Columbia River Treaty & Adaptive Management

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Kai Lee

Background

Thanks to Matt for giving me an occasion to look back on things I did long, long ago. I'd also like to thank my long-ago colleague Chip McConnaha, a distinguished fisheries scientist with long experience in the Pacific Northwest. Chip helped me fill in, very roughly, the more than two decades that I've been absent from the Columbia River basin.

When I arrived at the Northwest Power and Conservation Council in 1983, I thought of myself as a student of the electric power system that grew up around the Bonneville Power Administration. That system was embroiled in controversy then, around an ambitious and misconceived program to build nuclear and coal-fired power plants to supplement the extraordinary hydropower resources of the Columbia.

I was astonished to discover, then, that under Section 4(h) of the Northwest Power Act of 1980—the law that gave birth to the Council—there was a legal duty to "protect, mitigate, and enhance fish and wildlife" in the Columbia basin. This awkward language was the gift of Representative John Dingell of Michigan, chairman of the House Commerce Committee. Dingell died earlier this year, after serving longer in the Congress than any other person. He was an avid hunter and fisherman, who brooked no opposition in a long and fruitful political career. During the deliberations on the Power Act he went to the Northwest, where one of the treaty tribes took him fishing. He caught nothing. When they explained that the dams had blocked the habitat Dingell determined to do something about it.

I had thought of the salmon of the Northwest as collateral damage, irretrievably lost in the development of the region. I was in some ways wrong. As I grappled with the magnitude of my error, and the immense responsibilities that we on the Council faced, I heard a talk by the biologist Randall Peterman of Simon Fraser University. In the long paper from which he drew his remarks (Argue *et al* 1983), Peterman described an idea—a Canadian idea, mostly—developed by C.S. Holling and his students at the University of British Columbia, including a young man named Carl Walters. They called this idea "adaptive environmental assessment and management." As I read Peterman's paper in the *Canadian Bulletin of Fisheries and Aquatic Sciences*, I began to understand the direction that the Columbia Basin should follow: to use the amazing opportunity of Section 4(h) to run the world's largest ecological experiment, in an attempt to recover some of the glories of the salmon that ranged across a terrain the size of France as well as most of the North Pacific Ocean.

I'd like to share with you some observations about what has happened since the 1980s, and then to put before you some provocations about the work ahead.

Observations

- *Plus ça change…* — salmon abundances have not recovered substantially in the past generation; but neither has the freshwater environment been transformed, despite a great deal of improvement in many places. The comprehensive ecosystem-based view that seems so sensible in principle remains beyond reach in practice.

- The hope of adaptive management was that enough could be learned, quickly enough, to guide a positive transformation. That has not happened. In part because active AM has not been implemented, so that the conditions for rapid, unequivocal learning have not been feasible or possible. There are other reasons, and it would be interesting to discuss them.

  To me, the greatest frustration has been the realization that the salmon ecosystem couples freshwater and marine realms in ways that are too complicated to untangle quickly. In the 1980s I thought adaptive management was possible because the ecosystem was likely to be loosely connected, so that one could isolate responses to specific changes and do this quickly enough to inform management decisions. This has not come to fruition, despite ambitious efforts.

- Tribes have not regained what they lost in the 19th and 20th centuries, including what they lost in the upper Columbia basin. If the Columbia had been restored (in part through adaptive management), the historic situation of the tribes might have been dramatically altered, but this has not happened.

- In some respects things *have* been transformed. Chief among them is environmentalism as a durable social value, and the faith in scientific knowledge that goes along with the dream of sustainability. There is public support and legitimacy for environmental goals that did not exist when the Treaty went into force in 1964.

  Of comparable importance is the acceptance of the tribes and First Nations as legitimate actors in the landscape of governance. This was underway in 1987, and it may be the development that most gratifies me, looking back. What it means for a new Columbia River Treaty remains to be seen.

- Modeling has become indispensable as a way to organize data and to infer its significance. This may be the greatest legacy of adaptive management in practice, to find ways to handle the gusher of data that the information revolution has produced. At its best, the framework of models, data, and hypotheses can provide what Bill Werick called a single negotiating text, a way for people to argue over what to while agreeing on the facts.

  Models are not usually very good at predictions; the data we have come from the past, after all, and ecosystems do not respond in simple ways as environmental conditions change. Moreover, some environmental changes—notably those driven by a changing climate—are novel, some in a qualitative way. But models do often illuminate the implications of actions before they are taken. Even when you don't have a good map, it helps to have headlights.

- Climate change is now a practical reality, a source of surprises as the environment exceeds its long-term averages in more and more dimensions, and as its life-forms struggle to adapt. This means that irrigation and flood control may become more valuable than they were in the 1980s.

It already means that the market for export of power southwards to California has shifted significantly.

...and the emergence of renewable generation and conservation as significant elements of the electric power system has altered the economics of the Columbia's hydropower system; this affects what can be done in the Columbia basin's environmental management.

- All this means that the scope of a new treaty will be important. With only two purposes in the 1964 agreement, it was possible to delegate decision making to expert entities. These entities could in turn define implementation in the form of contracts and rule curves. The polycentric reality of the 21st century means that there is no single decision maker but rather a negotiating process. Whatever benefits this brings in equity and legitimacy, it means that the rationalist assumption of adaptive management—that there is a unitary decision maker with a straightforward objective function—is an even greater stretch going forward than it was a generation ago.

Provocations

What should science advice contribute to a new Columbia River Treaty? I'll draw upon a thoughtful article by Francis *et al* that appeared several months ago, entitled "Linking knowledge to action in ocean ecosystem management." They identified five dimensions of linking knowledge to action: Co-production of knowledge; aspiration; application; parsimony; and amplification. Let me explain.

1. Co-production: to ground inquiry and analysis in the needs and problems of the communities of the Columbia basin. Scientific review and advice is a process, rather than a product. Each report needs to be a joint outcome, so that it is salient, credible, and legitimate to *both* users and advisers. Bear in mind that salience, credibility, and legitimacy may mean somewhat different things to user and producer of knowledge—e.g., a decision support tool needs to be timely, accurate enough to inform a pending choice, and seen to be backed by evidence. Only the last of those three attributes is generally appropriate—or present—in a published paper.

2. Aspiration: working with stakeholders and decision makers, to improve over time their *strategic* grasp of sustainability in the Columbia basin. Knowledge contributed from independent outside advisers should make a difference. Improved management of habitat should lead to more fish and wildlife, or at least to a better understanding of how much the modified habitat can support in the face of a changing climate and other stressors. Thus, science that leads to learning should clarify what sustainability means in the Columbia. Bear in mind, of course, that sustainability is also a goal—and that there will be conflicting values at stake in defining that goal. For that reason, among others, sustainability is a moving target.

3. Application: to contribute timely knowledge useful in making decisions—about investment, operations, transparency, and process. This is the obvious contribution of knowledge. But it is harder to achieve, and less often obtained, because in real decision settings the value of knowledge is shaped by its salience and its legitimacy, more than by whether scientists find it credible.

4. Parsimony: to move monitoring and modeling of the coupled human-natural Columbia basin toward higher value and lower cost, timely knowledge. This is hard to do! The welcome success of the Great Lakes Adaptive Management committee shows it can be done, with leadership and scrappy determination.

5. And last, amplification: to enrich the understanding of stakeholders of the practical potential of the Columbia to move toward sustainability. If the process of co-production works, there will be relationships forged—often forged in conflict and under the pressures of deadlines and compromise. Those relationships can, however, lead scientists and stakeholders to understand how the knowledge they share means different things, and to see connections among different bits of knowledge.

Like the science it helps to articulate, adaptive management is subversive rather than confrontational. In testing the plausibility of actions, an adaptive approach can sometimes show what works and what does not. And sometimes it can do more: it can open new options and reshape our sense of what can be striven for. That subversive potential is only more valuable now.

In principle the Columbia River basin is one of the world's largest working landscapes—an area the size of a nation-state, where cities, dams, prairies, and vineyards might all be operated in harmony with one another. A landscape in which tribal peoples can look beneath these recent artifacts to inhabit the world where their ancestors forged and found their traditions. In practice, the basin is an untidy assemblage of water rights and properties and management authorities, whose governance is the result of the push and pull of interest groups.

The hope of the 2017 Columbia River Treaty workshop, where many of the people here met, was that a "broader array of shared values and interests could flow from a more restorative approach relying on the best available science." How to realize this brave hope amid the contest of interests is a challenge that is political and economic ...but also irreducibly scientific.

I wish you good luck.

Sources cited

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