Beach Erosion and Regional Sediment Management

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Typical Beach Profile

Coast

Dunes

Berms

Berm crest

Beach scarp

Backshore

Foreshore

Nearshore (through breakers)

Offshore

Longshore trough

Longshore bars

High tide

Low tide (dotted line)
Wisconsin Diverse Coasts with Natural Beaches

High Bluffs

Low Bluffs

Sandy Berms

Dunes
Beach Erosion Examples
Natural Beach Sediment Transport

**Longshore**
*Wave at an angle*

- *Longshore transport* moves with waves

**Cross-shore**
*Wave parallel*

- *Offshore transport* occurs naturally during storms
- *Onshore transport* occurs naturally during mild waves
Beaches vs. Water Level Changes

Lake Michigan water levels rapidly rise after record lows

Lake Michigan water levels see 'historic' rise

Lake Michigan Annual Average Water Level

2016

Beaches shrinking as Lake Michigan rises to near-record level
Beaches vs. Wave Seasonal Changes

- **Summer**: Beaches are wide and open, with plenty of sand.
- **Spring/Early Summer**: Sediment is gradually being transported by waves.
- **Fall**: Beaches are narrower as sediment is transported offshore.
- **Winter/Late Fall**: Beaches are reduced to rocks and pebbles as sediment is transported out to sea.

*Beach sediment is transported naturally by waves.*
Coastal Structure Beach Alteration

Revetments

Ozaukee County

- Protected uplands
- Beach loss in front of revetment
- Adjacent beach and bluff erosion
Coastal Structure Beach Alteration

Groins & Jetties

Racine County

• Maintained beaches
• Longshore sediment drift trapped (Down drift beaches eroded)

Milwaukee County
Coastal Structure Beach Alteration
Offshore Breakwaters

Milwaukee County

- Stabilized beaches and bluffs
- Dangerous currents!
- Possible water quality concern
- Adjacent beaches eroded

Lake Forest, IL
Summary

• Wisconsin’s beaches are ecologic, economic, and cultural assets.

• Fluctuating lake levels either rapidly drown or expose beaches.

• Unbalance of longshore and cross-shore sediment transport will affect beach stabilization.

• Coastal structures (revetments, groins, offshore breakwaters) mitigate beach erosion but lead to coastal erosion elsewhere and other issues.

• “Integrated Beach Management” strategies needs to be developed and implemented. Beach Health, Safety & Stability!!
Comments or Questions ???????