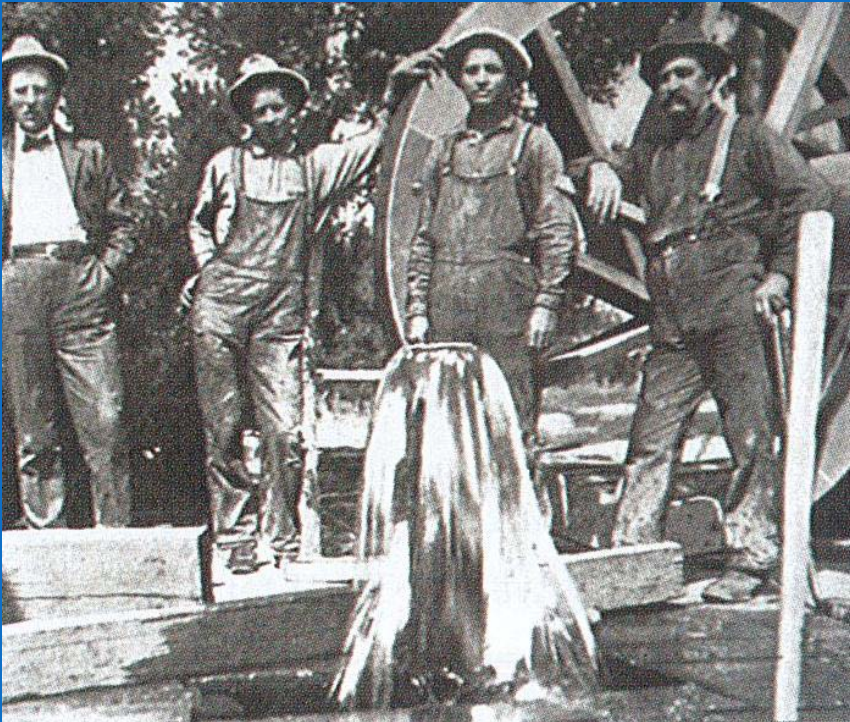


Denver Basin Economic Analysis

One way to look at it..

Arapahoe and Laramie-
Fox Hills Aquifers



Contributors

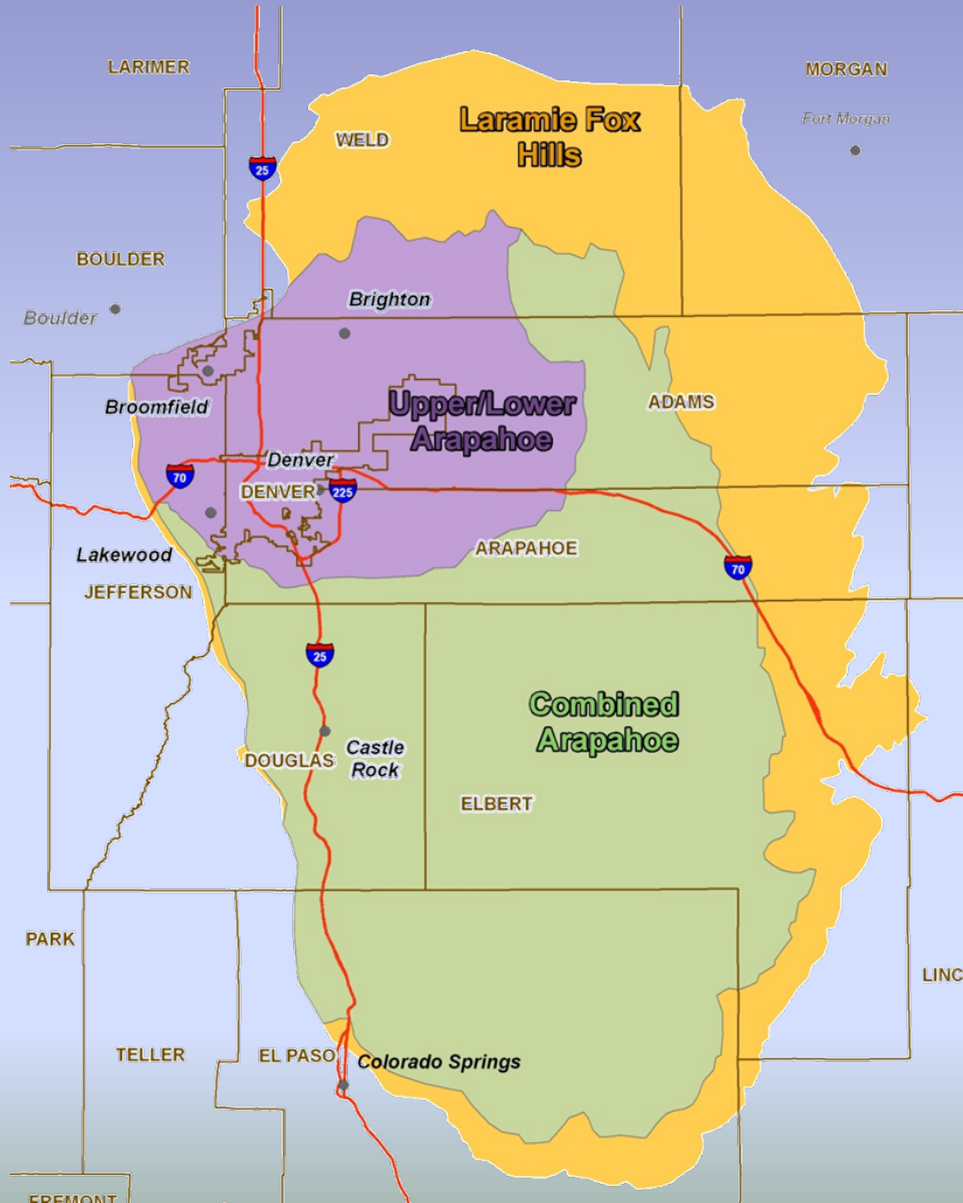
Heather Justus

Jason Kord

Advisor

Jon R. Ford

Arapahoe and Laramie-Fox Hills Aquifers



Project, Purpose, and Approach



- Artesian Flowing Conditions
- Domestic and Municipal Use



- Over 1,000 well permits
in the Arapahoe Aquifer
- ~500 well permits
in the Laramie-Fox Hills Aquifer

Well Yield

$Q = \text{Saturated Thickness } (b) * \text{ Available Drawdown } (s) * \text{ Empirical Constant}$

- Using the modified Theis equation :

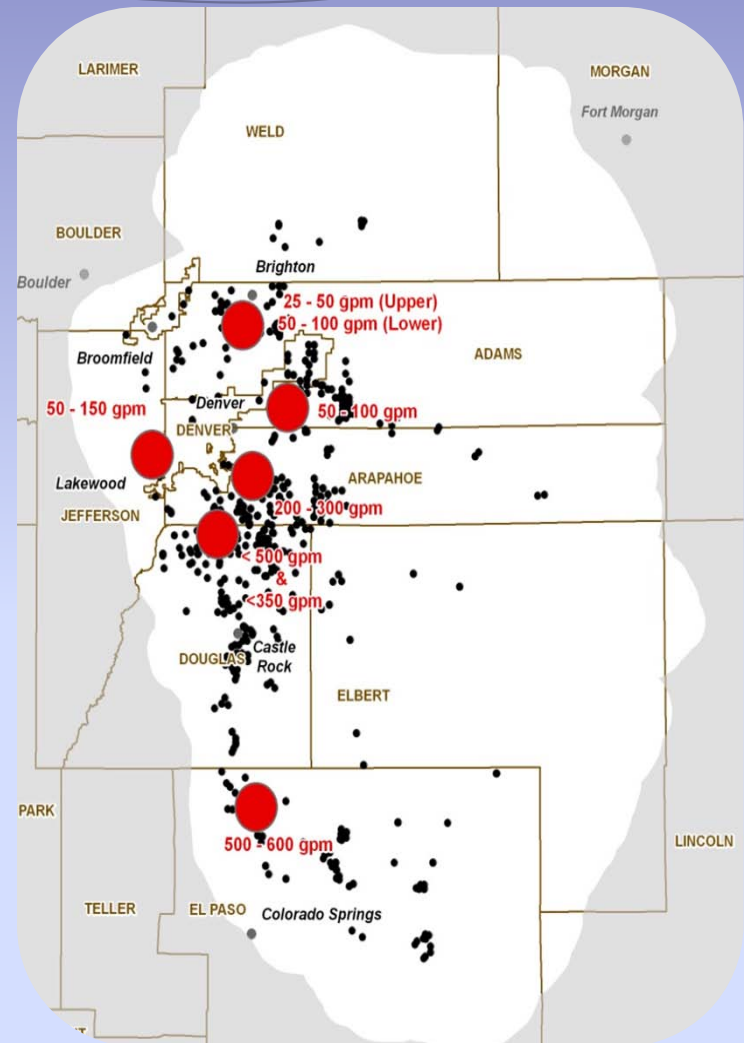
$$s = (264Q/T) * (\log(0.3Tt/r^2S))$$

$$Q/s = T / (264 * \log(0.3Tt/r^2S))$$

$$Q = (K * b / (264 * \log(0.3Tt/r^2S))) * s$$

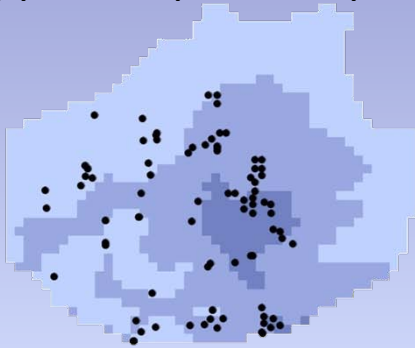
- The empirical constant represents:

$$K / (264 * \log(0.3Tt/r^2S))$$

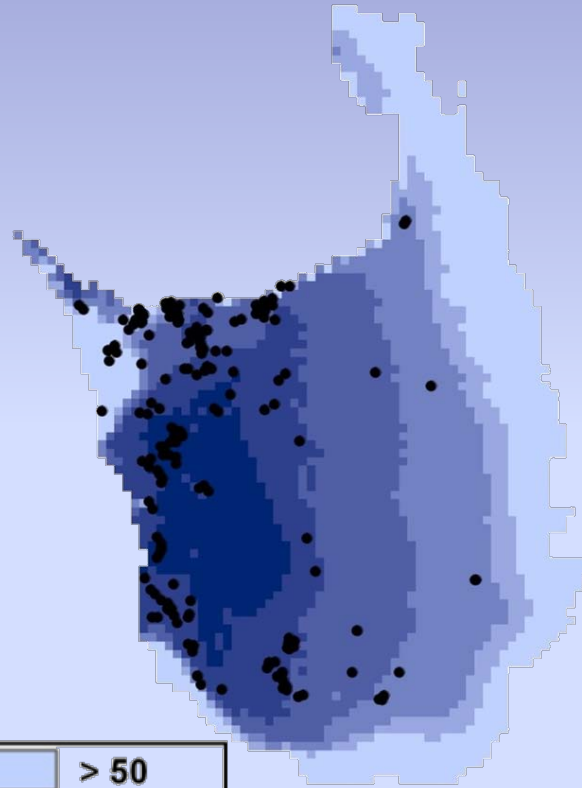


Well Yield Results

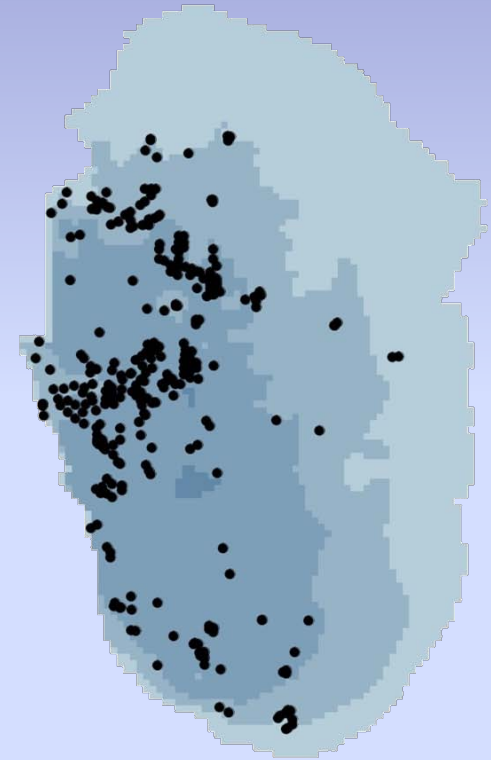
Upper Arapahoe Aquifer



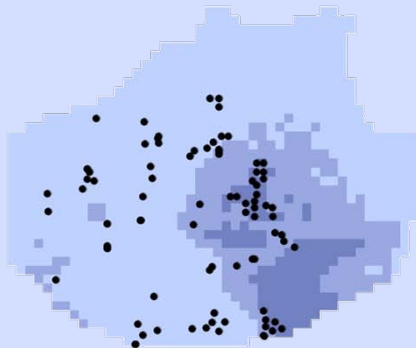
Combined Arapahoe Aquifer



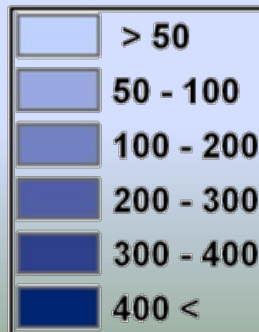
Laramie-Fox Hills Aquifer



Lower Arapahoe Aquifer



● Non Exempt Wells



Well Yield (gpm)

Estimated Well Cost

Relationships:

if $Q < 100$ gpm then

$$\text{Cost} = \text{depth} * 113 + 90,000$$

if $100 \text{ gpm} < Q < 300$ gpm then

$$\text{Cost} = \text{depth} * 117 + 100,000$$

if $Q > 300$ gpm then

$$\text{Cost} = \text{depth} * 125 + 160,000$$

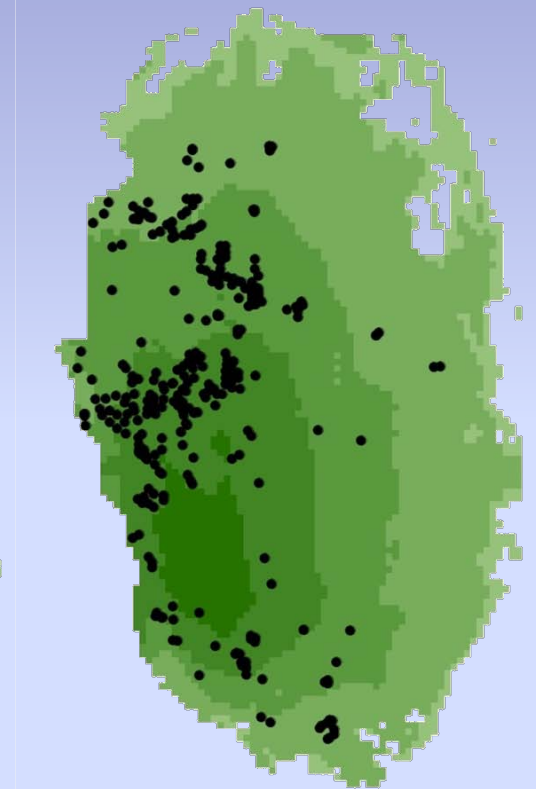
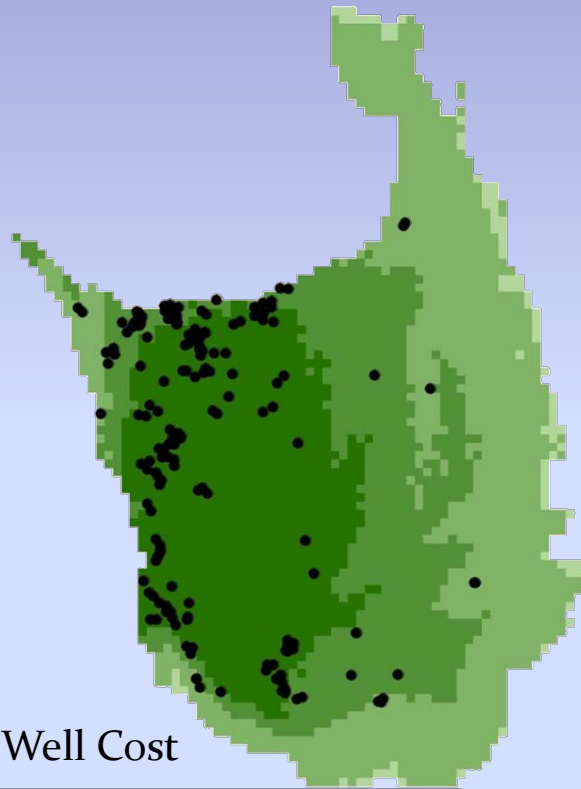
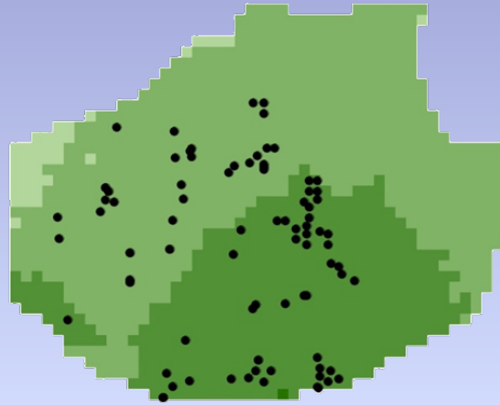


Estimated Well Cost Results

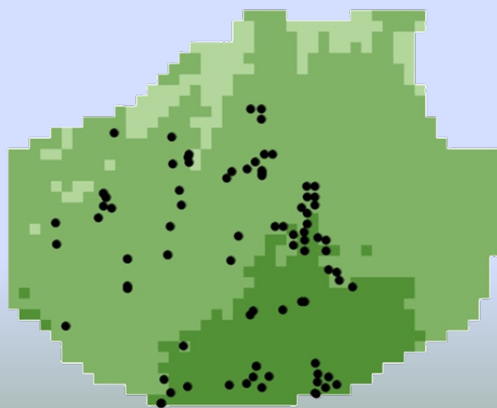
Upper Arapahoe Aquifer

Combined Arapahoe Aquifer

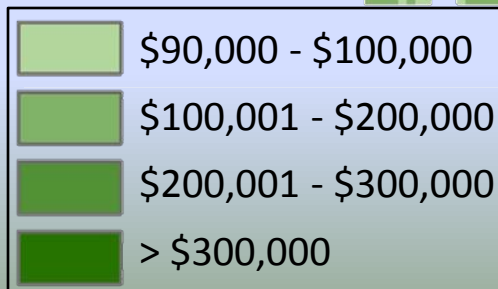
Laramie-Fox Hills Aquifer



Lower Arapahoe Aquifer



Well Cost



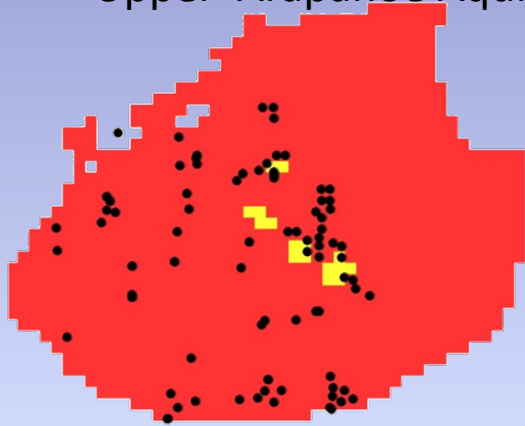
● Non Exempt Wells

Economic Viability

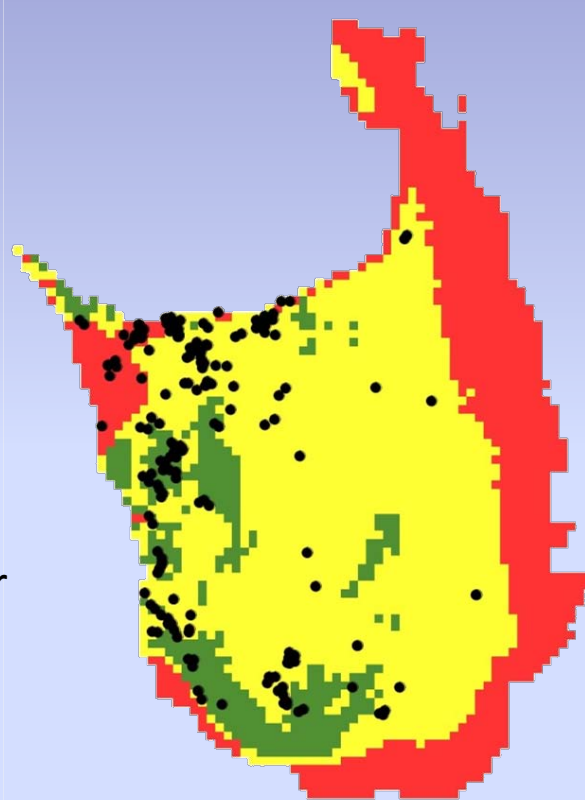
- Economic Viability can be expressed as the well cost divided by the well yield.
- Our definitions:
 - < \$1,000 /gpm - **Economic**
 - \$1,000 – \$2,000 /gpm - **Marginally Economic**
 - > \$2,000 /gpm - **Uneconomic**

Economic Viability Results

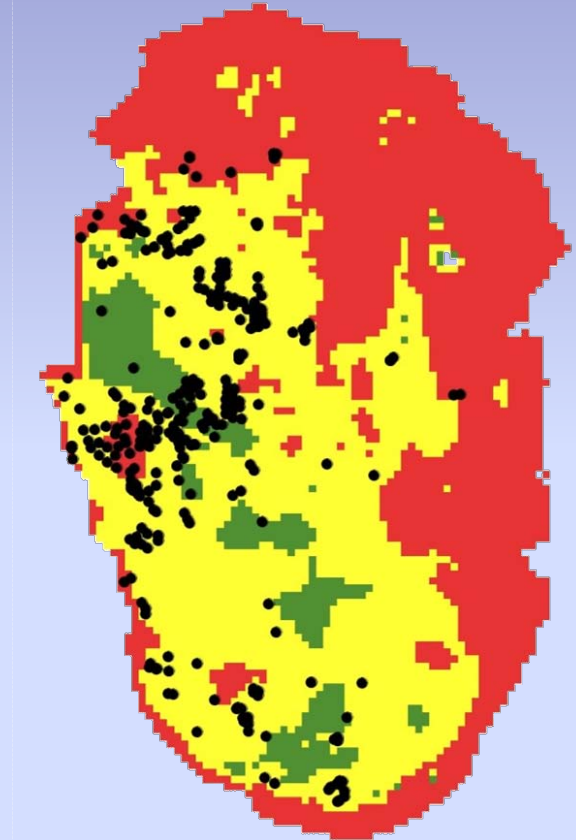
Upper Arapahoe Aquifer



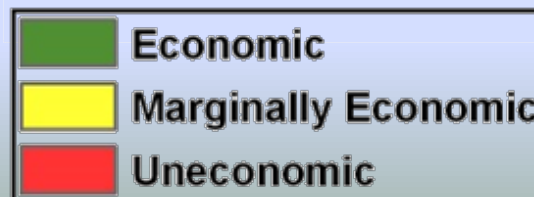
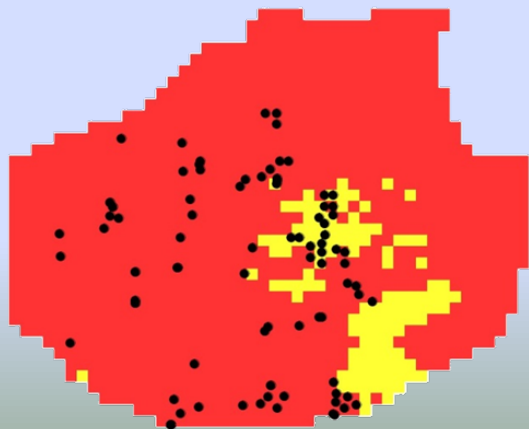
Combined Arapahoe Aquifer



Laramie-Fox Hills Aquifer



Lower Arapahoe Aquifer



- Non Exempt Wells



Questions?