

Climate Change may catalyze Fundamental Worldview Shift

- Certainty vs • Uncertainty
- Static view of world vs • Dynamic view
- Fixed rules and rule curves vs • Flexible process for accommodating change
- Departmentalized plan implementation vs • Integrated systems collaboration

Generally, we have not experienced rapid ecosystem change. The prospect of climate change could alter that circumstance. By rapid in this context, we are talking about decades.

While it is true that water policies change (usually by law suits), water policy does not have change at its core. Water rights, FERC licenses and the like, are long term rights based on an historic average of hydrology due to climate conditions. Rights granted into the future are based on 50-150 year patterns from the past. The effort is made to grant rights based on certainty of yield, averaged over time. There are startling examples of where these estimates of certainty in yield have been in error, like the Colorado River where yield may have been based on an historic anomaly and over-estimated. But the underlying assumption is stability; the future will be like the past.

As seen in scenarios generated by the climate calculator, which are within the range of variability of the Global Climate Models, yield in the future could be reduced from 25-50% of historic yield. This would no doubt cause disputes about the rights granted when conditions were much more predictable. This may catalyze a shift from a static view of a certain world to a dynamic view of an uncertain world. Water policy will no doubt change as the worldview shifts to accommodate a changing world.

Our rules, our rule curves that govern releases from dams, are one kind of procedure that is perhaps ill-suited to manage a changing environment. It is likely that flexible processes that accommodate change will become the norm in such a world. We have some early examples of adaptive management, but this skillset is in an early stage of development.

Our current method of operation is to define the rule (or rule curve, or workplan) and delegate implementation to a department. With changing condition in a community

Integrated Watershed Planning

Ecosystem Services prioritized:

- Water
- Power
- Recreation/tourism
- Timber
- Flood control (?)
- Other: foraging, fuel...

Who pays currently?

- Timber and taxes
- Not water, power, etc
- Future watershed management will optimize water, power, flood mgt
- They will cost share!

Watersheds will be managed fire ecosystems first and foremost.

Currently our watershed provide multiple services, listed in the column on the left in roughly their priority based on dollar value. But currently, the managers of the forest (USFS, BLM, private companies) have only the revenue stream from timber, and reduced revenues from taxes. Climate change will very likely stress all ecosystem services, and a new way of managing watersheds for integrated, optimized ecosystem services will have to emerge.

Fire is the looming crisis, which will be dramatically exacerbated by climate change. We have not managed our fire ecosystems for fire, and have suppressed fire until we have current fuel loaded forest and range conditions that are far outside the natural range of variability. This management toward catastrophe has to be reversed, as it poses catastrophic threats to all ecosystem services listed above. Our watershed management systems are generally in denial of this condition; while we are now paying some lip service, we have not paid enough real revenue to reverse the trend in all but the smallest areas and pilot projects. What this major management shift looks like is yet to be determined.

Integrated Regional Resource Planning

- Now gaining traction as basic approach
- Renewed focus on storage reservoirs, not on surface, but in groundwater basins
- Conflict of interests: water supply vs flood
- Full integration of surface and groundwater, with different view of water rights
- Re-evaluate priorities of beneficial uses, with water market reflecting costs

Integrated Regional Resource Planning is now gaining notoriety, with the Proposition 50 Section 8 grant cycle and subsequent Prop. 50 Implementation grant cycle. This effort is still in its infancy, but holds the promise to begin to develop the integrated watershed management approaches that can address our current challenges, and lay groundwork for the expanded challenges of climate change.

Move to flexible and adaptive decision-making processes

- Multi-stakeholder, multi-agency collaborations will be the norm
- Choice points, triggers, criteria for change will be built into all management plans
- Adaptive management will evolve and become the norm
- E.g. DWR's Bulletin 160 includes scenario planning
- E.g. SCVWD Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) includes Adaptive Management

Multi-stakeholder, multi-agency collaborations are more common, and will likely emerge as the norm for decision making. Agreements from these collaborations will reflect the uncertainties of a changing world, with choice points, triggers, and a criteria for change built into management plans. Adaptive management models have begun to emerge from complex disputes resolutions.

CA Department of Water Resources (DWR) has released the new Bulletin 160, which includes scenario planning. This approach to decision-making will become common in local and regional planning efforts. Scenario planning anticipates possible alternative futures, and provides options that can help organizations and entities better adapt to changing circumstances.

Santa Clara Valley Water District has agreed to, along with many agency and environmental groups, an adaptive management approach to the restoration of streams and fisheries in the Santa Clara Valley. This agreement, which is in the environmental review process, uses an adaptive approach.

http://www.valleywater.org/Water/Watersheds_-_streams_and_floods/Taking_care_of_streams/FAHCE/index.shtml

Needs

- Increasing flood conveyance capacity below main flood control reservoirs
- Off stream storage opportunities, optimizing groundwater basins, enhancing on-stream reservoirs for flood control
- Institutionalized framework for trading of mitigation obligations and benefits for optimization package on regional management priorities scale (similar to SO₂ cap-and-trade)

As just a starting list for the brainstorm of our needs in the face of climate change, we will need:

- Greater flexibility and capacity for flood conveyance and more reliable levees, as winter storm runoff increase due to warming
- Water supply storage opportunities will optimize groundwater basins for off-stream storage, reducing evaporation losses
- Trading schemes for mitigation obligations will be more important, giving more flexibility to meet greatly increased needs for refugia as ecosystems adapt to climate change

Hopefully, this final discussion has catalyzed creative thinking in facing the challenge of climate change. This presentation is meant to be a living document, and grow to include your views and reviews. Please provide feedback to otis@foothill.net If response is lively, we will create a website to host the ongoing dialogue.