

Meeting 2/1/2018-
Jefferson Watershed Drought Committee
Andy Bobst Groundwater Presentation Notes:

Groundwater Investigation Program- Program in bureau and geology in 2009, to look at small areas housing development, expansion of agriculture, industrial and commercial growth, sources of groundwater.

Waterloo area questions- What are effect of lining canals (parrot, creeklyn, jefferson) how does the altering canal leakage affect gw recharge and discharge to surface?

Conversion from flood to pivot irrigation, become more efficient on streamflows for efficiency.

New development/subdivisions and changes in land use. Irrigated area to subdivision, how will that affect the water balance?

Waterloo and Whitehall. Effects of surface water from groundwater and connectivity.

Monitoring surface and groundwater to understand gaining and losing streams need to understand where the geologic units are located, aquifer tests, and aquifer properties, gw budgets, numerical models.

Every fishing access site along Jefferson River, well put in to test sw gw interchange.

103 wells monitored monthly for almost 2 years. Create potentiometric map or elevation or top of surface of groundwater. Draw flow lines perpendicular to groundwater map.

Look at a particular well over time rather than multiple wells.

Overall, not large overall trends in water levels, seasonality does exhibit changes in water levels as expected.

To develop surface water connection model, 52 surface water monitoring slights, 11 Confluence Engineering sites, 2 USGS, 39 monitored by MBMG.

Disconnected losing streams have unsaturated losing zone between stream and groundwater.

Generally as you have higher flows you have a losing stream, low flows gaining stream from groundwater. Important to keep in mind losing and gaining stream change in both space and time.

Temperature in stream over 2014, begin in April, out in November. Change in temperature on stations. August temperatures are cooling when warm out, then November temperatures are

warming up when cool out. Neutral reach or losing reach? Does show gaining reach trends.
Less sw but more gw, more deviation from 1:1.

Sharp increases, drop off irrigation season. After 4th of July and canal shuts off, ground water drains out. Groundwater levels have a direct connection with irrigation canals.

What are important sources of recharge to the aquifer?

Flow in=flow out over long term, +- any changes in storage, assume flow in=flow out.

Waterloo GW budget inputs. Jefferson River, alluvial groundwater, canal leakage, irrigation recharge, mtn front recharge.

Willow springs, parsons slough eventually Jefferson River gather 75% of water, 25% flows out as GW in the system.

Whitehall SW/GW and GW/SW, $\frac{3}{4}$ to recharge to aquifer is from river. Irrigation recharge, canal leakage, recharge to aquifer are remaining $\frac{1}{4}$.

In 80% comes from surface water, Out 95% flows to surface water.

Management action- flood to pivot irrigation and lining canals?

Loss of flow for Pipestone over time? Yes.

Models for changes in streamflow:

- 1) No Canal leakage July: -11.9 CFS August: -17.0
- 2) Areas 1-5 flood to pivot: July: -10.2 CFS August: -12.8
- 3) Combined 1+2 scenarios: July: -22.0 CFS August: -29.7
- 4) Split season irrigation: apply water equal to flood irrigation till the end of june, pivot to groundwater recharge and efficiency: Areas 1-5: July: -7.4 CFS August: -12.1
All Fields: July 0.6 CFS August 10.3

-More water earlier in season, a month later water is nearly gone.

-Split season irrigation, when will timing be? Backup split season, to March, April?

-Drop off hydrograph extremes from draining of aquifer.

-What areas could we identify to increase late season flows?

-Still remains true, gallon out is a gallon out.

-Dependent on where the water taken out, and how long will it take to affect surface water? If you pull near the stream, you may as well be pulling from the river. Withdrawing groundwater from further from stream will effect flows, but may take time.

-Irrigated ag land to subdivision, not using as much water but not recharging groundwater.

-Difference from flood to pivot, using pivot irrigation to mimic flood irrigation? Subdivision and individual landowners with wells do not return provide return flows.

Land use conversions:

-Irrigated ag to subdivision: greater increase on mean august stream flows after 10 years

-Nom irrigated to subdivision: little stream flow change on mean stream flows

-1 acre lots, 5 acre lots or 20 acre lots.

-Change irrigated ag to subdivision, order of magnitude on groundwater discharge, increase amount of water coming out, and decreasing amount of recharge going in.

-Surface water and groundwater are a single resource

-Emphasize GW recharge when water is abundant

-Emphasis on efficient irrigation methods when flows are low

-Pivot irrigation

-Biodegradable canal sealant?

-Split season irrigation will help mitigate effects of irrigated land to subdivision conversion but hydrograph will remain flashy from late season irrigation return flow.