Groundwater, Streams, Lakes and Pumping in the Central Sands

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Little Plover

Long Lake

Pickerel Lake

Stoltenberg Cr.
A Little History
“The public will not stand for the destruction of streams... We have the water now, but what will we have if we pump it out at a faster rate?”
- V.J. Muench, Isaac Walton League, 1950

“Wisconsin has vast water resources... Irrigation ... has no permanent effect on the ground or surface water levels.... No reasonable person is concerned about this....”
- Wisconsin Agricultural Water Conservation Committee, 1959
1960 – 165 High Capacity Wells

2003 – ~3000 High Capacity Wells
Three Central Counties
Groundwater Use (Buchwald, 2009)

(78 Billion gallons per year)
Hydrology of the Little Plover River Basin
Portage County, Wisconsin
And the Effects of Water Resource Development

GEOMORPHIC SURVEY WATER-SUPPLY PAPER

Prepared in cooperation with the Wisconsin Conservation Department and the University of Wisconsin Geological and Natural History Survey
Irrigation Pumping Impacts

With $\frac{1}{2}$ the land area irrigated, during drought:

- headwaters streams that would otherwise flow will dry up

- water levels will decline an extra 4 - 5 feet on top of “natural” decline
Is it Pumping or Weather???
Indicators of Weather and Dry Conditions

1. Precipitation:
   - Hancock: average to slightly above average
   - Stevens Point: slightly below average

2. Drought index since 2000: Near normal

3. Reference streams (not too affected by pumping):
   - A little low (10-50 percentile); 2007 lowest

4. Reference groundwater levels (wells not too affected by pumping):
   - Somewhat low (10-20 percentile), not record low.

5. Reference lake levels:
   - Lower than average, but not close to record low.
Other commentary on stressed water

1. Impervious surface reduced infiltration.
2. Dewatering for the Plover water main drained the aquifer.
3. Lake Michigan is down – St. Clair River connection.
4. The Little Plover didn’t exist until the farmers dynamited it in.
5. Record drought.
6. Some ponds got filled at the head of a river.
7. Dams used to compress water in the aquifer and cause more groundwater storage.
9. Low water in the Wisconsin River.
11. Pumping by cranberry producers in Wood / Jackson Counties.
12. Some gullies around lakes were filled.
13. Lake Superior is down.
14. People living on lakes pump lots of water.
15. Springville pond was drained.
16. McDill Pond was drained.
17. Water is being pumped into the deep subsurface for oil production in Texas.
18. Irrigation doesn’t use water – it all goes back into the ground.
19. Lawn sprinkling uses more water than crop irrigation.
20. There were no trout in central Wisconsin until the farmers put them there.
Is it Pumping or Weather???

A little to middling dry??
Is There “Missing” Water?
(Can’t be Explained by Weather Alone)

Little Plover
Little Plover River – 1980s
Little Plover – (Dry stretches 2005-2009)
Little Plover @ Hoover: 1959-1987

Flow - cfs

1959-1987 Average

Month/year

Some previous droughts

Historic record low flow: 3.9 cfs
### Table 11. Regression equations to predict Little Plover baseflow (cfs) developed from binned data as shown in Table 10.

<table>
<thead>
<tr>
<th>Station</th>
<th>Regression</th>
<th>R²</th>
</tr>
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<tbody>
<tr>
<td>WI Dell</td>
<td>y = 0.0010x + 2.93</td>
<td>R² = 0.95</td>
</tr>
<tr>
<td>Fox R. at Berlin</td>
<td>y = 0.0064x + 3.37</td>
<td>R² = 0.89</td>
</tr>
<tr>
<td>Eau Claire R. @Kelly</td>
<td>y = 0.0156x + 6.76</td>
<td>R² = 0.72</td>
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<tr>
<td>Wolf at New London</td>
<td>y = 0.0042x + 2.86</td>
<td>R² = 0.89</td>
</tr>
<tr>
<td>Embarrass at Embarrass</td>
<td>y = 0.0275x + 3.31</td>
<td>R² = 0.85</td>
</tr>
<tr>
<td>Tenmile Ck nr Nekoosa*</td>
<td>y = 0.0845x + 5.40</td>
<td>R² = 0.70</td>
</tr>
</tbody>
</table>

*Tenmile Creek uses unbinned data
1959-1987: avg = 10 cfs, min = 3.9 cfs

<table>
<thead>
<tr>
<th>Source</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Del Monte</td>
<td>0.2</td>
</tr>
<tr>
<td>Whiting</td>
<td>0.7</td>
</tr>
<tr>
<td>Irrigation</td>
<td>2.5</td>
</tr>
<tr>
<td>Plover</td>
<td>1.1</td>
</tr>
<tr>
<td>TOTAL “MISSING”</td>
<td>4.5</td>
</tr>
</tbody>
</table>
Is There “Missing” Water?
(Can’t be Explained by Weather Alone)

Water Levels in Monitoring Wells & Lakes Over Whole Central Sands
Factor out the weather: Compare a “Control Well” with one near Many High Capacity Wells.
Plover (Many High Caps) Compared with Amherst Junction (Few High Caps) 1959-2007
Early History – Pumping Is Less Developed

Control Wells (Am Jct):

Plover

Depth to Water (ft)

Depth to Water (ft)
Early History Shown
Late History – Pumping
More Developed
Late History

Shown
About 3 Ft “Missing” Water
Nelsonville Amherst Jct. Wild Rose Wautoma

Down 3 ft Down 1 ft Down 1 ft

Nelsonville Amherst Jct. Wild Rose Wautoma

Down 3 ft Down 1 ft Down 1 ft
“Missing Water” in Waushara County Lakes

- Huron Lake: 3.6 ft
- Pine Lake (Hancock): 3.2 ft
- Fish Lake: 2.7 ft
- Pleasant Lake: 1.5 ft
- Burghs: 0.9 ft
- Pine (Springville): 0.8 ft
MISSING WATER

Colors:
Groundwater Model - With 1.9” average recharge reduction on Irrigated land

Boxes:
Statistically estimated
Conclusions for Central Sands

- Present “dry” weather is not that unusual

- Water is “missing” from lakes, streams, and groundwater

- Recharge reduction on irrigated land (due to increased ET) averaging ~ 2” explains missing water in Waushara County

- Recharge reduction on irrigated land averaging 5.5” explains LPR missing water
Pumping lowers water by 2.5 units.