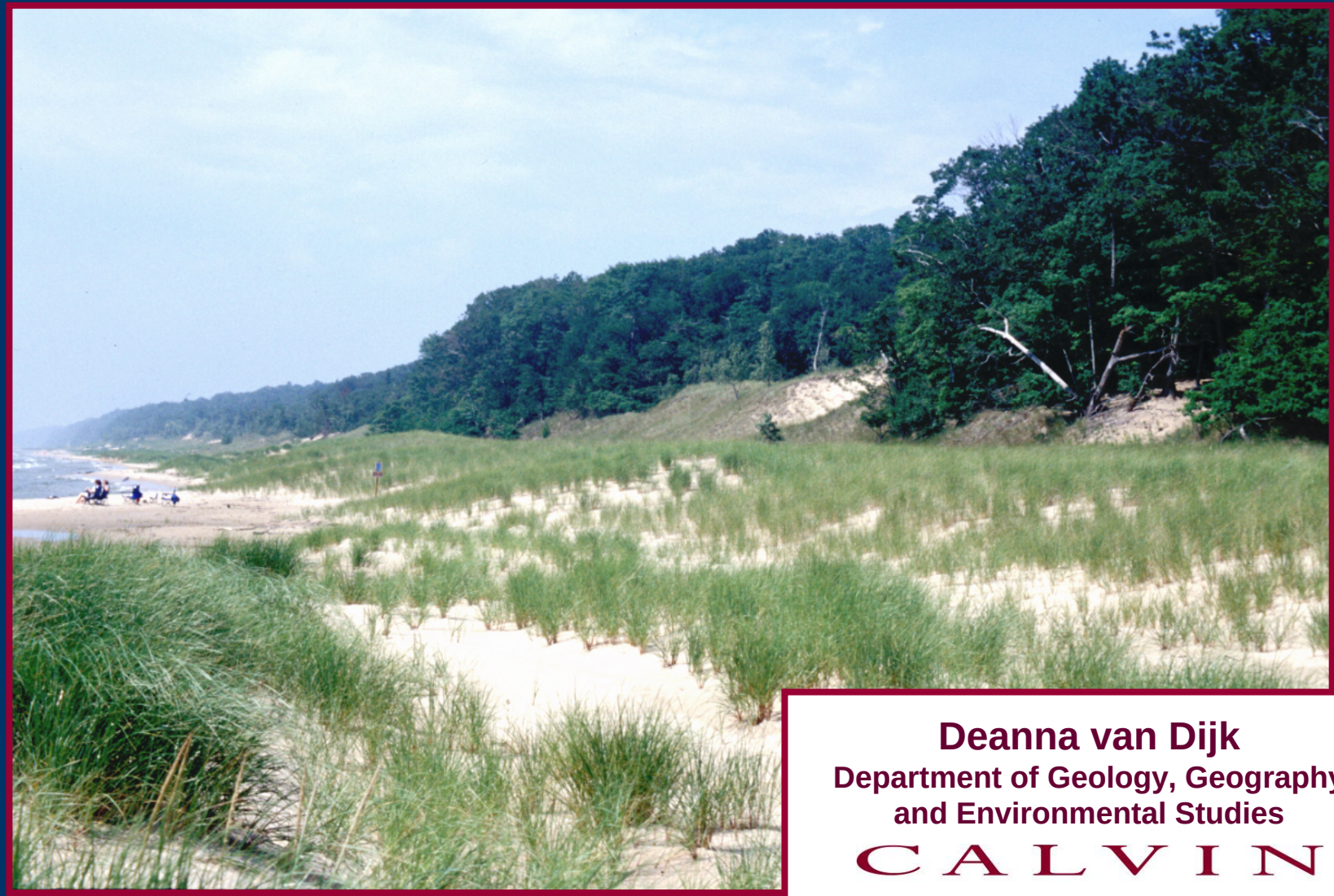
Contemporary Geomorphology of Great Lakes Dunes

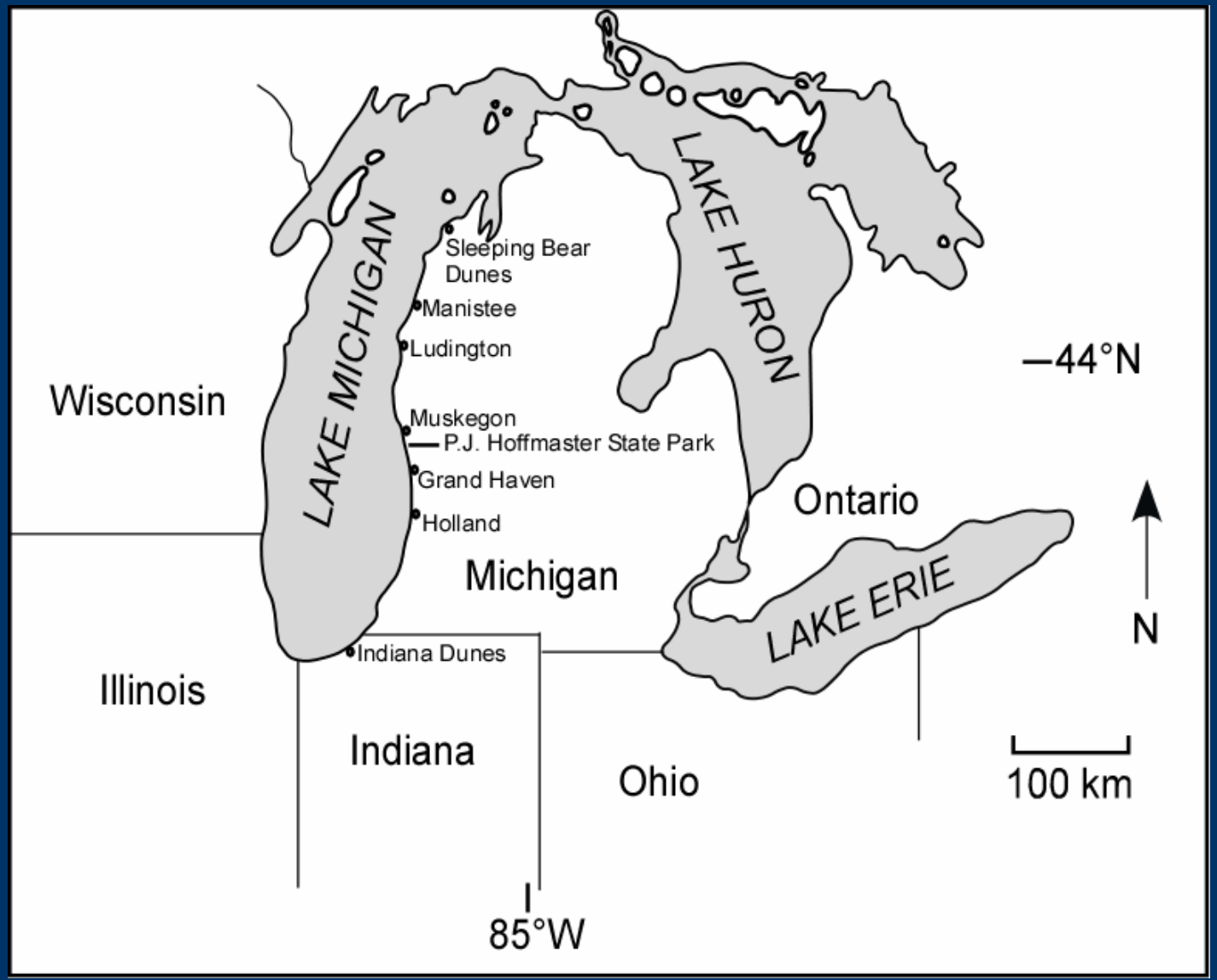


Deanna van Dijk
Department of Geology, Geography and Environmental Studies
CALVIN
College

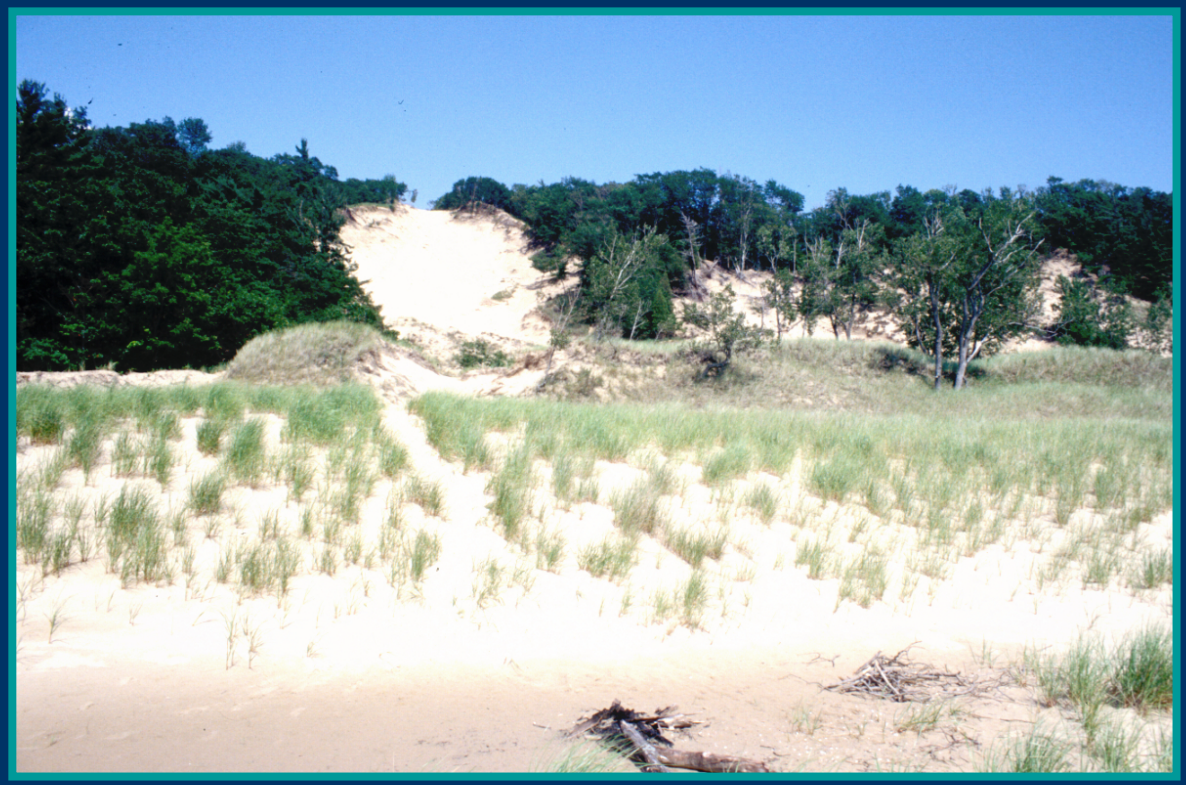
Introduction

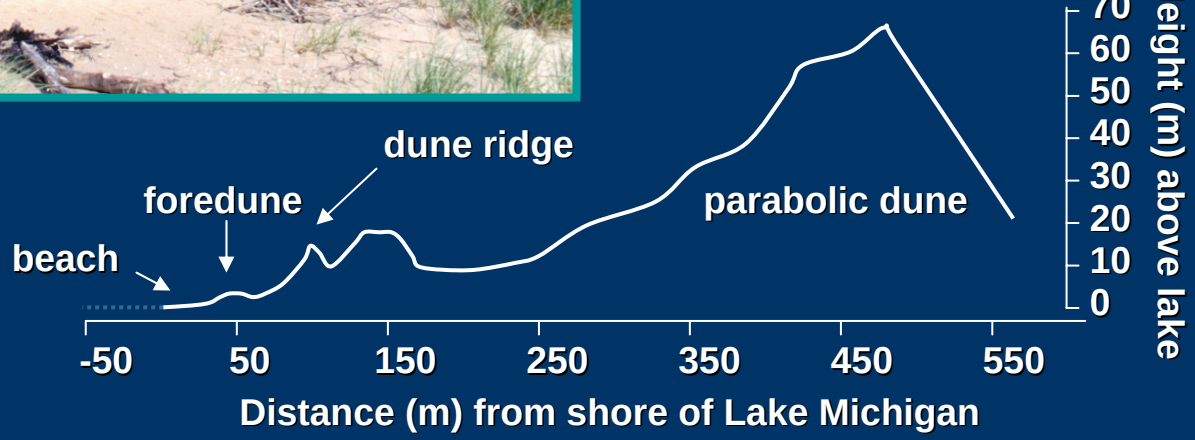
Research Objective: To study how contemporary processes are changing Lake Michigan coastal dunes.

Study Location



Study Location Geomorphology





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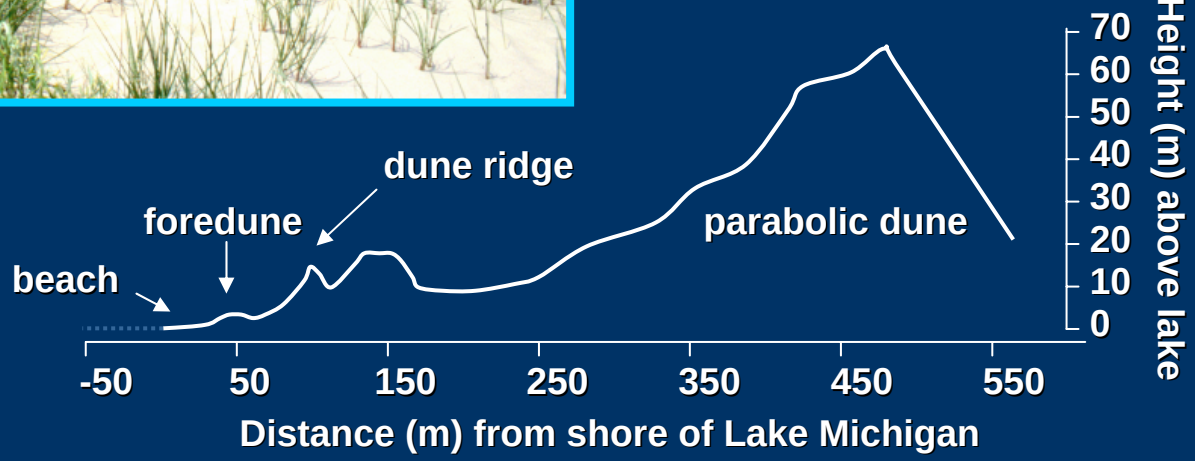

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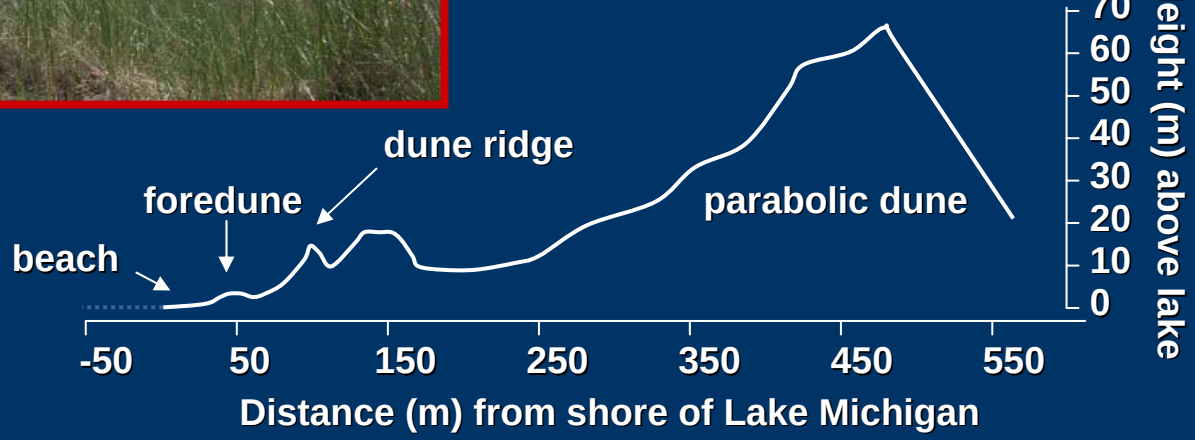
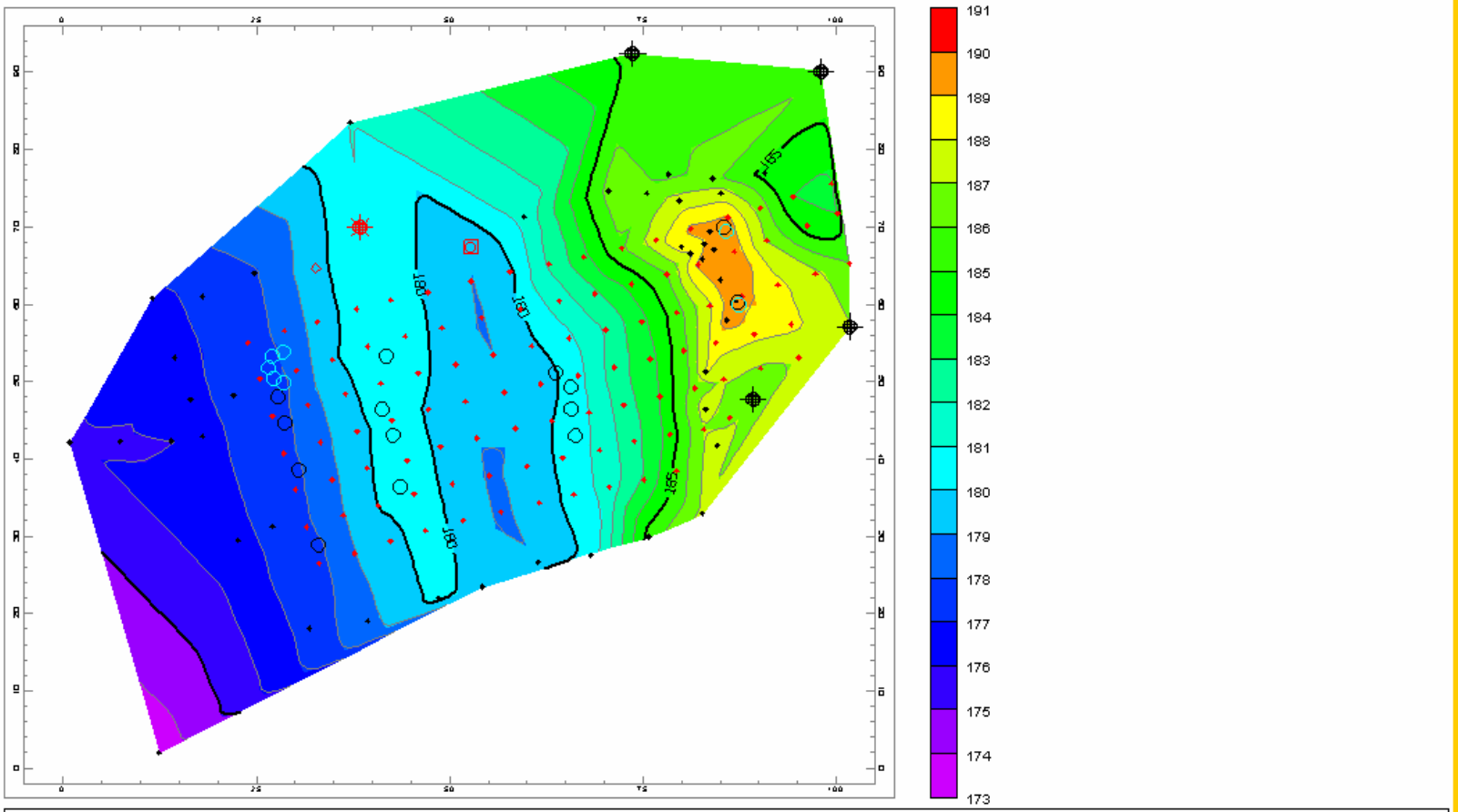


Study Methods



Hoffmaster State Park Study Area

12 April 2003

N

- Survey Point
- Erosion Pin
- Sand Trap (Leatherman)
- Sand Trap (Winter)
- Benchmark
- Instrument Tower
- Shed and Solar Panel
- Soil Temperature Probes

Elevations are meters above sea level.
Lake Michigan level in April 2003 was 175.81 m.
Contour interval is 1 meter.
Scales along map borders are in meters.
N.B. Contour lines become less accurate near edges of map because there are less points for interpolation.

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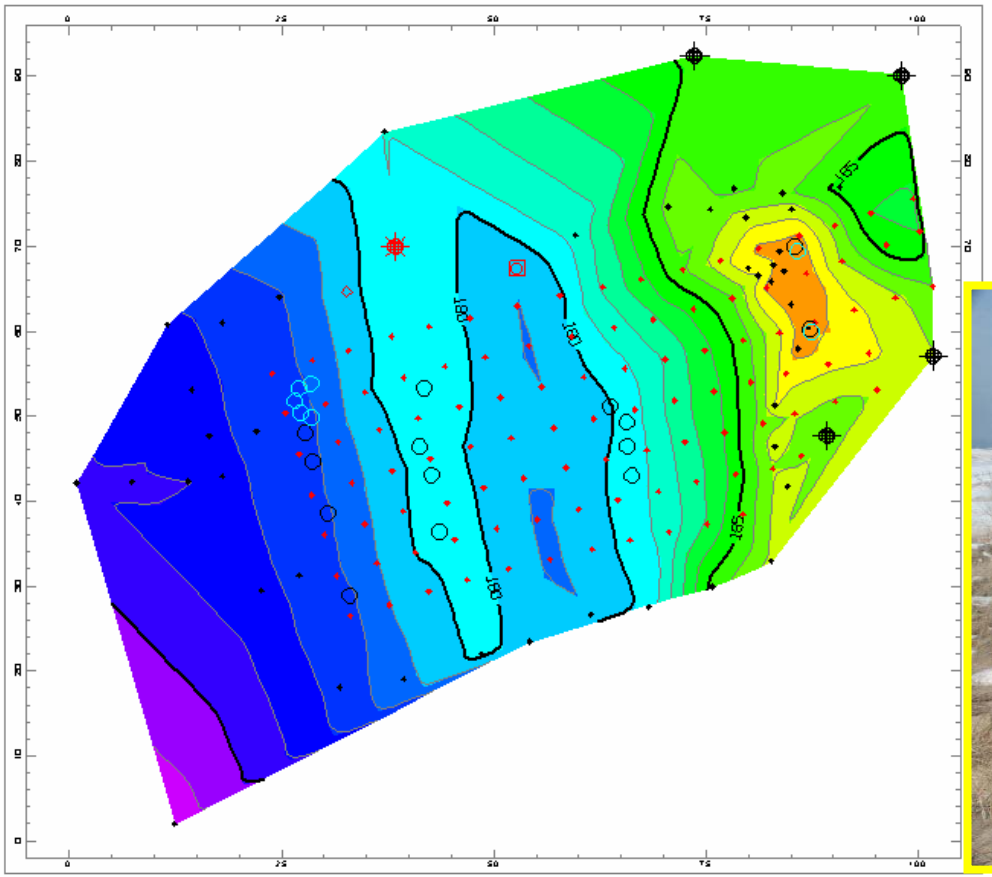

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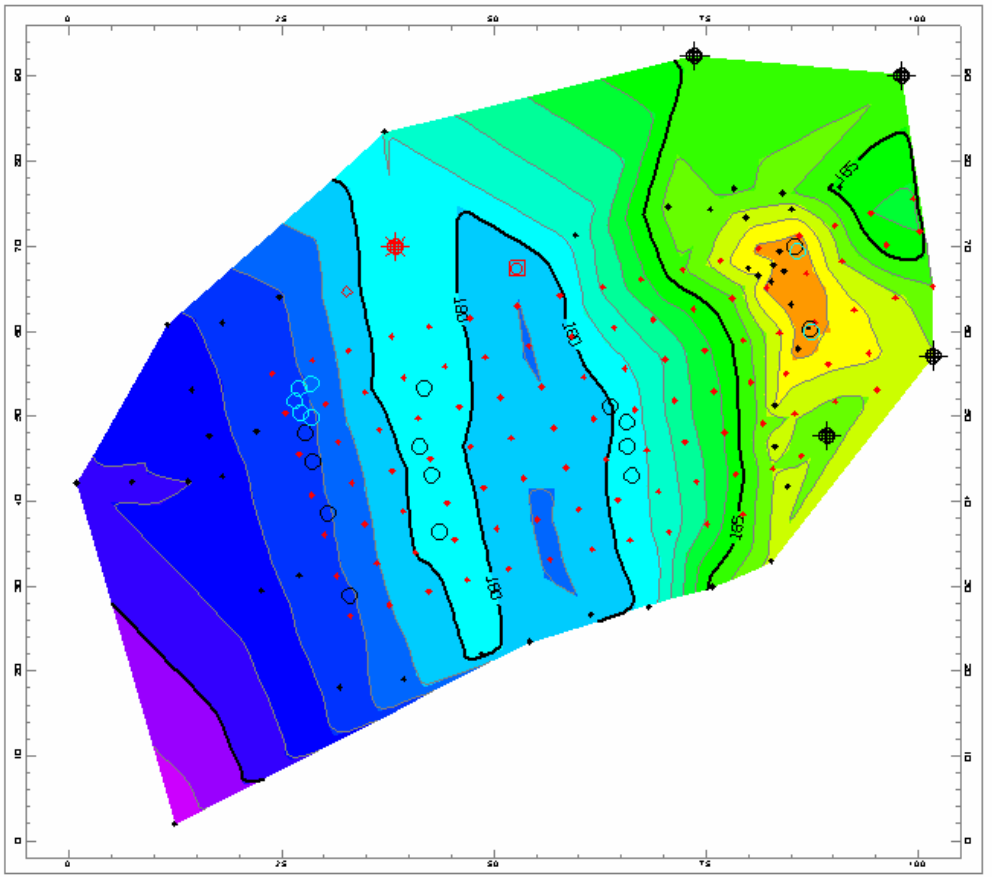

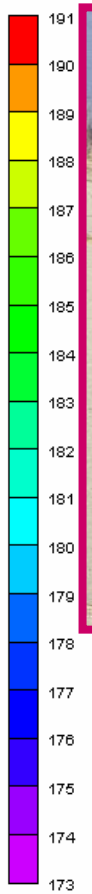

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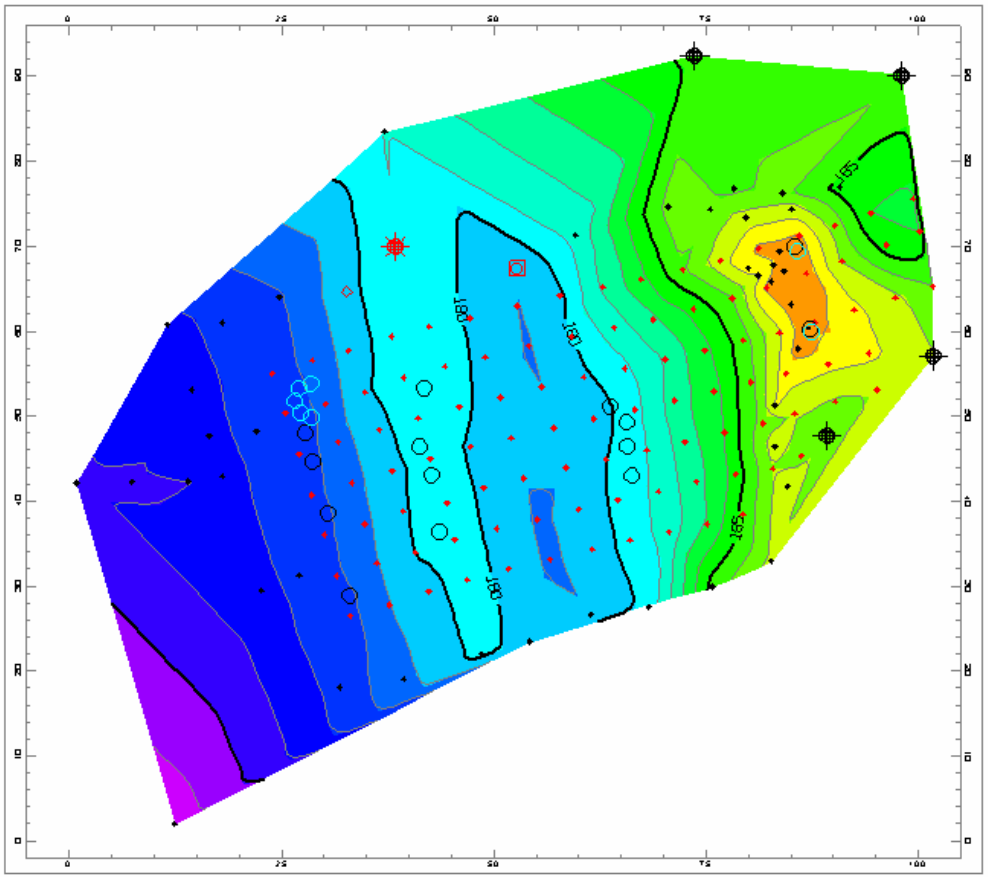

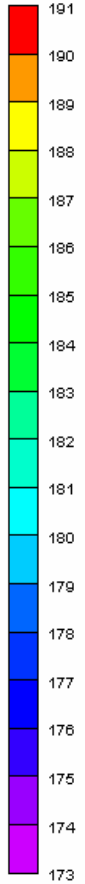

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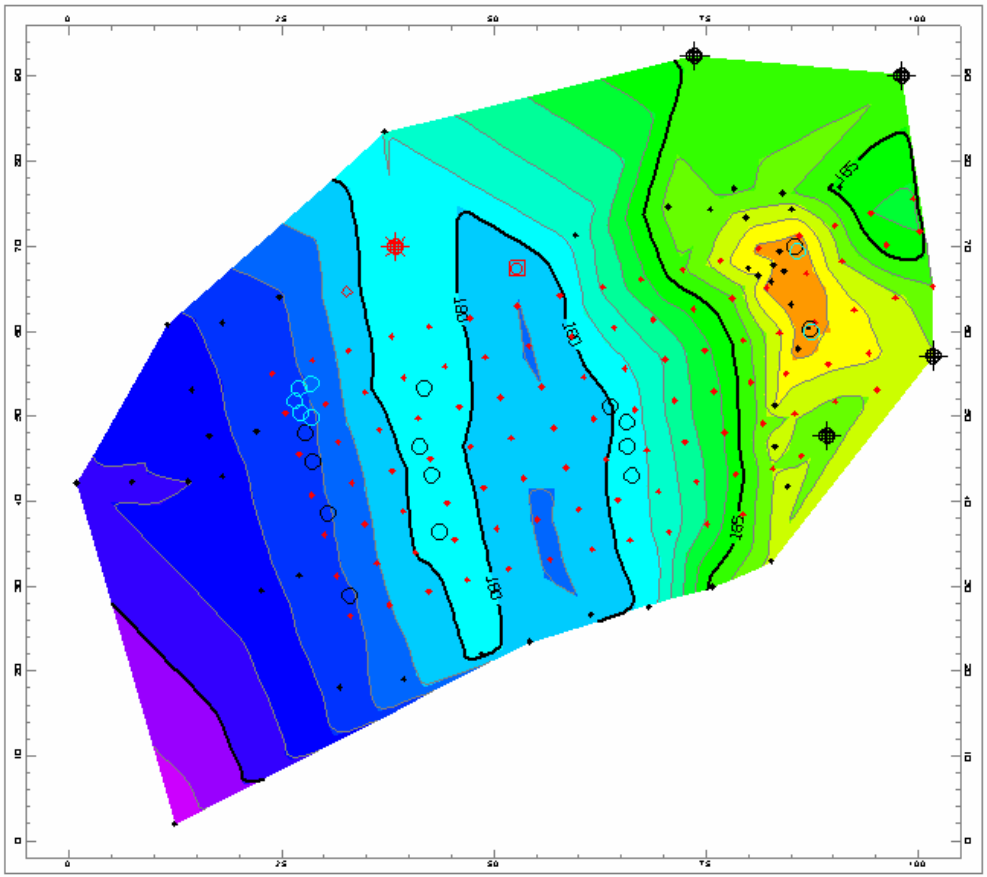

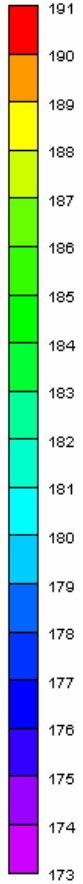

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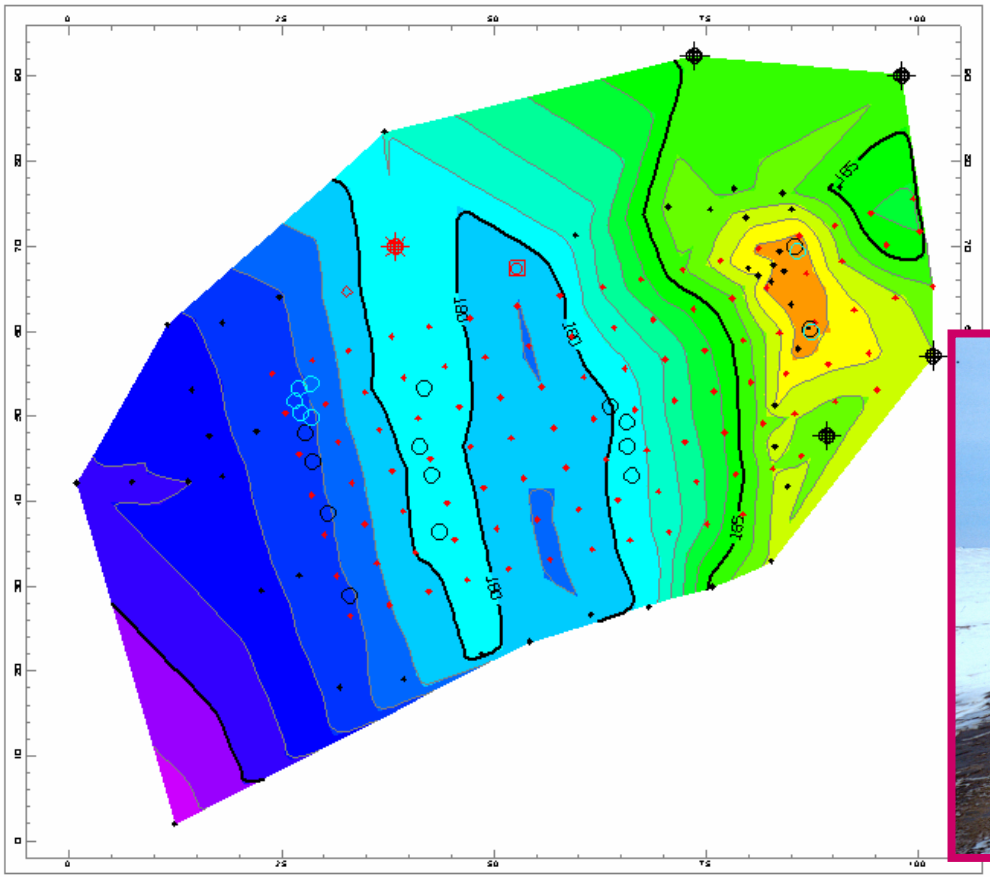

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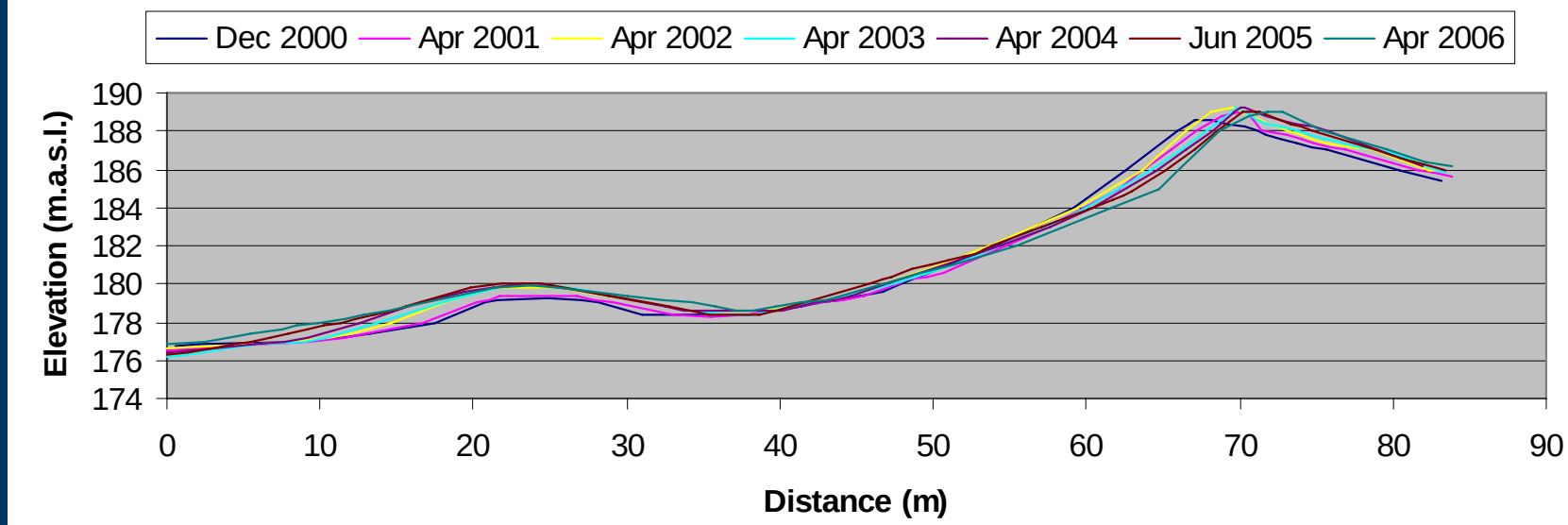
Results: Dune Changes



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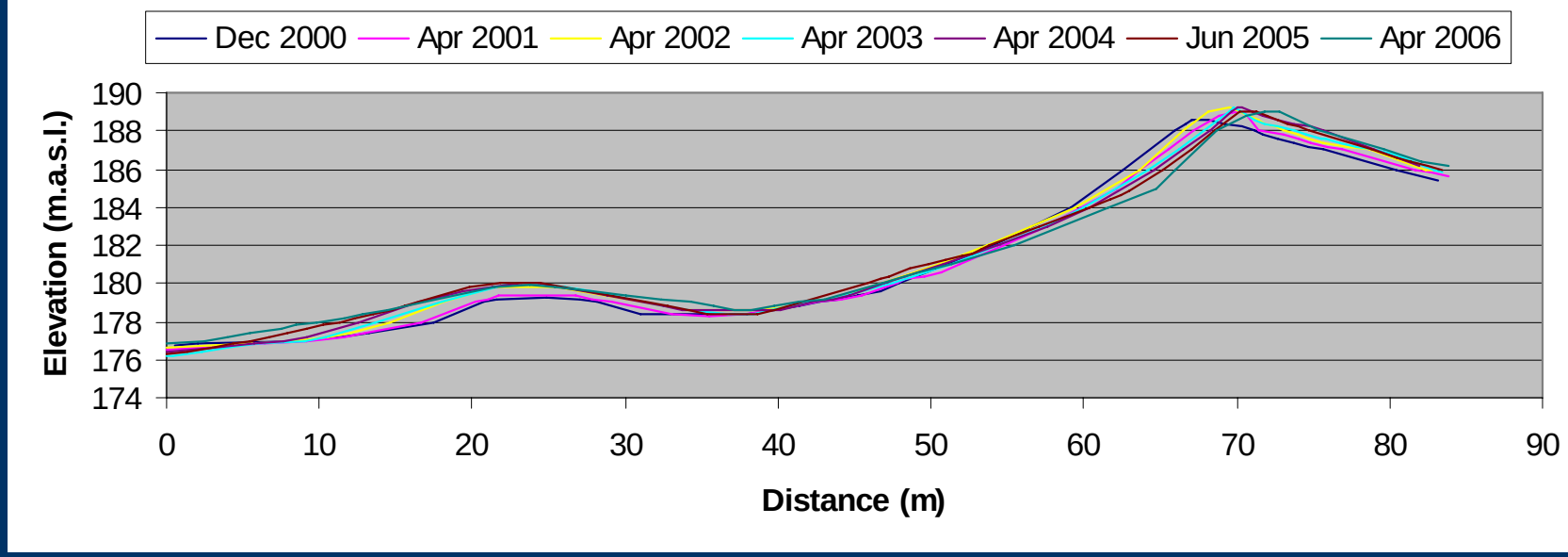
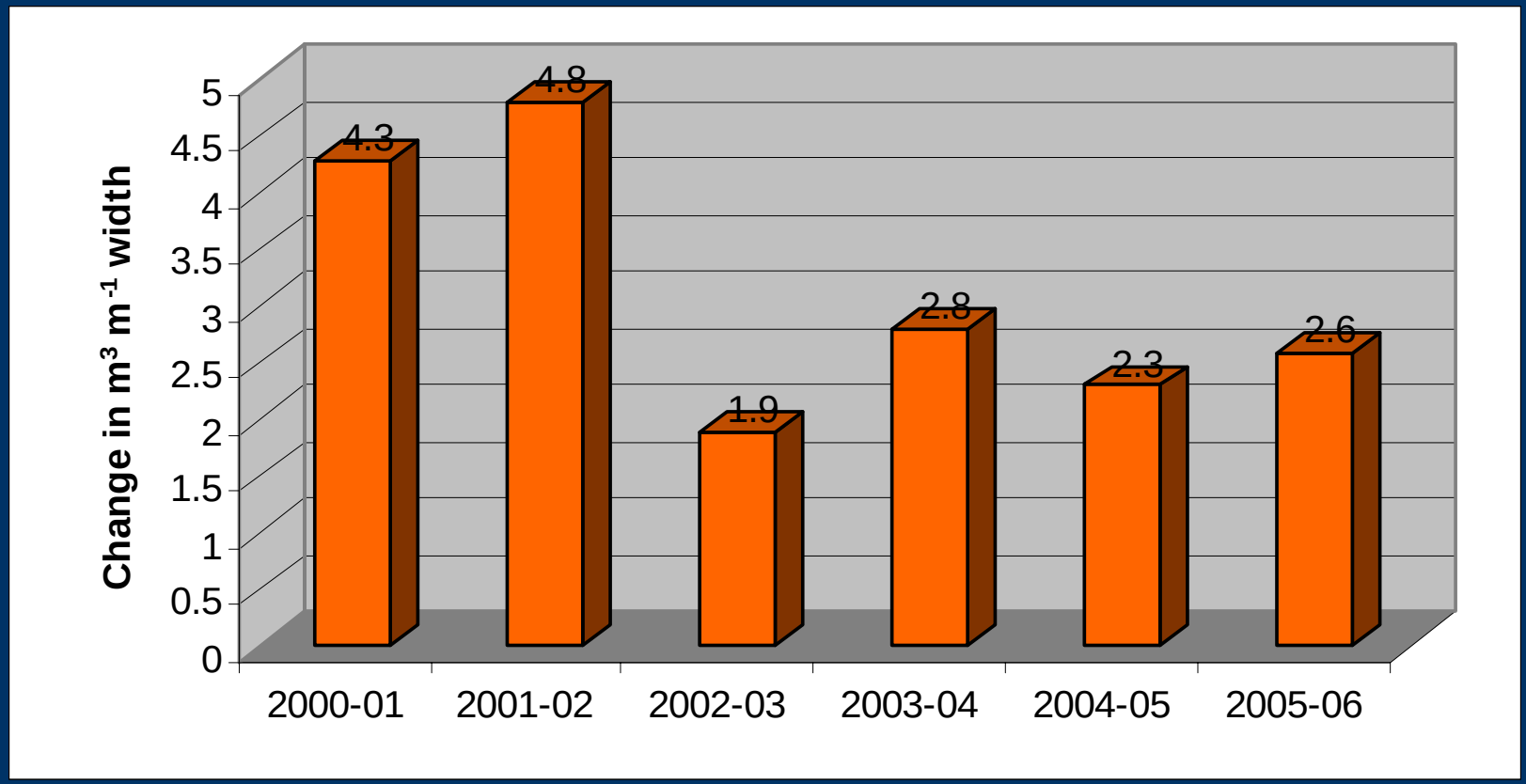
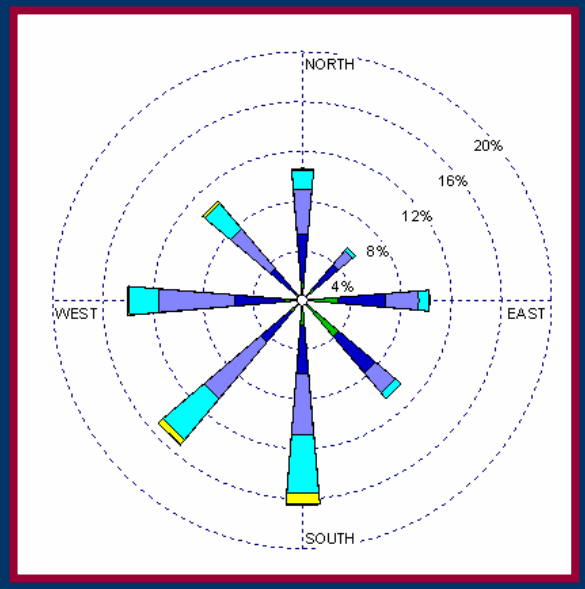
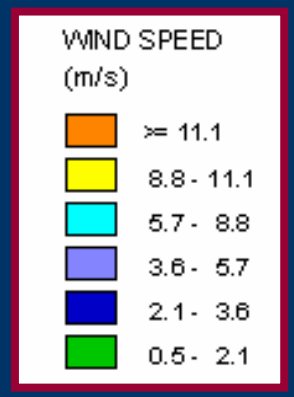


Results: Annual Rates of Change



Results: Seasonal Patterns



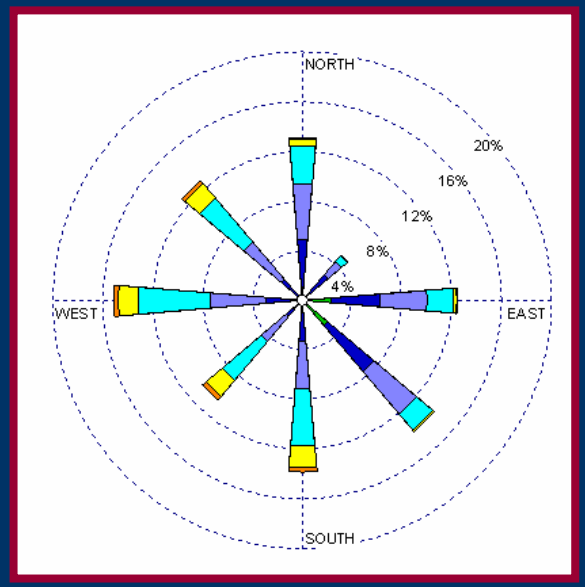


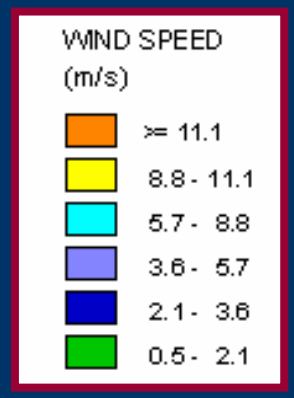
Summer

- weak winds
- dry sediments
- maximum vegetation growth
- estimated 0-10% annual dune change

1961-1990 wind data for Muskegon, MI, from National Weather Service

Results: Seasonal Patterns



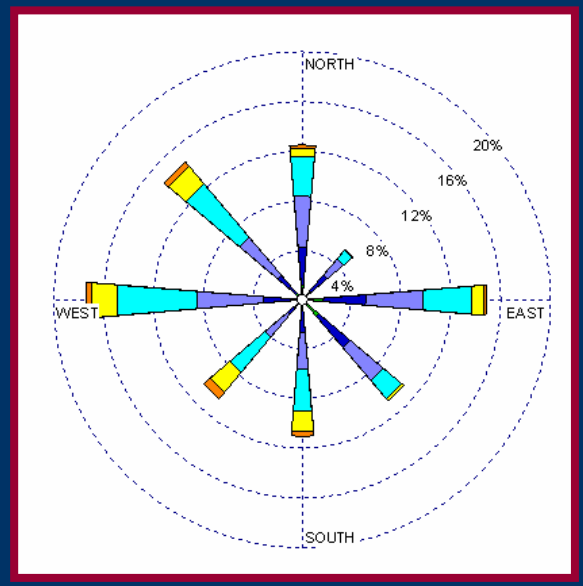


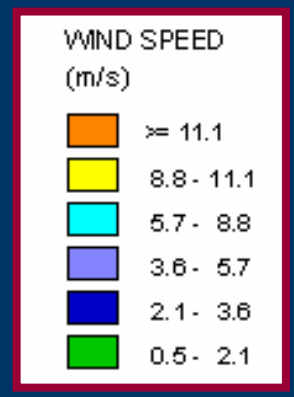
Autumn

- strong winds
- wet surface conditions
- variable beach width
- estimated 30-75% annual dune change

1961-1990 wind data for Muskegon, MI, from National Weather Service

Results: Seasonal Patterns



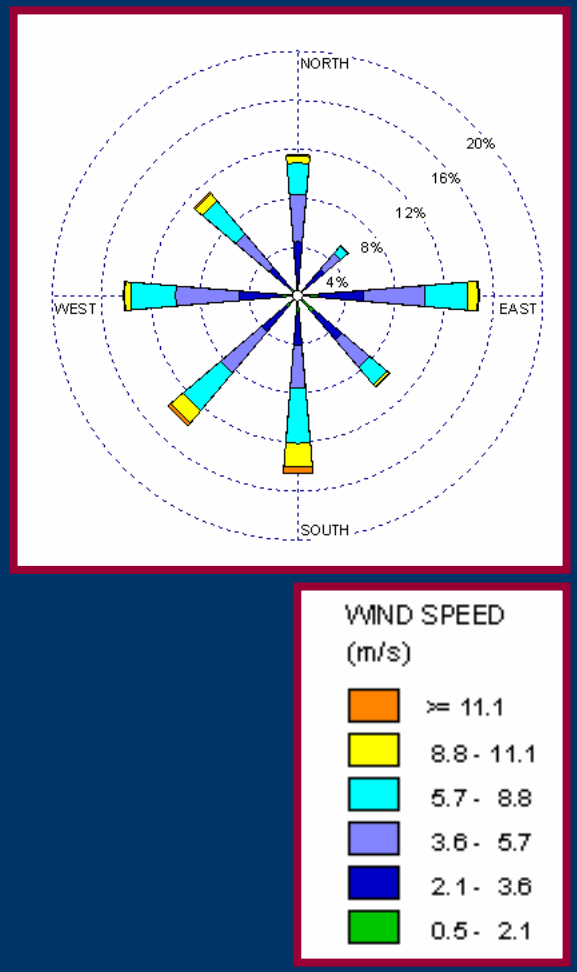


Winter

- strong winds
- variable surface conditions (snow, ice, frozen)
- niveo-aeolian transport
- estimated 25-50% annual dune change

1961-1990 wind data for Muskegon, MI, from National Weather Service

Results: Seasonal Patterns



Spring

- variable winds
- moist surface conditions (thawing snow ice, and niveo-aeolian deposits)
- estimated 15-35% annual dune change

1961-1990 wind data for Muskegon, MI, from National Weather Service

Conclusions...and applications

- Lake Michigan coastal dunes are complex and fascinating environments.
- We still have a lot to learn.

Conclusions...and applications

- Contemporary change is site specific…

Conclusions...and applications

- Contemporary change is site specific…
- …but some knowledge is transferable.

North Beach Park parabolic dune in January 2005

Conclusions...and applications

- **Effective management needs a solid understanding of site characteristics and contemporary processes.**

Mt. Pisgah (Holland, MI) in July 2005

Acknowledgements

- Many students and volunteers who provided field assistance.
- Michigan Department of Natural Resources for permission to work in P.J. Hoffmaster State Park.
- Elizabeth Brockwell-Tillman and the staff at P.J. Hoffmaster State Park for support and information.

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