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WILLIAM P. BLAKE'S DESERT OF THE COLORADO RIVER

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Landscape transformation is almost synonymous with California. Although images of urban sprawl in the coastal basins spring to mind readily, changes in such areas as the Colorado Desert have been equally dramatic. Eighteenth and nineteenth century descriptions of this region leave vivid impressions of an arid and desolate land. During the twentieth century the desert wastes have yielded to irrigated commercial agriculture and urbanization. Many of you can attest to changes in this region now known as theCoachella and Imperial valleys.However, the intent of this paper is not a compilation of specific changes, but rather an examination of the prediction of this landscape transformation by an astute observer, William Phipps Blake.

In 1853 Lieutenant R. S. Williamson was ordered to explore for routes along which rail service could be extended from the Mississippi River to the southern California coast.[1] The geologist-mineralogist attached to Williamson's Pacific Railroad Survey team was twenty-seven year old, Yale-educated William P. Blake. Blake's servey observations, including maps, profiles, sketches, and water color plates, are collected in a hefty volume, which was published originally by the War Department as a part of the expedition's report and reprinted subsequently by a private publisher.[2]

The Role of the Colorado River as a Geomorphic Agent

Although the survey party spent less than a month (from mid-November to early December) trekking the uncharted wilderness that lay beyond San Gorgonio Pass, Blake was able to comprehend the essential features of the region's physical geography, including the dynamic role that the Colorado River played in shaping the landscape of the desert basin. Blake's observations and topographic

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measurements led him to the following conclusions.[3] In structural terms this desert region is the northern extremity of the Gulf of California and it was submerged during the late Tertiary period. The agent primarily responsible for blocking marine waters from this area was the Colorado River. The sediments discharged by the Colorado into the water-filled trough created a delta that grew southwestward from the vicinity of the present-day Yuma, Arizona. Upon reaching the Cocopah Mountains, the delta formed a barrier of sufficient elevation to cut off the the gulf from the region north of it. As the sea water evaporated the area became an arid lowland. The influence of the Colorado River on the desert, however, did not cease. On occasion floods or gradational instability in the delta diverted the Colorado from its gulfward course and sent its waters flowing into the desert basin. Each of these innundations created a lake that persisted until after the river again changed its course. The ultimate demise of these lakes accounts for the widespread occurence of fertile sediments that can provide the basis for large-scale agricultural development of the desert.

Lakes in the Desert Basin

It should be pointed out that blake formulated his ideas about these physiographic relationships in the absence of such twentieth century landscape clues as the Salton Sea. His first inkling of the region's dynamic physical history came three days after the wagon train entered the desert. At a site near present-day Indian Wells, Blake penned the following remarkable passage: (Fig. 1)

> The broad plain of the Desert was before us, reaching to the horizon. On the right, it was bounded by the high mountains which extended down to the plain in successive ridges, one beyond another, until blue outline could hardly be discerned in the distance.
>
> On turning around the point, I saw a discoloration of the rocks extending for a long distance on a horizontal line on the side of the mountains. On appraoching this, it was found that the white color was produced by a calcareous incrustation, extending over the whole surface, and into every cavity and crevice. This crust had evidently been deposited under water, and when seen at a distance of a few yards, its upper margin appeared to form a distinct line, which indicated the former level of the water undershich it was deposited. This water line...could be traced along the mountain sides following all the angles and sinuosities of the ridges for many miles--always preserving its horizontality--sometimes being high up above the plain, and again intersecting long and high slopes of gravel and sand; on such places a beach line could be traced. The evidences of of a former submergence were so vivid and conclusive that it became evident to everyone in the train that we were travelling in the dry bed of a former and extended sheet of water, probably an Ancient Lake or an extensive bay.[4]

Blake dubbed the ancient water body represented by the beachlines and travertine deposits Lake Cahuilla, after the native inhabitants.

That evening, when the survey party camped at a Cahuilla village, Blake inquired among the Indians and discovered that they possessed traditional knowledge of the ancient lake. Blake reported:[5]

> When questioned about the shore-line and water marks of the ancient lake, the chief gave an account of a tradition they have of great water (agua grande) which covered the whole valley and was filled with fine fish. There was also plenty of geese and ducks. Their fathers lived in the mountains and used to come down to the lake to fish and hunt. The water gradually subsided 'poco,' 'poco,' (little by little) and their villages were moved down from the mountains, into the valley it had left. They also said that the waters once returned very suddenly and overwhelmed many of their people and drove the rest back into the mountains.

In addition, the Cahuillas believed that the waters would return again.[6]

The observations Blake made and the data he compiled led him to conclude that the Cahuilla legend was credible. The barometric readings revealed the below sea level, basin-like character of the region, and he had seen water in New River, one of the Colorado's distributaries in the basin. Since flows from the Colorado could enter the basin via such distributary channels, Blake acknowledged that "the sudden floods of which they speak undoubtedly took place."[7] He also understood that once the inflow from the Colorado ceased the lake in the desert basin would evaporate in the face of "violent arid winds, pouring in from the surrounding deserts and over the mountains from the sea."[8] Blake felt that this was consistent with the Chauillas' contention that the lake waters receded little by little.

Evidence derived from recent archaeological excavations also lends some credence to the Cahuilla legend.[9] Sites around the shores of the ancient lake have yielded abundant remains of a variety of fish and waterfowl species. The lake's drying seems to have influenced population distribution as well as resource avaiability. Settlements shifted from the lake shore to the mountains and back again to the desert valley after mesquite groves became established on the former lakebed.

In addition, the notion that the waters could return suddenly has been borne out by subsequent events. At various times during the nineteenth century there were reports of water appearing abruptly in the desert basin.[10]

One of the more spectacular of these incidents occured in June, 1891.[11] On this occasion, water flowed steadily into the desert lowland from the southeast and created a salty lake some thirty to forty miles long, ten miles wide, and four to six feet deep. The sudden appearance of this lake in such close proximity to the Souhern Pacific Railroad tracks created quite a stir. Wild rumors circulated about the origin of the salty water. Prime among these was that sea water from the Gulf of California was seeping into the desert from some underground source. All of the rumors were dispelled, however, when a number of investigating parties navigated small boats from the flood-swollen Colorado River to the lake in the desert basin. The high salt content of the lake was not really a mystery. Salt from the basin's salina had dissolved in the river water.

This salina was not observed directly by Blake during the survey but

Figure 1
Travertine encrustation marks the high water line of ancient Lake Cahuilla on a spur of the Santa Rosa Mountains, Colorado Desert.

he noted that, "The Indians are accustomed to resort to it for salt, which they say is found in large quantities."[12] This feature apparently attracted distant users as well. Guinn reported that between 1815 and 1830 an annual "journada para sal" (journey for salt) was conducted from the pueblo of Los Angeles and nearby missions to this desert salt bed.[13] Blake tried to locate the dry salt lake "as nearly as possible" on his 1853 map entitled "Geological Map of the Country Between San Diego and the Colorado River California"[14] (Figure 2). It was on this map that Blake also christened the region the "Colorado Desert."

The Misunderstood "Colorado Desert"

Since its inception, the term "Colorado Desert" has suffered misunderstanding and misapplication. In his later years Blake sought to right this situation by explaining:[15]

> The name 'Colorado Desert' was given to this region by the writer in 1853. This was before the State of Colorado received its name. It was deemed most appropriate to connect the name of the Colorado River with the region, inasmuch as the desert owes its origin to the river by the deposition of alluvions and the displacement of sea-water.
> . . .The appelation may properly be confined to the regions reached by the deposition of the silt of the Colorado, whether in the form of deltas or at the bottom of ancient lakes. It should also include the bordering detrital slopes from the contiguous mountains. So restricted, the area is practically conterminous with the ancient beachlines and terraces of the lakes which occupied the valley.

Despite Blake's efforts at clarification, the designation "Colorado Desert" has continued to be misinterpreted even by exceedingly knowledgeable California geographers. For example, in a 1968 discussion Richard Logan wrote of the Sonoran Desert:[16]

> The California section is sometimes set off as a distinctive portion, to which the name "Colorado Desert' has unfortunately been affixed--unfortunately, in this writer's mind, since it has no relationship to the state of that name and the river of the same name merely skirts its eastern boundary.

Perhaps clarity and Blake's original intent could both be served if the term "Desert of the Colorado" were employed. Blake occasionally used this designation, as did LeConte in an article dated 1855 and Sykes on a 1907

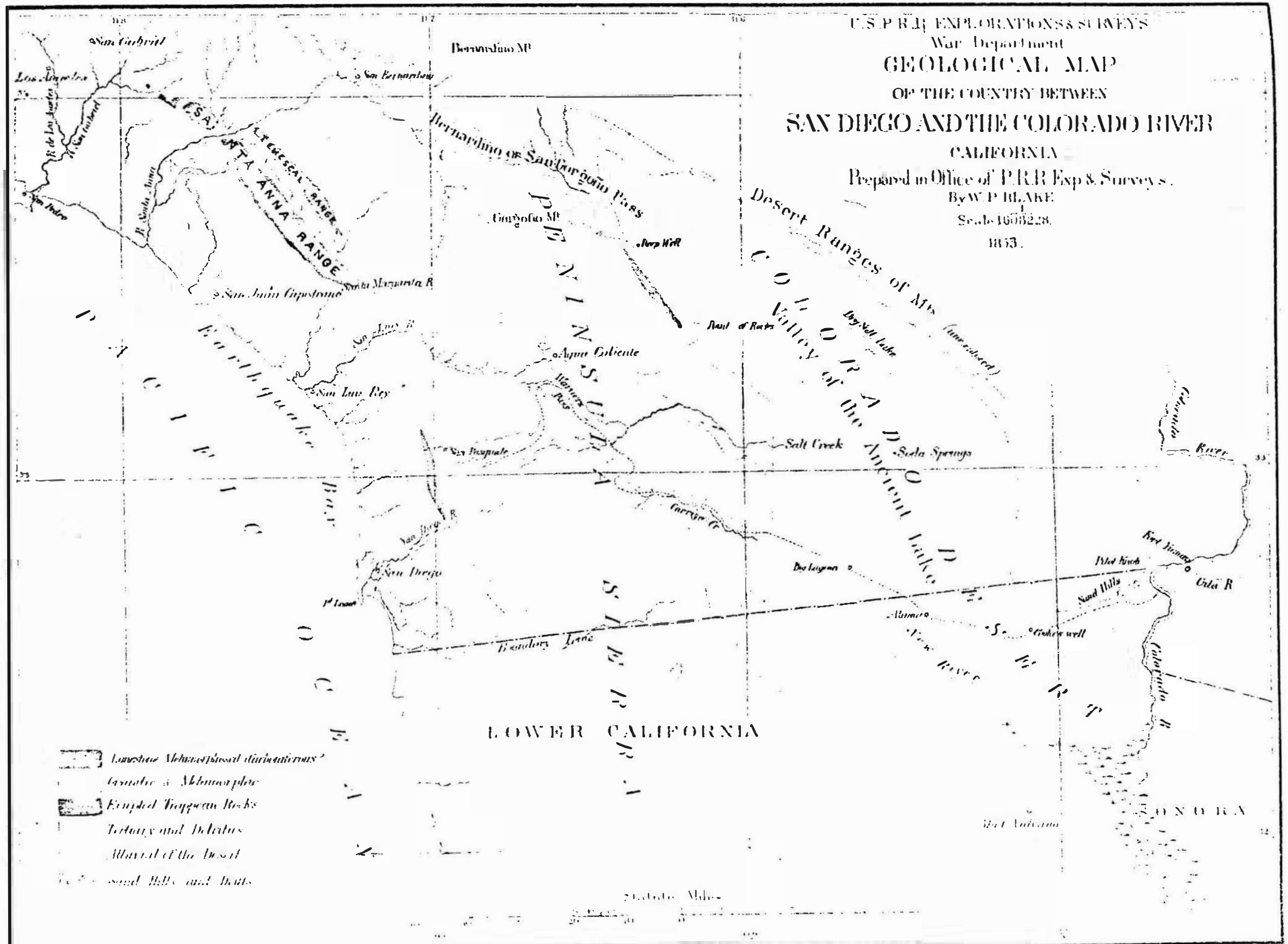

Figure 2. Blake's geological map christened the region the "Colorado Desert".

map of the newly formed Salton Sea.[17]

Notion of the Desert's Agricultural Potential

Blake's understanding of the role the Colorado River played in the evolution and dynamics of this desert region had implications that extended beyond place name identification. Blake used his insight to call attention to the region's agricultural potential. Afterall, few nineteenth century desert travelers would have shared Blake's vision that, "If a supply of water could be obtained for irrigation, it is probable that the greater part of the desert could be made to yield crops of almost any kind."[18]

Blake based his contention on the high quality of desert soil that derived from Colorado River alluvium, the luxuriance of the native vegetation on sites where adequate moisture was avaiable, and his knowledge and observations of the productivity of Indian agriculture along the Colorado River and in the desert basin.[19] In the latter instance, Blake reported that the desert Cahuillas produced fairly abundant crops of maize, beans, squash, barley, and melons from small irrigated patches of land.[20] An even earlier written account of these small gardens appears in a diary kept by Jose Maria Estudillo, a member of the Romero Expedition in the winter of 1823-24.[21] Estudillo noted that the Cahuillas had planted small patches of maize, pumpkins, melons, and watermelons. Although the Cahuillas employed a variety of techniques to exploit water from springs, wells, and intermittent washes, the scarcity of this resource imposed severe restrictions on the scale of their agricultural endeavors.[22]

Predicted Sources of Irrigation Water

In order to sustain large-scale agricultural development of the desert, irrigation water had to be avaiable in abundance. Blake believed that large quantities of water could be obtained from two sources. First, his assessment of the nature and tilt of the region's strata led him to conclude that artesian waters lay beneath the desert surface, and that "a copius supply" could be tapped by digging or boring.[23] Before the turn of the century this prediction had become a reality. The development of artesian waters initiated and sustained commercial agriculture in the Coachella Valley, which did not receive irrigation water from the Colorado River until the

Coachella Branch of the All America Canal was completed in 1948.[24]

The second source of irrigation water that Blake proposed was the Colorado River. He suggested that the delta's slope and distributary channels could form the basis of a gravity-flow system to send water into the basin. Blake wrote, "By deepening the channel of New River, or cutting a canal so low that the water of the Colorado would enter at all seasons of the year, a constant supply could be furnished to the interior portions of the Desert."[25] Blake was aware, however, of the danger inherent in such a diversion scheme. He noted, "It is, indeed, a serious question whether a canal would cause the overflow of a vast surface, and refill, to a certain extent, the dry valley of the Ancient Lake."[26] A half century later (1905-07) this prophecy was fulfilled dramatically when faulty irrigation works resulted in an accidental inundation of the desert creating the Salton Sea.[27]

Conclusion

William P. Blake's study of the Colorado Desert constitutes one of the earliest scientific records of this regions. He was a keen landscape observer, the likes of which any of us could envy.[28] His basic portrayal of the complex and dynamic relationships between the Colorado River and the desert region bearing its name has withstood the test of time.[29] Likewise, his assessment of the desert basin's agricultural potential has been borne out. According to Kennan, "only a bold and original mind could have entertained the idea of getting crops out of such a 'Death Valley' as the Salton Sink was then."[30] If Blake saw his desert today it is unlikely that he would be surprised. Yet he would probably caution that this desert turned garden still depends on the Colorado, whose waters are becoming an increasingly scarce resource.[31] In the end, the Desert of the Colorado remains inextricably bound to the river that created it.

NOTES

1. George Leslie Albright, "Official Explorations for Pacific Railroads, 1853-1855," _University of California Publications in History_, Vol. 11 (1921); Jean C. Anderson, "The Pacific Railroad Survey in California July-December, 1853," _Historical Society of Southern California Quarterly_, Vol. 30 (1948), 176-95.

2. William P. Blake, "Geological Report," in Lt. R. S. Williamson, _Report of Explorations in California for Railroad Routes to Connect with the Routes near the 35th and 32d Parallels of North Latitude_, Vol. V, Pt. II (Washington, D.C.: War Department, 1856); William P. Blake, _Report of a Geological Reconnaissance in California: Made in Connection with the Expedition to Survey Routes in California, to Connect with the Survey Routes for a Railroad from the Mississippi River to the Pacific Ocean, Under the Command of Liet. R. S. Williamson, Corps Top. Eng'rs._ in 1853 (New York: H. Bailliere, 1858).

3. Blake, _op. cit._, note 2, pp. 232-50 and Sections 12 and 13 on Sheet VIII.

4. Blake, _op. cit._, note 2, p. 97 and opposite plate. The "extended sheet of water" that Blake found evidence of was a high level filling of the desert basin that created a lake one hundred miles long, thirty-five miles wide, and three hundred feet deep. It stretched from just north of present-day Indio in the southern Coachella Valley to Cerro Prieto, an extinct volcano located east of the Cocopah Mountains near the delta's divide.

5. Blake, _op. cit._, note 2, p. 98.

6. Blake, _op. cit._, note 2, p. 436.

7. Blake, _op. cit._, note 2, p. 238.

8. _Ibid._,

9. Philip J. Wilke and Harry W. Lawton, "Early Observations on the Cultural

of the Coachella Valley," Ballena Press Anthropological Papers, no. 3(1975), pp. 9-43; Philip J. Wilke, Thomas F. King and Stephen Hammond, "Aboriginal Occupation at Tahquitz Canyon: Ethnohistory and Archaeology," Ballena Press Anthropological Papers, no. 3 (1975), pp. 45-73; Philip J. Wilke, "Ethnography," in Irwin P. Ting and Bill Jennings, eds. Deep Canyon, a Desert Wilderness for Science (Palm Desert: Philip L Boyd Deep Canyon Desert Research Center, U. C. Riverside, 1976), pp. 97-105.

10. Blake, op. cit., note 2, p. 109; Lieut. Eric Bergland, "Preliminary Report Upon the Operations of Party No. 3, California Section, Season of 1875-'76, With a View to Determine the Feasibility of Diverting the Colorado River for Purposes of Irrigation," in Wheeler Surveys West of the One Hundredth Meridian, Annual Report of the Chief of Engineers for 1876, Appendix JJ, 1876, p. 118; C. E. Grunsky, "The Lower Colorado River and the Salton Basin," Transactions, American Society of Civil Engineers, Vol. 59, Paper No. 1051 (1907), p. 17; H. T. Cory, "Irrigation and River Control in the Colorado River Delta," Transactions, American Society of Civil Engineers, Vol. 76, Paper No. 1270 (1913), p. 1228; D. T. MacDougal, "General Discusssion," in D. T. MacDougal, ed., The Salton Sea: A Study of the Geography, the Geology, the Floristics, and the Ecology of a Desert Basin (Washington, D.C.: Carnegie Inst., Pub. No. 193, 1914), p. 173.

11. B. A. Cecil-Stephens, "The Colorado Desert and Its Recent Flooding," Journal of the American Geographical Society, Vol. 23 (1891). pp. 373-75; E. B. Preston, "Salton Lake," in Eleventh Report of the State Mineralogist (Sacramento: California State Mining Bureau, 1893), p. 389; Grunsky, op. cit., note 10; George Wharton James, The Wonders of the Colorado Desert(Boston: Little, Brown, and Company, 1911), p. 487; William P. Blake, "The Cahuilla Basin and the Desert of the Colorado," in D. T. MacDougal, ed., The Salton Sea. op. cit., p. 10; Godfrey Sykes, "Geographical Features of the Cahuilla Basin," in D. T. Mac Dougal, The Salton Sea, op. cit., p. 19

12. Blake, op. cit., note 2, p. 245.

13. J. M. Guinn, "Las Salinas," Historical Society of Southern California Annual Publications, Vol. 7 (1907-1908), p. 19.
14. Blake, op. cit., note 2, p. 246 and map opposite p, 228.
15. Blake, op. cit., note 11, p. 6.
16. Richard F. Logan, "Causes, Climates, and the Distribution of Deserts," in G. W. Brown, ed., Desert Biology, Vol I (New York: Academic Press, 1968), p. 36.
17. Blake, op. cit., note 11, p. 1; John L. LeConte, "Account of Some Volcanic Springs in the Desert of the Colorado, in Southern California," American Journal of Science and Art, Vol. 19, 2nd Ser.(1855), pp. 1-6; Sykes, op. cit., note 11, map facing p. 6.
18. Blake, op. cit., note 2, p. 249.
19. Blake, op. cit., note 2, pp. 98-99, 109-11 and 248-250.
20. Blake, op. cit., note 2, 98 and 249.
21. Lowell John Bean and William M. Mason, Diaries and Accounts of the Romero Expeditions in Arizona and California 1823-1826 (Palm Springs: Desert Museum, 1962), pp. 46 and 104.
22. Blake, loc. cit.; H. W. Lawton and L. J. Bean, "A Preliminary Reconstruction of Aboriginal Agricultural Technology Among the Cahuilla," The Indian Historian, Vol. 1 (1968), pp. 18-24, 29; Wilke and Lawton, op. cit., note 9, pp. 28-32; Wilke, King and Hammond, op. cit., note 9, pp. 51-54.
23. Blake, op. cit., note 2, pp. 246-48.
24. Walter C. Mendenhall, Ground Water of the Indio Region, California with a Sketch of the Colorado Desert (Washington: U. S. Geological Survey, Water Supply Paper 225, 1909), pp. 6-7 and 31-43; Arthur F. Pillsbury, Observations on Use of Irrigation Water in Coachella Valley, California, Sacramento: University of Cal. Ag. Exp. Stn, Bulletin 649, 1941) pp. 5, 7, 39 and 43-6; Robert M. Glendinning, "The Coachella Valley, California, Some Aspects of Agriculture in a Desert," Papers of the Michigan Academy of Science, Arts and Letters, Vol. 35 (1949), pp. 183-187; Collis H. Steere, Imperial and Coachella Valleys (Palo Alto: Stanford University Press, 1952), pp. 30, 39-41 and

60-62; H. H. Blossom, "The Agricultural Development of the Coachella Valley, California," Unpubl. M. A. Thesis, Geography Department, University of California, 1959; California Department of Water Resources, Feasibility of Serving the Coachella Valley County Water District from the State Water Facilities, Bulletin No. 119-3, May, 1963; D. R. Lee, "Date Cultivation in the Coachella, California," Ohio Journal of Science, Vol. 63 (1963), pp. 82-87; California Department Water Resources, Coachella Valley Investigation Bull. No. 108, 1964; Ole J. Nordland, ed., Coachella Valley's Golden Years (Coachella: Coachella Valley County Water District, 1968).

25. Blake, op. cit., note 2, pp. 249-50.
26. Blake, op. cit., note 2, p. 250.
27. Arthur P. Davis, "The New Inland Sea," National Geographic Magazine Vol. 18 (1907), pp. 37-49; Grunsky, op. cit., note 10, pp. 2-5 and 22-26; F. H. Newell, "The Salton Sea," Smithsonian Institution Annual Report, 1907, pp. 331-45; Edgar Howe and Wilbur J. Hall, The Story of the First Decade in Imperial Valley, California (Imperial: Edgar F. Howe and Sons, 1910), pp. 95-116; Cory, op. cit., note 10, pp. 1268-93, 1320-24 and 1406-10; W. B. Crane, "The History of the Salton Sea," Historical Society of Southern California Annual Publications, Vol. 9 (1914), pp. 215-24; D. T. Mac Dougal, "The Salton Sea," American Journal of Science, Vol. 189 (1915), pp. 231-50; George Kennan, The Salton Sea: An Account of Harriman's Fight with the Colorado River (New York: MacMillan, 1917), pp. 28-33; 57-58.
28. Blake had a long and illustrious career which included: travel; teaching; publishing; and public service. In 1864 he was appointed Professor of Mineralogy and Geology at the College of California (later the University of California) and Mineralogist for the State Board of Agriculture. At the age of seventy he was appointed Professor of Geology and Mining and Director of the University of Arizona's School of Mines. Blake was accorded a variety of honors, including honorary degrees from Dartmouth, the Universities of Pennsylvania and California. It was after an arduous journey to attend the latter ceremony at Berkeley in 1910 that Blake contracted pneumonia and died. Additional bio-bibliographic

information is to be found in R. W. Raymond, "Memoir of William P. Blake," Bulletin of the Geological Society of America, Vol. 22 (1911), pp. 36-47.

29. Charles Russell Orcutt, "The Colorado Desert," in Tenth Annual Report of the State Mineralogist (Sacramento: California State Mining Bureau, 1890), p. 915; Ralph Arnold, The Tertiary and Quaternary Pectens of California (Washington: U.S. Geological Survey, Prof. Paper No. 47, 1906), pp. 21-22; E. E. Free. "Sketch of the Geology and Soils of the Cauhilla Basin," in D. T. Mac Dougal, op. cit., pp. 21 and 27-28; William S. W. Kew, "Tertiary Echinoids of the Carrizo Creek Region in the Colorado Desert," U. of California Pubs. in Geology, Vol. 8 (1914), p. 45; F. E. Vaughn, "Evidence in San Gorgonio Pass, Riverside County, of a Late Pliocene Extension of the Gulf of Lower California" (Abstract), Bulletin, Geological Society of America, Vol. 29 (1918), pp. 164-65; F. B. Kniffen, "The Natural Landscape of the Colorado Delta," U. of California Pubs. in Geography, Vol. 5 (1932), p. 204; W. P. Woodring, "Distribution and Age of the Marine Tertiary Deposits of the Colorado Desert," in Papers Concerning the Palaeontology of California, Oregon and the Northern Great Basin Province (Washington: Carniege Inst. of Washington, Pub. No. 418, 1932), pp. 7-9; R. M. Glendinning, "Desert Contrasts Illustrated by the Coachella," Geographical Review, Vol. 39 (1949), p. 221; T. W. Dibblee, Jr., "Geology of the Imperial Valley Region, California," in Richard H. Jahns, ed., Geology of Southern California (San Francisco: Cal. Div. Mines, Bull. No. 170, 1954), Ch. 3, p. 25; Chester R. Longwell, "History of the Lower Colorado River and the Imperial Depression," in R. H. Jahns, op. cit., ch. 5, p. 53; C. R. Allen, "San Andreas Fault Zone in San Gorgonio Pass, Southern California," Bulletin, Geological Society of America, Vol. 68 (1957), p. 328; G. M. Stanley, "Prehistoric Lakes in the Salton Sea Basin," (Abstract), Geological Society of America, Special Paper No. 73 (1963), pp. 249-50; E. C. Allison, "Geology of Areas Bordering the Gulf of California," in Tjeerd H. van Andel and George G. Shor, eds., Marine Geology of Gulf of California (Tulsa: Am. Assn. of Petrl. Geologists, Memoir 3,

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30. Kennan, op. cit., note 27, p. 14.

31. R. Boeth, et. al., "Western Water Fight," Newsweek, June 12, 1978, pp. 49-55; Anon., "The Mighty Colorado--an Ailing Giant?", U. S. News and World Report, June 19, 1978, pp. 52-55; J. Boslough, "Rationing a River," Science 81, June, 1981, pp. 26-37; A. F. Pillsbury, "The Salinity of Rivers," Scientific American, Vol. 245, No. 1 (1981). pp. 63-65.