

Mitchell, Charles E. and Alison G. Power. 2003. "Release of invasive plants from fungal and viral pathogens." *Nature* 421: 625-627.

Invasive plant species, like dandelions and kudzu, are a common sight. Invasive species are not just annoying, they can be a major threat to biodiversity. In this study, Mitchell and Power used data on plant pathogens to test hypotheses about why some introduced species become invasive pests. Mitchell and Power focused on plant species that have been introduced from Europe to the United States.

The background paper, "Parasites lost" (Clay 2003 [*Nature* 421: 585-586]), provides a clear explanation of why Mitchell and Power's key findings are important. Although the questions below are based on the paper by Mitchell and Power, the background paper will help you understand their paper.

Pre-discussion report. Due at the beginning of class, Thursday, April 1.

- 1) Write thoughtful responses to *two* of the following questions. Responses should put ideas in your own words and should draw support both from the article and from your own knowledge and ideas.
 - a) Introduced species become invasive pests when their populations grow and spread out of control. Given what you've learned about species interactions, describe at least two different factors that can limit population sizes of introduced species. Be sure to describe how each factor can limit population sizes. Propose a hypothesis for why some introduced species do not become invasive. How could you test your hypothesis? What data would support your hypothesis?
 - b) Invasive species grow and spread because their birth rate exceeds their death rate. We've learned how the logistic model of population growth can be used to describe limits to population growth. According to the logistic model, what factors can cause population growth to slow down and stop? Explain whether this model does or doesn't apply to invasive species. We've also learned how the Lotka-Volterra model can be used to describe increases and decreases in population sizes. According to the Lotka-Volterra model, what factors can cause populations to grow and shrink. Explain whether this model does or doesn't apply to invasive species.
 - c) Mitchell and Power describe two hypotheses for why some introduced species become invasive, the "enemy release hypothesis" and the "biotic resistance hypothesis." For each hypothesis, use an example to illustrate what the hypothesis means. In Mitchell and Power's study, was each hypothesis supported? Use the data presented in Figures 3 and 4 to describe the evidence for or against each hypothesis. Be sure to consider each hypothesis separately.
 - d) Invasive species are an important concern for conservation biologists. Explain how invasive species can be a threat to biodiversity. Considering what you've learned about how keystone species can alter the outcome of competition, propose a hypothesis for how

pathogens affect the invasiveness of an introduced plant species. How could you test your hypothesis? What data would support your hypothesis?

3) Write one thoughtful question that you have about the article. Begin with a sentence or two that describes the context for the question (e.g., what the writer said, what you know about biology). Then ask a question that relates to the content of the article. Good questions will try to deepen your understanding of concepts, or will try to relate the content of the article to other ideas. The most interesting questions will be used to fuel our in-class discussion!