Park Rapids: A Practical Application of a Perennial Crop in Wellhead Protection

Minnesota Groundwater Conference
11/9/10
Overview....

• Park Rapids wellhead protection process...

• Drinking water system and nitrogen level trends....

• Engaging agricultural partners...

• A major rotation change inserting a perennial crop...

• Important factors through this process...
Park Rapids
Population
~3,500
What is Wellhead Protection?

• An EPA requirement...
  
  Community water suppliers must come up with a plan to protect their water supply

• MN Department of Health & MN Rural Water Association

• MDA involved to engage agricultural partners

• Three basic phases:
  
  Plan Part I
  Plan Part II
  Implementation
Park Rapids Timeline

1999: City engaged in WHP process

2002: Part I completed

2004: Part II completed

....Implementation not happening.

Nitrate Issues

(Septic vs. Agriculture)

2006: Newspaper article series, Signs installed
Park Rapids Timeline

2007: Sampling network protocol

2008: Sampling began

2009: Sampling & Field Study

(5/09) Well #4 above 10ppm

2010: Sampling & Field study continues

(5/09) Well #7 above 10ppm
PARK RAPIDS WELL 4

NO3 (mg/L)
Linear (NO3 (mg/L))

\[ y = 0.0012x - 40.114 \]
\[ R^2 = 0.688 \]
PARK RAPIDS WELL 5

\[ y = 0.0001x + 1.4598 \]
\[ R^2 = 0.049 \]

Nitrate (mg/L)

Jan-93 Oct-95 Jul-98 Apr-01 Jan-04 Oct-06 Jul-09

NO3 (mg/L)
Linear (NO3 (mg/L))
PARK RAPIDS WELL 6

y = 0.0009x - 26.156
R² = 0.6923

Nitrate (mg/L)

Jan-93 Oct-95 Jul-98 Apr-01 Jan-04 Oct-06 Jul-09

9.0 ppm on 1/27/10
9.1 ppm recently

9.0 ppm on 1/27/10
9.1 ppm recently
\[ y = 0.0003x - 5.2962 \]
\[ R^2 = 0.0415 \]

<table>
<thead>
<tr>
<th>Jan-93</th>
<th>Oct-95</th>
<th>Jul-98</th>
<th>Apr-01</th>
<th>Jan-04</th>
<th>Oct-06</th>
<th>Jul-09</th>
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<tr>
<td>9.6</td>
<td>ppm on 2/2/10</td>
<td>11.0 ppm recently</td>
<td></td>
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Confirmed & Shut Down on 5/11/10
Engaging the Producers...

• Focused on the land closest to the cities' wells.
• Provide solid data that is current and specific to the area in question.
• Continually keeping them informed.
• Activities to answer the questions they have.
  – Sampling Network
  – Field Demonstration Site
  – BMP Challenge Plot
  – Meetings w/ Key Players Involved
Data Collected by:
The City of Park Rapids
Nitrate Leaching Field Study

BMP Challenge Plot
20% Lower N rate

A cooperative effort between:
Becker Farms
RDO – Park Rapids
The City of Park Rapids
The MN Dept. of Agriculture
Typical Irrigated Crop Rotation - Central Sands

- Russet Potatoes
- Edible Beans
- Corn
2010 planting status

Rotation Change to Include a Perennial Crop
Advantages of this Rotation:

- **Reduced nitrogen requirements** of the Altura Variety of potatoes (35% less).

- Sorghum Sundangrass should be an effective crop for **cleaning up residual N** from the previous potatoes.

- Used as a **“green manure” crop** generating a huge amount of biomass to help reduce erosion and runoff.

- Literature suggests that crops such as sorghum and mustards naturally produce chemicals similar to Vapam (a soil fumigant used in the potato industry).
## Cost Implications

### Traditional

<table>
<thead>
<tr>
<th>Year</th>
<th>Land Rent</th>
<th>Crop Net Income</th>
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</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>$190/ac</td>
<td>$350/ac</td>
</tr>
<tr>
<td>Year 2</td>
<td>$125/ac</td>
<td>-</td>
</tr>
<tr>
<td>Year 3</td>
<td>$135/ac</td>
<td>-</td>
</tr>
</tbody>
</table>

### Alternative

<table>
<thead>
<tr>
<th>Year</th>
<th>Land Rent</th>
<th>Crop Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>$190/ac</td>
<td>$235/ac</td>
</tr>
<tr>
<td>Year 2</td>
<td>-</td>
<td>($300/ac)</td>
</tr>
<tr>
<td>Year 3</td>
<td>-</td>
<td>($300/ac)</td>
</tr>
</tbody>
</table>

### The Difference

<table>
<thead>
<tr>
<th>Year</th>
<th>Land Rent</th>
<th>Crop Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>-</td>
<td>($115/ac)</td>
</tr>
<tr>
<td>Year 2</td>
<td>($125/ac)</td>
<td>($150/ac)</td>
</tr>
<tr>
<td>Year 3</td>
<td>($135/ac)</td>
<td>($150/ac)</td>
</tr>
</tbody>
</table>

### Annual Balance:

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>($30,475)</td>
</tr>
<tr>
<td>Year 2</td>
<td>($72,875)</td>
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<tr>
<td>Year 3</td>
<td>($75,325)</td>
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<tr>
<td>Total Loss</td>
<td>($178,675)</td>
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Information provided by R.D.O.
...Proposed planting in 2011

<table>
<thead>
<tr>
<th>MUSYM</th>
<th>ACRES</th>
<th>% AREA</th>
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</thead>
<tbody>
<tr>
<td>1126B</td>
<td>569</td>
<td>74.9%</td>
</tr>
<tr>
<td>1248C</td>
<td>5</td>
<td>0.7%</td>
</tr>
<tr>
<td>567A</td>
<td>186</td>
<td>24.5%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>760</td>
<td>100.0%</td>
</tr>
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Beans
Wheat
Sudangrass
Important Factors...

• Time, Commitment, and Communication.

• Meetings have to be relevant.

• Provide neutral information upon which decisions can be based.

• Find answers.…

• Local data always trumps values from literature.

• Provide opportunities for communication.

• Several opportunities…

• Being available to meet, discuss, and explain.
Time for Questions?

Luke Stuewe  
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