

Hantavirus Outbreak 1993

Field Investigations



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Objective

Discuss field studies that followed the identification of the suspected pathogen

- Case vs Control / Risk Factor Studies
- Environmental assessments
- Extensive rodent trapping & testing
- Overview of events 20 years ago

Events Triggering the HPS OB

- El Nino → above average precipitation in Winter & Spring 1993.
- Increased vegetation growth & large crop of seeds, pinyon nuts, acorns, etc.
- Wild rodents populations increased 10X based on ongoing studies in NM.
- Excessive rodent populations facilitated pathogen transmission & increased rodent exposures to humans.

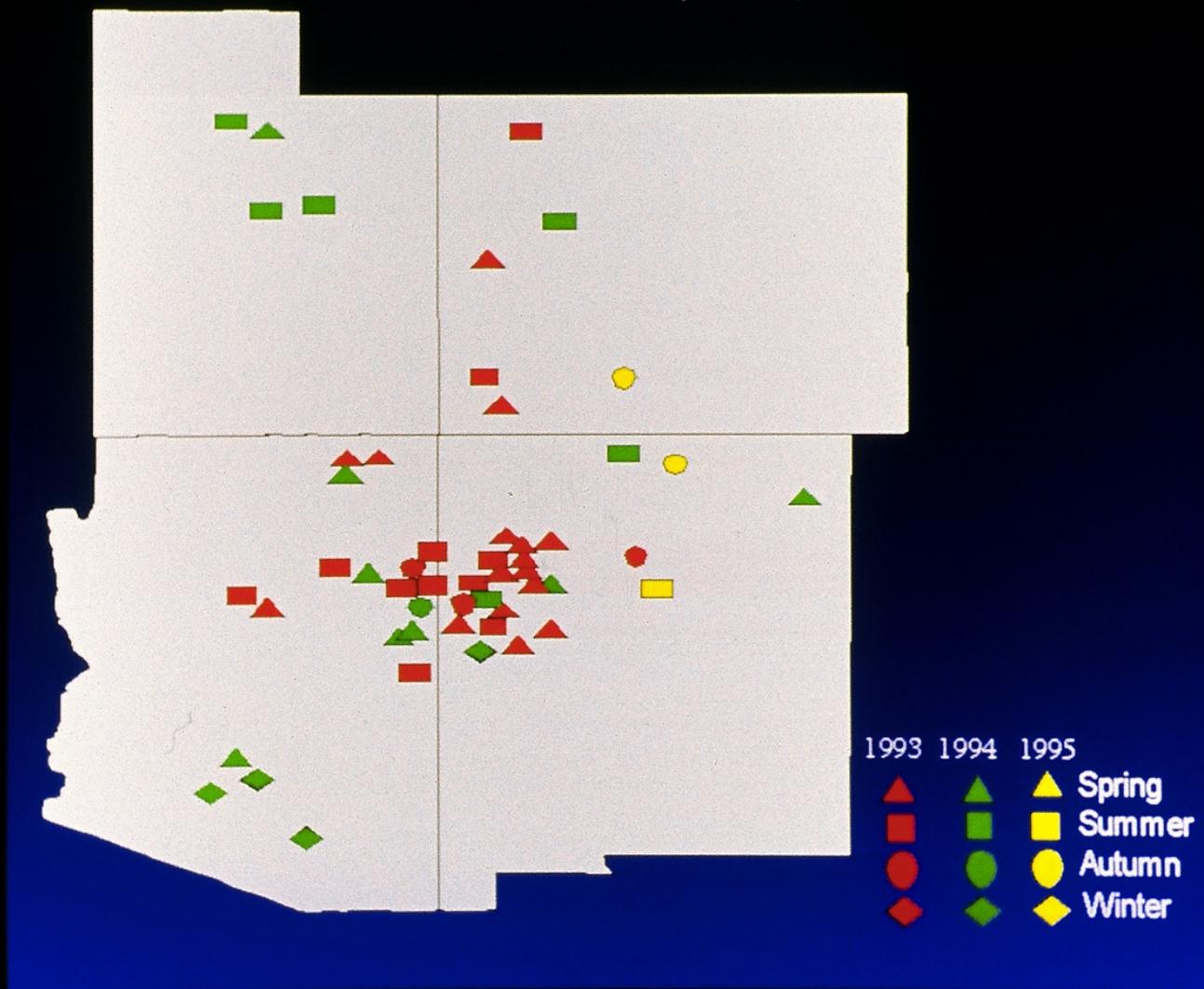


The Outbreak Begins

- May 1993 - OB of unexplained ARDS was first reported in the Four Corners Area.
- June 1993 - CDC testing of autopsy tissues of fatal human cases identified the pathogen as a hantavirus of some kind. Hantaviruses are typically rodent-borne.
- June & July - Initial rodent trapping & testing efforts by CDC & IHS identified deer mice (*Peromyscus maniculatus*) as a probable reservoir.

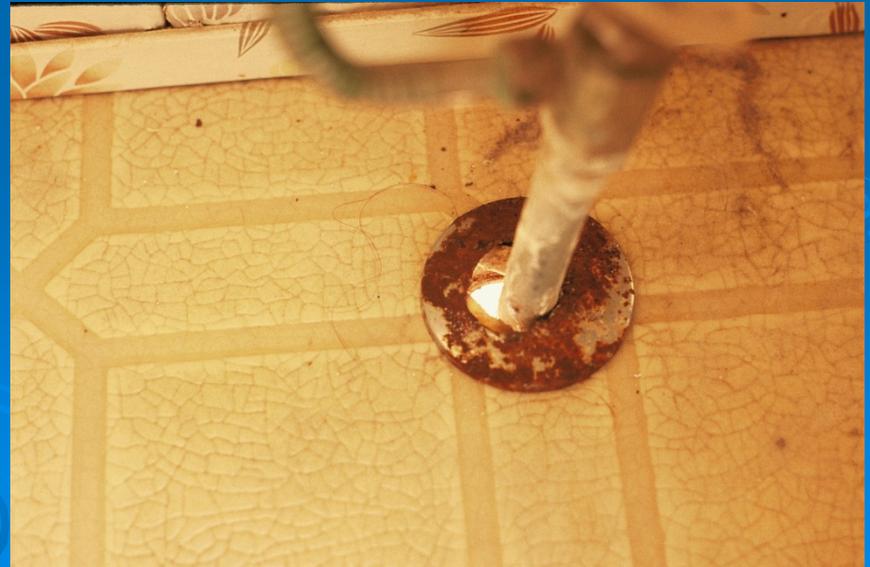


Total HPS cases in the Four Corners States, 1993-1995 (n=52).



Environmental Assessment

- Drew maps of case and control home sites – inside and out
- Recorded vegetation data
- Noted rodent sign & habitat – droppings, gnaw marks, nests, burrows
- Noted access routes for rodents to gain entry into homes and out buildings
- Ranked risk level for rodent exposure



Environmental Assessment



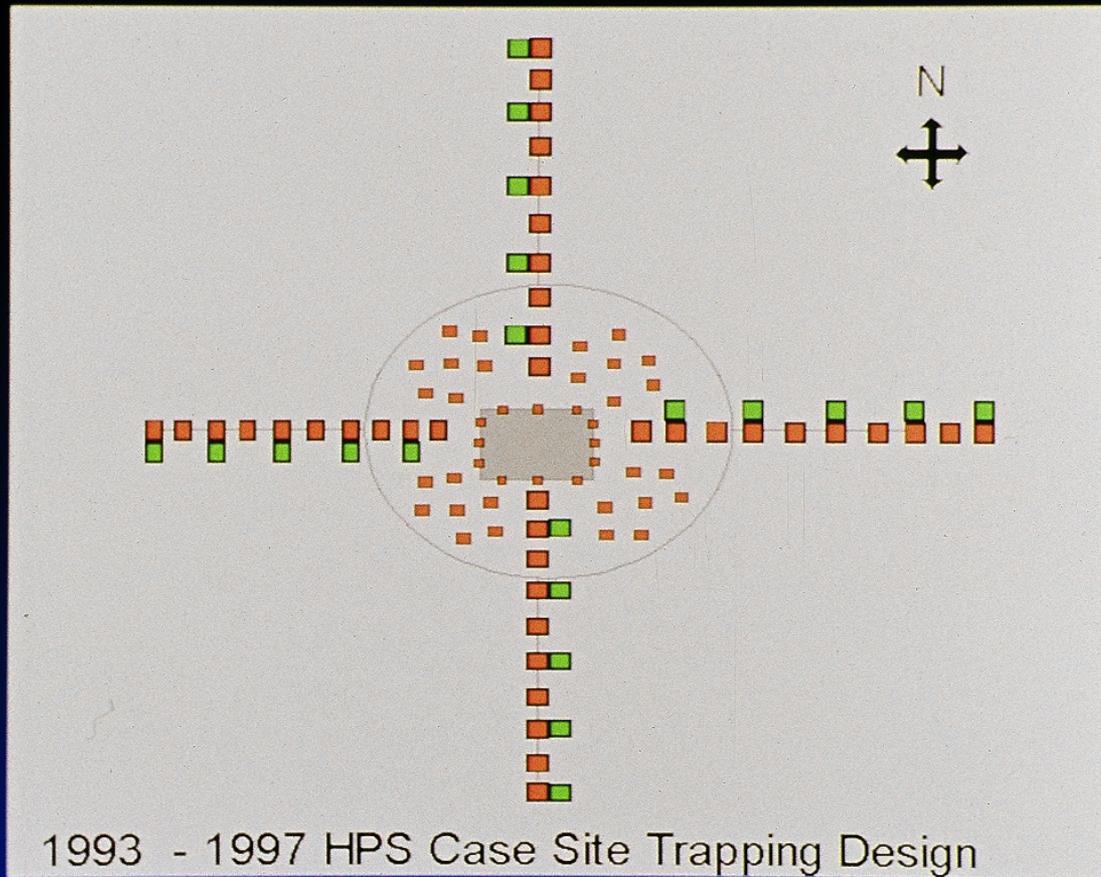
Environmental Assessment



Rodent Trapping

- Rodents were trapped at the case house, near control house and far control house
- 100 traps were set for each
- Two nights of trapping per house
- For every HPS case that occurred, we had to do six nights of trapping (600 trap nights)
- Trapping teams consisted of staff from ADHS, IHS-OEH, CDC, county health, etc.

Rodent Trapping



Rodent Trapping

Setting & Harvesting Traps

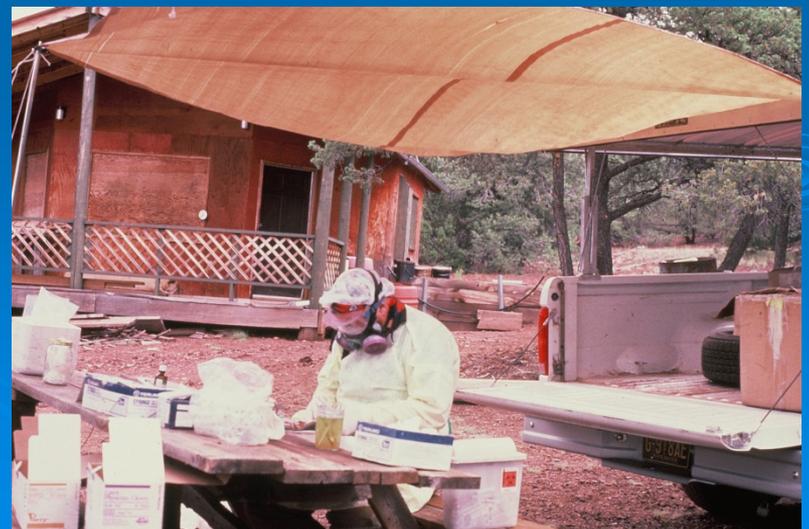


Rodent Processing



PPE

- Gowns
- Goggles
- Double gloves
- Half Face Respirators w/ HEPA Filters (N-100) - fit tested



Rodent Processing

Anesthetize

Record Data: species, weight, sex, reproductive status, scars, etc.



Rodent Processing

Collecting Blood

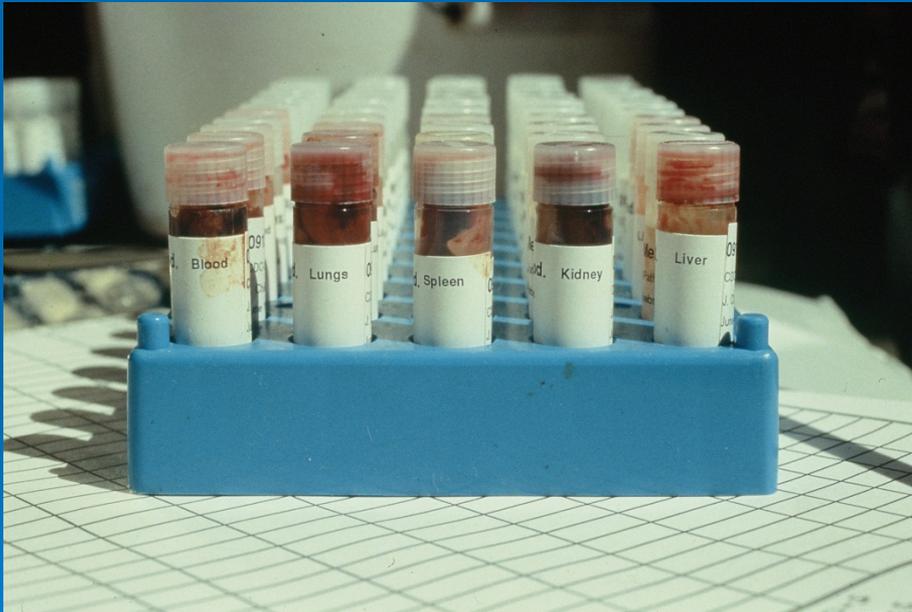


Harvesting Tissues



Rodent Processing

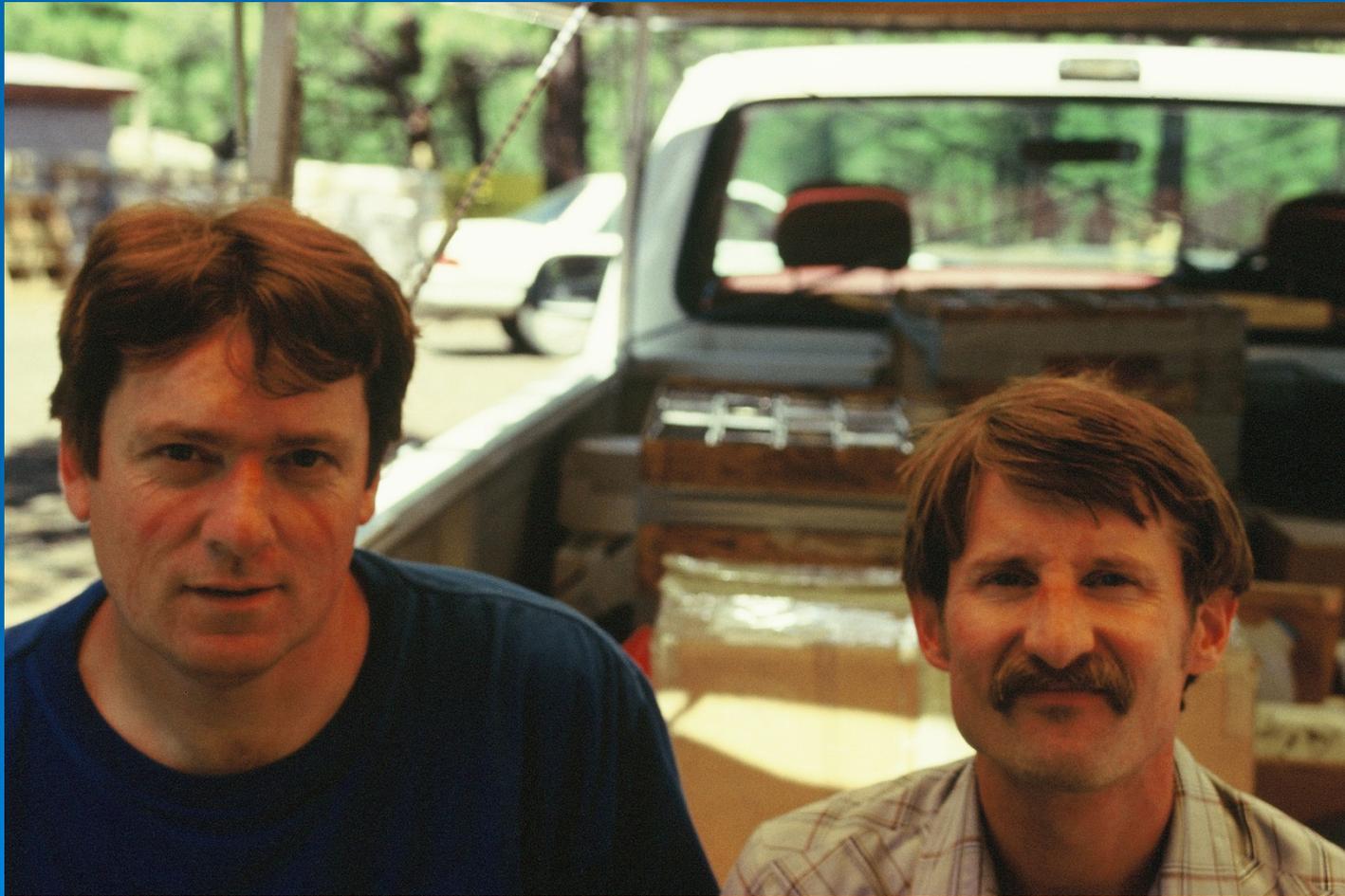
Tissue Specimens



Disinfection



Respirator Battle Scars



Results of Field Studies: Four Corners

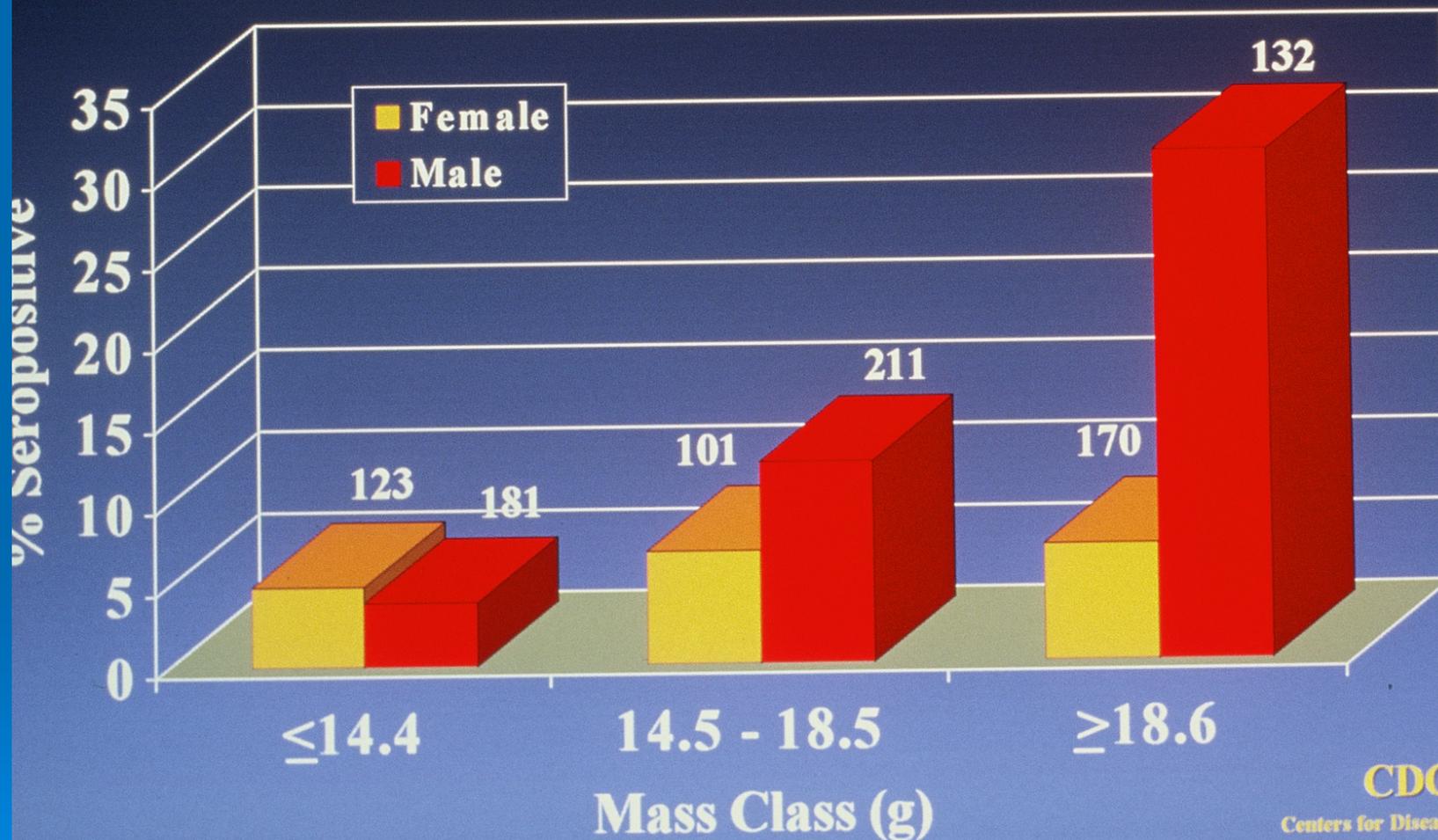
- Deer mice were the most commonly trapped rodent species around homes (50% +) and were more likely to invade homes.
- Seroprevalence w/ SNV varied from 0 – 80% among deer mice.
- Seroprevalence among deer mice at case homes site averaged ~ 30%.
- Other rodent species also tested SNV +, but with lower prevalence, including other *Peromyscus* spp., *Reithrodontomys* (harvest mice), *Microtus* (voles), and *Neotoma* (woodrats).

Results of Field Studies

- Older adult mice were more likely to be SNV+ compared to juveniles.
- Seroprevalence was 3X higher in male mice than in females.
- Older male mice commonly had more “battle scars” (evidence of fighting).
- SNV transmission among mice occurs “horizontally” and is not transmitted from mother to offspring.

Prevalence of Ab Reactive with SNV in *P. maniculatus* by Sex and Mass Class

53



(n=number tested)

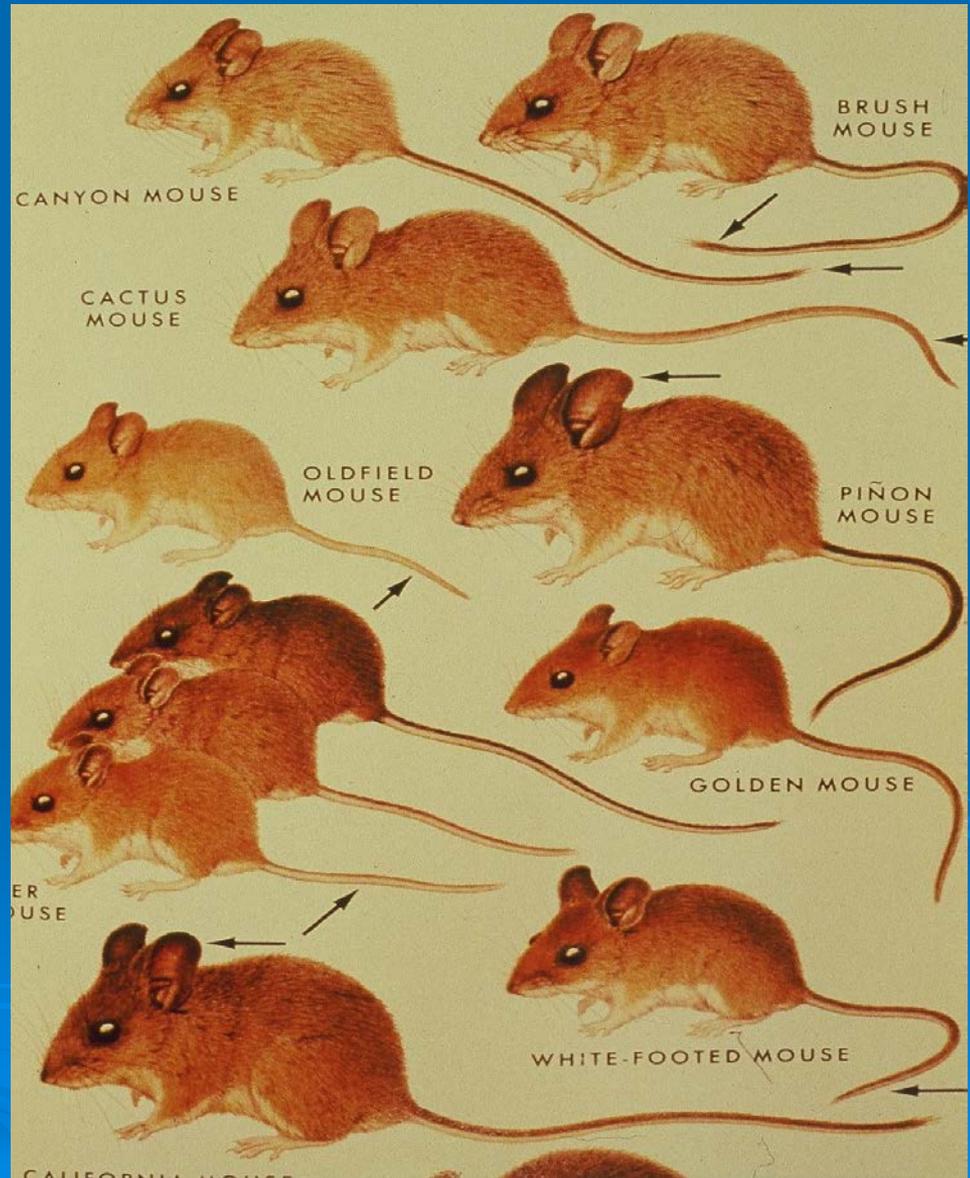
CDC
Centers for Disease Control
and Prevention

Case vs Control Study Results

- Childs, et al. - 17 case houses were compared to near and far control sites.
- No significant differences observed for house type or outside habitat.
- Case homes had significantly higher deer mouse infestation compared to controls.
- There was no significant difference in mouse seroprevalence between case vs control home sites.

Peromyscus Spp. Ab+ for SNV in AZ

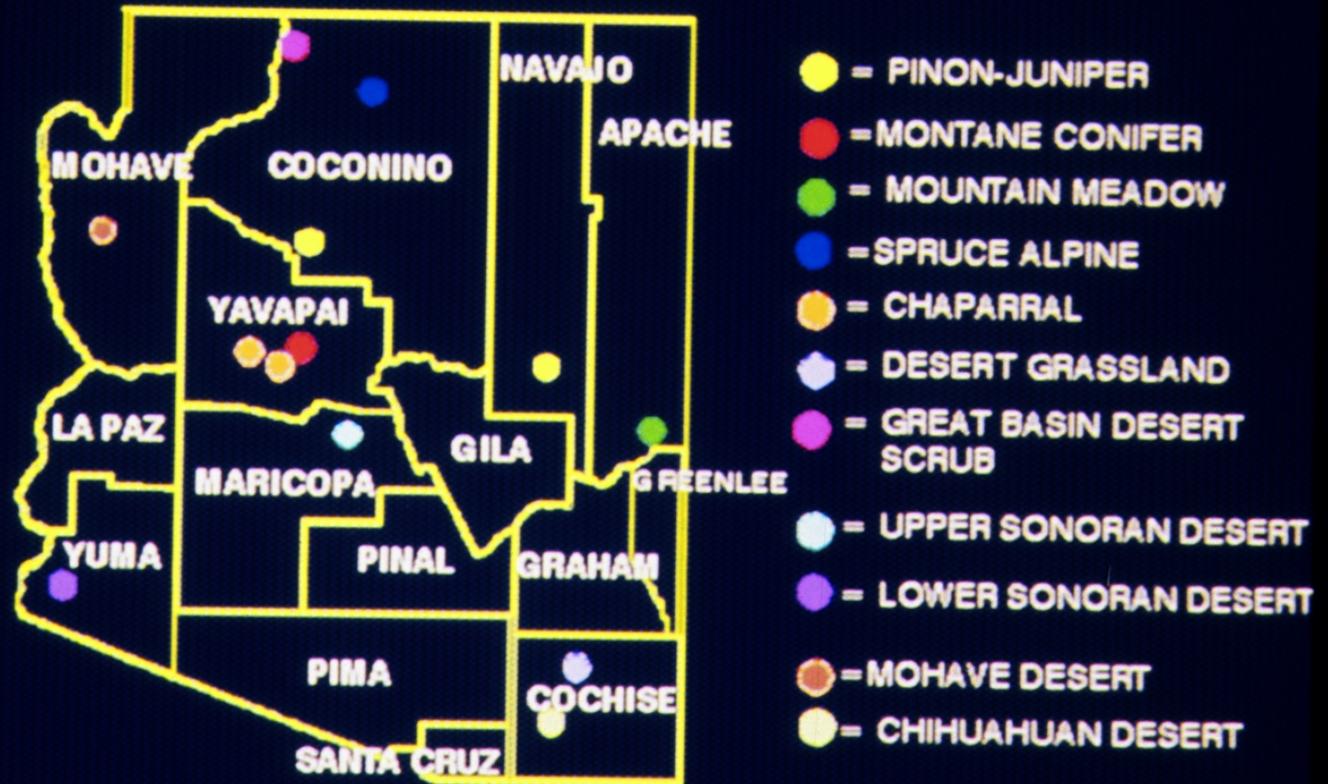
- Deer mice*
- Cactus mice*
- Brush mice
- Pinyon mice
- White-footed mice
- Canyon mice



Anecdotal Observations in AZ

- Deer mice were almost never trapped in homes infested w/ house mice (*Mus musculus*). Interspecies competition?
- Cactus mice (*P. eremicus*) are also significant sources for hantavirus transmission to humans in AZ. Human HPS cases have occurred in areas w/ high populations of cactus mice where deer mice were scarce/lacking.

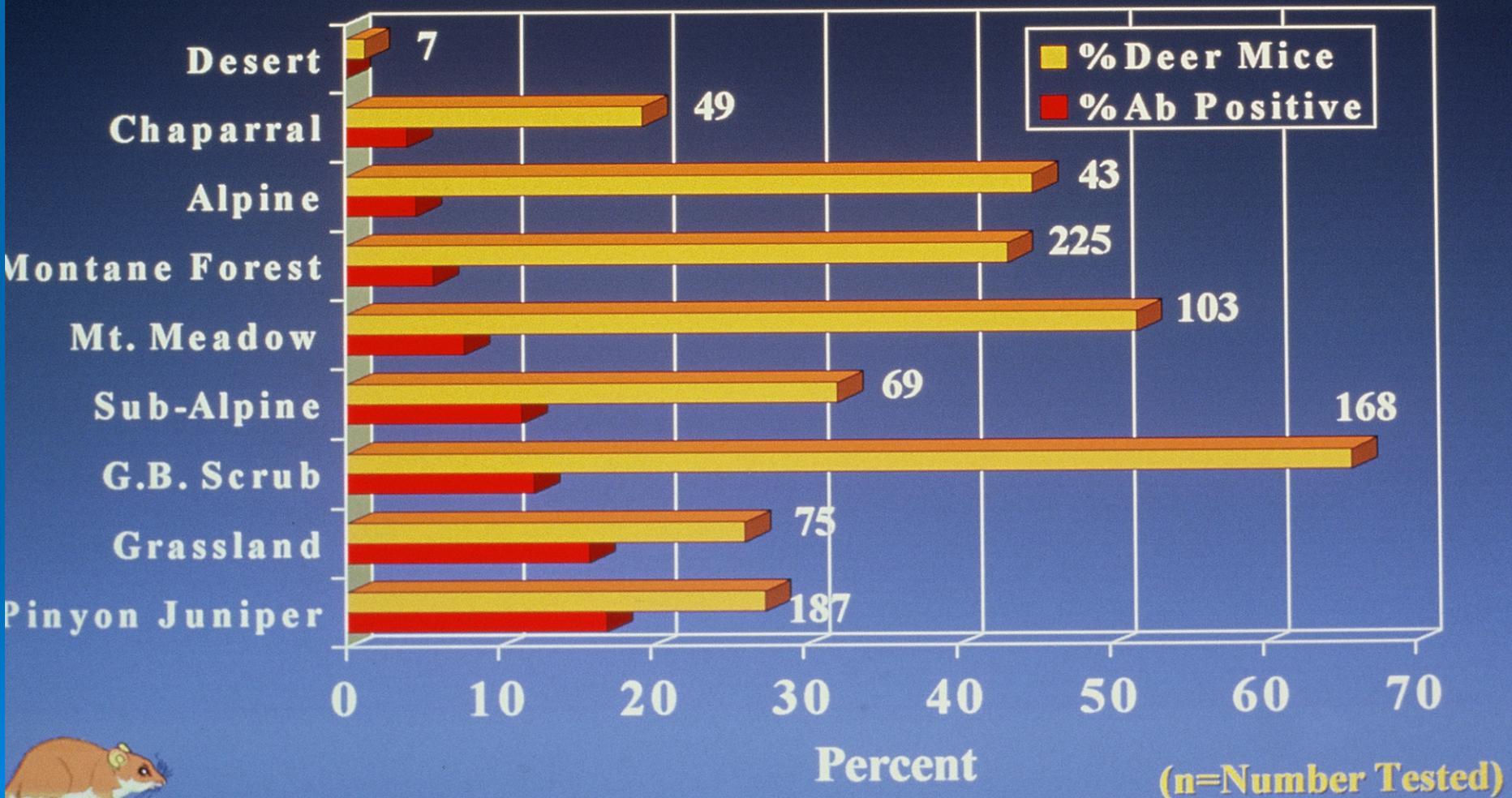
Biome Study, AZ 1994



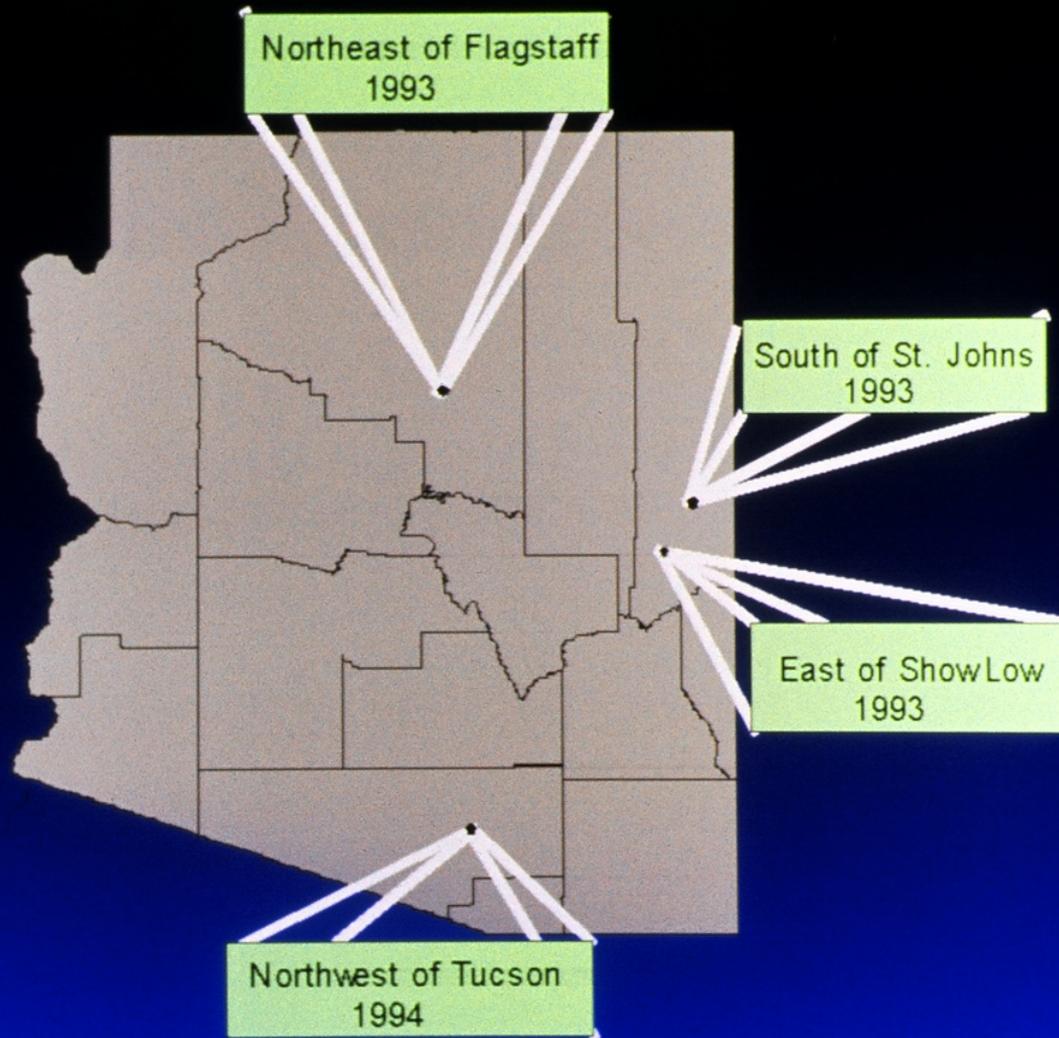
1994 Hantavirus Habitat Study

Contribution of *P. maniculatus* to Rodent Assemblage and Prevalence of Ab

49



1993-1997 Arizona Hantavirus Retrap Study Sites



Conclusions

- Peromyscus mice are widespread and common. They can be found in almost all rural environments.
- SNV+ mice were found in almost every biome sampled in Az.
- Hantavirus infection levels in mice fluctuate and are influenced by rodent population changes. Rodent populations may be greatly influenced by climate events.
- People living, working and recreating in rural areas should simply assume that hantavirus is out there and take steps to minimize risk.

Bye !

