Wisconsin Water Use:
Withdrawal Reporting and Inventory

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Water Withdrawal: Definition

Taking water from a surface or ground water source making it unavailable for other purposes, even if only temporarily.
(Re)Starting a Reporting Program: Groundwater Protection Act and Great Lakes Compact

• 2003 Groundwater Protection Act
  • 2003 WI Act 310, § 281.34
  • Required reporting for properties capable of withdrawing >100 kgpd of groundwater
  • Environmental review of well applications in Groundwater Protection Areas

• Great Lakes Compact in 2007
  • 2007 WI Act 227, § 281.346
  • Water use program created
  • Register all properties capable of withdrawing >100 kgpd of groundwater or surface water
  • Water Use fees of $125 per property
    • Scaled per gallon fee above 50 Mgy in GLB
    • $1000 small business cap

• Lake Beulah WI Supreme 2011 Court Case
  • DNR expanded environmental review to avoid impacts to all waters of the state
  • Not formalized in rule or statute
Groundwater Sources Inventory: Data Migration and Source Registration

- Municipal and high capacity wells regulated for over 100 years
  - WI Board of Health up to 1969
  - WDNR from 1969 to present
  - High capacity wells automatically registered

- Implementing reporting and registration requirements required:
  - Creation of a new system based on surface and groundwater withdrawals
  - Migrating multiple file types and records to one registration system
  - Determining status of wells
  - Determining current ownership

- Current registered GW Sources
  - ≈7,600 High Capacity Wells
  - ≈4,150 Low Capacity Wells
Groundwater (GW) Sources:
Growth in Construction of High Capacity Wells

- Expansion of High Capacity wells
  - 1910 – 4 wells
  - 1935 – 125 wells
  - 1960 – 1087 wells
  - 1985 – 4836 wells
  - 2010 – 7398 wells
  - Average 150 new wells per year since 1960

- Groundwater irrigated agriculture
  - Emerges during prolonged dry period in 1950’s and 1960’s
  - Average 90 new irrigation wells per year since 1960
  - Irrigation wells comprise 70% of the growth in high capacity wells after 1960
Groundwater (GW) Sources: Drivers of well construction and abandonment

- Drought and High Capacity Wells
  - High capacity well completions usually spike in year following drought
  - Record year for completions in 1977 following 3 year drought in ‘74 to ’76.

- New wells and the 2012 Drought
  - 307 high capacity wells approved in 2012
  - Over 100 application still under review
  - Lake Beulah decision has increased time for review
  - Application procedures are currently being evaluated and revised through LEAN process.

- Abandonments
  - High capacity well abandonments undergo a sustained spike starting in 2007
    - New reporting efforts
    - Fee collection
Surface Water Sources:
Outreach, Collaboration and Source Registration

- Surface water (SW) withdrawals have been regulated in the past by other programs
  - Chapter 30 irrigation
  - CWA 316(b)
  - Municipal systems

- Other withdrawals have not been regulated
  - Cranberry producers
  - Paper manufacturing
  - Non-metallic mining
  - Aquaculture
  - Disconnected ponds

- Registration challenges
  - Migrating historical data from other programs into one registration system
  - Outreach
  - Disconnected ponds

- Current registered GW Sources
  - 822 SW withdrawals
Reporting and Fees:
Improving inventory data through repeated contact

- Withdrawal reporting was reinstituted by WDNR in 2008
  - Response rates have increased each year.
    - ≈70% in 2010
    - =91% in 2011
    - Already >80%, 11,000 sources for 2012
- Water use fees were first charged in 2010
- Fees along with repeated reporting requests have greatly improved quality of inventory and reporting data
- Current registered properties:
  - ≈5,900 total
  - ≈5,250 – have only GW sources
  - ≈450 – have only SW sources
  - ≈200 have both GW and SW sources
2011 Results: Total Statewide Withdrawals

- Total 12,580 Sources
  - 826 SW
  - 11,754 GW
- Total volume withdrawn = 2.156 trillion gallons
- 11,418 reports received
  - Top sector response rates:
    - Power = 100%
    - Municipal = 98%
    - Paper Man. = 98%
    - Aquaculture = 97%
  - Lowest response rate was Non-Ag/non-Golf irrigation = 86%
- Unreported withdrawals were estimated based on capacity and use category
  - Estimated withdrawal volume for unreported sources accounted for 0.59% of total volume
  - Unreported sources were more likely to be low capacity wells
2011 Reporting Results:
Monthly Variation

- Increased temperatures drive power, paper and municipal demand during the summer months
- Growing season drives agricultural irrigation in July and August
- Harvest and frost flooding for cranberries drives water demand in fall
2011 Groundwater Withdrawals:
213 Billion Gallons Statewide

- Municipal Water Supply: 42%
- Agricultural Irrigation: 35%
- Industrial: 5%
- Aquaculture: 4%
- Non-Municipal Public Water: 3%
- Livestock: 2%
- Golf Course Irrigation: 2%
- All other uses: 6%

[Image of water tower and irrigation system]
2011 Reporting Results: Groundwater Withdrawal Locations

- Groundwater withdrawals totaled 213 billion gallons from 11,754 sources
- Most concentrated in urban areas and vegetable-producing regions

<table>
<thead>
<tr>
<th>Sector</th>
<th>Sources</th>
<th>%</th>
<th>2011 Total BGY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal Water Supply</td>
<td>1625</td>
<td>42%</td>
<td>90</td>
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<tr>
<td>Agricultural Irrigation</td>
<td>3772</td>
<td>35%</td>
<td>74</td>
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<tr>
<td>Industrial</td>
<td>610</td>
<td>5%</td>
<td>11</td>
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<tr>
<td>Aquaculture</td>
<td>140</td>
<td>4%</td>
<td>8</td>
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<tr>
<td>Non-Muni Public Water</td>
<td>1768</td>
<td>3%</td>
<td>5</td>
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<tr>
<td>Livestock</td>
<td>723</td>
<td>2%</td>
<td>4</td>
</tr>
<tr>
<td>Golf Course Irrigation</td>
<td>444</td>
<td>2%</td>
<td>4</td>
</tr>
</tbody>
</table>
2011 Surface Water Withdrawals: 1.94 Trillion Gallons Statewide

- Power Generation: 84.6%
- Municipal Water Supply: 5.4%
- Paper Production: 6.2%
- Cranberry Production: 2.2%
- Mining: 0.6%
- Aquaculture: 0.4%
- Industrial: 0.2%
- All Other Uses: 0.2%
2011 Reporting Results: Surface Water Withdrawals

- Surface water withdrawals totaled 1,942 trillion gallons from 826 sources
- Most concentrated along Lake Michigan shoreline, Fox and Wisconsin rivers and in cranberry growing areas.
- Dominated by power production

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<th>Sources</th>
<th>%</th>
<th>2011 Total BGY</th>
</tr>
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<tbody>
<tr>
<td>Power Generation</td>
<td>30</td>
<td>84.6%</td>
<td>1,644</td>
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<tr>
<td>Paper Production</td>
<td>49</td>
<td>6.2%</td>
<td>121</td>
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<tr>
<td>Municipal Water Supply</td>
<td>40</td>
<td>5.4%</td>
<td>105</td>
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<tr>
<td>Cranberry Production</td>
<td>287</td>
<td>2.2%</td>
<td>43</td>
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<tr>
<td>Mining</td>
<td>166</td>
<td>0.6%</td>
<td>12</td>
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<tr>
<td>Aquaculture</td>
<td>19</td>
<td>0.4%</td>
<td>9</td>
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</table>
Reporting and Inventory: Quality Assurance and Known Unknowns

• QAQC- Current
  • Outlier analysis - withdrawal vs. capacity
  • Source error detection and correction

• QAQC- Planned
  • Benchmarking reported withdrawals against known withdrawals
  • Collaborating with selected users to test validity of estimate parameters
  • Cooperation with USGS Water Use research
  • Outlier analysis - withdrawal vs. capacity by sector and spatial extent

• Disconnected pond withdrawals
  • Limited DNR regulation of withdrawals
  • Limited knowledge of non-registered pond withdrawals
  • Inconsistent regulations in different counties

• Unregulated construction and approval violations
  • Drill first, apply later
  • Horizontal wells
Reporting and Inventory: Data availability and future plans

- Data aggregated at section level is publicly available upon request
- Data for specific sources, areas or sectors is available through a signed data request
  - Requests can be facilitated through user provided GIS extents
  - GIS source and withdrawal shapefiles can also be provided upon written request

- Currently integrating county parcel data with well ownership data
- Testing different methods for providing online section level data
  - WDNR public GIS viewer
  - Google Earth (.kmz files)
Thank You!

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