Supplementary Material

# Sensitivity analysis

A sensitivity analysis was performed to determine the robustness of the results presented in the main text to variations in the underlying wildlife disease system. This analysis explored how variations in key parameter values affect the culling outcomes of different population reduction strategies (i.e. variations in culling coverage , and removal rate ) which parallel the strategies explored in the main text. Parameters explored here are: intrinsic reproduction rate , carrying capacity , mortality rate , and within groups transmission coefficient . The qualitative findings do not vary across the parameter ranges explored, demonstrating that the results are robust across a wide range of systems.

However, the details of the focal wildlife system do affect the outcome of a given culling strategy (measured in variations in culling coverage , and removal rate ). The area where the population dies out (purple) is shown to reduce for higher (Figure A1), higher (Figure A2), and lower (Figure A3), as these values allow the population to recover more rapidly from depletion via culling. does not directly affect the population size, except in conjunction with disease induced mortality rate , and so a higher might be associated with a larger extinction area if is also high, otherwise it has little influence. The region where the perturbation effect occurs (green) increases with higher , higher , and lower , (thus shifting the position of the Goldilocks region), and also increases with . The Goldilocks region (yellow) is maximised with high , low , high , and low .



Figure A1 The impact of intrinsic reproduction rate () on the Goldilocks zone. How total culling effort and the spatial distribution of culling effort affects population survival and disease eradication for host populations with varying intrinsic reproduction rate .



Figure A2 The impact of carrying capacity () on the Goldilocks zone. How total culling effort and the spatial distribution of culling effort affects population survival and disease eradication for host populations with varying carrying capacity .



Figure A3 The impact of natural mortality () on the Goldilocks zone. How total culling effort and the spatial distribution of culling effort affects population survival and disease eradication for host populations with varying natural mortality rate .



Figure A4 The impact of with group transmission coefficient () on the Goldilocks zone. How total culling effort and the spatial distribution of culling effort affects population survival and disease eradication for host populations with varying within group transmission coefficient .