

## **CHAPTER 5**

### **RESULTS AND DISCUSSION**

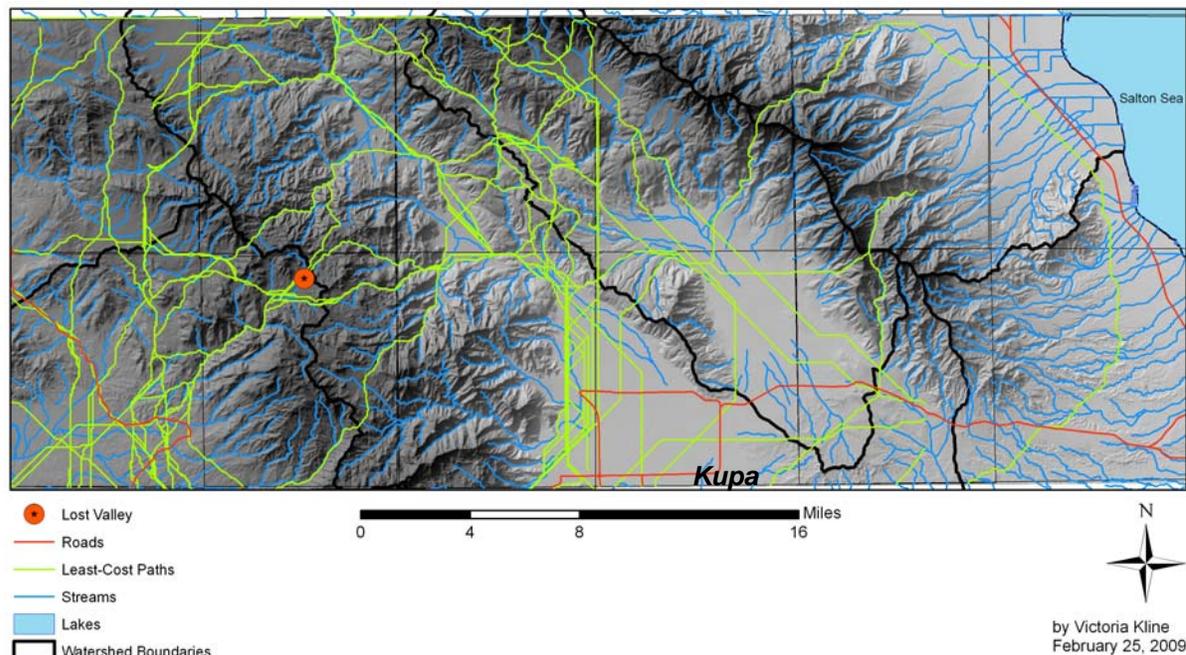
This chapter presents the results and discussion of the methods outlined in the previous chapter. Chapter sections include first the original research questions that were posed in the introduction to this thesis, the project in the context of landscape theory, and the results of the virtual tour. The resulting virtual tour was created from the information derived from one of the paths in the network. That one path was chosen over all of the others because it had (1) overlapping instances of portions of the path where two or more paths traversed the same space, (2) stretches of sufficient length to be of interest, and (3) a segment which crossed through Lost Valley, over the watershed boundary, and into the Anza-Borrego desert. The tour is illustrated in small images with captions and, for certain images, additional narrative.

#### **ORIGINAL RESEARCH QUESTIONS**

1. How is Lost Valley linearly connected to areas to the west and east, within portions of the San Luis Rey and Anza Borrego watersheds?
2. Is Lost Valley situated on a travel network from the Borrego Springs area, which is within the Hot Springs Mountain and Borrego Palm Canyon DEMs, following a least-cost path to sites west of Lost Valley?
3. How does the natural topography of the watershed function in defining travel or trade networks?
4. Is there a relationship between the modeled paths and the archaeological sites that have been documented and recorded?

#### **HOW IS LOST VALLEY CONNECTED?**

The first two questions can be combined. How is Lost Valley connected linearly to the areas west and east, within portions of the San Luis Rey watershed, and the Anza-Borrego watershed? And, is Lost Valley situated on a travel network from the Borrego Springs area that continues on to the west of Lost Valley? Visual inspection of Figure 10 provides a tentative answer. The multiple renderings of least-cost path analyses provided a network of paths that traversed the Cupeño territory and fanned out in every direction. Lost Valley is passed through by more than one least-cost path, but there are not an abundant



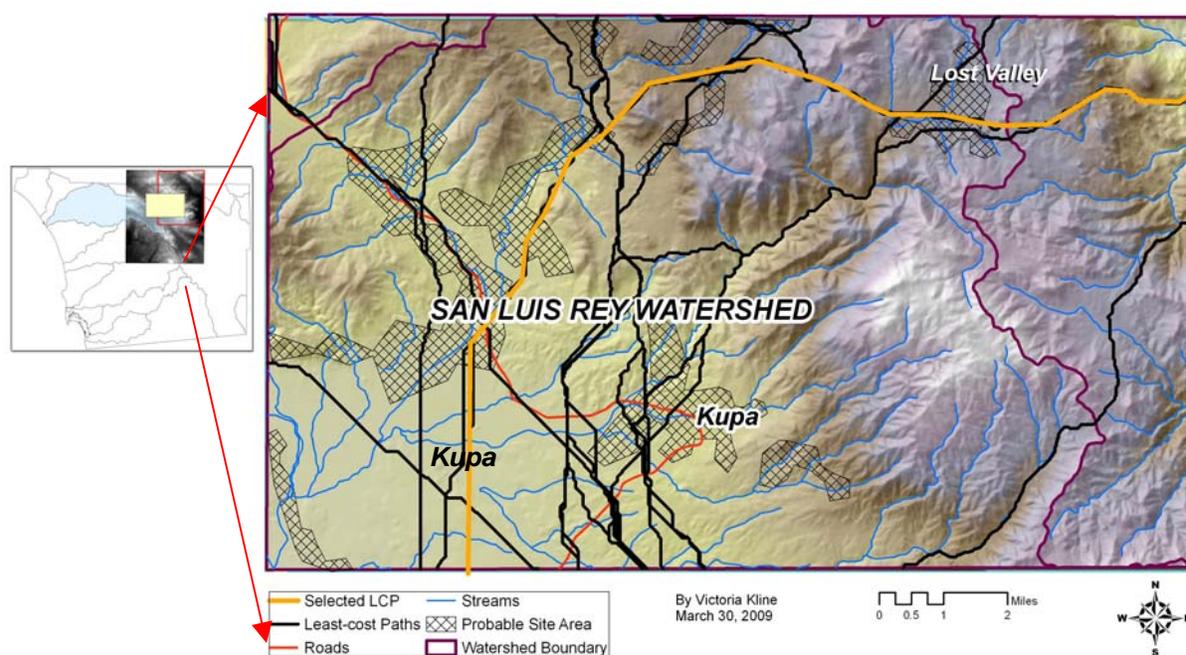
**Figure 10. Least-cost paths covering ten DEMs to show relationship of the path network to Lost Valley.**

number of crossings. The least-cost path analyses produce a virtual path from *Kupa* to Lost Valley without using either location as the start or the end of a path. Many more LCPs cross through the lower elevation and flatter area of the San Jose del Valle, mainly in north-south directions. Logically, the network of trails fans out in wide and flat areas to create a wide swath of paths.

Footpaths (rather than cross country perambulating) are still the preferred conveyance, as it is better to walk where one can see the ground, especially in areas with snakes, not to mention less laborious traveling. An explanation of how a foot trail evolves begins as many feet, hooves, and paws flatten the vegetation, causing the ground to become compacted by constant use. Seeds that sprout are trampled down, and eventually the soil becomes too compacted for new seeds to sprout. Only at the edges of the path are plants able to make their way. The ground becomes scarred by generations of pedestrian travelers. This explanation is supported by the research on urban foot traffic presented in *Nature* by Helbing and colleagues in 1997 (see Chapter 3). Ancient trails are still used by modern day hikers traveling from Lost Valley to the Anza Borrego Desert.

## CONSIDERATION OF THE NATURAL TOPOGRAPHY

In many instances, least-cost paths follow the drainages. For the path chosen for the virtual tour, the least-cost path did not follow the drainage except to parallel the San Luis Rey River at the west end of the path for a distance, then to meet briefly with Agua Caliente Creek in Lost Valley (Figs. 11 and 12). The path does not follow the drainages as it does in the least cost path from Lost Valley to *Kupa* (see Fig. 3). Because of the topography, Lost Valley is semi-difficult to reach from either east or west. There seems to be no north to south entry or exit of the valley according to the least-cost path analyses. To go north or south of Lost Valley requires greater effort than to move to the east or west first, then to the north or south.

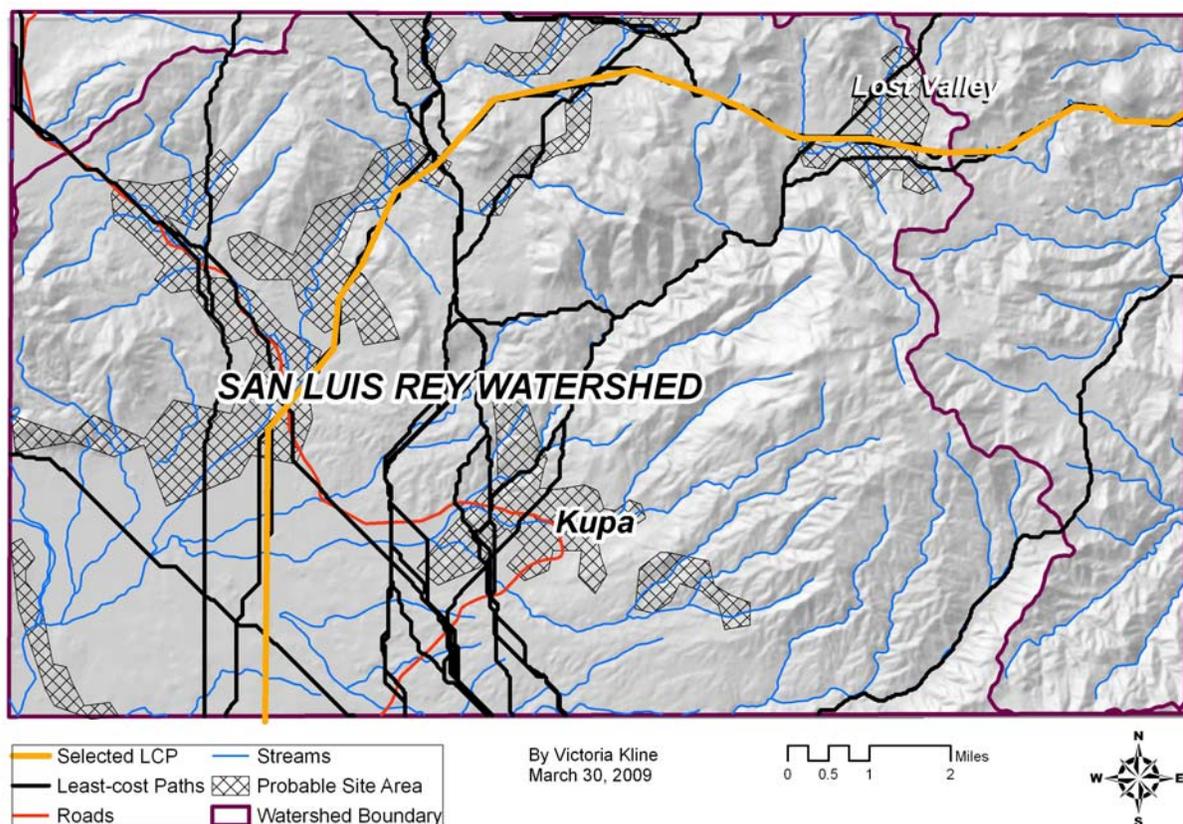


**Figure 11. Using sample data from SCIC for approximate site locations.**

## RELATIONSHIP BETWEEN LEAST-COST PATHS AND SITE LOCATIONS

There is a visual correlation between the generated least-cost paths and the site locations (Figs. 11, and 12). There is also a visual relationship between the site locations and waterways. There is distinct clustering of sites around the watercourses; in fact, all seem to be within a certain distance of the watercourses. Distance to water may be visualized by using the buffer function in ArcView 9.2. Buffer zones of differing widths can be set up for

different features. In this case, we would be testing to see if sites fell within a certain distance of the watercourses (drainages). It is also possible to create concentric buffers, but for the purposes of this thesis, neither of these tests were conducted.



**Figure 12. Areas of probable sites shown with the path chosen for the virtual tour.**

## GIS AND LANDSCAPE THEORY

According to Knapp and Ashmore (1999), trail networks are a part of the constructed landscape. Human non-sedentary groups (mobile hunter-gatherers or nomadic peoples) leave trails, views, campsites, and other clues to their activities. Just to the east of Lost Valley there is a mountain that all least-cost paths skirt. This mountain is called Hot Springs Mountain. Knapp and Ashmore (1999) also describe conceptual landscapes consisting of special places of ritual, sacred, or social significance. Also, Marcos Llobera (2001) talks about the power of locations on the landscape that are prominent and that command a view over the surrounding area. He suggests that one study how these relate to certain structures in the landscape. Hot Springs Mountain, rimming Lost Valley, would fall under the category of conceptual landscape as a mountain with a commanding view over the valleys below.

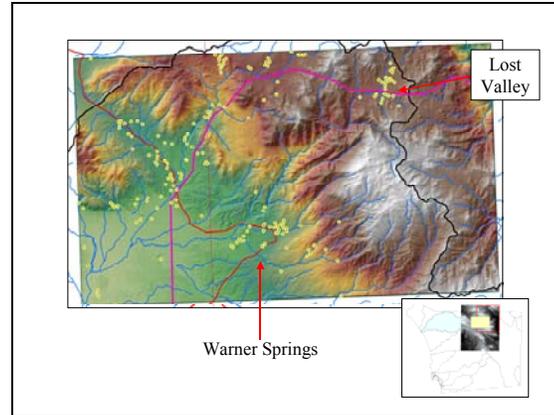
In plan view, the landscape in the project area reminds us of the landscape perspective from Kenneth Kvamme (2003) who looked for hidden features of the landscape through GIS analysis with archaeo-geophysical methods of data collection. By using GIS to predict least-cost paths, we are also finding possible connections that may be found on close inspection.

If landscape is something to be experienced, that is embedded in the human psyche, then some way to provide that experience is in order. To provide an experience of landscape from a “fly through” perspective, in order to get some feeling for the commanding views at some points along the chosen path, and possibly the difficulty or ease that the modeled path might take on, the virtual tour was a possible way of presenting my findings and it is to the virtual tour that we now turn.

### **VIRTUAL TOUR**

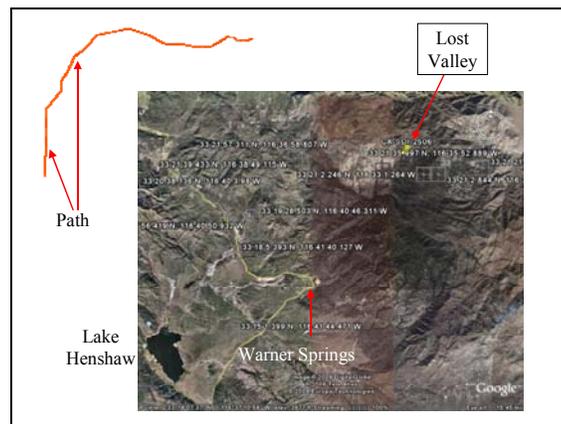
A virtual tour was created using ArcView 9.2, PhotoShop CS, and Google Earth. The results of the tour are presented below. The virtual tour is an idea that I came up with when using Google Earth to find points of junction from my least-cost path analysis in order to inspect the aerial images up close to see what was manifest at these junctions. I thought it would be interesting and extraordinary to take one of the least-cost paths and attempt to follow it to see if a correlation could be seen with actual paths on the ground. A true test would be to take a GPS unit and follow trails on the ground, and then compare these to the least-cost paths generated by the software. The GPS idea was considered, but had to be rejected in the interest of time. It is not known if access is allowed across the many privately owned properties that now comprise the San Jose del Valle and the surrounding area. Permission must first be granted to be allowed into the Lost Valley Boy Scout camp. The trails into Anza-Borrego are California State Park lands and are open to foot travel. Taking the GPS readings for the trail(s) from Lost Valley into Anza-Borrego would be an excellent future project.

The tour begins at a point southwest of *Kupa* in the San Jose del Valle and travels north, then northeast, then east to the boundary of the San Luis Rey watershed (Figs. 13 to 25).



**Figure 13. Least-cost path for comparison to an aerial view of the landscape.**

The LCP used for the virtual tour is in bright pink. The choice was arbitrary, except that the northeast start point crossed the watershed boundary. Along the path, I took the coordinates produced in ArcGIS using the Info tool.



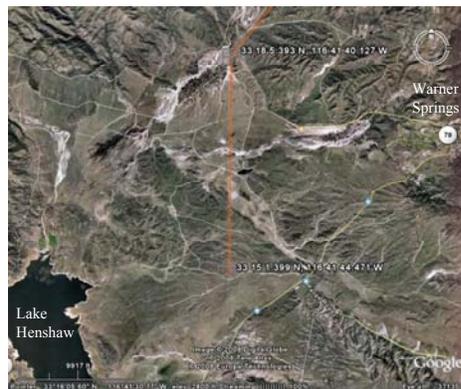
**Figure 14. Isolated LCP saved as a jpg file.**

I loaded the jpg into PhotoShop so that I could make it into an image file with a transparent background. I marked the coordinates in Google Earth. The line color was changed to bright orange.



**Figure 15. LCP imported into Google Earth.**

The line file was adjusted to the marked coordinates with the end points and junctions aligned with the marked coordinates in Google Earth



**Figure 16. Plan view of the southern end of the line file.**



**Figure 17. A closer view of the southern end of the line file showing the terrain.**



**Figure 18. Landscape view from the southern end of the line file looking north at a near 90 degree angle.**

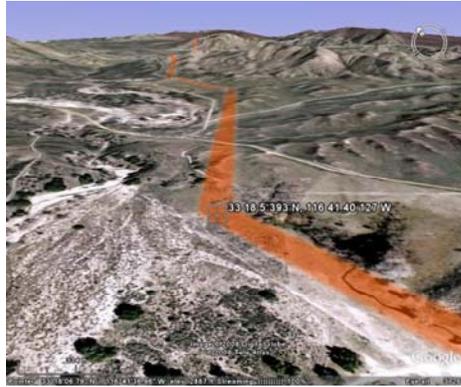
The fairly flat meadow, part of San Jose del Valle, comes into view.



**Figure 19. View of the LCP at the first junction looking north.**



**Figure 20. First junction pivot. Turning the corner at the first junction to head northeast.**



**Figure 21. Landscape view from first junction of the LCP facing northeast with Lost Valley on the horizon.**

In this image the Google Earth camera is tilted to a near horizontal angle. Looking northeast at the junction towards Lost Valley.



**Figure 22. Plan view of the watershed boundary past Lost Valley.**

This is where the LCP crosses the highlands between the San Luis Rey watershed and the Anza-Borrego watershed.



**Figure 23. View to the east from the crossing of the watershed boundary out to the Anza-Borrego desert. The Salton Sea can be seen on the horizon.**



**Figure 24. View towards the west from the watershed boundary. A 180 degree turn to the west, looking back at Lost Valley.**



**Figure 25. A day of instruction at field school in summer of 2003.**

Larry L. Leach at the white board. Interested, and motivated students looking on. Giant oaks, serene shade, soft breeze blowing through pines. When you visit, you understand why people traveled to Lost Valley. A serene sanctuary is found.

The virtual tour was intended to give visual perspective to the landscape. On the tour, the most apparent shortcoming was that a moving tour would provide the best experience. The ability for a person to move through a virtual landscape and to be totally immersed in the images could provide an experience of our California landscape to people on the other side of the globe. Short of that, the thumbnail images are most revealing when the horizon is in the image. The 3-D effect is manifest in those images with the horizon. These 3-D images give the best experience, as if one were standing on the spot and looking out. Three-D images can inspire awe, just as the natural landscape can (in special places) for the backwoods hiker and probably did for the ancient traveler as well. Prominences and depressions, besides guiding the path of the traveler, also provide the ability to find Llobera's (2001) eminences from which to look out over the landscape.

### **CHAPTER SUMMARY**

This chapter has summarized the results of experimental GIS methods applied to archaeological data that were presented in Chapter 4. The watersheds form natural corridors and least-cost path analyses show this correlation. The LCPs form the basis for possible trade and travel between the Cupeño and the linguistically related neighbors, the Luiseño and Cahuilla, to the west and east respectively, and to the Ipai (Kumeyaay) to the south. The rough topography of interior southern California creates a challenge for travelers now as well as in the past. Finally, the results presented in this chapter provided sufficient information to allow for a virtual, on-the-ground tour by importing a path to follow into Google Earth. The next (final) chapter brings this investigation to a close and contains the conclusions and recommendations for future research and study.