A Perspective on Water Quality Issues Across Washington State

How Well are the wells in the Yakima Valley?

Curt Black & Sandy Halstead
EPA Region 10
Outline of Today’s Discussion

• Overview of the Yakima Valley
  – Where, who, why, and what

• EPA’s involvement and approach
  – Three Phase source assessment study
  – Reducing exposure / drinking water risk

• Next steps / Lessons Learned
Yakima Basin

Land use across the watershed

http://pubs.usgs.gov/sir/2008/5045/figure2.html
Complex landscape diversity

• **Top Crops**
  - First in the nation for
    • Milk production per cow
    • 20% of the world’s hop supply
    • 42% of the nation’s pears
    • 38% of the nation’s concord grapes
    • 29% of the nation’s sweet cherries
  
  - Top in the state for
    • Cattle, sheep, and bee colonies
    • Corn, spearmint, and peppermint
In 2008, the Yakima Herald-Republic ran a series of articles titled, *Hidden Wells, Dirty Water*.

The articles highlighted:

- Existing studies documenting groundwater pollution in the lower Yakima Valley.

- Public frustration with a lack of action from government agencies.

- Confusion over which agency is responsible for regulating groundwater

- EPA CARE project for community concerns

- Outlook School well replaced
Yakima Valley Well Users

• Primarily Lower Yakima Valley

• 75,000 residents – 30,000 groundwater users

• Historical data:
  • 12% of 453 wells exceed NO$_3$ MCL
  • E. coli in shallow wells

• No one has worked out how to link land use/sources to nitrate in wells
EPA’s Yakima Valley approach

• Convene/ facilitate conversations with agencies and the community

• Reduce Exposure to the most vulnerable residents
  – Outreach on health impacts
  – Assist residents with understanding their risk

• Source assessment
  • Focus on the potential dominant N sources
    – CAFO, septic, and cropped land
Environmental Justice Community

- Designated in November 2009
- Focus attention
- Provide regional resources to coordinate actions ($$, FTE, lab support, outreach)
Imminent & Substantial & Endangerment Finding under SDWA Section 1431

• Cites historical groundwater data in the valley as basis for action

• Concludes:
  – contaminants that are, or may be, present in an aquifer may present imminent and substantial endangerment to the health of persons

• Overall problem still unaddressed even though some state/local/tribal governments have taken some preliminary actions related to the contamination
Potential sources for nitrate, bacteria and other pollution in the lower valley include:
• inorganic fertilizer application,
• manure from dairy and non-dairy livestock,
• on-site septic systems
• industrial application of wastewater.
Potential Pollution Pathways

- Leaching to groundwater
- Surface water recharge in polluted irrigation drains.
- Poorly constructed wells.
- Improperly located, constructed or abandoned wells can bring pollution from the surface to groundwater
Summary of EPA Activities

Four Phases:

– Phase 1: Nitrogen Loading / GIS

– Phase 2: Screening for Current Nitrate Concentrations

– Phase 3: Research Sampling

– Phase 4: Follow-up
Objectives of Sampling

- Protect users of shallow ground water
- Determine current distribution of nitrate
- Develop tools to link high nitrate to their source(s)
- Utilize resulting information – select management options to reduce nitrate
Phase 1: Nitrogen Loading

- Purpose is to better understand relative quantities of nitrogen applied to the land within County.

- Evaluated several sources:
  - crops;
  - livestock;
  - septic/wastewater treatment;
  - and precipitation.
SUMMARY: Nitrogen Loading Percentiles by Largest Contributor

DRAFT – does not yet include 1.2% imported biosolids
Phase 2: Screening Sampling

• Purpose: to understand the magnitude and extent of nitrate contamination
  – help residents understand their drinking water risk
  – assist in selecting sites for more detailed sampling in Phase 3

• Use GIS to identify potential sites

• Partnered with Center for Hispanic Health Promotion for recruitment and translation
Phase 2: Screening Results

- Sampled 337 domestic wells in late winter 2010
- Sampled for nitrate and coliform along with several indicators at tap (temperature, turbidity, pH, and DO)
- EPA found 21% of wells selected (70) had nitrate greater than the MCL at 10 parts per million nitrate.
- Some wells were 4 times the standard
- 6 wells had Total Coliform and 2 wells E.coli
- Results were shared with each homeowner
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>11.45 °C</td>
</tr>
<tr>
<td>DO</td>
<td>0.00 mg/L</td>
</tr>
<tr>
<td>pH</td>
<td>7.85</td>
</tr>
<tr>
<td>TDS</td>
<td>0.321 g/L</td>
</tr>
<tr>
<td>pHmV</td>
<td>-67</td>
</tr>
<tr>
<td>ORP mV</td>
<td>-191</td>
</tr>
<tr>
<td>Resistivity</td>
<td>0.493 mS/cm</td>
</tr>
<tr>
<td>NTU</td>
<td></td>
</tr>
<tr>
<td>Depth</td>
<td>0.25 ft</td>
</tr>
</tbody>
</table>

Press MEAS to collect data.
### Nitrate Nitrogen ppm

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>50</td>
</tr>
</tbody>
</table>

### Nitrite Nitrogen ppm

<table>
<thead>
<tr>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>0.15</td>
</tr>
<tr>
<td>0.3</td>
</tr>
<tr>
<td>1.0</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>3.0</td>
</tr>
</tbody>
</table>

**DIRECTIONS:**

1. Dip a strip into water for **1 second** (or pass under gentle water stream) and remove. **Do not shake** excess water from test strip.
2. Hold the strip level, with pad side up, for **30 seconds** after dipping into water.
3. Compare the NITRITE test pad to the color chart above.
Community Right to Know

- Outreach venues including radio, TV, and community events to provide info on nitrate risk
- Sampled an additional 265 homes via voluntary sign-ups
- Nitrate Contamination rate at 20.9%
Nitrate Concentrations in Drinking Water Wells
Sampled by EPA in 2010
Phase 3: Research/Sampling

• Purpose - test techniques to link specific sources to high nitrate levels seen in wells
• EPA used the results from Phase 2 to select 63 locations for sampling April 12 – 22, 2010

• Evaluated three potential sources:
  – Rural Residential Septic Systems
  – Irrigated Crop Land
    • (hops, corn, and mint)
  – Animal Feeding Operations
    • (lagoons, fields, manure)
Phase 3: Research/Sampling –
200 Parameters, Analyses, Isotopes or Organisms

- Nitrate and forms of Nitrogen
- Microbiology
- Field Parameters
- General Chemistry/Metals
- Pesticides
Phase 3: Research/Sampling – 200 Parameters, Analyses, Isotopes or Organisms

- Androgenic & Steroid Hormones
- Isotopic Analysis of N and O in NO3 and NH4
- Age Dating of Water
- Trace Organics
- Veterinary Antibiotics
- Pharmaceuticals
Phase 3: Summary

- EPA collected over 1000 samples and delivered them to 7 different labs
- Over 10,000 pieces of data have been QA’d from 7 labs
- Interpretation of these data is underway
- Final report anticipated winter 2011
- QA data on website
Lessons Learned:

On the land:
• Use of domestic wells verses monitoring wells
• Landscape complexity complicates ‘sourcing’
• Limited sampling window

In the Lab:
• Costs and QA concerns associated with organic chemical analyses
  • Narrow focus to highly specific organics & major cation/anions/metals
  • Age dating techniques still evolving
  • Isotope analysis useful but not a clear determination
Reducing Exposure

- Legislative grant via WDOH to Yakima Co.
- $400,000 in ‘toxics tax’ funds
- January – June 2011 program
- 166 Point of Use RO system systems installed
  - Less demand than supply
  - Barriers to participation
Next Steps

- Provide results to Phase 3 homeowners
- External federal peer review of draft report
- Finalize and release report
- Explore additional sampling if warranted
- Support County/State and Yakama Nation efforts to reduce groundwater contamination
Questions?

For more info:
http://yosemite.epa.gov/R10/WATER.NSF/GWPU/Iyakimagw

Many thanks to:
• The Lower Valley residents that allowed us into their homes
• Our local partners in recruiting and translating
• Our lab partners for analysis
• EPA management and staff support for this work