Peat Lands of the Delta

a 26-year study shows disappearing surface of islands is result of combined factors

Walter W. Weir

The peat soils of the Sacramento–San Joaquin Delta are disappearing at a measurable rate—averaging slightly more than three inches a year—and there is no indication that the rate is decreasing.

The area has lowered from six to eight feet since 1922 when this study was started, and most of its quarter of a million acres are now between 10 and 11 feet below sea level.

With minor exceptions the entire area was reclaimed from tule swamp and is in a high state of cultivation—producing more than 25 million dollars of farm products a year.

There are several factors involved in the conditions which exist in this area, all of which may have some part in the lowering of the surface of the Delta islands. Among the more important of these are:

1, Geological subsidence of the entire area; *2*, compaction by tillage machinery; *3*, shrinkage due to drying; *4*, oxidation; *5*, burning; *6*, wind erosion.

There is considerable evidence of a general subsidence of the entire Delta area. The fact that the peat—extending to depths of 30 feet or more—is made up of the remains of plants very similar to those growing on the surface at the present time does not seem logical unless the surface elevations have been rather constantly at or about sea level. It is likely that the growth of tules and reeds kept pace with the receding substratum.

The use of large and heavy farm equipment has been a common practice since the beginning of cultivation in the Delta region. Although many of the crops—such as onions, celery, and potatoes—require a great deal of hand labor, the fields are prepared for planting with tractors and heavy tools. A tractor passing over these soils will shake the surrounding area noticeably for a radius of 200 feet or more.

Undoubtedly there is some compaction of the surface soil caused by cultivation, but it is now believed to be much less than was formerly attributed to this cause.

Each plowing which varies from 12 to 14 inches in depth turns over a layer of peat heretofore untouched by the plows. There is no visible evidence that either the tilled layer of soil or the undisturbed portions immediately below it are more compact than when first farmed.

Highly organic soils shrink on drying. In the Delta this process is most noticeable where large cracks develop when the soil is thoroughly dry. Newly excavated material placed on levees, for example, where it can become thoroughly dry, will shrink and crack to a marked degree. In cultivated fields, the normally high water table and irrigation do not permit the soil to become excessively dry.

It is believed that although shrinkage adds somewhat to the subsidence in this area it is only one contributing factor.

The almost continuous submergence of the Delta soils in their virgin condition prevented or greatly retarded oxidation which enabled these highly organic soils to accumulate to their present depth.

Reclamation, drainage, and cultivation have greatly stimulated the disintegration and oxidation. Although most crops are now irrigated the moisture is dissipated by evaporation and transpiration so that the soils on the immediate surface dry out to at least the wilting point during a part of the year. The frequent stirring of the surface soils by tillage must certainly increase—though it is not essential—the rate of oxidation.

Oxidation is believed to be the major cause of subsidence in the farmed lands of the Delta area and it is believed that it occurs at a rate readily measurable.

The mild climate and almost ideal moisture conditions together with a fertile soil are conducive to a heavy growth of weeds. They sprout, grow and mature after row crops are too large to be cultivated or after grain is harvested. Frequently potato fields become so weedy as to interfere with harvesting. There are many weeds, but kelp and nut grass are particularly troublesome.

It is a common cultural practice to burn off the upper few inches of soil periodically. This is intended to clean up the fields by destroying weeds and weed seeds and kill plant pests and diseases.

Burning is normally done only about once in five to 10 years, and only portions of an island or tract will be burned in any one year. During the 26 years covered by this study every portion of the areas included was burned at least once to a depth of three to five inches.

There is much evidence to show that burning even to five inches does not destroy all of the weeds or kill all pests. No evidence was found that fire produces killing temperatures in the soil to a depth of 12 to 18 inches below the portion burned.

Barley seeds are much more easily killed than most weed seeds and volunteer barley will sprout and come up through the ashes within two or three weeks after the fire is extinguished. The nuts from nut grass remain uninjured at a depth of only one inch below the ashes which remain after burning.

The peat soils of this area are somewhat lacking in available potash, an essential element in high potato production in this area. Potatoes are almost invariably the first crop grown after burning and the liberation of available potash may be a more important reason for burning than is generally admitted.

The normal procedure is to grow one or two crops of barley before burning but during the war when potato and sugar beet production was greatly encouraged, burning was more frequent and often followed a crop of beets and occasionally a crop of potatoes.

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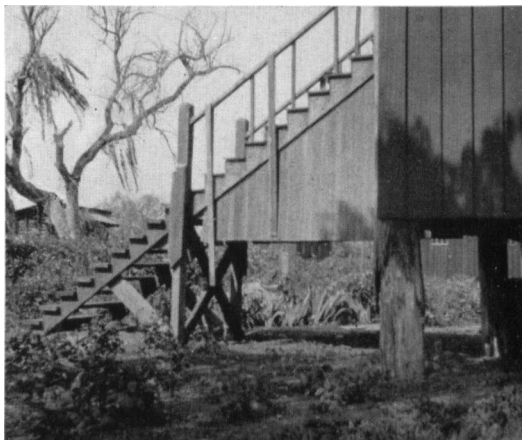
Burning peat soil to destroy weed seeds, plant diseases and pests.

Buildings on pilings do not settle as the soil subsides. Note added steps.



Fluid Milk Production

state's human population up 300% but dairy cow population up only 50%

W. M. Regan

Fluid milk must be produced near the point of consumer markets.

It is increasingly difficult for California—with a continually growing population—to furnish enough market milk and cream to provide an adequate diet for her people.

Most other dairy products may be purchased elsewhere. During 1948, almost 40 million pounds of butter and slightly more than 40 million pounds of cheese were imported.

Except at times during the late war, the market milk supply has kept pace with increasing demand. This has been possible primarily because of two conditions, of which one may not, and the other cannot, obtain in the future. The milk supply has been enhanced by a marked increase in production per cow and by the diversion of milk from manufacturing purposes, primarily butter making, to market milk.

In 1920 about 50% of all the milk produced in the state was made into butter, 20% went into other manufactured products, and 30% was used for market milk and ice cream. Today, only about 10% is used for butter, 20% for other products, and 70% for market milk and ice cream. It is doubtful whether further diversion of milk from the manufacturing of butter, cheese, condensed, and evaporated milk is possible. From a practical standpoint, 70% of the state's milk supply is probably about the maximum that can be used for market milk purposes.

Nineteen twenty marked the beginning of a concerted state-wide program, which was designed to increase, through better breeding, feeding, and management, the average production of California's dairy cows. There were 834,000 dairy cows of milking age in California on January 1, 1949. They had averaged during 1948 a little over 7,190 pounds of milk per cow or 2,390 pounds more than the 1920 average, when the annual average production was about 182 pounds of butterfat. Thus in 1948, there was available for California's tables, almost a billion more quarts of milk than there would have been, had our cows produced at the 1920 level.

Since 1920 the state's population has increased seven million, or almost 300%, whereas the number of dairy cows has increased about 50%. Yet, the market milk needs of the state have been met. The devices through which this has been accomplished have been the increased production per cow and the diversion of milk formerly used for manufacturing purposes into market milk channels.

Authorities on population statistics predict another seven million people for California in the next 25 years. By 1975, they anticipate a population of 17 million. Last year, Californians consumed about 3.8 billion pounds of market milk and cream. If, as predicted, the average Californian in 1975 consumes 425 pounds of market milk, more than seven billion pounds will be required. Figuring market milk at 70% of the total supply, California's dairy herd must produce about 10 billion pounds of milk, almost four billion more than the present production.

This increase may be accomplished in three ways: *1*, by increasing the number of cows; *2*, by increasing the productive capacity of our present cows; or *3*, by a combination of these two.

The first means is the most obvious, but the most expensive method. To produce four billion pounds of milk, 560,000 cows, with the same productive capacity of the present California cow, will be required.

For their replacement an additional 300,000 heifers and calves would be needed. To maintain this new herd, there would be required 3½ billion pounds of total digestible nutrients—the equivalent of 3,600,000 tons of hay or the product of six or seven hundred thousand acres of land. If the cost of maintaining these extra cows can be avoided the result will be more efficient milk production.

Last year in California more than 150,000 cows in cow-testing associations averaged 9,842 pounds of milk per cow or 2,652 pounds more than the 7,190 pound average for all of the dairy cows in the state. When the productive level of the 834,000 dairy cows of milking age has been raised to that of those in cow-testing associations, it will mean another two billion pounds of milk, half of the needed amount with no increase in cow numbers.

Cows in the herds of nine dairymen coöperating with the University in the dairy cattle breeding experiment averaged last year 475 pounds of butterfat. In terms of 3.8% milk, this is 12,400 pounds per cow—5,410 pounds more than the present production of the average California cow.

It is within the realm of possibility that the average production by 1975 could be made to reach this figure, in which case the entire market milk needs would be met with no additional maintenance cost, thus releasing 600,000 acres of land for other purposes.

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Burning the top soil has undoubtedly contributed appreciably to the subsidence of the peat lands although probably not to the same extent as that occasioned by natural oxidation.

The burning of peat lands, for whatever purpose, is one of the most destructive processes involving this area. This is the only one of the destructive processes which can be prevented and the total abolition of burning will undoubtedly prolong the life of the peat by several years.

Wind erosion plays a part in the lowering of the surface soils in the Delta area. Dry peat soils are very light and fluffy and clouds of dust are easily aroused. Miniature whirlwinds can be seen any summer afternoon carrying dust high into the air.

If the ashes on a burned field are not plowed under while the surface is still moist, there will be considerable loss by wind erosion. Peat dust and ashes are carried many miles by wind. Although no actual measurements have been made of the amount of soil lost by wind erosion, it may be as much as one-quarter to one-half inch a year.

The layer of peat overlying the mineral soils varies from nothing around the edges of the Delta to more than 30 feet in places near the center of the area. The average depth of peat remaining is probably about 10 to 12 feet.

Reclamation and the destruction of the native cover of tules and reeds, prevents any further accumulation of peat in this area and there are no compensating influences.

When reclamation of the Delta began in the 1850's peat soils extended almost to Stockton. At the present time there are no truly peat soils left east of Holt which is about seven miles west of Stockton. The soils which remain after the peat is gone are, however, of higher organic content than most soils of the state and still very productive.

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