Possible Environmental Effects for Potential Measures

NO ACTION

- Do Nothing

  - Continued lack of side channel habitat
  - Continued lack of flood refugia
  - Minimal LWD in river
  - Minimal riparian vegetation
  - No attenuation of flood flows

DIKING OPTIONS – The construction and/or upgrade of levees could have positive, negative or neutral effects depending upon the amount of additional bank hardening that occurs and the level of mitigation that occurs. In general, improvements to levees will increase the amount of rock in the river, remove vegetation, and probably increase bed scour due to the transfer of energy from the rock faces. Fish will have less cover and experience greater velocities during flood flows.

- Higher Dikes

  - Precludes future restoration option
  - Channel locked in place with little off channel habitat
  - Changes in river flows could produce significant changes in channel substrate and form
  - Without effective mitigation, continued loss of riparian habitat

- Stronger Dikes

  - Precludes future restoration options
  - Channel locked in place with little off channel habitat
  - Changes in river flows could produce significant changes in channel substrate and form
  - Without effective mitigation, continued loss of riparian habitat

- Setback of Levees

  - Provides additional refugia during flood events
  - If area is returned to natural riparian habitat will result in increased bank vegetation and side channel formation
  - Degree of benefit is dependent upon the character of the area between the new levee and the old levee. If the bank remains hardened then there are fewer benefits. Likewise if the area between the two levees is not converted to riparian forest then the benefits are less.

- Sea Dike Outlets

  - Not sure of impact since designs have not been presented
  - Could be increased stranding of fish on tidal cycles.

- Ring Dikes – cities

  - Some loss of wetlands due to construction of new levees
  - If accompanied by lowering of rural levees could produce better channel conditions due to reduction of rock in river

- Overtopping Levees

- Possible increase or decrease in the number of fish stranded after flood event.
- Should be evaluated in concurrence with other dike options

HYDROLOGIC AND CHANNEL CHANGES

- Dams

  - Direct loss of in-river habitat
  - Modification/elimination of channel forming flows
  - Changes in base instream flows

- Dredging

  - Elimination of instream habitat (clearing of logjams and other LWD; modification of spawning areas)

- By Passes

  - Padilla Bay

    o Reduction in eel grass beds
    o Potential Water quality impacts to Padilla Bay

  - Permanent Flow

    o Could provide increase estuary rearing habitat

  - Samish Bay

    o Mingling of fish stocks
    o Potential Water quality impacts to Samish Bay

- Move Whole River

  - Impacts dependent upon design and location
  - Loss of old river channel?
  - Wetland impacts due to new channel construction

NONSTRUCTURAL

- Non-structural

  - Structures still remain in floodplain

- Increased Flood Warning

  - neutral?

- Buyouts, House Raising, Flood Proofing

  - Some reduction of structures in the floodplain

- Land Use Controls - setbacks
  - Increased riparian vegetation
  - Greater riparian area
- Flood Storage
  - Greater flood refugia
  - Possible increases in stranding
- Bigger Floodplains
  - Greater flood refugia
  - Possible increases in stranding
- Reconnect Channels
  - Improved rearing habitat
  - Increased flood refugia
- 'Softening' Banks
  - Need more specific designs
  - Will improve the bank surface that fish "see" possibly leading to improved rearing habitat
- Improve Bank Vegetation
  - Incorporation of overhanging vegetation will improve fish habitat
  - Will provide increased LWD production depending upon size of the riparian zone
- Re-establish Bay Habitat e.g. sediment
  - Provide greater salmonid rearing habitat/transition zone
- More Wood
  - If complex wood structures are added, should improve in-river fish habitat
  - Will reduce hydraulic conveyance
- 4(d) Rule/ State Shorelines
  - Will set limits on types of inwater work that could occur
  - Will encourage the use of setbacks
  - Could impact future land use
- Effects on Eel Grass
  - See Padilla Bay Bypass

In some cases there will be synergist effects from combinations of options. For example, the impacts of dike strengthening will change if the level of protection increases. Likewise, the use use of some of the mitigation techniques will reduce the level of impact.