



# ***Fungal Frontiers:*** Non-native and Invasive Mushrooms in California

Christian Schwarz — California Invasive Plant Council 2025



# ***Invasive Plants vs. Invasive Fungi***

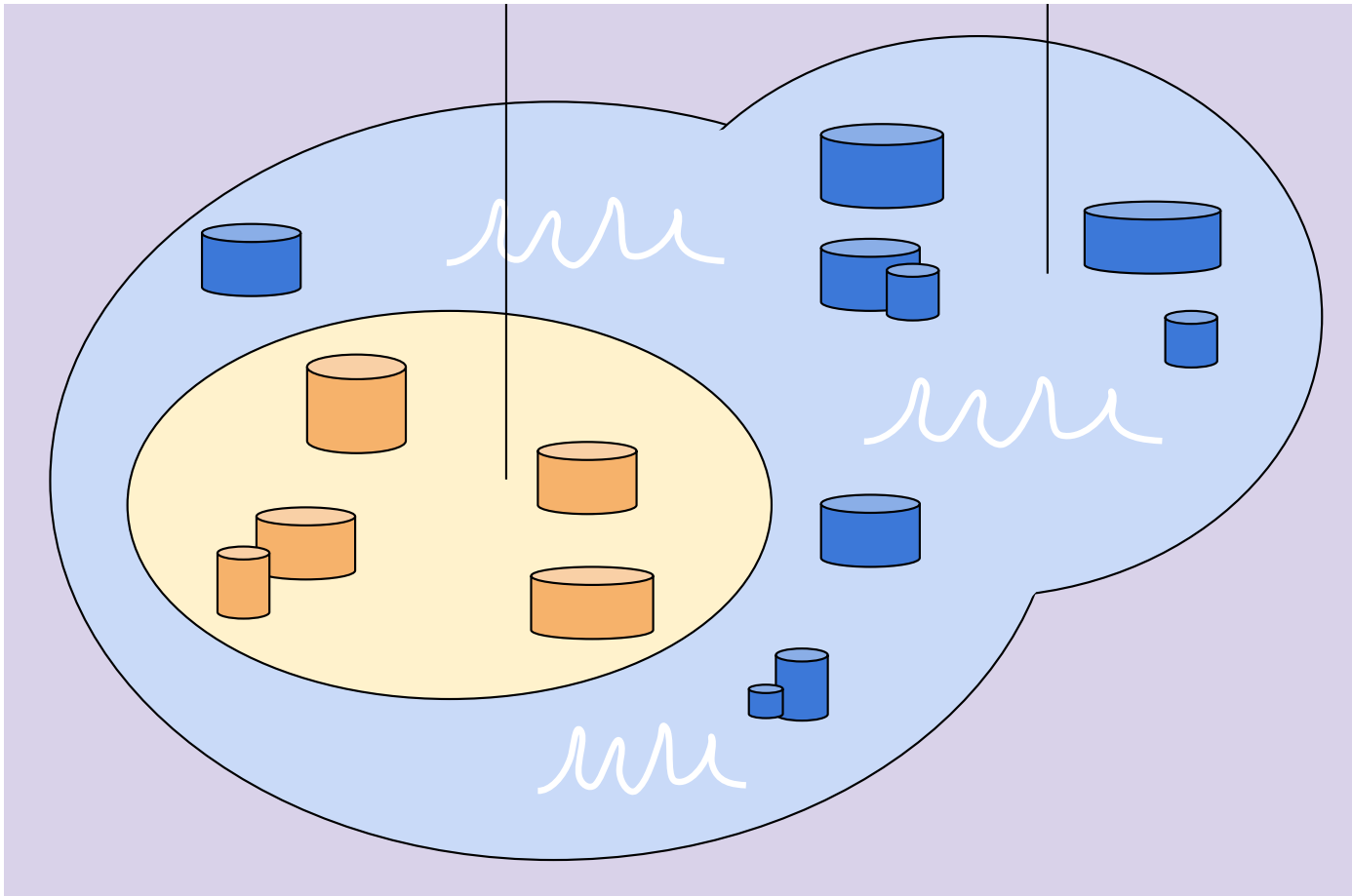


## ***IN CALIFORNIA:***

- Around 2,000 non-native plants
  - >200 invasive/noxious
- 1-2 hundred non-native fungi
  - Low double-digit invasive/noxious



# ***Evidence of Invasiveness***



- **Theoretical:**
  - Niche theory
- **Empirical:**
  - Almost no data



# ***Hort- & Agr- icultural Pathogens***

*Sudden Oak Death Syndrome*  
*(Phytophthora ramorum)*

*Pistacio Canker*  
*Leptosillia pistaciae*

***Phytophthora* species repeatedly introduced in Northern California through restoration projects can spread into adjacent sites**

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# ***Urban Incubators: Fungal Junk Food***

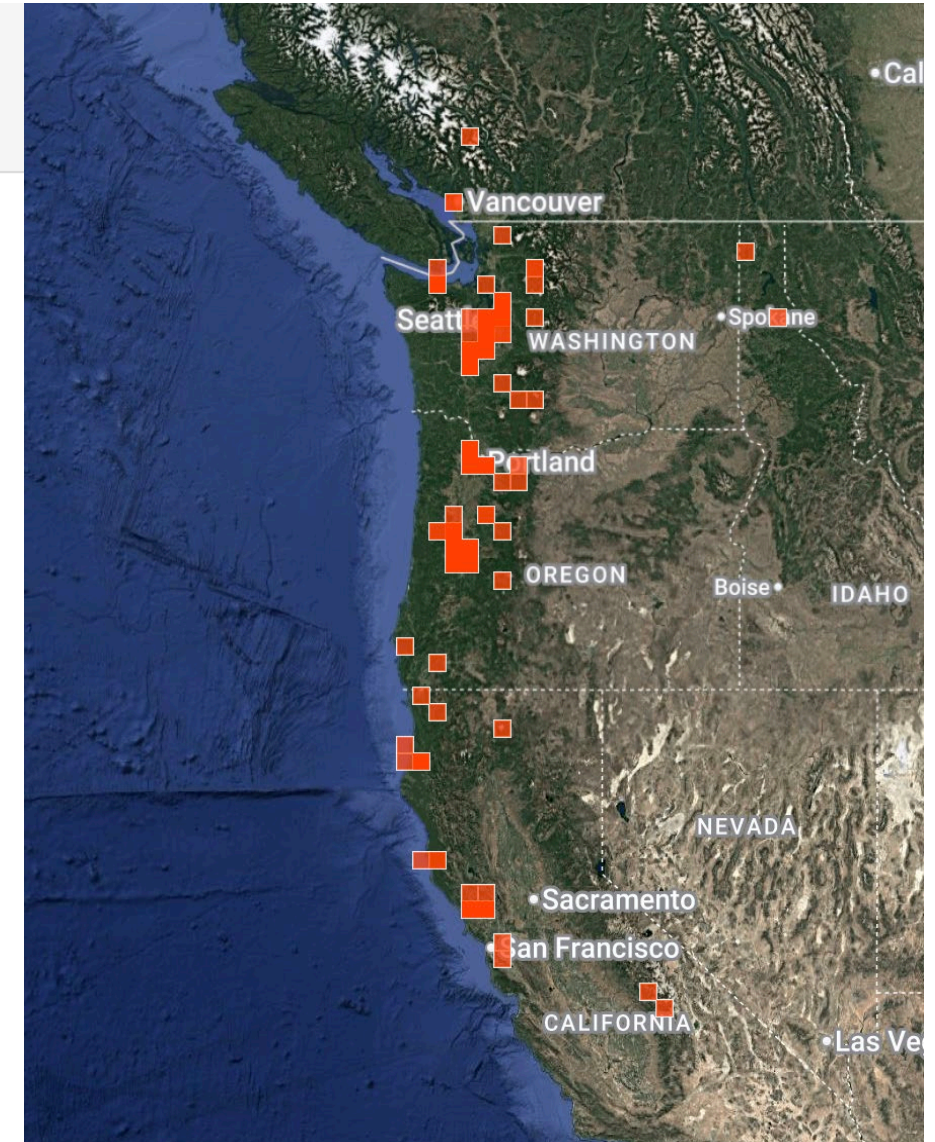
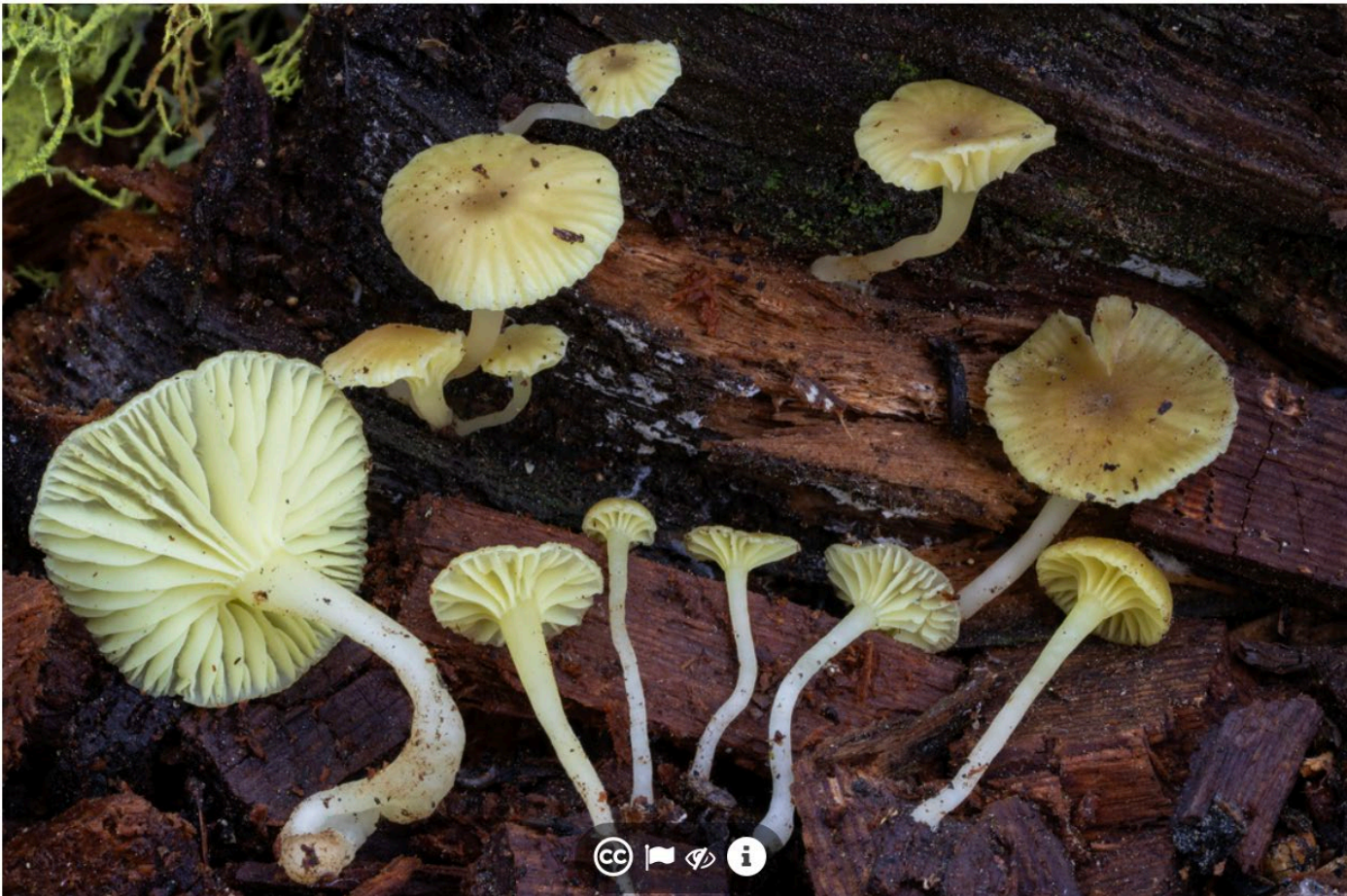


- Woodchips / mulch
- Horticultural plantings
  - Irrigation

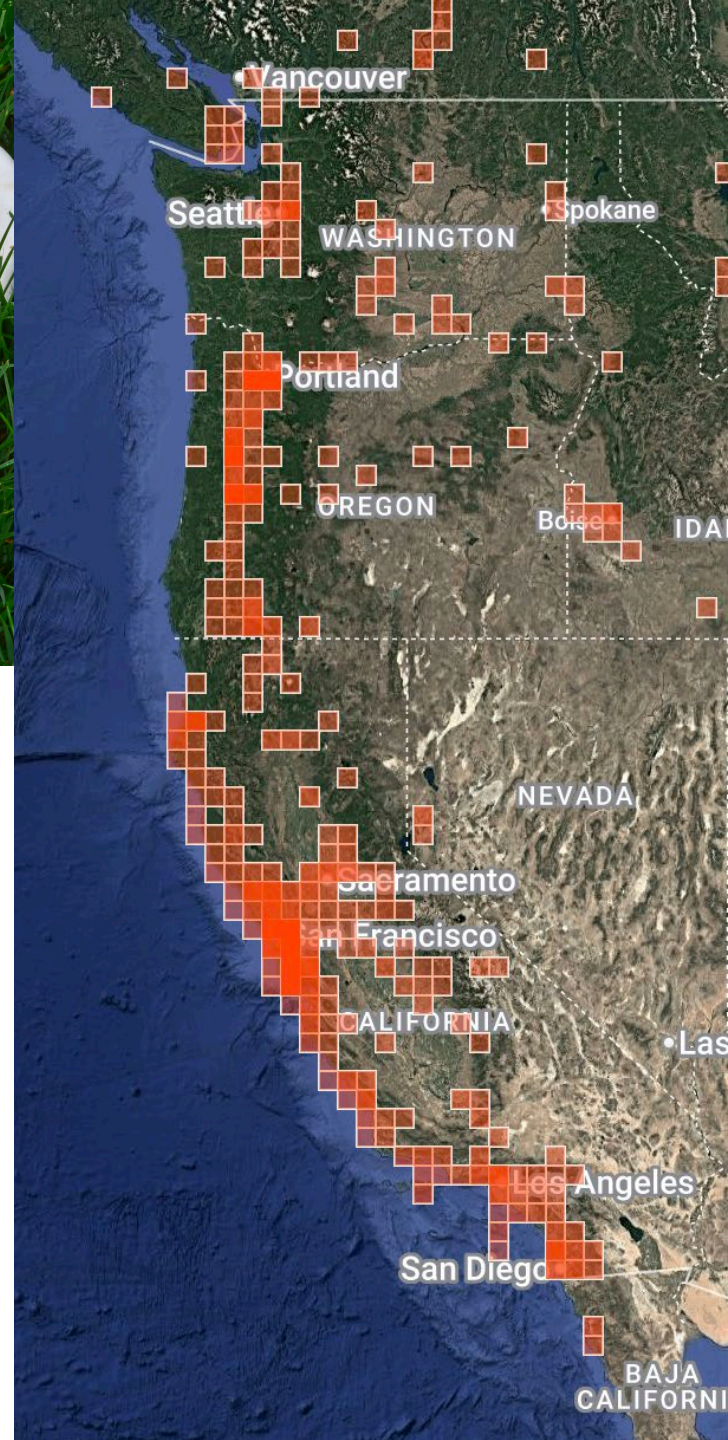


# Urban Incubators: Fungal Junk Food

*Chrysomphalina grossula* (Green Navel) VU Research Grade



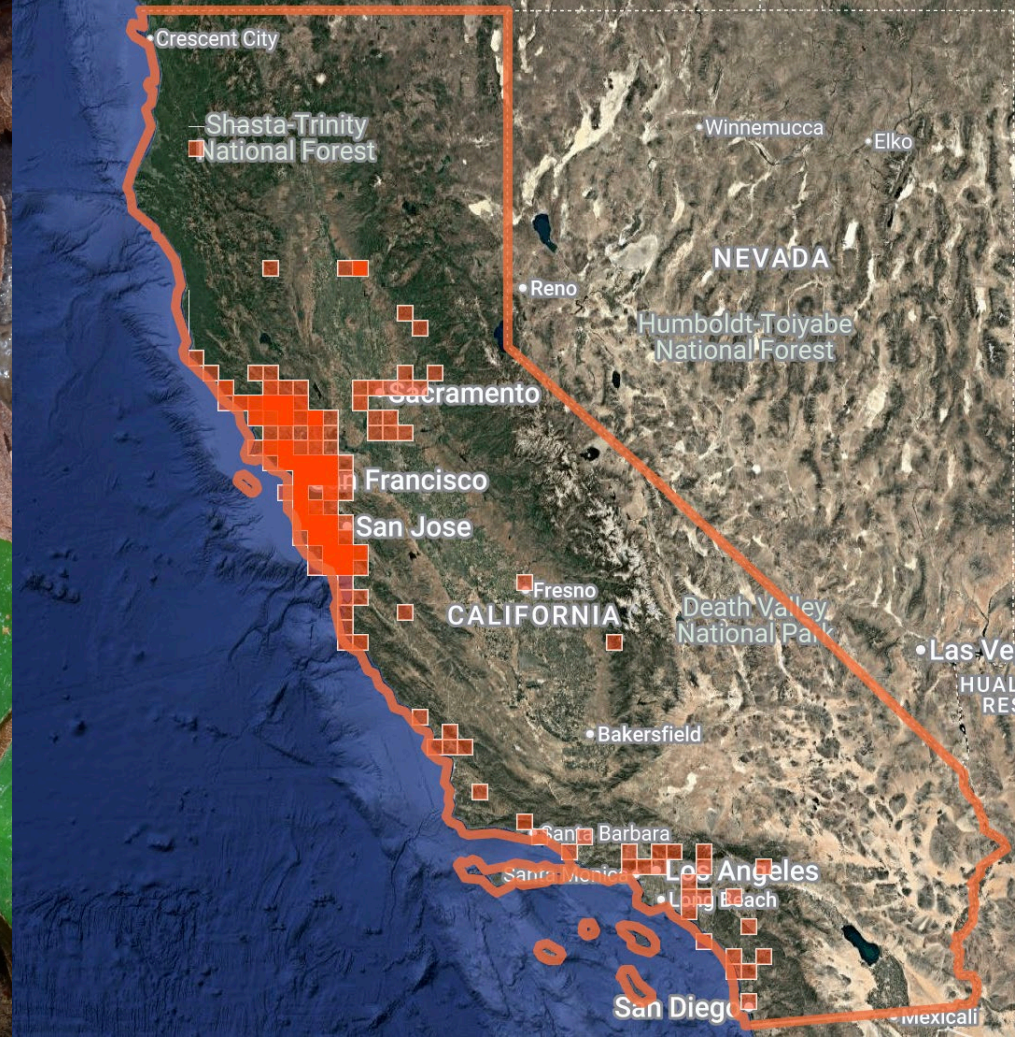




## Yellow Stainer (*Agaricus xanthodermus*)

- Native to Europe
- Expanding north on irrigated lawns
  - Jumping into native habitats

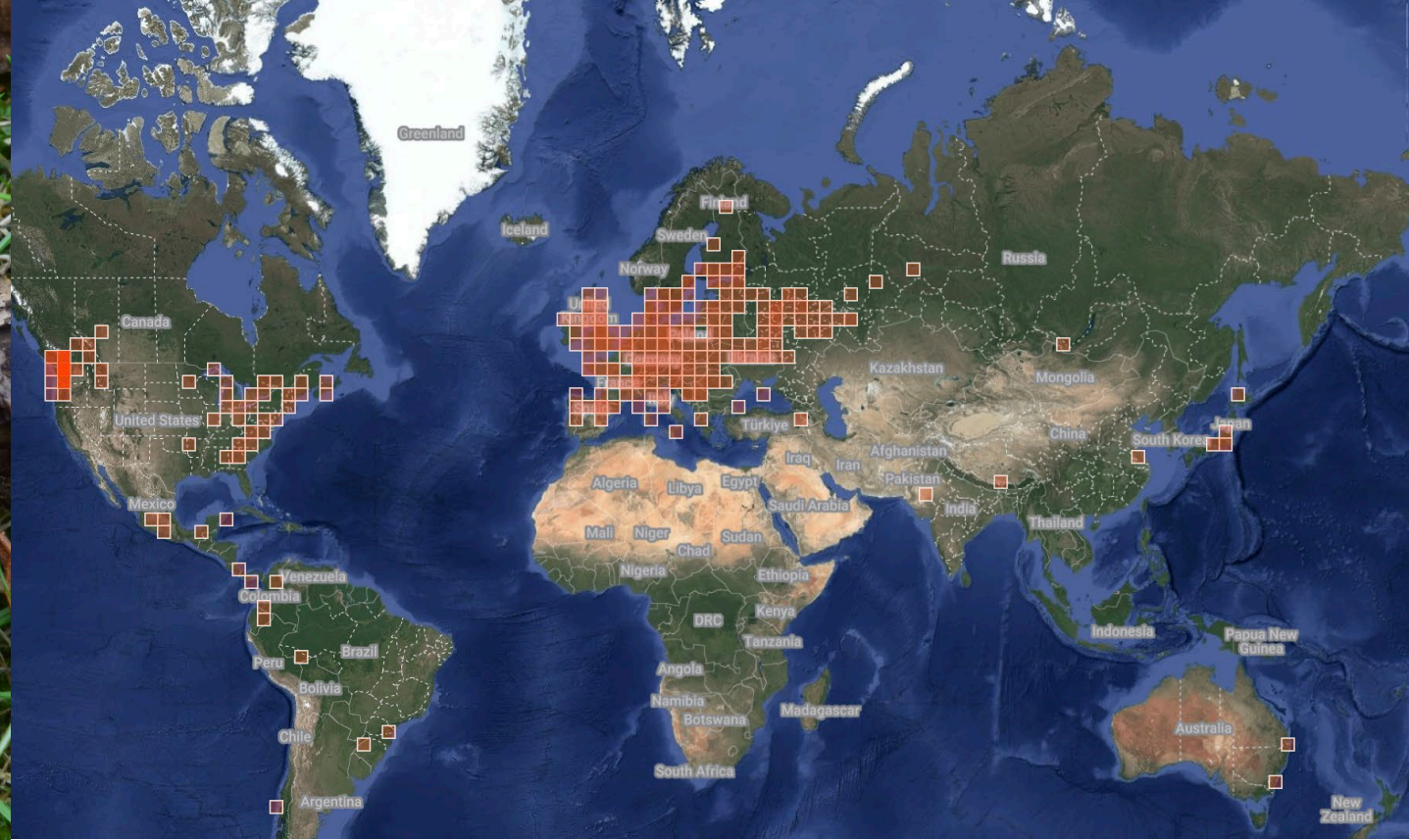




# Cabbage Parachute (*Gymnopus brassicolens*)

- Woodchips
- Delayed jump-off into native habitats





# Woollyfoot (*Collybiopsis peronata*)

- Litter decomposing generalist
- Rapid jump-off into native habitats
- Southward range expansion





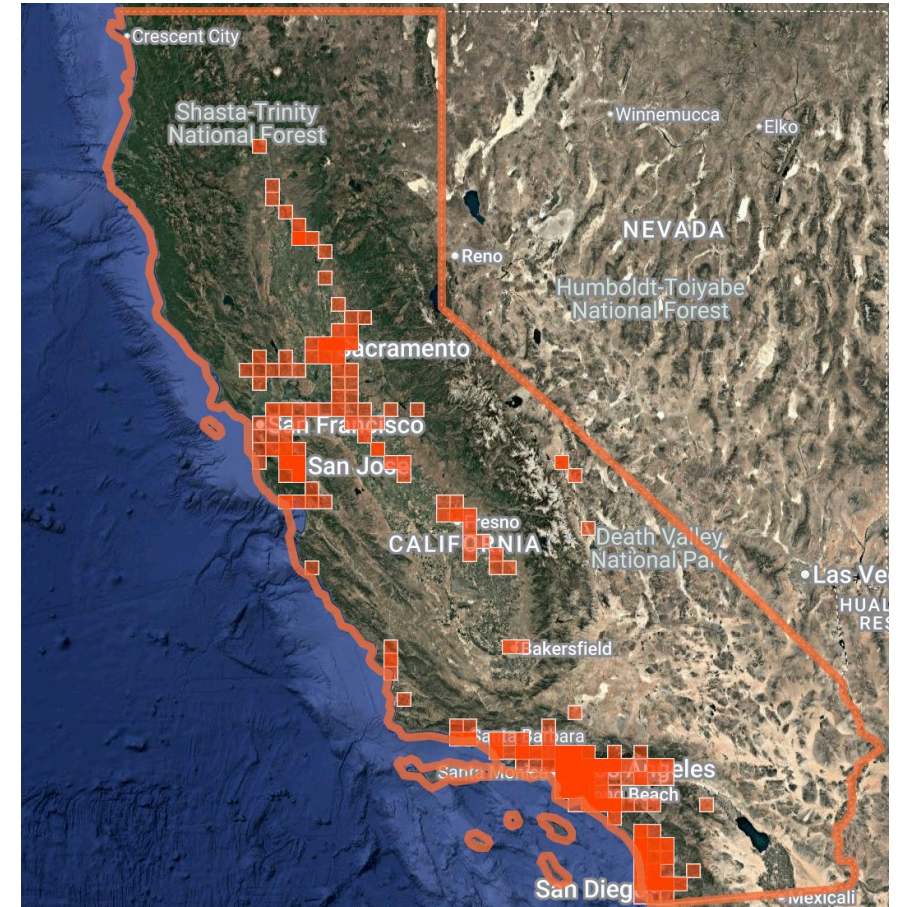
# Olive Parasol (*Chlorophyllum olivieri*)

- Nutrient enriched substrates
- Immediate jump-off into native habitats
- Possibly hybridization





# Lantern Stinkhorn (*Lysurus mokusin*)



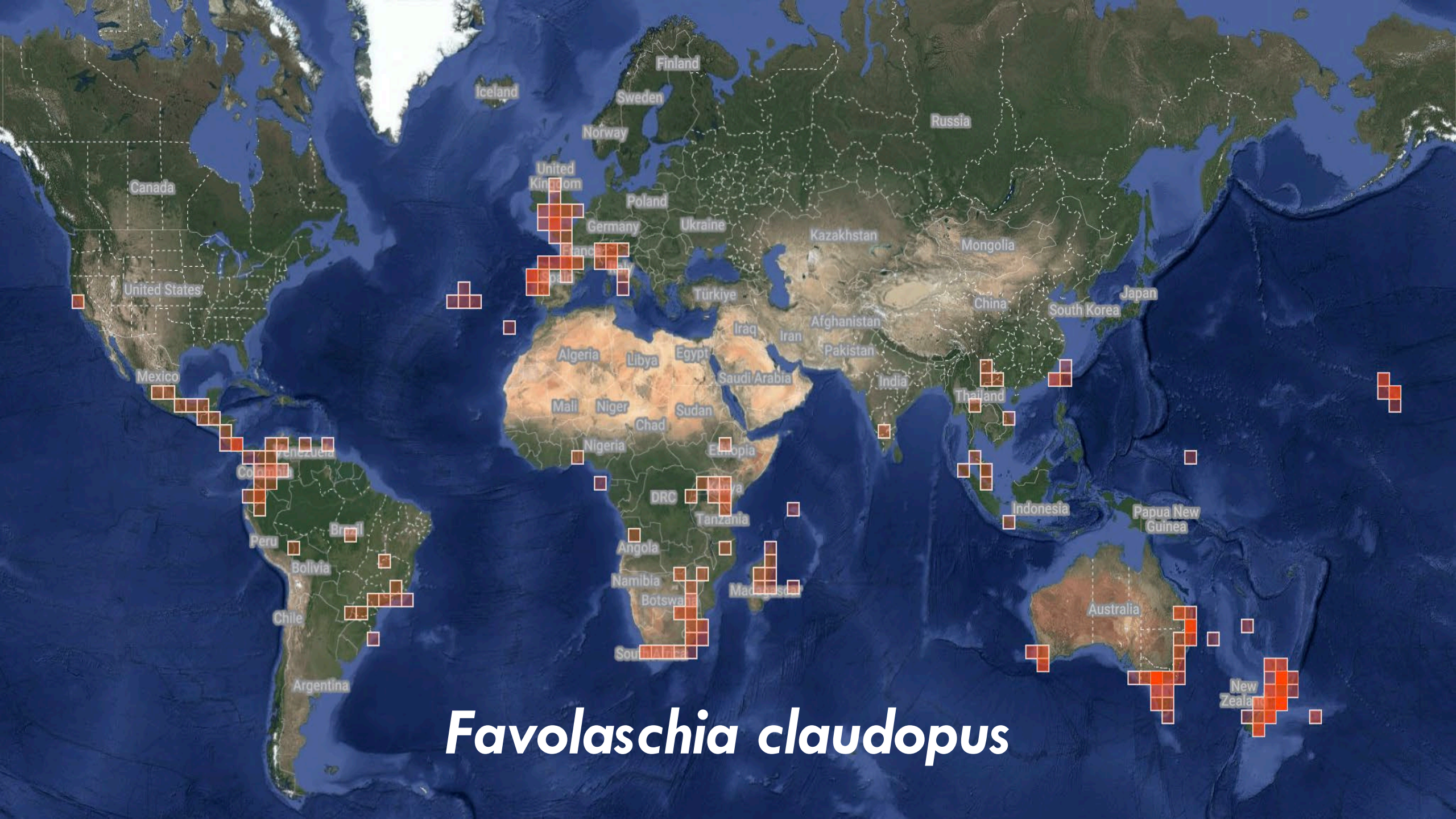
- Woodchips and gardens
- No significant jump-off into native habitats





***Favolaschia***





*Favolaschia claudopus*

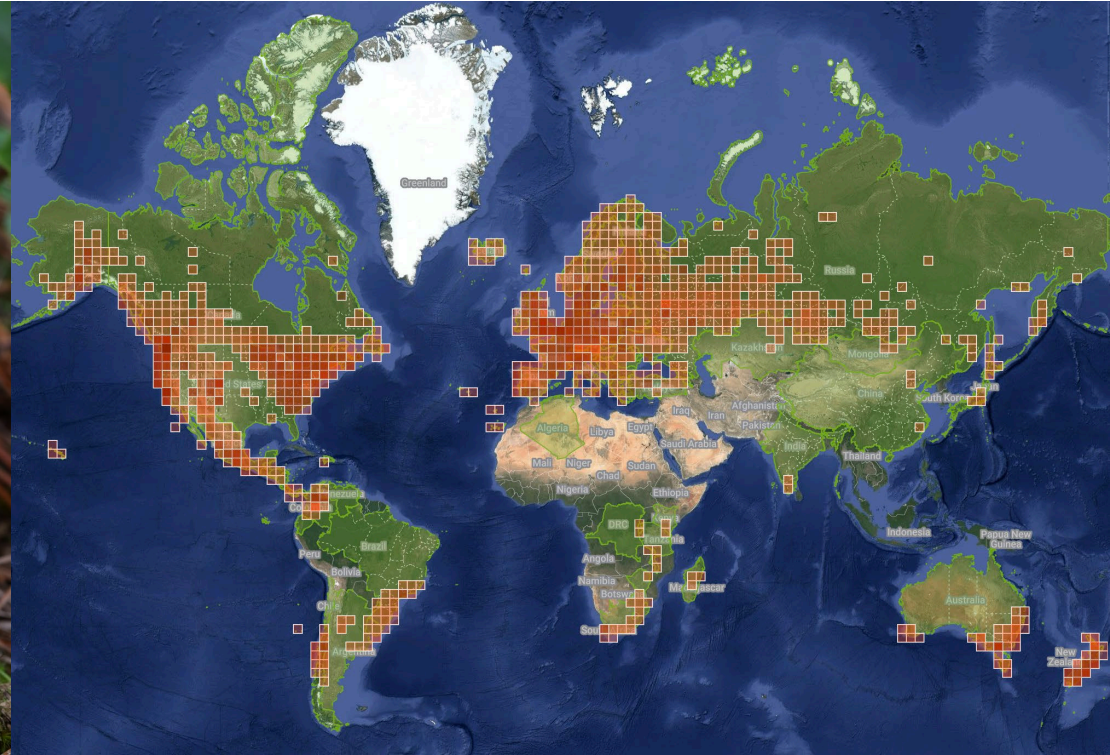




**Co-invasion**



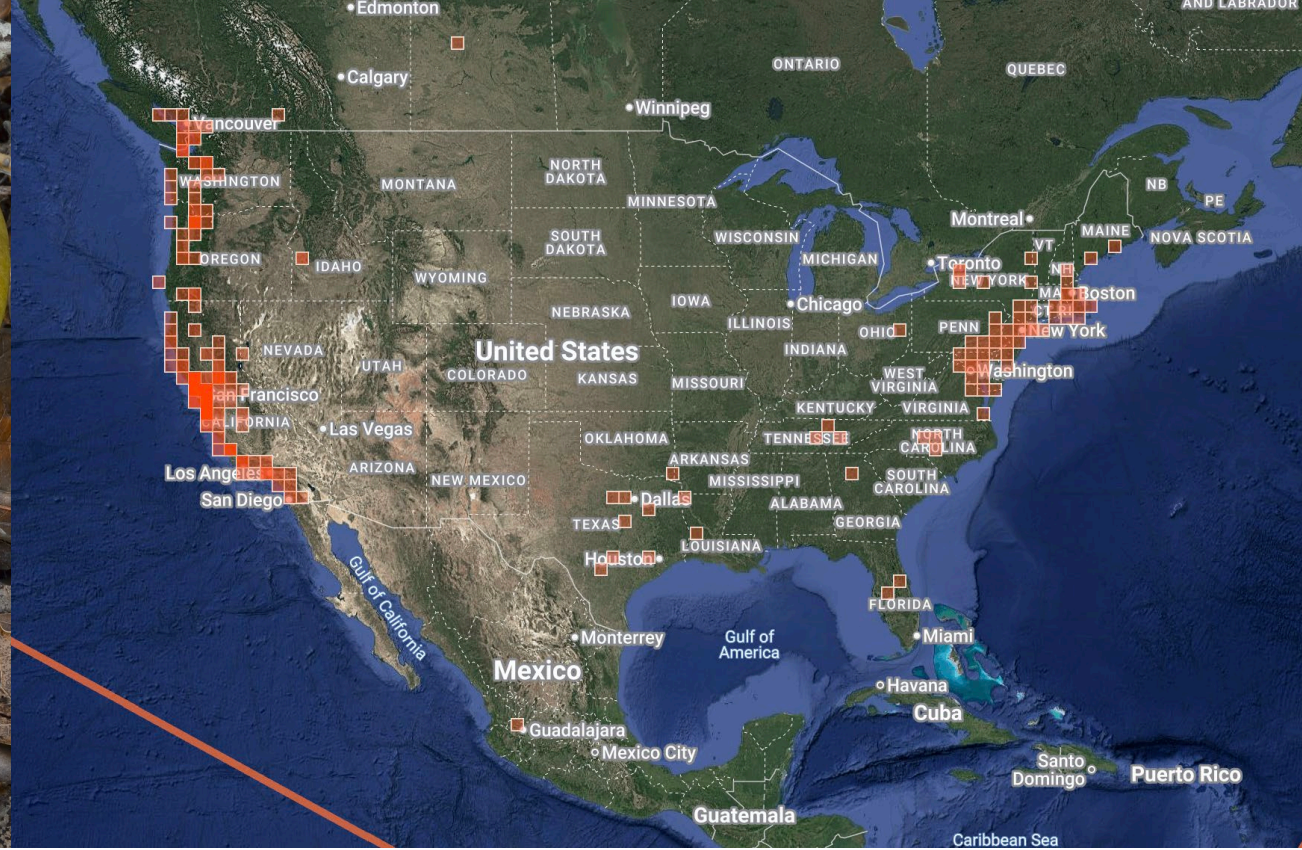
# *Californian Fungi overseas*



## **PLANTATION TREES:**

- **Lumber, pulp, windbreaks**
- **Monterey Pine, Douglas-fir, Monterey Cypress**





## Death Cap (*Amanita phalloides*)

- Introduced from Europe to CA with cork oaks, ~1930s
  - Rapid expansion and host-jumping
    - Deadly toxic





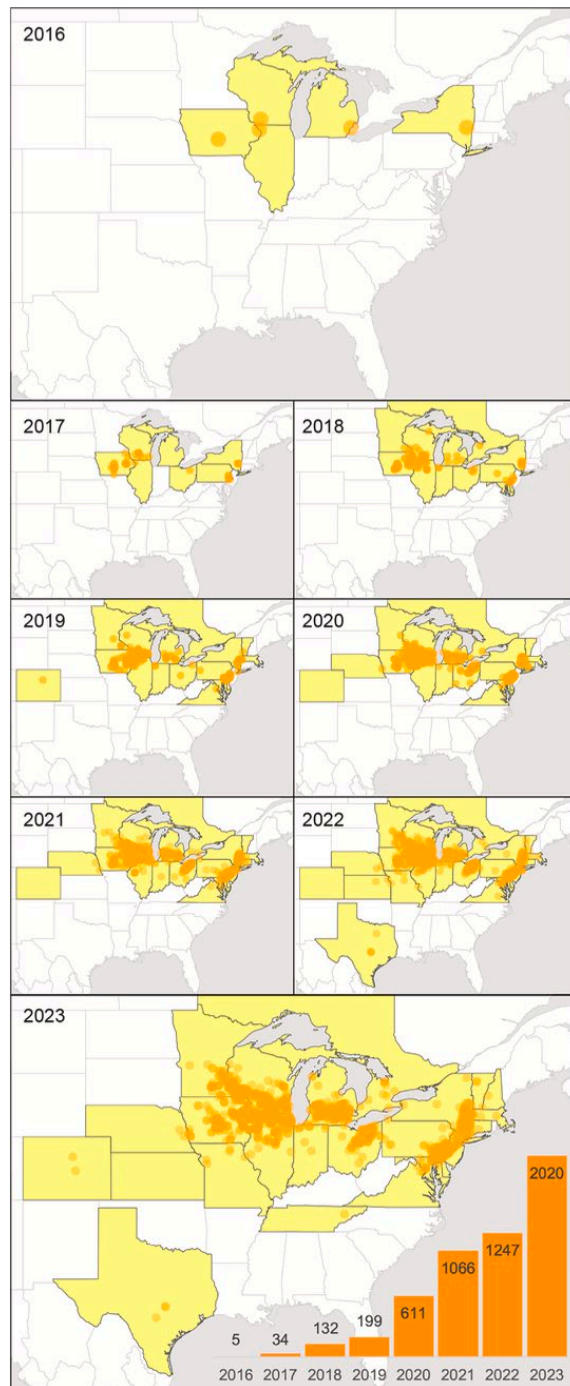
**White Button Mushroom**  
(*Agaricus bisporus*)



# ***Golden Oyster Mushrooms (GOM)***

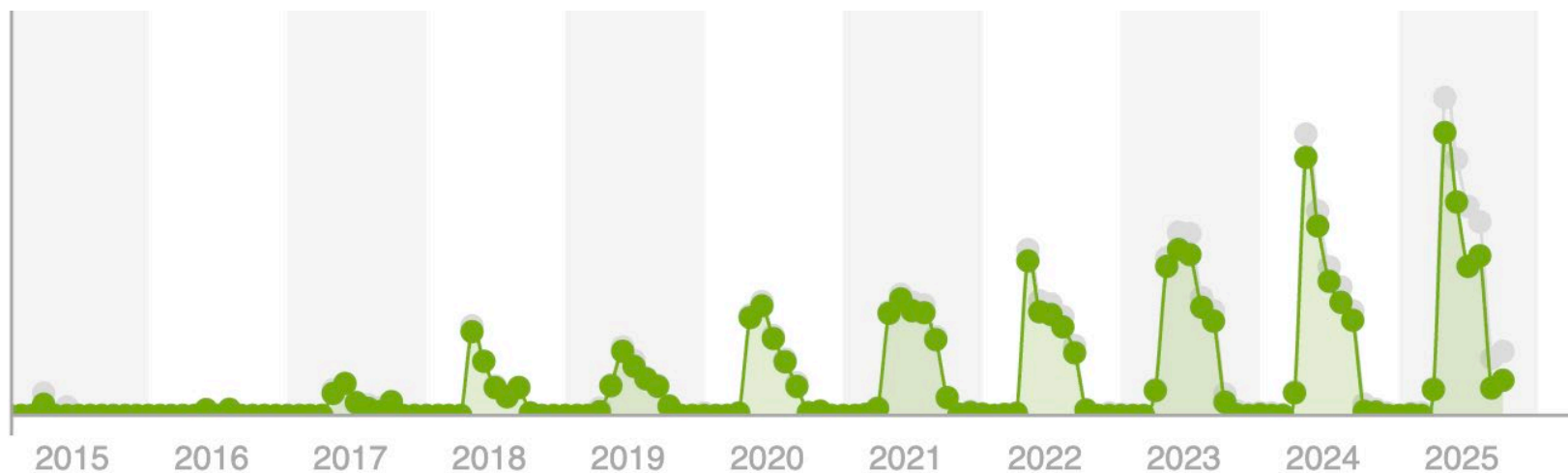






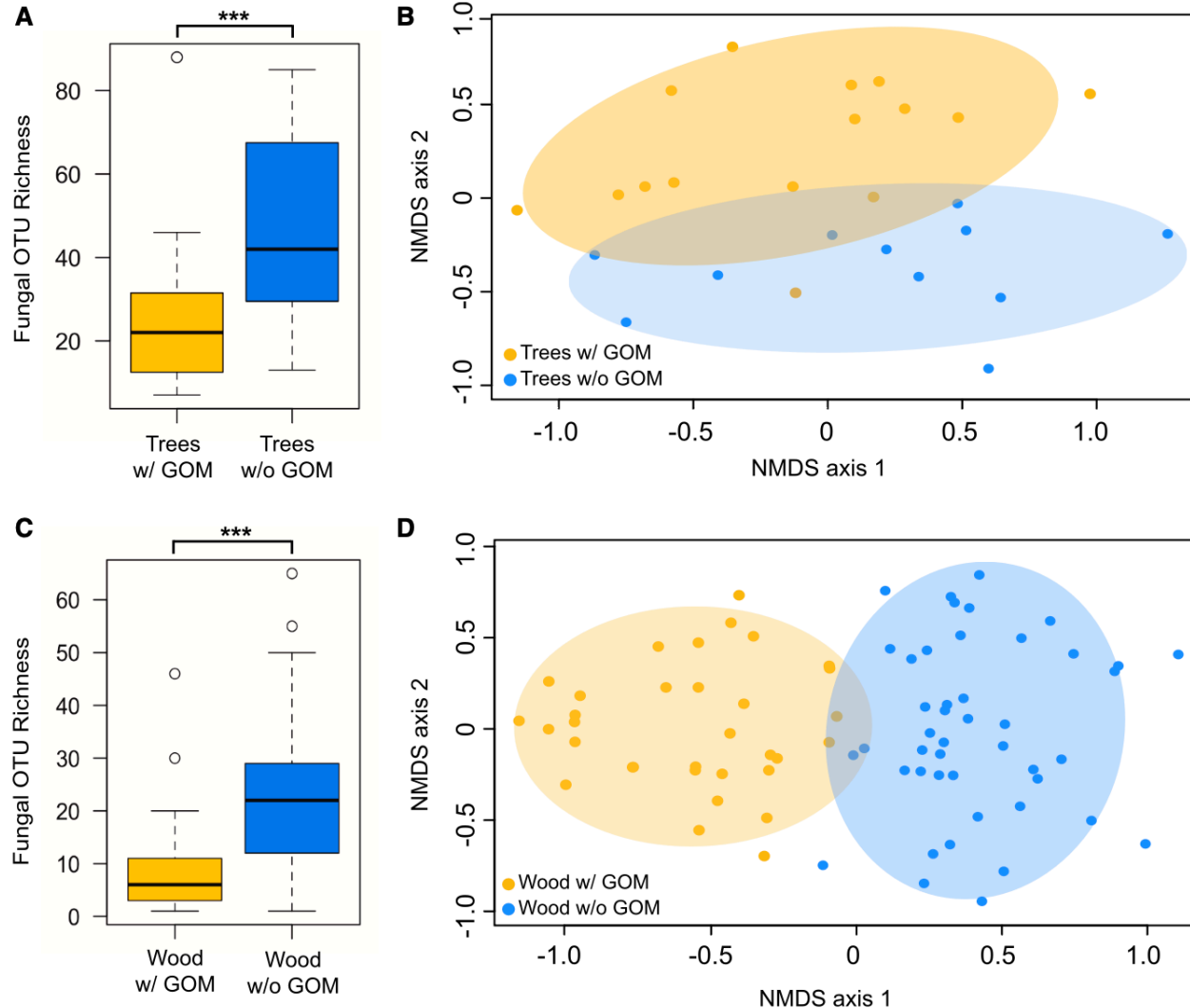
# Golden Oyster Mushrooms (GOM)

- *Pleurotus citrinopileatus*
- Native to east Asia
- Cultivation in North America began in ~2000s
- Escaped in 2010
- Extremely rapid spread — now in 25 states and 1 province





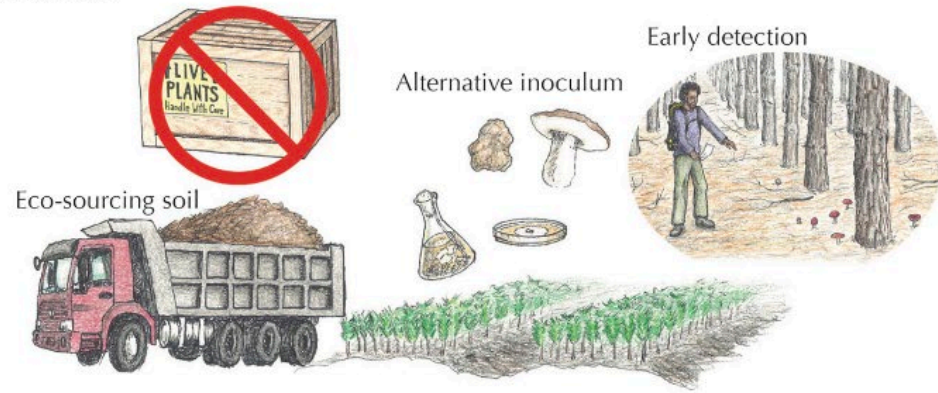
# Golden Oyster Mushrooms (GOM)



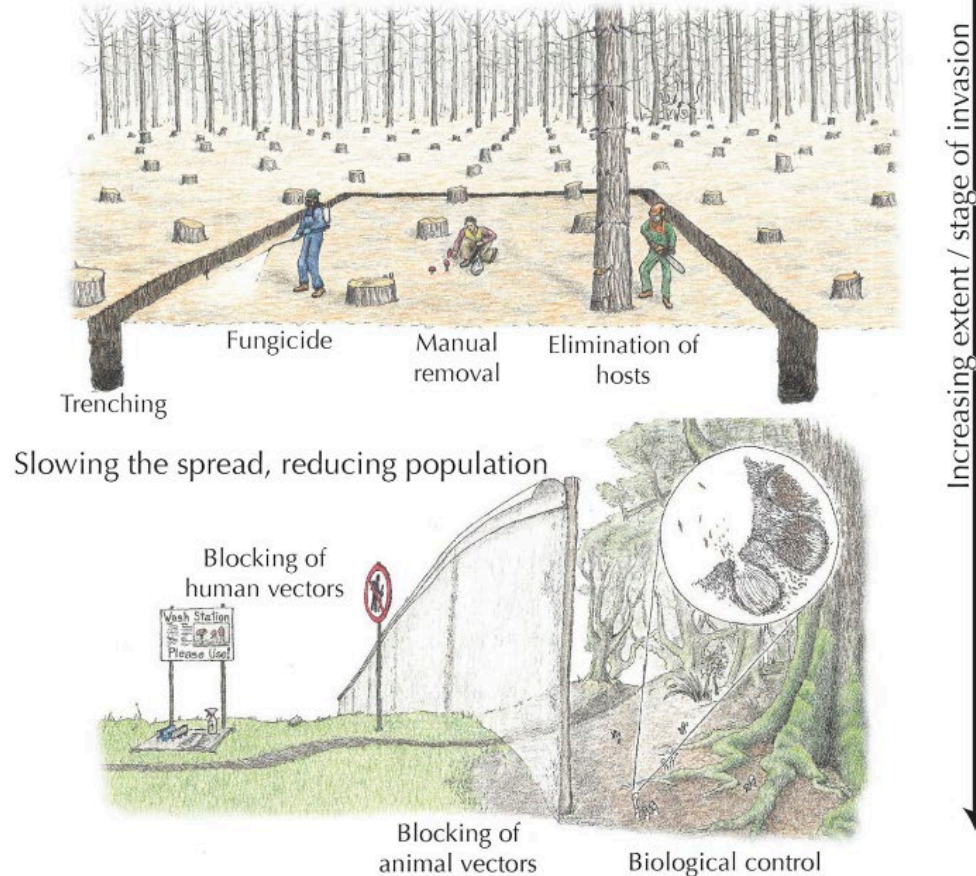
- Lower overall diversity of fungi on both standing trees and fallen wood infected with GOM
- Different suite of species tolerate co-inhabitation of trees/wood with GOM
- Most directly-threatened species?



## Prevention



## Control and eradication



Increasing extent / stage of invasion

# Management

- Virtually no hope for post-hoc management
- Prevention of plant movement
- Regulation of cultivated species (complicated by amateur / non-commercial efforts)
- Year-to-year control of poor soil competitors?