Portland Harbor Natural Resource Trustee Council
"Expert Panel" Discussion of Habitat Restoration for Chinook Salmon

Executive Summary

On November 30 and December 1, 2009, a panel of experts was convened by the Portland Harbor Natural Resource Trustee Council to develop a scientific foundation for restoration planning being conducted under the Natural Resource Damage and Assessment program (NRDA) for the Portland Harbor Superfund site. The Trustees have been engaged in the early phases of restoration planning since 2007, and have developed some preliminary approaches and priorities for restoration of natural resources and habitats that may have been injured by releases of hazardous substances in Portland Harbor. Before moving into a more formal phase of restoration planning and closer to settlements with Potentially Responsible Parties (PRPs), the Trustees paused to invite the review and input of recognized experts on salmon and salmon habitat in the Lower Willamette River, in order to identify a scientific framework and priorities to guide the development of a restoration plan.

The purposes of the two-day expert panel session were to:

- identify the most relevant scientific literature and technical resources to guide restoration planning;
- understand the primary habitat requirements and limiting factors for juvenile Chinook salmon in the Lower Willamette River; and
- identify the types, characteristics and geographic locations of habitat restoration actions that would provide the greatest benefit for juvenile Chinook salmon.

The expert panel was comprised of the following members:

- Tom Friesen, Fish Biologist, Oregon Department of Fish and Wildlife's Corvallis Research Lab
- Stan Gregory, PhD, Professor of Fisheries, Oregon State University
- Nancy Munn, PhD, Aquatic Ecologist and Policy Analyst, National Marine Fisheries Service, Habitat Division
- Chris Prescott, Watershed Ecologist, City of Portland's Bureau of Environmental Services

Other participants included:

- Charles "Pete" Peterson, PhD, Interdisciplinary Marine Conservation Ecologist, University of North Carolina

- Erin Madden, Chair, Portland Harbor Natural Resource Trustee Council, representative of Nez Perce Tribe
- Robert Wolotira, NOAA Restoration Center, Habitat Equivalency Analyst
- Megan Callahan Grant, NOAA Restoration Center, Restoration Planning Coordinator for Portland Harbor Natural Resource Trustee Council (facilitator)
- Megan Hilgart, NOAA Restoration Center (recorder)

Erin Madden provided an overview of the Portland Harbor Natural Resource Trustee Council, its authorities under CERCLA and NRDA, and its phased plan for making the public whole for losses of natural resources, habitats and services in Portland Harbor. Nancy Munn presented background information on Endangered Species Act listings of salmonids that utilize habitat in the Harbor area, and factors that have been identified as limiting recovery of these species. Robert Wolotira provided an overview of Habitat Equivalency Analysis, using a Puget Sound site as an example. Tom Friesen described the findings of his research on juvenile Chinook diet and habitat utilization in the Lower Willamette River. Stan Gregory and Chris Prescott provided relevant information on their biological and ecological research and monitoring of the Upper and Lower Willamette River.

The expert panel reached consensus in the following areas:

1. Juvenile Chinook salmon utilize the Lower Willamette River for feeding and rearing before entering the Columbia River Estuary to a greater extent than previously believed. Chinook salmon are present almost year-round in the Lower Willamette.

2. Both yearling and subyearling (young-of-the-year) juvenile Chinook are found in the Lower Willamette. Although migration rates for subyearlings have not been directly evaluated, studies have shown that Chinook migration rate increases with fish size. Therefore, subyearlings may spend more substantial amounts of time than yearlings (more than two weeks) feeding and developing in the lower Willamette.

3. The area of the Lower Willamette that is most important for juvenile Chinook extends from Willamette Falls to the mouth of the Willamette (the broadest definition of the mouth or confluence with the Columbia includes the Lower Columbia mainstem from the Sandy River confluence upstream to the Lewis River confluence downstream), including the confluence areas of the major tributaries (Clackamas, Johnson, Kellogg and Tryon creeks), and Multnomah Channel.

4. The most limited or scarce habitat types within this area include any refuge from mainstem Willamette flows (alcoves and off-channel habitats, tributary mouths); shallow water and beach habitats with or without large wood assemblages; and undulating, natural shorelines. Other important potential limiting factors include temperature and toxics, as well competition and predation by non-native species that are more tolerant of high temperatures and toxics.

5. The extreme scarcity of key habitat types within the Portland Harbor study area (RM 1-11.8) makes it the expert panel's highest priority for restoration actions. Additional justification for this priority was provided by the panel
   - The study area contains the most impaired habitat in the river; the river is almost completely disconnected from its floodplain in this reach, with many ecosystem processes severely impaired. Further, physical alterations to the channel's edge severely limit availability of nearshore shallow water habitats.
   - The Lower Willamette is the first (lowermost) major tributary junction in the Columbia River basin.
   - A significant number of threatened and endangered (Columbia River and Willamette River) species use the area; all Willamette River stocks must pass through the study area twice during their life cycle.
   - The area's history of toxic contamination poses growth and survival challenges for juvenile salmonids, reducing their resiliency to other stressors.
   - The Lower Willamette contains the largest number of invasive/non-native species in the Willamette system, posing a further survival challenge to native salmonids.
   - There is an important opportunity for public education and outreach in the urban area.
   - Habitats within the study area are underserved by exsiting, non-NRDA sources of funding for restoration, compared to the mainstem Lower Columbia River, and tributaries such as the Clackamas River.

6. The expert panel developed a set of values for existing and potentially restorable types of habitat. The habitat types were evaluated based on their relative importance to juvenile Chinook, with the most important habitat types valued at 1.0, and all other habitat types valued relative to those "ideal" habitat types. These values will be used by the Trustees to identify the current, as well as potential future, value of specific habitats at specific locations as part of the Habitat Equivalency Analysis (HEA) model, and to calculate the increased habitat value or "lift" generated by restoration projects. The table of HEA values generated by the expert panel is attached to this summary.

7. The expert panel identified several characteristics that could increase the value of a restoration project. These include:
    - Restoration actions that would result in high quality habitat along both banks of a stretch of river
    - Projects that provide off-channel habitats or flow refuges at regular intervals ("stepping stones"), especially along the same side of the river
    - Restoration actions that provide a connection to a cold water tributary
    - Projects that provide cumulative ecosystem services (carbon sequestration, non-structural flood storage, wetland, wildlife benefits)
    - Projects of substantial size (expert panel noted that these are rare within the study area) so that ecosystem functions and processes are able to maintain habitats with minimal human manipulation or maintenance
    - Projects that restore multiple functional habitat types
    - Projects that protect existing, high-quality habitats
    - Projects that reconnect portions of the historic flood plain

Recommendations:

The expert panel recommended a strong emphasis on restoration of habitats within the Portland Harbor study area, but also noted the importance of habitats upstream and downstream of the study area. For upstream habitats (upstream of the study area to Willamette Falls), the panel recommended a focus on protecting intact habitats along the mainstem Willamette and tributary mouths that are currently developable and in private ownership. For downstream habitats (Multnomah Channel and Willamette River mouth and environs), the focus should be restoration of forested, complex and undulating shorelines, and the restoration of off-channel habitats.

Although the panel developed a table of initial relative values for each existing and potentially restorable habitat type (for habitat equivalency analysis), the panel members recommended that the Trustees contract out for an independent literature review, and that values be adjusted based on the results of that review.

The panel suggested that Potentially Responsible Parties should be required to direct a minimum of one third to one half of their total liability to restoration projects inside the study area. The panelists identified conservation banking as one possible mechanism to ensure timely and efficient implementation of high-priority restoration actions. The panel also stressed the importance of long-term monitoring, management and stewardship of restoration projects in order to ensure the highest possible degree of

scientific learning and the greatest chance of success, and encouraged the Trustees to account for these functions when estimating cost and value of restoration actions.

Table 1. Relative Chinook Salmon Lower Willamette Habitat Values

Habitat	Habitat Characteristics	Function Hab. Val	Yrs Until Full Function
Upland	forested, in hist. floodplain, >200 ft from ACM*	0.65	50
	forested, outside historic floodplain	0.15	40 (80% in 10 yrs)
	vegetated, grass/shrub outside floodplain	0.1	5
	vegetated, invasive spp. outside floodplain	0.05	--
	forested along tributary into Willamette	0.15	40
	forested and part of the historic floodplain	0.3	40
	vegetated, grass/shrub in historic floodplain	0.2	5
	vegetated, invasive spp in historic floodplain	0.1	--
	unvegetated/paved/buildings	0	--
Riparian	naturally vegetated forest, <200 ft from ACM	0.5	40** (80% in 10 yrs)
	and in the historic floodplain	0.65	50
	naturally vegetated, grass/shrub	0.2	5
	and associated with historic flood plain	0.35	5
	invasive species	0.1	3
Active channel margin	Sloped (<5:1 or 11°), unarmored and vegetated	1	3
	Sloped (>5:1 or 11°), unarmored and vegetated	0.2	3
	sloped (<5:1), unarmored and unvegetated	0.8	3
	sloped (<5:1), bio-engineered	0.4	3
	sloped (>5:1), bio-engineered	0.2	3
	riprapped	0.1	1
	sheetpile	0	--
	pilings (1 per 100 sq ft)	half value of margin type	
	covered structures over channel margins	max of 0.1	--
Main Channel	shallow water, gravel and finer substrates	1	1
	shallow water, natural rock outcrop	1	1
	shallow water with riprap or concrete	0.1	1
	shallow water with covering structures	0.1	--
	shallow water with pilings (1 per 100 sq ft)	0.5	1
	deep water with natural substrates	0.1	1
	deep water with artificial substrates	0.05	1
Off Channel	"Cold" water tributary	1	1
	"Warm" water tributary	0.9	1
	side channel	1	1
	alcove or slough with tributary	1	1
	alcove or slough without tributary	0.8	1
	embayment (cove) with tributary	1	1
	embayment (cove) without tributary	0.8***	1

*--ACM = Active Channel Margin

**--this time adequate for juvenile chinook because of flood protection.

***--around 0.6 further upstream

Draft HEA Habitat Values for ESA Consultation			
Habitat	**Habitat Characteristics**	**Yrs Until Full Function**	**Salmonid Value**
Riparian	naturally vegetated forest, <400 ft from ACM[1]	40 [2]	0.5
	and in the historic floodplain	40 [2]	0.65
	naturally vegetated, grass/shrub	5	0.2
	and associated with historic floodplain	5	0.35
	invasive species[3]	3	0.1
	vegetated riprap	NA	0.05
	unvegetated/paved/buildings/riprap	NA	0
Active channel margin	sloped (<5:1 or 11°), unarmored and vegetated[4]	3	1
	sloped (>5:1 or 11°), unarmored and vegetated[4]	3	0.8
	sloped (<5:1), unarmored and unvegetated	3	0.8
	sloped (>5:1), unarmored and unvegetated	1	0.1
	sloped (<5:1), bio-engineered	3	0.2
	sloped (>5:1), bio-engineered	3	0.2
	riprapped	NA	0
	sheetpile	NA	0
	pilings	NA	1/2 value of margin type
	covered structures over channel margins[5]	NA	0.1
Main channel	shallow water, gravel and finer substrates	1	1
	shallow water, natural rock outcrop[6]	NA	1
	shallow water with riprap or concrete	NA	0.1
	shallow water with covering structures[5]	NA	0.1
	shallow water with pilings	NA	1/2 value of channel type
	deep water with natural substrates	1	0.1
	deep water with artificial substrates	NA	0.05
Off channel	"cold" water tributary	1	1
	"warm" water tributary	1	0.9
	side channel	1	1
	alcove or slough with tributary	1	1 [7]
	alcove or slough without tributary	1	0.8
	embayment (cove) with tributary	1	1 [7]
	embayment (cove) without tributary	1	0.8 [8]

[1] ACM = active channel margin

[2] achieves 80% of full function within 10 years; this time is adequate because of flood protection

[3] eg. Himalayan blackberry

[4] native species

[5] eg. docks

[6] cannot be created

[7] value is 0.9 for salmonid adults if "warm" water tributary

[8] value is around 0.6 further upstream

Notes:

-Debits and credits for a given project need to come from the same habitat category (eg. main channel), unless credits come from creating off channel habitat because it is a primary limiting factor for salmonids.

-No credit will be given for creating any new habitat with riprap, artificial substrates, pilings or covering structures.

- Credit for simply removing pilings is limited to 0.1 and for removing covering structures is limited to 0.5.

-For ESA purposes, shallow water habitat is defined as <20 feet of water depth as measured at the ordinary low water elevation.

- Bio-engineering is defined as the use of living and nonliving plant materials in combination with natural and synthetic support materials for slope stabilization, erosion reduction, and vegetative establishment. To receive credit for bio-engineered ACM, the treatments may include inert components and grading but they must fundamentally rely on riparian plants to provide long term strength to the bank. Inert material may be used but generally only to temporarily reduce hydraulic pressures so that the planted live material can become established. NMFS must appove any proposal for bio-engineered ACM for credit to be given.