



Comparing socioeconomic characteristics of households affected by two forest pests

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Motivation

- Analysis prompted by a fairly basic question: Can we determine how many households are affected by a forest pest?
- Developed into a more interesting research question: In socioeconomic terms, how different are households affected by different forest pests?

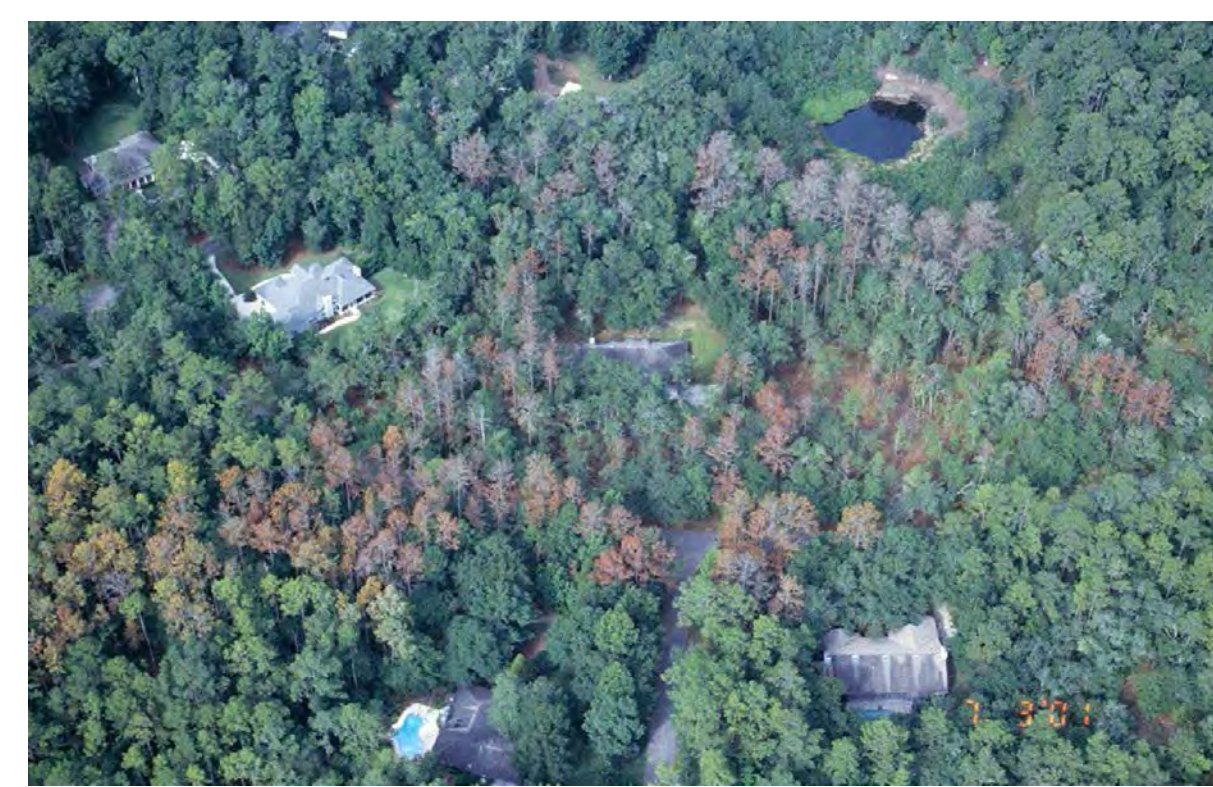


Image: J. Meeker, USFS

Pests of Interest

Native pest:
mountain pine beetle,
Dendroctonus ponderosae



Image: William M. Ciecha, Forest Health Management International, Bugwood.org

vs.

Non-native pest: European gypsy moth,
Lymantria dispar

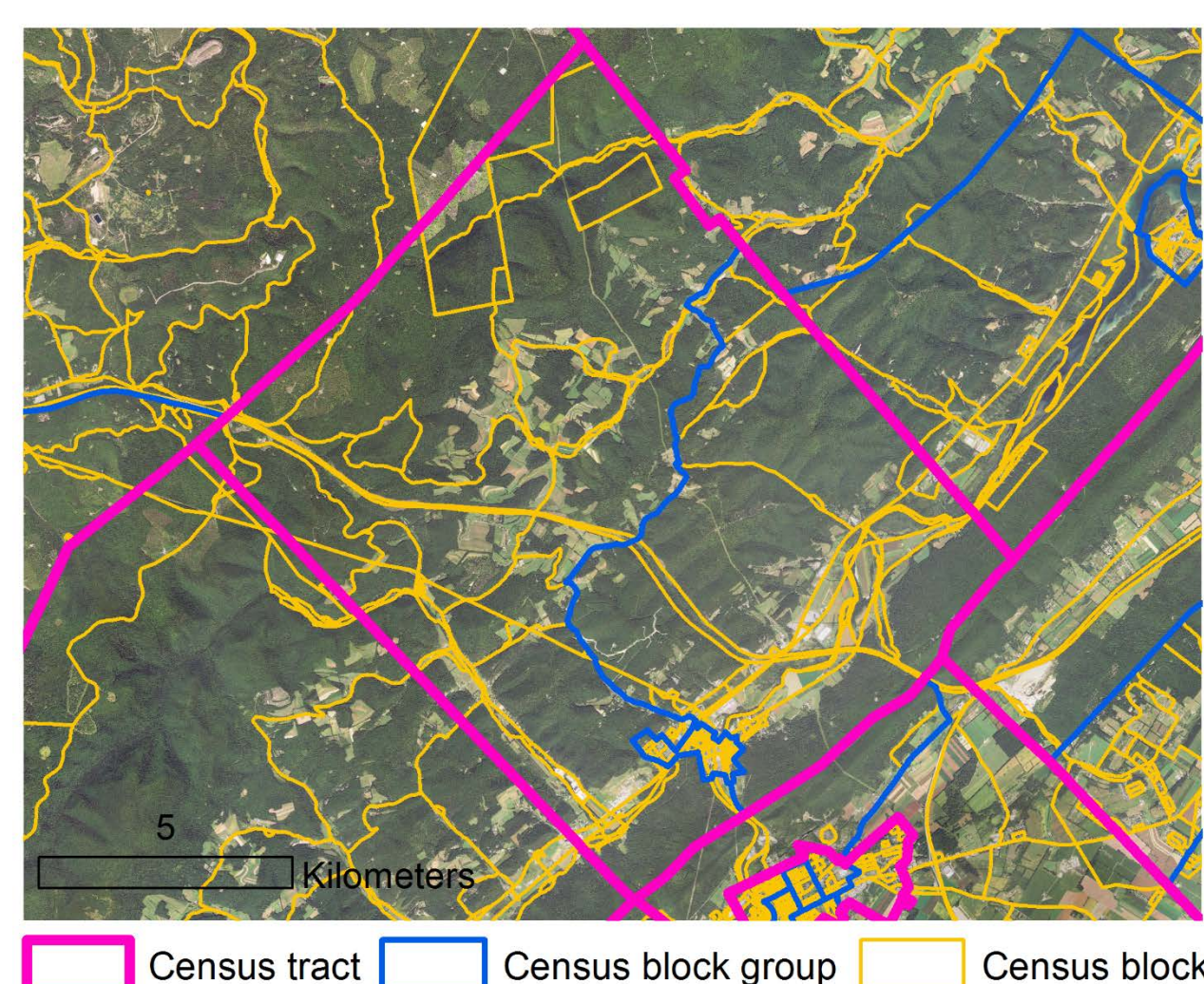


Image: John Ghent, Bugwood.org

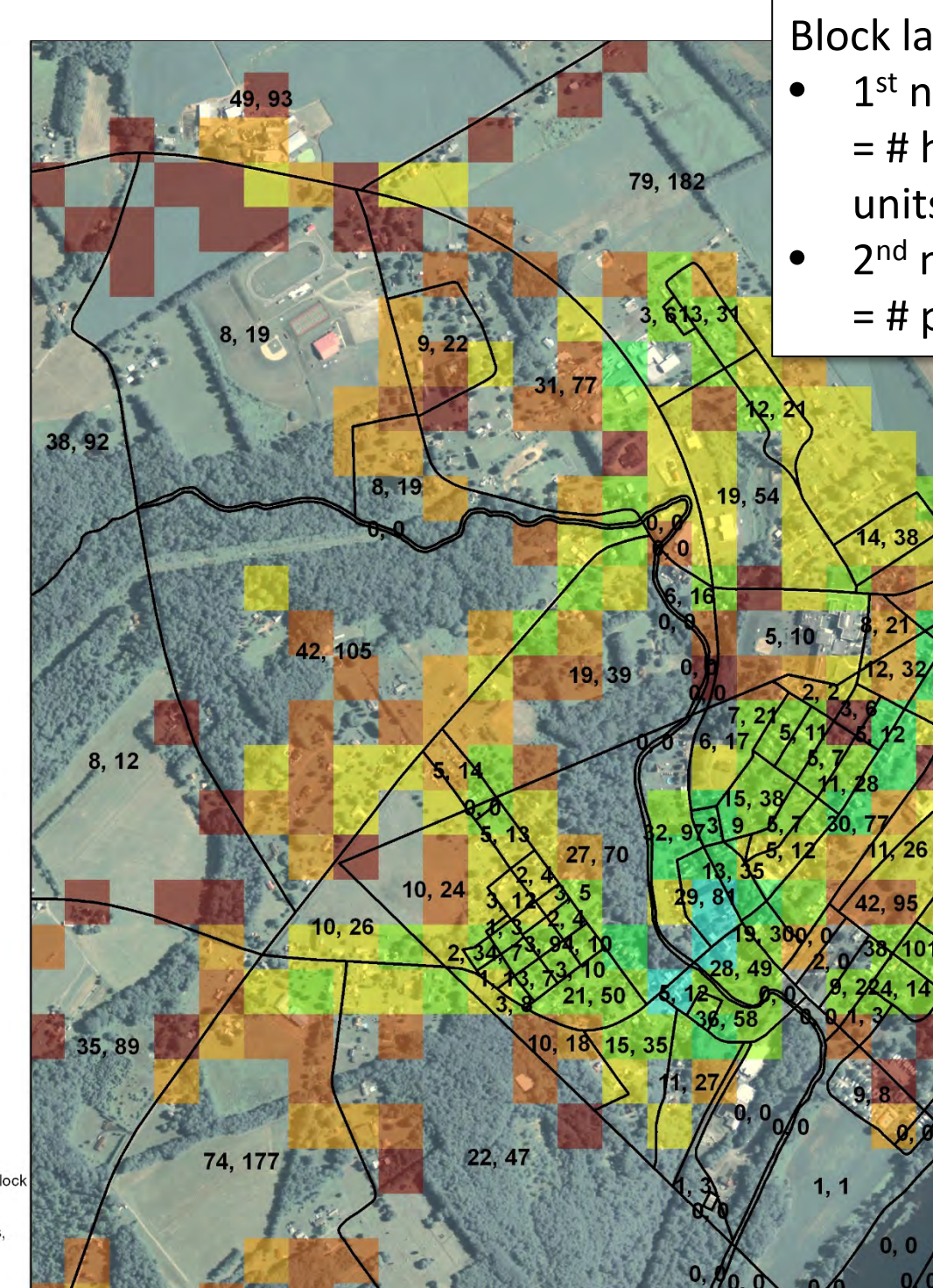
Three-Step Analytical Approach

Step 1: Locate homes across landscape

- US Census 2010 data on population and housing
- Census block is the primary reporting unit
- Blocks (polygons) are nested within block groups, which are nested within tracts
- In rural areas, a census block can be much larger than a city block
- To distribute homes across each block polygon, used LandScan USA raster map of nighttime population (from Oak Ridge National Laboratory)
- Geospatial modeling process yielded raster map of housing distribution as of 2010



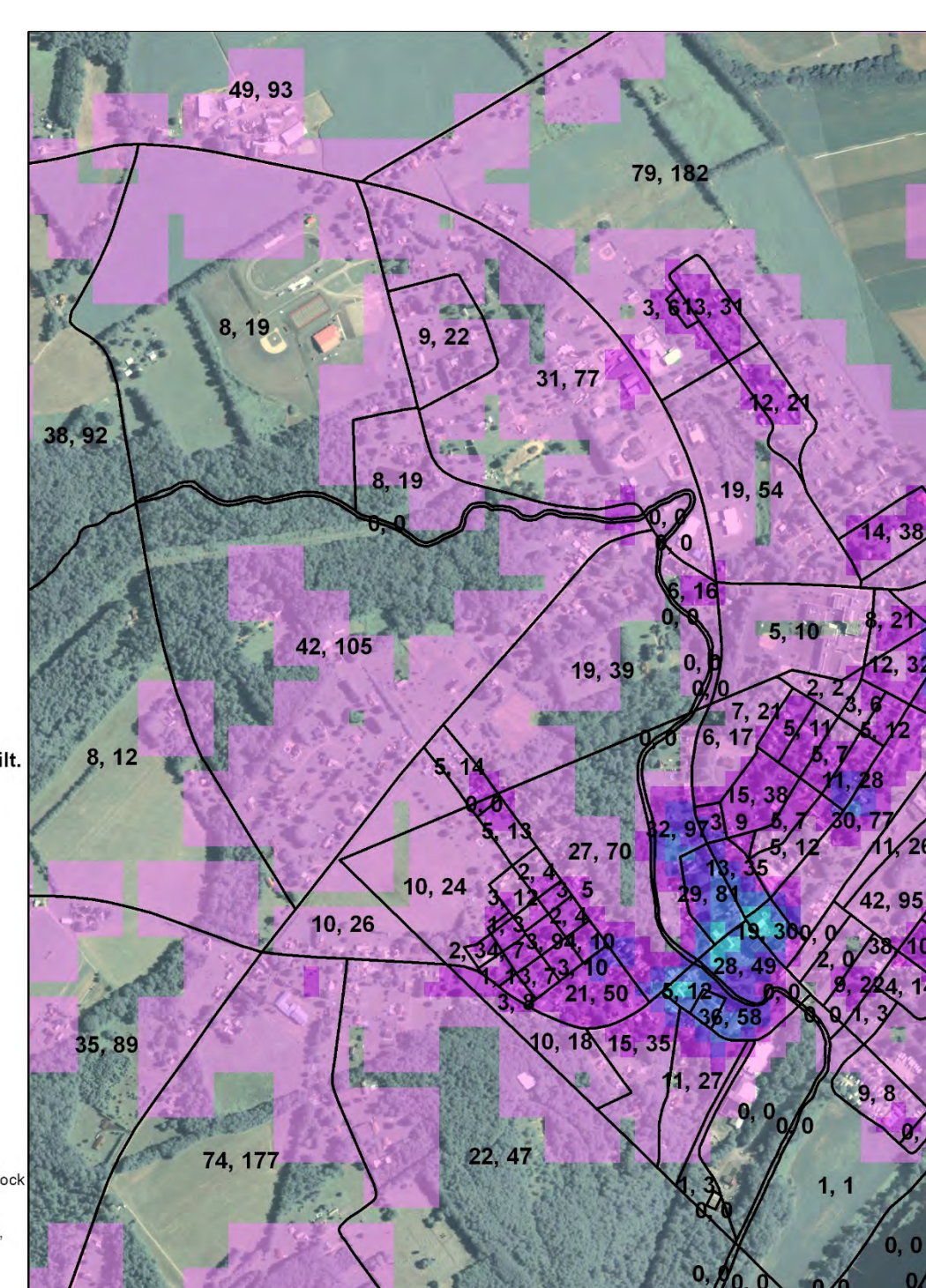
Legend: Census tract (pink), Census block group (blue), Census block (yellow)



Nighttime population from LandScan USA (90-m resolution)

Block labels:
• 1st number = # housing units
• 2nd number = # people

Geospatial modeling:
➤ Resampling
➤ Zonal statistics
➤ Map algebra
➤ Low-pass filtering (to minimize edge effects between blocks)

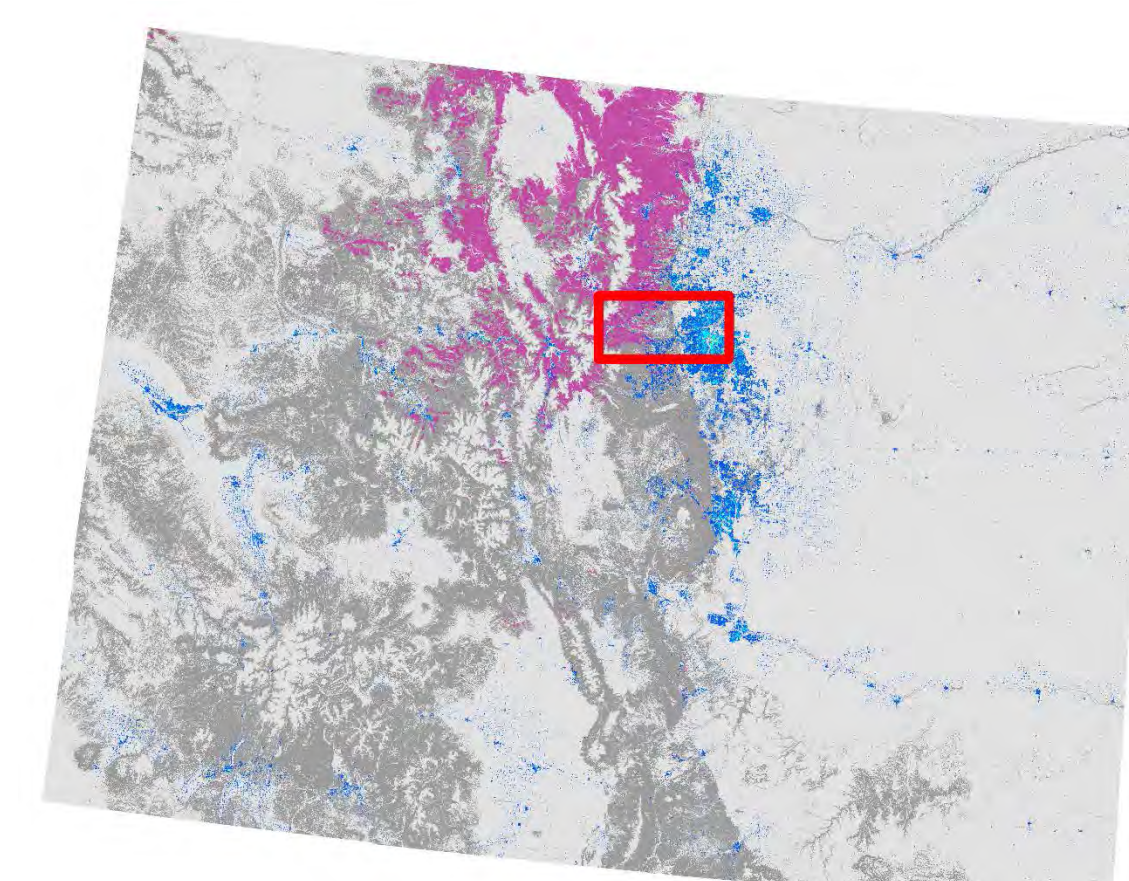


2010 housing distribution (30-m resolution)

Step 2: Determine geographic footprint for each pest

- Used Insect and Disease Survey (IDS) geospatial data (from USFS Forest Health Protection)
- IDS polygons identify (1) damage agent and (2) type & degree of damage
- Compiled IDS damage polygons caused by mountain pine beetle in Colorado, and by European gypsy moth in Pennsylvania
- Same five-year impact footprint, 2008-2012, for each pest
- Damage polygons buffered by 100 m based on research indicating home values affected at this distance

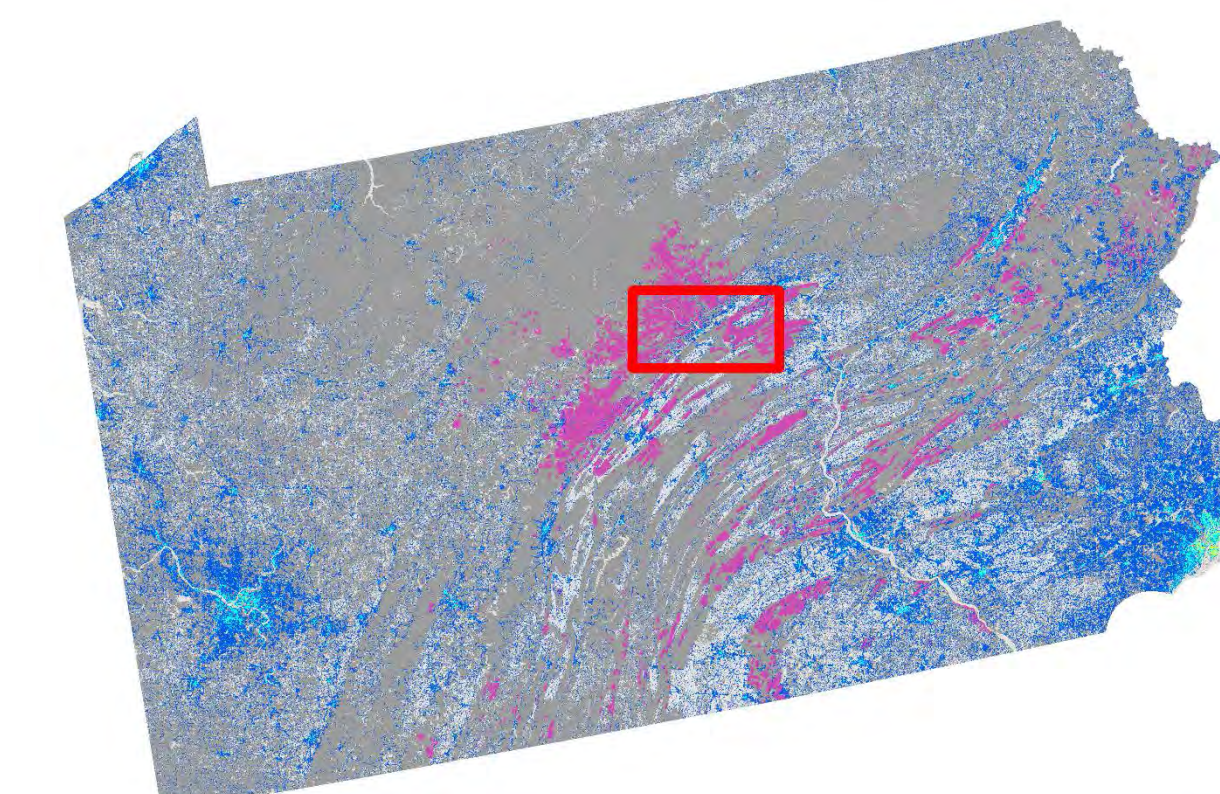
Step 2 (cont.): Determine geographic footprint for each pest



Housing density
housing units / 30-m cell

- <= 1
- 1 - 4
- 4 - 8
- 8 - 16
- 16 - 40
- > 40

Mountain pine beetle impact in Colorado, 2008-2012



Housing density
housing units / 30-m cell

- <= 1
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- 8 - 16
- 16 - 40
- > 40

European gypsy moth impact in Pennsylvania, 2008-2012

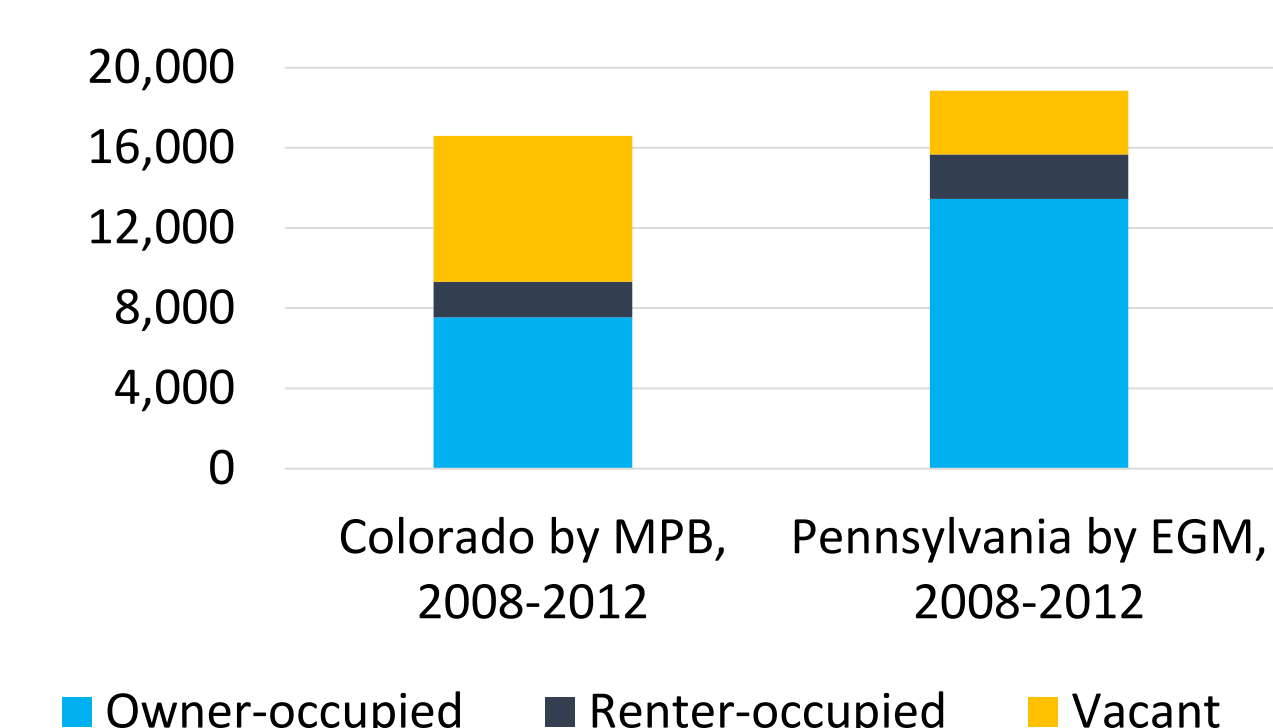
Step 3: Intersect and summarize

- Straightforward for main metric (# homes affected), other measures not block level
- Block group level: tenure (owner- or renter-occupied, vacant) and median home value
- Tract level: median household income
- Added complexity to geospatial analysis

Results & Discussion

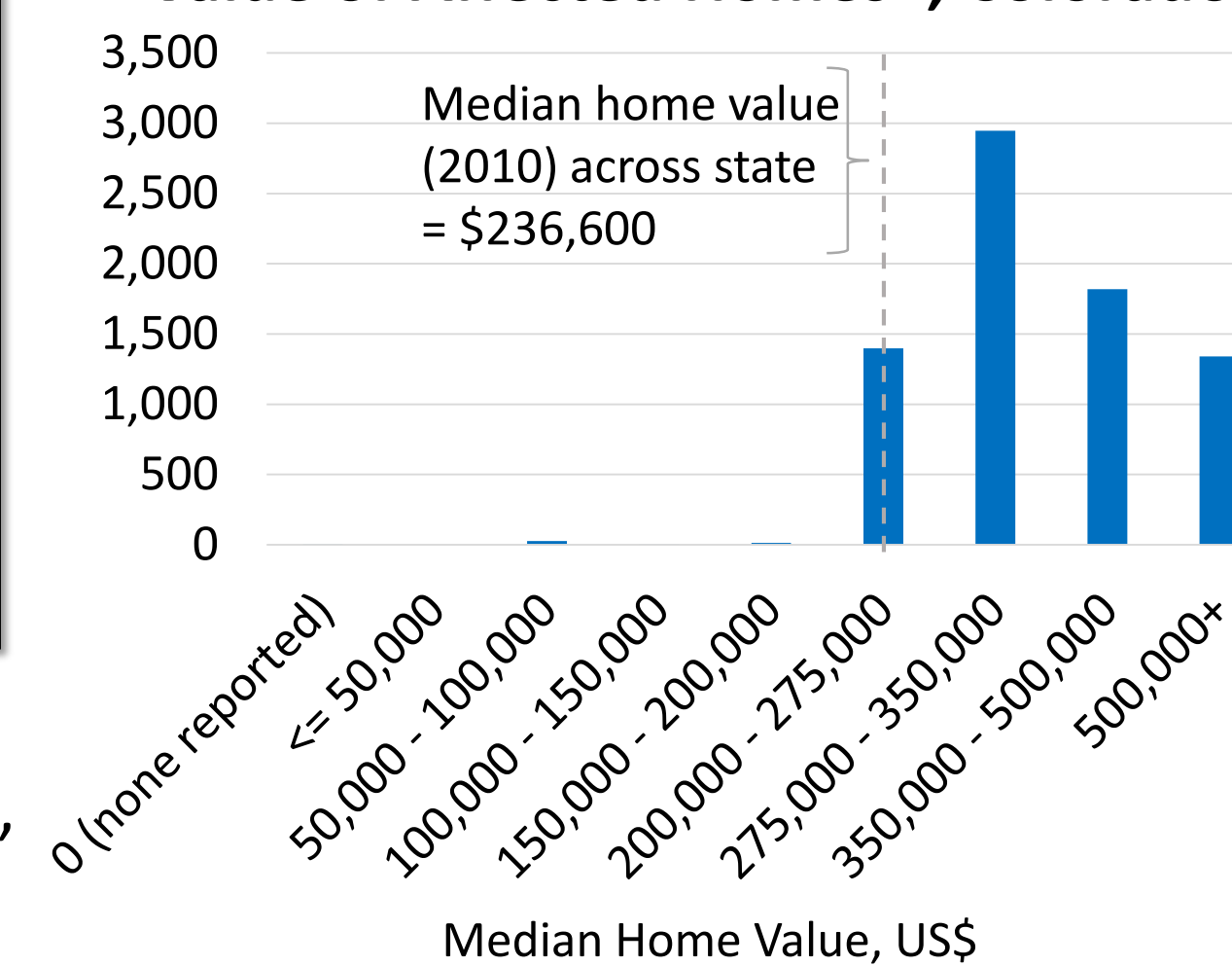
- Similar numbers of homes affected in each state
- Many more "vacant" homes in Colorado: second homes, vacation homes (?)

Number of Homes Affected



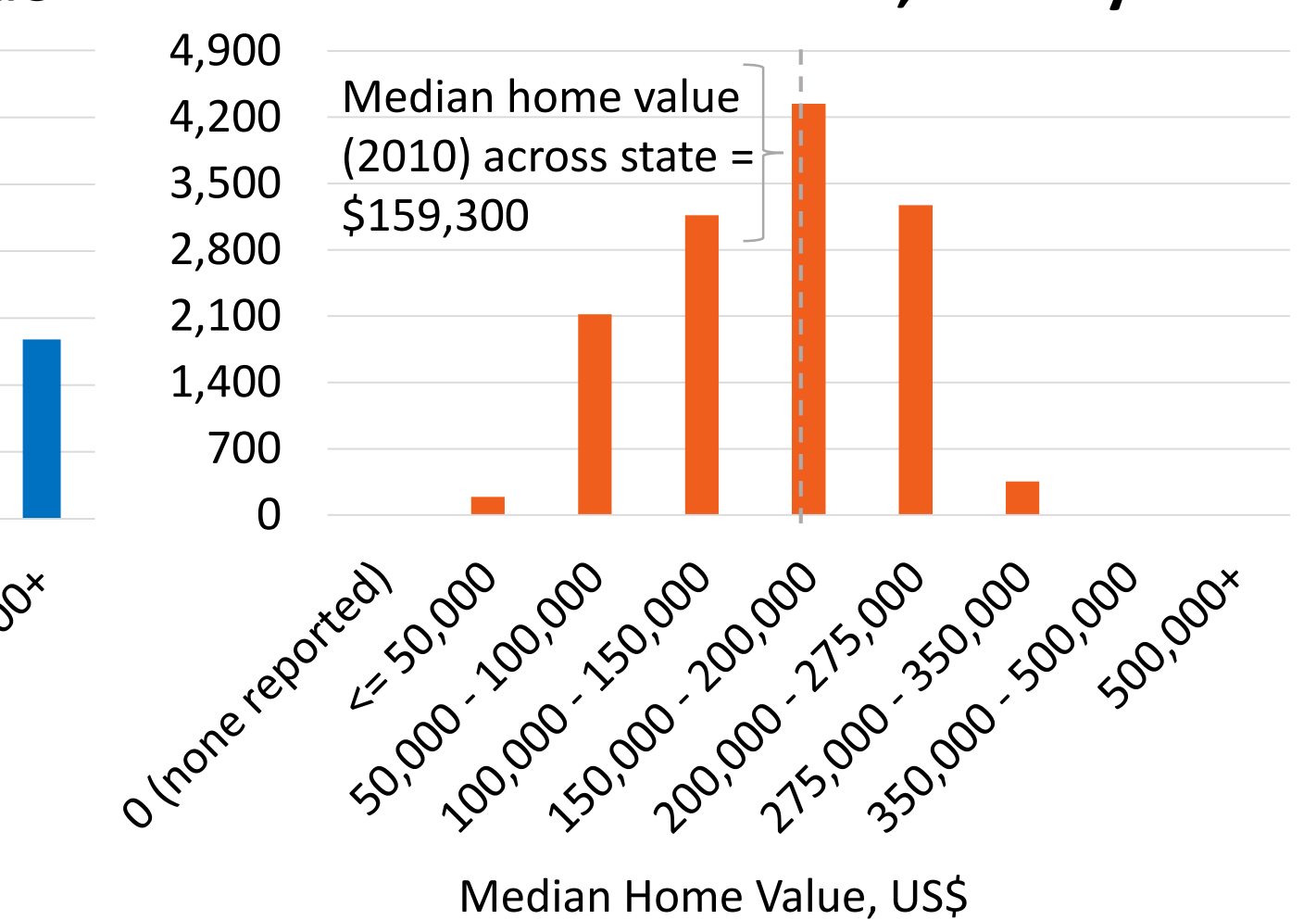
Greater percentage of affected homes* in Colorado above state-level median home value than in Pennsylvania

Value of Affected Homes*, Colorado

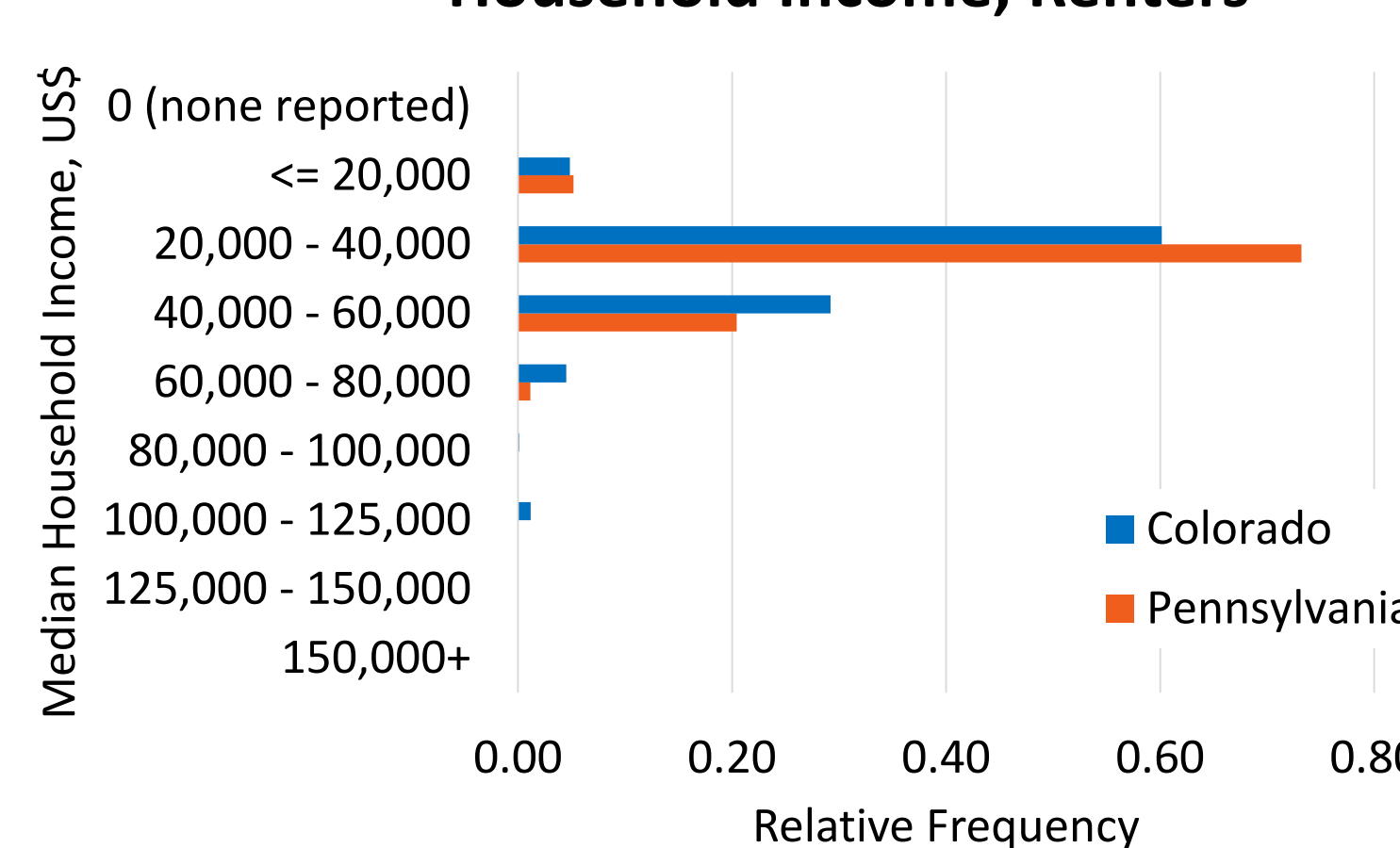


*values of owner-occupied homes only (N=7,550 in CO, N=13,443 in PA)

Value Of Affected Homes*, Pennsylvania

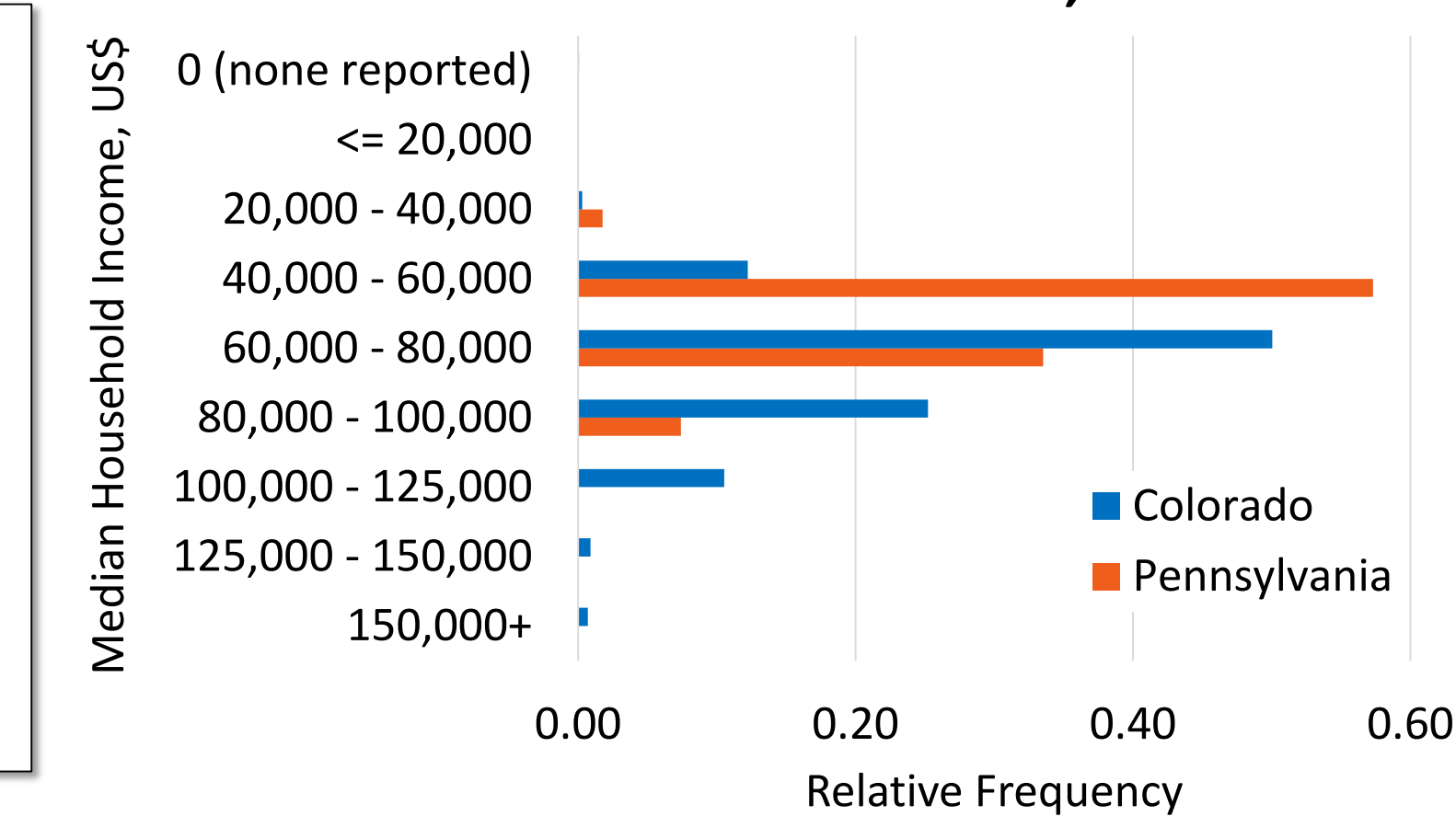


Household Income, Renters



Similar incomes of renters but not owners (higher in Colorado)

Household Income, Owners



- Analysis revealed some noteworthy socioeconomic differences between households affected by the two pests
- However, the pests have qualitatively different kinds of impacts on trees (bark beetle vs. defoliator), and only analyzed one state for each, so results should be interpreted cautiously
- Nevertheless, this sort of information could be useful for targeting pest responses and addressing issues of environmental equity