

An Introduction to Geoprocessing

Geoprocessing

- What is Geoprocessing
- What are Geoprocessing Models

What is Geoprocessing?

Geoprocessing is the processing of geographic information, one of the basic functions of a GIS

Typical geoprocessing functions involve...

- Data Conversion – CAD2GIS
- Overlaying analysis – combining features and attributes
- Proximity analysis – finding the nearest feature
- Extracting data – clipping features
- Etc...

Geoprocessing in ArcGIS 9.0

Geoprocessing tools in ArcGIS make it easy to process spatial data and model aspects of the real world.

ArcGIS 9 includes...

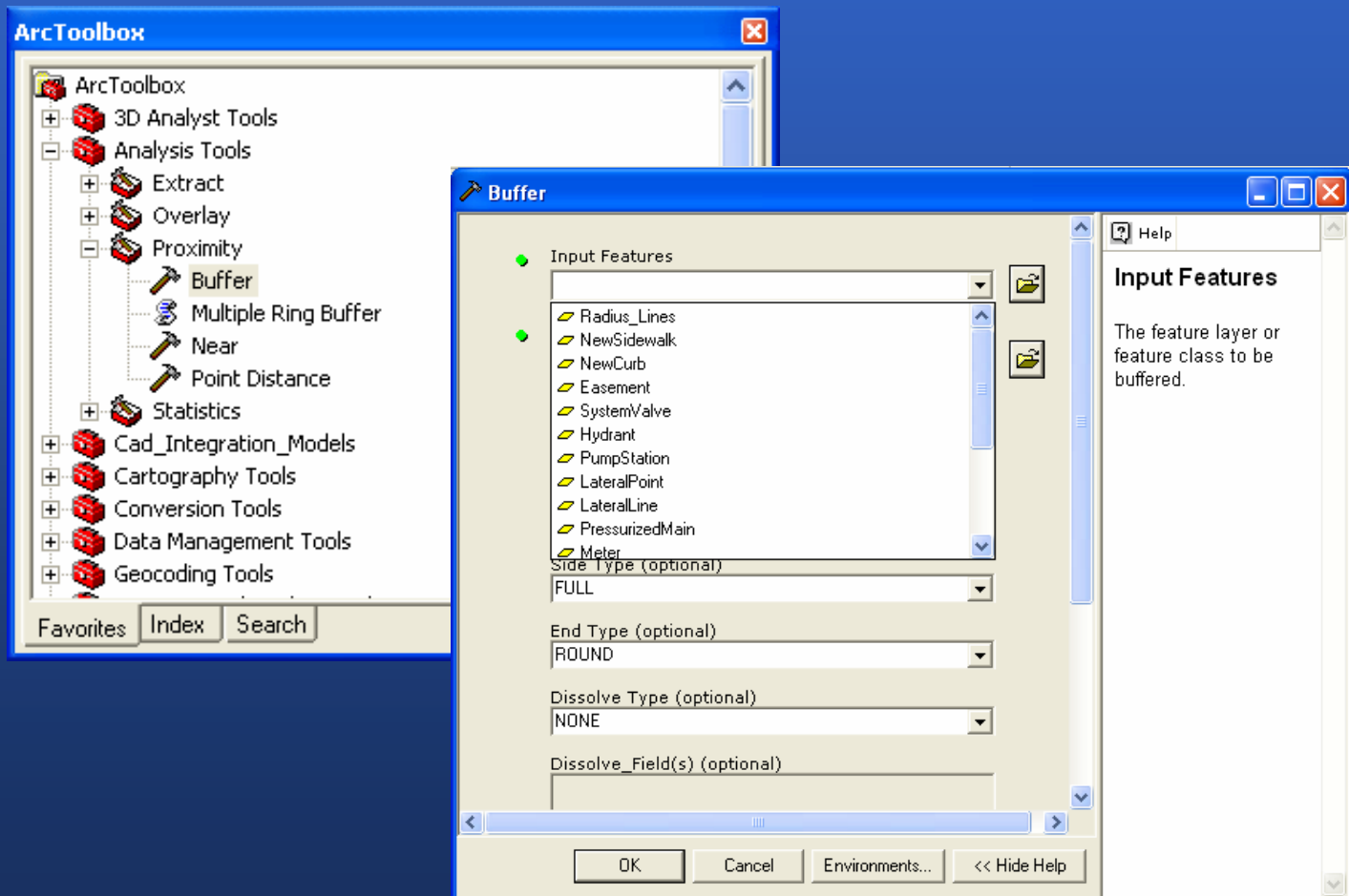
- New tools and framework fulfill the requirements of workstation ArcInfo users
- Provides a mechanism to automate workflows
- Extends the usability of geoprocessing in ArcGIS – Script tools & Models: A new paradigm

Geoprocessing Framework

- How a tool is used depends on a user's needs and preferences. There are **four** ways:
 - As a dialog
 - As a command on the command line
 - As a process in a model
 - As a function in a program or script

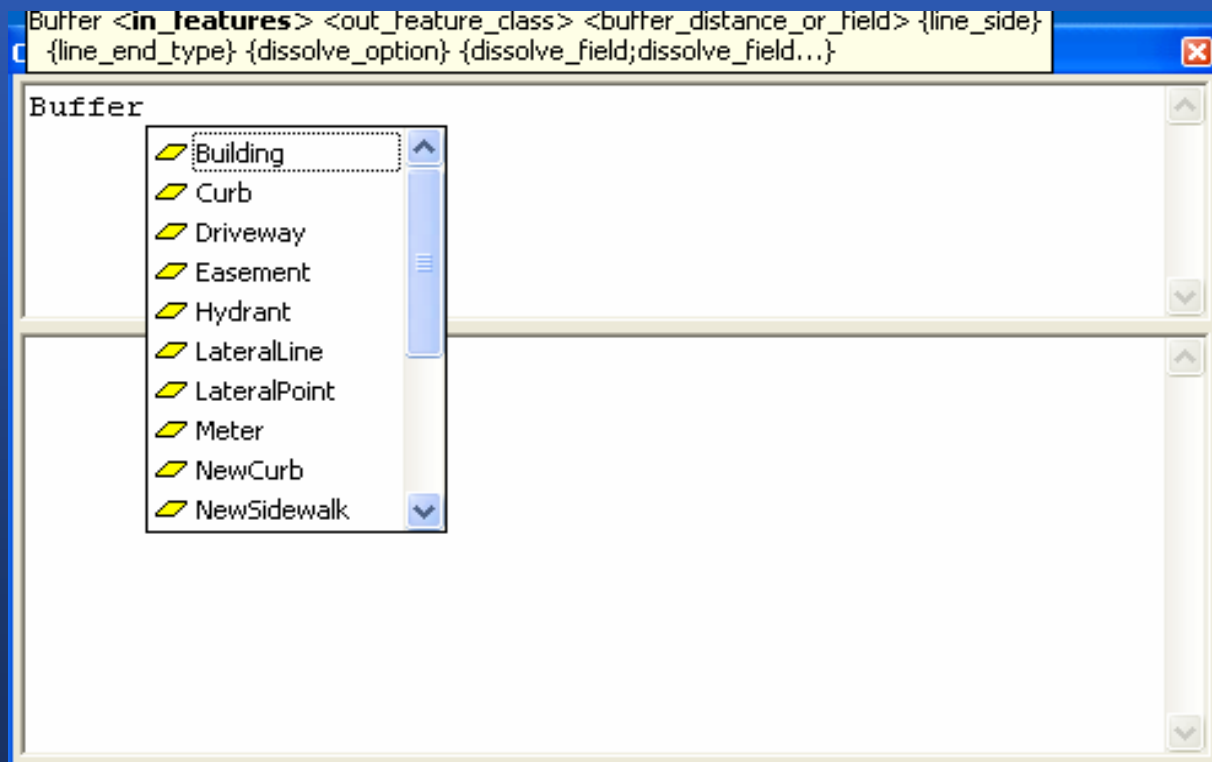
Dialogs

Your geoprocessing tasks can easily be performed by running the dialog box of a system tool.



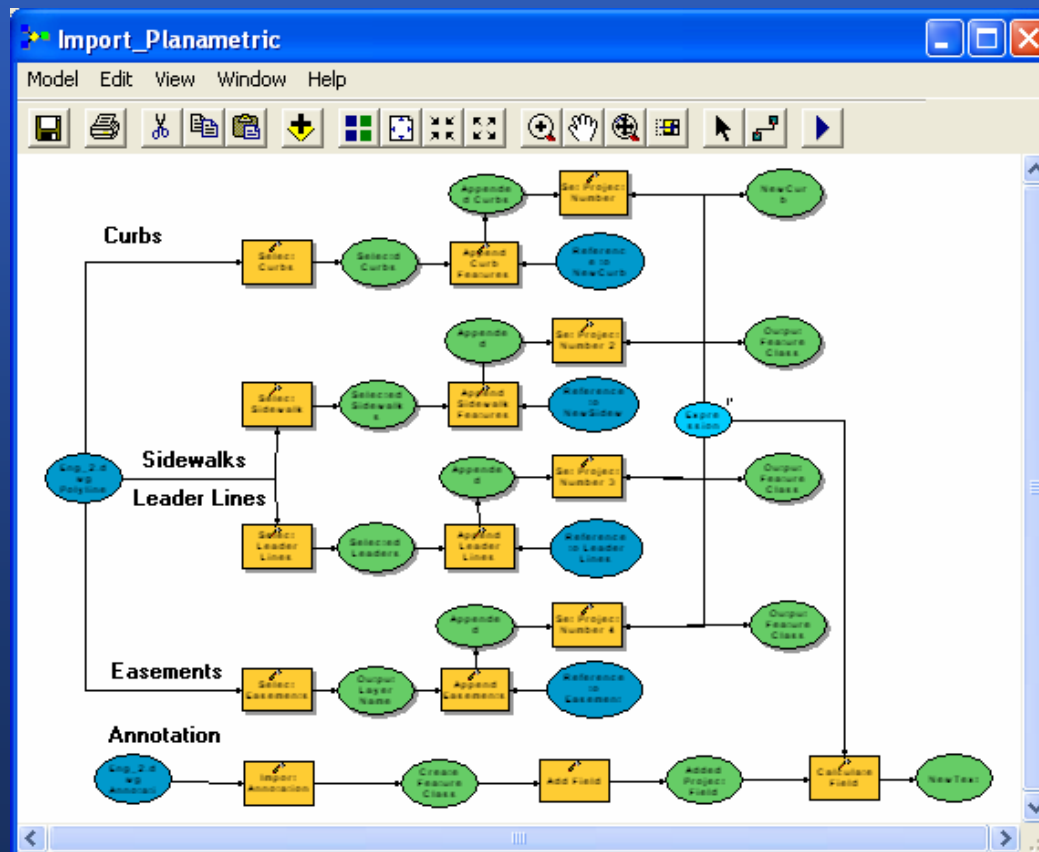
Using Command Line

- Tools can be run at a command line.
 - Prompts for correct command syntax
 - Drag and drop inputs (ArcCatalog)
 - Layers show up in a popup list (ArcMap)



Geoprocessing Models

When there are many steps involved in geoprocessing workflow, it can be difficult to keep track of the assumptions, tools, datasets etc...

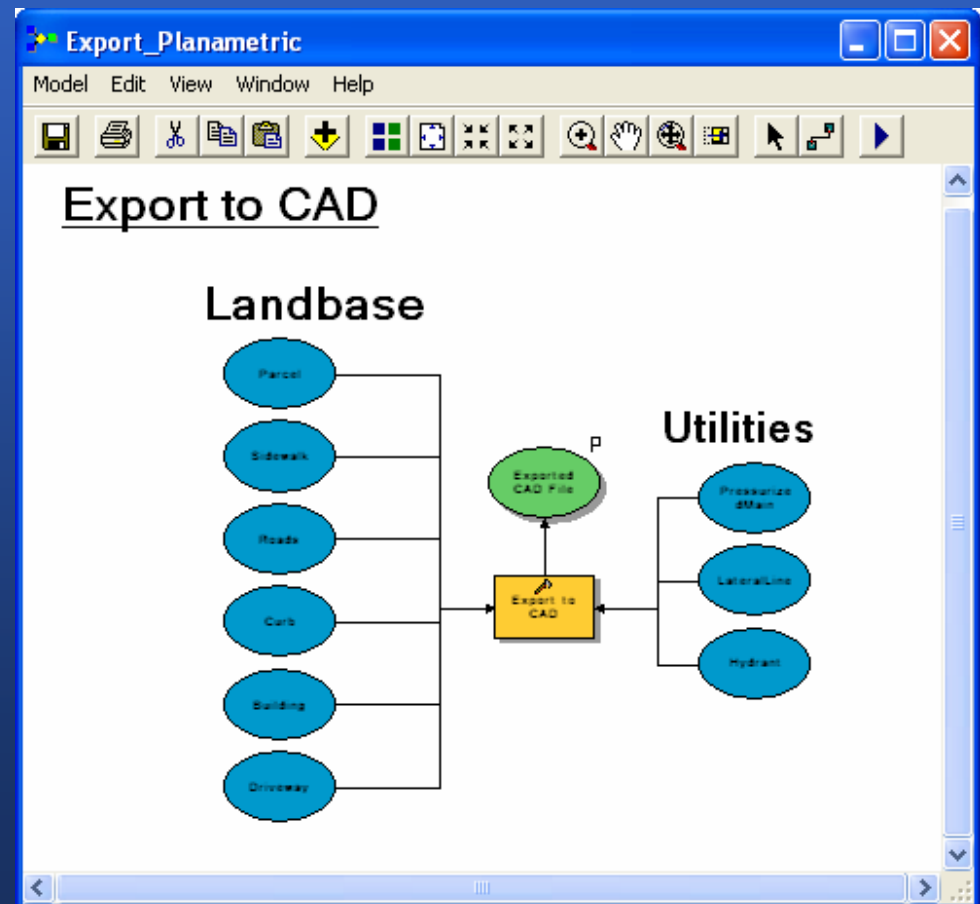


Why Geoprocessing Models

Models allow you to perform a workflow, modify it, and repeat the process over and over with a single click.

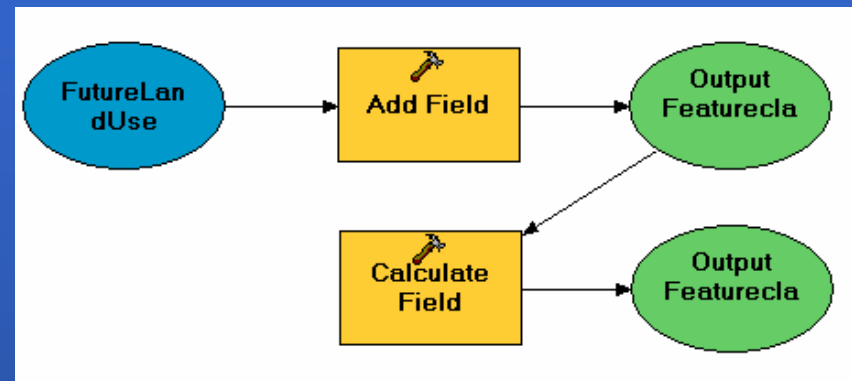
Why use Models

- Fast analysis
- Re-executable
- Graphical documentation of work
- Simplify complex tasks etc...

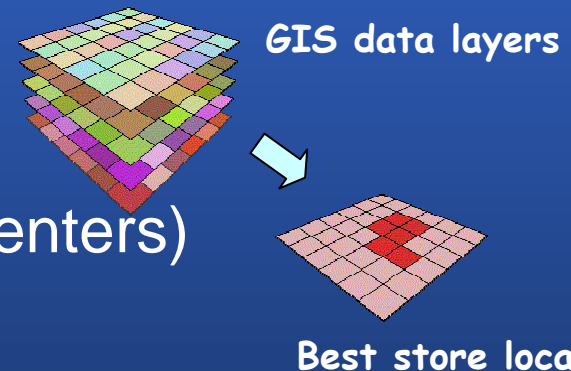


Types of models

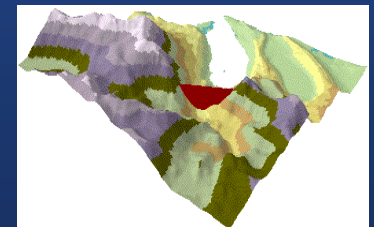
- Repetitive tasks
 - Minimize *grunt work*
 - Efficiently execute a series frequently used tools



- Suitability models
 - Use to find best location (businesses, vineyards, evacuation centers)



- Process models
 - Show the landscape as conditions change (fire spreads, rivers flood, oil slicks move)

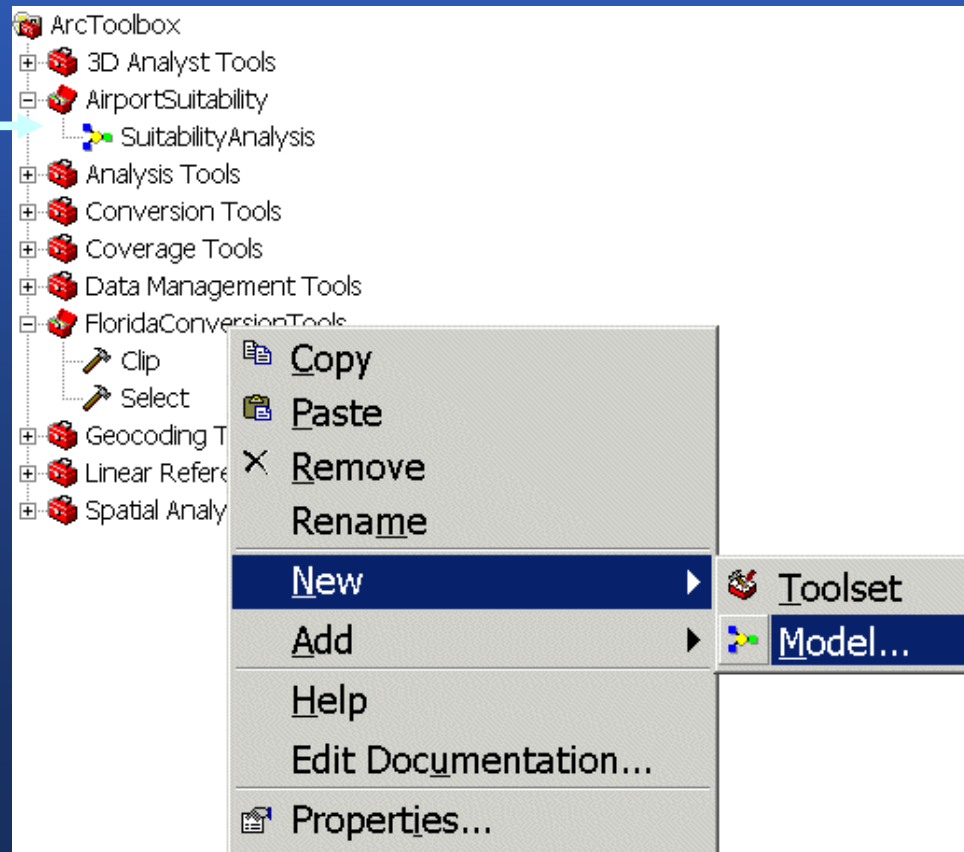


Filling a reservoir

Using ModelBuilder

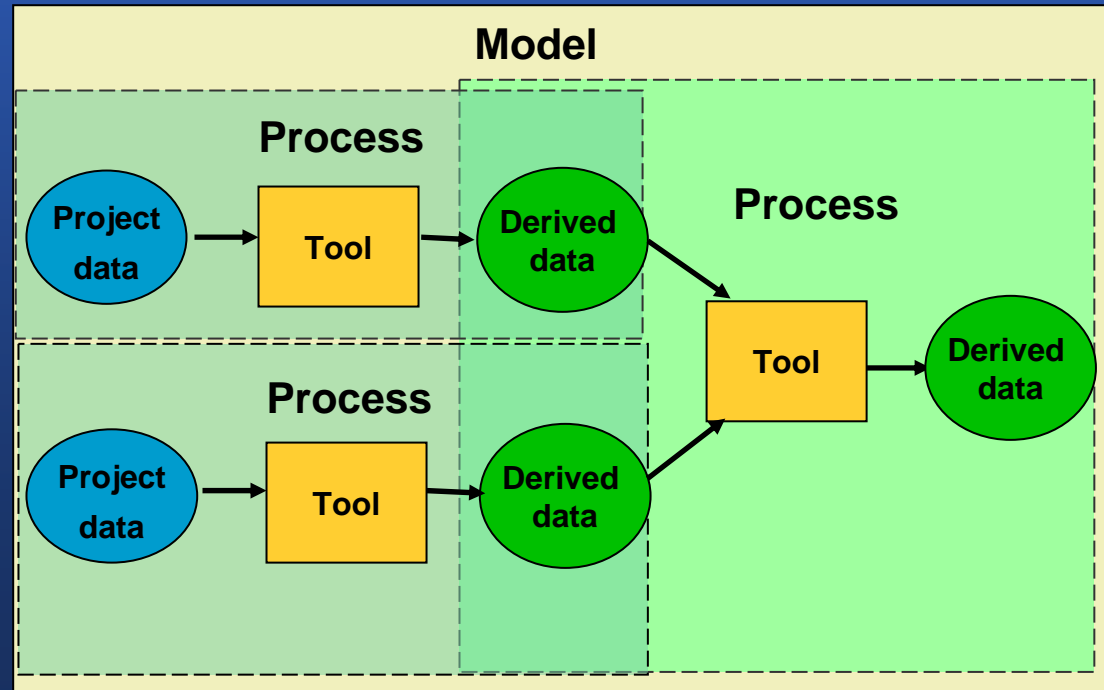
- Obtained from a toolbox
- Create new models in your own toolboxes
- All tools within ArcToolbox can be used in ModelBuilder

Existing model



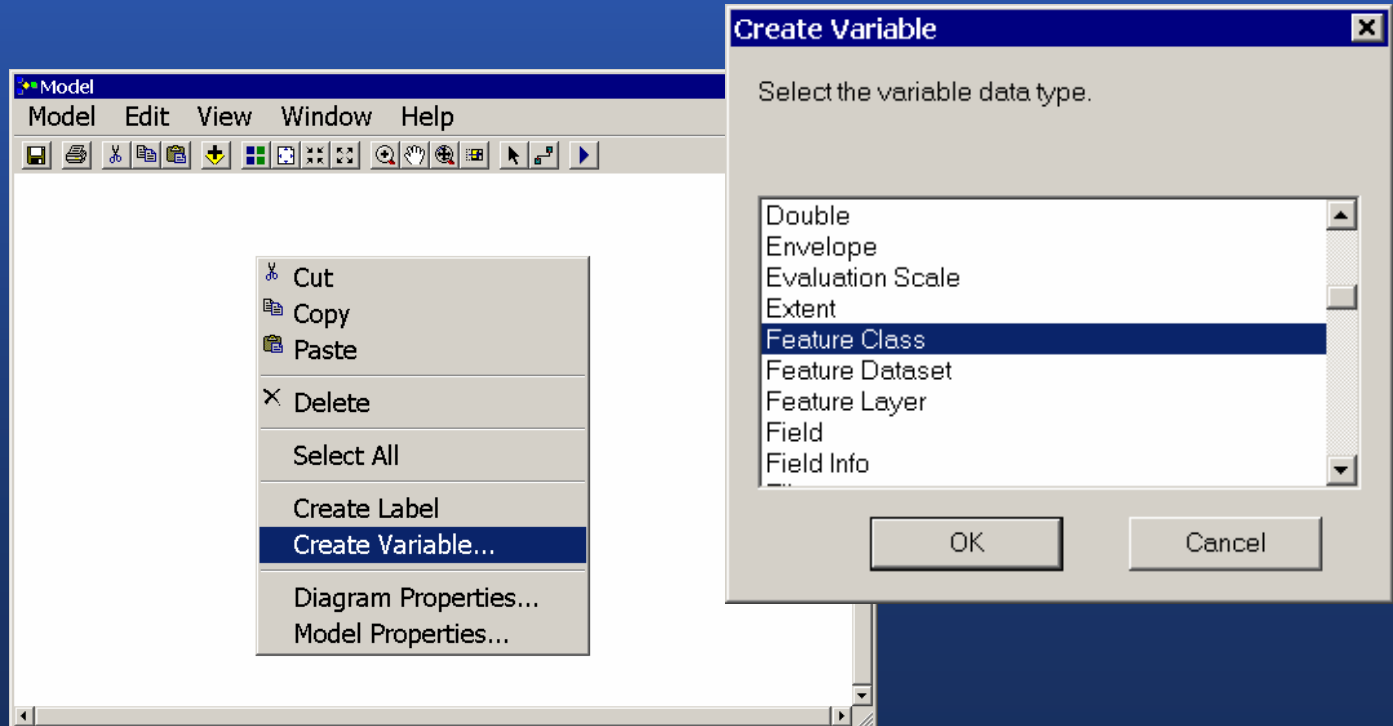
Model elements

- Project data: Data that exists before model is run
 - Blue oval
- Tool: Operation performed on input data
 - Yellow-orange rectangle
- Derived Data: Output data created by a function
 - Green oval
- Process: Set of elements
 - Run one process at a time or all at once



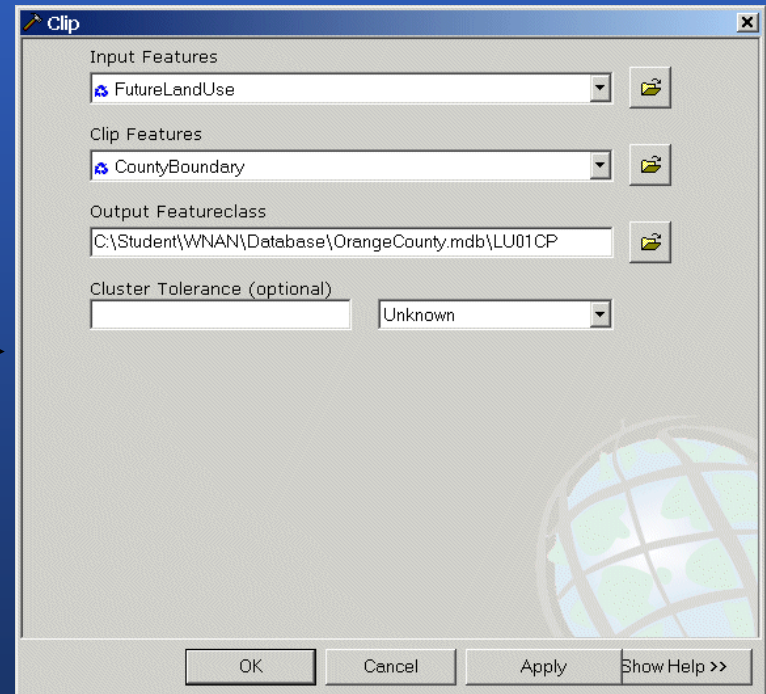
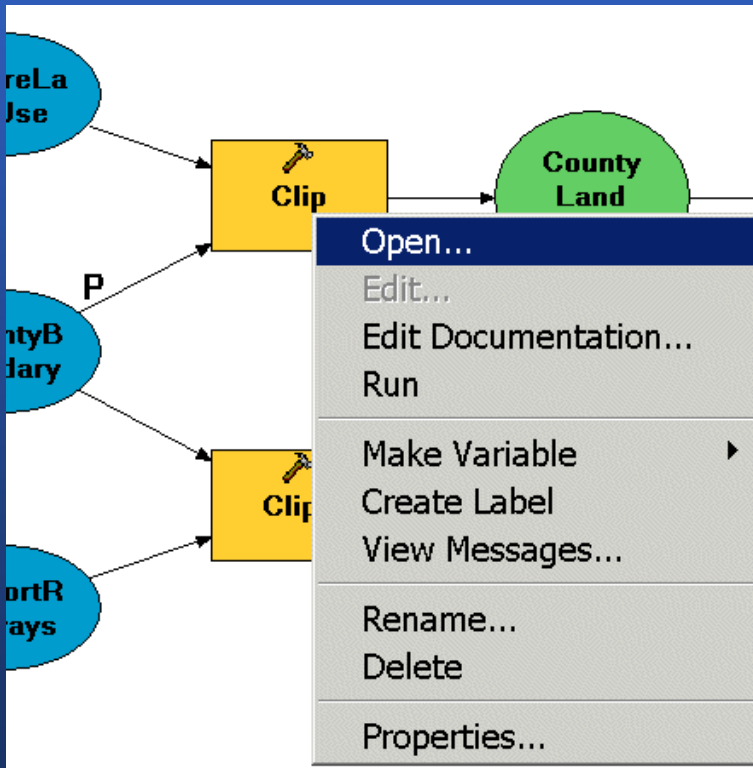
Adding model elements

- Drag and drop from ArcCatalog or ArcMap
 - Tools from ArcToolbox
 - Data
- Add empty variables
 - Supply data source at a later time



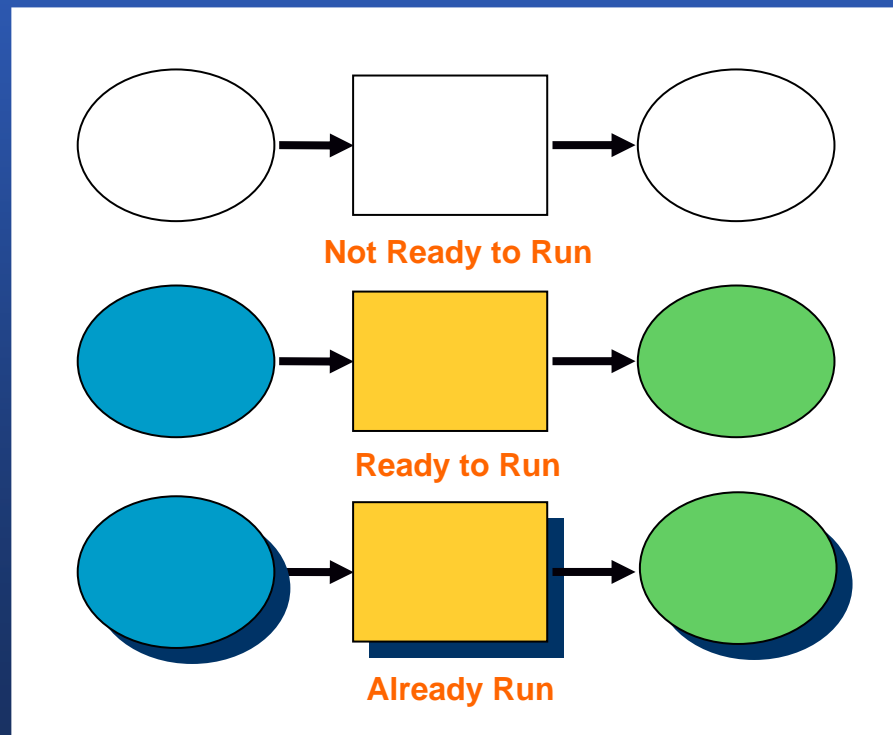
Tools within a model

- Right-click or double-click to obtain parameters
 - Same dialog as tools from a toolbox



Three states of model elements

- Not ready to run: Parameters not defined
- Ready to run: All elements colored
- Already run: All elements colored and shadowed



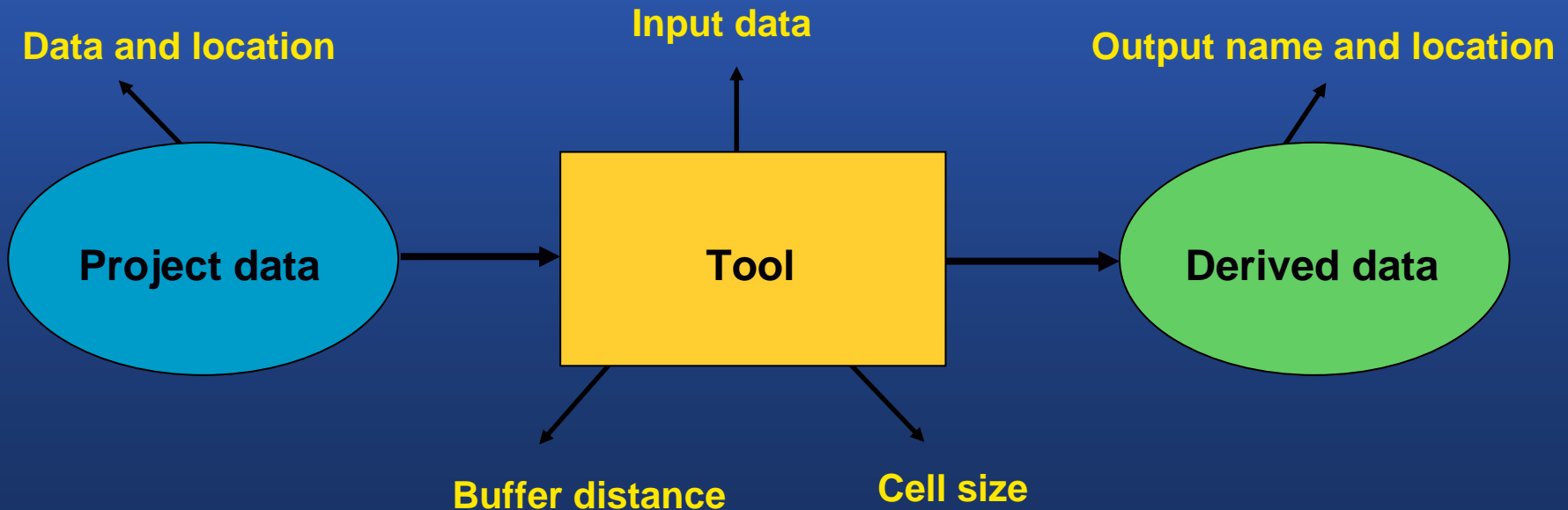
How to execute models

- Run the model from ModelBuilder
- As a tool dialog

The image displays two overlapping windows from ArcGIS. The foreground window is the 'clipbuffer' tool dialog, which is a standard Windows-style application window. It features a title bar with the text 'clipbuffer' and standard window controls (minimize, maximize, close). The main area contains several input fields, each with a folder icon to its right. The fields are labeled 'Input Roads' (with the path 'C:\Student\OCRoads.shp'), 'City Limit' (with the path 'AN\Database\Florida.mdb\CityLimits'), 'Roads_Buffer_Clip.shp', and 'Roads_Buffer.shp'. At the bottom of the dialog are buttons for '<', 'Cancel', 'Environments...', and 'Show Help >>'. The background window is the ArcGIS ModelBuilder interface, also titled 'clipbuffer'. It has a menu bar with 'Model', 'Edit', 'View', 'Window', and 'Help'. Below the menu is a toolbar with various icons, including a play button. The main workspace shows a flowchart with five nodes: 'Input Roads' (blue oval), 'Buffer' (yellow rectangle), 'Buffered Roads' (green oval), 'Clip' (yellow rectangle), and 'Final Output' (green oval). Arrows indicate the flow from 'Input Roads' to 'Buffer', then to 'Buffered Roads', then to 'Clip', and finally to 'Final Output'. There are also two additional nodes, 'City Limit' (blue oval) and 'Final Output' (green oval), which are connected to the 'Clip' node. Each node has a small 'P' icon next to it.

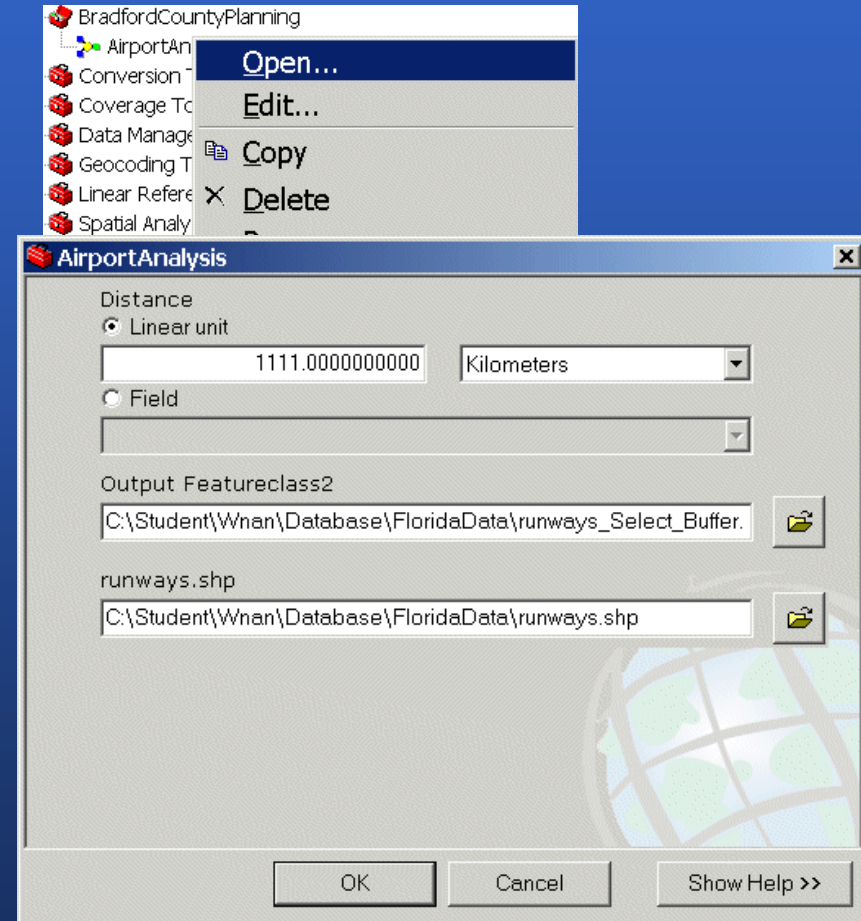
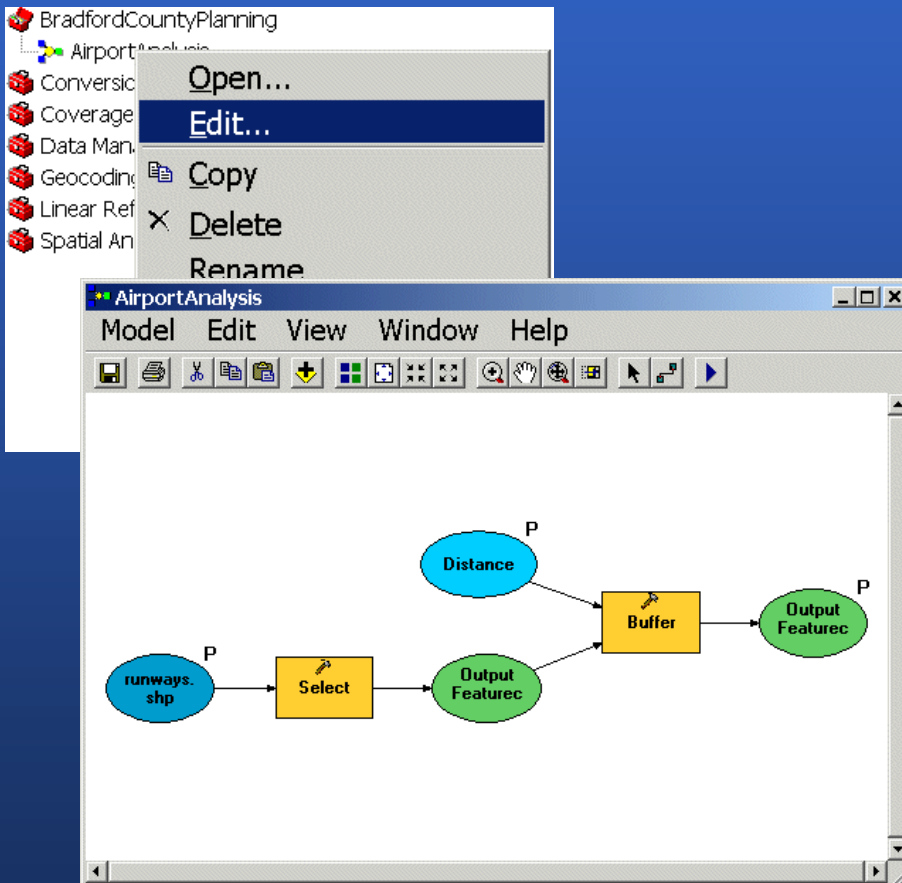
Parameters

- Input/Output data and values for a tool
- Used for running model as dialog
- Right-click model element and choose to create parameter



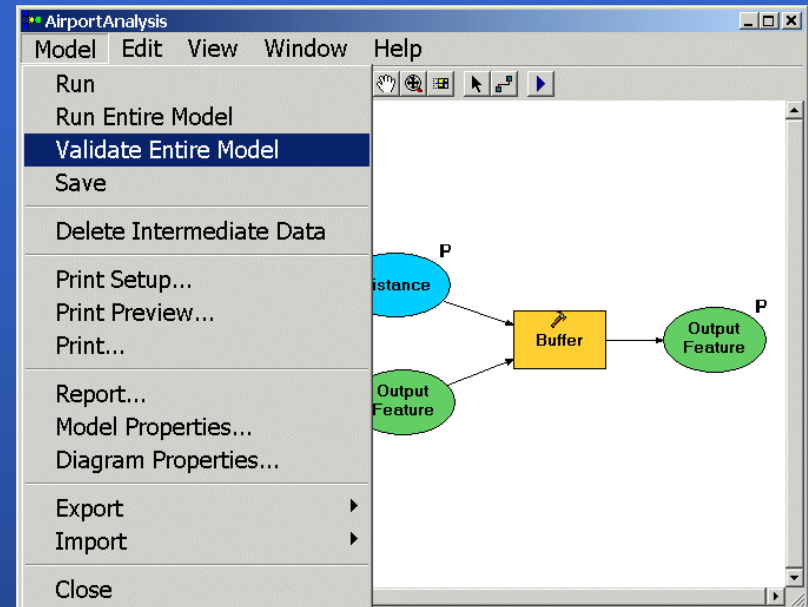
Running models

- All parameters created in model appear in model dialog



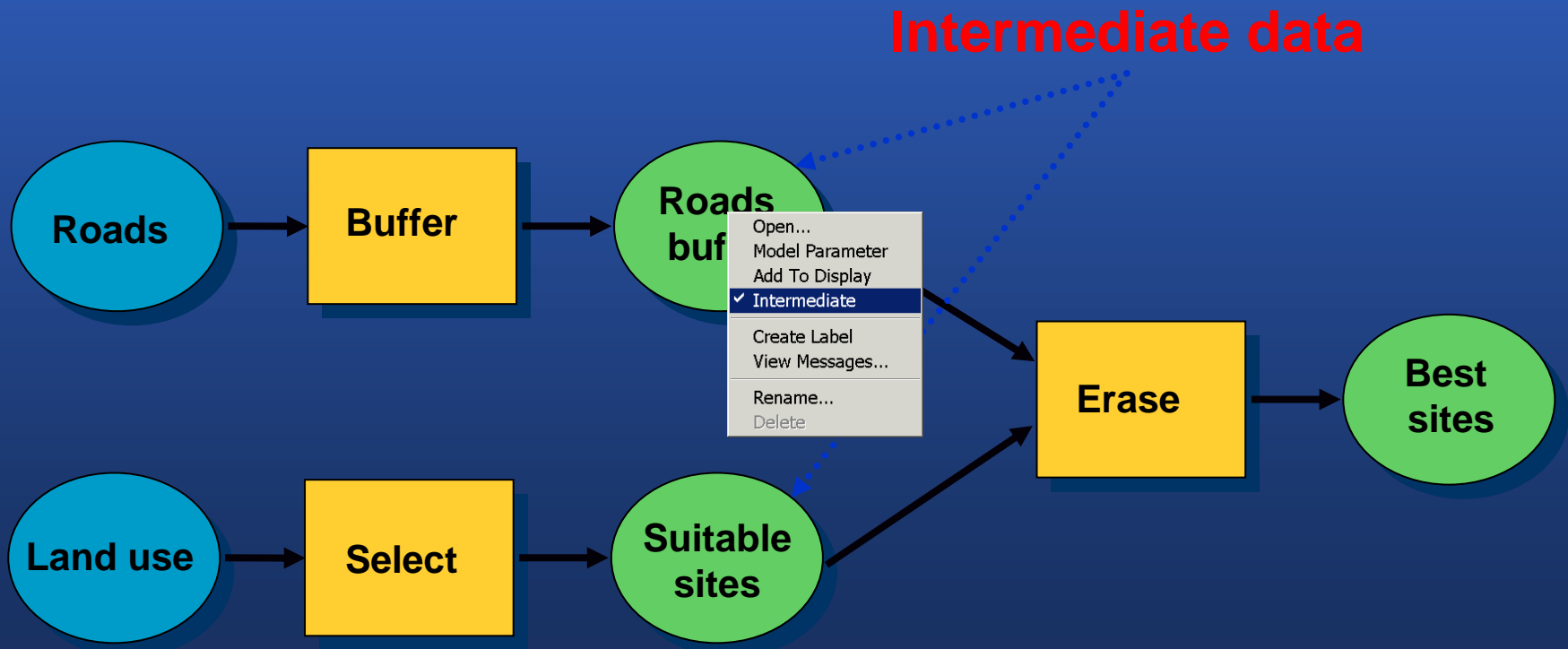
Validating a model

- Validating a model
 - Returns model elements to *ready-to-run* or *not ready-to-run* states
 - Validate to determine if model is invalid
- Invalid models
 - Parameter values no longer valid (referencing non-existent data)
 - Tools referenced no longer exist



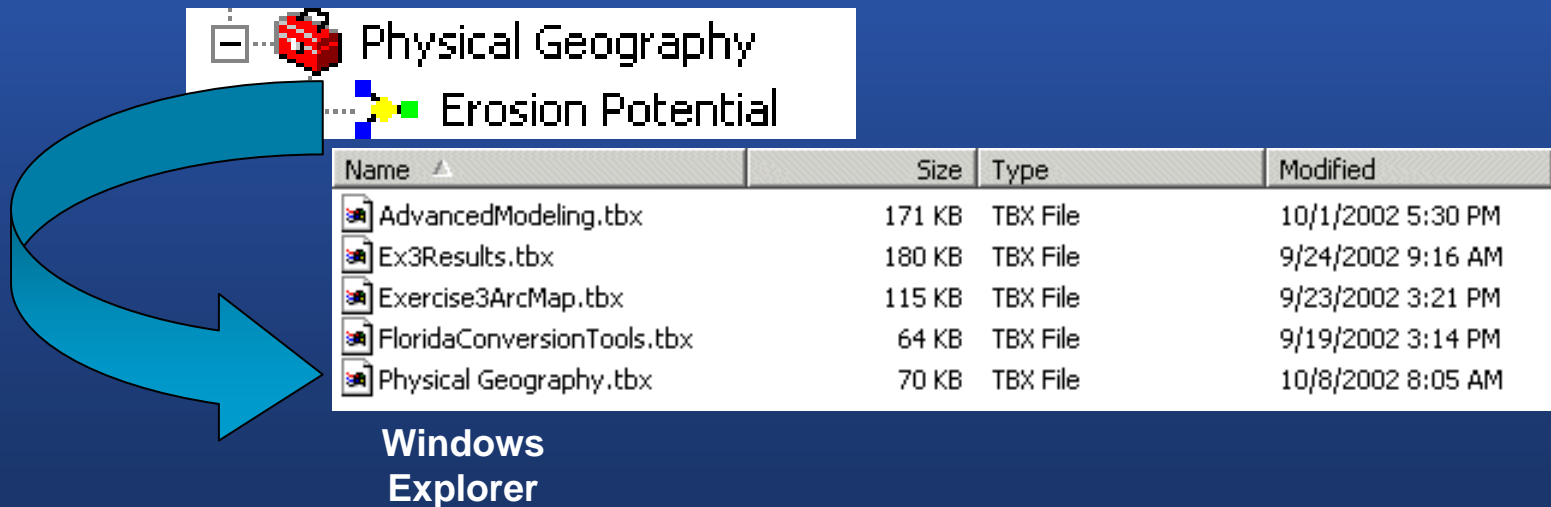
Intermediate data

- You determine which derived data elements are intermediate
- Can delete after model has been executed
 - Save disk space



Saving and sharing models

- Model is saved to .tbx file or geodatabase
 - Give others .tbx or geodatabase to share model
 - Set parameters if used with different data
 - Export model as a script



Demonstration