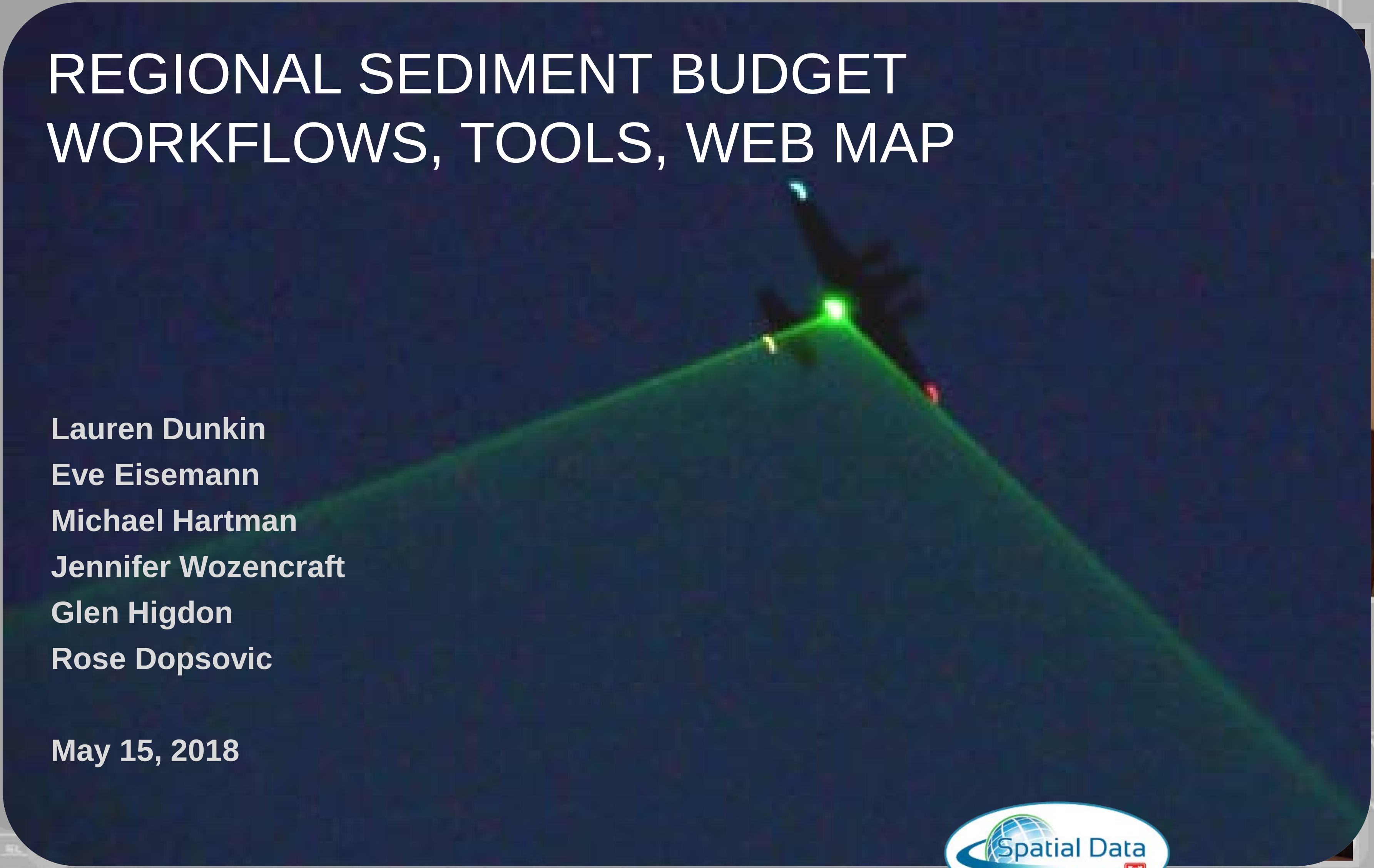
REGIONAL SEDIMENT BUDGET WORKFLOWS, TOOLS, WEB MAP



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Glen Higdon
Rose Dopsovic

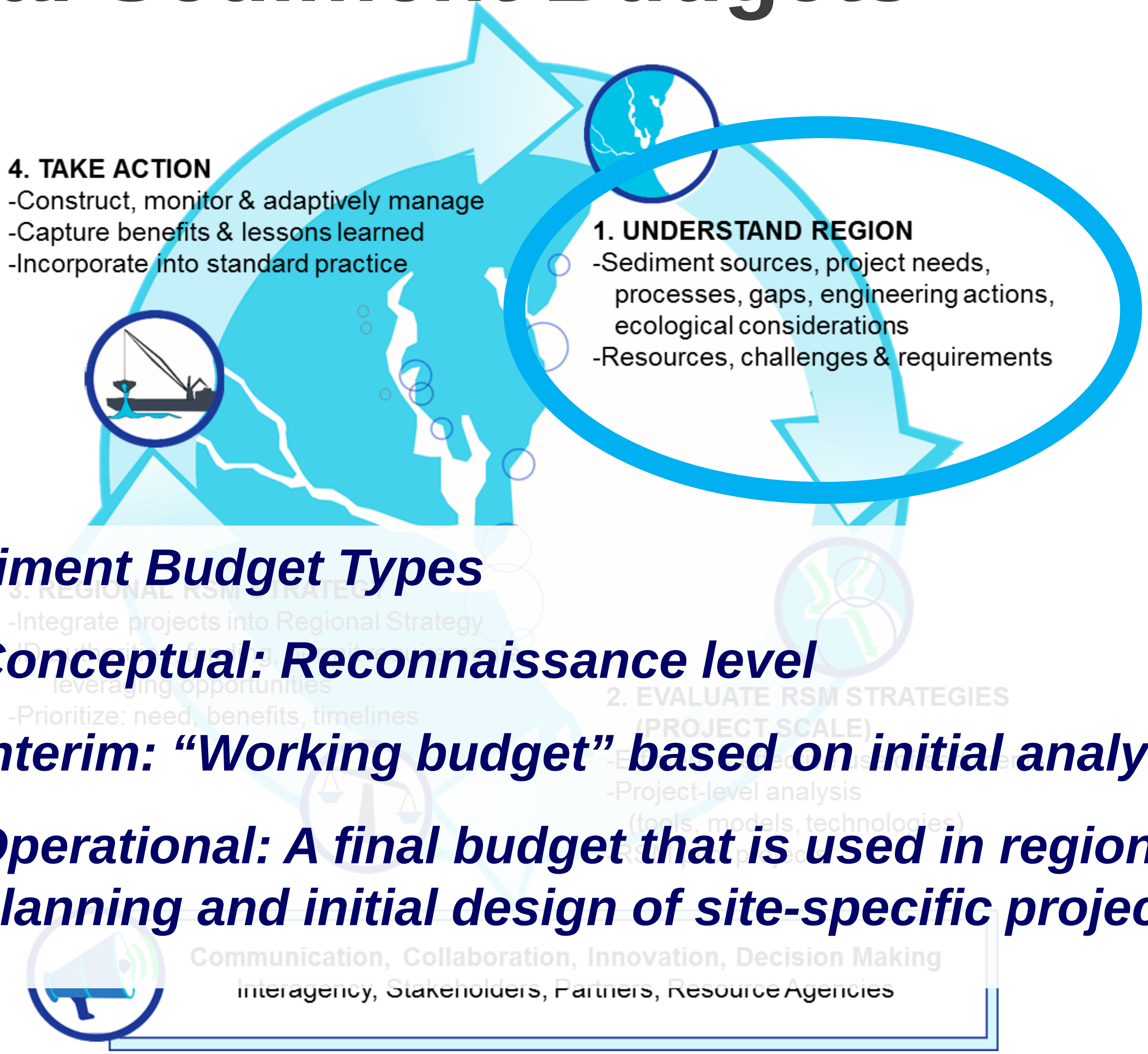
May 15, 2018

Spatial Data
MOBILE DISTRICT

COASTAL & HYDRAULICS LABORATORY

ERDC
Engineer Research and Development Center

Regional Sediment Budgets



4. TAKE ACTION
-Construct, monitor & adaptively manage
-Capture benefits & lessons learned
-Incorporate into standard practice

1. UNDERSTAND REGION
-Sediment sources, project needs, processes, gaps, engineering actions, ecological considerations
-Resources, challenges & requirements

3. REGIONAL RSM STRATEGY
-Integrate projects into Regional Strategy
leveraging opportunities
-Prioritize: need, benefits, timelines

2. EVALUATE RSM STRATEGIES (PROJECT SCALE)
-Project-level analysis
(tools, models, technologies)

Communication, Collaboration, Innovation, Decision Making
Interagency, Stakeholders, Partners, Resource Agencies

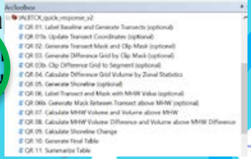
Sediment Budget Types

- ✓ ***Conceptual: Reconnaissance level***
- ✓ ***Interim: "Working budget" based on initial analyses***
- ✓ ***Operational: A final budget that is used in regional planning and initial design of site-specific projects***

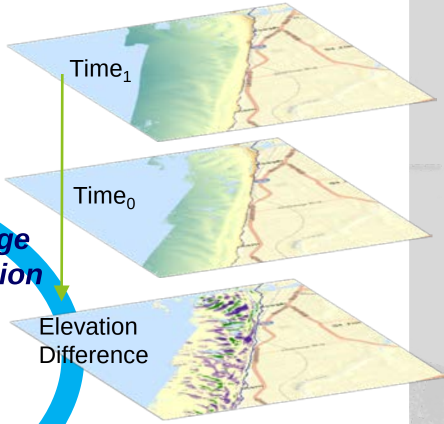
Regional Sediment Budgets

1) Developing workflows and tools to use lidar data for volume change analysis;
2) Improve Sediment Budget Analysis System (SBAS) to use pre-defined cells and ingest results from volume change toolbox;
3) Web map tools that incorporate the sediment budget files and existing image services for comprehensive regional spatial data access platform.

JALBTCX Volume Change Toolbox


ArcToolbox
JALBTCX_quick_response_v2
QR 01. Label Baseline and Generate Transects (optional)
QR 01b. Update Transect Coordinates (optional)
QR 02. Generate Transect Mask and Clip Mask (optional)
QR 03. Generate Difference Grid by Clip Mask (optional)
QR 03b. Clip Difference Grid to Segment (optional)
QR 04. Calculate Difference Grid Volume by Zonal Statistics
QR 05. Generate Shoreline (optional)
QR 06. Label Transect and Mask with MHW Value (optional)
QR 06b. Generate Mask Between Transect above MHW (optional)
QR 07. Calculate MHW Volume and Volume above MHW
QR 08. Calculate MHW Volume Difference and Volume above MHW Difference
QR 09. Calculate Shoreline Change
QR 10. Generate Final Table
QR 11. Summarize Table

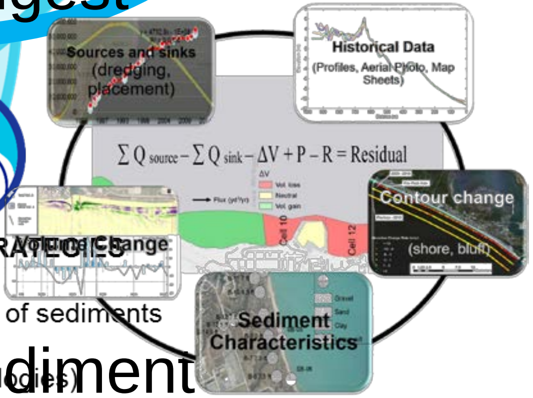
Change Detection



Sediment Budget Analysis System Toolbox


SBAS.pyt
00 - Set Up SBAS Environment
01a - Create SBAS Alternative
01b - Load SBAS Alternative
01c - Import Legacy SBAS Alternative
01d - Import Modern SBAS Alternatives
01e - Edit SBAS Alternative
02a - Convert Graphics to New Features
02b - Convert GenCade data to SBAS Features
03a - Add Selected Features to Micro Alternative
03b - Add Selected Features to Macro Alternative
04a - Update Littoral Alternative Values
04b - Update Flux Alternative Values
05a - Change Symbology
05b - Reverse Fluxline Direction
06a - Export Alternative to ZIP
06b - Upload Alternative to Enterprise
07 - Delete SBAS Alternative

SBAS Workflow



$$\sum Q_{source} - \sum Q_{sink} - \Delta V + P - R = \text{Residual}$$

4. TAKE ACTION
Construct, monitor & ada
Capture benefits & lesso
-Incorporate into standard

1. UNDERSTAND REGION
-Sediment sources, project needs, processes, gaps, engineering actions, ecological considerations
-Resources, challenges & requirements

3. REGIONAL RSM STRAT
-Integrate projects into Regi
…ing, per
-Leveraging opportunities
-Prioritize: need, benefits, ti

2. EVALUATE RSM STRATEGIES (PROJECT SCALE)
Efficient & effective use of sediments
-Project-level analysis (tools, models, technologies)
-RSM pilot projects

Communication, Collaboration, Innovation, Decision Making
Interagency, Stakeholders, Partners, Resource Agencies

Volume Change

$$\sum Q_{\text{source}} - \sum Q_{\text{sink}} - \boxed{\Delta V} + P - R = \text{Residual}$$

Q source

Sediment Transport Rates

Avg. Rates per Cell

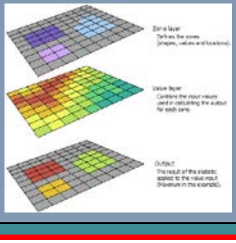
Q sink

Grid Surface #2

Grid Surface #1

Elevation Difference

Volume Change – per cell



ΔV – volume change toolbox

Placement Values:
Beach Fill
* values from Beach Nourishment web site

Removal Values:
Dredge Events

Flux Data Entry

Cell Data Entry

Residual

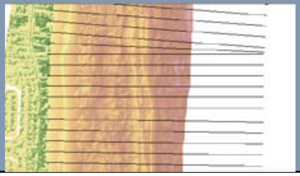
Historic Data (Maps, Charts, Profiles)

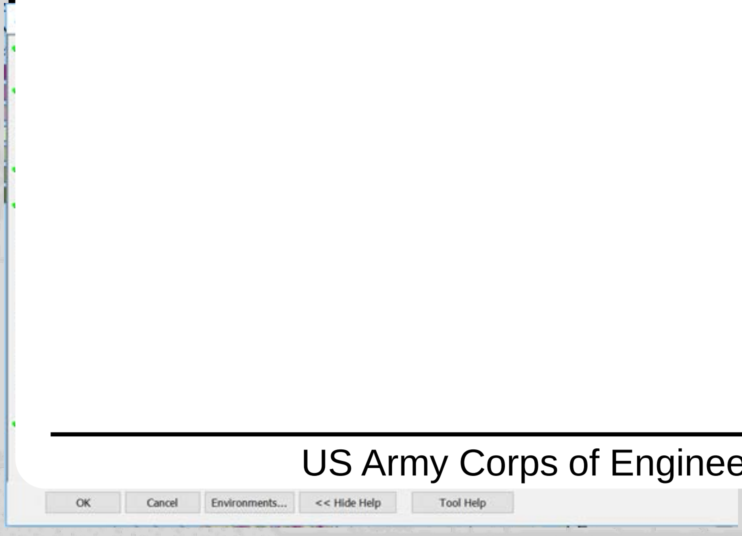
Extract profile from Grid

Grid Surface #1

Elevation Difference

Contour change




OK
Cancel
Environments...
<< Hide Help
Tool Help

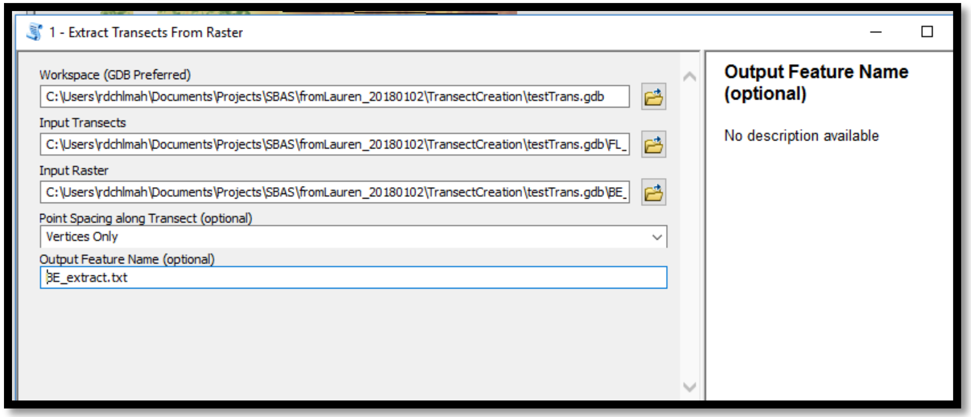

0
0.2
0.4
0.8 Miles

Volume Change

1. Beach Volume and Shoreline Change

- **Interim/Operational**

JALBTCX Transect Processing Toolbox



1 - Extract Transects From Raster

Workspace (GDB Preferred)
C:\Users\rdchlmah\Documents\Projects\SBAS\fromLauren_20180102\TransectCreation\testTrans.gdb

Input Transects
C:\Users\rdchlmah\Documents\Projects\SBAS\fromLauren_20180102\TransectCreation\testTrans.gdb\FL_

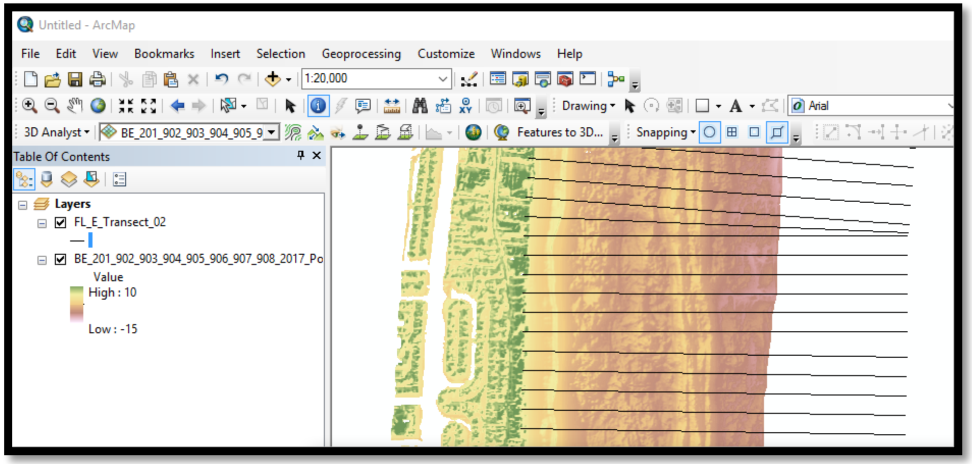
Input Raster
C:\Users\rdchlmah\Documents\Projects\SBAS\fromLauren_20180102\TransectCreation\testTrans.gdb\BE_

Point Spacing along Transect (optional)
Vertices Only

Output Feature Name (optional)
BE_extract.txt

Output Feature Name (optional)

No description available



- Transect Processing Toolbox
  - improve the data comparison process
  - user-specified transects (2D Polyline Shapefiles) and elevation raster data as inputs and outputs generates a 3D Polyline Shapefile

Dune Crest

Dune Toe

Beach Slope

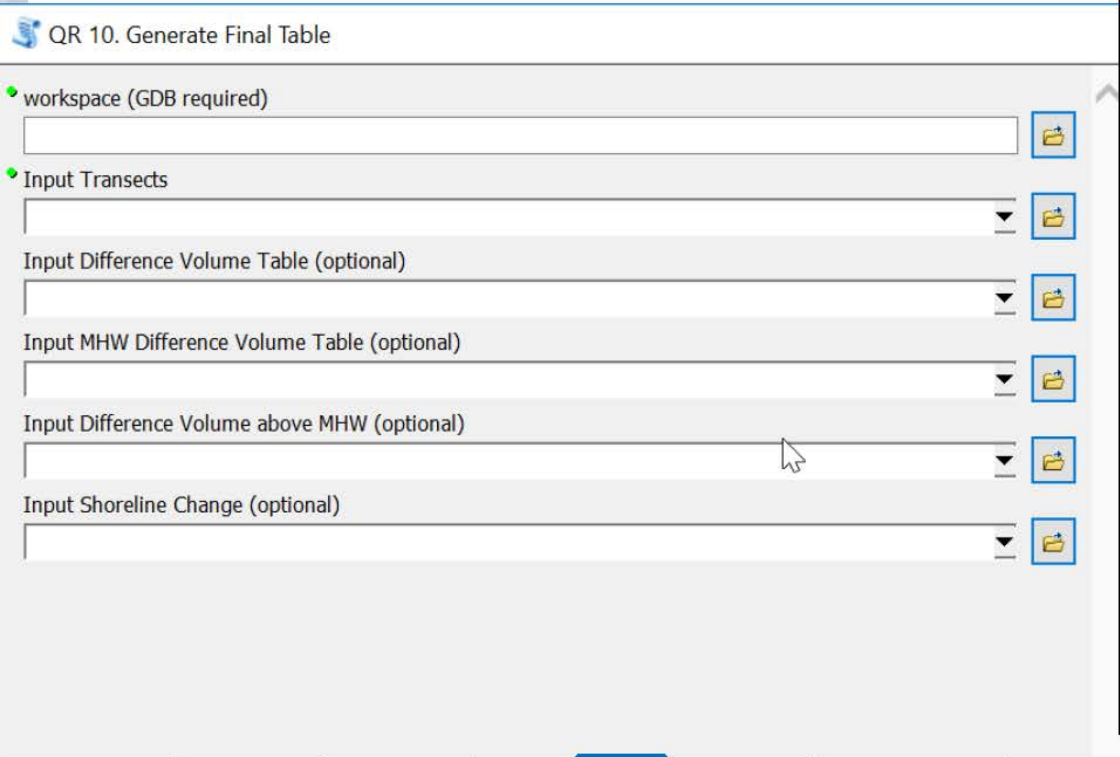
Shoreline

MHW

Beach Width


0
1.5
3
6 Miles
Grand Beach
Pokagon Reservation

Volume Change



QR 10. Generate Final Table

workspace (GDB required)

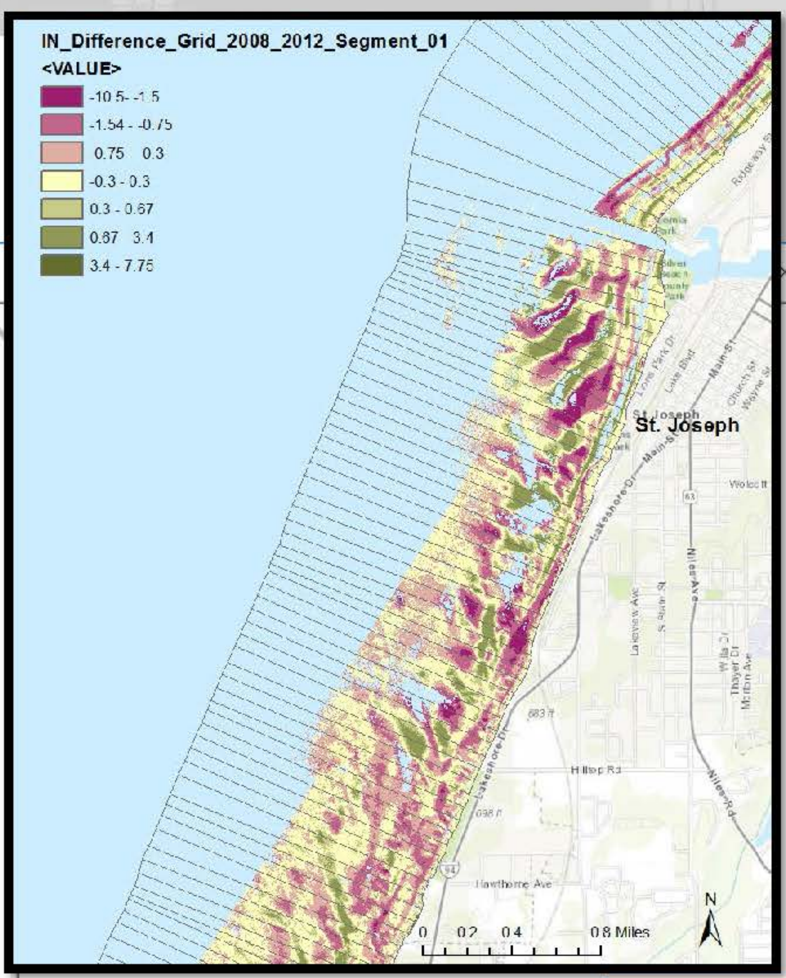
Input Transects

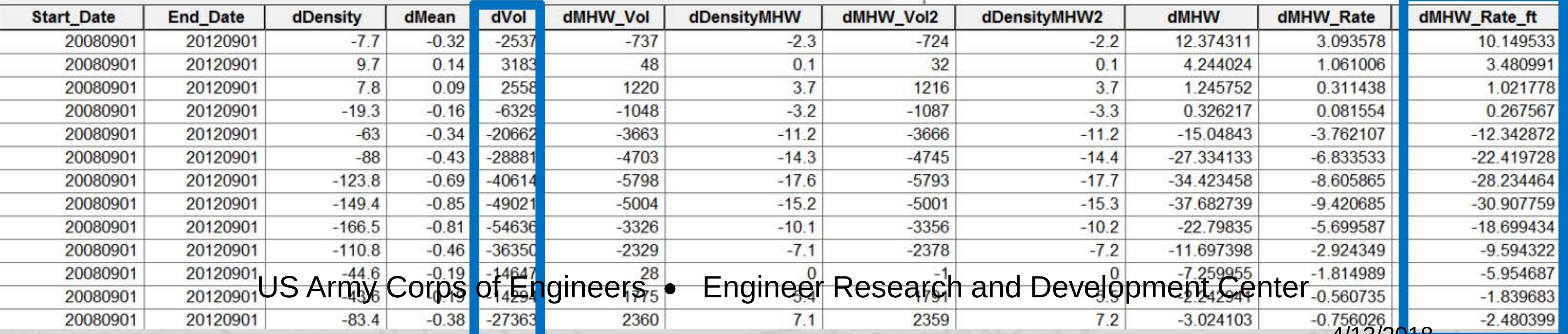
Input Difference Volume Table (optional)

Input MHW Difference Volume Table (optional)

Input Difference Volume above MHW (optional)

Input Shoreline Change (optional)





Start_Date	End_Date	dDensity	dMean	dVol	dMHW_Vol	dDensityMHW	dMHW_Vol2	dDensityMHW2	dMHW	dMHW_Rate	dMHW_Rate_ft
20080901	20120901	-7.7	-0.32	-2537	-737	-2.3	-724	-2.2	12.374311	3.093578	10.149533
20080901	20120901	9.7	0.14	3183	48	0.1	32	0.1	4.244024	1.061006	3.480991
20080901	20120901	7.8	0.09	2558	1220	3.7	1216	3.7	1.245752	0.311438	1.021778
20080901	20120901	-19.3	-0.16	-6329	-1048	-3.2	-1087	-3.3	0.326217	0.081554	0.267567
20080901	20120901	-63	-0.34	-20662	-3663	-11.2	-3666	-11.2	-15.04843	-3.762107	-12.342872
20080901	20120901	-88	-0.43	-28881	-4703	-14.3	-4745	-14.4	-27.334133	-6.833533	-22.419728
20080901	20120901	-123.8	-0.69	-40614	-5798	-17.6	-5793	-17.7	-34.423458	-8.605865	-28.234464
20080901	20120901	-149.4	-0.85	-49021	-5004	-15.2	-5001	-15.3	-37.682739	-9.420685	-30.907759
20080901	20120901	-166.5	-0.81	-54636	-3326	-10.1	-3356	-10.2	-22.79835	-5.699587	-18.699434
20080901	20120901	-110.8	-0.46	-36350	-2329	-7.1	-2378	-7.2	-11.697398	-2.924349	-9.594322
20080901	20120901	-44.6	-0.19	-14647	28	0	-1	0	-7.259955	-1.814989	-5.954687
20080901	20120901	-43.6	-0.19	-14294	1775	5.4	1791	5.5	-2.242941	-0.560735	-1.839683
20080901	20120901	-83.4	-0.38	-27363	2360	7.1	2359	7.2	-3.024103	-0.756026	-2.480399

BlankEnvironments.mxd - ArcMap

SBAS: Enterprise

- Published Metadata Record:
  - Metadata allows the budget to be discoverable to others and provides an official archive of the budget.
  - Content can be linked with other applications where web services are supported.

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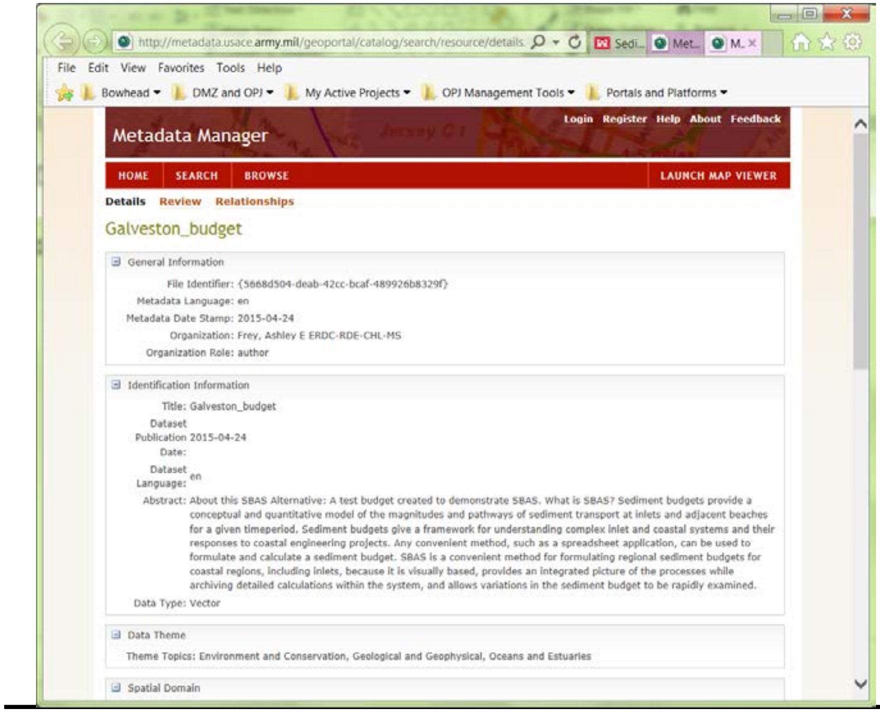


Metadata Manager

Galveston_budget

General Information

File Identifier: {5668d504-deab-42cc-bcaf-489926b8329f}
Metadata Language: en
Metadata Date Stamp: 2015-04-24
Organization: Frey, Ashley E ERDC-RDE-CHL-MS
Organization Role: author

Identification Information

Title: Galveston_budget
Dataset Publication Date: 2015-04-24
Dataset Language: en
Abstract: About this SBAS Alternative: A test budget created to demonstrate SBAS. What is SBAS? Sediment budgets provide a conceptual and quantitative model of the magnitudes and pathways of sediment transport at inlets and adjacent beaches for a given timeperiod. Sediment budgets give a framework for understanding complex inlet and coastal systems and their responses to coastal engineering projects. Any convenient method, such as a spreadsheet application, can be used to formulate and calculate a sediment budget. SBAS is a convenient method for formulating regional sediment budgets for coastal regions, including inlets, because it is visually based, provides an integrated picture of the processes while archiving detailed calculations within the system, and allows variations in the sediment budget to be rapidly examined.
Data Type: Vector

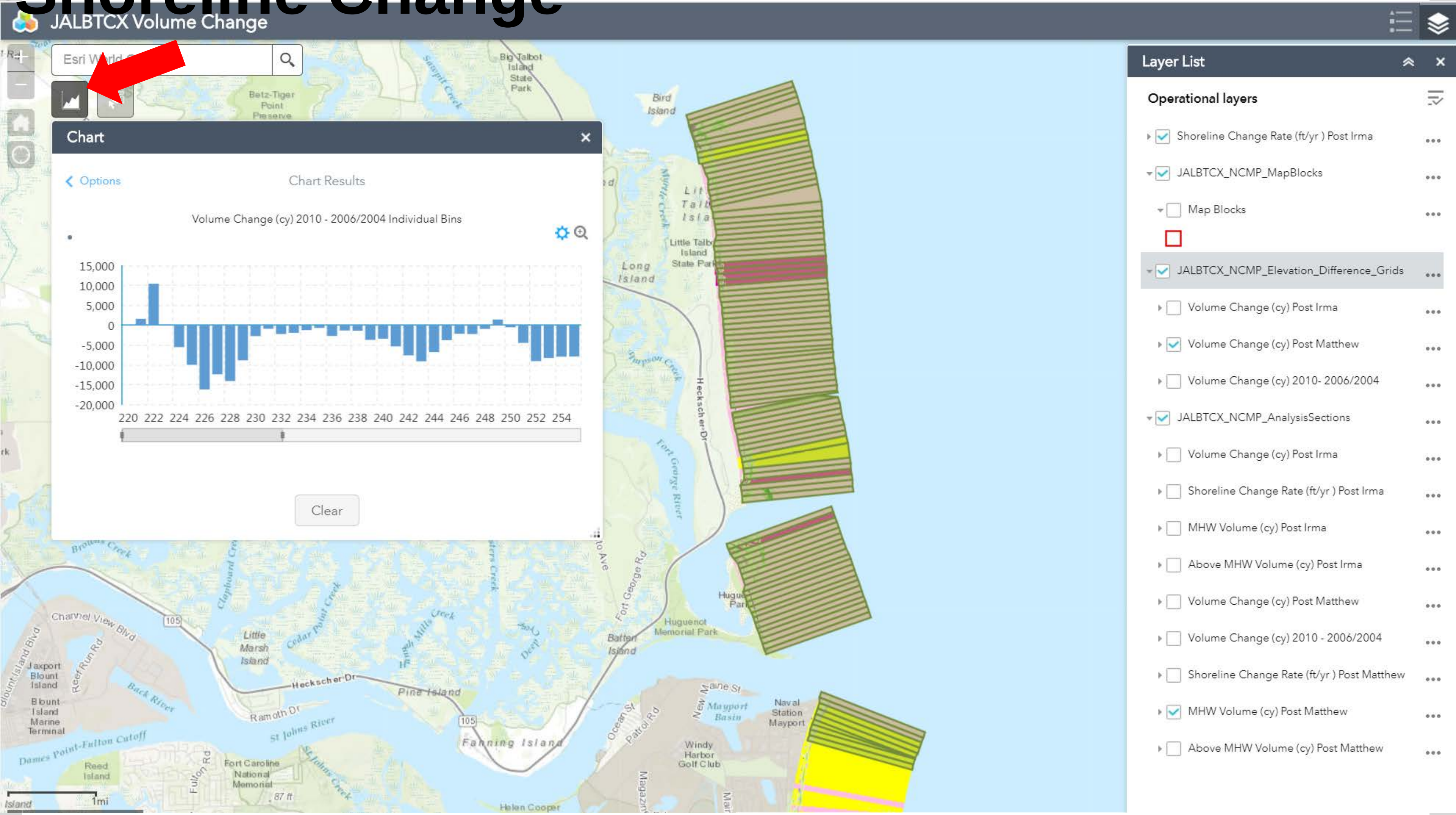
Data Theme

Theme Topics: Environment and Conservation, Geological and Geophysical, Oceans and Estuaries

Spatial Domain

3. Web Map

Shoreline Change



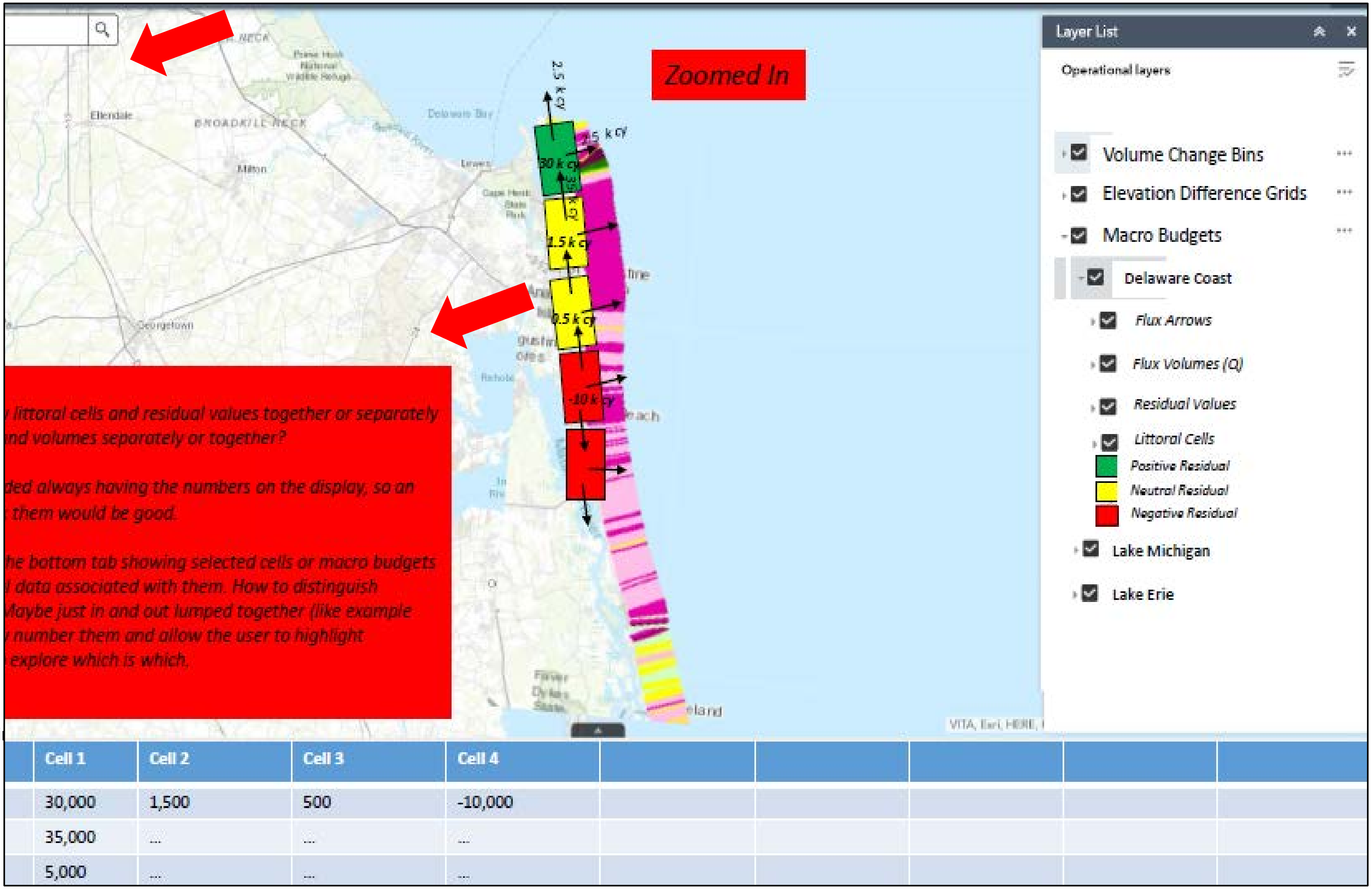
Layer List

Operational layers

- ☑ Shoreline Change Rate (ft/yr) Post Irma
- ☑ JALBTCX_NCMP_MapBlocks
  - ☐ Map Blocks
- ☑ JALBTCX_NCMP_Elevation_Difference_Grids
  - ☐ Volume Change (cy) Post Irma
  - ☑ Volume Change (cy) Post Matthew
  - ☐ Volume Change (cy) 2010- 2006/2004
- ☑ JALBTCX_NCMP_AnalysisSections
  - ☐ Volume Change (cy) Post Irma
  - ☐ Shoreline Change Rate (ft/yr) Post Irma
  - ☐ MHW Volume (cy) Post Irma
  - ☐ Above MHW Volume (cy) Post Irma
  - ☐ Volume Change (cy) Post Matthew
  - ☐ Volume Change (cy) 2010 - 2006/2004
  - ☐ Shoreline Change Rate (ft/yr) Post Matthew
  - ☑ MHW Volume (cy) Post Matthew
  - ☐ Above MHW Volume (cy) Post Matthew

Web Map

3. Web Map



littoral cells and residual values together or separately
nd volumes separately or together?

ded always having the numbers on the display, so an
them would be good.

he bottom tab showing selected cells or macro budgets
l data associated with them. How to distinguish
Maybe just in and out lumped together (like example
number them and allow the user to highlight
explore which is which.

Joi

	Cell 1	Cell 2	Cell 3	Cell 4					
	30,000	1,500	500	-10,000					
	35,000	...	...	...					
	5,000	...	...	...					

Thank You!

Sources and sinks (dredging, placement)

Historical Data (Profiles, Aerial Photo, Map Sheets)

$$\sum Q_{source} - \sum Q_{sink} - \Delta V + P - R = Residual$$

Volume Change

Contour change (shore, bluff)

Sediment Characteristics

Lauren.m.dunkin@usace.army.mil