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RE: Water Management Strategy

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A few ideas for your consideration.

I believe that a coherent water management strategy can be constructed by extending the concept of "time value of water" to become "value of water management". I broached this idea several years ago, but got little support because (in my opinion) the development of the idea can be abstract. The idea is fairly close to what the approach known as IRP.

My point is that various actions have value and disvalue (or costs). This includes both the value and disvalue from the action itself, the ripple effects (e.g., third party impacts), and the financial costs of implementation. CALFED's goal is create (1) high net value overall, constrained by the need to assure that no single sector experiences negative value (e.g., draining export ag to meet urban and environmental needs).

The challenge, then is to identify the sources of value and disvalue, quantify them, then apply various scenarios against these scales.

There is nothing magical about this, we do this whenever we try to think through a solution. I am just suggesting that we can be more explicit about our assumptions, thereby allowing more rational discussion and analysis.

The steps in this analysis might be as follows:

- o Define a baseline for analysis. For example, current conditions, current demand, current regulatory regime, current efficiency. Or we could pick a time in the future.
- o Define various possible actions which will have value or disvalue. For example:

Action	Value	Disvalue
Screening	Reduced entrainment	Cost of screens
Storage facilities designed to pick off winter peak flows to provide water at times of greater value	The value of the water when used (water use patterns would need to be specified). Reduced pumping heads for groundwater banks	Local impacts from facility. The cost of facility. Possible groundwater fluctuations when groundwater retrieved.
Isolated system	Better protection for most fish. Improved water quality. Improved security	Worse protection for some fish. Financial cost.

Water conservation	The value of saved water when used (use of this water would need to be specified)	The cost of the conservation.

o Assign relative value and disvalue to various water management changes. This is the hard part. How important is screening compared to reduced pumping or changed intake location. Impossible to define exactly, yet this is precisely what we are asked to do when we are told to develop an optimum solution. Here are some of the values that must be defined:

1. Value functions for delivery patterns for a particular urban area. For example:

   V_{urban} = f (1%[1], 10%, 50%, 90% exceedences for delivery quantity and price, price elasticity, baseline demand[2], efficiency coefficient (how efficient is the district), 10%, 50%, 90% exceedences for water quality, water market supply curve).

   Given the existence of this function, we can calculate the benefits from improvements in the various parameters and compare that benefit to the costs. Thus, water conservation will reduce the baseline demand, increasing value, but will also increase the efficiency coefficient, which will increase demand hardening and will increase the disvalue of shortages. The value is probably positive, particularly if a district has storage and can bank the saved water for use in dry years (thus, increasing the 90% exceedence water supply value). Better yet is a more extensive program that combines conservation with strong measures to significantly close the gap between the 10% and 90% exceedence values. Similarly, there is value, both in increasing the average quality of water and reducing fluctuations over time.

2. A similar function would exist for agriculture, but would have different coefficients. Thus, because most of ag has groundwater as a backup, the loss in value from the 90% exceedence figure is less significant than the 50% exceedence and 90% exceedence values. Also, the ag value function would include the demand curve for water in the market.

3. Environmental value function for water operations in the Delta. For example:

   V_{Delta} = f (10%, 50%, 90% exceedences for Feb-June outflow, species specific entrainment values, acres of various types of habitat activated, various measures

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[1] The 1% exceedence value is designed to allow us to consider the long-term loss of supplies due to earthquake outages in the Delta.

[2] This might be demand assuming that water were to be delivered at 10% exceedence every year at a reference price/af. I.e., a very stable supply in quantity and cost.

of toxic effects, commercial fishing rates/base population), where the entrainment values are themselves complex functions of intake locations, screening technology, the timing and volume of diversions, and the success of fish salvage.

Thus, improving 90% outflow exceedence may provide benefits, even if it slightly reduces 10% outflow exceedences. Reducing the volume of diversions could increase Delta Value, but so could improved screening and changing the timing of diversions using the EWA.

4. Local community value function = f (local employment, local unemployment, local income, expected value of future development, etc.)

5. Delta agricultural = f (level of state/ federal subsidies for levees, 10%, 50%, 90% exceedence values for salinity, probability of temporary levee failure, probability of permanent levee failure, demand curve for water in the market)

Putting all of these together (and insisting that we must see positive values in each area), we see why so many people like the IF. It provide large jumps in environmental and urban value, and some increase in ag value at a relatively low cost (water quality benefits, environmental benefits, security benefits, a cheapening of the supply curve due to easier access to markets). The main negative impact is to Delta ag values, where it may reduce water quality and raises concerns over reduced levee subsidies.

Without an IF, these value functions point more towards:

- Storage: --relatively small losses due to shaving periods of high environmental flows can be turned into increased urban and ag value and into increased environmental value via increased instream flows and reduced entrainment
- Efficiency -- increased urban and ag demands would lower the environmental value function
- Real time diversion operations -- a way to reduce entrainment without reducing deliveries
- Markets -- a way to improve urban and enviro value functions while improving profits for individual farmers. The catch is that, once we write our value function for local communities, we may find that markets could cause negatives. This implies that the water market must be taxed in some way to assure that local communities benefit from the movement of water out of their areas.
- Habitat -- there may be a relationship between habitat and flows. That is, increased habitat may provide enough value to compensate for reduced flows.

Of course, for every increase in value, there is generally a financial cost. Ultimately, we will choose neither the solution which provides the highest possible values or the lowest possible cost, but one that provides significant net value (value minus cost) and which allows us to distribute positive benefits to each sector.