Managed Recharge and Base-Flow Enhancement in an Unconsolidated Aquifer in the Boulder River Valley, Montana

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in conjunction with:
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and
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Groundwater Investigation Program:
Boulder River Valley Groundwater Investigation

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Background

- **Boulder River Valley**
  - Appropriations exceed physical supply in most years\(^1\)
  - Boulder River runs dry in the late irrigation season – just when water is needed most
  - Several previous investigations to create a supplemental water supply (1967-1980)\(^2,3,4,5\)
Project Definition

• Purpose: Determine if the unconsolidated aquifer in the Boulder River Valley is suitable for a managed recharge project.

• Scope: Focus on the timing and magnitude of changes in flux between the aquifer and the Boulder River as a result of managed recharge.
Methods

• Field Data Collection
  – Surface water: hourly stage and bi-weekly flow monitoring
  – 23 well monitoring well network: generally monthly, hourly at 12 wells
  – Location and elevation surveyed by licensed surveyor

• Numerical Modeling
  – GMS by Aquaveo using USGS finite difference model MODFLOW
  – Model based on field parameters
  – Resulting model is a tool used to improved conceptual understanding and to make assessments or predictions under varying stress changes
Key Field Results

- Irrigation ditch/Groundwater relationship

- Boulder River/Groundwater relationship
Model Development
Modeling
Using the Tool

- Key Scenarios
  - Scenario 1: Terminate upper pediment irrigation ditch leakage
Scenario 7
- Maximum Murphy Ditch Capacity at central basin location (15 cfs)
  • Recharge applied March 15\textsuperscript{th} thru May 9\textsuperscript{th}
- Reduction of Boulder River losses
  • Average annual - 1.93 cfs
  • July – Sept. - 2.04 cfs
Using the Tool

Predicted surface water management impacts on aquifer water levels

- **Scenario 1**: No irrigation ditch leakage
- **Scenario 7**: Managed Recharge
- **20yr Baseline - Existing Conditions**
Findings

Managed Recharge is Viable

1. Possible uses of 1.93 cfs
   a) Agriculture ≈ irrigation of 930 acres
   b) Development ≈ 2,850 residences with lawns & gardens (11,400 people)
   c) Drinking water ≈ 620,000 people
   d) In-stream flow

2. Regulatory Concerns

3. Cost/Benefit Analysis
   • Purpose dependent

4. Looking Ahead
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Questions?

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Project Webpage -
http://www.mmbmg.mtech.edu/gwip/project-boulder.asp
Selected References


