

Dec. 4, 2009

## To Whom It May Concern

As scientists who work in Puget Sound on shoreline issues, we are compelled to comment on a document recently circulated by Dr. D. F. Flora entitled “Evidence of near-zero habitat harm from nearshore development.” Dr. Flora’s document is presented as a rigorous scientific evaluation of the effects of human activity on the ecological condition of Puget Sound shorelines, but it falls well short of any reasonable standard for scientific rigor or credibility. While the document has many problems, we have identified four general categories.

First, the document is incomplete in many respects. Rigorous science presents a thorough and unbiased review of available information, but this work does not. It uses limited results from a few Puget Sound studies, ignoring much of the data and nearly all the context presented in those sources, as well as relevant studies from other, related ecosystems. Science from both Puget Sound and other parts of the world shows clear adverse effects from armoring and other forms of shoreline modification. A forthcoming proceedings of a workshop on armoring in Puget Sound and associated literature review will provide a much more comprehensive evaluation of the topic.

Second, Dr. Flora’s description of his analytical methods and reporting of results are so incomplete that it is impossible to evaluate, reconstruct, or even understand them, all requirements for any sound scientific document. The statistical analyses he performed were methodologically flawed, incorrectly using linear regression analyses to analyze the data from a report by Williams et al. (2004). These data consisted of subjective assessments of shoreline conditions, variables that are unlikely to have followed a normal probability distribution. Thus the standard statistical tests used by Dr. Flora to seek relationships (or lack thereof) are not applicable. In addition, “peer review” of Dr. Flora’s analysis was apparently done informally by “friends.” True scientific peer review is carried out objectively (and usually anonymously) by experts on the specific topic at hand.

Third, the document is inconsistent in that it claims to make the case for conclusive evidence of “no harm” yet acknowledges that major information gaps exist, especially with respect to biological responses to human activity. In addition, the document includes no mention of cumulative effects, which is the focus of great concern by acknowledged experts in nearshore conditions. Specific habitat parameters at any given site challenge our attempts to measure potential impacts. In many ecosystems, scientists are working to find methods for effectively measuring both site-specific and cumulative impacts.

Finally, the document is factually incorrect in many places, especially in its use and interpretation of studies. It incorrectly describes regional science on the topic as a large, concerted effort when it is not. Local research was either mischaracterized by Dr. Flora (e.g., citations of Rice (2006), Sobocinski (2003)), or completely incorrect (e.g., citation of Tonnes (2008)). For example, Dr. Flora concluded from the work in Rice (2006) and

Tonnes (2008): *"Two studies purport to show the effects of bulkheads on surf smelt egg survival. In fact they compare treeless (and bulkheaded) unshaded shores with treed (non-bulkhead) shaded places."* The Rice (2006) study did not attribute observed differences in smelt eggs specifically to armoring but to shoreline modification, and the Tonnes (2008) study did not measure smelt embryo condition. Similarly, Flora's comment that *"Two studies have shown no difference in subsurface fauna in front of bulkheaded versus unprotected shores, so this part of the habitat issue also seems moot"* cites only part of one study (Sobocinski 2003) as support for this conclusion. In fact, other results from the Sobocinski work showed that natural beaches had higher invertebrate abundance and taxa richness in both fall-out traps and benthic cores than did armored beaches. Dr. Flora also claims that the beach profile analysis done by Herrera (2005) showed that the effects of armoring on beach slope are negligible. However, he fails to address the data in this report that clearly show evidence for lowering of beach profiles associated with bulkheads.

The management of Puget Sound's shorelines is complex, as is the problem of evaluating impacts of shoreline armoring. All acknowledge that more careful, well thought-out local research on this topic is necessary. However, the available research, which consists of a small number of studies in Puget Sound but a large number elsewhere, clearly supports the contention that armoring can have physical and biological impacts on beaches and their ecological functions, and that society should take a precautionary approach to shoreline management. While science and policy dialog on this topic is healthy, a document such as Dr. Flora's does little to advance this dialog. Science organizations and even the federal government are taking action to make the public more aware of the key role that science plays in informing policy, and of what needs to be done to prevent distortion of science from misinforming policy decisions (e.g., Sullivan et al. 2006, BPC 2009).

Signed by:

James S. Brennan  
Megan N. Dethier  
Jason Toft  
Steve Ralph  
Dan Tonnes  
Jeff Cordell  
Randy Carman  
James R. Karr  
Dave Shreffler  
Gregory D. Williams  
Bruce Taft  
Stephen C. Conroy  
Wendy Gerstel  
Laura Arber

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