

## IMPACTS OF VARIOUS FLOOD CONTROL TECHNIQUES TO SALMONID HABITAT IN THE LOWER SKAGIT RIVER

Flood Control Techniques	Positive	Negative
<b>Dredging/Channelization</b>	<ul style="list-style-type: none"> <li>• None known</li> </ul>	<ul style="list-style-type: none"> <li>• Destabilizes stream bed, potentially impacting spawning redds and rearing habitat.</li> <li>• Impacts water quality during dredging, siltation</li> <li>• Removal of LWD</li> <li>• Impacts riparian areas</li> <li>• May undermine adjacent banks</li> <li>• Disrupts/destroys invertebrate food source for Salmonids</li> <li>• Potential loss of spawning gravels</li> <li>• Homogenization of the habitat</li> </ul>
<b>By-pass or overtopping dikes</b>	<ul style="list-style-type: none"> <li>• May lessen in channel scour</li> <li>• May direct flow to more fish friendly area where they can return to the river</li> </ul>	<ul style="list-style-type: none"> <li>• May move fish into areas where they may be stranded, unable to return to river</li> <li>• May transport silt and pollution into the aquatic environment</li> <li>• Some construction impacts</li> </ul>
<b>Dike setbacks w/riparian buffers inside</b>	<ul style="list-style-type: none"> <li>• Allows establishment of riparian areas benefiting both fish and wildlife</li> <li>• Retains or allows for natural river bank characteristics, providing critical cover and rearing niches; maintain channel complexity; maintains migratory habitats</li> <li>• Trap and routes sediments</li> </ul>	<ul style="list-style-type: none"> <li>• May still “hem” in the river, not allowing full natural processes to occur</li> <li>• May still require floodgates which would restrict fish movements to tributary stream and off-channel habitats</li> <li>• Some construction impacts</li> </ul>

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<b>Dike setbacks w/riparian buffers inside</b> cont.	<ul style="list-style-type: none"> <li>• Allow river to “meander” within a wider area</li> <li>• May allow the river to naturally create habitat i.e. back water areas,</li> <li>• Provide an area to recruit LWD into system</li> <li>• Provide flood refugia for Salmonid during high flow events</li> <li>• Decreased velocity/flow in channel reducing redd scour.</li> <li>• Attenuate flow and moderate impacts from high flow events</li> <li>• Generally facilitate groundwater recharge and maintain summer low flows</li> <li>• Helps retain and detritus and salmonid carcasses</li> </ul>	
<b>Sea dike removal or modification</b>	<ul style="list-style-type: none"> <li>• Allows natural process to occur</li> <li>• Reestablish estuarine environment</li> <li>• Provide increased “nursery” and rearing area for juvenile Salmonids</li> <li>• Fish passage restriction would be removed or lessened</li> </ul>	<ul style="list-style-type: none"> <li>• Construction impacts such as channel excavation</li> </ul>
<b>Levees – general with little or no buffer</b>	<ul style="list-style-type: none"> <li>• <i>May provide for a maturing riparian area behind levee</i></li> </ul>	<ul style="list-style-type: none"> <li>• Confined river channel with little opportunity for habitat development</li> <li>• “Creeping levee job” syndrome</li> </ul>

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<p><b>Levees – general with little or no buffer cont.</b></p>		<ul style="list-style-type: none"> <li>• <i>Prevent river from using its historic floodplain which deposited fine silts in floodplain</i></li> <li>• Large riparian vegetation typically not allowed to grow on levee face</li> <li>• Fish passage to tributaries and adjacent habitat often block by floodgates or bad culverts</li> </ul>
<p><b>River bank armoring - Riprap bank protection</b></p>	<ul style="list-style-type: none"> <li>• <i>May provide for a maturing riparian area behind bank armor</i></li> </ul>	<ul style="list-style-type: none"> <li>• “Creeping bank job” syndrome; increase streambank erosion</li> <li>• Not good fish habitat along riprap; little habitat value</li> <li>• Confined river channel; river not allowed to meander and create habitat; side channel, multi-channel system</li> <li>• Increased velocity along harden bank.</li> <li>• Riparian vegetation not allowed or will not: grow on harden banks decreased sources of instream shade, detritus and cover</li> <li>• Blocks off adjacent habitat areas such a sloughs and small tributaries</li> <li>• Decreased sources of instream shade and cover</li> <li>• Increased water temperatures</li> </ul>