Progress in Adoption of Beneficial Management Practices and Environmental Farm Plans in the Great Lakes Basin 2005-2008

International Association for
Great Lakes Research Conference
May 18-22, Toledo, Ohio

Paul Smith, Cindy Bradley-Macmillan, Maxine Kingston,
Andrew Graham and David Armitage

Canada OFA OSCIA Ontario

Outline

- Purpose
- Background
  - Agricultural Policy Framework
  - What are Environmental Farm Plans & Beneficial Management Practices?
  - Ontario-wide results
- Methods
  - Data – 2006 Census & 2005-08 EFP/BMP adoption
  - Methods of analysis
- Results - EFP & BMP adoption
  - Great Lakes Basin and Lake Basins
  - Spatial analysis (counties/regions)
- Conclusions

Purpose of this Analysis

- Report on success in EFP/BMP adoption
- Analyze results of EFP/BMP adoption in Great Lakes basin
- Assess EFP/BMP adoption in relation to agri-environmental risks
  - Correlate EFP and BMP adoption to agriculture-related environmental risks
  - Is BMP adoption directed to key risks for agricultural practices & production types?

Agricultural Policy Framework
Environment Chapter

- 2005-08 implementation
- Environment one of five pillars of agricultural policy
- Nation-wide agri-environmental programs
- $78 million invested in Ontario
- Historic boost to agricultural stewardship
- Now in transition to Growing Forward, the 2009-2013 policy framework

What is an Environmental Farm Plan?

- Voluntary, confidential risk assessment prepared by each farm
- Rank performance in 23 topic areas
- Builds farmers' environmental awareness
- Rank farm's performance on each topic
  - 1, 2, 3, 4 (Best)
- Action Plan: priority actions to improve all ratings to at least 3
- Peer review
- Ready to take action
  - Projects in Action Plan eligible for cost shared funding

What is a Beneficial Management Practice (BMP)?

- Addresses priority areas of soil, water, air and biodiversity
- Practices widely accepted within agricultural sector to be effective at reducing risk or improving environment
- Practical, realistic approach to reducing risk based on sound science
- Cost effective reduction of environmental risk
- Cost share funding available under APF programs

Beneficial Management Practices

Environmental Accomplishments under APF 2005-08

	Total
Farms preparing EFPs 2005-08	11,778
Peer-reviewed EFPs 2005-08	8,867
Farms completing BMP projects	5,683
Total BMP projects completed	13,726
Funds invested	>$200M

Data: EFPs & BMPs Adoption 2005-08

- EFP participation by county/region
  - EFP participation rate, peer review rate
- BMP adoption by county/region, Lake/River Basin
  - Top BMP categories of 36 categories
  - BMPs grouped by predominant effects (numbers / county, numbers / km^2 of farmland):
    - Nutrient Management
    - Greenhouse Gas mitigation
    - Biodiversity enhancement
    - Soil management
    - Water management
- Spatial analysis – 47 counties/regions

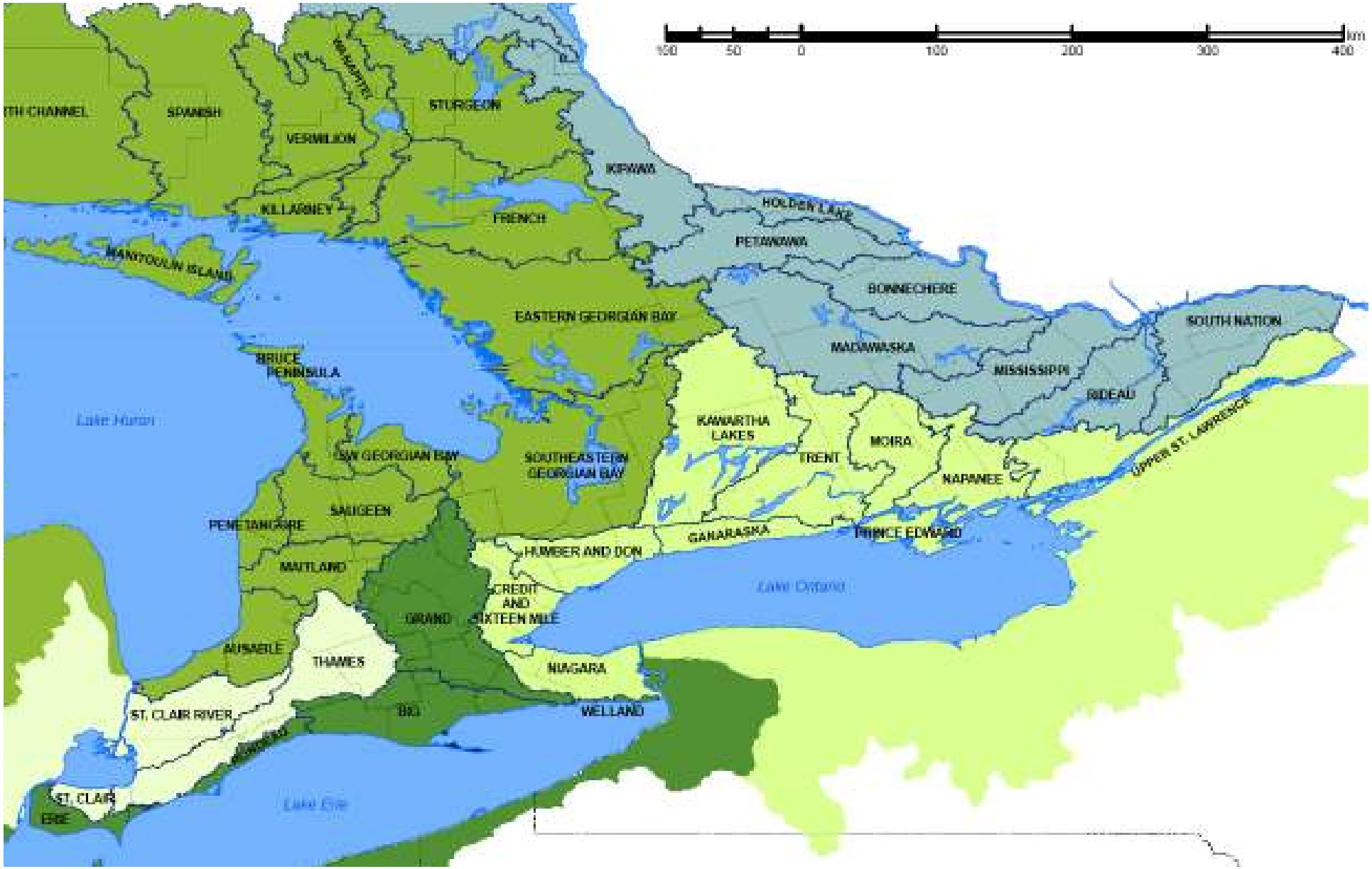
Data: Farm Characteristics

- Farm Data - 2006 Census of Agriculture
  - Numbers of farms, types of farms, farm & crop area, numbers of animals
  - Farm income
  - Land practices - tillage, pesticide use, manure production & application etc.
- Estimated manure production using standard coefficients
- Patterns within Great Lakes Basins
- Summary data for 47 counties/regions

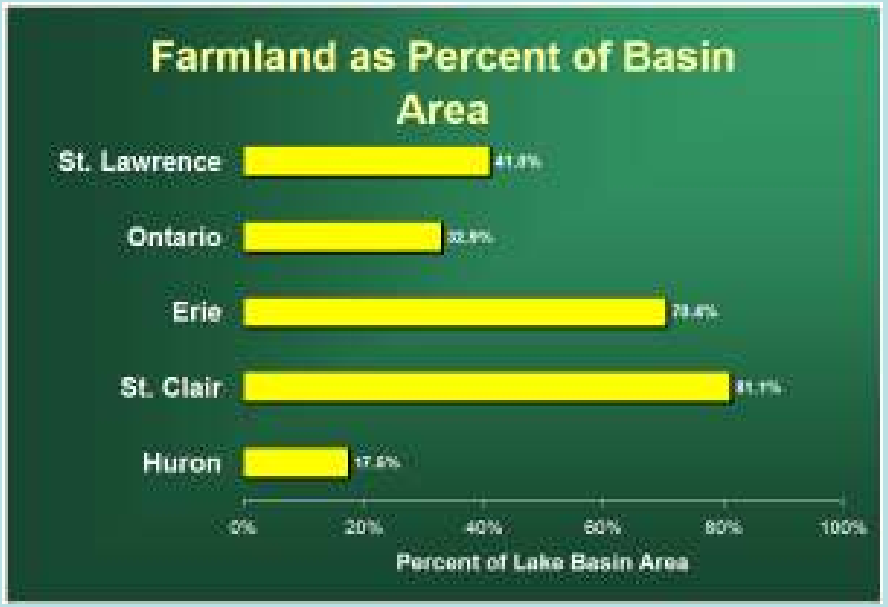
Methods of Analysis

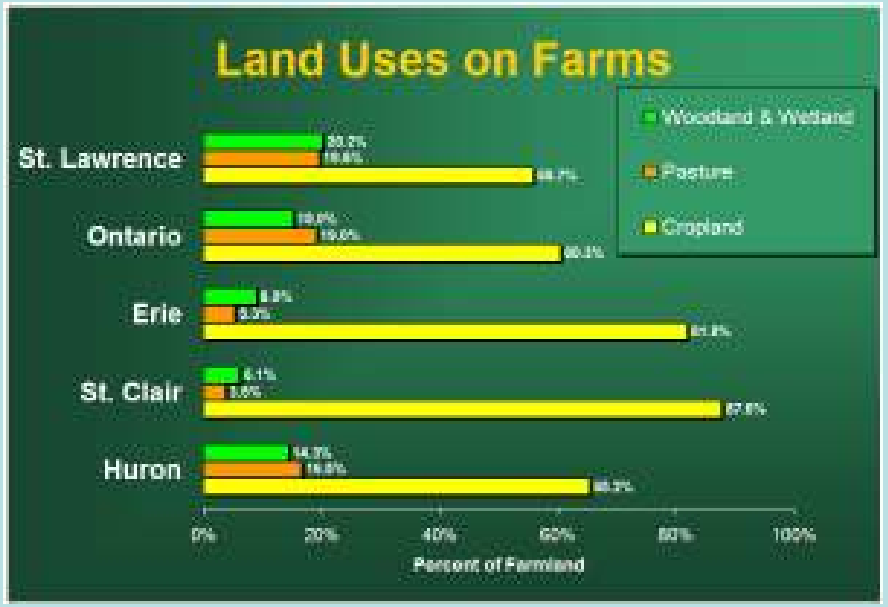
- Descriptive analysis, cross-tabulation
- Spatial correlation and regression
  - Exploratory data analysis approach
    - Identify & explore relationships & patterns
  - Statistical inference not emphasized

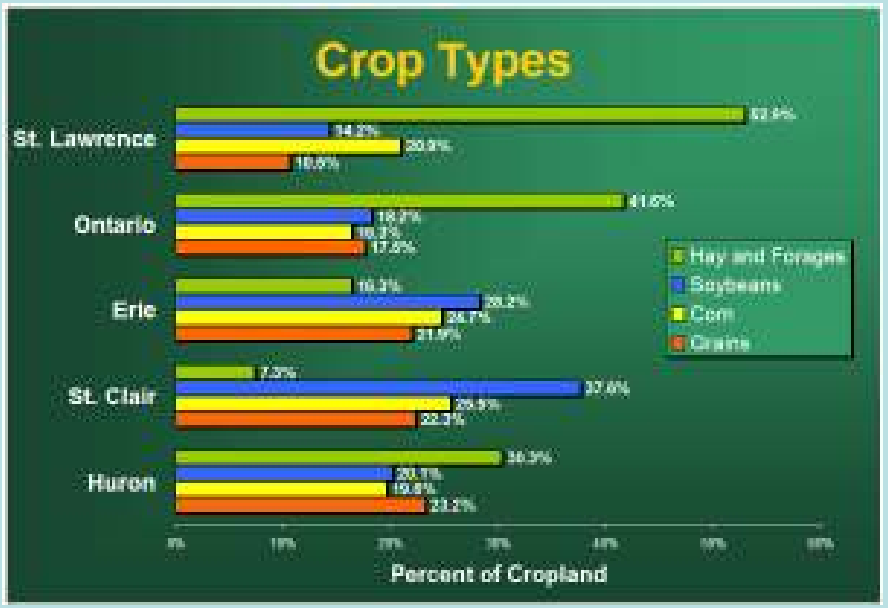
Great Lake Basins

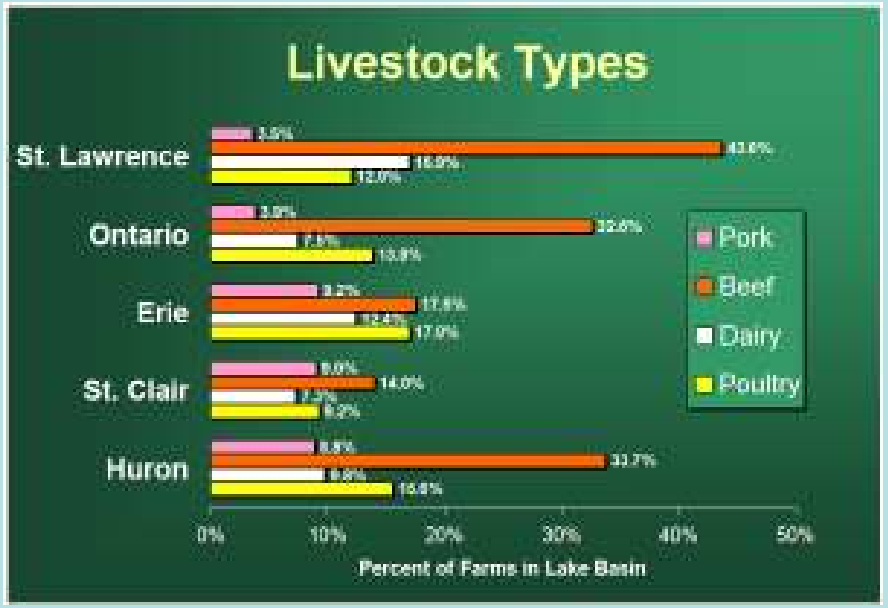


Differences Among Lakes

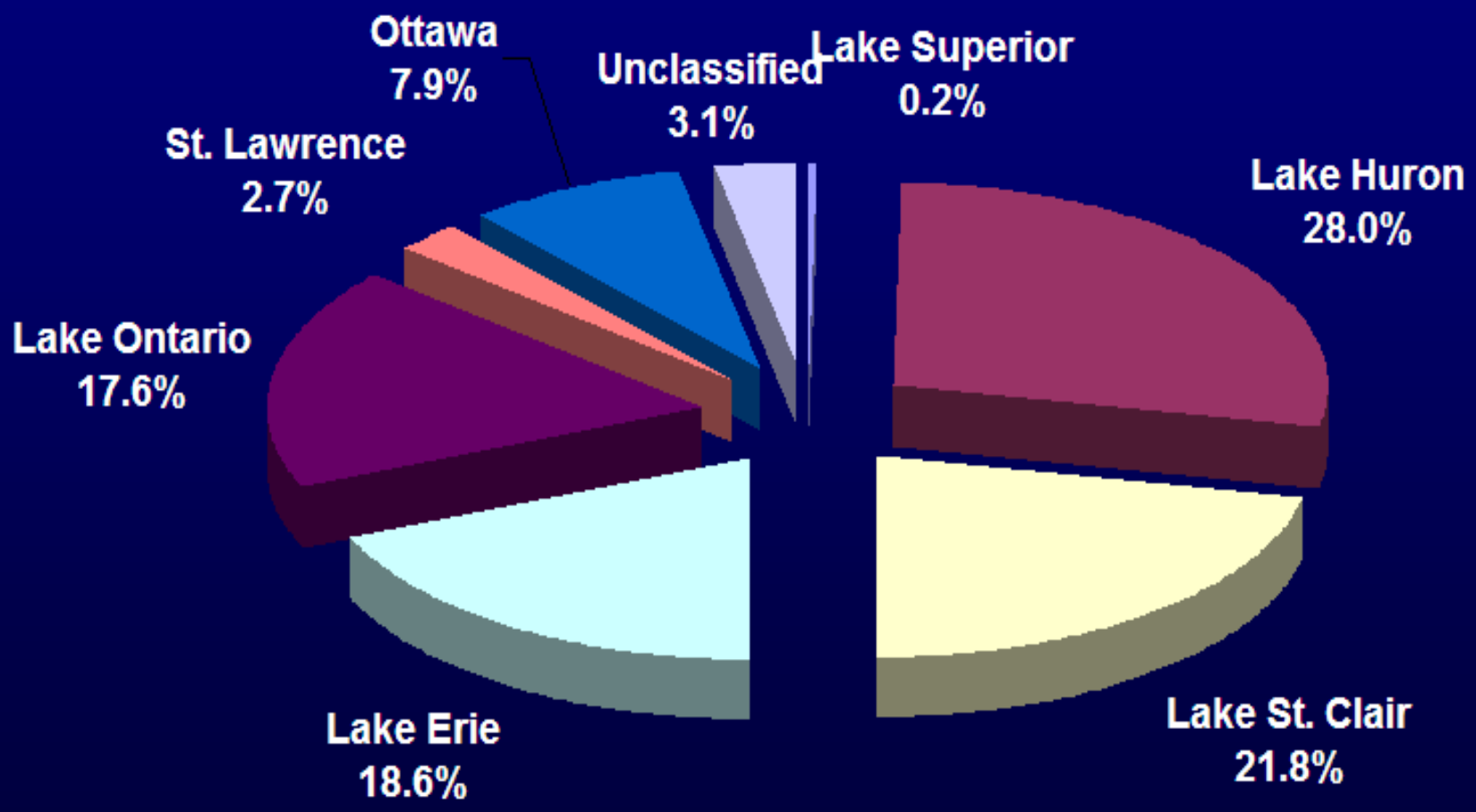




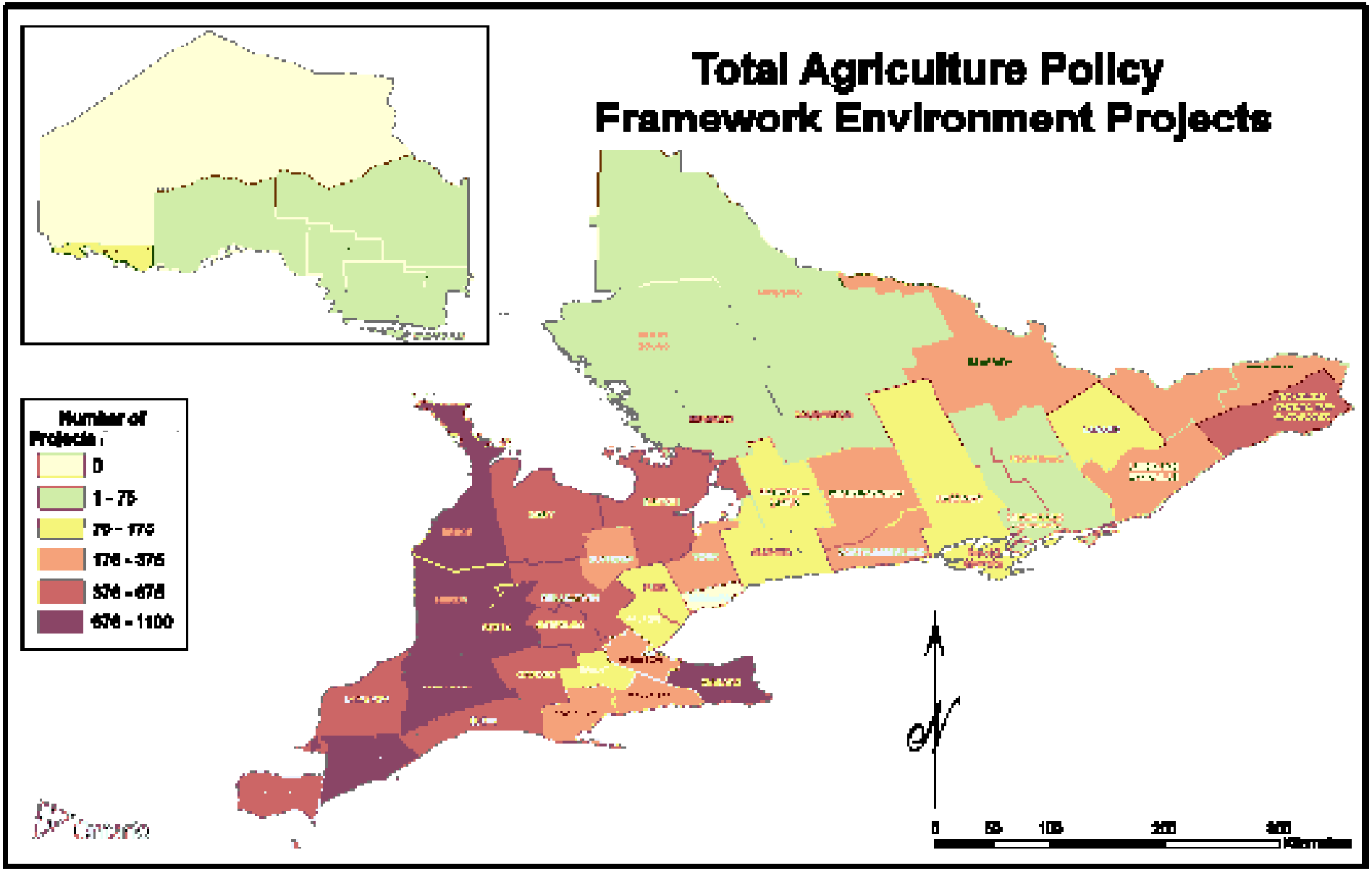




All On-Farm BMP Projects 2005-08
13,726 Projects



Spatial Analysis of EFP and BMP Adoption



Top BMPs by Lake Basin

	1st	#	2nd	#	3rd	#
Superior	New Water Wells	10	Shelterbelt Establishment	5	Farm Water Treatment Equipmt	4
Huron	Improved Cropping Systems	688	Water Well Management	427	Runoff Control	424
St. Clair	Improved Cropping Systems	871	Improved Pest Management	376	Nutrient Management Plans	260
Erie	Improved Cropping Systems	442	Improved Manure Storage	319	Water Well Management	276
Ontario	Product & Waste Management	340	Improved Pest Management	273	Improved Cropping Systems	205
St. Lawrence	Improved Cropping Systems	78	Improved Manure Storage	36	Water Well Management	26
Ottawa	Improved Cropping Systems	229	Improved Pest Management	115	Improved Manure Storage	99

Differences in Key BMPs by Lake

	Improved Cropping Systems	Improved Pest Manage-ment	Improved Manure Storage	Water Well Manage-ment	Nutrient Manage-ment Planning
Province	19.8%	9.4%	8.5%	8.0%	7.3%
Superior	4.1%	0.0%	0.0%	4.1%	0.0%
Huron	18.9%	6.5%	11.5%	11.7%	8.7%
St. Clair	30.8%	13.3%	8.8%	7.2%	9.2%
Erie	18.2%	9.1%	13.2%	11.4%	9.6%
Ontario	9.0%	11.9%	5.8%	7.0%	2.7%
St. Lawrence	22.1%	5.4%	10.2%	7.4%	7.1%
Ottawa	22.2%	11.1%	9.6%	7.7%	7.9%

BMP Groupings by Effect

	Nutrient Management	Soil Management	Water Management	Biodiversity Enhancement
Province	34.5%	52.0%	28.1%	6.1%
Superior	0.0%	27.4%	72.6%	19.2%
Huron	40.9%	45.1%	33.3%	5.2%
St. Clair	33.2%	63.8%	17.1%	2.9%
Erie	39.2%	50.9%	27.6%	3.4%
Ontario	22.0%	49.5%	32.6%	11.3%
St. Lawrence	35.1%	48.4%	30.3%	10.8%
Ottawa	29.3%	57.3%	25.8%	8.1%

EFP Participation & Total BMP Projects:

Spatial Correlations – County/Region

N=47

Variable	*Correlation*	*Variable with Highest Correlation*
Number of EFP Workshop Participants	0.907	Number of census farms
No EFP workbooks	0.932	Number of Farm Businesses
Percent EFP Peer reviewed	0.537	Manure solids per area of farms (kg/ha)
Total Number of BMP Projects	0.922	Number of Farm Businesses
Number of BMP Projects per Farm	0.703	Manure solids per area of farmland where manure applied (kg/ha)

Correlations for Top Five BMP Project Categories

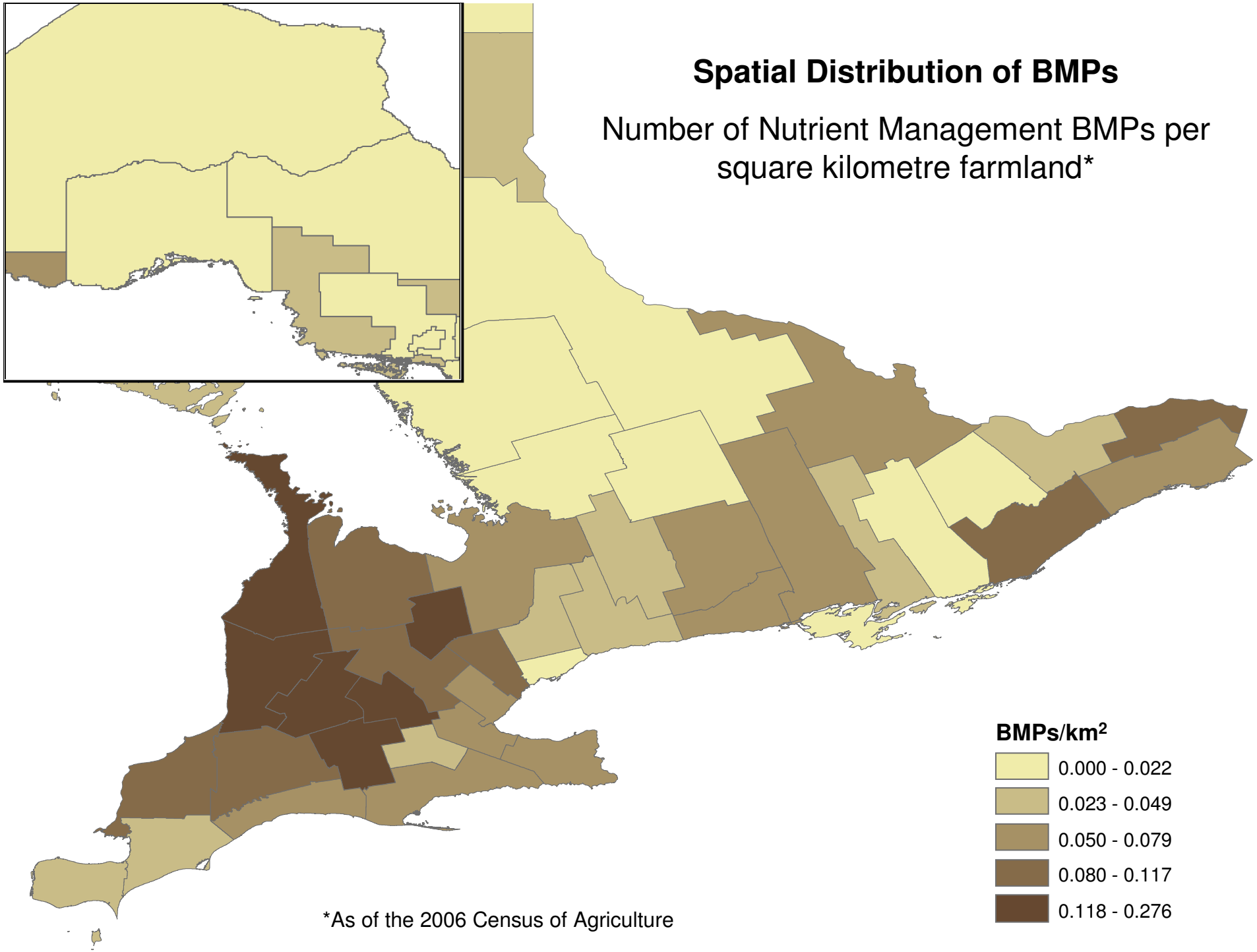
N=47

BMP Category	*Correlation*	*Variable with Highest Correlation*
Improved Cropping Systems	0.943	Number of oilseed and grain farms
Improved Pest Management	0.904	Number of all crop farms
Improved Manure Storage	0.932	Area where manure applied (ha)
Water Well Management	0.905	Area where solid manure applied (ha)
Nutrient Management Planning	0.959	Total number of cows, pigs, horses & sheep (# of animals)

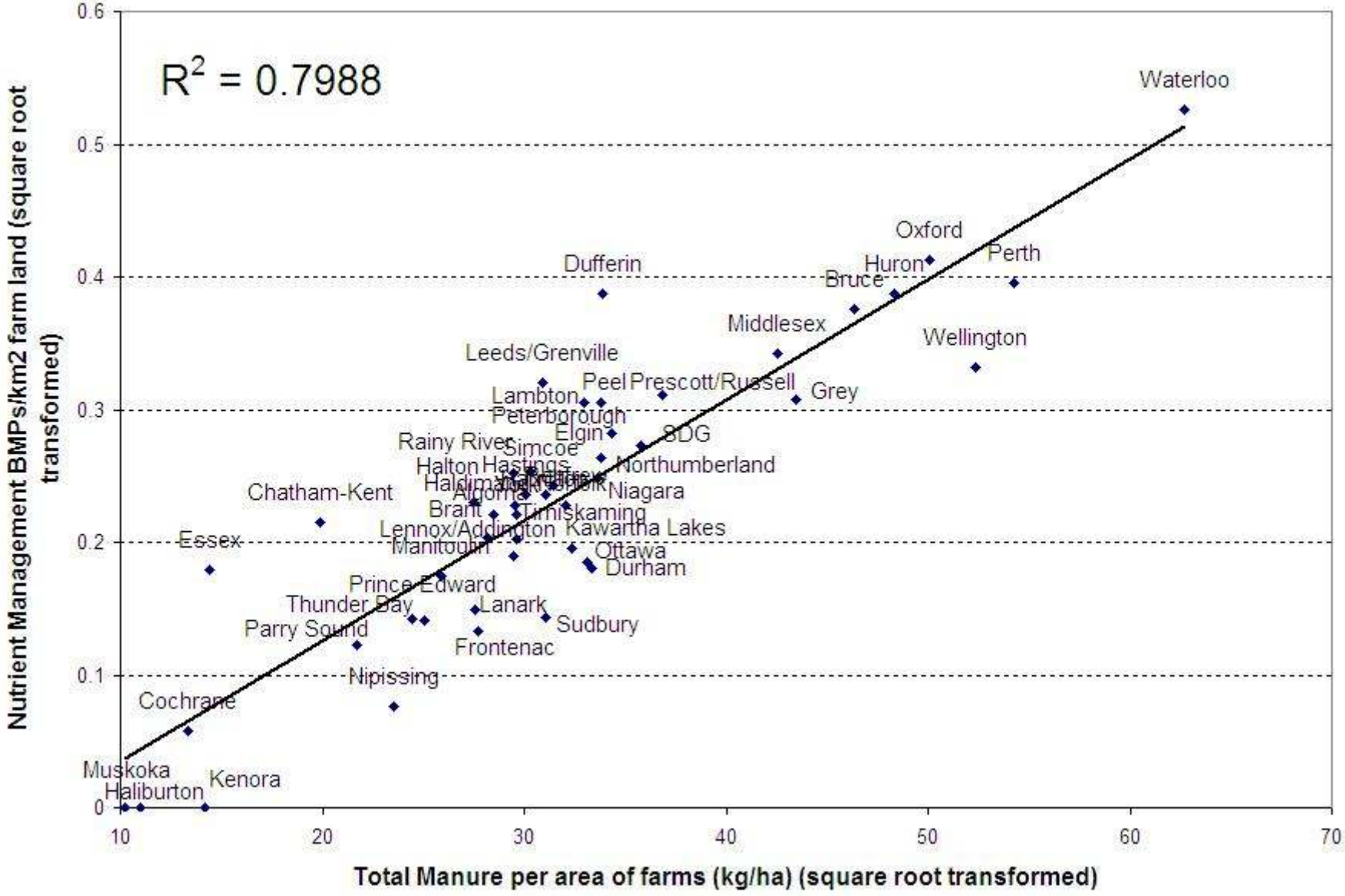
Correlations for Groupings of BMPs by Issue

N=47

BMP Grouping	*Correlation*	*Variable with Highest Correlation*
Nutrient Management BMPs/km^2 farm area	0.903	Manure per area of farms (kg/ha)
Greenhouse Gas BMPs/km^2 farm area	0.855	Percent of County in crops
Biodiversity BMPs/km^2 farm area	0.817	Number of all crop farms
Soil Management BMPs/km^2 farm area	0.821	Percent of farmland with herbicide application
Water management BMPs/km^2 farm area	0.829	Total number of horticulture / greenhouse farms


Spatial Distribution of BMPs
Number of Nutrient Management BMPs per square kilometre farmland*
BMPs/km2
0.000 - 0.022
0.023 - 0.049
0.050 - 0.079
0.080 - 0.117
0.118 - 0.276
*As of the 2006 Census of Agriculture

Nutrient Management BMPs / Sq. Km. vs Manure per Area of Farmland



Spatial Analysis

- Distribution of projects generally reflects
  - Distribution of farms & agricultural commodities
  - Environmental risks of production practices
- Priority setting using EFP risk assessment is working
- Further analysis using environmental data needed

Conclusions/ Next Steps

- Excellent progress for a short 3-year period
- Additional spatial environmental data will refine conclusions
- Higher resolution geographic analysis may aid in analysis
- Help guide efforts under Growing Forward 2009-2013
- Help identify key watersheds for action