

**Intro to research:
Research questions and literature
reviews**

Research problem/question

- Tell what will be studied
- Tells how the study will meet the identified need
- Can be studied (operationalized)

Research problem/question

- Tells us...
 - The purpose of this study is...
 - This study investigates...
 - What is the relationship between...?
 - Is there a difference between...?
 - This study explores...

Basic Research Problem

- Under what (time and space) conditions does interflow reach the channel?
- Rationale: Water that reaches the channel does not recharge groundwater. Flowpaths may also play a role in thinking about septic, erosion, floods, and landslides.



General research problem

How can we improve debris flow prediction for initiation zones in the North Carolina mountains?

Specific research question

Is water flowing through shallow soil flowpaths during storms that may destabilize slopes?

Operational research question

If we measure soil moisture in different soil horizons, do we see changes in soil moisture that indicates water is flowing through the soil during a storm? The water may destabilize slopes.

Where do research questions come from?

- Experience
- Application of theory
- Replication (from other locations)
- Clarification of the literature

Experience (Field Work and Observations)

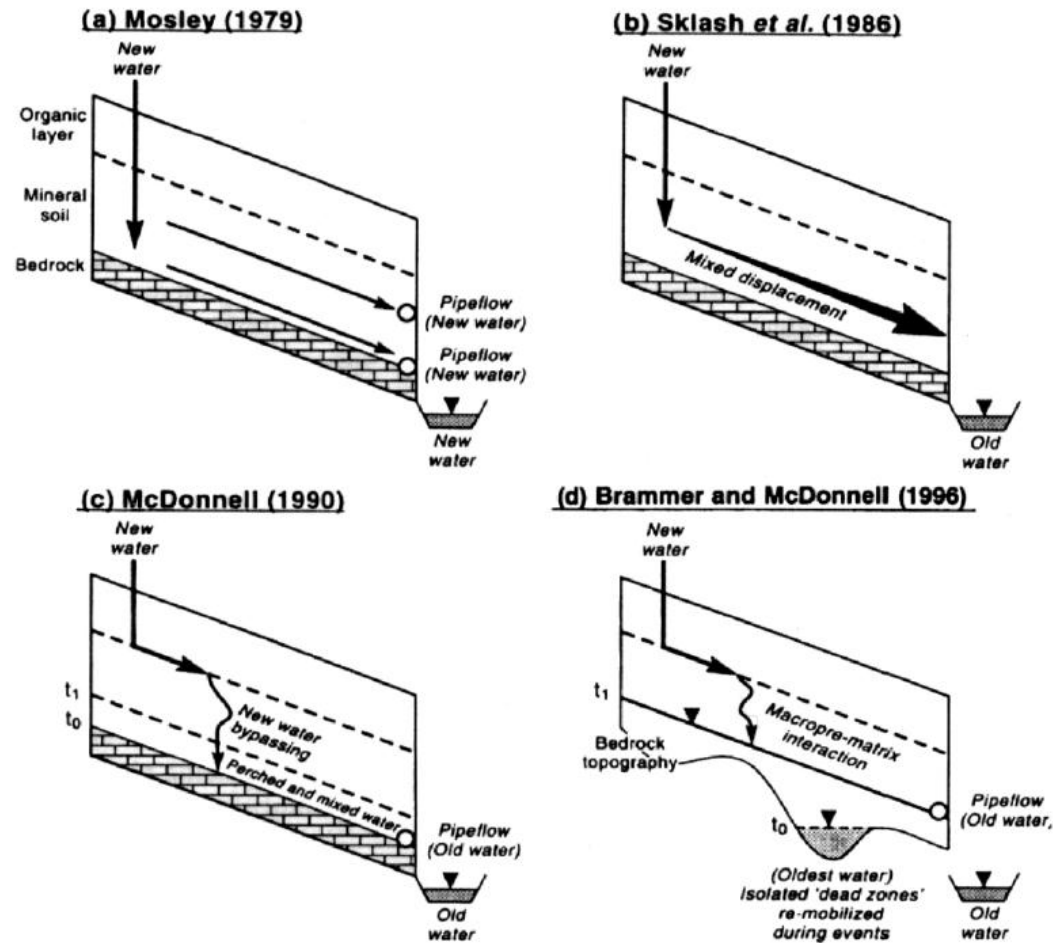


Fig. 4. Maimai conceptual models: (a) Mosley (1982); (b) Mosley (1982); (c) Sklash *et al.* (1986); (d) McDonnell (1990a); (e) Brammer *et al.* (1996).

Replication

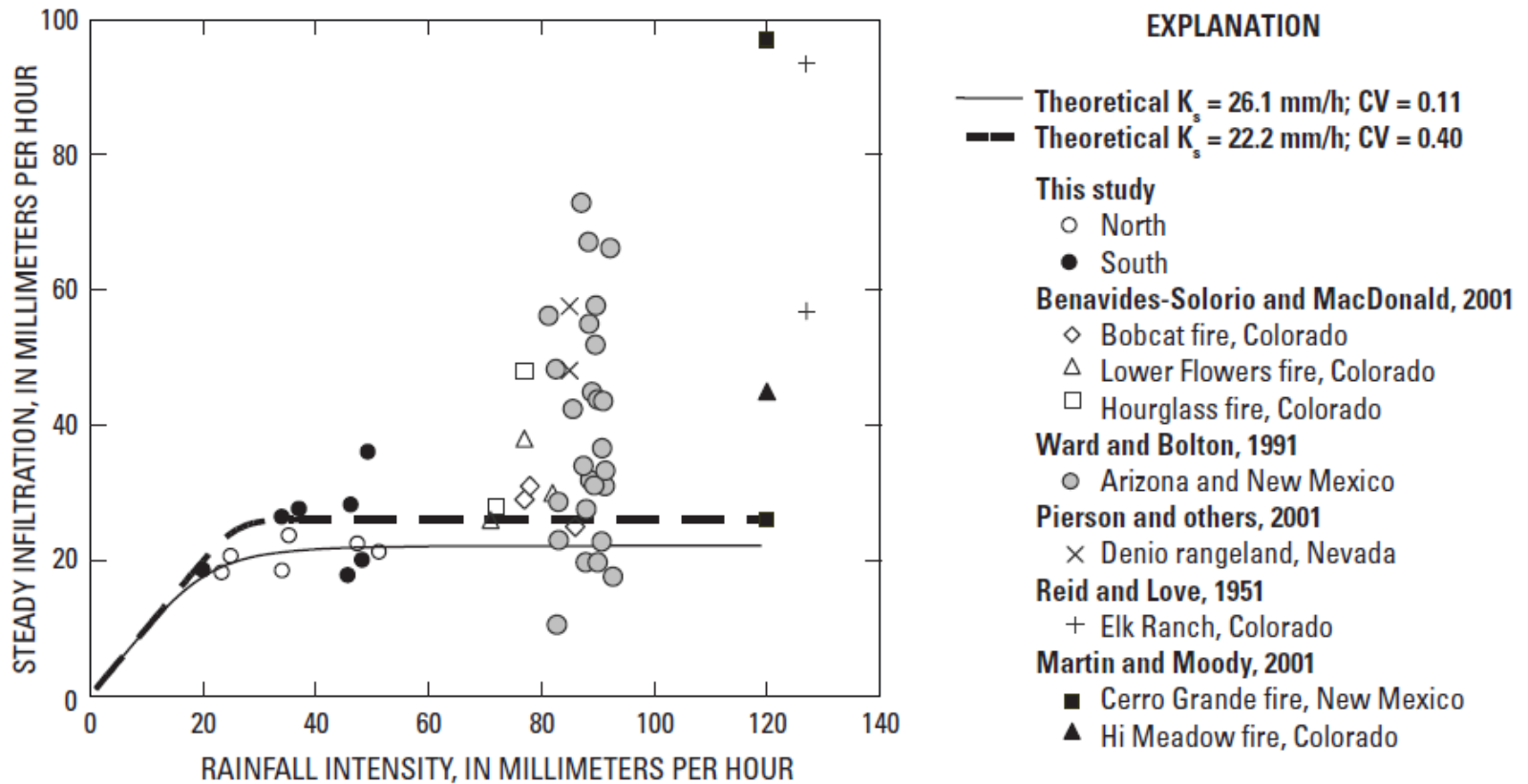
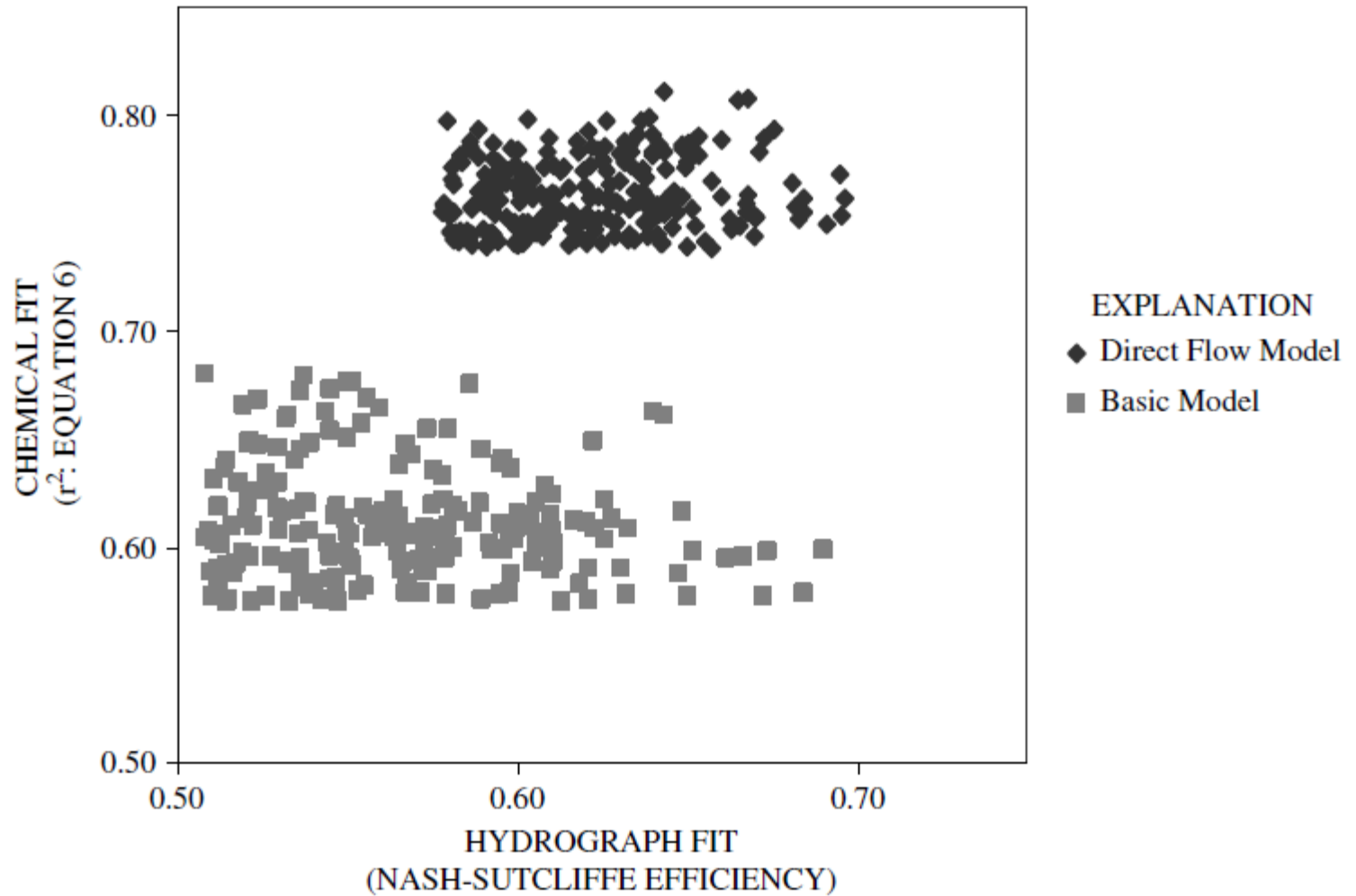


Figure 24. Steady-state infiltration rates as a function of steady rainfall intensity for burned and unburned plots in Colorado, New Mexico, and Nevada.

Theory



Research questions

- Once you have a general research problem, then you need to clearly and concisely specify exactly what will be studied
- Able to collect data to answer the question(s)
- Tell what the study is about... the “population”
- We will consider 3 types of questions in class:
 - Descriptive: What are the values of a variable in a study?
 - Comparative: Are the value of variables the same or different in multiple groups?
 - Relationship: Are the values of two separate variables related?

Quantitative variables

A “variable” is a construct or characteristic that takes on different values or scores

- Categorical – Mineral type or name, male or female
- Continuous – bulk density, height
- Discrete-Number of something (whole numbers), age (in years)
- Independent (IV) – known, thought to influence (stress)
- Dependent (DV) – outcome (strain)

- Confounding/extraneous – a variable that systematically “messes up” the relationship between IV and DV