

# Geochemical Signatures for Monitoring & Tracking Sediment for RSM Projects

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RSM Webinar

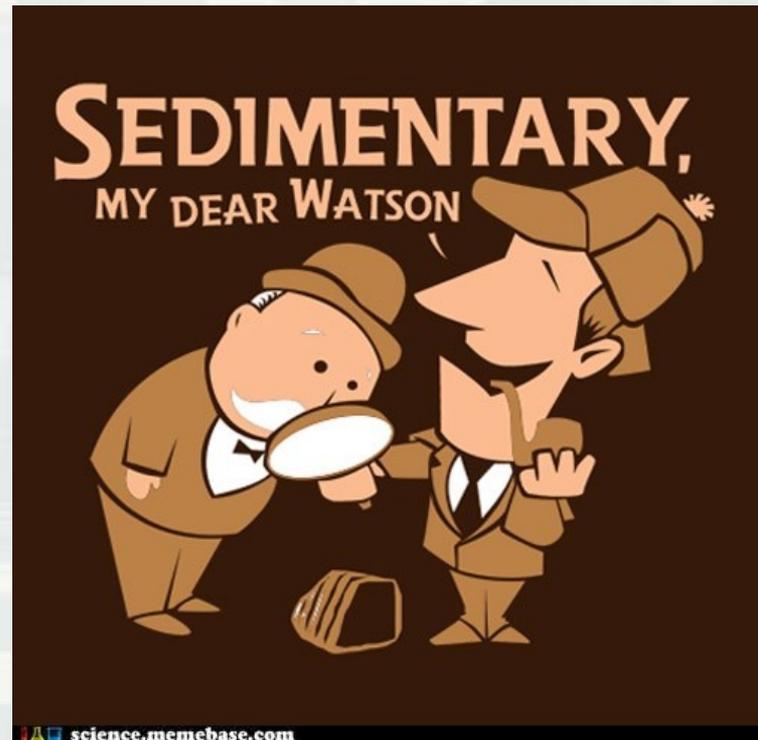
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# How Geochemical Signatures Can Help

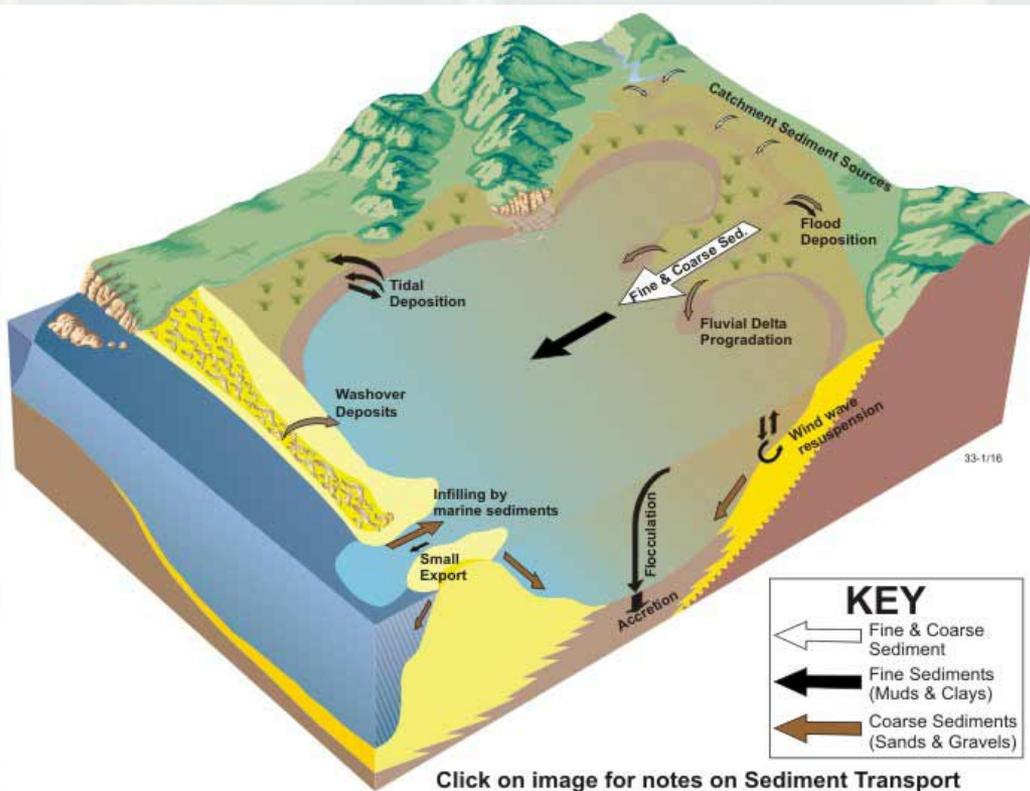
Two key questions that we heard at the RSM meeting:

- Where is the sediment in my project area coming from and how is it getting there?
- What can we do to better satisfy monitoring requirements during/after sediment placement?



# Where is my sediment coming from?

Know your drainage basin & potential sources. Sediments often have signatures that identify environments they originate from.



- Marine vs Terrestrial Sediment
- Urban vs Rural Sediment
- Surface vs Gully Sediment

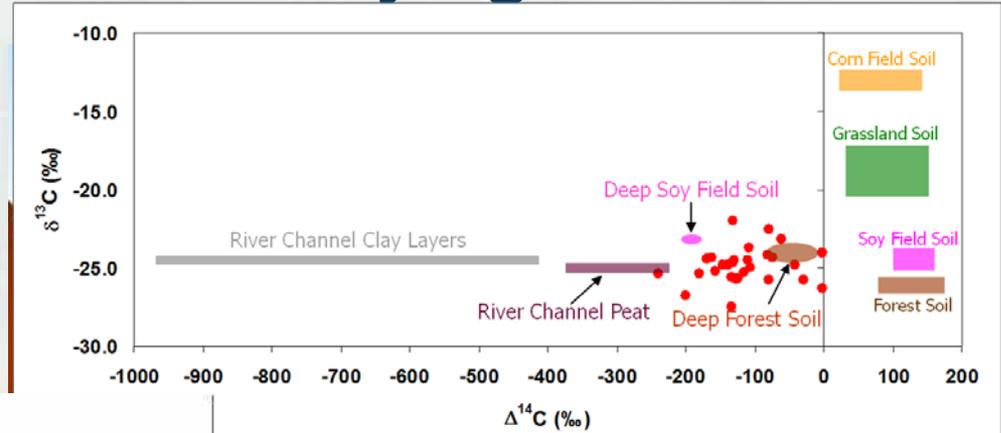


# Chemical Tools for Identifying Sources

- Stable Isotopes

- $^{13}\text{C}$
- $^{15}\text{N}$

- Radio Isotopes



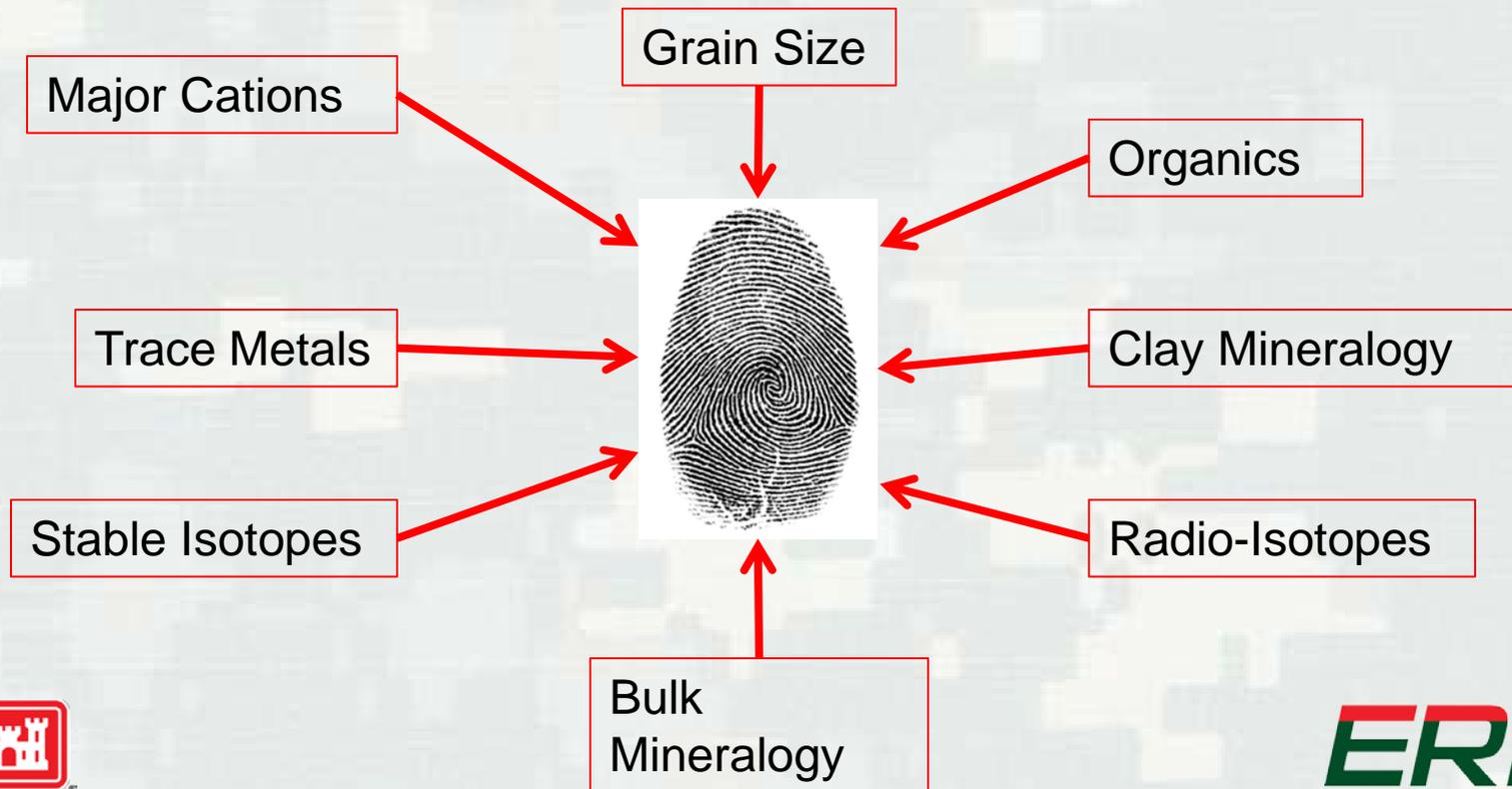
Time Scales	High Nitrate-N	Low Nitrate-N
~3 months)	-----	
to ~6 months)	-----	
up to ~80 years)	-----	
to ~50 years)	-----	
to ~50kya)	-----	
sample is older,	-----	





# Combining Parameters

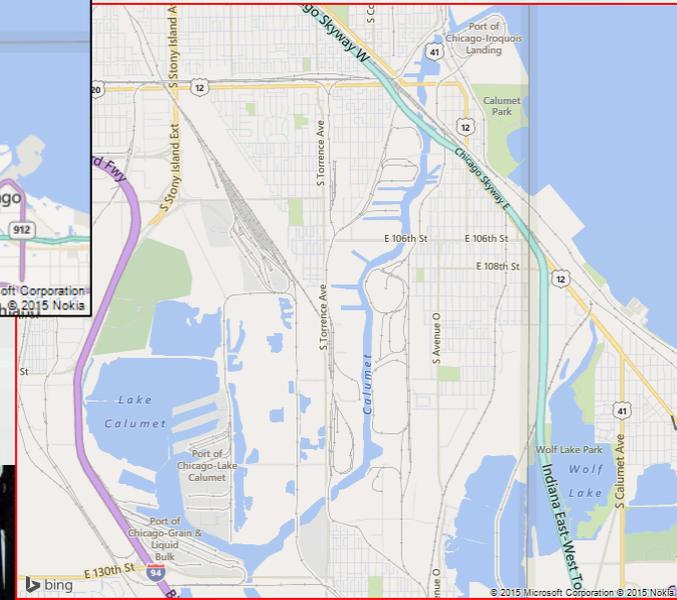
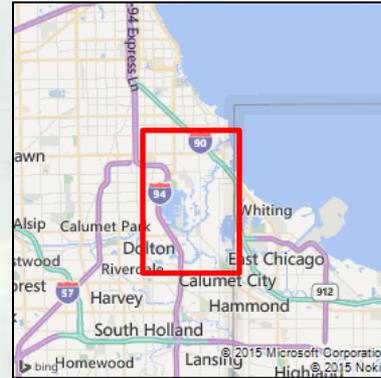
- Multiple geochemical properties combined together can often provide a unique fingerprint for identifying sediments.



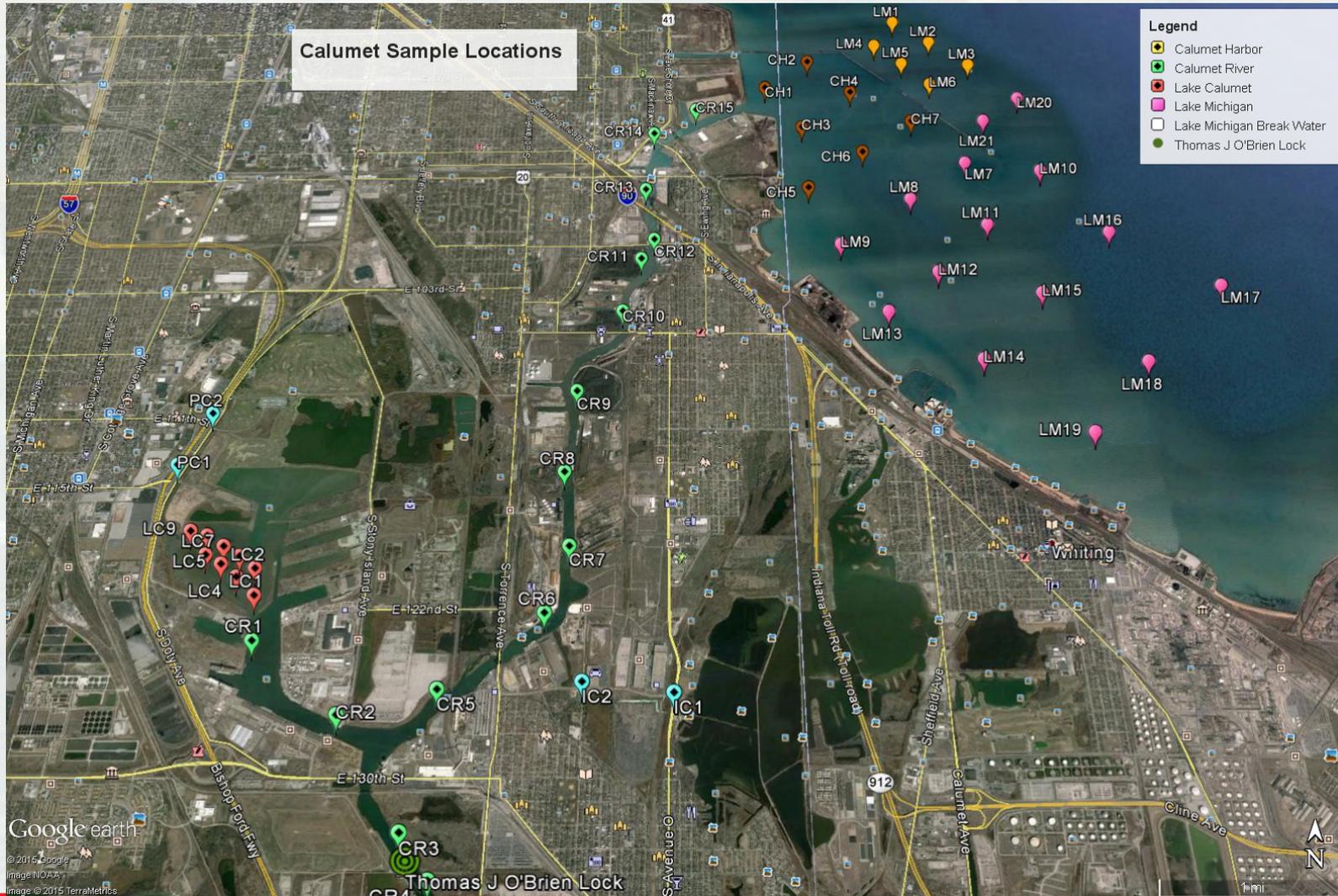
# Example Case Study: Calumet, IL

## Sediment Issue

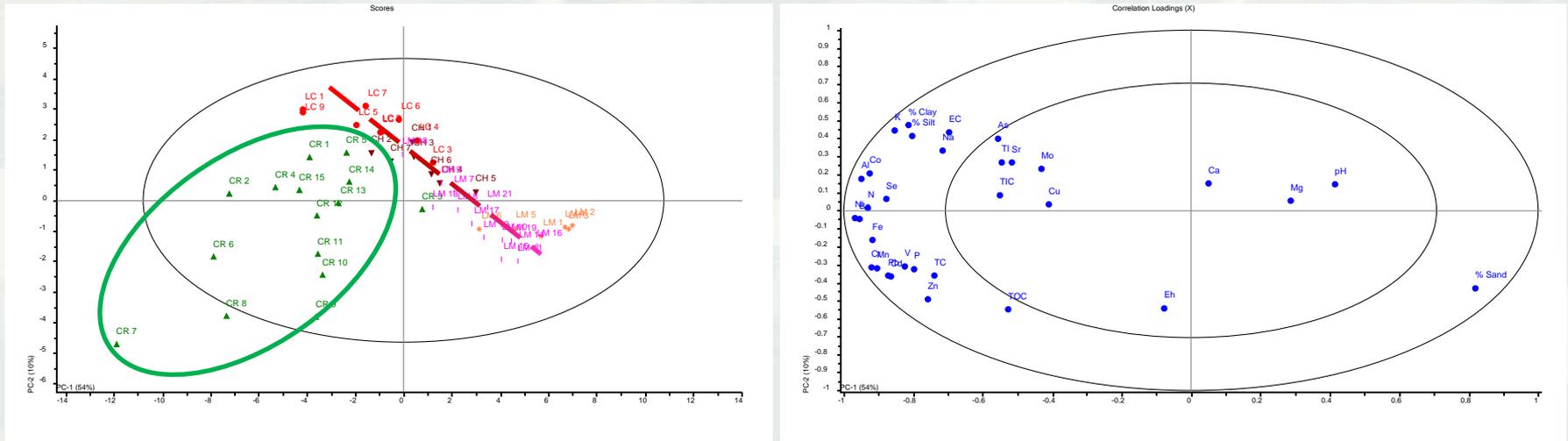
- Calumet River and Harbor routinely dredged
- Contamination levels currently too high for BU placement
- CDF near capacity
- Need to identify primary sources of sediment & contamination



# Calumet Sample Map



# Unique signature of Samples



Calumet PCA plot: Sample clusters on left, components used for characterization on right

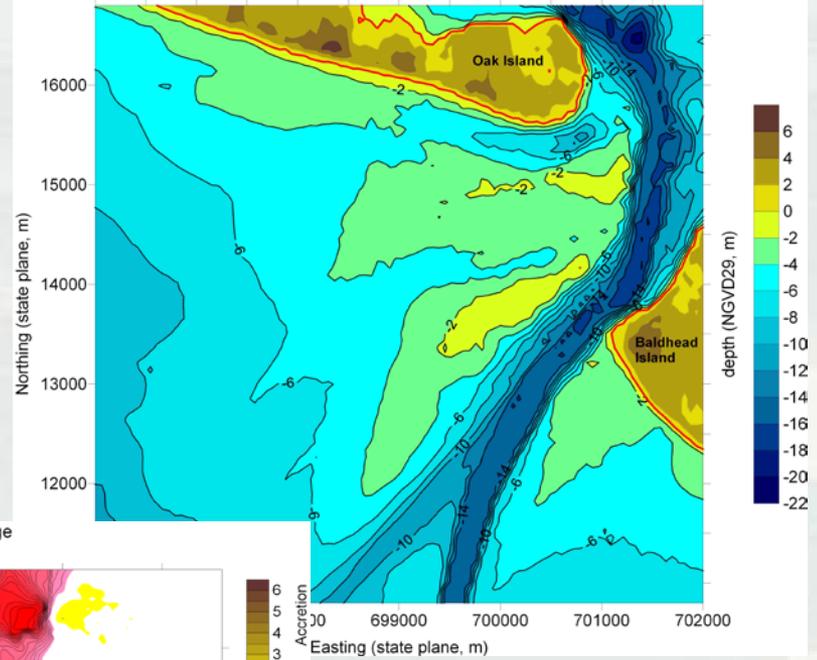
- LC, CH, & LM samples fall on gradient trend line
- CR samples group separately from other samples



# Unique Signature helpful in Monitoring

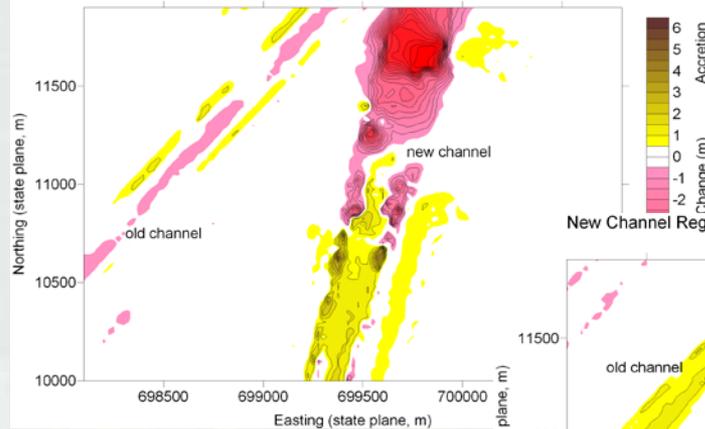
- Sediment fingerprint can also be used for tracking/monitoring sediment movement
- Provides additional information to bathymetry/topographic surveys or turbidity monitoring
- Can also provide infilling rates if desired by including radioisotope analysis

Cape Fear River ebb tidal delta bathymetry: January, 2008

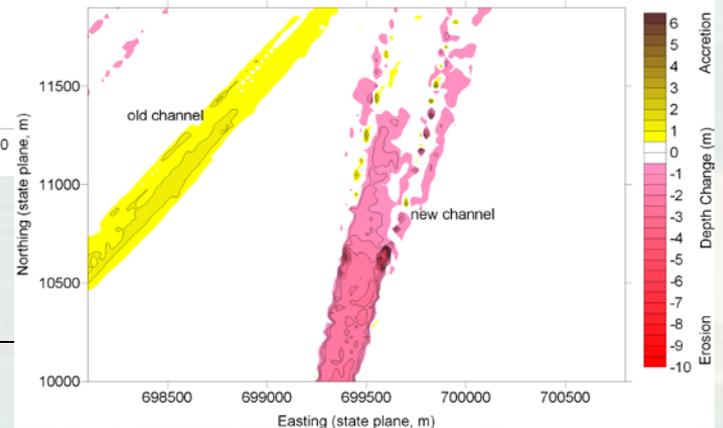


Yearly variation in erosion/accumulation in newly dredged channel, Cape Fear River, NC

New Channel Region: 2001 - 2002 change



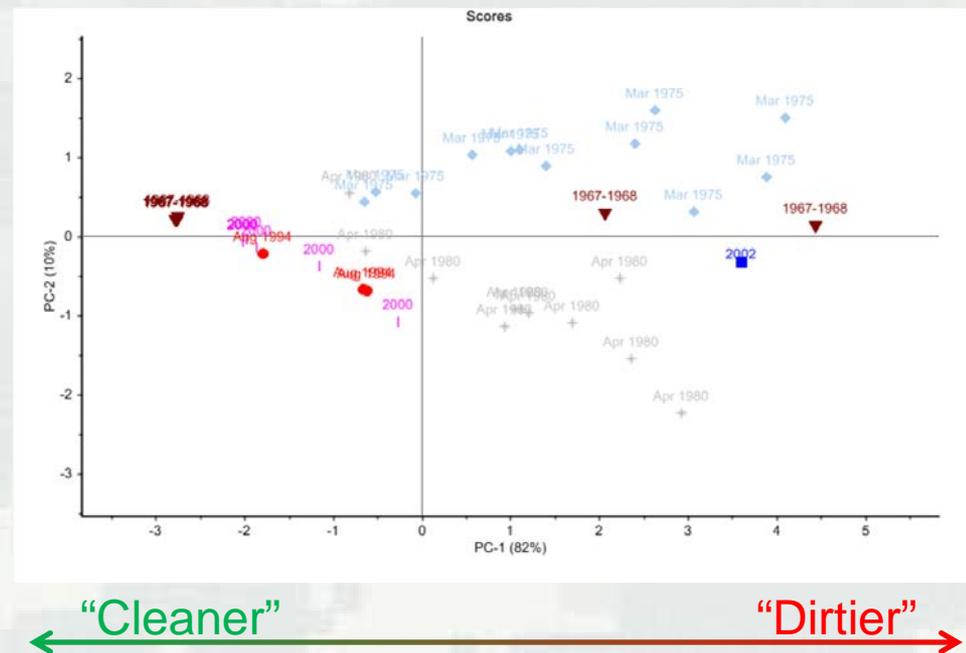
New Channel Region: 2002 - 2004 change



# Great, but what about the added cost?!

- Analysis done for regulatory & compliance reasons can also be used for fingerprinting:
  - ▶ Grain size
  - ▶ Trace Metals
  - ▶ Nutrients
  - ▶ pH
  - ▶ Others
- Compile all these measurements to look for unique signature
- Adding a selected parameter to help provide fingerprint may not be significant cost increase

- Historic Calumet Dredge Data
  - ▶ 14 of 30 parameters used in our PCA analysis were already being collected



# Summary

- Geochemical signatures can help identify sediment sources
- A unique sediment fingerprint can be valuable in monitoring and tracking movement
- Sediment parameters measured for regulatory & compliance reasons can also be used for fingerprinting



# Contact us for more Information

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