Sediment Budget Components

Linda S. Lillycrop
Program Manager, National RSM

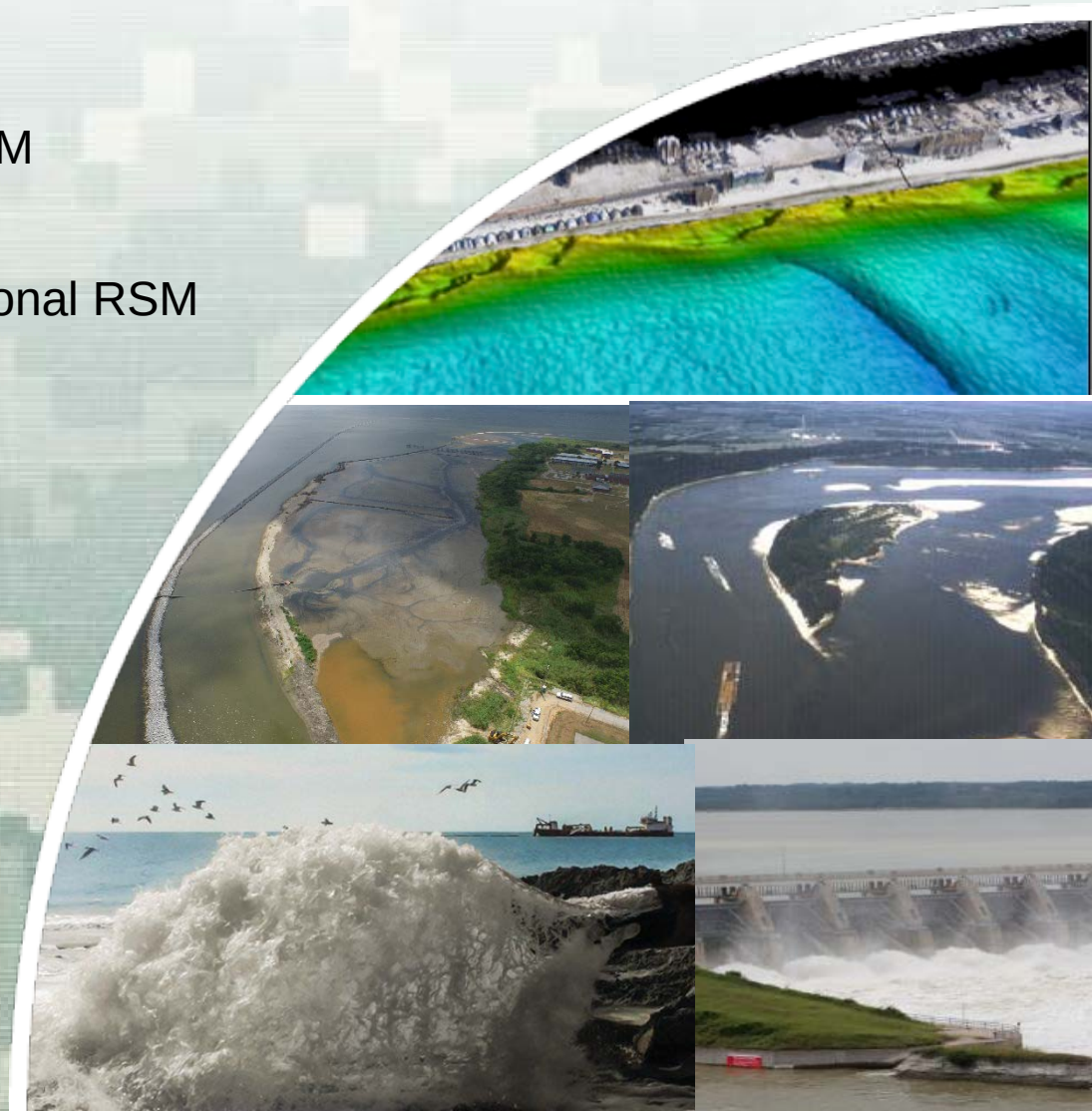
Katherine Brutsché, PhD
Deputy Program Manager, National RSM

Lauren Dunkin
ERDC CHL

Michael Hartman
ERDC CHL

Eve Eisemann
ERDC CHL

Rusty Permenter
ERDC CHL



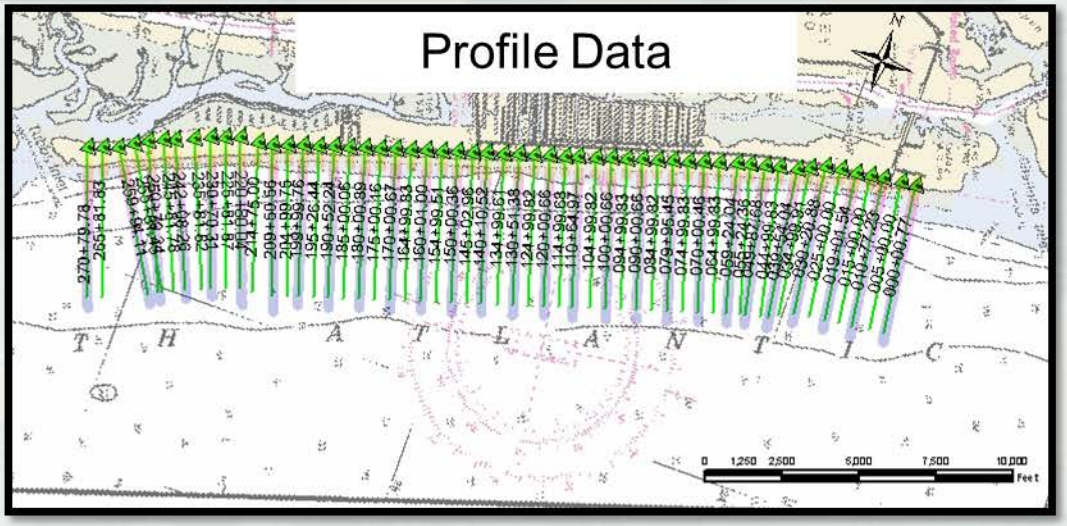
ERDC
Engineer Research and Development Center

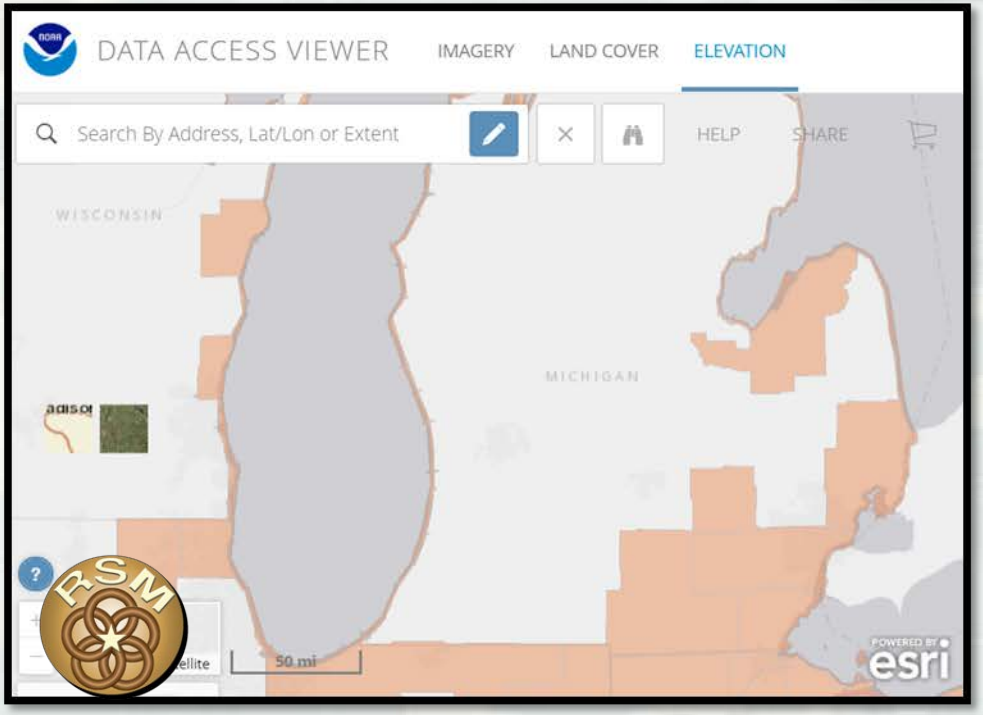
Sediment Budget Components

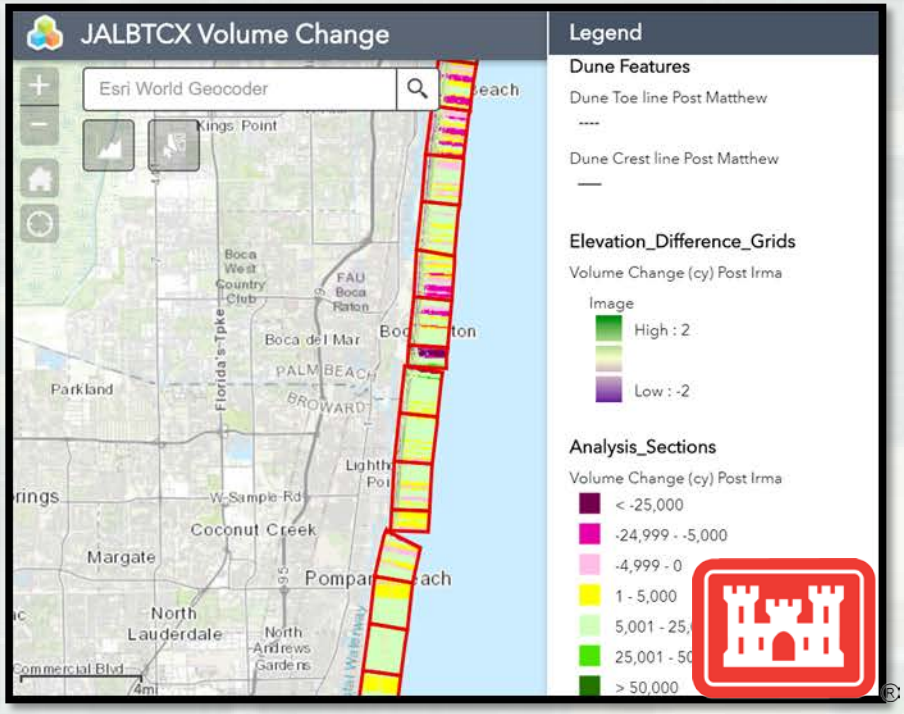
1. Dredging and Placement
2. Beach Nourishment
3. Beach Volume and Shoreline Change
4. Inlet Morphology
5. Coastal Processes
6. Cross-shore Change
7. Sediment Budget

3. Beach Volume and Shoreline Change

- Conceptual
  - ▶ Monitoring Reports
  - ▶ Online Databases







3. Beach Volume and Shoreline Change

- Interim/Operational
  - BMAP/RMAP
  - ArcGIS
    - Volume Change Toolbox
  - MATLAB
    - Bluff Crest & Toe Detection

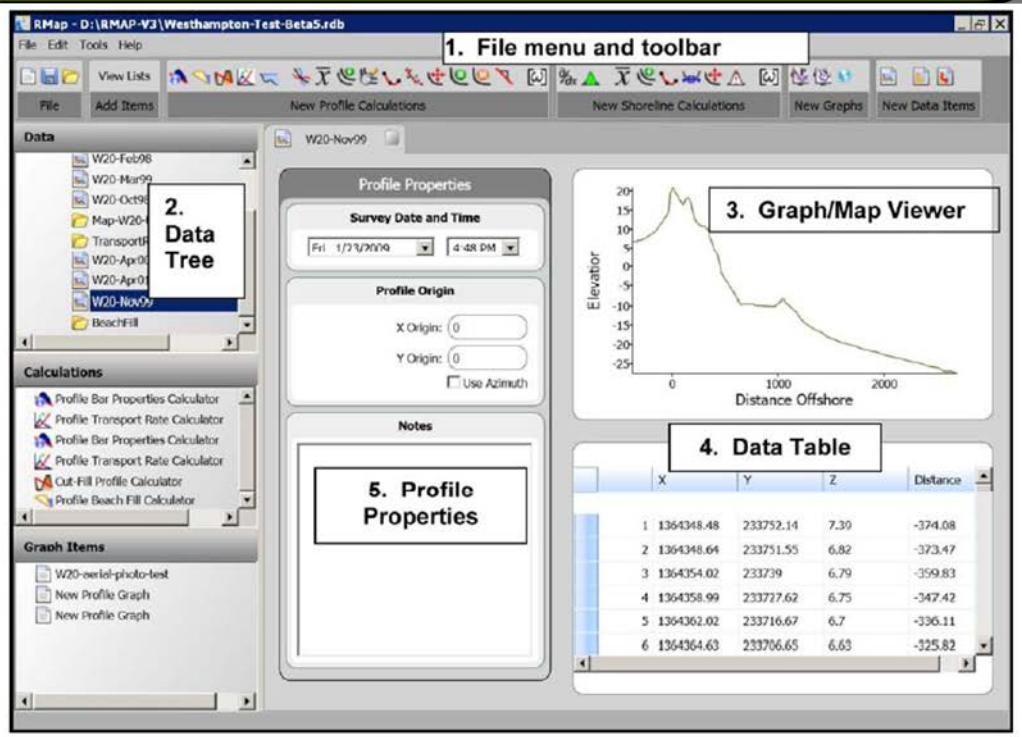
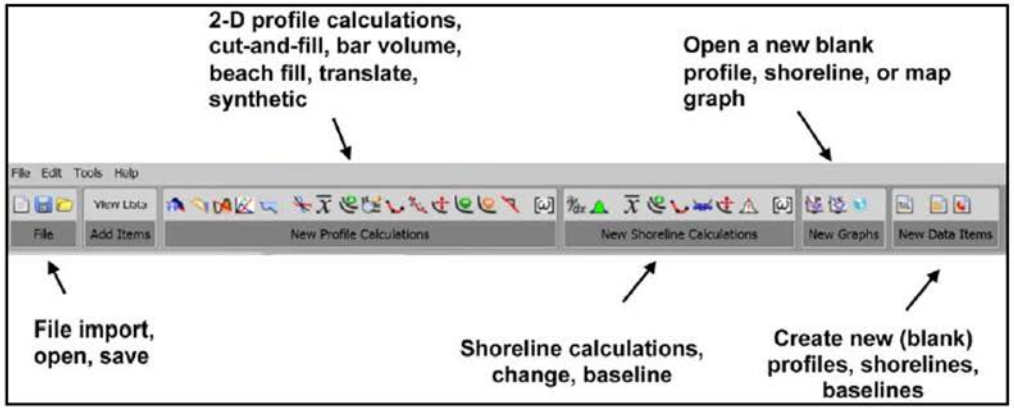


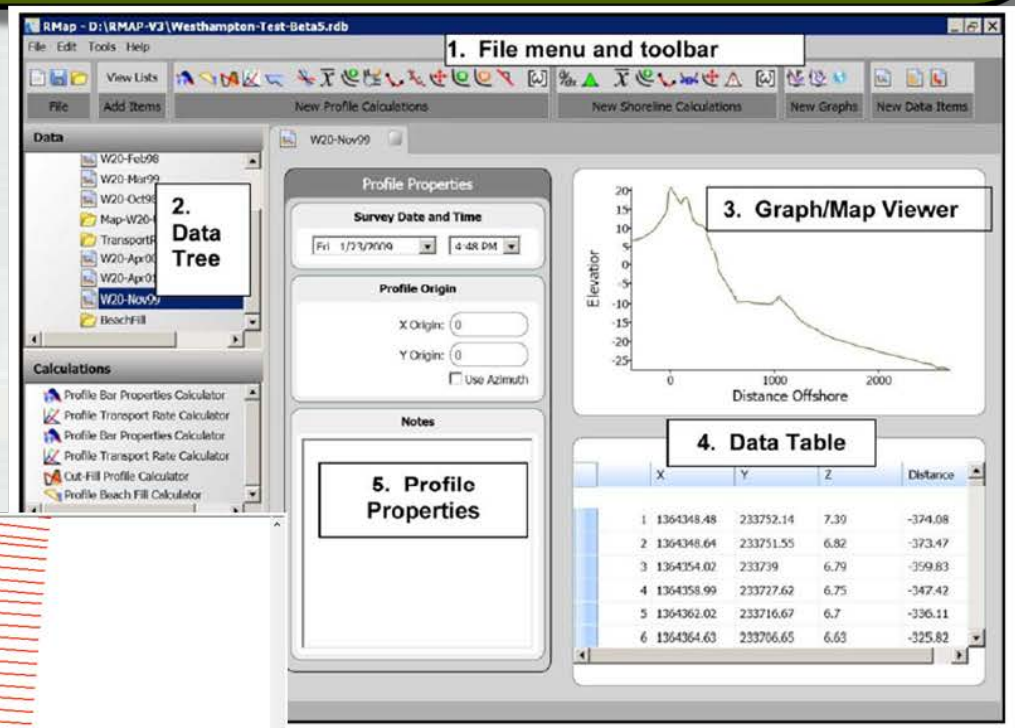
Figure 1. RMAP Version 3 interface is organized as: (1) file menu and toolbar, (2) data tree, (3) graph/map viewer, (4) data table, and (5) profile properties.



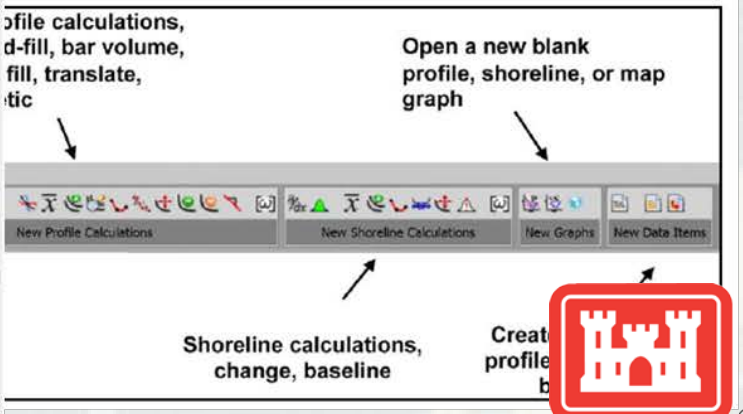
Morang et al. 2009

3. Beach Volume and Shoreline Change

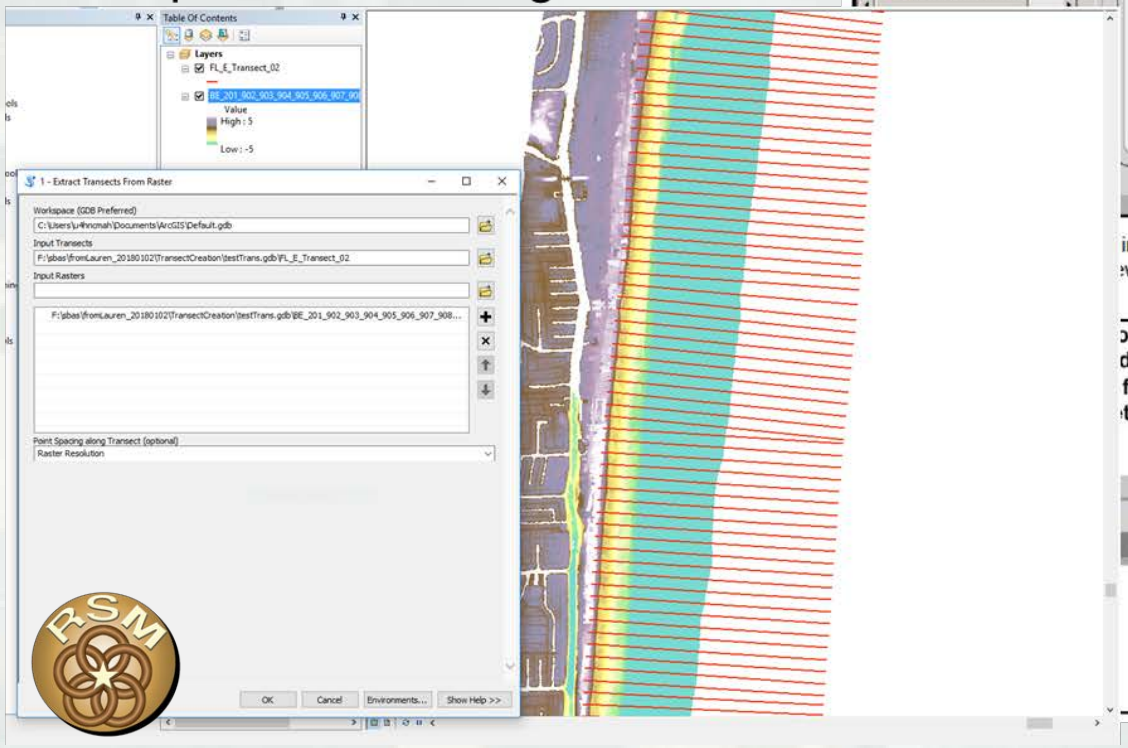
- Interim/Operational
  - BMAP/RMAP
  - ArcGIS
    - Volume Change Toolbox
  - MATLAB
    - Bluff Crest & Toe Detection



interface is organized as: (1) file menu and toolbar, (2) data tree, ewer, (4) data table, and (5) profile properties.



ArcMap - Extract Along Transect

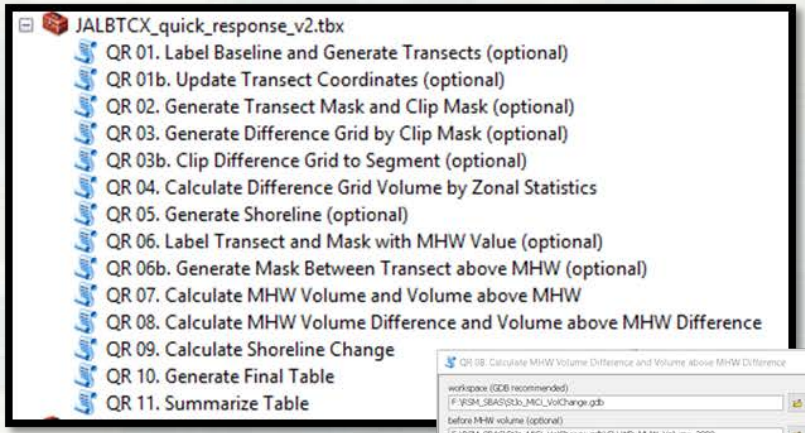


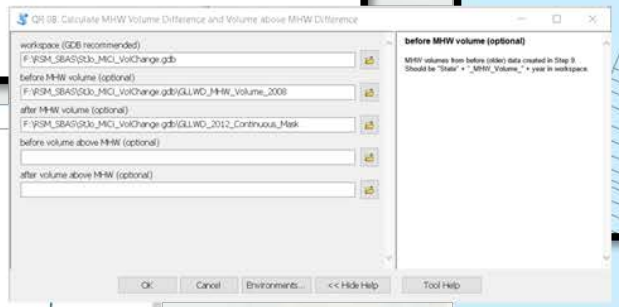
3. Beach Volume and Shoreline Change

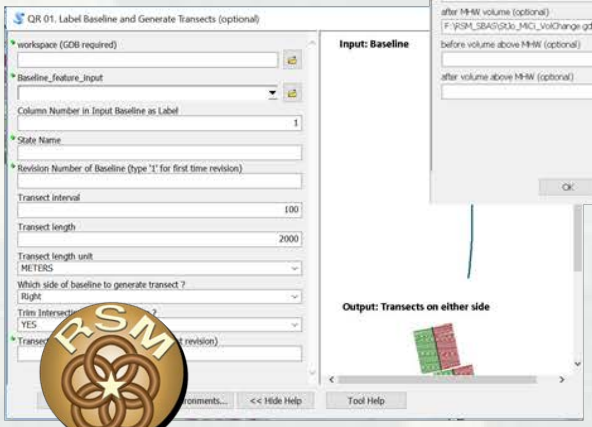
- Interim/Operational
  - BMAP/RMAP
  - ArcGIS
    - Volume Change Toolbox
  - MATLAB
    - Bluff Crest & Toe Detection

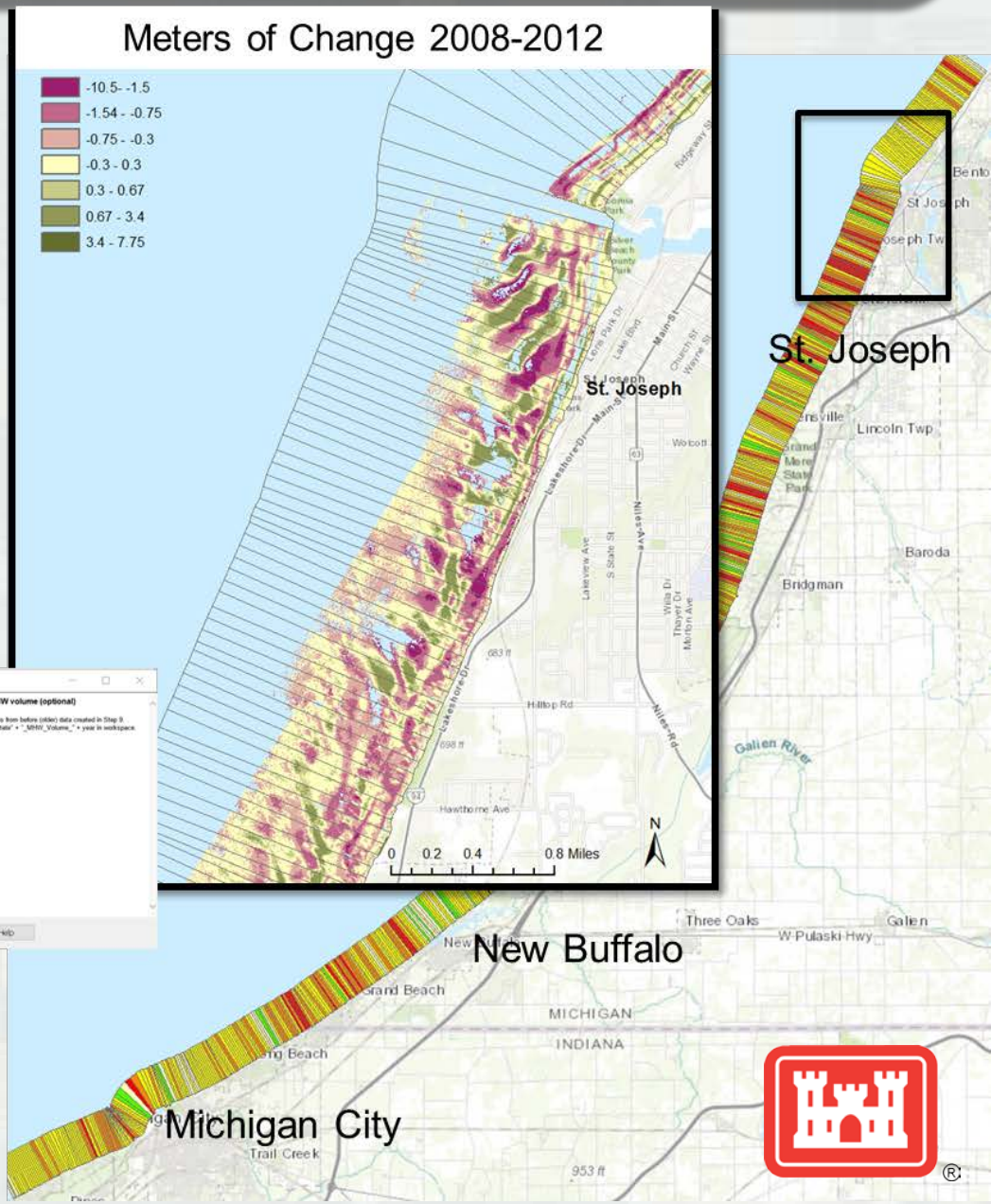
3. Beach Volume and Shoreline Change

- Interim/Operational
  - BMAP/RMAP
  - ArcGIS
    - Volume Change Toolbox
  - MATLAB
    - Bluff Crest & Toe Detection



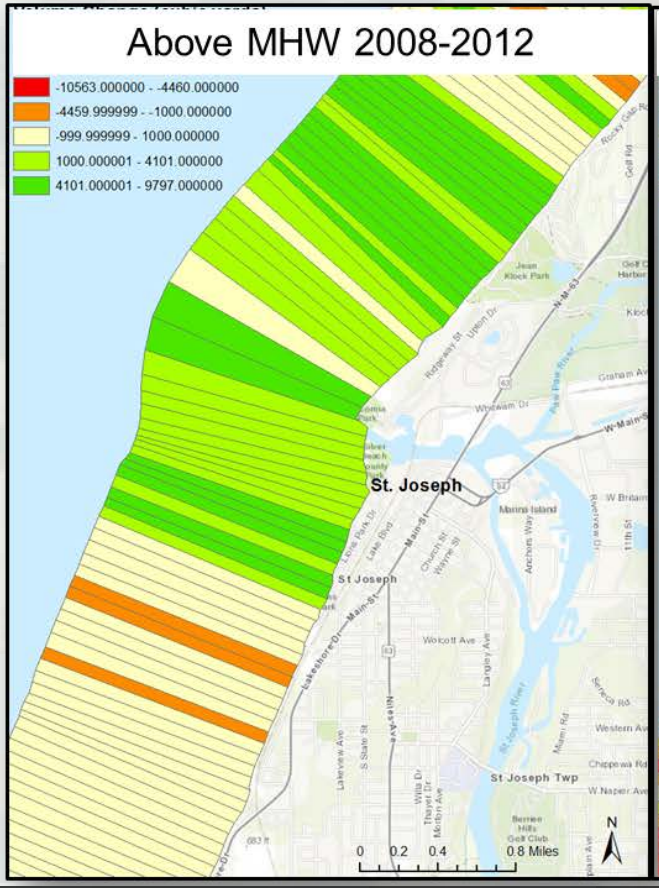


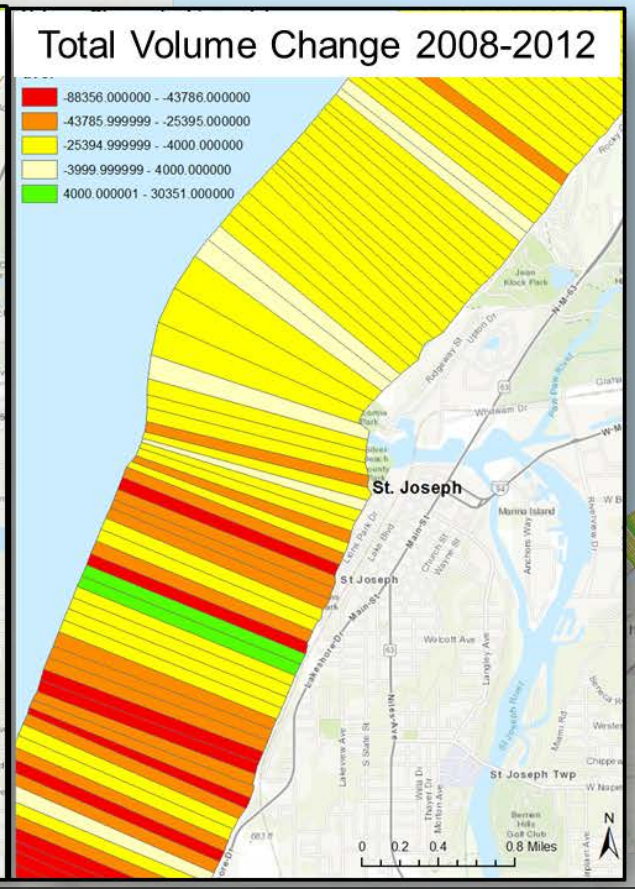




3. Beach Volume and Shoreline Change

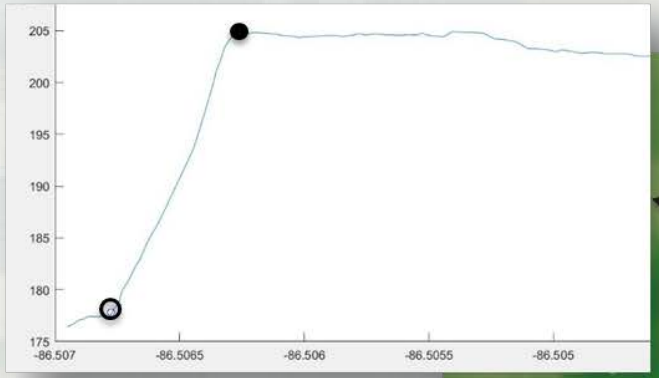
- Interim/Operational
  - BMAP/RMAP
  - ArcGIS
    - Volume Change Toolbox
  - MATLAB
    - Bluff Crest & Toe Detection

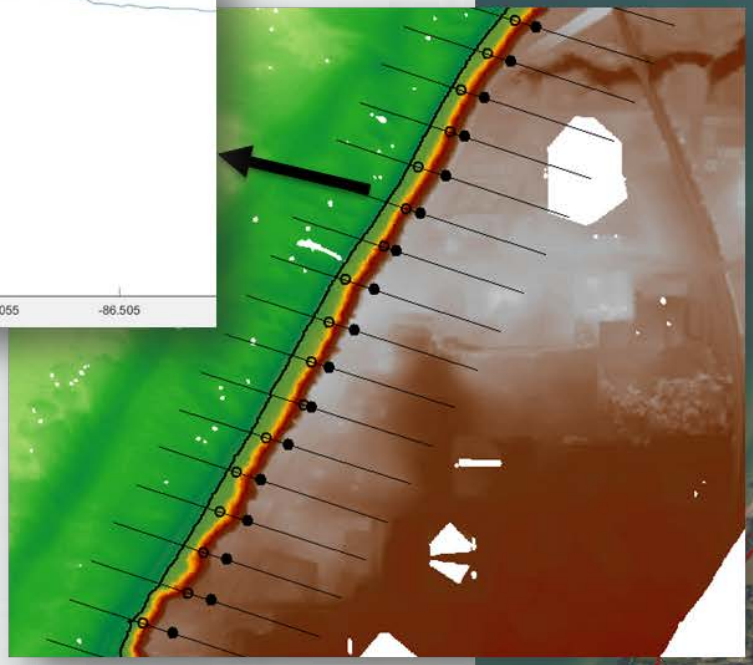


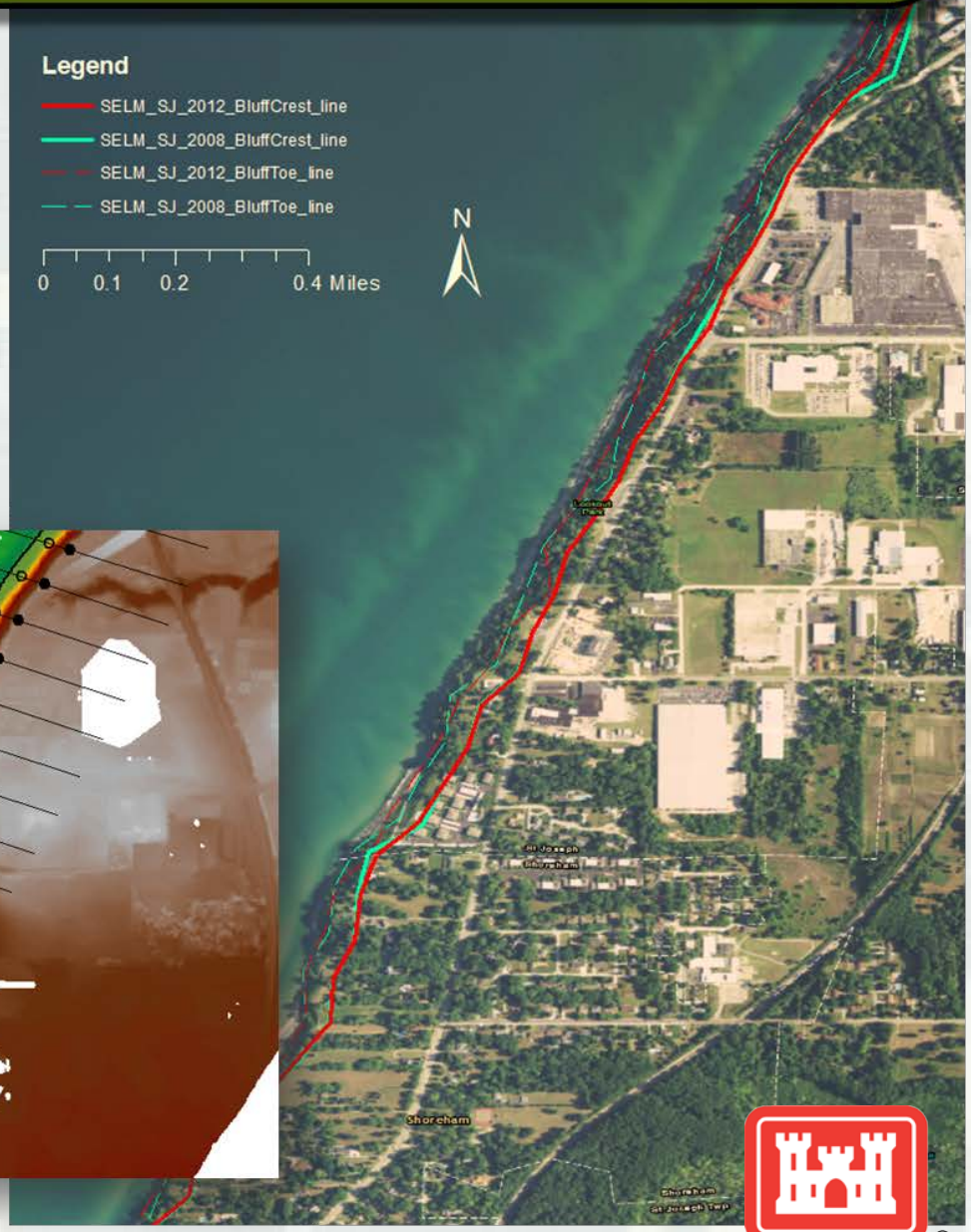


3. Beach Volume and Shoreline Change

- Interim/Operational
  - BMAP/RMAP
  - ArcGIS
    - Volume Change Toolbox
  - MATLAB
    - Bluff Crest & Toe Detection





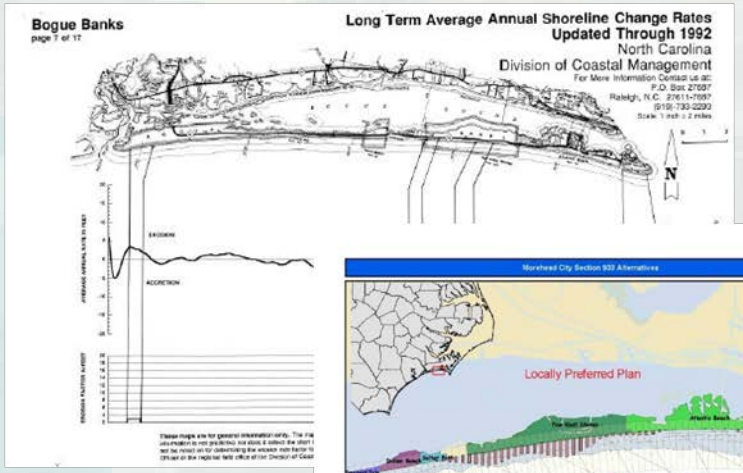


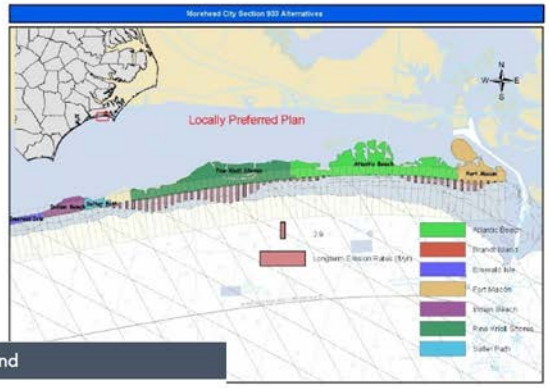
3. Beach Volume and Shoreline Change

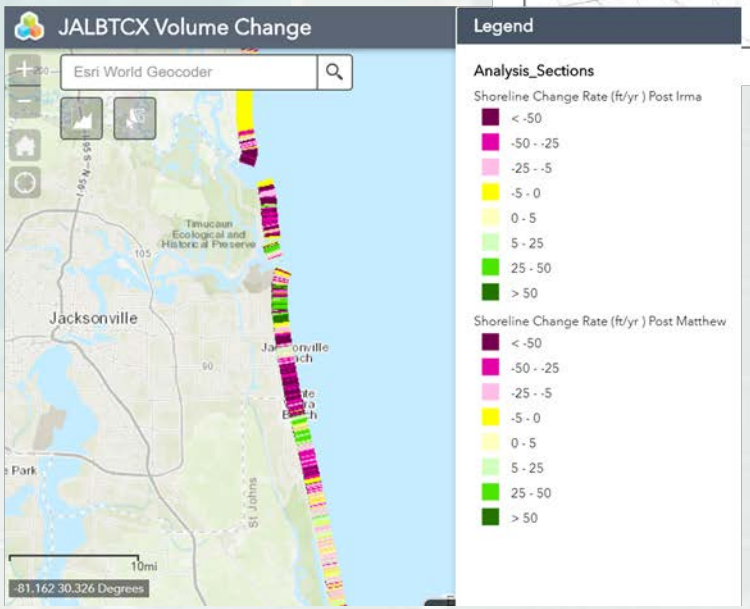
- Conceptual

Shoreline Data & Sources

- USGS
- Coastal Zone Management
- NOS T-sheets
- Photogrammetric
- LIDAR
- Beach Profiles
- Other…



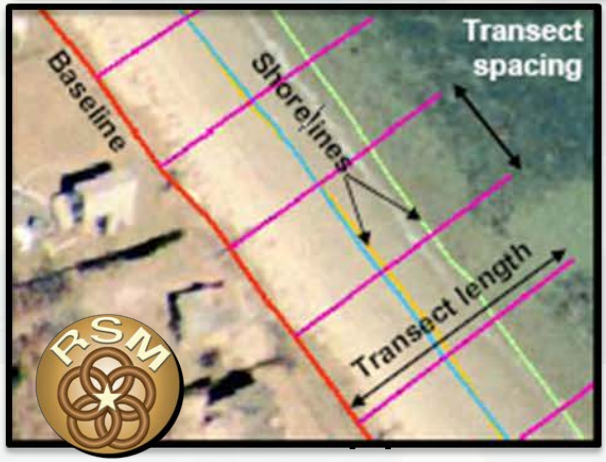


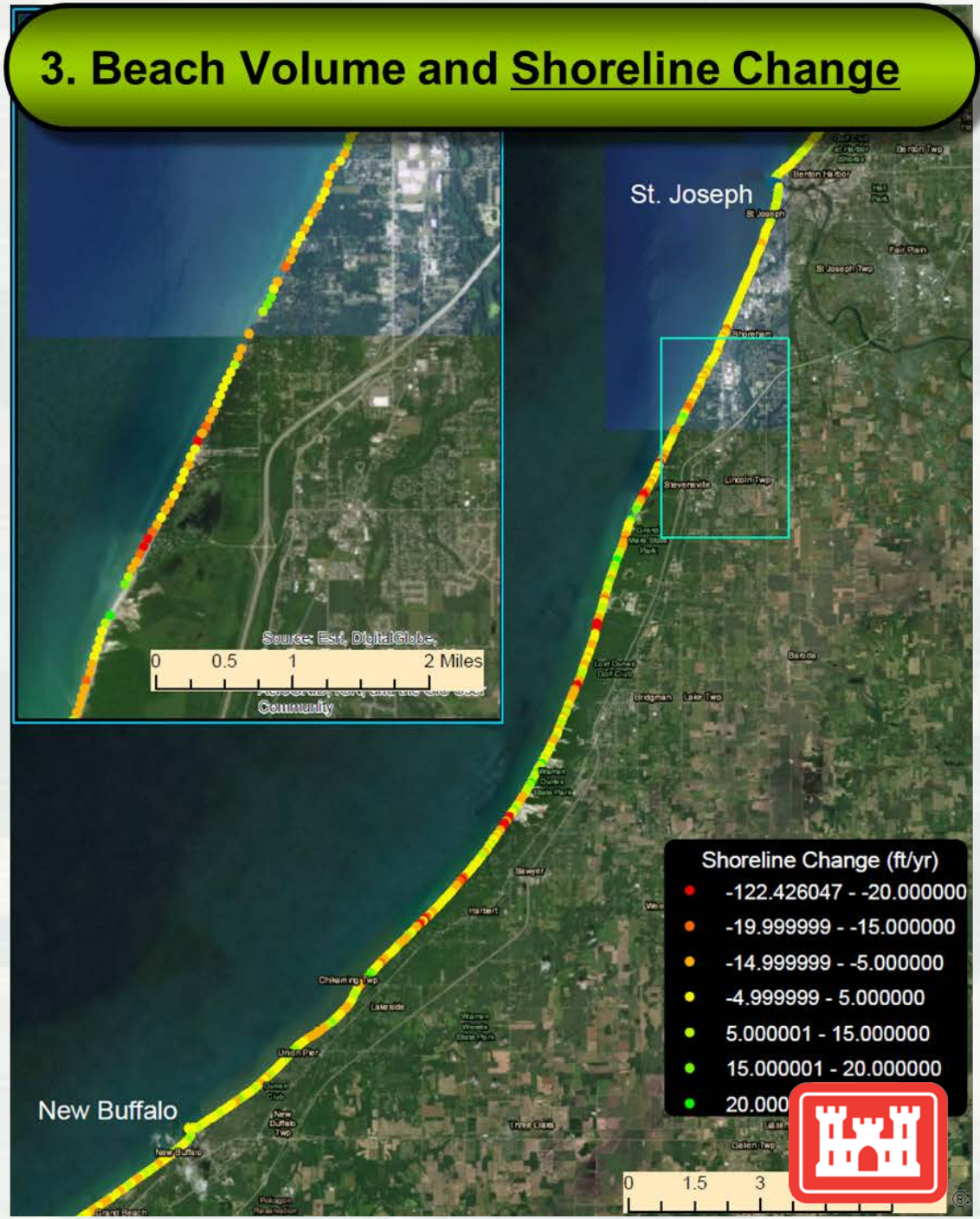


3. Beach Volume and Shoreline Change

- Interim/Operational
  - ▶ ArcGIS
    - JALBTCX toolbox
    - DSAS

JALBTCX_quick_response_v2.tbx
- 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

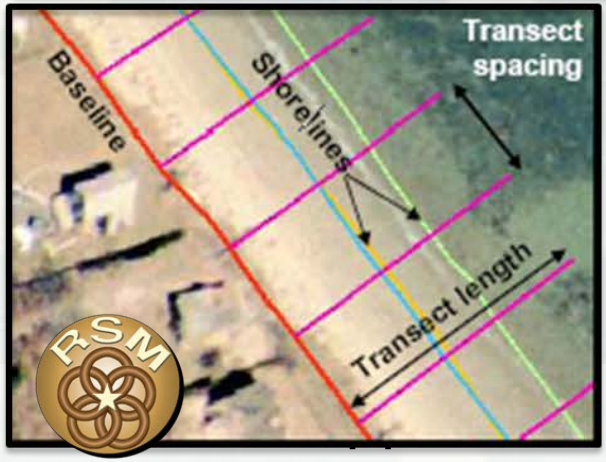


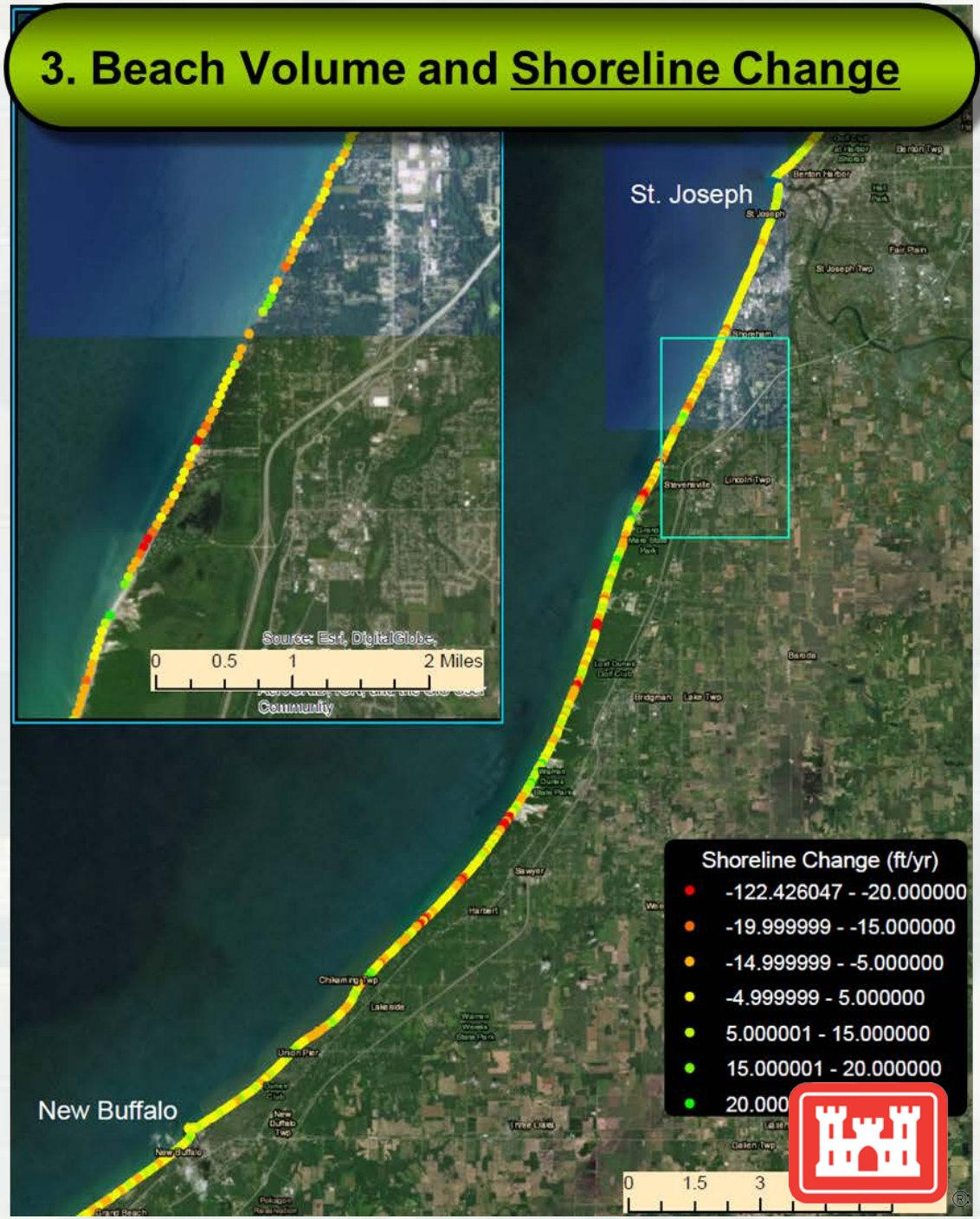


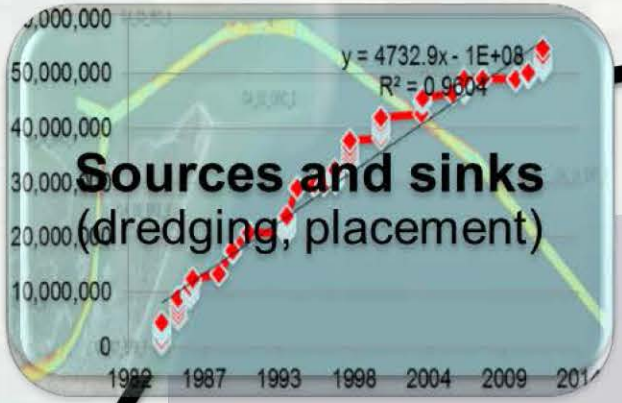
3. Beach Volume and Shoreline Change

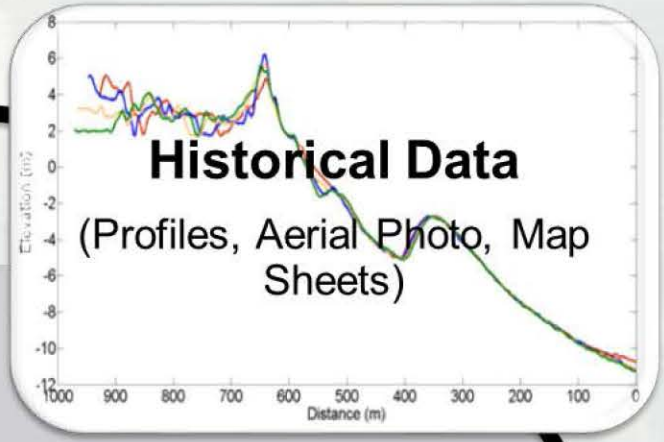
- Interim/Operational
  - ▸ ArcGIS
    - JALBTCX toolbox
    - DSAS

JALBTCX_quick_response_v2.tbx
- 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

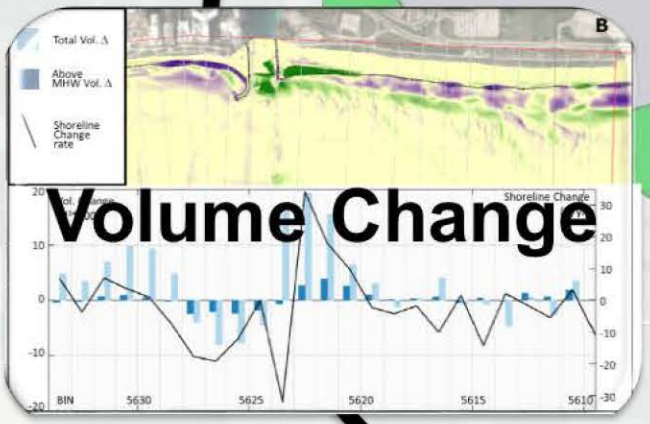


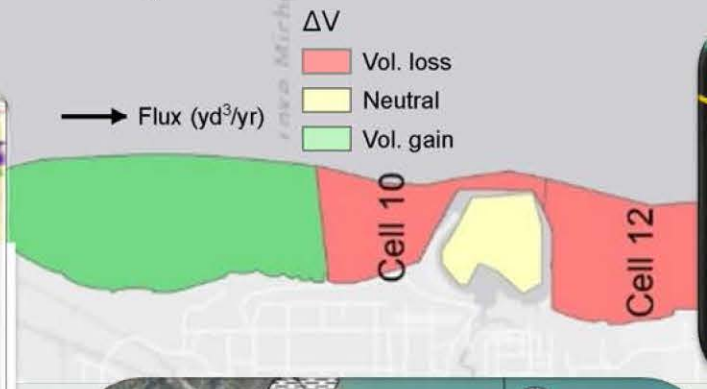


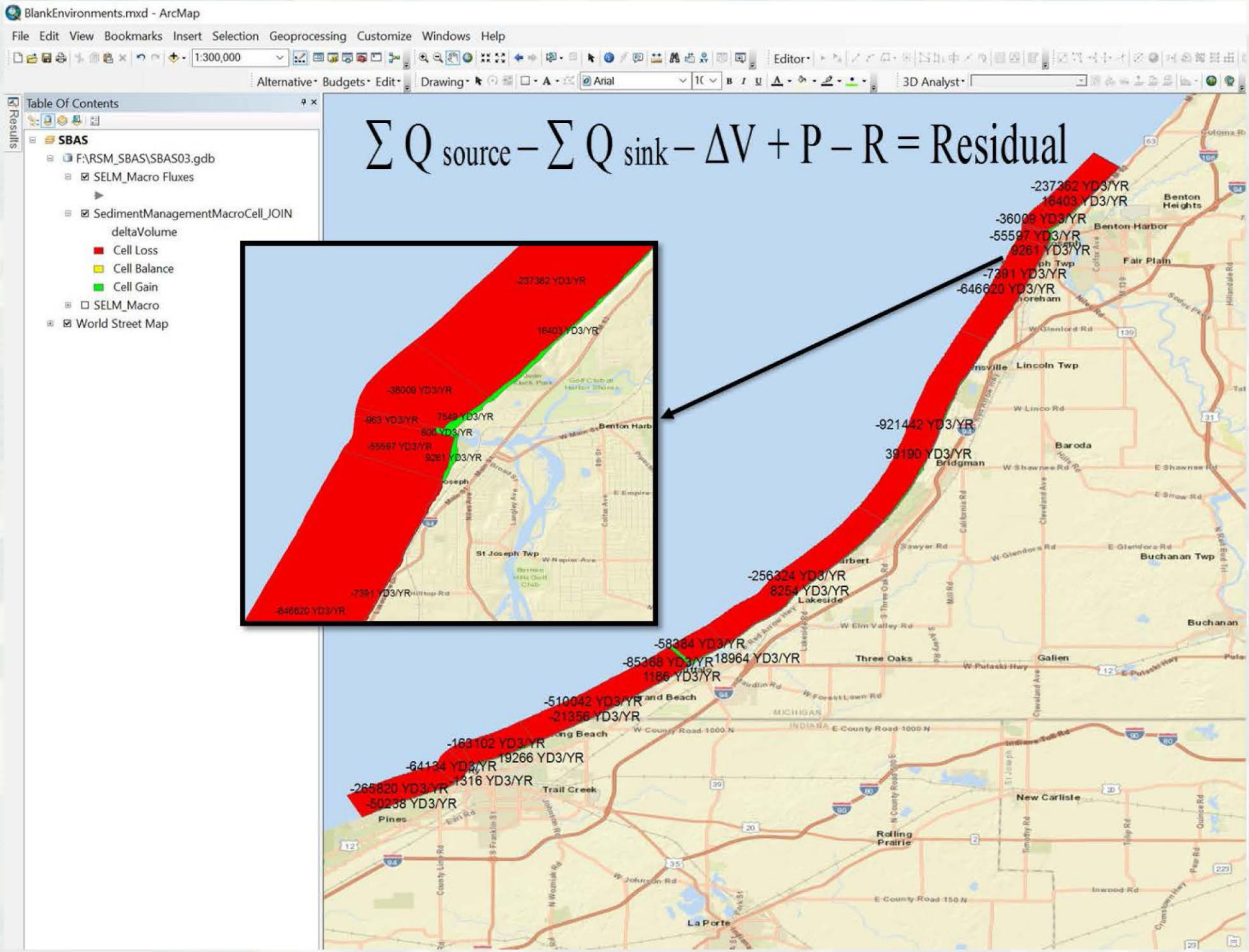




$$\sum Q_{source} - \sum Q_{sink} - \Delta V + P - R = Residual$$






BlankEnvironments.mxd - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table Of Contents
SBAS
F:\RSM_SBAS\SBAS03.gdb
SELM_Macro Fluxes
SedimentManagementMacroCell_JOIN
deltaVolume
Cell Loss
Cell Balance
Cell Gain
SELM_Macro
World Street Map
$\sum Q_{source} - \sum Q_{sink} - \Delta V + P - R = Residual$
-237352 YD3/YR
16403 YD3/YR
-36009 YD3/YR
-55597 YD3/YR
9261 YD3/YR
-7391 YD3/YR
-646620 YD3/YR
-921442 YD3/YR
39190 YD3/YR
-256324 YD3/YR
8254 YD3/YR
-58384 YD3/YR
-85368 YD3/YR
18964 YD3/YR
1166 YD3/YR
-510042 YD3/YR
-21356 YD3/YR
-163102 YD3/YR
19266 YD3/YR
-64134 YD3/YR
-1316 YD3/YR
-265820 YD3/YR
-50238 YD3/YR
Benton Heights
Benton Harbor
Fair Plain
Lincoln Twp
Baroda
Bridgman
Buchanan Twp
Lakeside
Buchanan
Three Oaks
Galien
Trail Creek
Pines
New Carlisle
Rolling Prairie
La Porte
St Joseph Twp

Sediment Budget Analysis

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

Q_{source}

Sediment Transport Rates

↓

Avg. Rates per Cell

Q_{sink}

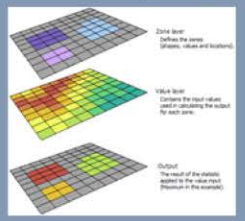
Grid Surface #2

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

Historic Data (Maps, Charts, Profiles)

Extract profile from Grid

↑

Grid Surface #1

Elevation Difference

↓

Volume Change Per Cell

Flux Data Entry

Cell Data Entry

↓

Residual