desert conservation
PROGRAM
respect, protect and enjoy our desert!

Clark County Rare Plant Modeling, Inventory and Soil Analysis

Sonja Kokos
Project Manager
kokos@co.clark.nv.us


Background


Presentation Overview
• Process
• Modeling
• Sample Design
• Validating models through surveys
• Soil Analyses
• Next Steps

desert conservation
PROGRAM
respect, protect and enjoy our desert!

Selected Rare Plant Species

Beaver Dam breadroot

Las Vegas buckwheat

desert conservation
PROGRAM
respect, protect and enjoy our desert!

Selected Rare Plant Species

Las Vegas bearpoppy

Threecorner milkvetch

desert conservation
PROGRAM
respect, protect and enjoy our desert!

Selected Rare Plant Species

White bearpoppy

White margined beardtongue

Selected Rare Plant Species

Sticky ringstem

Yellow twotone beardtongue

desert conservation
PROGRAM
respect, protect and enjoy our desert!

Process for determining where to conduct surveys

A contracted soil scientist and county staff reviewed and ground truthed the SSURGO Soils Data:

- Determined there were major gaps in coverage and badlands mapping appeared inconsistent

- Significant over-selection and under-selection for both gypsum and sandy soils

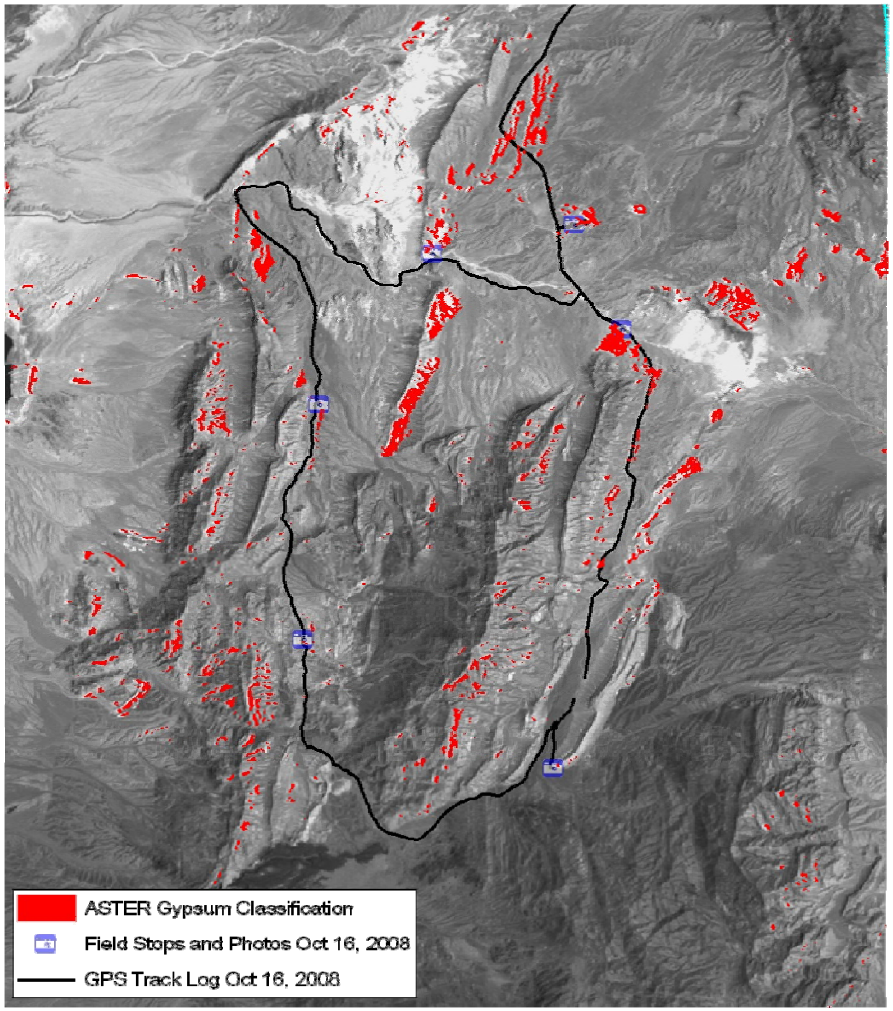
- Remote sensing offered an alternative approach for systematically mapping gypsum and sandy soils

TerraSpectra Geomatics

- Used remote sensing to identify potential areas of gypsum and sandy soils within Clark County
- Classifications were evaluated against
  - Aster Imagery, SSURGO Soils Data, and Landsat ETM+ Imagery
  - Selected geologic maps
  - Known plant locations
  - Validation field trips
- Classifications used to select survey locations
- Quick and relatively inexpensive

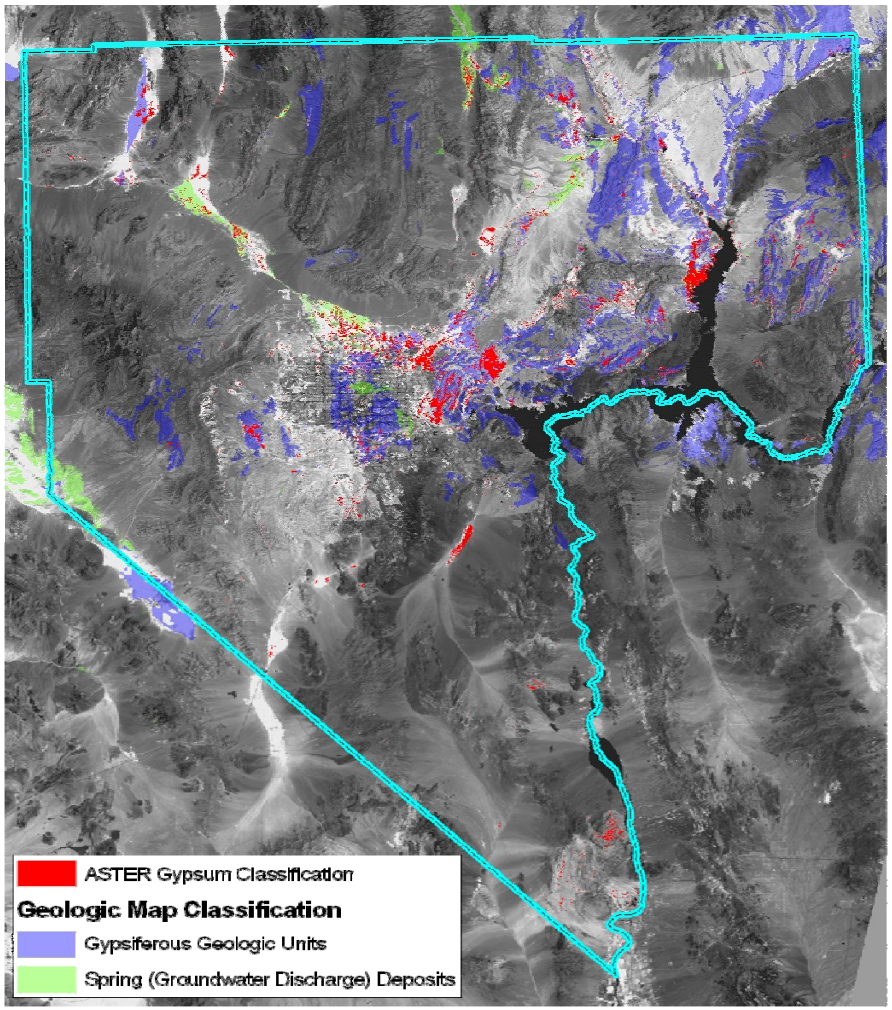
desert conservation
PROGRAM
respect, protect and enjoy our desert!

ASTER Gypsum Classification

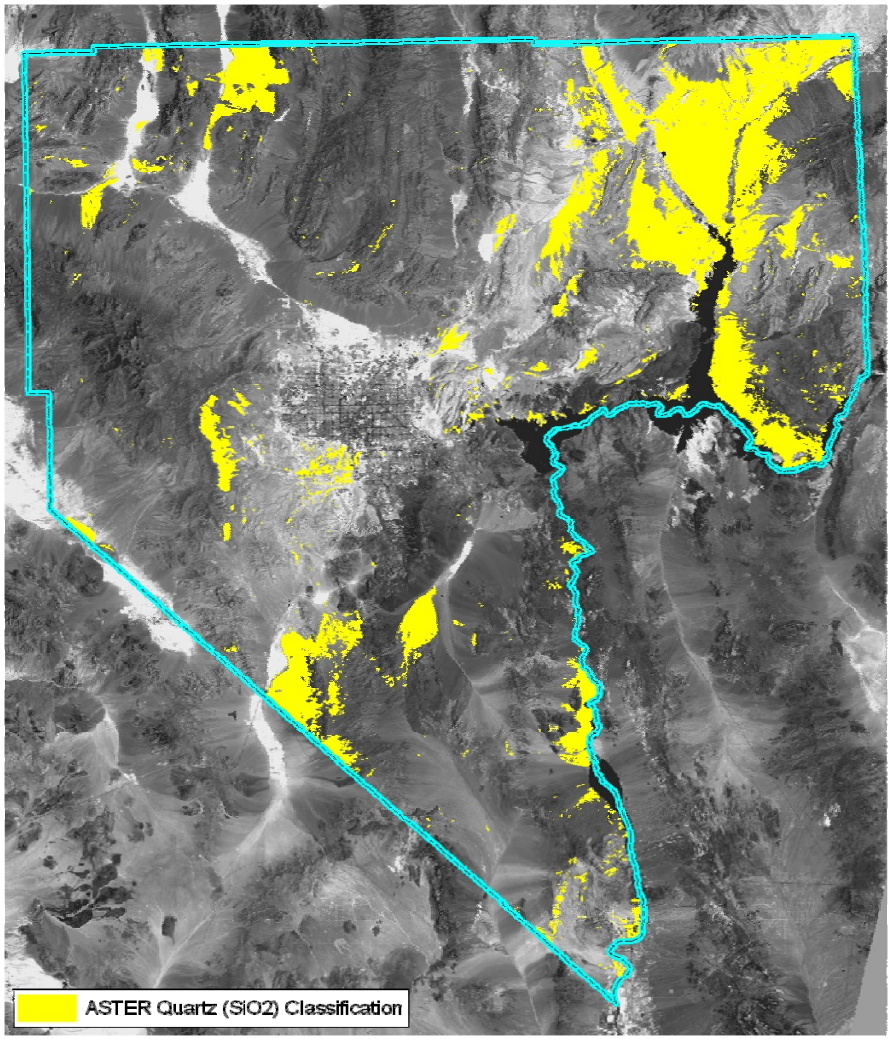


desert conservation
PROGRAM
respect, protect and enjoy our desert!

Geologic Mapping and Aster Classification for Gypsiferous Soils



ASTER Quartz Classification



desert conservation
PROGRAM
respect, protect and enjoy our desert!

Gypsum and Sand (Quartz) Classification

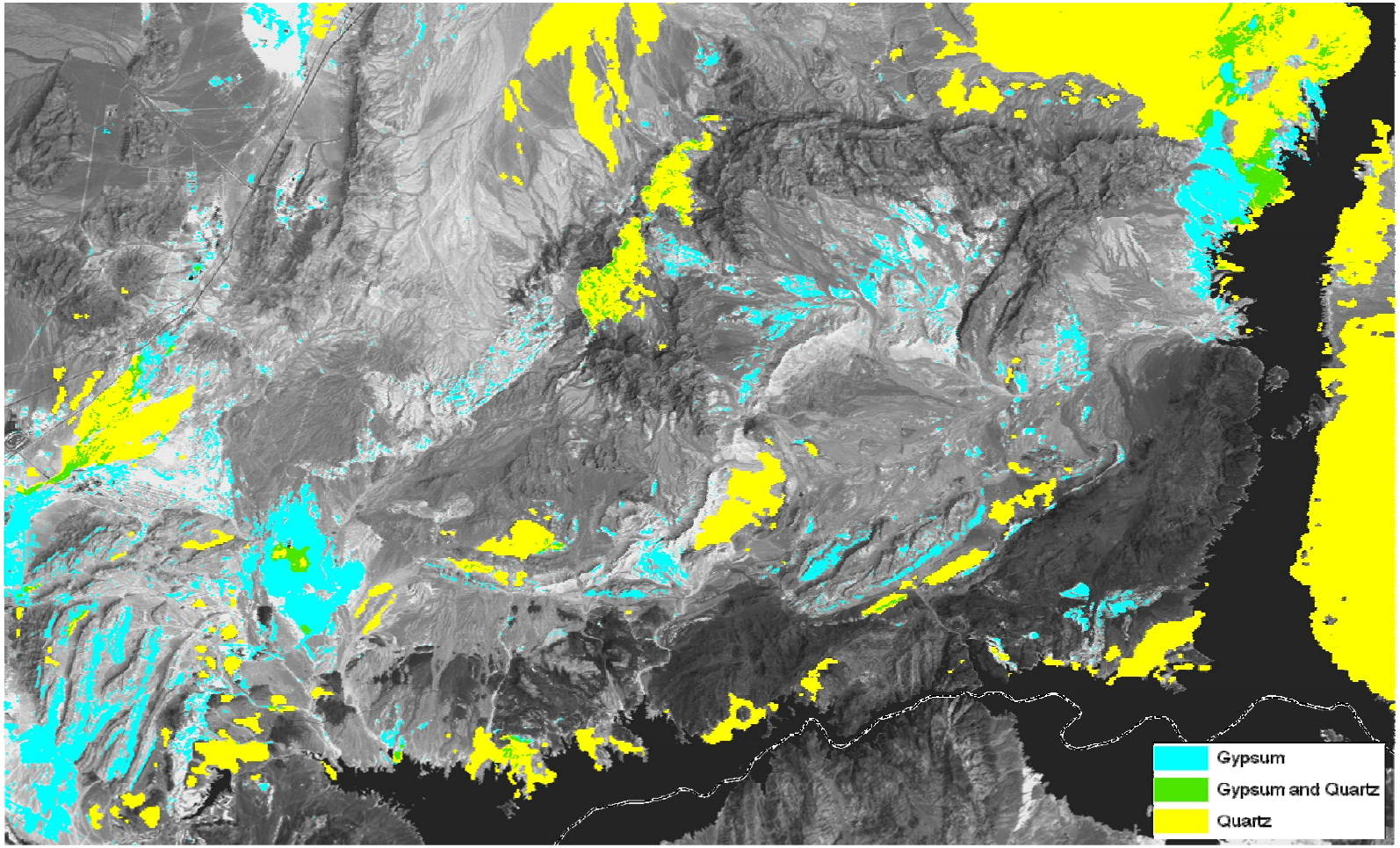


Table 1. Gypsum Species Distribution by Classification

Species	ASTER Classed Gypsiferous Geologic Unit	ASTER Classed Non-Gypsiferous Unit	ASTER Classed Spring (Groundwater Discharge) Deposit	Not ASTER Classed Gypsiferous Unit	Not ASTER Classed Non-Gypsiferous Unit	Not ASTER Classed Spring (Groundwater Discharge) Deposit
Anulocaulis leiosolenus var. *leiosolenus*	66	1	2	32	2	1
Arctomecon californica	1161	196	52	1298	662	422
Eriogonum corymbosum var. *nilesii*	88	76	260	88	147	542

Table 2. High, Medium, and Low Intensity Sampling Strata for Gypsum Species

Species	ASTER Classed Gypsiferous Geologic Unit	ASTER Classed Non-Gypsiferous Unit	ASTER Classed Spring (Groundwater Discharge) Deposit	Not ASTER Classed Gypsiferous Unit	Not ASTER Classed Spring (Groundwater Discharge) Deposit
Anulocaulis leiosolenus var. *leiosolenus*	High	Medium	Low	High	Medium
Arctomecon californica	High	Medium	Low	High	Medium
Eriogonum corymbosum var. *nilesii*	Medium	Medium	High	Medium	High

Sand Habitat Model

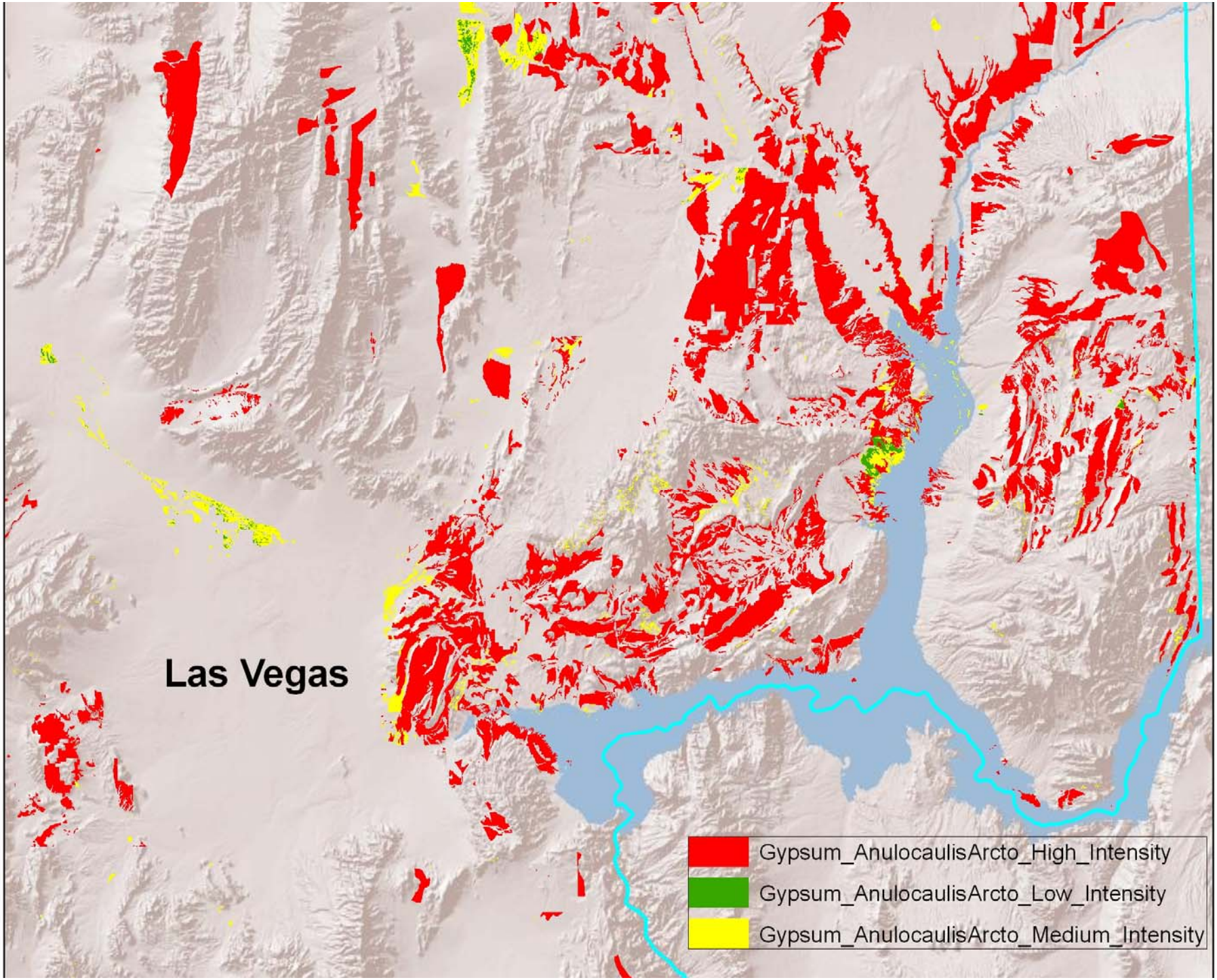
Table 3. Sand Species Distribution by Classification

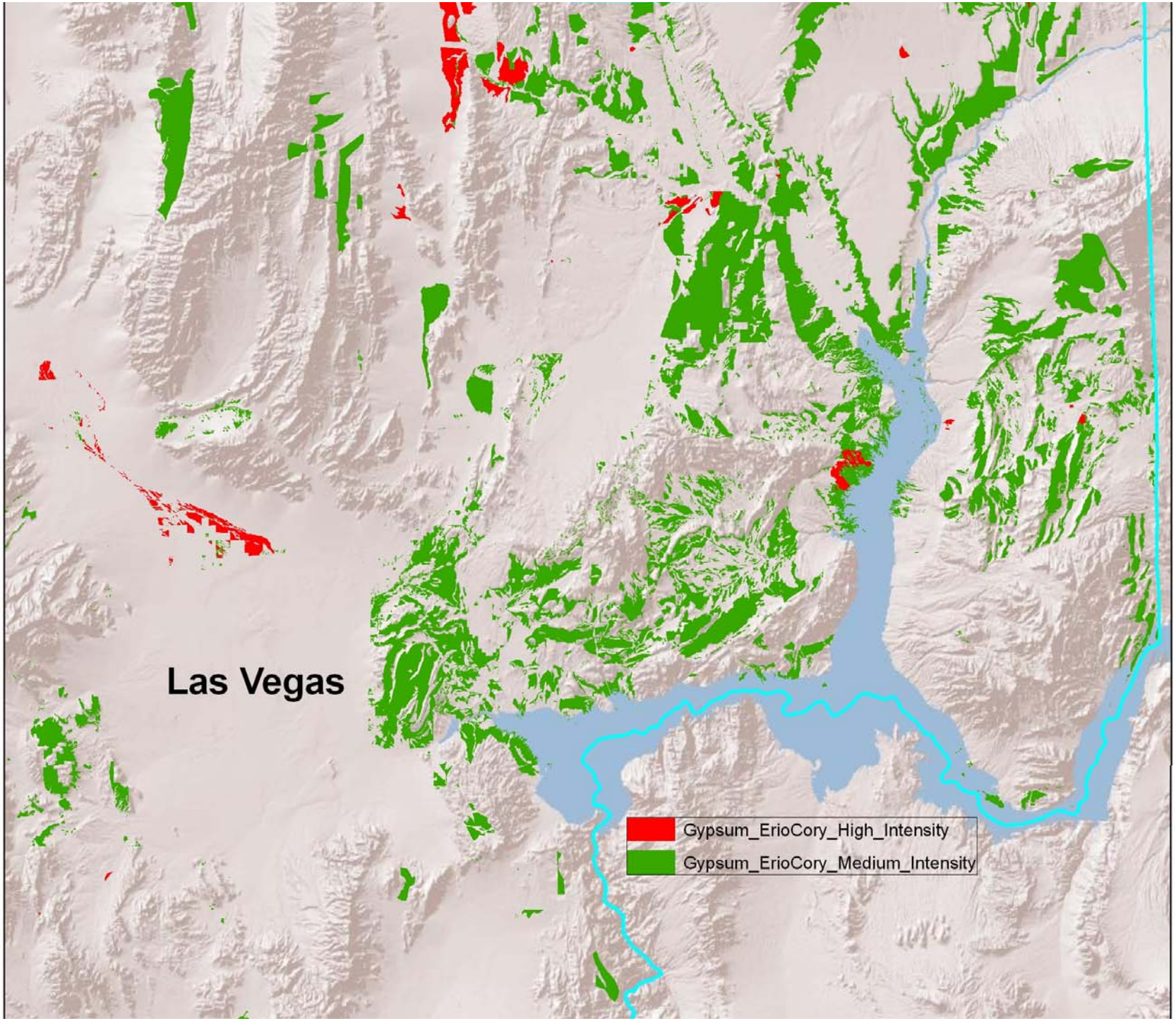
Classification	*Astragalus geyeri* var. *triquetrus*	*Eriogonum bifurcatum*	*Eriogonum viscidulum*	*Pediomelum castoreum*	*Penstemon albomarginatus*
Not Quartz Classified, Eolian	1				504
Not Quartz Classified, Mixed Eolian and Alluvium		71			3414
Not Quartz Classified, Younger Alluvium, Beneath a Soil with at least 75% Sand by Weighted Average within the First Foot of Soil	2				543
Quartz Classified, Drought Exposed Lake Bed	1		45		
Quartz Classified, Eolian	532		3	1	
Quartz Classified, Mixed Eolian and Alluvium					830
Quartz Classified, Non-Clastic Tertiary Bedrock and Mesozoic, Paleozoic, and Proterozoic Bedrock, Beneath a Soil with at least 75% Sand by Weighted Average within the First Foot of Soil	64		1		
Quartz Classified, Older Alluvium	72		56	1	
Quartz Classified, Playa					6
Quartz Classified, Quartz Sand Veneer Over Calcrete	62			1	
Quartz Classified, Tertiary Clastic Bedrock	45		48	6	
Quartz Classified, Younger Alluvium	161		19	2	82

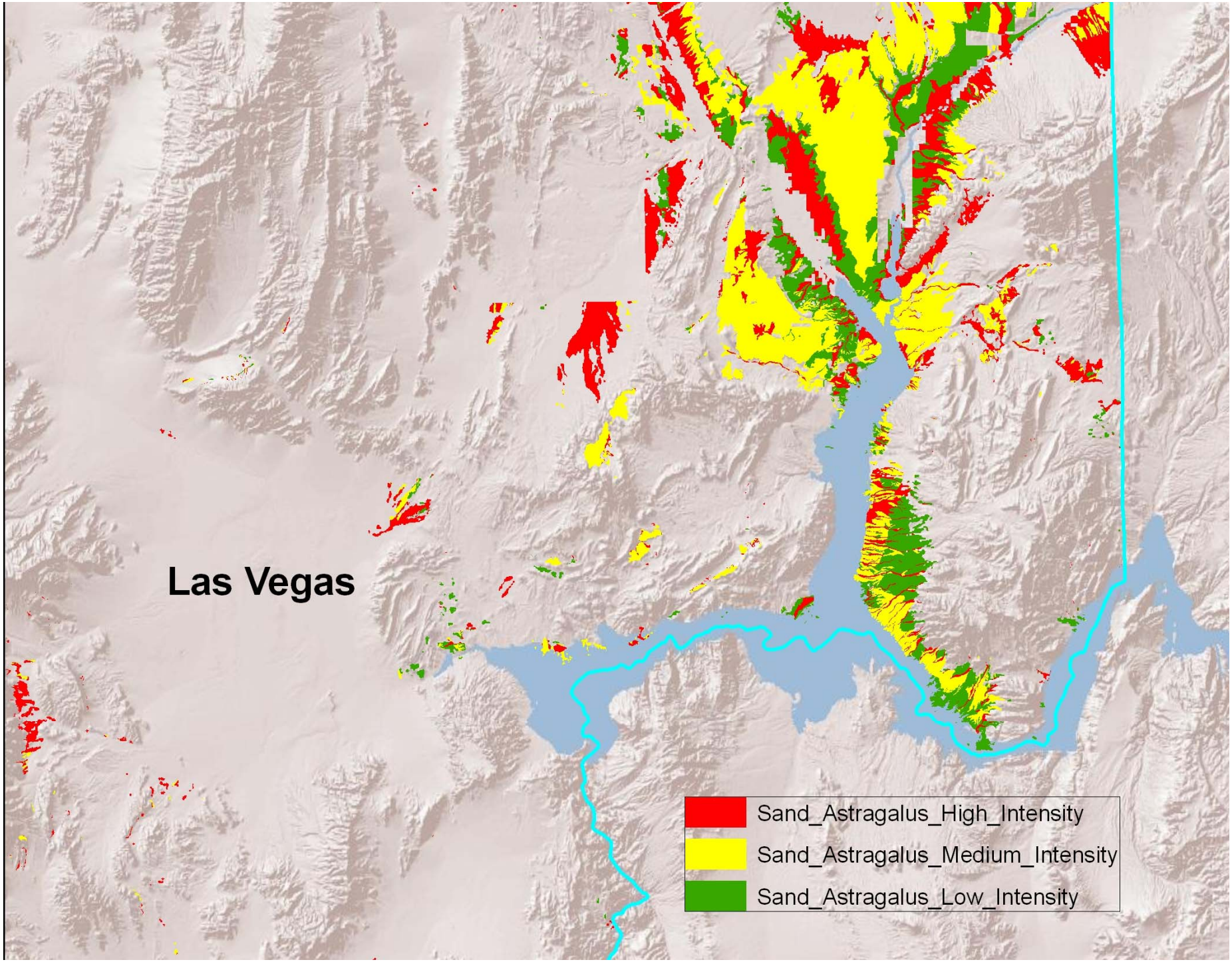
Sand Habitat Model

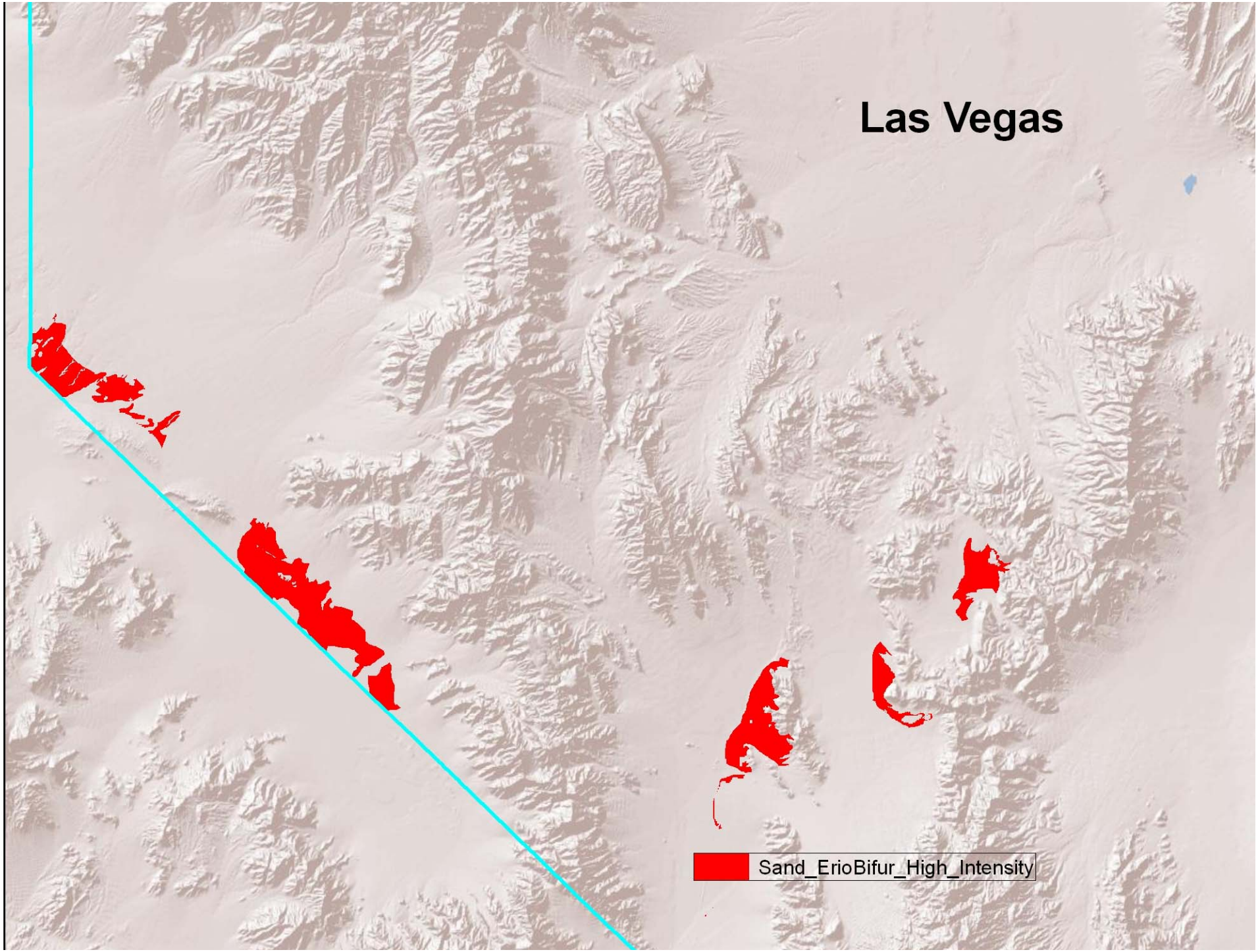
Table 4. High, Medium, and Low Intensity Sampling Strata for Sand Species

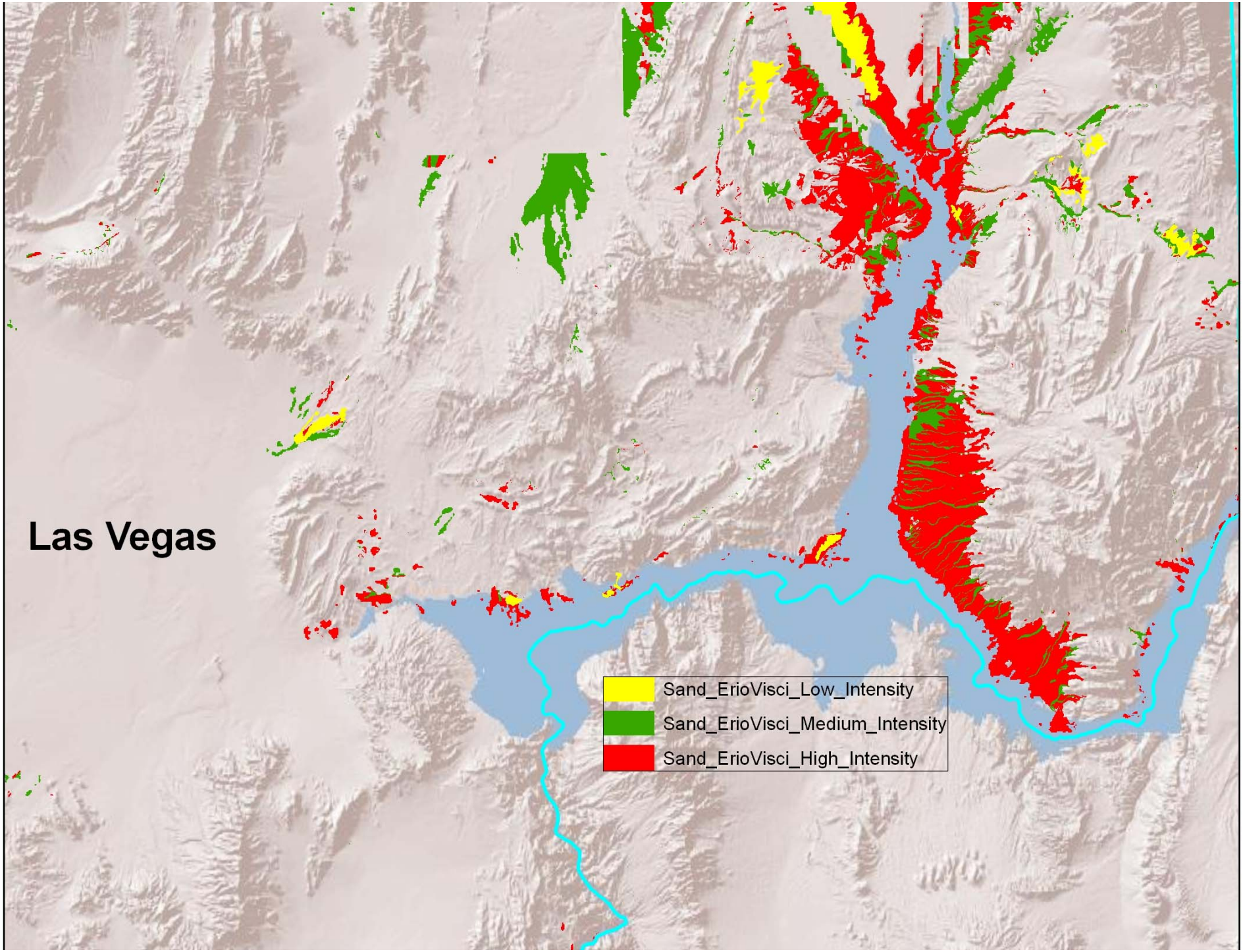
Classification	*Astragalus geyeri* var. *triquetrus*	*Eriogonum bifurcatum*	*Eriogonum viscidulum*	*Penstemon albomarginatus*
Not Quartz Classified, Eolian				High
Not Quartz Classified, Mixed Eolian and Alluvium		High		High
Not Quartz Classified, Younger Alluvium, Beneath a Soil with at least 75% Sand by Weighted Average within the First Foot of Soil				High
Quartz Classified, Drought Exposed Lake Bed			High	
Quartz Classified, Eolian	High		Low	
Quartz Classified, Mixed Eolian and Alluvium				High
Quartz Classified, Non-Clastic Tertiary Bedrock and Mesozoic, Paleozoic, and Proterozoic Bedrock, Beneath a Soil with at least 75% Sand by Weighted Average within the First Foot of Soil	Medium			
Quartz Classified, Older Alluvium	Medium		High	
Quartz Classified, Quartz Sand Veneer Over Calcrete	Medium			
Quartz Classified, Tertiary Clastic Bedrock	Low		Medium	
Quartz Classified, Younger Alluvium	High		Medium	Medium

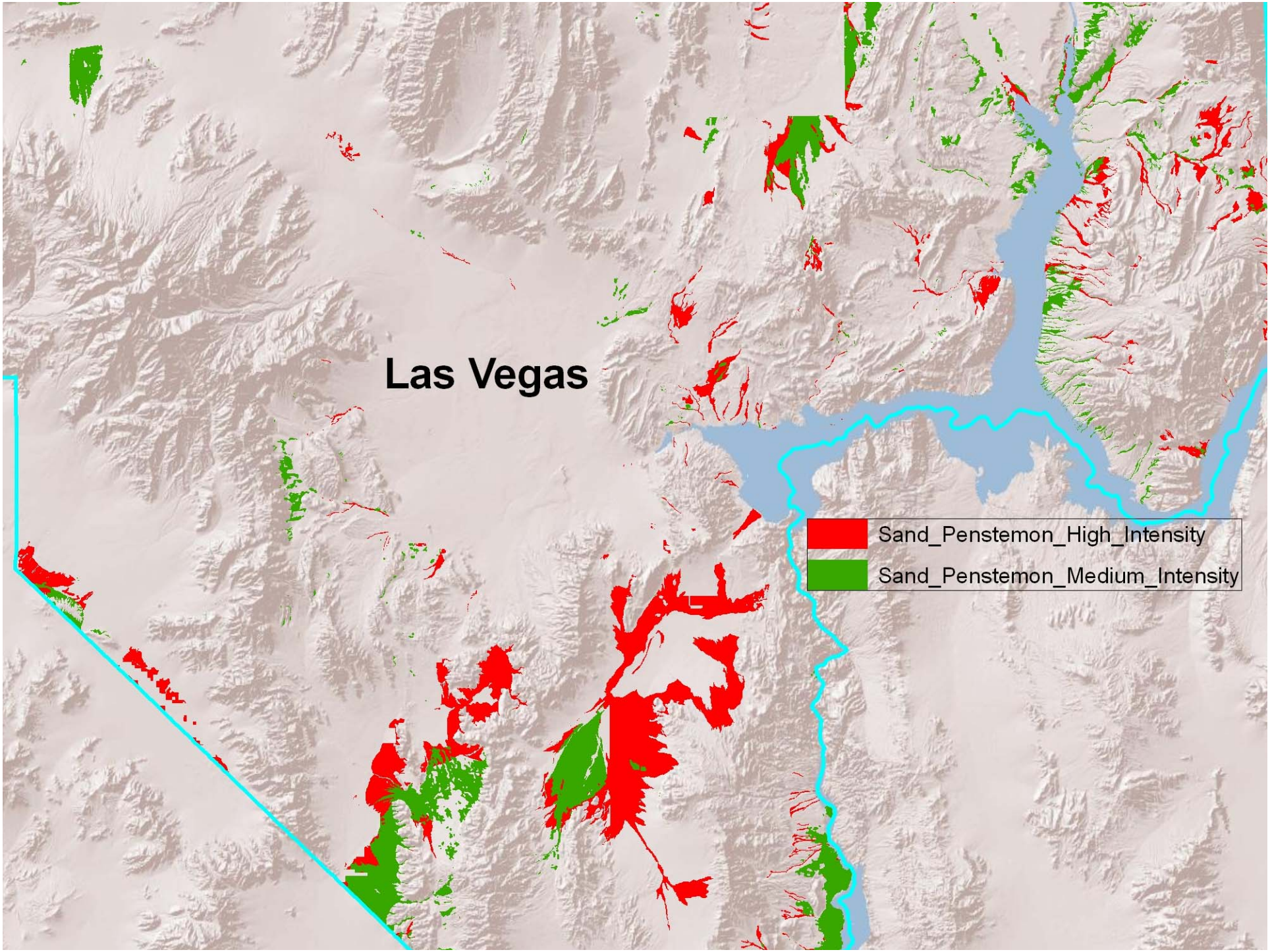

Las Vegas
Gypsum_AnulocaulisArcto_High_Intensity
Gypsum_AnulocaulisArcto_Low_Intensity
Gypsum_AnulocaulisArcto_Medium_Intensity


Las Vegas
Gypsum_ErioCory_High_Intensity
Gypsum_ErioCory_Medium_Intensity


Las Vegas
Sand_Astragalus_High_Intensity
Sand_Astragalus_Medium_Intensity
Sand_Astragalus_Low_Intensity


Las Vegas
Sand_ErioBifur_High_Intensity


Las Vegas
Sand_ErioVisci_Low_Intensity
Sand_ErioVisci_Medium_Intensity
Sand_ErioVisci_High_Intensity


Las Vegas
Sand_Penstemon_High_Intensity
Sand_Penstemon_Medium_Intensity

desert conservation
PROGRAM
respect, protect and enjoy our desert!

Sample Design and Model Validation

- Sites were randomly selected using Generalized Random Tessellation Stratified (GRTS) survey design

- Surveys began the first week of April
- Over 400 sites have been surveyed to date

Clark County Desert Conservation Program Rare Plant Inventory

Field Survey Data Form for SURVEY PLOTS

ICF Jones & Stokes
an ICF International Company

Send to: ICF Jones & Stokes
Attn: Brad Schafer
630 K Street, Sacramento, CA 95814
Fax: 916-737-3030
email: bschafer@isanet.com

Date of Field Work: 10 MAY 2007 Approximate Time: 10:20 Survey Plot #: G-34

Botanist Names: LAUREL A. McBARRON GPS Unit Number: 74950

Geographic Unit:
- ☐ Apex
- ☐ Bowl of Fire
- ☐ Coyote Springs
- ☒ Gold Butte
- ☐ Sandy Valley
- ☐ Sheep Range
- ☐ Ivanpah
- ☐ Mormon Mesa
- ☐ Muddy River
- ☐ Paiute Eldorado
- ☐ Rainbow Gardens
- ☐ Spring Mountain Foothills
- ☐ Upper LV Wash

Target Species Observed:

Anulocaulis leisolenus	Yes ☐ No ☒	*Eriogonum corymbosum* var. *nilesii*	Yes ☐ No ☑
Arctomecon californica	Yes ☐ No ☒	*Eriogonum viscidulum*	Yes ☐ No ☒
Arctomecon merriamii	Yes ☐ No ☒	*Pediomelum castoreum*	Yes ☐ No ☐
Astragalus geyeri var. *triquetrus*	Yes ☐ No ☒	*Penstemon albomarginatus*	Yes ☐ No ☐
Eriogonum bifurcatum	Yes ☐ No ☑	*Penstemon bicolor* ssp. *bicolor*	Yes ☐ No ☑

General Aspect:
- ☐ North
- ☐ South
- ☐ East
- ☐ West
- ☒ Variable
- ☐ North east
- ☐ South east
- ☐ South west
- ☐ North west
- ☐ Flat

Cryptogamic Crust Present? Yes ☐ No ☒

Slope:

Minimum	Maximum
☐ 0–1 degree	☐ 0–1 degree
☒ 1–5 degrees	☐ 1–5 degrees
☐ 5–10 degrees	☐ 5–10 degrees
☐ 10–20 degrees	☐ 10–20 degrees
☐ 20–45 degrees	☒ 20–45 degrees
☐ greater than 45 degrees	☐ greater than 45 degrees

Threats/Disturbance:
- ☐ Roads
- ☒ Trails
- ☐ OHV Activity
- ☐ Dumping and Trash
- ☐ Evidence of Fire
- ☐ None

Vegetation Composition:

	Dominant	Co-dominant	Associate
Larrea tridentata	☒	☐	☐
Ambrosia dumosa	☐	☒	☐
Atriplex canescens	☐	☐	☐
Atriplex confertifolia	☐	☐	☐
Atriplex hymenelytra	☐	☐	☐
Chrysothamnus sp.	☐	☐	☐
Coleogyne ramosissima	☐	☐	☐
Encelia sp.	☐	☐	☐
Ephedra sp.	☐	☐	☒
Grayia spinosa	☐	☐	☐
Hymenoclea salsola	☐	☐	☐
Juniperus osteosperma	☐	☐	☐
Acacia greggii	☐	☐	☐
Lycium sp.	☐	☐	☐
Prosopis glandulosa	☐	☐	☐
Psorothamnus sp.	☐	☐	☒

Vegetation Composition Cont'd:

	Dominant	Co-dominant	Associate
Yucca baccata	☐	☐	☐
Yucca brevifolia	☐	☐	☐
Yucca schidigera	☐	☐	☐
Yucca utahensis	☐	☐	☐

Indicator Species:

Petalonyx parryi	Yes ☐	No ☒
Petalonyx thurberi	Yes ☐	No ☒
Astragalus sabulonum	Yes ☐	No ☒
Astragalus amphioxys var. *amphioxys.*	Yes ☐	No ☒
Pleuraphis sp	Yes ☒	No ☐
Oenothera sp.	Yes ☐	No ☒
Achnatherum hymenoides	Yes ☐	No ☒

Soils:

Sand	Rock	Gypsum/Calc
☒ 0-25%	☐ 0-25%	☒ 0-25%
☐ 25-50%	☐ 25-50%	☐ 25-50%
☐ 50-75%	☒ 50-75%	☐ 50-75%
☐ 75-100%	☐ 75-100%	☐ 75-100%
☐ None	☐ None	☐ None

Rock Outcrops:
- ☐ Limestone
- ☐ Sandstone
- ☐ Other
- ☒ None

Photo Taken: Yes ☒ No ☐ Photo Facing Direction: S E

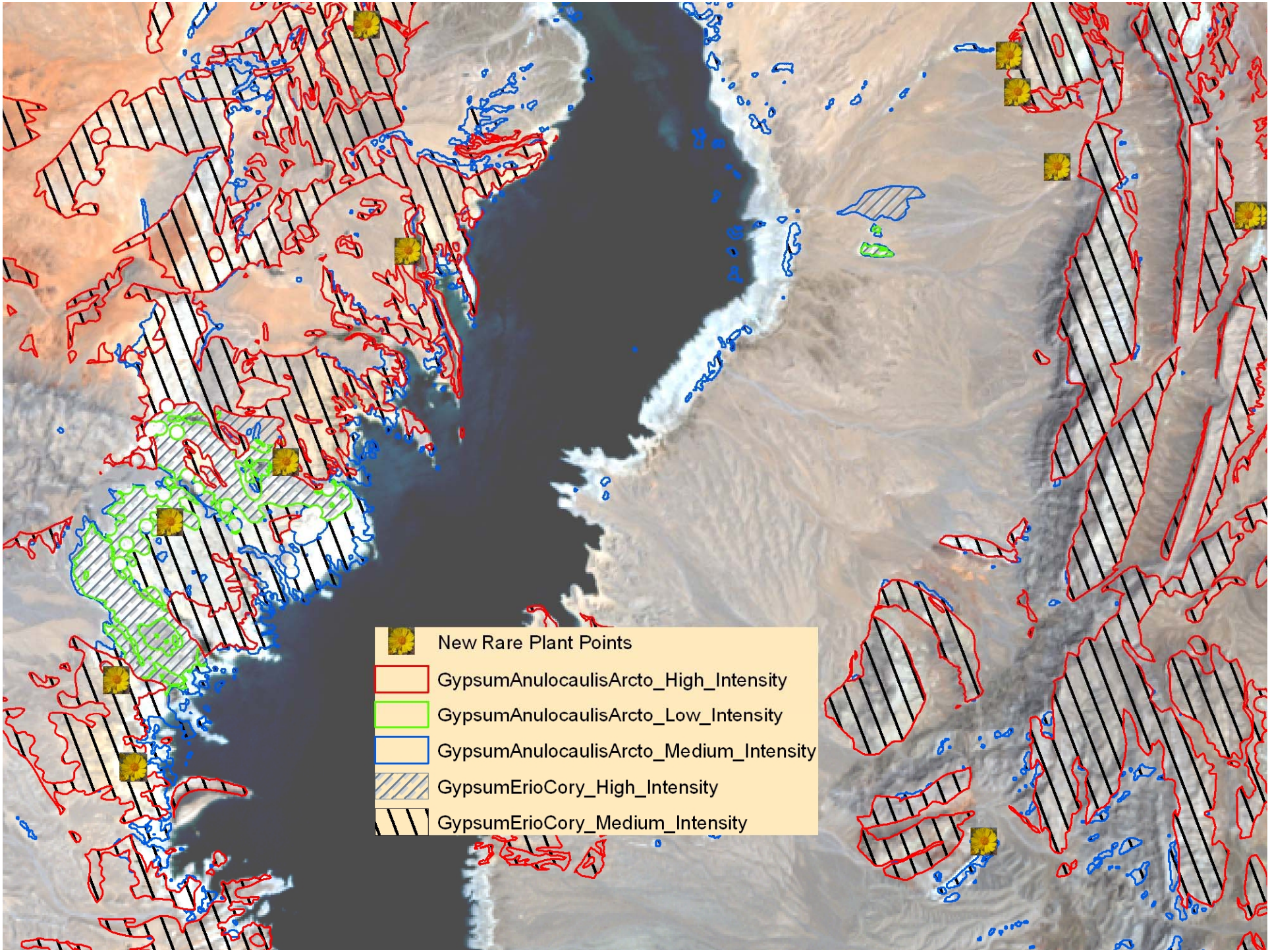
Other Rare Species Observed:

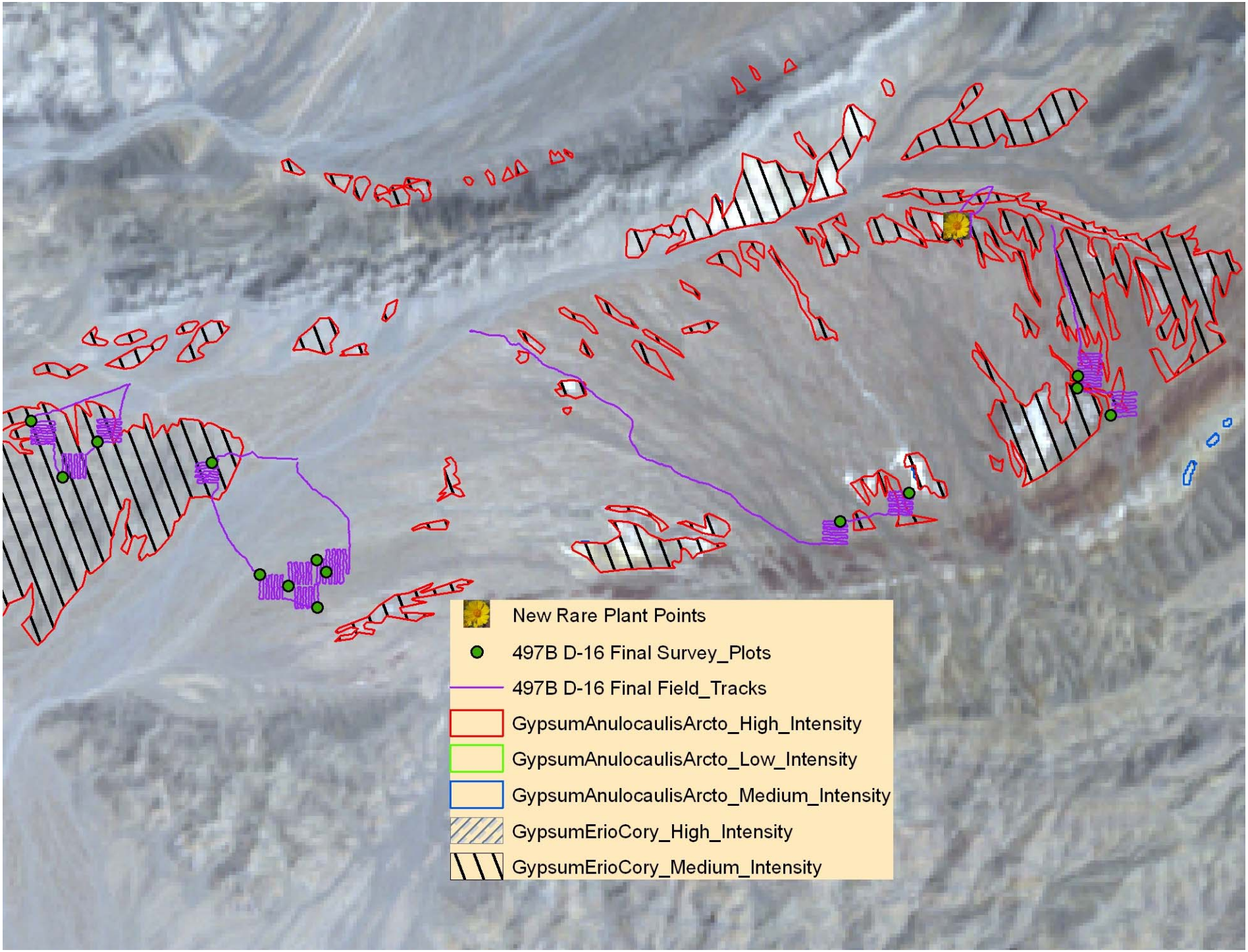
Invasive Plants:
Schic, brma, erci,

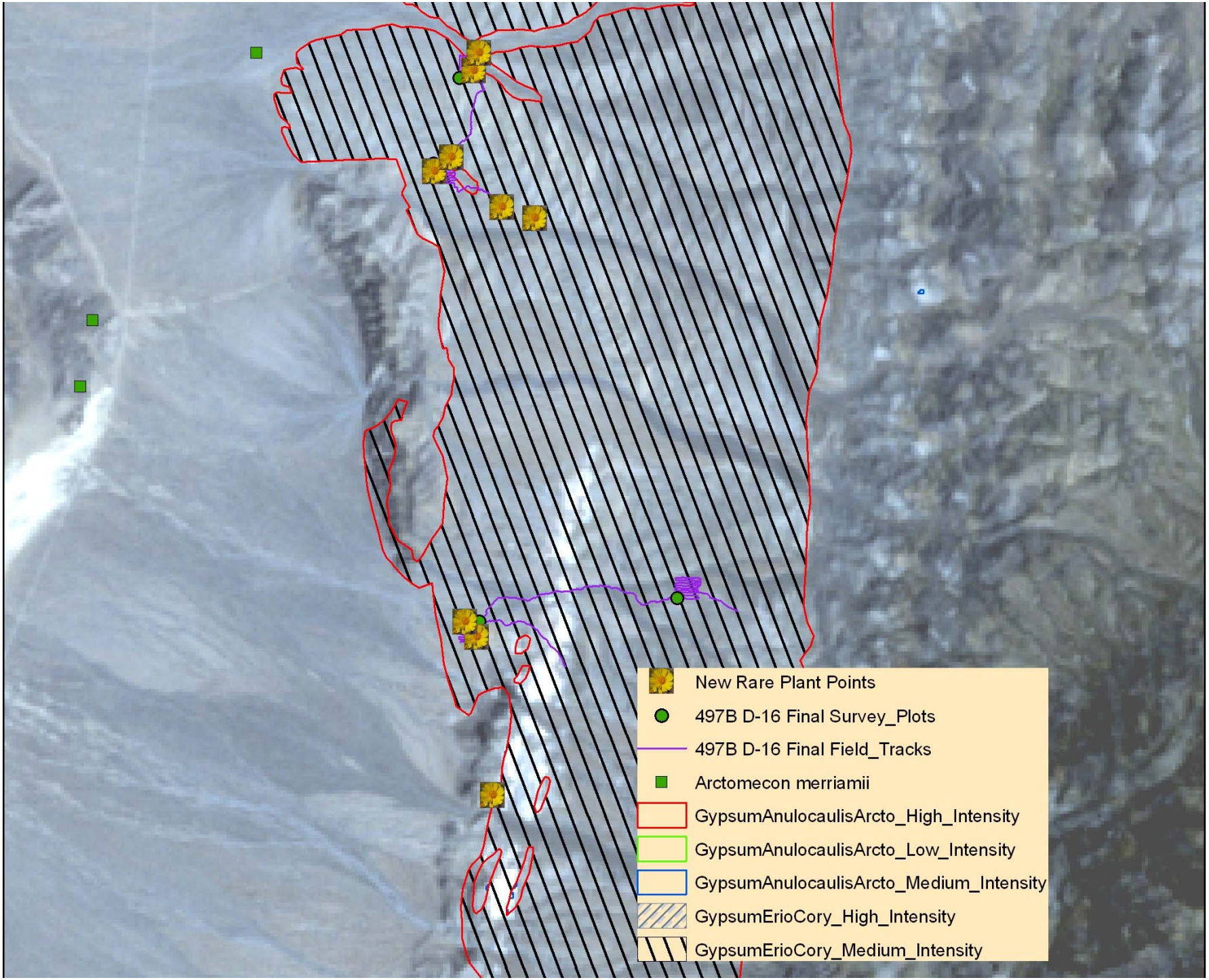
Other Comments:

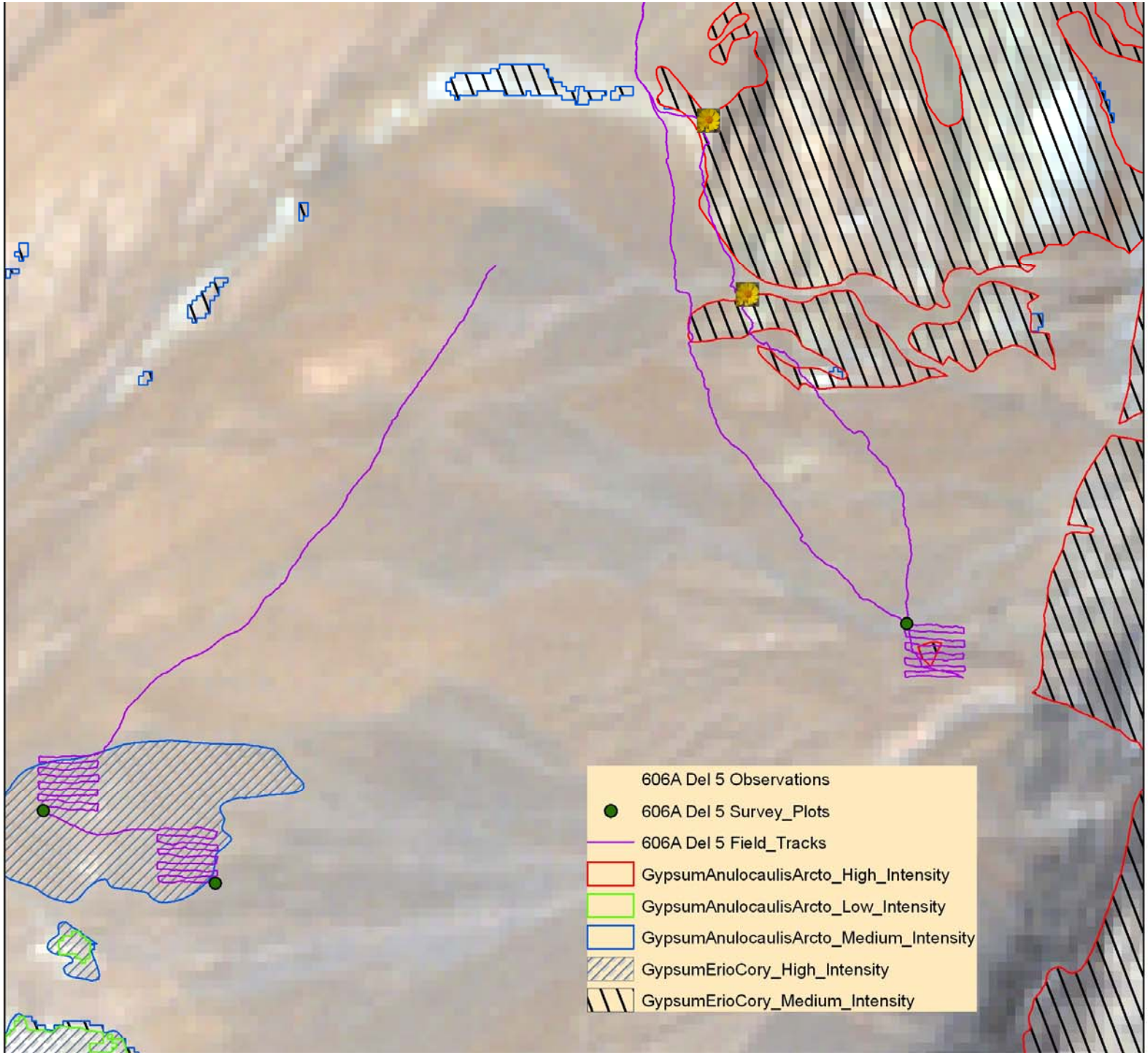
LARREA TRIDENTATA, Ambrosia dumosa, Ephedra terroyana, Opuntia Sp, acanthocarpa, Encelia virginensis, E. farinosa, Tiquilia canescens, Aristida purpurea, Chrysothamnus viscidiflorus, Dasyochloa pulchella, Schismus barbata, Bromus madritensis, Lepidium lasiocarpum, Pleuraphis rigida, Cryptantha pterocarya, C. micrantha, Sphaeralcea ambigua, Calochortus flexuosus, Mammillaria tetancistra, Echinocereus engelmannii, Cylindropuntia echinocarpa, Krameria erecta, Chorizanthe brevicornu, C. rigida, Amphipappus fremontii, Machaeranthera pinnatifida, Amsinckia tessellata, Camissonia brevipes, Opuntia basilaris, Cuscuta californica, Psorothamnus fremontii, Erodium cicutarium, Delphinium parishii, Phacelia crenulata, Chaenactis carphoclina, Ephedra aspera, Eschscholzia glyptosperma, Loeseliastrum tenellum, Chaenactis fremontii, Enceliopsis covillei, Cryptantha micrantha, Mentzelia albicaulis, Camissonia boothii, Pectocarya platycarpa, Chaenactis macrantha, Stylocline micropoidea, Pleuraphis rigida, Mentzelia tricuspis, Eriogonum deflexum, Atriplex platyphylla, Gutierrezia sarothrae, Encelia farinosa, Gilia, Fendlerella utahensis, Erodium texanum, Camissonia claviformis, Tiquilia latior, Cryptantha circumscissa, Pectocarya heterocarpa, Krameria grayi, Hymenoclea salsola,

PRELIMINARY DATA


New Rare Plant Points
GypsumAnulocaulisArcto_High_Intensity
GypsumAnulocaulisArcto_Low_Intensity
GypsumAnulocaulisArcto_Medium_Intensity
GypsumErioCory_High_Intensity
GypsumErioCory_Medium_Intensity


New Rare Plant Points
497B D-16 Final Survey_Plots
497B D-16 Final Field_Tracks
GypsumAnulocaulisArcto_High_Intensity
GypsumAnulocaulisArcto_Low_Intensity
GypsumAnulocaulisArcto_Medium_Intensity
GypsumErioCory_High_Intensity
GypsumErioCory_Medium_Intensity


New Rare Plant Points
497B D-16 Final Survey_Plots
497B D-16 Final Field_Tracks
Arctomecon merriamii
GypsumAnulocaulisArcto_High_Intensity
GypsumAnulocaulisArcto_Low_Intensity
GypsumAnulocaulisArcto_Medium_Intensity
GypsumErioCory_High_Intensity
GypsumErioCory_Medium_Intensity


606A Del 5 Observations
606A Del 5 Survey_Plots
606A Del 5 Field_Tracks
GypsumAnulocaulisArcto_High_Intensity
GypsumAnulocaulisArcto_Low_Intensity
GypsumAnulocaulisArcto_Medium_Intensity
GypsumErioCory_High_Intensity
GypsumErioCory_Medium_Intensity

desert conservation
PROGRAM
respect, protect and enjoy our desert!

Soil Analyses

- Starting this fall UNLV will begin to collect additional soils data for the Las Vegas buckwheat.
- The goal of the soil analyses is to bridge the gap in the current knowledge regarding why this particular species occurs in some areas and not in others with visually identical substrates

desert conservation
PROGRAM
respect, protect and enjoy our desert!

Next Steps

- Survey remaining plots
- Analyze the data being collected by Jones & Stokes
- Refine models using latest vegetation layers, soils information, elevation, fire history, data collected from surveys, etc.
- Collaborate with agencies conducting similar modeling exercises

desert conservation
PROGRAM
respect, protect and enjoy our desert!

Acknowledgements

- Matt Hamilton and Lee Bice for their assistance and support on all aspects of the project
- Dave Brickey and Larry Tinney for their assistance in developing the gypsum and sand models
- Rob Sutter and Analie Barnett for their assistance with the sample design
- Jones & Stokes and their subcontractors for the inventory work
- BLM, FWS, NPS, BOR, NDF, NDSL, NRCS, and NNHP