Beaver Dam Analogs

History

Prior to colonization and the introduction of fur trapping, much of the North American landscape was shaped by beavers. Accounts from early explorers describe thousands of successive beaver dams climbing every branch of every river, forming wide ponds and wetlands, wherever the geography allowed. Current estimates suggest that up to 250 million beaver ponds once puddled the continent, impounding tremendous amounts of water late into the dry season, and trapping sediment which would otherwise have been washed away. And they'd been a part of that ecosystem for so long that many surrounding species had adapted to thrive in these habitats.

European colonists saw beavers as a resource to be exploited, and did so as unsustainably as they extracted everything else they found in North America. They killed thousands of beavers per year and shipped their pelts across the ocean for use in clothing. By the end of the massacre, an estimated 1% of the continent's original population was still alive.

Even after the fur trade became unprofitable, successive generations of colonists continued the killing. Beavers need winding, flood-prone wetlands, but the colonists and their descendants wanted wide open, dry fields for farms and cattle, roads, and straight, tidy rivers that never flooded their banks. They cleared the forests beavers relied on, filled in wetlands because they saw them as wasted ground, straightened the rivers, and killed beavers whenever they clogged the flow of water or flooded roads or property.

The loss of the beavers reshaped the land in ways the colonists and later Americans never imagined. Many streams and rivers became 'incised' meaning they carved their way deeper into their banks. As the surface water level dropped, the water table underground dropped with it. Less water was retained in the surrounding land and the region became drier, especially later in the summer and fall. Many aquifers became depleted, and streams once fed by groundwater springs stopped flowing seasonally or altogether.

The nature of rewilding work depends on the region, climate, and current condition of the land. In some areas, where beaver populations are already established, they will naturally resume work when left to their own devices. But some of the more deeply-incised streams are difficult for beavers to re-establish in on their own. They need slow moving streams, wide ponds where they can shelter from predators, and these steep-sided, fast moving, shallow rivers are a hard, dangerous place for them to start.

Design

Beaver Dam Analogues (BDAs) are simple structures built in streams using logs and branches, meant to mimic the placement and function of real beaver dams. Nearby trees are cut and delimbed to form short posts two-to-four inches wide. One end is sharpened and the posts are driven vertically into the stream bed like a sort of fence with each post roughly one foot from its neighbors. Limbs from the cut tree are then woven between the uprights to add support, and leafy or evergreen branches are packed in to form a sort of natural sieve which traps sediment and silt. Usually a large log is added at the top to pack everything down and prevent movement.

Depending on the velocity of the water, a crew may build a BDA with one or two rows of posts for

support. If they build a double row, the two fences are interwoven with branches and leafy brush gets packed between them. It's common practice to build one large BDA that can withstand more force upstream from several smaller ones. This helps form deeper pools of water and slows the overall movement of the water through the dams. It also mimics the kind of environment beavers tend to build.

Often once the BDAs have begun to work and the shape and flow of the river has started to mimic a beaver habitat, beavers will return and begin shoring up the BDAs with branches and mud, and building dams of their own.

In this way, BDAs represent a sort of system humans can use to collaborate with beavers - to suggest locations for dams and to combine our perspective and planning with their relentless drive to build and maintain these structures. The end result is a strange mix - too organic for a manmade project, but a bit more regular than something a rodent might build. And unlike other manmade dams, these both fit the ecosystem they exist in, and are guaranteed long term maintenance, as successive generations of beavers repair existing structures and add new ones. Once beavers return and re-establish the mazes of pools and side channels the river historically formed, the surrounding ecosystem can recover startlingly quick. Often unexpected species return to the area, water temperatures cool, plants re-establish, and seasonal streams flow longer into the year.

Examples

https://www.northwoodscenter.org/wordpress/how-to-build-beaver-dam-analogs-w-mwa/

https://wildfishconservancy.org/wp-content/uploads/2022/06/Chehalis-BDA_Overview.pdf

https://landscouncil.org/news/beaver-dam-analogs-on-thompson-creek

https://www.balancehydro.com/a-partnership-with-nature-beaver-dam-analogs/

https://wildfishconservancy.org/projects/beaver-dam-analog-project/

https://i.abcnewsfe.com/a/aafc7144-e4a8-49ef-a9a1-abdabee993bb/colorado-river-beaver-dam-ht-jt-2 30405_1680716954892_hpEmbed_9x5.jpg

In a Solarpunk Society

If your setting is generally already pretty solarpunk, it's likely that these kinds of interspecies-collaborative restoration projects are generally known about and well-accepted.

That doesn't mean there isn't room for conflict:

- In more populated and developed areas, these projects may run into trouble with outdated laws (or regulators) concerned with water rights, or with construction in waterways. For example, many US States have existing laws meant to protect shorelines and bodies of water, which prevent construction in rivers, and which can, ironically, cause problems when humans try to get permits for their half of this work.
- Even in a more solarpunk world, humans often don't want to get their feet wet, or see their home or property flooded. Even people who steward land with good intentions may have plans for how the habitats in their care will take shape, and feel upset when a large rodent kills their

trees or decides that their space will actually become a wetland. This is especially true in more densely-populated areas, where the land has been carved into many smaller parcels, and a new beaver's continued existence essentially depends on every affected human treating them decently.

- For their own safety, Beaver Dam Analogs and wetland restoration may not be achievable or worthwhile in some areas, and beavers in these areas may be caught and relocated to wild where they don't have to worry about dangerous human neighbors.

On a similar subject in coexisting with beavers, there are also several clever mechanisms for mitigating some of their activities so that they don't come into conflict with humans. Beavers have a compulsive instinct to dam flowing water, which causes problems when they set up near human dwellings, or come across a culvert under a road humans built through a wetland and jam it full of sticks and mud, causing the road to flood.

The following devices are designed with an understanding of how beavers detect moving water, by feeling currents or hearing flowing water. In the modern day many town and state governments, and individuals skip right to killing beavers rather than accepting the financial cost and hassle of setting these up, but they might be quite common in a solarpunk society:

Pond Leveller This is basically a long tube with a large wire cage around one end. The caged end goes into the beaver pond below the water level, and the rest goes downstream, through the beaver dam (humans cut a trench through it and put it back afterwards), to create a permanent leak through the dam that the beavers cannot stop. The point where the tube goes through the dam is higher than the rest of it on either end. This determines level of the entire pond above the dam. Water will flow through the pipe unless the pond level drops below the peak of the tube. The height of the tube (and thus the upstream pond) can be adjusted up or down if desired. To allow beavers to remain at the site, it is important that the water level remain as high as can be tolerated by neighboring humans; the lodge entrances must remain submerged and the pond needs to be deep enough that it will not freeze to the bottom in the winter. If the water level is lowered too far, the beavers may build additional dams and restart the cycle.

The cage around the intake end of the tube prevents the beavers from getting close enough to detect water movement. Because the tube opening is underwater it doesn't make a flowing water noise they'll feel compelled to fix.

Culvert Fences Culverts (a pipe under a road) are an "easy" dam for beavers, as they only need to plug the culvert to back up the water and create a pond. The growing pond can quickly flood the road, trail, and nearby areas, making it impassable and sometimes damaging the infrastructure. There are a few ways to prevent this, and a culvert fence is a straightforward one. This is basically a metal wire fence which boxes in the 'inlet' end of the culvert. It starts narrow at the culvert and extends wider and wider out into the water upstream in a trapezoid shape. The holes in the fence are fairly large, enough to minimize floated debris building up, and sometimes even large enough for a beaver to squeeze through on its own, but too narrow for it to bring sticks through (this allows them to travel through the culvert like an animal underpass). Fence flooring is often installed to prevent tunneling under the fence.

When beavers try to dam the culvert inlet, the trapezoid shape forces them to dam further and further from the culvert, which discourages them from trying to use the fence as part of the structure. This is because as they get further away from the culvert inlet the opening that the stream is flowing into is widening. This widening of the water reduces the water movement at the fence where the beaver is damming. Since the sound and feel of moving water are strong damming stimuli for beavers, their desire to continue damming is reduced. And if that's not enough, a culvert fence also

creates a long perimeter that the beavers must dam against. Typically over 40 feet, this long perimeter makes for a lot more work than jamming some sticks into a pipe.

Culvert Protector/'Beaver-Proof Culvert' These look like a metal culvert extending out from under the road, into the upstream water, with a T-junction piece mounted to the end so the 'top' of the T is upright, extending up above the water and down into it. The top and bottom of this extension are open, but are protected with grates. The T-junction funnels the sound of running water upwards, decreasing the beaver's desire to plug the culvert, and the grate allows water to flow through but prevents sticks or debris from being placed in the culvert.

Diversion Dams This has a lot of overlap with the Beaver Dam Analogs (though they're usually made with beaver fencing, concrete reinforcing wire, or stronger gauge fencing, supported by metal fence posts, etc) - it uses an understanding of the locations beavers would like to dam, and the stimuli that causes them to build dams in order to get them to build at a location chosen by humans to prevent future conflict. These are often a good fit where roadbeds are built high with respect to the water level and the water level upstream is not a concern. In situations such as these, humans will build a smaller culvert fence to prevent plugging, and a larger, semi-circular fence upstream. By using strategically placed stones and other material to create some pooling and cascading water noise they can encourage the beavers to dam against the larger fence.

Tree wrapping/wiring In addition to causing flooding, beavers can be rough on the local trees, which they see as future dams, lodges, and food (they eat the soft inner tree bark). They can kill and cut down remarkably large and healthy trees in a surprisingly short time. To prevent this, and to protect individual trees or areas of vegetation (such as restoration sites with newly planted vegetation for example) humans can set up a protective fence made of wire mesh. This is considered a type of 'exclusion fencing.' Like many of the other tools, the fencing requires maintenance, both to ensure the beavers can't get past it, and to keep the trees from being choked by the wire as they grow.