RECLAMATION SEQUENCE IN THE SACRAMENTO-SAN JOAQUIN DELTA

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Just over a century ago the Sacramento-San Joaquin Delta was a great fresh-water tidal marsh. Tules (Scirpus lacustris L.) occupied all but the deeper ribbons of water and thin corridors of shrub and woods covered the natural levees. The hygrophytic plants overlaid a body of decomposed organic matter which at the western apex of the delta had a maximum vertical development of 50 or 60 feet. The peat, overlying a mineral substratum of alluvial and lacustrine origin, accumulated during a period of prolonged areal subsidence.¹

The bulk of the 535,000 acres which comprise the delta is enclosed by the 10-foot contour (Figure 1). Over half of the area is at or below sea level.² An account of the transformation of the swamp into an intensively farmed landscape is the purpose of this paper.

CALIFORNIA'S SWAMP AND OVERFLOWED LAND

The delta embraces about 20 per cent of the total swamp and overflowed land which the United States awarded to California from the public domain.³ The granting of such lands was provided for in the Arkansas Act, which Congress passed on September 28, 1850. The state in accepting the land also accepted responsibility for directing revenue derived from


² At least since 1869 the contour has been recognized to embrace a floodplain segment with subaerial deltaic features. Sherman Day, "Report," in Tide Land Reclamation Company, Fresh Water Tide Lands of California (San Francisco: M.D. Carr and Co., 1869), p. 15; California, Commissioner of Public Works, Report . . . to the Governor of California, containing "Report of Consulting Engineers," by Marsden Manson and C. E. Grunsky (Sacramento: 1895), p. 8. Bureau of Reclamation water-use investigators adopted the five-foot contour, but added higher lands that were irrigated from delta channels. U.S. Department of the Interior, Bureau of Reclamation, Project Development Division, "Delta Report," by John A. McKeag (Sacramento: 1954), unpaginated manuscript.

swampland sales into reclamation. Relatively little revenue resulted, however, and whatever was used for reclamation was insufficient for the job. Nevertheless, the state's permissive legislation and its post-1910 Central Valley flood control program contributed enormously to the ultimate success of reclamation.

The history of swamp and overflowed land measurement and transfer to the state is a morass, which may be appropriate. Years elapsed before federal and state agencies agreed on segregation lines or surveying procedures. Cooperation in surveying became effective after 1859, but there was no mechanism to review contested surveys until 1866 and the Secretary of the Interior did not agree to all of California's claims until 1871. By that time the state had sold nearly all of the swamp and overflowed land anyway.

Reclamation Initiated

Reclamation was begun in the early 1850's by individual settlers who, acting independently, constructed low earthen barriers to withstand exceptional tides and seasonal floods. The levees on given tracts were joined gradually and an attempt was made to dress them to uniform specifications. Most such work was performed by brigades of Chinese, other Asians, and Hawaiians equipped with shovels and wheelbarrows.

In 1853 there were low discontinuous levees along the Sacramento River between Rio Vista and Freeport, on the lower Mokelumne, and in the vicinity of the Calaveras River mouth. Levees appeared on southern Roberts Island at least by 1856. The San Joaquin's east bank opposite Roberts Island, parts of Union Island, mainland patches to the east of Anti-

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4 84 U.S. Statute at Large (1845-51), IX, 519; California, Swamp Land Commissioners, First Annual Report . . ., December 15, 1861, in Appendix to Journals of Senate and Assembly of the 13th Session of the Legislature (Sacramento: 1862), p. 9.

5 For a detailed description of the involved situation see the writer's "The Settlement Geography of the Sacramento-San Joaquin Delta, California (unpublished Doctoral dissertation, Department of Geography, Stanford University, December 1957), pp. 185 ff.


och, and Sherman Island were being protected by levees by 1859. At the time a big levee stood 2 to 4 feet above a base that was 6 to 8 feet broad.

**STATE LEADERSHIP**

Although some settlers hesitated to make improvements on swampland during the 1850's because of uncertainties in titles, the chief problem was to develop accord among landowners on reclamation plans and financing. The legislature attempted to solve this problem in 1861 by creating an agency to supervise reclamation. The agency was empowered to direct reclamation in districts expressly created upon petition of owners of one-third "of the land susceptible of being reclaimed together, and contained within natural boundaries" (interpreted to be natural levees and/or high land). That owners of one-third of the land in given area were so privileged was not approved universally. The state’s assumption of responsibility for reclamation was far ahead of the times, notwithstanding the Arkansas Act.

The supervisory State Board of Reclamation Commissioners approved the formation of reclamation districts, drew up and partially executed levee and drainage plans, and devised tax programs for 1) all of the backswamp east of the Sacramento River between the capital and the Cosumnes; 2) a tract flanked on three sides by the Mokelumne; 3) an area between the San Joaquin River's east bank and the road linking Tracy and Stockton; 4) Grand, Staten, and three or four adjacent islands, and 5) the entire backswamp between Rio Vista and Knights Landing. The latter project failed with the bankruptcy of the major contractor. All centrally-directed work halted in 1866 upon the legislature's dissolution of the controversial board.

By 1870 not more than 15,000 acres were moderately secure from flood. The artificial levees usually rose 2 to 8 feet from bases up to 30 to 40 feet wide. Such reclaimed strips occupied natural levees along the Sacramento above Rio Vista, along the Mokelumne and Calaveras, and flanking

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12 The writer concurs with the California Division of Water Resources estimate, *Variation and Control of Salinity in Sacramento-San Joaquin Delta and Upper San Francisco Bay*, Bulletin No. 27 (Sacramento: 1932), p. 158.
the San Joaquin River to the south of Stockton. Drained and broken, such land increased in value twelve to eighty times. It was worked by self-employed and tenant farmers who raised wheat, potatoes, beans, onions, and deciduous fruit. Except for wheat, operations tended to be on a small scale by present standards.  

**INDEPENDENT LARGE-SCALE RECLAMATION**

After 1866, when the Board of Reclamation Commissioners ceased to function, matters pertaining to swamp and overflowed land became the responsibility of county agencies. Acreage limitations were removed in 1868, and land agents and development companies flourished. Reclamation became a matter of speculation for capitalists from San Francisco and elsewhere. The actual work was pursued independently and with vigor, but with slight comprehension of the complexities involved.

The individuals who dominated reclamation activity after 1866 employed labor, draft animals, and machinery on a large scale. They had remarkable success at first, but in the decades following 1871 floods were experienced annually somewhere in the delta. General disasters in 1878 and 1881 shattered fortunes and, for many people, stilled hopes that reclamation could succeed. The persistent men recognized that existing levees were too low and thin, that due regard had not been paid to their placement, and that something had to be done to check the enormous volume of mining debris carried into the Central Valley from the Sierra Nevada.

A variety of techniques and tools were employed to achieve reclamation and to reduce costs. Peat blocks and fill for levee construction, originally obtained inside the tracts, were dug from borrow ditches outside the artificial levee at least by 1869, though the practice was not general for some years. Levees up to 25 and 30 feet high and 100 feet across at the base were being set behind broad berms after 1875; drainage canals and steam pumps were introduced around 1870 and were in general use by 1875. The clamshell dredge, without which reclamation could not have been sustained, was employed after 1879. This dredge moved more fill more rapidly and at lower cost than any other piece of equipment.

**EXPANSION OF RECLAIMED ACREAGE**

Large-scale operations resulted in the more or less successful reclamation of about 110,000 acres during the 1870's (See Map 1). Most of the

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15 The foregoing discussion, based largely on contemporary newspaper and magazine reports, development company brochures, Federal and State documents. See Thompson, pp. 218-286, 446-456.

16 Thompson, pp. 468-509, traces the expansion. For general data see Division of Water Resources, *Variation and Control . . .*, p. 158.
tracts lay in the west-central delta between the Sacramento and San Joaquin Rivers and between Stockton and Tracy. Apparently west-central tracts were favored because of their accessibility to main waterways and because of relatively low local flood crests. The more southerly islands possessed unusually well-defined natural levees and the land was close to Stockton.

Some 70,000 acres were reclaimed during the 1880’s and 60,000 acres in the 1890’s. The earlier levee enclosures were made in the eastern-central, southern, and Calaveras River areas. The Sacramento River districts were slower to complete reclamation for various reasons. Flood crests were especially high along the debris-choked and levee-constricted river. Serious wave erosion on back levees occurred whenever water flowed through the broad Yolo depression west of the Sacramento River. Moreover, diffuse land ownership handicapped policy making and execution. Elsewhere in the delta land tended to be owned in large parcels.

Reclamation of the western-central and eastern-central delta occurred between 1900 and 1920. About 88,000 acres were reclaimed in the first decade and 94,000 acres in the second. It was a period when farm mechanization, crop specialization, contract planting, labor contracting, and marketing procedures developed into modern forms. The virgin land that was drained at this time produced splendid potato crops, and it was reclaimed largely for this purpose. Since a fungus problem rendered peat lands unprofitable for potato production after three years, there was a steady demand for fresh soil. Beans, asparagus, barley, and alfalfa were major crops too. Onions, sugar beets, field corn, and celery occupied lesser acreages.17

The feasibility of swampland reclamation on either side of the Sacramento was greatly enhanced after 1910 by flood control works developed through federal and state cooperation. The river was widened and deepened below Rio Vista, and the Yolo Bypass was lined with great levees.18

Some 24,000 acres were reclaimed in the 1920’s to the north of Rio Vista. The area lies within the Yolo Bypass and is subject to periodic flooding.

Conclusions

An incalculable price has been paid to reclaim the delta. It may be estimated that no three-year period passed between 1852 and 1911 during which some improved land was not inundated by flood or high tide. Regional disasters occurred in 1852, 1861-62, 1878, 1881, 1904, 1906, 1907, and 1909. Although there were no inundations between 1911 and 1925, there have been levee breaks in some part of the delta on an average of once every three and a half or four years since. Most of these are limited to single tracts, some of them in the Yolo Bypass.19

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17 Thompson, pp. 234-237, 313-315, 330-335.
19 For an account of the hydrography of the delta and an historical description of floods see Thompson, Chapter I, Appendix A and B.
The permanent loss of once-reclaimed land has occurred in areas west and south of Sherman Island and near the center of the delta. Here flooding occurred between 24 and 34 years ago, and owners did not choose to recover their land.

It is unlikely that there will be additional permanent losses and the incidence of floods should diminish sharply now that the state and the federal governments plan to raise massive levees along the Sacramento and San Joaquin Rivers. The delta will continue to be a major beneficiary of the political and engineering triumphs that mark California's water supply, flood control, and reclamation experience.