Review of Draft Policy for Maintaining In stream Flows in Northern California Coastal Streams

Comments by Dr. R.A. Gearheart, Ph.D., P.E. **February 4, 2008**

Definition of protectiveness

The list of protectiveness factor is inclusive of the stream flows and diversions of attributes that are protective of anadromous salmonids. The last bullet includes the phrase "downstream transport of energy and material" which can be interpret as not including thermal inputs and thermal insulations to maintain critical temperature. Since stream temperature is one of the major attributes to salmonid life cycles, I suggest that it should be implicitly stated in the list.

The habitat analysis section of the report to assess protectiveness is well organized and well referenced. It appears to be scientifically sound and representative of the resource. While mention of water quality is referenced in several sections it seems that a continuity discussion of the impact of water quality constraints should be addressed. A question would be, 1) are there permitted NPDES discharges to consider in the reaches of concern and are there temperature and/or sediment/turbidity issue associated with various land uses. Does the policy consider permitted discharges as a component of the flow? The inclusion of these types (of flows NPDES) might be more critical (beneficial and/or detrimental) during periods of summer and early fall flows.

There seems to be a potential interagency (California) void in terms of the involvement of other state agencies which impact the fisheries beneficial uses of the these rivers. What role does the Department of water Resources play in terms of water rights, irrigation efficiencies, etc.? Does the state Maybe I missed something but it doesn't appear that the Regional Water Quality Control Board has been involved with the preparation and/or review of the draft policy. The success of the implementation of this policy is seriously constrained due to the possible agency voids. There is also a limitation due to the fact that there appears to be little to no interest by the State Board in considering the role of groundwater abstraction on stream flows. A comment could also be made of how the issue of tail water (if in fact it is an issue) is considered in the policy?

Figure 4-1 was a good starting point and should, in my opinion be presented early in the document to give the reader a road map of how the policy was developed. This figure also helps show why the gaps in the historic data required site-specific information.

The choice of the February median flood flow as the normalizing factor is based on sound science and universal professional opinion. Using this as the starting point and the point of comparison is the strongest science contribution to the study. As the policy is developed in the document the science, while appropriate, needs further development and validation. My concern is there are conditions on the elbows of the season (especially in the later spring of a dry winter)and the low flow conditions in the summer that appear to me affected by irrigation diversion

Setting seasonal limits on diversion

The literature findings along with the data collected for establishing the limits on seasonal diversion have for the most part been integrated into a scientifically acceptable format for inclusion in the policy. Precedent flow condition and flow peak intervals could potentially be factors in the seasonal diversion limits section of the North Coast In stream Flow Policy which includes a significant amount of data and analysis which is applicable to the implementation of the policy. A general comment was made in the initial paragraphs concerning low flow conditions in the summer and early flow, during the period of maximum potential irrigation diversion, as it

relates to this Policy

Establishing minimum bypass flow requirements

Minimum bypass flow requirements have several components to their implementation. The first is the maintenance flow downstream from the barrier and the second being the access. Using the timing and the flow stage criteria designated ratio of reference flow appears to be sufficient for passage. There are other factors associated with barriers, which are potentially important protectiveness issues such as sediment supply, temperature, early life stage predation, etc.

Establishing maximum cumulative diversion requirements

Groundwater recharge and abstraction (changes in interflow) have not been include in the policy for establishing maximum diversion requirements and could factor sin considering the conjunctive relationship with high stream and diversion rates. The recharging of the groundwater during the high flow period charges the near stream groundwater storage, which then charges the interflow for groundwater flows back to the stream as the stage of the river recedes. Without data analysis the question is whether this potential is reflected in the MCD rates?

Conducting site-specific studies

The site-specific studies are the most valuable elements of the policy. These studies demonstrate how a policy model can be validated and also are stand alone scientific studies which are valuable in establishing baseline conditions for other quantity (timing and distribution) and quality issues. Exactly how the findings of the site-specific studies can be translated (curve fitting, etc.) into other watersheds in the three county areas is problematic. Not with standing the preceding comment these studies are valuable studies rich with information and predictive value.

Assessing the cumulative effects of water diversions on in stream flows needed for the protection of fishery resources

The rationale for this policy element is well developed. The approached taken in the analysis with the various alternatives is descriptive and graphic. Without a sensitivity analysis, though, discrimination between effects and policy are not clear or perhaps don't exist (Figure 4-6 for example). It appears that one size doesn't fit all when it comes to the flow alternatives. There is no discussion on how the different flow alternatives collectively (all species considered) would be implemented.

Minimizing the effects of on-stream dams on fishery resources

Minimizing the effects of on-stream dam is a necessary but not sufficient element of the policy for protectiveness of salmon species. Straightforward presentation of the issue is based on professional experience and years of data collection associated with impounded salmonid streams. This should be the easiest of the elements of monitor and enforce.

Providing passage for fish migration and requiring screening of water diversion intakes

This section is well developed and well documented. Providing passage for fish migration and

requiring screening of water diversion intakes is well developed and its effectiveness has been well document. This is another policy element that is necessary but not sufficient.

General questions about implementation

It is not clear if unimpaired flow represents the same resource distribution as undeleted or native base flows. If the unimpaired only removed the diversions and did not include anthropogenic changes in land use then it is starting the analysis at impaired conditions Such land uses as wetland conversion, riparian vegetation losses, forest practices, agricultural activity, roads/highways, urban development, etc., could also affect the hydrology away from a baseline condition. The question would be; does the policy developed unimpaired flow condition encompass the close to "natural condition" to afford protectiveness? For example, groundwater could have been used historically to irrigate vineyards but now surface water is being diverted. Groundwater removal could potential have an affect on the "unimpaired flow values". Maybe this is not an issue but there is no discussion in the document to alleviate my concern.

Are water rights grandfathered into this policy? If water rights are grandfathered in without seasonal and flow considerations then the question is how much water is remaining to be regulate. This is exactly the issue on the Upper Klamath in Oregon where water right adjudications are under way. A general observation in the Oregon processes is that the water rights were 1) over allocated, 2) unmeasured, and 3) mostly unregulated (except for an attempt to regulate groundwater abstraction).

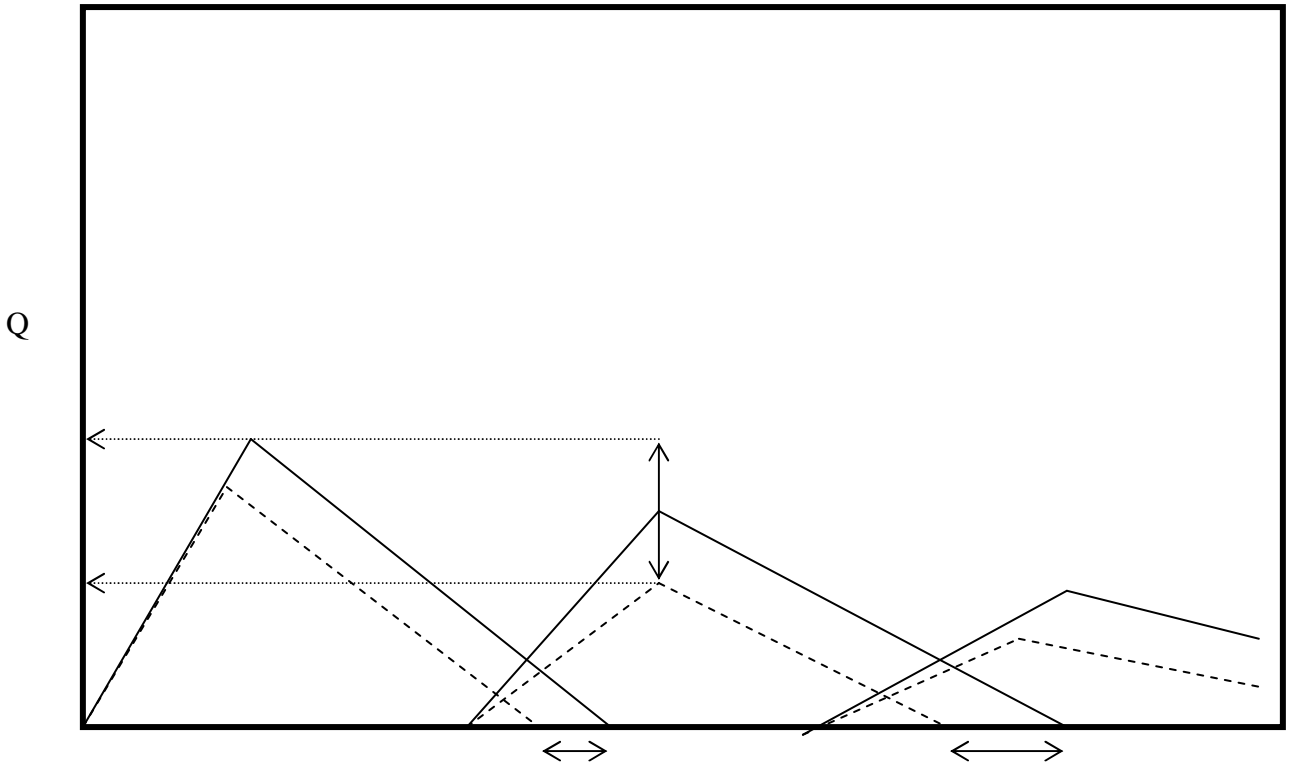
While this a draft guidelines, it seems that the implementation of this policy could ratchet down the base conditions for the diversion and bypass recommendations. Just as the impact of that climate change might have on any of these guidelines. I am not sure how one could answer these questions unless the policy left open an adaptive approach to the implementation n of the guidelines. For example, what are the probabilities of the DS-1 dates and their associated MBF's and MCD criteria not meeting the flow in stream flow requirement. Page 7-2 gives an attempt to state the uncertainties of flows outside of the diversion season in drought years. We have examples of mild and low flow in winter months where flow bypasses and diversions, using the February median flows, might not be protective to salmonid in stream needs.

There must be a good reason by the developers of the draft policy to not include any streams for site analysis in Humboldt County (access, lack of diversions issues, statutory limitation, lack of bypass concerns, etc.) There must also be good reasons for the inclusions of the sites in Sonoma and Marin Counties. Without a detailed assessment of these sites it appears that the sites in Sonoma and Marin Counties are sites with significant land use changes from natural conditions. So the questions remains what would the flows for this policy development be if one used a zero sum approach? It does seem that the flow regimes the stream flows have been irreversibility Ed of the guidelines.

The issue of implementation of the Policy is problematic. An implementation option might be to prioritize stream reaches, instrument them, implement the full range and coverage of management practices, and then measure effectiveness. The issues of barriers, bypasses, and diversion combined with culvert passages makes the implementation of the Policy a major issues. If policy element implementations were scattered out throughout water sheds with partial investment in instrumentation and data collection. Then limited protectiveness effectiveness could be measured. The recommendations for stage gauge and the associated operational investment are significant. The question might be how and where to invest infrastructure and monitoring effectiveness with the probability of success at its greatest?

The figure below (conceptual) shows the potential impact of successive diversions on the peak stream flow diversion concept. If the storm conditions are in the upper watershed and or the rainfall is significantly greater in the watershed than the cumulative impact of multiple diversion might be complex. It appears to me as one evaluates the cumulative effect of scalping 5% of the peak as the storm hydrograph precedes down stream the reduction in the total flow reduces and the delay time (1/2 day recession -flow restricted) increases.

The combined effect of both by-passes and flow diversions on critical stream flows is a complex issue especially under conditions of 1) over allocation, 3) omission of groundwater effect, and 3) the potential effect of the climate change on stream flows and runoff timing. Wouldn't the cumulative effect of scalping given % of the flood flow have a potential dewatering impact if successive diversions occur in a stream? Wouldn't also the potential period of reduced flow increase as one proceeds downstream? If in fact this cumulative effect is seen then the policy should determine a maximum allowable (volume of water) that could be scalped from the river to maintain the necessary conditions at the furthest downstream point of passage.



Appendix
Matrix Worksheet

An attempt to organize the analysis of relationships of the policy elements

	1 Season limits	**2** Minimum By-pass Diversion	**3** Maximum Cumulative Diversion	**4** Site Specific Studies	**5** Access Cumulative Impact Fisheries	**6** Minimize effect of dams	**7** Fish Screen	**8** Application Of criteria Protection Salmonids
1	Critical to all policy elements Fish screen	Establish window-	Potential Ground water impact (?)	Unimpaired Flows Based on Flood flows	**D**river for the policy	Not applicable	Necessary but not sufficient Always Applicable	Risk of missed windows
2	**X**	**X**	Not Analyzed (?)	Unimpaired Flows Based on Flood flows	Established by Hydrologic Analysis	Direct effect mitigation	Necessary but not sufficient Always Applicable	Difficult to implement costly (?)
3	**X**	**X**	**X**	Unimpaired Flows Based on Flood flows	Established by Hydrologic Analysis	Not appiicable	Necessary but not sufficient Always Applicable (?)	Loss of GW recharge (?) No discussion of cumulative storage
4	**X**	**X**	**X**	**X**	Validation step	Not applicable	Necessary but not sufficient Always Applicable	Small sample land use not described
5	**X**	**X**	**X**	**X**	**X**	Not applicable	Necessary but not sufficient Always Applicable (?)	Critical link/s not identified and/or quantified
6	**X**	**X**	**X**	**X**	**X**	**X**	\ Necessary but not sufficient Always Applicable (?)	Fish passage sediment trapping Warm water fisheries predation
7	**X**	**X**	**X**	**X**	**X**	**X**	**X**	Necessary Step enforceable Immediate
8	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**