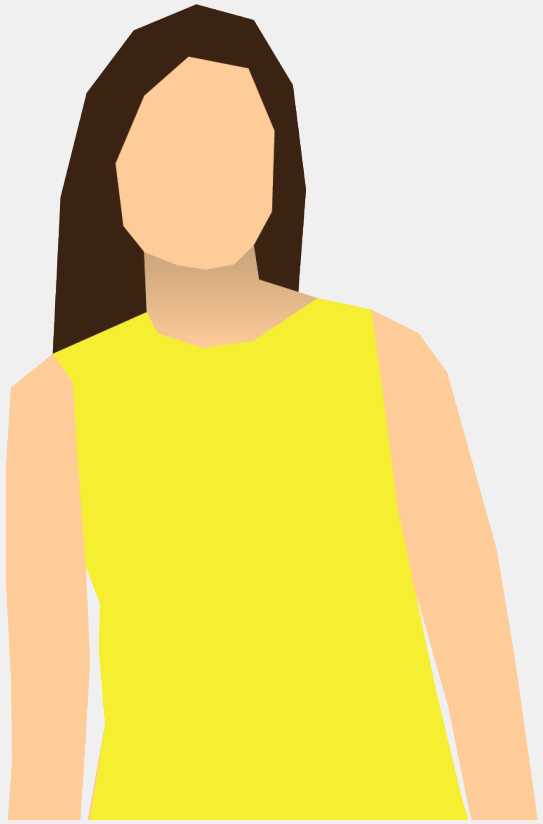
Human-Accelerated **Biodiversity Loss** during **Climate Change** *Threatens* Human Health & Food Security

by **Miles Robertson**, Math/Stats and Biology, *CAI 5200*

Ecosystems include Humans

Ecosystem:
A set of interacting organisms and their physical environment

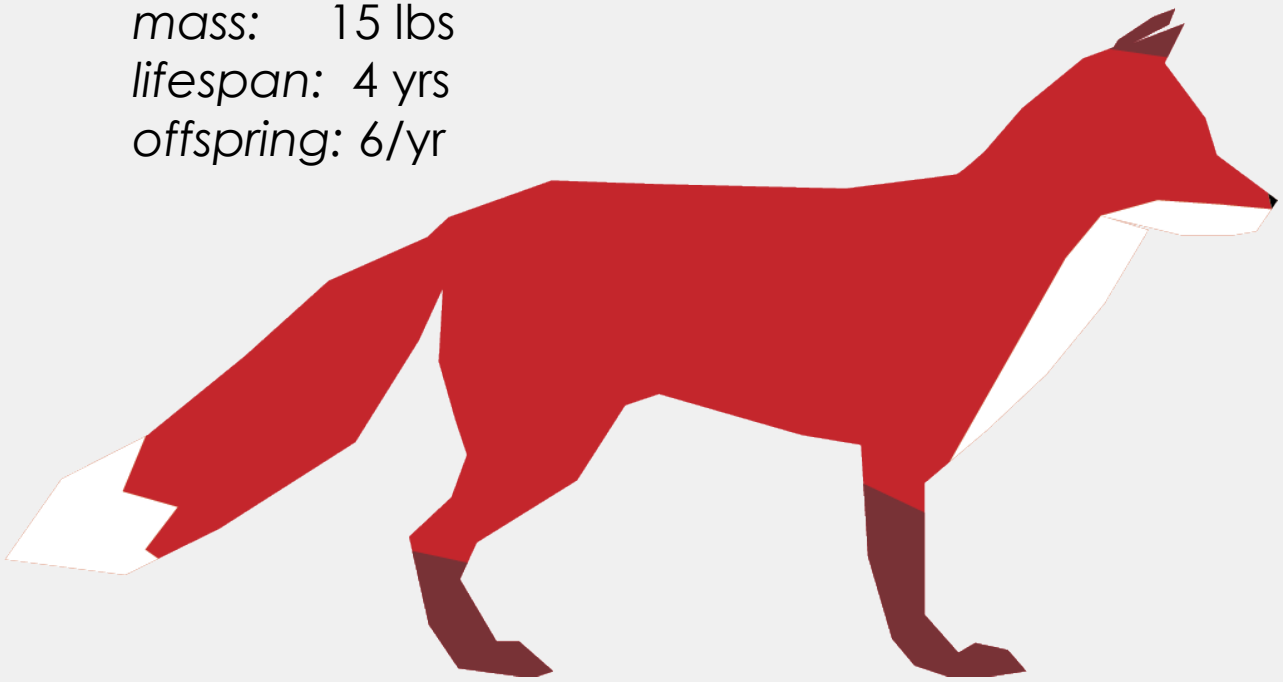


Climate Change will Cause Destruction

Ecosystem Dynamics are Difficult to Predict

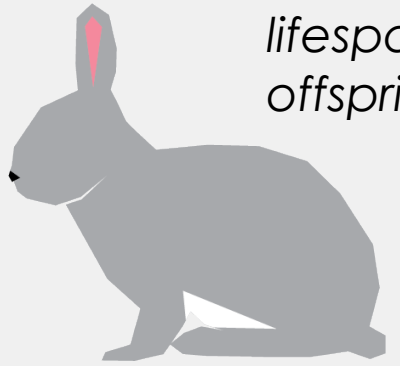
FOX

mass: 15 lbs
lifespan: 4 yrs
offspring: 6/yr

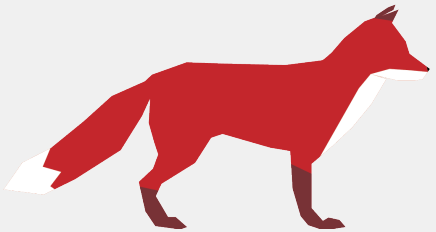


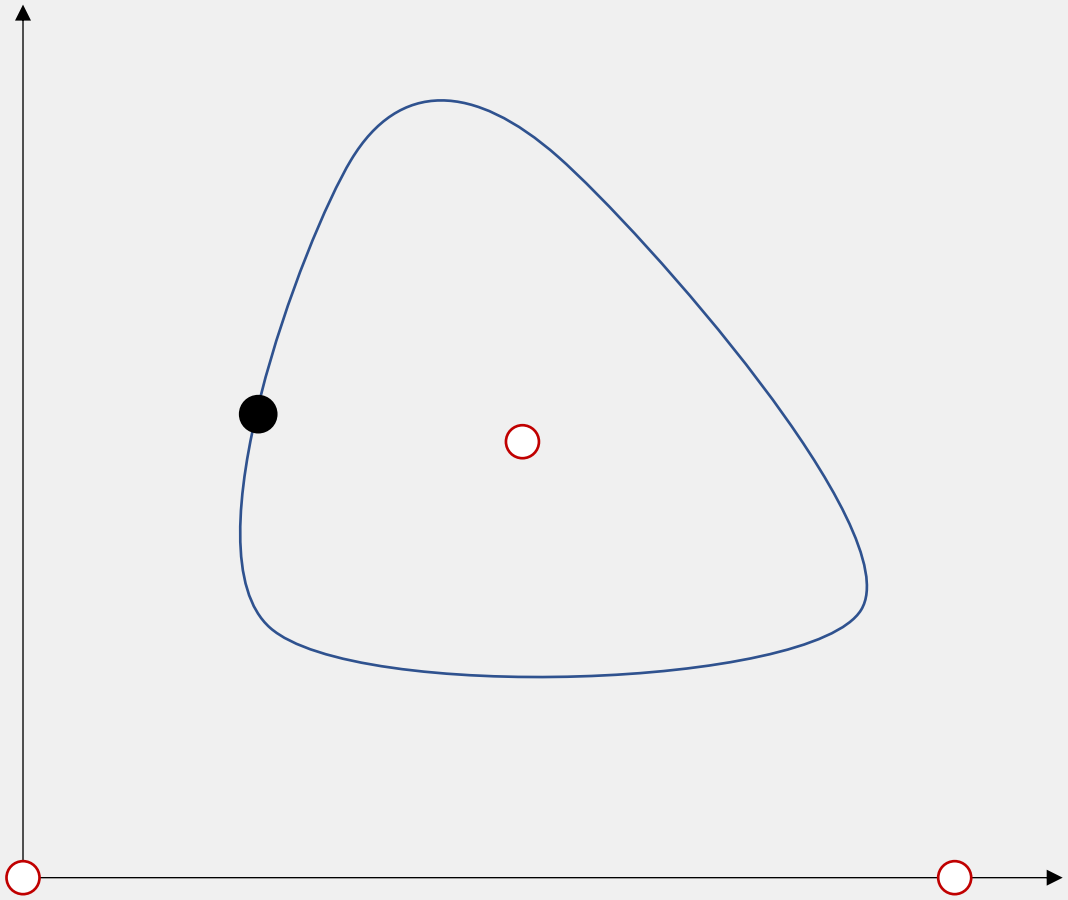
RABBIT

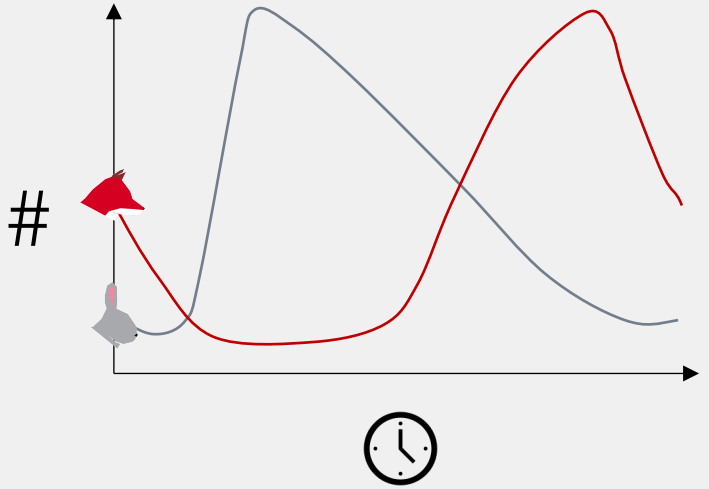
mass: 3 lbs
lifespan: 9 yrs
offspring: 100/yr



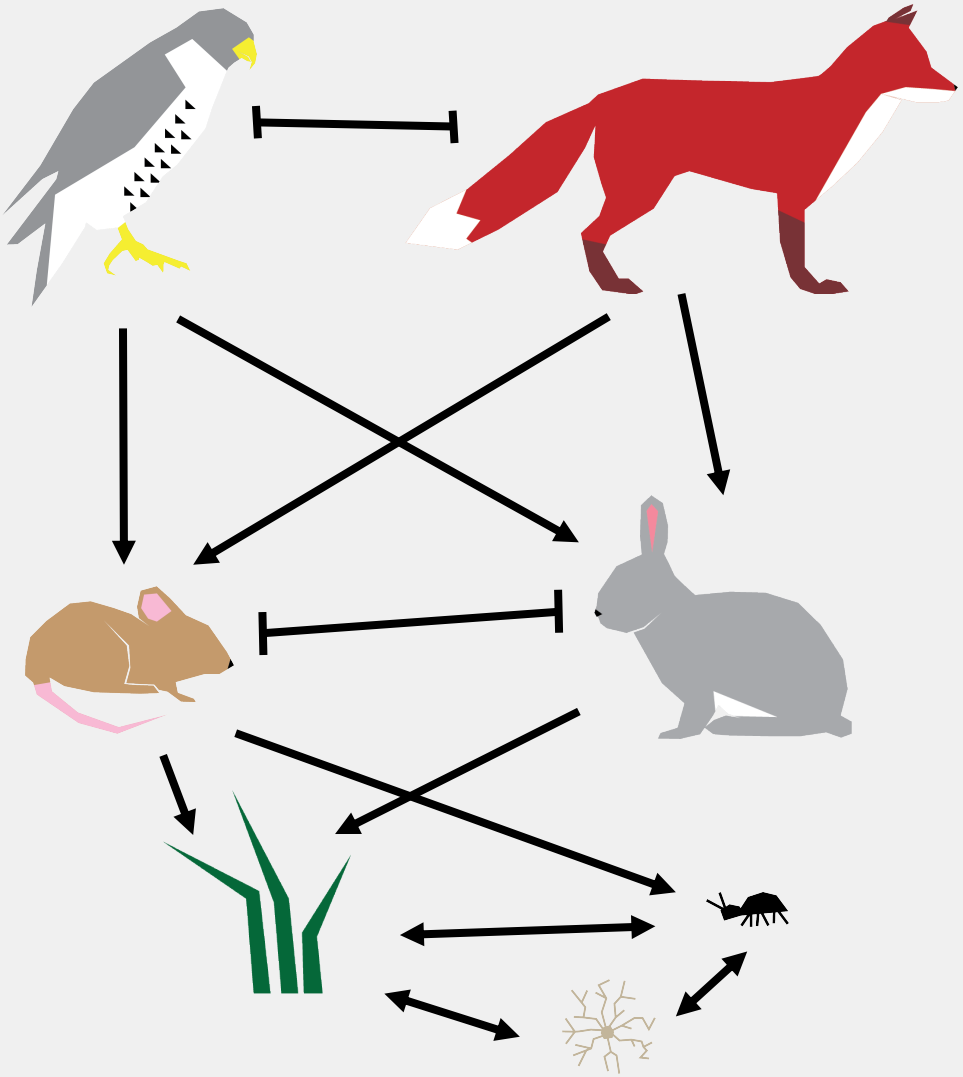
Ecosystem Dynamics are Difficult to Predict





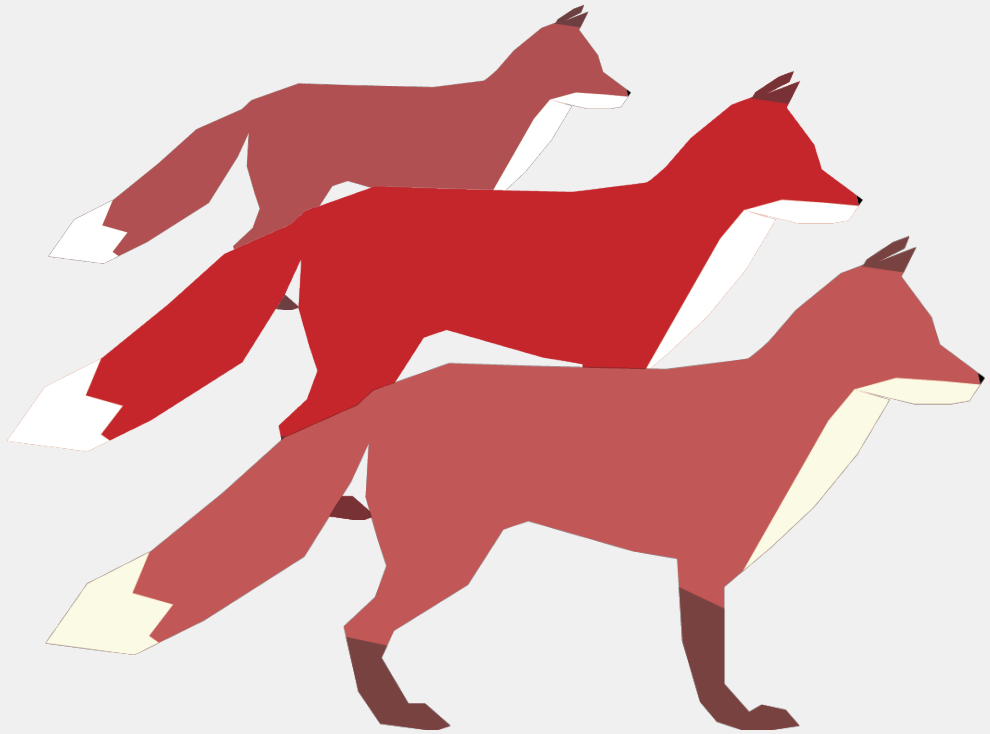


Ecosystem Dynamics are Difficult to Predict

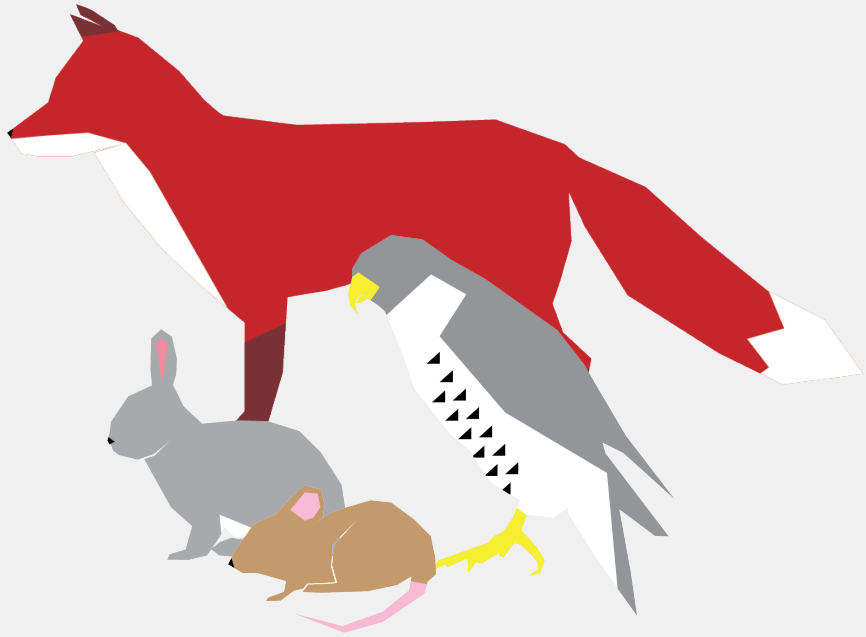


Biodiversity Stabilizes Ecosystems

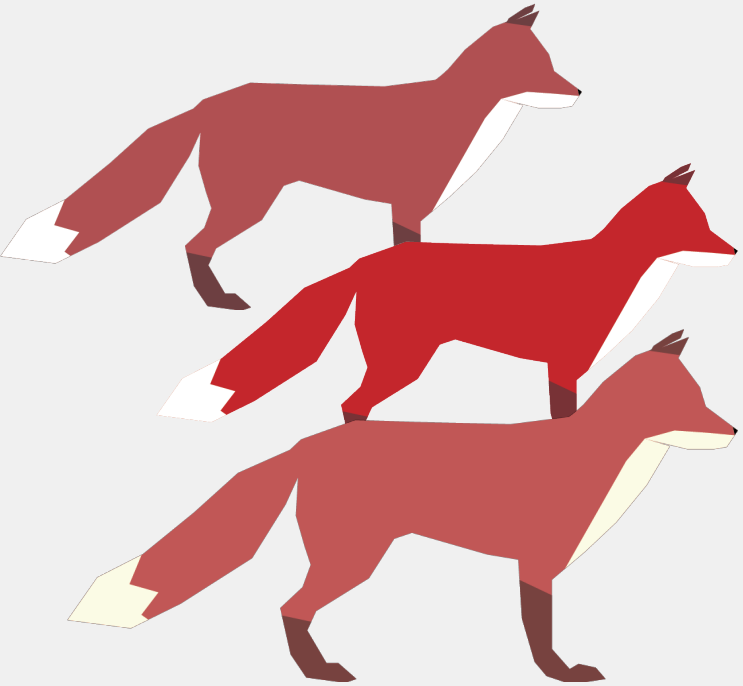
Interspecific Biodiversity

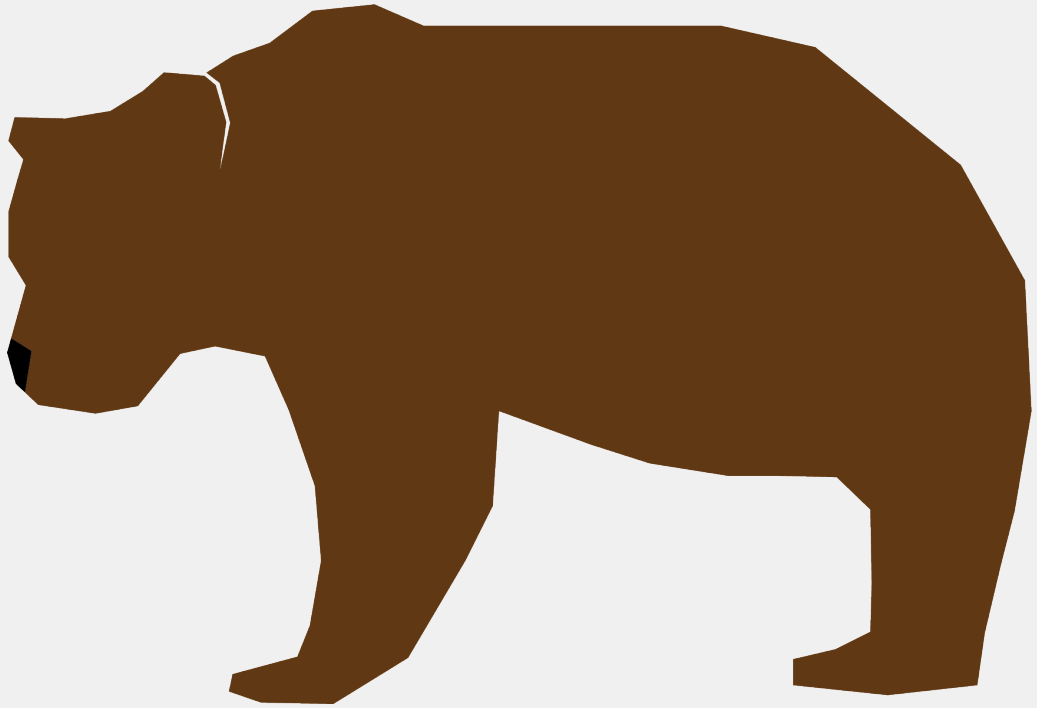


Intraspecific Biodiversity

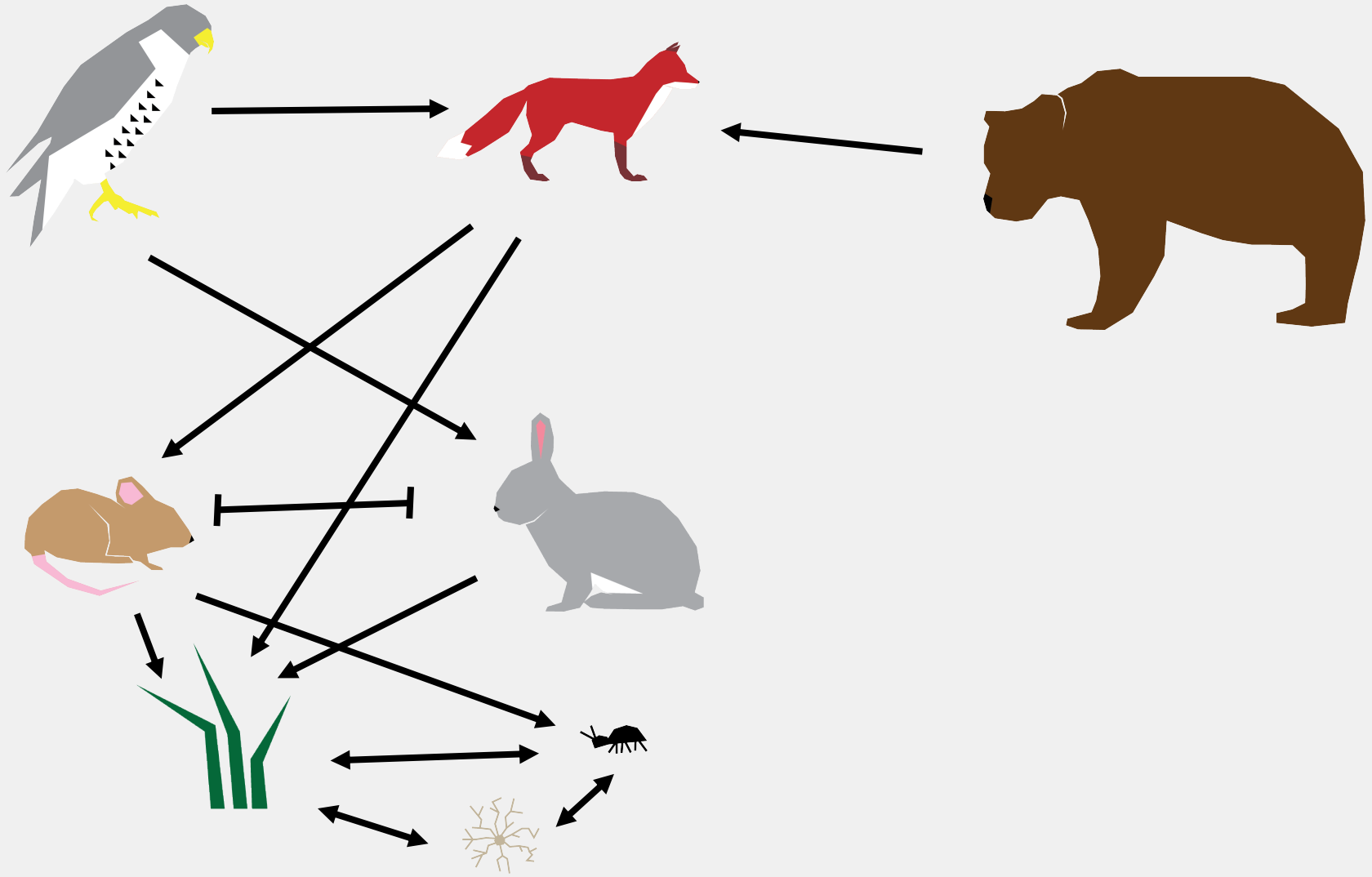


Ecosystems are Resilient, but not Indestructible

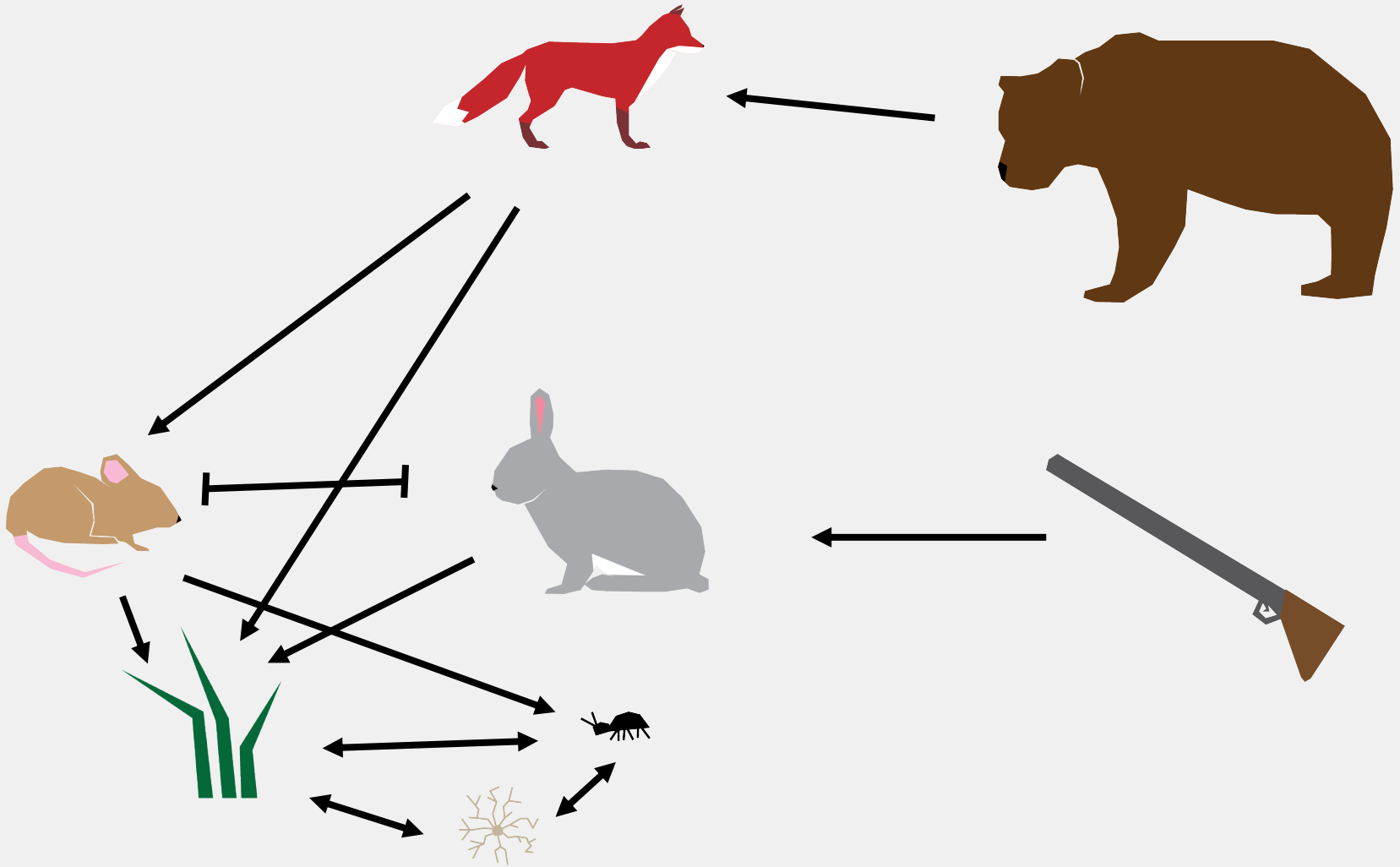




Ecosystems are Resilient, but not Indestructible



Ecosystems are Resilient, but not Indestructible



3 Case Studies of Biodiversity Loss - **Methods**

Data Sources

- Government-collected data
- Academic research papers
- Climate change projections

4R Resilience Framework

- Resistance
- Retention
- Resurgence
- Recovery

South China Sea

Biodiversity Interest:
Marine ecosystems supporting fisheries

Countries:
China, Taiwan, Indonesia, the Philippines, Thailand, etc.

Affected Population Estimate:
~2 billion people

South China Sea - Threats

82% ± 12%

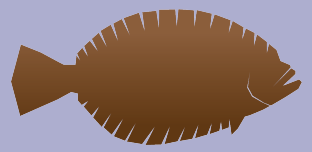
decrease in SCS **fish stock** since 1950 due to overfishing

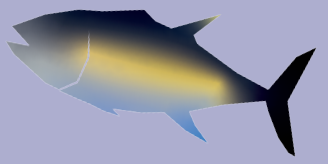
half

of worldwide fishing vessels are in SCS

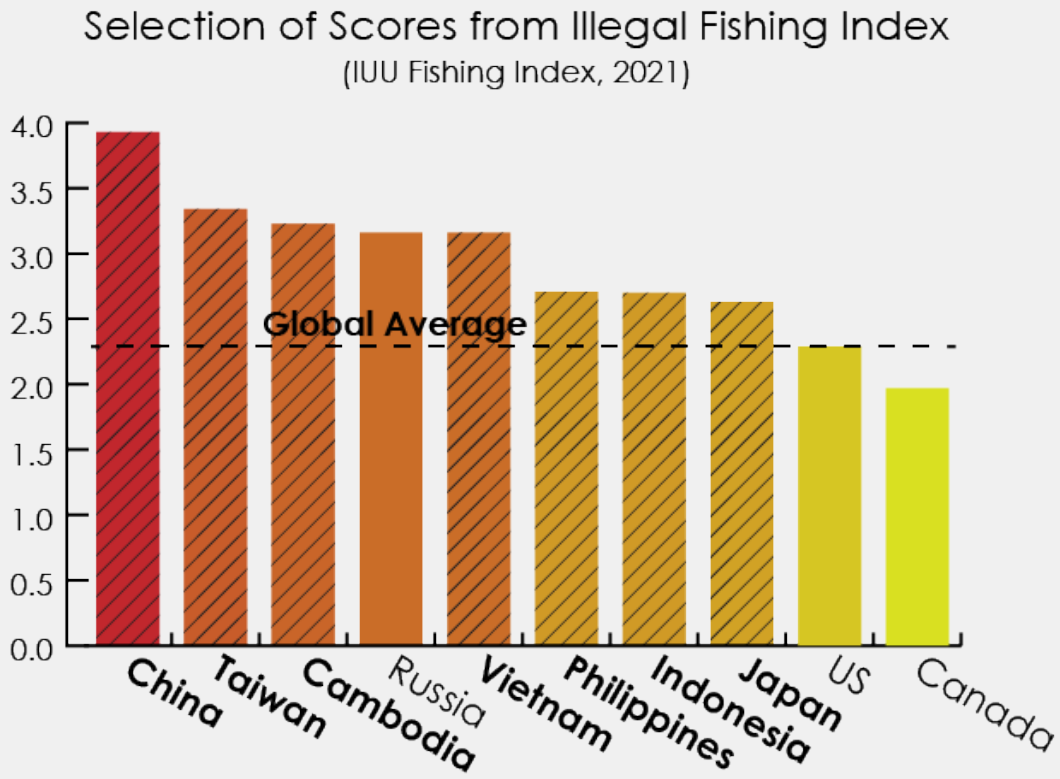
25% ± 5%

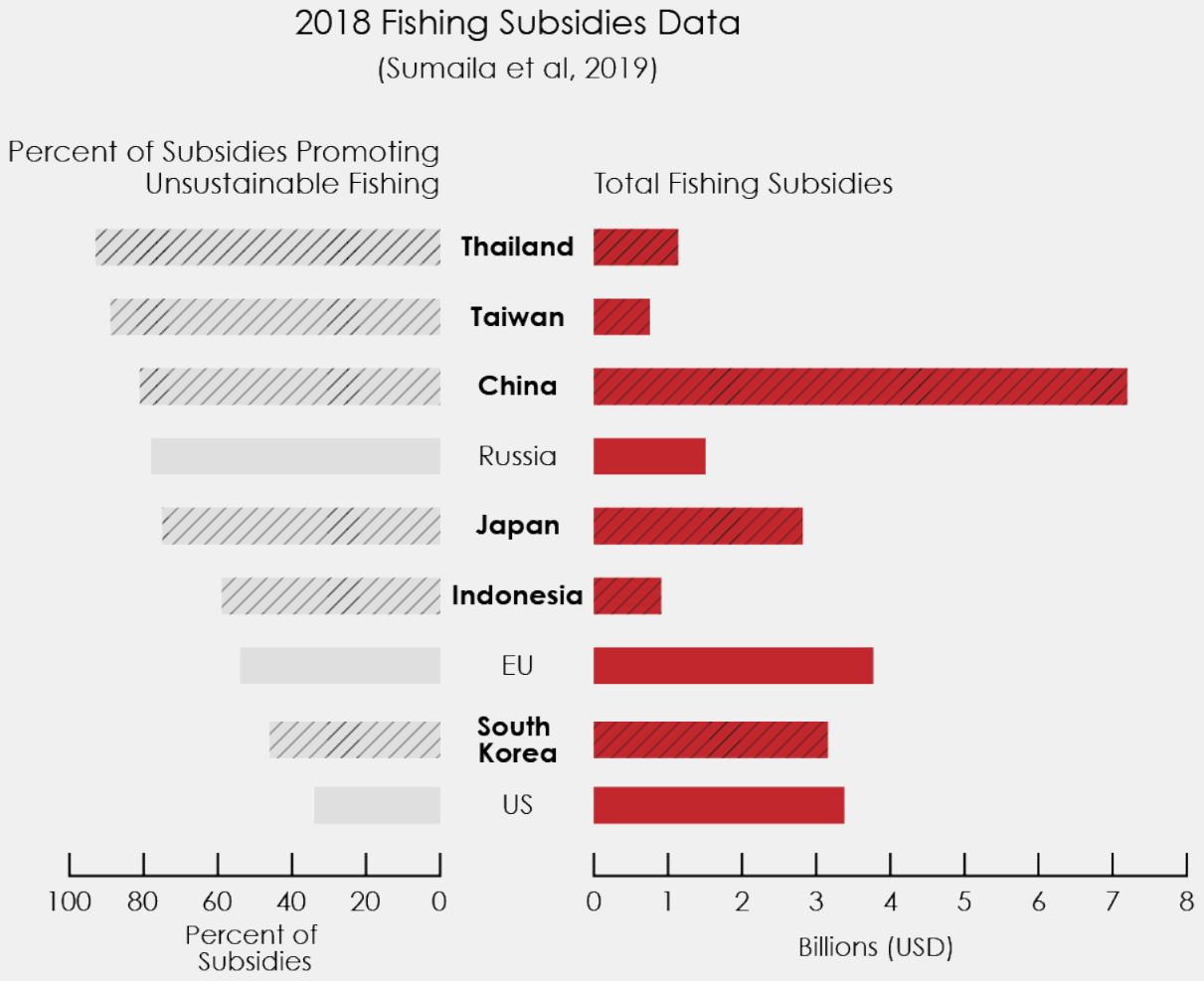
projected **biomass loss** in SCS by 2100 due to climate change





South China Sea - Resilience





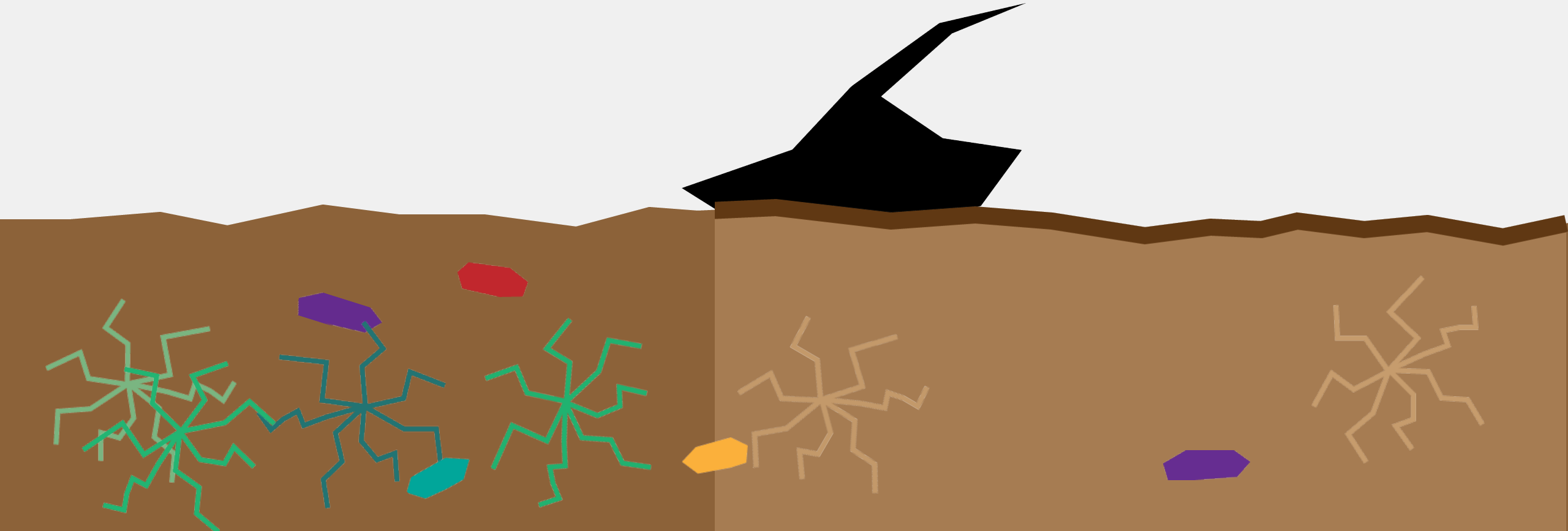
US Corn Belt

Biodiversity Interest:
Fungal and microbial populations in crop soil

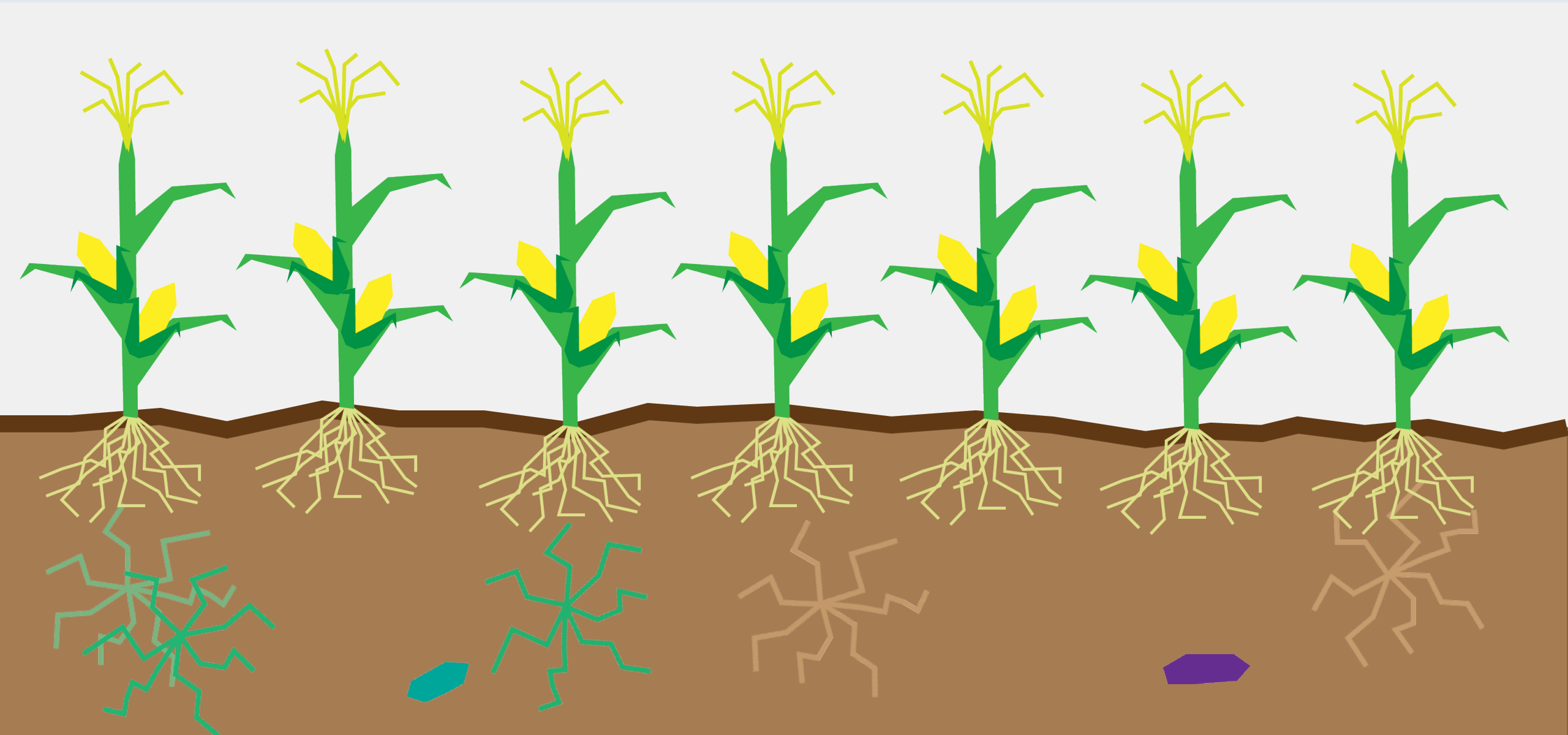
Countries:
USA, US Export Nations

Affected Population Estimate:
~1 billion people

US Corn Belt

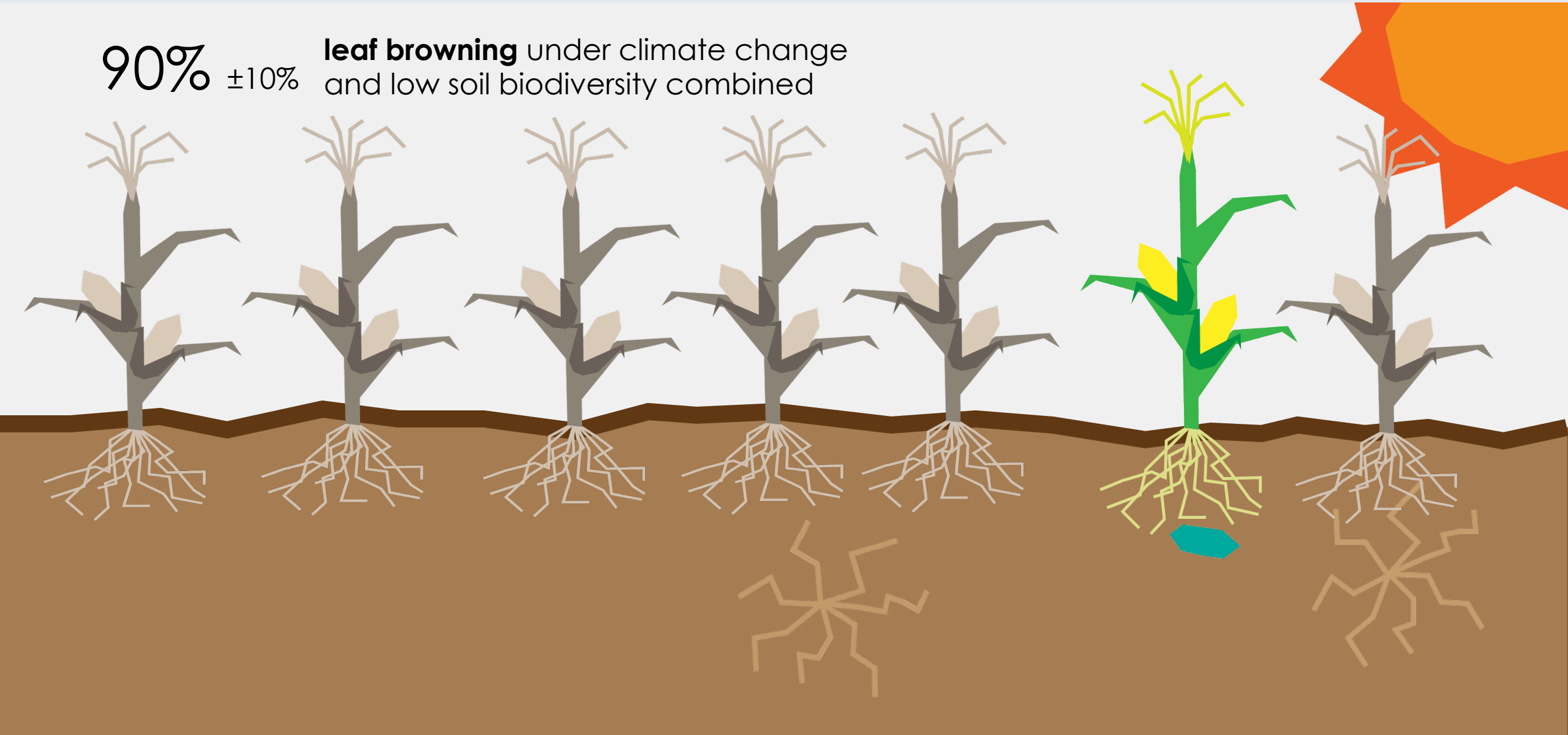


US Corn Belt



US Corn Belt

90% ±10% **leaf browning** under climate change and low soil biodiversity combined



Amazon Rainforest

Biodiversity Interest:
Pathogen host populations

Countries:
Brazil, Colombia, Peru, Bolivia etc.

Affected Population Estimate:
~500 million people

Amazon Rainforest

Amazon Rainforest

Amazon Rainforest

many zoonotic diseases

increase

spread when there is a decrease in the diversity of pathogen hosts

Conclusions

- Ecosystems are resilient to challenges if...
  - biodiversity is preserved
  - changes are gradual
  - challenges are sporadic
- Some human activities threaten our place in the biosphere
- Biodiversity nurturing buffers consequences of climate change

Miles Robertson

Mathematics, Statistics and Biology

Utah State University

miles.robertson@aggiemail.usu.edu

Jeannie Johnson

Political Science & Anticipatory Intelligence

Utah State University

jeannie.johnson@usu.edu

Briana Bowen

Anticipatory Intelligence

Utah State University

briana.bowen@usu.edu

For More Information:

cai.usu.edu (4R Resilience Framework)

(Project Citations)

CENTER FOR ANTICIPATORY INTELLIGENCE

COLLEGE OF HUMANITIES AND SOCIAL SCIENCES
UtahStateUniversity