Update on SSCAFCA Research

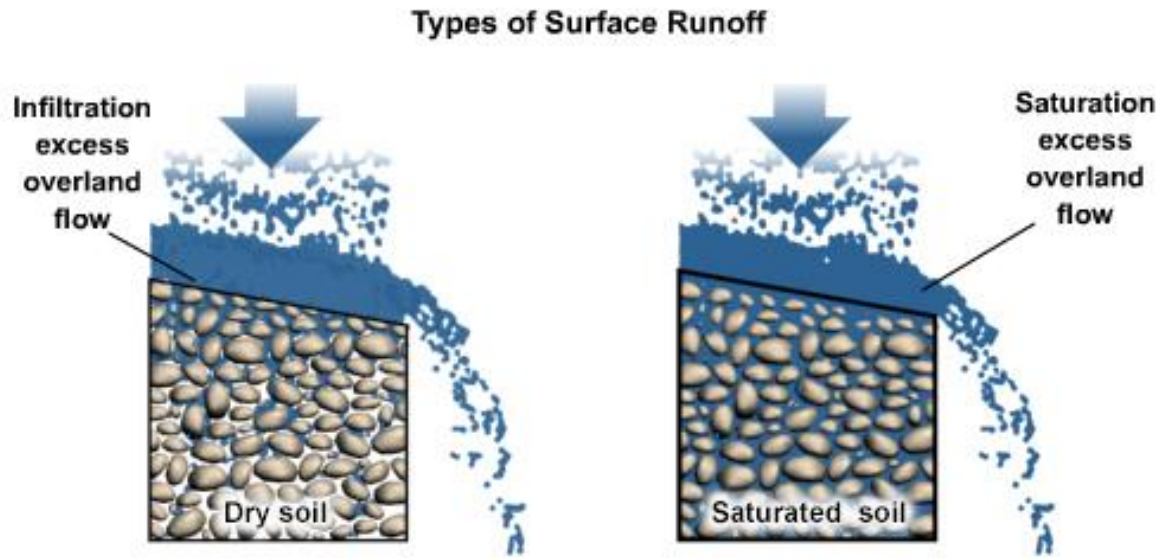
Jan 2024

Introduction

Flash Flooding: One of the most hazardous natural disasters worldwide.

Hydrologic Models

Infiltration Models: Infiltration models are vital for predicting the **onset** and **magnitude** of flash floods.



Introduction

Modeling Challenges in Arid and Semi-arid Regions:

- Balancing complexity and data availability.
- model calibration and validation

Selecting Appropriate Infiltration Model

Methods

Simple

Complex

Infiltration Models:

1. Curve Number
2. Initial & Constant Model
3. Linear & Constant Model (Newly added)
4. Green & Ampt Model

Model Scenarios

Model	Parameter	Parameter value based on published guidance	Parameter range, constrained calibration	Parameter range, unconstrained calibration
Curve number (CN)	CN	85	59 - 95	20 - 100
Green-Ampt (GA)	K_{eff} (mm/h)	15	11 - 21	1 - 200
	ψ (mm)	83	0 - 183	0 - 2000
Initial-constant (IC)	K_{eff} (mm/h)	15	11 - 21	1 - 200
	I_a (mm)	15	0 - 45	0 - 100
Linear-constant (LC)	K_{eff} (mm/h)	15	11 - 21	1 - 200
	F_c (mm)	26	0 - 72	0 - 100

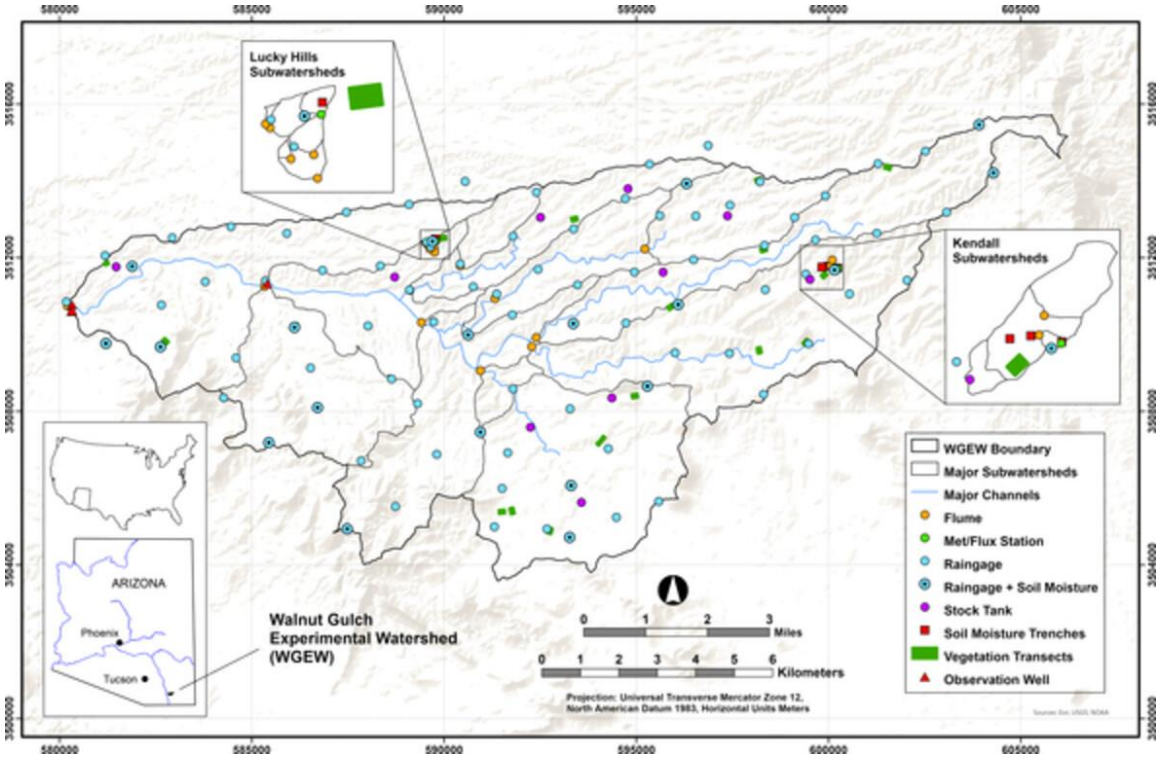
Methods

Testing Model Performance

testing the model performance for a real-world watershed using available rainfall and runoff data from the Walnut Gulch Experimental watershed.

Why Walnut Gulch?

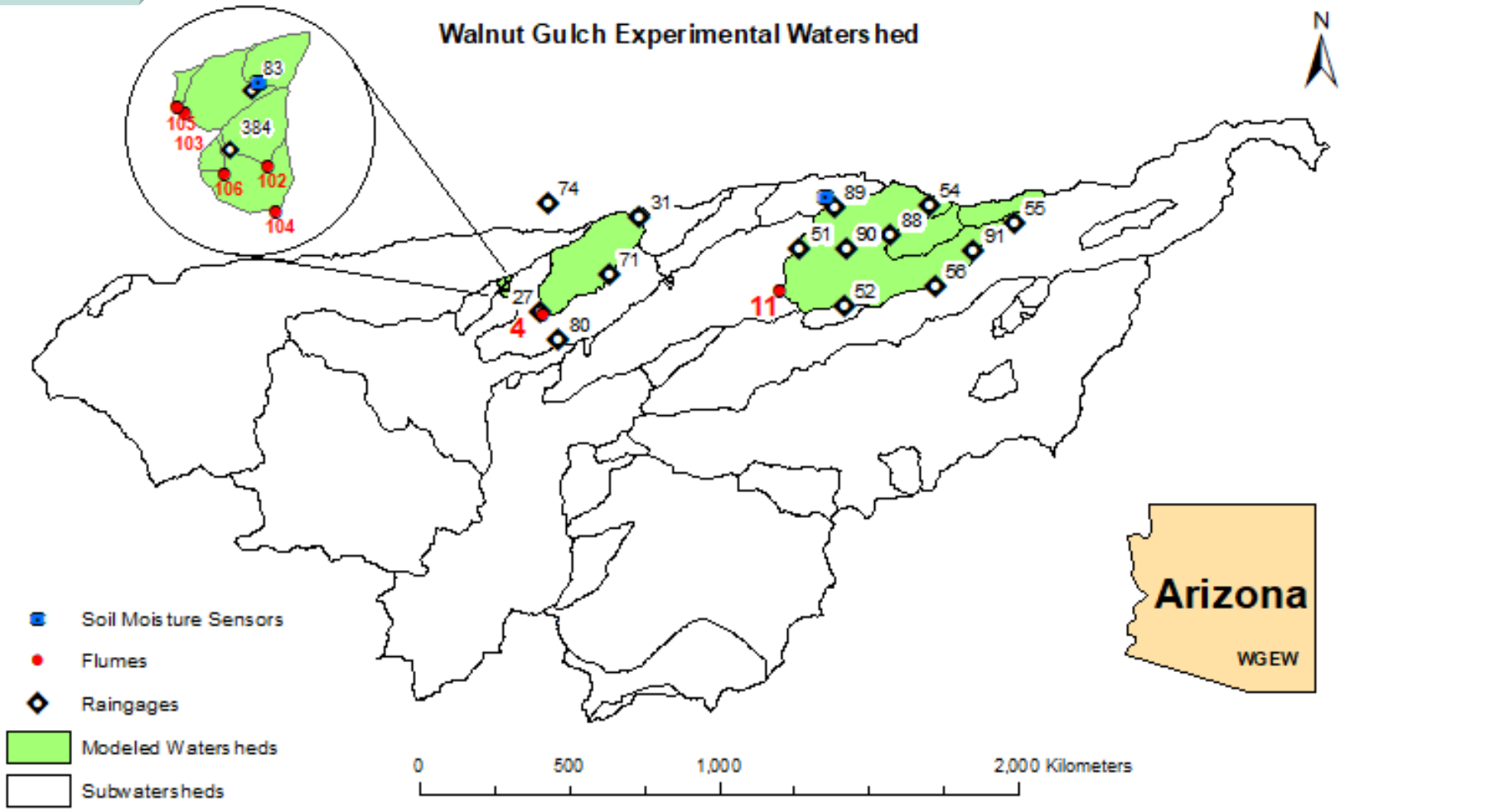
- Available soil texture, rainfall, and runoff data since 1953.
- Influenced by the North American monsoon



(Goodrich et al., 2021)

Methods

Testing Model Performance

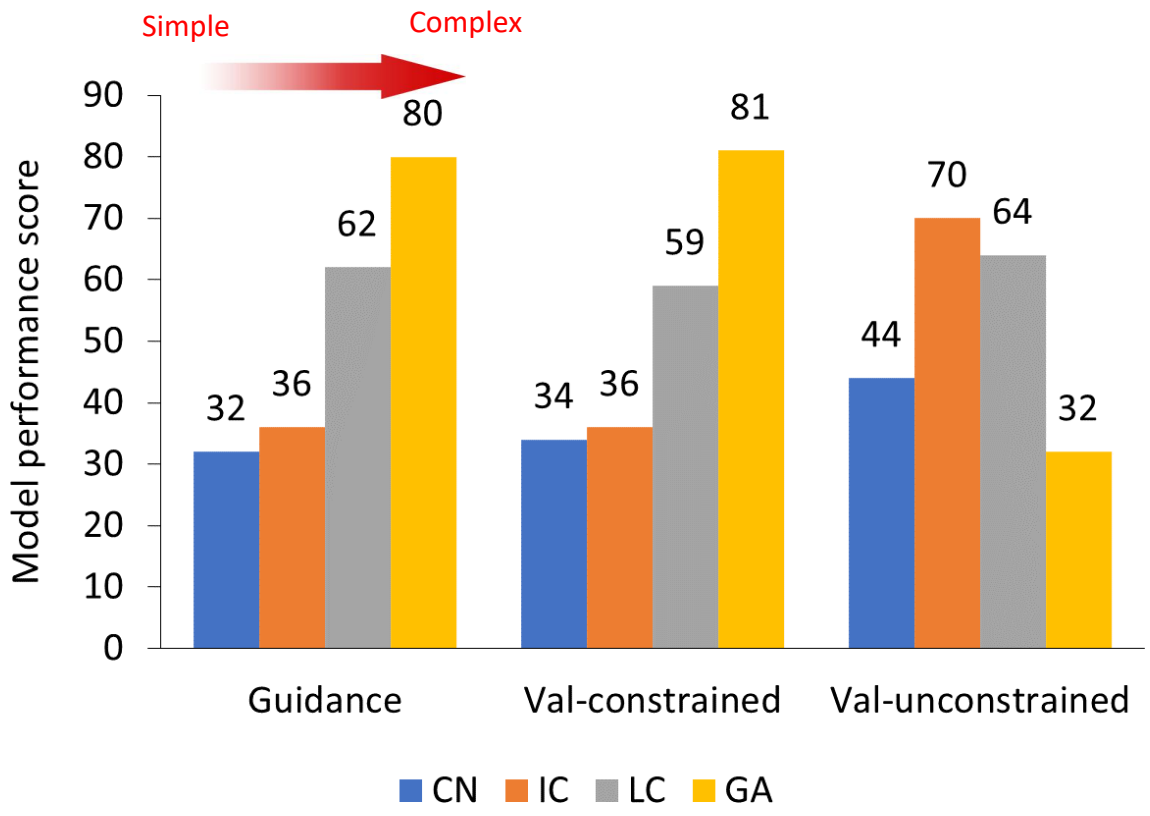


Results

Model Performance

Highlights:

- Importance of model complexity.
- Importance of constraining parameters range for calibration.
- Optimal balance between complexity and accuracy in LC model.



What does all this mean for SSCAFCA?

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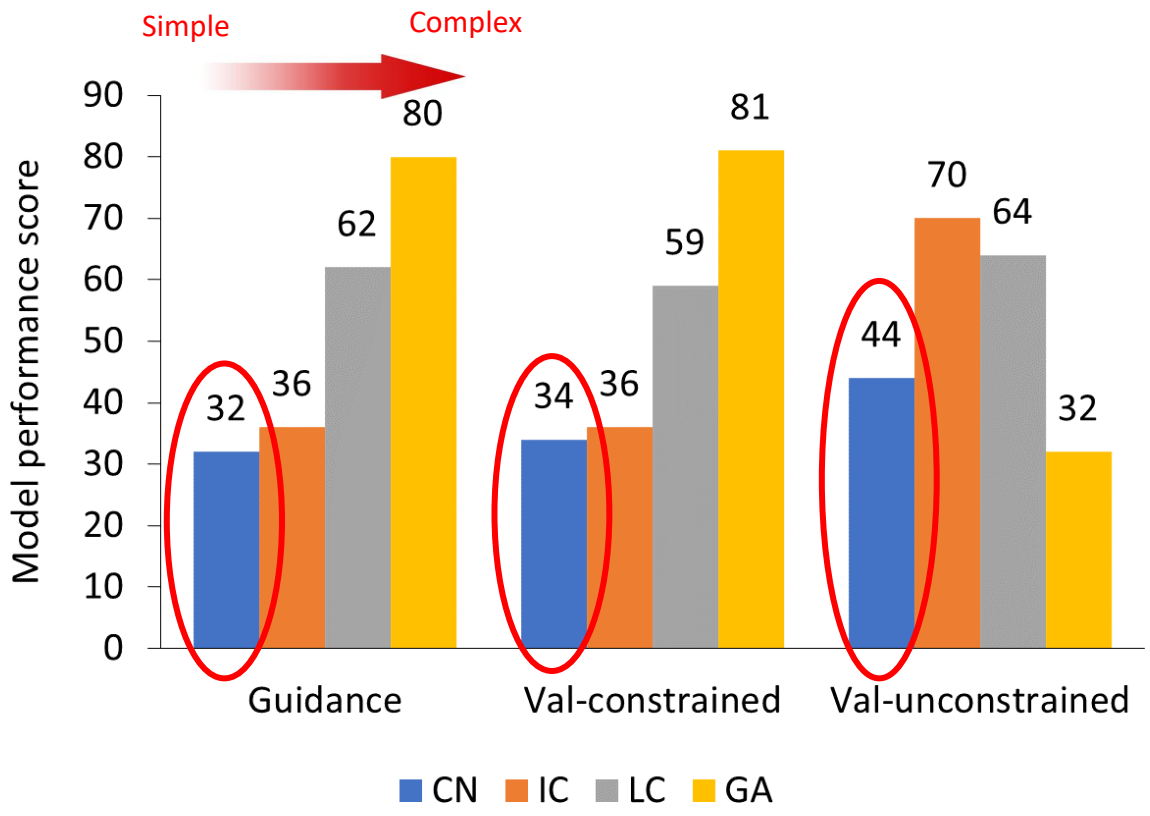

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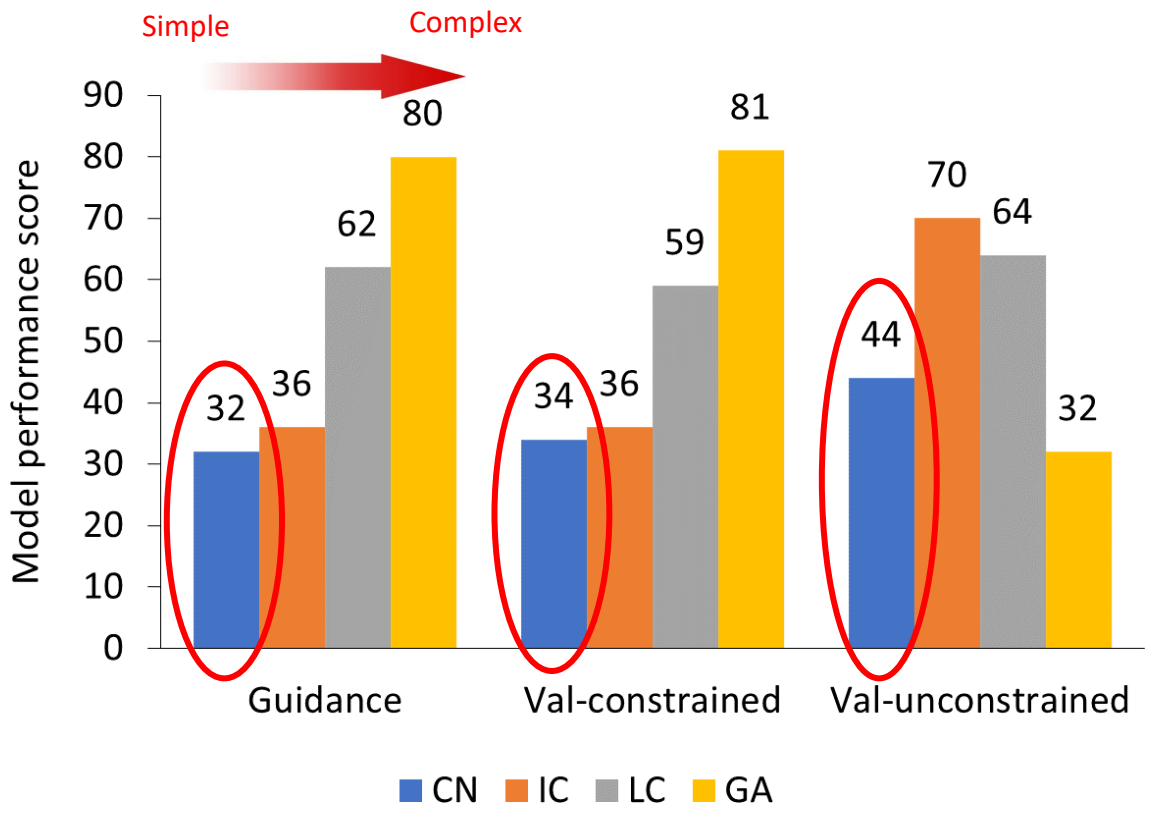

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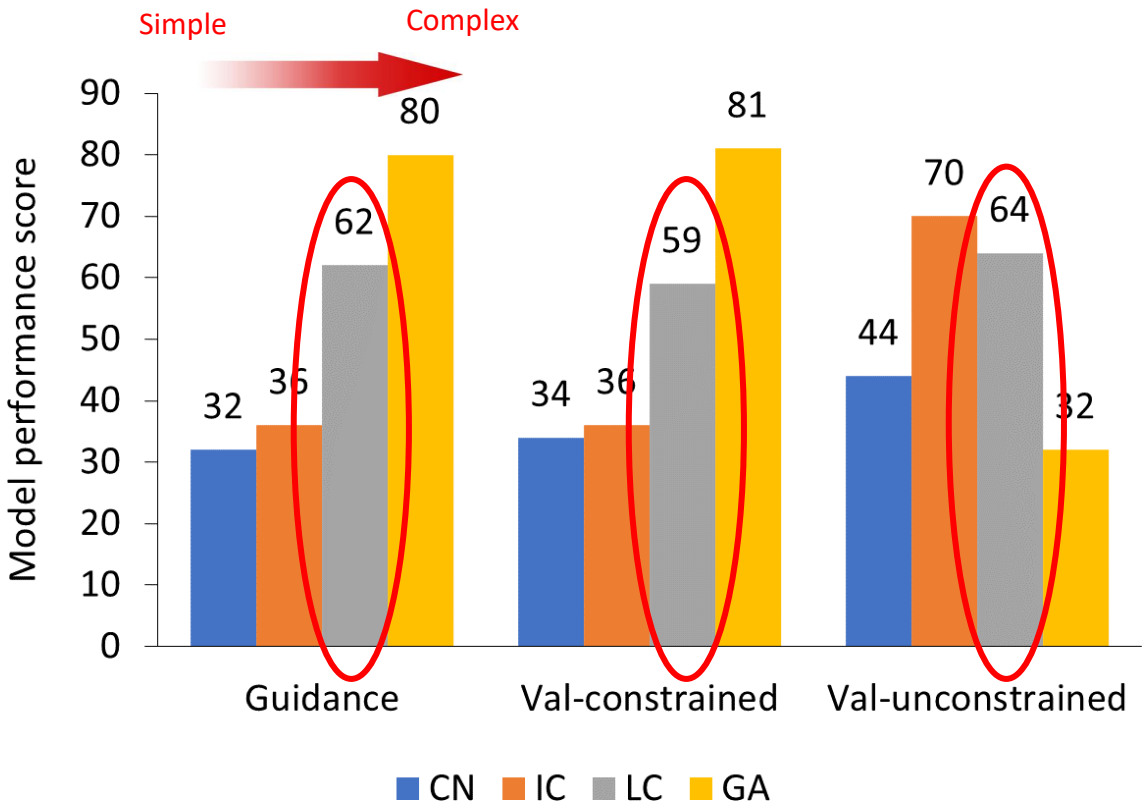

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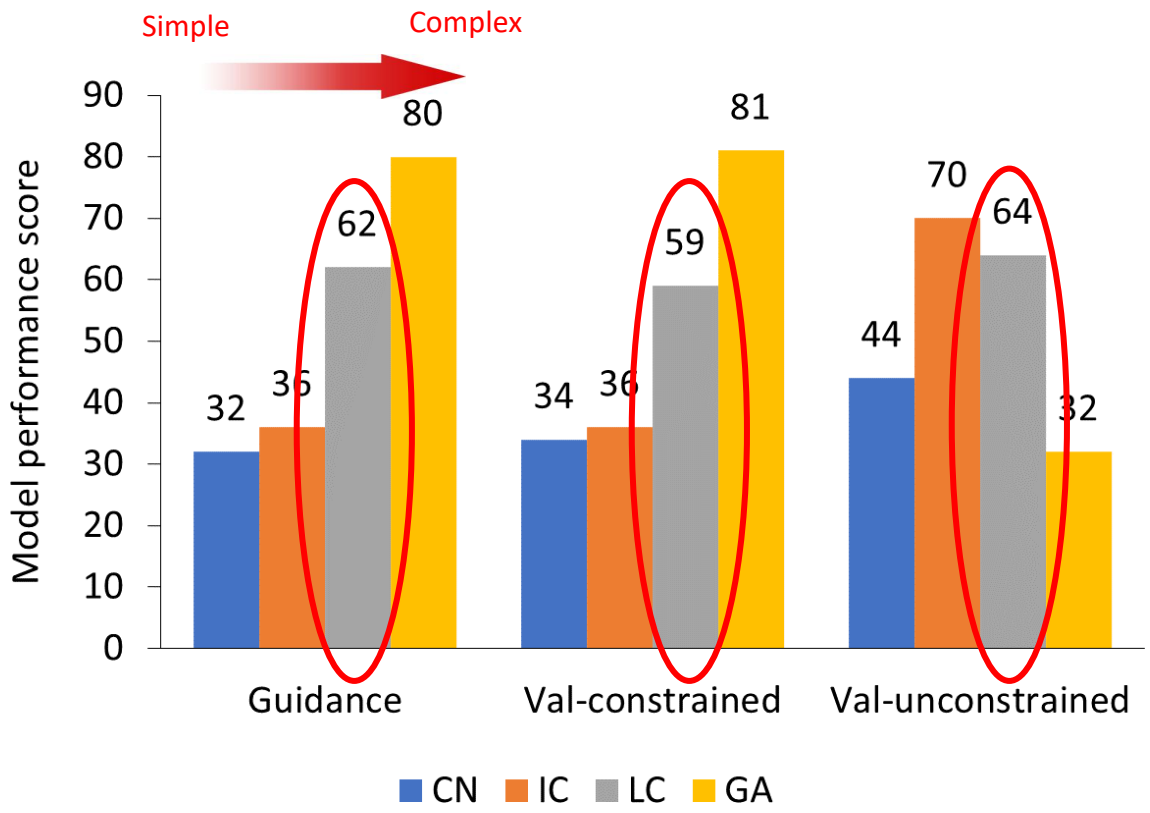
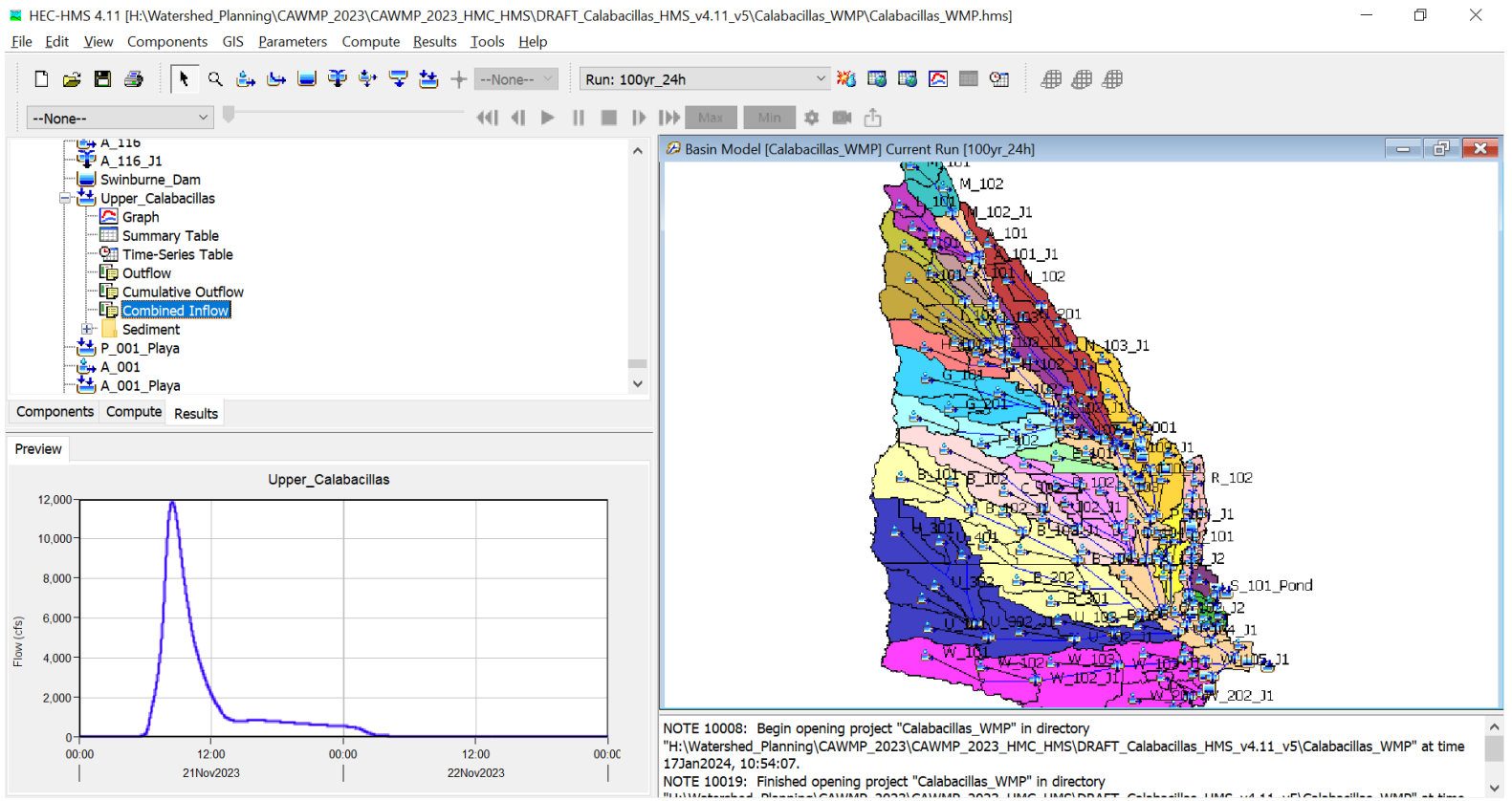
- Why? Because it is simple and easy to apply in practice
- We had some ideas for an improved model that is still simple
- This is the first real-world test of the new model, and it looks promising!



Next steps

- More testing, including in SSCAFCA watersheds



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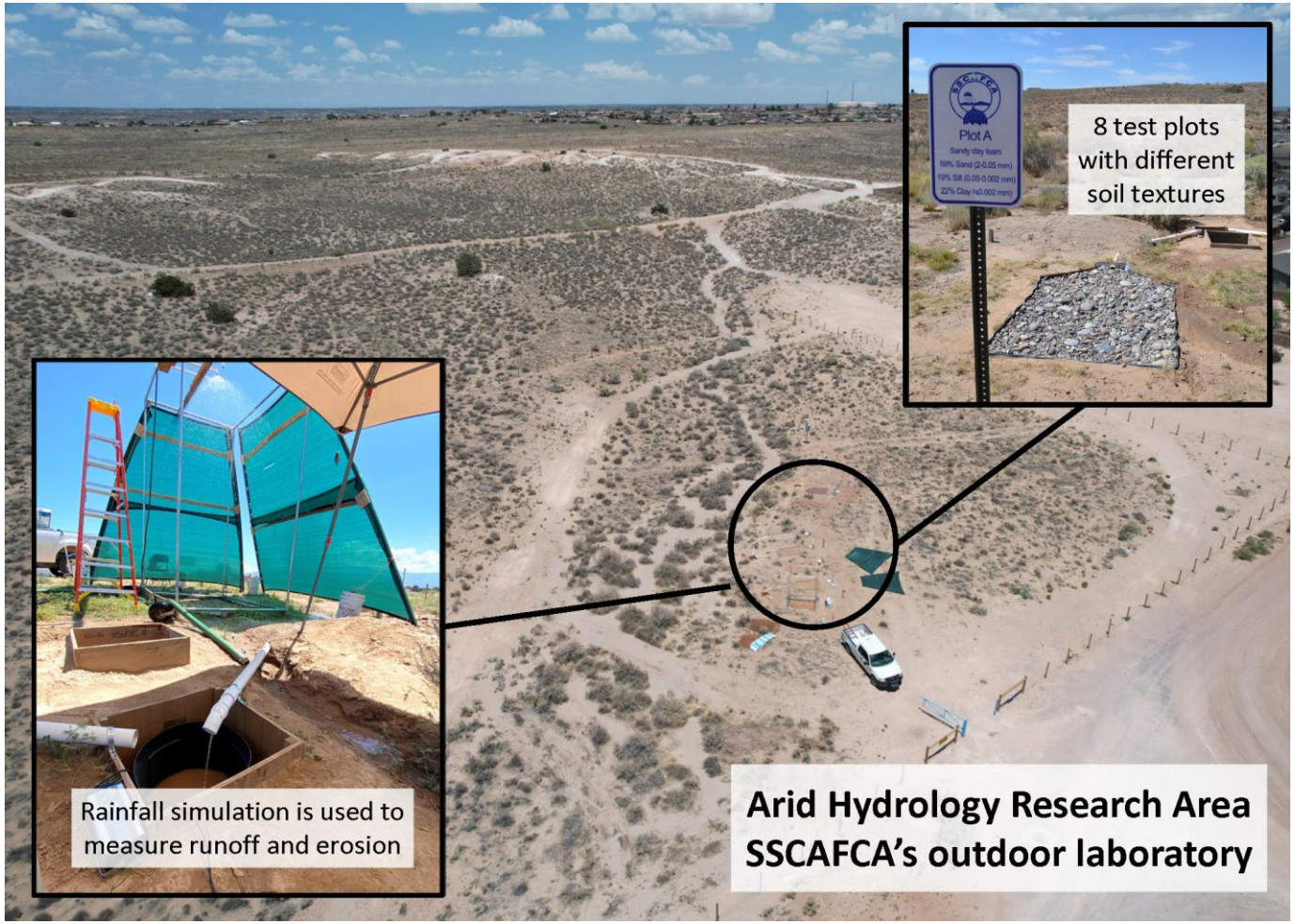
- Additional work at the field lab



Overarching goals

- Develop more accurate tools and actionable information that help us do our job better

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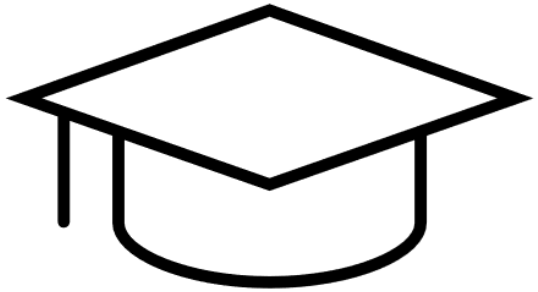
- Bridge the gap between theory and practice

Theory



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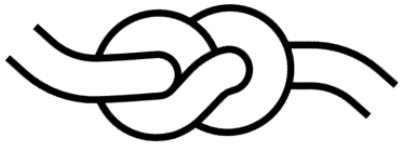

Practice

THANK YOU FOR YOUR ATTENTION