

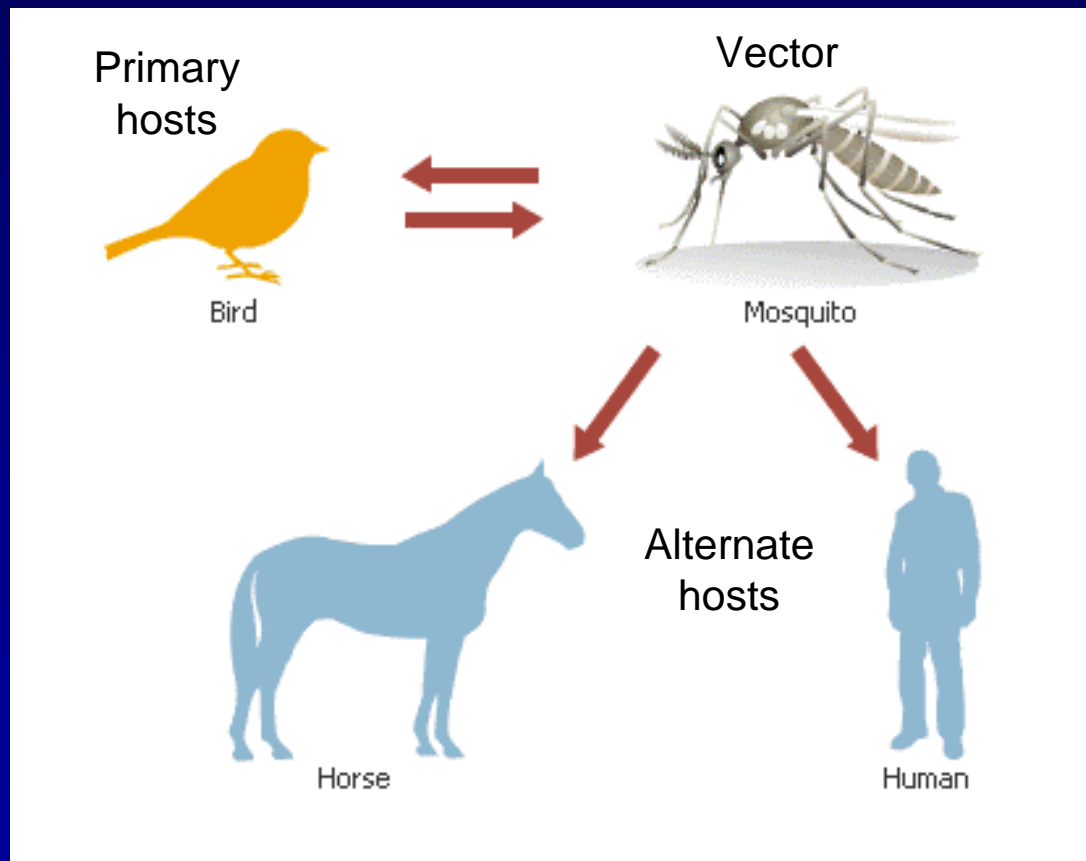
West Nile Virus: Ecology and Impacts on Greater Sage-grouse Populations

Dave Naugle
Brett Walker
Jason Tack



West Nile virus

- Arthropod-borne flavivirus



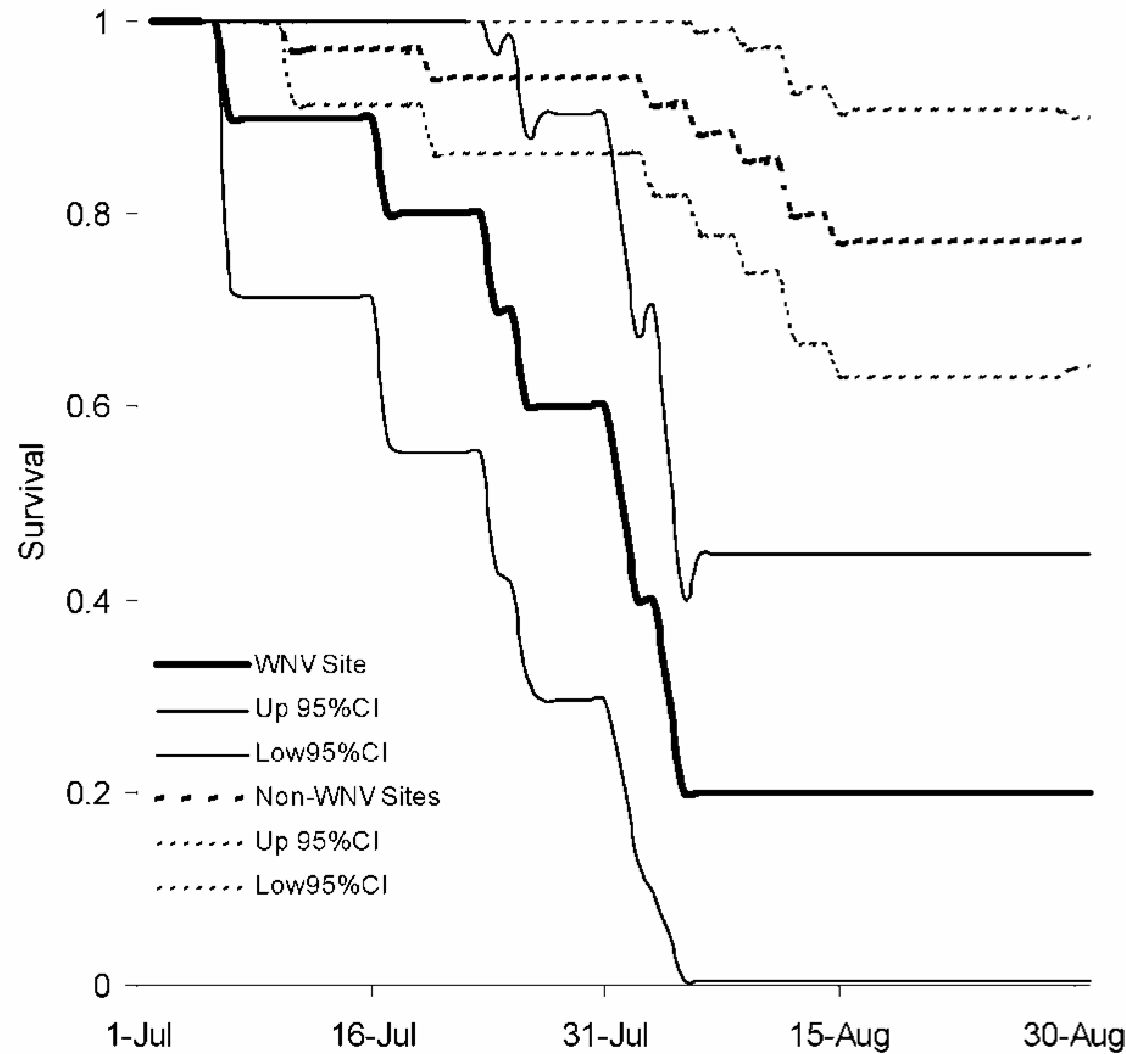
Ecology in sagebrush habitats

- Outbreaks more common during drought
- Epstein and deFilippo 2001, Shaman et al. 2005
- High temperatures = faster virus amplification, mosquito development, and population growth
- Reisen et al. 2006, Zou et al. 2006
- More surface water = more mosquitos for longer
- Zou et al. 2006, Doherty 2007





Hen survival July-August 2003, PRB

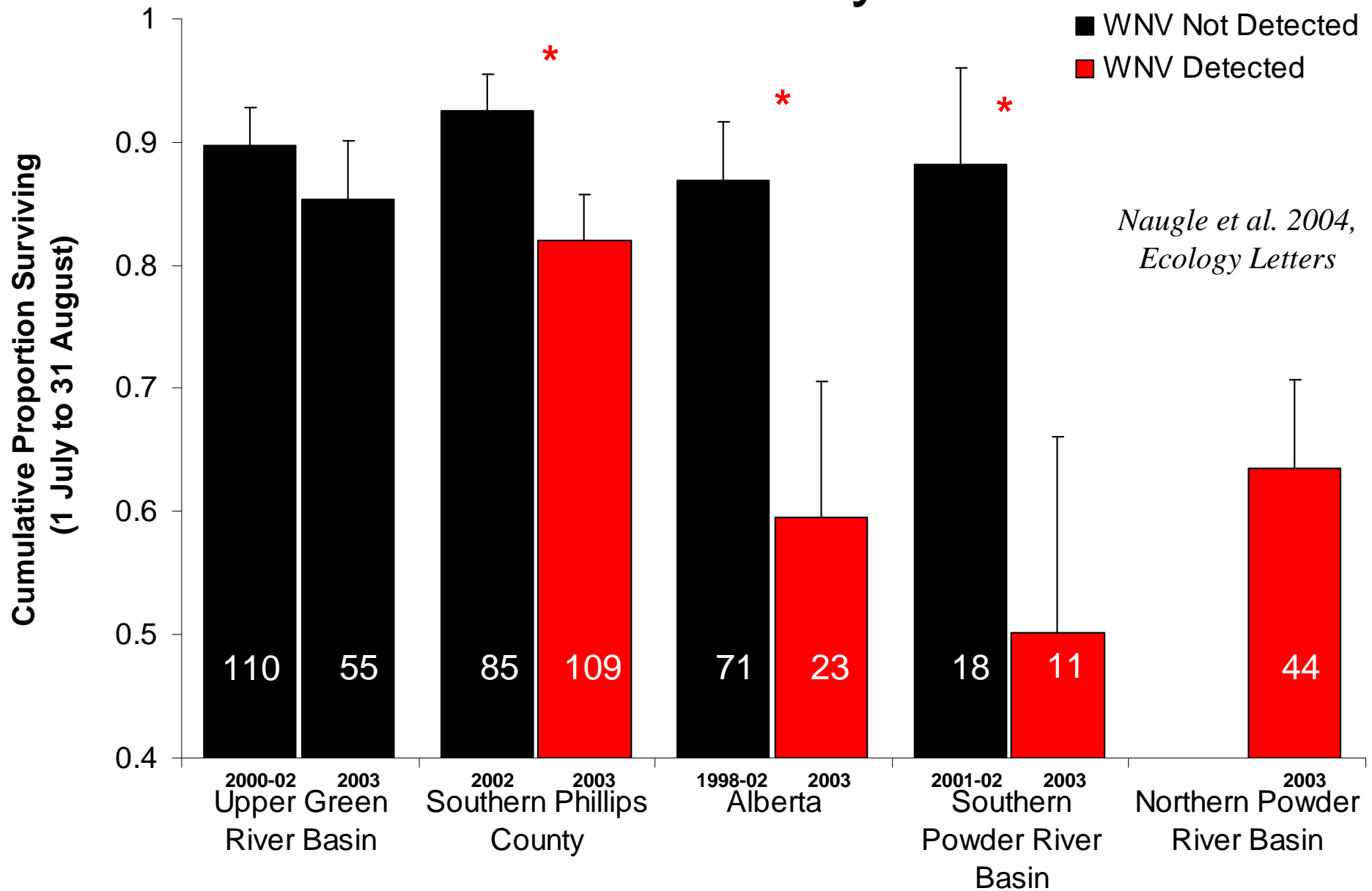


76%
(no WNV)

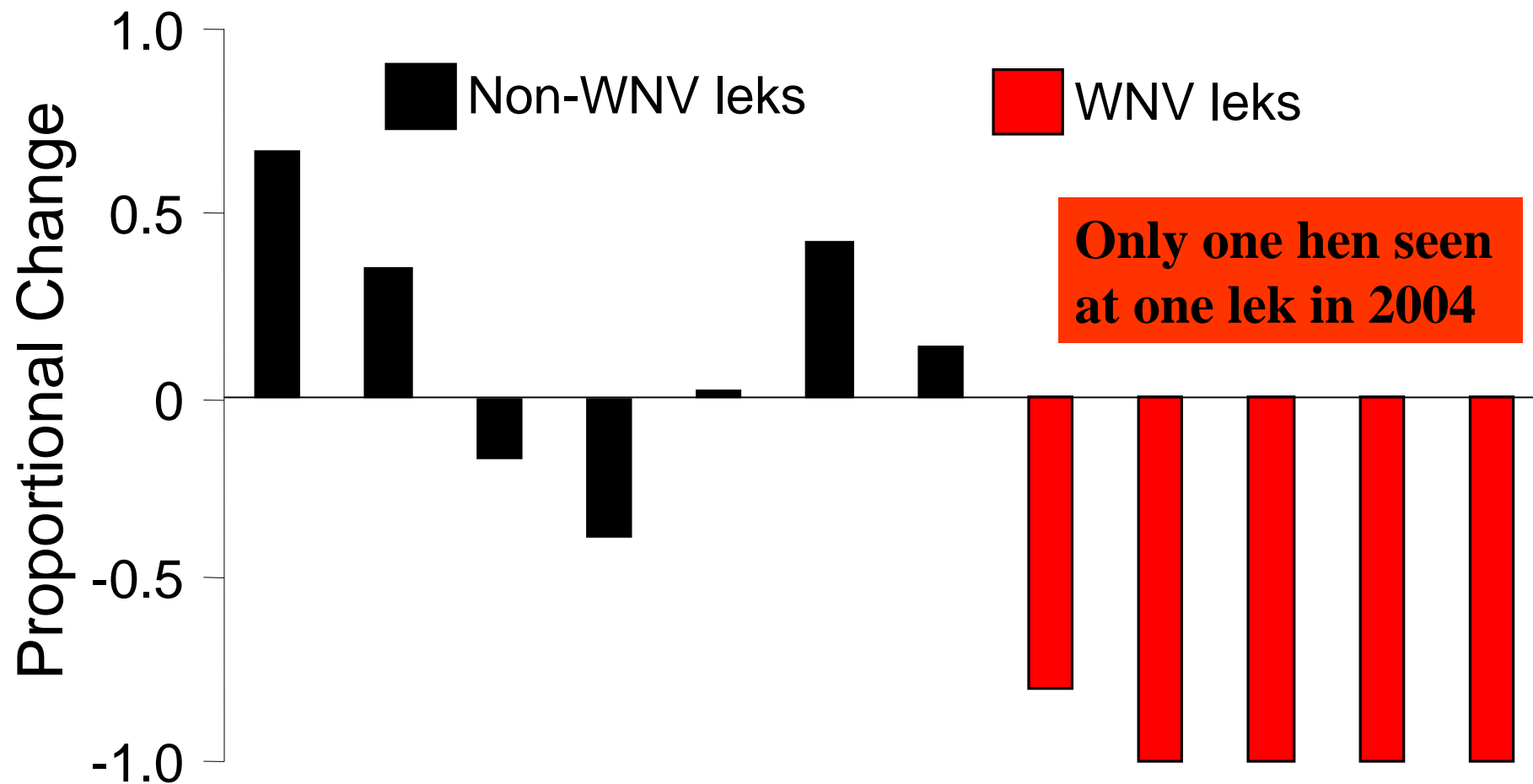
20%
(WNV)

Walker et al. 2004, Wildlife Society Bulletin

WNV reduced survival by 25% in 2003

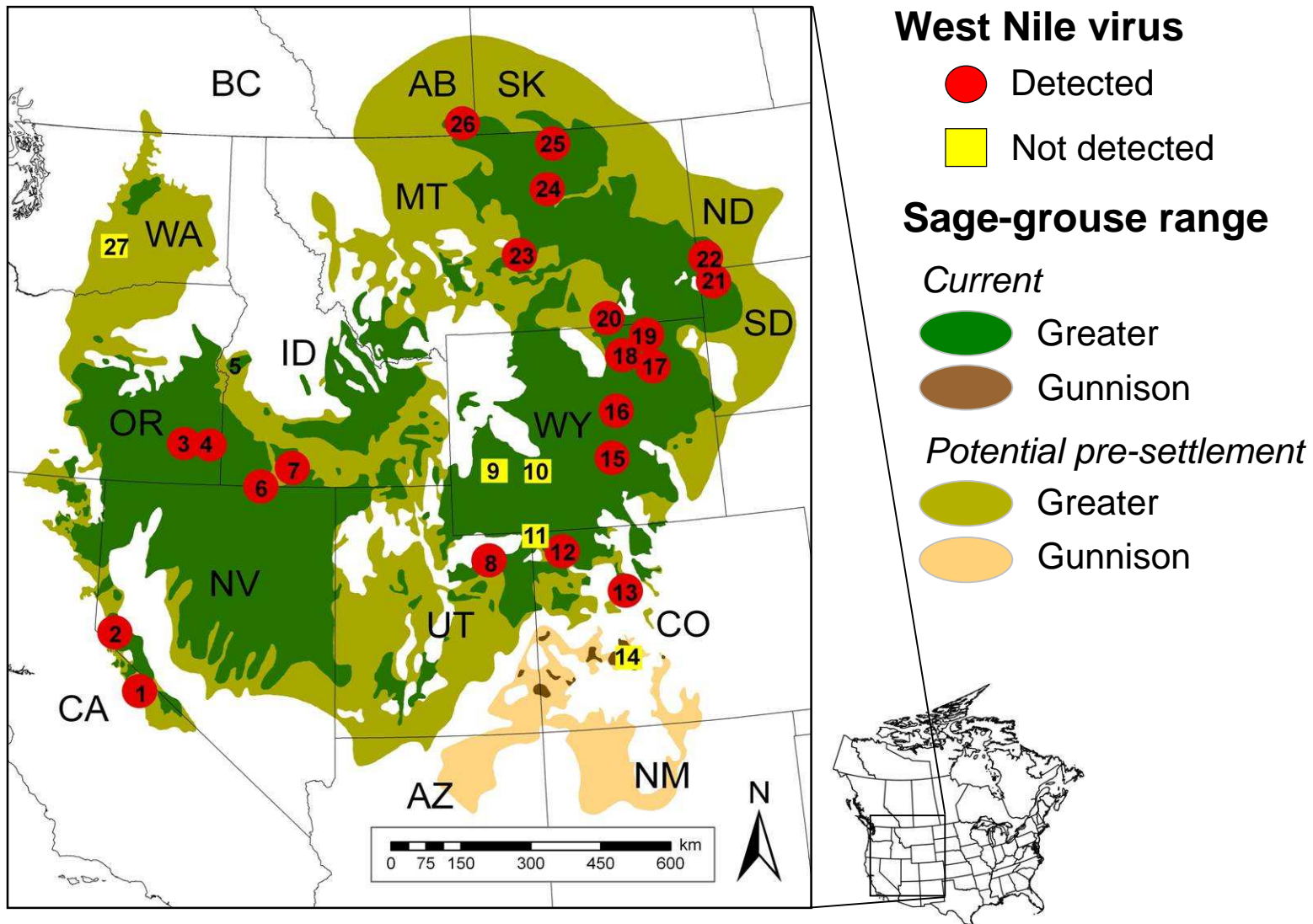


Lek Attendance Declined ~85% in 2004



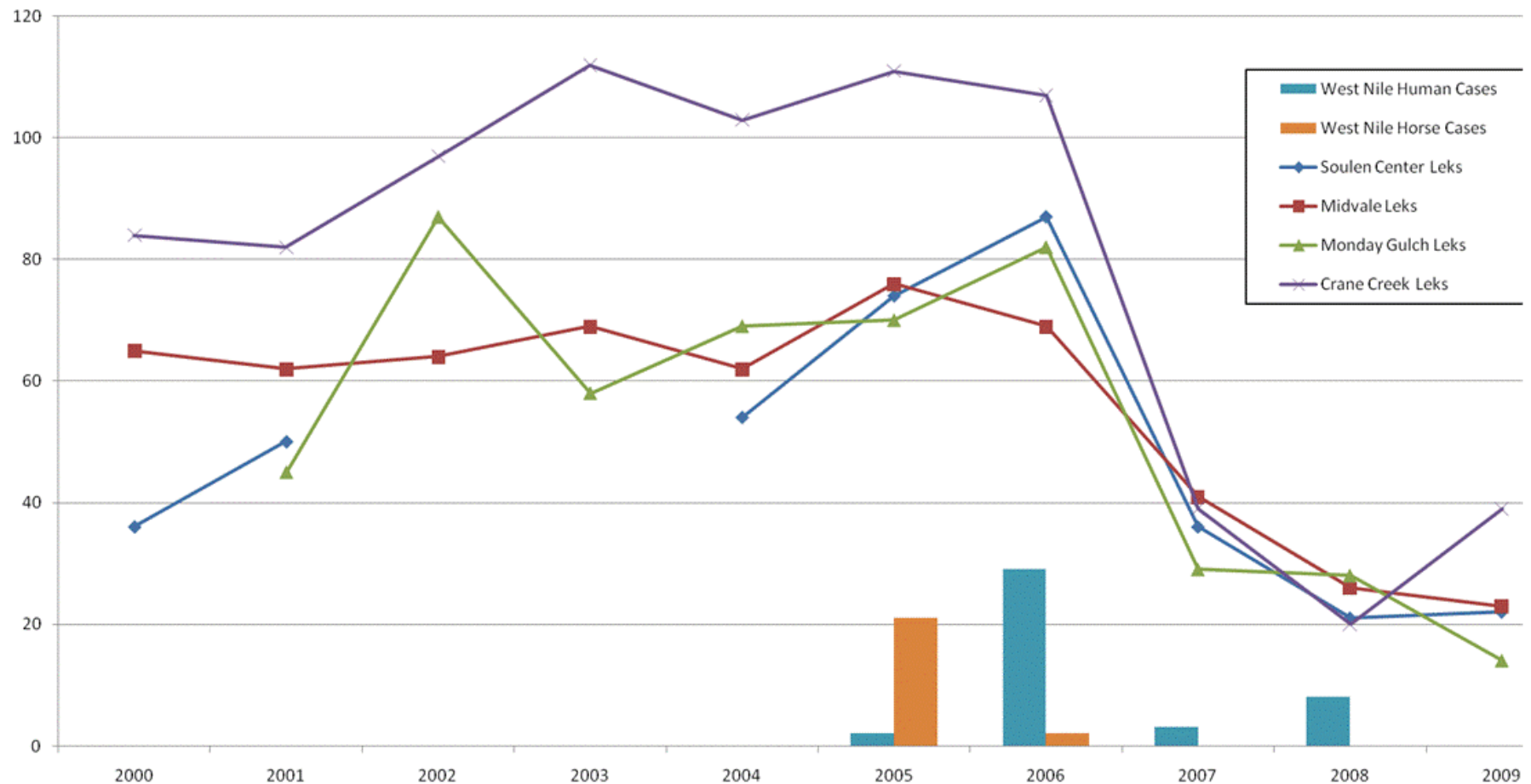
Walker et al. 2004, Wildlife Society Bulletin

Reported WNV mortality in sage-grouse



Recent example from western Idaho

Adams & Washington County West Nile Cases vs Sage-grouse Lek Counts



What we know so far

- WNV affects both sexes, all age classes
- Aldridge 2005, Kaczor 2008, Walker 2008
- Lab tests confirm that all birds that contract disease die *- Clark et al. 2006*
- WNV mortality varies temporally, geographically
- Naugle et al. 2005, Walker and Naugle 2008
- Laboratory and field data suggest very low resistance
- Clark et al. 2006, Walker et al. 2007



Population Modeling

How much does WN_v mortality affect population growth?

Will increasing resistance offset impacts?



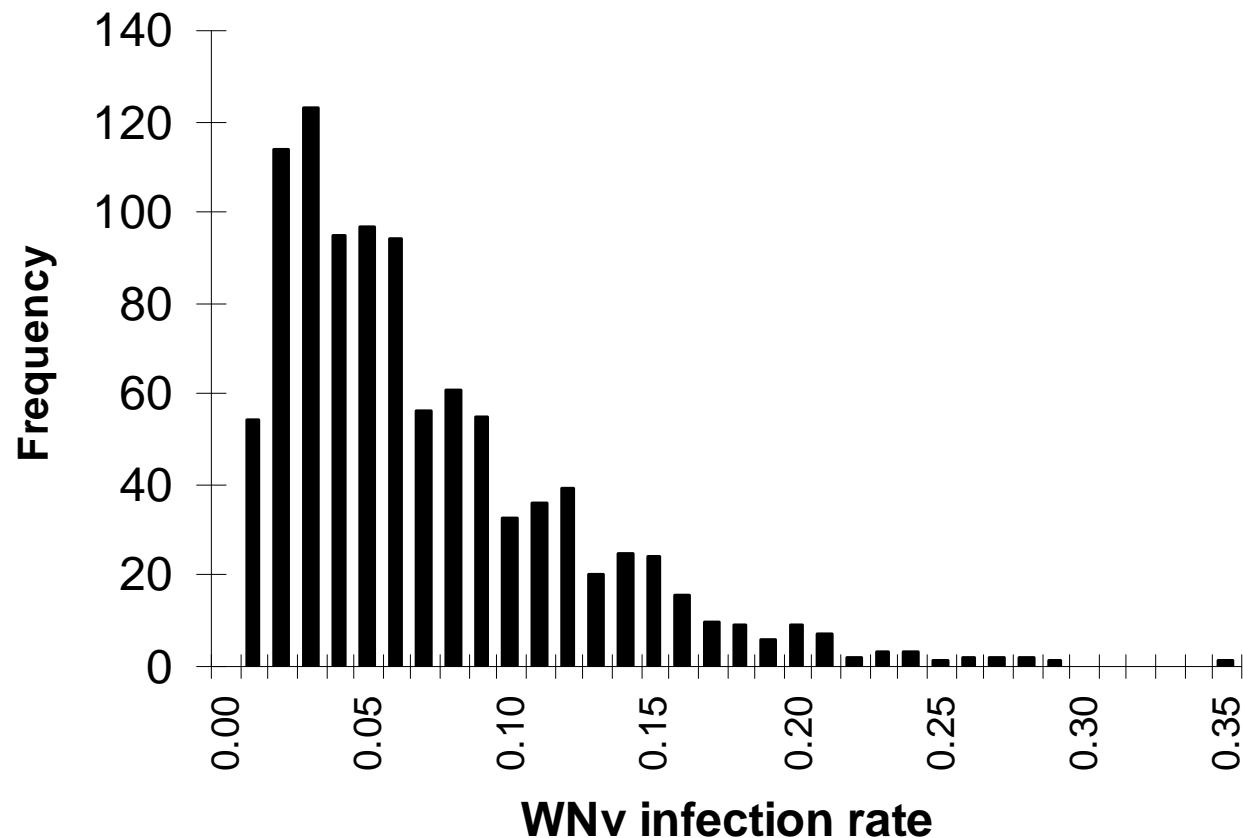
Simulations

- Three simulation scenarios:
 - 1) No WNV
 - 2) Simulated WNV (4% resistance)
- Walker et al. 2007
 - 3) Simulated WNV (increasing resistance)
- 1000 replicates per simulation

Simulated WNV infection rates

- Typically low, but with extreme values (~50%)

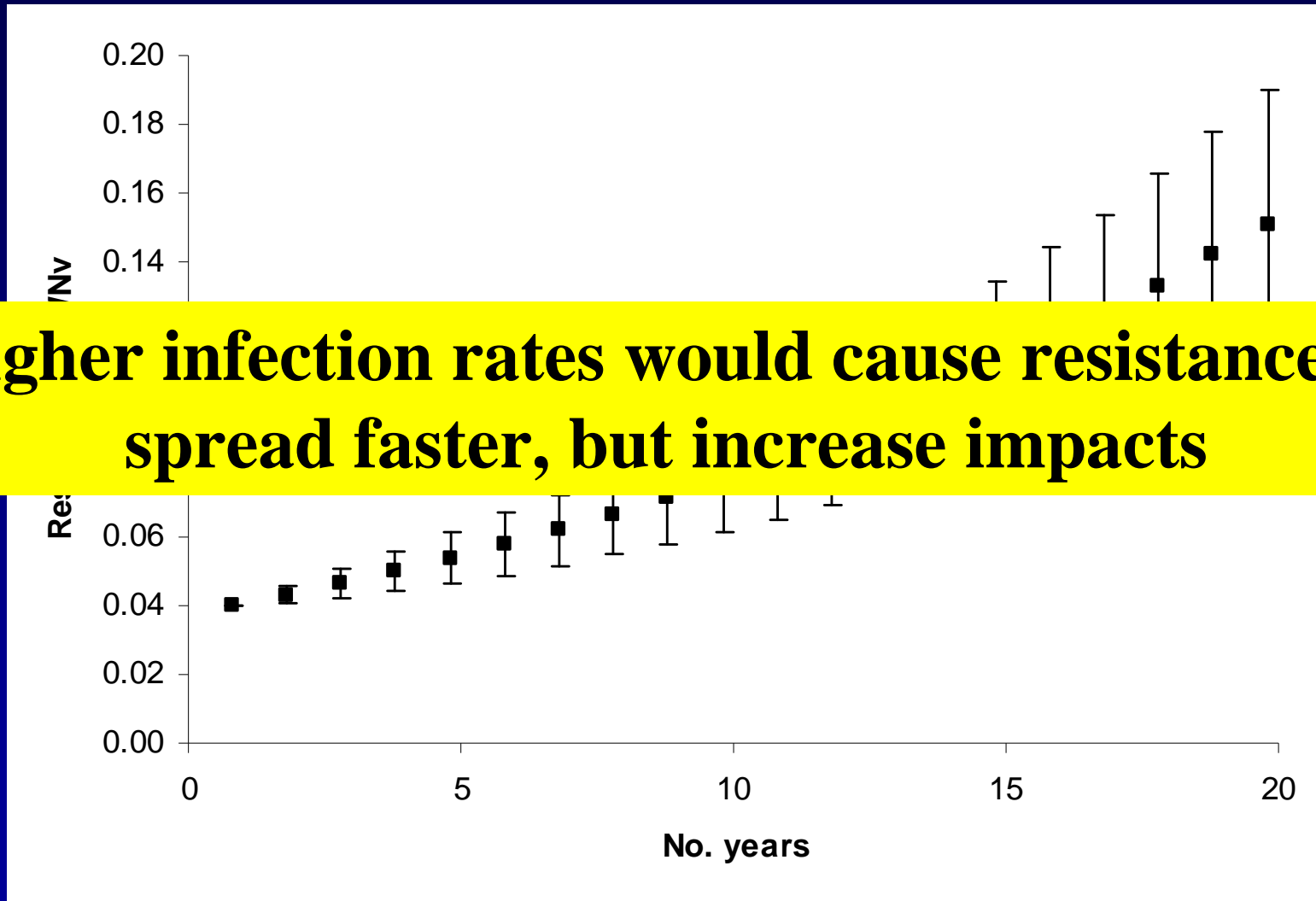
- Walker et al. 2007



Disease reduced population growth by 6 – 9% per year

Scenario	Change in Population Growth
WN _v	6 – 9 %
WN _v with increasing resistance	6 – 8 %

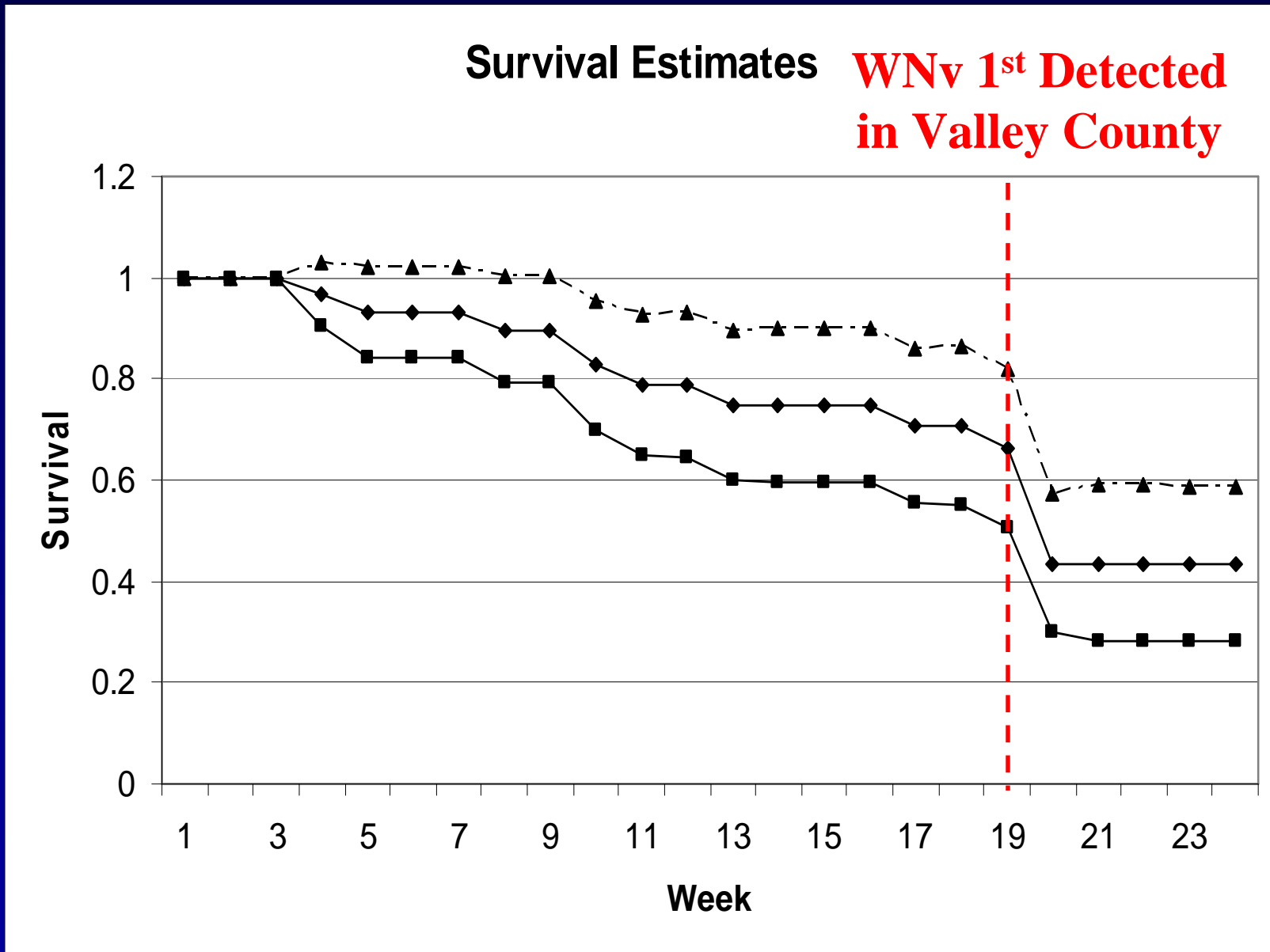
Resistance increased marginally



6 ways to build a pond that doesn't grow mosquitoes

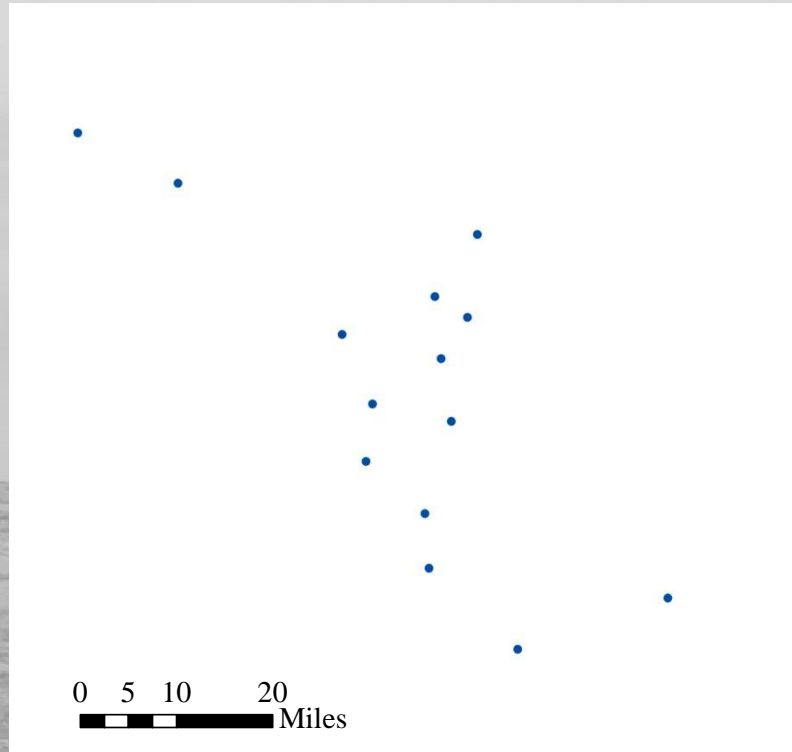
- 1) Overbuild CBNG ponds to accommodate water
- 2) Build steep shorelines to reduce shallow water and vegetation and increase wave action
- 3) Lower water levels to maintain muddy shorelines
- 4) Dig ponds in flat areas instead of damming natural draws to restrict slope seepage
- 5) Line channel and overflow spillway with crushed rock to limit sediment and vegetation growth
- 6) Fence pond site to restrict access by livestock

Effects of West Nile in Valley County:

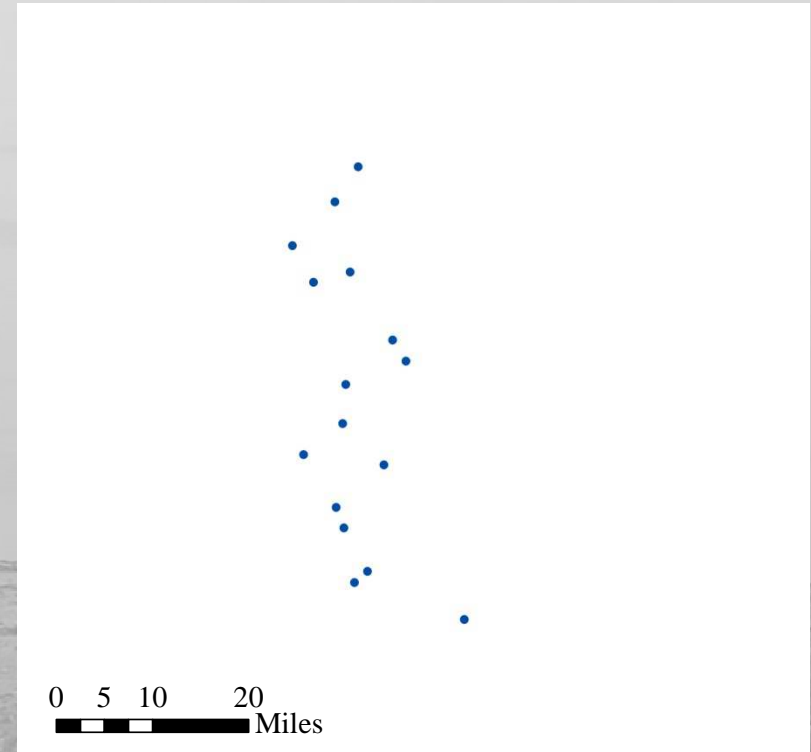


Population trends in healthy vs impacted landscapes

Milk River Basin

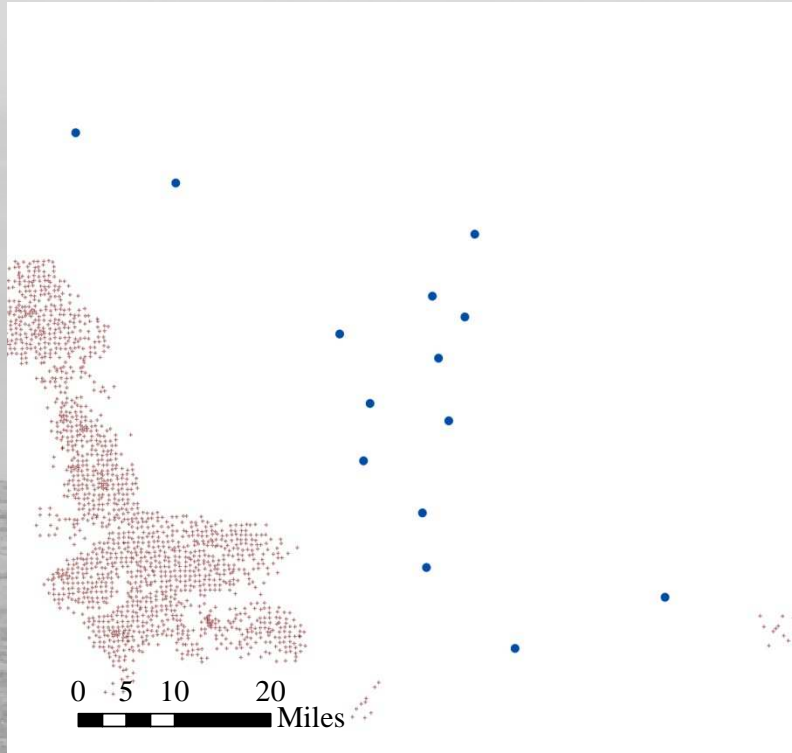


North Dakota

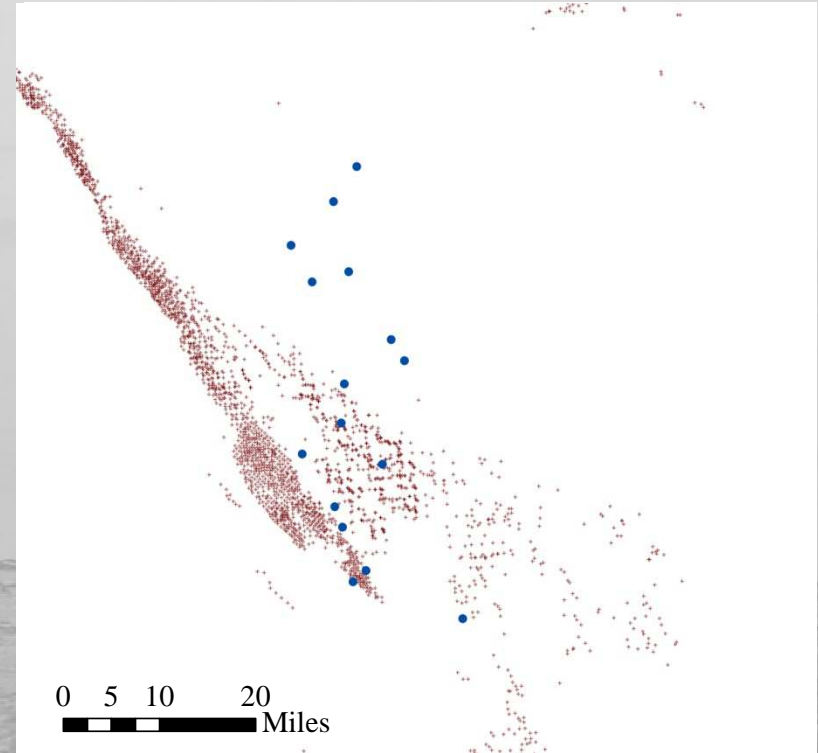


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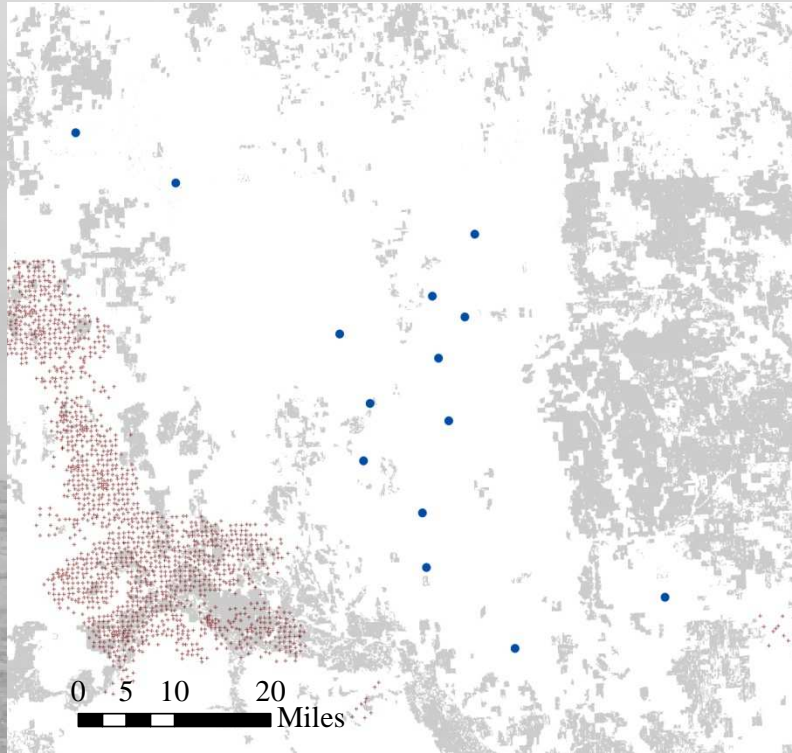


North Dakota

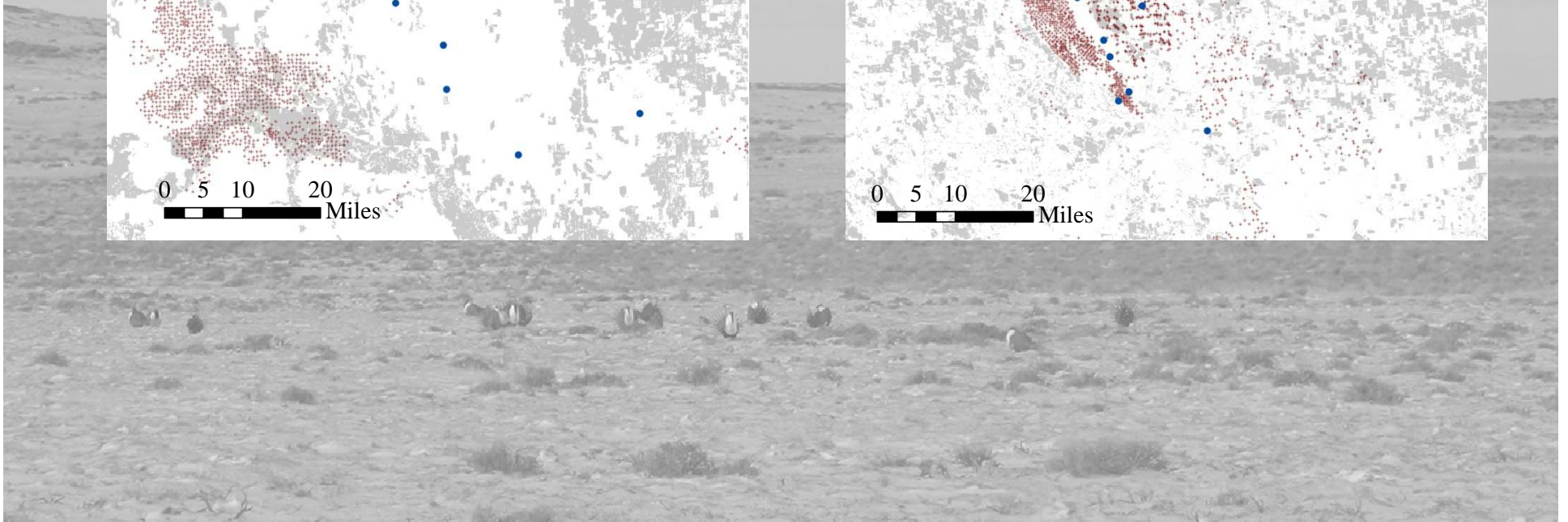
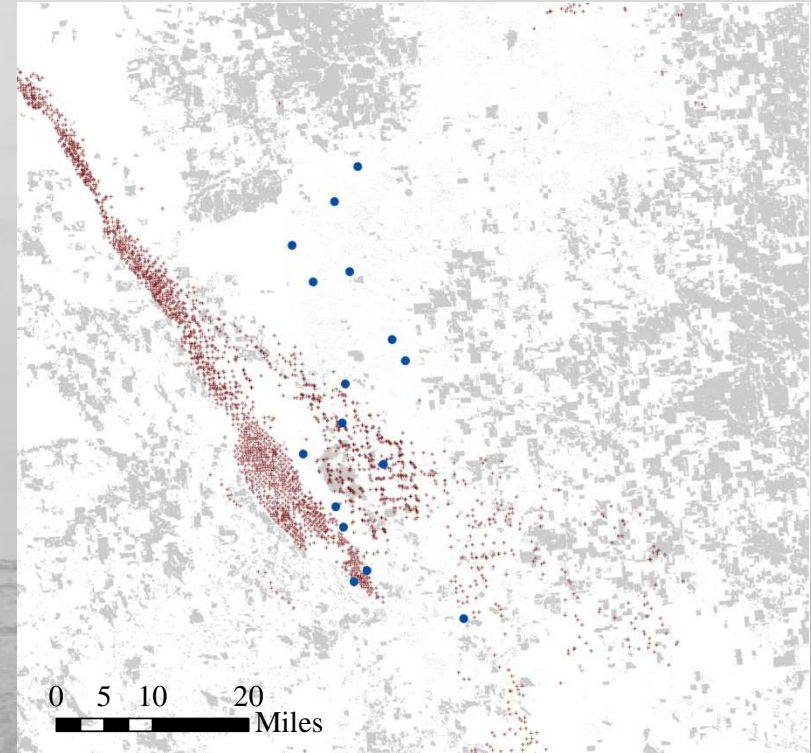


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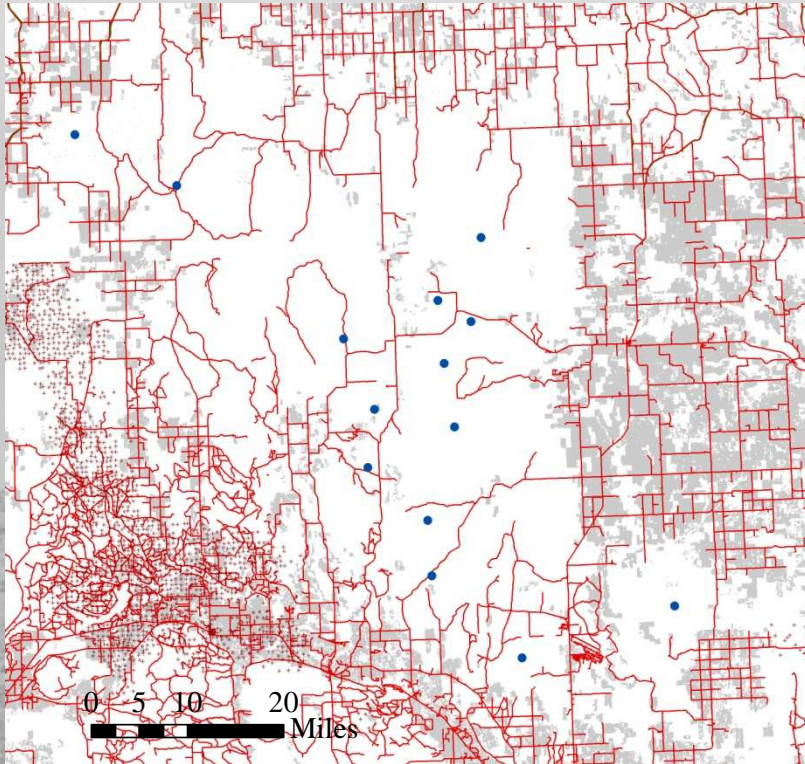


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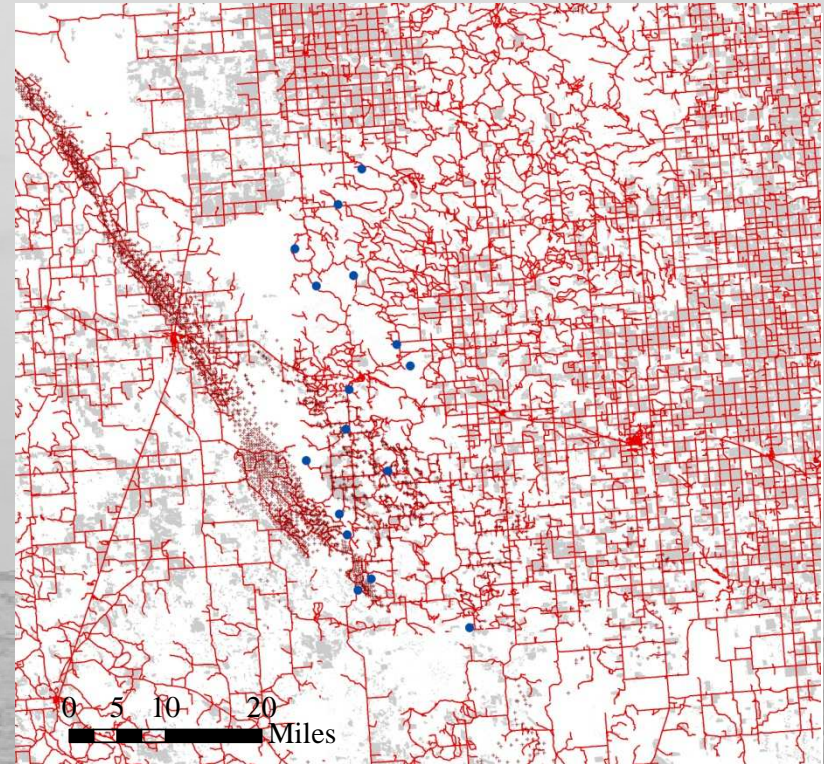


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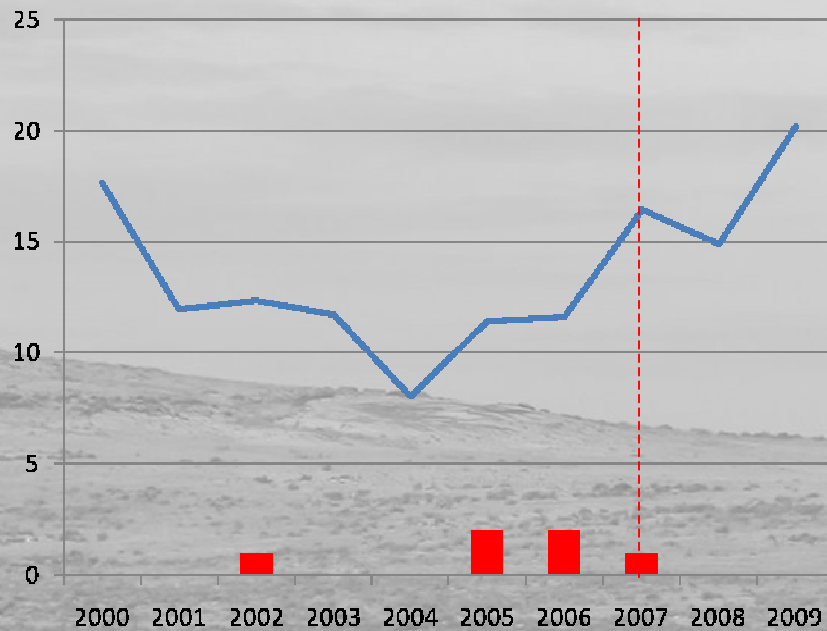


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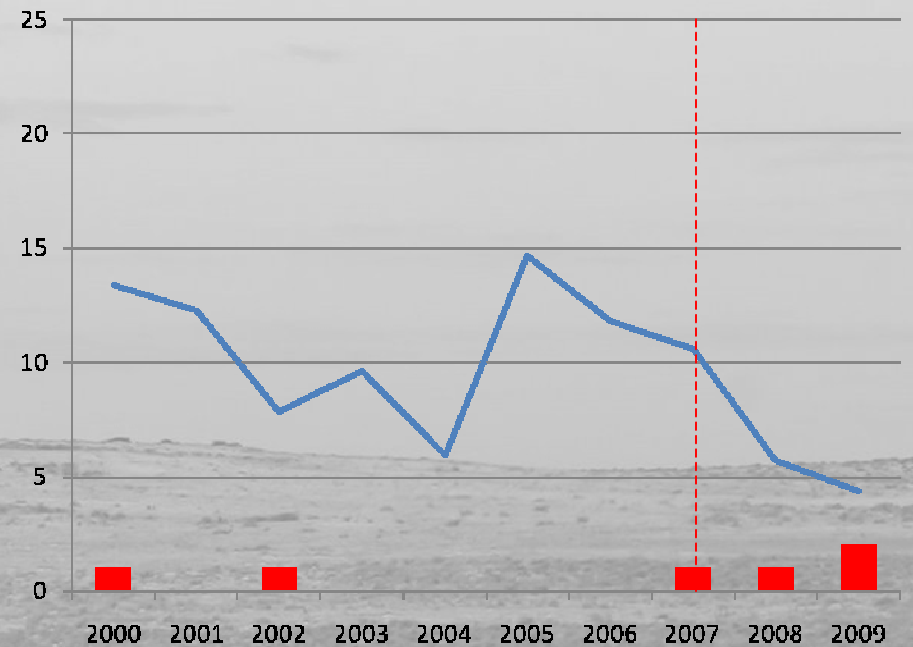


Population trends in healthy vs impacted landscapes

Milk River Basin



North Dakota



Take Homes

- WNV is an endemic stressor that is here to stay
- Locally we can design water projects to help reduce impacts
- Continue to monitor resistance to see if rates increase to buffer against losses
- Small populations will experience inordinately large impacts
- A call for conservation of large intact landscapes

Thanks for listening, questions or comments?

