SBAS 2020TUTORIAL

Create your sediment budget data in ArcGIS Pro!

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TOPICS

DATA DICTIONARY - ALTERNATIVE

Alternative is a table that holds basic metadata information related to individual sediment budgets.

Field	Type	Length	Definition
scenarioIDPK	Text	50	Primary Key. This value is auto-generated by SBAS and provides a unique identifier for each alternative (or scenario).
sdsID	GUID		This value is auto-generated by SBAS and provides a unique identifier for each alternative (or scenario). Value can be used to link to items in other enterprise GIS.
scenarioAuthor	Text	100	Author of the Alternative. Name of author is pre-determined by the user login to ArcGIS Pro. Name is listed as the ArcGIS Online username.
sdsFeatureName	Text	50	Name or label of alternative.
sdsFeatureDescription	Text	255	Description of alternative.
geoAreaDescription	Text	255	Description of location of sediment budget.
projectID	Text	255	Optional project id for internal management purposes. The SBAS application does not reference or write to this field.
dateScenarioCreated	Date		Date alternative created in the SBAS database.
budgetType	Text	50	Type of sediment budget (Micro - local or Macro - regional).
dateIntervalStart	Date		Start date of alternative epoch.
dateIntervalEnd	Date		End date of alternative epoch.
cellUnits	Text	255	Units of volume for littoral cells (Cubic Yards or Cubic Meters)
qUnits	Text	255	Units of volume for sediment transport rate (Cupic Yards/Year or Cubic Meters/Year)
uncertaintyMethods	Text	50	List of uncertainty methods used in Sediment Budget. The SBAS application does not reference or write to this field.
medialDPK	Text	50	ID to hold links to related media documentation. The SBAS application does not reference or write to this field.
sdsMetadataID	Text	50	ID to hold unique metadata ID.

Continue

TOPICS

DATA DICTIONARY– SEDIMENT TRANSPORT DIRECTION

Sediment Transport Direction (polyline) is the linear representation (flux) of sediment transport.

Field Name	Type	Length	Definition
sedimentTransportDirectionIDPK	Text	50	Primary Key. This value is auto-generated by SBAS and provides a unique identifier for each flux.
sdsFeatureName	Text	50	Name or label of the flux.
sdsFeatureDescription	Text	255	Description of the flux.
scenarioIDFK	Text	50	Foreign Key. Value to the related alternative (or scenario).
qValue	Double		Volume of sediment moving in or out of cell
transportUom	Text	50	Units of measure for Sediment Transport Rates. Cubic Yards/Year or Cubic Meters/Year.
alternativeLabel	Text	50	Name of Alternative

Continue

TOPICS

DATA DICTIONARY– SEDIMENT MANAGEMENT CELLS

Sediment Management Cells (polygon) are the boundary of each littoral cell. Each cell holds a relationship back to the related Alternative.

Field Name	Type	Length	Definition
littoralCellIDPK	Text	50	Primary Key. This value is auto-generated by SBAS and provides a unique identifier for each littoral cell.
sdsFeatureName	Text	50	Name or label of the littoral cell.
sdsFeatureDescription	Text	255	Description of the littoral cell.
scenarioIDFK	Text	50	Foreign Key. Value to the related alternative (or scenario).
removalVolume	Double		Volume of sediment removal (per littoral cell and alternative).
placementVolume	Double		Volume of sediment placement (per littoral cell and alternative).
deltaVolume	Double		Change in volume per littoral cell and alternative.
valConfidence	Text	255	Determine level of data confidence, assigned by sediment budget author. Low, Medium, High
residualVolume	Double		Computed Residual volume per littoral cell and alternative.
transportRemoval	Double		Sum of transport removal per cell.
transportPlacement	Double		Sum of transport placement per cell.
volumeUom	Text	50	Units of measure for Volume Change, Removal, Placement and Residual volumes. Cubic Yards or Cubic Meters.
transportUom	Text	50	Units of measure for Sediment Transport Rates. Cubic Yards/Year or Cubic Meters/Year.
alternativeLabel	Text		Name of Alternative
mediaIDPK	Text		ID to hold links to related media documentation. The SBAS application does not reference or write to this field.
sdsMetadataID	Text		ID to hold unique metadata ID.
projectID	Text		Optional project id for internal management purpose. The SBAS application does not reference or write to this field.
sdsID	GUID		This value is auto-generated by SBAS and provides a unique identifier for each alternative (or scenario). Value can be used to link to items in other enterprise GIS.

END OF TOPIC

Data Dictionary

SEE ALL TRAINING TOPICS

TOPICS

TERMINOLOGY

- Alternative—A representation of one set of assumed conditions for a sediment budget. Each alternative has its own set of fluxes, cells, placements (inputs), and removals (outputs).Alternatives may be created to reflect different assumptions about sediment-transport rates and paths, and engineering activities within a budget, or they may reflect different time periods.
- Attribute Table—A table used to store attribute information for a specific coverage feature class (for example, littoral cell, flux, and confidence layers). Each row represents a feature, and each column denotes a field. To view a layer's attribute table, in the ArcGIS Pro's Table of Contents right-click the layer and from the pop-up menu select Open Attribute Table.
- Confidence—The certainty level that the values assigned to littoral cells and fluxes are accurate.
- Feature—A point, line, or polygon in a coverage, shapefile, or geodatabase feature class.
- Flux—Representation of the input and output of sediment into a littoral cell. Each cell requires both eastward and westward transport rates.

Continue

TOPICS

TERMINOLOGY

- Layer—A collection of similar geographic features (such as rivers, lakes, littoral cells, and fluxes) in a particular area or place referenced together for display on a map. A layer references geographic data stored in a data source, such as a shapefile, and defines how to display it.
- Littoral Cell—A collection of information describing similar physical, biological, and cultural characteristics within a particular area along a river, lake, sea, or ocean.
- Macro Budget—A sediment budget for a region; it may consist of multiple micro budgets.
- Micro Budget—A sediment budget for a specific local area.

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TOPICS

TERMINOLOGY

- Sediment Budget—A measure of sediment (usually sand) "sources" (inputs), "sinks" (outputs), and net change within a specified "control volume" (a cell or series of connecting cells) over a given period of time.
- Shapefile/Feature Class—A vector data storage format for storing the shape, location, and attributes of geographic features. A shapefile is stored in a set of related files and contains one feature class.
- Sink—The destination of sediment that is moved from its original location.
- Source—The point of origin of sediment that is moved to a different location.
- Table of Contents—In ArcGIS Pro, a list of all the data frames and layers on the map, showing what features the symbols in each layer represent.

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END OF TOPIC

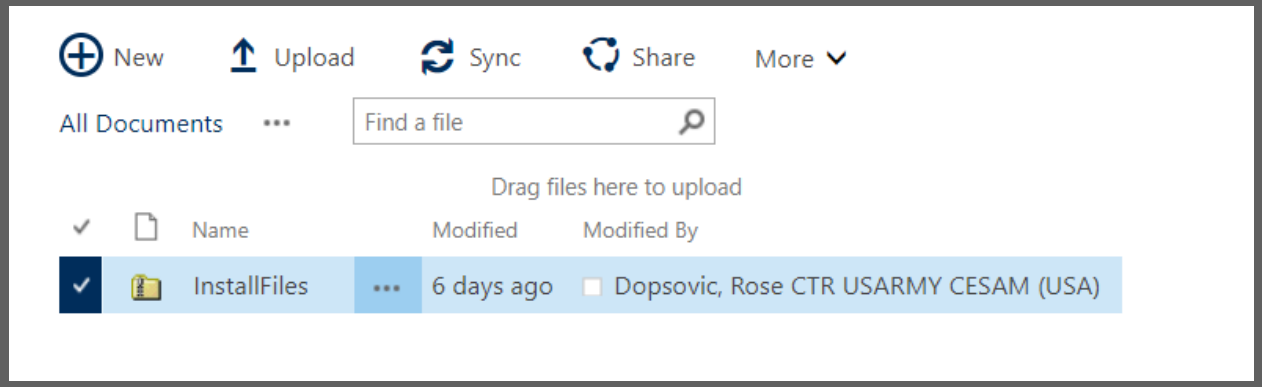
Terminology

SEE ALL TRAINING TOPICS

TOPICS

SBAS 2020 INSTALLATION

- Installation for SBAS for ArcGIS Pro is as simple as unzipping the distribution file to a local drive.
- Download the ArcGIS Pro Toolbox from https://team.usace.army.mil/sites/ERDC/PDT/RSM/SBAS%20Library/SBAS%202020/InstallFiles.zip
  - The zip file includes the toolbar (SBAS_2020.pyt), layer packages (*.lyrx), a settings file (SBAS_settings.txt), and a template geodatabase (SBAS.gdb).
- In Windows Explorer, unzip the file into a local directory.



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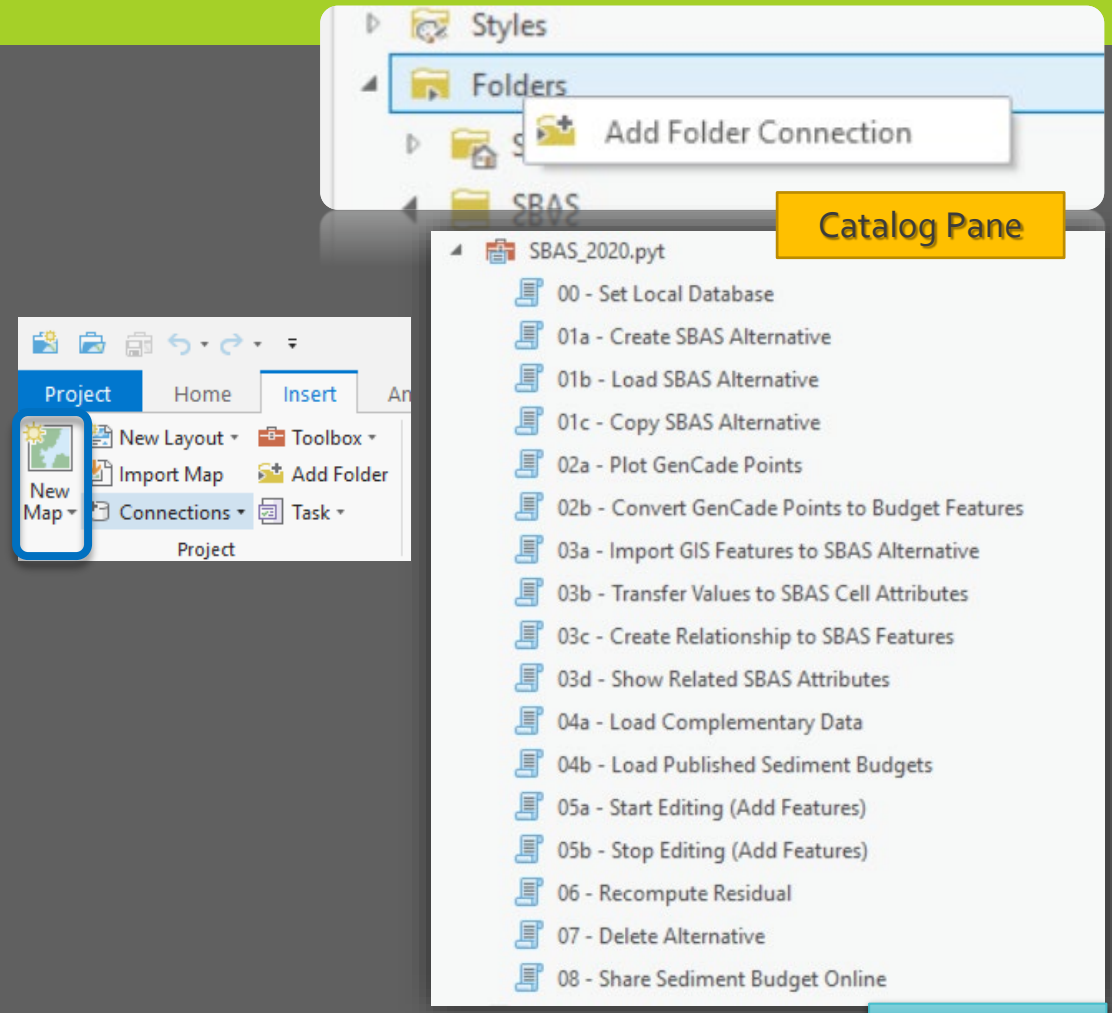
TOPICS

SET UP ARCGIS PRO

- Start a new ArcGIS Pro project or open an existing project.
  - If New Project, from the Insert Menu, select New Map
  - Existing project, select the **Map** from ArcGIS Pro Home Menu
  - If **Catalog** page does not appear, from the **View** menu choose **Catalog Pane**
- If not done so already, right-click on Folders and Add Folder Connection to the location of the unzipped toolbar download.
- Browse and expand the SBAS_2020.pyt file.
- The toolbox reads a settings file, **SBAS_settings.txt**, that MUST side in the same directory as the pyt file. This file is used by the different SBAS tools connect to the designated local SBAS database.



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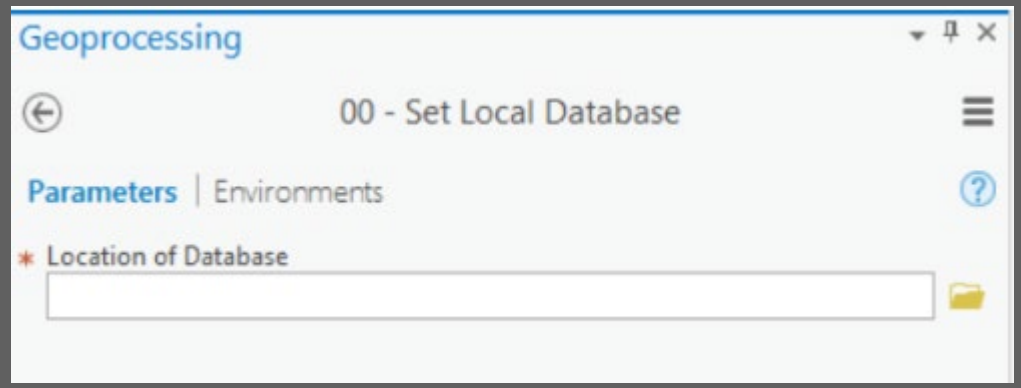
TOPICS

SET LOCAL DATABASE CONNECTION

- **Tool 00 - Set Local Database** is used to set a known local for your local SBAS database. This provides the flexibility to have *one or more* local SBAS databases. Use Tool **00a** to let ArcGIS Pro know which database is your active database for this SBAS session.
  - If you want to create a duplicate SBAS database, copy the *SBAS.gdb* in Catalog into another location.
- Behind the scenes this tool is writing a string value into **SBAS_settings.txt** (which is housed in the same directory as the SBAS_2020.pyt file). Each time SBAS needs to locate the SBAS database in the data processing, it will put the value listed in this file.



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END OF TOPIC

Installation & Setup

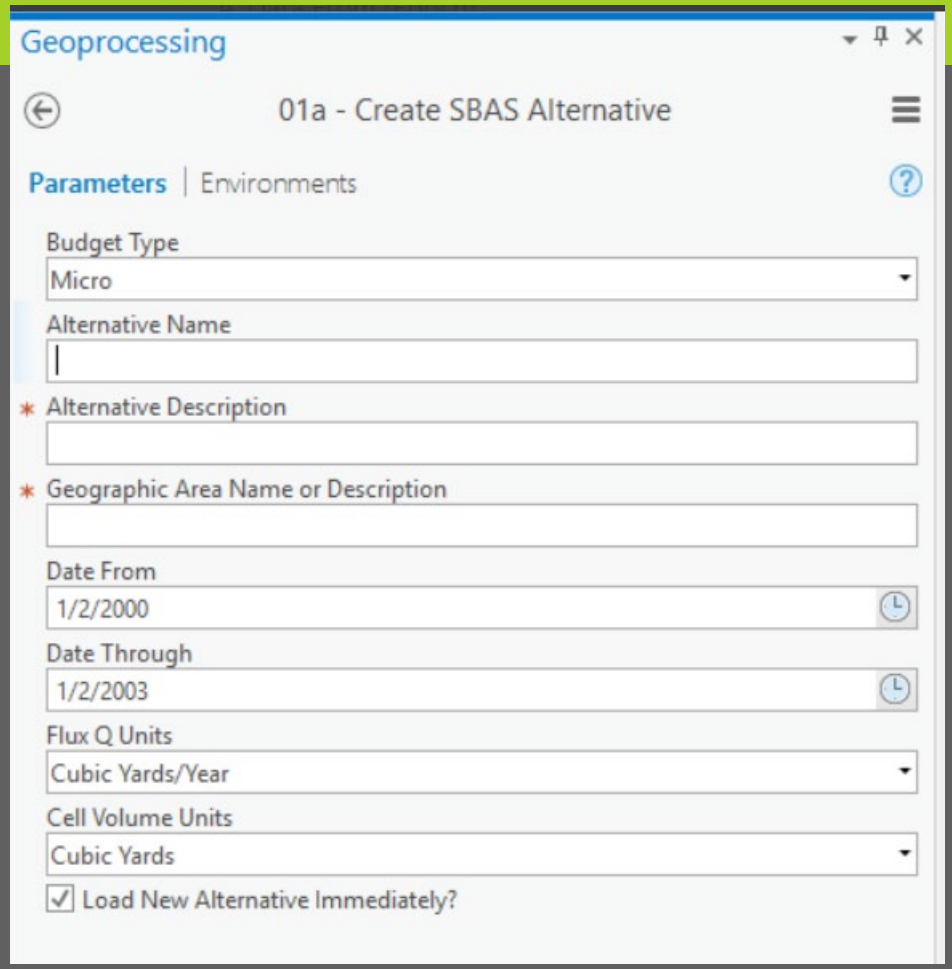
SEE ALL TRAINING TOPICS

TOPICS

CREATE SBAS ALTERNATIVE

New Alternative

- 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:
  - Budget Type (Micro or Macro)
  - Alternative Name
  - Alternative Description
  - Geographic Area Name or Description
  - Data From (Epoch)
  - Date To (Epoch)
  - Flux Q Units (Cubic Year/Year or Cubic Meters/Year)
  - Cell Volume Units (Cubic Yards or Cubic Meters)



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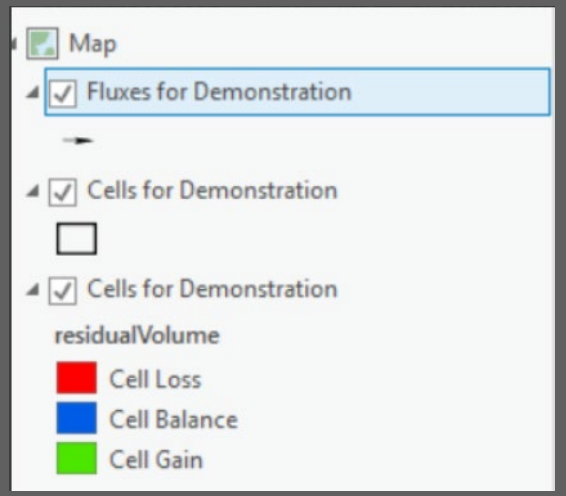
TOPICS

CREATING A SEDIMENT BUDGET, MORE INFO

New Alternative

- Sediment Budget data is grouped into *Alternatives*. Alternatives are representations of one set of assumed conditions for a sediment budget. Each alternative has its own set of littoral cells (with delta, placement [input], and removal [output] volumes) and fluxes.
- Alternative Notes:
  - Alternatives may be created to reflect different assumptions about sediment-transport paths/rates 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 **Alternative** 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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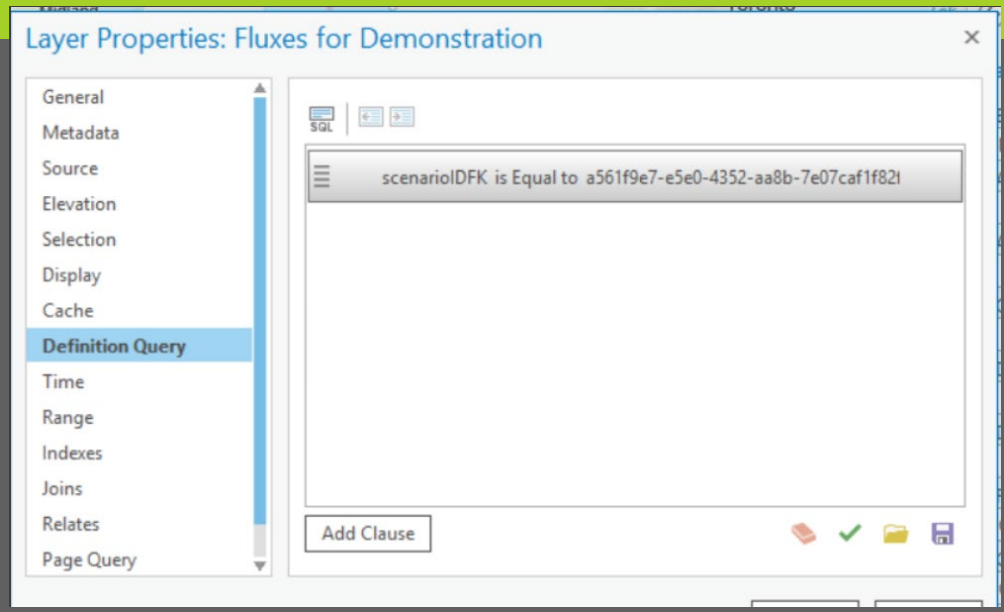
TOPICS

CREATING A SEDIMENT BUDGET, MORE INFO

New Alternative

- As different alternatives are created, each are assigned a unique ID. This value is stored in the *scenarioIDPK* attribute field. When added to the Table of Contents, the SBAS tool pulls the supplied layer files (*Cells.lyrx*, *AllCells.lyrx*, and *Flux.lyrx*) and applies a definition query to the items that filters only on the assigned unique ID for the active alternative.
- Creating a New Alternative is the first step in building the geometry container to hold littoral cells and fluxes features.



You will use additional tools - **02b, 03a, or 05a/05b** to add geometry to the sediment budget alternative.

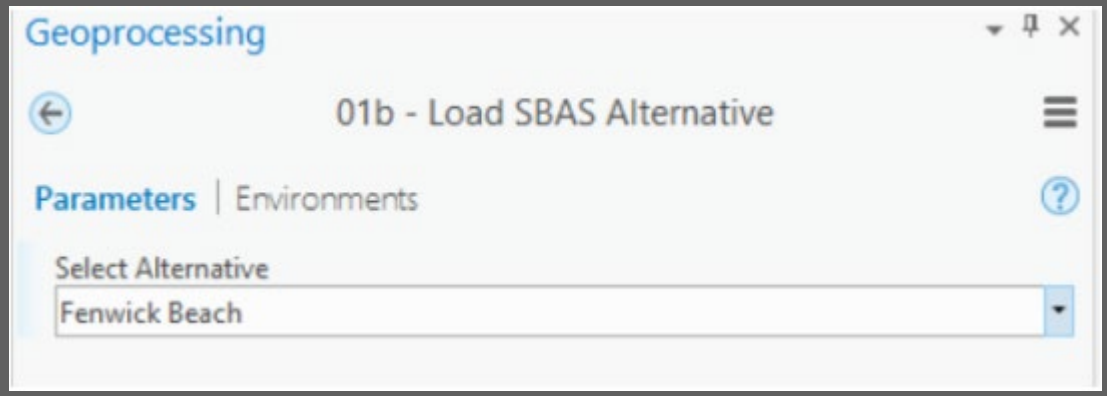
Continue

TOPICS

LOAD EXISTING ALTERNATIVES

Load Alternative

- If an alternative was created using tool **01a**, tool **01b - Load SBAS Alternative** is used to load the respective feature layers into Table of Contents. *Multiple alternative can be loaded at the same time.*
  - Definition queries are used in each layer to filter the respective alternative.
- All available alternatives are listed in the drop down menu are that are stored in your local SBAS database. Select the Alternative and click Run.
  - Data layers for this alternative are loaded into the Table of Contents. If no features are visible it is possible that geometry has not been created, appended, or imported. Use tools **02, 03, and 05** to add features.
- As different alternatives are created, each are assigned a unique ID. This value is stored in the *scenarioIDPK* attribute field. When added to the Table of Contents, the SBAS tool pulls the supplied layer files (*Cells.lyrx*, *AllCells.lyrx*, and *Flux.lyrx*) and applies a definition query to the items that filters only on the assigned unique ID for the active alternative.



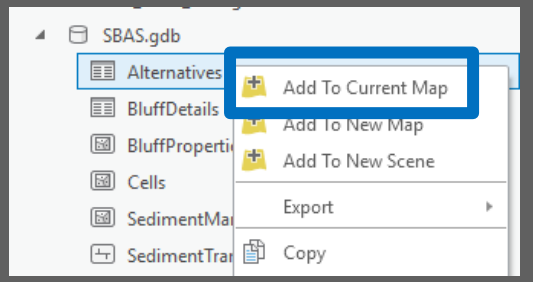
Don't see your alternative listed? Close the tool and right-click on the SBAS_2020.pyt in the Catalog view and select Refresh. Re-open the tool to see your alternative name.

Continue

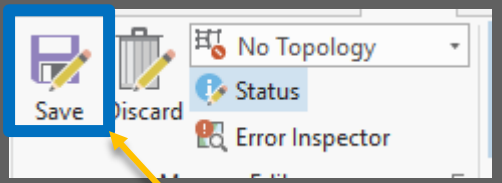
TOPICS

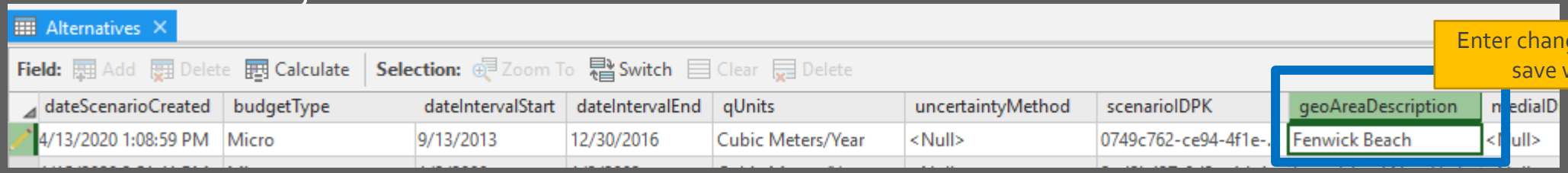
CHANGE ALTERNATIVE PROPERTY VALUES

If you need to change any of the Alternative details like Name, Description, Start and End Date you can directly modify the Alternative table.



1. In the Catalog pane, browse and expand the SBAS.gdb.
2. Right-click on the Alternative table and select Add to Current Map.
3. In the Table of Contents pane, right-click on the Alternative table and select Open.
4. In the Attribute window, double-click cell to modify. Enter any changes.
5. When complete, from the Edit ribbon click the Save button.
   - Note: If the Save button is disabled, hit the enter key (with the attribute table) to complete the change
   - If you have *renamed* your Alternative, to see these changes reflected in toolbox right-click on the toolbox name and click Refresh.





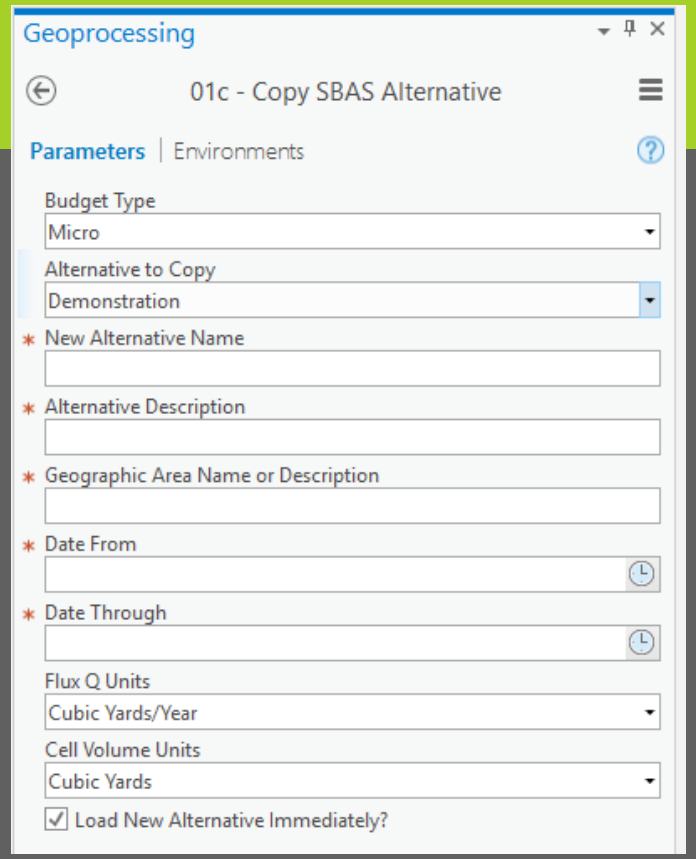
Enter changes in cell. Be sure to save when complete!

Continue

TOPICS

COPY ALTERNATIVE

- Tool **01c - Copy Alternative** is used to copy and existing Alternative into a new Alternative.
- Use this tool if you would like to reuse the feature geometry for a selected Alternative. All features will be copied and labeled with the new Alternative ID (scenarioIDFK) value.
  - Using the same geometry, you can apply a different set of values to reflect different scenario.
  - This tool will make a copy of all geometry in your selected Alternative.
- Select your existing alternative and enter in details for the new alternative you would like the features and values copied into.
- Click Run when complete.



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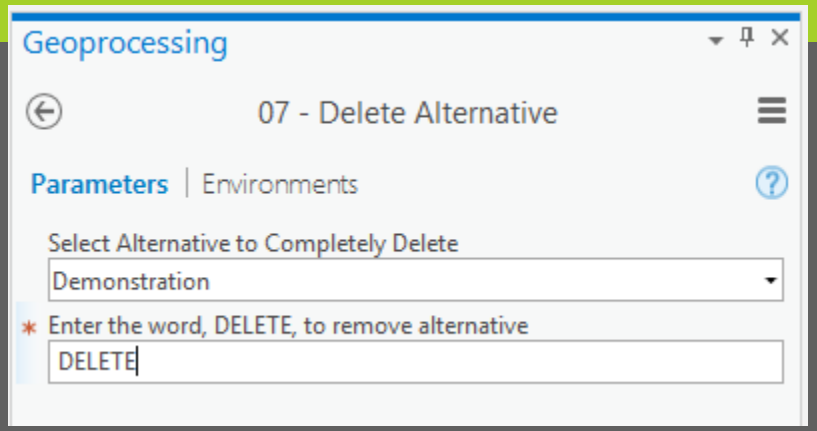
TOPICS

DELETE ALTERNATIVE

- Use tool **07 - Delete Alternative** if you need to delete an alternative, use this tool to remove the Alternative from your personal database.
- This tool does NOT automatically remove any published datasets.
  - If you have published a sediment budget to ArcGIS Online, and you would like to remove it, log-in to https://usace.maps.arcgis.com/home/index.html and delete the feature service from My Contents.
- To delete an Alternative from your local database, use this tool to select the Alternative to delete, then type in DELETE.
- Click Run to complete the removal.



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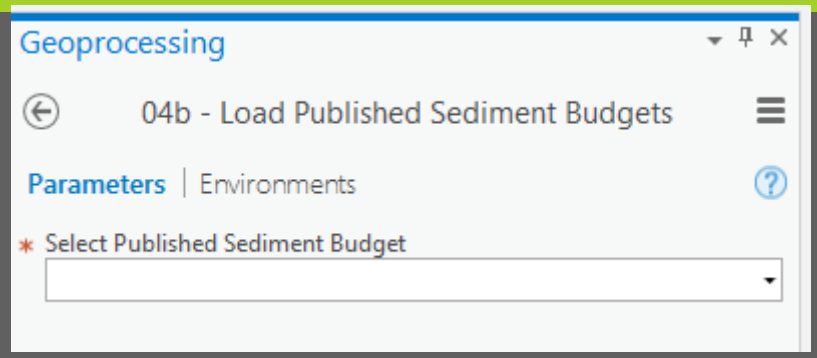
TOPICS

LOAD PUBLISHED SEDIMENT BUDGETS

- Users of SBAS 2020 can publish their completed sediment budgets into a master database. SBAS 2020 is configured to work with available content on ArcGIS Online (AGO).
- Tool **04b** allows you to quickly connect to online content that has been appropriately tagged in AGO item descriptions or data published through the SBAS 2020 toolbox (see tool **08 - Share Sediment Budget Online**). To view available budgets, use tool **04b - Load Published Sediment Budgets**
- Note: Ensure you are logged in to an account within ArcGIS Pro that has access to the USACE AGOL.
- Choose the budget you'd like to load into the Table of Contents and click Run



END OF TOPIC

Working with Alternatives

SEE ALL TRAINING TOPICS

TOPICS

COMPLEMENTARY DATA

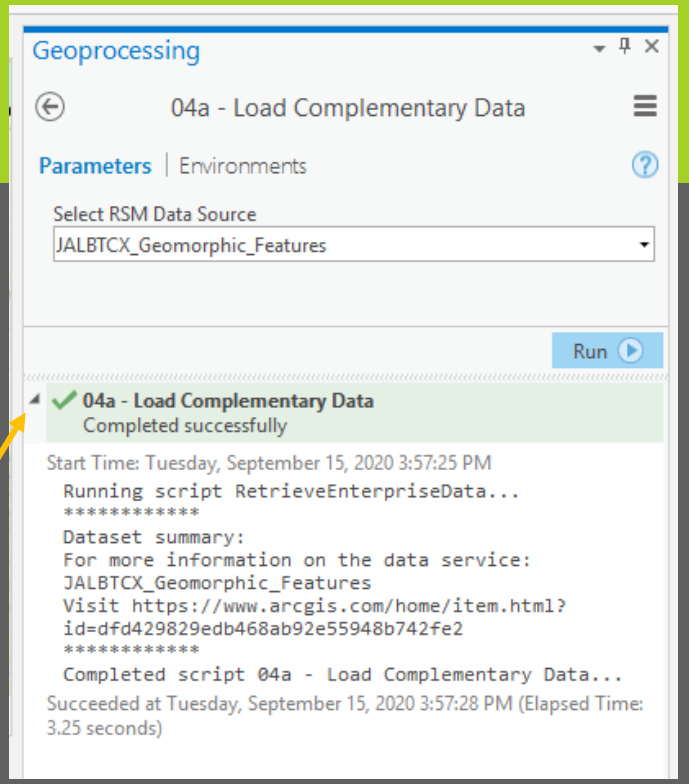
Access and load data others has tagged as applicable Sediment Budget resources.

Continue

TOPICS

LOAD COMPLEMENTARY DATA

- SBAS 2020 is configured to work with available content on ArcGIS Online (AGO). You to quickly connect to online content that have been appropriately tagged in AGO item descriptions.
- Use tool **04a - Load Complementary Data** to view or load data that may support your sediment budget, use this tool.
- Open the tool and view data sources listed under *Select RSM Data Source*, a list of datasets configured in AGOL to assist with finding data
- Choose the desired dataset and click Run
- Expand the tool results window. A short summary and link to discover more details is provided.



TOPICS

CONTRIBUTE TO SBAS COMMUNITY

- If you discover a data resource that is useful to building sediment budgets, Esri's ArcGIS Online is used to flag the dataset for future use.
- SBAS 2020 is configured to read ArcGIS content that is either a feature service or a web map. If these items are identified with the "**SBAS Data Source**" tag, SBAS 2020 will locate these datasets when tool **04a** is executed.
- To tag a dataset, log into ArcGIS online (https://usace.maps.army.mil). Search and/or locate the dataset.
- Open the Item page, and click Edit next to Tag. Enter "SBAS Data Source" . Keep in mind that if this dataset is not shared to Everyone or the Organization, users will not be able to access this layer.

Continue

END OF TOPIC

Working with Complementary Data

SEE ALL TRAINING TOPICS

TOPICS

SBAS FEATURE GEOMETRY

Sketch New Features

- Use the Add New Feature tools in ArcGIS Pro to create new cell polygons and polylines.

Import from GenCade Data

- Do you have budget data that was created in GenCade? SBAS 2020 uses the .slo, .gen, and .map file to import your feature geometry.

Import from Existing GIS layer

- If you have GIS layers already created that represent cells or fluxes, but were created outside of this SBAS toolbox, these features can be imported into SBAS.

TOPICS

CELL GEOMETRY

Sketch, GenCade Imports, Import from Existing GIS

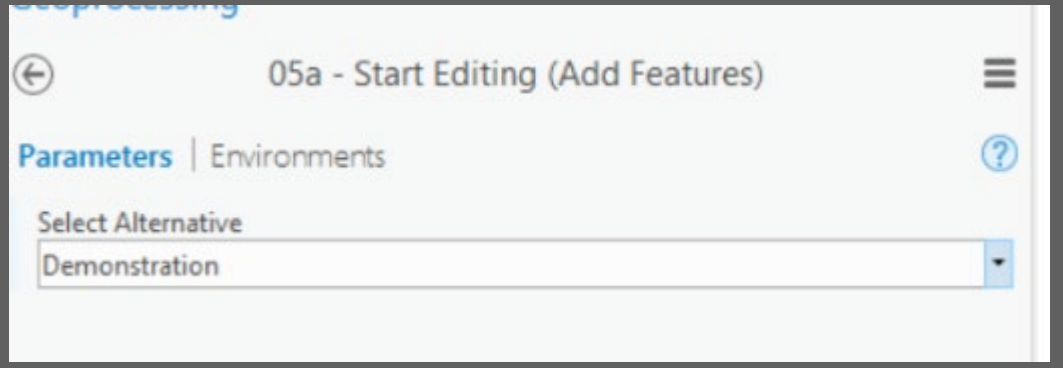
Continue

TOPICS

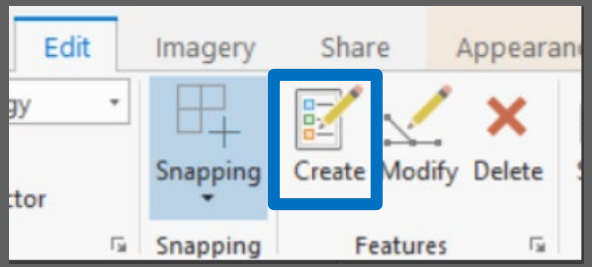
SBAS FEATURE GEOMETRY – SKETCH

Cell Geometry

- Creating new feature geometry in SBAS, follows much of the same process inherent in GIS, however in SBAS we first have to start an 'SBAS Edit Session' so geometry is related to the correct alternative.
- To begin launch tool **05a - Start Editing (Add Features)**
- A list of all alternative in the Table of Contents will be listed in the drop-down list. Choose the desired alternative and click Run.
- Zoom to your area of interest and click on ArcGIS Pro's **Edit** ribbon and click on **Create**.



In the background, SBAS sets the default values for the scenarioIDFK equal to that of the selected alternative. Remember, this is the value that is used in all of the definition queries.



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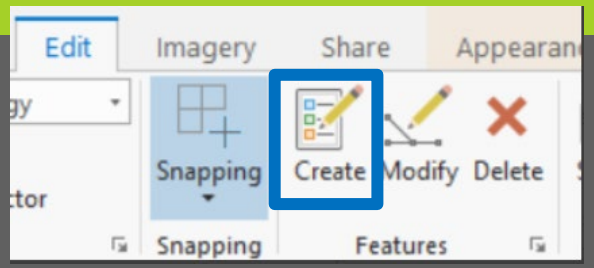
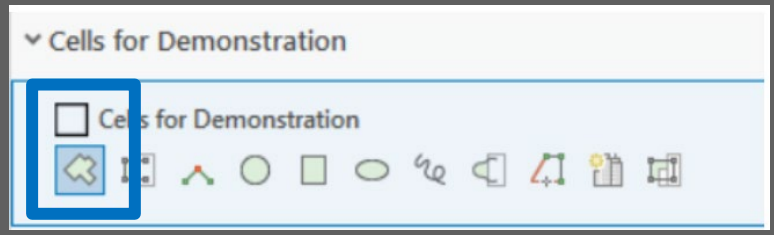
TOPICS

SBAS FEATURE GEOMETRY – SKETCH

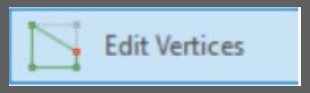
Cell Geometry



- In the *Create Features* panel, click on the symbol in front of Cells for *Alternative Name* layer. This will expand to show you the sketch options. Click on the first icon. This is turn on your sketch tool.
  - Click in the map to drop vertices for your littoral cell polygon.
  - Double-click to complete sketch.



- When done sketching all of the new littoral cell features, launch tool **05b - Stop Editing (Add Features)** to commit your changes.



To Modify location of vertices, click on the **Modify** button from ArcGIS Pro's **Edit** ribbon. Click on Reshape, then Edit Vertices. Click on the vertices to move to new location or right click to remove.

Sketch your cells by clicking to drop a vertex.

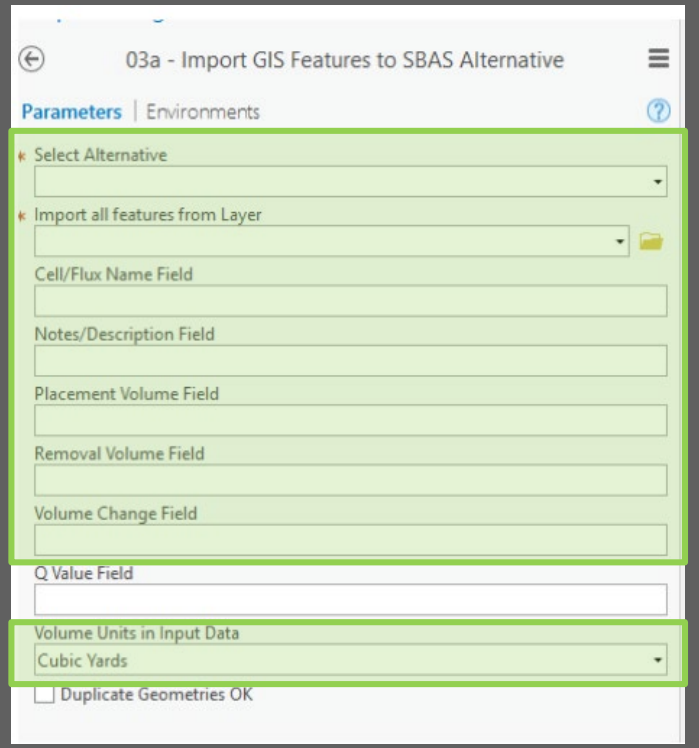
- Save changes (on Edit ribbon) when complete.

TOPICS

SBAS FEATURE GEOMETRY – IMPORT

Cell Geometry

- If you have GIS layers already created that represent cells or fluxes, but were created outside of this SBAS toolbox, these features and values can be imported into SBAS.
- If your existing features are to be a part of a new Alternative, use tool **01a - Create New Alternative** to set up your Alternative Placeholder.
- Using tool **03a - Import GIS Features to SBAS Alternative**, browse to an existing feature class or shapefile, then provide field mapping to connect your original field names to the SBAS values.
- The field mapping to bring over the geometry and field values into the new SBAS Alternative layers.
  - Field mapping for Littoral Cells include: *Name*, *Description*, *Placement Volume*, *Removal Volume*, *Volume Change*, and *Volume Units*
- Duplicate Geometries
  - This tool will check for duplicate geometries, or polygons and polylines footprints that already exist in the local SBAS database. If this is what you would like to do (e.g., you use the same cells for multiple alternatives), check the ***Duplicate Geometries OK*** checkbox.



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TOPICS

SBAS FEATURE GEOMETRY – IMPORT

Cell Geometry

What happens?

- Each feature in the selected feature class is appended in the *SedimentManagementCells* feature class with the SBAS database. Fields are cross-referenced so data is added to the correct fields.
- All new features are attributes with the correct Alternative ID (*scenarioIDPK* value is pulled from the selected Alternative and inserted into the *scenarioIDFK field)*
- Note: Data types must match. E.g., volumes must be numeric & description or name field must be strings. Refer to the Data Dictionary for data types.

END OF TOPIC

Working with Sketching & Importing Cell Geometry

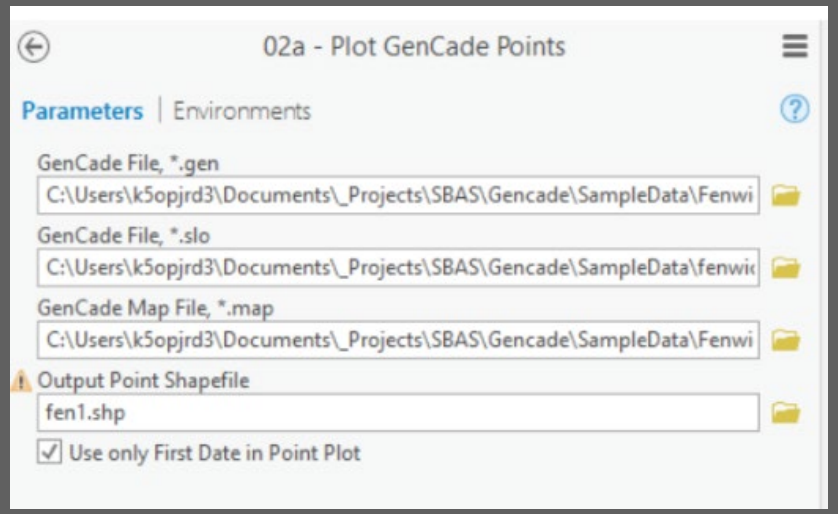
SEE ALL TRAINING TOPICS

TOPICS

SBAS FEATURE GEOMETRY – GENCADE

Cell Geometry

- When importing GenCade data, geometry for both Cells and Fluxes is created.
- Littoral cells and fluxes defined in GenCade can also be imported into SBAS. Tools **02a - Plot GenCade Points** and **02b - Convert GenCade Points to Budget Features** are used for this data transformation.
- For the data transformation, for the GenCade budget, the associated *.gen, *.slo, and *.map are required.
- First run **02a - Plot GenCade Points**. This will plot the shoreline point locations documented in the .slo file. The output shapefile is need for the input into 02b.



Continue

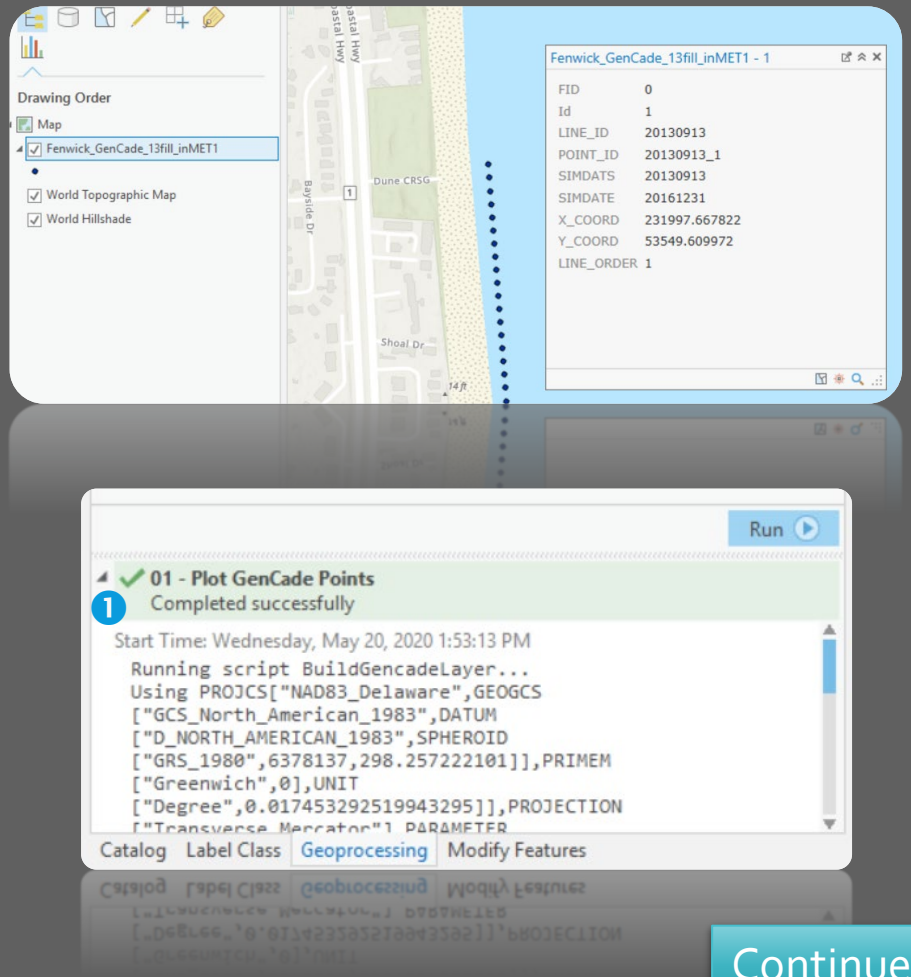
TOPICS

SBAS FEATURE GEOMETRY – GENCADE

Cell Geometry

- A point feature class is created and added to the Table of Contents
- Each point is identified by:
  - LINE_ID = Date from .slo file
  - POINT_ID = LINE_ID + sequence number
  - SIMDATS = Simulation Start Date
  - SIMDATE = Simulation End Date
  - X_COORD = X coordinate computed from .slo and starting point defined in .gen
  - Y_COORD = Y coordinate computed from .slo and starting point defined in .gen file
  - LINE_ORDER = Sequence number per simulation date

❶ Didn't plot as expected? Check the log for error. Expand the arrow in front of 01- Plot GenCade Points under the Run button. Any errors will be reported here.



Continue

TOPICS

SBAS FEATURE GEOMETRY – GENCADE

Cell Geometry

How does it work?

- The values are extracted from the .gen file
  - Xo and Yo values = the starting coordinate
  - Azimuth
  - Dx = distance between points
- The collection of distances from the starting location is collected for each date is extracted from the .slo file
- Coordinate system is pulled from the .map file
- A new point shapefile is constructed from the starting coordinate + each of the distance from X values in the .slo file
  - Note: if "Use only First Date in Point Plot" is selected in the tool, *only the first row* of the .slo is used to for plot.

```
***** MODEL SETUP *****
GENUNITS: (m)
X0:*      231781.051562
Y0:*      53572.974344
AZIMUTH:* 180.938817
NX:       271
DX:*      19.812040
SIMDATS:  20130913
SIMDATE:  20161231
DT:       0.050000
DTSAVE:   120.000000
K1:       0.880000
K2:       0.350000
PRTOUT:   t
PRWARN:   f
ISMOOTH:  5
IREG:     0
```

.gen file

```
Shoreline Position Output
20130913        216.97          219.03
  228.87        230.68          232.49
  241.53        243.34          245.15
  254.93        256.97          259.00
```

.slo file
For each date, distance from X is provided

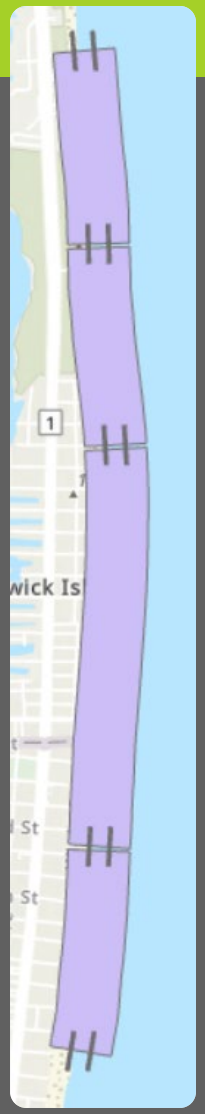
```
COV_WKT PROJCS["NAD83_Delaware",GEOGCS["GCS_North_American_1983",DATUM
["D_NORTH_AMERICAN_1983",SPHEROID["GRS_1980",6378137,298.257222101]],PRIMEM["Greenwich",0],UNIT
["Degree",0.0174532925199433295]],PROJECTION["Transverse_Mercator"],PARAMETER
["scale_factor",0.999995],PARAMETER["central_meridian",-75.41666666666667],PARAMETER
["latitude_of_origin",38],PARAMETER["false_easting",200000],PARAMETER["false_northing",0],UNIT
["Meter",1]]END_COV_WKT
```

.map file

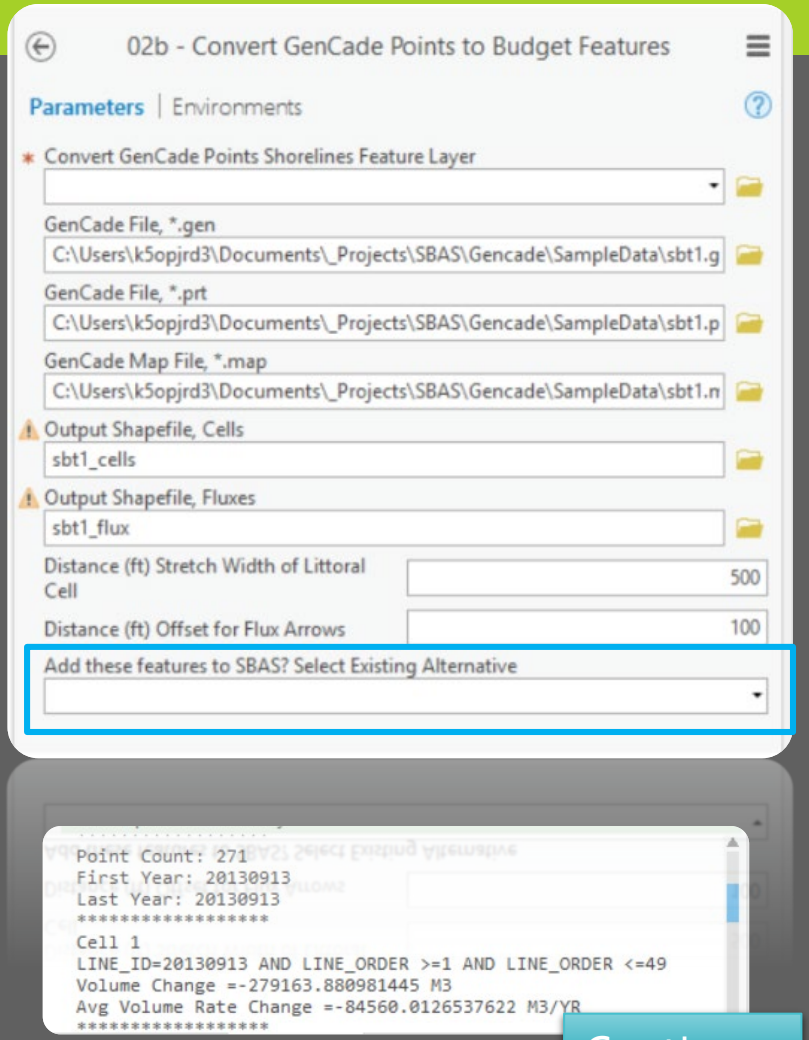
Continue

TOPICS

SBAS FEATURE GEOMETRY – GENCADE



- **Double-click on 02b – Convert GenCade Points to Budget Features t**o create the geometry foundation needed to construct the polygon littoral cells and polyline sediment fluxes.
- You will need to supply the 3 GenCade input files, the newly created GenCade shoreline points, output feature classes for the Cells and Fluxes, set design distant variables.
  - Distance variables are for the design width of the littoral cells and the length of the flux lines.Distance (ft) Stretch Width of Littoral Cell - when this conversion tool is constructing the cells, the script builds a buffer around the shoreline position plot. The width of the buffer correlates to the width of the littoral cell. The value listed for this parameter is used as the buffer width.
  - Distance (ft) Offset for Flux Arrows - when this conversion tool is constructing the fluxes, the script builds 2 flux arrows. The distance defined here defines how far apart the flux lines will be offset.
- If you want to immediately import these budget features into an Alternative, be sure to select it now.
- Click Run to execute tool.
- To check for error or see the status of each Geoprocessing step, click to expand the arrow in the Geoprocessing window at the bottom



Continue

TOPICS

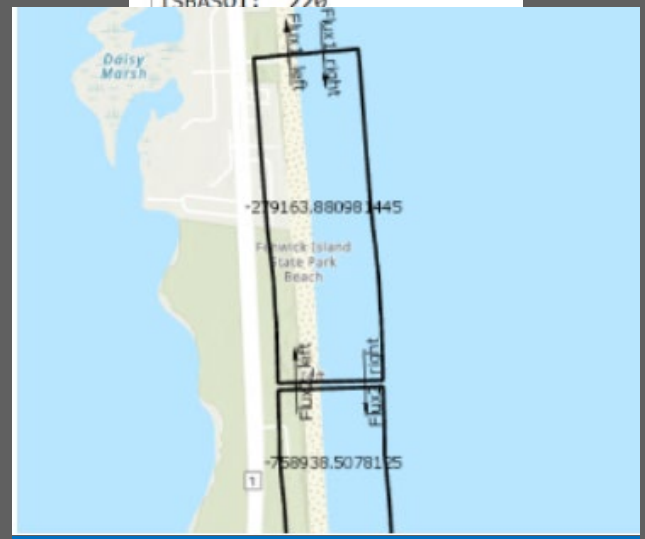
SBAS FEATURE GEOMETRY – GENCADE

Cell Geometry

How does it work?

- Cell and flux boundaries are pulled from the SBAS section of the .gen file.
- Cell boundaries are captured by the sequence of start/end definitions. In this example, there are 4 cells. Values represent point counter.
  - V1 = start location of cell
  - V2 = end location of cell
- Flux connections are captured by the sequence of start/end definitions. In this example, there are 5 fluxes. Values represent point counter.
  - Q1 = start of flux
  - Q2 = end of flux

```
***** SBAS *****
ISBASV1:  1
ISBASV2:  49
ISBASV1:  50
ISBASV2:  99
ISBASV1:  100
ISBASV2:  199
ISBASV1:  200
ISBASV2:  250
ISBASQ1:  1
ISBASQ2:  1
ISBASQ1:  50
ISBASQ2:  50
ISBASQ1:  100
ISBASQ2:  100
ISBASQ1:  200
ISBASQ2:  200
ISBASQ1:  220
```



GenCade data visualized in GIS.

Continue

TOPICS

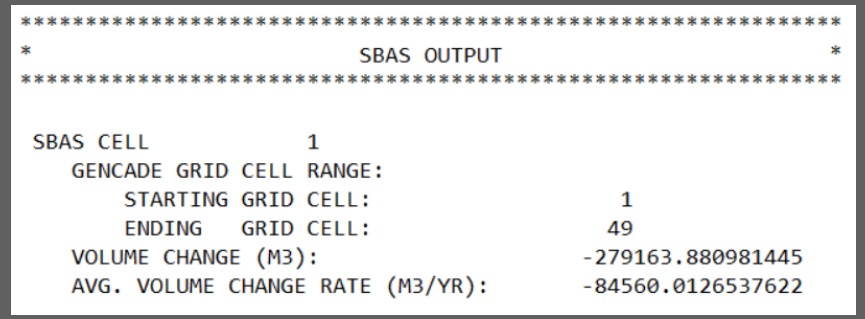
SBAS FEATURE GEOMETRY – GENCADE

Cell Geometry

How does it work?

Littoral Cell construction:

- GenCade points are selected that are within the cell range for the first year (in the same data above, cell 1 boundaries from Point 1 to Point 49)
- Convert Points to Line
- Buffer Line based on User-Defined Distance
- Get geometry of new cell shape
- Add GenCade Volumes to newly created Cells
  - Volumes are extracted from the .prt file under the SBAS Output section.
  - To correctly pull values the script looks for specific strings, *that are case-sensitive*, on each line. For cell volumes the scripts is looking for:
    - SBAS CELL
    - VOLUME CHANGE
    - AVG. VOLUME CHANGE RATE
    - VOLUME CHANGE (
      - To determine units, the "(" is needed
    - AVG. VOLUME CHANGE RATE (
      - To determine units, the "(" is needed
    - Values MUST follow the : on the line
  - The value for Volume Change, Average Volume Change Rate and Units are captured.



```
************************************************************
*                        SBAS OUTPUT                       *
************************************************************

 SBAS CELL            1
    GENCADE GRID CELL RANGE:
        STARTING GRID CELL:                  1
        ENDING   GRID CELL:                 49
    VOLUME CHANGE (M3):                -279163.880981445
    AVG. VOLUME CHANGE RATE (M3/YR):    -84560.0126537622
```

Final Output - new geometry and volumes to final shape. Values are store in the following fields in the User-Defined output file:

- deltaVolume = Volume Change
- avgVolumeChangeRate = Average Volume Change Rate
- volumeUoM = Volume Change Units
- changeRateUoM = Average Volume Change Rate Units

TOPICS

SBAS FEATURE GEOMETRY – GENCADE

Flux Geometry

How does it work?

Sediment Flux construction:

- Build centerline for each Littoral Cell from GenCade Points
  - Points are filtered based on start and end values documented in the .gen file.
  - Points are converted to a polyline.
- For each centerline feature get start point and end point
- Extend the start and end point locations by 5 increments in both directions.
  - Increments are sequential points from the GenCade point file.
  - This extension is done so the flux arrows *connect* the littoral cell polygons.
- Duplicate the line geometry and flip line direction.
  - Each flux line pulled from GenCade will be represented as 2 separate arrows in GIS.
  - One arrow (where the end point/arrow head) represents the Sediment Source.
  - The other arrow (where the start point/arrow end) represents the Sediment Sink.
- Offset lines (so the individual arrows can be seen) the distanced defined by the Distance (ft) Offset for Flux Arrows tool parameter.
- Update flux lines with GenCade Volumes
  - Volumes are extracted from the .prt file under the SBAS Output section.

```
SBAS FLUX ARROW           1
   GENCADE GRID CELL RANGE:
       STARTING GRID CELL-WALL:              1
       ENDING   GRID CELL-WALL:              1

   TRANSPORT AT GRID CELL-WALL:              1
       VOLUME TO RIGHT (M3):              1816205.
       VOLUME TO LEFT  (M3):             -2854533.
       AVG. RATE TO RIGHT (M3/YR):        550513.500000000
       AVG. RATE TO LEFT  (M3/YR):       -865243.250000000

   TRANSPORT AT GRID CELL-WALL:              1
       VOLUME TO RIGHT (M3):              1816205.
       VOLUME TO LEFT (M3):              -2854533.
       AVG. RATE TO RIGHT (M3/YR):        550513.500000000
       AVG. RATE TO LEFT  (M3/YR):       -865243.250000000
```

Continue

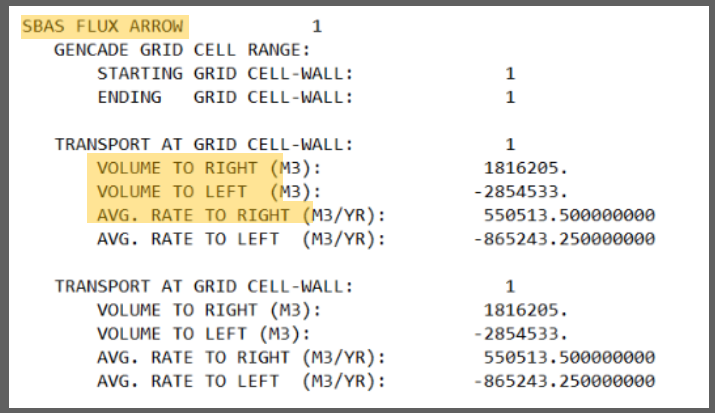
TOPICS

SBAS FEATURE GEOMETRY – GENCADE

Flux Geometry

How does it work?

- To correctly pull values the script looks for specific strings, *that are case-sensitive*, on each line. For flux volumes the scripts is looking for the following text in the input file:
  - SBAS FLUX ARROW
  - VOLUME TO RIGHT
  - VOLUME TO LEFT
  - VOLUME TO RIGHT (
    - To determine units, the "(" is needed
  - AVG. RATE TO RIGHT (
    - To determine units, the "(" is needed



- Values MUST follow the **:** on the line
- Net transport for the flux is computed by adding VOLUME TO RIGHT + VOLUME TO LEFT
- Absolute value for VOLUME TO RIGHT and VOLUME TO LEFT is used for sediment flux Q values, since SBAS uses the arrow geometry to determine if the arrow is a source or a sink for the cell.
  - In SBAS, when computing the Residual the sediment flux line direction determines if the value is negative or positive

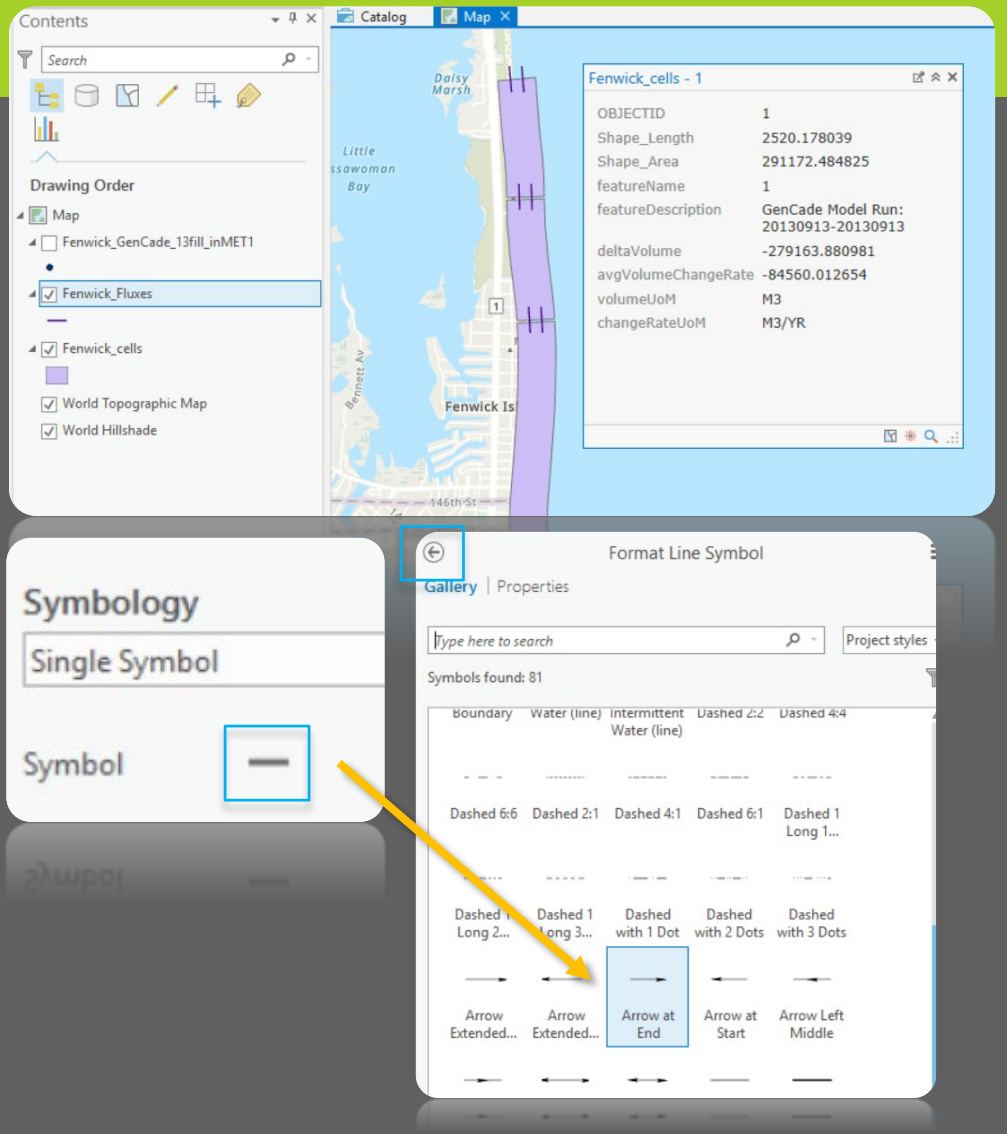
Continue

TOPICS

SBAS FEATURE GEOMETRY – GENCADE

Flux Geometry

- Newly created layers are automatically added to the Table of Contents. By default, the sediment fluxes are not symbolized with arrows.
- Click on any feature to see its properties.
- To adjust the flux line symbology,
  - Right-click on the flux layer name (*line layer, not the point*) and choose Symbology.
  - Click on the line graphic next to Symbol
  - Scroll down and click to select the ***Arrow at End*** symbology (under ArcGIS 2D)
  - Click the Back arrow and close the symbology window.
  - The sediment fluxes are now represented as arrows.



END OF TOPIC

Working with GenCade

SEE ALL TRAINING TOPICS

TOPICS

FLUX GEOMETRY

Sketch, GenCade Imports, Import from Existing GIS

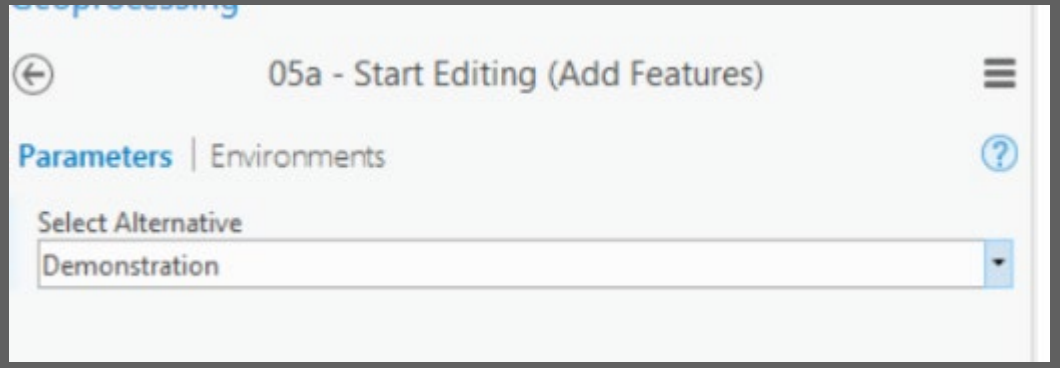
Continue

TOPICS

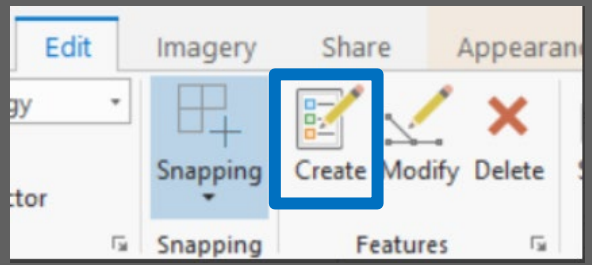
SBAS FEATURE GEOMETRY – SKETCH

Flux Geometry

- Creating new feature geometry in SBAS, follows much of the same process inherent in GIS, however in SBAS we first have to start an 'SBAS Edit Session' so geometry is related to the correct alternative.
- To begin launch tool **05a - Start Editing (Add Features)**
- A list of all alternative in the Table of Contents will be listed in the drop-down list. Choose the desired alternative and click Run.
- Zoom to your area of interest and click on ArcGIS Pro's **Edit** ribbon and click on **Create**.



In the background, SBAS sets the default values for the scenarioIDFK equal to that of the selected alternative. Remember, this is the value that is used in all of the definition queries.

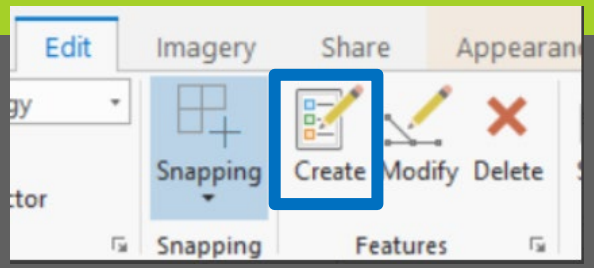


Continue

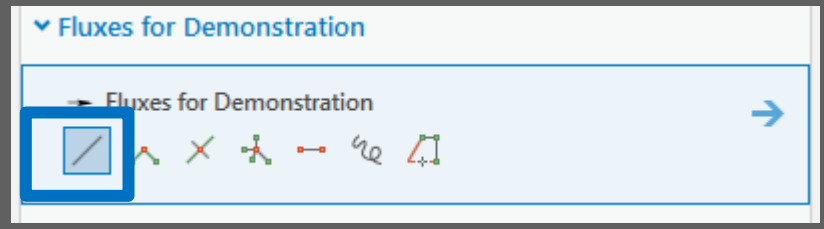
TOPICS

SBAS FEATURE GEOMETRY – SKETCH

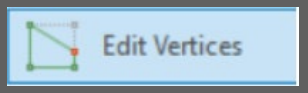
Flux Geometry



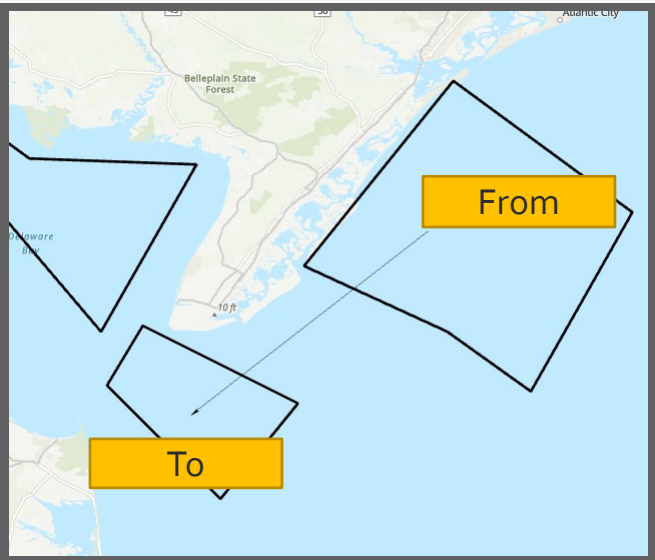
- In the *Create Features* panel, click on the symbol in front of **Fluxes for Alternative Name** layer. This will expand to show you the sketch options. Click on the first icon. This is turn on your sketch tool.
  - The direction your draw your flux will indicate the sediment transport direction.
  - The first point your drop indices the "from", the final point represents the "to".
  - Double-click to complete sketch.



- When done sketching all of the new littoral cell features, launch tool **05b - Stop Editing (Add Features)** to commit your changes.



To Modify location of vertices, click on the **Modify** button from ArcGIS Pro's **Edit** ribbon. Click on Reshape, then Edit Vertices. Click on the vertices to move to new location or right click to remove.



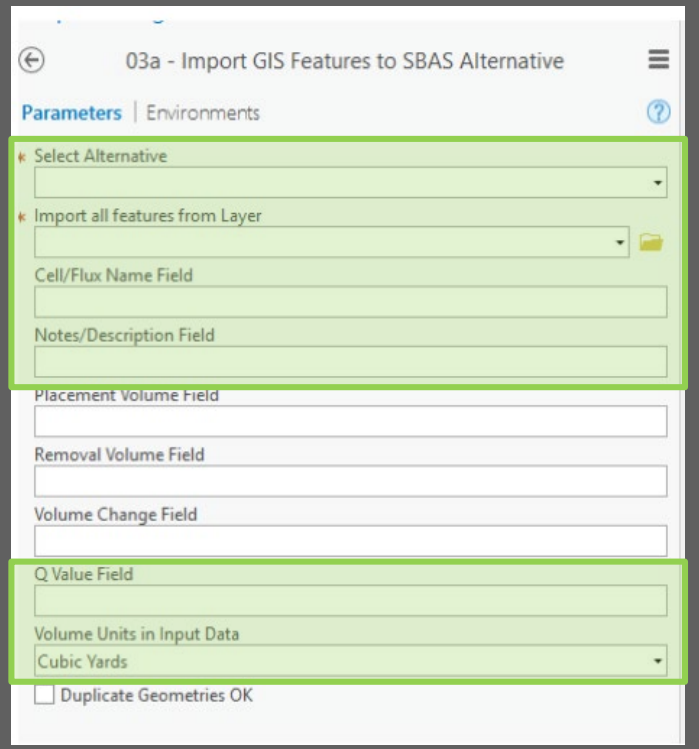
- Save changes (on Edit ribbon) when complete.

TOPICS

SBAS FEATURE GEOMETRY – IMPORT

Flux Geometry

- If you have GIS layers already created that represent cells or fluxes, but were created outside of this SBAS toolbox, these features and values can be imported into SBAS.
- If your existing features are to be a part of a new Alternative, use tool **01a - Create New Alternative** to set up your Alternative placeholder.
- Using tool **03a - Import GIS Features to SBAS Alternative**, browse to an existing feature class or shapefile, then provide field mapping to connect your original field names to the SBAS values.
- The field mapping to bring over the geometry and field values into the new SBAS Alternative layers.
  - Field mapping for Littoral Cells include: *Name*, *Description*, *Q Value*, *Volume Units*
- Duplicate Geometries
  - This tool will check for duplicate geometries, or polygons and polylines footprints that already exist in the local SBAS database. If this is what you would like to do (e.g., you use the same cells for multiple alternatives), check the ***Duplicate Geometries OK*** checkbox.



Continue

TOPICS

SBAS FEATURE GEOMETRY – IMPORT

Flux Geometry

What happens?

- Each feature in the selected feature class is appended in the *SedimentTransportDirection* feature class with the SBAS database. Fields are cross-referenced so data is added to the correct fields.
- All new features are attributes with the correct Alternative ID (*scenarioIDPK* value is pulled from the selected Alternative and inserted into the *scenarioIDFK field)*
- Note: Data types must match. E.g., volumes must be numeric & description or name field must be strings. Refer to the Data Dictionary for Data Types.

Continue

END OF TOPIC

Sketching & Importing Flux Geometry

SEE ALL TRAINING TOPICS

TOPICS

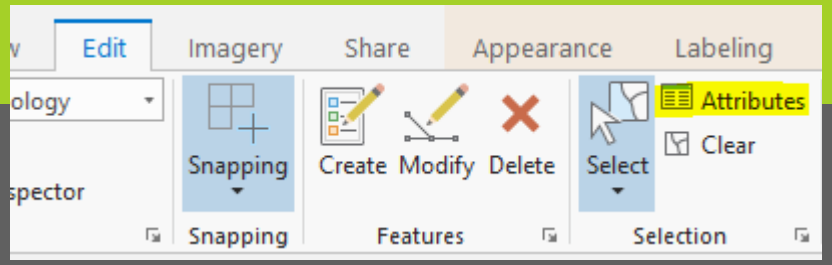
EDITING BUDGET VALUES

Add values into your sediment budget for cells and fluxes.

Continue

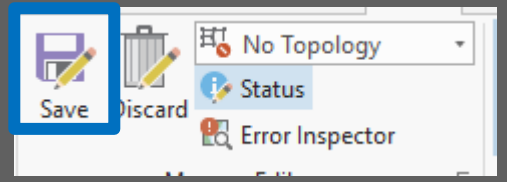
TOPICS

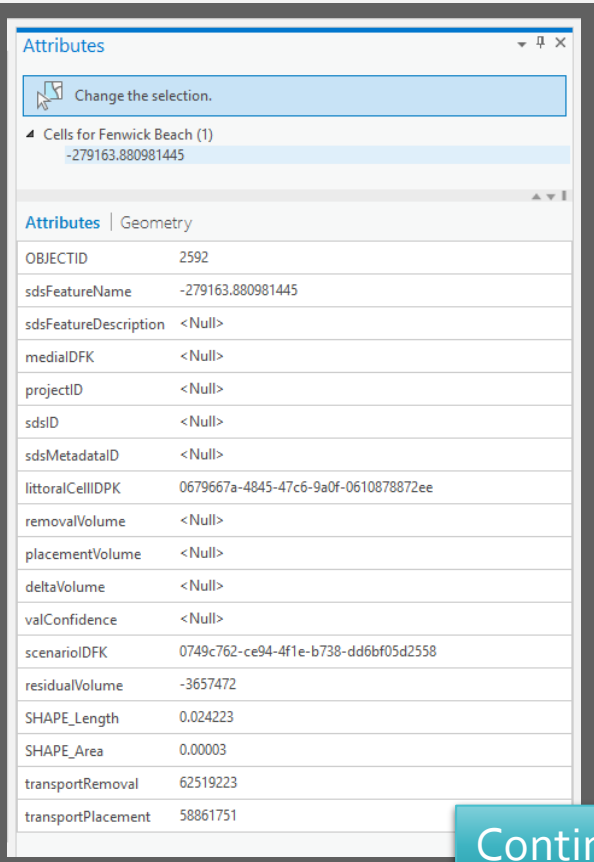
MANUALLY UPDATE FEATURE VALUES



Sediment budget values linked to cell volumes or fluxes can be added and modified to geometry as feature attributes. Use these steps to add or modify values for Cells (Placement, Removal, Delta Volume, Confidence Level) & Flux (Q Values)

1. From the Edit ribbon, click the Attributes button. This will open the Attribute pane.
2. Select a budget feature (cell or flux) on the map with the Selection Tool. The Attribute pane will display the values for the selected feature.
3. Click on the value next to the attribute to edit. Enter in the new value.
   - Some attributes will auto-calculate based on values of intersecting and other SBAS automation. DO NOT EDIT : residualVolume, transportRemoval, transportPlacement, scenarioIDFK,or alternativeLabel
4. Save Attribute Changes
   - From the Edit ribbon, click the Save button.
   - If you adjusted any of the volumes, be sure to launch the **06 – Recompute Residual** tool to recalculate.





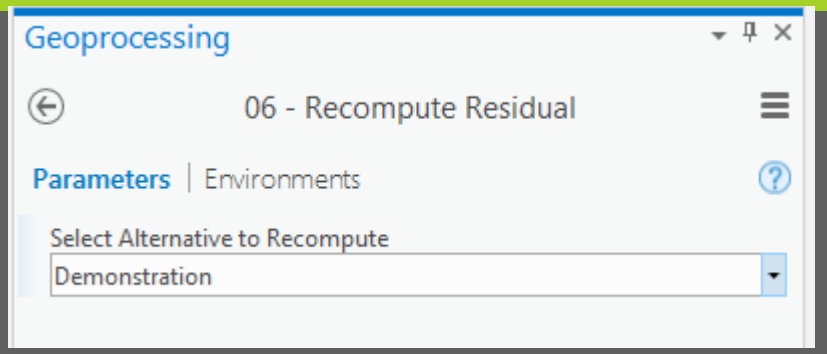
Continue

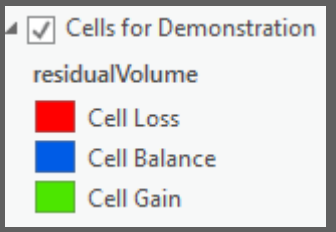
TOPICS

RECOMPUTE RESIDUAL

- The residual is the representation of the degree to which the cell is balanced. By default, when a littoral cell is created, all residual values are set to 0.
- As you add features and values to your sediment budget, the residual can be automatically recalculated using tool **06 – Recompute Residual**.
- Once you select the Alternative and click Run, SBAS 2020 will locate all intersecting flux polylines and determine their direction as either sink or source to the intersecting cell. These values are fed into the residual calculation so an overall residual can be computed for the cell.

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





where

Q_{source} = input of sediment into a cell

Q_{sink} = loss of sediment from a cell

ΔV = 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

Continue

TOPICS

ATTRIBUTE FIELD DEFINITIONS

Attribute Values to Edit:

- Littoral Cells, *user-defined values*:
  - sdsFeatureName (text, 50 characters). *Name or label of the littoral cell.*
  - sdsFeatureDescription (text, 255 characters). *Description of the littoral cell.*
  - removalVolume (double). *Volume of sediment removal (per littoral cell and alternative).*
  - placementVolume (double). *Volume of sediment placement (per littoral cell and alternative).*
  - deltaVolume (double). *Change in volume per littoral cell and alternative.*
  - valConfidence (text, 255 characters). *Determine level of data confidence, assigned by sediment budget author. Low, Medium, High*
  - projectID (text, 50 characters). *Optional project id for internal management purpose.The SBAS application does not reference or write to this field.*

Continue

ATTRIBUTE FIELD DEFINITIONS

Littoral Cells, *dynamic fields:*

- *For littoral cells, the **residual**, **transportRemoval**, and **transportPlacement** attribute values will automatically re-calculate each time the **o6 - Recompute Residual** tool is executed. Values for these fields DO NOT NEED to be manually updated.*
- residualVolume. *Computed Residual volume per littoral cell and alternative.* Residual is computed by Sum of Transport Placement - Sum of Transport Removal - delta volume + Placement volume - Removal volume.
  - SBAS tools will compute the residual volume based on values assigned to SBAS features.
  - SBAS determines the direction of sediment fluxes and automatically identifies each as either a "source" or "sink" for each cell.
- transportRemoval. *Sum of transport removal per cell.*
  - SBAS finds all sediment fluxes where the starting point of the line intersects the littoral cell. These fluxes are classified as "sink" volumes.
  - All sink volumes are summed and values reported to this field.
- transportPlacement. *Sum of transport placement per cell.*
  - SBAS finds all sediment fluxes where the end point of the line (arrow head) intersects the littoral cell. These fluxes are classified as "sources" volumes.
  - All source volumes are summed and values reported to this field.
- Flux, *user-defined values*:
  - sdsFeatureName (text, 50 characters). *Name or label of the flux.*
  - sdsFeatureDescription (text, 255 characters). *Description of the flux.*
  - qValue (double). *Volume of sediment moving in or out of cell.*

Continue

END OF TOPIC

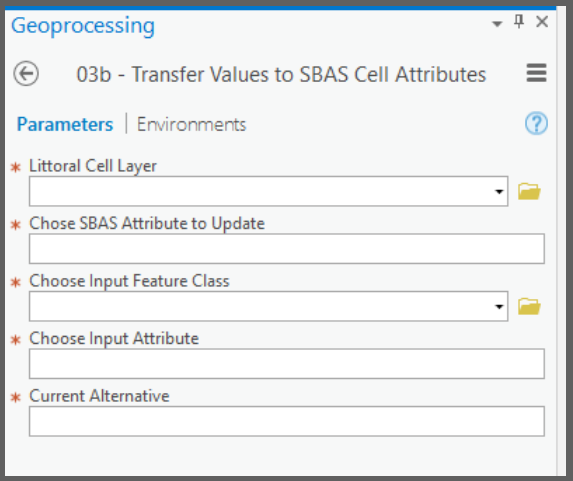
Editing Attribute Values

SEE ALL TRAINING TOPICS

TOPICS

TRANSFER VALUES INTO SBAS CELL ATTRIBUTES

- If sediment budget geometries and values exists outside of your local SBAS database in a feature class with identical geometry, the attributes can be transferred into your selected Alternative using tool **03b - Transfer Values to SBAS Cell Attributes**.
  - Note: To use this tool to update feature values. The geometries in both datasets must match.
- Verify that the geometries in the SBAS dataset and outside dataset match, e.g. polygons and polylines should be identical. Coordinate systems would be the same..
- Open tool **03b - Transfer Values to SBAS Cell Attributes**, select your desired input parameters and click Run.
  - All values from your Input Feature Class will be used to update your littoral cell layer.
  - A record of all transferred values will be listed in the Results Window.
- The residual is automatically recalculated for each of the littoral cells.



If you have another GIS dataset that represents your cells and is storing an attribute value you need, use this tool to transfer values into your current alternative.

Continue

TOPICS

CREATE RELATIONSHIPS TO SBAS FEATURES

Additional attribute data may be stored outside of the SBAS local database in different feature classes . Contents from supplemental databases can be related to SBAS features using the **03c - Create Relationship to SBAS Features** tool.

- This tool uses spatial and non-spatial relationships to determine how to connect the data attribute to the sediment budget. If you created geometry and values outside of this SBAS toolbox, but would like to use these in your budget, this tool will create a spatial relationship and add the correct SBAS foreign keys to easily join the datasets together.

Do you have data that uses the same geometry, does NOT have a SBAS key attribute, but has values you would like integrated in your budget? This tool should be used if there is not an ID field in the comparison layer and the geometry of the compares, and therefore a simple table join can not easily be performed.

Continue

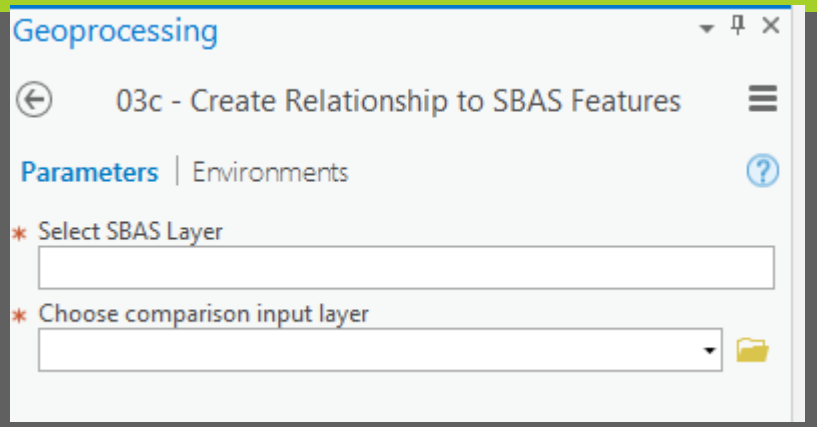
TOPICS

CREATE RELATIONSHIPS TO SBAS FEATURES

- A FOREIGN KEY is a key used to link two tables together. A FOREIGN KEY is a field (or collection of fields) in one table that refers to the PRIMARY KEY in another table.
- The PRIMARY KEY for each littoral cell is littoralcellIDPK & the PRIMARY KEY for each flux is sedimentTransportDirectionIDPK
- This tool adds a new FOREIGN KEY field to the comparison dataset: littoralCellIDFK or sedimentTransportDirectionIDFK

Open tool **03c - Create Relationship to SBAS Features** tool.

1. Select SBAS Layer : choose the layer in SBAS to which values will be related
2. Choose Comparison Input Layer : select the layer outside of the SBAS database to be related
3. Click Run
4. When complete a data join is automatically created. You can access your attributes by opening the attribute table through the Table of Contents.



This tool does NOT support Grouped layers. If this tool opens with a "No Parameters" message, or intended data layers are not listed in the drop down menus.

Continue

END OF TOPIC

Transferring & Relating Data to SBAS Features

SEE ALL TRAINING TOPICS

TOPICS

SHARING SEDIMENT BUDGETS

Share your completed sediment budget online!

Continue

TOPICS

DATA SHARING WORKFLOW

Create Sediment Budget on Local PC

- Use your local copy of ArcGIS Pro to build and modify your sediment budgets.

Publish Budget to ArcGIS Online when Budget is complete

- When you are ready to Share your finished budget, publish your budget to ArcGIS Online

Modify sharing levels on ArcGIS Online to share to selected groups or everyone.

- You control the accessibility of your budget. Be sure to change the sharing levels to open your data layer to selected groups or everyone!

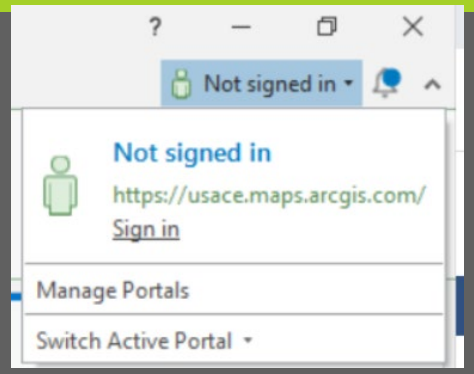
Continue

TOPICS

SHARE YOUR BUDGET

Publish Alternative

- All users of SBAS can control the accessibility of their published Sediment Budgets.
- You must be signed into to ArcGIS Pro with your user id. To determine if you are logged into ArcGIS Pro, look in the upper right corner. If you are signed in you will see your account name, otherwise it will list "Not signed in".
  - Click the drop-down menu, and follow the Sign-In link to log into your account.
  - When running SBAS, if you drop a connection and are signed out you will receive this error. If this occurs, just sign in again and relaunch the tool.
- To publish your completed datasets to the "enterprise", use tool **08 - Share Sediment Budget Online**.

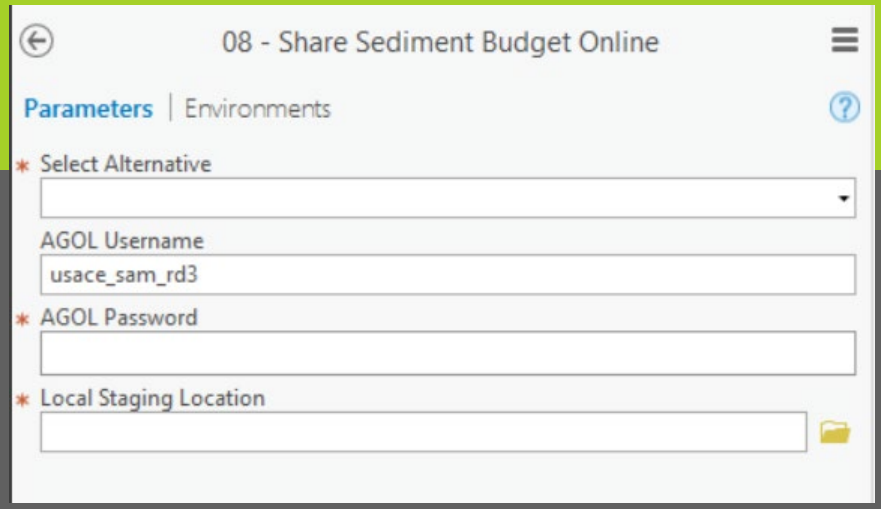



```
Traceback (most recent call last):
  File "<string>", line 257, in execute
  File "<string>", line 2057, in new_alternative
  File "<string>", line 1471, in agol_get_user_info
KeyError: 'user'
```

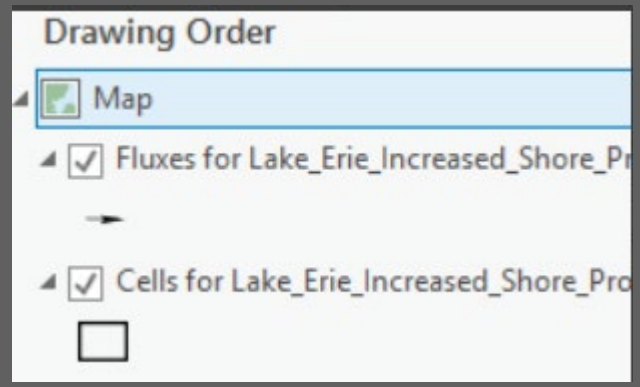
Continue

TOPICS

SHARE YOUR BUDGET



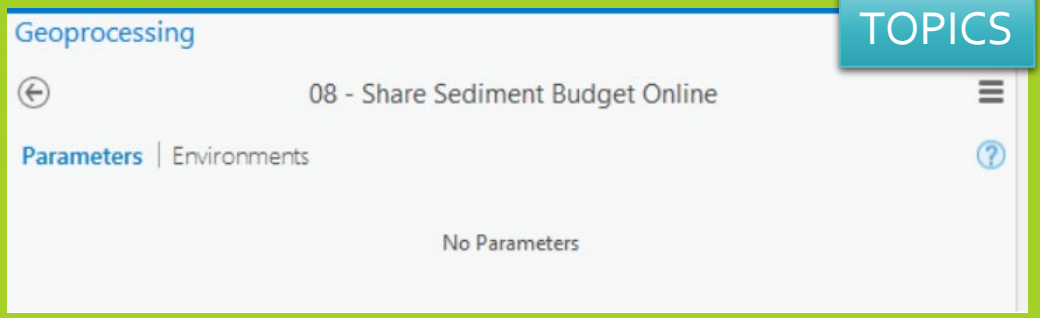
- This tool will create a copy of your selected Sediment Budget Alternative and create a feature web service hosted on USACE's ArcGIS Online (AGO).
- Feature web services are a way geographic information is created, modified and exchanged on the Internet.
- Prepare your ArcGIS Pro project. Remove any extraneous datasets from the Table of Contents. Anything list here will be included in your web service. *Don't forget to to Save your project.*
- The Table of Contents may have multiple display options for a single dataset, e.g. cell outlines and color-coded cells by residual. **Only keep one visualization per dataset for your service. Remove all others from your table of content.**



Continue

SHARE YOUR BUDGET

TOPICS



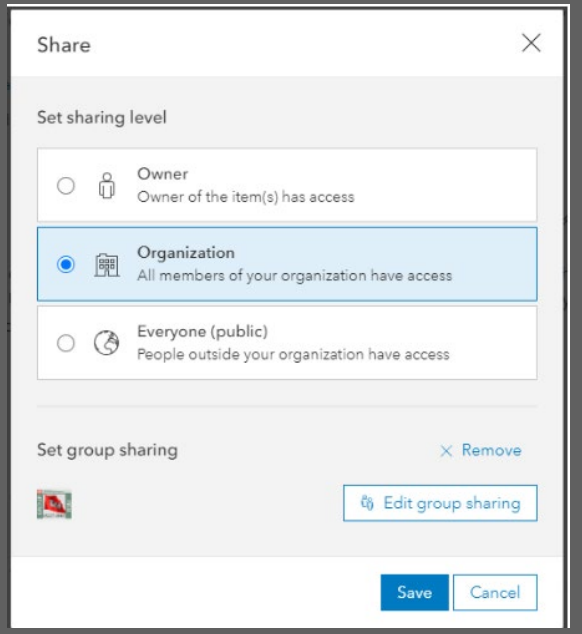
- In order to launch this tool you will need an account created for you on https://usace.maps.arcgis.com/home/index.html
- In ArcGIS Pro you must be logged in with your USACE AGO credential to correctly publish SBAS data.
- If your tool shows "No Parameters" message, this means you have been logged out of ArcGIS Online within ArcGIS Pro. To fix, in the upper right corner of ArcGIS Pro, click Sign-In.
- This tool will OVERWRITE any web services you own of the same name.
- Set your connection and content parameters.
  - Local Staging Location is the local drive where ArcGIS ArcPro will copy temporary files needed to create your service.
- Your SBAS Service will be created for ***all layers*** within your current **saved** version of your ArcGIS Pro project.
  - Your selected Alternative will be used to build a summary and description for your Feature Service.
  - If you have more than 1 alternative loaded in your Table of Contents, all will be combined into a single feature service but as separate layers.
    - The Feature Service description will be pulled from the Alternative selected with tool **o8 - Share Sediment Budget Online**.
    - All layers will be listed in your service definition.
    - Supplemental Budget Data
      - Do not publish any datasets that contain PII (Personally identifiable information), For Official Use Only (FOUO), and other sensitive information.
      - Do not publish datasets that are already available online. E.g., NOAA Shorelines are available as a web service hosted by NOAA and ***should not*** be included as part of your service package.
      - SBAS Budget service should include littoral cells, sediment fluxes, and optional supplemental data such as properties of bluffs

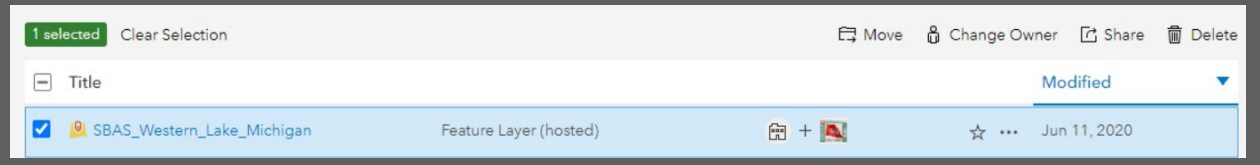
Continue

TOPICS

SHARE YOUR BUDGET

- Feature Web Services are created for each alternative and are documented with the details you provide when the Alternative is created.
  See *Create SBAS Alternative* section
- Web Services are initially only shared to the USACE organization. To share your sediment budgets to Everyone, edit the AGO item in My Contents on https://usace.maps.arcgis.com/
  - Log-in to https://usace.maps.arcgis.com/
  - Browse to **My Contents** and locate the budget to share. Click the checkbox in front of the budget item.
  - Click the **Share** link
  - To share to Everyone (public) click this sharing level. Group level sharing can also be modified. All sediment budgets created in SBAS should be shared





Continue

END OF TOPIC

Sharing your Sediment Budget

SEE ALL TRAINING TOPICS