

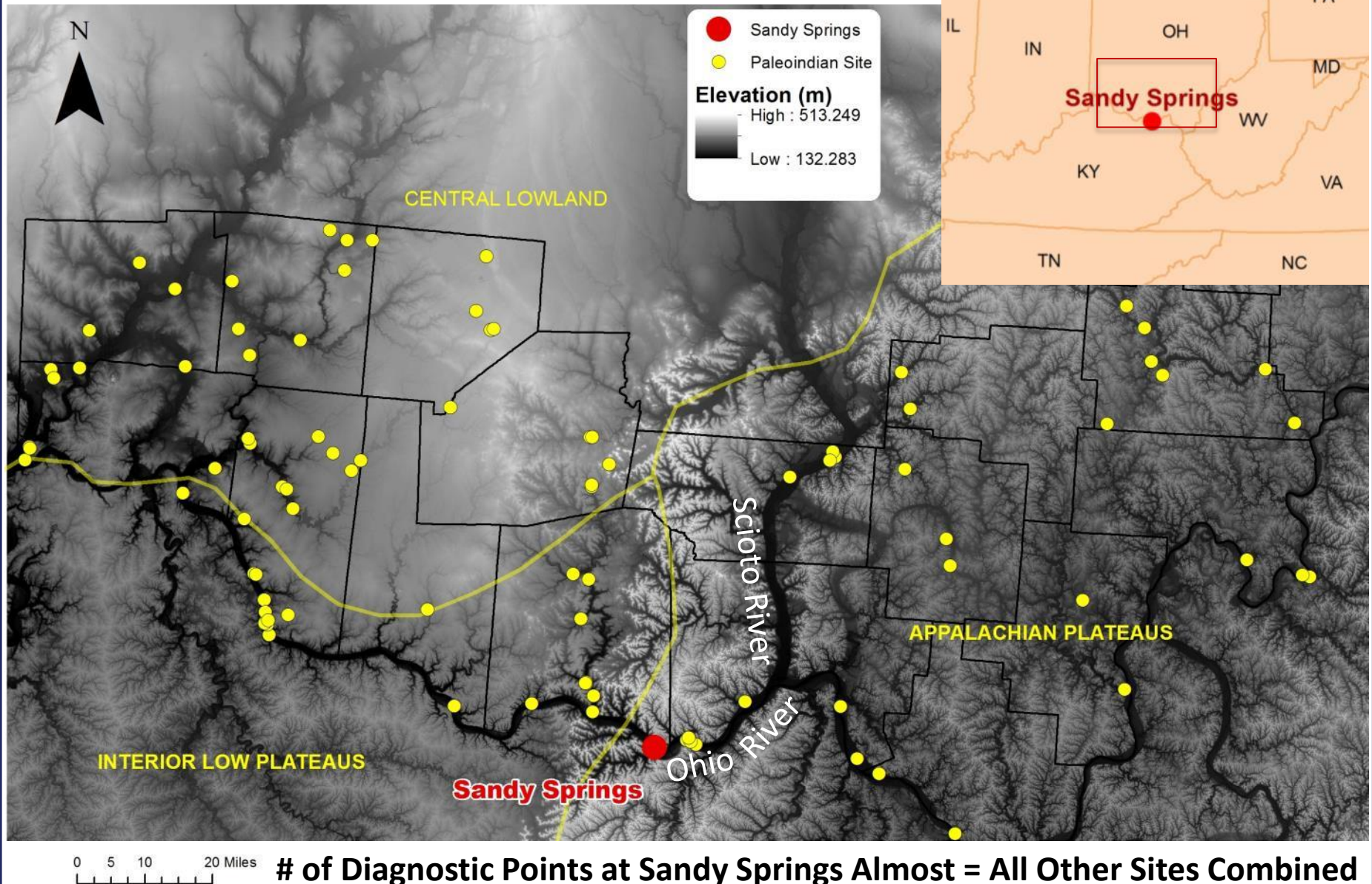
Midwestern Sand Dunes, Geoarchaeology, and LiDAR: Preliminary Geomorphic Landform Analysis of the Sandy Springs Paleoindian Site in the Upper Ohio River Valley

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GSA North-Central Section
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Madison, Wisconsin

Paleoindian Sites in Southern Ohio



Paleoindian Temporal Period:

- 13.5 – 11.4 ka cal yrs B.P.
- Initial large-scale human colonization of North America
- Low populations and high mobility
- Regionally, large sites away from high-quality chert sources are uncommon



Clovis and Gainey-style fluted points from Sandy Springs (Photo courtesy of Mark Seeman)

Sandy Springs Site:

- Unusually large site with multiple occupations throughout Paleoindian period.
- >100 fluted points documented
- Little professional archaeological or geomorphological study

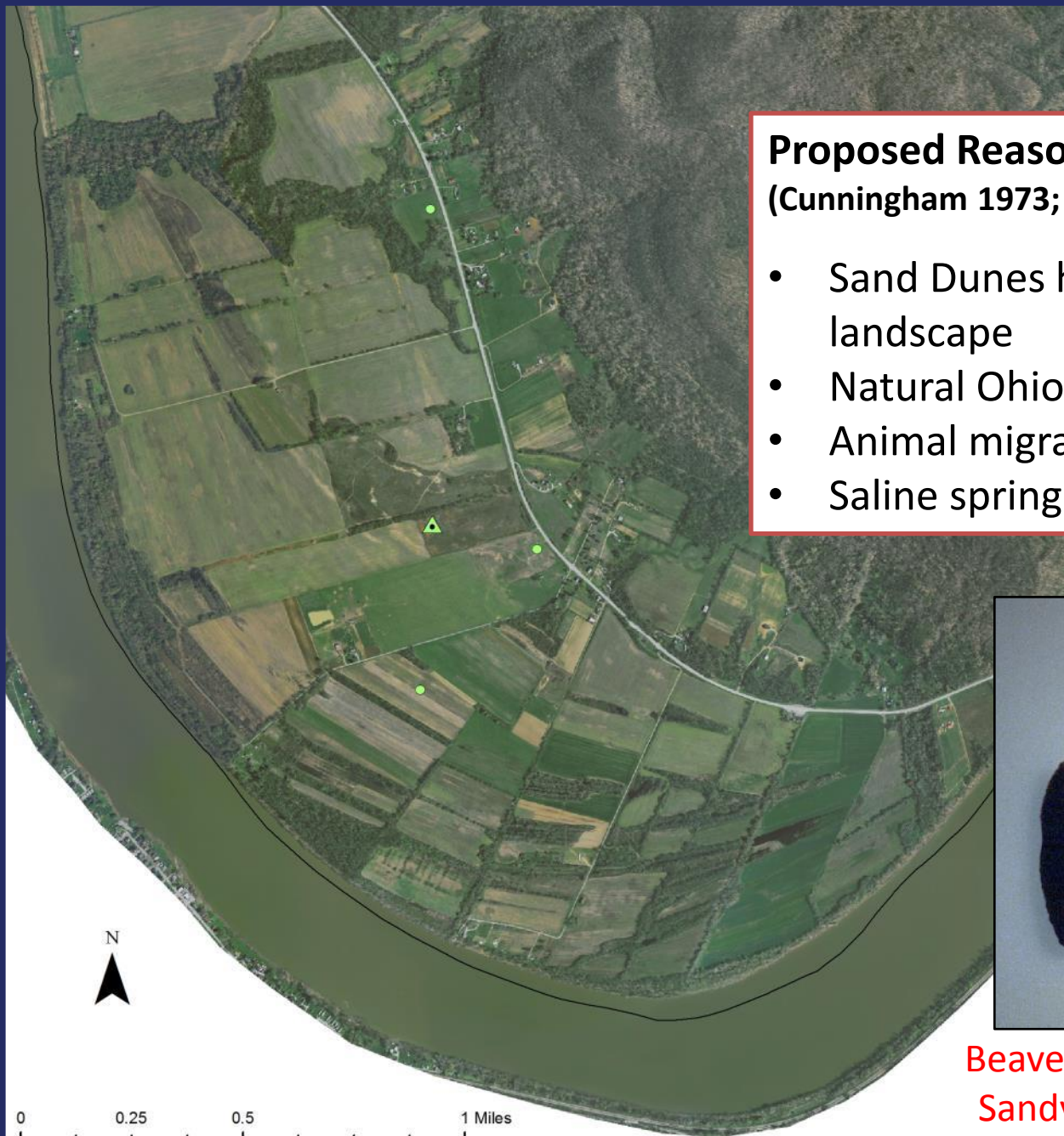
Why Sandy Springs?

Proposed Reasons for Intense Occupation (Cunningham 1973; Seeman et al 1994):

- Sand Dunes had excellent views of landscape
- Natural Ohio River ford
- Animal migration trails
- Saline springs

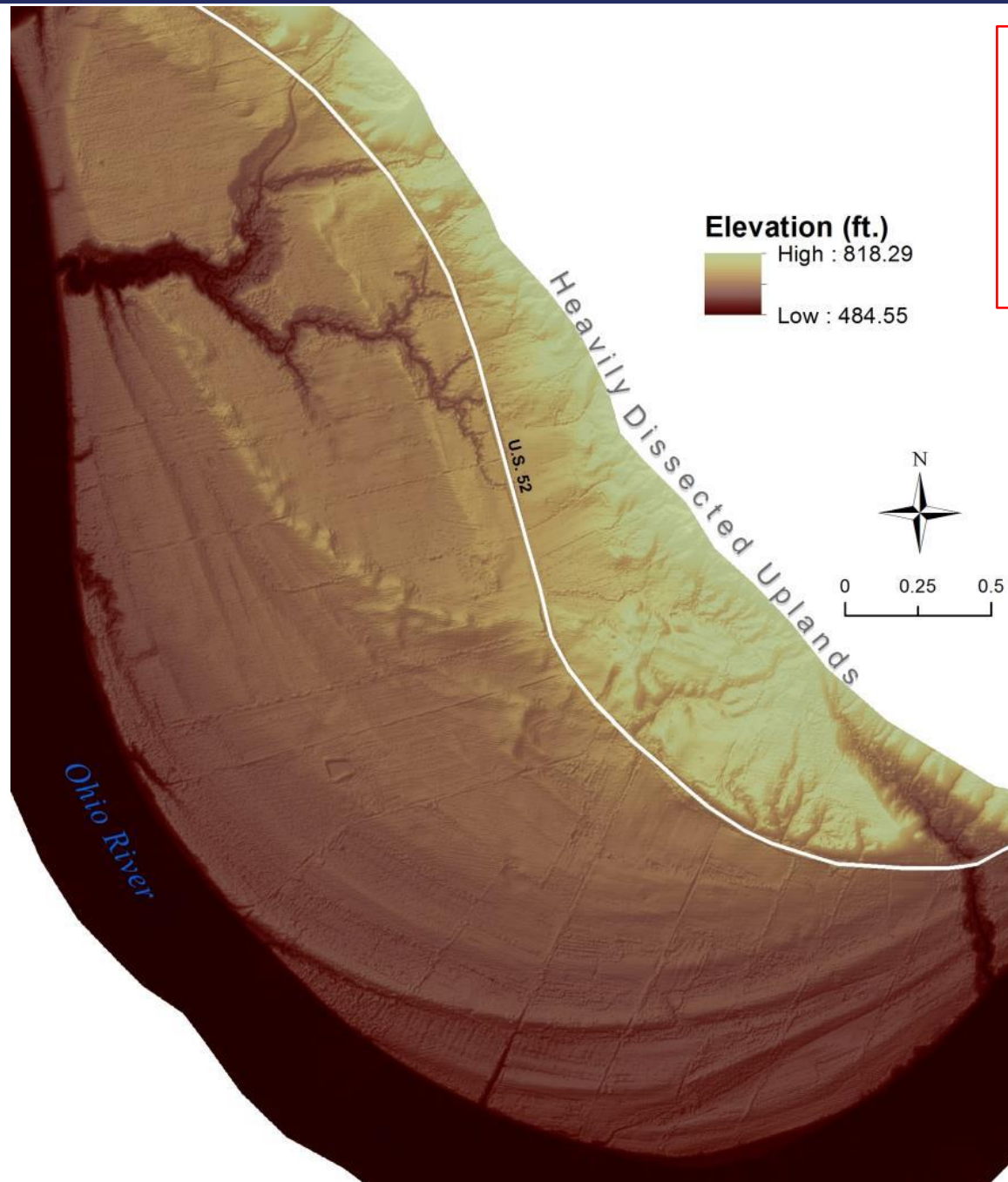


Beaver Lake-style fluted points from
Sandy Springs (Photo: Mark Seeman)

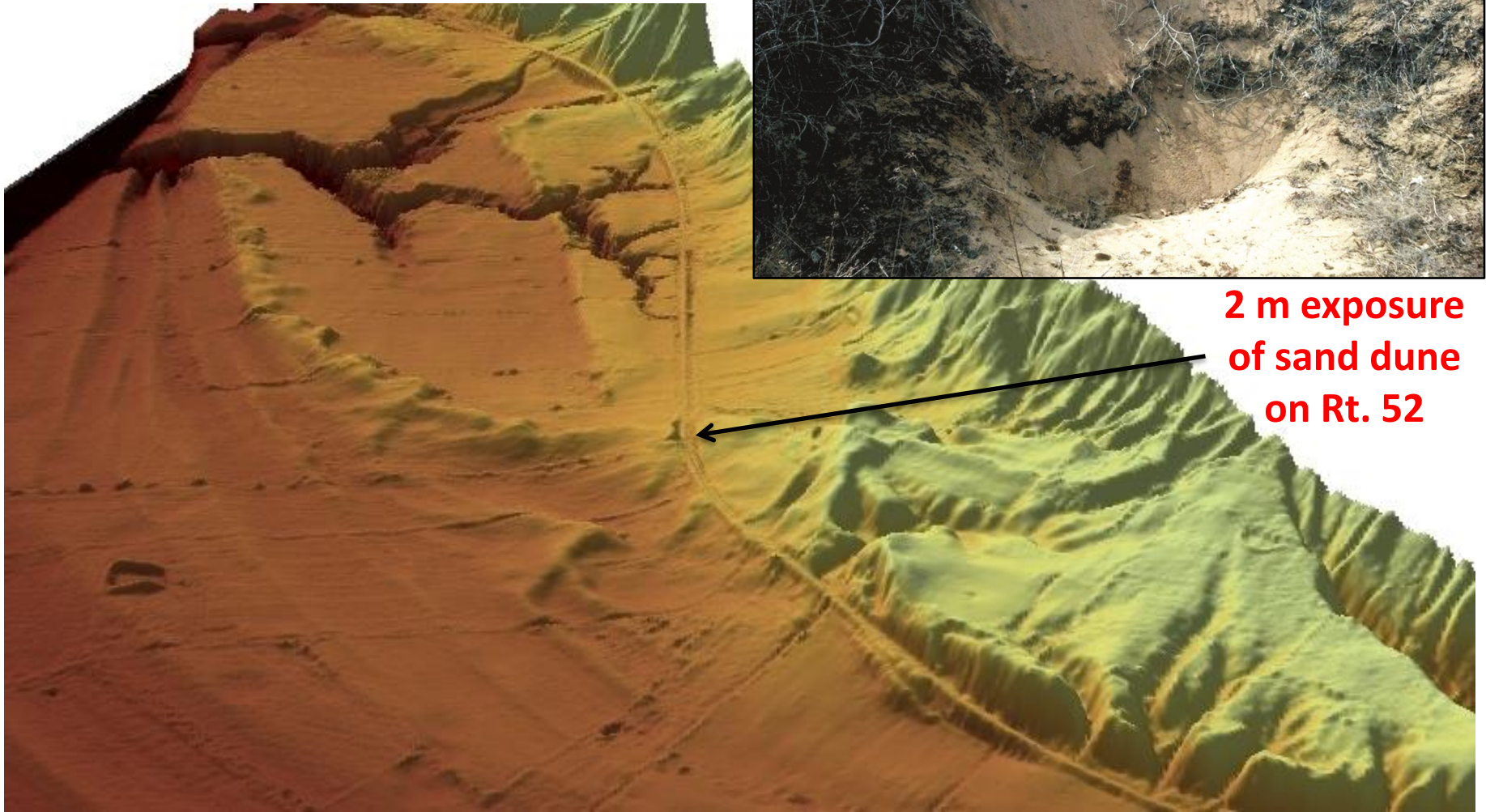


LiDAR imagery:

Data tiles at 0.762 m resolution obtained from the Ohio Geographically Referenced Information Program (OGRIP)

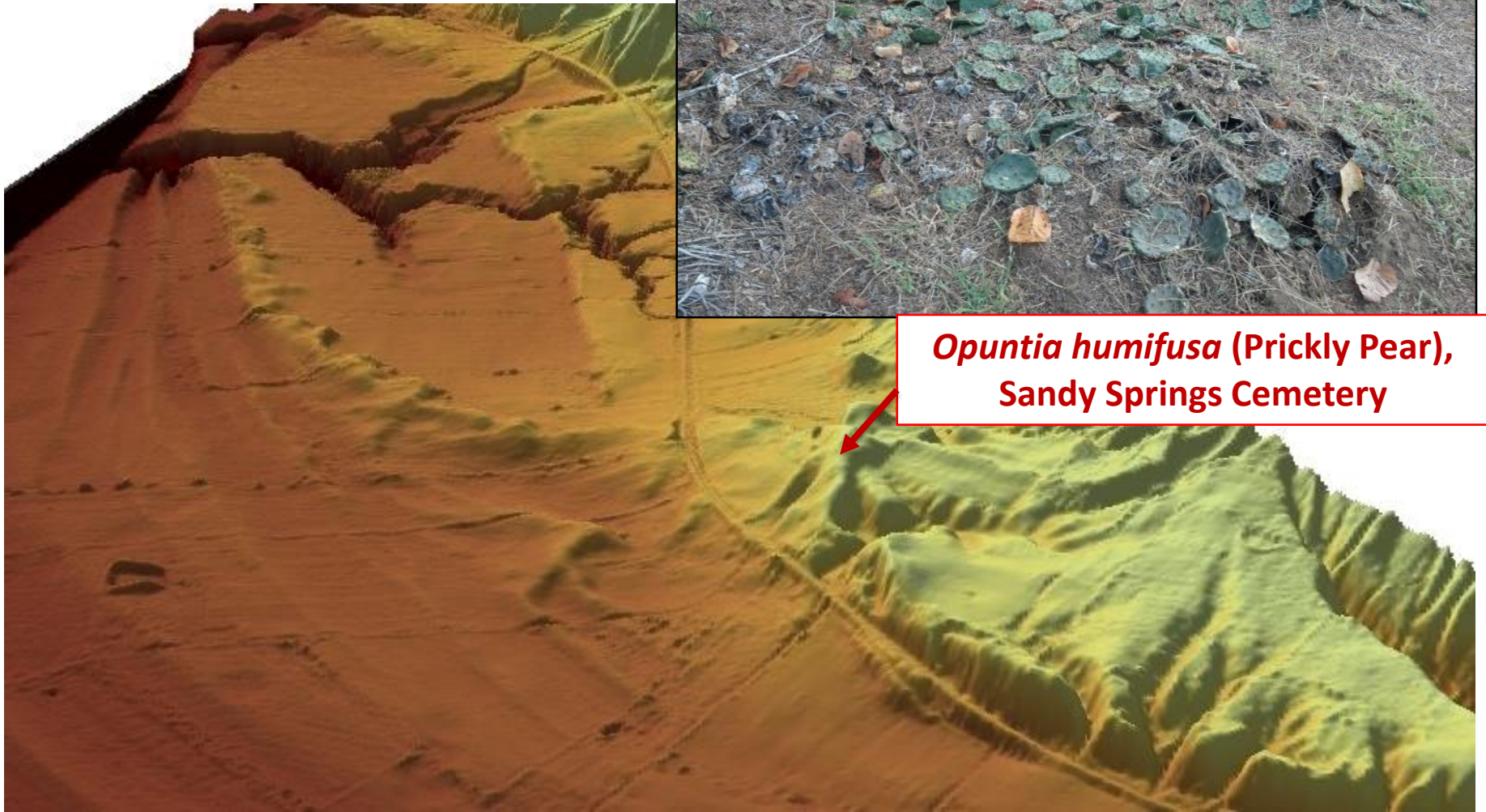


ArcScene View

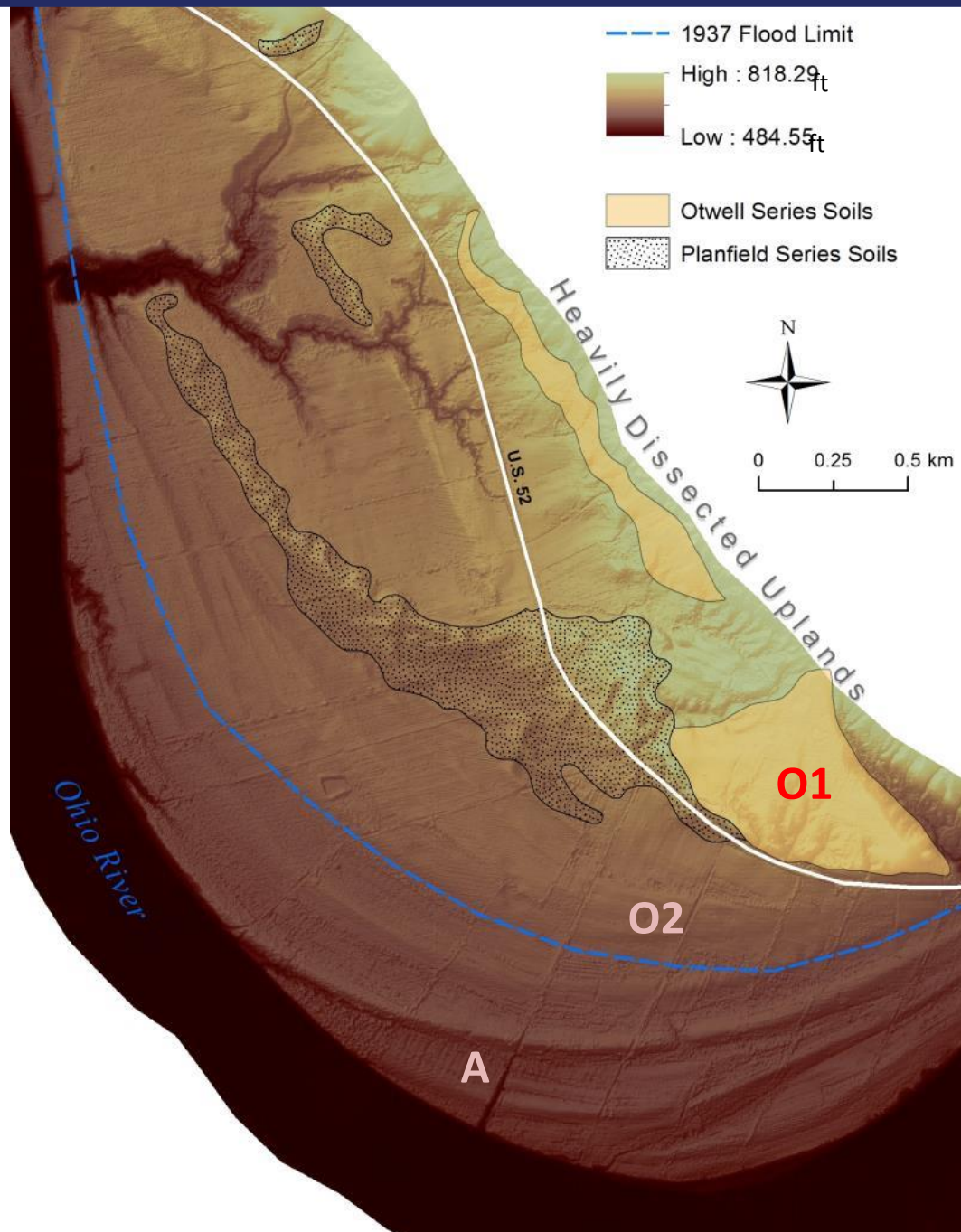


Vertical exaggeration = 7
Hillshade = 1

ArcScene View



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Surficial Geology after Pavey *et al.* 1999:

O1 - High-level
outwash terrace
22-18 ka years BP

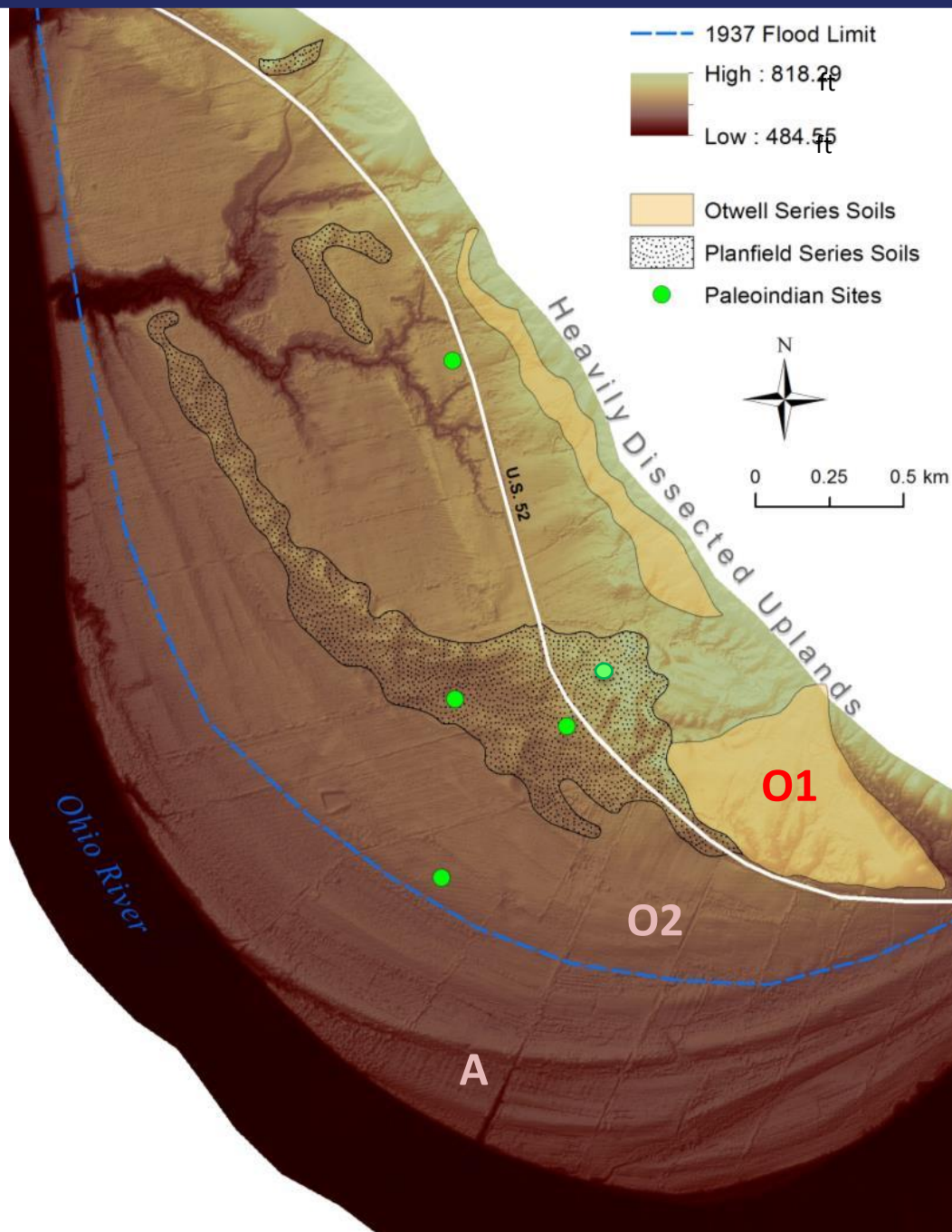
O2 - Intermediate
outwash terrace
18-15 ka years BP

A – Alluvium
Holocene

Soils:

Otwell, Fine-silty, Mixed,
Active, Mesic Oxyaquic
Fragiudalfs

Plainfield, Mixed, Mesic
Typic Udipsamments



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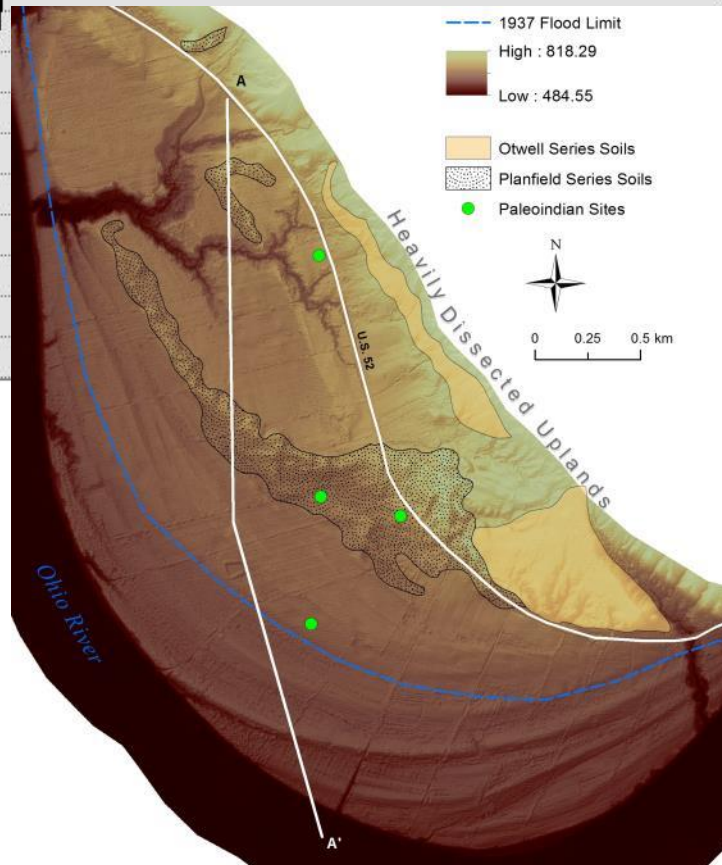
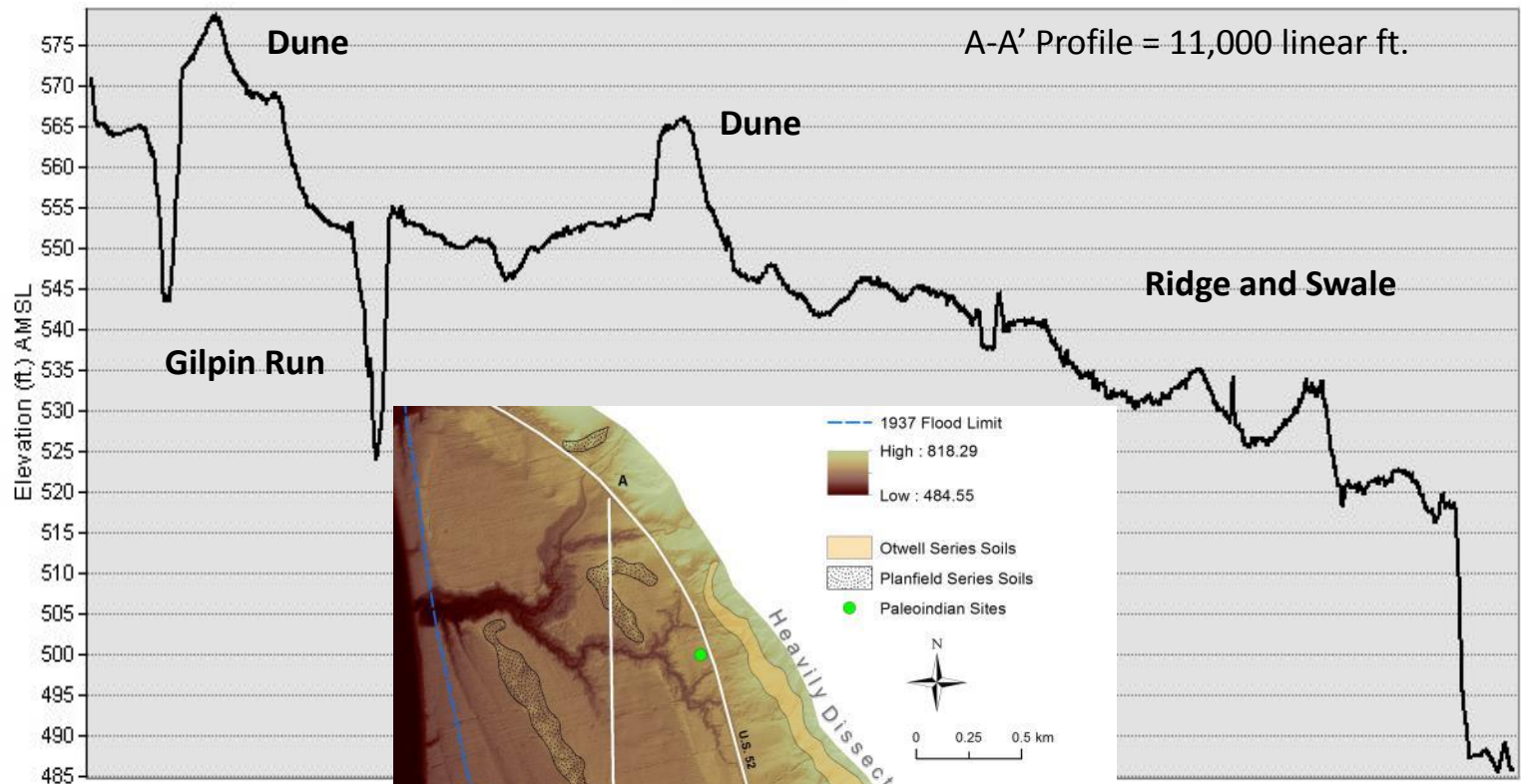
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A to A' Profile

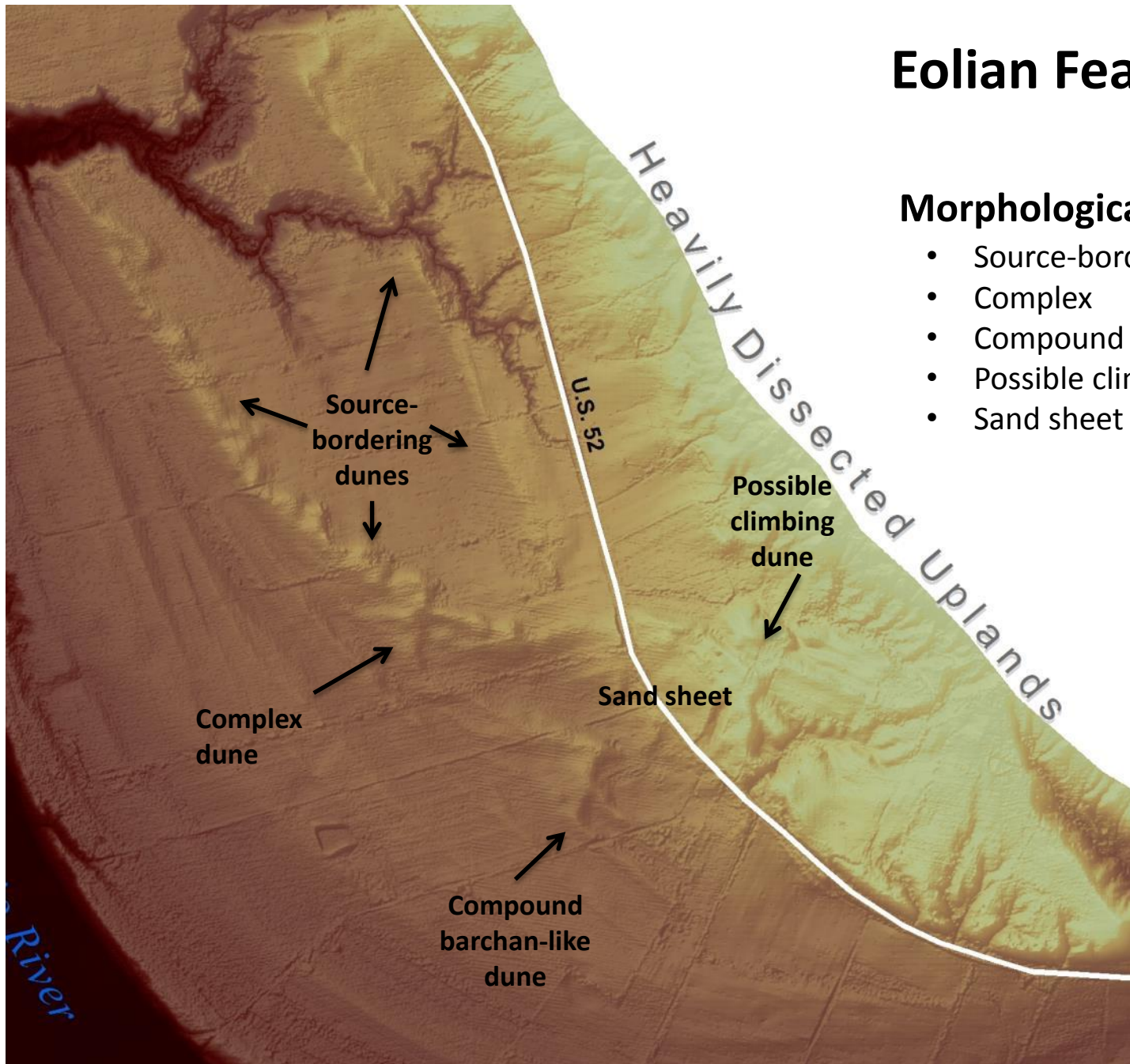


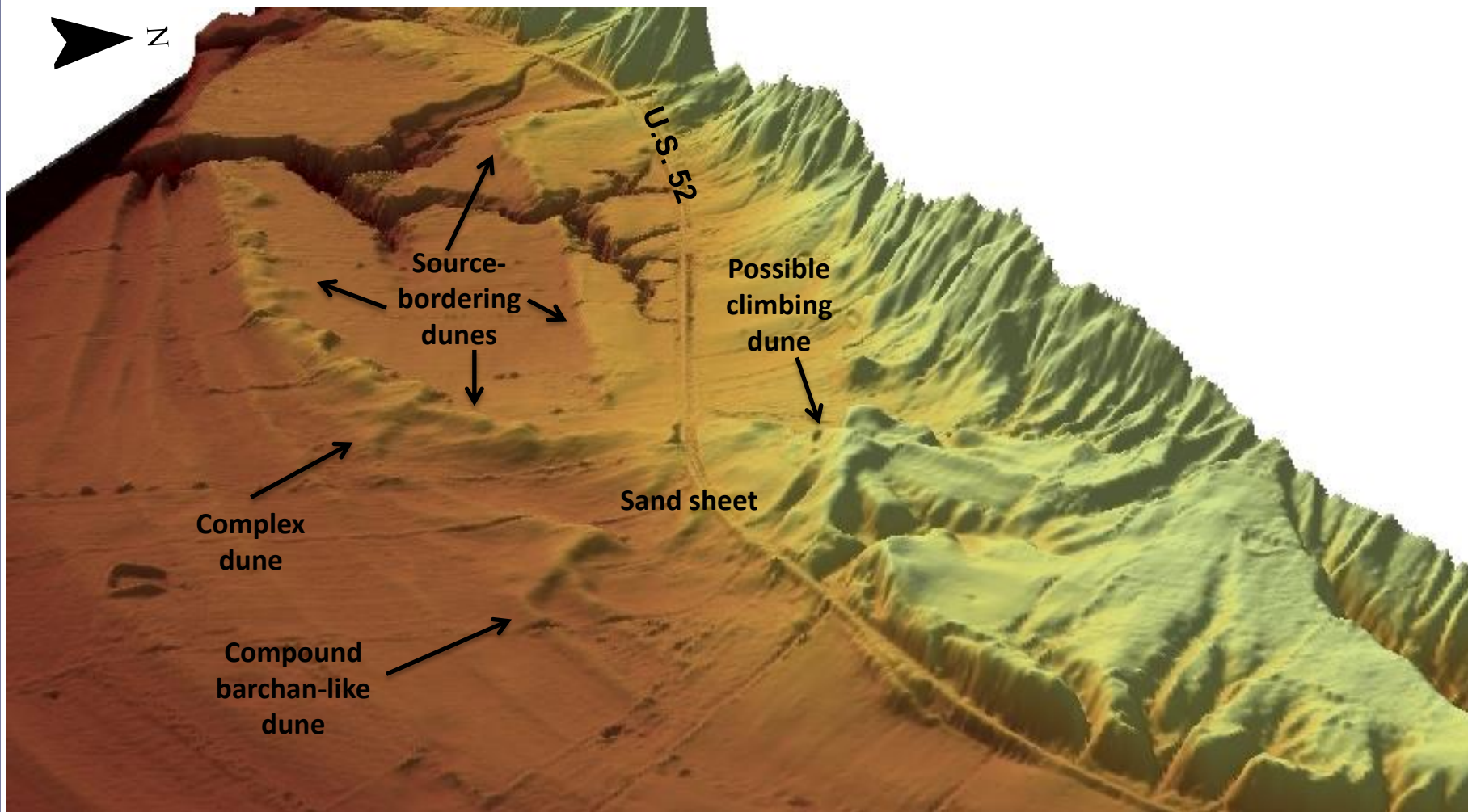
A to A' Profile

Eolian Features

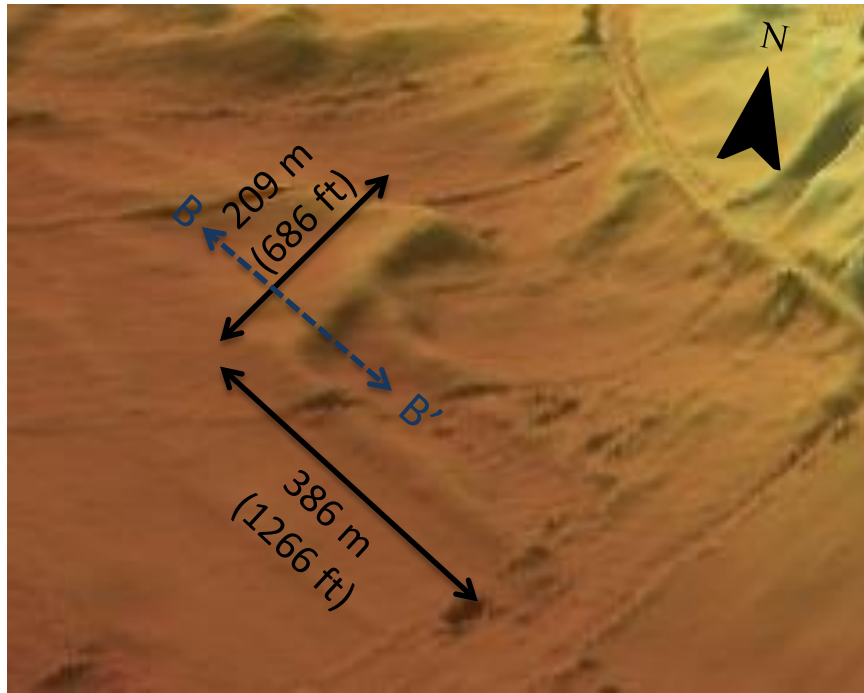
Morphological Dune Forms

- Source-bordering
- Complex
- Compound barchan-like
- Possible climbing
- Sand sheet



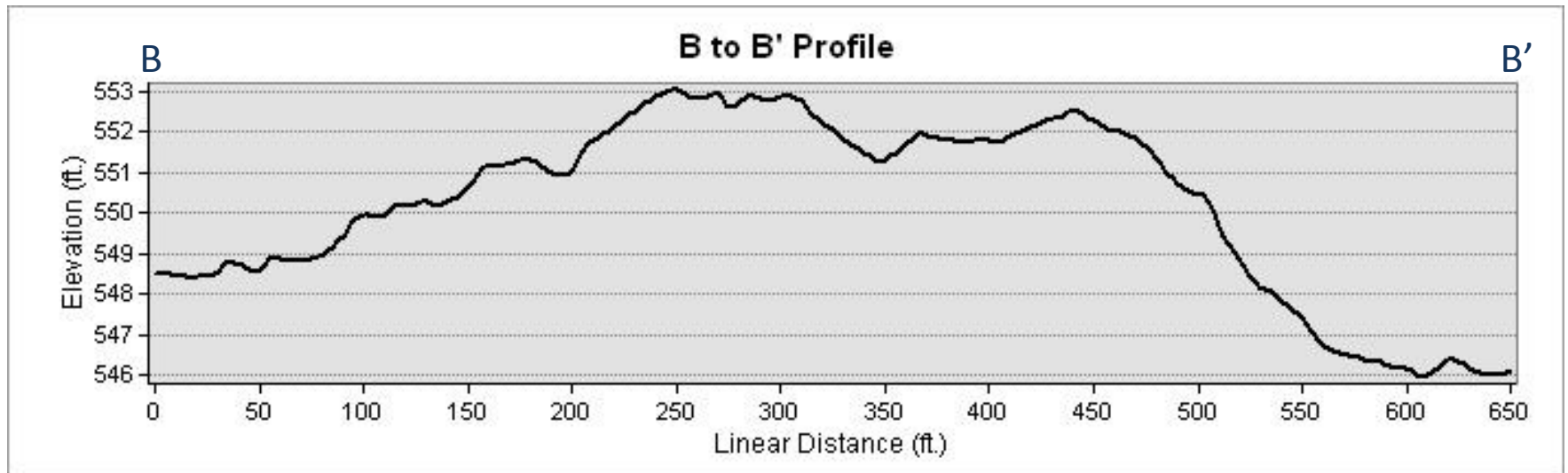


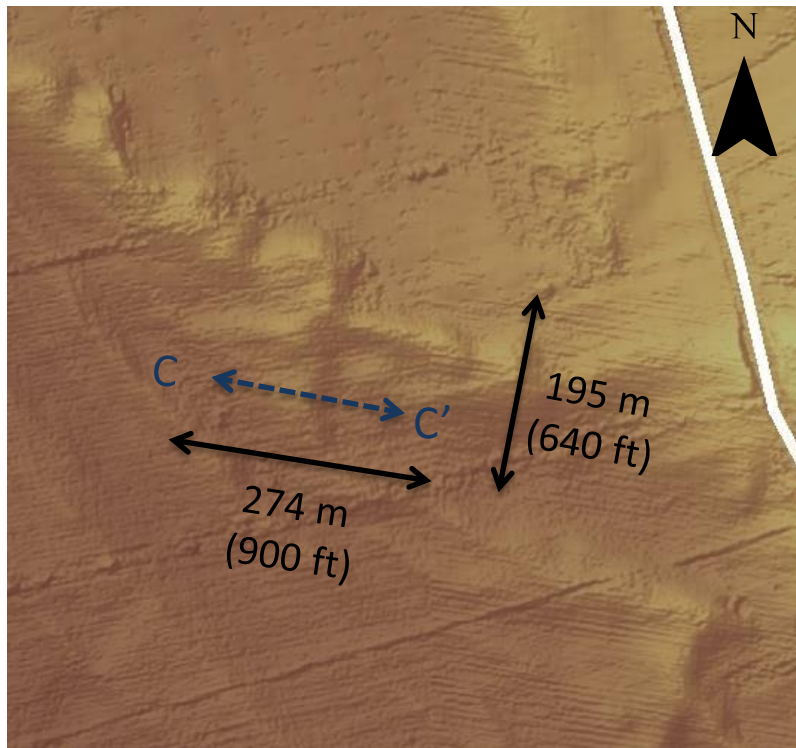
Vertical exaggeration = 7
Hillshade = 1



Morphometrics of Compound Barchan-like Dune

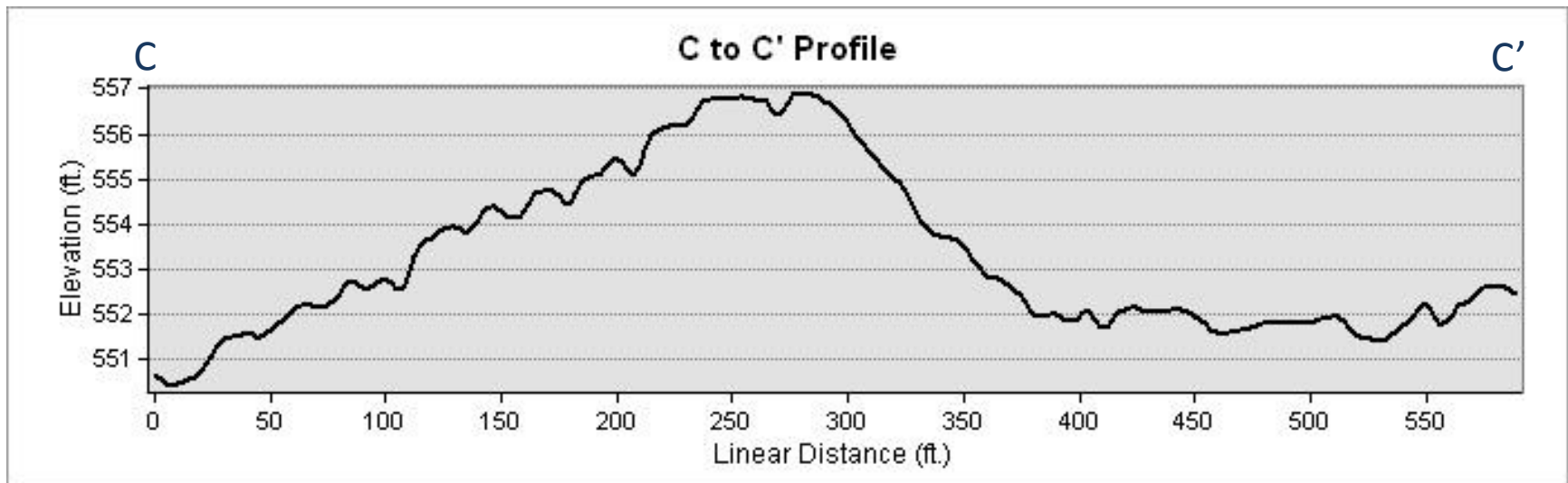
- Max. height = 3.7 m (12.1 ft)
- Length/width ratio = 1.85
(non-elongated, after Pye 1982)
- B side slope = 1.8 %
- B' side slope = 4.1 %





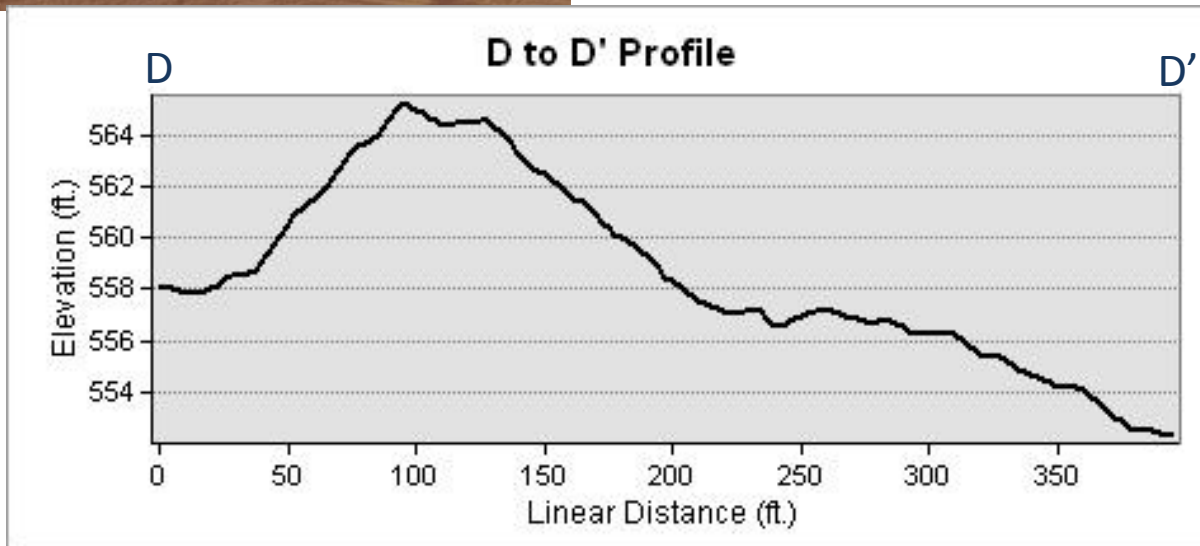
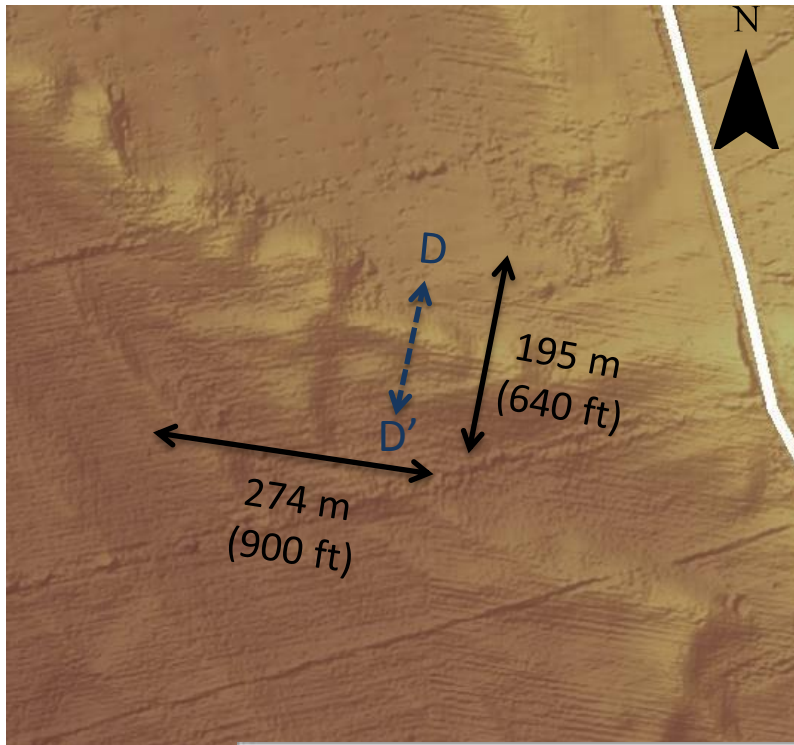
Morphometrics of the Complex Dune

- Max. height = 5 m (16 ft)
- C side slope = 2.5 %
- C' side slope = 5 %



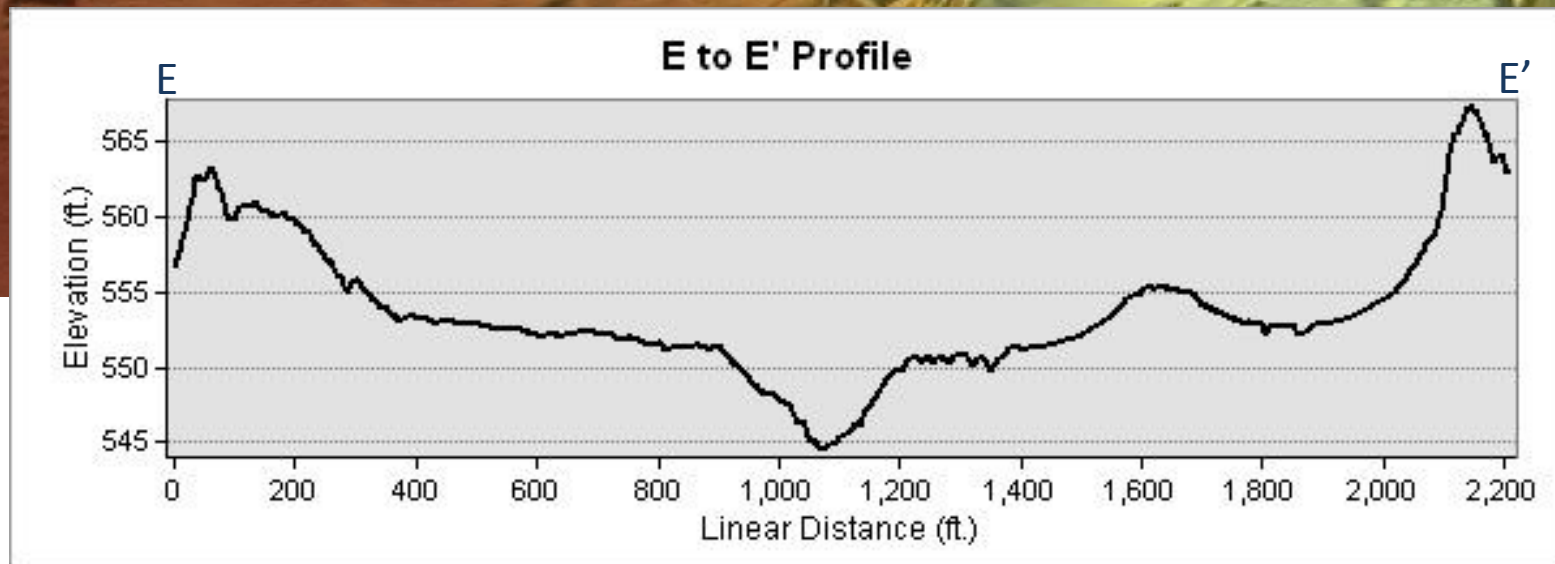
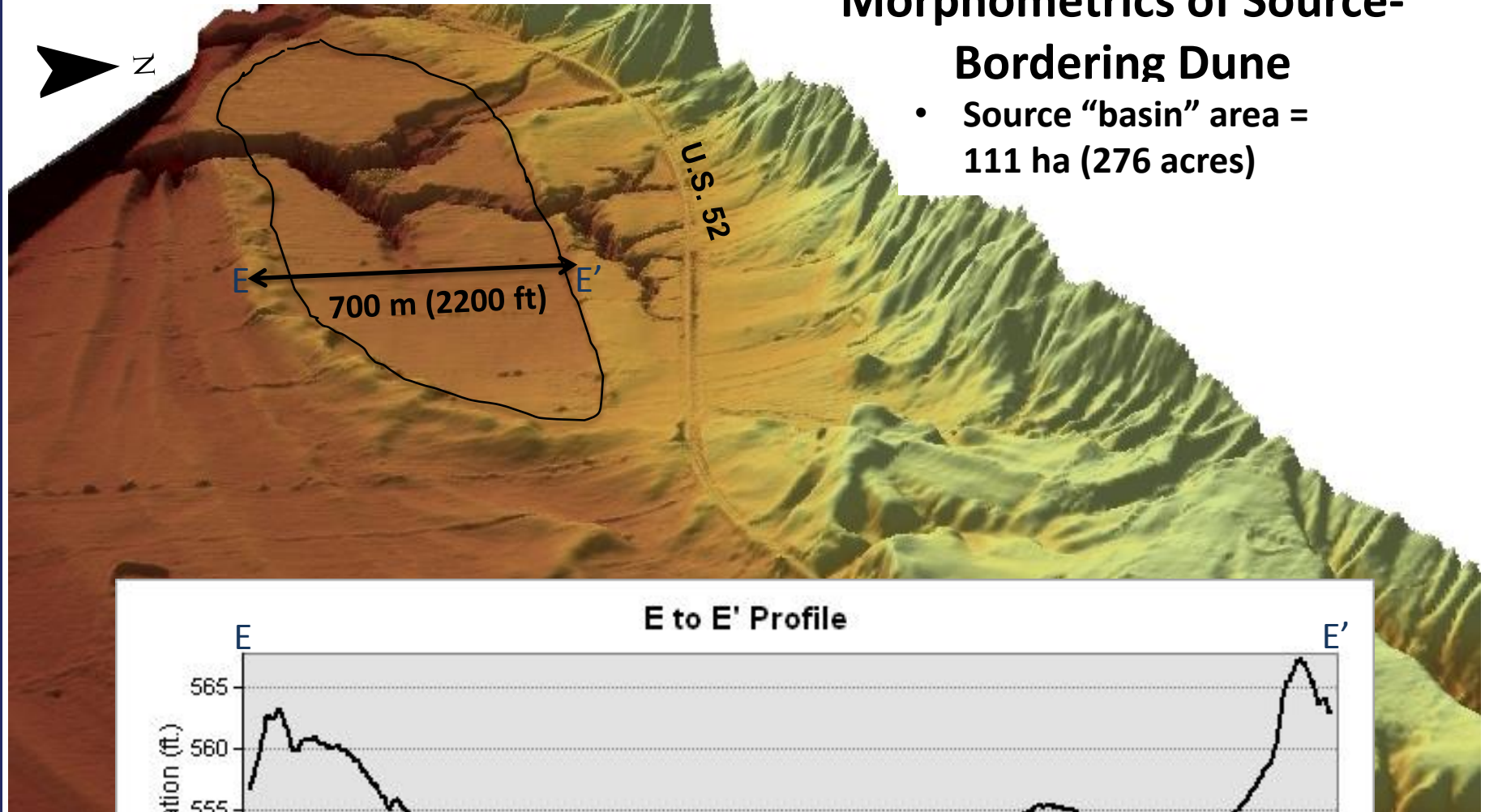
Morphometrics of the Complex Dune

- Max. height = 5 m (16 ft)
- **D** side slope = 8.75 %
- **D'** side slope = 6.25 %



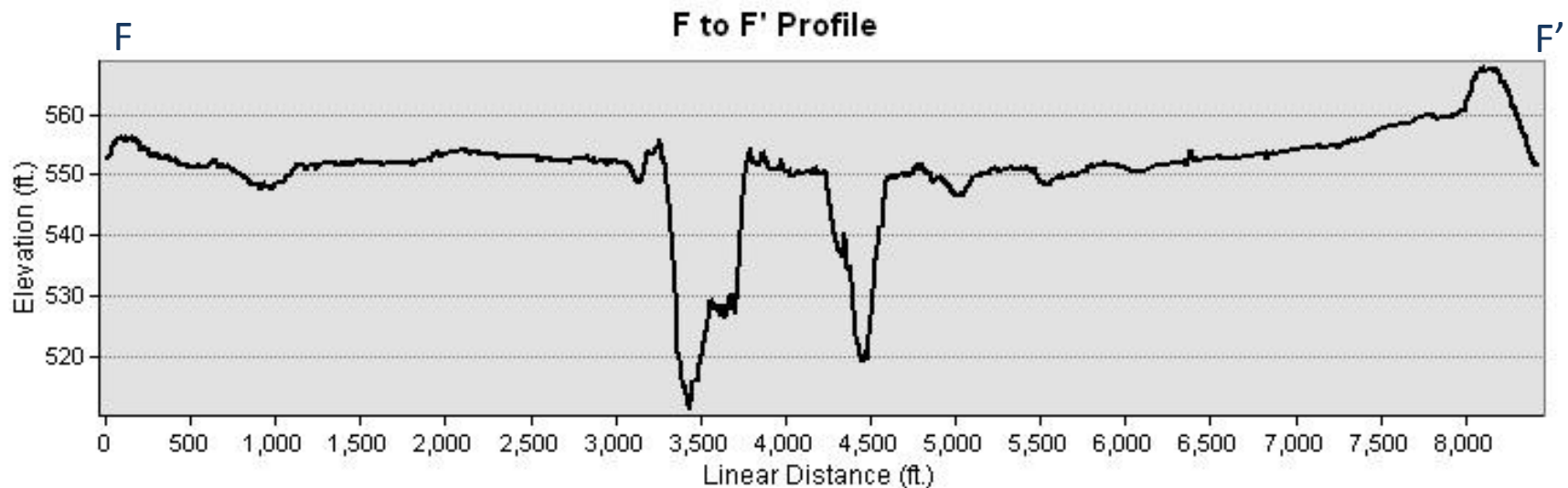
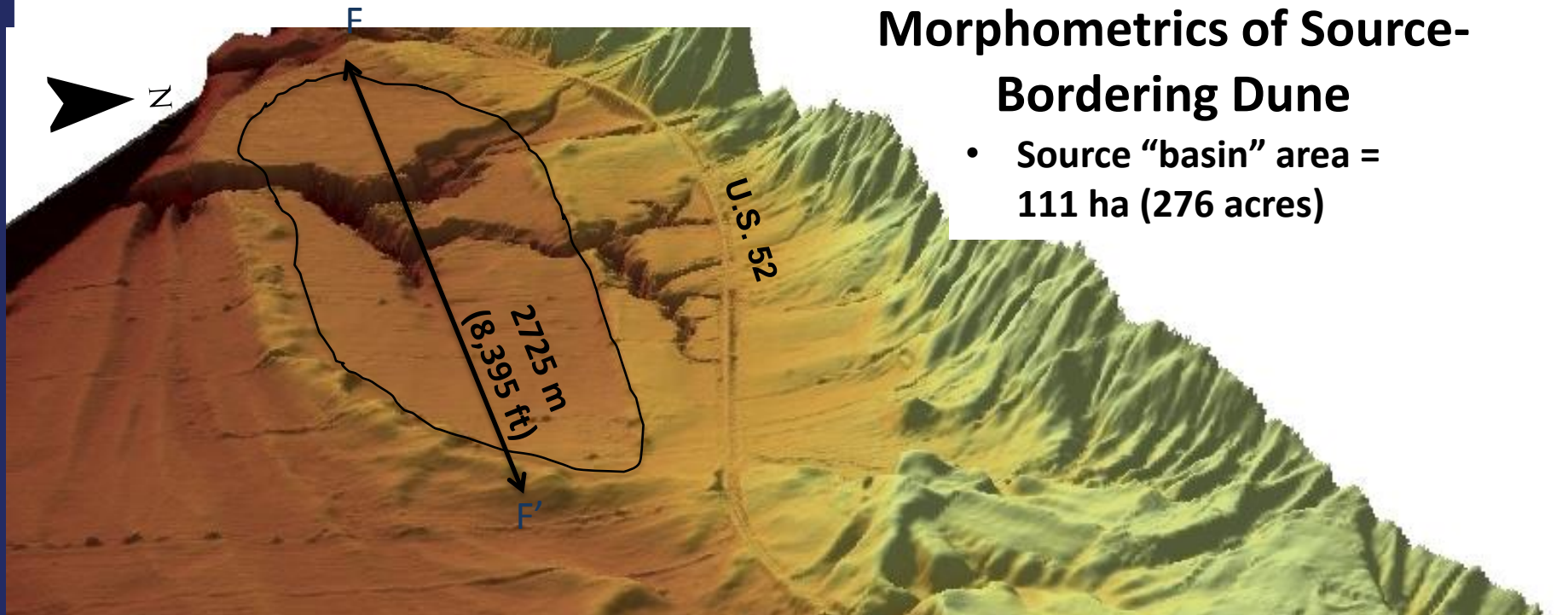
Morphometrics of Source-Bordering Dune

- Source “basin” area = 111 ha (276 acres)

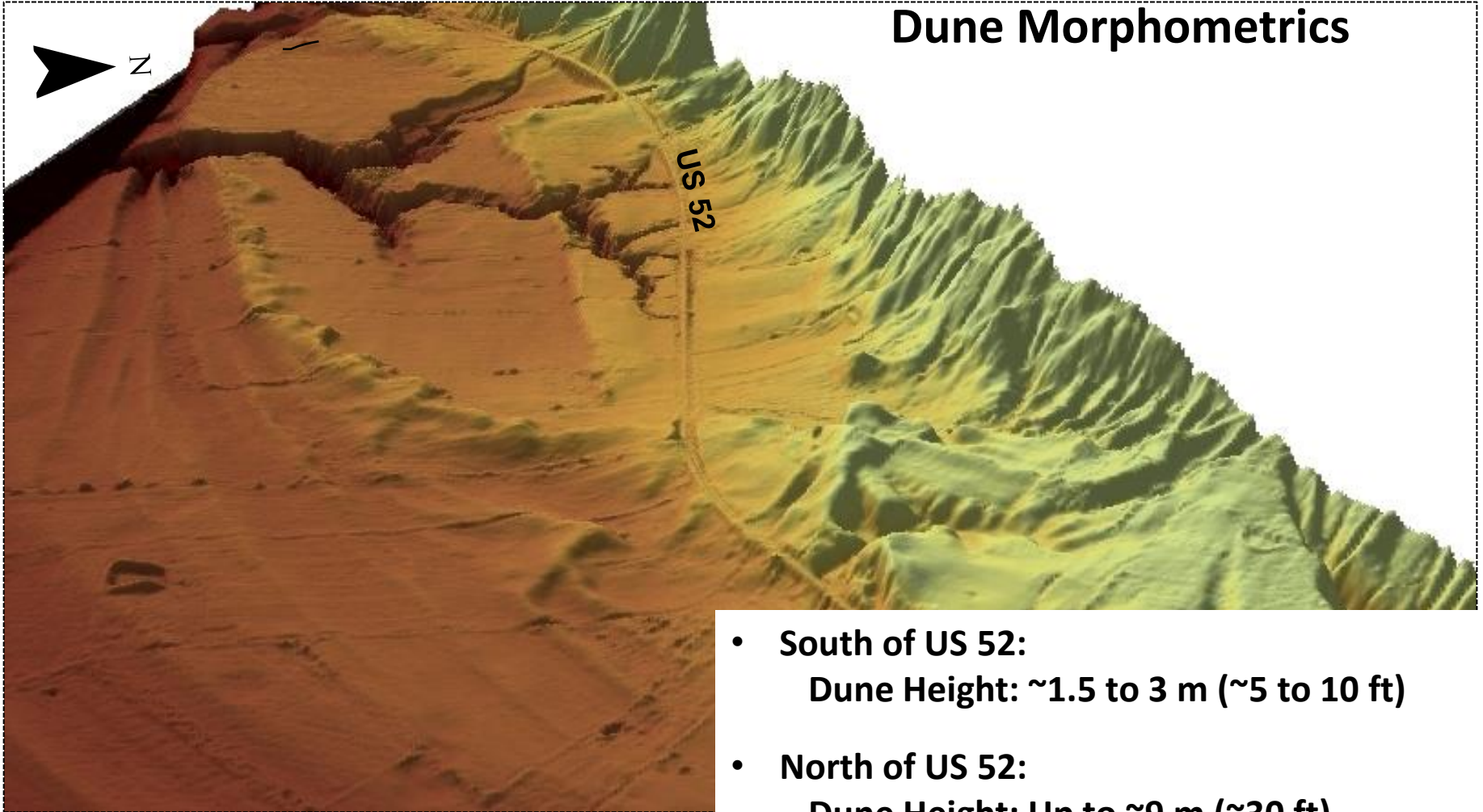


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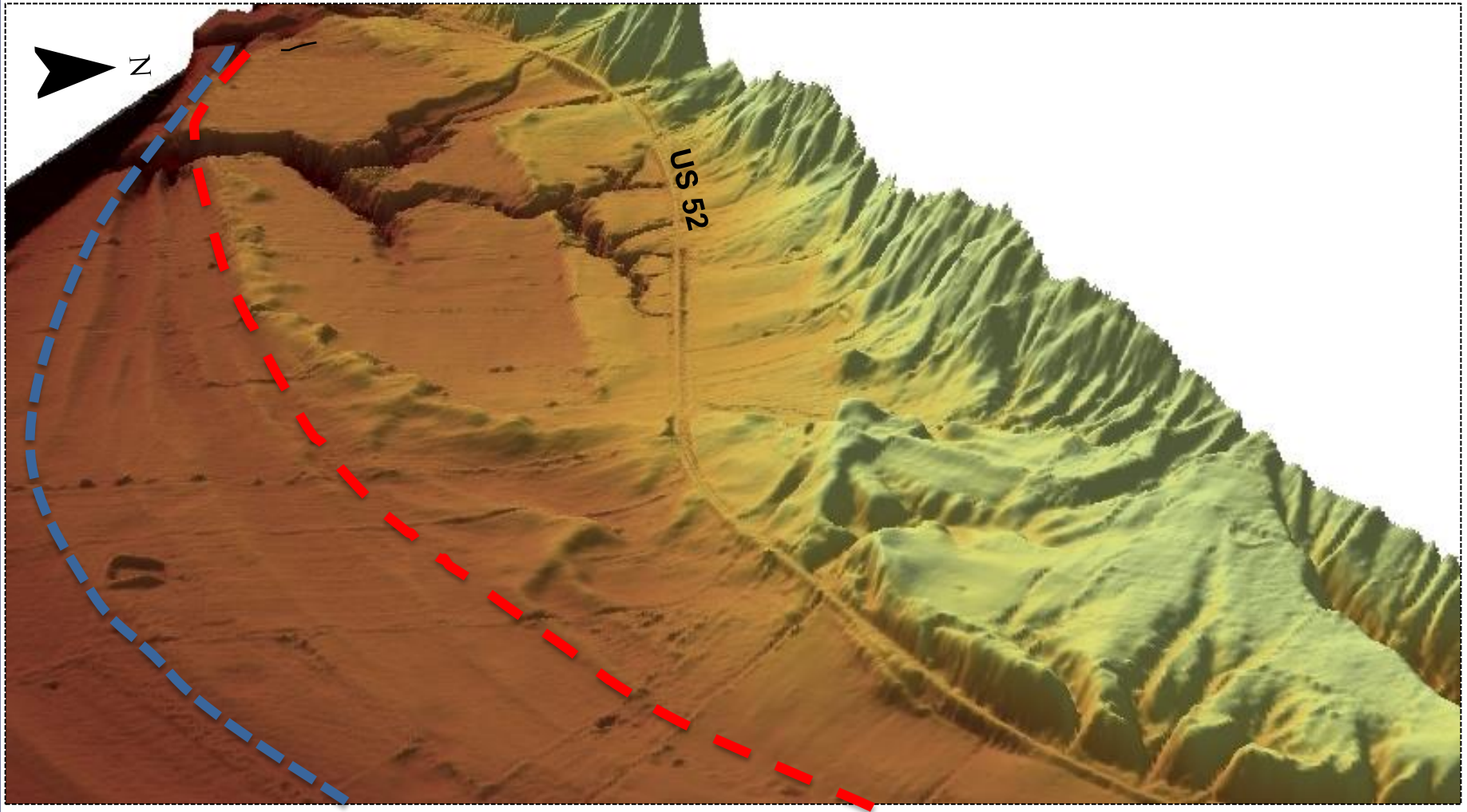
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Dune Morphometrics

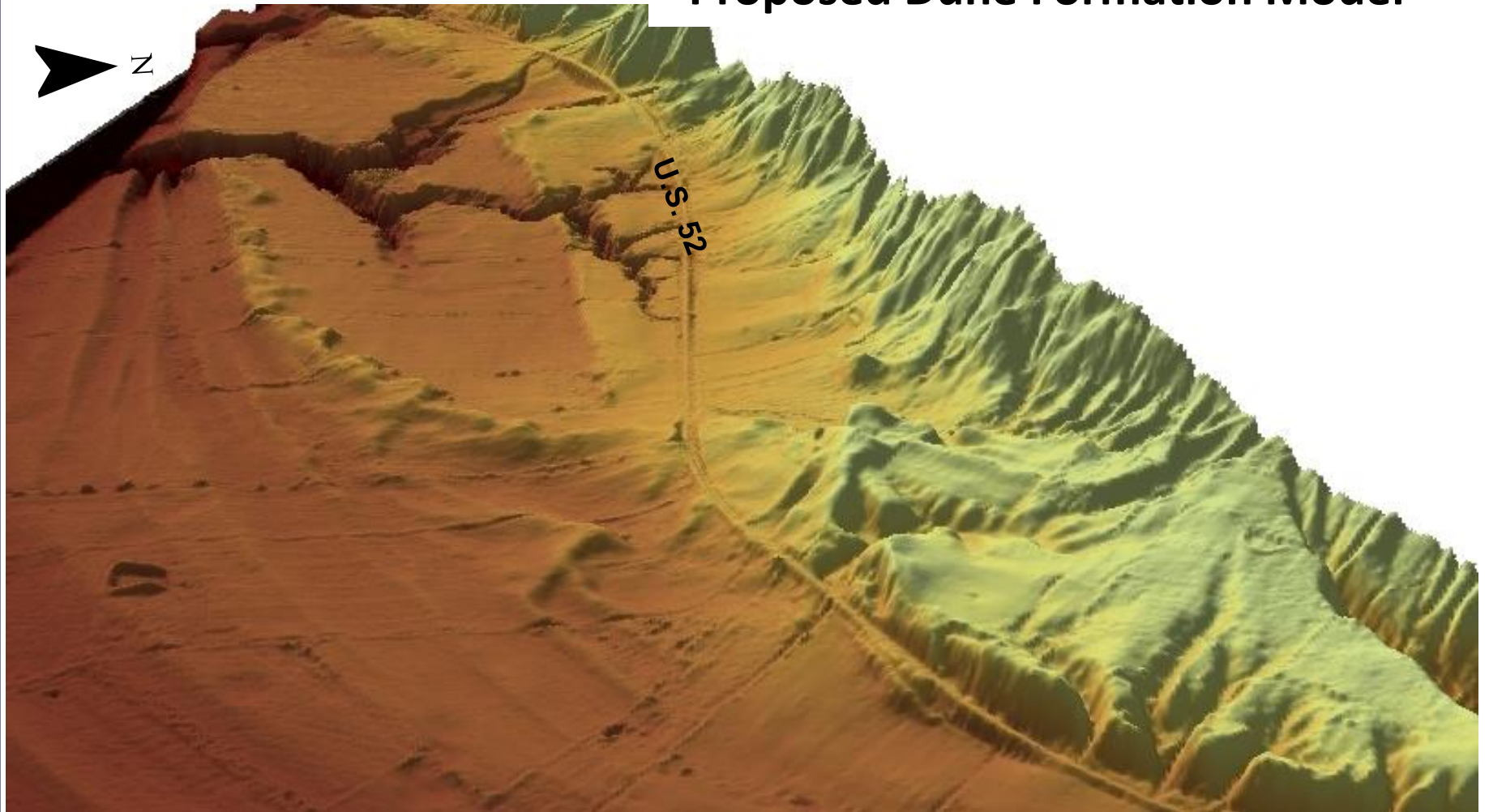


- **South of US 52:**
Dune Height: ~1.5 to 3 m (~5 to 10 ft)
- **North of US 52:**
Dune Height: Up to ~9 m (~30 ft)
- **Variable Texture: Sand Near U.S. 52 Cut,**
Increasing Silt to the West



Possible Fluvial Erosion Trim Line
(Above 1937 Flood Limits)

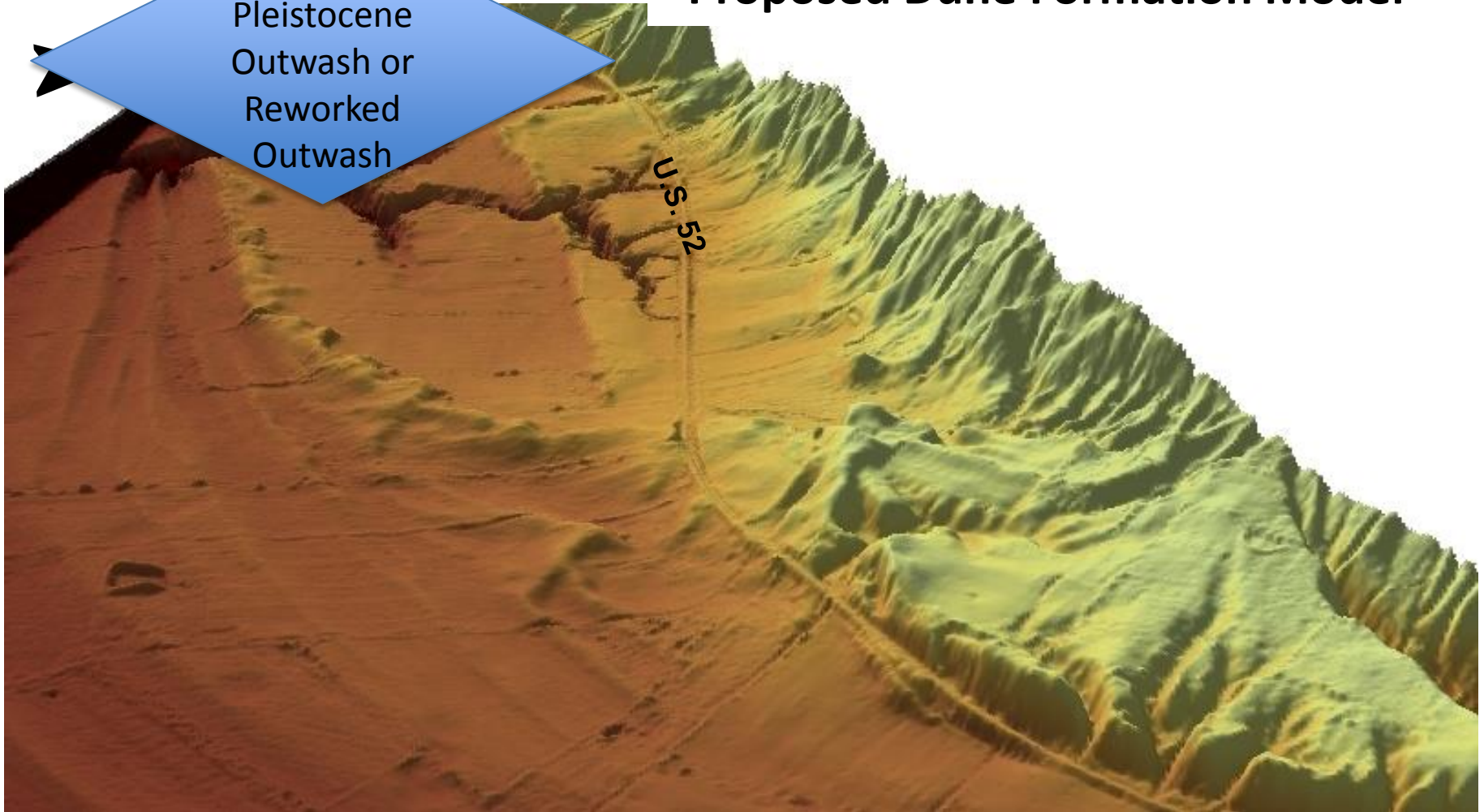
Proposed Dune Formation Model



Source

Pleistocene
Outwash or
Reworked
Outwash

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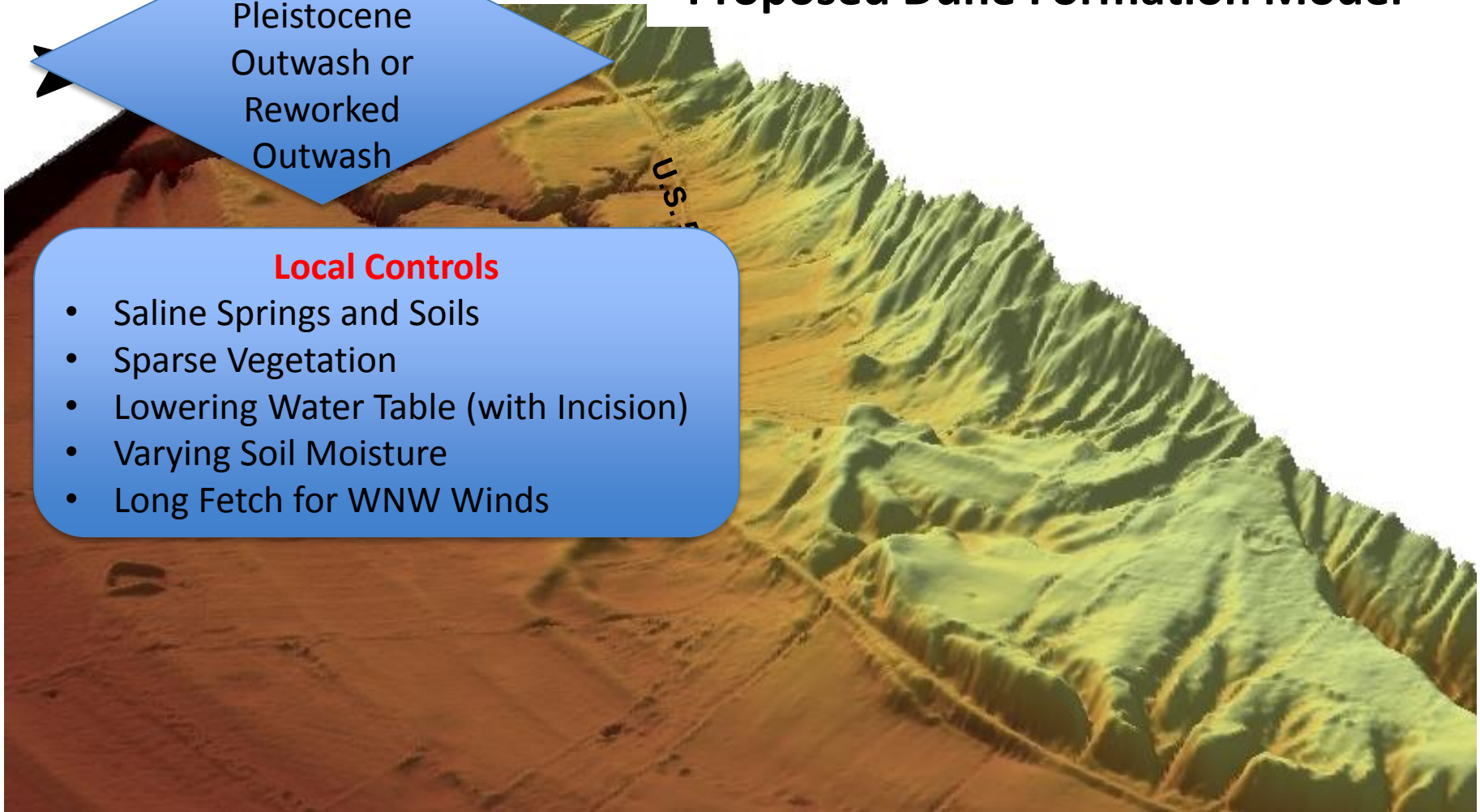
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Local Controls

- Saline Springs and Soils
- Sparse Vegetation
- Lowering Water Table (with Incision)
- Varying Soil Moisture
- Long Fetch for WNW Winds



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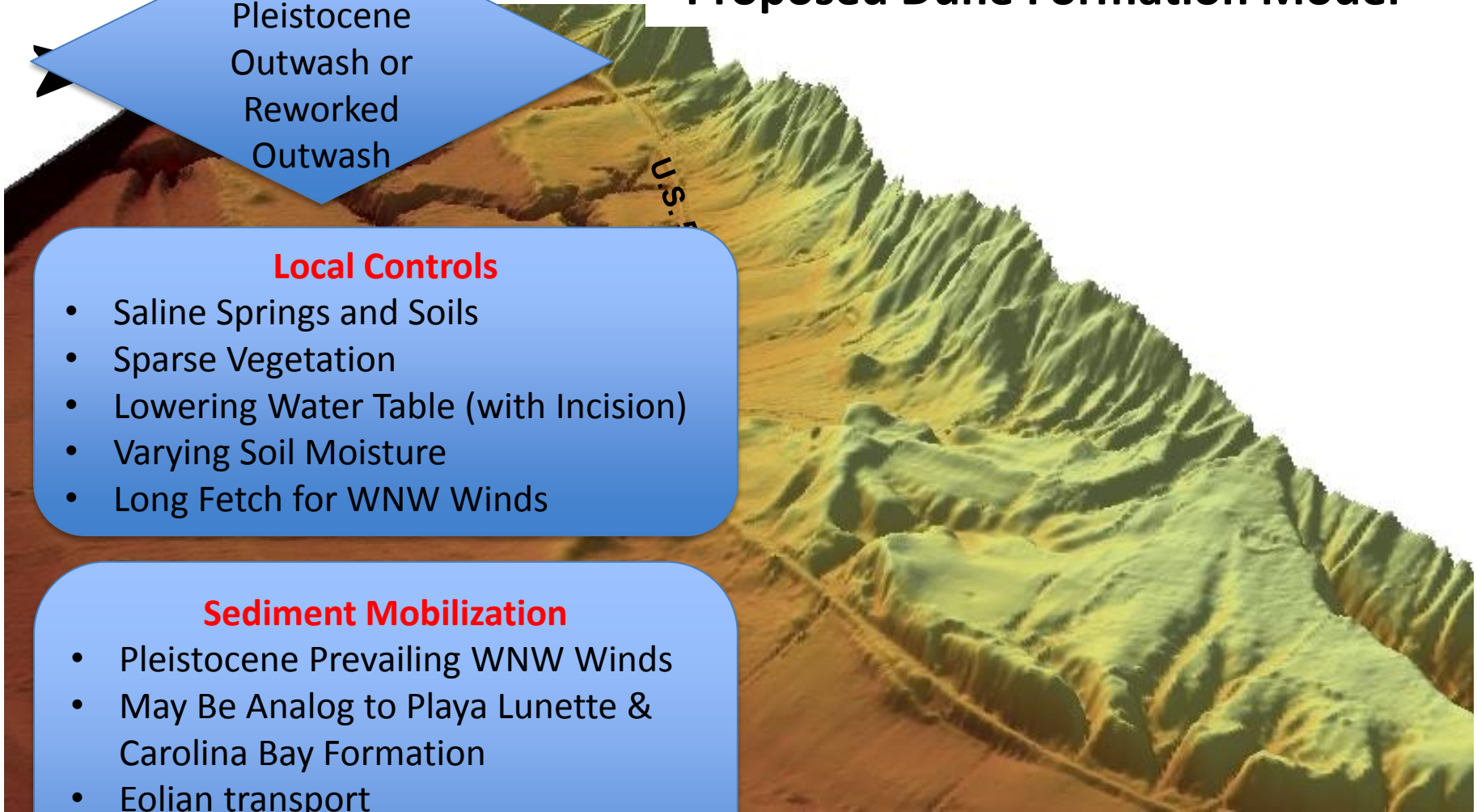
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Sediment Mobilization

- Pleistocene Prevailing WNW Winds
- May Be Analog to Playa Lunette & Carolina Bay Formation
- Eolian transport
 - Suspension (Silt)
 - Saltation (Fine-Med. Sand)
 - Clay-Silt Pelletization



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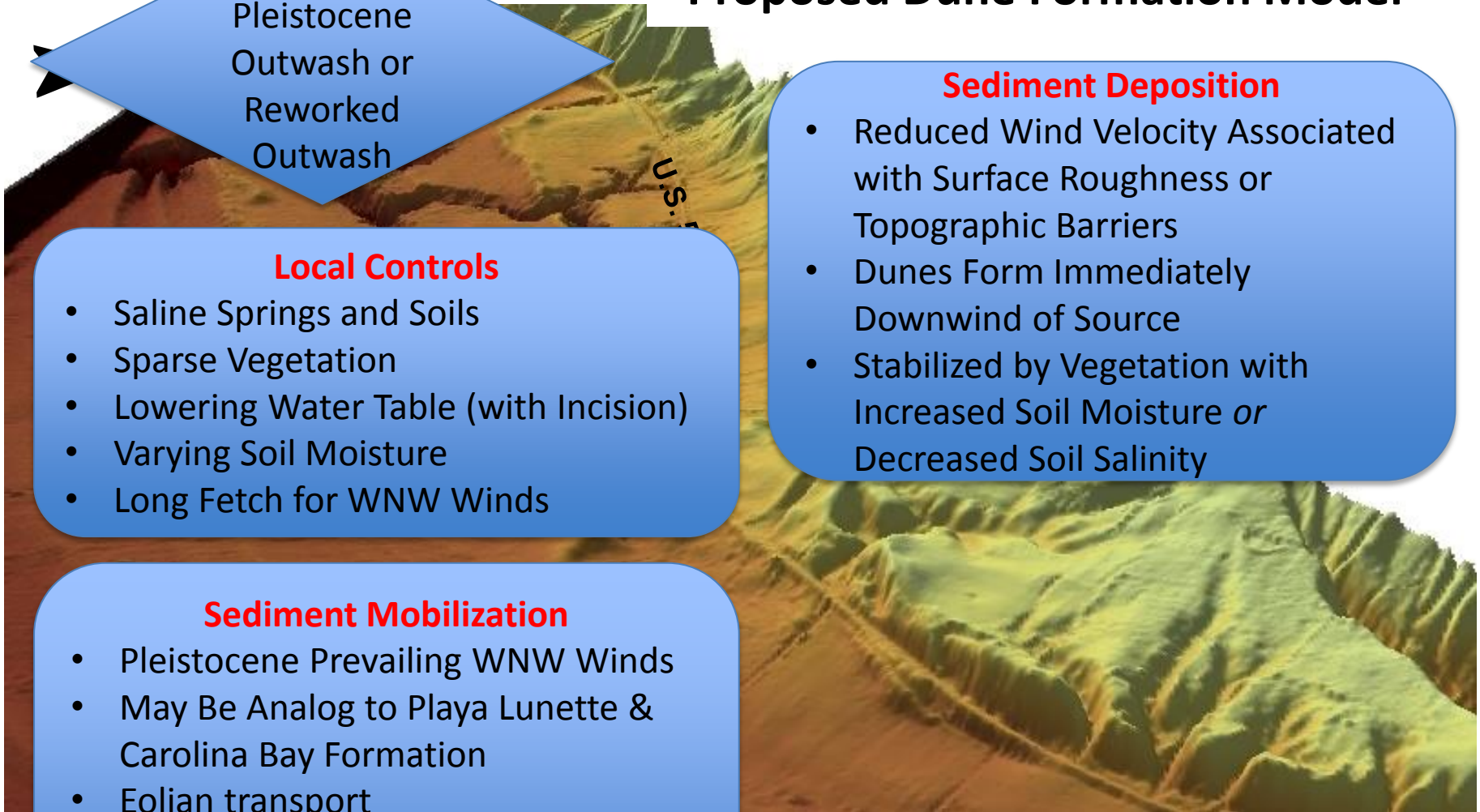
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- Dunes Form Immediately Downwind of Source
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Sediment Remobilization?

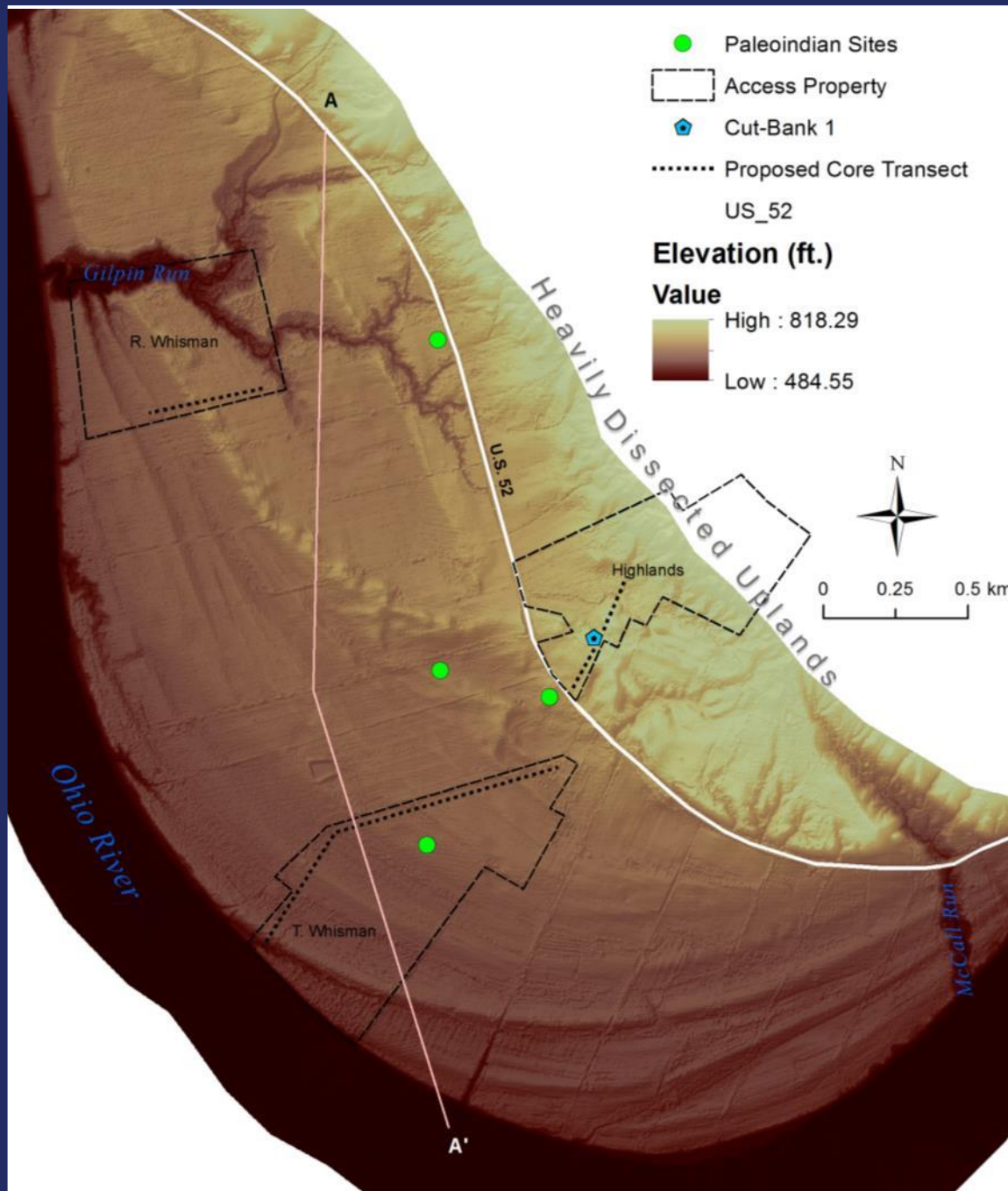
- Possible Remobilization to Form Sand Sheet, Complex Dune and Compound Barchan
- Potential Burial of Paleoindian Sites or Eolian Reworking of Artifacts

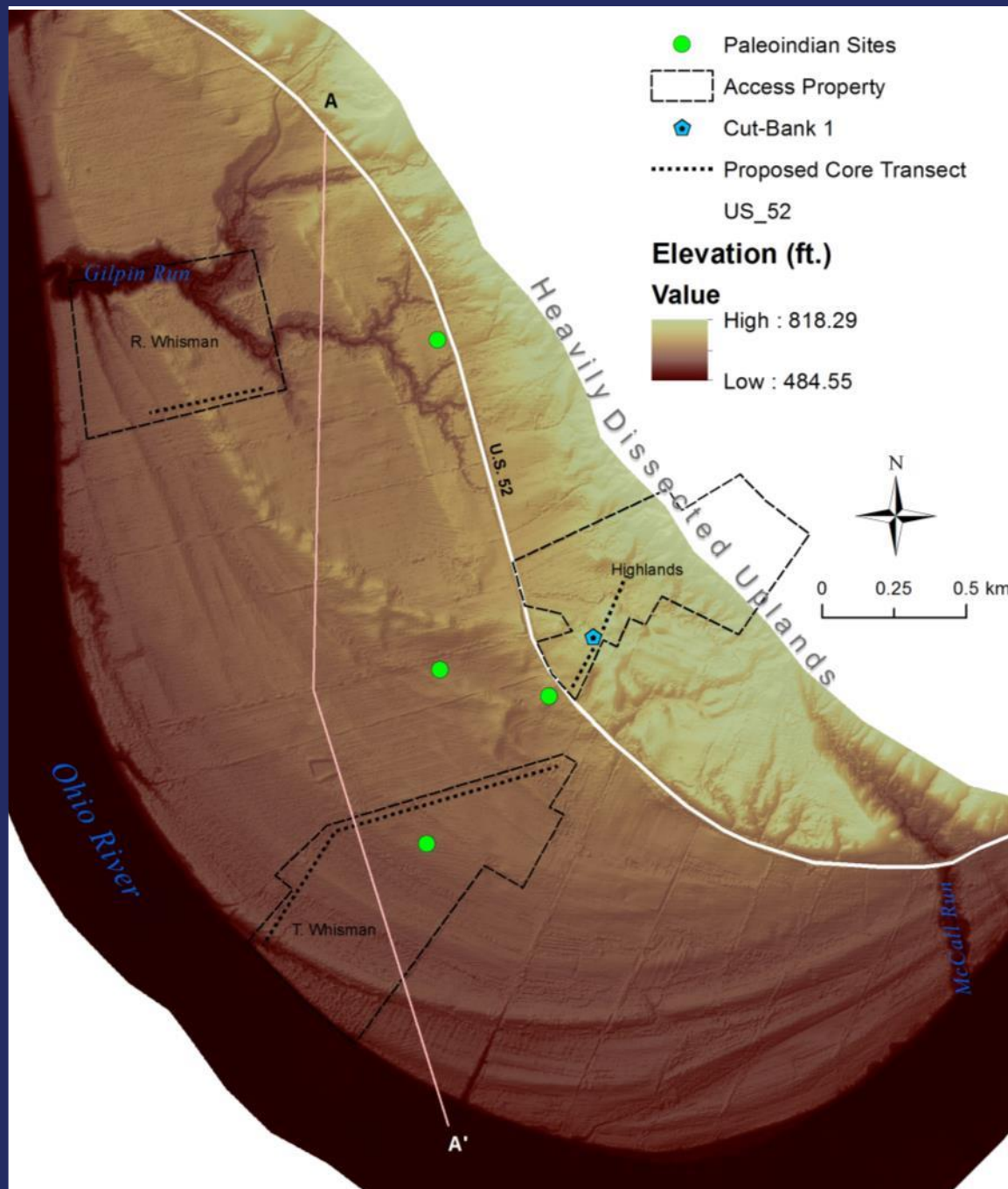
Proposed 2015-2016 Investigations

Project Objectives

Landscape geochronology:
especially the dunes.

Determine if eolian sediments
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components within the dunes
or on adjacent landforms.





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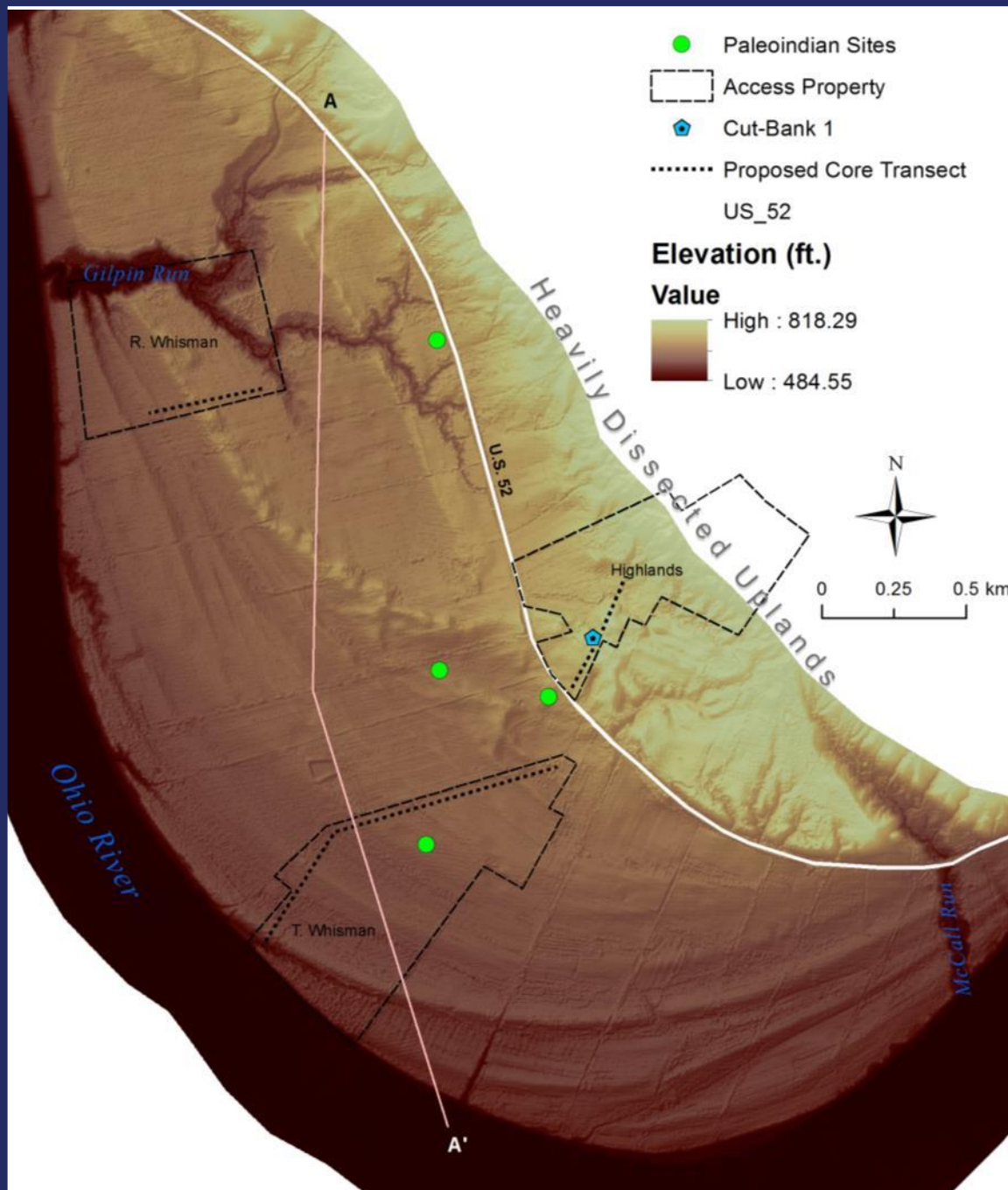
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Primary Field Methods

- Cut-Bank descriptions
- Truck-mounted and hand-operated auger cores
- Archaeological shovel testing of Highlands property

Primary Lab Methods

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- Particle-size analysis
- Soil micromorphology



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**Great Potential Contributions
Look for More to Come from
Matt Purtill**

References Cited:

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