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DISECONOMIES INHERENT IN WESTERN WATER LAWS

A CALIFORNIA CASE STUDY

by

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A paper read before the Western Agricultural Economics Research Council at Tucson, Arizona on January 23, 1961

As published in Economic Analysis of Multiple Use, Report No. 9 in the series Water and Range Resources and Economic Development of the West, Proceedings of Western Agricultural Economics Research Council, Range and Water Section, Tucson, Arizona, January 23-24, 1961, pp. 55-82.

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DISECONOMIES INHERENT IN WESTERN WATER LAWS: A CALIFORNIA CASE STUDY

I. Introduction

Is our system of water law compatible with economic use of the resource? This old question came again to the fore as the postwar cycle of resource development brought renewed pressures on limited water resources. For a time the negative answer seemed ascendant, at least in the intellectual world (it made somewhat less headway with the holders of superior water rights.) More recently the positive has been accentuated by Professors S. V. Wantrup[1], Stephen Smith[2], George Tolley[3], V. S. Hastings[3], and others. Even Professor S. T. Harding, who once might have been regarded as a sharp critic of the system[4] (especially its riparian components), has recently risen to its defense.[5]

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[1] Wantrup, S. V., "Concepts Used as Economic Criteria for a System of Water Rights", 32 Land Economics (4) 295-312, November, 1956.

[2] Smith, Stephen, "Legal and Institutional Controls in Water Allocation", 42 JFE (5) 1345-58, December, 1960.

[3] Tolley, George, and Hastings, V. S., "Optimal Water Allocation for the North Platte River", dittoed MS, nd, (c. 1957).

[4] Harding, Sidney T., Water Rights for Irrigation. (Stanford: Stanford University Press, 1936).

[5] Harding, Sidney T., Water in California, (Palo Alto: N-P Publications, 1960), pp. 59-60, 211-12. Professor Harding is specifically contrasting the established diligence principle favorably against the exemption from diligence of filings by the State. But his language and evident purport become much more general.

While it is hazardous to summarize so many authors, they seem to share the view that water law in its entirety does not work out in practice in nearly the absurd ways that one might expect from a priori analysis of the enunciated principles; that in fact it would be hard to improve on the allocation achieved in the field; and critics should be required to show how allocation might be improved.

This allegation shifts the emphasis of the debate from the analysis of principles to the observation of practice. For this purpose I have selected the Kaweah River system, which is in the southeastern San Joaquin Valley, largely in Tulare County. This system, like all local situations, is unusual in some particulars, but contains diseconomies of kinds and in degrees that in my observation prevail throughout the Valley and the State.

The Kaweah system makes a good study area for the following reasons:

A. Unusually complete data on diversions are available. The stream has long been administered by a water master, and his 1920-55 records of daily flows in the ditches of some 21 water user organizations are published in California Division of Water Resources Bulletins 49, 49A and 49B[6].

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[6] State of California, Department of Public Works, Division of Water Resources, Kaweah River Flows, Diversions and Service Areas, Bulletins Nos. 49, 49A, and 49B (Sacramento: State Printing Office, 1940, 1950, and 1956.)

B. As the Kaweah River emerges from the foothills it fans out over an alluvial cone, in such wise that water may be shifted among the rival claimants through existing channels with minimal transfer costs. There is therefore, no appreciable transportation cost barrier among the separate water users to complicate the analysis.

C. There is no great problem of water quality to complicate the analysis.

D. The unit is small enough for analysis in some depth, yet its institutions are complex and varied enough to present in microcosm many basic problems of water law.

E. The river is located where water is clearly the limiting factor on economic expansion. A high scarcity value imputes to Kaweah River water, so there are compelling economic reasons for allocating it to its best uses.

F. The area is important for its own sake. It was the alleged crisis of this area that originally triggered off the Central Valley Project in the 'twenties, and it remains the major payoff area for that project. It is the major State and national producer of navel oranges and plums, and an important producer of clings and freestones. In respect to water law, the Kaweah is the locale of at least two

leading cases, Tulare Irrigation District vs. Lindsay-Strathmore Irrigation District,[6a] and Ivanhoe Irrigation District and the State of California vs. McCracken, et al.[6b]

G. Toward the end of the period of study the area received a large imported water supply from the completed Central Valley Project. Observation of the reactions of the local water economy to this increment has brought out a number of significant points that are obscured in a static situation.

[6a] 3 Calif. (2d) 489, 45 Pac. (2d) 972 (1935)

[6b] 357 U.S. 275 (1958)

II. Diseconomies in the Kaweah River Distributary System

A. Indications of wide dispersion of marginal revenue productivities of water within the system.

It is a weakness of much grand-scale project planning to assume implicitly that there is an operative local market mechanism which has succeeded in equating the marginal productivities of water among different users. Thus, one hears statements of the order "Down in Tulare County they pay $15 an acre-foot for water". In fact, in the Kaweah system, the marginal productivity of water varies from less than zero in some areas (where it is applied in such excess as to damage crops and soil) to an upper figure that I hesitate to specify. To save a heavy citrus crop worth $1,000 an acre on the tree, and to save the trees themselves, a marginal acre-foot at the critical moment assumes a short-run value many times greater than the maxima we ordinarily discuss. Within the area there have been citrus groves in just such straits at the very moment that water was wasting elsewhere.

So great is the range of marginal productivities obtaining in the system that it is possible, without pretending to fine accuracy, to establish the contrast beyond cavil. These contrasts have persisted over several decades because, as we shall see, the system's evolution has been almost completely arrested since before 1920.

Each of over twenty water user groups has its own insulated supply-demand balance, hence its own marginal productivity. Lands without surface water using pumped wells of greatly

divergent lifts have still more separate marginal productivities. This paper focuses on what is probably the most extreme divergence, that between the "thermal" areas, the "coves" and benchlands above about 350' elevation, and the lower Kaweah delta of cold nights and alkali-damaged soils. The thermal zone is adapted for citriculture; the lower delta at best for alfalfa and cotton, at worst for barley and pasture. These areas are in direct competition for the same water deliverable by gravity to either area through existing channels.

There are several means by which the outside observer can estimate the marginal productivity of water. In the larger study from which this paper is drawn many of these means were essayed. While some of them eventuate in only crude estimates, plus or minus considerable margins of doubt, they are adequate to the present purpose which is simply to establish the contrast between the lowest and the highest marginal productivities. Possible uncertainty attaching to single methods of estimate was resolved by the fact that the different methods consistently pointed to the same conclusion. The methods of estimate and their results are listed and described below.

1. Water conservation expenses

There is some index to the marginal value of water in the pains that water users take to conserve it. Let us take the Lindsay-Strathmore Irrigation District, extending east from Lindsay and Strathmore to the foothills, as the prototype of citrus water organizations. The following description applies

to the period before its acute water shortage was relieved by the deus ex machina of the Central Valley Project.

This district pumps water up over 200 feet from the river to the top of its system (a cost, as we shall see, imposed not by nature but by water law). It distributes water in steel pipe under pressure throughout its area, so that sprinklers may be used. It operates a surface and an underground reservoir and has the necessary excess distributive capacity to serve water on demand so that operators need apply water only when the trees require it. It has withal one of the most elaborate water conservation systems of any Irrigation District in the State, a fact reflected in persistently high tax rates and water tolls: in 1949, $6.79 per assessed acre and $8.14 per delivered acre-foot.[7]

By contrast, the Tulare Irrigation District (around Tulare in the southwestern Kaweah Delta) loses some 50% of the water it diverts through a long unlined ditch.[8] When it finally

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[7] Computed from State of California, Dept. of Public Works, Division of Water Resources, Irrigation Districts in California, 1944-1950, Bul. No. 21-P, (Sacramento: State Printing Office, nd). In 1929 the District Charged $24.50 per acre and $10 per acre-foot. State of California, Dept. of Public Works, Div. of Water Resources, Permissible Annual Charges for Irrigation Water in the Upper San Joaquin Valley, Bulletin No. 34 (Sacramento: State Printing Office, 1930), p. 65, Table 39.

[8] Adams, Frank, Irrigation Districts in California, State of California, Dept. of Public Works, Division of Engineering and Irrigation, Bulletin No. 21 (Sacramento: State Printing Office, 1929), p. 247.

reached the District, ". . .the use of water is very ununiform and generally wasteful" observed Frank Adams in 1915.[9] William Horn, in studies preliminary to the 1955 Bulletin 2,[10] assigned this District the low overall "irrigation efficiency" of .39.[11] Let me emphasize that neither Mr. Horn, Mr. Adams nor I are necessarily levelling any criticism at the management of this Irrigation District. Its behavior may be perfectly rational within the framework of water law. It is rather that framework itself which is under examination here.[12]

The Tulare Irrigation District is not the worst example. Indeed it is, among our twenty-odd water users, one of those more pressed for water. There is only one lined canal in the entire Kaweah system (Foothill Ditch in the thermal zone). Wasteful rotation systems of water distribution are the rule.

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[9] State of California, Dept. of Engineering, Irrigation Districts In California, 1881-1915, Bulletin No. 2 (Sacramento: State Printing Office, c. 1916), p. 88

[10] State of California, Water Resources Board, Water Utilization and Requirements of California, Bul. No. 2, Vol. 1. (Sacramento: State Printing Office, 1955).

[11] Correspondence in writer's files.

[12] Messrs. Horn and Adams are not implicated, of course.

2. Marginal costs of lifting ground water

The marginal cost of lifting ground water in individual pumped wells is an excellent guide to marginal productivity, since individuals are in a position of complete control wherein they can pursue the natural tendency to equate private marginal cost and marginal revenue product.

The Lindsay-Strathmore Irrigation District, like much of the thermal citrus zone, is underlain by very poor aquifers. Lifts had increased to over 150 feet before 1920,[13] and costs were higher even than that would suggest because the underlying rock imposed high drilling costs and low yields per well.[14] From about 1913, many wells struck connate brines with boron, toxic to citrus.[15]

By contrast, along the lower reaches of the St. Johns River, (the northern distributary of the Kaweah,) between Goshen and Traver, ground water has damaged the soil by intermittently evaporating from the surface, and is not far down today.[16]

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13 State of California, Dept. of Public Works, Division of Engineering and Irrigation, Water Resources of Tulare County and their Utilization, Bulletin No. 3 (Sacramento: State Printing Office, 1922), Map No. 1.

14 Hearings on S. 912 before Senate Public Lands Subcommittee, 80th Congress, 1st Session, 1947, p. 636.

15 Ibid., p. 400

16 Althouse, Irvin H., "Water Requirements of Tulare County", Report to Tulare County Board of Supervisors, January, 1942 (mimeo.), p. 13.
Weir, Walter W., Transactions of the American Geophysical Union, 1941, cited in U. S. Dept. of Agri., Bureau of Agri. Econ., "San Joaquin Valley Water Investigations, Agricultural Aspects". (Berkeley, 1944,) p. 149.

Despite this accessible water table, there is little pumping, due to poor soils.[17] A large amount of Kaweah water is nonetheless consigned to the area each year, under vested rights in surface diversion and channel seepage. In most of the Kaweah delta area over the period of study, pump lifts averaged less than 25'. Only in the southwestern delta were lifts much greater.[18]

3. Water applied per acre

Lindsay-Strathmore Irrigation District was forced by unfavorable court judgements to subsist for many years on 1.76 acre-feet per acre.[19] Even to achieve this depth it had to halve its acreage.[20]

As the other extreme, the Consolidated Peoples' Ditch Company mean annual diversion over 36 years has been about 7 acre-feet per acre,[21] plus whatever may be lifted by private pumps from shallow wells after July when the river usually runs dry.

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17 U. S. Department of Agriculture, Bureau of Agricultural Economics Division of Land Economics, Water Utilization Section, "Area Proposal, Kaweah-Tule Area, California", September, 1941, p. 7.

18 Note 13, supra; and U. S. Bureau of Reclamation, Central Valley Basin, Senate Document 113, 81st Congress, 1st Session, 1949, Plates 4-6 facing p. 104.

19 Statement of Donald Burr, Manager, Lindsay-Strathmore I.D., 1958.

20 Kerr, S. A., in Hearings on S. 912..... supra (Note 14), p. 390.

21 Computed from Kaweah River Flows....., supra (Note 6), Table 8. Cf. Permissible Annual Charges....., supra (Note 7), p. 81, on the lavish use of water by irrigators in the Kaweah Delta.

Let me repeat that it is physically possible to shift water from Consolidated Peoples' Ditch Company to Lindsay-Strathmore Irrigation District without cost, simply by changing the point of diversion. The only barrier is legal. Lindsay-Strathmore Irrigation District was prepared to make the shift in 1928, having bought shares in Consolidated Peoples' Ditch Company and an easement in Foothill Ditch, and was stopped only by injunction.[21a]

4. Value of output per acre-foot

We all know of course that the average revenue product per acre-foot is not the marginal revenue product. But it is a near relative, so that differences as great as those recorded here, especially in conjunction with the other data, are worth noting. In fact, the use of average products understates the contrast of marginal productivities, probably a good deal, since thirstier areas are nearer the stage of increasing average returns to water, and some are in that stage.

The Lindsay-Strathmore Irrigation District, before the advent of Central Valley Project water, grossed something like $5,000,000 per year[22] from 16,400 acre-feet per year, or about

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21a Consolidated Peoples' Ditch Company v. Foothill Ditch Company 205 Calif. 54, 269 Pac. 915 (1928).

22 Adapted from data compiled under supervision of Wm. Taggart, U. S. Bureau of Reclamation, Sacramento; from Annual Reports of Tulare County Agricultural Commissioner; and several contributing sources.

$300 per acre-foot. Consolidated Peoples' Ditch Company, I would estimate, (exact figures are not compiled) grossed in the rough neighborhood of $2,000,000 from its 66,000 acre-feet, or little more than 10% as much per acre-foot.

If we go by crops instead of area, we can deduct current variable costs (i.e. cultural and harvest costs) and arrive at a more significant figure. Costs are higher for navels, of course, and that reduces their advantage, but leaves it still impressive. The average net product of water applied to navels, at current levels of prices and costs, would run from $200-$500 an acre-foot compared to around $40 for cotton, $20 for alfalfa, $20 for barley, and $10 for pasture.[23]

In the long run the advantage of navels would be still less because of their long development period and heavy fixed costs. But for our present purpose the short run difference is relevant. For in the Kaweah area it was not just raw citrus land that was denied water for the benefit of downstream barley and pasture. It was also established citrus groves, with fixed costs already sunk. The economic pressure that water law has withstood is the full difference in the short run values of water between citrus and pasture.

Contrasting to the high yields and low water requirements of citrus, irrigated pasture grasses in the lower delta are little more than domesticated phreatophytes. Irrigated pasture uses

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[23] Cost data supplied by Tulare County Farm Advisers.

about five acre-feet per acre. Michael Brewer has recently tabulated water cost as a percentage of all variable costs in pasture operation.[24] He finds it to be 23%, a good deal more than for cotton at 5%, Emperors at 2.7%, and even rice at 14.9%.

But this contrast, striking as it is, understates the full economic contrast a good deal because only explicit outlays are considered. No opportunity cost value is assigned to the water itself, even though this may be the predominant social cost of water use. If, in the Kaweah area, we were to charge against irrigated pasture an opportunity cost of about $15 per acre-foot, there would remain no net return at all to other variable inputs, the operator or the equity. There would remain precious little return to growers of barley and alfalfa. These crops can be grown here only because water law insulates their growers from feeling the social cost of water as a personal cost.

5. Production response to increased water supply

From 1952, the Central Valley Project brought a prodigious increment to the area's water supply. According to Tulare County Agricultural Commissioner reports, the response of navel output was immediate and continuing. Tulare County navel yields for 1952-58 are about double those for 1943-51, and the division between 1951 and 1952 is clean and sharp. By way of a control,

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[24] Brewer, Michael, "Water Pricing and Allocation with Particular Reference to California Irrigation Districts", Giannini Foundation Mimeographed Report No. 235, 1960, p. 84.

in neighboring Fresno County, where navels received no new Central Valley Project water, there was no significant change in yields between the two periods.

Crops grown in the middle and lower delta--plums, alfalfa and walnuts--show no increased yields after 1952 (cotton is not used as an example because its intermittent acreage control program overshadowed other factors influencing yields).

6. Land-value response to increased water supply

In the thermal citrus zone, access to a reliable water supply today is worth something in the neighborhood of $500-$800 an acre. This is the difference in the price of raw land with and without water. Dry land, of which there is ample, would bring some $50-$100 an acre based on grazing income. Water raises this to $500-$900. Access to water is not free, but entails annual land taxes and water tolls of some $30 an acre, and the land value increment is based on expected income net of these charges.[25]

This index is inflated by today's high land prices, based in part on speculative anticipations that may be unwarranted. Ten years ago the figure was less than half today's, and ten years hence, in my opinion, it will be that low again, or lower, due to overexpansion of water-supply and related land-development projects.[26] Still it contrasts sharply with the lower delta,

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[25] Interviews with local realtors and water officials, 1958. See also Hearings on S. 912..., supra (Note 14), pp. 654-55.

[26] See Section IV, infra.

where it is difficult to find evidence of any land value increment related to increased water supply, and for our present purpose it is the contrast, not the absolute quantity, that is important.

7. Willingness to pay for water and water rights

Lindsay-Strathmore Irrigation District before 1935 had bought, and downstream interests had sold shares in most of the Ditch Companies in the Kaweah Delta, despite the high risk (which came to pass) that Lindsay-Strathmore Irrigation District could never use them. Consistently thwarted in her quest for water, Lindsay-Strathmore Irrigation District just as consistently put up whatever money seemed necessary to get it some other way.

In 1949 when the Irrigation Districts' Association sought to maintain a united front in bargaining with the Bureau of Reclamation, it was Lindsay-Strathmore Irrigation District which first broke ranks and consented to a contract with several unpopular features. By contrast the lower delta ditch companies have never even organized as Irrigation Districts to contract for Bureau water. The Kaweah Delta Water Conservation District, representing the whole delta, is unwilling to pay the Bureau's prices.

8. Competent appraisals of soils and climate

The excellence of the benchlands in soils and climate is documented in sources cited in the appended footnote.[27] Parts of the lower delta also have excellent soils, but the thermal qualities of the benchlands suit them for much more productive uses of water.

9. Size of farms

In Lindsay-Strathmore Irrigation District almost all the land is in unusually small and intensive farms, averaging about 15 acres.[28] At that size clearly the operator is in sore need to spread his overhead over as much output per acre as possible. He is likely to have on hand underutilized indivisible input items to make the fullest use of marginal water at the least marginal associated cost.

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27 USDA Bureau of Agr. Economics, "San Joaquin Valley Water Investigations, Agricultural Aspects", (Berkeley: 1944), Mimeo. A Report to the War Dept. U. S. Engineers Office, Sacramento District, made of public record by introduction by Paul Johnstone in testimony at Hearings on S. 912. . ., supra (Note 14) p. 842, Table 19, p. 44; Table 24, p. 60; Table 39, pp. 108-09

USDA Bureau of Agricultural Economics, "Area Proposal, Kaweah-Tule Area, California", supra (Note 17), pp. 7 ff.

Althouse, Irvin H., op. cit. (Note 16), pp. 12, 96-97.

U. S. Dept. of Interior, Bureau of Reclamation, "Factual Report, Tulare Irrigation District", (Fresno: 1949), mimeo.

28 U. S. Dept. of Interior, Bureau of Reclamation, "Factual Report, Lindsay-Strathmore I.D." (Fresno: 1949), Mimeo.

Nowhere else in the delta are farms nearly so small.[29]

B. Unreliability of water supply

A common rationalization for rigidity of water allocations, and unresponsiveness to demands, is that this is simply the price we must pay for security and stability of supply. But this argument will not bear much weight in the Kaweah River situation, since the division of waters is such as to increase materially the system's aggregate variability over what it might be; and the allocation of the burden of variability among different users is such as to deprive a needlessly large share of the diverted water of much of its value, as will be shown directly.

It is natural to think that irregularity of irrigation water supply must reflect irregularity of demand, but such is not the case in the Kaweah system. Demand plays no part in timing deliveries. Diversions are regulated by an iron-bound schedule based exclusively on rates of flow in the river. Demand must adjust to the supply so determined.

1. Aggregate variability in the system

Nature imposes a certain variability on water supply, which man can reduce only by physical means, i.e. storage. But he can increase it, when dividing the supply among many claimants, by the counter-movement of diversions. That is, if one diversion rises as another falls there is new variability introduced in

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[29] Clawson, Marion, and Wilson, Edwin E., "Agricultural Land Ownership and Operation in the Southern San Joaquin Valley", USDA Bureau of Ag. Econ., (Berkeley: 1945), Mimeo.

the system. Or if the diversions change disproportionately (even though perfectly correlated) there is a sort of increased variability introduced, if we define and measure "variability" in such a way (as I think we should) that deviations are weighted in step with their magnitudes (e.g. by squaring them).

For this purpose the variance divided by the mean makes an appropriate measure. For annual flows from 1920-55 this figure for the sum of all diversions was 63,016 acre-feet. This represents the variability which nature imposed on that portion of the river which man diverted. But the sum of the corresponding figures for the individual diversions was 98,050 acre-feet, or 56% more.[30] Thus, man's division of the waters added, by this measure, 56% to the burdens imposed by nature.[31]

Three user-organizations actually received supplies which were less steady than wasted flood waters, i.e. Kaweah River flows in excess of diversions. This hardship is clearly unnecessary, and is imposed by the system on junior appropriators to the benefit of no one.

2. Distribution of variability among water-users

System variability is very unequally distributed. The steady portion of the flows, which is of course much the more valuable share, goes to a few. In general, these are the same which get the heavier per acre mean annual supplies.

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30 Computed from Kaweah River Flows . . ., supra, (Note 6).

31 The percentage increase is greater in the summer months, which are by far the more important ones. Exact figures on this, however, have been derailed in a vacuum tube deep in the bowels of our computer and could not be located in time for this meeting.

The result is that few acres receive water supplies that are adequate in both quantity and reliability. To give some quantitative measure of this I have improvised a "coefficient of reliability" defined as $.1 \div [.1 + (\text{coefficient of variation})^2]$. This is not the best such coefficient that human ingenuity might devise, but is frankly a Rube Goldberg gadget which simply corresponds to my intuitive evaluation of the importance of steadiness in water supply. I will rise to defend it against simple misunderstanding or sandbagging, but gladly abandon it to a better alternative.

After adjusting mean annual supplies with this coefficient the acres getting adequate water supply are seen to be much less than they could be.

89,500 acres get some Kaweah surface water. Mean annual flows could supply them nearly four acre-feet per acre. Multiplying by the coefficient of reliability for the River this becomes 1.13 adjusted acre-feet per acre. But, due to the unequal distribution of water and steadiness, the acreage receiving that good a supply or better is only 29,000. These acres receive very good supplies indeed. But they are only 32% of the acres (89,500) that might receive that good a supply.

When we consider further that the 29,000 acres for whose benefit the others are deprived do not include the best combinations of soil and climate, we have a notion of the undeveloped potential in the Kaweah River.

C. Excess diversion capacity

A third important diseconomy in the system is excessive diversion capacity. One would expect this from the excessive aggregate variability discussed above, but there is more excess than that accounts for. With few exceptions, ditch diversion capacity far exceeds all recorded diversions except perhaps one--one day in 36 years--and that one diversion apparently undertaken in the hope of stretching and/or nailing down a claim to water.

The sum of all diversion capacities is 4740 second-feet,[32] or 2.2 times the peak of the sum of all diversions reached on June 4, 1952,[33] and 11.5 times the mean diversion.

D. Excess canal mileage

Excess canal mileage is one of the more conspicuous diseconomies in the Kaweah system. Probably over two-thirds of it could be dispensed with in a compact integrated system. I have not tried to demonstrate this directly. The indirect evidence happens to be easier to marshal, and it suffices.

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[32] Computed from Kaweah River Flows . . ., supra, (Note 6).

[33] June 4, 1952, is not necessarily the all-time peak of the sum of diversions. The task of computing this series daily for 36 years was beyond my resources. But this was certainly near the all-time peak, and far above the normal annual peak.

1. Scattered service area

The 89,500 acre Kaweah service area is strewn over about 440,000 acres, or five times as much land, which is contained within the perimeter of service.[34] Some of the bypassed lands are poor, but some are very good, and better than those getting service, and in general the scatter cannot be rationalized as an effort to apply limited water to better soils. Neither is it an effort to bring surface water where underground water is costly, for there is clearly no such pattern. It is a heedless, haphazard scatter reflecting random historical forces now frozen tight.

2. Overlapping service areas

Shares of the separate ditch companies have traded freely over the area and reached the sort of reductio ad absurdum that might be lampooned in an elementary text to dramatize the inevitability of monopoly in public utilities, but which one hardly expects to meet face to face.

Only 12,000 acres are actually served by two or more companies, but the company service areas are now scattered among each other most intricately, so that there is much overlapping of the areas within service perimeters. The sum of the areas within the service perimeters of the separate companies is 356,000 acres, or four times the net area served (89,500 acres).

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[34] Computed from Kaweah River Flows . . ., supra (Note 6), map in back pocket.

One company, the Wutchumna Water Company, is so scattered that it serves only 11% of the lands within its perimeter. Five other companies operate within this same area.[35]

3. Unintegrated ditches and cross-hauling

Many ditches in this system cross one another, some of them two or three times. A most conspicuous waste are the parallel ditches which work at cross purposes, carrying water in opposite directions, or at least with significant contrary vector components. For example, by long standing tradition (and court order) the River must be split 50-50 at McKay Point between the St. Johns, or northern distributary, and the "Kaweah Branch", or southern distributary. This division has behind it no rationale that I have discovered deeper than that there is a ring of rough and ready justice to "fifty-fifty". The productivity of and demand for water are greater in the south. And so the Ketchum Ditch and Packwood Canal have been built to carry St. Johns' water from below McKay Point back to the southern branch. The Tulare Irrigation District canal goes even farther north to tap the Wutchumna Ditch, whence it crosses both branches (with the most sanitary precaution against intermingling) and proceeds many miles southwest to lands which could be served from one of the natural distributaries of the south branch,

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[35] Ibid.

Cameron Creek. From this same Wutchumna Ditch the Lindsay-Strathmore pipeline carries water not only back southeast whence it came, but back up hill to lands that the water could reach by gravity *via* an existing aqueduct, Foothill Ditch.

E. Conveyance losses

The problem has at least two important dimensions.

1. Loss of elevation

From about elevations 650 feet down to 250 feet the Kaweah River falls freely. This drop could hardly be used to generate power, but it could be used to move water southeast at high elevations. The gradient of marginal productivity rises rapidly to the southeast, and uphill, so this would be a very productive use of the elevation. This valuable elevation is completely dissipated in the process of moving water through the present system to low lands that could be served by imported northern waters--if waters must be imported--much more cheaply than the higher and more southerly lands.

2. Channel seepage

Both the natural and artificial channels pass over porous materials and lose large fractions of their flow to the underground. Much of this water is later pumped and used, but it still represents significant loss.

First, much of it percolates in the wrong places, *e.g.* the lower St. Johns channel, where ground water is too high already and the marginal productivity is zero. And once it has sunk it becomes subject to the paramount rights of overlying land-owners and is very difficult to export.

Second, much of it percolates at the wrong time, that is in summer when pumps are busy lifting water from the ground reservoir and surface delivery of this seepage water would save a needless round trip.

F. Inadequate use of the ground reservoir

1. Storage use

Below the surface of the Kaweah delta lies a resource that is comparable in value to the River itself, viz. a large underground storage reservoir in coarse gravel that is notable for ease of recharge and withdrawal, especially toward the apex of the cone. Like the River the reservoir has high location value, because in this area storage, like water, is scarce. Neither the Kaweah nor the neighboring Tule has a large and economical site for surface storage, and ground storage south and especially southeast from the Kaweah delta is poor.[36] Clearly this ground storage should be filled in spring and drawn down in summer to regulate the flow.

But many overlying landowners have strong rights in surface water, so hardly need the ground water. And the reservoir cannot be used for the benefit of other lands. California law allows only "surplus" waters to be exported from a ground water basin, and in this area exports have been enjoined. Even if

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[36] Gardner, Wm., testimony at Hearings on S. 912 . . ., supra, (Note 15), p. 417.

the "foreign" land holder supplies his own water by artificial recharge, wishing only to use the reservoir, he cannot, because the natural and artificial waters commingle underground. When he withdrew the equivalent of what he had "deposited" in this bank it would include some natural water, thereby threatening to establish a prescriptive right which overlying owners would be bound to enjoin.

The Lindsay-Strathmore Irrigation District did, it is true, operate a well-field in this area for several years up to 1952, but was forced finally to discontinue. It had only enough bargaining power to get consent to continue its use until Central Valley Project water became available. Even this well-field used only a small fraction of the underground reservoir capacity.

2. Permanent recharge

In some areas in recent years, recharge of aquifers would have been desirable. One of the most productive uses of water often is to submerge it permanently to support the water table and reduce pump lifts. In aquifers of 10% water-holding capacity, for example, one acre-foot per acre should raise pump lifts 10 feet, worth about $1.50 a year if three acre-feet per acre are pumped. A dollar and a half a year at 5% would be worth $30, an exceedingly rough figure, but suggestive of the order of values involved.[36a]

[36a] Preliminary studies by Edward Renshaw at the Giannini Foundation appear to yield comparable figures.

Recharge has not proceeded as fast as it should. The Tulare Irrigation District, interested in recharge, could not or did not pick up enough water from other organizations. The Kaweah Delta Water Conservation District, whose primary physical function is recharge, has acquired no water rights of its own whatever.

A prime cause is the scattering of irrigated farms among dry farms in the area. Not only are organizational service areas scattered, as described above, but pump-irrigated land is similarly interspersed with dry-farmed land over a wide area.[37] This pattern of course multiplies the volume of water that must be sunk underground to support water tables beneath the irrigated acreage, and no doubt helps to make uneconomical an operation that would, with compact development of irrigation, often be feasible.

Corresponding to inadequate recharge is the problem of excessive withdrawal. The individual pumper feels no constraint to economize on ground water and accordingly treats it as a free good.

G. Inadequate reuse of water

The early diversions from the Kaweah, which today have fixed priorities based on historical use as well as privileged riparian status, were largely made at lower elevations, toward

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37 Water Resources of Tulare County . . ., supra, (Note 13), Map 1; Althouse, Irvin H., supra (Note 16), map in back pocket.

the bottom of the system. Water so applied drains out of the system with less reuse than if it were applied initially on the higher bench lands.

H. Segregation of the Kaweah from small local streams

There are several small intermittent streams nearby the Kaweah, whose flows aggregate some 20% of the Kaweah's. Generally, the smaller a stream the less reliable its flow, so these waters are largely unusable.

It is interesting to note, however, that these intermittent waters could be made usable by integration with the Kaweah, materially augmenting the area's usable water supply. They rise from much lower watersheds than the Kaweah, so their patterns of flow are different, tending to offset each other and the Kaweah. When all the flows are aggregated, in fact, the coefficient of variation of the combined flows is little greater than for the Kaweah alone.[38] This benefit would flow simply from applying the principle of pooling offsetting risks. However, it has not been done. Rather, as we have seen in II, B, the contrary: the Kaweah itself is unpooled, split up in such a way as to create more risk, regressing from Nature rather than improving on her.

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[38] .52 for the Kaweah and .54 for the combined flows. The coefficients of variation for the small streams taken individually run around .75-.80. Computed from data for 1890-1940 in Althouse, Irvin H., op cit. supra (Note 16).

I. Segregation of the Kaweah from the Kings River

Integration of the Kaweah with its larger northern neighbor, the Kings, has been recommended by most students of the area of an engineering or economic orientation. These include Irvin Althouse,[39] a leading engineer of Tulare County; the California Division of Water Resources in its original plans for the Central Valley;[40] and more recently the Bureau of Reclamation.[41] Some of the advantages would be:

1. The Kings River has abundant cheap surface storage (at Pine Flat), which could be used to firm up the Kaweah, thus indirectly helping to regulate the latter.

2. The Kings has a relative water surplus, and its present service area is much cheaper to reach from the north if more supplies are to be imported.

3. The Kings could serve much of the Kaweah delta by gravity, releasing Kaweah water for export southeastward at high elevations into the zone of highest marginal productivity. The Friant-Kern canal could have been shortened into a "Kaweah - south" canal and its cross-section could have been reduced by utilizing some elevation to increase the very low gradient,

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39 op. cit. supra (Note 16), p. 97

40 Bailey, Paul, Water Resources of California, State of California, Dept. of Public Works, Division of Engineering and Irrigation, Bul. No. 9 (Sacramento: State Printing Office, 1925), Plate IV facing p. 10.

41 Central Valley Basin, supra (Note 18), p. 132.

presently just six inches per mile. These measures would have greatly reduced its high cost, which was incurred by maintaining elevation through the rough foothills between the San Joaquin and the Kings.[42]

These net gains waited upon getting some flexibility into water allocations. They still wait. Not only was local enterprise blocked, but even when outside benefactors, the State and the Nation, offered to cover most of the expenses, the obstacles of water law proved insurmountable.

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[42] Boke, Richard, testimony at Hearings on S. 912 . . ., supra (Note 14), p. 661.

The role of water law in imposing and perpetuating diseconomies[42a]

I have several times already alluded to the role of water law in the diseconomies described. The present section spells out this relationship more systematically.

A. Productivity not the initial basis of water rights

The State has never allocated its valuable waters by putting a rental on their use, neither has it ever sold licenses or titles to the highest bidder. Rather it has followed a mixture of methods whose rationale bears little apparent relationship to marginal productivity.

1. Riparian rights

Riparian rights are limited, as we all know, to lands fronting on natural channels. The Kaweah delta with its many distributaries is endowed with more than the usual quota of riparian lands. The Kaweah channels are unusually shallow, as well as absorptive. Ground water gradients, therefore, slope down away from the channels, so that riparian lands in general have the easiest pump lifts and the least need of surface water. Thus riparian rights attach surface waters to the lands that need them least.

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[a] I am indebted to Thomas Crocker for assistance in research for this section, and to Professor Fred Mann for tolerant legal counsel.

2. Appropriative rights

Appropriative rights, as we all also know, are based on priority of use and ranked by seniority. Rights become appurtenant to lands in the order that they are developed for irrigation.

Now the supersession of lands from less to more intensive uses in our society has almost never proceeded orderly-wise, in compact increments, and irrigation use is no exception. The more diligent early irrigators are sprinkled among dry farmers, and their appropriative rights the same, so that conveyance costs are excessive.

Early appropriative rights are not necessarily biassed toward better soils, since dry-farmers on these are under less pressure than those on poor soils to augment their incomes, and are more typically holdouts against innovations like irrigation. Early rights are biassed, however, toward soils and locations better suited to quick-development crops, uses like hay or grain. The slower evolving user with high per-acre capital requirements, like orchards, tend to join the race too late to get good water, even though they ultimately develop higher marginal productivities than the fast starters. Thus it is that the citrus zone has such inadequate water rights. Not only is land development slow, but extension of ditches to serve these higher lands requires more capital and a longer development period. The earliest pioneers were short on the capital and organization for such projects.

Worst of all, the appropriative system puts a premium on excessive and wasteful diversions. Even before that the "doctrine of relation", which bases priorities on the date of first claim rather than first use, puts a premium on premature and inflated claims, which are a source of enervating uncertainty. But when the chips are down, the courts have generally fallen back on histories of diversion as the ultimate basis for prorating scarce waters. The individual's incentive is, therefore, to divert water whether he needs it or not. It is the accepted means of staking a claim for the future.

Thereby a cost to society--withdrawing water--is made a revenue to the appropriator. Where water was superabundant this may once have served some useful function in accelerating development. Now when water has become scarce it would be hard to contrive a more perverse arrangement.

3. Correlative rights

In California rights to percolating ground water are called "Correlative". They have no statutory basis but are based on court traditions and judgements. Land overlying an aquifer is treated analogously to land riparian to a stream, and correlative rights are limited to these overlying lands. "Surplus" waters may be exported, but the meaning of "surplus" is for a court to decide in each case and on the Kaweah, despite the situations described in II, A, above, the courts have denied permission to export ground water from acres of low to high marginal revenue productivity.

As mentioned above (II, F, 1) the prohibition on exporting ground water also stops "foreign" land holders from using underground reservoirs.

B. The initial pattern is frozen

The initial pattern would be of limited concern if it could be altered to meet changing demands. But under prevailing water laws, water users are insulated from social opportunity costs. The State charges no economic rental for the use of its waters, or indeed any rental at all. The counties hardly tax water rights (unless held by rich outside cities). Nor is there much appreciable implicit opportunity cost felt by the individual because he cannot easily sell surplus waters even if he wants to. The last point bears elaboration.

1. Allegations of transferability

It is generally recognized that riparian and correlative rights are not transferable, but several writers have alleged that appropriative rights are. S. T. Harding in 1936, seemingly in a glow of optimism over Peabody vs. Vallejo,[42a] could write that "economic pressure will eventually result in the available water supplies' being used where the greatest return will be secured",[43] but this was little more than an expression of faith and hope. Several other allegations of transferability ultimately

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[42a] 2 Calif. (2d) 351, 40 Pac. (2d) 486 (1935)

[43] Harding, Sidney T., Water Rights for Irrigation, supra (Note 4), p. 46.

trace back to a citation in Wells Hutchins[44] wherein he discusses some of the possibilities of and obstacles to transfer in various states. But the discussion is purely legalistic with no purport of economic analysis or quantitative evaluation, and certainly should not be asked to bear much weight as a demonstration that any significant volume of our water resources are effectively transferable in response to ordinary economic pressures. To my knowledge there is no such general demonstration, but only a belief in some quarters that one exists.

2. Kinds of transfers achieved on the Kaweah

Certain limited kinds of water transfers actually have been effected in the Kaweah system. The most common kind is the sale of shares in Mutual Water Companies. There has been an active and continuing market in these shares, among individuals and areas. In general, the movement has been in economical directions, from north to south. Big buyers have been the Irrigation Districts: The Lindsay-Strathmore, Tulare and Corcoran. Biggest sellers have been shareholders in the Wutchumna Water Company, which had an undoubted surplus.

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[44] Hutchins, Wells, Selected Problems in the Law of Water Rights in the West, USDA Misc. Publication No. 418 (Washington: Government Printing Office, 1942) pp. 378 ff.

3. Uneconomic aspects of these transfers

Transfer of water company shares has bemused several water economists recently as a means toward that workable water market most of us would postulate as an ultimate goal.[45] Unfortunately, these are drawbacks to this type of transfer which severely narrow its potentiality.

a. Fixed point of diversion

The buyer of Mutual Water Company shares in California must use the selling company's diversion works, however inconvenient. In 1928, Lindsay-Strathmore Irrigation District, having bought shares in several downstream Mutual Water Companies, sought to divert its share of their waters by gravity through Foothill Ditch from a higher diversion point. The courts enjoined this,[46] requiring Lindsay-Strathmore to let the water flow freely downhill to the Mutual Water Companies' diversion works, tap onto the individual ditches below their heads, regather the waters and then pump them back uphill. These requirements precluded most of the transfers, and imposed extra costs which consumed much of the net benefits from the one such transfer that was consummated (from Wutchumna Water Company).

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[45] Anderson, Raymond L., "Operation of the Water Rental Market in the South Platte Basin", 42 JFE (5): 1501-03 (December, 1960).

_____, "The Irrigation Water Rental Market: a Case Study." Agricultural Economics Research 13 (2): 54-58 (April, 1961).

[46] Consolidated Peoples' Ditch, Co. v. Foothill Ditch Co., 205 Calif. 54, 269 Pac. 915 (1928).

Tulare Irrigation District, which lies below Wutchumna Water Company, in order to divert its share has had to build the long canal previously described, paralleling the Kaweah Branch and crossing both branches to tap the Wutchumna Ditch near Woodlake.

Thus the Kaweah water distribution system has had to grow physically in a manner analogous to the law itself, with one principle hanging on another back to the ancient and ultimate fountainheads of authority. It is questionable whether circuitous transfers of this sort are desirable at all, even if each individual operation shows a net gain. For as one ditch is tacked on to another, more and more interests become vested in an increasingly absurd tangle, and the hope of rationalization recedes ever further into the realm of unattainable visions.

b. Short run inflexibility

The flexibility achieved by sale of shares is largely long run. Within some areas there is some leasing, but between companies it would usually be necessary to extend a ditch to effect a transfer. There is lacking a planned excess ditch capacity such as is necessary to allow much flexibility. The process of transfer is slow and sticky, whereas demands fluctuate continually and to a degree unpredictably.

c. Deconsolidation of service areas

Individuals selling shares give little heed to the overall effect on distribution costs, so the company service areas are shot full of holes, resulting in the pattern of scattered and overlapping service areas noted above. (II, D).

d. Limited area of transfer

The transferability of Mutual Water Company shares is limited to the Kaweah delta area. Areas of higher marginal productivity outside the delta cannot get Kaweah water this way (or any other way). This point was decisively settled by the out-of-court treaty closing the "17-years war" against Lindsay-Strathmore. While this one persistent district was finally vouchsafed an interim supply until Central Valley Project water should arrive, there was clearly no hope for other citrus lands, none of whose owners have since found the temerity to try to tap the Kaweah.

4. Kinds of transfers blocked

Other types of voluntary transfer have been blocked almost completely.

a. Riparian rights

Riparian rights in California are "part and parcel" of land and transferable only by extinction. The same holds for Mutual Water Company shares based on riparian rights.

Riparian rights are not good for storage. If a riparian claimant wants to store water he can do so only by filing as a junior appropriator and taking his place at the end of the

line. Since the Kaweah is all "claimed up" this would avail him nought, and if he sought to put water at the end of the line by abandoning his riparian claim he would find this water completely swallowed up in the inflated claims of prior applicants.

A riparian, therefore, has little choice but to insist on maintenance of the natural flows he can claim and use them without any storage regulation. Transfer of these waters to storage is legally impossible, in the normal course of events.

b. Correlative rights

Like riparian rights these are completely non-transferable.

c. Appropriative rights

The basic legal presumption is that appropriative rights are transferable, and sometimes they have been transferred. But there are many hurdles to cross which, in their cumulative effect in the Kaweah area, have the effect of complete prohibition.

(1) Uncertainty of tenure

An appropriator does not "own" a water right. He has a permit or a license to use the State's water. Appropriators would like to have these licenses regarded as firm property rights, and in part they have succeeded, but only in part. The law is equivocal, now asserting the State's ownership, now deferring to the licensees' "property" rights, and

in the last analysis will no doubt, like Mr. Dooley's Supreme Court, follow the election returns. Meantime appropriative rights are left hanging in a tenuous limbo, the judicial reflection of public schizophrenia.

The appropriators' position rests on a kind of mystic philosophy that value is entirely created by use, a mystique that will not bear analysis and so must deny much of the rationalism associated with the commercial revolution. This mystique is roughly violated, and the acquiescent public outraged, by the spectacle of licensees "trafficking" in their privileges and measuring them in the balance with something so profane as money.

Some of this attitude rubs off on the licensees themselves, many of whom put water rights in a class with family heirlooms and heap social disapproval on any of their number who would sell, the more so because publicity attending sales at high prices might weaken the already shakey position of licensees generally, expose them to regulation, taxation, or royalty charges, and rouse opposition to their receiving subsidized reservoir services from Federal agencies. And so there is a strong bias against commerce in appropriative rights. By its nature the relative strength of this factor is impossible to

quantify, but in my observation and judgment it is appreciable.[47] It has some measure in the zeal with which landholders agitate to have Federally developed and delivered waters made "appurtenant" to their lands.

(2) Marginal adjustments

Ordinarily an appropriator with surplus water would not want to sell his entire supply, but only the surplus, that is the part whose marginal productivity falls below its opportunity cost. It is doubtful if a licensee could guarantee the buyer a good title in such a transfer, however, because the validity of the license rests on historical beneficial use, and sale of surplus water could and doubtless would be seized upon by thirsty junior appropriators as evidence that the water ever had been used "beneficially" and should revert to them.

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[47] The "Chicago School" approach of Drs. Hirshleifer, De Haven and Milliman is doomed to frustration, I believe, for failure to acknowledge this aspect of the problem. They argue most persuasively the benefits to flow from removing barriers to transfer of water, their means being to strengthen absolute private property control over water. (Water Supply [Chicago: University of Chicago Press, 1960] pp. 222-54). But to convert a conditional into an absolute "Giveaway" is to clarify the issue of distributive equity to the degree that the public will become aware of it. So long as the licensees are ascendant they are unlikely to tolerate market transfers that risk arousing the public; while if the public were ascendant, it would not likely abandon all interest in its waters without exacting some quid pro quo. We are not likely to achieve the benefits of market allocation of water rights without an unequivocal resolution of this incertitude: the licensees gain full control of the water by buying or (I think preferably) leasing it from the State.

Thus a licensee cannot sell something as good as what he has because the process of sale weakens the license. A strong bias against change inheres in the system.

(3) Rights held by water-users' organizations

Additional difficulties beset transfers of water rights when these are held by Mutual Water Companies or Irrigation Districts. Since most water rights on the Kaweah and in California are so held, these special hurdles are of prime importance in any discussion of water-right transfers. Curiously, however, I have found little such discussion, so that what follows must be partly the conjecture of a guardhouse lawyer. If it is seriously misleading, I hope it will at least irritate some real lawyer into publishing a definitive correction.

Mutual Water Companies and Irrigation Districts hold property and water rights as trustees for the beneficial owners, the served landholders. The landholder is more than an ordinary shareholder in a Mutual, or a voter in a District: he is the beneficiary of a trust. The law presumes that the trustees will continue the customary service to the customary beneficiaries in the absence of some new condition which a judge finds compelling and persuasive.

Just what a judge might deem compelling and persuasive is sometimes hard for an economist to fathom. I have found no clear-cut decision authorizing a Mutual or District to sell water rights. Nor have I found any instance where one has done so, save to another organization serving the same lands.

But there are several instances of conveyances through sale or foreclosure being enjoined.[48] Since there are scores of Districts and Mutuals with surplus appropriated water they should but do not sell, it seems that judicial interpretation of the trustee relationship has virtually prohibited sale.

The would-be seller is pinched between the devil and the deep, for on one hand he must satisfy the courts that he is not depriving any litigious trust beneficiary of something of much value, and on the other hand that the District or Mutual has a valid appropriation to convey, based on beneficial use. An economist might feel he could resolve such a dilemma to the mutual benefit of all parties, but economic concepts are not to be presumed as among the intellectual equipment of jurists, especially in the lower courts. So the trustees play it safe by hanging on to all the water they can for such future use as it may have to them. It is effectively withdrawn from commerce in a mortmain grip as deadly as that fastened on the lands of medieval Europe.

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[48] Copeland et al. v. Fairview Land and Water Co. et al., 165 Cal. 89 (1913); Bent v. Second Extension Water Co. et al. 51 C.A. 648 (1921); Hutchins, Wells, Mutual Water Companies in California and Utah, Farm Credit Administration, Cooperative Division, Bulletin No. 8 (Washington: Gov't. Printing Office, 1936), pp. 87-91, 137-38; Tulare Irrigation District v. Collins, 154 Cal. 440 (1908). "An Irrigation District owns no lands in a proprietary sense, and its property is owned by the State and is held only for governmental purposes". --Allen v. Hussey, 225 Pac. 2d 674, (1950); 101 C. A. 2d 457 (1951).

(4) Point of diversion

In transferring an appropriative right one may shift the point of diversion only if no one is damaged. The most economical transfers in the Kaweah area would entail shifting points of diversion, as we have noted. But today one cannot shift any point of diversion without damaging or at least discommoding someone else.[49] One could seek an agreement from him not to press his claim, but his ransom is not necessarily limited to actual damages. No point of diversion has been changed on the Kaweah during the period this study covers most intensively, that is back to 1919; and the general patterns of uneconomic diversions still extant go back at least to 1880, when they were roundly condemned by the California State Engineer.[50]

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[49] On the neighboring Kings River a few changes have been possible, but only downstream. --Clarence Smith, Kings River Water Master, in interview, 1958. The General need, however, is for upstream shifts, and these are blocked by intervening land holders with interests in channel seepage.

[50] Hall, Wm. H. Report of the State Engineer to the Legislature of California, Session of 1880, Part I (1880), pp. 33, 35, 36, 105-17 et passim. Hall's observations applied specifically to the Kings, Tule, and Kern, which border on and overlap the Kaweah service area.

IV. The dynamic evolution shaped by water law

Professor Wantrup has remarked that a system of water law should be judged over time,[51] and the point is well taken. But if this is to imply that the judgment will thereupon become more favorable, it is not.

The effect of water law on economic development is to reinforce other economic and political pressures working toward premature over-development of new lands, a process already past the point of no return today. Let me expand on this perhaps startling asseveration.

A. Marginal vs. monumental adjustments

Legal perception of economic values is too crude, as we have seen, to effect or even to permit of marginal adjustments among local water-users. Yet Justice is not entirely blind. It is more to be likened to the near-sighted Mr. Magoo who does respond, however inappropriately, to the major outlines of things. After the water-seeker has ranged far enough from home, and crossed several underused streams, he ultimately reaches one in which the courts will acknowledge the existence of a "surplus".

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[51] Wantrup, S. V., "Conceptual Problems in Projecting the Demand for Land and Water", Giannini Foundation Paper No. 176 (Berkeley: 1959) mimeo., p. 14.

He finds the courts little concerned with any monetary comparison of productivity F.O.B. the source. Such comparisons might leave him with a negative or very low net product, after deducting his high conveyance costs. But the law is disposed to count that in his favor as a mark of sincere purpose and acute thirst.

Panglossian philosophers may point to this as evidence that water law is, after all, dynamic. On the Kaweah, it is true water law has attained to a nearly perfect degree of stagnation which the law contemplates with equanimity. But this has not stopped, indeed it has materially accelerated great interregional transfers of dimensions that dwarf the Kaweah.

Thus water law as a whole does not simply resist change. Inexpensive little local economies on the Kaweah meet a stone wall of judicial disapproval, but water law opens up wide avenues for monumental projects to effect grand interregional transfers.[51a] Rather than block development, it biasses development toward remote sources. This is the dynamic growth pattern imposed by water law. If we wish to criticize the law, it must be on grounds that the type of change it promotes is less desirable than the alternatives.

[1a] For a more general criticism of monumental transfer projects see Hirshleifer et al., op. cit. (Note 47).

B. Drawbacks of monumental projects

Monumental interregional transfer projects have captured the imaginations of the State's voters and politicians to the extent that they now dominate water development. It is my thesis that this type of development is leading to overexpansion.

1. Size of increment

A remote import must usually be a large one for several reasons. First, to be economical at all it must realize scale economies springing from the fact that canal cross sections increase out of proportion to their cost. Second, it requires strong political support, to secure both water rights and State or Federal financing, and for these purposes it must have a large service area. Third, this service area typically has scattered irrigation developments, and to keep project distribution costs within bounds it must plan to serve the included dry lands as well. Likewise, in recharging underground reservoirs, it must import enough to recharge the entire area over which irrigation is scattered. Fourth, the political conjuncture which permits the region to import water is an opportunity to be fully exploited, and the beneficiaries will try to stake claim to as much water as possible.

So a remote import is likely to be a large one, an indivisibility in economic development, in contrast to the continual fine adjustments that would be possible under a more flexible system of water law. In the Kaweah area the increment from

the Central Valley Project is in fact several times the local supply. The Friant-Kern Canal with 4,000 second-feet capacity can import most of the San Joaquin River, whose mean annual flow of nearly two million acre-feet is about four times the combined means of the Kaweah and Tule Rivers. More, this is regulated water from Millerton Lake. Almost one million acre-feet is to be Class I water delivered on demand. The increment to summer water is much greater than 400%.

The potential impact of this increment has been concealed, among other ways, by the belief that much of it would go to overcome overdraft. But the annual overdraft is of a much smaller order than the San Joaquin imports. Equally important, there is no basis for assuming that irrigated land development will cease when water equilibrium shall have been attained. There are no controls on pumping and nothing (except market collapse) to stop development short of another overdraft. But in fact, before this becomes an issue there will be a question of how to dispose of the waters now used for recharge and soon to be available for other uses as that operation is completed.[52]

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[52] In their commendable zeal to maintain the Government's bargaining position in drawing up water contracts, Bureau of Reclamation officials have understandably tended to minimize this eventuality. See, for example, Hearings on S. 912 . . ., supra (Note 14), pp. 710 et passim. Whether their prognostications of continued high demand are correct is a question of fact which I am content to leave to the verdict of events. The current drought forestalls the emergence of a surplus, but on the other hand helps stimulate more new water supply developments that in the long run may aggravate the oversupply.

In terms of acreage, size of the increment has been concealed by most of its having gone into alfalfa, pasture, and cotton, whereby the impact is absorbed by nationwide markets or government storage. But these uses could never justify the cost of the Central Valley Project. They are lower uses in an area of excellent soils and superlative climate suited for horticulture and winter vegetables. It is only a question of time before these slower-developing, higher-yielding farm enterprises lay claim to much of the new water.

But here the impact will be overwhelming. Three local products of which California produces most of the nations' supply are plums, freestone peaches, and navel oranges. These supplies come from the following acreages: plums, 21,000; freestones, 36,000; navels, 65,000.[53] In the last five years, new non-bearing acres of these (and other) tree fruits have turned up sharply, reversing long declines. The potential acreage increments of 10% or 20% have aroused considerable anxiety, as well they might, the moreso because they are more intensively planted than the old and with better stock. But they are as nothing compared to the eligible acres now newly supplied with water from Friant-Kern. The increment of almost one million acre-feet

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[53] Dean, Gerald W., and McCorkle, Chester O., Trends for Major California Fruit Crops, California A.E.S. Extension Service Circular 448, 1960.

Sherwood W. Shear of the Giannini Foundation has been more than gracious in supplying acreage and production data. Neither of the above is implicated in the use of the data here.

per year of Class I water, and additional Class II of variable water, could support 300,000 or 400,000 new acres, far more than markets could absorb in the foreseeable future. This one project has brought water supply to so much potential fruit land that fruit land as such is hardly any longer a scarce economic good. Scarcity today attaches only to producing groves, and tomorrow perhaps not even to them. Only this relationship is not yet reflected in land prices, whose inflated levels lend a specious plausibility to the Project still.

2. Slow response to changing demands

Another serious drawback of remote imports is the long lag between stimulus and response. Lindsay-Strathmore's wells began striking boron in 1913. Friant-Kern water reached them in 1951, 38 years later. Meantime the area's high potential citrus development was arrested completely, and other regions filled the gap. The scale economies of monumental projects are to be considerable discounted on account of their ponderous immaneuverability. They are slow a-building, and once built they are slower to liquidate. They cannot be rolled up when obsolete, and they pay out slowly if at all.

3. A cycle of over development

A response which is both slow and excessive is the basic element in a cycle of over development along the lines of the classic cobweb theorem (corn-hog cycle). Only with land and water development the period is much longer, the mistakes irreversible, and the excesses much greater for several reasons I will mention.

a. Lag of private land improvement behind public works

To increase public water supplies rarely results in commensurate increases in the products of irrigated land until long after, because private improvement of the lands made irrigable lags many years, decades in fact, behind the public works.[54] Thus, the price effects and capital requirements of the incremental land supply are deferred and concealed until the project and its several features are committed past the point of no return. The long developmental period of tree fruits lends itself to its own cycle of overexpansion anyway. When this is combined with the lag in building large water supply systems the lags and accompanying perils of overexpansion are multiplied.

b. Incitement of other projects

(1) The price umbrella

Lagging private development of project-served lands holds a price umbrella that entices more starts than markets can ultimately absorb and for which capital can be found at feasible cost. The high prices bring on competitive starts of several kinds. Private lands in older irrigated areas are intensified, for which the sloppy developments of the past

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[54] Teele, Ray P., The Economics of Land Reclamation, (Chicago: A. W. Shaw Co., 1927), pp. 99-100.

_____, Land Reclamation Policies in the United States, U. S. Dept. of Agri. Bulletin No. 1257 (Washington: Government Printing Office, 1924), p. 15.

Huffman, Roy, Irrigation Development & Public Water Policy, (New York: The Ronald Press, 1953), pp. 61-62, 81.

leave considerable scope--in fact, if lands served by pre-Central Valley Project water supplies were developed to capacity, there would be little need for new public water supplies. Lands in the new project area are planted at high standards of intensity based on high land values that do not accurately reflect the impending abundance of raw land.

Most striking of all, entirely new water supply projects are begun. To a degree this is simply analagous to what has happened in land cycles of every kind throughout our history. But water law is responsible for amplifying the cycle in ways besides those already mentioned.

(2) Racing for water rights

When one region goes foraging about the whole State for "surplus" waters, this naturally awakens anxieties in others lest they lose out. They seek to nail down claims that others cannot jump. The surest means to this end is to begin developing waters to establish a history of use. It takes little imagination to anticipate the result, which today one observes throughout California: premature interest in developing water ahead of need.

(3) Logrolling

Monumental interregional transfers are usually too costly for local finances. They are undertaken with State and Federal subsidies. This incurs political debts to be repaid in kind, less on a basis of economic productivity than of political bargaining power. There must be something for everyone,

or at least for enough legislators to constitute a working majority. And most projects need to be started before any is completed, lest late starters lose their bargaining power. This process clearly lends itself to the cycle of overexpansion, too: the impact of the first project is suppressed by non-completion until the later ones are well underway. This is the sort of process by which Indiana went bankrupt in another kind of canal boom that busted in 1836.

C. Current overexpansion of water-supply projects

J. K. Galbraith has won wide support for his thesis that we put too small a portion of our resources into the public sector. While this may be true in comparing tail fins vs. school rooms, it can be very misleading in comparing private vs. public contributions to land and water development. Public water supply works stand ready to serve far more land than private capital has improved to use the water.

This is not a new phenomenon. David Weeks & Charles West documented it extensively in 1927 in their classic The Problem of Securing Closer Relationship Between Agricultural Development and Irrigation Construction.[55] They noted that capital flowed into public water supply works much easier than into

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[55] Univ. of Calif. College of Agriculture, Agri. Expt. Sta., Bulletin 435 (Berkeley: Univ. of Calif. Printing Office, 1927).

corresponding private farm improvement, with a resulting lag, serious imbalance, and ultimate overdevelopment of irrigated land. Their judgment was abundantly confirmed in the ensuing collapse of land values.

The premature excessive public works they observed were the product of local enterprise almost entirely. To redress the balance would seem to have called for diversion of capital from public works to individual land improvement. Yet instead the last 25 years have witnessed the opposite, and on a scale hitherto undreamed of.

First, the value of the tax-exempt feature of local bonds has risen along with p rsonal income tax rates. In the 1920's these bonds often sold at big discounts: today at handsome premia.

Second, local water enterprises receive new State and Federal subsidies, under the Small Projects Act, the Davis-Grunsky Act, and interest-free loans from the Bureau of Reclamation.

Third, Irrigation Districts and private power companies have cemented an effective working alliance whereby the power company borrows the Irrigation Districts' immunity from local property taxes and pays for it with free water. This is a big factor in the estimated one billion dollars worth of local projects now under way in California.[56]

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[56] Western Water News, October, 1960

Fourth, the Army Engineers have gotten into water supply under guise of flood control, especially since the Flood Control Act of 1944, and are planting Federal projects in hitherto neglected sites all over the State, including Terminus on the Kaweah, and Success and Pine Flat on its neighbors the Tule and Kings.

Fifth, the Bureau of Reclamation, once a negligible force in California, has contributed the Central Valley Project and its slowly proliferating appendages.

Sixth, if all this were not enough, we add now the Feather River Project, whose $1.75 billion bond issue is conceived as only a beginning on an overall California Water Plan.

Finally, seventh, Secretary of Interior Udall announces that the U.S. has shirked its duties and will increase its contributions to water supply development.

There has been no commensurate stimulus to the flow of capital into improving private farm lands. On the contrary, higher personal income tax rates, in conjunction with the various capital gains loopholes, have encouraged much more land buying to reap price increments without land improvement, a type of behavior that has previously played a central role in creating this problem even without such added stimulus. Indeed it is only in the last five years or so that bearing acreages of most of California's distinctive specialty crops have ceased

contracting.[57] Here is the bottleneck that has held back output and sustained the prices on which the whole mammoth structure of public works is premised. Modest increases of a few thousand bearing acres, soon finally to be forthcoming, are adequate to meet the market demands that ultimately must justify investments in water supply.

Irrigation is new enough in American history that it has figured in only two major land collapses, 1893 and 1929. But in those two it figured prominently, through excessive expansion of water supply works for undeveloped lands. "Too much, too late" has characterized the denouement of each cycle. There is evidence that we have moved too far on the same course again.

In this cycle water law, while not solely responsible, plays an important role. It is water law that blocks the economical use of the best waters, compelling recourse to marginal sources, gigantic projects, and State and Federal financing with consequent log rolling. It is water law that sets region racing against region, and agency against agency to establish use rights ahead of need.

And so when we view water law in the dynamics of development the view is more illuminating, but not more complimentary. How serious the defects, again I am willing to leave to the verdict of events.

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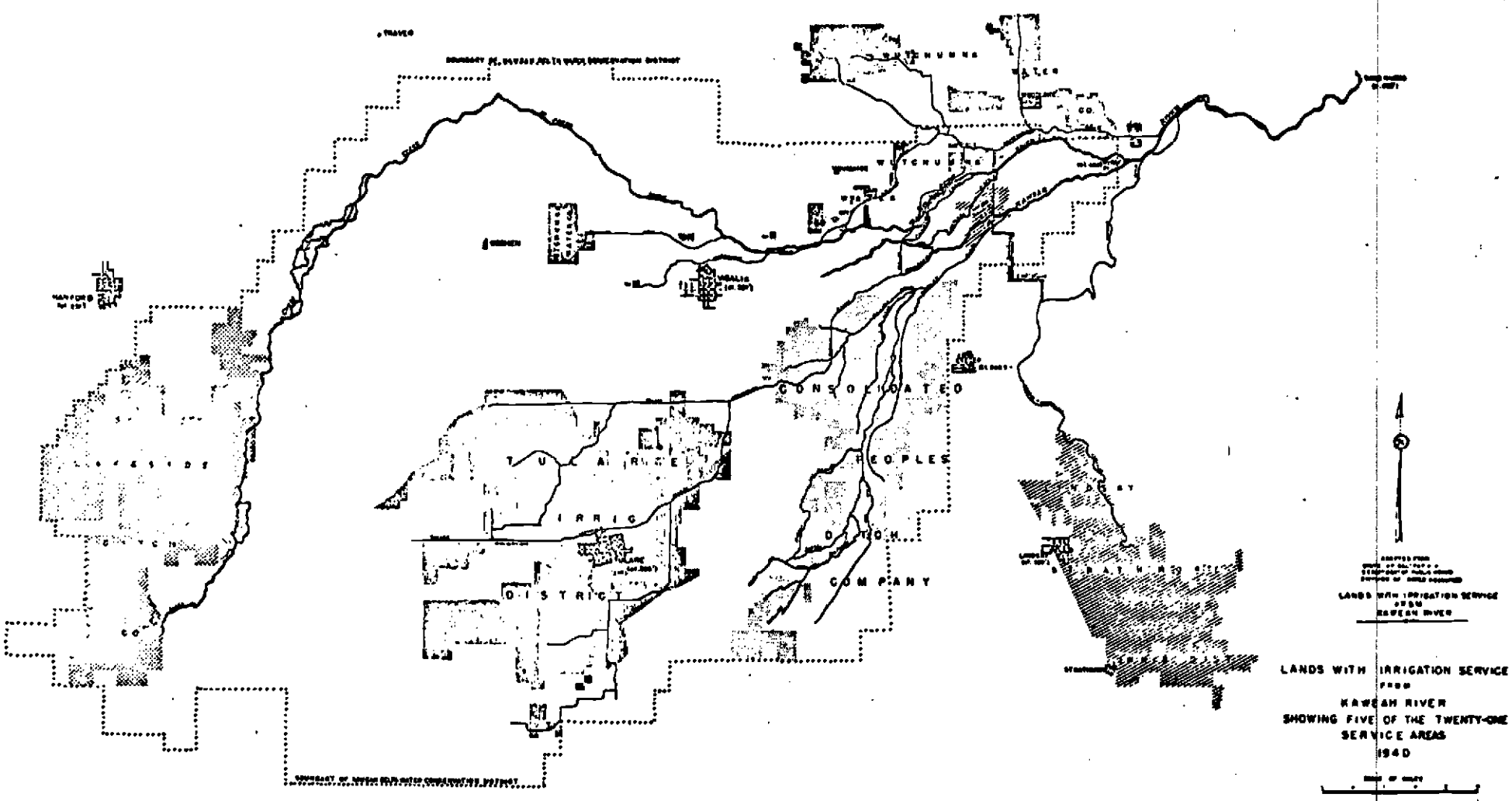
[57] Dean and McCorkle, op. cit. (Note 53).

V. Conclusion

In this paper I have sought to expound the conclusion I have reached from observation of water use in the Kaweah area, that water use is grossly uneconomical. I have laid the blame where I believe it belongs, on the doorstep of water law. I have gone on to show how water law contributes to the cycle of overexpansion which has run so far along today.

I have not suggested, save by indirection, alternative policies, nor will I impose further on your patience by doing so now. But assuredly, if it be established that present policies are intolerable, the moulding of new is the greatest challenge facing our profession.



LANDS WITH IRRIGATION SERVICE
FROM
KAWEAH RIVER
SHOWING FIVE OF THE TWENTY-ONE
SERVICE AREAS
1940