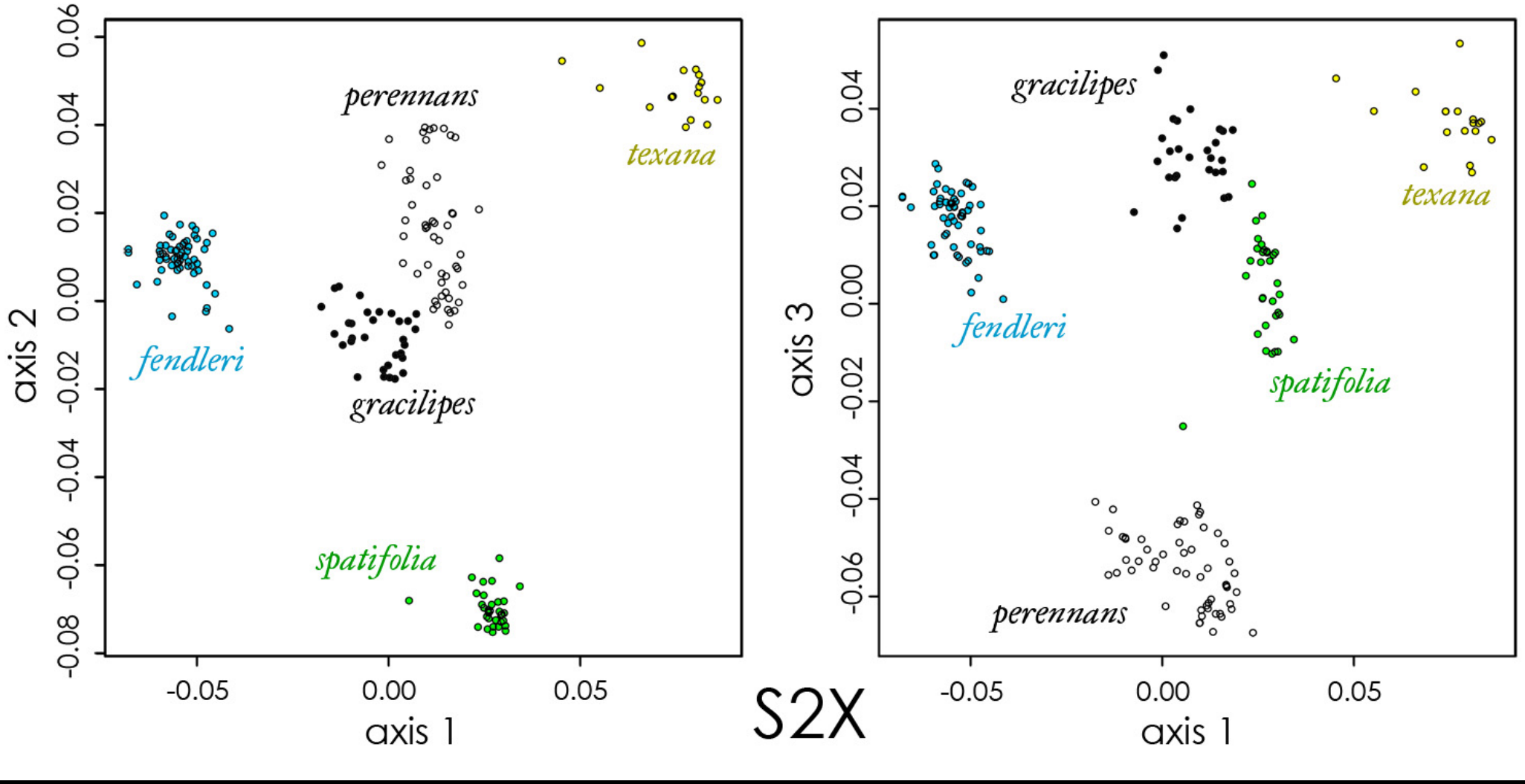

How do we understand
plant communities?

The problem…

I'm used to taxonomy, but want to understand how plants are grouped in geography and ecology, too.

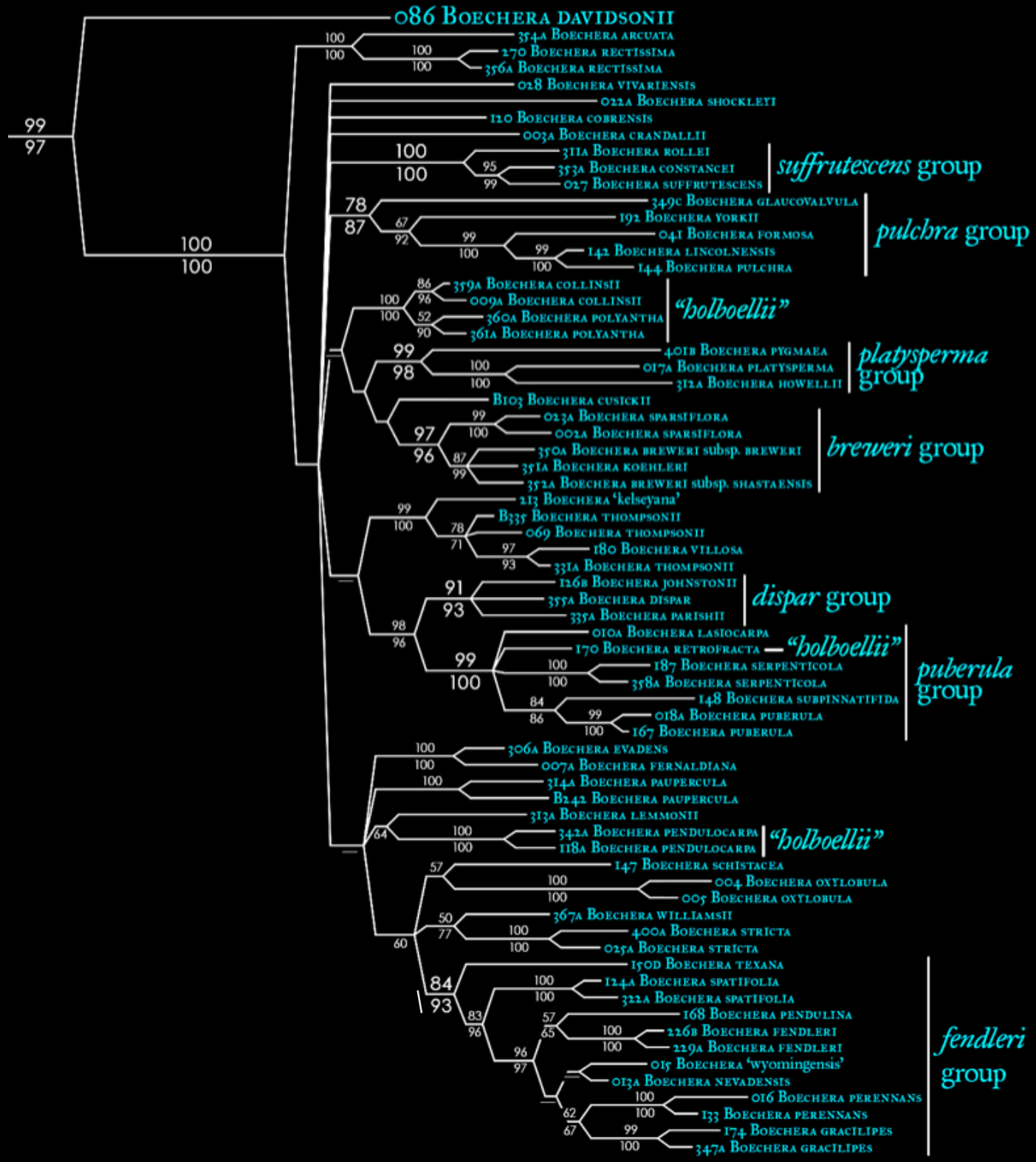
The problem…

In taxonomy, the lines are already there (at least, mostly); we just need to find them.



The problem…

We also have a good handle on understanding relationships among species.



The problem…

What about plant communities?

Clearly there's a lot of variation out there:

Clearly there's a lot of variation out there:

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Clearly there's a lot of variation out there:

But how do we make sense of it?

There are two main conceptual approaches:

1) What are the dominant species?

creosote shrubland

pinyon/juniper woodland

ponderosa forest

2) What are the soils & other ecological variables?

gravelly ecological site

limestone hills ecological site

mountain meadow ecological site

USNVC!

United States National Vegetation Classification

USNVC

Overview | Get Involved! | Explore The Classification | Revisions | Data Standard | Resources | About

The U.S. National Vegetation Classification

YOUR GUIDE TO INVENTORYING NATURAL AND CULTURAL PLANT COMMUNITIES

Your Guide to Inventorying Natural and Cultural Vegetation Communities

The National Vegetation Classification is a central organizing framework for documentation, inventory, monitoring, and study of vegetation in the United States from broad scale formations like forests to fine-scale plant communities. The Classification allows users to produce uniform statistics about vegetation resources across the nation at local, regional, or national levels.

Highlights

Launch of NVC for the U.S. >

Try out the new Hierarchy Explorer >
View vegetation classifications for U.S. plant communities

PARTNERS: USGS GAP | ESA | USFS | NatureServe

Site developed by GreenInfo Network and hosted by NC STATE UNIVERSITY

USNVC!

Complete NVCS Summary: 8009 Records

- 1 Forest & Woodland Class
- 2 Shrub & Herb Vegetation Class
- 3 Desert & Semi-Desert Class
- 4 Polar & High Montane Scrub, Grassland & Barrens Class
- 5 Aquatic Vegetation Class
- 6 Open Rock Vegetation Class

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- **3 Desert & Semi-Desert Class**
  - **3.A Warm Desert & Semi-Desert Woodland, Scrub & Grassland Subclass**
    - 3.A.1 Tropical Thorn Woodland Formation
    - 3.A.2 Warm Desert & Semi-Desert Scrub & Grassland Formation
      - 3.A.2.Na North American Warm Desert Scrub & Grassland Division
        - M130 Tamaulipan Scrub & Grassland Macrogroup
        - M086 Chihuahuan Desert Scrub Macrogroup
          - G286 Chihuahuan Desert Succulent Scrub Group
          - G287 Chihuahuan Desert Sand Scrub Group
          - G288 Chihuahuan Creosotebush - Mixed Desert Scrub Group
          - G299 Chihuahuan Desert Lowland Basin Scrub Group
        - M087 Chihuahuan Semi-Desert Grassland Macrogroup
          - G489 Chihuahuan Semi-Desert Lowland Grassland Group
          - G490 Chihuahuan Desert Foothill-Piedmont & Lower Montane Grassland Group
          - G491 Chihuahuan Sandy Plains Semi-Desert Grassland Group
          - G492 Chihuahuan Gypsophilous Grassland Group
        - M088 Mojave-Sonoran Semi-Desert Scrub Macrogroup
        - M117 North American Warm Semi-Desert Cliff, Scree & Rock Vegetation Macrogroup

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Macrogroup Detail Report: M086

Larrea tridentata - Flourensia cernua - Prosopis spp. Chihuahuan Desert Scrub Macrogroup

Print Report

Collapse All :: Expand All

Translated Name:	Creosotebush - American Tarwort - Mesquite species Chihuahuan Desert Scrub Macrogroup
Colloquial Name:	Chihuahuan Desert Scrub

Type Concept Summary

This widespread Chihuahuan Desert scrub macrogroup has a moderate to sparse xeromorphic shrub layer frequently dominated by diagnostic species *Acacia constricta, Acacia neovernicosa, Flourensia cernua, Larrea tridentata, Prosopis glandulosa*, or *Prosopis velutina*. Stands may be dominated by a single species or be mixed, composed of a variety of desert scrub, thornscrub, stem rosette and succulent species present to codominant.

Type Concept

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- G288 Chihuahuan Creosotebush - Mixed Desert Scrub Group
  - A3164 Chihuahuan Desert Creosotebush Scrub Alliance
    - CEGL001265 Larrea tridentata / Bouteloua eriopoda Shrubland Association
    - CEGL001266 Larrea tridentata / Bouteloua gracilis Shrubland Association
    - CEGL001269 Larrea tridentata / Dasyochloa pulchella Shrubland Association
    - CEGL001270 Larrea tridentata - Flourensia cernua Shrubland Association
    - CEGL001272 Larrea tridentata / Muhlenbergia porteri Shrubland Association
    - CEGL001274 Larrea tridentata - Parthenium incanum Shrubland Association
    - CEGL001275 Larrea tridentata - Prosopis glandulosa Shrubland Association
    - CEGL001276 Larrea tridentata / Sparse Understory Shrubland Association
    - CEGL001380 Lycium berlandieri - Larrea tridentata var. tridentata Shrubland Association
    - CEGL004562 Larrea tridentata - Agave lechuguilla Shrubland Association
    - CEGL004563 Larrea tridentata / Bouteloua ramosa Shrubland Association

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Association Detail Report: CEGL001270

***Larrea tridentata* - *Flourensia cernua* Shrubland**

Print Report

Collapse All :: Expand All

Translated Name:	Creosotebush - American Tarwort Shrubland
Colloquial Name:	

Type Concept

From Muldavin et al. (2000b): This established, but minor, plant association of White Sands Missile Range occurs within both the Jornada del Muerto and Tularosa basins and has been described on Fort Bliss Military Reservation. Stands are found on lower alluvial slopes and upper basin bottoms at elevations of 1070 to 1520 m (3500-5000 feet). Slopes are usually less than 1% and occasionally have scattered rock or gravel on the surface. *Flourensia cernua* occurs most often on heavy, fine soils, while *Larrea tridentata* is adapted to a wide range of soils. Stands are characterized by a shrub layer codominated by *Larrea tridentata* and *Flourensia cernua*. The shrubs are tall, evenly distributed and typically form a moderately open canopy. Scattered *Gutierrezia sarothrae, Opuntia macrocentra*, and *Prosopis glandulosa* are often present. The grass layer is poorly represented, but can include scattered clumps of *Sporobolus airoides* between shrub canopies, or *Muhlenbergia porteri* growing underneath them. The forb layer is scattered and *Acourtia nana* is most common. Increases in *Flourensia cernua* were difficult to distinguish from increases in *Larrea tridentata*, as *Larrea tridentata* establishment often followed or quickly replaced *Flourensia cernua* in particular areas. Because *Larrea tridentata* exploits deeper water sources than *Flourensia cernua*, it may not be as vulnerable to drought.

Classification

Vegetation Hierarchy	Name:	Database Code:	Classification Code:
Class	Xeromorphic Woodland, Scrub & Herb Vegetation Class	C03	3
Subclass	Warm Desert & Semi-Desert Woodland, Scrub & Grassland Subclass	S06	3.A
Formation	Warm Desert & Semi-Desert Scrub & Grassland Formation	F015	3.A.2

ESIS!

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Quick Access

- > PLANTS
- > Plant Materials
- > ESIS
- > ESD Home
- > FSGD
- > ESI-Forestland
- > ESI-Rangeland

United States Department of Agriculture Natural Resources Conservation Service

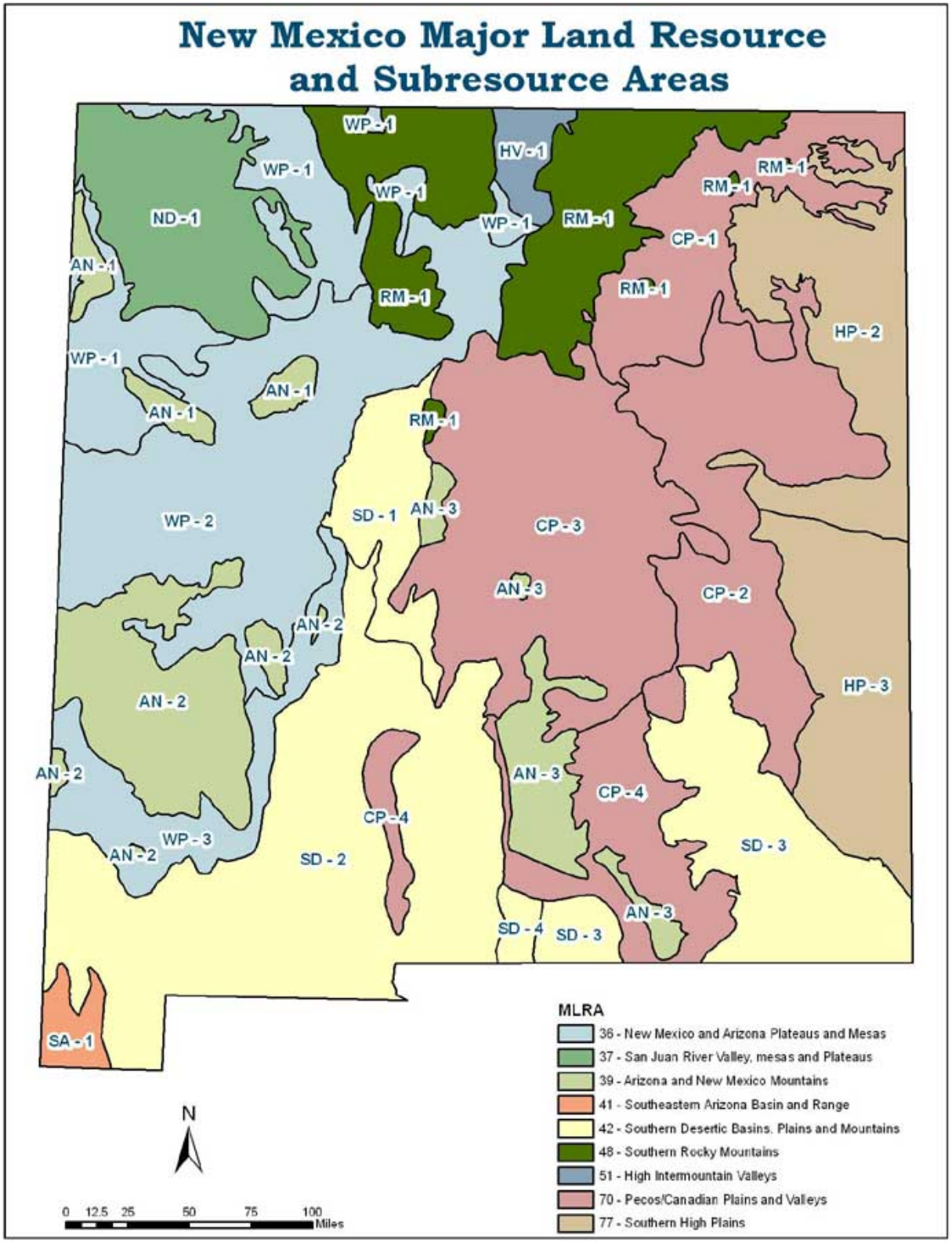
The Ecological Site Information System (ESIS) is the repository for the data associated with the collection of forestland and rangeland plot data and the development of ecological site descriptions. ESIS is organized into two applications and associated databases:

Ecological Site Description (ESD)

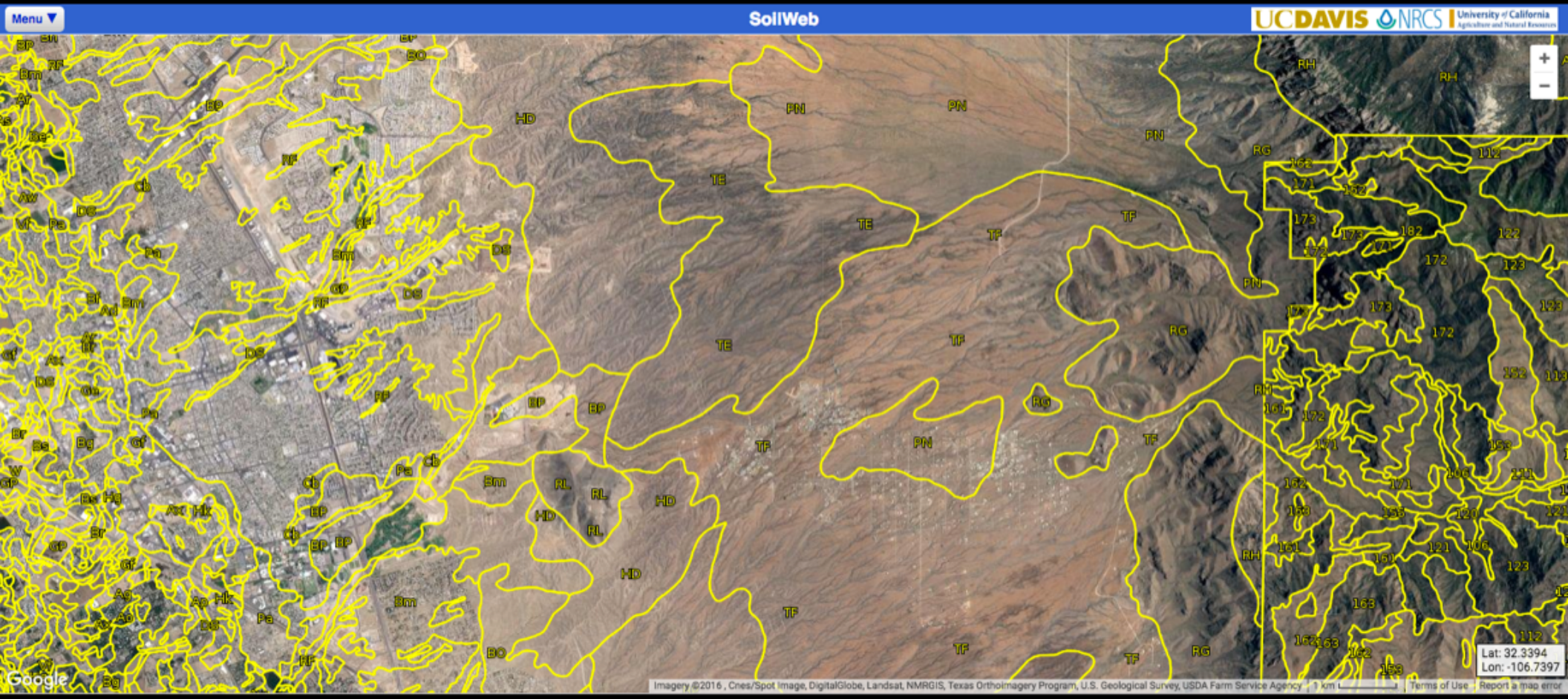
Overview -- The Ecological Site Description (ESD) application provides the capability to produce automated ecological site descriptions from the data stored in its database. ESD is the official repository for all data associated with the development of forestland and rangeland ecological site descriptions by the Natural Resources Conservation Service.

Looking across any landscape it is not difficult to recognize that some parts are different from other parts in regard to the kinds and amounts of vegetation. To understand this variation across the landscape, we classify these different parts into units called ecological sites. Ecological site is defined as "a distinctive kind of land with specific characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of

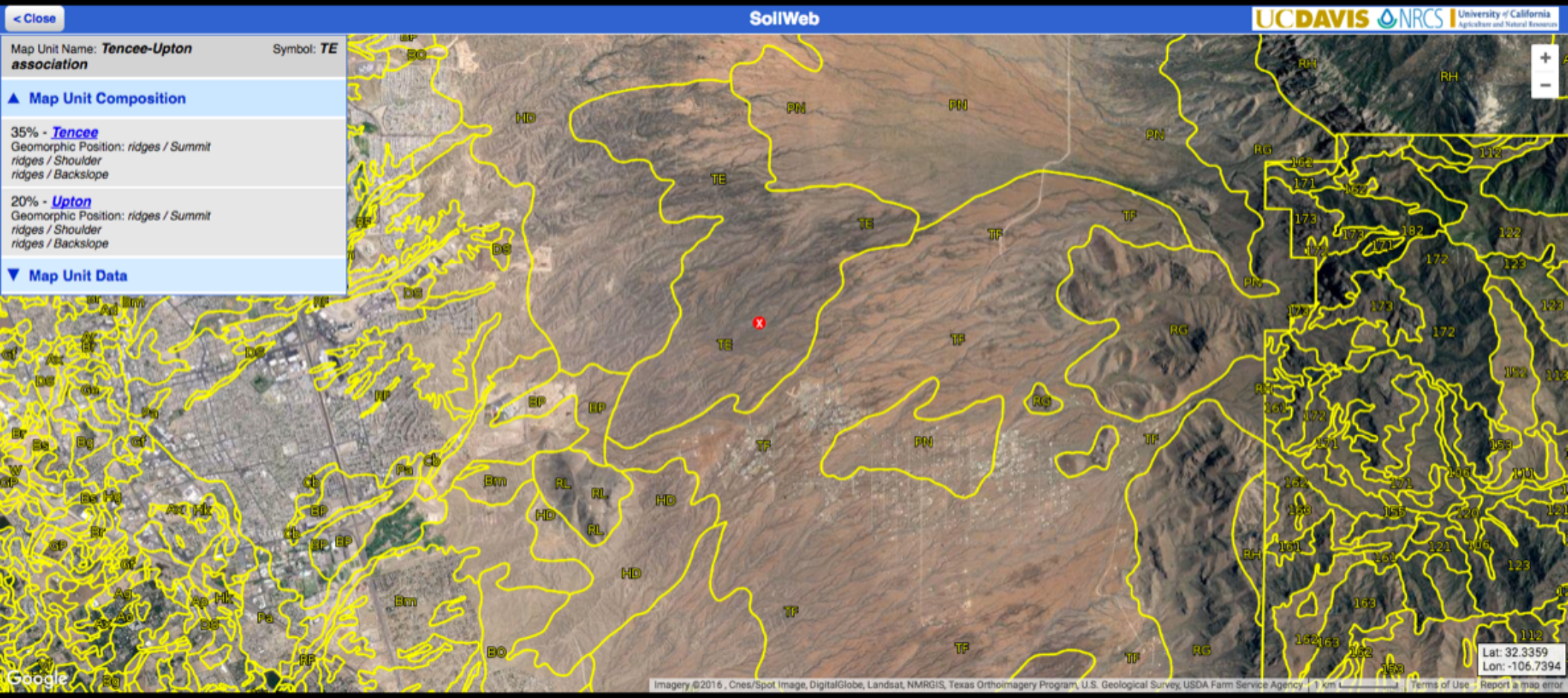
ESIS!


New Mexico Major Land Resource and Subresource Areas
WP - 1
HV - 1
RM - 1
ND - 1
AN - 1
CP - 1
HP - 2
SD - 1
AN - 3
CP - 3
CP - 2
AN - 2
HP - 3
CP - 4
SD - 2
SD - 3
SD - 4
SA - 1
N
0 12.5 25 50 75 100
Miles
MLRA
36 - New Mexico and Arizona Plateaus and Mesas
37 - San Juan River Valley, mesas and Plateaus
39 - Arizona and New Mexico Mountains
41 - Southeastern Arizona Basin and Range
42 - Southern Desertic Basins, Plains and Mountains
48 - Southern Rocky Mountains
51 - High Intermountain Valleys
70 - Pecos/Canadian Plains and Valleys
77 - Southern High Plains

ESIS!


Menu
SoilWeb
UCDAVIS
NRCS
University of California
Lat: 32.3394
Lon: -106.7397
Google
Imagery ©2016 , Cnes/Spot Image, DigitalGlobe, Landsat, NMRGIS, Texas Orthoimagery Program, U.S. Geological Survey, USDA Farm Service Agency
Terms of Use
Report a map error

ESIS!


< Close
SoilWeb
UCDAVIS NRCS University of California
Map Unit Name: Tencee-Upton association
Symbol: TE
Map Unit Composition
35% - Tencee
Geomorphic Position: ridges / Summit
ridges / Shoulder
ridges / Backslope
20% - Upton
Geomorphic Position: ridges / Summit
ridges / Shoulder
ridges / Backslope
Map Unit Data
Lat: 32.3359
Lon: -106.7394
Google
Imagery ©2016 , Cnes/Spot Image, DigitalGlobe, Landsat, NMRGIS, Texas Orthoimagery Program, U.S. Geological Survey, USDA Farm Service Agency
1 km
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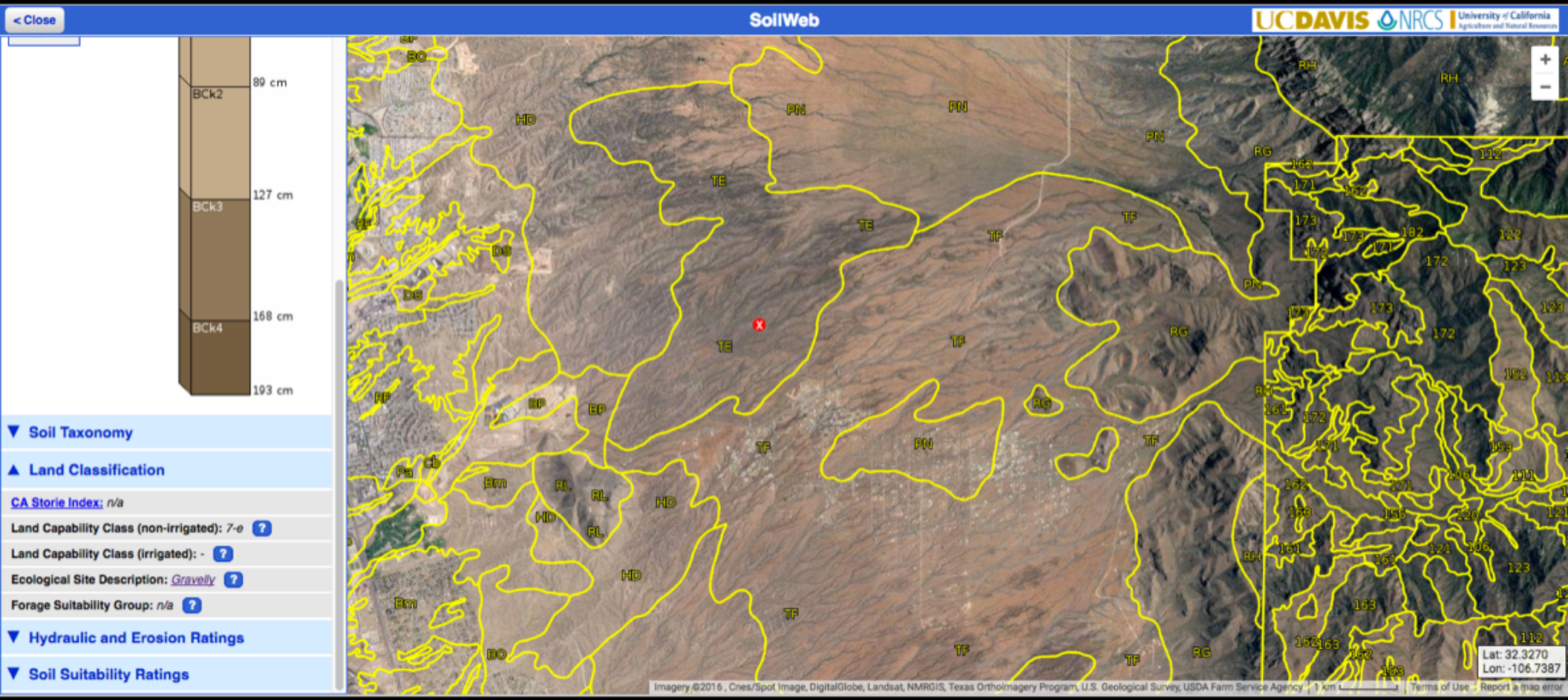
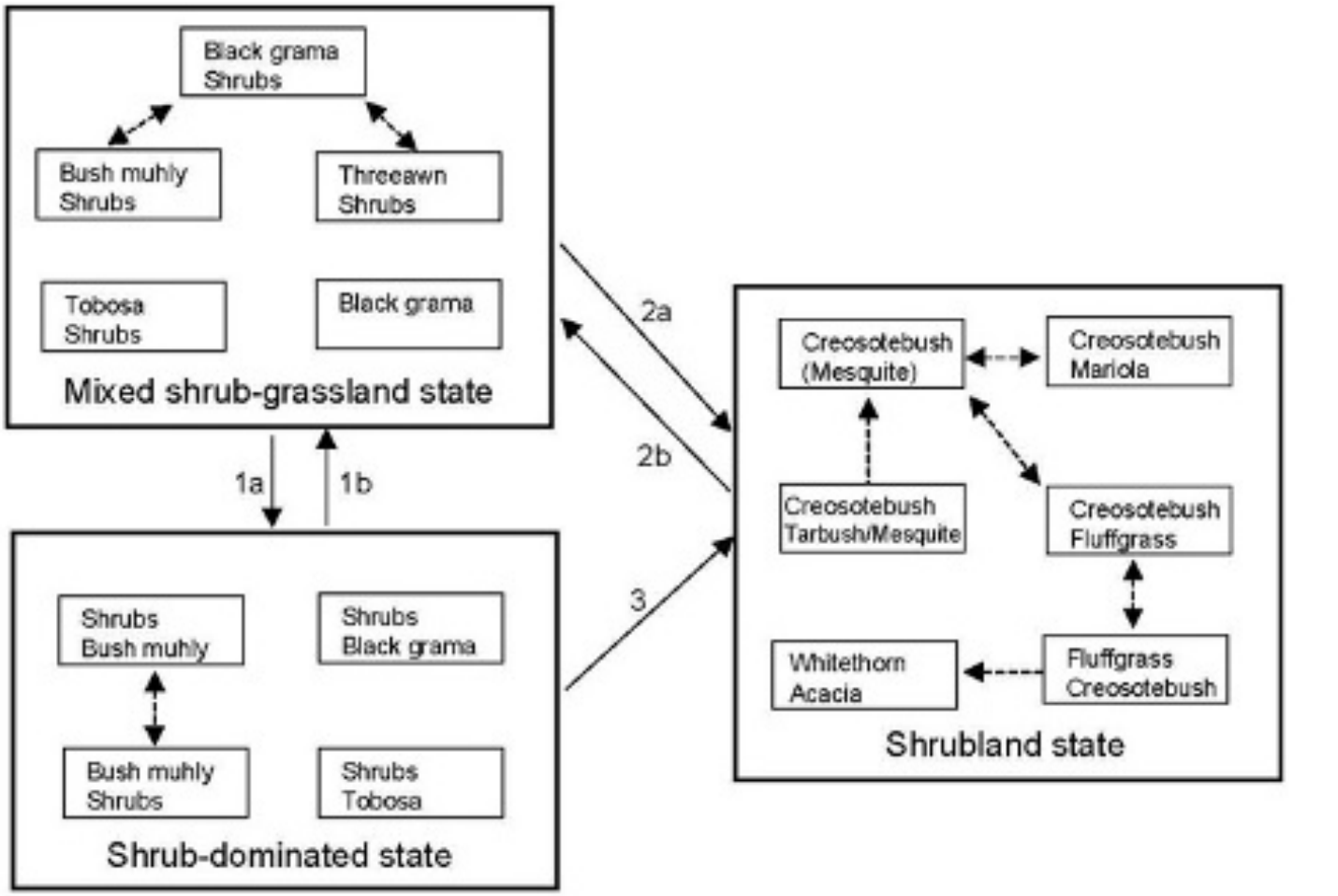

< Close
SoilWeb
UCDAVIS NRCS University of California
BCk2
89 cm
BCk3
127 cm
BCk4
168 cm
193 cm
Soil Taxonomy
Land Classification
CA Storie Index: n/a
Land Capability Class (non-irrigated): 7-e
Land Capability Class (irrigated): -
Ecological Site Description: Gravelly
Forage Suitability Group: n/a
Hydraulic and Erosion Ratings
Soil Suitability Ratings
Lat: 32.3270
Lon: -106.7387
Terms of Use
Report a map error

ESIS!



1a. Overgrazing, summer drought, or lack of fire; 1b. Shrub control
2a. Severe overgrazing, widespread grass mortality, with erosion and soil truncation
2b. Shrub control with soil addition or modification and stabilization
3. Persistent reduction in grasses, competition by shrubs, erosion and soil truncation

But how do we make sense of it?

Both of these approaches divide plants into distinct communities.

Claim 1:

> Plant communities are distinct entities with objective, identifiable boundaries.

Dominant species

This approach requires another claim.

Claim 2:

> We can understand variation in ca. 4000 plant species (in NM) by looking at a small set of common plants.

Habitat classification

This approach requires a third claim.

Claim 3:

> We can predict what plants occur at a site (or “should” occur)
> by measuring the soils or other abiotic conditions at that site.

How can we start evaluating those claims?

I stop periodically, on the job or out for fun, and...

take a picture...

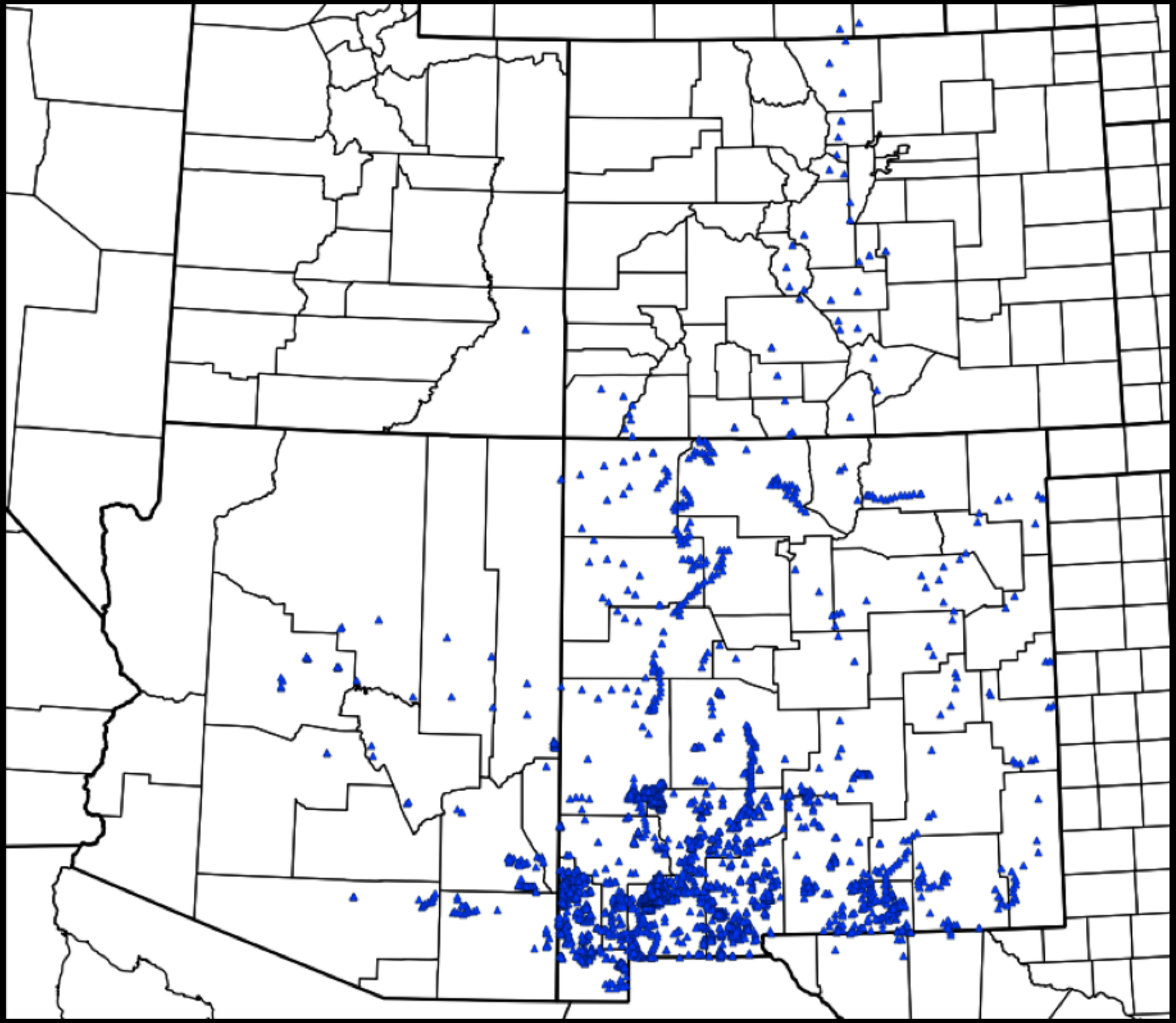
record my location...

32.37929°N 107.92020°W

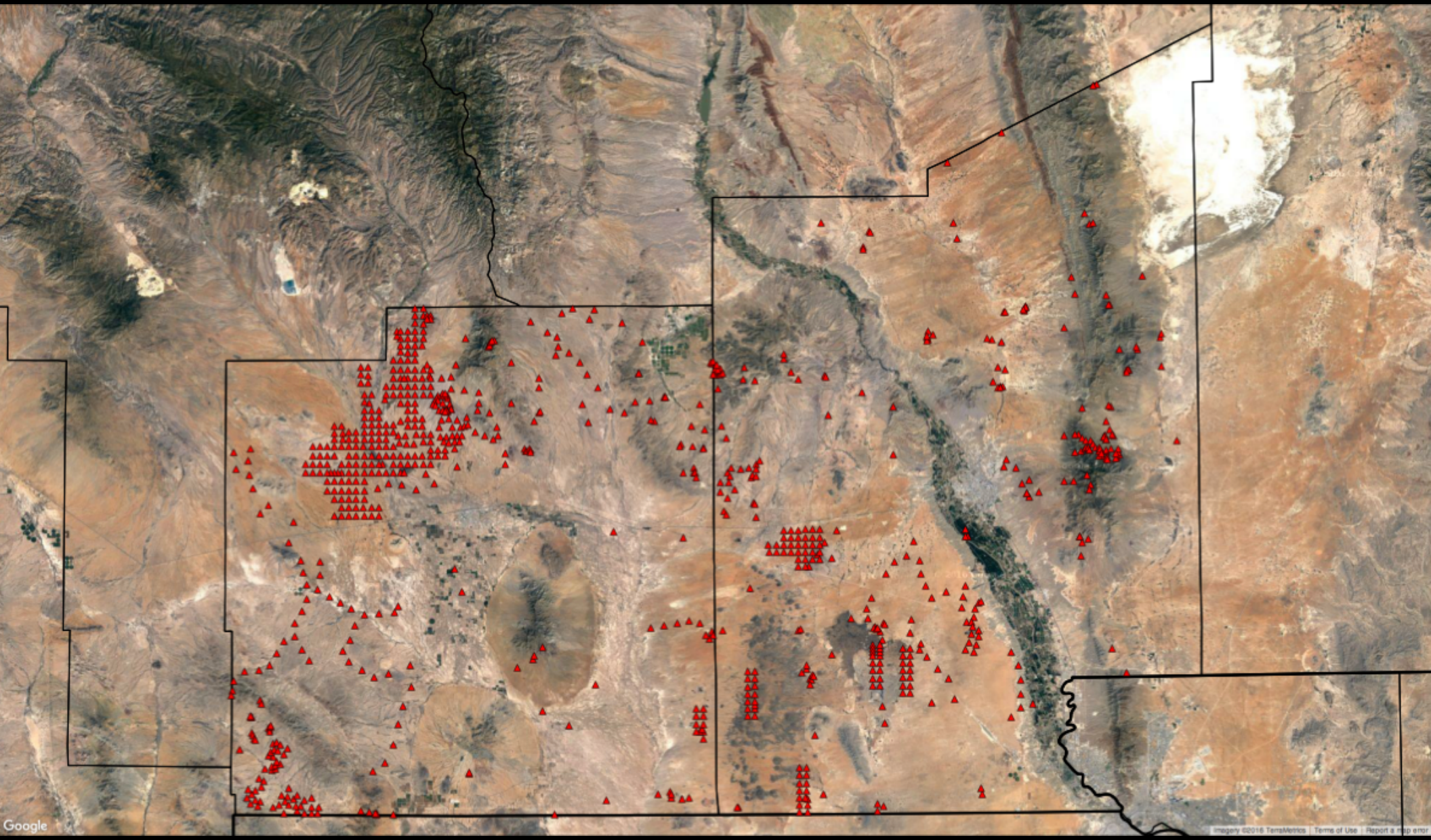
record all plants identifiable in a 10m radius...

Atriplex elegans
Aphanostephus ramosissimus
Hymenoxys odorata
Cryptantha
Phacelia arizonica
Descurainia pinnata
Physaria gordonii
Astragalus allochrous
Astragalus nuttallianus
Hoffmannseggia glauca
Prosopis glandulosa
Erodium cicutarium
Malvella lepidota
Sphaeralcea hastulata
Bouteloua aristidoides
Bouteloua barbata
Chloris virgata
Eragrostis pectinacea
Pleuraphis mutica

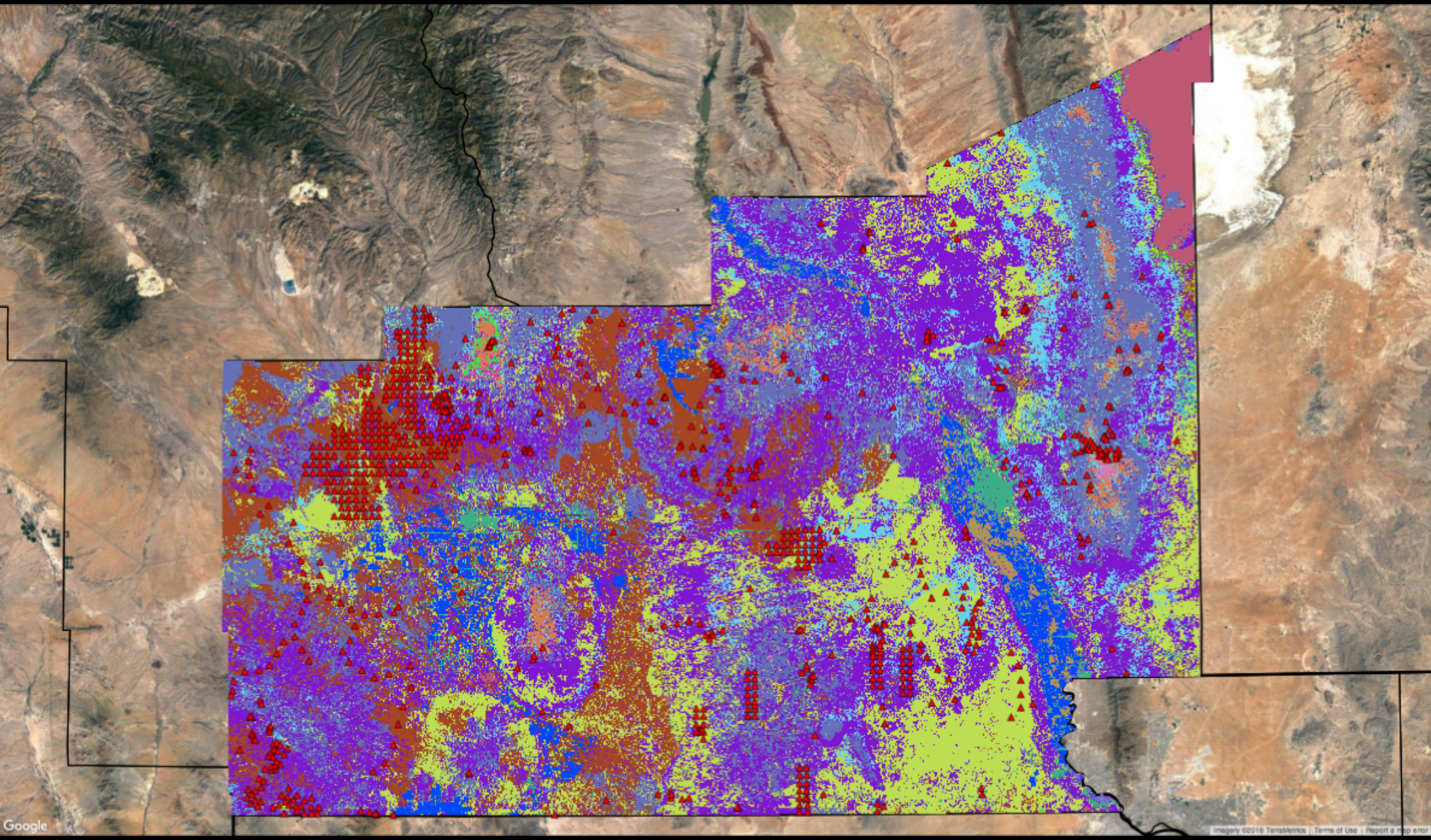
I have about 2800 of these points.



Let’s limit ourselves to 860 in Doña Ana & Luna counties.



We can pull USNVC (LANDFIRE) & ESIS from GIS



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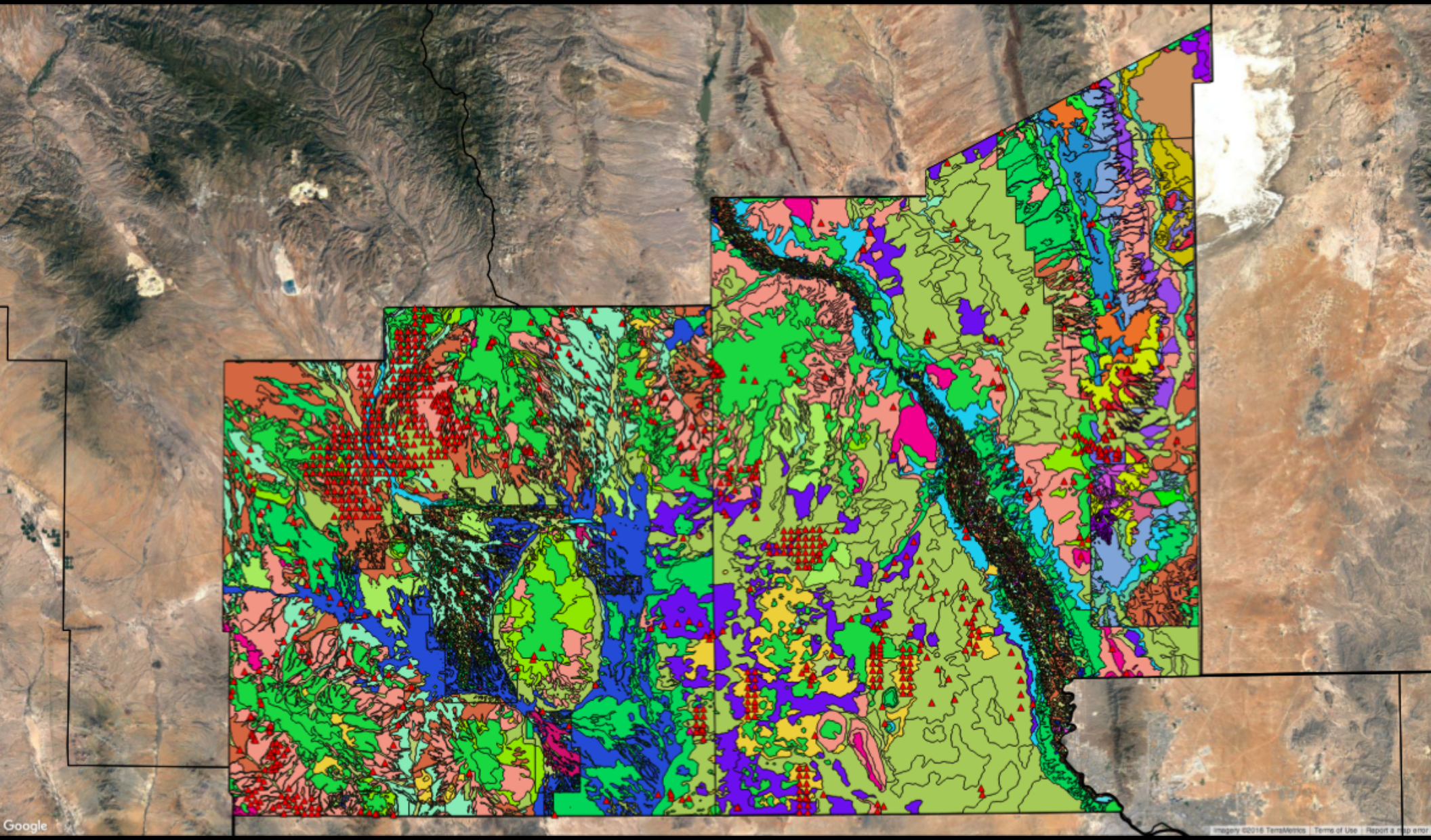
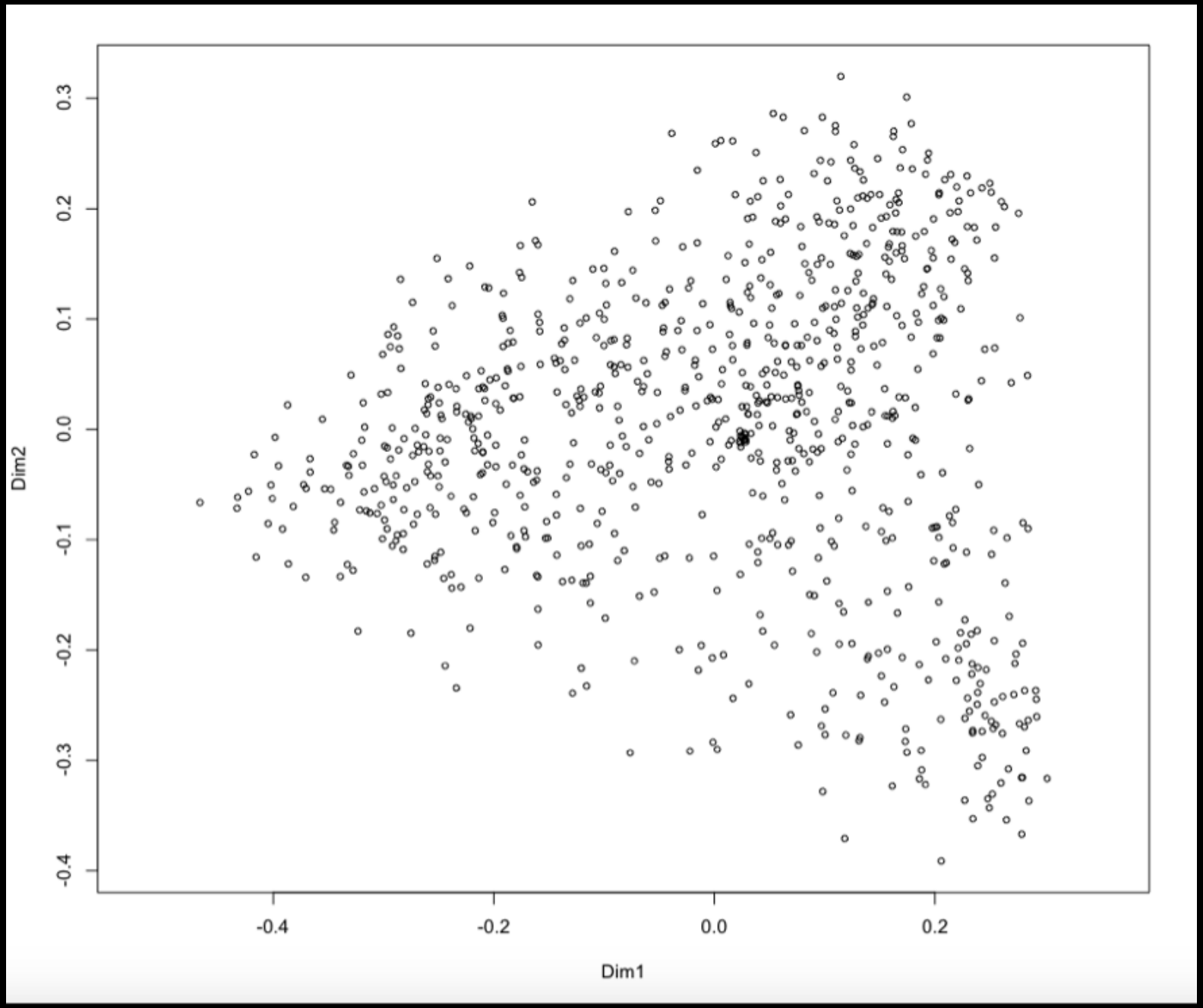


Claim 1: Plant communities are distinct entities with objectively identifiable boundaries.



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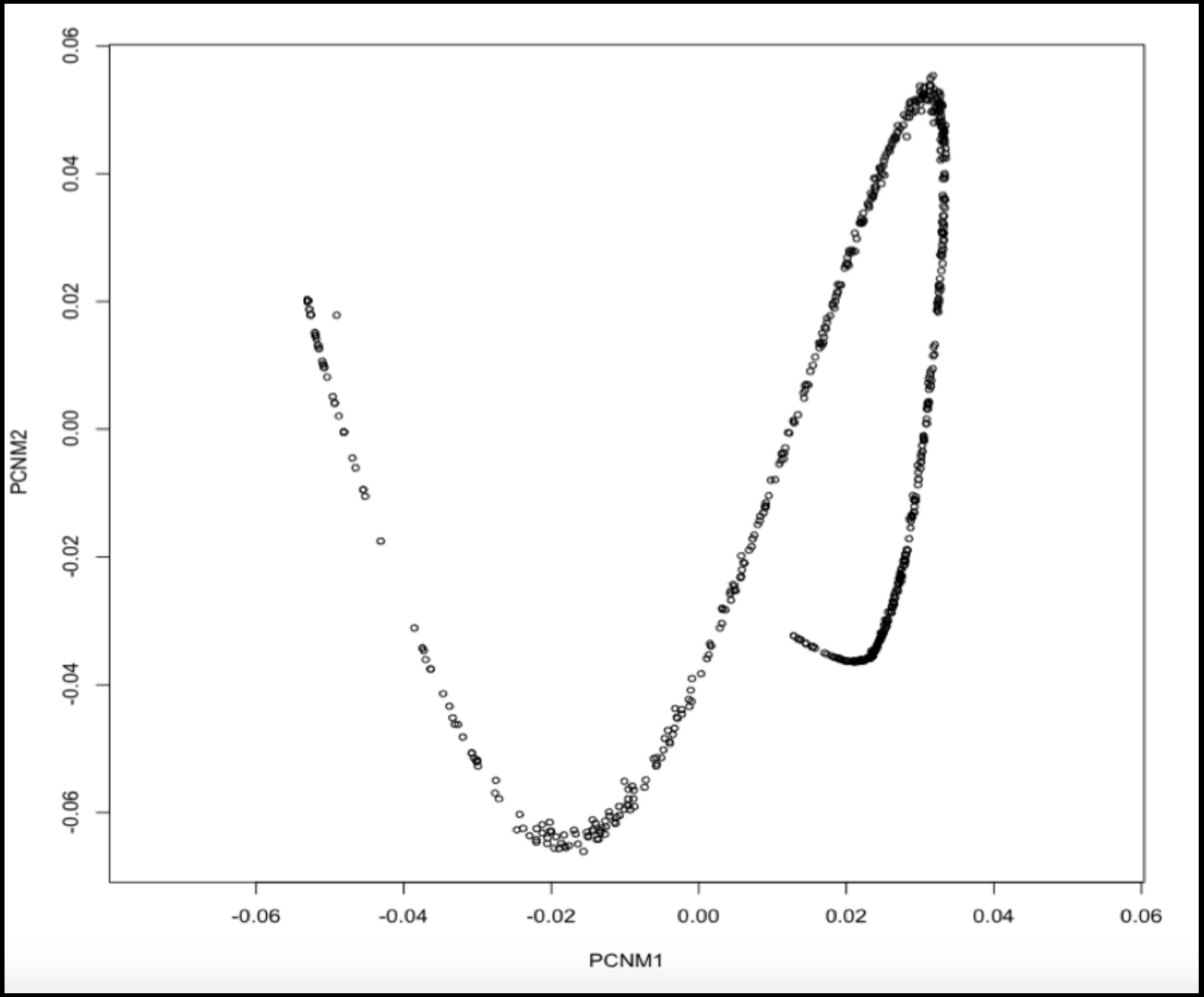

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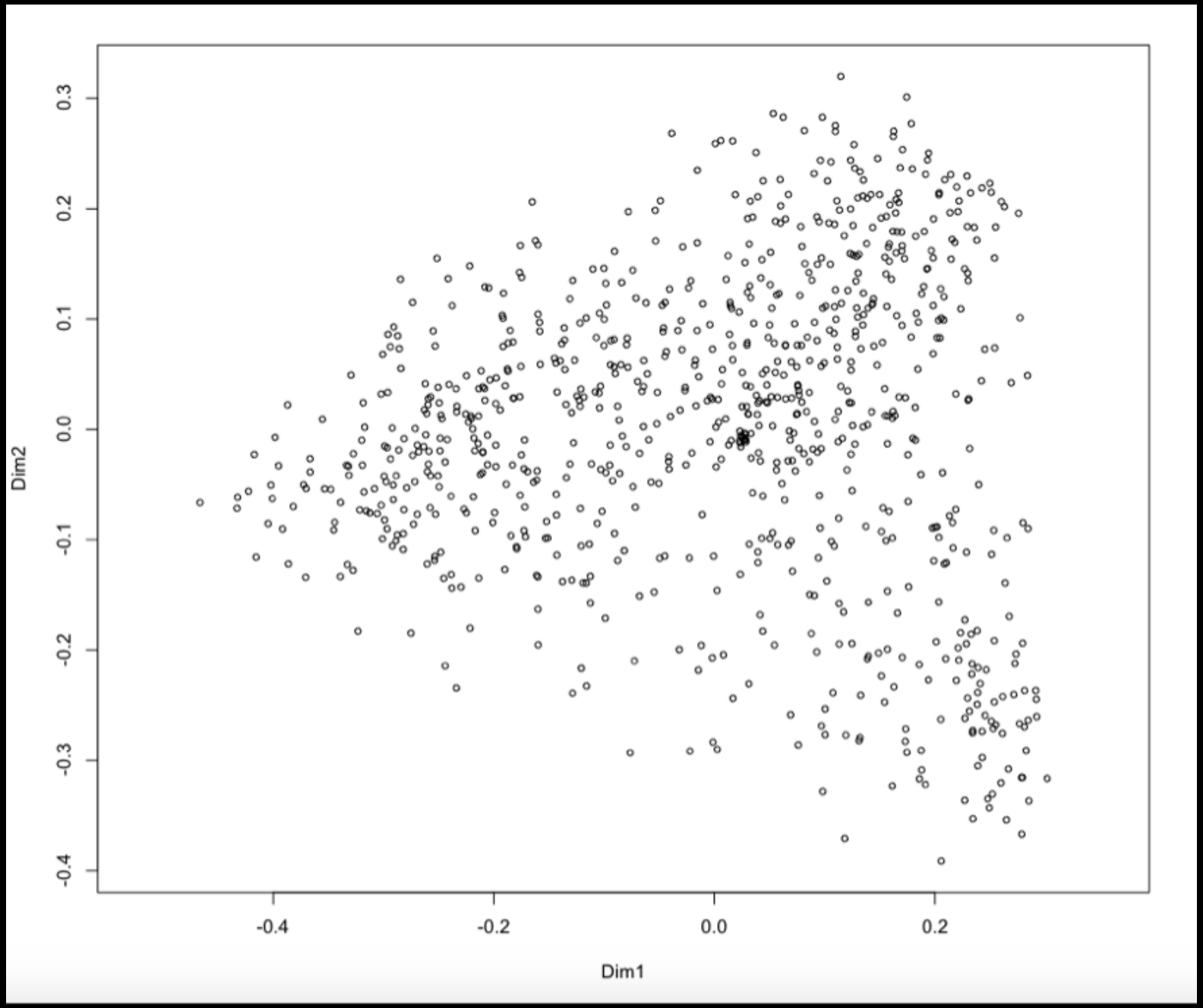
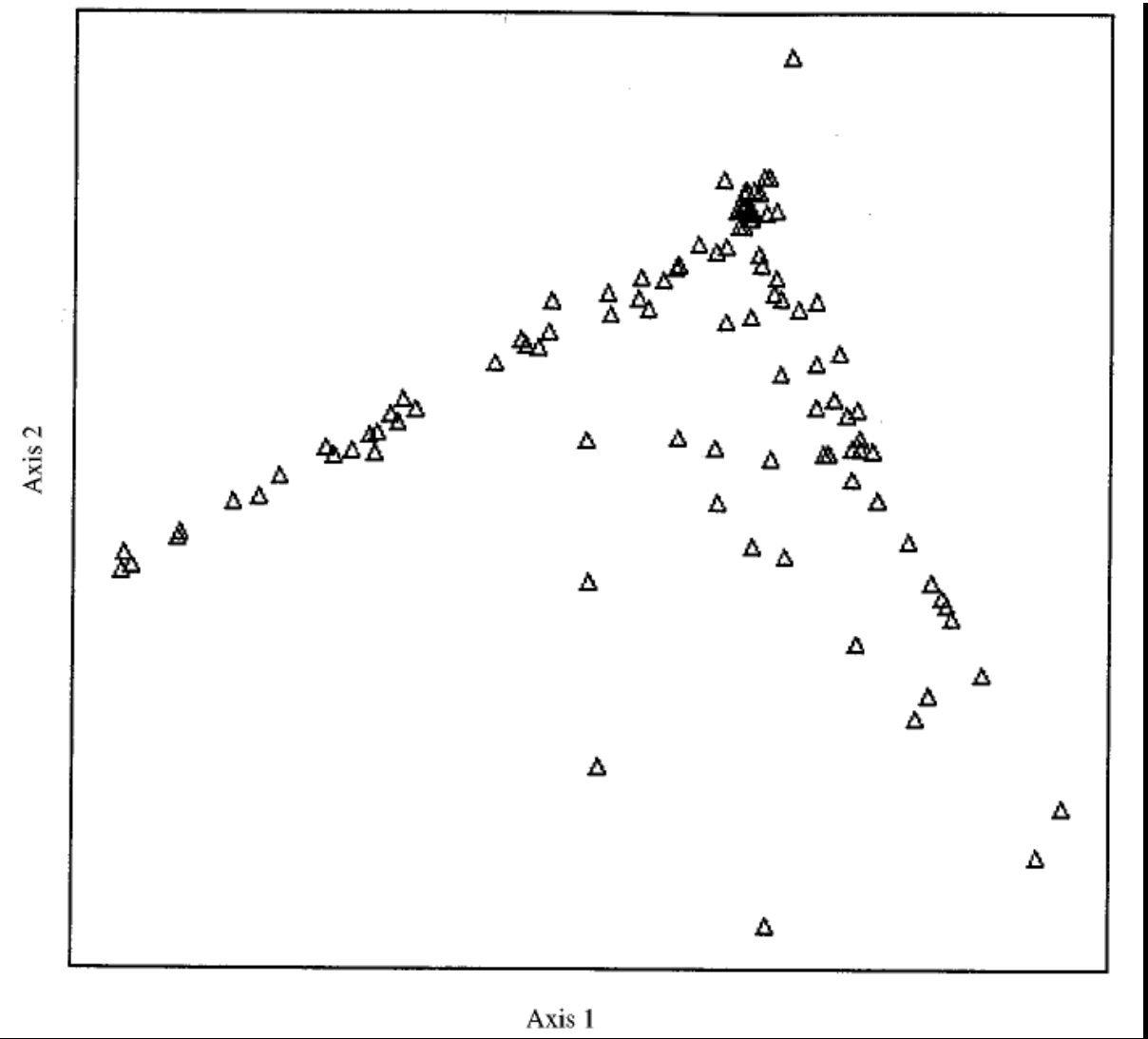


Claim 1: Plant communities are distinct entities with objectively identifiable boundaries.

Journal of Arid Environments (2000) **44:** 305–325
doi:10.1006/jare.1999.0597, available online at http://www.idealibrary.com on IDEAL®

Multivariate characterization of perennial vegetation in the northern Chihuahuan Desert

A. R. Johnson*, S. J. Turner†, W. G. Whitford‡, A. G. de Soyza§ & J. W. Van Zee¶



Claim 1: Plant communities are distinct entities with objectively identifiable boundaries.

No.

However, the categories could still be useful!

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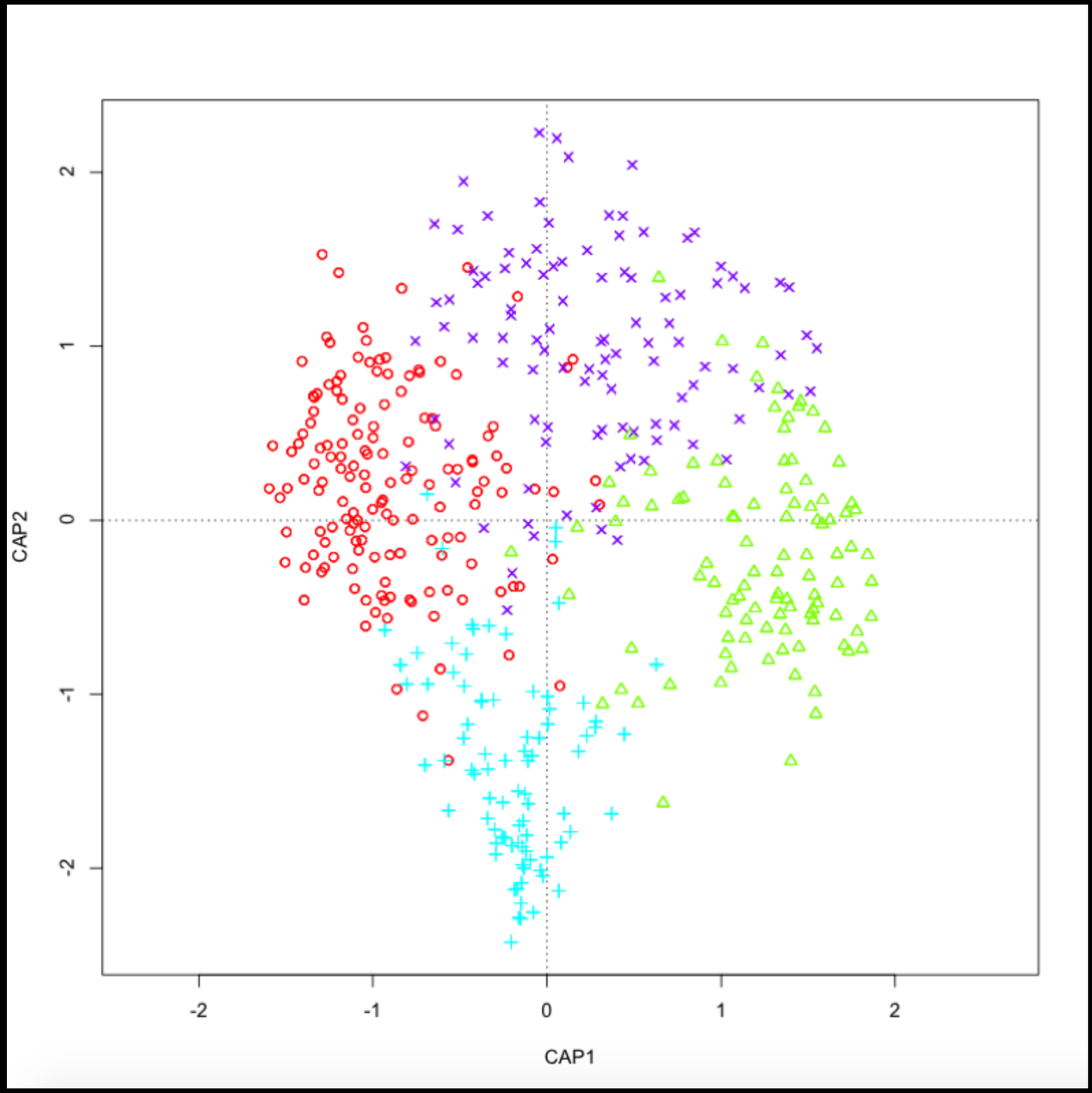
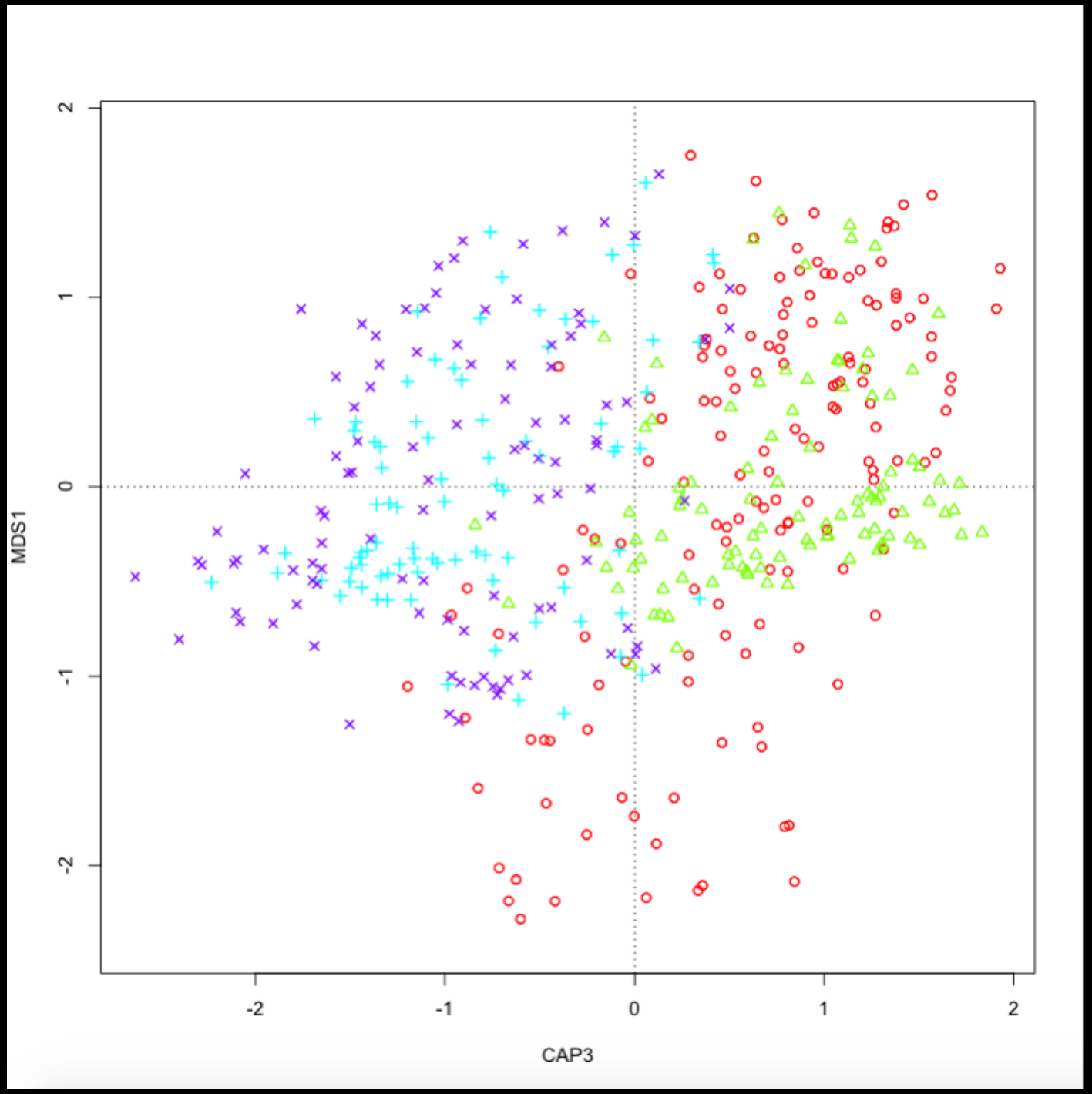
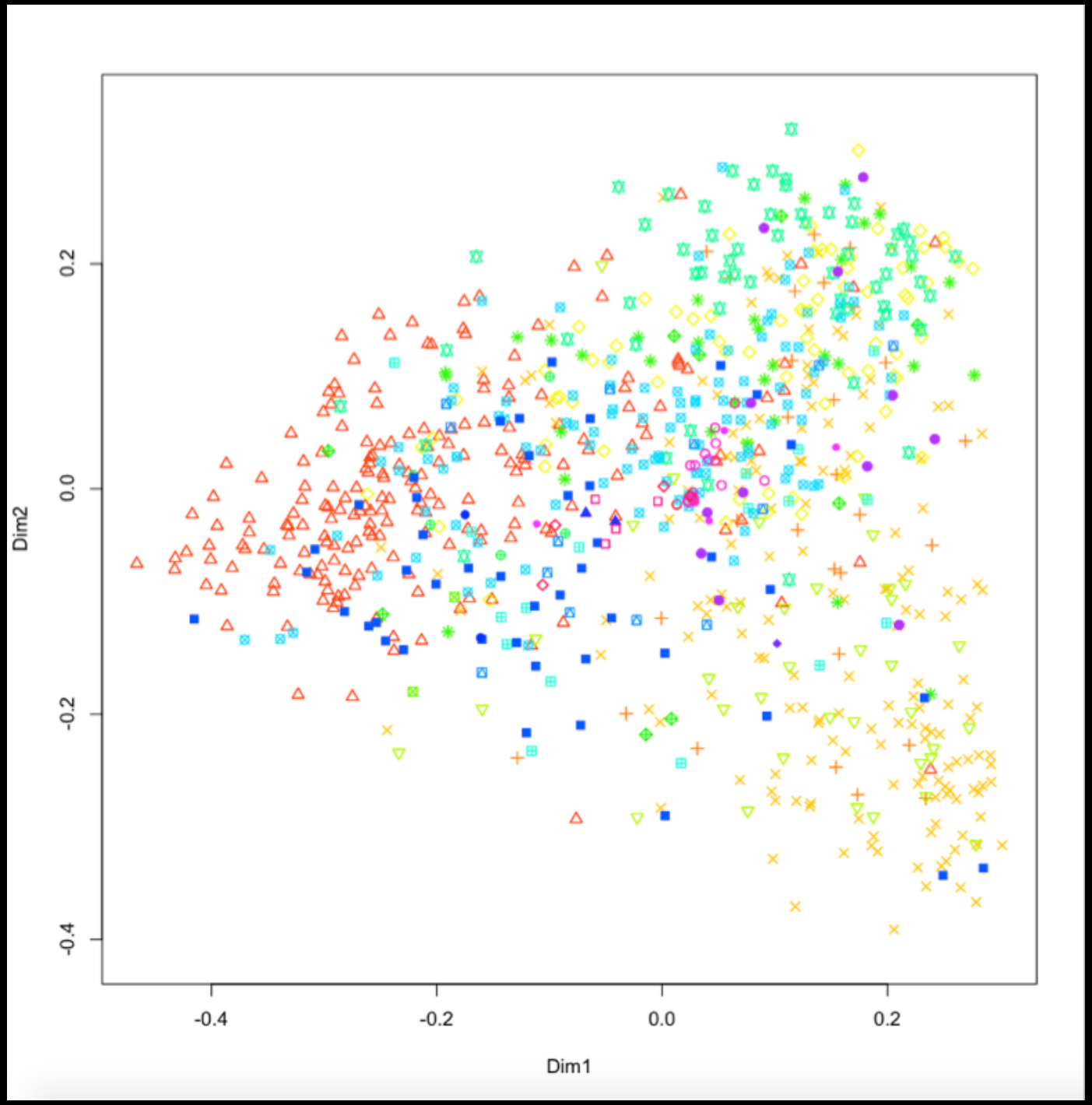


Or not!



However, the categories could still be useful… or not!



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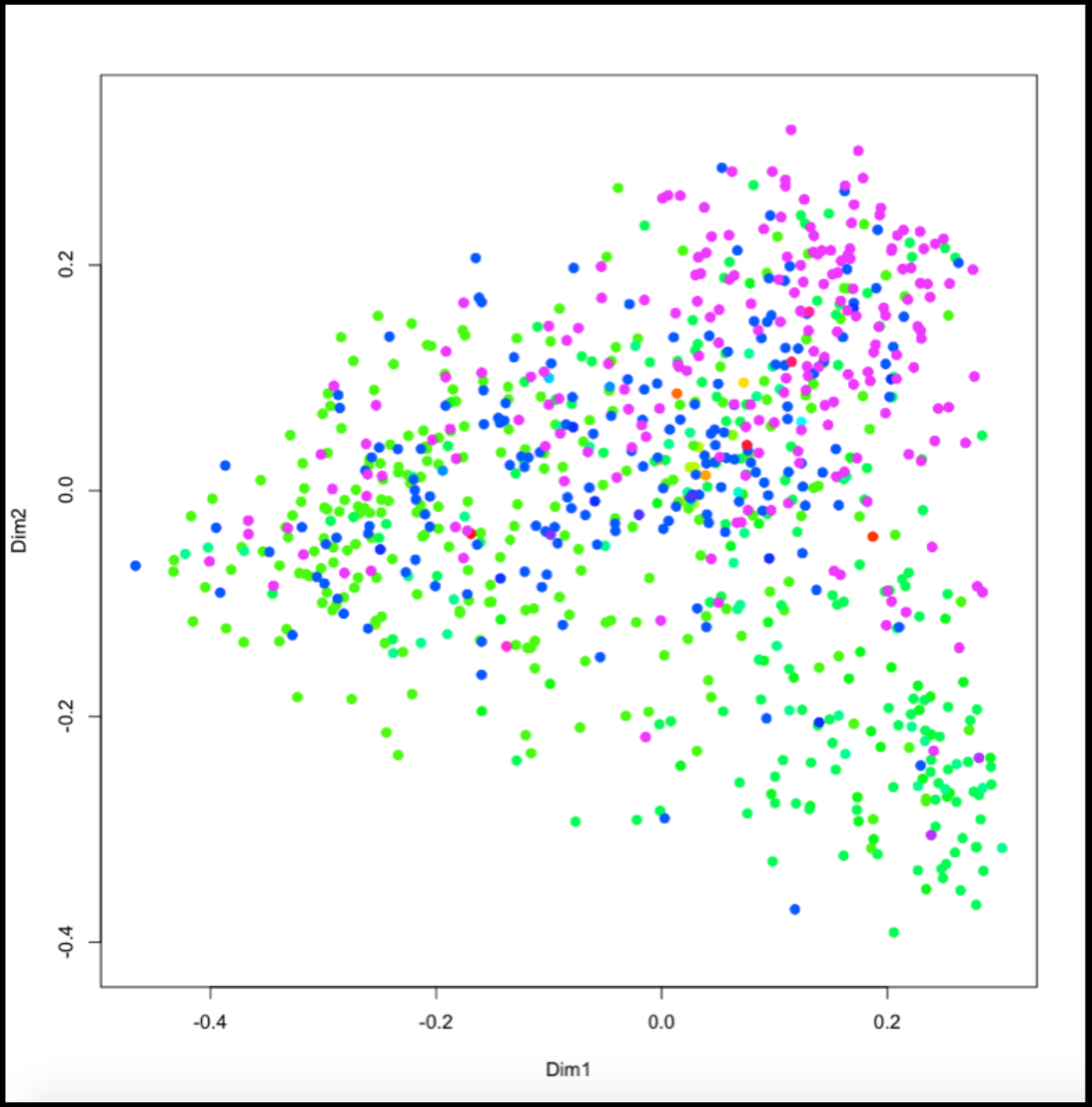
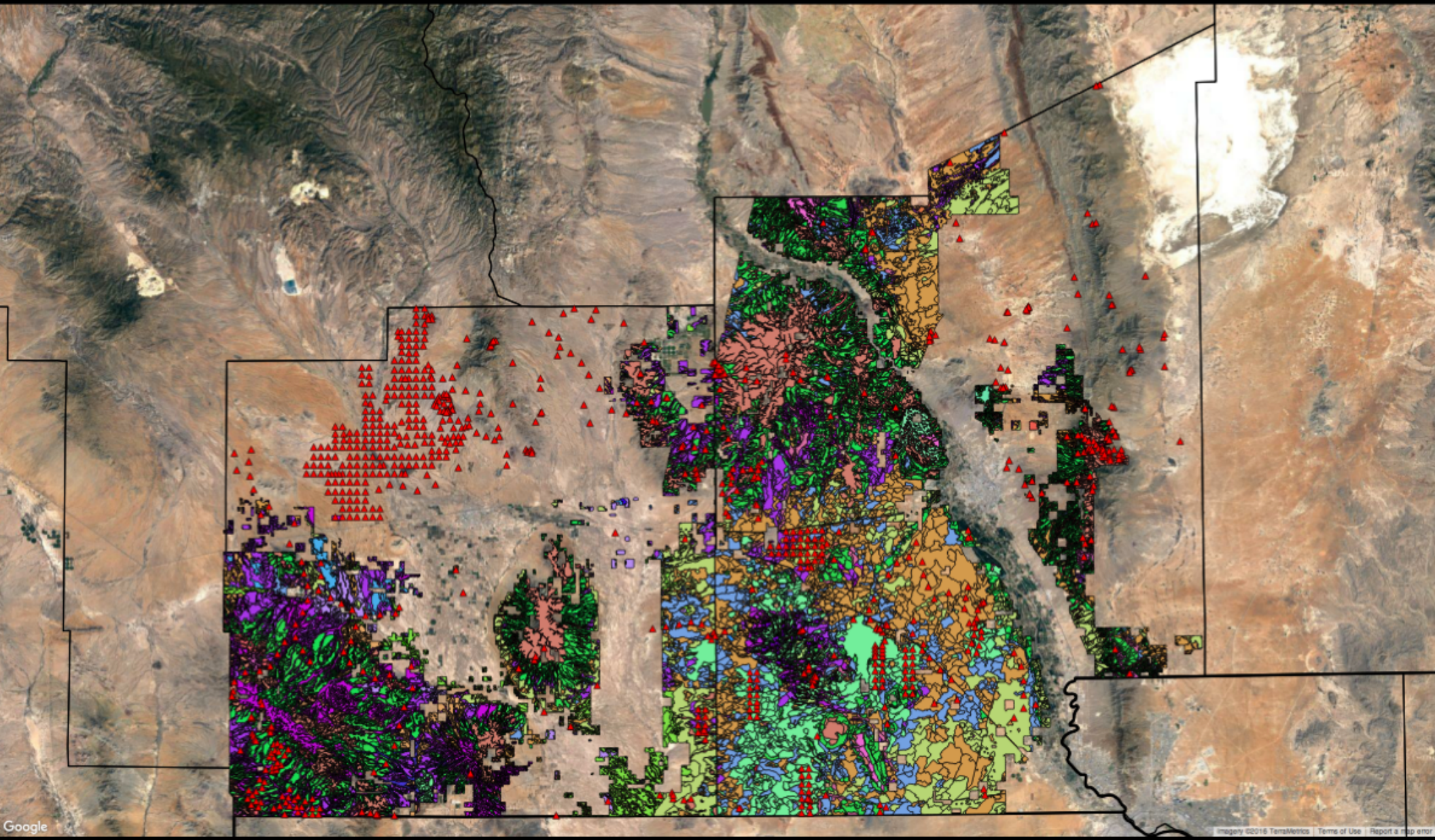
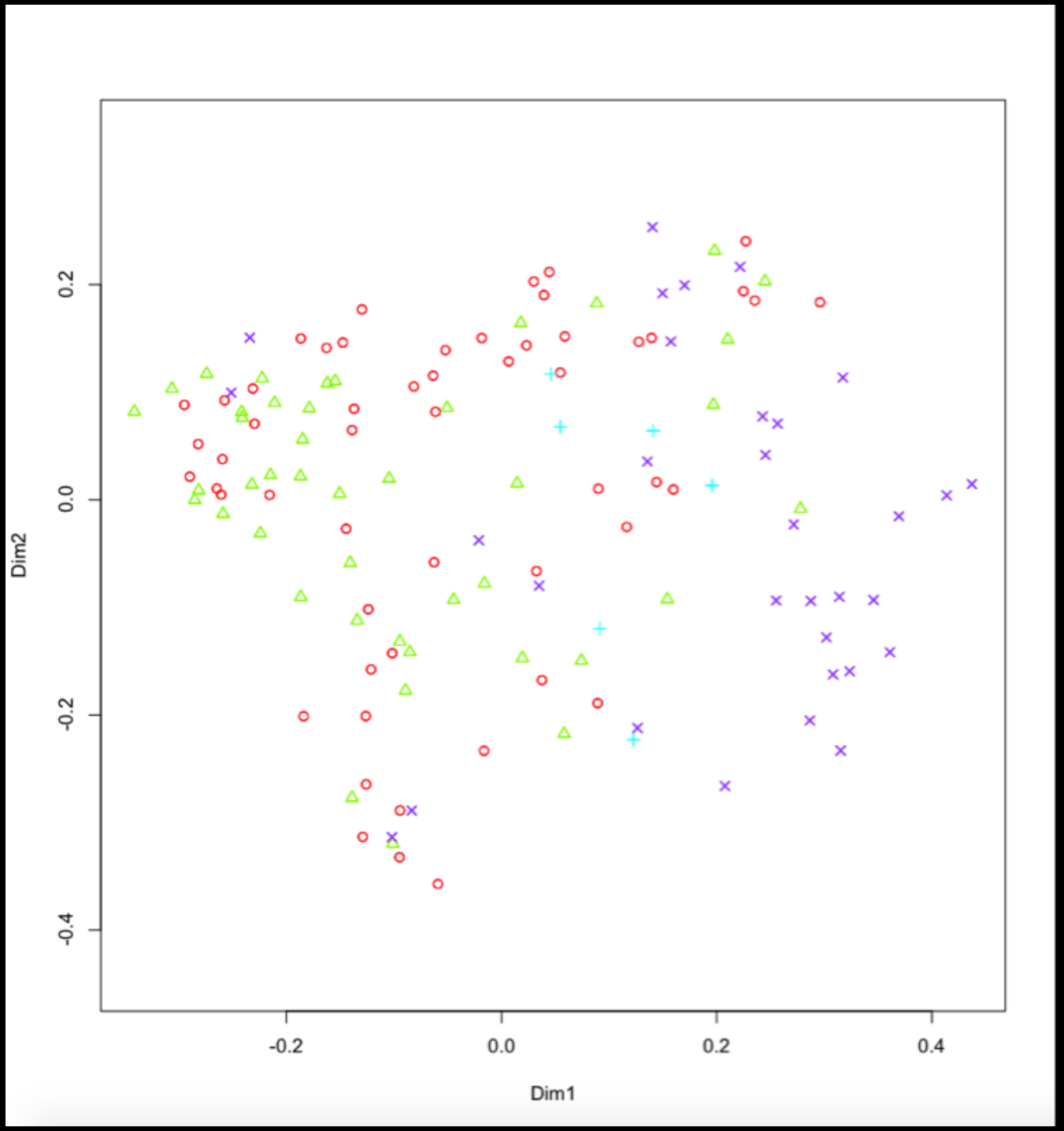


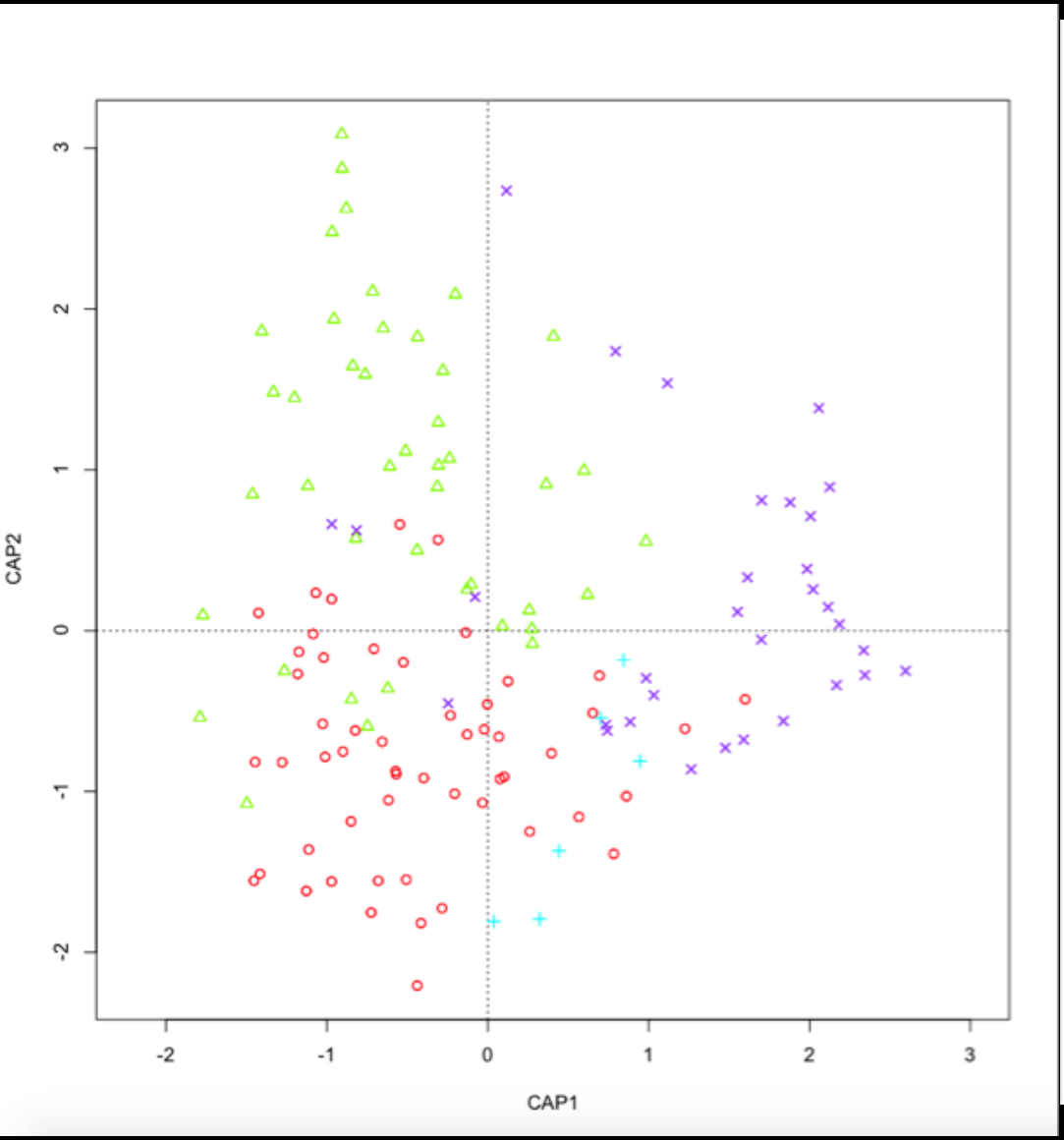
OK, here's a best-case scenario: high-accuracy mapping of ecological sites, and let's just look at a subset of the variation…

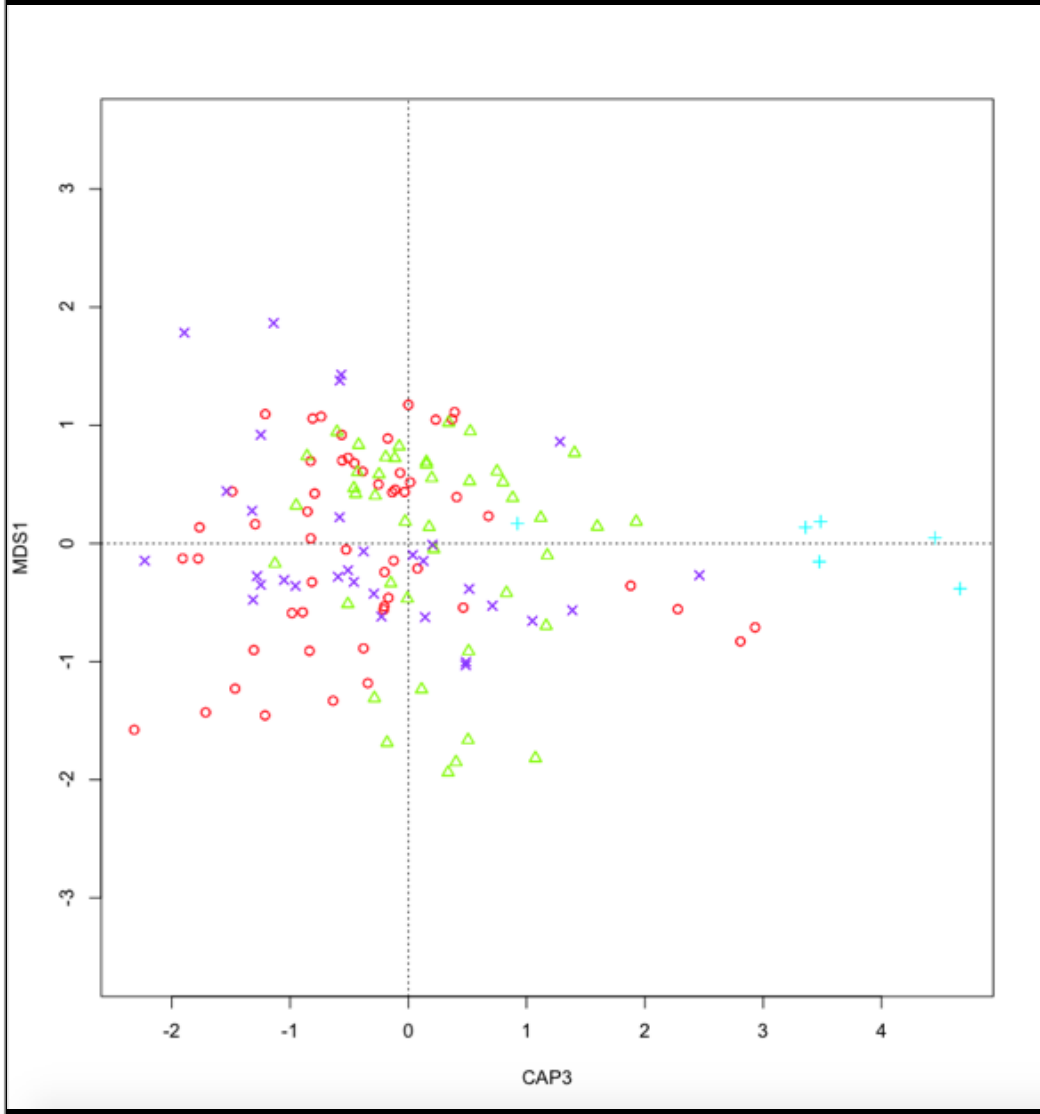


Hmm... maybe if we try a constrained ordination?

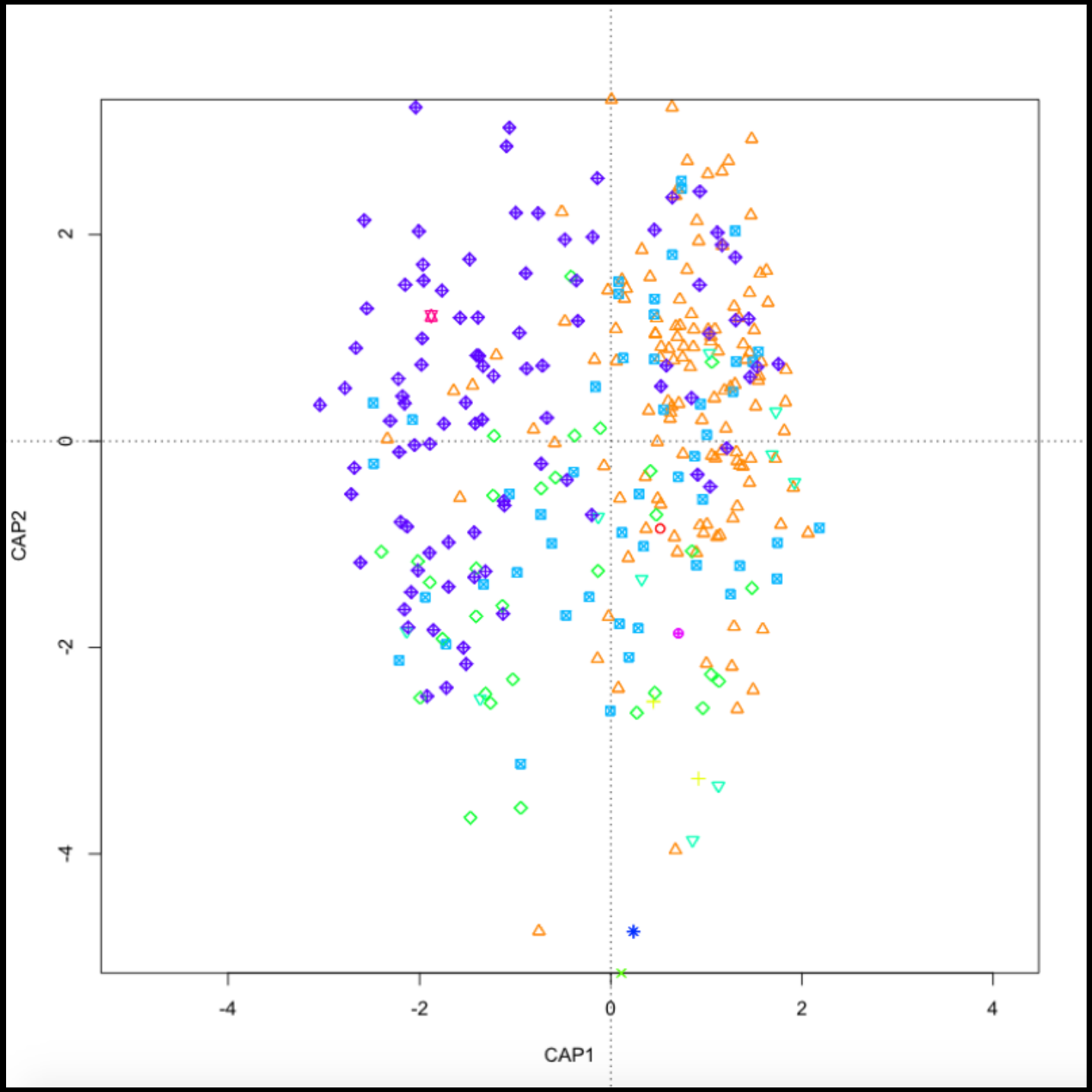


OK, that's getting somewhere.





Can we finagle the LANDFIRE plant communities in the same way?



Dominant species

This approach requires another claim.

Claim 2:

> We can understand variation in ca. 4000 plant species (in NM) by looking at a small set of common plants.

Claim 2: We can understand variation in ca. 4000 plant species by looking at a small set of common plants.

Salsola tragus
Artemisia carruthii
Berlandiera lyrata
Chaetopappa ericoides
Grindelia squarrosa
Ratibida tagetes
Zinnia grandiflora
Chamaesyce albomarginata
Sphaeralcea angustifolia
Sphaeralcea coccinea
Argemone squarrosa
Aristida divaricata
Bothriochloa sp.
Bouteloua gracilis
Panicum hallii
Schedonnardus paniculatus
Portulaca oleracea
Solanum elaeagnifolium
Glandularia wrightii
Verbena plicata

Dysphania graveolens
Dyssodia papposa
Heterosperma pinnatum
Laënnecia coulteri
Berberis haematocarpa
Juniperus monosperma
Salvia reflexa
Aristida adscensionis
Bouteloua gracilis
Muhlenbergia repens
Muhlenbergia torreyi

Nolina texana
Yucca elata
Gutierrezia microcephala
Cylindropuntia imbricata
Evolvulus nuttallianus
Chamaesyce lata
Chamaesyce stictospora
Aristida adscensionis
Bouteloua eriopoda
Bouteloua gracilis
Dasyochloa pulchella
Erioneuron avenaceum
Sporobolus flexuosus
Glandularia wrightii

Maybe that was a fluke?

Chenopodium sp.
Salsola tragus
Chaetopappa ericoides
Schkuhria multiflora
Zinnia grandiflora
Sphaeralcea coccinea
Aristida divaricata
Aristida purpurea
Bouteloua gracilis
Sporobolus cryptandrus

Amaranthus powellii
Salsola tragus
Suaeda nigra
Artemisia filifolia
Gutierrezia sarothrae
Machaeranthera tanacetifolia
Packera multilobata
Cryptantha sp.
Cryptantha crassisepala
Lappula occidentalis
Descurainia pinnata
Dimorphocarpa wislizeni
Cleome serrulata
Tripterocalyx carneus
Oenothera albicaulis
Oenothera coronopifolia
Plantago patagonica
Bouteloua gracilis
Munroa squarrosa
Sporobolus cryptandrus
Eriogonum cernuum

Yucca baileyi
Chaetopappa ericoides
Dyssodia papposa
Schkuhria multiflora
Cryptantha cinerea
Dalea candida
Oenothera suffrutescens
Aristida adscensionis
Aristida divaricata
Bouteloua gracilis

Habitat classification

This approach requires a third claim.

Claim 3:

> We can predict what plants occur at a site (or should occur)
> by measuring the soils or other abiotic conditions at that site.

Claim 3: We can predict what plants occur at a site (or "should" occur) by measuring the abiotic conditions at that site.

Acourtia nana
Bahia absinthifolia
Baileya multiradiata
Flourensia cernua
Parthenium incanum
Cryptantha crassisepala
Lappula occidentalis
Descurainia pinnata
Lepidium lasiocarpum
Astragalus nuttallianus
Hoffmannseggia glauca
Erodium cicutarium
Erodium texanum
Oenothera primiveris
Aristida adscensionis
Bouteloua barbata
Dasyochloa pulchella
Muhlenbergia porteri
Eriogonum abertianum
Larrea tridentata

Allium sp.
Zephyranthes longifolia
Hedosyne ambrosiifolia
Cryptantha sp.
Lepidium sp.
Echinocereus fendleri
Echinomastus intertextus
Ferocactus wislizeni
Mammillaria grahamii
Commelina erecta
Evolvulus alsinoides
Apodanthera undulata
Croton pottsii
Calliandra eriophylla
Dalea sp.
Senna bauhinioides
Hibiscus denudatus
Sida abutifolia
Allionia incarnata
Aristida adscensionis
Bouteloua eriopoda
Eragrostis lehmanniana
Linanthus bigelovii
Eriogonum abertianum
Portulaca suffrutescens
Talinum aurantiacum
Kallstroemia grandiflora
Larrea tridentata

Yucca baccata
Bahia absinthifolia
Flourensia cernua
Melampodium leucanthum
Parthenium incanum
Sanvitalia abertii
Sidneya tenuifolia
Thymophylla pentachaeta
Verbesina encelioides
Opuntia phaeacantha
Chamaesyce revoluta
Chamaesyce serrula
Dalea sp.
Dalea formosa
Prosopis glandulosa
Senna bauhinioides
Sida abutifolia
Boerhavia triquetra
Bouteloua aristidoides
Bouteloua barbata
Bouteloua curtipendula
Dasyochloa pulchella
Digitaria californica
Enneapogon desvauxii
Eragrostis lehmanniana
Muhlenbergia porteri
Panicum hirticaule
Setaria leucopila
Aloysia wrightii
Kallstroemia parviflora
Larrea tridentata

Maybe that was a fluke?

Yucca baccata
Acourtia nana
Bahia absinthifolia
Gutierrezia microcephala
Parthenium incanum
Thymophylla acerosa
Coryphantha macromeris
Cylindropuntia leptocaulis
Opuntia macrocentra
Ephedra torreyana
Prosopis glandulosa
Aristida purpurea
Dasyochloa pulchella
Muhlenbergia porteri
Sporobolus sp.
Larrea tridentata

Gutierrezia sarothrae
Hymenoxys odorata
Laënnecia coulteri
Pectis papposa
Verbesina encelioides
Descurainia pinnata
Prosopis glandulosa
Aristida adscensionis
Bouteloua barbata
Chloris virgata
Eragrostis pectinacea
Sporobolus airoides
Sporobolus pyramidatus

Yucca elata
Nama hispidum
Descurainia pinnata
Ephedra trifurca
Croton pottsii
Astragalus allochrous
Hoffmannseggia glauca
Lupinus brevicaulis
Prosopis glandulosa
Erodium cicutarium
Sphaeralcea hastulata
Oenothera primiveris
Plantago patagonica
Aristida adscensionis
Bouteloua aristidoides
Bouteloua barbata
Dasyochloa pulchella
Muhlenbergia porteri
Eriastrum diffusum
Chamaesaracha coronopus
Solanum elaeagnifolium

Claim 3: We can predict what plants occur at a site (or "should" occur) by measuring the abiotic conditions at that site.

Habitat classification

This approach requires a third claim.

Claim 3:

We can predict what plants occur at a site **(or should occur)**
by measuring the soils or other abiotic conditions at that site.

Habitat classification

This approach requires a third claim.

Claim 3:

We can predict what plants occur at a site **(or should occur)** by measuring the soils or other abiotic conditions at that site.

Reference Sheet

Author(s)/participant(s):

Contact for lead author:

Date: **MLRA:** 042X **Ecological Site:** Gravelly R042XB010NM This *must* be verified based on soils and climate (see Ecological Site Description). Current plant community cannot be used to identify the ecological site.

Why does it matter?

Well, apart from general curiosity…

We use these classifications of plant communities / ecology in land management.

For example: gravelly ecological site--often looks like this:

but “should” have black grama / creosote shrub savanna

If we get rid of the creosote… we get the plant community we should have?

Maybe… maybe not…

Maybe… maybe not…

Maybe… maybe not…

Maybe… maybe not…

Maybe… maybe not…

So, given that how we manage land depends on ideas about plant communities, like:

1) Plant communities are distinct entities with identifiable boundaries. (NOPE)

2) We can understand variation in ca. 4000 plant species by looking at a small set of common plants. (KIND OF?)

3) We can predict what plants occur at a site (or "should" occur) by measuring the abiotic conditions at that site. (MAYBE?)

4) We know how to create a desired change in plant communities. (SOMETIMES?)

We should ask:

> “Are these plant communities real?”
>
> “How many species did you study?”
>
> “How do we know what ‘ought’ to grow here?”

Or, if land management is involved, add:

> “How do we know this land management plan will have the desired effect? And will that be good for plants or local ecology as a whole?”

The answers might be great!

We might understand what's going on, or at least have a good idea what to do.

But we can't take that for granted.