

# Mapping US Local Food Systems

the impacts of diet on US foodsheds

Julie Kurtz, Christian Peters, Peter Woodbury

**Tufts**  
UNIVERSITY

GERALD J. AND DOROTHY R.  
Friedman School of  
Nutrition Science and Policy

Cornell  
**CALS**  
College of Agriculture  
and Life Sciences

The background of the slide features a soft-focus photograph of a rural landscape with green and brown agricultural fields under a clear sky. Overlaid on this image is a faint, light-blue outline map of the United States, which serves as a backdrop for the text.

# Acknowledgments

Elena Naumova, Tufts Friedman School of Nutrition Science and Policy

Sumeeta Srinivasa, Tufts School of Urban & Environmental Planning

John Vanderhide, Institute for Health Metrics and Evaluation

Tania Alcaron, Tufts School of Engineering

## **Funding**

Tufts School of Medicine and Public Health

Tufts Friedman School of Nutrition Science and Policy



# Outline

- Research Questions
- Calculating Land Requirements
- 6 Diet Scenarios
- U.S. Findings
  - Regional Self-Sufficiency
  - Foodshed Size
  - Perennial & Grazing Land Teaser
- Limitations & Discussion



# Research Questions

- **If all food were local, how far would food need to travel to satisfy the entire contiguous US population?**
- **How do the different variables (diet type, land productivity, available cropland, population) impact the number of people the US land base can feed and the distance food must travel?**



# Working Backwards: from Fork to Farmland

---

## Example: Leaf lettuce

Intake		Preferences		Composition		Losses and conversions	
0.5 servings leafy green vegetables	×	60% of consumption from leaf lettuce	×	42 g per serving	×	2.0 units grown / unit eaten	=

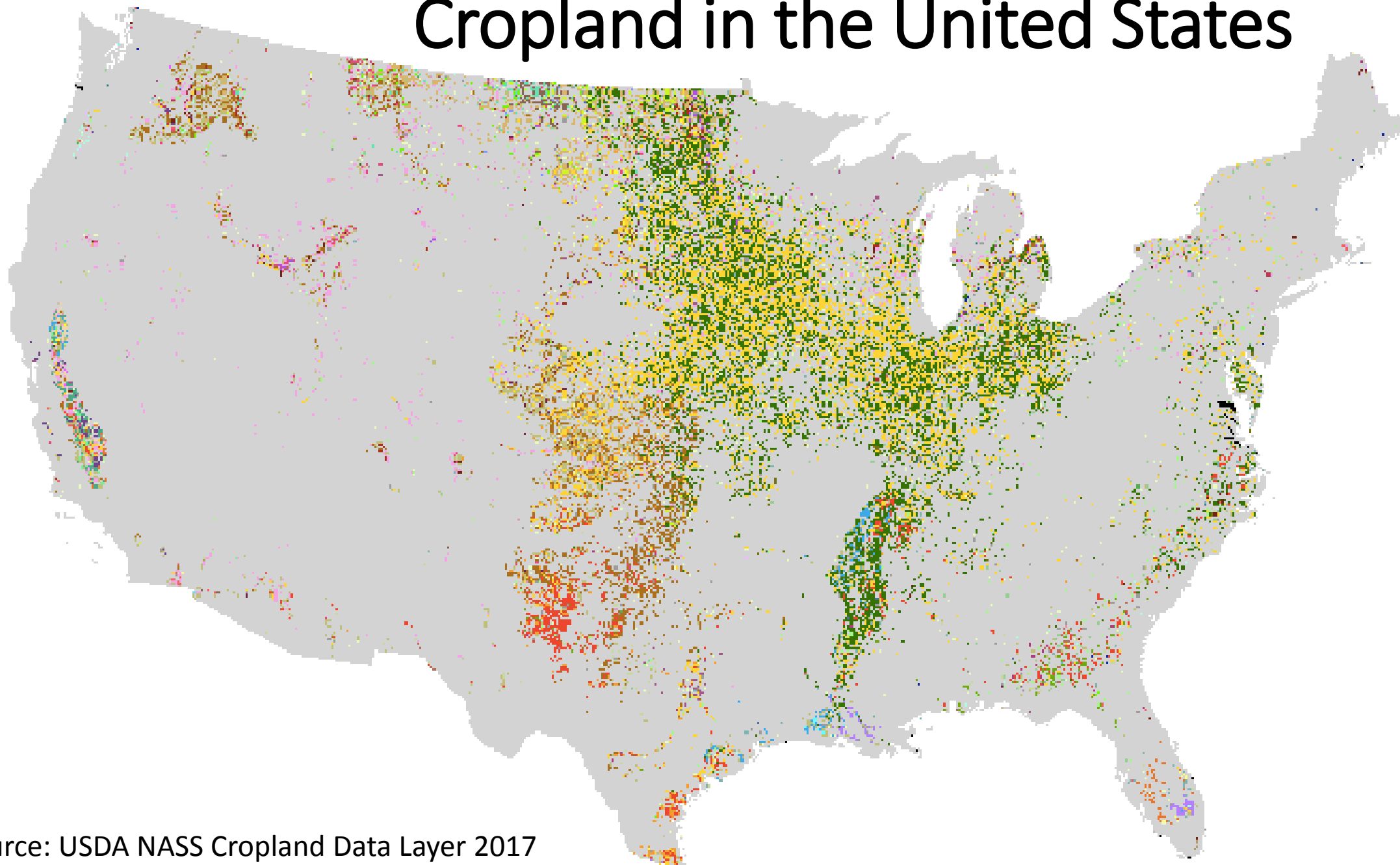
Crop need		Crop yields		Land needs (per capita)
26 g /day (21 lbs/yr)	÷	26,600 lbs/acre	=	0.0007 acres

# Six Complete Diet Scenarios

	<u>Land Needs</u> (hectares)	<u>Total Energy</u> (kcal/day)	<u>Protein</u> (g/day)	<u>Fat</u> (g/day)	<u>Carbohydrate</u> (g/day)
US Baseline	0.175	2,844	93.0	119.0	363.1
Positive Control	0.152	2,153	91.9	80.0	272.6
80% Omnivorous	0.142	2,153	86.5	72.0	301.4
20% Omnivorous	0.123	2,153	78.9	71.0	315.4
Ovolacto Vegetarian	0.120	2,153	77.5	70.5	320.1
Vegan	0.129	2,153	74.0	65.8	336.2

*Based on calculations from the US Foodprint Model, Peters et al. 2016*

# Cropland in the United States



500 km  
200 mi

Source: USDA NASS Cropland Data Layer 2017

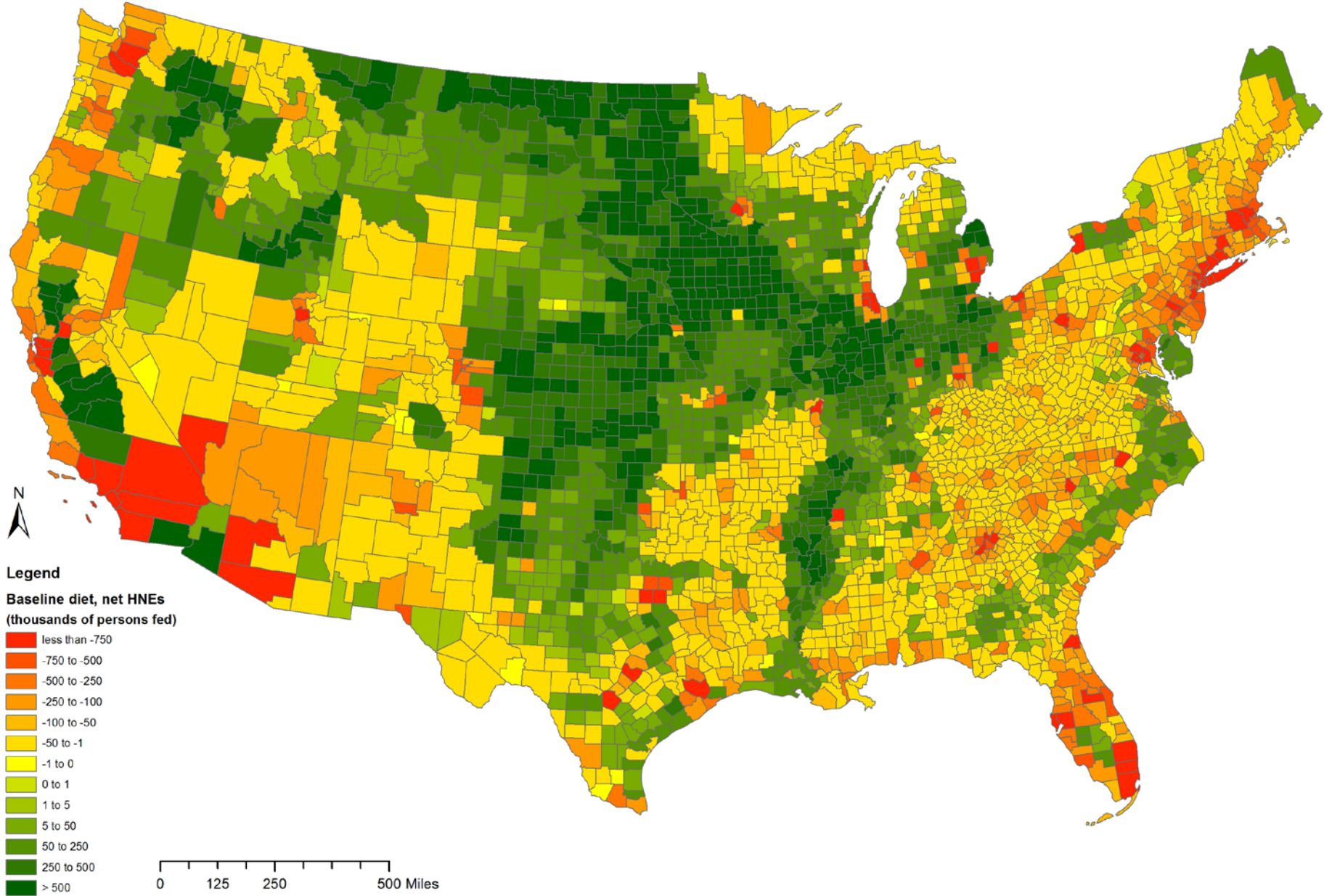


# Calculating Net Producer/Consumer Counties

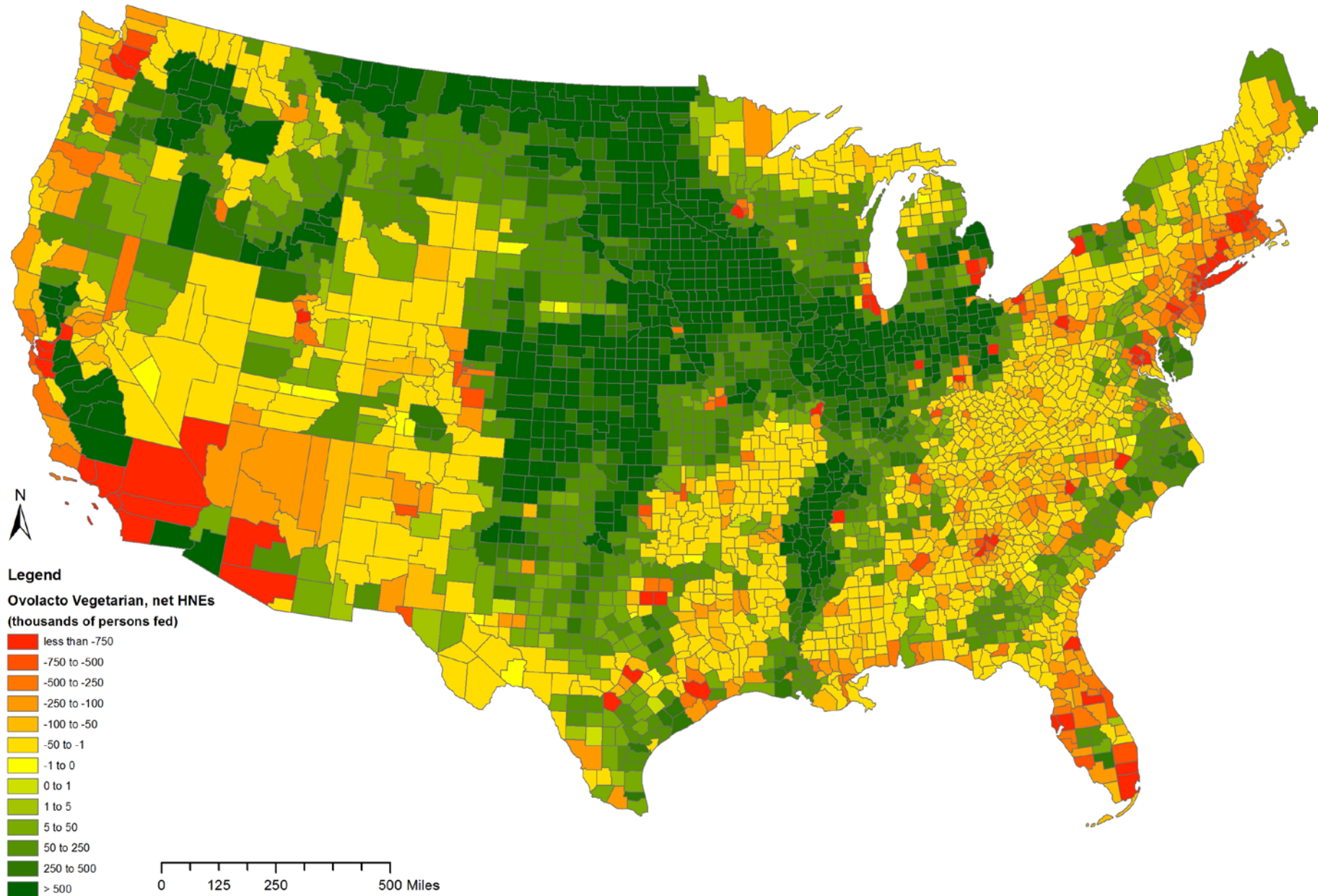
Production – Consumption = Degree of Self-Sufficiency

$$\text{Available Cropland (by county)} - \left( \frac{\text{Land Requirement (per capita)}}{\text{Local Productivity}} \times \text{Population (by county)} \right)$$

# Net number of persons fed (net HNEs) by county, Baseline diet



# Net number of persons fed (nethHNEs) by county, Ovolactarian diet



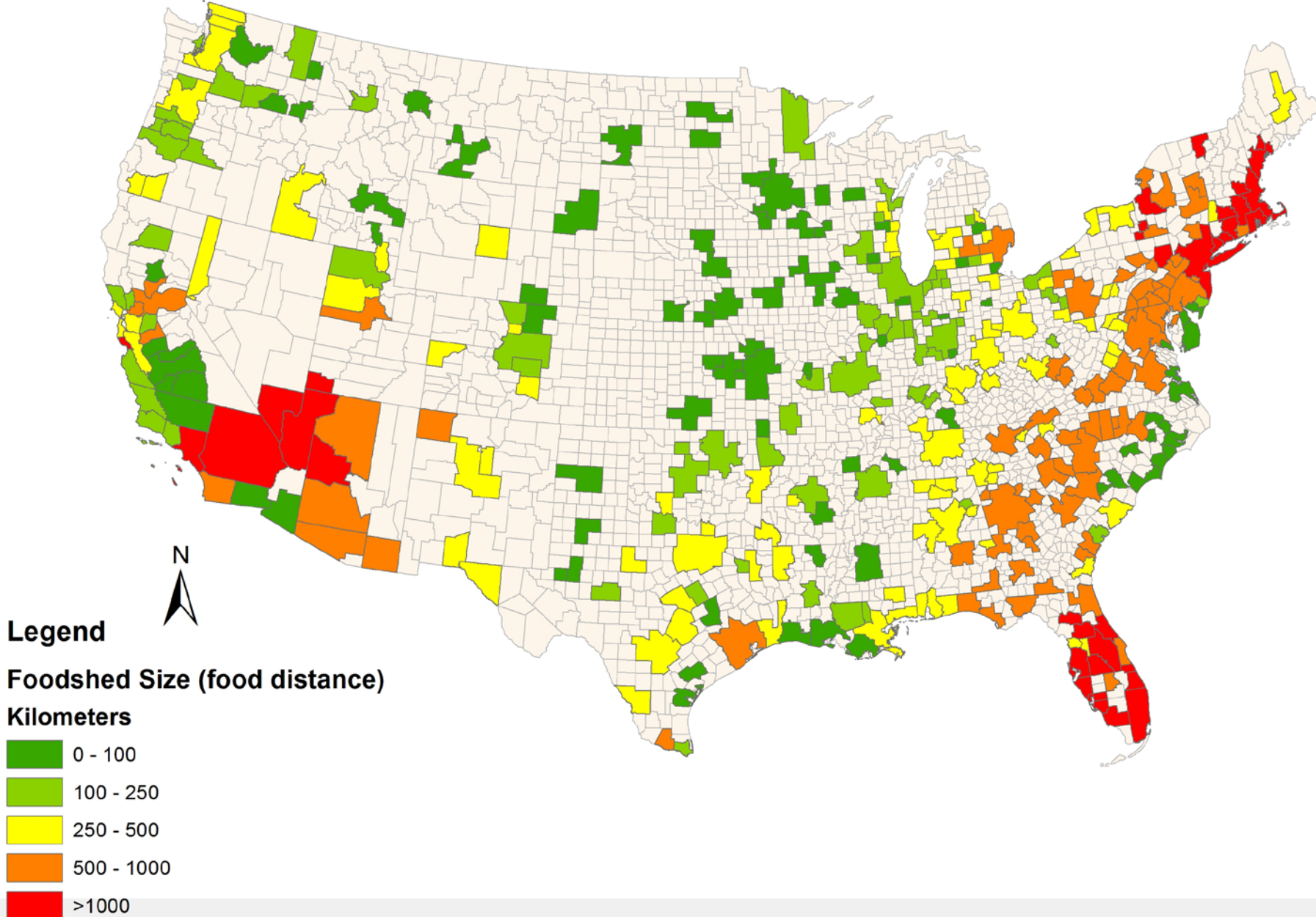


# Defining a Foodshed

**Foodshed:** the surrounding area required to feed a population center. It captures the essence of natural resources flowing toward a gravitational center...

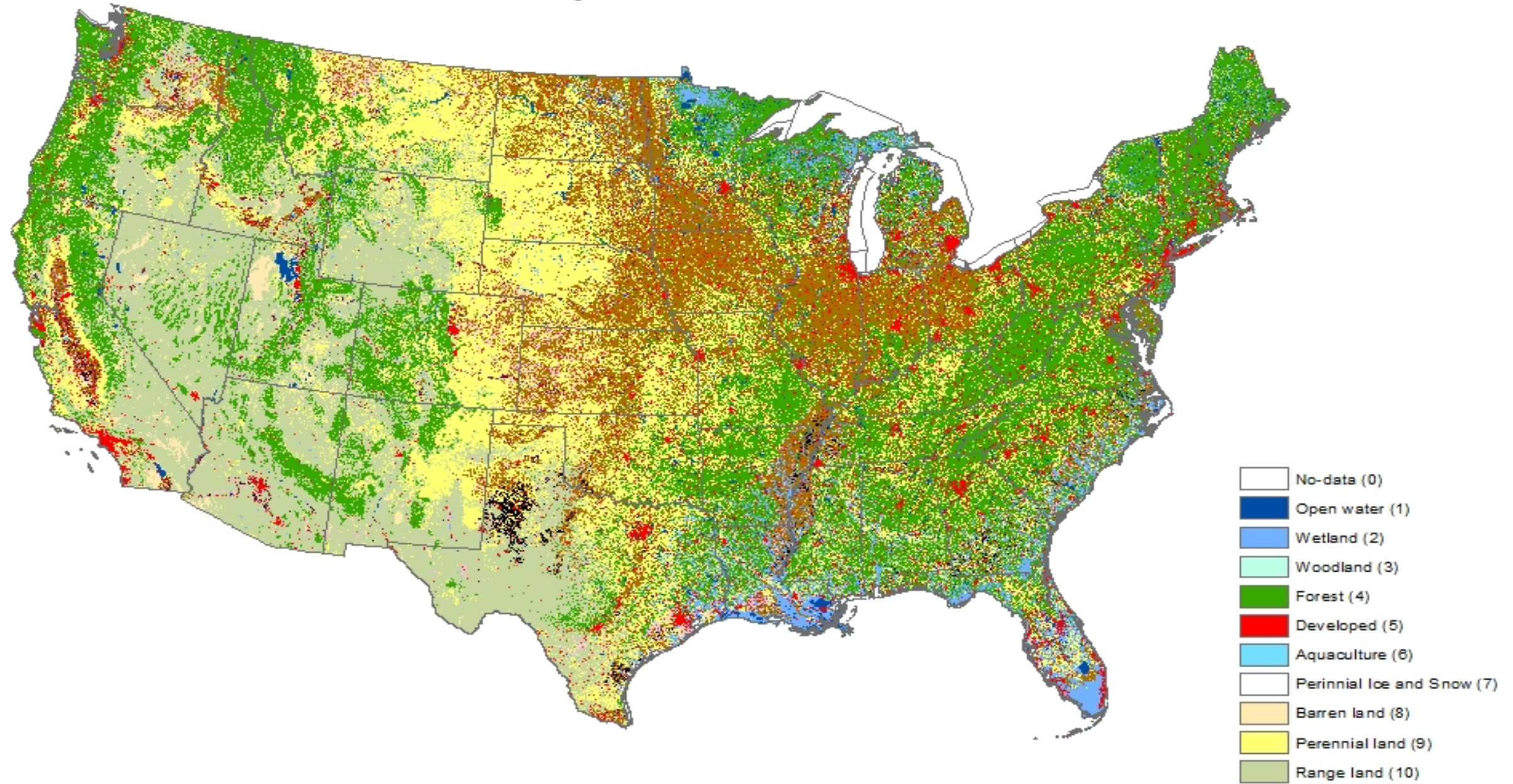


# Weighted Average Source Distance, US Metropolitan Consumption Zones



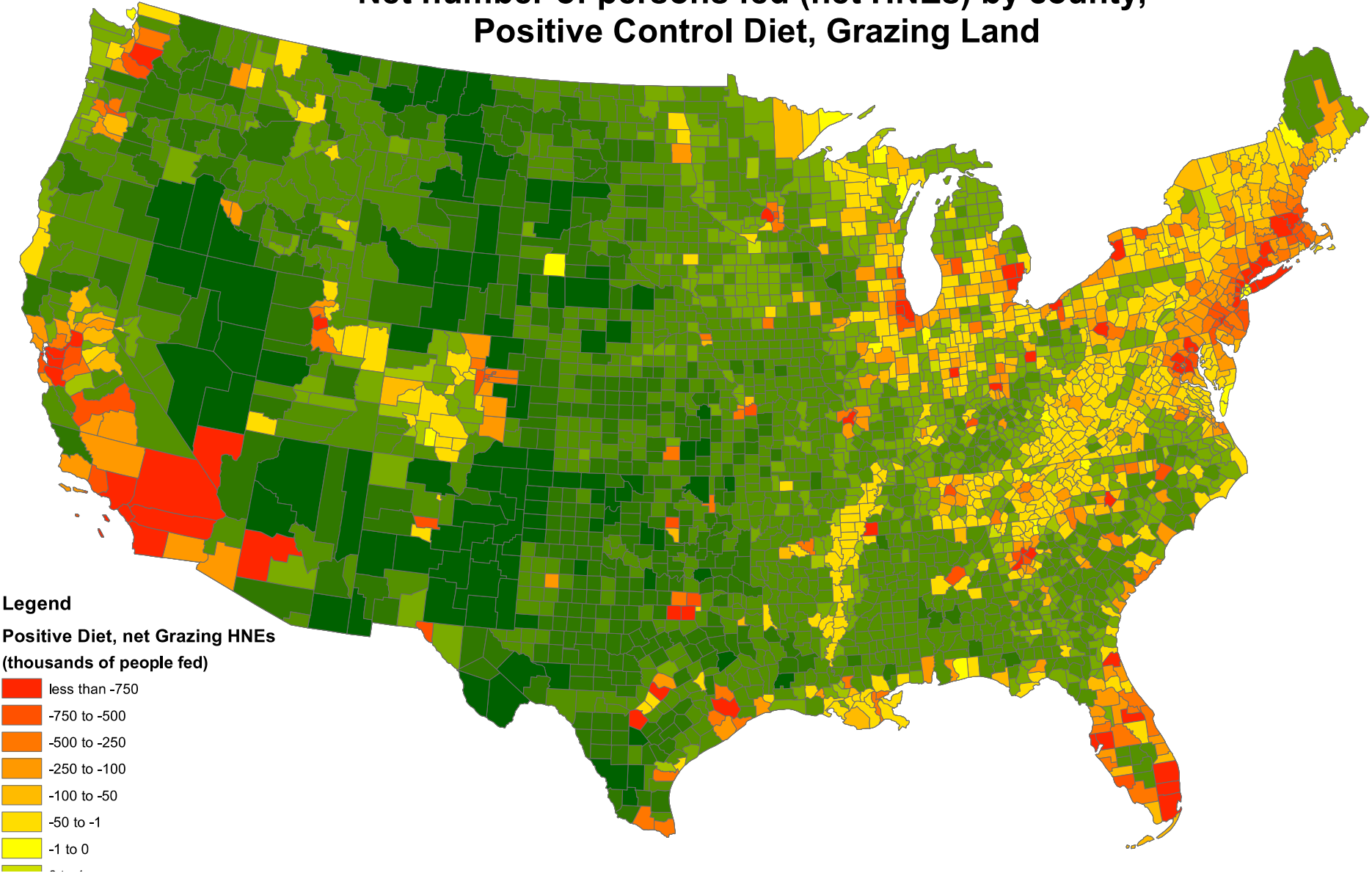


# Grazing & Perennial Land





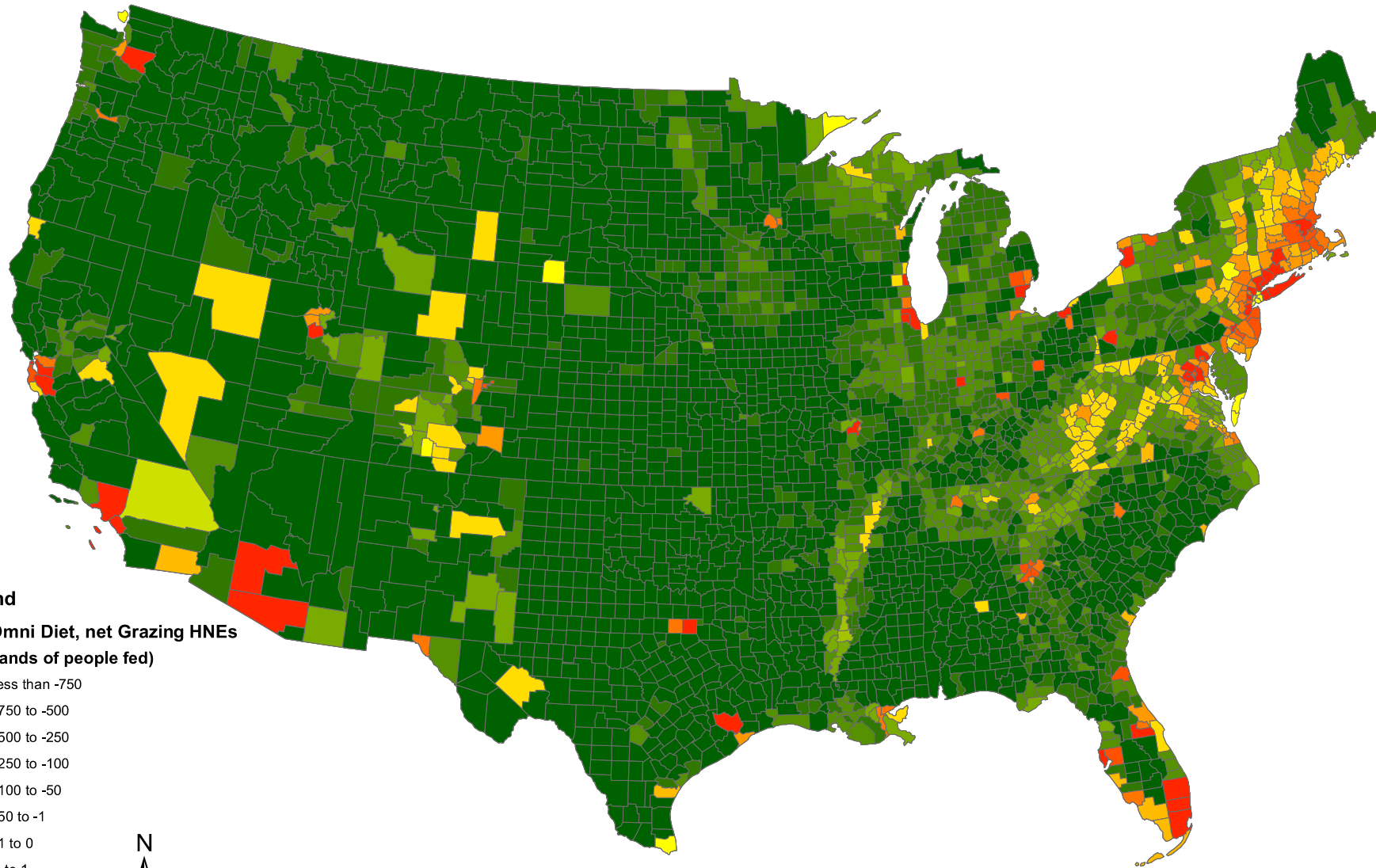
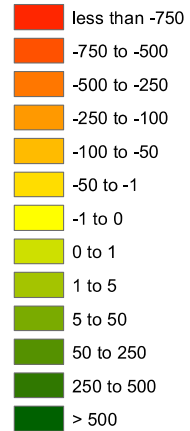
# Net number of persons fed (net HNEs) by county, Positive Control Diet, Grazing Land



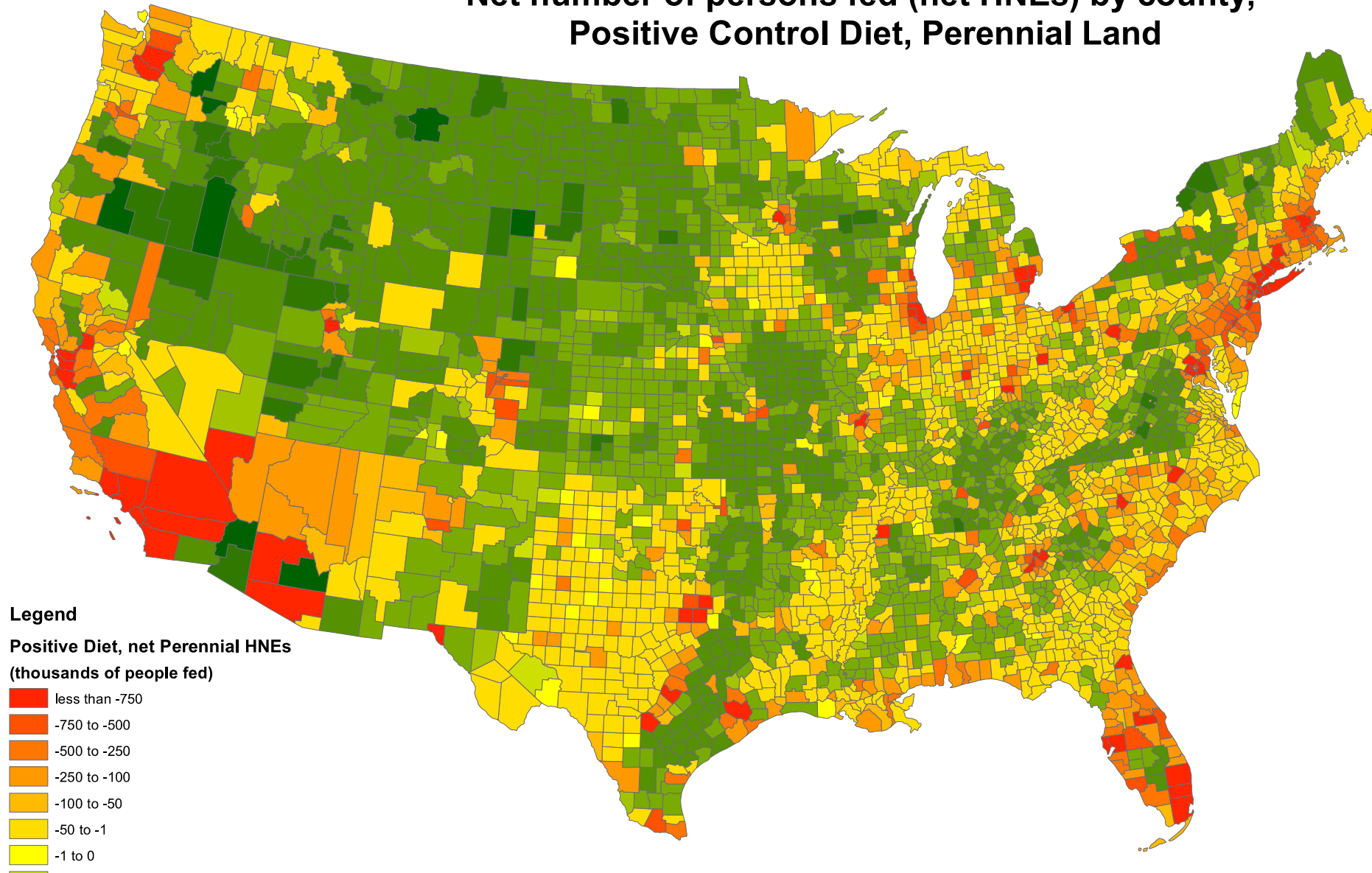
# Net number of persons fed (net HNEs) by county, 20% Omnivorous Diet, Grazing Land

## Legend

20% Omni Diet, net Grazing HNEs  
(thousands of people fed)

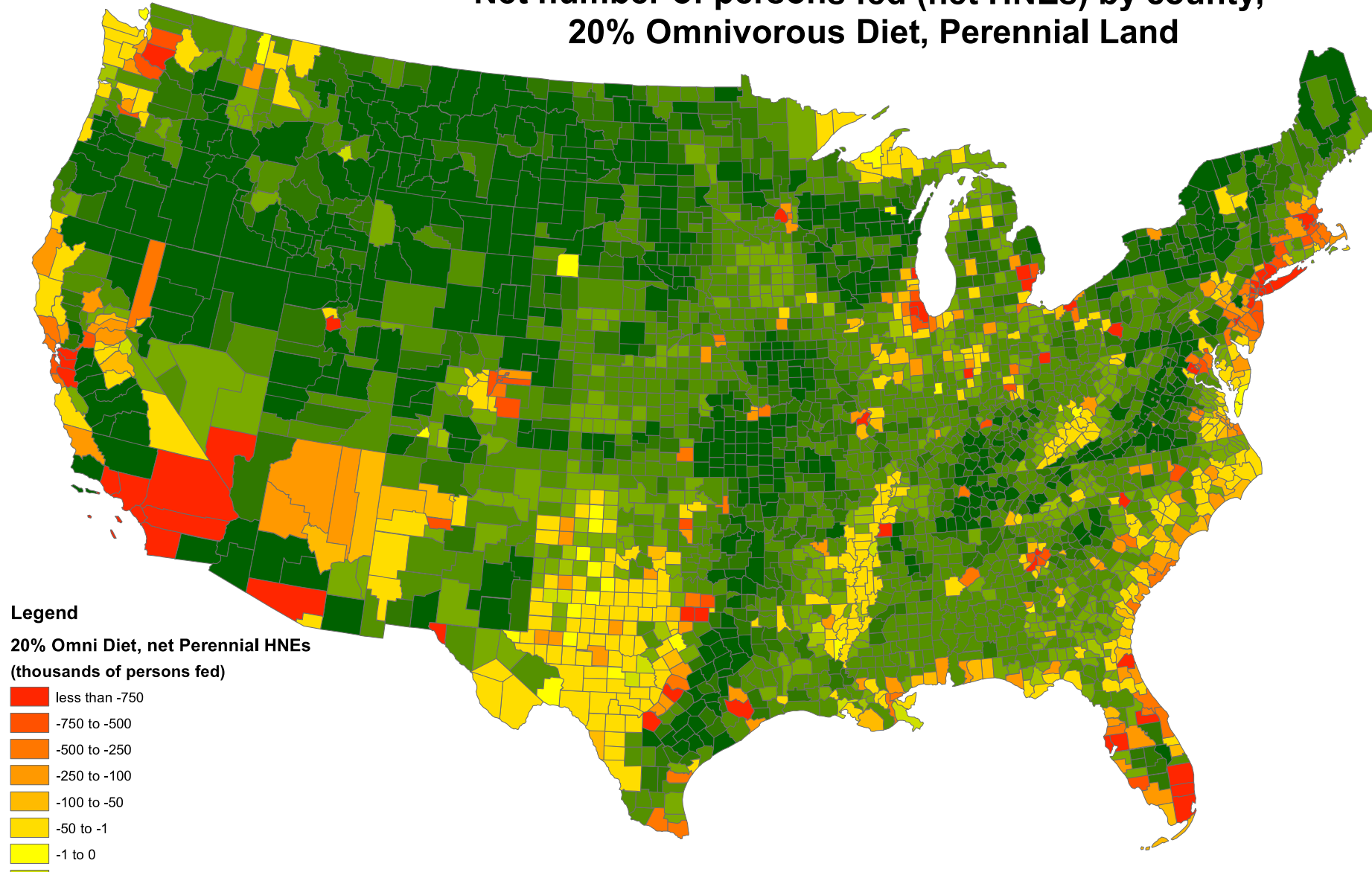


# Net number of persons fed (net HNEs) by county, Positive Control Diet, Perennial Land





# Net number of persons fed (net HNEs) by county, 20% Omnivorous Diet, Perennial Land



# Limitations & Discussion

## **LIMITATIONS**

- Assume conventional management and livestock practices
- No economic or distributional considerations
- Spatial data errors, and may overlook small and peri-urban farms

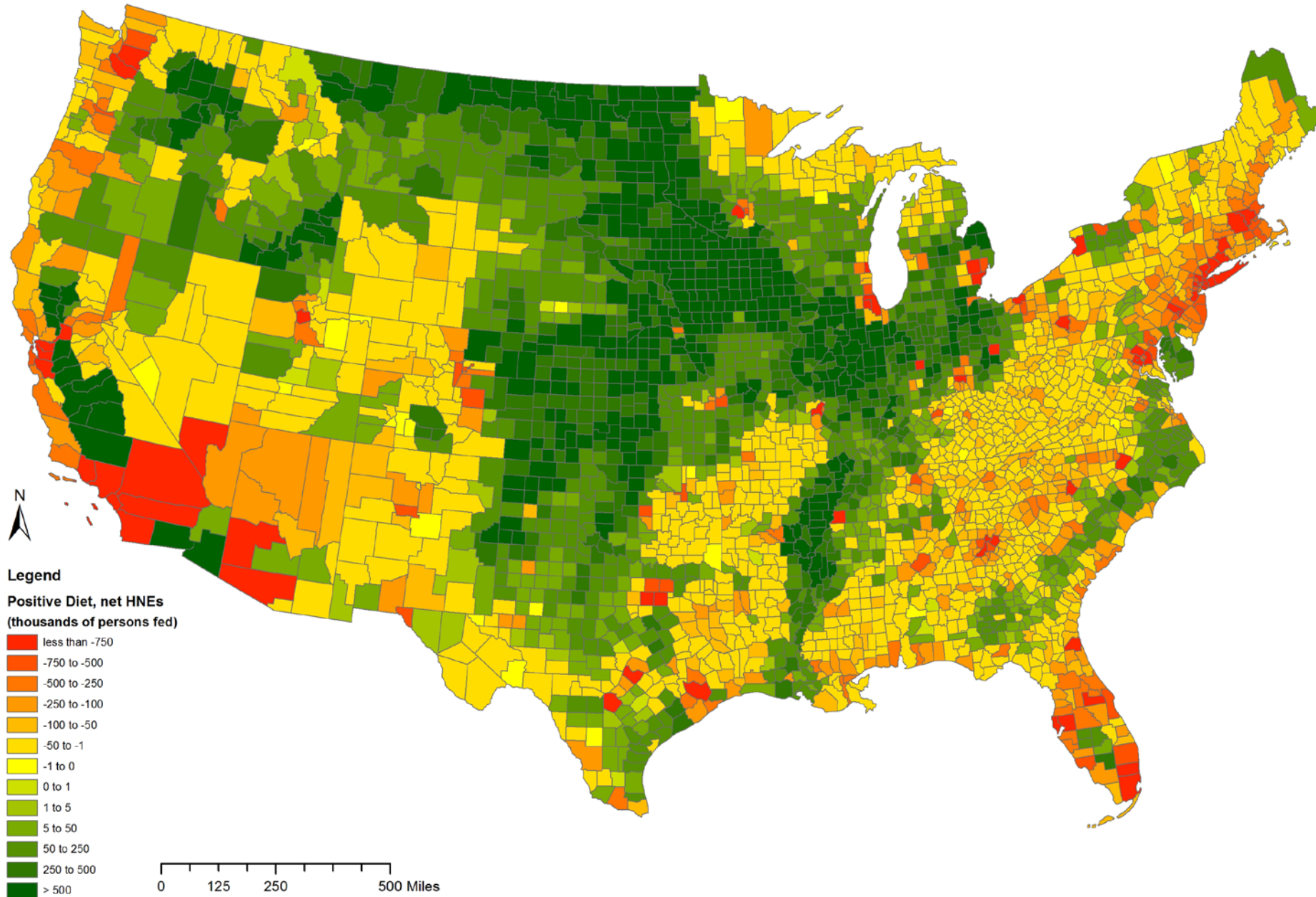
## **DISCUSSION**

- Appropriate expectations for a local diet?
- Changing the diet doesn't change the overall pattern
- Largest opportunities, based on land quality and regional diets



Thank You!

# Net number of persons fed (net HNEs) by county, Positive control diet

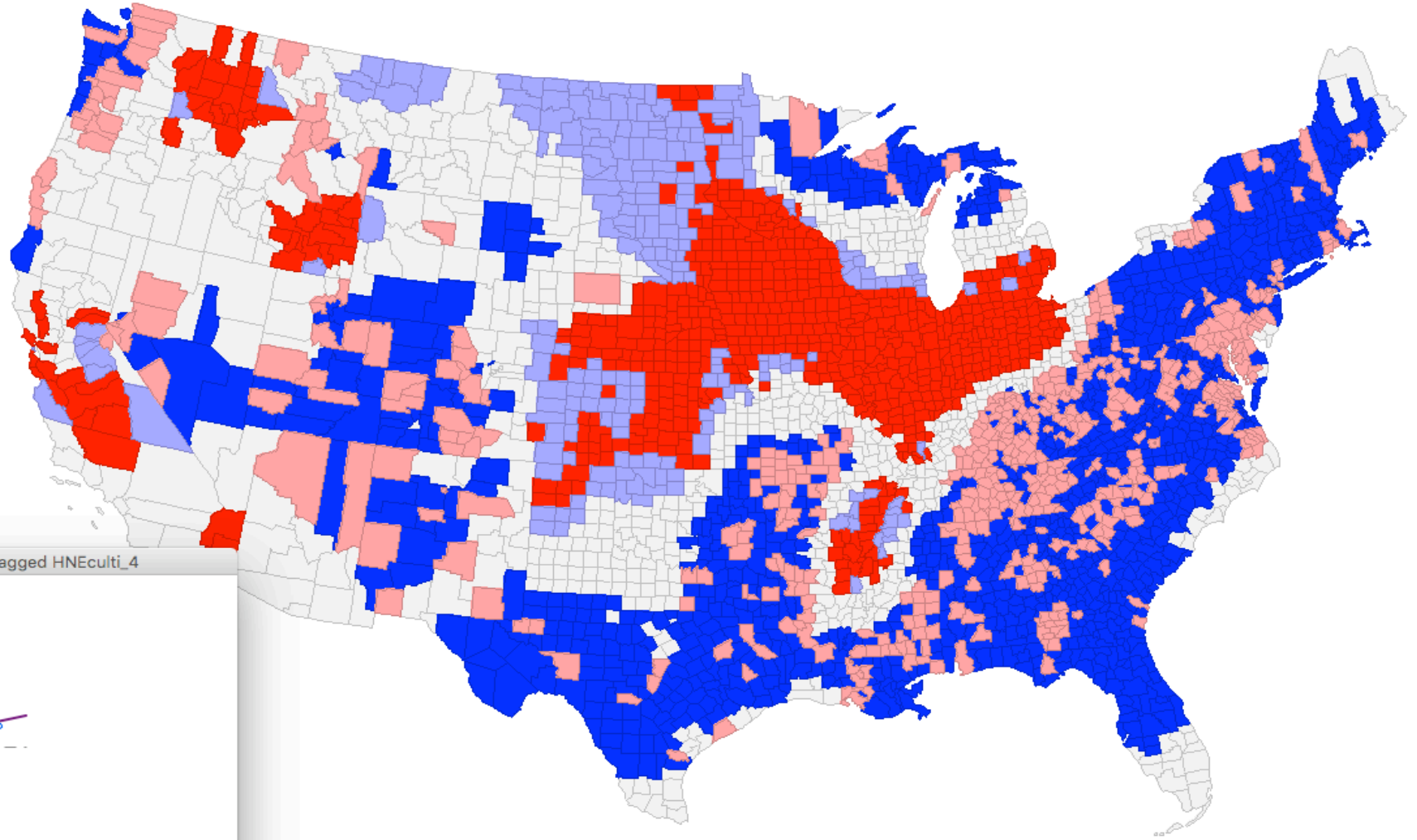




# Clustering of Productivity & Food Production

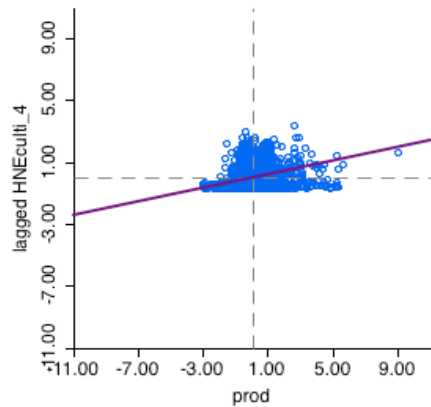
BiLISA Cluster Map: counties\_dist-thresh, prod w/ HNEculi\_4 (9)

- Not Significant (660)
- High-High (616)
- Low-Low (1077)
- Low-High (226)
- High-Low (529)



Bivariate Moran's I (counties\_dist-thresh): prod and lagged HNEculi\_4

Moran's I: 0.223003

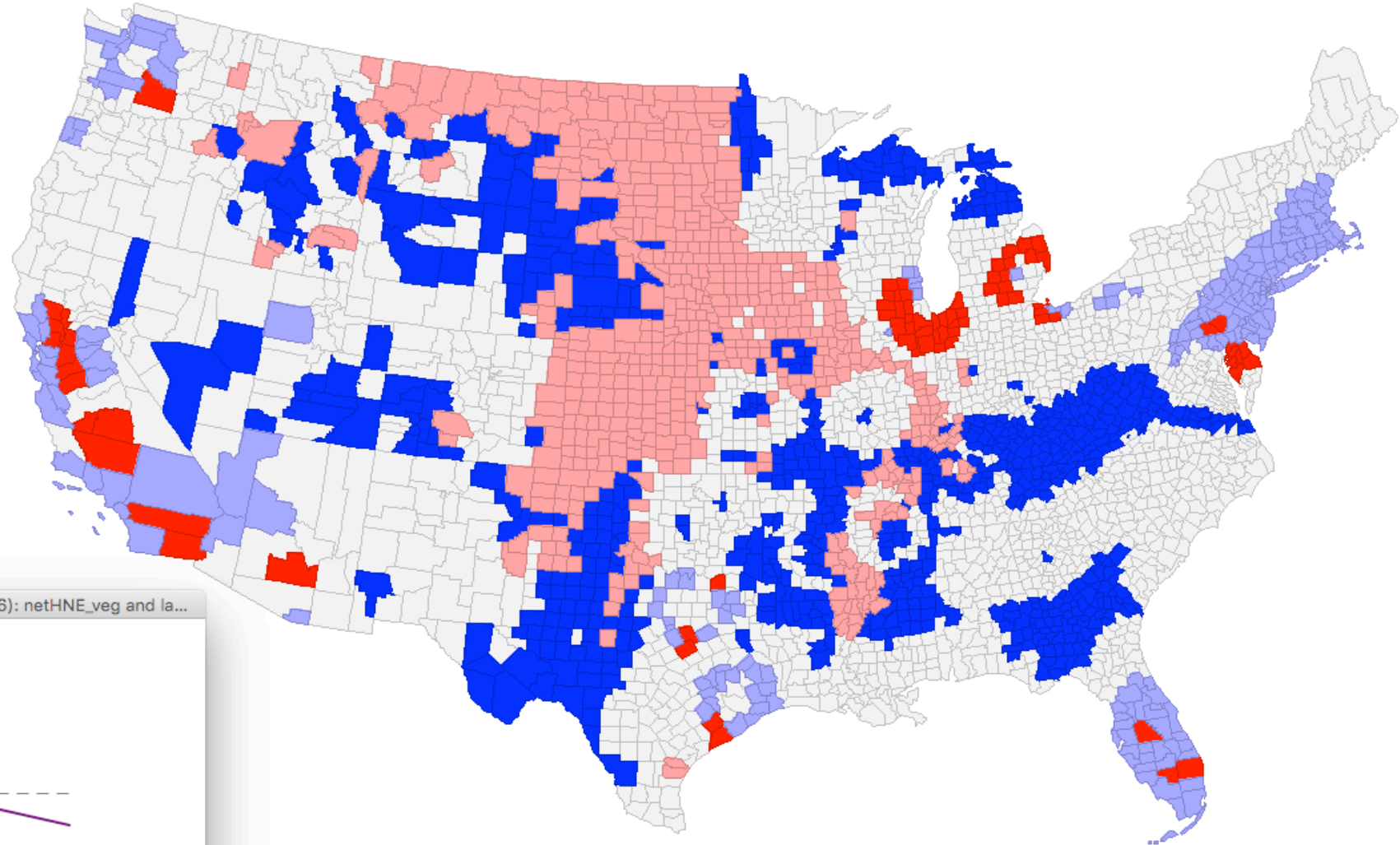




# Clustering of Food Production & Population

BiLISA Cluster Map: counties\_dist-thresh,

- Not Significant (1564)
- High-High (78)
- Low-Low (708)
- Low-High (225)
- High-Low (533)



● Bivariate Moran's I (counties\_nearest6): netHNE\_veg and la...

Moran's I: -0.234694

