Introductions

Tom Heinlein – District Manager – BLM Front Range District

Joe Vieira - Project Manager - Renewable Energy –BLM San Luis Valley Field Office

Karen Smith- Argonne National Laboratory

May 13-14, 2015

Colorado Solar Energy Zone
Solar Regional Mitigation Strategies
BLM Public Workshop

Monte Vista, Colorado May 13, 2015

Wind-Blown Dust Modeling and Health Assessment

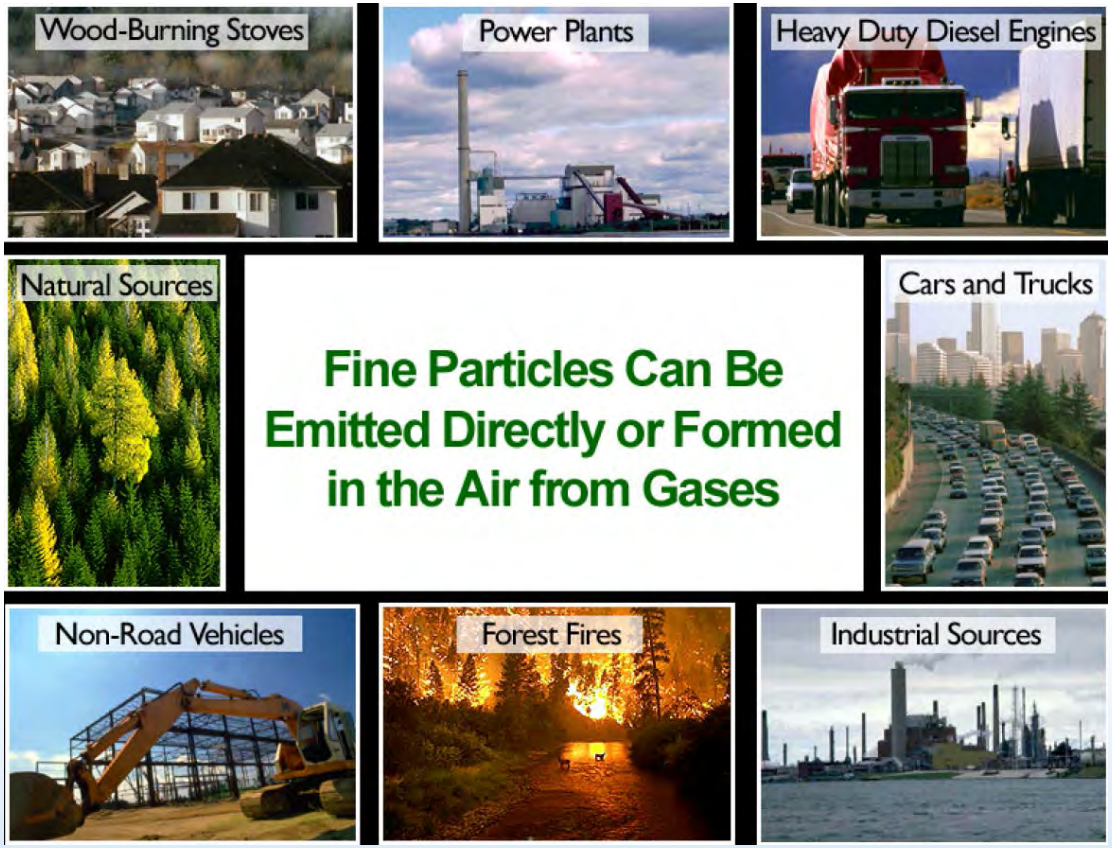
Young-Soo Chang and Heidi Hartmann
Argonne National Laboratory

Background: Dust in the San Luis Valley

- Particulate Matter (Dust) Sources: un-vegetated areas, unpaved roads, off-road vehicle use, woodstoves, winter street sanding, etc.
- Causes of wind-blown dust: (1) high winds; (2) dry and loose soils with sparse vegetation, agricultural activities
- Monitoring: wind-blown dust events mostly in springtime
- Dust events can deteriorate air quality and visibility, and have adverse effects on health
- Increases in wind-blown dust events - Climate change, desertification?

PM Emission Sources

Fine ($PM_{2.5}$)



Coarse ($PM_{2.5\text{-}10}$)

Construction

Wind-blown dust

Unpaved road traffic

Rock crushing

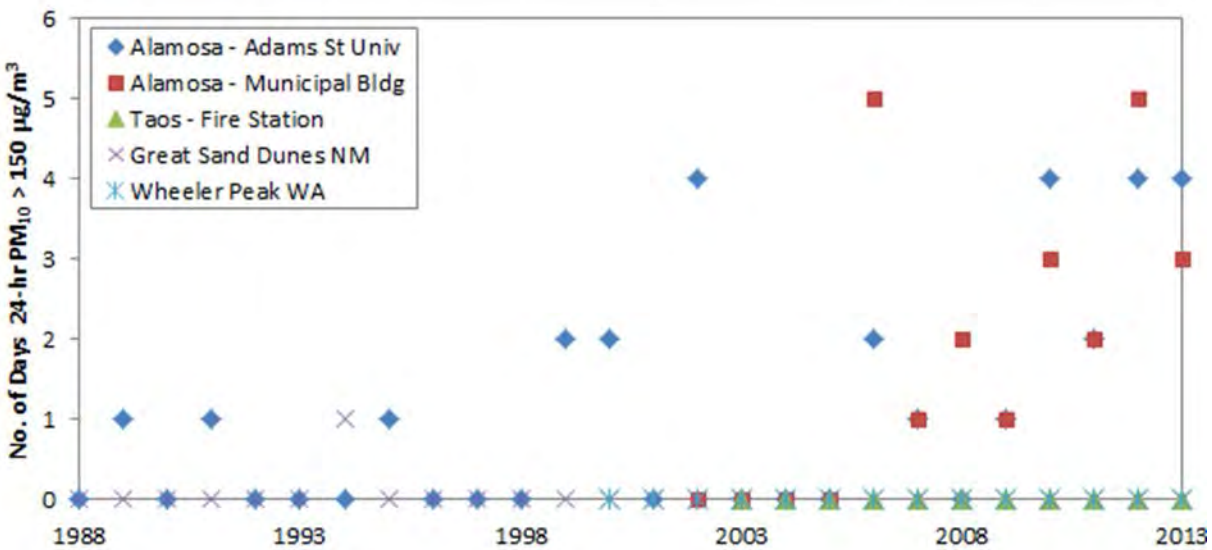
Reasons for the Study

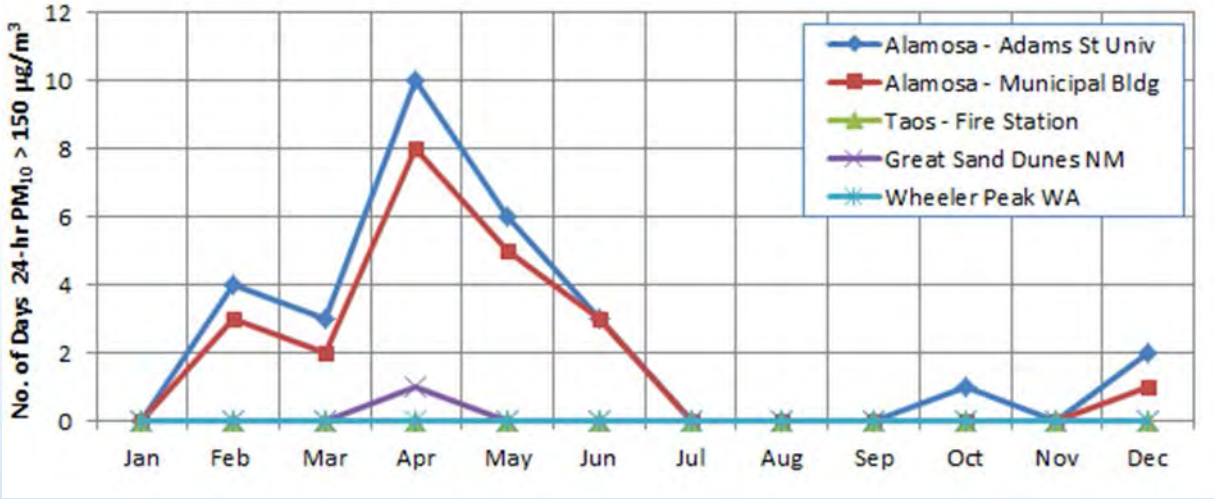
- Local residents concern: potential air quality impacts associated with possible development of three solar energy zones (SEZs)

- Construction dust emissions evaluated in Solar PEIS, but emissions during operations were not.

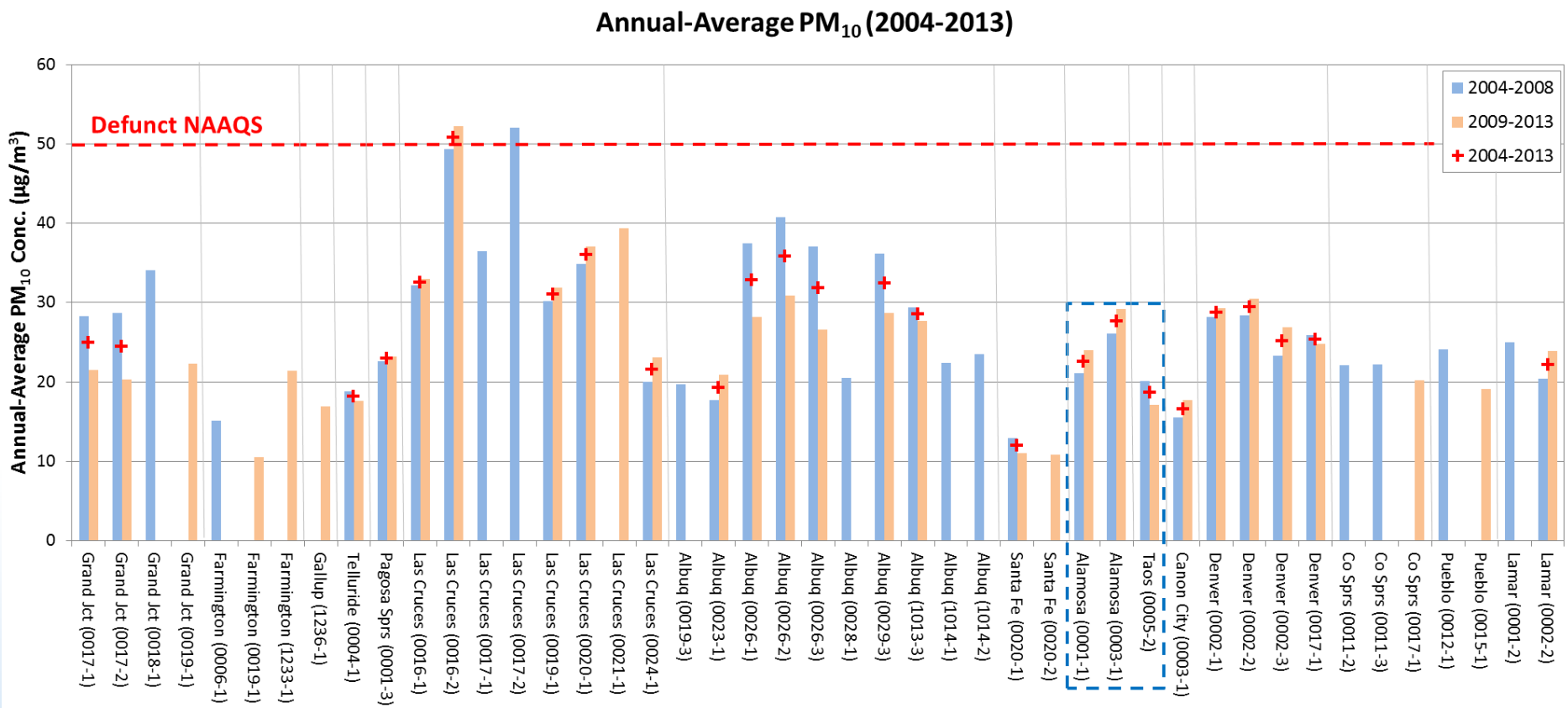
- Overall Study Objective:
  - Assessment of Wind-Blown Dust Impacts Associated with Operations in SEZs Within the San Luis Valley
  - Assess potential for health impacts during construction and operations

No. of Days by Year & by Month with Monitored 24-Hour PM_{10} Conc. > NAAQS of 150 $\mu g/m^3$





Annual-Average PM_{10} in San Luis Valley Compared to Other Cities in CO and NM



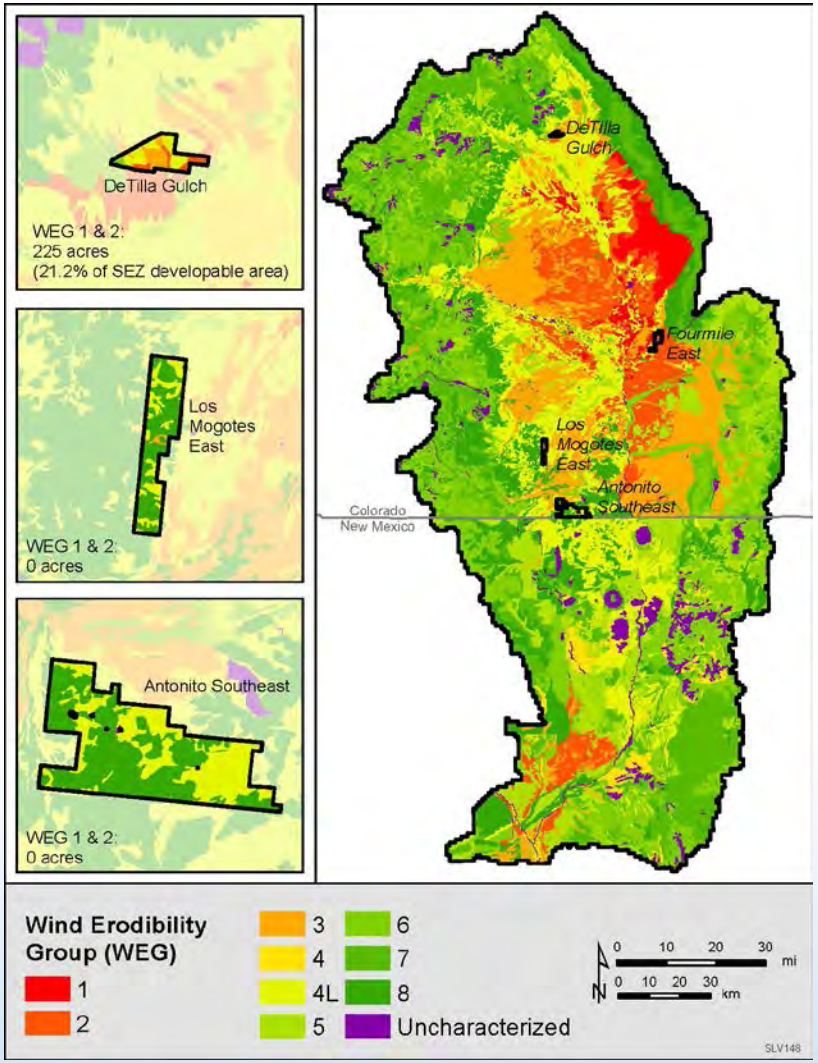
Modeling Methods for Operations Emissions

- Weather Research and Forecasting Model coupled with Chemistry (WRF-Chem) used – model used for daily weather forecasting

- Model usually is mostly used for global-scale or regional-scale wind-blown dust issues; this study is first modeling application focused on a smaller area, e.g., San Luis Valley

- To obtain PM emission estimates, surrogate erosion factors were obtained using combination of wind erodibility group (WEG) and land use (LU) for the SLV

Wind Erodibility Group (WEG) in the San Luis Valley and the SEZs



WEG

1
2
3
4/4L
5
6
7
8

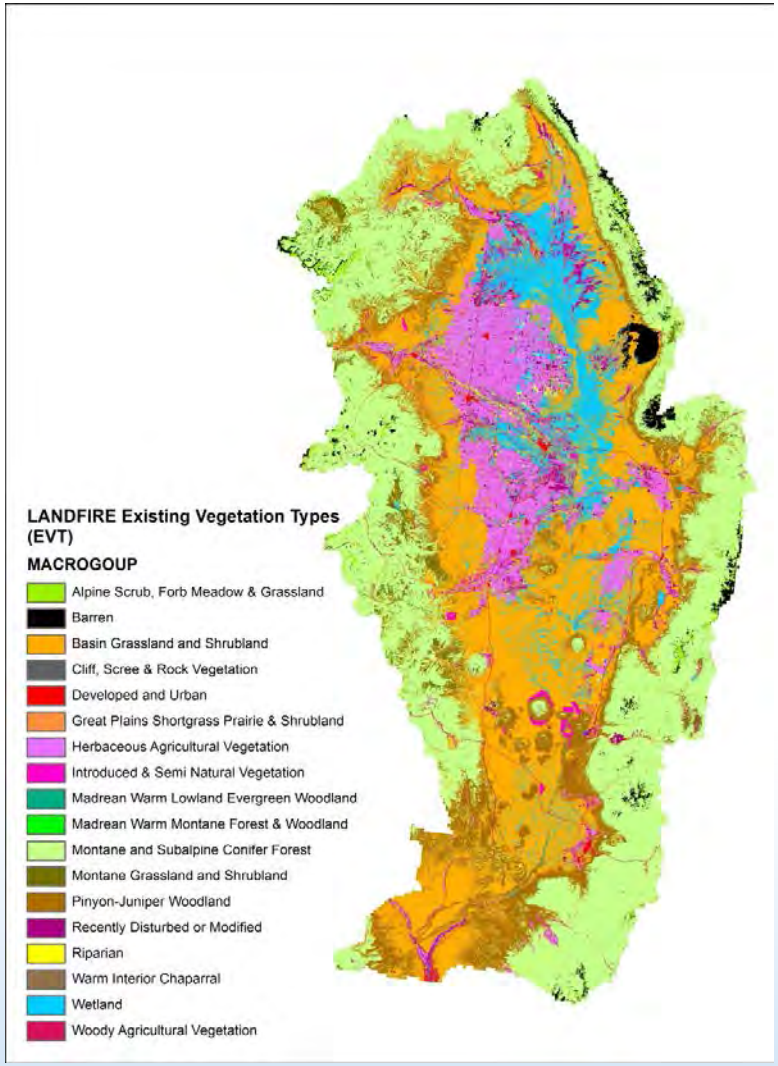
More dust potential

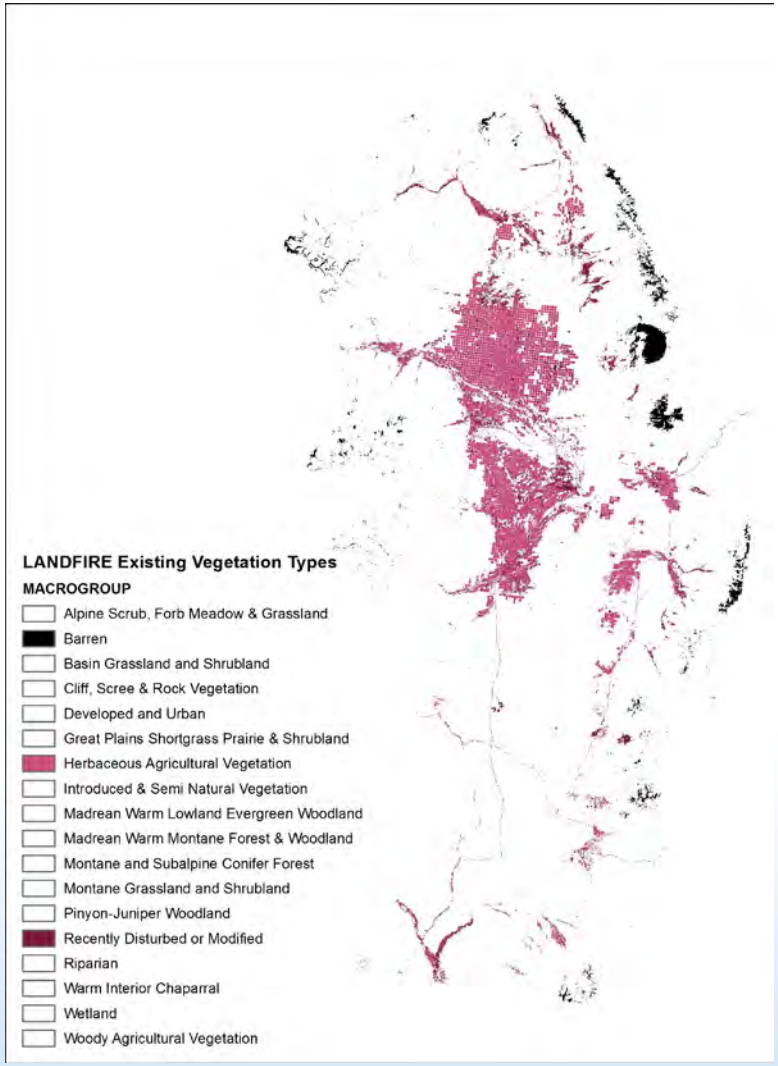
Less dust potential

De Tilla Gulch SEZ

Lost Mogotes East SEZ
Antonito Southeast SEZ

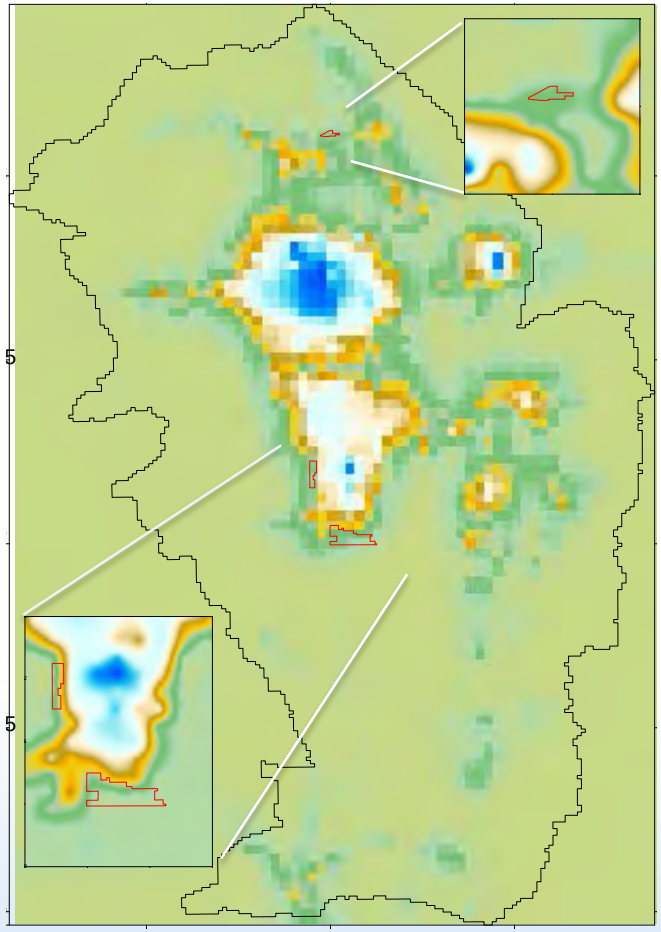
Erosion Factor Proxy (Continued):
Land Use: All Vegetation Types and Assumed Erodible Types



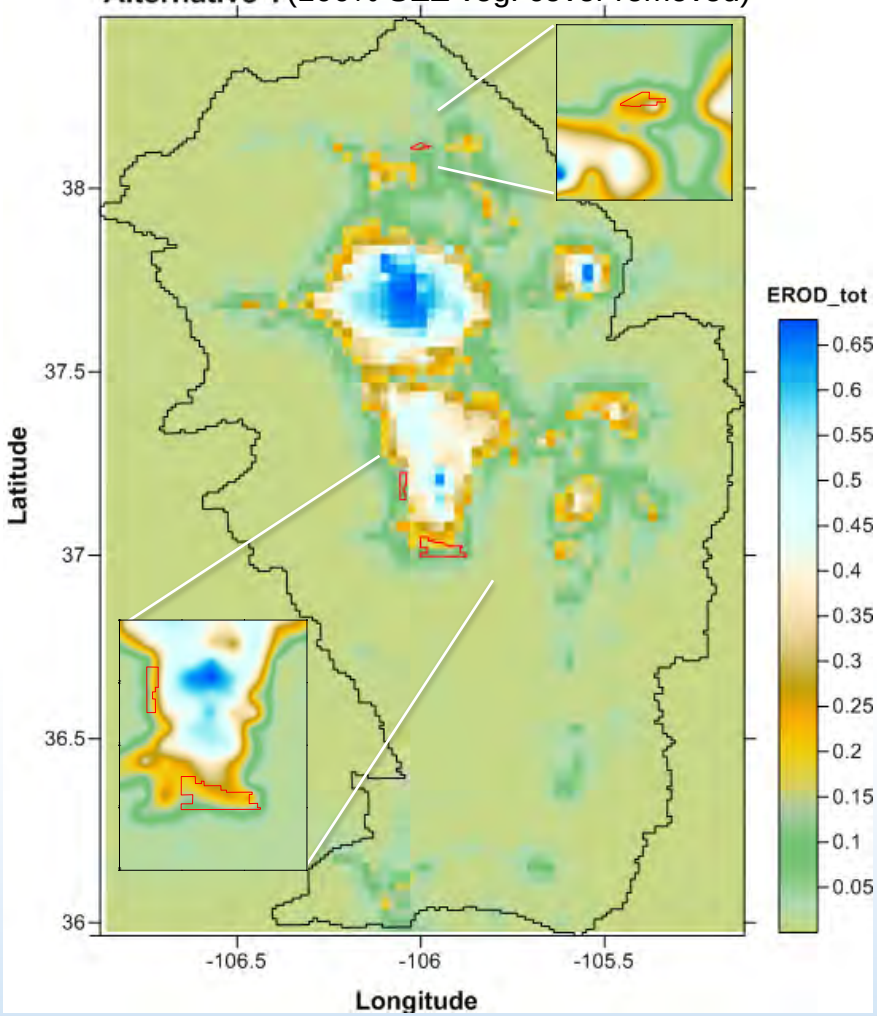


Erosion Factor Distribution in the San Luis Valley

(pre-development)



Alternative 1 (100% SEZ veg. cover removed)

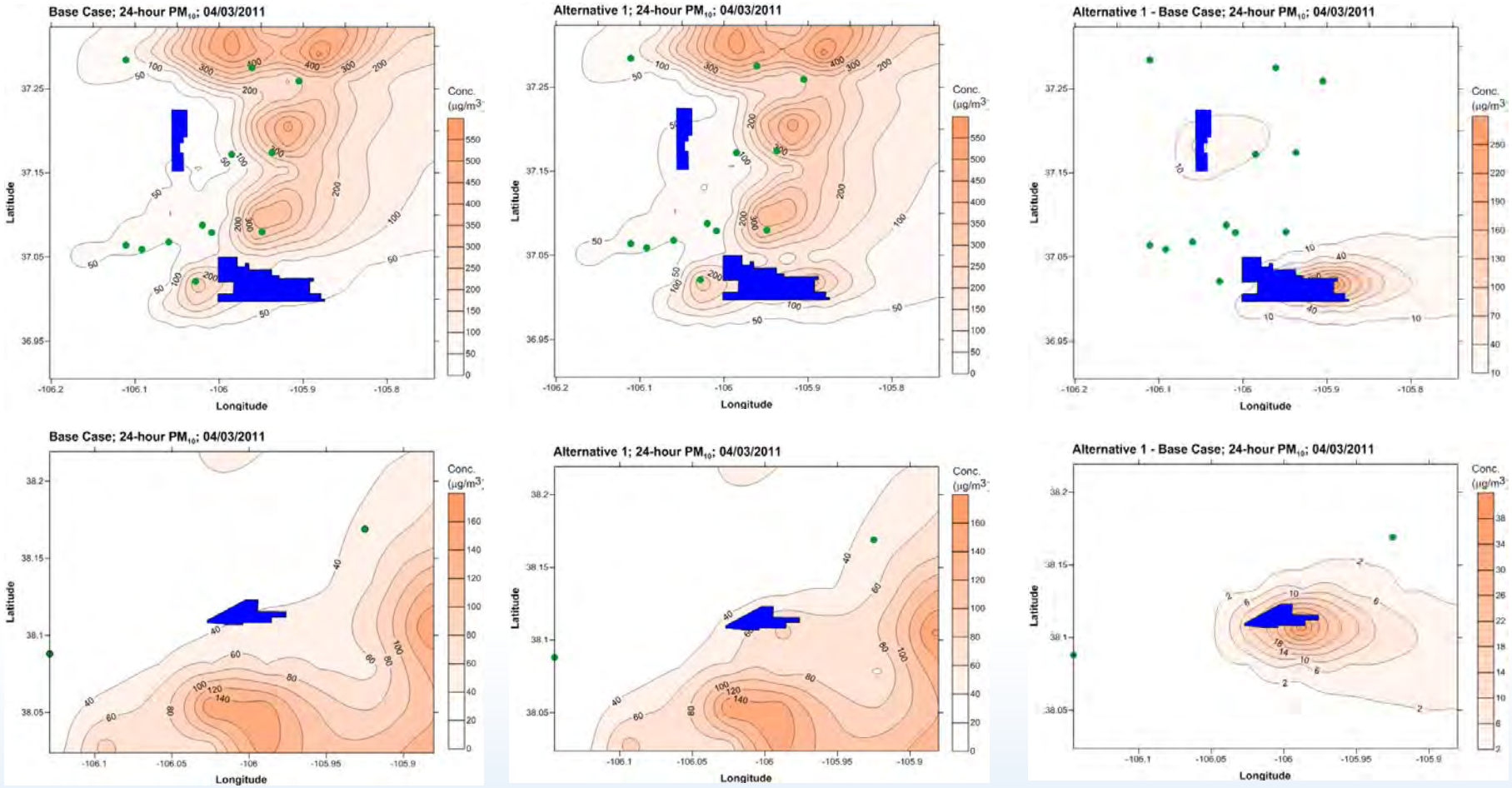


Dust Impact Modeling for Operations – Scenarios

- Baseline – pre-development (current)
- Scenario 1: 100% of SEZ vegetative cover is removed for all three SEZs ***(most dust)***
- Scenarios 2 – 4: 50, 75, or 90% vegetative cover is retained for all three SEZs
- Scenario 5 –no vegetative cover is retained, dust suppressant is applied over 20% of SEZ (85% of Scenario 1 emissions)

24-hr PM_{10}: Base Case (pre-development) vs. Scenario 1 (100% SEZ veg. cover removed)*

Difference



*Based on hypothetical future event assuming weather conditions identical to those that occurred on 4/3/2011, with the added SEZ land disturbance.

Modeled Changes in Concentration for a Dust Episode: Base Case (pre-development) vs. Scenario 1 (100% SEZ veg. cover removed)*

City Name	Base Case	Alternative 1	Change
Around Antonito Southeast and Los Mogotes East SEZs			
Antonito	57.8	58.0	0.3%
Capulin	78.9	78.8	-0.1%
Conejos	57.8	58.0	0.3%
La Jara	246.6	250.6	1.7%
Las Mesitas	87.7	87.7	0.1%
Lobatos	317.4	316.8	-0.2%
Manassa	251.2	257.5	2.5%
Mogote	43.4	43.5	0.3%
Paisaje	59.2	59.1	-0.2%
Romeo	80.8	96.7	19.8%
San Antonito	292.0	294.9	1.0%
Sanford	191.4	195.6	2.2%
Around De Tilla Gulch SEZ			
Joyful Journey Hot Springs Spa	53.6	55.5	3.6%
Crestone	102.0	103.2	1.2%
Moffat	92.3	92.6	0.3%
Saguache	21.7	21.7	-0.3%
Air Monitoring Sites			
Alamosa - Adams State University	233.6	234.3	0.3%
Alamosa - Municipal Building	233.6	234.3	0.3%
Taos - Fire Station	48.5	48.5	0.0%
Great Sand Dunes NM	127.1	127.4	0.2%
Wheeler Peak WA	22.0	22.0	0.0%

* *Based on hypothetical future event assuming weather conditions identical to those that occurred on 4/3/2011, with the added SEZ land disturbance.

Summary of Dust Modeling

- Predicted PM_{10} concentrations were relatively close to observed data, considering that the SLV is located in complex terrain

- Potential air quality impacts associated with operations in the SEZs are predicted to be relatively small because:

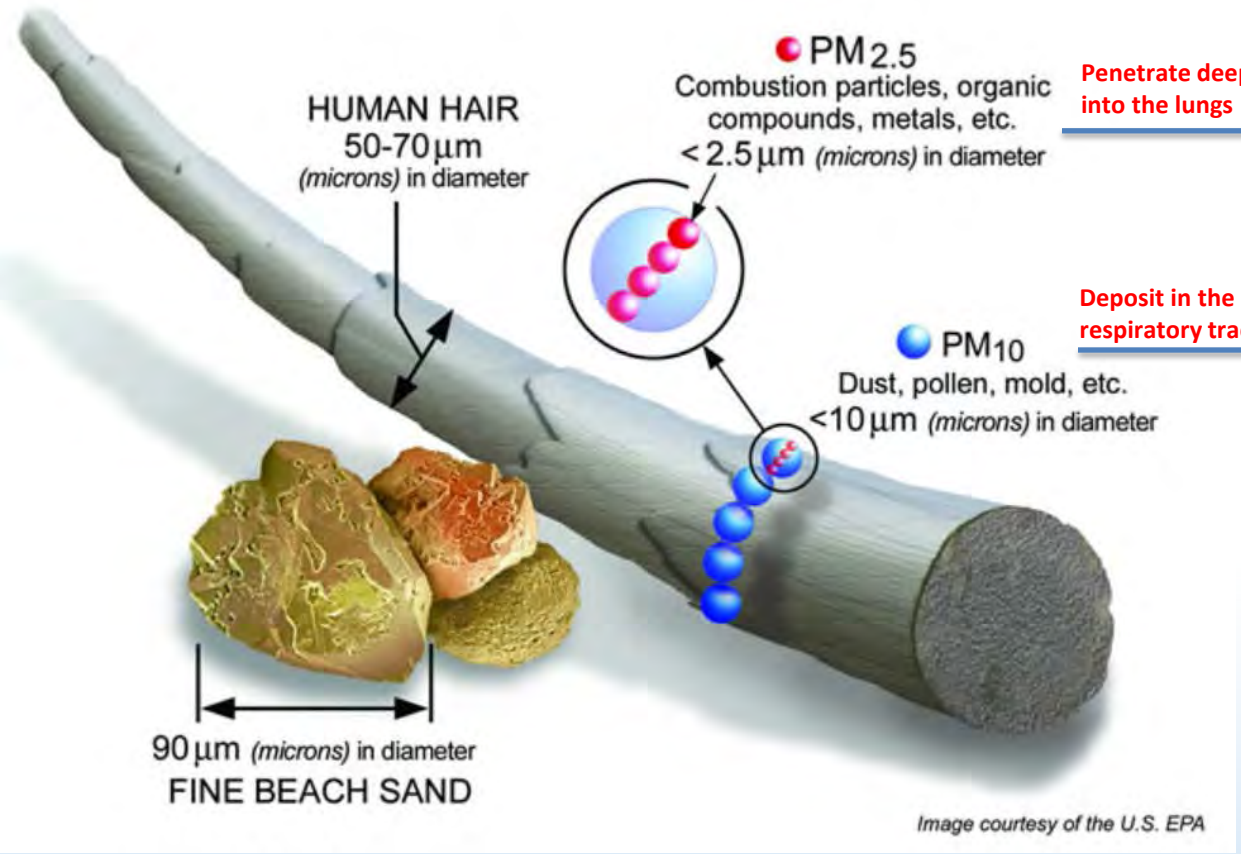
  - De Tilla Gulch has highest dust potential based on WEG group, but smallest development area, no impacts at nearby communities

  - Development of Los Mogotes East SEZ would have highest dust impacts because it is upwind of town of Romeo; however, still would not result in exceedance of PM standard

  - Antonito Southeast SEZ would have lower impacts – large area but less dust potential and nearby communities are upwind

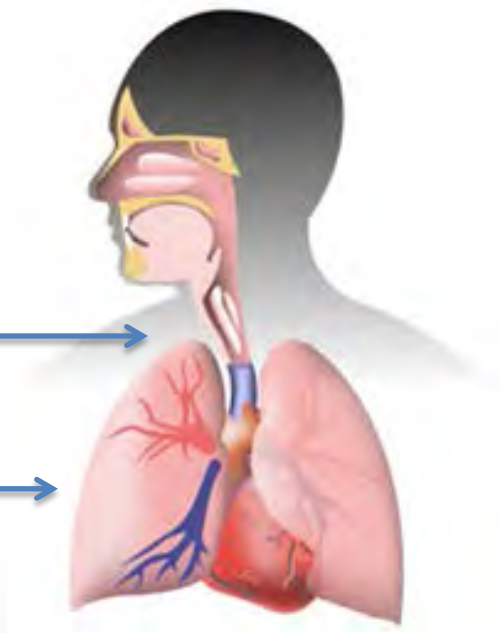
Health Effects - Particulate Matter (PM): $PM_{2.5}$ and PM_{10}

(A mixture of extremely small particles and liquid droplets)



Penetrate deeper into the lungs

Deposit in the upper respiratory tract



Potential Health Impacts of PM near the SEZs

- Current (pre-development) status:
  - Modeling and limited data show low levels of PM near the SEZs on most days
  - A few towns downwind of dust-emitting locations likely have several high dust episodes (>150 ug/m^3 PM10) each year
    - no monitoring data
  - High dust episodes can lead to respiratory and/or cardiac problems (like difficulty breathing, asthma, heart attack), especially in people already susceptible

Potential Health Impacts of PM near the SEZs

- Post-development status:
  - Dust levels would depend on area disturbed and construction techniques
  - For worst case assumptions, construction emissions might cause some high dust episodes per year at nearest homes or the town of Antonito
  - For worst case assumptions during operations, highest modeled increase (at Romeo) would not cause high dust episodes
  - Dust control would be needed (required under Solar Program)

Argonne NATIONAL LABORATORY

SRMS:
Visual Resource Analysis

Robert Sullivan, Environmental Science Division, Argonne
Jeff Brown, BLM

May 2015

U.S. DEPARTMENT OF ENERGY

Two Types of Visual Analysis

- **Solar Energy Zone (SEZ) analysis** - Determines if regional offsite mitigation is required to compensate for residual impacts associated with the loss of scenic quality *in the SEZs* resulting from solar development. The analysis is done using a geographic information system (GIS).
- **Visually Sensitive Area (VSA) analysis** - Determines if mitigation is required to compensate for impacts from solar development on scenic views from important viewpoints in the SLV. The analysis is done primarily in the field.

What is the SEZ Analysis?

Considers the effect developing solar facilities in the SEZs on scenic values in the San Luis Valley as a whole.

- The SEZ analysis evaluates:
  - The condition and trend of scenic resources within the region;
  - The relative scarcity of high quality scenery in the region;
  - The resiliency of the scenic resources (the ability to absorb visual change without loss of visual value, and to recover quickly from visual impacts); and
  - The balance of management priorities for visual resources relative to other values.
- In light of these factors, is the change in the scenic qualities of the SEZs significant? If yes, then mitigation may be appropriate.

What is the Basic Premise of the SEZ Analysis?

That regional offsite mitigation may be appropriate if one or more of the following conditions are met:

- The condition of visual resources within the region is poor and/or the trend of visual resource quality within the region is downward;
- The visual values lost through development in the SEZs are scarce within the region;
- The resiliency of the visual resources is low; or
- The change in visual values in the SEZs is inconsistent with the balance between resources envisioned in the RMP.

Generally, more than one of these conditions must be met to warrant mitigation.

What is the VSA Analysis?

Considers the effects of solar development in the SEZs to important views in the SLV.

- Essentially a more rigorous and detailed version of the Solar PEIS analysis.
- Looks at views from Visually Sensitive Areas (VSAs) - communities, specially designated areas, scenic and other roads, areas of importance to tribes, and other points of interest.
- If important views are heavily impacted, regional compensatory mitigation may be warranted.

VSAs included in the VSA Analysis

DeTilla Gulch SEZ:

- Moffat
- Center
- Liberty Trail Trailhead
- Old Spanish Trail

Los Mogotes SEZ:

- La Jara
- Sanford
- Manassa
- Romeo
- Los Caminos Antiguos Byway
- San Luis Hills ACEC
- San Luis Hills WSA
- West Fork of N Branch of OST

Antonito SE SEZ:

- Antonito
- Cumbres and Toltec Scenic Railroad
- Cerra de la Olla
- Ute Mountain
- San Antonio Peak
- San Antonio WSA
- San Antonio Mtn. Wildlife Viewing Area
- Stateline NM

What is the Basic Premise of the VSA Analysis?

That regional mitigation may be indicated if a VSA is subjected to moderate or strong visual contrasts and one or more of the following conditions is met:

- A significant portion of the SEZ is within view of a significant portion of the VSA; and
- That portion of the VSA is important to viewers;
- There are likely to be a large number of viewers;
- The viewers are likely to be sensitive to changes in the view;
- The views are likely to be of long duration.

Generally, more than one of these conditions must be met to warrant mitigation.

Example: La Jara and Los Mogotes East SEZ

- Distance from SEZ to nearest point in La Jara – 5.2 mi
- Residents considered sensitive, with long duration views
- 819 residents, many more in vehicles on roads
- No view of SEZ from “downtown” due to screening by vegetation and structures
- SEZ is within view from southern and western edges of town, while traveling south on Highway 285, or west on CO-136 or Highway 15
- SEZ on a slight slope rising toward the west
- Angle of view is very low, so facilities seen as narrow band at foot of low ridge
- Glare may be visible briefly, mostly in mornings

La Jara KOP Photo of Los Mogotes East SEZ

Photograph from KOP on Mulberry St. toward Los Mogotes East SEZ

SEZ would be visible as very thin dark line at base of ridge in center of photograph, and would be partially screened by vegetation and structures.

Visual Contrast Rating Summary

DEGREE OF CONTRAST		FEATURES											
		LAND/WATER BODY				VEGETATION				STRUCTURES			
		Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
ELEMENTS	Form			√					√			√	
	Line			√					√			√	
	Color			√					√			√	
	Texture				√				√			√	

- Predicted visual contrast is weak.

Summary of VSA Analysis for La Jara

- Solar development visible and likely noticeable to persons on western and southern edge of La Jara
- Many people would see the SEZ for brief period while driving by
- Development would be seen as a very thin, low but wide band of dark or light color at base of Los Mogotes Peaks.
- Glare could be observed at times, but likely minor
- Overall contrast levels weak
- Because of weak contrast levels, compensatory mitigation not recommended

SEZ and VSA Analysis Status

SEZ Analysis

- Required data gathered
- GIS analyses designed and run
- Some maps produced

VSA Analysis

- Fieldwork completed
- Visibility analysis completed
- VSA report template designed
- Individual VSA analysis underway
- Partial preliminary results available

VSA Analysis Status Partial Preliminary Results

- Regional offsite mitigation is **recommended** for the following VSAs:
  - Community of Moffat
  - Old Spanish Trail
  - U.S. 285? – needs additional analysis
- Regional offsite mitigation is **not recommended** for the following VSAs:
  - Community of Center
  - Liberty Trail Trailhead
  - Orient Land Trust
  - Black Canyon Wilderness Study Area
  - Community of La Jara

Cultural Landscape Assessment for the San Luis Valley-Taos Plateau

Presented by:

Brian Fredericks, Bureau of Land Management, Monte Vista, CO

Konnie Wescott, Argonne National Laboratory

Angie Krall, Rio Grande National Forest

May 13, 2015

CO SRMS Public Workshop

San Luis Valley-Taos Plateau

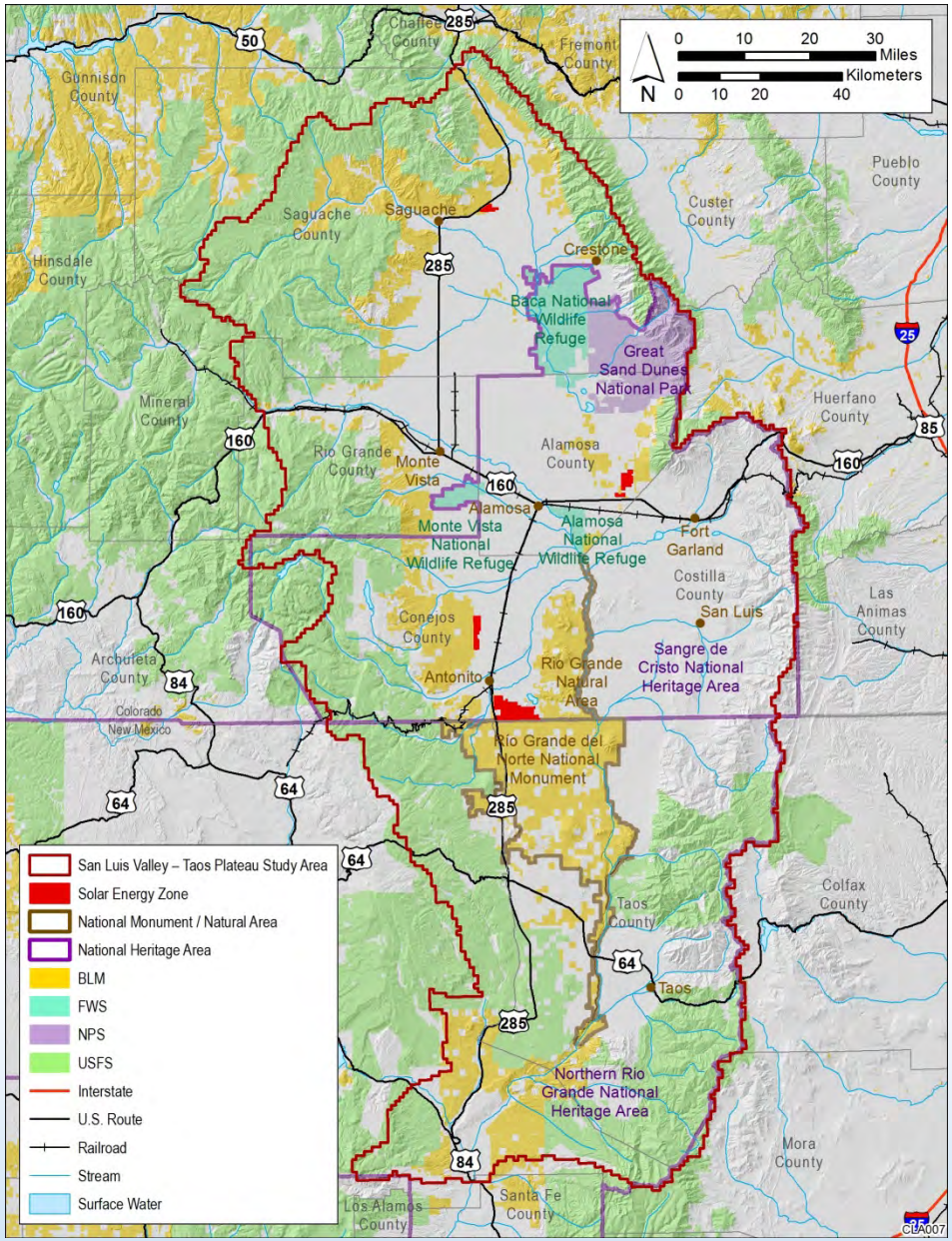
Pilot Cultural Landscape Assessment

- Bureau of Land Management adopting regional landscape approach to land management
- Several Rapid Ecoregional Assessments (REAs) conducted for ecological resources across the western U.S. to address current status and future trends of the natural landscape condition
- Cultural Landscape Assessment pilot project in CO/NM in support of CO SRMS follows REA approach but for the cultural landscape
- **Collaboration** with Tribes, federal agencies, archaeologists, subject matter experts, and stakeholders

– Colorado SEZS in the San Luis Valley–

Cultural landscape assessment being used to identify compensatory mitigation options and the *unmitigatables* (areas to be avoided)

San Luis Valley-Taos Plateau Study Area in Colorado and New Mexico



Goals of Cultural Landscape Assessment

- Synthesize existing cultural information
- Identify sensitivity areas
- Identify baseline condition, long-term trends, vulnerabilities, and risks
- Develop a research design and research questions
- Prioritize resources (significance, risk, ability to answer research questions, stakeholder interest)
- Identify regional mitigation options
- Document methodology

Examples of Data Sources Incorporated

- Narrative information from ethnographies and cultural contexts converted to spatial data that is protected
- Trail, acequia, and heritage area information converted to spatial data from various sources
- Local expert knowledge converted to spatial data

Examples of Data Sources Incorporated (cont.)

- Colorado and New Mexico SHPO spatial data for the ecoregion
- National Park Service spatial data
  - National Historic Trails
  - National Historic Landmarks
  - National Register of Historic Places
- BLM- and FS-specific spatial data (e.g., road networks, special designations)
- Existing climate change, fire, human development, vegetation and land cover, and other base and environmental data

Management Questions

- Where are known traditional cultural properties, sacred sites and landscapes?
- Where do areas of cultural resource management and protection occur?
- What are the traditional cultural land use patterns?
- Where are known significant archaeological sites, traditional cultural properties, and sacred sites vulnerable to change agents?
- Where are high potential areas or high density areas for significant archaeological sites that address the highest priority research goals?
- Where is cultural landscape connectivity vulnerable to change agents?

Conservation Elements

- Places of Traditional Cultural Importance (Tribes)
- Traditional Resource Collection Areas
- Trails, Passes, and Travel Corridors
- Hispano Land Grants, Communal Use Patterns, and Places of Traditional Cultural Importance
- Eligible Prehistoric Properties
- Eligible Historic Properties
- Paleontology

Change Agents

- Climate Change
- Human Use and Development
- Fire
- Invasive Species

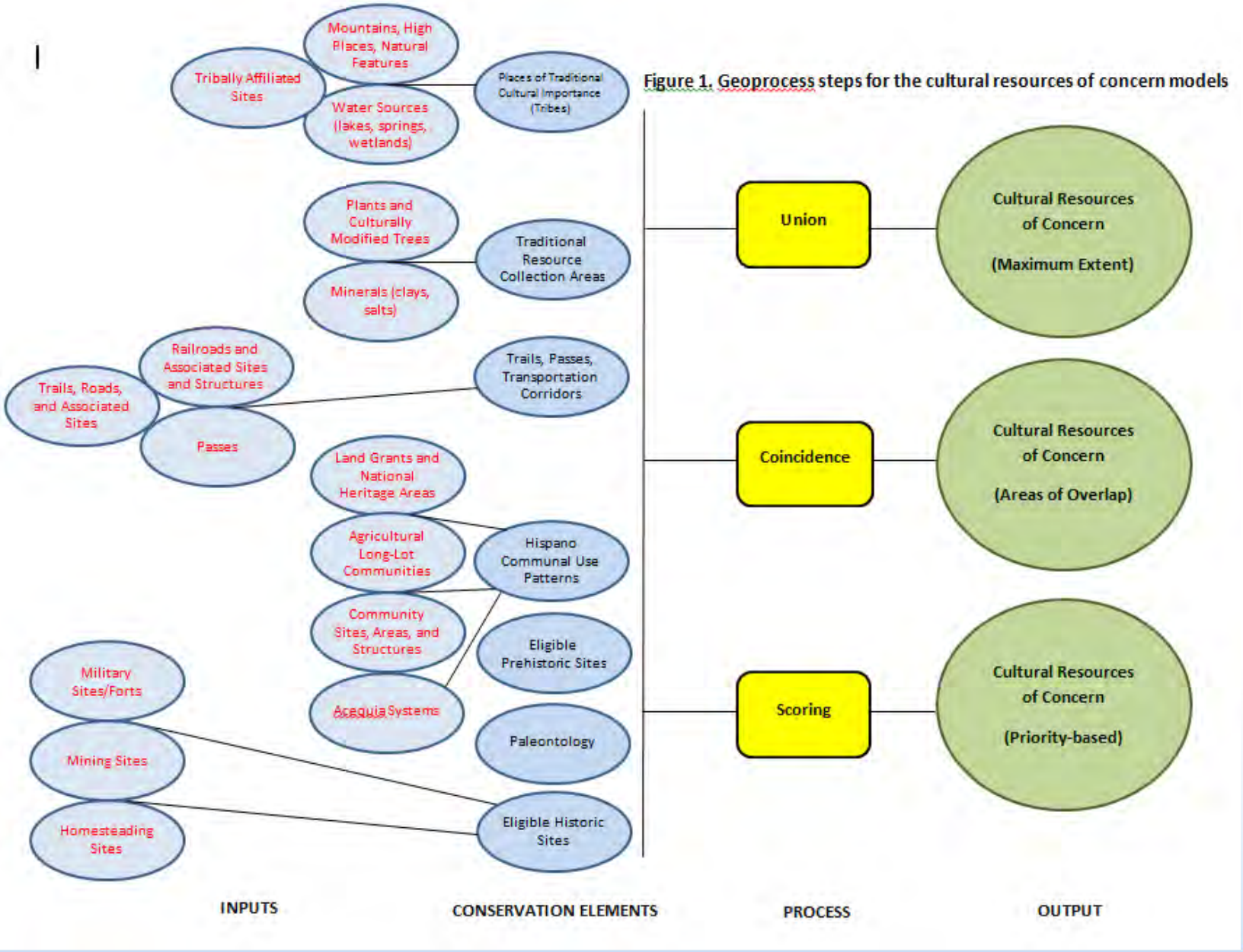
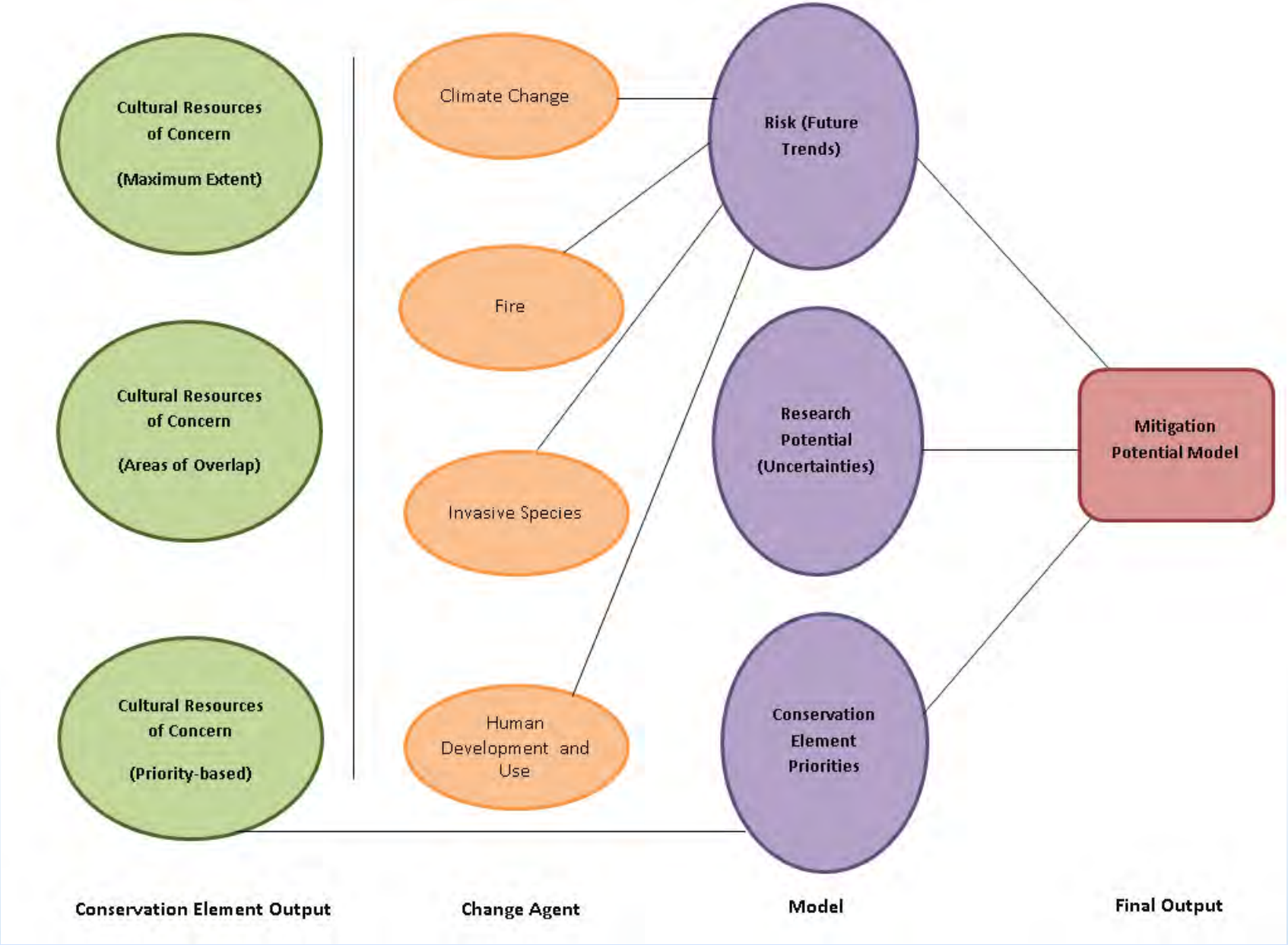
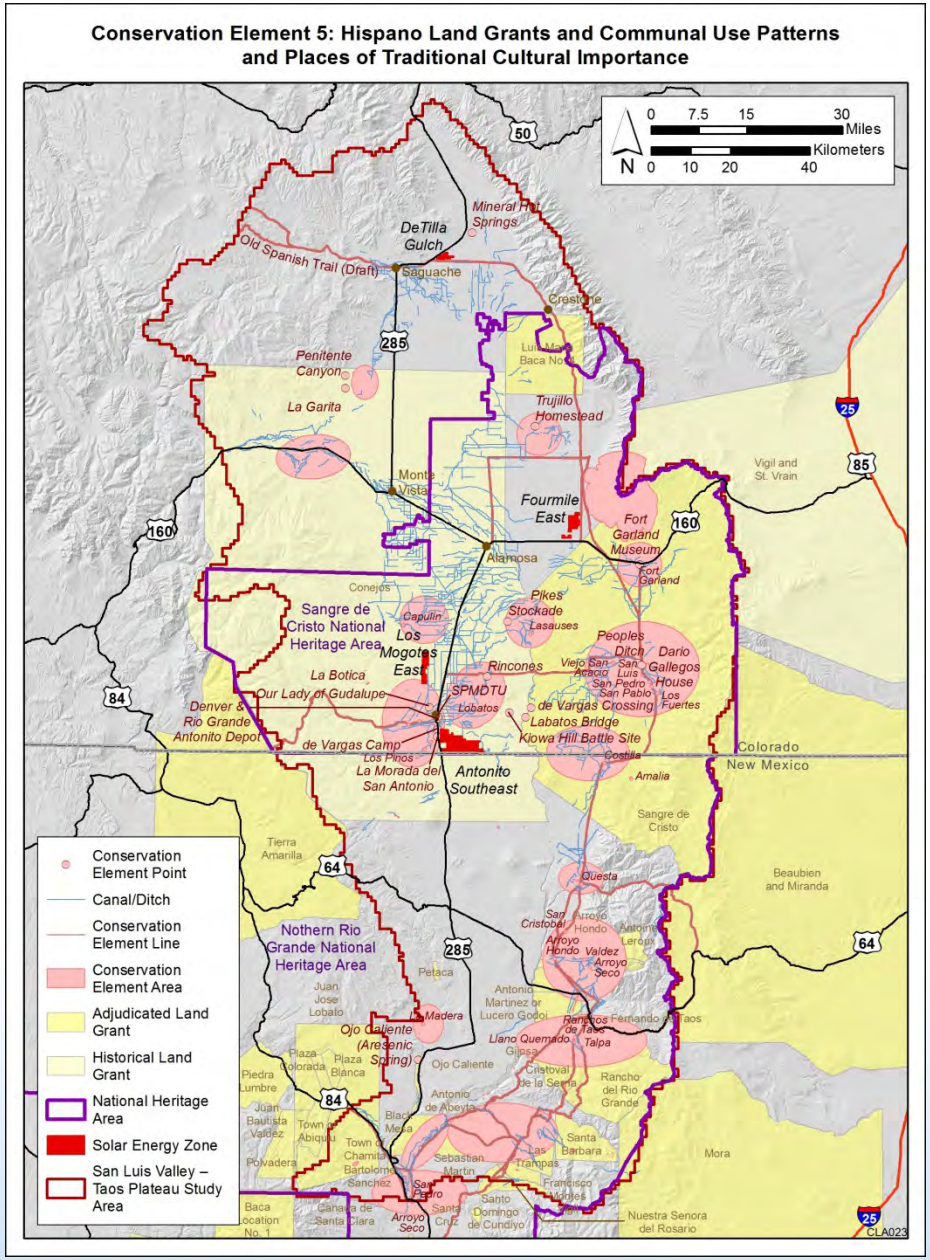


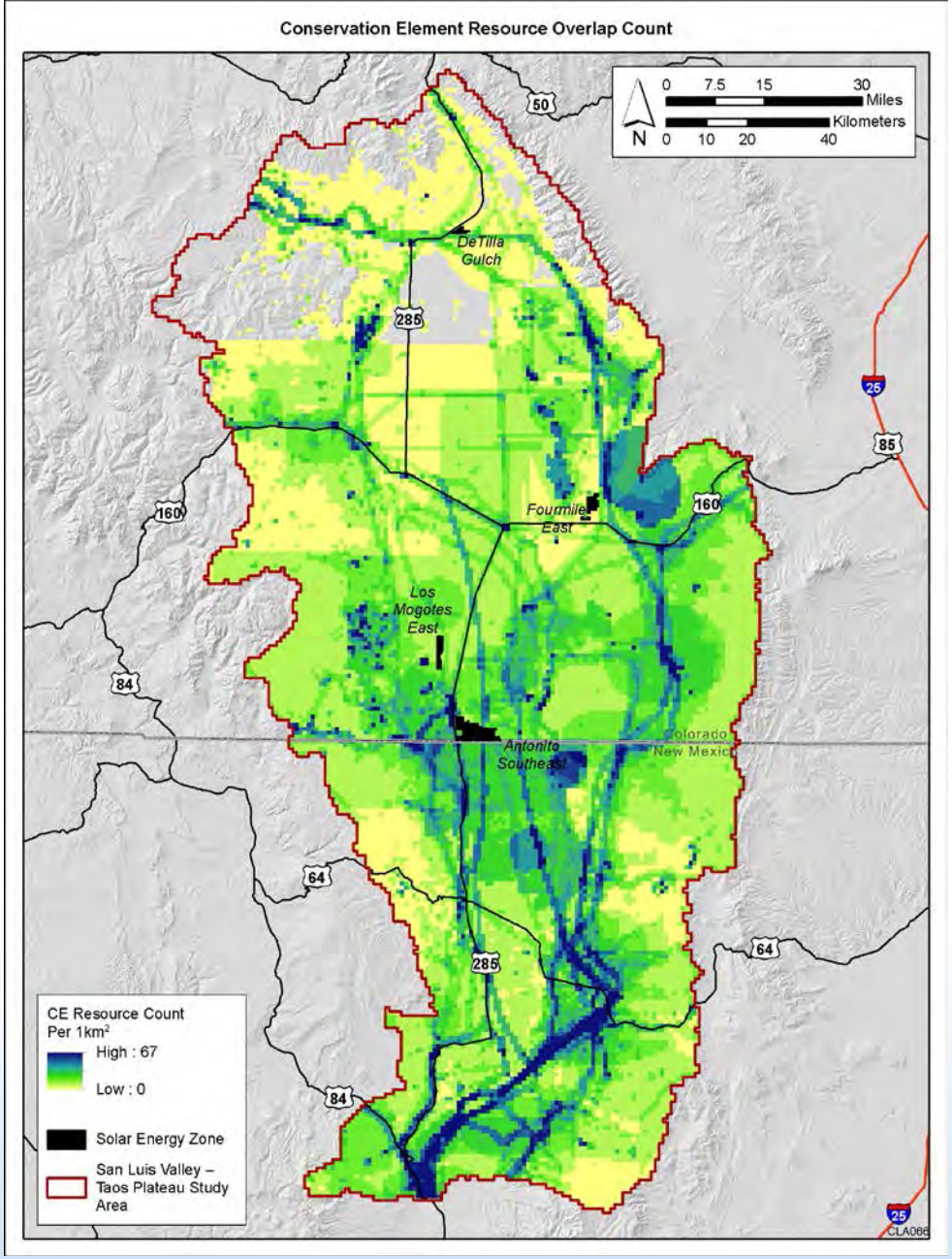
Figure 1. Geoprocess steps for the cultural resources of concern models

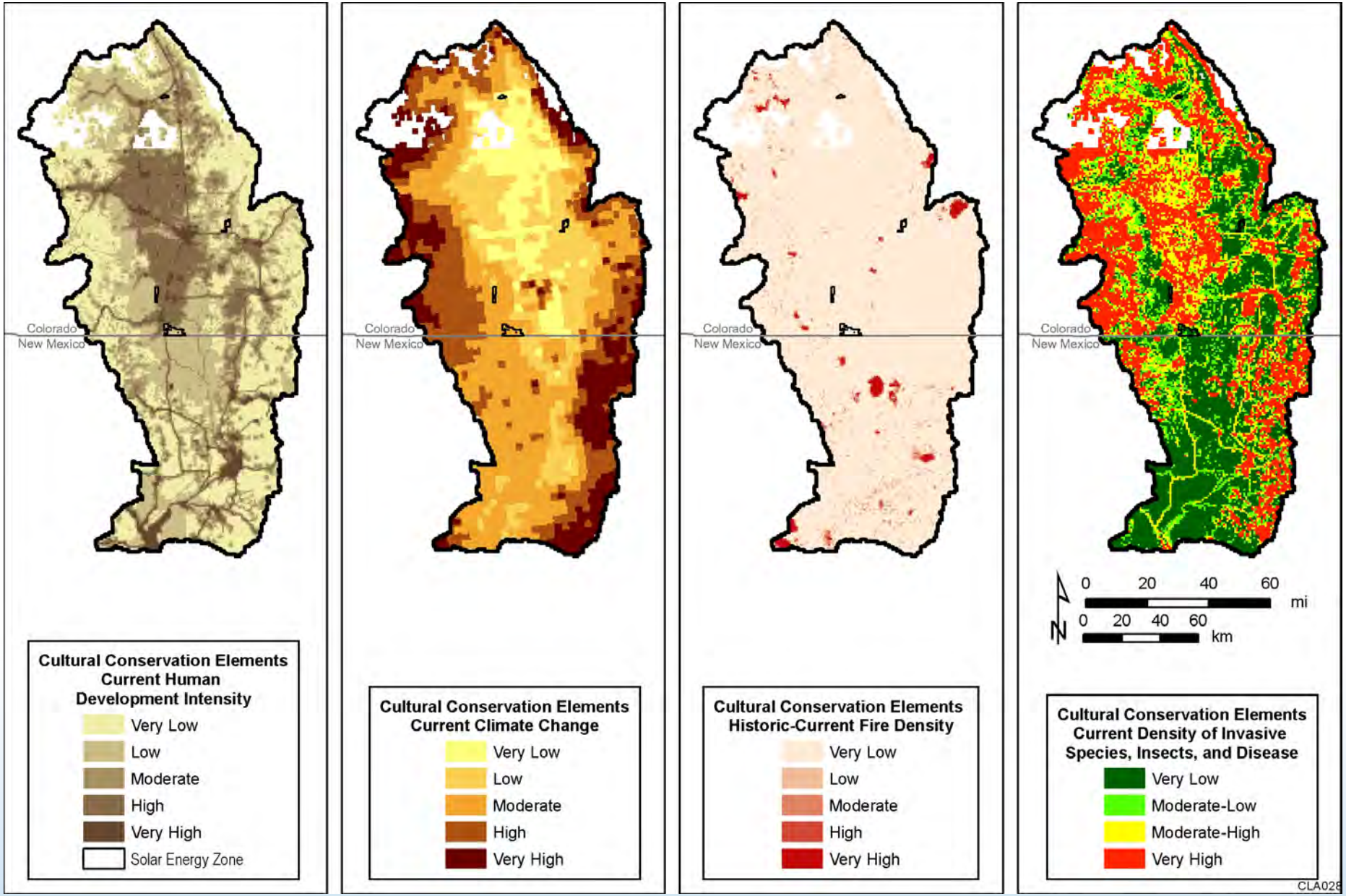

Cultural Resources of Concern (Maximum Extent)
Cultural Resources of Concern (Areas of Overlap)
Cultural Resources of Concern (Priority-based)
Climate Change
Fire
Invasive Species
Human Development and Use
Risk (Future Trends)
Research Potential (Uncertainties)
Conservation Element Priorities
Mitigation Potential Model
Conservation Element Output
Change Agent
Model
Final Output

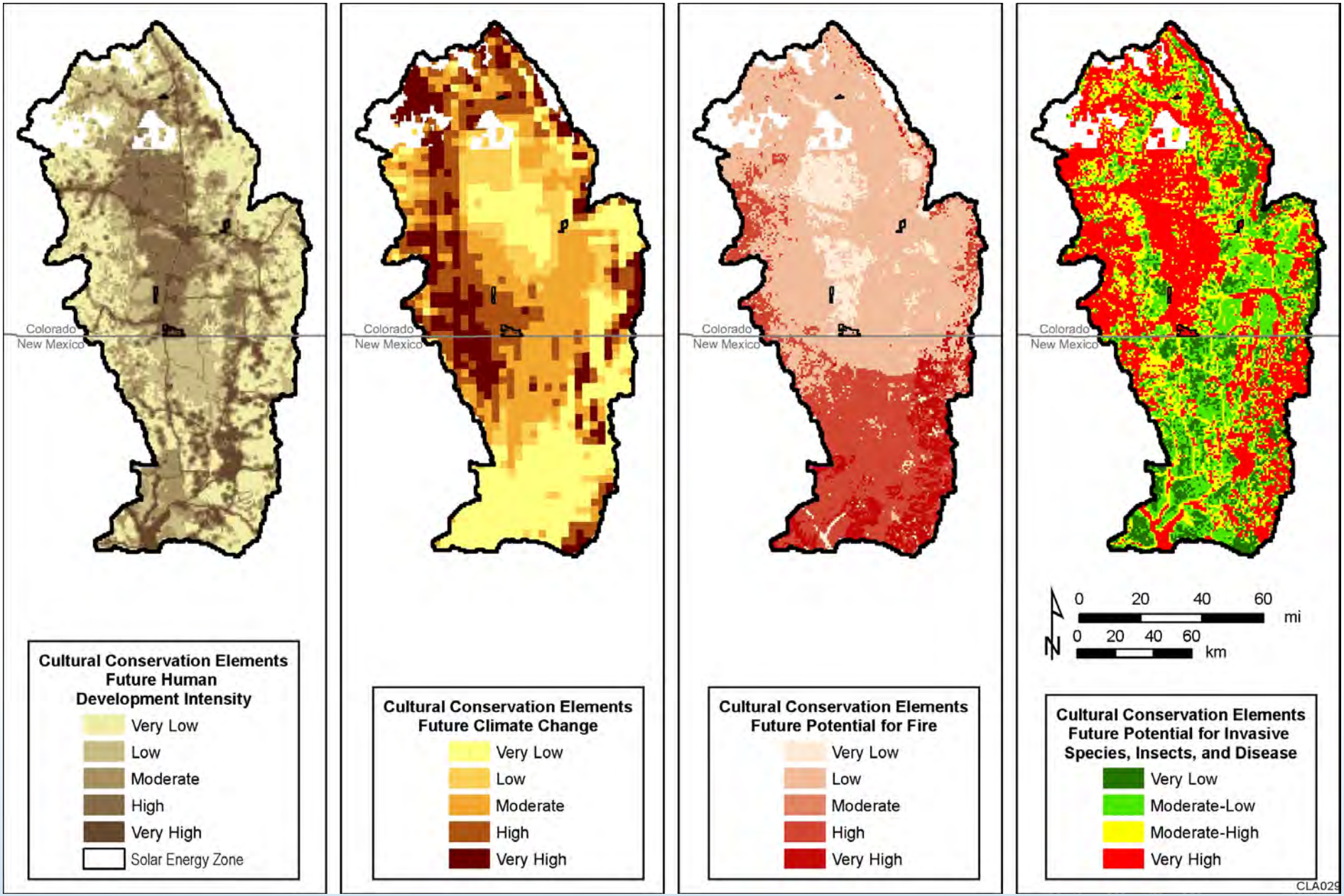
Conservation Element: Hispano Land Grants, Communal Use Patterns, and Places of Traditional Cultural Importance

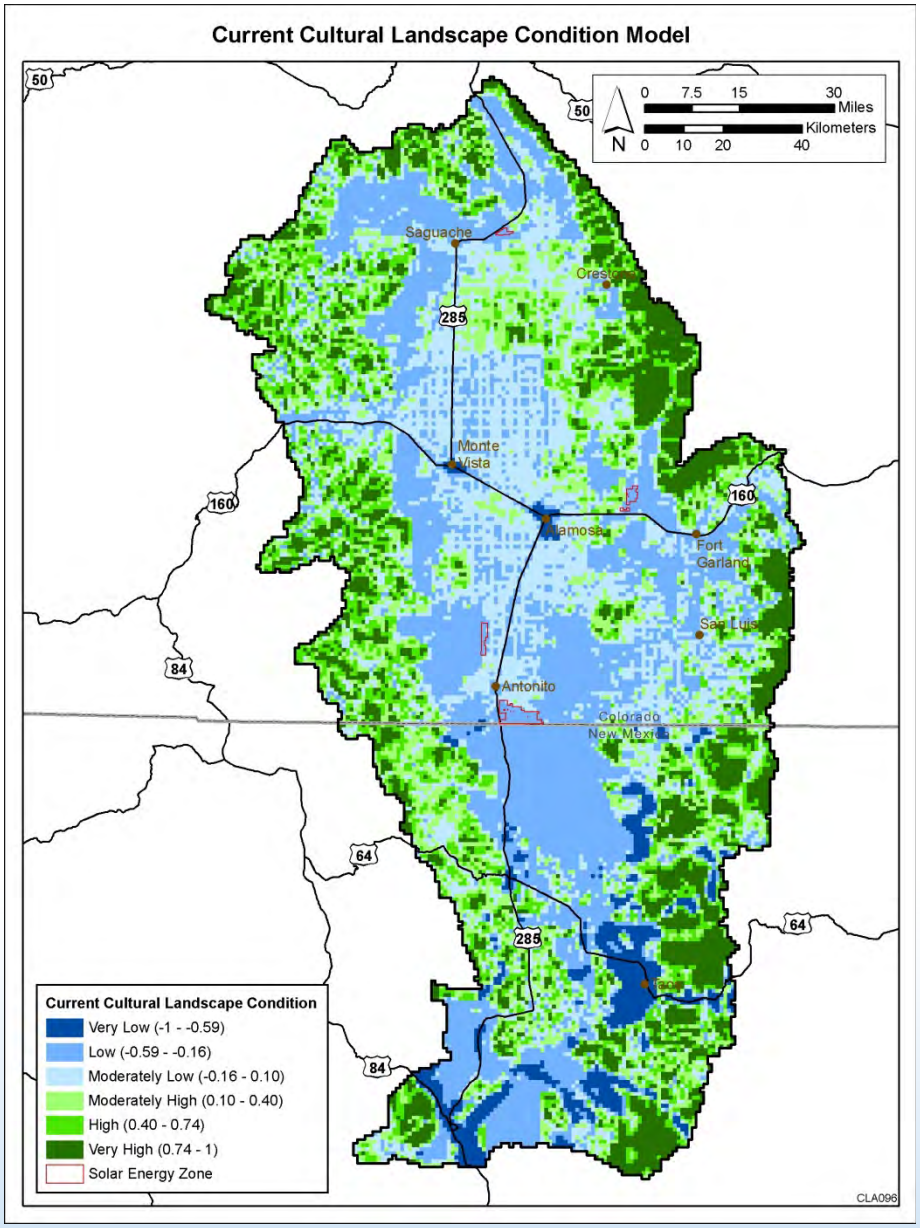


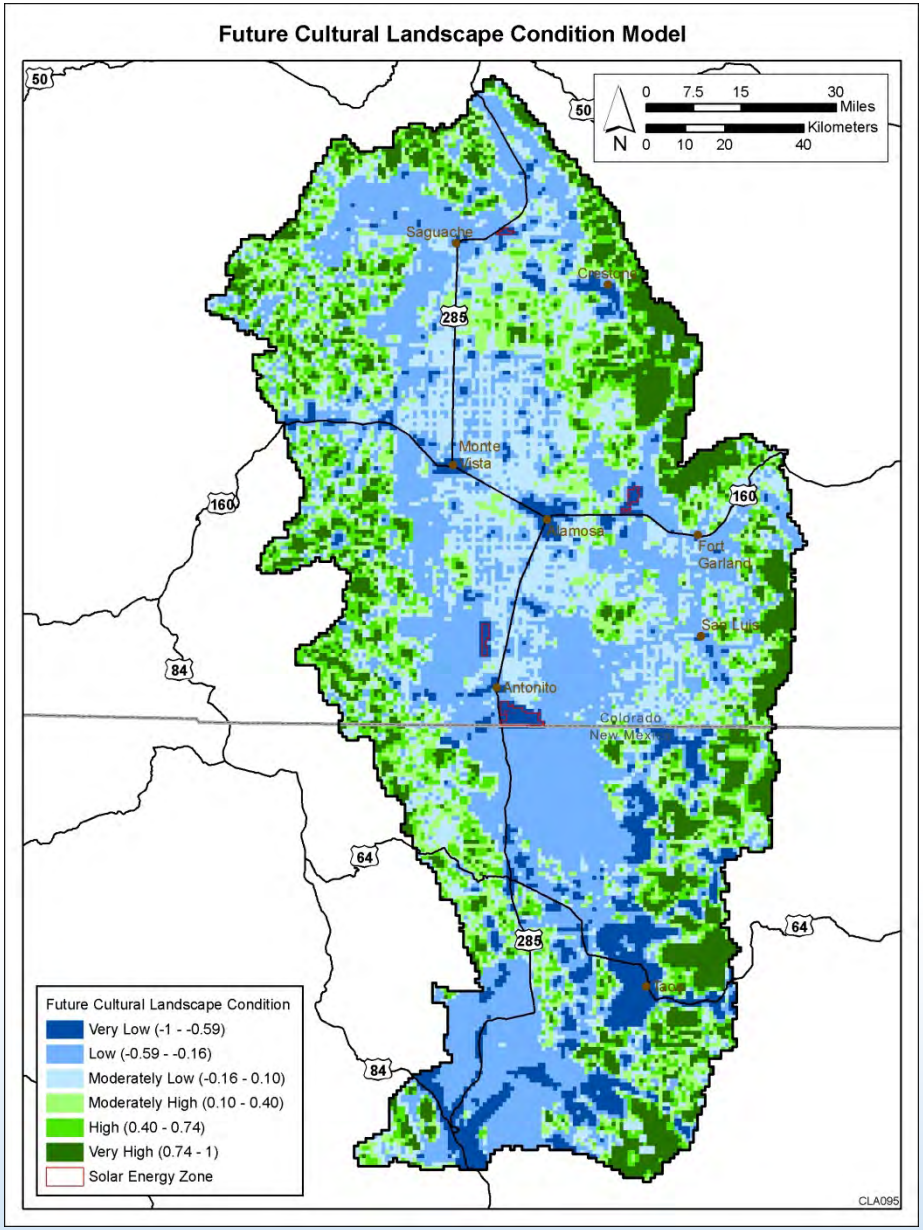
Coincidence of Conservation Elements



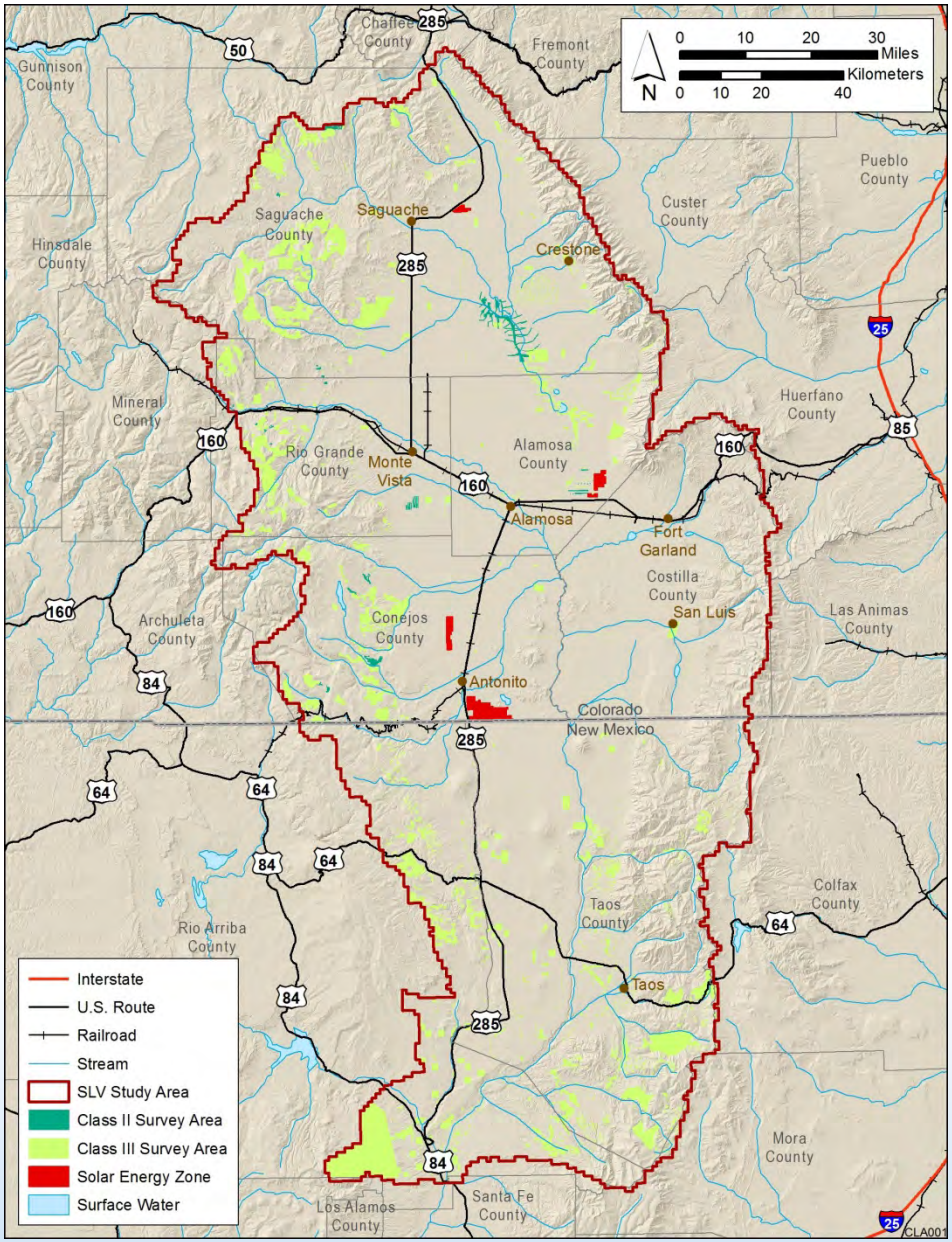

Colorado
New Mexico
Cultural Conservation Elements
Current Human
Development Intensity
Very Low
Low
Moderate
High
Very High
Solar Energy Zone
Cultural Conservation Elements
Current Climate Change
Very Low
Low
Moderate
High
Very High
Cultural Conservation Elements
Historic-Current Fire Density
Very Low
Low
Moderate
High
Very High
0 20 40 60 mi
0 20 40 60 km
N
Cultural Conservation Elements
Current Density of Invasive
Species, Insects, and Disease
Very Low
Moderate-Low
Moderate-High
Very High
CLA028


Colorado
New Mexico
Cultural Conservation Elements
Future Human
Development Intensity
Very Low
Low
Moderate
High
Very High
Solar Energy Zone
Cultural Conservation Elements
Future Climate Change
Very Low
Low
Moderate
High
Very High
Cultural Conservation Elements
Future Potential for Fire
Very Low
Low
Moderate
High
Very High
0 20 40 60 mi
0 20 40 60 km
N
Cultural Conservation Elements
Future Potential for Invasive
Species, Insects, and Disease
Very Low
Moderate-Low
Moderate-High
Very High
CLA029


Current Cultural Landscape Condition Model
0 7.5 15 30 Miles
0 10 20 40 Kilometers
N
Saguache
Crestone
Monte Vista
Alamosa
Fort Garland
San Luis
Antonito
Colorado
New Mexico
Taos
50
285
160
84
64
Current Cultural Landscape Condition
Very Low (-1 - -0.59)
Low (-0.59 - -0.16)
Moderately Low (-0.16 - 0.10)
Moderately High (0.10 - 0.40)
High (0.40 - 0.74)
Very High (0.74 - 1)
Solar Energy Zone
CLA096

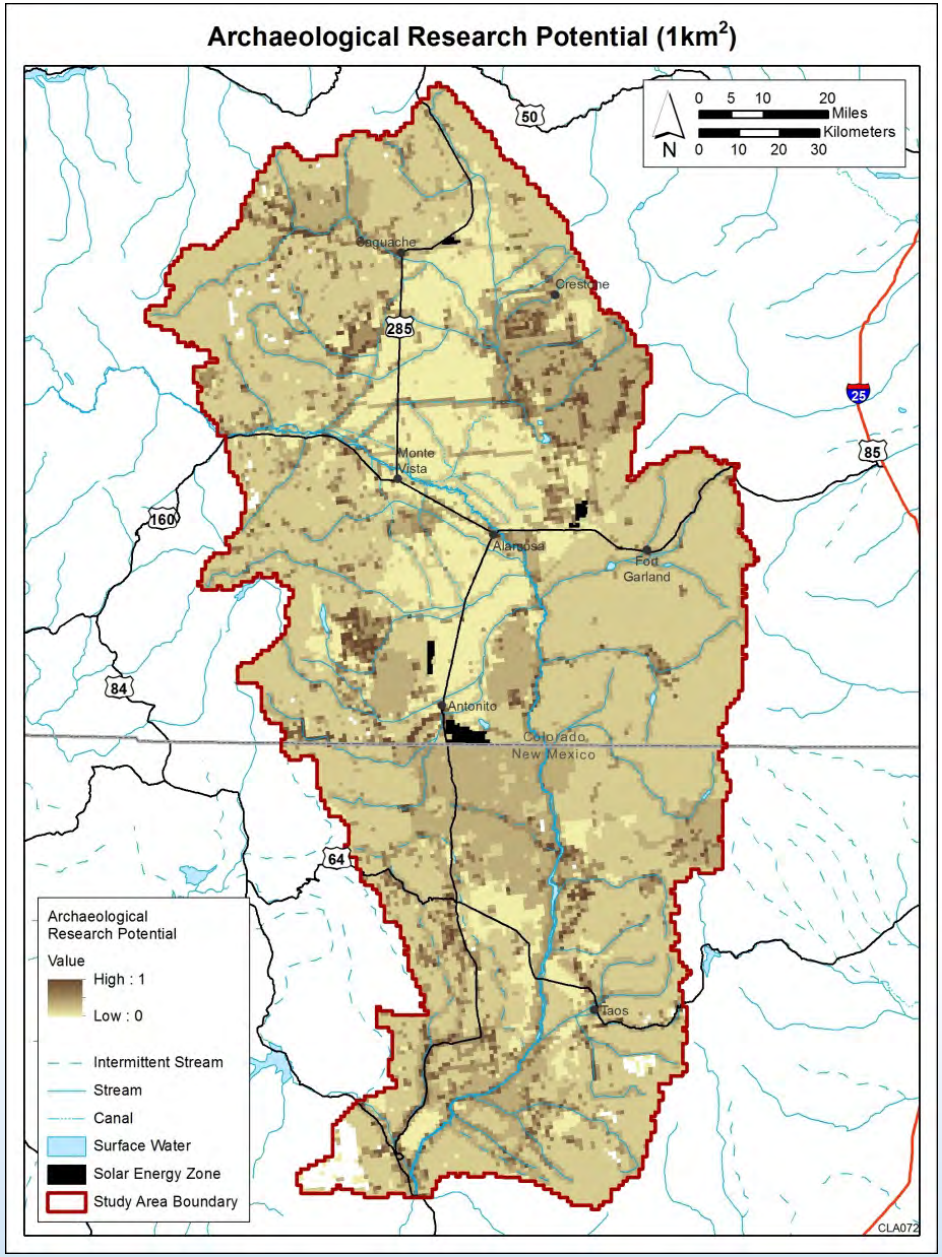

Future Cultural Landscape Condition Model
0 7.5 15 30 Miles
0 10 20 40 Kilometers
N
Saguache
Crestone
Monte Vista
Alamosa
Fort Garland
San Luis
Antonito
Colorado
New Mexico
Taos
50
285
160
84
64
Future Cultural Landscape Condition
Very Low (-1 - -0.59)
Low (-0.59 - -0.16)
Moderately Low (-0.16 - 0.10)
Moderately High (0.10 - 0.40)
High (0.40 - 0.74)
Very High (0.74 - 1)
Solar Energy Zone
CLA095

Surveyed Areas



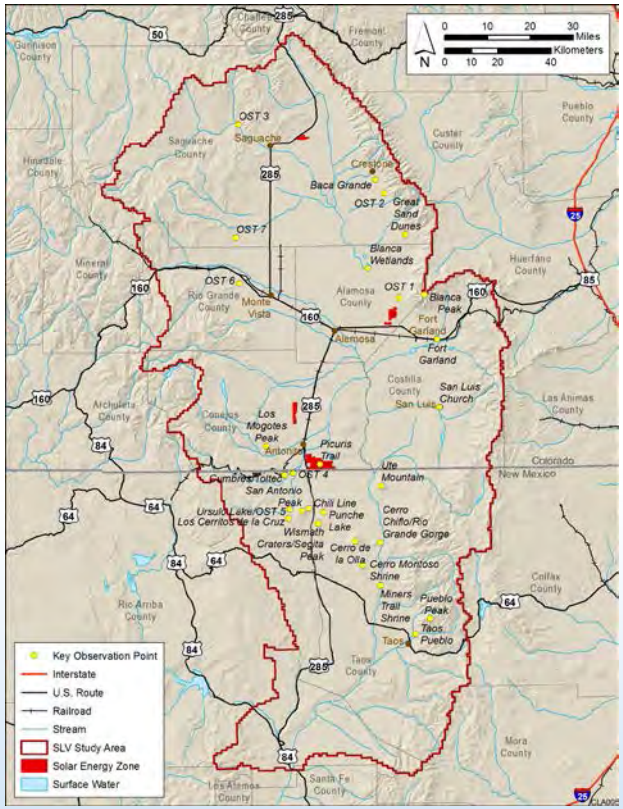
Archaeological Research Potential Model

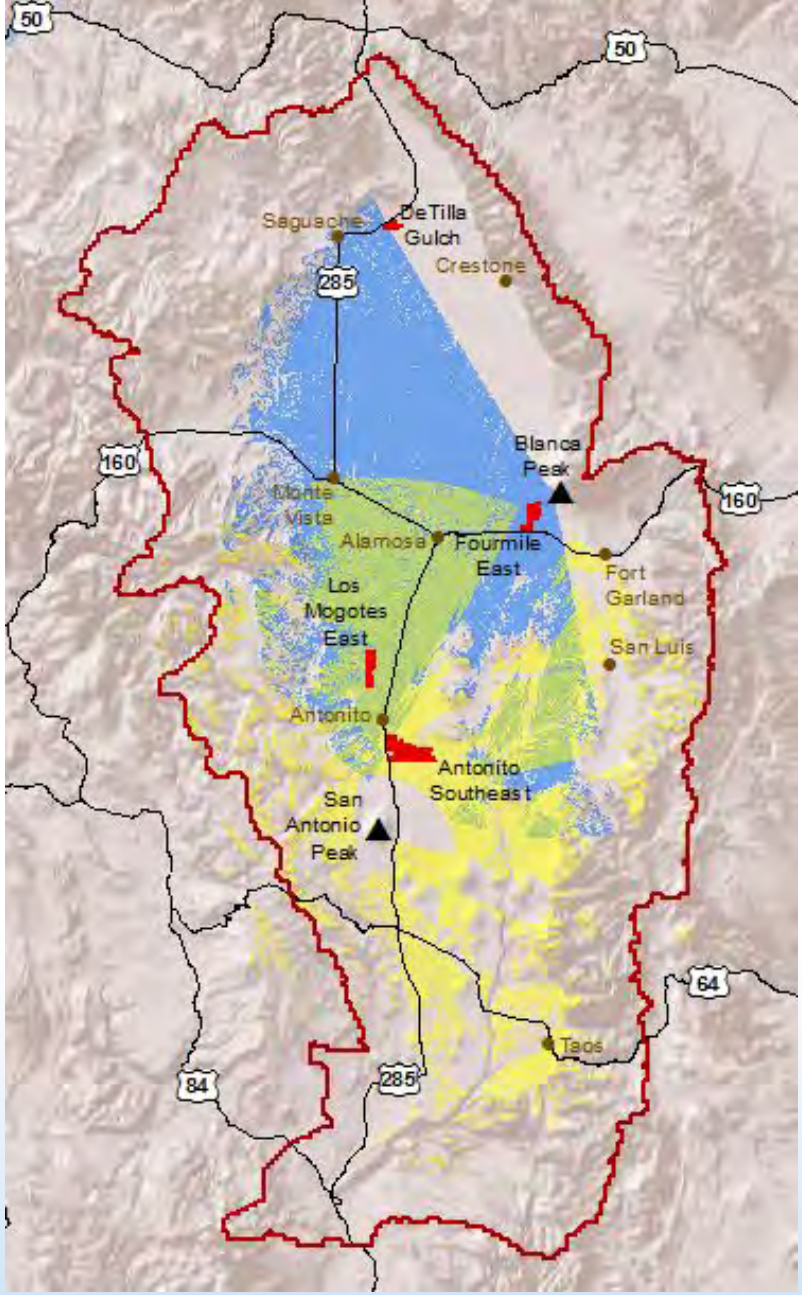
- Scores to acknowledge **uncertainty** - unknown areas and areas where material was found, potential for material to be found, and possible access for research
  - Unsurveyed Areas (0.2)
  - Unevaluated Sites (0.2)
  - Sites Determined Not Eligible (0.1)
  - Eligible Sites (0.2)
  - Federal Land (0.1)
  - Specially Designated Areas (0.1)
  - Within 1500 ft of water body (0.1)



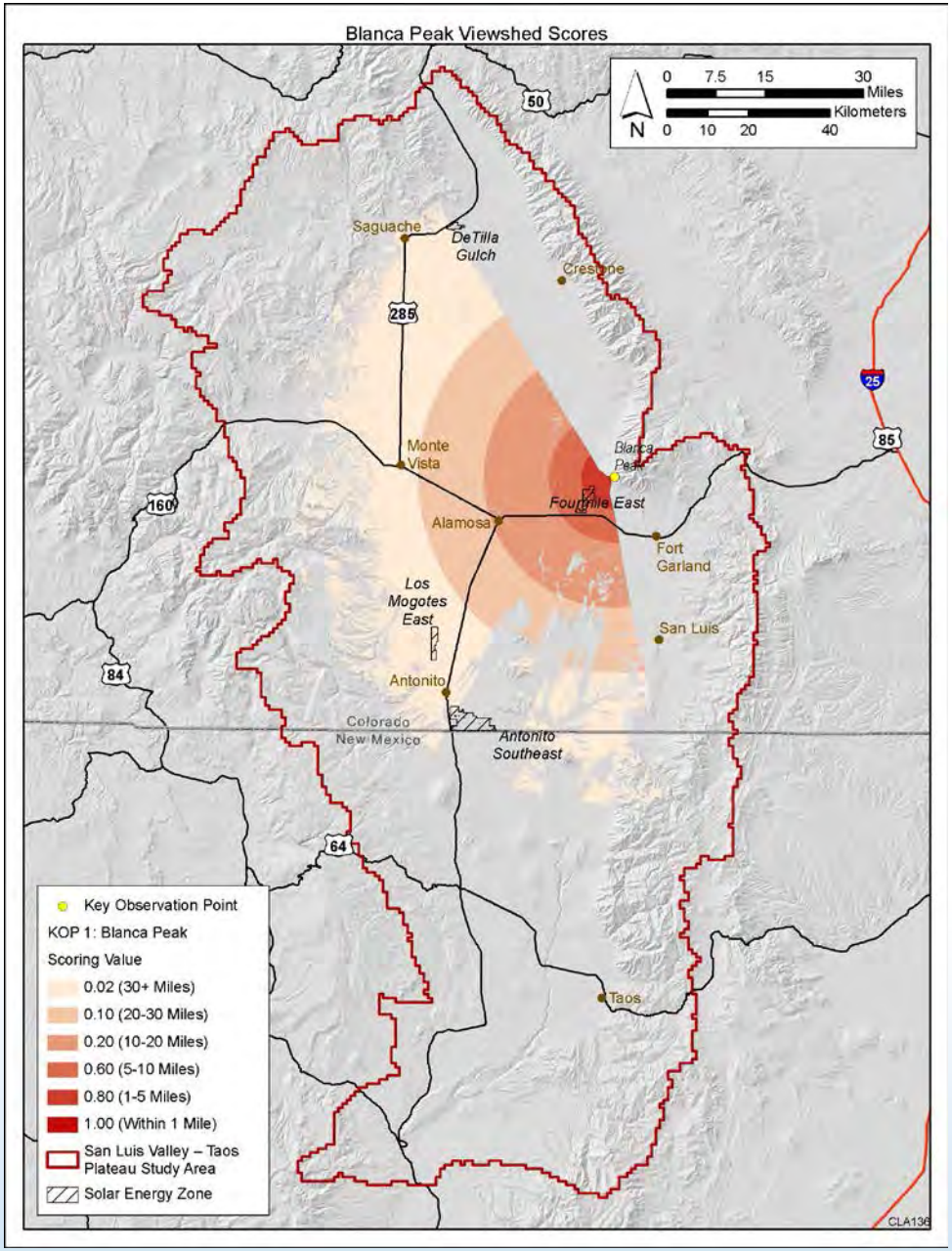
Cultural Viewshed Analysis

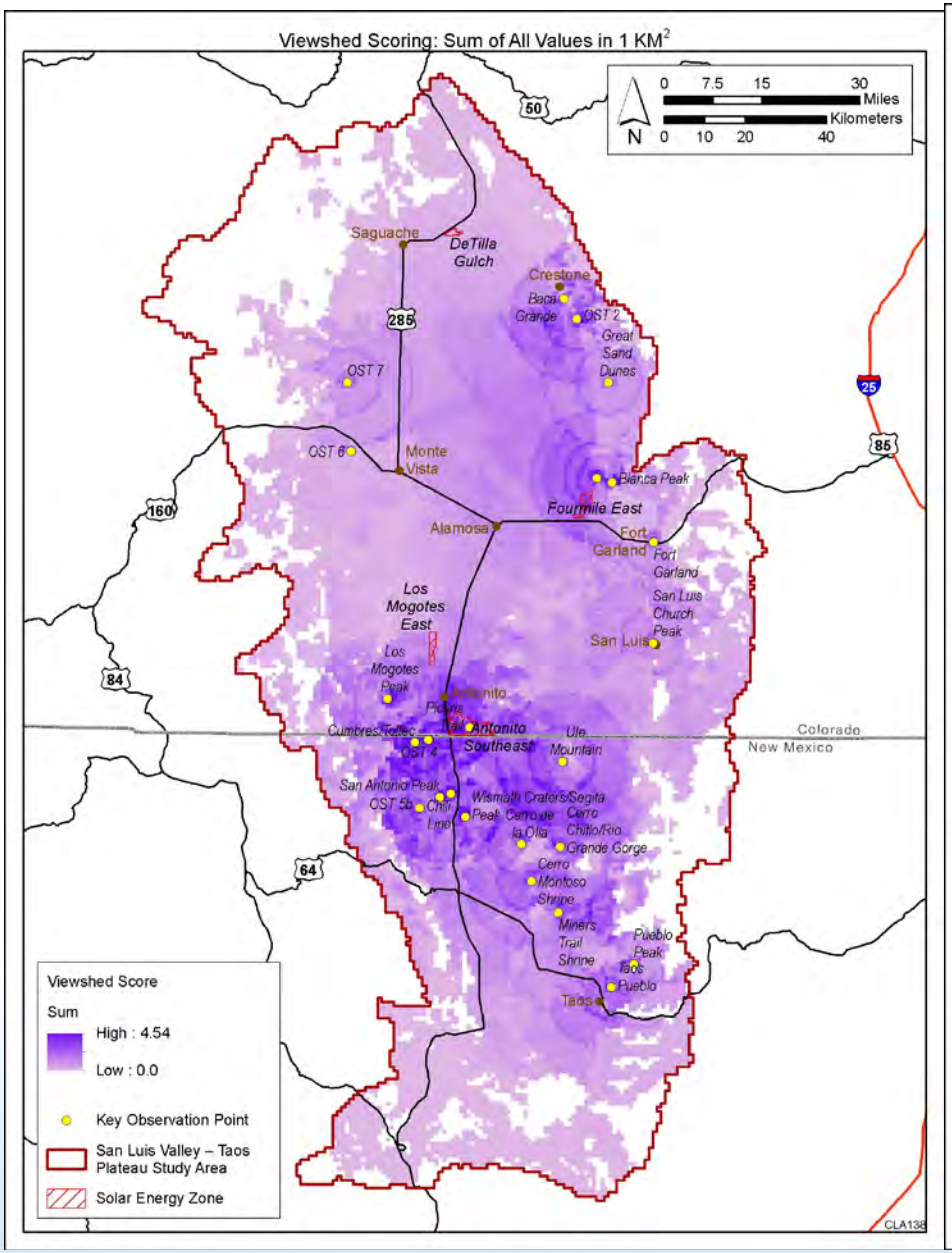
- 29 key observation points selected
- 50-mile viewing radius

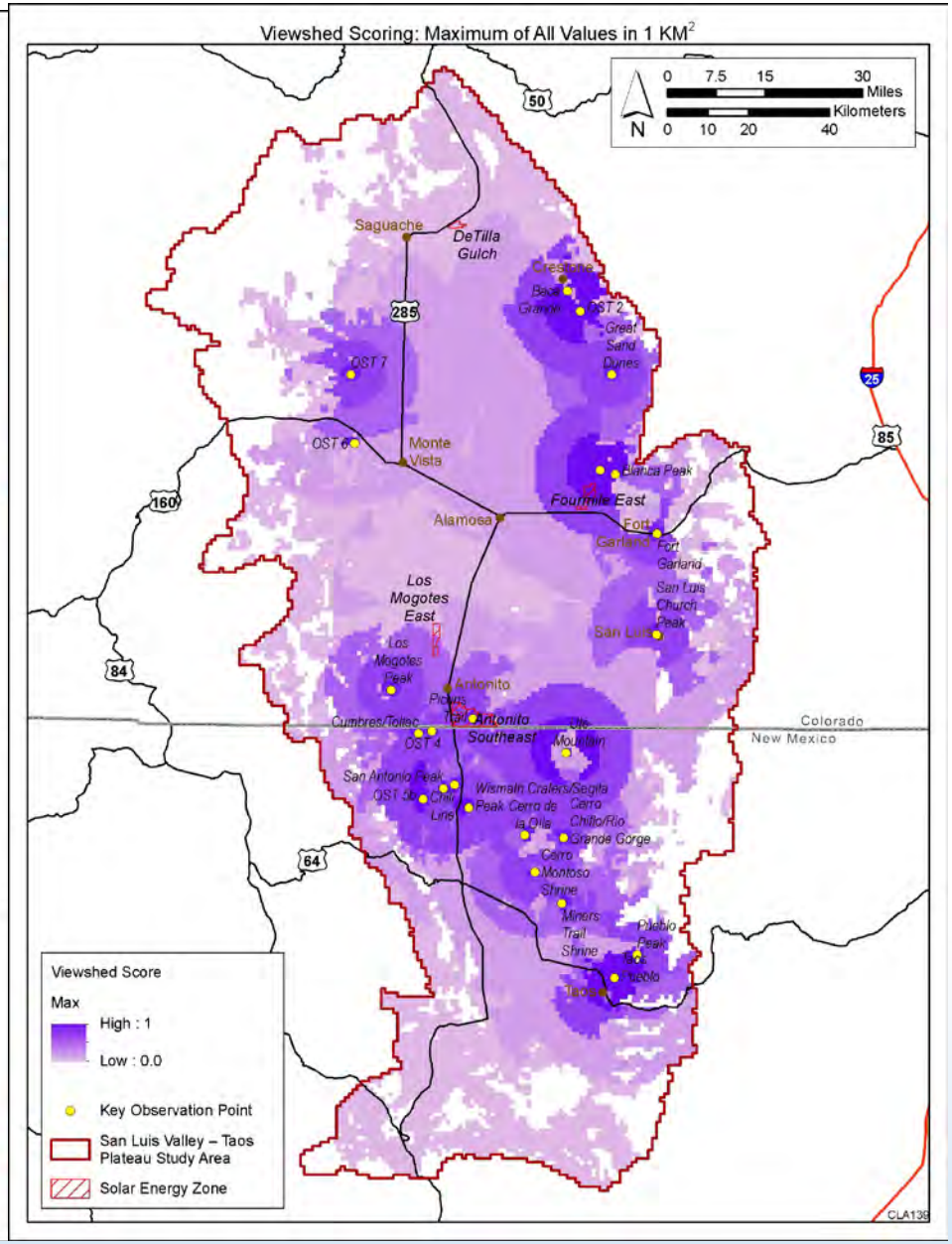




Establishing Viewshed Scores Based on Distance




Viewshed Scoring: Sum of All Values in 1 KM²
0 7.5 15 30 Miles
0 10 20 40 Kilometers
N
Saguache
DeTilla Gulch
Crestone
Baca Grande
OST 2
Great Sand Dunes
OST 7
OST 6
Monte Vista
Blanca Peak
Fourmile East
Alamosa
Fort Garland
Fort Garland
San Luis Church Peak
San Luis
Los Mogotes East
Los Mogotes Peak
Antonito
Picuris Trail
Antonito Southeast
Cumbres/Toltec
OST 4
Ute Mountain
San Antonio Peak
OST 5b
Chili Line
Wismath Craters/Segita Peak
Cerro de la Olla
Cerro Chiflo/Rio Grande Gorge
Cerro Montoso Shrine
Miners Trail Shrine
Pueblo Peak
Taos Pueblo
Taos
Colorado
New Mexico
Viewshed Score
Sum
High : 4.54
Low : 0.0
Key Observation Point
San Luis Valley – Taos Plateau Study Area
Solar Energy Zone
CLA138


Viewshed Scoring: Maximum of All Values in 1 KM²
0 7.5 15 30 Miles
0 10 20 40 Kilometers
N
Saguache
DeTilla Gulch
Crestone
Baca Grande
OST 2
Great Sand Dunes
OST 7
OST 6
Monte Vista
Blanca Peak
Fourmile East
Alamosa
Fort Garland
Fort Garland
San Luis Church Peak
San Luis
Los Mogotes East
Los Mogotes Peak
Antonito
Picuris Trail
Antonito Southeast
Cumbres/Toltec
OST 4
Ute Mountain
San Antonio Peak
OST 5b
Chili Line
Wismath Craters/Segita Peak
Cerro de la Olla
Cerro Chiflo/Rio Grande Gorge
Cerro Montoso Shrine
Miners Trail Shrine
Pueblo Peak
Taos Pueblo
Taos
Colorado
New Mexico
Viewshed Score
Max
High : 1
Low : 0.0
Key Observation Point
San Luis Valley – Taos Plateau Study Area
Solar Energy Zone
CLA139

Mitigation Potential Model

- Risk (Future Trends)
  - Combination of the change agent model results for future condition to identify CE areas at highest risk of impact from change agents
- Research Potential
  - Scores of areas based on uncertainty that important resources could be present and research opportunities are available
- Resource (Conservation Element) Priority Level
  - Coincidence results of CEs
  - Viewshed scores, as appropriate

Next Steps

- Colorado SRMS and Cultural Landscape Assessment
  - Completion of Mitigation Potential Model
  - Peer Review Workshop
  - Present to Tribes
  - Revisions as Needed
  - Completion of Documentation (Methodology and Regional Research Design)
  - Integration with SRMS
- BLM Cultural Landscape Assessment Review
  - Pilot Lessons Learned (Application Scales, Alternative Strategies to REA Model)
  - Guidance Document for Future Cultural Landscape Assessments

Contact Information

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Colorado Solar Energy Zone
Solar Regional Mitigation Strategies
BLM Public Workshop

Monte Vista, Colorado May 13, 2015

Regional Mitigation Goals and Objectives
Joe Vieira and Sue Swift-Miller,
BLM San Luis Valley Field Office

Regional Mitigation Goals – Review:

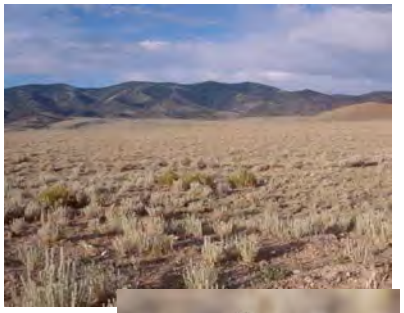
- **Overarching Regional Mitigation Goals in terms of *Desired Future Outcomes***
  - **Goals** should:
    - consider all *resources* and *values* that may warrant regional mitigation due to SEZ development
    - be based on understanding of:
      - affected ecosystem
      - landscape condition
      - current trends in the condition of resources and values
      - external actions that may affect condition
      - potential for restoration, enhancement, and/or preservation
    - enhance the ability of state and federal agencies to invest in larger scale conservation and mitigation efforts, and to prioritize investments

BLM IDT Reviewed Guidance on Goals:

Multiple existing documents provide guidance for establishing regional goals and corresponding objectives for resources warranting mitigation:

- *BLM SLV & Taos Resource Management Plans (1991, 2012)*
- *BLM Draft Rio Grande del Norte National Monument Goals and Objectives*
- *CO & NM State wildlife action plans*
- *NPS Great Sand Dunes NP General Management Plan*
- *FS Plan Goals*

Recommended Resources Warranting Regional Mitigation in CO SEZs



- **Ecology**
  - Terrestrial Wildlife Habitat
    - Pronghorn, mule deer, elk
  - Vegetation
    - Inter-mountain basins semi-desert shrub steppe - winterfat-shortgrass
  - Migratory Birds & Raptor Habitat
    - Shorebirds & water birds – Eagles-Raptors
  - Animal and Plant Special Status Species Habitat
    - 7+ species
- **Cultural**
- **Visual**
- **Air Quality**
- **Environmental Justice**
- **Hydrology**
  - Surface and groundwater
- **Soils**

BLM IDT Identified Resources Warranting Mitigation Correspond to 9 broad Regional Goals:

- 3 goals for Ecology
- 1 goal for Cultural
- 1 goal for Visual
- 1 goal for Air Quality
- 1 goal for Environmental Justice
- 1 goal for Surface Water and Groundwater
- 1 goal for Soil Health

IDT Identified Regional Objectives Corresponding to Goals:

- The objectives are:
  - Specific,
  - Measureable,
  - Attainable,
  - Relevant, and
  - Time-Sensitive
- Objective setting is an iterative process; will be revisited as specific mitigation actions and outcomes are considered

Goals 1-3: Ecology

- Goal 1: Healthy watersheds and landscapes support ***ecological processes*** that maintain ecosystem resiliency and integrity to support ***natural abundance and diversity of terrestrial and aquatic populations*** and communities

- Goal 2: Sufficient acreage of ***high quality habitats*** is spatially distributed across the landscape providing all necessary habitat components to support life history requirements to maintain a ***natural abundance and diversity of migratory birds and special status species***, avoiding the need for future listing.

- Goal 3: Sufficient acreage of ***upland vegetation, riparian and wetland communities*** providing functioning ecological processes across the landscape to support ***healthy watersheds and viable and resilient populations of native species***.

Regional Objectives Corresponding to Ecological Goals

- Objective 1: Preserve, restore, enhance, conserve, or acquire equivalent acreage of ***winterfat-saltbush-blue grama grasslands habitat and shrubland ecosystem*** in the San Luis Valley and Taos Plateau for landscape lost through development on the SEZ to 80% of cover and composition of primary plant species within 5-10 years of initiation of land disturbing development on the SEZ.

- Objective 2: Preserve, create, enhance, and/or acquire ***playa, wet meadow, emergent and riparian habitats to attract migratory birds to sustain avian populations*** in the San Luis Valley and Taos Plateau landscape and offset "lake" effect impacts of SEZ development within 1-5 years of initiation of SEZ land disturbing activities.

- Objective 3: Preserve and/or restore winterfat-saltbush-blue grama grasslands habitat and shrubland ecosystem to ***sustain a natural abundance and diversity of terrestrial wildlife populations*** in the San Luis Valley and Taos Plateau landscape within 5-10 years of initiation.

Goal 4: Cultural (3 parts)

- Significant ***cultural resources are identified, preserved, and protected*** to ensure that they are available for appropriate uses by present and future generations.

- ***Imminent threats are reduced*** and potential conflicts from natural or human-caused deterioration or potential conflict with other resource uses are resolved by ensuring that all authorizations for land use and resource use comply with Section 106 of the National Historic Preservation Act.

- ***National historic trail routes*** and historic settings, remnants, and artifacts ***are identified and protected*** for public use and enjoyment.

Regional Objectives Corresponding to Cultural Goal

- Objective 1: ***Enhance and/or protect National Historic Trails and other cultural resources in the San Luis Valley–Taos Plateau*** *f*or communities affected by public land solar energy development and to avoid adverse effects to traditional cultural properties.

- Objective 2: ***Rectify and enhance visual resources***, including high contrasts in the San Luis Valley-Taos Plateau.

- Objective 3: (Hispano Cultural Landscape only): ***Enhance cultural heritage education & Sangre de Cristo & Northern Rio Grande National Heritage Area values*** by increasing regional & national knowledge of the Spanish & Mexican land grant and *Hispano* settlement patterns the San Luis Valley and Taos Plateau landscape. Map and document land grant era acequia - long lot settlement areas (as identified by A. Valdez, October 2014) roughly proportional to SEZ area developed within 2-5 years of project initiation.

Goal 5: Visual

- Enhance and rectify visual quality in the Sangre de Cristo National Heritage Area

Regional Objective Corresponding Visual Goal

- Rectify and enhance visual quality within 1-5 years of initiation of land disturbing development on the SEZ.

Goal 6: Air Quality

- Air quality conditions near households and communities ***maintain EPA NAAQS*** and criteria pollutant standards, ***retain low contribution to ambient dust***, promote Great Sand Dunes National Park Class I Airshed protected area visibility goals, and foster federal greenhouse gas reduction goals

Great Sand Dunes National Park. Photo Credit: NPS.gov

Regional Objectives Corresponding to Air Quality Goal

- Objective 1: ***Apply mitigation measures to disturbed soils and/or reduce fugitive dust*** on an area roughly proportional to SEZ area developed within 1 to 5 years of project initiation.

- Objective 2: ***Restore Baca National Wildlife Refuge or other disturbed agricultural circles*** for wildlife habitat. (Previously Obj. 4 for Goal 7, EJ)

- Objective 3: To improve, protect, and conserve watershed/ groundwater and air quality; ***protect thru acquisition and ACEC designations*** sensitive and significant cultural features.

- Objective 4: Enter into potential land exchange opportunities to ***protect and conserve watershed & air quality by relocating possible recreational facility development*** in sensitive areas (streambank and riparian).

Goal 7: Environmental Justice

- Disproportionately high and adverse human health or environmental effects on minority and low-income populations are avoided or offset in the landscape.

Regional Objectives Corresponding to Environmental Justice Goal

- Objective 1: ***Restore and rectify disturbed soils and/or reduce fugitive dust*** on an area roughly proportional to SEZ area developed within 1 to 5 years of project initiation.

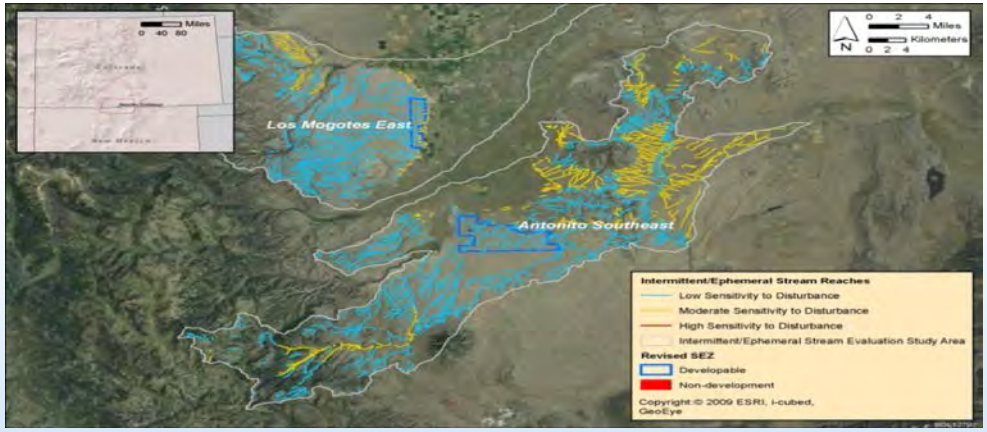
- Objective 2: ***Enhancement of grazing opportunities by fencing*** to create reserve common allotments.

- Objective 3: Enhance grazing and recreational opportunities, improve air quality & water maintenance.

- Objective 4: ***Conserve watershed & air quality***.

Goal 8: Surface Water and Groundwater

- Surface water and groundwater quantity and quality, and watershed functions, result in compliance with Clean Water Act and other applicable water quality requirements, which ***maintain or improve sufficient water to support people, economies, wildlife, and ecological systems***.



Surface Water Features in the Hydrologic Basin that includes the Antonito Southeast SEZ. Source: BLM 2012 – Solar PEIS.

Regional Objectives Corresponding to Surface Water/Groundwater Goal

- Objective 1: ***Replace or offset groundwater recharge*** area lost due to solar development within 1-5 years of SEZ development.

- Objective 2: ***Enhance groundwater recharge and protection through creation of additional wetlands*** within 1-5 years of SEZ development.

- Objective 3: ***Enhance, rectify and protect surface water quality by constructing stream rehabilitation*** and erosion control structures to reduce, avoid, eliminate, minimize soil erosion within 1-5 years of SEZ development.

- Objective 4: ***Enhance groundwater recharge & protection by applying water to wetlands*** within 1-5 years of SEZ development.

- Objective 5: ***Acquire augmentation water for Blanca Wetlands*** *wel*ls, to protect wetlands habitat within 1-5 years of SEZ development.

Regional Objectives Corresponding to Surface Water/Groundwater Goal (cont.)

- Objective 6: ***Construct infrastructure improvements*** (i.e. ditches, dykes, head gates, etc.) ***to maximize wetlands habitats*** by maximizing existing water rights/water use efficiencies within 5-10 years of SEZ development.

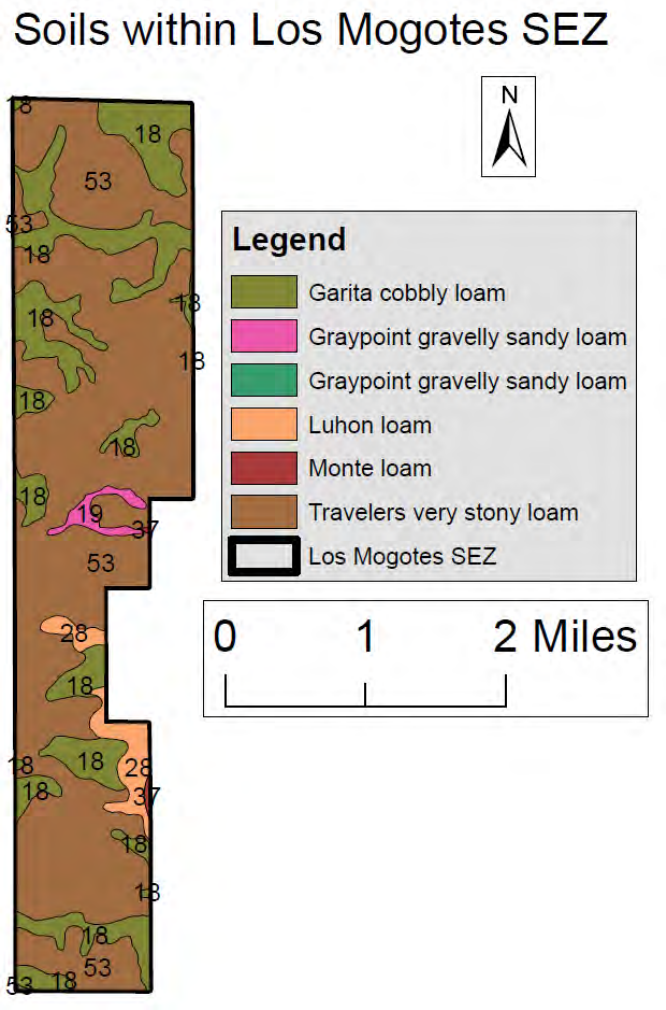
- Objective 7 : ***Water right acquisition and enhancements to attract migratory birds*** within 5-10 years of SEZ development.

- Objective 8: ***Acquire augmentation water for McIntire Simpson wells*** and re-drill McIntire Simpson wells to produce adjudicated amount to create more wetlands within 1-5 years of SEZ development.

- Objective 9: ***Potential land exchange with other entities*** to provide alternate recreation development sites to conserve watershed health within 1-5 years of SEZ development. (Reworded from previous version.)

Goal 9: Soil Health

- Soil health exhibits functional, biological and physical characteristics that are appropriate to soil type, climate and landform, and retain soil conditions including soil stability, land cover, and characteristics that meet BLM's land health standards, contribute to public health and safety, avoid damages to natural site characteristics, and contribute to economic productivity and ecological sustainability.



Regional Objectives Corresponding to Soil Health

- Objective 1: Preserve, restore, enhance, conserve, protect, or acquire equivalent acreage of winterfat-saltbush-blue grama grasslands habitat and shrubland ecosystem. ***Same as Objective for Goal 1: Ecology***

- Objective 2: ***Restore and rectify disturbed so***ils and/or reduce fugitive dust on an area roughly proportional to SEZ area developed within 1 to 5 years of project initiation, ***through re-vegetating agricultural circles, dust abatement effort***s on dirt roads.

- Objective 3: ***Protect and enhance soil conditions*** on an area roughly proportional to developed SEZ area within 1 to 5 years of project initiation, ***by constructing stream rehabilitation and erosion control structures; rehabilitating roads/routes, and expanding ACEC protections.***

- Objective 4: Protect and retain soil conditions by constructing stream rehabilitation and erosion control structures.

Regional Objectives Corresponding to Soil Health (cont.)

- Objective 5: ***Rehabilitate Travel-Management Plan-unauthorized routes*** (rip/reseed), and install erosion control structures.

- Objective 6: ***Restore Baca NWR disturbed agricultural circles*** for wildlife habitat.

- Objective 7: ***Riparian and upland habitat restoration***

- Objective 8: ***Augment law enforcement capabi***lities to increase Travel Management Plan compliance.

- Objective 9: ***Expand Los Mogotes ACEC*** during RMP revision prioritizing winterfat -grassland habitat for viable wildlife populations.

- Objective 10: ***Establish conservation easement or land acquisition*** to expand existing protected grassland and shrubland habitat.

Regional Objectives

- Discussion Group Questions:
  - Do the mitigation goals and objectives presented by the BLM adequately address the residual or unavoidable impacts of solar energy development that may warrant regional mitigation for each SEZ?
  - Are there other mitigation goals and objectives beyond those established in the BLM resource management plans that should be considered (e.g., from state action plans, species-specific management plans, etc.)?
  - Are the mitigation goals and objectives sufficiently defined to support identification and assessment of candidate mitigation sites and actions for each SEZ?

Candidate Sites Evaluation

Candidate Site Evaluation

- Informed by regional mitigation goals based on resource residual impacts
- Sites and Actions must *logically and defensibly relate back to Residual Impacts Warranting Mitigation and Regional Goals*
- Key Compensatory Mitigation Criteria: ***Durability & Additionality***

Candidate Site Evaluation

- Location Requirements
  - appropriately located (within ecoregion or watershed of SEZ)

- Mitigation Actions to consider include:
  - *Restoration or rehabilitation of degraded lands*
  - *Conservation easements or Conservation land acquisition*
  - *Recommendations for new RMP ACECs or RMP ACEC expansion areas*
  - *Preservation and protection (e.g., reroute access; law enforcement)*
  - *Enhancement (e.g., interpretation of cultural and natural resources)*

Candidate Site Evaluation

- During February webinar, asked stakeholders to provide candidate mitigation propose and score locations and actions

- Great response! Received
  - 11 sites – The Nature Conservancy
  - 2 sites – The Wilderness Society
  - 7 sites – Defenders of Wildlife
  - 3 sites – Conejos County Clean Water Inc.
  - 4 sites – San Luis Valle Ecosystem Council

- Also received recommendations from Colorado Parks and Wildlife

- BLM Interdisciplinary team also proposed and scored 17 sites

Candidate Site Evaluation

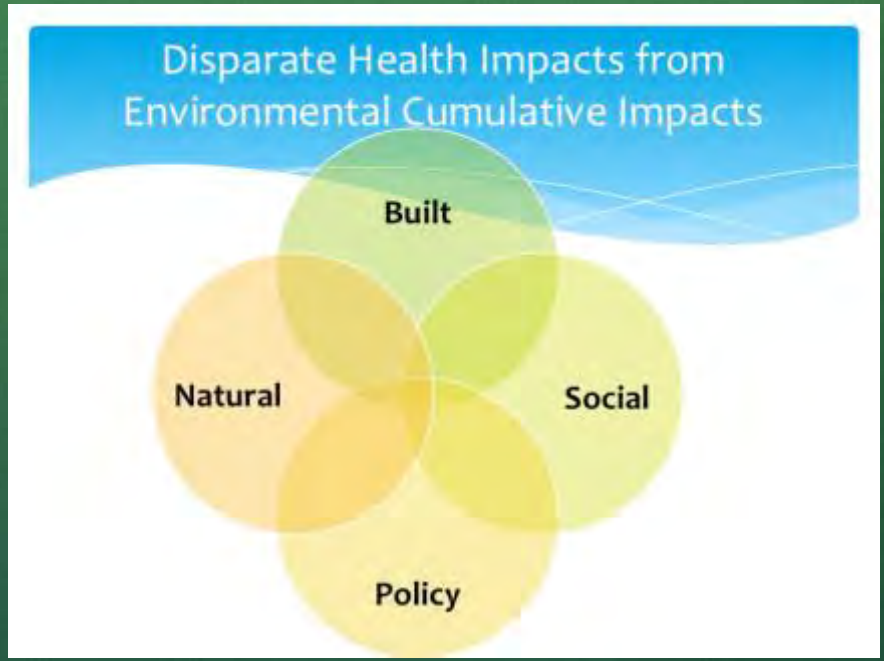
- Screening matrix handouts
- Each group will present sites and rationale
- During group exercise tomorrow we will discuss sites, evaluation criteria, and scoring

Conejos County Clean Water, Inc.

Presented by Michael A. Armenta, CCCW Project Coordinator
Jay Mashburn, Waste Specialist
Illegal Dumpsites and Proposed SEZ Mitigations

Environmental Justice

"It is the unfortunate plight of many poor, socioeconomically depressed communities to be forced to choose between their livelihood, sustenance and basic survival and the many intrinsic factors that make them human, such as their culture, heritage and local history." – CCCW Member



Illegal Dumpsites

Illegal Dumpsites

Illegal Dumpsites

Illegal Dumpsites

Illegal Dumpsites

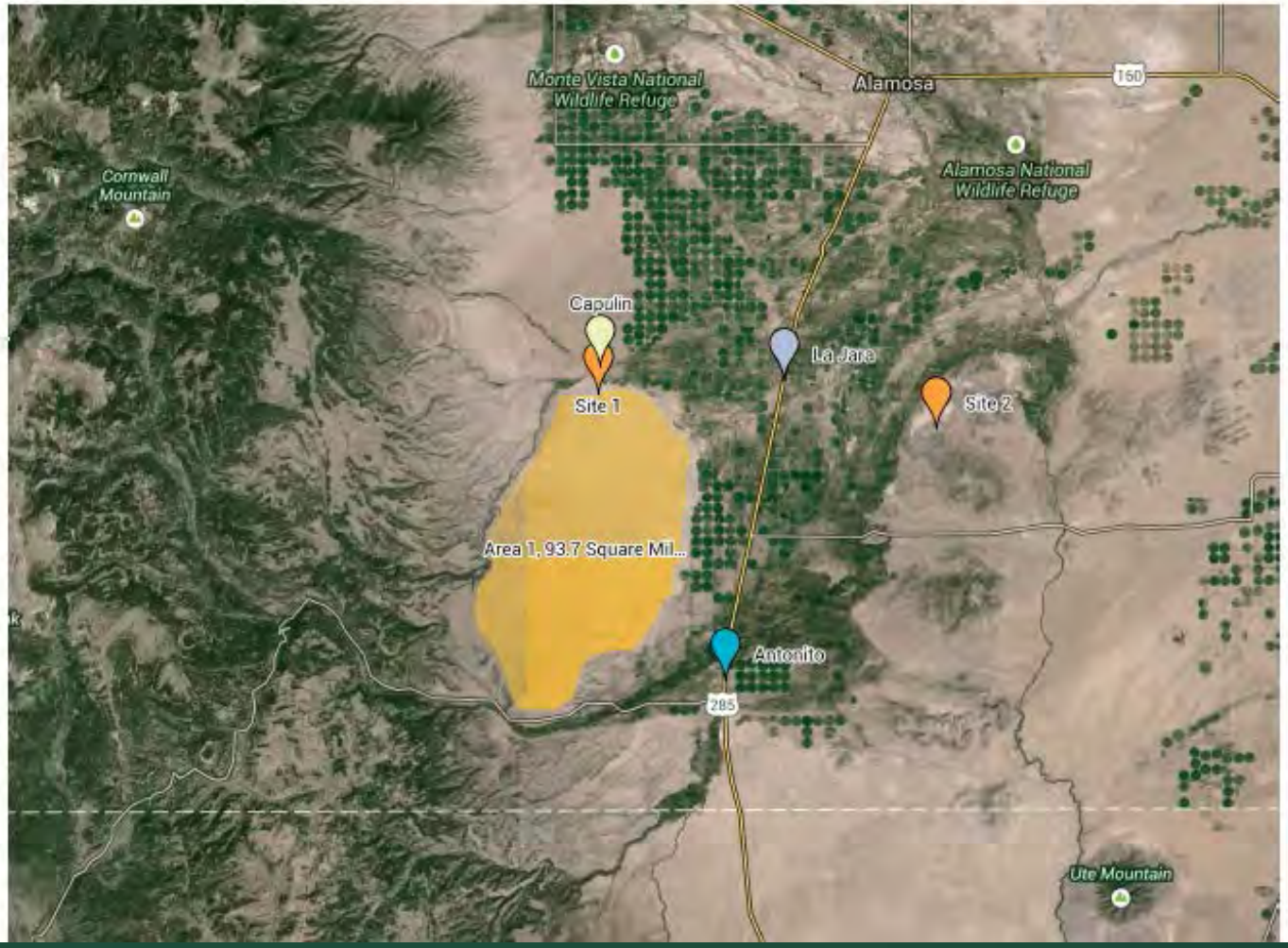
Illegal Dumpsites

Area Map

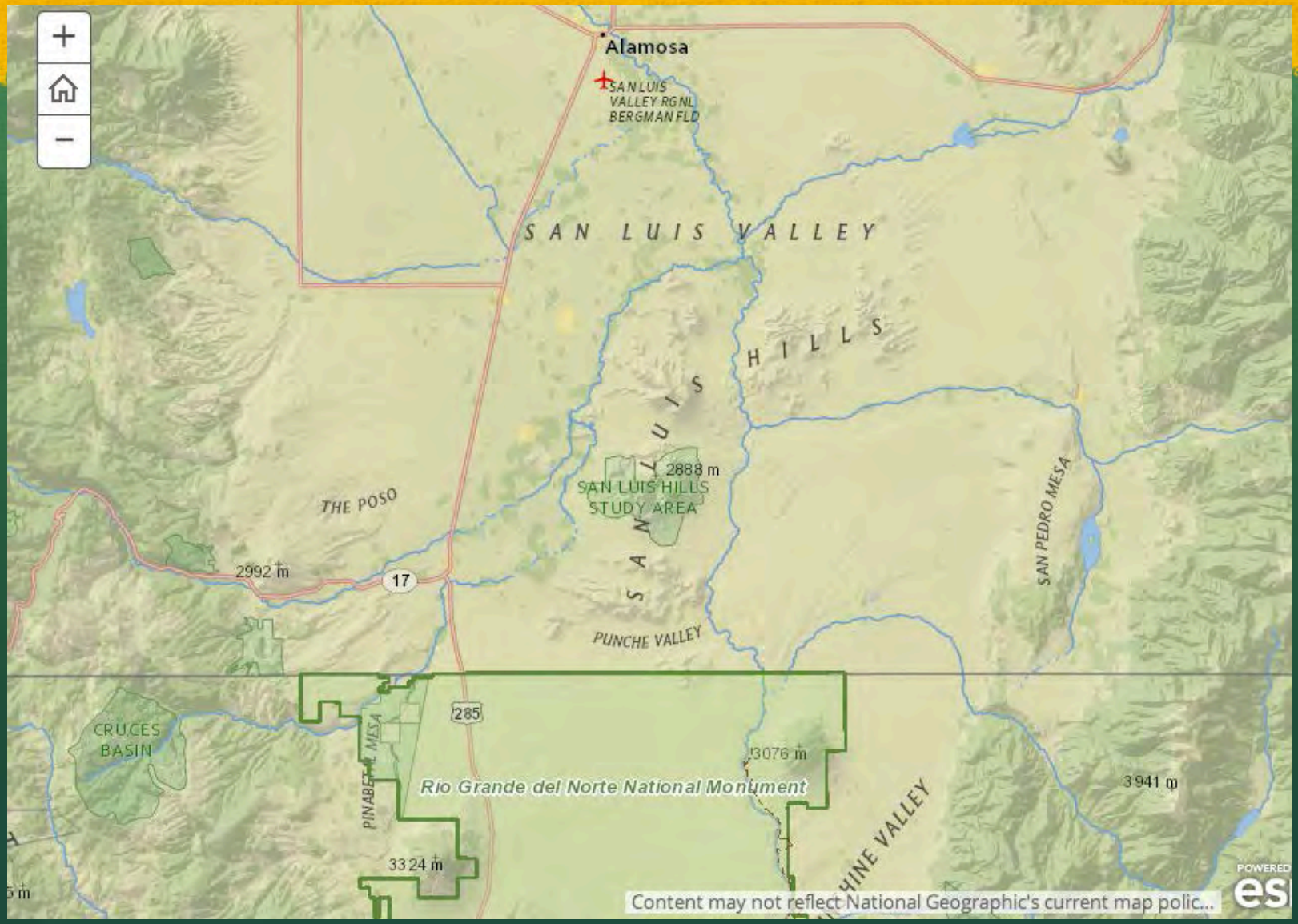
BLM Solar/Illegal Dumpsite

BLM Solar/Illegal Dump

- Antonito
- Area 1, 93.7 Square Miles
- Capulin
- La Jara
- Site 1
- Site 2



Proposed National Monument



Proposed Mitigations

- Use incentives to motivate energy-related companies to hire local staff and construction workers. Encourage companies to prioritize hiring workers in local families who live in the towns of Romeo and Antonito rather than importing workers who live in "man-camps." - Social
- Schedule energy construction work to avoid planting and harvest seasons to expand opportunities for local workers. - Social

Proposed Mitigations

- Cautious phasing of any solar development on SLV BLM lands, which would promote long-term, locally based jobs in Conejos County. CCCW recommends that BLM lands be developed over a period of 10-20 years. - Social
- that BLM and DOE prohibit a loss of remaining soil structure by using advanced soil mitigation techniques including carbon-capture mechanisms. - Natural

Proposed Mitigations

- prohibit typical over-lot grading (100% soil disturbance) and promote conservation of intact patches, stabilizing disturbances immediately, and conserving and reusing all topsoil materials immediately. –Natural
- Quantify the impact of the future use of converted M & I water rights, especially where technological changes will occur that render these utility scale solar facilities obsolete. -Social

Proposed Mitigations

- Develop conservation guidelines that include native buffer strips and shrub windrows. It's important to maintain native vegetation along solar-panel drip lines.
- Ensure that all renewable energy development in Conejos County:
  - does not put at risk our critically important aquifer, wetlands and other water sources that support migratory waterfowl, diverse ecosystems, historical and vital water-intensive agricultural uses;
  - does not in particular deplete the extensive but fragile aquifers that support these values, which CCCW and the citizens of the SLV have worked long and hard to protect.

Proposed Mitigations

- Develop a conservation design to promote continuous wildlife movement across SEZs, maintain pods of conservation habitat within solar facilities, and evaluate impacts of high-flying waterfowl mistaking solar facilities as water bodies, along with a mitigation plan if impacts are identified. – Natural
- Acknowledge the area is part of a Mexican Land Grant: Los Conejos. – Social
- Assure that all development is done with respect to natural history and cultural values by performing complete cultural surveys and ethnographic studies of the SEZs, including utilizing local cultural authors and artists. - Social

Proposed Mitigations

Developers must fund DG projects that would generate abundant power in smaller increments (less than 20MW)), and sites that are already disturbed, as well as BLM lands. Also, please include smaller sites owned by towns, Conejos County, and school districts that can help reduce electrical costs. Sites identified in Conejos County during a Colorado Renewable Energy Society Workshop in Monte Vista, Colorado November 2011 have been submitted to BLM.

Proposed Mitigations

- BLM study the patterns of wind, sand and dust deposits in Conejos County and access the negative impacts that large-scale development would impose on the agrarian community. –Natural
- CCCW supplied data from baseline air study for radionuclides and PM10. We did not have an occurrence over 150ug/ml during the project.
- Monitor associated public health metrics with regard to the impact on asthma and other respiratory diseases in Conejos County. - Built

Thank You

www.cccwater.org

www.slvec.org

Twitter @Conejoswater

Also visit us on Facebook

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BLM Candidate Solar Energy Zone Regional Mitigation Sites Cultural Focus

- **Brian Fredericks-Archeologist**
- **Joe Vieira-Project Manager**
- **Bureau of Land Management**
- **San Luis Valley Field Office**

- **May 13, 2015**

- Overview 3 of 17 sites
  - Fourmile Traditional Cultural Landscape
  - West Fork Old Spanish Trail
  - Hispano Cultural Landscapes

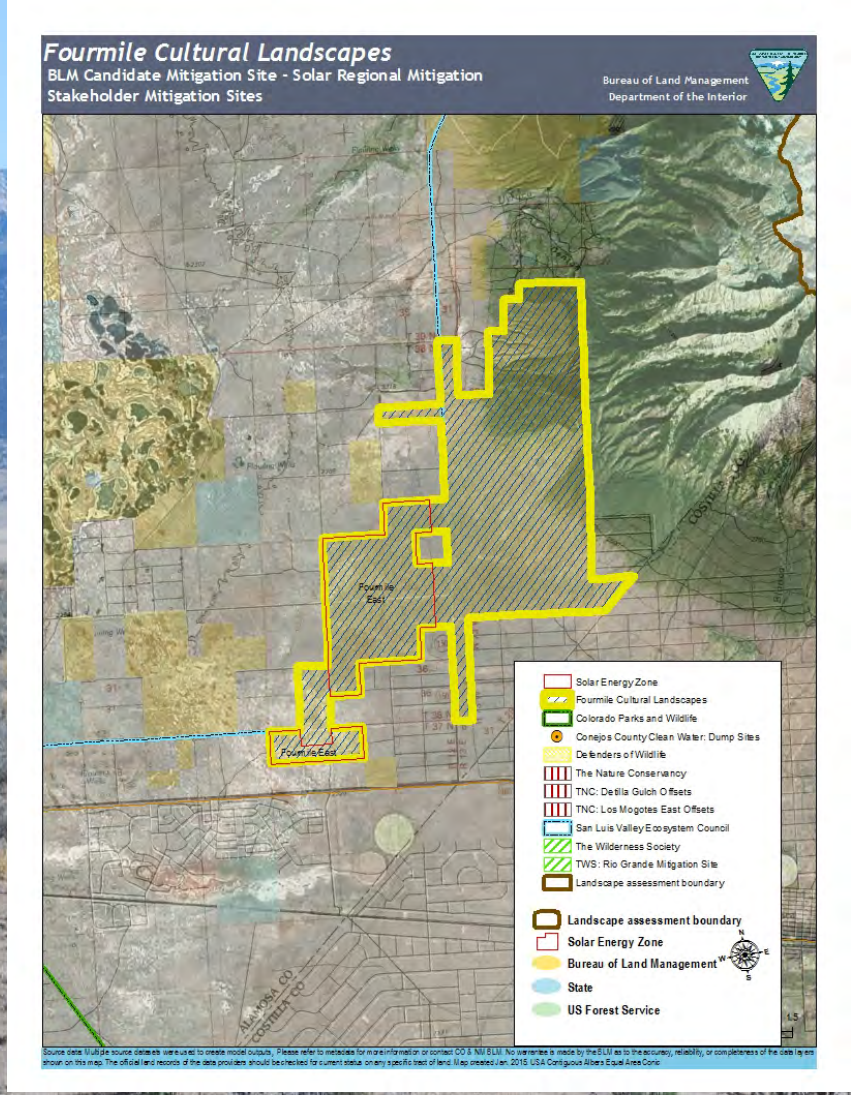
- Cultural resource focus
- Remainder overviewed May 14

Fourmile

Traditional Cultural Landscape

SEZ Regional Mitigation Site

Site Location –
Fourmile Traditional Cultural Landscape



Site Description - Fourmile Traditional Cultural Landscape

- The *Fourmile Traditional Cultural Landscape* mitigation site includes nationally significant cultural values characterized by human occupation among the most ancient documented in North America. Cultural values precede Spanish settlement by 1,000's of years continuing through settlement of the overlapping Mexican era Land Grants from the 1830's to 1860's

- The area also includes desert shrub-grassland habitat adjacent to the Great Sand Dunes NP and supports pronghorn, elk, and mule deer herds , Gunnison's Prairie Dog similar to DeTilla Gulch, Antonito, and Los Mogotes SEZ's,, as well as Burrowing Owl & Mountain Plover habitat, migrating shorebird-water bird flyways, and occupied Golden Eagle habitat residually impacted by SEZ development

Site Description

- **Fourmile Traditional Cultural Landscape site includes desert shrub-grassland similar to De Tilla Gulch SEZ**
  - High-low landscape condition in REA assessment model
  - 2-20 miles to DeTilla SEZ

- **Candidate Mitigation Site Extent: ~**10,9735 total acres
  - All BLM

- **Residual Impacts Offset and/or Resources Protected**:
  - E. Fork Old Spanish Trail
  - Pronghorn corridor
  - Visuals,
  - Los Caminos Antiguos Scenic Highway

Proposed Mitigation Actions (Measures)

- **Change RMP land use allocation and identify solar exclusion to Fourmile SEZ under plan amendment in response to cultural information gained in BLM ethnography study (2013).**
- **Establish cultural and ecological mitigation bank(s)**
- **Enhance Old Spanish Trail East Fork NHT**
- **Conduct piñon-juniper edge thinning operations to rectify adverse visual effects of historic chaining on Blanca slopes**

Site Scoring Criteria

- ***Effectiveness-Additionality –***
  - Highest cultural landscape protection goal achievement among sites - Additive and consistent with BLM Healthy Lands Focal Area;

- ***Feasibility-***
  - Ethnographic documentation recent and direct;
  - Potential DOI-BLM input on RMP Revision reallocation & other resources warranting mitigation;

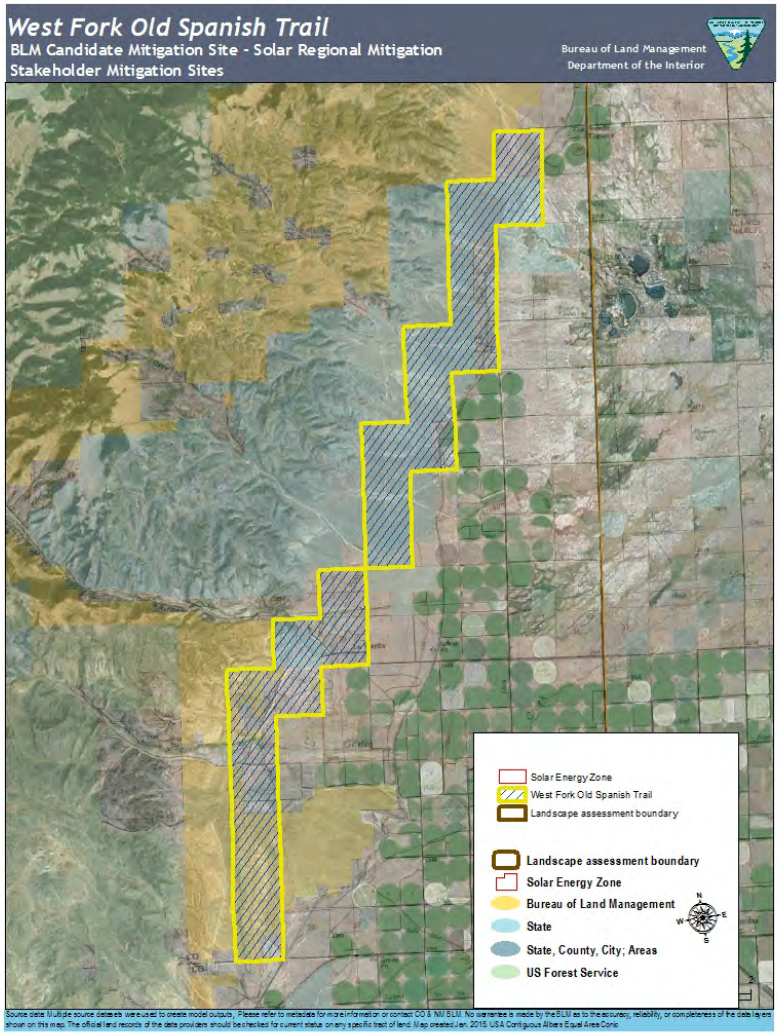
- ***Durability***
  - Long-lasting cultural resource protection benefit

- ***Risk***
  - DOI-BLM prioritization of SEZ solar exclusion in all SLV RMP revision NEPA alternatives
  - Surrounding land uses are varied; NPS GSDNP, FWS refuges, BLACEC wetlands, promote potential mitgation success.
  - Transmission corridors & WUI housing development represent higgest mitigation success risk

West Fork Old Spanish Trail

SEZ Regional Mitigation Site

Site Location –
West Fork Old Spanish Trail



Site Description - West Fork Old Spanish Trail

- The *West Fork Old Spanish Trail* mitigation site includes significant cultural values characterized by human occupation among the most ancient documented in North America. Cultural values precede Spanish settlement by 1,000's of years continuing through settlement of the overlapping Mexican era Land Grants from the 1830's to 1860's as well as travel route to frontier California

- The area also includes desert shrub-grassland habitat supports pronghorn, elk, and mule deer herds , Gunnison's Prairie Dog similar to DeTilla Gulch, Antonito, and Los Mogotes SEZ's,, as well as Burrowing Owl & Mountain Plover habitat, migrating shorebird-water bird flyways, and occupied Golden Eagle habitat residually impacted by SEZ development

Proposed Goals - Objectives

- See Draft BLM Goals & Objectives Handout for Goals 1-4, 7-9

Proposed Mitigation Actions (Measures)

- **Identify record and evaluate section of the W. Fork OST and establish cultural and ecological mitigation bank(s),**
- **Establish wildlife forage bank;**
- **Install wildlife friendly fence at or Remove fencing or Install wildlife friendly fence**
- **Develop wildlife water enhancements (i.e. stock tanks, spring enhancements)**
- **Promote ground water recharge and protection (purchase water rights, manage disturbance in recharge areas)**

Site Scoring Criteria

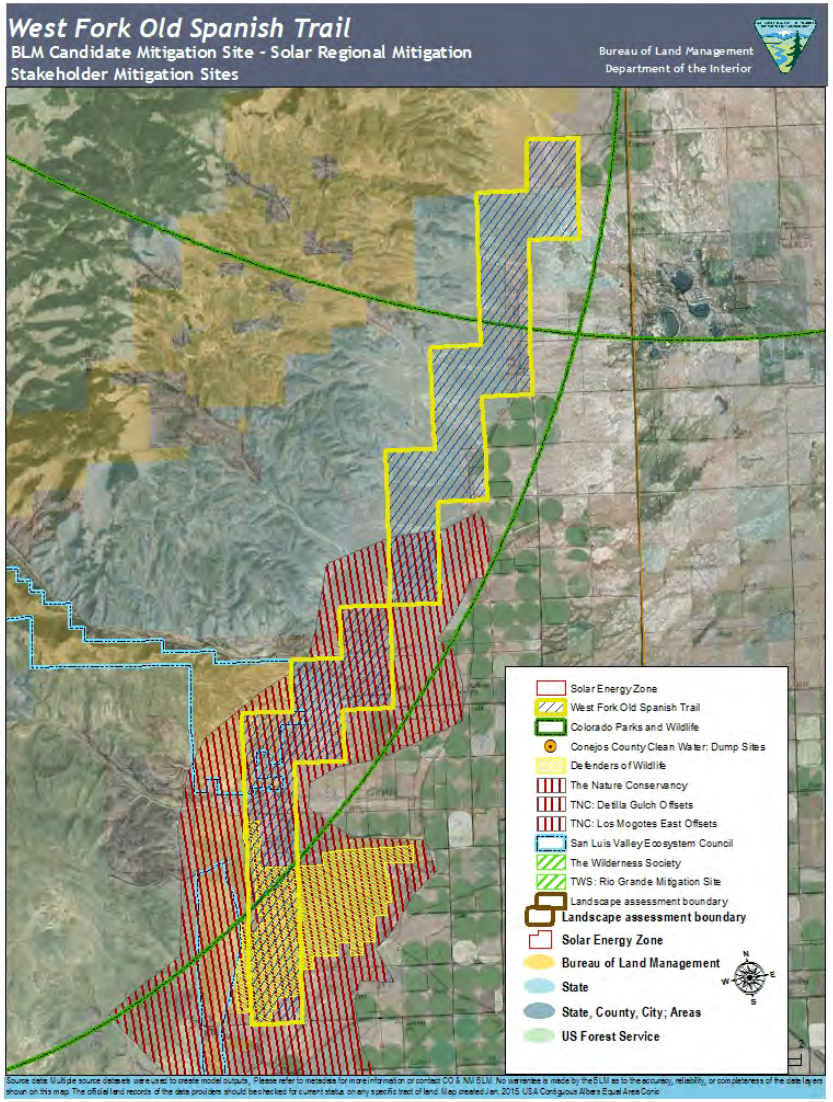
- ***Effectiveness-Additionality*** –
  - High cultural landscape protection goal in terms of national historic trails
  - Additional wildlife habitat enhancements

- ***Feasibility-***
  - Some challenge based on uncertainty in State priority and future stewardship agreement status between BLM, State Land Board and National Park Service.

- ***Durability***
  - Long-lasting cultural resource protection benefit

- ***Risk***
  - Priorities and Procedural constraints with State Land Board,
  - Effective level of grazing management,
  - Degraded visibility of the West Fork OST could be difficult to locate and evaluate

Overlapping Stakeholder Site Locations
West Fork Old Spanish Trail

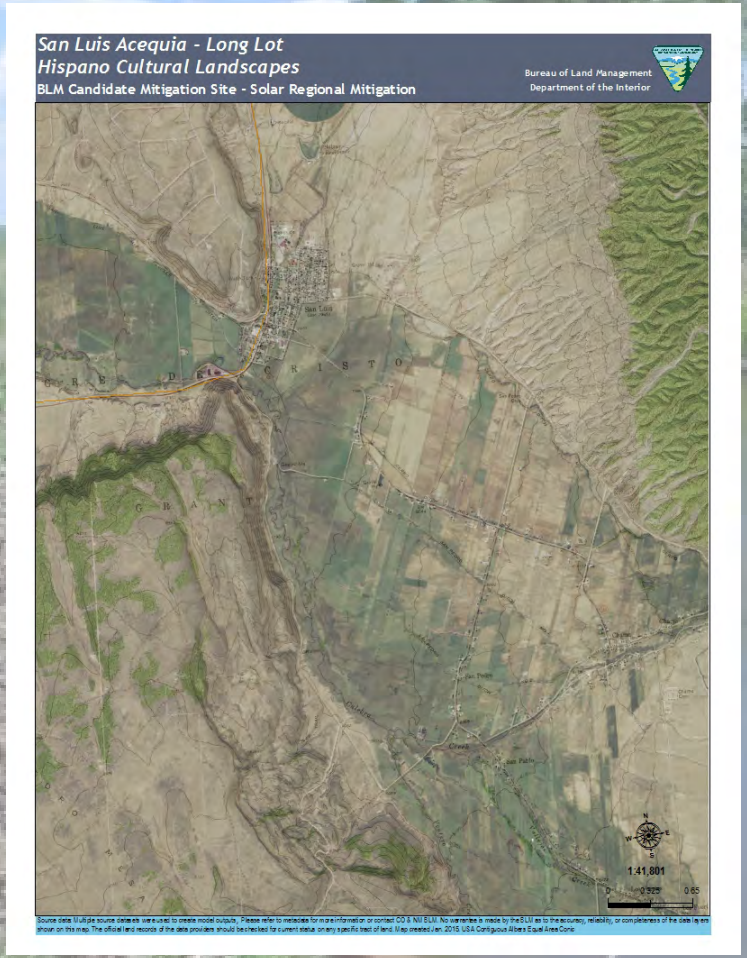


Hispano Cultural Landscapes

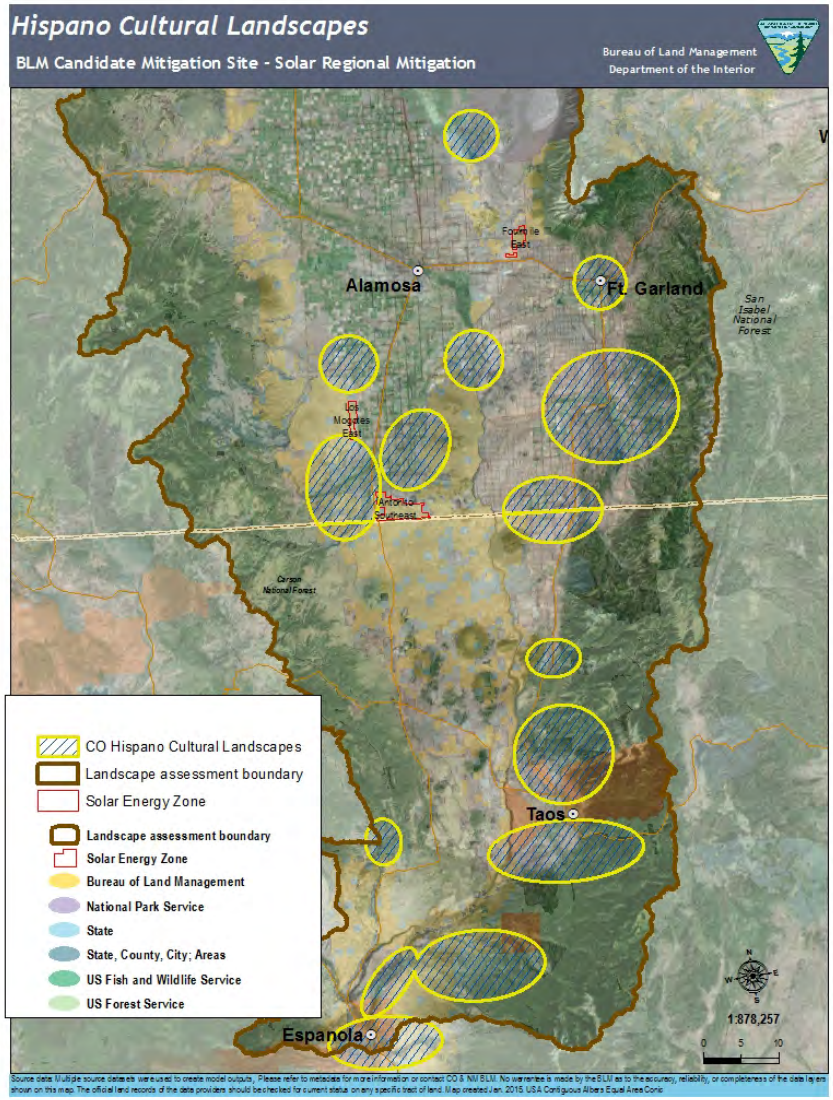
SEZ Regional Mitigation Site

Colorado Landscape Assessment/Solar Regional Mitigation Project

Hispano Acequia-Long Lot
Historic Agricultural Landscape Signature



Site Location – Hispano Cultural Landscapes



Site Description - Hispano Cultural Landscapes

- ***Hispano Cultural Landscapes*** have been described by A.Valdez (2014) and encompass areas in the *Sangre de Cristo* and *Northern Rio Grande* National Heritage Areas where there is high likelihood of historic Spanish and Mexican era *acequia*-long lot systems.

- Hispano acequia-long lot systems are living historical features that characterize community land grant, terrain, water use, and subsistence agriculture as adapted by hispano settlers to the study area landscape beginning in the 18th century extending to 1830's and 1860's.

Site Description

- Hispano Cultural Landscape mitigation sites includes areas from Alamosa to Taos county within two national heritage areass where un-mapped acequia long lot systems likely occur

- Candidate Mitigation Site Extent: variable

- Residual Impacts offset and/or Resources Protected:
  - Land grant era cultural landscapes
  - E. & W Fork Old Spanish Trail,
  - Pronghorn, Big Game Migration Corridor, Connectivity, Visual, SS, Raptor, Mtn Plover, Swift Fox, Shorebirds, Waterbirds

Proposed Goals - Objectives

- See Draft BLM Goals & Objectives Handout for Goals 1-3, 7-9

Proposed Mitigation Actions (Measures)

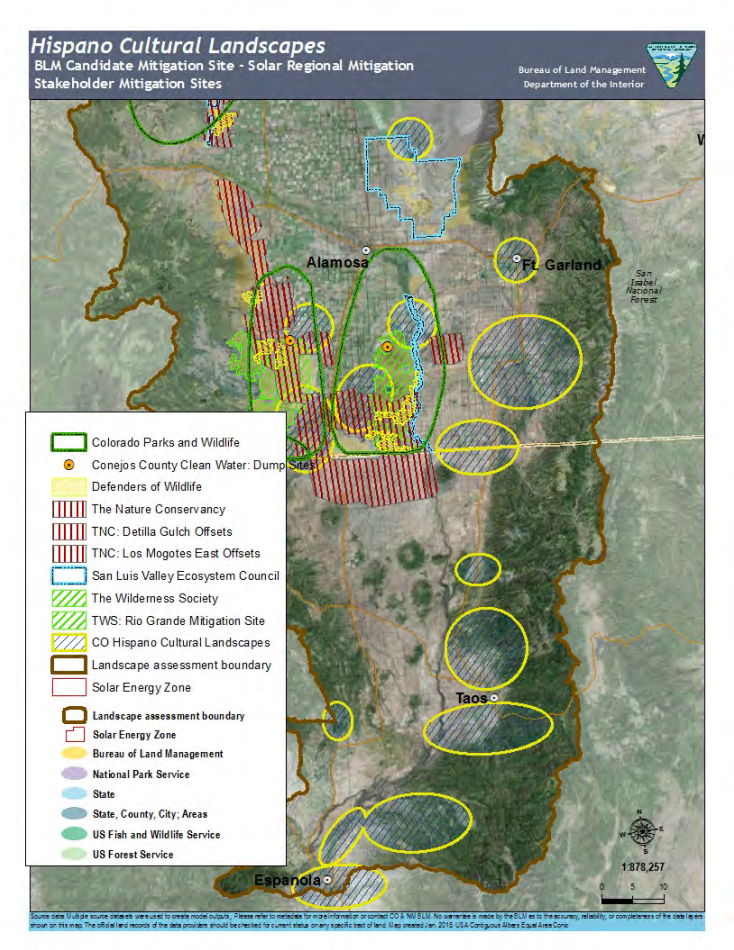
- Measure 1.
  - Establishment of 3rd-party administered cultural heritage area compensation fund
- Measure 2.
  - Map and document Spanish & Mexican era land grant hispano settlement era acequia-long lot agricultural heritage areas in the Sangre de Cristo & Northern Rio Grande NHA areas

Site Scoring Criteria

- ***Effectiveness-Additionality*** –
  - Augments and expands *hispano* cultrual landscape characterization and regional research in National Heritage Area
  - Culural resource documentation could expand national understanding of Spanish and Mexican era hispano settlement patterns in two NHA's
  - Mitgation site and action responds to special designated area and NHA cultural heritage values, but not necessarily ecosystem intactness or species conservation goals

- ***Feasibility-***
  - Established methodology - See Library of Congress documentation of NM acequia-long lot systems for La Cienega NM (A.Valdez, 2013

- ***Durability***
  - Assuming academic and student involvement, long-term & permanent knowledge base development
  - Very high conservation outcomes assuming riverine corrdidor protections

- ***Risk***
  - Uncertain SHPO, NPS, NHA & academic support and engagement

Overlapping Stakeholder Site Locations
Hispano Cultural Landscapes