

**King County Comments on  
PSP Species and Biodiversity Topic Forum Draft Discussion Paper  
May 6, 2008**

Here are comments from King County on the Species and Biodiversity topic forum draft discussion paper. These are organized in three sections, from the general to the particular. The first section provides high level answers to key questions for the county; the second section offers the county's general concerns on the topic as presented in the paper; and the last section provides specific notes on gaps, inaccuracies, or particular points of concern. Wherever possible and appropriate, we have included references to back our comments. Thanks for considering our comments as you revise the paper and move it into the integration phase.

**County Questions for Review**

***Is the paper thorough, accurate, and telling the truth? Are the conclusions grounded in fact?***

The paper is focused heavily on the marine environment. Very little mention is made of terrestrial or freshwater species, the food webs in those environments, and their biodiversity. The information that is presented is generally accurate; however, because some sections are highly generalized, it is difficult to determine what information is missing and what was simply summarized for the sake of brevity. Much of the information probably lies in the references but it is not readily accessible to the reader. It might be advisable to not stick to a page length limit for the first question, but rather to present or refer to all that is relevant and available. One suggestion may be to use examples to illustrate the status of biodiversity. Ex: salmon, how many stocks there are, how many we've lost, etc., which can show biodiversity at a number of levels.

***Does the paper lay out the major threats, as they pertain to Puget Sound and King County Action Areas, succinctly?***

Major threats are summarized and include all the threats to the other four topic areas – everything that threatens one of them also threatens biodiversity. Again, there are no surprises here, probably because we do not have much information specific to particular taxa for some of the threats. Some more specific examples of a threat playing out in biodiversity would be welcome.

***Does the paper propose solutions and the key factors influencing their implementation feasibility? Are the solutions likely to be effective? If not, why?***

The paper does not do a great job prioritizing solutions. As currently written, the paper is not thorough enough to afford much help to decision makers. In fact, one could easily be overwhelmed by the number and pervasiveness of threats. That the paper(s) fail to make a clear and supportable case for particular solutions and their feasibility is not surprising given the time for their production. And given the complexity of the problems with the Sound, any attempt to assess the effectiveness of a proposed solution would likely be mainly a guess, anyway, and would require considerably more analysis than the authors had time for.

The paper proposes ecosystem-based management as the over-arching model for addressing the Sound's problems; however, the EBM framework is not well-defined nor explained in sufficient detail to understand it easily. Furthermore, according to many authors in the forefront of EBM, significant institutional barriers stand in the way of implementation and none of these were discussed. Thus, it is not clear how resource agencies would begin to make those wholesale institutional changes in the way they do business.

***Are there other existing programs and models that are not covered as possible solutions that we can share? If so, what do we know about their effectiveness?***

A number of examples of programs can be found in the literature surveys: Chesapeake Bay, San Francisco Estuary, the Great Lakes, and the Everglades are all mentioned but little is known about their long-term effectiveness as models for Puget Sound recovery. Most models that have been suggested are either too small in scale, assume a simple linear recovery effect, or have not been evaluated against the original goals.

***Where criteria for prioritizing actions are proposed, are they appropriate and sufficient? Are there other criteria to consider? Where they are applied to suggested actions, do the results of their application make sense?***

Several criteria were suggested in the paper, urgency and effectiveness among them, but without a clear statement of goals and objectives, the criteria cannot be easily applied. More over, the criteria tend to be too general and lack the specificity necessary for a confident application. Some criteria are absent or implied: importance, feasibility, cost-benefit, public support are all additional criteria that should be considered. Furthermore, weighting of the criteria will be a necessary step in separating actions.

***What are possible implications to county departments and divisions (cost and resource impacts, and on lines of business)?***

Four implications seem apparent:

1. The cost of recovery actions will depend on scale and magnitude of actions and these actions are assumed to be large in scale and scope;
2. Current lines of business, and the institutional framework that supports them, are unlikely to be robust to the recovery tasks anticipated in this paper;
3. For most local governments, the capacity for even developing effective actions does not likely exist in their agencies;

For King County, there are probably insufficient resources—staff, knowledge, and monies—to carry out our anticipated responsibilities.

**General Comments / Comments**

1. Point out that “biodiversity” includes species and food web processes by adopting a more commonly accepted definition of biodiversity. We suggest this definition:

“Biodiversity is the variety of living organisms considered at all levels, from genetic diversity through species, to higher taxonomic levels, and includes the variety of communities, habitats, ecosystems, and landscapes in which the species are found” (see Wilson 1988, Noss and Cooperrider 1994, and Szaro and Johnston 1996.)

We understand you are using the definition from the State’s Biodiversity Strategy. However, a more science-based definition is appropriate for this work.

2. Expand Appendix 1. In general, definitions for many terms are not provided. Even among scientists familiar with the technical language of biodiversity, there is often misunderstanding about the use and meaning of such terms. For the general public, the confusion may be even greater. Some terms to add:

- Key Species
- Marine
- Estuarine
- Upland
- Freshwater
- Pollution

3. As you are probably aware, freshwater ecosystems are underrepresented in the paper. Although there are few species associated with FW ecosystems in Puget Sound (when compared to saltwater systems), there is an astonishing variety of streams, rivers, lakes, and wetlands that range from the Cascade Mountains to the lowlands. Although the effort of the PSP is mainly on the Sound itself, some further work on freshwaters is necessary.

4. The same could be said of terrestrial ecosystems. For a usable treatment of both of these regions, see “King County Biodiversity Report,” a report for the Local Action for Biodiversity (LAB) Project, 2008. <http://dnr.metrokc.gov/wlr/waterres/biodiversity/index.htm>

5. It might be useful to explain a bit of the background and context for ecosystem-based management. It is especially important that some of the criticisms and difficulties associated with the concept be addressed. We have excerpted a section of a paper by Fuerstenberg and Lucchetti that discusses ecosystem management in the context of salmon management – see the attachment at the end of these comments. Please refer to the articles that follow for further background.

6. A key to ecosystem-based management is the recognition that ecosystems are part of a hierarchy of ecological organization and scale. Thus, ecosystem management admits that no single level of management—including the ecosystem—is always appropriate. The strength of ecosystem-based management is its attention to the structure and process that underlies ecosystem function. However, care must be taken to avoid an idiosyncratic attention to the ecosystem while its members (salmon, for example) head toward extinction.

7. Both the precautionary principle and adaptive management will be keys to the recovery of Puget Sound. A further principle for action might be the medical dictum “*above all, do no harm*”.

8. It seems that some sort of classification scheme would be useful as an organizing tool for management and evaluation. Of course, EPA has developed the Ecoregional Approach which involves at least four levels of ecological organization, down to Level 4. Most management activities, however, tend to occur at scales smaller than level 4, mostly at a scale of the landscape (see the English models for landscape conservation) or ecodistrict (see Crins, Ontario primer for ecological mapping). Such a system should be developed for Puget Sound and applied to the terrestrial and marine environments. King County is hoping to embark on such an exercise in 2008 as part of its responsibility for the LAB Project. R. G. Bailey has employed a set of characteristics to map landscapes near Lake Tahoe, and has written extensively on ecological mapping and classification. Two useful publications are:

Bailey, R.G. 1987. Suggested hierarchy of criteria for multi-scale ecosystem mapping. *Landscape and Urban Planning* 14: 313-319.

\_\_\_\_\_. 2002. *Ecoregion-based design for sustainability*. Springer, New York.

Crins, W. J. 2002. *The Ecozones, Ecoregions, and Ecodistricts of Ontario*. [map] Prepared for the Ecological Land Classification Working Group. Ontario Ministry of Natural Resources, Peterborough, Ontario.

9. We noticed that in several instances, secondary sources were cited. It would be more appropriate to cite the primary sources.

10. We propose you are more direct. For example: regarding primary producers – we know very little about their status and should just say so. Another example: the very large goal of ecosystem-based management will require wholesale changes in the way resource agencies do business – it will require institutional change, and this should be stated.

### **Specific Comments**

**Pg 1.** 1st paragraph under main SQ #1 heading: This paragraph is confusing as it's not clear if the # of species presented in for marine or includes freshwater and terrestrial. The way it's written it seems like marine, but the number of species doesn't seem accurate if it's just marine. Also, if that 1st sentence is just referring to marine, don't use the term 'plants' to refer to marine vegetation that includes seaweed--it's not the correct terminology.

Pg 1, under A. Section was supposed to present abundance, distribution, and diversity of key species, but fell short of actually providing some type of summary information. A summary table would have been a good way to present this information.

We understand the need for brevity in this summary. However, rather than providing single examples, it might be more useful to estimate total numbers of species when appropriate, or list more examples – to give readers an idea of the breadth and depth of the diversity we're talking about.

A concern here is that because so much is generalized, it is difficult for us to know what is missing so that we may provide it.

Note: great-blue heron colonies seem relatively well documented, especially compared with other bird species. Also note that this species also uses freshwater habitats, not just estuarine.

Your page numbering goes directly from page 1 to page 4.

**Pg 4.** Upland primary producers – why the focus on aquatic-related species? It is interesting and important, but there is/was a lot more going on there.

Upland upper trophic species – I think the prairies were a very small portion of this area – important, but small. What about bears, wolf, goshawk, spotted owls, fisher?

Please provide citations for “ecopath.” By googling around I discovered it is modeling software developed within International Center for Living Aquatic Resources Management, Fisheries Resources Assessment and Management Program – out of Canada.

Food Web Status, 2nd paragraph. Reword 2<sup>nd</sup> sentence to say "Riparian vegetation and salmon carcasses provide insects and organic matter to the freshwater food web." 4th paragraph, add zooplankton to 1st sentence.

This section needs to mention that there is existing information on general food web linkages for benthic, pelagic, and nearshore food webs; however, the information is lacking for certain functional groups and trophic levels such as phytoplankton and zooplankton.

There is no mention of benthic infauna.

**Pg 5.** Deficiencies in Current Knowledge. Please give examples for certain functional groups.

Should mention in this section that although there is information on adult life stages for various species, data is lacking on the early life stages for many key species. This is important when it comes to addressing data gaps.

In the “Threats to Species...” section, do not omit diversity as a critical component. This is critical to salmonids, for example, and is probably the foundation of their remarkable resilience. Both genetic and phenotypic diversity is key for salmonids and probably for other species exhibiting meta-population structure.

**Pg 6.** Habitat alteration – freshwater alterations are not mentioned (examples: channelization, water withdrawal, removal of large woody debris, and riparian forests).

Climate Change – Mention changes in spatial distribution of species/species ranges (vertical and horizontal in space) – in some cases, habitats will be blinked out and with them goes the species. Mention the change in acidity of marine waters and impacts on shell-forming animals.

Pollution. This paragraph needs beefing up as pollution is woefully under-addressed. Should also add definition for pollution and need to mention biotoxins and viruses as these are threats to species (from invertebrates to mammals), particularly viruses originating from humans and domestic pets, such as toxoplasmosis transference to sea otters from cat waste. Need to discuss plastics – which at the microscopic level may kill marine primary producers.

Suggest introduction of term “bioaccumulation.”

**Pg 7, B.** Main Gaps. 1st paragraph is a sweeping statement. This section would be better with a bulleted list of gaps and refer to the Puget Sound Update for gaps which aren't included here.

Might want to also include sea-level change models.

**Pg 8. A.** This strikes me as more a vision than a definition. Also, re. the very last sentence in this section – I am not sure the Sound has to be resilient to respond to change. You may want to be more specific there.

**B.** Under bullets, should include the # of species of concern and candidate species for listing. Also under bullets, please indicate how many species of rockfish (I think 9 of 17 species have been proposed?).

**Pg 12. A.** The 1st sentence says that management approaches designed to address key threats have been in place for decades, however the effectiveness of these programs aren't well known and should be stated as such.

**Pg. 14.** Under “Ecosystem-based Management” – Were any species removed from the list? Also, what are the combined lists you refer to?

**Pg. 15.** First unnumbered bullet: The contents of this bullet may have a faulty premise, as the imbalances exist because of the actions of humans. We alter things, then later individual species take the blame.

Very bottom of the page, last full sentence (regards precautionary principle) – rather than “even if” I would say “especially when.”

**Pg. 20.** Third paragraph – Should include Washington Invasive Species Council Strategy.

First bullet under Habitat Alteration – specify that take is allowed under the ESA *via approved HCPs*.

**Pg 21.** Under Citizen and non-profit organizations, some names are wrong. Note Beach Watchers (with an s), Puget Sound Alliance Soundkeeper (not watcher), and Salmon Watcher (no s).

Under Pollution. Where it says Tribes monitor water quality--the Tribes only do a limited amount of water quality monitoring. Add counties monitor water quality within their jurisdiction (e.g., King County has large freshwater and marine water quality monitoring programs). Add PSAMP program components assess pollution in water, sediments, and biota

**Pg. 22**, Washington Department of Fish and Wildlife established Marine Protected Areas (MPAs), not “marine reserves.” Please correct and use this link instead of the current citation: [http://wdfw.wa.gov/fish/mpa/puget\\_sound/](http://wdfw.wa.gov/fish/mpa/puget_sound/). Additionally, they are established not to “iconic or reference habitats” but rather “for the protection and preservation of species and/or habitat.” Also in that bullet WDNR’s Aquatic Reserves are mentioned. Please correct that sentence to reflect the following: “The Aquatic Reserves Program is part of Department of Natural Resources (DNR) efforts to promote preservation, restoration, and enhancement of state-owned aquatic lands—sites that benefit the health of native aquatic habitat and species in the state.”. And add this reference: [http://www.dnr.wa.gov/ResearchScience/Topics/AquaticHabitats/Pages/aqr\\_rsve\\_aquatic\\_reserves\\_program.aspx](http://www.dnr.wa.gov/ResearchScience/Topics/AquaticHabitats/Pages/aqr_rsve_aquatic_reserves_program.aspx)

Under Human Disturbance. Add WDFW implements "work windows" under the HPA permit process for shoreline and in-water projects to protect fish and nesting birds from human disturbance. Add the Derelict Gear Program was established to remove threats to fish, birds and mammals from derelict fishing nets and crab pots.

**Pg. 23**. Would add increasing amounts of underwater noise from commercial and military vessels to marine mammals isn't being adequately addressed. Also, drop in pH of marine water as carbon dioxide from atmosphere is added – shells dissolve.

Last paragraph on page: species conservation and harvest are not necessarily conflicting. Harvest has been a tool in wildlife management for a very long time. I would be careful here – this sounds like an uneducated statement or one that borders on proselytizing. Same comment for page 29, first bullet under B. And in fact, on page 30, third bullet, you say harvest management should continue (so why *not* continue to do so with benefits to other species?).

**Pg. 24**. Beginning of third paragraph – Specify if some or all other species, and add the words “of concern” after “species.”

Under D, why is 157 estimated? That is a very specific number for an estimate.

**Pg. 25**, F. Please mention LAB (Local Action for Biodiversity - <http://www.iclei.org/index.php?id=lab>), which is part of ICLEI (<http://www.iclei.org/>) – which is what King County is operating under as part of its Biodiversity Initiative. LAB is an international initiative, and the purpose is to kick-start local governments around the world at planning for biodiversity conservation in urban (and urbanizing) areas. The LAB process begins with an assessment of local biodiversity. Next comes a framework and strategy. Then the final step is an action plan.

**Pg. 29.** Second bullet – I’m not sure how you can manage climate change, which would be one of the drivers of ecosystem change. Might need to add something in here about managing effects of change when change cannot be averted.

**Pg. 30.** C. Add shoreline regulations are often inconsistent and ineffective due to 'grandfathering' laws. Last bullet under C where it refers to PSAMP. PSAMP is Puget Sound Assessment (not ambient); this change was made to their name a couple years ago.

**Pg. 31.** Under “Steps towards ecosystem-based management:” – first bullet, change “improve” to one of the following: “include” or “include improved” or “include effective.” Fourth bullet: I don’t know what “sustainable species needs” means. Fifth bullet, change “consider” to “incorporate.”

Section A “Where should we start and why?” Do not underestimate the difficulty of developing coherence between ecosystem management and institutions. A number of authors over the past several years have spoken to the necessity of creating the institutional capability to manage at the ecosystem level. See especially Gunderson, Holling, and Light, eds. 1995. *Barriers and Bridges to the Renewal of Ecosystems and Institutions*. Columbia University Press.

Bullet 3 – We must first determine which areas these are, especially in light of climate change, before we can protect or conserve them.

**Pg. 32.** 5<sup>th</sup> bullet under “Take action...” – include the notion of taking climate change into account when determining these areas.

**Pg. 33.** Under “Protect important habitats” – why just the marine areas? And as for the rationale, tell us why we should protect them – this is not currently a rationale.

**Pg. 34,** Under A, re. first bullet – somewhere it should be addressed that species that do merit listing will be listed (versus not doing so for lack of funds or political reasons).

**Pg. 35.** “Implementers’ compliance” and the bullet point are not the same thing – these are two separate things.

Second paragraph under “Research and other studies” – last sentence: don’t those characteristics become indicators by default?

From: Fuerstenberg, R. and G. Lucchetti. 1999. *Scientific and Management Framework for Salmon Conservation*. Return of the Kings. King County. Seattle, Wa.

### **The Management Framework**

The ecological view of conservation is the basis for the development of *ecosystem management*, an approach to resource management that is more comprehensive and inclusive than many aspects of conventional management. While there remains some debate over the definition and details of this framework, ecosystem management generally implies abandoning single-use, single-species approaches in favor of management designed to ensure the health of ecosystems. The goal is to use natural resources in a sustainable manner that does not threaten the integrity of the natural ecosystems that provide the resources (Peters, Waller et al. 1997). Ecosystem management demands a much broader vision of resources than traditional management practice. It requires that resource managers:

- widen their focus from a few species with economic value to all species within the ecosystem;
- understand and conserve not just species but the interactions among species that collectively maintain the ecosystem and provide ecosystem services;
- extend the management time frame to include timescales of ecosystem process, e.g. large flood pulses, woody debris inputs or channel migration;
- enlarge the planning process to encompass whole ecosystems or watersheds, communities, and populations;
- pursue solutions to off-site threats such as non-native pests and pollution;
- accommodate the needs of all users of the resource;
- use adaptive management.

### **The background of ecosystem management**

Some authors remain critical of this approach (see Kessler et al. 1992), dismissing it as another version of multiple-use management or, worse, as so ill-defined that virtually any management activity could be justified under its guidance (or lack thereof). Grumbine (1994) provides an illuminating look at the history of the concept and offers both a working definition and summarizes dominant themes taken from an extensive literature review. In his essay *What is Ecosystem Management?* he cites ten themes of ecosystem management that appear to have wide support and agreement in the scientific literature:

- 1. Hierarchical context.** A focus on a single level of the biodiversity hierarchy (genes, species, populations, ecosystems, landscapes) is insufficient to address a problem.
- 2. Ecological boundaries.** Management requires working across administrative and political boundaries in order to respect ecological boundaries at appropriate scales.
- 3. Ecological integrity.** Protecting native diversity and the ecological patterns and processes that maintain that diversity.

4. **Data collection.** Management requires more research and data collection as well as better use of data.
5. **Monitoring.** Managers must track the results of their actions quantitatively.
6. **Adaptive management.** Scientific knowledge is provisional; management is crafted as a learning process and incorporates the results of monitoring in subsequent actions.
7. **Interagency cooperation.** Managers must integrate often conflicting legal mandates and management goals across federal, tribal, state, local and private organizations.
8. **Organizational change.** Implementing ecosystem management will require changes in the structure of many management institutions and in their operating procedures.
9. **Humans are embedded in nature.** People cannot be separated from nature and are fundamental influences on ecosystems.
10. **Values.** Human values play a dominant role in ecosystem management goals.

To Grumbine, these themes form the basis of a working definition: *Ecosystem management integrates scientific knowledge within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long term.*

Most authors in the review agreed that setting clear goals is crucial to the success of ecosystem management; to achieve ecological integrity, five specific goals were endorsed:

1. Maintain viable populations of all native species *in situ*.
2. Represent, in protected areas, all native ecosystem types.
3. Maintain evolutionary and ecological processes.
4. Manage over time scales sufficient to maintain the evolutionary potential of species.
5. Accommodate human use and occupancy within the constraints above.

There is a developing consensus on the definition and the need for clear goals but not on the relative importance of each of the themes. Least referred to are the themes of organizational change, adaptive management and any discussion of values. The majority of authors--mostly biologists--tend to emphasize the scientific aspects of ecosystem management and generally underestimate the policy implications of such a shift in emphasis and the complexities of integrating diverse values into management.

Grumbine RE. 1994. What is ecosystem management. *Conserv Biol* 8: 27-38.

Kessler, W.B. 1992. A arable of paradigms: personal wellness and forest health. *Journal of Forestry* 90(4): 18-20.

Lackey, Robert T. 1998. Seven pillars of ecosystem management. *Landscape and Urban Planning*. 40(1-3): 21-30

A more recent article relevant to marine ecosystems is

Arkema, K.K., S.C. Abramson, and B.M. Dewsbury. 2006. Marine ecosystem-based management: from characterization to implementation. *Frontiers in Ecology and Environment* 4(10): 525-532.

Topic: Puget Sound Partnership Topic Forum Papers: Analysis of Data Management Needs

From: Stewart Toshach –NOAA/NWFSC

Data/Information Management Needs Identified in Puget Sound Partnership Topic Forum Papers and Suggestions for Further Work to Identify and Document Needs.

Introduction

I am providing this analysis for your consideration as I thought it would be useful to the Partnership as it decides how to proceed on data management.

In any science based decision making enterprise, such as that proposed for the recovery of the Puget Sound by 2020, it is critically important to identify, plan and provide for information management practices, services, tools and technologies.

Identification of actual data and information needs is an important step to be completed before investments are made in system changes or improvements.

The Puget Sound Partnership (PSP) recently published 7 separate Topic Forum papers for public discussion. Through some basic analysis the papers offer a ‘window’ into some of the data that could be needed for Puget Sound science and recovery decisions. The papers also reveal that more work is needed to define data/information management needs.

Analysis Method:

Each paper was searched for the use of common data or information management terminology as follows: “data management”, information management”, “data quality”, “data gaps”, “data inventory”, “data” and, “database”. Table I shows the number of ‘hits’ for the use of each term are shown in Table I.<sup>1</sup>

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<sup>1</sup> This analysis has not been reviewed.

Then each of the ‘hits’ was reviewed for the context of the use of the term. Where the use of the term identified a possible data need such as at page 8 in the Human Health paper –*“Most of the data characterizing metals are from sediment sampling programs. There is less information characterizing metals in the water column”* the need was compiled in Table II. In addition a brief summary of the possible need was written, eg *“More data needed on metals in water column. Lack of Comprehensive data”*

Note that when a report stated, for example in the Risk Analysis paper at page 8, *“We briefly summarize methods and data sources for each ecosystem attribute below.”*, this comment did not constitute a data or information management need so was not compiled into Table II.

### Analysis Results:

While Table I shows some 387 references to common data management terms the great majority of these references are for generic uses of the terms and do not identify needed improvements to data/information quality, systems or gaps.

Table II shows approximately 60 information or data management needs. They identify a typical range of needs from data being inadequate to establish certainty to data not being collected at all to the need to specific data bases to the need to link data to management objectives or principles. Each of these is instructive but they do not define the extent of data or information management needs. In part this is because of the limited questions that were posed to the Authors of the Topic Forum Papers. No questions specifically asked authors to address data management or information management needs. In addition the authors were all asked to answer questions within their specialty or discipline. None were asked to identify needs or gaps with respect to our Puget Sound wide capability to integrate data across multiple disciplines. Therefore it could appear as if integrated cross-discipline data is not needed – which is unlikely to be the case. This is understandable for a couple of reasons. Few if any information specialists have participated as authors in the Topic Forums and the task of understanding how all of the Topics relate to each other is, in fact, a future topic. The Partnership may want to consider including data/information specialists in this upcoming discussion.

The results are instructive and helpful but they are insufficient for the purpose of designing, providing or locating data/information management practices, services, tools and technologies to meet Partnership science (or management) needs. Other methods such as focus groups, surveys and interviews are typically used by data/information management professionals to define data needs within and across disciplines. When put together these are called information needs assessments. In conventional data/information management practice these are considered to be a prerequisite before data/information management investment decisions are made.

In addition to local knowledge about specific Puget Sound Data/Information management needs there is a wealth of information from needs assessments prepared for other environmental recovery efforts that are similar in size and scale to the proposed Puget Sound recovery. These assessments and the lessons learned from deployment are interesting and instructive and could provide valuable information to the PSP as it decides what information and data management practices, services, tools and technologies are needed to support Puget Sound Recovery.

The Puget Sound Science Panel has a task at @ RCW 90.71.280 (1) b “...to assist in developing an ecosystem level strategic program that: (i) addresses monitoring, modelling, data management and research...”, and at @ RCW 90.71.290 “...a strategic science program shall be developed by the [science] panel and may include recommendations regarding data collection and management to facilitate easy access and use by all participating agencies and the public...”

As the Panel and the Leadership Council address data management action items for Puget Sound Recovery by 2020 the value of first completing a formal and detailed enterprise level information needs assessment might be considered before proceeding too far in addressing data management needs.

Again, this analysis and suggestions are offered only as information that may be useful to the Partnership.

Data/Information Term	Human Health	Quality of Life	Species Biodiversity	Land Use, Habitat, Food Web	Water Quality	Water Quantity	Risk Analysis	
Data management	0	NA	0	0	0	0	0	0
Information management	0	NA	0	1	0	0	0	1
Data quality	0	NA	0	0	0	0	0	0
Data gaps	1	NA	0	0	1	12	0	14
Data inventory	1	NA	0	0	0	0	0	1
Data	26	NA	21	11	19	79	42	198
Information	24	NA	18	29	20	14	51	156

Database	2	NA	1	3	5	6	0	17
	54		40	44	45	111	93	387

Table 2: References to Data Needs from Topic Forum Text			
PAGE #	Topic Forum	Reference	Summary of Data Mgt Need
		Key: HH: Human Health, SB: Species and Biodiversity, LU&H: Land Use and Habitat, WQL: Water Quality, WQ Water Quantity, RA: Risk Assessment	
5	HH	Limited data on toxics in shellfish from Puget Sound have been collected and evaluated by the Washington State Department of Health (DOH).	More data on shellfish
7	HH	<i>C. What is the certainty about our understanding of these threats and their status?</i> The certainty of understanding relating to characterizing human health risks varies. Human health risk is dependent on chemical toxicity, pathogen virulence, and level of exposure. However, many years of monitoring data help to shape the understanding of these risks, and in some cases provide a reasonable certainty.	<i>More certainty from monitoring data</i>
8	HH	Metals Most of the data characterizing metals are from sediment sampling programs. There is less information characterizing metals in the water column.  Limited site-specific data for metals indicate a potential human health risk from consumption of shellfish in urbanized bays and at hazardous waste sites. Levels of metals in shellfish outside of these sites indicate little risk, but comprehensive data are lacking.	More data needed on metals in water column. Lack of Comprehensive data
9	HH	Fish consumption rates More data about the historical use of resources across different populations would allow for a more accurate assessment of human health exposure for different communities and their cultural uses.	Data needed on historical use
10	HH	"Emerging" contaminants, pathogens, and biotoxins A host of chemicals are present in discharges to Puget Sound that have not yet been assessed for their risk to human health. These include pharmaceuticals and PFCs, amongst others. In addition, there are a number of pathogens that will require additional analysis to determine the risk they pose to human health. One example is <i>Vibrio parahaemolyticus</i> , for which there are data available regarding presence in water, shellfish, and plankton, but the synthesis of that information has not yet occurred.	Synthesis of data on contaminants pathogens and biotoxins

10	HH	Broad risk assessment for toxics in shellfish While a Puget Sound-wide risk assessment has been done for human health threats associated with the consumption of toxics in finfish <sup>72</sup> , a similar risk assessment has not been conducted for shellfish. ....More data are available for metals in shellfish than other contaminants.	Data on shellfish contaminants
10	HH	Toxics and pathogens in crab Data are limited for toxics and pathogens in Puget Sound crab.	More toxic and pathogen data
10	HH	Toxics in additional species Information about toxics in other salmon species such as pink, chum, and sockeye is currently limited. This information is needed to confirm predicted low contaminant levels in these Puget Sound species. DOH work has characterized these as species likely to be consumed, but for which data are unavailable (DOH professional judgment). Lingcod, cabezon, and shrimp are additional species that are consumed, but with little characterization of contaminants.	More data on toxics in pink, chum and sockeye
10	HH	Cumulative impacts Little is known about the cumulative, additive, and synergistic impacts of exposure to multiple contaminants through multiple consumption pathways or direct contact over time. Traditional risk assessment should assume that exposure to multiple contaminants is additive with respect to overall risk when considering the same toxic endpoint (e.g., neurodevelopment). More specific information about interaction of toxics in the body would be helpful in validating this assumption.	Information on cumulative impacts of toxics in humans
10	HH	Toxics in the water column There is a lack of understanding about the presence and concentration of toxics in the water column. Information from PSAMP and NPDES monitoring is available, but it is either site-specific or does not address the specific toxics of concern. More complete information about toxics in the water column may lead to a better understanding of the human health risk from direct exposure, as well as the sources of contamination in fish and shellfish.	Improved data on toxics in water column
11	HH	Reference conditions While some site-specific data are available, the extent to which current conditions in Puget Sound meet or exceed reference conditions is not fully known.	Improved data on Puget Sound reference conditions

14	HH	<p><i>From a scientific standpoint, which management approaches have been documented to have the most effective response?</i></p> <p>Several programs have been documented as effective in reducing threats to human health, within the limitations of effectiveness measurement.</p> <p>Washington State Mercury Chemical Action Plan based on reductions in mercury concentrations in the 2005-2006 biosolids data.</p> <p>Fish consumption advisories, based on awareness of advisories and on success of outreach efforts (including Washington Department of Fish and Wildlife pamphlet, website hits, and grocery store pilot project and evaluation). There are limited data that show these advisories are reducing human health risk. However, there is some indirect evidence of the programs' effectiveness in that species with lower contamination levels are increasingly preferred by consumers</p>	<p><i>Data to show effectiveness of health advisories</i></p>
20	HH	<p>A new European Community Regulation, referred to as the Registration, Evaluation, Authorization and Restriction of Chemical Substances (REACH), was established in 2007. This regulation requires that manufacturers and importers of chemical substances gather information about the properties of these substances to ensure their safe handling and register the information in a central database maintained by the European Chemical Agency. The agency will coordinate in-depth evaluation of chemicals that present a potential threat and maintain a public database for consumers and professionals to provide information on these chemicals.</p>	<p>A database for chemical substances affecting Puget Sound</p>
22	HH	<p><i>What are the gaps between existing programs or plans and the identified needs?</i></p> <p>There are both "general" gaps (such as geographic gaps in data collection) and "specific" gaps (such as lack of information on specific biotoxins) that limit the effectiveness of existing programs and plans.</p>	<p><i>Data gaps in geographic extent of and specific biotoxins</i></p>
23	HH	<p><b>What criteria should be considered for prioritizing actions to address threats to human health?</b></p> <p>A comprehensive inventory of data being collected would enhance the coordination of data collection and information between state and local agencies and Tribes.</p>	<p>Comprehensive inventory of data related to human health</p>
24	HH	<p><b>How will we know we are making progress on human health?</b></p> <p>We will know we are making progress on reducing threats to human health when... We have reduced the number and severity of data gaps.</p>	<p>Identify and reduce data gaps for human health</p>





















