



## Why do species invasions matter?



### Active Listening Questions:

- Which type of global change does Dr. Vitousek state is the most irreversible?
- What is the example Dr. Vitousek provides of an ecological impact of invasive

**WHAT:** In this 1994 clip from the presentation "Biological Invasion Overview," Dr. Peter Vitousek describes different types of global change. Among these changes, he highlights biological invasion, or the impacts of invasive species. He attributes the importance of biological invasion to the fact that it can lead to biodiversity loss or changes in how entire ecosystems function.

**HOW:** Dr. Peter Vitousek draws his information from the work of previous scientists and uses charts to present his information in a clear, concise manner.

**“... THESE ARE ALL CHANGES IN THE WAY THE WORLD WORKS.”**

**WHY:** Peer review forms an important component of scientific research. Group meetings and discussions with other well-respected members of a scientific field are one way for scientists to learn about and critique each other's work. In this clip, you hear confirmation of the impact of invasive plants on fire regimes from a member of the audience.

**SO WHAT:** The spread and development of human communities has led to changes in the natural world occurring on a global scale, particularly the spread of non-native species. Introduction of a new species to an area can lead to changes in how the ecosystem works or a loss of some native species. Research, such as Dr. Vitousek's, helps communities to understand what may occur from and potential causes of species invasions, so that they may make informed decisions about preventing or responding to these changes.



**BIO:** Dr. Peter Vitousek is an ecologist and professor at Stanford University, where he has been faculty since 1984. He has a PhD in biology and focuses primarily on nitrogen and phosphorus enrichment in soils and the impact of invasive species. He is a Senior Fellow of the Woods Institute for the Environment. Dr. Vitousek began college as a Political Science Major but was inspired to change the focus of his studies after reading a Charles Elton book about ecology for an English class. Dr. Vitousek was born in Hawaii and continues to conduct field work there periodically. A summary of his talk on invasive species and global change is available on the AGCI website in the Elements of Change Series, *Biological Invasion as an Element of Change*, pages 65-67.



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### TAKING THE REINS

#### **DISCUSSION QUESTIONS:**

Discuss with a friend or record your thoughts in a journal.

- Dr. Vitousek describes the establishment of invasive species as nearly irreversible, similar to species extinction. Consider invasive species in your area and strategies for their removal. Based on your experience, do you agree or disagree with Dr. Vitousek?
- Why do you think that Dr. Vitousek links invasive species with biodiversity loss?
- Which type of global change do you think is most important and why?

#### **QUIZ QUESTIONS:**

**Quiz 1.** Which of the following type of global change does Dr. Vitousek say is the most irreversible?

- increasing atmospheric CO<sub>2</sub> concentration
- biodiversity loss
- land use change
- none of the above

**Quiz 2.** Which of the following type of global change does Dr. Vitousek describe as having the most extensive influence so far?

- increasing atmospheric CO<sub>2</sub> concentration
- biodiversity loss
- land use change
- none of the above

**Quiz 3.** Which of the following type of global change does Dr. Vitousek say is the best documented?

- increasing atmospheric CO<sub>2</sub> concentration
- biodiversity loss
- land use change
- none of the above

**Quiz 4.** Which of the following interactions best describes the relationship between an introduced grass and land use change, as shown on the second slide in Vitousek's presentation?

- Humans cleared the land for agriculture, leading to increased fire and the growth of small shrubs.
- Invasive grasses increased fire frequency, creating areas of land that had soil unsuitable for agriculture.
- Humans planted trees, creating corridors that furthered the spread of invasive grasses, increasing wildfires.
- An invasive grass allowed increased fire occurrence, leading to the formation of a grassland and a cycle of increased burning.

#### **GLOSSARY TERM: BIOLOGICAL INVASION**

When a species move into an area where it was not formerly present and establishes successful colonies, sometimes displacing native species in the process.



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### CLIP ACTIVITY: Understanding Ecological Relationships

Look at the second slide Dr. Vitousek shows and answer the following questions, either in your science journal or through discussion with a friend.

1. Can you explain what each of the arrows represent and why they point the direction they do?
2. Print a copy or draw your own version of the diagram. On this diagram, add boxes and arrows of changes that would change the loop between fires and grasslands.
  - o Your arrows should represent an event or action that would break the cycle.
  - o Your box should show what new condition(s) might exist.

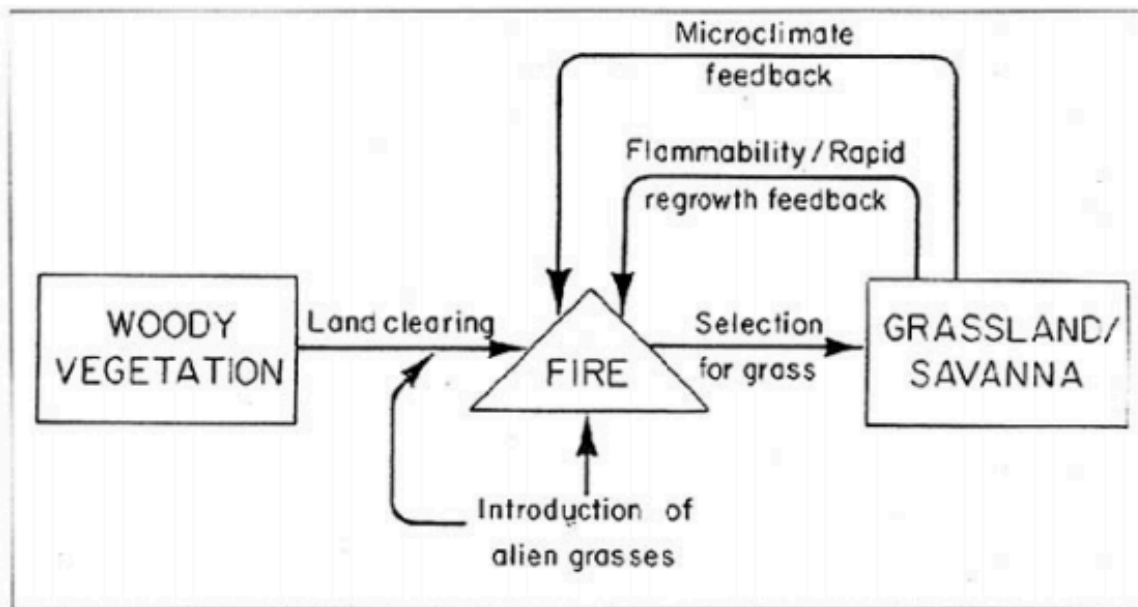


Figure ii.3. Grass invasion and the grass-fire feedback. Land clearing and grass introductions act synergistically to convert forest to grassland or savanna, once conversion has occurred, two feedbacks operate to maintain grass dominance. The hot, dry, windy microclimate of grasslands, and the inherent flammability of grasses favor fire, and the rapid regrowth of grasses following fire keeps communities fire-prone. From D'Antonio and Vitousek (1992).



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### GO BEYOND: SCIENCE JOURNAL

In this 1994 lecture, Dr. Vitousek called biodiversity loss irreversible. Stories such as Jurassic Park have played with this idea in a fictional way. Now, in 2013, recent developments in science have allowed researchers to implant embryos from rare species into more common species, creating a host mother that is a different species of animal from the offspring. Using your science journal to record your thoughts, explore and research the questions below.

- Do you think it may one day be possible to re-introduce a species that has gone extinct in real life?
- In terms of real world populations, do you think that this type of research could change the statement that extinction is irreversible?

1. Without looking anything up, write down or sketch out your answers.
2. Ask a family member, friend, or teacher the same question and write down their answers.
3. What are the common answers you've collected? Write or sketch the common themes/ideas.
4. Devise your own strategy for digging deeper (ask a scientist, check out university and government agency websites like NOAA and NASA, go to the library, ect.) until you are satisfied that the answer makes sense to you.
5. Summarize what is known and unknown about extinction, and reintroduction. Also note what evidence there is in supporting what is known and how the evidence was obtained.
6. Rate the answer you've come up with on a scale of 1 to 10, 1 being weak with lots of uncertainty, 10 being perfect.
7. Do you think this type of research is ethical? Why or why not?

### FURTHER READING:

A text summary of this presentation can be found in the AGCI library ([agci.org](http://agci.org)) under **Biological Invasion as a Global Change**, 1994, p 65.