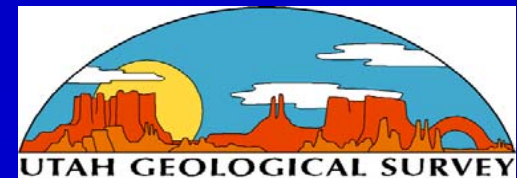


Guidelines For Geologic Evaluation of Debris-flow Hazards On Alluvial Fans in Utah



Richard E. Giraud
Utah Geological Survey



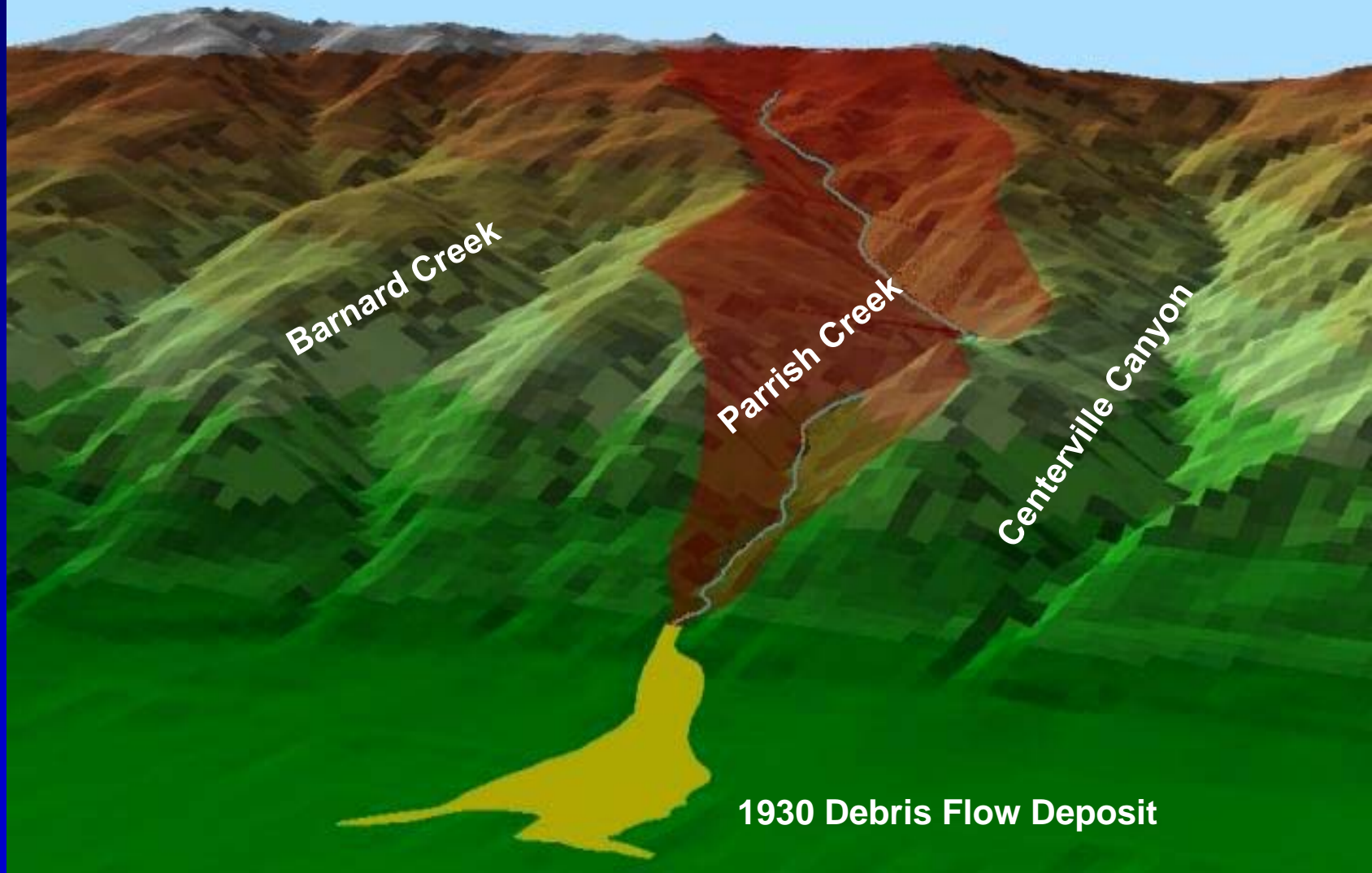
Introduction

- **Debris-flow processes and hazards**
- **Debris-flow hazard evaluation**
 - **Alluvial-fan evaluation**
 - 1) active depositional area
 - 2) alluvial-fan deposits
 - **Drainage basin and sediment supply evaluation**
 - 1) drainage basin conditions
 - 2) sediment supply conditions

Debris-flow Processes and Hazards

- **Drainage basin and alluvial fan**
- **Flow types and the sediment-water flow continuum**
- **Debris-flow hazards and hazard parameters**

Drainage Basin and Alluvial Fan



1930 Debris Flow Deposit

Parrish Creek July 1930



Flow Types and the Sediment-water Flow Continuum

- **Debris flow (> 60% sediment by volume)**
- **Hyperconcentrated flow
(20-60% sediment by volume)**
- **Stream flow (<20% sediment by volume)**

Sediment Flow Types

Debris Flow

Rudd Canyon May 30,
1983



Hyperconcentrated Flow

Vivian Park August 31,
2000



Debris-flow Hazards and Parameters

Hazards

- Catastrophic
- Impact Pressure
- Sediment burial
- Water flooding
- Erosion

Parameters

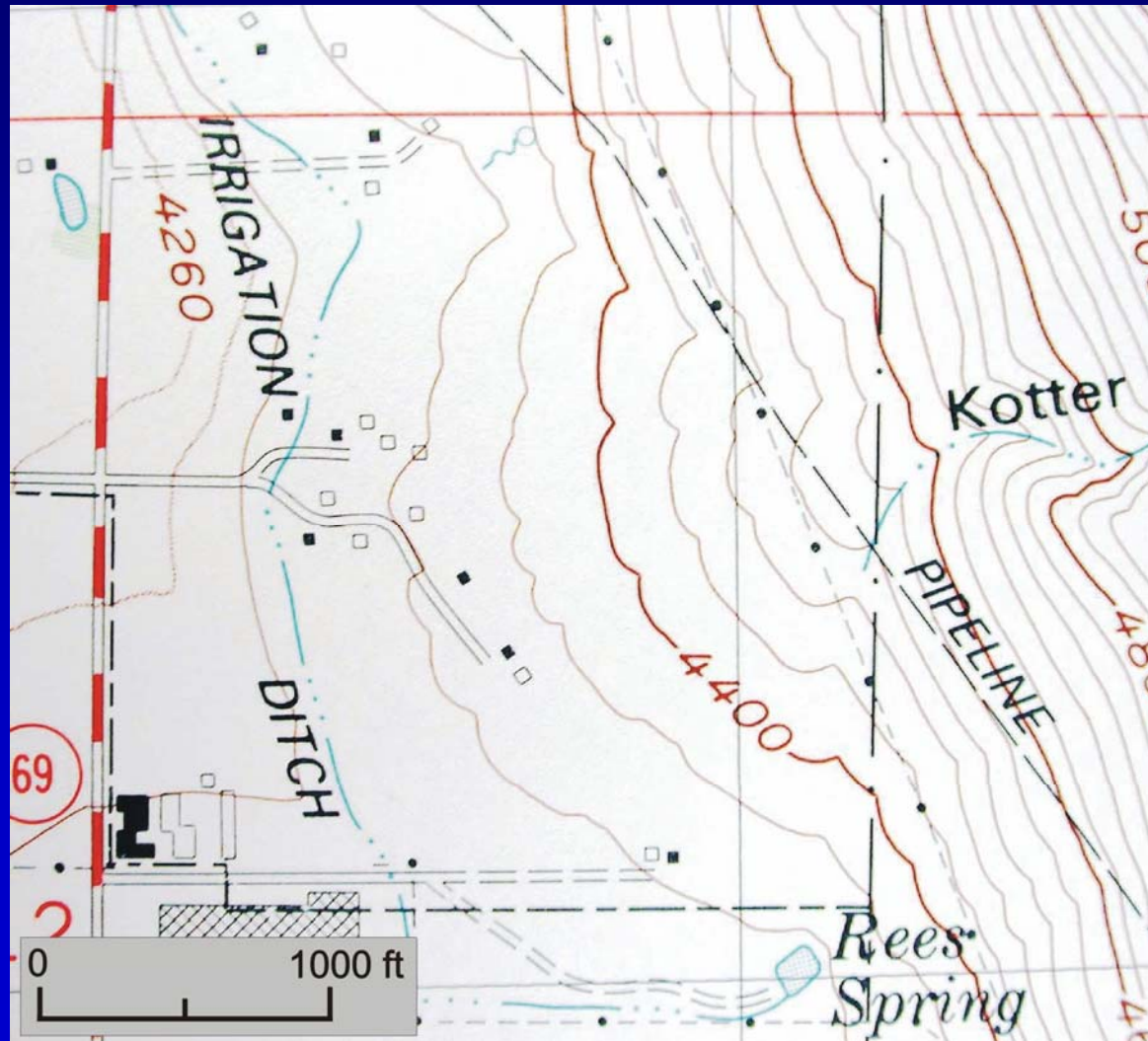
- Frequency
- Volume
- Runout
- Flow height
- Velocity

Alluvial-fan Evaluation

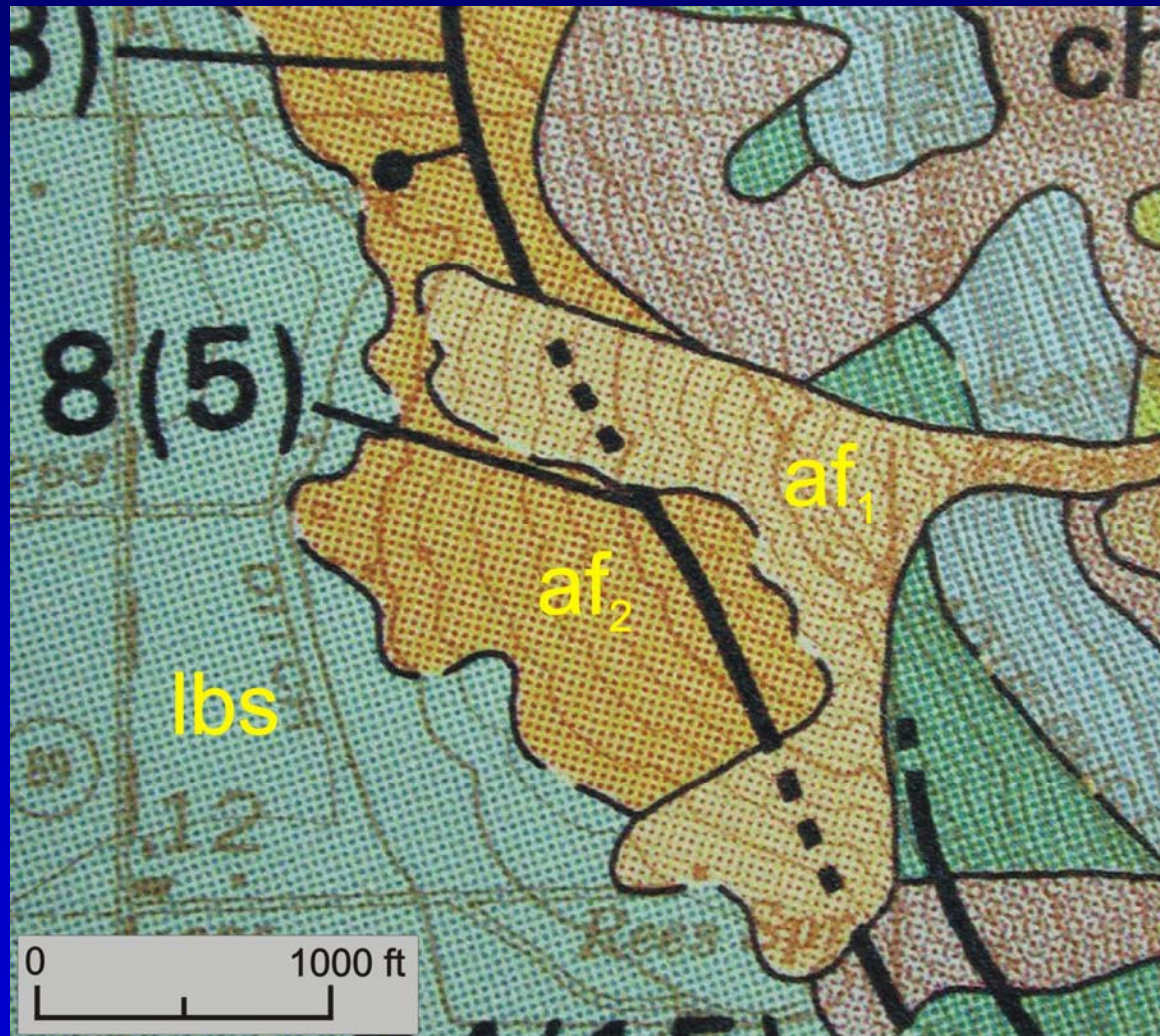
- **Active depositional area**
- **Alluvial-fan deposits**

Active Depositional Area

Topographic Map



Active Depositional Area Surficial Geologic Map



From
Personius
(1990)
USGS Map
I-1979

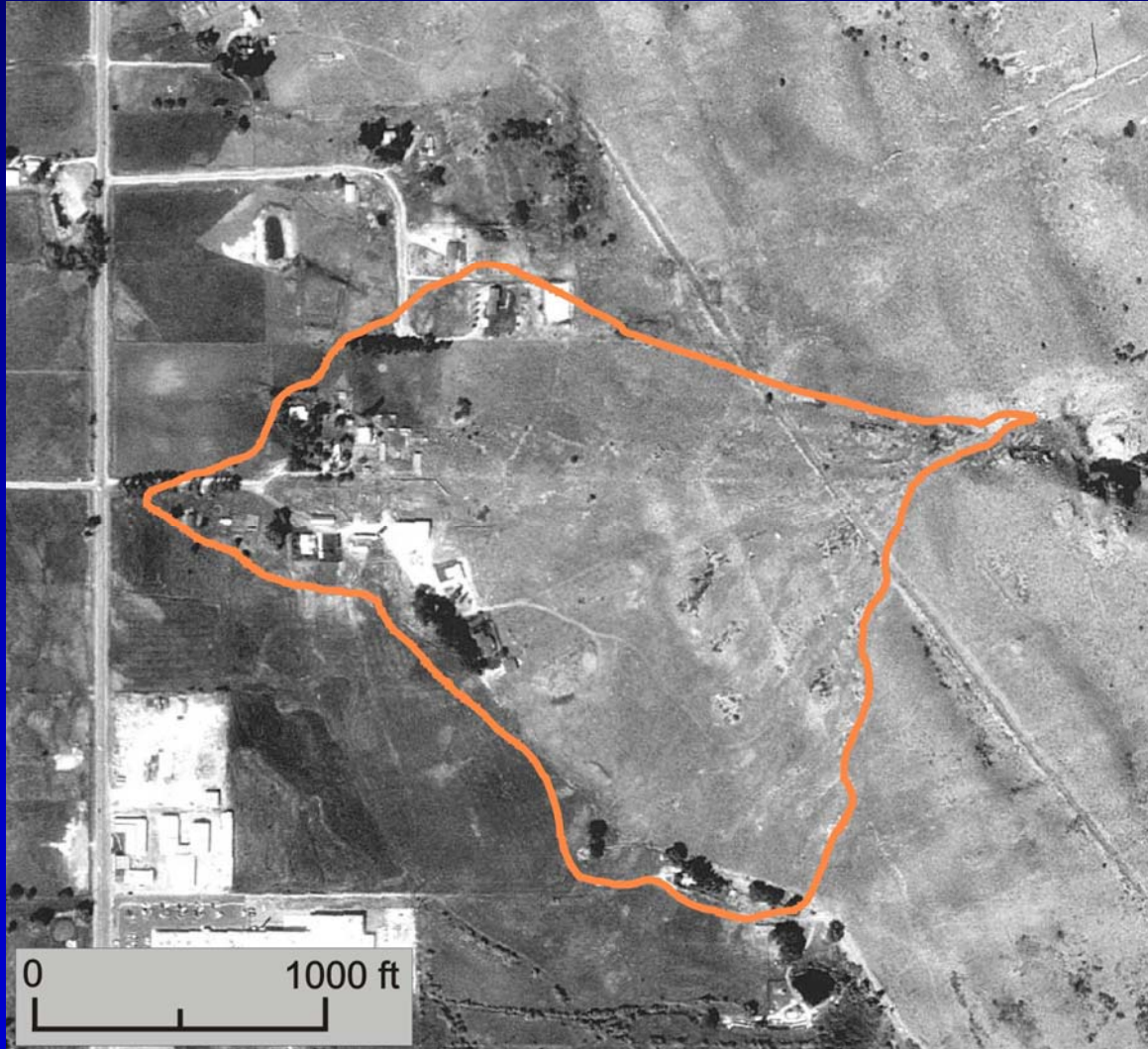
Active Depositional Area

Aerial Photograph



Active Depositional Area

Aerial Photograph



Alluvial-fan Deposits

Surface

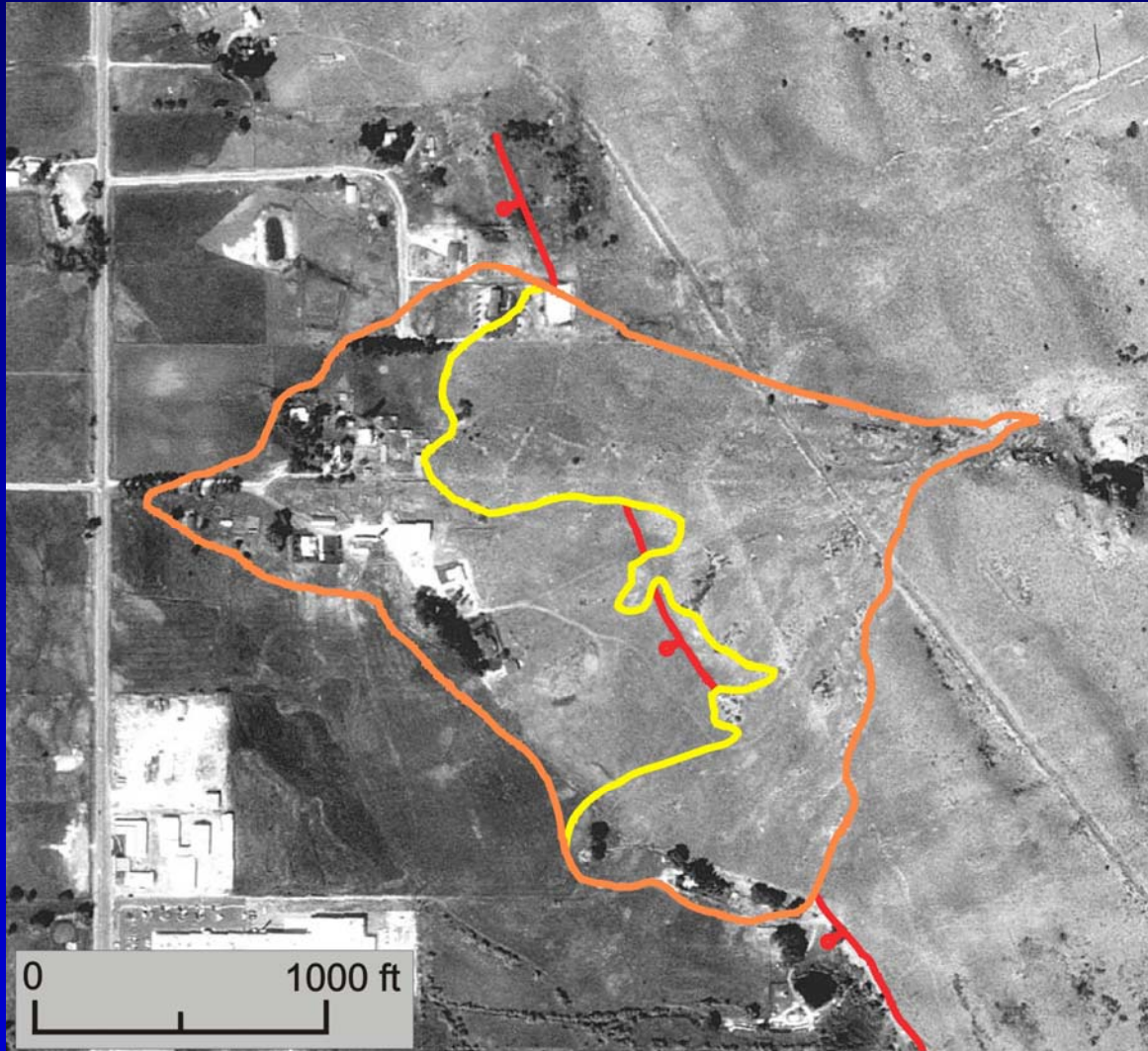
- Geomorphology
- Mapping

Subsurface

- Sedimentology
- Stratigraphy

Alluvial-fan Deposits

Mapping and Geomorphology



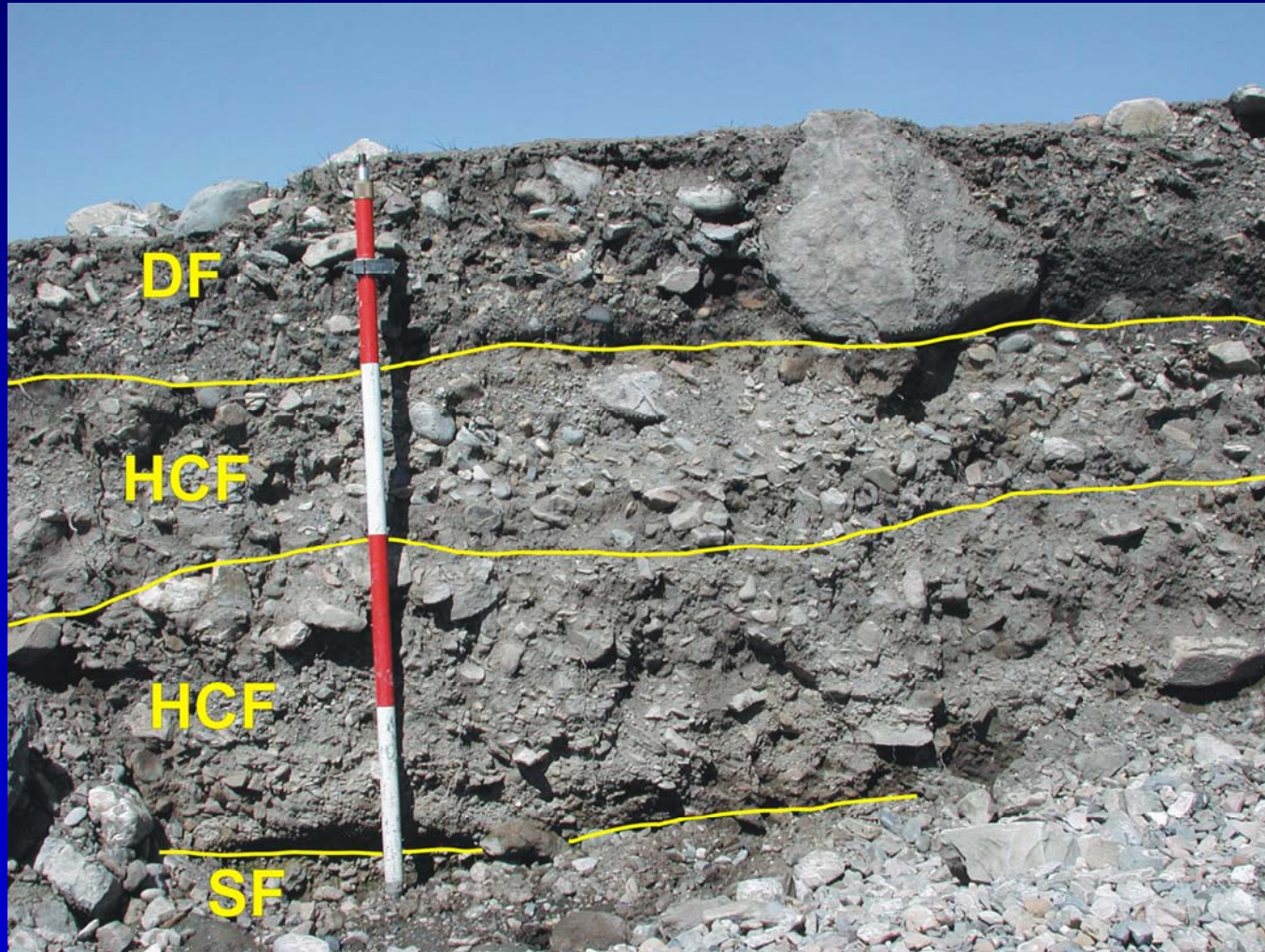
Alluvial-fan Deposits

Big Canyon



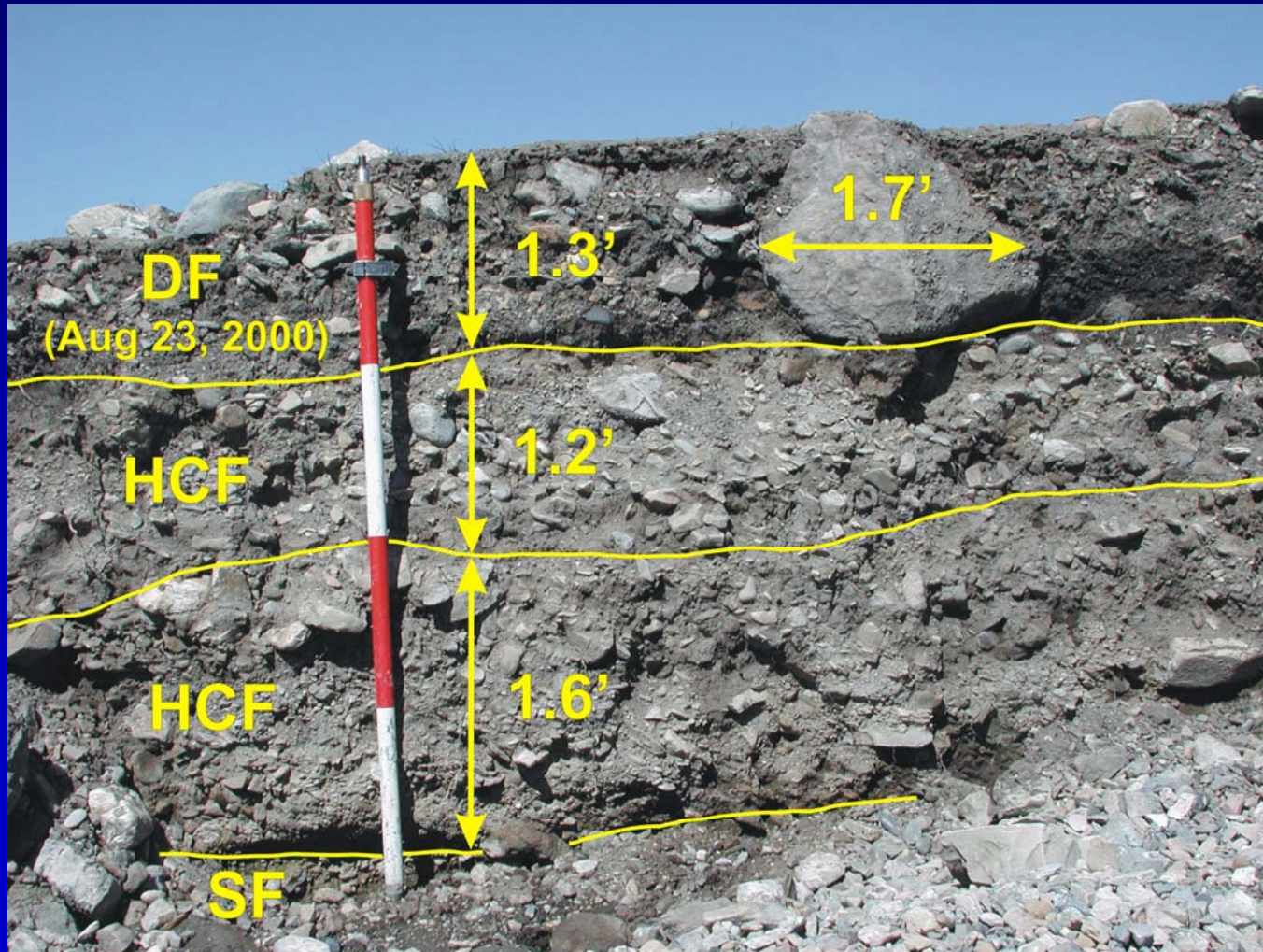
Alluvial-fan Deposits

Big Canyon



Alluvial-fan Deposits

Big Canyon



Alluvial-fan Deposits

Big Willow Canyon



Alluvial-fan Deposits

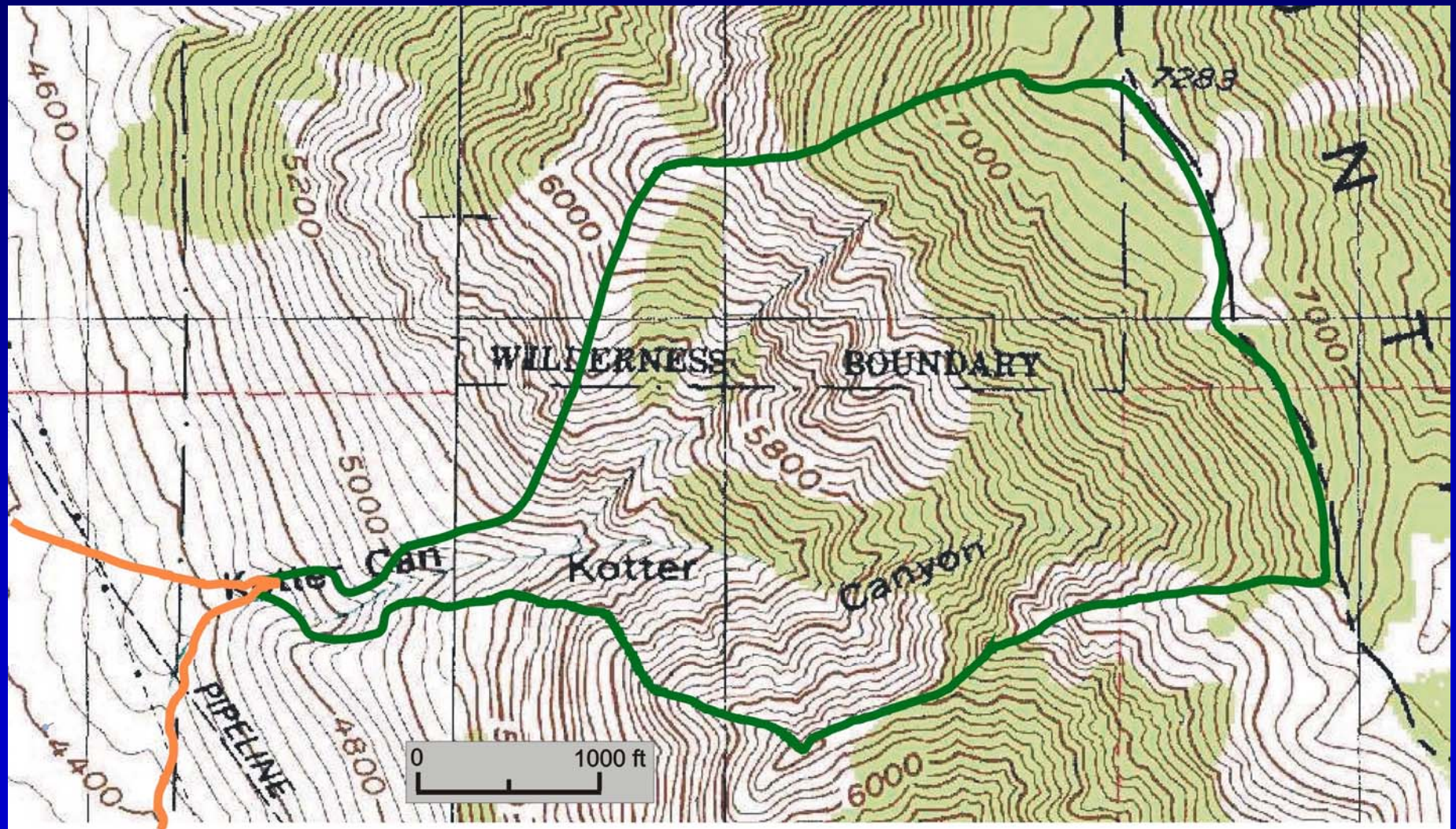
Big Willow Canyon



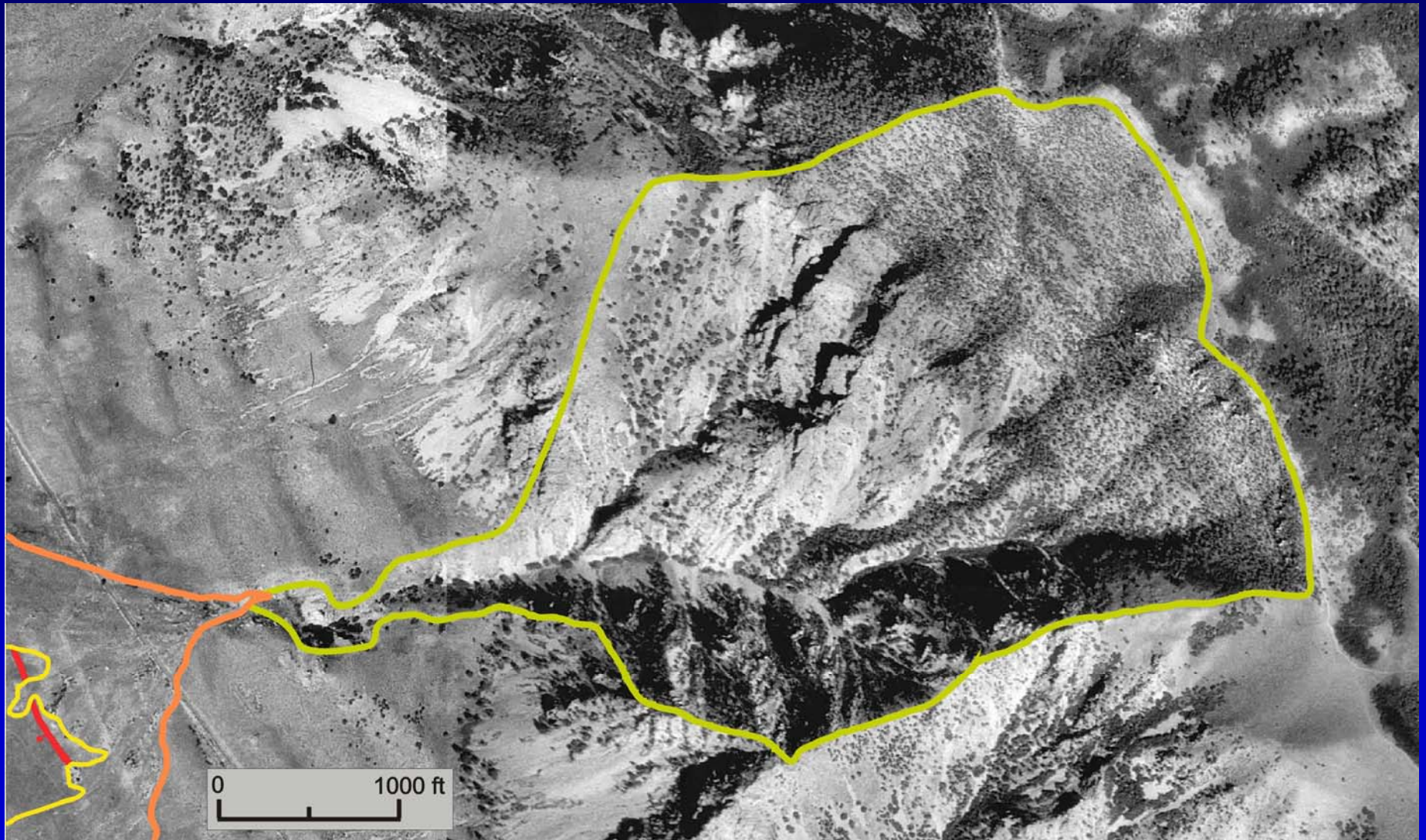
Drainage Basin and Sediment Supply Evaluation

- **Drainage-basin conditions**
- **Sediment-supply conditions**

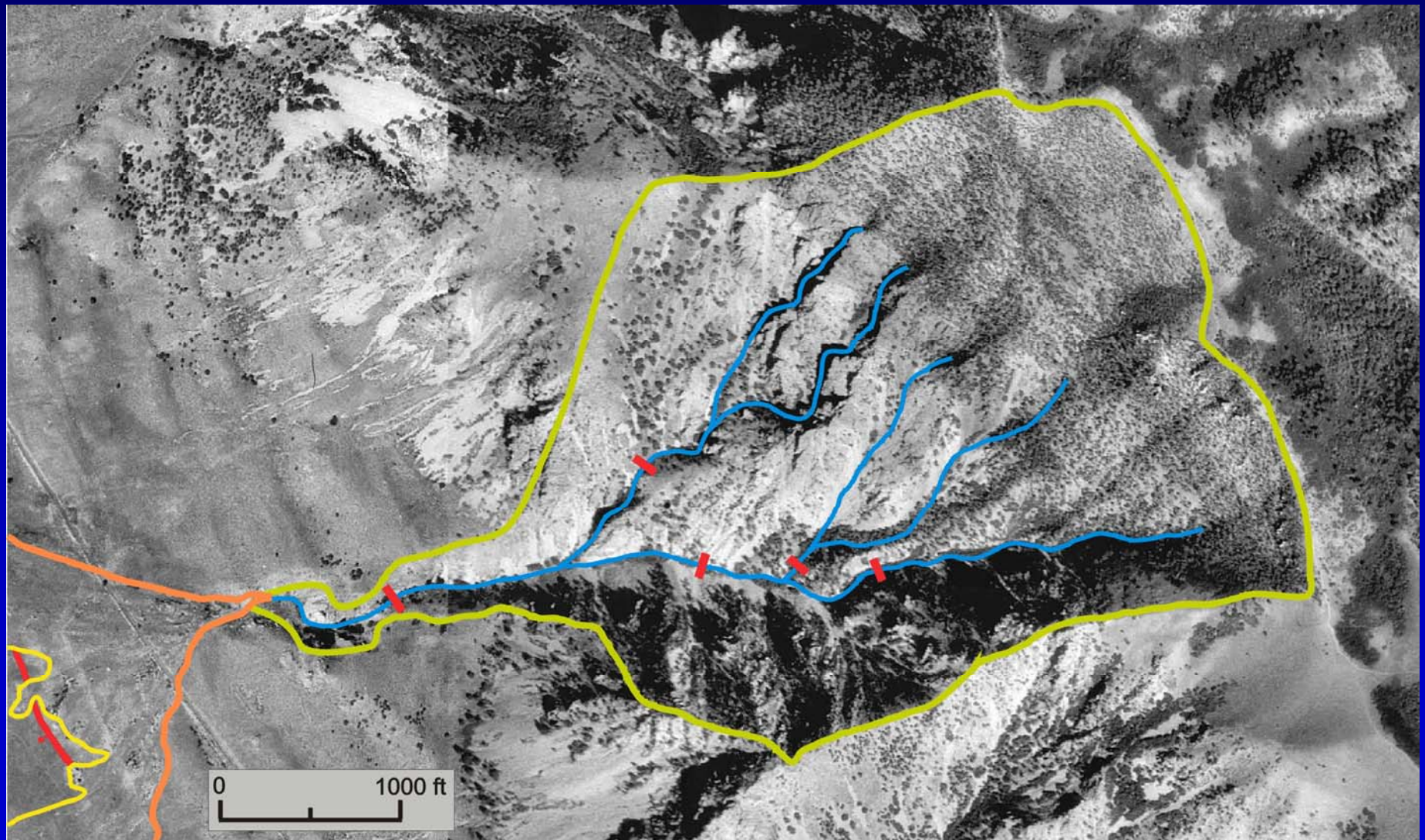
Drainage Basin Topographic Map



Drainage Basin Aerial Photograph



Drainage Basin Sediment Supply



Preston Canyon August 2001

Sediment Supply



Preston Canyon August 2001

Sediment Supply



Drainage Basin Cross-channel Profiling



Summary

Alluvial Fan

- **Active depositional area**
- **Alluvial-fan deposits**
 - **Surface**
 - Mapping
 - Geomorphology
 - **Subsurface**
 - Sedimentology
 - Stratigraphy

Drainage Basin

- **Drainage-basin conditions**
 - **Surficial geology**
 - **Bedrock geology**
- **Sediment-supply conditions**
 - **Cross-channel profiling**