

# Management of on-farm risk to livestock from bovine TB in white-tailed deer within Deer Management Unit 452:

## Predictions from a spatially-explicit model

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# Spatial model of bTb in WTD in DMU452



- Recent development of a spatial model of TB in WTD has examined the efficacy of management options for DMU452
- Modelled scenarios included
  - Increase in harvest
  - Vaccination
  - Increase in harvest + vaccination
  - The effect of baiting
- All scenarios were examined as to their efficacy to eradication of TB from WTD within 30 years

# Efficacy of alternative WTD management options



- Current MDNR management is unlikely to eradicate TB over the next three decades
- Eradication *is* possible within three decades, but is likely to require substantial increases in current harvest and/or vaccination
- TB establishment in a previously TB-free region is ~8 times more likely if baiting occurs during the hunting season
- In the meantime, cattle on farms within DMU 452 continue to be at-risk of TB infection from WTD

# The way forward ?



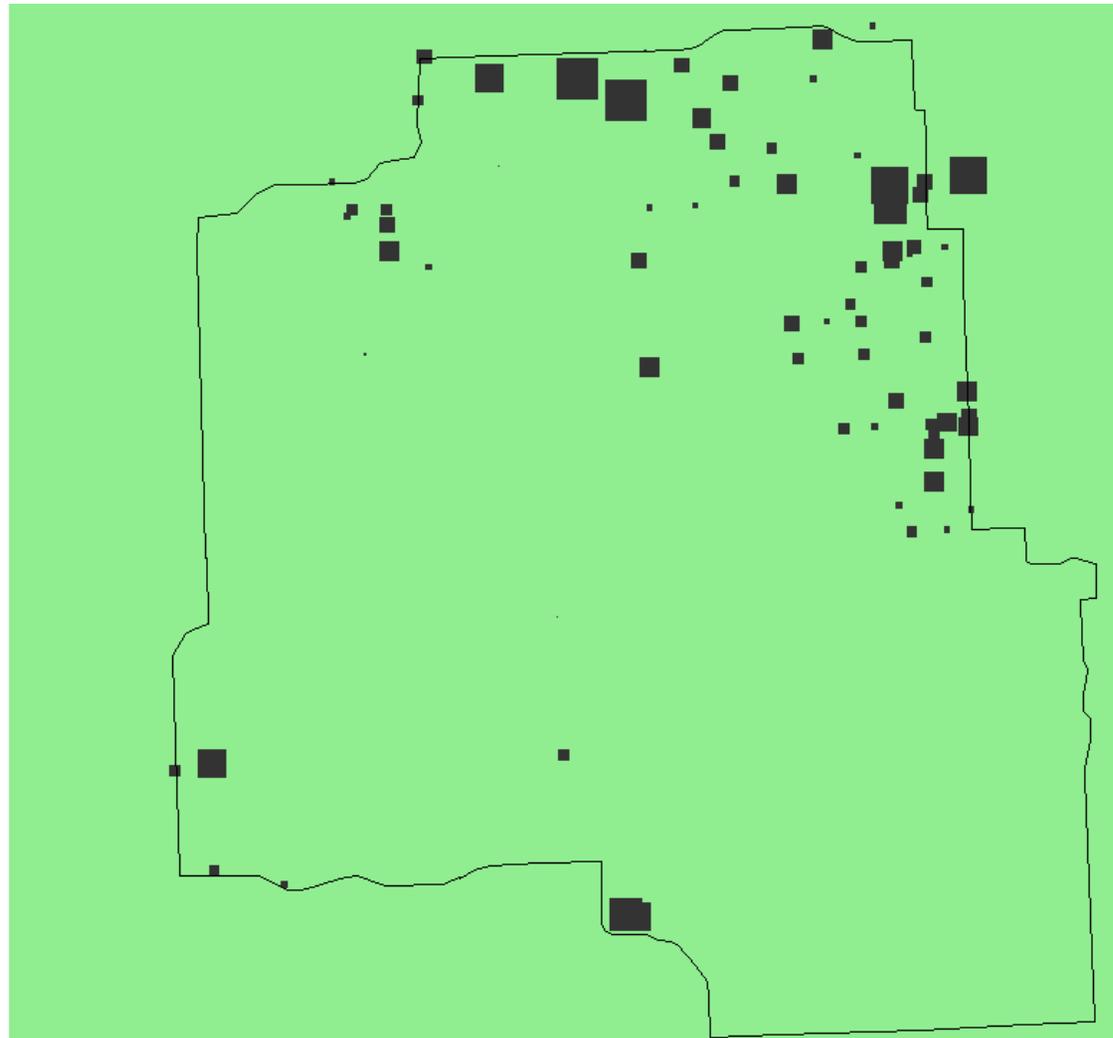
- If complete eradication of TB from WTD is too difficult, should focus change to risk mitigation for livestock?
- Acceptable management options may exist that will minimize risk of on-farm transmission from WTD to livestock
- Modelling of different scenarios proposed as a way forward
- Extend current spatial model to include transmission of TB from WTD to livestock

# Modelling livestock transmission

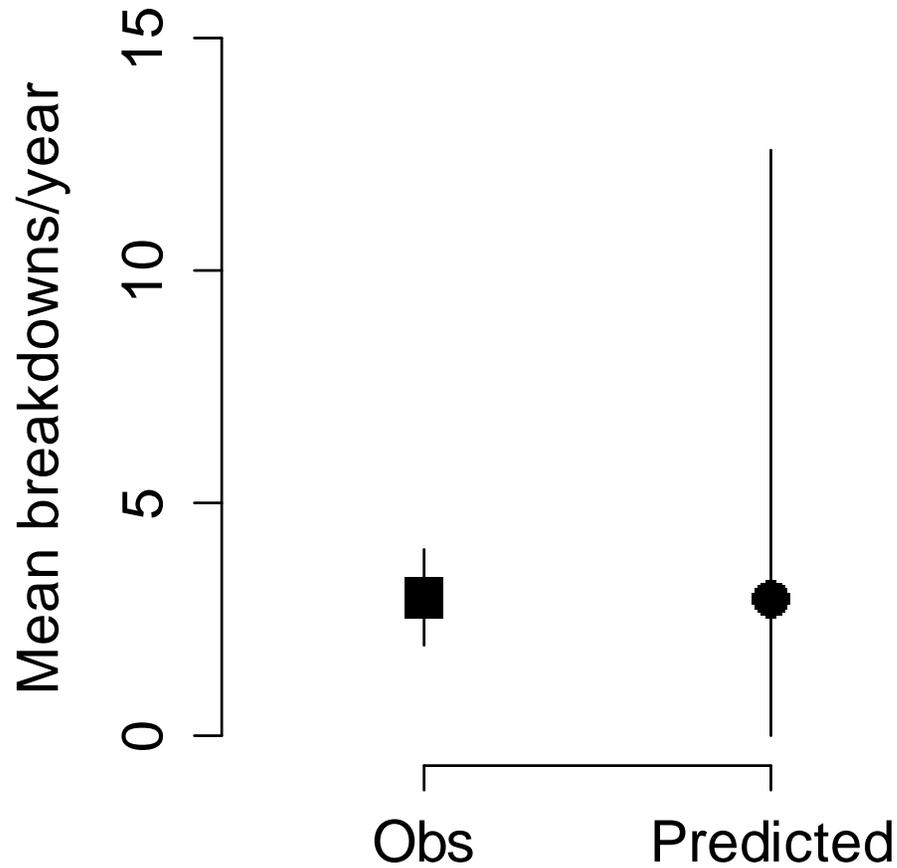


- A spatial “livestock” layer was created for the existing model using records from the Michigan Department of Agriculture & Rural Development
  - Farm location
  - Area of cleared pasture
  - Stocking rate
- Data on the TB cattle herd breakdown rate 2003 – 2012 was also collated and used to calibrate transmission
- TB transmission dependent on stocking rate and contact rate with infected WTD

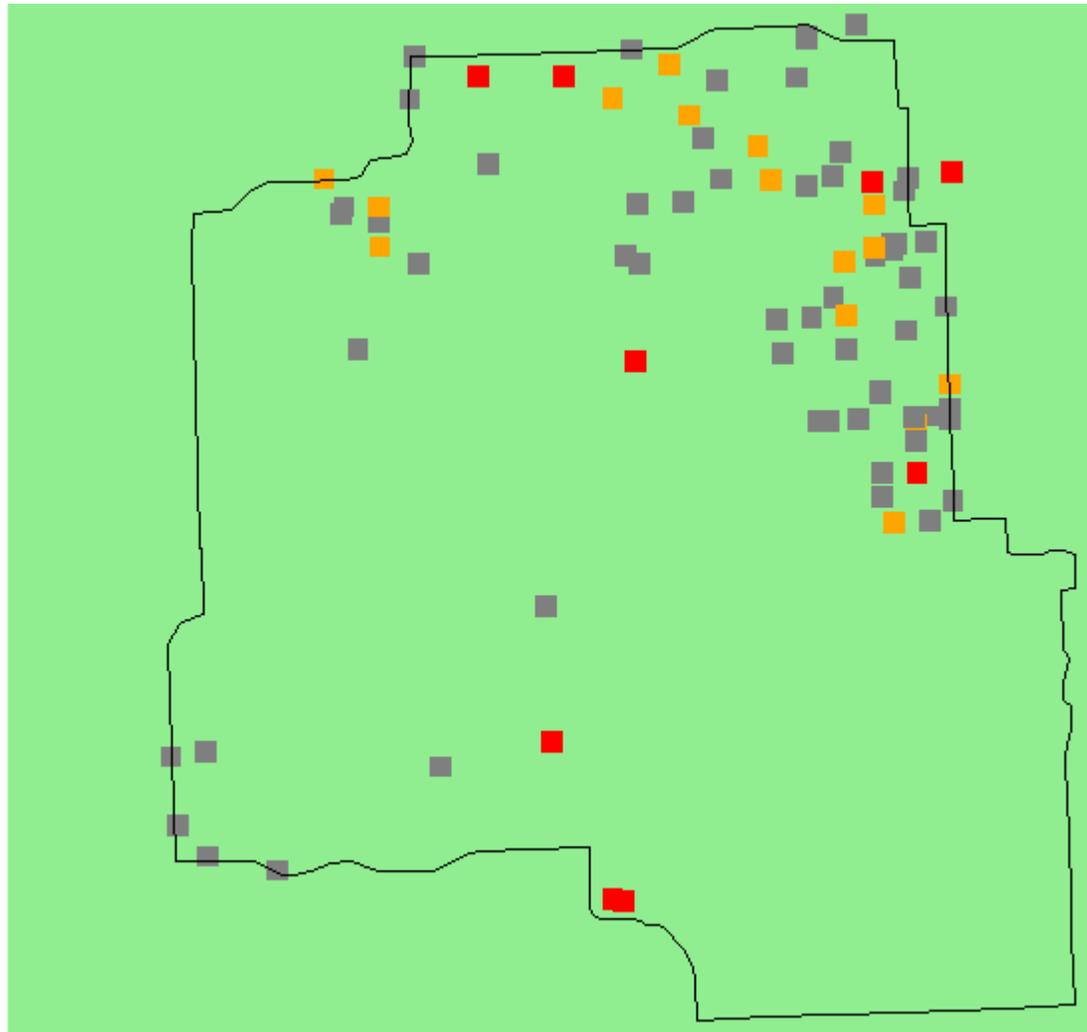
# DMU 452 showing farm locations



# Mean herd breakdown rate/year vs predicted



# On-farm risk by location (no mitigation)



- High risk
- Mod risk
- Low risk



# Effect of management on transmission to livestock



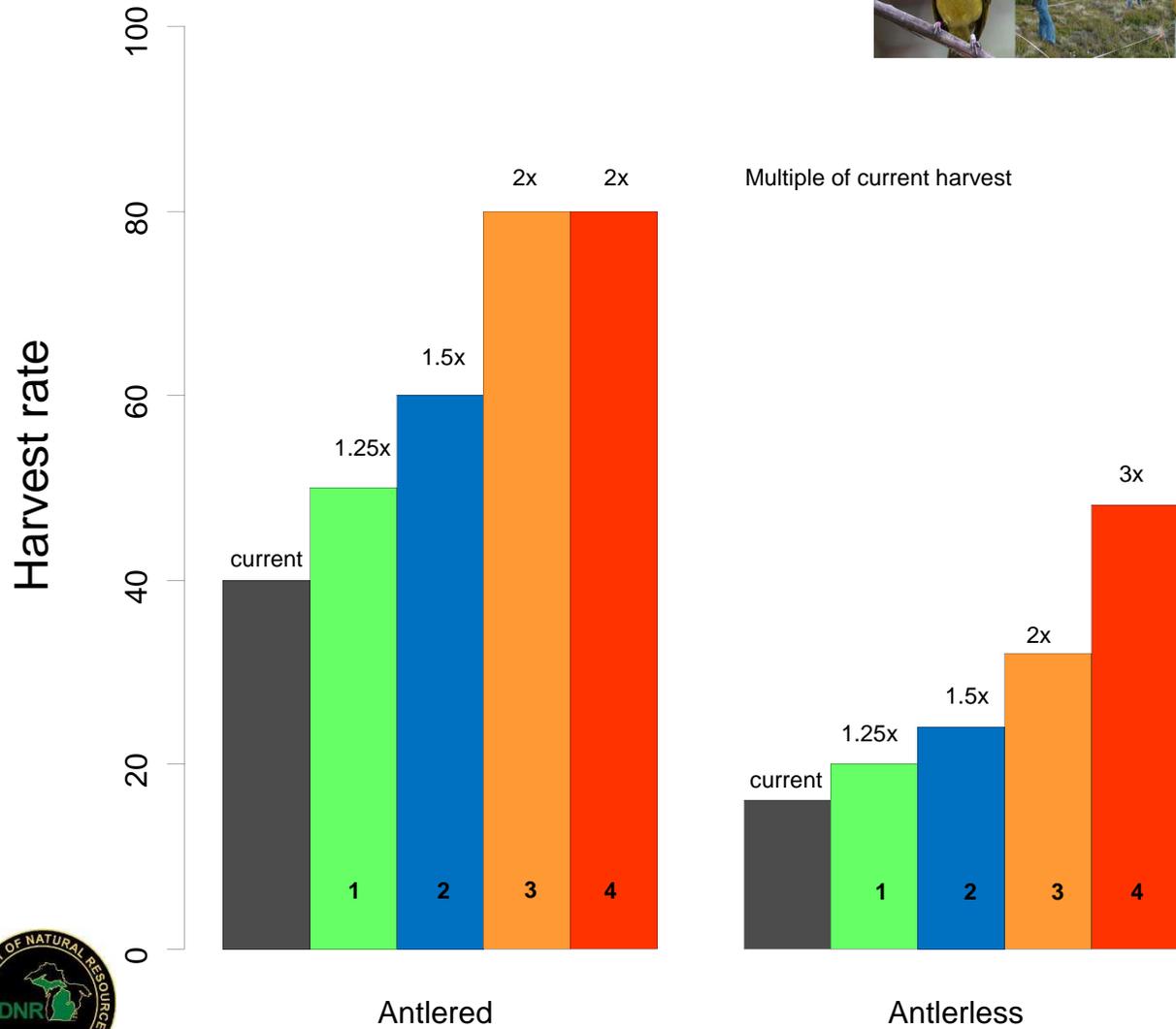
- Evaluate effects of various management options on the risk of transmission to livestock (herd breakdowns)
- Management of WTD within DMU452
  - Increasing harvest rate
  - Vaccination
  - Increase harvest + vaccination
- On-farm management practices
  - Restricting contact between WTD and cattle on farms
  - Local WTD control in the vicinity of farms
- Scenarios examined with and without baiting



# Effect of management of WTD in DMU452 on the herd breakdown rate on farms

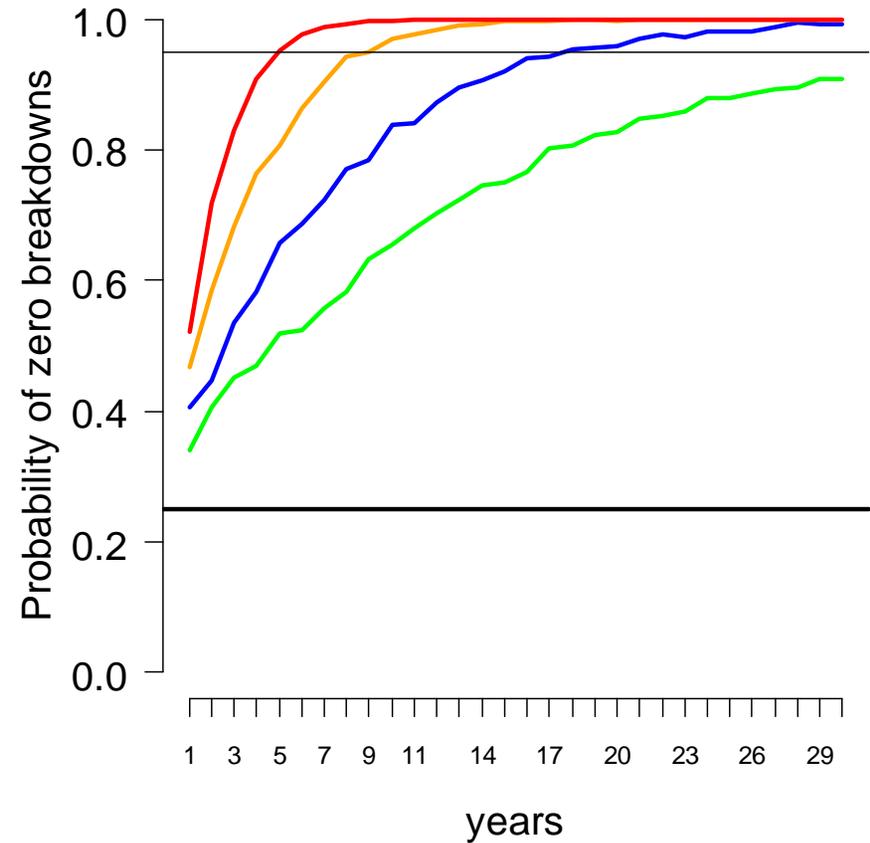
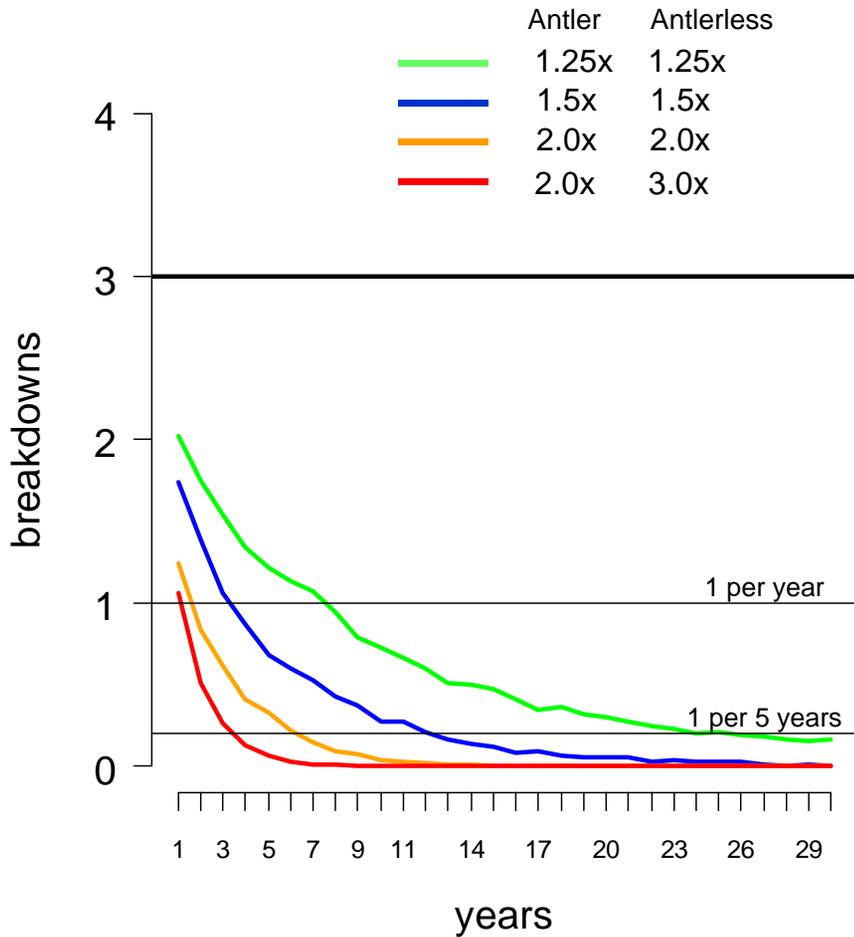


# Increasing harvest rates

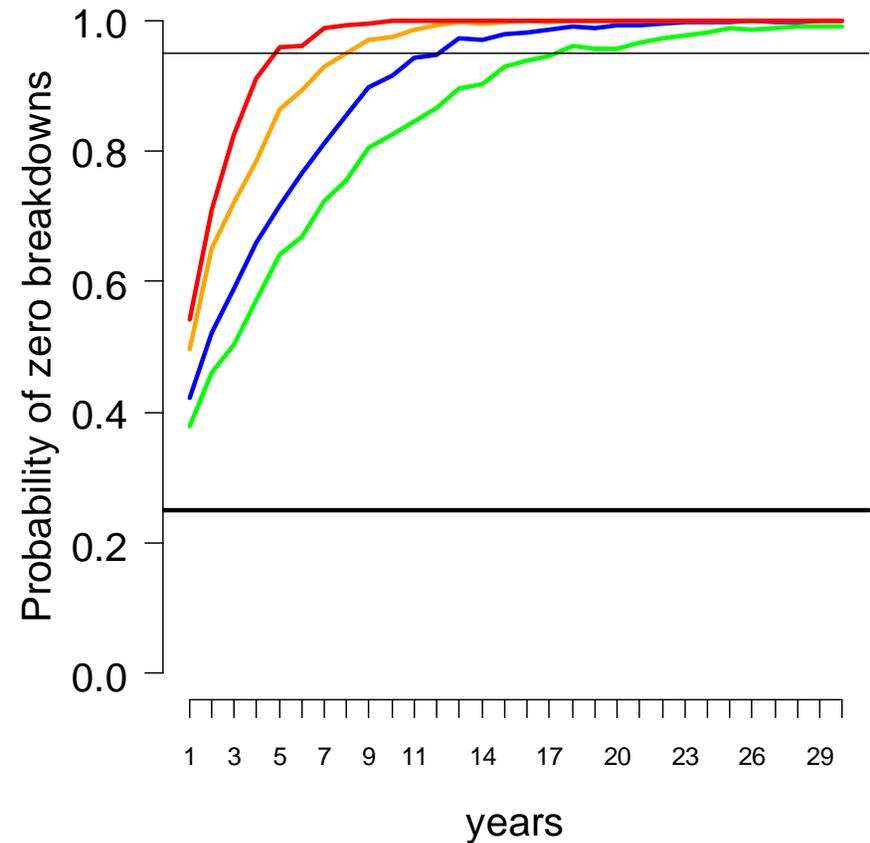
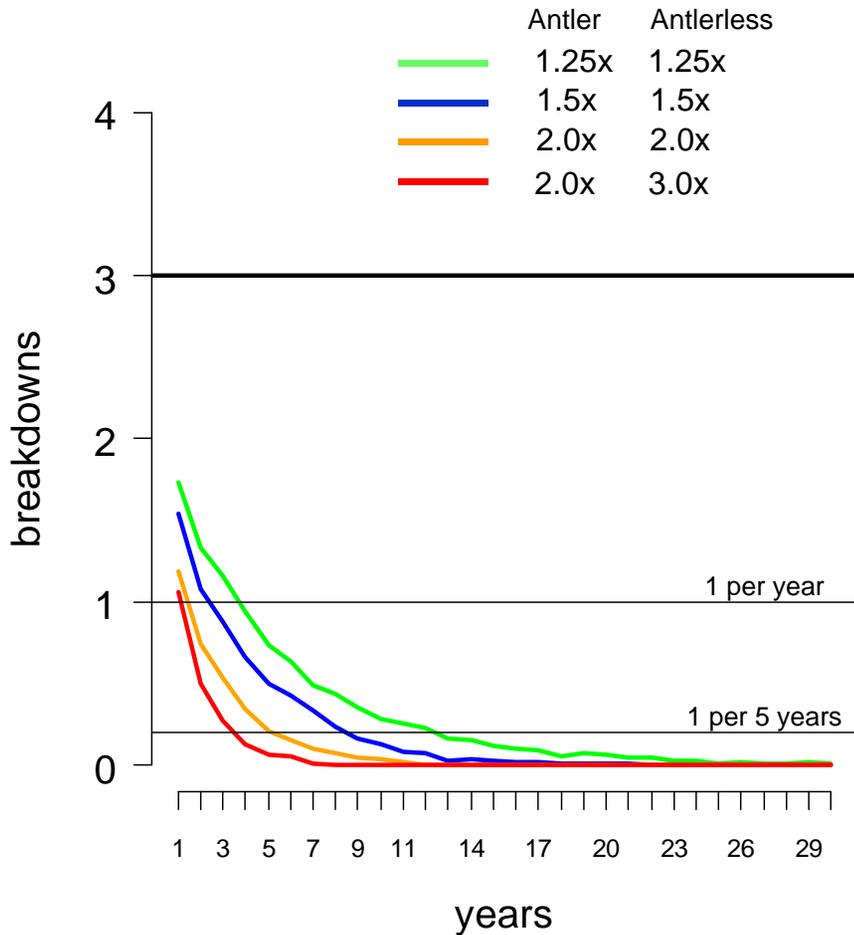


Scenarios

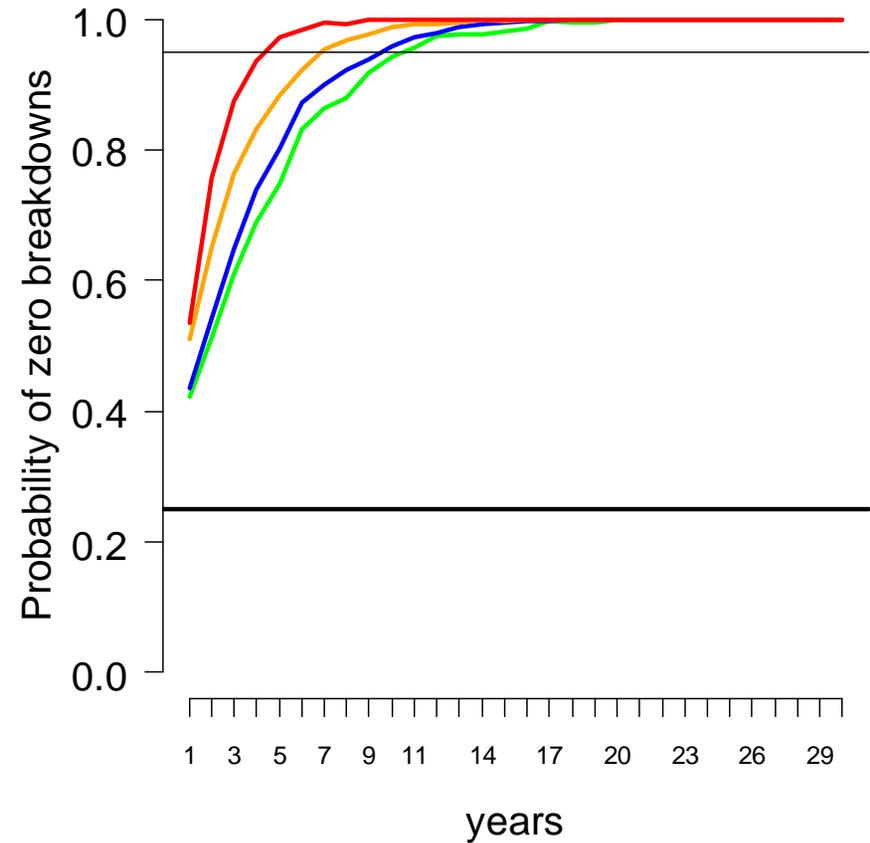
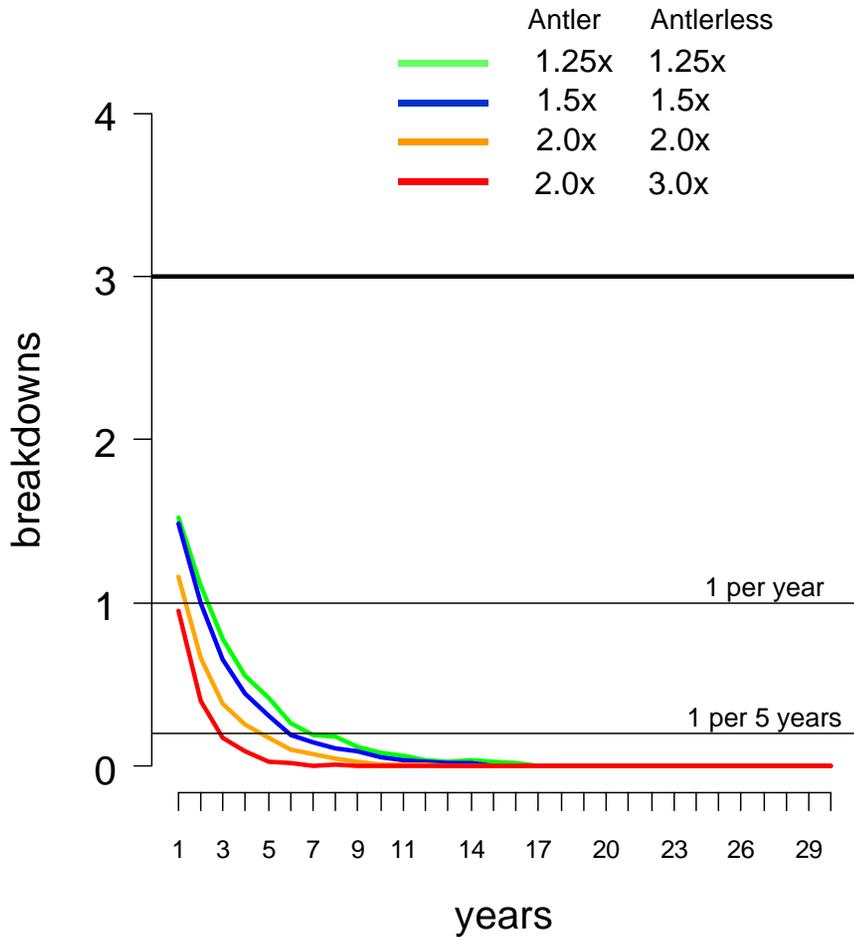
# Effects of increasing harvest on HB (with baiting)



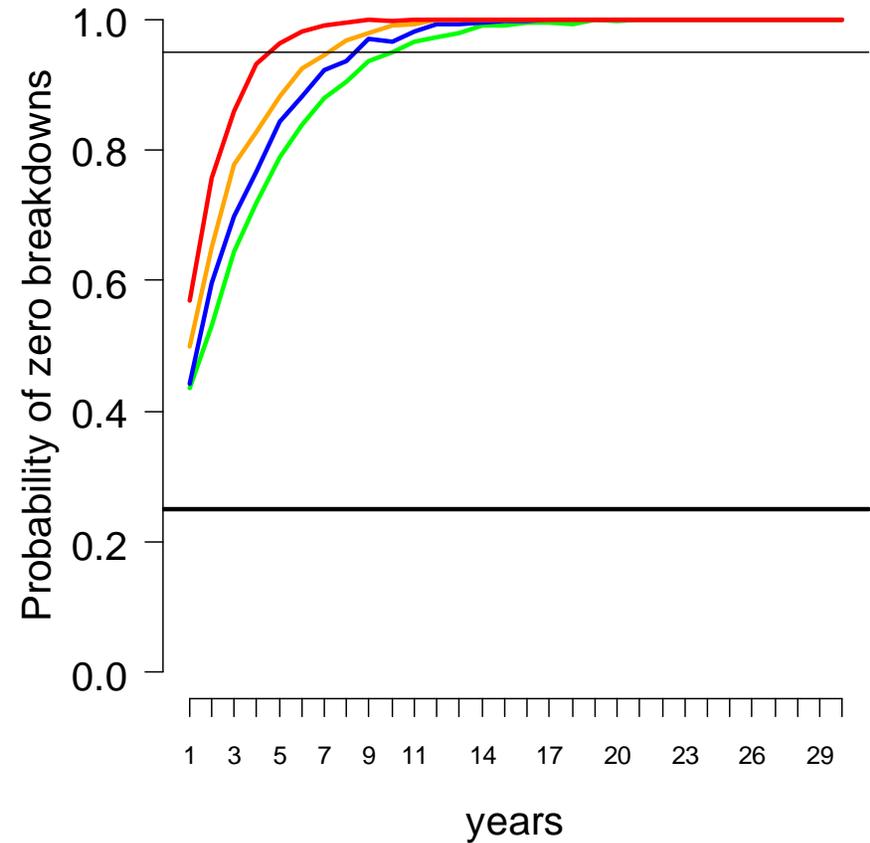
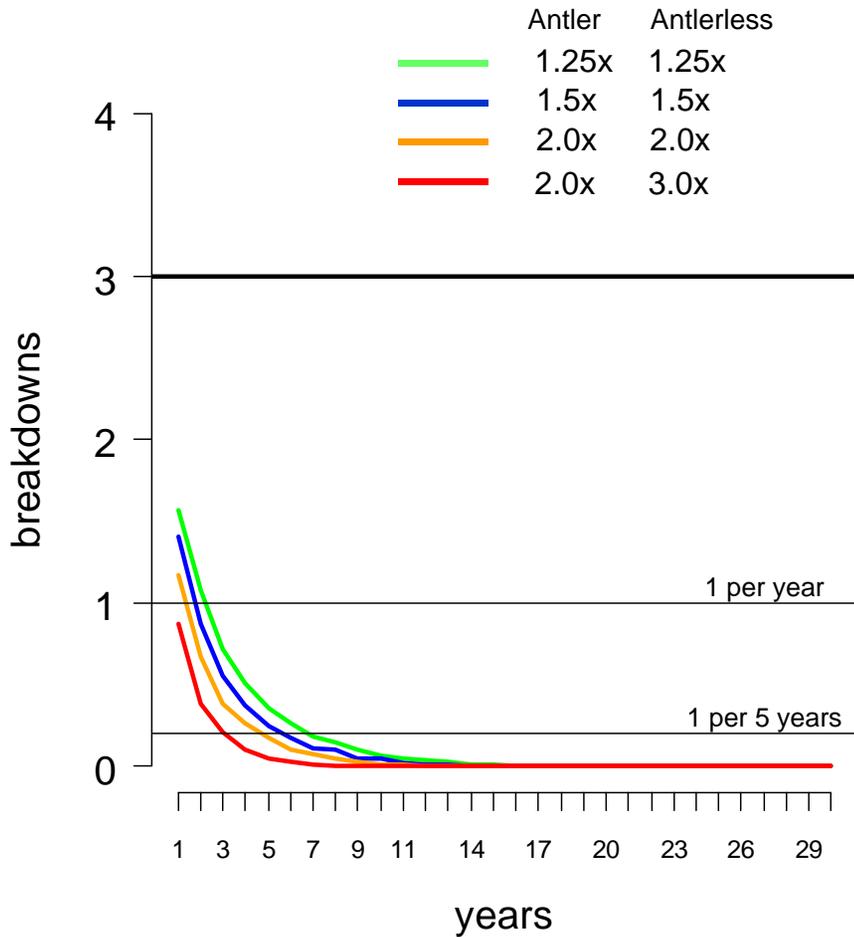
# Effects of increasing harvest on HB (no baiting)



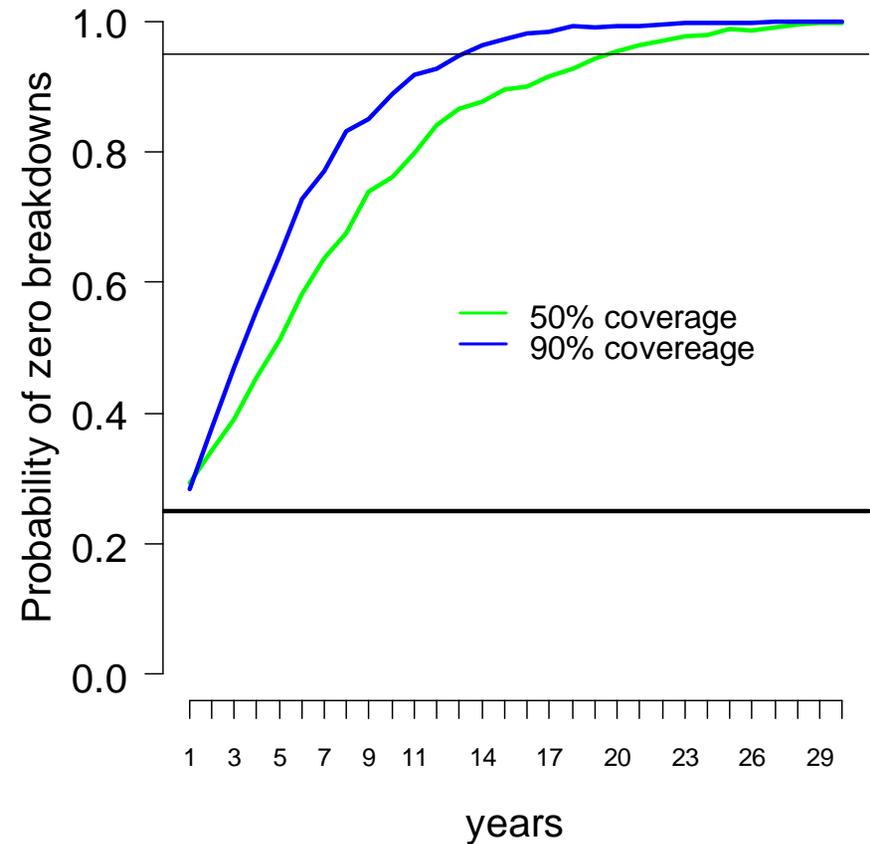
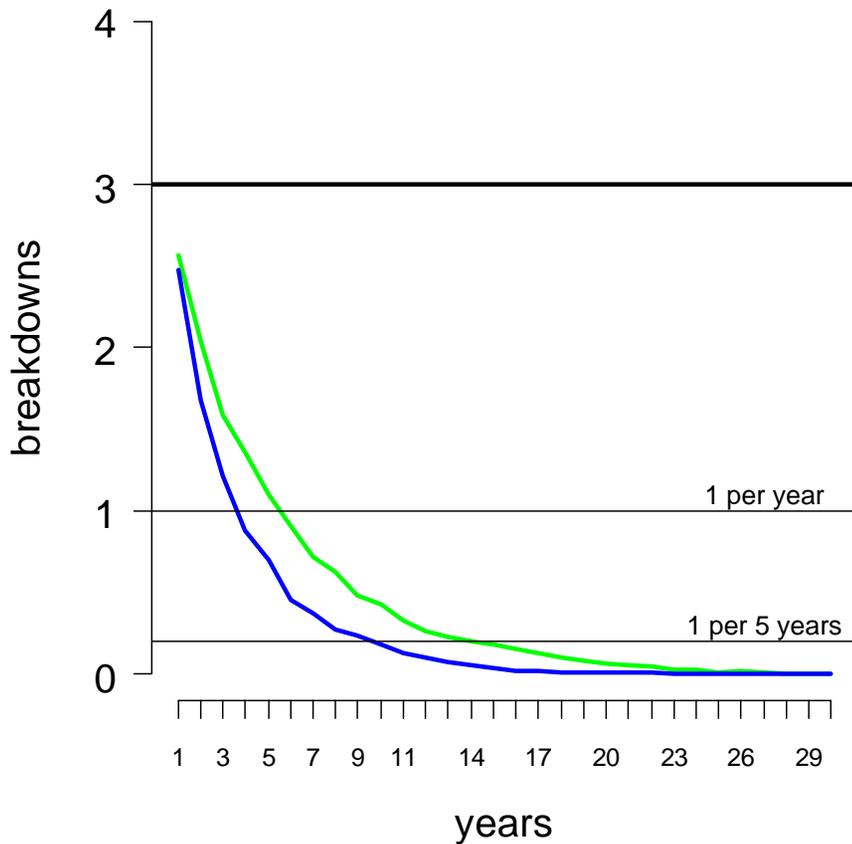
# Harvest + 90% vaccinated annually (with baiting)



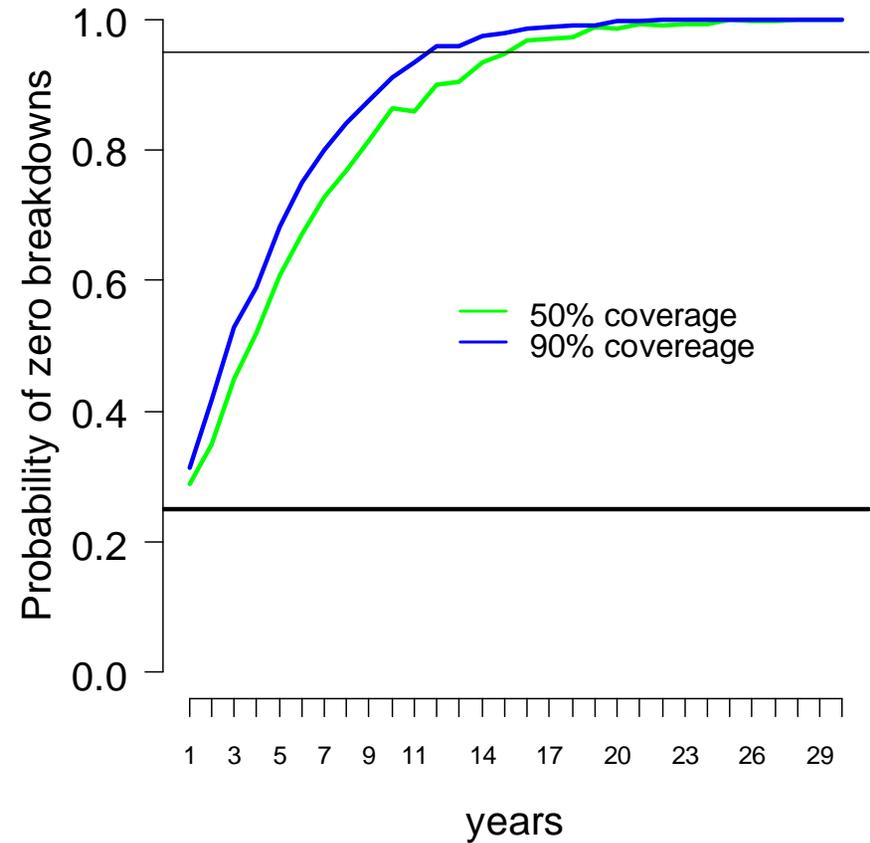
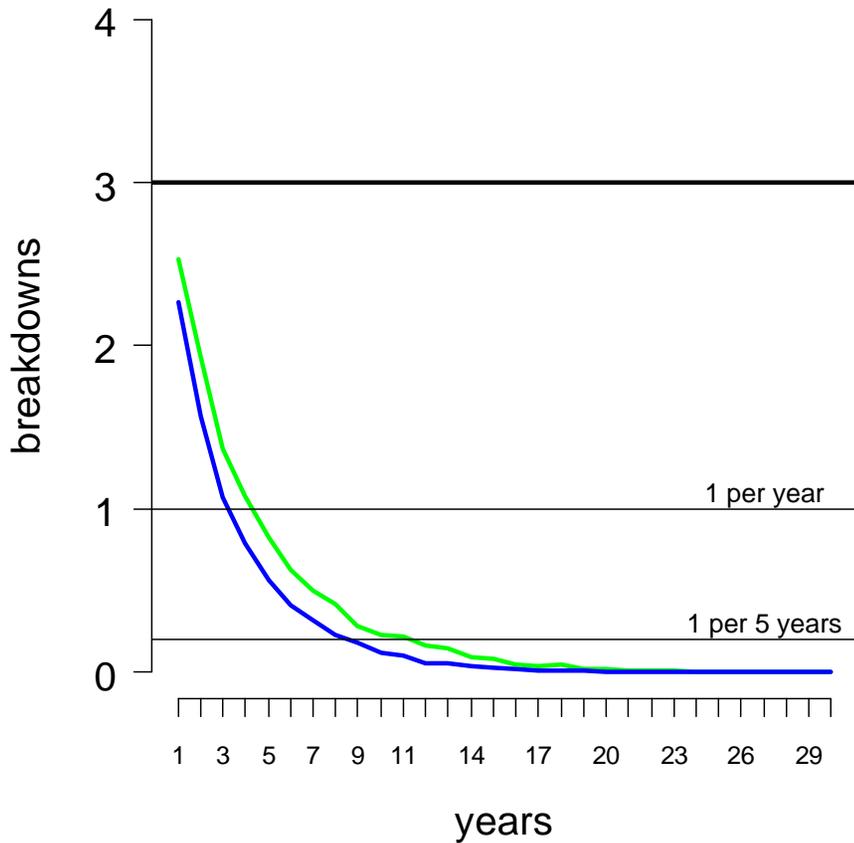
# Harvest + 90% vaccinated annually (no baiting)



# Vaccination only (with baiting)



# Vaccination only (no baiting)





## Effect of on-farm management



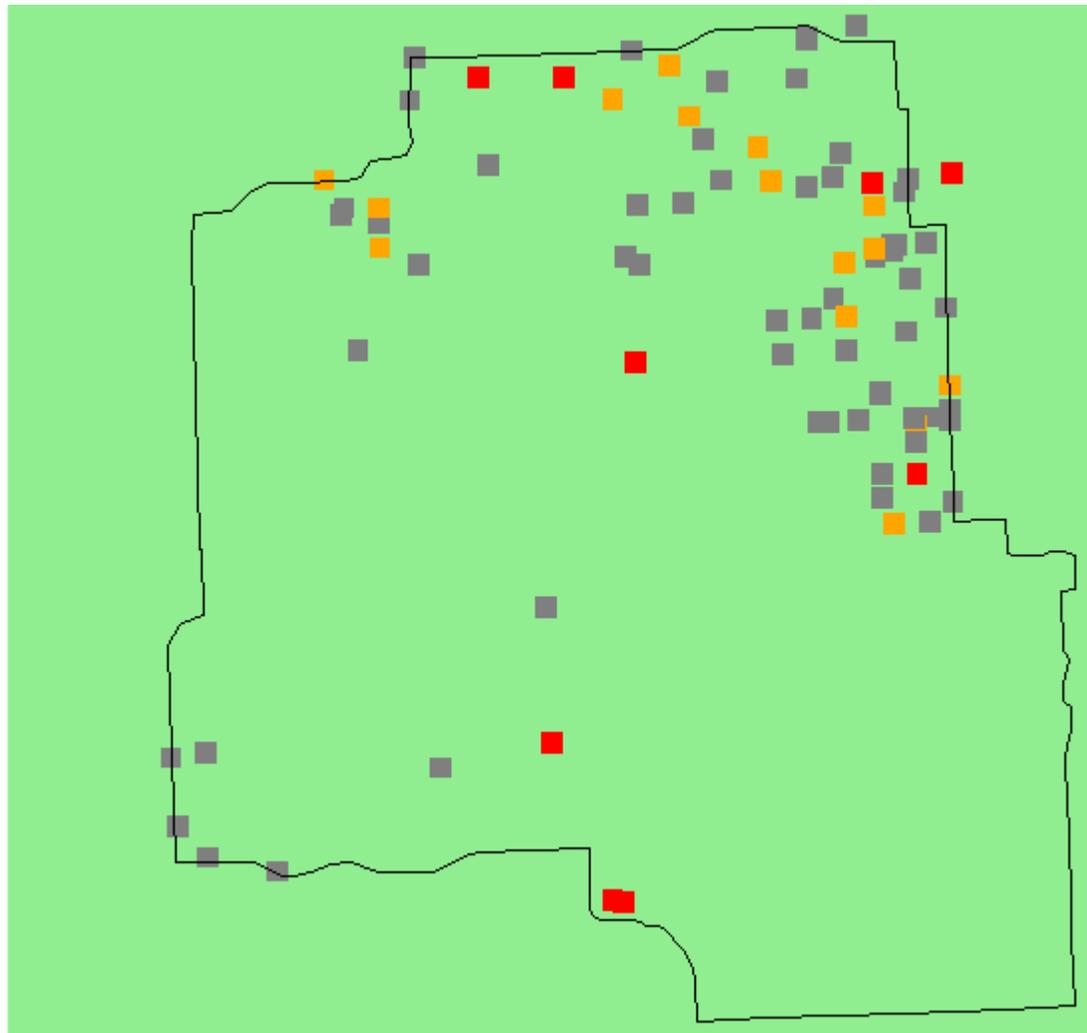
# Restriction of contact between WTD and cattle



- Baseline model assumes unrestricted contact between WTD and cattle on farms
- Examined the effect of restricting contact on herd breakdowns
- Practically this can be achieved (for example) by
  - Improved fencing
  - Restricting access to food sources

# On-farm contact reduction (%)

No reduction

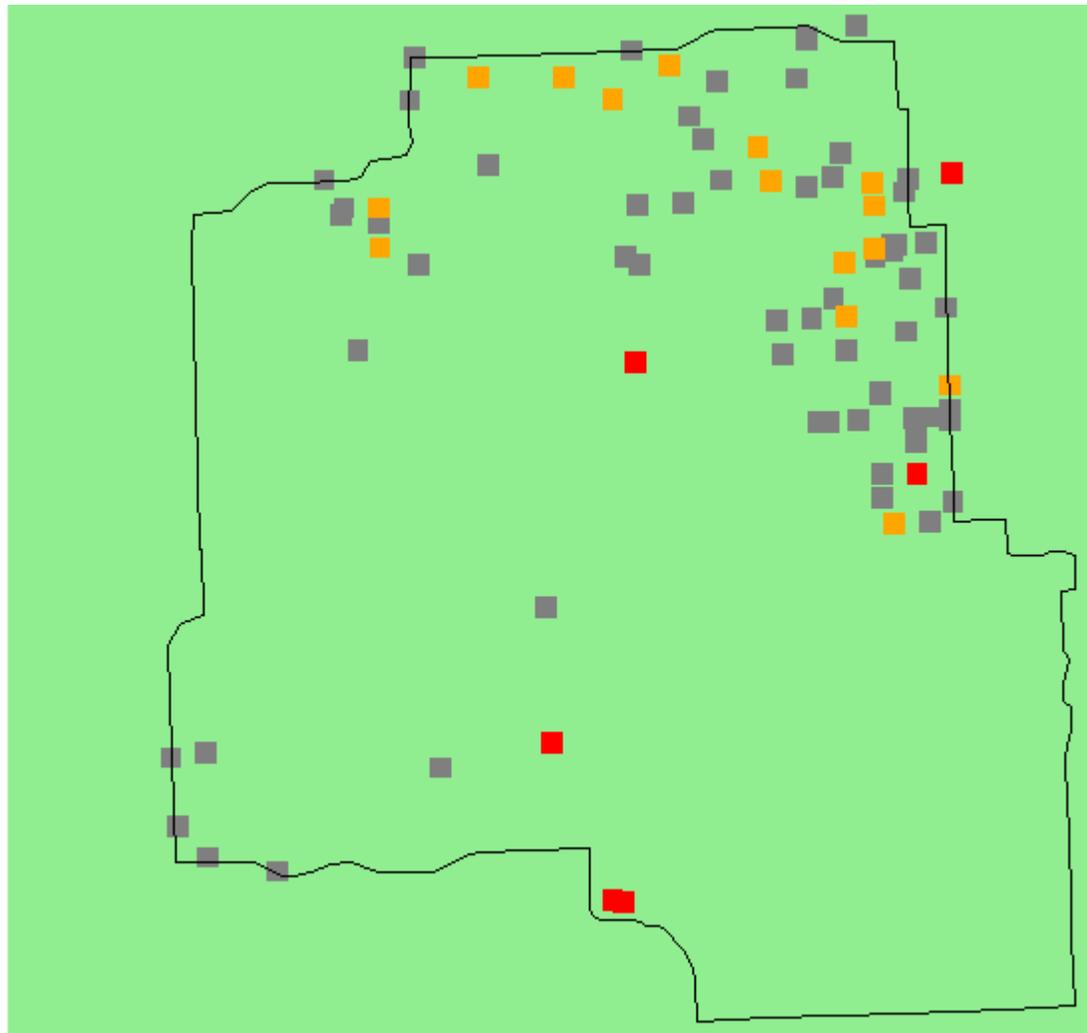


- High risk
- Mod risk
- Low risk



# On-farm contact reduction (%)

20% reduction

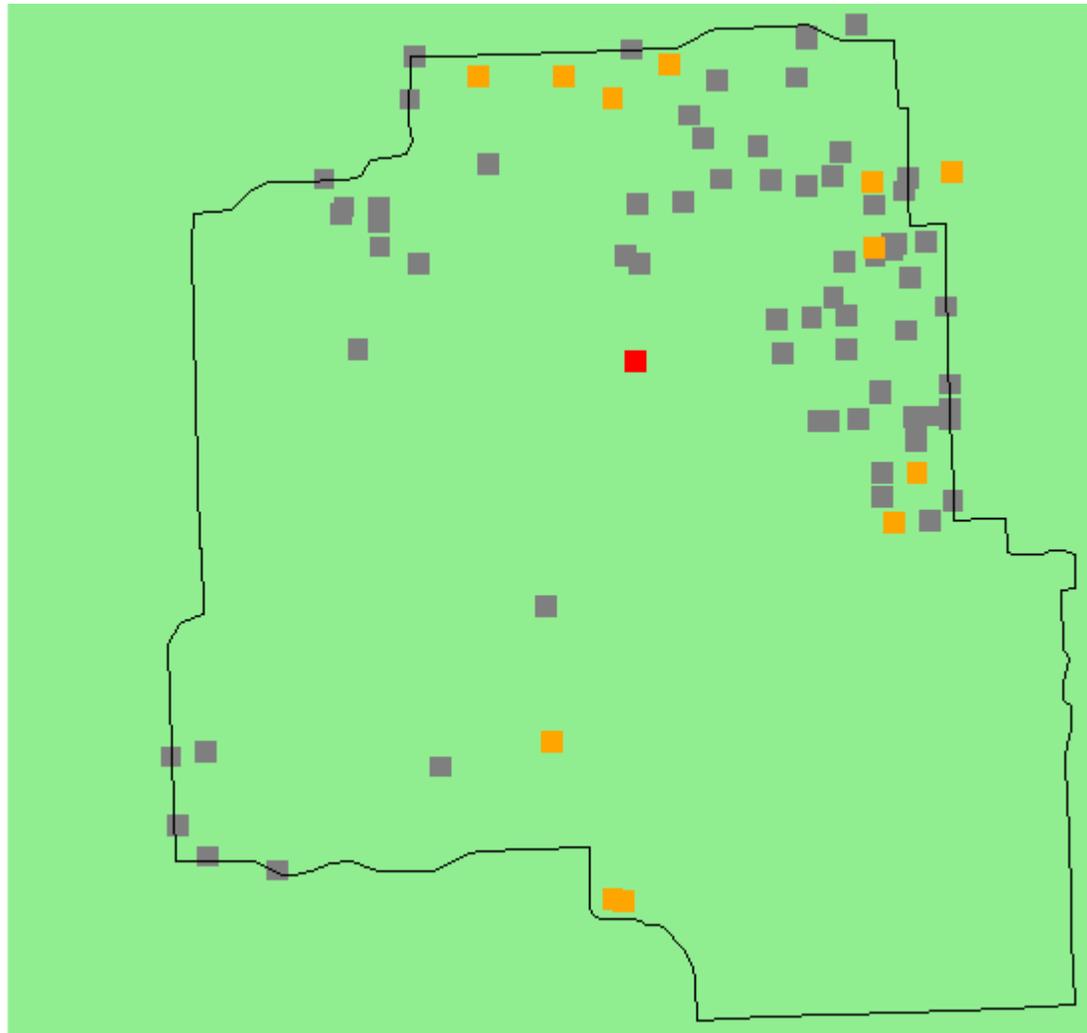


- High risk
- Mod risk
- Low risk



# On-farm contact reduction (%)

50% reduction

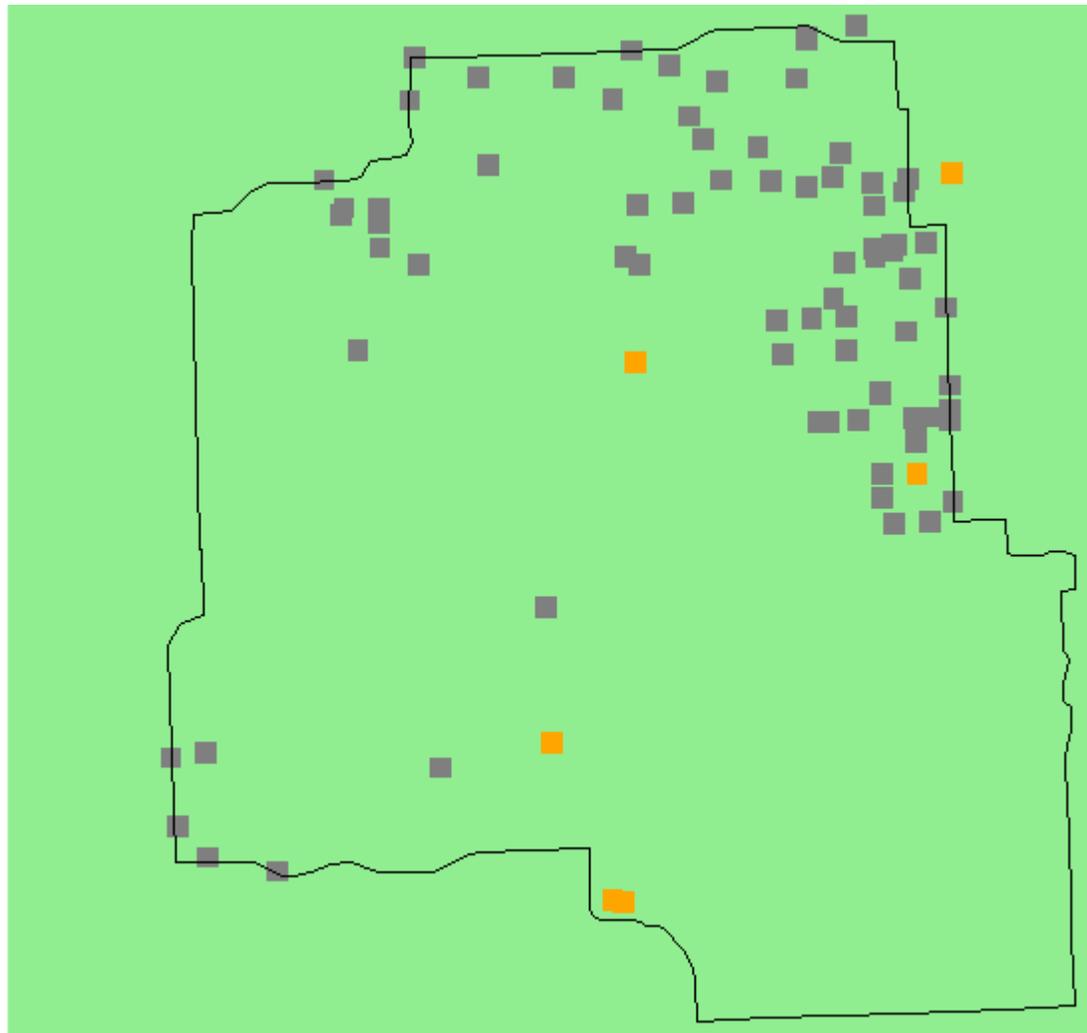


- High risk
- Mod risk
- Low risk



# On-farm contact reduction (%)

80% reduction

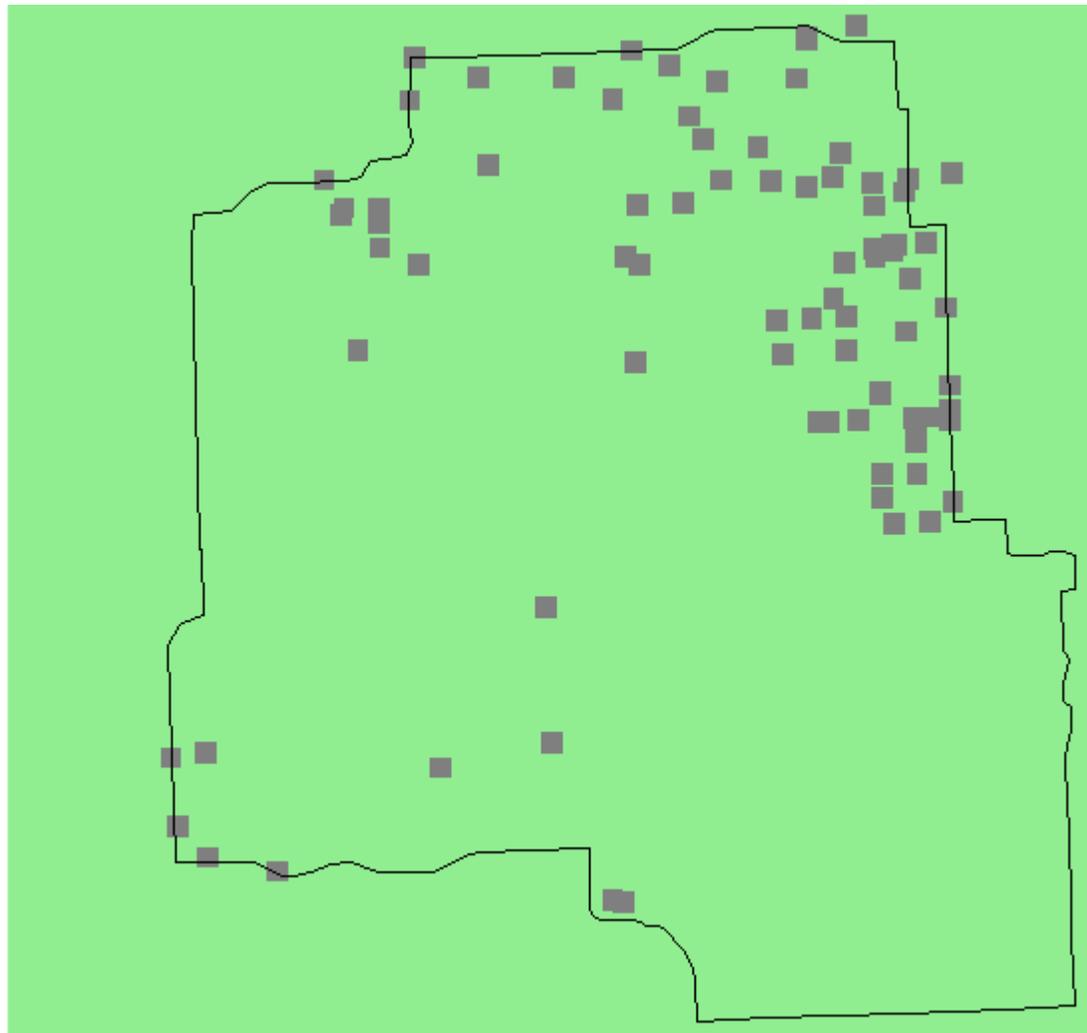


- High risk
- Mod risk
- Low risk



# On-farm contact reduction (%)

90% reduction



- High risk
- Mod risk
- Low risk

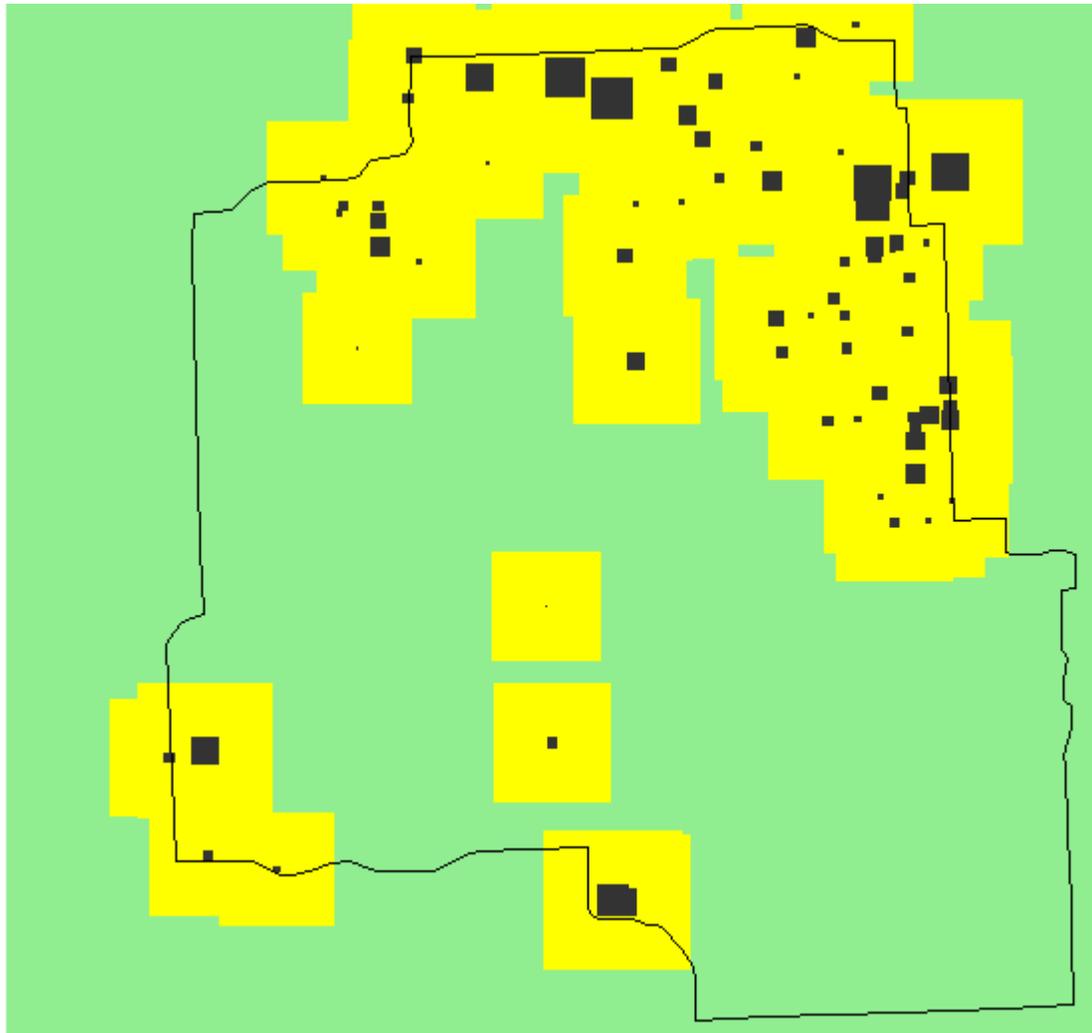


# Local control of WTD

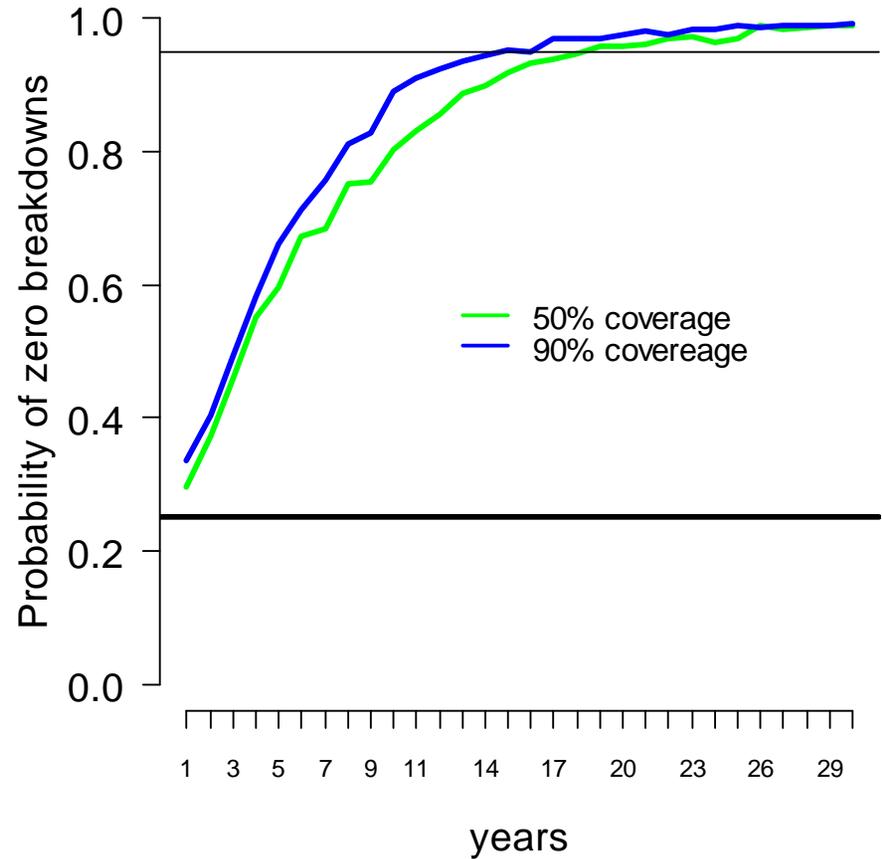
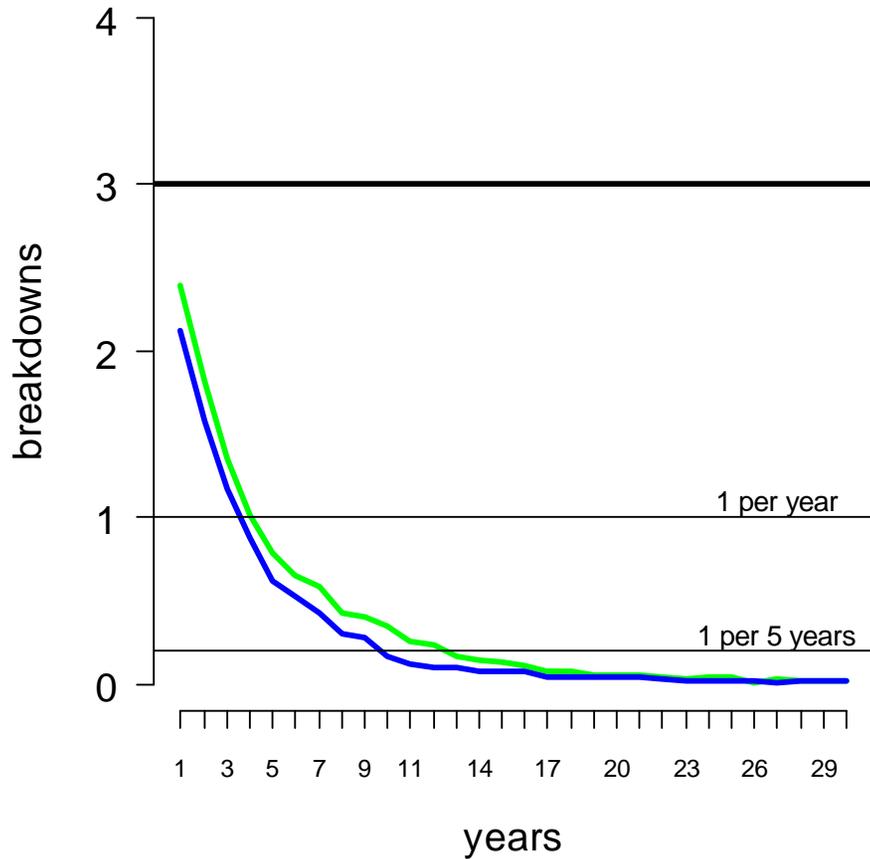


- Manage WTD in the vicinity of farms only
- Less expensive option than management of entire DMU
- What size buffer would be adequate to achieve significant reduction in herd breakdowns?
- Spatial model ideal to answer such questions

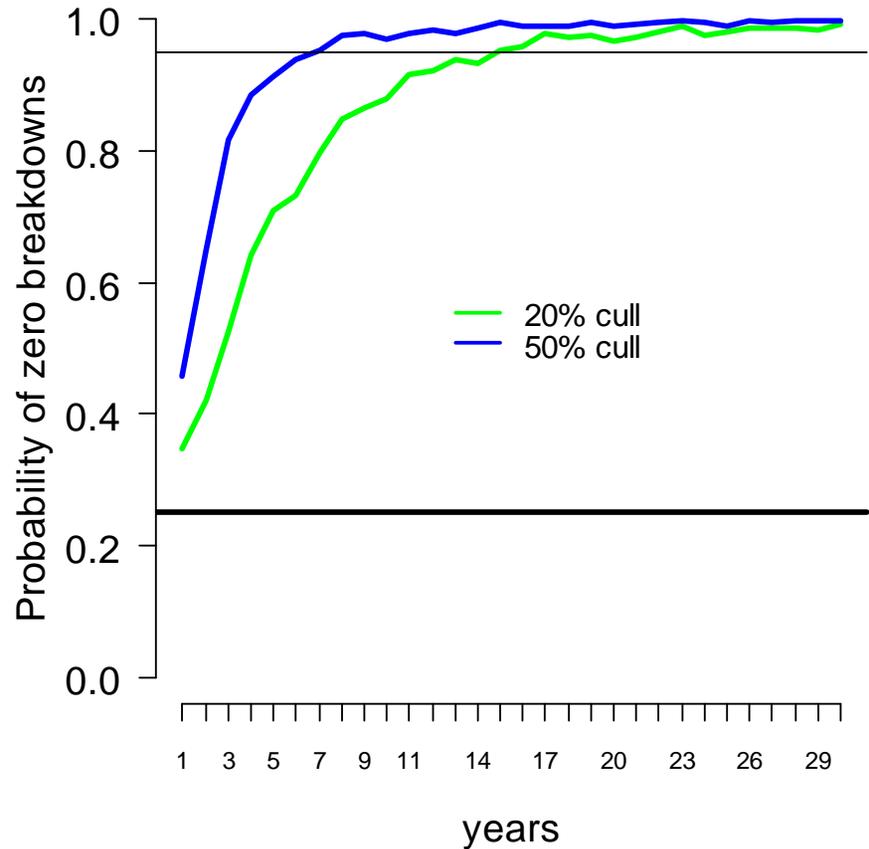
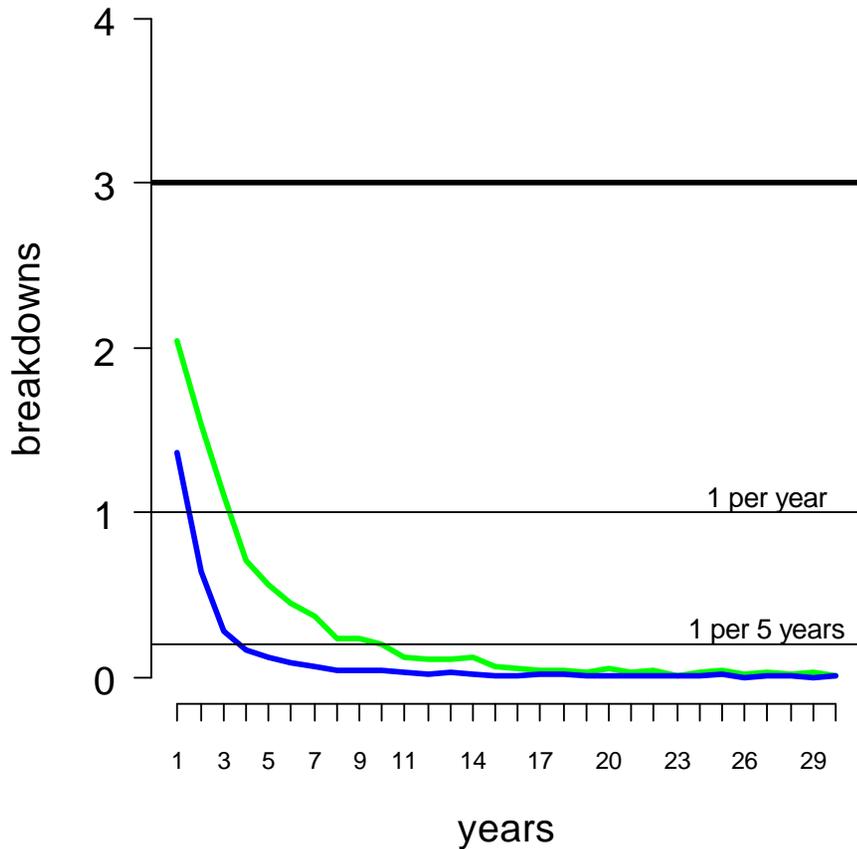
# 5 km buffer around farms (32% of total DMU area)



# Local vaccination within 5km buffer (no baiting)



# Local control within 5km buffer (no baiting)



# Conclusions (DMU wide control)



- Compared with TB control in WTD directly, management aimed at reduction of cattle herd breakdowns requires much less effort (\$)
- *But...* management needs to continue in perpetuity as TB remains in the wider deer population
  - Gains will be rapidly lost once management ceases (e.g. lifting of baiting bans)
- A 25% increase in harvest and no baiting would halve the rate of cattle herd breakdowns within 3-5 years and reduce it by 95% within 15 years
- Vaccination each year achieving 50% coverage would also achieve the same result

# Conclusions (farm level control)



- Substantial reduction in the risk of herd breakdowns is achieved if contact between WTD and cattle on farms is reduced by at least 80%
- Local control measures can also be effective
  - Vaccinating at least 50% of WTD within 5 km of farms will reduce the cattle herd breakdown rate by 95% within 13 years
  - Culling 50% of deer in addition to harvest within the 5 km buffer would reduce the herd breakdown rate by 95% within 10 years

Thank you



PGC Photo/Hal Korber