



Biosecurity Priorities to Forestall Amphibian Chytrid Transmission

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Two Amphibian Chytrid Fungi: Bd and Bsal*

- Cause fatal skin disease in non-resistant species



Photo by Eric Isselée

* **Bd** = *Batrachochytrium dendrobatidis*

Bsal = *Batrachochytrium salamandrivorans*



Photo by Frank Pasmans

Bsal Summary

- **Native to Asia (yellow)**
No disease known
- **Invasive to Europe (red)**
High Mortality
2010 Netherlands
2013-2014 Belgium
2016 Germany
2018 Spain
2020 Bavaria, Germany

Bsal in Captive Animals

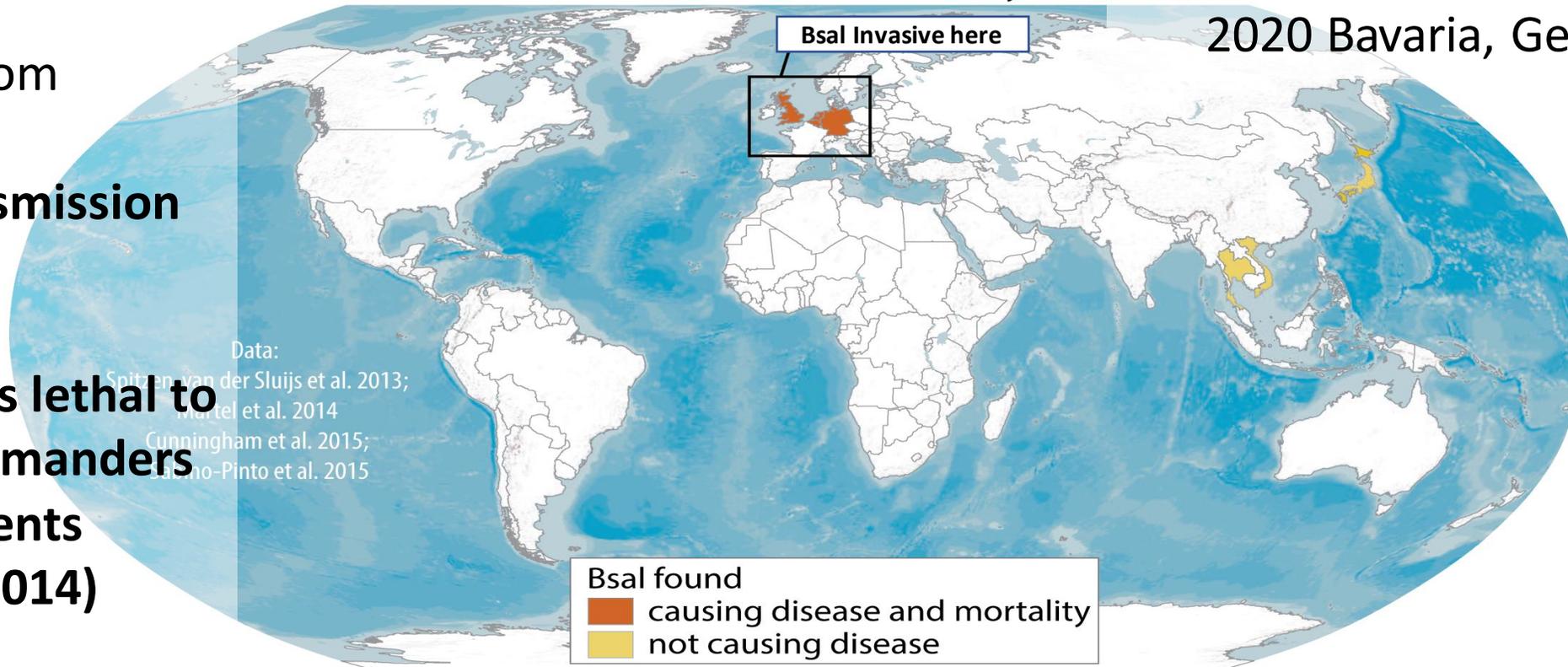
Germany

United Kingdom

**Pet Trade Transmission
is implicated**

**Bsal infection is lethal to
some USA Salamanders
in lab experiments
(Martel et al. 2014)**

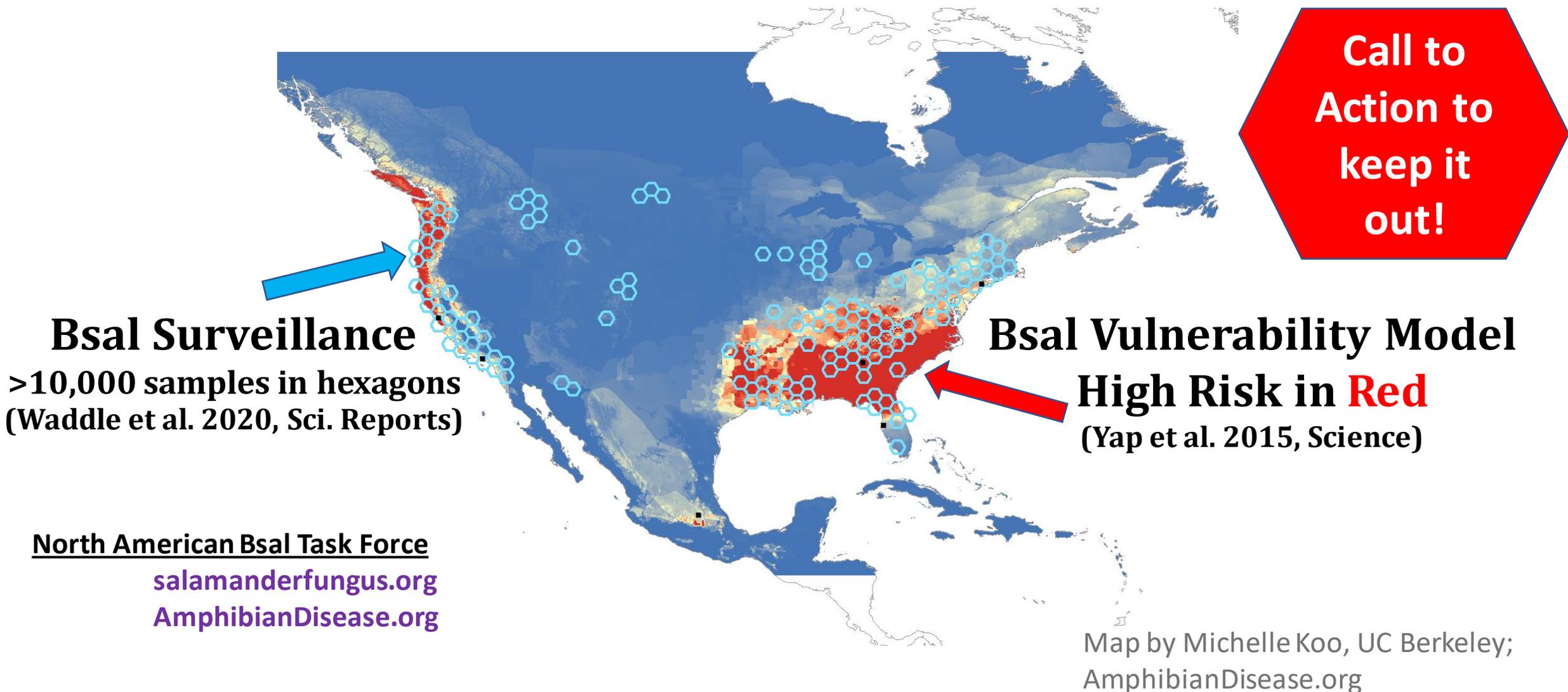
Bsal occurrence as of February 2016



Data:
Spitznagel van der Sluijs et al. 2013;
Martel et al. 2014
Cunningham et al. 2015;
Lima-Pinto et al. 2015

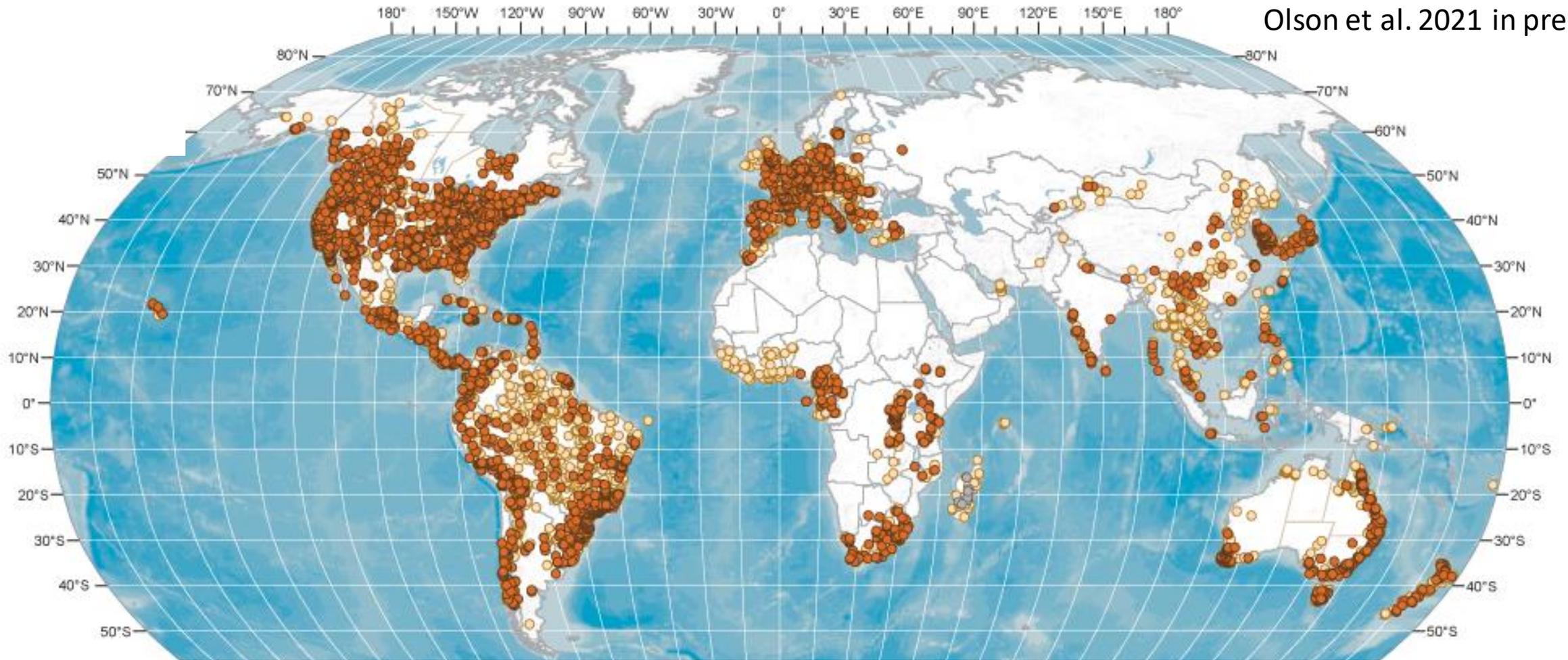
USA is world biodiversity hotspot for salamanders.

Bsal is not introduced here yet --



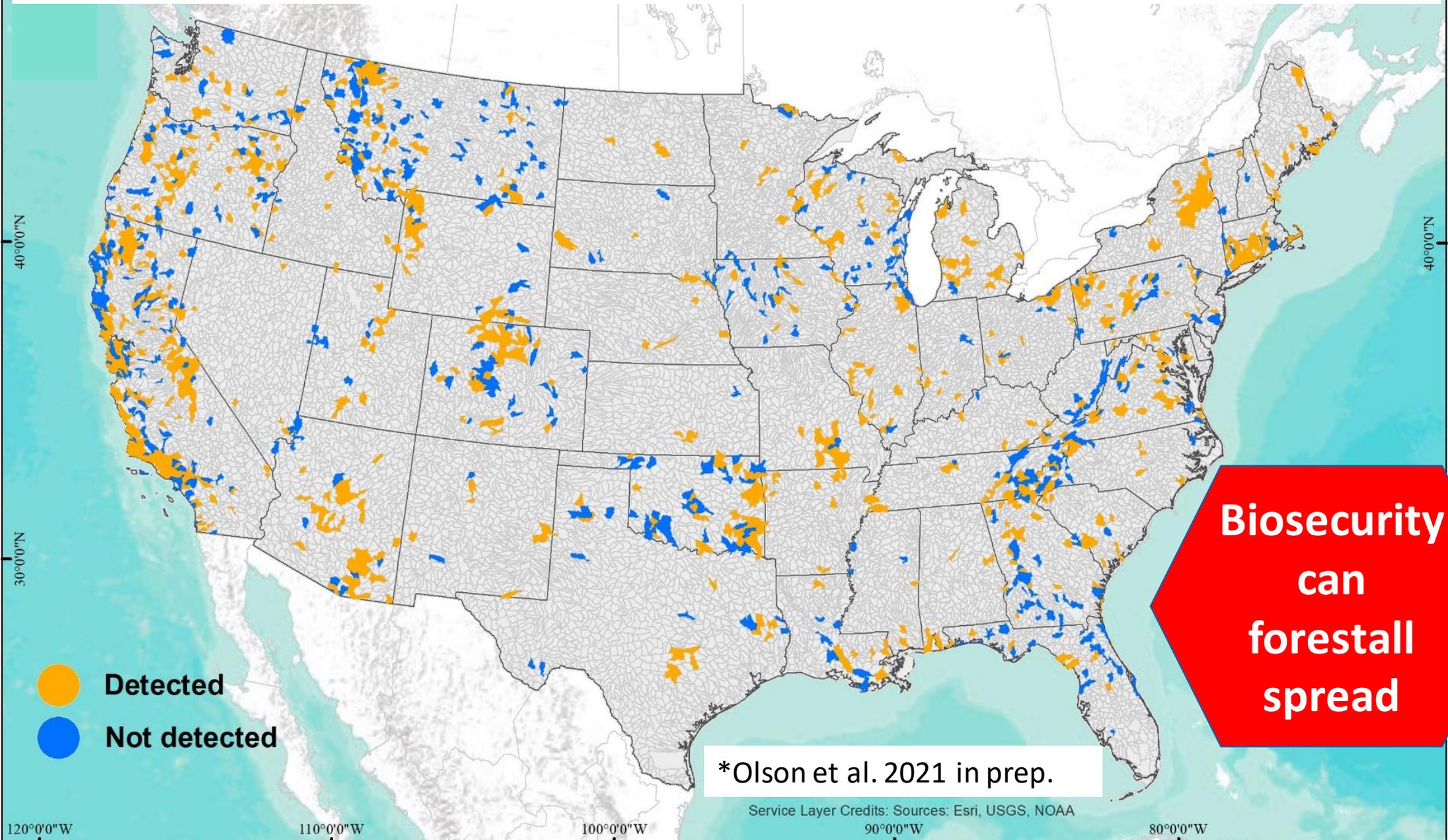


- Bd “**poses the greatest threat to biodiversity of any known disease**”
(Wake and Vredenburg 2008)
- Bd chytridiomycosis is the “**most devastating panzootic to date**”
(O’Hanlon et al. 2018)
- Bd is “**one of the most destructive invasive species**”
(Scheele et al. 2019)



- Bd occurs on all continents with amphibians
- Frogs & salamanders can be infected
- Lethal in non-resistant species
- Genetic support of transmission in commercial trade

USA 5th-field watersheds with Bd sampling (49% Bd+)*



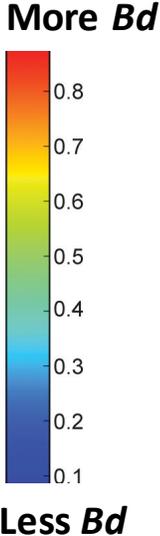
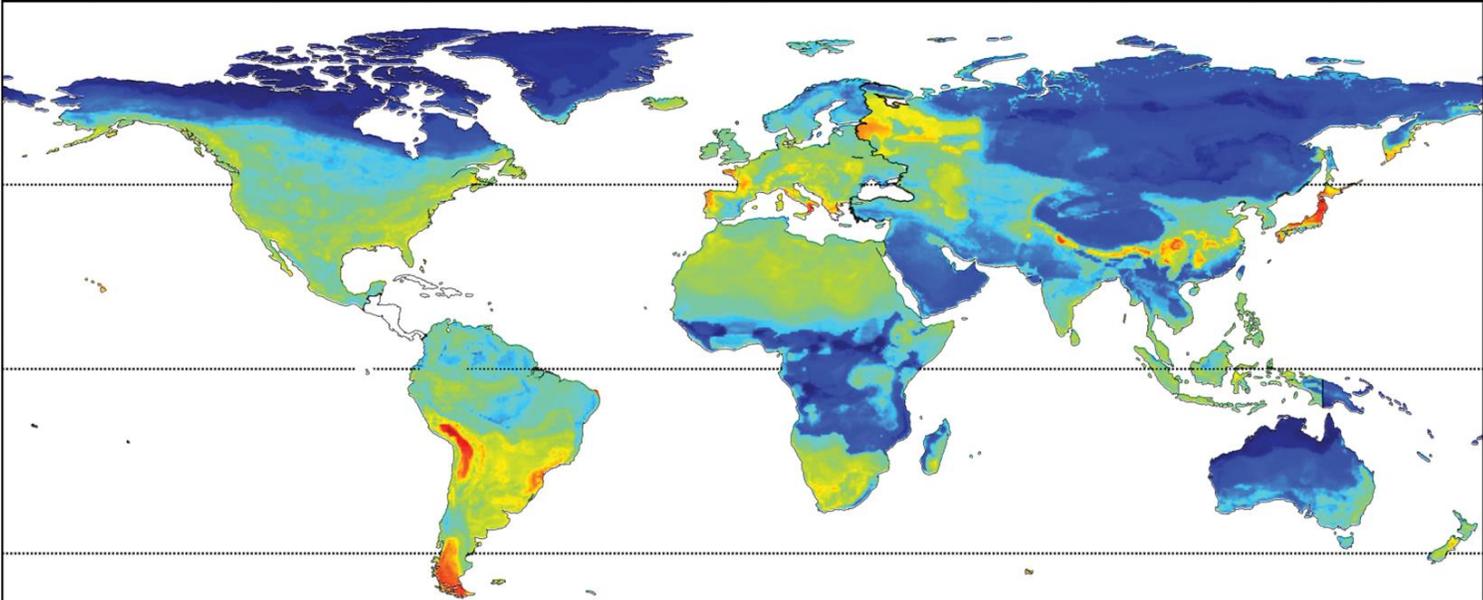
**Biosecurity
can
forestall
spread**

*Olson et al. 2021 in prep.

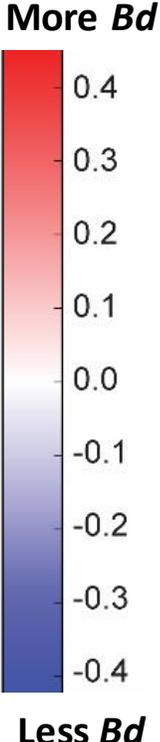
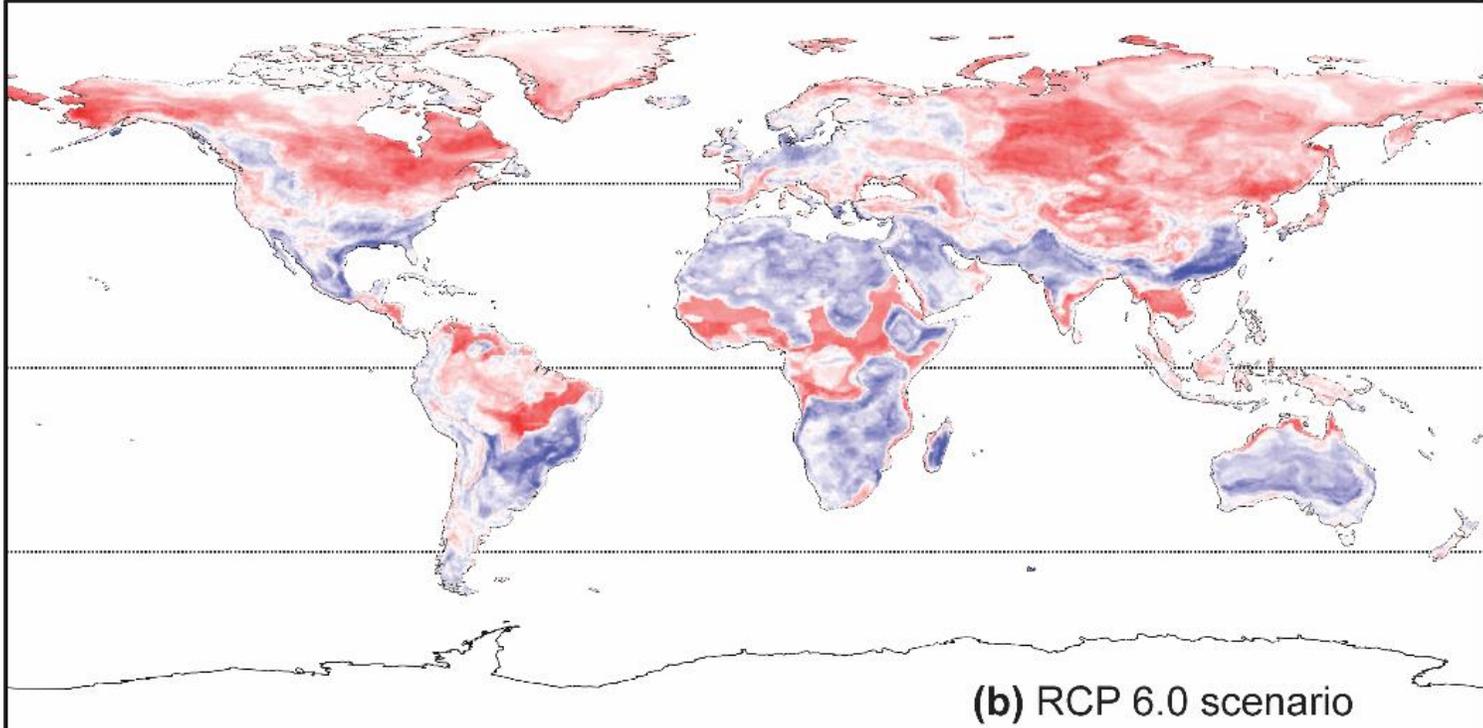
Service Layer Credits: Sources: Esri, USGS, NOAA

Bd habitat models
→ *Climate Niche*

Current:



Future:



Xie, Olson, and Blaustein 2016

(b) RCP 6.0 scenario

Biosecurity Rules of Thumb

1) Standard Between-Site Biosecurity

Disinfection: 1 part household bleach, 9 parts water (1 cup:1 gal.)

→ Field gear², Large equipment³, Water draws for wildfire

2) Enhanced biosecurity for rare species, refuges, pathogen-free areas

Plan field work from uninfected areas first (refuges), then infected areas

Dedicated site gear, enhanced disinfection procedures at site

→ Gear, Clothing, Vehicles inside & outside

→ Extend standard biosecurity to public access of special places

3) Do not transport wild animals or water between sites

4) Do not turn amphibian pets loose

¹Olson, Haman et al. 2021, March issue Herpetol. Rev.

²Gray et al. 2017, Herpetol. Rev. (see Appendix)

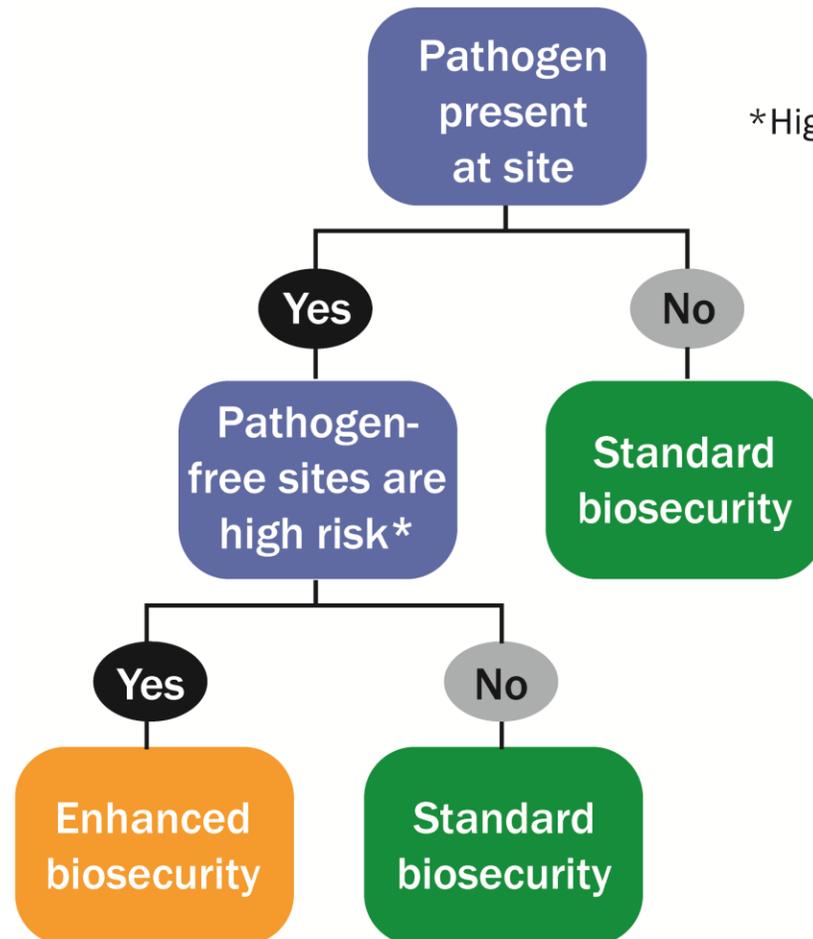
³Julian et al. 2020, Herpetol. Rev.

Management Implications: Biosecurity Priorities

1) Standard vs Enhanced Between-Site Biosecurity

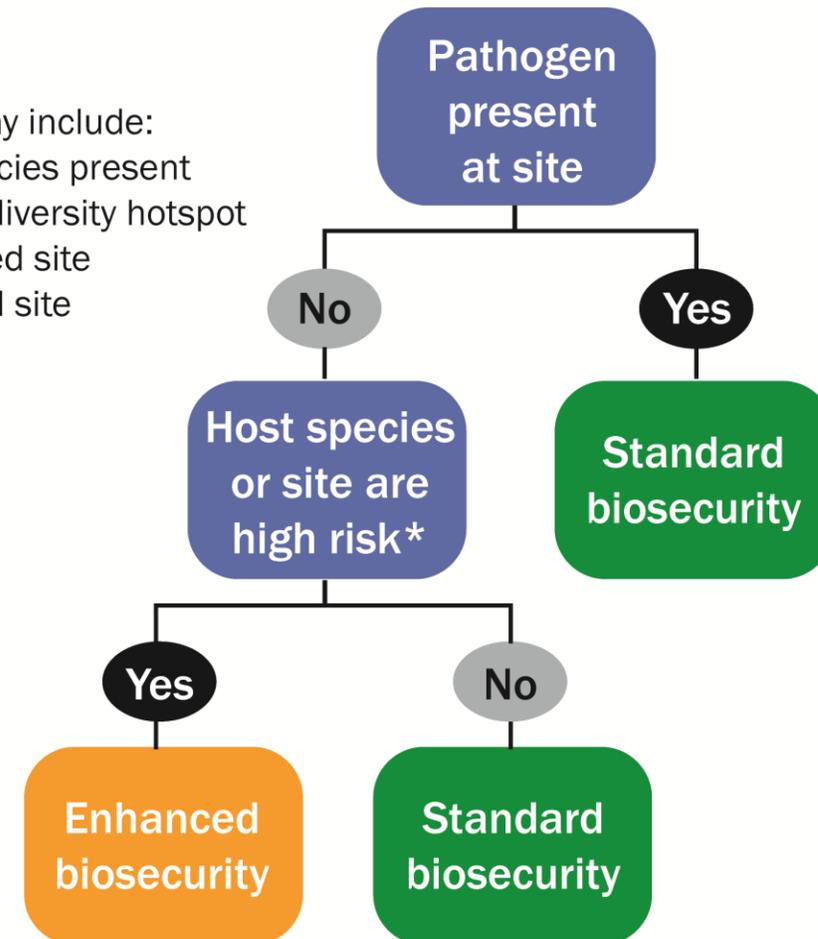
Olson, Haman et al. 2021, Herpetol. Rev., March

A. Pathogen Export



B. Pathogen Import

*High risk may include:
Rare species present
Host biodiversity hotspot
Connected site
Protected site





Thank you! Stay safe, keep our animals safe too!

PARC National Disease Task Team [Parcplace.org/resources/](https://parcplace.org/resources/)

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