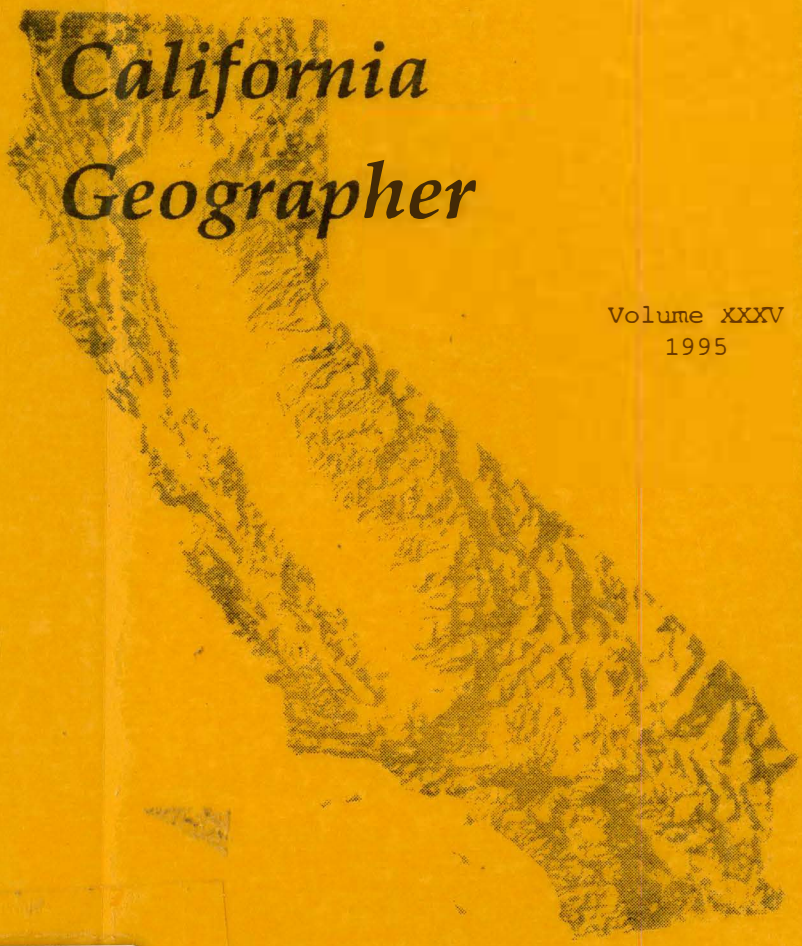
The California Geographer



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Golden Anniversary Publication of the
CALIFORNIA GEOGRAPHICAL SOCIETY

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From the Editor

The present volume is a celebration of 50 years of existence of the California Geographic Society. The Society's first incarnation, the California Council of Geography Teachers, was born in a tea-room in Westwood Village in December 1946 [Carthew, 1965, 11]. The Council's early publication, the Newsletter, grew into the Bulletin in 1953, but a need for a printed yearbook led to the publication in 1960 of Volume I of The California Geographer [Frazer, 1980, 3]. The CCGT underwent a name change to the California Council for Geographic Education in 1969, and became the California Geographic Society in 1984, in which form it continues to promote geography enthusiastically and energetically throughout the state and beyond.

In commemoration of our first half century, it was decided to re-publish a selection of significant articles from previous Volumes of The California Geographer, since back copies are somewhat scarce, and since many of our contemporary members and friends were not around in earlier years.

Thirty-four volumes of research, scholarship and commentary - how can one make a representative selection from such an *embarras des richesses*? First, it was decided to omit the most recent decade, reasoning that these copies of the journal are relatively accessible. This left a "mere" 25 volumes, containing 194 articles, not including book reviews, bibliographies, reports of meetings and other sundries. The review of these volumes led to some insights worth sharing.

Who was our most prolific author? Setting aside the eight bibliographies of the indefatigable Robert W. Durrenberger, the honor is shared among the stalwarts : Richard E. Preston [6 incl.2 joint author], Christopher L. Salter [5 incl.1 joint author], Donald R. Floyd [4], and Norman Thrower [4].

The invaluable "Cumulative Index" [Floyd, 1989] and the earlier Index [Peetz & Holtgrieve, n.d.-1977?] include a topical listing of articles, which reflects an intriguing distribution. Comparison of the two shows where the research emphasis has lain throughout the history of The California Geographer. Historical Geography articles are twice as numerous as the next topic - Educational Geography - with significant concentrations also in Cultural,

Agricultural, Economic, and Urban Geography, as well as in Physical Geography, when the separate branches are combined. See Table 1.

An agonizing first pass produced a short list which would have filled four volumes, and still had significant omissions. Who can forget the Zierer Festschrift comprising half of Volume VIII [1967]? Or the gorgeously colored "Climates of California" map accompanying James [1966]? Non-California articles were eliminated. Attrition led to the reluctant setting aside of such gems as Thrower on geomorphology in Strabo's Geography [1964], or Spencer's discourse on the comparative morphology of pre-Communist and Communist society in China [1962]. Length also excluded the study by Lin & Bland of variation in photochemical smog concentrations in Los Angeles County [1980], as well as Josif's dissection of the location of Interstate highway 40 [1978]. Reproduction problems ruled out the cultural studies of Russians in Sacramento [Hardwick, 1979] and Buddhist landscapes in California [Fellows, 1972]. Ruthlessly, grapes, salmon, deserts, perceptions, education, Yosemite, biogeography, ranchos, and more were also set aside.

All this does not, of course, totally explain the ultimate selection of the present Volume, for which I take entire responsibility, secure in the knowledge that probably every reader of the present volume will have at least one favorite piece which they will feel has been unjustly omitted. I therefore urge readers to go back to your old copies, or seek them out in a library. You will find many hours of fascinating and rewarding reading.

Ray Sumner
Guest Editor, Golden Anniversary Volume XXXV

THE CHINESE ROLE IN THE MAKING OF THE EARLY CULTURAL LANDSCAPE OF THE SACRAMENTO-SAN JOAQUIN DELTA

*Daniel D. Arreola**

The decline of gold mining in California in the 1860's left a great number of Chinese laborers in search of alternate futures. Between 1863 and 1867, the Central Pacific Railroad absorbed a large portion of this labor force.[1] After 1867, reclamation and irrigation projects were undertaken primarily with Chinese labor. In addition, the Chinese began to provide California farmers with manual labor for a variety of agricultural crops. These activities, particularly land reclamation and agricultural labor, brought the Chinese into various areas of the Sacramento-San Joaquin Delta.[2] They became firmly established in river Chinatowns in the Delta during the twentieth century, and relics of this early occupance are found in the Delta country today.

THE CHINESE IN THE DELTA

The Chinese movement to and occupance of the Delta is in many ways reflective of the greater history of the Chinese in California. The hearth area in Southeast China from which most Chinese emigrated was principally a rural landscape. In most cases, however, Chinese immigrants arriving in the host environment settled in the urban centers of the Pacific west coast.[3] For many, the urban center acted as a home base from which they departed to participate in rural labor projects, returning to the city at the close of a job.[4] Between 1850 and 1882, the Chinese were seen throughout California, working in the countryside in small migrant camps.[5] Many of the Chinese bonded into local concentrations and eventually occupied distinct quarters in various California rural communities.[6]

The immigration of Chinese to California was closely associated with district ties in heart areas of Southeast China. Lyman has characterized this process as "group immigration," that is, Chinese immigrants arriving in California were representative of particular village districts in Kwangtung, China.[7] The two districts in Kwangtung from which most of the Chinese in the Delta emigrated were Sze Yup and Chungshan.[8] Sze Yup refers to the people of the "Four Districts" of Sunwui, Sunning (Toishan), Hoiping and Yanping, who are bound by a link of common dialect.[9] Chungshan refer1s to the people of Chungshan district who speak a dialect

which closely resembles standard Cantonese, but which is practically unintelligible to the Sze Yup. In California, the majority of Chinese immigrants have always been Sze Yup.[10] With the decision to reclaim the swamplands of the Delta during the 1850's and 1860's, Chinese, both Sze Yup and Chungshan, were attracted to the area as laborers.

RECLAMATION

The first recorded efforts at reclamation of the Delta were in 1851 when individual settlers attempted small-scale projects in selected areas.[11] In 1852, California Governor McDougal requested that settlers be given the opportunity to secure land on the condition that they reclaim it within a certain period.[12] A new policy of reclamation was embarked upon in 1861, and for the first time, the state became responsible for reclamation which had previously been conducted by individual landowners. During the period of state control, reclaimed areas were designated reclamation districts and an acreage limit (first 320 acres, later 640 acres) was imposed on individual ownership of reclaimed lands. In 1868, however, the responsibility of handling reclamation matters was transferred to county governments and the acreage limits set down earlier by the state were then dropped.[13]

The removal of acreage limits in 1868 prompted a new period in the reclamation process. Large tracts of swampland rapidly came under the control of land agents and corporations. The Tide Land Reclamation Company, under the direction of George D. Roberts, for example, acquired 250,000 acres between 1868 and 1871.[14] Reclamation became the primary concern of the corporations whose existence depended on the availability of laborers willing to work in the swamps for small wages. The Chinese met these requirements.

Chinese laborers

While some East Indian and Hawaiian labor was used in Delta reclamation, the majority of the labor used in early work was Chinese.[15] Driven from the gold mines of the Mother Lode and attracted by the prospect of work, Chinese began to move into the Delta as laborers in reclamation projects. During the 1870s, Ratzel noted that Chinese were widely employed in the reclamation of the "tule lands" of the Delta.[16] In 1876, Brooks commented on the role of the Chinese in such projects.

> Chinamen reclaim these lands; they build levees; they patiently work in the mud and water where whitemen will not; and as a rule it may be said they "create" wealth for

they do that work which but for them *would not be done at all.*[17]

Besides being numerous, the Chinese worked under a contract system for Chinese bosses.[18] Recruiting of individuals by the reclamation corporations was unnecessary since the employer negotiated directly with the bosses who did all of the hiring, paying and firing.[19] Labor gangs of up to a thousand men were distributed throughout the Delta, using shovels and wheelbarrows provided by employers to dam sloughs, cut drainage ditches, build floodgates and pile levees. Rates paid to the Chinese bosses ranged from $.09 to $.25 per cubic yard of material emplaced in levee construction.[20] This amounted to a daily wage of approximately $1, or $25-30 per month for the Chinese laborers.[21] Finally, the Chinese gathered in their own makeshift camps to eat and sleep, further reducing the contractors' expenses.[22]

Levee construction and land preparation

Artificial levees were superimposed on the outer edges of the natural levees.[23] Early construction relied on island tule sod which was highly organic and shrank when dried and set into blocks for fill.

> The sod was removed from the ditch with a great spade, locally a "tule cutter" or "tule knife," and used to face one or both sides of the proposed levee. The material underlying the ditch was tramped into place between the sod block rows or on the inside of the single sod wall. Sometimes the sod blocks were placed in the levees as soon as cut and at other times the blocks were permitted to dry on the ground first. In either case, they were forked into wheelbarrows and taken along planked paths to the levee, where they were fitted or tramped into a firm embankment. [24]

Cracks and surface irregularities developed on the early levees, and wave erosion eventually discouraged the use of this material. Later, mixtures of mineral and organic soils were used. A typical finished levee measured thirteen feet at the base, five feet at the crown and three feet in height.[25]

By the late 1870s, manual and horse power were nearing the limit of practicable employment and alternate means of construction were sought. One continual problem had been the small structure of the early levees. Owing to the methods of construction, early levees were little more than fragile retaining walls which often gave way during the season's first flood. Dredges were introduced in 1870, but were not put to general use until 1876. The clamshell

dredger, devised in the early twentieth century, proved the ultimate in levee construction and was capable of moving fill at a cost of $.03 per cubic yard, or one-third to one-eighth the cost of earlier methods.[26] With the use of dredges, river bottom clay became popular as a surface material on levees. Sand was also obtained with clay to give a more protective surface which did not crack or leak like clay or peat, and it retarded rodent penetration. Dredging also allowed for the construction of massive levees which measured as much as 200 feet at the base and 30 feet high, and which functioned more effectively than earlier works.

Once the land had been reclaimed, the costly and troublesome clearing of tules *(Scirpus lacustrus)* and breaking of virgin organic or mineral-organic soils was necessary. Here again, Chinese labor gained widespread use. Fire was considered the cheapest method of removing tule and was often utilized in the fall after the tules had dried through the summer. Chinese laborers were also used to set fire to peat soil by digging holes in the turf and dropping straw in the holes which was then ignited.[27] Usually a soil depth of three to five inches at a time was fired. This not only helped clear tule and kill pests, but it also liberated potash, adding to the fertility of the soil.[28] Burning of the peat, like burning tule, was a common practice and was justified as a necessary step in bringing the land to cultivation.

Between 1860 and 1920, fully ninety percent of the Delta had been reclaimed.[29] The Chinese had been instrumental in the early reclamation and construction efforts, but by the 1880's they had been replaced by mechanical operations which were cheaper and more efficient. However, reclamation had been undertaken with the intention of leasing reclaimed land. From the earliest days of reclamation, tenant farming developed, and later this was accompanied by crop specialization. The Chinese became very active in the farming process. In addition, the Chinese contract labor system shifted into agriculture and thus ensured the continued presence of the Chinese in the Delta.

AGRICULTURE

The role of the Chinese in early California agriculture is a story of migrant labor and farm tenancy. Brace, in travelling California in 1867, frequently saw Chinese laborers working fruit orchards, and Loomis similarly observed Chinese harvesting hops, strawberries and small fruit.[30] Bowen has noted that during the feverish growth of the Vacaville district in the 1880's and 1890's, gangs of Chinese laborers excavated extensive orchard terraces throughout the English Hills.[31] Coolidge has also remarked that

> ...many immigrants who came directly from farms in China and were not skilled in handicrafts, went directly to the country to engage in vegetable raising, orchard work and general farm work.[32]

Chinese workers began to drift into agricultural district throughout California at a time when growers were beginning to demand a large supply of cheap labor to work in fields and harvest crops. By 1886, the Chinese comprised over seventy-five percent of the state's agricultural laborers.[33]

Chinese agriculturalists in the Delta

Of those Chinese who lingered in the Delta after reclamation, some were farmers who came with the intention of buying and tilling small tracts of land such as they had known at home.[34] However, there had never been any widespread interest on the part of Delta landowners in subdividing and selling. Rather, owners chose to rent, lease on shares, or assign the land to managers. This proved more convenient and profitable for the landowners, who had no desire to live in the Delta.[35]

Land tenancy on a sharecropping basis became an institution in the Delta. At the turn of the century, seventy-five percent of the farmed land in the Delta was tenant farmed and seventy-five percent of the tenant farmers were Orientals.[36] Most of the Chinese who leased land were sharecroppers. Aside from attending the gardens or orchards, the Delta Chinese cut and stored hay, drained water, made boxes or baskets for fruit and performed numerous other services and duties on the farm. The Chinese tenants usually received one-half of the proceeds of the vegetables and two-fifths of the return on the fruit harvested on the leased land.

Small-scale farming and vegetable gardening

Delta agriculture prior to 1900 was considered primarily small-scale farming and vegetable gardening, and not until the twentieth century did it become large-scale, specialized field agriculture. [38] The Chinese were an important part of the farming and gardening process as it evolved in the Delta (Tables 1 and 2).

Table 1: Chinese Farmers in Sacramento County, 1860-1880

Year	Number
1860	3
1870	37
1880*	558

*The figure for 1880 includes farm laborers who worked on farms operated by the Chinese.

Table 2: Chinese Vegetable Gardeners in Sacramento County, 1860-1880

Year	Number
1860	120
1870	72
1880	184

Source: Chiu (1963), p. 76.

George D. Roberts commented, in 1881, on Chinese farming in the Delta.

> *There is a disposition among them [Chinese] to turn their attention to farming. They think it is a more quiet life; they get out of the excitement of the city. Many of them have rented patches and are paying $25 and $30 a year per acre for lands.*[39]

In the 1880s, there were sixty-four Chinese-operated farms in Sacramento County, forty-eight of which were owned and operated on a partnership basis, with two to thirteen partners each.[40] Many other Chinese were involved in vegetable gardening. Smaller in size than Chinese-operated farms, Chinese vegetable gardens, between 1850 and 1860, lined the east bank of the Sacramento River from the city of Sacramento to opposite Rio Vista.[41] Crops grown included sweet potatoes, maize, melons, squash, peanuts and celery In addition, Chinese vegetables such as tubers, greens, beans, bean sprouts and water chestnuts were cultivated.[42] Vegetable gardens were considerably smaller than farms with only one to five persons working each garden. Gardeners maintained outlets for their produce in San Francisco and Sacramento, which were reached by rivercraft that moved along the Sacramento River daily. Annual incomes from these plots were small and most were valued at $500 or less.[43]

Orchard work

In the 1870's, the 9,000-acre Pierson district between Walnut Grove and Courtland was one of the only tracts in the Delta which was completely reclaimed and farmed.[44] Tree crops were the principal land use along the river, with stone fruit such as peaches, apricots, cherries, figs, nectarines, grapes and apples covering the landscape near the levees.

The Chinese operated some of these fruit orchards along the Sacramento River, the land being rented from Caucasian landowners. Most of the Chinese orchards were valued at less than $800, but

four, owned in partnership, were assessed at over $1,000. Usually from fifteen to twenty workers labored in each orchard, with each laborer receiving $10-$16 per month plus board.[45] Also, in the 1870s, Cone found Chinese employed extensively on Caucasian-owned fruit ranches along the Sacramento River. Ranches employed six to ten Chinese year-around, and twice that labor force during the harvest. In winter, the Chinese plowed, pruned, grafted and transplanted. The workers were organized under a Chinese foreman and each worker received $28-$30 a month without board.[46]

In the 1880s, stone fruit orchards along the Sacramento River declined as a result of water seepage through the levees. Pears (Bartlett variety) quickly assumed importance since they were better adapted to existing edaphic conditions than other deciduous fruits. Also, a prime market for pears began to develop on the East Coast. Returns on pear orchards in the vicinity of Courtland and Walnut Grove were $200 per acre in the 1890's, $350 in 1906, $500-$1,000 in the 1920's.[47] The Chinese also worked these fruit orchards, and again under the contract labor system, provided orchard operators with the majority of the labor necessary to prune and harvest.[48]

Ethnic specialization and population concentration

Delta agriculture was characterized from its beginnings by ethnic groups who were identified with particular types of husbandry. Thus, Chinese, Italians and Portuguese were vegetable gardeners, whereas American-born settlers were involved in grain and livestock activities. The Chinese took this specialization one step further: Chungshan Chinese specialized in orchard work, whereas Sze Yup concentrated on potato and onion farming.[49] This ethnic crop association had its antecedents in Southeastern China where Sze Yup had previously been engaged in potato farming and Chungshan had been occupied predominantly with mulberry and other orchard work.[50]

This tendency toward crop specialization was, in turn, reflected in the local concentrations of Chinese in the Delta. By the 1880's, the Chungshan Chinese were localized up the Sacramento River in the fruit district with Courtland at its center. Further downstream, near Rio Vista, the Sze Yup maintained potato patches.[51]

In the 1870's, waterside Chinatowns were scattered along the levees of the Sacramento River (Figure 1). Courtland, founded in 1870, contained a Chinese quarter which burned in 1879 just before its inhabitants had intended to open a clothing factory in the area.[52] After the fire, a new quarter was rebuilt. Also, in 1885, Elliott Village, a Chinatown which had been located on the Sacramento

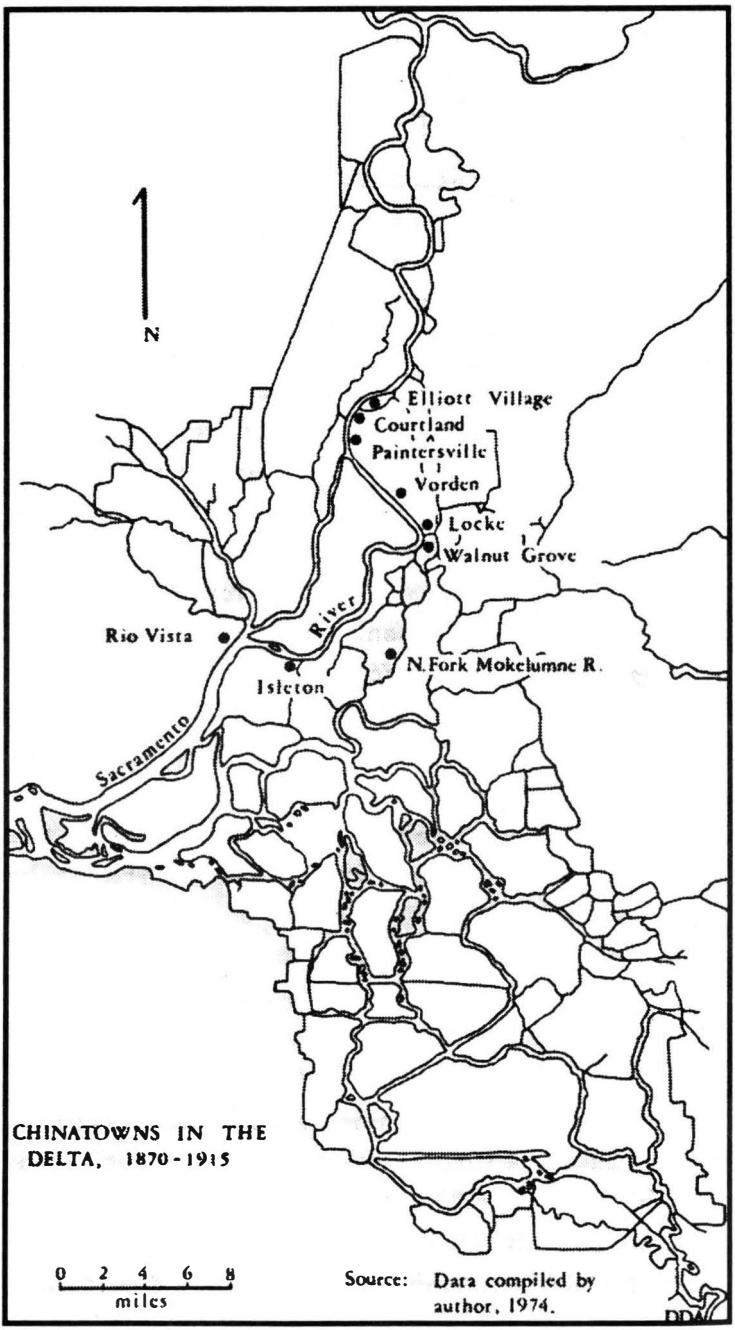

Figure 1. Chinatowns in the Delta.

River just north of Courtland, was completely burned. Many of the Chinese from Elliott Village reestablished themselves in villages on the Deming Ranch near Courtland and at Paintersville between Courtland and Walnut Grove.[53] Rio Vista, settled in 1857, had Chinese as early as the 1880's, and Isleton, founded in 1874, contained concentrations of Chinese during the 1890s.[54]

One of the first Chinatowns in the Delta had been established on the North Fork of the Mokelumne River at a point about six miles south of Walnut Grove. This village was also destroyed by fire in 1885, and the Chinese from this area then located in Walnut Grove.[55] Shortly after the turn of the century, Locke, a new and independent Chinese town, was founded and built just north of Walnut Grove along the Sacramento River.[56]

Chinese exclusion

Between 1850 and 1880, the Chinese were scattered up and down the Sacramento River, laboring in reclamation crews, working vegetable gardens and fruit orchards, and residing in Chinese quarters in various small river communities. However, an economic depression which hit California during the 1870's fostered a sense of discontent with Chinese agricultural labor.[57] Unemployment among the general population and the Chinese presence as cheap laborers aggravated the problem and soon resentment against the Chinese turned to terrorism and violence.

Growing fear among the Chinese was reflected in a drop in the Chinese population in the state between 1890 (71,066) and 1900 (40,262).[58] Those who could afford to, returned to China, many others departed for the East Coast, while still others sought refuge in the crowded settlements of the large cities of Central California. In Sacramento County, the Chinese population of the time mirrored this statewide decline and gave evidence of the situation in the Delta region in general. In 1890, the Chinese population of Sacramento County numbered 4,371 and by 1900, this total had fallen to 3,254.[59] With the increase in anti-Chinese attitudes and the passage of the Exclusion Act of 1882, Chinese farm laborers in Sacramento County fell from 668 in 1870 to 218 by 1880.[60]

Although the number of Chinese immigrants allowed into California had dropped and many of those who had lived and worked in the Delta began to move away from the area, a small number of Delta Chinese persisted. They began to concentrate in the small river communities about halfway between Sacramento and Antioch. At the turn of the century, a new phase of agricultural activity focused on asparagus production became widespread throughout the Sacramento River area of the Delta. This new period

marked the passing of the early Chinese occupance of the Delta and ushered in a period of bustling activity based on the river Chinatowns of the region.

SUMMARY

During the mid-nineteenth century, many Chinese immigrants found work as laborers in the reclamation of the Sacramento-San Joaquin Delta. Between 1850 and 1880, the Chinese as laborers and tenant farmers, were primary agents in the molding of the early cultural landscape of the Delta. Although Chinese exclusion in 1880's forced many Delta Chinese from the region, some persisted and collected in a number of small Sacramento River communities.

These communities became the basis of the Chinatowns which flourished during the twentieth century as the Chinese influence in the Delta passed into a new phase of activity.

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NOTES

1. Ping Chiu, *Chinese Labor in California, 1850-1880* (Madison: State Historical Society of Wisconsin, 1967), p. 9.
2. George Chu, "Chinatowns in the Delta: The Chinese in the Sacramento-San Joaquin Delta," *California Historical Society Quarterly,* vol. 49 (1970), pp.23-25
3. Sen-Dou Chang, "The Distribution and Occupations of Overseas Chinese, *Geographical Review,* Vol. 58 (1968), p. 102.
4. Victor G. Nee and Brett de Bary Nee, *Longtime Californ': A Documentary Study of an American Chinatown* (New York: Pantheon Books, 1972), p. 22; A.W. Loomis, "How Our Chinamen Are Employed," Overland Monthly, Vol. 2 (1869), p.231.
5. Theodor Kirchhoff, *Californische Kulturbilder* (Cassel: T. Fischer, 1886), pp. 336-376.
6. Book Club of California, *Cathay in Eldorado: The Chinese in California* (San Francisco: Book Club of California, 1972).
7. Stanford M. Lyman, "The Structure of Chinese Society in 19th Century America," Unpublished Ph.D. dissertation, University of California, Berkeley, 1961, p. 41.
8. Chu (1970), p. 27.
9. Thomas W. Chinn (ed.), *A History of the Chinese in California: A Syllabus* (San Francisco: Chinese Historical Society of America, 1969), p. 3.
10. Chinn (1969), p. 20.
11. Doyle Roberts, "A History of the Reclamation of the Delta Lands~of California," Unpublished Master's thesis, University of the Pacific, 1951, p. 31.
12. Zoeth Hidredge, *History of California,* Vol. 4 (New York: The Century Company, 1915), pp. 307-308.
13. John Thompson, "The Settlement Geography of the Sacramento-San Joaquin Delta, California," Unpublished Ph.D. dissertation, Stanford University, 1957, pp. 196-198.
14. Thompson (1957), p. 226.

15. Charles Nordhoff, *Northern California, Oregon and the Sandwich Islands,* (New York: Harper and Brothers Publishers, 1874), p. 130. Julian Dana, *The Sacramento: River of Gold* (New York and Toronto: Farrar and Rinehart, Inc., 1939), p. 162.
16. Paul S. Taylor, "Foundations of California Rural Society," *California Historical Society Quarterly,* Vol. 45 (1945), p. 206. Friedrich Ratzel, *Die Vereinigten Staaten von Amerika,* Vol. 2 (Munchen: Druck und Verlag von R. Oldenbourg, 1893), p. 246.
17. Benjamin S. Brooks, "The Chinese in California," Report delivered to the Committee on Foreign Relations of the U.S. Senate, San Francisco, 1876, n.p.
18. Nordhoff (1974), pp. 130, 143-144.
19. George F. Seward, *Chinese Immigration* (New York: Charles Scribner and Sons, 1881), p. 132. Chu (1970), p. 24.
20. Thompson (1957), pp. 212, 260-261, 490.
21. Chiu (1963), p. 72.
22. Nee and Nee (1972), p. 20.
23. George A. Atherton, "Reclamation and Development in the Sacramento-San Joaquin Delta," *Agricultural Engineering,* Vol. 12 (1931), pp. 129-130.
24. Thompson (1957), p. 240.
25. Chu (1970), p. 25.
26. Thompson (1957), p. 272.
27. Nordhoff (1974), pp. 130-131.
28. Walter W. Weir, "Subsidence of Peat Lands of the Sacramento-San Joaquin Delta, California," *Hilgardia,* Vol. 20 (1950), p. 51.
29. Thompson (1957), p. 219.
30. Carey McWilliams, *Factories in the Fields: The Story of Migratory Farm Labor in California* (Boston: Little, Brown and Company, 1939), p. 66. Loomis (1869), pp. 233-235.
31. William A. Bowen, "The Evolution of a Cultural Landscape: The Va liE Fruit District of Solano County," Unpublished Master's Thesis, University of and California, Berkeley, 1966, p. 168.
32. Mary R. Coolidge, *Chinese Immigration* (New York: Henry Holt and Company, 1909), p. 390.
33. George T. Renner, "Chinese Influence in the Development of the WestE United States," *Annals of the American Academy of Political* and *Social Science,* Vol. 152 (1930), p. 365. Mcwilliams (1939), p. 67.
34. Roberts (1951), p. 51.
35. Edwin E. Cox, "Farm Tenantry in California," *Commonwealth Club of California Transactions,* Vol. 11 (1916), p. 444.
36. California Legislature, "Report on Land Colonization and Rural Credits," Sacramento, November 29, 1916, pp. 43-44.
37. Chiu (1963), p. 78.
38. Thompson (1957), p. 312.
39. Seward (1681), p. 60.
40. Chiu (1963), p. 73.
41. Thompson and West, *History of Sacramento County, California* (Oakland: Thompson and West, 1880), p. 190.
42. Walter C. Blasdale, "A Description of Some Chinese Vegetable Food Materials and Their Nutritive and Economic Value," *U.S.D.A. Office of*

Experiment Stations Bulletin, No. 68 (1899), pp. 9-38.
43. Chiu (1963), p. 75.
44. Walter G. Reed (ed.), *History of Sacramento County California with Biographical Sketches* (Los Angeles: Historic Record Company, 1923), p. 121.
45. Chiu (1963), p. 77
46. Mary Cone, *Two Years in California* (Chicago: S.C. Griggs and Company, 1876), p. 140.
47. Thompson (1957), pp. 359-362.
48. Chu (1970), p. 32.
49. Chu (1970), p. 27.
50. Betty L. Sung, *The Story of the Chinese in America* (New York: Collier Books, 1967), p. 19. Glenn T. Trewartha, "Field Observations of the Canton Delta of South China," *Economic Geography,* Vol. 15 (1939), p. 8.
51. Chu (1970), p. 28.
52. Thompson and West (1880), p. 220.
53. *Stories of the Sacramento River Delta,* n.p., n.d., Bancroft Library, p. 14.
54. Chinn (1969), p. 59. Chu (1970), pp. 27-31.
55. *Stories of the Sacramento River Delta,* p. 14.
56. Daniel D. Arreola, "Locke, California: Persistence and Change in the Cultural Landscape of a Delta Chinatown," Unpublished Master's thesis, California State University, Hayward, 1975.
57. C.W. Brooks, "The Chinese Labor Problem," *Overland Monthly,* Vol. 3 (1869), pp. 407-419. J.R. Dodge, "Chinese Labor in Agriculture," *U.S.D.A. Reports, Executive Documents, U.S. House of Representatives, Third Session, Forty-first Congress* (1870), p. 574.
58. Allyn C. Loosley, "Foreign Born Population of California, 1848-1920," University of California, thesis, 1927, p. 34. Reprinted by R & E Research Associates, San Francisco, 1971.
59. Coolidge (1909), p. 503.
60. Chiu (1963), p. 82.

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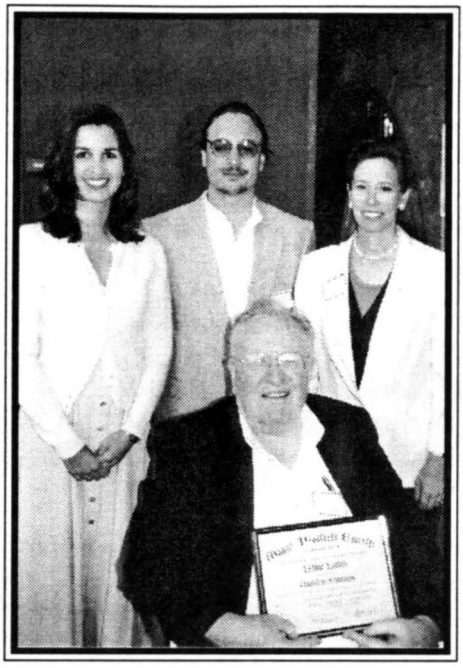

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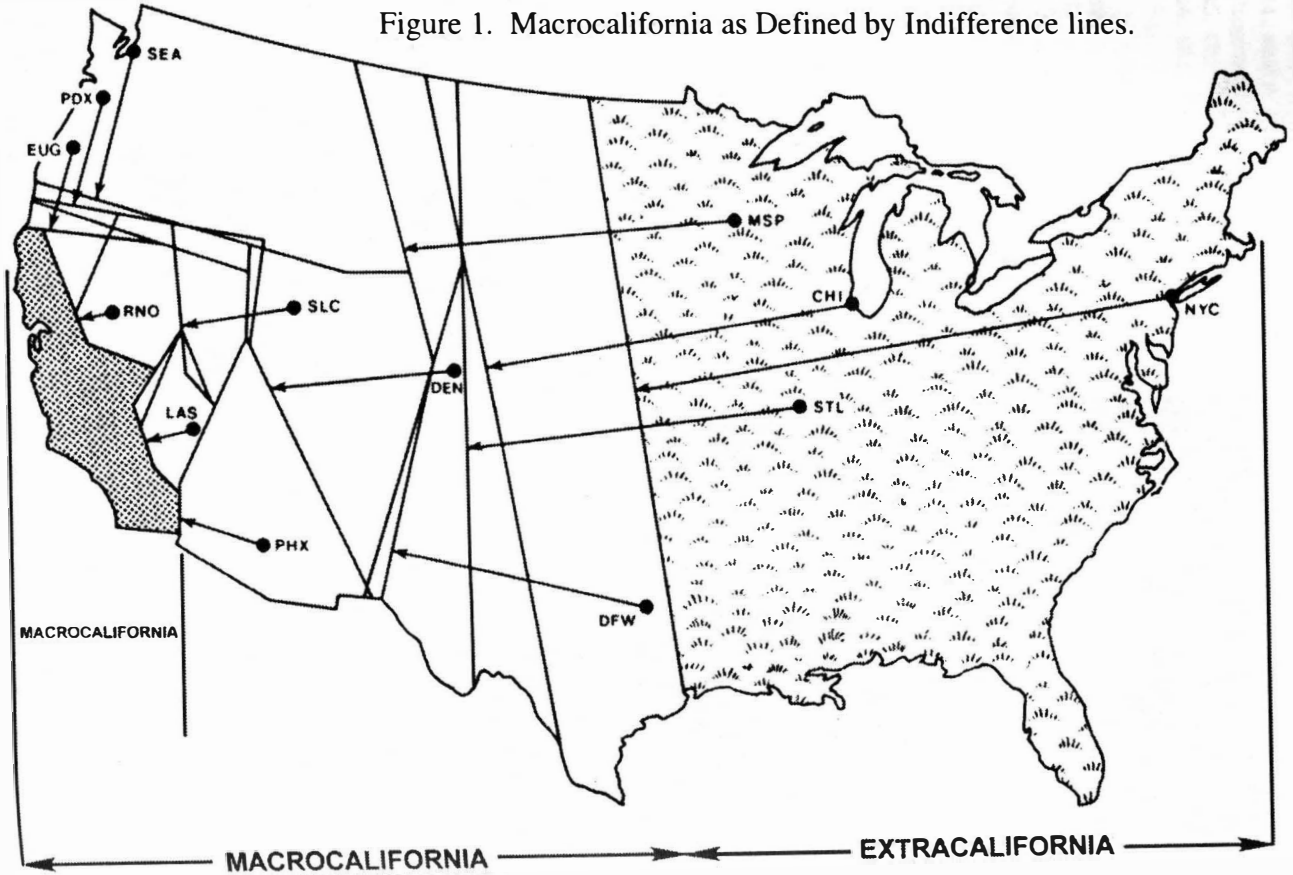
Photo by: Richard Raskoff

Figure 1. Macrocalifornia as Defined by Indifference lines.



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MACROCALIFORNIA AND THE URBAN GRADIENT

*Harold M. Elliott**

Buridan's ass is a classic example of the dilemma of indecision. In a story originating with Aristotle, but usually attributed to the late medieval French philosopher Jean Buridan, a donkey once found himself located between two bales of hay lying at identical distances to his right and to his left. Unable to decide between the equally attractive bales, the unfortunate animal starved to death.[1] In other situations like this there is a more prudent course of action. In the absence of prior information leading a person to prefer one alternative over another, the rationally justified procedure is random choice.

Indifference Lines

In geography, the problem of choice without preference finds expression in the indifference line. Such lines are used to measure the spatial reach of cities and to identify boundaries between competing market areas. When individuals plan shopping trips they often must decide between alternate destinations. If, after considering such things as time and effort, they find that they have no particular preference between two different cities, then their location between the two cities straddles what is called an indifference line. In such cases it is usually said that they have feelings of indifference toward both cities.

Indifference lines are often defined as the midpoint between two places. Buridan's ass was located on just such a line. If human beings acted like Buridan's ass we might expect to find starved bodies lying at irregular intervals along each of these indifference lines. However, people are not usually this indecisive and along each line random choices are made. Huff has considered such lines and sees them as 50% probability lines.[2] Right on the indifference line half the people are likely to choose one city and half will choose the other. Farther away, the probability that people will cross over the line for a trip to a market center on the other side decreases. Indifference lines have also been called lines of equilibrium, where the gravitational forces of one city are balanced by the gravitational forces of surrounding cities. Even though a given city's influence actually extends beyond these lines, into the

territory of adjacent cities as it were, its influence is greatest within the lines.[3]

Larger places are often seen as having greater attraction. However, attractiveness is an elusive quality and characteristics other than size are often part of it. Where two places are of unequal attractive power the indifference line between them will be curved away from the place with the higher level of attraction.[4] In the special instance where two places are of equal attractiveness, the line between them will be straight.[5]

Indifference lines have many uses in geography and several new ones will be explored here. The first such use involves the various levels of influence California exerts outside the state and how far this influence might extend. The second involves the connections and paths of influence that exist between California cities and other cities beyond California.

Indifference Lines and Economic Functions

Market area boundaries can be drawn between competing firms, between competing cities, and even between competing states. California is usually defined by its political border. Another definition involves indifference lines and the hypothetical areas of influence they separate. Individuals, ideas, and artifacts are both attracted to and emitted from the cities of California along various well-known channels of movement. California's attractive and emissive qualities are strongest within the state's area of influence and weakest beyond it. This area of influence and its many levels of intensity can be identified by the multiple lines of indifference that separate California cities from cities farther east.

As has been established in studies of threshold, range, and economic hinterlands, higher order functions are increasingly concentrated in successively larger central places, and a greater variety of goods and services can be found in larger central places than in smaller ones.[6] Size and function are thus positively related. If higher order functions with higher thresholds tend to be located in larger central places, then it follows that there are some functions whose thresholds are so high that they can only be met in the largest central places. There are also some functions whose thresholds are so high that their minimum ranges extend beyond individual places and include the entire nation. Such functions survive (or survive best) in a system's largest central place. In the United States most, though not all, of these highest order functions can be found in New York, the highest order central place in the country. They include such things as the diamond market, Wall Street, specialized retail facilities, rare services, and much of the nation's

best talent in law, medicine, advertising, corporate management and the arts. At the highest functional level, then, New York's hinterland stretches across the entire nation. Individuals wishing access to these highest, or first, order functions must either travel to or communicate with New York. They may also have things shipped or transmitted to them from New York.

If all economic and cultural functions in the United States were listed in rank order from highest to lowest threshold, it could be shown that all or most functions exist in the nation's primate city and that only a few of the lowest order functions exist in the nation's smallest cities. At the lower end of the scale many such lists can be found in the literature.[7] Immediately below these first order functions existing only in the primate city are the second order functions existing in both the primate city and the second largest city. Individuals wishing access to these second order functions must travel to either the primate city or the second largest city. If we assume that the attractiveness of both the largest and the second largest city is the same with respect to second order functions, then the indifference line between the two cities will be straight and will lie halfway between them.[8]

Macrocalifornia and Microcalifornia

Figure 1 shows the indifference line separating New York from Los Angeles, the nation's second largest metropolitan area. Since the 1975 population of the Los Angeles Standard Consolidated Statistical Area (SCSA) was well over 10,000,000 this can be called the 10M indifference line. Individuals wishing access to goods and services existing only in urban areas of 10,000,000 and above must look for them either in New York or Los Angeles. Take, for example, the case of Dallas, which in Figure 1 is located just to the west of the New York-Los Angeles, indifference line. Residents of Dallas who wish access to second order (10M) goods and services (those available only in New York and Los Angeles, but not in Dallas) must seek them in one of these two larger centers. Because Los Angeles is closer (in physical distance, though not in other kinds of distance) there is a higher probability that they will be sought or obtained in Los Angeles instead of New York. Therefore, at least for second order (10M) goods and services, Dallas and other places west of the New York-Los Angeles indifference line are within the orbit of what might be called Macrocalifornia.

To the east of this line second order goods and services are more readily obtainable in the closer city of New York and individuals are more likely to seek them there than in Los Angeles. This area can thus be called Extracalifornia, since it is here that the

influence of California cities becomes minimal. Most of the cities in the nation do not share an indifference line with a California city. Some do, however, and when they are brought into the calculation their presence causes the boundary of Macrocalifornia to shift westward.

Just as there are second order functions available in the largest and the second largest central places in the nation, so also are there third order functions available in the largest, second largest, and third largest central places. In the United States the third largest central place is the Chicago SCSA (over 7,600,000 in 1975). Figure 1 shows the 7.6M indifference line, separating Los Angeles and Chicago, just to the west of the 10M indifference line separating Los Angeles and New York. Between these two lines the influence of California is low, although it is higher than in Extracalifornia. Second order goods and services (available only in the 10M cities of New York and Los Angeles) will be sought in Los Angeles, while third order goods and services (available only in the 7.6M cities of New York, Los Angeles, and Chicago) will be sought in Chicago, since Chicago is nearer. All other lower order goods and services desired by individuals located within this zone will be sought in beyond-California cities like Dallas, St. Louis, and Minneapolis.

As smaller and smaller urban areas are added to the map, the accompanying indifference lines mark off the boundaries between places where successively lower and lower order functions become available. The Dallas-Los Angeles indifference line marks off the boundary between this California city and the nearest non-California city where goods and services available only in places of at least 2,500,000 (the population of the Dallas-Ft. Worth SMSA in 1975) can be found. The Portland-San Francisco and the Phoenix-San Diego indifference line mark off the boundary between California cities and the nearest non-California city where things available in places of at least 1,000,000 can be found.

Eventually the indifference lines will identify a third region, Microcalifornia, by retreating west of the Sierras and south of the Siskiyous. When city sizes reach the level of approximately 100,000, all subsequent regions marked off by the indifference lines of smaller and smaller central places lie completely within California. At this point the influence of California and its central places becomes total. A listing of all the indifference lines used to delineate Macrocalifornia at its various levels of intensity appears in Figure 2. By themselves these lines are not particularly significant. However, they do lead directly to a new conception of how urban systems in the United States might be arranged.

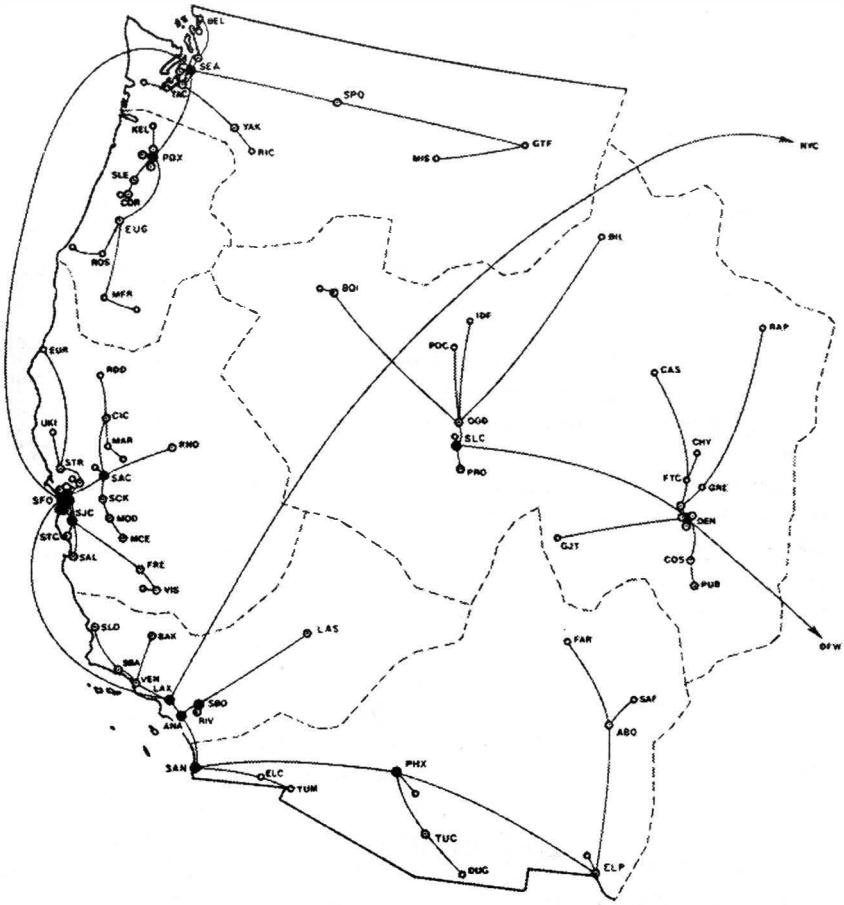
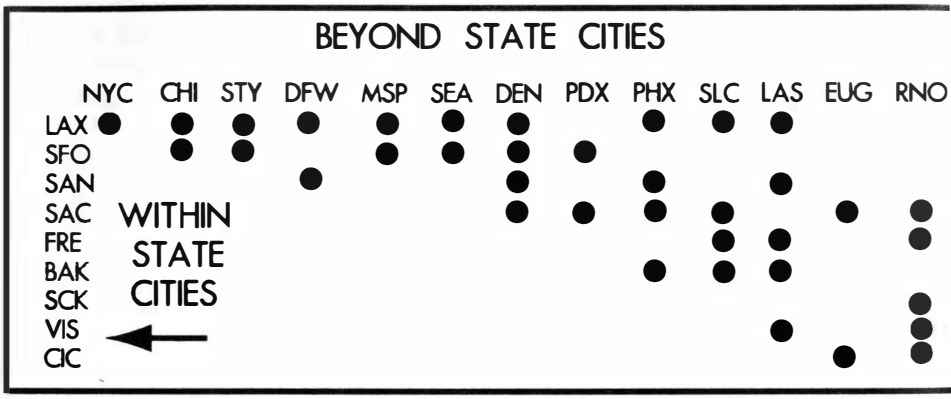


Figure 3. 1M Cantons in the Pacific Coast-Rocky Mountain Region.

Figure 2. Cities Sharing an Indifference Line with California Cities.



Christaller and the Indifference Line

Indifference lines also play a role in the Christaller System.[9] In Christaller's K=3 hierarchy lower order central places are located at indifference points between three larger centers and in the K=4 hierarchy they are located between two larger centers. In the K=7 hierarchy six lower order central places are located on one side of an indifference line separating three larger centers. In the K=3 system Christaller argues that since individuals in lower order centers are equidistant from three higher order centers, they will gravitate with equal intensity toward all three larger centers for those higher order goods and services that are not available locally. At the same time, one of these higher order centers is larger than the other two and it is to this center that people will travel when they have a need for the highest order goods and services.

Surrounding each central place in the Christaller system there is a nested series of concentric hexagons that define that central place's field of influence.[10] Each one of these successively smaller hexagons is an indifference line. Each one also happens to coincide with the location of lower order central places. The outer hexagon defines the area within which people will travel for the highest order functions. The inner hexagon defines the area of travel for the lowest order functions.

In Figure 1 the New York-Los Angeles indifference line is the equivalent of a single outer hexagon in the Christaller system while the indifference lines delineating Microcalifornia are the equivalent of several inner hexagons. Every city in the United States is surrounded by these concentric zones of influence. However, unlike the Christaller pattern, they are not, nor are they ever likely to be, hexagonal or regular in nature. Instead, they form irregular wedges and polygons that share sides at many points in

the hierarchy. A brief exercise with the Proximal Map elective in SYMAP, where cities are added one at a time (from largest through smallest) to a number of separate computer runs, will confirm this observation.

Displaying the results of such a procedure is difficult, however, and the complete picture of these nested and overlapping polygons is chaotic and virtually impossible to decipher. Fortunately, there is another way of looking at the patterns formed by indifference lines. This way is provided by the closely related nearest larger neighbor method, which follows directly from the spatial patterning of indifference lines.

The Nearest Larger Neighbor Method

Note in Figure 1 that Dallas lies to the west of the New York-Los Angeles indifference line. This means that for goods and services available only in urban areas of 10,000,000 or larger, people in Dallas will find their nearest source in Los Angeles. Note also that Dallas is to the east of the Chicago-Los Angeles indifference line. This means that for goods and services available only in urban areas of 7,600,000 or larger, people in Dallas will find their nearest source in Chicago, There are no other cities that are larger than Dallas and nearer to Dallas than Chicago.[11] Chicago is therefore Dallas' nearest larger neighbor. Anything not available in Dallas must be sought first in Chicago (assuming that the choice to do without is not made). If the desired good or service is not available in Chicago, people in Dallas will seek it in their second nearest larger neighbor, Los Angeles. If it is not available in Los Angeles, it must be sought in New York, the highest order central place in the nation and Dallas' third nearest larger neighbor. If it is not available in New York, it doesn't exist.

A hierarchy of nearest and subsequent nearest larger neighbors can now be envisioned for every city in the nation. Just as Dallas is part of a hierarchy that includes New York, Los Angeles, and Chicago, so also is every other city part of a similar hierarchy. If things are not available locally, they must be sought in a nearest larger neighbor. The lines connecting a city with its primary, secondary and subsequent nearest larger neighbor are called nearest larger neighbor axes. Macrocalifornia can now be defined by a hierarchy of nearest larger neighbor axes. Every city west of the New York-Los Angeles indifference line has Los Angeles on one of its nearest larger neighbor axes. West of the Sierras, in Microcalifornia, all axes save the highest one extending to New York are located within the state. Beyond Macrocalifornia there is Extracalifornia, where nearest larger neighbor axes extending into

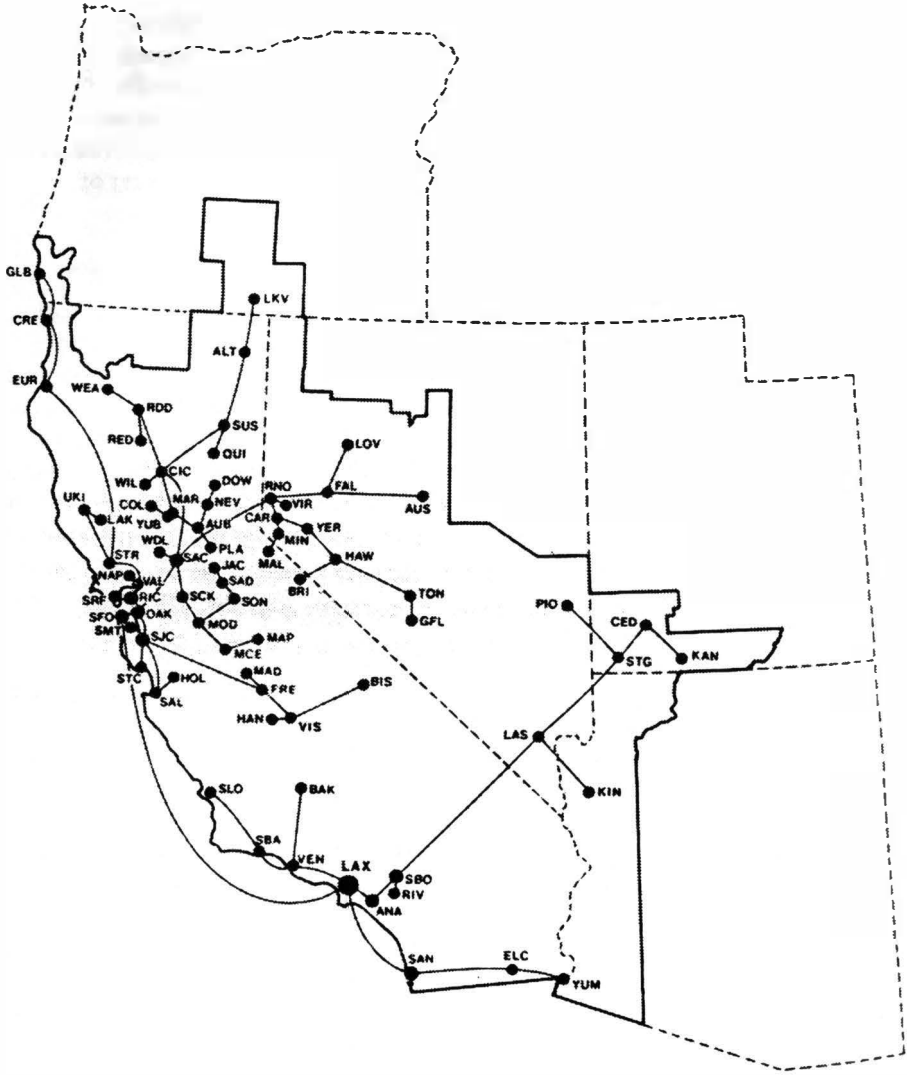


Figure 4. Macrocalifornia as Defined by .9M Cantons.

California are absent.

The Urban Gradient

Figure 3 shows the primary nearest larger neighbor hierarchy in California and the eleven western states, as derived from county and metropolitan populations in the 1970 census. Since this hierarchy focuses primarily on cities it can be called the urban gradient. All cities located in counties with populations greater than 50,000 are shown on this map. Hollow circles indicate places between 50,000 and 100,000. Circles with dots indicate places between 100,000 and 500,000. Solid circles indicate places above 500,000. The county seat, or the largest central place in each county, is connected by a line with its nearest larger neighbor. Places within 10% of each other in population are considered to be the same size. This urban gradient, or capillary system, identifies all the nearest places where higher order goods and services are likely to be available. Only the primary axes appear on this map. Axes connecting each city with its second, third, fourth, or higher nearest larger neighbor are not shown.

The logic of the indifference line requires that on the average consumers patronize the closest centers offering the goods and services they need. Although agreement is not universal,[12] many investigators support this rule.[13] It is a rule, however, that should always be stated in the probabilistic terms favored by Huff and Pred.[14] If something cannot be found in Chico, for example, a likely and reasonable strategy is to look for it first in Sacramento, not in Redding or Susanville. If it cannot be found in Sacramento, it is reasonable to look for it next in San Francisco, not in Fresno. Such a strategy is logically sound and conforms to the Principle of Least Effort, an important though not fully appreciated concept.

In Figure 3 the dashed lines, called population divides, separate adjoining regions called nearest larger neighbor cantons. On this particular map, each population divide marks the boundary of a nearest larger neighbor canton associated with an urban area having a population of greater than 1,000,000. They can thus be called 1,000,000 (or 1M) cantons. Note that in the eleven western states there are six such 1M cantons focused on Denver, Seattle, Portland, San Francisco, Los Angeles, and San Diego. All of these cantons are separated from their neighbors by 1M population divides.

As one travels up the gradient, away from the population divide, the size of each central place gets larger and larger. Eventually all such travel terminates in New York. On the west coast, all such travel terminates in Los Angeles, the highest order central

place in the west. In the Great Basin-Rocky Mountain region, all such travel terminates in Denver and its nearest larger neighbor, Dallas.

Cantons are named after their highest order central places. However, each canton can exist at many different scales. For example, at the highest level of abstraction the Los Angeles canton and its nearest larger neighbor gradient covers the entire Pacific Coast and engulfs four of the five smaller cantons referred to above. At this level it can be called (in 1970) the Los Angeles 10M canton since it is associated with a central place having a population of at least 10,000,000 and has a population divide separating it from another central place with a population of at least 10,000,000. It is bounded by the I0M Great Basin-Rocky Mountain population divide, which extends from eastern Montana and central Idaho, through central Nevada and southern Utah, to eastern New Mexico and the extreme tip of west Texas.

Since the highest order central place in this 10M canton is Los Angeles, it also represents another definition of Macrocalifornia. In Figure 1, Macrocalifornia was defined by a series of indifference lines. In Figure 3 it is defined by a series of population divides. The 10M Great Basin-Rocky Mountain population divide defines Macrocalifornia at the I0M level and the IM population divides associated with the San Francisco, Los Angeles, and San Diego cantons define it at the IM level. At a much lower level of abstraction the Los Angeles canton shrinks even more in size. If the population divides for all central places larger than 100,000 were drawn, the Los Angeles canton would become a .IM canton

The cantons of California will now be considered. Figure 4 shows the California urban gradient and the outer boundary of the three California cantons that emerge when the Los Angeles 10M canton is divided into . 9M cantons, based on 1970 SMSA populations. Here, the Phoenix, Portland, and Seattle cantons have been calved off from the larger Los Angeles 10M canton leaving the Los Angeles, San Francisco, and San Diego . 9M cantons. Although they are not shown in Figure 4, the population divides separating the urban gradients of these three California cities from each other are the same as those appearing in Figure 3. In Figure 4 only the outer population divide showing the maximum reach of the California nearest larger neighbor system has been drawn. This outer population divide separates the . 9M cantons of California from the Portland, Denver, and Phoenix . 9M cantons. It also defines Macrocalifornia at the . 9M level.

Figure 4 differs from Figure 3 in that it shows end cities. End cities are the lowest order central places in any given canton and their locations are used to define the population divide. They are

usually found in remote areas and are located nearer to population divides than are higher order centers. As one travels down the gradient, from larger to smaller cities, end cities are the ones found "at the end of the line." Also in Figure 4 the outer population divide has been drawn along the county boundaries separating the end cities of the San Francisco, Los Angeles, and San Diego urban gradients from the end cities of the Portland, Denver, and Phoenix urban gradients. In Figure 3 the population gradients have been drawn along indifference lines separating the various end cities. Note closely in both figures 3 and 4 the population divide between the Los Angeles and the San Francisco urban gradients matches the straightline, a traditional boundary between northern and southern California marked off by the northern borders of San Luis Obispo, Kern, and San Bernardino counties. Note also in both figures how clearly the San-San gap appears. This rural discontinuity in the San Francisco-San Diego megalopolis, which has been described recently in this journal coincides very nicely with both the straightline and the urban gradient.[15]

Empirical Test

What evidence is there that the nearest larger neighbor gradient, population divides, and Macrocalifornia indifference lines correspond to things in the real world? Are people within the San Francisco canton actually oriented toward that city for their higher order goods and services? To test such a hypothesis it would first be necessary to sift through mountains of data to determine the hinterland of each urban area in the nation, much as Ullman did for Mobile in 1943, Harris did for Salt Lake in 1939, and Borchert and Adams 16 did for Minneapolis in 1963.[16] Fortunately something like this has already been done (quite independently) by Rand McNally in their Commercial Atlas and Marketing Guide, which contains a map showing fifty major trading areas in the United States.[17] Each of these regions focuses on a major center of specialized higher order activities like banking, wholesaling, advertising, and corporate decision-making. The boundaries of these major trading areas were drawn along county lines after a lengthy consideration of such factors as physiography, population, economic activities, highway facilities, newspaper circulation, railroad services, suburban transportation, and sales reports.

This Rand McNally system can be used as an empirical standard against which the nearest larger neighbor system can be judged. The agreement between the Rand McNally trade areas and the their corresponding nearest larger neighbor cantons is quite high. Of 408 counties in the eleven western states, 318 (78%) are

placed within the hinterland of the same major city by both classification systems. When this pattern was compared with an even distribution, which might exist if there were only a chance relationship, a chi-square goodness of fit test indicated that the difference was significant at beyond the .001 level. Within California, 56 counties out of 58 (96%) were classified correctly by the nearest larger neighbor method, with only Modoc and Inyo counties being classified differently. In the case of Inyo county and its largest city, Bishop, Rand McNally classified it as part of the Los Angeles trade area, while the nearest larger neighbor method placed it within the San Francisco canton. The disagreement can be attributed to the use of straight-line distances by the computer program used to generate the nearest larger neighbor axes appearing in Figures 3 and 4.[18] Within the larger area of the entire Macrocalifornia urban gradient shown in Figure 4, 69 counties out of 77 (89%) were classified correctly by the nearest larger neighbor method. There is strong evidence, then, that the nearest larger neighbor gradient and the indifference lines that define the retreating boundary of Macrocalifornia accurately describe something that exists in the urban landscape of California and its eastward extension.

Applications

There are several possible applications of the nearest larger neighbor method. The first is highly practical. The nearest larger neighbor gradient is a very efficient way of designing a marketing and wholesaling distribution network, where each smaller subsidiary location is oriented toward its nearest larger neighbor. Many such networks may in fact already be arranged in this chain of command fashion. Another application lies in transportation research. Are airline routes that follow the urban gradient more profitable than ones that connect hierarchically unrelated cities? The answer to this question might be interesting. The nearest larger neighbor gradient might also provide a more realistic criteria for delineating time zones. Perhaps the most significant application of the nearest larger neighbor method lies in historical research, where it has promising applications in central place theory. Such things as bank records, transportation schedules, shipping receipts, and newspaper subscriptions serve as the raw material against which theoretical central place geometries must ultimately be tested. However, as the investigator delves farther and farther into the past, information of this sort quickly disappears. This is a major problem faced by those who study the evolution of central place systems and it has even caused some scholars to advocate the abandonment of central place theory entirely.[19] If geographers

really wish to describe and explain central place hierarchies, it will be necessary to observe how these urban systems have actually evolved through time. The nearest larger neighbor method, which owes part of its inspiration to the dilemma of Buridan's ass, provides a means for investigating their historical development.

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ABQ Albuquerque, NM
ALT Alturas, CA
ANA Anaheim, CA
AUB Auburn, CA
AUS Austin, NV
BAK Bakersfield, CA
BEL Bellingham
BIS Bishop, CA
BOI Boise, ID
BRI Bridgeport, CA
CAR Carson City, NV
CAS Casper, WY
CED Cedar City, UT
CHI Chicago, IL
CHY Cheyenne, WY
CIC Chico, CA
COL Colusa, CA
COR Corvallis, OR
COS Colorado Springs, CO
CRE Crescent City, CA
DEN Denver, CO
DFW Dallas/Ft. Worth, TX
DOW Downieville, CA
DUG Douglas, AZ
ELC El Centro, CA
ELP El Paso, TX
EUG Eugene, OR
EUR Eureka, CA
FAL Fallon, NV
FAR Farmington, NM
FRE Fresno, CA
FTC Ft. Collins, CO
GFL Goldfield, NV
GJT Grand Junction, CO
GLB Gold Beach, OR
GRE Greeley, CO
GTF Great Falls, MT
HAN Hanford, CA
HAW Hawthorne, NV
HOL Hollister, CA
IDF Idaho Falls, ID
JAC Jackson, CA
KAN Kanab, UT
KEL Kelso/Longview, WA
KIN Kingman, AZ
LAS Las Vegas, NV
LAX Los Angeles, CA
LKV Lakeview, OR
MAD Madera, CA
MAL Markleeville, CA
MAP Mariposa, CA
MAR Marysville, CA
MCE Merced, CA
MFR Medford, OR
MIN Minden, NV
MIS Missoula, MT
MOD Modesto, CA
MSP Minneapolis/St. Paul, MN
NAP Naps, CA
NEV Nevada City, CA
NYC New York City, NY
OAK Oakland, CA
OGD Ogden, UT
PDX Portland, OR
PHX Phoenix, AZ
PIO Pioche, NV
PLA Placerville, CA
POC Pocatello, ID
PRO Provo, UT
PUB Pueblo, CO
QUI Quincy, CA
RAP Rapid City, SD
RIC Richmond, CASAC
Sacramento, CA
SAF Santa Fe, NM
SAL Salinas, CA
SBA Santa Barbara, CA
SBO San Bernardino, CA
SEA Seattle, WA
SF0 San Francisco, CA
SAD San Andreas, CA
SAN San Diego, CA
SJC San Jose, CA
SLC Salt Lake City, UT
SAD San Andreas, CA
SAN San Diego, CA
SJC San Jose, CA
SLE Salem, OR
SLO San Luis Obispo, CA
SMT San Mateo, CA
SON Sonora, CA
SPO Spokane, WA
SRF San Rafael, CA
STC Santa Cruz, CA
STG St. George, UT
STL St. Louis, MO
STR Santa Rosa, CA
SUS Susanville, CA
TAC Tacoma, WA
TON Tonopah, NV
TUC Tucson, AZ
UKI Ukiah, CA
VAL Vallejo, CA
VEN Ventura, CA
VIR Virginia City, NV
VIS Visalia, CA
WDL Woodland, CA
WEA Weaverville, CA
WIL Willows, CA
YAK Yakima, WA
YER Yerington, NV
YUB Yuba City, CA
YUM Yuma, AZ

Figure 5. Three Letter City Codes.

NOTES

1. For a detailed account of this problem see Nicholas Rescher, "Choice Without Preference: A Study of the Logic and of the History of the Problem of Buridan's Ass," Kant-Studien, Vol. 21 (1959/60), pp. 142-175.
2. David L. Huff, "A Probability Analysis of Shopping Center Trading Areas," Land Economics, Vol. 39 (1963), pp. 81-90.
3. David L. Huff and James M. Lutz, "Ireland's Urban System," Economic Geography, Vol. 55 (1979), p. 200.
4. Raymond Gambini, David L. Huff, and George F. Jenks, "Geometric Properties of Market Areas," Papers of the Regional Science Association, Vol. 20 (1968), pp. 86-87.
5. Ibid.
6. Brian J. L. Berry and William L. Garrison, "The Functional Bases of the Central Place Hierarchy," Economic Geography Vol. 34 (1958), p. 45; Brian J. L. Berry, Geography of Market Centers and Retail Distribution Englewood Cliffs: Prentice-Hall, 1967), p. 13; Raymond E. Murphy, The American City, and Urban Geography (New York: McGraw-Hill, 1974), p. 58; Michael E. Eliot Hurst, A Geography of Economic Behavior (North Scituate: Duxbury Press, 1972), p. 204; Howard A. Stafford, "The Functional Bases of Small Towns," Economic Geography , Vol 39 (1963), p. 171; John R. Borchert. "The Urbanization of the Upper Midwest, 1930-1960," Upper Midwest Economic Study, Urban Report No. 2 (Minneapolis: University of Minnesota Press, 1963); William L. Garrison and Brian J. L. Berry, "A Note on Central Place Theory and the Range of a Good," Economic Geography , Vol. 34 (1958), pp. 304-311; Brian J. L. Berry, H. G. Barnum, and R. H. Tennant, "Retail Location and Consumer Behavior," Papers of the Regional Science Association, Vol 9 (1962), pp. 65-106.
7. John F. Kolars and John D. Nystuen, Geography, The Study of Location, Culture and Environment (New York: McGraw-Hill, 1974), p. 95; John E. Brush, "The Hierarchy of Central Places in Southwestern Wisconsin," Geographical Review, Vol. 43 (1953), p. 386; Maurice Yeates and Barry Garner, The North American City (San Francisco: Harper and Row, 1980), p.160; Truman A. Hartshorn, Interpreting the City: An Urban Geography (New York: Wiley, 1980), p. 121.
8. One justification for this appears in Raymond Gambini, A Computer Program for Calculating Lines of Equilibrium Between Multiple Centers of Attraction (Lawrence: University of Kansas Center for Regional Studies, (1966), p. 9.
9. Walter Christaller, Central Places in Southern Germany, trans. by Carlisle W. Baskin (Englewood Cliffs: Prentice-Hall, 1966, orig. 1933).
10. This is best illustrated in Harm J.de Blij, Human Geography: Culture, Society, and Space (New York: Wiley, 1977), p. 266.
11. Wattenberg, op. cit., pp. 926-932.
12. Eliot Hurst, op. cit., p. 207; R. G. Golledge, G. Rushton, and W. A. V. Clark,

"Some Spatial Characteristics of Iowa's Dispersed Farm Population and Their Implications for the Grouping of Central Place Function." Economic Geography, Vol 42 (1966), p. 271.
13. Berry, op. cit., p. 10; William Bunge, "Theoretical Geography," Lund Studies in Geography, Series C, Number 1 (Lund: Gleerup, 1966), pp. 151, 159.
14. Huff, loc.cit.; Huff and Lutz, op. cit - p. 198; Allan R. Pred, "Behavior and Location: Foundations for a Geographic and Dynamic Location Theory," Lund Studies in Geography, Series B, Number 27 (Lund, Gleerup, 1967), p. 115.
15. Calvin Wilvert, "San Luis Obispo County: Heart of the San-San Gap," The California Geographer, Vol. 19 (1979), pp. 69-85.
16. Edward L. Ullman, "Mobile: Industrial Seaport and Trade Center," Ph.D. Dissertation, University of Chicago, 1943; Chauncy D. Harris, "Salt Lake City: A Regional Capital," Ph.D. Dissertation, University of Chicago, 1939; John R. Borchert and Russell B. Adams, Trade Centers and Tributary Areas (Minneapolis: University of Minnesota Press, 1963).
17. _____, Commercial Atlas and Marketing Guide (Chicago: Rand McNally, 1980), p. 64.
18. This computer program, called the Nearest Larger Neighbor Algorithm, is available from the author in either FORTRAN or BASIC.
19. John A. Dawson, The Marketing Environment (New York: St. Martin's Press, 1979, p. 190.

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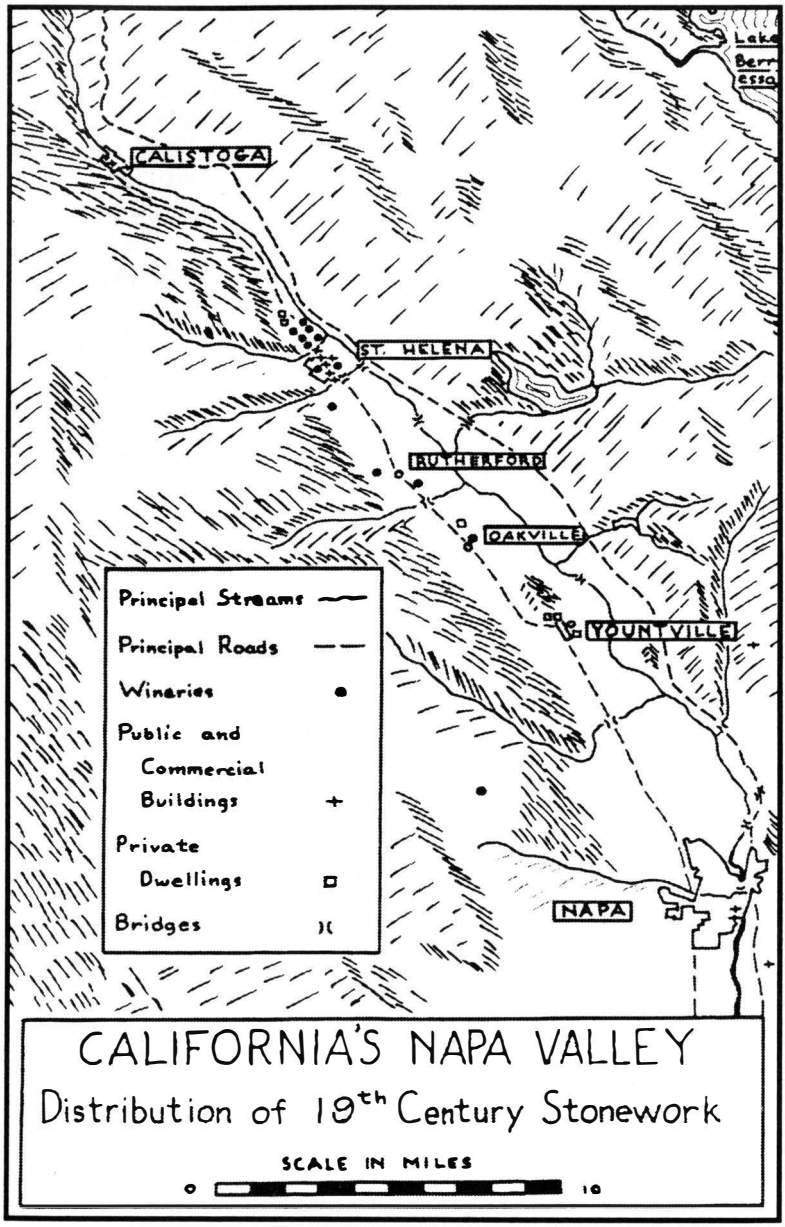
Lake
Berr
essa
CALISTOGA
ST. HELENA
RUTHERFORD
OAKVILLE
YOUNTVILLE
NAPA
Principal Streams
Principal Roads
Wineries
Public and
Commercial
Buildings
Private
Dwellings
Bridges
CALIFORNIA'S NAPA VALLEY
Distribution of 19th Century Stonework
SCALE IN MILES
0
10

Figure 1.

NINETEENTH - CENTURY STONEWORK IN CALIFORNIA'S NAPA VALLEY

ROBERT FREDERICKS
San Francisco State College

California's Napa Valley probably features more functional stone construction, in greater variety, than any comparable area in the western United States. The tradition of fine stone masonry goes deep, with the peak of building activity occurring in the late 19th century. Unique factors uniting harmoniously both natural landscape and pioneer settlement have produced structures of native stone for a variety of uses, but with remarkable consistency of heritage and design.

Stone has been used extensively for private dwellings, public and commercial buildings, wine cellars and distilleries, bridges, fences and resorts. Stone has been gathered up loose from fields and Stream beds, as well as quarried from rich layers of volcanic rock and sandstone in the surrounding hills. And stone structures have thus become a part of the tradition and heritage of the area.

THE NATURAL LANDSCAPE

The Napa Valley is a long, narrow slightly crescent-shaped lowland about 35 miles in length, extending in a general north-west to south-east direction (see Figure 1). The foot of the valley broadens into the lowlands of San Pablo Bay at the south, while Mount St. Helena, 4343' high, blocks the north-west head. On both sides of the valley, and restricting it to an average width of one to three miles, extend the peaks of a Section of California's Coast Ranges. On the west, the southerly heights reach 2375' while on the east more massive mountains attain elevations in excess of 2600'.

The elevation of the valley floor ranges from just 18' at Napa in the south to 419' north of Calistoga at the north-west. The floor of the valley is quite flat, the surface broken only by an occasional isolated hill.

The surrounding mountains are volcanic in origin, and generally date from the Sonoma volcanics of the early Pleistocene period.

An accumulation of flows, agglomerates, tuff and tuffaceous land-laid sediments, later folded and faulted. Well exposed in hills on both sides of the Napa Valley." [1] The presence of easily available natural building stone is noteworthy.

The valley is well-drained by the Napa River, which wends its way through the lowlands from its headwaters on the slopes of

Mount St. Helena. Numerous small tributaries originating in the mountains on either side, some of which are all-season spring-fed streams, flow into the river. Others are active only during periods of rainfall runoff. The stream pattern is generally angular.

Natural vegetation on the valley floor, as well as on the lower slopes of the mountains on either side, is a typical California open pattern of live oaks and seasonal grasses. The natural oaks and grasses give way to coniferous forest of fir and pine at the higher elevations on the east and west, and particularly in the north. The streams and river contribute to occasionally thick brush along their banks.

EARLY HISTORICAL BACKGROUND and LAND GRANTS

When the first Caucasian explorer, Padre Jose Altimira, arrived in the Napa Valley in 1823, he was primarily searching for a suitable site for a mission for the Roman Catholic Church. Because of the somewhat isolated character of the area he decided to recommend the nearby Sonoma Valley region, and it was there that the building of the northernmost mission was begun the same year.

Altimira discovered some three to six thousand Indians of the Wappo tribe living in the valley and the surrounding area at this time. The Wappos were typical primitive Indians of early California, but they did employ an extremely rudimentary agriculture in the lowlands areas. Smallpox and other diseases had virtually eliminated the entire Indian population by 1870.

The first permanent settler was George C. Yount, who obtained a grant of nearly 12,000 acres in the fertile central portion of the valley from the Mexican authorities in 1837. His "Rancho Caymus" became the site for Sebastopol (later renamed Yountville), the first lasting settlement in the Napa Valley.

The same year, Nicholas Higuerra was granted two parcels by the government – "Rancho Entre Napa," which is the site of the present city of the same name, and "El Rincon de los Carneros," located to the south.

Dr. Edward Turner Bale, who married the niece of the Mexican administration governor, General Vallejo, received his interestingly named "Rancho Carne Humana" in 1843. Here, in 1846, he built the first structure in the Napa Valley to employ quarried stone: the millstones used in his early grist mill. Three miles to the south, the town of St. Helena was founded in 1853.

Several other land grants were extended to the early settlers by the Mexican government in the years between 1843 and 1850, when California was removed from the Mexican administration. While the entire Napa Valley was thus claimed prior to statehood,

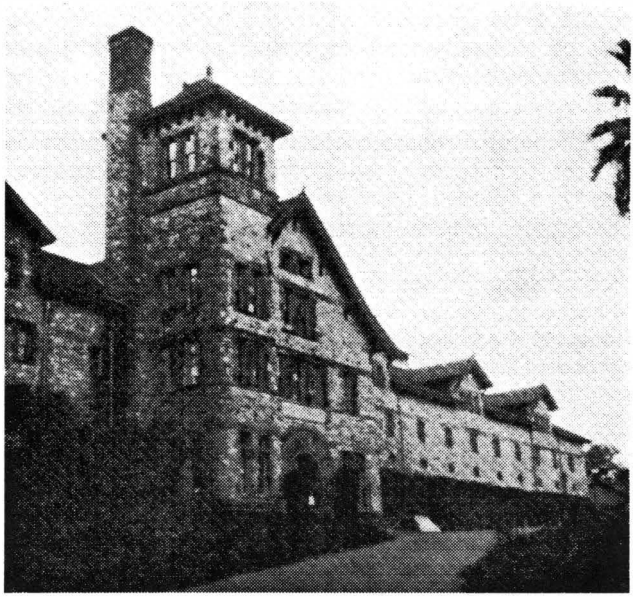

Figure 2
Christian Brothers Greystone Winery

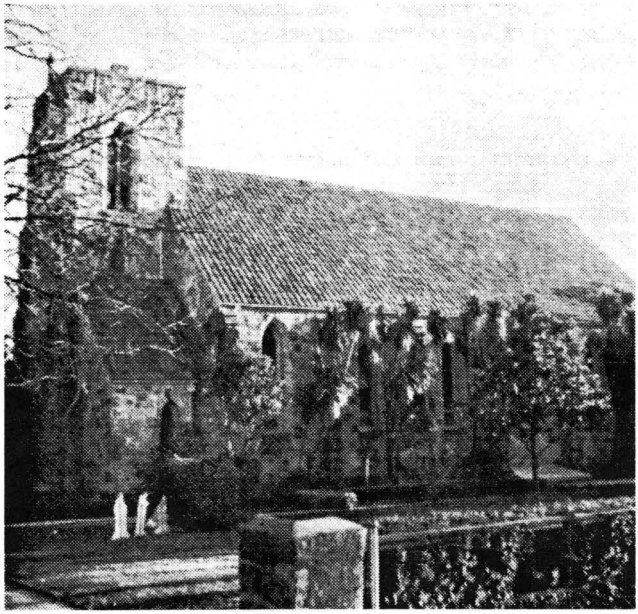

Figure 3
Roman Catholic Church, St. Helena

much of the original early ownership was later disputed under United States authority, and many of the first settlers lost holdings in court litigation.

ECONOMIC DEVELOPMENT

The Napa Valley was recognized by most of the earliest pioneers as agricultural land of great promise. Dr. Bale had grown wheat and erected his famous grist mill shortly after his first coming to the region. George Yount supervised extensive cultivation at his "Rancho Caymus." The rich soil and warm climate seemed conducive to the growing of virtually any crop.

But when Colonel Agoston Haraszthy, a Hungarian nobleman, imported 100,000 cuttings of choice European vines for his vineyards near neighboring Sonoma in 1862 and sold his proven stock to Napa Valley farmers and ranchers the following year, the true foundation for much of the valley's agricultural richness was laid. The entire area soon proved ideal for the cultivation of grape vines, and before long extensive vineyards were planted in the valley and on the surrounding foothills.

Many new settlers soon arrived from the great vineyard areas of Germany, France, Switzerland, and Italy, bringing with them the skills and traditions of their homelands. These pioneers in Napa Valley viticulture realized the need for cool cellars and distilleries. Today, the Napa Valley is one of the richest vineyard areas in the United States.

The northernmost portion of the Napa Valley is one of the most active areas of hot springs and geysers in California.

Sam Brannan, an early California pioneer of many facets, immediately recognized the scenic and commercial value of such an asset. In 1860 he bought the land from an earlier settler, named the locale of greatest hot spring activity "Calistoga" (from "California's Saratoga"), and opened his "Calistoga Hot Springs." The vacation spot soon proved popular with the residents of San Francisco and surrounding cities. The popularity of the area was one factor leading to the building of a railroad traversing the valley from Vallejo north to Calistoga.

The resort at one time featured a bath house and headquarters, built partly of stone, surrounded by small guest cottages. Robert Louis Steven-son, who honeymooned at an abandoned quicksilver mine on Mount St. Helena in 1880, describes the area vividly in his "Silverado Squatters."

Napa Soda Springs, another famous resort, was built on a mountain slope near the eastern side of the valley in 1856, and rebuilt in 1900 following a fire. The hotel rotunda was a massive

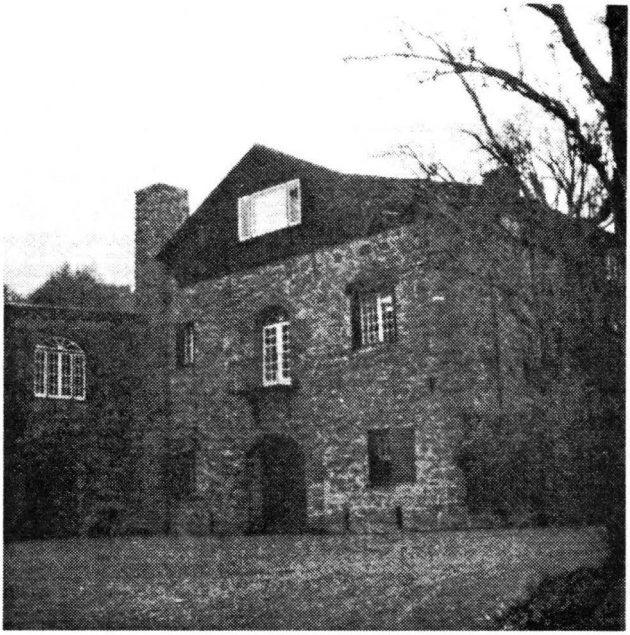

Figure 4
Stone Residence, St. Helena

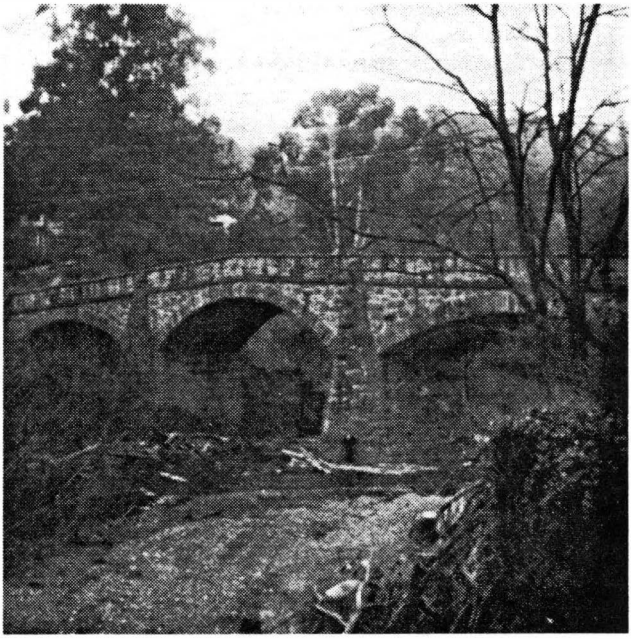

Figure 5
Pope Street Bridge, St. Helena

structure of Stone, and masonry was employed to a considerable extent in other portions of the structure. This property has long been deserted, but the ruins of the hotel still remain.

Extensive deposits of cinnabar ore for the production of quicksilver were discovered in northern Napa County, and in southern Lake County, as early as 1860. Great quantities of the mineral were mined and taken back to the San Francisco area by way of the famous Silverado Trail which skirts the eastern side of the valley. By 1875, the peak of mining activity had passed, and the mines have been operated on a commercial basis rarely since the turn of the century.

NAPA VALLEY STONEWORK

Several key reasons present themselves to explain the prevalence of stone construction in the Napa Valley.

First, the traditions of the settlers. Immigrants tend to bring with them the familiar building methods and architectural styles with which they are familiar. Most of the early settlers of the Napa Valley were from the rural provinces of Europe. They knew the techniques of stone masonry, and their farms and vineyards called for the building of fences, bridges, distilleries and cellars. Many experienced stonemasons were among those in the early stream of immigrants.

Second, the availability of appropriate natural resources. The fact that both sides of the Napa Valley are amply blessed with easily reached, abundantly available volcanic rock and sandstone is a key factor. In addition, a great deal of suitable building stone was available in the fields and stream beds.

Third, the availability of abundant and inexpensive manual labor. Many Chinese were indentured to work in the valley vineyards, and many others to work in the quicksilver mines. Since the mines ceased effective production within a very few years, and since extensive labor supplies were required in the vineyards only on a seasonal basis, ample manpower was usually present for the building of stone projects.

In sum, the Europeans supplied the knowledge and tradition, the "Celestials" furnished the manual labor, and the bountiful hills ringing the valley supplied the appropriate raw materials.

The locations of the various remaining 19th Century stone structures are shown by general types on Figure 1.)

WINERIES

Among the most prominent and numerous stone buildings are the wineries of the Valley. They are nicely described by Anne Roller

Issler in the following terms:

"Architecturally, the old stone wineries are the most interesting feature of the county. Built of 'memorial stone' in the first years between 1865 and 1885 (the first few earlier) ... Covered with ivy, they are scattered throughout the valley; sometimes in the towns, sometimes in the vineyards. Several are very large. The Greystone Winery is said to be the largest in the world. But most of them are smaller structures that might be mistaken for old mills minus their mill wheels."

"The earliest wineries here were built of stone blocks quarried out of nearby bills, many borrowing in architecture from German schloss and French chateau, familiar to the pioneers from Germany, France and Switzerland." [2]

One of the best examples is the Christian Brothers Greystone Winery at St. Helena, shown in Figure 2. This attractive structure, complete with extensive wings, numerous galleries, and a central tower, was built in 1889 and is reputedly the world's largest individual winery. It is built of light grey quarried volcanic stone.

PUBLIC and COMMERCIAL BUILDINGS

Stone construction is used in many early Napa Valley buildings designed for commercial or public use, ranging from a tiny jail-like structure in St. Helena to the imposing County Court House in Napa. Most are carefully built of volcanic rock and sandstone, sometimes of varying color tones for decorative effect.

Commercial and public buildings of stone are largely concentrated in downtown St. Helena, although some exist in the older part of Napa. The traditional architecture of many of these structures has not been preserved and they display false fronts of brick or stucco ... their true heritage revealed only by the unaltered sides and backs of the structures.

A very fine example of this type is the Roman Catholic Church at St. Helena, shown in Fig 3. This church, of color-blended sandstone, was built in 1879. It shows excellent workmanship and is very well preserved.

PRIVATE RESIDENCES

Impressive examples of Napa Valley masonry are not confined to large public and commercial buildings or to wineries. Many private homes, ranging in size from modest homes to substantial mansions, were built during the latter part of the 19th century. An imposing example of volcanic stone, built in 1880, is shown in Figure 4.

Still other stone buildings have changed in function. Small wine cellars and distilleries, store buildings, and even a rock wall

have been converted into private residences.

WALLS AND FENCES

The abundance of natural fieldstone and inexpensive labor combined to produce many miles of stone walls and fences in 19th-century Napa County. Most are of loosely piled rock, although some are more carefully mortared and fitted. A few, such as the remarkable wall surrounding "Grandview" in St. Helena, are very ornate.

Many of the walls and fences have been embellished, either concurrently or at a later date, with columns or other forms of entrance ways. Some pillars and arches are quite elaborate.

Most of the stone fences and walls are in current use, although many are in a distinct state of disrepair.

Natural fieldstone is also found in extensive use for retaining walls and terracing, particularly along the eastern edge of the valley.

NAPA VALLEY STONE BRIDGES

By the turn of the century, Napa County was known as the ''County of the Stone Bridges." Between sixty and seventy public stone bridges were constructed, including some of the largest in the western United States. Some of these bridges have since been replaced by more modern structures of steel and reinforced concrete, but many are still in use and are performing their function admirably. Nearly all are built of quarried volcanic rock or in combination with sandstone, and most show evidence of highly competent workmanship and considerable engineering skill.

The first stone bridge to be built in the area spanning the Napa River was located in the town of Napa in 1860. For at least 50 years stone continued to be the prime building material for bridge construction in the valley. One of the best preserved and most graceful of the structures of the period is the Pope Street Bridge in St. Helena, shown in Figure 5. This attractive bridge was built in 1894 and is in active use today.

THE END OF THE STONE ERA

For nearly seventy years, from the 1846 quarrying of stone to grind wheat in the Bale Mill until the advent of the First World War, Napa Valley stone masonry continued to distinguish most of the wineries and bridges, together with many private residences and commercial buildings. But eventually the use of newer, cheaper, labor-saving methods of building such structures became inevitable. Several related factors may be adduced to account for the demise of the stonework era in the valley.

First, the nature of the population settled in the Napa Valley changed. The original Europeans were gradually replaced both by their Americanized heirs and by newcomers to the area. Such people, without the Old World heritage and traditions of the earlier pioneers, were more interested in newer, faster, less expensive methods of accomplishing the building that needed to be done.

Second, the mass supply of inexpensive labor diminished. The "Chinese," now second-generation Chinese-Americans, left the rigors of their lot in the Napa Valley to move to the cities, or sometimes to return to their homeland.

And third, the very temper of the times changed. After the War, the traditional, time-honored materials and methods of workmanship no longer seemed very important. America — even the pastoral America of the Napa Valley — craved the new, the different, the fashionable.

Recent indications in the Napa Valley offer some slight hope that the heritage of the era of building in stone is not to be totally lost. The Bale Mill of 1846 is now partly restored. Some of the abandoned stone wineries have been returned to a useful existence as private homes, art galleries, or gift shops. And, of course, many other wineries, public buildings, stores, and bridges continue to function actively in their planned use.

Such structures certainly deserve preservation. Stonework in the Napa Valley represents a unique period of California history and architecture and is a fascinating example of the influence of geographical, economic, and social factors upon one aspect of the cultural landscape.

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1. Taliaferro, N. L. *Geology of the San Francisco Bay Counties*. California Division of Mines, Geologic Guidebook of the San Francisco Bay Counties. San Francisco. State of Calif., 1951
2. Issler, Anne Roller. *Stevenson at Silverado*. Caldwell, Idaho: The Caxton Printers, 1939

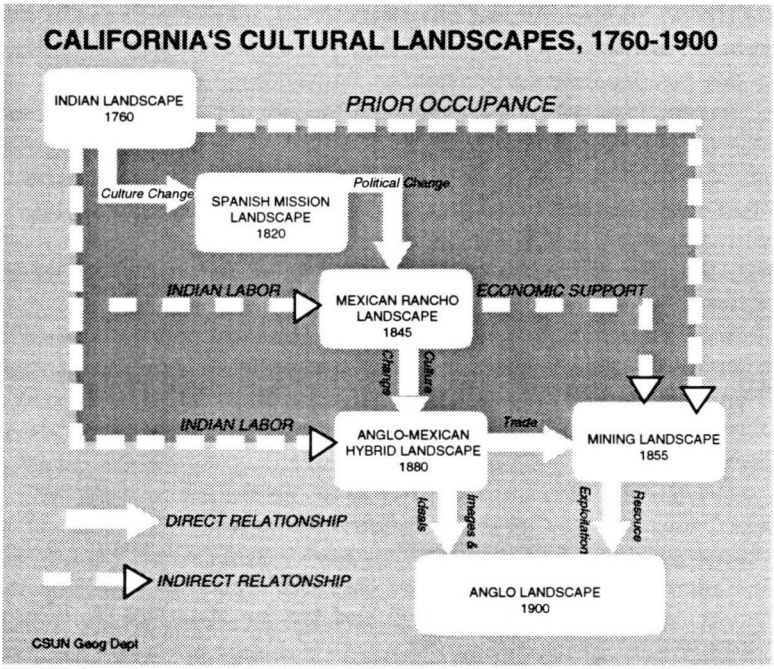

Figure 1.
Schematic of California's cultural landscapes to 1900.

A TOOL FOR TEACHING ABOUT CALIFORNIA'S LANDSCAPES 1760-1900

*David Hornbeck**

Teaching the Geography of California to college juniors and seniors can be a frustrating experience, especially when students seem to have almost no awareness of what has gone into the making of California's present-day landscape. From television and movies, most students are aware that California is somehow different from other states; yet they have a myopic view of California from overgeneralized textbooks and limited travel outside of their immediate region. Few college students have been exposed to the many and varied cultural landscapes of the past that together provide California with its uniqueness as a place. This limited experience tends to create a confined regional consciousness, with few students aware that they are active participants in a larger, more dynamic region that has its foundation in the past.

California's contemporary landscape does not reflect the continued occupance of a single culture, but instead is a composite landscape affected by conflict and eventual compromise of several contrasting systems of spatial organization and resource evaluation. In an ongoing attempt to familiarize my students with these cultures, their landscapes and the changes they imposed on the land, I have experimented with slides, handouts, readings, movies, and lectures. All have had moderate success, but the one that has been most successful is a diagram illustrating California's major landscapes and their relationship to each other. In hopes of assisting others who may have similar difficulties with their California classes, this paper presents the diagram along with a brief description of each of California's major cultural landscapes between 1760 and 1900, and a list of selected references.

California's Major Cultural Landscapes

The first cultural imprint on California's landscape was made by Indians. Aboriginal occupance of California dated from 40,000 BC, yet their imprint rested lightly on the land. They lacked the technical ability to significantly shape or alter their environment, yet had a population density four times that of any other group in North America. However, no one aboriginal group dominated the land. California was divided among twenty linguistic families encompassing 135 dialects; at most, a thousand could speak the

same language. Agriculture was unknown and land was held by hunting, fishing, and gathering rights. The environment provided all that was needed to sustain the aboriginal way of life. (Figure 1)

Spanish soldiers came next, hungry for wealth and anxious to add new lands to those already held by the Spanish crown. Land was easily taken from the Indians, but the soldiers' voracity for wealth was not satisfied The priests who accompanied the soldiers were interested in wealth of a different kind and saw in the docile natives souls to be gathered for the church. Under guidance from priests, California became an ecclesiastical empire designed to convert the heathen Indian to the more civilized ways of Spanish life—to be a Catholic and a loyal subject of the Spanish Crown. By 1823, the church had established 21 missions along the California coast and had gathered over 90,000 souls. In addition, the Government established three pueblos and four presidios, mainly as secondary institutions to assist the missions. Missions, however, dominated the spatial order, imparting a far different character to California's landscape than the Indian had previously. In effect, Spanish settlement imposed a rigid method of organizing space as prescribed in the Laws of the Indies. With the Spanish came the first formal, systematic attempt to see and organize space for a specific goal.

Mexico's independence from Spain was the beginning of a new order to the California landscape, stimulated more by political change than cultural change. The rigid settlement policies of the Spanish crown were removed in favor of a more liberal use of land and resources; land tenure laws were changed, trade barriers were removed, and the missions were secularized, thereby opening up land for individual settlement. To encourage settlement of former mission lands, the Mexican government granted more than seven-hundred ranchos to private citizens, ranging in size from a few hundred- acres to over 133,000 acres. Cattle became the primary economic base in response to the growing demand for hides and tallow in New England. The hide and tallow trade opened new avenues of change, particularly economic, but also brought the vanguard of Americans to California. Their numbers were soon to increase and start California on another series of landscape changes.

The Americans had a different way of life than the hispanic settlers, and initiated changes designed to bring the landscape into alignment with anglo settlement institutions. The number of anglos was relatively small after acquisition of California in 1846, but their number increased substantially with the discovery of gold. In the first four years of anglo occupance the population grew from 15,000 to 100,000 and by 1860 had increased to 300,000. The gold rush

accounted for a sizable portion of the early migration, resulting in a new landscape in the interior, away from the established hispanic settlement along the coast. Soon, however disillusioned miners turned to other pursuits, mainly farming, but found to their dismay that much of the best agricultural land in California was held in large tracts by Mexican rancheros. After considerable legal maneuvering between ranchero and farmer, the large ranchos were finally broken up into smaller mid-western type farms. Along with small farms came new towns, railroads, and many more settlers, each adding a different element to the landscape. The changes initiated by newcomers were not accepted without difficulty; the anglos could not push aside the hispanic landscape and begin anew but were forced to compromise, resulting in a hybrid landscape containing elements of both hispanic and anglo settlement traditions. By 1880 California had two distinct cultural landscapes, a hispanic-anglo landscape along the coast and an anglo landscape in the interior.

The last twenty years of the nineteenth century were no less tumultuous than the first thirty years of anglo occupance; bringing resources and space into a coordinated system was complicated by divergent interests. The difficulty lay in the unrealistic interpretation of resources. The search was for the ideal, a foundation upon which to build a western utopia. There were many starts, some successful, others less so. By 1900, the California landscape was a composite of contrasting and sometimes conflicting cultural and spatial systems, but representing the aspirations, failures, and expectations of a people about to enter the twentieth century.

Conclusion

California's landscape has undergone many changes during the past two centuries — changes that reflect a succession of culture groups each with its own ideas of how space and resources should be organized and used. The change in the shape and character of California's landscape between 1760 and 1900 can be described as a movement from a landscape without a set of formal settlement institutions to one in which space was organized by many and often conflicting institutions. Cultures interacting through time and space have given California a diversity of present-day regional landscapes. For students, learning to identify various remnants of past landscapes and speculating about process of changes and their impact on the present provides an awareness and understanding of California's unique landscape heritage and its importance in shaping the present.

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SELECTED REFERENCES

Ashmano, Homer. "The Evolution of a Wild Landscape and Its Persistence In Southern California," *Annals of the Association of American Geographers*, Supplement, Vol. 49, No. 3, Part 2 (September 1959), pp. 34-56.

Bauer, John E. *The Hearth Seekers of Southern California, 1870-1900.* (San Marino, California: Huntington Library, 1959).

Bauer, John E. "California's Nineteenth-Century Futurists," *Southern California Quarterly*, Vol. 53 (March 1971) , pp. 1-40.

Baugh, Ruth E. "Site of Early Los Angeles," *Economic Geography*, Vol. 18, No. 1 (January 1942), pp. 87-96.

Bolton, H. E. "The Mission as a Frontier Institution in the Spanish-American Colonies," *American Historical Review*, Vol. 23 (1918), pp. 42-61.

Bowman, J. N. "The Number of Californians Baptised During the Mission Period," *Southern California Quarterly*, Vol. 42, No. 3 (September 1960) pp. 273-277.

Cleland, Robert Glass. *The Cattle on a Thousand Hills: Southern California, 1850-1870* (San Marino, California: The Huntington Library, 1941).

Dana, Richard H., Jr. *Two Years Before the Mast* (New York: Harper and Brothers, 1840).

Dufault, David. "The Chinese in the Mining Camps of California: 1848-1870," *Southern Califorlia Quarterly*, Vol. 41 (June 19's9), pp. 155-170.

Dumke, Glenn S. *The Boom of the Eighties* (San Marino: The Huntington Library, 1944).

Gentilcore, R. Louis. "Missions and Mission Lands and Alta California," *Annals of the Association of American Geographers*, Vol. 51, No. 1 (March 1961), pp. 46-72.

Hale, Dennis and Jonathan Eisen (Eds.). *The California Bream* (New York:Collier Books, 1968).

Heizer, R. F. and H. A. Whipple. *The California Indians: A Source Book* (Berkeley: University of California Press, 1951).

Hornbeck, David. "Mexican-American Land Tenure Conflict in California," *Journal of Geography*, Vol. 74 (April 1976), pp. 209-221.

Kelley, Robert L. *Gold vs Grain, the Hydraulic Mining Controversy and California's Sacramento valley* (Glendale: A. H. Clark Co., 1959).

Kroeber, A. L. *Handbook of the Indians of California*, Smithsonian Institute, Bureau of American Ethnology, Bulletin 78 (Washington, D.C.: Government Printing Office, 1925). Reprinted by Dover Publications, Inc., New York, 1976.

Landbery, Leif C. U. *The Chumash Indians of Southern California*, Southwest Museum Papers No. 19 (Highland Park: Southwest Museum, 1965).

Lewis, Oscar. *Sea Routes to the Gold Fields, the Migration by Water to California in 1849-1852* (New York: Alfred A. Knopf, 1949).

McWilliams, Carey. *California: The Great Exception* (Salt Lake City: Peregrine, Inc., 1976).

Nelson, Howard, et al. "Remnants of the Ranchos in the Urban Pattern of the Los Angeles Area," *The California Geographer*, Vol. 5 (1964), pp. 1-9.

Paul, Rodman W. *California Gold: The Beginning of Mining in the Far West* (Cambridge: Harvard University Press, 1947).

Paul, Rodman W. "The Beginnings of Agriculture in California: Innovation vs. Continuity," *California Historical Quarterly*, Vol. 52 (Spring 1973), pp. 16-27.
Raup, H. F. and William Pounds, Jr. "Northernmost Spanish Frontier in California: As Shown by the Distribution of Geographic Names," *California Historical Society Quarterly*, Vol. 32, No. 1 (March 1953), pp. 43-48.
Robinson, Alfred. *Life in California Before the Conquest, Hispano-Californians, Leperos and Indians* ... (New York: Thomas C. Russell, 1846). Reprinted by Peregrine Smith, Salt Lake City, 1970.
Robinson, William U. *Land in California* (Berkeley: University of California Press, 1948).
Starr, Kevin. *Americans and the California Dream, 1850-1915* (New York: Oxford University Press, 1973).

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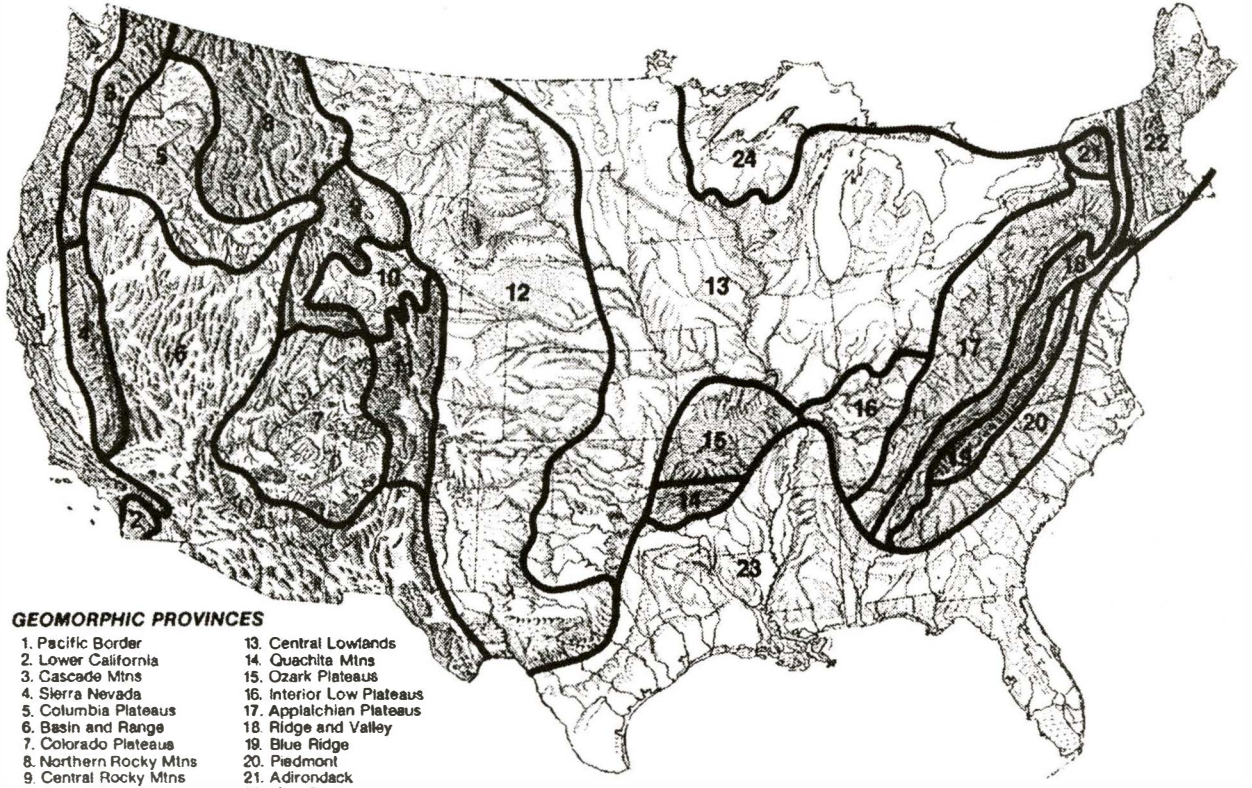


Figure 1.
Geomorphic Provinces of the United States
[Editor's note: map substituted for Fenneman's]

VOLUME XXIV [1984]

THE PHYSIOGRAPHIC REGION IN PHYSICAL GEOGRAPHY AND GEOMORPHOLOGY: HISTORICAL APPRAISAL AND RE-EVALUATION

*Robert B. Howard**

Introduction

An examination of introductory physical geography texts reveals topical coverage exhibiting coherence and a clear sense of spatial pattern, particularly when it comes to climate, soils, vegetation, and hydrology. These interrelated topics establish the notion, necessary for beginning students, that the natural environment consists of a complex web of interdependencies. Unfortunately, when the atmosphere, hydrosphere, or biosphere are exchanged for the geosphere, these interrelations seem to disintegrate in confusion with a loss of spatial coherence. What has happened to the sense of the geosphere's cohesion and its interrelatedness with the rest of physical geography? More importantly, where is geomorphology's spatial aspect which is so necessary in an introductory course?

This paper attempts to draw attention to this inadequate spatial coverage in geomorphology, particularly at the macro-scale, and suggest physiographic regionalism as a partial solution. However, any re-introduction of the physiographic region needs to take as its basis the recent advances in the solid earth sciences, especially those in global tectonics.

Some of the aforementioned confusion in dealing with the geosphere in general and geomorphology in particular is probably due to the two different scales at which geomorphology needs to be examined for even rudimentary understanding. At the macro-scale we are dealing with entire landscapes, those elements of topography that are structurally controlled and which depend primarily upon endogenic processes.[1a] At the micro-scale, we deal principally with the detailed sculpting or etching of landscapes by exogenic processes whose magnitudes and frequencies are interrelated with climate and hydrology. These exogenic processes, interacting with earth materials (rocks and sediments), are responsible for producing the myriad individual erosional and depositional land-forms which are etched into, or superimposed upon, the landscape's major structural elements. In addition to producing individual erosional features, these etching processes also enhance structure's influence on topography through exploitation of any structural weaknesses.

Historical Appraisal

In the development of what we now call geomorphology, the physiographic province was a very important and integral part. One of the earliest mentions of anything akin to a physiographic region in the United States was the early nineteenth-century recognition of the topographic uniqueness of the Ridge and Valley region.[1] The development of regional physiographic concepts occurred later in the same century. Recognition of intraregional topographic similarities leading to delimitation of physiographic provinces came during the period of westward expansion and western exploration in the years immediately following the Civil War. Physiographic regions or provinces received the greatest geologic and geographic attention in the late nineteenth and early twentieth centuries.

An early scheme of nomenclature for the United States' physiographic provinces was that of Powell.[2] Subsequently, Powell's scheme was modified by Lobeck[3] and finally by Fenneman.[4] Fenneman's provincial boundaries and terminology are still recognized and employed by the U.S. Geological Survey (Figure 1). For geographers, the idea of physiographic regions was what made the study of physiography spatial or geographical. Without this spatial element it is doubtful that physiography would have continued to be included within what today is considered physical geography. Following this early period of prominence, however, the use of physiographic regions suffered a sharp decline.

The decline in the intellectual content of physiographic studies in the early twentieth century had many causes. Among these was the split between geography and geology as each field underwent separate development and specialization. Coupled with this was the demise of environmental determinism as a major rationale for physiographic studies together with the rise of human or cultural geography which displaced physical geography from its central role in the field. Finally, there was an unthinking mimicry involved in applying the Cycle of Erosion to landscapes. The Cycle of Erosion or cycle of Landmass Denudation, developed by Davis,[5] was an admirable first attempt at organizing into a meaningful format what was then known, or at least surmised, about the origin and development of the earth's landforms. It was designed as a pedagogical model; and herein lies its problem, since this teaching device was then used as a research model by Davis and his disciples. Uncritically they applied this simplistic cycle to their task of unravelling the denudational history of the world's landscapes. The basic assumption concerning the innate correctness of the cycle was never questioned; and reality was, therefore, made to fit the model rather than the reverse, as would be dictated in a real scientific field. To assume that all landscapes will evolve in a predictable and simplistic sequence of stages ignores reality. Davis himself had said

on numerous occasions that a myriad of possible complications are possible within the cycle framework (for example, pattern of uplift). Curiously, neither Davis nor any of his students ever examined, even theoretically, these complications. It was this unscientific and formalistic simplicity passed off as scholarship that those outside the budding science of geomorphology saw and found decidedly wanting in scientific rigor.

Geomorphology's resurrection from its near demise began in the 1940's and 1950's, as a result of Strahler's development of morphometric studies based on the seminal work of Horton.[6] These studies included a strong areal element and clearly demonstrated the importance of spatial organization in the landscape. In fact, morphometric studies gave rise to the many ideas which eventually caused the collapse of the classical, or Davisian, school of geomorphology. Coupled with these morphometric studies the U.S. Geological Survey's Hydrologic Studies of Rivers, initiated in the 1950's, forever turned geomorphology's attention away from hypothetical studies of landscape evolution, based on deductions from unsubstantiated premises of the classical geomorphologists, and redirected it toward exogenic processes. The rationale for this change in scale and perspective was that if we are to understand landscape development we must first understand what occurs on the landscape's surface. For too many years postulates about an entire landscape system had been constructed without any attempt to study, understand, or even identify the system's constituent parts. However, in our recent fascination with the study of exogenic processes, we have tended to ignore that spatial element which can be a significant link in physical geography courses-the physiographic region. This is true not only at an advanced level in geomorphology, but also and especially at the introductory course level.

I think geomorphology has maintained its place within the body of physical geography more by tradition and historical precedent than by any meaningful spatial rationale. As a geomorphologist and a geographer (but not a geographical geomorphologist), I have always had an interest in physiographic regions and have desired to see them incorporated in a meaningful and appropriate manner into the body of physical geography courses. After all, climatology has its climatic regions, and soils and vegetation are frequently discussed regionally. How, though, can geomorphology and geomorphic regions in particular be most effectively presented? Maps such as Murphy's,[7] while providing some spatial information for the initiated, offer little in the way of insights or integration for the beginner. Fenneman 's maps, coupled with unrealistic and fanciful notions of peneplains, even though spatial or regional in intent, are justly viewed as historical curiosities,

singularly unrewarding to the knowledgeable and particularly so to any beginning student.

Most physical geography texts maintain a schizophrenic treatment of geomorphology. Our geological roots are acknowledged in chapters dealing with the rudiments of mineralogy and petrology. Chapters on the dynamic and stratigraphic influences on topography are often the last in a book. Such is the usual geographic treatment of endogenic processes, but exogenic processes are generally covered in detail, often with a definite bias toward climatic geomorphology. ***

A desire for regionalism brings us back to the physiographic province or, in more modern parlance, the geomorphic region. What is needed is a regional approach which is shorn of classical geomorphic trappings. A search of the contemporary literature for some guidance on geomorphic regions leads to only two texts that deal with regional aspects of geomorphology, namely, Thornbury[8] and Hunt.[9] While Hunt is probably the more physiographic *(sensu stricto)*, it is written without any insights which recent advances in global tectonics could provide. Thornbury on the other hand, although analyzing each physiographic/geomorphic region, does so primarily in the light of the voluminous and outdated literature in classical geomorphology. How then can the physiographic region be tied into the body of modern geomorphology and, by extension, provide a useful framework for beginning as well as advanced physical geography or geomorphology students?

Re-evaluation

A scientific revolution occurred in the solid earth sciences during the 1960's and early 1970's. This dramatic shift in perspective involved the rise and eventual acceptance of the plate tectonic paradigm as a basis for explanation of global patterns of tectonics and volcanism, among other phenomena. This same paradigm can, with imaginative application, provide a basis for re-evaluating the meaning and significance of our physiographic or geomorphic regions. The physiographic region is usually defined as a spatial analog based on geologic structural regions. While physiographic regions are recognized and delimited on the basis of surface morphology, gross surface morphology is in turn an expression of underlying structures. Geologic structure is the key to understanding physiographic regions because structural elements owe their existence to the three major stress regimes (compression, tension, and shear), which in turn are functions of plate motions and interactions occurring at plate boundaries. Where crustal consumption occurs, as in subduction zones, compression tends to be the dominant stress. Tension tends (though not exclusively) to occur where new crust is being generated, and shearing is found along those

plate boundaries in which crustal conservation is favored.

In the tectonically active western United States, there is a growing and voluminous literature relating present plate motions directly to structural geology. From there it is an easy step to relate it directly to structural geomorphology. In the central United States, it is doubtful if much can be applied directly from plate tectonics except as pertains to the Mississippi embayment. This is not to say, however, that structural geomorphology has no application in this area. Structural elements are present, but because of the absence of tectonism and volcanism they are far more subtle than on either coast, being primarily associated with lithology and stratigraphy. In the eastern United States, there is a growing trend toward re-

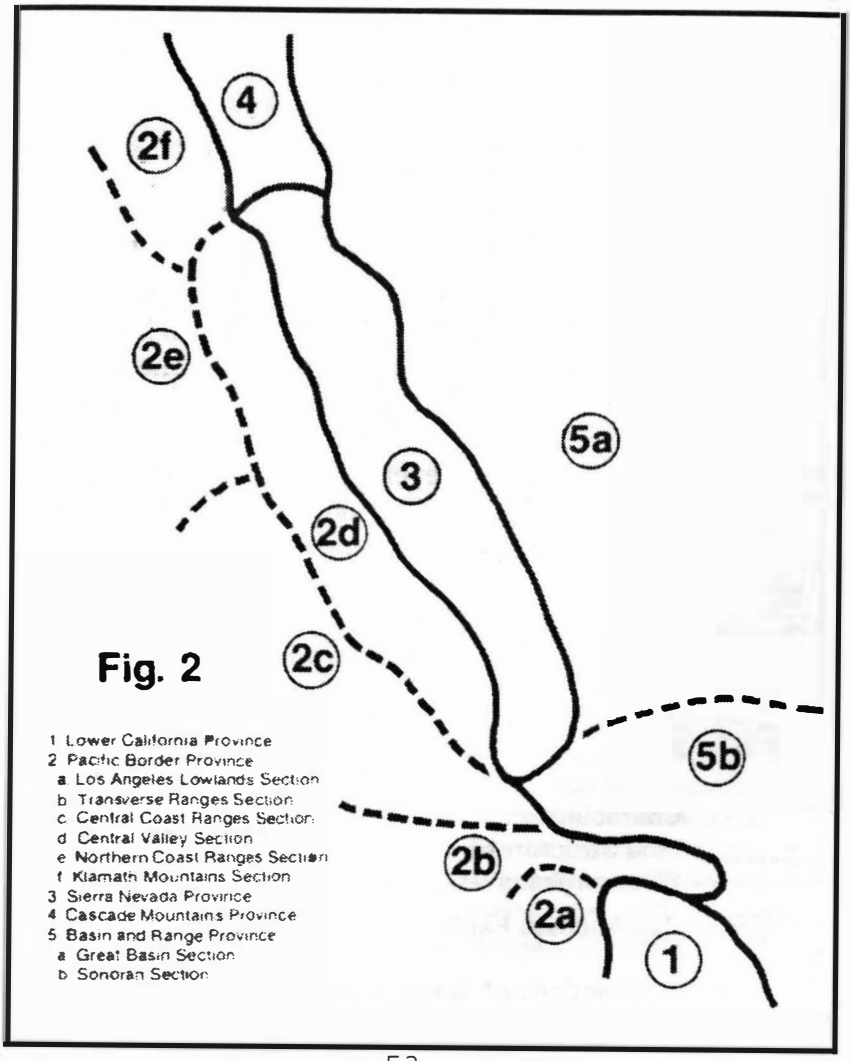
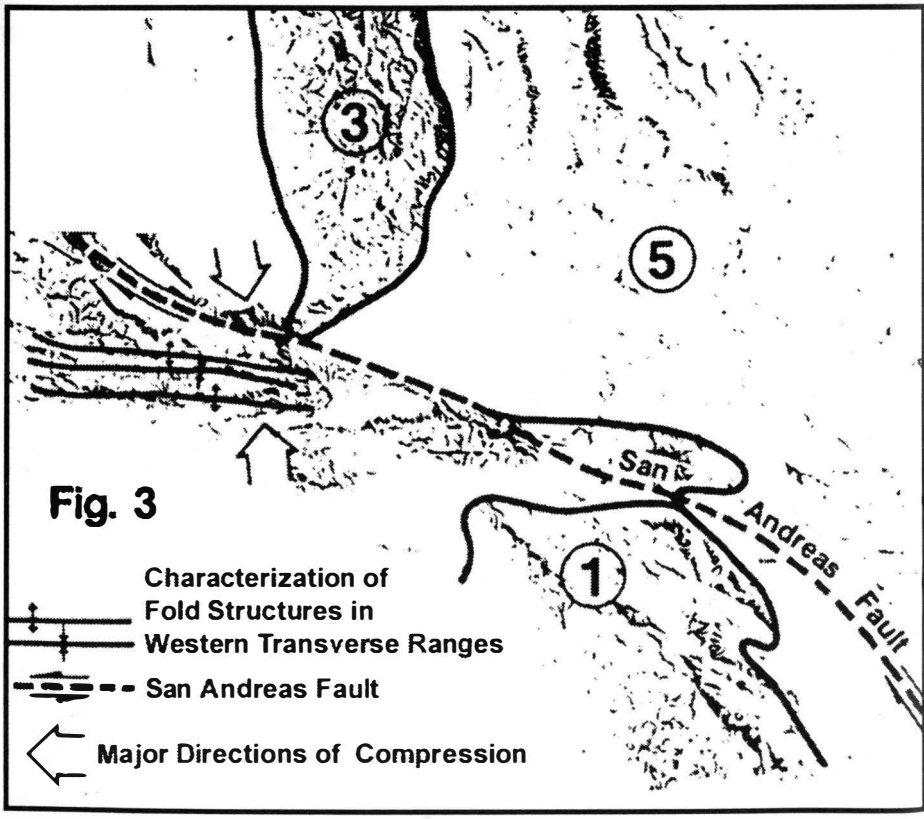


Fig. 2

evaluation of regional geology in view of the plate tectonic paradigm, although here the re-evaluation applies to more ancient, and thus more problematical, prePangaean plate motions. Some tentative but profitable beginnings have been made in this direction; and, though still a long way off, the implications for structural geologic and physiographic explanations are far reaching.

Imaginative application of the plate tectonic paradigm enables one to re-evaluate the various physiographic regions in more rewarding and meaningful historical terms. At the same time, a more complete spatial synthesis of structural geomorphic notions, coupled with our geologic/earth science roots, can be achieved. Ultimately, this re-evaluation and synthesis yields a meaningful regionalism in macro-geomorphology.

Examples of the possible re-evaluation of western physiographic regions or sections that might here be mentioned in very brief synopsis include the California Coast Ranges and Transverse Range Sections of the Pacific Borderland Province, the Cascade Range Province, the Sierra Nevada Province, and the Great Basin Section of the Basin and Range Province (Figure 2).



Prior to the complete subduction of the Farallon Plate and the East Pacific Rise off of what is presently coastal California, compression was the principle stress. This compressive stress regime resulted in a squeezing and an east-west shortening of the crust, producing the characteristic thrusts and folds found in the present Coast Ranges.[1c] Once the East Pacific Rise was subducted, a process commencing some 30 million years (m.y.) ago, the apparent oblique subduction was replaced by strike-slip motion.[10] This strike-slip motion now concentrated along the San Andreas fault provides the final structural detail that is now being etched into relief by present exogenic processes.[1d]

The east-west trend of the Transverse Range section in Southern California appears to be due to the opening of the Sea of Cortez, thus separating Baja California from mainland Mexico, some 4 to 5 m.y. ago. This opening resulted in a bend or "dog-leg" in the San Andreas fault. Right-lateral strike-slip motion proceeds relatively unimpeded in a northwest-southeast direction to the north and to the south of the Transverse Range section. In the vicinity of the Transverse Ranges, however, compression is also occurring in addition to the shearing because of this bend in the fault (Figure 3). At the eastern end of the section this compression has resulted in the squeezing and upthrusting of massive basement crystalline rocks of the San Gabriel Mountains south of the San Andreas fault and the San Bernardino Mountains to the north. Both of these mountain masses, in addition to being separated from each other by the San Andreas strike-slip fault, are further bounded by thrust faults which serve to take up the necessary crustal shortening in this zone of both shearing and compression. In contrast to the crystalline rocks of the eastern portion of the section, the western Transverse Ranges have yielded to this crustal compression by developing massive folds in their Tertiary sedimentary rocks. The axes of these folds trend east-west, as would be expected from the north-south directed compression.

The Cascade Range of today has many elements in common with the Sierra Nevada of perhaps 40 or 50 m.y. ago. The subduction of the Juan de Fuca Plate (a segment of the Farallon Plate, most of which is now long since subducted) provides the "wet" oceanic crust which, when partially melted, provides the intermediate composition magmas that have erupted for the past several million years to form the majestic Cascade stratovolcanoes. This extremely dynamic link between plate tectonics, subduction, and volcanism is further exemplified by the eruptions at Mount St. Helens since May of 1980.

The Sierran block is, in many respects, genetically related to the Basin and Range Province, of which it forms the western bound-

ary. It is given separate status as a physiographic province primarily because of its rather uniform lithology (principally granitic) and its sheer massiveness. Since it is genetically related to the Great Basin Section of the Basin and Range, its reasons for uplift are probably related to the extensional activity of the Great Basin.

The extensional tectonics in the Great Basin Section of the Basin and Range, which has continued for about 30 m.y., has had several explanations. Probably the most rewarding, and the one which offers the best explanation with the fewest problems, is related to the nature of shearing. It can be easily demonstrated that a shear stress regime will possess elements of both tension and compression. As a result, the right-lateral northwest to southeast shearing along the San Andreas fault in the lithologically heterogeneous crust of the western United States should yield an east-west extensional component. The topographic expressions of this extension-normal fault scarps, faultline scarps, grabens, horsts, or tilted fault blocks-should trend north-south. A glance at a topographic map of the Great Basin reveals rather strikingly the north-south trend of the fault-block mountains and their intervening basins of internal drainage.

As these all too brief sketches indicate, the integration of plate tectonics, geologic structure and ultimately topography as the surficial expression of structure, is easily accomplished for any of the West's physiographic provinces. This is facilitated because of the recency of tectonic and volcanic activity. This is more difficult in the eastern United States because of the absence of recent endogenic activity. These difficulties can be ameliorated as more information is developed on the period of geologic time prior to the creation of Pangaea and the subsequent breakup of the supercontinent. For example, Pangaea's break up is probably responsible for the various Triassic-aged lowlands of the East Coast. Pre-Pangaean plate motions will eventually help to explain not only the Ridge and Valley Province's folds, but also the structure and topography of, say, the New England Province as we come to understand the nature of the Acadian or Caledonian orogeny in terms of collision between the Paleozoic American and European Plates.

Exogenic Activity

As noted above, all landscapes are historical documents whether viewed on macro- or micro-scale. This is due to the fact that no landscape can maintain steady-state over its entirety. The dynamic equilibrium that characterizes landscapes allows relict landforms to continue in existence until their processes of formation have adjusted to new conditions. Relict landforms are eventually effaced because they are no longer in equilibrium with existing processes.

What is needed is a way in which exogenic processes may be integrated into physiographic regions. In order to avoid the obscuring influences of climatic or climatogenetic geomorphology, the individual exogenic processes are best studied systematically. In the systematic approach, room is easily made for showing the interrelationships between the earth surface processes, the hydrologic cycle, and climatic patterns.[1e] But once a rudimentary understanding of external processes is achieved by the introductory student, the influence of these processes on each physiographic region can be initiated. A benefit of this approach is that discussion of contemporary, as well as historical, activity inevitably emphasizes or reinforces the notion of environmental change.

Conclusions

It is particularly appropriate that any rebirth of regional geomorphology be made here in the West. After all, the stark physiographic differences across the United States were noted by the decidedly eastern physical geographers, geologists, or physiographers of the King, Hayden, Wheeler, and Powell surveys who worked in the West. Powell, Gilbert, Dutton, and even Davis wrote about these differences based largely on their western experiences, and Holmes illustrated them in his striking drawings for the works of Gilbert and Dutton.

I believe there is an environmental perceptual problem for eastern physical geographers and geomorphologists that prevents them from realizing the inherent value of the reevaluated physiographic region. They live in a tectonically quiescent, humid environment where internal processes are a thing of the past. The humid climate forces them to emphasize not just running water (our most important exogenic agent even in the dry west) but chemical weathering, soil development, hillslope creep, and all those other natural humid processes which lead to a mantling of rocks and a rounding off of the landscape. As far as macro-geomorphology is concerned, these surficial props (particularly soils and vegetation) mask the geologic stage upon which all else depends. In the West our arid to semiarid climates act to inhibit vegetation as well as to reduce chemical weathering, soil development, and hillslope creep, thus generally leaving the rocks exposed so that their influence on topography becomes obvious. An elementary student shown a landscape photograph of, say, the Colorado Plateaus quickly appreciates the influence of sandstones, limestones, or shales on individual slope segments and thence their cumulative influence on the entire landscape. The immediate grasp of this simple relationship is far more problematical when shown a photograph of the Appalachian Plateaus. Although the structures are the same and the rocks are quite similar in age and lithology, the

landscape has a vastly different appearance than that of the Colorado Plateaus. The frequency of tectonic and volcanic activity in the western United States also forces us to pay more attention to internal processes.

This plea for a return to the re-evaluated physiographic region serves two purposes. First, it introduces a nonartificial and more precise spatial unit into the geomorphology taught in physical geography. This can have the effect of eliminating the use of climatic regionalism as the spatial basis for geomorphology. It also offers a means whereby we can synthesize and integrate the research of the other earth sciences into physical geography in a coherent manner. Second, this re-evaluated physiographic region offers new insights and research opportunities in an atrophied aspect of geomorphology long overdue for renewed attention.

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NOTES

1. R. J. Chorley, A. J. Dunn, and R. P. Beckinsale, *The History of the Study of Landforms* (London: Methuen, 1964), Vol.1, pp.[346-354].
2. J. W. Powell, *Physiographic Regions of the United States* (National Geographic Society Monograph, 1895), Vol.1, No.3.
3. A. K. Lobeck, "Block Diagrams," *The Journal of Geography*, Vol.19 (1920), pp. 24-33; and *Physiographic Diagram of the United States* (Madison: The Geographical Press, 1922). [small-scale edition of eight folio pages]
4. N. M. Fenneman, "Physiographic Boundaries within the United States," *Annals of the Association of American Geographers*, Vol.4 (1914), pp. 84-134; *Physiography of the Western United States* (New York:McGraw-Hill Book Company, 1931); and *Physiography of the Eastern United States* (New York: McGraw-Hill Book Company, 1938).
5. W. M. Davis, "The Geographic Cycle," *Geographical Journal*, XIV (1899), pp. 481-504; and "The Geographical Cycle in an Arid Climate," *Journal of Geology*, XIII (1905), pp. 381-407.
6. R. F. Horton, "Erosional Development of Streams and Their Drainage Basins: Hydrophysical Approach to Quantitative Morphology," *Bulletin of the Geological Society of America*, Vol.56(1945), pp. 275-370.
7. R. F. Murphy, "Landforms of the World," *Annals of the Association of American Geographers*, Vol.58 (1968), map supplement No.9.
8. W. D. Thornbury, *Regional Geomorphology of the United States* (New York: John Wiley and Sons, 1964).
9. C. B. Hunt, *Natural Regions of the United States and Canada* (San Francisco: W. H. Freeman and Company, 1974).
10. T. Atwater, "Implications of Plate Tectonics for the Cenozoic Tectonic Evolution of Western North America," *Bulletin of the Geological Society of America*, Vol.81 (1970), pp. 3513-3536.

[See page 73 for Footnotes]

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THE VENTURA CHUMASH: AN EXAMPLE OF GEOGRAPHIC ADAPTATION

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Orange County State College

Although Indian population was sparse in most of southern California at the time of Spanish settlement, a dense population did exist along the Santa Barbara Channel from Malibu to Point Conception. Kroeber[1] estimates that 8,000 to 10,000 Chumash Indians lived in villages closely spaced along the shore.

Like the other Indians of California, the Chumash depended directly on the natural environment and lived by hunting, fishing, and gathering. However, although they hunted inland to the divide between the coastal ranges and the Great Valley, their exceptional population density was supported primarily by the abundant Channel marine life. The Chumash were more nearly maritime than any other California Indians, and their distinctive attribute was a large seagoing canoe by which they could make long voyages and gather marine resources. They were predominantly a coastal people whose villages were usually established within a mile of the beach and preferably at the mouth of a stream.

Five villages are known to have been located near the mouth of the Ventura River at what is now Ventura. This site illustrates the geographic factors which were important to the Chumash economy and shows how careful adaptation to geographic conditions made it possible to support so many people by hunting, fishing, and gathering.

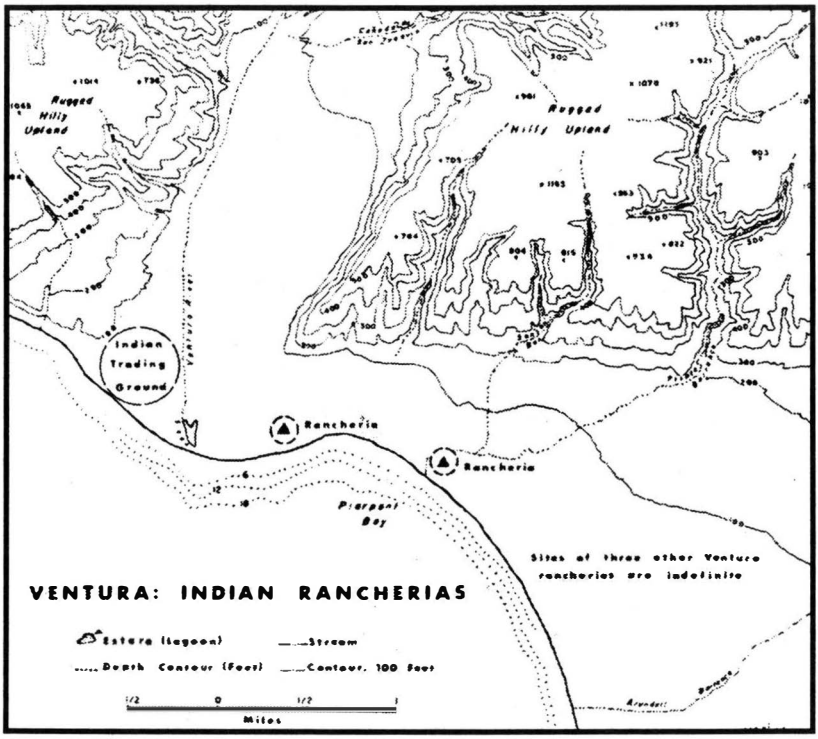
THE VENTURA SITE

The Ventura site on which the five villages were built is a narrow coastal plain about half a mile wide, formed of a series of uplifted marine terraces and hacked by the steep, barren slopes of the Transverse Ranges. At the west end of the plain is the deltaic mouth of the Ventura River, which emerges from the mount]ins through a narrow valley, and has cut a shifting channel across the plain. The river itself, fed by the high and fairly well-watered Santa Ynez Mountains, is described in early accounts as carrying a large volume of water all year and supporting a dense growth of willows and other vegetation along its lower course and around an estero or lagoon on the delta.

To the Chumash the site near the mouth of the Ventura River was almost ideal for villages. It offered easy access to varied re-

sources and had a mild climate which facilitated all-year gathering The sea and beach furnished marine life and shellfish which were the most important food sources, and from the river fresh water and food were obtained. The river valley provided small game, construction materials, and a route to the interior grasslands and forests for larger game, timber, and trade. The marine terraces were suitable village sites.

The flat land west of the river mouth was used as a resort by the Indians from Santa Cruz Island, who regularly beached their



boats in a cove west of the mouth of the river and traded with the Ventura Chumash[2] (see Figure 1). East of the river mouth was a major cluster of villages or rancherias. Although the names of five villages in the Ventura area are known, only two specific sites have been located.

The Indian houses were hemispherical in shape, from twelve to twenty feet or more in diameter, and designed to shelter more than in one family. They were used only in bad weather. Father Pedro Font described them in 1775-76 as having a framework of strong willow poles bent together at the top, with a top opening to admit light and let out smoke. The walls were of dried grass or tules woven

between the poles and the door a woven curtain held in place by whale bone or a stick.[3]

Within the village, debris was left where it fell and the accumulation of fish oil, camp refuse, and soot impregnated the ground as much as eighteen inches below the surface. This "greasy soil" is still one of the best indications of a former village site.[4]

The Indians themselves greatly impressed Father Crespi, who described them as:

> *"of good figure and disposition, active industrious, and inventive They have surprising skill and ability in the construction of their canoes which are made of good pine planks, well joined and of graceful shape, with two prows. They handle them with equal skill; three or four men go out in the open sea in them to fish and they hold as many as ten men. . . All the things which they make are neat and well finished and the most surprising thing is that they have no other tools for working the wood and stone than those made of flint, for they are ignorant of the use of iron and steel. . . The soldiers traded beads with them in exchange foot baskets, pebbles, and wooden plates which would not be more graceful if they were turned with a wheel. They gave us a lot of fish, especially very savory bonito."*[5]

DISTINCTIVE ATTRIBUTE: THE CANOE

The large seagoing canoe was the distinctive attribute of Chumash culture. By increasing the efficiency of food gathering it made the dense population possible, elevated the Chumash to a level above their neighbors who had none, and illustrated best their ingenious use of the materials at hand in their environment. The canoes are described as holding from two or three to as many as twenty people.[6] They were up to eight to ten varas long (25 to 30 feet) with a four-foot beam, and were built of pine planks. although it is possible that the bottoms were dugouts made from drift logs. Near Ventura, logs off sufficient size for carving dugouts were available only a long distance away in the mountains There was no stream large enough to float them down, and carrying them down would have been laborious. However, splitting the pine logs was relatively easy and two men could carry long boards down the trail.

Without nails the boards were lashed together Cord from bark sir animal sinews was tied through holes drilled about tone inch from the edge.[7] This was then sealed by the use of asphaltum from tone of the numerous seeps. Although the plank boat of such construction is not strong there is no evidence that the canoes had strength-giving ribs. Perhaps they were not needed, because the

Santa Barbara Channel is not an especially rough body of water.

The canoes were used extensively, for the Chumash were skillful mariners who took too the water daily if weather permitted. Fortunately the mild climate made all-year fishing possible, and the Chumash regularly made large catches of the abundant Channel marine life which provided their principal food. Every type of local fish and shellfish was gathered, hooked, speared, or netted with finely wrought implements of fiber, bone, or shell.

Nearly as important was the trade which the canoes permitted. Although Father Crespi noted the adequate supple of stone for building, the local rocks were not hard enough to act as tools nor resistant to the action of fire and sudden cooling without cracking. Steatite, which could withstand rapid heating and cooling, was apparently available only on Catalina Island. To obtain it required a two-hundred-mile round trip in the canoes.[8] Yet it was used extensively to make "ollas," which were globular thin-walled vessels with a volume up to five gallons. Flint from the San Francisco area, greenstone from the interior mountains, and obsidian from the desert were all used for making tools.[9] These indicate an extensive trade.

Without the canoe and the sea contact the dense population could not have been supported. The Chumash had no agriculture. The advantages of the site for agriculture uses which the later Spanish found so attractive had no significance to the Indians, for their culture pattern was based entirely on fishing, hunting, and gathering. They supplemented the marine resources by specialized use of the land flora and fauna. Along the river were tules and willow which were used for house construction, thatch, and mats. Willow was also used to weave baskets which were ingeniously waterproofed on the inside with asphalt

Although the interior offered few inducements, seasonal trips to higher elevations were made at harvest time or when game was needed. Acorns and pinon nuts were the basic vegetable foods, with grass, seeds, bulbs, roots, and berries. Coastal sage and chaparral at lower elevations offered little game, but at intermediate elevations on north-facing slopes were grasslands interspersed with California live oak which offered good browse.

These forests, reached by way of the Ventura River Valley, supplied planks for the canoes and offered good hunting. Deer and antelope were sought for food and hides. A variety of other animals and birds was accessible from the Ventura River Valley coyotes, ground squirrels and other rodents, ducks, geese, quail, and doves. Grizzly bears and mountain lions were present in quantity but were more feared than hunted by the Indians. The game provided meat, hides and skins foot clothing, sinews for bow strings and fish nets,

and bones for tools and whistles. Other tools, implements, and currency were made of stone, shell, or whalebone.

CONCLUSION

The Chumash, therefore, made the maximum possible use of the varied resources tees the Ventura site them. The Channel, the beach, the river, and the mountainous hinterland provided the food, fibers, and materials for artifacts which the Chumash used so efficiently. Without a domesticated beast of burden, without iron or any other metal, without the wheel, and without any cultivated crop, the Chumash by careful adaptation to their environment supported the densest population of any Indian group in California. They succeeded because they developed a distinctive tool – the seagoing canoe – by which they were able to increase their efficiency in gathering the abundant Channel marine resource as a reliable food supply.

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1. A.L. Kroeber, *Handbook of the Indians of California*, Smithsonian Institute, Bureau of American Ethnology, Bulletin 78 (Washington: Government Printing Office, 1925) p. 550.
2. Sol N. Sheridan, *History of Ventura County, California*, Vol. I (Chicago: S.J. Clarke Publishing Company, 1926) p. 119.
3. E.K. Ritter, *History of Ventura County, State of California: Its People and Its Resources* (Santa Barbara: H. M. Meier, 1940) p. 5.
4. Owen H. O'Neill, *History of Santa Barbara County* (Santa Barbara: H. I. Meier, 1939) p. 3.
5. H.E. Bolton, *Fray Juan Crespi, Missionary Explorer on the Pacific Coast* 1769-1774 (Berkeley: University of California Press, 1927) p. 159.
6. Kroeber, *op. cit.*, p.559.
7. B. L. Olson, *Chumash Prehistory*, University of California Publications in American Archaeology and Ethnology (Berkeley: University of California Press, 1930) Vol. XXVIII, p.18.
8. D. B. Rogers: *Prehistoric Man of the Santa Barbara Coast* (Santa Barbara: Museum of Natural History, 1929) p.392.
9 *Ibid.*, p. 414.

Carl O. Sauer
[From Land and Life, UC Press, 1963]

VOLUME XI [1970]

THE QUALITY OF GEOGRAPHY

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(Text of the banquet address by Mr. Sauer that highlighted the annual meeting of the California Council of Geography Teachers held on May 4, 1968, at California State College, Hayward. At this annual meeting, formal action was taken that led to the organization's change of name to the California Council of Geographic Education. Mr. Sauer, Emeritus Professor of Geography, University of California, Berkeley, was introduced by the C.C.G.T. President for 1967-68, Dr. William L. Thomas, Jr., who subsequently edited the text for publication.)

As I look over this vast concourse, the thing that impresses me most is the ruddiness of complexion of the participants. Thereby, I have the feeling that I am among my kind of geographers. This raises the question as to how you came to be geographers? When I was a young fellow, there were testimonial meetings, especially in wintertime, when people would gather together and testify as to how they came to undertake a Christian living. The same thing is of interest with regard to how you came to be geographers.

I start with the premise that you became geographers because you like geography. This is an important premise that does not apply to all people in all professions. The reasons are undoubtedly various, but they probably go back with most of you into quite early years. Perhaps the thing that you would find most common among yourselves is that you liked maps. I think this is important: all geographers who have been any good, in my judgment, have been people who have liked maps, or the conversion of maps into language.

THE MAP AS GEOGRAPHY'S SYMBOL

I think that there may be one person here -maybe only one- who remembers Miss Ellen Semple and her lectures. When Ellen Semple lectured, you could see the people trailing across the Appalachians and into the Bluegrass Region; you could follow them mile by mile. Or when she was dealing with the ancient Mediterranean, you could watch the ships turning the promontories on which the temples stood. You went with her! I think this is an important quality. With some it is a God-given gift; she had it. With others it is a learning that follows upon an inclination in that direction. The map is the common language.

There is an old saying, largely true, that "if it is geography,

you can show it on a map." Maps speak an international language that, in large measure, is dissociated or quickly dissociated from particular training. The map, of course, is a wandering by the mind's eye; the feeling of wandering depends largely upon one's particular desire and yearning to wander.

Kids like maps! So far as I know, they genuinely *like* them. It may be that education gets in their way so that they no longer wonder about the world, taking pleasure in recognizing again on the map what they have known visually, adding to it some sort of insight into what they have not seen and may see or may not see. I think that the map is perhaps the best common ground by which we can identify the convergence of our interests.

I suspect that the map has been with us ever since there has been geography, and that is almost ever since man existed. I am thinking of the first human who scratched a line on the sand and, with a stammering speech, said: "Now you go this way and then you go that way and you get to that point and that's where the fat oysters are." Therein lies the beginning of geographic nomenclature. That place became known as "Fat Oyster Point," a proper name that had to be learned by the people who grew up in that community. I look on geographic thought as having that antiquity, supported by fundamental interests.

CONTINUITY IN GEOGRAPHY'S BREADTH OF INTERESTS

The map represents an assemblage of things that you think belong together. This "belonging together" business is one of the most rewarding and one of the most difficult things about trying to be a geographer.

I am reminded of a good parallel in psychology. Prominent some years ago was a form of psychology called *gestalt*, of which Professor Koehler was the principal exponent. Gestalt psychology has always been respected but not followed very much because it operates on the idea that the person or group is more than components, the parts. Not lending itself readily to analysis or experimentation, gestalt psychology is regarded as more of an intuition than a discipline. Well, I accept that same sort of thing for geography. One of the things that I have always hoped to do was to present life and nature as a whole in whatever area I had been studying. I know that this is not a matter that is satisfactorily subject to analysis; I have been trying for a kind of understanding that is other than an examination by analytic methods.

In addition to the inclusive map, from which one starts with information and extends his learning process, there is the topical map, which also is very old. A topical map is one on which there is no attempt to show the gestalt — the everythingness — but which

establishes the distribution or ranges of some particular thing. This concern about the description and distribution of whatever you are working at and the concern as to the meaning of its range is the only thing that is recognized in the rest of the world as "the geographic method."

I have implied that geography is a broad subject, that it has always been broad, that it should remain broad, and that it has no lesser task than the one that it has always had. I have no sympathy with these people who say, "Well, let's not have anything to do with physical geography because it is not significant to the kind of human geography in which we are interested." I think that whenever a group who call themselves geographers try to reduce the field, to make it only the kind of field in which they are most interested, they are taking a step in the wrong direction.

We are now in a time when innovation is tremendously "in," when the only thing that is recommended for me to buy as being old is distilled liquor (and one beer, I believe). For the rest, innovation, the newness, is the thing that recommends it. In geography, we are having rather a time with innovators. I do not object to their playing their particular kind of a game, but I do object to these folks coming and saying, "We are the geographers." I do not object to a person who really likes statistics doing quantifying work; there are things that he probably can do that are worthwhile doing. I should even admit that a person is entitled to be a simulator and a model builder; if that is the game that interests him, that is all right. The one thing that I am worried about is when geographers offer themselves as decision makers. This seems to me to be going a bit far, that those who have a title in geography can then set themselves up as decision makers.

I think that if they take over in geography, my kind of geography is gone. If they take over in geography, I also think that public school geography is gone. Can you imagine getting grade school kids interested in regression analysis in order to study geography?

I think that ever since primitive man scratched the route to the oyster bed on the sand, the basic continuity of direction of geography has been set. We redefine geography in terms of our needs and our interests - but are these reformulations so very different? I do not object to one of the definitions: "Geography is the organization of space." But why be so esoteric about it? We all know, or ought to know, what the essential interests of geography are: the diversity of the earth, the patterns of resemblance and repetition, and (this is my personal addition which I find necessary) how things came to be.

By and large, geography has been historical. It has been historical in the physical sense, also. Professor William Morris Davis

made the most gallant attempt ever to make physical geography non-historical, and he failed. No one may ever do as well as that again! When man is introduced into the geographic scene and into the geographic process, explanations can only be in terms of origins and changes. The Bible, as you know, begins with *Genesis,* and the second book is *Exodus.* I think that is just about the way geography has its main problems presented to it. This is true, you know, of primitive geography (I am not apologizing for being interested in primitives). Primitive peoples have their creation myths and they have their migration myths, the equivalents of the Jewish *Genesis* and *Exodus.* There is a need in mankind to look back and see how he came to be and how he changed and how he went from one place to another. There is thus a greatly enduring reason why the historical approach has its basic place in geography.

THE CALIFORNIA EXPERIENCE

You are all well aware that I am not a California specialist, sometimes to my regret. But many of you are primarily interested in California, which is good. California geography, in my view, is a greatly under-cultivated field.

If I were to undertake its study, I would start with the first known human beings in California. This would take me to the Channel Islands off the coast of Santa Barbara, where an interesting story of human antiquity raises some very intriguing geographic questions. In establishing a reasonable view of where the natives lived and what they did, geographers have contributed very little. The notable study by the late Erhard Rostlund on Indian fishing in the streams of California is first-class geography, but there is not much along that line. There is, then, a field of Indian geography which is intellectually interesting and on which there is material available.

On the coming of the white man, I have done a little reading in the past few days. I want to share with you some discoveries of mine of new knowledge and new meaning.

For example, I think all Californians know the name of Cabrillo, since his voyage of discovery for Spain is taught in all the histories, but always his name is mispronounced. Cabrillo was not a Spaniard, but a Portuguese, which is rather interesting; his second in command was a Christian Levantine, which is also interesting; and the third was a Corsican. This expedition of two ships, one of which had no deck to it, started off from the known — which at that time was Cedros Island, halfway north along the coast of peninsular California. That far these people knew where they were; beyond was untrodden ground to civilized people. As they came north, their descriptions of the coast throughout are quite interesting. Although

all the names they used have been forgotten with one exception, the whole route can be established quite well. The coast was pretty bleak until they approached the present-day Mexico-California border. Their interest picked up markedly when they sailed into the Bay of Ensenada, to use the current place-name. Ashore, they saw groves of trees and savannas of grass intermingled, and repeatedly herds of animals ranging from 100 to 150 in number. Even without their description of these animals, the mere designation of the savannas and the herds would establish prong-horn antelopes.

Farther north at San Diego the Cabrillo expedition encountered unusually stalwart Indians. Nothing much happened in San Diego (sorry!), but then they went on to the Port of Smokes. Because this occurred in September or the beginning of October, fires were burning on the hills behind this Port of Smokes-San Pedro. Continuing to a point northwest (they were quite good in directions, not good on latitude), they came upon villagers living in houses, whereupon the story becomes quite interesting in human terms. From this point, which later is identified in the text as Mugu, they were then going through the Santa Barbara Channel for weeks, naming and counting the villages, 50 or more. They were impressed by the quality and the size of the canoes, made and used by the best native navigators anywhere south of Puget Sound. They were very freely served sardines, fresh and in great diversity. The houses interested them and are fairly well described.

They came to areas in the villages where there were poles. Spaniards are always kind of casual about the size of timber (for example, using the phrase *Palo colorado,* the "red pole," as their name for the redwood). But these poles were not redwoods, being described as painted and having figures on them. This is the first evidence that these Santa Barbara Channel people were kinfolk of the people of the Pacific Northwest, a suggestion that has had a good deal of reinforcement since then.

The Cabrillo expedition had a marvelous time in the Santa Barbara Channel country. They provide some very appreciative descriptions of how nice this country was and how nice the people were, but in so fooling around, they consumed several weeks of precious time. About the first of November, when they decided to go on, they learned a significant lesson about California's climate. They were just beyond Point Concepci6n when they were hit by their first storm, which drove them back south to the town of the sardines. They started out again and the next storm took them in the other direction, chasing them north until they entered a bay where the pine trees came down to the water's edge. This was Monterey, and from then on they were in continual trouble. They were experiencing a season in which the fall and winter storms had

come early and unusually hard. When they were being driven along the coast south of Monterey they recorded how the waves broke unceasingly against a cliffshore and how the mountains were so close and so high and covered with snow (in November, which is possible) that they feared the mountains might fall down and crush the ships. From their description, they did not know where they were a good deal of the time, because of being battered back and forth by storms. The question whether they reached as far north as Cape Mendocino or not, is academic and no longer of interest, really, to the geographer.

Here is a remarkably good first account of the presence of white men on the coast of California, from which I have taken some of the highlights. After this introduction to the historical geography of California, for 60 years there is nothing more. It is an interesting matter that there is no more concern with California for a while. But finally the colonial period begins with the settlement of the whites that leads on to all that you know so well about California in the 19th century.

Then in 1923, C. O. Sauer came to California, and that was some California! I am sorry that I never studied it; I just experienced it. To use the current term, I have had only some "environmental perception." We came out for the first time on the Santa Fe Railroad, all the way from Kansas City. During this trip, the train stopped for every meal and we put on our coats before entering the Harvey dining room, an interesting cultural note. Then we got to Southern California, to Pasadena, the goal of the old folks who had a moderate income. What a wonderful place these towns were down there: Pasadena, Sierra Madre - (still a bit on the youngish side), and Laguna Beach!

After I had been in California for not too long a time, I was invited to a very august place right in the middle of the best of Southern California to make a geographical address. In reassuring my audience about California, I said, "You have a wonderful state here. You have people who enjoy it, who appreciate it, people who have the means and the good sense to come out here and choose it as a place to live, and you won't need to worry about the future. This is so because California has climate but it does not have the resources that will sustain industrialization. You will enjoy your citrus fruits, your palm trees, your living, and you're not going to be overwhelmed by industrial and urban growth." I am afraid that shortly after this I quit predicting the future!

AN APPRECIATION of DIVERSITY

What a state this California was! And now we have a magazine called *Cry California*. Just this past week I was sent a copy of a new

book by Raymond Dasmann, who was at Humboldt State College at Arcata for a good long time. He should have been brought into a geography faculty, but he did not have a Ph.D. in geography and, as you know, this is required now. Dasmann is now one of the members of the Conservation Foundation in Washington, and a very good observer; a wildlife man, among other things. His book is called *A Different Kind of Country.* It has California in it although it is not a book about California, but about what is happening to the United States at a dreadful rate. I refer to the loss of diversity, a thing that I have felt so very, very much in a particular way in respect to the farms.

When I left the Middle West, nobody would have thought that the then American farmer was on the way to extinction. By the American farmer I mean a person who grew a diversity of crops, who rotated his crop system, who had animals on the farm, who produced some of the food for himself, the pigs, the farm orchard, and that sort of thing. This type of person is more nearly extinct in the American scene today than the Indian is. Nobody would have dreamed of that sort of thing a half century ago. The agricultural colleges, the experiment stations, were telling the farmer to keep on being a farmer of diversified crops, that the family farm was the good thing toward which American rural and small town life was looking.

I cannot describe this change for California as I can for the Middle West, which is my home country. Clover there was almost the sign of farming decency. Now, over the Mississippi Valley one must go a long way to find a field of red clover. I happen to be a farmer, in absentia, by inheritance. The farm used to be a farm; it is now just a piece of a larger operation in the middle of the best country in Illinois. It has yielded up to 210 bushels of corn an acre, which is something that no self-respecting piece of land can do by itself. This is just feeding it by the bottle. In that township I do not think there is a single living domestic animal; only a few birds and a very few bumblebees.

Now this is the sort of thing that has happened. The barn, over a large part of the United States, is as much of a relic as the hand pump in the yard. The farm houses are coming down. The land may even bring a somewhat better price if it does not have a house on it. The change between the world of my youth and the present rural world is fantastic!

There are other illustrations of this process in California, but here more strongly compounded with actual urban and industrial expansion. I am talking about the greatest granary of the world and the manner in which the American Midwest has become completely unrecognizable as to the way of life.

The thing that scares me is how fast things can come in this country. In the early 1930s' one rarely saw soybeans; if so, one was likely to stop and ask what they were. The American farmer had grown corn by the Indian method for more than 300 years, "laying by the corn." This was the final cultivation by which the earth was heaped up or "hilled" around the corn. The American farmer did all of his cultivation in the Middle West by the Indian method of mounding the earth around almost whatever he grew; corn, potatoes, and everything that he planted. It was not necessary to do it, but a tradition that lasted and lasted, although people no longer knew how it started. This hilling cultivation of the Midwestern American farm was knocked out, beginning in the 1930s. The cornfields of today are an entirely different sort of thing from the cornfields on which America lived for hundreds of years.

Not liking a lot of change, certainly not too much change, I come back to an old creed and delight, as a geographer, of enjoying the uses of diversity, which I think is one of the most attractive features of human living. For diversity we currently have substituted the word "development." As you may have gathered, I am very, very cool on development. Our old friend, Lewis Mumford, who I think is one of the most interesting people in this country, recently wrote a book on *The City in History.* Long before that he had introduced the term "megalopolis." Concerned about the life of cities (before there were riots or anything like that), Mumford thought that large cities represented a great and possibly insoluble problem, an impasse for civilization. Then along comes a geographer, Jean Gottman, who writes a book called *Megalopolis* in which all is sweetness and light.

I should like to call to your attention the fact that geographers do not worry enough. I worry a lot, but I cannot get enough people to worry along with me. I am terribly worried about megalopolis. I am very worried about underdeveloped countries, mainly because I am afraid of how they are being developed.

This is a finite world. It is a terrible truth, but what a truth it is! We are running along as though everything was infinitely expandable and we are not concerned about the expansion. I believe that more geographers should become recorders of where we are. A very, very serious question is whether we are going to have a world that is kept tolerable by the restraint of its civilized people who realize the importance of diversity in making the world attractive.

In closing, I have just one question to ask. It was asked of me by a youngster, and I think it is the biggest question of all: "Do you wish you were a teenager now?"

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(Continued from page 58)

Howard Footnotes

1a. *Here structure is used in its broadest or geomorphic sense rather than in its more common and narrower geologic connotation. Used in the geomorphic sense, structure includes not only the attitude (dip and strike) of rocks (that is, geologic structure or structure *sensu stricto)* but also lithology and stratigraphy as well as any continuing tectonism or volcanism that will have an influence on surface morphology.

1b. I have no intention at this juncture of getting involved in arguments concerning climatic or climatogenetic geomorphology. Suffice it to say that the belief (which remains unsubstantiated) that there is a direct relationship between form and climate is simplistic, at best, given the multivariate character of nature and all the ramifications of the principle of equifinality. I think the emphasis by some physical geographers on climatic geomorphology derives from their desire for some type of geomorphic regionalism. Since geomorphology apparently has none, and climate does, then the combination of the two must result in an approach that can be looked upon as regional whether the combination is valid or not.

1c. It should be mentioned that some of the present-day exogenic, geomorphic processes occurring in the California Coast Ranges section are affected by this pre-Miocene subduction. Compression in the "California trench" caused the sediments accumulating there to undergo blueschist (high. pressure, low-temperature) metamorphism, creating a melange known to-day as the Franciscan, formation. This formation is characterized under present-day conditions by its high weatherability and its propensity for mass failure.

1d. Of course, it must be recognized that Pleistocene environmental changes also left a very important imprint on the landscapes of the United States. This point must be emphasized continuously, as it should be a leitmotif of both physical geography and geomorphology. No entire landscape can be in a steady-state condition. Since environments are dynamic, any change in one or more environmental parameters will necessitate changes in rates of a series of process activities. Changing types or rates of exogenic processes will mean that erosional and depositional forms must change as a response. Because all process rate changes have unique lag times, one process may be adjusted to new conditions while others are in varying stages of adjustment. All this means that any landscape will contain relict features, features whose formative processes no longer operate at original rates, if at all.

1e. Note here that while I tend to reject as simplistic the notion of climatic or climatogenetic geomorphology, I make no such rejection concerning the relationships between climate and process. The magnitude and frequency of virtually all exogenic processes tends to be atmospherically dependent.

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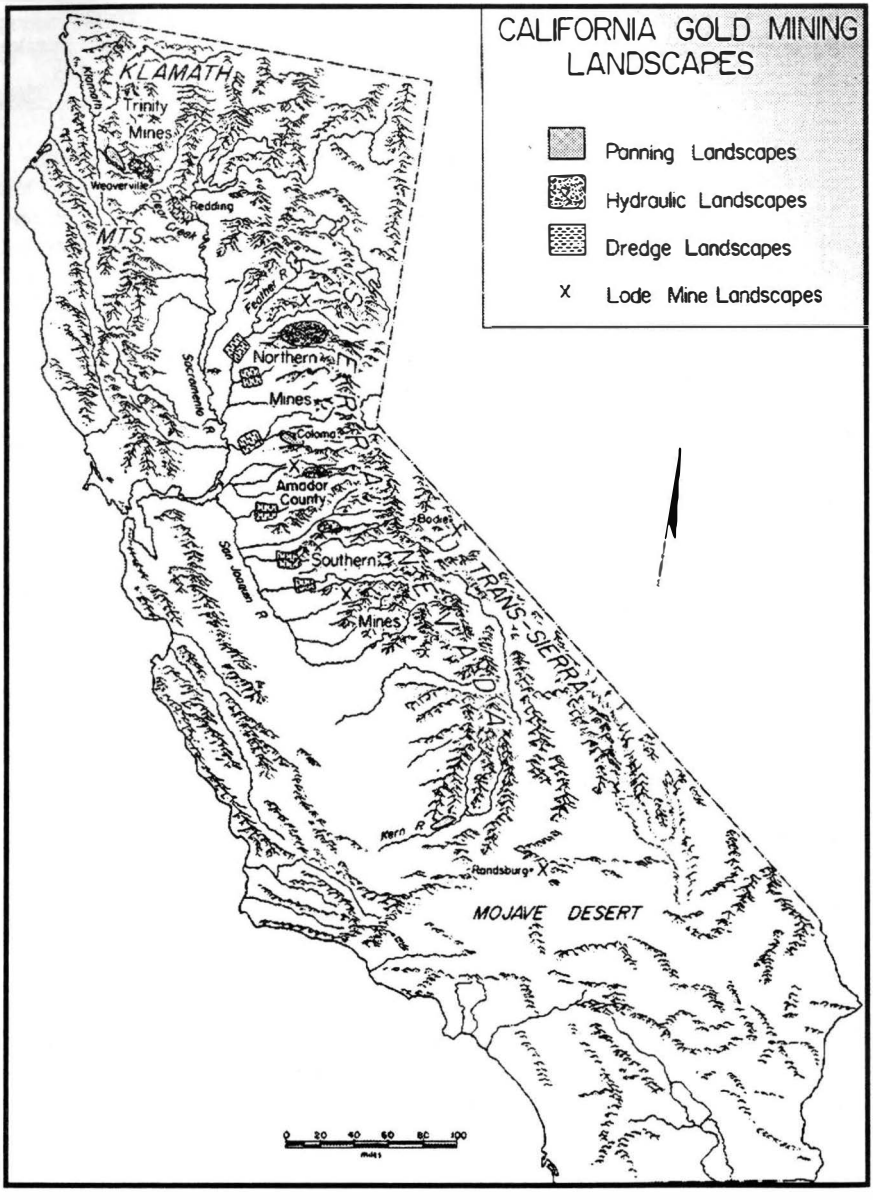
CALIFORNIA GOLD MINING LANDSCAPES
Panning Landscapes
Hydraulic Landscapes
Dredge Landscapes
X Lode Mine Landscapes
KLAMATH
MTS.
Trinity
Mines
Weaverville
Redding
Feather R.
Northern
Mines
Sacramento R.
Coloma
Amador
County
Bodie
Southern
Mines
San Joaquin R.
SIERRA
NEVADA
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CALIFORNIA GOLD MINING LANDSCAPES

FRANK K. SCOTT
California State College, Hayward

California is known as the "Golden State." Gold was the principal attraction for the early pioneers and its exploitation stimulated the growth of the state for many years. This precious yellow metal led California's mineral production for over half a century, until surpassed by petroleum in 1907, but gold continued to be the state's most valuable metallic mineral until World War II. Since 1848, California has yielded more than 100,000,000 troy ounces of gold, valued at nearly $2,500.000,000.[1]

Today, California gold mining is almost non-existent. The last major gold mining operation in the state — a dredge working on the Yuba River - ceased operations in October, 1968 (Fig. 1). With the shutdown of this dredge, gold mining as an industry virtually ended in California.[2] A few mines are still in partial operation and some gold is found by amateur prospectors and skin divers. However, most gold produced today is a by-product of other mining operations. In 1968, only about 15,000 ounces of gold, valued at slightly more than $600,000.000, was produced.[3] Nearly two-thirds of this figure came from Yuba River operations. Record yield occurred in 1852 — the height of the Gold Rush - when an estimated 4,000,000

Figure 1.
A floating gold dredge. This dredge is of the same design as the last operating dredge in California

Figure 3.
The Malakoff Diggings.

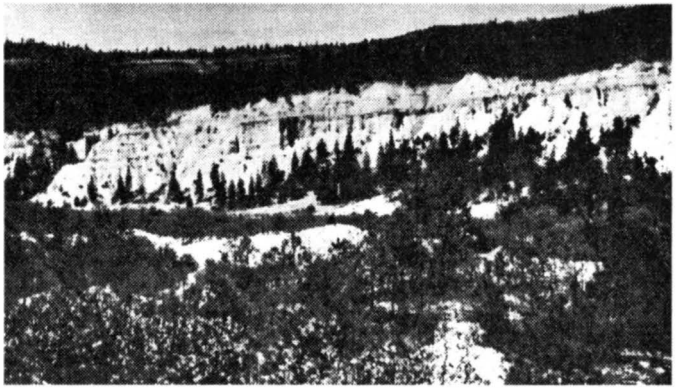


Figure 4.
Dredge landscape along the Yuba River.

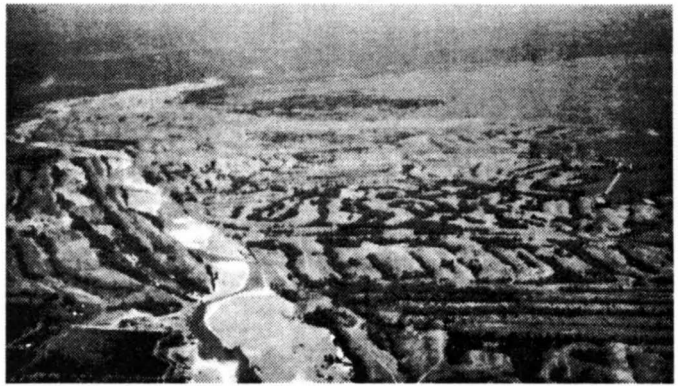


Figure 5.
The Pine Tree and Josephine mine.

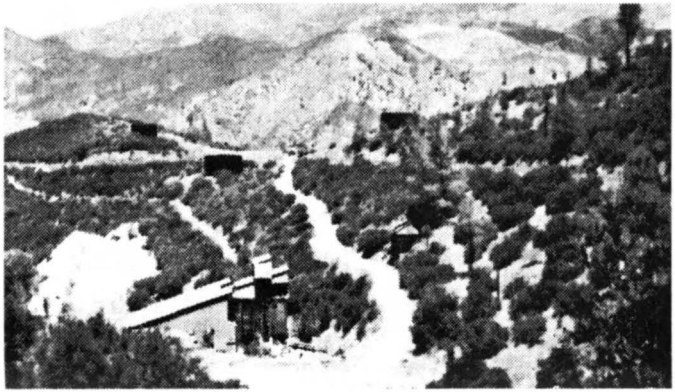
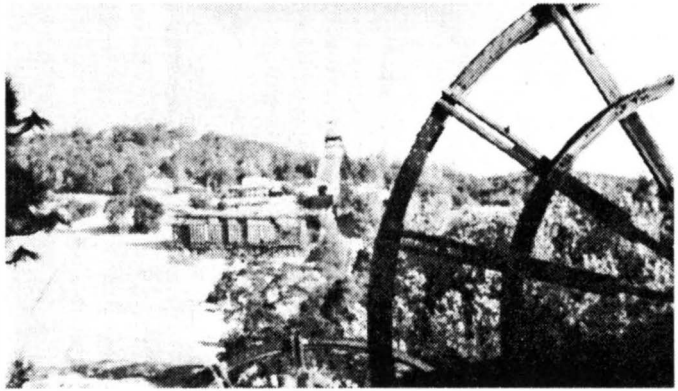


Figure 6.
The Kennedy mine.



ounces were recovered.

GOLD MINING LANDSCAPES

The past exploitation of this precious yellow metal has left a striking imprint on the land. Some conceptions of a gold mining landscape may include roads, settlements, and other features associated with the exploitation of the metal. This paper however focuses on the several types of landscapes created by the mining operations themselves.

Four distinct types of landscapes are associated with gold mining. Most are located in the foothills of the Sierra Nevada, with secondary locations in the Klamath Mountains. A few gold mining landscapes are scattered throughout the Trans-Sierra and the Mojave Desert (Fig.2).

PANNING LANDSCAPES

The least perceivable gold landscapes are areas of panning debris. A small scale of operation and scattered locations have made this landscape much more difficult to recognize than other gold landscapes which represent larger operations and more, centralized locations. Panning landscapes are often marked by round, symmetrical piles of rock and gravel from one to three feet in height, generally evenly spaced over an area. These piles are often obscured by grass, brush, and trees, and their distinctive shape has sometimes been greatly modified by over a century of erosion. Along the smaller intermittent streams, sharp angular rocks — which contrast markedly with stream-rounded ones - also distinguish a panning landscape.

Placer gravels containing gold weathered from quartz veins and transported by water were first exploited on a large scale during the Gold Rush of 1848-1849. The first implements used were the pick and the pan. Soon, machines were developed which enabled the miners to process larger amounts of dirt and gravel. The rocker, the long tom, and the sluice were basically wooden boxes or troughs into which auriferous gravel and water were poured. The lighter materials were washed out of the box and the gold, being heavier, dropped to the bottom, where it was caught by cleats.[4]

The primary locations of this early placer mining — and hence today's panning landscapes - are the stream valleys along the western slope of the Sierra Nevada. Following the historic discovery by James Marshall at Coloma on January 24, 1848, the American River became the initial goal of most gold seekers. Quickly the Argonauts began to search northward to the Feather River and southward to the Kern. North of Amador County the diggings were

called the "Northern Mines" and south of this county they were termed the "Southern Mines." Gold was also discovered on the KIamath River in 1848, and many miners moved into the Trinity Mines.

Although most of the Sierra foothills and much of the Klamath Mountains have been well-worked for gold, panning landscapes are today limited in extent and occupy very small areas. In addition to the reasons cited above, reservoirs on the major rivers have inundated many placer mining areas. Since this was usually the initial type of mining in most areas, subsequent settlements have expanded over and eradicated many placer remnants.

Rich surface placers were quickly exhausted. By the middle 850's, miners were turning to other methods to reach deeply buried auriferous gravels. In the Sierra, gold had been trapped in stream channels of tertiary age and these channels had been buried by volcanic deposits.

HYDRAULIC LANDSCAPES

The chief method of exploiting these buried gravels – hydraulicking - has created the second type of gold mining landscape. This type of mining began near Nevada City in 1852 and spread rapidly throughout the Sierra foothills and the Klamath Mountains.[5] It involved the direction of a jet of water against a hillside. The stream of water undermined the hillside and the earth and gravels were then washed through a sluice t0 trap the gold. Because of the depth of these buried channels, hydraulicking became the cheapest method of exploiting the auriferous gravels.

Hydraulicking ended for all practical purposes in 1884. A judicial decision prohibited the dumping of debris in the Sacramento and San Joaquin Rivers and their tributaries.[6] The mines had been dumping their waste into streams which carried it into the Central Valley, covering once prime farm land with silt and debris. The decree did hot outlaw hydraulic mining itself, but the costs involved in impounding the debris made most hydraulic operations unprofitable, and hydraulicking has been of little importance since this date. A few hydraulic operations – principally in the Klamath Mountains - have been worked since 1884, but their output has been minimal compared with other types of gold mining.

Hydraulic landscapes are widely scattered in the foothills of the Sierra Nevada. Near Columbia, hydraulic mining has washed away soil and left the limestone bedrock visible. In some places, pillars of dark grey limestone rise some ten feet from the surrounding ground level; these may be as large as five or six feet in width. Broken smaller pieces litter the ground adjacent to the huge boulders. Much of this area is overgrown with the "Tree of Heaven,"

a plant brought to California by Chinese miners.

The area around Volcano also presents a hydraulic landscape. Mining activities were not as intense as at Columbia, so more soil remains. The exposed bedrock here is limestone and the appearance of the Volcano area is similar to that of Columbia. Fewer pillars of limestone mark this landscape and much of the hydraulic debris is overgrown by berry vines.

Perhaps the most striking example of a hydraulic gold mining landscape is the Malakoff Diggings (Fig. 3). A badlands has been created by the washing away of the hillsides. These badlands are faced with steep cliffs and badly gouged ravines, and soil layers of tan and buff colors have been exposed. Erosion has modified these scars in the earth and they are now clothed with a cover of pines.

Another area of hydraulic landscape is near Weaverville in the Trinity Mines. This area resembles the badlands of the Malakoff Diggings. A great scar has been created on the surface and the hydraulic activities are clearly evident. Mining continued into the 20th century and large-scale operations ceased about 1918.

Many smaller areas in the Sierra Nevada and the Klamath Mountains exhibit areas of hydraulic landscape. Badlands areas and regions of exposed bedrock reveal the extent of past hydraulic mining. Hydraulic landscapes are much more evident than panning landscapes; in fact, many panning areas have been eradicated by later hydraulic operations.

DREDGE LANDSCAPES

The third type of gold mining landscape — dredge tailings - is also associated with placer gravels. Dredging in California began on the Feather River near Oroville in 1898.[7] This landscape is most notable in the Central Valley along the major rivers flowing from the Sierra Nevada. Characteristically, dredge areas are recognized by the orderly rows of rock piles. Often these tailings are composed of rocks with little or no dirt or alluvial material present. Where dirt is present, the rock piles are obscured by vegetation.

The extent of a dredge landscape is related to the type of dredger which operated. On small streams, drag-tine dredges have left areas as small as one-tenth of a mile in length by twenty-five feet in width. In spite of their small dimensions, these dredged areas are easily recognizable by their parallel rows of rocks.

Larger floating dredges operating on the Central Valley floor created landscapes that extend over as much as twenty-five square miles. Significant areas of dredge landscapes are located along the Feather River, the Yuba (Fig. 4), on the American, and along the Tuolumne. Smaller dredge areas are located on the Calaveras River arid along the Merced River. Streams flowing into the Central

Valley from the Klamath Mountains also exhibit dredge landscapes. Clear Creek, south of Redding, has a sizeable area of dredge tailings.

Dredge landscapes are perhaps the most striking arid most discernible of the gold mining landscapes of California. The parallel rows of tailings clearly indicate the intensity of past gold mining activity, and any vestiges of the previous landscape have been completely eradicated and covered with the dredge landscape.

LODE MINE LANDSCAPES

The last type of landscape is associated with lode deposits rather than placer gravels. Lode gold was in its place of origin and became the basis of hardrock mining. Lode mine landscapes are scattered and cover very small areas in comparison with the landscapes associated with the exploitation of placer gravels. The largest lode mine landscape covers less than five acres. Because most of the mining was carried on deep within the earth, there is often little surface evidence of these landscapes.

A prominent feature of almost all lode mines is the tailings pile. This waste often forms a distinctive landform at or near the mine site. Many of the mine buildings and most of the surface equipment have been removed, but a few headworks buildings still stand (Fig. 5). Commonly, they are of corrugated iron sheets attached to a wooden framework. Several steel headframes rise over tailings piles and the concrete foundations of stamp mills and other machinery used to crush the quartz. A small number of lode mine landscapes are marked by rusting machinery and other surface equipment.

Although lode mining started in 1849, its technology was not perfected until the late 1880's and 1890's. Use of dynamite, use of chlorine and cyanide to treat ores, availability of electricity to replace other sources of power, and improved mining methods in general highlight the long list of achievements of these decades.[8] With the depletion of the surface placers in the early 1860's, the end of hydraulic mining in the early 1880s, and the many technological improvements of the 1880's and 1890's, lode mining became the dominant form of California gold mining in the 20th century

The history of lode mining reflects rises and declines caused by several factors. Lode mining declined from about 1915 to 1929 because of high costs following World War I. Increased output from dredge operations partially offset these declines. With the depression of the early 1930's, production costs were reduced and the mines increased production. In 1934 the price of gold was increased from about $21 to $35 per ounce. In 1940 gold production amounted to 1,455,000 ounces, valued at nearly $51,000,000. This was the

highest yield since the Gold Rush.[9]

World War II caused a precipitous drop in gold production. All gold mines were shut down in 1942 by federal government order. After nearly four years of idleness, the order was lifted in 1945. Most lode mines, however, remained closed because of rising production costs. A few of the larger mines reopened, but the last large mine on the Mother Lode ceased operations in 1954.[10] The mines at Grass Valley shut down in 1956 [11] and the mines at Allegheny closed in 1966.[12]

Lode mine landscapes are most prominent in the Sierra Nevada along the so-called "Mother Lode," a series of gold-bearing veins running from Georgetown southward to Mariposa, a distance of some 120 miles. North of this belt other important lode mining districts are centered on Grass Valley and Allegheny. Several prominent lode mine landscapes are located along the Mother Lode. An immense tailings site, which is estimated to contain over 3,000,000 toils of waste rock, marks the lode mine landscape of Carson Hill. Another impressive feature of this landscape is the glory hole on the north side of the hill. Carson Hill mines have produced over $26,000,000, including the largest mass of gold ever recovered in California: this lump weighed 195 pounds troy.[13]

A unique form of lode mine landscape is located at the Kennedy mine at Jackson. Four tailings wheels were built to remove tailings from the drainage of Jackson Creek (Fig. 6). The tailings were lifted over a small hill and stored behind an impounding dam. Three of these wheels are presently standing; one has recently fallen in ruins. The Kennedy was the greatest Producer of the Mother Lode with a total production of over $34,000,000. The mine has been idle since 1942.[14]

The area around Bodie in the Trans-Sierra also presents lode mine landscapes. Little surface equipment is left, but the area has many tailings piles and mine adits. A significant area of lode mine landscapes is located at Randsburg in the Mojave Desert. Here, tailings piles are found scattered among the few remaining structures and the surrounding hillsides are dotted with mine shafts and surface buildings.

Although lode mine landscapes are generally not as impressive as hydraulic or dredge landscapes, lode production has been very important. The Mother Lode between Jackson and Plymouth, a distance of some twelve miles, has produced over $160,000,000 in gold, and Grass Valley mines have yielded about $190,000,000 of the precious yellow metal.[15]

SIGNIFICANCE OF GOLD MINING LANDSCAPES

These four types of landscapes illustrate the colossal effects

on the surface of California caused by gold mining. Gold areas have an "overturned" look. The surface layers have been dug up, turned over, and rearranged by man in his search for gold.

Until recently, gold mining landscapes have been thought to have little or no value. A few small dredged areas have been leveled[16] and some lode mine tailings were reworked in the depression for gold or used for gravel.[17] However, gravel and boulders precluded agriculture, and the chemicals used for the processing of lode mine ores made general utilization of gold landscapes impractical. In the last few years, however, a practical use has been found for dredge tailings. The Oroville Dam on the Feather River and the new Don Pedro Dam on the Tuolumne are constructed of dredge tailings. Use of these tailings, besides providing materials for the construction of the dams, has resulted in the leveling of areas once covered with debris. Future use of these once valueless areas may include agriculture or recreation.

These man-made gold landscapes stand as a constant reminder of the past importance of gold in the economy of California. Even though erosion has acted on these landscapes for many years, the effects of gold mining will be visible for countless years to come. Such a vast venture as gold exploitation has indeed left its mark. ==========

REFERENCES

1. California Division of Mines and Geology, *Mineral Resources of California* (San Francisco: Bulletin #191, 1966), p.183.
2. *Mineral Information Service*, Vol.22, No.2 (February, 1969), p. 20.
3. *Mineral Information Service*, Vol.23, No.4 (April, 1970), pp.80-85.
4. These devices are described in "Mining for Gold in California," *Hutchings' California Magazine*, Vol. 2, Nos. 1,3,4 (July, September, October, 1857). This article is reprinted in Elisabeth L. Egenhoff, ed., "The Elephant as they saw it," *California Journal of Mines and Geology* (Supplement to October, 1949), pp. 113-91.
5 Rodman W. Paul, *California Gold* (Cambridge, Mass.: Harvard U. Press, 1947), pp. 151-153.
6. The best over-all discussion of the hydraulic mining controversy is Robert U. Kelley, *Gold vs. Grain* (Glendale: The Arthur H. Clark Co., 1959).
7. *Mineral Resources of California*, p. 182.
8. John W. Caughey, *Gold is the Cornerstone* (Berkeley and Los Angeles: U.C. Press, 1948), pp. 251-268; C. A. Logan, "History of Mining and Milling Methods in California," in Olaf P. Jenkins, ed., *Geologic Guidebook Along Highway 49-Sierran Gold Belt: The Mother Lode Country* (San Francisco: Division of Mines, Bulletin #141, 1948), pp. 33-34.
9. *Mineral Resources of California*, p.182.
10. The Central Eureka mine at Sutter Creek shut down in early 1954 and has been idle ever since. "Current Mining Activities Along Highway 49," *Mineral Information Service*, Vol, 9, No. 1 (January, 1956), p. 4.
11. The Idaho-Maryland and the Empire Star mines were the last of the large, deep underground lode mines worked in the state. *Mineral Information Service*, Vol.12, No.2 (February, 1960), p.14.
12. William B. Clark and Willard P. Fuller Jr., "The Original Sixteen to One Mine," *Mineral Information Service*, Vol. 21, No.5 (May, 1968), pp. 71-78; *Gold Rush Country* (Menlo Park: Lane Books, 2nd edition, 1968), p. 90.
13. William B. Clark and Philip A. Lydon, *Mines and Mineral Resources of Calaveras County, California* (San Francisco: California Division of Mines and Geology, County Report 2, 1962), pp. 44-50.
14. Denton W. Carlson and William B. Clark, "Mines and Mineral Resources of Amador County, California," *California Journal of Mines and Geology*, Vol.50, No. 1 (January, 1954), p. 183; Evelyn Garbarni, *The Kennedy Wheels* (Jackson: Published by the author, not dated), p. 6; "Kennedy Mine Tailing Wheels," *Mineral Information Service*, Vol.11, No.7 (July, 1958), p. 7.
15. Oliver E. Bowen Jr., and Richard A. Crippen Jr., "Geologic Maps and Notes Along Highway 49," in Jenkins, ed., *op. cit.*, p.62 & pp. 74-76.
16. A few very small areas near Oroville were leveled because municipal land was covered with debris. "Leveling Dredge Ground at Oroville," *Engineering and Mining Journal*, Vol.94, No.17 (1912), p. 782.
17. The dumps of the Utica mine in Angels Camp were worked for small amounts of gold in the 1930's. Clark and Lydon, *op. cit.*, p. 72. In 1927 the California Highway Commission produced 35,000 tons of rock from the dumps of the Mariposa mine in Mariposa. This was used in highway construction and repair. Oliver E. Bowen Jr., and Cliffton H. Gray Jr., "Mines and Mineral Deposits of Mariposa County, California," *California Journal of Mines and Geology*, Vol.53, Nos. 1 & 2 (January-April, 1957), pp. 128-130.

COMPETITION FOR A DESERT LAKE: THE SALTON SEA, CALIFORNIA[1]

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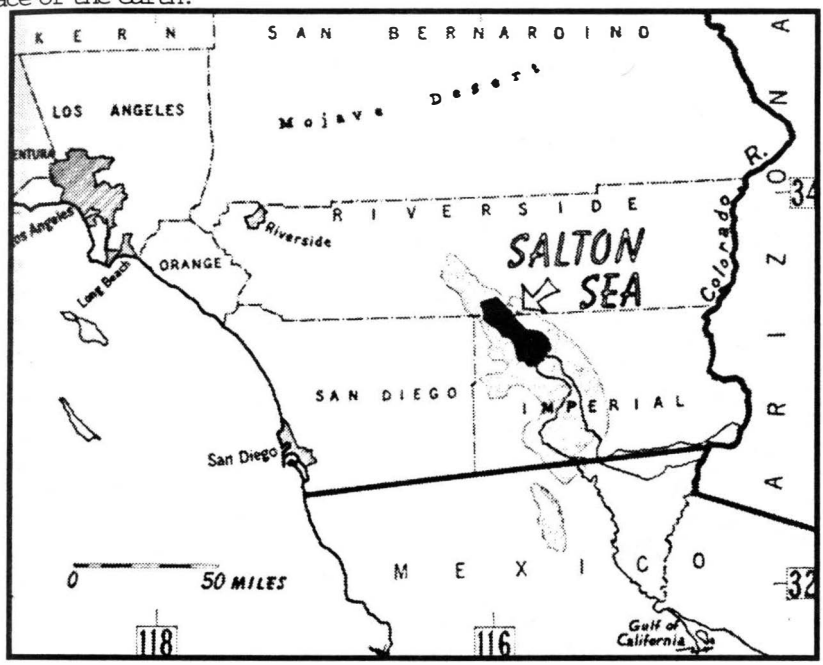
The Salton Sea fits well into the American public's image of Southern California as a fabulous place that has been conjured into existence. After all, what is now regarded as an invaluable asset did come into being through an engineering mistake! For about eight months (during 1905-06, with a renewed break in 1907) the full flow of the Colorado River flooded about 518 square miles of a formerly dry, salt-encrusted basin 274 feet below sea level to create California's largest lake (Figure 1). Originating as an unintentional end-product of one of the greatest disasters in California's history, this desert lake strikingly illustrates man's ability to transform the face of the earth.



But the story of the Salton Sea's origin is well-known. More important for an understanding of present-day man in California are its most recent developments, for this desert lake also affords a prime example of changing human interpretations of what constitutes a valuable resource. The problem is that the use of the Salton Sea is being interpreted by different people in different, and even

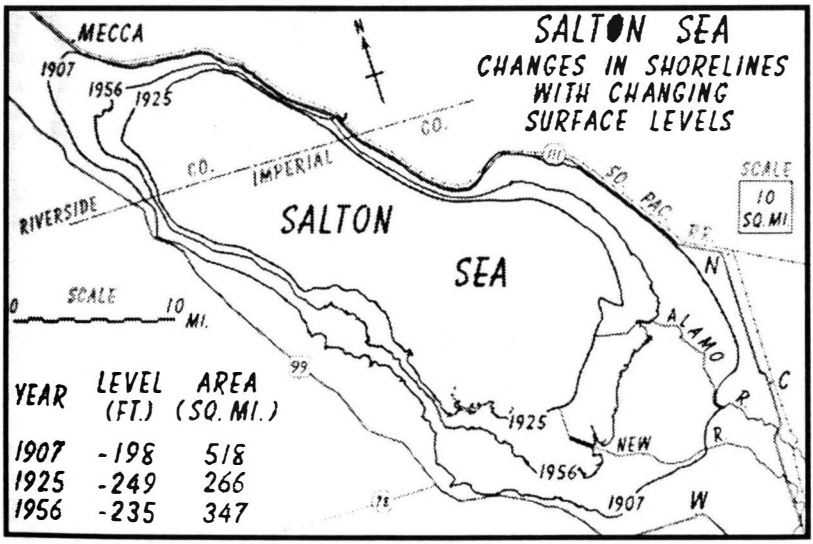
mutually contradictory, ways. One vivid example is the bathhouse at the resort of Desert Beach on the north shore, which was built in 1948 only to be flooded out and abandoned by 1953. Competition may be "the spice of life," but it is also creating some man-made difficulties of increasing complexity. Compromise solutions are seldom easy, and the long-term use of the Salton Sea will involve all the engineering, biological, political, and economic skills Californians can master.

The history of the use of the Salton Sea is a story of ever-increasing intensity for ever more varied purposes. Present uses, listed in approximate order of chronologic development, are multiple:

Agricultural Sump or Drainage Basin
Urban Waste Disposal
Conservational - Migratory Bird Refuge
Armed Forces Test Base-U.S. Navy; Atomic Energy Commission
Recreational-Hunting, Fishing, Boating and Water Sports, Camping
Residential

USE AS AN AGRICULTURAL SUMP OR DRAINAGE CATCHMENT BASIN

In 1907, at the time of closure of the break of the river, the sea covered 331,000 acres and had reached a maximum elevation of 198 feet below sea level (Figure 2). This was its maximum size and highest surface elevation. The present pattern of railroad and roads, upslope at a considerable distance from the nearest seashore, derives from their placement during and shortly after this high sea



stand of 1907.

Over the next dozen years an excess of evaporation over inflow caused the elevation of the sea to drop rapidly. By 1920, its depth had decreased from 79 to 25 feet in this arid region which receives an annual average rainfall of only three inches. Meanwhile, the Colorado Desert was being conquered, to become the Imperial Valley. The disaster of 1905-07 was but a tragic interlude in the epic story of the diversion of Colorado River water that began in 1901 and went on to become the greatest single irrigation development in the United States - a canal system now 1,800 miles in length. By 1925, irrigation development had reached a point where water flow to the sea had caught up with evaporation and the minimal low point of 249.6 feet below sea level was reached. The decade 1925-1935 witnessed fluctuations with an amplitude of 7 feet: rising to -243 feet by 1931, due in part to a plentiful water supply for irrigation and in part to several severe local winter Storms, then dropping to -248 feet in 1935, due particularly to a water shortage in 1931 and 1934.

Since the beginning of storage of the Colorado River behind Hoover Dam in February, 1935, there has been an ample water supply available to the lower river, and the sea has been rising, although at varying rates. It is now at approximately -234 feet, and varies about one foot annually, being highest in April and lowest in October. Some 1,376 miles of drainage canals and 128 miles of the Alamo River and New River channels serve as main outlets to the sea from the more than 3,700 miles of tile draining the 5,500 farms occupying over half a million acres in Imperial Valley. To the north, in Coachella Valley, some 75,000 acres are irrigated by Colorado River water, and these lands, too, are drained into the sea.

A very important use of the Salton Sea is to maintain a "salt balance" in the irrigated areas tributary to the sea. In order to assure continued production of an irrigation project, it is necessary to remove from the project each year, on the average, at least as much salt as is brought into it yearly with the irrigation water. Until 1949, the amount of salt being removed from the Imperial Valley each year was less than that being brought in. Commencing in 1949, there has been a favorable salt balance, with over 4 million tons of dissolved salts annually draining into the sea. It follows that any increase of salt brought into the valley (for example, diversion of fresh water in the headwater, or Upper Basin, region will in-crease the salinity of waters of the Colorado River) will require an increase of drainage-water flushing salt into the sea, thus raising the level.

The importance of the Salton Sea as a drainage basin has been realized for a great many years, and studies have been made, from

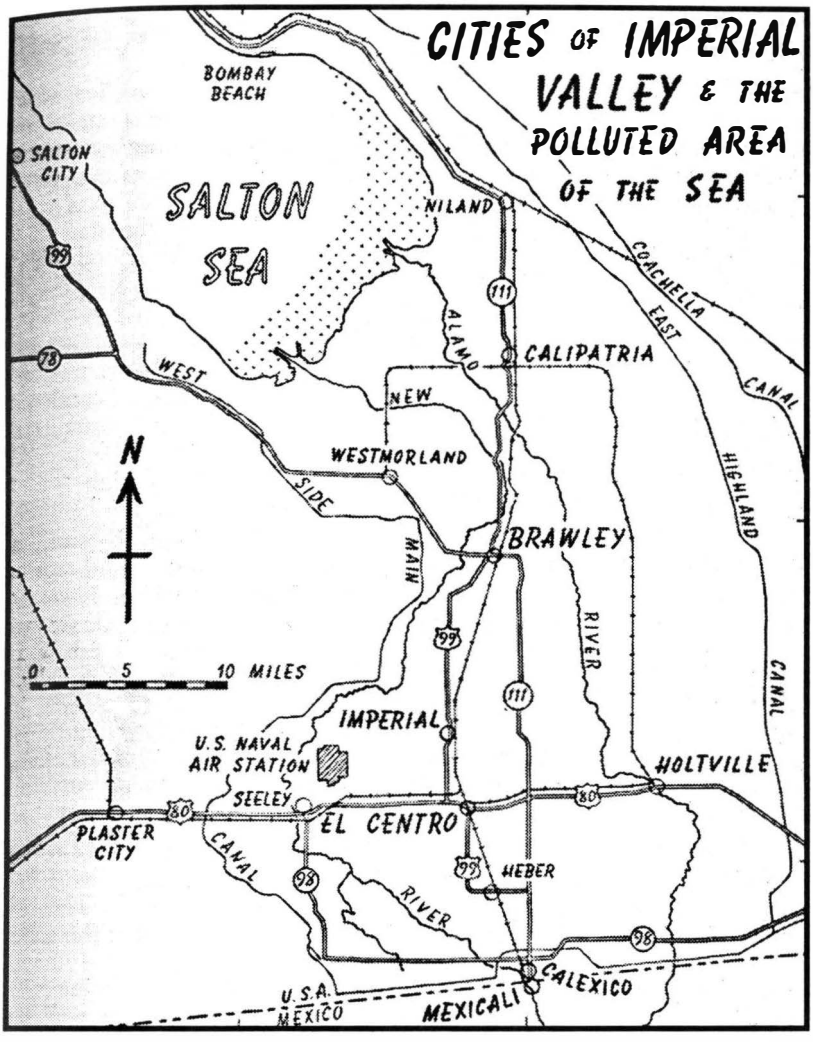
time to time, of what might be expected in the future. In 1924, the federal government, by executive order, withdrew from all forms of entry all public lands of the United States in the Salton Sea area lying below -244 feet, and created a Public Water Reserve. At the time the elevation of the sea was it its minimum point of -250 and a vertical difference of 6 feet was thought to be sufficient. In a 1927 report, the United States Geological Survey concluded that the future stabilized elevation of the sea might be between -223 and -226 feet, but for safety the maximum elevation should be considered as 220 feet below sea level. This is about 14 feet higher than the present sea level. Based on these conclusions, the federal government, by another executive order, withdrew more lands from public entry, adding the area lying below -220 feet to the Public Water Reserve created in 1924.

The Imperial Irrigation District, the administrative operating agency for all Colorado River water and power channeled into the valley, has expended over a half million dollars acquiring fee title to, or flooding rights on, practically all of the private lands under and around the Salton Sea lying below the -230 foot elevation. The district, a private cooperative enterprise, realizes that the sea may reach a higher elevation in the future, but feels that this much drainage reserve is as much acquisition as the district can undertake.

The importance of the Salton Sea as an agricultural sump or drain age basin for the flushing of salt is far greater than its immediate benefits to the 71,000 inhabitants of the Imperial County. The valley enabled the county to rank seventh nationally in the value of its agricultural products. More cattle are fed here than in any county in the eleven Western States; over 60 vegetable fruit and nut and field crops are grown in the valley, 14 of which bring in $1,000,000 or more, for a gross-income in 1958-59 of about $138,000,000. The valley is literally the food basket for metropolitan Southern California, as well as for winter fruits and vegetables for much of the rest of the United States and Canada. It is a unique and valuable place with an unbeatable combination of ample sunshine and water. Where else can farmers grow winter vegetables and raise cattle in the same hothouse!

USE FOR URBAN WASTE DISPOSAL

This sea is a sump for more than agricultural drainage. Imperial Valley towns that grew to cities during the past half-century continue to dump their untreated domestic sewage into New and Alamo Rivers which lead into the Salton Sea (Figure 3). However, they have come under pressure from the state and the local Chambers of Commerce to cease such practice.



Since 1956 the State Department of Health and the Colorado River Basin Regional Water Pollution Control Board have contended that four cities-Calipatria, Brawley, Calexico, and Mexicali, plus the U. S. Naval Air Station west of El Centro-are endangering recreational use of the sea. Prolonged "campaigns of persuasion" have been waged with the local city officials. Brawley has objected to "spending $350,000 to $400,000 for a sewage disposal plant to protect a few acres of the Salton Sea." Calexico has defended itself on the grounds that its larger twin city of Mexicali, Mexico, dumps more sewage into the New River than "all Imperial Valley combined." Mexicali, of course, lies outside California's jurisdiction, but it, too, is seeking funds for treatment-plant construction during

1961. In April, 1960, the Pollution Control Board "got to" and ordered Brawley and Calipatria to build sewer plants and quit dumping raw sewage into the Salton Sea by October 30, 1961.

Bacteriological studies of collected samples of Salton Sea show that there is pollution in a 30-square-mile area in the south end the sea, from the point where New and Alamo Rivers enter, extending northward to immediately south of Bombay Beach on the eastern shore. This area has been posted as closed to water sports. The problem of water pollution has become acute not from any marked rise in the amount of pollution, but because of intensified use of the desert lake for other purposes - recreation and residential development.

RECREATION: FISHING

Though of fresh water origin, the Salton Sea now has a total salt content comparable to that of the ocean. The fauna of the sea consists of hardy marine animals able to tolerate a great annual temperature range of over 400 F., extreme high summer temperatures in the upper 90's (about 80 days over 1000 F.), and periods in summer of high concentrations of sulfide and ammonia and of oxygen depletion at the bottom.

The predominant plants of the sea are dinoflagellates, diatoms, and other single-celled algae. These serve as food for zooplankton, and together they comprise the rich bottom mud on which the pileworm, *Neanthes,* feeds. These worms, introduced from San Die go Bay in 1930 are present by the billions, and are the principal food for small fish and salt vital link in the Salton Sea food chain. The Gulf croaker, *Bairdiella,* a bait-sized fish introduced in 195051 from the Gulf of California, has built up in great numbers. Its establishment provided the kind and quantity of food for predatory fish. Orangemouth corvina, a close relative of white sea bass, were introduced almost yearly from 1950 to 1955, and this game fish has established itself, adding another link to the food chain.

Corvina grow to about 3 pounds in their third year and 12 pounds in their fourth year. Specimens ranging up to 16.5 pounds have been caught on ocean-type wobbling spoons suitable for yellowtail. The principal fishing is from boats, since corvina is a school-fish chasing the schooling croaker, but early-morning surfing, by wading out from shore in swim trunks, has proved successful, especially during spring when corvina spawn around the inshore areas. A corvina population estimated at well over 1,000,000 ("boosters" say several million) assures successful fishing, which, together with a year-round day-and-night fishing season and daily limit of six fish, is attracting more and more people and their boats to the sea.

RECREATION: BOATING, WATER-SPORTS, SWIMMING, AND CAMPING

A desert lake convenient of access by paved highway from the Los Angeles metropolitan area has been a mecca for speedboaters, and water-skiers. There were more boats than autos sold during 1959 in Southern California; these small pleasure craft must now be registered with the State Department of Motor Vehicles under a law approved by the 1959 -State Legislature. Pleasure boating and outboard racing have been stimulated for the Salton Sea by the shore-based facilities, focused at access points or launching areas provided by both private developers and public agencies.

Salton Sea State Park was established in 1954 on the northeast shore. About one-third of its 24-mile shore is still in private hands, but the State Division of Beaches and Parks is buying these private properties that now split up the park in about a dozen places, with the goal of a continuous of park-site between Highway 111 and the shoreline. Improved facilities include 50 elaborate camping places for tents and small trailers with ramadas, tables, stoves, food lockers, toilets, and showers, a bathing beach and picnic area, a launching ramp for trailered boats, a turning basin protected from the wind, and a boat beach for water-skiers. Over 175 more campsites are planned, to make the park the second largest in California. In 1959 there were 308,500 visitors. At present, week-ends are congested. On Memorial Day week-end, 1960, there was a daily average 11,040 visitors in 2,760 cars, with 1,073 boats on the water along both improved and unimproved beaches.[2]

The Coachella Valley Advisory Planning Committee has led a fight against state acquisition of the private parcels, arguing that more tourist are needed along the northeast shore and that to rule out private enterprise would be to lose a sizable chunk of tax base. To counter this argument, the state park plans to offer lease arrangements under which private developers can build such facilities as motels, restaurants, and possibly trailer parks, and operate them under state supervision.

But private enterprise elsewhere is capitalizing on the attraction of is sea as a recreational base, whether for the seasonal parking of trailers for permanent homes. North Shore Beach Estates, for example, is a "membership association" with a private yacht club which offers docking and landing services, with boat slips, storage lockers, fresh water, and electricity Recently added was a 48-unit two-story motel. Boating involves a combination of recreational activities. Fishing, picnicking, camping, sightseeing, resting, speedboat racing, water-skiing, A swimming are associated activities. Except for fishing, offshore portions of the sea are used

much less intensively than are the near-shore portions near the launching areas. Boating also competes with other recreational uses of the sea. Powerboats and skiers conflict with fishermen, sail-boaters and swimmers. The noise of powerboats is objectionable to people seeking a quiet, restful experience.

Closing of the southeast end of the Salton Sea to water sports because pollution has been a failure, because people pay no attention to signs and there is wholesale violation, especially on the weekends. It is possible, but impracticable, to enforce the closure by patrolling the area by boat. Officials of the two counties (Imperial and Riverside) in which the sea lies have discussed the possibility of a cooperative venture to enforce county and state boating-safety regulations, with responsibility for enforcement over the whole sea delegated to the Imperial County sheriff's office.

Clearly, the invasion of powerboats will increase the problems of the federal and state agencies charged with operating the south shore of the sea as a migratory bird refuge. The Fish and Wildlife Service of the U.S. Department of Interior manages the Salton Sea National Wildlife Refuge which covers more than 50 square miles.

RESIDENTIAL DEVELOPMENT

There are a number of striking real estate developments on the north and west shores of the Salton Sea-Desert Beach Resort, North Shore Beach Estates, Desert Shores, Salton Sea Beach-but the most fabulous is Salton City.

Salton City did not exist three years ago. A tract of 19,600 acres along Highway 99 on the western shore in Imperial County was purchased in 1957 by a Los Angeles syndicate, and subdivisions were first offered for sale by nine sub-developers on May 17, 1958. On the opening week-end over four million dollars worth of property was sold. In the first year $30,000,000 worth of bare desert lots was purchased by the general public; 110 miles of roads were graded, and 30 miles were paved. On the occasion of its second anniversary the city contained a 4,500-foot airport landing strip, 2 gas stations, 2 restaurants, 2 motels, 2 marinas or boat harbors, a hardware and boat shop. Thirteen thousand lots had been recorded, but only 60 homes had been built upon them. The zoning plan even includes a section for light industry. Electricity is supplied by the Imperial Irrigation District.

Although commercial buildings completed by spring, 1960, were valued at more than two million dollars, Salton City still mostly resembles a "mirage." One rubs one's eyes in disbelief at the "fancy" buildings along the highway, the miles of bulldozed and paved roads complete with name-signs at intersections that criss-cross many vacant square miles of perfectly barren desert. There

has been a tremendous expenditure for publicity by means of colored half-page advertisements in national magazines, in newspapers throughout California, by billboards, brochures, radio and television announcements, and a host of air and water "events." Speculation is rampant; the many purchasers of "city" lots are hopeful they are in on the ground floor of the new "Palm Springs-by-the-Sea." Not much is advertised about water supply and sewage disposal. Wells several miles to the west care for a population of 300 and the heavily mineralized water must be treated before drinking or cooking. Clay soils are not favorable for septic tanks and cesspools, except temporarily, and oxidation ponds and a sewage-treatment plant are to be located south of the city. Neither is anything said about the effects of the gradually-increasing salinity of the sea; present estimates arc that about two decades the sea will become too heavily mineralized to support game fish.

Ever since World War II the Navy has used the east lobe of the sea for an aerial minelaying test area and a seaplane landing area. The south-west corner of the sea has been set aside as the Salton Sea Test Base operated by the Sandia Corporation of Albuquerque, New Mexico, under contract with the U.S. Atomic Energy Commission. When these defense installations began operations, the Salton Sea was a rather forlorn, isolated area. Only occasionally would someone go boating, hunting, or swimming in the sea. The present population explosion with its in-creased use of Salton Sea has become too much even for the A.E.C. In March, 1960, it announced plans to relinquish the Salton Sea Test Base by July, 1961, with a gradual reduction of activity while transferring operations and its 150 employees elsewhere. The base has its own beach area and boat launching facilities, and its buildings include a lodge which could become the focal point of a winter resort.

The A.E.C. also cited Southern California's smog as another reason moving away from the Salton Sea. High altitude layers of smog which occasionally drift eastward from Los Angeles have interrupted tracking of simulated missiles and caused cancellation of test flights.

For the most part, the present competition for use of the Salton Sea stems directly from the demands of the remarkably affluent, spectacularly mobile population of metropolitan coastal California for desert-resort living and recreation (boating and fishing). But such activities result in debris and pollution. The peoples of Imperial Valley have abundantly proven that cattle and vegetables can be grown in the same hothouse. But can fish and boats and people and sewage and salt all continue to thrive in the same sink? The "handwriting" of future problems is in the air and in the sea.

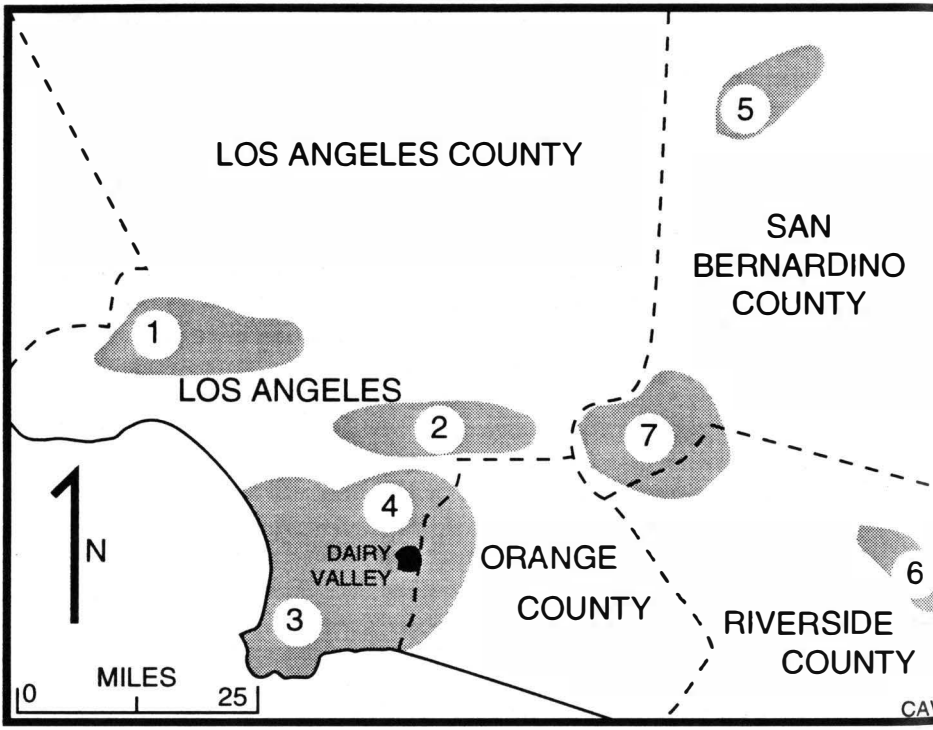


Figure 1.

Past and present milk-producing districts in Southern California:
1. San Fernando Valley 1920-1950
2. San Gabriel Valley 1930-1950
3. Southwest 1930-1950
4. Southeast 1930-1970
5. Mojave River Basin 1960-present
6. San Jacinto-Hemet 1930-present
7. Chino Valley 1930-present
Source: L.B. Fletcher and CO McCorkle, 1962.

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FROM DAIRY VALLEY TO CHINO: AN EXAMPLE OF URBANIZATION IN SOUTHERN CALIFORNIA'S DAIRY LAND

Carol Van Kampen*

As with most economic activities, spatial movements in California's dairy industry are constantly influenced by fluctuating cultural and economic processes. Urbanization is perhaps the most critical process affecting the industry because it involves intensifying land uses and increasing population densities. Many dairy regions which served the Los Angeles Metropolitan area in the early 1950's to mid-1960's have since experienced drastic land-use transformation. This metamorphosis involved a conversion of dairy land-use to more urban-oriented land uses, particularly residential and commercial. In the recent past, three Southern California areas, Cypress, Dairyland, and Dairy Valley, incorporated in an effort to forestall encroaching urbanization and to preserve the land for dairying. When these areas incorporated in the mid-1950's, nearly all their land uses were associated with dairying, and their importance as a major milk-producing area for the Los Angeles market was firmly established. However, by the late 1960's, much of this dairying activity, along with most other agriculture, was eliminated.

This paper is an analysis of urbanization's influence on land use patterns in the Dairy Valley portion of Southern California. The urbanization process lasted little more than ten years and eliminated nearly all dairy land in the area in spite of the aforementioned effort to stop it.

Historical Background

Most of the dairies in Southern California have been operated by Dutch and Portugese people whose ancestors came to America from Holland or the Azores during the early 1900's. Both ethnic groups have contributed significantly to the functioning of the industry in Southern California, although the Dutch still control the majority (70%) of the dairies in the area.[1] During the 1920s and 1930s, many dairies were in close proximity to Los Angeles (Figure 1). However, as that city expanded, these operations have proved vulnerable to the forces of urbanization. The long-term effect of urbanization has caused the industry, which first established in parts of the San Fernando Valley in the 1920's, to retreat in a southeasterly direction.

In each successive stage of settlement, a complex of interrelationships developed to service the industry and the personal needs of the area's inhabitants. Economic activities related to dairying, such as grain and hay sales, equipment services, cattle sales yards, and veterinary practices specializing in the care of dairy animals, located nearby. Along with these activities, a complementary labor force evolved. Although most dairying has now moved out of Los Angeles County, remnants of the area's past dairying activity can still be seen along the busy thoroughfares of many urban communities. As examples, grain suppliers are still located in Bellflower, Paramount, and Artesia. Cultural remnants exist in areas first settled by Dutch and Portugese dairymen. Dutch Christian Reform Churches and schools remain in Bellflower, Paramount, and Artesia. Portugese Catholic Churches are located in Artesia and Paramount. A grocery store specializing in Dutch imports is located in Bellflower, and one specializing in Portugese foodstuffs is located in Artesia. Also, a unique Dutch bakery operates in Artesia.

When dairymen moved into the Dairy Valley region in the early 1950's, they realized that they must innovate a more lasting means to preserve the land for dairying and their strong community life.

Dairy Valley was, therefore, incorporated in 1956 with this one aim in mind.[2] It was a unique city with more dairy cows than people; 100,000 cows resided on 400 dairies, while the human population was 3,500.[3] Incorporation allowed the entire area to be zoned solely for agriculture, thus preventing the encroachment of any non-harmonious activity. Property taxes were kept to a minimum because land values were assessed in terms of agricultural use. Since the city was operated as a rural community, only the facilities necessary for dairying were provided. Municipal costs accordingly remained low, minimizing local taxes.[4] Commercial activities necessary for the functioning of the industry were given variances to enable establishment in the area. Most residential structures were associated with the dairies and such lots were kept to a five-acre minimum in order to prevent subdivision of the land.[5] A pleasant, rural landscape was created where, for acre upon acre, all that could be seen were dairy farms. Dairying had indeed been preserved as a way of life for the inhabitants.

As part of the south-east milk-producing region, Dairy Valley produced nearly 80 percent of Los Angeles County's fluid milk.[6]

Basic to Dairy Valley's intensive production was the drylot technique of dairying. Introduced by the Dutch and Portuguese settlers, it entailed confining dairy animals in a corral and bringing feed to them. In this way, valuable energy is not expended and the feed can be controlled to ensure the highest possible production

per cow. Also, since land is a high-cost factor in dairying, the drylot method enables dairymen to use it more intensively, as opposed to the pasture method. The results are a higher ratio of cows per acre of land, thereby increasing production, and a higher ratio of cows per person, thereby decreasing labor costs.[7]

Using the drylot method, dairymen in Los Angeles County were able to achieve higher production per cow than in any other county in the United States.[8] But total production for the county, and for Dairy Valley, declined drastically since the early 1960's. Present county production is now less than one-fifth that of 1963.[9] This decline occurred in an area whose inhabitants were dedicated to the preservation of dairying and a unique way of life which had been carefully cultivated.

Urbanization Applies Pressure

There were many reasons for Dairy Valley's decline as a milk-producing area. With Los Angeles' "urban sprawl" moving closer, the dairy land became more attractive to developers. As the land values rose, assessment procedures by the county were revised. Land was no longer assessed by the county for its agricultural use, but rather for its potential urban use. From 1951 to 1964, assessed valuations increased nearly 450 percent. The Dairy Valley property tax per acre which averaged $20 in 1951, increased to $280 in 1964. Also, during this period, the tax rate rose almost 40 percent.[10] Increasingly, the farmers' profits could not compensate for the extra tax burden imposed by the county and other taxing districts out of their control. Even though milk production costs in southern California are less than other areas, this advantage could not justify the use of high-cost land for a basically low-income industry.[11]

Those dairymen who were farsighted (and who also might be accused of being speculators) knew it would not be long before urban development would force its way into the area. The lure of profit on high-priced land eventually became too great to resist. Dairymen increasingly realized they could sell their land for attractive profits and establish new, modern dairies elsewhere. Thus, the farmers' resolution to remain in the area was gradually diminished.

As urbanization approached the periphery of Dairy Valley, conflicts developed which increased operating costs and undermined the dairymen's pride as members of the community. Complaints from nearby residents about odors and flies were common. The complaints caused enforcement of stricter health inspection codes which, in turn, required many dairies to undertake expensive control programs. Also, as vacant land near the dairies was subdivided and developed, it could no longer be used for waste disposal

from barns.

Neighborhood nuisance problems also appeared. New children, seeing the vast open fields, were tempted to play on the farmland. Occasionally, acts of malicious mischief resulted in haystacks being set afire. The possibility of such fires prevented purchase and storage of hay when the price was lowest. They were, consequently, unable to take advantage of lower hay prices and had to pay the going price for hay as it was needed. At present, because of the 1976-77 drought, the price of hay is about $100 per ton, which is three times its cost in 1965.

Recognizing the above problems, voters modified the city ordinances in 1965 to permit subdivisions of less than five acres per residence.[12] This vote was the deciding factor in the eventual urbanization of Dairy Valley.

Land-Use Transition and Urban Growth

From 1960 to 1976, a dramatic change in land-use occurred. In 1960, agricultural land-use was predominant, covering approximately 70 percent of the total area, whereas urban uses occupied only 7 percent (Figure 2).[13] At this time, there were nearly 4,000 inhabitants in Dairy Valley. Between 1966 and 1973, almost 200 new residential tracts were built in the city.[14] Each new tract ate away at land devoted to dairying, until, by 1970, agricultural land-use was reduced to approximately 34 percent. Urban uses occupied 30 percent of the total and the remaining land became largely vacant (Figure 2.)[15] By 1970 the city had been renamed Cerritos, and its population was 15,800.[16] The population has now reached 43,000 and urban land-use covers approximately 75 percent of the total area, while only 8 percent remains in agriculture (Figure 2).[17] Only 14 dairies remain in Dairy Valley and the chance of their continuing existence is uncertain, for the 1973 Cerritos Master Plan calls for the elimination of all agriculture by 1980.[18]

Outmigration of Dairies

The major period of outmigration occurred between 1965 and 1970. During 1965 and 1966, nearly 100 dairies moved out of Dairy Valley.[19] In the early phase of the outmigration, dairymen had no problem selling their land. After 1967, the Master Plan was approved, thereby determining all land-use development within the city and providing for an orderly transition from an agricultural community to a suburban community.[20]

Due to very specific zoning conditions set forth by this Master Plan, some dairymen experienced difficulty selling their land.

To better evaluate the effects of Dairy Valley's urbanization on its former rural inhabitants, questionnaires were sent to dairymen

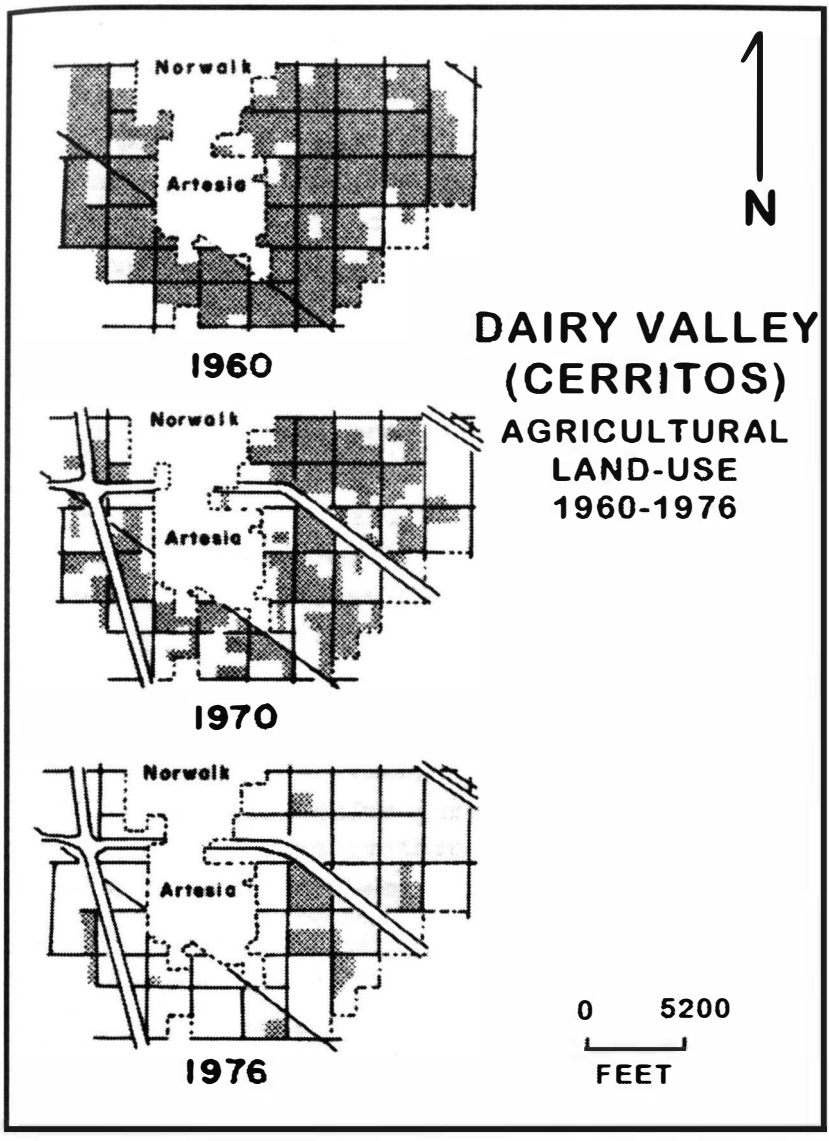

Figure 2.

Dairy Valley (Cerritos) Agricultural
Land-Use 1960-1976.
Source: City of Cerritos, Analysis of Land-Use Activities, Dept. of Environmental Affairs Report, Sept. 1, 1973.

who relocated from Dairy Valley to the Chino valley region, the most frequent relocation destination.[21] The results reveal that no single factor influenced the decision to relocate.

Seventeen percent chose to move solely because of the early opportunity to realize a large profit, since land was selling at $25,000 per acre in 1965. Fourteen percent of the respondents indicated that their move was prompted by the desire to update their facilities. This group, burdened by outdated equipment, viewed the land sale as a means to finance the establishment of a more modern dairy farm.

The balance of the respondents indicated that various negative pressures compelled them to relocate. Twenty-seven percent stated that as farm renters in Dairy Valley, they were forced to move subsequent to the sale of their rented farms. Since other rental farms were not available at this time in Dairy Valley, relocation became necessary. The remaining respondents were almost equally divided between mounting property taxes and growing urban harassment as reasons for abandoning Dairy Valley.

Relocation of the Industry

Since Dairy Valley was the last concentrated dairy region in Los Angeles County, the outmigration of these dairies has practically stripped the county of its milk producers. Once the leading milk-producing county in California, Los Angeles has relinquished its dairy production to areas farther from the market.

Chino Valley, located in parts of San Bernardino and Riverside counties, is the last extensive area in southern California capable of producing for the large Los Angeles milk market. About 100 dairies from Dairy Valley were relocated in Chino Valley.[22] When questioned about the advantages of moving to Chino, dairymen cited large amounts of inexpensive land and low taxes as principal reasons. Also, the milk haul from Chino Valley to the Los Angeles metropolitan area is much shorter and less expensive than from the San Joaquin valley, California's other extensive dairy region. The moderate climate was also considered an advantage over San Joaquin, even though the average temperatures are more extreme than in Dairy Valley.

Chino Valley is now the most productive dairy region in southern California; however, many dairymen feel it is only a matter of time before the dairies must again migrate. An overwhelming 70 percent of the Chino Valley respondents felt urbanization would eventually force them out of their area.

Conclusion

Dairy farming as a way of life has been preserved in southern

California by generations of Dutch and Portugese people at the cost of continued relocation. Because the perishability of milk necessitates locating close to market and because large amounts of land are needed for operation, dairying usually develops on the urban fringe of its market area. Since the urban fringe is dynamic, any land-use patterns not compatible with urban expansion are forced farther from the population center, as evidenced by the southern California dairy industry.

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NOTES

1. G.J. Fielding, "Dairying in Cities Designed to Keep People Out," *The Professional Geographer*, Vol. XIV, no. 1 (Jan. 1962), p. 15.
2. Incorporation was possible through the California Government Code, Section 34,302.
3. S. Fidman, *The Cerritos Factbook* (published by the City of Cerritos, date uncertain), p 5.
4. Fielding, p. 16.
5. N. Irving and Associates, *Comprehensive General Plan* (published by the City of Cerritos, 1966), p. 2.
6. This percentage was obtained by taking the number of milk cows in both L. A. County and Dairy Valley, and multiplying each figure by the average annual milk production per cow in California for 1965 as listed by the California Crop and Livestock Reporting Service.
7. B. L. Anderson and E. Boersma, "Changing Location Factors in the Los Angeles Milkshed," *The California Geographer* (1952), p. 50.
8. California Crop and Livestock Reporting Service, *Manufactured Dairy Products, Milk Production, Utilization, and Prices* (California State Department of Agriculture, Dairy Industry Statistics), 1956-1960.
9. *Ibid.*, 1960-1974.
10. Irving, p. 2.
11. L. B. Fletcher and C. P. McCorkle, *Growth and Adjustment of the Los Angeles Milkshed, A Study in the Economics of Location*, Bulletin 787 (University of California, Agricultural Experiment Station, Berkeley, 1962), p.45.
12. Fidman, p. 5.
13. City of Cerritos Planning Commission, *Analysis of Land-Use Activities* (Dept. of Environmental Affairs Report, Sept. 1, 1973), p. 16.
14. *Ibid.*, p. 46.
15. *Ibid.*, p. 16.
16. *Ibid.*, p. 1.
17. Information obtained from the Planning Department of the City of Cerritos.
18. City of Cerritos Planning Commission, *Cerritos General Plan*, 1973.
19. County of Los Angeles Health Department, *L.A. County Producer Mailing List*, 1965 and 1976.
20. City of Cerritos, 1973.
21. There was a 42 percent response from 75 questionnaires sent to Chino Valley dairymen who had relocated from Dairy Valley.
22. County of L.A. Health Department, *Riverside and San Bernardino Producer Mailing List*, 1976.

CALIFORNIA GEOGRAPHICAL SOCIETY ANNUAL MEETING, 1995

"CALIFORNIA'S ETHNIC DIVERSITY"

PROGRAM

MAY 5-7, 1995

CALIFORNIA STATE UNIVERSITY, FRESNO

FRIDAY, MAY 5
11:45 AM FIELD TRIP :FRESNO—RE-CREATION OF L.A. OR NEW PATH TO THE FUTURE?

Trip Leader: Russell C. Fey, Professor Emeritus, City and Regional Planning, Department of Geography, California State University, Fresno

7:45 PM OPENING SESSION FEATURE PRESENTATION

"Changing Ethnic Patterns in Greater Los Angeles"-James Allen, Chair, American Ethnic Geography Specialty Group, AAG, CSU Northridge.

SATURDAY, MAY 6
9:00 AM - 4:00 PM EXHIBITORS

9:00 AM - 4:00 PM POSTER SESSION

Coordinator: Emily Lieb, California State University, Fresno

Presenters: Kerry Lee Gray, California State Polytechnic University, Pomona
"The Expansion of Office Depot: A Pilot Study

Gabor Bihari, California State Polytechnic University Pomona
"Native But Not Endangered: The California Black Walnut, A Study Using ARC/INFO"

Emily Lieb, California State University, Fresno
"Hmong Cultural Adaptation: Fresno, California, 1993"

Robert E. Pfister, California State Polytechnic University, Pomona
"Ethnic Diversity: Environmental Views in Los Angeles"

Dawn M. Yeager, California State University, Chico
"Chico's Windows of Worship"

PAPER SESSION ENVIRONMENT AND PLANNING

Chair: C. K. Leung, California State University, Fresno

Presenters: Marne Cottriel, California State University, Chico
"Problems and Mitigation Caused by Improper Planning: A Case Study of Robbins California"

Gabor Bihari, California State Polytechnic Universit Pomona
"Where in the World Can We Apply Regenerative Technologies?"

John E. Williamson, California State University, Chico
"Environmental Planning Through the Use of Specific Plans in Smaller Applications"

Rebecca Dagnine and Garth Phillips, California State Polytechnic University, Pomona
"Problems and Constraints in Freeway Construct Planning "

PAPER SESSION URBAN AND SOCIAL GEOGRAPHY

Chair: Christina Kennedy, California State University, Hayward

Presenters: Bing-Yee (Zeppelin) Lui, California State University, Hayward
"Land Use, Location and Customer Attraction: Stonestown Galleria, San Francisco"

Tess Tyler, California State University, Hayward
"Gaslight Malland Fremont Plaza: A Shopping Center in Transition or Decline?"

Frederick Wilson, California State University, Fresno
"Participation in Utility Company-Sponsored Energy Efficiency Programs in Fresno"

Marta Miernik, San Jose State University
"The Death Penalty Across the United States: Historical and Geographical Views"

PANEL PRESENTATION UNIVERSITY GEOGRAPHY IN CALIFORNIA

Keynote: Joseph Beaton, California State Polytechnic University, Pomona
"How Many Geography Majors Does California Need?"

Moderator: Joseph Beaton, California State Polytechnic University, Pomona

Panelists: Stanley F. Norsworthy, California State University, Fresno
Susan Hardwick, California State University, Chico
Richard Taketa, San Jose State University
Jenny Zorn, California State University, San Bernardino

PAPER SESSION LANDSCAPE, CULTURE, AND ENVIRONMENT

Chair: Barry Warmerdam, Kings River Community College

Presenters: Steven Koletty, University of Southern California
"Island Traces on the Urban Facade"

Chris Lukenbeal, California State University, Hayward
"The Function of Place in Popular Films"

Laurey Hemenway, California State University, Hayward
"Alameda Creek Inflatable Dam #3: Its Effects on the Landscape"

Thomas F. McNeill, San Jose State University
"Santa Clara Buildings and Ethnic Diversity"

PAPER SESSION SOCIAL AND CULTUAL GEOGRAPHY

Chair: Bill Preston, California State Polytechnic University San Luis Obispo

Presenters: William Bowen, California State University, Northridge
"Mapping California's Ethnic Diversity"

Bill Preston, California State Polytechnic University San Luis Obispo
"Comunity Health and Land Tenure Patterns in Selected San Joaquin Valley Towns"

Peter Charles Unsinger, San Jose State University
"Matsu—The Offshore Islands"

PAPER SESSION GEOGRAPHIC EDUCATION: PROSPECTS AND PROBLEMS, K-12

Chair: Donald G. Holtgrieve, California State University, Chico

Presenters: Susan W. Hardwick, California State University, Chico
"Insuring Our Future: Disseminating the National Geography Standards"

Donald G. Holtgrieve, California State University, iChico
"How Japan is Depicted in American Textbooks, and How the United States is presented in Japanese Texts"

Stephen C. Smith, Black Oak Mine Unified School District
"Geography Education and Educational Technology"

Barry F. Warmerdam, Kings River Community College
"The Geography Program in a Dutch Secondary School"

PAPER SESSION CALIFORNIA'S NATURAL LANDSCAPE: VEGETATION, WATER AND LANDFORMS

Chair: Guy King, California State University, Chico

Presenters: Guy King, California State University, Chico
"Late Quaternary Paleolakes of Butte Valley, Siskiyou County, California"

Richard Kangas, Selma High School
"Desert Influences in Central California"

Jay Negrin, Los Angeles Department of Water and Powez
"An Overview of the Hydrologic Cycle With Emphasis on Local Water Issues"

Aribilola Omolayo, California State University, Fresno
"Characteristics of Fresno's Rainfall"

PAPER SESSION GEOGRAPHIC EDUCATION—COLLEGE AND UNIVERSITY CONCERNS

Chair: David Helgren, San Jose State University

Presenters: Marcia Holstrom (Presented by David Heigren), San Jos State University Geography 123: What Should We Teach Future Teachers?"

Christina B. Kennedy, California State University, Hayward
"A Comparison of San Francisco's and Oakland's Chinatowns; Student Observations From an Urban/Cultural Field Course"

Robert Hall, California State University, Fresno
"Rural Geography in the College Curriculum"

Felix Campos, San Jose State University
"Gamma Theta Upsilon: The Value of an Honor Society"

STUDENT SESSION : ENVIRONMENT, PLANNING AND SENSE OF PLACE

Chair: Chris Mayda, University of Southern California

Presenters: Chris Mayda, University of Southern California
"Mapping Fear: Multiple Methodologies"

Wendy Winsted, California State university, Hayward
"The Ardenwood Deer: A Valuable Lost Resource"

Debbie S. Morris, California State University, Long Beach
"Risk Map perceptions"

LESSON DEMONSTRATIONS: INNOVATIVE PRESENTATIONS OF GEOGRAPHIC TOPICS

Chair: Robert E. Lee, California State University, Fresno
Demonstrations:

Cheryl Anderson, Deane Grivich, Felix Campos, Charlie Davis, Judy Howard, Al Yeh—all from San Jose State University
Faculty Advisor: Richard Ellefsen, San Jose State University
"A Different Method of Teaching the Process of Regionalization: The Regions of the Land of Oz"

Joseph H. Leeper, Humboldt State University
"Found Poetry: Enriching the Experience of Time and Place"

PRESENTATION WALKING ON THE WORLD: CLASSROOM EXERCISES USING MAPS
Presenter: Paul W. Blank, Humboldt State University

PANEL PRESENTATION TEACHING GEOGRAPHY AT A CALIFORNIA COMMUNITY COLLEGE
Organizer and Chair: Stephen Cunha, Cosumnes River College
Panelists/ Presenters: Robert Christopherson, American River College
"Fact and Fiction: A Realistic Job Description"

Stephen Cunha, Cosumnes River College:
"The Journey: Imediate and Long-Term Preparation"

Carol Jean Cox, Shasta College:
"Landing a Fish: Job Search, Application and Interview Strategies"

PAPER SESSION CALIFORNIA'S NATIVE PEOPLES: PREHISTORY TO THE PRESENT

Chair: John Pryor, California Sate University, Fresno

Presenters: John Pryor, California State University Fresno: "The Skyrocket Site: 9,200 Years of Prehistory ir the Central Sierra"

Matthew Moore, California State University, Fresno:
"Late Prehistoric Population Boundaries and Movements on the West Side of the San Joaquin Valley"

Kathy McCovy and Kevin Boot, California State University, Fresno:
"The Karuk: Salmon Fishing With the Upriver People" (video)

Robert Pennell and Doug Hall, California State University, Fresno
"The New Buffalo" (video)

SUNDAY, MAY 7
FIELD TRIP:6:30 AM YOSEMITE NATIONAL PARK HIKERS' TOUR

Trip Leader: Steve Cunha, Cosumnes River College.

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