

# 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.

# Infiltration excess overland flow Dry soil Saturated soil

# Introduction





#### **Modeling Challenges in Arid and Semi-arid Regions:**

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



**Selecting Appropriate Infiltration Model** 

# **Methods**





#### **Infiltration Models:**

Simple

Complex

1. Curve Number

2. Initial & Constant Model

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 <sub>eff</sub> (mm/h)	15	11 - 21	1 - 200
	$\psi$ (mm)	83	0 - 183	0 - 2000
Initial-constant (IC)	K <sub>eff</sub> (mm/h)	15	11 - 21	1 - 200
	I <sub>a</sub> (mm)	15	0 - 45	0 - 100
Linear-constant (LC)	K <sub>eff</sub> (mm/h)	15	11 - 21	1 - 200
	F <sub>c</sub> (mm)	26	0 - 72	0 - 100

## **Methods**





#### **Testing Model Performance**

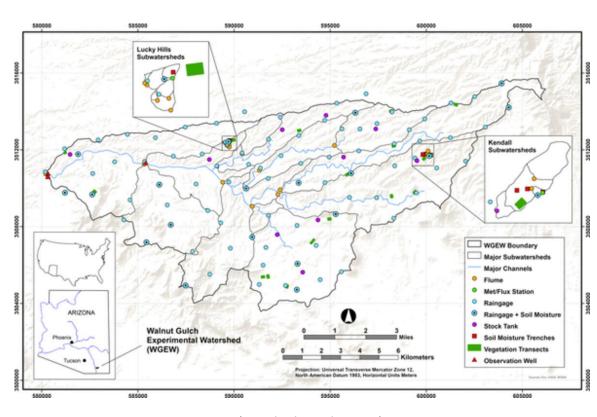
testing the model performance for a real-world watershed using available rainfall and runoff data

from the Walnut Gulch Experimental watershed.

#### Why Walnut Gulch?

Available soil texture, rainfall, and runoff data since 1953.

Influenced by the North American monsoon

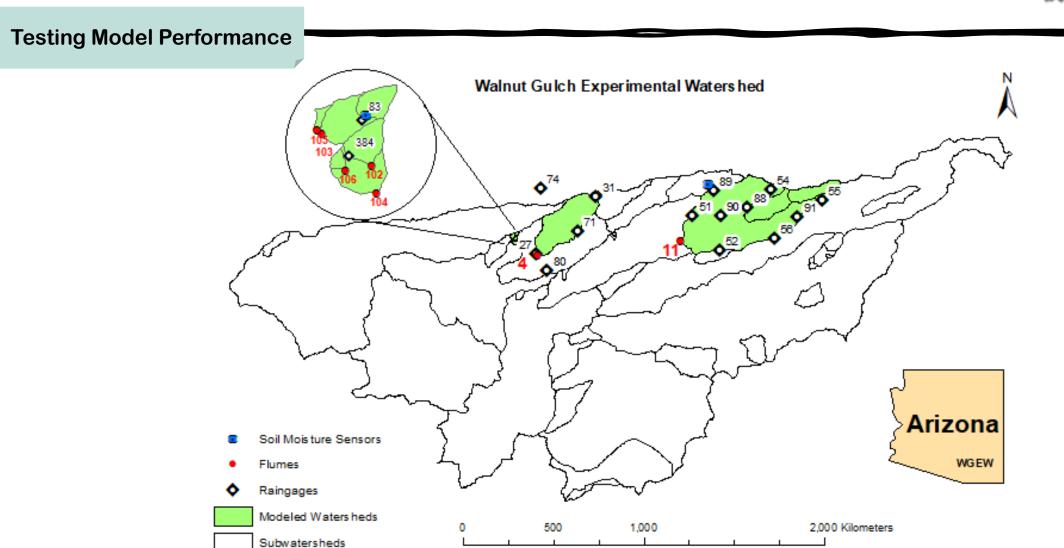


(Goodrich et al., 2021)

# **Methods**







## Results

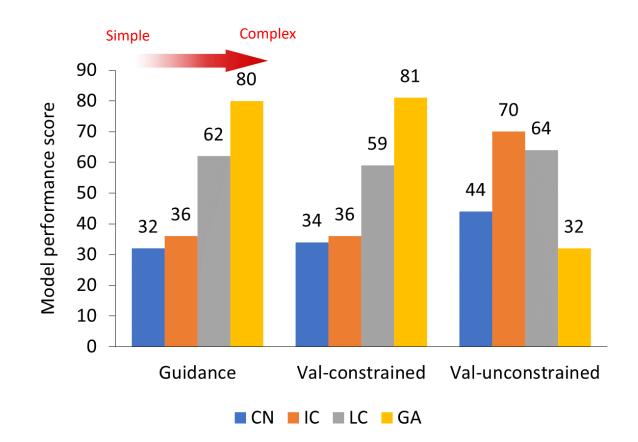




#### **Model Performance**

#### Highlights:

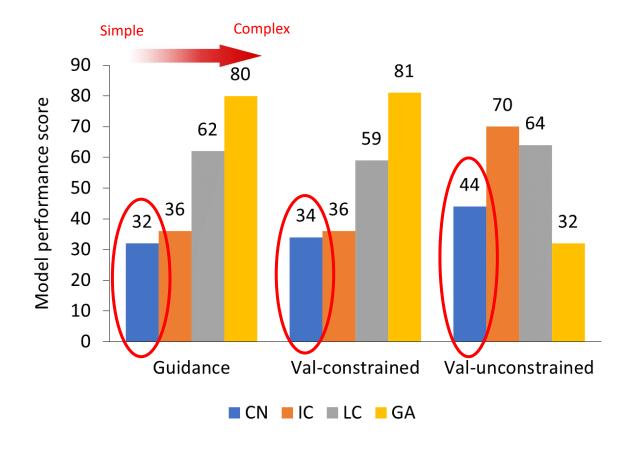
- Importance of model complexity.
- Importance of constraining parameters range for calibration.
- Optimal balance between complexity and accuracy in LC model.







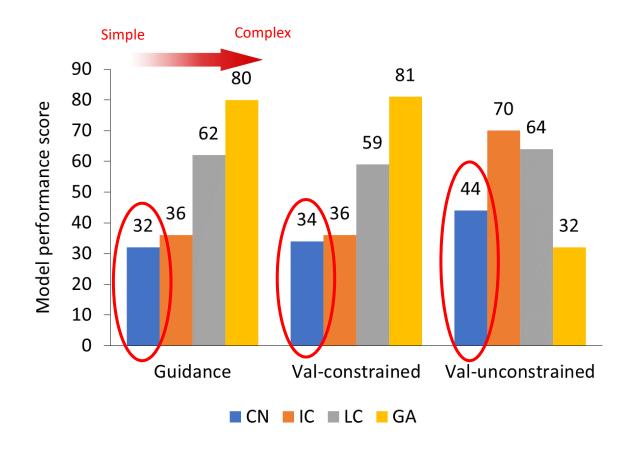
 We (and many other agencies) currently use this method in our models







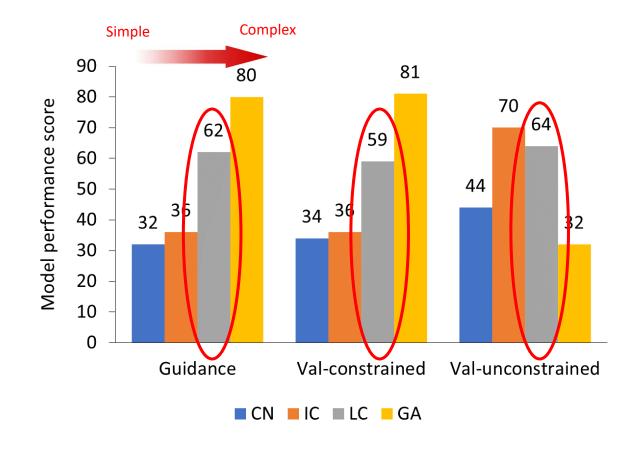
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- Why? Because it is simple and easy to apply in practice







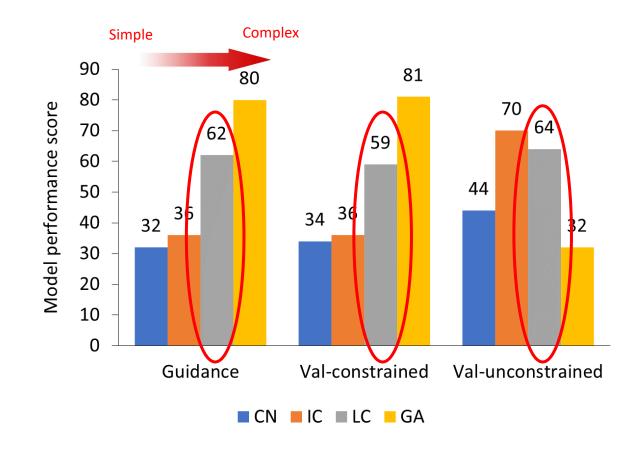
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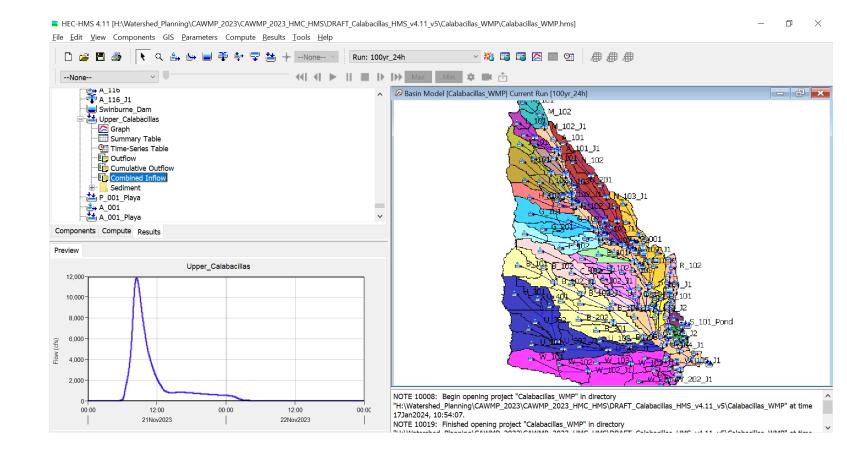
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- Why? Because it is simple and easy to apply in practice
- We had some ideas for an improved model that is still simple
- This is the first real-world test of the new model, and it looks promising!



# **Next steps**



 More testing, including in SSCAFCA watersheds

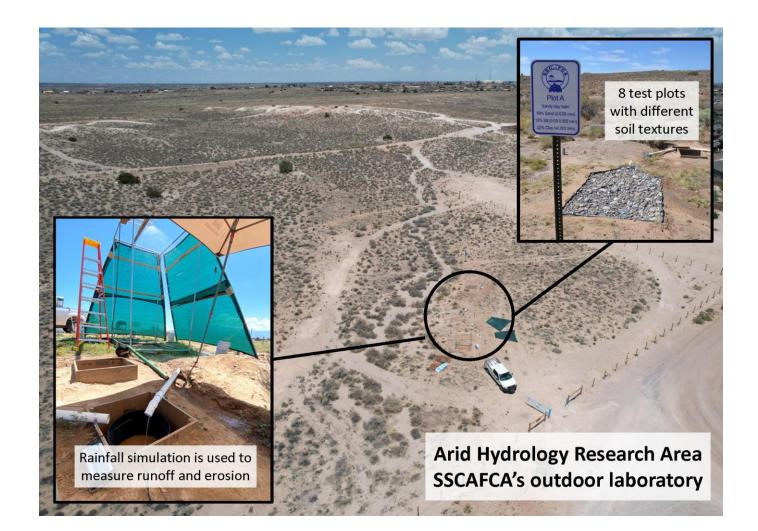


# Next steps





- More testing, including in SSCAFCA watersheds
- 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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- Develop more accurate tools and actionable information that help us do our job better
- Bridge the gap between theory and practice

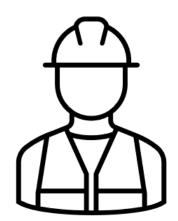
Theory

**SSCAFCA** 

**Practice** 









# THANK YOU FOR YOUR ATTENTION