

Miradi/Adaptive Management and Monitoring Framework: WRIA 8 Project update March 12 2014

WRIA 8 has been working with the Puget Sound Partnership (PSP) to create a local adaptive management and monitoring framework using a common regional language. PSP's goal is to support the creation of local, watershed-scale monitoring and adaptive management plans that are consistent and integrated across the Puget Sound region. Consistency will help PSP identify regional trends, address gaps, and identify common funding needs. Regional monitoring and adaptive management is a required (though yet to be delivered) element of the Puget Sound Chinook Recovery Plan approved by NOAA. The effort is supported by the Puget Sound Recovery Implementation Technical Team (RITT), which produced a technical guidance document and continues to provide input into the process.

Benefits to WRIA 8. The 2005 WRIA 8 Chinook Conservation Plan acknowledged that its Adaptive Management and Monitoring components would need to be refined and elaborated. Regional guidance was considered important to keep the watershed in sync with regional efforts, as well as to benefit from the work of other technical bodies. This is an opportunity for WRIA 8 to advance its own work program to develop an adaptive management and monitoring framework, and gain a more sophisticated local understanding of our implementation gaps and monitoring needs. This work is funded by the EPA through PSP, and will support implementation of the WRIA 8 Chinook Plan, help identify those areas in need of extra attention, and contribute to the upcoming 10-year Plan review. Future capital project funding through the Puget Sound Partnership will be tied to whether the proposed projects are clearly linked to our watershed's monitoring and adaptive management framework.

Phase 2 of the project, if funded, will support completion of the framework and implementation of operational monitoring and adaptive management plans by each watershed. Funding for Phase 2 is being sought by PSP.

The framework currently in development includes the following tasks/elements:

1. Identify the **ecosystem components** relevant to Chinook salmon recovery in WRIA 8. Ecosystem components are the specific species and habitat elements we want to protect or restore: the things we care about in the context of Chinook salmon recovery. The two Chinook populations in WRIA 8 are considered the species components in this context. The WRIA 8 Technical Committee identified seven ecosystem components that comprise the freshwater and nearshore marine habitat in addition to two Chinook salmon components in WRIA 8 (Table 1).

Offshore marine habitat is not included in the WRIA 8 framework. Offshore marine habitat is outside the control or jurisdiction of the WRIA 8 Salmon Recovery Council membership, and is not a focal subject of the WRIA 8 Plan.

2. Define **WRIA 8 goals** for each component. The overall goal of the WRIA 8 Chinook Conservation Plan is "sustainable, genetically diverse, harvestable populations of naturally spawning Chinook salmon." Since the WRIA 8 Plan was not created using the "ecosystem component" terminology employed in the current framework, specific and quantifiable goals at the component level were not identified in the Plan; however, the implicit goal of the Plan is to maintain or restore the

habitat conditions and processes that sustain Chinook salmon viability (Table 1). Those habitat conditions and processes are identified below as Key Ecological Attributes.

3. Identify and prioritize ***Key Ecological Attributes and indicators*** for each component. Key ecological attributes (KEAs) are those conditions or processes that best describe the health of a particular component. Indicators are the specific elements to measure in order to assess the condition of the KEA. The Puget Sound Recovery Implementation Technical Team (RITT) provided a general taxonomy of potential KEAs and associated indicators; the WRIA 8 Technical Committee narrowed the list of KEAs and indicators to those most relevant to WRIA 8 (Table 2).

Attributes and indicators for the Chinook salmon components are consistent with the NOAA-National Marine Fisheries Service “Viable Salmonid Population” concept, as identified in the WRIA 8 Plan. Attributes and indicators for the habitat components are congruent with RITT guidance and with the NOAA-National Marine Fisheries Service *Matrix of Pathways and Indicators*.

4. Report baseline (~2005) and current (~2013) ***status*** for all indicators. Baseline and current status reporting is ongoing. Chinook abundance and productivity indicators from WRIA 8 “Fish In/Fish Out” monitoring are fairly robust in WRIA 8. Habitat information from a 5-year stream monitoring program will be available in 2014. Other data may need to be collected, either by the watershed or through a future regional monitoring effort. Still other data are available through county or state agencies (e.g. water quality indicators or remote sensing) but must be aggregated and synthesized before they are useful. The Technical Committee will continue to work to collect and report appropriate status information.

The online reporting tool being developed for this project will have a link to indicator status information.

5. Describe ***desired near-term and long-term future status*** for components and indicators. WRIA 8 Chinook salmon VSP goals were articulated in the WRIA 8 Chinook Conservation Plan (2005) and further refined through the H-Integration process (2009). Specific desired status of habitat components was discussed only in general terms in the 2005 WRIA 8 Plan. The WRIA 8 Technical Committee will work to further define and clarify desired future conditions of all selected indicators. The online reporting tool being developed for this project will have a link to indicator status information. This work will continue into Phase 2 of the project.
6. **Document what constitutes “poor, fair, good, excellent” (condition bins) for all indicators.** Some progress has been made in defining Chinook viability goals in this context; for habitat, the NOAA *Matrix of Pathways and Indicators* provides useful guidance for many relevant indicators. The online reporting tool being developed for this project will have a link to condition bins information. This work will continue into Phase 2 of the project.
7. **Identify Pressures and Stresses** affecting Chinook salmon and their habitat in WRIA 8. Pressures are human activities or natural processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of ecosystem components or their KEAs. Pressures deliver stresses directly to ecosystem components. The terminology used in this step follows PSP guidance and the International Union for Conservation of Nature (IUCN). The WRIA 8

Technical Committee has drafted an initial list of the pressures and stresses affecting Chinook salmon in this watershed (Table 3).

8. **Create results chains** describing the theory of change behind WRIA 8 salmon recovery strategies. Results chains are diagrams, like flow charts, describing the logic, sequence and expected outcomes of actions to achieve a goal. A *strategy* is a group of actions that, when combined, are intended to achieve a salmon recovery goal. WRIA 8 strategies were called “Technical Hypotheses” in the WRIA 8 Chinook Plan and were shown in bold type in Chapter 9 of the Plan. These technical hypotheses translate into 23 strategies. Results chains will be developed for these strategies through a joint Technical/Implementation Committee workshop in March 2014.

Future capital project funding through the Puget Sound Partnership will be tied to whether the proposed projects can be linked to strategies and results chains in our watershed’s monitoring and adaptive management framework. An initial assessment of the WRIA 8 Three Year Work Program has linked all capital projects to 15 strategies (Table 4).

9. **Incorporate details in the Miradi program** and platform. Incorporating the WRIA 8 Plan into the Miradi program continues on schedule.
10. **Final reporting** and documentation for Phase 1 will be complete by May/June 2014.

Tables for WRIA 8 Miradi update March 6 2014

Table 1. WRIA 8 Components and Goals

| Component | Goal |
|---------------------------------------|--|
| Bluff backed beaches | |
| | Maintain/restore <u>nearshore</u> habitat conditions/processes that support long-term viability of Chinook salmon |
| Pocket estuaries | |
| | Maintain/restore <u>estuary</u> habitat conditions/processes that support long-term viability of Chinook salmon |
| | Protect/restore water quality |
| Channels less than 50m BFW | |
| | Maintain/restore <u>freshwater</u> habitat conditions/processes that support long-term viability of Chinook salmon |
| | Protect/restore water quality |
| Side channels | |
| | Maintain/restore <u>freshwater</u> habitat conditions/processes that support long-term viability of Chinook salmon |
| Non-Channel Lakes and Wetlands | |
| | Maintain/restore <u>freshwater</u> habitat conditions/processes that support long-term viability of Chinook salmon |
| | Protect/restore water quality |
| Chinook salmon (Cedar) | |
| | W8-Chinook-1. VSP Viability-Cedar Population |
| Chinook salmon (Sammamish) | |
| | W8-Chinook-2. VSP Viability-Sammamish Population |
| Species & food webs | |
| | Maintain species/food web assemblages that support conservation and recovery of Chinook salmon |
| Uplands | |
| | Protect and Restore Forest Cover |

Table 2. WRIA 8 Key Ecological Attributes and Indicators

| Component | Attribute (KEA) | Indicator |
|-----------------------------------|---|--|
| Bluff backed beaches | | |
| | Coastal sediment deposition and accretion - extent | Length of natural shoreline |
| | Coastal sediment supply - distribution | Distribution of natural shoreline |
| | Marine riparian vegetation (MRV)-Spatial extent and continuity | Amount of MRV (shoreline length, in feet) |
| | Spatial extent of submerged aquatic vegetation (SAV) | Amount of SAV (acres) |
| Pocket estuaries | | |
| | Spatial extent of submerged aquatic vegetation (SAV) | Amount of SAV (acres) |
| | Spatial extent of pocket estuaries | Number and total acreage of pocket estuaries |
| | Marine riparian vegetation (MRV)-Spatial extent and continuity | Amount of MRV (shoreline length, in feet) |
| Channels less than 50m BFW | | |
| | Sediment dynamics - sediment transport and storage | WRIA8-rip5. Substrate composition |
| | Hydrology - high flow hydrological regime | WRIA8-rip6. Peak flow characteristics |
| | Organic matter - retention/processing | WRIA8-rip4. Large wood |
| | Riparian - spatial extent and continuity of riparian areas | WRIA8-rip1. Acres of natural riparian vegetation in mapped 100y floodplain |
| | | Total length of natural riparian bank |
| | Nutrient supply - water quality | WRIA8-rip6. Summer stream temperature (7DADM) |
| | | [Dissolved Oxygen] |
| | | [Chlorophyll A] |
| | | [Fecal Coliform] |
| | Floodplain-channel interactions - floodplain connectivity | WRIA8-rip2. Acres of 100y floodplain connected to channel (Cedar) |
| | | WRIA8-rip3. Amount of unarmored channel |
| | Habitat connectivity | % of historic accessible stream miles available to adult Chinook |
| Side channels | | |
| | Floodplain-channel interactions - floodplain connectivity | Total length of side channels |
| | Floodplain-channel interactions - floodplain structure and function | Number of side channels |

| Non-Channel Lakes and Wetlands | | |
|---------------------------------------|---|---|
| | Riparian - spatial extent and continuity of riparian area | WRIA8-lake1. Spatial extent of riparian area |
| | | Length of natural shoreline |
| | Nutrient supply - water quality | Temperature: 7DADM |
| | | [Dissolved Oxygen] |
| | | [Chlorophyll A] |
| | | [Fecal Coliform] |
| | Habitat connectivity | WRIA8-lake2. Shallow shoreline extent |
| | | WRIA8-lake3. Functioning/restored creek deltas |
| Chinook salmon (Cedar) | | |
| | Abundance | WRIA8-abund1. Total spawner abundance AUC (Cedar) |
| | | WRIA8-abund2. Total spawner abundance -- Redd Count (Cedar) |
| | Productivity - survival rate | WRIA8-prod1. Egg to migrant survival (Cedar) |
| | | Placeholder -- survival rate questions |
| | | WRIA8-prod7. Juvenile survival through lake (Cedar) |
| | Productivity - fish growth | WRIA8-prod2. Size at age (Cedar) |
| | | WRIA8-prod3. Size of fry, parr at outmigration (Cedar) |
| | Productivity - population growth | WRIA8-prod4. River outmigrants/spawner (Cedar) |
| | | WRIA8-prod5. Redd:Redd Productivity (Cedar) |
| | | WRIA8-prod6. Adult:Adult Productivity (Cedar) |
| | Spatial distribution | WRIA8-dist1. Number of subbasins occupied by spawners (Cedar) |
| | Diversity - life history diversity | WRIA8-div1. Spawning timing (Cedar) |
| | | WRIA8-div2. Age structure of upriver migrants (Cedar) |
| | | WRIA8-div3. Diversity of outmigration timing (Cedar) |
| | Diversity - genetic diversity | WRIA8-div4. Spawner alleles per locus (Cedar) |
| | | WRIA8-div5. pHOS (Cedar) |
| | | |

| | | |
|-----------------------------------|------------------------------------|--|
| Chinook salmon (Sammamish) | | |
| | Abundance | WRIA8-abund1S. Total spawner abundance (Sammamish) |
| | | WRIA8-abund2S. Total spawner abundance Redd count (Sammamish) |
| | Productivity - survival rate | WRIA8-prod1S. Egg to migrant survival (Sammamish) |
| | | Migrant to locks survival rate |
| | Productivity - fish growth | WRIA8-prod2S. Size at age (Sammamish) |
| | | WRIA8-prod3S. Size of fry, parr at outmigration (Sammamish) |
| | Productivity - population growth | WRIA8-prod4S. River outmigrants/spawner (Sammamish) |
| | | WRIA8-prod5S. Redd:Redd productivity (Sammamish) |
| | | WRIA8-prod6S. Adult:Adult Productivity (Sammamish) |
| | Spatial distribution | WRIA8-dist1S. Number of subbasins occupied by spawners (Sammamish) |
| | Diversity - life history diversity | WRIA8-div1S. Spawning timing (Sammamish) |
| | | WRIA8-div2S. Age structure of upriver migrants (Sammamish) |
| | Diversity - genetic diversity | WRIA8-div4S. Spawner alleles per locus (Sammamish) |
| | | pHOS (Sammamish) |
| Species & food webs | | |
| | Predator population size | WRIA8-web3. Lake WA predator/competitor survey |
| | Food web energy & material flow | Isotopic signature |
| Uplands | | |
| | Spatial extent of forest cover | WRIA8-for1. Acres of forest |
| | Continuity of forest cover | Forest fragmentation index |

Table 3. WRIA 8 Pressures and Stresses to Chinook salmon in WRIA 8. Definitions of terms follows International Union for Conservation of Nature (IUCN) terminology.

| Pressure | Stress |
|---|--|
| Housing & Urban Areas | Conversion of land cover for residential, commercial, and industrial use |
| Commercial & Industrial Areas (Including Ports) | Conversion of land cover for natural resource production |
| Tourism & Recreation Areas | Conversion of land cover for transportation & utilities |
| Annual & Perennial Non-Timber Crops | Terrestrial habitat fragmentation |
| Livestock Farming & Ranching | Shoreline hardening |
| Marine & Freshwater Finfish Aquaculture | Shading of shallow water habitat |
| Mining & Quarrying | Dams as fish passage barriers |
| Roads & Railroads (Including Culverts) | Culverts and other fish passage barriers |
| Utility & Service Lines | Terrestrial and freshwater species disturbance in human dominated areas |
| Shipping Lanes and Dredged Waterways | Terrestrial and freshwater species disturbance in natural landscapes |
| Logging & Wood Harvesting | Species disturbance - marine |
| Fishing & Harvesting Aquatic Resources | Altered peak flows from land cover change |
| Recreational Activities | Altered peak flows from climate change |
| Fire & Fire Suppression | Altered low flows from land cover change |
| Abstraction of surface water | Altered low flows from climate change |
| Abstraction of ground water | Altered low flows from withdrawals |
| Dams | Flow regulation -- prevention of flood flows |
| Freshwater Levees, Floodgates, Tidegates | In channel structural barriers to water, sediment, debris flows |
| Marine Levees, Floodgates, Tidegates | Other structural barriers to water, sediment, debris flows |
| Freshwater shoreline infrastructure | Animal harvest (e.g. fishing) |
| Marine shoreline infrastructure | Bycatch |
| Sewer - Domestic & Municipal Wastewater to Sewer | Timber harvest |
| OSS - Domestic and Commercial Wastewater to Onsite Sewage Systems (OSS) | Predation from increased native species |
| Runoff from residential and commercial lands | Displacement by increased native species |
| Oil Spills | Predation from non-native species |
| Industrial Wastewater | Displacement by non-natives |
| Industrial Runoff | |
| Agricultural & Forestry Effluents | |
| Garbage & Solid Waste | |
| Air-Borne Pollutants | |
| Release of Excess Energy (light, heat, sound) | |

(Stress – continued)

| |
|---|
| Spread of disease and parasites to native species |
| Air pollution from mobile sources |
| Air pollution from stationary sources |
| Point source, persistent toxic chemicals in aquatic systems |
| Non-point source, persistent toxic chemicals in aquatic systems |
| Point source, non-persistent toxic chemicals in aquatic systems |
| Non-point source, non-persistent toxic chemicals in aquatic systems |
| Large spills |
| Point source conventional water pollutants |
| Non-point source conventional water pollutants |
| Changes in water temperature from local causes |
| Harmful algal blooms |
| Changing air temperature |
| Changing precipitation amounts and patterns |
| Changing ocean condition |

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Table 4. Strategies in the WRIA 8 Chinook Conservation Plan and their relationship to the 2013 Three-Year Work Plan.

| Strategy # | Strategy name | # of actions in 2013 3Y WP |
|------------|---|----------------------------|
| 1 | Protect/restore forest cover | 4 |
| 2 | Protect/restore riparian veg (incl invasives; incl MRV) | 28 |
| 3 | Protect/restore floodplain connectivity | 27 |
| 4 | Protect/restore channel complexity | 18 |
| 5 | Protect/restore water quality | 4 |
| 6 | Provide adequate streamflow for migration and spawning | 3 |
| 7 | Identify and protect headwater areas | 3 |
| 8 | Protect/restore cold water sources (Sammamish R; Holder and Carey Cr; etc) | 2 |
| 9 | Restore floodplain connectivity/river meandering (merged with 3) | 2 |
| 10 | Increase off channel habitats and enhance/reconnect riparian wetlands (for juvenile survival) (merged with 3-4) | 2 |
| 11 | Increase refuge areas for adult migration (merged with 4) | 0 |
| 12 | Reduce predation on outmigrating chinook (reduce bulkheads, create shallow shoreline areas) (= Restore lake shorelines) | 5 |
| 13 | Restore coho runs to reduce cutthroat population | 0 |
| 14 | Reconnect and enhance small creek mouths (tribs, lakes, nearshore) | 6 |
| 15 | Reduce water temperature in ship canal | 0 |
| 16 | Reduce predation in ship canal | 0 |
| 17 | Protect and restore sediment sources (nearshore) | 1 |
| 18 | Reduce bank hardening in estuary and nearshore areas | 0 |
| 19 | Reduce impacts of overwater structures | 0 |
| 20 | Reconnect backshore areas (marine) | 0 |
| 21 | Protect and restore water/sediment quality, esp. near commercial and industrial areas (estuary/nearshore) | 0 |
| 22 | Protect and restore high quality habitat in Tier 2 subareas | 4 |
| 23 | Restore and enhance spatial diversity esp. in Tier 2 areas (protect and restore small streams) | 1 |
| 24 | Improve juvenile and adult survival at locks | 1 |
| [25] | Increase awareness of and support for salmon recovery | 2 |
| [26] | Remove fish passage barriers | 3 |
| Total | | 116 |

Parking lot

H-integration: line on 3 y work program but no particular projects or strategies to carry out Programmatic actions?