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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

<table>
<thead>
<tr>
<th>Description</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farms preparing EFPs 2005-08</td>
<td>11,778</td>
</tr>
<tr>
<td>Peer-reviewed EFPs 2005-08</td>
<td>8,867</td>
</tr>
<tr>
<td>Farms completing BMP projects</td>
<td>5,683</td>
</tr>
<tr>
<td>Total BMP projects completed</td>
<td>13,726</td>
</tr>
<tr>
<td>Funds invested</td>
<td>&gt;$200M</td>
</tr>
</tbody>
</table>
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 / km² 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

**Farmland as Percent of Basin Area**
- St. Lawrence: 41.8%
- Ontario: 32.9%
- Erie: 74.4%
- St. Clair: 81.1%
- Huron: 17.5%

**Land Uses on Farms**
- St. Lawrence: Woodland & Wetland 10.0%, Pasture 19.8%, Cropland 89.7%
- Ontario: Woodland & Wetland 8.5%, Pasture 19.0%, Cropland 82.5%
- Erie: Woodland & Wetland 0.6%, Pasture 16.0%, Cropland 83.8%
- St. Clair: Woodland & Wetland 14.9%, Pasture 16.0%, Cropland 87.8%
- Huron: Woodland & Wetland 3.8%, Pasture 16.6%, Cropland 86.3%

**Crop Types**
- St. Lawrence: 34.2%, 20.3%, 41.6%
- Ontario: 16.9%, 16.2%, 17.5%
- Erie: 16.3%, 29.2%, 21.9%
- St. Clair: 25.5%, 22.2%, 37.6%
- Huron: 20.1%, 19.6%, 36.3%

**Livestock Types**
- St. Lawrence: Pork 3.5%, Beef 18.0%, Dairy 16.9%
- Ontario: Pork 3.9%, Beef 13.3%, Dairy 34.0%
- Erie: Pork 3.2%, Beef 17.8%, Dairy 17.4%
- St. Clair: Pork 7.7%, Beef 8.0%, Dairy 14.0%
- Huron: Pork 8.6%, Beef 15.8%, Dairy 33.7%
All On-Farm BMP Projects 2005-08
13,726 Projects

- Lake Erie: 18.6%
- Lake St. Clair: 21.8%
- Lake Huron: 28.0%
- Lake Ontario: 17.6%
- St. Lawrence: 2.7%
- Ottawa: 7.9%
- Unclassified: 3.1%
- Lake Superior: 0.2%
Spatial Analysis of EFP and BMP Adoption

Total Agriculture Policy Framework Environment Projects

Legend:
- D: 0
- 1 - 75
- 76 - 175
- 176 - 375
- 376 - 675
- 676 - 1100

Number of Projects:
## Top BMPs by Lake Basin

<table>
<thead>
<tr>
<th>Lake Basin</th>
<th>1st</th>
<th>#</th>
<th>2nd</th>
<th>#</th>
<th>3rd</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior</td>
<td>New Water Wells</td>
<td>10</td>
<td>Shelterbelt Establishment</td>
<td>5</td>
<td>Farm Water Treatment Equipment</td>
<td>4</td>
</tr>
<tr>
<td>Huron</td>
<td>Improved Cropping Systems</td>
<td>688</td>
<td>Water Well Management</td>
<td>427</td>
<td>Runoff Control</td>
<td>424</td>
</tr>
<tr>
<td>St. Clair</td>
<td>Improved Cropping Systems</td>
<td>871</td>
<td>Improved Pest Management</td>
<td>376</td>
<td>Nutrient Management Plans</td>
<td>260</td>
</tr>
<tr>
<td>Erie</td>
<td>Improved Cropping Systems</td>
<td>442</td>
<td>Improved Manure Storage</td>
<td>319</td>
<td>Water Well Management</td>
<td>276</td>
</tr>
<tr>
<td>Ontario</td>
<td>Product &amp; Waste Management</td>
<td>340</td>
<td>Improved Pest Management</td>
<td>273</td>
<td>Improved Cropping Systems</td>
<td>205</td>
</tr>
<tr>
<td>St. Lawrence</td>
<td>Improved Cropping Systems</td>
<td>78</td>
<td>Improved Manure Storage</td>
<td>36</td>
<td>Water Well Management</td>
<td>26</td>
</tr>
<tr>
<td>Ottawa</td>
<td>Improved Cropping Systems</td>
<td>229</td>
<td>Improved Pest Management</td>
<td>115</td>
<td>Improved Manure Storage</td>
<td>99</td>
</tr>
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</table>
## Differences in Key BMPs by Lake

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

- **Canada**
- **OFA**
- **Ontario**
## BMP Groupings by Effect

<table>
<thead>
<tr>
<th>Province</th>
<th>Nutrient Management</th>
<th>Soil Management</th>
<th>Water Management</th>
<th>Biodiversity Enhancement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior</td>
<td>34.5%</td>
<td>27.4%</td>
<td>72.6%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Huron</td>
<td>40.9%</td>
<td>45.1%</td>
<td>33.3%</td>
<td>5.2%</td>
</tr>
<tr>
<td>St. Clair</td>
<td>33.2%</td>
<td>63.8%</td>
<td>17.1%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Erie</td>
<td>39.2%</td>
<td>50.9%</td>
<td>27.6%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Ontario</td>
<td>22.0%</td>
<td>49.5%</td>
<td>32.6%</td>
<td>11.3%</td>
</tr>
<tr>
<td>St. Lawrence</td>
<td>35.1%</td>
<td>48.4%</td>
<td>30.3%</td>
<td>10.8%</td>
</tr>
<tr>
<td>Ottawa</td>
<td>29.3%</td>
<td>57.3%</td>
<td>25.8%</td>
<td>8.1%</td>
</tr>
</tbody>
</table>
# EFP Participation & Total BMP Projects:

## Spatial Correlations – County/Region

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

N=47
Correlations for Top Five BMP Project Categories

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

N=47
Correlations for Groupings of BMPs by Issue

<table>
<thead>
<tr>
<th>BMP Grouping</th>
<th>Correlation</th>
<th>Variable with Highest Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrient Management BMPs/km² farm area</td>
<td>0.903</td>
<td>Manure per area of farms (kg/ha)</td>
</tr>
<tr>
<td>Greenhouse Gas BMPs/km² farm area</td>
<td>0.855</td>
<td>Percent of County in crops</td>
</tr>
<tr>
<td>Biodiversity BMPs/km² farm area</td>
<td>0.817</td>
<td>Number of all crop farms</td>
</tr>
<tr>
<td>Soil Management BMPs/km² farm area</td>
<td>0.821</td>
<td>Percent of farmland with herbicide application</td>
</tr>
<tr>
<td>Water management BMPs/km² farm area</td>
<td>0.829</td>
<td>Total number of horticulture / greenhouse farms</td>
</tr>
</tbody>
</table>
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

$R^2 = 0.7988$
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