ACTION	DESCRIPTION	USE / PURPOSE	EFFECTIVE LIFE	PERMITS REQUIRED?	ADVANTAGES	DISADVANTAGES	Initial Costs
REMEMBER: Many of these techniques can be used in tandem. They are not mutually exclusive.				**Costs do <u>not</u> include critical areas studies associated with some permits. $=10s. $$=100s. $$$=1000s. $$$$=10s of 1000s.**			
Passive "Management"							
Acceptance	When beaver flooding is not damaging property, landowner allows them to thrive.	Leaving beavers alone to do their natural thing in areas where their activities do not impact human use or infrastructure.	As long as no flooding to personal property or infrastructure lasts.	None.	No need for devices or other expenditures.	Consider potential downstream impacts.	NA
Tree Protection							
Fencing /tree barriers	Fence individual trees if few, or fence groups of trees. Fence along water's edge. Wire fencing or corrugated plastic pipe (min 3' in height) around vegetation to be protected.	Isolates beaver from forage and dam building materials.	Welded mesh wire ~2-5 years. Cattle fence: ~20 years. Plastic pipe: ~2-3 years.	Fencing along water body may require DPER permit and HPA if within Ordinary High Water mark.	May reduce need for managing dams. Construction is relatively easy and inexpensive.	May trigger tunneling behavior in beavers. May trap debris during floods. May limit wildlife dispersal.	$$ to $$$ $10-40/ linear ft. for fencing
Tree Painting	Painting bottom three feet of the trunk with a mixture of exterior latex paint and sand.	Unpleasant texture of paint discourages beaver damage.	1-2 years.	None.	Relatively easy and inexpensive.	Not effective if beavers are using small woody and non-woody vegetation that cannot be painted.	$
Choose trees and shrubs beavers don't prefer for planting projects	Avoid use of alder, birch, cottonwood, willow and other preferred deciduous plants in buffer restoration projects. In planting plans, use non-desirable vegetation (Sitka spruce, hawthorn, cascara, elderberry, osoberry, ninebark, twinberry). See www.kingcounty.gov/beavers for more information.	If planting a new area, keeps availability of preferred food & dam materials at a minimum to deter beaver presence. If replanting an area with beavers already present, may reduce tree damage or encourage them to relocate.	Permanent, but effectiveness may vary.	None (though all projects involving tree planting by King County staff require going through Cultural Resources).	If effective, allows riparian vegetation to remain standing and deters presence of beavers by limiting their access to preferred food types.	May take longer to establish desired riparian conditions. Limited species depending on local conditions. Uncertain outcomes. Likely less effective if beavers are already present on site. Potted trees cost more than live stakes, so tree/shrub prices likely more.	$ to $$
Flood Control							
Beaver Dam Notching	Removing a portion of the dam to lower the water level behind the dam.	Temporarily lowering the water level behind a beaver dam.	12 to 48 hours.	Hydraulic Project Approval (HPA) from Washington Department of Fish and Wildlife (WDFW). Case-by-case evaluation by King County DPER to determine if a permit is required. DPER: 206-296-6600.	Easy to do. Can typically be performed by hand / with hand tools. Effective in the very short term.	Very short term solution. The sound of water flowing through the notch and the velocity of water flowing through the notch are both damming triggers in beaver. Beaver will usually repair the dam overnight. Beavers cut new material to repair dams so repeated notching results in more vegetation removed from the riparian buffer. Requires permits.	Once = $$ Lifetime = $$$
Beaver Dam Removal	Removing the dam entirely (bank to bank, down to the bottom of the origninal stream channel).	Allowing free flow of the stream. Temporarily alleviate flooding caused by dammed streams.	24 to 96 hours.	HPA from WDFW. Case-by-case evaluation by King County DPER to determine if a permit is required. DPER: 206-296-6600.	Can be performed with hand tools. May be used in combination with trapping/removal to "reset" new beaver activity in an area: dams are removed and problem beavers are removed, and new beavers move in, pond levelers can be set so new pond levels with new beavers are not causing flooding.	Short term solution unless the surrounding land cover (trees and shrubs) is also changed. Beaver will usually rebuild a dam in the same location or nearby within a couple days. Beaver cut new material to rebuild dams, so repeated dam removal results in more vegetation removed from the riparian buffer. After beaver rebuilds dam, stream may go dry downstream while the pond fills up again. In older, established ponds, dam removal can result in sediment behind the dam moving downstream, which can result in fish kills. Removing dams results in loss of habitat for many fish and wildlife species. Requires permits.	Once = $$ Lifetime = $$$

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Flood Control, cont.							
Flexible Pond Leveler	A 12-18" pipe installed through a beaver dam that controls the maximum water level behind the dam under normal flow conditions. During fall and winter storms, water flows over or around the dam like it would without a pond leveler.	To lower the water level behind a dam and reduce the area of impounded water (reduce unwanted flooding). Less typically used to lower the water level behind a dam to reduce the hazard level if dam failure could pose a significant risk.	A pond leveler can remain effective as long as the building materials remain competent and the device is maintained. Effective life is greatly determined by how the beaver react to the lower water level behind the dam. Ideally the water level is adjusted so the beavers' needs are met while not flooding property.	HPA from WDFW, which are currently challenging to obtain in streams with salmon. Case-by-case evaluation by King County DPER to determine if a permit is required. DPER: 206-296-6600.	The leveler is set to determine the maximum water level behind a dam under low-flow conditions. Relatively easy and cheap to construct (not including permits). Easy to maintain in situations where they work properly. When they work, co-existence can be successful in the long-term.	Typically does not work in flat areas such as ag lands. Only effective when the reduced water level created by leveler is acceptable to the beaver. If water is dropped too low, beaver will go upstream or downstream and build a new dam. Installation and maintenance by professionals is strongly recommended. Requires permits.	$$$
Culvert Protection (Beaver Deceiver)	Fencing around the inlet of a culvert or spillway that is intended to keep beavers from being able to block the culvert.	To protect the inlet of a culvert from being dammed by beavers.	Deceivers can be effective as long as their building materials remain functional.	HPA from WDFW. Case-by-case evaluation by King County DPER to determine if a permit is required. DPER: 206-296-6600.	Cost effective way to keep the inlet of culverts, spillways, control structures and other structures free flowing to protect downstream infrastructure. When they work, co-existence can be successful in the long-term.	Beavers will frequently build dam upstream of the deceiver so the deceiver will not address backwater effects from the dam. May require help with installation. Requires permits.	$$$
Trapping	Using a licensed trapper to trap and kill beaver, or to live-trap and relocate beaver. Property owner may use live-traps then subsequently euthanize the animal.	Temporarily removing beaver from the area in order to extend the effective period of notching or dam removal.	2 to 18 Months	The beaver is classified as a furbearer (WAC 232-12-007). A trapping license and open season are required to trap or shoot a beaver recreationally. The owner, the owner's immediate family, an employee, or a tenant of property may shoot or trap a beaver on that property if a threat to personal property exists (RCW 77.36.030). In such cases, no special trapping permit is necessary for the use of live traps. However, a special trapping permit is required for the use of all traps other than live traps (RCW 77.15.192, 77.15.194; WAC 232-12-142). There are no exceptions for emergencies and no provisions for verbal approval. All special trapping permit applications must be in writing on a form available from the Department of Fish and Wildlife (WDFW).	When combined with dam removal, can re-establish previous water levels. Can also be used as a "reset" -- to allow time to install flow-control devices, so any new beavers that move in will not have same habits as previous beavers, and the site will be ready for the next beavers that show up. A list of licenced trappers (Wildlife Control Operators) is readily available from WDFW.	Hiring a trapper can be expensive depending on the number of beaver in the area. Trapped out areas are prime areas for new beaver to move into. Removing beavers and their dams results in loss of good habitat used by many fish and other animals. Trappers will remove beavers but not dams, and if dams are not removed and are not maintained by beavers, they may fail. Trappers vary in skill.	$$ to $$$ $250 to set + $75-200/ beaver
Beaver Manipulation							
Rebuilding/ reinforcing dams	Intentional removal of an old dam that may be prone to failure to force beavers to build a new dam.	Beavers build new dams in the place of old dams that may be vulnerable to failure.	Several years.	HPA from WDFW. Requires a King County Clearing and Grading permit.	The beavers do what they are good at in building the new dam, and dam failure is less likely. We control the water release -- the timing and the amount of flow -- instead of a dam blow-out that releases water and sediment all at once.	If the old dam is very large and includes a lot of mud and growing vegetation, removal could be a large and expensive undertaking.	$$$ to $$$$
Creating natural water storage	Trapping and relocating beavers to areas lacking them so they create new ponds/wetlands and help recharge groundwater.	Using beavers for natural water storage, groundwater recharge, and summer flow of tributaries.	Location where beaver is trapped out may have new beavers in 2-18 months. Locations with new beavers creating beneficial impacts may last indefinitely.	Relocation requires working with a permitted and certified beaver relocator. Any associated dam removal would require appropriate permits (see above).	Beavers can be removed from locations where they are creating problems and released in areas where they won't impact human infrastructure. They create multiple hydrologic benefits and improve climate change resiliency.	Requires a relocation program with capacity. Would require receiving sites. Currently only the Tulalip Beaver Project is doing this work in our part of Western Washington.	$$$ to $$$$$