

**Bob Benze's Comments  
on the  
Draft Action Agenda  
and  
Science Work Plan  
11-16-08**

The Puget Sound Partnership has stated that the Action Agenda is intended to guide efforts to protect and restore Puget Sound based on science... Yet, the Action Plan contains no specific actions to increase spending on science from the current 1.6% of the \$570 million currently budgeted biennially for protecting the Sound. This is simply unacceptable and will result in failure to improve the health of the Sound in any meaningful way.

Puget Sound is a complex natural system. Historically, human efforts to manage such systems have almost always failed. One of the many examples is Yellowstone, where people didn't understand the system and made a series of decisions that wrecked the park in an attempt to restore it (The History of Yellowstone Park: Playing God in Yellowstone by Austin Chase).

There are a number of reasons that such efforts fail. One is that much of the science that is employed is drastically out of date. But another, perhaps more important reason is that our current decision-making system tends to rely on intellectual beliefs and common wisdom that is often bereft of scientific foundation or historical knowledge. One of these beliefs is that we can obtain a "balance of nature" by removing human impacts. But the environment changes even when it is left alone – and, historically, the Puget Sound basin is no exception. Unfortunately, this is not recognized by the initial goal that the legislature established for the Partnership, which is to achieve "A healthy human population supported by a healthy Puget Sound that is *not threatened by changes in the ecosystem.*"

And attempting to validate the Action Plan by stating that "people commented that we already know what the problems are and that we should just get on with fixing them." is simply disingenuous, and a recipe for expending enormous amounts of money with almost no chance of success.

The late author Michael Crichton posed the question of whether human beings are even capable of managing complex systems. He cited the work of Prof. Dr. Dietrich Dorner in Germany, an expert in complex systems, who, as part of his research, established computer models for several complex environmental systems, such as the Sahara Desert, and brought in various people from academia to do a 10 year management exercise. The results were that almost everyone ran the environment into the ground. But a few people were successful. It turned out that the people who failed managed from a philosophical point of view. They applied what they believed would work and then generally left the systems alone. As time went on, they applied fewer and fewer decisions because whatever they tried was failing. This is why the Plan/Do/Assess/Adapt approach of the Action Plan won't work.

The people who succeeded waited to observe the system, gathering information. They looked for unexpected consequences. As they began to understand the system they started to interact with it, making more and more decisions. The conclusion was that you can't manage complex systems from a philosophical point of view. But to a great extent, that is exactly what the Action Plan proposes to do.

The other conclusion from Dr. Dorner's work as noted by Chrichton was that "there are strategies to manage complexity; that they can be learned; they can be taught; but they're not necessarily natural to us." Interactive management of complex environmental systems requires a lot of work (mostly scientific) and Chrichton says "that's going to be stupefyingly expensive".

If we are going to improve the health of the Sound, we are going to have to spend a lot of money on a scientific, interactive program that begins with extensive information gathering. This is not recognized by the Action Plan, "adaptive management" notwithstanding. The truth is that there is a lot more that we don't know than we do know about the Puget Sound system – and we need to spend a lot more time and effort making observations and gathering information before recommending any significant actions to adaptively manage.

The key document for restoring the Sound is not the Action Agenda, but it is the Science Work Plan. However, from all appearances, the Science Plan is being published as a minor appendage to the Action Agenda – where it is barely mentioned. The reality is that the Action Agenda should be an appendix to the Strategic Science Work Plan, and that the state's budget should be dramatically revised to reflect this reprioritization of how the restoration will be directed and managed. This will eventually require the money allocated to science to be increased by orders of magnitude. Anything else will be "business as usual" with the money continuing to flow largely to special interest groups and their narrow agendas – with no hope of success.

Now, let me make some specific observations on what is found in the Action Plan:

Introduction | Page 1: The Action plan is intended to "...help us turn the tide on the decline of Puget Sound health." The report (Question 2 | Page 1) cites indicators that include "starving orcas, missing salmon runs, closed shellfish beds, massive fish kills, and disease outbreaks from eating contaminated seafood,...".

But there are a lot of indicators that say that Puget Sound is healthier. Some of us remember the '60s when oil slicks and floating debris were the norm. Much of the Sound was murky and the visibility was only a few inches deep. Today that is all changed. Even the smallest oil sheen will generate headlines and you can see many feet down into the depths. The Battelle laboratory sediment core samples tell us that chemical pollution in sediments has been decreasing steadily since the mid '60s and that water quality is generally within the safe, conservative limits established by the EPA. An article in the Sep '08 issue of Environmental Science and Technology by Battelle scientists indicated that lead and copper concentrations in Puget Sound surface sediments should recover to pre-industrial levels around 2020 – 2030 without any additional actions.

Two of the alarmist indicators, fish kills and contaminated seafood, actually appear to be more the result of Mother Nature than human activity.

And while the Action Plan talks about the amount of pollutants released to the Sound, it is almost at a loss to define specific cause and effect relationships (An exception is the work on PAHs and English Sole by Usha Varanosi at NOAA). Even the most cited reference to PCB burdens in marine mammals has a problem, since PCBs have been banned for over 30 years and it is not clear what can be done to eliminate the residuals from the environment.

A particular example of out-of-date science is the Introduction | page 6 recommendation that copper be controlled and that people should take actions to eliminate copper, such as changing out their copper brake pads for ones made of hemp (semi-metallic pads replaced asbestos pads a long time ago). The latest science indicates that the copper of concern is the small bioavailable (ionic) fraction (less than 1%), and that this is generally tied up in marine chemistry and not a threat to Blue Mussel or Pacific Oyster larvae as was thought back in the 80's. (See the SPAWAR copper workshop reports.) NOAA and others have done laboratory testing which shows that ionic copper in levels less than 10 ppb can affect a salmon's sense of smell, but it is not clear that this work can be extrapolated to the marine waters of Puget Sound. We should therefore be cautious before deciding to put metallic copper on the Action Agenda's priority list of pollutants without a clear, peer-reviewed scientific basis for doing so.

The Introduction | Page 7 advises limiting what goes down sinks, toilets and drains as it makes its way into Puget Sound. While this may help the operators of the sewage treatment plants in processing the sewerage, it may not really help the Sound, since these plants have strict NPDES discharge limits and will fall under the Notice of Violation hammer of the regulators if they discharge pollutants above those limits.

Question 1 | Page 2 correctly notes that the Action Plan should specify "outcomes" (even though it then gets into specifying "processes" like changing brake pads) – but it then links (translates) outcomes into "indicators". And there are only *six* of them. This is patently absurd – see the discussion above on complex systems.

Another curious indicator is to maintain farmland acreage. What is the environmental benefit? A friend of mine, Don Flora, PhD, is providing you with studies he has accomplished on the effects of land use on pollutants, including the effectiveness of buffers on stream and marine shoreline protection from pollutants. It turns out that big buffers of a hundred or two hundred feet don't have any serious advantage over 30 ft buffers. And lawns may be as good or better than forests for retaining stormwater. So again, let's get the science right before we pass any more restrictive land use policy.

Talking about trees, Question 2 | Page 1 bemoans the fact that we removed 66 to 84% of the old growth forest in the basin in the last 50 years. What is not mentioned is that 100 years ago there were almost no trees in the basin -- the lumber industry had cut them all down. And, as noted in research by Dr. Flora, "Prior to European colonization only about 40% of the Puget Sound Lowlands were dense (old-growth) coniferous forests. Burns accounted for the sparseness. And

the prairie actually predated all else, part of the oak-grass savannah that remains in many places, our most native upland ecotype.”

Quoting Dr. Crichton: “And we know that the world that the white men saw when they first came to the New World was something they didn’t understand at all. It was a world that was entirely altered by the native people who were there at the time. They were burning down the plains. They were burning down the old-growth forests. There is more old-growth forest in California today than there was in 1850. The Indians didn’t like old growth because it didn’t support enough game. They burned it down. So what people saw as “nature” had been very much managed by a people who were true students of nature.”

Yes, trees are good, but let’s make sure we understand what we want them for (aesthetics, bird and animal habitat, erosion control) and then, from a science basis, not an “intellectual” basis, decide what can go and what should stay.

Question 1 | Page 2 mentions PCBs and mercury as persistent chemicals of concern – particularly in herring. As mentioned, PCBs are already banned and much of the mercury comes out of the air or in from the ocean. And a lot of what is in the air in Puget Sound does not originate in this country – and probably a quarter comes from natural sources. So what actions would we take that are not already being taken under EPA rules?

Much is made of the bulkheads along the shoreline – i.e. one third of the shoreline is “armored”. But much of the concern about bulkheads is not supported by science. For example, in Thurston County a county-wide sampling of bulkheaded and bareheaded beaches has found no scouring, no change in beach profiles, and no coarsening of the upper beach. Studies show that bulkheads generally affect beach ecology only when they are built below the high water line. This is no longer done and most of the bulkheads above the high water line actually serve a beneficial purpose as recognized by the Shoreline Management Act. See the report on bulkheads submitted by Don Flora PhD. To blanketly condemn all bulkheads as “bad” is simply wrongheaded.

Question 2 | Page 3 expresses concern about diminishing eelgrass, stating: “Many (eelgrass) habitats have been shrinking in size, diminished in quality, fragmented, and the processes that form and sustain them have been disrupted in many places.” Yet the Puget Sound Action Team says otherwise. In their 2007 Puget Sound Update they say that “On a Sound wide scale, there has been no evidence of a trend in eelgrass area.” Again, it is important to get a scientifically correct assessment before we decide to make this a priority action item on which we spend taxpayer dollars.

Another issue is the construction of docks. Question 2 | Page 4 indicates this alteration of habitat threatens various species, including orcas. Yet this does not appear to be a scientific conclusion. For example, work by Dr. Flora shows that juvenile salmon traveling from the end of Sinclair Inlet to the Straights of Juan DeFuca make a trip of approximately 55 miles but in that distance there are only 55 residential docks. Other studies, particularly of ferry terminal impacts, do not indicate that docks have a noticeable impact on salmon. Yet we continue to promulgate rules to hinder dock construction citing disruption of sunlight and other habitat disruption factors – which, on balance, are virtually insignificant in the efforts to restore salmon populations.

Question 2 | Page 5 again raises the specter of sewerage discharge, saying: “Sewage treatment systems, malfunctioning septic systems and direct discharge are pathways to rivers, lakes, and marine waters, and add concentrated nutrients, viruses and bacteria to this mix.” And the report goes on to say: “The half-million on-site septic systems in Puget Sound are significant sources of nitrogen loading into rivers and marine waters. Where systems do not function properly, they are also major sources of bacteria and viruses.” Yet, in its background material supporting septic system inspection regulations, the state Department of Health could cite only six examples in Washington State history of illness caused by failing septic – and none of these involved fatalities. Hardly a cause for alarm and major action.

And if fecal pollution is really a concern what are we doing about animal control? Dr. Flora points out that “An estimated 15,000 dogs in Kitsap County generate about 10,000 pounds of feces daily. Dogs are a bigger problem, apparently, than stormwater in CSOs and out-of-whack septic systems...” It would be an interesting exercise to calculate the annual dog feces pollutant loading for the entire Puget Sound Basin. Perhaps a little more study should be accomplished to determine the various sources of fecal pollution and their relative impacts, before we jump the gun with more questionable and expensive on-site sewage regulations.

Regarding nitrogen loading, recent studies indicate that effluent from a properly functioning gravity septic system may not exceed the nitrogen limits established by the state. Additionally, the Hood Canal Dissolved Oxygen Program results indicate that nitrogen from septic systems and alder trees does not have a significant effect in most of the Canal but these human-caused sources could, under certain weather conditions, trigger a “tipping point” for a low oxygen event that would endanger fish in the poorly flushed lower Canal including the Lynch Cove area. It is not apparent from information provided just what the probability of such an anthropogenic tipping point event may be, i.e. whether the number of fish kills over time would be significantly greater than those that would occur naturally without these additional inputs.

Dr. Newton’s team is in the process of obtaining a peer review of their Hood Canal Low Dissolved Oxygen studies and has not yet established a date for releasing their final report. In any case, it appears that more scientific work (at least a published report) is needed before the legislature entertains septic legislation that would follow the Action Agenda’s recommendation to “Revise the current septic system rules no later than December 2010 so that standards are established to address new septic system technologies.” Just because a technology (i.e. nitrogen removal) exists doesn’t mean we need rules to use it – particularly when it would impose heavy costs on property owners without solid scientific evidence that the environment would benefit.

Question 2 | Page 5 also expresses concerns about “Altered weather regimes associated with climate change...” This is a controversial and highly-charged subject. But, again, the latest science is being discounted. Over 31,000 scientists have signed a petition which says that they do not believe that global warming and climate change is caused by anthropogenic CO<sub>2</sub>. In fact, the most recent correlation favors causation from sunspot activity. And even if the cause is CO<sub>2</sub> and the IPCC models are correct, the real scenarios for the year 2100 are far from the apocalyptic predictions we encounter from activist groups. In fact the benefits may outweigh the problems. For example, studies show that for a temperature rise of 4.7 degrees F by 2100 (one IPCC

scenario), for every one person who will die from the increased warming, about five deaths will be avoided by people who would otherwise perish due to a colder (i.e. today's) climate.

Likewise, the oceans will rise less than a foot (which they also did the last 100 years) – something that will easily be accommodated. We again need to remember that natural systems change with or without mankind – 11,000 years ago this area was under two miles of ice.

This issue of climate change is a critical area for a legitimate scientific debate – one which is currently being stifled by intellectual beliefs and a political system that is invested in these beliefs. The wrong answers could produce an economic catastrophe – with laws already on the books to cut energy production in half and eliminate half the vehicle miles we travel.

And energy and travel aren't the only penalties proposed to limit our lifestyle. Although limiting growth to designated urban areas sounded intellectually like the right thing to do, in practice, people are learning to hate it. City neighborhoods with houses on lots with yards for children to play on are being replaced by high rise condos. People are now being forced into the same city densities they fought to escape with last century's movement to the suburbs. And, surprisingly enough, some experts are making the argument that "sprawl" may be as good (i.e. sustainable) for the environment as the pack-'em and stack 'em approach to land use planning. Again, we need a far better scientific look at this complex system called Puget Sound. We are already paying a healthy financial penalty for the Growth Management Act approach, with the University of Washington estimating that the GMA is directly responsible for increasing the average price of a house in the Seattle area by \$200,000 – driving most young couples completely out of the market. Is this a trend we want to continue based on limited knowledge?

The suggestion to encourage marketing programs to bring (and eventually mandate?) locally-grown food to Puget Sound markets also flies in the face of scientific and economic reasoning. The marketplace functions extraordinarily well to bring people the goods they want at a price they can afford. Virtually every attempt by government to tinker with this system has raised costs and reduced choice. Is that really what people want?

Question 3 | Page 20 advocates for national standards for new and emerging contaminants. These could include endocrine disruptors and epigenetic chemicals. The problem with this approach is that there are tens-of-thousands of new chemicals and it is simply not possible to run the EPA's water quality criteria testing program on them all – or even on representative samples. And, as it turned out with TBT, concentrations in a few parts per trillion can have a major disruptive effect on shellfish reproduction. Going back to Dr. Dorner's argument, what is needed is a careful observation of unexpected consequences. When you observe shellfish reproduction problems, begin a scientific investigation to see if a cause and effect relationship can be established. Make hypothesis and test them (isn't that what real science does?). That is how the TBT relationship was discovered and it is how most of the problems in a complex system should be handled.

Question 3 | Page 20 talks about establishing No Discharge Zones for all or parts of Puget Sound that are nutrient-limited. Before we just decide this is a good idea, let's do a little work to see if this will have any real impact. When the EPA, the state and the environmental activist

organizations were demanding that the city of San Diego install secondary treatment on its sewage treatment plant outfall in accordance with the Clean Water Act, someone finally decided that a scientific study should be done to see if there would be any benefit from the huge cost that would be involved. It turned out there wasn't and the EPA agreed. The scientific approach is outlined in a book, *Managing Wastewater*, published by the National Research Council. Alan Mearns of NOAA in Seattle was a principal author.

This desire to use the "precautionary principle" is fraught with danger. I recall a presentation at a Washington D.C. environmental conference where a keynote speaker, Rich Guida, discussed the story of EPA's new rule to require benzene-contaminated soil to be incinerated before disposal in a landfill. They had missed a decimal point in their risk calculation, which was pointed out to them, and the actual cost of disposal for saving a theoretical life became an extraordinary large number. And then it was pointed out to them that the probabilistic certainty of additional traffic deaths from transporting the soil the additional miles to and from the incinerator would far outweigh the number of people saved from a lowered potential for benzene exposure. The rule was passed anyway. This approach, repeated over and over, quickly eats up resources that could be used to resolve real problems, and has the downside of imposing unnecessary burdensome costs on American industries that must be financially competitive to survive in a global economy.

I will not spend much time discussing funding strategies, except to say the state and federal governments are broke and that taxpayers won't stand for many more fees and assessments. It is unlikely that many of the funding schemes to budget an additional \$200 to \$300 million will survive the legislative process. But to do the work correctly will, as noted above, be very expensive. It will, at a minimum, require a painful, politically unpopular reprioritization of existing funds if we are going to do what is really needed. This is the challenge!

And Yellowstone is only one of many examples of failure to manage complex environmental systems. Let people think the status quo approach of the Action Agenda for Puget Sound will be good enough, let's revisit how a similar approach has worked for Chesapeake Bay, a part of the federal Great Waters Program. A Martin Law Group news bulletin notes that "Experience on the nation's other coast suggests that it is easier to agree on problems and goals than to assemble the political will and tools to make real progress towards these goals. Twenty-five years of restoration efforts for the Chesapeake Bay have resulted in little progress and continual extension of water quality deadlines, culminating in an October 29, 2008 notice of intent to sue EPA..." The Law Group goes on to say that "EPA has admitted that the goal (to remove the Bay from the federal 'dirty waters' list by 2010) will not be achieved and officials are now discussing pushing the Bay cleanup goal back another 12 years. In 2008 scientists concluded that Chesapeake Bay suffered the fourth worst "dead zone" since 1985. The Bay's crab population is near historic lows. As a result, Maryland and Virginia have severely limited the commercial crab harvest."

I am familiar with the Chesapeake Bay program. Along with Navy scientists, I visited the Chesapeake Bay Foundation as part of the preliminary research leading to the joint EPA/Ecology/Navy ENVVEST pilot program for Sinclair and Dyes inlets. To be frank, we were not very impressed with their scientific approach and found little to benchmark. The Action Agenda plan for Puget Sound, as currently constructed, will fare no better than the Chesapeake

Bay program. 25 years later we will be in the same position, wondering how we could have spent hundreds of millions of dollars with so little progress.

In conclusion, the key to this entire endeavor of restoring Puget Sound is found in Action Plan paragraph E.3.4 “Build and sustain regional capacity to conduct science”. We have a small cadre of scientists who have a grasp of the scientific programs that will be required to interact with and benefit the complex system that is Puget Sound. The Science Work Plan is a starting point, but it needs to be revised to incorporate the concepts of Dr. Dorner and the lessons-learned from past failures to manage complex environmental systems.

These scientists should be chartered and funded to begin this enterprise. It will be hugely expensive. But the alternative is even more expensive and will end in bitter disappointment.

The Action Agenda, at a minimum, should be revised to include a minority report that provides the above recommendations for policy makers to consider.

Respectfully submitted,

Bob Benze  
Environmental Engineer  
Silverdale, WA  
(360) 692-0800  
robert@benze.com