

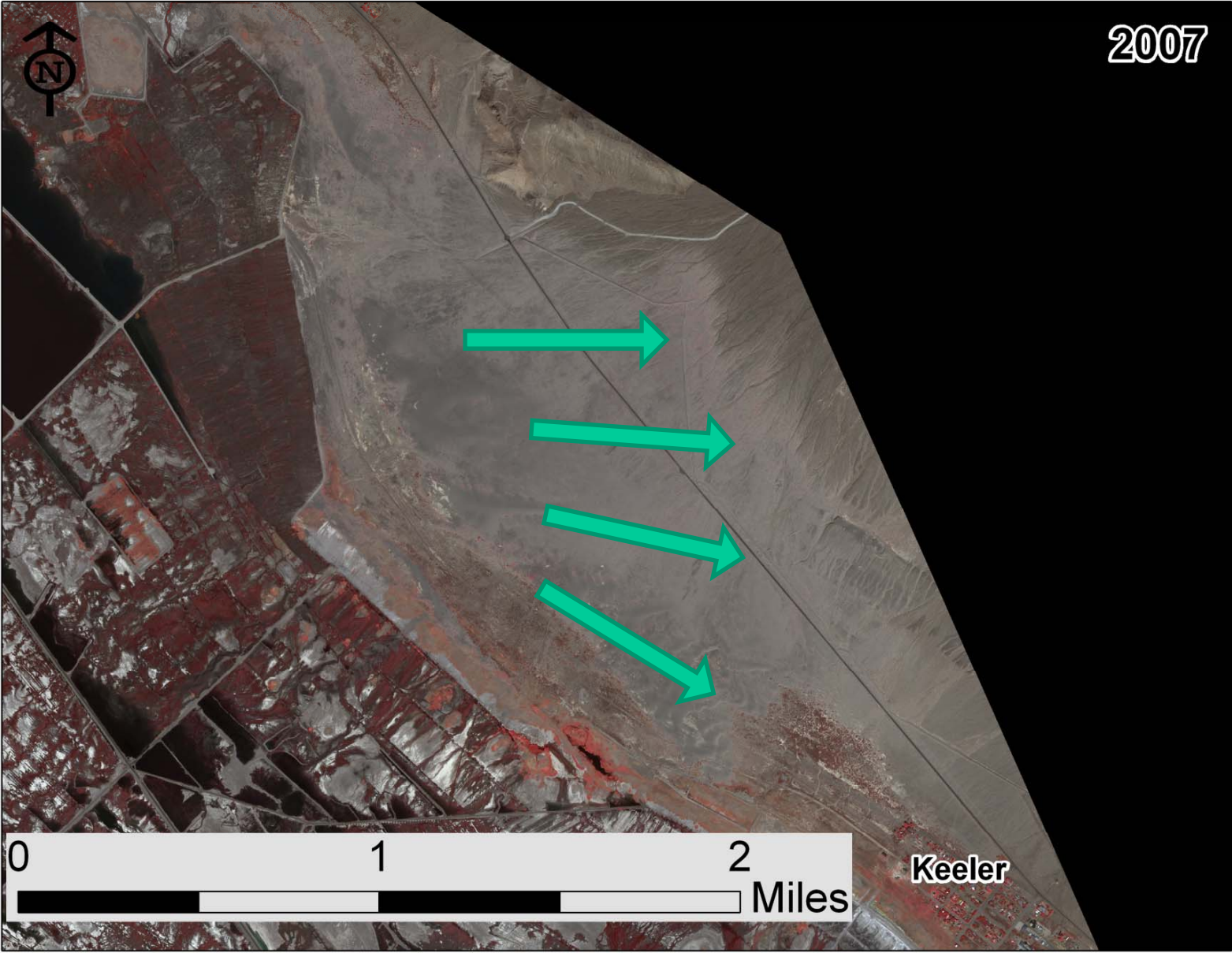
Keeler Dunes Migration

A LandSat TM5 Analysis

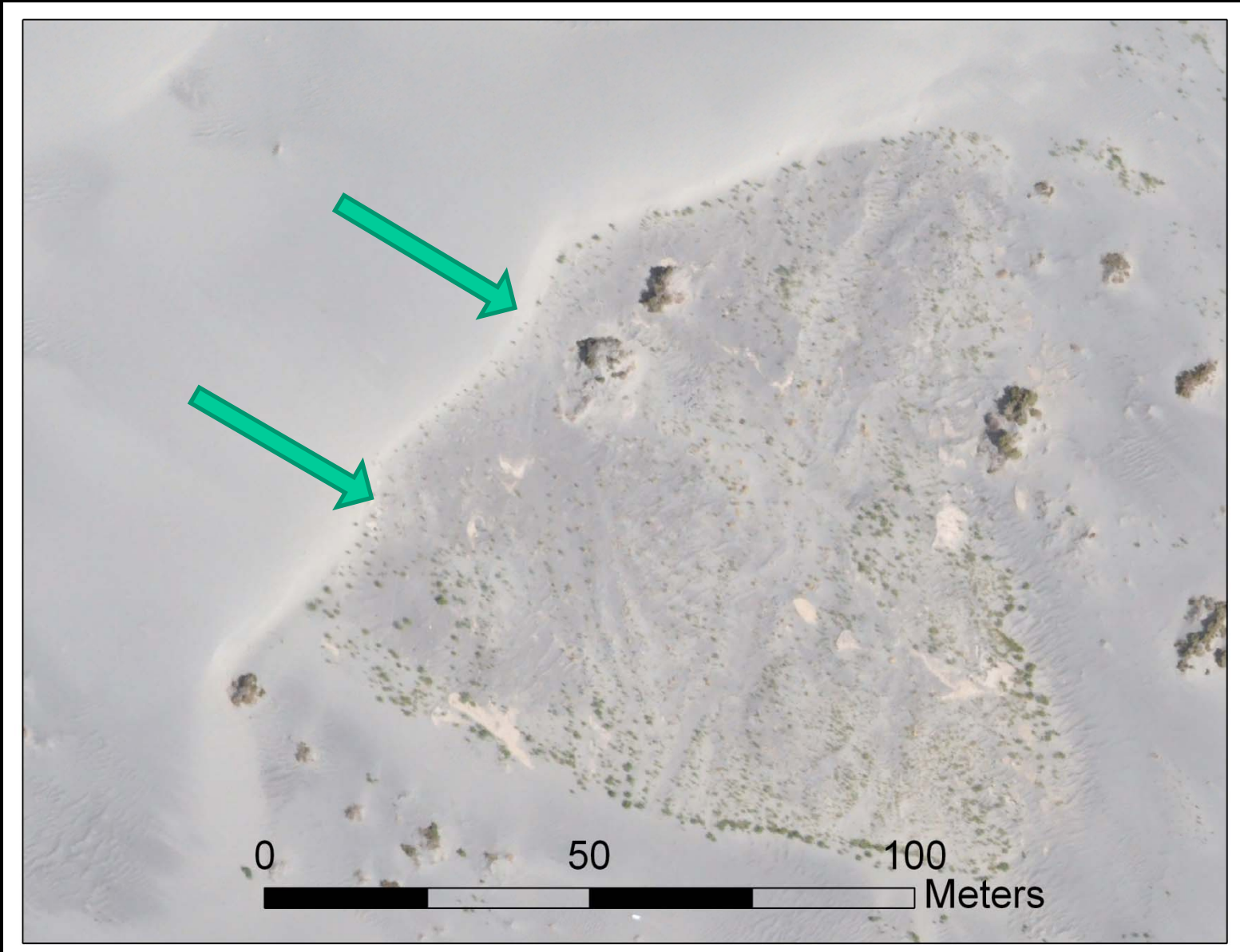
HydroBio
Advanced Remote Sensing



Dune Migration



Dune Intrusion



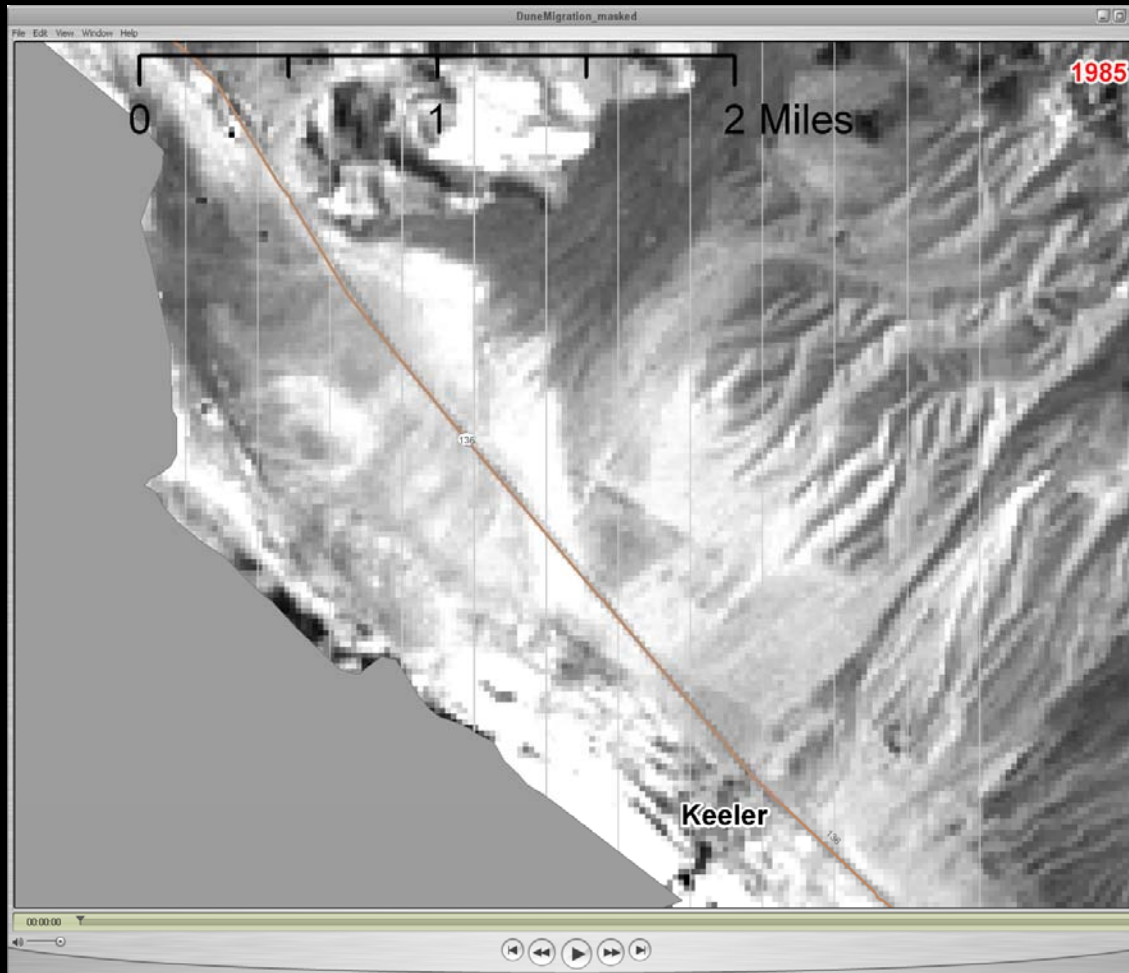
LandSat TM5

- 28 years of imagery of Keeler Dunes
- Analysis of Band 5
 - Reflection difference due to water content/mineralogy—identify sand sheets on fans
- Analysis of NDVI vegetation index
 - Sharp contrast between vegetation and bare ground
- Images selected by closest cloud-free scene to the annual summer solstice

TM Band 5



Dune Migration Video



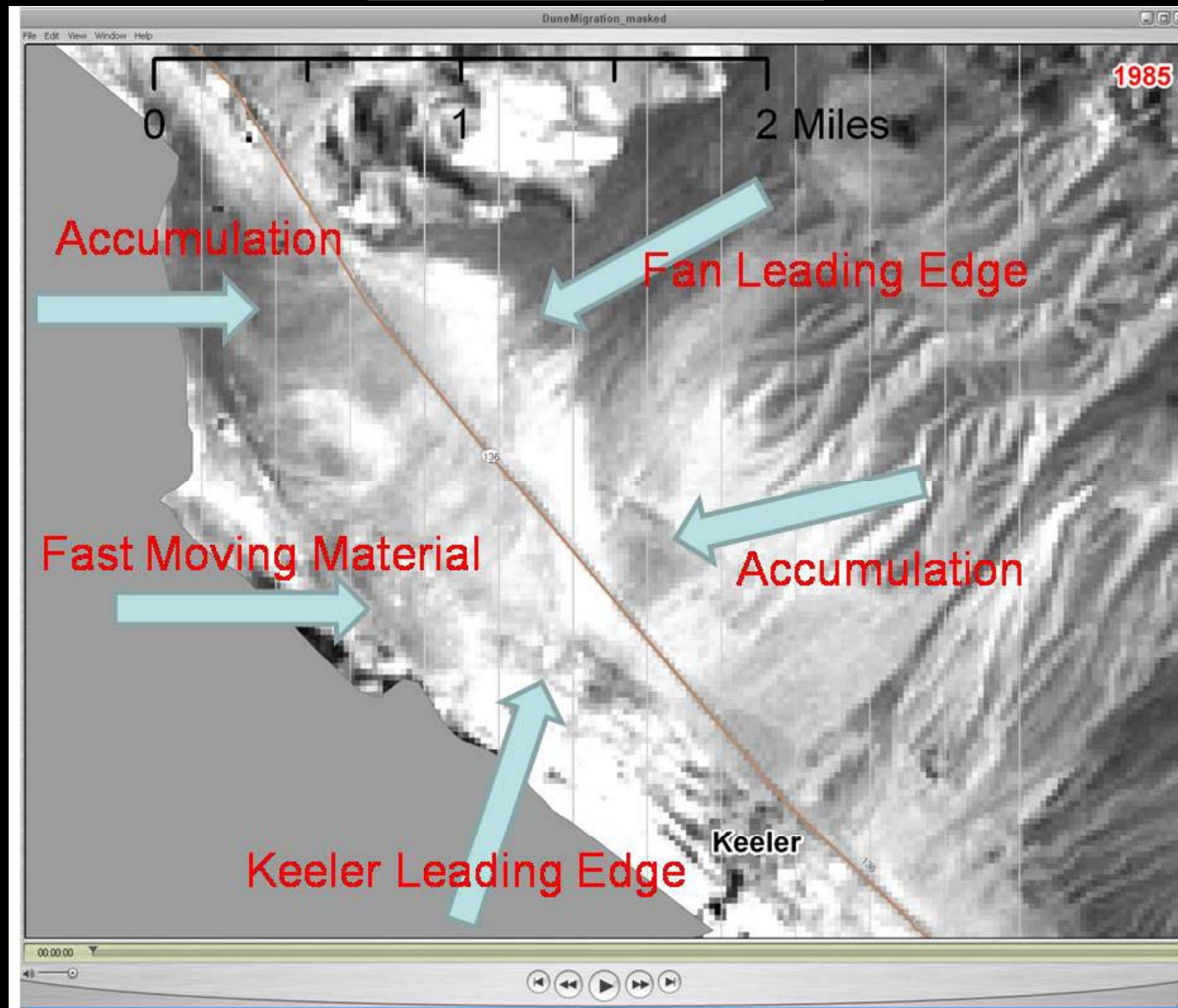
- Midsummer TM5 Band 5 scenes
– 1985-2010
- Equalized Histograms to display changes
- Shows highly reflective material (sand) moving SE towards Keeler, NE up Fan.

Dune Migration

- Things to look for:

[QuickTime Video Link](#)

[Image Sequence Link](#)



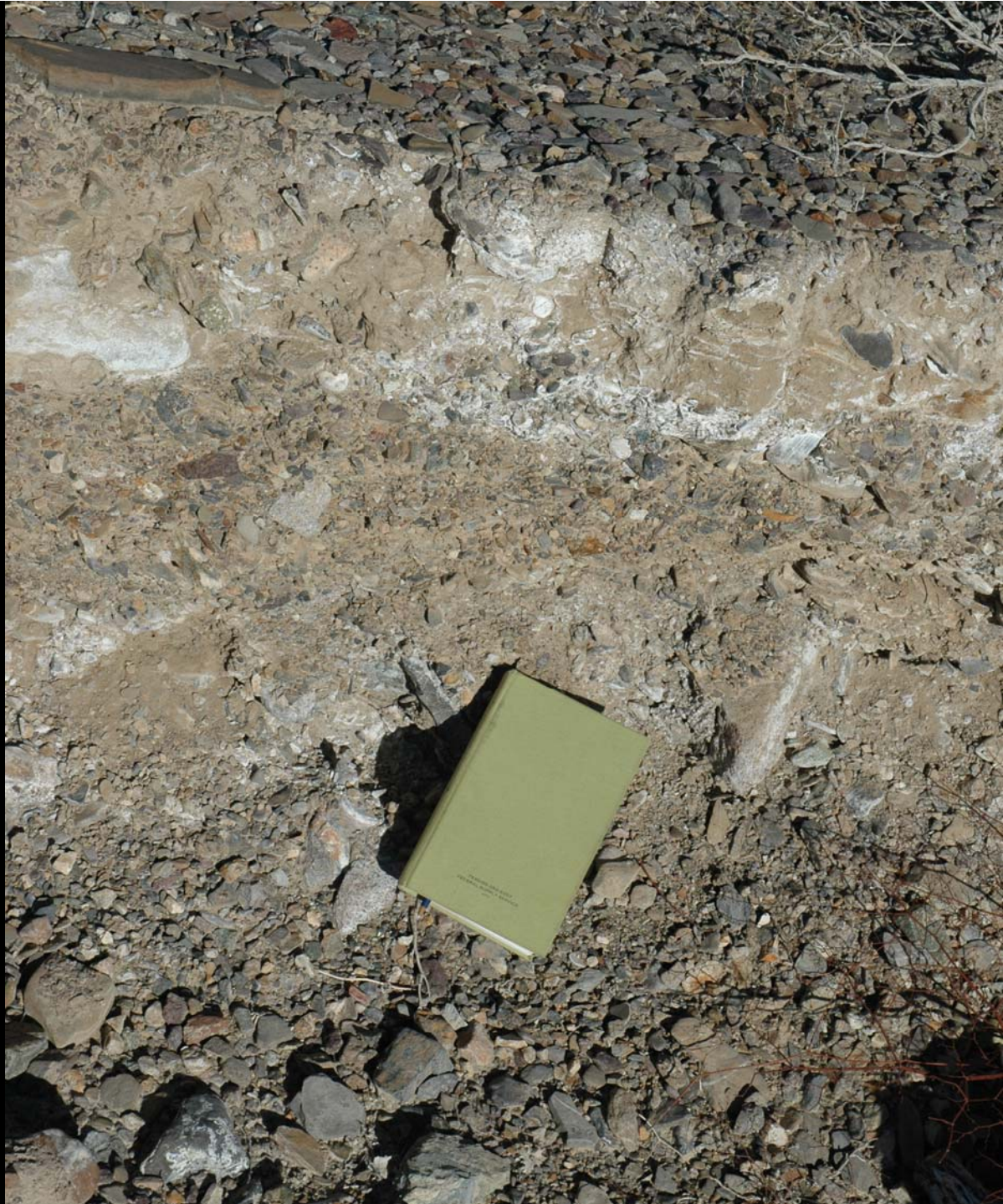


Desert Pavement











Precipitation Influence on Dune Stability

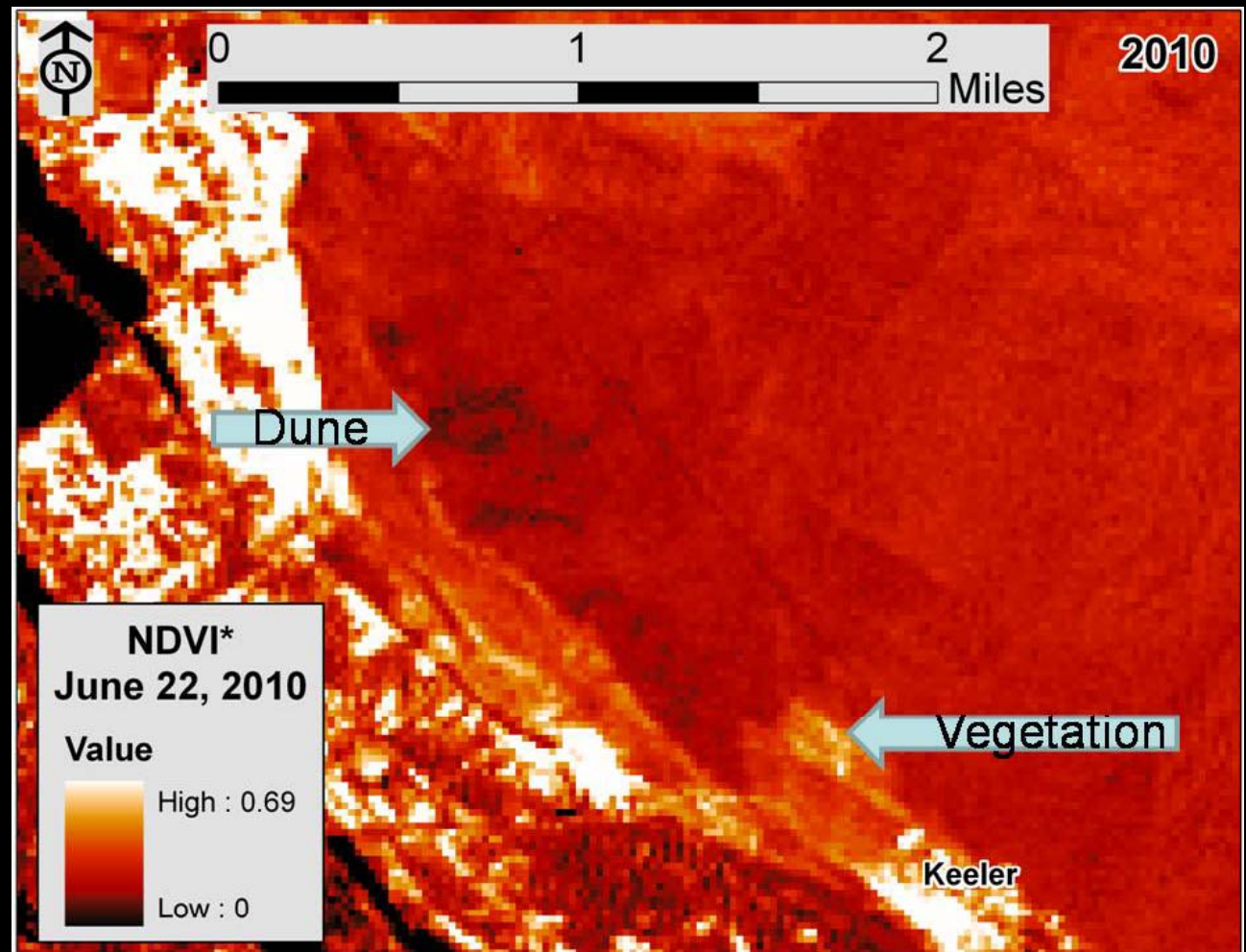
**Winter Precipitation
Leading up to Midsummer
TM5 Scene
December 1 – July 1
Keeler MET station**

Year	Winter Precip <u>in</u>
1989	1.14
1997	1.63
1998	3.54
2003	1.84
2010	2.33

- More Precipitation =
More Vegetation
- More Vegetation =
More Stability
- Mid Summer TM
scenes analyzed for
Vegetation Density
across Dunes

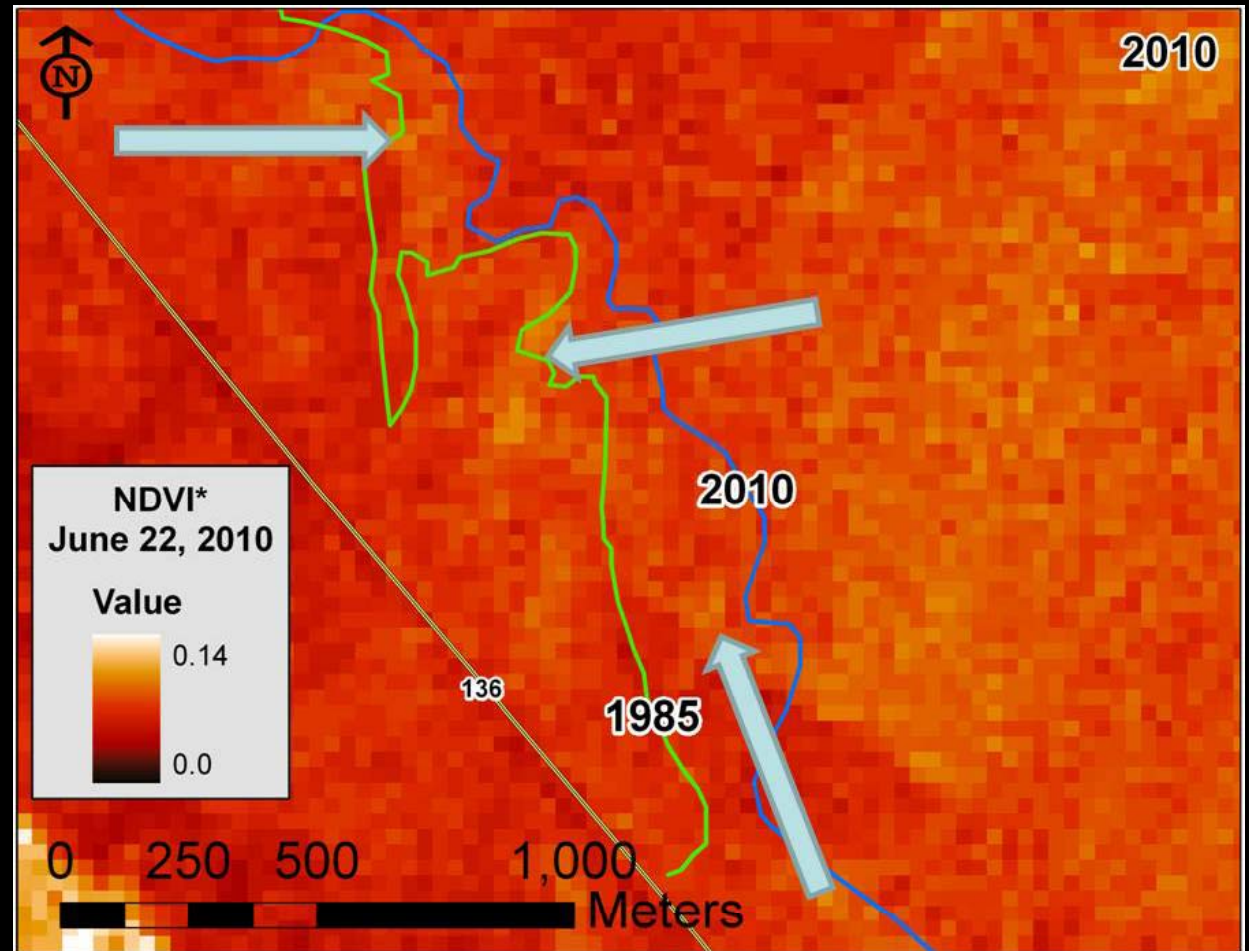
TM NDVI*

- Stretched between saturated NDVI and bare ground
- Measures Vegetation density and response to prior rainfall

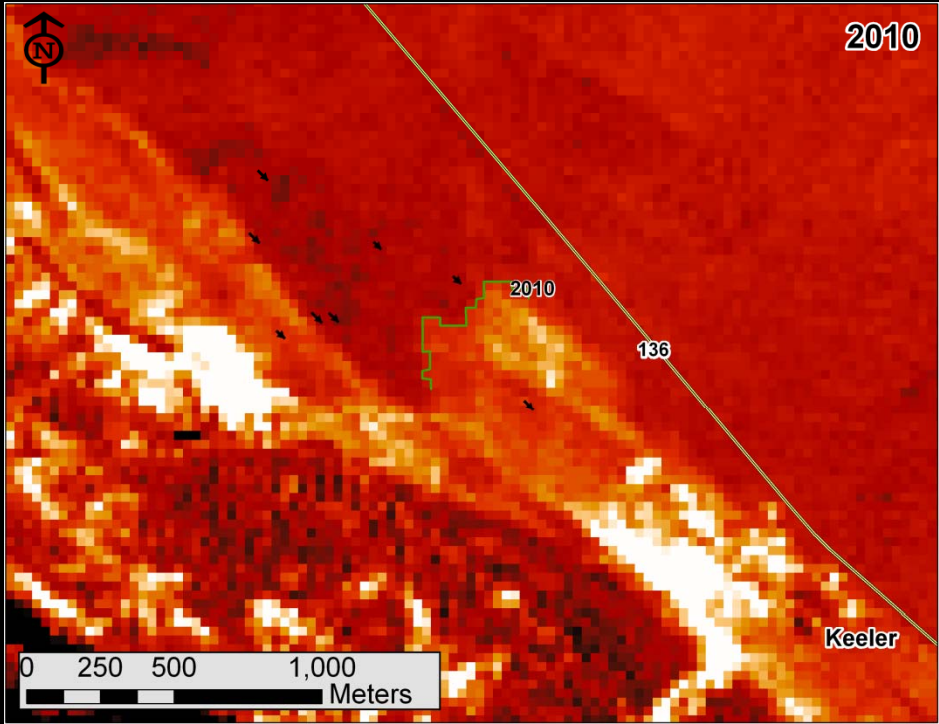
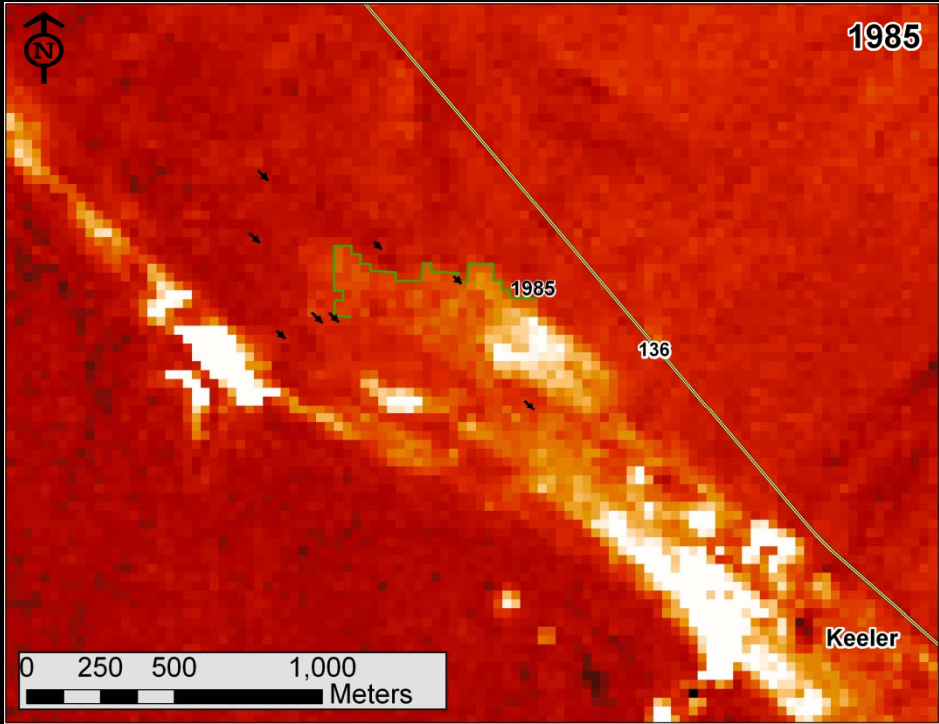


Observations--Vegetation and Stable Areas

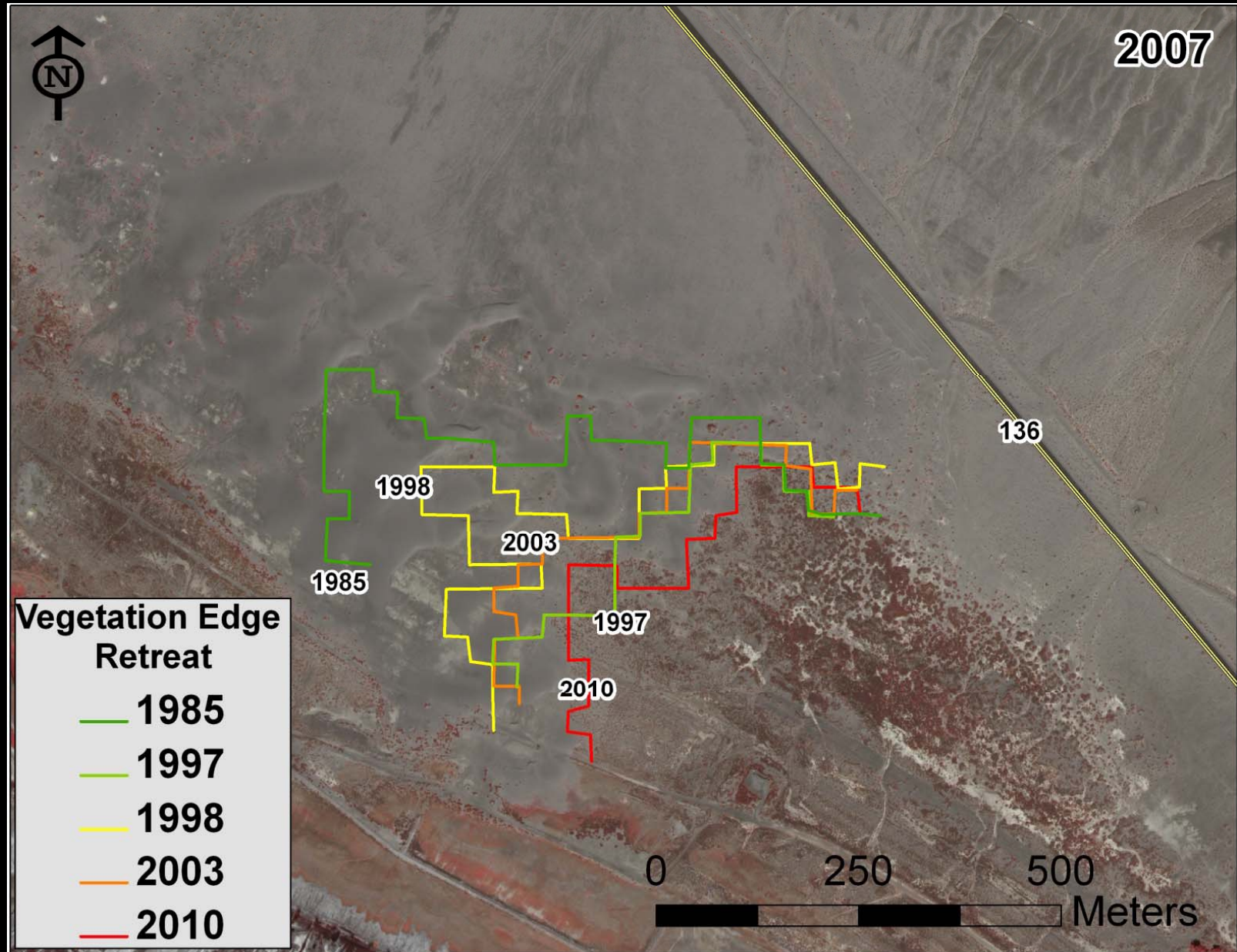
- Increase in Vegetation along Fan Leading Edge
- Possibly Fostering Vegetation and Material Stability
- Advancing Material Burying Veg?



Keeler Dunes Leading Edge



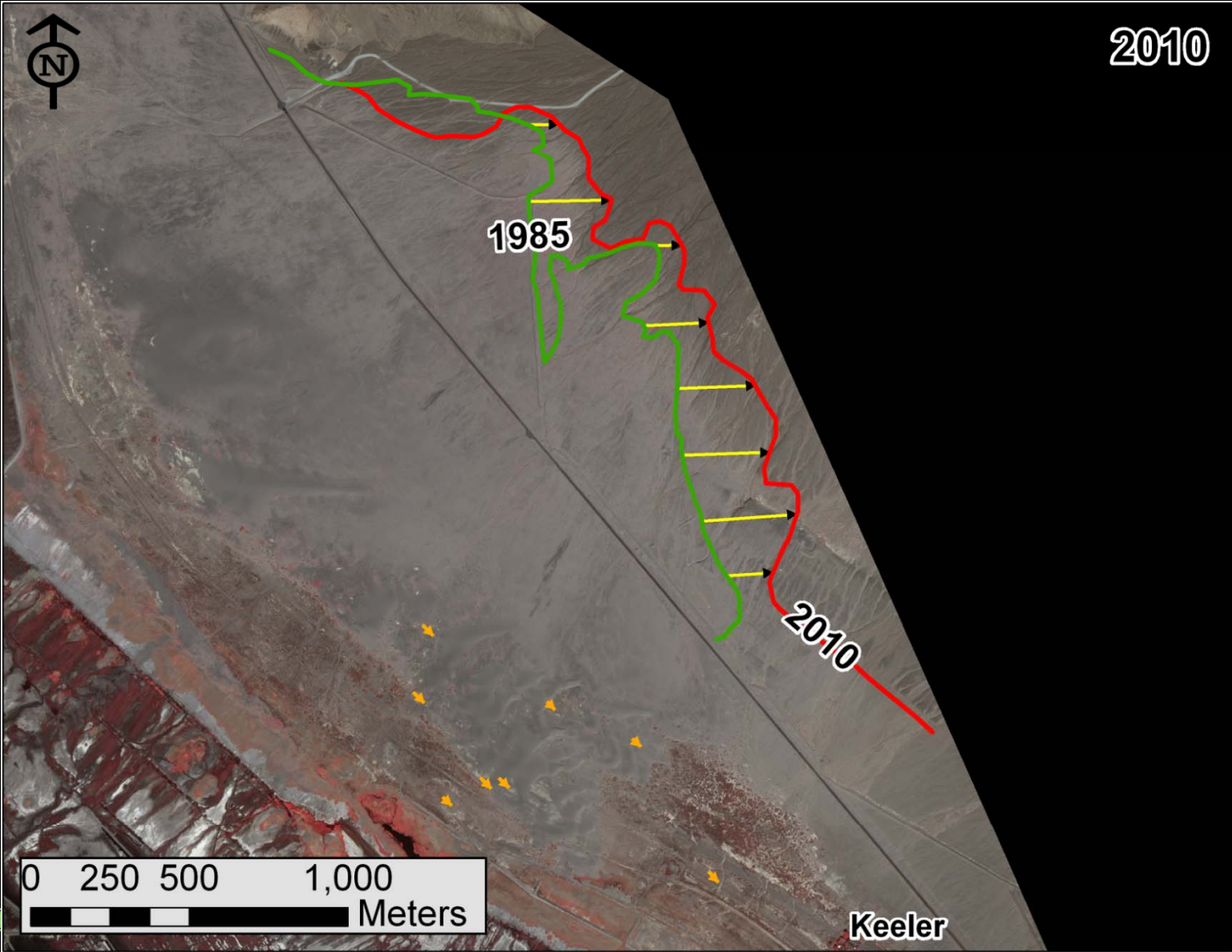
Keeler Leading Edge



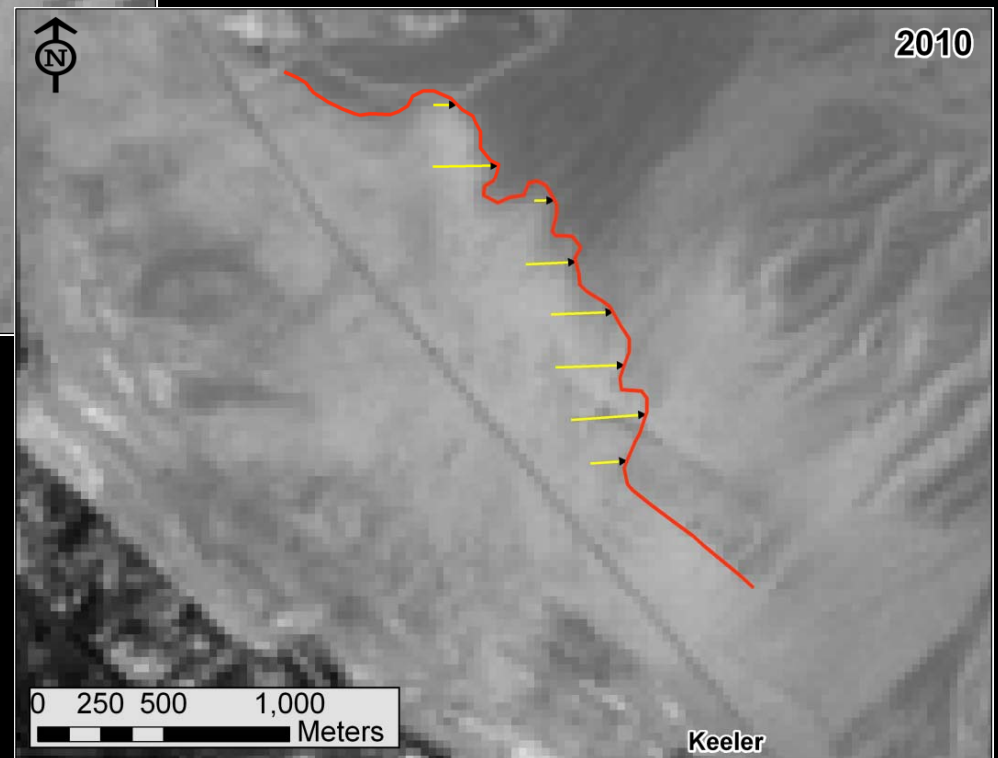
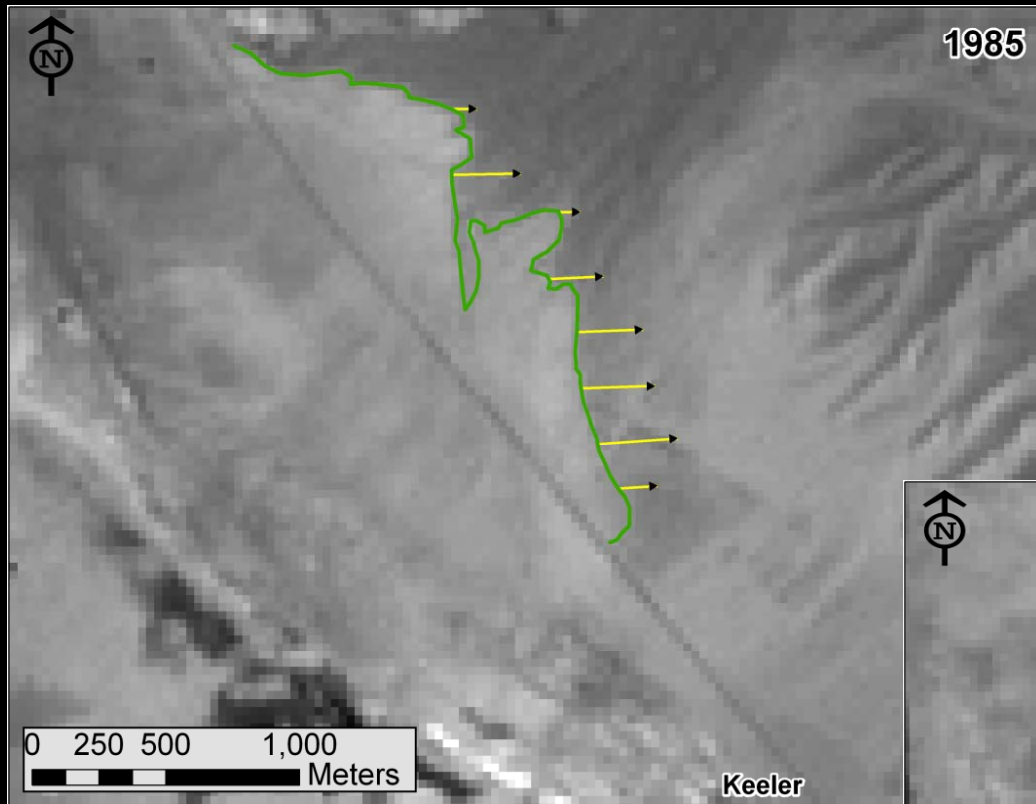
HydroBio

NDVI* threshold used to establish dune boundary

Material Movement Rates



Fan Material Leading Edge



TM Band 5 Analysis

Rates of Material Movement

- Keeler Leading Edge

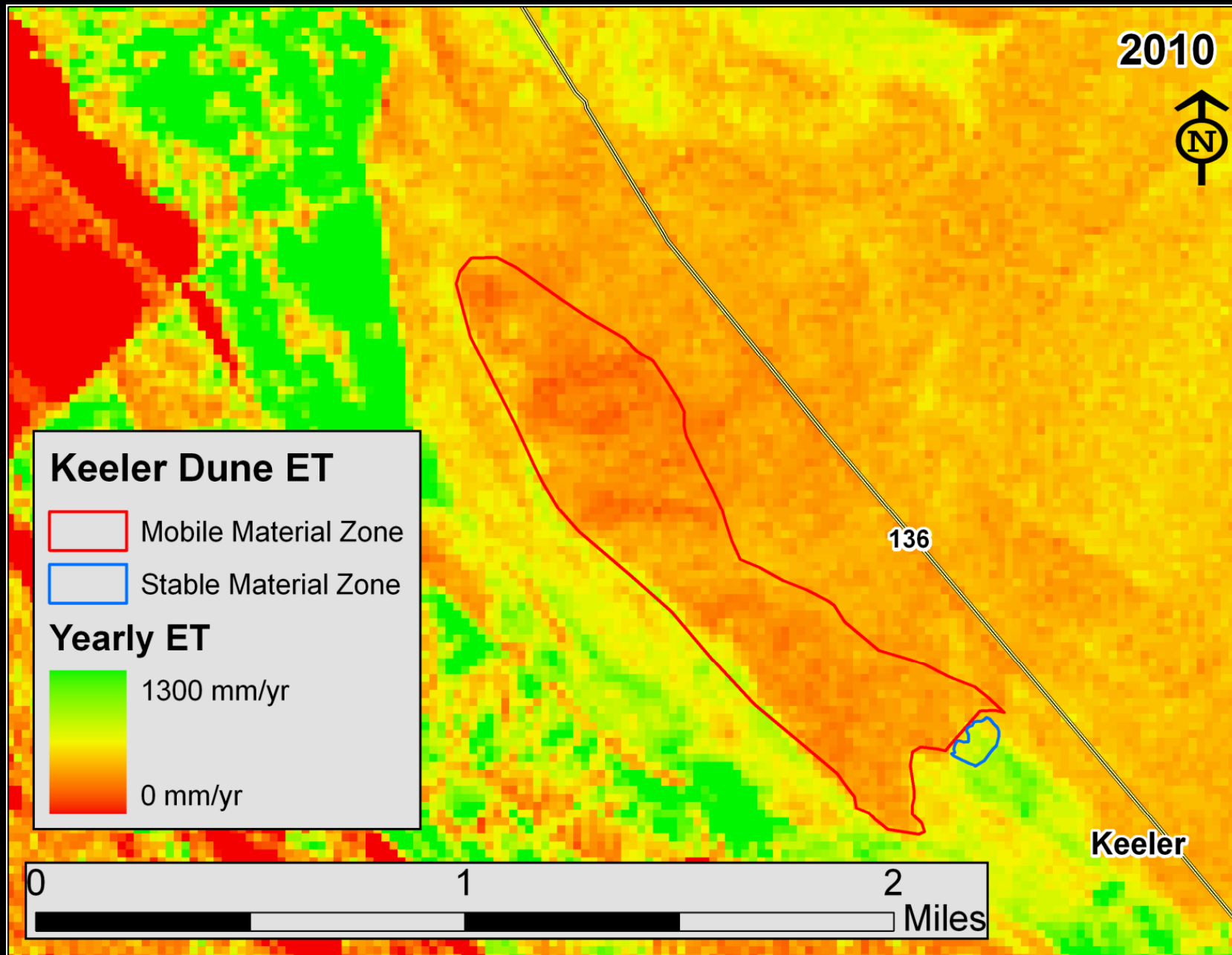
point	m/yr
1	51
2	49
3	37
4	46
5	48
6	38
7	40
8	46
Yearly average	
m	
44.4	

- Fan Leading Edge

Point	m/25yr
1	146
2	298
3	275
4	248
5	200
6	79
7	261
8	94
Progression	
m	
200.1	
Yearly avg	
m	
8.0	



Water consumption



Water Consumption

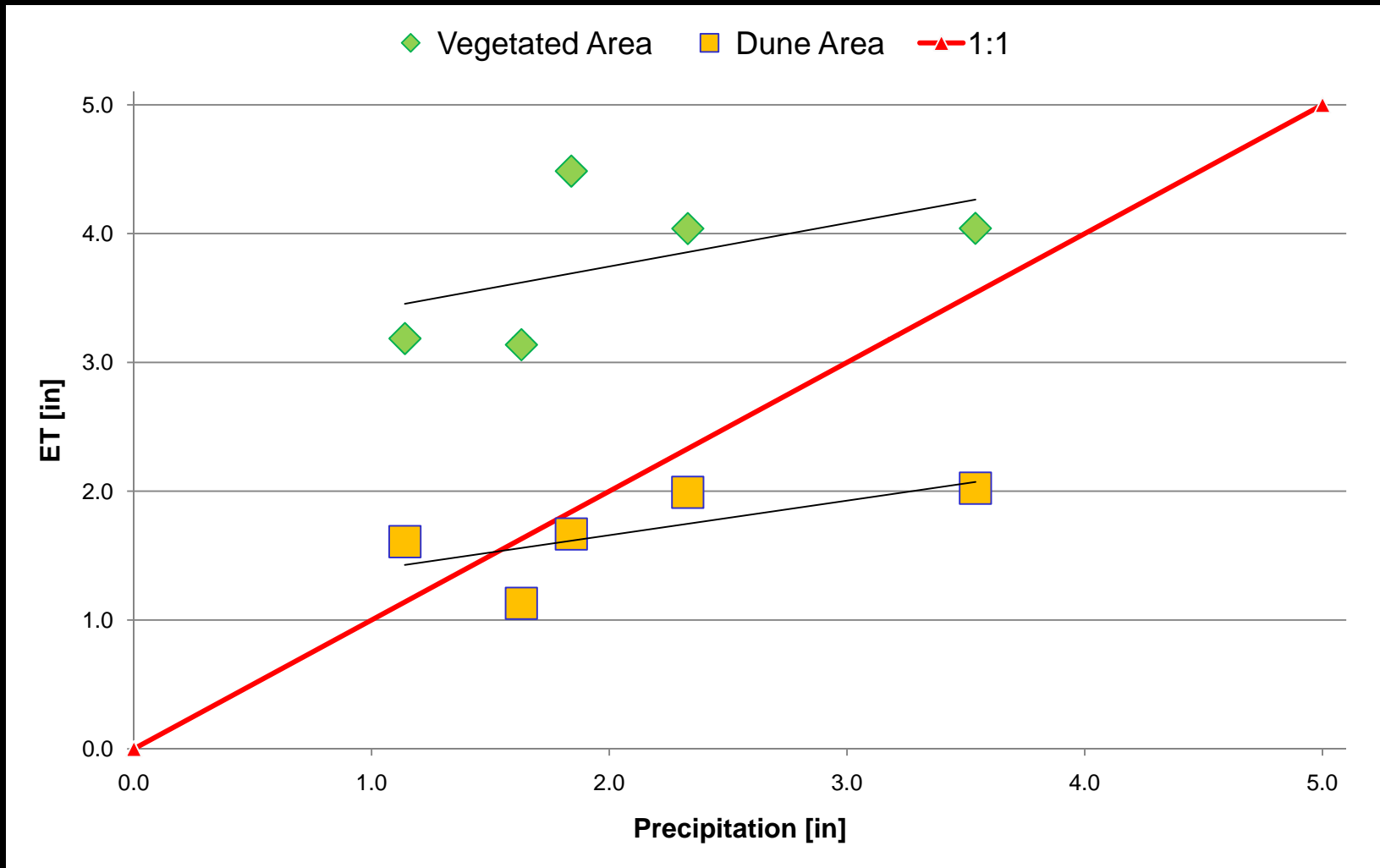
- Stable Material Zone
- High Vegetation
- Mobile Material Zone
- Sparse Vegetation

Year	Area	Dec-June		Volume
		Precip	ET Dec-Jun	
	<u>acre</u>	<u>in</u>	<u>in</u>	<u>AFY</u>
1989	4.7	1.1	3.2	2.4
1997	4.7	1.6	3.1	2.4
1998	4.7	3.5	4.0	3.1
2003	4.7	1.8	4.5	3.4
2010	4.7	2.3	4.0	3.1

Year	Area	Dec-June		Volume
		Precip	ET Dec-Jun	
	<u>acre</u>	<u>in</u>	<u>in</u>	<u>AFY</u>
1989	292.8	1.1	1.6	77
1997	292.8	1.6	1.1	54.1
1998	292.8	3.5	2.0	96.8
2003	292.8	1.8	1.7	79.8
2010	292.8	2.3	2.0	95.3



Water Consumption/Availability Relationship



Field Investigations

