

## Supplemental materials

Supplemental materials for Ossanna & Gornish (2022), “Efficacy of labile carbon addition to reduce fast-growing, invasive non-native plants: A review and meta-analysis”.

### Table S1 & S2. Raw data

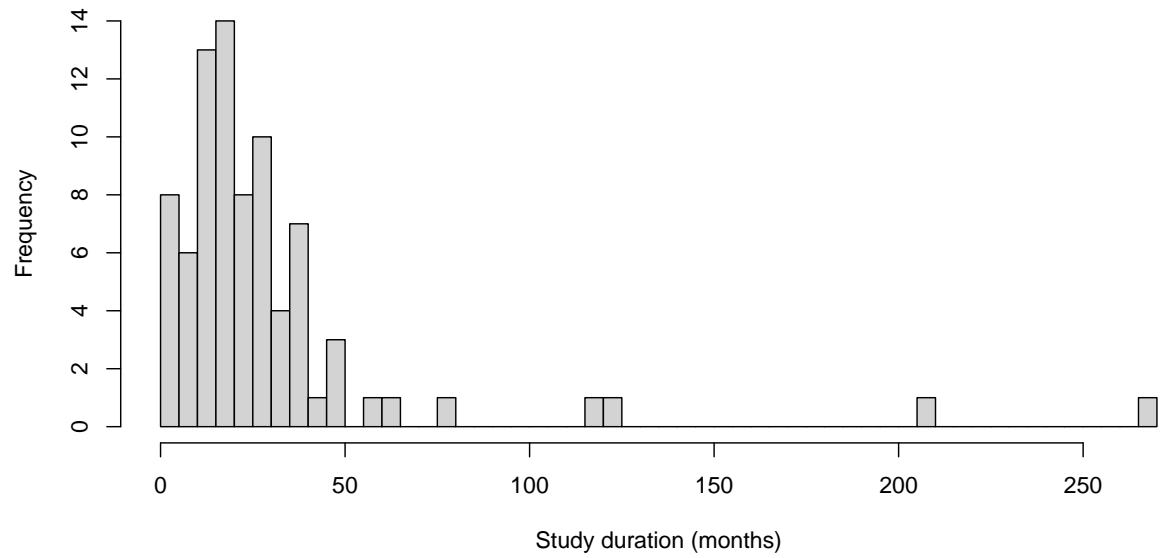
For Tables S1 & S2, see accompanying Zenodo archive at <https://doi.org/10.5281/zenodo.6800070>. The Zenodo archive also includes R Markdown documents further detailing analysis and code.

### Table S3. Systematic review: Publication types

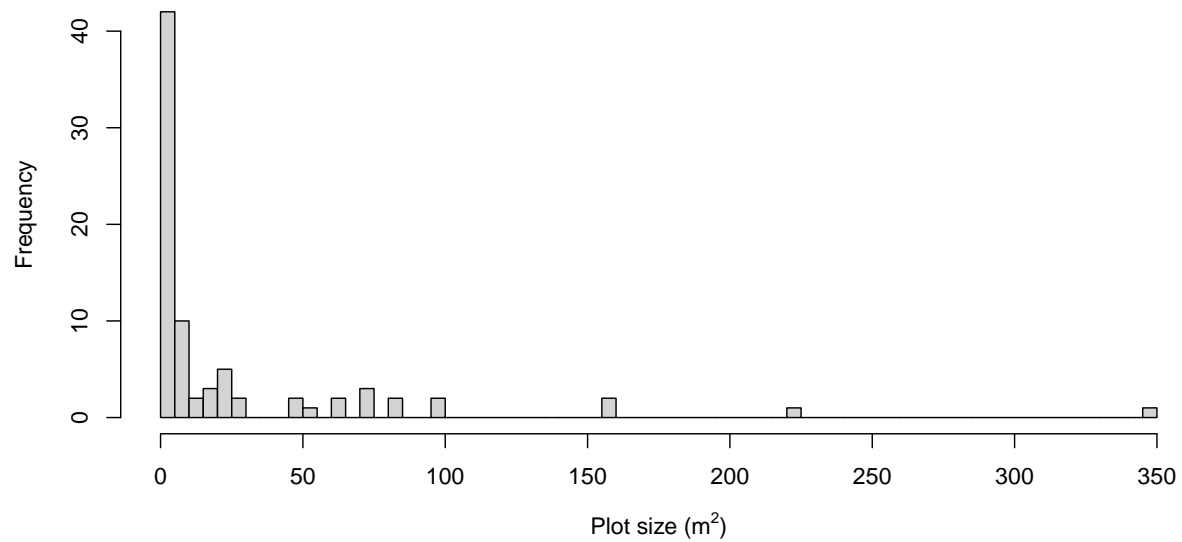
Publication type	n	Percent (%)
peer-reviewed article	63	75.9
master’s thesis	11	13.3
technical report	5	6.0
doctoral dissertation	3	3.6
conference	1	1.2

### Table S4. Systematic review: Study regions

Region	n	Percent (%)
Rocky Mountains, USA	12	14.5
Great Basin, USA	11	13.3
southeast Australia	10	12.0
Midwest, USA	9	10.8
coastal CA, USA	8	9.6
Pacific Northwest, USA	8	9.6
central Canada	6	7.2
Great Plains, USA	5	6.0
Europe	3	3.6
HI, USA	3	3.6
northeast USA	2	2.4
South Africa	2	2.4
southwest USA	2	2.4
Gulf of Mexico, USA	1	1.2
Himalaya	1	1.2



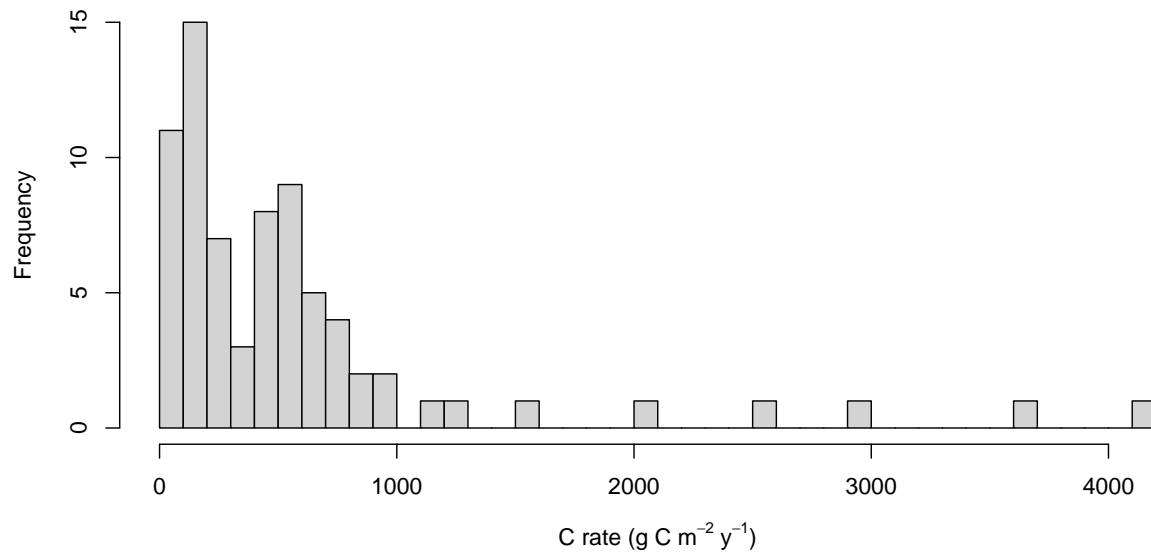
**Figure S1.** Study duration for systematic review, where study duration is defined as months from the first C application to the last plant measurements.



**Figure S2.** Plot size for systematic review.

**Table S5. Systematic review: C types**

C type	n	Percent (%)
sucrose	42	50.6
sawdust	19	22.9
sucrose AND sawdust	11	13.3
activated carbon	2	2.4
mulch	2	2.4
straw	2	2.4
woodchip	2	2.4
dextrose	1	1.2
wood mulch	1	1.2
woodchip mulch	1	1.2



**Figure S3.** Average C rate for systematic review.

**Table S6.** Systematic review: Number of treatment combinations with C addition

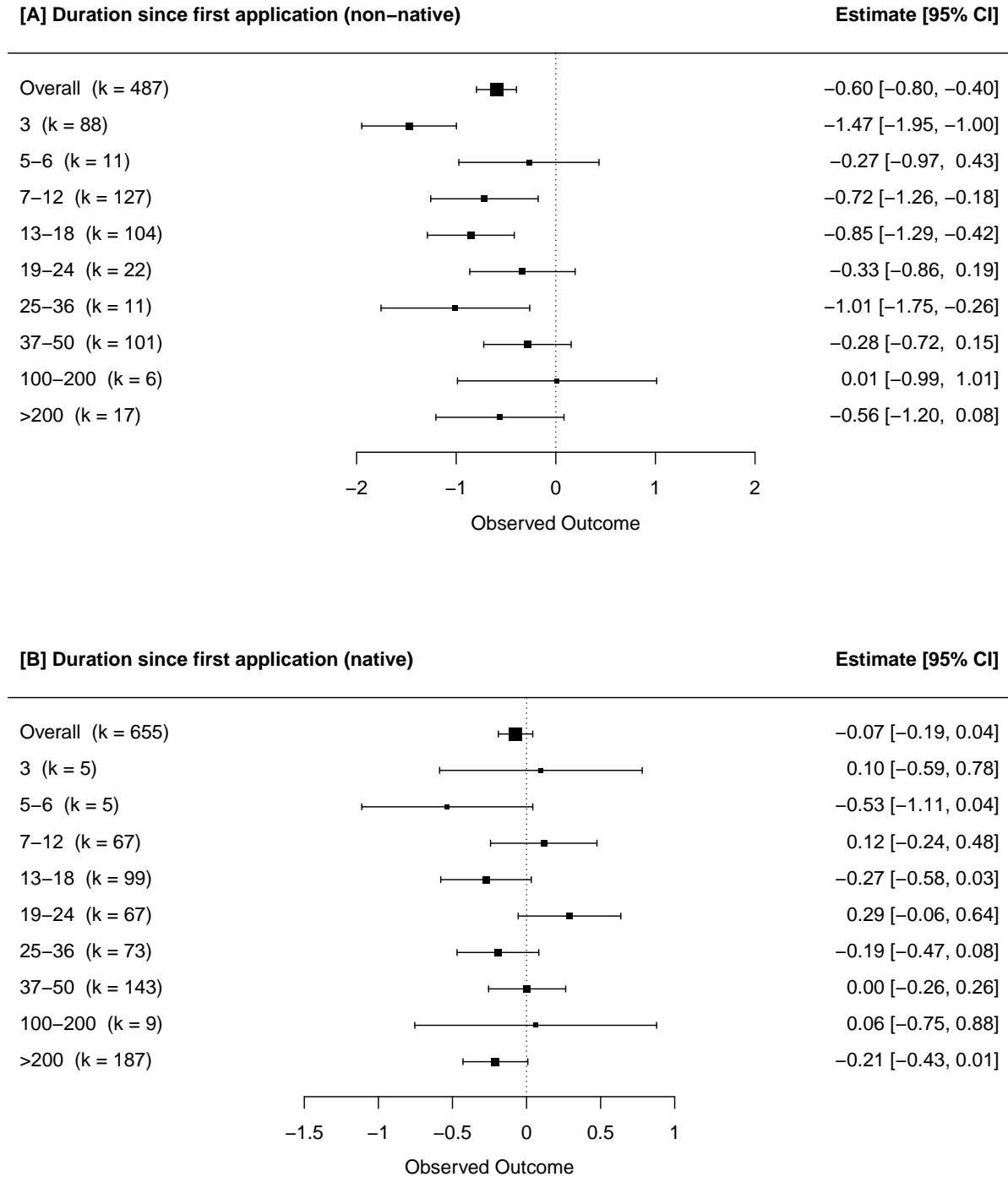
Number of additional treatments	n	Percent (%)
1 additional treatment	33	39.8
C addition only	31	37.3
2 additional treatments	15	18.1
3 additional treatments	4	4.8

**Table S7. Systematic review: Types of treatment combinations with C addition**

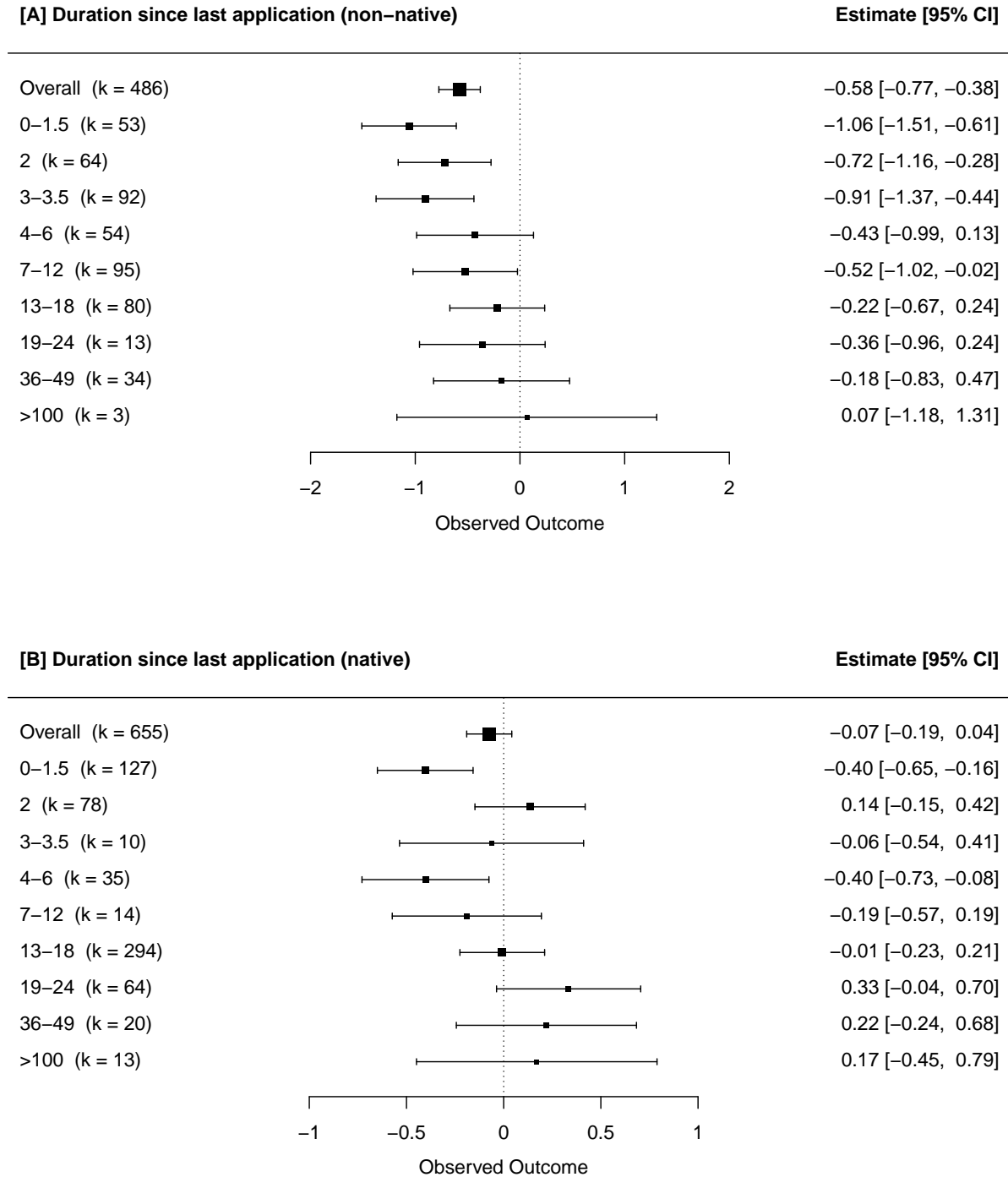
Additional treatments	n	Percent (%)
native seeded	13	28.9
burn	11	24.4
tilling	5	11.1
water manipulation	4	8.9
soil amendment	3	6.7
cutting	2	4.4
fertilizer	2	4.4
grazing	2	4.4
hand-pulling	2	4.4
litter removal	1	2.2

**Table S8. Systematic review: Inclusion of cost**

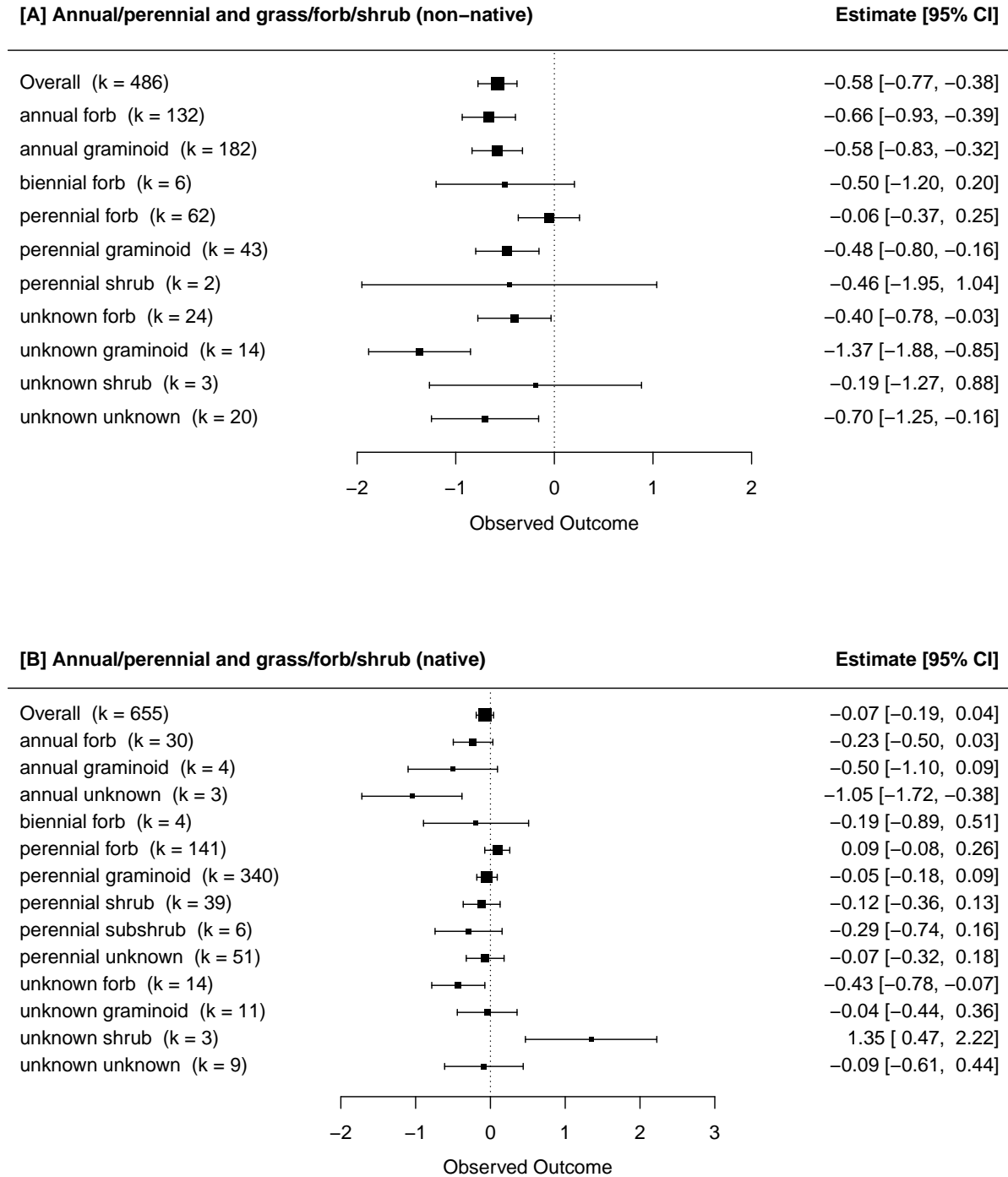
Cost inclusion	n	Percent (%)
absent	51	61.4
mentioned briefly	18	21.7
discussed in context of results	9	10.8
quantitative estimate	5	6.0



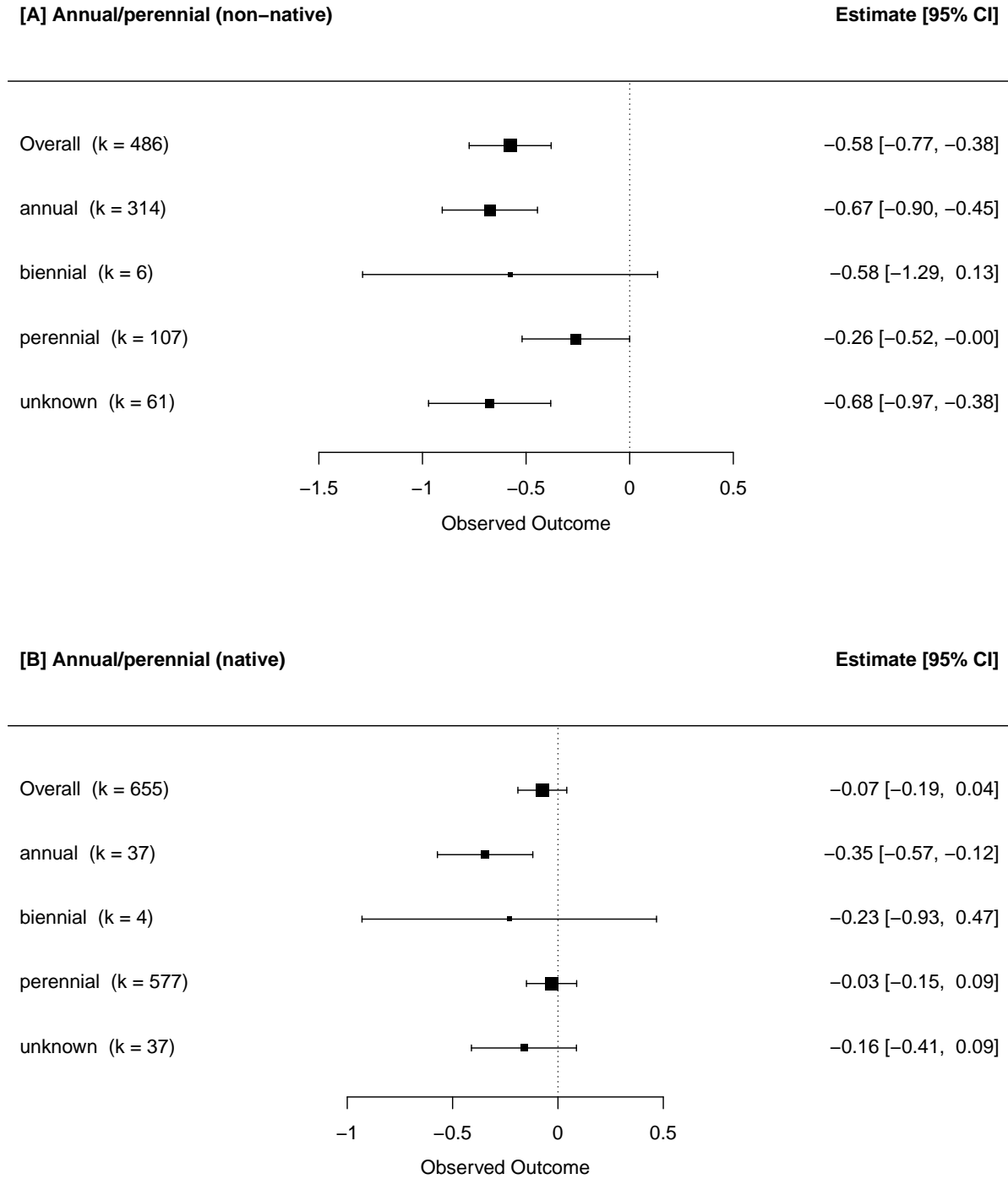
**Figure S4.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by study duration (months from first C application to when first plant measurements taken). CIs that do not overlap zero are considered significant.



**Figure S5.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by study duration (months from first C application to when last plant measurements taken), with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.

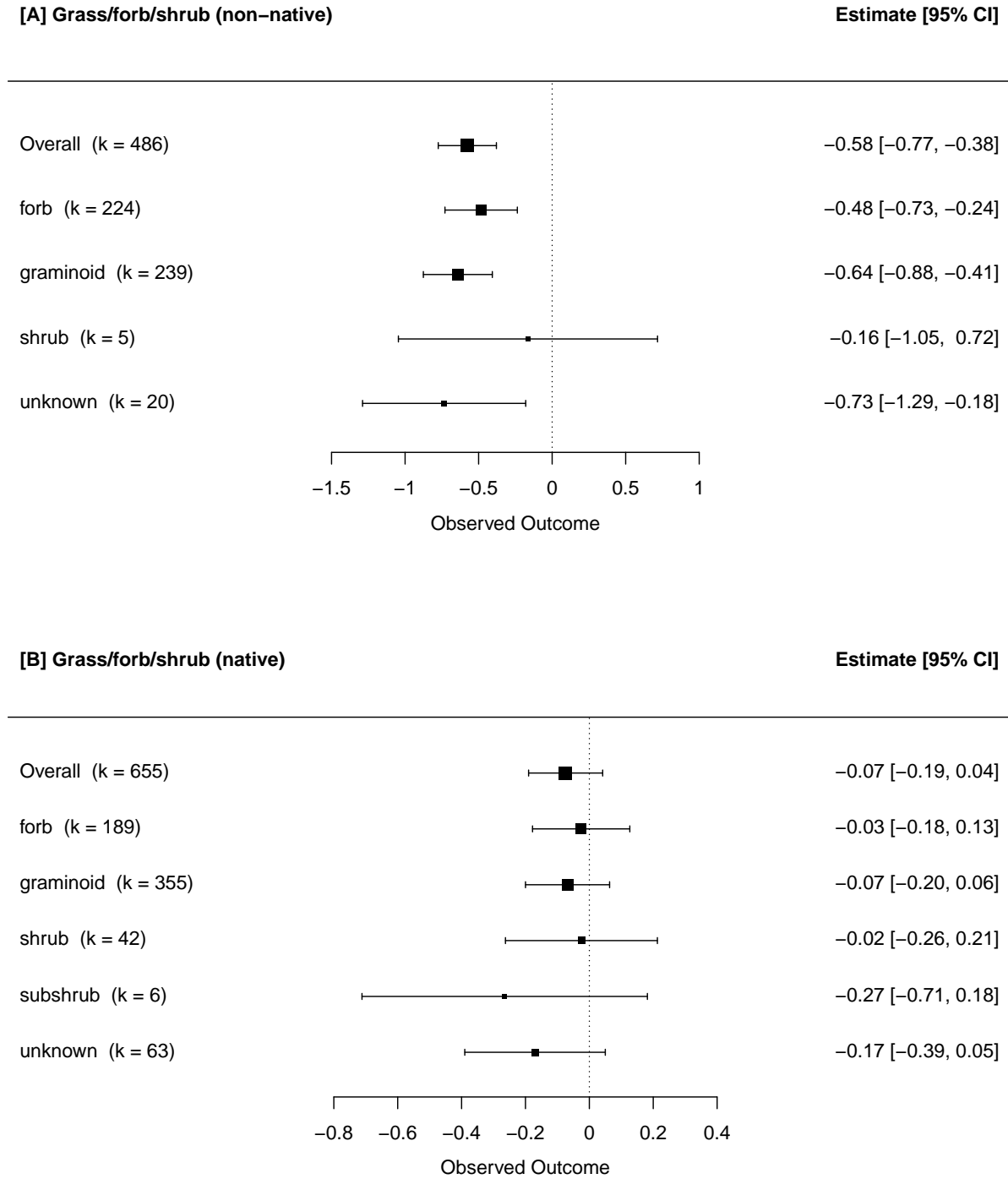


**Figure S6.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by plant lifeform and duration (annual/perennial and grass/forb/shrub), with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.

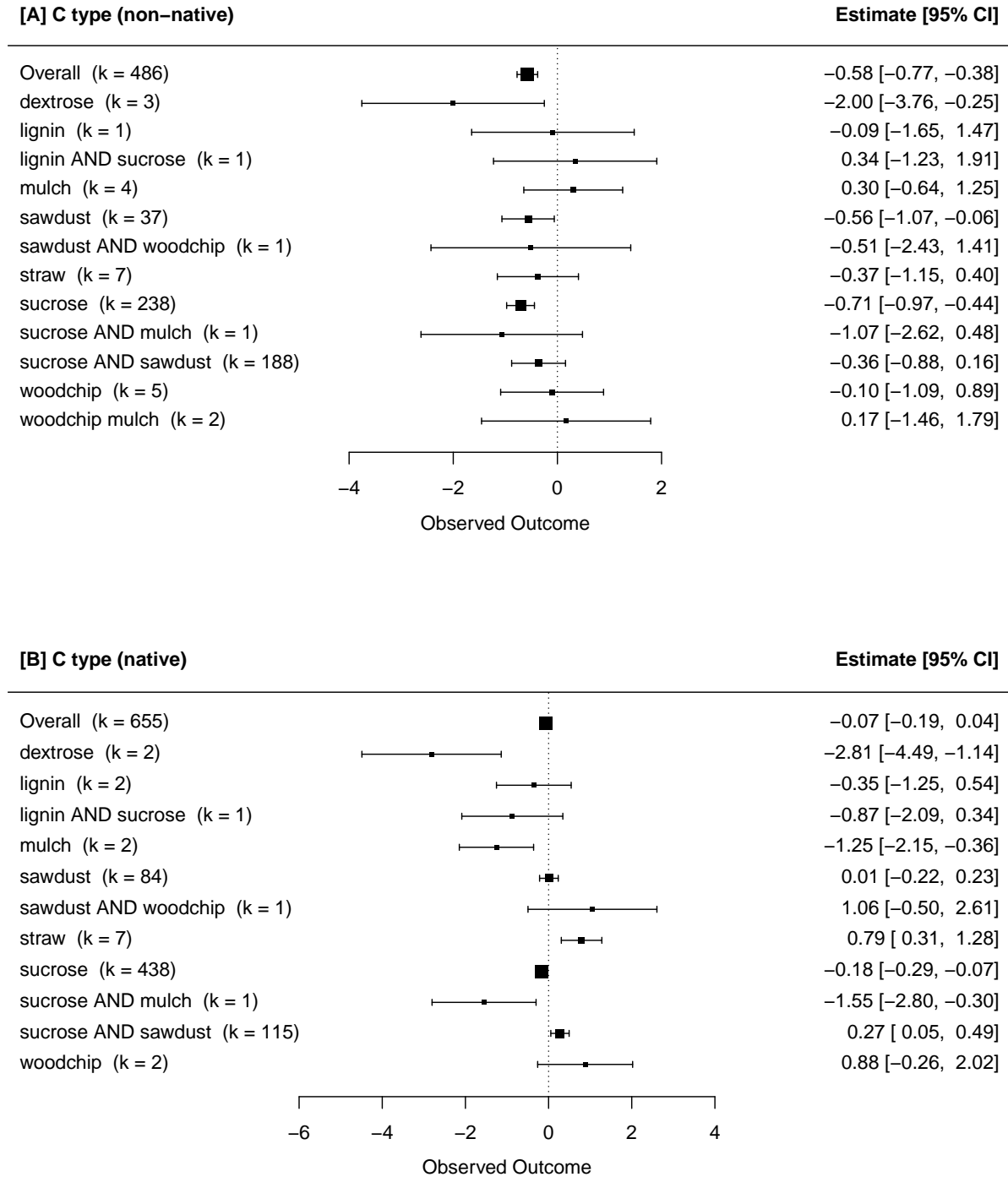


**Figure S7.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by plant duration (annual/perennial), with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.

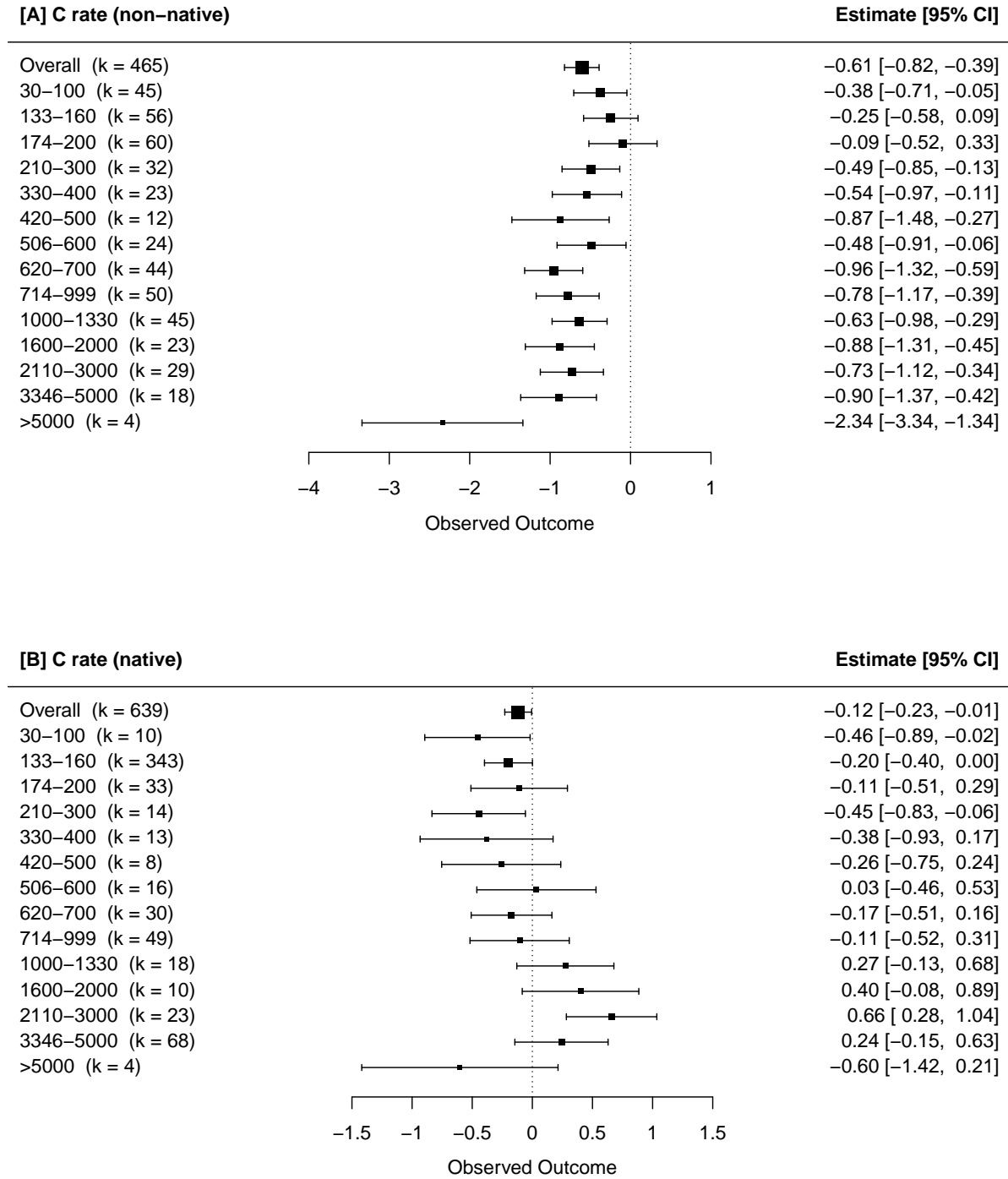




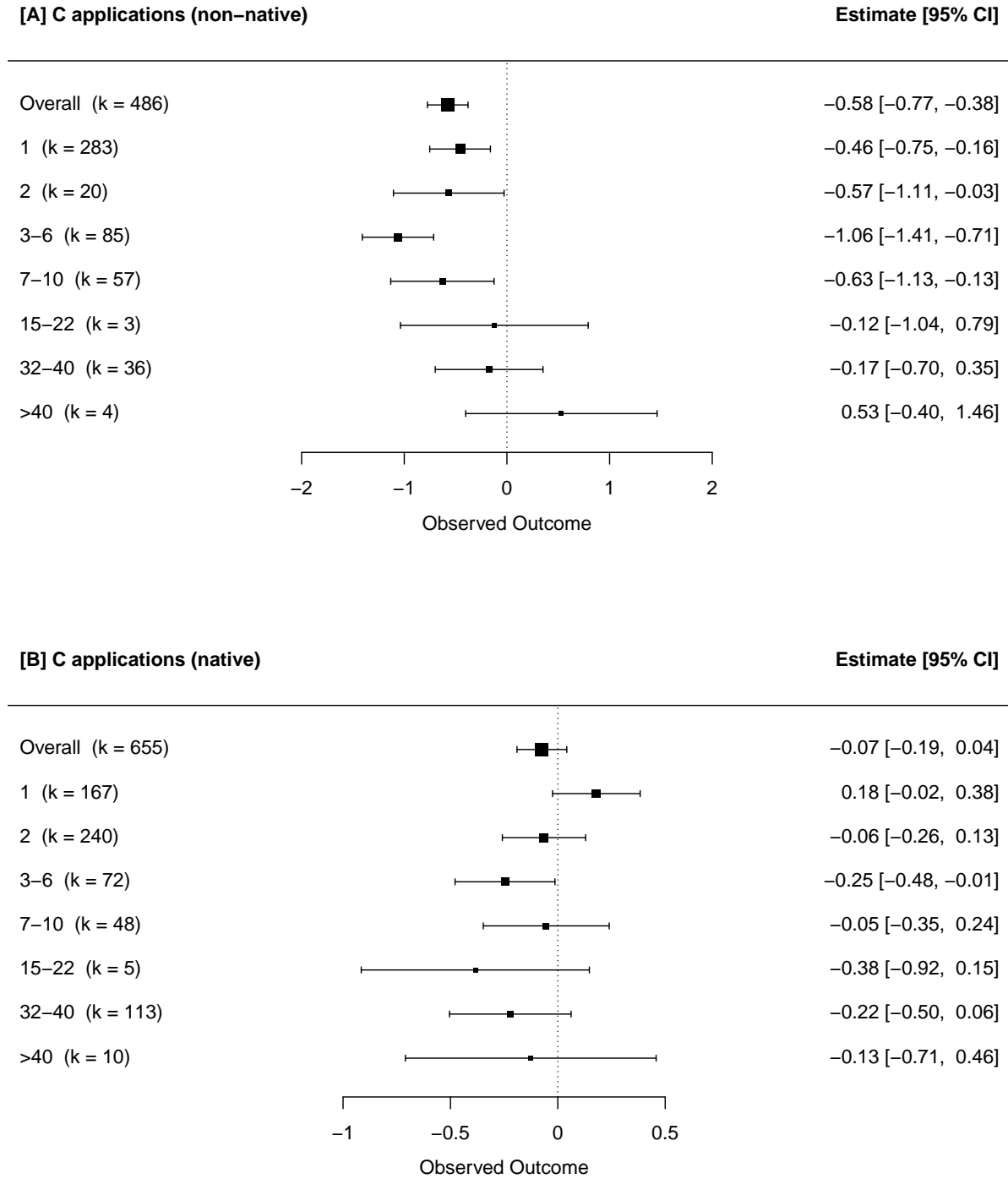
**Figure S8.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by plant lifeform (grass/forb/shrub), with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.



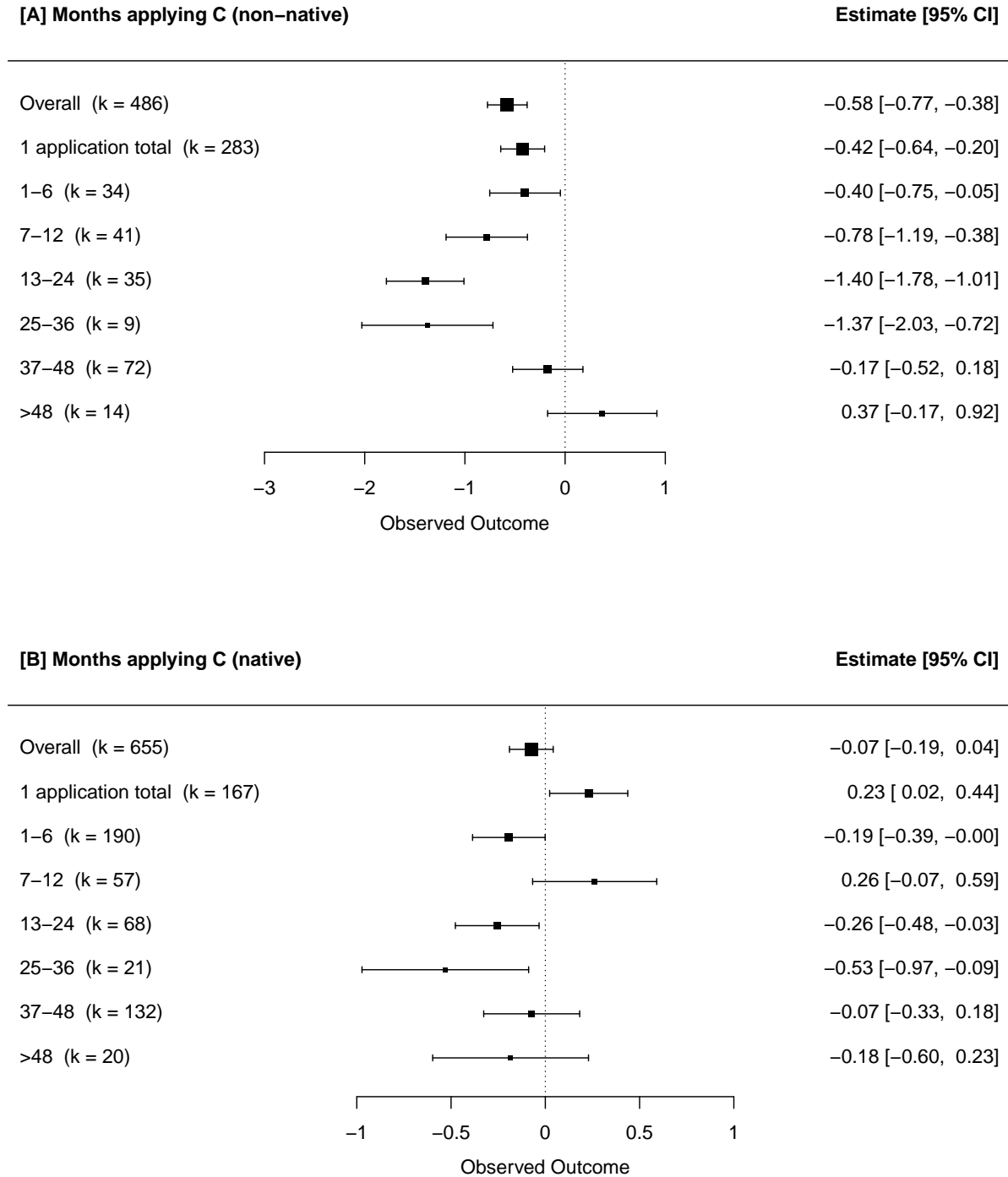
**Figure S9.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by C type, with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.



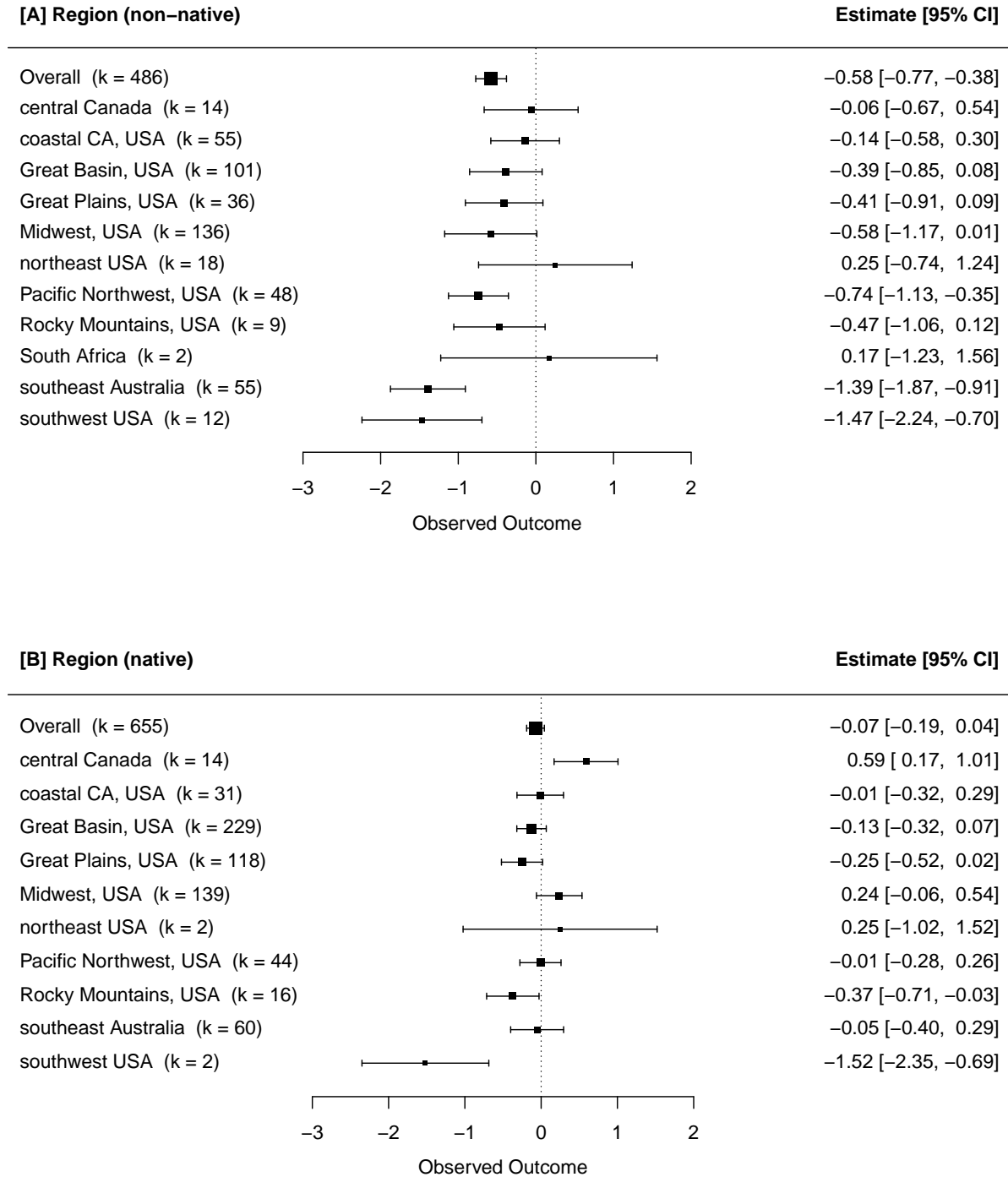
**Figure S10.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by C rate ( $\text{g C m}^{-2} \text{y}^{-1}$ ), with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.



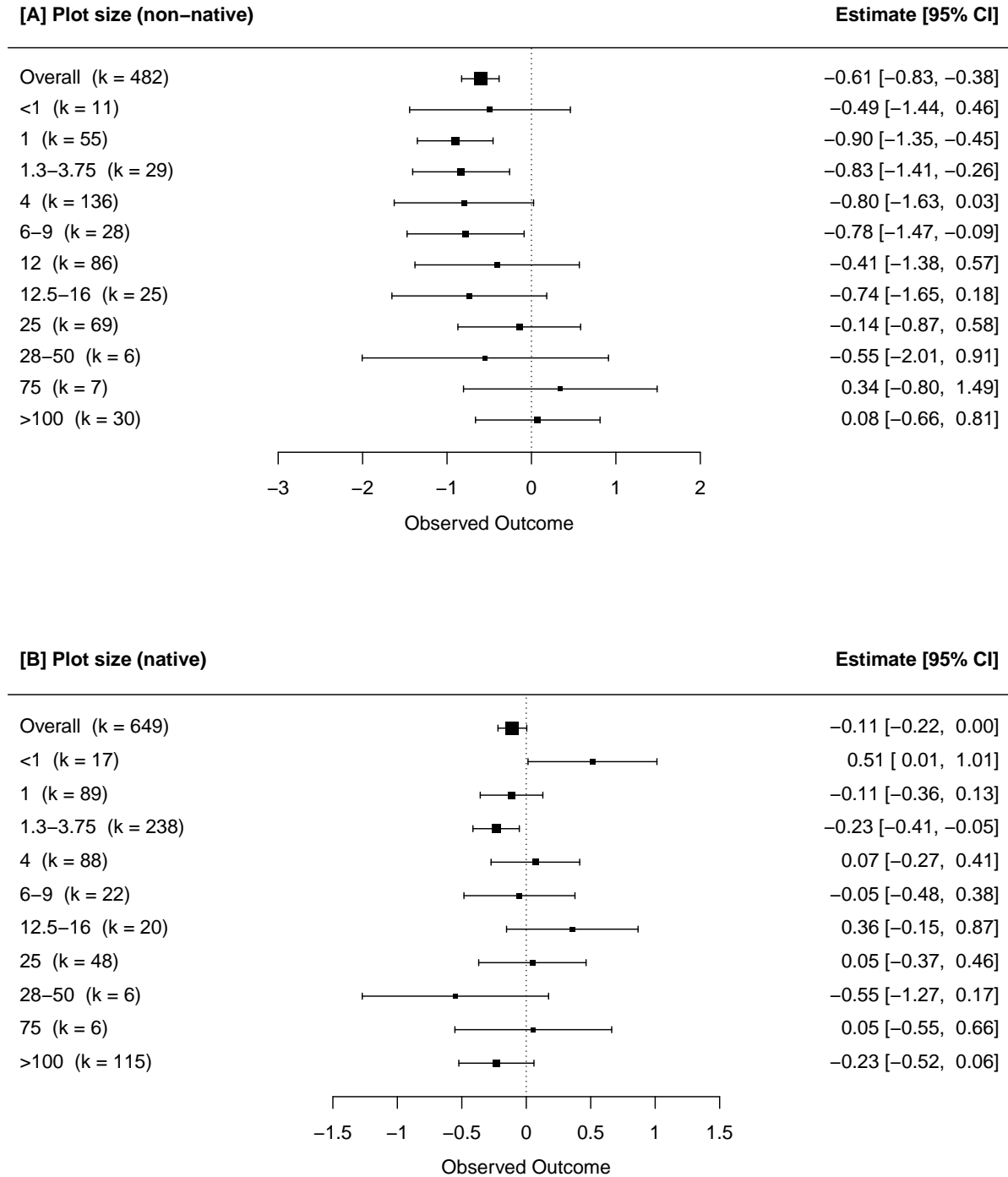
**Figure S11.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by total number of C applications, with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.



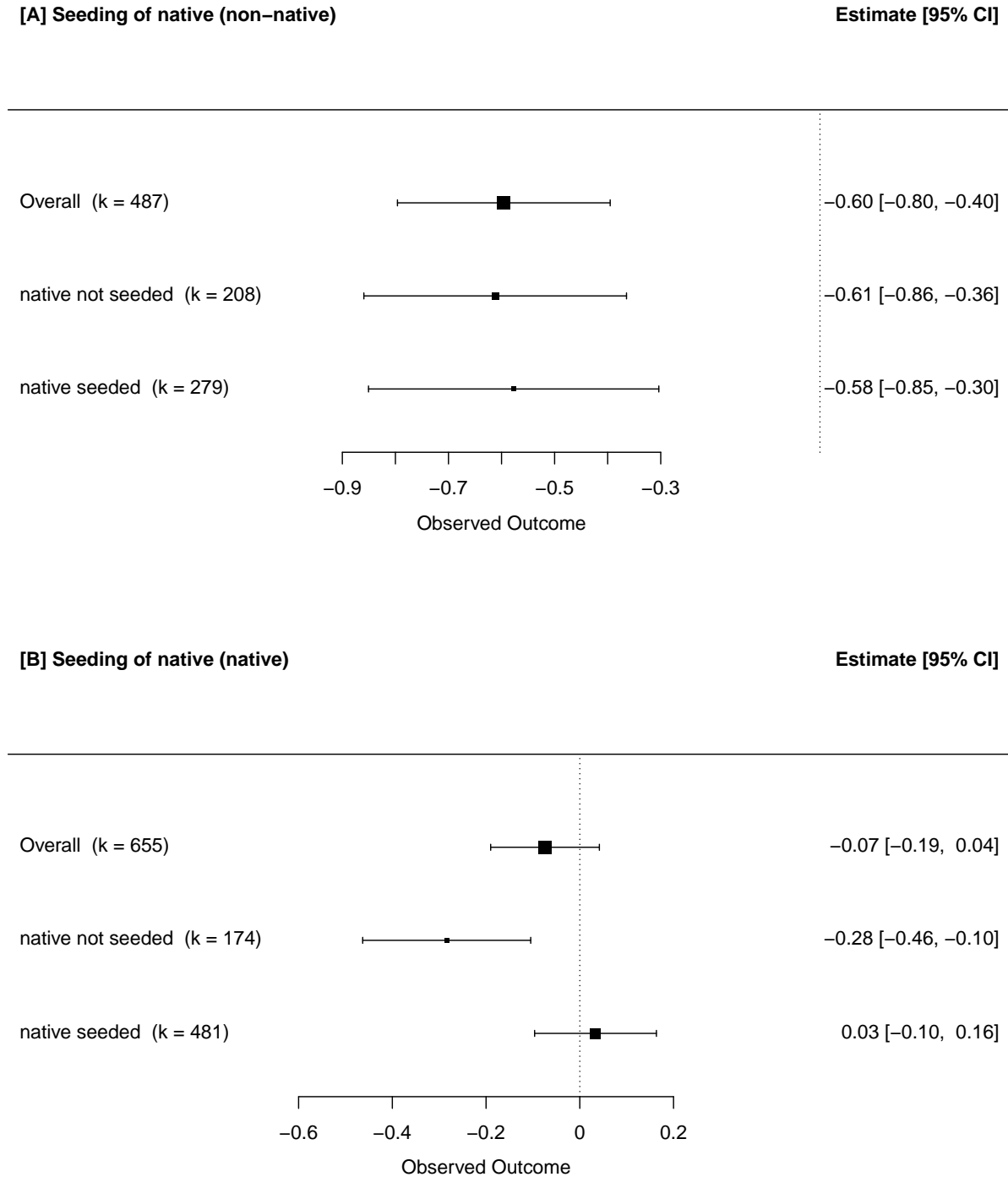
**Figure S12.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by number of months applying C (takes into account reapplication and study duration), with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.



**Figure S13.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by study region, with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.



**Figure S14.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by plot size (m<sup>2</sup>), with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.



**Figure S15.** Standardized mean Hedges'  $g$  effect size  $\pm$  95% confidence interval (CI) for non-native (A) and native plant abundance (B) in response to C addition, categorized by seeding of native plant species (seeded/not seeded), with number of comparisons  $k$ . CIs that do not overlap zero are considered significant.



**Table S9. Meta-analysis: Heterogeneity statistics**

Model	QE	QE_df	QE_p	QM	QM_df	QM_p	QM_QT
<b>Summary</b>							
Non-native	1013.0	485	0.0e+00	32.680	1	0.0000000	0.031260
Native	925.8	654	0.0e+00	1.573	1	0.2097000	0.001697
<b>Region</b>							
Non-native	871.4	485	0.0e+00	71.990	11	0.0000000	0.076320
Native	841.8	654	3.0e-07	32.480	10	0.0003331	0.037150
<b>Duration since first C app</b>							
Non-native	959.4	486	0.0e+00	60.610	9	0.0000000	0.059420
Native	884.8	654	0.0e+00	13.620	9	0.1364000	0.015160
<b>Duration since last C app</b>							
Non-native	954.6	487	0.0e+00	64.110	9	0.0000000	0.062940
Native	883.2	654	0.0e+00	23.030	9	0.0061220	0.025420
<b>C type</b>							
Non-native	948.4	487	0.0e+00	42.870	12	0.0000238	0.043240
Native	814.0	654	5.6e-06	56.400	11	0.0000000	0.064800
<b>C rate</b>							
Non-native	879.8	464	0.0e+00	72.930	14	0.0000000	0.076540
Native	799.4	638	2.6e-06	41.870	14	0.0001297	0.049770
<b>Total C applications</b>							
Non-native	956.7	487	0.0e+00	49.720	7	0.0000000	0.049400
Native	875.6	654	0.0e+00	12.450	7	0.0867700	0.014020
<b>Months applying C</b>							
Non-native	890.9	487	0.0e+00	98.500	7	0.0000000	0.099550
Native	866.5	654	0.0e+00	19.860	7	0.0058790	0.022410
<b>Grass/forb/shrub</b>							
Non-native	1003.0	487	0.0e+00	48.880	4	0.0000000	0.046450
Native	909.1	654	0.0e+00	10.630	4	0.0310600	0.011560
<b>Annual/perennial</b>							
Non-native	1034.0	487	0.0e+00	33.070	4	0.0000012	0.030980
Native	918.8	654	0.0e+00	4.090	5	0.5365000	0.004432
<b>Annual/perennial and grass/forb/shrub</b>							
Non-native	973.9	487	0.0e+00	68.770	10	0.0000000	0.065950
Native	881.2	654	0.0e+00	37.230	13	0.0003817	0.040530
<b>Plot size</b>							
Non-native	937.3	481	0.0e+00	37.840	11	0.0000833	0.038800
Native	824.1	648	9.0e-07	18.570	10	0.0461400	0.022030
<b>Seeding of native</b>							
Non-native	1005.0	486	0.0e+00	33.420	2	0.0000001	0.032190
Native	894.7	654	0.0e+00	10.240	2	0.0059620	0.011320

*QE*, unexplained heterogeneity (dispersion); *QE\_df*, corresponding degrees of freedom; *QE\_p*, corresponding p-value; *QM*, heterogeneity explained by the model; *QM\_df*, corresponding degrees of freedom; *QM\_p*, corresponding p-value; *QM/QT*, proportion of observed (total) heterogeneity explained by the model.