



## What is WNS and the Importance of Bats?

White nose syndrome (WNS) is a disease caused by fungus called *Pseudogymnoascus destructans* (*Pd*), and it has caused severe declines in North American bat populations since it was discovered in 2006. *Pd* grows in cold and moist environments which is very similar to northeastern bat hibernation sites.

Bats have high agricultural value as natural pest controllers, seed dispersers and pollinators. According to recent studies, in areas severely affected by WNS, pesticide use increased by 30%, while infant mortality rates increased by 8% due to pollution.

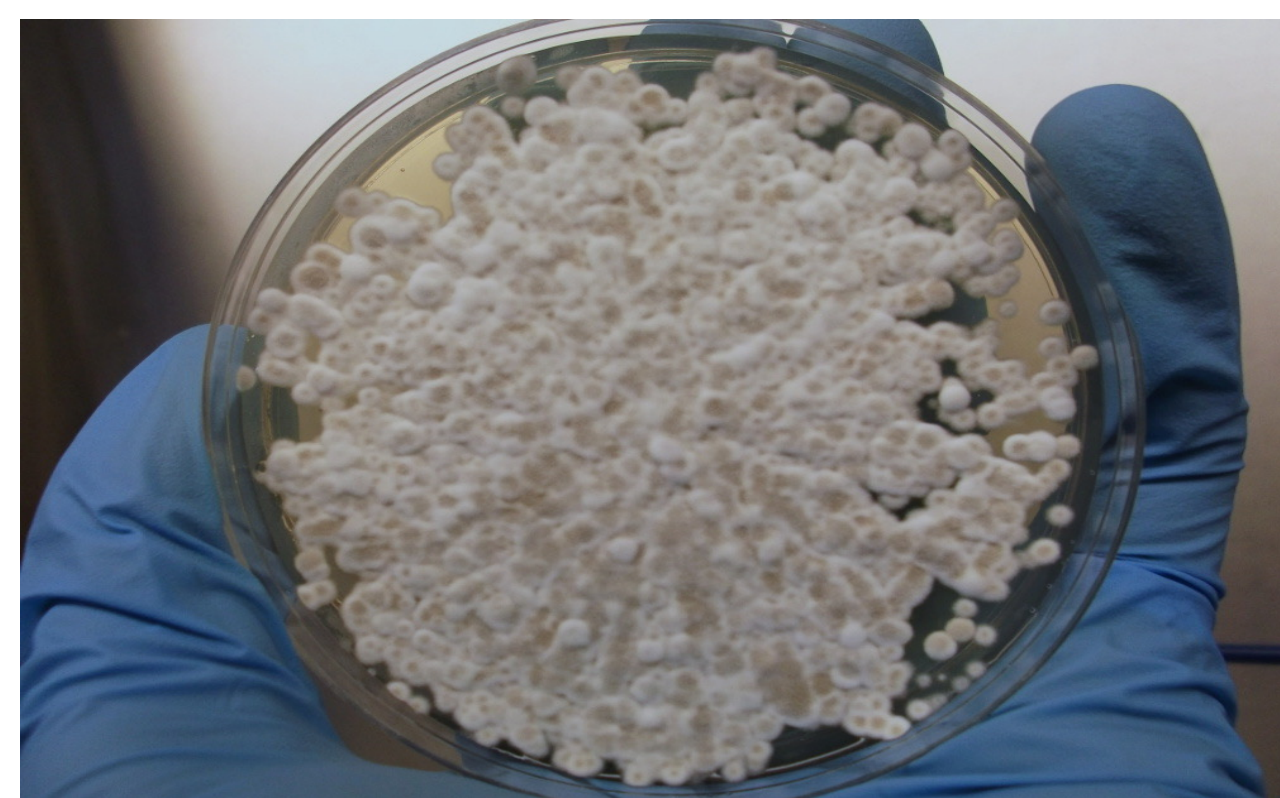


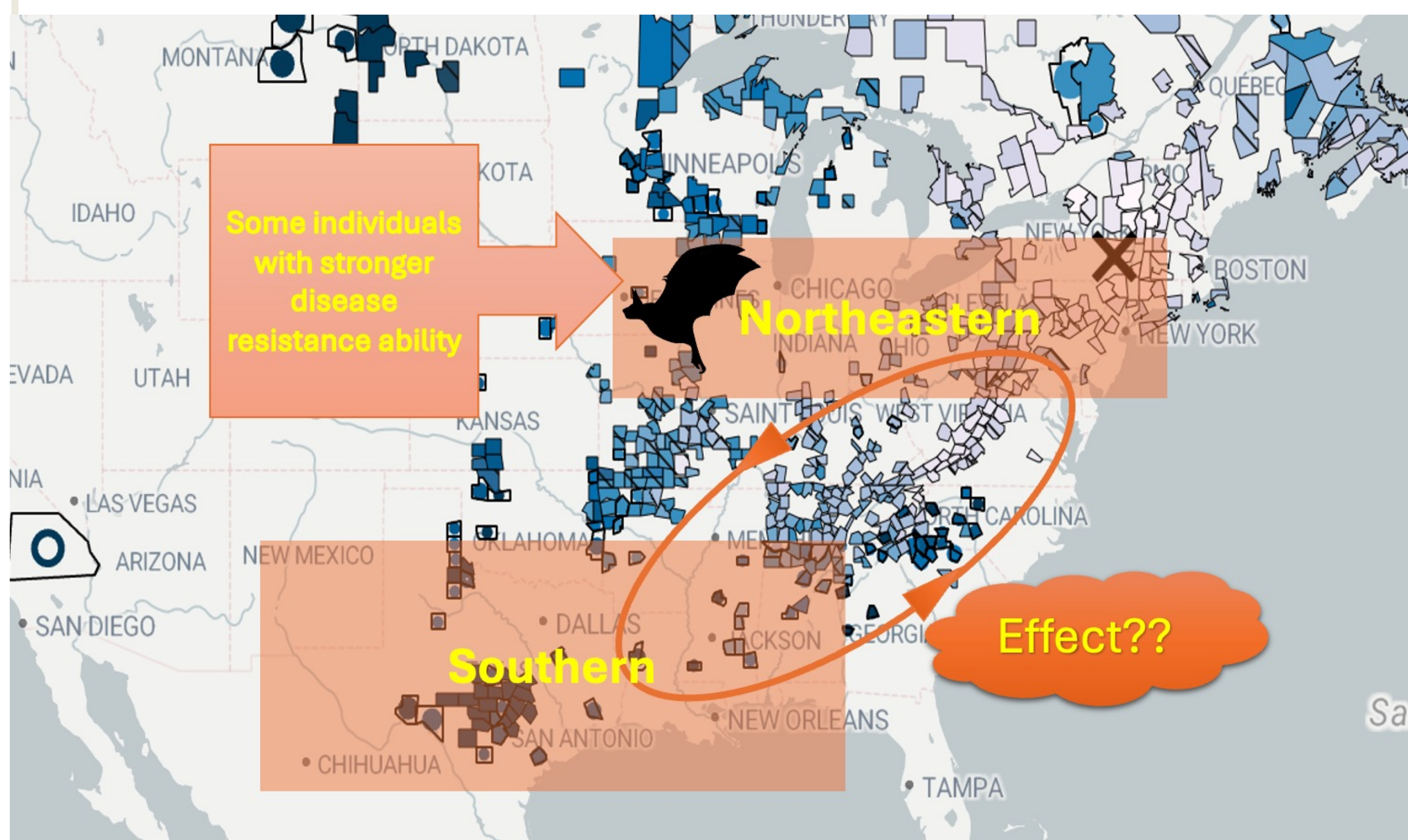
Fig1: *Pseudogymnoascus destructans* (Kyle Gabriel and Dr. Robert Simmons, Georgia State University) and a bat infected with WNS (National Park Service).

## Current Knowledge

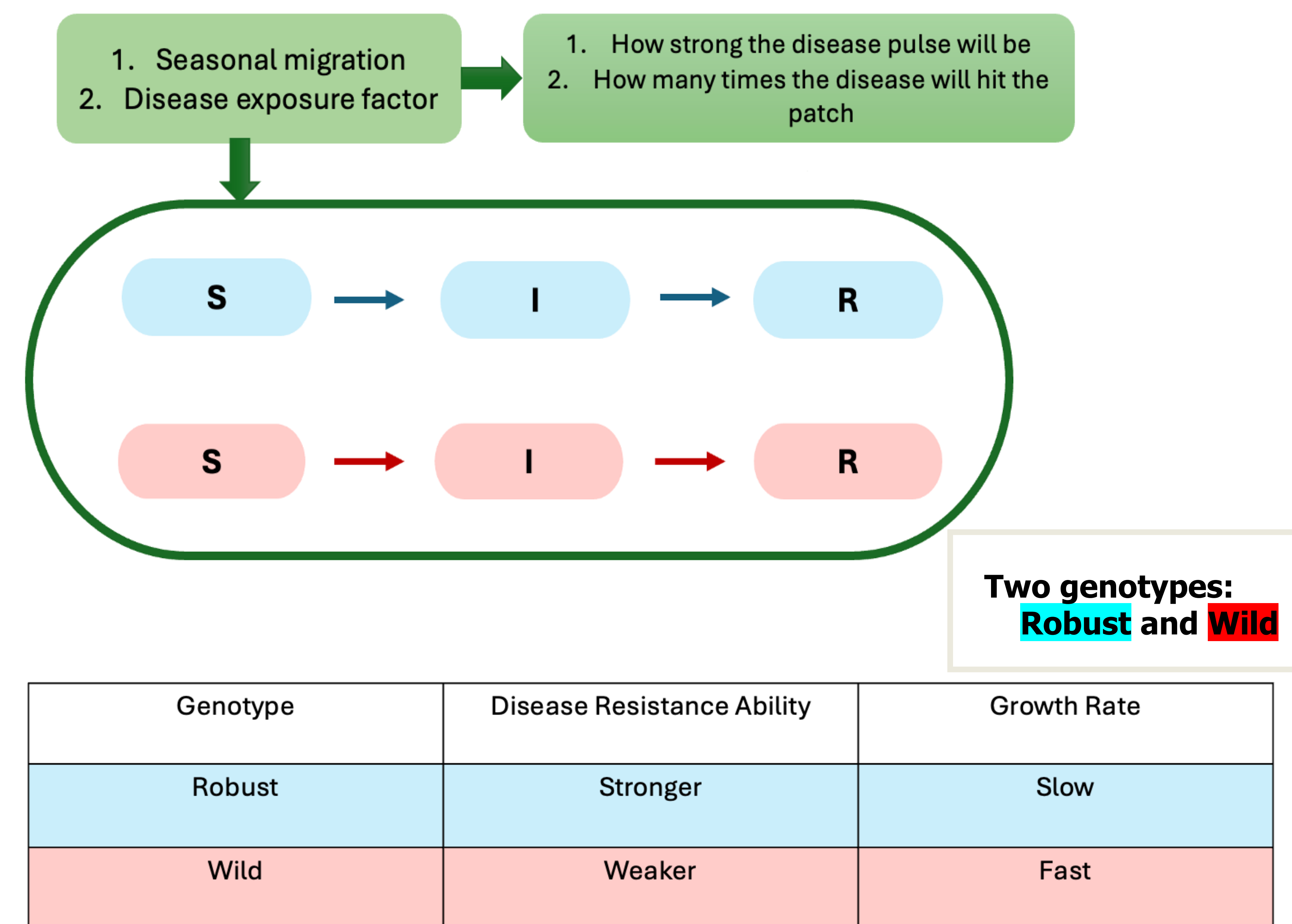
- Southern regions – WNS sink: higher temperature leads to shorter hibernation length, means bats are more active. Therefore, unlike Northeastern bats, they are less likely to get infected or have severe symptoms.
- Carriers: allowing WNS to exist in southern environments and then transmit the disease when northern bats migrate south.
- New genotype – Robust type: some populations in northeastern states have developed greater resistance ability to the disease.

## Objective & Hypothesis

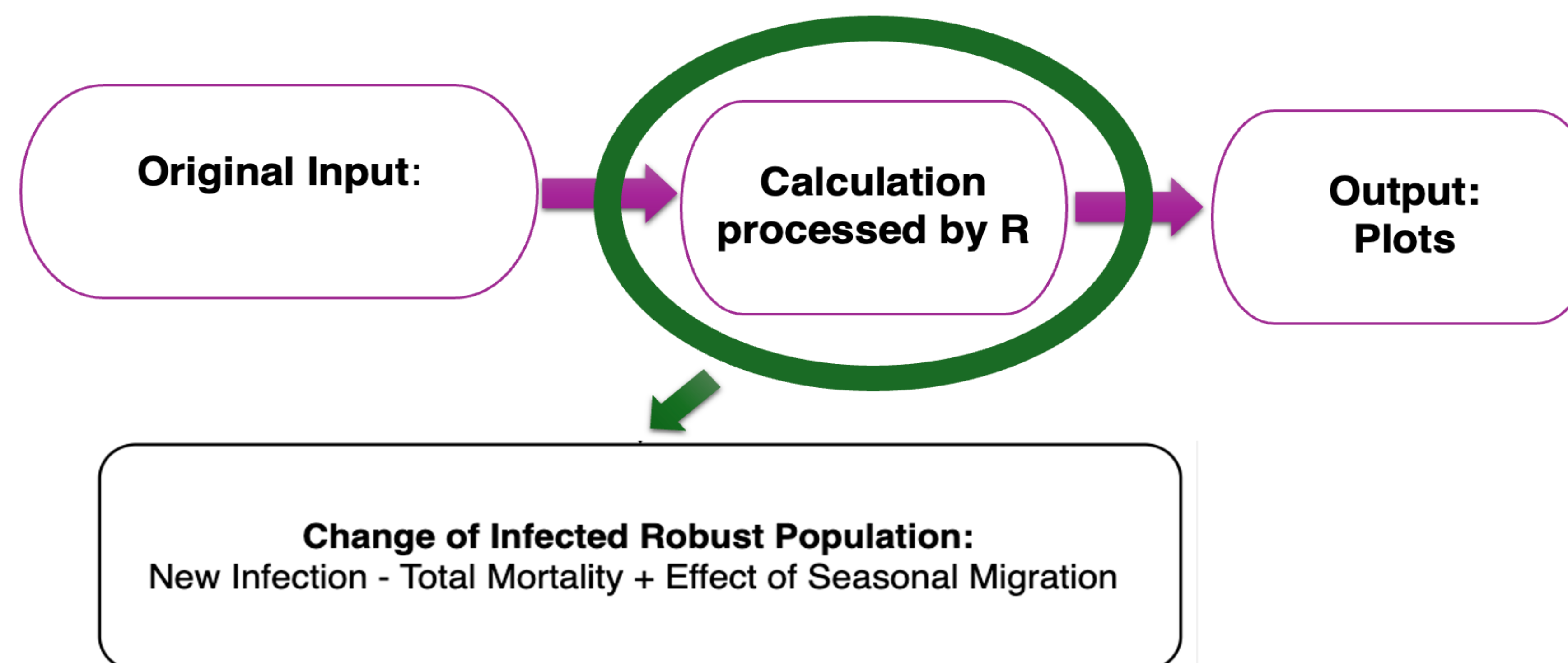
- Explore the impact of the magnitude of migration and disease exposure factors on population and disease dynamics in robust and wild genotypes.



## Methods: SIR Model



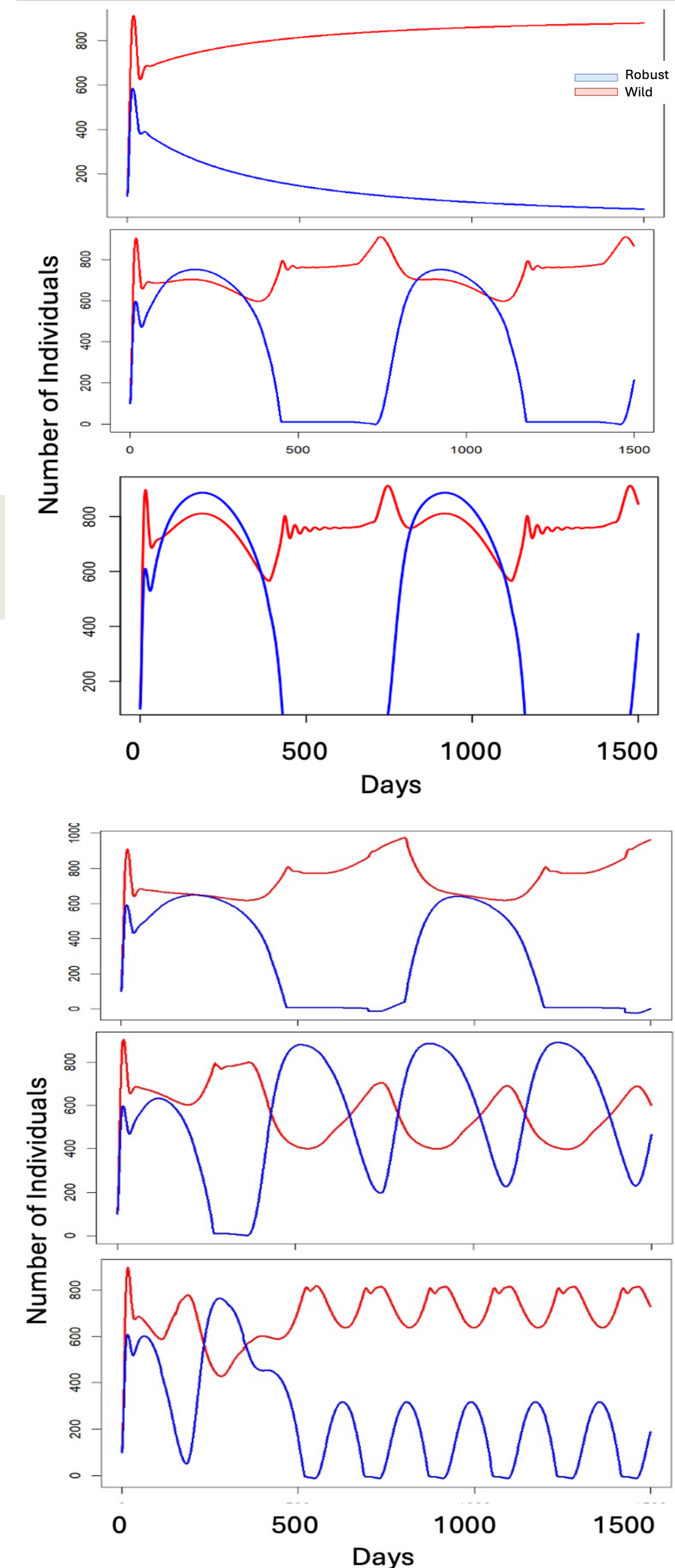
## Simplified Model Design



## Hypothesis 1 & 2

- As migration increases, the Robust type will gradually be favored.
- The increased disease exposure factor will initially favor the Robust. Too frequent disease pulse will decrease the Robust population.

## Results

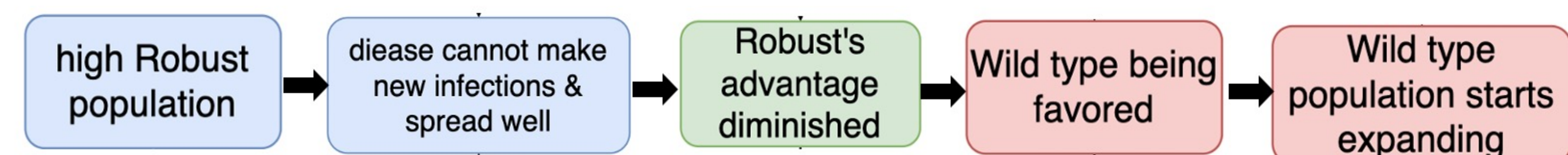


### Hypothesis 1:

- Robust type goes extinction
- Robust type outperformed the Wild type
- Robust type to be the dominant group is also longer.

### Hypothesis 2:

- Robust surviving but cannot compete with the Wild
- Robust is being the dominant type in certain periods
- Robust surviving but become the inferior type.
- Why?



## Conclusion & Next steps

- The combined effect will influence the Northeastern bat population and disease dynamics.
- Consider potential conservation implications.