Preliminary graphs for results exploration

grantvagle

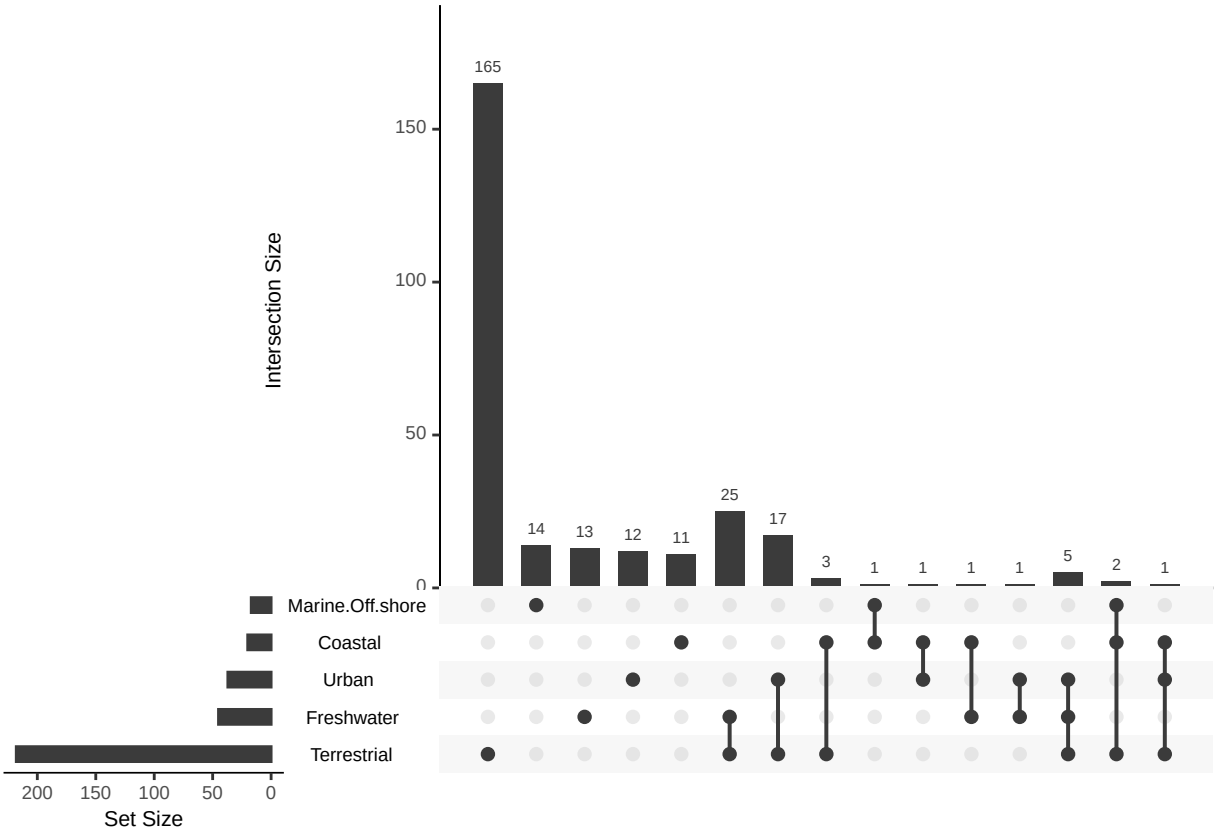
2020-07-01

```
knitr::opts_chunk$set(echo = FALSE, warning = FALSE)
```

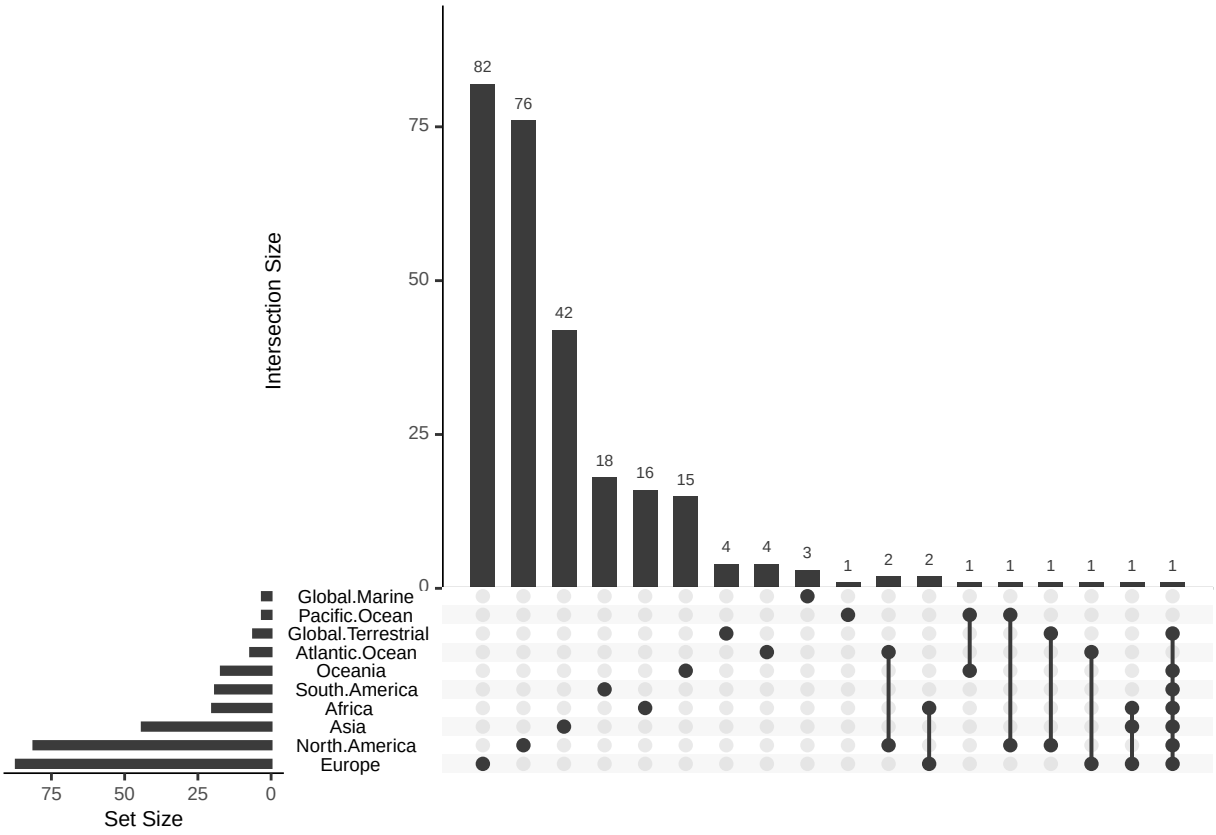
1) How are we studying the ecology of ecosystem services?

Study systems, places, methods

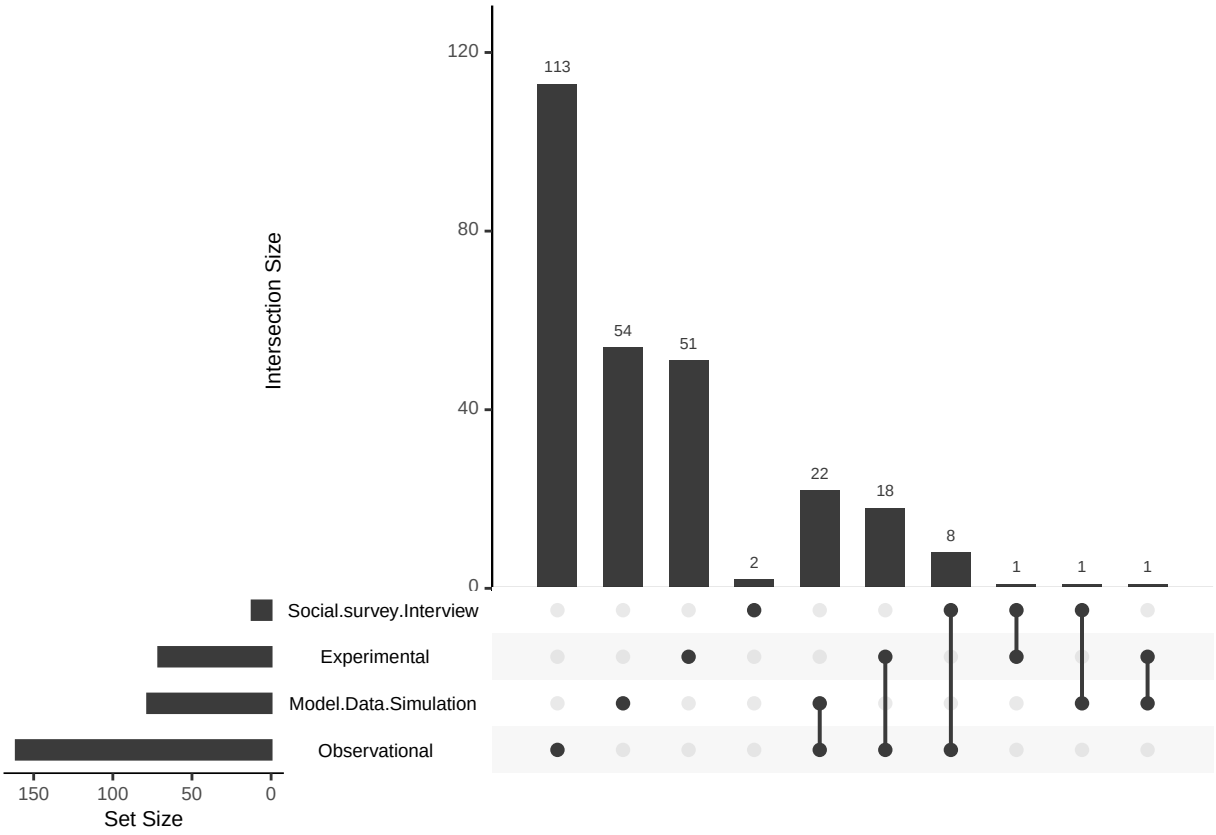
Study system



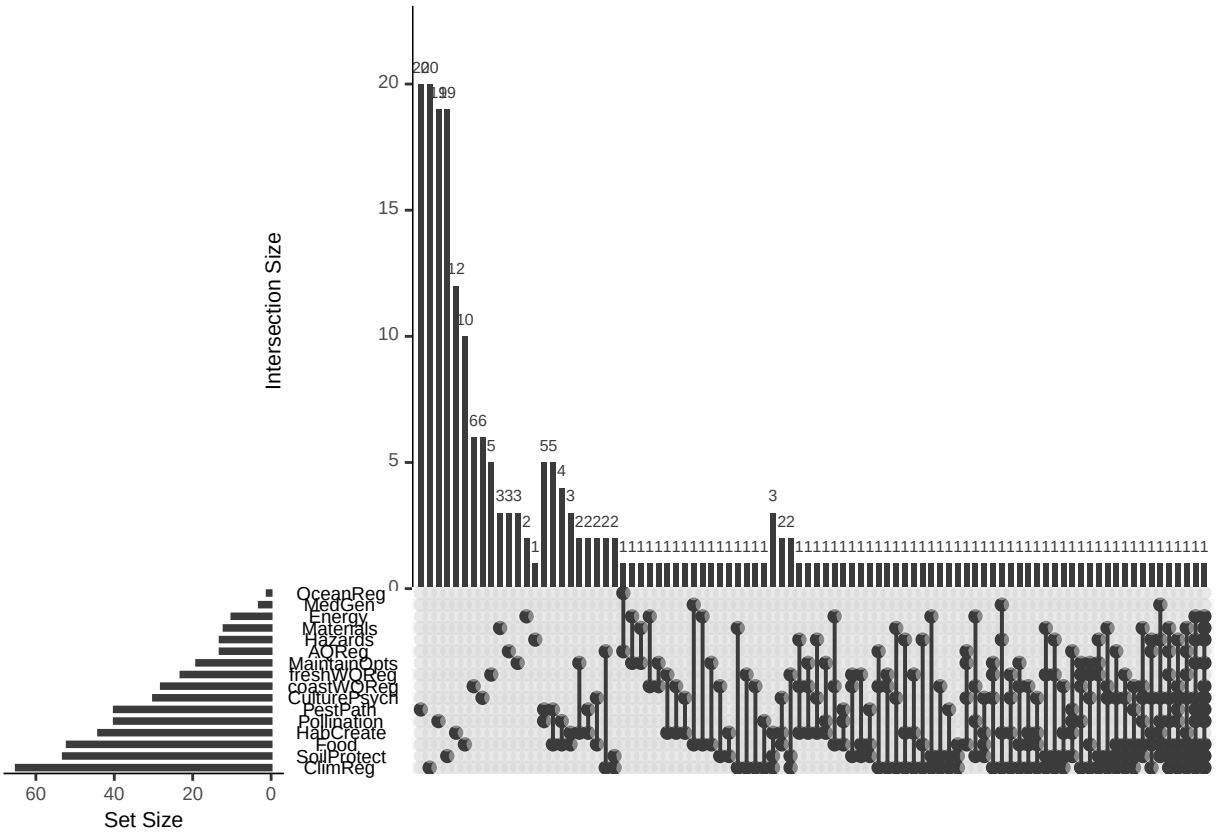
Places


Intersection Size
82
76
42
18
16
15
4
4
3
1
2
2
1
1
1
1
1
1
75
50
25
0
Global.Marine
Pacific.Ocean
Global.Terrestrial
Atlantic.Ocean
Oceania
South.America
Africa
Asia
North.America
Europe
75
50
25
0
Set Size

Study type


Intersection Size
120
80
40
0
113
54
51
2
22
18
8
1
1
1
Social.survey.Interview
Experimental
Model.Data.Simulation
Observational
150
100
50
0
Set Size

ES type (grouped) & Multifunctionality



Notes: Most studies fall in single ES type bin, some 2 or 3 ES types. Max 11 ES bins in single study (see below)

Looking at number of studies (bottom row) with number of service types considered (top row)

```
## .
##   1   2   3   4   5   6   7   8   9  11
## 129  44  26  12   8   2   1   3   1   1
```

Multifunctionality

Can be observed in above plot

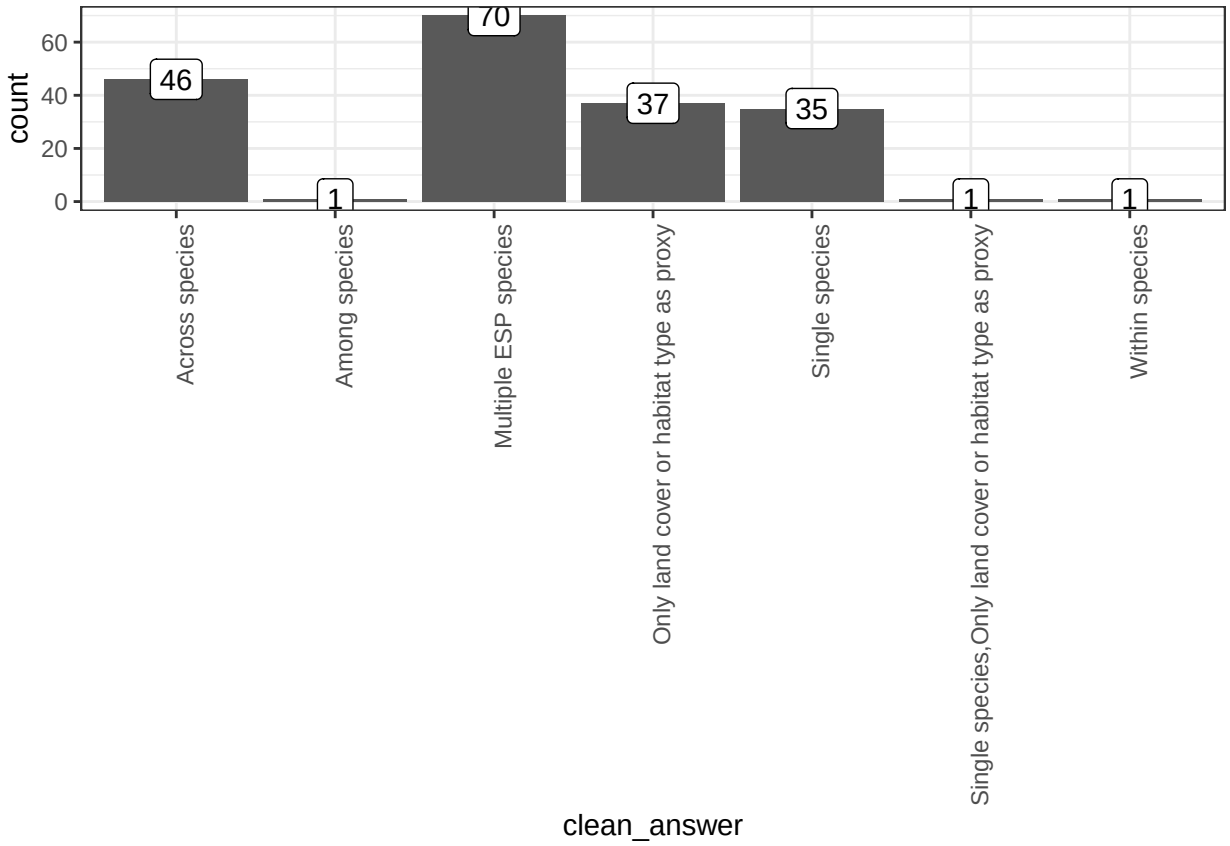
Response variables by ES type

Probably a word cloud or another sankey (sankey would require binning similar response var's which is probably too much to bother with)

2) Biotic drivers of ecosystem services

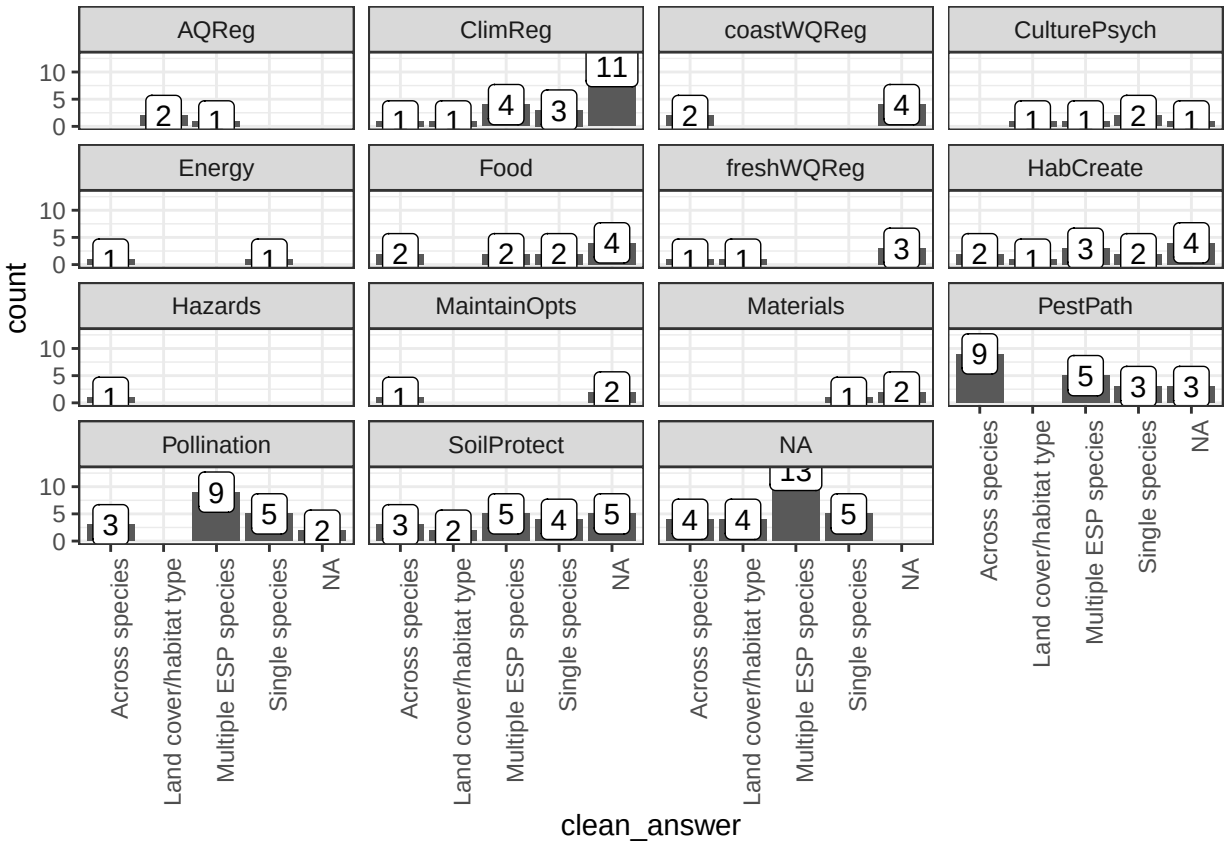
Ecosystem service providers

ESPs - single, multiple, interacting



Notes: Not sure exactly how this will be used, or if the quality is usable?

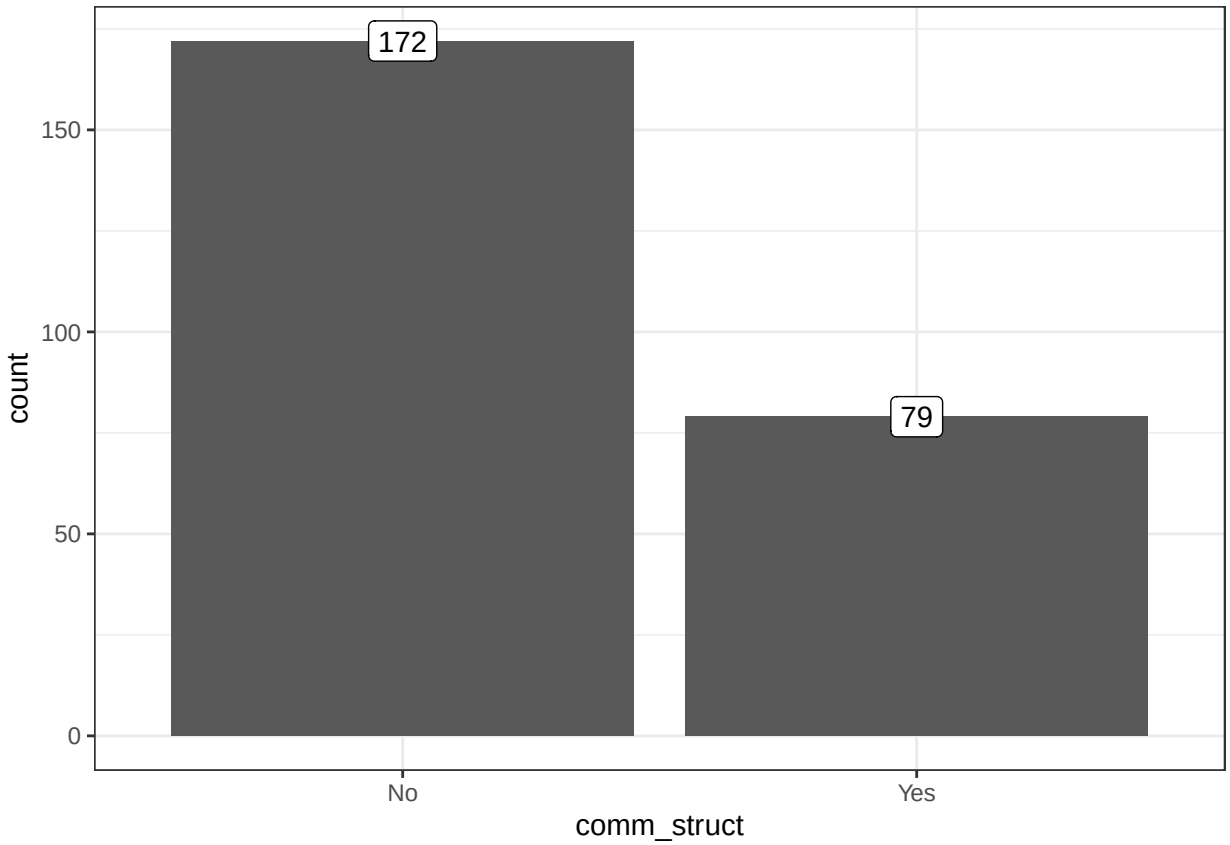
ESPs and ES type



Notes: pest pathogens more 'across species', climate regulation more NA thus less often ESPs considered, Pollination more 'multiple ESP species'

Community structure

A 'Yes' means that the box for community structure in the Kremen themes question was checked.

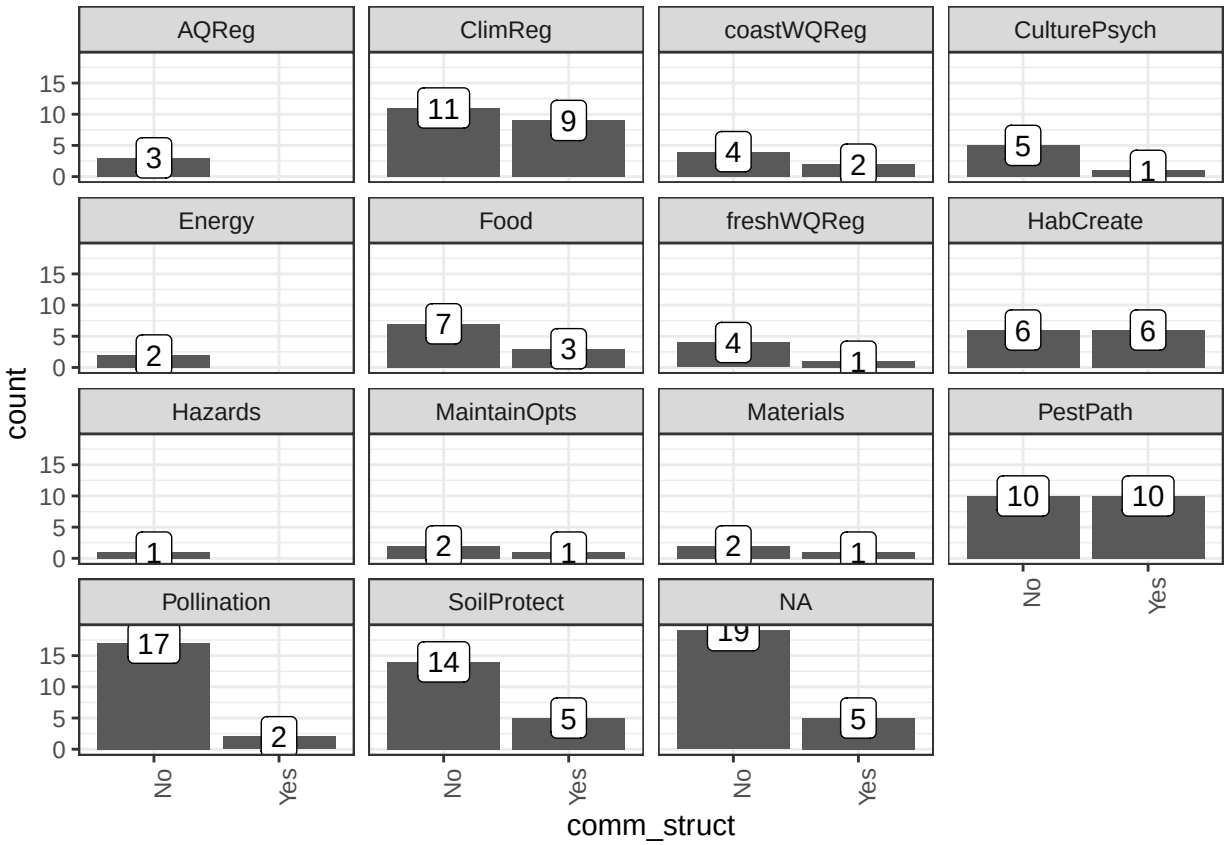


Notes: 79 studies look at comm structure influencing function and got included

Community structure - how many stopped at biodiversity?

will have to ask Caitlin about this one (or she might be doing it already?)

Community structure and ES type



Notes: Pest pathogens, Habitat creation, Climate regulation pretty even (which means more Yes than expected), Pollination may have more No's than expected

3) Abiotic drivers of ecosystem services

Environmental drivers

SANKEY

Human drivers

SANKEY

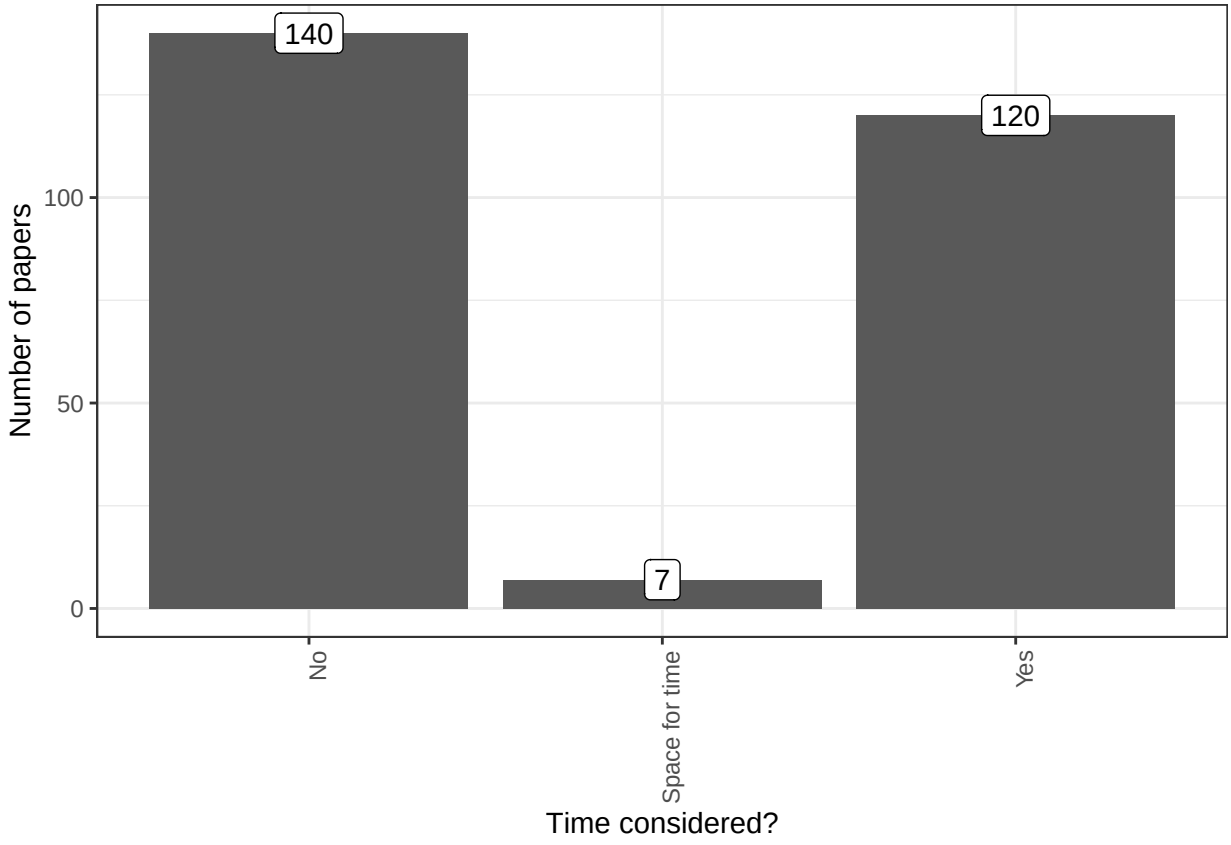
Mediation through biotic driver

not sure exactly what this means or if/how we could test it?

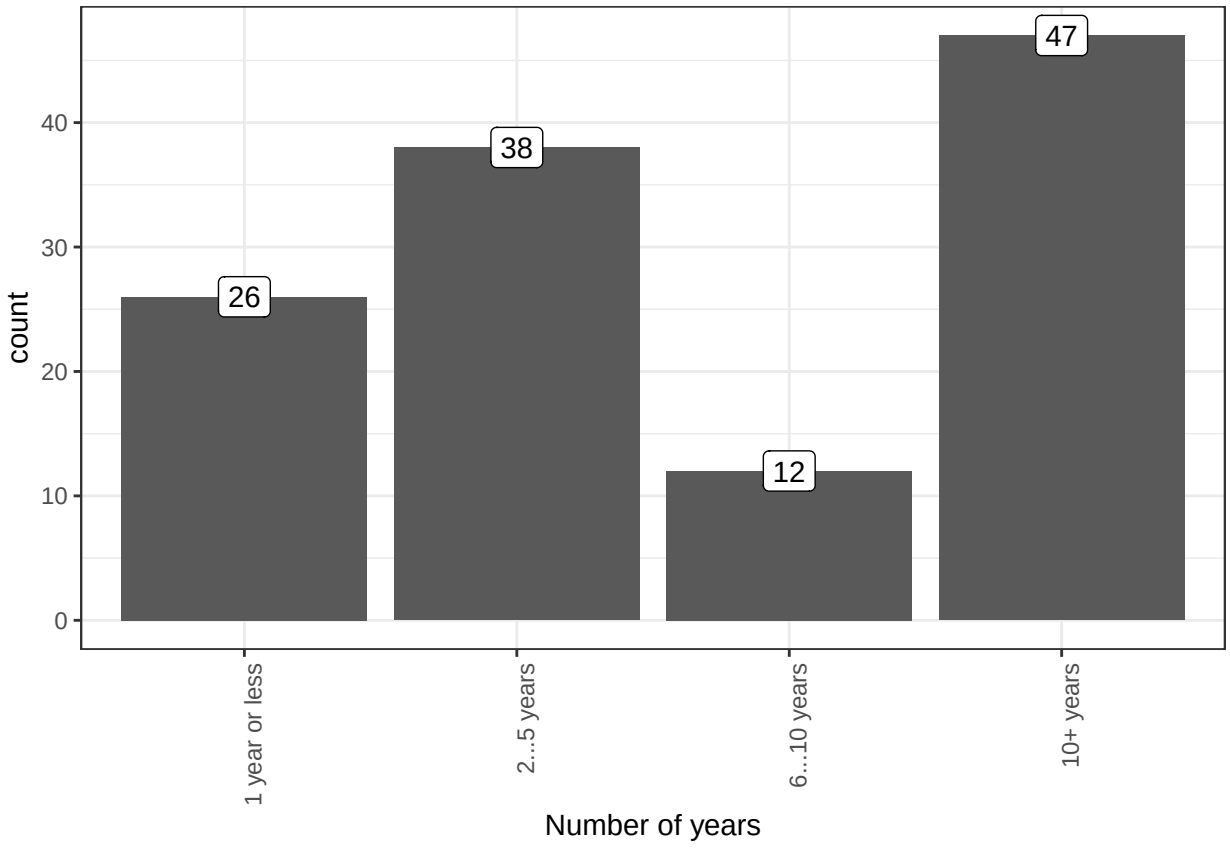
4) Temporal and spatial scale

This section contains three subsections. First, there are some basic plots of the overall trends of spatio-temporal scale across all papers. Second, there is a section looking at space-time tradeoffs. Third, there is a section on scale biases for Methods used, ES type, and Driver group.

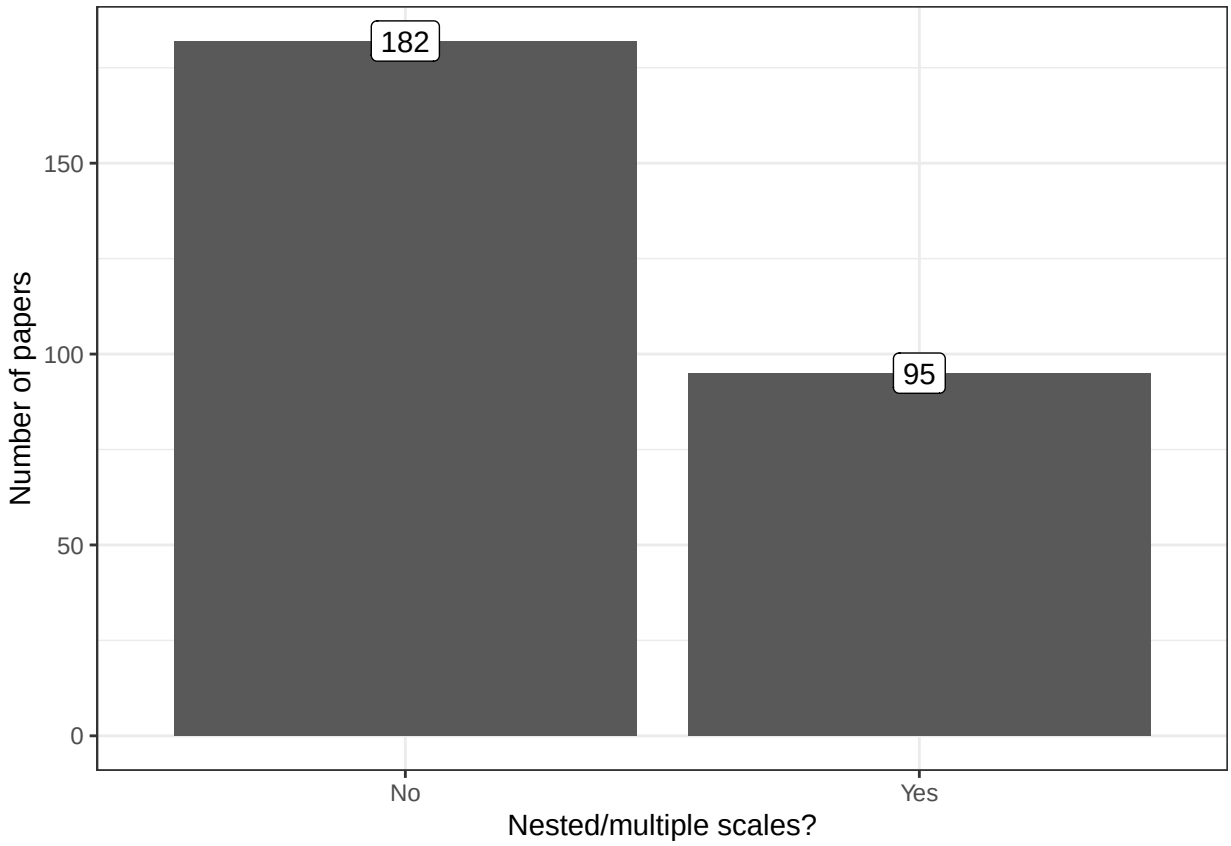
Time considered



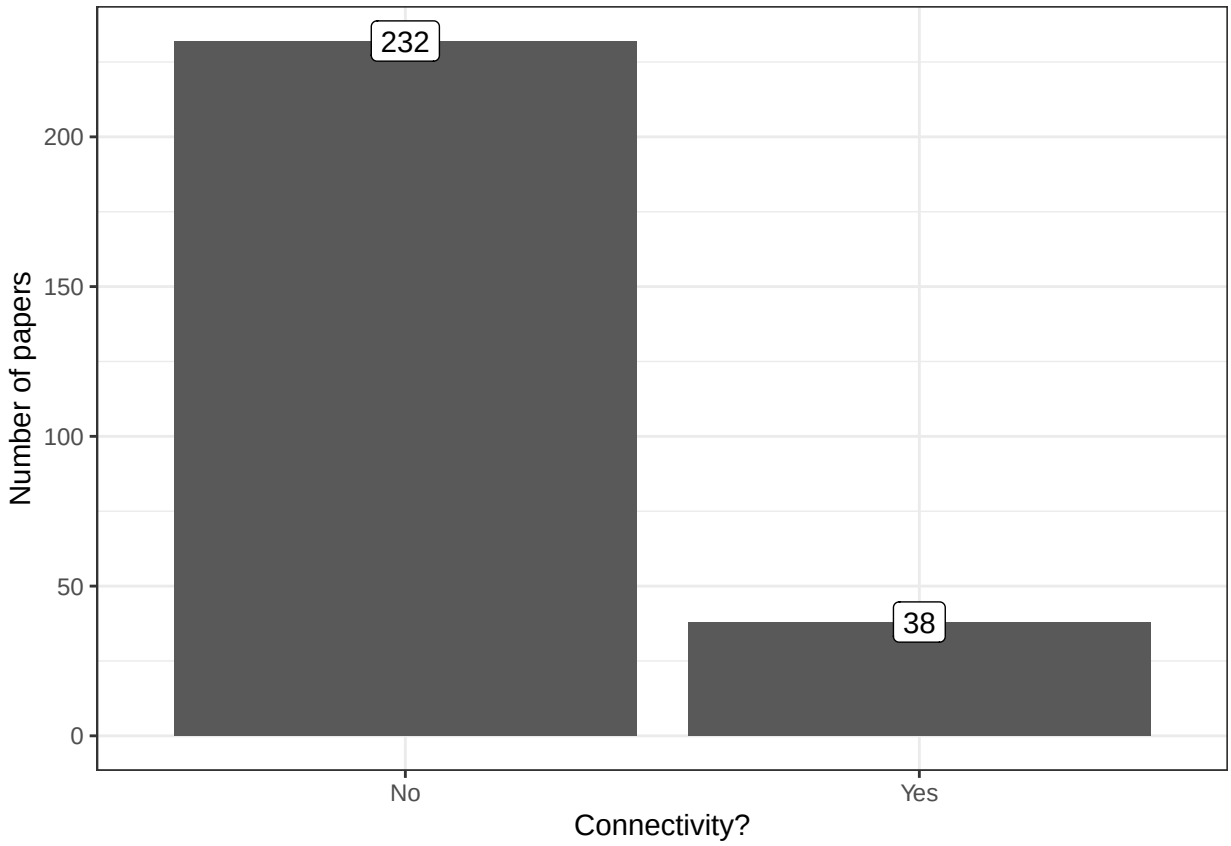
Number of years


47
38
26
12
40
30
20
10
0
count
1 year or less
2...5 years
6...10 years
10+ years
Number of years

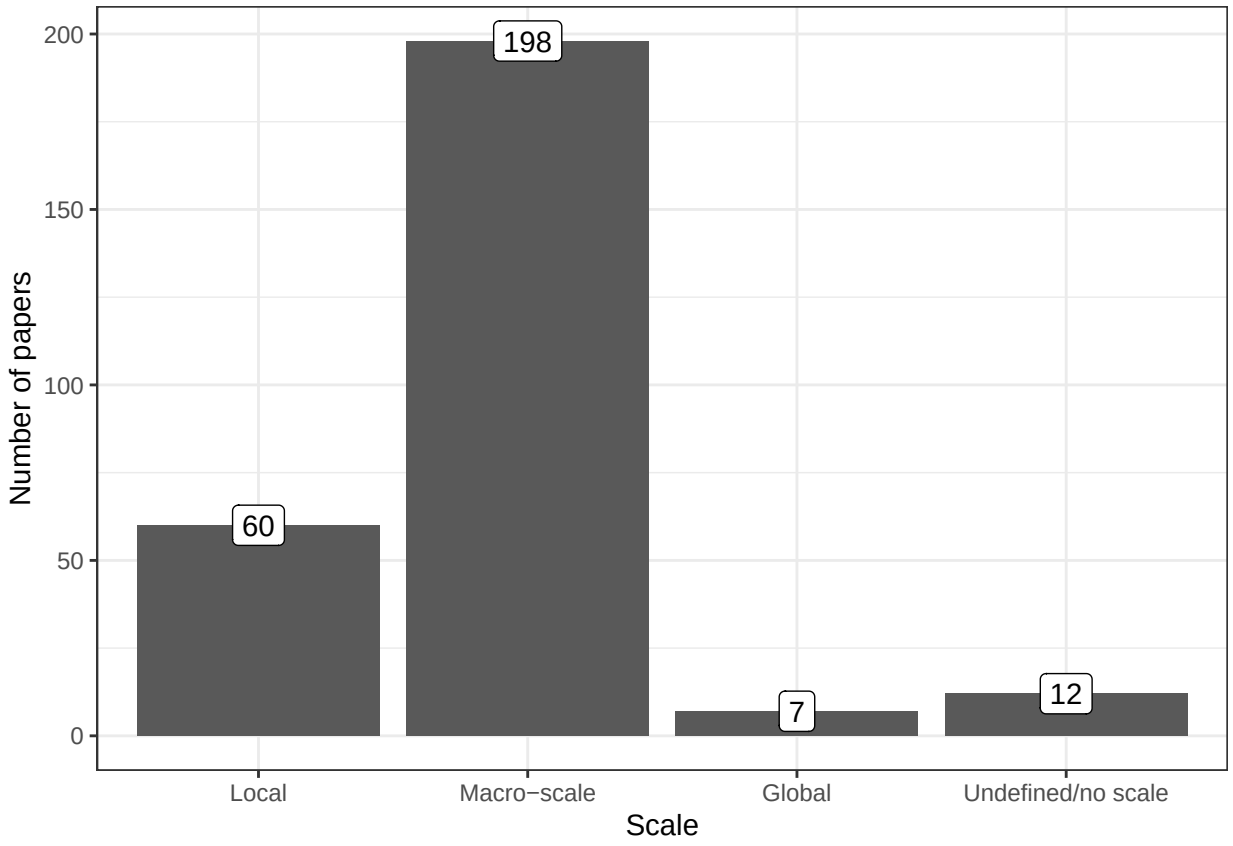
Multi scale



Connectivity considered



Spatial extent



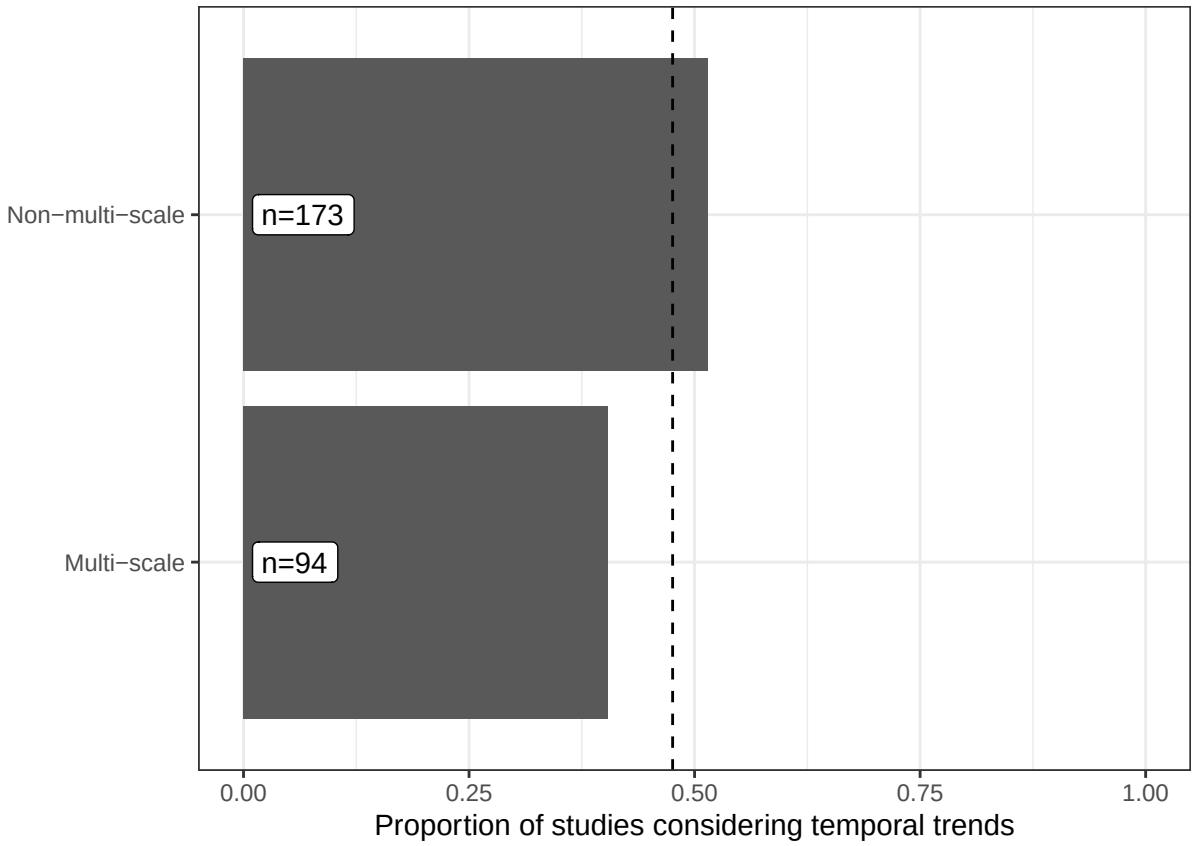
Scale biases

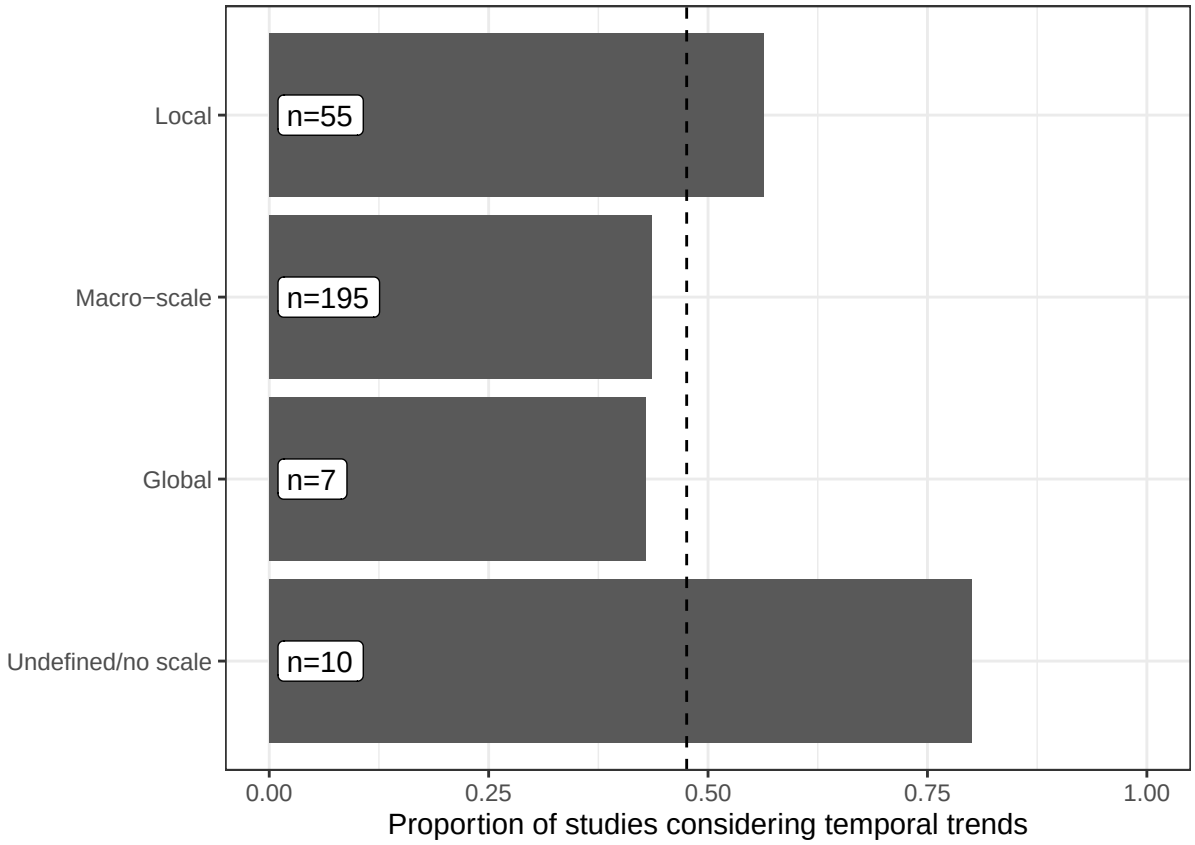
In this section, the dashed line represents what we would expect if subgroups were selected at random from the overall distribution from Yes's and No's. Thus, bars larger or smaller than the dashed line show that either time or space is more/less likely to be considered in that group. (I'm still working on how to write this up more specifically in a non-confusing way. . . so let me know if you have questions!). It's also useful to keep in mind that these proportions can also be considered in absolute terms, not just with respect to the dashed line. So, for example, even if something is more likely than expected to be multi-scale, it still may be the case that less than half of the studies in that group are multi-scale (which would still point to some sort of absolute gap).

For temporal trends, a study was considered as a 'Yes' if it used 'space for time' to simplify plotting.

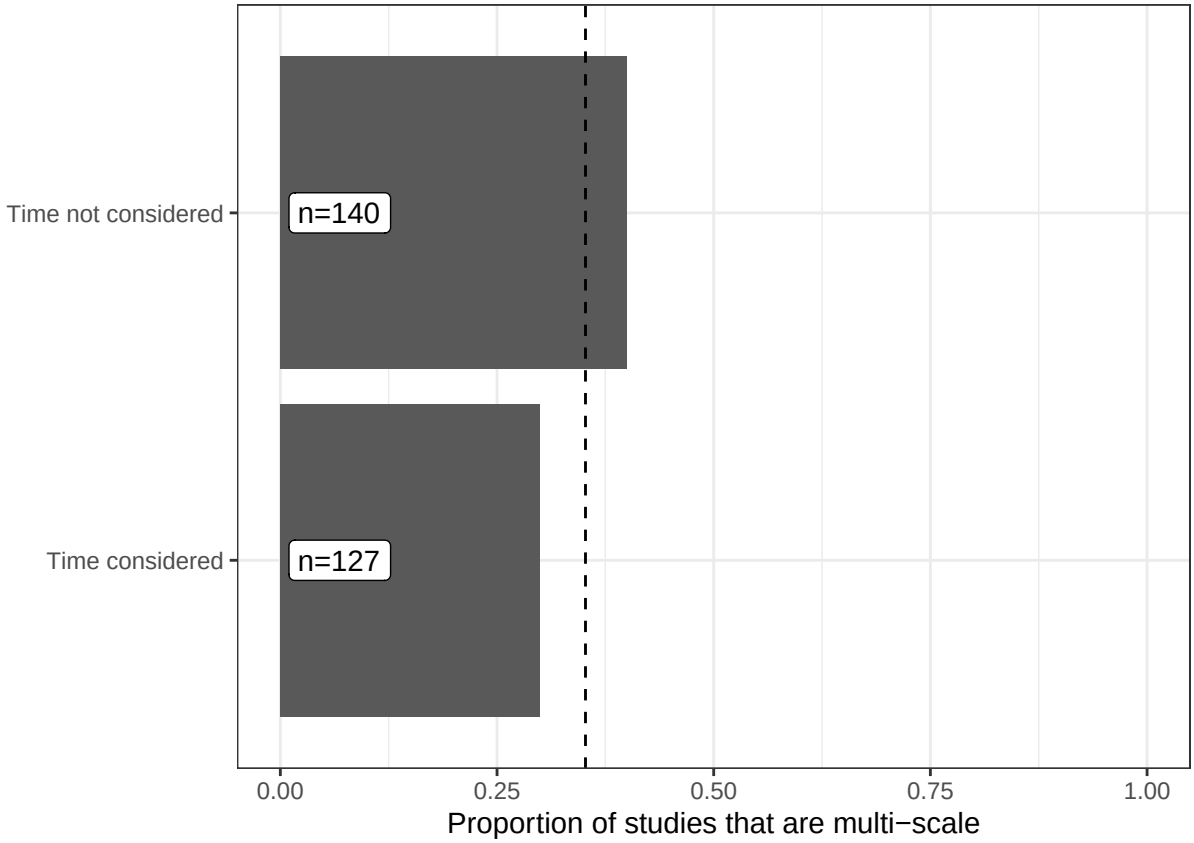
Space-time tradeoffs

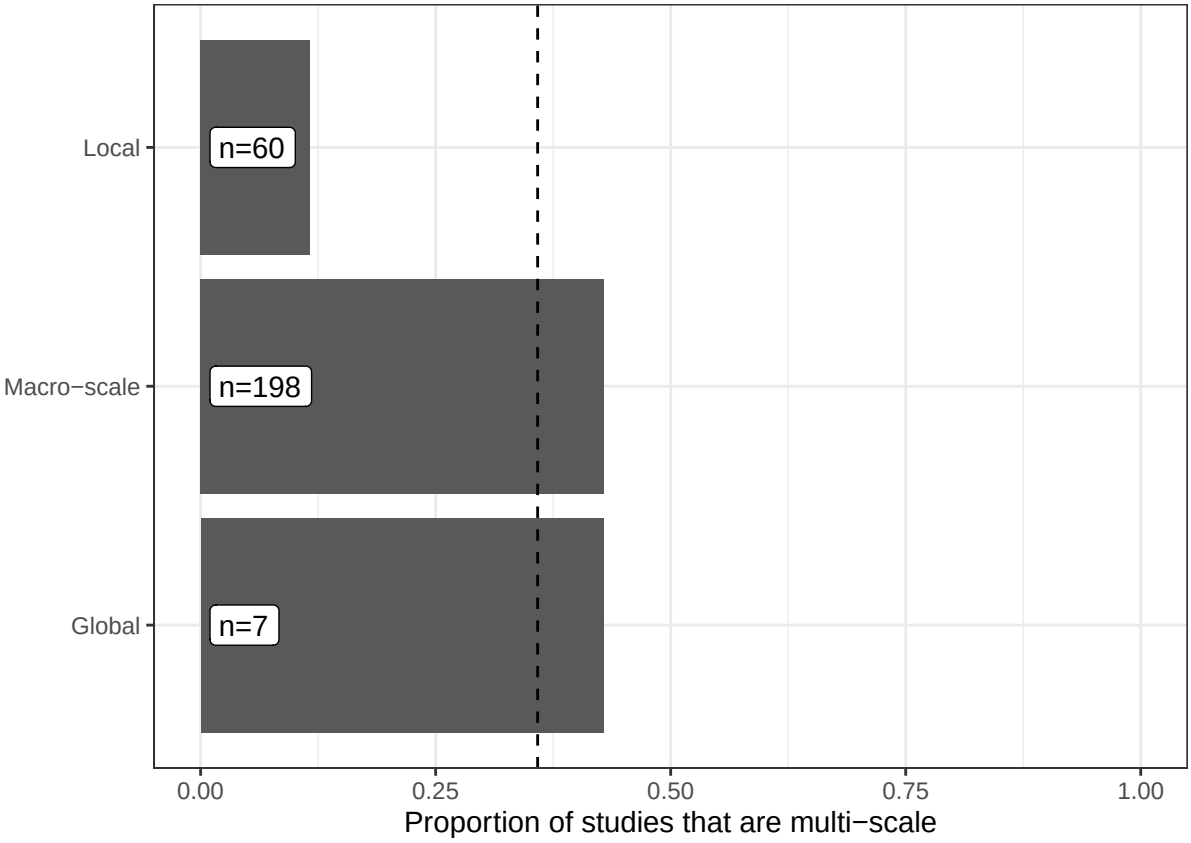
Time trends and space


Non−multi−scale
n=173
Multi−scale
n=94
0.00
0.25
0.50
0.75
1.00
Proportion of studies considering temporal trends

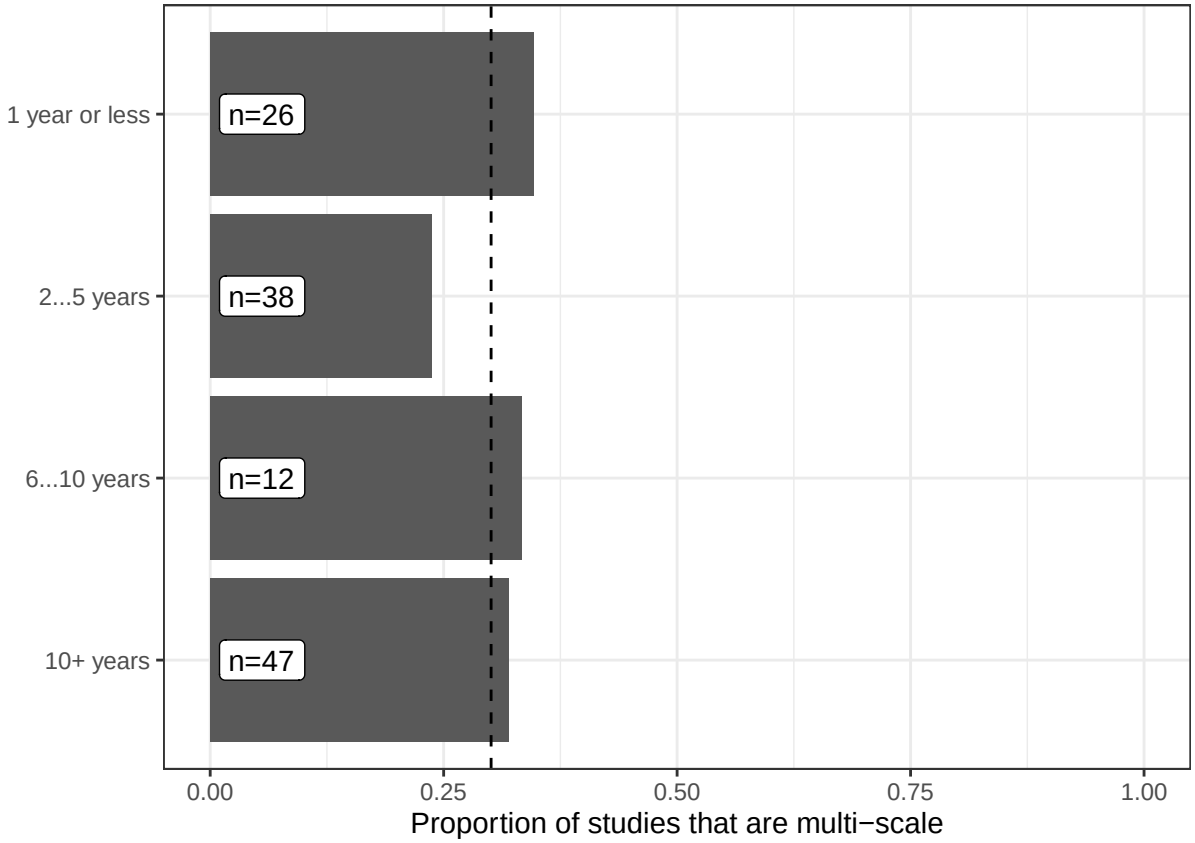

Local
n=55
Macro−scale
n=195
Global
n=7
Undefined/no scale
n=10
0.00
0.25
0.50
0.75
1.00
Proportion of studies considering temporal trends

Multi-scale and time





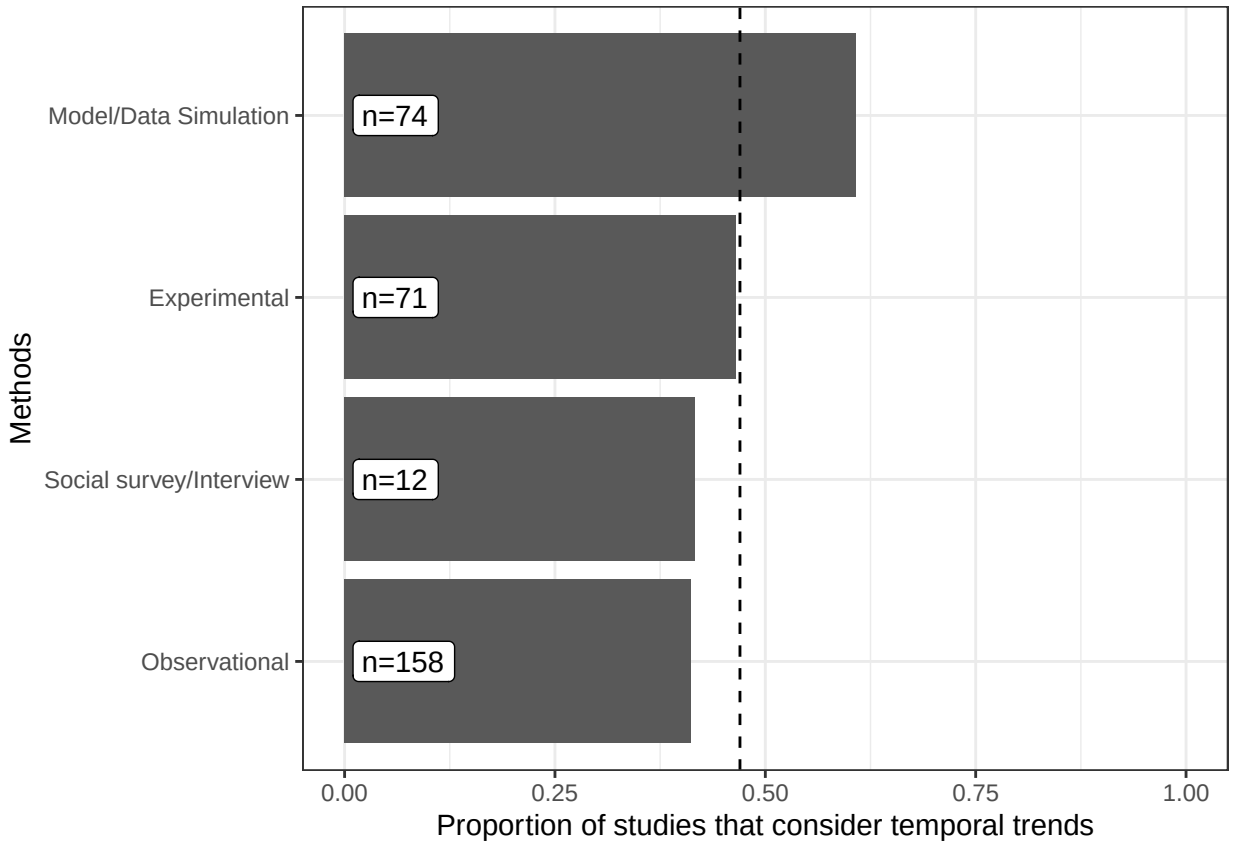
In the plot below, the dashed line represents the overall proportion of multi-scale studies given that the study considered temporal trends (since that was the only way to get the number of years).



Methods scale biases

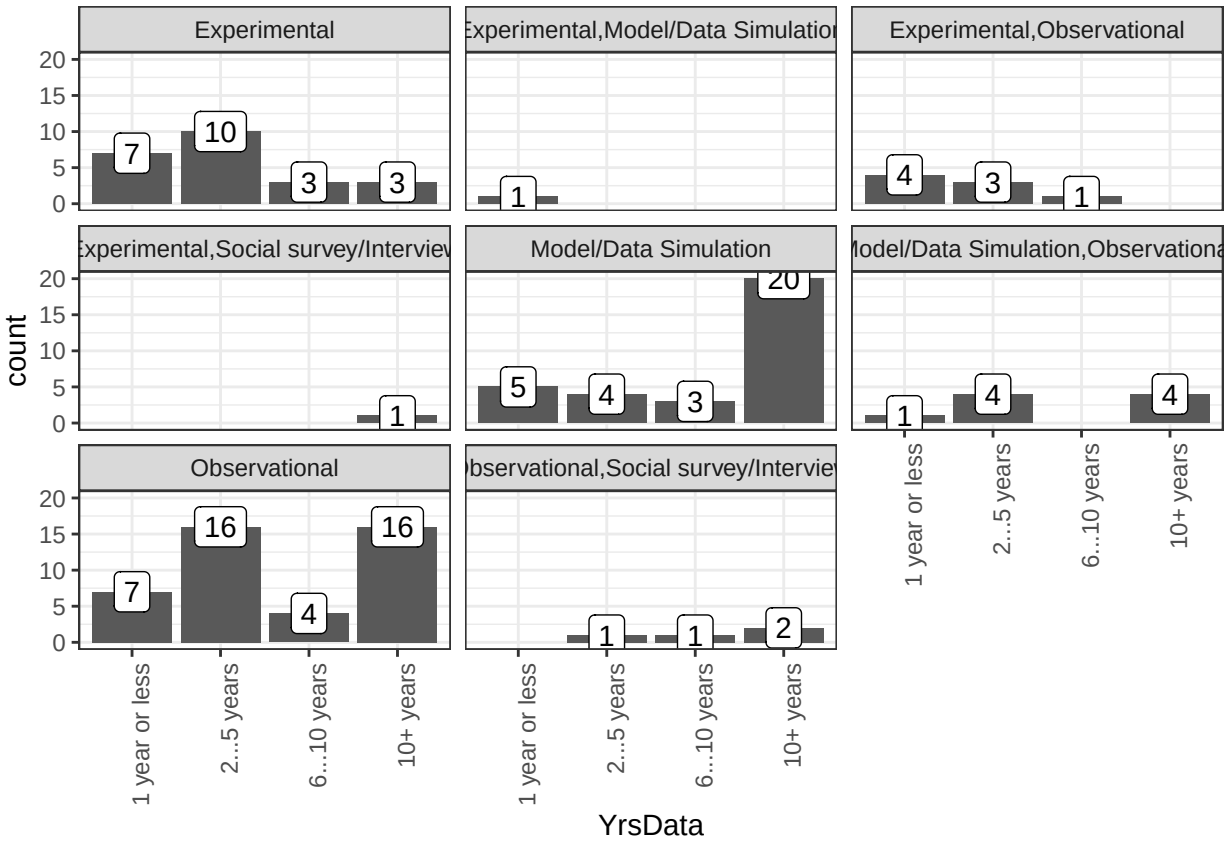
For these biases plots, a single paper can fit into multiple groups (e.g. a paper that used Observational and Model/data simulation methods). The dashed line accounts for this, so that it still serves as a 'random expectation', but it is a little complicated to explain (I'm working on putting together a little explanation with an example though!).

TimeTrends

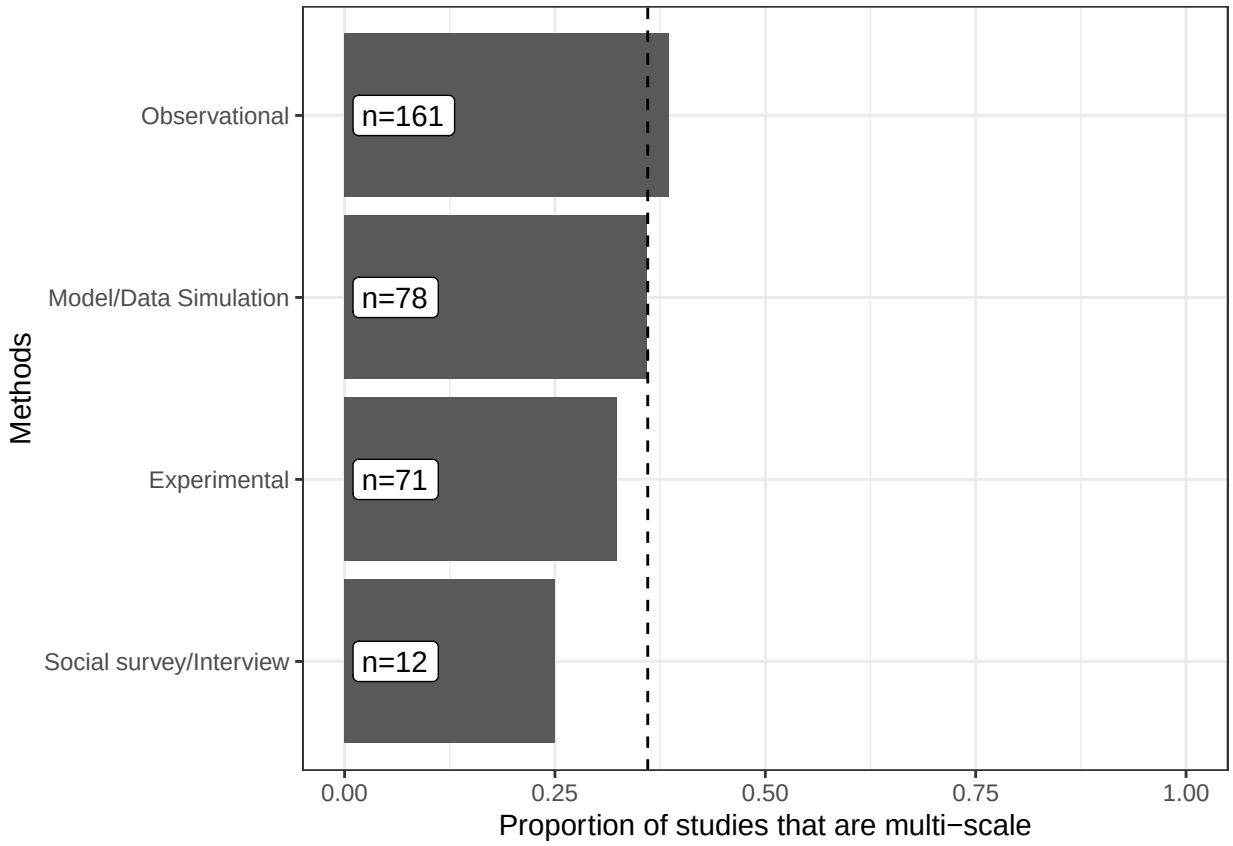


Number of years

Unlike the above plots which double count papers that are in multiple groups, these plots keep papers single counted because it shows the counts and not proportions. These also keep all intersecting groups separate instead of only looking at the groups individually. These plots are a little messier, but I'm working on a way to better show these patterns (if it seems worth it).


Experimental
Experimental,Model/Data Simulation
Experimental,Observational
Experimental,Social survey/Interview
Model/Data Simulation
Model/Data Simulation,Observational
Observational
Observational,Social survey/Interview
count
YrsData
1 year or less
2...5 years
6...10 years
10+ years

Multi-scale



Spatial extent

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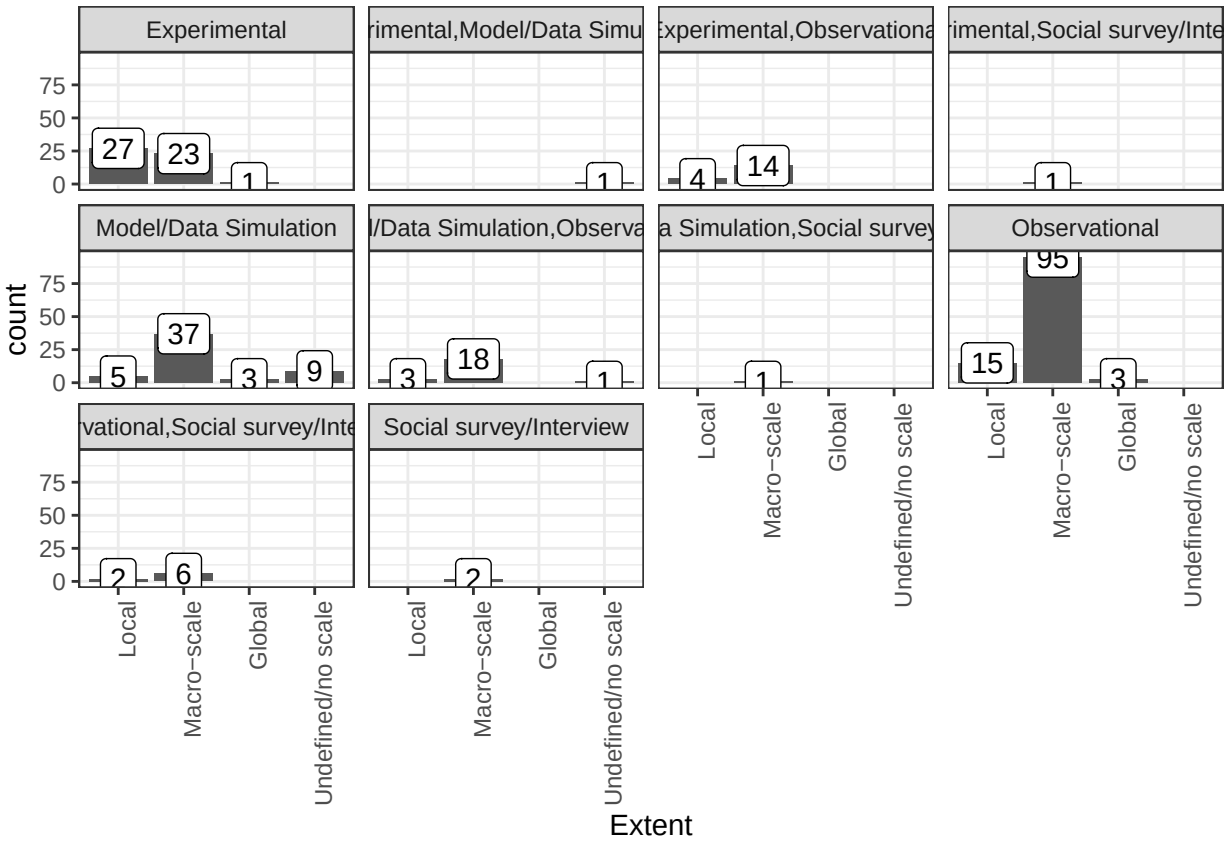

ES type scale biases

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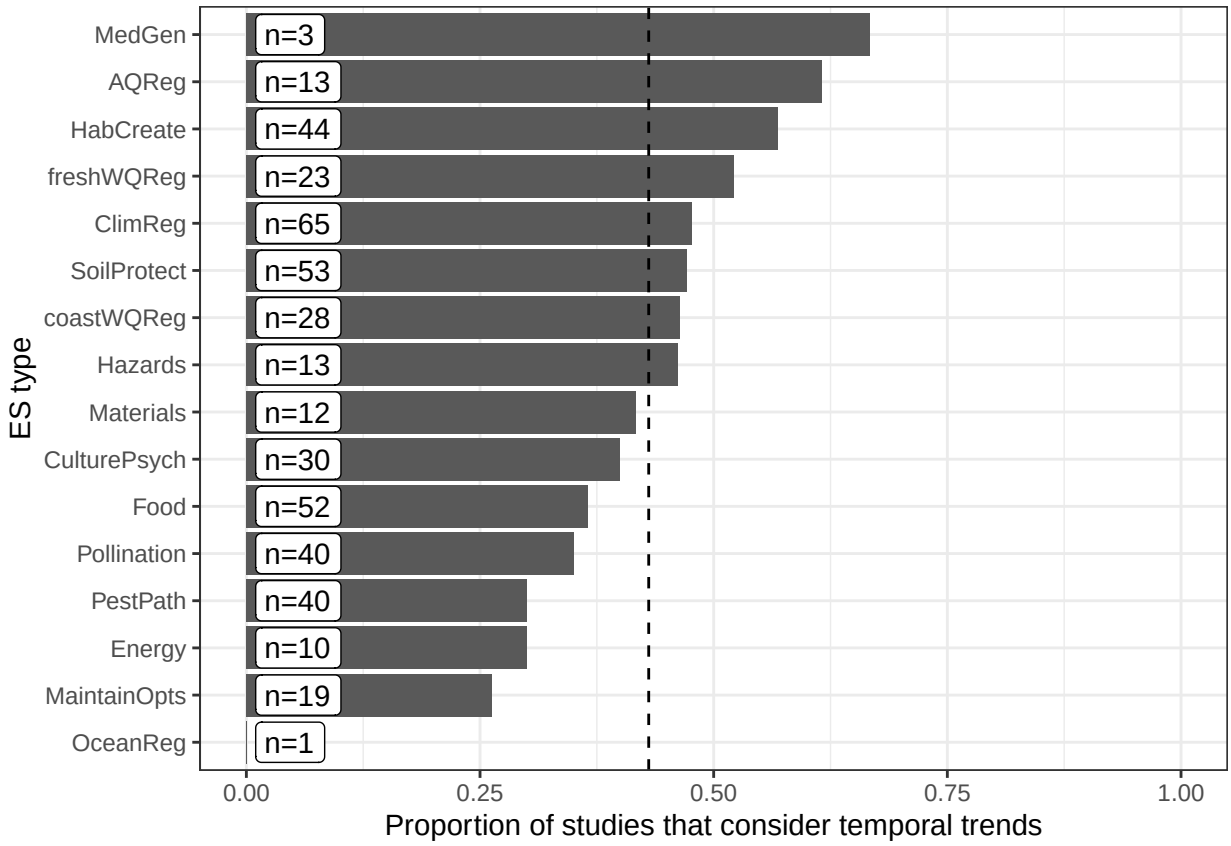
TimeTrends



Number of years

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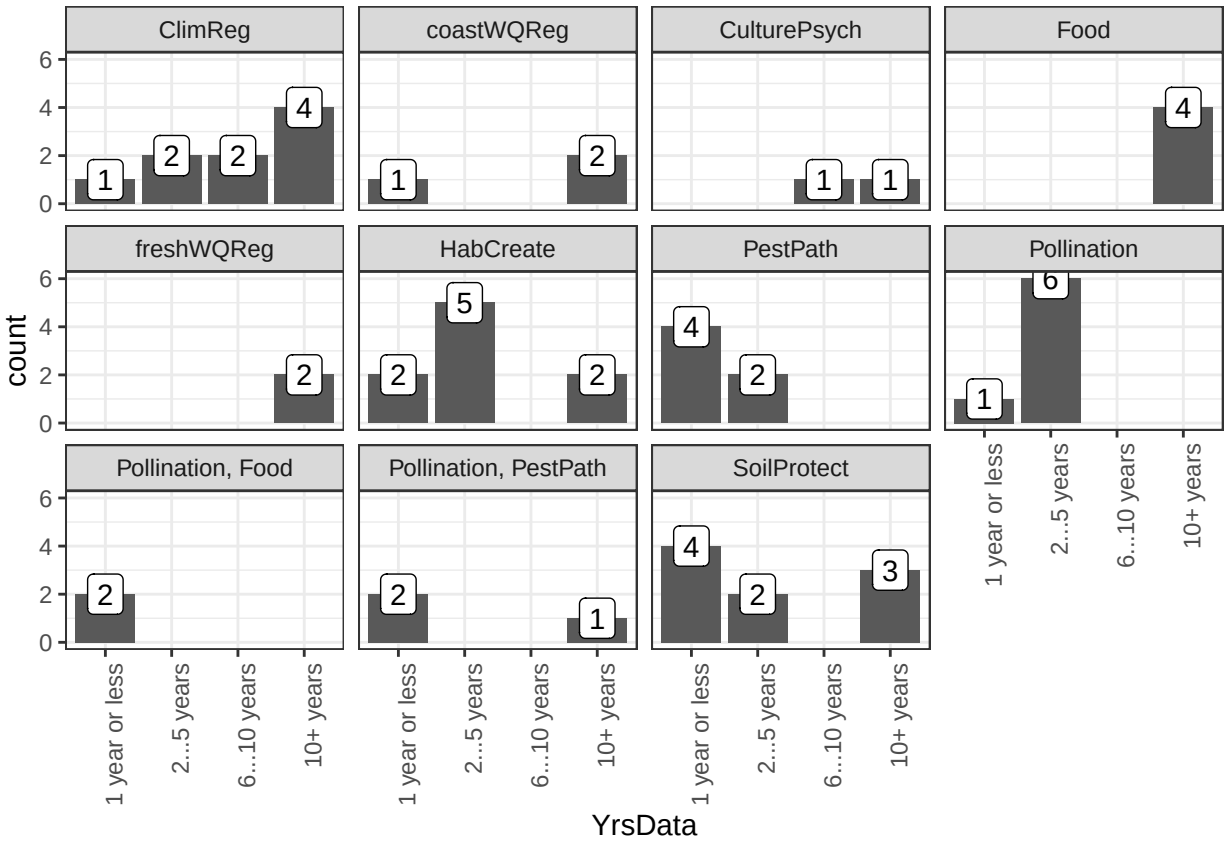
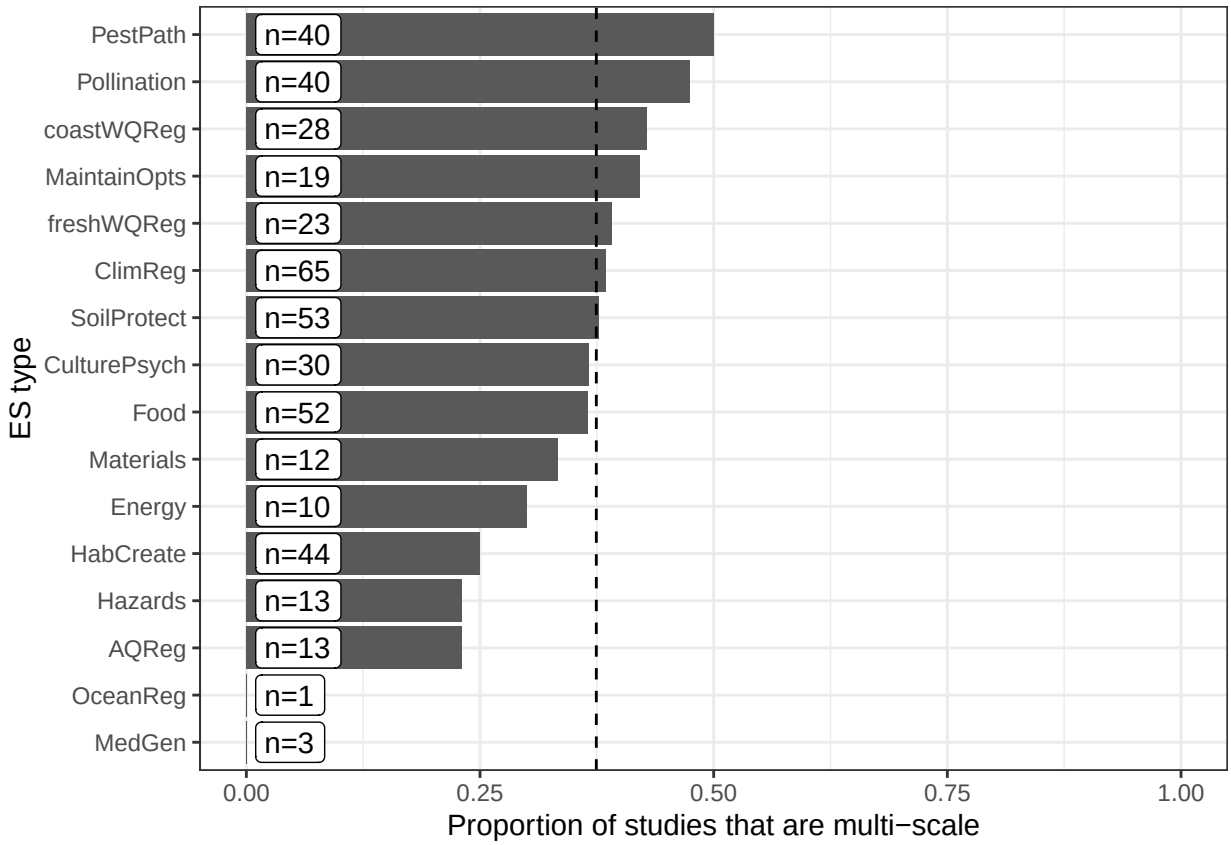

ClimReg
coastWQReg
CulturePsych
Food
freshWQReg
HabCreate
PestPath
Pollination
Pollination, Food
Pollination, PestPath
SoilProtect
count
YrsData
1 year or less
2...5 years
6...10 years
10+ years

Multi-scale



Spatial extent

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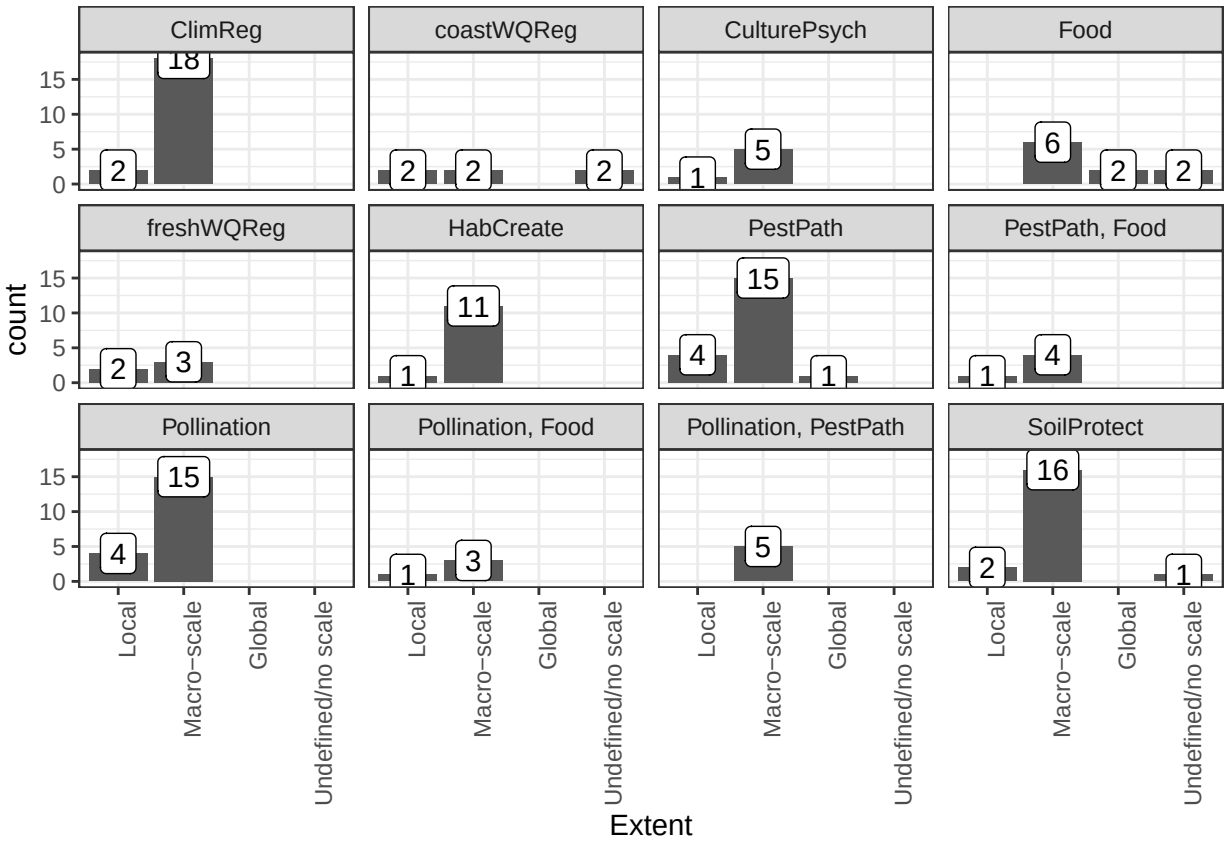

Driver scale biases

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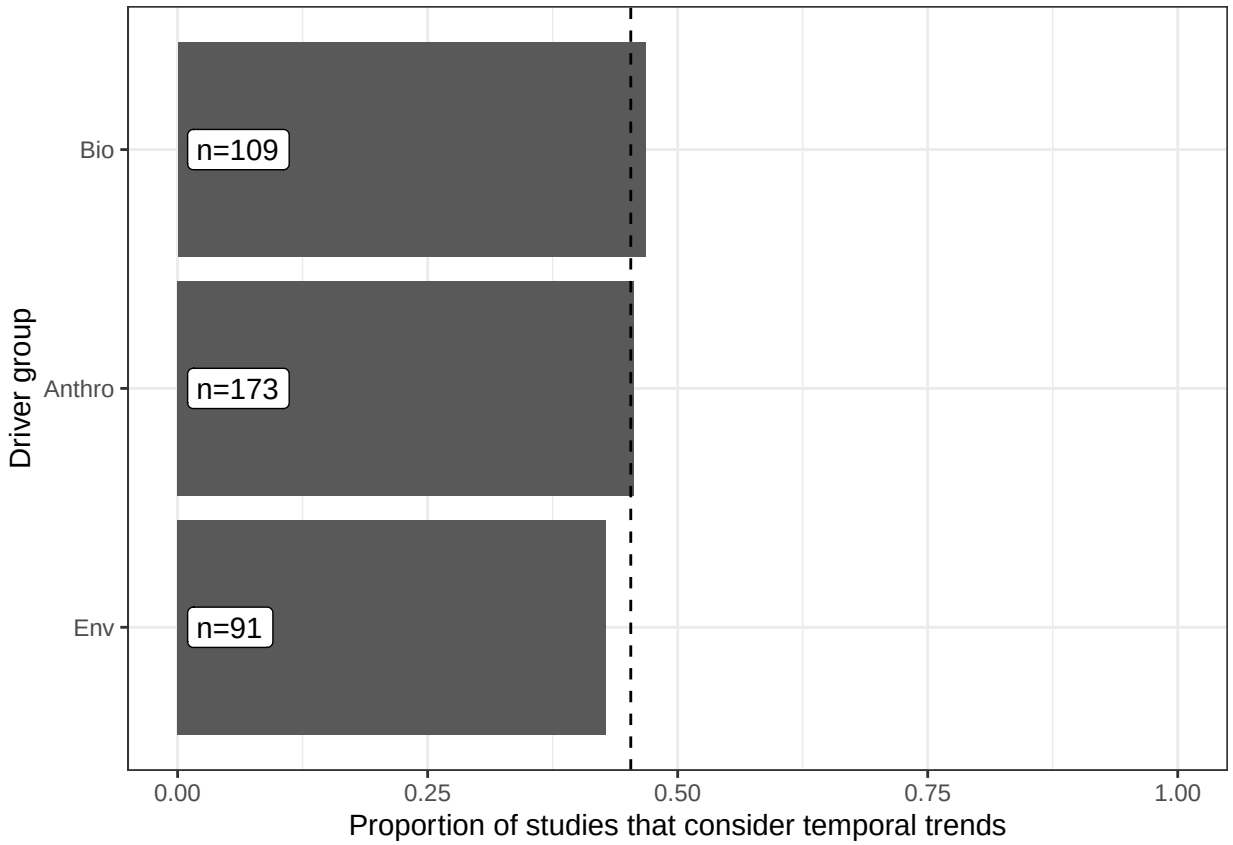
TimeTrends



Number of years

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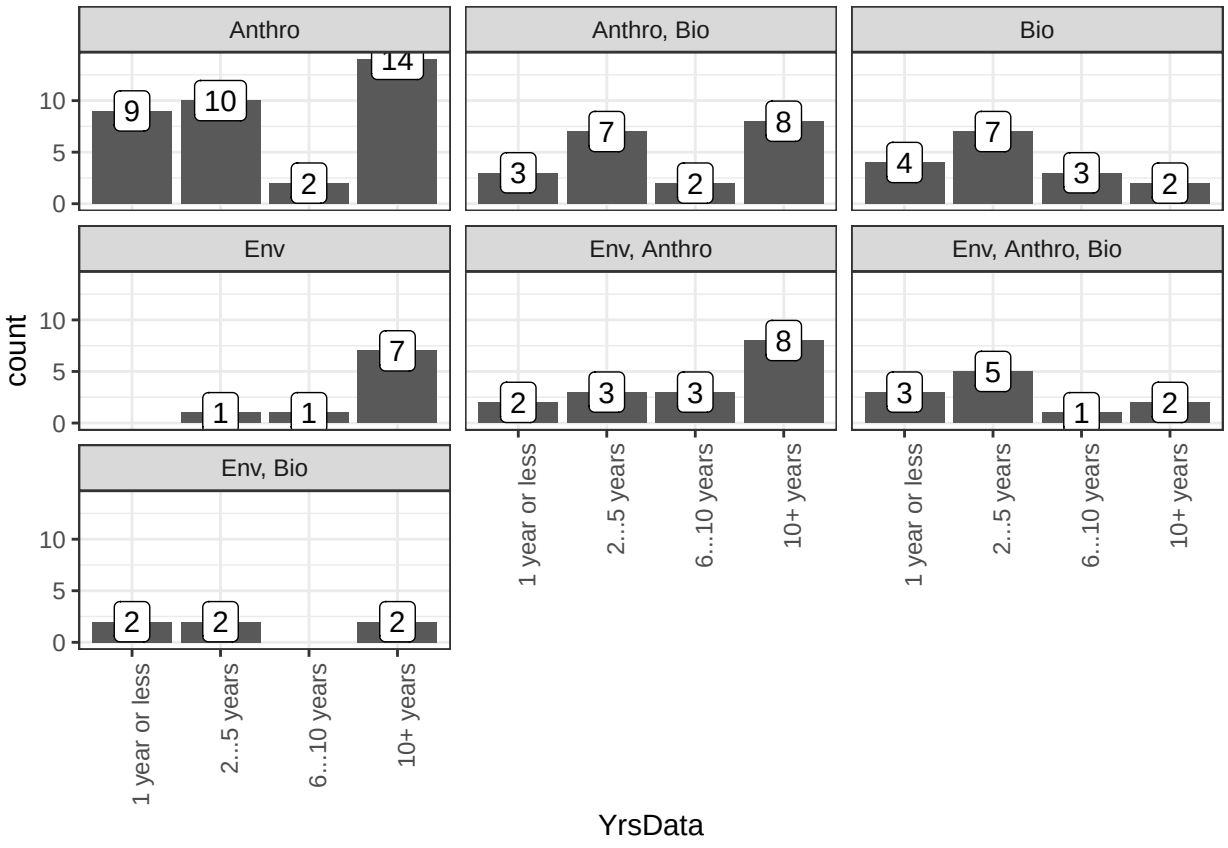
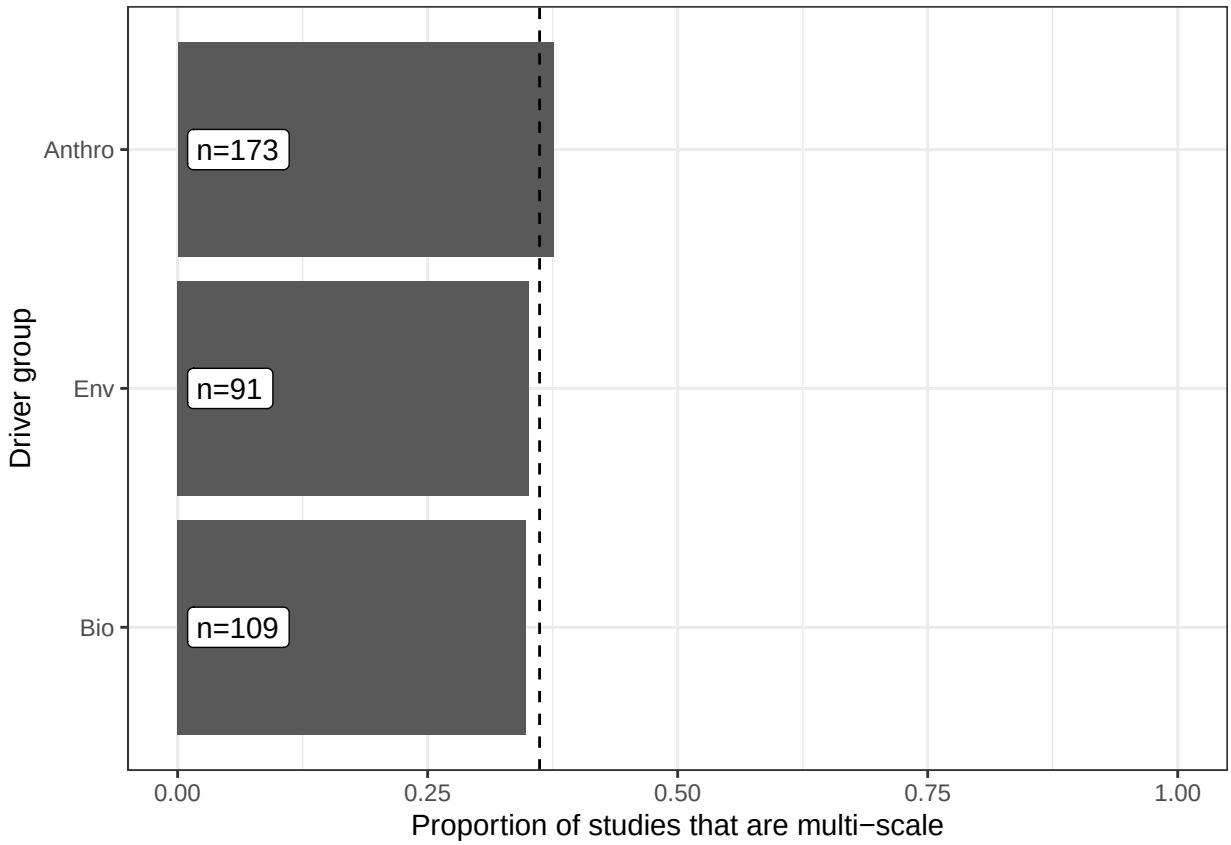

Anthro
Anthro, Bio
Bio
Env
Env, Anthro
Env, Anthro, Bio
Env, Bio
count
0
5
10
9
10
2
14
3
7
2
8
4
7
3
2
1
1
7
2
3
3
8
3
5
1
2
2
2
2
1 year or less
2...5 years
6...10 years
10+ years
YrsData

Multi-scale



Spatial extent

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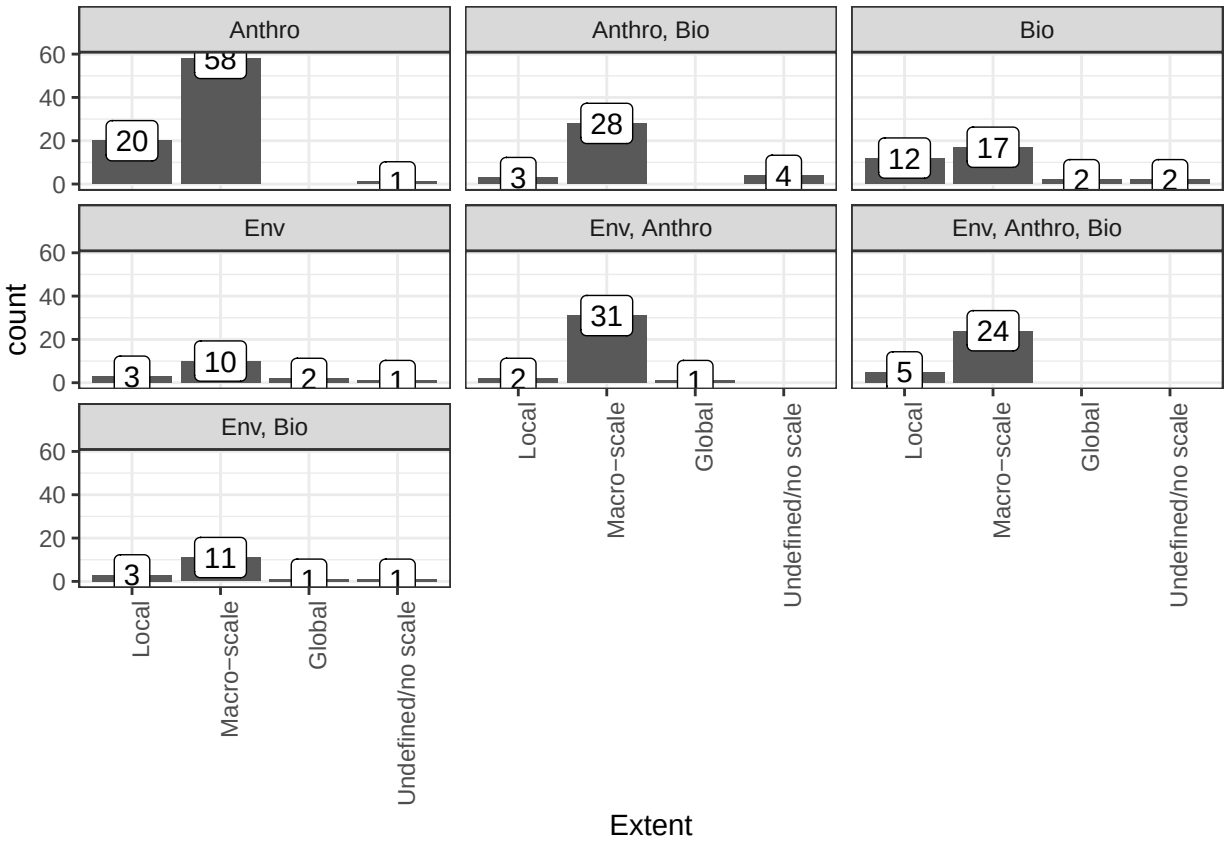
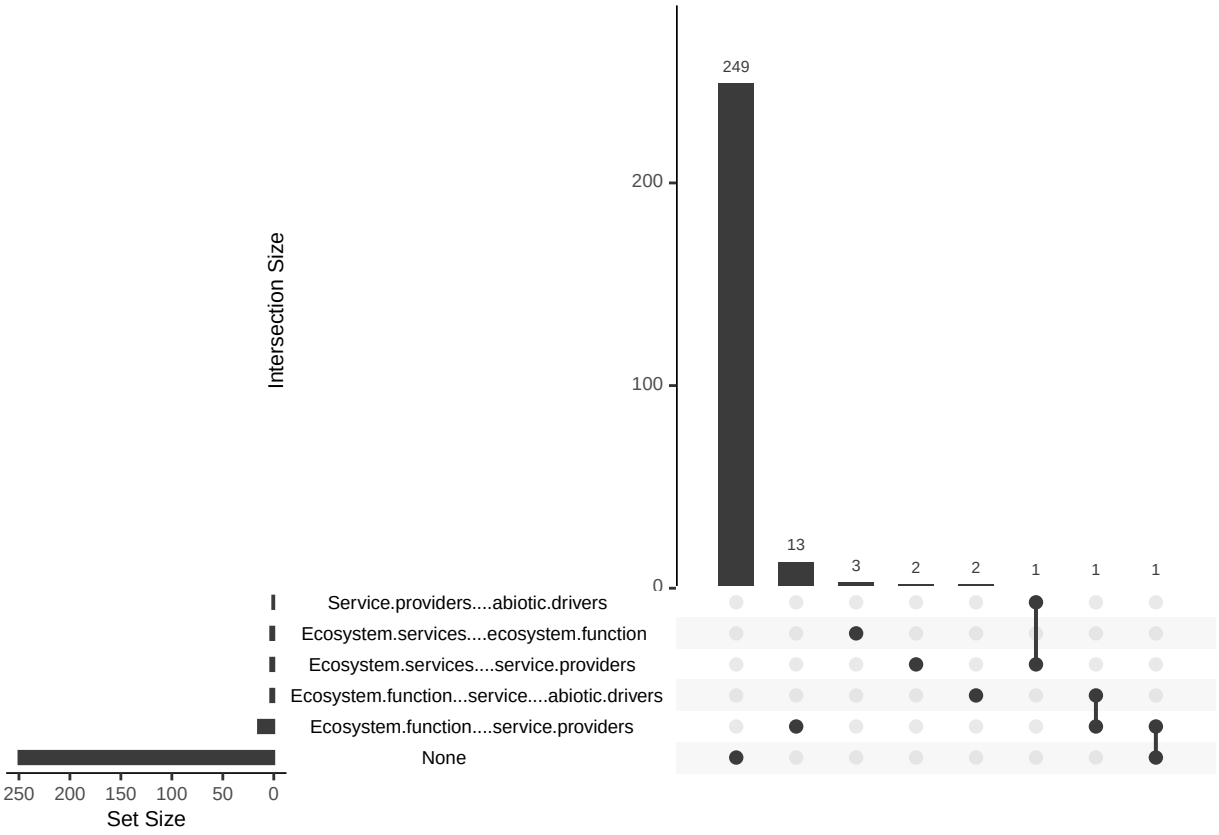
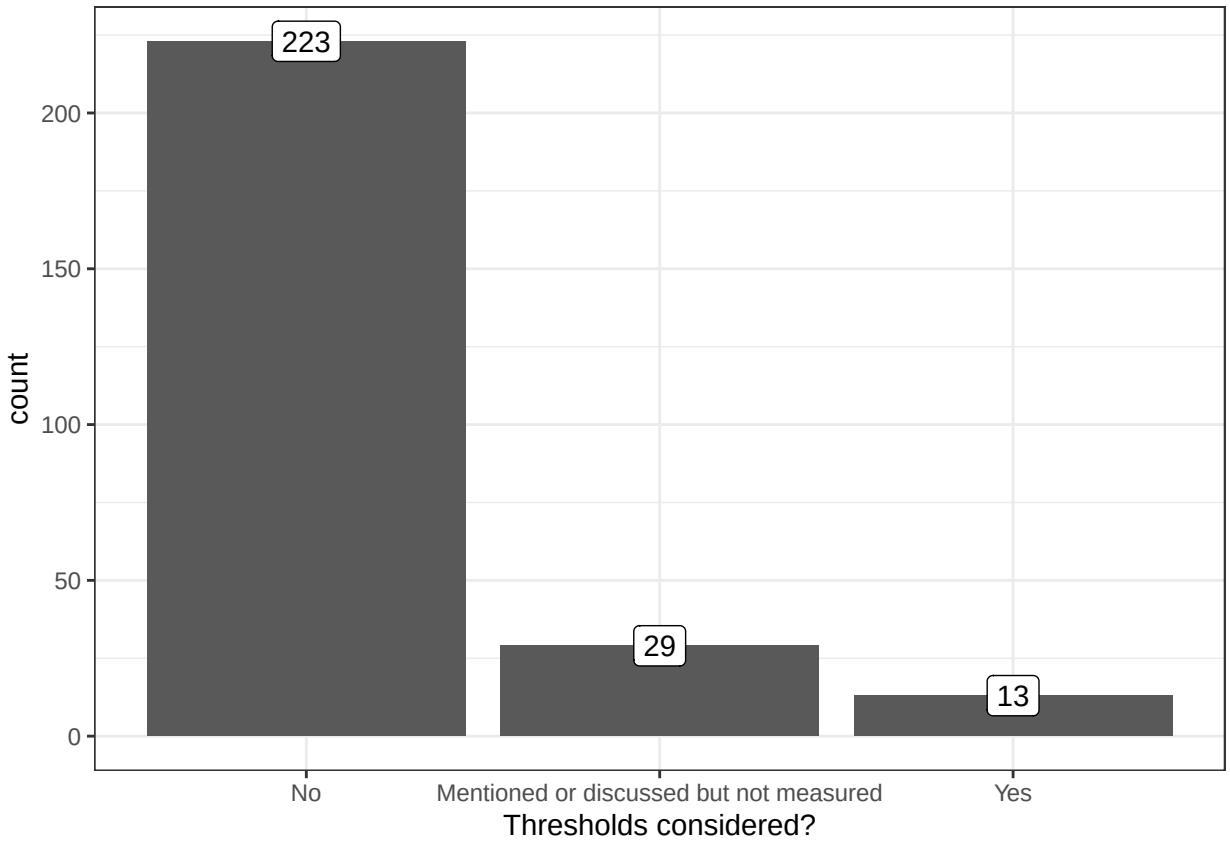

Anthro
Anthro, Bio
Bio
Env
Env, Anthro
Env, Anthro, Bio
Env, Bio
count
Extent
Local
Macro−scale
Global
Undefined/no scale
0
20
40
60
20
58
1
3
28
4
12
17
2
2
3
10
2
1
2
31
1
5
24
3
11
1
1

5) Analytical methods

Feedbacks




```
## # A tibble: 8 x 2
##   clean_answer                                                      count
##   <fct>                                                             <int>
## 1 Ecosystem function -> service providers                              13
## 2 Ecosystem function -> service providers,No feedbacks measured directly       1
## 3 Ecosystem function / service -> abiotic drivers                      2
## 4 Ecosystem function / service -> abiotic drivers,Ecosystem function -> s~     1
## 5 Ecosystem services -> ecosystem function                             3
## 6 Ecosystem services -> service providers                              2
## 7 No feedbacks measured directly                                     249
## 8 Service providers -> abiotic drivers,Ecosystem services -> service prov~     1
```

Non-linearities/thresholds