Argonne uses digital tools to preserve Southwestern cultural heritage

August 3 2017, by Steve Koppes

In 2016, Argonne conducted a cultural assessment stemming from a Solar Energy Programmatic Environmental Impact Statement (Solar PEIS) covering six Southwestern states that Argonne's Environmental Sciences Division. One of the first studies to portray how Spanish and Mexican settlers of the area related to the land before the U.S. government assumed jurisdiction. Argonne's charge was to determine which public lands within those states would be technically and environmentally suitable for solar energy development. Credit: K. Wescott/Argonne National Laboratory

Hollywood's Indiana Jones gained fame for wielding his pistol and bullwhip, but researchers at the U.S. Department of Energy's (DOE) Argonne National Laboratory prefer to equip themselves with something far more sophisticated: Geographic Information Systems (GIS) analysis.

Instead of conducting their investigations snake pit by snake pit, temple by temple, cavern by cavern, these archaeologists and their colleagues aggregated their GIS data by grids of one square kilometer (nearly four-tenths of a square mile) of a study area that encompasses 9,786 square miles of the San Luis Valley-Taos Plateau area of southern Colorado and northern New Mexico. The grids are packed with data pertaining to the presence of sites and landmarks that are archaeologically, historically, culturally and scenically important, and the potential threats to and opportunities for their future.

These findings are documented in the cultural heritage values and risk assessment report for the study area that Argonne completed last year for the Bureau of Land Management (BLM). The multi-faceted study is one of the first to portray how Spanish and Mexican settlers of the area, the recipients of land grants from their governments, related to the land before the U.S. government assumed jurisdiction.

"It's getting away from the project-specific, site-specific types of analysis into this broader landscape to look more at patterns and distribution of the archaeological sites and the cultural significance areas," said Konnie Wescott, who heads Argonne's Natural and Sociocultural Systems Department. "That larger landscape perspective is what really makes this different from a lot of activities that we as archaeologists tend to do."

The cultural assessment was a pilot project that stemmed from a Solar Energy Programmatic Environmental Impact Statement (Solar PEIS) covering six Southwestern states that Argonne's Environmental Sciences

Division had completed for BLM in 2012. Argonne's charge was to determine which public lands within those states would be technically and environmentally suitable for solar energy development. In addition, during that time the BLM was conducting Rapid Ecoregional Assessments (REAs) across the West to evaluate the condition and trends of the natural environment.

The Solar PEIS resulted in the designation of four solar energy zones in the San Luis Valley, and strategies for mitigating the environmental impact of any utility-scale solar energy development that may ensue. Largely unaddressed, however, was the potential cultural impact of such development.

"All those things that drive change in the natural environment—human development, fire, invasive species and climate change—they affect the cultural environment as well," noted Wescott, the cultural assessment's lead author. That's why she and her colleagues designed their pilot project to see if the REA framework for assessing ecological resources that had already been implemented elsewhere in the West could be applied to a cultural environment.

"Quite frankly, it worked pretty well," Wescott said.

Participants in the project included the BLM, the U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, Native American tribes and representatives from the National Heritage Areas for descendants of the Hispano community that had migrated into the area from Mexico.

"We talked with all these groups to figure out what in the area was important to them and their stakeholders," said Emily Zvolanek, a GIS senior analyst at Argonne and co-author of the report.

The Native American tribes, for example, hold sacred various sites in the San Luis Valley. Tsisnaasjini' (or Blanca Peak) in Colorado's Sangre de Cristo Mountains, is the eastern sacred mountain of the Navajo.

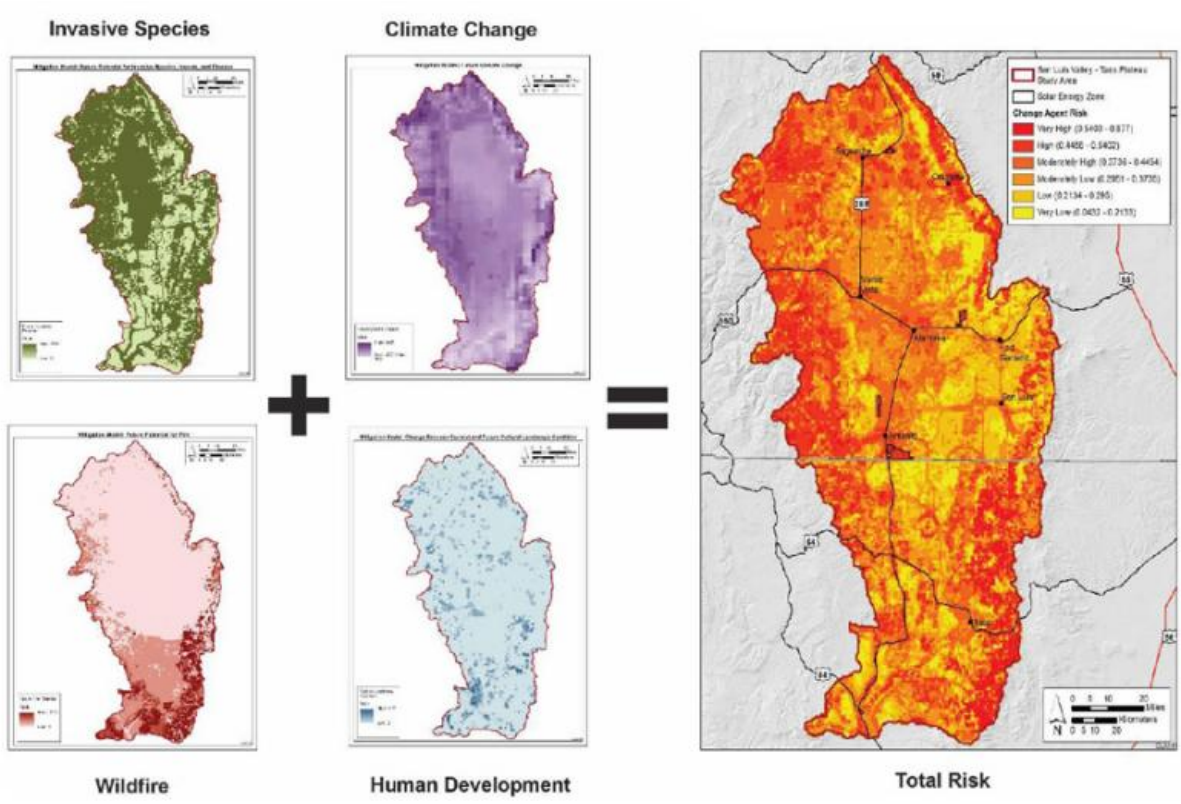
Members of the Hispano community have also established their own distinctive lifeways in the area.

"They have their very own culture that doesn't really exist anywhere else," Zvolanek said.

An important characteristic of the Hispano community is its practice of long-lot agriculture. Under this system, farms are laid out in long, thin plots so that each one has access to water, crop land and grazing land.

"It's very strategic and it's not practiced in many places anymore," Zvolanek said.

The Old Spanish National Historic Trail that runs through the San Luis Valley on route to Los Angeles includes culturally significant features along its path. Argonne's research team plotted those points of interest on a map, then ran viewsheds of those spots, as well as other places with important views and settings.



This figure shows the areas of greatest potential risk. Argonne researchers calculated risk by modeling the likely future conditions for areas likely to experience climate change, wildfire and the spread of invasive species, as well as the added areas of anticipated future new development. Credit: E. Zvolanek/Argonne National Laboratory

The viewshed analyses take into account the physiography and topography of an area to determine what parts of the valley would be visible from a particular point of interest. This would reveal whether a potential new solar facility or transmission line could be seen from those viewpoints, thus detracting from the area's beauty and cultural significance.

"We identified areas that have what we termed high cultural resource

value," Zvolanek said. "The most important thing is to look at archaeological and historical resources that are unique to these areas. How can we keep them protected?"

Especially helpful to the Argonne team was an ethnographic study completed in 2013 that identified sacred landscapes and traditional cultural properties that could be negatively affected by solar energy development.

Nancy Keohane and Joseph Vieira, both of BLM's Rocky Mountain District Office, were among the federal land managers who contributed to Argonne's cultural assessment. The final report has become a valuable public resource that BLM has shared with the U.S. Fish and Wildlife Service, Colorado Parks and Wildlife and other agencies, said Keohane, a project manager for BLM's Colorado Renewable Energy Team.

"We've had a lot of interest around the state of Colorado in doing more of these assessments," said Keohane, a project manager for BLM's Colorado Renewable Energy Team. "It's really nice to be able to pick up one document and understand that whole landscape."

The project also has helped federal land managers to better appreciate how people have moved through and interacted with the landscape over the centuries and even the millennia, said Vieira, a national monument project manager and a co-author of the final report.

"In renewable energy but also other land uses, these types of studies across the West benefit the peoples who live there now so they have a greater respect and understanding about the peoples who lived there before," he said.

A case in point is the land-grant heritage of the area's Spanish and Mexican settlers.

"It's a heritage that preceded the American era and is the source, unfortunately, of conflict between members of the public and the Hispanic Americans from that area who have felt disenfranchised from their land," Vieira said.

Although the report is publicly available, it does not include the exact locations of lawfully protected archaeological sites. More detailed data that Argonne turned over to BLM is only available to credentialed researchers.

The benefits of the cultural assessment led to a second such study that Argonne is conducting in Utah, another state where the BLM has established solar energy zones.

The southwest Utah study area contains different cultural resources from Colorado and New Mexico, but similar methods still apply. For example, the Hispano community is absent from Utah, but Mormon history and culture loom large. And so does water scarcity, which Utah has in common with Colorado and New Mexico. Water quality and availability affects the cultural environment in multiple ways, Wescott noted.

"Human habitation has always gravitated toward water, so there's always been a strong correlation between water and areas of cultural sensitivity and significance," she said.

Water is a risk factor, as well. A reliable water supply will affect the long-term sustainability of the Hispano culture's long-lot agriculture. And its erosional and flash-flood effects in dry environments also pose a threat to archaeological sites.

"It's a very complex problem," Wescott said.

San Luis Valley-Taos Plateau – did you know?

- Three types of utility-scale solar energy technologies were evaluated for development on public lands in the San Luis Valley-Taos Plateau region of Colorado and New Mexico.
- Photovoltaics are flat, rectangular solar panels, which use semiconducting materials to convert sunlight into electricity. Several photovoltaic-powered plants already operate in the San Luis Valley.
- Concentrating solar power (CSP) plants, such as the world's largest capacity power tower plant in Ivanpah, California, employ thousands of heliostats (tracking mirrors) that concentrate the sun's energy into a receiver that tops a tower standing more than 200 feet high.
- Parabolic solar troughs are also CSP plants that include large arrays collecting and concentrating solar radiation onto receiver tubes that run along the focal lines of the troughs. The concentrated radiation heats synthetic oil circulating through the pipes beforeit gets pumped to a generating station.

Provided by Argonne National Laboratory