

# Dilemmas of “green” extraction

irrigation H<sub>2</sub>O contamination +  
alfalfa crop productivity  
at the Thacker Pass lithium mine





## There's a Fortune to Be Made in the Obscure Metals Behind Clean Power

COMMENTARY • COP26

### Green energy can't become a reality without critical minerals

### Why Elon Musk wants Tesla to start mining lithium

SCIENCE \ ENERGY \ ENVIRONMENT

### Clean energy faces its own supply chain crisis

*That jeopardizes the US's climate goals*

### Cobalt Is the New Oil

A New York Times investigation details China's rapid acceleration of cobalt mining as countries gear up in renewable energy and battery demand.

### EVs and Cleaner Energy Are Giving a Boost to Copper and Other 'Green' Metals

# LITHIUM

- + used in **lithium-ion batteries**
- + extraction = **dirty**
- + 1 domestic mine, **several in development**

# **Thacker Pass (Peehee Mu'huh), Humboldt County, NV**

**Northern Paiute + Western Shoshone lands**

**Proposed mine:** ~9 sq-mile pit,  
30 sq-mile project area

**EIS:** ↑ TDS, heavy metals in groundwater

**#1 ag-producing county in driest state**



## ALFALFA

#1 produced + irrigated crop in Humboldt County

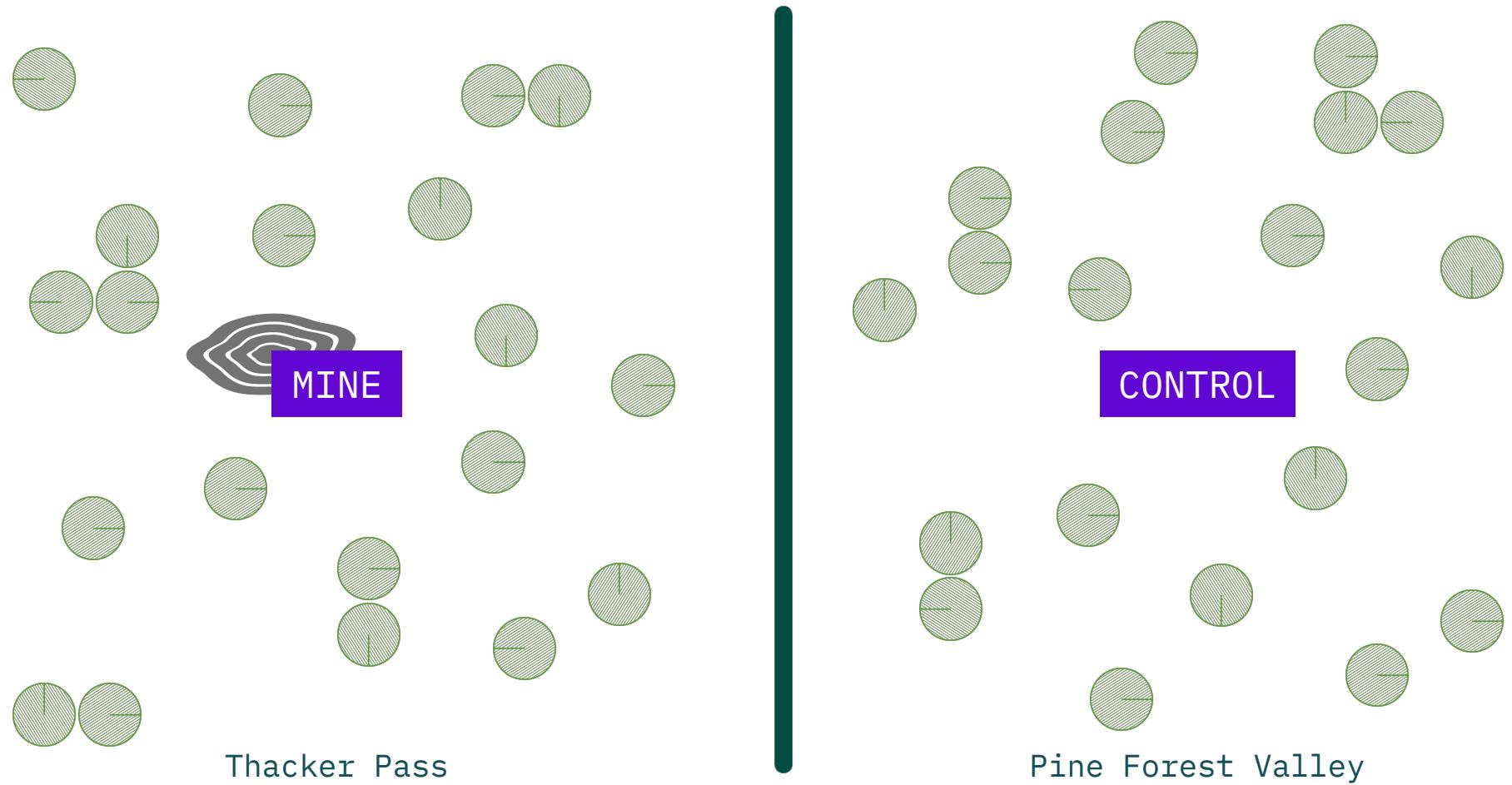
**salt stress:** ↓ germination, seed vigor, biomass accumulation, growth

**heavy metals:** ↓ germination, growth

**RQ1:** Is the Thacker Pass lithium mine associated with heightened **contamination of water used for irrigation** on surrounding alfalfa fields?

**RQ2:** Are mining activities and irrigation water contamination associated with **reduced crop productivity** on surrounding alfalfa fields?

# Methodology: field selection



# Methodology: RQ1

Is the Thacker Pass lithium mine associated with heightened **contamination of H<sub>2</sub>O used for irrigation** on surrounding alfalfa fields?



irrigation H<sub>2</sub>O samples  
TDS, heavy metals

**Frequency:** quarterly

**Duration:** 2 yrs

Yr 1: pre-operation  
Yr 2: active

changes in **TDS + heavy metals**  
from Yr 1 to Yr 2 in **mining vs. control** field irrigation H<sub>2</sub>O

whether changes are correlated w/  
**proximity** to mine

# Methodology: RQ2

Are mining activities + irrigation H<sub>2</sub>O contamination associated with **reduced crop productivity** on alfalfa fields?



**crop productivity surveys**  
stem density, height

**Frequency:** 6 per yr  
pre-bud + bud stages prior to  
1st, 2nd, 3rd summer cuttings

**Duration:** 2 yrs  
Yr 1: pre-operation  
Yr 2: active

magnitude of changes in  
**stem density + height** from  
Yr 1 to Yr 2 on **mining vs. control** fields

whether changes  
are correlated  
w/ changes in  
**irrigation H<sub>2</sub>O quality** (RQ1)

whether changes  
are correlated w/  
**proximity** to mine

# Methodology: interviews



semi-structured interviews

crop productivity

stand characteristics

management practices

**Frequency:** 1 per yr

**Duration:** 2 yrs

identify covariates +  
bolster findings

	F 22	W 23	Spr 23	Sum 23	F 23	W 24	Spr 24	Sum 24
H2O quality sampling								
crop productivity surveys								
interviews								

F=Fall, W=Winter, Spr=Spring, Sum=Summer

# Considerations / predicaments

- + Timeline: Phases of mine development
- + Design: BACI, groundwater, distance of fields from mine
- + Feasibility: \$\$\$, time

# Outcomes + applications

## **Local applications**

Advocacy  
H<sub>2</sub>O quality data  
Other directions

## **Broader applications**

Green + just futures

