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3 **Synthesizing Parcel-Level Households Using Census 2000 Data**
4

5 January 21, 2005
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9

10 **Abstract**
11

12 Metropolitan Planning Organizations (MPOs) require individual household data for long-range
13 travel demand modeling. Household surveys, however, can be expensive and have limited sample
14 sizes. To supplement survey results and Census 2000 CTPP data, the Southeast Michigan Council
15 of Governments, SEMCOG, has developed a new procedure for synthesizing individual
16 household data with the following characteristics: age of householder, tenure, household type,
17 race of householder, household size, presence of children, median household income, housing
18 value or rent, number of vehicles, and number of workers.

19 The procedure synthesizes households within block groups using Census 2000 Summary File 1,
20 Summary File 3, CTPP, and 5-Percent PUMS data. The general approach is to: 1) prioritize use
21 of Census 2000 data sources with better coverage of household characteristics first, 2) control the
22 number of synthesized households to 100% count household data, and 3) preserve the "joint
23 distribution" of variables in 5-Percent PUMS household data.

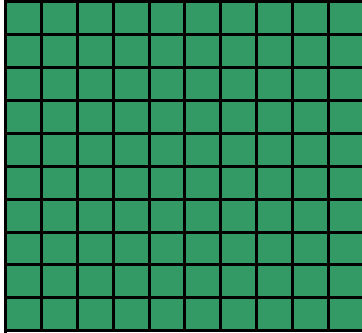
24 Because Census block groups often do not aggregate into traffic analysis zones, knowledge-based
25 placement of households within block groups is preferred over random placement of households.
26 Placement of synthesized households into individual parcels is performed by matching the
27 housing value or rent of synthesized households to the assessed property values in a digital parcel
28 file. Households can then be analyzed at the parcel level or at higher levels of geography.
29

30 Approximately 125,000 households in Washtenaw County, Michigan have been synthesized with
31 favorable results. Puget Sound Regional Council (PSRC) is currently porting the algorithm's
32 open source code from Visual Basic to Python for faster execution. In addition, PSRC is making
33 enhancements to the algorithm for its own use and broader public use.
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Census 2000 Data Products

Each 10x10 grid represents average sample size per 100 persons

Short Form (Summary File 1)

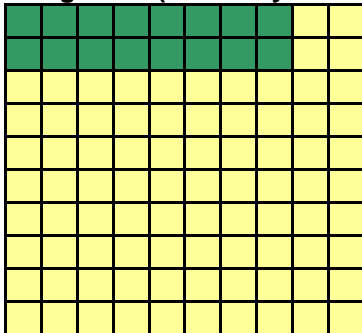


100% of population

Variables available:

Tenure
Household Type
Age
Race
Presence of Children
Household Size

Long Form (Summary File 3)

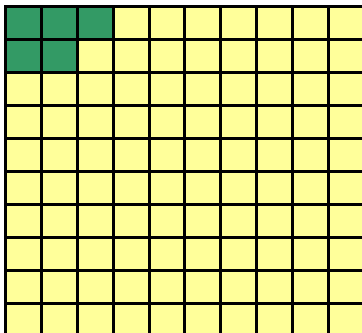


16% of population

Variables listed above, plus:

Household Income
Housing Value / Rent
Number of Vehicles Available
Number of Workers

5-Percent PUMS



5% of population

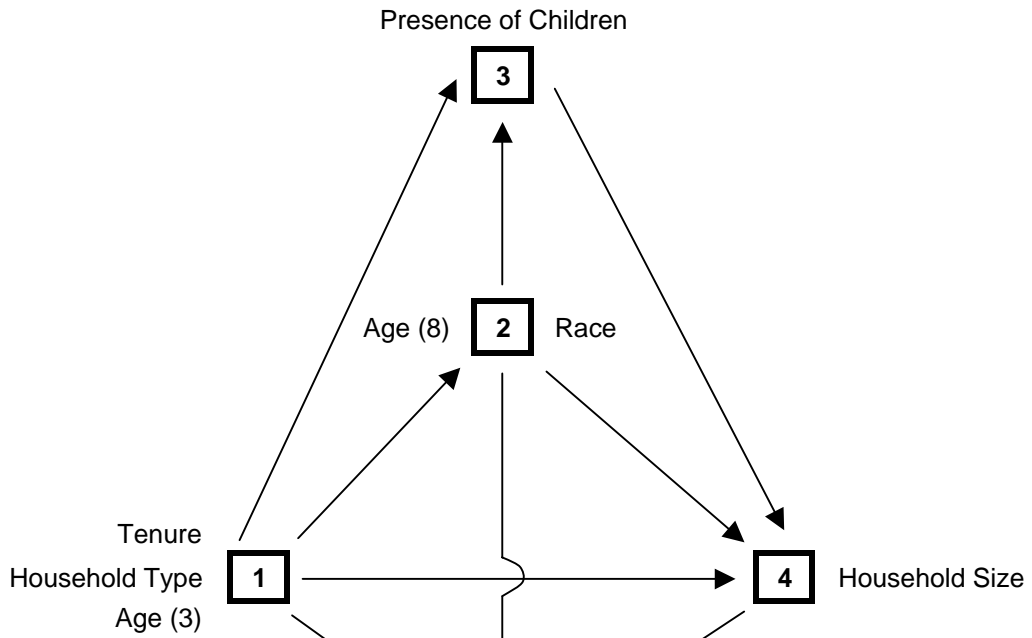
Variables listed above, plus:

All remaining non-confidential data items available

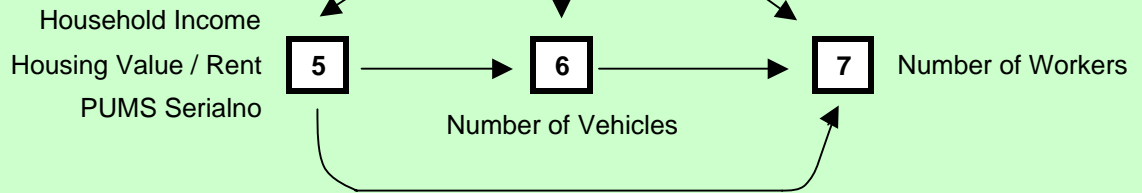
SEMCOG Household Synthesis Utility:
Prioritization of Variables, Variable Relationships,
and Process Flow

May 9, 2004

Short Form Variables



Long Form Variables



Comparison of Household Synthesis Results

May 24, 2004

Block Group 4053006

Percent of Households Matching Census 2000 Variable Distribution

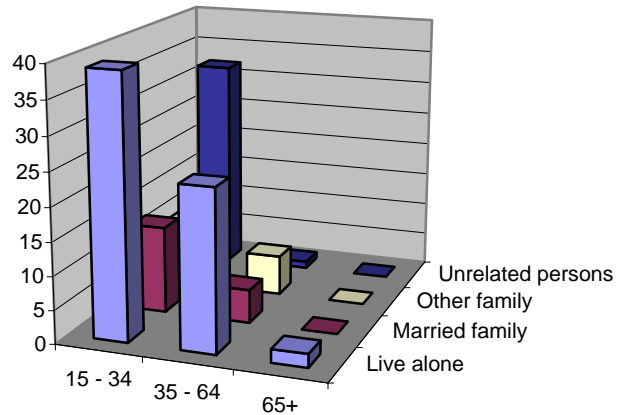
Variable (Number of Categories)	UrbanSim Utility	SEMCOG Utility
Age (8)	84.1%	100.0%
Race (6)	96.4%	100.0%
Children (2)	96.4%	100.0%
Persons (5)	94.7%	100.0%
Income (16)	92.8%	93.4%
Cars (4)	93.0%	99.7%
Workers in Families (4)	N/A	97.1%

SEMCOG Utility's Detailed Results for Block Group 4053006

Renters (23.9% of all households)

Households with children: 22%
 Average household size: 1.8
 Median household income: \$39,500
 Median monthly rent: \$690
 Average number of vehicles available: 1.34
 Average number of workers: 1.05

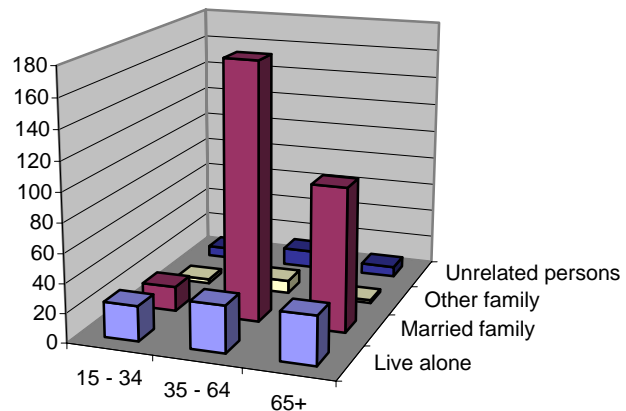
Renter Households by Age and Household Type



Owners (76.1% of all households)

Households with children: 24%
 Average household size: 2.3
 Median household income: \$106,900
 Median housing value: \$225,000
 Average number of vehicles available: 1.92
 Average number of workers: 1.23

Owner Households by Age and Household Type



Owners, Married Couple Family,

Age 35 to 64 (41.9% of owner households)

Households with children: 44%
 Average household size: 3.1
 Median household income: \$141,150
 Median housing value: \$275,000
 Average number of vehicles available: 2.01
 Average number of workers: 1.66

Owners, Married Couple Family,

Age 65+ (23.3% of owner households)

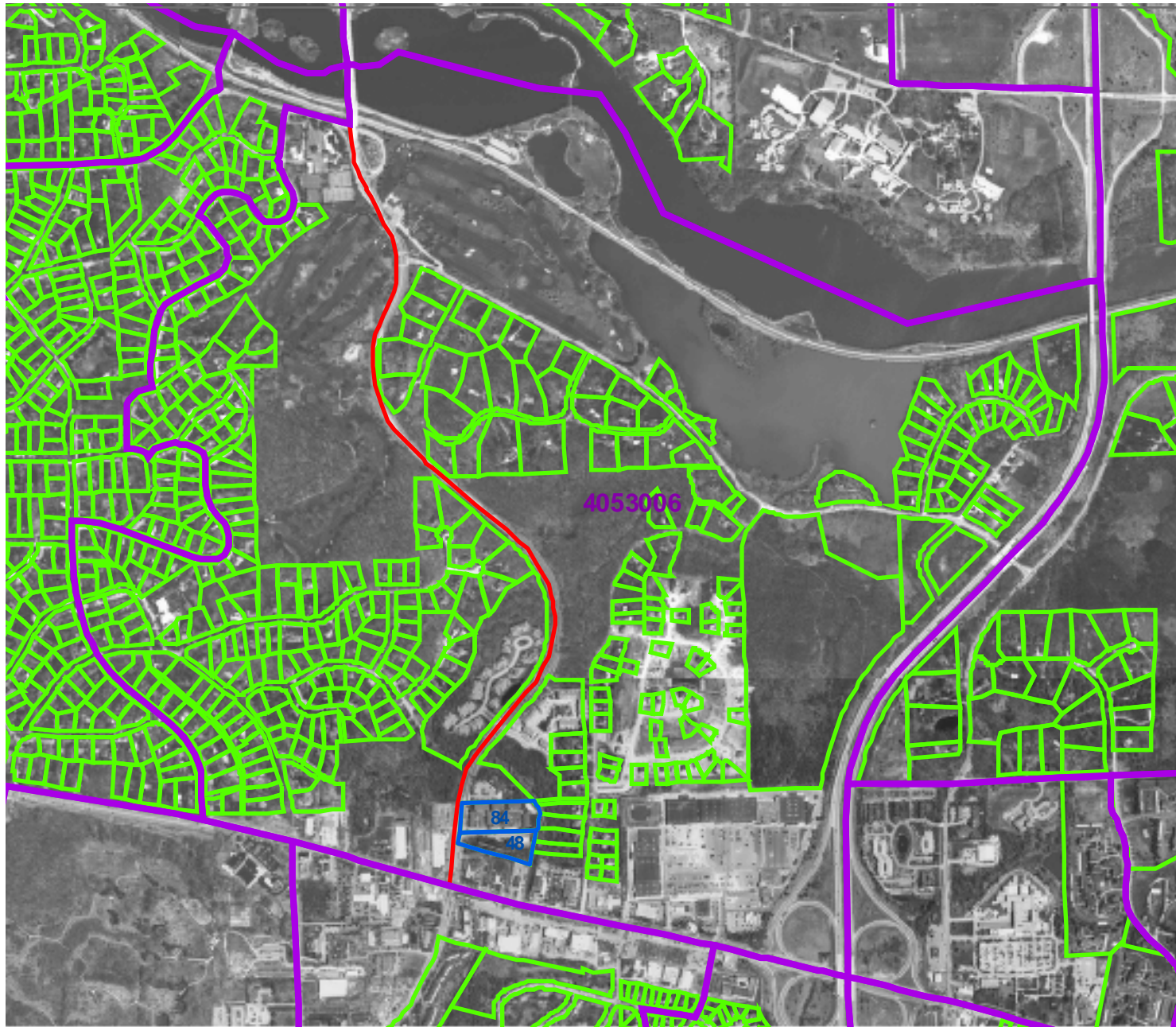
Households with children: 3%
 Average household size: 2.0
 Median household income: \$102,350
 Median housing value: \$225,000
 Average number of vehicles available: 1.88
 Average number of workers: 0.87

Owners, Householder living alone,





All ages (21.2% of owner households)

Households with children: 0%
 Average household size: 1.0
 Median household income: \$70,000
 Median housing value: \$187,500
 Average number of vehicles available: 1.69
 Average number of workers: 0.53

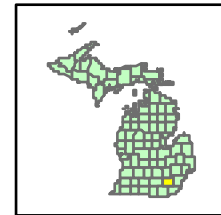
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Reference Map Block Group 4053006

-  Block Group
-  Traffic Analysis Zone (TAZ) Boundary
-  Apartment Complex
-  Residential Parcel

State Plane NAD83
June 2004



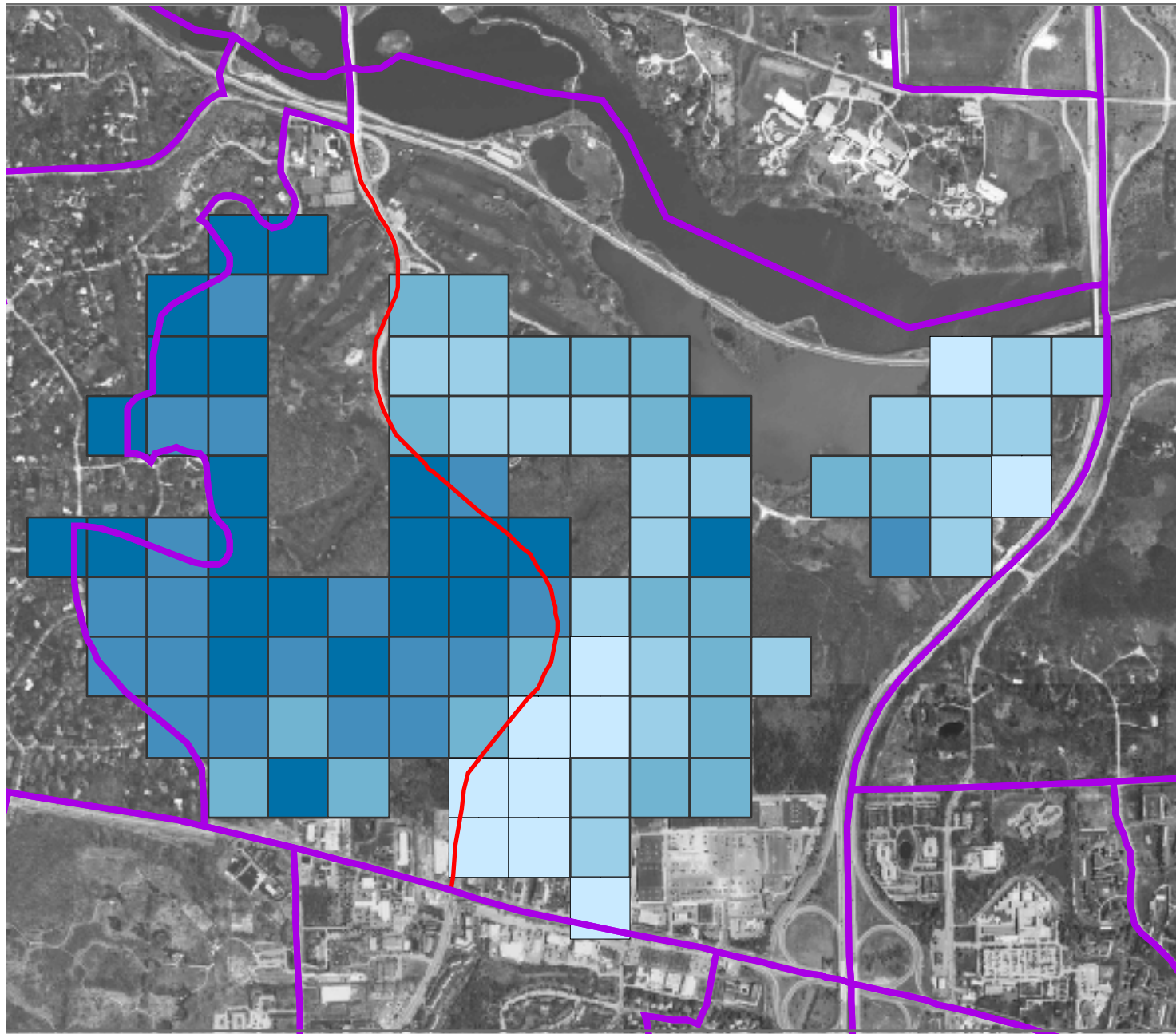
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SEMCOG

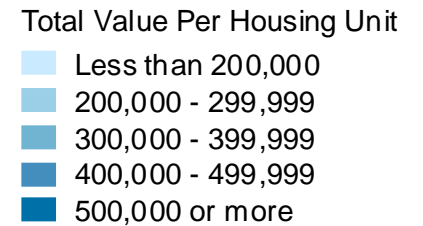
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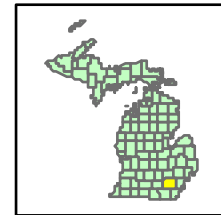


Total Value Per Housing Unit by Gridcell

Block Group 4053006



State Plane NAD83
June 2004



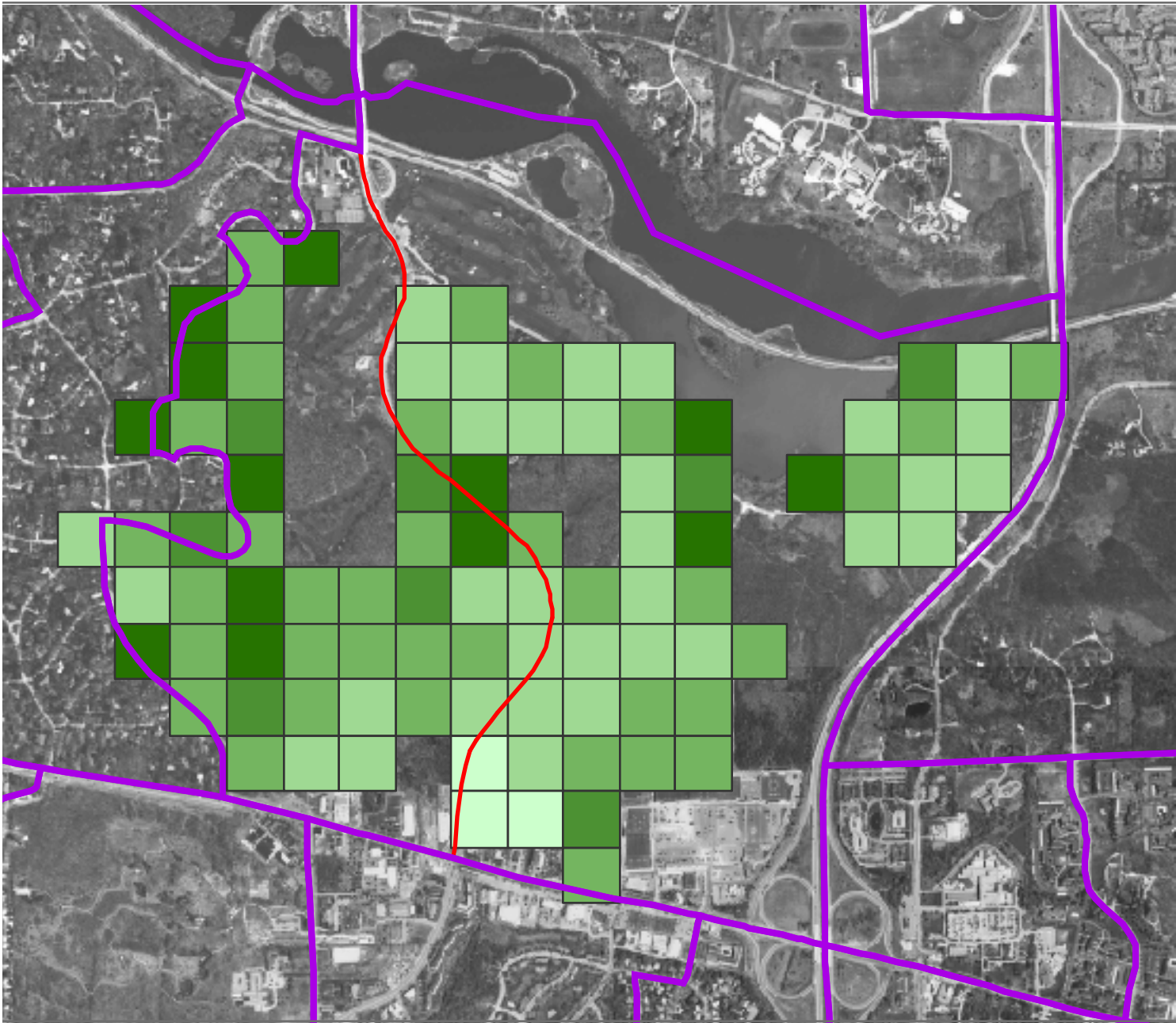
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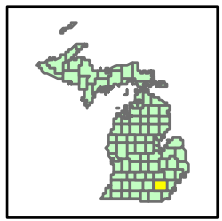


Median Household Income by Gridcell

SEMCOG Household Synthesis Utility

- Median Household Income
- Less than 50,000
 - 50,000 - 99,999
 - 100,000 - 149,999
 - 150,000 - 199,999
 - 200,000 or more

State Plane NAD83
June 2004



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