Agricultural Chemicals in Wisconsin Groundwater

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Objectives

• Obtain a current picture of agricultural chemicals in Wisconsin’s groundwater

• Compare levels of agricultural chemicals in groundwater in 2000 to levels found in 1994
Study Design

• Sampled groundwater in Wisconsin using existing private water supply wells

• Collected 336 samples
  – stratified random sampling design based on Agricultural Statistics Districts
  – number of samples per district proportional to acres of agriculture in each district
Sample Analysis

- Each sample analyzed for 18 compounds
  - 7 herbicide active ingredients
  - 10 herbicide metabolites
  - nitrate-N

- Survey included 5 “new” metabolites of Acetochlor, Alachlor and Metolachlor

- 8 compounds do not have a groundwater standard
Well Locations and Agricultural Statistics District Boundaries
2000 Survey Results

• Estimates of statewide proportion of detections
• Estimates of mean concentrations
• Geographic distribution of selected compounds
<table>
<thead>
<tr>
<th>Compound</th>
<th>Number of Detects</th>
<th>Proportion Estimate (%)</th>
<th>95% CI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate</td>
<td>216</td>
<td>61.7</td>
<td>56.5-67.0</td>
</tr>
<tr>
<td>Any Herbicide</td>
<td>135</td>
<td>37.7</td>
<td>32.7-42.8</td>
</tr>
<tr>
<td>Alachlor ESA</td>
<td>103</td>
<td>27.8</td>
<td>23.2-32.3</td>
</tr>
<tr>
<td>Metolachlor ESA</td>
<td>88</td>
<td>25.2</td>
<td>20.6-29.8</td>
</tr>
<tr>
<td>Nitrate &gt; 10 mg/l</td>
<td>53</td>
<td>14.1</td>
<td>10.5-17.7</td>
</tr>
<tr>
<td>Total Atrazine</td>
<td>48</td>
<td>11.6</td>
<td>8.6-14.7</td>
</tr>
</tbody>
</table>
Nitrate-N
Results from the 2000 Survey

- **Yellow** Exceeds 10 mg/l
- **Pink** Less than 10 mg/l
Alachlor ESA and OA Results from the 2000 Survey

- **ESA and OA**
- **ESA**
Metolachlor ESA and OA Results from the 2000 Survey

- **ESA and OA**
- **ESA**
- **OA**
Total Atrazine results from the 2000 Survey

- Yellow: Exceeds 3 ug/l
- Pink: Less than 3 ug/l
### Estimates of Mean Concentrations of Detections

<table>
<thead>
<tr>
<th>Compound</th>
<th>Number of detects</th>
<th>Mean detect concentration (ug/l)</th>
<th>95% confidence interval (ug/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate</td>
<td>216</td>
<td>6.9 mg/l</td>
<td>5.9-7.9</td>
</tr>
<tr>
<td>Alachlor ESA</td>
<td>103</td>
<td>1.0</td>
<td>0.76-1.3</td>
</tr>
<tr>
<td>Metolachlor ESA</td>
<td>88</td>
<td>0.79</td>
<td>0.53-1.0</td>
</tr>
<tr>
<td>Total Atrazine</td>
<td>48</td>
<td>0.97</td>
<td>0.59-1.4</td>
</tr>
</tbody>
</table>
Comparison of Proportion Estimates & 95% confidence intervals for 1994 and 2000
Summary of Findings

• The estimate of the proportion of wells that contained a detectable level of any herbicide or herbicide metabolite was 37.7%.

• Alachlor ESA and metolachlor ESA were the most commonly detected herbicide compounds with proportion estimates of 27.8 and 25.2%, respectively.

• The estimate of the proportion of wells that contained Total Atrazine was 11.6%.
Summary of Findings

• The estimate for the proportion of wells that exceeded the 10 mg/l enforcement standard for nitrate-nitrogen was 14.1%

• The statewide proportion of wells that contained parent atrazine showed a statistically significant decline between 1994 and 2000

• The statewide proportion of wells containing Total Atrazine did not show a statistically significant decline between 1994 and 2000