



Puget Sound Partnership
Water Quantity Topic Forum – Introduction
May 5, 2008

PugetSoundPartnership
our sound, our community, our chance



Welcome

- Thank you in advance for your contribution

Water Quantity Core Workgroup

- Bill Graham
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- Brian Walsh
Water Resources Program Manager, Washington Department of Ecology
- Carl Samuelson*
Policy Assistant, Washington Dept of Fish and Wildlife
- Hal Beecher*
Instream Flow Section Manager, Washington Dept of Fish and Wildlife
- Jim Miller
Engineering Superintendent, City of Everett
- Llyn Doremus
Hydrologist, Nooksack Indian Tribe
- Steve Hirschey
Regional Water Policy Analyst, King County Department of Natural Resources

* WDFW represented by Hal Beecher/Carl Samuelson team

Core Group Charge

- **Develop 4 Memos - 2 Science, 2 Policy**
 - Define the scope of water quantity wrt Partnership Goals
 - Broad scale (Puget Sound Region – 19 WRIAs)
 - Every point must be supported by science
 - Address the “what” not the “how”
 - Answer specific questions
 - Used 2006 Partnership work as a jumping off point
- **Three week timeframe**

Water Quantity Scope

- Based on goals of the 2020 Action Agenda

A healthy Puget Sound region can be defined as having quantities of fresh water that are sufficient to support:

- Freshwater and terrestrial food webs and human uses and enjoyment within **all watersheds draining into the Sound**; and
- Estuarine, nearshore, and marine food webs and the habitats upon which they depend.

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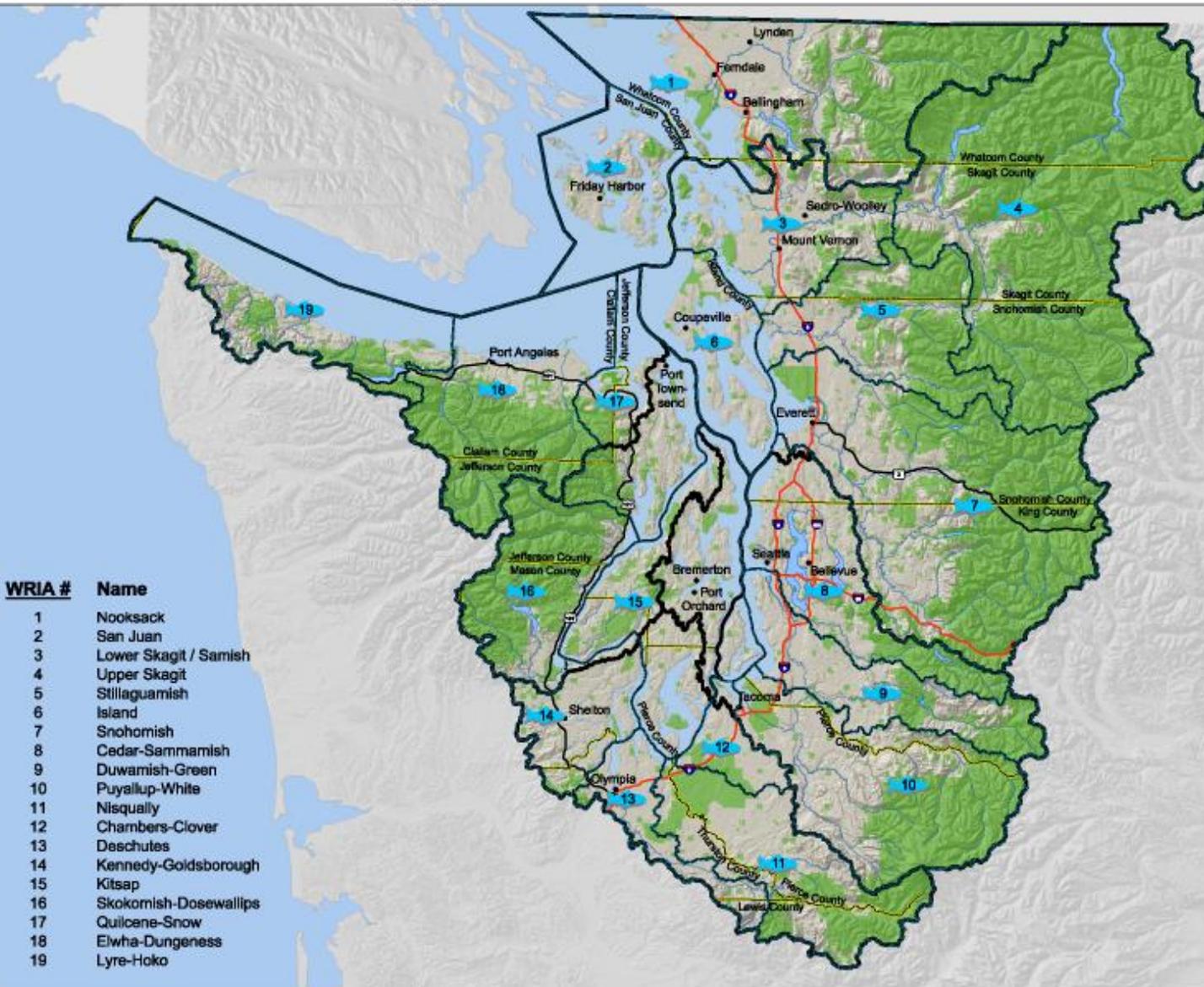
Scope of Water Quantity Effort

- Stream flows and groundwater, and effects on habitat productivity and domestic water supply within 19 Puget Sound WRIAs.
 - *How can we ensure that freshwater supply (groundwater and surface water resources) is sufficient to support freshwater and terrestrial species and human uses?*
- Freshwater inflows to Puget Sound.
 - *How can we ensure that freshwater supply is sufficient to support estuarine, nearshore and marine food webs and the habitats on which they depend?
Circulation, salinity?*

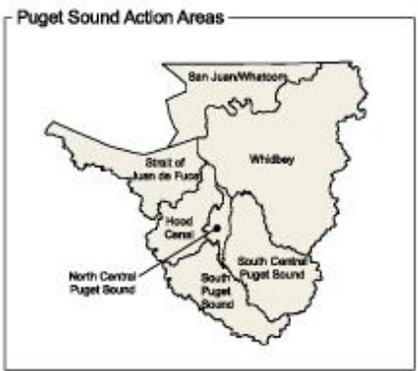
Geographic region includes all 19 WRIAs within the Puget Sound (mountains to sound)

**Puget Sound Action Agenda
Base Map
March 5, 2008**

-  Action Area Boundary
-  County Boundary
-  Water Resource Inventory Area (WRIA) #
-  Federal, State, Local Publicly Owned Lands
-  Major Cities
-  Interstate Route
-  US Route
-  Rivers



WRIA #	Name
1	Nooksack
2	San Juan
3	Lower Skagit / Samish
4	Upper Skagit
5	Stillaguamish
6	Island
7	Snohomish
8	Cedar-Sammamish
9	Duwamish-Green
10	Puyallup-White
11	Nisqually
12	Chambers-Clover
13	Deschutes
14	Kennedy-Goldsborough
15	Kitsap
16	Skokomish-Dosewallips
17	Quilcene-Snow
18	Elwha-Dungeness
19	Lyre-Hoko



Today

- Assume you have read the paper
- Threats associated with land use are addressed by the Land Use/Habitat Topic Forum
- Moving from S1 to P2 – Will park P2 comments until this afternoon

Your Input

- References that would further the science, regionally
- Have we missed any major threats
- Holes
- Management strategies with document effectiveness monitoring
- Key themes from each paper that can be carried forward in the action agenda
- What recommendations would you like to add or change, why (Memo P2)



Puget Sound Partnership

Science Question S1

Status of Freshwater Quantity in Puget Sound

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Freshwater Topic Questions

- Where are the amount, timing and distribution freshwater flows adequate? Impaired?
- Where is freshwater supply not adequate to protect habitat function?
- Where is freshwater supply inadequate to meet current and future human demands?
- Threats to water supply and availability
- Data sources: watershed assessments, others
- Certainty/ Gaps in our understanding

Freshwater Inflows to Puget Sound

What we know -

- River & stream flows support multiple ecologic functions
- River flow regimes also play a major role in estuarine, nearshore and marine health
 - Deliver nutrients and sediments
 - Affect salinity levels
 - Affect circulation
- Skagit and Snohomish River discharge most fresh water to Puget Sound from the US watersheds
- Two major periods of freshwater runoff into Puget Sound
Peak flows in Dec and June
- Freshwater entering Puget Sound decreased by 18% between 1948 and 2003 (Snover, et.al., 2005)

Upland Watershed Hydrology

Where are flows adequate, where are they impaired?

- “Adequate” flow threshold is not well defined
- Full ecosystem functions must be considered when assessing what constitutes “adequate” flows
- Water bodies with “altered” hydrology are well known

Upland Watershed Hydrology

Where are flows adequate?

- Most watersheds in Puget Sound have been altered by various land uses.
 - Health of aquatic systems declines when the level of impervious surface exceeds $<10\%$
 - high population density and associated land uses lead to greater variation between low and peak flows
 - Water withdrawals for human use lead to flow impairment
- Hydrologic alteration occurs at low levels even in undeveloped watersheds without mainstem dams



Upland Watershed Hydrology

Where are flows impaired?



12 of 19 watersheds in Puget Sound have some portion of the streams or rivers are closed to further appropriation

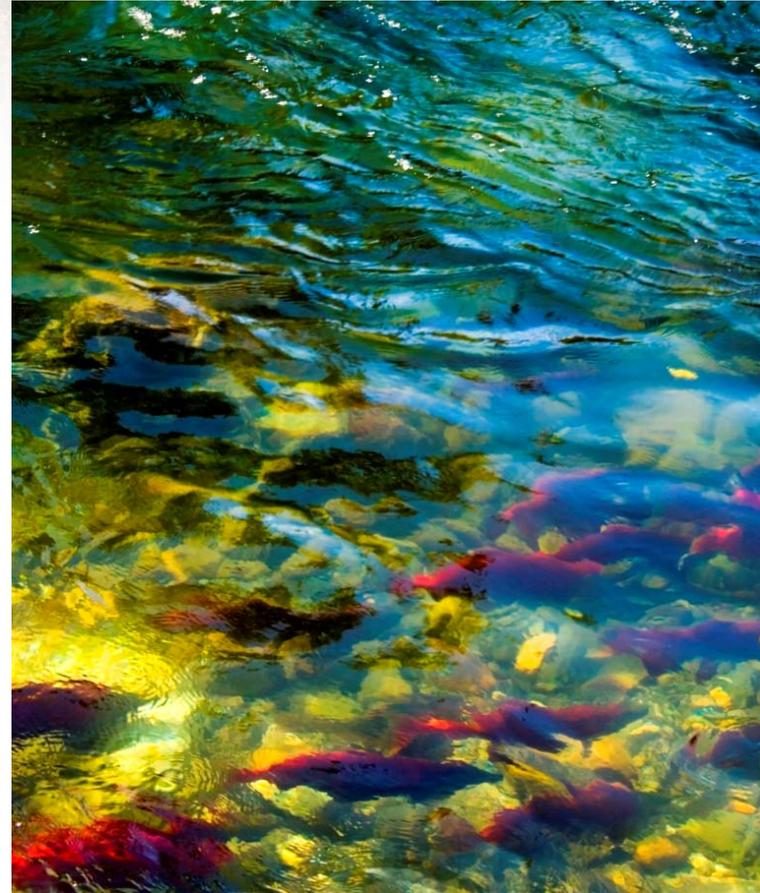
Upland Watershed Hydrology

Where are flows adequate, where are they impaired? **GAPS**

- No regional characterization of freshwater resources in Puget Sound exists
- Typically assessed at the WRIA scale or smaller
- Challenges to assembling a Regional Summary:
 - Disparity in water quantity data and its varying geographic distribution
 - Regional variation in climate and geology
 - Temporal and geographic variability in species needs
 - Institutional and political sensitivities associated with water use and instream flows

Adequacy of freshwater to protect habitat function

- Limiting Factors (WSCC, 2005)
 - 11/19 WRIAs – “poor” low flows that may be limiting to fish survival
 - 12/19 WRIAs – “poor” high flow ranges
- 2004 State of Salmon Watersheds Report
 - Nooksack, Snohomish, Lake Wa., Green, White, Puyallup, Dungeness, Elwha (water critical – overappropriated)
 - Stillaguamish and lower Skagit (low flow)
- Empirical data supporting these ratings are generally lacking!!



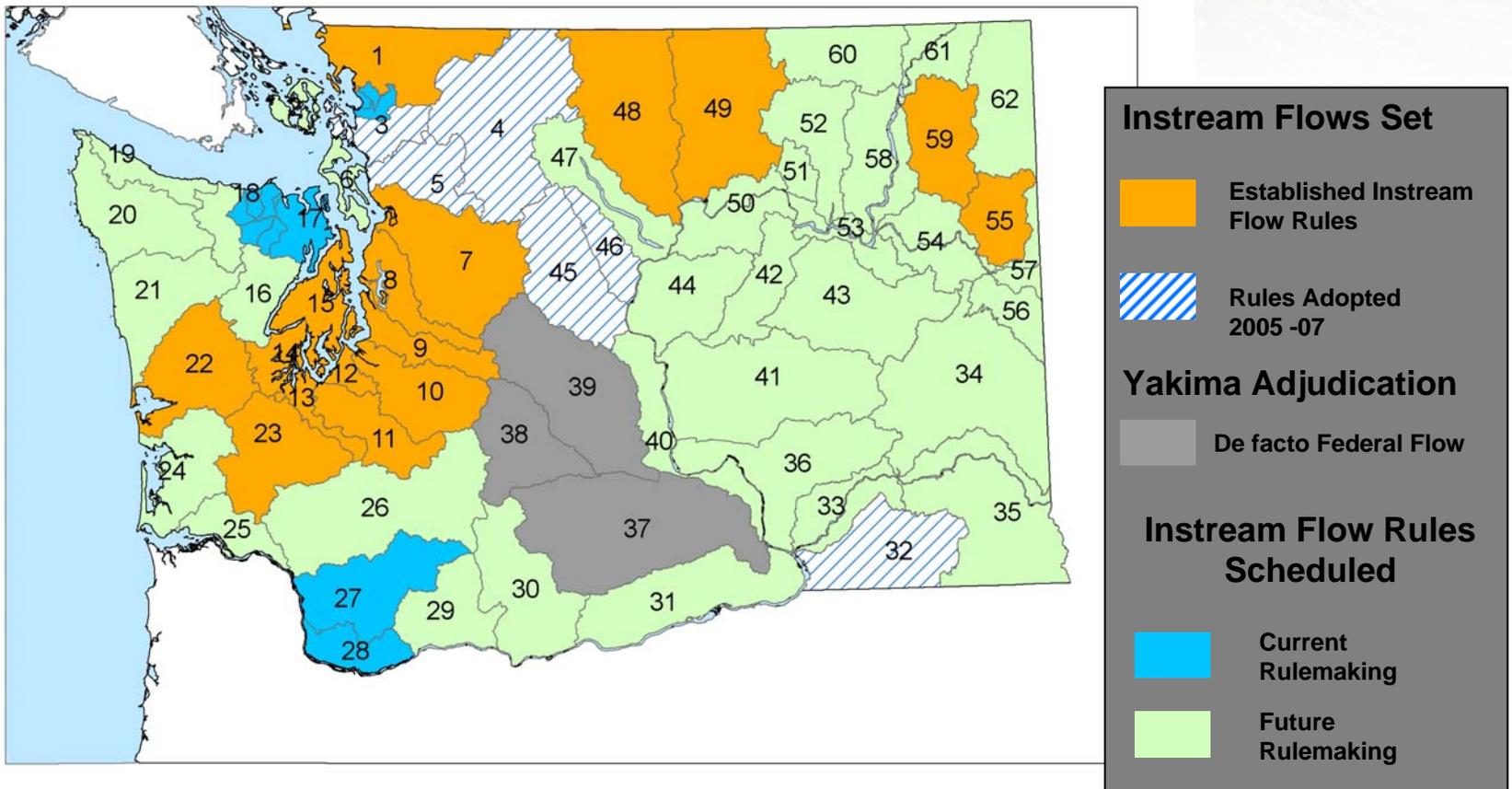
Adequacy of freshwater to protect habitat function – GAPS

- Low flow requirements for aquatic species are not well understood, and they are linked to other ecosystem elements.
- Relationships between flow and the 4 VSP (Viable Salmon Population) parameters have not been determined. No flow targets have been set for fish.
- Lacking regional assessment of adequacy of flow variations for optimum habitat function
- Limited local data indicating effects of flow alterations on native species exist, however the data have not been quantified or extrapolated more regionally.
- Future adequacy of flows for aquatic habitat is unknown. No assessment of impacts of future withdrawals, climate change, etc.

Adequacy of freshwater supply for current and future human uses

- Almost all WRIAs have local areas where supplies are not adequate for current or future domestic and municipal demands (physical availability, legal availability, seawater intrusion).
- Exempt wells – unquantified and growing component of supply
- Future demand – 1.4 million people by 2020 (136 MGD additional water for domestic and municipal use)
- Instream flow rules set in 12 watersheds, closed or partially “closed” basins, makes obtaining new water rights for future growth uncertain or more difficult.

Instream Flow Rules



Adequacy of freshwater supply for current and future human uses- GAPS

- Actual water use is unknown.
- No statewide program compiles and reports domestic and municipal water use information -- potential water supply shortfalls are not known at a regional level.
- No program compiles agricultural water use information or tracks trends in agricultural water use.
- Regional water supply planning, although occurring in the central Puget Sound, is not widespread.
- Water system plans are numerous and not regionally compiled or coordinated.
- Permit-exempt water use is not well accounted for.

Major Threats to Freshwater Supply and Availability

- **Human consumption**
 - Over commitment through current withdrawals and diversions
 - Projected increases in consumptive use due to population growth
- **Altered hydrology**
 - Land use practices: (*addressed by Land Use Topic Forum*)
 - increase impervious surfaces,
 - cause higher peak flows and lower low flows,
 - reduce groundwater recharge,
 - reduce wetlands extent and function
- **Altered weather patterns** - associated with climate change
- **Seawater intrusion** - Loss of coastal groundwater supplies

Major Threats - Climate Change

- Known threat that will compound other threats.
- Effects vary between snow dominated watersheds and lowland watersheds within the Puget Sound
- Generally, global warming will cause
 - Increased winter flows
 - Earlier and reduced peak flows in spring
 - Reduced summer flows
- No regional Puget Sound efforts to quantify impacts of climate change on streamflows and water supply are currently underway

Certainty of Our Understanding

- Little certainty re. the adequacy of freshwater supply for instream needs and out-of-stream beneficial uses at a regional level, now and into the future.
- Relationship of instream flow to aquatic species habitat not well quantified. Most information is general or qualitative in nature.

Overview of GAPS

- localized hydraulic continuity between surface water and groundwater poorly understood;
- quantitative relationship between streamflow and fish productivity undefined;
- quantitative understanding of high flows affects on geomorphology and fish habitat undefined;
- flow impairments need delineation (both low and high flow problems) for Puget Sound watersheds (similar to the inventory of low flow impairments conducted by the King County Tributary Flow Committee (2006) in WRIAs 8 and 9);
- freshwater requirements for estuary health poorly understood;

Overview of GAPS (cont'd)

- comprehensive Puget Sound-wide understanding (survey) of water system plans and watershed plans is lacking;
- locations where water supply is inadequate to meet projected demand between now and 2020 and the projected quantity of water needed are unknown;
- trends in Agricultural water use in Puget Sound undefined;
- groundwater level trends unknown on a regional scale.

Overview of GAPS (cont'd)

presented in Table S1-1

- summary of watershed scale assessments by WRIA , showing where assessments have and have not been done in Puget Sound region.
- overview of full or partial basin closures and instream flow rules by WRIA, where flow rules are older or have not been codified in the Puget Sound.

(page 11-14 of Freshwater Resources Topic Forum paper)

Discussion – Your Input Is Needed

- What did we get right?
 - Have we accurately described what we know and don't know about this issue in Puget Sound and our certainty of the knowledge?
- Have we missed any major findings? References?
 - We need your references if your data/studies deepen the knowledge base of this paper at a regional scale
- Have we missed any major threats?
- What are the 3 key themes from this paper that should carry forward to the Action Agenda?