Developing the Updated IWFM Soil Data Builder Tool Using ArcGIS Pro SDK

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- Engineering Geologist at DWR/SGMO/Modeling and Tools Support Section in Sacramento, CA
- Graduated from California State University, Sacramento - Bachelor degree in Geology (emphasis in Hydrogeology)
- Nine years of experience in hydrogeology using ArcGIS for hydrological conceptional modeling, groundwater investigation projects, and calibration of C2VSimFG groundwater model
- Enjoy snowboarding, biking, and everything outdoor

Agenda

- Updated IWFM Soil Data Builder (SDB) Tool
- Migration Complications
- How the SDB Tool Works
- Demonstration SDB
- Questions & Answers

Updated SDB Tool

- Hydrological modeling utility tool
- Calculates the low, representative, and high values of the soil parameters for each map unit
- E.g., saturated hydraulic conductivity, wilting point, field capacity and other parameters

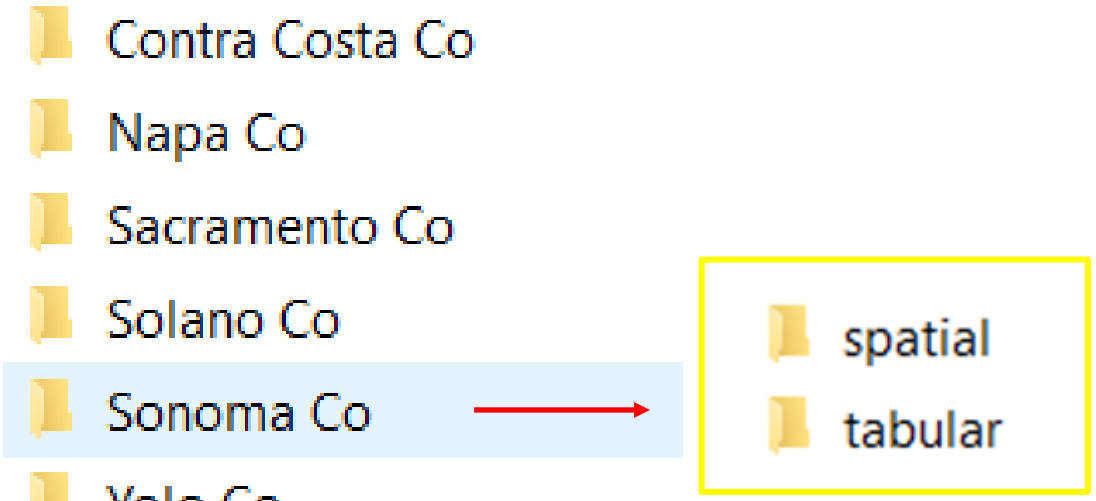
Updated SDB Tool

- Calculates the average parameters for each model grid cell
- Inputs for the IWFM, IWFM Demand Calculator and other groundwater models
- Using the updated 2022 USDA-NRCS Soil Survey Geographic (gSSURGO) Database
- Migrated SDB from ArcMap Desktop to ArcGIS Pro

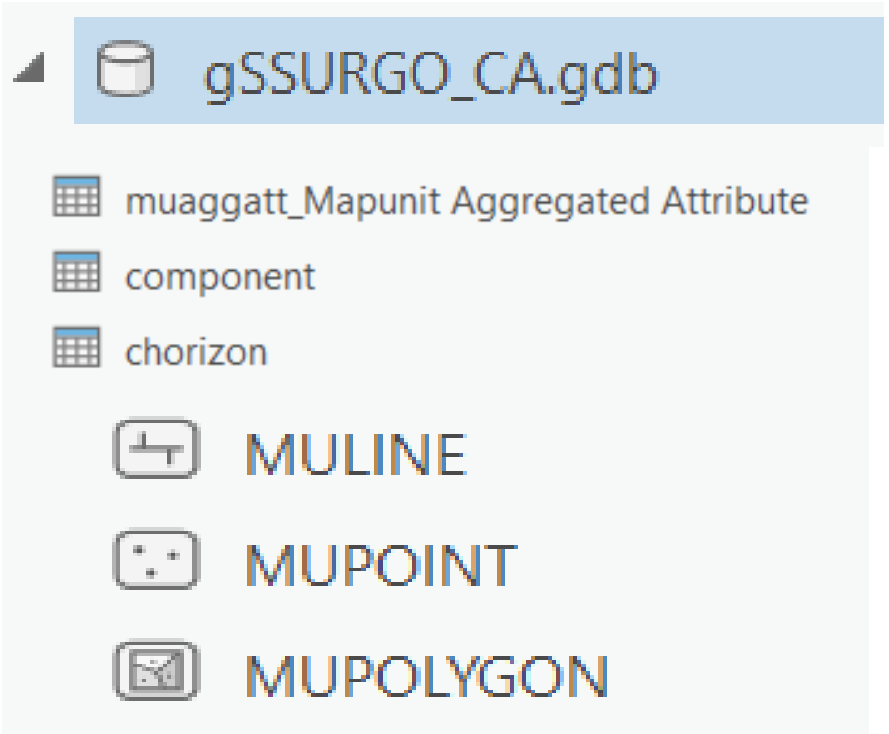
Migration Complications

- Updating SSURGO dataset with different dataset format

Older SSURGO Database



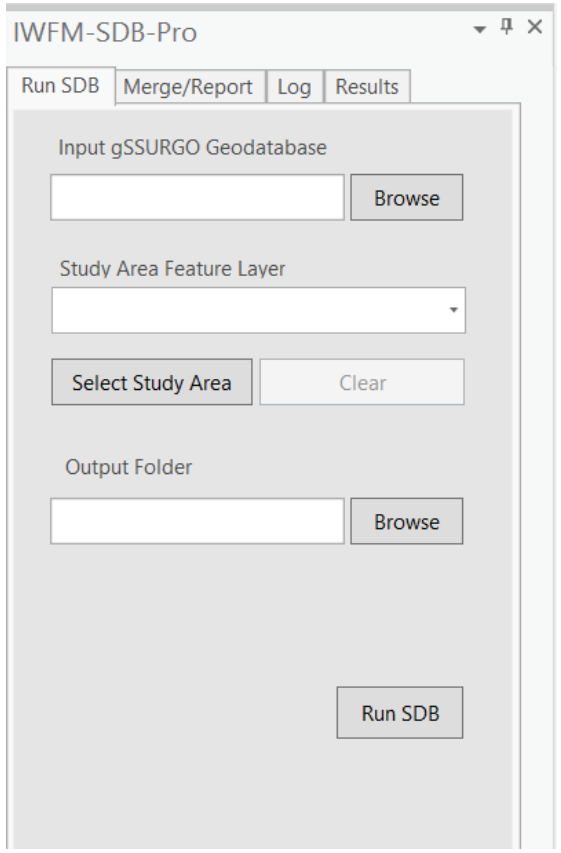
Updated gSSURGO Database



Migration Complications

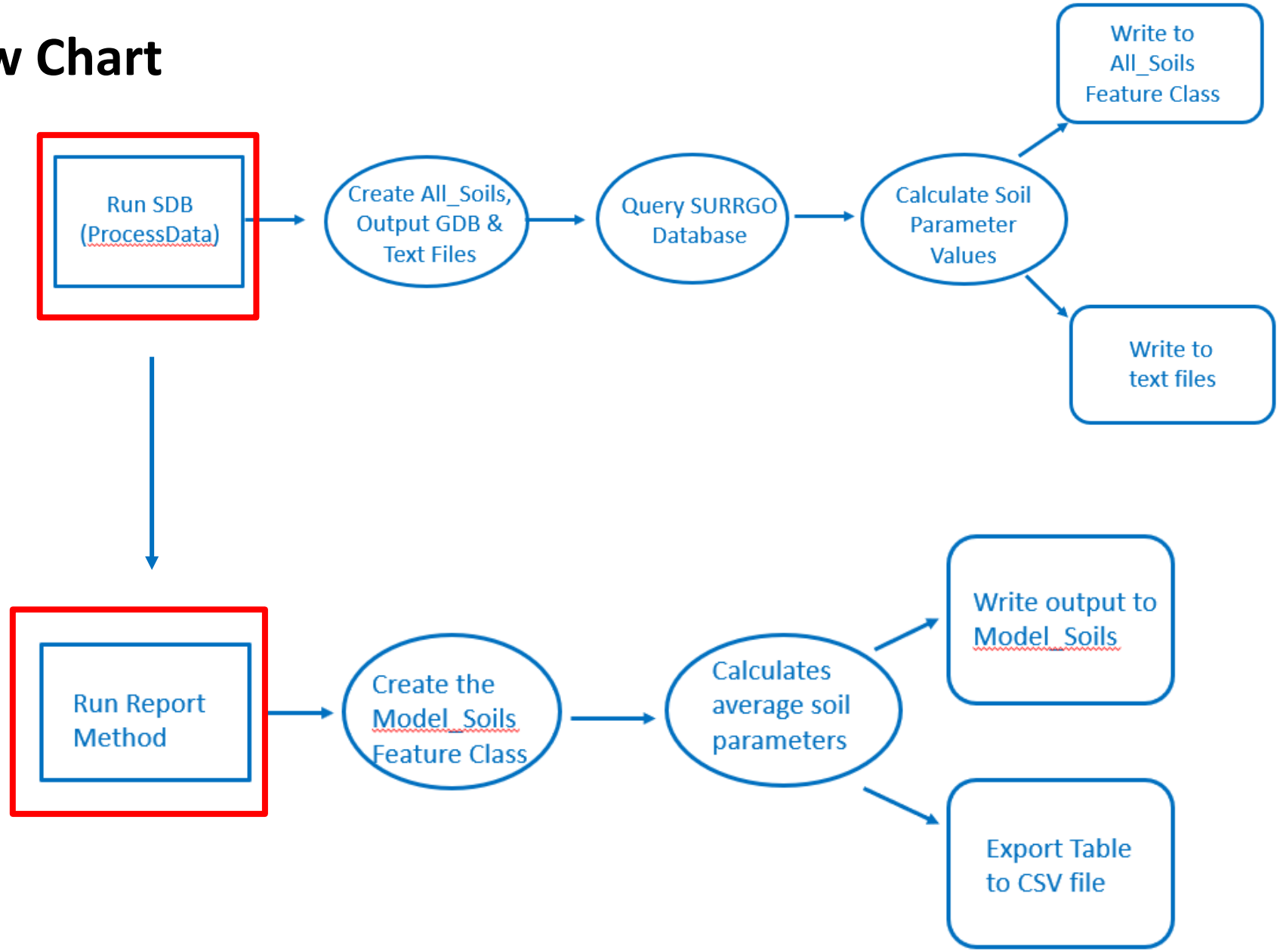
- Updating SSURGO dataset with different dataset format
- Visual Basic to C#
- Arc Object SDK to ArcGIS Pro SDK
- Learning ArcGIS Pro SDK's MVVM platform & WPF

IWFM SDB-Pro Tool Requirements

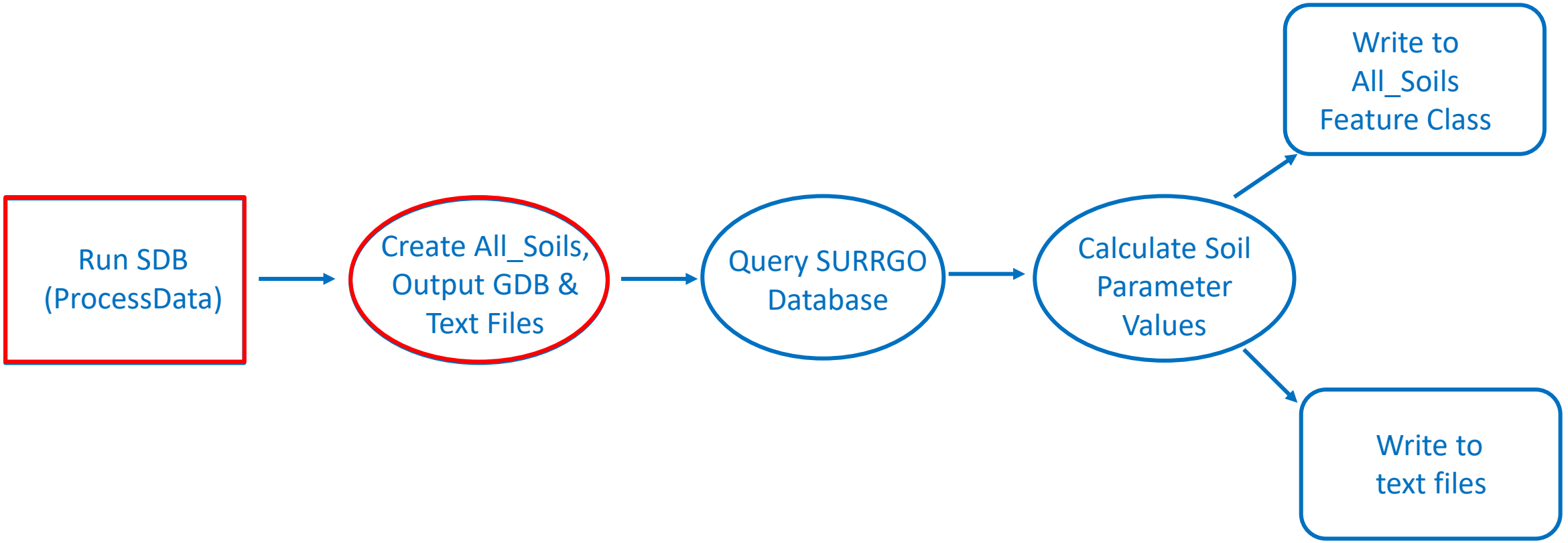


- ArcGIS Pro version 2.8 or 2.9.x
  - Except version 3.x
- Advance ArcGIS Pro License
- Spatial Analyst License
- Updated gSSURGO Database

SDB-Pro Flow Chart



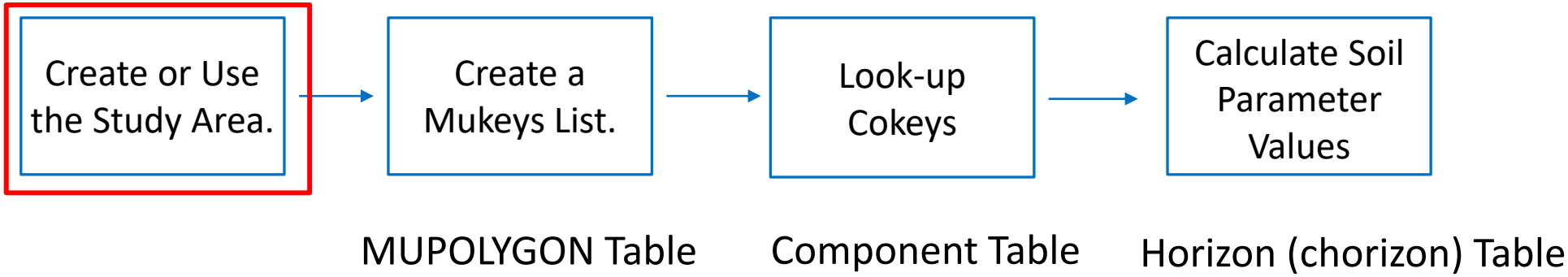
Part 1: Run SDB



Query the gSSURGO Database

- Large amount of tabular and spatial data
- Numerous of null values within the gSSURGO
- Each map unit is divided into soil components based on percent area of specific soil types
- Each map unit component is divided into soil layers (horizons)

Query the gSSURGO Database



Run SDB: Calculating the Soil Parameters

- Calculates the low, representative and high soil parameters for each map unit:
  - ❑ Porosity
  - ❑ Saturated Hydraulic Conductivity
  - ❑ Available Water Content
  - ❑ Water Content at 15 bar, 1/3 bar and 1/10 bar tension
  - ❑ Pore Size Distribution Index
  - ❑ Soil Texture Classification
  - ❑ Soil Depth
  - ❑ Hydrologic Group (based on the dominant conditions)

ProcessData Main Methods

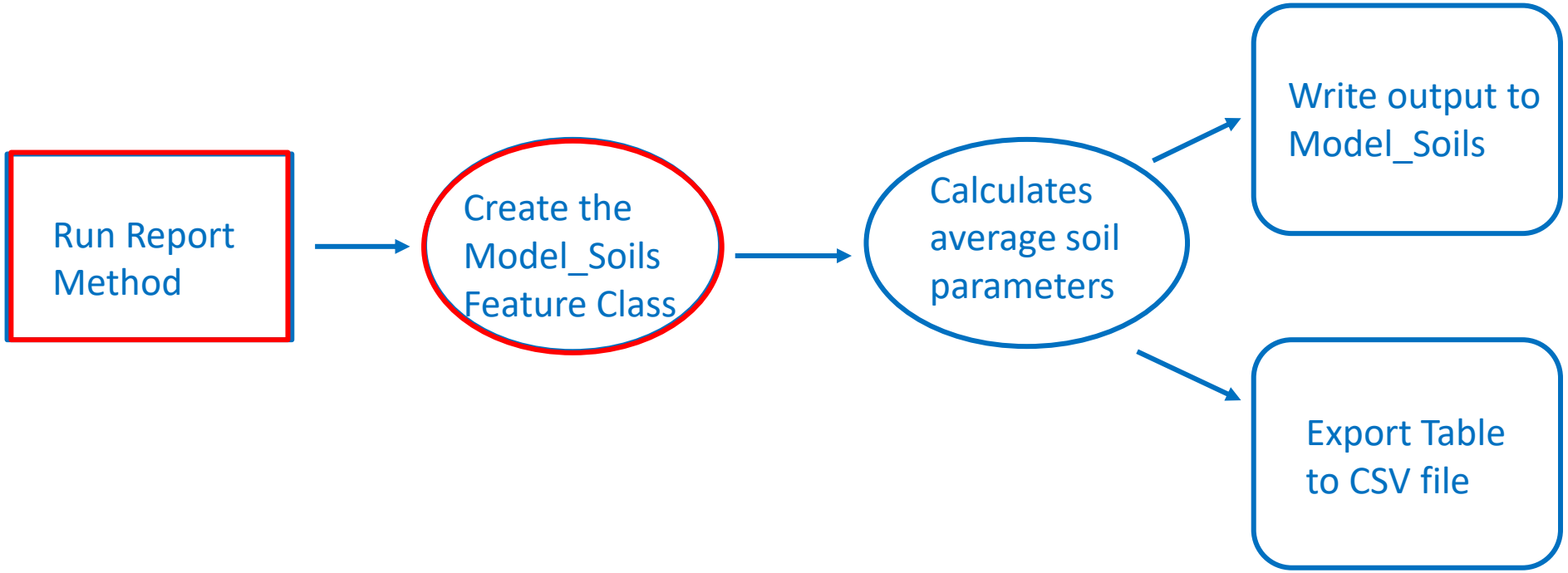
```
//Process saturated hydraulic conductance
Process.ChorizonData_Harmonic(CokeysList, CompPctsList, KsatPath, Mukey,

//Process porosity(AWC, w15thbar, w10thbar, & w15thbar)
Process.ChorizonData(CokeysList, CompPctsList, PorosityPath, Mukey, "wsatiated_l"

//Process texture
Process.Texture(Mukey, CokeysList, CompPctsList, TexturePath, ref rClayPct, ref r

//Process soil depth
Process.ProcessSoilDepth(CokeysList, CompPctsList, Mukey, SoilDepthPath, inPath);

//Process hydrologic group
Process.LookupHydGroup(CokeysList, CompPctsList, HydGroupPath, Mukey, inPath);
```

Process Data Method Output

Outputs:

- Subfolder & SDB Geodatabase
- All_Soils Feature Class
- Text Files (10) – used as inputs soil parameters into models

Part 2: Run Report Command



Calculating the Aggregate Soil Parameters

- Calculates the aggregate low, representative and high soil parameters for each model grid cell:
  - ❑ Porosity
  - ❑ Saturated Hydraulic Conductivity
  - ❑ Available Water Content
  - ❑ Water Content at 15 bar, 1/3 bar and 1/10 bar tension
  - ❑ Pore Size Distribution Index
  - ❑ Soil Texture Classification
  - ❑ Soil Depth
  - ❑ Hydrologic Group (based on the dominant conditions)

Run Report Main Methods

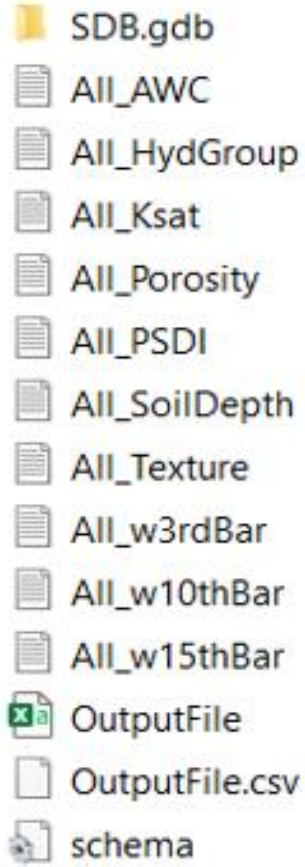
- AggregateValues Method
- AggregateSoilDepth Method
- AggregateHydGroup Method

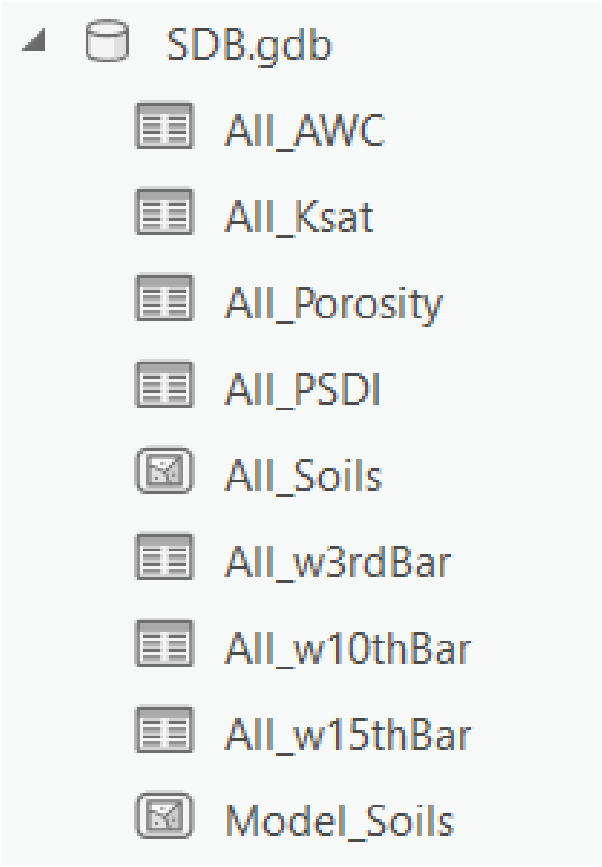
Run Report Outputs

Outputs:

- Model_Soils Feature Class
- Excel Table (csv file)

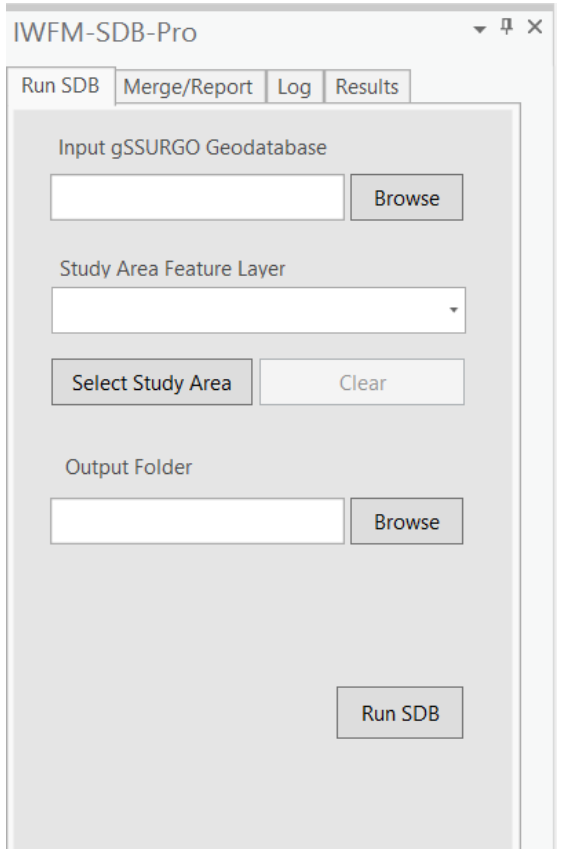
Final SDB Tool Outputs





- SDB Geodatabase
- Soil Parameter Textfiles
- OutputFile CSV File
- All_Soils Feature Class
- Model_Soils Feature Class

IWFM Soil Data Builder (SDB-Pro) Tool



Demonstration on How the IWFM Soil Data Builder-Pro Tool Works….

Additional Resources

- IWFM and IDC Support Tools (IWFM Soil Data Builder Tool):

  https://data.cnra.ca.gov/dataset/iwfm-supporting-tools

- Updated SSURGO Dataset in The Box by State:

  https://nrcs.app.box.com/v/soils/folder/180112652169

- ArcGIS Pro SDK Documentations:

  https://pro.arcgis.com/en/pro-app/latest/sdk/


Thank
you