PugetSoundPartnership
our sound, our community, our chance

Science Expert Review Workshop
February 20, 2008
Workshop Summary

Purpose
The Puget Sound Partnership held a workshop for the regional science community on Feb. 20, 2008 with the following objectives:

1) Solicit input on existing indicator datasets for status and threats in the Puget Sound ecosystem
2) Refine methodology for assimilating status and threat indicators across the region
3) Help identify existing conceptual models of watersheds, estuarine and marine portions of the Puget Sound ecosystem to help link status and threats

Overview
More than 70 scientists attended the meeting at the South Lake Union Naval Reserve Center in Seattle. Attendees included members of the regional science community from non-profit organizations, federal, state and local agencies, and Partnership staff.

Summary
Martha Neuman, Action Agenda Director, opened the meeting with an introduction describing the Partnership's goals and how the workshop would help achieve those goals. She also provided a schedule for the first round of action area meetings and described their purpose: to gather perspectives from stakeholders and add local knowledge and expertise to Partnership work.

Mary Ruckelshaus, NOAA, described the ongoing Sound-wide status and threats analysis, noting the need for continued participation by the scientific community. She described the analysis as a qualitative integrated ecosystem assessment that will become a quantitative assessment as the program progresses over the next year.

The following is a list of questions and comments from workshop participants following the presentations. Answers are indicated with italics.

- Will work done prior to the formation of the Puget Sound Partnership carry over into this process? *Yes, this process is meant to be a synthesis of older, on-going and new work.*

- What is the mechanism for coming up with proper indicators and how sure are we about the data? *Through conceptual models we can document the logic using the Driving Force-Pressure-State-Impact-Response (DPSIR) framework.*

- It would be a good idea to keep the assessments partially explicit. The process is maybe moving too quickly at this level rather than through the action areas. The rolled-up data is a concern.

- We need an average of geo-spatial analysis for capturing status/threats data.

- Have we changed the question from ten years ago? How do we propose to incorporate existing science into this process based on an old question and how is that connected to the new question? *The Partnership is searching for an answer to this question as well.*

- How do we take the six topics and combine them to create a plan? *The Partnership structure is working to find the value of each ecosystem component and find out where efforts have been focused already.*

- When it comes to exposure, how is the time/spatial component captured? *We measure what the level of risk is to the species, for instance, or measure over time and refine the data.*

- What level of information will be used to influence policy makers? *The Partnership is working to figure out the best way to deliver the message to policy makers. This first step is rough and the Action Agenda will not be perfect, but we will learn from what happens this time around.*

- The Whidbey action area is huge and the meeting is soon. Will we have any of this information (from today) back by then? *Probably not at this round of meetings.*

- Why are we not using a desktop modeling program that takes the data down to the pixel level? *For now we only have preliminary data and we did not want to get down to that level of detail.*

- There are better options for mapping this material. *Great! If the scientific community can provide the data, then others might know how better to display it. That is definitely good information to have.*

Status small group discussions
Meeting participants broke into six self-selected workgroups based on the ecosystem goals (habitat/land-use, human health, quality of life, species/biodiversity, water quantity, water quality). They were asked to consider three questions related to the status of Puget Sound:

1) What other datasets are available to contribute to the status analyses?
2) How can we translate quantitative data into a categorical assessment of status (e.g. (H)igh, (M)edium and (L)ow)?

3) Should several status attributes ('indicators') be rolled up into a single category, and if so, how should we do this?

Key responses are highlighted below and organized by ecosystem goals.

Habitat/Land-use

1) What other datasets are available to contribute to the status analyses?
   - Puget Sound Nearshore Partnership
   - National Resource Council, 2000
   - Forest Service study at potential natural vegetation area
   - University of Vermont and University of Washington work estimating Puget Sound services
   - Shoreline Management, Washington State Department of Ecology (Ecology)
   - Habitat monitoring protocol, 1991 (species associated with attributes)
   - Flood zone data (flood inundation areas)
   - Habitat assessments
   - Nature Conservancy data (terrestrial biased)

2) How can we translate quantitative data into a categorical (e.g., H, M, L) assessment of status?
   - Need short-term trends as well as historical data
   - Need to look at "range of potential" as a metric of departure

3) Should several status attributes ('indicators') be rolled up into a single category, and if so, how should we do this?
   - Need extent and status for each indicator
   - Goods and services

Additional indicators:
- Water temperature
- Conceptual model used as guideline – eel grass monitoring, land use, land cover, sea map, air, streams, rivers, lakes, sea lattice, percent of historical marsh areas, estuary marsh types, historical estuary, river and channel type, longitudinal perspective (sub metrics for rivers)
- Future effects of deposition

Remaining questions/concerns:
- Level of scale – At what level do we detect change? This is very important in order to compare data
- How to compare habitat to species indicators? For example, Hood Canal summer chum diversity looked at habitat and used Eco-regional units; may need different spatial scales for different species
- Population density map may be useful for species

- Habitat mapping assessment connecting to threats may lead to problems because threats are the focus
- It is very important to track work
- Include humans (use areas) and get correct human health factor; elements impacting public impact human health, not just ecosystems
- Need to factor in environmental trade-offs
- Is it necessary to map urban tree cover?

Human Health

1) What other datasets are available to contribute to the status analyses?
   - Puget Sound Update (PCBs, Mercury, PBDEs, PBT)
   - National Ambient Air Quality Standards (NAAQS); Puget Sound Clean Air Agency; Olympia Clean Air Authority. Need to add air quality to the list of concerns and contact the local air agencies – particulate matter is an indicator and monitors already exist
   - County-wide assessments on community health
   - NOAA status and trends program
   - Mussel watch program with rich data set
   - Department of Health data on paralytic shellfish poisoning (PSP) and domoic acid
   - Levels of blood lead – the Department of Labor and Industries maintains records and Ecology will have a recommendation in the Chemical Action Plan (contact: Steve Whittaker)
   - County data sets on arsenic in soil samples, private/public wells
   - Toxic waste plans; Superfund, MTCA
   - Measure blood of certain populations – more practical to measure fish tissue for toxins
   - Cancer registry
   - Birth defects registry
   - EPA Manchester facility
   - What people eat, drink, breathe and swim in

2) How can we translate quantitative data into a categorical (e.g., H, M, L) assessment of status?
   - Use whether the data meets the health standard or not (exceeds safe doses, etc.)
   - Health comparison values
   - For other items (such as asthma rates) you have to use trends (trending up or down)

3) Should several status attributes ('indicators') be rolled up into a single category, and if so, how should we do this?
   - Fish index
   - Fecal coliform index
   - Puget Sound index

Additional indicators:

- Particulate matter (diesel particulates)
- Paralytic shellfish poisoning (PSP)
- Pathogens on beaches – fecal coliform; algal growths
- Vibrio outbreaks
- Sewage exposures
- Combined sewer overflow
- Failing septic systems
- West Nile virus
- Number of hazardous waste sites
- Arsenic in soil samples
- Asthma rates
- Nitrate, bacteria, arsenic in well water samples
- Frequency and volume of sewer overflows
- Nitrate, bacteria, arsenic in well water samples

Remaining questions/concerns:

- Graphic of fecal coliform distribution did not identify data source used (Ecology does not study nearshore and Department of Health does mainly nearshore)
- What testing has been done for other contaminants (such as flame-retardants)?
- Don't these issues need to be unique to Puget Sound?

Quality of Life

1) What other datasets are available to contribute to the status analyses?
    - Sustainable Seattle indicator system categorizes indicators as leading or lagging (www.sustainableseattle.org)
    - Siteline maintains an index for happiness in ID, WA, OR; could act as a guide to find helpful indicators
    - King County – land use zoning
    - Gov. Gregoire mandated new data sets be tracked (e.g. greenhouse gasses)
    - Puget Sound Regional Council maintains transportation data for four counties
    - Washington State Department of Transportation tracks travel time between points by distance; average daily trips for all major roadways in region
    - Aquaculture data
    - Ecological Footprint model could provide good structure for explaining human well being

2) How can we translate quantitative data into a categorical (e.g., H, M, L) assessment of status?
    - Not discussed in detail

3) Should several status attributes ('indicators') be rolled up into a single category, and if so, how should we do this?
   - Not discussed in detail

Additional indicators:
- Population density
- Agricultural production
- Transportation impacts
- Visibility (view shed)
- Gross Domestic Product
- Resource industry jobs in rural counties
- Drinking water quality
- Greenhouse gas emissions
- Property loss due to flood events
- Land use: agriculture, schools, affordable housing

Remaining questions/concerns:
- Need to decide whether indicators are positive or negative signs
- Need to marry scientific approach to community approach
- Last three indicators on handout are 'bizarre'
- Fishing data is always ~5 years behind
- Important to keep rural values vs. urban values in mind

Species/Biodiversity

1) What other datasets are available to contribute to the status analyses?
   - Not discussed in detail

2) How can we translate quantitative data into a categorical (e.g., H, M, L) assessment of status?
   - Not discussed in detail

3) Should several status attributes ('indicators') be rolled up into a single category, and if so, how should we do this?
   - According to ecosystem level
   - Levels of attributes must be informed by multiple levels of biological organization and related to humans
   - Lay out attributes and identify potential for testing
   - Identify data sets with long-term average and baseline

Additional indicators:
- Non-native species (in addition to threats)
- Benthic micro algae should be a single attribute (not grouped with benthic diatoms and other micro algae)

- Need greater terrestrial habitat representation

Remaining questions/concerns:

- Are you looking at published data outside the area?
- The process is not looking at higher-level ecosystem analysis
- Need metrics
- How will attributes turn into indicators? Are the terms synonymous? *In San Juan County; attributes were linked to indicators. We identified attributes and then identified indicators.*
- It is disingenuous to invite us here and ask our opinion, but then say this is the process.
- This seems process heavy. Why go through a bureaucratic process when the State of the Sound reports got people's attention in the first place? Why not cut out all the process and use those indicators?
- What are High, Medium and Low? Is it a risk level?
- Is there room in this process to look at other areas where the ecosystem state has totally changed, like the Bering Sea? We should have an integrated approach – have we changed the state of the habitat in Puget Sound? Is it human-caused or ocean-caused? Look at long-term trends
- The message is too compartmentalized
- Do you want raw numbers or a summary of a summary?
- Why aren't we talking about critical species and trophic pathways instead of saying let's go search for stuff and assume it is right?
- Organizationally, this needs the six status measures under each group (abundance, quality/persistence, trends, productivity, spatial structure, and spatial distribution). This is very heterogeneous
- Need to have more than just abundance data to make your data more robust. Datasets need more analysis. You can't lump all assessments and expect to get a better assessment.
- Baleen whales might need to be taken off the attribute list

Water Quantity

1) What other datasets are available to contribute to the status analyses?
   - <u>Freshwater</u>
     - American River assessment on delta flows under potential CO^2 increase
     - Ecology (new hydro model)
     - US Geological Survey (USGS); surface water low flow stats may be useful for base flows and draw inferences
     - Ecology Stormwater Manual (2009)
     - UW (Booth's work)
     - Green Building Development Industry (case by case basis; need to standardize)
     - Western Washington University (long-term changes in surface water in the Skagit River)

    - Pacific Northwest National Library is conducting a study for the Snohomish River and there is a collection of data on snow pack and satellite data that is somewhat useful. Ed Jasper is working on change in the South Cascade Glacier and impacts to the Skagit River and Thunder Creek. There has been a lot of work done in this area.
    - Surface water by wells study
- Saltwater
    - EPA; San Francisco implemented standards to maintain salinity regime that is important for habitat; EPA here is doing the same
    - NOAA (Casey Rice); field studies of salinity regimes and temperature around Sound (need data for North and South Sound)
    - Model of Snohomish estuaries on tidal effects
    - Chinook distribution

2) How can we translate quantitative data into a categorical (e.g. H, M, L) assessment of status?
    - Not discussed in detail

3) Should several status attributes ('indicators') be rolled up into a single category, and if so, how should we do this?
    - Not discussed in detail

Additional indicators:
- Off-channel storage facilities
- Temperature
- Key locations of low flow

Remaining questions/concerns:
- What status are we reporting on?
- Does the Partnership want maps for average flows?
- What does water quantity mean? Does it mean extreme events, because we have a lot of specific data for a few events, or do they want average flow conditions?
- How important are groundwater studies and are groundwater flow and models available?
- USGS data is available but what else?
- Does water quantity mean the amount coming into the Sound or being taken out?
- Should this group deal with the effects of climate change?
- Need Sound-wide future stream flow modeling (Skagit and Snohomish currently being done) and small scale estuary data to evaluate the impacts
- Need to know comprehensive land use plans in the urban growth boundaries –useful tool would be alternative future analysis related to development patterns
- Need to know impact of groundwater withdrawals on nearshore environments. There is some work being done in Hood Canal
- Shallow groundwater

- Wind-direction effect on the South Sound
- Important to capture the stream types in the South Sound that are not snow pack driven, but lake fed – there is a hydrological divide in stream flows around Olympia due to glacier vs. lake fed streams
- Sound plumbing and impacts; small streams and sub surface flow are important to habitat
- Effects of dams on flow quantity?
- Key locations and temperature
- Should the Fraser River be included?
- Look at small estuaries

Water Quality

1) What other datasets are available to contribute to the status analyses?
    - Ecology – 303(d) list (toxics in fish tissue)
    - Washington State Department of Fish and Wildlife – toxics in fish/crabs
    - Toxics in low impact development stormwater
    - Department of Agriculture and USGS – pesticides in rivers (NAWQA data)
    - US Fish and Wildlife and USGS – bird data
    - Air Quality (particulates)
    - WSDOT (ferries) – stormwater data
    - National data sets
    - National Urban Run-off Program
    - EPA
    - Federal Highways Administration
    - Atmospheric deposition
    - Toxic loading study – Puget Sound Partnership (Scott Redmond)
    - Trace metals data for stormwater marine water sediments
    - NOAA – Mussel Watch
    - EPA – E-Map
    - NOAA – Oceans and Human Health
    - Ecology – Toxics at Ocean Boundaries (Dale Norton)
    - Ecology - Freshwater
    - USGS – Lakes (Bob Black)
    - USGS – Snow pack (Olympic National Park)

2) How can we translate quantitative data into a categorical (e.g. H, M, L) assessment of status?
    - Must be based on science
    - Set different standards for each category
    - If little/no science exists, then use elevation over background, change in time, comparison to other areas

3) Should several status attributes ('indicators') be rolled up into a single category, and if so, how should we do this?
   - Water quality can be rolled up into four categories:
     - Toxics (15 types) – water, sediments, air, tissue, freshwater (ground, surface)
     - Biotoxins (domoic acid and PSP) – water, tissue
     - Eutrophication/Nutrients/Dissolved Oxygen – some work already done
     - Pathogens – FCB, Entero, other water/tissue
   - Roll-ups for communication should hit specifics in text and link to impacts

Remaining questions/concerns:
- A number of "threats" are missing or require modifications with respect to pollution
  - Stormwater should be separated into developed and un-developed run-off
  - Climate change, forest practices, aquaculture and loss of wetlands need to be added
  - Spills should be separated from discharges

Threats small group discussions
Attendees re-organized into four self-selected groups to discuss threats to Puget Sound and the use of conceptual models to represent data and analyses. They were asked four questions:
1) What other datasets are available to contribute to the threats analyses?
2) How can we translate quantitative data into a categorical (e.g., H, M, L) assessment of threats?
3) Should several threats indicators be rolled up into a single category, and if so, how should we do this?
4) What refinements to conceptual models should we consider for linking status and threats to priorities?

The following is a summary of these discussions.

1) What other datasets are available to contribute to the threats analyses?
   - US Coast Guard risk assessment for oil spills
   - Vibrio analysis
   - Domoic acid data
   - Ecology and local area monitoring data (air pollutants, lead)
   - Hood Canal analysis of net effect of services out of a watershed
   - Air quality measures – Joan Hardy
   - Other NAAQS
   - Pathogens in swimming areas (fecal, algal)
   - Sewage overflows (treatments) – frequency/volume/failures
   - NOAA status and trends project – 12 stations in the Puget Sound
   - Mussel watch
   - Inorganics as a result of flooding

- Biomonitoring of humans – fish tissue monitoring is a better measure
- Labor & Industries data on lead exposure
- Hazardous waste sites (State and Federal)
- Area-wide arsenic (soil)
- Drinking water and private wells
- State/local monitoring of public wells
- City wide assessments tracking cancer, birth defects and asthma (causes of death)

2) How can we translate quantitative data into a categorical (e.g., H, M, L) assessment of threats?
   - Starting with quartiles is okay, but there is literature on how much a stressor system can handle, so use that expert knowledge to create the levels
   - All threats are high until you can show they are not
   - PSAMP model
   - Need biologically meaningful responses; dose responses. Monitoring designs have to have a dose plot. Then you can have the nature of the relationship.
   - We can't make this an "out" for people by arbitrarily picking levels without asking for true science; we have to make sure it is done right

3) Should several threats indicators be rolled up into a single category, and if so, how should we do this?
   - Stormwater management
   - Habitat alteration
   - Human population growth
   - Natural drivers
   - Pollution
   - Species invasion
   - Surface/groundwater impacts
   - Harvest
   - Invasive species
   - Resources
   - Recreation
   - Aggravators
   - Economic development
   - Constraints in fish
   - Persistent bioaccumulatives and toxics
   - Fecal
   - Paralytic shellfish poisoning

4) What refinements to conceptual models should we consider for linking status and threats to priorities?
   - Need to include synergistic/non-linear threats
   - Climate change needed in the model
   - Links are not apparent in this model. We need to link the status and threats, link the indicators and goods and services
   - Add resilience factor in conceptual models
   - Group by region, use, type, etc.
   - Environmental indicators
   - Are we doing a model for each action area or the whole Sound?
   - What is our purpose? Who is our audience? These questions are critical considerations
   - Process of getting there is important to our group – a social exercise
   - Exposure through eating, drinking, breathing and swimming
   - Build a conceptual model for each threat and driver, e.g. littering is bad but it doesn't have a direct response. Start with individual conceptual models to understand linkages

Wrap up / Next Steps

The meeting was closed by Mary Ruckelshaus who thanked everyone for participating. She asked participants to remain engaged in the process and to continue to help this collaborative and thereby successful process. She also noted that:

- Meeting handouts and the PowerPoint presentation will be posted on the Partnership Web site
- An e-mail will be sent to the group regarding future meetings and document review