Outline

• Tributary aquifer recharge is difficult to determine
• Carter and Driscoll (2006) relationship between yield efficiency and elevation
• Aishlin (2006) calculated groundwater recharge for the Dry Creek Experimental Watershed
• Use Aishlin data and Carter and Driscoll technique and expand to whole Boise Front
• Look at other estimates
• Proposal
Tributary aquifer recharge is difficult to determine

• Can’t see it

• Attempts to quantify tributary aquifer recharge require lots of detailed measurements and are hence expensive
  – Still a calculated value, not a measurement

• How big a component of the water budget is tributary aquifer recharge
Carter and Driscoll

- Black Hills of South Dakota
- Part of Black Hills underlain by crystalline core
  - Igneous and metamorphic rock
    - Mount Rushmore
  - Assumed no recharge when watershed was on crystalline core
  - Monitored precipitation and surface water runoff
- Developed relationship between watershed yield efficiency and elevation
- Calculated recharge for area of Black Hills underlain by limestone
  - Knowing elevation and hence yield efficiency
Aishlin

- Use a chloride mass balance to calculate recharge
- Calculated ~5.5% of precipitation went to recharge
  - Was able to demonstrate that higher percentage of precipitation went to recharge at higher elevations
  - Came up with a similar recharge estimate on one of Aishlin’s catchments.
Aishlin
Method

• Obtain centroids for Boise Front cells
• Project centroids onto 10M DEM to get elevations
• Apply recharge fraction by elevation from Aishlin to the entire Boise Front
• Project recharge fraction points onto annual PRISM precipitation raster to obtain annual recharge through the Boise Front
Total recharge from Urban (2004) for year 1996 = 1,020,300 AF

Total recharge from Petrich and Urban (2004) = 1,035,000 AF

<table>
<thead>
<tr>
<th>Source</th>
<th>Mountain Front Recharge (AF)</th>
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<tbody>
<tr>
<td>This analysis</td>
<td>515</td>
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<tr>
<td>Petrich and Urban (2004)</td>
<td>905</td>
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<tr>
<td>Urban (2004)</td>
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<td>Newton (1991)</td>
<td>Small</td>
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<td>Welhan (2012)</td>
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<td>SPF (2007a)</td>
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<td>SPF (2007b)</td>
<td>5,580</td>
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Recommendation

• Boise Front Recharge probably will not contribute significantly to model predictive uncertainty
  – Option A: Fix Boise Front Recharge at zero
  – Option B: Make Boise Front Recharge an adjustable parameter and use the various estimates to establish an acceptable range
    • 0 – 9000 AF
Some References


- SPF Water Engineering, 2007a, Ground-water supply evaluation for the Mayfield town site property; November 1, 30 pp. plus appendices. Also available at https://idwr.idaho.gov/water-data/projects/east-ada-county/references.html

- SPF Water Engineering, 2007b, Ground-water supply evaluation for Elk Creek Village, Application for Permit No, 61-12090; December 17, 17 pp. plus appendices. [Also available at https://idwr.idaho.gov/water-data/projects/east-ada-county/references.html]


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