**INDEPENDENT MULTIDISCIPLINARY SCIENCE TEAM (IMST)**

**State of Oregon**

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Dear Mr. Cotugno,

The IMST has reviewed the documents that you provided us, as requested in your August 2 letter. Our review focused on

- Attachment 1, Metro's Scientific Literature Review for Goal 5, and
- Attachment 2, Functional Values and Landscape Features Identifying Significant Riparian Corridors and Rating Systems.

We did not review attachments 4, 5, 7 because these deal with policy. Attachment 6 served as a resource document, and was therefore not a focus of this review.

In general, our congratulations on compiling a most impressive array of documents for guidance of policy development as it relates to Goal 5 and the Oregon Plan for Salmon and Watersheds. While there is always more that can be done, we are impressed with the thoughtfulness and thoroughness of what has been done. This document will not only be valuable to staff of Metro working on recovery of listed Pacific salmon, but it will also benefit those working on similar tasks in other urban centers throughout Oregon and the region.

**Comments on Attachment 1**

We do suggest you consider retitling Attachment 1 (the "Literature Review"). A literature review should critically evaluate published literature and draw pertinent conclusions based on that literature (Day 1994). Attachment 1 draws heavily on the literature to provide perspective about a variety of topics important to Goal 5 and salmonid recovery, but it does little analysis of the literature in which clear distinctions are made between primary and secondary literature, or in which the quality or certainty of what is reported is determined. An example (there are many) is the citation to the Pacific Rivers Council (1996) on page 8. We believe this document draws conclusions but is not reporting original research or data. We think it is important to make distinctions between scientific findings that are based on specific data and the conclusions or opinions of knowledgeable people. This is not to say that the opinions or judgments are incorrect or inappropriate, only that in citing the literature it is important that the reader know whether the information or conclusions being reported is based on specific data or if it is more general conjecture. In addition, this attachment is not comprehensive in what is "reviewed". For instance, there are many more references on stream flow moderation (page 21) than the one cited (Marx et al. 1999).

Nonetheless, we do find that in general the information in Attachment 1 is well organized, reasonably comprehensive but concise, and scientifically sound in the conclusions reached. We are impressed with the recognition of the importance of considering:

- Stream, riparian and upland condition and function individually and in aggregate,
- Individual sites, individual reaches and streams, whole watersheds and aggregations of adjacent watersheds,
- Time scales that range from days to at least decades, or longer.

The IMST has called these three elements the "landscape perspective", meaning it has crucial elements of space and time. The importance of connectivity, both longitudinal and lateral, of the streams system and the role that Metro as a regional planning agency can play in supporting protection and restoration of streams and uplands in order to provide healthy watershed function is particularly important. We encourage METRO to find ways in which they can work collaboratively with entities outside their jurisdictional boundaries to towards this end.

We consider having and using the landscape perspective crucial to accomplishing the goals of the Oregon Plan, and we are sure it is equally important for achieving Goal 5. We are pleased to see it well represented in Attachment 1.

The section titled "Watershed Perspective" of Attachment 1 is generally well done, but we note the tendency to equate healthy with pristine, and further that it suggests that healthy means unchanged. This is most apparent in the bulleted list on page 7, but it appears in other places as well. The problem is that this approach fails to recognize the role of natural processes and the episodic nature of their intensity and frequency; it also does not reflect the resiliency of the systems in question. Additionally, it implies that anything less than pristine is not healthy. The reality is that (conceptually, at least) a gradient of health, and intensity, frequency, and extent of disturbance exist.

On page 31 of the document, Metro recognizes that urban ecology is a relatively new field and poses the question: Whether the use of scientific data from non-urban ecosystems is appropriate in an urban setting? For an answer to this question, Metro cited a report from a City of Portland peer review panel that it was appropriate until information from urban research is available (City of Portland 2000). We agree with your conclusion that the literature dealing with other types of ecosystems can (and needs to) be used in considering urban areas. As this is an important question it needs more attention in the body of the document; it is not always clear when scientific literature is from urban settings and when it is from other settings. Making a clear distinction would help the reader interpret the text and it would make it easier to identify areas where gaps in information exist and help to set research priorities. We also feel that you should define or describe what you mean by an urban area, and how urbanization as a process can be described. This will help in assessing the degree to which findings from non-urban settings can be extrapolated to urban settings or areas in which urbanization is occurring.

Our following specific comments on Attachment 1 are organized to focus on hydrology, fish passage, habitat and water quality, which the IMST considers of paramount importance in accomplishing the goals of the Oregon Plan for Salmon and Watersheds.

**Hydrology**

- The literature review does not quantify or describe (except in very general terms) the effect of increasing impervious area on key hydrologic parameters such as discharge volume, stream stage and hydrograph shape, in the various spatial and temporal scales in which this is important. We suggest study and analysis of the following primary data sources: Booth and Jackson (1997), Dinicola (1990), Schueler (1994), Beyerlein (1999), Booth (1991), Hollis (1975), Leopold (1968), Perret (1974), Harbor (1994), Law (1994), and Snodgrass et al. (1997).
- The relationship between total impervious area (TIA) and effective impervious area (EIA) is important and deserves more attention than it is given. This is particularly important because of the likelihood that, at least initially, TIA is likely to be the parameter of choice because it is relatively easily measured. EIA is a valid (and logical) concept, but there is limited research available showing its relationship with TIA. It seems likely that protection of both good quality sites and the restoration of degraded sites is likely to focus on management of EIA. For this reason more explanation and documentation is needed to help with the critical policy decisions that need to be made.
- It is important to distinguish between small streams that originate or are largely contained in the urban area and the larger streams that flow through urban areas. The reason is that urban decision makers have greater degrees of influence over the smaller streams within their jurisdictional boundaries.
- We appreciate the watershed level approach espoused in attachment 2 (for instance page 101), but urge that focus on site specific actions not be lost. Recall the popular bumper sticker of some years back to "Think Globally and Act Locally".
- The restoration section beginning on page 101 gives little attention to hydrology. In fact urban modified hydrology could well be the single most important factor influencing salmonid recovery in urban areas. Since the role of this document is to provide guidance for policy development, then it is important that it give more attention to reducing, minimizing or preventing increased total impervious area, and/or to other factors that will influence hydrology in urban streams. As examples – note the lack of a hydrologic perspective in figure 12, and the lack of provision for hydrologic monitoring on pages 111-112.

**Fish Passage**

- Fish passage is fundamental to the successful utilization of habitat by most species, but especially anadromous species. Attachment 1 notes (on page 31 and again on page 41) the remarkable degree to which habitat has been lost due to underground piping of streams or presence of impassable culverts. However it provides no guidance on the specific aspects that make these a problem. For instance, what characteristics make culverts impassable and what design characteristics can mitigate these effects?
- The text of the restoration chapter appears to give little attention to fish passage issues, although fish passage does appear in table 11 and figure 12. There are two aspects that deserve more attention.

- Guidance to literature on culvert and road crossing design that will help accomplish the strategy of "preserve the best". Doing it right initially will help the most.
- Guidance on restoration of specific sites where fish passage is a problem. This is in addition too the watershed level analysis of this problem. Extensive work has been done on fish passage through culverts, especially at road crossings. This information should be referenced in Attachment 1. Additionally, evaluation of opportunities for recovery in settings where underground piping has been done deserves attention. While there may only be a limited number of instances in which such recovery can be accomplished, dismissing this approach in total is not appropriate. Three broad strategies should be considered, and where appropriate made part of site-specific restoration actions.
    - Mitigate the factors that make underground piping not conducive to fish passage. What are these factors? Is it light? Is it gradient? Is it flow velocity? Likely it is some or all of these plus other factors. In some situations, some of these problems may be solvable.
    - Connect upstream reaches of piped streams to other streams where fish passage is not a problem. In some instances this "engineering" approach may potentially be used to reconnect quality upstream habitat to the larger elements of the watershed where fish passage is able to occur. While this may not be desirable in instances where significant downstream segments of piped streams reemerge, it may be a useful strategy in instances where the downstream segments are piped directly into larger streams.
    - Reconnect piped streams to the open environment, i.e. bring them back above ground (daylighting). There are likely instances where such a strategy could be used. For instance in parks, parking areas, and perhaps transportation rights-of-way it may be feasible to recreate an above ground stream. While initially it may not function effectively, with time it may be able to develop characteristics that will increase its use as habitat for some aquatic species.

**Habitat**

The discussion of fish habitat is found in several different sections of Attachment 1. While the habitat discussion cannot be considered a complete review of the literature, it is a good discussion of most of the relevant topics related to fish habitat.

- The document correctly states that watersheds are hierarchical (page 2). There is also a corresponding hierarchical organization of salmonid populations. Individual fish, populations and metapopulations are one way to describe levels in that hierarchy.
- References to fish habitat in the document refer almost exclusively to habitat requirements at the level of individual fish. There is a growing amount of literature addressing habitat requirements of populations and metapopulations. These areas include:
    - Habitat complexity and connectivity permit the expression of life history diversity at the population level, which in turn helps the population deal with environmental variation and natural disturbance.

  - Sustainable recovery of salmonids will require healthy habitat for individual fish, populations, and metapopulations.
  - The habitat requirements and effects of urbanization on those requirements for all three levels should be included in the document.
- The hierarchical organization of Pacific salmon should be incorporated into the recovery strategies. For example, the general strategy of protecting the best and restoring the rest (page. 106) is well accepted. However, the implementation of such a strategy could revert to a patch work of sites whose choice was opportunistic (for example, a willing land owner) rather than strategic (for example, the need to restore metapopulation connectivity). Many habitat restoration or protection projects need to take advantage of opportunity, but to be effective, those choices need to be embedded into a broader view of habitat and Pacific salmon ecology, a view that includes the population and metapopulation levels of organization.

**Water Quality**

- Attachment 1 and the riparian corridor assessment (Attachment 2) briefly address water chemistry, temperature, and toxic substances. The report clearly notes the emphasis on riparian vegetation and habitat functions.
- Many of the water quality issues have been addressed previously under Metro's *Policy Analysis and Scientific Literature Review for Title 3* (Metro 1997). While extensive analysis of water quality issues would be redundant, Metro needs to integrate the assessment of riparian conditions and management alternatives with the water quality requirements and management plans. That integration is addressed only in a table of published buffer widths required for different ecological functions (Table 5, page 68).
- The overall list of water quality issues is complete, and three water quality parameters (temperature, sediment, dissolved oxygen) are described in the overview. The overview and much of the literature review on water quality are derived from very general ecological literature (e.g., Naiman et al. 1992, Allan 1995, Gregory et al. 1991).
- Literature on water quality in urban areas and influences of riparian conditions is extensive but is only briefly addressed in Attachment 1 (pages 41–45). In addition, the extensive water quality information in the Metro area is only briefly mentioned and selected highlights are presented. Metro may want to consider incorporating more of the analysis that was addressed in the *Policy Analysis and Scientific Literature Review for Title 3* (Metro 1997) and in recent publications by USGS, DEQ (monitoring sites), and other environmental agencies.
- There is very little discussion of the links between water quality parameters and riparian area condition (pages 59–61).
- Toxic substances are not addressed except for brief acknowledgement of pesticides. Urban sources of toxic substances are not discussed at all.
- The role of the Clean Water Services (CWS) is noted under the section titled "Regional and Local Conservation, Assessment, and Restoration Efforts". Interaction between Metro and CWS, DEQ, and EPA could strengthen the literature review and the conceptual link between riparian management and riparian corridors. There is also no discussion of the recent designation of the Portland harbor as an EPA Super Fund site.

Nor does the document contain any discussion of the implementation team and possible issues related to riparian areas and management.

**Comments on Attachment 2**

- It is not clear how Attachment 2 is to be used. A narrative could be used to provide perspective about the document, including its organization and how it is to be used.
- We note that the rating system appears to focus on current condition to the exclusion of future potential condition. While current condition is critical to the policy approach of protecting the "best remaining" it does not provide guidance for restoration of situations or areas where some degradation has occurred. As an example of what we mean – the criteria for mapping landscape features specify that a landscape feature has primary functional value if it ***is*** in the specified condition, but gives no guidance on determining which sites could attain this condition with restoration efforts.

Thank you for the opportunity to review this material. We are encouraged to see the effort being taken by Metro, The City of Portland, Seattle and King County to address the urban related issues that are important in the recovery of depressed stocks of salmonids.

Sincerely yours,

Logan A. Norris, Chair
Independent Multidisciplinary Science Team

cc: IMST plus others

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