



# Development of the Keeler Dunes

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# Development of Keeler Dunes

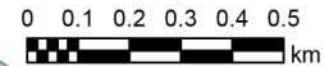
- Mapping of landforms and deposits
  - Provide geological context for Keeler Dunes
- Analysis of aerial photographs and satellite images
  - Determine how dunes have changed over time
- Dating of sand deposits
  - Determine age of landforms and deposits

# Geologic Mapping

- Map extent and relationships among Quaternary deposits and landforms
  - Alluvial fans
  - Beach ridges and shorelines
  - Dunes and sand sheets
- Use high-resolution imagery in combination with Lidar topography

# Preliminary Geomorphic Map of Keeler Dunes Area

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 Desert Research Institute



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## Shoreline Feature

- Erosional
- > Beach ridge

## Geomorphic Map Unit

### Anthropogenic Surfaces

- Af - Artificial fill
- Rd - Highway

### Aeolian Units

- Qss - Active sand sheets
- Qd - Active sand dune
- Qss<sub>c</sub> - Sand sheets with coppice dunes
- Qd<sub>v</sub> - Vegetated sand dunes

### Lacustrine Units (elevation AMSL)

- Qpl - Playa
- Qpl(d) - Disturbed playa surface
- Ql4<sub>lp</sub> - Historic lake plain [<1872 A.D.] (<1096 m)
- Ql3<sub>br</sub> - Beach ridge [<900-730 cal yr B.P.\*] (~1101 m)
- Ql3<sub>lp</sub> - Historic to Latest Holocene lake plain (1096-1101 m)
- Ql3<sub>lp</sub>(d) - Disturbed Ql3<sub>lp</sub> surface
- Ql2<sub>br</sub> - Beach ridge [900-730 cal yr B.P.\*] (~1103 m)
- Ql2<sub>lp</sub> - Latest Holocene lake plain (1101-1103 m)
- Ql1 - Early Holocene [~8 ka] terrace (~1118 m)

### Alluvial Fan Units

- Qf1 - Recent flood deposits
- Qf4 - Active channel
- Qf3 - Historic to Latest Holocene [<900-730 cal yr B.P.]
- Qf2 - Latest to Late Holocene [~0.8 to 3.5 ka]
- Qf1 - Late to early Holocene [~3.5 to 8 ka]

**Note:** Geomorphic map created using 0.5 m LiDAR and 0.1 m aerial photography. Age of shorelines from Bacon et al., 2006 and S. Stine\* (pers. comm.). Age constraints for alluvial fan units from cross-cutting relations with identified shorelines.

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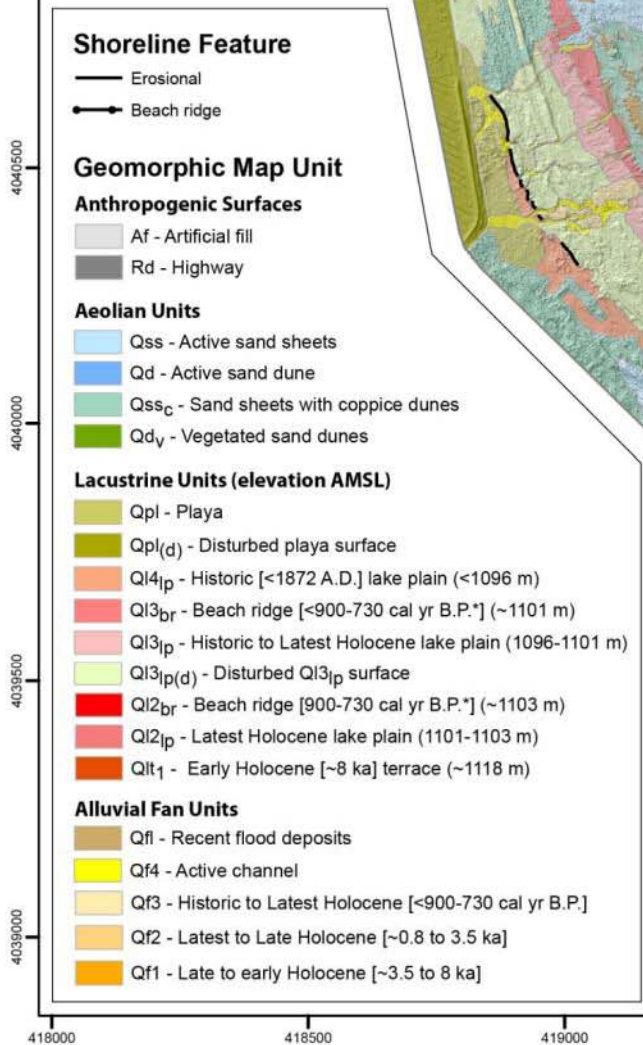
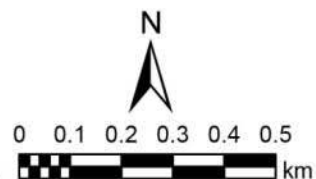
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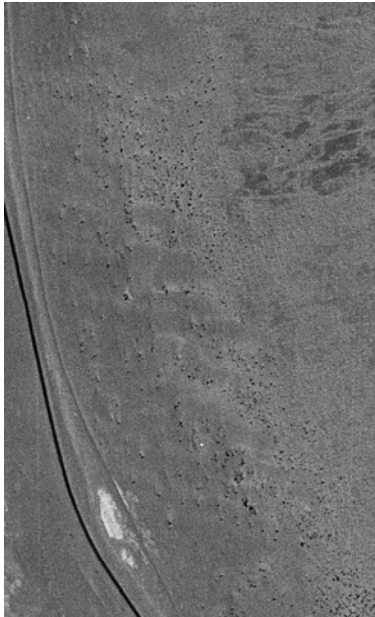
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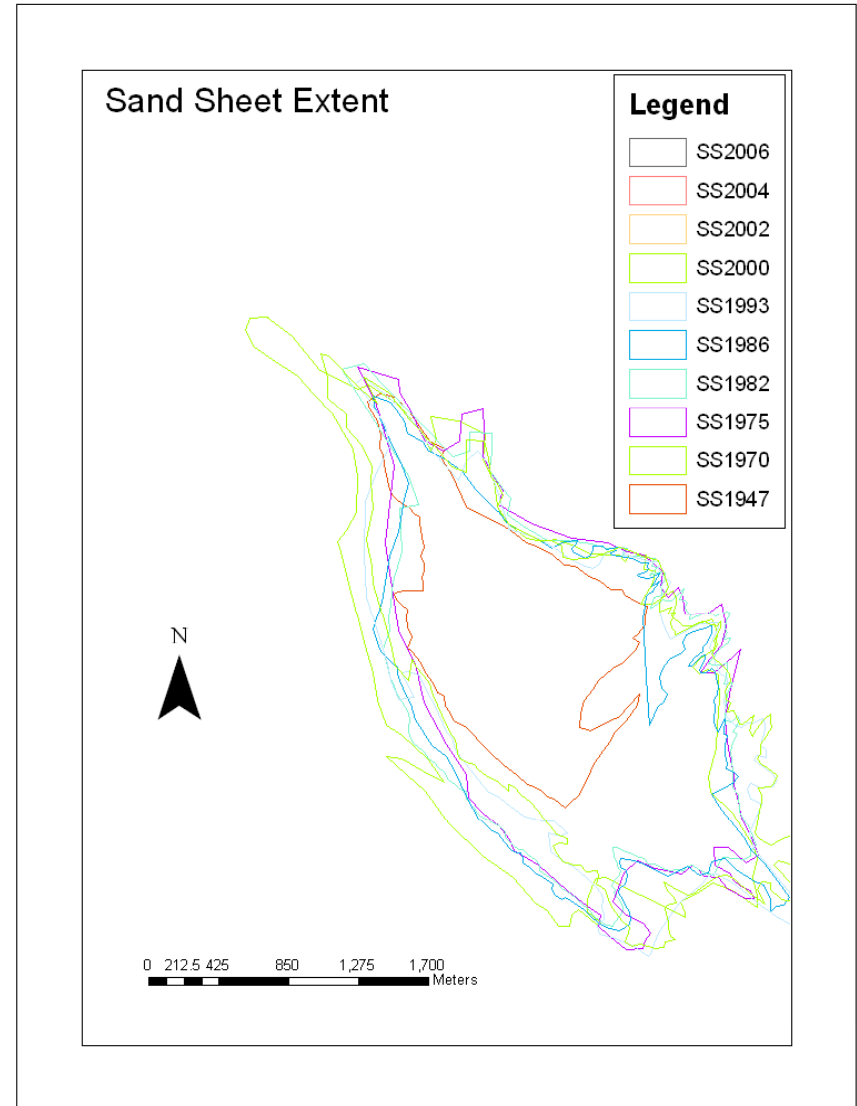
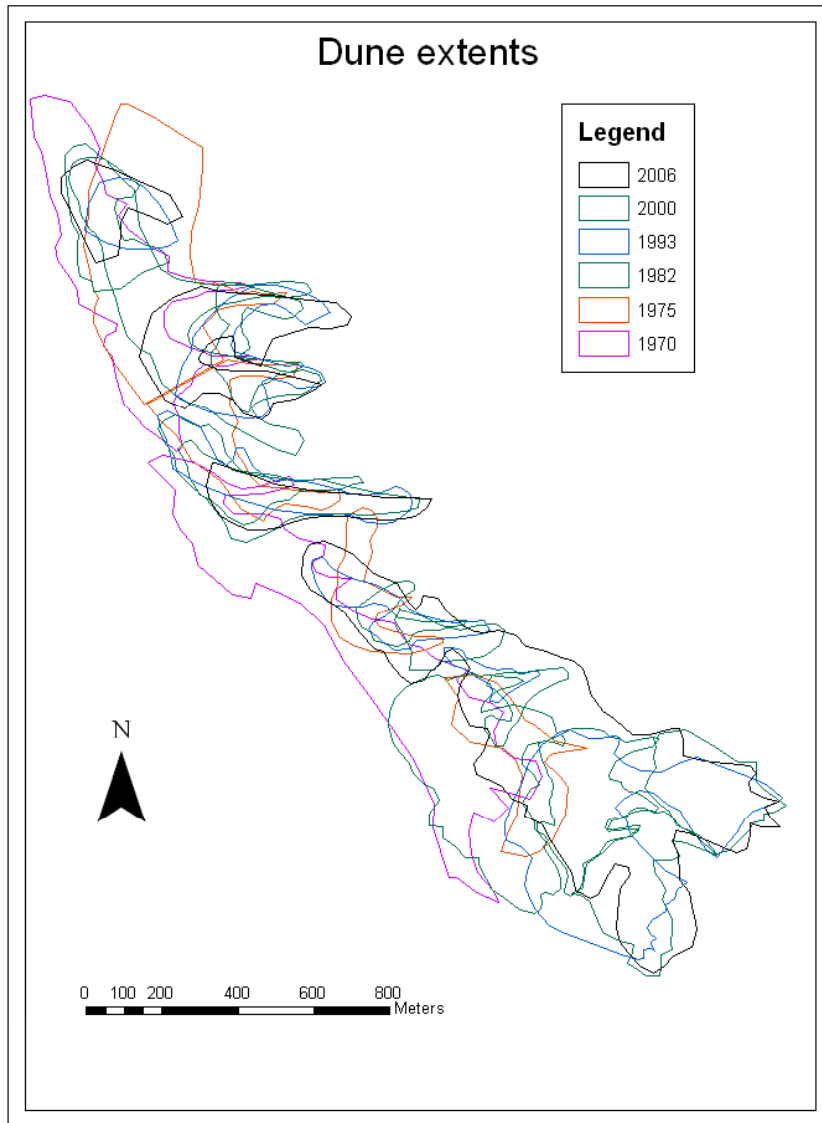
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# Detailed study of aerial photographs

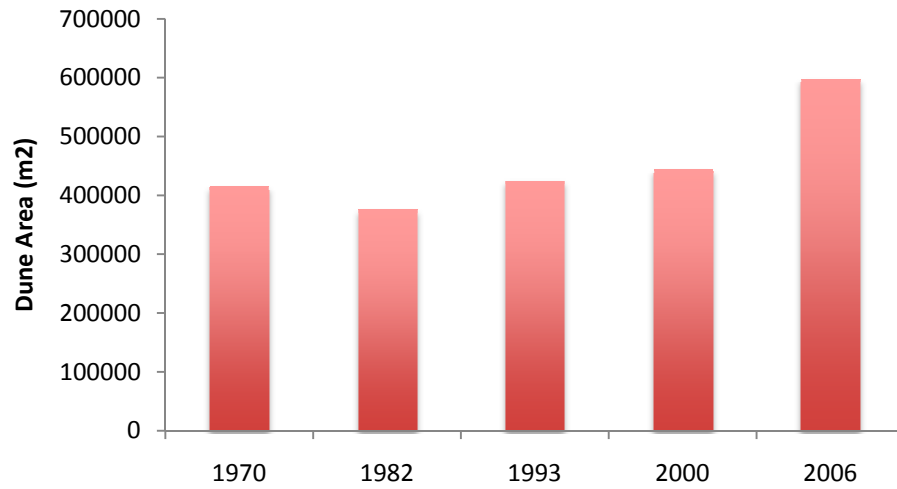
- Provides documentation of changes over time
- Changes in dune type and orientation
- Understanding of dynamics of system



# Dune and sand sheet extent over time

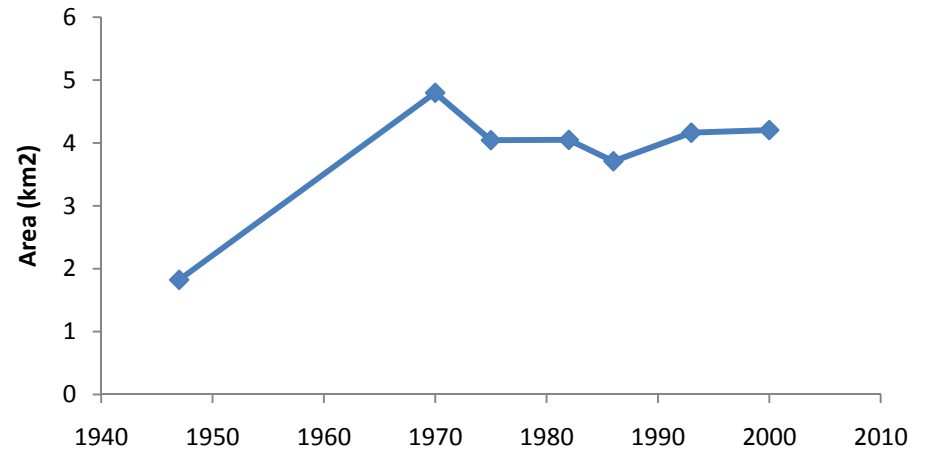


### Total dune area

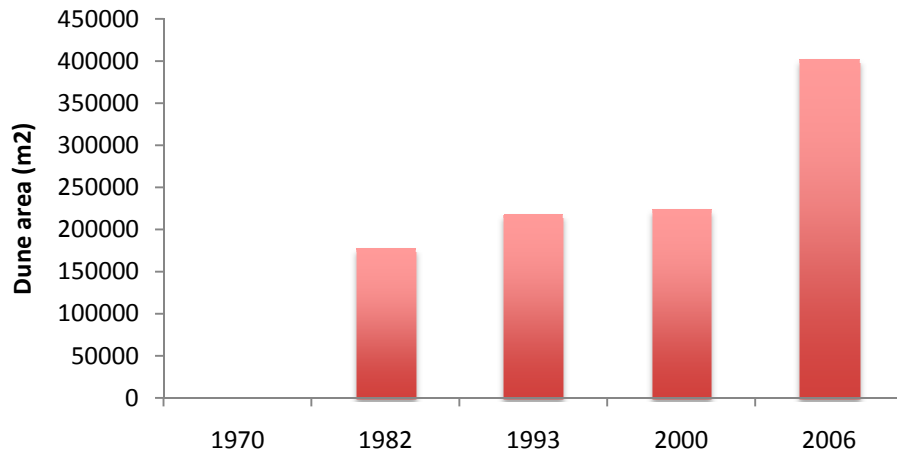


# Changes in dune and sand sheet area over time

### Sand Sheet Area



### Southern dune area





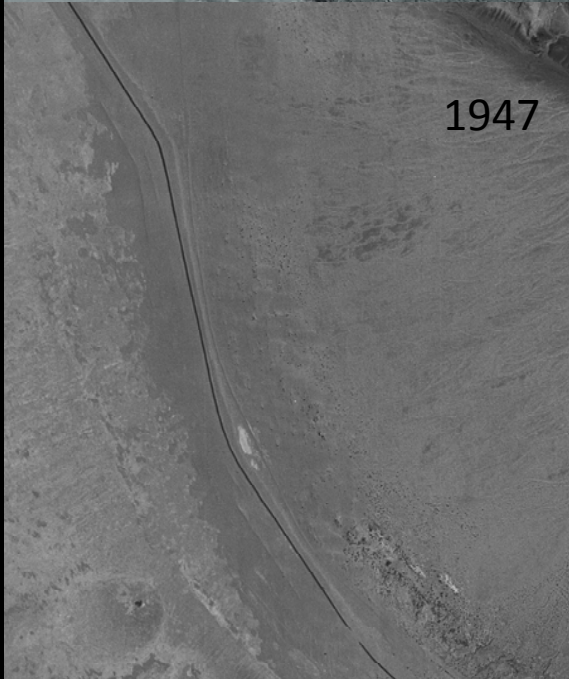


1944



1954

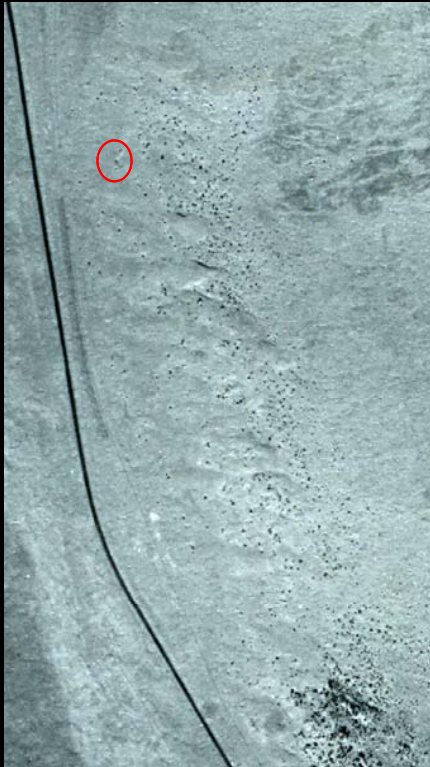
Early years



1947

Small dunes attached to vegetation

1944



Signs of slip faces

1947



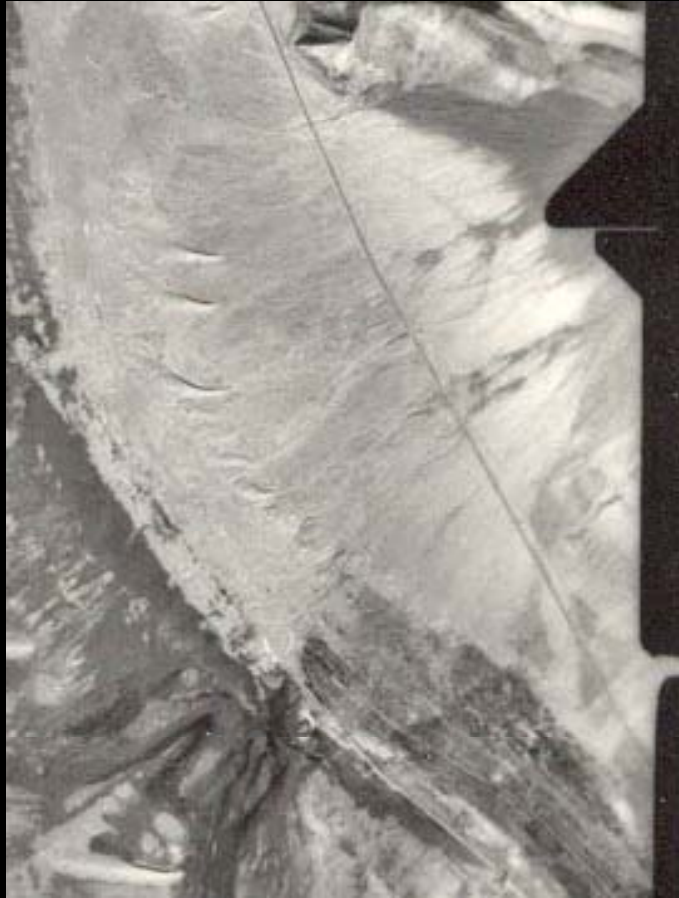
Very subdued topography

1954



Erosion of dunes ?

# First evidence of present-day dunes



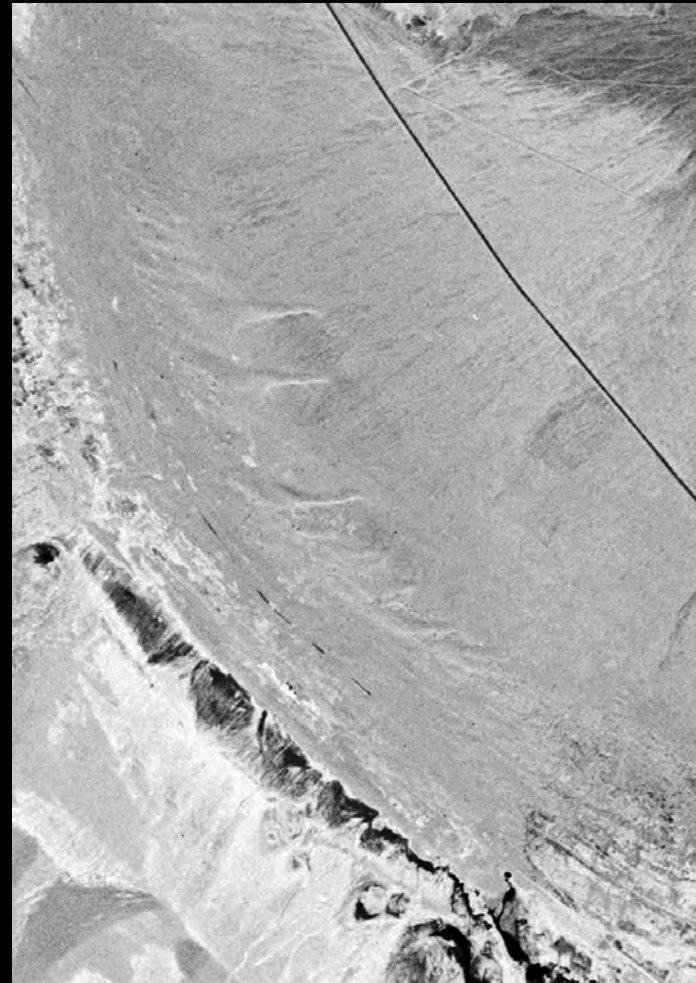
1967



1970



1967



1970

# Southern dunes start to develop in 1980's

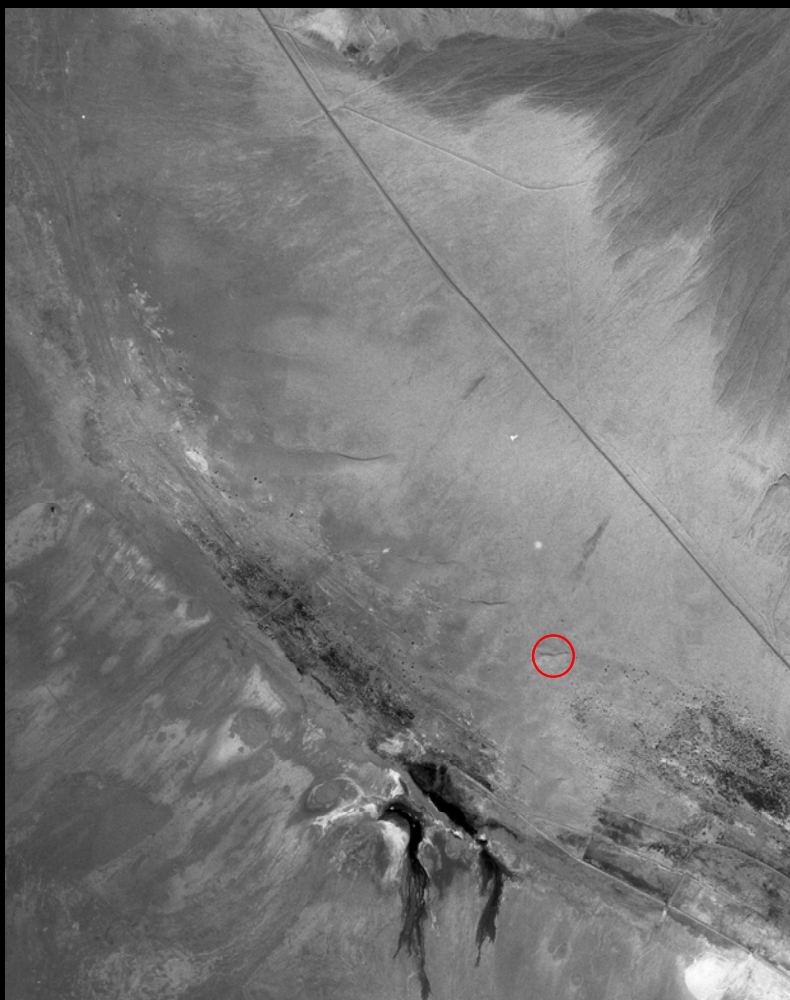


1975



1982

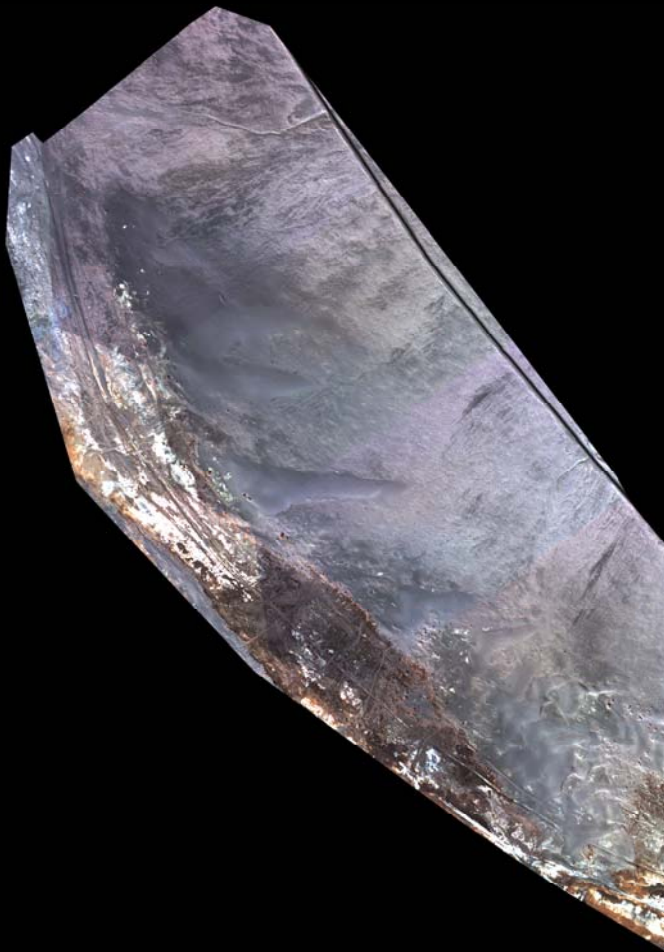
# Continued expansion of southern dunes



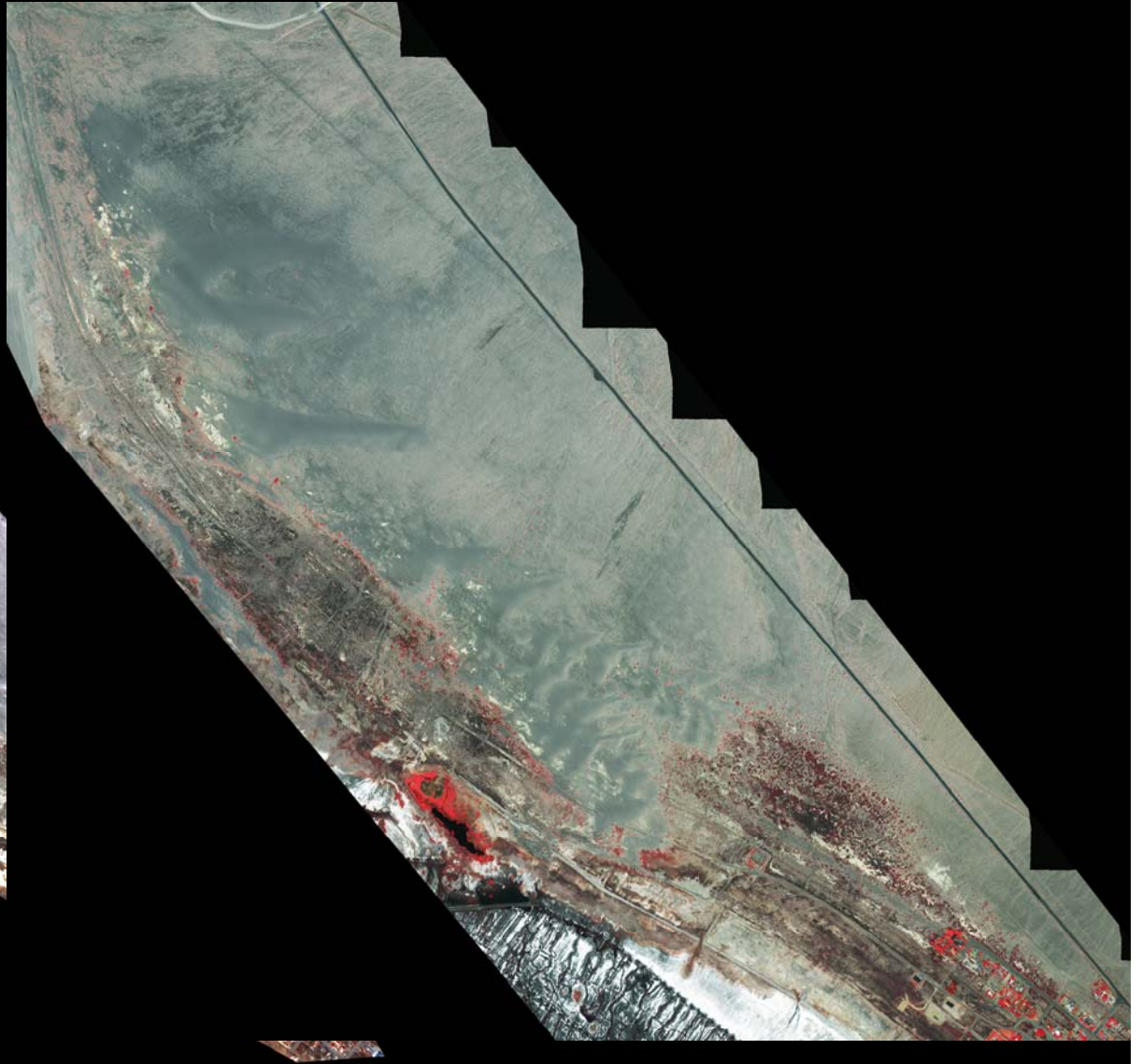
1993



2002



2004



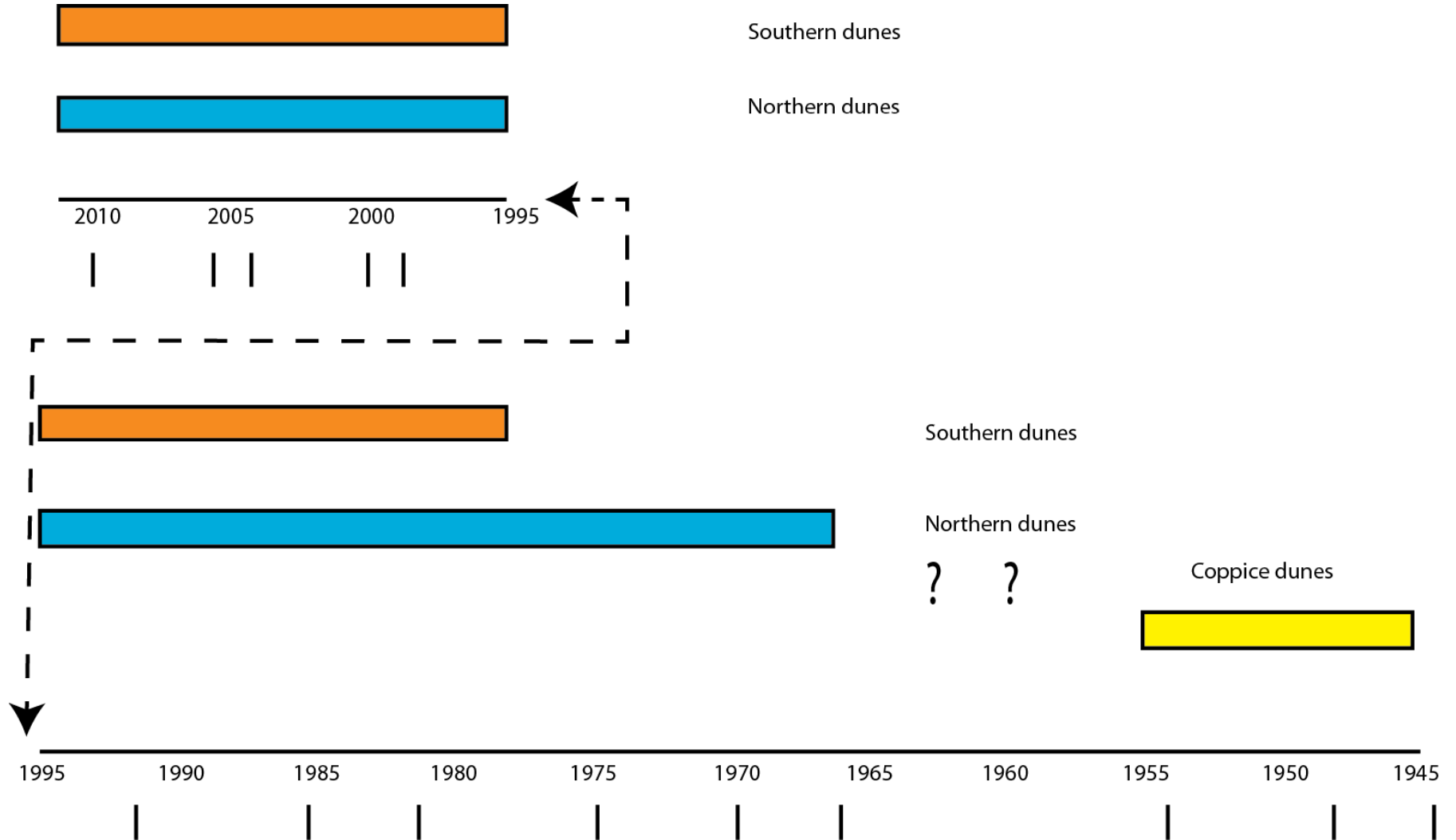
2006



2010

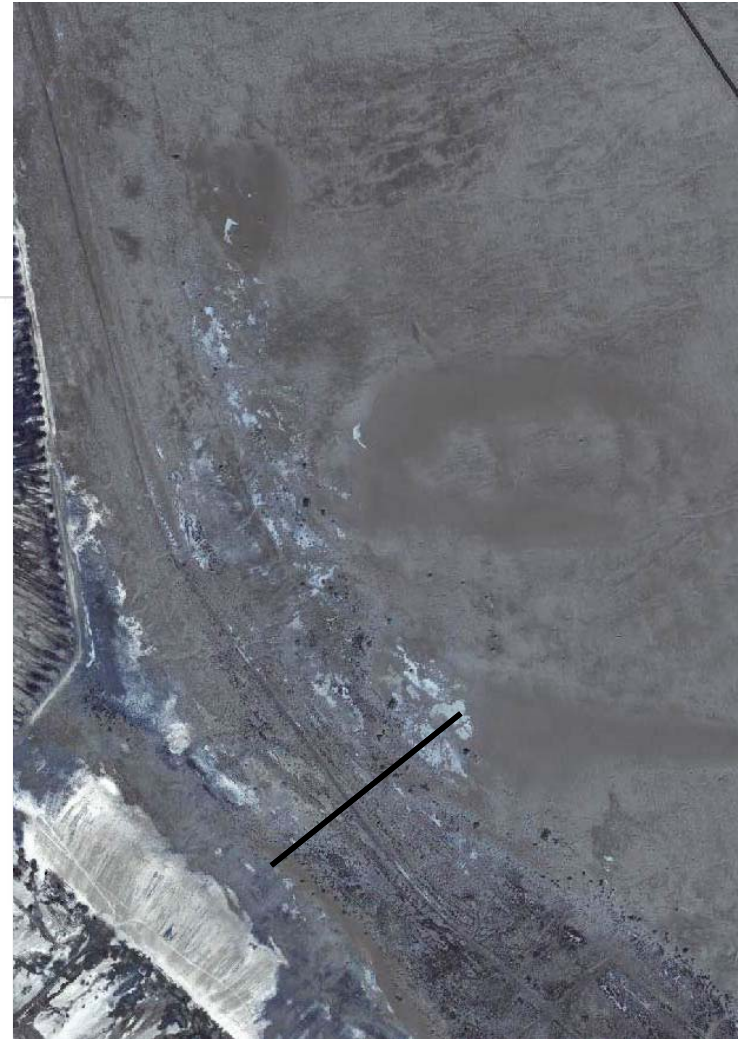
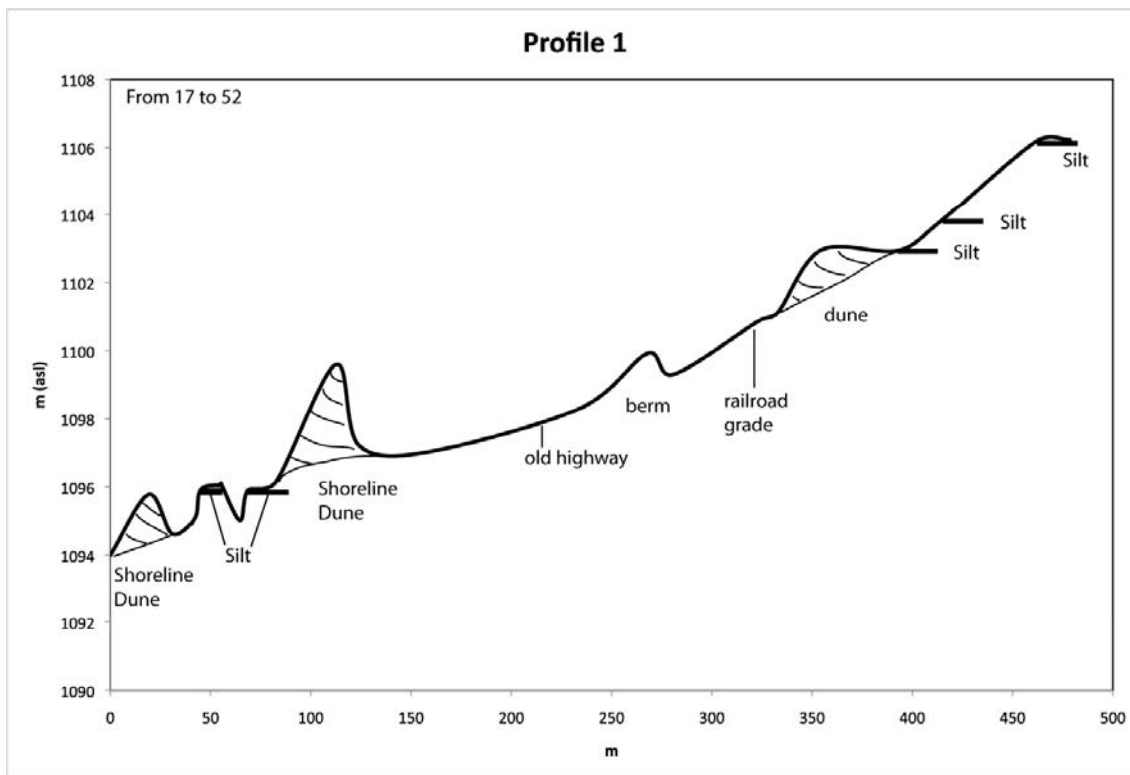


# Timeline



# Age of the dunes

- Dune and sand sheet sediments preserved beneath silt deposits at different elevations



# Dating of sand deposits



# First Results

OWN10-02

35.7 +/- 4.3 calendar  
years before July 2011

31.4 to 40 years ago

1970's

Silts deposited from 1984  
flooding ??

