

IWFM / IDC Users Group Meeting

July 18, 2013

Background on IWFM and IDC

- Multiple versions: IWFM v3.02, IWFM v4.0, IDC v4.0
- California Central Valley Groundwater-Surface Water Simulation Model (C2VSim) uses IWFM v3.02
- CalSim 3.0 development project required interfacing root zone and groundwater components of C2VSim to the CalSim (systems operation model)
 - Needed to redesign IWFM engine and its components for easy unplugging or plugging
 - Needed to improve the root zone component
 - Ultimately developed IDC v4.0 (stand-alone root zone component)
 - Modified IWFM engine to accept IDC v4.0 \Rightarrow IWFM v4.0

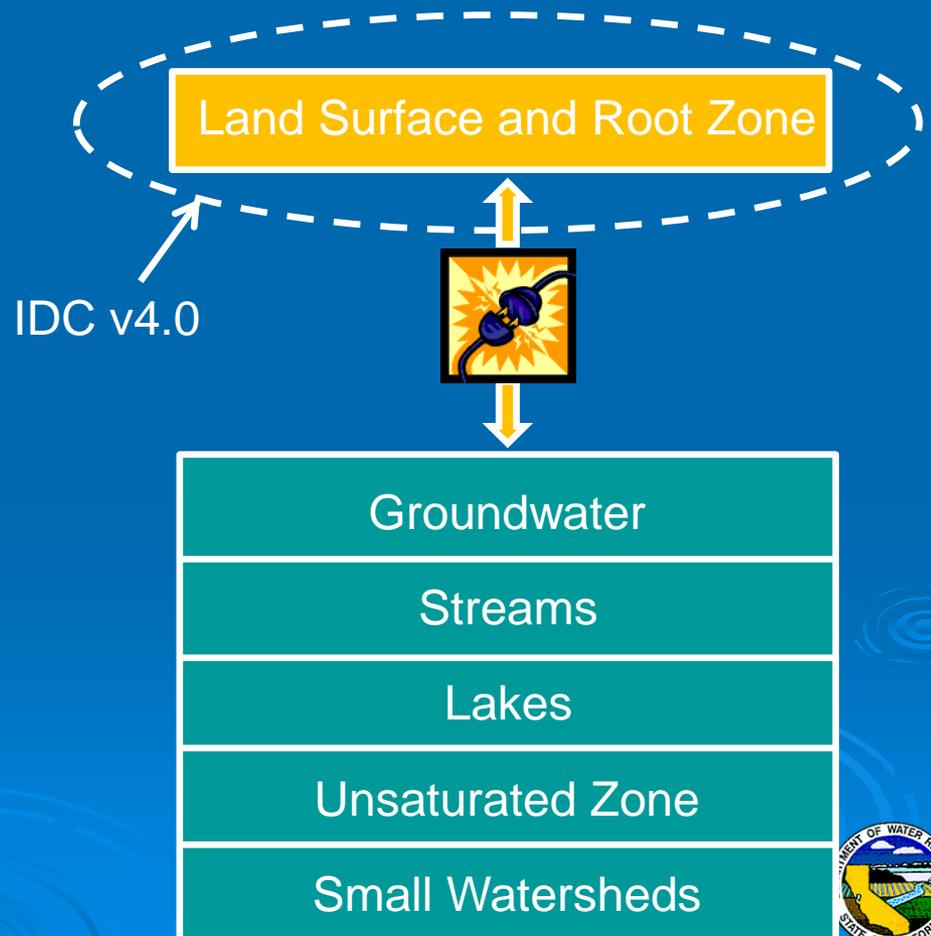


Background on IWFM and IDC

- IWFM v3.02



- IWFM v4.0



Differences between IWFM v3.02 and v4.0

- All components except the root zone component are essentially the same
- Differences between the two root zone components:
 - **v3.02** averages agricultural crop properties (rooting depth, minimum soil moisture requirement, irrigation efficiency, potential ET) based on crop acreages over a subregion to obtain a single, “representative” agricultural crop; no averaging in **v4.0** (i.e. each crop is treated separately)
 - **v3.02** calculates land surface and root zone flow terms at each subregion for combinations of 4 land use types (average ag., urban, native veg., riparian veg.) and 4 soil types (for C2VSim 336 calculations); **v4.0** calculates flow terms for each element for each ag. crop, urban lands, native veg. and riparian veg. (for C2VSim ~23600 calculations)



Differences between IWFM v3.02 and v4.0

- Differences between the two root zone components (*continued*):
 - **v3.02** does not have a special way of simulating rice fields and managed wetlands; **v4.0** simulates 3 types of rice growing practices (flooded-decomposition, non-flooded decomposition and no decomposition) and 2 types of managed wetlands (seasonal and permanent)
 - **v3.02** allows either dynamic demand calculations or prescribed demands but not both at the same time; **v4.0** allows dynamic demand calculation on some parts of the model domain and prescribed demands on the other parts
 - **v3.02** delivers water to a subregion; **v4.0** can deliver water to a subregion or to individual elements
 - **IWFM v3.02** must be calibrated as a whole; **IWFM v4.0** can be calibrated for the root zone and the rest of the hydrologic components separately



Advantages and Disadvantages of IWFM v3.02 and v4.0

- v4.0 requires more parameters for and better understanding of the root zone component
- v4.0 takes longer to run than v3.02; but it can be calibrated separately for the root zone and then for the rest of the model components
- v4.0 does a better job in simulating the effects of rice fields and managed wetlands on water resources
- v4.0 honors spatial distribution of precipitation, ET, crop water demand and stresses on groundwater better
- Choice between v3.02 and v4.0 mainly depends on characteristics of modeled area, project requirements and budget

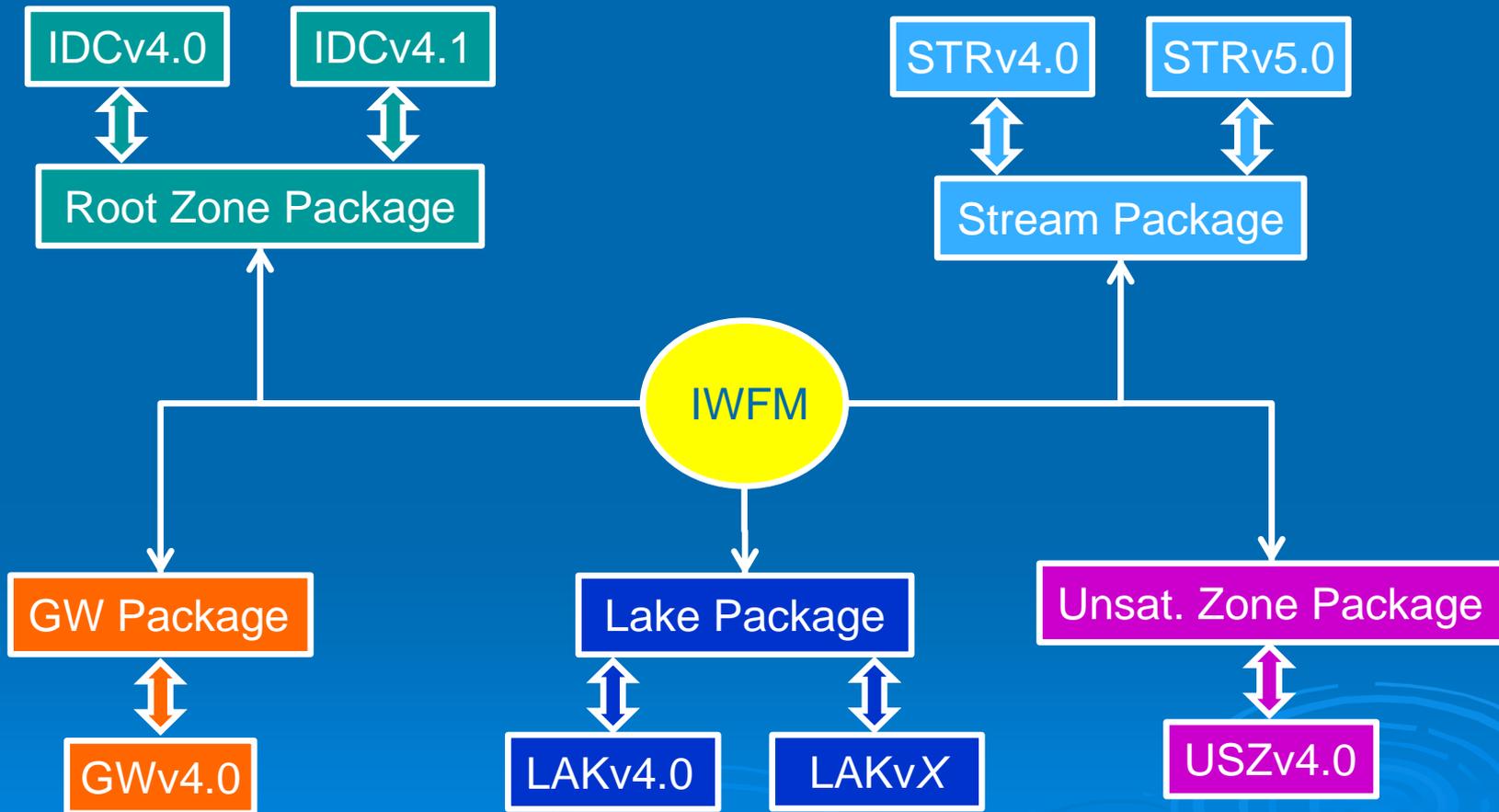


Upcoming Features

- Root water uptake from groundwater (IDC v4.1) – important for the simulation of native and riparian vegetation
- Hydrologic routing of streams – keep track of storage change at each stream node
- Prepare a FAQ and a summary sheet on different versions of IWFM, IDC and the other stand-alone components as they become available
- New features are implemented on top of IWFM v4.0; no major feature implementation is planned for v3.02
- All components will be able to run as a stand-alone program or as part of IWFM



Future Schematic Look of IWFM



Available Pre- and Post-Processors

- Available for download from the IWFM web site under **Support Tools** link

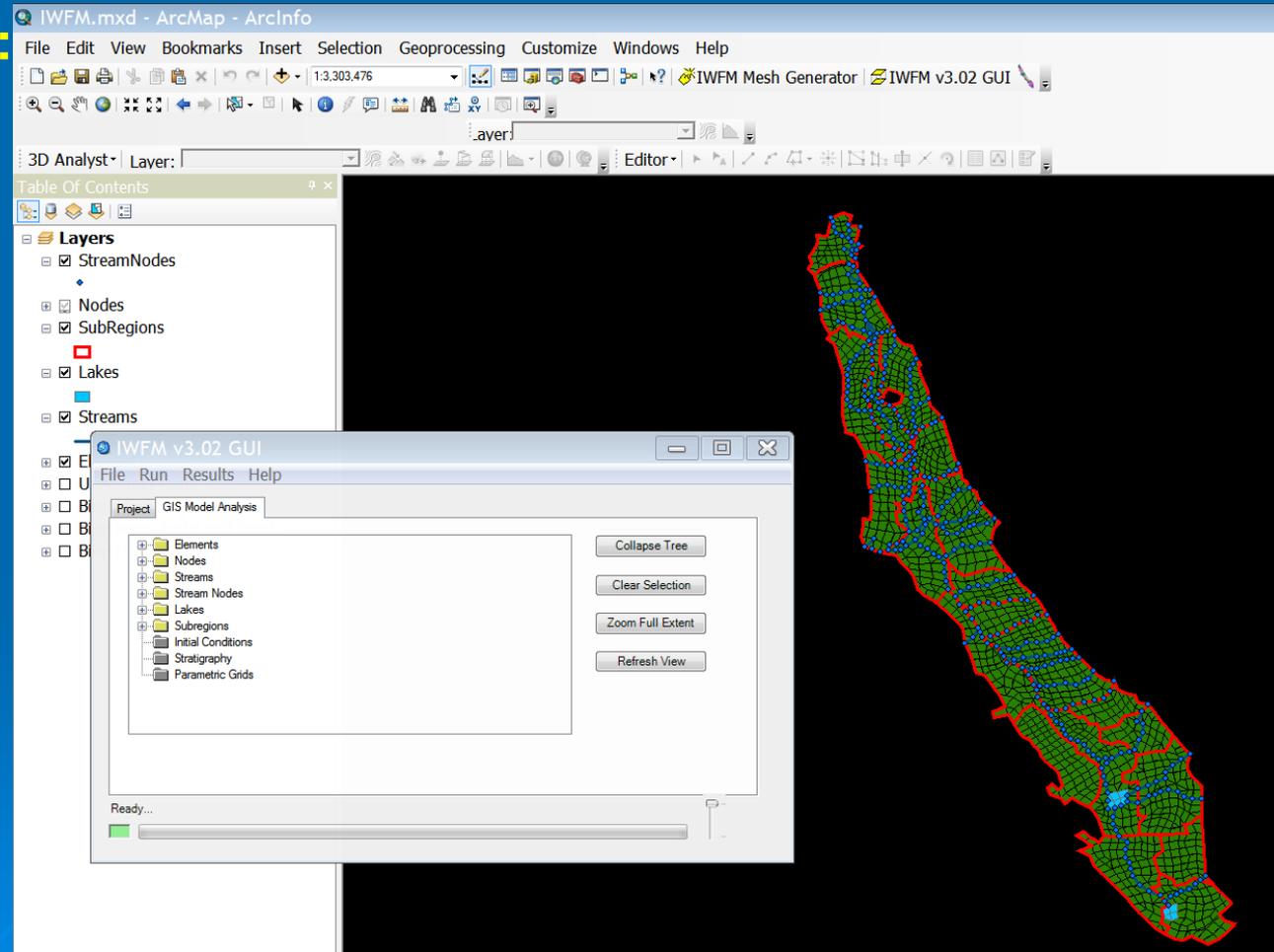
The screenshot shows the Department of Water Resources Bay-Delta website. The header includes the DWR logo and the text 'DEPARTMENT OF WATER RESOURCES BAY-DELTA'. A search bar and navigation links for 'DWR' and 'My CA' are visible. The main content area is titled 'IWFM: Integrated Water Flow Model - Support Tools' and lists three tools:

- IWFM v3.02 GIS/GUI** (Last updated: March 13, 2013): A work-in-progress, beta version GUI integrated into ESRI's ArcGIS v10.0 under Windows 7 OS. It allows users to bring the finite element grid, stream network, stratigraphy, and initial conditions from an existing IWFM model into a GIS environment. After downloading the setup executable file, users double-click it and follow the instructions to install the GUI. After installation, they start ArcMap and click the "IWFM v3.02 GUI" button.
- IWFM Mesh Generator** (Last updated: March 6, 2013): A mesh generator integrated into ESRI's ArcGIS v10.0 and v10.1 under Windows 7 OS. It uses shapefiles to define model boundaries, streams, enforcement lines, holes, and wells to generate a triangular finite element mesh. It uses *Triangle* developed by Dr. Jonathan Richard Shewchuk as the engine for mesh generation. The mesh can be converted to a shapefile for various data analysis tasks, such as soil properties, land use distribution, and development of stratigraphic layers for IWFM applications. Groundwater and stream nodes, as well as finite elements, can be numbered automatically, and IWFM mesh files can be exported to text files. After downloading the setup executable file, users double-click it and follow the instructions. After installation, they start ArcMap and click the "IWFM Mesh Generator" button.
- IWFM Tools Add-in for Excel 2007-2010** (Last updated: February 28, 2013): A tool that installs as a new tab named "IWFM Tools" into Excel 2007 or 2010. It currently includes three utilities:
 - data column export to a text file,

The left sidebar contains navigation links: DWR Home, BDO Home, Organization (Administration & Program Control, Delta Conveyance, Modeling Support, South Delta), DWR Computers Only, BDO Currents, DWR Forms, Organization Charts, SAP ESS, BDO Computer Support Request, and Training. The bottom left features a 'Summer' graphic with a person water skiing. The bottom right contains 'Section Pages' (Central Valley Water Resources System Modeling, Delta Modeling, Computer Assistance) and 'Quick Hits' (WRIMS/CalSim, CalLite, DSM2, C2V Sim). The DWR logo is in the bottom right corner.

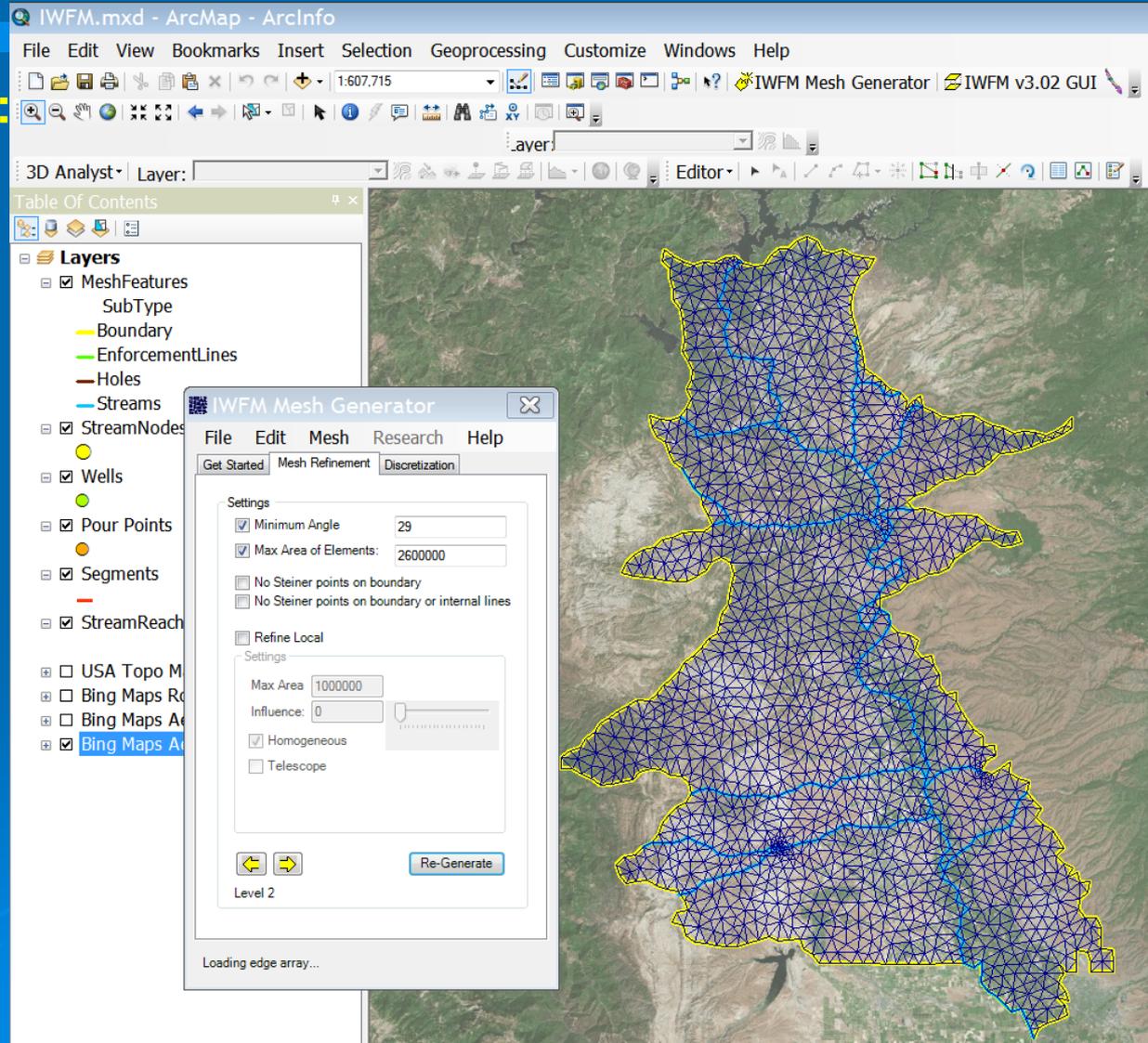
Available Pre- and Post-Processors

- **IWFM v3.02 GIS/GUI:** Installs as a button in ArcGIS; reads IWFM v3.02 data files and creates model shapefiles (elements, nodes, subregions, streams, lakes, stratigraphy, initial conditions)



Available Pre- and Post-Processors

- **IWFM Mesh Generator:**
Installs as a button in ArcGIS; iteratively generates triangular meshes that can be used with IWFM v3.02, IWFM v4.0 and IDC v4.0



Available Pre- and Post-Processors

- IWFM Tools Add-in for Excel 2007-2010:**

Installs as a new tab in MS Excel; provides several pre- and post-processing tools for IWFM and IDC

The screenshot shows the Microsoft Excel interface with the 'IWFM Tools' add-in tab active. The 'Budget To Excel' dialog box is open, displaying the following settings:

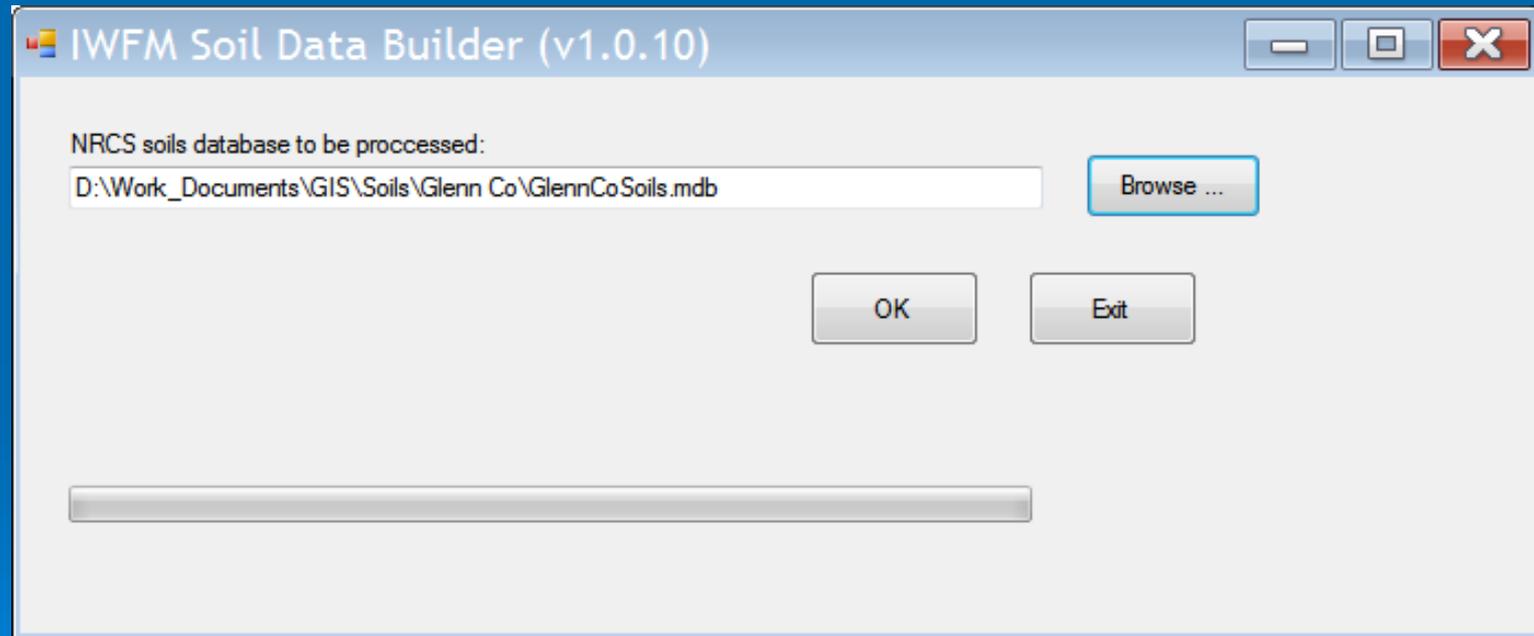
- Choose Budget Binary File:** D:\Work_Documents\VGSM2_IWFM Applications Related\VC2\SIM_r356_RipET_v4
- Output Conversion Factors and Units:** Length: 1.0 ft, Area: 2.29568E ac, Volume: 2.29568E ac.ft
- Output Begin Date/Time:** 10/01/1921_24:00
- Output End Date/Time:** 09/30/1930_24:00
- Output Interval:** 1MON
- Location for Data Import:** DSA 12 (SR3)

The spreadsheet data is as follows:

Time	Deep Percolation	Beginning Storage (+)	Ending Storage (-)	Net Deep Percolation (+)	Gain from Stream (+)	Recharge (+)	Gain fr
10/31/1921	52291191.27	3131960678.19	3126332103.83	51604402.43	-581638.01		0.00
11/30/1921	51289344.63	3126332103.83	3125742226.38	51208524.89	-289501.42		0.00
12/31/1921	55037916.18	3125742226.38	3125890010.25	54041352.88	179033.60		0.00
1/31/1922	58231276.74	3125890010.25	3125837693.08	56748283.05	-150639.06		0.00
2/28/1922	55523036.96	3125837693.08	3126471417.71	53599886.09	379816.37		0.00
					-371352.32		0.00
					-55660.53		0.00
					543864.31		0.00
					-322510.73		0.00
					-1214673.04		0.00
					-707602.08		0.00
					-451079.52		0.00
					-265946.19		0.00
					-100463.64		0.00
					302318.24		0.00
					-296034.19		0.00
					-455079.11		0.00
					-419949.32		0.00
					201271.57		0.00
5/31/1923	37424766.52	3120043387.94	3119700841.66	37231174.21	-42356.82		0.00
6/30/1923	32547997.17	3119700841.66	3118792710.33	32556484.05	-663699.48		0.00
7/31/1923	29772792.76	3118792710.33	3117719440.80	29842700.19	-720501.31		0.00
8/31/1923	26497930.60	3117719440.80	3116898457.09	26646473.61	-649286.60		0.00
9/30/1923	24173990.76	3116898457.09	3116608151.69	24284783.18	-353711.58		0.00
10/31/1923	25437980.77	3116608151.69	3116506168.32	25368010.79	-278511.61		0.00
11/30/1923	24543042.80	3116506168.32	3116458349.22	24567381.03	-275696.44		0.00
12/31/1923	26277992.22	3116458349.22	3116577600.92	26148200.94	-248101.94		0.00
1/31/1924	27544931.70	3116577600.92	3116772597.79	27220796.91	-214218.84		0.00
2/29/1924	28073403.78	3116772597.79	3117075927.02	27409298.42	-135858.50		0.00
3/31/1924	29354205.86	3117075927.02	3116955142.36	28924871.85	-453212.93		0.00
4/30/1924	27640589.27	3116955142.36	3116772790.65	27722641.79	-215677.10		0.00

Available Pre- and Post-Processors

- **Soil Data Builder:** Processes NRCS SSURGO soil databases to obtain soil parameters to be used in IWFM v4.0 and IDC v4.0



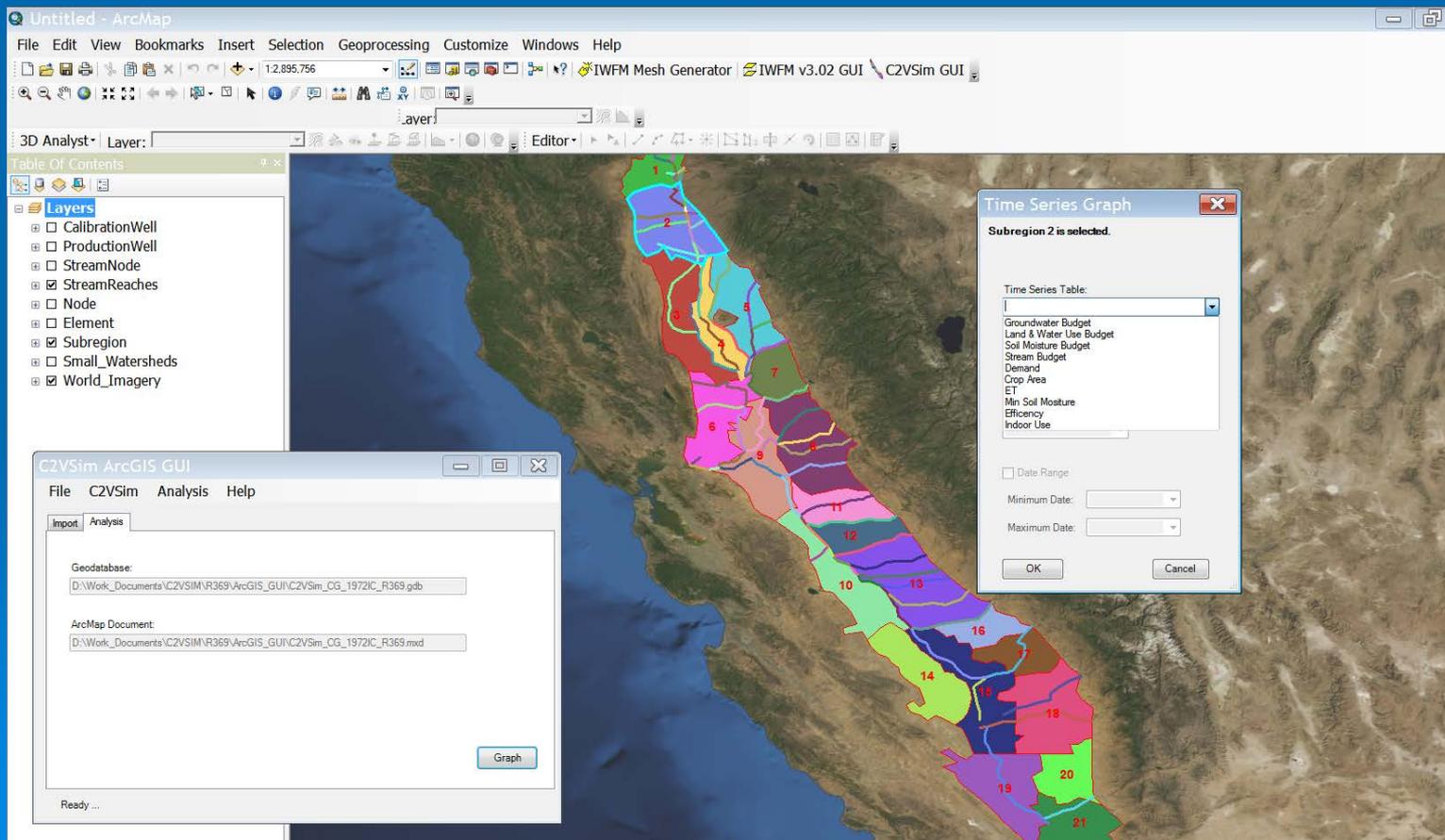
Available Pre- and Post-Processors

- **Land Use Adjustment Pre-processor:** Allows the user to generate a time series data set of elemental land use areas based on subregional time series data and elemental survey data



Available Pre- and Post-Processors

- **ArcGIS GUI for C2VSim:** Allows C2VSim results analysis within ArcGIS; soon will be offered to public as a generic post-processor tool to be used with any IWFM application



QUESTIONS?

