

The Scripted Truth about CNMS

2012 ESRI User Conference



FEMA



Stantec



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FEMA's Risk MAP Program

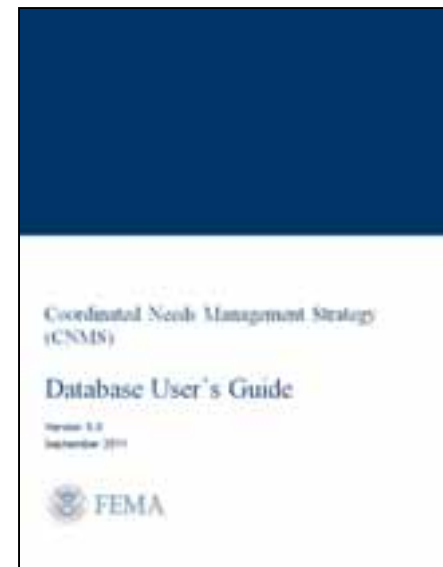
(Mapping, Assessment, Planning)

- The vision for Risk MAP is to deliver quality data that increases public awareness and leads to action that reduces risk to life and property.
- Risk MAP Program Metrics:
 1. Deployment
 2. Quality (CNMS)
 3. Risk Awareness
 4. Community Action
- FEMA Partners:
 - Cooperating Technical Partner (CTP)
 - Production and Technical Services (PTS)



What is CNMS

- CNMS – Coordinated Needs Management Strategy
 - A GIS file database that supports:
 - Locations of Special Flood Hazard Areas (SFHA) for studied streams using stream centerlines
 - Basic model information
 - Type of model, age of model, etc.
 - Needs
 - Model based SFHAs with documented quality issues.
 - Requests
 - Areas of SFHA lacking a model
 - Cartographic issue areas
 - Reporting / Exporting
 - NVUE – New, Validated or Updated Engineering (i.e. quality)
 - Decision Making / Prioritization
 - Where are studies valid or Unverified? Where is attention needed?



Still Confused?

- Goal:
 - Produce a National inventory database of flooding sources that:
 - Tracks program status on NVUE
 - Informs map planning production decisions - References mapped flooding sources as valid or as having an unmet need
 - Serve as FEMA's mapping needs management system
 - Document accomplishments - Resolution date of existing mapping needs will be captured
- CNMS Website
 - <http://cnms.riskmapcds.com>
 - National Inventory of CNMS data updated quarterly



CNMS Validation Checklist

- 7 Critical Element Checks and 10 Secondary Element Checks
- Triage of issues that may influence the effective flood study
 - Covers **P**hysical, **C**limatological, and **E**ngineering Methodological Changes (**PCE**)

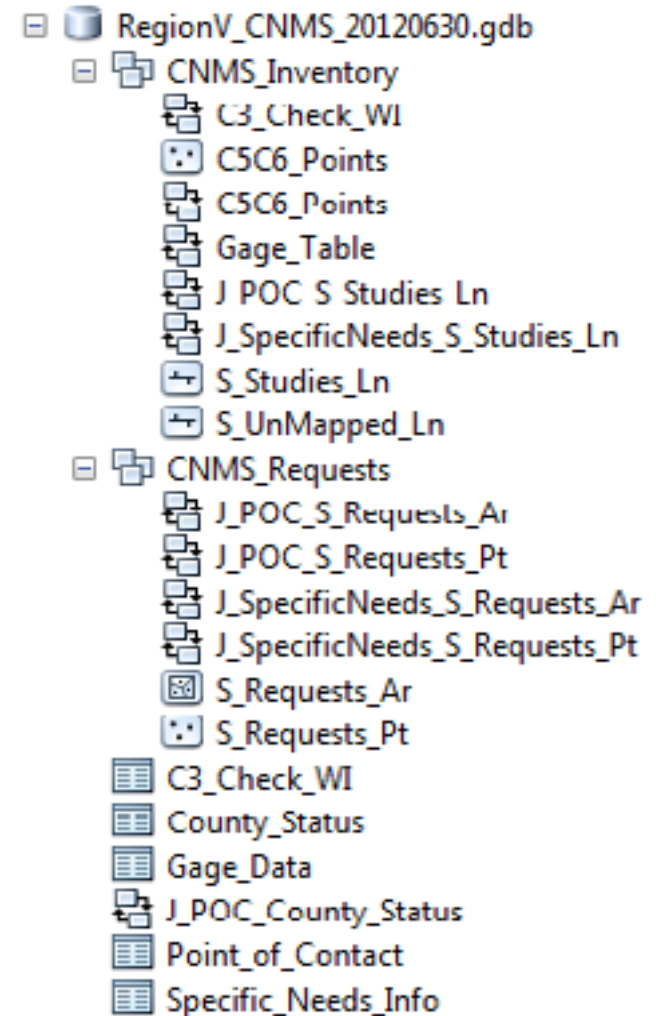
Critical Checks	Secondary Checks
Major Change in Gage Record	Use of rural regression eqns in urban areas
Significant Change in Discharge	Repetitive loss outside the SFHA
Model Methodology not appropriate	50% Increase in impervious Area
Major flood control structures added or removed	>1 and <5 new/removed hydraulic structures
Channel outside SFHA	Channel/shoreline improvements
5 new or removed hydraulic structures	Availability of better topographic data
Stream channel area change (scour)	Land use change since effective
	Failure to identify primary frontal dune
	Significant storms and high water marks data
	Release of updated regression eqns

Region V CNMS Project Details

- The 411:
 - Project area includes 6 States (IN, IL, MI, MN, OH, WI)
 - Build a database for all mapped Special Flood Hazard Areas within Region V (est. 123,000 Miles)
 - Assign each stream specific attributes (Zone Type, Model Type, Year of the Study, etc.)
 - Implement ArcSDE
 - Perform stream validation (17 Checks)
 - CNMS is a “living” database

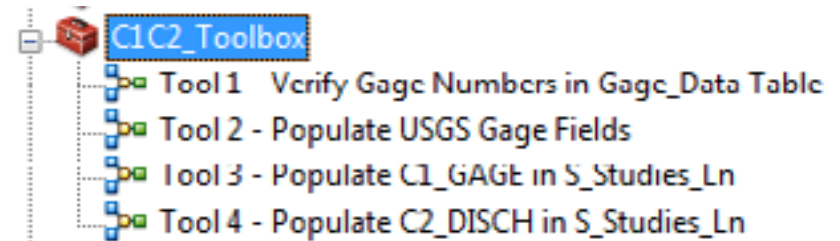
In-House File Geodatabase Enhancements

- 17 Checks added to stream centerlines
 - Formally in S_Studies_Ar
- Added comment fields
- Added tables and feature classes
 - Aided in data collection and tool utilization
- Added relationships
- Built in automated QC Tools



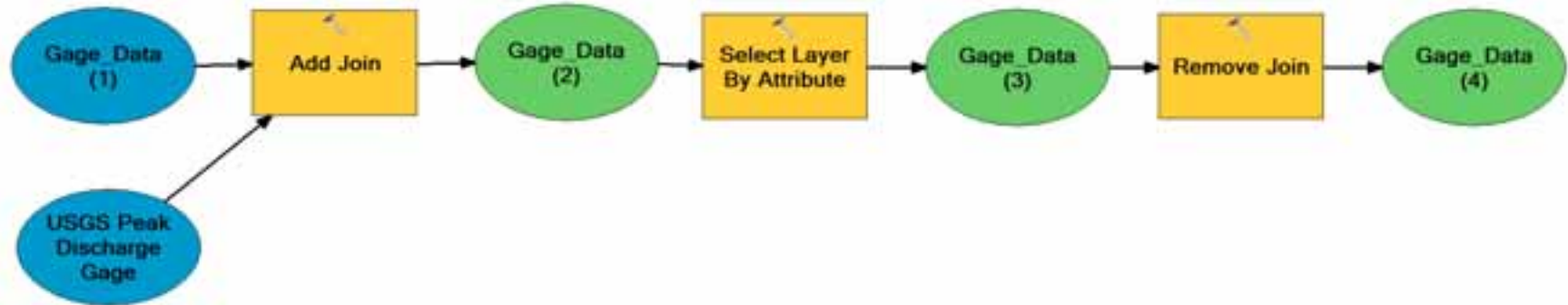
Automated Tool #1 (a.k.a....C1C2 Tool)

- Major change in gage record since effective analysis that includes major flood events
- Tool Inputs
 - USGS Gages shapefile (Modified)
 - CNMS stream centerlines
 - Gage table
 - Peak FQ or HEC-SSP results
- Challenges
 - Data extraction
 - Locating gages
- End Result
 - Use recorded historical flow data to verify the accuracy of the flow rates used in the hydrology analysis of the effective study. Recorded historical flow data is compared to any newly recorded data to show a change in flow pattern for the specific study extent.



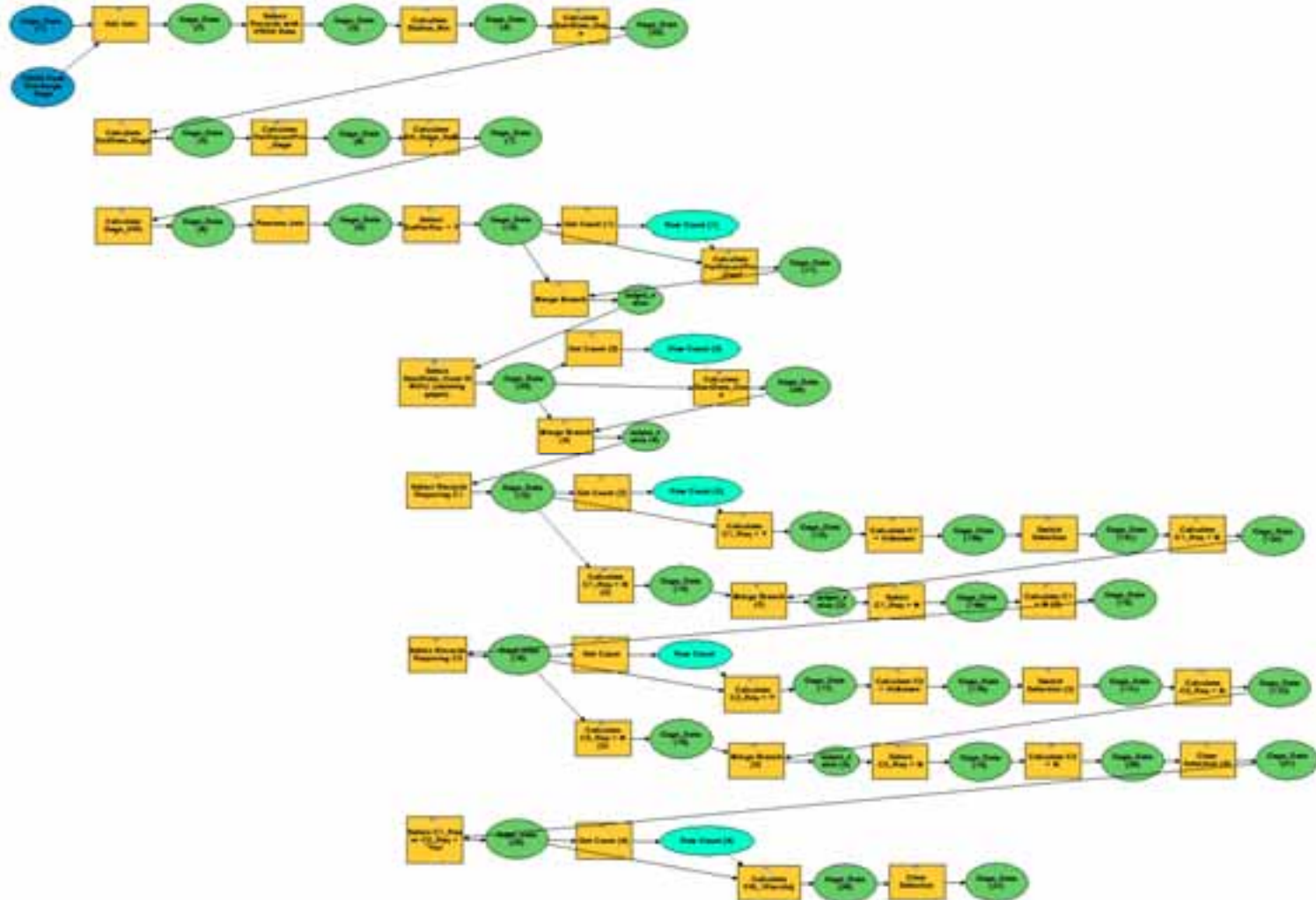
Model Builder Script

- Verify Gage Data



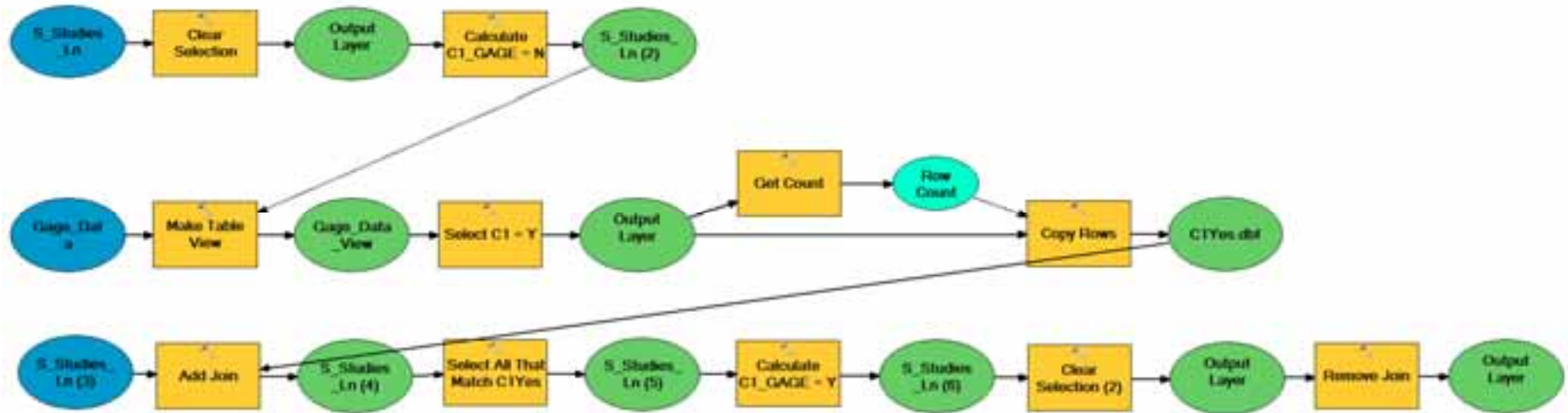
- **Populate USGS Gage Fields**

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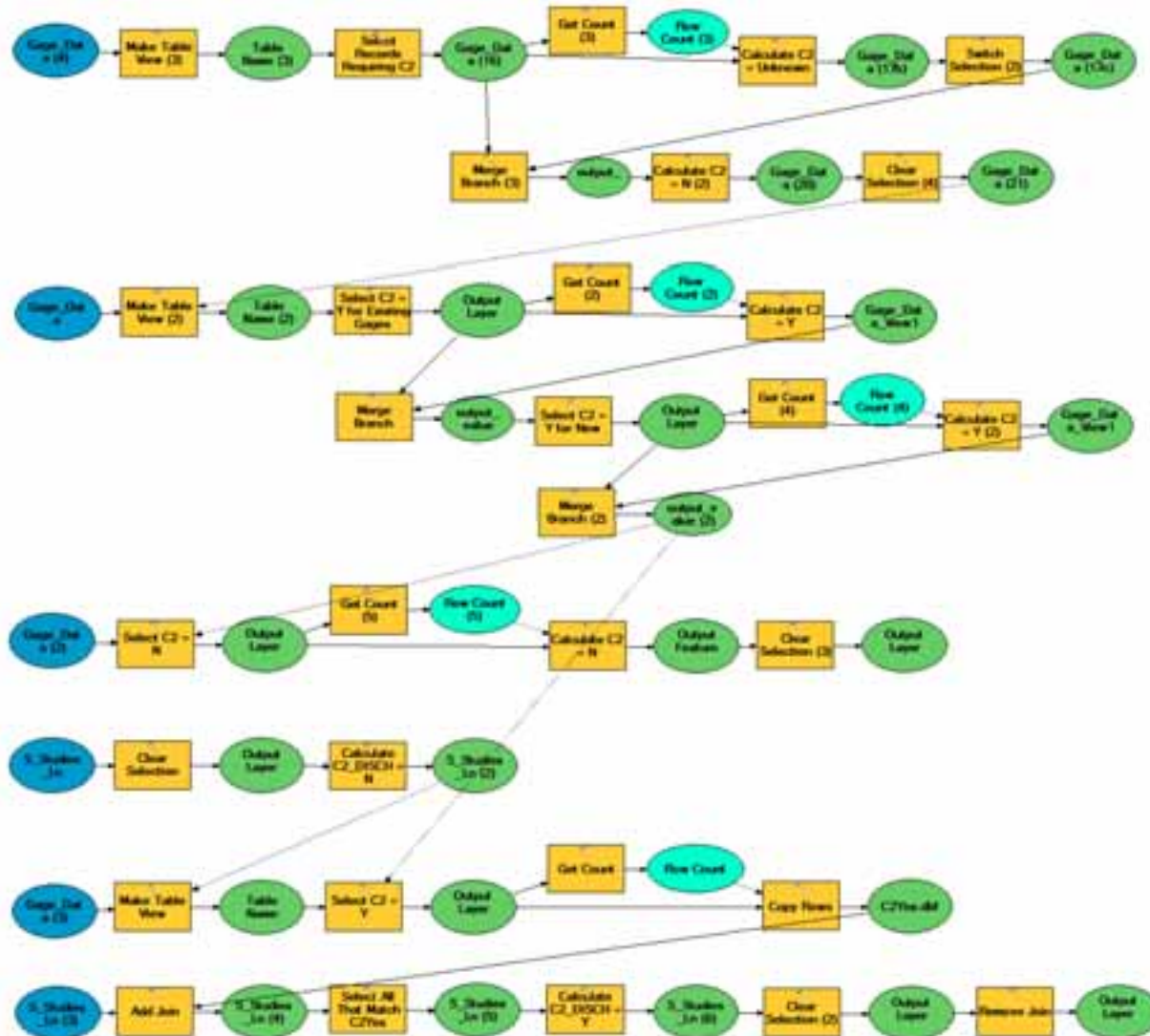
Model Builder Script

■ Populate C1



Model Builder Script

- Populate C2



Automated Tool #2 (a.k.a....C4 Tool)

- **Addition/removal of a major flood control structure**

- Tool Inputs

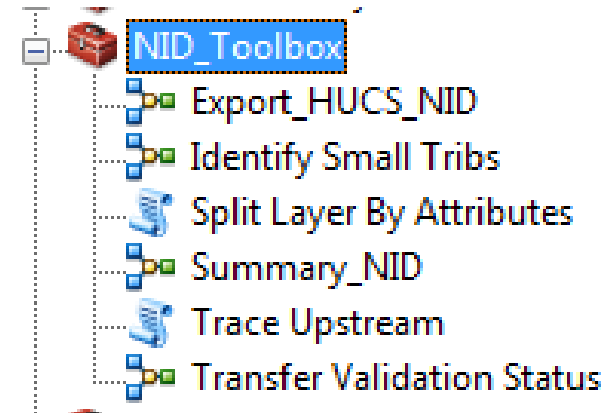
- National Inventory of dams shapefile
- National Hydrology Data (NHD) High Resolution
- USGS Watershed Boundary shapefile (HUC12)
- CNMS stream centerlines

- Challenges

- Finding the most down stream point
- Identifying the correct drainage area
- Unknown dam construction/modified date

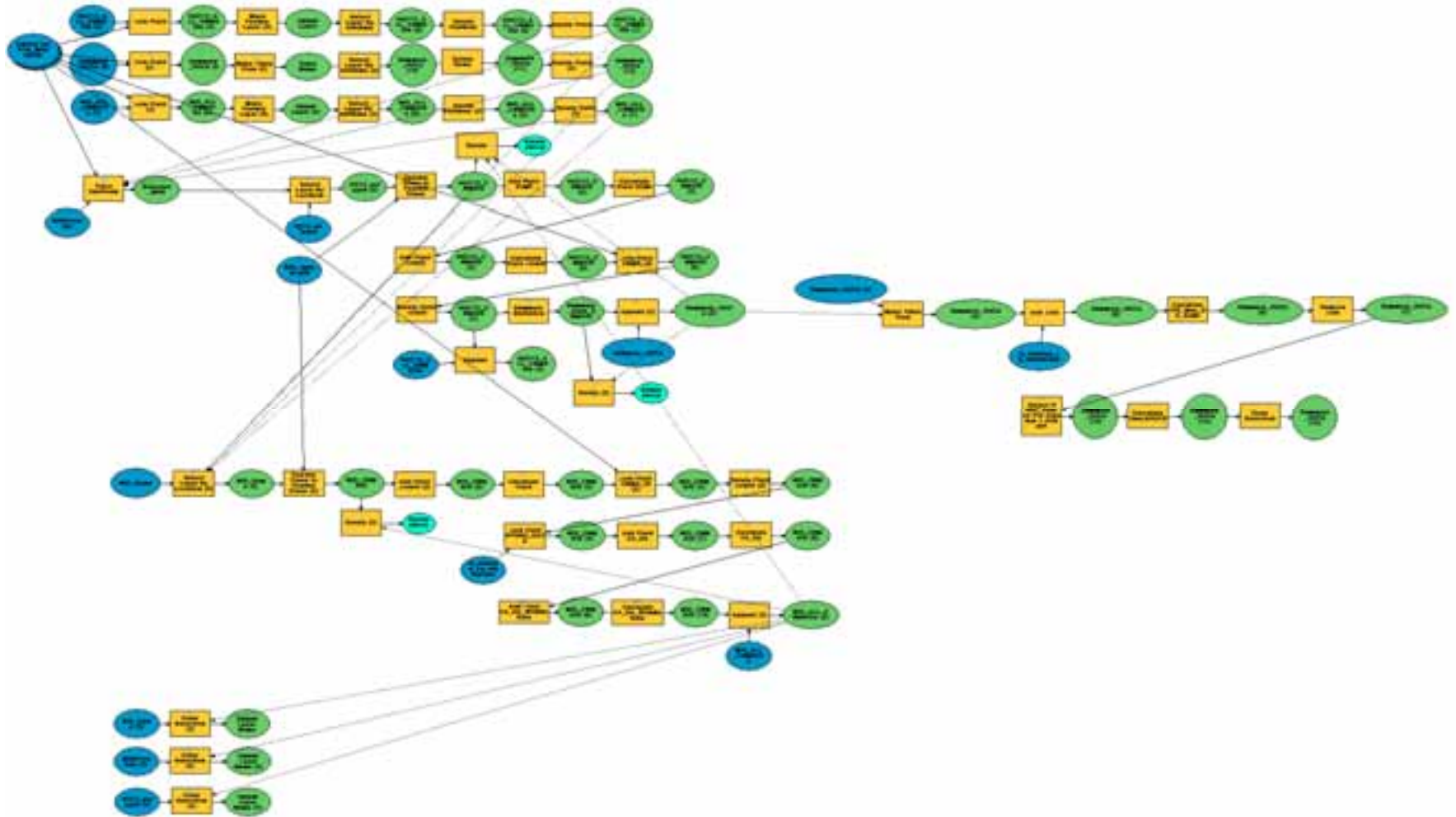
- End Result

- Each study drainage area is traced upstream to identify the studies watershed. All newly regulated drainage area (dams with construction/modification date after the study date) is calculated to see if the sum is greater or less than 30% of the study's drainage area.



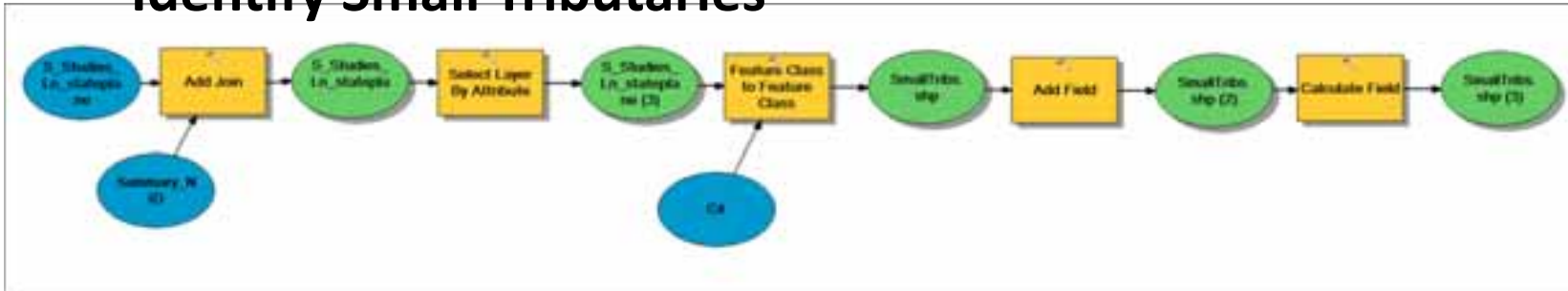
Model Builder Script

- Export HUCs

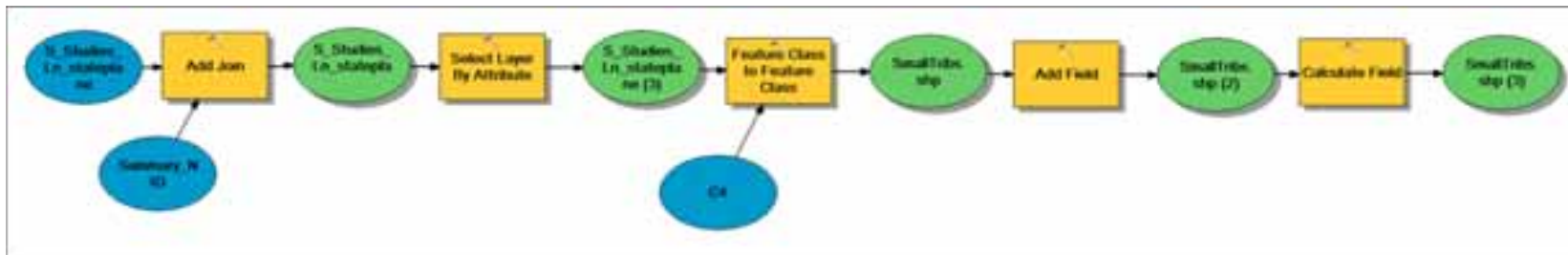


Model Builder Scripts

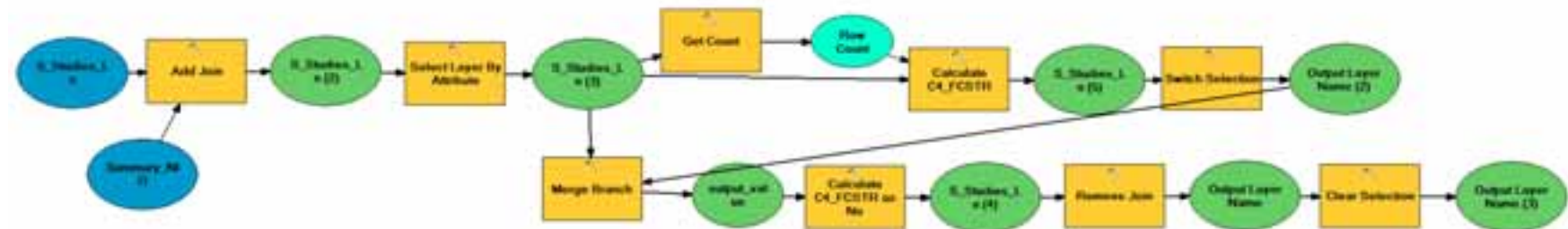
■ Identify Small Tributaries



■ Sum Drainage Area

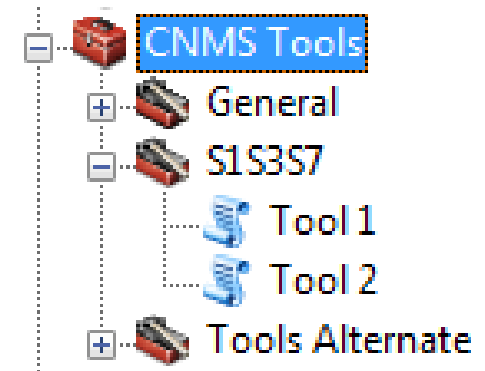


■ Transfer Attributes



Automated Tool #3 (a.k.a....S137 Tool)




- **Use of rural regression equations in urbanized areas, where an increase in impervious area in the sub-basin is more than 50%. (e.g. changes to vegetation or land use)**
- Tool Inputs
 - National Urban Change Indicator (NUCI) raster dataset
 - USGS National Land Cover Dataset (NLCD)
 - USGS Watershed Boundary shapefile (HUC12)
 - National Hydrology Data (NHD) High Resolution
 - CNMS stream centerlines
- Challenges
 - Intense data processing
 - Identifying only Urban Change pixels
- End Result
 - Three checks are completed simultaneously through one scripted tool. S1 looks at the type of regression equation used in the stream's study. S3 analyzes the change in impervious area over time in a stream's watershed. S7 focuses on how land use in the watershed has changed.

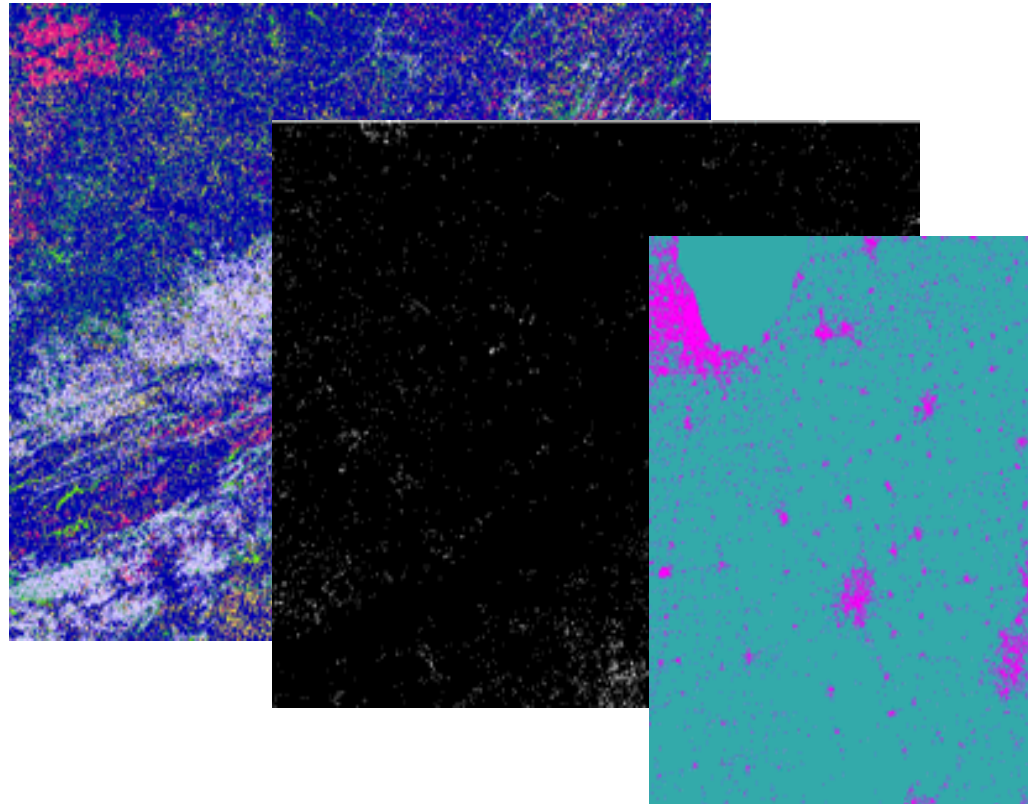


Python Script

Tool 1 - develops a table that lists urban/impervious area for every HUC-12 area within the range of dates in the NUCI and NLCD datasets

Tool 2 - evaluates and populates S1, S3, and S7 checks for specified stream lines in the database

- [-]  NUCI-Mask 16u.tbx
-  NUCI- Mask 16u
-  NUCI- Mask 16u Batch



Q and A

- Questions? Comments? Concerns?



Thank You

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