Midwest Residential Heating Fuel Use Assessment

Heating the Midwest Conference & Expo
Apr. 24-26, 2013 • Carlton, MN

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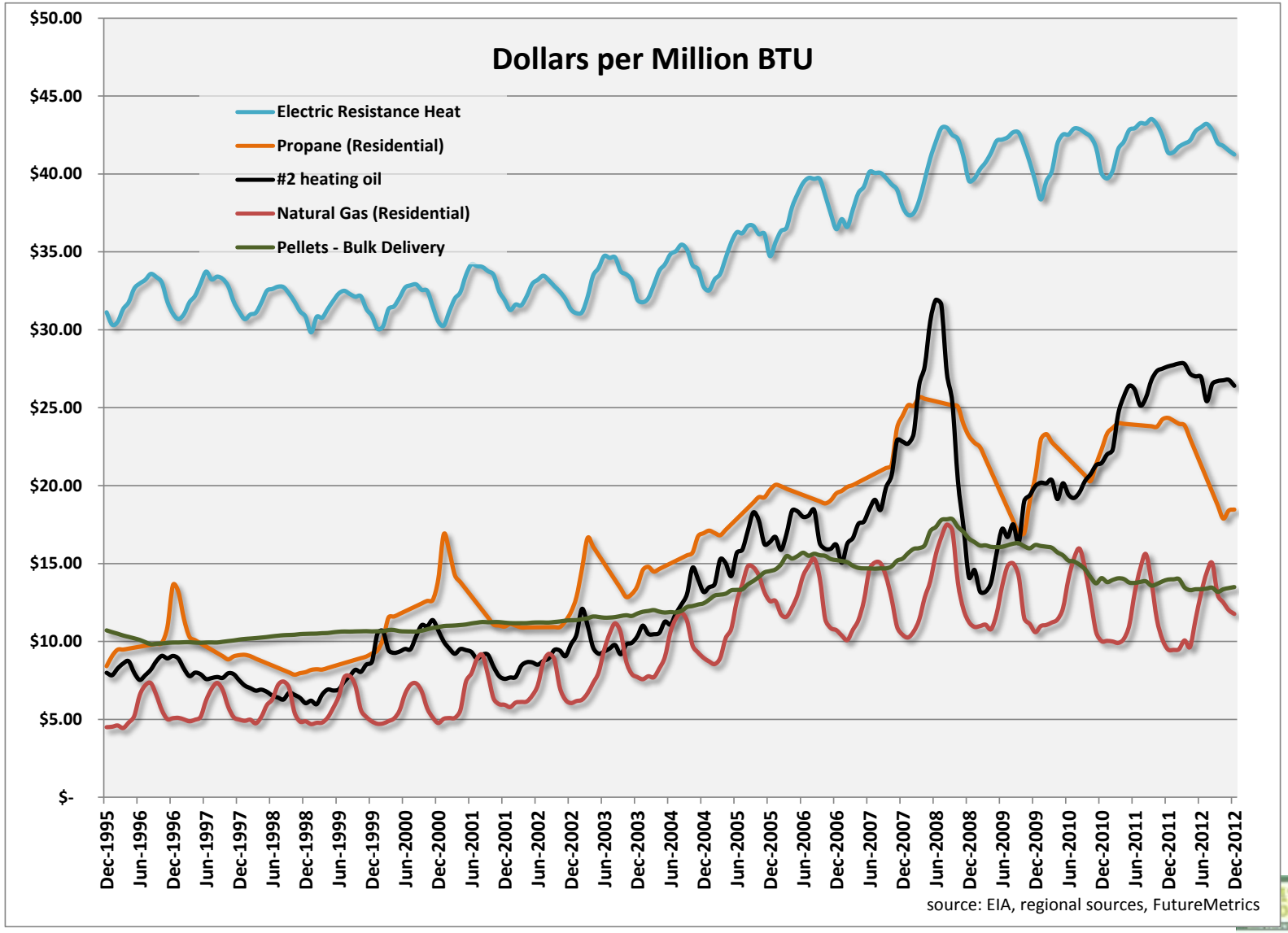
IIRA
Illinois Institute for Rural Affairs

WESTERN ILLINOIS UNIVERSITY

NDSU NORTH DAKOTA STATE UNIVERSITY

Residential heating: The low-hanging fruit of biomass development



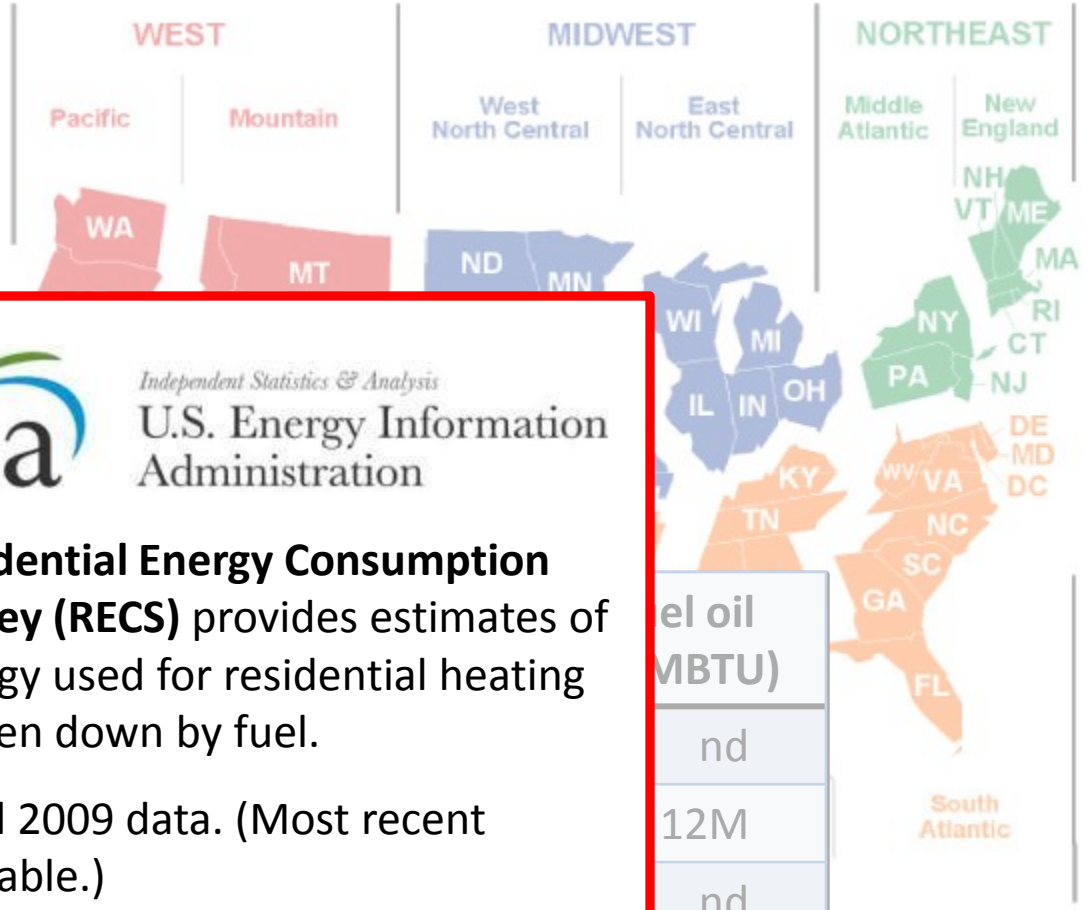
Strauss, 2013

Iutzi *et al.*, 2013

Problem statement

- Developing residential biomass markets involves displacing existing heating fuels.
- Therefore existing heating fuel use is one of the bases for assessing local and regional biomass market potential.
- …but fuel use statistics are usually only reported at the state level.
- So finer-scale numbers could be helpful.

Data



Independent Statistics & Analysis
U.S. Energy Information Administration

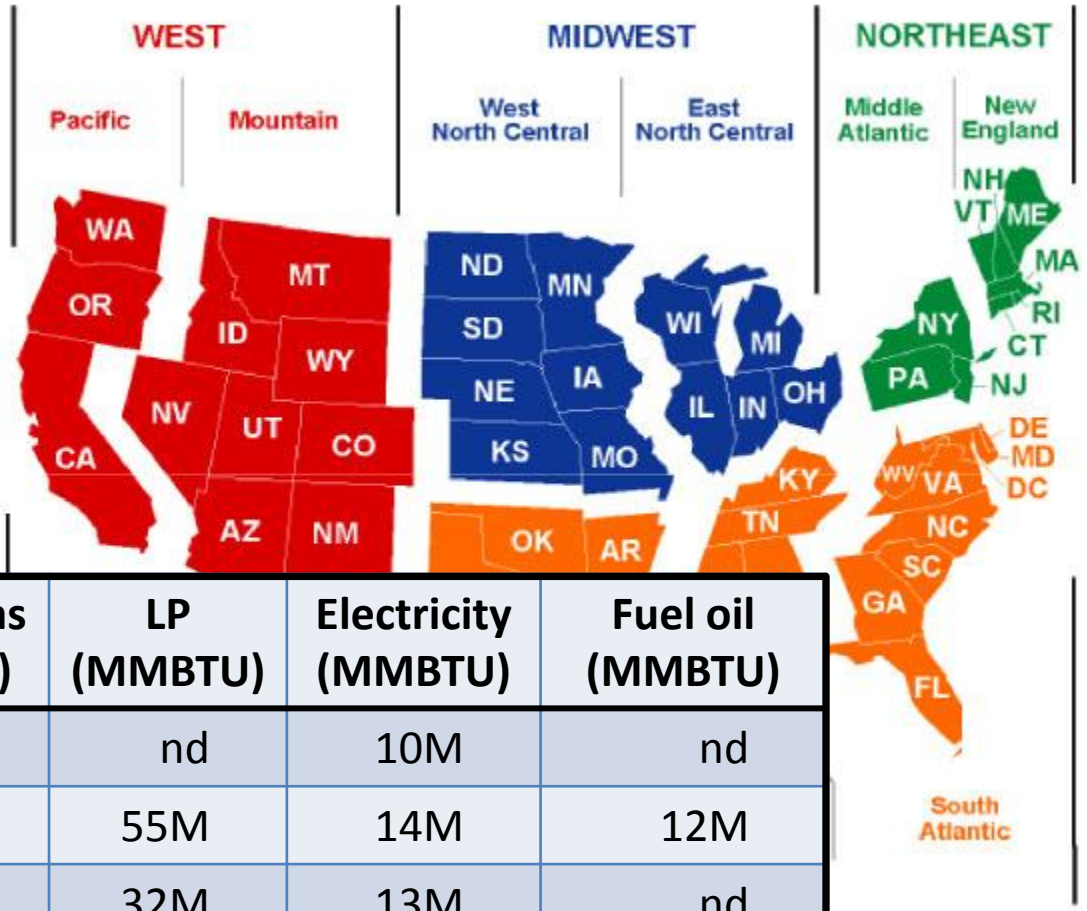
Residential Energy Consumption Survey (RECS) provides estimates of energy used for residential heating broken down by fuel.

Used 2009 data. (Most recent available.)

Geography	N (			el oil MBTU)
IL				nd
IA – MN – ND – SD				12M
IN-OH				nd
KS – NE				nd
MI	225M	24M	6M	nd
MO	68M	16M	13M	nd
WI	106M	12M	4M	8M

Iutzi *et al.*, 2013

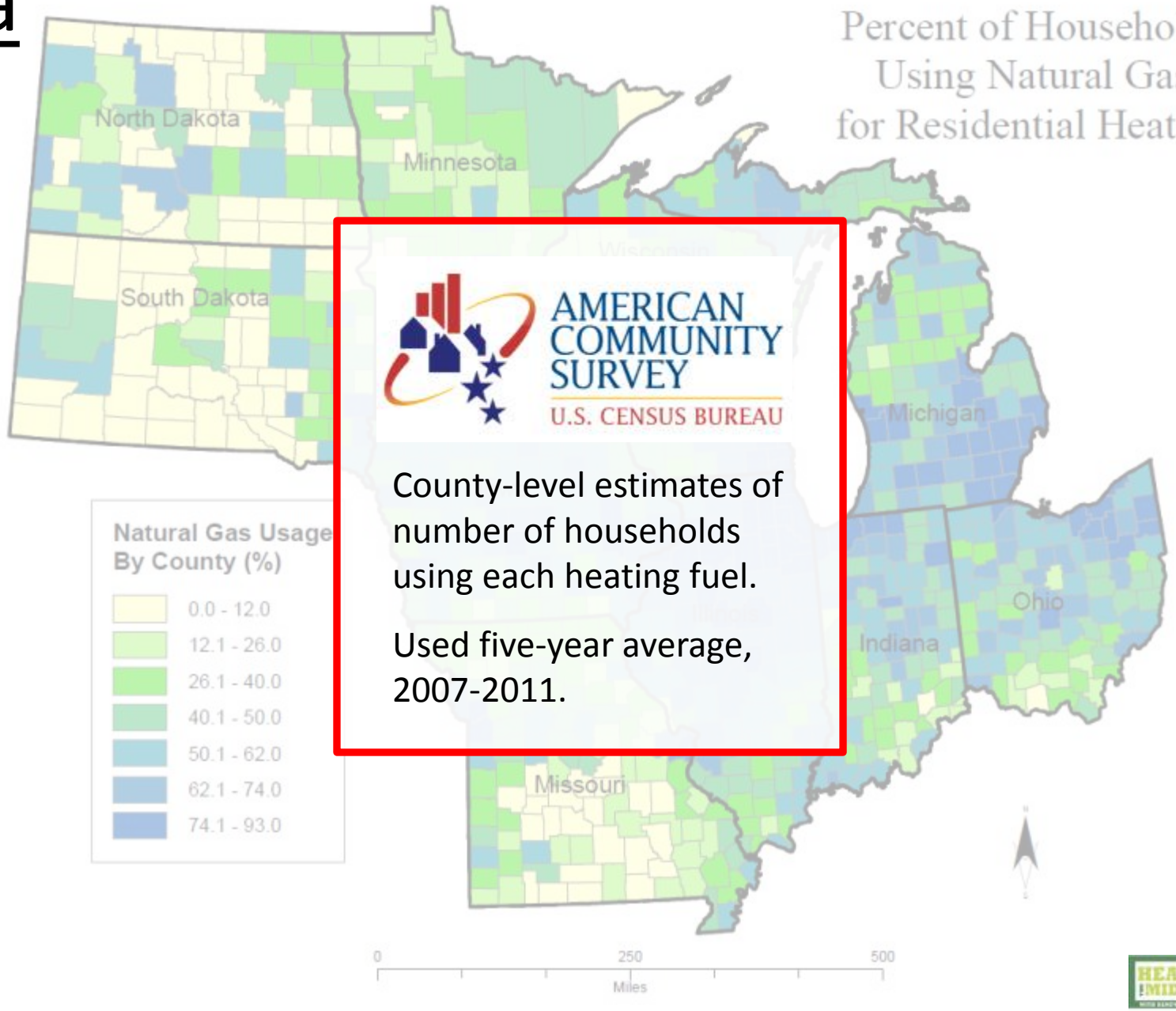
Data



Geography	Natural gas (MMBTU)	LP (MMBTU)	Electricity (MMBTU)	Fuel oil (MMBTU)
IL	289M	nd	10M	nd
IA – MN – ND – SD	158M	55M	14M	12M
IN-OH	296M	32M	13M	nd
KS – NE	77M	nd	6M	nd
MI	225M	24M	6M	nd
MO	68M	16M	13M	nd
WI	106M	12M	4M	8M

Iutzi *et al.*, 2013

Data



AMERICAN COMMUNITY SURVEY
U.S. CENSUS BUREAU

County-level estimates of number of households using each heating fuel.

Used five-year average, 2007-2011.

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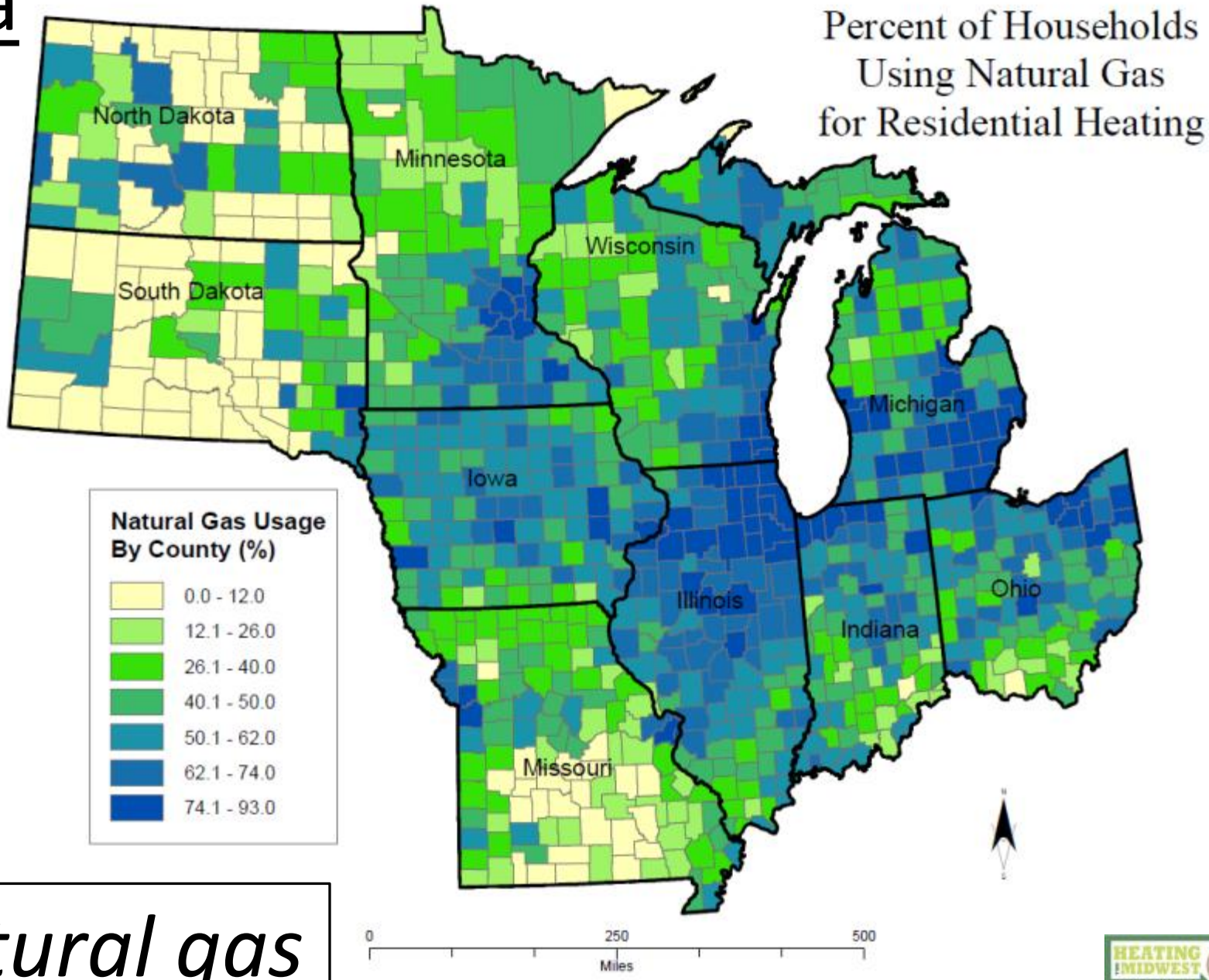
Data



Natural gas

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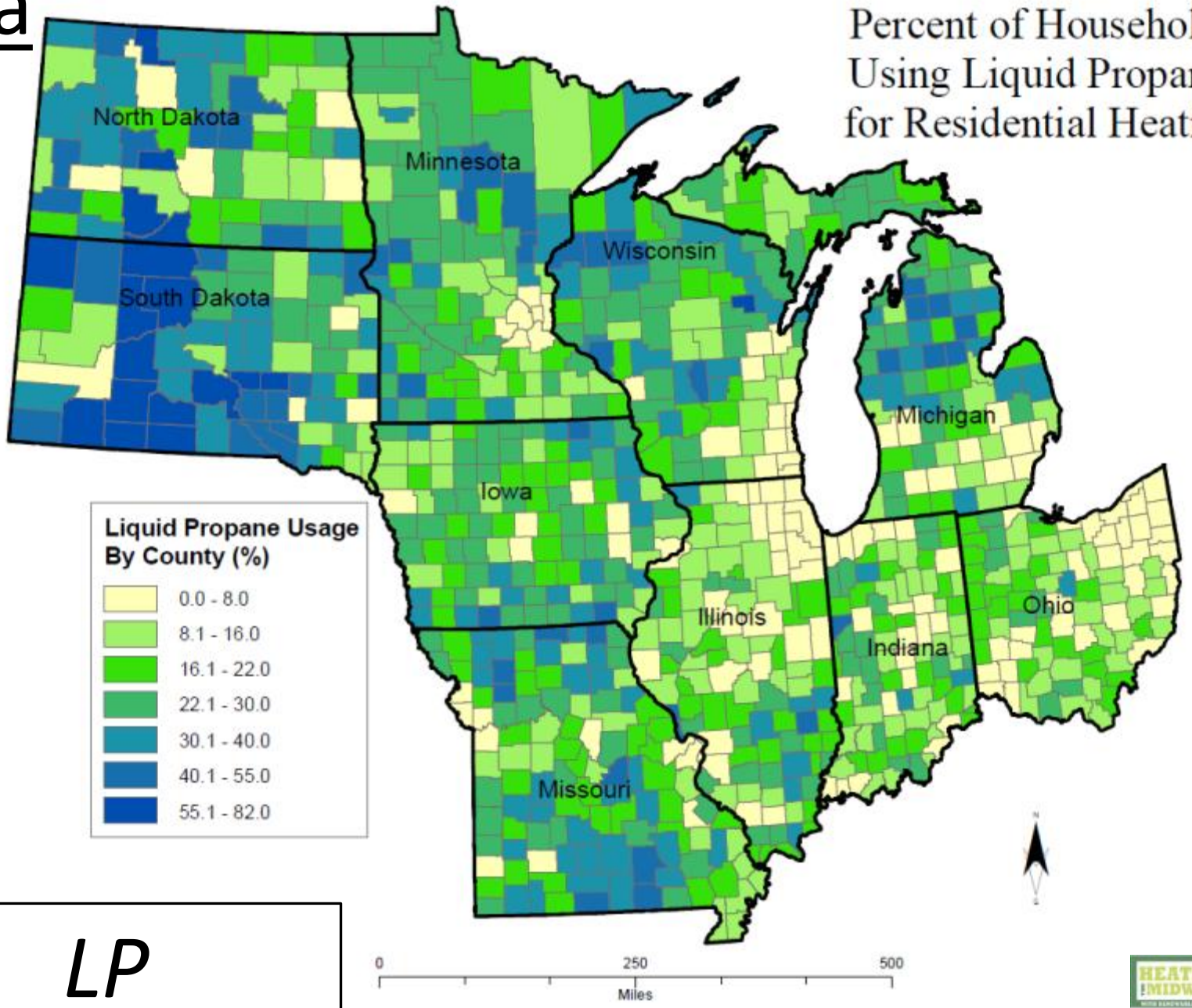
Data



LP

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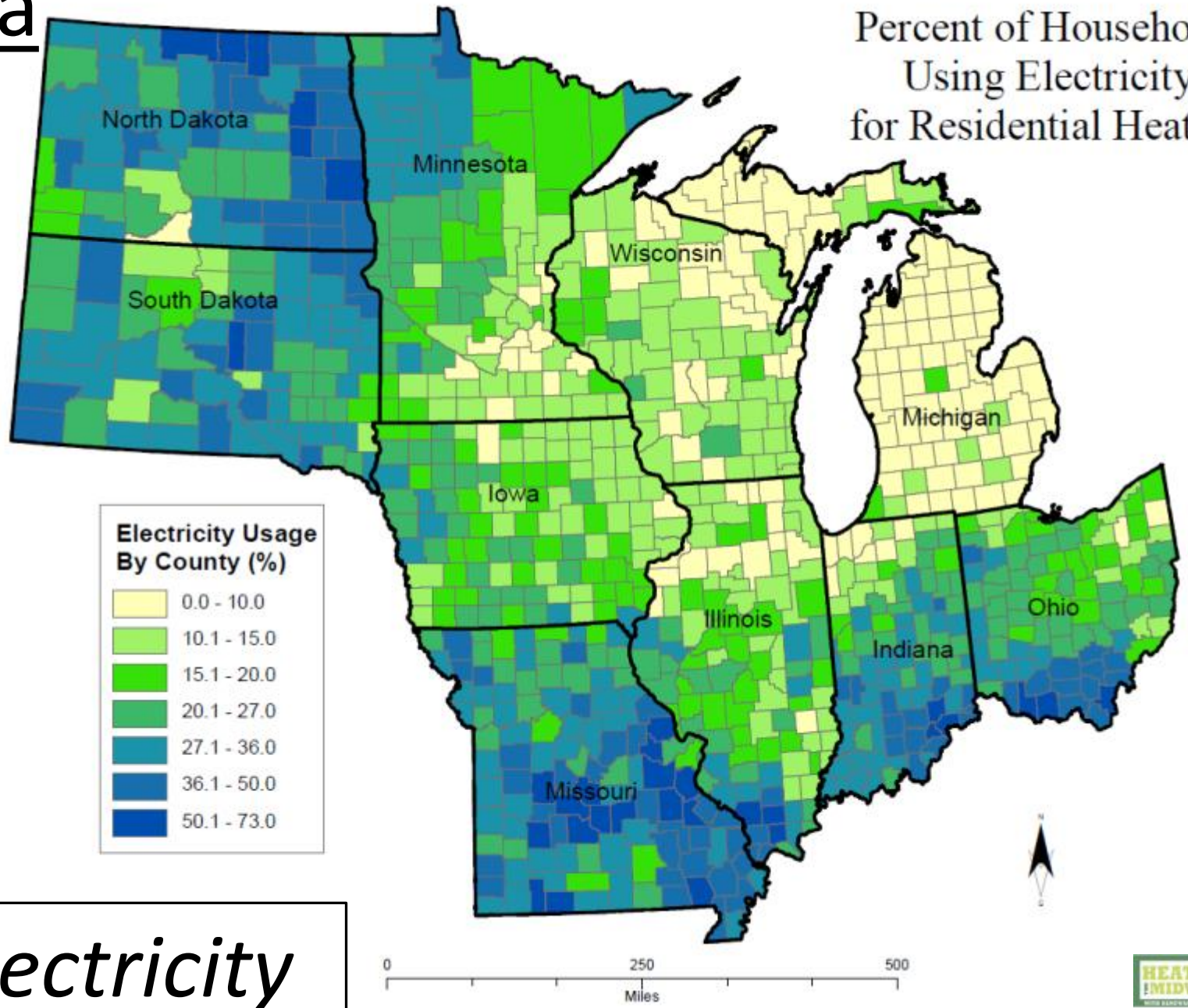
Data



Electricity

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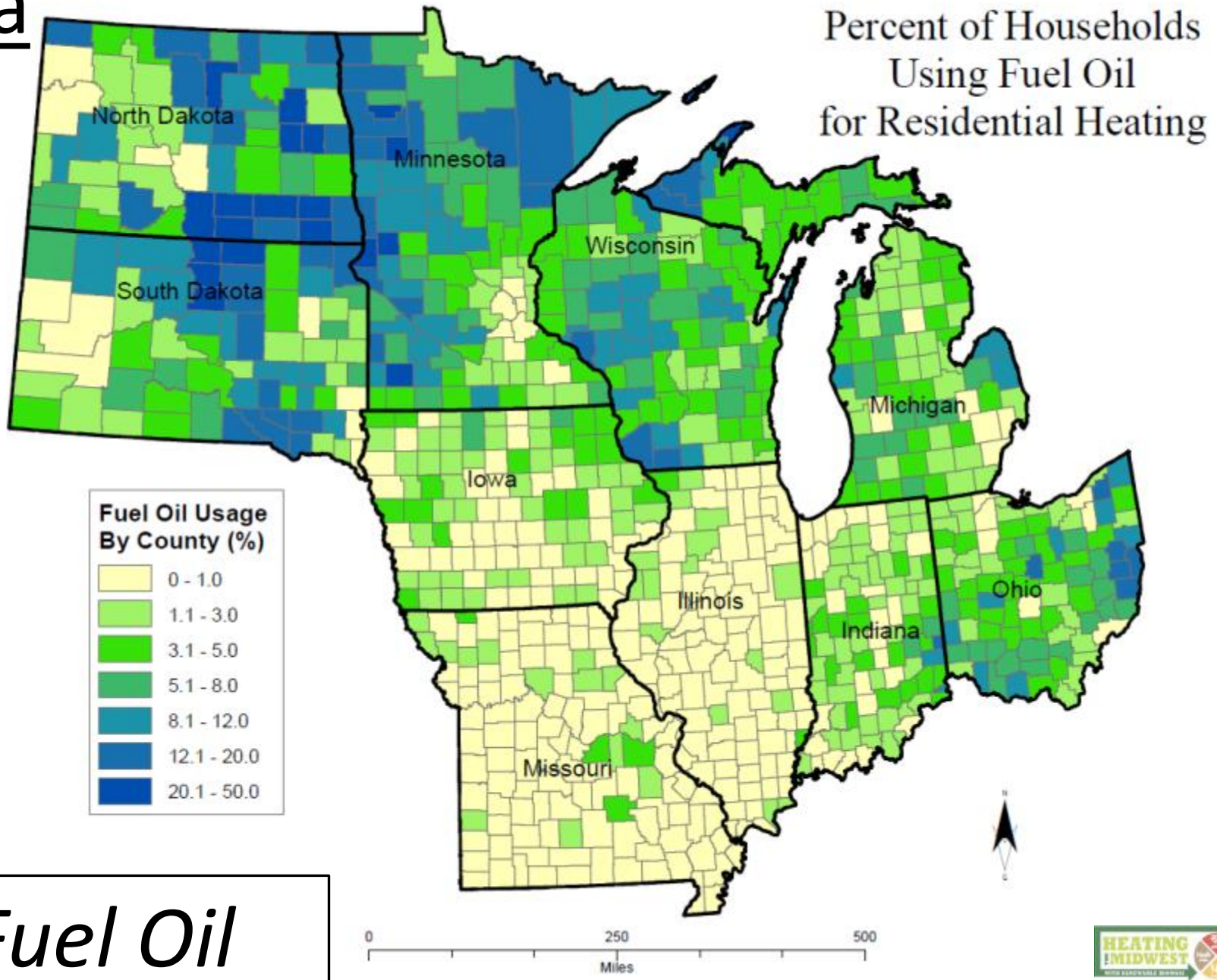
Data



Fuel Oil

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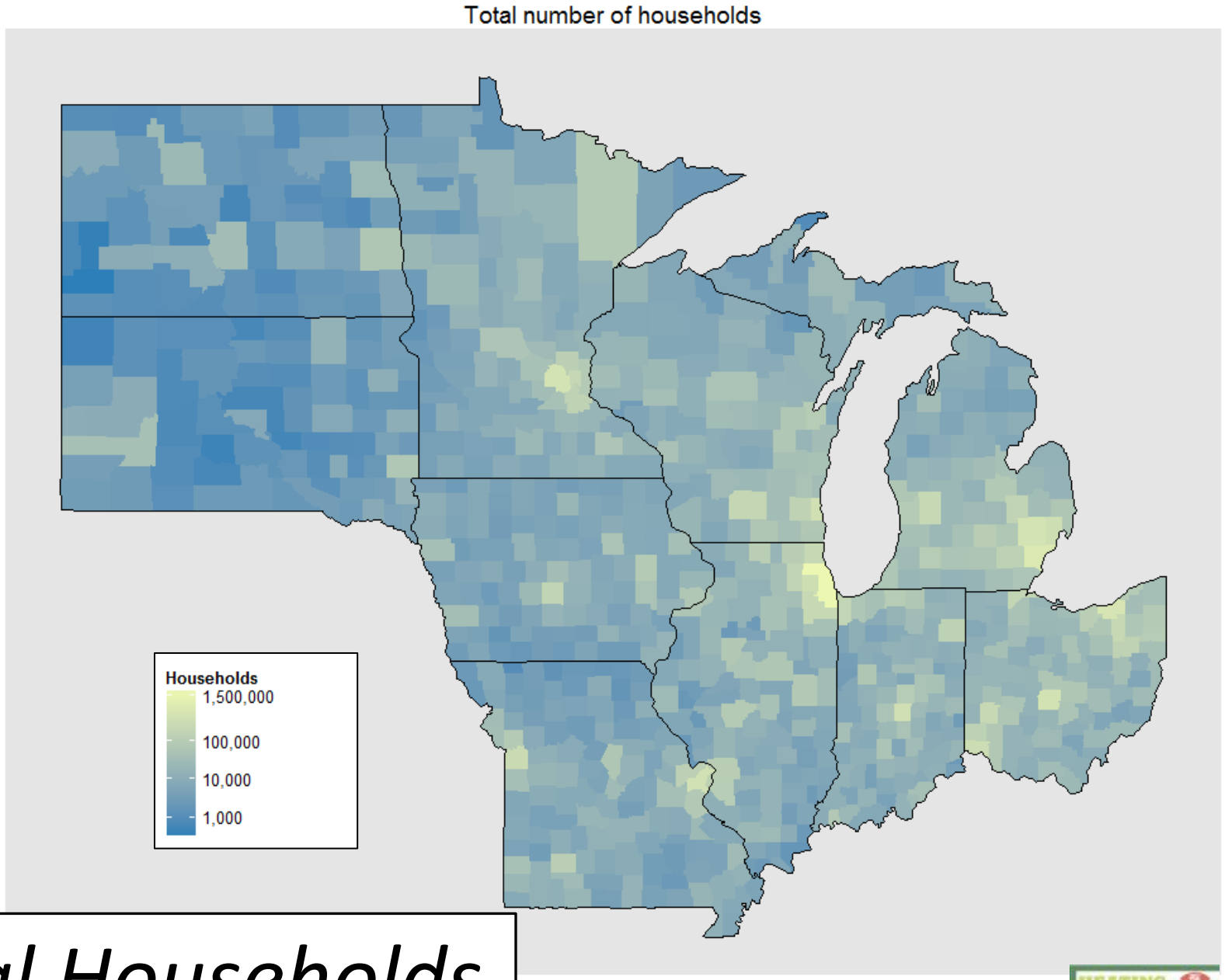
Data



Total Households

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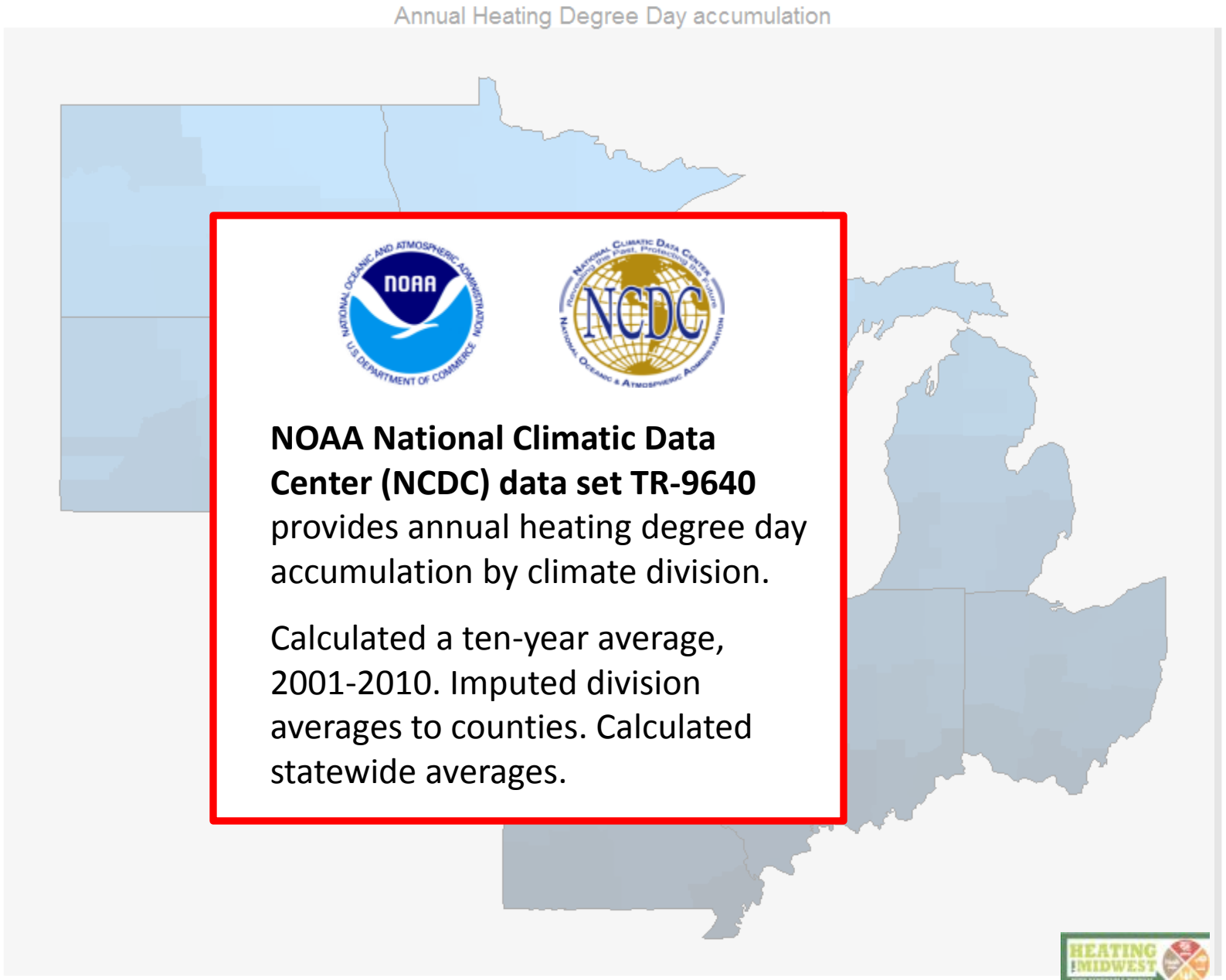
Data



NOAA National Climatic Data Center (NCDC) data set TR-9640 provides annual heating degree day accumulation by climate division.

Calculated a ten-year average, 2001-2010. Imputed division averages to counties. Calculated statewide averages.

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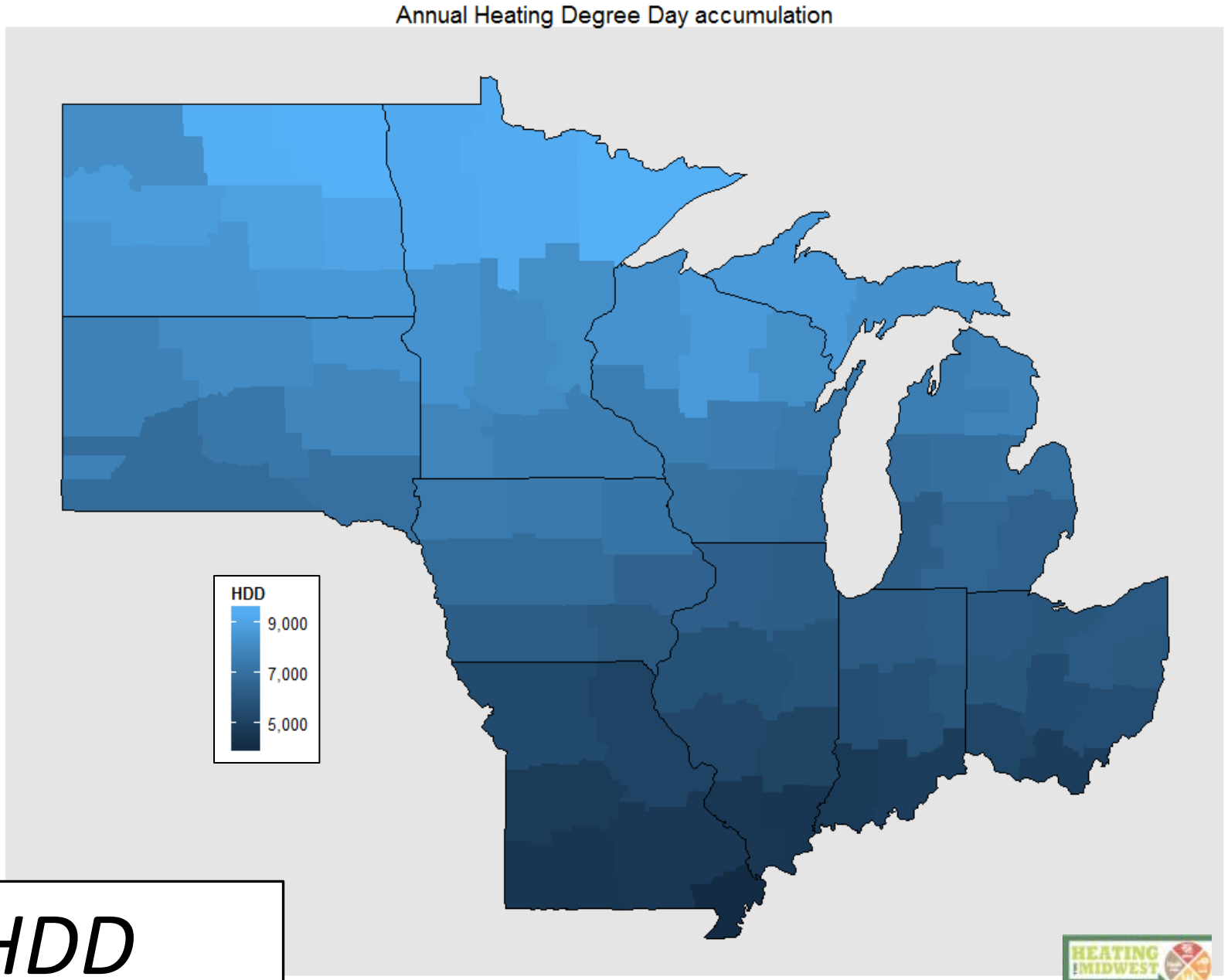
Data



HDD

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Methods

1. For each state or multi-state grouping, calculated fuel consumption in MMBTU per household per HDD. Repeated for each fuel.

MMBTU / household / HDD
=
consumption factor

- IA - MN - ND - SD
- IL
- IN - OH
- MI
- MO
- WI

- NG
- LP
- Elec.

2. For each county, multiplied corresponding state consumption factor by total households and annual HDD. Repeated for each fuel.

consumption factor
x
total households
x
annual HDDs
=
fuel consumption MMBTU

Each of:
- 305 co.
- 102 co.
- 180 co.
- 83 co.
- 115 co.
- 72 co.

- NG
- LP
- Elec.

3. For each county, calculated hypothetical biomass demand under scenarios of 10% & 25% displacement of LP + electricity.

(LP MMBTU + Elec. MMBTU)
x
% displacement
/
16 MMBTU / t DM

Each of:
- 857 co.

- 10%
- 25%

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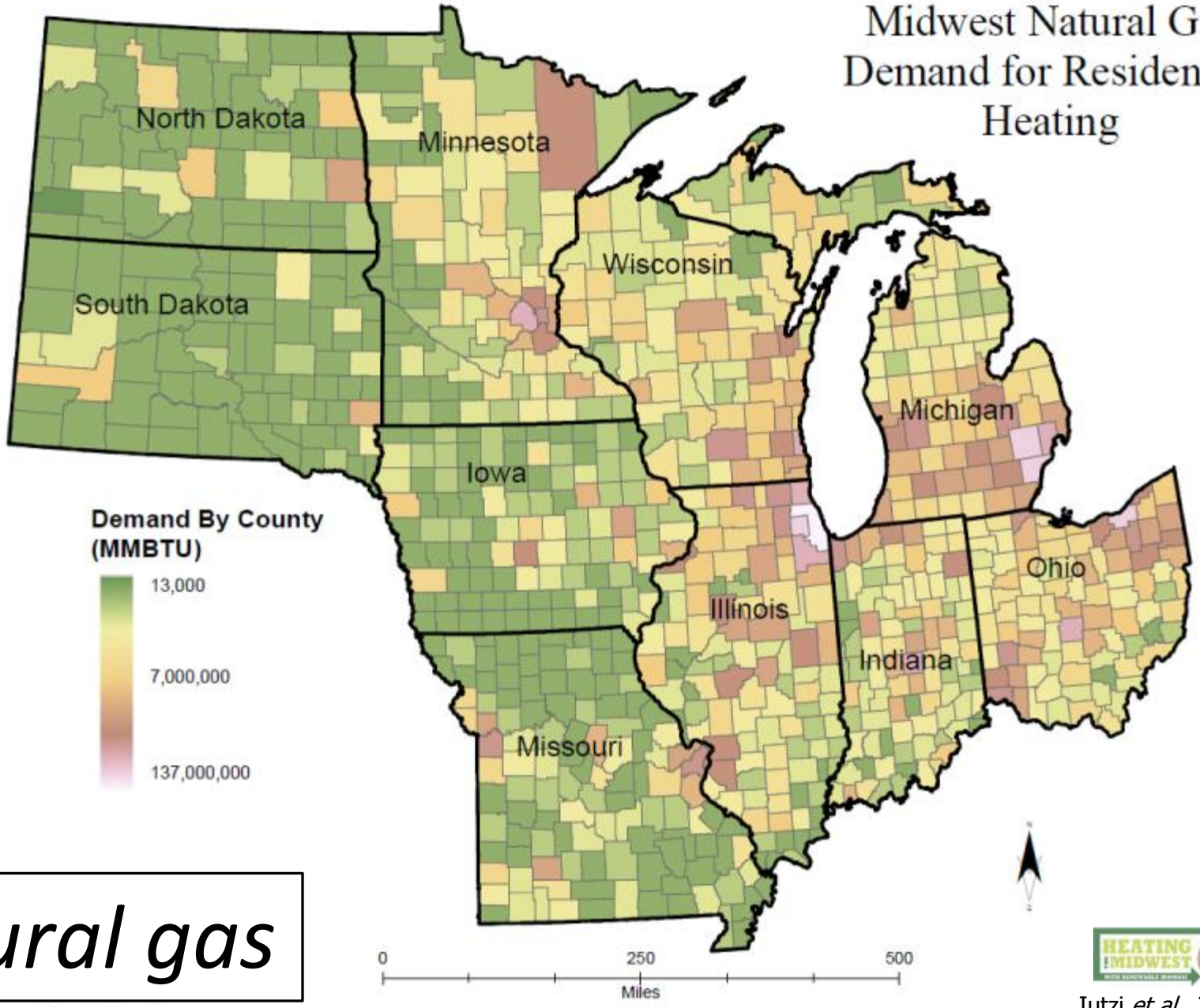
Results



Natural gas

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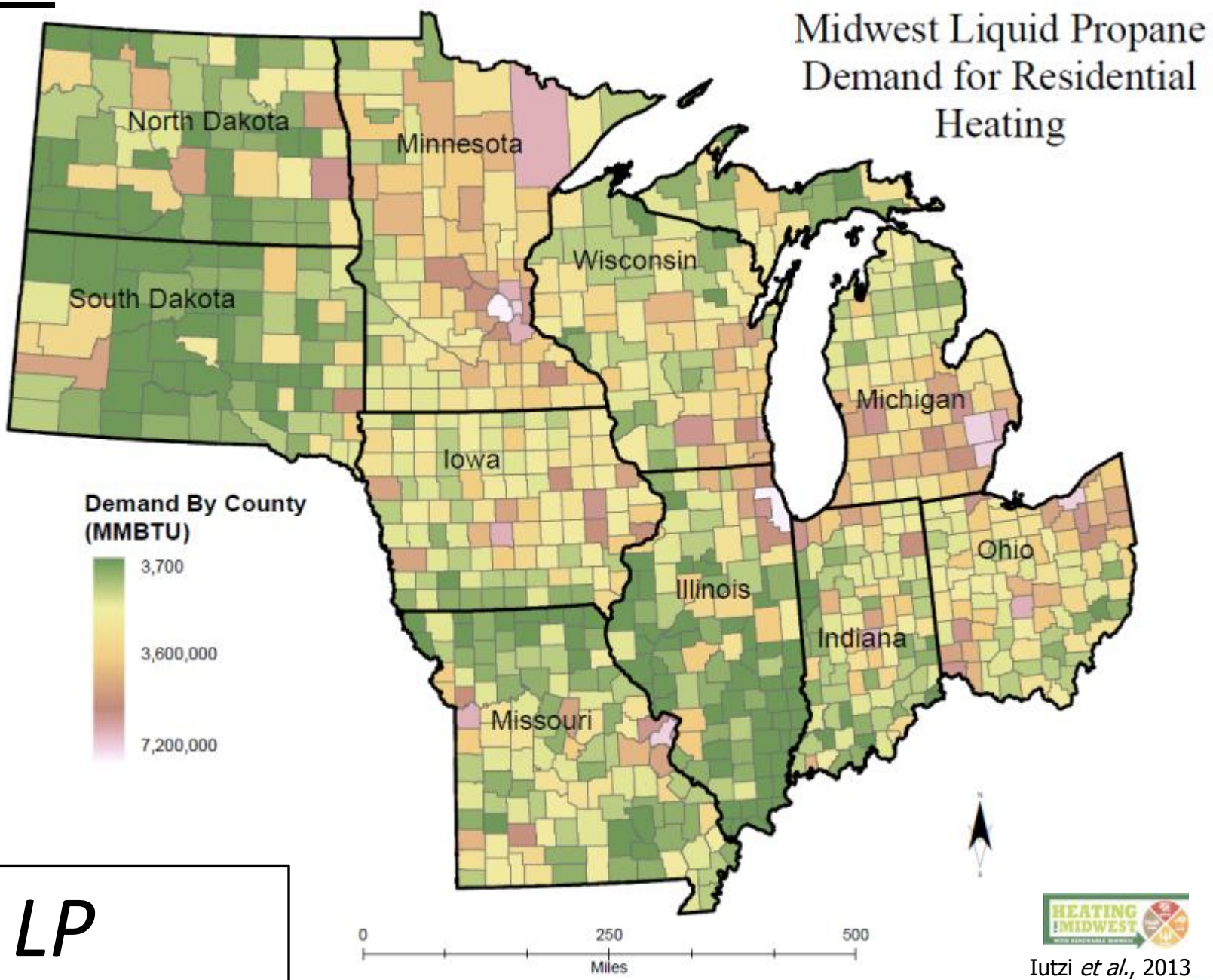
Results



LP

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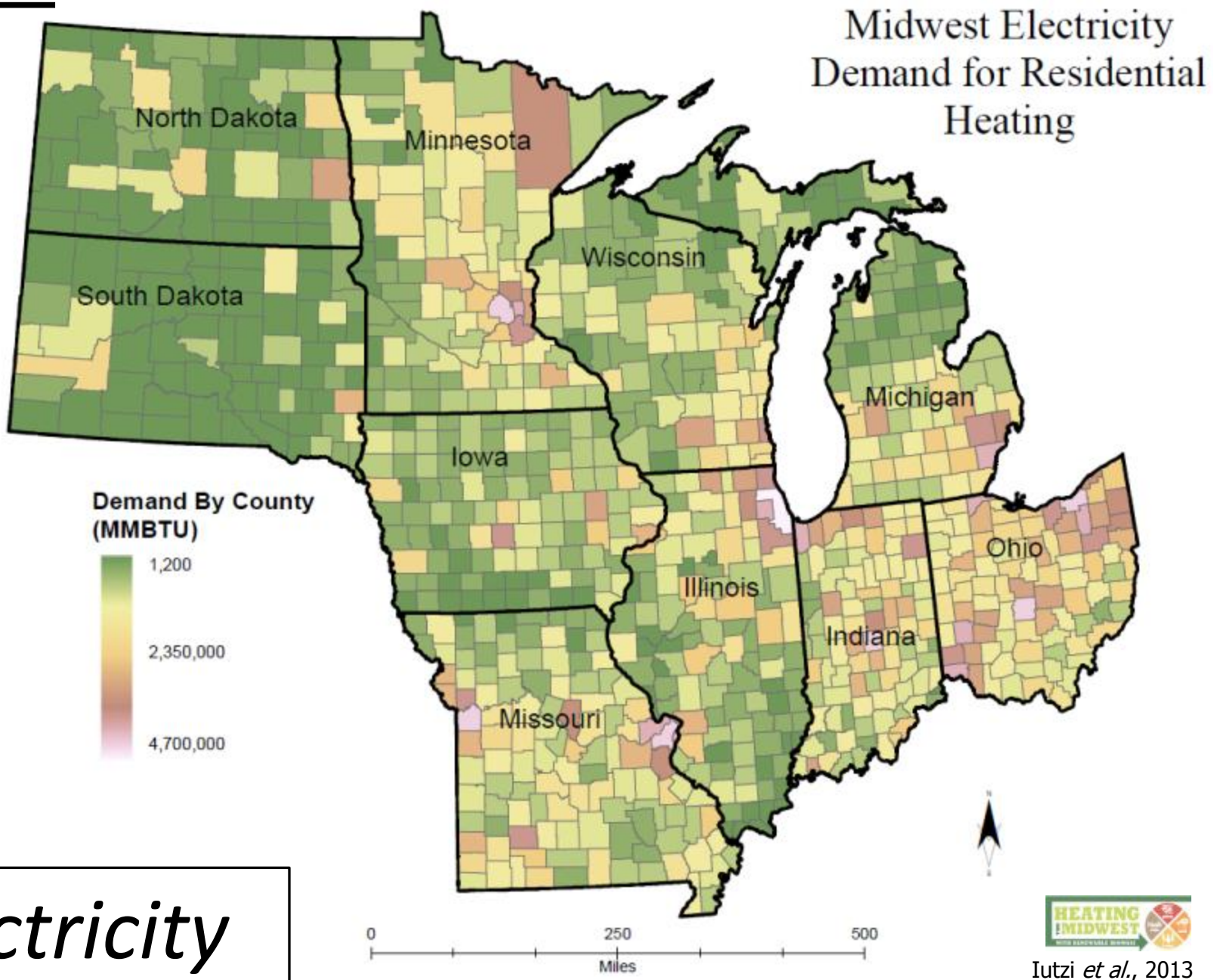
Results



Electricity

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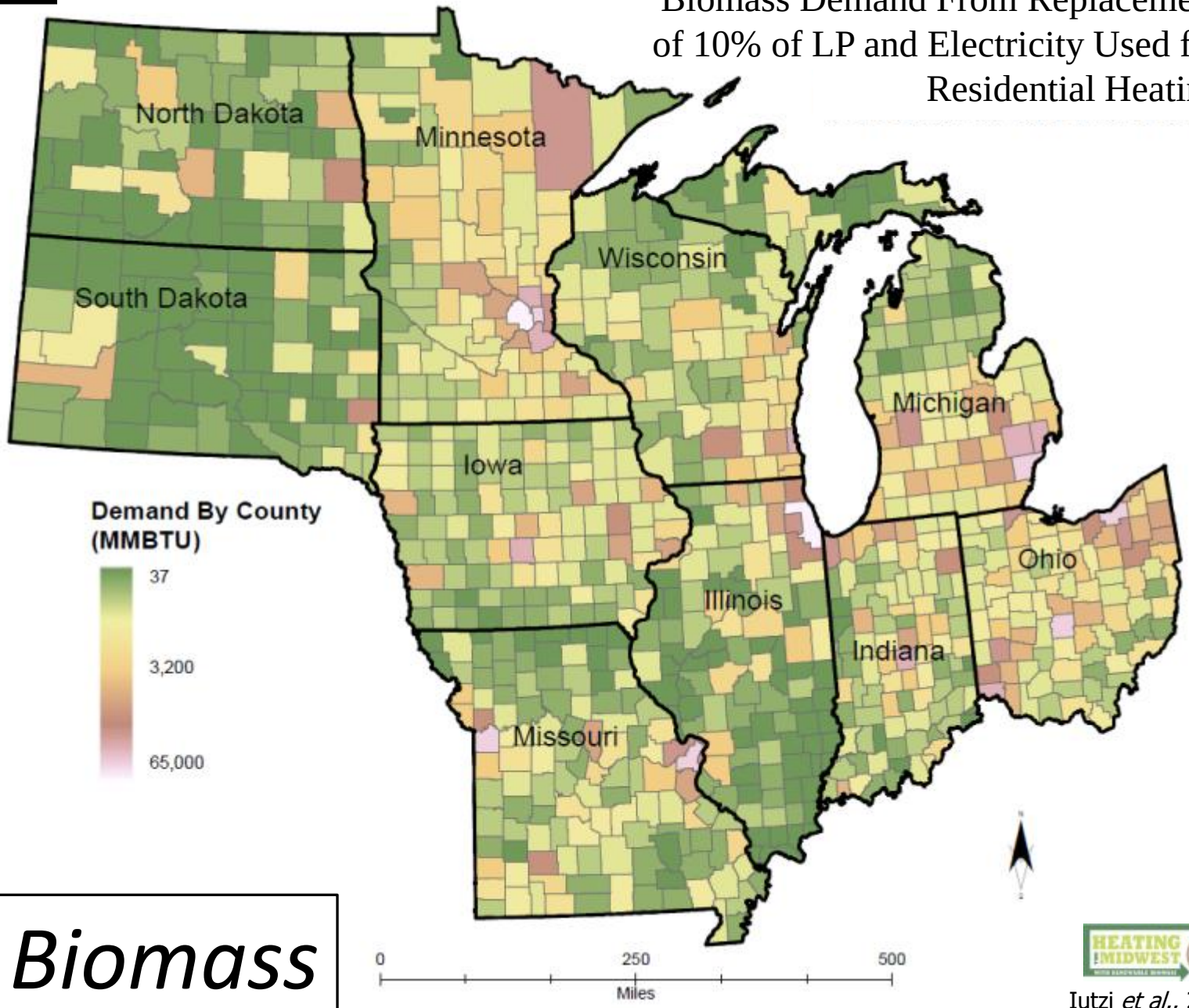
Results

Biomass Demand From Replacement of 10% of LP and Electricity Used for Residential Heating



10% Biomass

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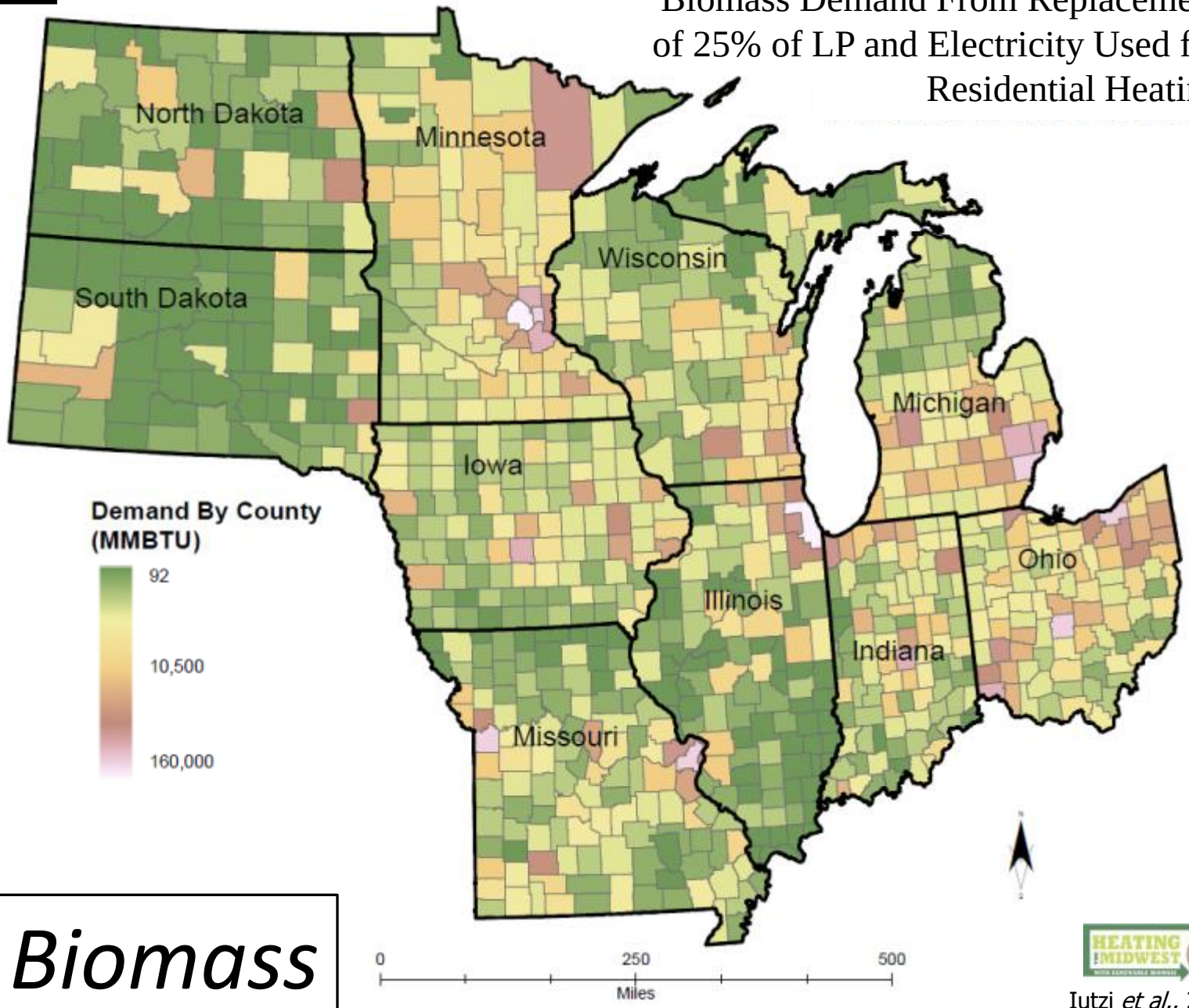
Results

Biomass Demand From Replacement of 25% of LP and Electricity Used for Residential Heating



25% Biomass

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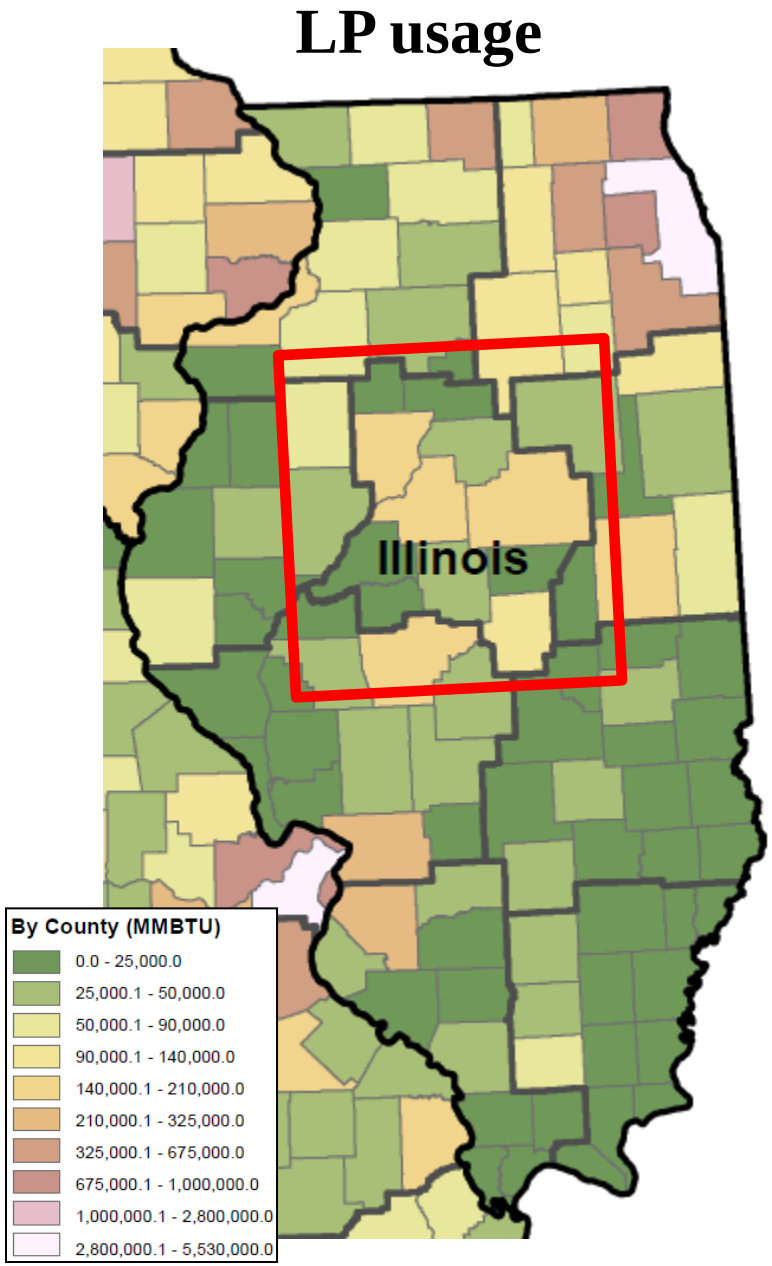
Use of results: Example 1



IL Climate Division 4

County	LP (MMBTU)	Electricity (MMBTU)
DeWitt	17,439	14,864
Logan	28,492	24,284
Macon	115,523	98,462
Marshall	13,118	11,181
Mason	16,657	14,197
McLean	164,417	140,136
Menard	12,854	10,956
Peoria	195,483	166,614
Stark	6,146	5,238
Tazewell	140,344	119,618
Woodford	36,504	31,113
TOTAL	**746,977**	**636,664**

Iutzi *et al.*, 2013

Use of results: Example 1

Fuel consumed	MMBTU
Propane	747,000
Electricity	637,000
Total high-price fuels	*1,380,000*
10% scenario	138,000
15% scenario	207,000
Biomass demand	**t DM / yr***
10% scenario	8,620
25% scenario	12,900

* Assuming 16 MMBTU / t DM.

11 counties of IL Climate Division 4

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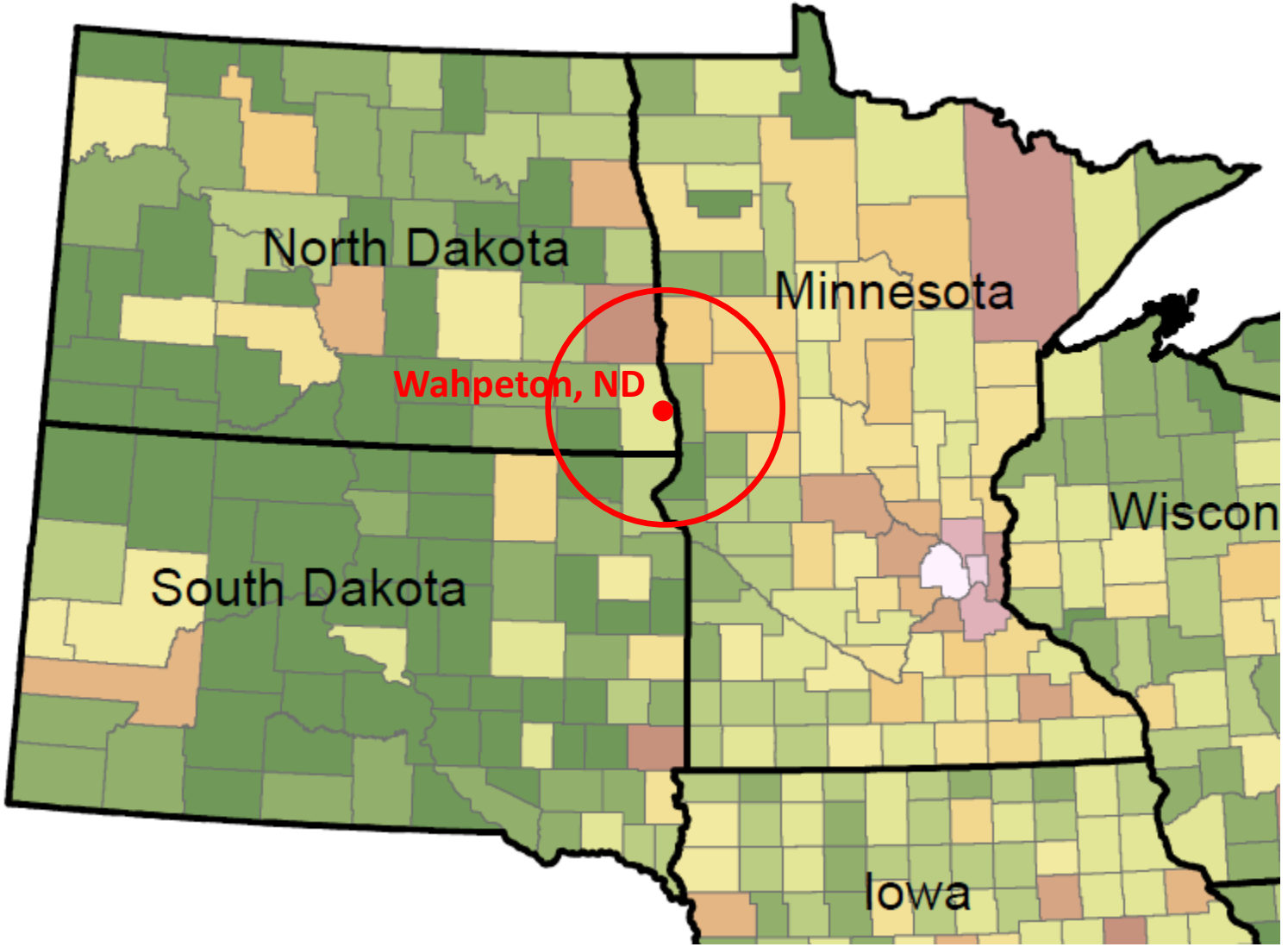
Use of results: Example 2



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Use of results: Example 2

Wahpeton, ND region

- Clay, MN
- Grant, MN
- Otter Tail, MN
- Traverse, MN
- Wilkin, MN
- Cass, ND
- Ransom, ND
- Richland, ND
- Sargent, ND
- Marshall, SD
- Roberts, SD

Fuel consumed	MMBTU
Propane	2,160,000
Electricity	950,000
Total high-price fuels	*2,710,000*
10% scenario	270,000
25% scenario	680,000
Biomass demand*	**t DM / yr**
10% scenario	17,000
25% scenario	42,500

* Assuming 16 MMBTU / t DM.

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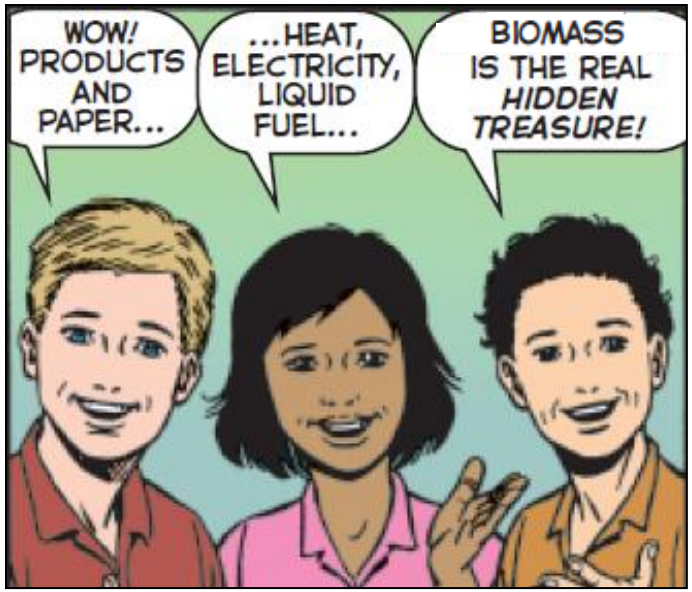
Accessing the results



Deschaine (NACD), 2007

- Spreadsheet of county-level results to be posted with slides on HTM website.
- Report will be published later in 2013.

www.heatingthemidwest.org

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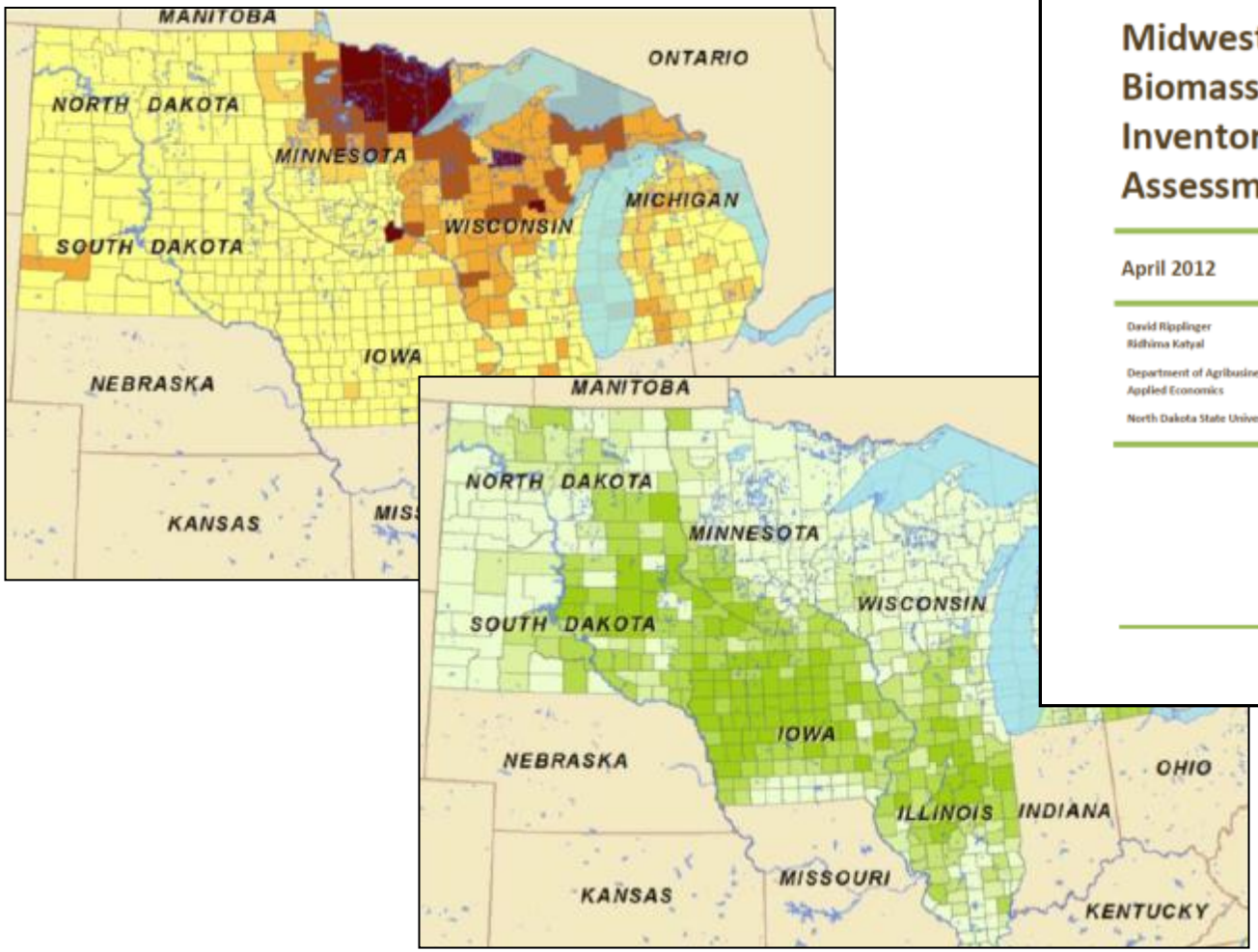
2012 Biomass Inventory



www.auri.org/2012/04/midwest-biomass-inventory/

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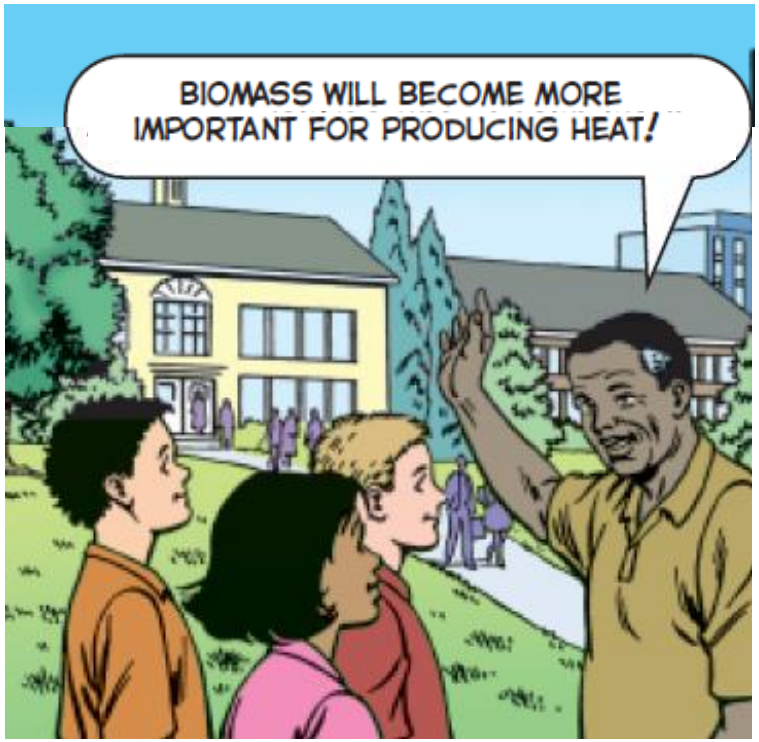
Next directions

- Expand assessment to commercial & ag sectors
- Link consumer demographics to market behavior
- Integrate natural gas distribution infrastructure and price information into assessment
- Other directions?



Deschaine (NACD), 2007

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