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Bluff Stabilization along Lake Michigan, using Active and Passive Dewatering Techniques

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Problem:

Bluff recession along Lake Michigan's Coast causes substantial property loss annually.

Recession rates:- 1 to 2 ft/yr at study site over the past 135 years.

Engineered structures consistently fail to deter erosion:

- Typically designed to prevent toe erosion, while precipitation and groundwater discharge from the bluff face may be the governing factor in bluff failure.

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Phase II - Dewatering the site

- Developed plan to dewater with pumps in vertical wells & passive horizontal wells drilled into bluff face
- Plan included instrumentation of slope for remote monitoring of:-
  - displacement
  - groundwater levels
  - ground temperatures
  - atmospheric conditions
  - bluff face freezing

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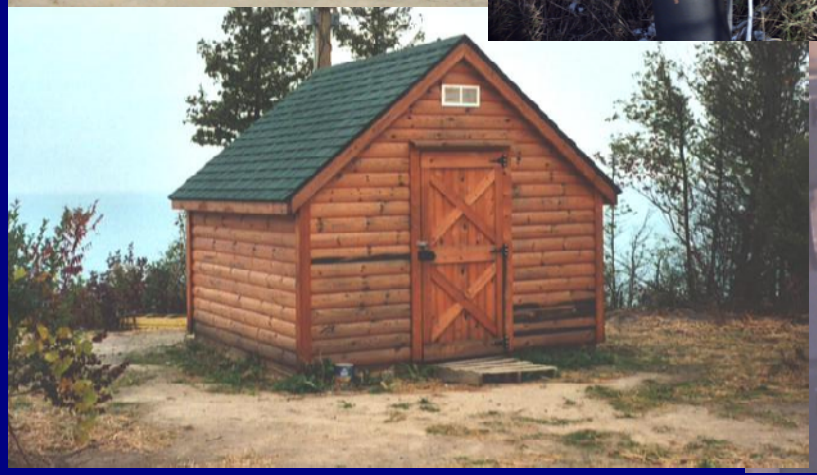

Conclusions of first year's dewatering efforts

- After bluff face froze, groundwater flow direction changed periodically
- Horizontal wells were not as effective as vertical wells
- Mean shear displacement in wells on dewatered site was about 2.83 in. per well
- Mean shear displacement in wells on control site was about 11.50 in. per well
- Removal of perched groundwater during the 2004-05 winter spring cycle created a three times more stable bluff than at control site
- Repeated experiments between now and 2009 will test repeatability of 2004-05 results

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