



# Research recommendations for understanding the decline of American Kestrels (*Falco sparverius*) across much of North America

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*Falco  
sparverius*





# American Kestrel

Breeding

Year-round

Winter





# American Kestrel



Photo: Rob Palmer





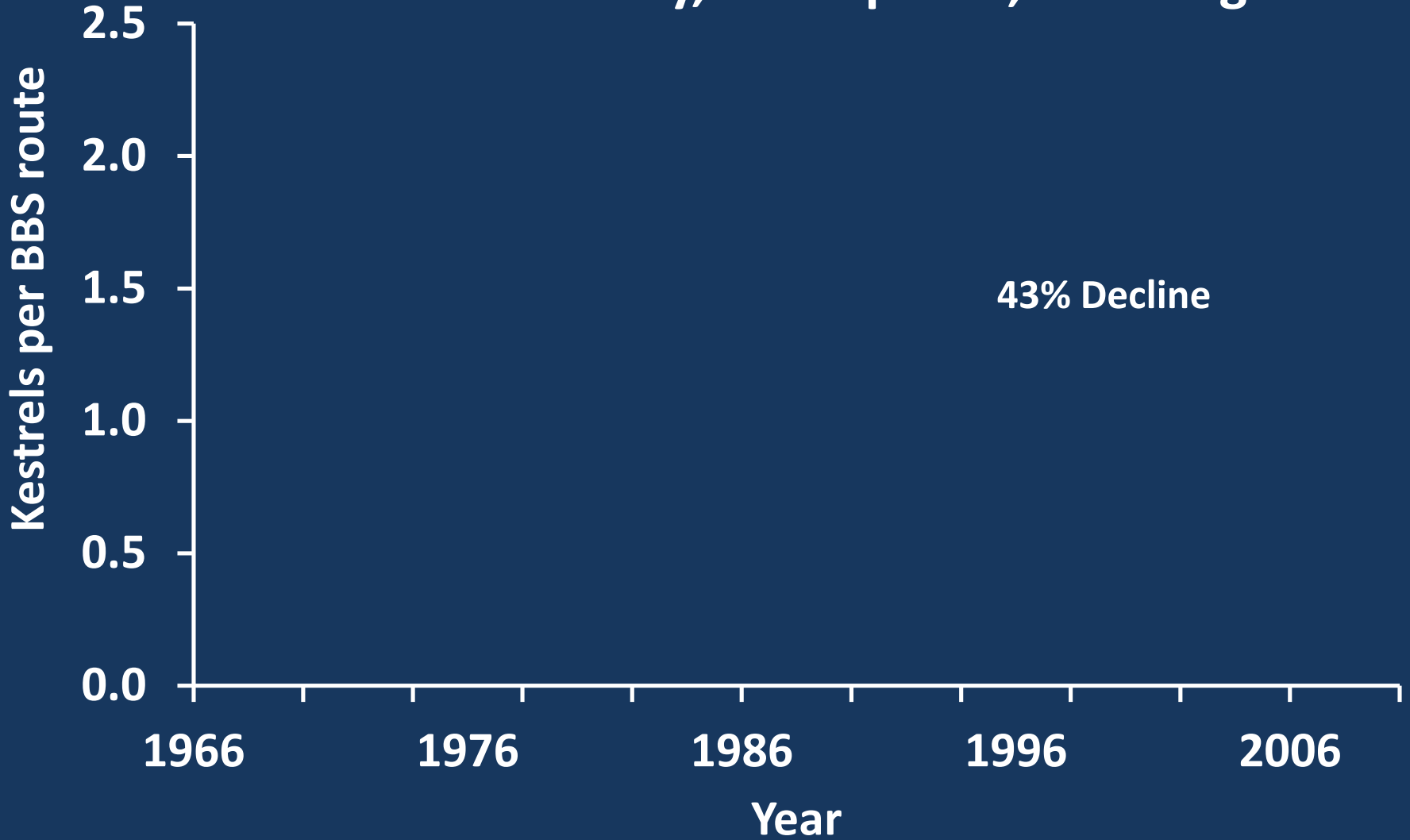
# American Kestrel

Photos: Peter Green, Providence Raptors



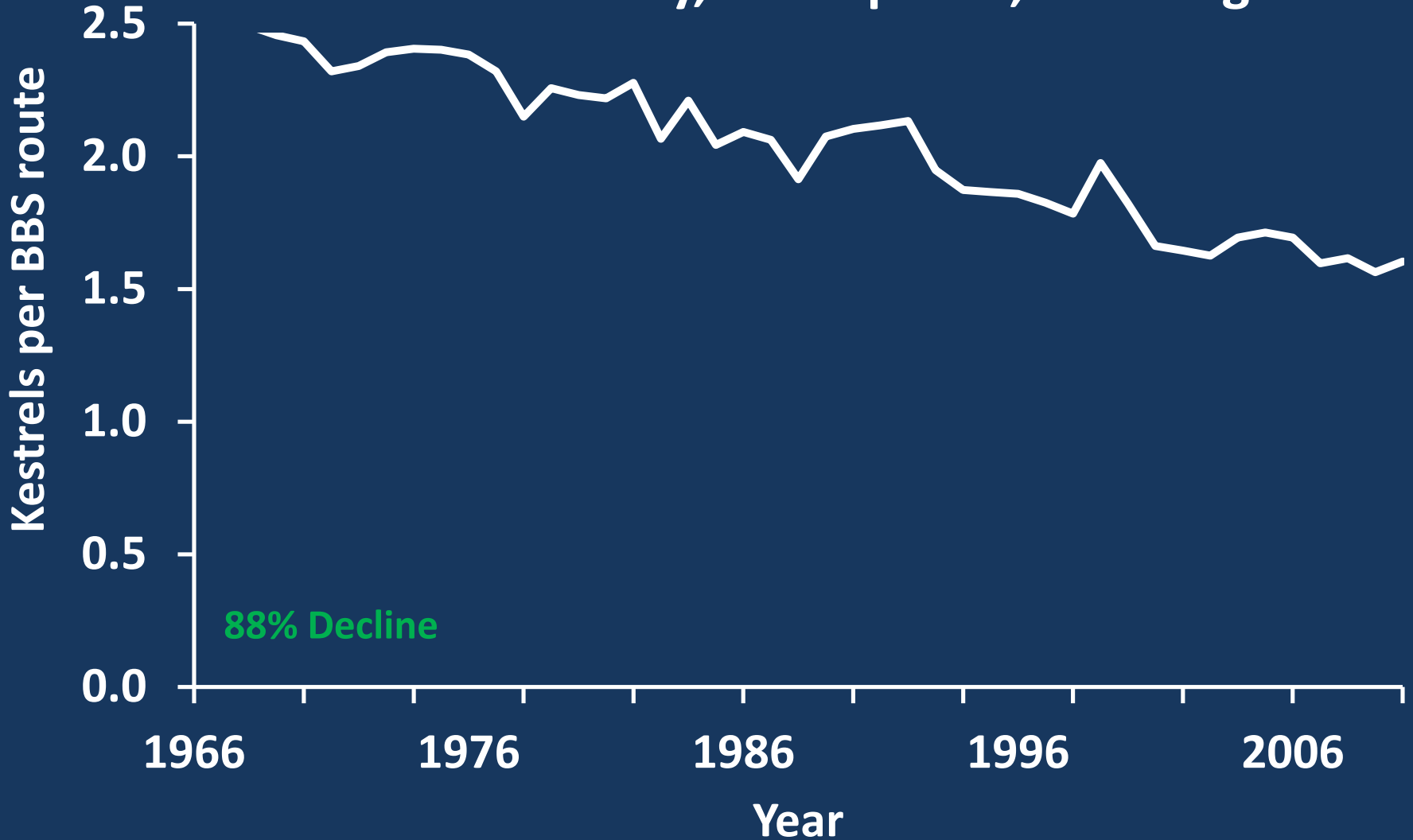


## Declines are steady, widespread, and enigmatic



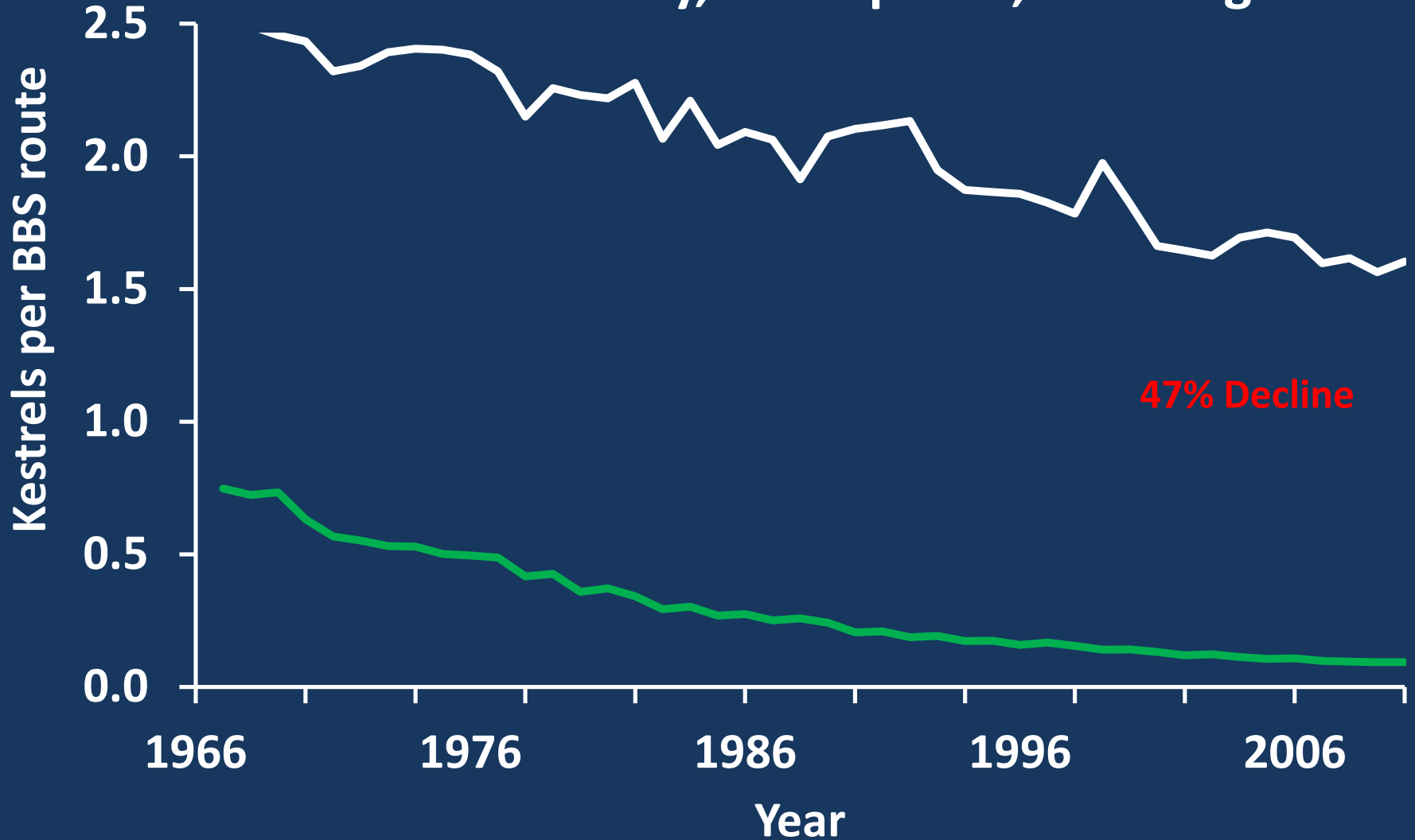


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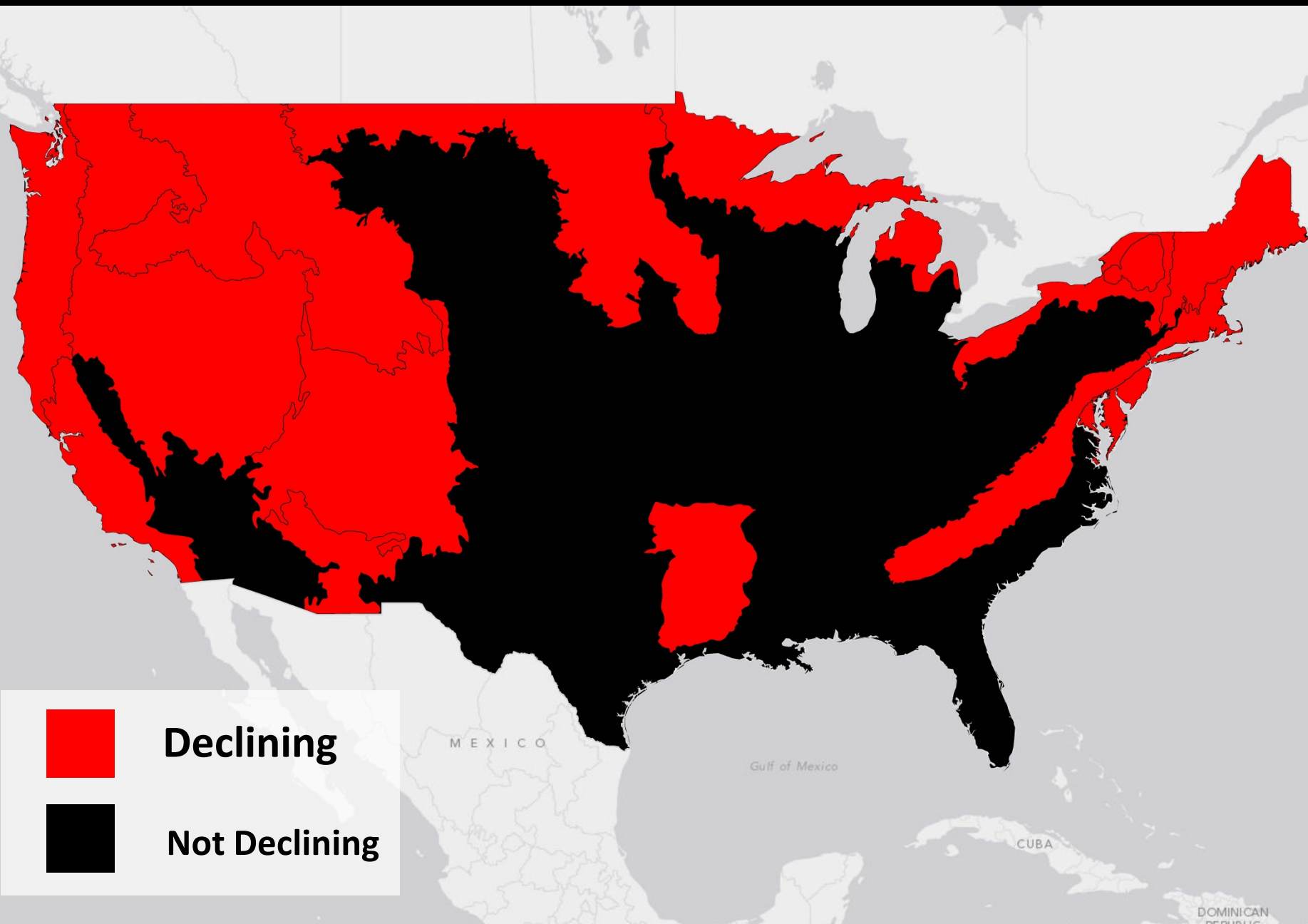




## Declines are steady, widespread, and enigmatic







**Declining**



**Not Declining**



## Declines are steady, widespread, and enigmatic

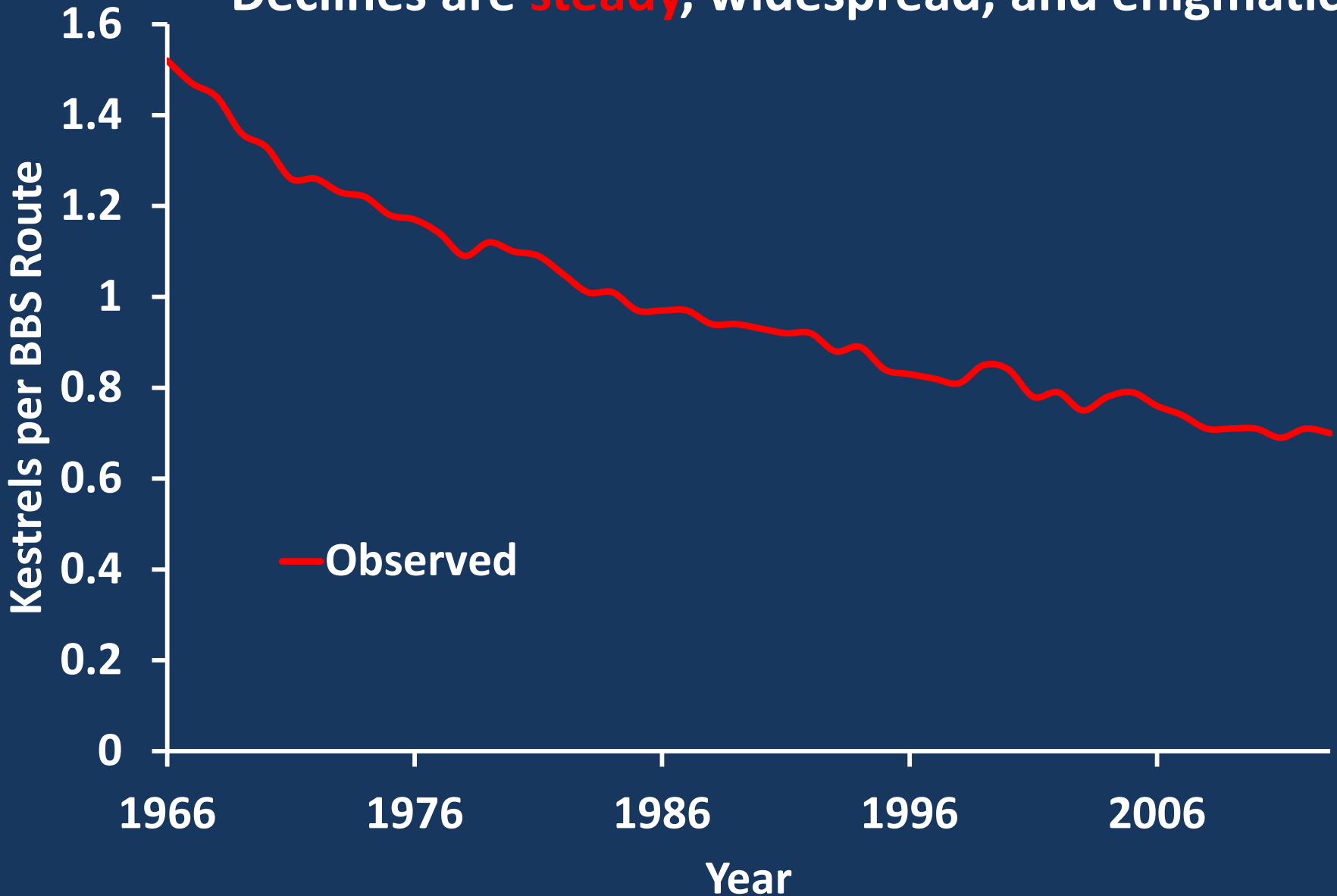
- **BBS** (Smallwood et al 2009, Sauer et al 2014, Balgiano et al. 2015)
- **Christmas Bird Count** (Paprocki et al. 2014, Balgiano et al. 2015)
- **Migration Counts** (Farmer and Smith 2009, Balgiano et al. 2015)
- **Nest Boxes** (Smallwood et al 2009)



# WHY?

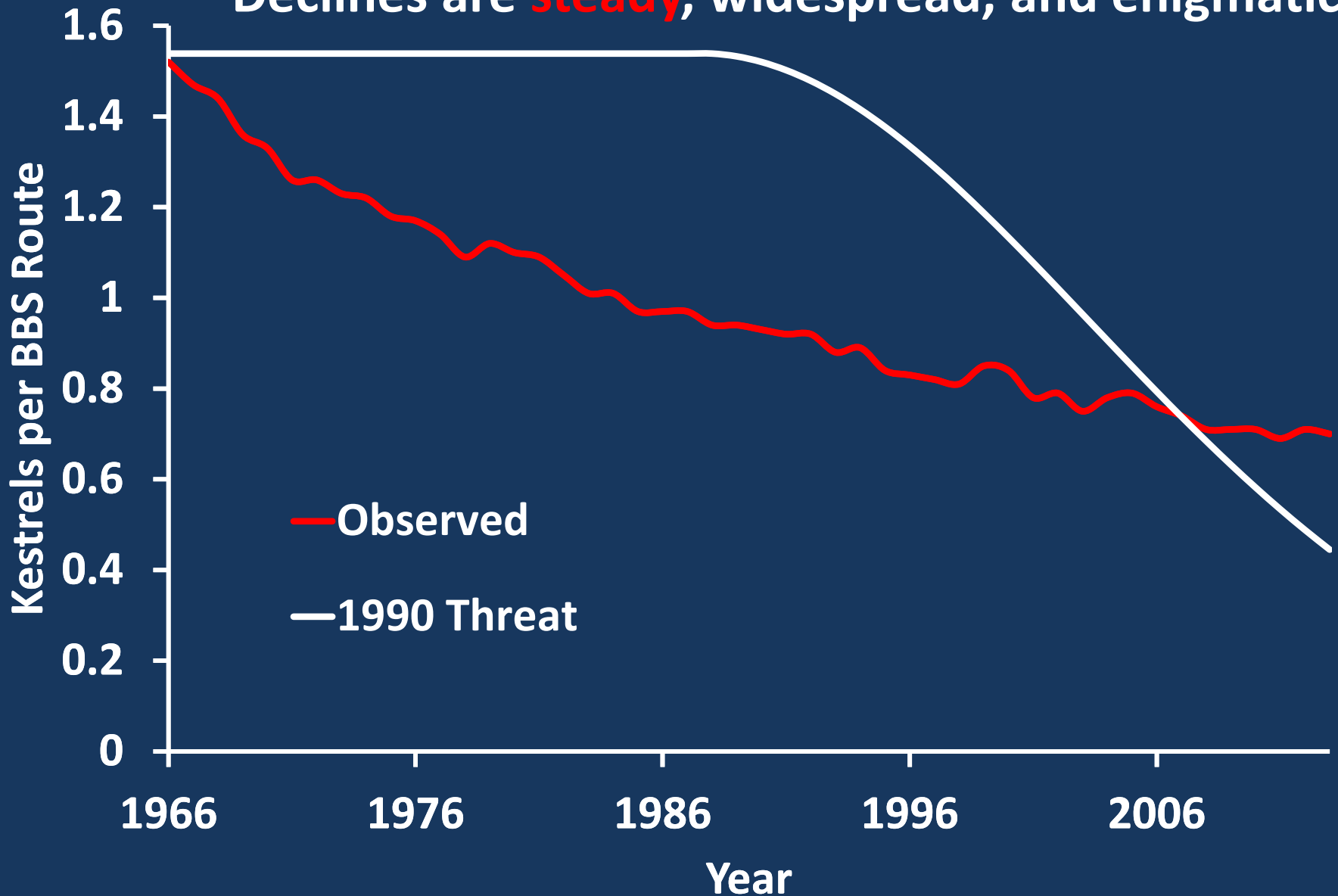


Declines are **steady**, widespread, and enigmatic





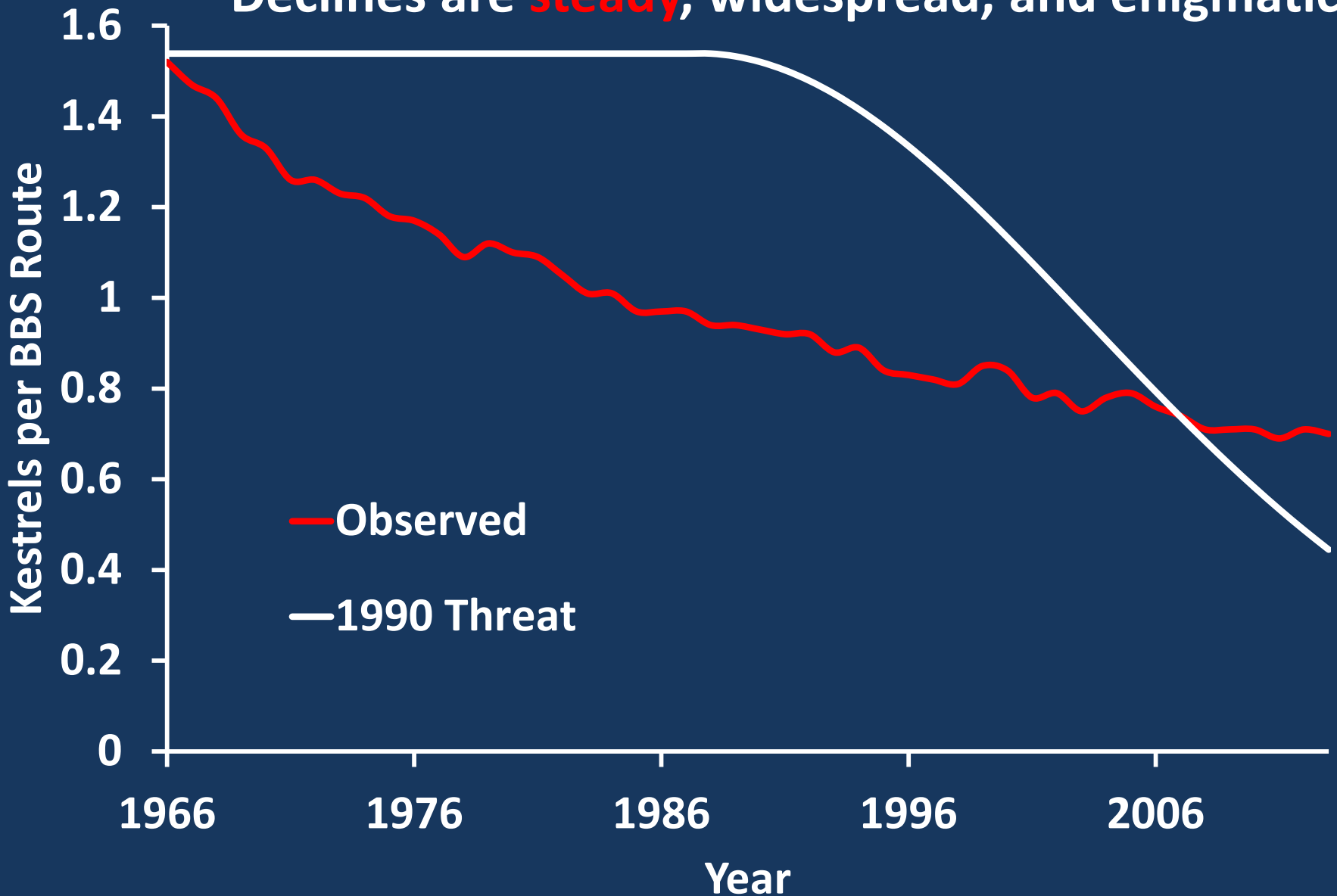
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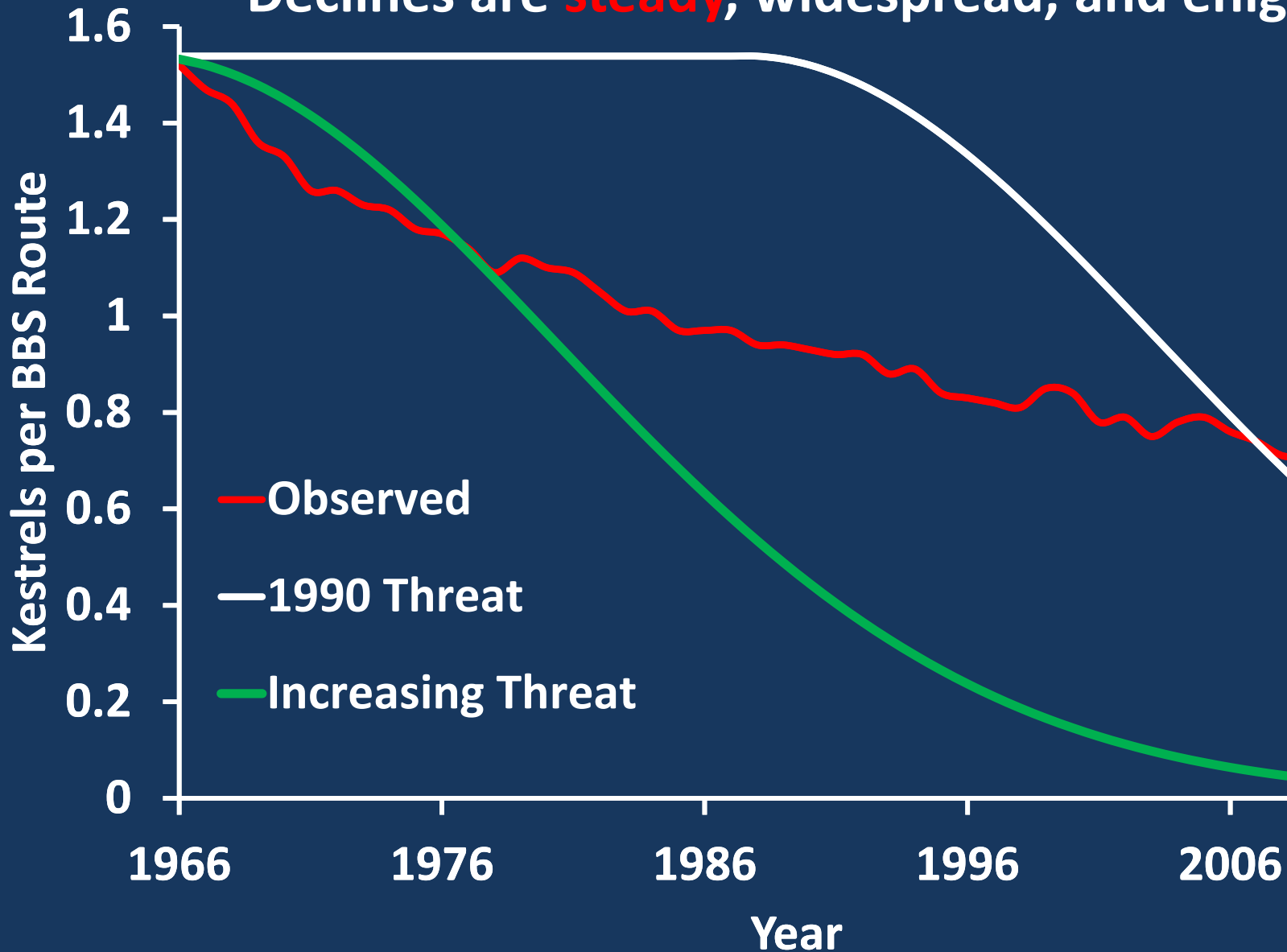


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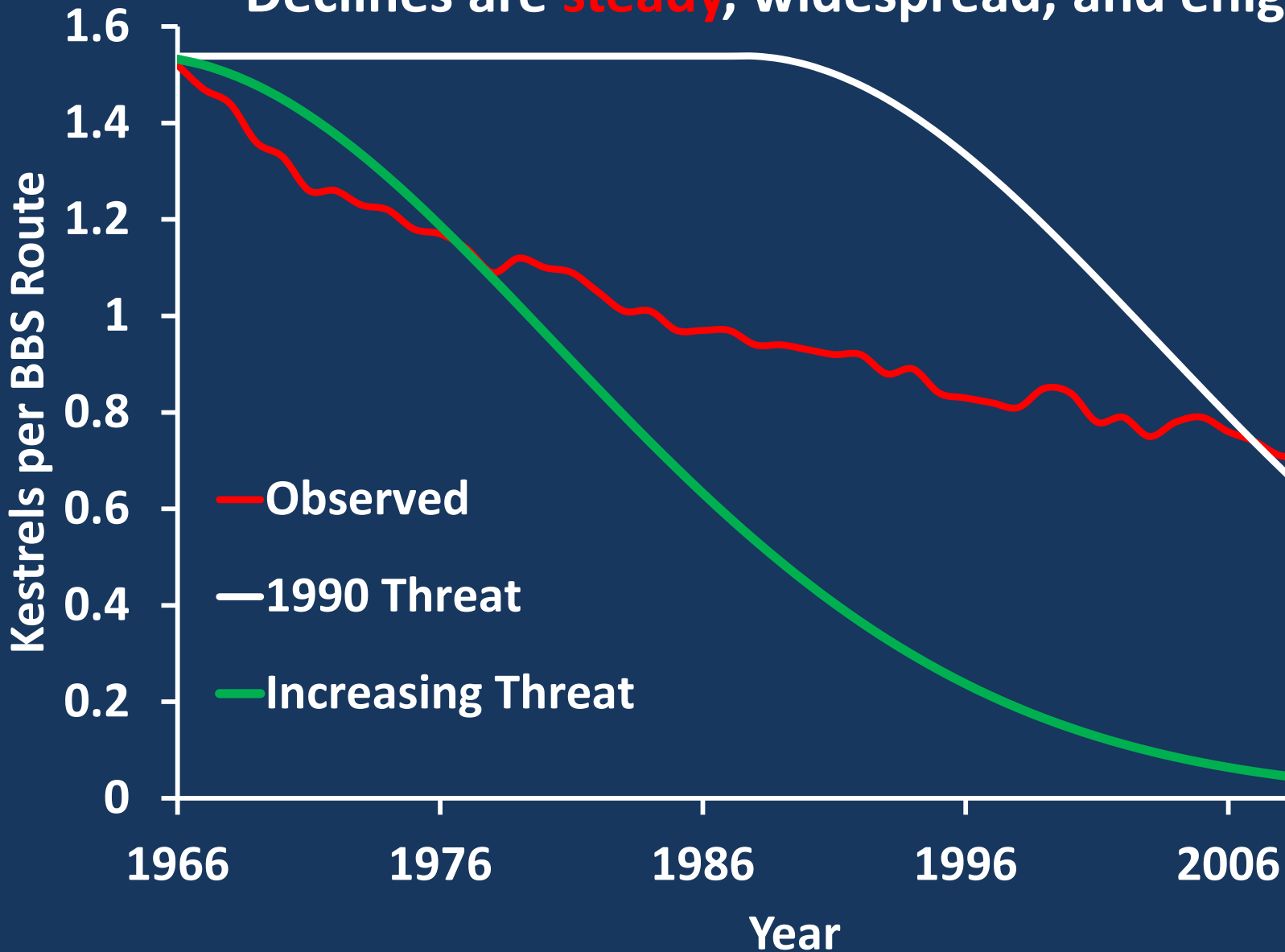


# Declines are **steady**, widespread, and enigmatic



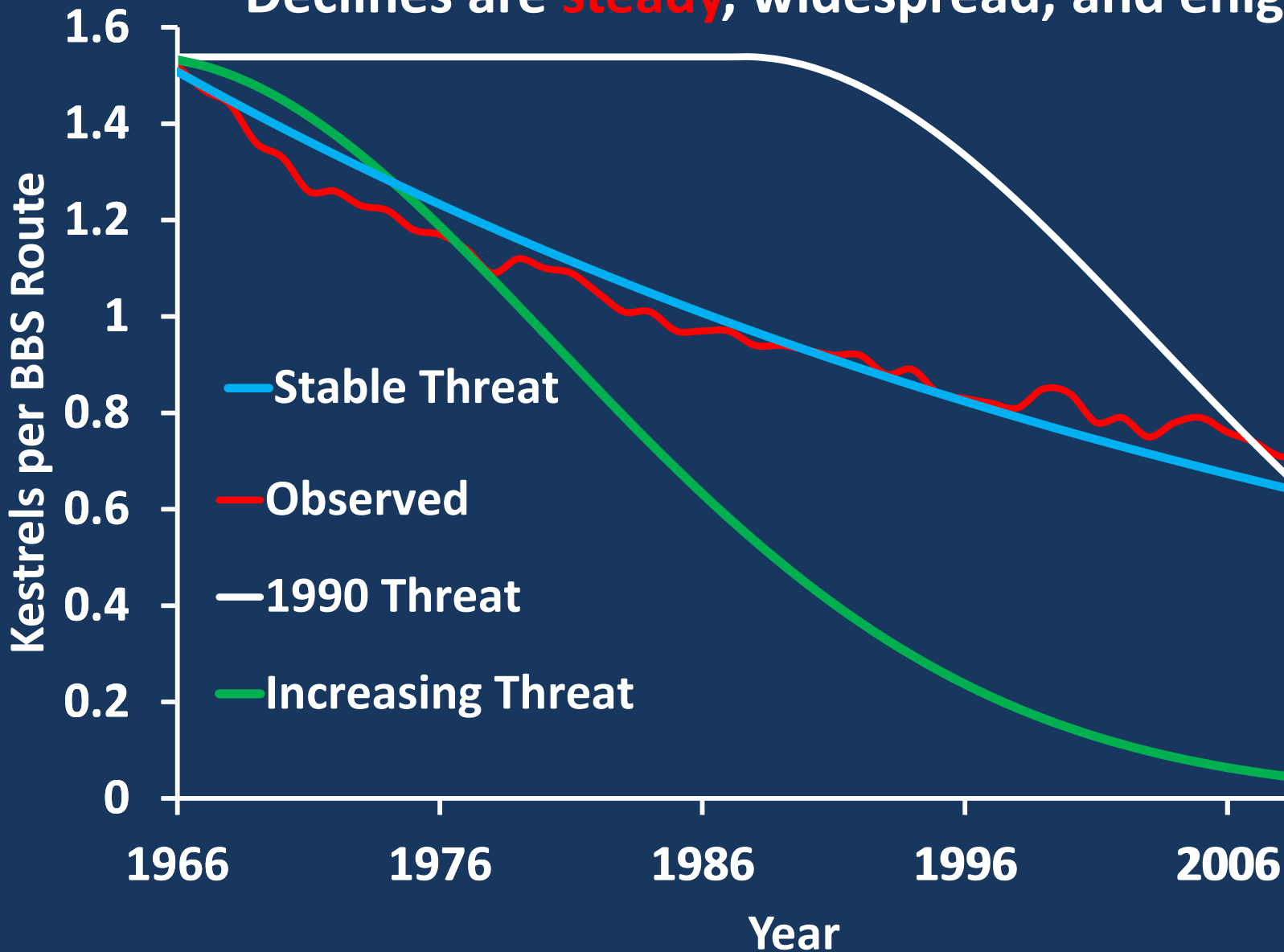


# Declines are **steady**, widespread, and enigmatic





# Declines are **steady**, widespread, and enigmatic





## Threats: Recent arrivals or increasing over time...

- **West Nile Virus** (Smallwood 2009)
- **Neonicotinoids**
- **Increased Cooper's Hawk**
- **Climate change**

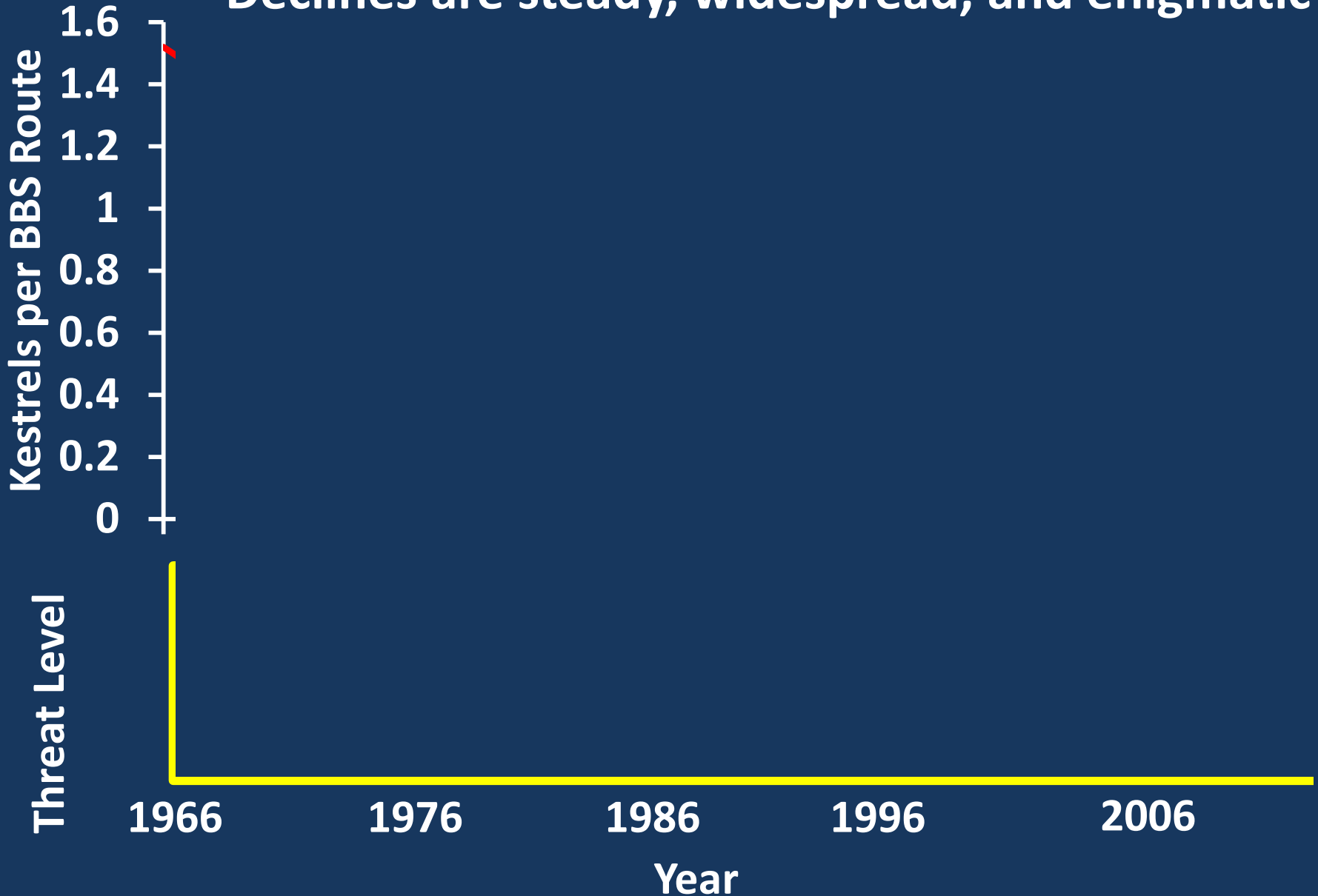


...do not explain a **long-term, steady** decline...





# Declines are steady, widespread, and enigmatic





## A Path Forward

- **Monitoring**
- **Studies of survival**
- **Studies of reproduction**
- **Full annual cycle**



## A Path Forward: Monitoring

➤ Phenology changes may induce false trends

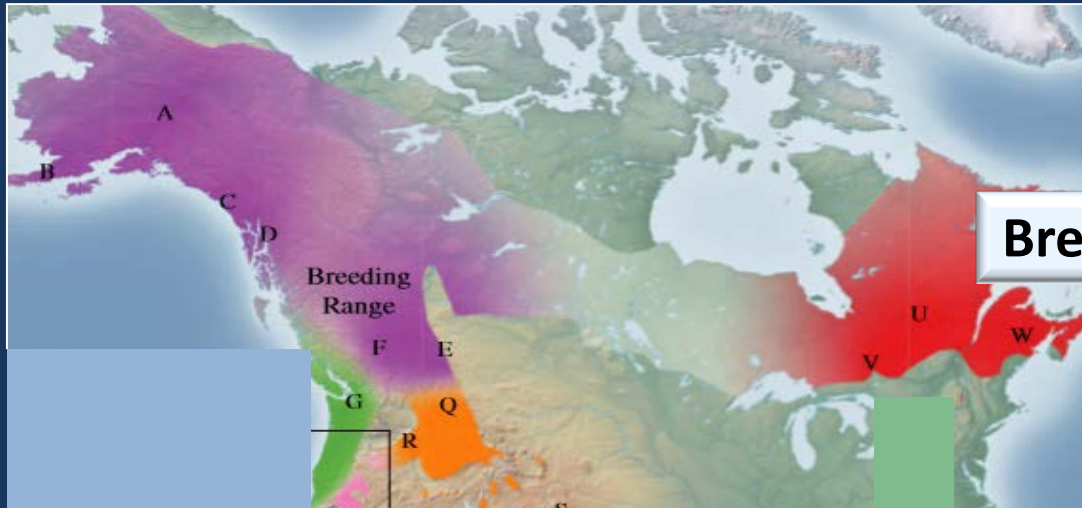
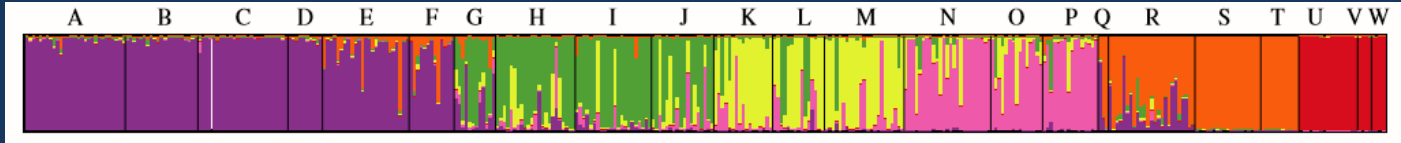
Study migratory connectivity

- Population genetics





# Breeding range population structure (Ruegg et al. 2012)



**Breeding Range**

**Migratory Stopover**

**Wintering Range**

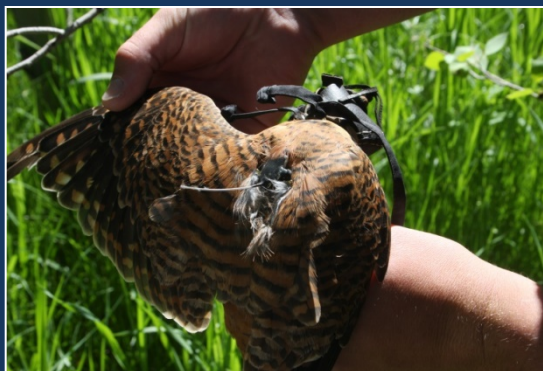


## A Path Forward: Monitoring

- Phenology changes may induce false trends

### Study migratory connectivity

- Population genetics
- Tracking devices (& technology)



**Ross Crandall**

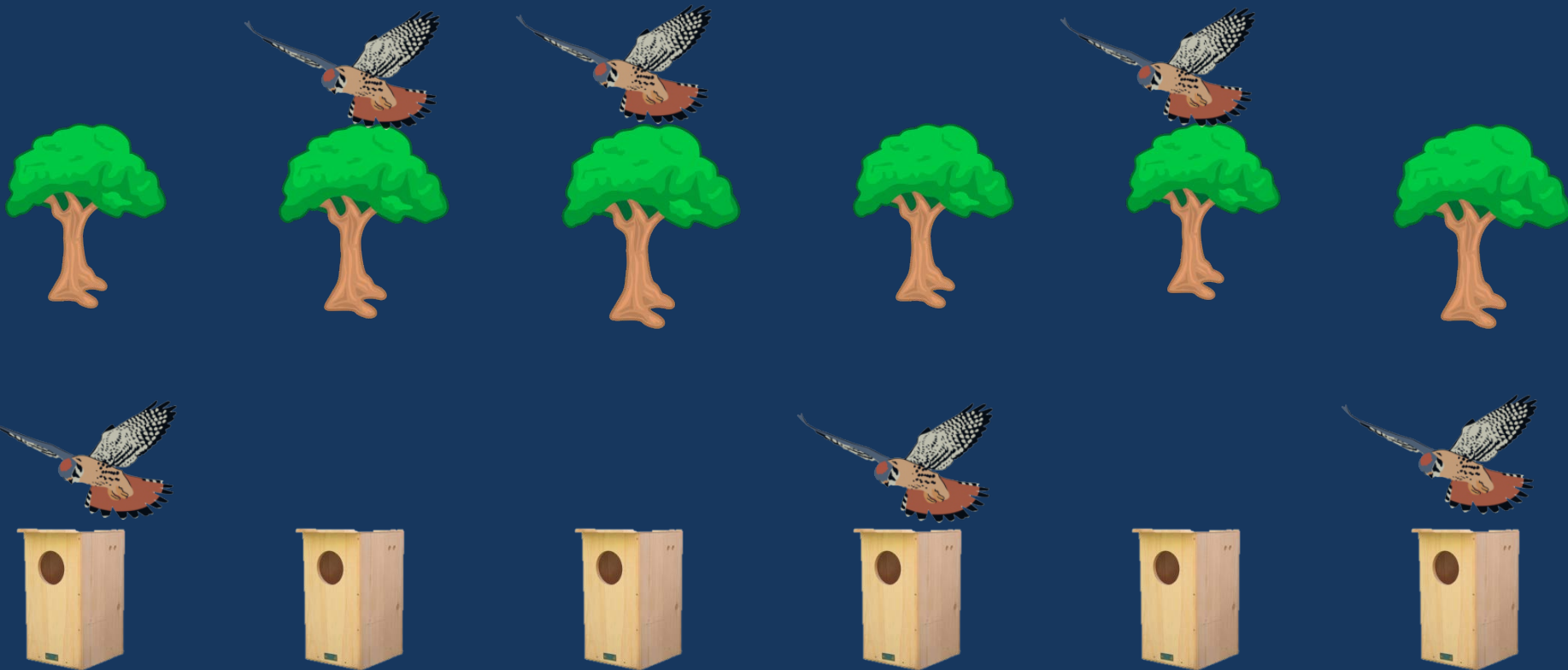
[ross@beringiasouth.org](mailto:ross@beringiasouth.org)





## A Path Forward: Monitoring

- Changes in availability of **unmonitored** nest sites may induce false trends





## A Path Forward: Monitoring

- Changes in availability of **unmonitored** nest sites may induce false trends

Develop methods to test scenarios

- Demographic models

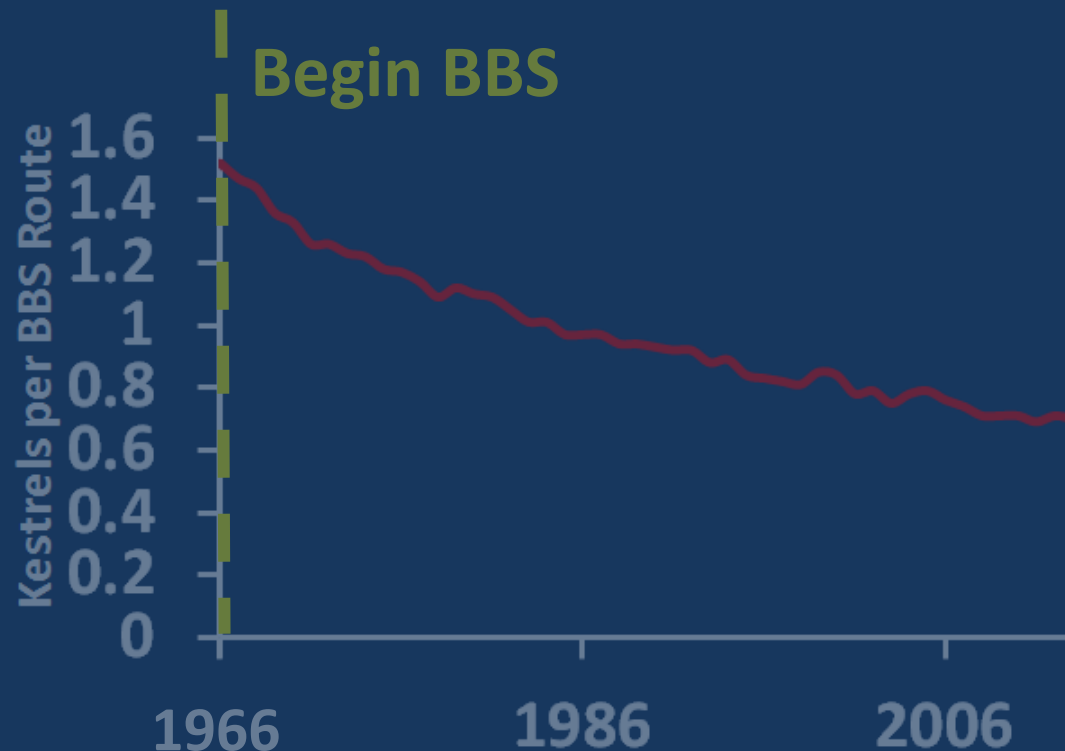




## A Path Forward: Monitoring

### ➤ Limited historical reach

Historic accounts & atlas data



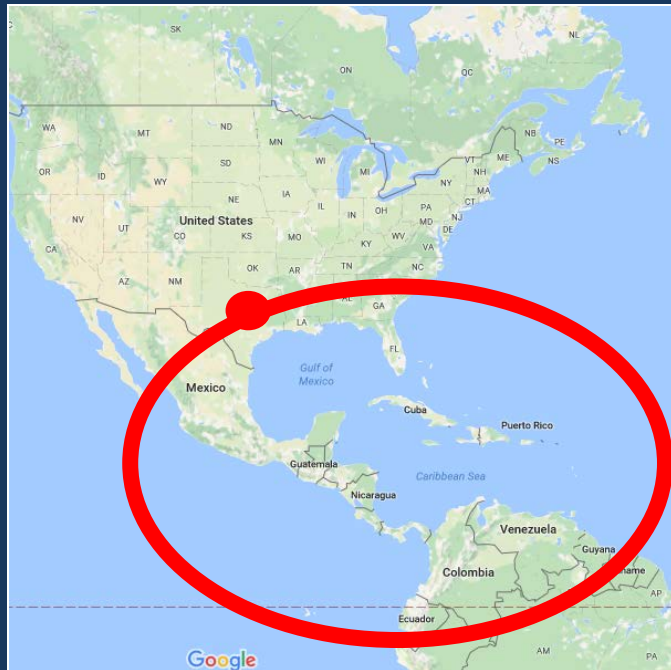


# A Path Forward: Studies of Survival

## ➤ Increased mortality during non-breeding (Smallwood 2009)

### Study survival during non-breeding

- Yearly survival: adults and young
- Overwinter and migration survival
- South of the US border



University of North Texas, Jim Bednarz



# A Path Forward: Studies of Reproduction

## ➤ MANY nest monitoring programs



## Protocol standardization

- Shared protocol
- Kestrel data base
- American Kestrel Partnership



## A Path Forward: Studies of Reproduction

### ➤ Lack of consensus or data for some issues



### Examine drivers of success and failure

- Roadside boxes
- Box placement
- Predator guards



## A Path Forward: Full annual cycle

### ➤ Survival & reproduction do not act in isolation

#### Study rates of entrance and exit

- Band and monitor reproduction and annual return to population
- Individual-based models



## A Path Forward: Summary

- **Build upon methods that have been used in the past,**
- **Expand to understudied regions,**
- **Incorporate new technology, and**
- **Increase focus on kestrels beyond the breeding season.**





# QUESTIONS?



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