Gypsum Soils Analysis Technical Conditions:

Do soil factors control distributions of the Las Vegas Buckwheat?

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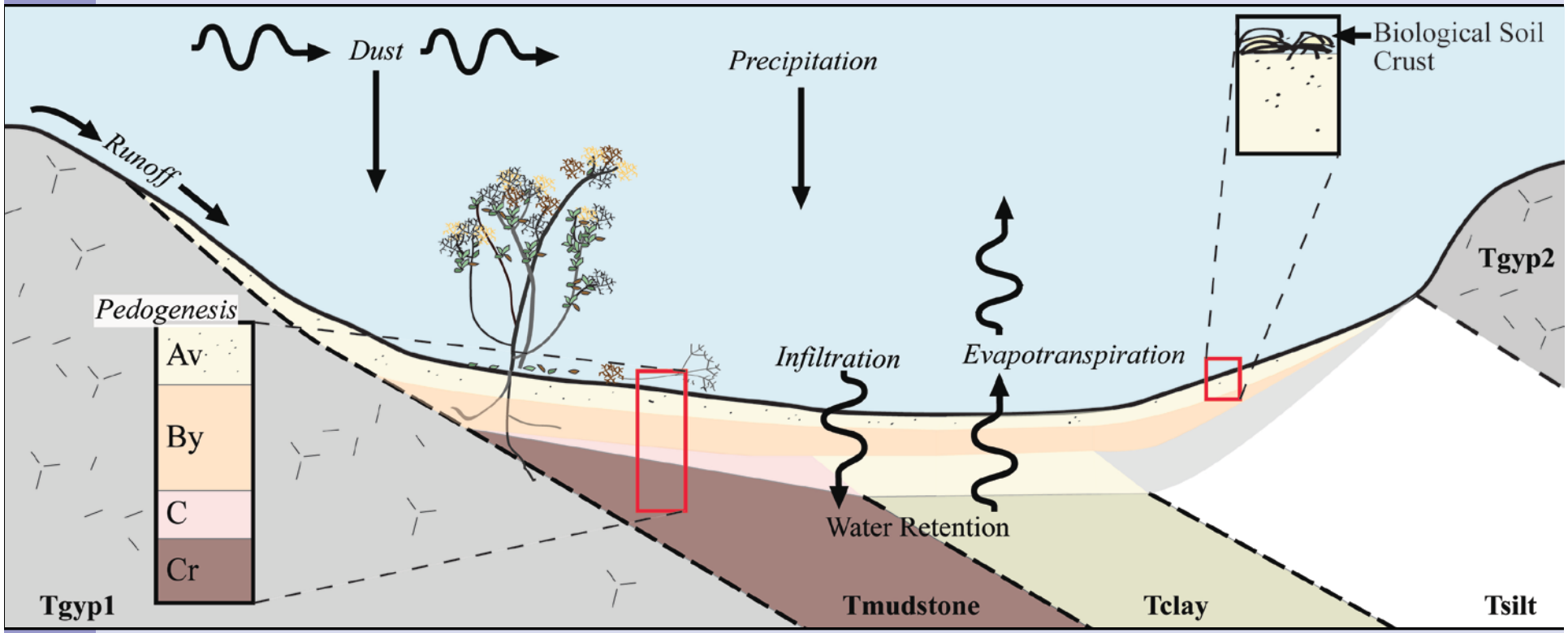
Introduction

- *Eriogonum corymbosum* Bentham *var. nilesii* (Reveal, 2004) = Las Vegas Buckwheat
- One of several presumed gypsophiles (*almost* exclusively) found in Clark County
- Isolated populations – perhaps not all gypsum soils are suitable habitat?
- Habitat modeling, prediction, & management are critical in light of:
  - (1) Continued urban development
  - (2) Projected climate changes

Significance

Soil geomorphologic processes represent a major gap in our knowledge of selective habitat species dynamics

- *especially* for the Las Vegas Buckwheat



Project Objectives

We do not know why *E. corymbosum* grows in some gypsum substrates, but not in apparently identical soils a short distance away.

To tackle this question:

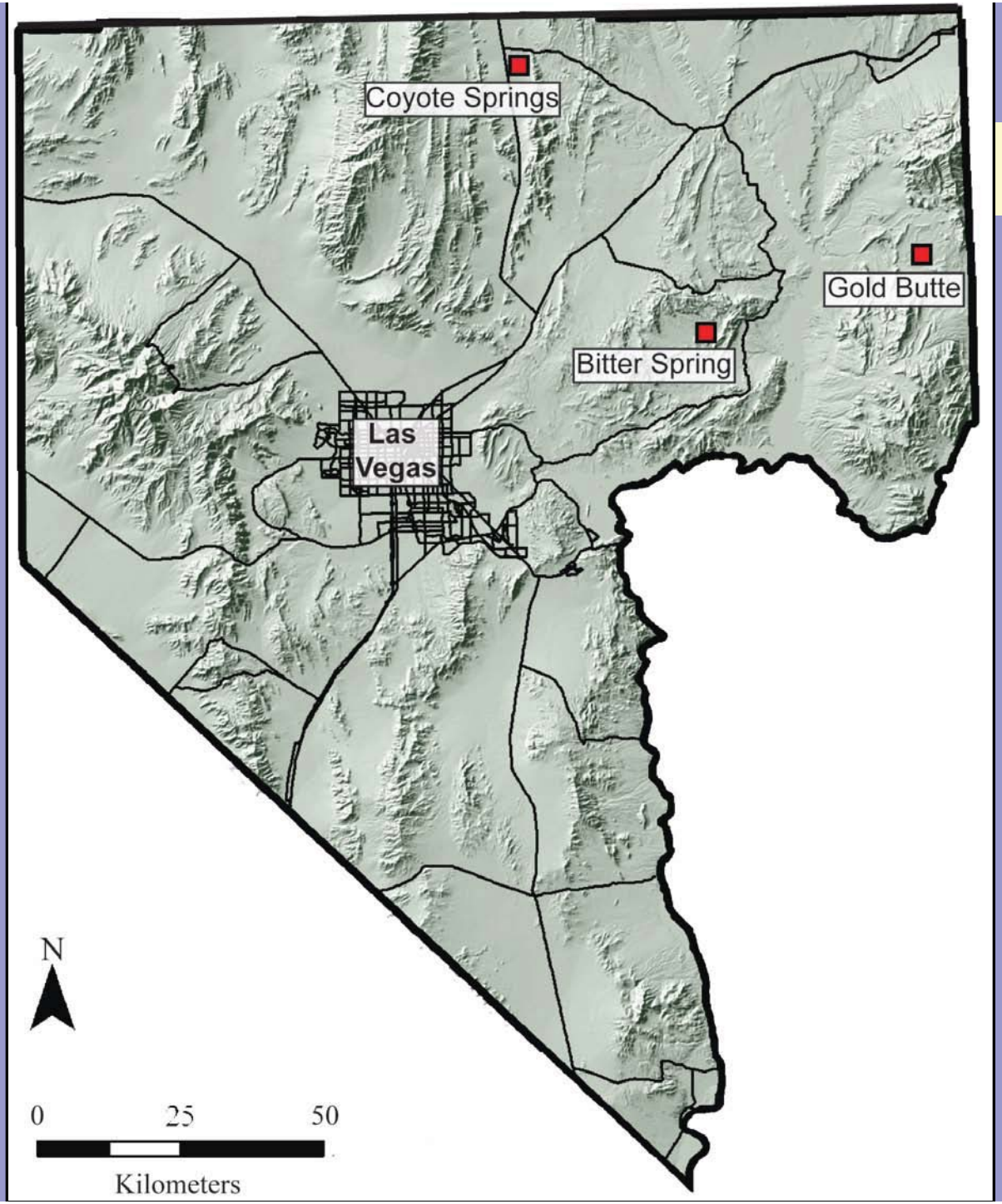
(1) Identify ***patterns*** of soils & land-surface properties controlling or influencing distributions of sensitive plants

(2) Interpret which ***processes*** most directly influence distributions of the Las Vegas Buckwheat

Scope of Work

- Confirm or refute influence of soil-geomorphology
  - ***Soils***, not just surface crusts or depth ranges
- Design study for use with other datasets &ongoing research by botanists, ecologists, &land managers
- Some variables not assessed directly or completely:
  - Wind speed, direction, intensity
  - Rainfall
- Other variables not assessed at all:
  - Germination,
  - Pollination
  - Predation

Site Locations



Methods

1. **Mapping**
   - Field & GIS-based
   - LiDAR data acquired in December, 2009
   - Soil, Geomorphic, & Surficial Geologic maps now in development

2. **Soil Profile Description** & **Sampling**
   - 99 Profiles dug, described, & sampled
3. **Surface Characterization & Sampling**

4. **Chemical Analysis** of Samples
   - Approximately 545 samples
   - Measurements include some mineralogical & physical properties



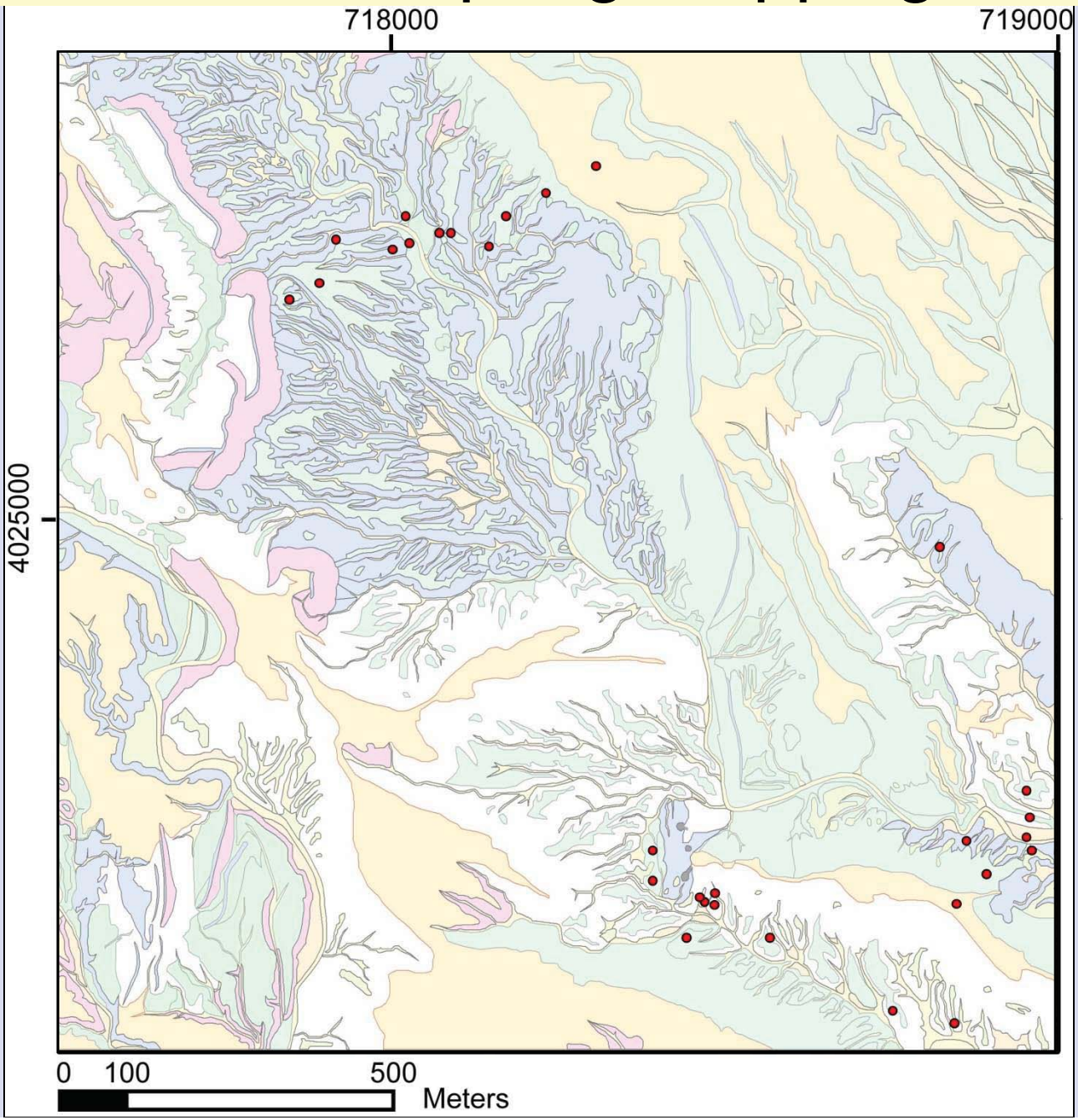


Bitter Spring Landscape

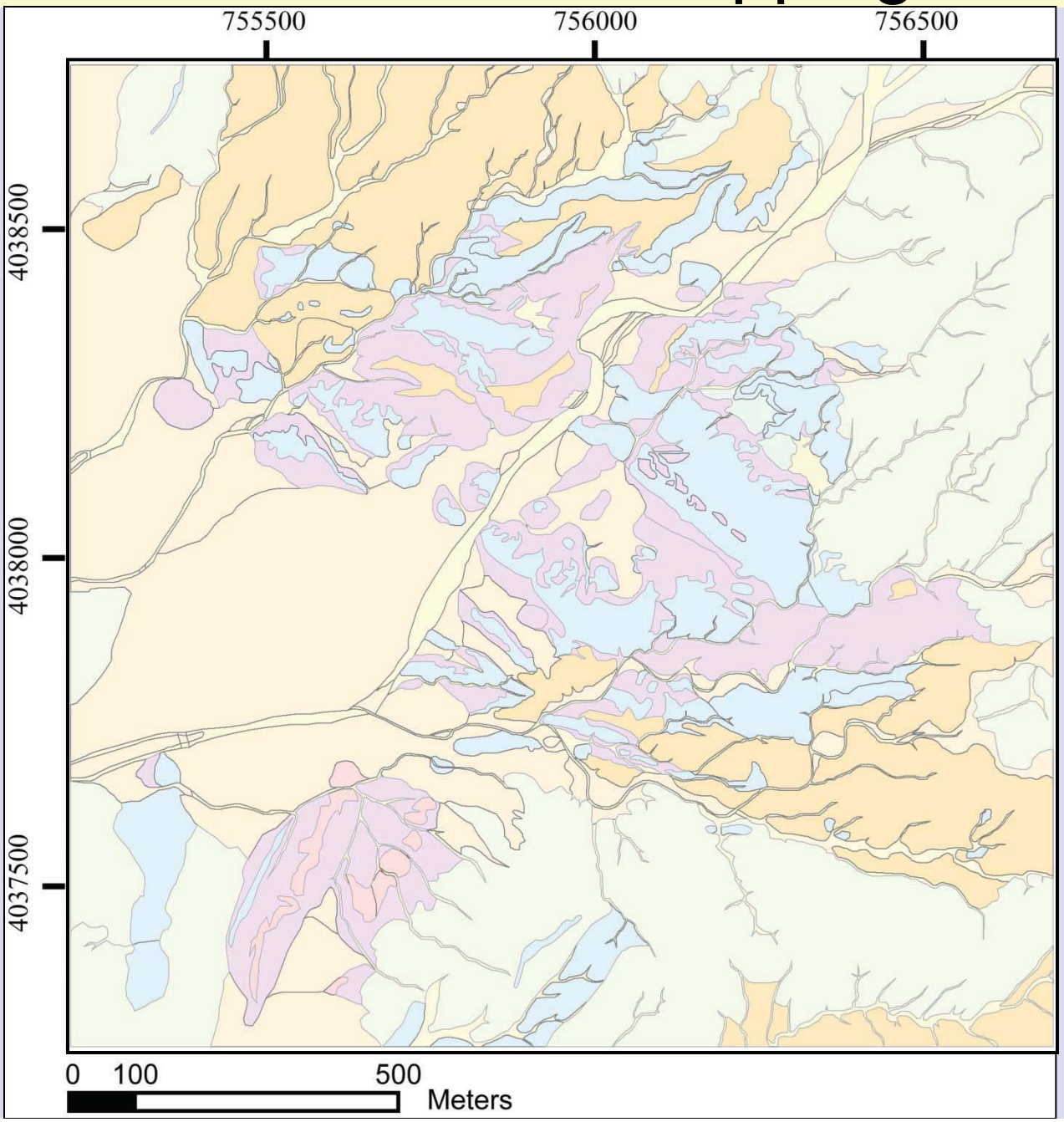
Gold Butte Landscape

Coyote Springs Landscape

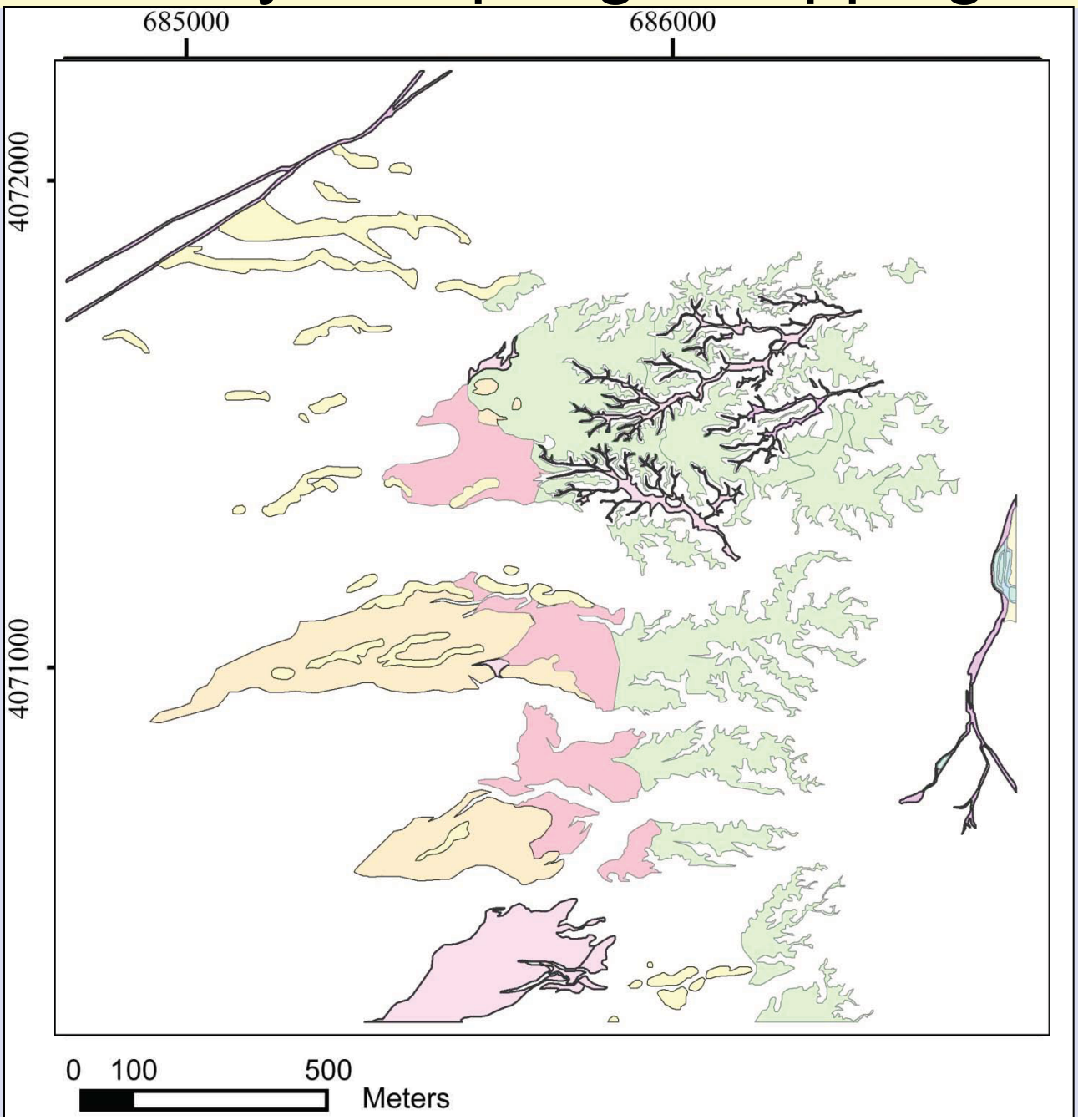
Bitter Spring Mapping



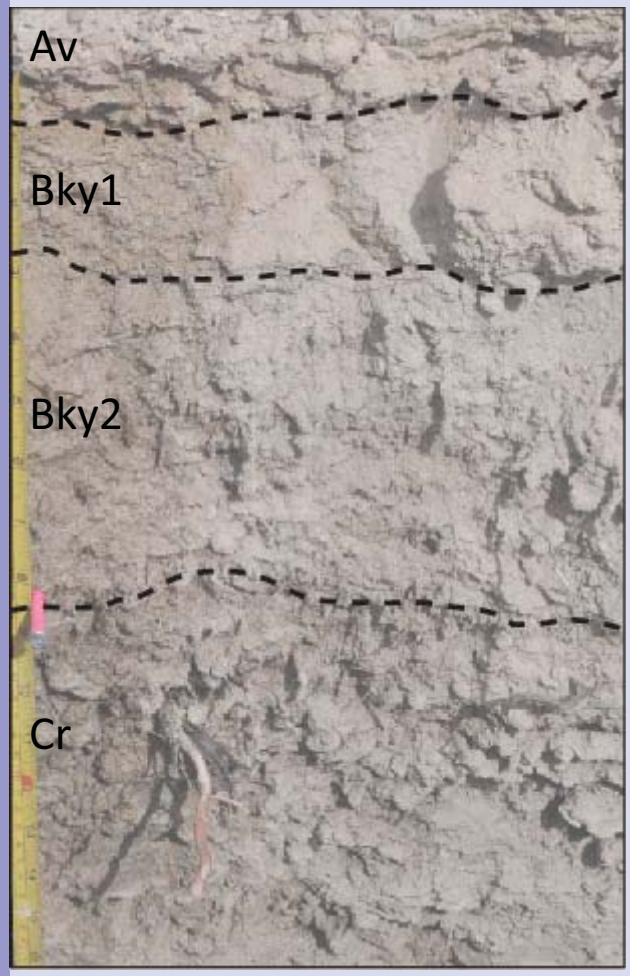
Gold Butte Mapping



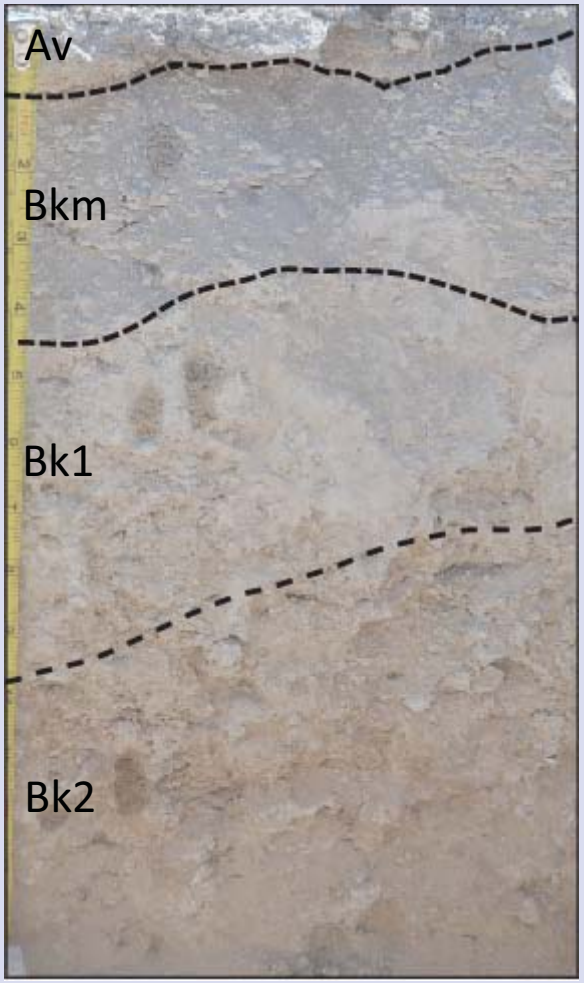
Coyote Springs Mapping



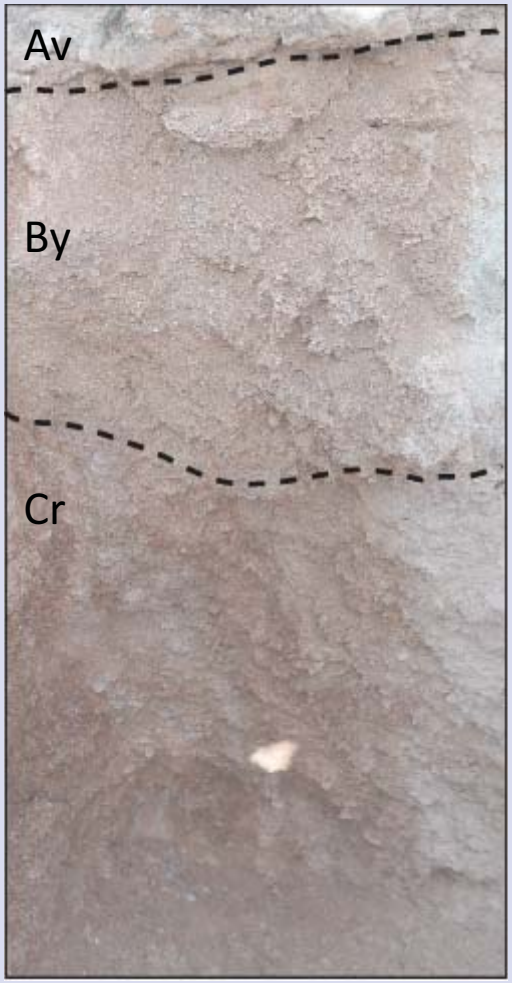
Early Results: Profile Morphology



BS Profile

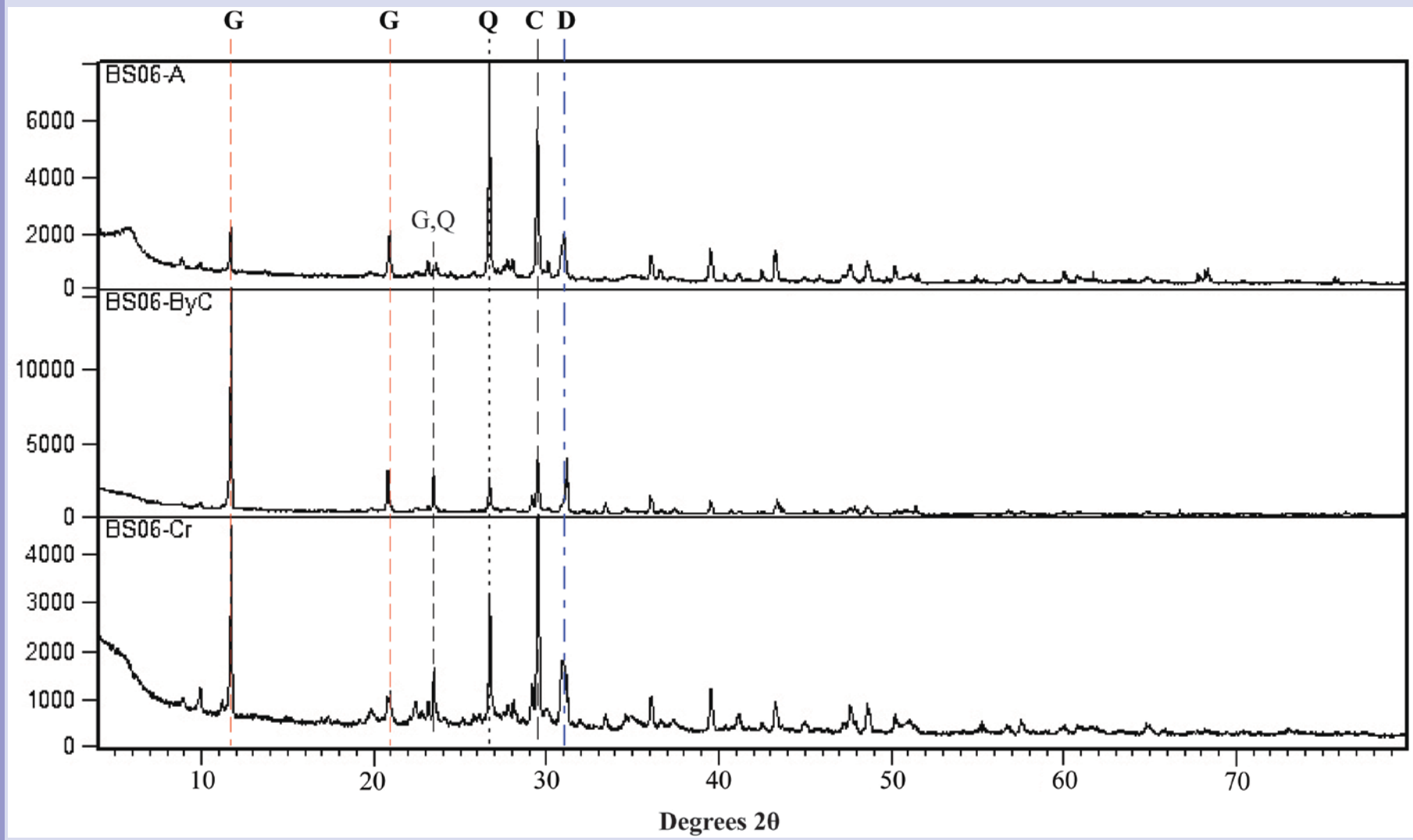


CS Profile

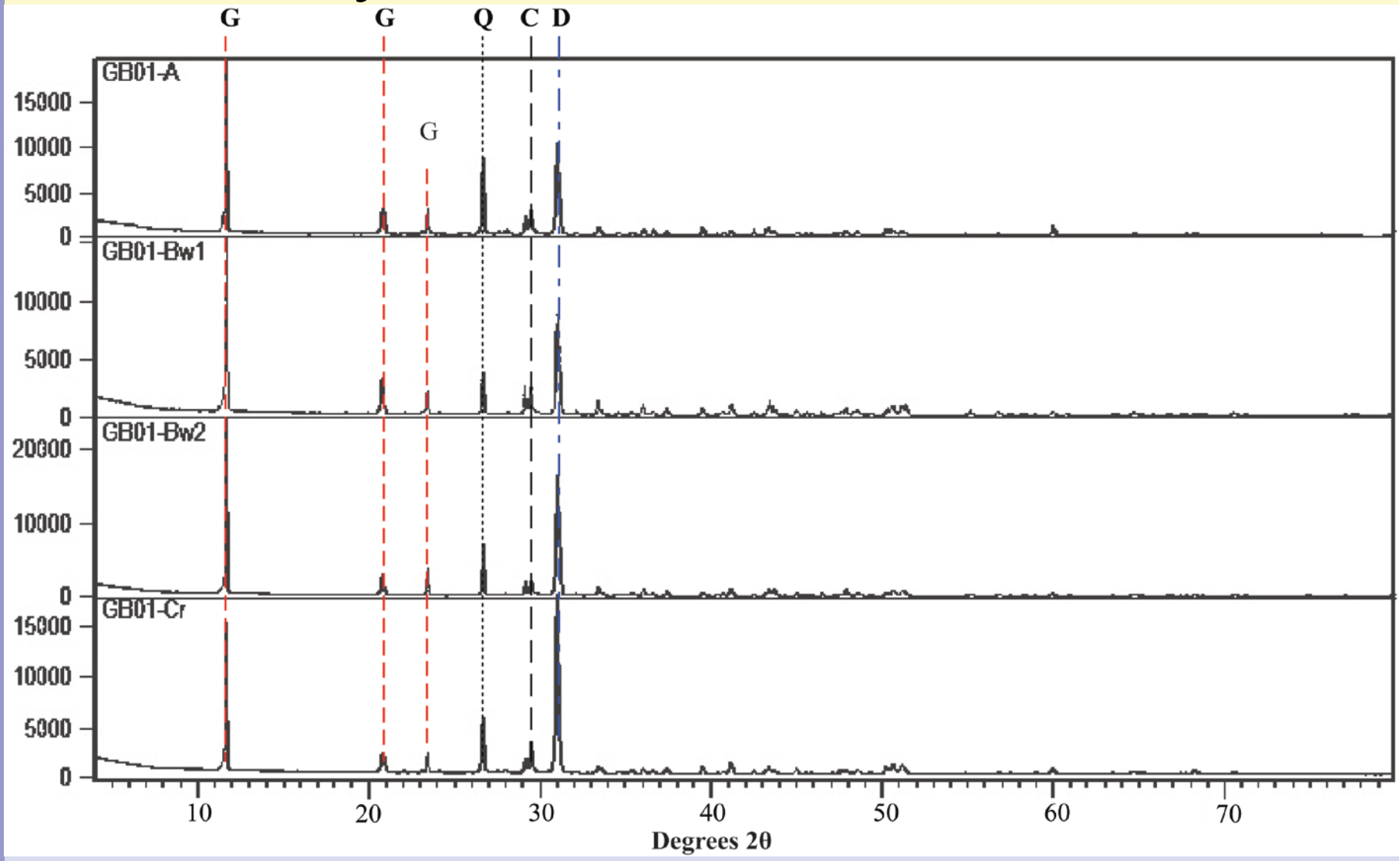


GB Profile

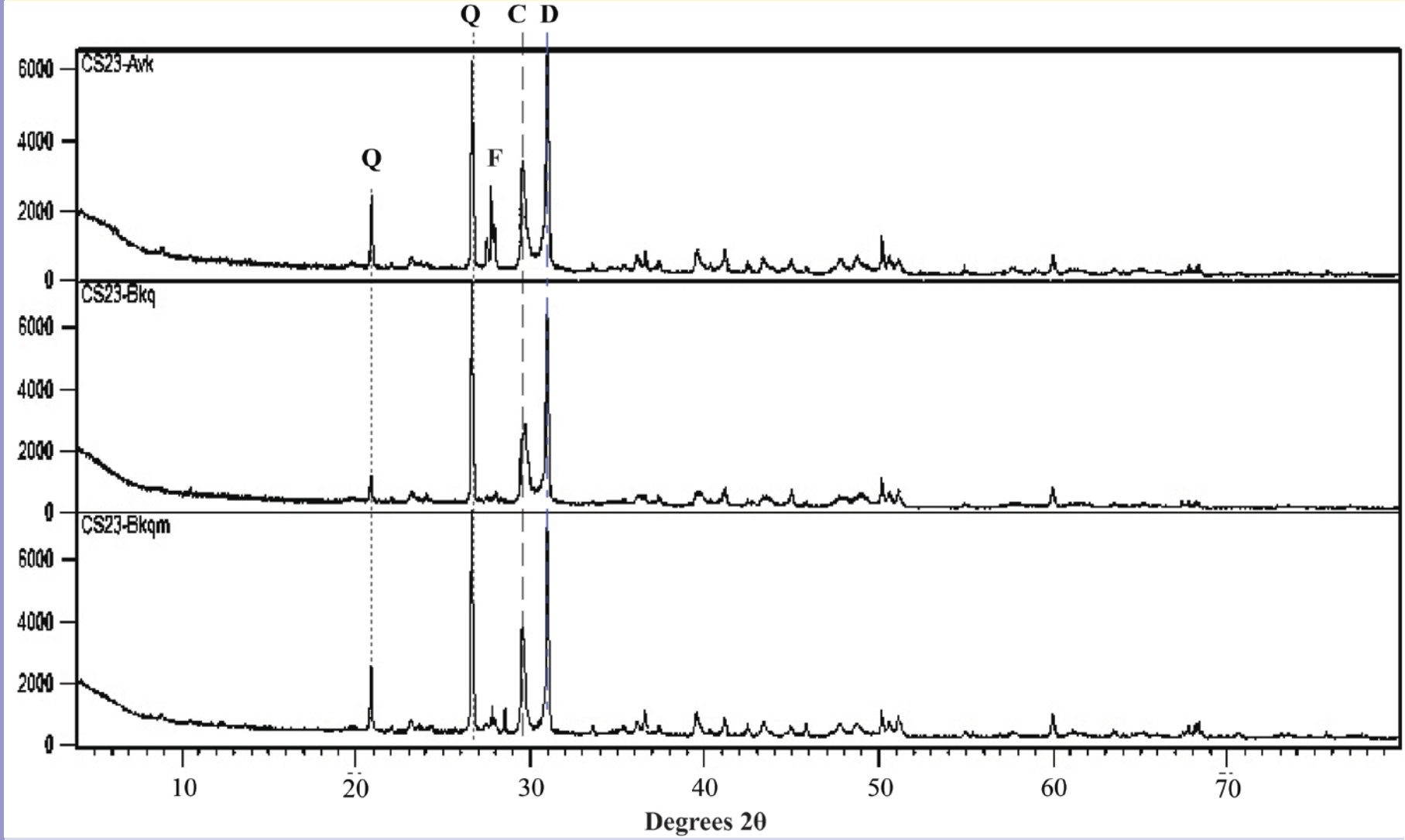
Early Results: Bitter Spring XRD



Early Results: Gold Butte XRD



Early Results: Coyote Springs XRD



In Progress: Soil Laboratory Data

- pH & electrical conductivity
- Cation exchange capacity: Na, K, Mg, Ca (NH_4OAc method, on AAS)
- Plant available ions (Mehlich method):
  - Na, K, Mg, Ca
  - P, Mn, Fe, Ni, Cu, Zn, Co, B, Mo, As (ICP)
  - NO_3, SO_4, Cl (ICS)
- $CaCO_3$ Equivalence (Inorganic C)
- Particle Size Determination (LASR method)

Gypsum Soil Analysis Considerations

Gypsum = $CaSO_4 \bullet 2H_2O$

Problematic in laboratory analyses because:

(1) **Dissolution** affects particle size determination, chemical data interpretations

(2) **Dehydration** (loss of crystal water) upon heating affects determination of moisture content and organic carbon content

(3) **Sample Heterogeneity** (% gypsum) complicates corrections

Statistical Analyses

Multivariate:
- Non-metric multidimensional scaling (NMS) and
- Multi-Response Permutation Procedure (MRPP).

Parametric & non-parametric ANOVA & t-tests (esp. surface characterization data)

Insolation Models

GIS-based insolation models will test for differences between map units, sites, habitat classes

Too soon for firm conclusions….

- Complex soil-plant relationships likely
- "Either-or/and-if" factors?
- Differences within & between sites should capture the range or tolerable or intolerable conditions
- Interesting lack of gypsum at Coyote Springs (thus far)

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