

Future of Farmland Preservation Programs

From Retention to Viability and Resiliency

Conference on the Science and Education of Land Use
A Transatlantic, Multidisciplinary and Comparative Approach,
Washington D.C.
September 24-26, 2007

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Introduction

- More states adopting farmland preservation programs.
- Local governments and NGO's also.
- By 2004, 1.4 million ac preserved by states and 500,000 ac locally (AFT).
- Current annual state war-chest is \$277 million.
- Some states have long-term funding arrangements (NJ, PA, etc.)
- Preservation based largely on appreciation of agricultures role as an industry (Hallerrstien and Nickerson, 2002), but also tied to public interest in open space and growth management.
- Farmers tend to be in charge of the state preservation infrastructure.

Introduction (continued)

- Most current farmland preservation programs overly focus on agrological factors.
- Ag's benefits go beyond food and fiber and the public is increasingly interested in the amenity values of agriculture.
- Few programs adequately address ecological, land, environmental, market, consumer, and social issues.
- Ecological, land, environmental, market, consumer, and social issues dominate non-farmer interest.
- Selling farmland preservation programs may require preserving farms that maximize public goods.
- The interests of farmer and the non-farm population may not coincide.

Introduction (continued)

- Farm community seem to prefer preservation to target agricultural features of the land.
 - Soils of statewide importance
 - Large parcels
 - Major farm locations (proximity to farmers' political base)
 - Major commodities (not those of necessary importance to non-farmers).
 - Water availability
 - Adequacy of weather
 - Other farming characteristics
- The public may want preservation that targets their environmental, social, and other interests.
 - Nearness of preserved lands.
 - Public access to farms.
 - Fresh food supply.
 - Inner-city farmers markets.
 - Bed and breakfasts
 - Agro-tourism.
 - Proximity to other green infrastructure.
- Goals of farmers and non-farmers may not be in synch.

Scoring Systems for PDR programs

- Demand for farmland preservation typically exceeds resources.
- Scoring systems help focus resources.
- Criteria typically focuses on agricultural related indicators and does not always account for viability, environmental sustainability and social sustainability, or factors of high importance to non-farmers.
- Current scoring systems must increasingly reflect the values and interests of the public.

Scoring Systems for PDR programs

State	Selection Criteria Code																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
CA	X	X	X		X	X				X											
CO																					
CT	X		X	X	X				X						X						
DE	X		X	X			X			X											
KY	X	X	X	X	X	X	X	X	X			X									
MN														X							
MD		X	X	X			X			X											
MS	X	X		X	X	X				X			X		X						
MI	X	X	X			X						X	X			X	X				
NH																					
NJ	X	X	X	X	X	X		X		X							X				

Key for Selection Criteria:

1. Number of Acres
2. Viable Agricultural Land
3. Proximity to other Farms
4. Soil Quality
5. Developmental Pressure
6. Location
7. Agricultural Preservation District

- Agricultural Practices
- 8. Level of Farm Management
- 9. Commitment
- 10. Natural Resources Protection
- 11. Percent of Acreage in Production
- 12. Gross Sales per Year
- 13. NRCS Conservation Plan.

15. Likelihood of Intergenerational Transfer
16. Cost of Preservation
17. Matching Funding
18. Farm Infrastructure
19. Local Comprehensive Plan
20. Mortgage
21. Reasonableness and Feasibility

Scoring Systems for PDR programs

	Selection Criteria Code																				
State	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
NY		X					X														
NC	X	X	X	X	X				X		X	X			X	X					X
OH	X	X	X	X	X	X		X	X		X	X	X	X	X		X	X	X		
PA	X		X	X	X	X	X	X						X					X	X	
RI	X	X	X	X			X	X						X							
UT	X	X		X				X	X		X		X					X			
VT	X	X	X		X	X	X				X										
Key for Selection Criteria:																					
1.Number of Acres						8. Agricultural Practices						15.Likelihood of Intergenerational Transfer									
2.Viable Agricultural Land						9. Level of Farm Management						16.Cost of Preservation									
3.Proximity to other Farms						10.Commitment						17.Matching Funding									
4.Soil Quality						11.Natural Resources Protection						18.Farm Infrastructure									
5.Developmental Pressure						12.Percent of Farm Acreage in Production						19.Local Comprehensive Plan									
6.Location						13.Gross Sales per Year						20.Mortgage									
7.Agricultural Preservation District						14.NRCS Conservation Plan						21.Reasonableness and Feasibility									

Objective

- Explore emerging societal goals for preservation.
- Review selection criteria for preservation programs.
- Identify emerging economic/ market, ecological/ environmental, land use/ social characteristics (“resiliency indicators”) that need to be considered for farmland preservation programs to receive wider acceptance are identified.
- Finally, the proximity of predicted preserved farmland (based on utilizing the 19 identified “resiliency indicators” as land selection criteria) to population center across the state is estimated.

Basic Premise and Approach

- Farmland preservation is an investment of public funds in the future of agriculture.
- The majority of contributors to preservation programs (through taxes) are the non-farm community.
- For preservation to appeal to the general public, it must convey benefits the public desires.
- Because urban areas tend to have greater population density, the more farmland preserved located near urban areas is likely to receive greater support (nearness determination of support expectation (Kline and Wichelns, 1996)).
- Making farmland preservation serve the public will increase support while enhancing survivability.

What Farms Do We Target to Maximize Farmer and Non-farmer Benefits?

- Farms that maximize environmental/ ecological, economic/ market, land use, and social benefits of agriculture, will enjoy greater public support and will be more likely to survive.
- “Resilient farms” as those farms that more appropriately meet the “Triple Bottom Line”.
- We go to the literature on agricultural resilience to develop an understanding of “resilient farms” -- farms that are most likely to survive in the long run.

Resilience

- Milestad and Darnhofer (2003) define it in terms of adaptability, self organization, and learning potential.
- Holling (1973, 1994, 1996, 2001) defines it in terms of reliance and stability.
- Agricultural resilience encompasses;
 - Efficient production while providing quality and safety,
 - Environmental compatibility and quality of life,
 - Adequate fresh produce access by underserved communities,
 - Adequate flexibility to withstand market instabilities and uncertainties,
 - Adequate production of environmental and scenic amenities
 - Adequate exploitation of supplemental farm income opportunities .
- Formally defined as “a state of agriculture that optimizes survival by optimizing its benefits to the public and to the farm community its self.”

Characteristics of Resilient Systems

- Carpenter (2001) identified 3 characteristics of resilient systems.
 - *Buffer capacity*
 - the ability to withstand uncertainty while maintaining basic functions
 - *Organizational capacity*
 - the ability of a system to self organize and network in spite of uncertainty (Holling, 2001)
 - *Learning and adaptive capacity*
 - the ability to adapt management and functions through learning and increased intelligence (Jiggins and Roling, 2000).
- The literature suggests the following important considerations:
 - Quality and safety to consumers, environmental compatibility, quality of life, profitability, flexibility, and value added.

Resilience Indicators

- Many resilience factors are personal and tied to the specific farm and farm operator.
- The goal is to use publicly available data to identify those resilience factors that are well publicly documented.
- We identified 22 “resilience” factors that better reflect public interest in agriculture.
- We then identified the spatial implications of preserving farmland based on each of these criteria.
- We try to compare the more agriculture oriented indicators to others reflecting increasing public and consumer interest and observe the spatial implications.
- The goal was to answer the question: “As we begin to move toward non-farmer objectives, how will the location of preserved farms change in proximity core areas where people (voters) are concentrated.

Resilience Indicators

■ Agro-ecological:

- Prime Farmland
- Unique Farmland
- Biodiversity

■ Economic:

- Farm Viability
- Commodity Viability
- Proximity to Consumers
- Proximity to Farmers' Markets
- Proximity to Food Processors
- Proximity to Grain Elevators
- Value-added Potential
- Economic Support
- Livestock Local Demand
- Product Diversity

■ Social:

- Income Demographics
- Ethnic Diversity
- Tourism
- Open Space

■ Land Use:

- Farm Size Diversity
- Farm Cluster Capacity
- Population Pressure
- Competition of Land Use
- Current Preservation

Basic Approach

- County was unit of analysis.
- Collected raw data for each indicator by county.
- Used 22 resiliency indicators (21 compared to current).
- Developed simplified score ranging from 1-10 for each indicator so that a county could score high or low in an indicator.
- Multiplied the score by total farmland available in each county.
- Scores are translated into proportions for the purpose of proportionality.

Basic Approach

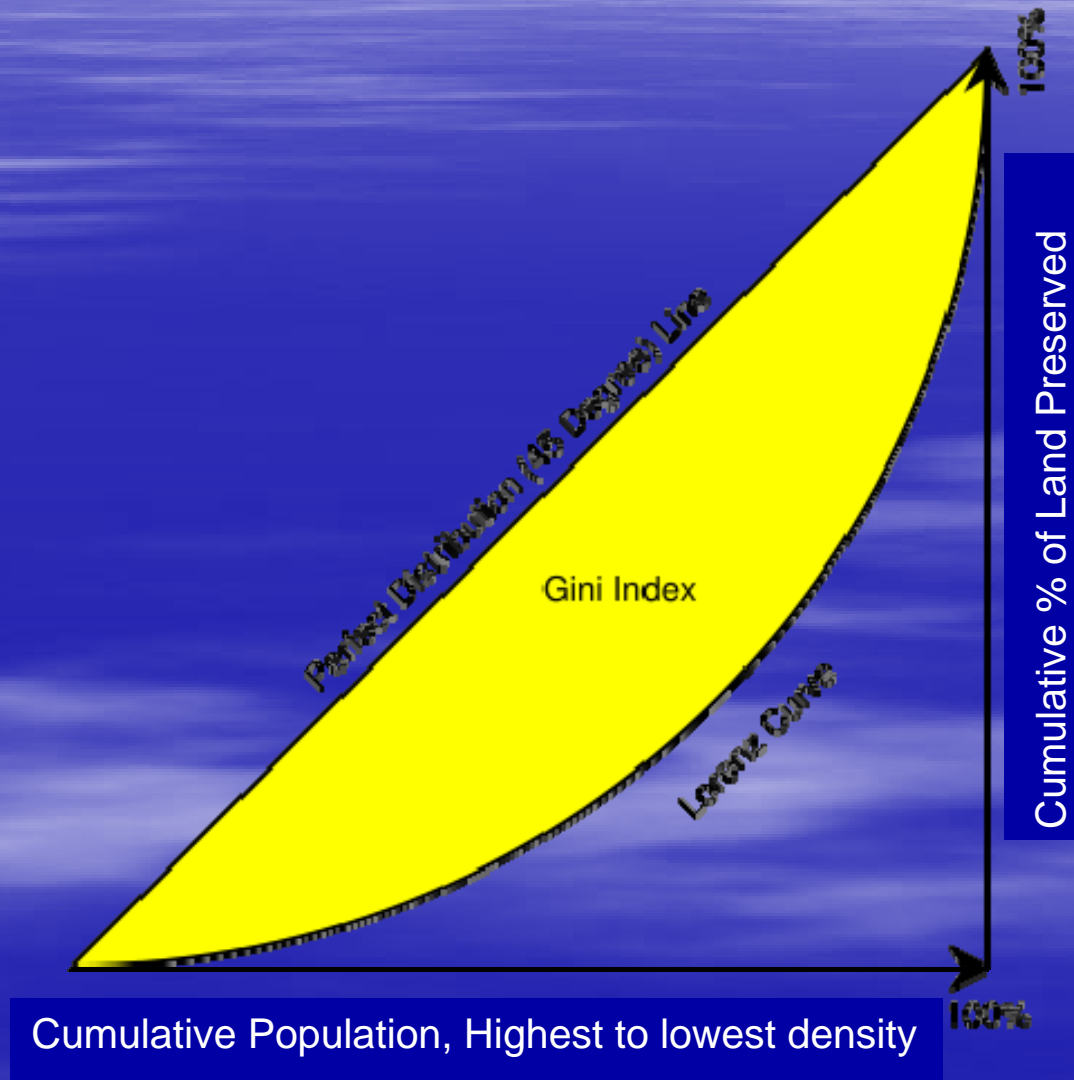
- Obtained acreage to be preserved by county.
- Evaluate closeness to highly populated areas of predicted target acreage for preservation.
- Rank each county by population density to create hierarchy of preserved land concentration in highly populated areas.
- To evaluate the nearness of preserved land to population center, used:
 - Gini (G) Coefficient
 - Ten County Concentration Ratio (CR10)

Gini Coefficient

- Gini Coefficient generally measures inequality, in this case between the distribution of preserved land and the distribution of the population.
 - A Gini of 0 coincides with perfect equality (ie preserved lands are located in the same proportion as population, hence closer to population centers)

$$G = \frac{1}{n} \left(n + 1 - 2 \frac{\sum_{i=1}^n (n + 1 - i) y_i}{\sum_{i=1}^n y_i} \right)$$

Hypothetical Lorenz Curve

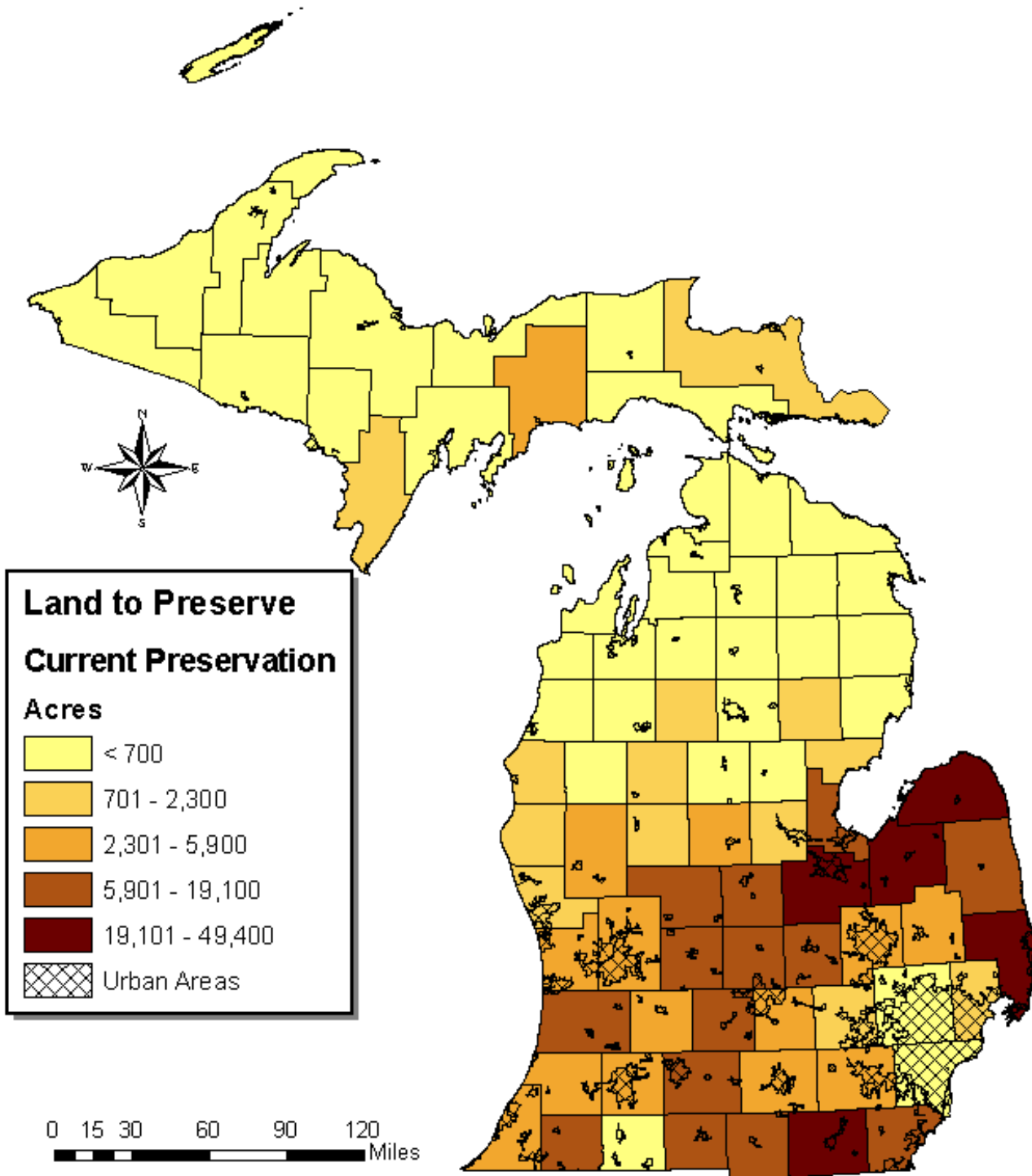


Ten County Concentration Ratio

- CR10 measures the total preserved land share within the largest 10 counties in terms of population.

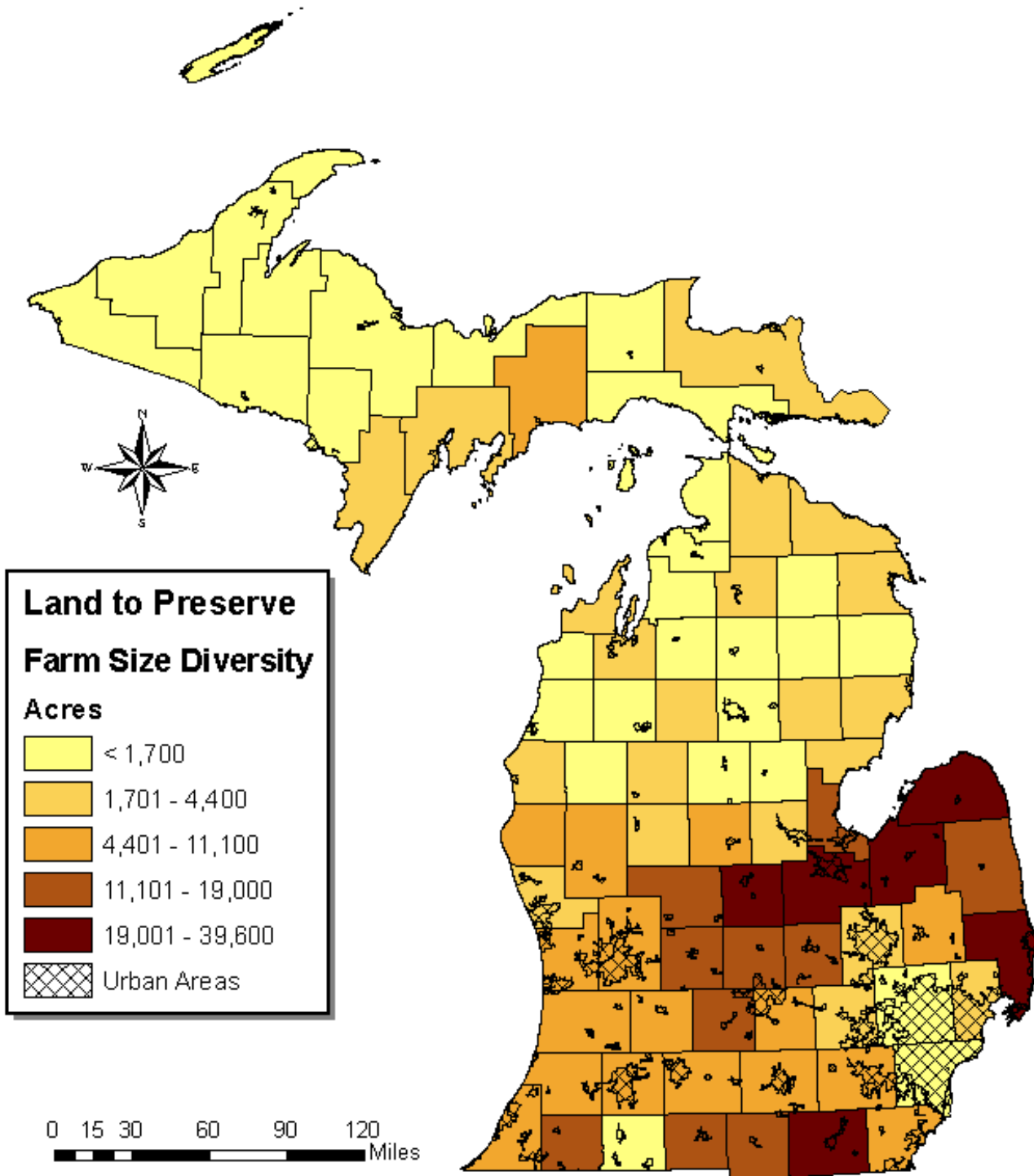
$$CR_{10} = \sum_{i=1}^{10} s_i$$

- A large CR10 means that many preserved lands would be concentrated near urban centers.



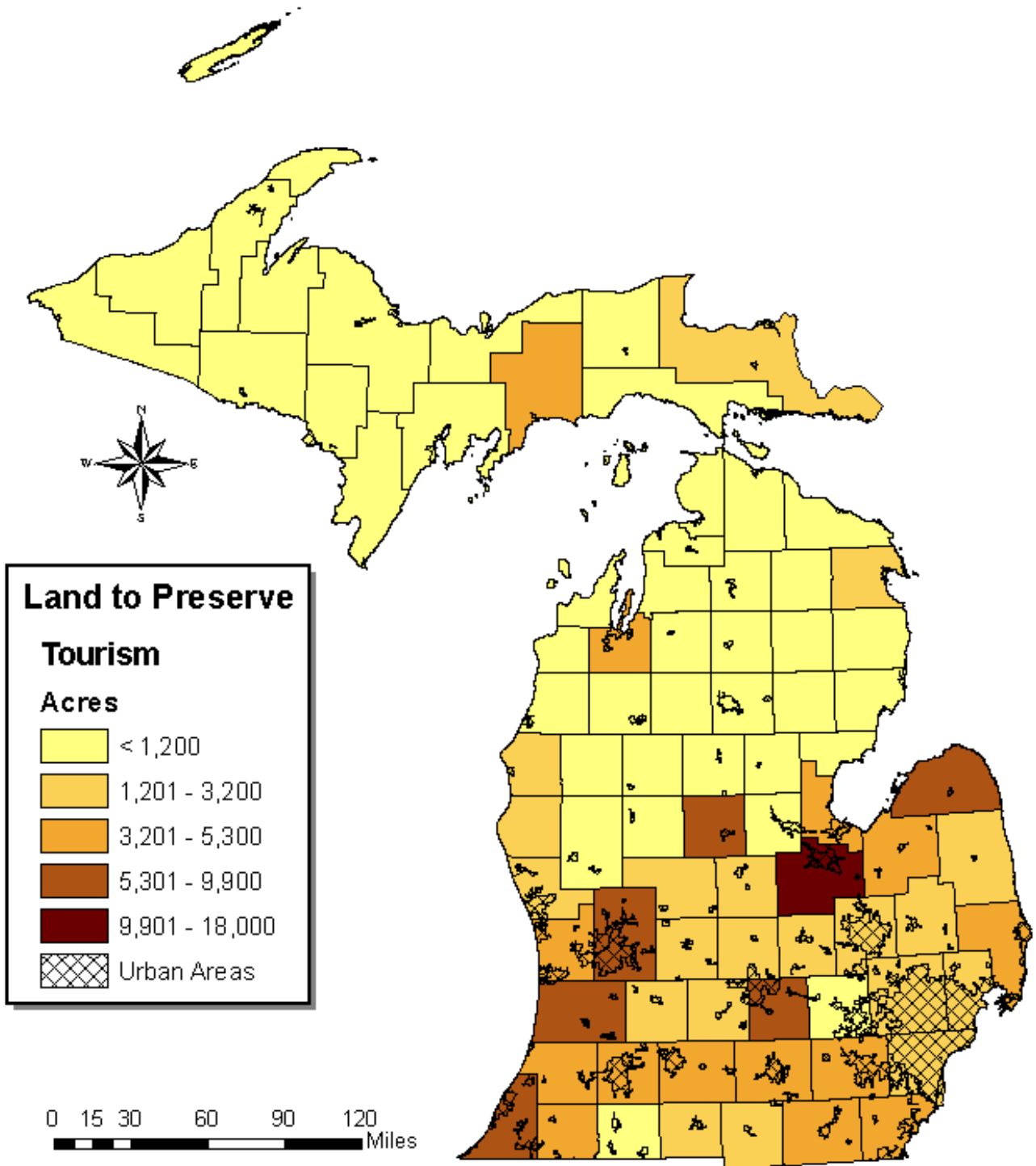
Projected Acreage
Preserved for
Current
Preservation

Rank 22 for both
the Gini and CR10 -
indicating most
dispersion away
from urban areas.



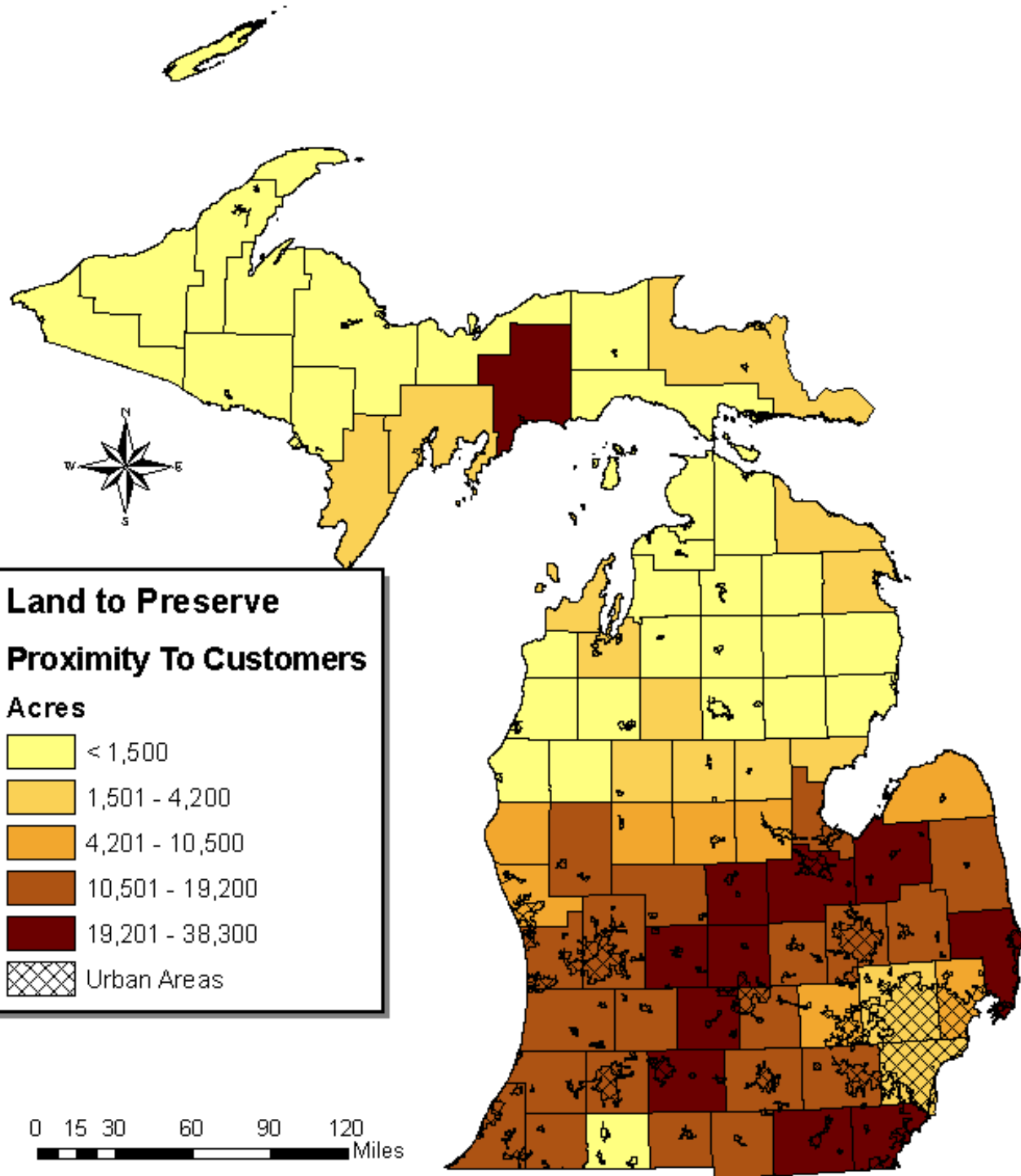
Projected Acreage
Preserved for Farm
Size Diversity

Rank 21 for Gini
and CR10



Projected Acreage
Preserved for
Tourism

Rank 1 for Gini and
CR10- indicating
most closely aligned
with population /
hence close to
population centers.

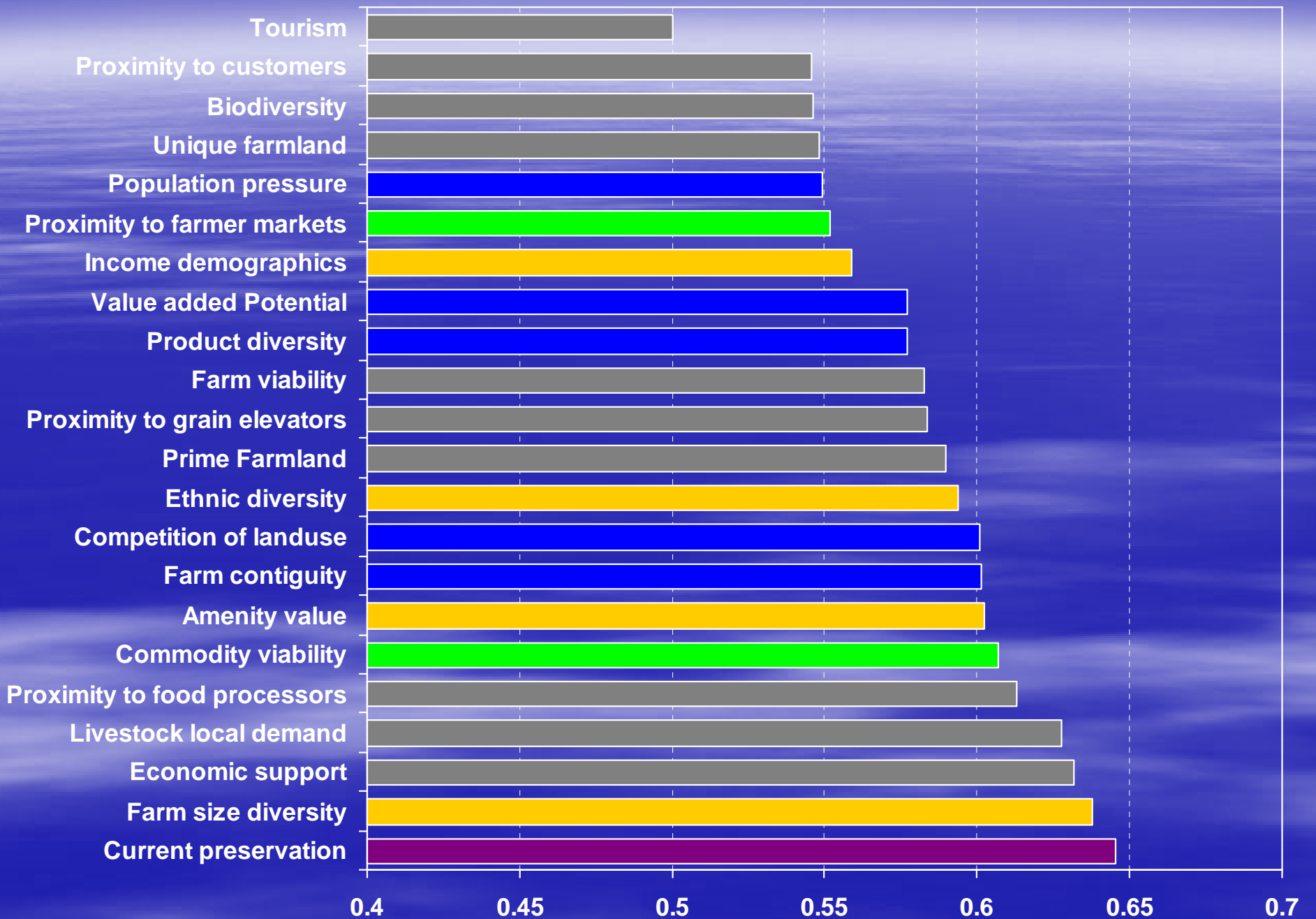


Projected Acreage Preserved for Proximity to Customers

Rank 2 for Gini and 4 for CR10

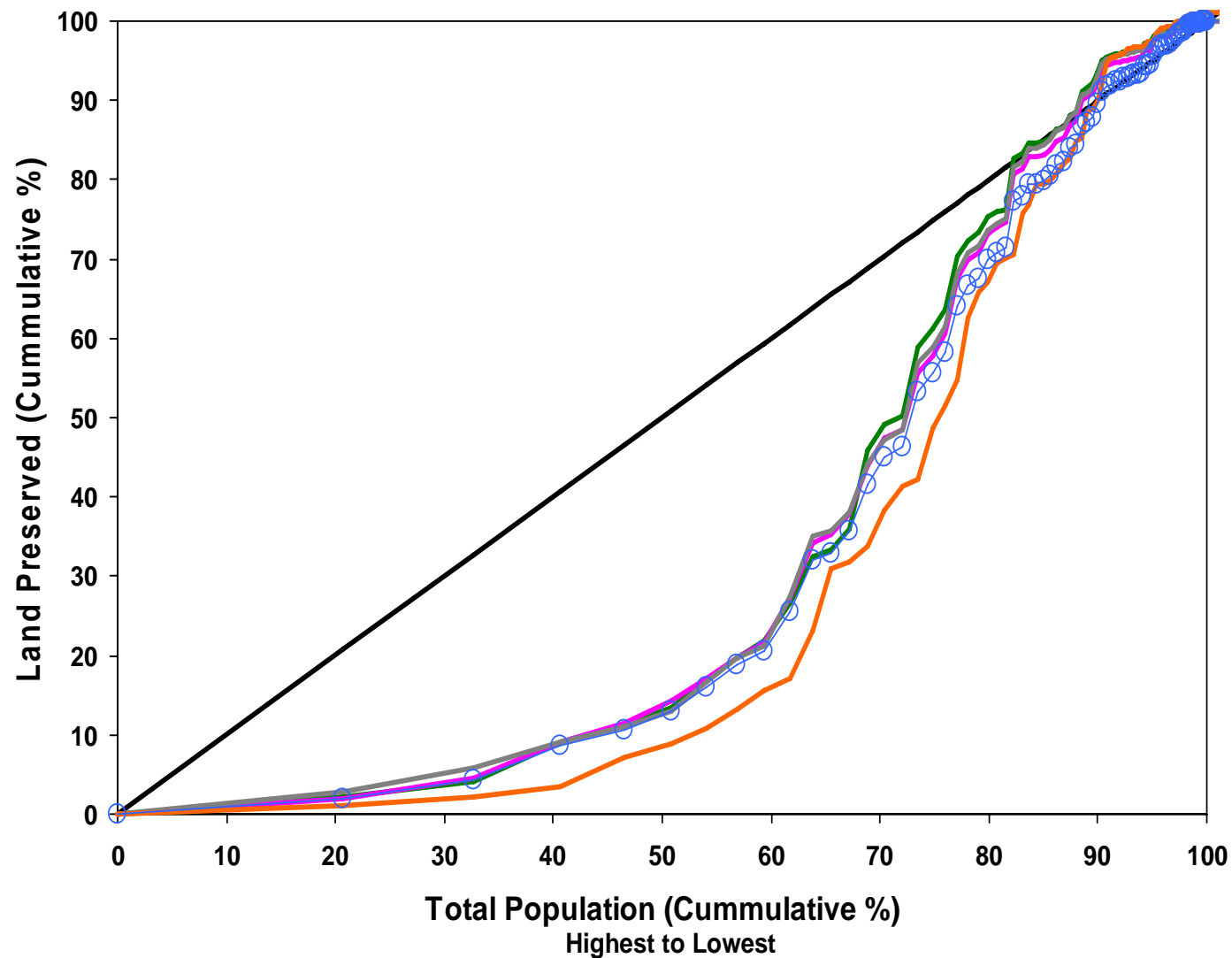
Gini Coefficient

Land Preserved and County population



Actual Lorenz Curve

Cumulative
Population
& Farmland
Preserved



— Theoretical
— Social Cummul %
— AgroEco Cummul %
— Economic Cummul %
— LU Cummul %
— Vulnerable Cummul %

Projected Preserved Acreage and Concentration Measures under 22 Preservation Scenarios

Category	Indicator	Projected Total Preserved Farmland (acres)	Rank of Preserved acreage	Gini Coefficient	Gini Rank	CR ₁₀	CR ₁₀ Rank
Land Use	Current preservation	369,547	17	64.56%	22	12.14%	22
Land Use	Farm size diversity	511,482	11	63.79%	21	12.42%	21
Economic/Market	Economic support	445,699	13	63.19%	20	13.51%	18
Economic/Market	Livestock local demand	385,318	16	62.79%	19	12.73%	20
Economic/Market	Proximity to food processors	315,850	20	61.32%	18	13.31%	19
Economic/Market	Commodity viability	869,880	1	60.68%	17	14.85%	15
Social	Amenity value	725,910	4	60.24%	16	14.24%	16
Land Use	Farm contiguity	698,487	7	60.15%	15	13.99%	17
Land Use	Competition of land use	544,574	9	60.07%	14	16.19%	12
Social	Ethnic diversity	299,374	21	59.38%	13	17.44%	7
Agricultural/Ecological	Prime Farmland	709,630	5	58.96%	12	15.50%	14
Economic/Market	Proximity to grain elevators	613,678	8	58.38%	11	16.09%	13
Economic/Market	Farm viability	369,285	18	58.28%	10	18.97%	5
Economic/Market	Product diversity	743,412	2	57.73%	9	16.96%	11
Economic/Market	Value added Potential	730,925	3	57.70%	8	17.05%	10
Social	Income demographics	415,739	15	55.87%	7	17.98%	6
Economic/Market	Proximity to farmer markets	523,715	10	55.20%	6	20.26%	3
Land Use	Population pressure	453,569	12	54.94%	5	17.28%	9
Agricultural/Ecological	Unique Farmland	443,840	14	54.83%	4	20.37%	2
Agricultural/Ecological	Biodiversity	362,908	19	54.62%	3	17.29%	8
Economic/Market	Proximity to customers	706,351	6	54.57%	2	19.17%	4
Social	Tourism	191,937	22	50.04%	1	28.92%	1

Results

- Most acreage preserved would be through a focus on:
 - Commodity viability (870,000 acres).
 - Product diversity (743,000 acres).
 - Value added potential (730,000 acres).
 - Amenity value (726,000 acres).
 - Prime farmland (710,000 acres).
 - Proximity to consumers (706,000).
- Least acreage preserved would focus on:
 - Tourism (192,000 acres).
 - Ethnic diversity (299,000 acres).
 - Proximity to food processors (316,000 acres)
 - Biodiversity (363,000 acres).
 - Farm viability (369,000 acres).
 - Current preservation (370,000 acres).

Results

- Targeting market/economic factors would preserve the most farmland.
- High ranking of prime farmland indicates abundance of good/functional soils.
- Surprising that preservation from proximity to consumers and amenity value score high.
 - good for those who favor preservation of amenity value.

Conclusions

- Evaluated implications of increasing focus on economic/market, land use, ecological/environmental and social priorities on proximity of resulting preserved land to urban populations.
- Results consistent with Hellerstein and Nickerson (2002) findings that program design has implications for the spatial pattern of permanently preserved lands.
- Traditional proponents of farmland preservation differ from the public in their priorities.

Conclusions

- As society begins to accommodate interests of non-farmers, priorities for preservation will shift away from preserving traditional agricultural characteristics (greater focus on amenities of importance to the public).
- Farmers must increasingly compromise and strike a balance between their priorities and those of stakeholders.
- A trade off therefore exists between farmer interests and public support.
- One question that comes to mind is whether by cooperating with the non-farm public, the benefits of public support outweigh the loss of benefit from meeting farmer objectives.