

# Impacts of Utility-Scale Solar Development on Cultural Resources

Konnie Wescott  
Environmental Science Division  
Argonne National Laboratory

wescott@anl.gov  
630-252-5789

February 21, 2013



# Cultural Resources

- Cultural resources include:
  - Archaeological sites (prehistoric and historic)
  - Historic structures
  - Features (e.g., trails, modified waterways)
  - Objects
  - Traditional cultural properties
- Significant cultural resources are listed or are eligible for listing in the *National Register of Historic Places*
  - These are termed **historic properties** and are the resources of concern under the National Historic Preservation Act



# Native American Concerns

- Native American concerns generally include:
  - Sacred and traditional sites, including burials, rock art, and natural features
  - Sacred landscapes and trail systems
  - Traditional plant and animal species and their habitat
  - Water use and quality
  - Economics (jobs, services, training/education)



# Cultural Resources: Common Impacts

- Complete destruction of historic properties due to:
  - Clearing, grading, and excavation of the project area
  - Construction of facilities and associated infrastructure, if properties are located within the footprint of the construction area
- Degradation and/or destruction of historic properties located downslope or downstream due to:
  - Alteration of topography or hydrologic patterns
  - Removal or erosion of soils
  - Runoff into and sedimentation of adjacent areas
  - Oil or other contaminant spills
  - Note: the accumulation of soils or sediment at a site could increase the protective cover of some downstream sites



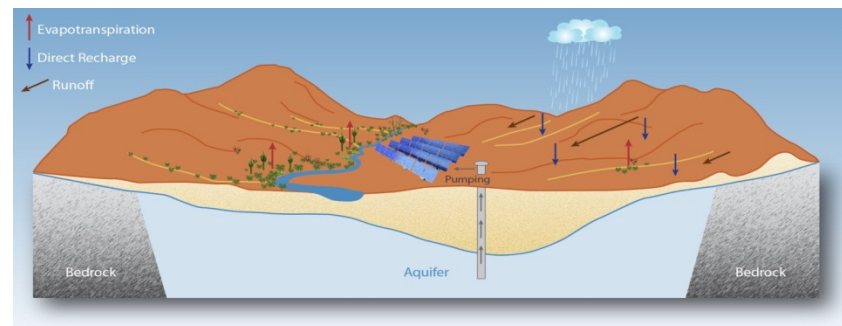
# Cultural Resources: Common Impacts (cont.)

- Increases in human access and subsequent disturbance (e.g., looting, vandalism, and trampling) of cultural resources could result from:
  - Establishment of corridors or facilities in otherwise intact and inaccessible areas
  - Increased human access (including OHV use) exposes archaeological sites and historic structures and features to greater probability of impact from a variety of stressors
- Visual degradation of settings associated with significant cultural resources could result from the presence of a utility-scale solar energy development and associated land disturbances and ancillary facilities
  - This could affect significant cultural resources for which visual integrity is a component of sites' significance, such as sacred sites and landscapes, historic structures, trails, and historic landscapes



# Cultural Resources: Technology-Specific Impacts

- Differences in land requirements among the technologies does not necessarily correspond to differences in magnitude of impacts; impacts are typically location- and resource-dependent
- Differences in water requirements (i.e., water use and discharge) among the technologies are not likely to be a factor in determining levels of impact of surface runoff on cultural resources. However, depending on the source of water for solar technologies using cooling towers or steam generators, drawdown of surface water levels could increase the potential for erosion or land subsidence in some locales



# Cultural Resources: Technology-Specific Impacts (cont.)

- Visual impacts are an exception (such as on trails, traditional cultural properties, and cultural landscapes) due to:
  - Heights of the different technologies
  - Expanse of the acreage required
  - Glare potential of the technology



# Native American Concerns: Common Impacts

- Many of the common impacts are similar to those described for cultural resources, but would also apply to:
  - Impacts on habitat for culturally important plants and animals
  - Sacred sites not identified formally as traditional cultural properties
  - Water and mineral sources
  - Burials
- Modifications of natural flow systems, including effects on floodplains, wetlands, and riparian areas and possible degradation of surface water quality could occur as a result of:
  - Construction activities
  - Water withdrawals
- Noise degradation of settings associated with significant cultural resources and sacred landscapes also could result from:
  - Presence of a utility-scale solar energy development
  - Associated land disturbances and ancillary facilities
  - This could affect the pristine nature and peacefulness of a culturally significant location



# Native American Concerns: Technology-Specific Impacts

- Same as for cultural resources regarding land requirements and visual impact differences
- Differences in water requirements for various solar technologies could be a factor as water use, quality, and availability are important issues of Native American concern. For example, reduction of spring flows would be of concern.

# Status of Tribal Consultation Activities for the Solar PEIS

- BLM initiated government-to-government consultation early in the Solar PEIS process, which began in 2008
  - 316 Tribes, Bands, and Chapters contacted
  - 65 Tribes or tribal organizations actively participated in the consultation process
  - Forms of consultation included letters, follow-up phone calls, meetings, and e-mails, as well as through the comment/response process for the PEIS
  - Consultation is ongoing as the BLM begins to implement their Solar Energy Program
- Additional activities related to the PEIS are currently being implemented and consultation is continuing:
  - Regional mitigation planning
  - Long-term monitoring

# Ethnographic Analyses

- For the Solar PEIS, the BLM contracted the SWCA Environmental Consultants and the Bureau of Applied Research in Anthropology at the University of Arizona to conduct an ethnographic analysis with Tribes known to attach religious or cultural significance to historic properties that could be affected by solar energy development.
  - The Tribes that participated were the Confederated Tribes of the Goshute Reservation, the Duckwater Shoshone Tribe, the Moapa Band of Paiute Indians, the Pahrump Paiute Tribe, the Paiute Indian Tribe of Utah, and the Timbisha Shoshone Tribe
  - Nine American Indian Study Areas were visited with Tribal members (Amargosa Valley, Delamar Valley, Dry Lake, East Mormon Mountain, Escalante Valley, Gold Point, Milford Flats South, Millers and Wah Wah Valley)
  - Concerns brought up in the ethnographic analyses included sacred trails and landscapes (including several areas that Tribal members would like to see nominated as TCPs), volcanic and geologic features, prehistoric and historic archaeological sites, trail systems, water sources, and traditional plant and animal species
  - Available at <http://solareis.anl.gov/documents/ethnographic/index.cfm>

# Recommended Data Collection Efforts to Facilitate Development

- Conduct Class I literature file search
- Conduct Class II stratified random sample survey to obtain a 10% sample of the proposed development area
- Prepare a cultural sensitivity map
- Continue with Government-to-Government consultations and consider utility of conducting new ethnographic studies

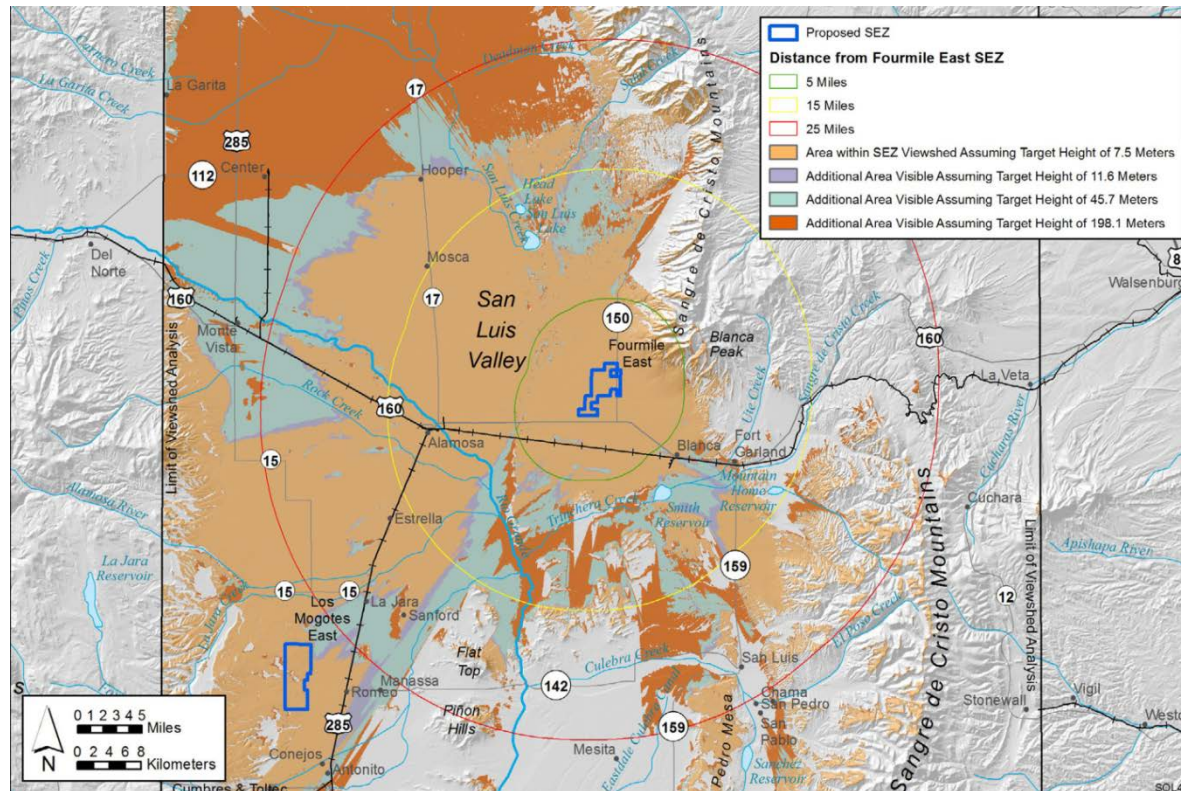
# Cultural Resources of Concern: Case Study Colorado – San Luis Valley



# Possible Range of Impacts on Cultural Resources in Southern Colorado

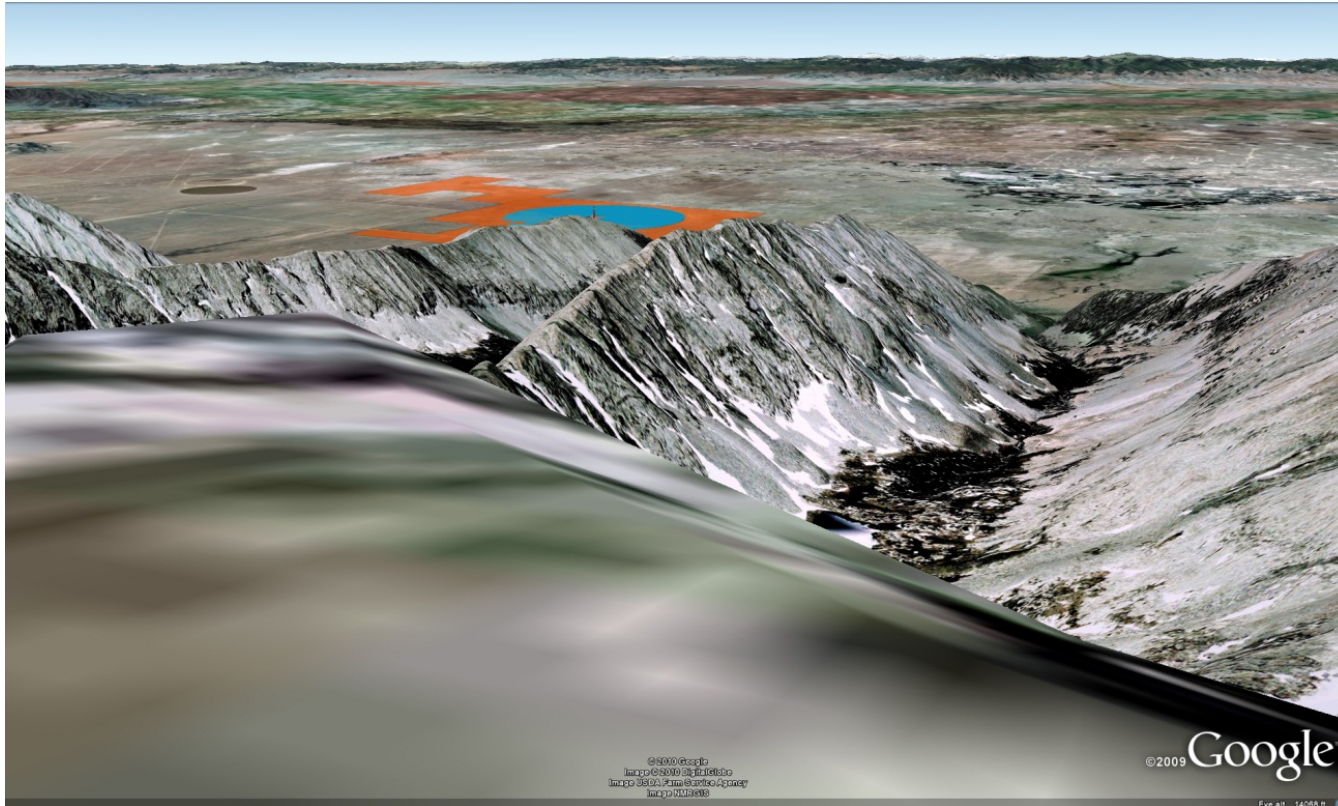
- Direct Impacts of Construction on Historic Properties
  - Trail systems
  - Former railroad corridors
  - Archaeological sites
  - Man made water/irrigation features
  - Possible Native American burials
- Direct Visual and Aural Impacts on
  - National Historic Trail (Old Spanish Trail)
  - Properties listed in the *National Register of Historic Places*
  - Places of traditional cultural importance (Blanca Peak, Great Sand Dunes)
  - Areas of Critical Environmental Concern
  - Sangre de Cristo National Heritage Area
  - Los Caminos Antiguos Scenic and Historic Byway
- Indirect Impacts from
  - Erosion
  - Looting/vandalism

# Use of Viewshed Analyses to Assess Extent of Possible Visual Impacts on Cultural Resources



Viewshed Analyses for the Proposed Fourmile East SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

# Use of Google Earth Visualizations to Assess Possible Visual Impacts on Cultural Resources

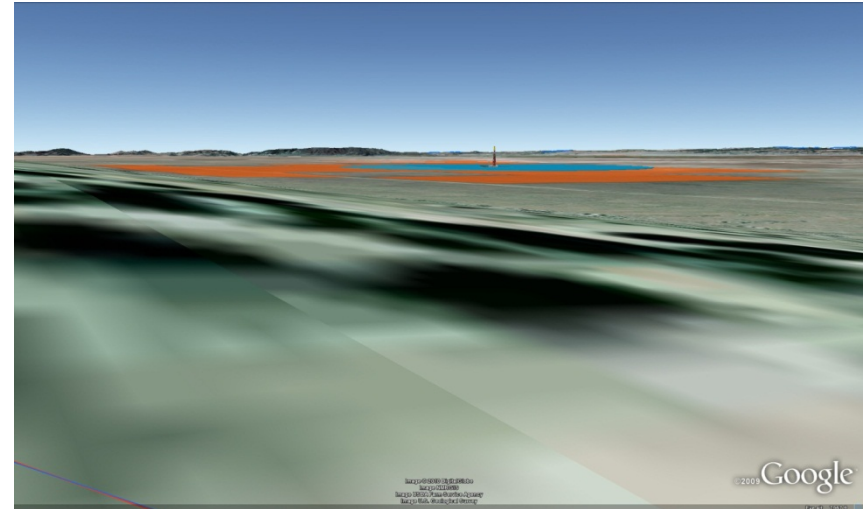
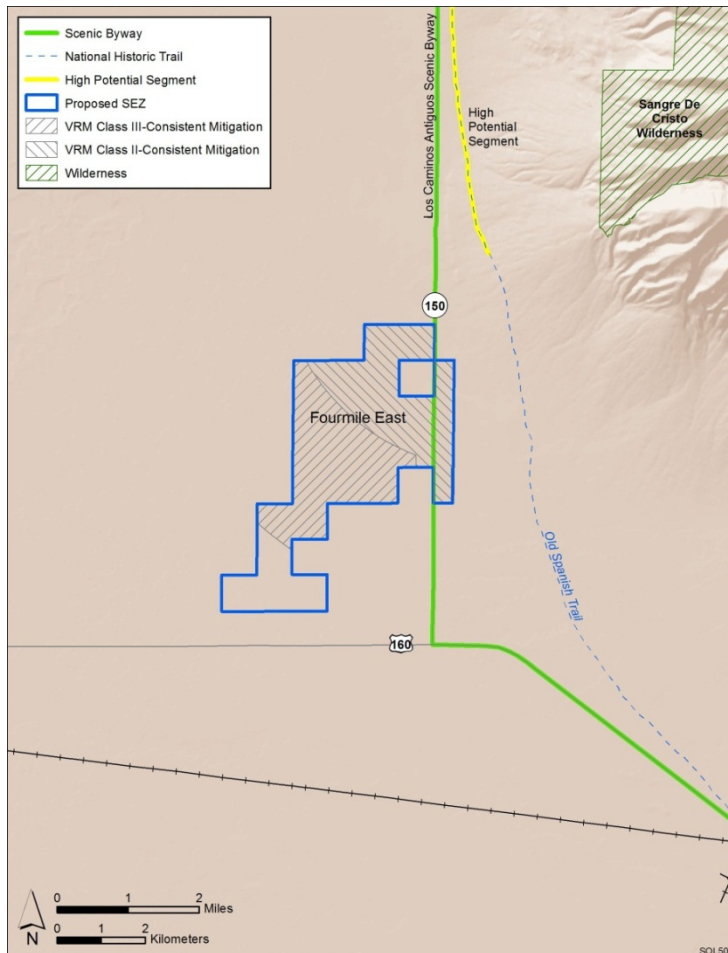


Google Earth Visualization of the Proposed Fourmile East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Ellingwood Point in the Sangre de Cristo WA

Note: Ellingwood Point is just northwest of Blanca Peak, only difference in view would be that SEZ would be totally visible, landforms would not obstruct



# Assessing Visual Impact on High Potential Segment of the Old Spanish National Historic Trail



Google Earth Visualization of the Proposed Fourmile East SEZ (shown in orange tint) and Surrounding Lands, as Seen from Viewpoint on High-Potential Segment of Old Spanish National Historic Trail

# Mitigation Measures for Cultural Resources

- **Use of previously disturbed lands** is encouraged
- Section 106 consultation should occur **early in the planning process**
- Project developers should:
  - Conduct a records search
  - Develop a survey design
  - **Complete a cultural resources inventory.**
- Phased sampling strategy (Class II) is recommended prior to the selection of individual project locations.
- **Formalized agreement** will be required to address management and mitigation options when historic properties are present or when the area has a high potential to contain significant cultural resources
- Surface disturbance could be restricted or prohibited within the viewshed of a sacred site or within the viewshed of the trail along those portions of the trail for which eligibility is tied to the visual setting

# Mitigation Measures for Cultural Resources (cont.)

- Where there is a probability of encountering cultural resources during construction that could not be fully detected during Class III inventory, cultural field monitors (appropriate for the resource anticipated) should be employed to **monitor ground-disturbing activities**. Development of a monitoring plan is recommended.
- Work should be halted in the vicinity of an **unexpected discovery**
- Use of **management practices**, such as training/education programs for workers and the public, should be implemented **to reduce occurrences of human-related disturbances to nearby cultural sites**.

# Mitigation Measures for Native American Concerns

- **Consult with Native American governments early in the planning process** to identify issues and areas of concern regarding any proposed solar energy project
- Appropriate mitigation steps, such as avoidance, removal, repatriation, or curation, should be determined during this consultation
- The following resources **should be avoided**:
  - Tribal burial sites
  - Springs and other water sources that are, or may be, sacred or culturally important
  - Culturally important plant species
  - Culturally important wildlife species and their habitats
  - Archaeological sites created by ancestral Native American populations
  - Rock art

# Mitigation Measures for Native American Concerns (cont.)

- **Visual intrusion on sacred areas should be avoided**
- **Standard noise design features should be employed** when near sacred sites
- **Health and safety design features for the general public should be employed** when solar facilities are located near Native American traditional use areas in order to minimize potential health and safety impacts on Native Americans
- Prior to construction, **training should be provided to contractor personnel** whose activities or responsibilities during construction could affect resources of significance to Native Americans