

Update on SSCAFCA Research



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Rainfall Simulator Tests



Purpose

Investigating the impact of:

soil
texture

antecedent
soil moisture

physical
soil crust

What we have done



SSCAFA Arid Hydrology Research Area

Rainfall Simulator Tests



Approach

Analyzing the Impact of Antecedent Moisture

Dry

Intermediate

Wet

Raked the soil

Analyzing the Impact of Soil Crust

Crusted Soil



Without Raking

What we have done

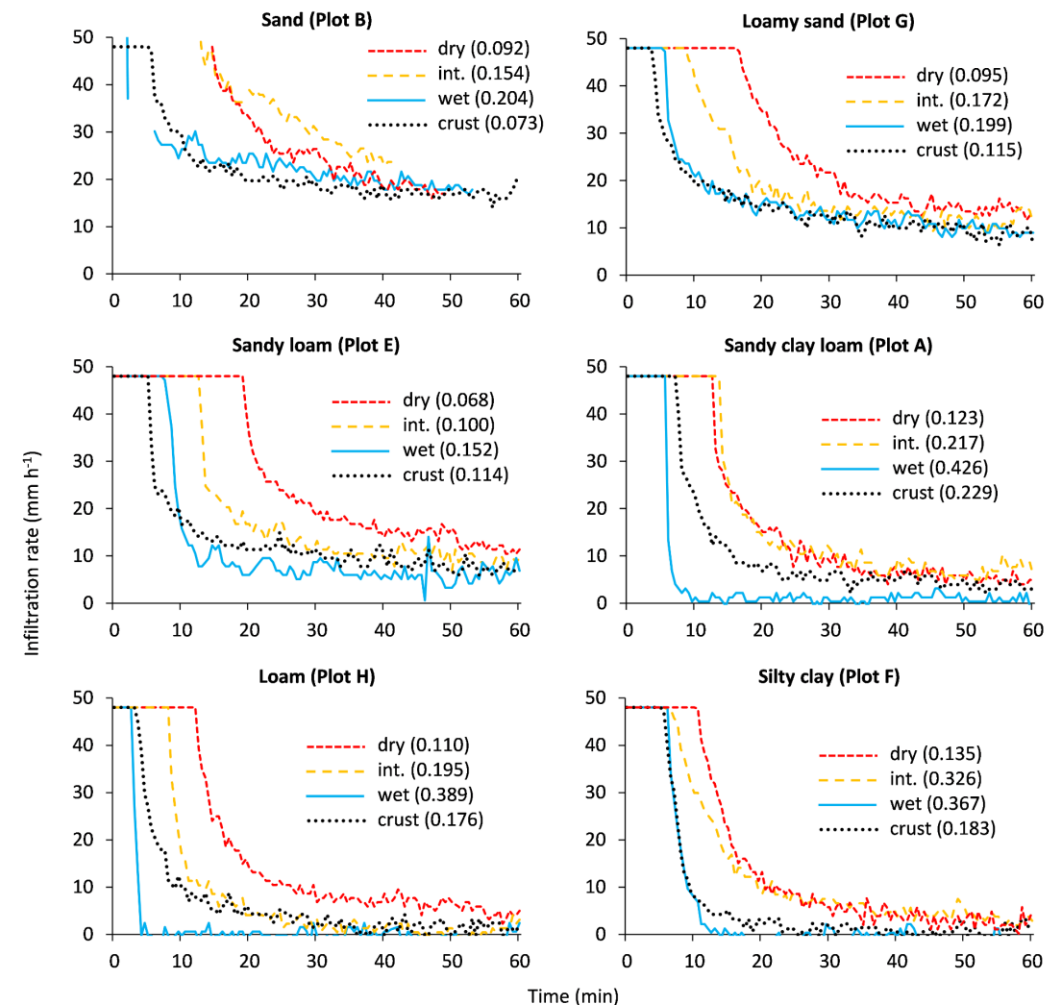
Rainfall Simulator Tests



Results

Runoff generation is affected by:

- **Soil texture**
- **Soil Antecedent moisture**
Soils with higher initial moisture generate more runoff.
- **Soil crust**
Similar behavior to wet soil in coarse-textured soil.
Between intermediate and wet soil in fine-textured soil.



Rainfall Simulator Tests

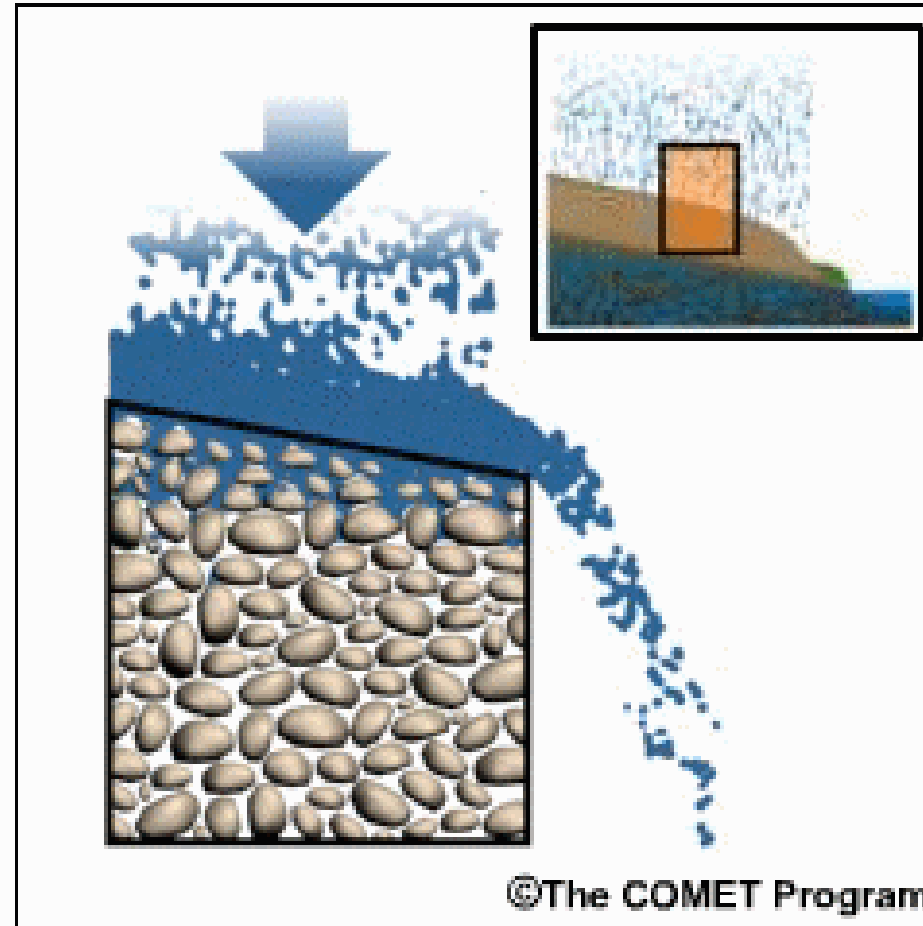


Results

Generating Parameter Estimation

1. Green & Ampt Model
2. Initial & Constant Model
3. Linear & Constant Model
(Introduced by Dr. Schoener)

G. Schoener, S. Rassa, M. Fleming, D. Gatterman, "Infiltration Model Parameters"



Journal of Hydrologic Engineering

Testing Model Performance

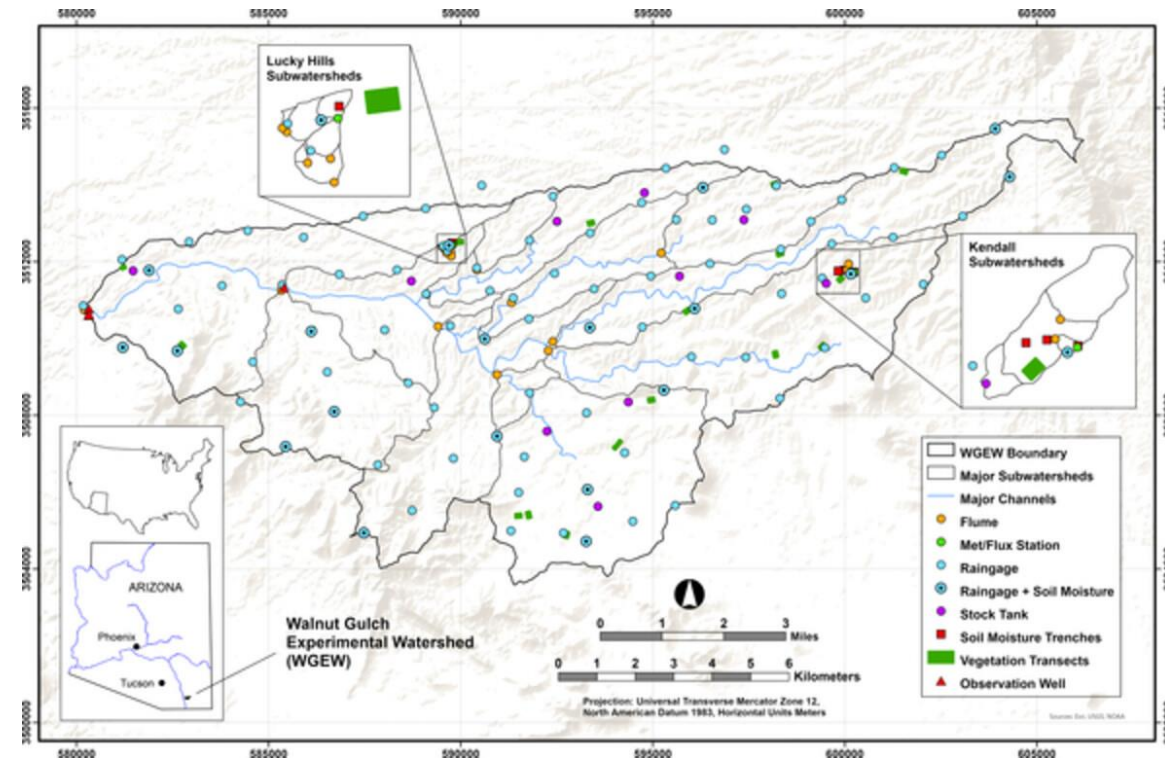


Purpose

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



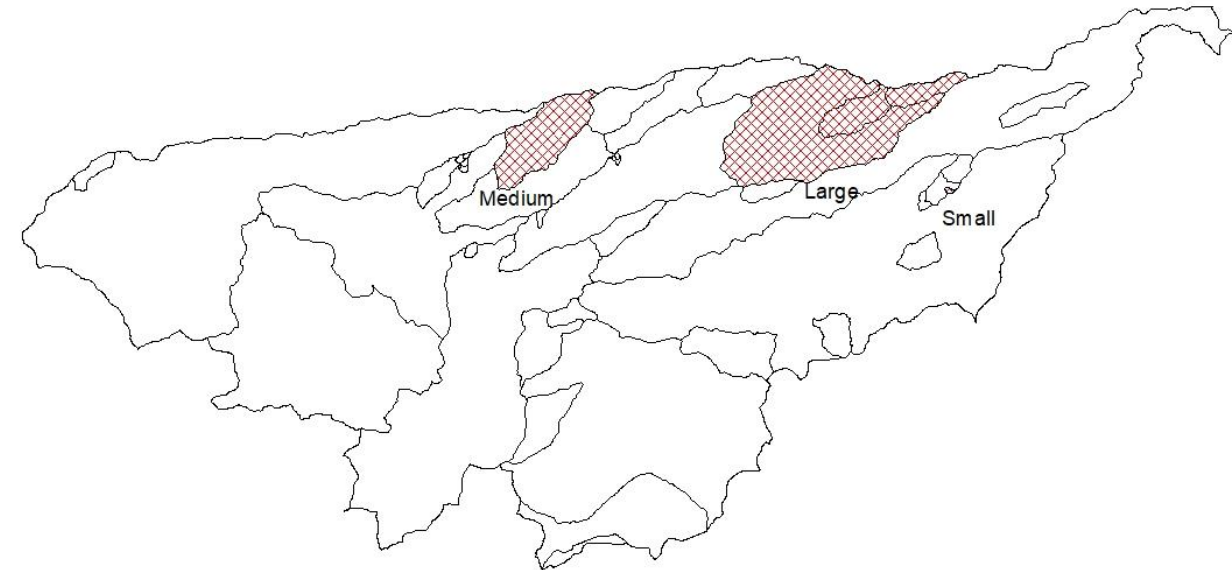
Testing Model Performance



Objectives

1. Compare the performance of the new infiltration model with the three other commonly used infiltration models
2. Analyzing the impact of spatial scale on Runoff Prediction
3. Assess using the guidance for parameter estimation compared to model optimization

Also, my thesis research questions



SWRC - Data Access Project (ag.gov)

Summary



Key Contributions of the Research

- Providing insights into the impact of soil texture, initial soil moisture, and soil crust on runoff generation.
- Generating guidance for infiltration model parameters estimation.
- Improving the performance of rainfall-runoff models in arid and semi-arid regions.

Conclusion



Benefits of the Study

1.Improved understanding of soil conditions on runoff generation:

The study provides valuable insights into the impact of different soil conditions on plot-scale runoff response, which can improve SSCAFCA's understanding of the effect of soil texture, antecedent soil moisture, and physical soil crust on runoff generation.

2.Improved rainfall-runoff modeling:

The guidance generated from the study can help SSCAFCA and other organizations estimate model parameters more accurately, which can improve the performance of rainfall-runoff models in arid and semi-arid regions.

3.Better understanding of semi-arid hydrology:

The study provides a better understanding of the hydrology of semi-arid regions, aiding in the design of flood mitigation and water conservation projects.

4.Informed decision-making:

Overall, this study can help SSCAFCA, and other watershed management and planning organizations make more informed decisions about water resource management and conservation efforts in arid and semi-arid regions.