CONSULTATION/CONFERENCING TECHNICAL ISSUES

Alteration of flow, salinity, and ETM

Small changes in salinity distribution may have significant effects on the ecology of fishes, including salmonids. In particular, small changes in the distribution and gradient of oligohaline salinities could change the type of habitats available when juvenile salmon must make the critical physiological transition from riverine to brackish conditions. Assessment of the ecological effects of salinity change on estuarine fishes, rearing habitat conditions at specific places and times that support at-risk populations are needed: additional modeling analysis of salinity intrusion and changes in estuarine currents would improve our ability to understand the effects of channel deepening.

Reduce ability to function as a conduit to ocean

The interaction of a deeper channel in concert with likely flow scenarios may reduce the estuary's ability to function as a conduit to the ocean environment by the altered flow.

Reduce sand transport to ocean

The mean density-driven upstream bottom flow in an estuary varies approximately with the cube of the maximum depth. Relatively small increases in depth can reduce the ability of the channel to scour itself. A deeper channel will make the system even less efficient at transporting bed material to the sea.

Dredging forecast is too low

Estimates of dredged material to be generated by the project necessarily rely on understanding the relationship between river flow and sand supply in the Columbia River. It is also vital that accurate hydrologic scenarios be employed for dredged material disposal predictions, because sand transport varies in the Columbia with approximately the fourth power of flow.

Increased suspended sediment

Dredging operations will likely result in resuspension of bottom sediments in the dredging area. NMFS expects the turbidity generated from the dredging process to be limited in spatial scope and confined to the area close to the draghead as a result of the coarseness of the sand being dredged. Mortality resulting from turbidity is not an issue, although there may be impacts associated with the following sub-lethal effects.

change bathymetry

Increased suspended sediment and concentration of flow in the main channel may cause increased deposition in side channels and shallow water areas.

deposition in spawning gravels

While the Corps has determined that there is a very small volume of fine grained material that will be resuspended, this material could affect spawning that may occur in the estuary. Egg mortality increases rapidly as fine sediment abundance in gravel increases.

redistribute contaminants

Sediment sampling results indicate the Columbia River material to be dredged is not contaminated and is suitable for non-confined in-water disposal. Dredging operations will likely result in resuspension and redistribution of bottom sediments in the dredging area. There is a potential that juvenile salmon that use shallow water, low flow habitats will ingest prey in which toxic material has accumulated.

behavioral/sub-lethal effects of increased turbidity

Non-lethal effects can have the effect of reducing fish fitness and contribute to elevated mortality later in the life of the fish. Increased turbidity may; affect the reactive distance of juvenile and adult salmonids and impair feeding; cause avoidance of preferred habitats; and increase straying of adults.

adult salmonid migration routes

Suspended sediment, and the turbidity it produces, can increase the straying rate of adult salmon. The straying rate of adult salmon in the lower Columbia River increased following the 1980 eruption of Mt. St. Helens and the consequent increase in suspended sediment. Turbidity levels lower than those seen in the early 1980's may be sufficient to elevate straying of returning adult salmon.

Contaminant exposure pathways

Recent investigations of salmon prey suggest that the potential for accumulation of redistributed contaminants may be more significant than is suggested by bulk sediment contaminant data.

Alteration the food web

Since the 1800's there has been a reduction in the macrodetrital food web associated with shallow water estuarine habitat. A microdetrital food web has essentially replaced the macrodetrital food web, thereby making the ETM the major secondary producer in the estuary. The ETM system is not as productive as the macrodetrital/Corphium-based food web. The food web may be impacted by altered bathymetry.

Alter salmonid habitat

Channel deepening has the potential to reduce the availability of suitable salmon habitat. Low velocity, shallow water habitats appear to be especially important to salmon. Changes in the salinity distribution could change the locations, surface areas and volumes of key low-salinity habitats used by salmonids. Bathymetric changes may also alter available habitat.

Entrainment

Hydraulic suction dredging has the potential to entrain juvenile salmonids when they come within the "zone of influence" of the cutter head. Portland District sampling of entrainment in the Columbia River in 1985-88 and 1997-98, found that no juvenile salmon were entrained during normal dredging operations.

Stranding

In the past, stranding of juvenile salmon by ship wakes has been identified as a significant cause of juvenile mortality in the lower Columbia River. Although they indicated that stranding is not presently a significant cause of juvenile salmonid mortality, Hinton and Emmett (1994) reiterated the Washington Department of Fisheries recommendation that measures be implemented to reduce the potential for stranding.

Dredging window

The use of time windows may reduce the potential impacts of dredging operations. Direct impacts to migrating salmon could be avoided by preventing dredging during migration periods.

Monitoring of physical and biological processes

Monitor physical and ecological changes associated with the project in the portion of the action area that is in the estuary during construction and for three years after completion of construction.