

# **PugetSoundPartnership**

our sound, our community, our chance

## **SUMMARY OF COMMENTS AND RESPONSES SPECIES AND BIODIVERSITY TOPIC FORUM**

**JULY 11, 2008**

**Species, Food Web, and Biodiversity**  
Comment Summary

July 11, 2008

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## Introduction

Following is a summary of comments received on the Species Biodiversity Topic Forum Paper. These comments were received at the Topic Forum Workshop, held on May 1 in Everett. More than 80 people attended the forum, providing comments on all aspects of the discussion draft. In addition, comments were obtained through email and through an online discussion tool on the Partnership's web page. More than 200 pages of comments were received on the Species Biodiversity discussion paper. These comments have been sorted and summarized by theme; and general responses provided below. Many comments were made numerous times, and some requested information at a level of detail that is beyond the scope of the topic forum paper or outside the Partnership's objectives. The responses provided below indicate how the comment was addressed; individual responses to each comment are not provided, but all comments were reviewed and considered. All comments received can be viewed on the Partnership web page.

## Key Themes

There has been a lot of data collected and information known about individual species and their interactions in the Puget Sound Region. We need to *act now* using the information we already have.

### More Discussion of Known Threats

In the report, greater emphasis needs to be placed on the known threats to species populations and ecosystem communities. For example, the introduction of invasive species from ballast water and other pathways.

### Consider all trophic levels/environments

Species management should be orchestrated through an ecosystem approach that encapsulates *all trophic levels* from primary producers to carnivores.

Need to effectively discuss both *terrestrial and aquatic species / environments* with equal parity.

More specific information need be collected, analyzed, and provided of ecosystem indicator species, for example; forage fish.

### Synthesis with Other Topic Areas

The biology (species / food web / biodiversity) component of this work needs to have *greater synergy with the other topic areas*. Cross – referencing and linked examples should be addressed in multiple topics.

### Partnerships

Greater emphasis need be placed on public/private partnerships for both action and study.

## **Accountability**

A *species-specific 'report card'* needs to be developed that is shared region-wide and linked to particular actions or potential programs.

## Missing / Underemphasized Threats

### Invasive Species

Comments	Response
Invasive species - What are the pathways? What are the effects of threats, specifically from pathogens and parasites.	Addressed in S1 under threats.
Invasive species are often considered the second greatest threat to recovery of imperiled species (second to habitat loss). There appears to be no comprehensive effort underway to understand and manage major invasive species pathways. Such an effort should be a high priority.....this issue [should] form an important part of the Action Agenda with greater emphasis on the prevalence, ecological impacts, and spread of invasive species in Puget Sound	Addressed in P1. Washington Invasive Species Council strategic plan recommends addressing gaps in our defenses against pathways. P2 recommends implementing plans to prevent non-native species invasions.
Olson et al 2000: This work needs to be updated and management programs targeted appropriately (citation under Documentation)	Addressed in P2. Washington Invasive Species Council strategic plan recommends addressing gaps in our defenses against pathways. P2 recommends implementing plans to prevent non-native species invasions.
Document fails to recognize threats from aquatic invasive species: three species of non-native tunicates, <i>Styela clava</i> , <i>Didemnum</i> sp., and <i>Ciona savignyi</i> Available at: <a href="http://www.dnr.wa.gov/Publications/aqr_nrsh_exotic_exped2000.pdf">http://www.dnr.wa.gov/Publications/aqr_nrsh_exotic_exped2000.pdf</a>	Addressed in S1, P1, P2.
Invasive species management requires a Report Card for each species: what is the distribution and abundance of each species? What countermeasures are being taken? How effective are these	Washington Invasive Species Council Strategic Plan recommends the use of a scorecard (in conjunction with the Washington Biodiversity Council). P2

Comments	Response
countermeasures (are we gaining or losing ground, and why?) What are the costs of countermeasures and are the funds/efforts adequate?	recommends implementing this plan (as well as the Biodiversity Strategy).
It will be extremely difficult to eliminate all of these invasive species. What we can only do is manage the abundance of the current ones at acceptable levels and increase our vigilance to prevent the introduction of new ones.	Agree. P2 notes that swift action to avoid introductions is more effective than trying to eradicate established species.
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.	Addressed in S1 under threats

### Water Quality

Comments	Response
Ecosystem health, particularly the impacts to the top of the food-chain including salmon, orcas, eagles and humans need to be prevented by actively reducing storm-water discharge volumes and specifically discharges of excess nutrients and a variety of toxic pollutants.	Addressed this in P2.
<p>Add information about what we know about the levels of known toxics in species in Puget Sound to better link with the discussion of water quality in the synthesis report.</p> <p>For example, EPA has information on their website (EPA/ Region 10/ Puget Sound Georgia Basin Ecosystem/ indicators/ toxics in harbor seals) about toxics in harbor seals, herring, salmon and killer whales and compares Puget Sound with other areas.</p>	Added this in S1 under Threats, Pollution.

Comments	Response
Fluoride is in water, food and toothpaste. Fluoride drains into ground, then surface waters, and into the world of marine life. What is the effect on them?	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.

### Derelict Fishing Gear / Marine Debris

Comments	Response
Derelict fishing gear (nets and crab pots) cause direct damage to species as well as marine habitats. These impacts are documented in our Cost/Benefit Analysis (attached). These impacts should be referenced in the Habitat topic paper as well as the Species and Biodiversity (or cross referenced).	Added to S1 under Threats, Pollution.
Discussion and acknowledgement of other marine debris issues (i.e. creosote debris, plastics, boater waste) also seem to be missing in these reports and should be included. See DG cost benefit final.pdf, PriorityRankingReport-041808.pdf.	Addressed in S1 under Threats, Pollution.

### Polymers / Plastics

Comments	Response
Need to discuss plastics – which at the microscopic level may kill marine primary producers: a great general reference on polymers: <a href="http://www.worldwithoutus.com/excerpt.html">http://www.worldwithoutus.com/excerpt.html</a>	Addressed in S1 under Threats, Pollution.
Plastics are not biodegrading (they are too new) in the marine environment, but they are being broken into smaller and smaller particles. How many chemical compounds, if any, are being released into the marine waters. PDF attachments	Addressed in S1 under Threats, Pollution.

## Ballast Water

Comments	Response
<p>The present Ballast Water regulations requiring mid-ocean exchange eliminates 95% of the non-native coastal organisms from the discharge (Ruiz and Reid 2007). As ballast water treatment technology becomes available, the threat will be reduced further via this pathway.  <a href="http://www.worldwithoutus.com/excerpt.html">http://www.worldwithoutus.com/excerpt.html</a></p>	<p>Addressed in P2 (via recommendation to implement Washington Invasive Species Council Strategic Plan)</p>
<p>Need to address the threat from aquatic invasive species often introduced through the discharge of ballast water.</p>	<p>Addressed in P2 (via recommendation to implement Washington Invasive Species Council Strategic Plan)</p>
<p>Treatment of ballast water onboard ship could serve as a model of cooperation and effective management for government, industry, the public and Puget Sound. Support of the Puget Sound Partnership could be an important impetus for moving forward the current state efforts, soon to be superceded by uniform national standards</p>	<p>P2 recommends implementing plans to prevent non-native species invasions.</p>

## Aquaculture

Comments	Response
<p>Washington has had large numbers of nonnative salmon escape from the farms into Puget Sound; these fish can compete with native fish: the chances increase for colonization when wild salmon populations are reduced.</p>	<p>Noted in S1, under Threats, Cultured Species</p>
<p>Recognize role of conservation hatchery programs (traditional, captive brood) in helping to prevent extinction of some critically low salmonid populations; also discuss (potential) impacts of sea lice from net pens – severe impacts have been found to pink salmon populations on Vancouver Island.</p>	<p>Conservation hatchery programs noted in S2 under Cultured Species. Sea lice threat noted in S1 under Threats, Cultured Species.</p>
<p>Fish farms (pen nets) can be damaging: i.e. -viral hemorrhagic septicemia was reported in the salmon farms in Washington and several state agencies oversee the aquaculture industry and frequently appear to be too closely aligned to provide adequate supervision.</p>	<p>Addressed viral hemorrhagic septicemia in S1, under Threats, Cultured Species</p>
<p>Geoduck: The Partnership should have this issue on their radar and be staying abreast of developments. Need to discuss how geoducks affect unstable bluffs, oyster aquaculture, eelgrass beds, destruction of macrophytes, birds, aesthetics.</p>	<p>Agree that Partnership should have this on their radar. Addressed in P2.</p>
<p>Geoduck aquaculture is introducing plastic tubes (PVC) and nylon netting along with rubber bands into the marine environment at a time when we need to keep plastic away from our marine systems. There is an RCW  <a href="http://apps.leg.wa.gov/RCW/default.aspx?cite=79.145&amp;full=true">http://apps.leg.wa.gov/RCW/default.aspx?cite=79.145&amp;full=true</a></p>	<p>Geoduck aquaculture addressed in S1, under Threats, Cultured Species.</p>

Comments	Response
Aquaculture and business interests should be kept out of the Puget Sound	This comment was not incorporated. The Partnership is charged with considering social, economic well-being. This includes natural resource dependent industries.
Geoduck aquaculture, expanding rapidly from the South Sound Action Area into Pierce County is a potential threat to the Puget Sound	Geoduck aquaculture addressed in S1, under Threats, Cultured Species.
Herring spawning is documented to be generally in the 0 to -10 water column--right where geoduck planting occurs. And what happens if rearing and protective habitat is eliminated? How does this affect salmon--particularly the ESA listed Chinook salmon and Puget Sound steelhead?	Geoduck aquaculture addressed in S1, under Threats, Cultured Species.
Chart from the South Sound Salmon Recovery group lists aquaculture as a stressor on salmon populations	Geoduck aquaculture addressed in S1, under Threats, Cultured Species.
More attention should be focused on protecting shellfish growing areas	Added nutrients as threat to shellfish growing areas in S1, under Threats, Pollution.

## Food Web / Trophic Levels

### Food Web

Comments	Response
Need more on food web concepts – linkages	Addressed in S1.
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	Addressed in S1.

Comments	Response
What are the key processes and pressure points in food webs and how are affected by all kinds of stressors?	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.

### Trophic Levels

Comments	Response
Trophic levels - report focuses too heavily on upper end, single species approach. Need to include lower levels. Document is too simplified, need a thorough understanding of the higher trophic levels.	See new discussions in S1.
Trophic interactions and distribution of salmon in Puget Sound (Duffy and co-authors).	See new food web discussion in S1.
Measurement of conventional pollutants and changes in higher trophic levels?	Expanded discussion of toxics in biota in S1 under Threats, Pollution.

### Species Information

Comments	Response
<p>For all species of concern: forage fish, bottom fish, sea birds, marine mammals, salmonids, invasive species, etc., we need a Report Card.</p> <ul style="list-style-type: none"> <li>quantitative assessment, at least once every five years, of distribution and abundance; a statement of the goal for distribution and abundance of each species on a longer time scale; a list of the measures being used to increase or suppress a species; a quantitative statement of achievement of the goal</li> </ul>	Added scorecard recommendation to P2.

Comments	Response
<p>Numerous species are in poor health, with the threats running the range of human activities represented in the other topic papers (water quality, water quantity, habitat, etc.)</p> <ul style="list-style-type: none"> <li>• Specific threats that may be identified in the other topic papers but should be discussed at length here include single species management (including artificial enhancement), the introduction of marine and terrestrial invasive species, oil spills, and human activities such as sonar testing and underwater explosives training by the Navy.</li> </ul>	<p>Discussions of all these threats, including human disturbance (but not specifically Navy activities) are in S1.</p>

### Primary Producers

Comments	Response
<p>Need anecdotal information on other species where there is no baseline</p>	<p>This comment represents an opinion or position that is currently unsupported by scientific data. As more documentation about this issue becomes available, this comment could be reconsidered.</p>
<p>Need to acknowledge the importance of zooplankton in any science and monitoring plan Beauchamp et al 2004 (Lake Washington; Duffy et al. 2005 Puget Sound</p>	<p>Added phytoplankton and zooplankton to list of items we need to understand about the food web in P2 under “How will we know we are making progress...”</p>
<p>Consider release of plankton into toxic algae and into red tide paralytic as a control method?</p>	<p>This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.</p>
<p>Freshwater plankton absorbs pesticides and plant nutrients in rivers, leaving less pesticides to kill ostreococcus in the gulf of mexico and leaving less nutrients for florida red tide algae. Applied here? Also the plankton, increase photosynthesis down stream.</p>	<p>This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.</p>

Comments	Response
<p>Macroalgae should be mentioned as marine and estuarine primary producers because they are an important group of primary producers and are important in providing habitat and structure for marine and estuarine organisms.</p>	<p>See revised discussion of species and food webs in S1.</p>
<p>Phytoplanktons are responsible for nearly half of the planet's photosynthesis. Need more discussion of phytoplankton in Hood Canal water.</p>	<p>This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.</p>
<p>Need more discussion of the importance of herring to the biodiversity of Puget Sound and the significance of the Cherry Point stock in particular.</p>	<p>See new discussion of herring under Species in S1.</p>

### Invertebrates

Comments	Response
<p>There is no mention of benthic infauna</p>	<p>See Food Web, S1.</p>
<p>Bees are killed by corn with internal insecticide</p> <ul style="list-style-type: none"> <li>• <a href="http://news.google.com/news?hl=en&amp;um=1&amp;tab=wn&amp;q=bees++washington&amp;btnG=Search+News">http://news.google.com/news?hl=en&amp;um=1&amp;tab=wn&amp;q=bees++washington&amp;btnG=Search+News</a></li> <li>• <a href="http://www.google.com/search?hl=en&amp;q=+++++++washington+state+university+bacillus+thuringiensis+genetically+modified&amp;btnG=Search">http://www.google.com/search?hl=en&amp;q=+++++++washington+state+university+bacillus+thuringiensis+genetically+modified&amp;btnG=Search</a></li> <li>• <a href="http://news.google.com/news?hl=en&amp;um=1&amp;tab=wn&amp;q=biodiesel+corn&amp;btnG=Search+News">http://news.google.com/news?hl=en&amp;um=1&amp;tab=wn&amp;q=biodiesel+corn&amp;btnG=Search+News</a></li> <li>• tree death caused by overwintered insects; not the only global warming effect.</li> </ul>	<p>This comment represents an opinion or position that is currently unsupported by scientific data. As more documentation about this issue becomes available, this comment could be reconsidered.</p>

Comments	Response
The "high profile" invasive tunicates (p. 22) are not being "actively managed by state agencies." They are being observed and documented only, with some random removal attempts in marinas	Addressed in P1.

**Fish**

Comments	Response
Habitat is one area of concern, but the continued harvest of ESA species as \"bycatch\" of gill netting practices still allowed is of immediate concern that is not being addressed	This comment presents information that is related to the Partnership’s objectives for the Species/Biodiversity/Food Web topic, but cannot be fully evaluated during the first phase of the Action Agenda. The Species/Biodiversity/Food Web topic forum recommends that the Partnership consider evaluating this issue in future phases of the Action Agenda.
We need to protect our existing resources (salmon) by not allowing the harvest to increase due to issues in California or Oregon	This comment represents an opinion or position that is currently unsupported by scientific data. As more documentation about this issue becomes available, this comment could be reconsidered.
Need more on forage fish - particularly herring	See Species, S1.

### Uplands species / terrestrial

Comments	Response
<p>The efforts presently underway toward upland conservation should be seen as a part of the whole in using an ecosystem based approach to improving and maintaining Puget Sound.</p>	<p>Added this to ecosystem-based management approach description under immediate actions in P2.</p>
<p>Adequate emphasis must be placed on the interaction of upland and aquatic environments. Plan should include protection of habitats upstream, because destruction upstream impacts the Sound.</p>	<p>This comment is addressed in the Land Use and Habitat topic discussion paper.</p>
<p>Very little mention is made of terrestrial, the food webs in those environments, and their biodiversity</p>	<p>See new discussions in S1.</p>
<p>The paper mentions that population growth and sprawl are driving upland fragmentation and are having a negative impact on the quality of the Sound. This language should be stronger; this threat will increase with the expected growth</p>	<p>This comment is addressed in the Land Use and Habitat topic discussion paper.</p>
<p>Need more on how bird populations have been affected by the food web</p>	<p>See new Food Web discussion in S1.</p>
<p>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.</p>	<p>See new Species discussion in S1.</p>
<p>Nearly all forest trees are dying from various pests. Trees sprayed with insecticide will die from fungus root rot.                      One solution is to distill pines for gasoline. cut and replant trees in rows along a line which goes downhill two feet every 100 feet (=2 %). do not allow local tree species to reseed ;plant trees from southern nurseries</p>	<p>This comment represents an opinion or position that is currently unsupported by scientific data. As more documentation about this issue becomes available, this comment could be reconsidered.</p>

### Abundance of species

Comments	Response
Directly cite documents prepared by the Co-managers, since these provide detailed information on harvest and hatchery management, as well as population assessment and monitoring information.	Appropriate scientific citations were used to reference all facts stated as needed.
Bottom fish, seabirds and forage fish have declined and continue to decline. Why? What processes are in play and how do we affect them?	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.
Regardless of the contradictions there are many species that need updated population health status reports. These reports should be developed and utilized.	Added scorecard recommendation to P2.
Changing hunting regulations for sea ducks does not address the causes of declines; they merely affect a reduction from some arbitrary number. How many sea ducks should be here and how to conditions in other states affect what we see here?	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.

### Indicator Species

Comments	Response
<p>Appropriate indicators will have to be recognized, chosen, or developed for use in the ecosystem-based management framework: Trends in and status of species' abundance, productivity, spatial structure, and diversity should be included.</p>	<p>Agree. NOAA and the Partnership are working on this now. See new discussion of abundance, productivity, spatial structure, and diversity in S1.</p>
<p>Include the five indicator species identified by the Partnership and add a few additional indicator species to help guide the creation of an ecosystem based plan.</p> <ul style="list-style-type: none"> <li>a) Seabird colonies (e.g., Western Grebe or Pigeon Guillemot)</li> <li>b) Shorebird colonies</li> <li>c) Chinook Salmon</li> <li>d) Herring spawning biomass and trends for each of the 19 stocks</li> <li>e) Intertidal species richness (Shellfish)</li> <li>f) Aquatic mammals (e.g., Orcas and Harbor Porpoises)</li> <li>g) Upland-dependent species (e.g., Bull Trout, Steelhead, or Great Blue Herons)</li> <li>h) Reptiles and amphibians (e.g., Western Pond Turtles, Oregon Spotted Frog or salamanders--Cascade Torrent, Dunn's, Van Dyke's)</li> <li>i) Subtidal species richness (e.g., Rockfish)</li> </ul>	<p>NOAA and the Partnership are working to identify indicators. Addressed Chinook salmon and Pacific herring in S1.</p>
<p>Develop cost/benefit analyses of the measures we're taking to augment or suppress particular indicator species.</p>	<p>This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the</p>

Comments	Response
	topic forum discussion draft. Through development of a funding strategy, the Partnership is looking at cost effectiveness of various actions.
Target key species and habitats such as eelgrass, herring, sand lance spawning	P2 recommends taking action where we know there is urgency, including implementing species plans.

### Biodiversity

Comments	Response
Biodiversity data is needed to track the status of species	Agree. See first section of S1.
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	See new discussion of Chinook salmon in S1.
Species biodiversity should be an important consideration. Target listed species for protection of habitat, food web, and habitat restoration.	Agree. See recommendations in P2.

### Make Connections / Add more detail

Comments	Response
Connections aren't obvious. Need more on linkages - need to remove artificial separation between species and habitat.	Removing this separation is outside our scope. The Partnership is doing this work as part of the Action Agenda.
S1: The omission of discussion of water quality degradation on species and biodiversity is problematic. <ul style="list-style-type: none"> <li>• Water quality degradation is one of the most important threats to species and biodiversity. This issue is covered to some degree in the water quality topic report; this report should reference those sections.</li> </ul>	Addressed in S1, under Threats, Pollution.

<b>Comments</b>	<b>Response</b>
It is widely believed that habitat loss is one of the greatest threats to recovery of threatened species, yet these topic forums have attempted to discuss these two topics in isolation.	Yes. Changing this is outside our scope.
Add information about what we know about the levels of known toxics in species in Puget Sound to better link with the discussion of water quality in the synthesis report	Addressed in S1, under Threats, Pollution.
Didn't see the State of the Sound Reports being used extensively to address the overall ecosystem functioning aspects of retaining biodiversity.	Appropriate scientific citations were used to reference all facts stated as needed.
The cumulative affects of pesticides need to be addressed more fully. WA State needs to work with organizations like the WA Toxics Coalition, the Eugene OR based NW Coalition for Alternatives to Pesticides (NCAP), and the WA D.C. based Beyond Pesticides to plan a strategy to do this.	Added pesticides in S1 under Threats, Pollution.

## **Data Gaps**

### **Acknowledge Gaps / Uncertainty**

<b>Comments</b>	<b>Response</b>
Need to acknowledge where there are data gaps <ul style="list-style-type: none"> <li>• 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</li> </ul>	Addressed in S1.
Limited data on impacts of harvest on populations outside of reserves	P2 recommends a critical assessment of harvest practices.
Long term status and trends of phytoplankton are not well known	Addressed in S1.
Need more information on trends, patterns	Added scorecard recommendation to P2.
Lacking fundamental data on basic food web elements	Addressed in S1.
Only limited marine biodiversity data <ul style="list-style-type: none"> <li>• Both genetic and phenotypic diversity is key for salmonids and probably for other species exhibiting meta-population structure</li> </ul>	Addressed in S1 under data gaps.
Data uncertainties limit predictions of impact of natural and anthropogenic stressors on ecosystem	Addressed in S1 under Main Gaps in Understanding of Threats

Comments	Response
Need methods to facilitate science/management gap - develop a communications plan	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Might want to also include sea-level change models.	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.
Need to acknowledge uncertainty and how to deal with it. <ul style="list-style-type: none"> <li>• Species don't just stay in Puget Sound. Also, time lags in monitoring to action can drive species to extinction.</li> </ul>	Added new sentence in introductory paragraph in P2 under Immediate or Short-Term Actions re: uncertainty. Added migration to discussion of Research and Other Studies at the end of P2.
The Natural Heritage Program has identified the need to address invertebrates, including aquatic species, as a biodiversity data gap. More attention to inventory and classification of this order of animals could help address some of the food web questions that must be answered so that higher order species recovery be addressed. Adding capacity to carry out the needed data collection could help forward food web recovery efforts and should be part of the strategies.	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.
At a minimum, for upper trophic levels adding some initial zooplankton sampling, a hydroacoustic and midwater trawling component, and some strategic expansion of the exiting PSAMP program would fill in some critical data & knowledge gaps between the water quality and birds-mammals data.	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.

Comments	Response
Nature mapping has data on numerous taxa, Karen Dvorich @ UW is contact for the program. Ebird.org has data online on the regions birds.	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.
Pierce County Biodiversity Alliance has data on biodiversity management areas, including shorelines.	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.
Citizens for a Healthy Bay has data on Commencement Bay.	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.
Puget Creek Restoration Society has data on Puget Creek and drainage into the Sound	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.
Bird Count and Great Backyard bird counts have count data on bird species in our region at <a href="http://www.audubon.org">www.audubon.org</a>	This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.
Need to use more caution when using government reports and statistics - often not realistic.	This comment represents an opinion or position that is currently unsupported by scientific data. As more documentation about this issue becomes available, this comment could be reconsidered.
Don't just use ESA status - many stocks don't have good population data and are therefore not eligible	Addressed in P1 – see discussion of species of concern.

Comments	Response
Discussion about linkages between toxic pollutants and species health or biodiversity is needed.	Addressed in S1 under Threats, Pollution.
Estimates of primary productivity for the Sound would indicate the maximum sustainable biomass of higher trophic level organisms. That number could be compared to what actually exists.	This comment presents information that is related to the Partnership’s objectives for the Species/Biodiversity/Food Web topic, but cannot be fully evaluated during the first phase of the Action Agenda. The Species/Biodiversity/Food Web topic forum recommends that the Partnership consider evaluating this issue in future phases of the Action Agenda.

### What we missed: documented effective programs

Comments	Response
Partnerships between private sector and government is not mentioned	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
PSAMP data not linked to management objectives or approaches	See Section B of S2.
<p>More important beyond a catalog of programs is an assessment of how effective they area and whether they're the right programs</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• A number of programs are mentioned, but little is known about their long-term effectiveness as models for Puget Sound recovery</li> </ul>	We agree. S2 describes the scientific literature we could find about the effectiveness of management approaches.

Comments	Response
Need to consider EPAs ecological risk assessment	Need more detail here. Which ecological risk assessment?
Puget Sound Dredge Disposal Analysis Program (PSDDA) <ul style="list-style-type: none"> <li>• That program also used a land use decision process based on Ian McHarg's "Design with Nature" concept that could be applied here</li> </ul>	This comment presents information that is related to the Partnership's objectives for the Species/Biodiversity/Food Web topic, but cannot be fully evaluated during the first phase of the Action Agenda. The Species/Biodiversity/Food Web topic forum recommends that the Partnership consider evaluating this program in future phases of the Action Agenda.

## Regulatory / Institutional Barriers

Comments	Response
Barriers that prevent the immediate adoption of effective ballast treatment include the lack of programs to test and verify treatment technologies and move them onboard ships. The first saltwater test facility in the nation is planned for construction in Puget Sound; support for this program by PSP is important.	P2 recommends implementing plans to prevent non-native species invasions.
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.	Institutional barriers are discussed in P1.  Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
For most local governments, the capacity for even developing effective actions does not likely exist in their agencies;	Institutional barriers are discussed in P1.  Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other

Comments	Response
	efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
For King County, there are probably insufficient resources—staff, knowledge, and monies—to carry out our anticipated responsibilities	<p>Institutional barriers are discussed in P1.</p> <p>Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.</p>
Avoid inconsistent actions, like those of NOAA in regards to Orca management concurred with the Army Corps decision to dump contaminated dredge spoils into the Sound as not being seen as contradictory to the recovery efforts of the Orca.	<p>Institutional barriers are discussed in P1.</p> <p>Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.</p>
More detail is needed about agency mandates, policy limitations, conflicts, and overlaps. For instance, it is difficult to assess whether or not current regulations are adequate to protect species because we know little about compliance in some instances. A comprehensive review of statutes, rules, and policies related to protecting species / biodiversity should take place.	<p>Institutional barriers are discussed in P1. P2 recommends prioritizing and enforcing regulations, and evaluating their effectiveness.</p> <p>Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.</p>

## Recommended management approaches: to be added / changed

Comments	Response
<p>Set Benchmarks, for example:</p> <ul style="list-style-type: none"> <li>Protection of existing herring spawning areas (no net loss)</li> <li>Enhancement of existing herring spawning areas (net increase of size/quality)                             <ul style="list-style-type: none"> <li>. Restoration of historic herring spawning areas (including spatial and temporal distribution)</li> <li>. Net increase in the total volume of all forage fish throughout Puget Sound</li> </ul> </li> <li>Similar benchmarks for freshwater and terrestrial actions would be needed as well.</li> </ul>	<p>This comment presents information that is related to the Partnership’s objectives for the Species/Biodiversity/Food Web topic, but cannot be fully evaluated during the first phase of the Action Agenda. The Species/Biodiversity/Food Web topic forum recommends that the Partnership consider evaluating this issue in future phases of the Action Agenda.</p>
<p>Puget Sound Leadership team should develop a decision making protocol with an accompanying training program that counties can use to make good decisions with regard to suitability for development -septics as well as other things.</p>	<p>This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.</p>
<p>Stream <b>water quality</b> improvement and day-lighting projects should be prioritized and barriers should be removed or improvements made to facilitate fish passage. In addition, the Estuary Salmon Restoration Program should be fully funded</p>	<p>This comment has not been incorporated into the revised Topic Forum discussion paper at this time. The comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.</p>

## Ecosystem Management

Comments	Response
<p>For Ecosystem Based Management to work, need a better understanding of how the ecosystem works.</p> <ul style="list-style-type: none"> <li>• Ecosystem management implies habitat - need to include habitat. Need more information on where ecosystem management has been successful, the basic approach and how the Partnership foresees its implementation.</li> <li>• Explain a bit of the background and context for ecosystem-based management</li> <li>• Some of the criticisms and difficulties associated with the concept should be addressed</li> </ul> <p>Need discussion of ecosystem functioning and how disturbance</p> <ul style="list-style-type: none"> <li>• How does IEA fit in with it?</li> <li>• An ecosystem-based species plan should not separate or focus attention only on the Herring subpopulations that are in decline, but look to ensure healthy and stable populations in all 19. However, it is critical that the status of all stocks are closely monitored and accurately portrayed in the issue paper which was not done in the first draft.</li> </ul>	<p>Addressed this comment in S2. Adding habitat to this paper is beyond our scope, but will be addressed as part of synthesizing findings from the individual topic forums into ecosystem-wide priorities. Much of the ecosystem-based management work, including a description of how the Partnership foresees its implementation, will occur during future phases of the Action Agenda. See new discussion of herring in S1.</p>
<p>Don't let EBM be an impediment to action - don't delay action for the perfect plan</p>	<p>P2 recommends taking action where we know there is urgency.</p>
<p>Look toward a working model that creates a suite of recovery plans for species that are both 'listed' and unlisted aiming to manage species for recovery and sustainability rather than harvest. These individual recovery plans would focus on critical habitats that would link together to form the</p>	<p>Addressed in several places in P2.</p>

Comments	Response
basis of a Sound wide recovery plan.	
The Puget Sound Environmental Caucus Species, Biodiversity and Food Web Subcommittee recommends that forage fish be the base of the pyramid of this Sound-wide recovery plan and that the Partnership seriously consider the interconnections among all of the issue groups or at least identify the potential unintended consequences of dealing with each issue separately.	This comment will be addressed as part of synthesizing findings from the individual topic forums into ecosystem-wide priorities.

### Precautionary Principle

Comments	Response
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 “ <i>above all, do no harm</i> ”.	Precautionary principle and adaptive management are addressed in S2.
Be aware of unintended consequences - make sure there is a solid understanding of linkages before taking certain actions	See Food Web discussion in S1.

### Approaches & Strategic Sequencing

Comments	Response
Develop a Puget Sound "lens" through which all management actions are viewed	This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.

Comments	Response
<p>The prioritization is focused on higher trophic levels and regulatory management. The prioritization needs to be based on goals established for sustainable populations of the species and communities most important to us.</p>	<p>This comment presents information that is related to the Partnership’s objectives for the Species/Biodiversity/Food Web topic, but cannot be fully evaluated during the first phase of the Action Agenda. The Species/Biodiversity/Food Web topic forum recommends that the Partnership consider evaluating this issue in future phases of the Action Agenda.</p>
<p>Approach needs to be top down (regulatory) and bottom up. Education and values is important.</p> <ul style="list-style-type: none"> <li>• One topic which should be emphasized more strongly is the public education/outreach element. The final plan should have a requirement that all schools in the Puget Sound region include a course about the Puget Sound -- importance, health and care thereof</li> </ul>	<p>This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.</p>
<p>Ecosystem services approach helps to get at a more realistic cost-benefit approach (will help to drive public support)</p>	<p>This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.</p>
<p>The Natural Heritage information system approach to inventory and classification of species and ecosystems would be appropriate for answering the first science question regarding the status of the biodiversity of the Sound.</p> <ul style="list-style-type: none"> <li>• This approach is used by Natural Heritage programs across the country and is captured in the Natural Heritage Plan which can be found on-line at DNR’s website at:  <a href="http://www.dnr.wa.gov/Publications/amp_nh_plan_2007.pdf">http://www.dnr.wa.gov/Publications/amp_nh_plan_2007.pdf</a> and is reflected in 79.71 RCW.</li> </ul>	<p>This comment presents information that is related to the Partnership’s objectives for the Species/Biodiversity/Food Web topic, but cannot be fully evaluated during the first phase of the Action Agenda. The Species/Biodiversity/Food Web topic forum recommends that the Partnership consider evaluating this suggestion in future phases of the Action Agenda.</p>

Comments	Response
<p>There should be simultaneous restoration of land on the Sound to natural uses consistent with preservation of plants, animals and sea-life whenever possible and at the same time, where there is development occurring</p>	<p>This comment will be addressed as part of synthesizing findings from the individual topic forums into ecosystem-wide priorities.</p>
<p>ESA species recovery, HCPs, marine reserves, commercial harvest regulations, etc. are pieces of a strategy but do not constitute a strategy.</p>	<p>This comment presents information that is related to the Partnership’s objectives for the Species/Biodiversity/Food Web topic, but cannot be fully evaluated during the first phase of the Action Agenda. The Species/Biodiversity/Food Web topic forum recommends that the Partnership consider evaluating this issue in future phases of the Action Agenda.</p>
<p>The strategy does need to look at the system on a watershed basis. Special interest advocates for commercial and sports harvests, including fishing and aquaculture of all kinds need to be parties to the solutions, not just clients.</p>	<p>Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.</p>

## Recommended Actions

### Principle Actions

Comments	Response
<ul style="list-style-type: none"> <li>• <b>Infrastructure</b> <ul style="list-style-type: none"> <li>A) Transportation                             <ol style="list-style-type: none"> <li>1. Mass transit. Get people out of their cars to reduce toxics in water.</li> <li>2. Slow road building to reduce impervious surface cover.</li> </ol> </li> </ul> </li> </ul>	<p>This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.</p>

Comments	Response
<p>Retrofit as needed.</p> <p>3. Improve signage for bikes and pedestrian trails.</p> <p>B) Water</p> <p>1. Purple pipe. Reuse wastewater for industrial/nonpotable uses</p> <p>2. Stormwater treatment. Something to keep sediment/toxics out of streams.</p> <p>3. Riparian/shoreline buffers to shade surface waters, filter contaminants.</p> <p>C) Housing</p> <p>1. Retrofit energy inefficient houses = water saved/atmosphere saved.</p> <p>2. Zone for density and pedestrian access to amenities = less driving.</p> <p>3. Greenbelts and parks.</p> <p>D) Habitat</p> <p>1. Habitat restoration where degraded</p> <p>2. Create habitat connectivity and parks</p> <p>3. Aggressive invasive species control</p>	
<ul style="list-style-type: none"> <li>● <b>Public diplomacy</b></li> <li>A) Create incentives for people who conserve</li> <li>B) Create incentives to locate green businesses here</li> <li>C) Educate adults about costs of inefficiencies. Educate children about conservation.</li> </ul>	<p>Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.</p>
<ul style="list-style-type: none"> <li>● <b>Regulation</b></li> <li>A) Ban more toxics, specifically carcinogenic ones</li> <li>B) Tugs for shippers of hazardous materials in state waters.</li> <li>C) Mitigation bank system for upland habitat development</li> </ul>	<p>This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.</p>

Comments	Response
D) Loosen or abolish requirements for parking assoc. w/businesses E) Increase enforcement capacity of Ecology	

**Proposed Criteria**

Comments	Response
Criteria for prioritizing actions need a more clear statement of goals and objectives, the criteria cannot be easily applied. criteria tend to be too general and lack the specificity necessary for a confident application <ul style="list-style-type: none"> <li>• 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</li> </ul>	This comment will be addressed as part of synthesizing findings from the individual topic forums in ecosystem-wide priorities (and criteria).
Whether the goal is the "save" or to "manage", what are the end points? How will we know that we are accomplishing what we have set out to do? <ul style="list-style-type: none"> <li>• The distinction between "save" and "manage" is a major one that, affects the attitudes of local citizens toward actions by government to deal with PS</li> <li>• Do you really mean you want to "save Puget Sound" which is a focused short-term goal or in fact is the purpose to manage impacts on the ability of Puget Sound to support a diversity of natural resources and functions.</li> <li>• Is the goal a return to pre-Caucasian arrival conditions? No? Conditions in 1900? If not some past set-point then how is the sustainable goal described?</li> </ul>	This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic forum.

### Adaptive Management and Monitoring

Comments	Response
<p>At the discussion forum, several comments were made about the incompatibility of HCPs and adaptive management. SPU's experience is that they can be compatible because there is flexibility in how actions are carried out in the HCP.</p>	<p>This comment has not been incorporated into the revised Topic Forum discussion paper at this time. This comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.</p>
<p>Some organizations don't allow adaptive management or have implemented plans (e.g., HCP) that are seemingly contrary- what's the answer?</p>	<p>This comment has not been incorporated into the revised Topic Forum discussion paper at this time. This comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.</p>
<p>Adaptive management - needs to be a cornerstone. Need to keep with it even if not perfect</p>	<p>See S2 and P2.</p>
<p>Adaptive management - turning science into management decisions - critical part of performance measure</p>	<p>See S2 and P2.</p>
<p>Need a finalized management agenda instead of just an action plan</p>	<p>This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic forum.</p>
<p>Strategic monitoring</p> <ul style="list-style-type: none"> <li>• describe state and tribes' salmon population monitoring efforts. Like with the reserves, it only provides species information, but it is a critical data need for biological effectiveness monitoring.</li> </ul>	<p>This comment has not been incorporated into the revised Topic Forum discussion paper at this time. This comment addresses a level of detail that is beyond the scope of the topic forum discussion draft.</p>
<p>Adopt the evolution of a monitoring plan - - need to make adjustments along the way, but need to start now</p>	<p>Addressed in P2.</p>

### Science / Research Needs

Comments	Response
Need more research in Puget Sound to understand what's going on with species and habitats	See P2.
Data needs to be accessible and coordinated. Need a data clearinghouse. Need a science center - physical location the make sure science is coordinated and data stored	Added accessibility and coordination to P2 description of research and other studies.
The inventory, classification and ranking system for species and ecosystems used by DNR's Natural Heritage Program. This model of data collection and distribution may provide a platform on which information regarding the aquatic environment can be collected, maintained and distributed. More information can be found at <a href="http://www.natureserve.org">www.natureserve.org</a>	This comment presents information that is related to the Partnership's objectives for the Species/Biodiversity/Food Web topic, but cannot be fully evaluated during the first phase of the Action Agenda. The Species/Biodiversity/Food Web topic forum recommends that the Partnership consider evaluating this suggestion in future phases of the Action Agenda.

### Scale

Comments	Response
Management scale should be sound wide	This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.
Need to engage at sub-areas because area are all different (sound-wide criteria, area specific criteria/priorities)	This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.

### Plan / Program Needs

Comments	Response
<p>A conservation framework for protecting critical aquatic lands may be found in the Natural Areas Preserve Act (79.70 RCW) and the Natural Resources Conservation Areas Act (79.71 RCW) both of which allow the acquisition of important aquatic lands for long-term conservation purposes</p>	<p>This comment presents information that is related to the Partnership’s objectives for the Species/Biodiversity/Food Web topic, but cannot be fully evaluated during the first phase of the Action Agenda. The Species/Biodiversity/Food Web topic forum recommends that the Partnership consider evaluating this suggestion in future phases of the Action Agenda.</p>
<p>Need to look at effects of activities that have an economic component (e.g., open cage fish farms). There is a site specific containment plan but that doesn't always work.</p>	<p>See S1 and P2.</p>
<p>Implement plans that are already out there</p>	<p>P2 recommends implementing existing plans.</p>
<p>To protect shorebird and other estuarine dependent species, we need to have much stricter, more enforceable and coordinated enforcement to protect the natural shoreline and prevent bulkheads and structures from encroaching on the shore. We need to create more buffer areas and protect natural areas essential to wildlife using compact and carefully planned development, and enforcement of existing laws and ordinances</p>	<p>P2 recommends better enforcement.</p>
<p>Draft a "Carrot &amp; Stick" scenario which would make State and Federal funding contingent on implementation of good policies.</p>	<p>This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.</p>
<p>The paper jumps from touting individual species recovery plans (page 12), to warning against species recovery plans for multi-species (page 12), to fully promoting ecosystem based management that does not mention species (page14). Is the Partnership going to promote individual</p>	<p>Addressed in P2.</p>

Comments	Response
species recovery plans, a broad based ecosystem management approach or multi-species recovery?	
We need to proactively address recovery plans from the perspective of 'listed' as well as non-listed species of concern.	Addressed in P2.
We can't wait until all baseline data is in for species populations. Need to act now on a comprehensive Sound-wise recovery plan and maintain individual action.	P2 recommends taking action where we know there is urgency, on many levels.
<p>Harvest Regulations - put a bag limit on catch</p> <ul style="list-style-type: none"> <li>• In all action areas there is a real problem with commercial salmon harvest methods – gillnetting and purse seining and their lack of selectivity between hatchery fish and wild stocks</li> <li>• Using a more selective method would reduce wild run mortalities, produce higher quality catch, and give more flexibility to tribal and state fishery managers.</li> <li>• While this paper identifies habitat loss or modification as one of the leading threats to species, there is little discussion about the existing regulatory processes that are in place to protect habitat. The only mention of the WDFW HPA in this paper is that the program is undergoing a Habitat Conservation Plan on page 20. If this issue is covered in the habitat topic paper, it should be cross-referenced.</li> </ul>	<ul style="list-style-type: none"> <li>• See discussion of by-catch in S1 under Threats, Harvest.</li> <li>• Added cross-reference to discussions of HPA in habitat paper in P1.</li> </ul>
Cannot wait until all the baseline data is in for critical species populations. We need to start acting now on a comprehensive Sound-	P2 recommends taking action where we know there is urgency, on many levels.

Comments	Response
wide recovery plan and maintain individual action already in the works. The Partnership should move forward in a two-tiered approach.	

### Partnerships / Coordination

Comments	Response
Need to include cross-topic experts - create coalitions, reduces competition for funding.	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Need a strategy to get all agencies to participate - incentives? Punishment? .	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Need a strategy to engage British Columbia	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.

Comments	Response
Need to communicate regional goals to federal agencies	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
The Partnership needs to get involved with local governments and land use decision-makers as their decisions impact at risk species. Ensuring the support of local governments is critical to create support for an ecosystem management plan and to avoid repeating the mistakes of the past.	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Need for very broad partnership and engagement - agency level, tribes, industry, agriculture, community level, NGO	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Integrated, coordinated research and monitoring, not just species-based and AM needed	See recommendations for science program under ecosystem-based management in S2 and P2.
Need focused communication - need to have outreach top to bottom. Get everyone involved.	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.

## Constituency Building

Comments	Response
Education / Community involvement	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Use established groups. Use existing organizations to facilitate community stakeholder involvement - i.e. PNAMP	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Engage people around universal issues, values	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Engage private sector - Hanford model (paired businesses). Businesses that benefit also must contribute.	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.

## Funding

Comments	Response
Funding for enforcement is important	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Need transparency in funding for projects that could affect Puget Sound	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Use federal funding agencies to underscore PSP goals when giving funds	Issues relating to broad institutional barriers, funding, and education/outreach are being addressed through other efforts being conducted by the Partnership. Outcomes from these efforts will be integrated with the findings from the topic forums in development of the Action Agenda.
Truckers pay extra highway taxes, shellfish growers should pay to mitigate water quality issues	This comment represents an opinion or position that is currently unsupported by scientific data. As more documentation about this issue becomes available, this comment could be reconsidered.

**Cost**

Comments	Response
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	This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.
Thinking should be broad on solutions, science-based, and not limited by cost.	This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.
Cost-effectiveness - include what inaction will lose, increment steps.	This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.

**Document Organization / Content / Style**

Comments	Response
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. However, the authors did not have enough time	This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.
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	We agree that the paper is highly summarized/generalized, but did not alter its scope at this time. The Partnership may choose to delve further into this topic in the future.

Comments	Response
<p>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.</p>	<p>We agree that the paper is highly summarized/generalized, but did not alter its scope at this time. The paper was intended to serve as an overview of the topic.. The Partnership may choose to delve further into this topic in the future.</p>
<p>So where is the basic conceptual model for physical, chemical and biological processes in the Sound with numerical submodels to test our understanding and data sufficiency?</p>	<p>This comment is best addressed in broad policies and priorities being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.</p>
<p>Structure and approach didn't lend itself to presenting recommendations</p>	<p>We agree that the paper is highly summarized/generalized, but did not alter its scope at this time. The paper was intended to serve as an overview of the topic.The Partnership may choose to delve further into this topic in the future.</p>
<p>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.</p>	<p>Removed reference to Ecopath from paper.</p>
<p>Should be 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</p>	<p>Primary producers – see new Food Web and Deficiencies in Our Knowledge sections in S1. Some institutional barriers discussion in P1.</p>
<p>We noticed that in several instances, secondary sources were cited. It would be more appropriate to cite the primary sources</p>	<p>Given our assignment, we relied on documents that summarized large amounts of information. Some of these are secondary sources.</p>

Comments	Response
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.	We agree that the paper is highly summarized/generalized, but did not alter its scope at this time. The paper is intended to serve as an overview, and was intended to be as concise as possible. The Partnership may choose to delve further into this topic in the future.

### Definitions

Comments	Response
A glossary is needed	
Suggested terms: <ul style="list-style-type: none"> <li>• Pollution</li> <li>• Bioaccumulation</li> <li>• Key Species</li> <li>• Marine</li> <li>• Estuarine</li> <li>• Upland Freshwater</li> <li>• Biodiversity</li> <li>• Disturbance</li> <li>• Urgency</li> <li>• Species Viability</li> <li>• Health</li> </ul>	We provided definitions of biodiversity, cultured species, diversity, and food web in Appendix A. The Partnership as a whole should define the other terms listed here.
Definitions are going to be important for our indicators and monitoring over time, to put in place adaptive management.	This comment is best addressed in broad policies being addressed by the Partnership as a whole, and is not specific to the Species/Biodiversity/Food Web topic.

## Document Specific Comments

Following are document specific editorial comments. These comments are to be reviewed and considered in revising the document, but do not warrant individual response.

p.13 2nd paragraph under "Harvest management": the last sentence is a repeat.

There is the use of the term "Memorandum" P1 when it probably should be "Section" P1, etc.

Page 15, Ecosystem-Based Management, last paragraph. With your reference to "Marine Resources Councils", do you mean "Marine Resources Committees"?

P. 1 under "marine trophic levels" – it is very important to include zooplankton.

Science Question 1, Key Findings, A. (pp. 1-2): This is a list of broad categories with some examples, but it is not abundance, nor productivity, nor spatial distribution, nor diversity of key species in Puget Sound

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. 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

Pg 1, under A rather than providing single examples, it might be more useful to estimate total numbers of species when appropriate, or list more examples

Food Web Status, 2nd paragraph. Reword 2nd 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

Page 7, 1st Paragraph: recognize role of conservation hatchery programs (traditional, captive brood) in helping to prevent extinction of some critically low salmonid populations; also discuss (potential) impacts of sea lice from net pens – severe impacts have been found to pink salmon populations on Vancouver Island.

P. 5-6. The ultimate identification of high priority actions will be aided by adding some indication of the relative significance of the listed threats to species abundance and

diversity. Perhaps this could be done by categorizing them as broad and specific threats. We should be clear about what is already recognized as being significant problems resulting in the depressed state of ecosystem health of Puget Sound. We need to say that the list of threats will evolve as our understanding of cause and effect relationships improves and we need to emphasize the importance of supporting this through time with effective monitoring and research.

Pg. 7-8: Food web indicators are needed.

p. 14 Cultured Species. Need to differentiate between hatcheries and hatchery practices when mentioning the rockfish concern. This concern appears to be associated with a hatchery practice that delays release of smolts to encourage released salmon to stay in Puget Sound instead of migrating to the North Pacific ocean. If the concern is valid, an alternative hatchery practice would be to release these fish at the normal smolting time with the result that they would likely exhibit normal migration patterns. Under this scenario, diet of natural and hatchery produced salmon would be expected to be similar. In other words, it's the management decision on how the hatchery is used and not an inherent effect of the hatchery. Suggest clarifying the statement about hatchery effects on rockfish.

Fifth paragraph. This paragraph (other than the first two sentences and the last sentence) seems to raise issues that are not significant enough to be included in this document.

p.16 Second paragraph. Perhaps it would be good to include a statement about the effectiveness of mitigation as it is currently implemented through the permitting of projects.

Pg 17 – The document correctly lists out “limitation on impervious surface, and protection of ecologically functional areas” as an area that needs more findings. These findings should comment on the cost effectiveness of using conservation and smart growth as stormwater prevention strategies as compared to treatment.

P7. Cultured species - second sentence. The sentence would be better said if “those populations” was replaced by “their progeny” to survive...”

3rd sentence. Are there documented cases where disease in a hatchery has created outbreaks in natural populations? It is usually the other way around due to the stress and density in the hatchery.

SQ 1, Threats (pp. 5-6): Climate change may be important in the future (as indicated in the discussion) but the emphasis in the next decade or so should be on addressing the current and continuing causes of decline

The paper jumps from touting individual species recovery plans (page 12), to warning against species recovery plans for multi-species (page 12), to

fully promoting ecosystem based management that does not mention species (page 14). Is the Partnership going to promote individual species recovery plans, a broad based ecosystem management approach or multi-species recovery?

Page 13, Harvest Management, 2nd paragraph: Second sentence (“Federal and WA State agencies...”, deleting “fish management plans”) should be moved to Species Plans. Elaborate on salmon harvest management framework (i.e. describe Comp Chinook). Also, present information on effectiveness at reducing harvest rates.

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 8 – The information on urbanization and stormwater would be stronger with more context on the degree to which growth is happening outside the UGA. Under the “urbanization” paragraph, the document could include the following sentence: “Significant growth continues outside the Urban Growth Boundary. In Pierce County, approximately 20% of the growth between 2000 and 2007 was outside the UGA. In Kitsap, between 40 and 60% of growth has been outside the UGA in recent years.” Source: Puget Sound Regional Council, Puget Sound Trends, April 2008  
<http://www.psrc.org/publications/pubs/trends/d5apr08.pdf>

There are inconsistencies in the paper related to forage fish populations and their actual status. The paper both implies a decline (page 1) and a stable population (page 8). There should be special attention paid to the Cherry Point herring stock which used to comprise half the State's spawning biomass of 15000 tons and now only constitutes 2000 tons.

In the section on Management Plans (starting on Page 28 of the Draft), you make a good start by referring to the Washington Biodiversity Conservation Strategy and promotion of habitat conservation. I urge you to strengthen this by outlining programs, both voluntary and regulatory for protecting habitats.

Page 21, Harvest, 1st bullet: at least for WRIA 1, the salmon recovery plan primarily addresses habitat, including harvest and hatchery actions largely by referencing other plans and planning processes already in place. It would be best to describe in more detail the salmon harvest management framework.

Pg 21 – The end of the list of existing regulatory or management programs for addressing stormwater could include, as an example, the stormwater benefits of preventing development on the 90,000 Snoqualmie Tree farm through King County's transfer of development rights from that property.

Page 12, last paragraph and elsewhere: Continued focus on some species (those that are culturally and economically important, like salmon) will be important for garnering and maintain tribal and broader public support for the PSP effort.

4th sentence. Lumping farmed fish with fish released to the ocean by hatcheries makes this sentence confusing. However, I am not aware of evidence that the level of natural reproduction of escapees from fish farms has resulted in sufficient progeny to represent a competitive threat to Pacific salmon. Historical attempts to transplant Atlantic salmon to the Pacific coast have failed. This sentence should be removed.

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.

Page 17, 2nd bullet. Tribal harvest opportunities have already been drastically reduced, so recognize the difficulty of further reducing harvest in favor of increasing escapement to support ecosystem benefits. However, where recruitment to hatcheries greatly outweighs broodstock needs, the excess carcasses could be transported to appropriate rivers and streams.

Page 16, Section B, 3rd paragraph: Here, and/or elsewhere as appropriate, describe state and tribes' salmon population monitoring efforts. Like with the reserves, it only provides species information, but it is a critical data need for biological effectiveness monitoring.

p.8 A. 3rd para. 2nd sentence. Conditions will may naturally change over time ....B. Status characterization of herring should be consistent with the most recent WDFW report. At least some herring stocks were not considered healthy (north Puget Sound: "below average"; Straits region "far below average") in 2004 Washington State Herring Stock Status Report by WDFW done in 2005. This information (or more up to date information) should be mentioned in the 3rd bullet given the importance of this species in the Sound.

p.8 Paragraph below bullets. Saying that herring stocks are in good condition seems to miss important regional differences, based on the 2005 report. Following on the above comment, suggest discussing the health of herring stocks by the three regions used in the WDFW report on stock status.

Pg 31 – Add a bullet under the Land Use section that states “concurrent with employing conservation strategies for undeveloped portions of watersheds in the Puget Sound basin, pursue strategies to direct growth into urban areas and foster a high quality of life in urban areas to provide a positive alternative to low-density growth on rural or resource lands. Match these growth strategies with a range of techniques for Low-Impact Development and green infrastructure in urban areas.”

p.34 under species.

Suggest adding zooplankton as a gap in our understanding of conditions in Puget Sound since abundance and species are critical to the food web and ultimately to much of the biota in the Sound, directly or indirectly. We need to include zooplankton monitoring in the monitoring program, even if phytoplankton monitoring had to be reduced..

Page 14: While WSDA has the general responsibility to promote aquaculture, many state agencies share management responsibilities. If any shortcomings are to be addressed, this dynamic must be understood. Refer to the following Statutes:

DNR - Chapter 79.135 RCW - Aquatic Lands, Shellfish and Aquaculture

Agriculture - Chapter 15.85 RCW - Aquaculture Marketing

WDFW - Chapter 77.60 RCW – Shellfish, Chapter 77.115 RCW -

Aquaculture Disease Control, Chapter 77.125 RCW - Marine Finfish  
Aquaculture Programs

Health - Chapter 69.30 RCW - Commercial Shellfish Operation Requirements

Ecology - Chapter 90.58 RCW - Shoreline Management Act, Chapter  
43.143 RCW - Ocean Resources Management Act

Pg 15 – The list of stormwater source control measures on this page could include “conservation and smart growth strategies”

p. 16 Adaptive management

Suggest including the following: Adaptive management allows actions to be taken in spite of uncertainty and to treat these actions as systematic learning opportunities to inform future decisions. Ideally, adaptive management allows a better understanding of cause and effect; however, this becomes challenging as adaptive management is applied to more complex systems due to the number of factors that can influence the results.

Should highlight the need to improve how we evaluate management actions.

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.”

Pg. 31. 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.

Pg. 31. 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. 5th 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?

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

Pg. 24. 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. 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. 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 mention need. 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 marinewater 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. 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?).

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. 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.

Pg. 15. 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.

Pg. 20 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).

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.

Pg 8. 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?).

Climate Change – Mention changes in spatial distribution of species/species ranges (vertical and horizontal in space) – 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.

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

Pg. 32, Section P2-b: Include some measure of poaching within the harvest regime.

The statement “keeping common species common” appears several times apparently as a goal. Given the current imbalance of the ecosystem, this assumption should be challenged

Pg. 29: Section P2-B: The statement “DNR manages... “ is not accurate. Replace with “DNR manages forest lands and uses them to generate funding for its trust beneficiaries. DNR manages aquatic lands to balance public benefits and may generate funds from the use of these lands that will fund restoration programs and resource management.”

Pg. 8: The use of “healthy condition (S1-A, p. 8) is confused with the use of reference condition (see last paragraph on p. 8). Does healthy condition refer to benchmarks that need to be set through policy or to a reference condition?

Pg. 8: Section S1-B: Include species that are known to have been extirpated from Puget Sound. Also describe fisheries that once existed in Puget Sound but no longer are viable.

Pg. 7: Additional research is needed on cumulative effects of threats, interactions of different threats, and the non-linear nature of threats.

Page 4: “ecopath” should be “Ecopath modeling”

Page 32, last bullet: Consider selecting key species for indicators, perhaps within each of the groups identified on pages 1 (3?) and 4.

p.33 under “protect important habitats”  
Should include important habitat even if used by a single keystone species (eg. spawning areas for herring) – unclear if current language does that.

p.17 C. second bullet. Some additional specificity for the conclusion that revised (reduced) harvest quotas would generate widespread benefits is needed (see comments under harvest management).

p.23 second bullet. Harvest management does include consideration of the needs of the ecosystem in setting harvest rates, by recognizing natural mortality in calculations of harvest rates. More could be done, but this statement ignores extensive efforts to account for the effects of predators.

p.23. last paragraph. Last sentence. Any resource management entity, state, federal or tribal, would have to deal with complications that result from the tension between harvest and species protection. Funding isn't the most important driver and this sentence is misleading.

p.29. third bullet. Suggest incorporating the idea of a science center that would be created to support the recovery of the Sound and affiliated with the U. of Washington. This center would implement the monitoring program and support research designed to answer key uncertainties. The center would have credibility because of its affiliation with an academic institution and this is key for acceptance of results that could drive the need for regulatory and behavioral changes to improve the Sound. This concept would allow a core group of multi- disciplinary scientists to work in spatial proximity to one another for a common purpose, providing opportunities for collaboration, shared insights and understanding. Better efficiency, coordination and productivity would be likely.

Page 14, Cultured Species: Consider also including description of the benefits to research of mass-marked hatchery fish. Also, describe HGMP and Hatchery Reform processes.

Page 22: A section for Cultured Species appears to be missing. It should include mention of HGMPs, Hatchery Reform.

Page 7, 3rd paragraph: include effects of ORV use and redd trampling in freshwater.

Page 7, Section B, 1st paragraph: qualify statement thus: "There is much we do not know about the forces that threaten the survival of many species..." We do know much (although not all) about the forces threatening some species like salmon and others with recovery plans.

Page 6, 1st paragraph: add "freshwater", i.e. "Conversion and modification of marine,estuarine, freshwater, and upland ecosystems..."

Page 6, 2nd paragraph: include effects on precipitation patterns and potential ecological implications to freshwater ecosystems.

Page 6, 3rd paragraph: low streamflows also exacerbate water quality problems in freshwater (dissolved oxygen, temperature).

Page 4, Section B, 2nd Paragraph: mention that declines in many salmonid populations has likely reduced the contribution of MDN to freshwater ecosystems. Some have attempted to quantify the loss; a quick Google search yielded the following:

<http://www.inforain.org/reports/Historic%20and%20Current%20Levels%20GRESH.pdf>

and Scheuerell et al. 2005: CJFAS 62(5): 961-964.

## **Additional Documentation**

Cohen, A., Mills, C., Berry, H., Wonham, M., Bingham, B., Bookheim, B., Carlton, J., Chapman, J., Cordell, J., Harris, L., Klinger, T., Kohn, A., Lambert, C., Lambert, G., Li, K., Secord, D. and Toft, J. 1998. Report of the Puget Sound Expedition Sept. 8-16, 1998: A Rapid Assessment Survey of Non-indigenous Species in the Shallow Waters of Puget Sound. Wash. State Dept. Nat. Res., Olympia, WA. 37 pp.,

Cohen, A. N., Berry, H. D., Mills, C. E., Milne, D., Britton-Simmons, K., Wonham, M. J., Secord, D. L., Barkas, J. A., Bingham, B., Bookheim, B. E., Byers, J. E., Chapman, J. W., Cordell, J. R., Dumbauld, B., Fukuyama, A., Harris, L. H., Kohn, A. J., Li, K., Mumford, T. F. J., Radashevsky, V., Sewell, A. T. and Welch, K. 2001. Washington state exotics expedition 2000: a rapid survey of exotic species in the shallow waters of Elliott Bay, Totten and Eld Inlets, and Willapa Bay. Washington State Dept. of Natural Resources Nearshore Habitat Program, Olympia. 47 pp.

Attachments: 2001-2000Washington\_exotic\_spp\_Srvy355.pdf, Washington State invasive tunicate survey for WDFW.doc, Washington State invasive tunicates -Gretchen Lambert June 2006.xls. From Jeff Adams.

Olson, A., J. Goen and N. Lerner. 2000. Handling and Disposal of Nonnative Aquatic Species and their Packaging. Washington Sea Grant Program, Seattle WA 12 ppgs.

Cohen, A., C. Mills, H. Berry, M Wonham and B. Bingham. 2000. The 1998 Puget Sound Expedition: A Rapid Assessment Survey for Non-indigenous Species in the Puget Sound. Proc. First Nat'l Conf Bioinvasions, Boston MA.

Dethier, M. and S. Hacker. 2004. Improving Management Practices for Invasive Cordgrass in the Pacific Northwest: A Case Study of *Spartina anglica*. Washington Sea Grant Program, Seattle WA 24 ppgs.

Jamieson, G., E. Grosholz, D. Armstrong and R. Elner. 1998. Potential ecological implications from the introduction of the European green crab, *Carcinus maenas* (Linnaeus), to British Columbia, Canada, and Washington, USA. *J. Nat. History* 32(10-11): 1587-1598.

G.M. Ruiz and D.F. Reid. 2007. Current State of Understanding about the Effectiveness of Ballast Water Exchange (BWE) in Reducing Aquatic Nonindigenous Species (ANS) Introductions to the Great Lakes Basin and Chesapeake Bay, USA: Synthesis and Analysis of Existing Information. NOAA Technical Memorandum GLERL-142.

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>

Approaches to analyzing food web interactions and contaminants (McIntyre et al 2006, 2007 papers)

Washington Dept. of Fish and Wildlife and Point no Point Treaty Tribes. 2000. Summer Chum Conservation Initiative - An Implementation Plan to Recover Summer Chum in the Hood Canal and Strait of Juan de Fuca Region. April, 2000. Washington Dept. of Fish and Wildlife. Olympia, WA. 800 p.

Washington Dept. of Fish and Wildlife and Point no Point Treaty Tribes. 2007. Five-year review of the Summer Chum Salmon Conservation Initiative: Supplemental Report No. 7. December 2007. Washington Dept. of Fish and Wildlife. Olympia, WA. 235 p.  
<http://wdfw.wa.gov/fish/chum/chum.htm>

<http://www.pnas.org/cgi/content/full/103/42/15506>

<http://news.nationalgeographic.com/news/2007/12/071213-salmon-lice.html>

[http://www.lib.noaa.gov/docaquareports\\_noaaresearch/straitoffinal\\_report2005\\_1.pdf](http://www.lib.noaa.gov/docaquareports_noaaresearch/straitoffinal_report2005_1.pdf)

[http://www.lib.noaa.gov/docaquareports\\_noaaresearch/juandefucarept.htm](http://www.lib.noaa.gov/docaquareports_noaaresearch/juandefucarept.htm)

<http://www.fra.affrc.go.jp/bulletin/bull/bull19/13.pdf>

[http://www.protectourshoreline.com/slideshow/POS\\_ShellfishAquacultureConcerns.pdf](http://www.protectourshoreline.com/slideshow/POS_ShellfishAquacultureConcerns.pdf)

[http://www.ProtectOurShoreline.org/legal/080326\\_PierceCnty\\_TaylorShellfishDecision.pdf](http://www.ProtectOurShoreline.org/legal/080326_PierceCnty_TaylorShellfishDecision.pdf)

<http://www.doh.wa.gov/ehp/oehas/fish/farmedsalmon.htm>

(<http://query.nytimes.com/gst/fullpage.html?res=9A01E3D81031F93BA15756C0A9659C8B63&sec=&spon=&pagewanted=all>)

<http://www.fluoridealert.org/pesticides/epage.teflubenzuron.htm>

<http://www.youtube.com/watch?v=of3URNIMLMk>

Haffernan has a study

[http://protectourshoreline.org/studies/Review\\_Mariculture\\_Ireland.pdf](http://protectourshoreline.org/studies/Review_Mariculture_Ireland.pdf)  
pages 80-91 and 96-103 are most relevant.

The CSAS study from Canada

<http://govdocs.aquake.org/cgi/reprint/2004/410/4100110.pdf> pages 44-47 speaks to bird effects.

Leah Bendell Young (Simon Fraser University) has a study

<http://www.protectourshoreline.org/articles/07BendellShellfishCommunityStructure.pdf>  
page 7 speaks to predator exclusion netting relating to birds.

Duffy et al 2005 hsrgr-marine trophic demand-synthesis.pdf

Duffy\_&\_Beauchamp\_TAFS\_2008 Cutthroat predation on salmon in Puget Sound.pdf

Ruggerone & Goetz 2004 Pink Salmon effects on Chinook Survival in Puget Sound.pdf

Beauchamp et al 2007 Bioenergetic response of salmon to climateecosystem change NPAFC Bull4.pdf

McIntyre et al 2006 Ontogenetic Trophic Interactions & Benthic-Pelagic Coupling in LW-Stable Isotopes-Diet.pdf

McIntyre & Beauchamp 2007 Age & trophic position dominate Hg & organochlorine bioaccumulation in Lk Washington foodweb.pdf

Beauchamp et al 2004 Early Food Supply-Demand Sockeye.pdf

“King County Biodiversity Report,” a report for the Local Action for Biodiversity (LAB) Project, 2008. <http://dnr.metrokc.gov/wlr/waterres/biodiversity/index.htm>

Seattle Audubon, 2007-8. "Puget Sound Seabird Survey" (pilot year). A citizen science seabird survey that monitors wintering seabird populations along near-shore saltwater habitat in King County. Survey Protocol: <http://seattleaudubon.org/science.cfm?id=1169>

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[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6V74476073H3&\\_user=10&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_sort=d&view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=856ff329e5a0308d535aa37ab811b5e2](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V74476073H3&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=856ff329e5a0308d535aa37ab811b5e2)

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