THE SETTLEMENT GEOGRAPHY
OF THE
SACRAMENTO-SAN JOAQUIN DELTA, CALIFORNIA

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By
John Thompson
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The trouble with these earlier machines was that they could not build large levees, and the levees that they did build were not as safe as was desirable because the borrow ditches were too close. The technical problem that had to be overcome was the development of a conveyor arm long enough to permit digging at a safe distance from the levee.

Improved dredges were launched at Stockton in 1875.[25] The two floating steam shovels, the Samson and Goliath, were built for leveeing the parts of Roberts Island where horse-drawn equipment could not be employed because of the soggy footing. Each machine was equipped with dippers of two and a half and three and a half cubic yards capacity. The dipper arms, rated at 40 tons capacity, could lift spoil from depths of 30 feet and carry the material over a bank at any distance under 55 feet from either side of the scow. As with most dredges, both pieces of equipment had to be towed into place. They moved fill at a cost of five cents per cubic yard.[26]

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[25]They were built by Stephen Davis on order of J. P. Whitney, then owner of much of Roberts Island. The machinery was brought by rail from Troy, N.Y., and most of the lumber was brought from Oregon. The Samson was launched September 29, and the Goliath two weeks later. "Roberts Island," SWI, Aug. 21, 1875, p. 7; "Launched," ibid., Oct. 2, 1875, p. 7; "Launched," ibid., Oct. 16, 1875, p. 5; "Reclamation of Roberts Island," ibid., Nov. 20, 1875, p. 5.

[26]"Roberts Island," SWI, Aug. 21, 1875, p. 7; "Gigantic Enterprise," ibid., Sept. 25, 1875, p. 4; "Reclamation and Ship Canal," ibid., Sept. 25, 1875, p. 7; "Reclamation," ibid., Nov. 11, 1875, p. 7.

The Samson's first job was on Duck Slough and Burns' Cut-off levees of Roberts Island,[27] but the water was so low that the equipment could not make headway unless a channel 30 by 7 feet was dug. The volume of material that had to be removed to keep the scow floating vastly exceeded the amount planned for the levee.[28] Nevertheless, the demonstration resulted in urgent requests from levee builders in the Sacramento and Mokelumne river districts for assistance from the new dredges. One of the machines was tried at Staten Island early in 1876, but its boom was so short that to dump fill where it was wanted required excavation into the natural banks of the Mokelumne.[29] In November 1876 one of these dredges was used in building a cross levee on lower Grand Island. The performance was more promising and was thought to be a successful demonstration of the utility of machinery for levee building.[30] The dredge did not, however, satisfy the requirement for a machine which would not weaken natural banks in the process of raising levees above them.

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[27]The levee followed the right bank of the slough southwestward toward Middle River from the slough's outlet on Burns' Cut-off. The present Honker Lake Tract, the Pocket, and Roberts Island north of the Santa Fe right-of-way (including McDonald Island) would be north of the levee.

[28]"Reclamation of Roberts Island," SWI, Nov. 20, 1875, p. 5.

[29]"Crops on the Lowlands," SWI, June 24, 1876, p. 5; "A New Contrivance," ibid., Nov. 18, 1876, p. 5.

[30]Ibid.; "Reclamation," ibid., Nov. 11, 1876, p. 7; "Roberts Island," ibid., Sept. 22, 1877, p. 7.

Removing the Tules

Burning was the accepted method of removing stands of tules. It was done in the fall, after the tops had died and when the sod was driest. Sometimes the standing tules were rolled or mowed before burning to insure more thorough destruction of the vegetation. At other times the standing cover was burned subsequent to the burning of the sod. Whatever the timing, the object was to remove an enormous bulk of matted material which hindered other steps in land preparation such as ditching or plowing.[9]

Breaking the Soil with Fire

Burning was also the cheapest and quickest method of reducing the fibrous organic soil to a workable condition. From the earliest times there was an awareness that the organic material lost about half of its original volume with burning, and that the surface of the land was lowered accordingly. Deeper burning was to be avoided.[10] The depth of

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[9]A representative roller, used on the Lisbon District, consisted of double cylinders mounted in a frame similar to that of a reaper. The diameter of the cylinders was about six feet. The equipment was mounted in front of the horses. "A Ride through Lisbon District," PRP, Jan. 19, 1878, p. 34. Rollers of ten feet diameter, pushed by four horses and steered into the tules by means of a rudder wheel are described also. Illustrations of Contra Costa Co., . . . , p. 8; Tide Land Reclamation Co. (1869), op. cit., p. 39, citing SF Times, June 22, 1869; Munro-Fraser, History of Contra Costa County, . . . , p. 54; Hoag, loc. cit., p. 341; "Our Reclaimed Tule Lands," PRP, April 3, 1875, p. 1; "A New Shipping Point," SWI, Aug. 24, 1878, p. 2; Nordhoff, op. cit., p. 130.

[10]Tide Land Reclamation Co. (1869), op. cit., p. 39.

fire penetration was controllable a little by using the tide gates to manage water levels in the tract or by postponing the burning until dessication had taken place to a desired depth. There is no direct evidence that the water levels were controlled for this purpose in the early reclamation days. Rather, the depth of burn was controlled by the timing; early burns resulted in shallow penetration because dampness retarded the fire.[11] It seemed to be customary to let the turf dry enough to be burned 6 to 18 inches deep.[12] The thoroughness and penetration of fire was greatest in the peat areas, and it diminished as the mineral content of sod increased. On the upper portion of Roberts Island, for instance, some of the burning would reach into only the top six or seven inches of peaty material.[13]

The general practice was to ignite the sod in many places.[14] One procedure was to have a Chinese laborer dig holes into the turf, followed by a second man who dropped wisps of straw into the holes and started the fires.[15] A second method, devised by a farmer on Upper Roberts Island when he could not start fires otherwise, was to ignite

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[11]"Reclamation of Swamp and Overflowed Lands in California," Report of the /U.S./ Commissioner of Agriculture for the Year 1872, p. 185.

[12]Tide Land Reclamation Co. (1869), loc. cit.; Browne, loc. cit., p. 397.

[13]"Burning Tules," PRP, Nov. 16, 1878, p. 309.

[14]Tide Land Reclamation Co. (1869), loc. cit.

[15]Nordhoff, op. cit., pp. 130-31.

kerosene that had been poured into numerous depressions kicked into the turf.[16] Willows and other undesirable woody growth were cut out of the ground after the fires.[17]

Ashes and the scorched alluvium that remained after the fire usually would not support horses or oxen.[18] Even though walking on peat ash surfaces was disagreeable, sowing was done by hand, commonly with a coffee-mill sower.[19] The broadcast seed was brushed in by dragging branches over the ashes,[20] or it was trampled in by slowly and systematically driving compact bands of sheep over the surface. Bands of 200, 300, and 500 sheep did thorough work. In districts where the mineral soil particles formed a large proportion of the volume of a soil, or where the peat was well dried out, plowing and harrowing preceded seeding and harrowing.[21]

While to burn and "sheep-in" land must have involved variable costs, records of the expenses entailed are sketchy. The following data may or may not have been representative. A tract of 1,500 acres was burned in 1871 or 1872 for $100.[22]

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[16]"Burning Tules," PRP, Nov. 16, 1878, p. 309.

[17]San Joaquin County Board of Supervisors, San Joaquin County, California, for the Farmer, p. 51.

[18]Hoag, loc. cit., p. 343.

[19]Nordhoff, op. cit., p. 131. Seeding was done at a rate of 20 to 40 pounds per acre. "Our Reclaimed Tule Lands," PRP, April 3, 1875, p. 221.

[20]Ibid.; Tide Land Reclamation Co. (1869), loc. cit.

[21]Hoag, loc. cit., p. 341; "Cultivation of the Tule Land," SWI, Jan. 18, 1879, p. 5.

[22]Nordhoff, loc. cit.

To "sheep-in" cost from 35 cents to $1.25 per acre.[23] A band of 500 sheep could cover about 10 to 16 acres per day, allowing time for feeding on the levees or on volunteer cover.[24] In later years, rolling, burning, and grubbing cost $3.75 per acre, plowing $5.00, and harrowing $1.25.[25]

The first grain crops averaged up to 40 and 60 bushels per acre, though not consistently. Harvesting with headers was accompanied by rather large grain losses. Sometimes sheep were permitted to glean and to tramp in seed for a volunteer second crop. At other times the second crop was encouraged by plowing with a two-share gang plow drawn by four horses wearing tule shoes.[26] By this time dessication and oxidation had proceeded far enough that the organic soil would support the teams.

Economy was not the only reason that made the burning of tule turf attractive to farmers. It produced fairly good seedbeds. Also, it was believed that the fires prevented "disastrous miasma," and in so doing made the islands more habitable.[27] More important, the system often resulted in

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[23]Tide Land Reclamation Co. (1869), loc. cit.; "Reclamation of Swamp and Overflowed Lands in California," loc. cit.

[24]Ibid.; Nordhoff, loc. cit.

[25]San Joaquin County Board of Supervisors, loc. cit.

[26]Nordhoff, loc. cit.; Hoag, loc. cit., p. 343.

[27]"A Ride through the Tule Country," SWI, Sept. 1, 1877, p. 5; "Burning Tules," PRP, Nov. 16, 1878, p. 309.

spectacular yields which "contributed to keep up the delusion that such was a proper treatment of these lands."[28]

The practice of burning peat had serious shortcomings. The fires were likely to penetrate irregularly, burning deep holes here and there; or to progress irregularly, leaving hummocks of unaltered living and dead organic material among the ashes.[29] The uneven surfaces that resulted hindered efficient operation of teams and equipment.[30] Lowered surfaces were harder and more expensive to keep drained.[31] Soils were depleted, and mineral salts became concentrated in a narrower zone. The occasional escape of fire into peat levees threatened immediate disaster. The dense smoke and ashes that blew eastward caused discomfort in communities to leeward.[32]

Breaking the Soil with the Plow

Virgin peat was difficult to plow before mechanically powered equipment came into use. When it was wet it was too

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[28]"Burning Tule Lands," ed. of SF Bulletin, Jan. 17, 1879, in BS, Set W 18:2, p. 317.

[29]Nordhoff, op. cit., p. 130.

[30]Browne, loc. cit.

[31]"Burning the Tule Lands," SF Bulletin, March 24, 1879, in BS, Set W 18:2, p. 317.

[32]An interesting case of a fire escaping into the levee of Lower Roberts Island occurred in November of 1878. The fire was restricted to a 450-foot section by cutting trenches into the levee; it was put out by pouring on water for a day and a half. The water was pumped by a fire engine which had to be barged some 60 miles from Stockton to reach the fire. "The Roberts' Island Fire," SWI, Nov. 2, 1878, p. 7.

By the 1870's farming was flourishing. The delta's early vegetables earned premium prices in central California cities, while the staple potatoes and beans comprised a large share of the state's produce.[1] Livestock, dairy products, and hay were shipped to San Francisco Bay cities, as were also deciduous fruits, chiefly peaches and pears. Moreover, the premium fruit found ready markets in the East once transcontinental rail shipments were feasible. Wheat, California's second golden harvest, was produced in the delta for export.

Some irrigating had been done earlier, but the practice does not appear to have become a common part of delta farming until the 1870's. Flood irrigation had been tried on small grain by 1871, but was given up because of the excessive weed growth that resulted.[2] For other crops land soaking before planting or flood irrigation were practices in use during the 1870's. Subirrigation prior to plowing and planting dates from the same decade; it was originally used for beans and potatoes or to encourage the growth of a volunteer hay crop.[3] Since then subirrigation has been used on all growing crops.

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[1]In 1875 nearly all of the delta produce trade was with San Francisco. "Down the River," Sacramento Bee, Nov. 5, 1875, in BS, Set W 5, "California Counties; Santa Cruz to Yuba," p. 1870.

[2]"Sherman Island Improvements," MSP, May 22, 1869, p. 330.

[3]"Crops on Sherman Island," correspondence to SF Bulletin, May 21, 1871, in BS, Set W 18:1, p. 147; "The Tule

Irrigation water was delivered to the backswamp land through tidal gates and drainage ditches in the 1870's. Filled mains backed water into field ditches of two- to four-foot depth; from these the water spread along the six-inch- to two-foot-deep laterals ("spud ditches") which were spaced at intervals of 65 to 85 feet. Seepage occurred in the peat soils. Water levels were controlled with dams across the ditches.[4]

Water delivery systems independent of drainage ditches were in use by the latter 1870's.[5] These systems were maintained by the farmer, only the drainage system being the responsibility of the reclamation districts. Water wheels, windmills, and low-head pumps were used on the higher alluvial banks[6] where furrow and check irrigation were the rule. Gravity flow and siphons after the 1900's were used on the lower tracts.[7] Nevertheless, it appears that much of the

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Lands of the San Joaquin," SF Bulletin, March 24, 1879, in BS, Set W 18:2, p. 336; "Reclamation of Swamp and Overflowed Lands in California," Report of the /U.S./ Commissioner of Agriculture for the Year 1872, p. 186; "Agricultural Notes--Contra Costa," PRP, April 5, 1879, p. 228.

[4]Letter of H. Eugene H. to ed., /PRP/, Feb. 11, 1878, in BLS, No. 21, p. 274; Report of the Conservation Commission of the State of California, January 1, 1913, p. 222.

[5]"Tule Farming," SWI, March 31, 1877, p. 7.

[6]McKeag, "Delta Report," Unit 3.

[7]"How Rich Land Is Saved from California Rivers," PRP, July 1, 1905, p. 5; Wells, "Tilling the 'Tules' of California," loc. cit., p. 314; idem., "San Joaquin County, California," loc. cit., p. 695.

land was without irrigation as late as 1898, when, to save grain crops, the Moss Tract levee was breached to admit water, and a steamer was used to pump water onto Rough and Ready Island.[8]

Agriculture, 1900-1924

Although it began earlier, the transformation of delta farming of perishable crops from garden to field agriculture is essentially a twentieth century development. Asparagus, celery, and tomatoes were handled thereafter on a scale previously associated only with such hardy staples as potatoes, beans, and onions. Sugar beets developed into an important cash crop. The scale of all operations expanded rapidly. Barley replaced wheat as the major winter grain crop. Dairying grew apace in the San Joaquin delta. To the north, along the natural levees of the Sacramento, Bartlett pear orchards reached their prime. Alfalfa hay was cut for the city livery trade or, along with crop waste and other feed, was moved to market in the form of beef and mutton.

Marketing methods altered around 1900. Canneries and wholesale produce houses began to handle delta crops directly; trade names and product standards were adopted; and buyers went into the field to contract for crops. Earlier the

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[8]Cosby, "Delta History Notes," pp. 18-19; SWI, March 25, 1898; ibid., April 9, 1898. In 1909 less than half of the reclaimed land was irrigable. Report of the Conservation Commission of the State of California, January 1, 1913, pp. 165, 222-23.