St. Johns River Water Management District (SJRWMD)/ECT presents:

Automating a Pollution Load Screening Model (PLSM)

Putting ArcObjects to Work in a Modern Interface

Presentation Overview

- Brief overview of Arc Hydro and the PLSM model
- Motivation: Going beyond ModelBuilder®
- Underlying Technology: Visual Basic .NET (VB .NET), ArcObjects, and Custom Libraries for VB .NET
- User Interface: How we put it all together
- Conclusion: Challenges and the future
- Demo: Interface and results

Please keep your questions until the end of the presentation. Thank you.

Overview of the PLSM Model and Arc Hydro

- The pollution load screening model calculates pollutant loads on an area of interest by combining landuse, soil, and rain values and applying runoff and pollution load coefficient tables.

- Arc Hydro is a geometric network (think MapQuest Routing) which simulates flow direction for various objects such as streams, where the objects are connected by a unique value called the HydroID.

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The PLSM Tool at a Glance

The motivation and technology

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Motivation: Why program a model?

- Currently many users at the SJRWMD use the PLSM in ModelBuilder.
- The ModelBuilder version generalizes vector data into raster format. It is also very time consuming to run.
- The SJRWMD wanted output that could be connected with Arc Hydro (a geospatial/temporal data model for water resources).
- The SJRWMD wanted to be able to have the PLSM in a format that was automated, accurate, efficient, reliable, and easily shared.

Underlying Technology

- In order to create a program that simulates the PLSM and provides a great user experience we looked toward the Visual Basic .NET (VB .NET) programming language.
- VB .NET allows us to use ArcObjects to interface with ArcMap as well as various controls that can display information to the user in innovative and accessible ways.
- Custom controls such as the 2007 ribbon interface allowed us to create a user friendly experience for the user that is impossible in ModelBuilder.

The User Interface

Going beyond ModelBuilder

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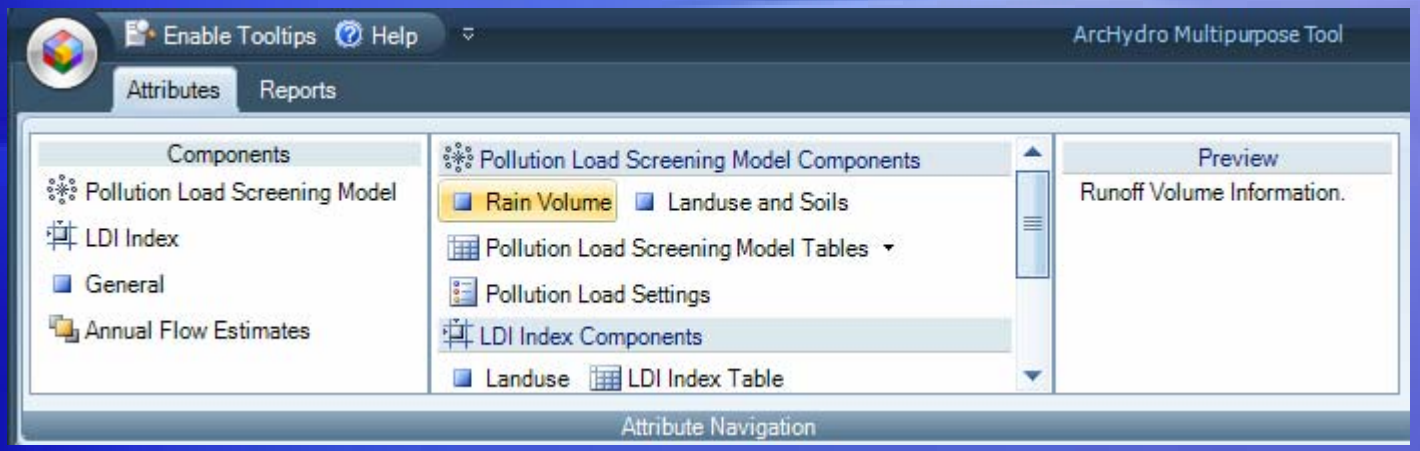
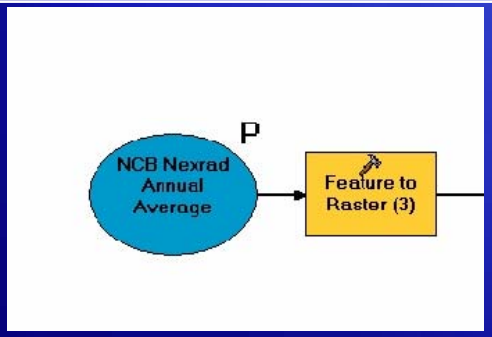
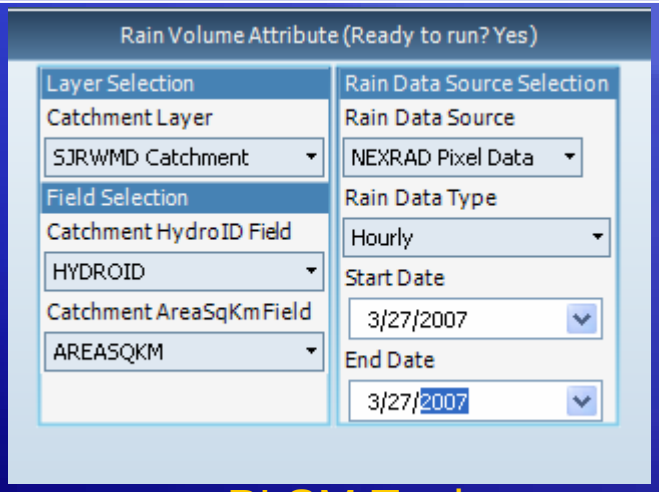
Navigation and Custom Data Entry



A modern 2007 ribbon interface guides the user through the various sub-components of the model with preview information.



ModelBuilder



PLSM Tool

Having to wade through every component and defining them in something like ModelBuilder could be quite cumbersome. Here we have a more accessible way of customizing and running the model.

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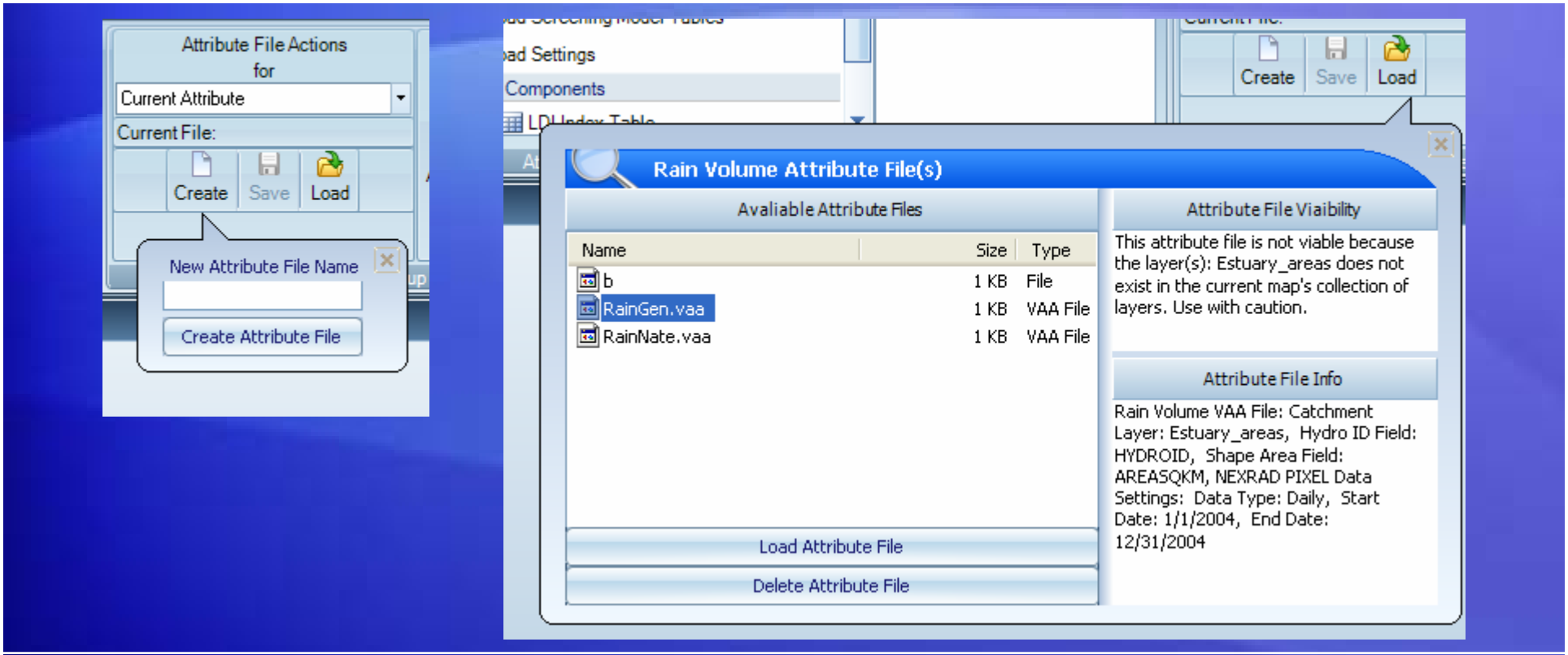
Creating and Loading



Users can create, save, and load their own specific setups for any of the PLSM components. This allows users to load their settings or a set of settings easily without having to fill out every component over again. Also each file comes with information that allows users to select the appropriate saved files for them. These functions would be hard to achieve outside of a custom program.

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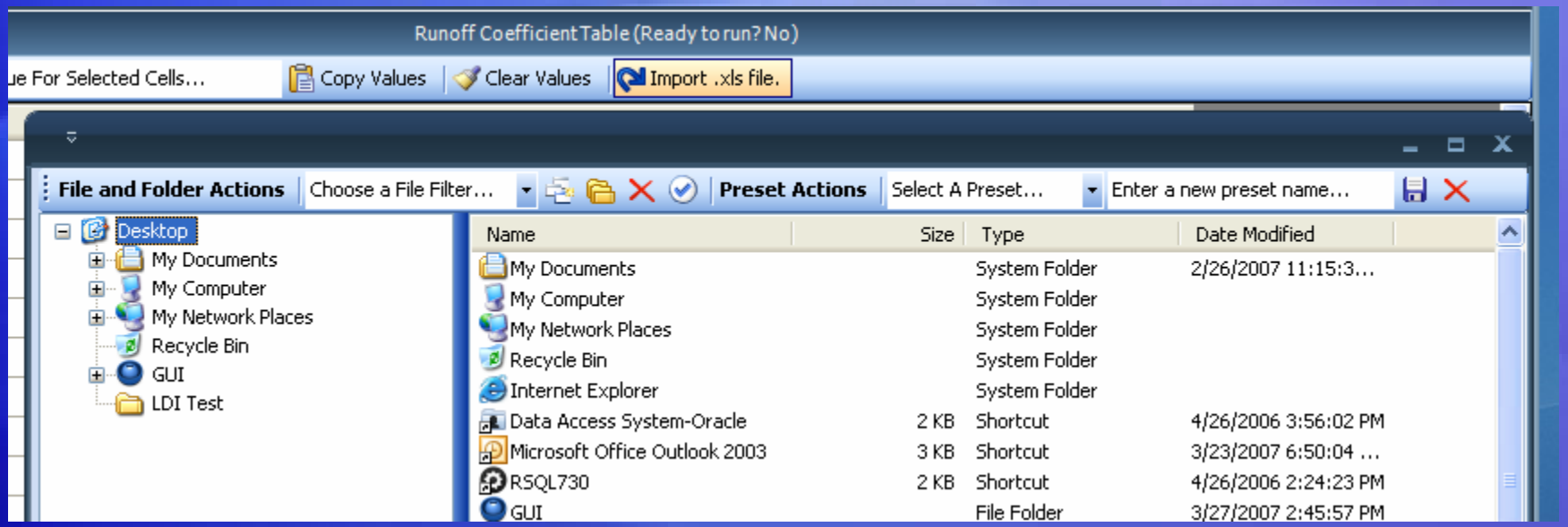
Importing Data via Excel



When users need to create tables used in the PLSM model users have the option of importing an .xls file. Also through the import window users can save file paths they like to navigate to as well as create folders and geodatabases.

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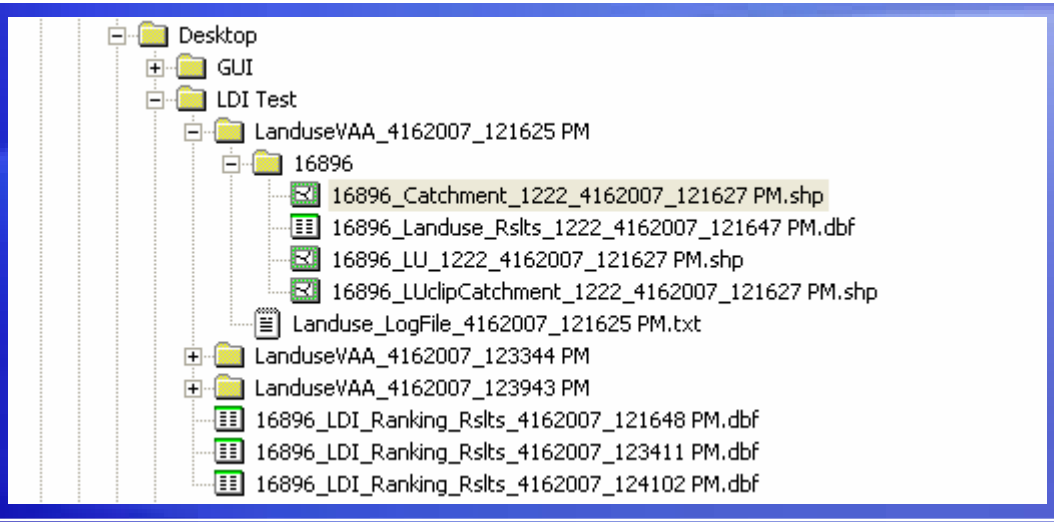
Results and Tables



All shapefiles and result tables can be saved for users so they can always trace their steps back as well as proof their data (QA/QC).

Every result table, shapefile, and folder is time stamped. Also the summary tables are automatically added to the source of the current ArcMap document.

Information is included in every summary and result table that allows for joins and for interconnectivity with Arc Hydro by virtue of HydroID (unique value identifier within the geometeric network).

In addition the model can create complex results through the Arc Hydro database, such as being able to accumulate pollution loads upstream of any area.

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What is next for the PLSM Tool?

Future enhancements and challenges

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The Future

- We are now working to make the tool have multiple functions. Various new attribute functions are going to be added and some are already complete such as:
  - (In Progress) Estimating mean annual flow through the unit runoff method (UROM), Vogel method, and by Drainage Basin (Arc Hydro)
  - (Complete) Estimating Land Development Index Ranks (Brown and Vivas, 2006)
  - Calculating mean and area weighted annual precipitation and temperature
  - Calculating elevation, slope, and stream order

Challenges

- In the future we will be facing many challenges in keeping the tool unique and powerful by
  - Keeping the interface clean and manageable
  - Creating good, useful, and attractive reports and graphics for users to report their findings
  - Continuing to proof all results and making them viable for publication and presentation
  - Further integrating the tool with Arc Hydro