



# ERDC, Sediment Budget Improvements to Support the National RSM Strategy

## BLUF: 1-2 sentence purpose/summary

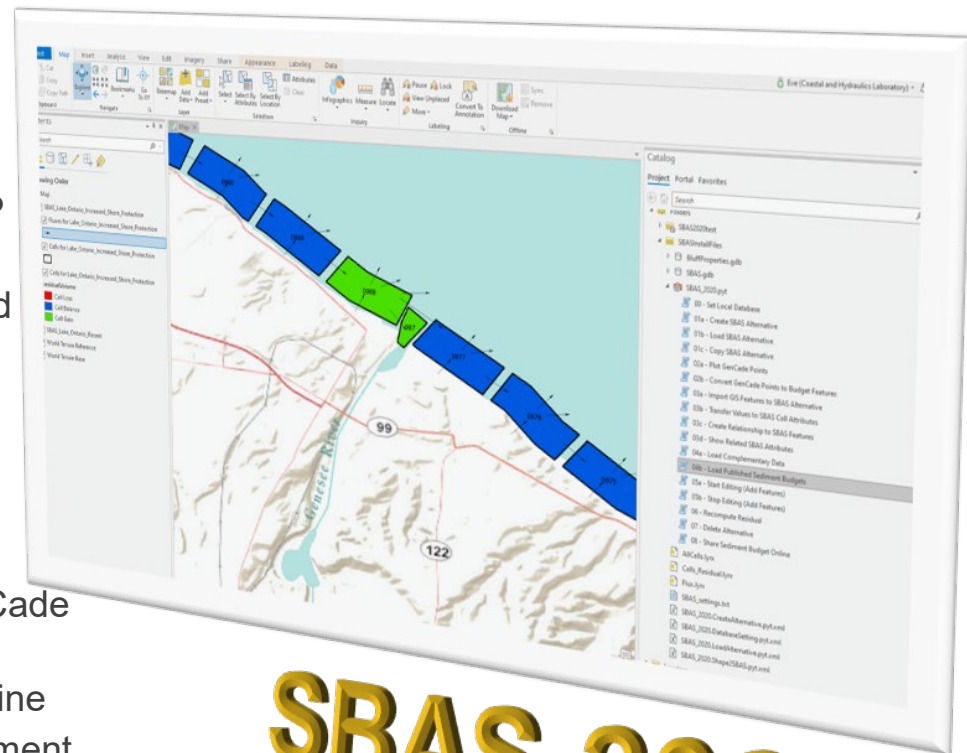
Output from models such as GenCode can provide additional sediment budget data where linked datasets, such as JALBTCX volume change and RSM BU database, are lacking, allowing SBAS to be applied universally along the coast. Updates to the user's manual and training materials now make the new ArcPro SBAS tool accessible to all.

## Objectives

- Integrate model results from GenCode, a CIRP tool predicting shoreline change, into SBAS.
- Produce a new user's guide & develop updated training materials
- Beta test the new toolbox

## Approach

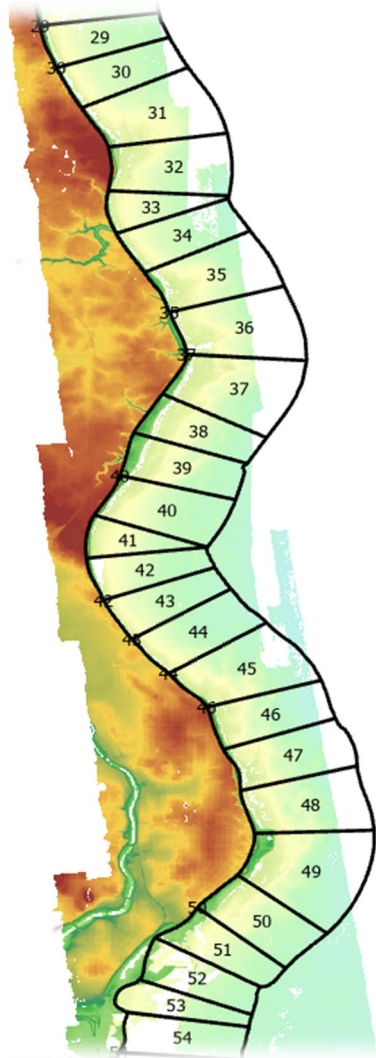
- GenCode compatibility tools - SBAS and GenCode developers worked together
- Updated tools utilize ArcGIS Pro & ArcGIS Online
- User's guide materials utilize the Wiki environment



# SBAS 2020



# ERDC, Sediment Budget Improvements to Support the National RSM Strategy



### Members

emann, ERDC CHL  
Styles, ERDC CHL  
Dunkin, ERDC CHL  
Hartman, ERDC CHL  
Wozencraft, ERDC CHL

### Stakeholders/Partners

Great Lakes & Ohio River Division (LRD)  
South Atlantic Division SAJ (Jacksonville)  
and SAM (Mobile)

opsovic, SAM OP-J  
h Godsey, SAM

### Overarching/Collaborative Opportunities

CIRP's GenCade tool  
Great Lakes & Ohio River Division (LRD) through the GLRI  
South Atlantic Division through the Coastal Comprehensive Study  
Elizabeth Godsey at Mobile District testing SBAS 2020  
National Coastal Mapping Program through the JALBTCX



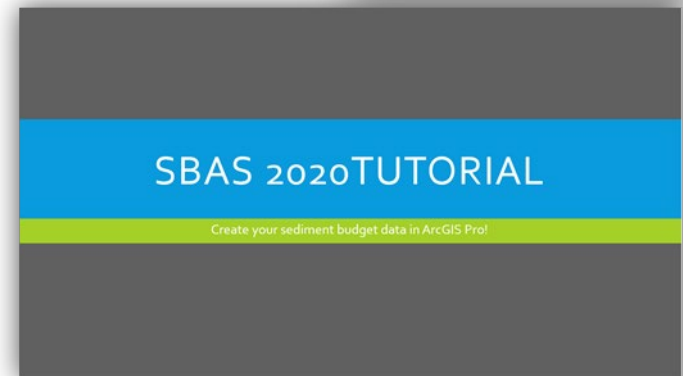
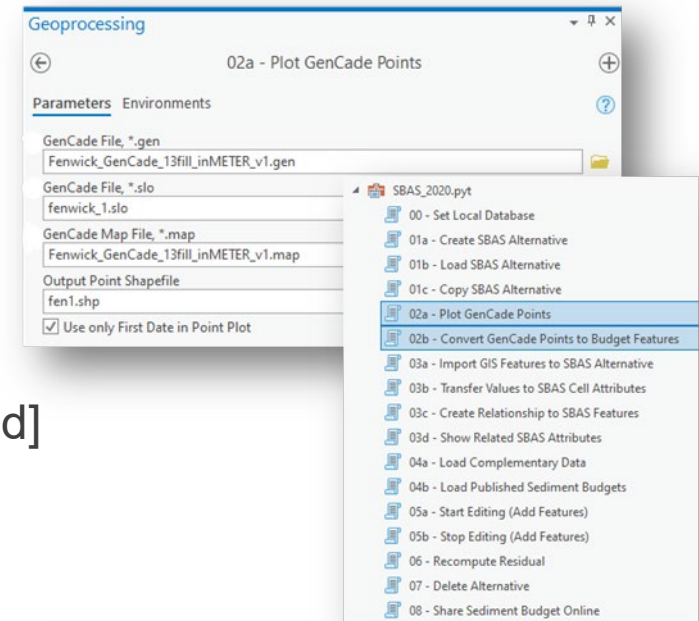
## ERDC, Sediment Budget Improvements to Support the National RSM Strategy

### Accomplishments/Deliverables

- GenCode compatibility tools for SBAS
- SBAS 2020 Tutorial & Training Materials
- Wiki User's Guide
- Enterprise database access [being improved]
- TR version of User's guide [in progress]

### Lessons Learned

- Value of beta testing
- Importance of experts on the team for each element of the project





# ERDC, Sediment Budget Improvements to Support the National RSM Strategy

**Sediment Budget Analysis System (SBAS)**

A Visualization and Calculation Tool for Sediment Budgets

The Sediment Budget Analysis System is a free sediment budget creation, visualization and calculation tool set for ESRI ArcGIS, with versions compatible with ArcMap 10.x versions and ArcGIS Pro. Once installed, this toolbox allows users to define a conceptual budget visually by creating a series of cells and arrows that represent fluxes into and out of cells (sources and sinks). Sand placement, P and removal, R, within cells can be accounted for. SBAS can then create quantitative "micro" (local) and "macro" (regional) sediment budgets, using a pre-defined sediment budget equation. The SBAS ArcMap toolset is available for download along with additional information from the RSM Webportal in the "Tools & Databases" dropdown. SBAS for ArcGIS Pro will be made available in the coming year. Legacy versions of the SBAS were developed as standalone executables for PC. For questions regarding older versions of SBAS please reach out to the contacts listed at the end of this article.

**Background (modified from Rosati and Kraus, 1999)**

Sediment budgets provide a conceptual and quantitative model of sediment transport magnitudes and pathways for a given time period. Sediment budgets are a framework for understanding complex coastal systems, whether natural or engineered. Often, the natural condition is studied to gain background information necessary for evaluating the inlet and adjacent beach response to coastal engineering projects (see Komar 1996, 1990 for an overview of concepts and applications).

**Theory**

SBAS calculates cell balances based on a conservation of volume (or volume flux) equation,

$$\Sigma Q_{source} - \Sigma Q_{sink} = \Delta V + P - R = Residual \quad (1)$$

where  
 $Q_{source}$  = input of sediment into a cell  
 $Q_{sink}$  = loss of sediment from a cell  
 $\Delta V$  = volume change within a cell  
 $P$  = placement into a cell (e.g., beach fill or dredged material)  
 $R$  = removal from a cell (e.g., dredging or mining)  
 $Residual$  = 0 for a balanced cell  
 Units are fluxes or volumes (e.g., cu yd/year, cu m/year, cu yd, cu m) representative of the period of interest.

**Applications**

Sediment budgets can enter at any of four stages in project development:

1. Existing Condition. A sediment budget for the existing condition is the most common type. This budget forms the basis for evaluating the impacts of planned engineering activities and the natural evolution of the coast.
2. Historical (pre-engineering activity) Condition. This budget is typically constructed for comparison with the existing-condition budget. A common application of the two budgets for inlet systems is a so-called "Section 111" or similar study, in which the impacts of inlet-related engineering activities (at Federal navigation projects) on the adjacent beaches are estimated.
3. Forecast Future Condition. Adapting and extrapolating the existing-condition sediment budget can assess the potential response to future projects or modifications.
4. Intermediate Condition. Sediment budgets representing other periods create a model of coastal evolution through time, which may lend insight to interpreting present or future evolution. As examples, intermediate-condition sediment budgets may document evolution of an inlet from initial formation to a quasi-equilibrium state, or they may reveal a picture of long-term natural bypassing through a cycle of channel migration and widening of a portion of the ebb-tidal shoal to the adjacent beach.

**Versions**

SBAS Version	Latest Update	Software Compatibility	Documentation
SBAS Pro	July 2020	ESRI ArcGIS Pro	SBAS User's Guide Wiki
SBAS Arc10	July 2016	ESRI ArcMap v. 10.x	SBAS ArcGIS 10 User's Guide (PDF) <a href="#">[link]</a>
SBAS-A	2007	ESRI ArcView v. 8.x	CHETN-XIV-7 <a href="#">[link]</a>
SBAS	1991	Windows 95, 98 & NT	CETN-IV-29 <a href="#">[link]</a>

**Access**

Download SBAS

- SBAS Toolbox for ArcGIS 10.x - updated 07 July 2020
- SBAS Toolbox for ArcPro - coming soon

**Documentation**

- SBAS User's Guide Wiki - continually updated guidance for tool installation and use
- ArcGIS 10 User's Guide (PDF) [\[link\]](#) - PDF user's guide specific to the ArcGIS 10 version

**Points of Contact**

Main POC: Eve Eisenmann  
 Email: [Eve.Eisenmann@usace.army.mil](mailto:Eve.Eisenmann@usace.army.mil)

Secondary POC: Katie Brutsche  
 Email: [Katherine.E.Brutsche@usace.army.mil](mailto:Katherine.E.Brutsche@usace.army.mil)

Technical Issues: Rose Dopovic  
 Email: [Rose.Dopovic@usace.army.mil](mailto:Rose.Dopovic@usace.army.mil)

The legacy SBAS standalone PC executable window [\[link\]](#)

**SBAS/UsersGuide**

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- 3 SBAS ArcGIS Desktop
  - 3.1 Installation
  - 3.2 Usage
- 4 Points of Contact

**Versions & Requirements** [\[link\]](#)

- SBAS ArcGIS Pro
- SBAS ArcGIS Desktop

Requires ArcGIS 10.1 - 10.4

- Python compytype package (tested with 0.8.2 - included with the tool)
- URL: <https://pypi.org/project/compytype/> - (Please link: <http://www.python.compytype.com/> (no longer works))
- Author: Thomas Heller, [heller@compytype.org](mailto:heller@compytype.org)
- License: MIT License
- The package must be installed into the local python instance.
- Install does not require admin rights.
- Can be installed by running `compytype-0.8.2\install_compytype.bat`
- Snippets is a slightly modified code snippets file for accessing ArcObjects via Python. (Included)
- File: `snippets.py` - (Please link: <http://www.python.compytype.com/snippets.htm> (no longer works))
- Author: Mark Cateforis

**SBAS ArcGIS Pro** [\[link\]](#)

**Installation Instructions** [\[link\]](#)

- Installation for SBAS for ArcGIS Pro is as simple as unzipping the distribution file to a local drive. The zip file includes the toolbox (SBAS\_2020.pyt), layer packages (\*.lyrx), a settings file (SBAS\_settings.ini), and a template geodatabase (SBAS.gdb).
- To launch the SBAS tools, create a new project in ArcGIS Pro. In order to access the contents of the SBAS tool, be sure to Add a Folder Connection to your project in the Catalog pane.
- The SBAS ArcGIS Pro Toolbox
  - SBAS for ArcGIS Pro is designed as an ArcToolbox within Python. Browsing to the file `SBAS_2020.pyt` in the Catalog pane, will expand to show the individual tools included in the toolbox (Figure 1).
  - The toolbox reads a settings file, `SBAS_settings.ini`, that MUST sit in the same directory as the `pyt` file. This file is used by the different SBAS tools to easily find the designated local SBAS database.

**Creating a Sediment Budget** [\[link\]](#)

**Set Local Database** [\[link\]](#)

- Tool 01a - Set Local Database is used to set a known locality for your local SBAS database. This provides the flexibility to have one or more local SBAS databases. Use Tool 01a to set ArcGIS Pro how which database is your active database for the SBAS session.
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**Create SBAS Alternative** [\[link\]](#)

- Tool 01a - Create SBAS Alternative is used to create a new alternative for a sediment budget. Basic information is collected to assist in building metadata for the alternative. The following pieces are data are required:
  - a. Budget Type (Micro or Macro)
  - b. Alternative Name
  - c. Geographic Area Name or Description
  - d. Data From (Epoch)
  - e. Date To (Epoch)
  - f. Flux Q Units (Cubic Feet/Year or Cubic Meters/Year)
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- Alternatives may be created to reflect different assumptions about sediment transport pathways and engineering activities, or they may reflect different time periods.
- Alternatives hold all values applied to littoral cells and fluxes.
- Data is written to the Alternatives table in the local geodatabase.
- There is a checkbox to Load New Alternative Immediately. If checkbox is ticked, 3 new layers will be added to the table of contents. Each layer will named "Fluxes for Alternative Name" or "Cells for Alternative Name".
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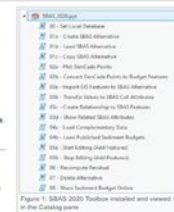


Figure 1: SBAS 2020 Toolbox installed and opened in the Catalog pane







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## Sediment Budget Analysis System (SBAS)



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SBAS	1991	Windows 95, 98 & NT	CETH-NV-20 <a href="#">Win</a>

### Access

Download SBAS

- SBAS Toolbar for ArcGIS 10.x - updated 07 July 2020
- SBAS Toolbar for ArcPro - coming soon

### Documentation

- SBAS User's Guide [Win](#) - continually updated guidance for tool installation and use
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### Points of Contact

Main POC: Eve Eisenmann

Email: [Eve.Eisenmann@usace.army.mil](mailto:Eve.Eisenmann@usace.army.mil)

Secondary POC: Katie Brutsche

Email: [Katherine.E.Brutsche@usace.army.mil](mailto:Katherine.E.Brutsche@usace.army.mil)

Technical Issues: Rose Doposvic

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The legacy SBAS standalone PC executable window

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### Versions & Requirements [pdf]

- SBAS-ArcGIS Pro
- SBAS-ArcGIS Desktop

Requires ArcGIS 10.1 - 10.4

Python script package (tested with 3.5.2 - included with this tool)

• URL: <http://python.org/programs/compindex/> (Previous link: <http://learning.python.net/index.html#compindex> no longer works)

Author: Thomas Heller: [heller@cityplex.org](mailto:heller@cityplex.org)

License: MIT License

The package must be installed into the local python instance.

Install does not require admin rights.

Can be installed by running `compindex-2.0.2\install_compindex.bat`

Snippets.py: slightly modified code snippets file for accessing ArcObjects via Python. (Included)

• File: `snippets.py` (Previous link: <http://www.python.com/snippets/> no longer works)

Author: Mark Cedarholm

### SBAS-ArcGIS Pro [pdf]

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### Creating a Sediment Budget [pdf]

#### Set Local Database [pdf]

- Tool 00 - Set Local Database is used to set a known locality for your local SBAS database. This provides the flexibility to have one or more local SBAS databases. Use Tool 00 to set ArcGIS Pro to know which database is your active database for this SBAS session.
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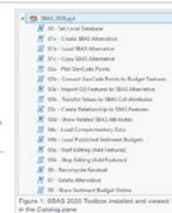


Figure 1. SBAS 2020 toolbox installed and opened in the Catalog pane








# ERDC, Sediment Budget Improvements to Support the National RSM Strategy

**What challenges did you face to get your project to implementation and how did you move past them? If not yet implemented, what is your path forward to construction?**

- Correct integration of output from a model in to the SBAS environment
- Developing and testing the tool to hone user's manuals and tutorial material
- Facing issues with out-dated versions and out-dated guidance documents – attempting to get this organized and documented for future work.

### Versions

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SBAS Arc10	July 2018	ESRI ArcMap v. 10.x	<a href="#">SBAS ArcGIS 10 User's Guide (PDF)</a> 
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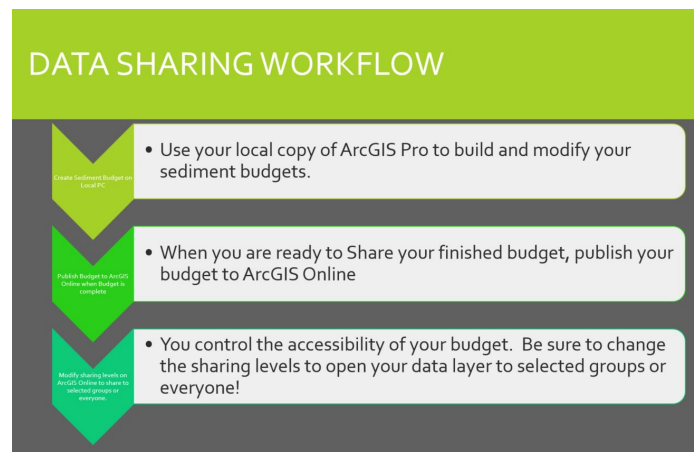
<https://cirpwiki.info/wiki/SBAS>



# ERDC, Sediment Budget Improvements to Support the National RSM Strategy

## How is this project benefiting the USACE and Nation?

- Streamlined sediment budget creation for all!
- Accessibility to other datasets through SBAS, including enterprise databases, model/tool outputs, and other sediment budgets
- Intuitive inclusion of this data in the sediment budget creation process.
- Enabling creation of conceptual sediment budgets in all regions, regardless of pre-existing data.
- Sediment budgets are relevant to most USACE districts, and all will be able to utilize the tools created here and share their results on the enterprise database.



# Thank you

