Task 3: Identify, compile, and summarize existing indicators that have been proposed, are currently being used, or have been used in the past for the Puget Sound ecosystem.

Development of selection of a set of environmental indicators to assess the health of the Puget Sound ecosystem will require a lengthy (i.e. two years or more) iterative dialogue between scientists, managers and the general public. In the near term, however, a short-term qualitative process that solicits and organizes expert judgment from the scientific community will be used to evaluate and select a list of provisional environmental indicators from locally **available** indicators, leaving development of new indicators to a Phase 2. Unlike previous indicator efforts in Puget Sound, the available indicators will be evaluated against a common set of criteria, developed separately in Task 1, to assess their quality. These provisional indicators will be used to assess whether the health of Puget Sound is improving and whether the Action Agenda is moving towards achieving the Partnership goals.

To create the list of available environmental indicators to be evaluated (i.e. potential individual indicators), NOAA staff worked with the Provisional Indicator Technical Working Group (TWG) to inventory the indicators that have been proposed, are currently in use, or have been used in the past in Puget Sound and Georgia Basin. First, the TWG members compiled a spreadsheet with the list of documents (and sometimes named databases) that included indicators. Each document was assigned a unique reference number. This list of references for Puget Sound indicators is referred to as the list of lists (see Table 3.1). Over 100 documents/datasets were identified, each containing its own list of individual indicators that needed to be inventoried into one comprehensive list of potential individual indicators. The sets of indicators covered in these reports include those developed by PSAT (including the Puget Sound Assessment and Monitoring Program), the Governor's Forum on Monitoring, Puget Sound Georgia Basin Trans-boundary Indicator Workgroup, Sustainable Seattle, The Nature Conservancy, Biodiversity Council, and others. The list of list also includes non-indicator reports such as the DOE 2006 Report on Status and Trend Monitoring Report for Watershed Health for Salmon Recovery, as it contains lists of proposed indicators. Collectively, these references include indicators for the whole ecosystem: terrestrial ecosystems, freshwater and marine environments, species diversity, and human well-being (i.e., health, socio-economic, cultural).

To compile the inventory of individual indicators, a consultant was hired to help identify the indicators in each document on the list of lists. Each document was briefly reviewed for the following:

-- Individual indicators, criteria or item measured for each indicator, a general description of methods used, scope of research, general conclusions (if any),
-- Data source(s),
-- Dates of data collection (generally by year),
-- Geographic area of coverage (to correlate with Action Areas) as represented in a figure or in text

Each individual indicator was then assigned the following:

-- Habitat type associated with specific indicator or where data was collected (Freshwater, Marine deep water, Nearshore & estuarine, Upland, or All)
-- PSP Ecosystem Component / (Habitat, Water Quality, etc.)
-- PSP Outcome (HB-1, WQL-2, etc.)

-- Master indicator (indicator "buckets" or categories).

With much assistance from TWG members, duplicate or near-duplicates were identified. Some edits provided by TWG members have yet to be edited (e.g. those from Glen Merritt). More work is needed to identify duplicates, however, some of this can be accomplished at our small group meeting to be held the week of April 21st.

The resulting spreadsheet contains the List of Individual Indicators (see Table 3.2). Individual indicators have been separated into those three groups: 1) "Potential Indicators" 2) "Broadly scoped HWB Indicators" and 3) "others". Each group is noted as separate worksheet Tabs within the spreadsheet.

The "Potential Indicators" worksheet includes indicators likely covered by the scope of the Puget Sound Partnership. A subset of the "Potential Indicators" worksheet contains indicators that may serve as both environmental indicators and human well being indicators (noted in column C with the works Retain HWB).

The "Broadly scoped HWB Indicators" contains those indicators of human well being that could be included in the list of potential indicators if a very broad definition of human well being is used. The indicators are closely linked to environmental indicators, and are value free.

The "Others" indicators are not being considered as potential indicators because they are unrelated to any of the PSP goals (both broadly and narrowly interpreted) and that are not value free.

The "Master Indicator" names were redefined into broader categories to more easily view related indicators. For example, all species related indicators have the word "Species" at the start of the name. For simplicity's sake, indicators associated with vegetative structures (e.g., eelgrass) were listed as habitat but not as species. Duplicate or near-duplicate records were identified and "New Indicator Name"(s) were assigned.

A Unique List of Individual Names (see Table 3.3) was created from combination of "Master Index Name" and "New Indicator Name".

NEXT STEPS:
Additional work is needed by the TWG to refine the list of individual to remove additional duplicates, remove obvious non-indicators, and complete indicator descriptions.

Coordinate with PNAMP to ensure continuity with other regional efforts to identify environmental indicators. Clarifying indicator definitions may help to minimize the functional duplicates.

Major gaps need to be identified. A list of non-Puget Sound references detailing indicators used nationally or in other regions (e.g. San Francisco Bay), or papers proposing a specific indicator (e.g. use of predator/prey ratios as an indicator of ecosystem health) has also been compiled (see Table 3.4). This information will used to identify gaps in the types of indicators for the Puget Sound region. As time allows, we will compile a list indicators used nationally, in other regions and proposed in the scientific literature. This list will not be evaluated per se, but can be compared with the inventory of indicators (Task #3) to identify major gaps in the Puget Sound indicators.

EARLY FINDINGS

The list of individual indicators is quite large (approximately 400), in large part because there is a non-standardized reporting of indicators throughout the regions. For example, the same data measurements are analyzed and reported in slightly different ways by multiple agencies.

The list of potential individual indicators consists mostly of state and impact indicators with few pressure or response indicators (see Task 2 for D-P-S-I-R). If the objective of developing and monitoring indicators of Puget Sound health is to assess the over status (i.e. just how serious a problem is then, state or impact indicators are preferable (Niemeijer and de Groot 2008). However, more focus on pressure and response indicators will be needed if the the objective is to best know how best to control a situation.

The number of indicators among the ecosystem components is unbalanced, with very few indicators of water quantity for example. Future selection efforts will need to focus on selecting the best available indicators for each ecosystem component. A well defined framework and set of criteria for selecting indicators (see Task 1 Summary) will be needed to identify "functional redundancy" (Pijak, 2000) of similar indicators.