Fig. 2. Equilibrium model state as a function of perennial birth rate (b_P), and annual birth rate (b_A). Throughout the region examined here, perennials extirpate annuals [or reduce annuals to extremely low levels ($<<0.1$ m^{-2})] in the absence of disease. With the pathogen in the system, perennials and annuals coexist with increasing domination by the perennials from region *A*-*D*. Regions *A* and *B* are annual-dominated; in region *A*, perennials are very rare (<0.1 m^{-2}), whereas in region *B*, perennials are more common (>0.1 m^{-2}). Regions *C* and *D* are perennial-dominated; in region *C*, annuals are relatively common (>0.1 m^{-2}), whereas in region *D*, annuals are rare (<0.1 m^{-2}). (X) marks field-estimated parameters.

Fig. 3. Equilibrium model state as a function of perennial birth rate (b_P), and perennial competition-death rate (μ_P). Regions *A* and *B* are annual-dominated, whereas region *E* is perennial-dominated. Perennials are always rare in region *A*, but in region *B*, perennials are common without disease (>0.1 m^{-2}) but rare with disease (<0.1 m^{-2}). In regions *C* and *D*, perennials dominate in the absence of the pathogen, and annuals dominate with the pathogen present. In region *C*, the rarer species remains relatively common (>0.1 m^{-2}). In region *D*, when annuals dominate (pathogen present), perennials remain relatively common (>0.1 m^{-2}) but when perennials dominate (pathogen absent), annuals persist at very low levels (<0.1 m^{-2}). (X) marks the field-estimated parameter values.

Fig. 4. Equilibrium model state as a function of the reduction in perennial fecundity by disease (ε_P), and the reduction in perennial inter-annual survivorship ($\sigma_{P_I} / \sigma_{P_S}$). In region *A*, perennials always dominate over rare (<0.1 m^{-2}) annuals. In regions *B* and *C*, perennials dominate over rare (<0.1 m^{-2}) annuals without disease, and annuals dominate over perennials with disease. In region *B*, perennials are relatively common (>0.1 m^{-2}) with disease, whereas in region *C*, perennials are rare (<0.1 m^{-2}) when the pathogen is in the system. Region *D* presents an interesting case in which perennials dominate over very rare annuals without disease, but with disease, annuals invade and extirpate perennials, thus extirpating the disease as well. This leaves the system vulnerable to re-invasion and

domination by perennials, unless some other process maintains the disease across seasons. (X) marks field-estimated parameter values.

Fig. 5. Equilibrium model state as a function of the rate of transmission to perennials (β_P), and to annuals (β_A). In region *A*, disease persists, allowing annuals to dominate; perennials persist but remain rare (<0.1 m^{-2}). In region *B*, disease dies out, leaving a perennial-only community. Note that a small boundary area exists where the disease persists at low levels, allowing perennials to dominate, but annuals are able to persist at low levels. The boundary curvature demonstrates that for parameters where disease cannot persist (region *B*), and $\beta_A = \beta_P$, for an increase in β_A sufficient to allow disease to persist, a similar increase in β_P will not necessarily sustain the disease. (X) marks field-estimated parameters.