### Is Water Scarcity an Issue for Hydraulic Fracturing in Semiarid Regions?

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#### Freyman et al., CERES, 2013

#### Questions

- 1. What is the **water demand** for hydraulic fracturing (HF)?
- 2. What are the **impacts** of HF on water resources?
- 3. What are the **water supplies** for HF? (water scarce?)
- 4. What is the **net impact** of water use for HF on water resources?



#### **Eagle Ford Shale Play**



## Vulnerability

### Water Demand

Impacts

#### **Freshwater Supplies**

GW Recharge & Storage

#### Scarcity = Demand >> Supply

### Resilience

Recycling Brackish GW

**Adaptation** 

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#### What is the water demand for hydraulic fracturing?



Mean water use: 5.5 mgal/well Water use (2009 – 2015): ~80 billion gallons from ~14,500 wells Scanlon et al., Env. Res. Lett. 2014

### Projected water demand for hydraulic fracturing



Additional 56,000 wells × mean HF water use in each zone = ~300 bgal in 20 yr



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### Long-term Impacts of Irrigation Pumping on Groundwater Levels



Projected water use for shale gas extraction = 10% of GW depletion for past irrigation <u>Scanlon et al., Env. Res. Lett. 2014</u>



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### Water Supplies: GW Recharge



Recharge: 20 – 60 bgal/yr 400 – 1,200 bgal over 20 yr life of the play

## Aquifers in Eagle Ford Area



#### www.twdb.state.tx.us

### Water Supplies: GW Storage At the Play Level: Fresh groundwater storage: 10,000 bgal

Agriculture, Municipal +

11%

Hydraulic Fracturing 3%

#### At the County Level: Demand vs GW Storage



### Alternatives to Freshwater: Flow back/Produced water



### Alternatives to Freshwater: Brackish Groundwater

WATER SUPPLY relative to 20-yr HF Water DEMAND (BGAL)



#### 20 yr Water Demand / FW and BW Supplies



Square Mile Grid Scale

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### Net Impact of Hydraulic Fracturing on Water Resources

Net impact of gas production: saves water

- Water use for shale gas extraction = 6% of water consumed to generate electricity using that gas
- Water consumed in natural gas power generation is ~ 1/3<sup>rd</sup> of that used in coal or nuclear plants

Water saved not collocated with water used for HF

# Water Savings

For every gallon of water used to produce natural gas through hydraulic fracturing



Texas saved 33 gallons of water by generating electricity with that natural gas instead of coal or nuclear fuel (in 2011)

#### Questions and Answers

- What is the water demand for hydraulic fracturing (HF)?
  Eagle Ford, consumed ~ 80 bgal from 14,500 wells (2009 2015)
  Projected water demand, ~300 bgal from 56,000 wells in 20 years
- What are the impacts of HF on water resources?
  Groundwater level declines ≤ 200 ft.
- Is hydraulic fracturing vulnerable to water scarcity? (20 years)
  FW supplies: GW storage: 10,000 bgal; HF = 3% of fresh GW storage
  Alternative Sources: Brackish GW: 80,000 bgal; HF = 0.4% of BW
- What is the net impact of water use for HF on water resources?
  Use of shale gas in power generation saves water relative to coal or nuclear plants

