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Travelers

Water Requirements

While precise numbers are hard to come by, water requirements for different sized groups can be estimated. Based on estimates of daily water requirements for people and different types of livestock, daily water requirements for the different groups range from approximately 135 gallons per day to 23,000 gallons

Three primary sources of water were identified, including the perennial spring Ojo del Muerto in McRae Canyon, the cluster of playas near Engle, and intermittent seeps in Aleman and Yost Draws in the central portion of the study area. When these water resources are ranked by reliability and quantity, the most important source would have been the regional spring at Ojo del Muerto, followed by the playas near Engle, followed by water available in the seeps of Aleman and Yost Draws. Other streams in the area rarely contain water and were not considered further (see 'Ranking of Water Sources' below).

Landform

Bedrock units (Tb, Rks, Rts, and Riv) are found in the northern and west central portion of the corridor. Stable, relatively flat piedmont surfaces are dominant in the southern and east central portions of the corridor and extend to the north (Qf3, Qf2, Qp3, Qp2, Qf1 and Qm1). These alluvial surfaces consist of pebbly sand and well developed calcium-carbonate horizons formed by episodes of deposition and stability during the Pleistocene (~12,000 years ago). Modern drainages are inset below the old surfaces and have low gradients (Qa, Qva, Qp4). Some exhibit episodes of arroyo cut-and-fill and may not have been entrenched when El Camino Real was first established.

Conclusions

Ojo del Muerto spring was the key to travel across the Jornada. The spring has been reliable and provides a steady supply of good quality water. Near the midpoint in the Jornada crossing, travelers who reach the spring were guaranteed finding water to enable them to finish the remainder of the crossing. The players also played "Ojo del Muerto" when they were in the area. The high quality water for even the largest of caravan or herd. Although these players often dry out, as long as large caravans do not attempt the crossing until after heavy monsoon rainfall, those who reached the players "ojo del Muerto" at this point and finish the remainder of the journey.

The seeds provide, at best, small amounts of water intermittently. The trail passes right by these sources, and they were undoubtedly used when available. However, the limited potential and intermittent nature suggests that they were probably viewed as an emergency supply.

Appendices, references, and the GIS data for the landform units, and this poster are available for free download on geology.nmt.edu/waterlong/projects/EI_Cosmiso_Real.html

Ranking of the Water Sources

We ranked water sources in terms of reliability and quantity. Each water source was scored, with a higher score representing a higher rating. Reliability of a water source is a measure of the how it responds to short-term variability in precipitation. A highly reliable water source (high score) will provide a fairly constant volume of water, even during short periods of drought. An unreliable water source (low score) will tend to dry up or become inaccessible during periods of drought. We utilized simple mathematical models to assess the reliability of the different water sources. Ojo del Muerto spring is the most reliable water source, followed by the local springs and seeps, and the playas.

Quantity was assessed in terms of volume of water available. We estimated spring discharge rates and playa volumes and compared these estimates to projected water requirements for the different group sizes. Playas provide the greatest quantity of water and can easily support large groups that included hundreds of people and thousands of livestock. Ojo del Muerto spring was ranked second, while the local springs and seeps ranked last.

Reliability score (R)			Quantity score (Q)		
Regional spring (Ojo del Muerto)	Highest reliability	3	Playas	approx. +1,000,000 gallons	3
Local springs and seeps	High reliability	2	Regional spring (Ojo del Muerto)	approx. 15,000-25,000 gallons/day	2
Playas	Intermediate reliability	1	Local springs and seeps	approx. 100 gallons/day	1

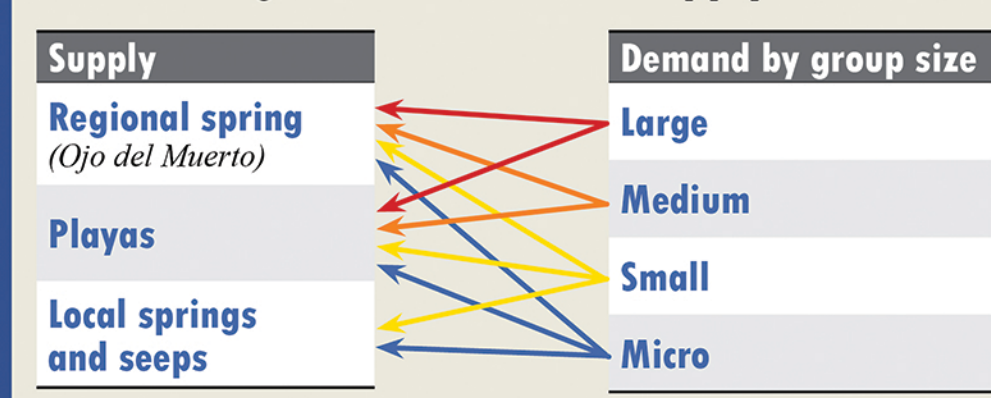
Water Source Evaluation: Reliability and Quantity

By adding reliability and quantity scores, the "best" water sources could be determined. Ojo del Muerto is identified as the "best" water source because of its high reliability and ample flow.

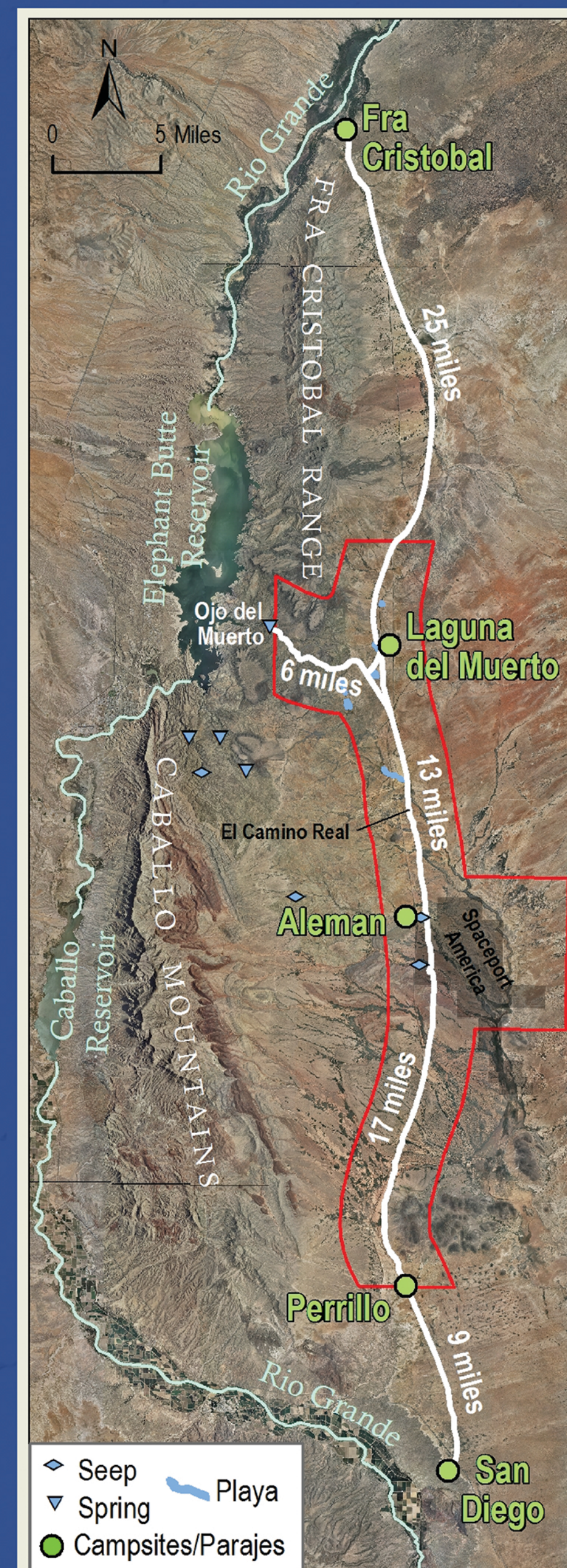
Water source	R	Q	Total
Regional spring (Ojo del Muerto)	3	2	5
Playas	1	3	4
Local springs and seeps	2	1	3



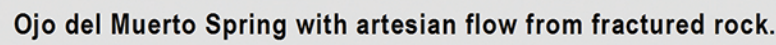
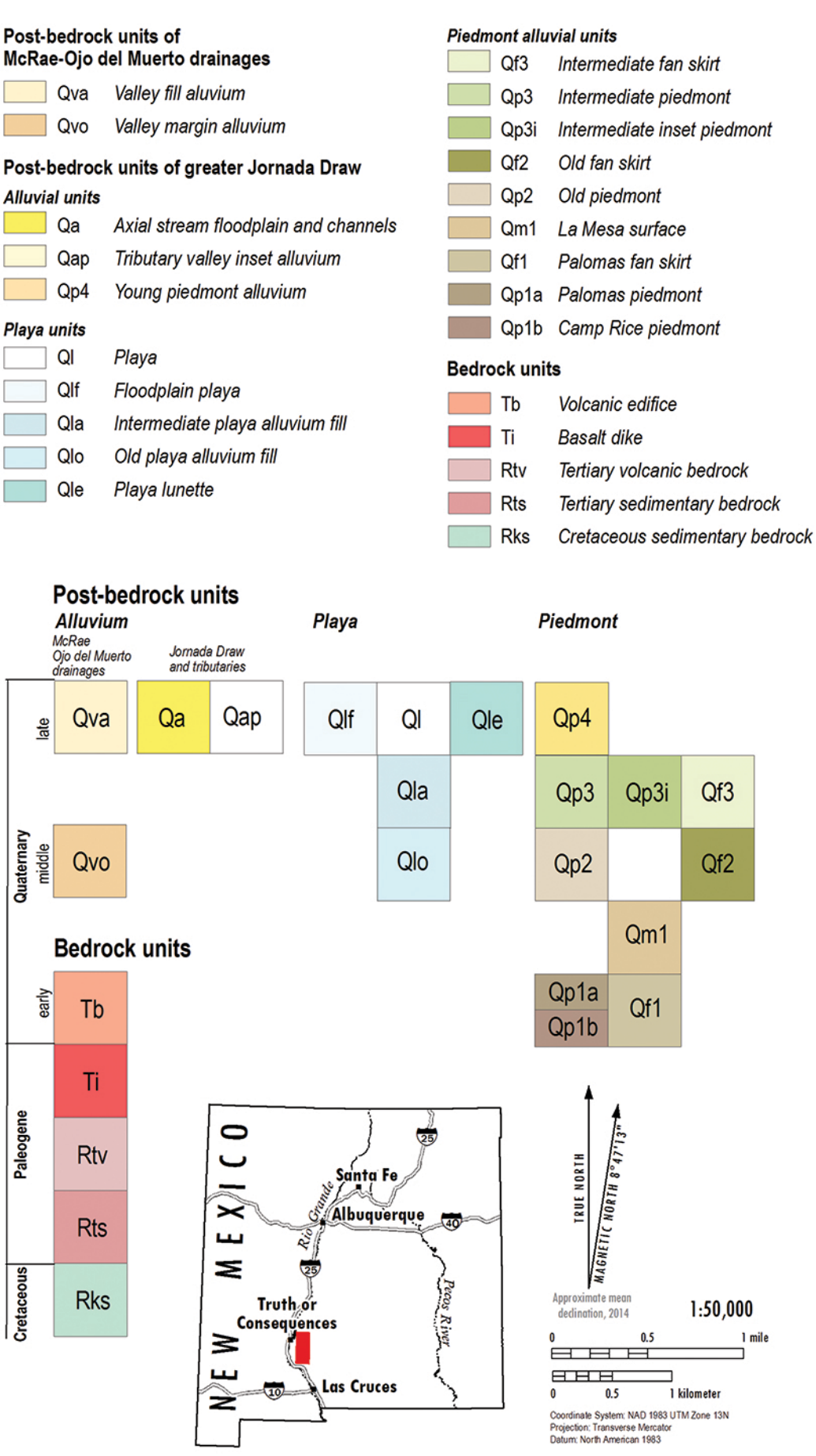
Water along the Camino Real: Supply vs Demand



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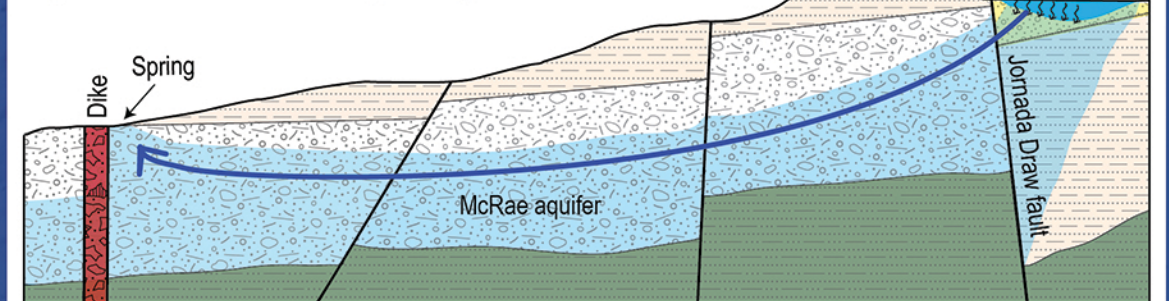


Correlation of Landform Units along El Camino Real, Jornada del Muerto Corridor, and Spaceport America



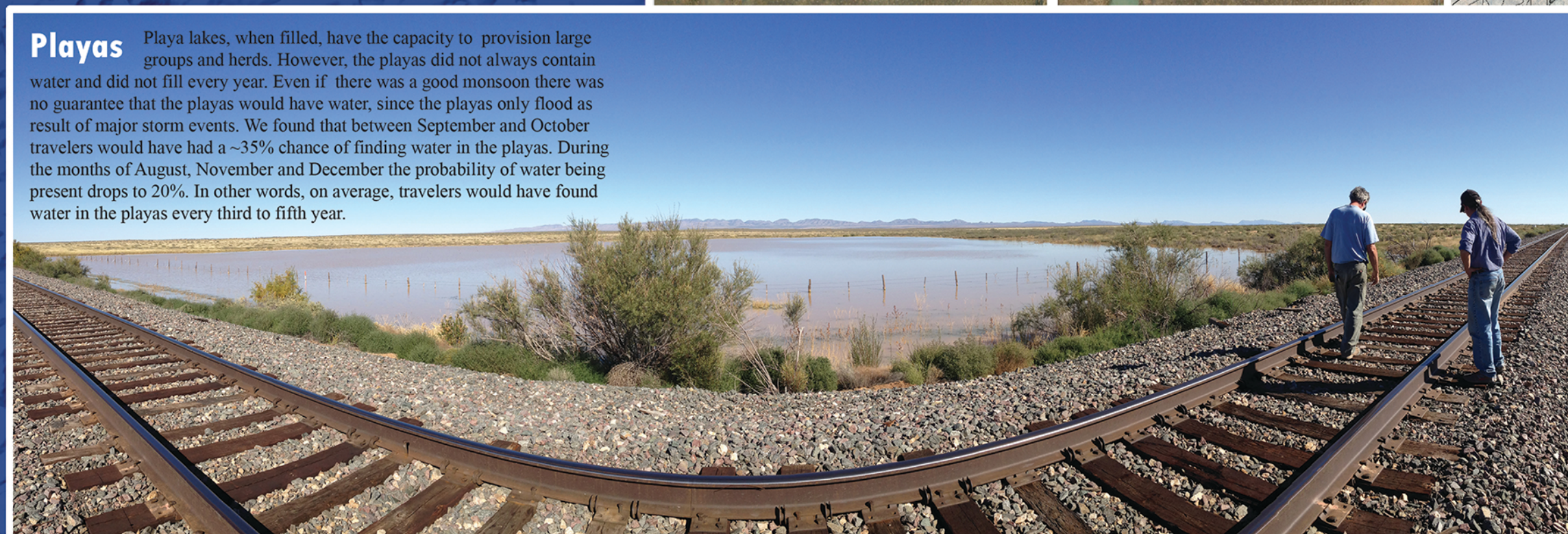
Regional Springs

Ojo Del Muerto Spring



This spring discharges from the deeper regional aquifer system, and therefore it is a very reliable water source. There is evidence that this spring may have produced 16,000 to 25,000 gallons per day (Smith, 1893). This spring is located roughly at the half-way point along the journey through the Jornada del Muerto, and was likely the primary water source for most travelers. During the time when the Camino Real was being used, the Ojo del Muerto Spring was located approximately two miles to the west of the present location of the spring.

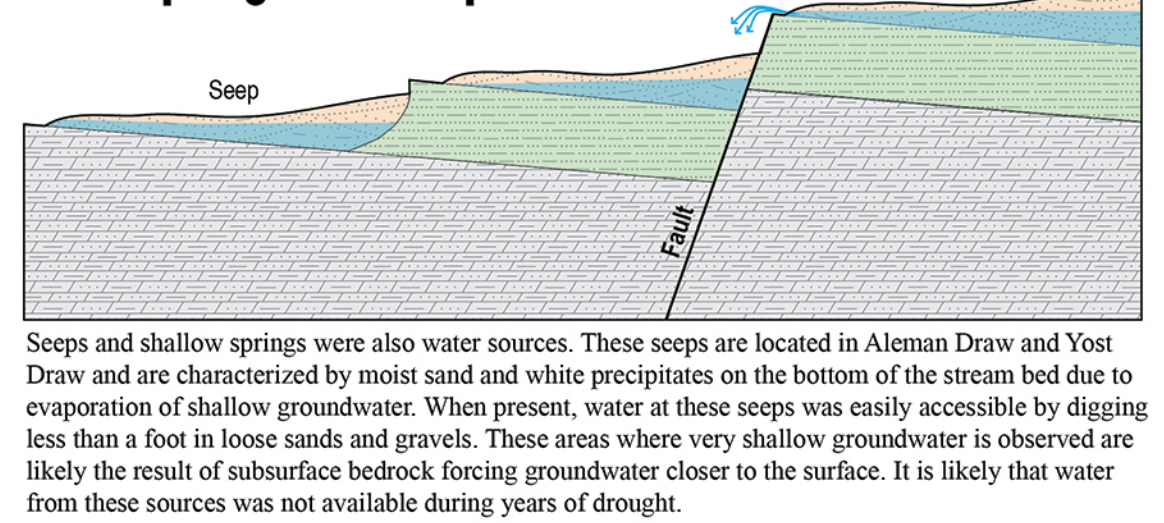
Hydrological Features



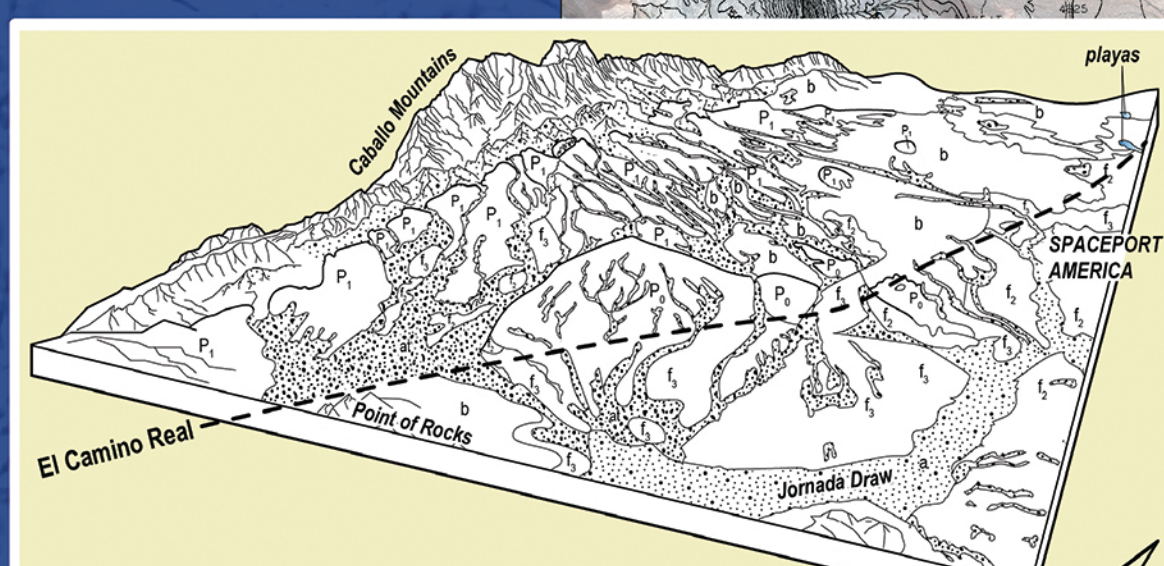
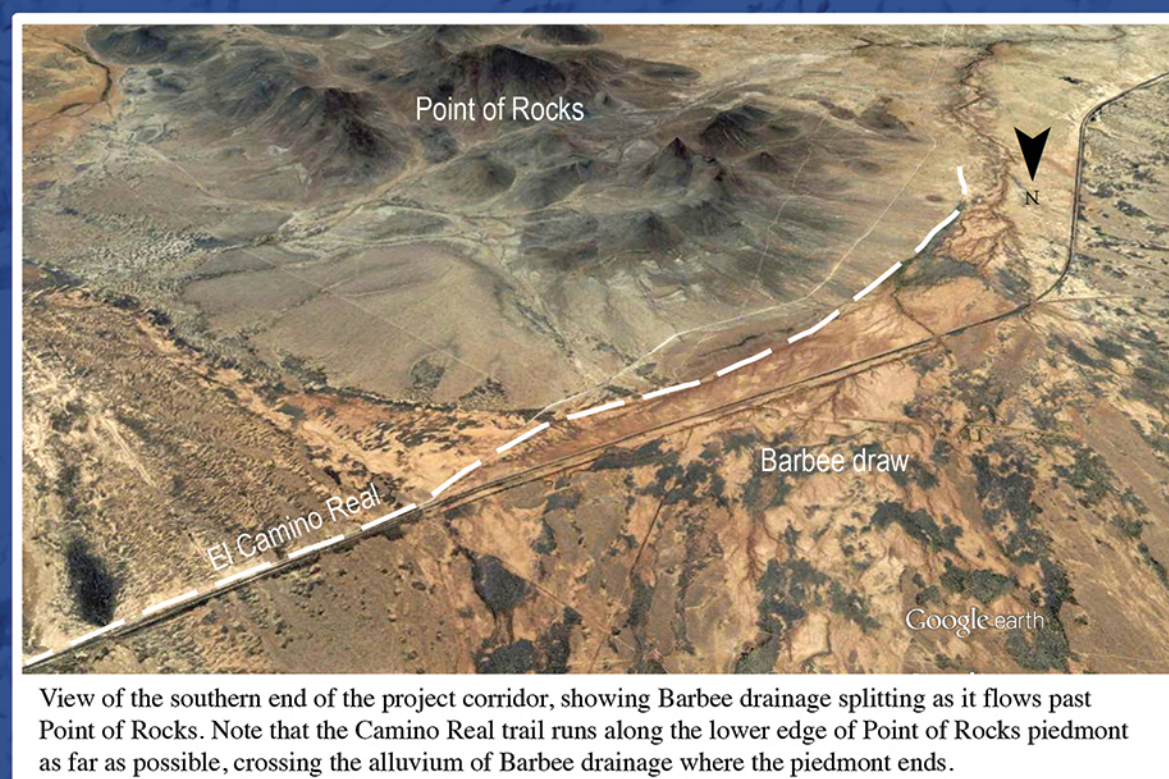
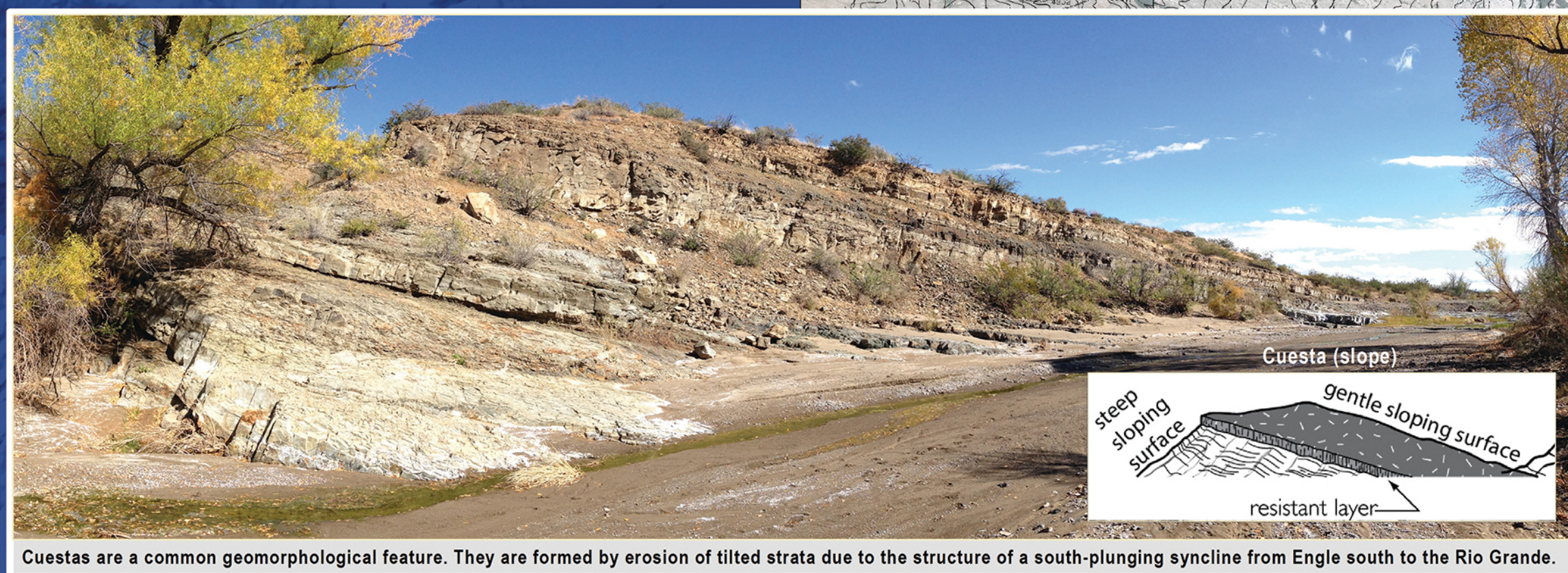
Local Springs and Seeps



Local Springs and Seeps



Geomorphological Features



This poster, OFR-254, is part of the Hydrogeology of the central Sonoran Desert: Myriad Implications for Travel along El Camino Real, a project of the Sonoran Desert of Tierra Adentro, Sierra and Dotsa Area Council, New Mexico (OFR-254), available online at geoinfo.nmfs.usda/watermap/projects/El_Camino_Real.html

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Path of El Camino Real across landforms of the Jornada del Muerto near Spaceport America. The trail crosses eroded, nearly planar bedrock (b), the lower margins of old piedmonts (P_0), old fan skirts (f_1 , f_2), and minimizes the distance crossing the problematic active alluvium (a—Jornada Draw; at—tributary alluvium). The western edges of old piedmonts (P_0) are separated from their alluvial sources on the east side of the C  balo Mountains and are buried by inset fan skirts on their eastern margins. Younger piedmonts (P_1) are inset below the older piedmonts and are closer to their eroded mountain-flank sources.