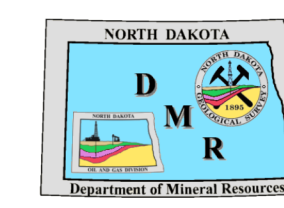
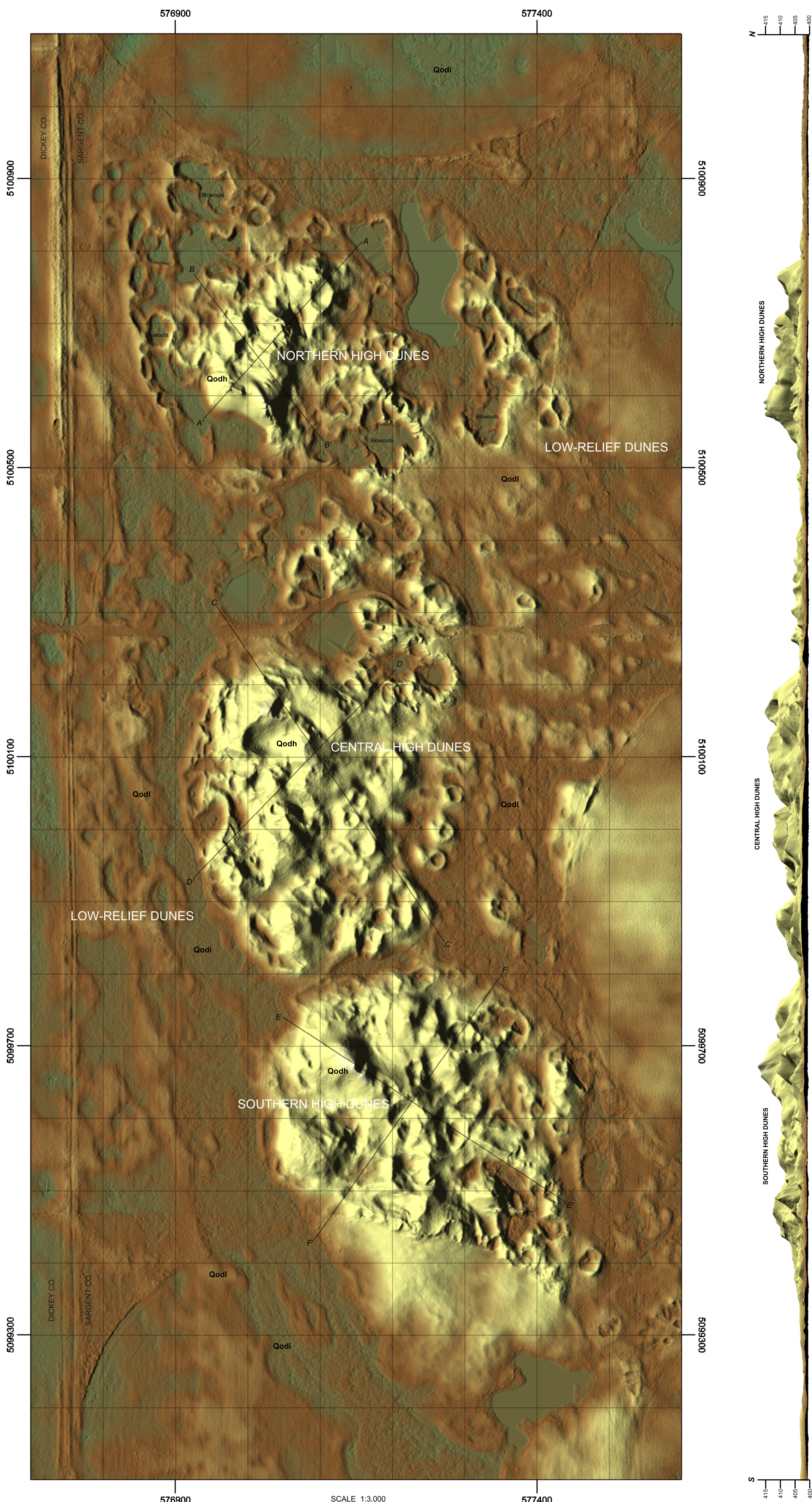


Geomorphology of Dune Sand Resources in Southwestern Sargent County

Fred J. Anderson
2016

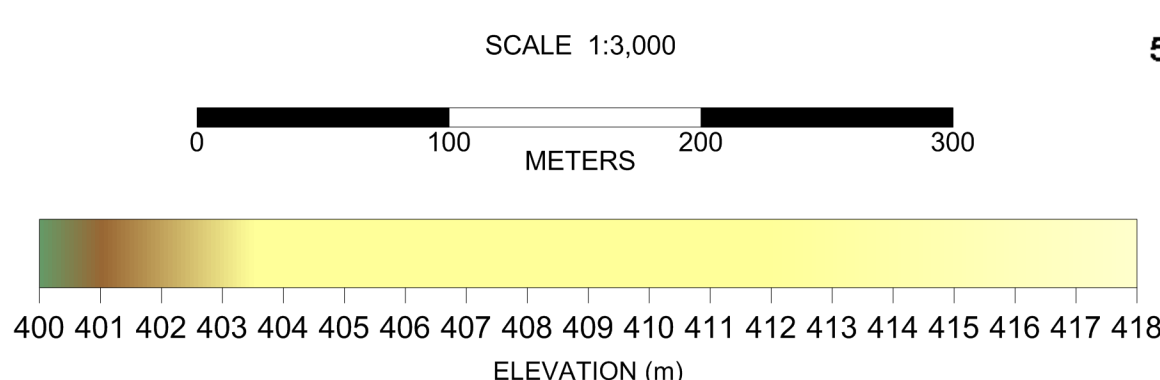


Edward C. Murphy, State Geologist
Lynn D. Helms, Director Dept. of Mineral Resources



ELEVATION DATA SOURCE
NRC/SUSP/MS/SHS/USACE 2010 James
River Basin LiDAR/Collect - Phase I
North American Vertical Datum of 1988.

HORIZONTAL CONTROL
Universal Transverse Mercator Zone 14



EXPLANATION

- QUATERNARY - Oahe Formation
- Qodl Sand sheet interdune areas as blowout features and water-filled depressions.
 - Qodl Sand dunes of low-relief commonly forming the ridges of circular blowout landforms.
 - Qodh Sand dunes of high-relief.



VERTICAL EXAGGERATION (VE) 4X
ELEVATION (m)

LOCATION OF MAP AREA

Dune sand resources are found in the Riverdale Ridge High Dunes Area located in the SE 1/4, Sec. 19 and the NW 1/4, Sec. 30, T. 130 N., R. 58 W., southwest Sargent County.

STUDY AREA DESCRIPTION

This map is a three-dimensional representation of the land surface geomorphology of the Riverdale Ridge High Dunes Area located in southeastern North Dakota in southwesternmost Sargent County adjacent to the border between North and South Dakota. This is an area of windblown sand that has been swept into a dune complex that includes three distinct high dune deposits.

DUNE GEOMORPHOLOGY

Windblown deposits of the Oahe Formation sourced from glacial Lake Dakota to the west are found in southwestern Sargent County. These eolian deposits consist of fine grained sand that was windswept into three major geomorphological features which include flat to planar sheet interdune areas, dunes of low relief, and dunes of high relief. Windblown sands are concentrated in three major dune complexes which include the northern, central, and southern dunes. The southern dunes cover the largest area of 50.4 acres, followed by the central high dunes (32.5 acres) and the northern high dunes (10.5 acres). Numerous blowout features are found in the northwest adjacent to the northern and central high dunes areas. The prevailing direction of the wind that deposited these dunes was out of the northwest. Large circular expressions of local center-pivot irrigation systems can be seen at the north, eastern, and southern margins of the map area.

MAPPING ELEMENTS DESCRIPTION

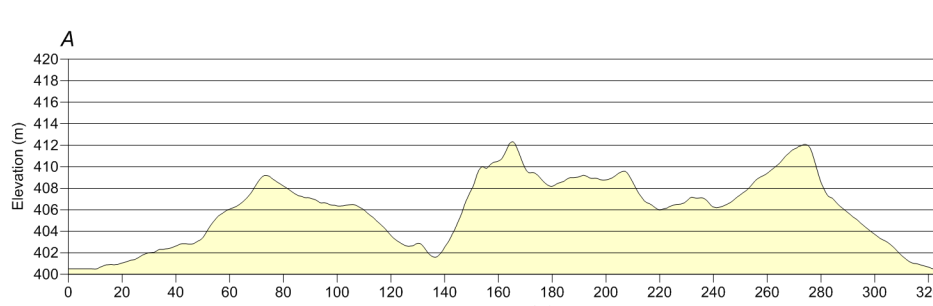
This map provides an overhead north to south view with an orthographic view face orientation of 90° from the horizontal. Illumination orientation of the map surface is from the west at 270° with a sun angle at 45° from the horizontal.

VOLUMETRIC ANALYSES OF DUNE SAND RESOURCES

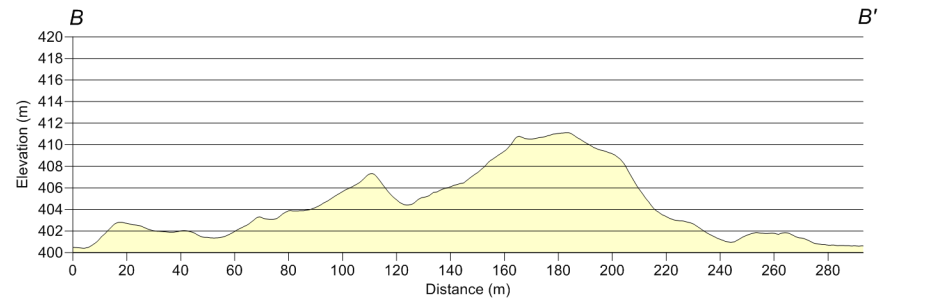
Dunes of Low-Relief: 706,459 m³ (925,461 yd³)
Dunes of High-Relief: 1,096,753 m³ (1,436,746 yd³)
Total Dunes (>401 m Elevation): 1,803,212 m³ (2,362,208 yd³)
Sand Sheet Interdune Areas: 1,624,867 m³ (2,128,576 yd³)
(400 - 401 m elevation)

POTENTIAL USES OF SAND RESOURCE

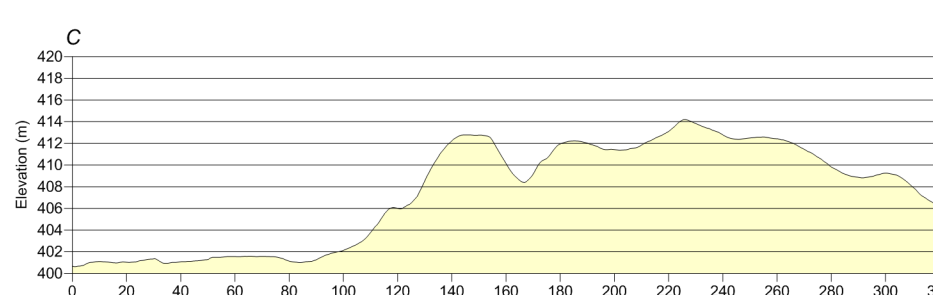
Sand mapped in this area of investigation could potentially find beneficial use as a sand resource for general construction and transportation related projects. Additional mineralogical assessment would be needed to identify any potential for highly specialized use.



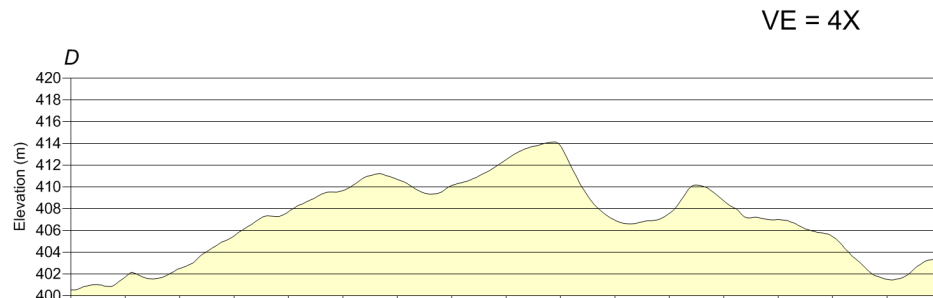
Topographic section A-A' from the northwest to the southeast across the northern high dunes area. Maximum slope is found on northwest facing slopes in the western half of the dunes area and on the bounding southeastern facing slope. Areas of minimum average slope are found on southeastern facing slopes in the central portion of the dunes area.



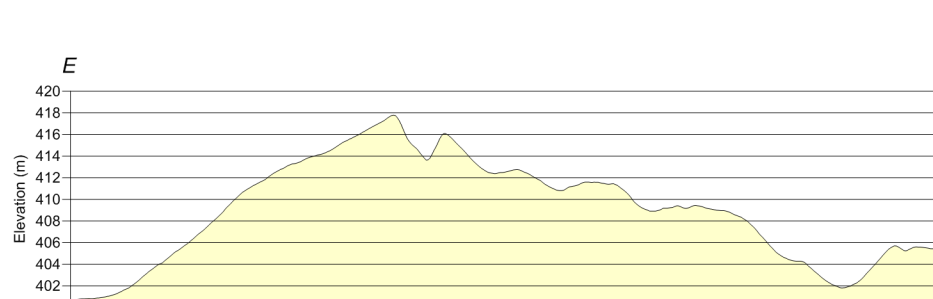
Topographic section B-B' from the southwest to the northeast across the northern high dunes area. Maximum slope is found on northeast facing slopes in the dunes area. Areas of minimum average slope are found on southwest facing slopes in the southwestern portion of the dunes area.



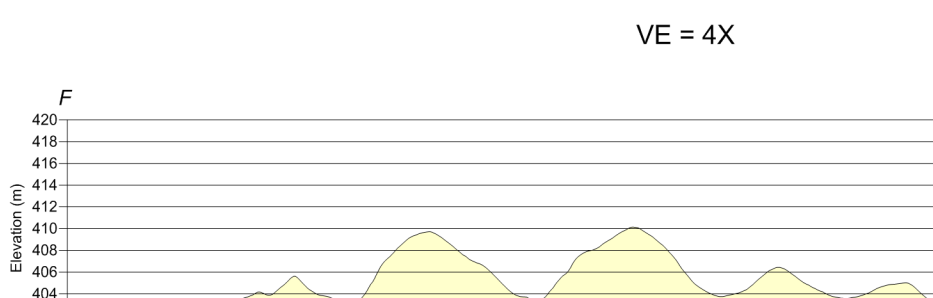
Topographic section C-C' oriented from the northwest to the southeast across the central high dunes area. Steep dune slopes are found on the northwest facing bounding slope of the dune complex and gradually decrease in elevation across the dune complex towards the southeast.



Topographic section D-D' oriented from the northeast to the southwest across the central high dunes area. Gradual dune slopes are found on the northeast facing slopes and steeper slopes occurring on southwestern facing slopes.



Topographic section E-E' oriented from the northeast to the southwest across the southern high dunes area. Steep dune slopes are found on the bounding dune complex slopes oriented to the northeast and southwest and more gradual slopes are found oriented towards the southwest.



Topographic section F-F' oriented from the northwest to the southeast across the southern high dunes area. Steep dune slopes are found in both orientations along strike of the section across the dune complex.

SOUTHERN HIGH DUNES

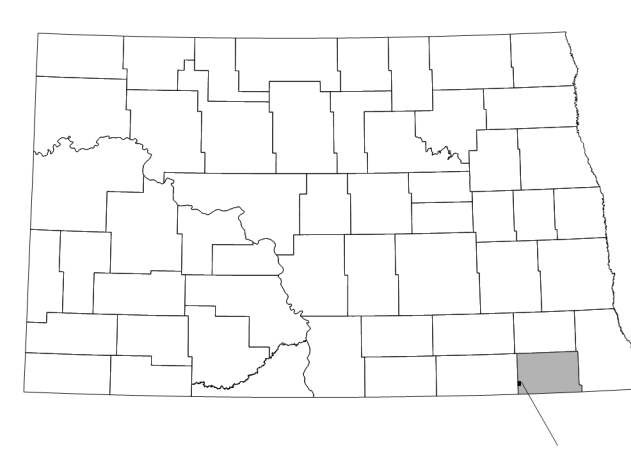
Dune Complex Characteristics
Length: 596.36 m (1,956.56 ft)
Width: 384.04 m (1,259.97 ft)
Height (Maximum): 17.93 m (58.83 ft)
Perimeter: 1,759.32 m (5,800.16 ft)
Area: 204,042.04 m² (669,429.27 ft²)

CENTRAL HIGH DUNES

Dune Complex Characteristics
Length: 499.73 m (1,639.53 ft)
Width: 158.58 m (520.28 ft)
Height (Maximum): 15.52 m (50.92 ft)
Perimeter: 1,444.45 m (4,739.01 ft)
Area: 131,499 m² (431,427.17 ft²)

NORTHERN HIGH DUNES

Dune Complex Characteristics
Length: 276.13 m (905.94 ft)
Width: 158.58 m (520.28 ft)
Height (Maximum): 15.31 m (50.23 ft)
Perimeter: 1,039.48 m (3,410.37 ft)
Area: 42,633.77 m² (139,874.57 ft²)

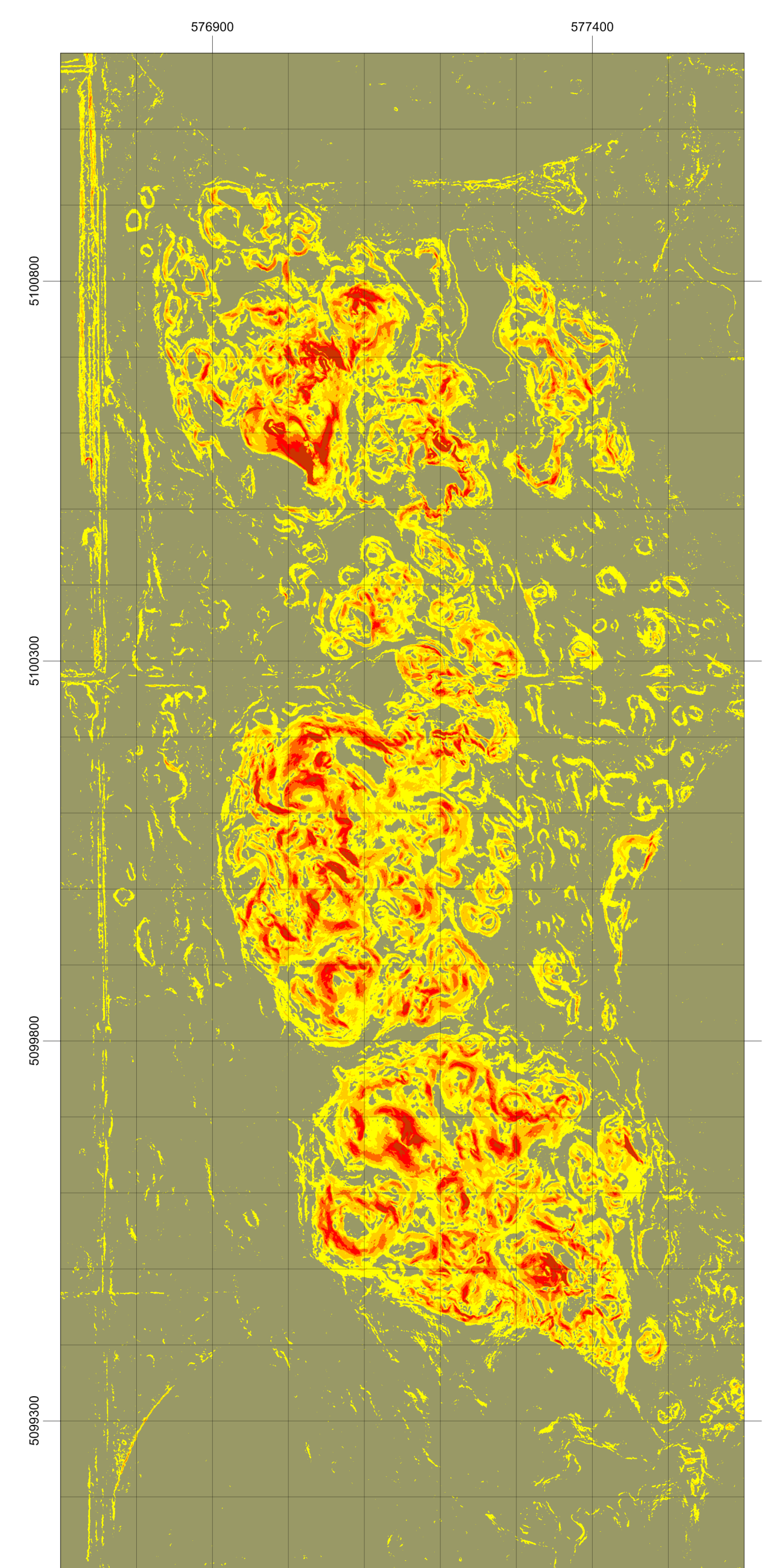


R. 58 W.					
6	5	4	3	2	1
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36
T. 130 N.					

REFERENCES

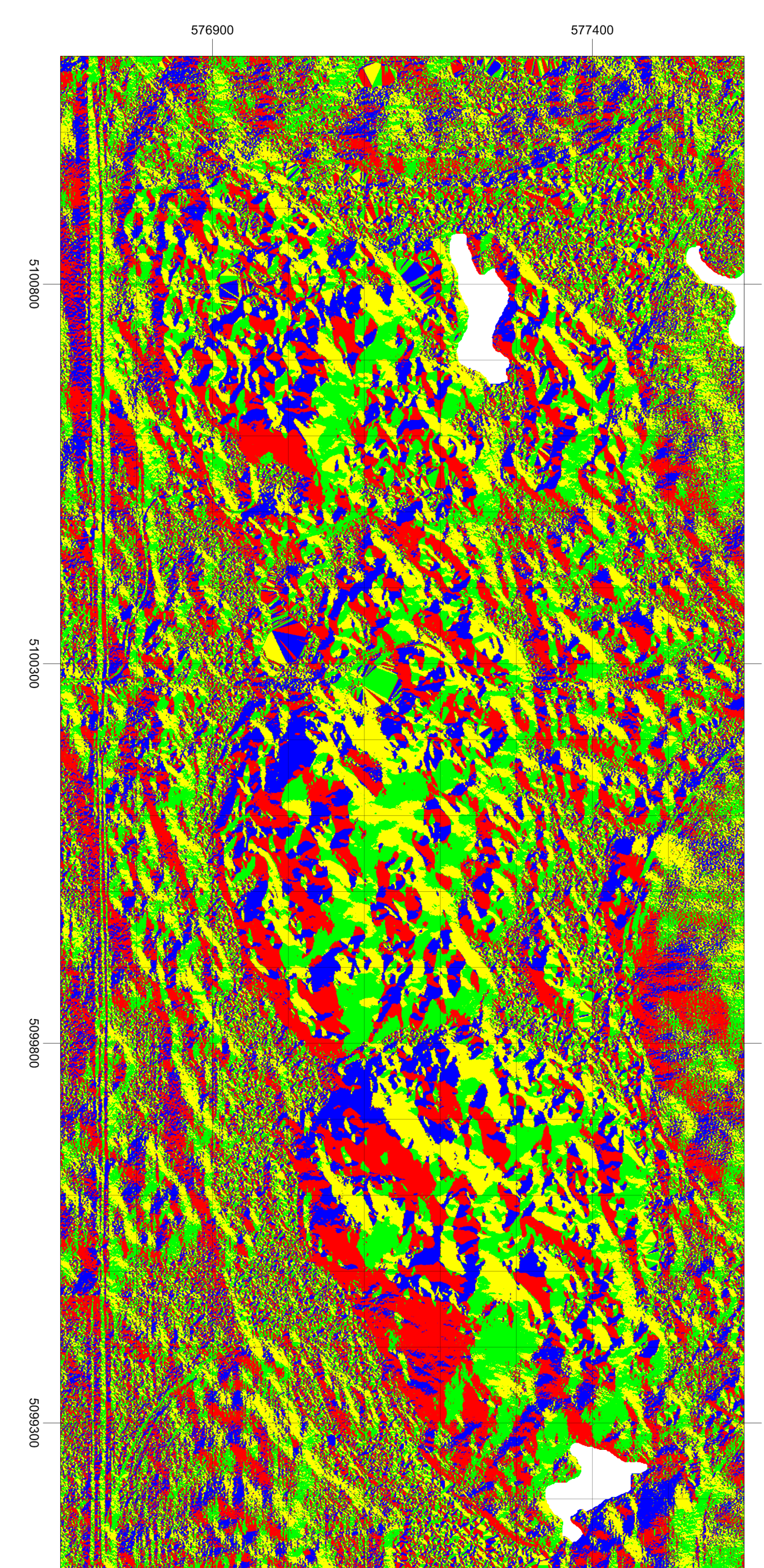
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TOPOGRAPHIC SLOPE MAP



Topographic slope map of the Riverdale Ridge High Dunes area in southwestern Sargent County, North Dakota. High degrees of slope (or steepness), shown here in degrees, are the areas where the rate of change in elevation per horizontal distance is greatest. Areas where gentle slopes are shown generally indicate areas on the windward side of a dune. Conversely, areas with steeper slopes generally indicate the lee side of the dune where deposition of the dune is occurring. Orientation of linear features within the low-relief dunes morphology also suggest dominant wind directions from the northwest.

TOPOGRAPHIC ASPECT MAP



Topographic aspect map of the Riverdale Ridge High Dunes area in southwestern Sargent County, North Dakota. Aspect is the orientation in compass degrees of the steepest axis of slope. The orientation of dune slope faces is depicted here in 90 degree classes. Analysis of aspect orientation suggests primary wind transport directions from the northwest and southeast.