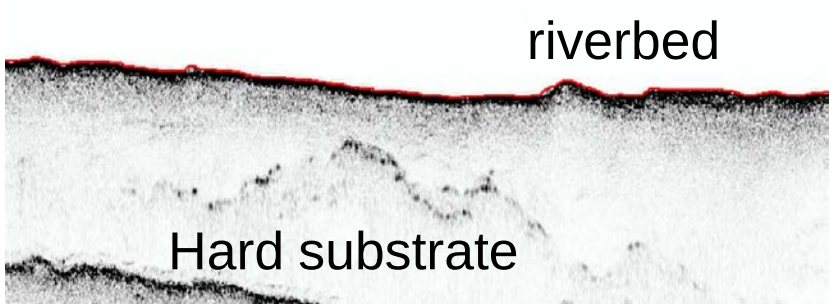
FY18 RSM IPR: Chirp Guidance
ERDC: Jesse McNinch & Heidi Wadman
MVM: Andy Gaines; MVS: Eddie Brauer

BLUF: Identify sampling protocols to maximize the use of acoustic (chirp) sub-bottom imagery for USACE projects.



Challenge/Objectives

- Chirp data have the potential to greatly improve USACE's mission
- No formal guidance, and little standardized training opportunities, on instrument selection, data collection, or data processing
- Risk embracing a potentially valuable data tool only to discard it because the returns do not justify the cost.

Approach

- Utilize previously collected data to determine cost/benefit of various collection strategies
- Identify basic standards for data collection
- Identify variables that need to be included in USACE standards
- Identify possible mechanisms to provide USACE training on purchasing, maintenance, data collection, and data processing.

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Spatial Sampling Protocol – Goldilock's Approach

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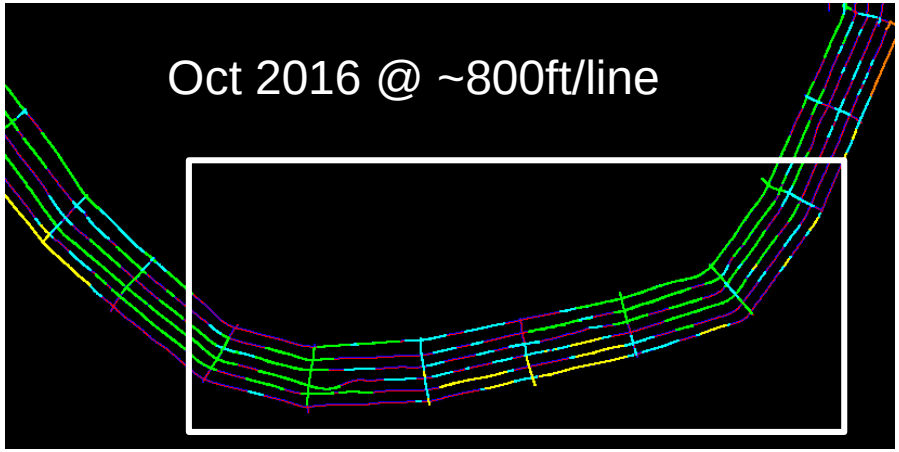
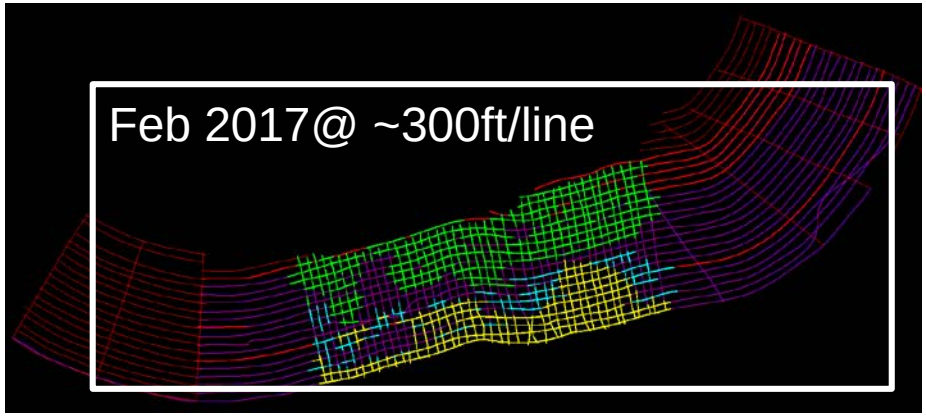


Leveraging/Collaborative Opportunities

-- Over 216 miles of chirp data previously collected in support of the Hickman Hardpoint study with ERDC

-- Multiple Districts currently attempting to incorporate this technology in a variety of ways



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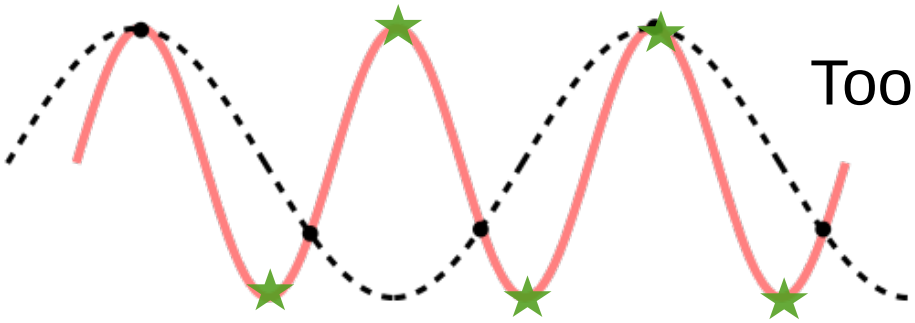
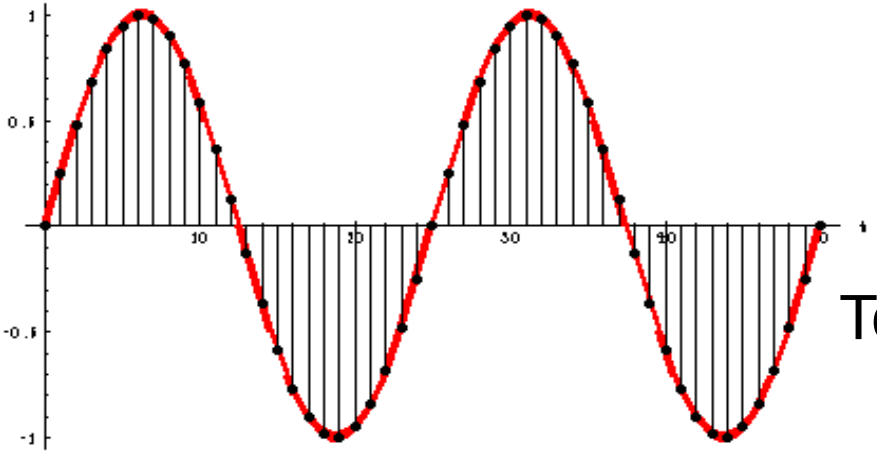
Spatial Sampling Protocol –
Nyquist Frequency for Spatial Features



Too few samples -- aliasing

Nyquist ~ Goldilock's

the minimum rate at which a signal can be sampled without introducing errors, which is twice the highest frequency present in the signal.



Too many samples -- $$$$

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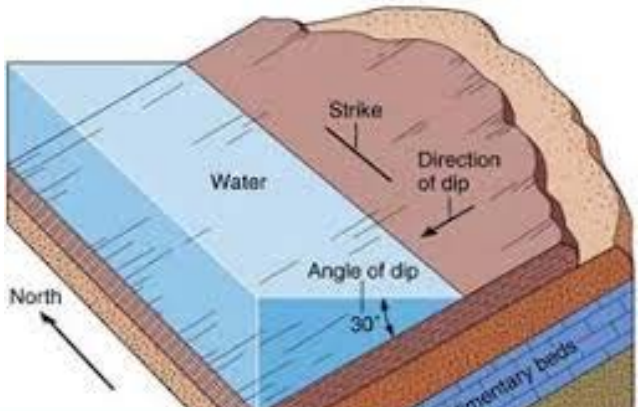
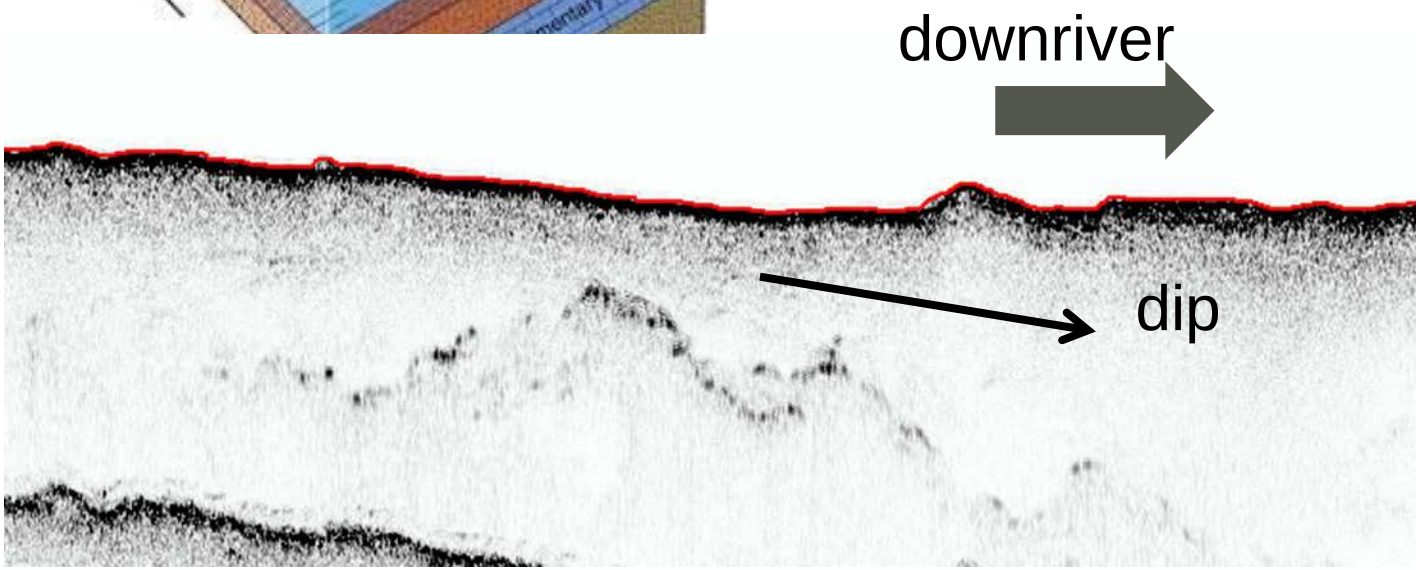
Spatial Sampling Protocol –
Geology not always periodic but is predictable



- Strike and Dip
- geology (sedimentary layers, volcanics)

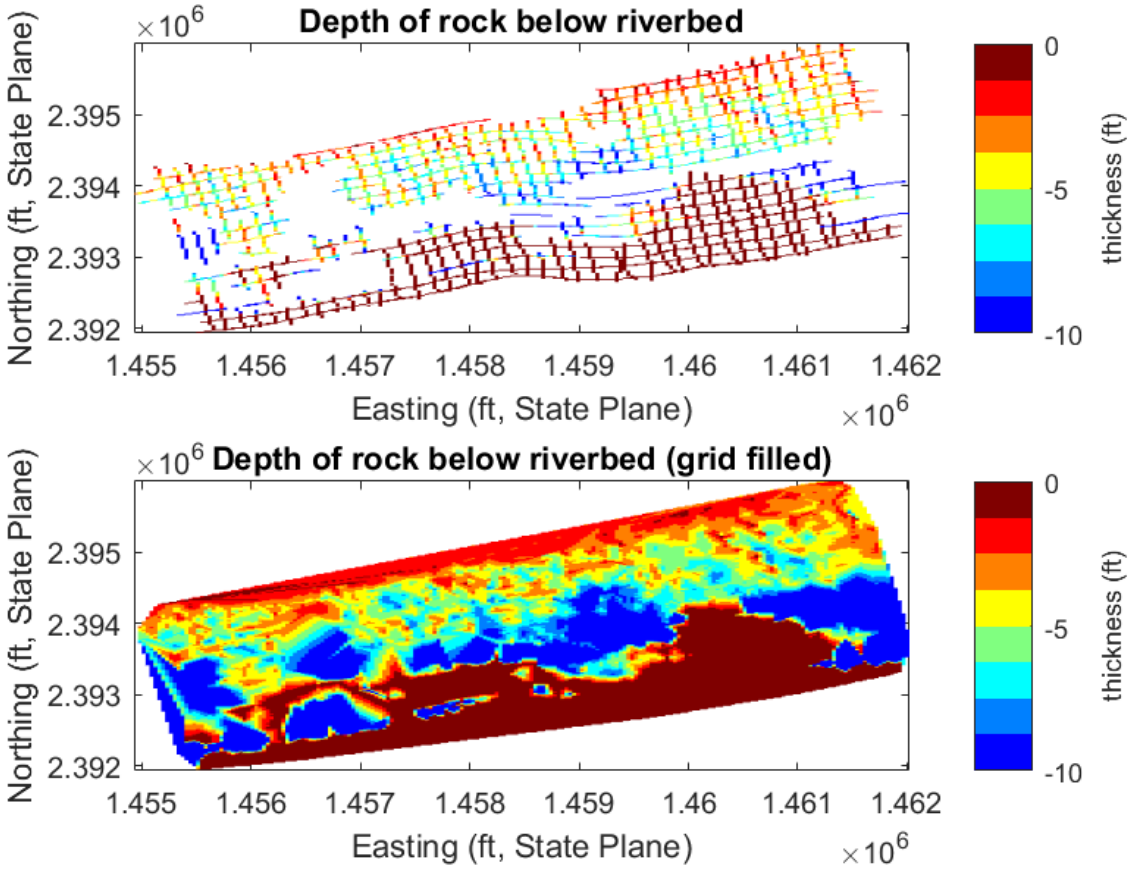


FY18 RSM IPR: Chirp Guidance
Spatial Sampling Protocol –
Geology not always periodic but is predictable

- All data have been processed (survey lines), including digitizing ~2000 features

- Data have been rectified to a common vertical datum (depth below riverbed) and exported

- Data are currently being gridded at a variety of resolutions/spacing to examine ability to accurately map subsurface elevation of hard substrates.



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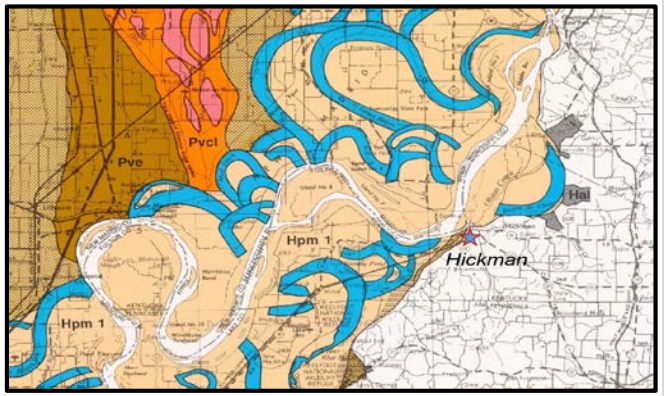
Spatial Sampling Protocol –
Survey-Line Spacing Guidance Curve

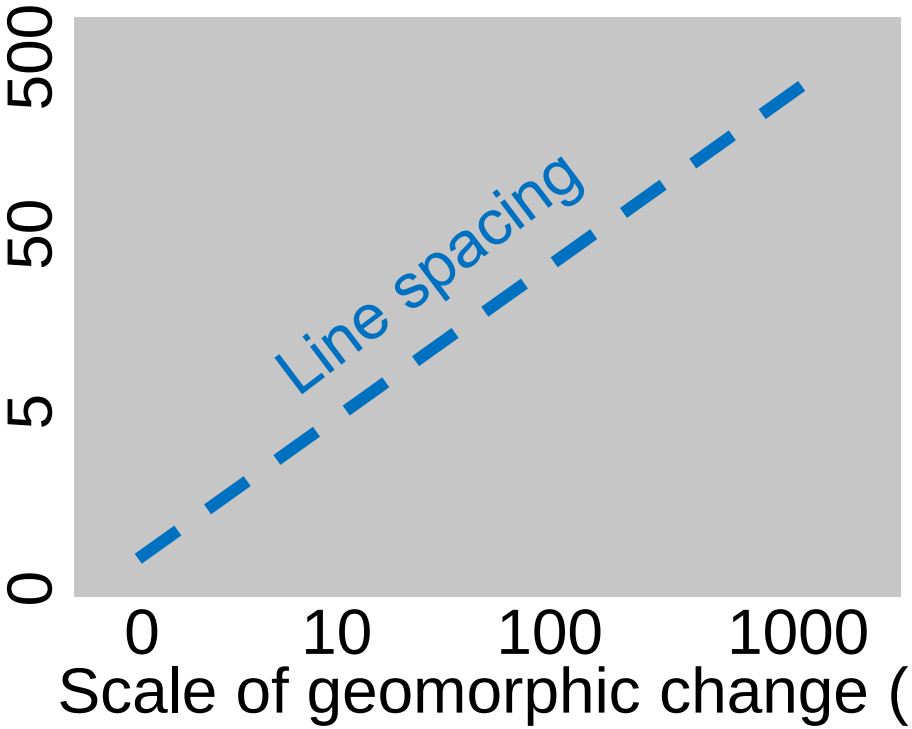


Challenges:

-- Digitization of features took longer than expected

-- Challenging to subsample geophysical data

-- Extremely complicated geology



Plan Forward:

-- Extrapolate results to a wide range of scenarios (e.g. hazard mapping vs. shoal volumes) and test simple geologic surfaces

-- Identify best ways to both collect & process data (managed at Division or District level, via ERDC), plus optimal training options

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Benefits to the USACE and Nation

-- Multiple applications (e.g. habitat mapping, accurate borrow area calculations, identification of fine-grained regions, hazard mapping, levee structure/stability, pre-dredge volumes/sediment variability, sediment transport mechanisms)

-- collected simultaneously with bathymetry (reduce collection costs)

-- significantly fewer sediment cores to characterize a region

-- 4 Districts have purchased sub-bottom equipment; More?

Challenges

-- Current model of ERDC-driven utilization is not sustainable