



Sonora Field Campaign 2006

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Overview

- Introduction
 - Experiment
 - Study Area
- Tower Experiment
- Rainfall Experiment
 - Valley
 - Mountain
- Slide Show

Introduction

- Experiment
 - Purpose
 - Multicultural Education
 - Evapotranspiration / Soil Moisture Relationship
 - Satellite Precipitation Estimation Validation
 - Study Area
 - Location within Mexico
 - Vegetation, Soil Type, Topography, Climate

Multicultural Education

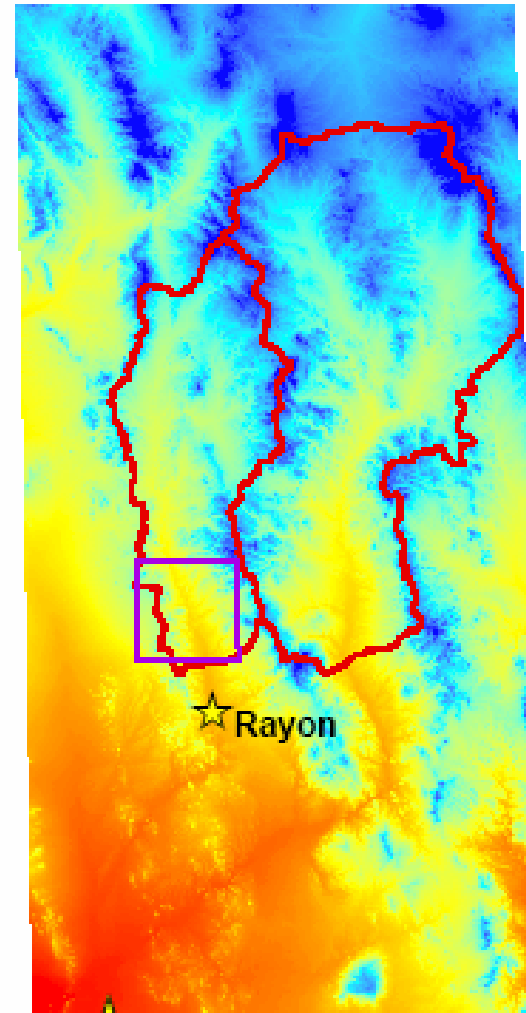
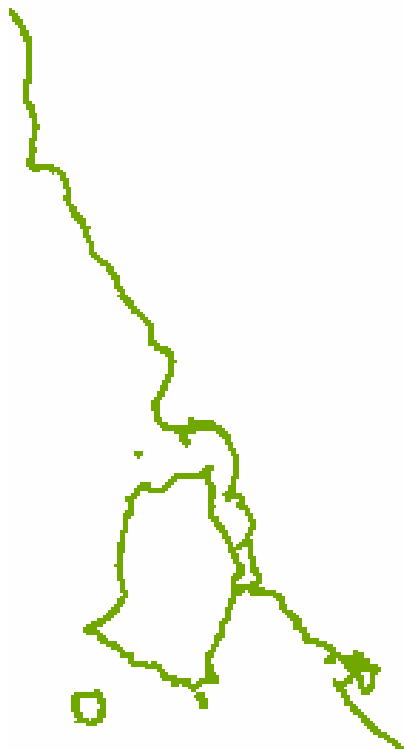
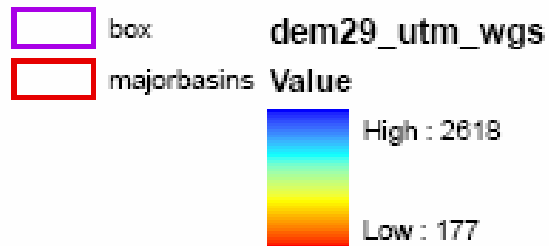
- Diversity of Participants
 - 6 Mexican Undergrads
 - 2 American Undergrads
 - 1 Mexican Professor of British Heritage
 - 1 American Professor of Puerto Rican Heritage
 - 2 Mexican Researchers
 - 1 Ethiopian Post-Doc
 - 1 Mexican Graduate Student studying in America
 - 2 Italian Doctoral Researchers studying in America

Satellite Precipitation Estimation Validation

- TRMM (Tropical Rainfall Measuring Mission)
- Pixel size 5 km x 5 km
- Determine variability within 25 km²
- Utilize event rain gauges randomly distributed within a 25 km² area of two different topographic profiles

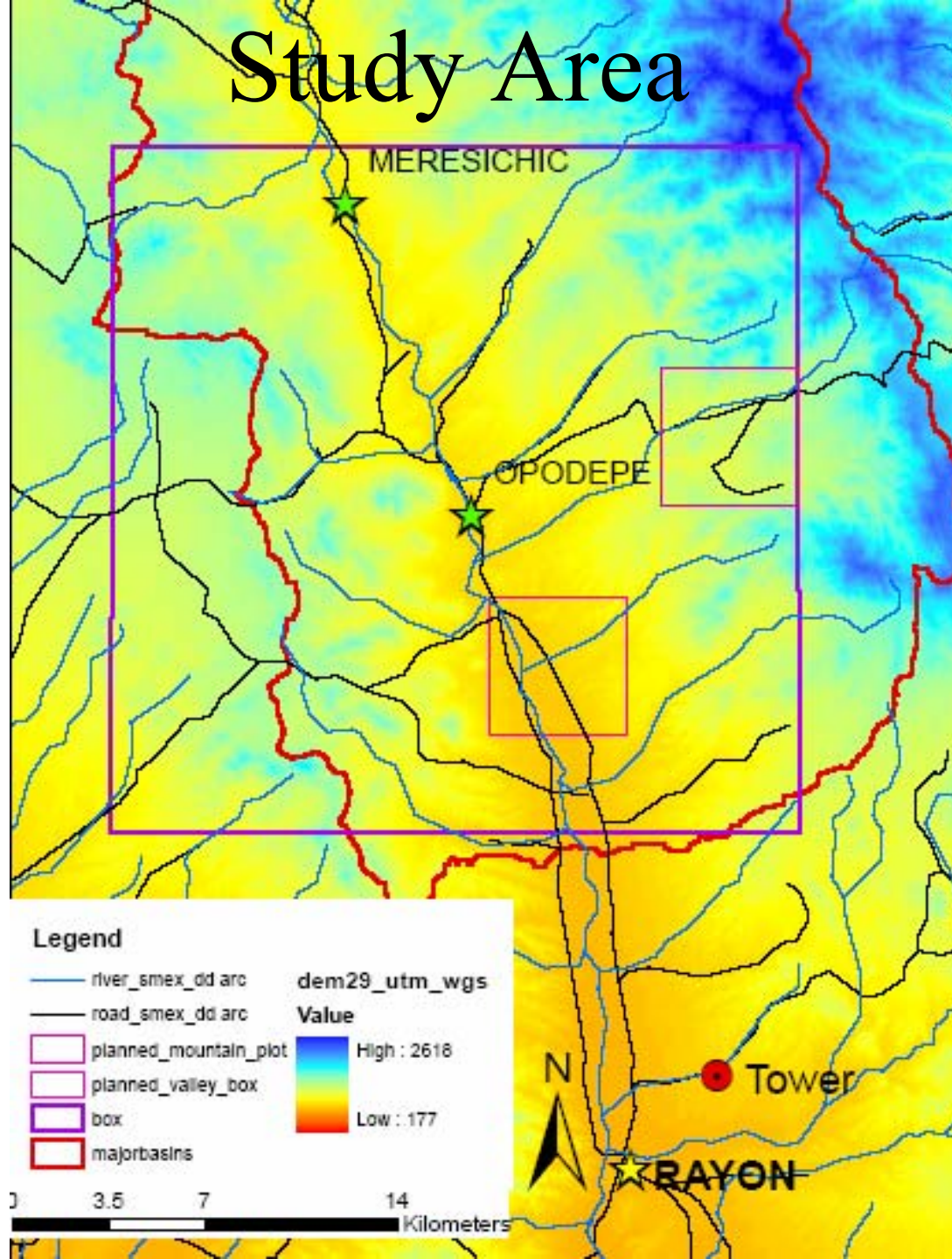
Study Area

Legend



★ Hermosillo

Study Area



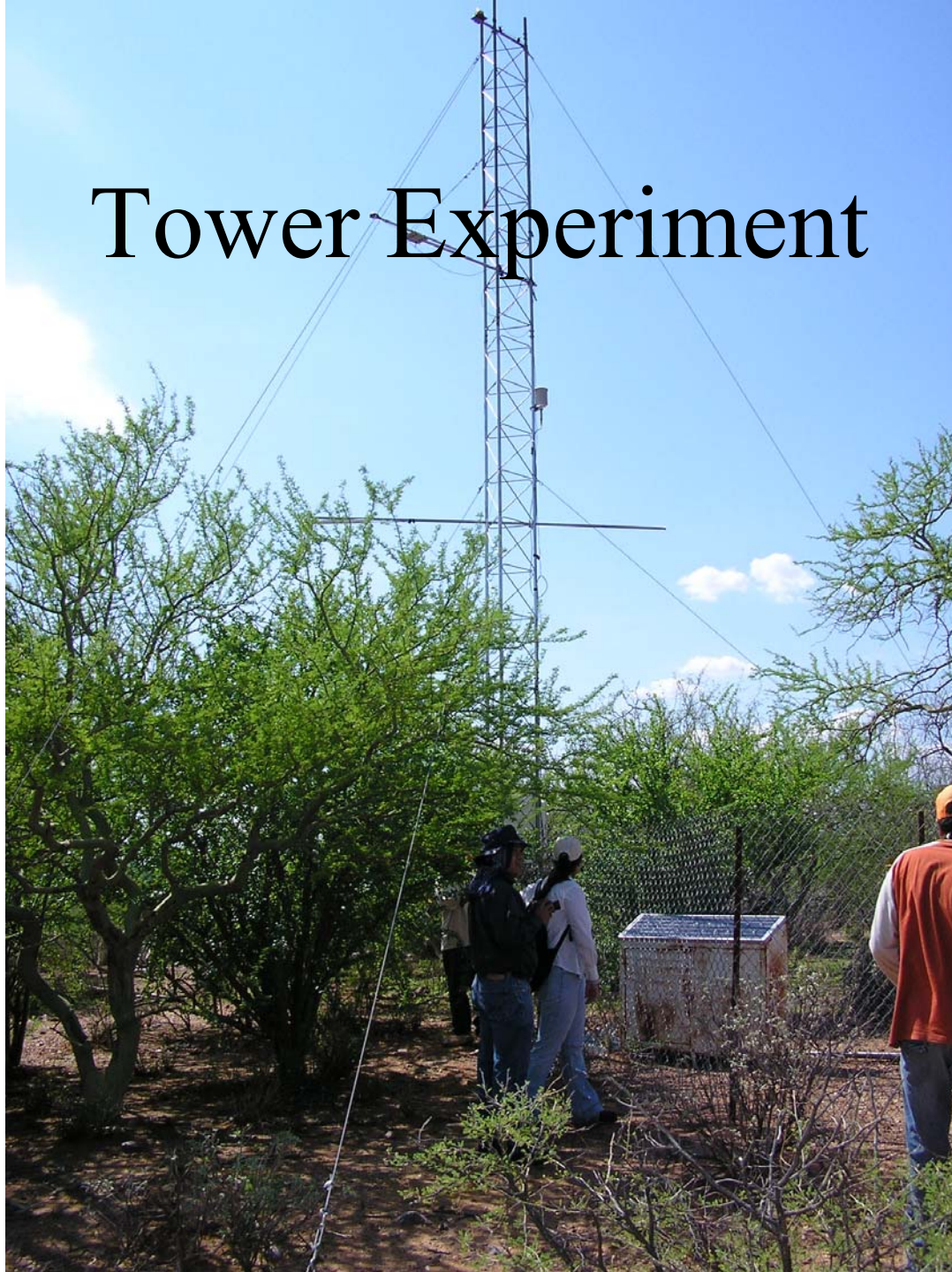
Vegetation & Soil

- Desert to Sub-Tropical Vegetation
 - Cacti – Cholla, Prickly Pear, Organ Pipe
 - Mesquite and Ocotillo
 - Soft-stemmed ground cover
 - Deciduous trees in higher elevations
- Rocky Mineral Soil in Mountains
- Silty Soil in Valley

Topography & Climate

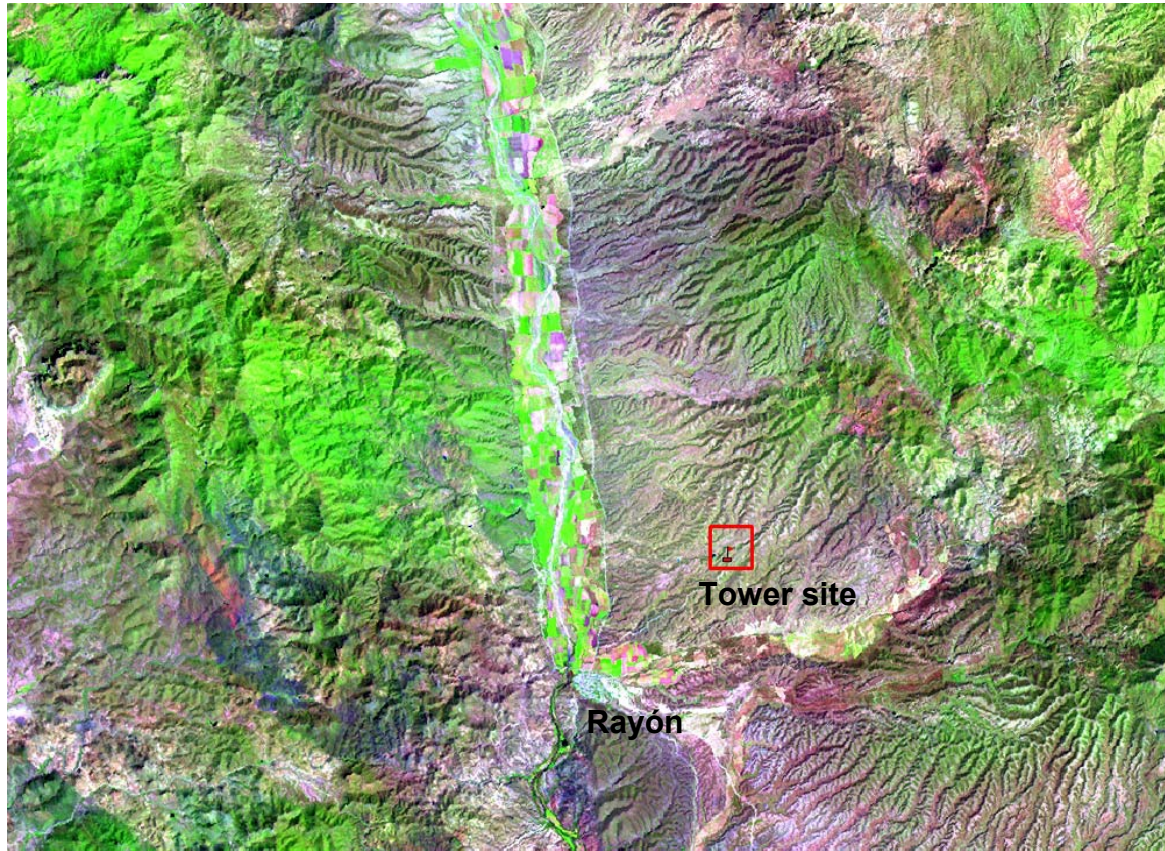
- Elevation range from 600 to 1600m
- Very complex terrain
- Temperature range from 0°C to 40+°C
- Seasonal monsoons in mid-summer and late-winter

Tower Experiment



Experiment 3. Soil moisture measurement around fluxes tower

1. Study site



- Located 4 km Northeast of Rayón, Sonora, México.
- Established in a subtropical Shrubland ecosystem.

Experiment 3. Soil moisture measurement around fluxes tower

2. Purpose

- Study the variability of soil moisture within an area of 250 m²
- This will be accomplished by taking soil temperature and soil moisture



Soil temperature at 1, 5 and 10 cm depth.
Soil moisture (Thetaprobe)

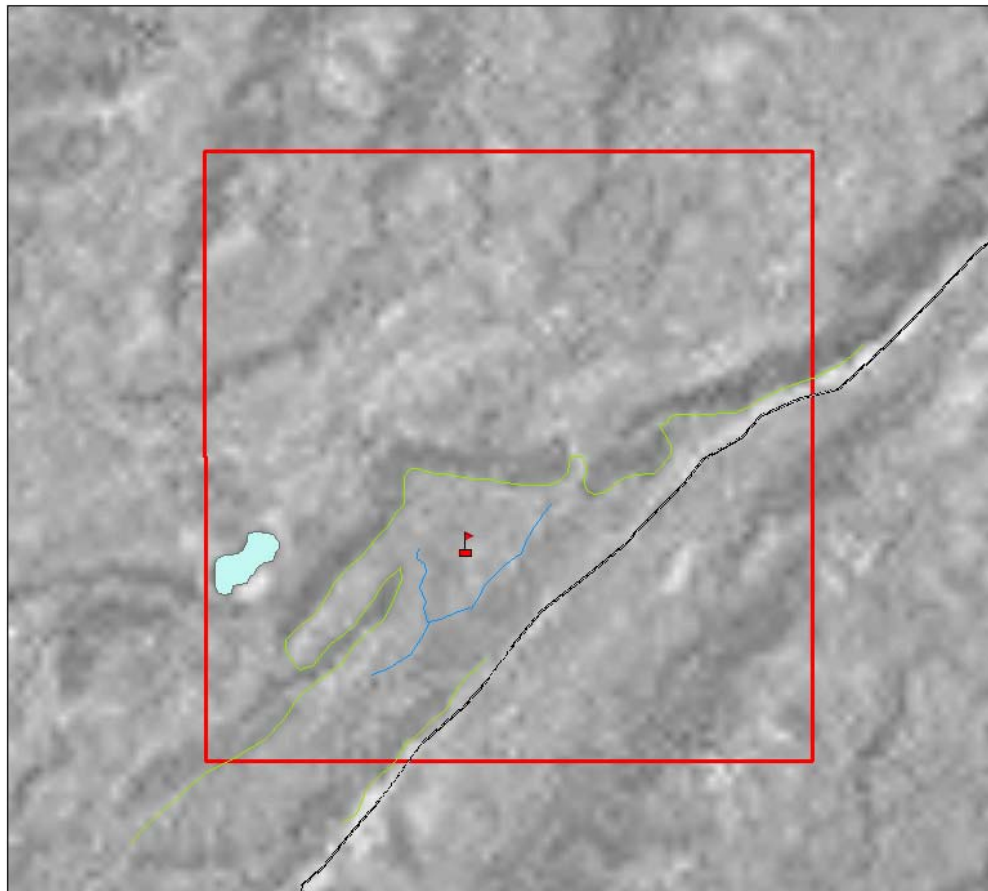


Soil surface temperature (IR thermometer)

Experiment 3. Soil moisture measurement around fluxes tower

3. Sampling plots set up

- Original Plots: 1 km²
- Simulates a LST MODIS pixel



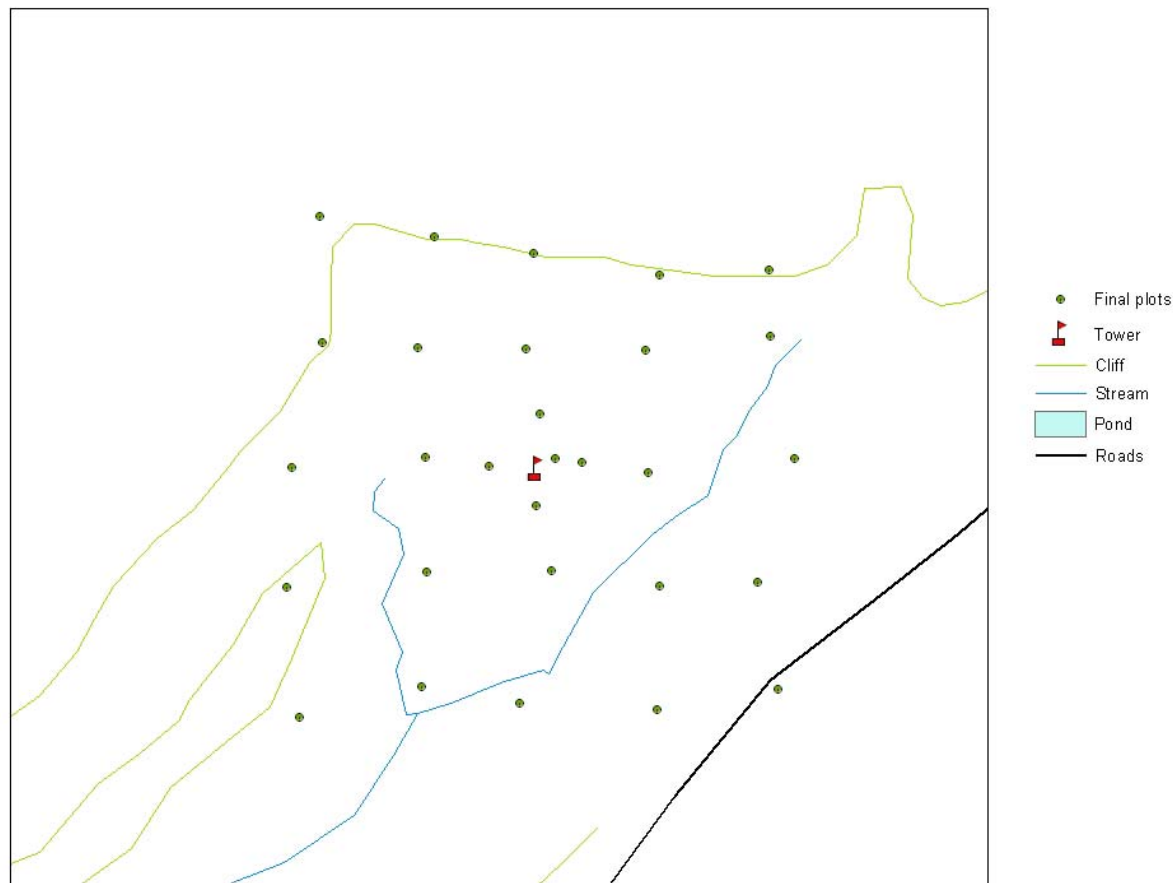
- Tower
- Cliff
- Stream
- Pond
- Roads



Experiment 3. Soil moisture measurement around fluxes tower

3. Sampling plots set up

- Final Plots: 250 m²
- Simulates a Vegetation MODIS pixel



Experiment 3. Soil moisture measurement around fluxes tower

4. Plot dimensions:

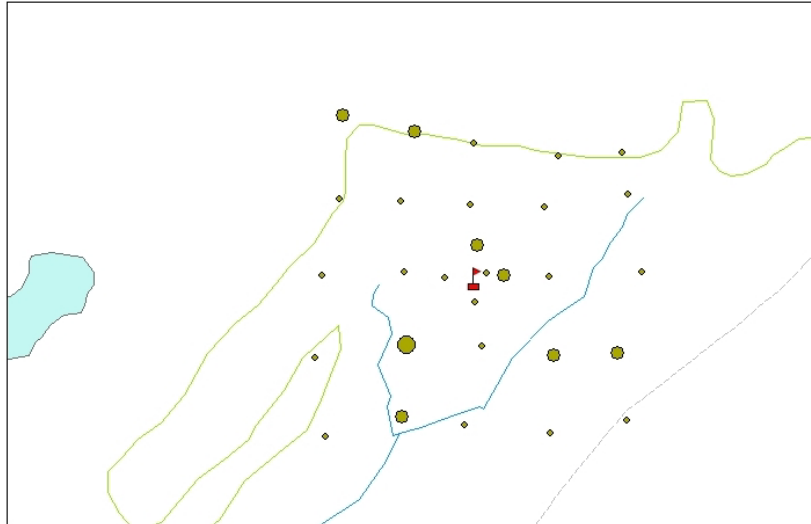
- Plot dimension: 1m²
- It contains four randomized points of sampling around the plot
- Possible bias



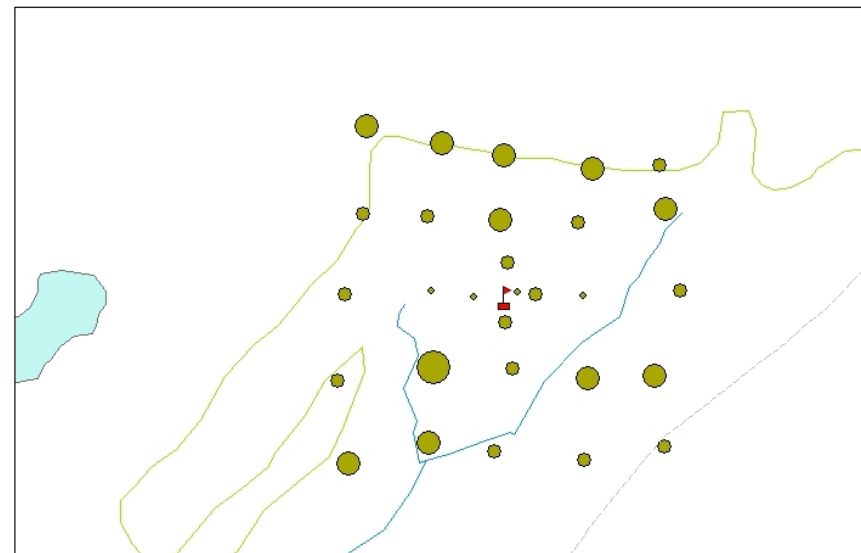
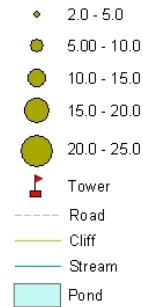
Experiment 3. Soil moisture measurement around fluxes tower

5. Preliminary results:

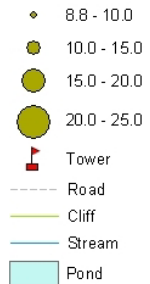
a) Rain event: July 11th 2006



• Before Rainfall



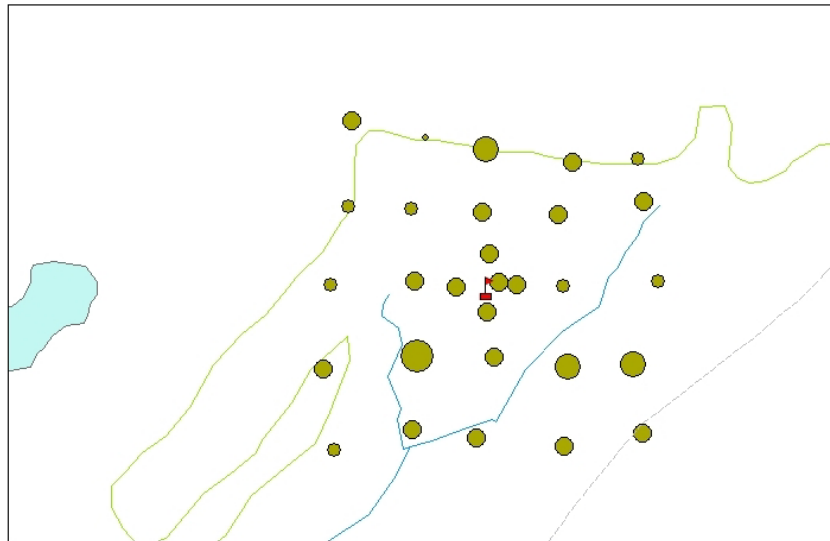
• After Rainfall



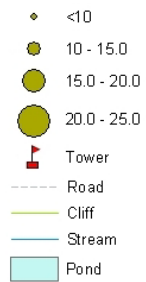
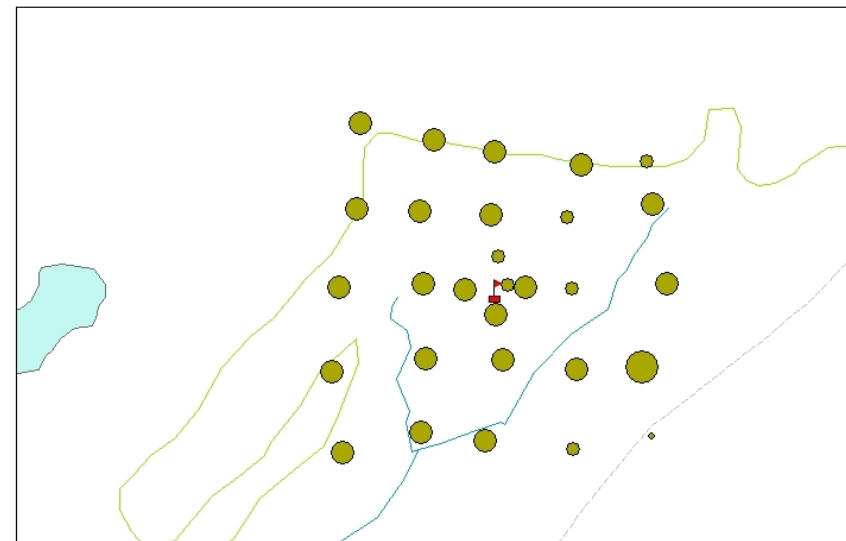
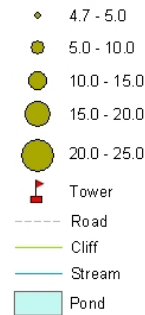
Experiment 3. Soil moisture measurement around fluxes tower

5. Preliminary results:

b) Rain event: July 13th 2006



• Before Rainfall

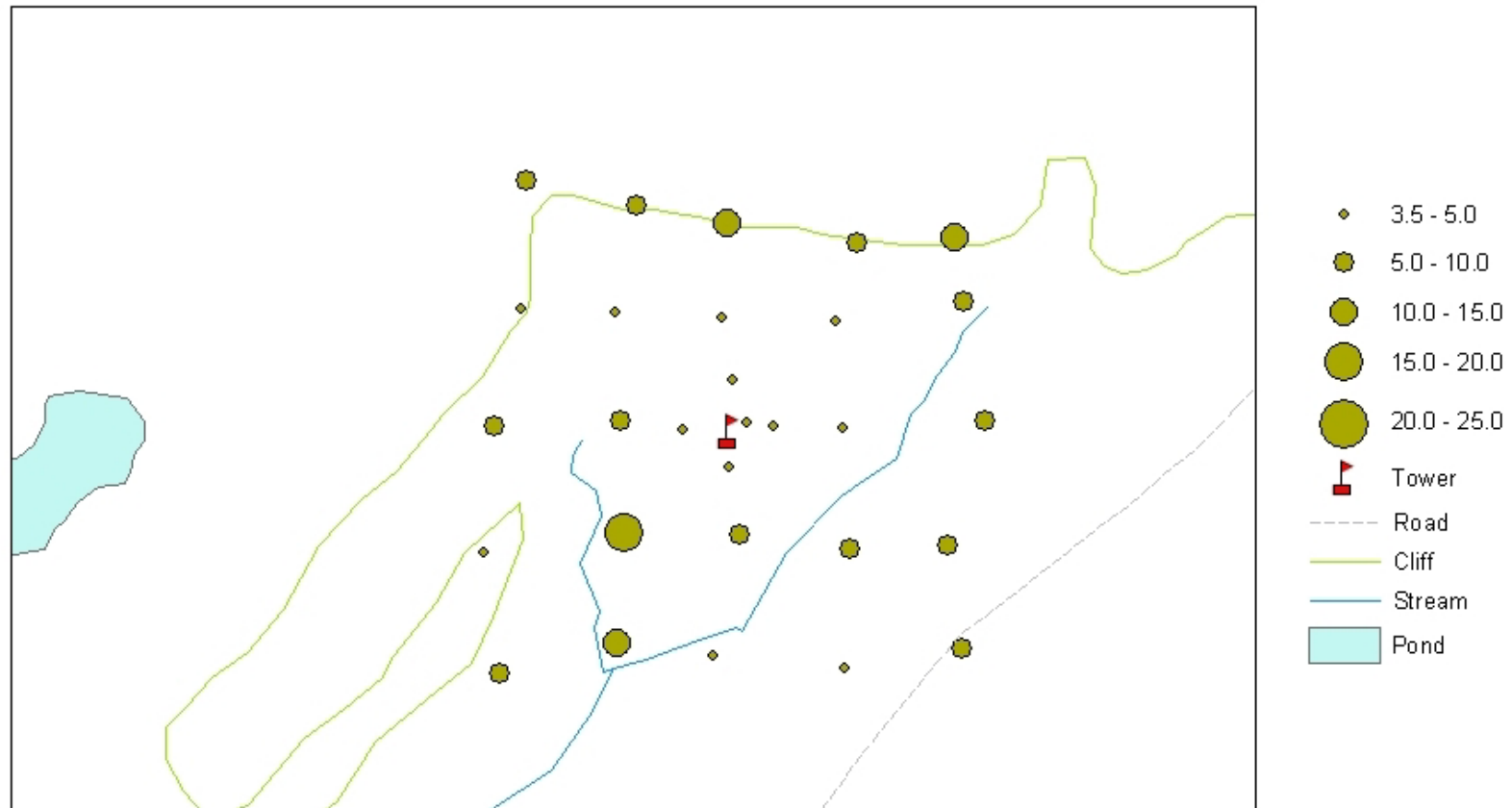


• After Rainfall

Experiment 3. Soil moisture measurement around fluxes tower

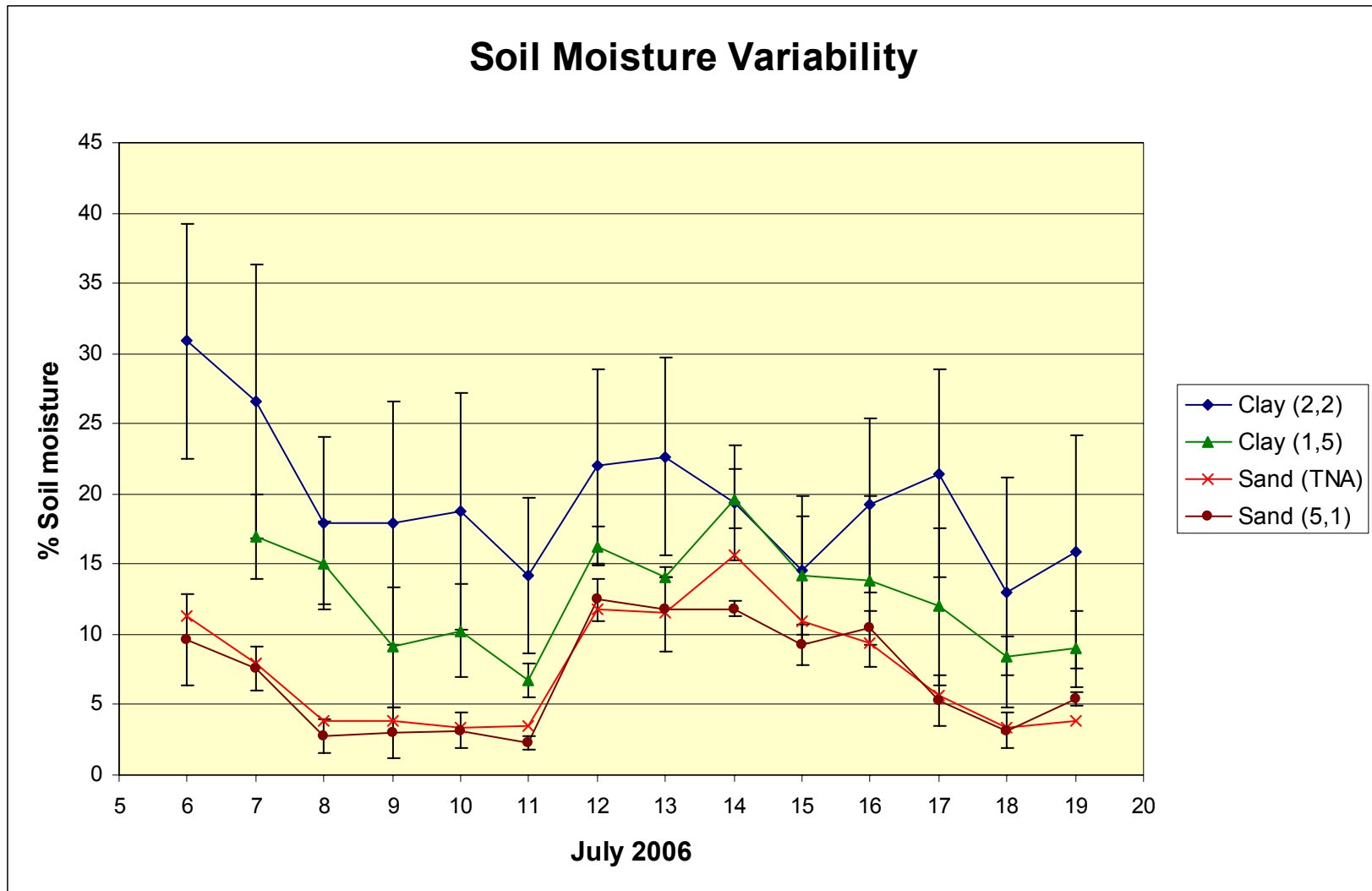
5. Preliminary results:

c) Last day of sampling: July 19th 2006



Experiment 3. Soil moisture measurement around fluxes tower

5. Preliminary results:



Experiment 3. Soil moisture measurement around fluxes tower

5. Preliminary results:

d) Plots 2,2 and 2,5 (clay soils)



- Field method
- Plasticity test
- Clay films

Valley Event Rain Gauges

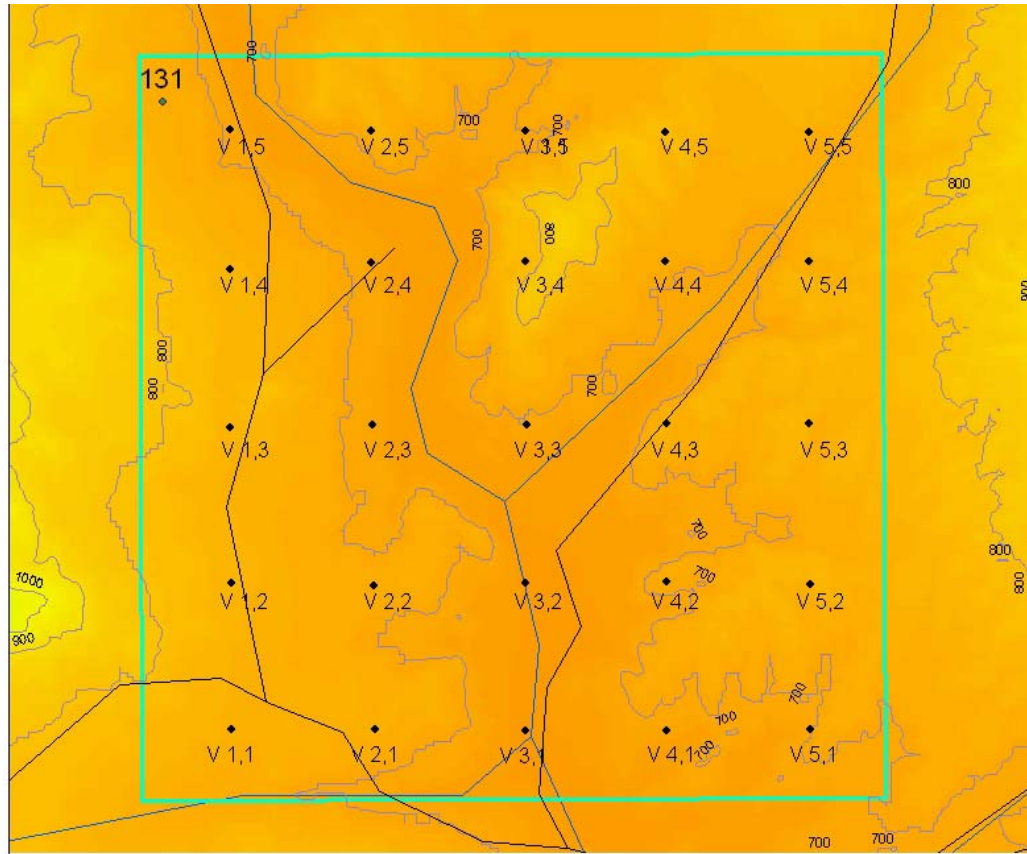


Equipment

- 25 individual event rain gauges
- 1 tipping bucket rain gauge
- GPS



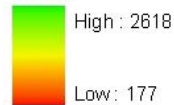
Site Selection & Planned Distribution



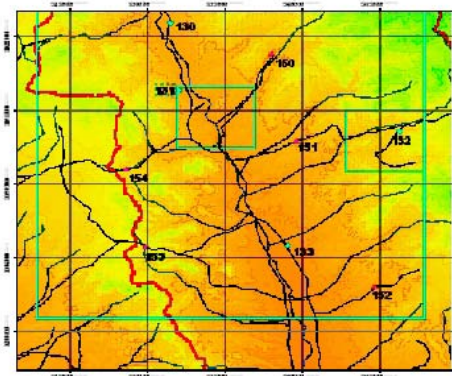
Legend

dem29_utm_wgs

Value

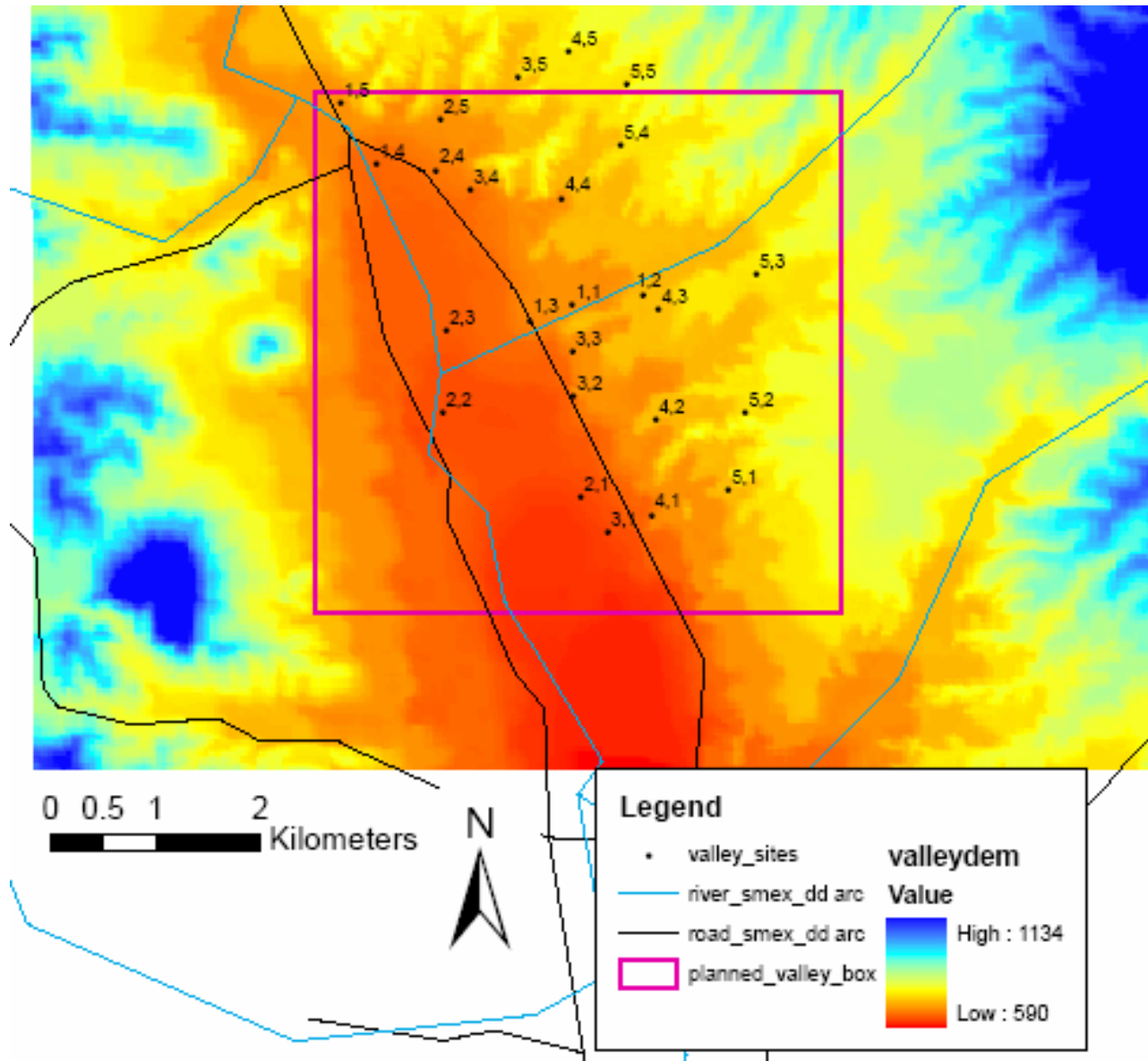


- dem29_ctour100
- Roads
- river_smex_dd arc
- ◆ smex04gauges
- valley_plot



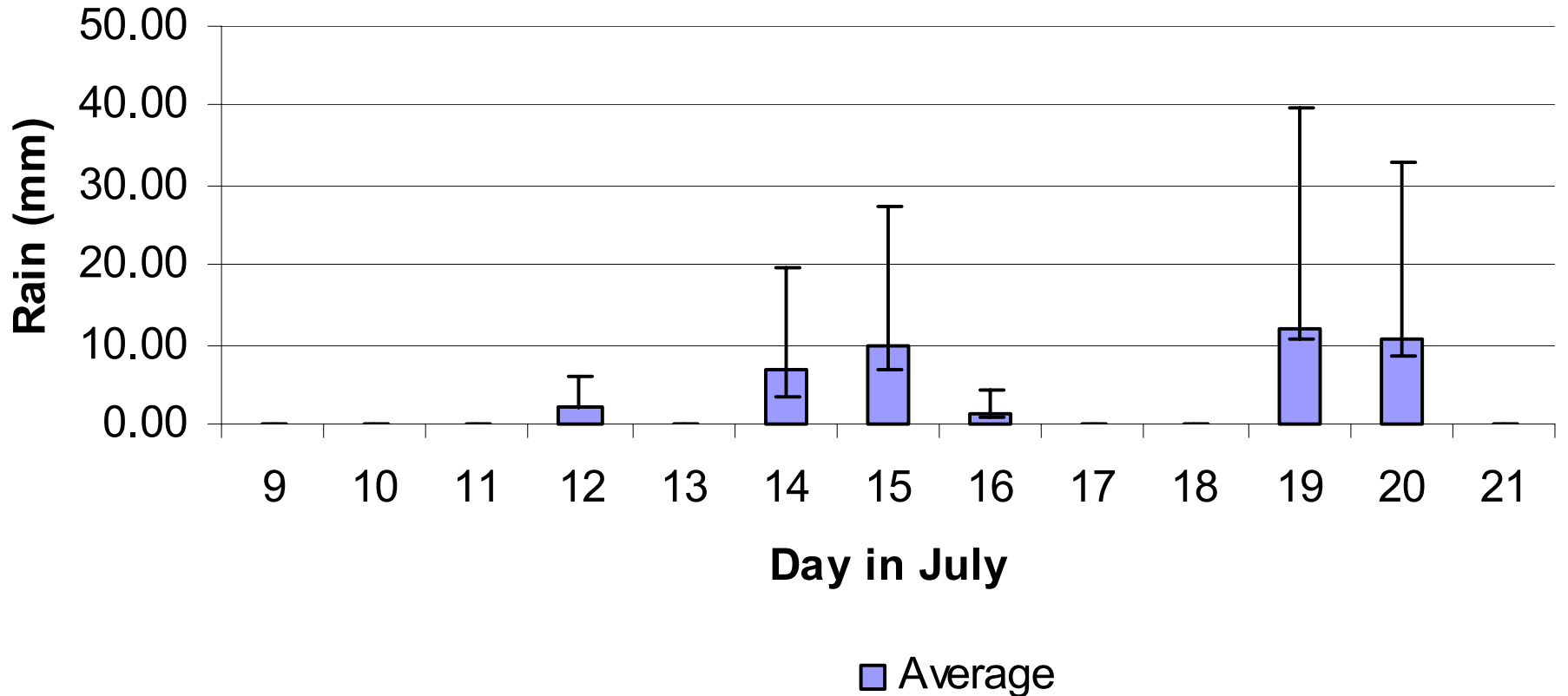
Index Map

Actual Site Distribution

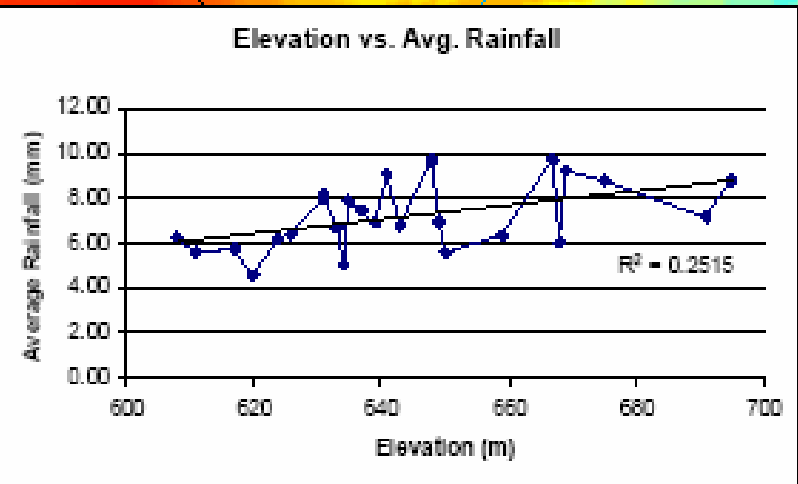
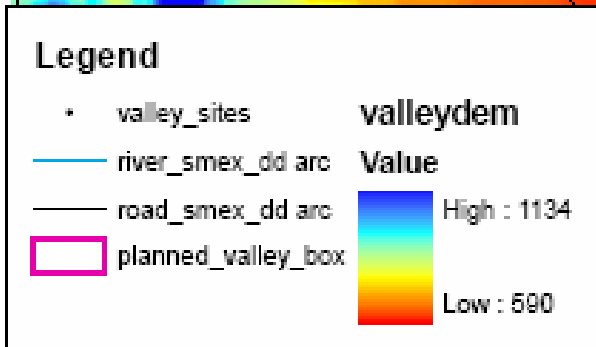
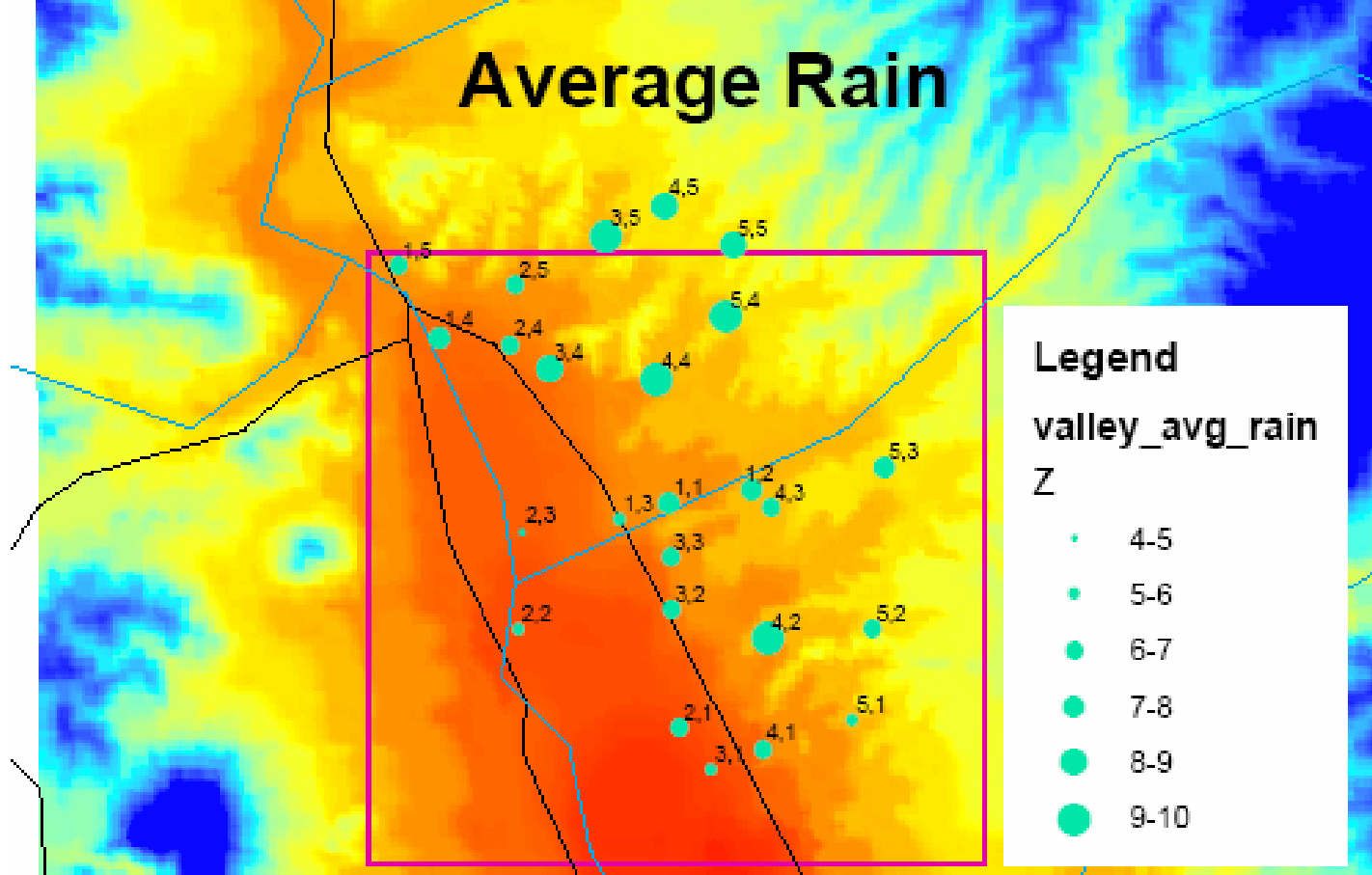


Rainfall Events

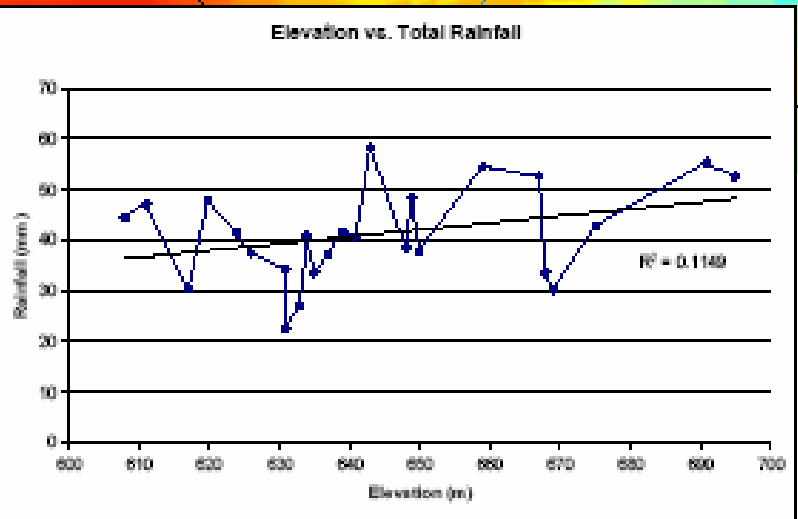
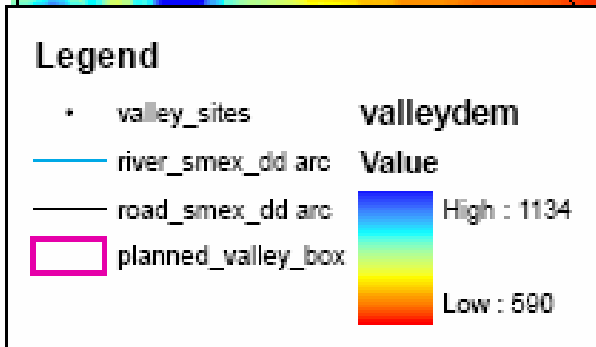
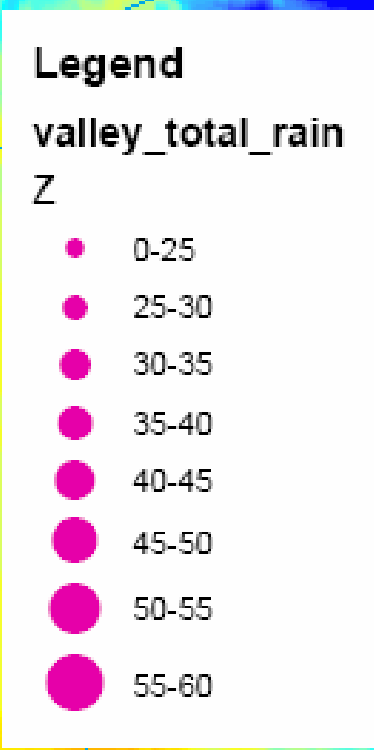
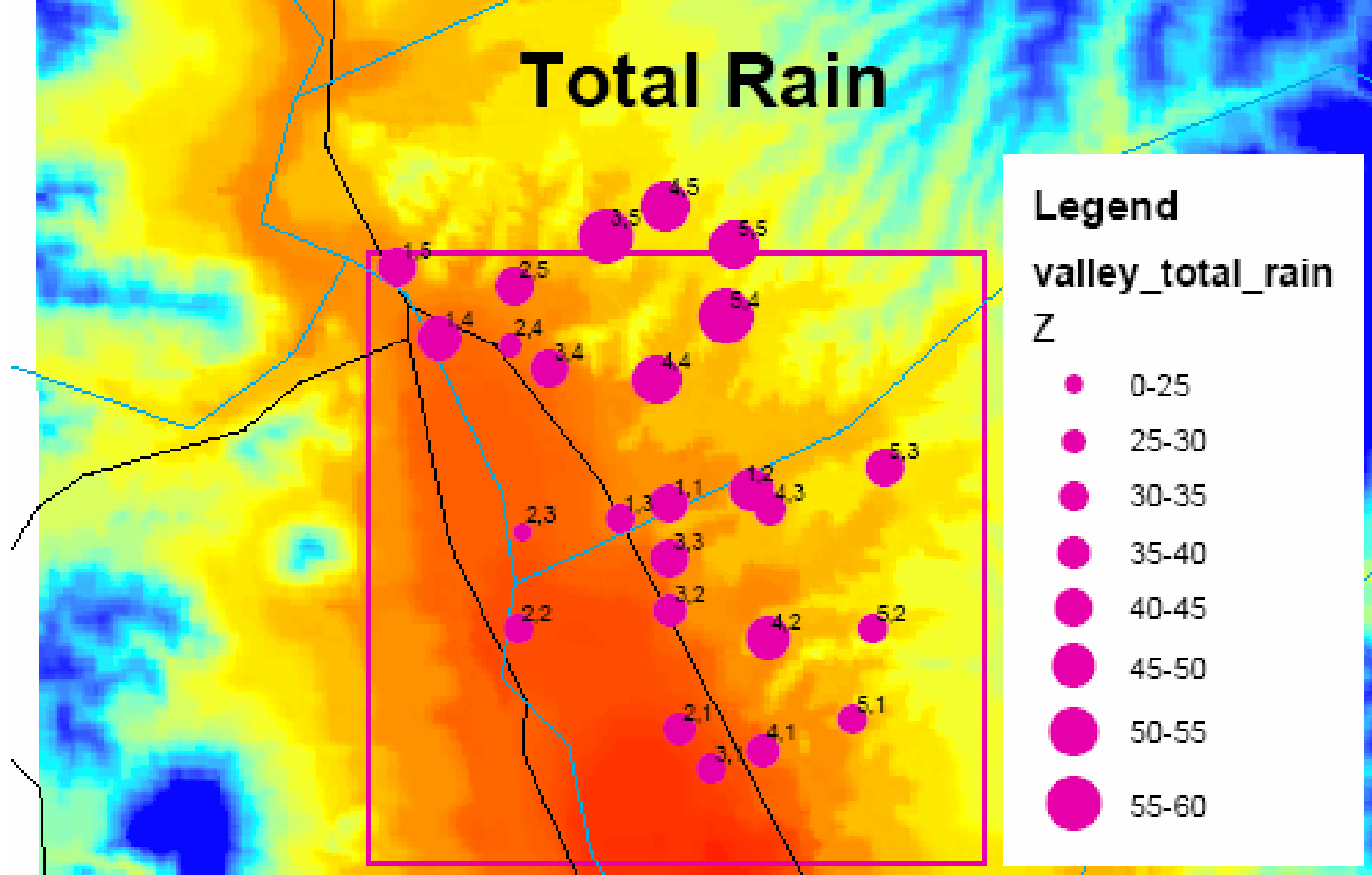
Average Rainfall



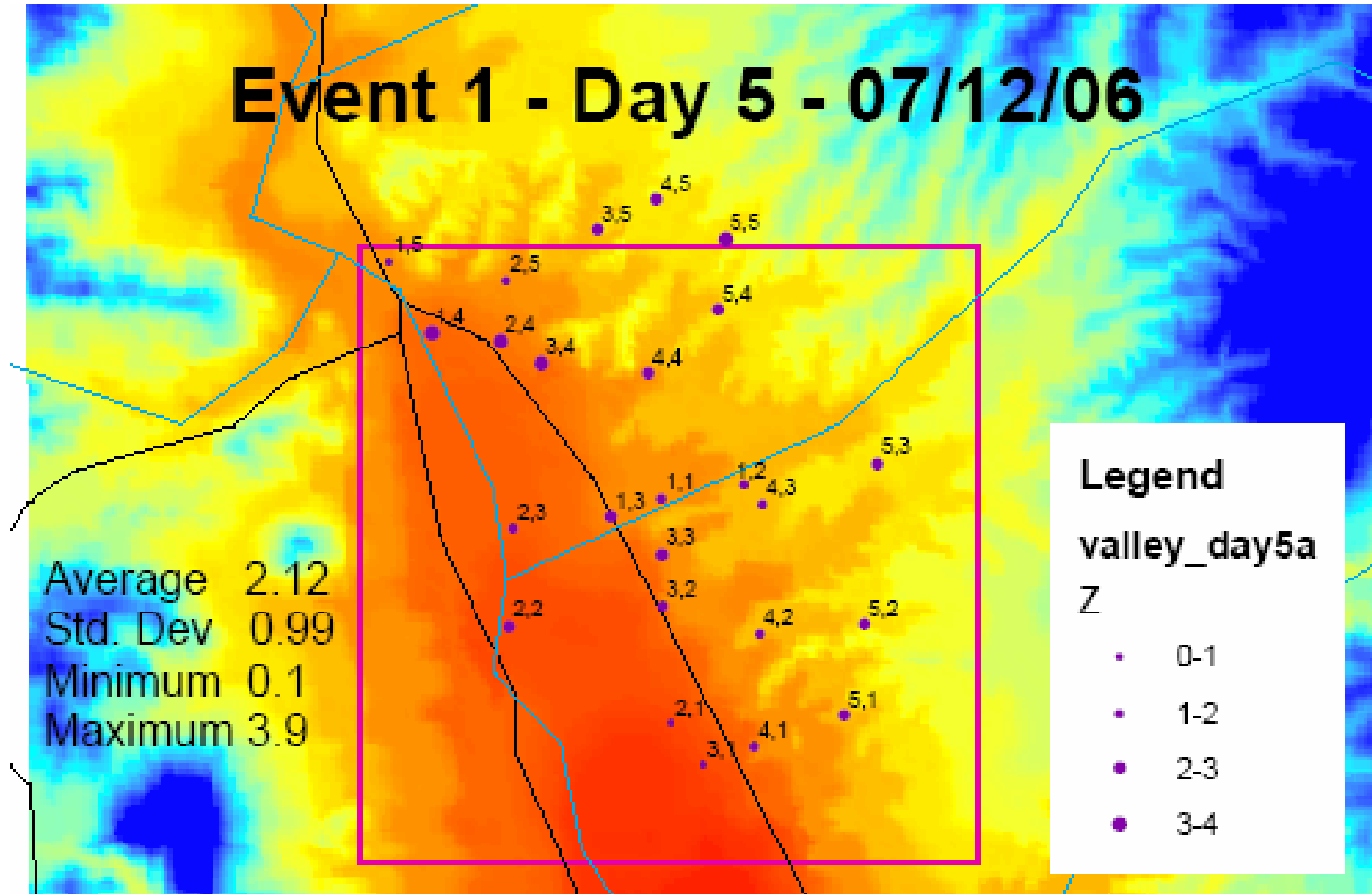
Average Rain



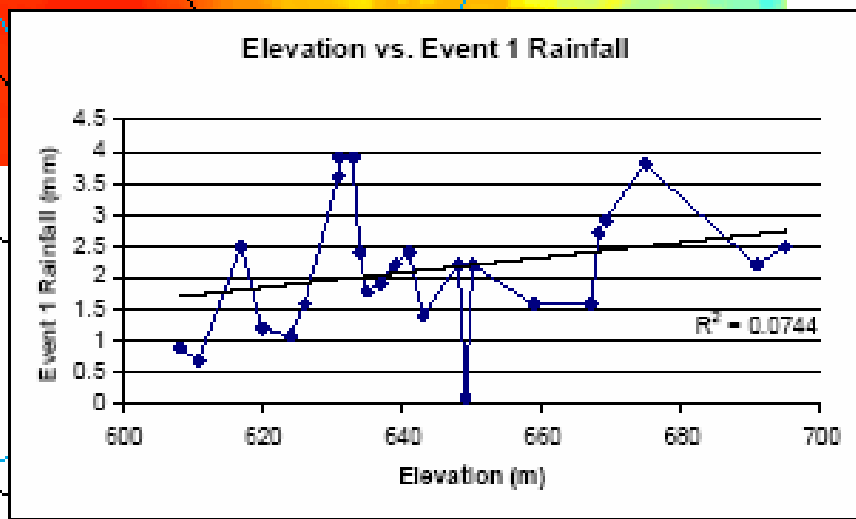
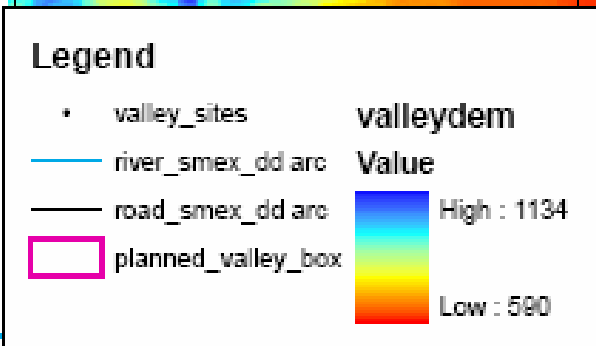
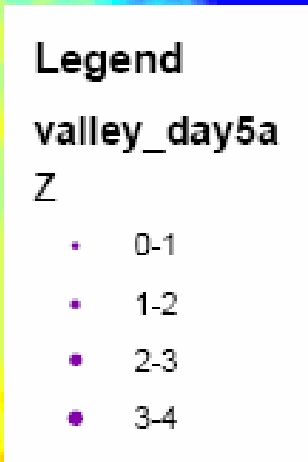
Total Rain



Event 1 - Day 5 - 07/12/06



Average 2.12
 Std. Dev 0.99
 Minimum 0.1
 Maximum 3.9



Event 2 - Day 7 - 7/14/06

Legend

valley_day7a

Z

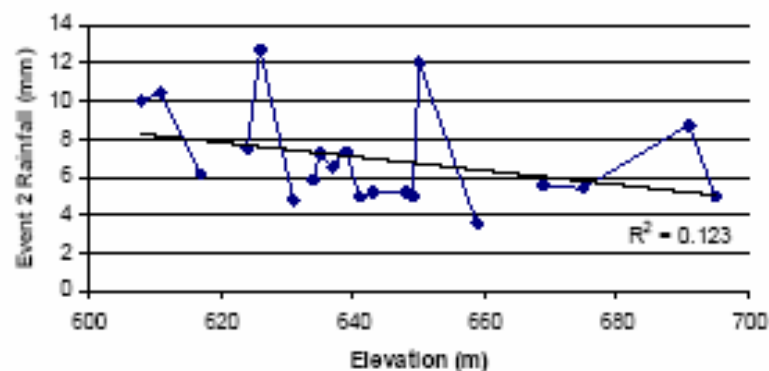
- 0-1
- 1-2
- 2-3
- 3-4
- 4-5
- 5-6
- 6-7
- 7-8
- 8-9
- 9-10
- 10-11
- 11-12
- 12-13

Legend

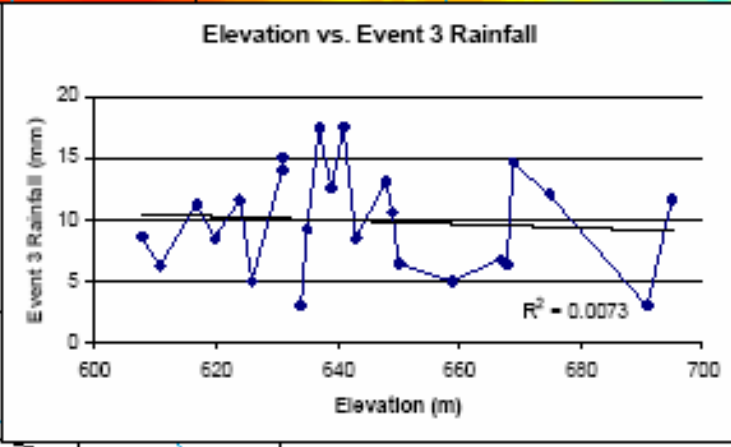
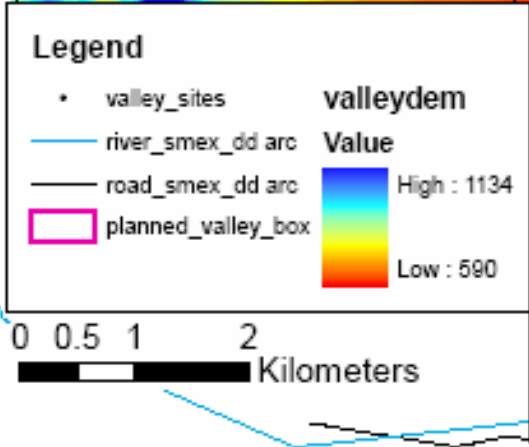
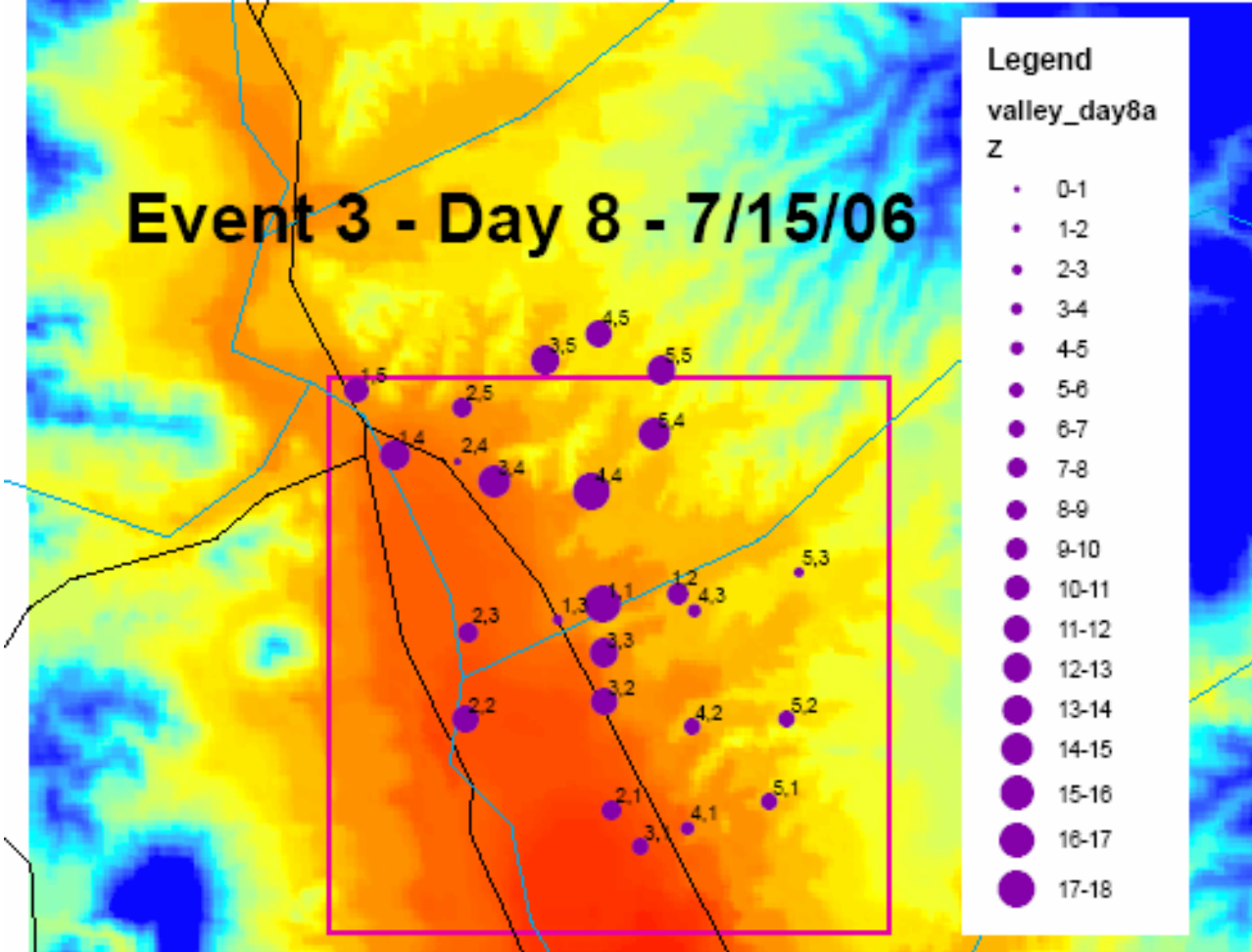
- valley_sites
 - river_smex_dd arc
 - road_smex_dd arc
 - ▭ planned_valley_box
- valleydem**
Value
- High : 1134
Low : 590

0 0.5 1 2
Kilometers

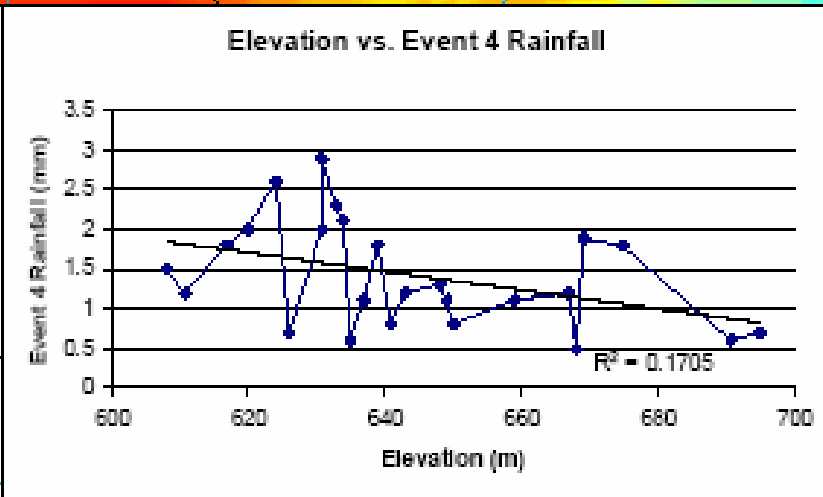
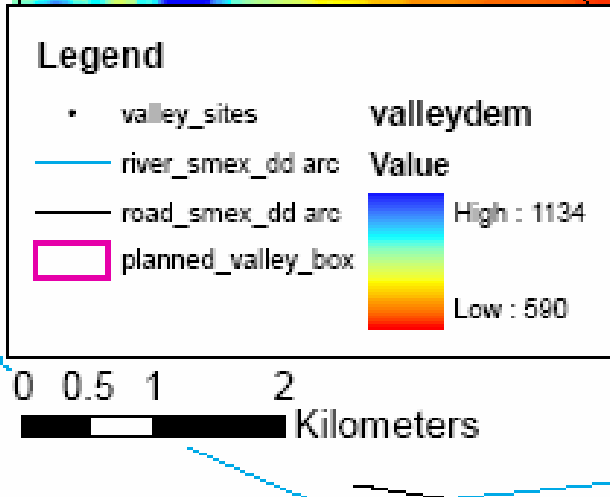
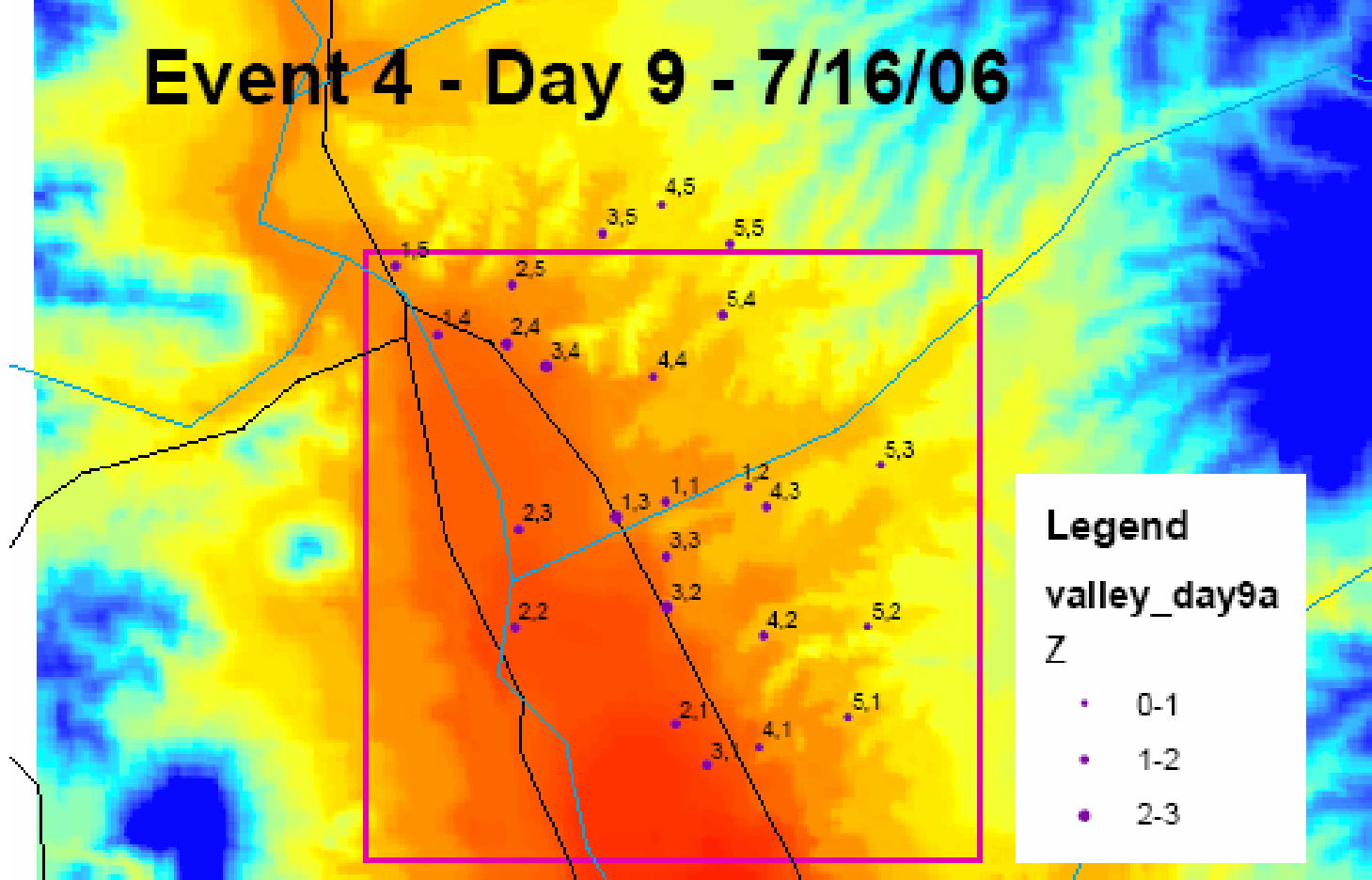
Elevation vs. Event 2 Rainfall



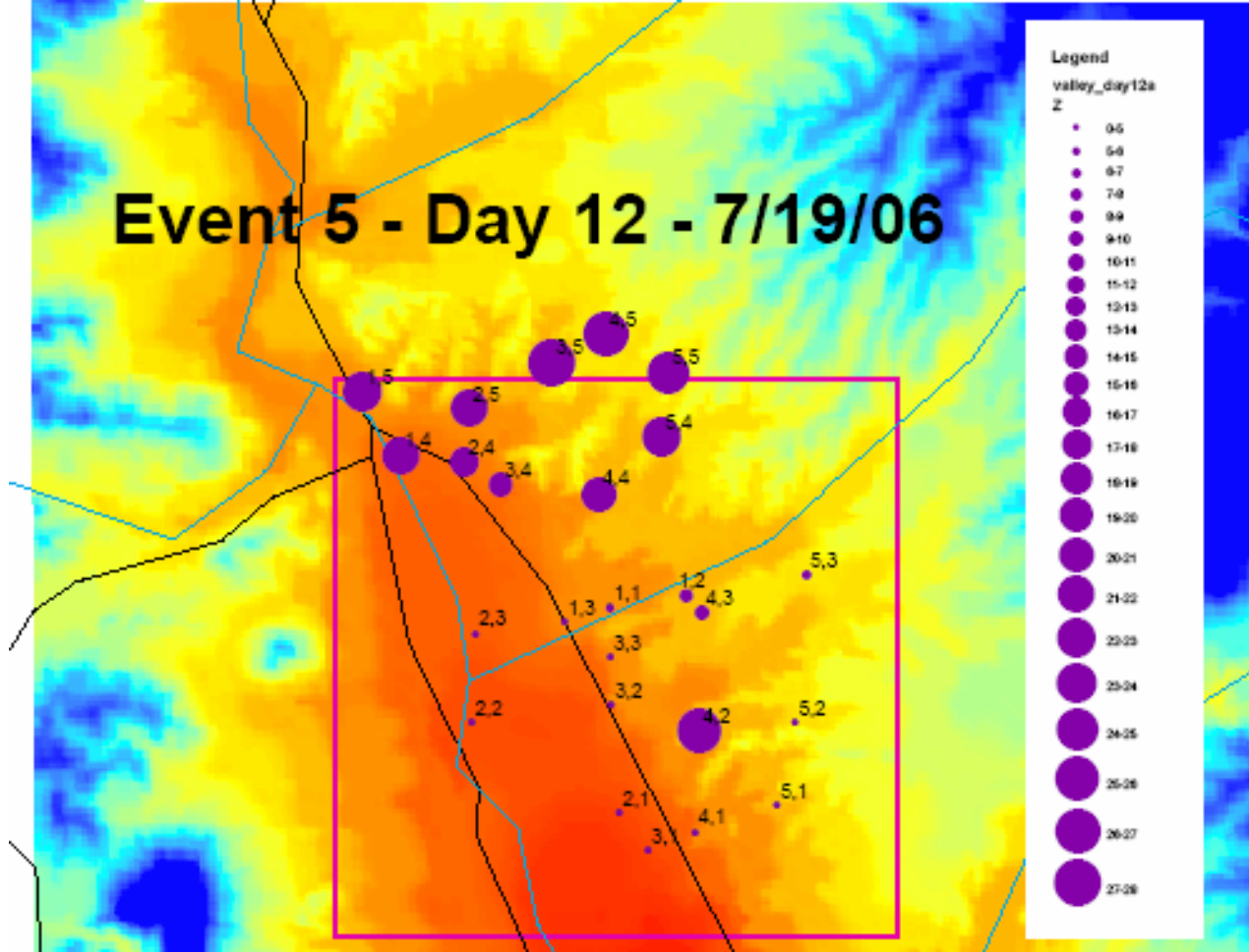
Event 3 - Day 8 - 7/15/06



Event 4 - Day 9 - 7/16/06



Event 5 - Day 12 - 7/19/06

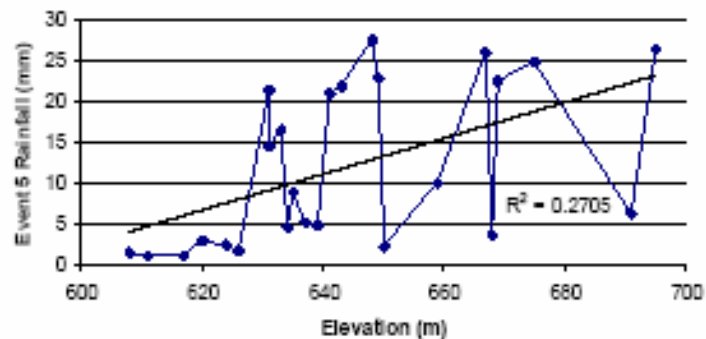


Legend

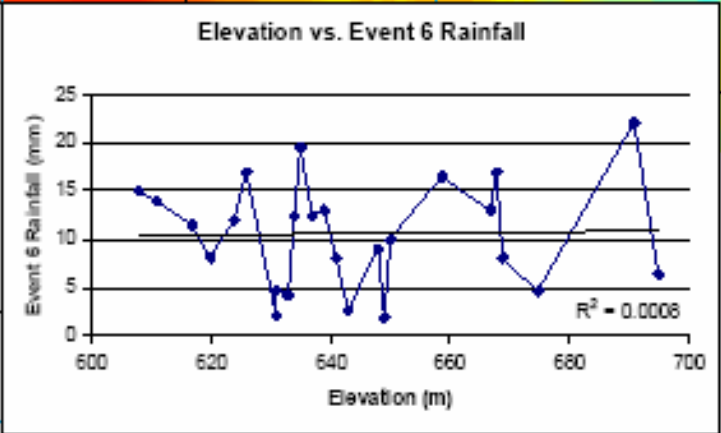
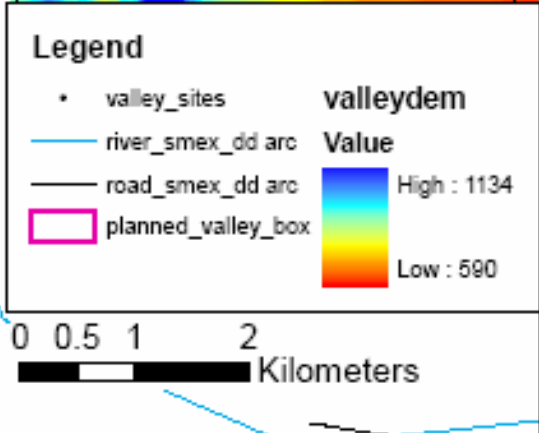
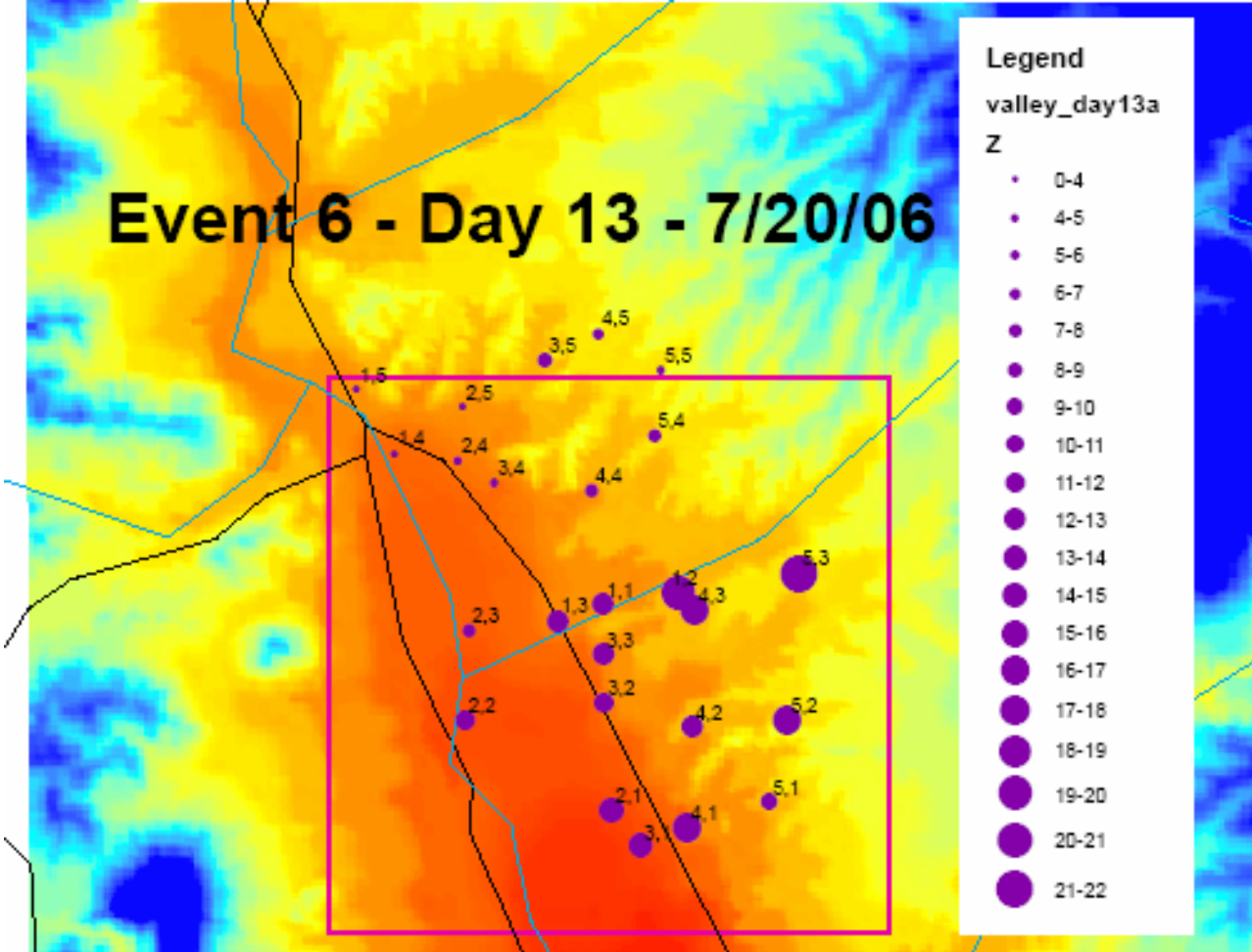
- valley_sites
 - river_smex_dd arc
 - road_smex_dd arc
 - ▭ planned_valley_box
- valleydem**
Value
- High : 1134
Low : 590

0 0.5 1 2
Kilometers

Elevation vs. Event 5 Rainfall



Event 6 - Day 13 - 7/20/06



Mountain Event Rain Gauges

- Equipment
- Site Selection & Planned Distribution
- Actual Distribution

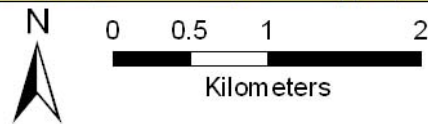
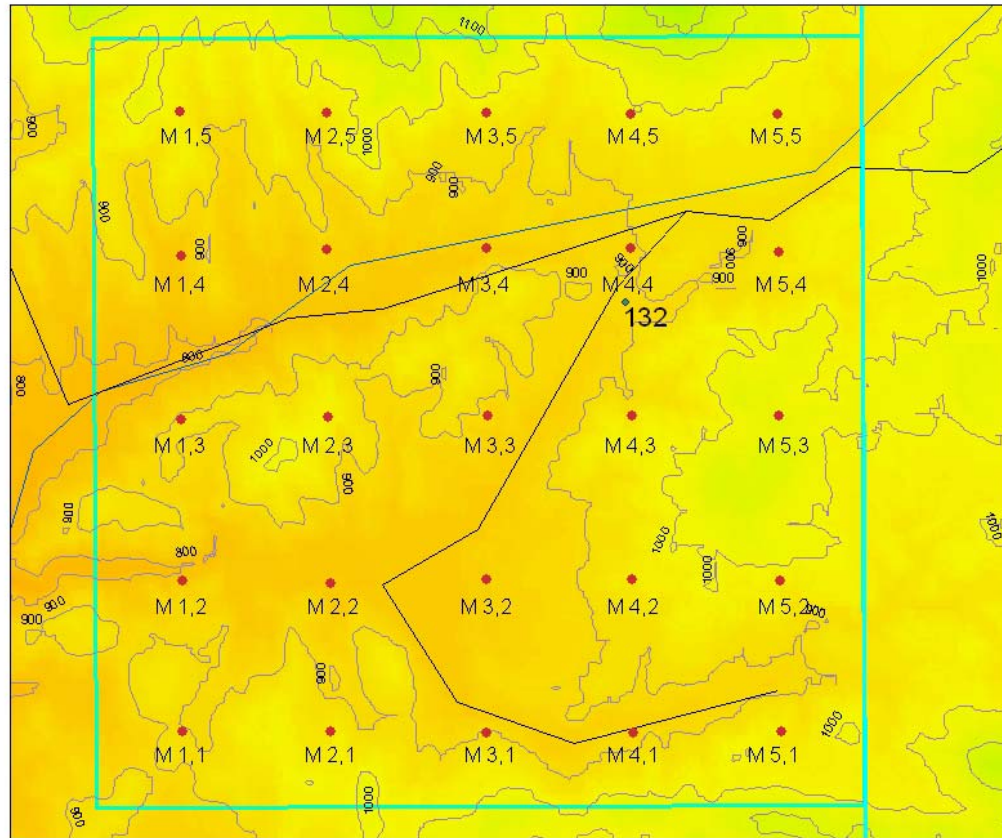


Equipment

- 25 individual event rain gauges
- 3 tipping bucket rain gauges
- GPS



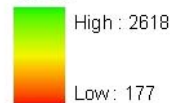
Site Selection & Planned Distribution



Legend

dem29_utm_wgs

Value



dem29_ctour100

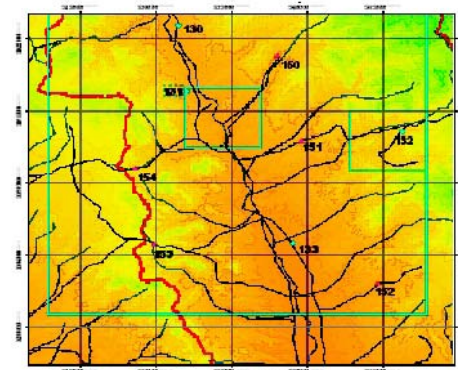
Roads

river_smex_dd arc

smex04gauges

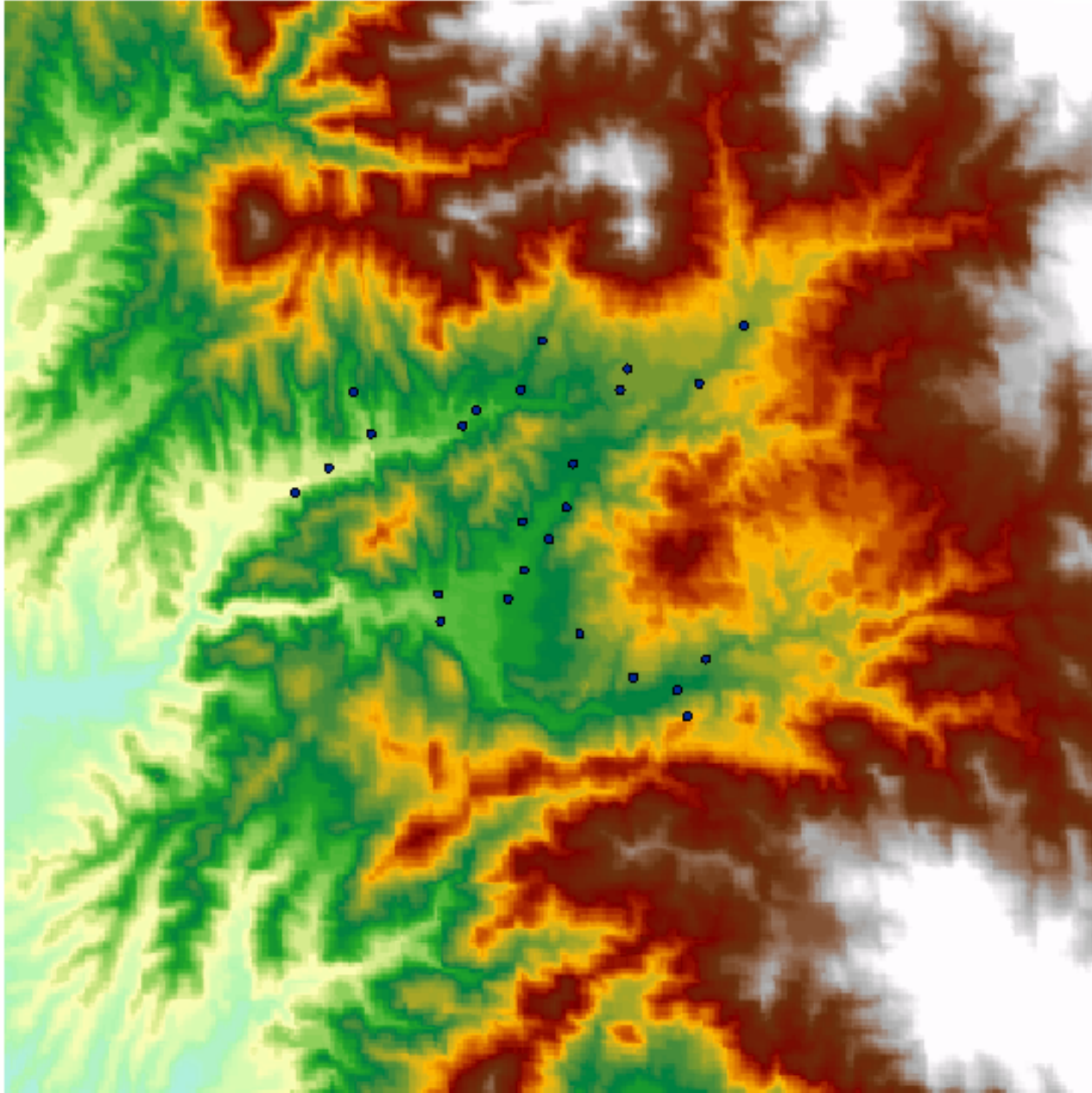
◆ smex04gauges

□ mountain_plot



Index Map

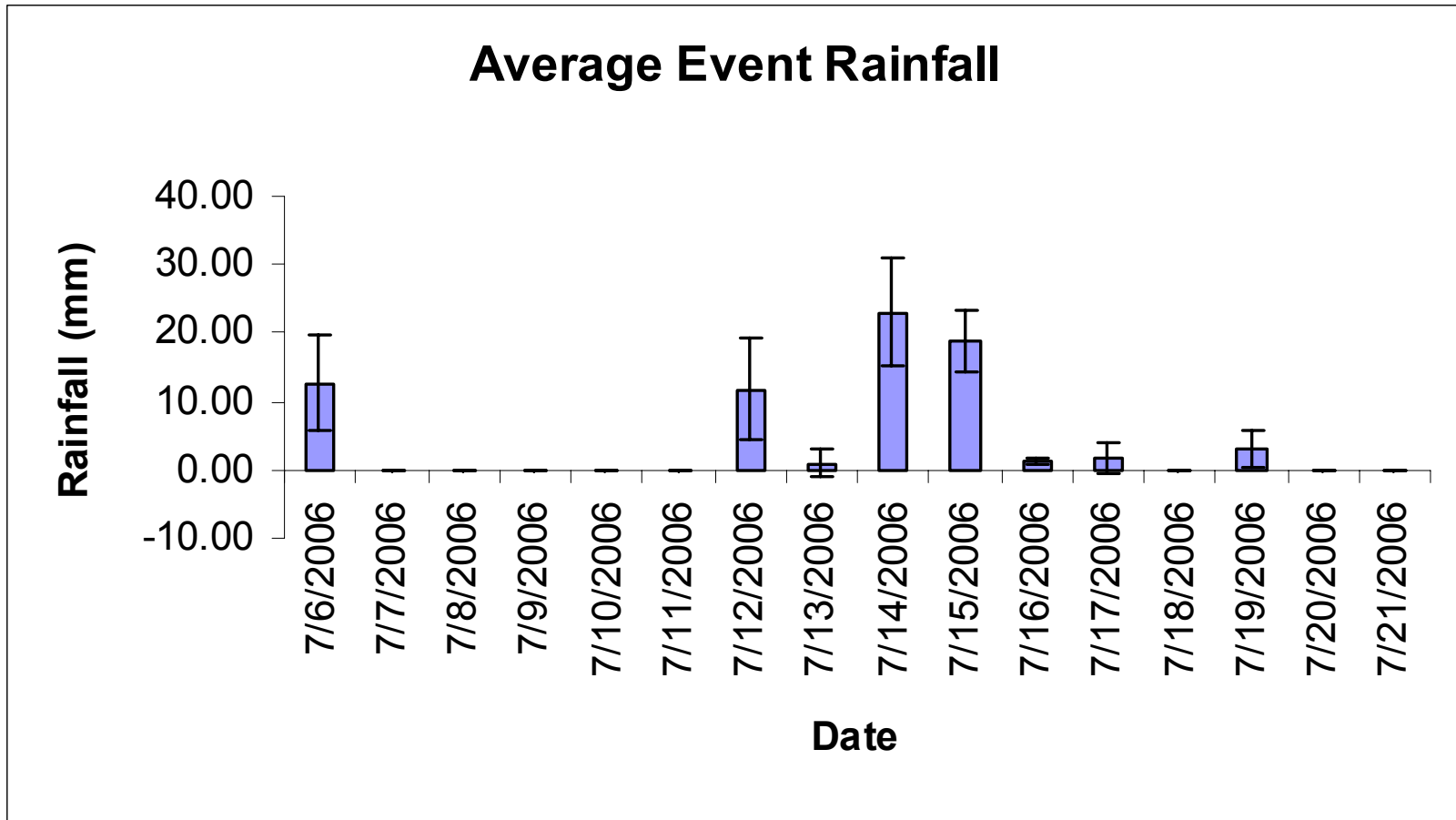
Actual Distribution



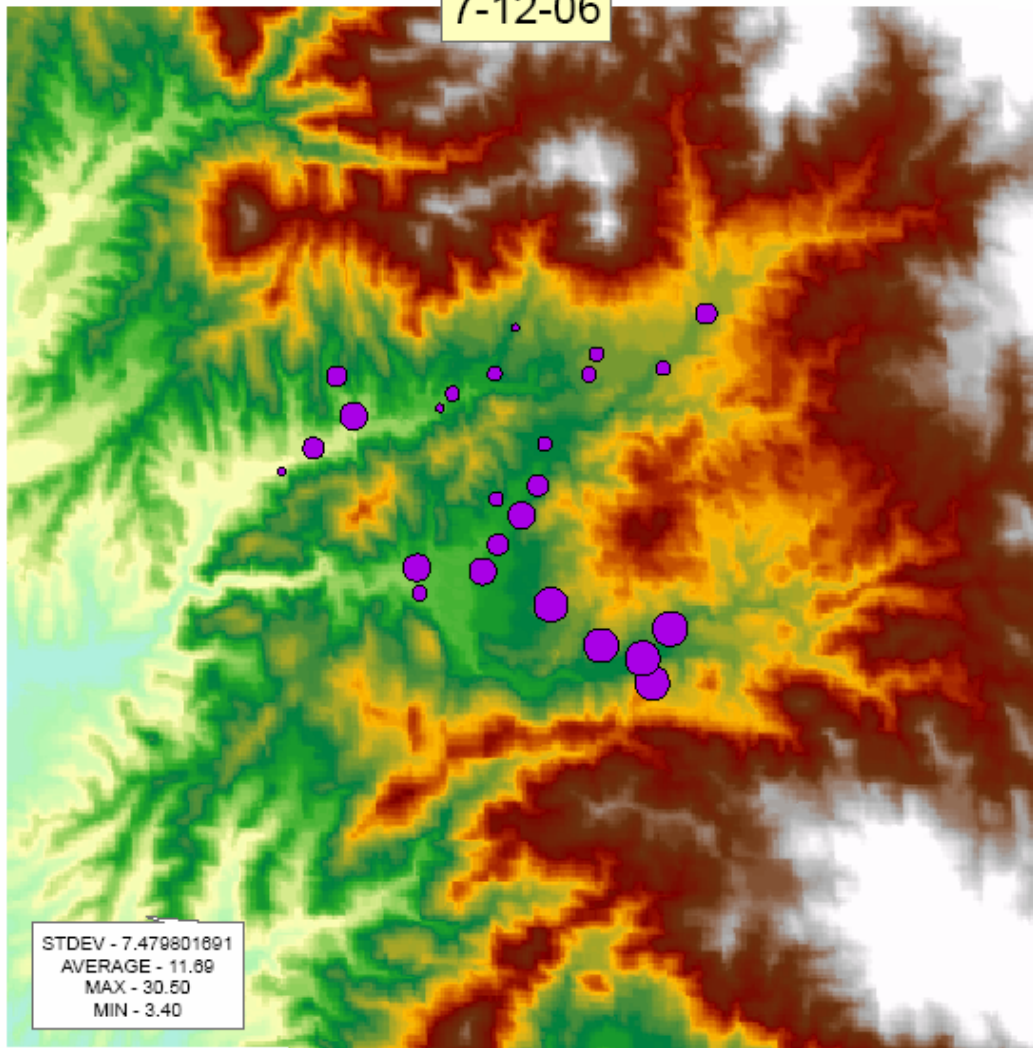
Topography & Climate

- Elevation range from 600 to 1600m
- Very complex terrain
- Temperature range from 0°C to 40+°C
- Seasonal monsoons in mid-summer and late-winter
- Snow at high elevations

Rainfall Events



7-12-06



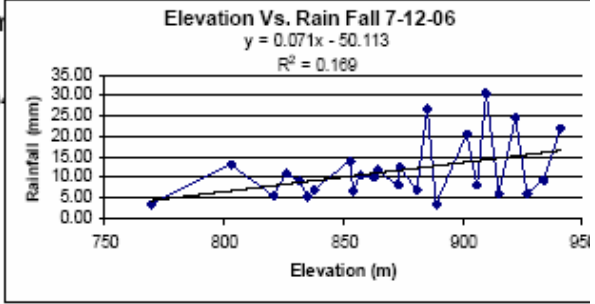
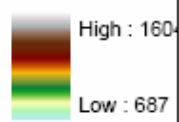
Legend

july 12.txt Events

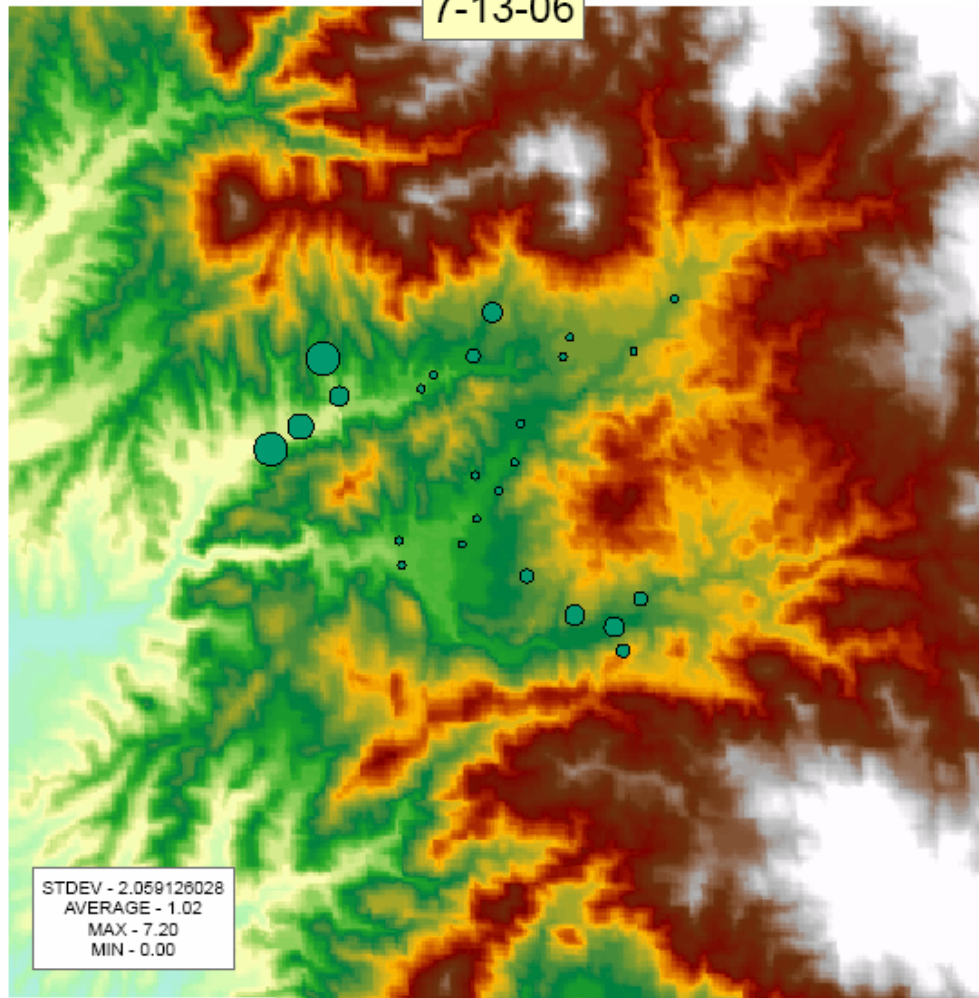
Z

- 3.400000 - 5.200000
- 5.200001 - 8.100000
- 8.100001 - 11.000000
- 11.000001 - 14.000000
- 14.000001 - 30.500000

**mountainden
Value**



7-13-06



Legend

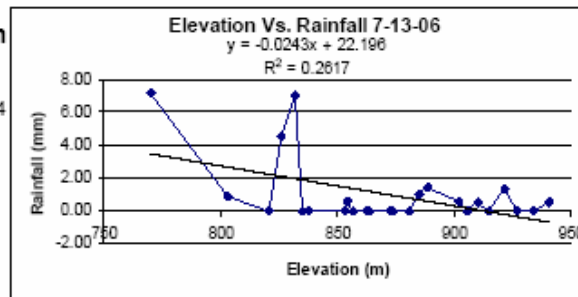
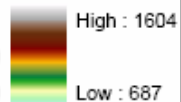
July 13.txt Events

Z

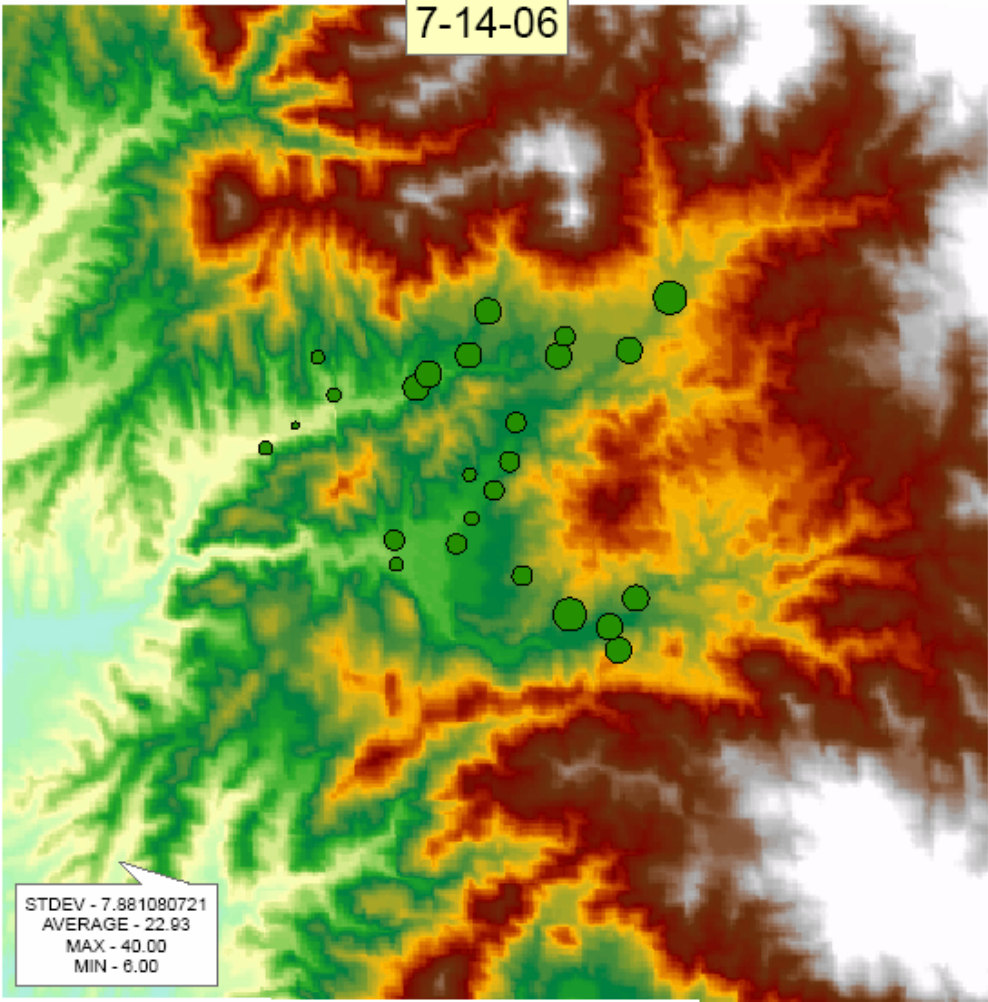
- 0.000000
- 0.000001 - 0.600000
- 0.600001 - 1.400000
- 1.400001 - 4.500000
- 4.500001 - 7.200000

mountainDEM

Value

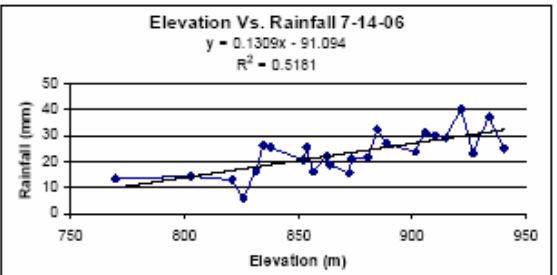
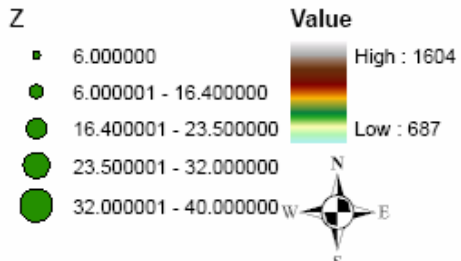


7-14-06

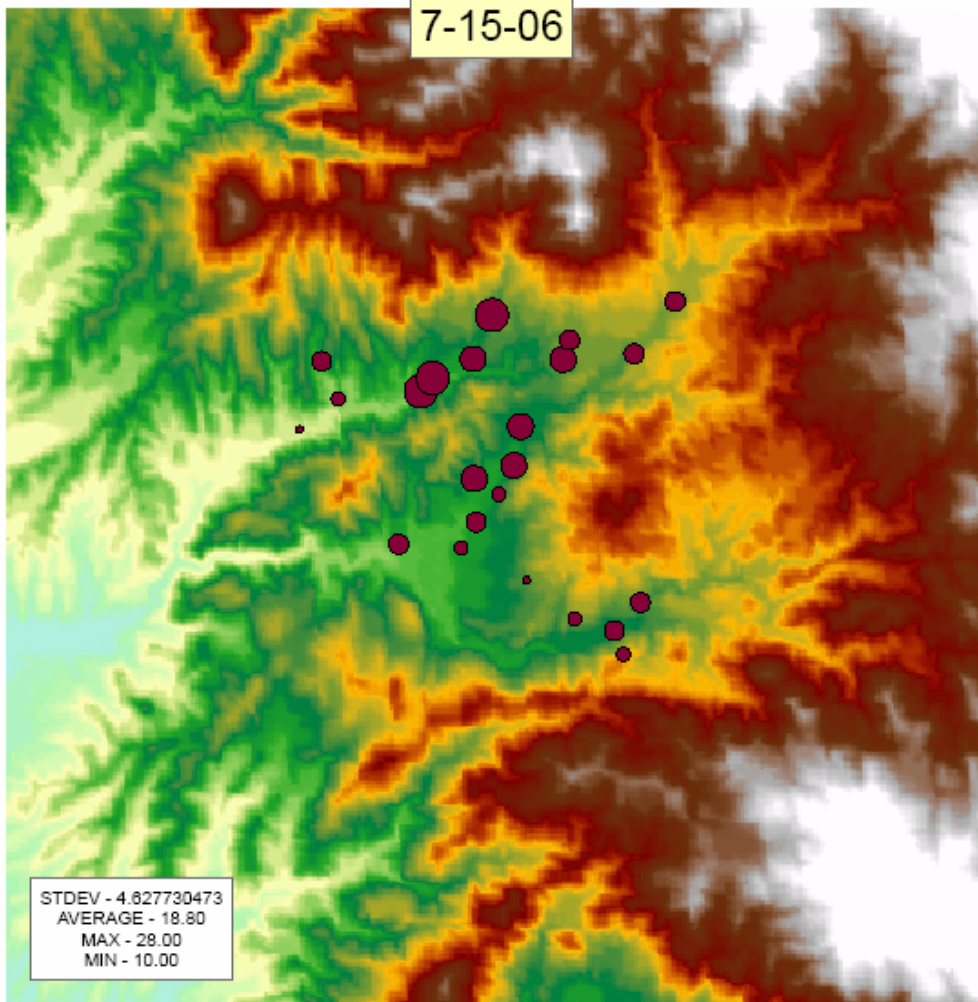


Legend

july 14.txt Events



7-15-06



Legend

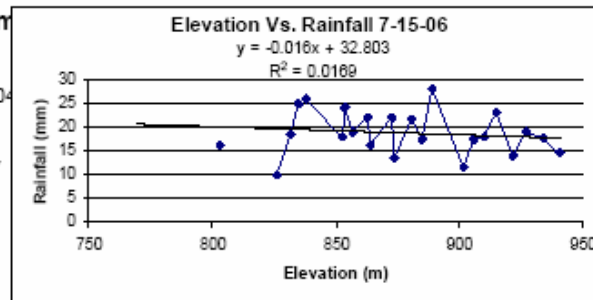
July 15.txt Events

Z

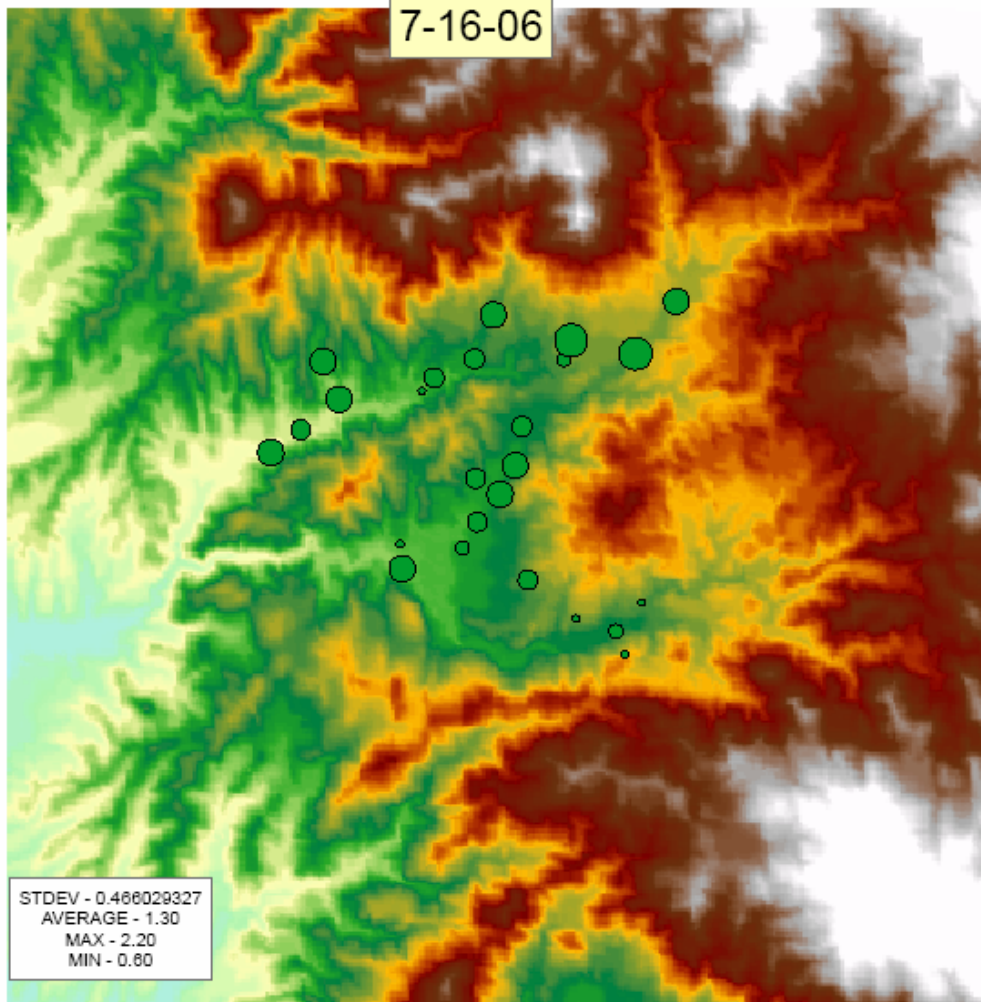
- 10.000000 - 11.500000
- 11.500001 - 16.000000
- 16.000001 - 19.000000
- 19.000001 - 24.000000
- 24.000001 - 28.000000

mountainDEM Value

High : 1604
Low : 687



7-16-06



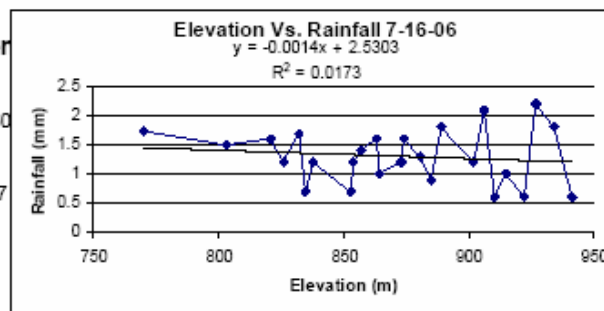
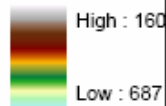
Legend

July 16.txt Events

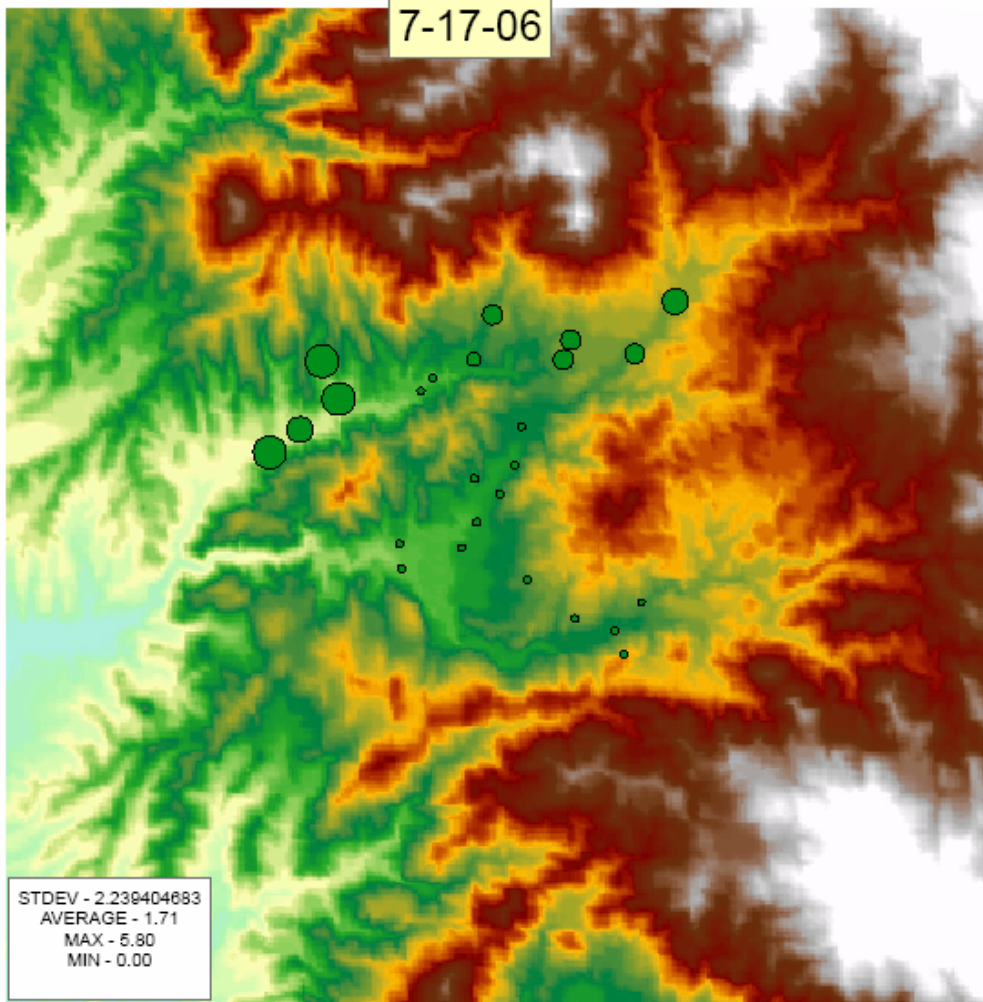
Z

- 0.600000 - 0.700000
- 0.900000 - 1.000000
- 1.200000 - 1.400000
- 1.500000 - 1.800000
- 2.100000 - 2.200000

mountainder
Value



7-17-06



STDEV - 2.239404683
AVERAGE - 1.71
MAX - 5.80
MIN - 0.00

Legend

July 17.txt Events

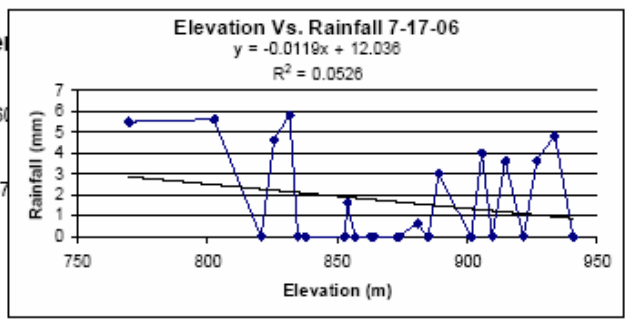
- Z
- 0.000000 - 0.600000
 - 0.600001 - 1.600000
 - 1.600001 - 4.000000
 - 4.000001 - 4.800000
 - 4.800001 - 5.800000

mountainide

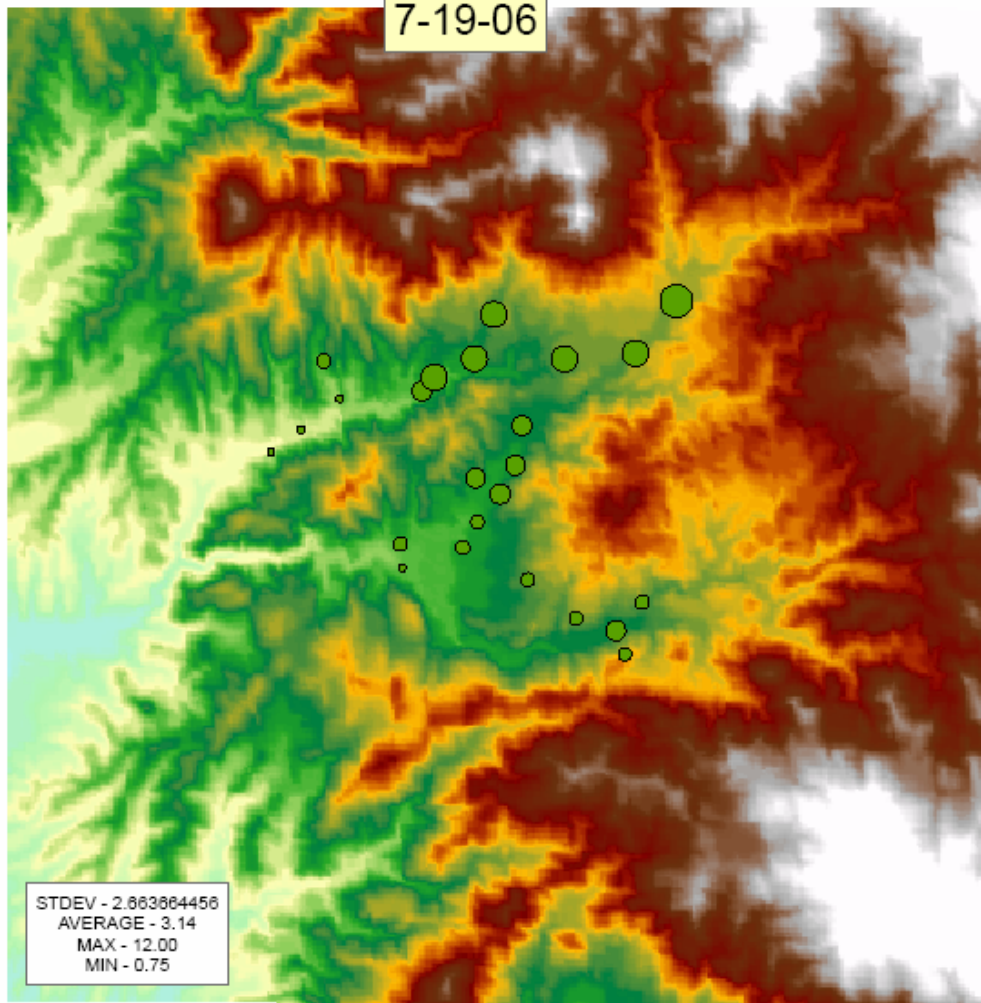
Value

High : 160

Low : 687



7-19-06



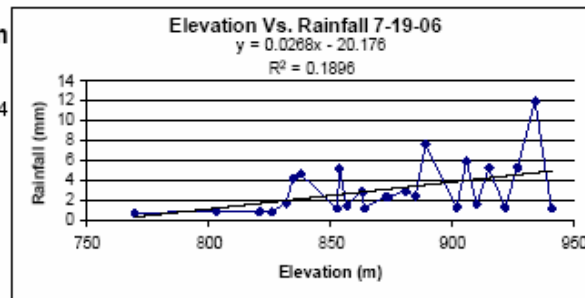
Legend

July 19.txt Events

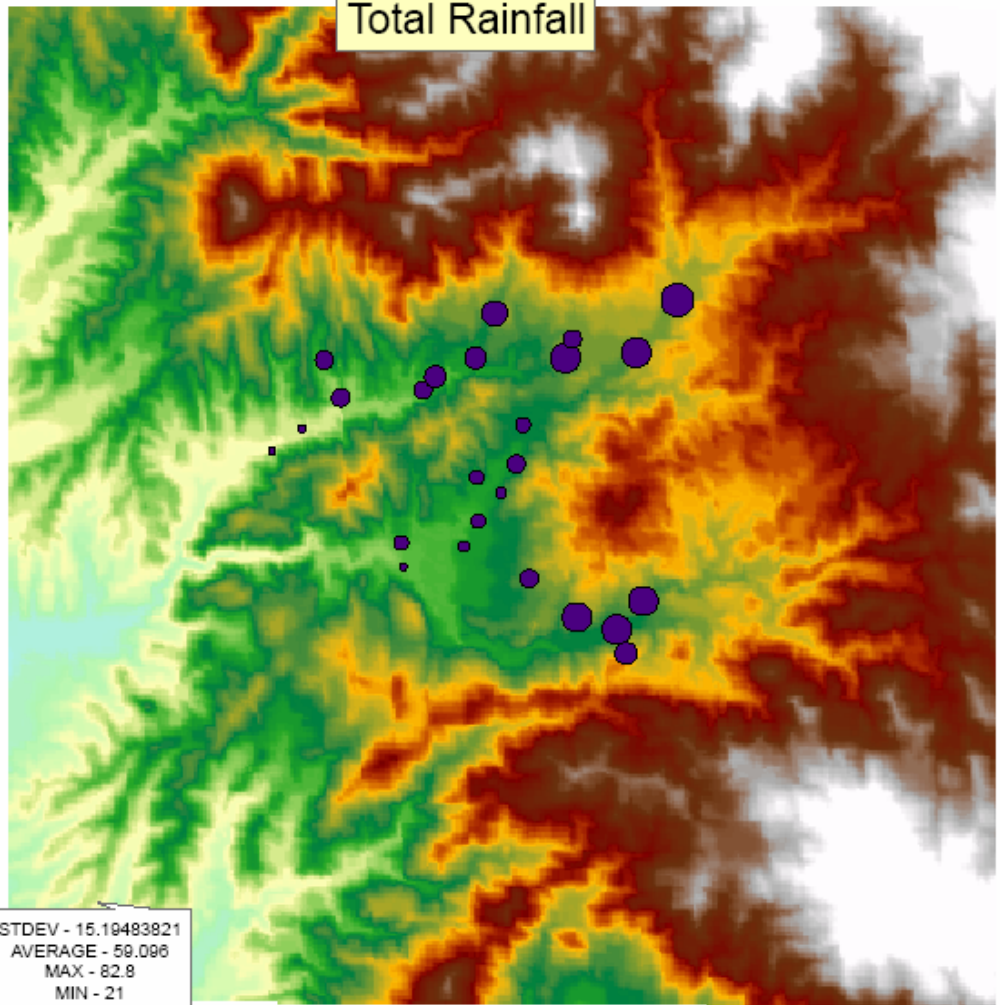
- Z
- 0.750000 - 1.000000
 - 1.000001 - 1.700000
 - 1.700001 - 4.200000
 - 4.200001 - 7.600000
 - 7.600001 - 12.000000

mountainDEM Value

- High : 1604
Low : 687



Total Rainfall

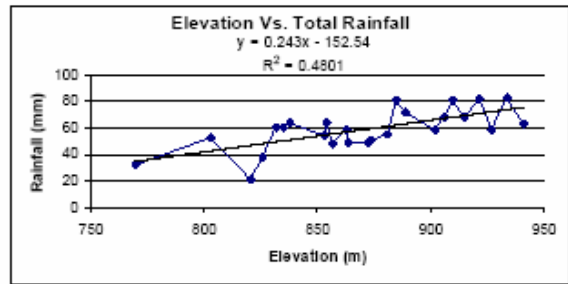
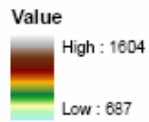


Legend

total measured rain.txt Eventsmountaindem

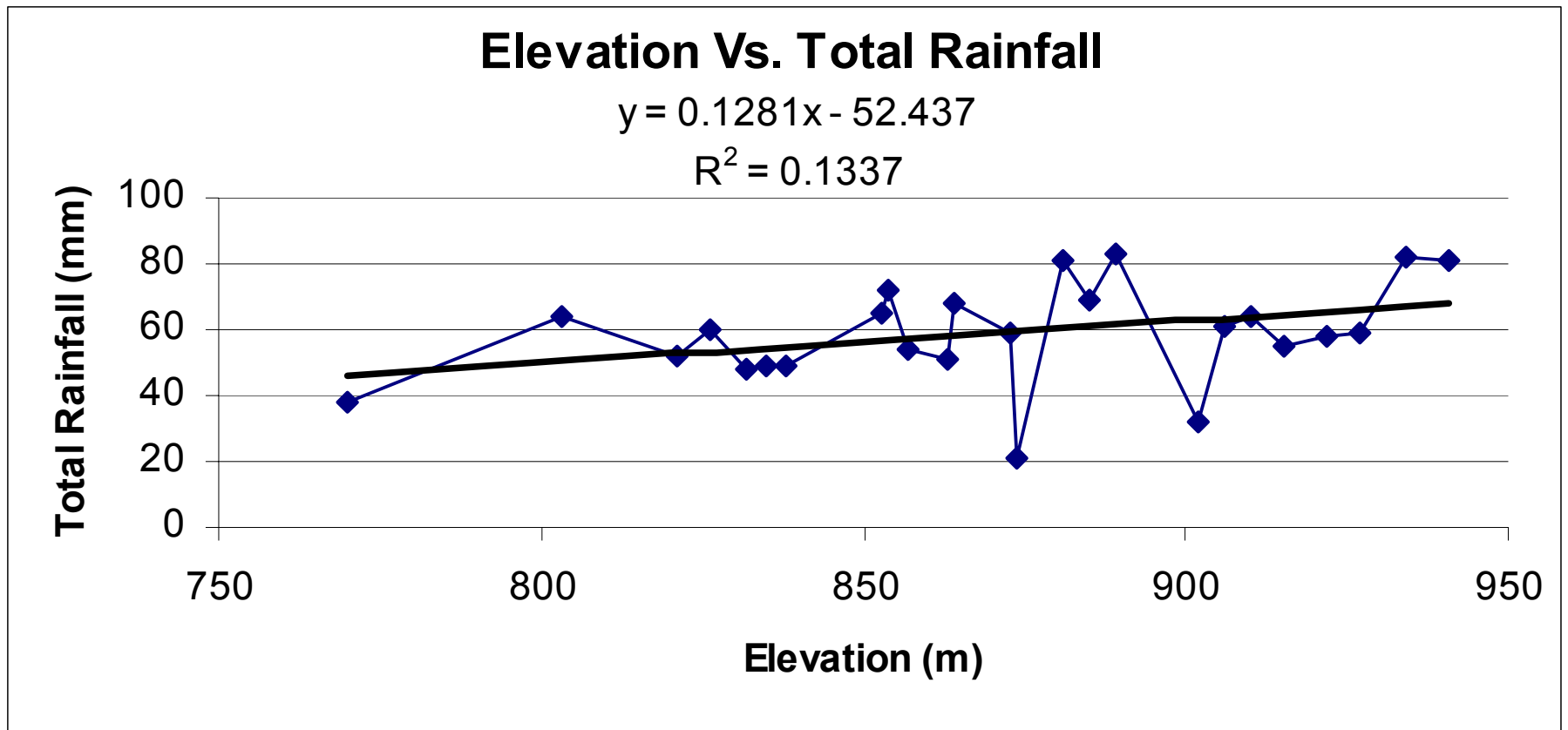
Z

- 27.750000 - 38.150000
- 38.150001 - 51.000000
- 51.000001 - 56.100000
- 56.100001 - 61.500000
- 61.500001 - 64.700000
- 64.700001 - 72.200000
- 72.200001 - 89.100000
- 89.100001 - 102.800000



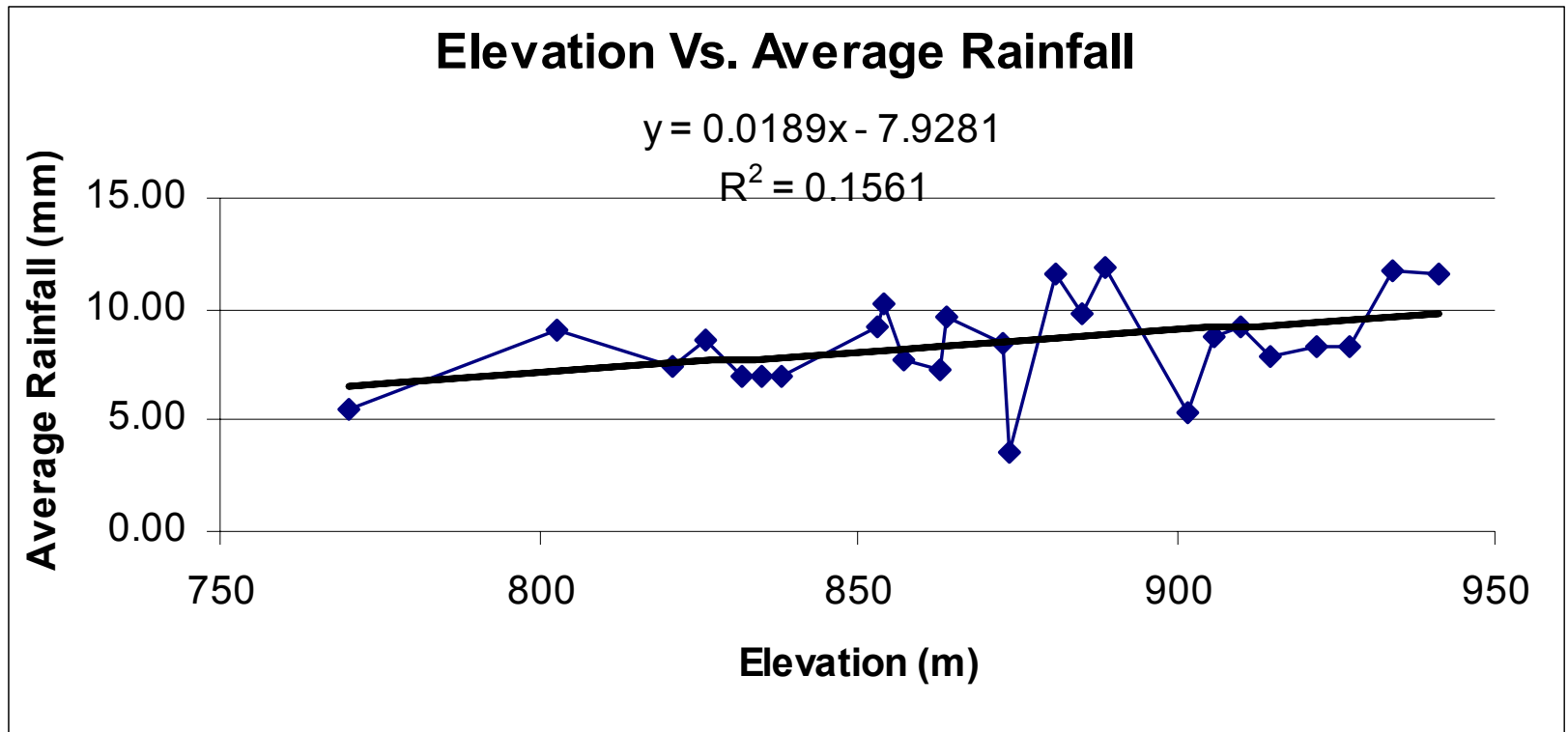
Elevation Vs. Total Rainfall

- STDEV= 15.19 AVG= 59.1mm



Elevation Vs. Average Rainfall

- STDEV= 2.07 AVG= 8.49 mm



Rio Sonora – July 7, 2006



July 8



July 9



July 10



July 11



July 12



July 13



July 14



July 15



July 16



July 17



July 18



July 19



July 20

