

Ecological Impacts on *Dermacentor andersoni* Abundance and Socioeconomic Impacts on *Dermacentor* Disease Incidence

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Introduction

- Colorado Tick Fever Virus (CTFV), Rocky Mountain Spotted Fever (RMSF), tularemia, Q Fever, and anaplasmosis are endemic to western North America with *Dermacentor* ticks acting as the vector
- *D. andersoni* presence and abundance is significantly associated with environmental factors in other states such as CO. In this study we tested these associations for the state of MT.
- Environmental factors and human factors increase risk of disease contraction leading to increased health disparities for disadvantaged populations.
- In this study, we studied environmental and socioeconomic factors associated with *Dermacentor andersoni* abundance and *Dermacentor* disease incidence in the state of Montana, a primarily rural state.

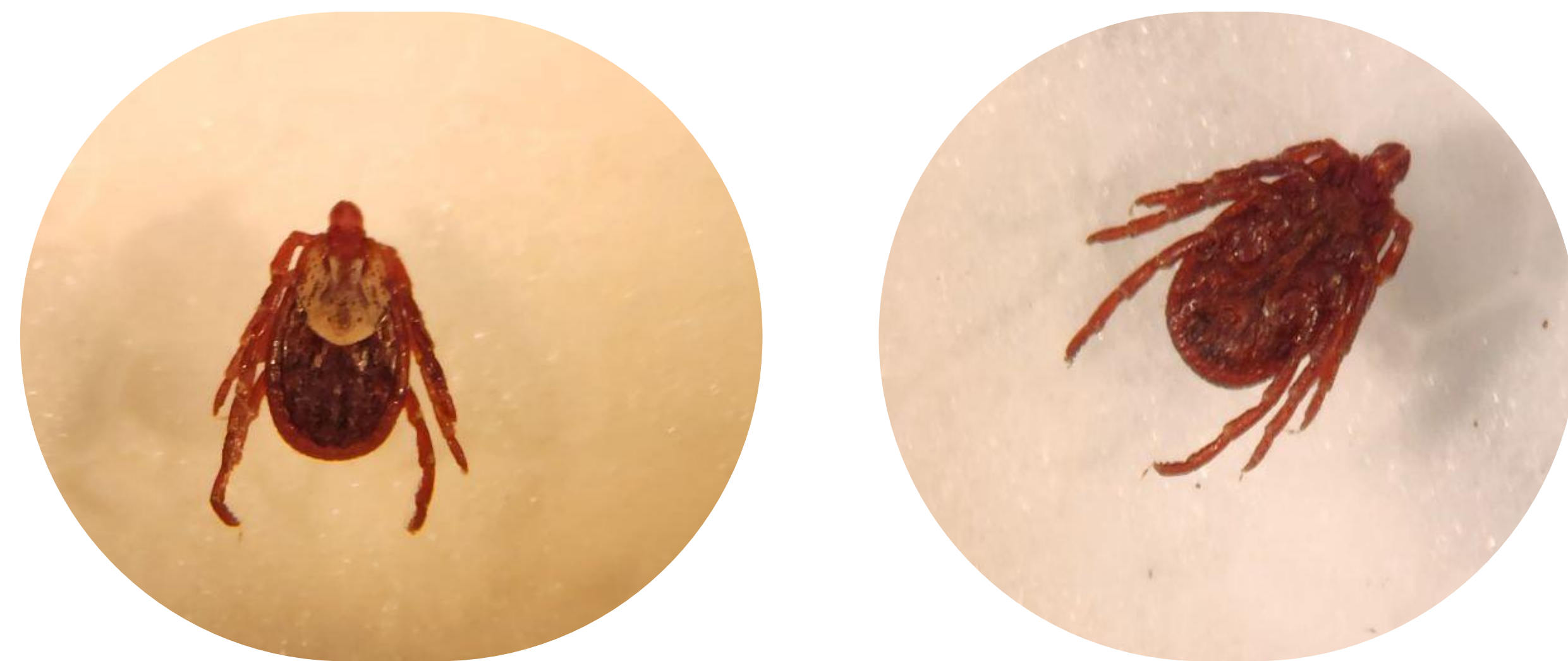


Figure 1. Ventral and dorsal images of *Dermacentor andersoni* under the microscope.

Methods

Environmental Methods:

- Using geospatial data from the MT State library, we analyzed environmental factors with Logistic Regression Analysis and Multiple Logistic Regression Analysis to test for associations with *D. andersoni* abundance.
- Tick abundance data was provided by former Carroll undergraduates who randomly sampled 156 sites in Western MT.

Socioeconomic Methods:

- Baseline *Dermacentor* disease incidence data was collected by Montana DPHHS.
- Linear regression analysis tested for correlations between the incidence rate and socioeconomic factors.
- Stepwise regression analysis provided variables significantly correlated with *Dermacentor* tick disease incidence.

Results

Variable	R ²	P-Value
Total Households	0.84	<0.001
%Female Households without spouse	0.56	0.001
%Male households over 65	0.41	0.026
%Households with Children	0.49	0.006
%Households over 65	0.42	0.022
1 km elevation	0.08	0.031
Vapor pressure deficit (May)	0.14	0.005
Max temp in May	0.14	0.006
Rmax in May	0.08	0.039

Table 1. Variables of significance after univariate analysis for socioeconomic and ecological variables. The R² and p-value are displayed.

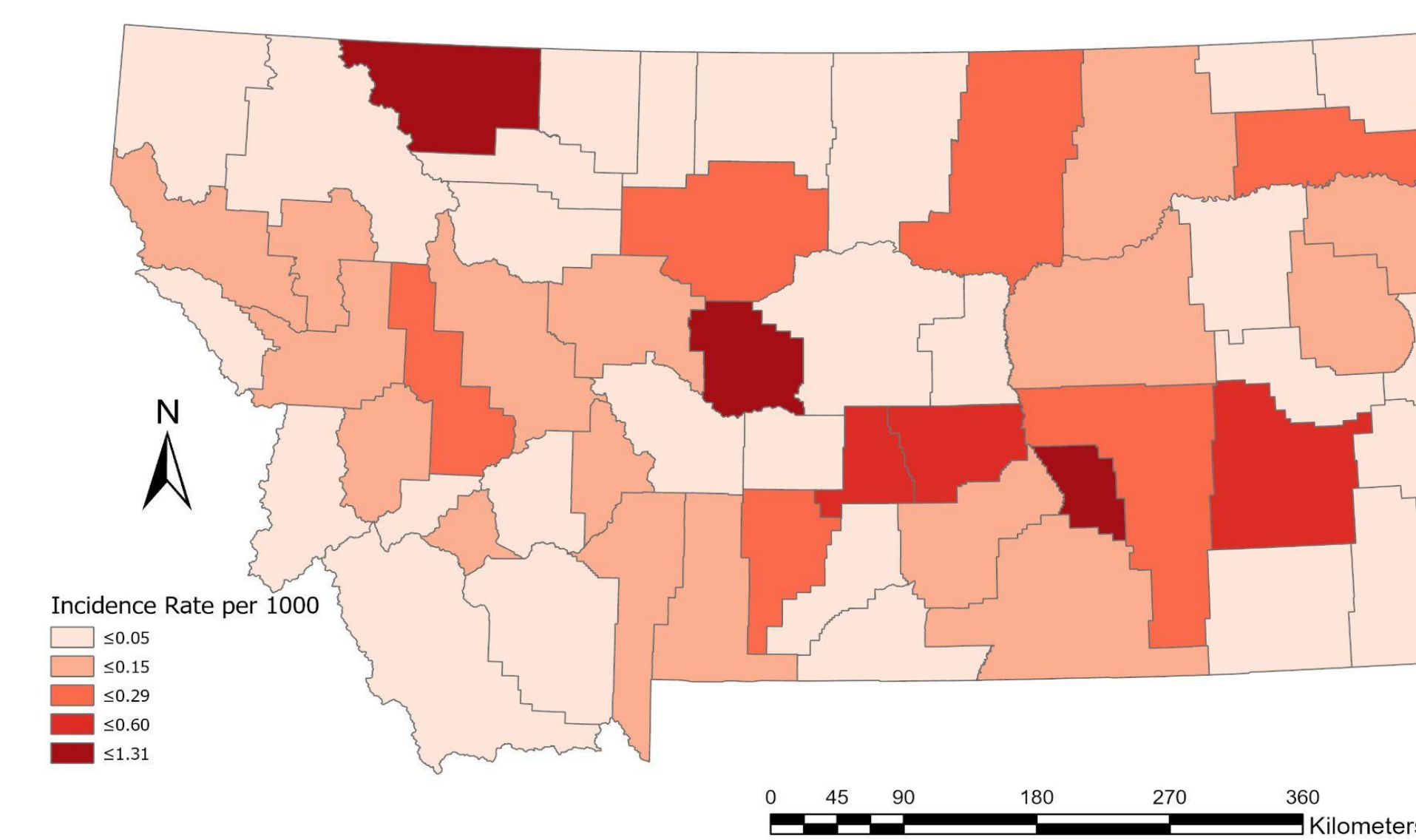


Figure 2. GIS model depicting county level incidence rate per 1000 humans of *Dermacentor* tick diseases.

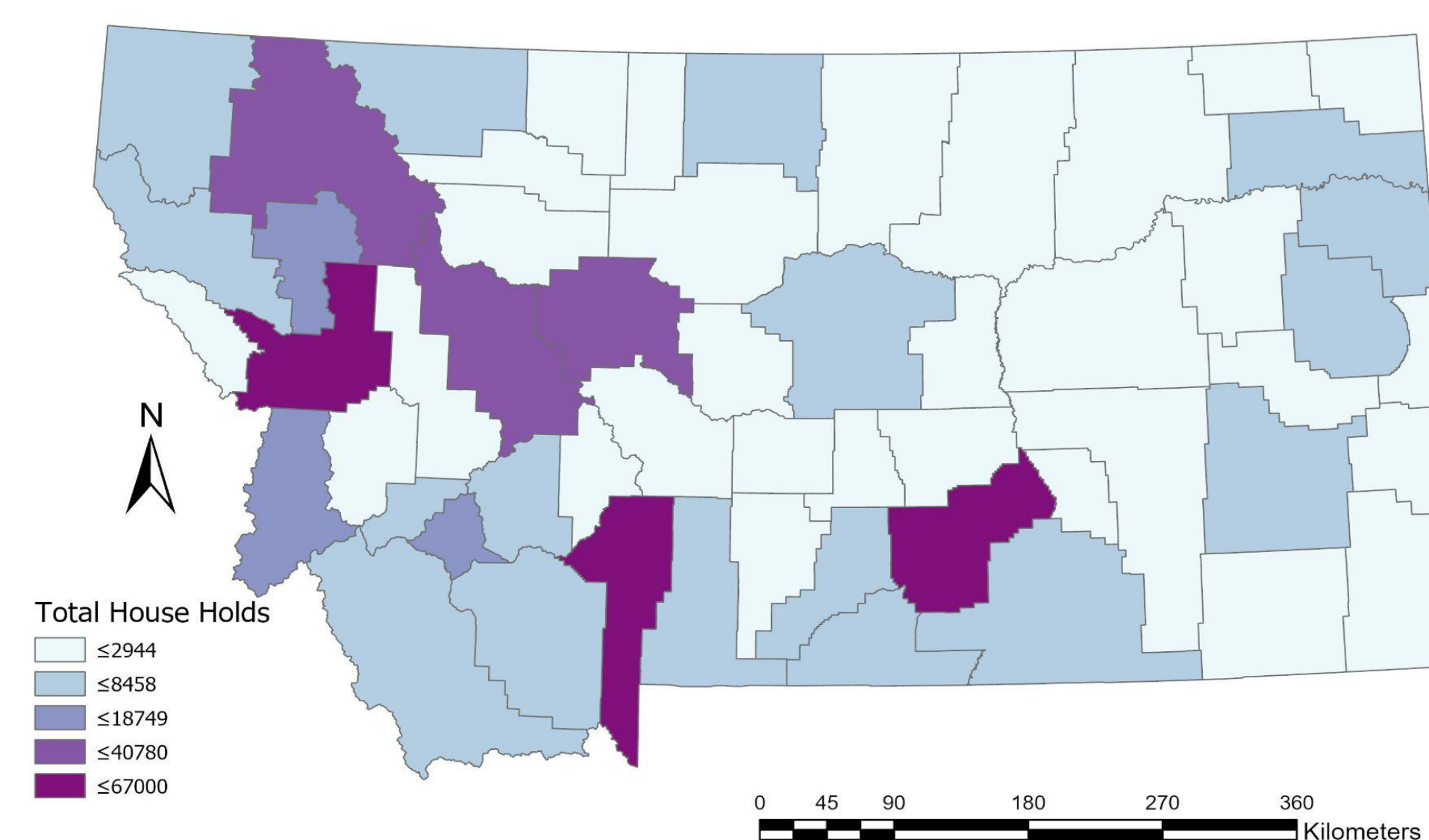


Figure 3. GIS model depicting total households by county.

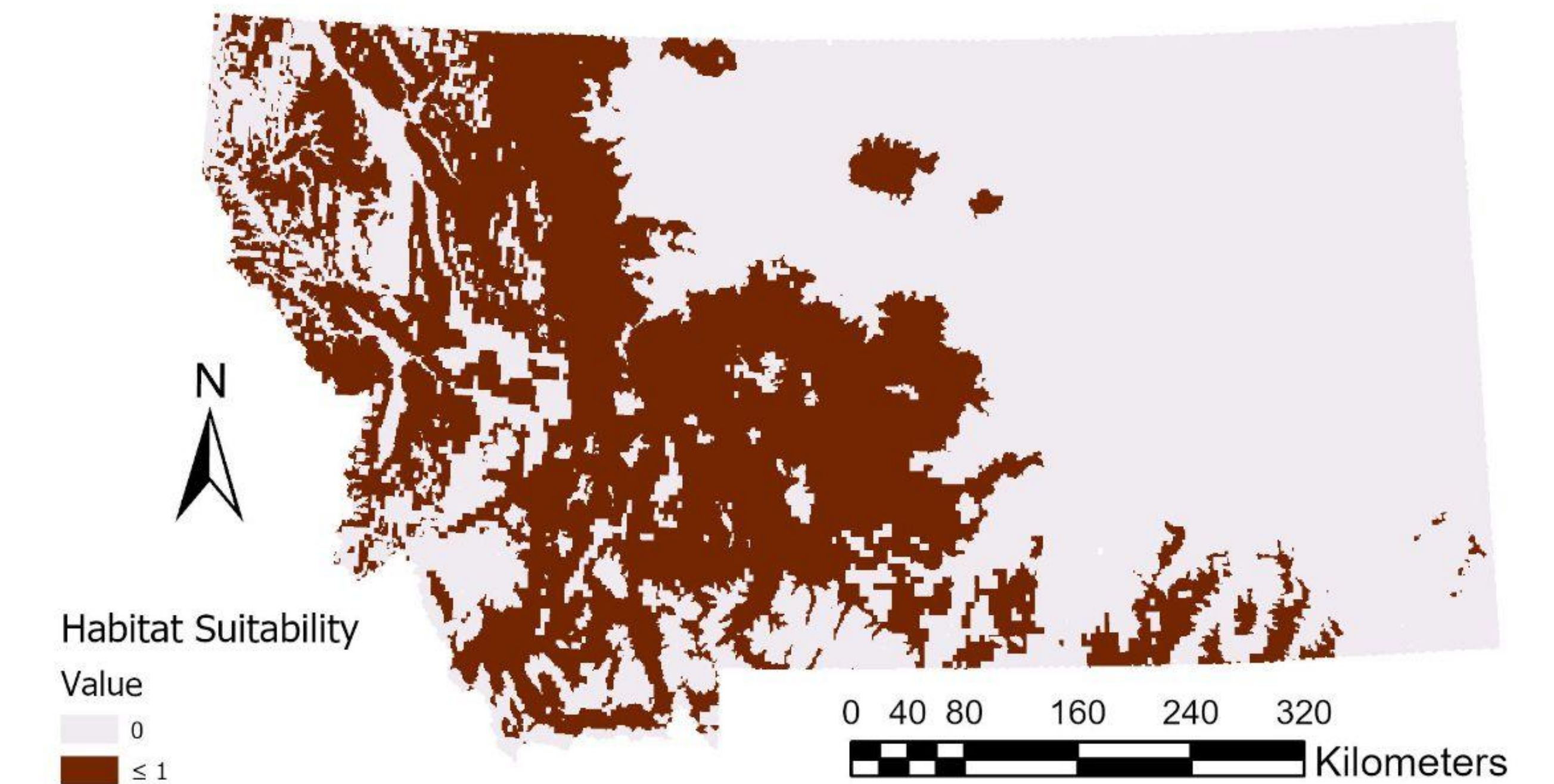


Figure 4. GIS risk model depicting 1 km resolution prediction of *Dermacentor* presence/absence.

Variable	R ²	P-Value
Total Households	0.70	<0.001
Elev* × VPD** × Rmax***	0.18	0.008

Table 2. Variables of significance after multivariate analysis for socioeconomic and ecological variables. The R² and p-value are displayed.

* Elevation 1km

** Vapor Pressure Deficit in May

*** Rmax in May

Conclusions

- The total number of households per county is positively correlated with *Dermacentor* tick disease incidence.
- Elevation and Rmax in May are negatively correlated with *Dermacentor andersoni* abundance, while vapor pressure deficit in May is positively correlated with *Dermacentor andersoni* abundance.

Acknowledgments

We would like to thank Dr. Grant Hokit for his support and guidance throughout this project.