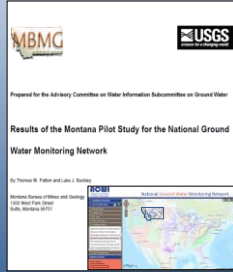


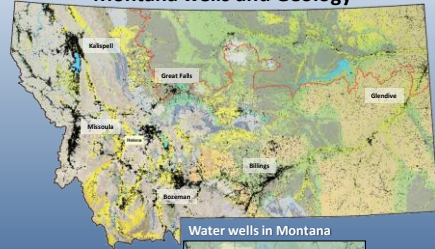
Montana in the National Ground-Water Monitoring Network



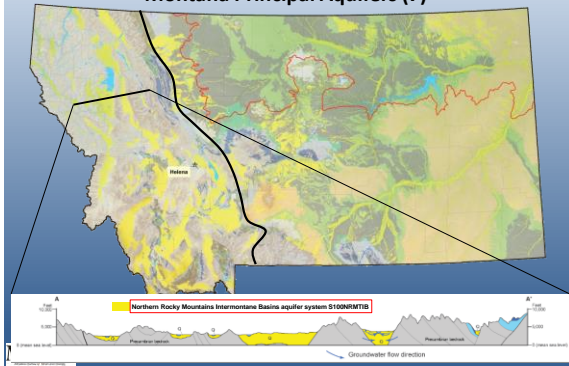
John LaFave and Thomas Patton
 Montana Bureau of Mines and Geology
 NGWA Groundwater Summit Dec. 4 2017



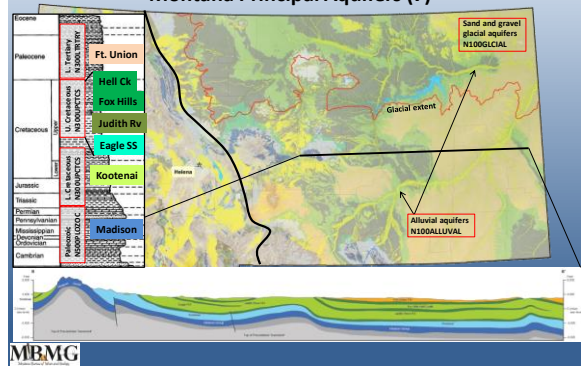
Montana in the NGWMN Montana wells and Geology



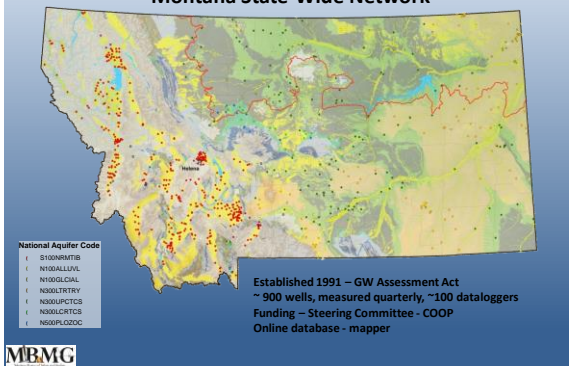
Montana in the NGWMN Montana Principal Aquifers (7)



Montana in the NGWMN Montana Principal Aquifers (7)



Montana in the NGWMN Montana State-Wide Network

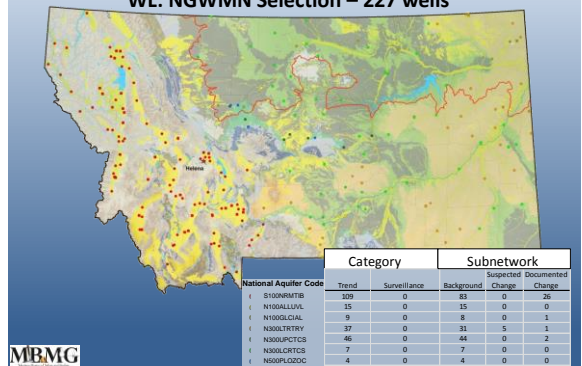


- National Aquifer Code
- | S100NMTB
- | N100ALLVAL
- | N100GLCAL
- | N00LTRYRY
- | N00LPTCTB
- | N00LCRTCS
- | N00PLCZDC

Established 1991 – GW Assessment Act
 ~ 900 wells, measured quarterly, ~100 dataloggers
 Funding – Steering Committee - COOP
 Online database - mapper



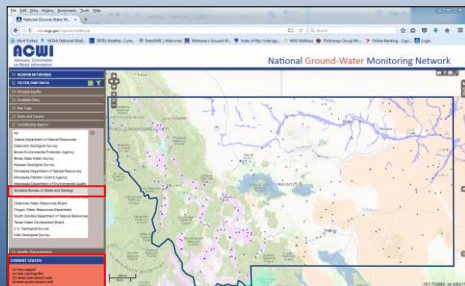
Montana in the NGWMN WL: NGWMN Selection – 227 wells



National Aquifer Code	Category				Subnetwork	
	Trend	Surveillance	Background	Change	Suspected	Documented
S100NMTB	109	0	83	0	26	0
N100ALLVAL	15	0	15	0	0	0
N100GLCAL	9	0	8	0	1	0
N00LTRYRY	37	0	31	5	1	0
N00LPTCTB	46	0	44	0	2	0
N00LCRTCS	7	0	7	0	0	0
N00PLCZDC	4	0	4	0	0	0



Montana in the NGWMN NGWMN Portal View

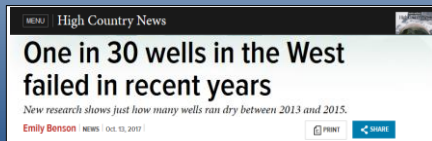


Montana in the NGWMN Ground Truthing Big Data

Environ. Res. Lett. 12 (2017) 104002
Dry groundwater wells in the western United States
D Perrone^{1,2,3,4} and S Jasechko^{4,5}
PUBLISHED 28 September 2017

“Unsustainable groundwater pumping... is depleting many western US aquifers”

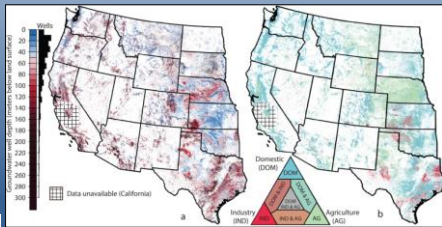
“Main findings: ... 1-in-30 wells constructed between 1950-2015 were likely dry during 2013–2015”



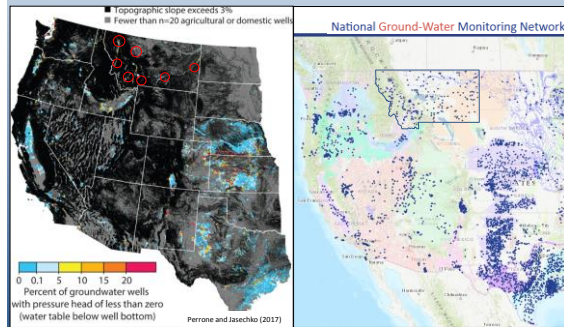
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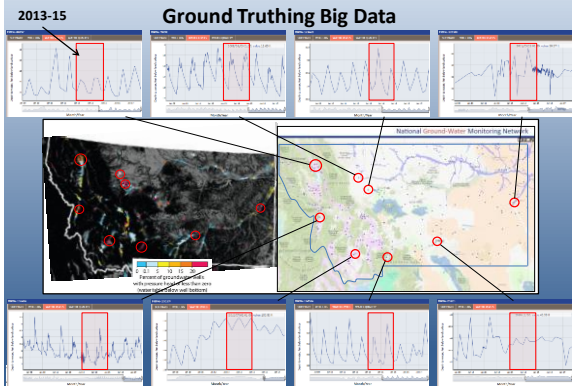
“Main findings: ... 1-in-30 wells constructed between 1950-2015 were likely dry during 2013–2015”



Montana in the NGWMN Ground Truthing Big Data

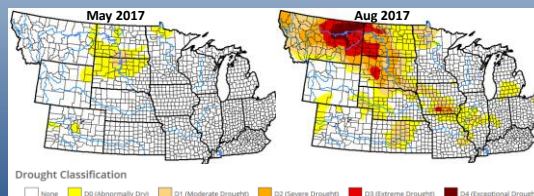


Montana in the NGWMN Ground Truthing Big Data

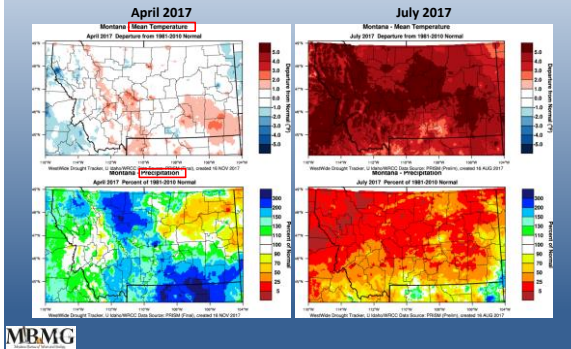


Montana in the NGWMN Drought Impacts

News & Features
‘Flash Drought’ Spreads Across Montana in Less Than 3 Months
More than a third of the entire state is now in severe, extreme or exceptional drought
@EARTHSCOPEPRESS 11/4/17
Montana drought ‘worst we’ve seen in 100 years’



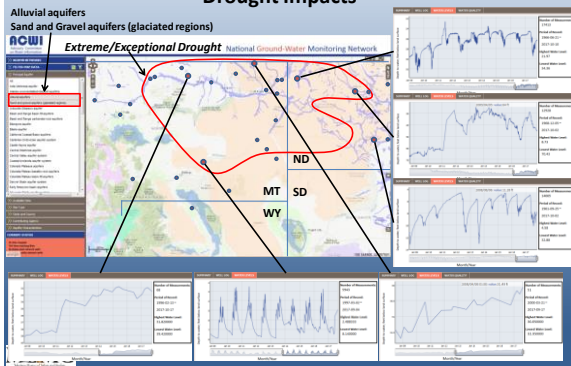
Montana in the NGWMN Drought Impacts



Montana in the NGWMN Drought Impacts



Montana in the NGWMN Drought Impacts



Montana in the NGWMN

- **Montana Update – Committed to NGWMN:**
 - Provide Well Registry updates and ongoing web services
 - obtain survey grade GPS locations and land-surface altitudes
 - install protective steel surface casing around PVC-cased wells
- **NGWMN critical to :**
 - “Ground Truth” Big and Remote Sensing Data
 - Understand Drought Impacts on Groundwater

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 Ground Water Assessment Program
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