

Irrigation service area supply/demand calculator

Stephen Hundt | Jacob Knight | Paul Thomas
USGS

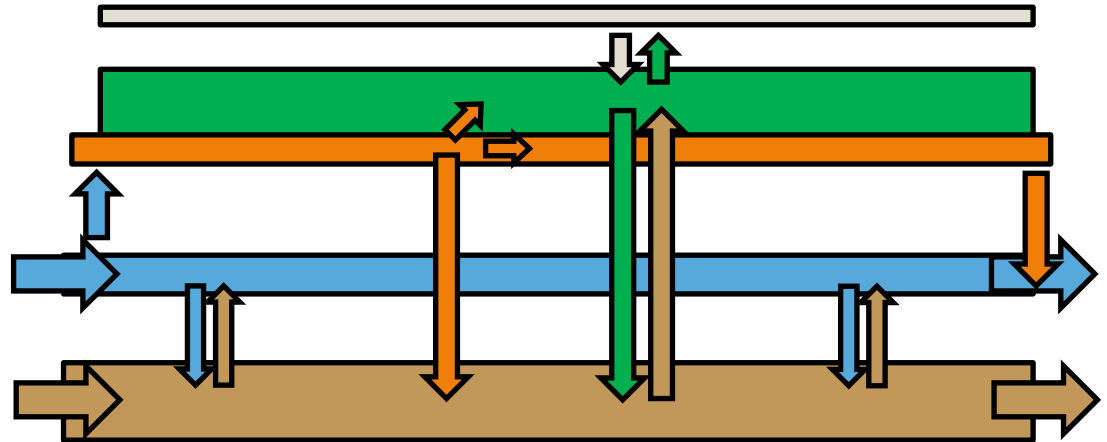
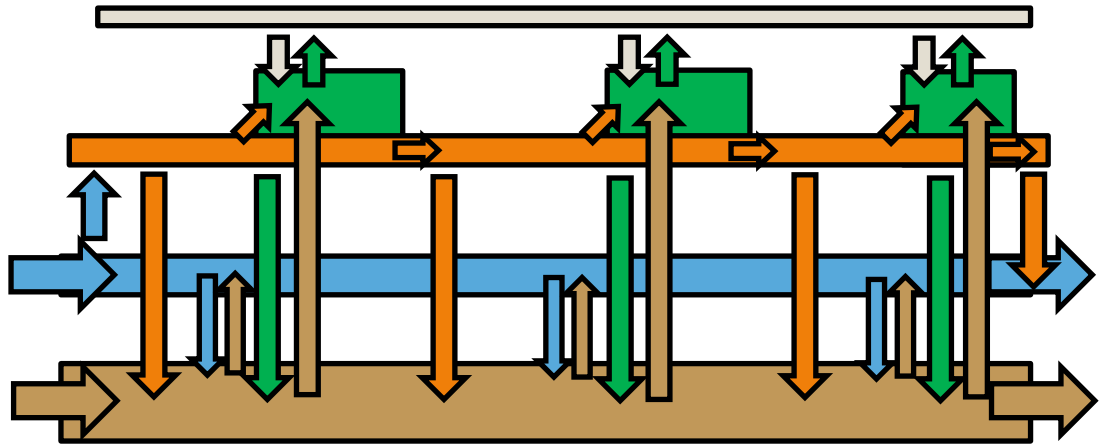
November 15, 2023

Data Availability

	Temporal Resolution	Source	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Diversion Records	daily	IDWR				[Yellow bar from 2003 to 2021]																				
Pumping Records	annual	IDWR				[Green bar from 2010 to 2021]																				
Irrigated Lands Shapefile	yearly	IDWR	[Orange]		[Orange]				[Orange]		[Orange]		[Orange]		[Orange]		[Orange]		[Orange]		[Orange]		[Orange]		[Orange]	
Metric EVT	monthly	IDWR	[Blue]		[Blue]				[Blue]		[Blue]		[Blue]		[Blue]		[Blue]		[Blue]		[Blue]		[Blue]		[Blue]	
Water Budget Report	yearly	IGS	[Yellow bar from 2000 to 2019]																							
Prism Precipitation Arrays	monthly	PRISM	[Grey bar from 2000 to 2022]																							
Proposed historical simulation period																										

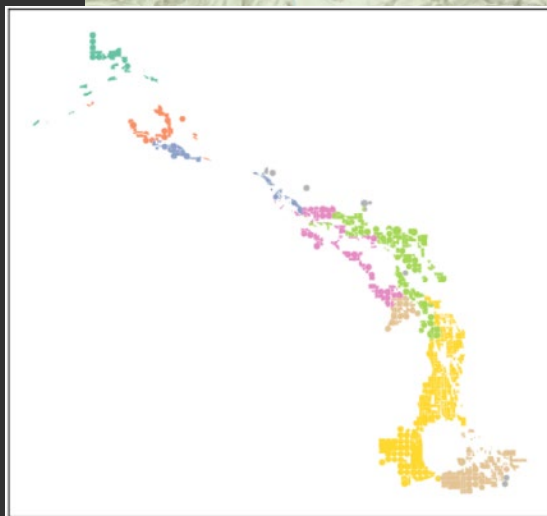
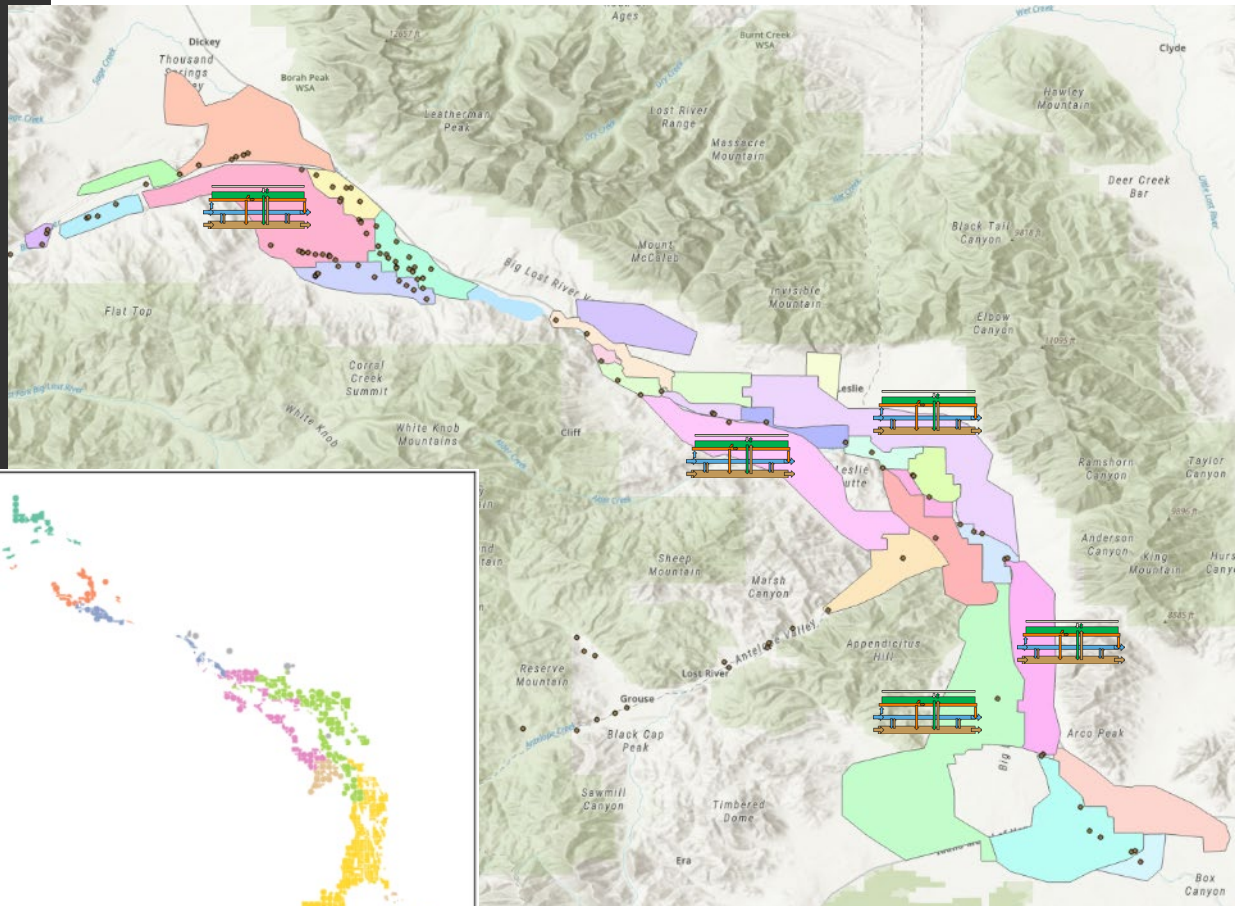
Service Areas

- **Motivation:** simplify necessary calculations of inputs and outputs to groups of irrigated lands instead of individual POU
- **Advantages:** more tractable problem, easier to back/forward-fill inputs when data unavailable
- **Disadvantages:** lose variability within grouped area, some processes become “hard wired” instead of dependent on simulated states
- **Need IDWR input as we develop the model logic**



Service Areas

- Tied to one or more BLR diversions
- SA are clipped to yearly irrigated land coverages for volume calculations

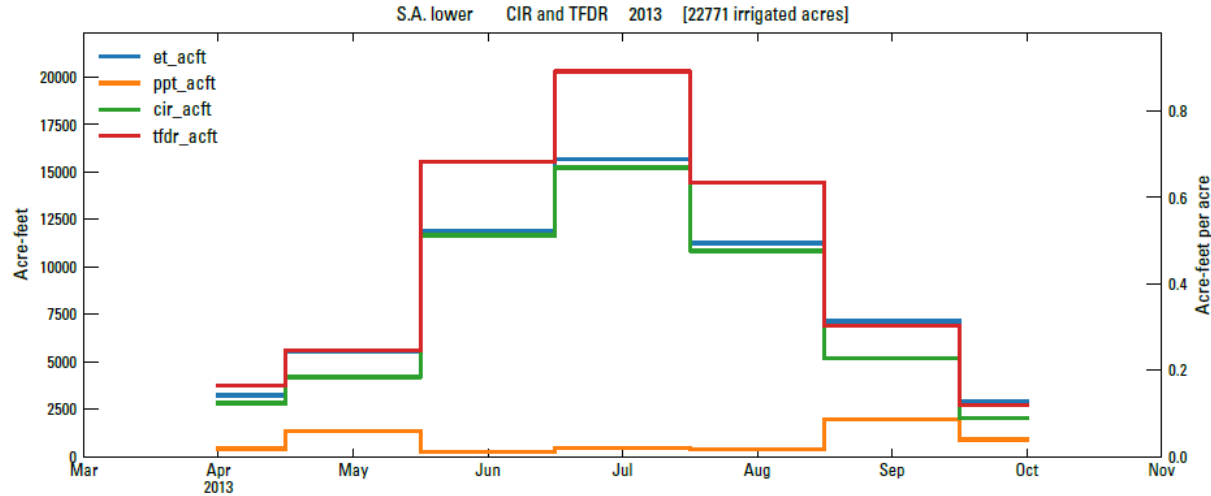


$$EVT - PPT = CIR$$

- **EVT:** Evapotranspiration: METRIC
- **PPT:** Precipitation: PRISM
- **CIR:** Crop Irrigation Requirement

$$CIR / OFE = TFDR$$

- **OFE:** On-Farm Efficiency
- **TFDR:** Total Farm Delivery Requirement

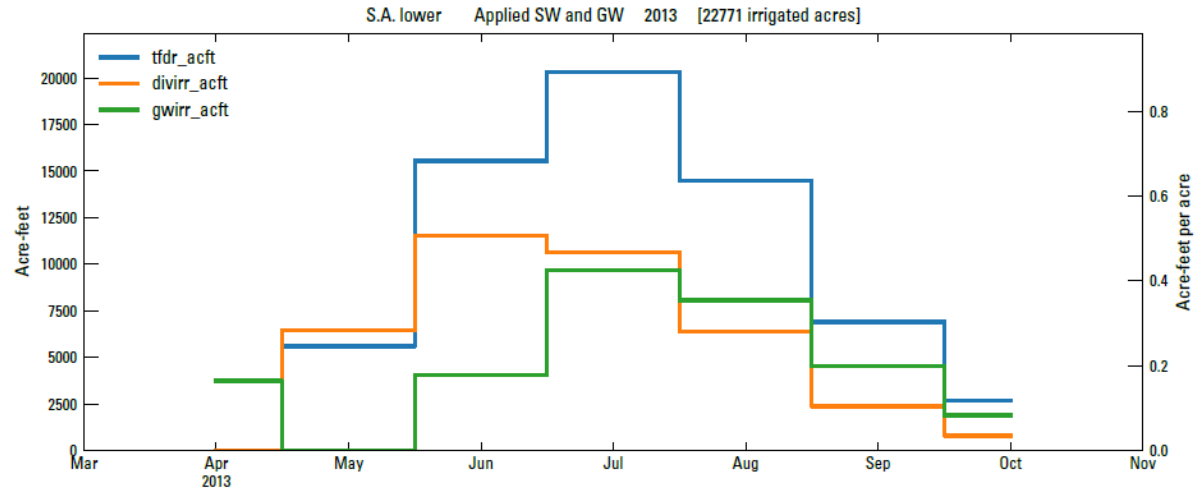


$$TFDR = SW_{irr} + GW_{irr}$$

- **TFDR:** Total Farm Delivery Requirement
- **SW_{irr}:** Applied Surface Water Irrigation
- **GW_{irr}:** Applied Groundwater Irrigation

$$SW_{irr} = SW_{div} - CL_{SW}$$

- **SW_{div}:** Recorded Diversion from Big Lost River
- **CL_{SW}:** Conveyance Loss



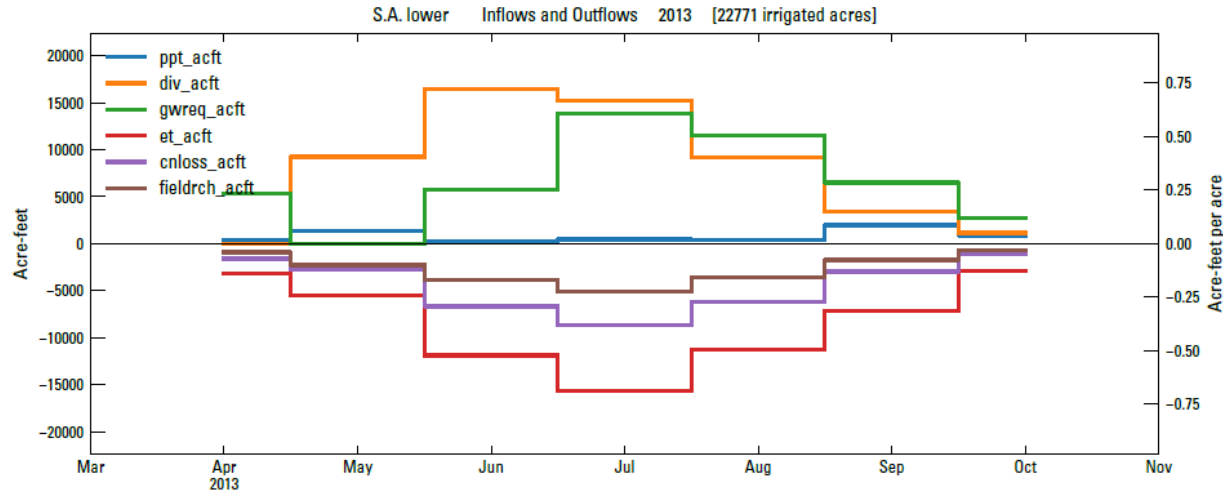
$$GW_{req} = GW_{irr} + CL_{gw}$$

- **GW_{req}**: Pumping required to accommodate conveyance losses (?)

$$CL = CL_{sw} + CL_{gw}$$

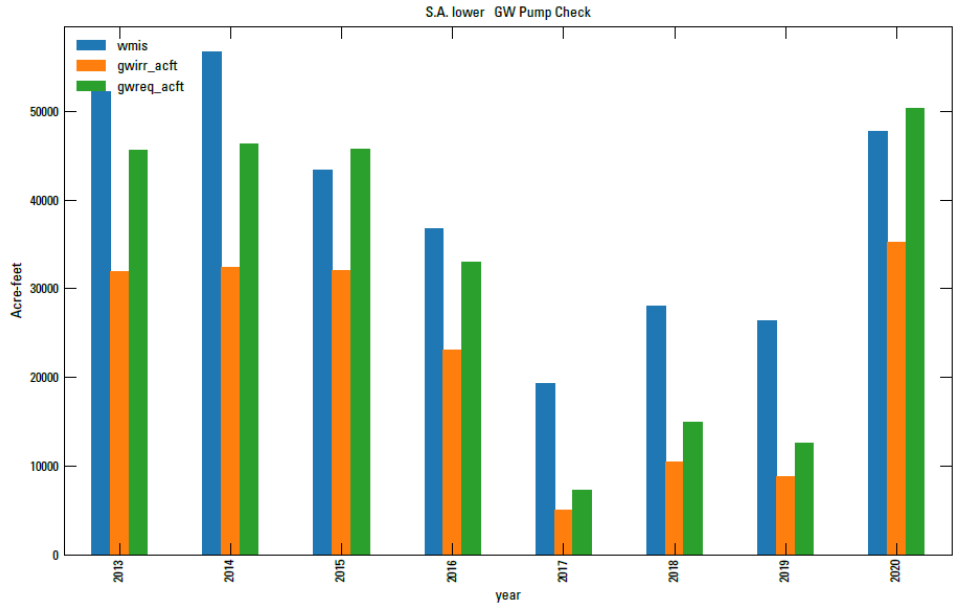
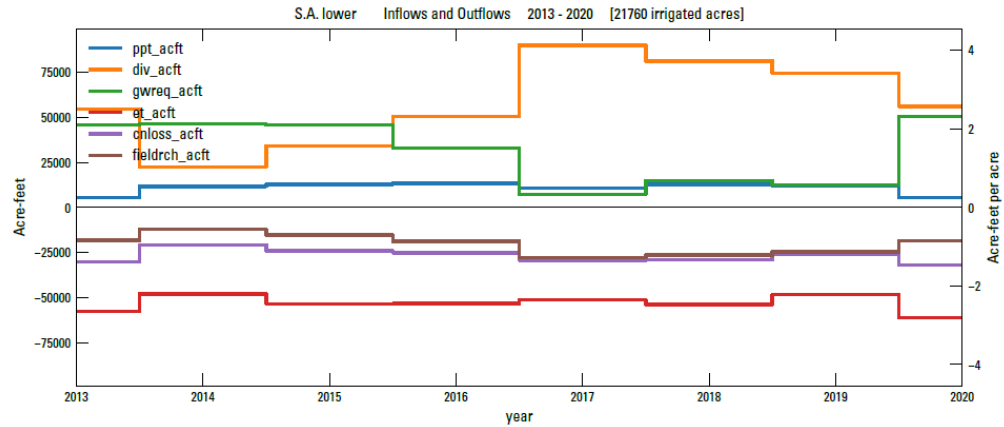
$$R = PPT + SW_{irr} + GW_{irr} - EVT$$

- **R**: On-farm recharge



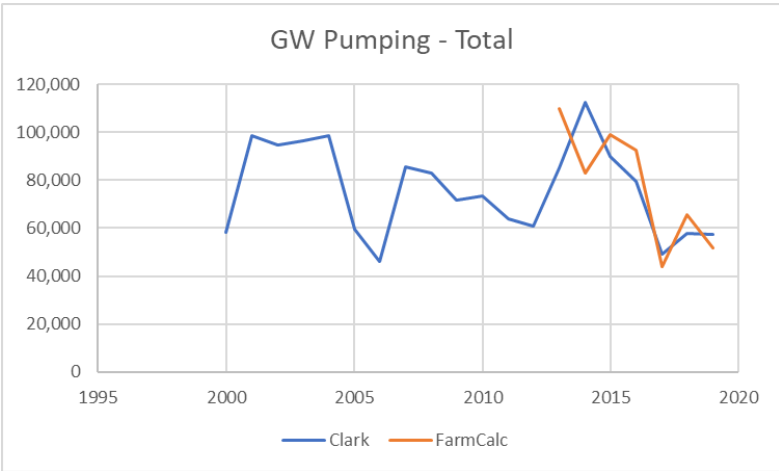
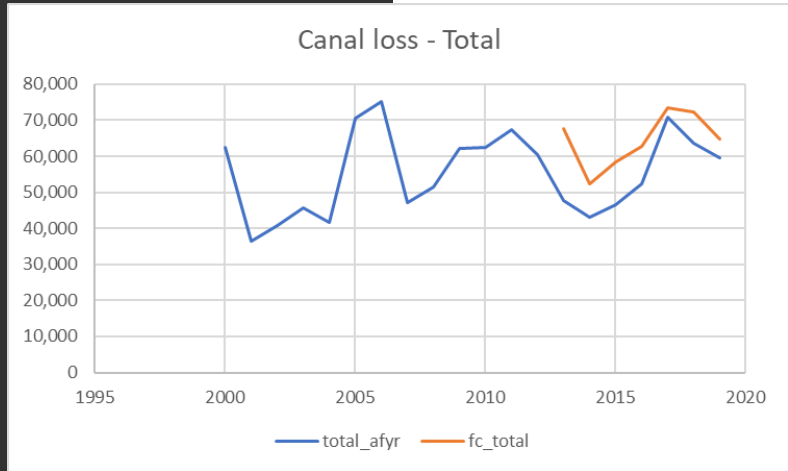
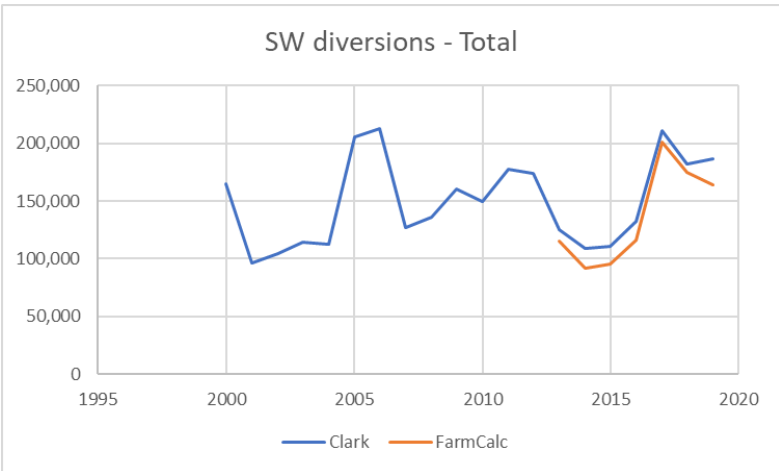
Constraining calculator output: WMIS annual GW pumping records

- **Source:**



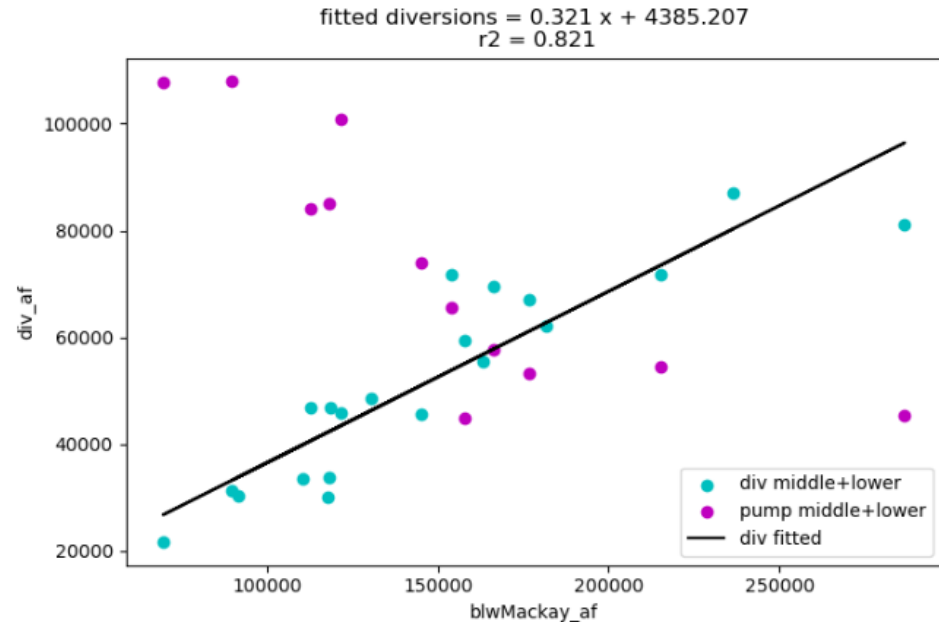
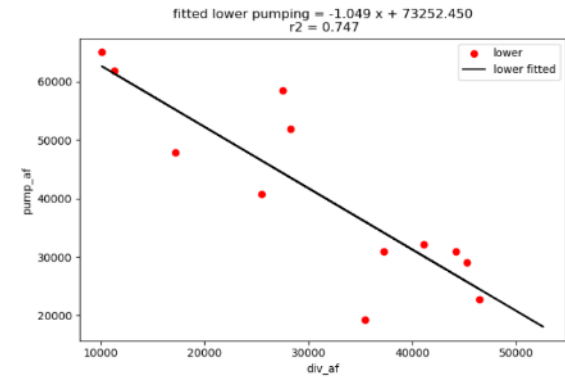
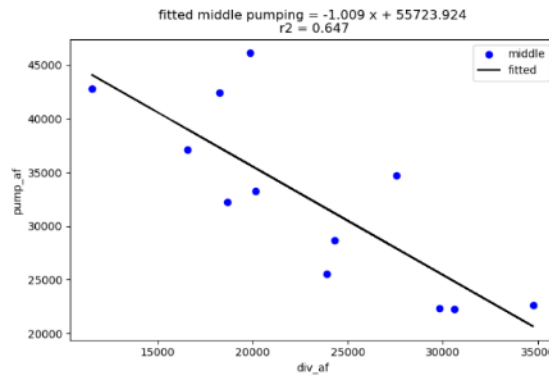
Constraining calculator output: Clark 2021 GW Budget

- **Source:**



Constraining calculator output: SW/GW diversion relation

- **Source:** IDWR Water Management Information System database
- **Temporal coverage:** overlap of availability of SW diversion data and GW pumping data
- **Spatial coverage:**
- **Reliability:** Very good
- **Important Gaps:** Must upscale annual to monthly, backfill to simulation start



Open issues, next steps

- **Precipitation:** Maximum monthly contribution toward crop demand?
- **Soil moisture:** calculator sometimes simulates pumping in early season
- **GW-only fields:** assign to service areas unassociated with SW diversion
- **Managed recharge:** Reduce volume of diverted water available for irrigation
- **Conveyance loss:** SW and GW loss factors

