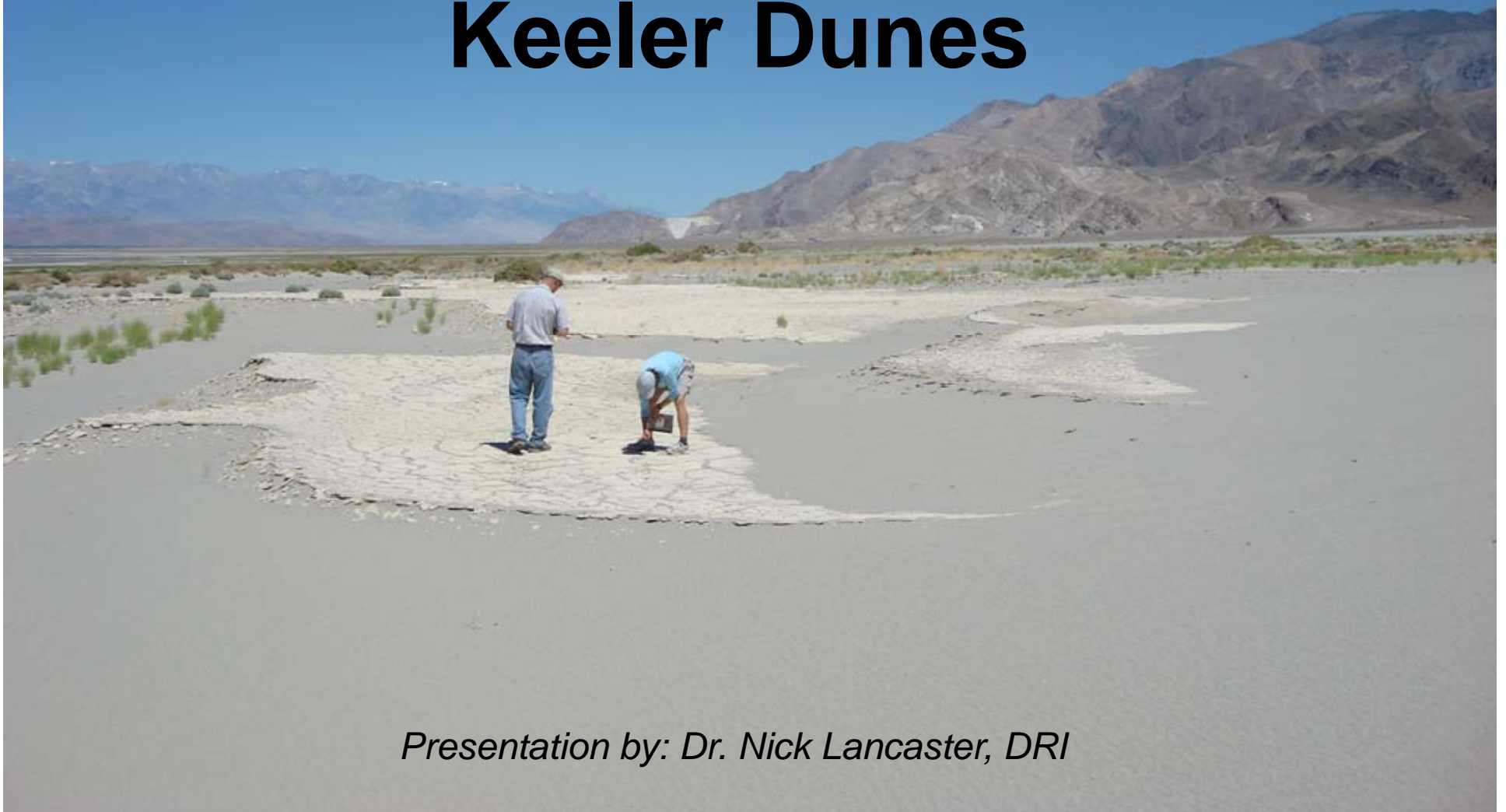


Historical Development of the Keeler Dunes



Presentation by: Dr. Nick Lancaster, DRI

Historical Development of the Keeler Dunes

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Reno, Nevada

Project Goals

- Determine how long dunes have existed in the area NW of Keeler
- Understand how dune field has developed over time
- Understand how dune development relates to changes in Owens Lake

Methods

- Map the extent of the dunes at different times
- Determine chronometric age of dune sediments using OSL (optically-stimulated luminescence techniques)
- Combine all information and data into a Geographic Information System (GIS) database

Data Sources

- Historical aerial photographs
- Satellite images
- Ground photographs
- Old maps and surveys, reports from travelers in area
- CALTRANS and other State and local government agency reports
- Information from local residents

Aerial Photographs

- Aerial Photographs
 - 1947
 - 1970
 - 1975
 - 1982
 - 1993

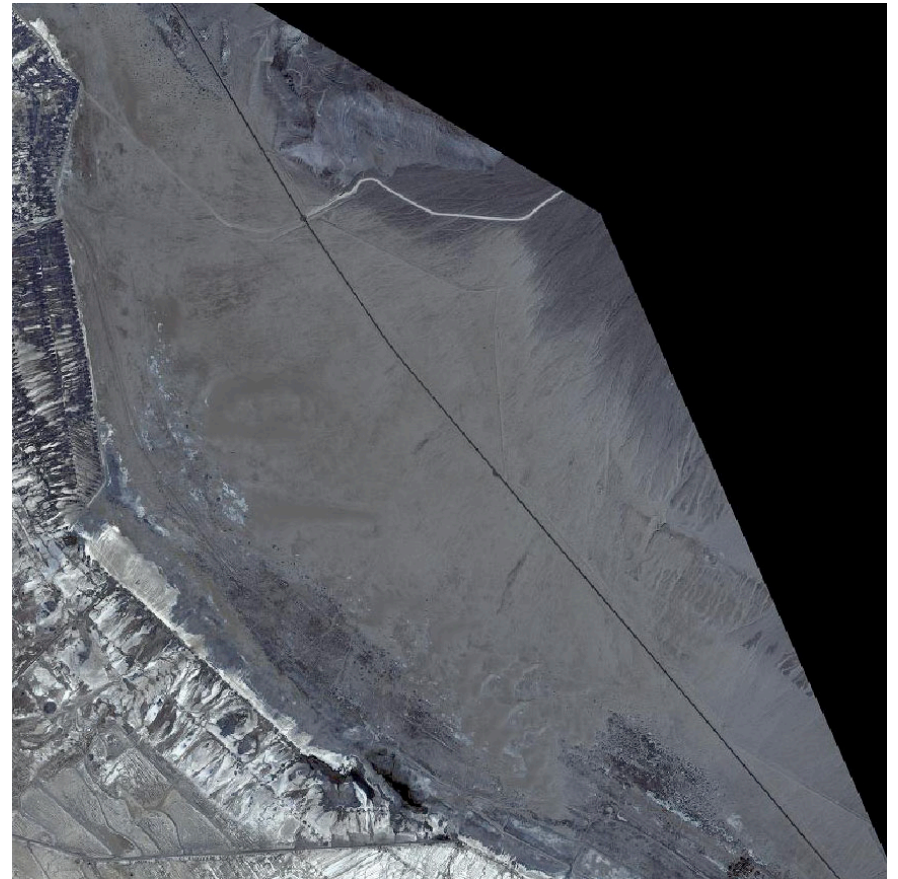


Additional data from low resolution images (e.g. USAF 1967)

High Resolution Satellite Images

- IKONOS – 2000, 2004
- QuickBird – 2002, 2010
- GeoEye - 2010

Quick Bird – August 2010



Keeler Dunes

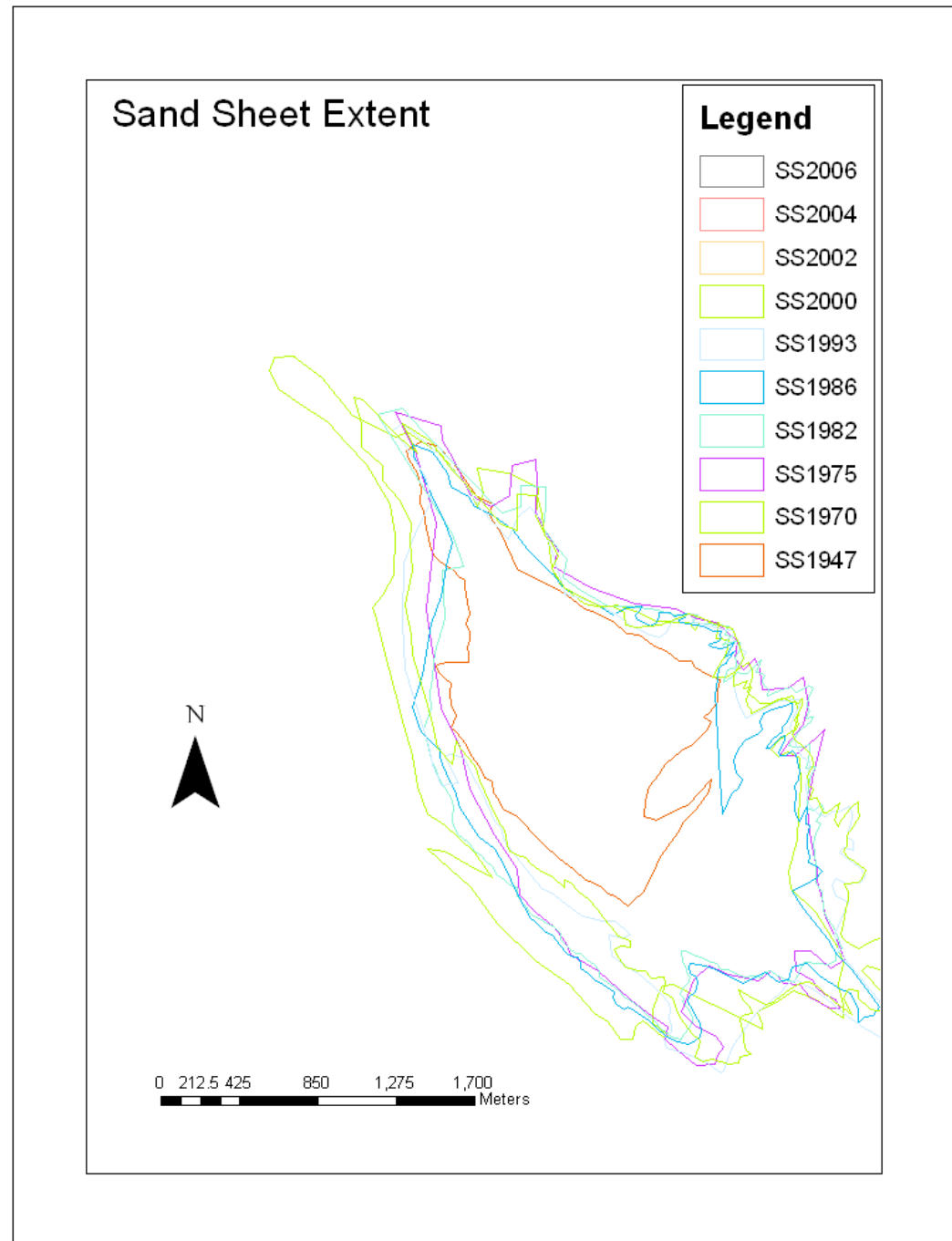
- Sand sheet
 - Variable thickness of sand that covers alluvial fan surface up to 1.6 km (1 mile) from the lake bed
 - Area about 4 sq km



- Dunes
 - 3 smaller dunes to NW
 - Complex of crescentic dunes to SE

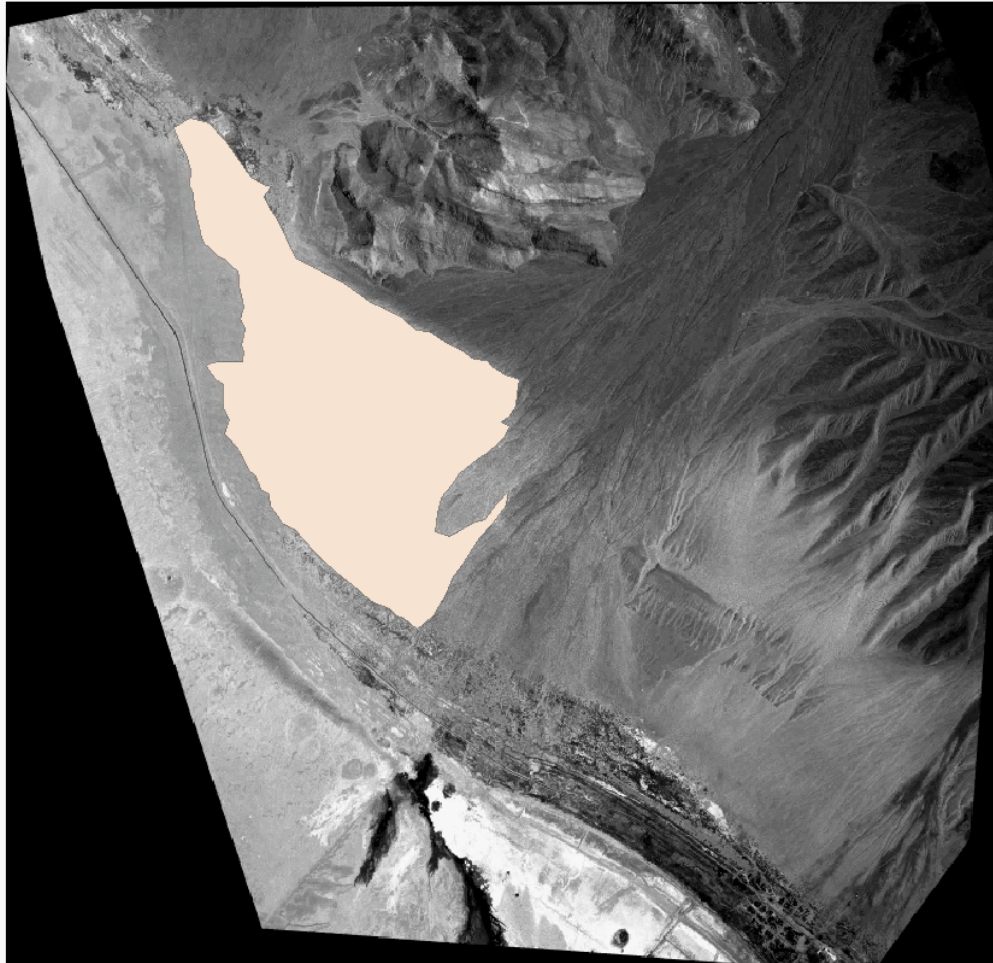


Sand Sheet Changes



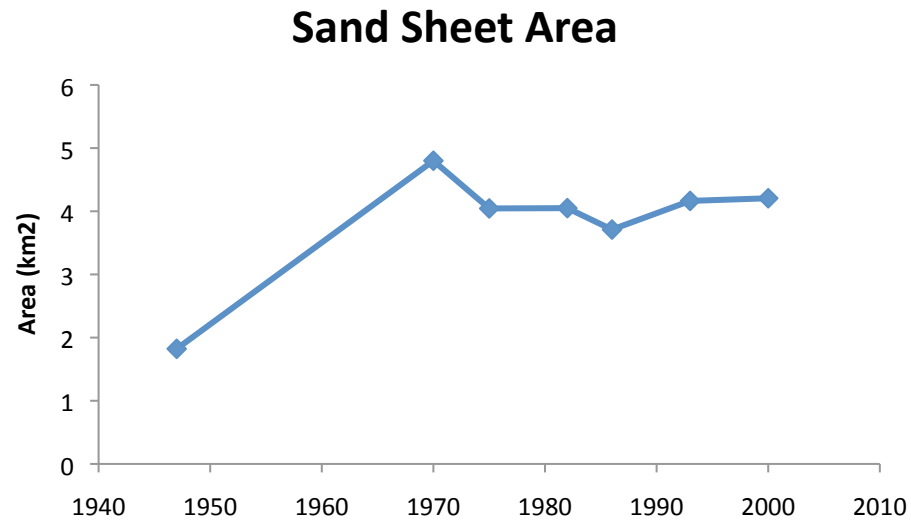
Sand sheet changes

Sand sheet
existed in
1947



1947
1970
1975
1982
1993
2000
2006

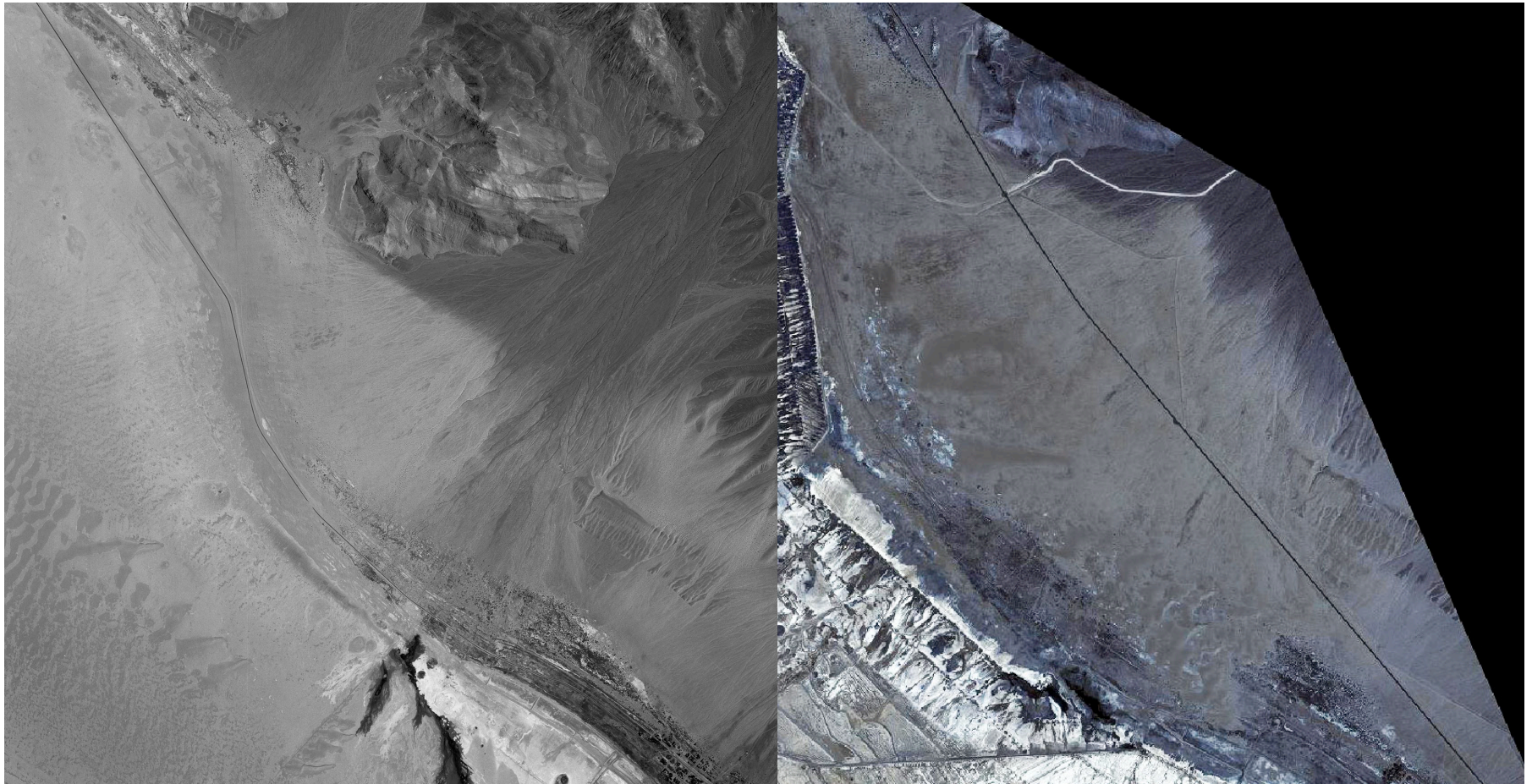
Trends



Sand sheet area has remained ~ constant since 1970
Volume of material may have changed however

Project growth in 1947-1970 back – 1930's

The Dunes in 1947 vs Today



1947

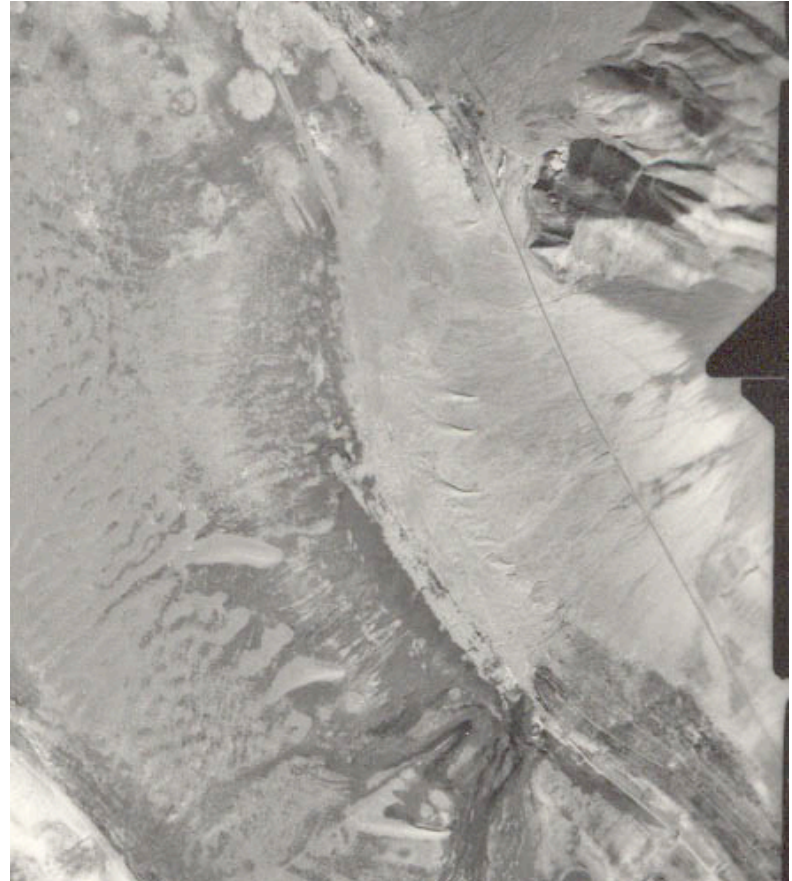
2010

Dune changes

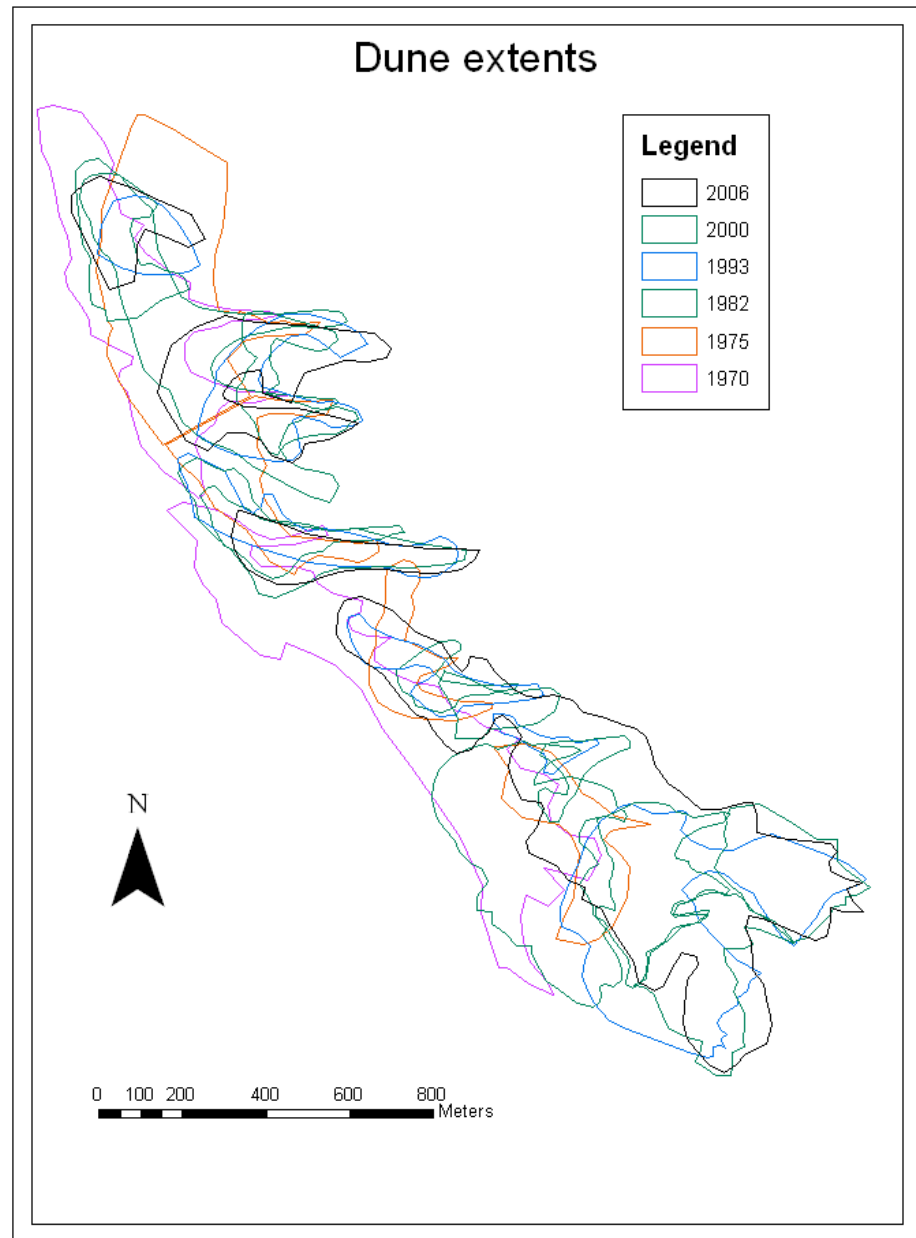
No dunes visible in 1947

Maybe in 1954 – but poor image

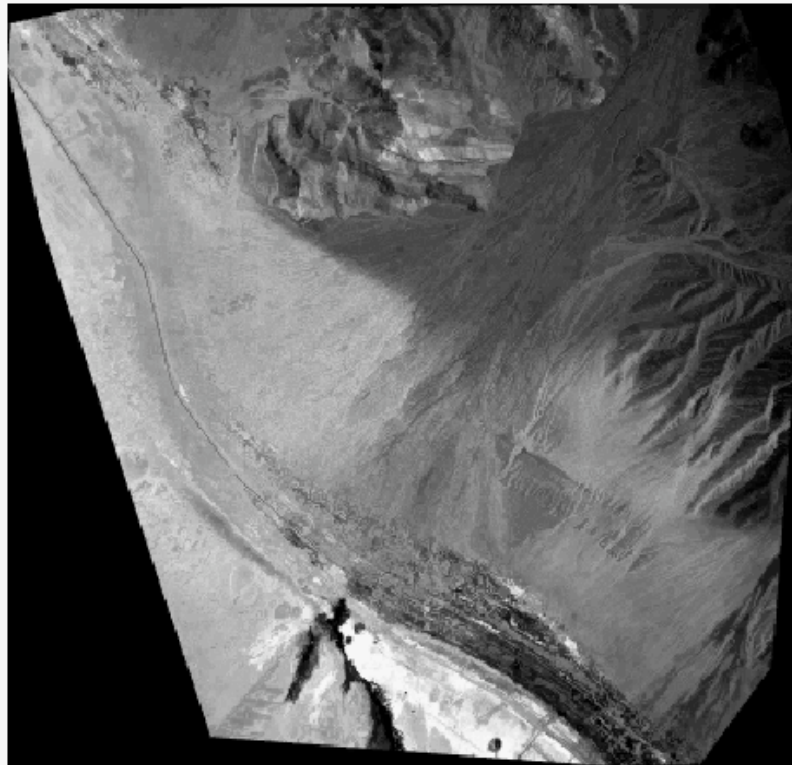
Visible clearly in 1967 USAF image



Dune changes



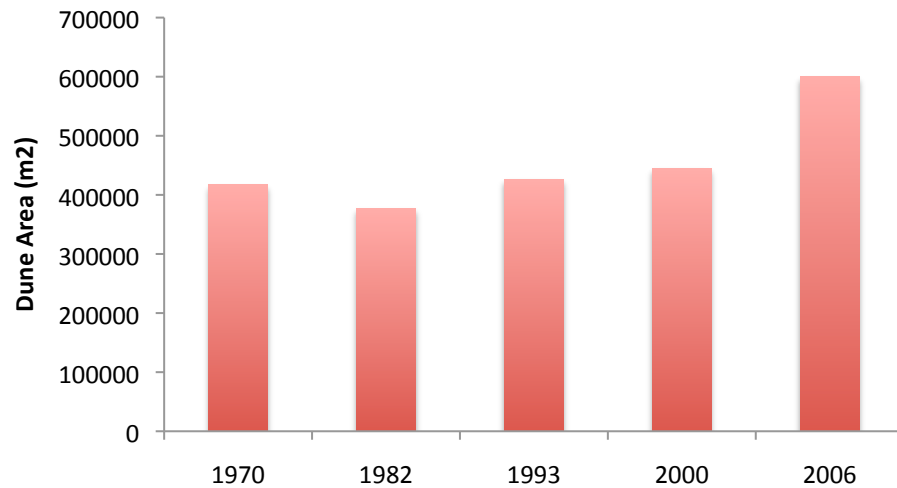
Dune changes over time



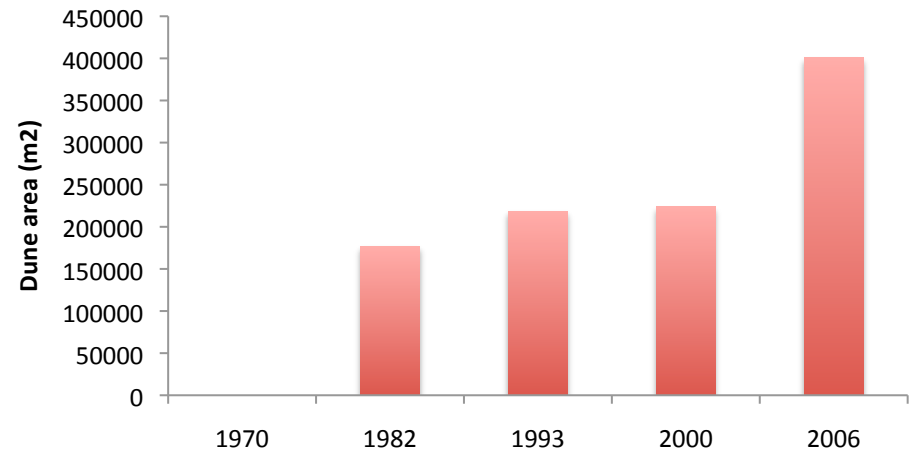
1970
1975
1982
1993
2000
2006

Dune area has increased over time

Total dune area

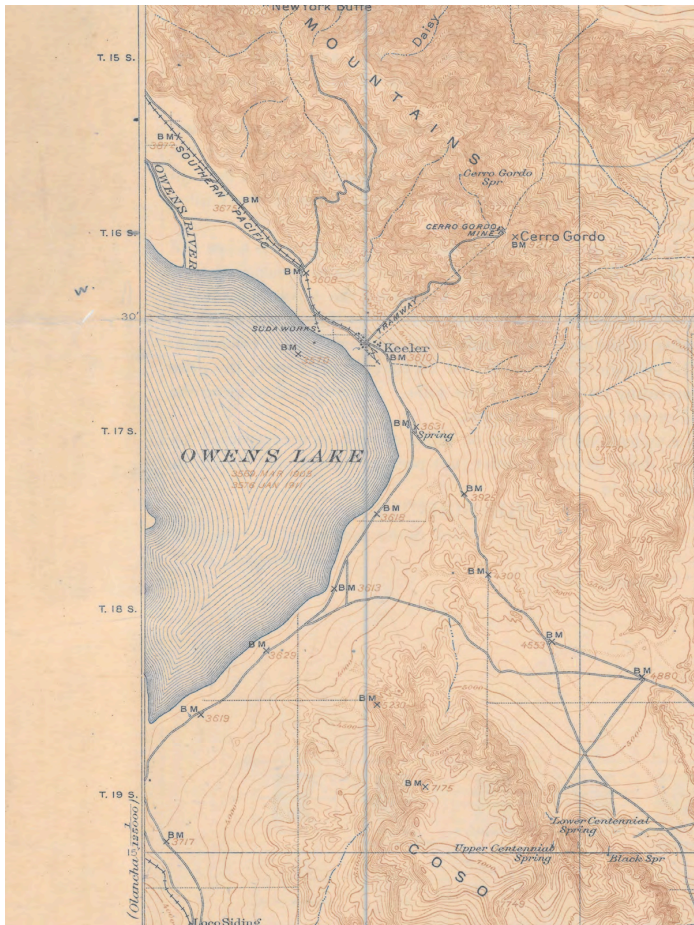


Southern dune area



Southern dunes have increased from 47% to 69% of area

Old Maps and Images

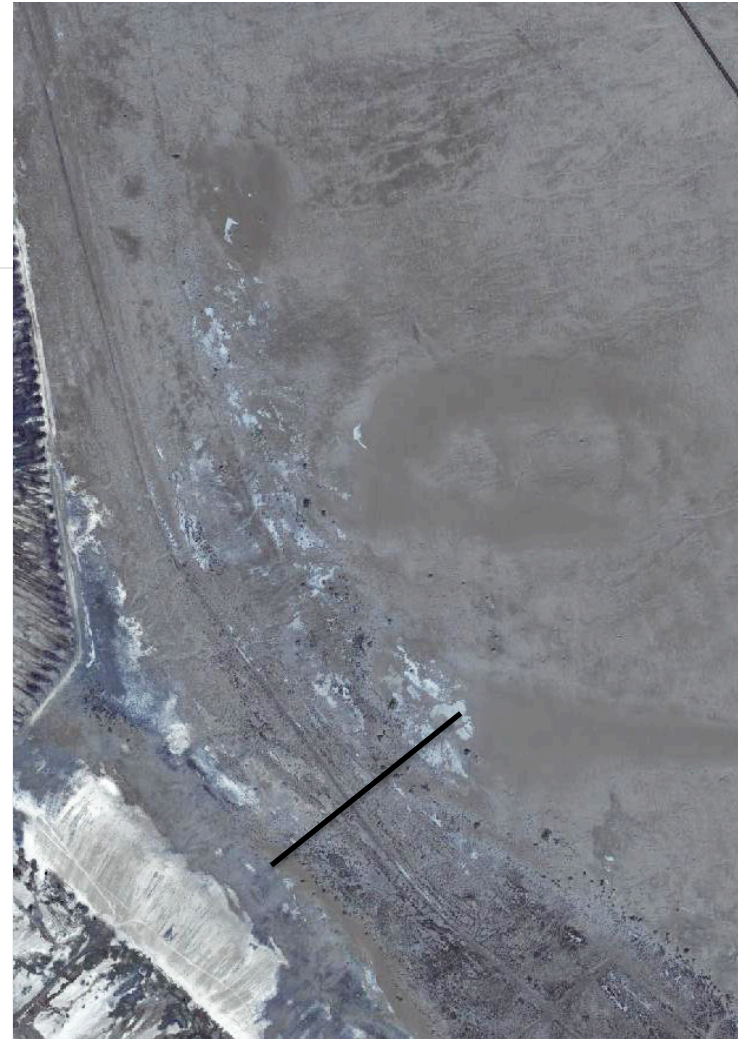
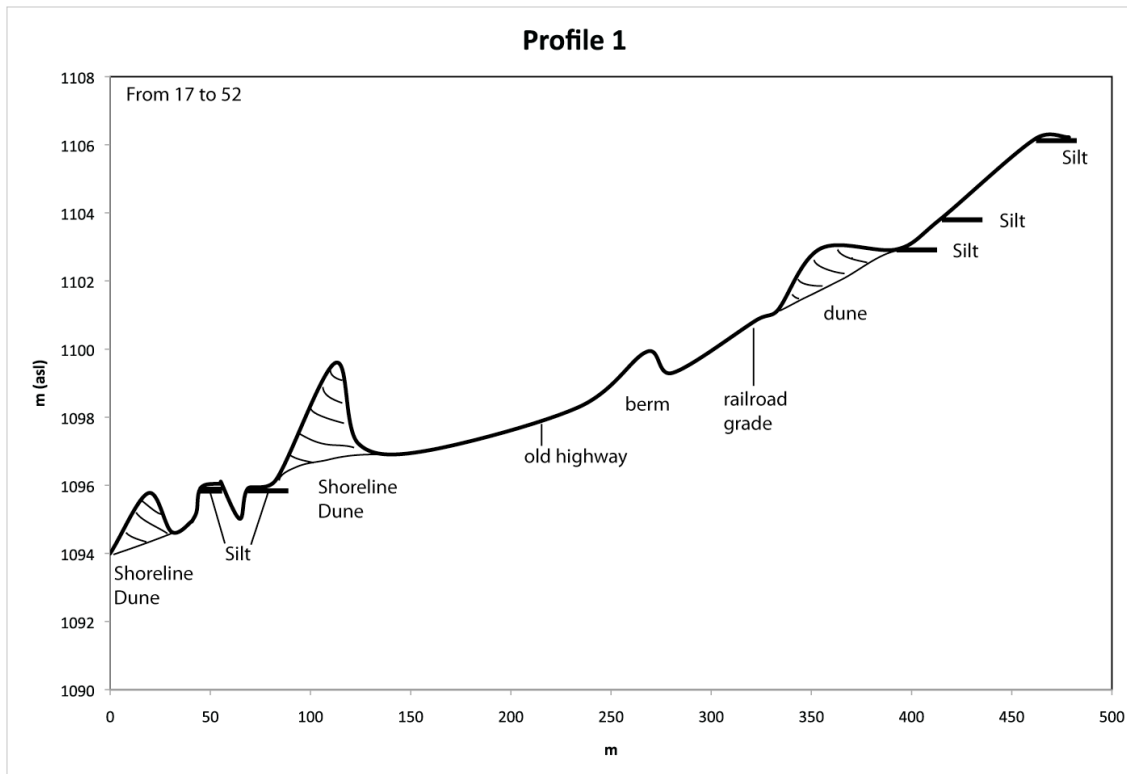


USGS 1:250,000 1913



Age of the dunes

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



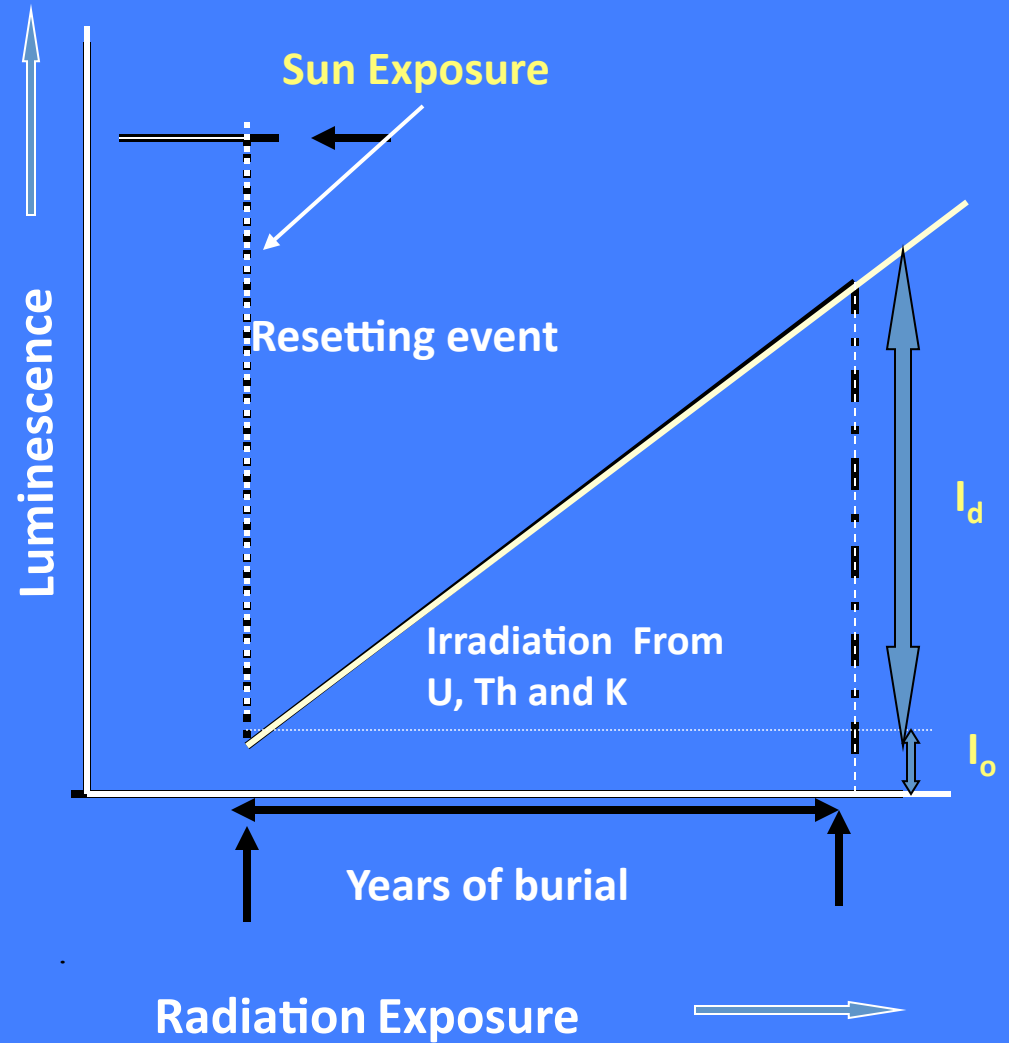
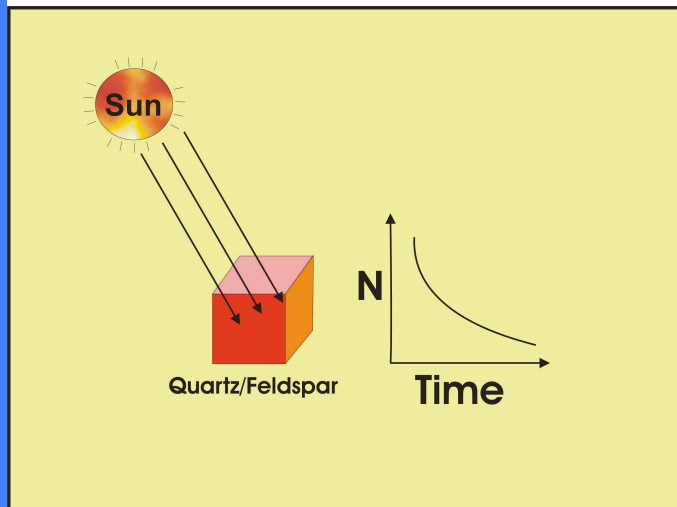
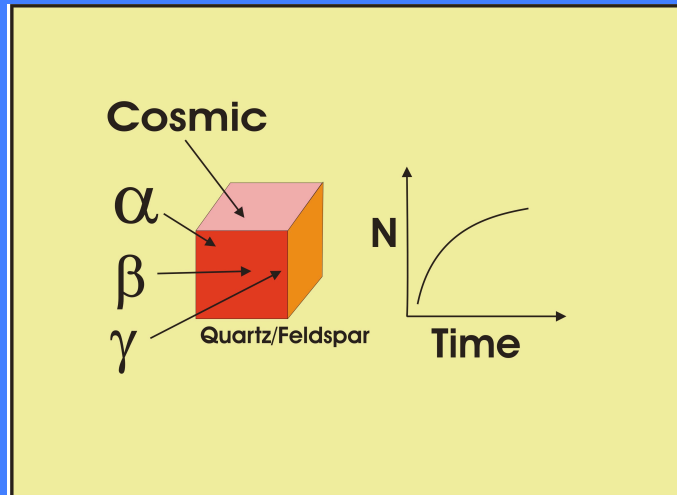
Silt Deposits



Sample sand below silt deposits for optically-stimulated luminescence dating

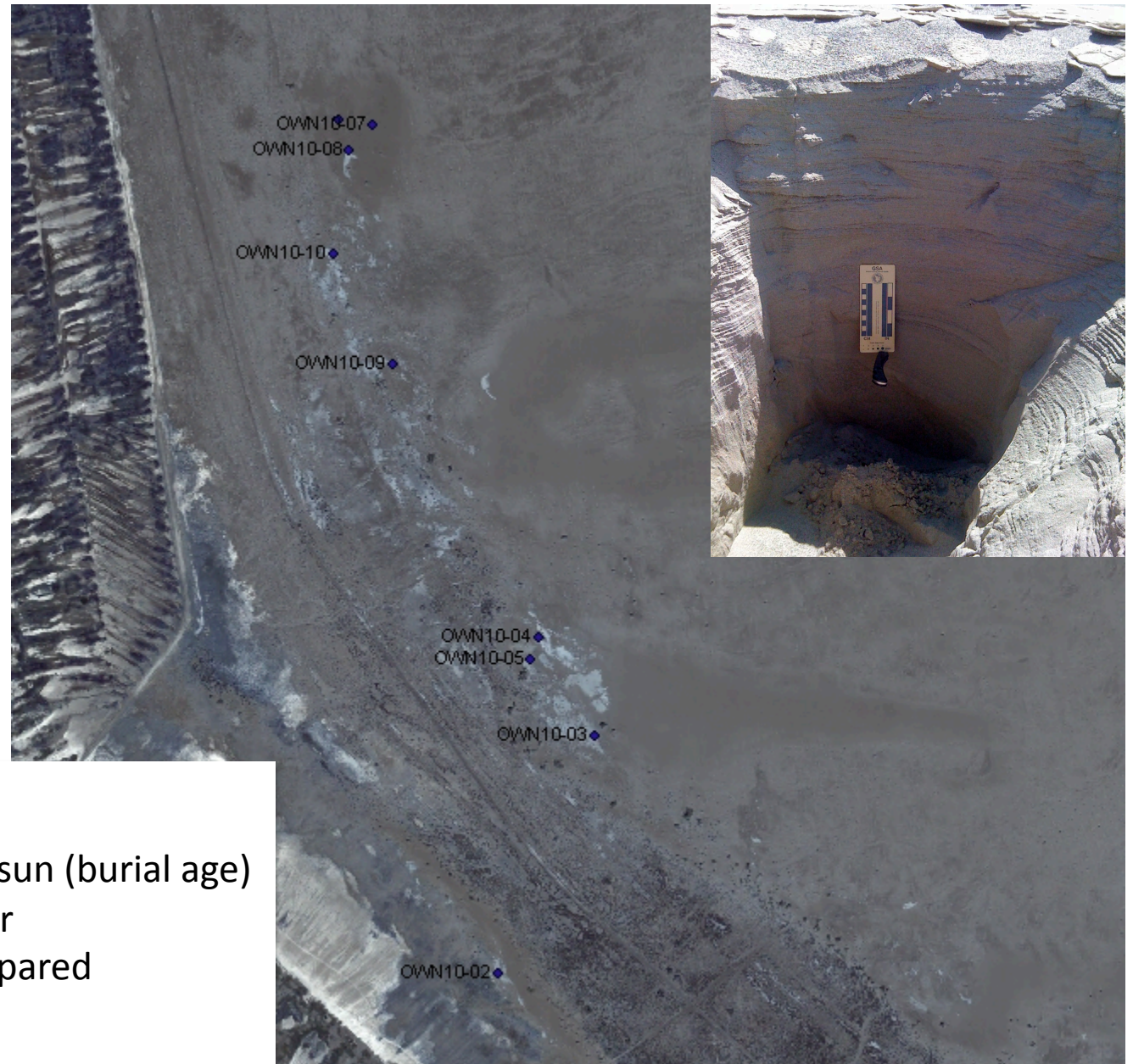


Principles of luminescence dating (From Ashok Singhvi)



OSL Dating

10 samples



Last time sediment saw the sun (burial age)
Precision – 10% in last 100 yr
Samples currently being prepared

Preliminary results

- 1947: extensive sand sheet – continuous with North Sand Sheet and Owens River deltaic deposits
- 1950s – 1960s: first identifiable dunes, sand sheet expands rapidly
- 2000 – present: northern dunes appear to be eroding on west side and decreasing in volume; southern dunes are expanding and migrating to SE (up to 18 m/yr)