Indirect effects in plant community ecology

“Apparent competition”

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Consider this pattern
Over time, the pattern changes
In ecology

• Outcomes of pairwise interactions shape our thinking in community ecology e.g. competitive interactions and competitive hierarchies exist and the outcome is competitive exclusion ($A>B$) – linear or transitive
Indirect interactions?

- Multi-species interactions (A>B>C)
Ants harvest seeds
Indirect Interactions - Not a new idea

See reviews by:

Gaining renewed interest:
Fig. 2  Aphid densities in Yolo County experimental grass stands in late spring of the first growing season (April 2001). The five stand types are shown as a function of *Avena* density, with and without *E. glaucus* (*E.g.*). Means ± SEM, *n*=3.

▲ Aphid densities rose 50- to 800-fold when the exotic grass was present
Fig 4. Feeding preference of *R. padi* apterous adults as determined in petri dish arenas with equal-area foliar tissue samples. Means ± SEM.

▲ Aphids preferentially select *Avena* as a host over native bunchgrasses in feeding trials
Fig. 1 Incidence of naturally acquired B/CYDV infection in Yolo County experimental grass stands in late spring of the second growing season (April 2002). Means ± SEM. a Incidence in *E. glaucus* grown with three densities of *A. fatua*.

The presence of *Avena* more than doubled the incidence of infection by B/CYDV.
Malmstrom et al. (2006) J.Ecol. 94: 264-275

Fig 1. Influence of virus infection on survival (%) of native bunchgrass seedlings, as a function of *Bromus* density (low, high)

Black bars (controls), gray bars (innoculated); percentages above bars indicate relative virus effects

▲ Invasion impact is influenced by the capacity of exotic species to increase the pathogen load on native species with which they compete.
The way forward

• Path analysis? Builds on alternative causal hypotheses

• Scenario building of interactions in a multi-species community:
  → the degree to which changing a causal variable will affect a dependent variable through both direct and indirect pathways