Living with Hogs in Iowa: The Impact of Livestock Facilities on Rural Residential Property Values

Joseph A. Herriges, Silvia Secchi,
Bruce A. Babcock

An old story…

- William Aldred's Case, 77 Eng. Rep. 816 (1610).
- Aldred sued because the defendant "erected a hogstye so near the house of the plaintiff that the air thereof was corrupted."
- The plaintiff claimed that he was "disturbed in and hindered from enjoying" his property.
- In response, the defendant argued that the plaintiff "ought not to have so delicate a nose that he cannot bear the smell of hogs."
- The court found for the plaintiff, concluding that "it may be that before time of memory [a landowner has had a right to] wholesome air" on his property.
- The defendant was thus found liable for depriving the plaintiff of the "use and profit of his house."

Iowa Farmer Today

Residents awarded 33 million from hog producer

Story posted 10/10/02

SAC CITY, Iowa (AP) — A jury on Wednesday awarded $33 million to four Sac County couples who complained that a hog lot owned by Iowa's largest hog producer has produced foul odors, noxious gases and too many flies. […]

The suit against Iowa Select Farms ended Wednesday when the Sac County jury awarded the eight plaintiffs $1.06 million in actual damages plus $32 million in punitive damages. […]

Iowa Select Farms opened a livestock facility in Sac County in 1997 and since then, the plaintiffs claim, it has become a health risk and nuisance. They allege the facility has improperly disposed of putrid animal carcasses and animal waste.

Iowa Select Farms denied the allegations. […].

County places 1-year moratorium on confinements

02/27/2002

The Cerro Gordo County Board of Supervisors voted unanimously Tuesday to ban construction of livestock confinements for a year, delaying Sparboe Farms' proposed egg farm south of Clear Lake.
The moratorium appears to be the first of its kind in the state, county officials and farm advocates said.

Edwards supports some meatpacker regulations

By JONATHAN ROOS
Register Staff Writer
11/15/2003

Edwards, a U.S. senator from North Carolina, also called for a national moratorium on construction and expansion of concentrated animal-feeding operations.
"They pollute our water and air. They drive down the value of property for miles around," he said.

DNR to stand pat on emissions Agency will stick with controversial standard on hydrogen sulfide

By PERRY BEEMAN
Register Staff Writer
09/16/2003

The Iowa Department of Natural Resources plans to recommend a standard for hydrogen sulfide at the Iowa Environmental Protection Commission's November meeting, said the DNR's Wayne Gieselman.
However, a limit for ammonia won't come for a while. Gieselman said University of Iowa scientists have noted that a federal agency is suggesting that previous health limits on ammonia may have been too strict.

Previous analyses

- North Carolina – Palmquist, Roka and Vukina, 1997.
- Michigan - Abeles-Allison and Connor, 1990.
- Minnesota – Taff, Tiffany, Weisberg, 1996.
- Missouri – Hamed, Johnson and Miller, 1999.
- Pennsylvania – Ready and Abdalla, 2003

	MO	MI	MN	NC
# properties	99	288	292	237
houses	39	N/A	292 (252 sales in town)	237
county	1	N/A	2	9
years	2	4	2	1.5
	Rural	N/A	< 2,500	< 2,500
# CAFOs	35	8 (received odor complaints)	N/A	N/A
Property characteristics		Square footage Type of construction Year of Construction Air Conditioning # of baths Fireplace Classification Month of sale Year of Sale	Square footage Type of construction # of bedrooms # of baths	Heated area Lot size Effective age # of baths Fireplace Date of sale
	Vacant lot Land grade	Vacant lot Garage Mobile Home	 Sale price/assessed value	 2 car garage Deck/patio
Neighborhood Characteristics	Road access Distance to farm	Distance to business district Distance to highway Type of road Wind direction Distance to closest farm Number of animals at farm	 Wind direction Distance to closest farm 3 mile radius dummy # animals in 3 miles radius # feedlots in 3 miles radius Swine dummy Lagoon dummy	Township population density Income by census tract Commute time by census tract Tons of manure 0-1/2 mile Tons of manure 1/2-1 mile Tons of manure 1-2 mile
RHS variable	Price per acre	House sale price	House sale price	House sale price
Findings	Negative effect of distance if there is a house	Negative effect of # animals but positive effect of distance	Positive effect of distance	Negative and decreasing effect of distance

What's the situation in Iowa?

- Before, minimum distance requirements.
- Now, with Senate file 2293 (April 29, 2002):
  - IDNR regulates new confinements in "100-year floodplains".
  - Permits awarded to new facilities on the basis of a scoring system that considers:
    - Proximity of structures and application fields to other properties, highways, water, public areas;
    - Size;
    - Manure management practices;
    - Ownership and labor characteristics.

Permits required if

- For AFOs that use **anaerobic lagoons or earthen manure storage basins** w/ animal weight capacity □:
  400,000 lbs bovine or 200,000 lbs for other animals.
- For AFOs that use **formed manure storage structures** (e.g. concrete, wood or steel tanks) w/ animal weight capacity □:
  1,600,000 lbs bovine or 625,000 lbs for other animals.
- For AFOs that store manure **exclusively in a dry form** with animal w/ capacity □:
  4,000,000 lbs bovine or 1,250,000 lbs for other animals.
- For AFOs that use an **egg washwater structure** w/animal weight capacity > 200,000 lbs.

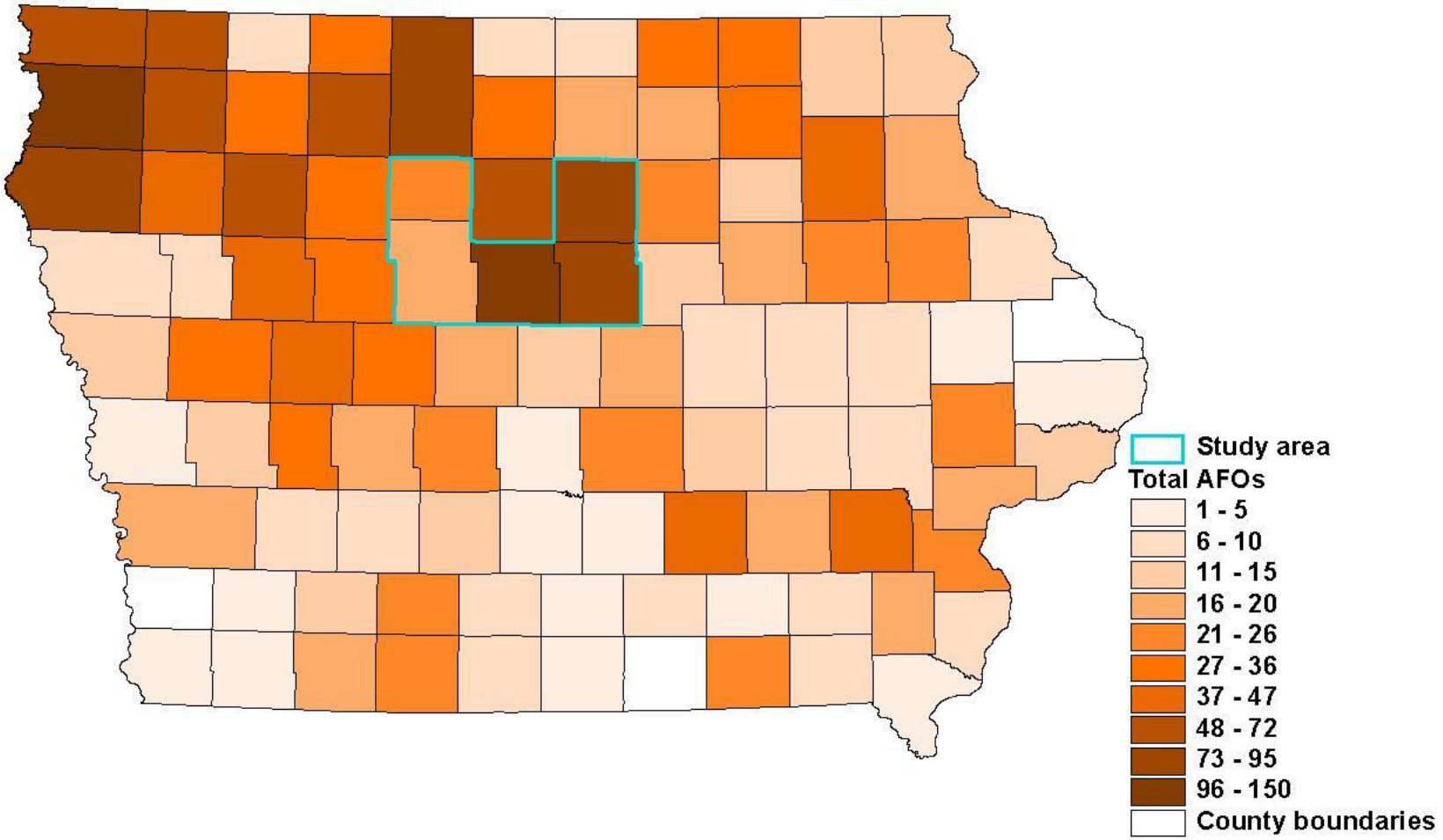
Manure management plans required if

- The operation has an animal weight capacity of more than 400,000 lbs of cattle or more than 200,000 pounds of other animals and the operation was constructed or expanded after May 31, 1985;
- The operation obtained or has applied for a construction permit after May 31, 1985;
- Note that manure management plans **are not required** for **open feedlots**.

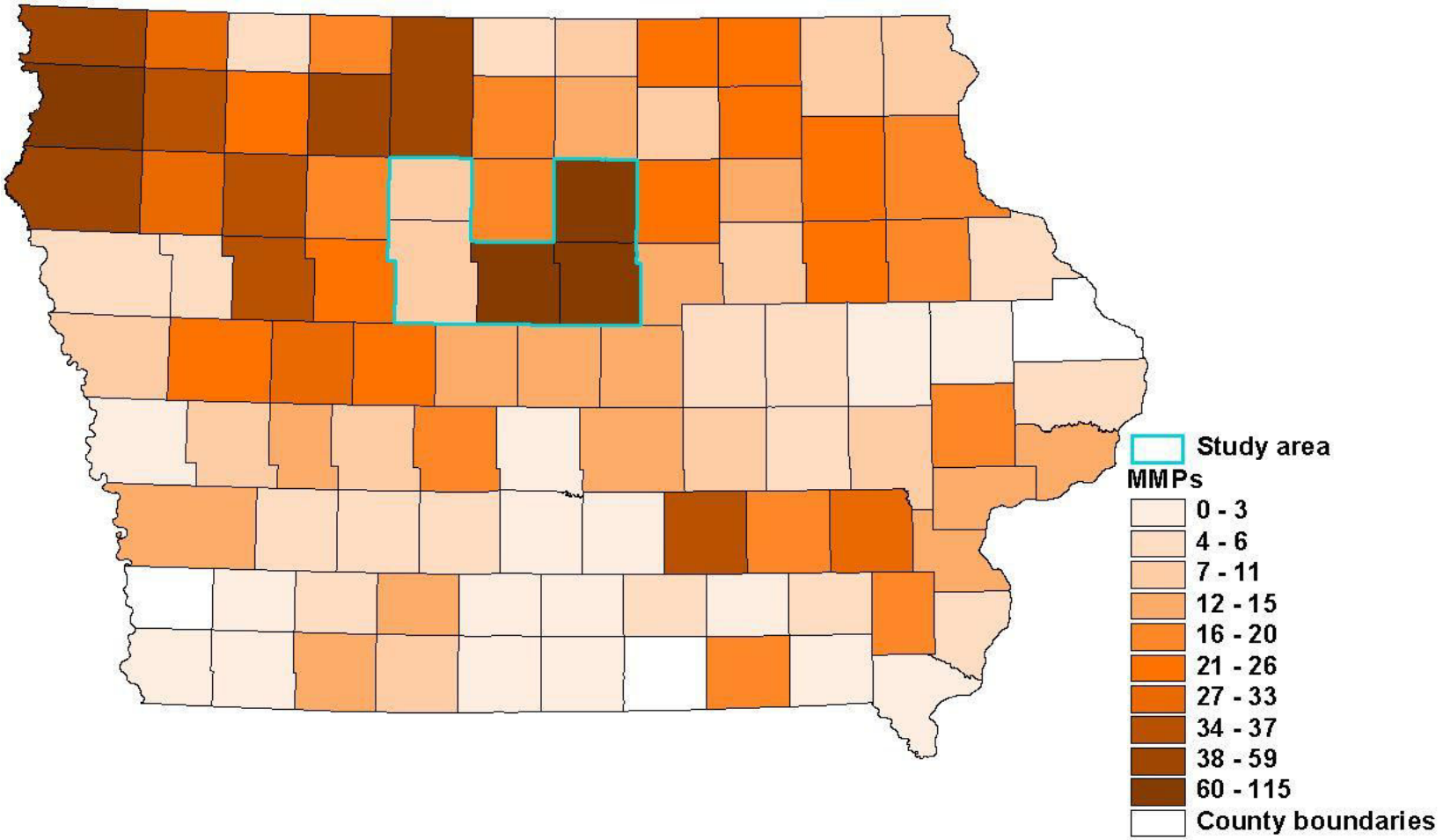
AFO data available for Iowa

- For all facilities:
  - Live weight;
  - Type of animal;
  - Location and ownership;
- For permitted facilities:
  - Type of manure treatment;
  - Year the permit was received

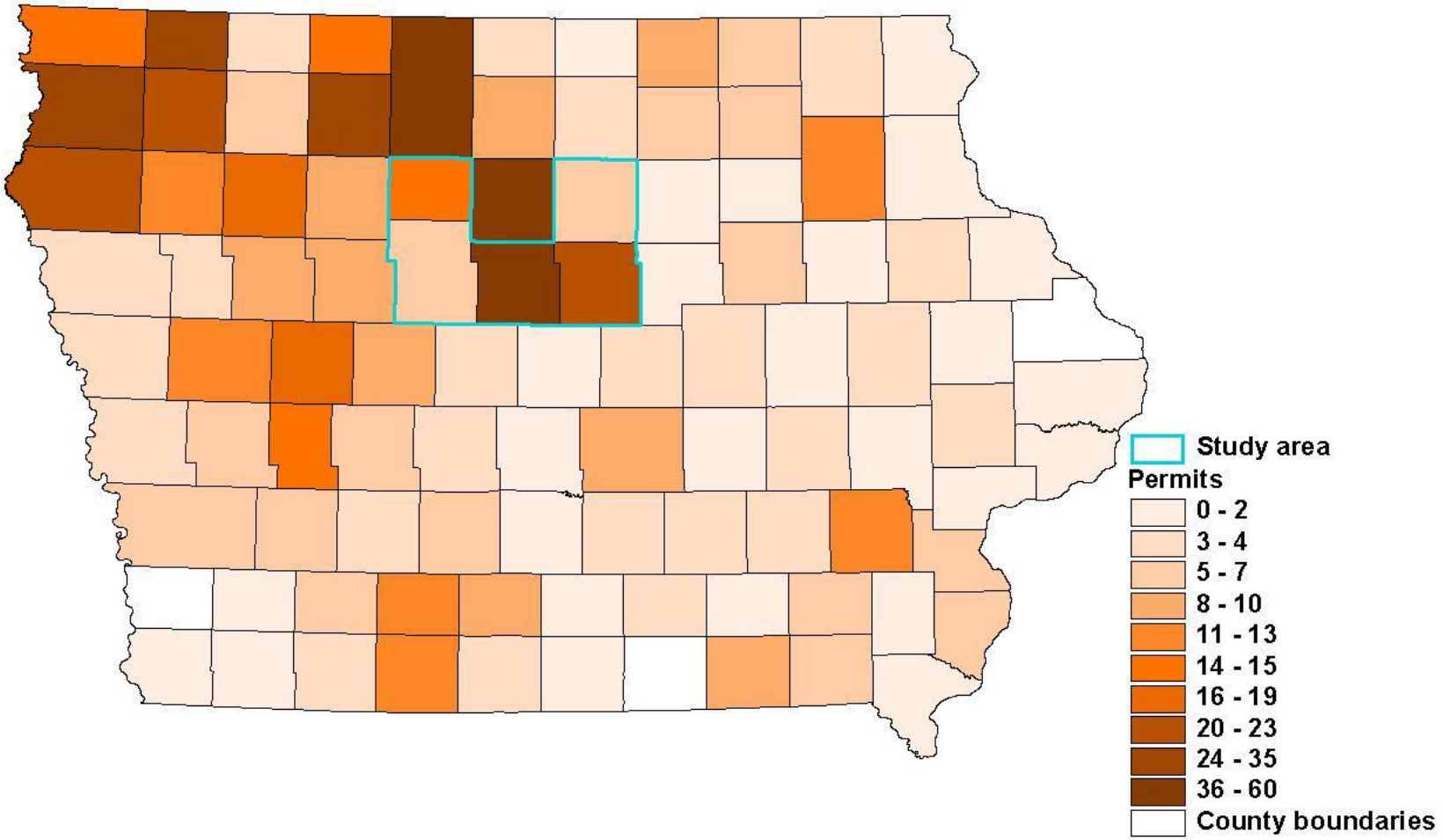
AFOs by county - all operations

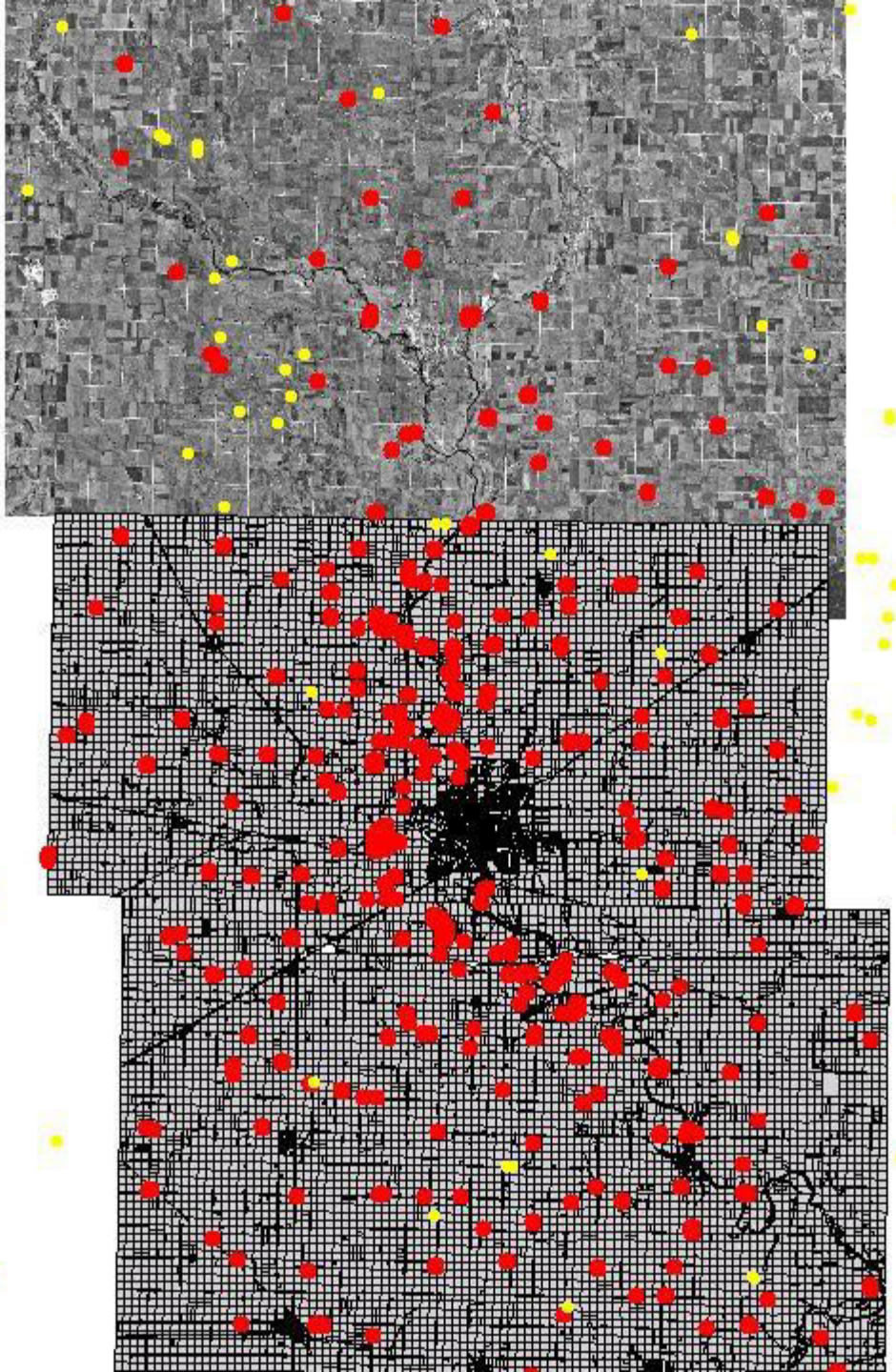


AFOs by county - MMPs

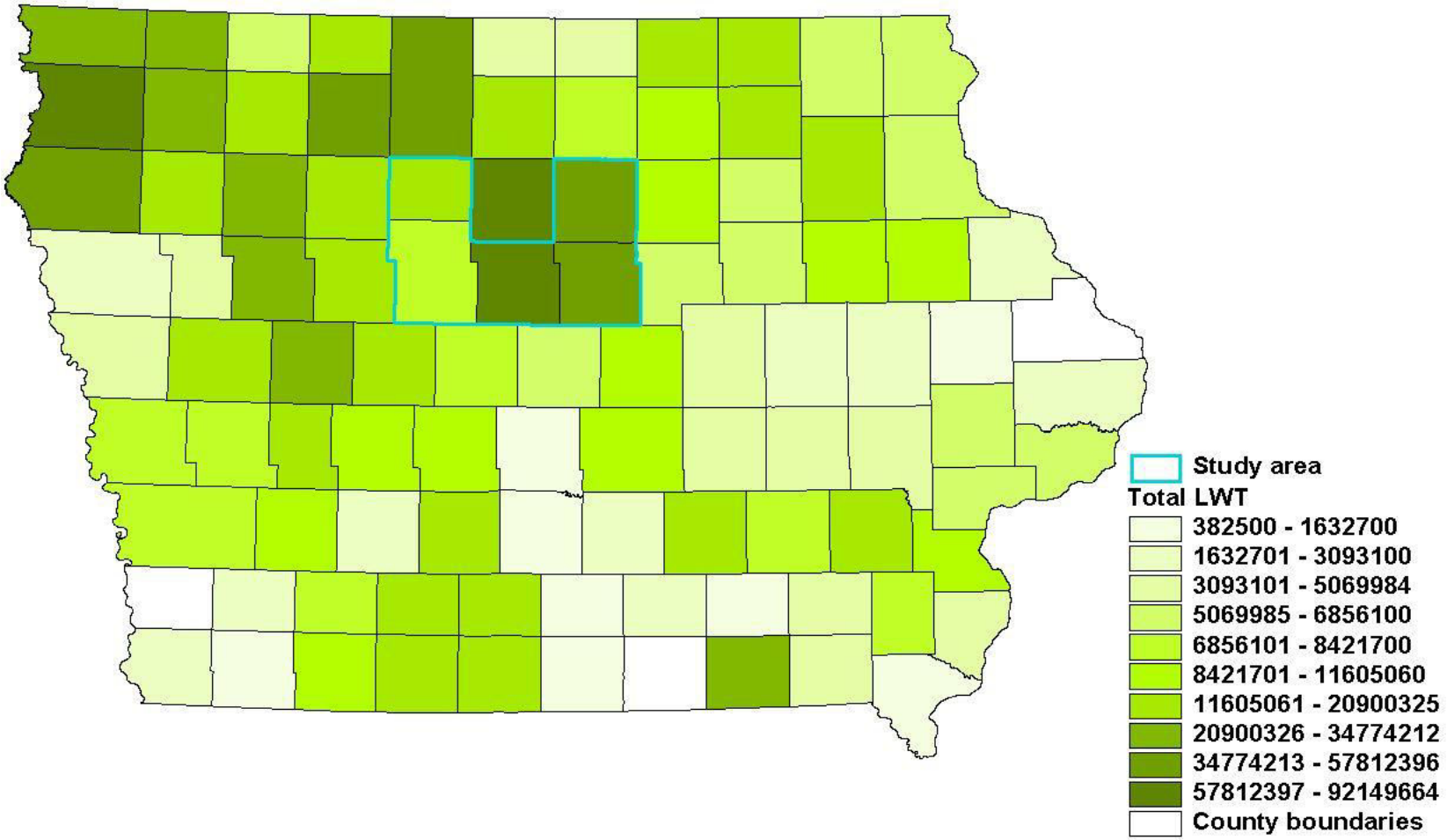


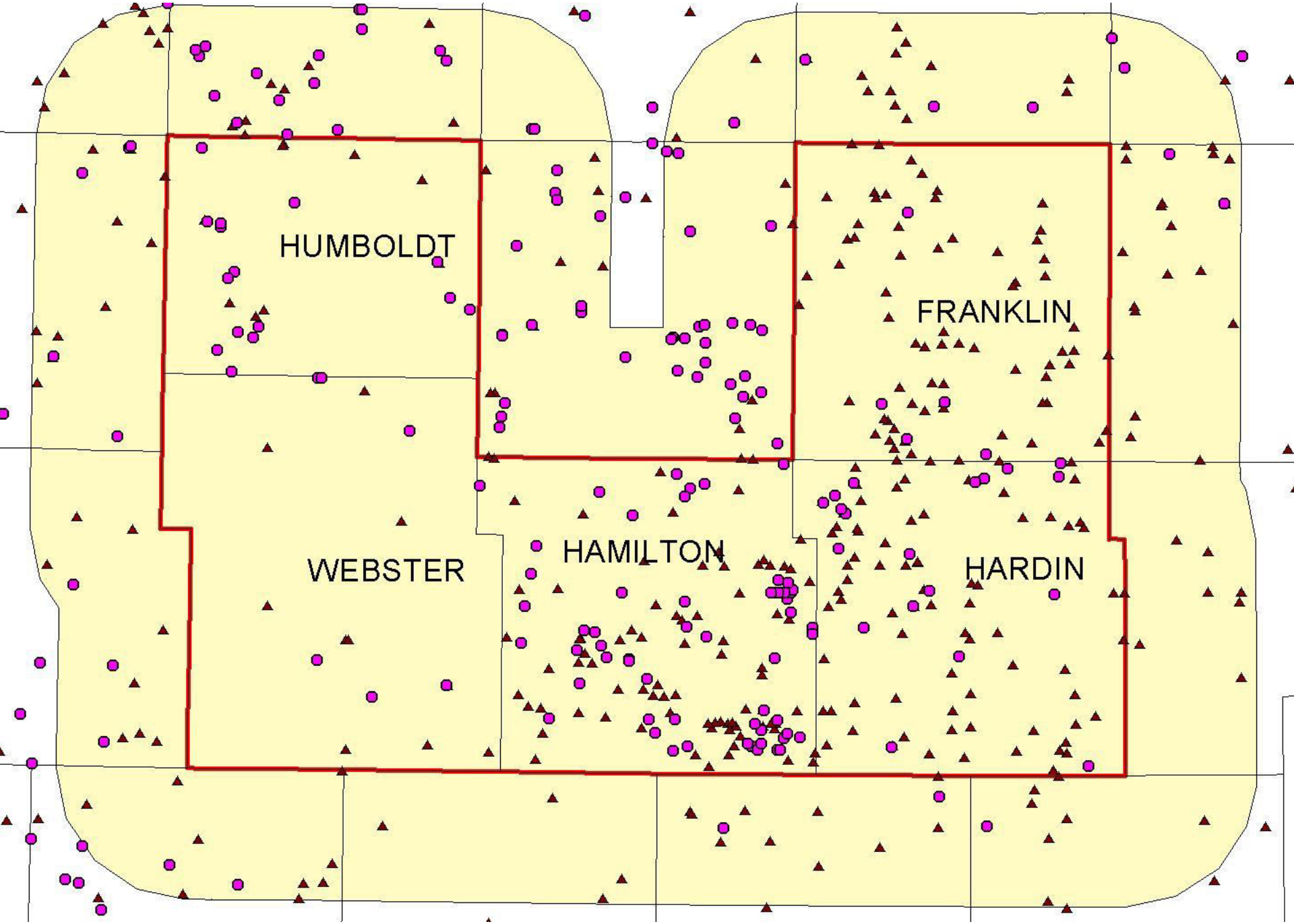
AFOs by county - Permits





AFOs by county - Total LWT



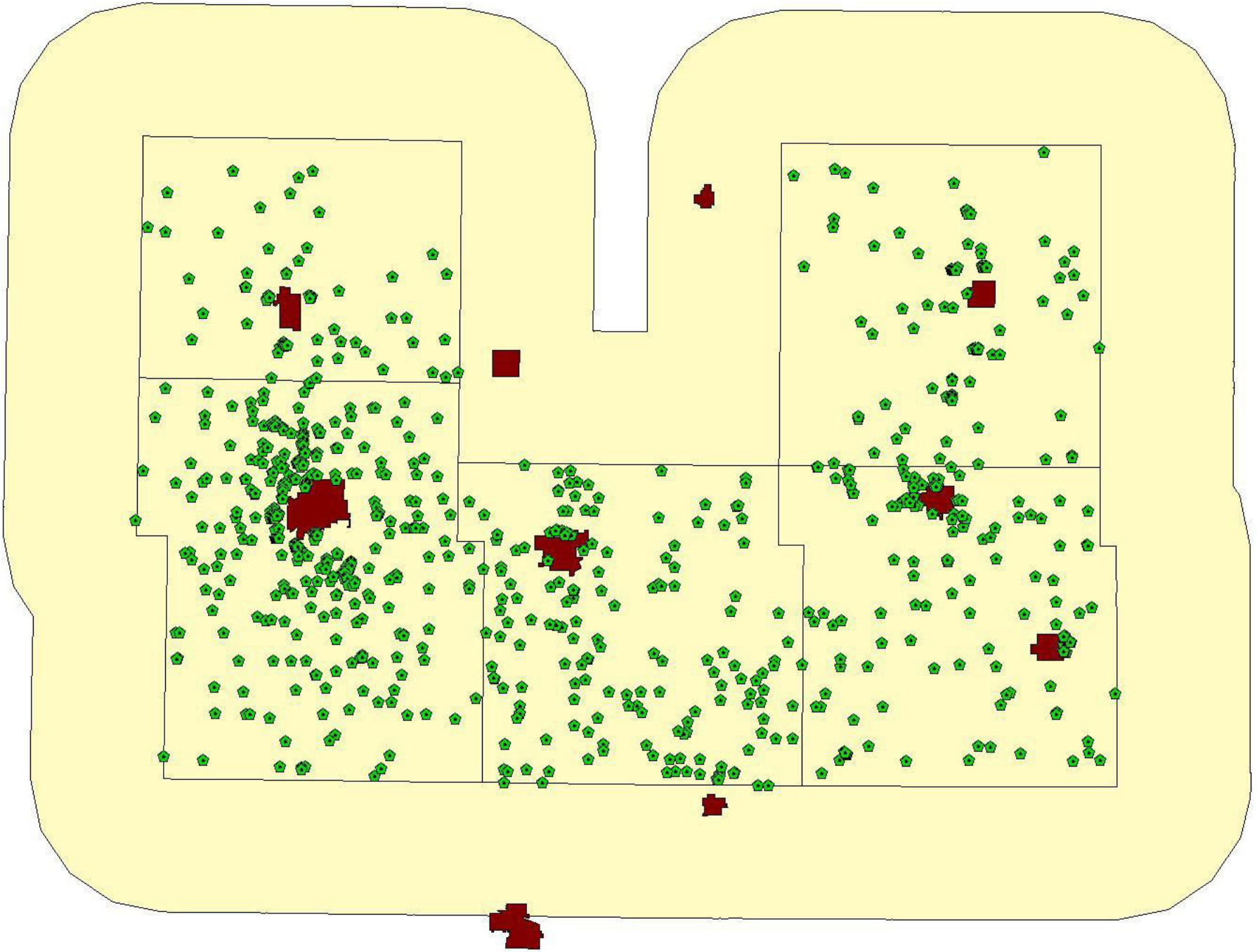

HUMBOLDT
FRANKLIN
WEBSTER
HAMILTON
HARDIN

Rural Residential Property Sales by County

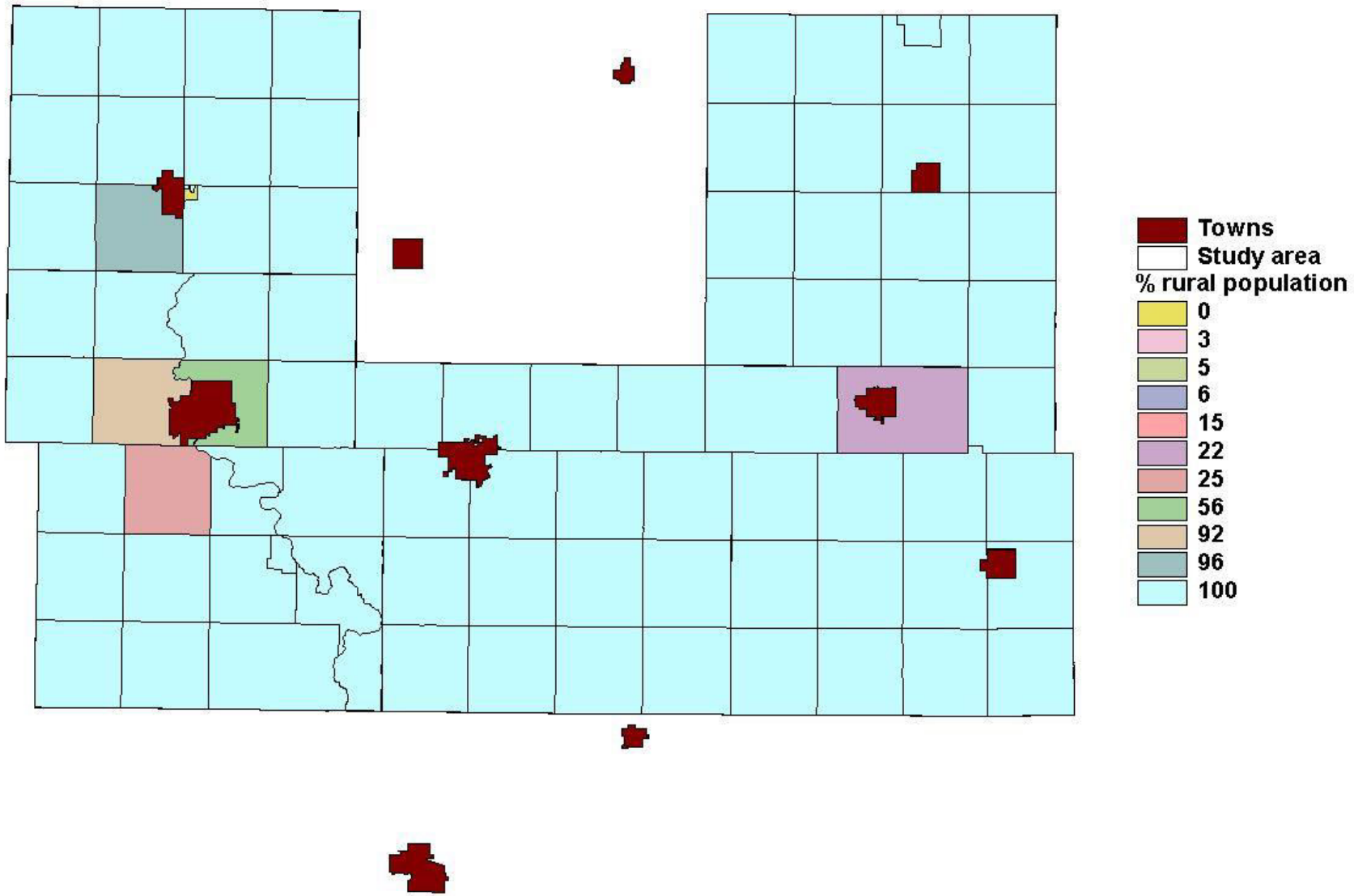
County	*Earliest sales date*	*Number of sales*
Franklin	January, 1993	141
Hamilton	January, 1992	190
Hardin	January, 1995	177
Humboldt	March, 1995	71
Webster	January, 1992	566

Summary Statistics for House Variables

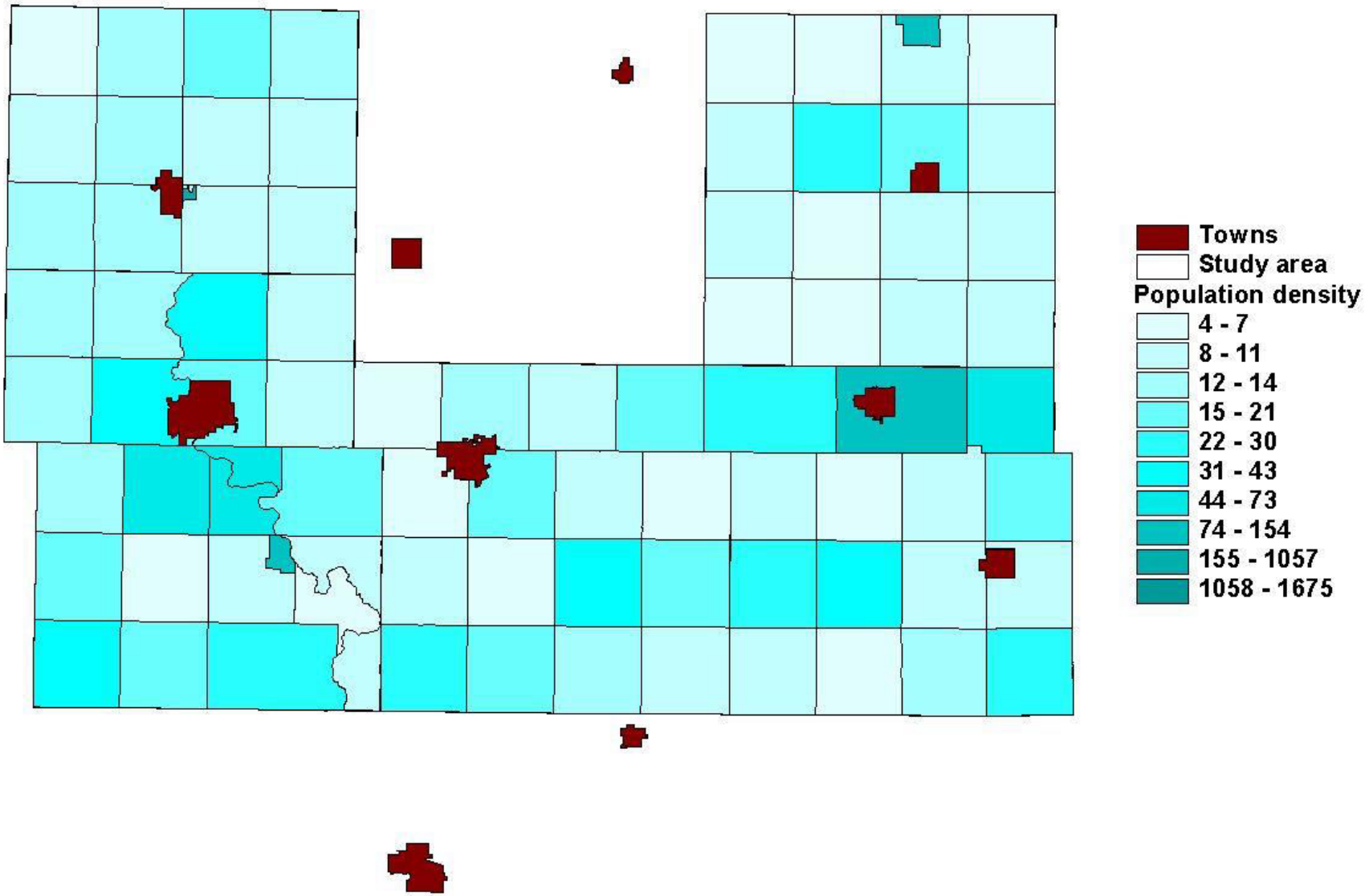
Name	*Description*	*Units*	*Min*	*Max*	*Mean*	*S. Dev.*
Price	Market Price	$	5200	475000	81667.6	55529.6
LSize	Lot Size	acres	0.05	10	2.38	2.22
SYear	Sales Year	yrs	1992	2002	1997.16	2.76
Age	Age of Home	yrs	0	142	52.62	32.59
LArea	Living Area (without additions)	sq. ft.	224	5112	1171.67	503.84
AdArea	Area of Additions	sq. ft.	0	1642	175.68	273.14
AC	Air conditioned	0/1	0	1	0.62	0.48
Baths	Number of Bathrooms	#	0.5	6	1.58	0.68
Decks	Number of Decks or Porches	#	0	5	1.61	0.98
Fire	Number of Fireplaces	#	0	3	0.39	0.54
AttG	= 1 if there is an attached garage	0/1	0	1	0.45	0.50
DetG	= 1 if there is a detached garage	0/1	0	1	0.47	0.50



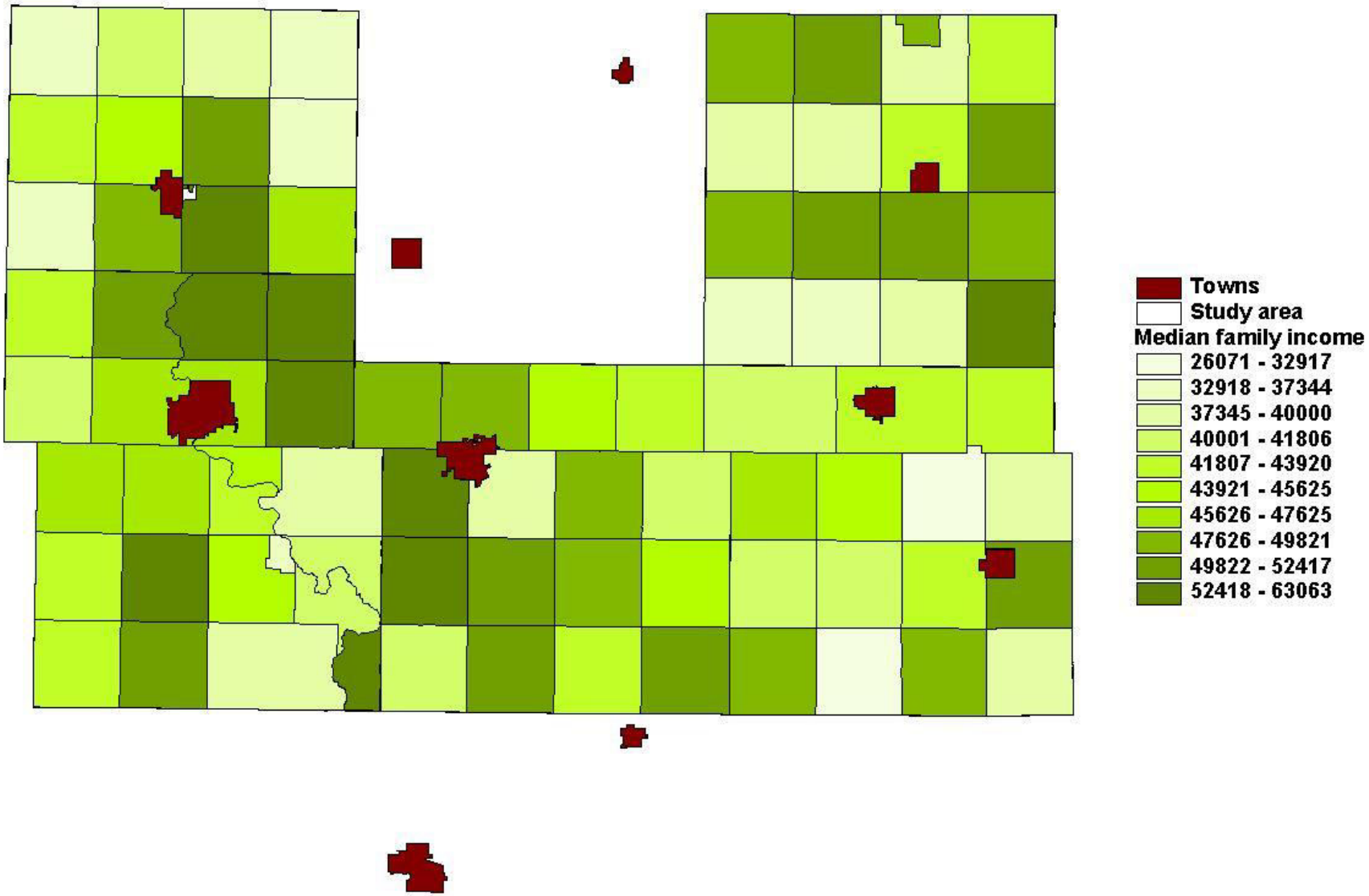
% rural population



Population density



Median family income



Summary Statistics for Census variables

Variable	*Description*	*Units*	*Min*	*Max*	*Mean*	*Std. Dev.*
DistTown	Distance to nearest large town	miles	0.60	35.20	9.87	5.77
DistHS	Distance to nearest High School	miles	0.90	51.20	10.89	8.79
PDens	Population Density by Township	#/sq. mi.	4.00	116.76	29.54	26.90
MedInc	Median Income by Township	$1000's /family	32.4	63.0	47.0	56.4

A proximity measure

- The measure incorporates:
  - Distance, size and direction of the closest facility
  - Average size, direction and number of the facilities within 3 miles
  - Number of facilities within 10 miles.

Summary Statistics for proximity variables

Variable	*Description*	*Units*	*Min*	*Max*	*Mean*	*Std.* Dev.
DI1	Distance to Nearest Livestock Facility	miles	0.01	6.78	2.77	1.75
Size1	Size of Nearest Livestock Facility	1000s pounds	160	2600	485.29	303.25
NW1	=1 if nearest livestock facility is northwest	0/1	0	1	0.30	0.46
SO1	=1 if nearest livestock facility is south	0/1	0	1	0.22	0.41
Mile3	Number of livestock facilities within 3 miles	#	0	27	2.48	3.39
Size3	Average Size of facilities within 3 miles	1000s pounds	0	1649	342.18	331.77
NW3	Percentage of facilities within 3 miles NW	%	0	100	18.43	29.00
SO3	Percentage of facilities within 3 miles SO	%	0	100	16.72	27.78
Mile10	Number of livestock facilities within 10 miles	#	2	104	28.36	25.93

Parameter Estimates

Variable	**Unconstr.**	$H_0^A : \beta = \delta = \gamma = 0$	$H_0^B : \delta = 0$	$H_0^C : \delta = \gamma = 0$	$H_0^D : \beta_k = \delta_k = 0$ $\forall\, k \neq 0$
Intercept	11.07*** (0.02)	11.11*** (0.01)	11.08*** (0.02)	11.11*** (0.02)	11.08*** (0.02)
LSize	0.059*** (0.006)	0.061*** (0.006)	0.059*** (0.006)	0.062*** (0.006)	0.058*** (0.006)
SYear	0.059*** (0.004)	0.059*** (0.005)	0.059*** (0.005)	0.059*** (0.005)	0.058*** (0.005)
Age	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)
LArea	0.00029*** (0.00003)	0.00028*** (0.00003)	0.00029*** (0.00003)	0.00028*** (0.00003)	0.00030*** (0.00003)
AdArea	0.00034*** (0.00005)	0.00035*** (0.00005)	0.00034*** (0.00005)	0.00034*** (0.00005)	0.00035*** (0.00005)
AirC	0.31*** (0.03)	0.31*** (0.03)	0.31*** (0.03)	0.31*** (0.03)	0.31*** (0.03)
Baths	0.17*** (0.03)	0.18*** (0.03)	0.17*** (0.03)	0.18*** (0.03)	0.17*** (0.03)
Decks	0.046*** (0.014)	0.046*** (0.014)	0.044*** (0.014)	0.044*** (0.014)	0.046*** (0.014)
Fire	0.076*** (0.027)	0.081*** (0.027)	0.077*** (0.027)	0.076*** (0.027)	0.084*** (0.027)
AttG	0.16*** (0.04)	0.17*** (0.04)	0.16*** (0.04)	0.16*** (0.04)	0.16*** (0.04)
DetG	0.09*** (0.04)	0.10*** (0.03)	0.09*** (0.03)	0.09*** (0.03)	0.09*** (0.04)

Parameter Estimates (cont.)

Variable	Unconstr.	$H_0^A : \beta = \delta = \gamma = 0$	$H_0^B : \delta = 0$	$H_0^C : \delta = \gamma = 0$	$H_0^D : \beta_k = \delta_k = 0 \; \forall k \neq 0$
DistTown	-0.0065** (0.0025)	-0.0070*** (0.0025)	-0.0068*** (0.0026)	-0.0066*** (0.0026)	-0.0070*** (0.0025)
DistHS	0.0036** (0.0016)	0.0030** (0.0016)	0.0035** (0.0016)	0.0026* (0.0016)	0.0040** (0.0016)
PDens	0.0011** (0.0005)	0.0013** (0.0005)	0.0012** (0.0005)	0.0014*** (0.0005)	0.0012** (0.0005)
MedInc	0.015*** (0.002)	0.013*** (0.002)	0.014*** (0.002)	0.013*** (0.002)	0.014*** (0.002)
Ln(DI1)	-0.009 (0.029)		-0.011 (0.026)	-0.038* (0.021)	0.029 (0.025)
*Size1 *Ln(DI1)*	-0.064 (0.042)		-0.086** (0.040)	-0.075* (0.040)	
*NW1 *Ln(DI1)*	0.052* (0.029)		0.045 (0.029)	0.047 (0.029)	
*SO1 *Ln(DI1)*	0.036 (0.029)		0.031 (0.029)	0.033 (0.029)	
Mile3	0.0010 (0.0079)				0.0080 (0.0066)
*Size3 *Mile3*	-0.0060 (0.0169)				
*NW3 *Mile3*	0.00043* (0.00025)				
*SO3 *Mile3*	0.00027 (0.00022)				
Mile10	0.0015 (0.0009)		0.0018** (0.0008)		0.0011 (0.0009)

Price Elasticities

Size of Nearest Facility	Wind Direction *NW=1*	*SO=1*	*NW1=SO1 =0*
250000	0.098*** (0.034)	0.085** (0.036)	0.053 (0.039)
450000	0.044 (0.029)	0.031 (0.029)	-0.009 (0.026)
650000	0.024 (0.033)	0.011 (0.032)	-0.022 (0.027)

% Reduction in Property Value from a New Facility 0.25 Miles Away

	Wind Direction		
Size of Facility	*NW=1*	*SO=1*	*NW1=SO1 =0*
250000	26** (5,49)	22** (1,45)	13 (-6,34)
450000	11 (-5,29)	7 (-7,24)	-1 (-13,13)
650000	3 (-11,16)	-1 (-16,17)	-8 (-20,6)

% Reduction in Property Value from a New Facility 0.50 Miles Away

	Wind Direction		
Size of Facility	*NW=1*	*SO=1*	*NW1=SO1 =0*
250000	18** (4,33)	15** (1,31)	9 (-4,24)
450000	8 (-4,20)	5 (-5,17)	-1 (-9,9)
650000	2 (-11,16)	0 (-12,12)	-6 (-15,5)

% Reduction in Property Value from a New Facility 1.50 Miles Away

	Wind Direction		
Size of Facility	*NW=1*	*SO=1*	*NW1=SO1 =0*
250000	6** (1,12)	6** (0,11)	3 (-2,9)
450000	3 (-1,7)	2 (-2,6)	0 (-4,3)
650000	1 (-4,6)	-1 (-16,17)	-2 (-6,2)