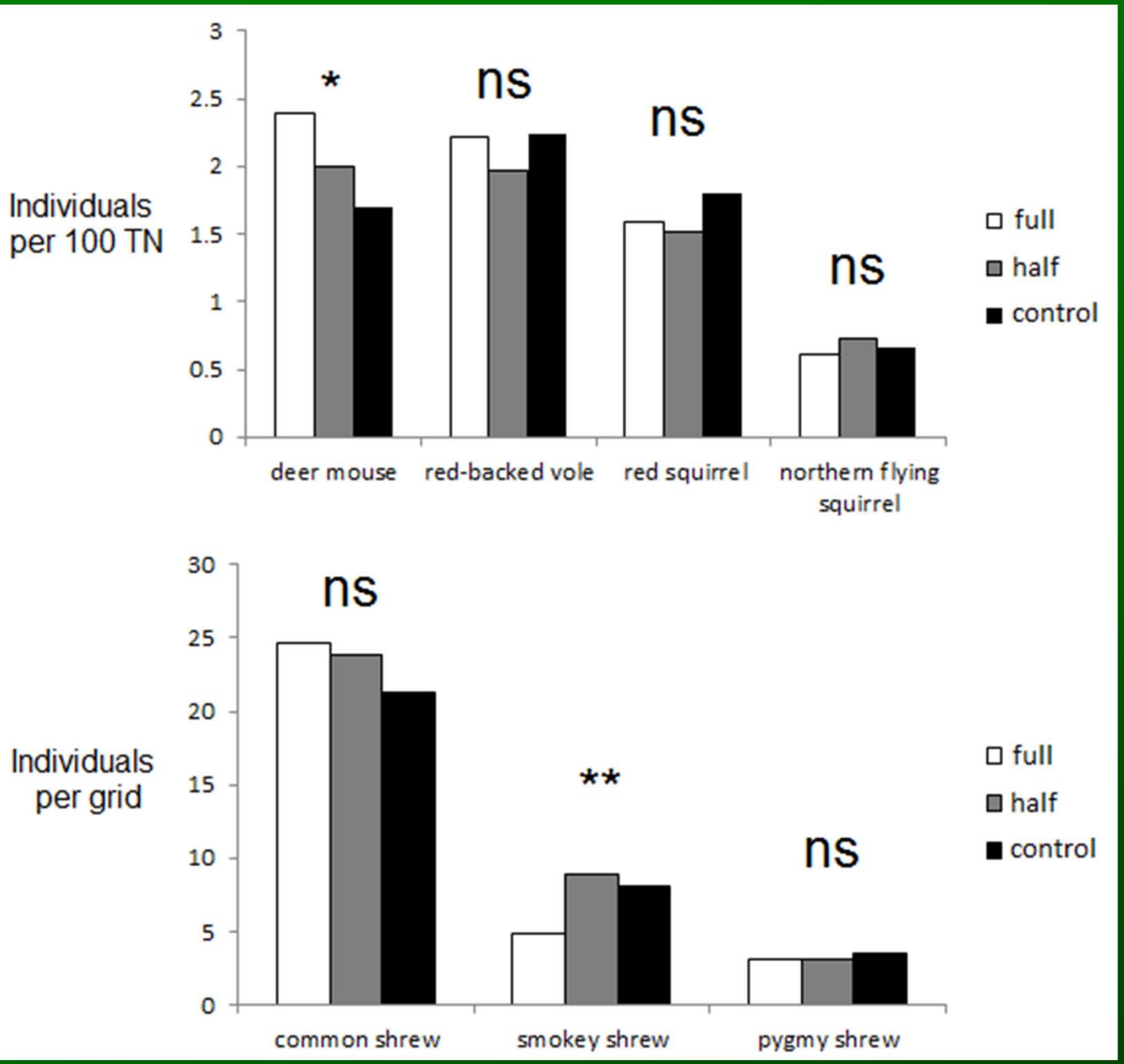
1) mark edge (for orientation)

2) mark and clear skid trails (minimize cutting) (controls too

3) skid out anything that can be skidded (or ½ of it) (7 cm-dbh cut-off)

4) go through with chainsaws and axes and cut-up and disperse remaining (decayed) material (or ½ of it)

5) now being removed

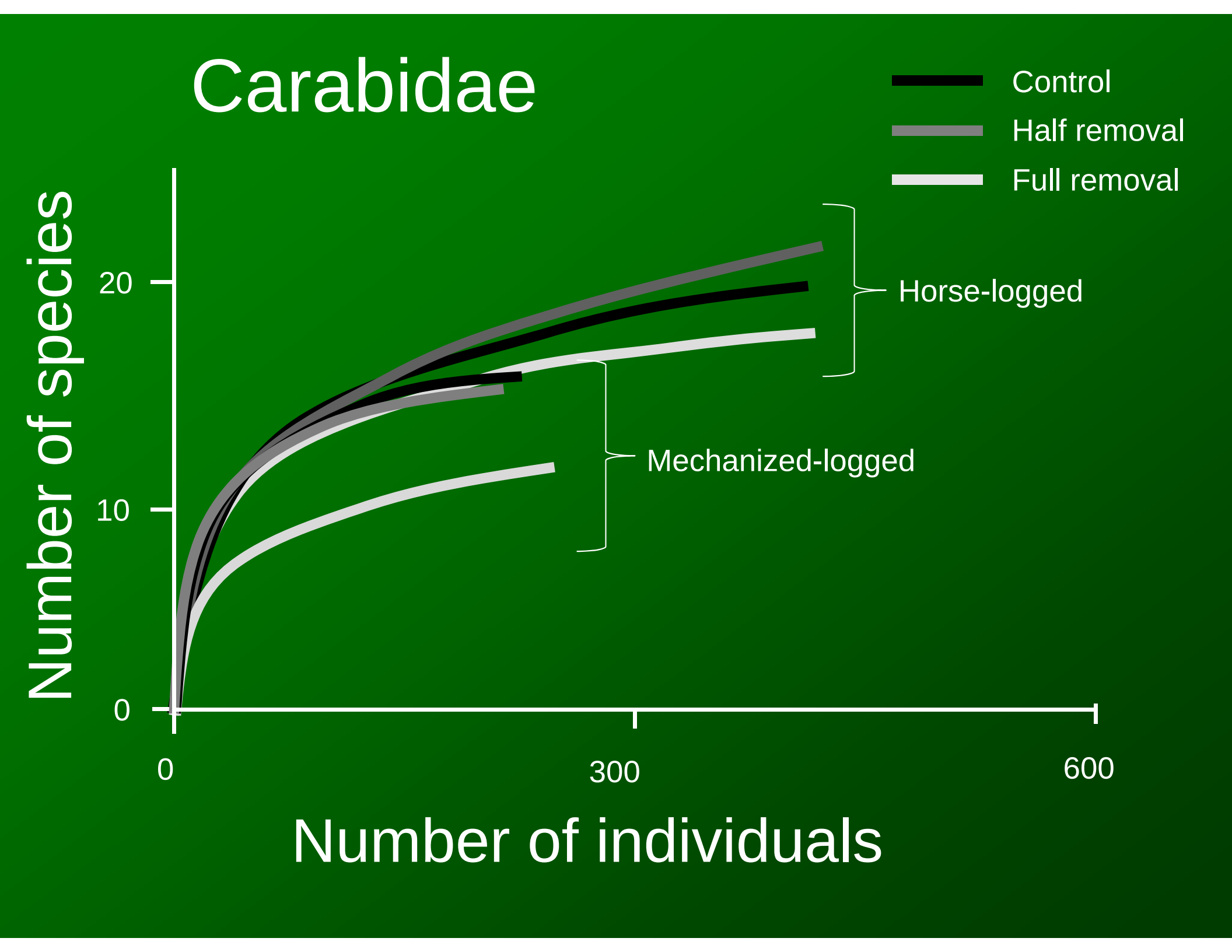


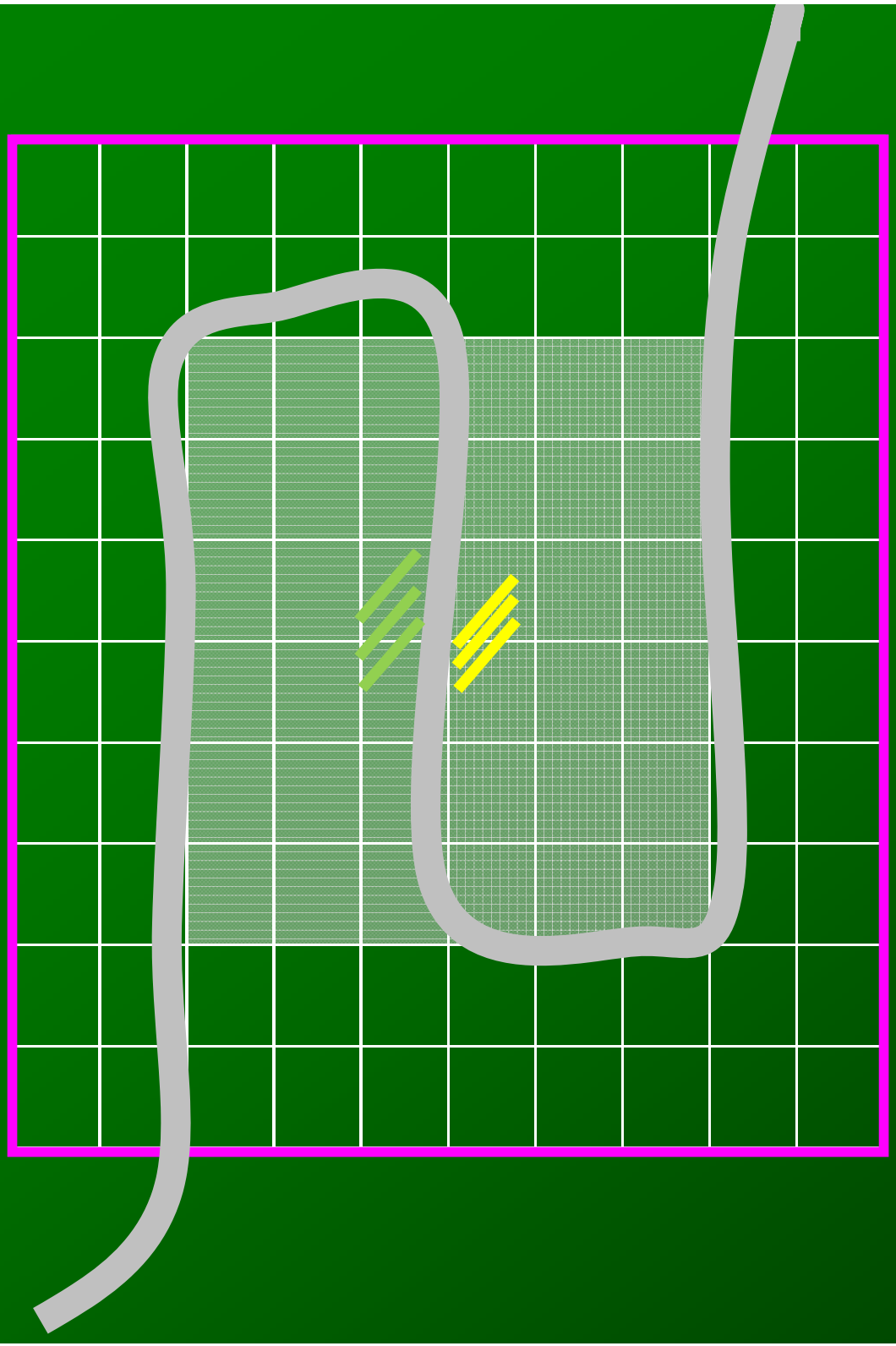
Rodents

-yearly or twice yearly trapping
-49 terrestrial traps; 16 arboreal per plot

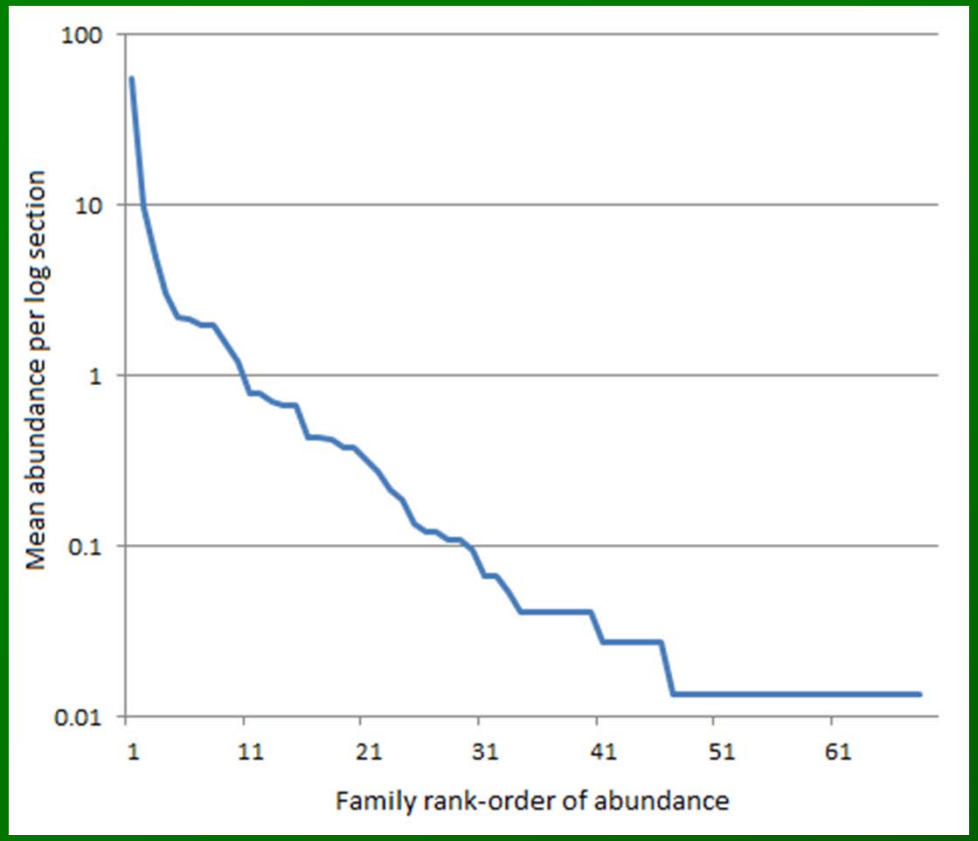
Shrews

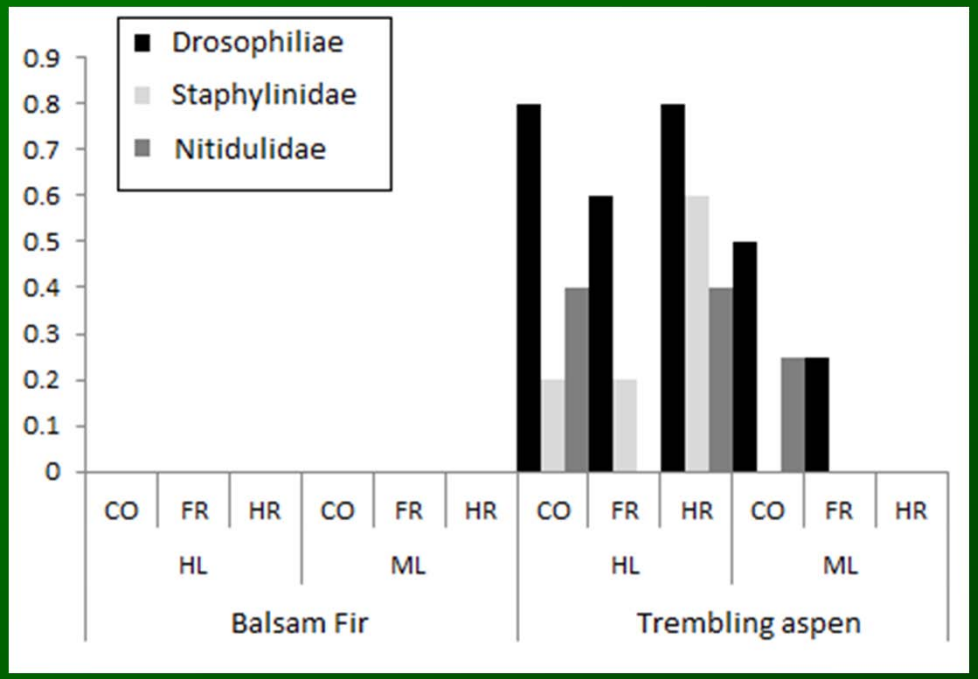
-yearly or twice yearly trapping
-3 pitfall arrays per plot


Carabidae
Control
Half removal
Full removal
Horse-logged
Mechanized-logged
Number of species
20
10
0
0
300
600
Number of individuals



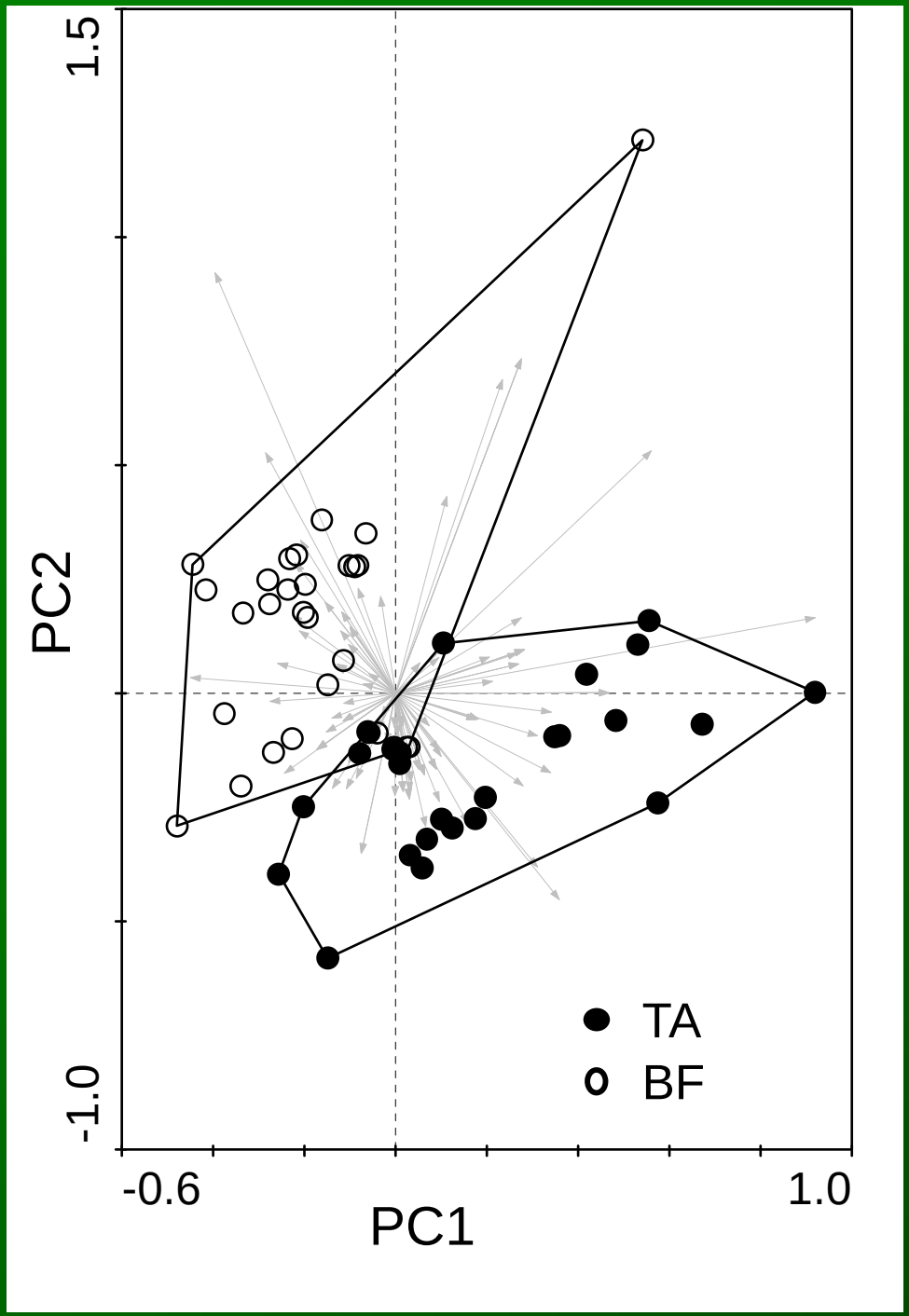
Three TA and three BF “trap logs” in the centre of each grid





Diptera and Hymenoptera families

Removal effect: ns



Fungi morphospecies

Removal effect: ns

In conclusion, some encouraging results concerning effects of DWD removal – great potential to identify indicator species and disentangle correlation vs. causation

Trap logs not very interesting as “islands” as yet, although at an early stage of decay (c. 3 years old). Presumably, this early-decay fauna is characterized by high dispersal capabilities in order to capitalize on this relatively ephemeral decay stage.