

# EROSION RATES FROM BADLANDS NATIONAL PARK



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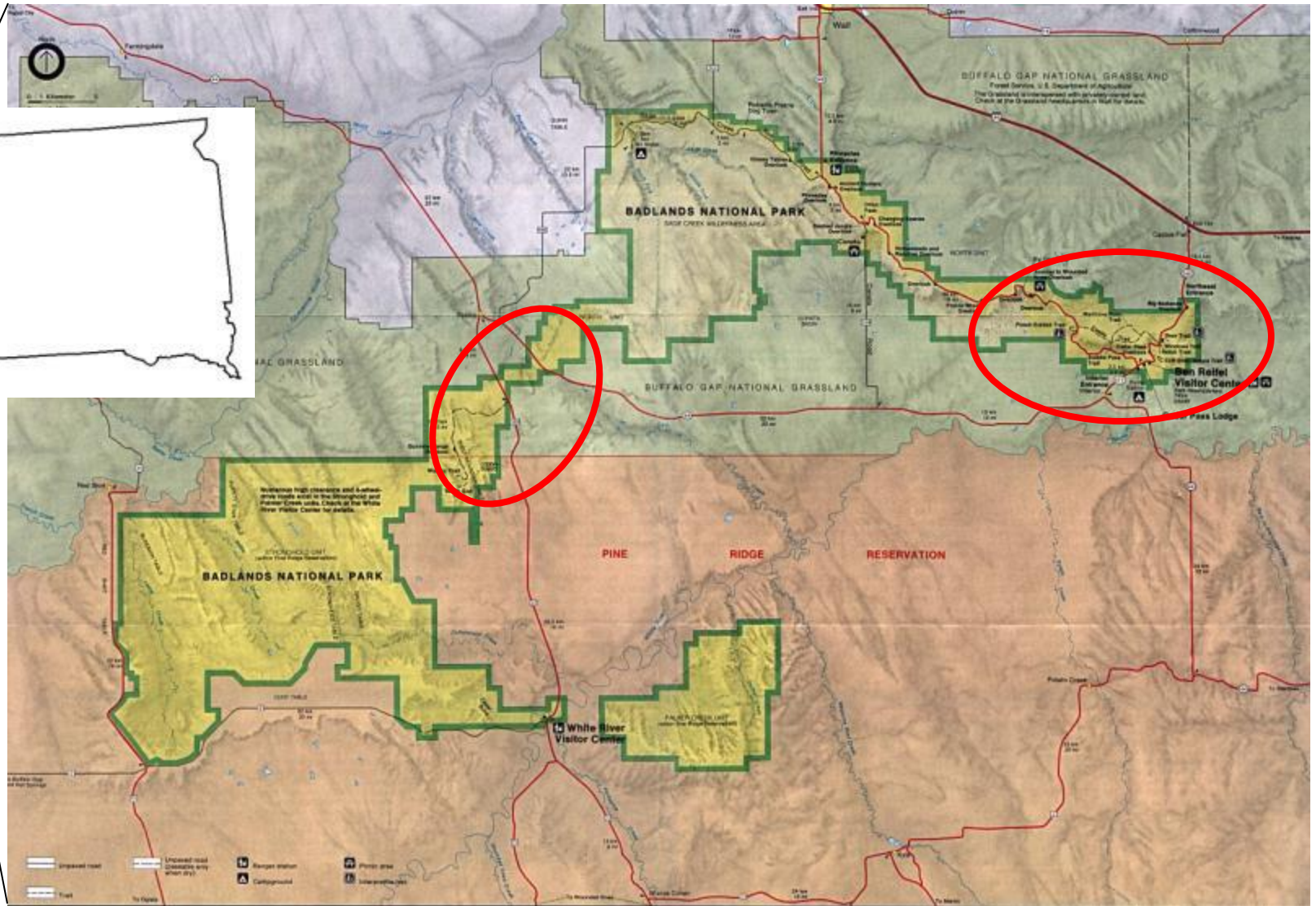


# Project Objectives

- 1) To establish measurement and monitoring procedures necessary to determine erosion rates for select fossil sites at Badlands National Park
- 2) To document the erosion rates at significant fossil sites described within the Park
- 3) To provide park management with a paleontological monitoring schedule based on erosion rates at specific fossil sites.

# Site Location

ND  
SD



# Research Methods

6 erosion sites established in 3 distinct fossil-bearing units spanning the Park

## Instruments:

- Precipitation gauge
- Erosion tools
  - Steel rods
  - Steel rulers
  - Aluminum engineers scales
- Sediment tray
- Photogrammetry
- Laser scanning



# Photogrammetry: Slopes

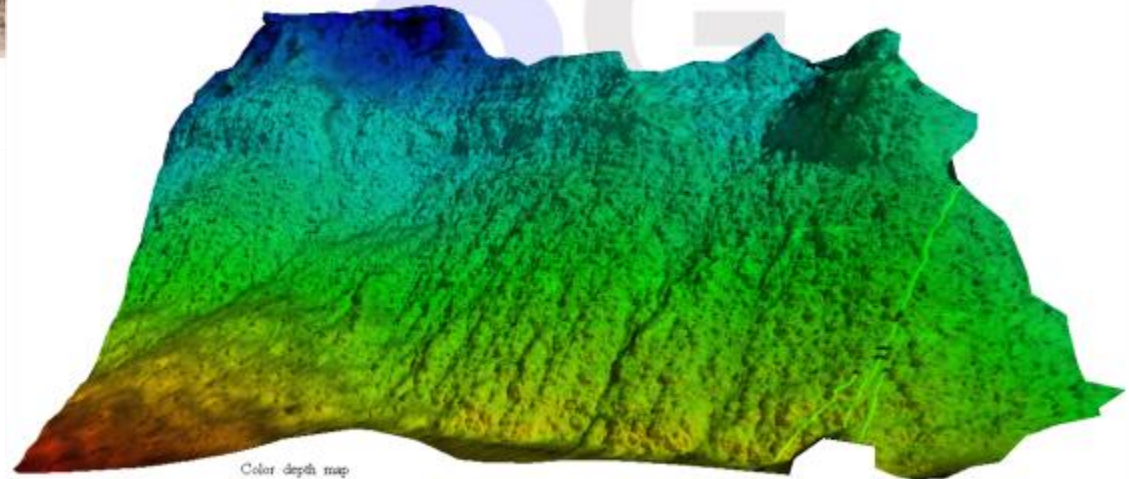


Left

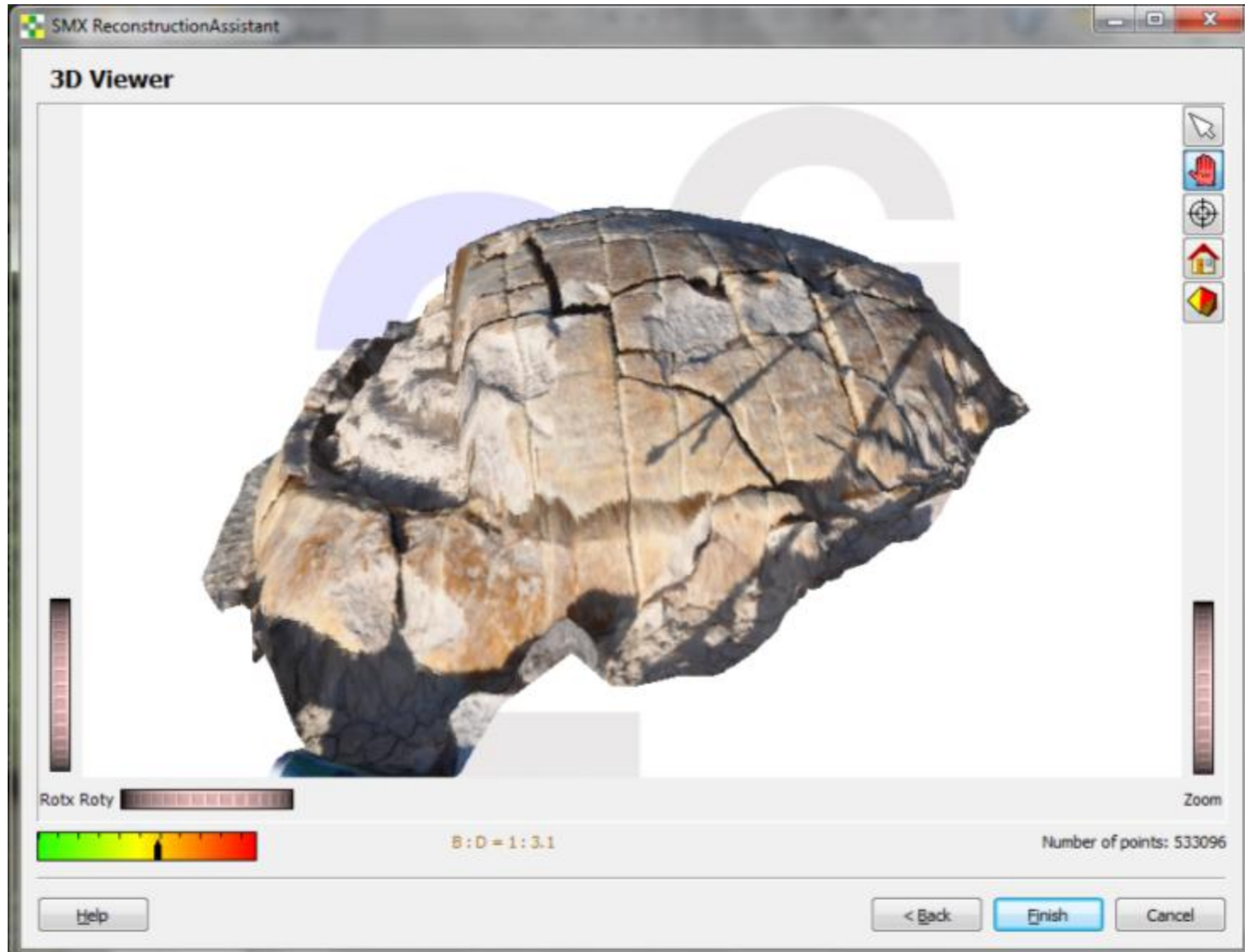
Right

Range pole common to both images

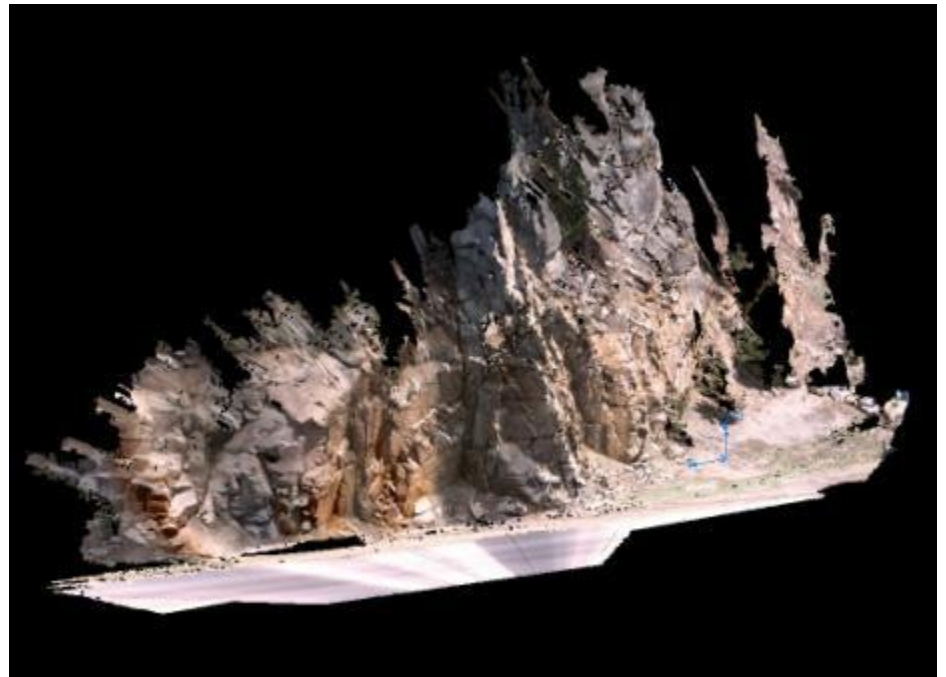
# Results



# Photogrammetry: Fossils



# Laser Scanning



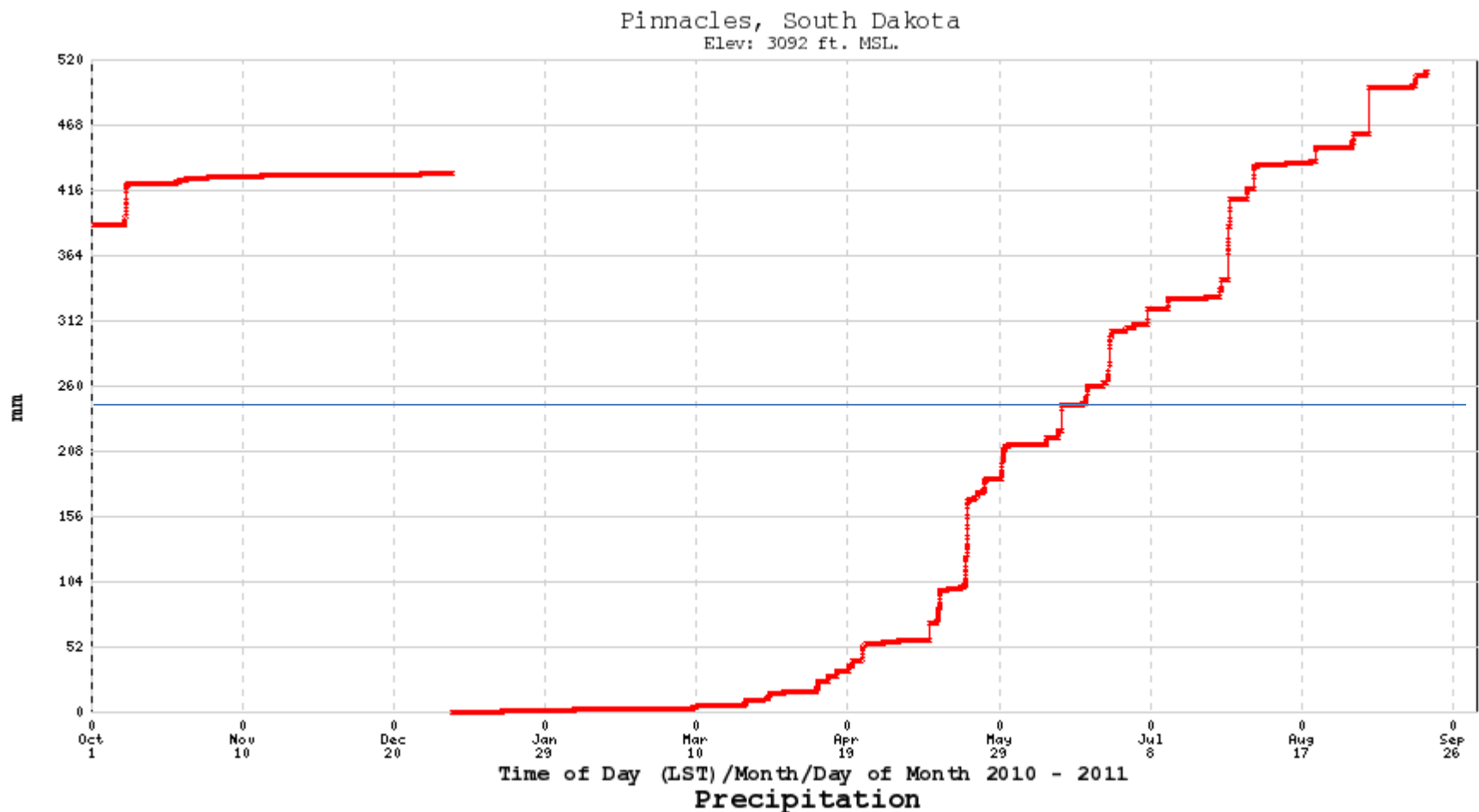
I-Site 4400 laser scanner



# Initial Erosion Results

10 data collection periods to date

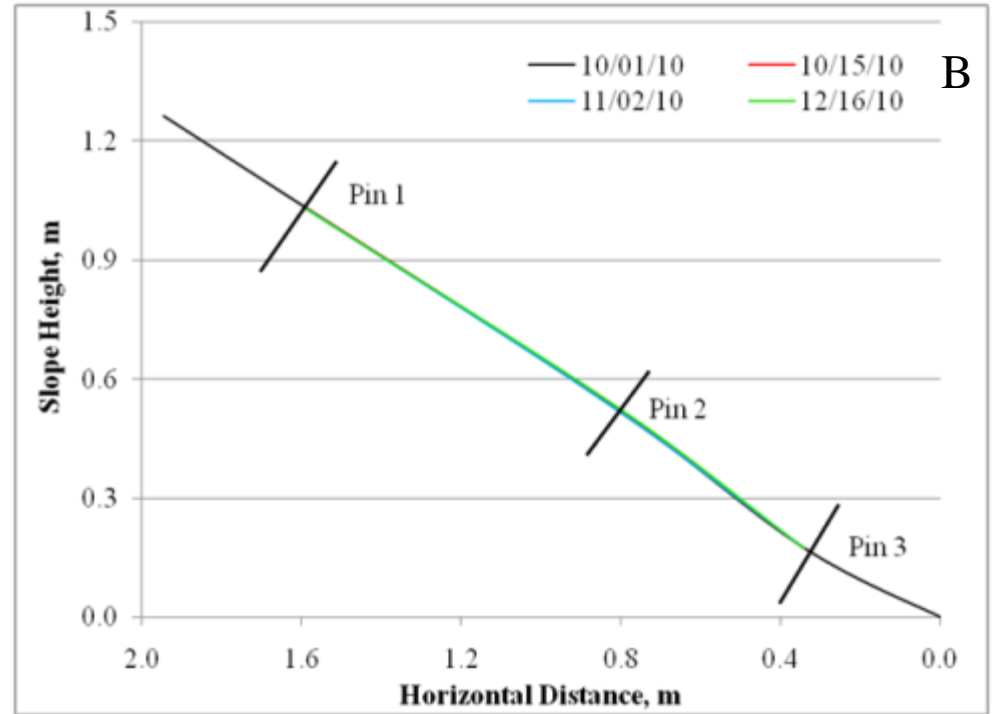
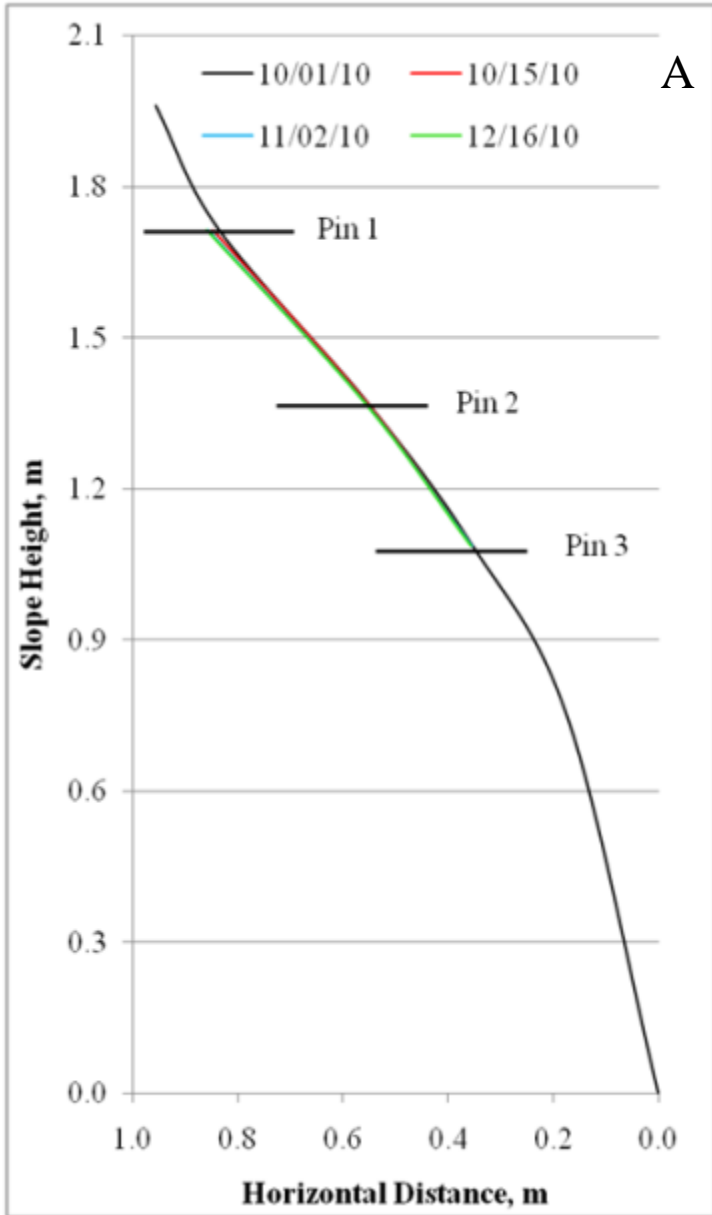
Unusual precipitation in 2010-2011 (wet)



# Sediment Runoff

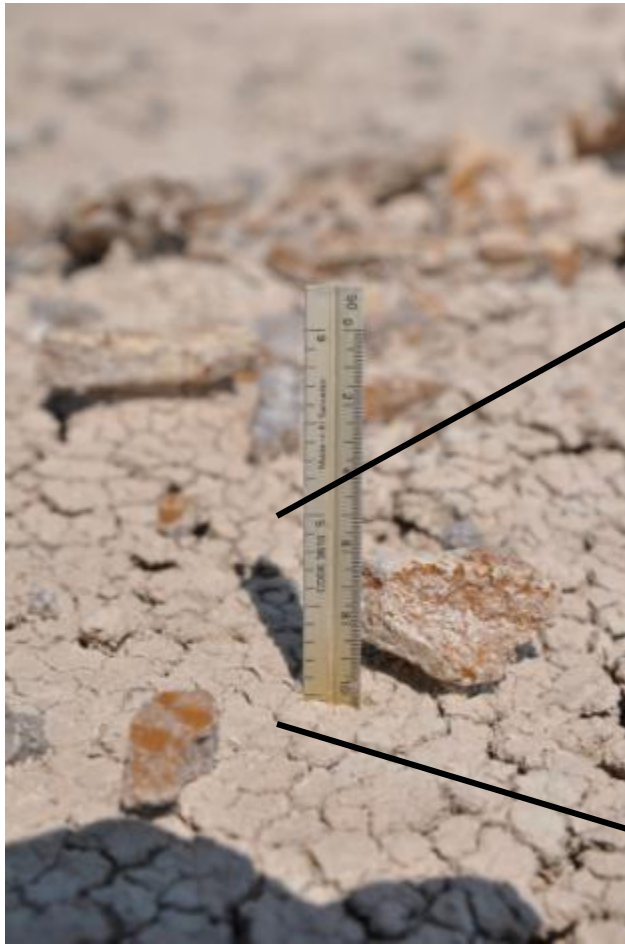


# Erosion Pins



Slope	10-01-10	10-15-10	11-02-10	12-16-10
A	0.00	10.60	9.31	1.97
	0.00	0.69	3.09	0.66
	0.00	1.40	-0.31	2.23
B	0.00	7.03	3.54	7.05
	0.00	-0.37	3.35	0.48
	0.00	1.15	3.73	-12.32

# Scales



Slope	Slope Position	Net Erosion		Net Erosion (mm)
		05/05/11	08/24/11	
BL-02-01R	Top	6.1	7.9	9.1
	Mid	7.3	9.4	10.7
BL-02-02R	Top	22.3	22.9	3.0
	Mid	8.3	11.5	16.3
	Btm	9.0	9.2	1.0

# Continuing Work

Erosion measurements, precipitation, and sediment collected monthly through the winter

Photogrammetry and scanning images collected bi-annually

Engineering properties of soils currently being determined

Slope modeling will be used to address failure mechanisms

Aeolian component will be assessed using a portable wind tunnel in summer 2012

# Results

Erosion rates at Badlands National Park are functions of:

Formation lithologic properties

Slope height and angle

Precipitation intensity

Rates vary on individual slopes with degradation on steep slopes and aggradation on low slope toes

Fossils can be severely damaged in 1 season

