L-THIA 2.0 -- A practical GIS model for regional and local water resource management

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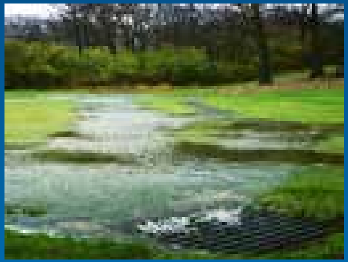
WHAT IS L-THIA?

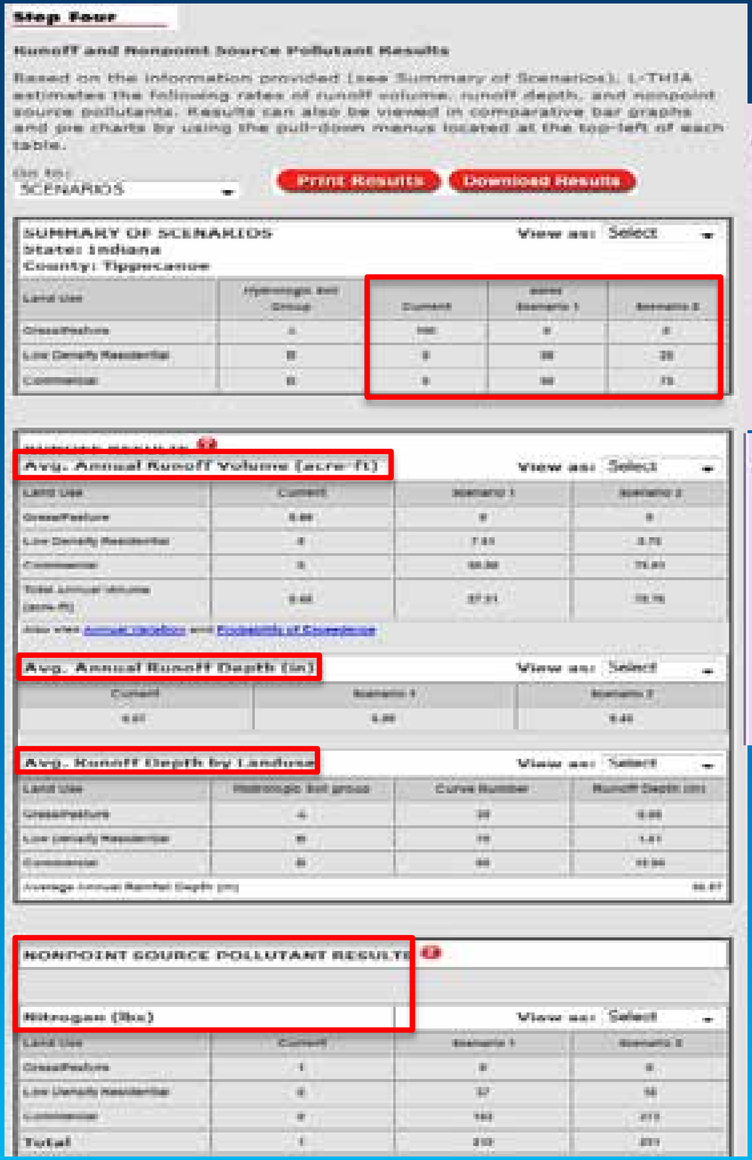
- Land use development plan screening tool
- Decision support tool for estimating the effect of land use change on surface runoff and Non-Point Source pollution (NPS)

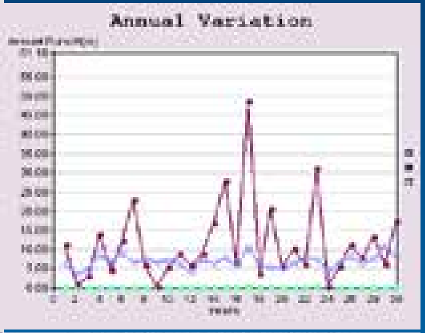


- Features
  - Based on Curve Number (CN)
  - For decision makers
  - Simple model & Easy to use
  - Minimum data input

Image Sources: http://epic.rs/studentske-organizacije/, http://ehp.niehs.nih.gov/docs/2001/109-12/forum.html/, and http://www.deq.state.or.us/wq/nonpoint/intro.htm

HOW DOES L-THIA WORK?





Output: Average Annual Runoff and NPS loadings

WHY L-THIA 2.0?

- No reflect critiques and updates of CN method

Rainfall-Runoff equation, parameters e.g., CNs/ARC, focus on local watersheds

- Lengthy calibration process

Manually local data processing, technically intensive

- Only one platform

Purdue L-THIA website https://engineering.purdue.edu/~lthia/

- Not use new datasets available

Remote Sensing and Ground-based observations

EXPERIMENT (CNs)

- Asymptotic Method

Match return period of rainfall and runoff data

- Least Squares Method (LSM)

Minimize the different between calculated and observed runoff

- NEH630 Statistical Method

CNs as random variable with upper and lower limits

- Current L-THIA lookup table

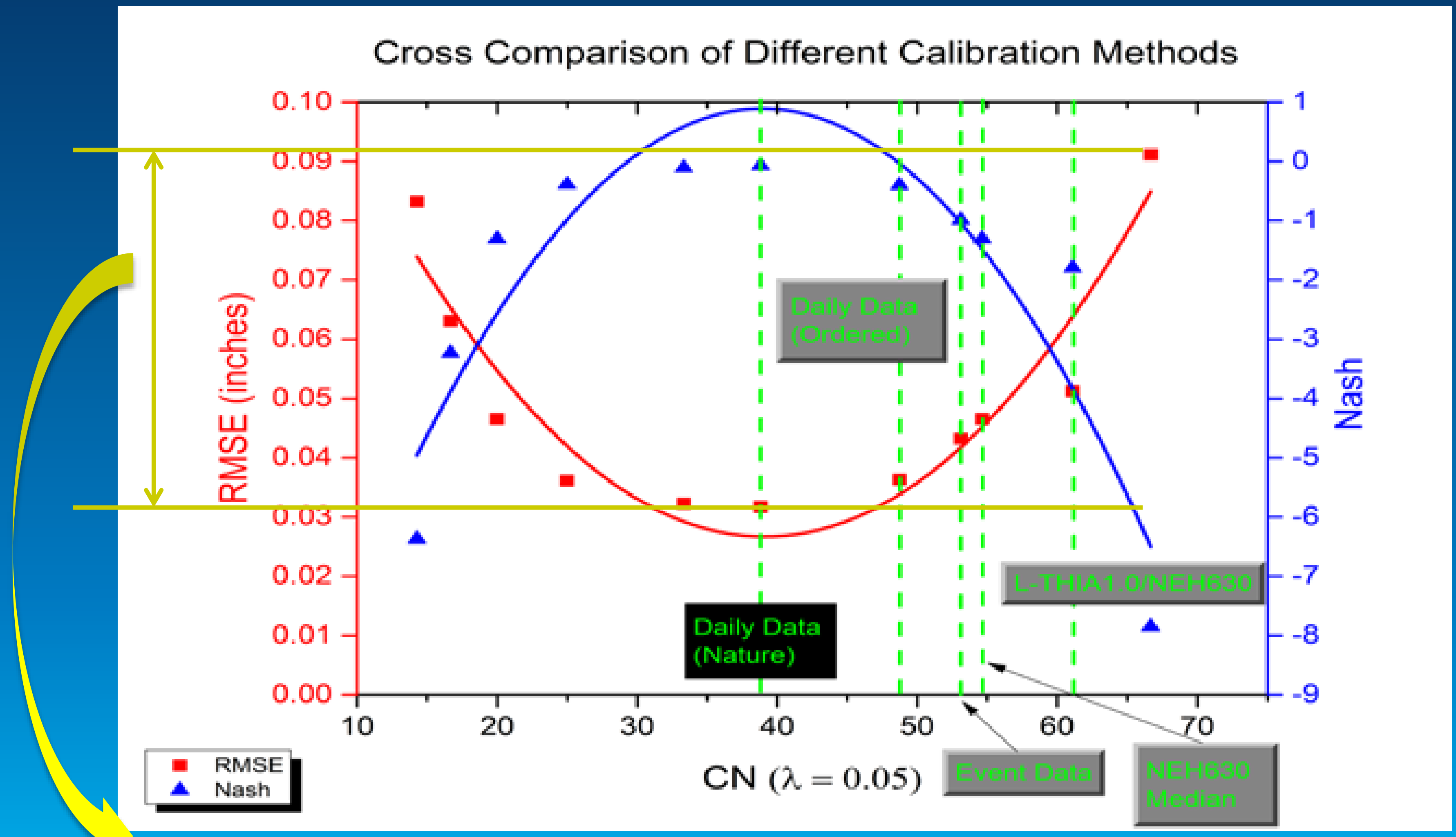
Currently used in L-THIA

- Lookup table in NEH630

Originally derived from some watersheds as the reference

Test Data: USDA-ARS Walnut Gulch Experimental Watershed, AZ

CURRENT RESULT



Note: Actual average annual runoff range from 0.003 – 0.08, so the RMSE covers almost 78% of the range!

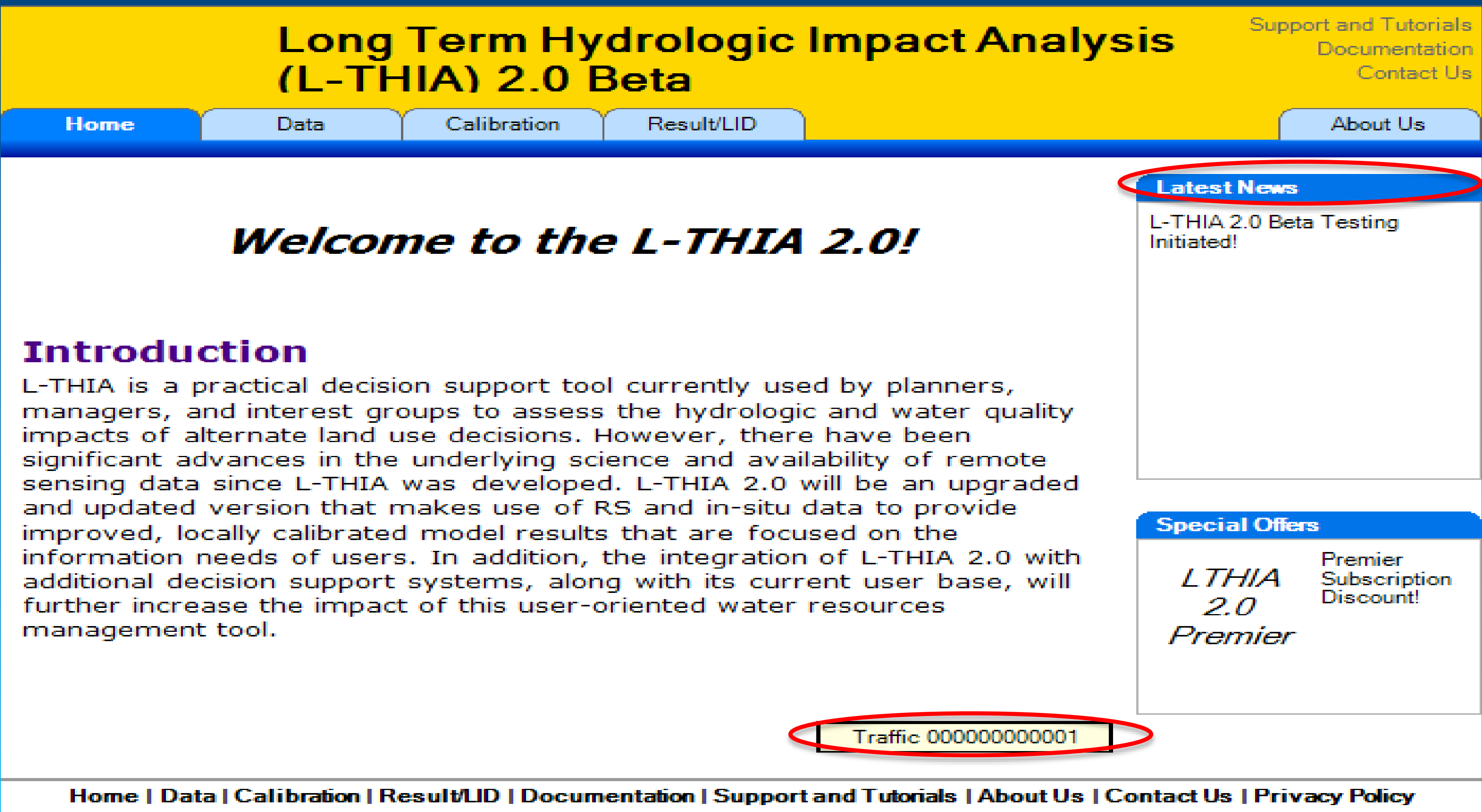
DESIGN FRAMEWORK

- 1st Priority: **Automatic Calibration**!
- Dynamic, end-user oriented solution for L-THIA 2.0

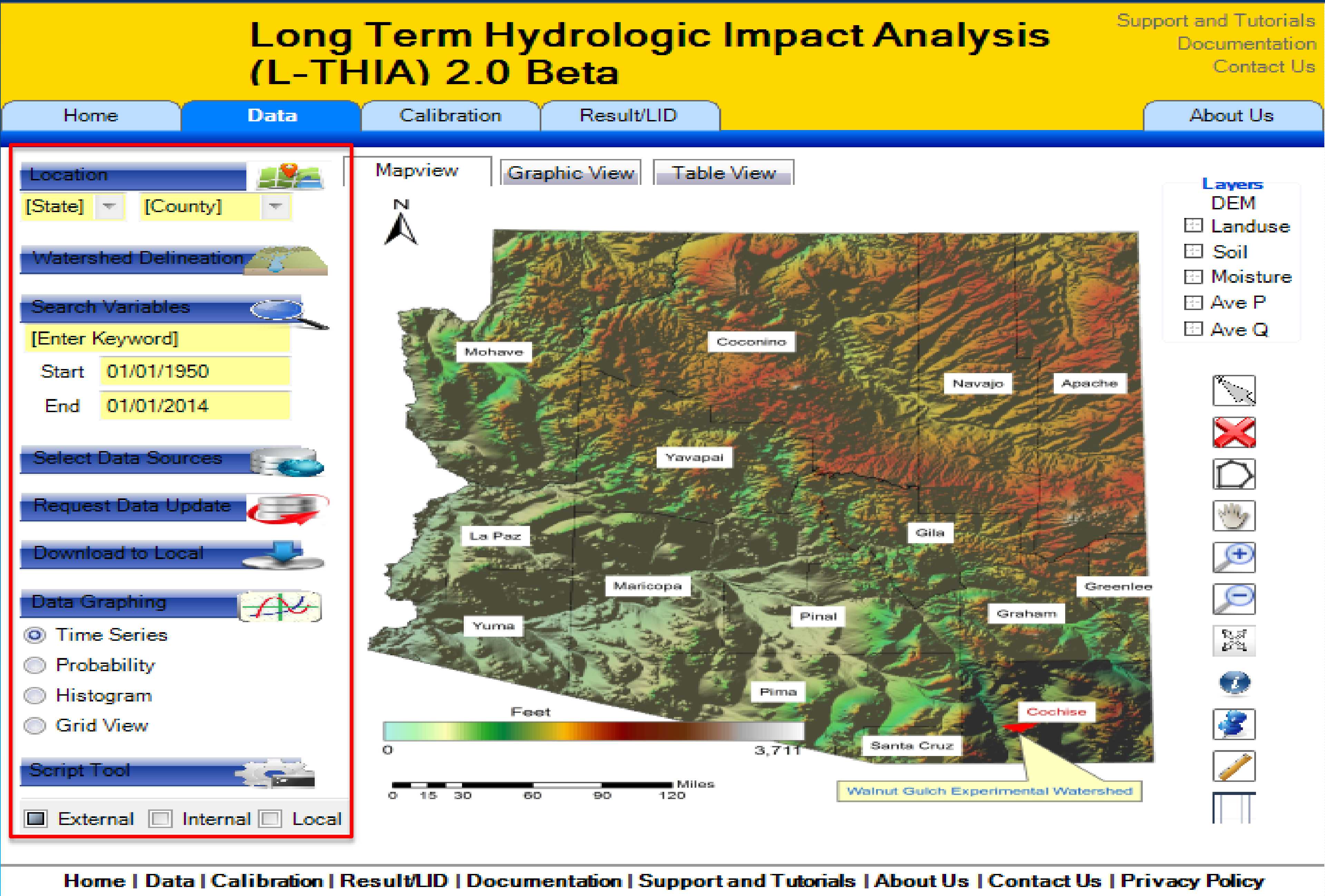
USDA USGS EPA NOAA NASA US Army Corps ……	Unification of different hydro Data	Model Revision, Parameter Calibration and Update Data Visualization GIS Services	Compatible with Multi-platforms Integrate into other decision support toolsets	Result Report Suggests/Rec. Table/Graph

USER INTERFACE DESIGN DEMO

- Homepage



- Data Acquisition/Visualization



• Calibration

Long Term Hydrologic Impact Analysis (L-THIA) 2.0 Beta

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Home | Data | **Calibration** | Result/LID | About Us

○ External ○ Internal ◉ Local

Graph

Step 1: Parameters

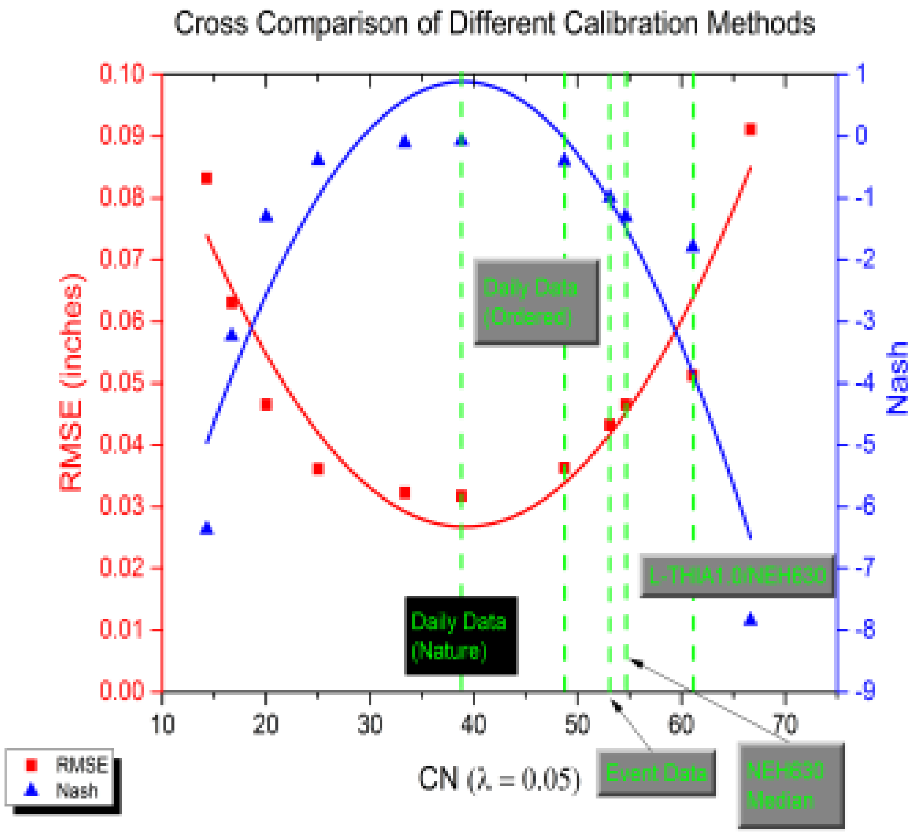
λ = ◉ 0.05 ○ 0.2 ○ Other, please specify: Enter Value

Variables
- ◉ CN Only -- Observational Data
- ○ CN Only -- RS Soil Moisture
- ○ CN and λ
- ○ Comprehensive (Revised CN Method)

Step 2: Graph
- ○ Rainfall -- Runoff
- ○ Watershed Behavior
- ◉ RMSE -- Nash -- CN

Step 3: Method

Daily	Event	No Calibration
◉ Natural	○ Asymptotic	○ L-THIA 1.0 Value
○ Ordered		○ NEH Lookup Table
○ NEH630 Median		



- Results and Rec.

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Map | Table | Graph

Step 1: LID Implementation

- (•) Bioretention
- ( ) Green Roof
- ( ) Rain Haversting
- ( ) Porous
- ( ) Grass Swale
- ( ) Rain Gadern

Step 2: Assessment Method

Opt 1 Goal Setting

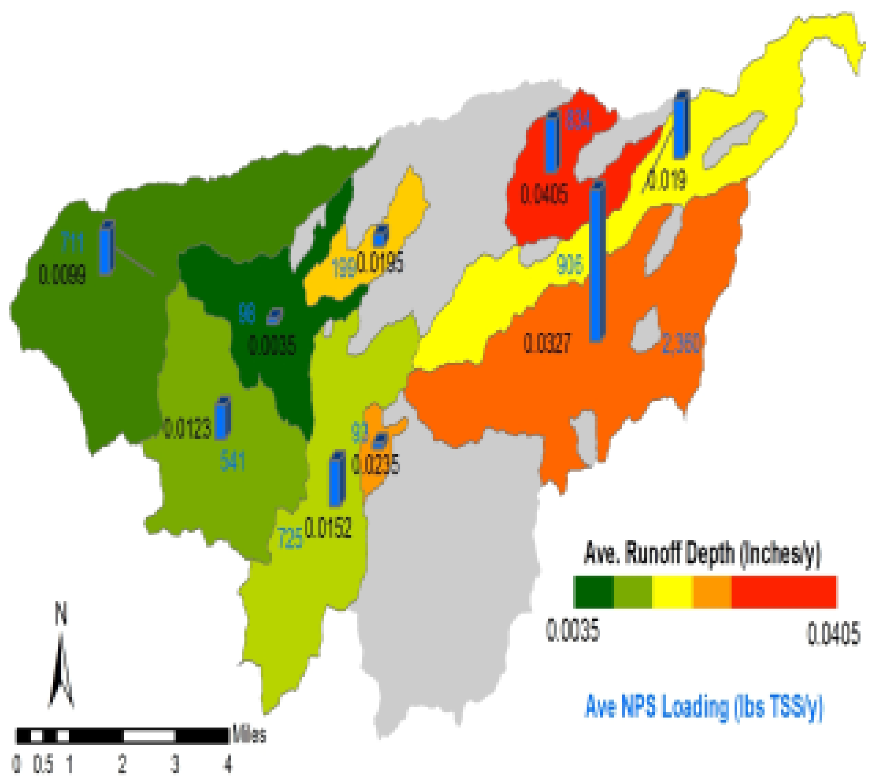
Runoff Volume Reduce (Acre-ft)	Enter Value
NPS Loading Reduce (lbs)	Enter Value

Opt 2 Landuse Change Scenarios

Pre-development Landuse (Optional)	Select Landuse
Lot Size (Acres, optional)	Select Size
Post-development Landuse	Select Landuse
Lot Size (Acres)	Select Size
Post-development Area with LID	Enter Value or XX.XX%

Step 3: View Result — Click to generate

Step 3: Report Download — Click to generate



Spatial Visulization of Runoff and NPS loading

Thank you for your attention!