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Plant-soil feedbacks: A meta-analytical review

Andrew Kulmatiski[1*], Karen H. Beard[1] and Stephanie Cobbold[2]

Department of Wildland Resources and the Ecology Center, Utah State University, Logan, UT 84322-5230, USA

Department of Biology and the Ecology Center, Utah State University, Logan, UT 84322-5305, USA

Correspondence: Email: andrewkulmatiski@hotmail.com, Phone: 435-770-9646; Fax: 435-797-3796

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ABSTRACT

Recent studies suggest that plant-soil feedbacks (PSFs) may provide mechanisms for plant diversity, succession, and invasion. To determine whether there is general support for these hypotheses, we conducted a meta-analysis of PSF experiments, determining effect sizes among plant types, ecosystems, and experimental approaches. Overall, PSFs had a medium negative effect size, indicating that most plants create soils that decrease growth of conspecifics. PSFs were very large and negative for annual and early-successional species, supporting the hypothesis that PSFs maintain diversity by accelerating species replacement (e.g., succession). Across all studies, non-native plants did not benefit from PSFs; however, in studies that measured non-native and native PSFs in the same study system, non-natives did benefit from PSFs. In a comparison of life-forms, grasses demonstrated more negative PSFs than forbs, shrubs, and trees. A review of PSF methodologies showed that experiments using sterilized/inoculated soils, greenhouse conditions, and manipulative experiments to cultivate soils exaggerated PSFs compared to experiments that used whole field soils, field conditions, and natural experiments to cultivate soils, respectively. Our findings provide broad support for the role of PSFs in plant community assembly, but also underscore the need for expanded testing under field conditions.

INTRODUCTION

In the last five years, there has been a rapid increase in theoretical and experimental plant-soil feedback (PSF) research. This research has suggested that PSFs are an under-explored factor that can determine plant abundance, persistence, invasion, and succession (Bever 1994, 2003; Callaway *et al.* 2004b; Ehrenfeld 2005; Kardol *et al.* 2007). Because of the growing appreciation for the role of PSFs, it is now possible to use a meta-analytical approach to test theoretical predications regarding the role of PSFs in plant community assembly across species and ecosystem types. However, differences in methodologies among studies require that previously untested biases associated with these methodologies also be examined.

Which species, processes, and ecosystems are most likely to be affected by PSFs?

Research in successional and invaded plant communities has dominated PSF research. Some of the first PSF studies were performed in successional dunegrass communities (van der Putten *et al.* 1988; van der Putten *et al.* 1991). Results from these and subsequent studies have lead to two competing hypotheses regarding the role of PSFs in succession. The first hypothesis grew from the observation that enemy accumulation encourages species replacements. This hypothesis suggests that negative PSFs accelerate succession in early-successional communities while positive feedbacks encourage persistence in late-successional communities (Kardol *et al.* 2006, Kardol *et al.* 2007). Theoretical models of PSFs lend support to this hypothesis because they have demonstrated that negative feedbacks maintain plant diversity as a result of sequential or reciprocal species replacements, and positive feedbacks decrease plant diversity as a result of positive frequency dependence (Bever *et al.* 1997).

Alternatively, a second hypothesis predicts that PSFs are positive early in succession and become more negative later in succession (Reynolds *et al.* 2003). In this hypothesis, symbioses are assumed to be critical to plant growth in high stress (i.e., early-successional, high latitude, and high altitude) growth conditions (Reynolds *et al.* 2003). As plant growth increases across successional sequences, pathogen accumulation is expected to produce negative PSFs (Reynolds *et al.* 2003). Few studies have explicitly addressed the role of PSFs in successional systems, but many PSF experiments have been performed on early-, mid-, and late-successional plant species. A review of published data, therefore, can be expected to identify patterns of PSFs across successional sequences in a wide array of ecosystems.

PSFs have also gained attention as a mechanism that could explain the abundance and persistence of non-native, invasive plants (Reinhart & Callaway 2006). More specifically, soils in adoptive habitats are expected to be relatively enemy-free and symbiont-rich because root herbivores and pathogens have not co-evolved to specialize on non-native species while common symbionts are generalists (Callaway & Aschehoug 2000). If non-native plants can perpetuate or accentuate these conditions, then a positive, or less negative, PSF will result (Klironomos 2002; Reinhart & Callaway 2004; Kulmatiski *et al.* 2006). Thus, if PSFs are a common mechanism of non-native plant invasion, then invasive plants would be expected to demonstrate positive, or less negative, PSFs than native plants.

As more research addresses the role of PSFs, it is becoming possible to determine whether there is broad support for these hypotheses. In addition, it is becoming possible to determine if PSFs are important for certain plant functional groups or in particular ecosystems.

Up to this point, there has been little discussion of the potential differences in PSFs among different plant functional groups or ecosystems, although it might be expected that there are differences. For example, some plant functional groups, such as annuals or grasses, may be more susceptible to belowground enemies and hence more likely to experience negative PSFs than other functional groups.

Measuring PSFs

PSF research is founded on two concepts: 1) plants cause species-specific changes to soils, and 2) plants demonstrate species-specific responses to these changes (Bever 1994; Ehrenfeld *et al.* 2005). Thus, a PSF experiment incorporates two phases. In Phase I, soils are cultivated by known plant species. In Phase II, plants are grown on self-cultivated (self) and non-self-cultivated (other) soils. The difference in plant growth between these two soil types is a measure of PSF. Researchers have used many different methods to conduct PSF experiments. These different methods were developed to address particular questions but often have limitations (Kulmatiski & Kardol 2007). These methods, therefore, need to be examined to determine if there are consistent methodological biases.

Soils in Phase I, for example, have been cultivated by naturally occurring plants (natural experiment) or by experimentally-grown plants (manipulative experiment). The natural experiment approach reduces the length of the experiment compared to the manipulative approach, and may reflect more natural soil conditions, but is susceptible to uncontrolled differences among sampling sites (Baack *et al.* 2006; Ellis & Weis 2006). Plants in Phase I have been grown in either field-collected soils (‘whole’ soils) or in homogenized, sterilized soils that have been inoculated with field soils (‘inoculated’ soils). Plants are grown on sterilized, inoculated soils to isolate plant-microbe feedbacks from plant-nutrient feedbacks (Bever 1994). This approach allows controlled tests of microbial feedbacks, but may not reflect plant-microbe feedbacks in field soils, because field soils contain large, diverse microbial communities (Troelstra *et al.* 2001; Ehrenfeld 2003; Sanchez-Moreno & Ferris 2007).

In Phase II, ‘other’ soils have been either sterilized soils or soils cultivated by other plant species. The use of sterilized soils provides information about a plant’s relationship to its own soil, but does not provide information about how different plant species respond to each other’s soils. Plant growth of the target species in Phase II has been measured using a single individual, multiple individuals, or individuals of the target species within plant communities. Similarly, most research has measured species-level PSFs, but two recent studies have attempted to measure whole plant community responses to differently cultivated soils (Kulmatiski *et al.* 2006; Kardol *et al.* 2007). PSFs measured using individual plants or individual species may isolate PSF effects on that species, but it is not known if PSFs would be smaller or larger in plant communities.

This study used a meta-analytical approach to address the following questions: 1) Do early-successional species realize more negative feedbacks than late-successional species? 2) Do natives realize more negative feedbacks than non-natives? 3) Do PSFs differ among life forms (i.e., grass, forb, shrub, or tree) or ecosystems? and 4) Do differences in experimental approaches influence PSFs? More specifically, 5) Do natural and manipulative experiments produce different PSFs? 6) Do inoculation and self-sterilized techniques over-estimate PSFs? 7) Does competition in Phase II growth exaggerate PSFs?, and 8) Do single plant species and plant communities respond similarly to changes in the soil?

METHODS

Our meta-analysis included studies that measured the effects of 'self' and 'other' soils on plant growth of target species. Self soils were soils that were either experimentally cultivated by a target species or field-collected in an area that was described as dominated or co-dominated by the target species. Other soils were soils that have been sterilized or cultivated by non-target plant species. This simple ruleset for data collection provided a robust basis for the meta-analytical approach (Lortie & Callaway 2006).

All manuscripts were located by searching keywords in Web of Science for the terms "plant, soil and feedback", "soil, feedback and experiment", or "plant, soil and transplant", examining references within, and by obtaining unpublished data. We excluded manuscripts that examined only the effects of components of the soil community (e.g., pathogens, fungi, or mycorrhizae), (2) only examined N-fixing species, because these were expected to produce a sampling bias toward positive PSFs, or (3) focused solely on agricultural systems.

We treated experiments where investigators subjected different species to the same treatments, or the same species to different treatments as separate experiments (Gurevitch & Hedges 1999; Gurevitch & Hedges 2001). Different measures on the same experiment were excluded. Aboveground biomass was the most commonly used response variable. Where other response variables were reported, the response variable that linked best to aboveground plant growth was used.

Successional stages were determined using the following rules. Annuals, biennials, and short-lived perennials were defined as early successional; species were defined as mid-successional only if the authors defined them as such; species described as dominant in their ecosystem were defined as late successional; and species not assigned to any of these classes were defined as unknown. Other classifications, such as life form, ecosystem type, and native or non-native, were derived directly from manuscripts. In a separate analysis conducted only on studies that were performed in the US, plant species were assigned to native, non-native, weedy, and noxious classes according to listings by the USDA Plants Database (http://plants.usda.gov/index.html), which only lists US species. Appendices A and B list the complete dataset.

To determine if plant growth differed between self and other soils, mixed model meta-analyses were performed (Gurevitch & Hedges 2001). For each experiment, we calculated an effect size, Hedges' *d* (Hedges & Olkin 1985):

$$d = \frac{\overline{X}_{\mathrm{E}} - \overline{X}_{\mathrm{C}}}{\mathrm{SD}_{\mathrm{pooled}}} J$$

where X_{C} is the mean of growth on 'other' and X_{E} is the growth on 'self'. The pooled standard deviation is given by:

$$\mathrm{SD}_{\mathrm{pooled}} = \sqrt{\frac{(n_{\mathrm{E}} - 1)(\mathrm{SD}_{\mathrm{E}})^2 + (n_{\mathrm{C}} - 1)(\mathrm{SD}_{\mathrm{C}})^2}{n_{\mathrm{E}} + n_{\mathrm{C}} - 2}}$$

where SD is the standard deviation of the self (E) or other (C) group, and *n* is the sample size. In the expression for *d*, *J* corrects for bias because of different sample sizes by differentially weighting studies as follows:

$$J = 1 - \frac{3}{4(n_{\mathrm{C}} + n_{\mathrm{E}} - 2) - 1}$$

One can think of the effect size *d* as the difference between the species' growth on their own and other soil, measured in units of standard deviations (analogous to a *t* statistic). A positive value of *d* indicates that plants grow better on 'self' soils than on 'other' soils, whereas a negative *d* indicates that plants grow better on 'other' soils than 'self' soils. Thus, the direction of *d* is consistent with the direction of PSFs.

We combined the effect sizes of individual studies to produce a cumulative effect size d_{i+}*, where larger studies are counted more heavily than smaller studies, assuming that larger sample sizes yield more precise results. We used the conventional interpretation of the magnitude of the effect size provided by Cohen (1969), where 0 indicates no effect, 0.2 is a small effect, 0.5 is medium, 0.8 is large, and 1.0 indicates a very large effect. Large differences and low variability generate the largest effect sizes. Effect sizes were judged statistically significant if the 95% confidence intervals of the effect size excluded 0.

We performed a between-class homogeneity statistical test (Q_B*) to test the null hypothesis that effect sizes were equal among classes against the alternative hypothesis that at least one true effect size was different. We evaluated the statistical significance of the Q_B* test using a standard chi-squared table. Formula for calculating d_{i+}* and $Q*_B$, are outlined in Gurevitch and Hedges (2001).

RESULTS

The full dataset included 290 experiments from 38 independent studies of which 33 (87%) were conducted after 2001 (Tables 1 and 2). Unless indicated, analyses were conducted using a smaller subset of 276 experiments and 36 studies, and excluded the two studies investigating whole plant community responses, which were analyzed separately. Where possible, analyses were conducted on the subset of studies that included all classes being compared.

We found that plants, in general, had a medium, negative effect size ($d_{++} = -0.63$, $n = 276$)(Fig. 1). However, effect sizes differed by the length of the plant's life cycle ($Q_B = 16.28$, df = 2, $P < 0.001$). Annuals had a very large, negative effect size ($d_{i+} = -1.22$) whereas biennials and perennials had medium, negative effect sizes ($d_{i+} = -0.61$, $d_{i+} = -0.53$, respectively)(Fig. 2A).

Most studies were conducted using either forbs or grasses, followed by trees and then shrubs. Grasses had the most negative effect size followed by forbs, shrubs, and trees ($Q_B = 15.11$, df = 3, $P < 0.01$)(Fig. 2A). Most experiments were conducted using species from grassland ecosystems ($n = 197$), but some were conducted using species from forest ($n = 41$), shrub-steppe ($n = 21$), alpine ($n = 4$), desert ($n = 2$), dunegrass ($n = 7$), and wetland ($n = 4$) ecosystems. Conducting an analysis using only species collected from grassland, forest, and shrub-steppe, we found that effect sizes for species from grasslands were large and negative ($d_{i+} = -0.77$), whereas effect sizes for species from either forests or shrub-steppe did not differ from zero ($Q_B = 29.88$, df = 2, $P < 0.001$).

The analysis on successional stage was only conducted on grassland species (215 experiments, 22 studies) because of the difficulty in determining successional stage for species in other systems. We found that effect sizes differed by successional stages ($Q_B = 15.92$, df = 3, $P < 0.01$), and that early-successional species had very large, negative effect sizes ($d_{i+} = -1.27$), mid-successional species had large, negative effect size ($d_{i+} = -0.71$), and late successional species were not different than zero (Fig 2B).

When all studies were included, the effect size of natives ($d_{i+} = -0.62$, $n = 194$) and non-natives ($d_{i+} = -0.64$, $n = 82$) were medium and negative, and not significantly different from one another ($Q_B = 0.04$, df = 1, $P > 0.05$). However, when the analysis was only performed on the 11 studies that included both natives and non-natives, natives demonstrated a large, negative effect size (d_{i+} = -0.95, n = 96) compared to the medium negative effect size of non-natives (d_{i+} = -0.58, n = 74) (Q_B = 5.06, df = 1, $P < 0.05$). When the same dataset was restricted to natives and non-natives, which could be categorized as non-native, weedy, or noxious (137 experiments, 5 studies), we found that there was a difference between classes with natives having a large, negative effect size (d_{i+} = -1.12) compared to noxious weeds having only a medium, negative effect size (d_{i+} = -0.48)(Q_B = 9.01, df = 3, $P < 0.05$)(Fig. 2B).

Experimental approaches greatly influenced effect sizes. For example, a test conducted on the importance of experimental venue showed that effect sizes were medium and negative in the greenhouse (d_{i+} = -0.68) whereas effect sizes for experiments performed in the field did not differ from zero (Q_B = 10.60, df = 1, $P < 0.01$)(Fig 3A).

We also determined that effect sizes differed depending on whether the cultivation of soil in Phase I was a manipulative or natural experiment; effect sizes were larger for manipulative (d_{i+} = -0.80) than natural experiments (d_{i+} = -0.36)(Q_B = 13.43, df = 1, $P < 0.001$)(Fig 3A). We conducted a test to determine if the media used in Phase I, whether sterilized and inoculated or whole soil, influenced effect size. We found that inoculated media had a large, negative effect size (d_{i+} = -0.79), whereas whole soil had a medium, negative effect size (d_{i+} = -0.52) (Q_B = 4.45, df = 1, $P < 0.05$)(Fig 3B).

We also compared how the “self-other” and “self-sterilized” methods influenced effect size. Both approaches produced negative effect sizes (d_{i+} = -0.61 and -0.70; n = 219 and n = 57, respectively) and were not significantly different (Q_B = 0.35, df = 1, $P > 0.05$). However, when a comparison of the techniques was made using only the studies that performed both techniques (89 experiments, 10 studies), the “self-sterilized” method had a medium, negative effect size (d_{i+}

= -0.65), whereas the "self-other" method had an effect size that did not differ from zero (Q_B = 5.62, df = 1, $P < 0.05$)(Fig 3B).

We determined that plant neighborhood in Phase II influenced effect size (Q_B = 21.23, df = 2, $P < 0.001$). Studies that measured Phase II plant growth using multiple individuals per experimental unit (intraspecific competition) demonstrated very large, negative effect sizes (d_{i+} = -1.07) compared to studies that measured plant growth using a single individual per experimental unit (d_{i+} = -0.47) or studies that measured plant growth in the presence of other species (interspecific competition; d_{i+} = -0.42)(Fig 3B).

Only two studies measured whole plant community responses to soil differences, and effect sizes were not different from zero (n = 14), even though studies measuring species-level responses had medium, negative effect sizes (d_{i+} = -0.63, n = 276) (Q_B = 7.28, df = 1, $P < 0.01$).

DISCUSSION

Most plants and all treatment classes realized negative or neutral PSFs. As a result, the average effect size of PSFs on plant growth was -0.63. This effect size on plant growth was larger than those observed in meta-analyses of leaf-litter addition (Xiong & Nilsson 1999), seed limitation (Clark *et al.* 2007), and seed feeders (Morris *et al.* 2007); similar to those observed in meta-analyses of aboveground herbivores, total herbivores, viruses, leaf chewers, root feeders (Morris *et al.* 2007), and soil warming (Rustad *et al.* 2001); and smaller than those observed in meta-analyses of biotic resistance (Levine *et al.* 2004), belowground herbivores, pathogens, pathogenic fungi, and nematodes (Morris *et al.* 2007).

PSFs may be even more important than suggested by these comparisons because both positive (25% of experiments) and negative PSFs were observed, while most effect sizes in other meta-analyses were in one direction. For example, competitors rarely facilitated growth in the meta-analysis of biotic resistance so nearly all effect sizes of biotic resistance were negative (Levine *et al.* 2004). The absolute value of effect size provides an estimate of effect size that is not affected by the sign of the value. The average absolute value of effect sizes in this meta-analysis was 1.24, which is comparable to the effect of biotic resistance (Levine *et al.* 2004). In summary, this review indicates that, relative to many other plant growth factors, PSFs are important.

Plant types

Annuals and early-successional species realized very large negative PSFs and perennials and late-successional species realized significantly less negative PSFs. This contradicts the hypothesis that PSFs will become more important and more negative across successional sequences (Reynolds *et al.* 2003), and provides widespread support for the hypothesis that negative PSFs increase the rate of succession (Van der Putten 1997; Kardol *et al.* 2007). Because early-successional species, which typically demonstrate the greatest maximum growth rates, were found to be most susceptible to negative PSFs, the results also support the idea that there is an inherent trade-off between enemy defense and fast growth rates, as has been observed in above-ground systems (Coley *et al.* 1985).

In the comparisons of PSFs among different plant life-forms and ecosystems, we found that grasses and grasslands demonstrated the most negative effect sizes. To explain grass sensitivity to belowground enemies, we suggest that high growth rates, high root:shoot ratios, greater root longevity, and a larger proportion of roots near the soil surfaces increase grass exposure to belowground enemies (Gleeson & Tilman 1994; Schenk & Jackson 2002; Wilsey & Polley 2006). Because woody plants did not have large negative PSFs (this study), and they are not as affected by biotic resistance (Levine *et al.* 2004) or pathogens (Morris *et al.* 2007), woody plants appear to be less sensitive to belowground enemies and competitors than herbaceous plants.

Non-native plants

Identifying mechanisms of non-native plant success is a central theme in invasion ecology. Several studies suggest that PSFs may explain how non-native, invasive plants maintain dense, persistent populations (Klironomos 2002; Agrawal *et al.* 2005; Kulmatiski 2006; Reinhart & Callaway 2006). This review, however, found that non-natives, in general, do not benefit from PSFs relative to natives. It should be noted, however, that non-natives were comprised of a larger proportion of early-successional species (90%) than natives (47%). Thus, because early-successional species demonstrated some of the most negative PSFs, non-native PSFs were actually less negative than expected based on their successional stage. Because species with less negative PSF are thought to outcompete species with more negative PSFs (Bever *et al.* 1997; Eppstein & Molofsky 2007), this suggests that non-natives are more likely to invader early-successional native communities than in late-successional native communities.

To better control our test of PSFs among native and non-native species, we conducted an analysis that included only studies with data for natives and non-natives in the same system

(Lortie & Callaway 2006). Most studies excluded from this conservative dataset examined natives (88%). After removing these studies, the effect size for native plants was more negative. This could not be explained by a difference in the proportion of annuals and perennials because natives were represented by 20 and 24% annuals and 74 and 74% perennials in the conservative and full datasets, respectively. For non-natives, effect size did not differ between the two datasets. The fact that natives had more negative effect sizes in studies that included both native and non-native species indicates that invasion success may be a function of the invaded community and not the invasive plant.

When we further divided this analysis to distinguish PSFs realized by non-native, weedy, and noxious plants from PSFs realized by native plants, we found that noxious non-natives, those of the greatest concern, had the least negative effect sizes. Thus, to summarize, in general native and non-native plant effect sizes do not differ, but in studies that examine both natives and non-natives, native communities are more susceptible to invasion (i.e., have more negative effect sizes). Within these communities, the worst invaders benefit the most from PSFs.

Results from this meta-analysis and other reviews of plant invasions indicate that invasion success is correlated with early-successional plant traits (Rejmanek 1996; Reichard & Hamilton 1997; Prinzing *et al.* 2002). This raises an interesting question: why would species with the most negative PSFs, and therefore, the least ability to maintain dense, persistent populations become the most successful invaders? We suggest that early-successional species have the most to gain from enemy release because growth of these species is controlled by enemies. In contrast, late-successional species are likely to dedicate large amounts of resources to constitutive defenses. These defenses should decrease the benefit of release from enemies and also preclude rapid growth responses.

Implications of different experimental methods

Controlled experiments produced different results than less-controlled, more natural experiments. More specifically, experiments using sterilized soil, inoculated soil, and greenhouse conditions produced larger effect sizes than experiments using 'other' soil, whole field soil, and field conditions, respectively. Similarly, the manipulative-experiment method produced larger effect sizes than the natural-experiment method. Highly controlled experiments have similarly been found to produce larger effect sizes in studies of enemy and mutualist effects on plants (Morris *et al.* 2007). These findings contradict the suggestion that PSFs will be more important in microbially-rich soils (Reynolds *et al.* 2003). Rather, it appears that microbially-rich soils provide functional redundancy and disease suppressiveness that minimizes the importance of PSFs (Sanchez-Moreno & Ferris 2007).

Plant community-level PSFs

Plant communities were used in two types of feedback experiments. In the first type, species-level responses of plants grown alone, in monocultures (intraspecific competition), or in mixed communities (interspecific competition) were compared. PSFs of plants grown in monocultures produced the largest (i.e., most negative) feedback effects. This suggests that intraspecific competition exaggerates PSFs relative to PSFs measured on plants grown alone or with other species (Kardol *et al.* 2007).

In the second type, PSFs were assessed using whole plant communities (Kulmatiski *et al.* 2006; Kardol *et al.* 2007). These studies measured the biomass response of all plant species grown on self and other soils. Conclusions drawn from two studies should be taken with caution, but community-level PSFs produced the only class of data for which the mean effect size was positive (0.22), though not significantly different from zero. In contrast, species-level PSFs, as already described, were medium and negative (-0.63).

PSF models of interacting species provide some insight into why community-level responses may be less negative than species-level responses. Bever *et al.* (1997) demonstrated that for two species to coexist plant growth on 'other' soil had to be greater than plant growth on 'self' soil, otherwise the species that benefits most from its own growth will competitively exclude the other. From this, we might expect that co-existing species in a community grow better than species in a monoculture. Our data supports the idea that community-level PSF are less negative than individual-level PSFs.

CONCLUSIONS

Plants, in general, realized negative PSFs. Negative PSFs are predicted to encourage species replacements and therefore increase plant diversity and successional processes. Consistent with these model predictions, we found that annual and early-successional species realized the most negative PSFs. Among plant types, grasses and grasslands realized the most negative PSFs. We suggest that this may reflect greater growth rates and exposure to belowground enemies, though further research is needed to address these hypotheses. Non-native plants, in general, did not benefit from PSFs, though they did demonstrate less negative PSFs than native plants in the systems that they invade.

We also found that controlled experimental conditions produced large and negative effect sizes relative to more natural conditions. We suggest that PSFs measured in controlled conditions are likely to differ from PSFs measured in the field for two reasons. First, microbial communities in the field are large and diverse relative to the small microbial communities used as inocula in controlled experiments. Second, plants in the field grow in communities, not monocultures. Both these conditions are likely to produce less negative effect sizes in the field. Thus, formal tests of PSFs under field conditions are needed to provide a link between a growing body of theoretical and greenhouse-derived data, and plant growth on the landscape.

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LITERATURE CITED

Agrawal A.A., Kotanen P.M., Mitchell C.E., Power A.G., Godsoe W. & Klironomos J. (2005) Enemy release? An experiment with congeneric plant pairs and diverse above- and belowground enemies. *Ecology*, 86, 2979-2989

Baack E.J., Emery N.C. & Stanton M.L. (2006) Ecological factors limiting the distribution of *Gilia tricolor* in a California grassland mosaic. *Ecology*, 87, 2736-2745

Beckstead J. & Parker I.M. (2003) Invasiveness of *Ammophila arenaria*: Release from soil-borne pathogens? *Ecology*, 84, 2824-2831

Belnap J., Phillips S.L., Sherrod S.K. & Moldenke A. (2005) Soil biota can change after exotic plant invasion: does this affect ecosystem processes? *Ecology*, 86, 3007-3017

Bever J.D. (1994) Feedback between plants and their soil communities in an old field community. *Ecology*, 75, 1965-1977

Bever J.D. (2003) Soil community feedback and the coexistence of competitors: conceptual frameworks and empirical tests. *New Phytologist*, 157, 465-473

Bever J.D., Westover K.M. & Antonovics J. (1997) Incorporating the soil community into plant population dynamics: the utility of the feedback approach. *Journal of Ecology*, 85, 561-573

Bezemer T.M., Harvey J.A., Kowalchuk G.A., Korpershoek H. & Van der Putten W.H. (2006a) Interplay between *Senecio jacobaea* and plant, soil, and aboveground insect community composition. *Ecology*, 87, 2002-2013

Bezemer T.M., Lawson C.S., Hedlund K., Edwards A.R., Brook A.J., Igual J.M., Mortimer S.R. & Van der Putten W.H. (2006b) Plant species and functional group effects on abiotic and microbial soil properties and plant-soil feedback responses in two grasslands. *Journal of Ecology*, 94, 893-904

Bodelier P.L.E., Stomp M., Santamaria L., Klaassen M. & Laanbroek H.J. (2006) Animal-plant-microbe interactions: direct and indirect effects of swan foraging behaviour modulate methane cycling in temperate shallow wetlands. *Oecologia*, 149, 233-244

Bonanomi G. & Mazzoleni S. (2005) Soil history affects plant growth and competitive ability. *Community Ecology*, 6, 23-28

Bonanomi G., Rietkerk M., Dekker S.C. & Mazzoleni S. (2005) Negative plant-soil feedback and positive species interaction in a herbaceous plant community. *Plant Ecology*, 181, 269-278

Callaway R.M. & Aschehoug E.T. (2000) Invasive plants versus their new and old neighbors: A mechanism for exotic invasion. *Science*, 290, 521-523

Callaway R.M., Thelen G.C., Barth S., Ramsey P.W. & Gannon J.E. (2004a) Soil fungi alter interactions between the invader *Centaurea maculosa* and North American natives. *Ecology*, 85, 1062-1071

Callaway R.M., Thelen G.C., Rodriguez. A. & Holben W.E. (2004b) Soil biota and exotic plant invasion. *Nature*, 427, 731-733

Casper B.B. & Castelli J.P. (2007) Evaluating plant-soil feedback together with competition in a serpentine grassland. *Ecology Letters*, 10, 394-400

Clark C.J., Poulsen J.R., Levey D.J. & Osenberg C.W. (2007) Are plant populations seed limited? A critique and meta-analysis of seed addition experiments. *American Naturalist*, 170, 128-142

Cohen J. (1969) *Statistical power analysis for the behavioral sciences*. Academic Press, New York.

Coley P.D., Bryant J.P. & Chapin F.S. (1985) Resource availability and plant antiherbivore defense. *Science*, 230, 895-899

De Deyn G.B., Raaijmakers C.E. & Van der Putten W.H. (2004) Plant community development is affected by nutrients and soil biota. *Journal of Ecology*, 92, 824-834

Ehlers B.K. & Thompson J. (2004) Do co-occuring plant species adapt to one another? The response of *Bromus erectus* to the presence of different *Thymus vulgaris* chemotypes. *Oecologia*, 141, 511-518

Ehrenfeld J.G. (2003) Effects of exotic plant invasions on soil nutrient cycling processes. *Ecosystems*, 6, 503-523

Ehrenfeld J.G., Ravit B. & Elgersma K. (2005) Feedback in the plant-soil system. *Annual Review of Environment and Resources*, 30, 75-115

Ellis A.G. & Weis A.E. (2006) Coexistence and differentiation of 'flowering stones': the role of local adaptation to soil microenvironment. *Journal of Ecology*, 94, 322-335

Eppstein M.J. & Molofsky J. (2007) Invasiveness in plant communities with feedbacks. *Ecology Letters*, 10, 253-263

Gillespie I.G. & Allen E.B. (2006) Effects of soil and mycorrhizae from native and invaded vegetation on a rare California forb. *Applied Soil Ecology*, 32, 6-12

Gurevitch J. & Hedges L.V. (1999) Statistical issues in ecological meta-analyses. *Ecology*, 80, 1142-1149

Gurevitch J. & Hedges L.V. (2001) Meta-analysis: combining the results of independent experiments. In: *Design and Analysis of Ecological Experiments* (eds. Scheiner SM & Gurevitch J), pp. 347-369. Oxford Press, Oxford

Gustafson D.J. & Casper B.B. (2004) Nutrient addition affects AM fungal performance and expression of plant/fungal feedback in three serpentine grasses. *Plant and Soil*, 259, 9-17

Hedges L.V. & Olkin I. (1985) *Statistical methods for meta-analysis*. Academic Press, San Diego.

Holah J.C. & Alexander H.M. (1999) Soil pathogenic fungi have the potential to affect the co-existence of two tallgrass prairie species. *Journal of Ecology*, 87, 598-608

Kardol P., Bezemer T.M. & van der Putten W.H. (2006) Temporal variation in plant-soil feedback controls succession. *Ecology Letters*, 9, 1080-1088

Kardol P., Cornips N.J., Van Kempen M.L., Bakx-Shotman J.M. & Van der Putten W.H. (2007) Microbe-mediated plant-soil feedback causes historical contingency effects in plant community assembly. *Ecological Monographs*, 77, 147–162

Klironomos J.N. (2002) Feedback with soil biota contributes to plant rarity and invasiveness in communities. *Nature*, 417, 67-70

Knevel I.C., Lans T., Menting F.B.J., Hertling U.M. & van der Putten W.H. (2004) Release from native root herbivores and biotic resistance by soil pathogens in a new habitat both affect the alien *Ammophila arenaria* in South Africa. *Oecologia*, 141, 502-510

Kulmatiski A. (2006). Exotic plants establish persistent communities. *Plant Ecology*. 187:261-275.

Kulmatiski A., Beard K.H. & Stark J.M. (2006) Soil history as a primary control on plant invasion in abandoned agricultural fields. *Journal of Applied Ecology*, 43, 868-876

Kulmatiski A. & Kardol P. (2007) Getting plant-soil feedbacks out of the greenhouse: experimental and conceptual approaches. In: *Progress in Botany* vol. 69 (eds. Esser K, Lüttge UE, Beyschlag W & Murata J). Springer

Levine J.M., Adler P.B. & Yelenik S.G. (2004) A meta-analysis of biotic resistance to exotic plant invasions. *Ecology Letters*, 7, 975-989

Lortie C.J. & Callaway R.M. (2006) Re-analysis of meta-analysis: support for the stress-gradient hypothesis. *Journal of Ecology*, 94, 7-16

Meiman P.J., Redente E.F. & Paschke M.W. (2006) The role of native soil community in the invasion ecology of spotted (*Centaurea maculosa* auct. non Lam.) and diffuse (*Centaurea diffusa* Lam.) knapweed. *Applied Soil Ecology*, 32, 77-88

Morris C., Call C.A., Monaco T.A., Grossl P.R. & Dewey S.A. (2006) Evaluation of elemental allelopathy in *Acroptilon repens* (L.) DC. (Russian Knapweed). *Plant and Soil*, 289, 279-288

Morris W.F., Hufbauer R.A., Agrawal A.A., Bever J.D., Borowicz V.A., Gilbert G.S., Maron J.L., Mitchell C.E., Parker I.M., Power A.G., Torchin M.E. & Vazquez D.P. (2007) Direct and interactive effects of enemies and mutualists on plant performance: a meta-analysis. *Ecology*, 88, 1021-1029

Niu H.-b., Liu W.-x., Wan F.-h. & Liu B. (2007) An invasive aster (*Ageratina adenophora*) invades and dominates forest understories in China: altered soil microbial communities facilitate the invader and inhibit natives. *Plant and Soil*

Packer A. & Clay K. (2000) Soil pathogens and spatial patterns of seedling mortality in a temperate tree. *Nature*, 404, 278-281

Peltzer D.A. (2001) Plant responses to competition and soil origin across a prairie-forest boundary. *Journal of Ecology*, 89, 176-185

Prinzing A., Durka W., Klotz S. & Brandl R. (2002) Which species become aliens? *Evolutionary Ecology Research*, 4, 385-405

Puerta-Pinero C., Gomez J.M. & Zamora R. (2006) Species-specific effects on topsoil development affect *Quercus ilex* seedling performance. *Acta Oecologica*, 29, 65-71

Reichard S.H. & Hamilton C.W. (1997) Predicting invasions of woody plants introduced into North America. *Conservation Biology*, 11, 193-203

Reinhart K.O. & Callaway R.M. (2004) Soil biota facilitate exotic *Acer* invasions in Europe and North America. *Ecological Applications*, 14, 1737-1745

Reinhart K.O. & Callaway R.M. (2006) Soil biota and invasive plants. *New Phytologist*, 170, 445-457

Reinhart K.O., Greene E. & Callaway R.M. (2005a) Effects of *Acer platanoides* invasion on understory plant communities and tree regeneration in the northern Rocky Mountain. *Ecography*, 28, 573-582

Reinhart K.O., Packer A., Van der Putten W.H. & Clay K. (2003) Plant-soil biota interactions and spatial distribution of black cherry in its native and invasive ranges. *Ecology Letters*, 6, 1046-1050

Reinhart K.O., Royo A.A., Van der Putten W.H. & Clay K. (2005b) Soil feedback and pathogen activity in *Prunus serotina* throughout its native range. *Journal of Ecology*, 93, 890-898

Rejmanek M. (1996) A theory of seed plant invasiveness: The first sketch. *Biological Conservation*, 78, 171-181

Reynolds H.L., Packer A., Bever J.D. & Clay K. (2003) Grassroots ecology: plant-microbe-soil interactions as drivers of plant community structure and dynamics. *Ecology*, 84, 2281-2291

Rustad L.E., Campbell J.L., Marion G.M., Norby R.J., Mitchell M.J., Hartley A.E., Cornelissen J.H.C. & Gurevitch J. (2001) A meta-analysis of the response of soil respiration, net nitrogen mineralization, and aboveground plant growth to experimental ecosystem warming. *Oecologia*, 126, 543-562

Sanchez-Moreno S. & Ferris H. (2007) Suppressive service of the soil food web: Effects of environmental management. *Agriculture Ecosystems & Environment*, 119, 75-87

Schenk H.J. & Jackson R.B. (2002) Rooting depths, lateral root spreads and below-ground/above-ground allometries of plants in water-limited ecosystems. *Journal of Ecology*, 90, 480-494

Suding K., Larson J., Thorsos E., Steltzer H. & Bowman W. (2004) Species effects on resource supply rates: do they influence competitive interactions? *Plant Ecology*, 175, 47-58

Suguenza C., Corkidi L. & Allen E.B. (2006) Feedbacks of soil inoculum of mycorrhizal fungi altered by N deposition on the growth of a native shrub and an invasive annual grass. *Plant and Soil*, 286, 153-165

Troelstra S.R., Wagenaar R., Smant W. & Peters B.A.M. (2001) Interpretation of bioassays in the study of interactions between soil organisms and plants: involvement of nutrient factors. *New Phytologist*, 150, 697-706

Van der Putten W.H. (1997) Plant-soil feedback as a selective force. *Trends in Ecology & Evolution*, 12, 169-170

Van der Putten W.H., Kowalchuk G.A., Brinkman E.P., Doodeman G.T.A., Van der Kaaij R.M., Kamp A.F.D., Menting F.B.J. & Veenendaal E.M. (2007) Soil feedback of exotic savanna grass relates to pathogen absence and mycorrihizal selectivity. *Ecology*, 88, 978-988

Van der Stoel C.D., van der Putten W.H. & Duyts H. (2002) Development of a negative plant-soil feedback in the expansion zone of the clonal grass *Ammophila arenaria* following root formation and nematode colonization. *Journal of Ecology*, 90, 978-988

Wilsey B.J. & Polley H.W. (2006) Aboveground productivity and root-shoot allocation differ between native and introduced grass species. *Oecologia*, 150, 300-309

Xiong S. & Nilsson C. (1999) The effects of plant litter on vegetation: a meta-analysis. *Journal of Ecology*, 87, 984-994

Table 1. Studies included in the meta-analyses and the number of experiments (means, standard deviations, and sample size for control and experimental groups) extracted from each paper.

Study	Reference	Experiments
1	Agrawal *et al.* 2005	20
2	Beckstead and Parker 2003	1
3	Belnap *et al.* 2005	2
4	Bever 1994	12
5	Bezemer *et al.* 2006a	2
6	Bezemer *et al.* 2006b	13
7	Bodelier *et al.* 2006	4
8	Bonanomi and Mazzoleni 2005a	11
9	Bonanomi *et al.* 2005b	1
10	Callaway *et al.* 2004a	1
11	Callaway *et al.* 2004b	8
12	Casper and Castelli 2007	6
13	De Deyn *et al.* 2004a	13
14	Ehlers and Thompson 2004	1
15	Gillespie and Allen 2006	3
16	Gustafson and Casper 2004	6
\17	Holah and Alexander 1999	4
18	Kardol *et al.* 2006	12
19	Kardol *et al.* 2007	42
20	Klironomos 2002	61
21	Knevel *et al.* 2004	1
22	Kulmatiski *et al.* 2006	2
23	Kulmatiski unpublished data	6
24	Meiman *et al.* 2006	1
25	Morris *et al.* 2006	1
26	Niu et al 2007	8
27	Packer and Clay 2000	4
28	Peltzer 2001	2
29	Puerta-Pinero *et al.* 2006	7
30	Reinhart and Callaway 2004	10
31	Reinhart *et al.* 2003	8
32	Reinhart *et al.* 2005a	2
33	Reinhart *et al.* 2005b	2
34	Suding *et al.* 2004	4
35	Suguenza *et al.* 2006	1
36	Troelstra *et al.* 2001	4
37	Van der Putten *et al.* 2007	3
38	Van der Stoel *et al.* 2002	1
	Total =	290

Table 2. List of references, species origin, the growth form, successional stage, experimental venue, habitat where species were collected, experimental approach (self-other, self-sterilized), whether the test was natural or manipulative, inoculum or whole soil approach, cultivation by monoculture or community in Phase I, length of Phase II, Phase II neighborhood, which indicates whether there was competition, and the response variable measured for each of the 286 experiments. Because some studies had multiple experiments, in some cases, there were multiple treatment levels within a study and these are presented with a backslash.

Author	**Species origin(s), Growth form(s), Successional stage(s), Experimental setting, Habitat, Approach(s), Natural or Manipulative, Inoculum or Whole soil, Phase I Cultivation, Phase II Neighborhood, Response Variable**
Agrawal *et al.* 2005	Native/Non-native, Perennial grass/Annual forb/Biennial forb/Perennial forb, Early/Middle/Late/Unknown, Greenhouse, Grassland, Self-other, Manipulative, Whole soil, Monoculture, Alone, Aboveground
Beckstead & Parker 2003	Non-native, Perennial grass, Early, Greenhouse, Dune grass, Self-sterilized, Field, Whole soil, Monoculture, Intra-specific, Aboveground
Belnap *et al.* 2005	Native, Perennial grass, Unknown, Greenhouse, Desert, Self-other, Field, Whole soil, Monoculture, Intra-specific, Aboveground
Bever 1994	Native, Perennial grass, Late, Greenhouse, Grassland, Self-other/Self-sterilized, Manipulative, Inoculum, Monoculture, Intra-specific, Total biomass
Bezemer *et al.* 2006a	Native, Biennial forb, Early, Greenhouse, Grassland, Self-other, Manipulative, Inoculum, Community, Alone, Total biomass
Bezemer *et al.* 2006b	Native, Perennial grass, Biennial forb, Middle/Late/Unknown, Greenhouse, Grassland, Self-other, Manipulative, Whole soil, Monoculture, Alone, Total biomass
Bodelier *et al.* 2006	Non-native, Perennial forb, Unknown, Greenhouse, Wetland, Self-sterilized, Field, Whole soil, Community, Alone/Intraspecific, Total biomass
Bonanomi & Mazzoleni 2005	Native, Perennial grass/Perennial forb/Perennial shrub, Late/Unknown, Greenhouse, Grassland, Self-other, Manipulative, Whole soil, Monoculture, Alone/Intraspecific/Interspecific, Total biomass
Bonanomi *et al.* 2005	Native, Perennial grass, Late, Greenhouse, Grassland, Self-Other, Field, Whole soil, Monoculture, Alone, Total biomass
Callaway *et al.* 2004a	Non-native, Biennial forb, Early, Greenhouse, Grassland, Self-Other, Field, Inoculum, Community, Alone, Aboveground
Callaway *et al.* 2004b	Native/Non-native, Biennial forb, Early, Greenhouse, Grassland, Self-other/Self-sterilized, Manipulative/Field, Inoculum, Community/Monoculture, Intra-specific, Aboveground
Casper & Castelli 2007	Native, Perennial grass, Middle/Late, Field, Grassland, Self-other, Field, Whole soil, Community, Alone/Inter-specific, Aboveground
De Deyn *et al.* 2004	Native, Annual forb/Perennial grass/Perennial forb, Early/Middle/Late, Greenhouse, Grassland, Self-

	Sterilized, Field, Whole soil, Community, Inter-specific, Aboveground
Ehlers & Thompson 2004	Native, Perennial grass, Unknown, Field, Grassland, Self-other, Field, Whole soil, Community, Intra-specific, Aboveground
Gillespie & Allen 2006	Native, Annual forb, Early, Greenhouse, Grassland, Self-other/Self-sterilized, Field, Inoculum, Community/Monoculture, Alone, Aboveground
Gustafson & Casper 2004	Native, Perennial grass, Middle/Late, Greenhouse, Grassland, Self-other, Field, Inoculum, Community, Alone, Total biomass
Holah & Alexander 1999	Native, Annual forb/Perennial grass, Early/Middle, Greenhouse, Grassland, Self-other/Self-sterilized, Field, Inoculum, Community, Alone, Height/Number of leaves
Kardol *et al.* 2006	Native, Community, Early/Middle/Late, Greenhouse, Grassland, Self-other, Manipulative/Field, Inoculum, Community, Inter-specific, Aboveground
Kardol *et al.* 2007	Native, Annual grass/Annual forb/Perennial grass, Early, Greenhouse, Grassland, Self-other, Manipulative, Inoculum, Monoculture, Intra-specific/Interspecific, Aboveground/Total biomass
Klironomos 2002a	Native/Non-native, Perennial grass/Biennial forb/Perennial forb, Early/Middle/Unknown, Greenhouse, Grassland, Self-other, Manipulative, Whole soil, Monoculture, Alone, Total biomass
Knevel *et al.* 2004	Native, Perennial grass, Early, Greenhouse, Dune grass, Self-sterilized, Field, Inoculum, Monoculture, Alone, Total biomass
Kulmatiski *et al.* 2006	Native/Non-native, Community, Middle/Late, Field, Shrub steppe, Self-other, Field, Whole soil, Community, Community, Plant cover
Kulmatiski, unpubl. Data	Native/Non-native, Annual grass Perennial grass/Biennial forb/Perennial forb, Early/Middle/Late/Unknown, Field, Grassland, Self-other, Field, Whole soil, Community, Community, Aboveground
Meiman *et al.* 2006	Non-native, Biennial forb, Early, Greenhouse, Grassland, Self-other, Field, Whole soil, Community, Alone, Total biomass
Morris *et al.* 2006	Non-native, Perennial forb, Unknown, Greenhouse, Grassland, Self-other, Field, Whole soil, Monoculture, Alone, Total biomass
Niu *et al.* 2007	Native/Non-native, Perennial forb/Perennial grass/Perennial shrub, Early/Unknown, Greenhouse, Forest, Self-other/Self-sterilized, Field, Inoculum, Community, Intra-specific, Total biomass
Packer & Clay 2000	Native, Perennial tree, Unknown, Greenhouse, Forest, Self-sterilized, Manipulative/Field, Inoculum, Community, Alone, Aboveground
Peltzer 2001	Native, Annual grass, Early, Field, Grassland, Self-other, Field, Whole soil, Community, Alone/Interspecifc, Growth
Puerta-Pinero *et al.* 2006	Native, Perennial tree, Late/Unknown, Greenhouse, Forest, Self-other/Self-sterilized, Field, Whole soil, Monoculture, Alone, Total biomass
Reinhart & Callaway 2004	Native/Non-native, Perennial tree, Unknown, Greenhouse, Forest, Self-other/Self-sterilized, Field, Inoculum,

	Community, Alone, Total biomass
Reinhart *et al.* 2003	Native/Non-native, Perennial tree, Middle/Unknown, Greenhouse, Forest, Self-other/Self-sterilized, Field, Inoculum, Community, Alone/Intra-specific, Aboveground
Reinhart *et al.* 2005b	Native, Perennial tree, Middle/Unknown, Greenhouse, Forest, Self-other/Self-sterilized, Field, Inoculum, Community, Intra-specific, Seedling survival %
Reinhart *et al.* 2005a	Native/Non-native, Perennial tree, Middle/Late, Field, Forest, Self-other, Field, Whole soil, Community, Inter-specific, Aboveground
Suding *et al.* 2004	Native, Perennial grass/Perennial forb, Late, Field, Alpine, Self-other, Field, Whole soil, Community, Intra-specific/Inter-specific, Relative abundance/Relative growth
Suguenza *et al.* 2006	Native, Perennial shrub, Late, Greenhouse, Shrub steppe, Self-sterilized, Field, Inoculum, Community, Alone, Total biomass
Troelstra *et al.* 2001	Native, Perennial grass, Unknown, Greenhouse, Dune grass, Self-sterilized, Field, Whole, Community, Alone, Total biomass
Van der Putten *et al.* 2007	Native/Non-native, Annual grass/Perennial grass, Early/Late, Greenhouse, Grassland, Self-sterilized, Field, Inoculum, Monoculture, Intra-specific, Aboveground
Van der Stoel *et al.* 2002	Native, Perennial grass, Early, Greenhouse, Dune grass, Self-sterilized, Field, Inoculum, Monoculture, Intra-specific, Relative total biomass

Figure Legends

Figure 1. Number of plant-soil feedback experiments by effect size. Negative effect sizes suggest that plants grow better on ‘other’ than on ‘self’ cultivated soil. Three outliers beyond -6 are not shown (*n* = 290 experiments).

Figure 2. Effect sizes for experiments separated into (a) length of life cycle and life form classes, and (b) successional stage and species origin. Sample sizes are indicated at the top.

Figure 3. Effect sizes for experiments separated into (a) experimental approach, whether the soils in Phase I are cultivated through a manipulative or natural experiment, and experimental venue, and (b) soil media or volume used in Phase I, soil cultivation method, and target species neighborhood in Phase II. Sample sizes are indicated at the top.

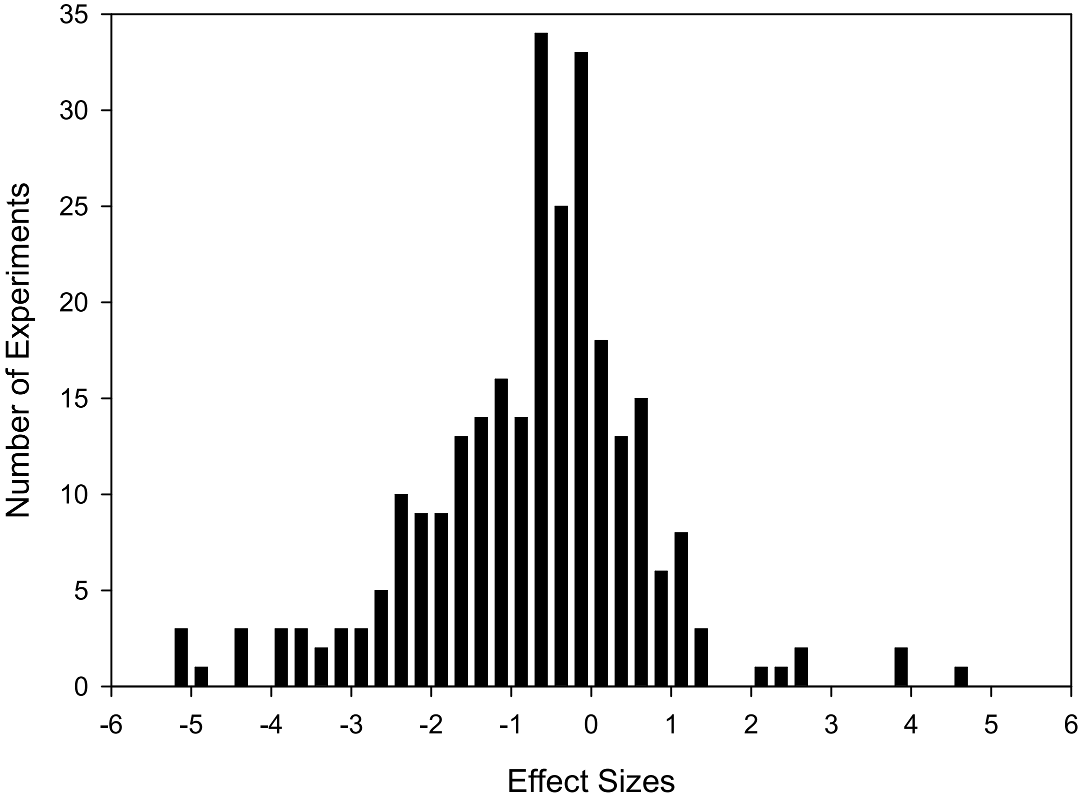

Figure 1. Number of plant-soil feedback experiments by effect size. Negative effect sizes suggest that plants grow better on ‘other’ than on ‘self’ cultivated soil. Three outliers beyond -6 are not shown (*n* = 290 experiments).

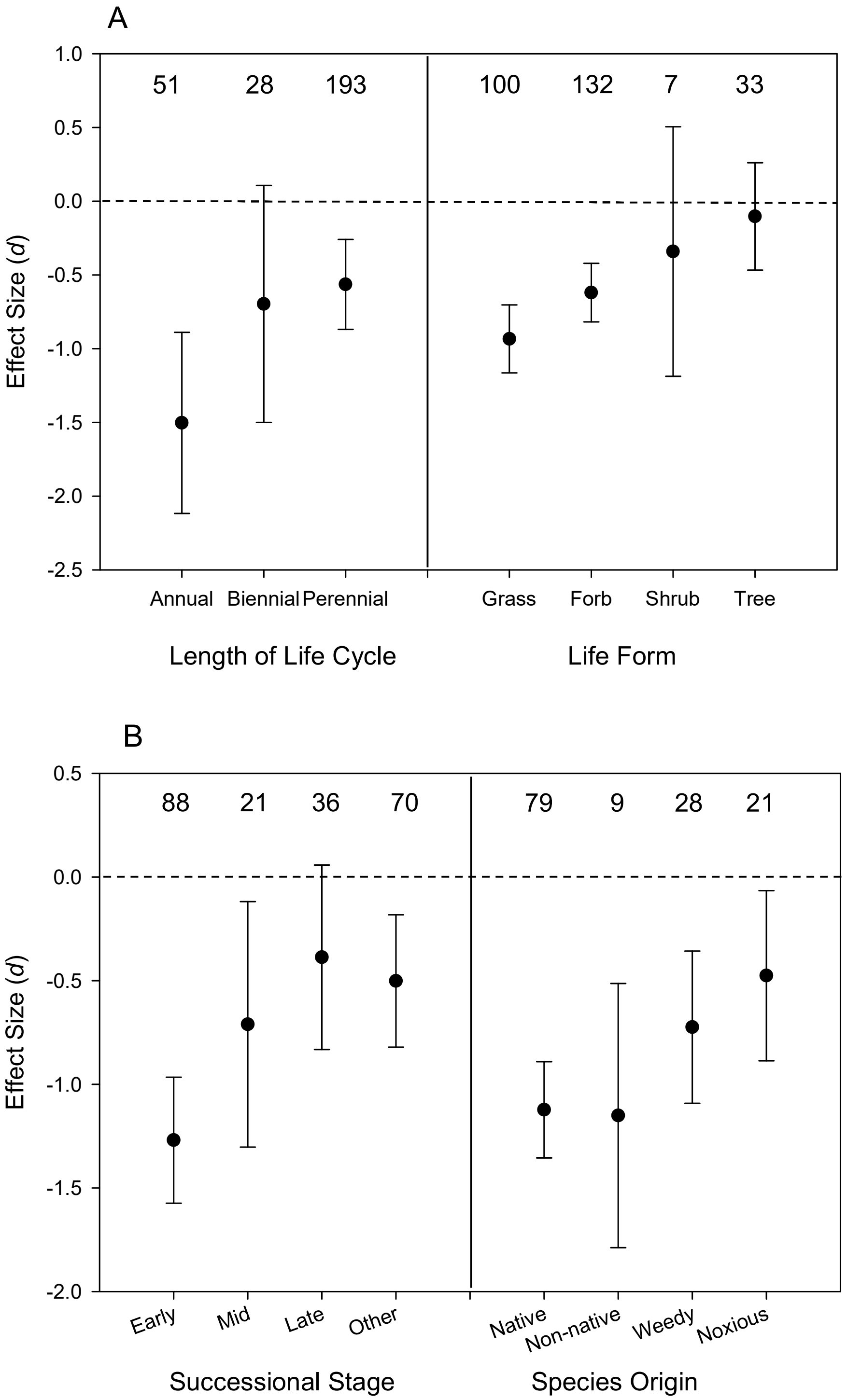

Figure 2. Effect sizes for experiments separated into (a) length of life cycle and life form classes, and (b) successional stage and species origin. Sample sizes are indicated at the top.

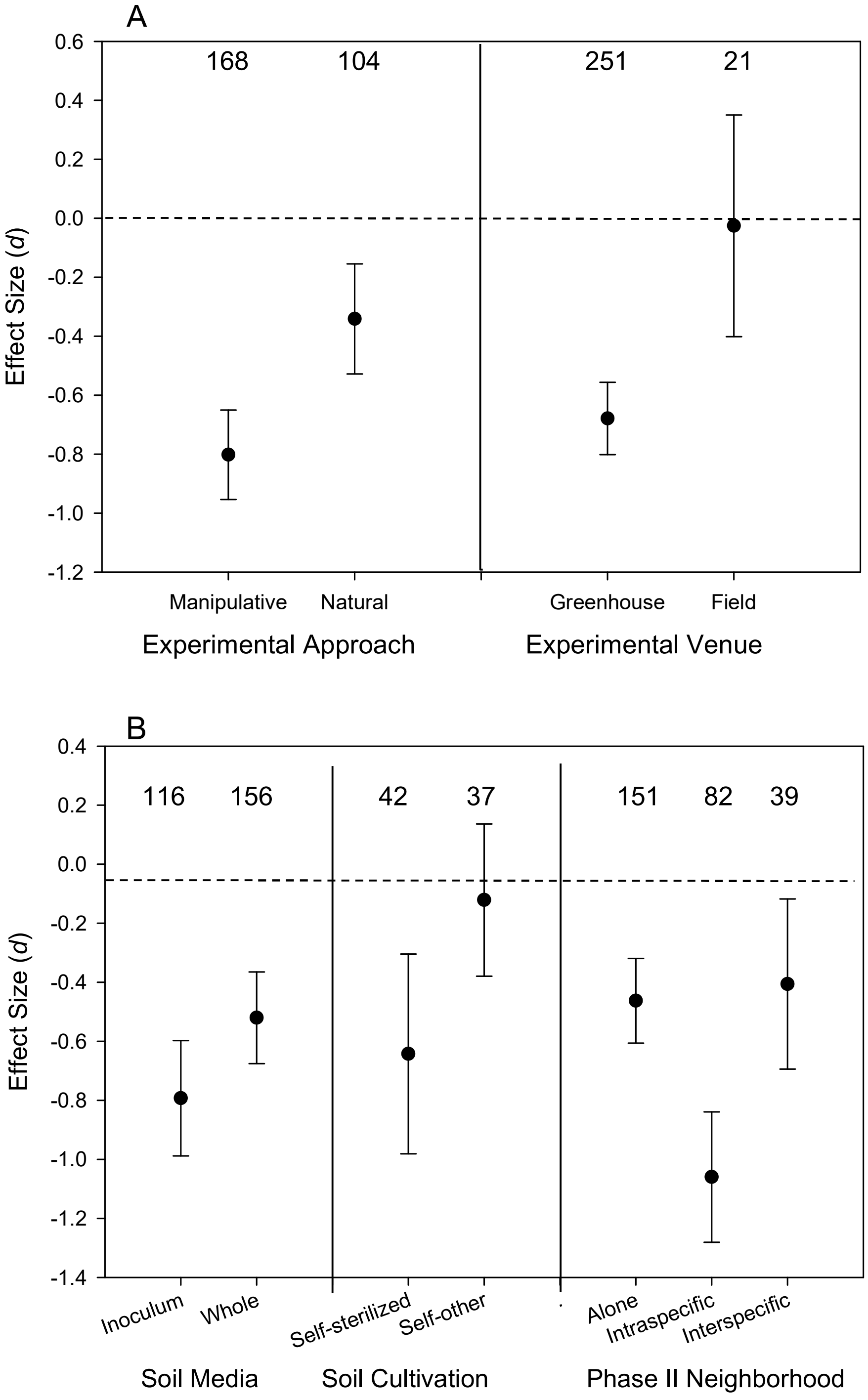

Figure 3. Effect sizes for experiments separated into (a) experimental approach, whether the soils in Phase I are cultivated through a manipulative or natural experiment, and experimental venue, and (b) soil media or volume used in Phase I, soil cultivation method, and target species neighborhood in Phase II. Sample sizes are indicated at the top.

Appendix A. List of references, species origin, the growth form, successional stage, experimental setting, habitat where species were collected, experimental approach, length of Phase I in months which also indicates whether the test was natural or manipulative, inoculum or whole species approach, cultivation in Phase I, length of Phase II, method of Phase II growth, which indicates whether there was competition, and the response variable measured for each of the 286 experiments.

Author	**Target Species**	**Species origin**	**Growth form**	**Successional stage**	**Experimental setting**	**Habitat**	**Approach**	**Phase 1 (months)**	**Inoculum or Whole soil**	**Phase I: Cultivated by Monoculture or Community**	**Phase II Growth**	**Response Variable**
Agrawal *et al.* 2005	*Artemisia biennis*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Artemisia campestris*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Bromus inermis*	Non-native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Bromus kalmii*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Campanula rapunculoides*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Campanula rotundifolia*	Native	Perennial forb	Late	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Cerastium arvense*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Cerastium fontanum*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Elymus repens*	Non-native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Elymus trachycaulus*	Native	Perennial grass	Middle	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Geum aleppicum*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Geum urbanum*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Lepidium campestre*	Non-native	Annual forb	Early	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Lepidium densiflorum*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Plantago major*	Non-native	Annual forb	Early	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Plantago rugellii*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Potentilla arguta*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.* 2005	*Potentilla recta*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Agrawal *et al.*	*Silene*	Native	Annual	Early	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground

2005	*antirrhina*		forb									
Agrawal *et al.* 2005	*Silene vulgaris*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	1.0	Whole soil	Monoculture	Alone	Aboveground
Beckstead and Parker 2003	*Ammophila arenaria*	Non-native	Perennial grass	Early	Greenhouse	Dune grass	Self-Sterilized	Field	Whole soil	Monoculture	Intra-specific	Aboveground
Belnap *et al.* 2005	*Hilaria jamesii*	Native	Perennial grass	Unknown	Greenhouse	Desert	Self-Other	Field	Whole soil	Monoculture	Intra-specific	Aboveground
Belnap *et al.* 2005	*Hilaria jamesii*	Native	Perennial grass	Unknown	Greenhouse	Desert	Self-Other	Field	Whole soil	Monoculture	Intra-specific	Aboveground
Bever 1994	*Anthoxanthum odoratum*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Anthoxanthum odoratum*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Anthoxanthum odoratum*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Anthoxanthum odoratum*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Sterilized	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Danthonia spicata*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Danthonia spicata*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Danthonia spicata*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Danthonia spicata*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Sterilized	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Panicum sphaerocarpon*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Panicum sphaerocarpon*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Panicum sphaerocarpon*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bever 1994	*Panicum sphaerocarpon*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Sterilized	15.0	Inoculum	Monoculture	Intra-specific	Total biomass
Bezemer *et al.* 2006a	*Senecio jacobaea*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	72.0	Inoculum	Community	Alone	Total biomass
Bezemer *et al.* 2006a	*Senecio jacobaea*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	72.0	Inoculum	Community	Intra-specific	Total biomass
Bezemer *et al.* 2006b	*Achillea millefolium*	Native	Biennial forb	Middle	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Agrostis capillaris*	Native	Perennial grass	Middle	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Anthoxanthum odoratum*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Briza media*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.*	*Briza media*	Native	Perennial	Unknown	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass

2006b			grass									
Bezemer *et al.* 2006b	*Bromus erectus*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Festuca ovina*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Festuca ovina*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Hypochaeris radicata*	Native	Biennial forb	Middle	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Plantago lanceolata*	Native	Biennial forb	Middle	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Plantago lanceolata*	Native	Biennial forb	Middle	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Prunella vulgaris*	Native	Biennial forb	Unknown	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bezemer *et al.* 2006b	*Sanguisorba minor*	Native	Biennial forb	Unknown	Greenhouse	Grassland	Self-Other	24.0	Whole soil	Monoculture	Alone	Total biomass
Bodelier *et al.* 2006	*Potamogeton pectinatus*	Non-native	Perennial forb	Unknown	Greenhouse	Wetland	Self-Sterilized	Field	Whole soil	Community	Alone	Total biomass
Bodelier *et al.* 2006	*Potamogeton pectinatus*	Non-native	Perennial forb	Unknown	Greenhouse	Wetland	Self-Sterilized	Field	Whole soil	Community	Alone	Total biomass
Bodelier *et al.* 2006	*Potamogeton pectinatus*	Non-native	Perennial forb	Unknown	Greenhouse	Wetland	Self-Sterilized	Field	Whole soil	Community	Intra-specific	Total biomass
Bodelier *et al.* 2006	*Potamogeton pectinatus*	Non-native	Perennial forb	Unknown	Greenhouse	Wetland	Self-Sterilized	Field	Whole soil	Community	Intra-specific	Total biomass
Bonanomi and Mazzoleni 2005	*Holcus lanatus*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Alone	Total biomass
Bonanomi and Mazzoleni 2005	*Holcus lanatus*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Intra-specific	Total biomass
Bonanomi and Mazzoleni 2005	*Holcus lanatus*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Inter-specific	Total biomass
Bonanomi and Mazzoleni 2005	*Holcus lanatus*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Alone	Total biomass
Bonanomi and Mazzoleni 2005	*Inula viscosa*	Native	Perennial shrub	Late	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Alone	Total biomass
Bonanomi and Mazzoleni 2005	*Inula viscosa*	Native	Perennial shrub	Late	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Intra-specific	Total biomass
Bonanomi and Mazzoleni 2005	*Inula viscosa*	Native	Perennial shrub	Late	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Inter-specific	Total biomass
Bonanomi and Mazzoleni 2005	*Inula viscosa*	Native	Perennial shrub	Late	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Alone	Total biomass
Bonanomi and	*Pulicaria*	Native	Perennial	Unknown	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Alone	Total biomass

Mazzoleni 2005	*dysenterica*		forb									
Bonanomi and Mazzoleni 2005	*Pulicaria dysenterica*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Inter-specific	Total biomass
Bonanomi and Mazzoleni 2005	*Pulicaria dysenterica*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	3.5	Whole soil	Monoculture	Alone	Total biomass
Bonanomi *et al.* 2005b	*Scirpus holoschoenus*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	Field	Whole soil	Monoculture	Alone	Total biomass
Callaway *et al.* 2004a	*Centaurea maculosa*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Aboveground
Callaway *et al.* 2004b	*Centaurea maculosa*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Intra-specific	Aboveground
Callaway *et al.* 2004b	*Centaurea maculosa*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Intra-specific	Aboveground
Callaway *et al.* 2004b	*Centaurea maculosa*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	3.8	Inoculum	Monoculture	Intra-specific	Aboveground
Callaway *et al.* 2004b	*Centaurea maculosa*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	3.8	Inoculum	Monoculture	Intra-specific	Aboveground
Callaway *et al.* 2004b	*Centaurea maculosa*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Sterilized	Field	Inoculum	Community	Intra-specific	Aboveground
Callaway *et al.* 2004b	*Centaurea maculosa*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Sterilized	Field	Inoculum	Community	Intra-specific	Aboveground
Callaway *et al.* 2004b	*Centaurea maculosa*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Sterilized	3.8	Inoculum	Monoculture	Intra-specific	Aboveground
Callaway *et al.* 2004b	*Centaurea maculosa*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Sterilized	3.8	Inoculum	Monoculture	Intra-specific	Aboveground
Casper and Castelli 2007	*Andropogon gerardii*	Native	Perennial grass	Middle	Field	Grassland	self-other	Field	Whole soil	Community	Alone	Aboveground
Casper and Castelli 2007	*Andropogon gerardii*	Native	Perennial grass	Middle	Field	Grassland	self-other	Field	Whole soil	Community	Inter-specific	Aboveground
Casper and Castelli 2007	*Schizachyrium scoparium*	Native	Perennial grass	Late	Field	Grassland	self-other	Field	Whole soil	Community	Alone	Aboveground
Casper and Castelli 2007	*Schizachyrium scoparium*	Native	Perennial grass	Late	Field	Grassland	self-other	Field	Whole soil	Community	Inter-specific	Aboveground
Casper and Castelli 2007	*Sorghastrum nutans*	Native	Perennial grass	Late	Field	Grassland	self-other	Field	Whole soil	Community	Alone	Aboveground
Casper and Castelli 2007	*Sorghastrum nutans*	Native	Perennial grass	Late	Field	Grassland	self-other	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Agrostis capillaris*	Native	Perennial grass	Middle	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Anthoxanthum odoratum*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Campanula rotundifolia*	Native	Perennial forb	Late	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Centaurea jacea*	Native	Perennial forb	Late	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.*	*Festuca*	Native	Perennial	Late	Greenhouse	Grassland	Self-	Field	Whole soil	Community	Inter-	Aboveground

2004a	*ovina*		grass				Sterilized				specific	
De Deyn *et al.* 2004a	*Festuca rubra*	Native	Perennial grass	Middle	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Lolium perenne*	Native	Perennial grass	Early	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Plantago lanceolata*	Native	Perennial forb	Middle	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Poa trivialis*	Native	Perennial grass	Early	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Prunella vulgaris*	Native	Perennial forb	Middle	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Rumex obtusifolius*	Native	Perennial forb	Early	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Stellaria media*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
De Deyn *et al.* 2004a	*Succisa pratensis*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Sterilized	Field	Whole soil	Community	Inter-specific	Aboveground
Ehlers and Thompson 2004	*Bromus erectus*	Native	Perennial grass	Unknown	Field	Grassland	Self-Other	Field	Whole soil	Community	Intra-specific	Aboveground
Gillespie and Allen 2006	*Erodium macrophyllum*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Aboveground
Gillespie and Allen 2006	*Erodium macrophyllum*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Aboveground
Gillespie and Allen 2006	*Erodium macrophyllum*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Sterilized	Field	Inoculum	Monoculture	Alone	Aboveground
Gustafson and Casper 2004	*Andropogon gerardii*	Native	Perennial grass	Middle	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Gustafson and Casper 2004	*Andropogon gerardii*	Native	Perennial grass	Middle	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Gustafson and Casper 2004	*Schizachyrium scoparium*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Gustafson and Casper 2004	*Schizachyrium scoparium*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Gustafson and Casper 2004	*Sorghastrum nutans*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Gustafson and Casper 2004	*Sorghastrum nutans*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Holah and Alexander 1999	*Andropogon gerardii*	Native	Perennial grass	Middle	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Height
Holah and Alexander 1999	*Andropogon gerardii*	Native	Perennial grass	Middle	Greenhouse	Grassland	Self-Sterilized	Field	Inoculum	Community	Alone	Height
Holah and Alexander 1999	*Chamaecrista fasciculata Michx.*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Alone	Number of leaves

Holah and Alexander 1999	*Chamaecrista fasciculata Michx.*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Sterilized	Field	Inoculum	Community	Alone	Number of leaves
Kardol *et al.* 2006	Early successional community	Native	Community	Early	Greenhouse	Grassland	Self-Other	5.0	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Early successional community	Native	Community	Early	Greenhouse	Grassland	Self-Other	5.0	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Early successional community	Native	Community	Early	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Early successional community	Native	Community	Early	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Late successional community	Native	Community	Late	Greenhouse	Grassland	Self-Other	5.0	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Late successional community	Native	Community	Late	Greenhouse	Grassland	Self-Other	5.0	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Late successional community	Native	Community	Late	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Late successional community	Native	Community	Late	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Mid successional community	Native	Community	Middle	Greenhouse	Grassland	Self-Other	5.0	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Mid successional community	Native	Community	Middle	Greenhouse	Grassland	Self-Other	5.0	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Mid successional community	Native	Community	Middle	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2006	Mid successional community	Native	Community	Middle	Greenhouse	Grassland	Self-Other	Field	Inoculum	Community	Inter-specific	Aboveground
Kardol *et al.* 2007	*Alopecurus geniculatus*	Native	Perennial grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Alopecurus geniculatus*	Native	Perennial grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Alopecurus geniculatus*	Native	Perennial grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Alopecurus geniculatus*	Native	Perennial grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Alopecurus geniculatus*	Native	Perennial grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.*	*Alopecurus*	Native	Perennial	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-	Total biomass

2007	*geniculatus*		grass								specific	
Kardol *et al.* 2007	*Alopecurus geniculatus*	Native	Perennial grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Inter-specific	Aboveground
Kardol *et al.* 2007	*Apera spica-venti*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Apera spica-venti*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Apera spica-venti*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Apera spica-venti*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Apera spica-venti*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Apera spica-venti*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Apera spica-venti*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Inter-specific	Aboveground
Kardol *et al.* 2007	*Capsella bursa-pastoris*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Capsella bursa-pastoris*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Capsella bursa-pastoris*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Capsella bursa-pastoris*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Capsella bursa-pastoris*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Capsella bursa-pastoris*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Capsella bursa-pastoris*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Inter-specific	Aboveground
Kardol *et al.* 2007	*Conyza canadensis*	Non-native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Aboveground
Kardol *et al.* 2007	*Conyza canadensis*	Non-native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Conyza canadensis*	Non-native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Conyza canadensis*	Non-native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Conyza canadensis*	Non-native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Conyza canadensis*	Non-native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass

Kardol *et al.* 2007	*Conyza canadensis*	Non-native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Inter-specific	Aboveground
Kardol *et al.* 2007	*Poa annua*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Poa annua*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Poa annua*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Poa annua*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Poa annua*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Poa annua*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Poa annua*	Native	Annual grass	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Inter-specific	Aboveground
Kardol *et al.* 2007	*Viola arvensis*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Viola arvensis*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Viola arvensis*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Viola arvensis*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Viola arvensis*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Viola arvensis*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Intra-specific	Total biomass
Kardol *et al.* 2007	*Viola arvensis*	Native	Annual forb	Early	Greenhouse	Grassland	Self-Other	2.0	Inoculum	Monoculture	Inter-specific	Aboveground
Klironomos 2002	*Achillea millefolium*	Native	Perennial forb	Middle	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Agrostis gigantea*	Non-native	Perennial grass	Middle	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Agrostis scabra*	Native	Perennial grass	Middle	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Apocynum cannabinum*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Asclepias syriaca*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Asparagus officinalis*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Aster novae-angliae*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Aster simplex*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Aster vimineus*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Bromus inermis*	Non-native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass

Klironomos 2002	*Carex aurea*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Carex flava*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Carex garberi*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Carex granularis*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Centaurea jacea*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Cerastium vulgatum*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Chenopodium ambrosioides*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Chrysanthemum leucanthemum*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Cichorium intybus*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Circium arvense*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Circium vulgare*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Convolvulus arvensis*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Coronilla varia*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Dactylis glomerata*	Non-native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Daucus carota*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Echium vulgare*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Erigeron philadelphicus*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Erigeron strigosus*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Fragaria virginiana*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Galium mollugo*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Galium palustre*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Geum aleppicum*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Hieracium aurantiacum*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass

Klironomos 2002	*Hieracium pilosella*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Hieracium pratense*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Hypericum perforatum*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Juncus dudleyi*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Linaria vulgaris*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Medicago lupulina*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Oenothera biennis*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Oenothera perennis*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Panicum lanuginosum*	Native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Phleum pratense*	Non-native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Plantago lanceolata*	Non-native	Perennial forb	Middle	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Poa compressa*	Non-native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Poa pratensis*	Non-native	Perennial grass	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Potentilla recta*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Prunella vulgaris*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Ranunculus acris*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Rudbeckia serotina*	Native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Satureja vulgaris*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Silene cucubalus*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Solidago canadensis*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Solidago graminifolia*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Solidago nemoralis*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Solidago rugosa*	Native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Taraxacum officinale*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Tragopogon pratensis*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass

Klironomos 2002	*Trifolium pratense*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Veronica officinalis*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Klironomos 2002	*Vicia cracca*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	5.0	Whole soil	Monoculture	Alone	Total biomass
Knevel *et al.* 2004	*Amnophila arenaria*	Native	Perennial grass	Early	Greenhouse	Dune grass	Self-Sterilized	Field	Inoculum	Monoculture	Alone	Total biomass
Kulmatiski *et al.* 2006	Exotic species mix	Non-native	community	Middle	Field	Shrub steppe	Self-Other	Field	Whole soil	Community	Community	Plant cover
Kulmatiski *et al.* 2006	Native species mix	Native	community	Late	Field	Shrub steppe	Self-Other	Field	Whole soil	Community	Community	Plant cover
Kulmatiski, unpubl. Data	*Balsamorrhizae sagittata*	Native	Perennial forb	Late	Field	Grassland	Self-Other	Field	Whole soil	Community	Community	Aboveground
Kulmatiski, unpubl. Data	*Bromus tectorum*	Non-native	Annual grass	Early	Field	Grassland	Self-Other	Field	Whole soil	Community	Community	Aboveground
Kulmatiski, unpubl. Data	*Lupinus* spp.	Native	Perennial forb	Middle	Field	Grassland	Self-Other	Field	Whole soil	Community	Community	Aboveground
Kulmatiski, unpubl. Data	*Poa bulbosa*	Non-native	Perennial grass	Unknown	Field	Grassland	Self-Other	Field	Whole soil	Community	Community	Aboveground
Kulmatiski, unpubl. Data	*Pseudoroegneria spicata*	Native	Perennial grass	Late	Field	Grassland	Self-Other	Field	Whole soil	Community	Community	Aboveground
Kulmatiski, unpubl. Data	*Sissymbrium loeselii*	Non-native	Biennial forb	Early	Field	Grassland	Self-Other	Field	Whole soil	Community	Community	Aboveground
Meiman *et al.* 2006	*Centaurea maculosa*	Non-native	Biennial forb	Early	Greenhouse	Grassland	Self-Other	Field	Whole soil	Community	Alone	Total biomass
Morris *et al.* 2006	*Acroptilon repens*	Non-native	Perennial forb	Unknown	Greenhouse	Grassland	Self-Other	Field	Whole soil	Monoculture	Alone	Total biomass
Niu et al 2007	*Ageratina adenophora*	Non-native	Perennial shrub	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Intra-specific	Total biomass
Niu et al 2007	*Ageratina adenophora*	Non-native	Perennial shrub	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Intra-specific	Total biomass
Niu et al 2007	*Eupatorium fortunei*	Native	Perennial forb	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Intra-specific	Total biomass
Niu et al 2007	*Eupatorium fortunei*	Native	Perennial forb	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Intra-specific	Total biomass
Niu et al 2007	*Loilium perenne*	Native	Perennial grass	Early	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Intra-specific	Total biomass
Niu et al 2007	*Lollium perenne*	Native	Perennial grass	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Intra-specific	Total biomass
Niu et al 2007	*Medicago sativa*	Non-native	Perennial forb	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Intra-specific	Total biomass
Niu et al 2007	*Medicago sativa*	Non-native	Perennial forb	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Intra-specific	Total biomass
Packer and Clay 2009	*Prunus serotina*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Alone	Aboveground
Packer and Clay 2000	*Prunus serotina*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	1.3	Inoculum	Community	Alone	Aboveground
Packer and Clay 2000	*Prunus serotina*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	2.5	Inoculum	Community	Alone	Aboveground

Packer and Clay 2000	*Prunus serotina*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	3.8	Inoculum	Community	Alone	Aboveground
Peltzer 2001	*Bouteloua gracilis*	Native	Annual grass	Early	Field	Grassland	Self-Other	Field	Whole soil	Community	Alone	Growth
Peltzer 2001	*Bouteloua gracilis*	Native	Annual grass	Early	Field	Grassland	Self-Other	Field	Whole soil	Community	Inter-specific	Growth
Puerta-Pinero *et al.* 2006	*Quercus ilex*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Whole soil	Monoculture	Alone	Total biomass
Puerta-Pinero *et al.* 2006	*Quercus ilex*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Whole soil	Monoculture	Alone	Total biomass
Puerta-Pinero *et al.* 2006	*Quercus ilex*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Whole soil	Monoculture	Alone	Total biomass
Puerta-Pinero *et al.* 2006	*Quercus ilex*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Whole soil	Monoculture	Alone	Total biomass
Puerta-Pinero *et al.* 2006	*Quercus ilex*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Whole soil	Monoculture	Alone	Total biomass
Puerta-Pinero *et al.* 2006	*Quercus ilex*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Whole soil	Monoculture	Alone	Total biomass
Puerta-Pinero *et al.* 2006	*Quercus ilex*	Native	Perennial tree	Late	Greenhouse	Forest	Self-Sterilized	Field	Whole soil	Monoculture	Alone	Total biomass
Reinhart and Callaway 2004	*Acer negundo*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Reinhart and Callaway 2004	*Acer negundo*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Reinhart and Callaway 2004	*Acer negundo*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Alone	Total biomass
Reinhart and Callaway 2004	*Acer negundo*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Alone	Total biomass
Reinhart and Callaway 2004	*Acer platanoides*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Reinhart and Callaway 2004	*Acer platanoides*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Reinhart and Callaway 2004	*Acer platanoides*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Alone	Total biomass
Reinhart and Callaway 2004	*Acer platanoides*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Alone	Total biomass
Reinhart and Callaway 2004	*Acer platanoides*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Alone	Total biomass
Reinhart and Callaway 2004	*Acer platanoides*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Alone	Total biomass
Reinhart *et al.* 2003	*Prunus serotina*	Native	Perennial tree	Middle	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Alone	Aboveground
Reinhart *et al.* 2003	*Prunus serotina*	Native	Perennial tree	Middle	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Intra-specific	Aboveground
Reinhart *et al.* 2003	*Prunus serotina*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Alone	Aboveground
Reinhart *et al.* 2003	*Prunus serotina*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Intra-specific	Aboveground
Reinhart *et al.* 2003	*Prunus serotina*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Alone	Aboveground

Reinhart *et al.* 2003	*Prunus serotina*	Non-native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Intra-specific	Aboveground
Reinhart *et al.* 2003	*Prunus serotina*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Alone	Aboveground
Reinhart *et al.* 2003	*Prunus serotina*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Intra-specific	Aboveground
Reinhart *et al.* 2005a	*Prunus serotina*	Native	Perennial tree	Middle	Greenhouse	Forest	Self-Other	Field	Inoculum	Community	Intra-specific	Seedling survival (%)
Reinhart *et al.* 2005a	*Prunus serotina*	Native	Perennial tree	Unknown	Greenhouse	Forest	Self-Sterilized	Field	Inoculum	Community	Intra-specific	Seedling survival (%)
Reinhart *et al.* 2005b	*Acer platanoides*	Non-native	Perennial tree	Middle	Field	Forest	Self-Other	Field	Whole soil	Community	Inter-specific	Aboveground
Reinhart *et al.* 2005b	*Populus trihocarpa*	Native	Perennial tree	Late	Field	Forest	Self-Other	Field	Whole soil	Community	Inter-specific	Aboveground
Suding *et al.* 2004	*Acomastylis rossii*	Native	Perennial forb	Late	Field	Alpine	Self-Other	Field	Whole soil	Community	Intra-specific	Relative growth
Suding *et al.* 2004	*Acomastylis rossii*	Native	Perennial forb	Late	Field	Alpine	Self-Other	Field	Whole soil	Community	Inter-specific	Relative abundance
Suding *et al.* 2004	*Deschampsia caespitosa*	Native	Perennial grass	Late	Field	Alpine	Self-Other	Field	Whole soil	Community	Intra-specific	Relative growth
Suding *et al.* 2004	*Deschampsia caespitosa*	Native	Perennial grass	Late	Field	Alpine	Self-Other	Field	Whole soil	Community	Inter-specific	Relative abundance
Suguenza *et al.* 2006	*Artemisia californicus*	Native	Perennial shrub	Late	Greenhouse	Shrub steppe	Self-Sterilized	Field	Inoculum	Community	Alone	Total biomass
Troelstra *et al.* 2001	*Ammophila arenaria*	Native	Perennial grass	Unknown	Greenhouse	Dune grass	Self-Sterilized	Field	Whole soil	Community	Alone	Total biomass
Troelstra *et al.* 2001	*Ammophila arenaria*	Native	Perennial grass	Unknown	Greenhouse	Dune grass	Self-Sterilized	Field	Whole soil	Community	Alone	Total biomass
Troelstra *et al.* 2001	*Carex arenaria*	Native	Perennial grass	Unknown	Greenhouse	Dune grass	Self-Sterilized	Field	Whole soil	Community	Alone	Total biomass
Troelstra *et al.* 2001	*Carex arenaria*	Native	Perennial grass	Unknown	Greenhouse	Dune grass	Self-Sterilized	Field	Whole soil	Community	Alone	Total biomass
Van der Putten *et al.* 2007	*Aristida meridionalis*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Sterilized	Field	Inoculum	Monoculture	Intra-specific	Aboveground
Van der Putten *et al.* 2007	*Cenchrus biflorus*	Non-native	Annual grass	Early	Greenhouse	Grassland	Self-Sterilized	Field	Inoculum	Monoculture	Intra-specific	Aboveground
Van der Putten *et al.* 2007	*Eragrostis lehmanniana*	Native	Perennial grass	Late	Greenhouse	Grassland	Self-Sterilized	Field	Inoculum	Monoculture	Intra-specific	Aboveground
Van der Stoel *et al.* 2002	*Ammophila arenaria*	Native	Perennial grass	Early	Greenhouse	Dune grass	Self-Sterilized	Field	Inoculum	Monoculture	Intra-specific	Relative total biomass

Appendix 2. Data used in the meta-analysis. List of references, the source of the data, sample size, mean, and standard deviation for plants grown on “self” and “other” soil. There were 272 experiments.

Author	**Source**	**N_c**	**N_e**	**X_c**	**X_e**	**SD_c**	**SD_e**
Agrawal *et al.* 2005	Author	8	8	5.91	6.38	1.98	2.20
Agrawal *et al.* 2005	Author	8	8	5.39	6.00	1.62	1.52
Agrawal *et al.* 2005	Author	8	8	9.96	10.25	2.31	1.87
Agrawal *et al.* 2005	Author	8	8	4.65	5.51	1.11	1.36
Agrawal *et al.* 2005	Author	8	8	5.88	5.81	1.69	1.43
Agrawal *et al.* 2005	Author	8	8	5.50	6.14	0.74	0.37
Agrawal *et al.* 2005	Author	8	8	5.00	5.56	1.74	1.93
Agrawal *et al.* 2005	Author	8	8	6.06	6.85	1.76	1.91
Agrawal *et al.* 2005	Author	8	8	7.74	7.86	1.51	1.52
Agrawal *et al.* 2005	Author	8	8	5.94	6.79	1.50	1.51
Agrawal *et al.* 2005	Author	5	5	2.76	3.42	1.18	1.50
Agrawal *et al.* 2005	Author	5	5	4.68	5.24	0.95	1.07
Agrawal *et al.* 2005	Author	5	5	6.34	6.86	0.77	1.10
Agrawal *et al.* 2005	Author	5	5	5.60	5.96	1.98	2.00
Agrawal *et al.* 2005	Author	5	5	6.10	6.68	1.13	1.45
Agrawal *et al.* 2005	Author	8	8	6.31	6.63	2.76	2.88
Agrawal *et al.* 2005	Author	8	8	5.06	6.08	1.24	1.34
Agrawal *et al.* 2005	Author	8	8	6.50	6.88	1.83	1.96
Agrawal *et al.* 2005	Author	7	7	7.27	7.47	2.09	1.85
Agrawal *et al.* 2005	Author	8	8	5.91	6.16	1.56	1.51
Beckstead and Parker 2003	Figure 2	8	8	0.38	1.10	0.08	0.13
Belnap *et al.* 2005	Figure 2	10	10	0.02	0.03	0.01	0.04
Belnap *et al.* 2005	Figure 2	10	10	0.02	0.02	0.01	0.05
Bever 1994	Figure 3a	9	6	2.40	1.80	0.41	0.63
Bever 1994	Figure 3a	9	9	2.40	2.60	0.41	0.63
Bever 1994	Figure 3a	9	9	2.40	2.51	0.41	0.63
Bever 1994	Figure 3a	9	9	2.40	2.40	0.41	0.41
Bever 1994	Figure 3a	9	6	1.05	2.53	0.60	0.63
Bever 1994	Figure 3a	9	9	1.05	2.10	0.60	0.63

Bever 1994	Figure 3a	9	9	1.05	1.75	0.60	0.63
Bever 1994	Figure 3a	9	9	1.05	1.78	0.60	0.66
Bever 1994	Figure 3a	9	6	2.08	2.50	0.60	0.60
Bever 1994	Figure 3a	9	9	2.08	2.09	0.60	0.57
Bever 1994	Figure 3a	9	9	2.08	2.53	0.60	0.60
Bever 1994	Figure 3a	9	9	2.08	2.53	0.60	0.63
Bezemer *et al.* 2006a	Figure 4	5	5	4.30	4.10	0.46	0.46
Bezemer *et al.* 2006a	Figure 4	5	5	4.75	4.20	0.89	0.89
Bezemer *et al.* 2006b	Figure 1	5	5	2.20	2.50	0.56	0.22
Bezemer *et al.* 2006b	Figure 1	5	5	2.15	2.50	0.22	0.22
Bezemer *et al.* 2006b	Figure 1	5	5	3.40	3.40	0.78	0.45
Bezemer *et al.* 2006b	Figure 1	5	5	2.48	2.50	0.34	0.22
Bezemer *et al.* 2006b	Figure 1	5	5	3.40	0.50	1.34	0.67
Bezemer *et al.* 2006b	Figure 1	5	5	2.30	4.30	0.89	0.89
Bezemer *et al.* 2006b	Figure 1	5	5	2.15	2.65	0.22	0.22
Bezemer *et al.* 2006b	Figure 1	5	5	3.60	2.30	1.57	0.89
Bezemer *et al.* 2006b	Figure 1	5	5	4.60	4.40	0.67	0.34
Bezemer *et al.* 2006b	Figure 1	5	5	2.90	2.80	1.12	0.22
Bezemer *et al.* 2006b	Figure 1	5	5	10.30	9.70	4.25	1.34
Bezemer *et al.* 2006b	Figure 1	5	5	7.70	6.60	2.24	1.57
Bezemer *et al.* 2006b	Figure 1	5	5	8.00	5.40	2.24	1.01
Bodelier *et al.* 2006	Figure 4a	6	6	0.45	0.76	0.24	0.25
Bodelier *et al.* 2006	Figure 4a	6	6	0.17	1.20	0.28	0.24
Bodelier *et al.* 2006	Figure 4a	6	6	1.10	1.65	0.24	0.25
Bodelier *et al.* 2006	Figure 4a	6	6	0.60	1.90	0.25	0.25
Bonanomi and Mazzoleni 2005	Figure 2	10	10	0.08	0.16	0.05	0.06
Bonanomi and Mazzoleni 2005	Figure 3	10	10	0.04	0.06	0.05	0.05
Bonanomi and Mazzoleni 2005	Figure 3	10	10	0.01	0.02	0.05	0.05
Bonanomi and Mazzoleni 2005	Figure 2	10	10	0.08	0.11	0.05	0.05
Bonanomi and Mazzoleni 2005	Figure 2	10	10	0.21	0.26	0.05	0.05
Bonanomi and Mazzoleni 2005	Figure 3	10	10	0.07	0.10	0.05	0.05
Bonanomi and Mazzoleni 2005	Figure 3	10	10	0.16	0.16	0.05	0.05
Bonanomi and Mazzoleni 2005	Figure 2	10	10	0.21	0.23	0.05	0.06

Bonanomi and Mazzoleni 2005	Figure 2	10	10	0.13	0.10	0.06	0.05
Bonanomi and Mazzoleni 2005	Figure 3	10	10	0.04	0.05	0.05	0.05
Bonanomi and Mazzoleni 2005	Figure 2	10	10	0.13	0.13	0.05	0.05
Bonanomi *et al.* 2005b	Figure 5	10	10	0.31	0.64	0.06	0.16
Callaway *et al.* 2004a	Figure 5	2	6	0.21	0.21	0.06	0.03
Callaway *et al.* 2004b	Figure 1	6	6	0.83	1.07	0.06	0.20
Callaway *et al.* 2004b	Figure 1	4	4	0.44	0.63	0.09	0.16
Callaway *et al.* 2004b	Figure 2	10	10	0.80	0.56	0.32	0.19
Callaway *et al.* 2004b	Figure 2	10	10	0.08	0.15	0.06	0.13
Callaway *et al.* 2004b	Figure 1	4	6	0.83	1.09	0.06	0.15
Callaway *et al.* 2004b	Figure 1	4	4	0.44	1.21	0.09	0.16
Callaway *et al.* 2004b	Figure 2	10	10	0.80	0.58	0.32	0.25
Callaway *et al.* 2004b	Figure 2	10	10	0.08	0.30	0.06	0.09
Casper and Castelli 2007	Figure 1	20	20	0.07	0.17	0.04	0.05
Casper and Castelli 2007	Figure 1	20	20	0.04	0.15	0.01	0.08
Casper and Castelli 2007	Figure 1	20	20	0.13	0.23	0.11	0.11
Casper and Castelli 2007	Figure 1	20	20	0.10	0.12	0.13	0.13
Casper and Castelli 2007	Figure 1	14	12	0.11	0.32	0.15	0.17
Casper and Castelli 2007	Figure 1	14	12	0.12	0.13	0.11	0.07
De Deyn *et al.* 2004a	Author	8	8	1.18	13.40	0.67	3.13
De Deyn *et al.* 2004a	Author	8	8	4.60	6.68	1.23	3.42
De Deyn *et al.* 2004a	Author	8	8	1.33	0.04	1.44	0.04
De Deyn *et al.* 2004a	Author	8	8	0.37	0.27	0.47	0.26
De Deyn *et al.* 2004a	Author	8	8	0.42	1.19	0.27	0.63
De Deyn *et al.* 2004a	Author	8	8	0.59	0.99	0.43	0.54
De Deyn *et al.* 2004a	Author	8	8	0.33	3.00	0.33	0.85
De Deyn *et al.* 2004a	Author	8	8	0.86	1.80	0.92	0.68
De Deyn *et al.* 2004a	Author	8	8	0.11	1.31	0.18	0.72
De Deyn *et al.* 2004a	Author	8	8	0.13	0.10	0.14	0.07
De Deyn *et al.* 2004a	Author	8	8	0.04	0.22	0.05	0.44
De Deyn *et al.* 2004a	Author	8	8	0.04	0.15	0.04	0.10
De Deyn *et al.* 2004a	Author	8	8	0.06	0.01	0.07	0.01
Ehlers and Thompson 2004	Figure 3b	87	87	2.60	3.20	0.47	0.56

Gillespie and Allen 2006	Figure 2a	10	10	0.18	0.27	0.05	0.06
Gillespie and Allen 2006	Figure 2a	10	10	0.18	0.22	0.05	0.09
Gillespie and Allen 2006	Figure 2a	10	10	0.18	0.15	0.05	0.05
Gustafson and Casper 2004	Figure 1	12	12	0.18	0.14	0.06	0.03
Gustafson and Casper 2004	Figure 3	12	12	0.18	0.16	0.06	0.03
Gustafson and Casper 2004	Figure 5	12	12	0.11	0.12	0.07	0.07
Gustafson and Casper 2004	Figure 5	12	12	0.11	0.07	0.07	0.04
Gustafson and Casper 2004	Figure 2	12	12	0.57	0.91	0.17	0.35
Gustafson and Casper 2004	Figure 4	12	12	0.15	0.25	0.05	0.05
Holah and Alexander 1999	Figure 1	5	5	48.09	37.23	4.47	8.90
Holah and Alexander 1999	Figure 1	5	5	48.09	54.84	4.47	2.24
Holah and Alexander 1999	Figure 1	4	5	8.00	1.90	4.40	2.90
Holah and Alexander 1999	Figure 1	4	5	8.00	8.40	4.40	7.80
Kardol *et al.* 2006	Figure 1	5	5	2.20	4.20	0.22	0.34
Kardol *et al.* 2006	Figure 1	5	5	2.20	4.30	0.67	0.37
Kardol *et al.* 2006	Figure 1	5	5	4.20	4.20	0.67	0.25
Kardol *et al.* 2006	Figure 1	5	5	4.20	4.30	0.67	0.25
Kardol *et al.* 2006	Figure 1	5	5	0.53	0.27	0.04	0.01
Kardol *et al.* 2006	Figure 1	5	5	0.68	0.28	0.07	0.01
Kardol *et al.* 2006	Figure 1	5	5	0.34	0.27	0.04	0.01
Kardol *et al.* 2006	Figure 1	5	5	0.34	0.28	0.04	0.00
Kardol *et al.* 2006	Figure 1	5	5	4.40	5.60	0.45	0.13
Kardol *et al.* 2006	Figure 1	5	5	5.10	5.50	0.67	0.66
Kardol *et al.* 2006	Figure 1	5	5	5.30	5.60	0.67	0.16
Kardol *et al.* 2006	Figure 1	5	5	5.30	5.40	0.67	1.50
Kardol *et al.* 2007	Author	5	5	8.33	9.58	1.14	0.43
Kardol *et al.* 2007	Author	5	5	0.94	1.56	0.07	0.17
Kardol *et al.* 2007	Author	5	5	0.94	1.65	0.07	0.27
Kardol *et al.* 2007	Author	5	5	0.94	1.67	0.07	0.20
Kardol *et al.* 2007	Author	5	5	0.94	1.40	0.07	0.14
Kardol *et al.* 2007	Author	5	5	0.94	1.41	0.07	0.16
Kardol *et al.* 2007	Author	5	5	0.18	0.45	0.07	0.17
Kardol *et al.* 2007	Author	5	5	6.44	7.95	0.74	0.26

Kardol *et al.* 2007	Author	5	5	1.55	2.02	0.29	0.18
Kardol *et al.* 2007	Author	5	5	1.55	2.25	0.29	0.13
Kardol *et al.* 2007	Author	5	5	1.55	2.05	0.29	0.15
Kardol *et al.* 2007	Author	5	5	1.55	1.73	0.29	0.12
Kardol *et al.* 2007	Author	5	5	1.55	1.95	0.29	0.33
Kardol *et al.* 2007	Author	5	5	0.76	1.56	0.10	0.40
Kardol *et al.* 2007	Author	5	5	6.31	7.97	1.52	0.90
Kardol *et al.* 2007	Author	5	5	1.21	1.35	0.28	0.19
Kardol *et al.* 2007	Author	5	5	1.21	1.44	0.28	0.24
Kardol *et al.* 2007	Author	5	5	1.21	1.84	0.28	0.12
Kardol *et al.* 2007	Author	5	5	1.21	1.33	0.28	0.10
Kardol *et al.* 2007	Author	5	5	1.21	1.52	0.28	0.09
Kardol *et al.* 2007	Author	5	5	0.68	2.85	0.09	0.34
Kardol *et al.* 2007	Author	5	5	6.18	6.40	0.74	0.13
Kardol *et al.* 2007	Author	5	5	1.12	1.31	0.06	0.08
Kardol *et al.* 2007	Author	5	5	1.12	1.32	0.06	0.10
Kardol *et al.* 2007	Author	5	5	1.12	1.25	0.06	0.09
Kardol *et al.* 2007	Author	5	5	1.12	1.19	0.06	0.23
Kardol *et al.* 2007	Author	5	5	1.12	1.28	0.06	0.04
Kardol *et al.* 2007	Author	5	5	0.60	0.75	0.05	0.04
Kardol *et al.* 2007	Author	5	5	7.67	9.08	1.01	0.64
Kardol *et al.* 2007	Author	5	5	1.24	2.24	0.23	0.71
Kardol *et al.* 2007	Author	5	5	1.24	2.41	0.23	0.18
Kardol *et al.* 2007	Author	5	5	1.24	2.27	0.23	0.19
Kardol *et al.* 2007	Author	5	5	1.24	1.74	0.23	0.12
Kardol *et al.* 2007	Author	5	5	1.24	1.98	0.23	0.10
Kardol *et al.* 2007	Author	5	5	0.10	1.58	0.03	0.16
Kardol *et al.* 2007	Author	5	5	6.35	8.63	3.47	0.86
Kardol *et al.* 2007	Author	5	5	0.47	1.13	0.12	0.32
Kardol *et al.* 2007	Author	5	5	0.47	1.19	0.12	0.31
Kardol *et al.* 2007	Author	5	5	0.47	0.97	0.12	0.40
Kardol *et al.* 2007	Author	5	5	0.47	1.20	0.12	0.38
Kardol *et al.* 2007	Author	5	5	0.47	1.14	0.12	0.19

Kardol *et al.* 2007	Author	5	5	0.36	0.95	0.16	0.16
Klironomos 2002	Author	10	10	5.90	5.60	0.60	0.90
Klironomos 2002	Author	10	10	9.80	11.10	2.30	1.70
Klironomos 2002	Author	10	10	4.80	6.40	0.60	0.40
Klironomos 2002	Author	10	10	3.80	4.80	0.30	0.80
Klironomos 2002	Author	10	10	5.90	6.90	0.40	0.50
Klironomos 2002	Author	10	10	2.60	3.30	0.50	0.70
Klironomos 2002	Author	10	10	6.90	7.40	1.60	0.80
Klironomos 2002	Author	10	10	3.60	4.10	1.20	0.50
Klironomos 2002	Author	10	10	3.40	3.00	0.80	0.70
Klironomos 2002	Author	10	10	9.30	9.30	1.60	1.60
Klironomos 2002	Author	10	10	1.20	1.70	0.90	0.80
Klironomos 2002	Author	10	10	2.40	3.00	0.70	0.60
Klironomos 2002	Author	10	10	2.10	2.80	0.40	0.60
Klironomos 2002	Author	10	10	3.40	4.30	0.90	0.60
Klironomos 2002	Author	10	10	4.00	4.90	1.20	0.60
Klironomos 2002	Author	10	10	7.20	8.30	0.70	0.80
Klironomos 2002	Author	10	10	10.80	14.70	2.70	1.80
Klironomos 2002	Author	10	10	14.20	13.60	2.80	2.40
Klironomos 2002	Author	10	10	4.80	5.90	0.60	0.40
Klironomos 2002	Author	10	10	8.20	8.30	0.90	0.70
Klironomos 2002	Author	10	10	7.70	8.80	1.50	1.20
Klironomos 2002	Author	10	10	5.30	6.00	0.50	0.40
Klironomos 2002	Author	10	10	2.20	2.40	0.80	0.70
Klironomos 2002	Author	10	10	1.90	2.30	0.50	0.60
Klironomos 2002	Author	10	10	8.60	9.00	0.90	1.30
Klironomos 2002	Author	10	10	5.90	5.80	0.60	0.40
Klironomos 2002	Author	10	10	4.10	5.10	0.50	0.40
Klironomos 2002	Author	10	10	8.00	8.90	1.00	1.30
Klironomos 2002	Author	10	10	3.80	3.50	0.80	1.40
Klironomos 2002	Author	10	10	1.20	1.80	0.70	0.50
Klironomos 2002	Author	10	10	1.40	1.90	0.70	0.70
Klironomos 2002	Author	10	10	2.00	2.50	0.60	0.50

Klironomos 2002	Author	10	10	3.10	3.60	0.40	0.40
Klironomos 2002	Author	10	10	3.80	3.90	0.60	0.60
Klironomos 2002	Author	10	10	11.80	11.60	2.30	2.00
Klironomos 2002	Author	10	10	9.80	11.20	1.40	1.20
Klironomos 2002	Author	10	10	0.80	1.10	0.70	0.80
Klironomos 2002	Author	10	10	6.50	7.90	0.80	0.70
Klironomos 2002	Author	10	10	3.50	4.70	0.70	0.70
Klironomos 2002	Author	10	10	11.60	12.40	3.50	1.90
Klironomos 2002	Author	10	10	3.40	4.40	0.90	0.60
Klironomos 2002	Author	10	10	3.90	5.30	0.70	0.70
Klironomos 2002	Author	10	10	2.90	3.10	0.80	0.80
Klironomos 2002	Author	10	10	8.90	10.10	2.60	1.80
Klironomos 2002	Author	10	10	4.90	5.60	1.60	1.10
Klironomos 2002	Author	10	10	3.30	3.30	0.90	0.40
Klironomos 2002	Author	10	10	5.20	6.00	0.30	0.70
Klironomos 2002	Author	10	10	8.40	6.70	1.50	1.40
Klironomos 2002	Author	10	10	1.50	2.00	0.60	0.70
Klironomos 2002	Author	10	10	8.20	7.20	0.30	0.40
Klironomos 2002	Author	10	10	2.30	2.70	0.70	0.60
Klironomos 2002	Author	10	10	3.00	4.20	0.60	0.40
Klironomos 2002	Author	10	10	17.00	15.80	3.60	3.50
Klironomos 2002	Author	10	10	9.90	10.30	0.90	1.80
Klironomos 2002	Author	10	10	8.40	8.30	0.50	0.50
Klironomos 2002	Author	10	10	8.30	8.20	0.80	0.90
Klironomos 2002	Author	10	10	8.40	10.60	1.80	0.90
Klironomos 2002	Author	10	10	3.60	4.50	0.50	0.50
Klironomos 2002	Author	10	10	4.20	5.40	0.40	0.70
Klironomos 2002	Author	10	10	4.40	6.30	0.70	0.80
Klironomos 2002	Author	10	10	5.50	5.70	1.30	0.80
Knevel *et al.* 2004	Figure 2	5	5	3.84	2.64	0.30	0.24
Kulmatiski *et al.* 2006	Figure 1	40	40	39.00	9.30	18.97	9.49
Kulmatiski *et al.* 2006	Figure 1	40	40	8.50	6.50	5.06	4.43
Kulmatiski, unpubl. data	Author	240	180	8.78	1.00	16.61	0.00

Kulmatiski, unpubl. data	Author	180	180	16.14	5.36	17.76	6.25
Kulmatiski, unpubl. data	Author	240	180	8.37	15.25	9.56	17.64
Kulmatiski, unpubl. data	Author	180	180	9.02	4.94	8.11	4.05
Kulmatiski, unpubl. data	Author	240	180	7.13	4.50	9.42	5.50
Kulmatiski, unpubl. data	Author	180	180	12.76	5.62	10.75	5.82
Meiman *et al.* 2006	Author	12	12	0.33	0.36	0.41	0.41
Morris *et al.* 2006	Table 3, Text	5	5	7.40	6.50	0.67	0.67
Niu et al 2007	Figure 4	4	4	6.00	5.56	0.50	0.70
Niu et al 2007	Figure 4	4	4	5.74	6.73	0.40	0.51
Niu et al 2007	Figure 4	4	4	5.90	4.40	0.30	0.27
Niu et al 2007	Figure 4	4	4	5.90	6.44	0.38	0.38
Niu et al 2007	Figure 4	4	4	10.00	11.89	0.94	0.56
Niu et al 2007	Figure 4	4	4	10.00	9.60	0.94	0.80
Niu et al 2007	Figure 4	4	4	6.79	5.10	0.40	0.70
Niu et al 2007	Figure 4	4	4	6.79	8.77	0.54	0.42
Packer and Clay 2000	Figure 2	125	125	0.11	0.11	0.03	0.05
Packer and Clay 2000	Figure 2	125	125	0.16	0.13	0.06	0.06
Packer and Clay 2000	Figure 2	125	125	0.16	0.15	0.05	0.04
Packer and Clay 2000	Figure 2	125	125	0.12	0.13	0.06	0.09
Peltzer 2001	Figure 2	10	10	1.02	1.02	1.01	1.01
Peltzer 2001	Figure 2	10	10	1.01	1.01	1.00	1.00
Puerta-Pinero *et al.* 2006	Table 2	20	20	0.38	0.58	0.40	0.18
Puerta-Pinero *et al.* 2006	Table 2	20	20	0.38	0.26	0.40	0.27
Puerta-Pinero *et al.* 2006	Table 2	20	20	0.38	0.57	0.40	0.27
Puerta-Pinero *et al.* 2006	Table 2	20	20	0.38	0.33	0.40	0.31
Puerta-Pinero *et al.* 2006	Table 2	20	20	0.38	0.36	0.40	0.27
Puerta-Pinero *et al.* 2006	Table 2	20	20	0.38	0.31	0.40	0.27
Puerta-Pinero *et al.* 2006	Table 2	20	20	0.38	0.70	0.40	0.27
Reinhart and Callaway 2004	Figure 2	12	12	28.81	29.72	16.07	19.23
Reinhart and Callaway 2004	Figure 2	12	12	16.90	17.60	11.71	11.22
Reinhart and Callaway 2004	Figure 2	12	12	28.81	39.81	16.07	38.76
Reinhart and Callaway 2004	Figure 2	12	12	16.90	21.83	11.71	7.79
Reinhart and Callaway 2004	Figure 2	9.5	9.5	5.85	11.40	6.16	10.79

Reinhart and Callaway 2004	Figure 2	8	8	6.00	10.50	5.66	8.49
Reinhart and Callaway 2004	Figure 2	9	9	3.12	5.00	4.50	4.68
Reinhart and Callaway 2004	Figure 2	9.5	9.5	5.85	14.80	6.16	13.87
Reinhart and Callaway 2004	Figure 2	8	8	6.00	13.00	5.66	12.73
Reinhart and Callaway 2004	Figure 2	9	9	3.12	7.12	4.50	7.89
Reinhart *et al.* 2003	Figure 2b	14.5	14.5	0.33	0.30	0.08	0.11
Reinhart *et al.* 2003	Figure 2b	11.5	11.5	0.31	0.21	0.12	0.11
Reinhart *et al.* 2003	Figure 2b	11.5	11.5	1.14	1.36	0.48	0.44
Reinhart *et al.* 2003	Figure 2b	11.5	11.5	0.80	0.80	0.27	0.34
Reinhart *et al.* 2003	Figure 2b	11.5	11.5	1.14	0.98	0.48	0.47
Reinhart *et al.* 2003	Figure 2b	11.5	11.5	0.80	0.45	0.27	0.27
Reinhart *et al.* 2003	Figure 2b	14.5	14.5	0.33	0.45	0.08	0.08
Reinhart *et al.* 2003	Figure 2b	11.5	11.5	0.32	0.20	0.12	0.08
Reinhart *et al.* 2005a	Figure 1	22	22	52.77	64.38	28.14	21.48
Reinhart *et al.* 2005a	Figure 1	22	22	52.77	69.24	28.14	20.50
Reinhart *et al.* 2005b	Figure 5	20	20	2.83	1.95	1.65	0.89
Reinhart *et al.* 2005b	Figure 5	20	20	4.25	3.80	3.80	2.24
Suding *et al.* 2004	Figure 2	10	10	0.45	0.31	0.22	0.19
Suding *et al.* 2004	Figure 4	6	6	0.70	0.23	0.15	0.07
Suding *et al.* 2004	Figure 2	10	10	0.58	0.75	0.19	0.19
Suding *et al.* 2004	Figure 4	6	6	0.61	0.13	0.29	0.06
Suguenza *et al.* 2006	Figure 1b	10	10	1.20	1.02	0.32	0.22
Troelstra *et al.* 2001	Author	15	15	2.08	2.58	0.39	0.44
Troelstra *et al.* 2001	Author	15	15	3.88	3.99	0.46	0.56
Troelstra *et al.* 2001	Author	10	10	2.09	2.48	0.42	0.40
Troelstra *et al.* 2001	Author	10	10	1.70	2.12	0.61	0.72
Van der Putten *et al.* 2007	Figure 1	5	5	4.66	1.98	3.35	3.35
Van der Putten *et al.* 2007	Figure 1	5	5	18.05	9.51	6.71	6.71
Van der Putten *et al.* 2007	Figure 1	5	5	15.91	19.94	3.58	8.94
Van der Stoel *et al.* 2002	Figure 2	5	5	39.50	100.00	28.17	0.00