U.S. DEPARTMENT OF ENERGY | Legacy Management

2018 Long-Term Stewardship Conference

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# A SURVEY OF SOIL MORPHOLOGY AT FOUR UMTRCA SITES

## WITH IMPLICATIONS TO LONG TERM HYDROLOGIC PERFORMANCE

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Track 1: Advancing current LTS practices at mission and non-mission sites within the Department
Session 2.3 – Understanding the Post-Closure Changes of Engineered Disposal Cell Covers

# SOILS ARE OPEN AND DYNAMIC SYSTEMS

## CONDITIONAL MORPHOLOGY EMERGES


Center For Land Use Interpretation

WHAT DOES THIS MEAN FOR ENGINEERED SOILS THAT WERE DESIGNED TO PERFORM REGULATED TASKS OVER TIME?

**TIME = 0**

**TIME = X**

# SITE INVESTIGATIONS

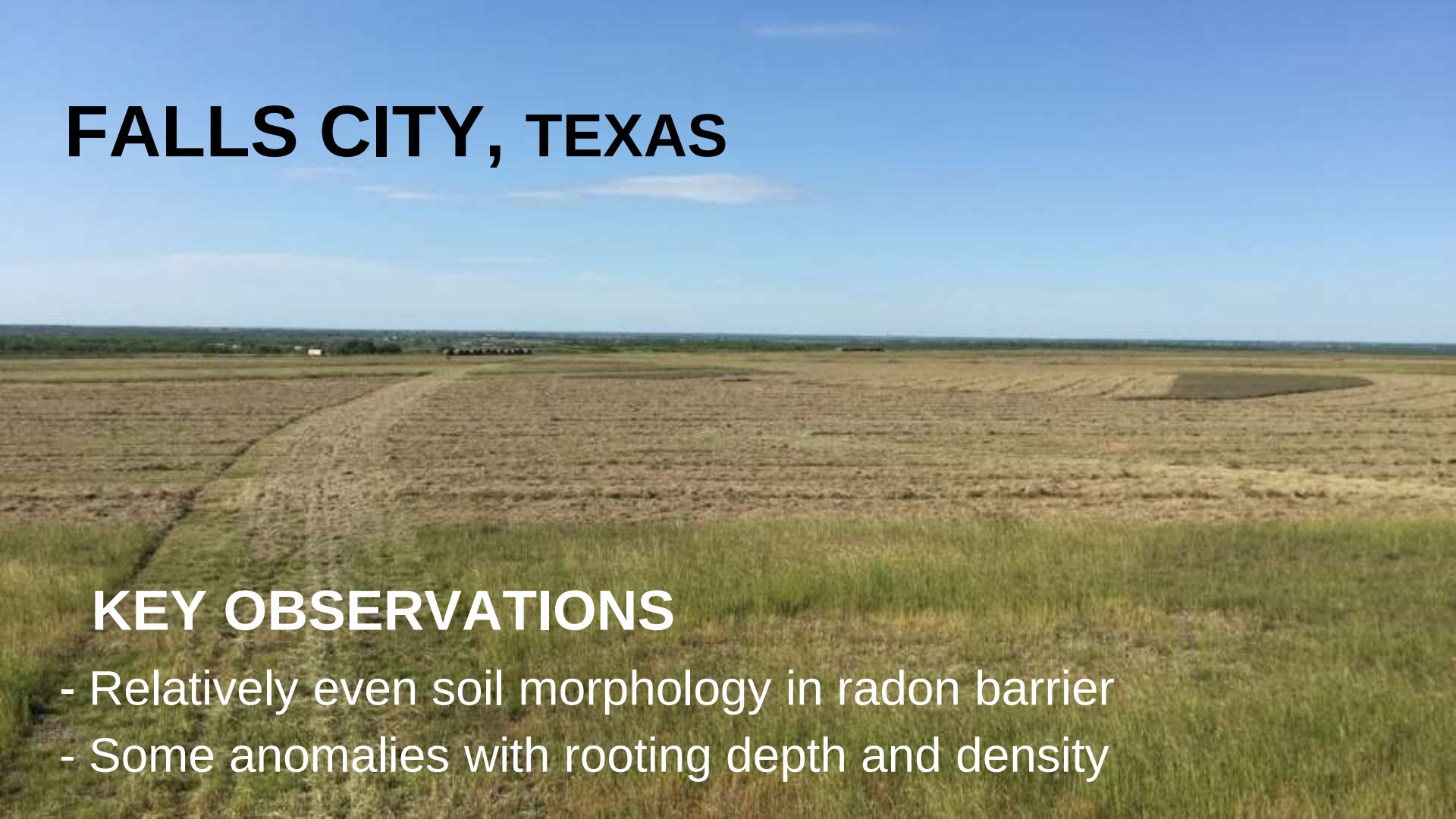
- SOIL STRUCTURE
  (COARSE SIZE AND GRADE)
- SOIL TEXTURE
  (SIZE AND QUANTITY)
- SOIL CHEMISTRY
  (CATIONS, EC, PH, ...)
- SOIL BIOLOGY
  (NEMATODES, BACTERIA…)
- ANOMALIES
  (CONSTRUCTION RELICS...)

~~MEASURED PROPERTIES~~

- ~~SATURATED HYDRAULIC CONDUCTIVITY (in Lab)~~
- ~~BULK DENSITY~~
- ~~INFILTRATION~~

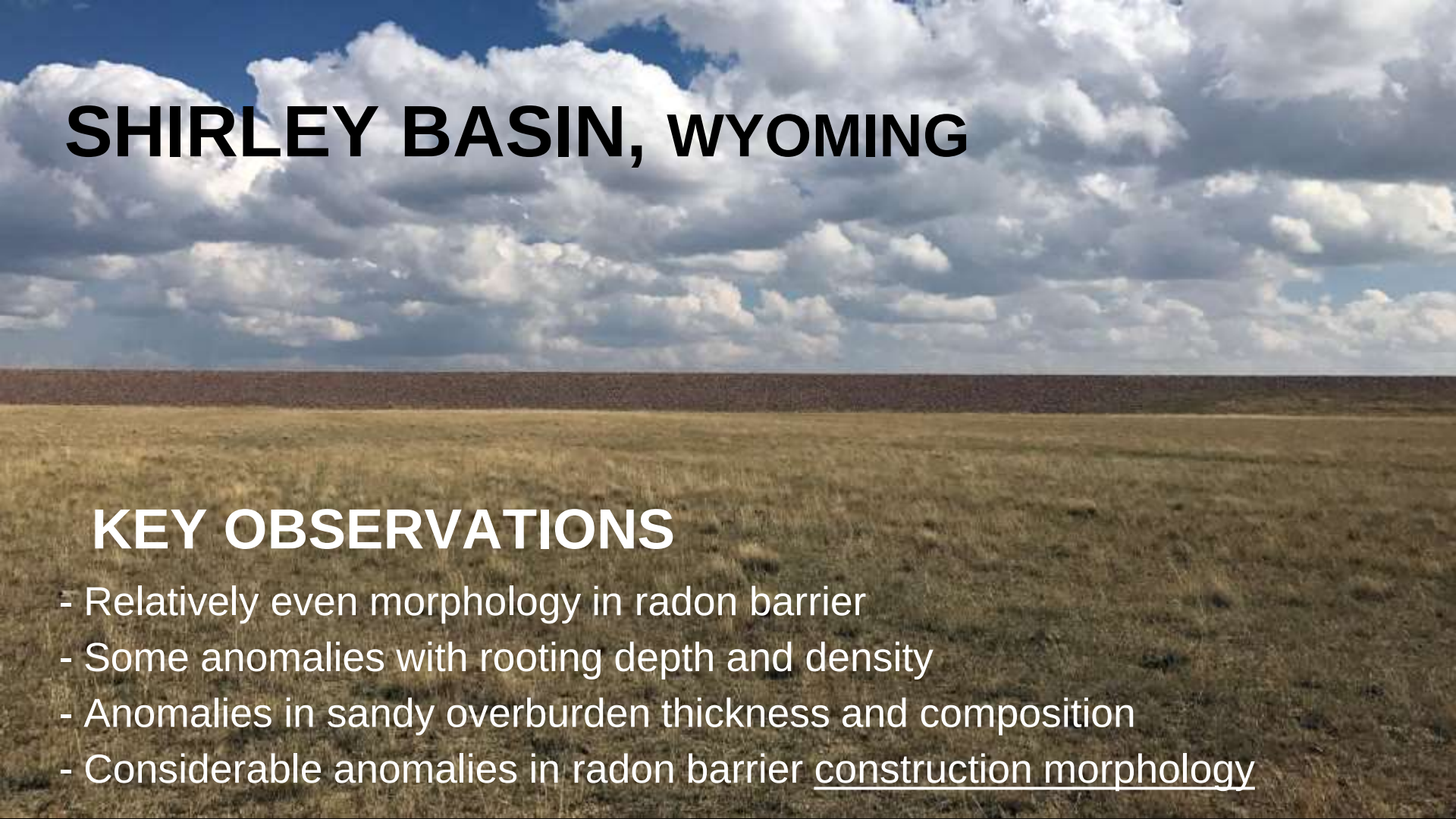
FALLS CITY, TX
BLUEWATER, NM
SHIRLEY BASIN, WY
LAKEVIEW, OR

# FALLS CITY, TEXAS



## KEY OBSERVATIONS

- Relatively even soil morphology in radon barrier
- Some anomalies with rooting depth and density



# SHIRLEY BASIN, WYOMING

## KEY OBSERVATIONS

- Relatively even morphology in radon barrier
- Some anomalies with rooting depth and density
- Anomalies in sandy overburden thickness and composition
- Considerable anomalies in radon barrier construction morphology

# LAKEVIEW, OREGON

## KEY OBSERVATIONS

- Emergence of impact gradients
- Surface feature(s) influence soil morphology of radon barrier
- Some anomalies in radon barrier construction morphology

# BLUEWATER, NEW MEXICO

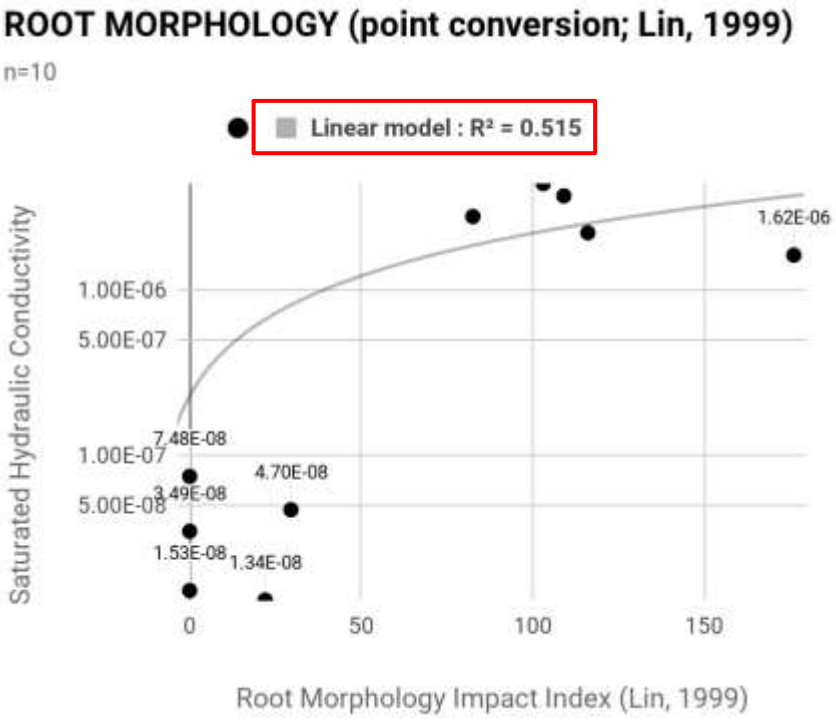
## KEY OBSERVATIONS

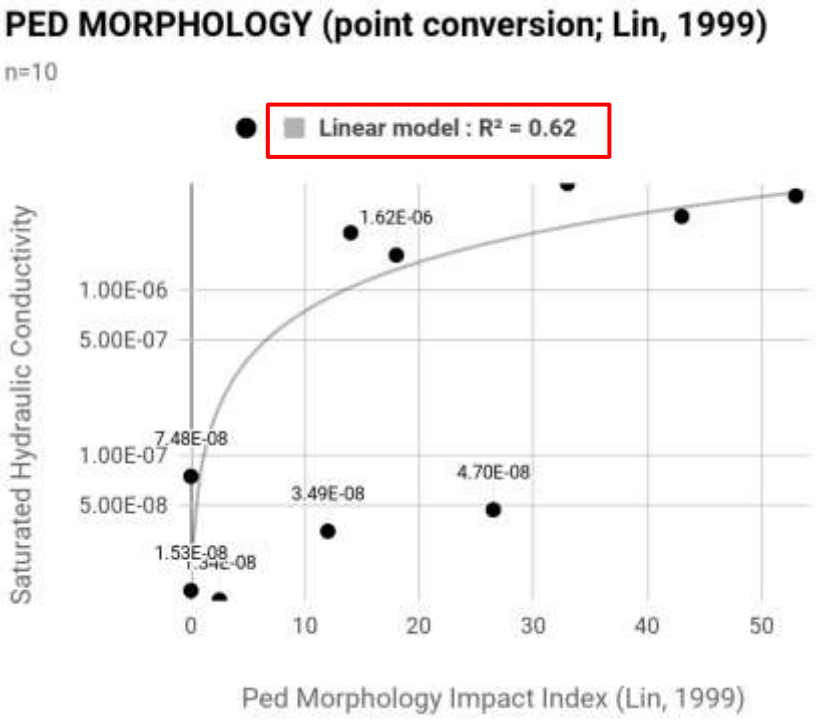
- Emergence of impact gradients
- Surface feature(s) influence soil morphology of radon barrier
- Rock armor preferentially collects nutrient rich debris

# BLUEWATER, NEW MEXICO

HOW DOES OBSERVED SOIL MORPHOLOGY INFLUENCE HYDRAULIC CONDUCTIVITY?

# POSSIBLE PREDICTORS FOR HYDRAULIC CONDUCTIVITY



# BLUEWATER, NEW MEXICO

## KEY OBSERVATIONS

- Hydraulic conductivity is most controlled by
  - SOIL PED > PLANT ROOTS > SOIL BIOTA (byproduct of)
- Ants and grasses increase soil structure the most (thus Ksat)

# KEY TAKEAWAYS

- Planted and deeper barrier sites are more even
- Unplanted and shallower barrier sites are more uneven
- Soil morphology is dependent on surface feature
- Gradients of impact exist at Bluewater and Lakeview
- Hydraulic conductivity (at Bluewater) is *most* controlled by the development of soil aggregate morphology

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