

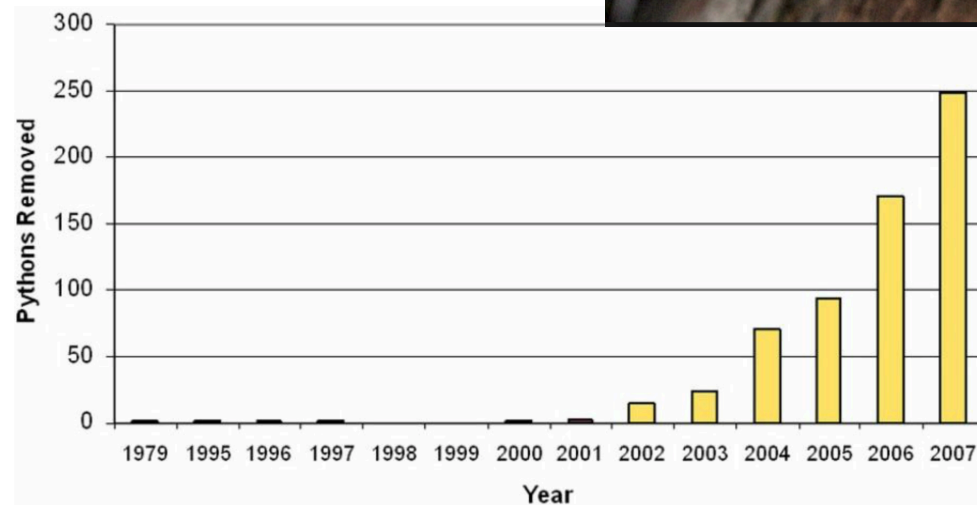
# Invasive Species

# Terms

- Introduced: species that originate in one location and are brought to another
  - Alien
  - Non-native Native: Species not introduced to that area
- Invasive: A non-native species in an ecosystem that causes or is likely to cause economic or environmental harm

# Methods of introduction

- Deliberate
  - Comfort
  - Biological control
  - Ecological remediation
  - Ornaments
  - Agriculture
  - Domestic
  - Sport



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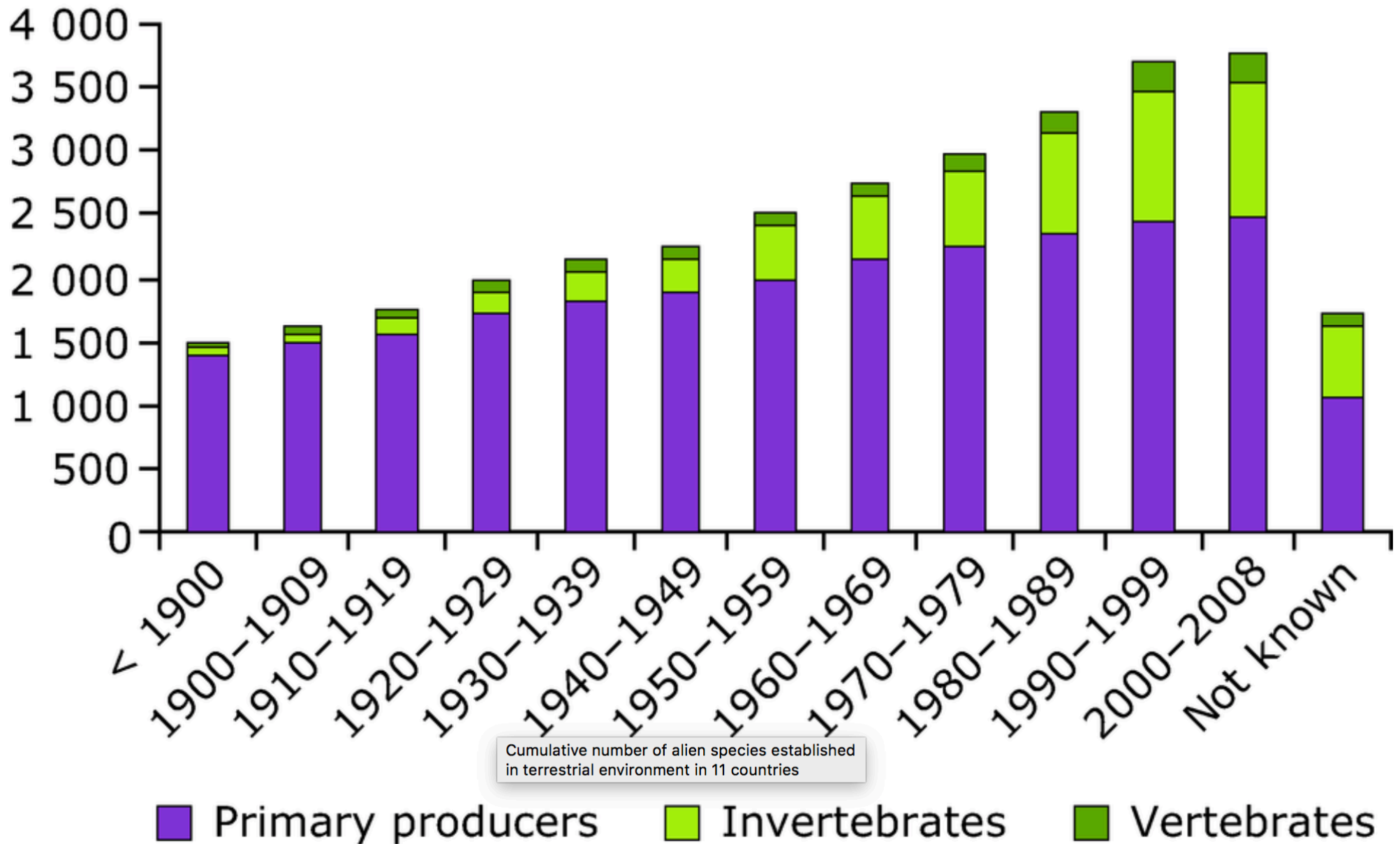


- Accidental

- Travel (air, sea, land)
- Shakespeare

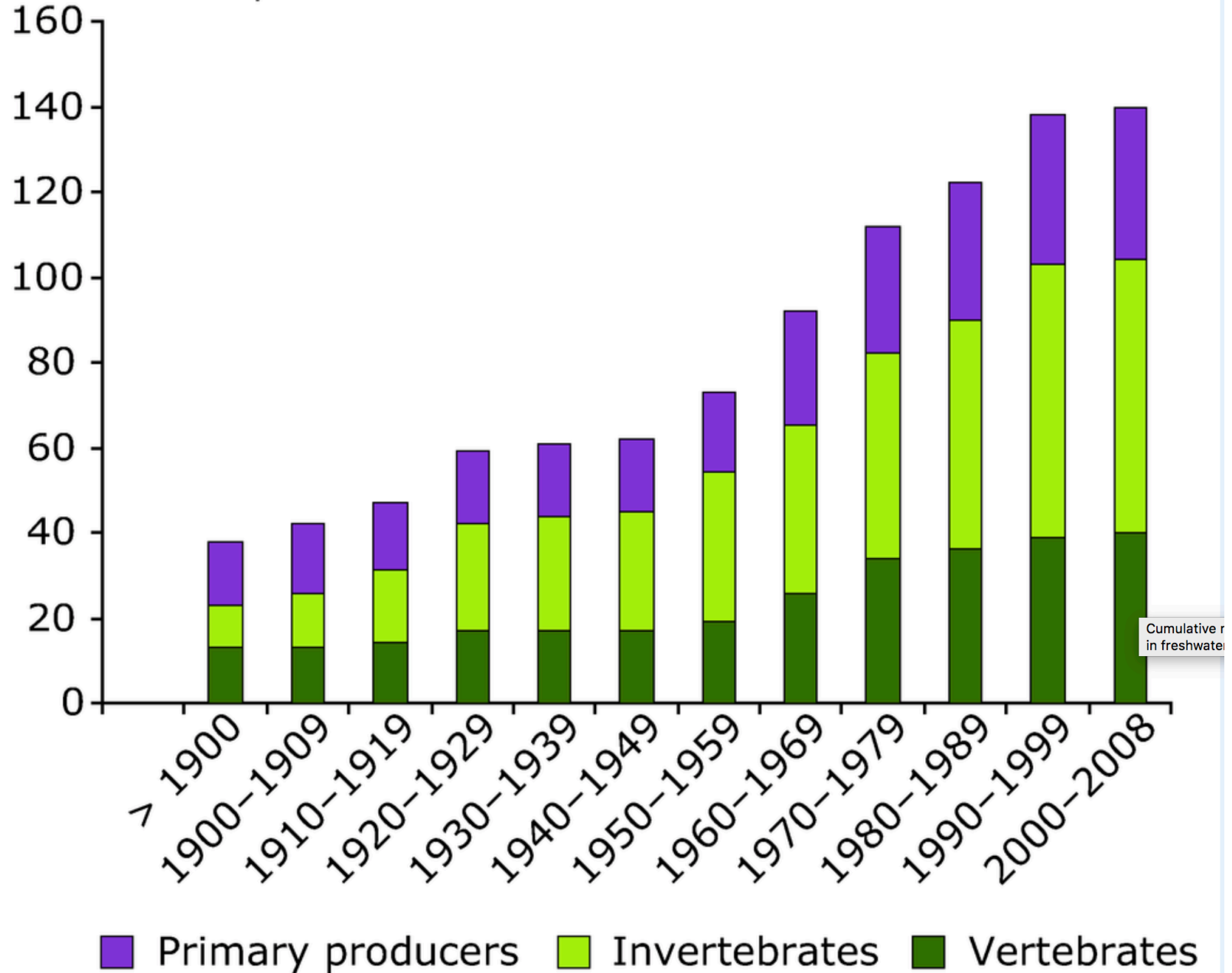


# How common?



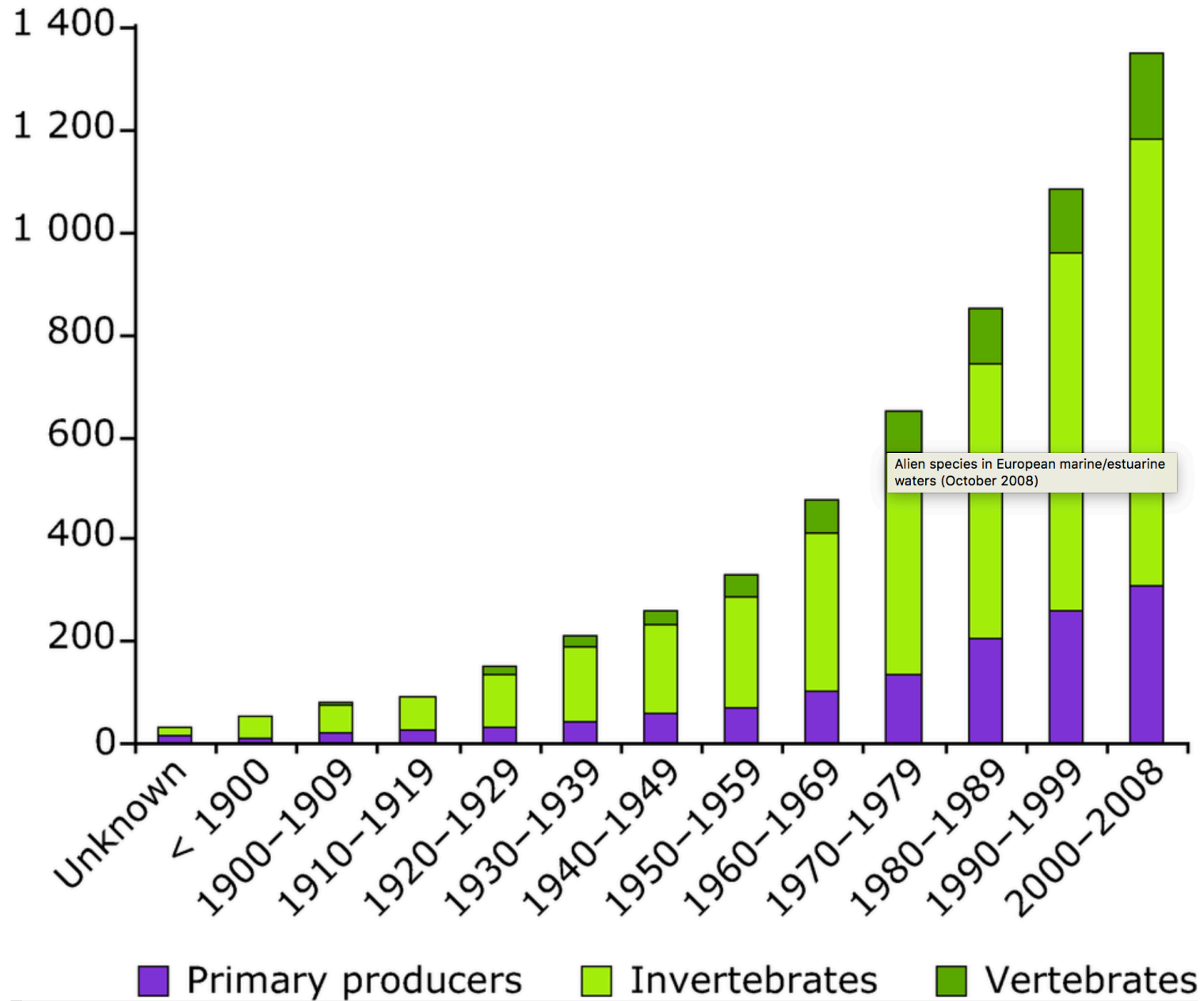
# How common?

Number of species

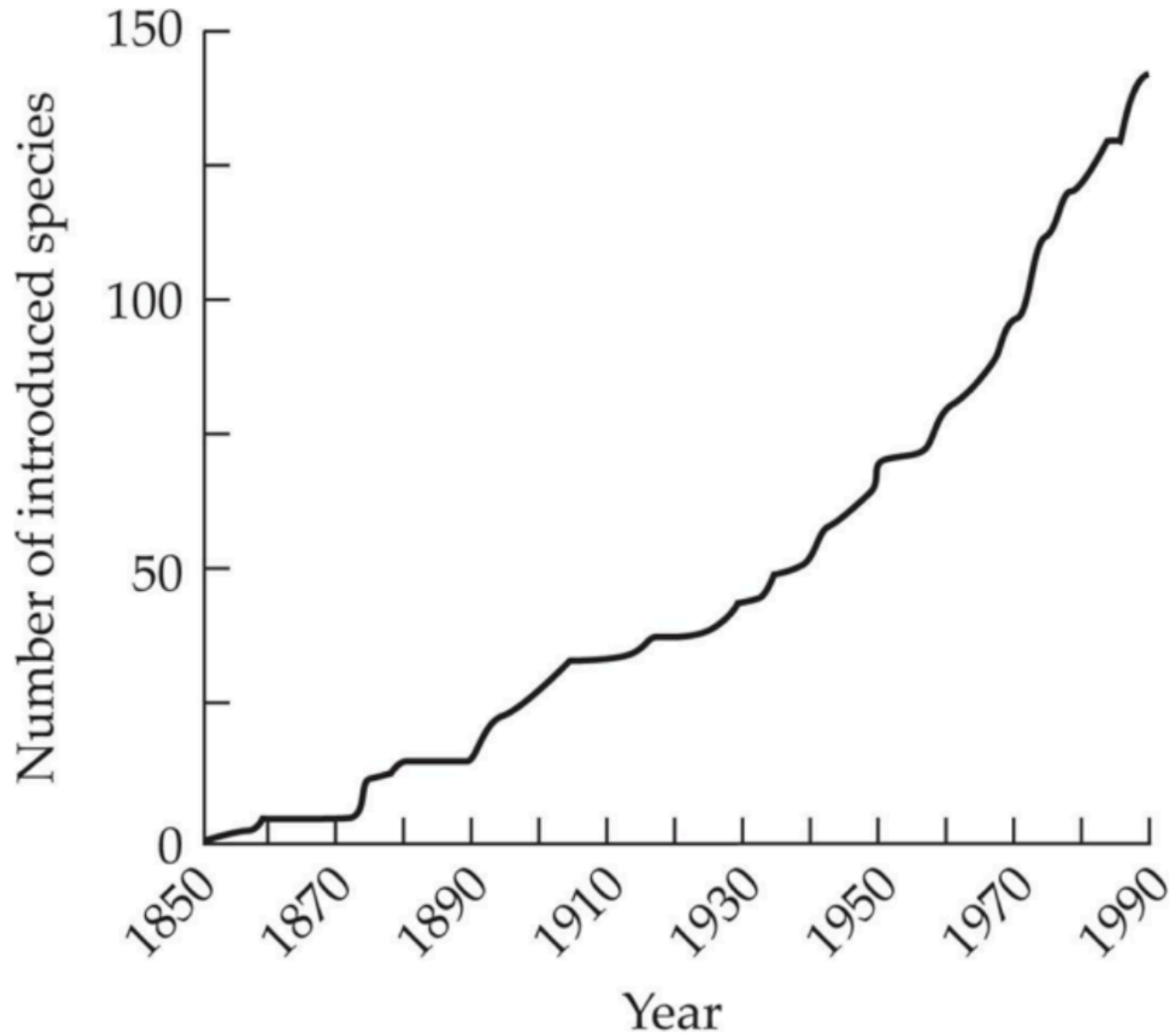


# How common?

Cumulative number of species



# How common?





# Economic cost of invasives

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Type of organism	Annual cost of damage + control (\$ billions)
Plants (e.g. weeds)	34.7
Mammals (e.g. rats, cats, feral pigs)	37.5
Birds (e.g. pigeons, starlings)	1.9
Fish	5.4
Arthropods (e.g. insects, crustaceans)	20.1
Mollusks (e.g. mussels, clams)	22.1
Microbes (e.g. pathogens, diseases)	25.7

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# Ecosystem costs

- Habitat loss
- Habitat alteration
- Predation
- Resource competition



# Invasions and conservation

- Invasives are the a leading cause of population decline and extinction in animals
- Invasives are a leading factor in freshwater fish endangerments and extinctions
- Brown tree snakes have been implicated in the extinction of 10 species in Guam
- More than 400 of the 1300 species currently protected under ESA are at risk at least partly because of the threat of invasive species

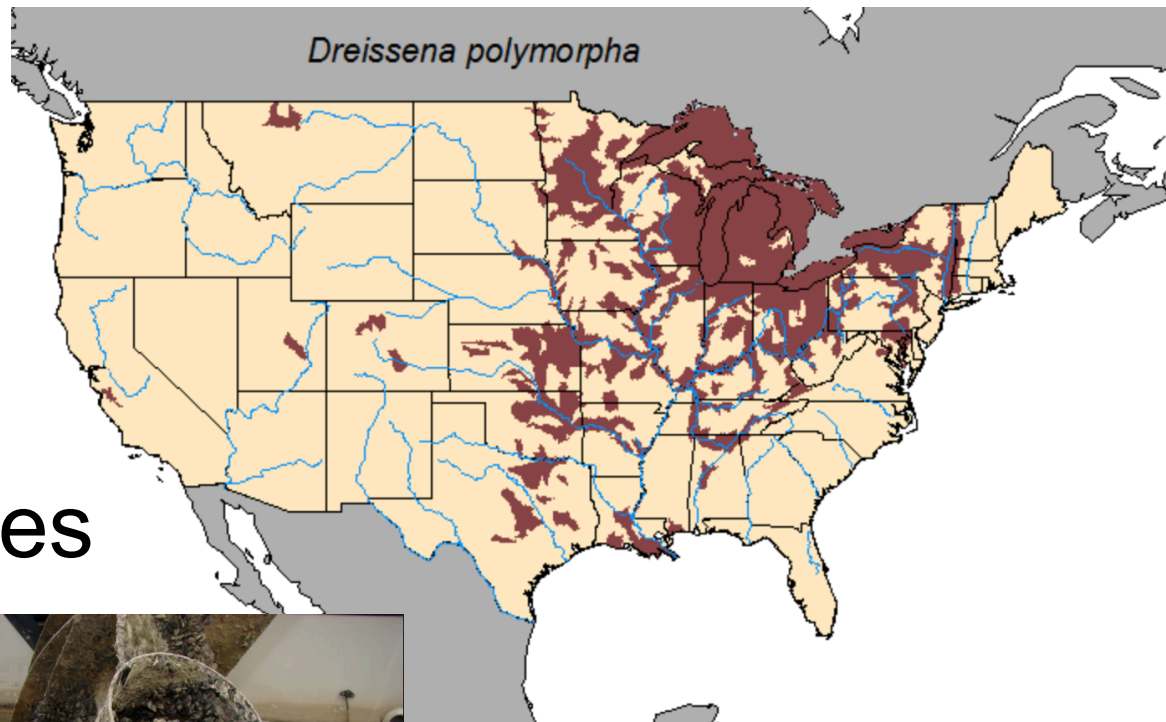
# European Starling

- American Acclimatization Society for European Settlers
- Eugene Scheiffelin (1890)
- 60 birds into Central Park



# Zebra mussel

- Native to Eastern Europe/Western Russia
- Introduced accidentally to Great Lakes via ballast
- 1988 first detected
- Outcompete Native
- Attach to boats
- Clog irrigation intakes



# Lionfish

- Two closely related species invasive in US waters
- Native to Indo-Pacific
- First detected in Florida coasts in 1980s
- Aquarium release-mediated introduction

