2013

Groundwater Levels

Roy Hull, Engineering Geologist
CA Department of Water Resources, Red Bluff
• Introduction

• Understanding GWL Change

• Technical Discussion:
  • Groundwater Monitoring Grid - Colusa County
  • Fall Measurement Maps - Colusa County
  • Fall Measurement Statistics
  • Hydrographs
Understanding GWL Change

2013 v 2012

2013 v 2004

2011-2004 = change of -3.0 ft.

2011-2010 = change of +2.0 ft.
• Precipitation amount and timing
  • Previous season - Very little and early in season
  • Current season – Drought emergency declared, Great precipitation past weekend

• Land Use
  • Truck crops to orchards, new orchards

• Source
  • GW, SW or Mix

• Irrigation methods and timing
  • Flood or (micro) drip

• Location of measurement and depth

• Transfers, surface water and groundwater interactions

• Timing of measurements - measurements are usually between the highest and lowest...
  • but never below the actual low or above the high
Colusa County

DWR GWL Monitoring Grid (22 wells)

Shallow (<200 feet)
Fall
Shallow
1ft
200ft

2012 V 2013
Annual

2004 V 2013
Long-Term
Shallow Hydrographs

Since Fall 1998, ~32 ft lower

Since Fall 2005, ~22 ft lower
Colusa County

DWR GWL Monitoring Grid (39 wells)

Intermediate (200 - 600 feet)
Fall Intermediate

200ft

600ft
Intermediate

Hydrograph

Nice Recovery!

Critical

Late 70’s Drought

Long term ~32 ft of decline

Annual - ~6 ft of decline

Overall – Below 70’s drought levels
Intermediate Hydrograph

Long term ~10 ft decline

Annual ~5 ft decline

Extensometer – Demonstrating elastic movement – $\frac{1}{4}''$ per year
Colusa County

DWR GWL Monitoring Grid (11 wells)

Deep ( > 600 feet)
Fall Deep
600ft
> 1000ft
Deep Hydrograph

Long term ~20 ft decline

Annual ~ 3 ft decline
Deep Hydrograph

Critical Water Year

Normal to Above Normal Water Years

Long term ~31 ft decline

Annual ~26 ft decline

<table>
<thead>
<tr>
<th>State Well Number at CA/GEM ID</th>
<th>Total Depth</th>
<th>Screen Interval (ft-bgs)</th>
<th>Ground Surface Elevation (ft-ms)</th>
<th>County</th>
<th>Well Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>16N02W05B001M</td>
<td>730</td>
<td>150 - 750</td>
<td>57.43</td>
<td>Colusa</td>
<td>Observation</td>
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</table>
## Fall Statistics

### Colusa Co

#### 2012 V 2013 Annual

<table>
<thead>
<tr>
<th>Level</th>
<th>Max Increase</th>
<th>Max Decrease</th>
<th>Avg. Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow</td>
<td>2.4</td>
<td>-4.9</td>
<td>-0.6</td>
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<tr>
<td>Intermediate</td>
<td>0.5</td>
<td>-11.5</td>
<td>-2.6</td>
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<tr>
<td>Deep</td>
<td>4.9</td>
<td>-26.0</td>
<td>-4.7</td>
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</tbody>
</table>

#### 2004 V 2013 Long-Term

<table>
<thead>
<tr>
<th>Level</th>
<th>Max Increase</th>
<th>Max Decrease</th>
<th>Avg. Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow</td>
<td>2.8</td>
<td>-20.9</td>
<td>-3.8</td>
</tr>
<tr>
<td>Intermediate</td>
<td>-1.8</td>
<td>-39.1</td>
<td>-16.0</td>
</tr>
<tr>
<td>Deep</td>
<td>NA</td>
<td>-31.2</td>
<td>-20.4</td>
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</tbody>
</table>
### Fall Statistics

#### North Sac Valley

(Shasta, Tehama, Glenn, Butte, and Colusa)

#### 2012 V 2013 Annual

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<th>Max Increase</th>
<th>Max Decrease</th>
<th>Avg. Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow</td>
<td>6.0</td>
<td>-14.3</td>
<td>-1.0</td>
</tr>
<tr>
<td>Intermediate</td>
<td>9.3</td>
<td>-18.2</td>
<td>-1.6</td>
</tr>
<tr>
<td>Deep</td>
<td>25.7</td>
<td>-32.1</td>
<td>-7.2</td>
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</table>

#### 2004 V 2013 Long-Term

<table>
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<th></th>
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<th>Max Decrease</th>
<th>Avg. Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow</td>
<td>7.6</td>
<td>-44.4</td>
<td>-5.8</td>
</tr>
<tr>
<td>Intermediate</td>
<td>6.8</td>
<td>-40.2</td>
<td>-9.9</td>
</tr>
<tr>
<td>Deep</td>
<td>5.6</td>
<td>-60.7</td>
<td>-18.2</td>
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</tbody>
</table>
Thank you for your time.

Questions?