

WATER WORKING GROUP, UNIVERSITY OF CALIFORNIA, BERKELEY

March 3, 2000

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Water trades in California

I'm going to cover the kinds of trading that have occurred in California to date, I have a...I actually did bring a paper, I wasn't going to originally, but I did bring this. This is the *Journal of California Agriculture*, there is a millennium issue coming out that covers natural resources, and I wrote a paper on California water and prospects for the future, so you may find this interesting, mostly for background. But it does contain some of the stuff I'll be talking about today.

So in any case, what I'd like to do is talk about trading and California as it exists now and go through some different categories of trades, and Brent (*meaning Brent Haddad*) will probably be doing some of the same thing, along the same line. Actually, I took a look at this book for the first time and I'm happy to see we're thinking along the same lines. Then I want to talk about where we're headed with water marketing in the next few years. I don't know how many of you cover what's happening under ground in this area, but things are really starting to rock and roll at this point. There's some pretty radical changes in very large companies moving into the state and getting quite active about setting up banking storage, active conjunctive use projects, and also real-time water markets; I'll talk about that in a second.

All right, a lot of people phrase the question about water trading in California as being one of "should we or shouldn't we" and I think to those of us who study this area this is the wrong question to ask. Water trading already happens in the state and in some areas it's quite pervasive, it's almost literally a routine activity, just like buying pesticides or buying cultivation equipment. It's what you have to do to survive, in some places in California. So the question is more how should the water market be developed, how should it be managed, how should it be

encouraged in the state, not whether should we or shouldn't we. I think in particular the legislature, not surprisingly, is a little behind the times in this area. They would love to believe that the water market could only happen in California if they create it and I think that events underground have pretty much passed them by, although that may be changing.

There are three basic types of, there are other kinds, but there are three basic types of water transactions that exist in California now and in the past. First, inter-sectoral emergency markets. Not surprisingly to economists, water markets arise in response to scarcity. During the last drought, '87 through '92 drought, there were three years when they were operated, in Inter-sectoral drought water banks in the state. Granite and Son -- someone else did this too.-- I'm going to talk about it for a second, but just breeze over it. There are also long term option contracts. These are especially common between agricultural and urban interests. These don't involve a permanent transfer of water rights but involve rather a long term sharing arrangement between agricultural and urban water districts. That's something I'm also going to be emphasizing, talk about briefly.

The other kind of activity, which actually I think is very, very interesting, occurs below the radar screen, but is quite important, in some areas of California anyway, is what I like to think of as regional stock markets. These are almost like rental markets where water is traded intra-annually, there's no change in the underlying places of diversion. There's no change in...there is change in place of use but no change within the region so that smoothes things out a little bit. These are actually very common and absolutely essential in some parts of the state. This, I think is -- in a real sense it looks into the future of water marketing in California, it's not the only kind of transaction that we're going to have but I think it's an important part of the mix.

Last, I want to talk about some of these very recent, privately financed storage and trading arrangements. But I do actually want to linger on this question of regional spot markets. For several years now I've been working with Westlands

Water District which is most of you know is the largest agricultural water district, certainly in the country, if not more than that. It covers over 600,000 cultivated acres. The entitlements are relatively modest; this is quite a junior district and is relatively late in being created. But it's very important both economically and politically. The water market that exists in Westlands is, in economic terms sort of a hybrid of a spot and forward market. It's actually quite similar to a pollution credit market. In a pollution credit market users are allocated the right to emit X-pounds of junk per year, something like that -- it's a lot like a water right, you're entitled to X-acre feet per year. And water trades in this market add to and subtract from X. So it just changes the constraint that farmers operate under so that's a hybrid of spot and forward market. There are cases where farmers actually purchase water as insurance but they never use it, it goes unallocated. Not usually but this does happen.

What are some motivations for water trading? You think, gosh, an agricultural district, isn't it awfully homogenous? You need differences in valuation to make a market, why is there water trading? Actually, I think just the opposite is true. If you look at an area like Westlands -- because it's so large and covers different types of terrain, but also because it's composed of a lot of different human beings who have different views and abilities, there are quite large differences in valuations of water. There are also differences in water rights that exist within the district. The district is composed of three separate priority areas. So, there's actually queuing even within that district. The reason that's important is, by unhappy coincidence, the area with the worst rights in the Westlands has the soil most adaptive to perennial crops. Those are the major factors that motivated the water market, right?. Economic productivity was highest on the land and it had the worst water rights, which is kind of the California agriculture story in miniature.

[Question: Are you talking about trees?

A: Yes, trees. The worst rights are where there are trees, the area that is best for perennials.]

There are also differences in environmental conditions, not just soil quality and slope and things like that but there are also some areas of in Westland that have tremendous drainage problems, and there are economic incentives to reduce water applications in those areas, to reduce the district's collective responsibility for dealing with drainage, in Westlands.

So how big are those markets? I have a sample here (*shows table*) We actually enumerated all the trades that occurred within Westlands, from one account to another within the district, just within the district. There are other trades where farmers and other users from outside Westlands sell to the farmers within. So, we're not counting those right now. Take here like '93, '94, 750,000 acre-feet were allocated to the district collectively from the Bureau of Reclamation, so that was a 50% entitlement. For the net year there were 2,519 trades. Now, we have good records for all of these because the district has to approve the trade. The approval is virtually pro-forma, I can't think of a case we studied (where the trade wasn't approved), but the district does need to know to get the billing straight. -- who's buying and who's selling. There were 382,000, nearly 400, 000, acre-feet of water that were sold on the market which amounted to just over half of Westlands' allocation. Now, that's a shocking number to most people; it's a secondary market, it's 50% of all the water that is coming into Westlands from the CVP. Similar patterns occurred in '94 and '95. These were relatively dry years, these two. Between '95 and '96 the allocation is 100... So here too, interestingly you have a smaller number of trades --similar acre feet, right around 400,000. The share of the market transactions vs. the overall allocation mostly because base allocation went up.

Now, things aren't quite that exciting in reality. There's something going on here that I think...it's a little bit factual, and in that sense not quite so interesting, but it actually gives you a flavor for why the water market is so complex, and will be for some time. In Westlands there's some 800 water use accounts. Alright, to understand how there are that many, water accounts when they're only, it's hard to know exactly, but there are right around 300 separate economic entities who farm down there. So why are there more accounts than farming entities? The

reason is an administrative one. Under reclamation law there's a break in the price for farms that are less than 960 acres. So they have a very large farm divided up into several, almost like shell accounts, but they're all the same corporate entity, but to get the cheaper water they divide the farm up into these 960 - acre units. Everybody knows it's happening. The district knows it's happening; they even know -- they helped us piece this together -- who's coupled up with who. It's a sensitive issue -- one could file a suit saying that the Bureau is not adequately implementing the Reclamation format.

I mean, nobody is renegade; the district and the bureau all approved of the accounting set up. But it's pretty thin...and this will be up for the courts to decide. So this is the basic reason that there are more water use accounts than there are separate farming entities. We actually went through; we did the hard work of going through every one of these transactions and figuring out who was partnered with who, and how many trades were actually arm's length and how many were within these little networks of accounts. It turns out that roughly a third, it depends a little bit, year to year, but roughly a third of the volume of water traded is actually between separate corporate entities. So, in other words, take a year like '93, '94, 250, 00 acre-feet were traded, internally, within the network of affiliated accounts. 135,000 were traded on the market in arm's length, transactions, so just about a third of the volume of water that was traded in that year is what economists call a "real market transaction". These trades are still good (*meaning, those internal to a network*). I think they still increase value added because they're moving water around on just one farm, from one field to another, so we don't necessarily want to stop those, but they're not real market transactions.

There's even another motivation too that's very important. There are some tax-motivated exchanges. If the farmers say, owns 500 acres, leases 250 and then keeps 250 for him or herself, they may want show a profit or loss on the leased land. So in Westlands they receive like -- see all this stuff you wouldn't know unless you go down and talk -- farmers are going to actually receive 13 different "colors" of water from the Bureau of Reclamation. This is not a simple industry.

All different types of water, where everyone has a different price, and the price varies according to the priority areas, so you've actually got 13 times 3 different types of water that are coming into the district. And that price disparity creates a lot of incentives to saving and using cheap water on your home ground, and then sell the expensive water to the land you're leasing. It shouldn't be surprising. Taxes distort all kinds of economic decisions, it shouldn't be any different in the water market. But your point about fallowing was a very interesting one (*this comment to Michael Hanemann, who had asked about the practice of fallowing land*) because right now, with the CALFED discussion, a lot of the problems, from the agricultural point of view are phrased in terms of reliability. We want reliability so you have to build us a dam. Essentially, take out the lower tail of the distribution. What's happening right now is that farmers are using the land market to provide reliability. If they want to put in 100 acres of pistachios, they'll buy 500 acres of ground and then use the water, reallocate the water, to the 100 acres of pistachios. Now, that's a little bit inefficient, in that you're losing the salvage value of the land. But is it more or less efficient than building a dam to deal with the same problem? It's a good question. What the farmers do is self provide the reliability to the land market right now. OK? So, be a little wary if you go out to do research on water marketing, I mean it's a great topic,-- be a little wary that these administrative and accounting complexities make a big difference at the end of the day. You can seriously over or underestimate how much trading is actually happening.

Alright, well, we also broke these trades down. Just to give you a flavor of ...what does the garden variety of water transaction look like? We broke these down by internal market transactions for each of the 40 years that we studied. The average internal trade was 135 acre-feet. The average market trade was almost 200 acre-feet. That makes perfect sense, given that market transactions have significantly higher transaction costs, these should be done in a large amounts.

[Hanemann: You mean external when you say market...]

Right, right, so it's an arm's length transaction. Remember the kind of area too that Westlands is. You probably have all driven down I-5 to Los Angeles, Westland is like right in the middle. About the time you're wishing that you could really get to Los Angeles, that's where Westlands is. It's not an area where people live. It's a very large area. Westlands is one and half times the size the state of Rhode Island. So farmers there may not know their neighbors. It's not like a long term kind of rural community, where people live and work together. They live in Fresno, they live in Merced, and they drive an hour to here to get to Westlands. So the transaction costs associated with these can be quite significant. If you're a buyer or seller it's hard to locate someone on the opposite side of the transaction, or could be. And this is one reason that we got interested in developing an electronic market, it seemed like a great -- I mean this is before anybody was talking about dot com -- it seemed like a great application of; internet technology, to help people find each other easier. But anyway, I think these numbers are useful to get kind of...an intuitive sense of what does an average water trade look like right now? Typical price? In a dry year like here should be something like 100, 125. -- remember, that's just a rental so that's for 1 year -- but I have seen prices over 250. It gets to be the end of the summer and you need a couple of inches to finish your trees, to finish your lettuce. Given that you've spent 6,000 per acre already, you're willing to pay an awful lot for water. So, what this means is the price is very peaky. Again, just like you'd expect. But anyway, suppose you have a transaction that is 200 acre-feet on the market, or something like that, 300 acre-feet, which is fairly typical. Price of \$100, a \$30,000 dollar transaction -- these are the kinds of things that happen.

[Question: Why is it that they're waiting 'til the last minute?]

A: Bad planning. Remember, irrigation demand has a lot to do with weather. You can have say a very hot couple of days, that increases irrigation demand.]

[Hanemann :You always...you don't know in July how hot it's going to be in September. So, you've got to plan on a certain amount of water, and you can have too much or too little, and if you have too little, you have a last-minute demand...]

Remember too, that there's another wrinkle that is important, I think that's a little specific to Westlands. Farmers don't have the ability to carry over their allocation from one year to another. Storage itself is stochastic They do have rights but it's just for a couple inches per acre, and that also has implications for water use, you don't want to leave anything on the table at the end of year.

Let's think about who uses this market, and again I'm going into some detail here because I think, if you have a hypothesis that markets arise in response to scarcity and that scarcity is increasing in California, it follows that we're going to see more markets like this. But I think it's worse than that. We're lingering on this little bit of data and it gives us a glimpse into the future -- How often is this market used? Again, the arm's length transactions only, not the internal transactions. For farms that are collectively 960 acres or less, these could be small farms in the Westlands sense, just about half of them participated in the market in an average year. That's pretty widespread adoption, for this kind of behavior. And that goes up for farms that are approaching 2000 acres, almost 90% of them engage in water marketing.

[Hanemann: What percent of the size distribution is going to be skewed? In other words, it's 600,000 acres? The average farm is 2000 acres. But there are some farms which are 5 and 10 thousand acres.

Sunding: Well, yes Boswell is 30,000 acres.

Hanemann: So, is that like the top 20%?]

Sunding: Yes, (*shows overhead with accounts*) .this is like top...It's just a couple of the accounts, but there are some huge ones. Harris Ranch is in this area, so there are a couple that are just huge.. But I think the biggest category is this one right here. Which in Westlands, was quite a significant investment. This is, if not the most, this is one of the most sophisticated and most economically productive farming regions, even in California.

The big change out there, not surprisingly, is wine grape -- even out there there's a lot of money from outside agriculture looking for tax shelters. Another tax

motivated transaction. In fact, it's kind of a scary statistic, since the end of the last drought, remember Westlands is at the end of the queue so they have worst water rights in the San Joaquin Valley, just about. There has been a seven-fold increase in the number of acres planted with perennials since the last drought. Now, the last drought was dealt with in this area, mostly by a combination of pumping ground water and by fallowing. Agricultural demand has hardened considerably since that last time around. What's going to happen next time? Well, I can tell you what's going to happen they're going to pump the hell out of the aquifer and we're going to see some serious economic dislocation.

Here's another way of taking a sociological look at the water market (*shows overhead*); the number of trades by farm size. This again would be for farmers who have less than 960 acres, who did participate in the market. Conditional on that, they did an average of three trades. So, it's not something that you have to do if you're going to be in the market at all. It's not something you have to do every day, or even every week, but during the growing season maybe every other month. It has the flavor of a routine activity. For farms that are larger, of course, if they participate in a market, and almost 90% of them do, then it's something they do a lot. There are a lot of trades that happen right at the beginning of the water year and I think that has a lot to do with financing. To get financing from your bank for operational purposes you have to prove to the bank that you have all the water you need to grow what you say you're going to grow. So farmers may purchase a lot of water upfront --which is one of the reasons bankers love the water market. They'll basically rely on these transactions to satisfy their loan requirements. So there's this element...there's a big spike in transactions right at the beginning of the water season in March. There's another big spike right around July/August when the weather gets hot and farmers have some acute water demands.

Westlands has gotten rid of, like a lot of the water districts in the San Joaquin valley, Westlands has gotten rid of the *take or pay* contracts. They all used to price water that way. Westlands doesn't do it anymore. So Westlands tries to price water right, so that costs equal revenues, but at the end of the year farmers can't

usually carry over water. I mean in a rainy year least of all because the reservoirs are going to be full and ag water is the first to get dumped. Anyway, sort of running out of time here...But what I want to convince you of, and maybe I already have, is that this is sort of a well-functioning institution. Water trading is routine in this part of California. Again, it's not a question of are we going to or not going to have water trading. It already exists. It's a common part of farming in the western San Joaquin Valley and the question there is really how should it be regulated.

I want to make just a few general remarks before I stop; time for advocacy now; the economic taste for trading. We have all kinds of markets, but water is different. What are some of the common economic arguments for trading? The most obvious one is that trading increases value through reallocation from users who have low value to users who have high values; so there's some economic gains from trade. An important one recently is that water trading can reduce the cost of constructing new supply facilities. If we reallocate supplies we're able to increase the value of what we already have, thereby reducing the demand for new supply facilities, and of course through the CALFED process we're right on the cusp of spending. Are we building now? On previous supply facilities? I mean, God knows what is actually going to be at the end of the day but this is a serious question. The water market can also minimize the cost of enhancing in-stream flows. There are number of us in the department who worked on a project dealing with the economic costs of implementing the Central Valley Project Improvement Act, which reallocated in the average year 800,000 acre-feet from agriculture to the environment to enhancing in-stream flows. Our conclusions were actually quite striking. Let's pause here for a second. Just like in a pollution trade market, the water market can allocate the burden of improving environmental quality efficiently. So we looked at two different scenarios. One, (*overhead*) and this is just expressed in terms of two kinds of common impacts measures of farm revenues and jobs. If the 800,000-acre foot cut were allocated proportionately -- which is actually better than it's being allocated right now from junior to senior users -- but if it were proportionately cut to all CVP users, the loss to farm revenue would be between 80 and 100

million dollars, using a range of models. Market allocation of that 800,000 acre-foot cut from the lowest value users impacts could be 20 to 40 million, so you get something like a 4 to 5 fold reduction in total economic impacts, if there's a market. Job impacts are just about the same; 2000 - 4500 in a proportional cut, 500 to 2000 jobs lost under the market allocation. Now of course, there are policy and distributional impacts. The proportional and market scenarios have different geographic implications. The San Joaquin Valley, which has a relatively high valuation of water within agriculture, is going to do better under a market scenario than it would be under a proportional scenario. This is just looking from the perspective of agriculture overall. We assumed that they were going to be cutting much more than we've actually been cut, but what's really interesting is the magnitude of the change. And what drives this is this incredible heterogeneity in the valuation of water, even within California agriculture. It's not surprising that the queuing system or a proportional cut is a pretty bad way to allocate responsibility for improving environmental quality.

Two other very interesting factors; an active water market provides an opportunity for environmental purchases, The Nature Conservancy, the Trust for Public Land, and many other environmental groups very commonly use the land market. They go out and buy land and set it aside for environmental restoration, all kinds of purposes. Why can't they do the same with water? Well, they can. In fact the Nature Conservancy has just announced a national fresh water initiative where they're proposing to spend serious money to do exactly this. Now of course, conceptual proviso, the desirability of water marketing has to factor in third party impacts. There are some legitimate externalities. And by third party impacts here I mean mostly ground water users. People who have made investments, adjacent land owners, who have made investments that rely on expectations about ground water tables being depleted at kind of normal rates. But that's disturbed and there's going to be some economic impacts that have to be factored in just like other externalities are factored in; with economic calculations.

Almost done. (*shows overhead*) Well, what can be done? We're all kind of interested in policy. What can be done from a policy point of view to encourage the water market, the spot water market, to develop on an efficient basis? Brent certainly is going to be talking about these longer term transfers and maybe intersectoral transfers. But I'll focus on the intra-sectoral transfers for now, although I'll have some things to say about those other kinds of markets as well.

Something that needs to be done in fairly short order is to straighten out the approval process; by that I mean the administrative approval process. Selling water is not like selling an umbrella, where you can just do it. The water itself is owned by the people of California, so there's administrative approvals, not to mention that there are conveyance problems that have to be dealt with if the water is going to be moved over a wide region. One concept that is kind of getting traction right now in California is this concept is free trade zones. So they have free-trade zones for water within which trades would be pre-certified. And basically what would happen is something like -- if you're within a ground water basin, this could be fairly large. If you're within a ground water basin and you want to sell water on a temporary basis, 1 year out of 4, 2 years out of 5, something like that, then the state would pre-certify the trade and the approval would be automatic. Now, there's a very good analogy here to the system of -- I don't know how much you know about section 404 of the Clean Water Act, that became the system by which the Army Corps of Engineers issues wetlands permits, for developing on wetlands. If you know that program you know that there are two kinds of permits that the court can issue. There are individual permits which have a very high degree of scrutiny that depends on the parameters of the individual project. And then there are what are called nationwide permits, which is a streamline permit program designed for developments that have what the court considers to be minimal impacts. So in other words, you write to the Corps of Engineers and you say I want to build a house, and I'm going to impact X-thousand square feet of wetlands, but you know, a small area. Then the Corps writes back and says: do it. If you certify that your project is within these parameters just go ahead and do it, you don't have to do an environmental impact statement. Well, what we're trying to do is set up the

same kind of program for water marketing but the trick here is defining the boundaries of the free-trade zone. The reason this works, the reason I think it's interesting is that it deals with these ground water impacts. If the buyer and the seller are within the same hydrologic basin then on an aggregate level the ground water table is not affected. Consumptive use is transferred from point A to point B; the deep percolation stays the same, so you avoid what I think is the most legitimate and serious environmental impact.

OK, I'm going to leave it there, and I'm sure we'll have more to talk about later on.

(Note: This is a transcribed talk. It has been only minimally edited, so that the speaker's individual "voice" still comes through -- Isha Ray.)