Removal of Dams for Salmon Survival

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The construction of dams has boomed in the past century, and now there are an estimated 80 thousand dams in the United States that are over 3 meters tall (Service, 2011). These dams have created disruptions to the natural flow of rivers, specifically for salmon (Flatt, 2020; Hilborn, 2013; McGlothlin, 2021; Service, 2011). This is because of how salmon reproduce. Salmon are born in spawning grounds in rivers. Then the juvenile salmon swim out to the ocean, where they mature. Once the salmon are fully grown, they swim back through the rivers to their spawning ground. This is also where the salmon die (Hilborn, 2013). This unique trait of swimming to the ocean and back has made them especially vulnerable to the impacts of dams. Currently, salmon spawning in areas with dams is a mere 4% of what it has been historically (McGlothlin, 2021). This is an important issue because salmon provide so much for the ecosystem. For instance, salmon populations help with the biodiversity of the ecosystem. This is because if there is a full salmon population, then bears and eagles have another food source (Service, 2011). This means that those predators will have more options and will be okay if another food source is dwindling. In addition, the migration of the salmon brings important minerals to river ecosystems. The salmon carry nitrogen and phosphorus nutrients in their bodies, that then gets put back into the ecosystem when they die (Service, 2011). The dams are hindering the success of the salmon population. Dams are creating barriers for salmon migration (Fullbrook, 2008; Hilborn, 2013; Service, 2011). The environment of the river has also been altered by the dams (McGlothin, 2021; Service, 2011). The removal of dams is vital for the restoration of salmon populations. There are many dams in the United States that need to be removed because they are no longer fulfilling any service and are merely causing problems (Service, 2011). However, there are some services that are provided by dams, but these services are either replaceable or not providing said services adequately (Asher, 2012; Fullbrook, 2008; Gohain, 2008; Lyon, 1913; McGlothlin, 2021; Service, 2011; Smith, 2005). The preservation of

Salmon populations is necessary to keep our ecosystems healthy, and that cannot start without the removal of dams.

The presence of dams harms salmon populations. Once dams are constructed, salmon are blocked off from their spawning grounds (Fullbrook, 2008; Hilborn, 2013; Service, 2011). This means that when salmon mature and attempt to return to spawn, they are blocked off and won't be able to spawn. One example of this is the Columbia River, where 55% of the rivers 673,000 km are completely inaccessible to salmon because dams block the river (Service, 2011). There are efforts being put in to make it possible for salmon to get past dams, the best example being fish ladders. In which, steps of water are installed so that fish can jump up them and past the dam. While these do make it possible for salmon to get through, they still don't enable salmon to freely travel along rivers. In fact, they still reduce salmon access to spawning grounds because the fish can only get past if filter into a small point at the base of the fish ladder (Hilborn, 2013). The fundamental issue of fish passage isn't solved with fish ladders, it's only lessened. In addition to the barriers created, dams also alter the rivers making them less suitable for salmon. One instance of this is that salmon prefer cold fast-moving water (McGlothlin, 2021). With the installation of dams, the water has slowed significantly, allowing the water to be dormant for long enough to warm up (McGlothlin, 2021). This warmer water is not ideal for salmon spawning, as temperatures over 48 degrees Fahrenheit cause developing eggs to hatch prematurely. Another way dams have altered river habitat is through the dispersal of sediment along the river floor. Salmon prefer to lay their eggs in fine gravel (Service, 2011). Within rivers sediment is constantly moving, but dams block the flow of sediment. Once water with sediment reaches the dam it slows and deposits the sand (Service, 2011). This means that downstream from dams there is no fine gravel, as it's all been washed away and was not replaced because of the sediment build-up behind the dam. The river floor downstream of dams consists of softball

size rocks and bigger, which is not ideal for salmon spawning (Service, 2011). This issue is further amplified by dams preventing the spread of seeds. The fine sediment could be partially stabilized if there were plants downstream of dams, but that isn't the case. This is because plant seeds aren't able to get through dams properly, instead they get caught on the dam and don't reach the other side (Service, 2011). When seeds can't transfer through, there are fewer plants that can grow downstream of dams, and in turn fewer plants to stabilize the sediment. Dams negatively impact salmon by creating partial or absolute barriers to spawning grounds, warming water, and altering river floors. These impacts challenge salmon survival.

The removal of dams will benefit salmon populations. This is because with the destruction of the dams, habitats that are conducive to salmon can return. The complete removal of a dam can take up to three years (Service, 2011). Once the dam is completely removed, the river can start returning to normalcy. The absence of dams would mean a free-flowing river (Fullbrook, 2008). This would also stop the river from pooling up and sitting dormant to be warmed, keeping the water cool (McGlothlin, 2021). These changes are essential for salmon survival because salmon populations are being harmed by the loss of habitat (Hilborn, 2013). Once the environment changes, the salmon population will follow soon after. In regions that have removed their dams, there were signs of improvement in salmon populations within three years. It is estimated that in 10 – 30 years the population will be stable again (Service, 2011). This gives hope that the absence of dams will enable population growth for salmon.

Of the many dams in the United States that are currently standing, the majority of them are blocking rivers and not serving any purpose. There are tens of thousands of dams that are obsolete, these smaller dams should be removed rather than continuing to block waterways. Dams can be obsolete either because they are too damaged to continue functioning or because they are too expensive to upkeep (Service, 2011). The latter of those situations are becoming

more common. This is because dams are becoming more regulated to counter the harm they do to the environment. One example of this is that some regions' dams are required to have fish ladders (Service, 2011). This creates more expenses to keep dams running. For dams that weren't built with fish ladders, the expense of adding a fish ladder could outweigh the potential profit from staying open. These expenses have been making dams obsolete (Service, 2011). However, these dams aren't being taken down. These smaller obsolete dams should be taken down to help restore rivers.

While some small dams don't serve a purpose and should be removed, most large dams serve roles that are important to their communities. For instance, dams can provide hydroelectric power, and drinking water (Asher, 2012; Fullbrook, 2008; Gohain, 2008; McGlothlin, 2021). Regarding hydroelectricity, dams can generate hundreds of megawatts of electricity a year. Some larger dams are able to generate 1,070 megawatts of electricity (Fullbrook, 2008). This is a very large amount of power, and it is all generated cleanly. However, there are many other ways of producing clean energy. Solar panels and wind turbines also create clean renewable energy and can be used on large and small scales. For large scale clean power, nuclear energy is most comparable. In many cases, nuclear power plants can produce more electricity than dams and this is done with zero emissions (Kessides, 2010). This means that dams aren't necessary for the creation of clean energy. Another service provided by dams is the production of clean drinking water (Asher, 2012). Once again, there are other means of gaining access to clean drinking water. In fact, the environment naturally filters water. Thus, by putting resources towards keeping the environment functional, the land will provide ecosystem services (Daily et. alt, 2000). One means of this would be funding the protection of watersheds and the preservation of ecosystems. This will provide clean drinking water because the ecosystem will now be able to properly filter water (Daily et al, 2000). There are other means, but this is just one example of

how dams are needed in order to get more drinking water. While dams do provide these services, dams aren't necessary for these services. If these services can be filled through other means, then the dams can be removed, and we can save the salmon.

Furthermore, some argue that dams are necessary to combat flooding, but the reality is that dams are harming flood cycles. There are some species that rely on floods in order to spread their seeds, which are known as floodplain plants (Smith, 2005). Flood cycles that happen naturally allow these unique plants to continue to be planted. One example of a floodplain plant is the boltonia flower, which has been negatively affected by dams (Smith, 2005). This is because dams either stop flooding completely or have controlled floods. These controlled floods aren't as effective because of their severity and timing not being compatible with the flowers nutrients cycles (Smith, 2005). This illustrates that dams interfering with flood cycles is harmful for floodplain plants. On top of this, dams can cause severe flash flooding. This is because in the rainy season, some dams either can't contain that much water, or the excess water is released (Gohain, 2008). This means there is a mass amount of water being channeled through a single point. Rather than dispersing slowly across a large space, the water is now concentrated and fast moving (Gohain, 2008; Lyon, 1913). This is extremely destructive, as the water is strong enough to sweep away cattle, people, and even homes. One instance in India, had weeklong flash floods that killed over a dozen natives (Gohain, 2008). If the water had not been built up in one location, then the harm from the flood would be lessened (Lyon, 1913). This means that without dams flooding would be more common, but the floods would be distributed over a larger amount of space, making it more difficult for the water to reach dangerous speeds. Furthermore, dams interrupt the transfer of nutrients that come from flooding. With natural flooding, fish populations are connected with regions they typically couldn't reach. In turn, the river receives nutrients from the fish, causing farmland soil to naturally be fertilized when it floods (Fullbrook,

2008). Floods from dams aren’t as helpful for the ecosystem. These floods spread different sediments in a more concentrated manner. For instance, if local forests are used to build the dam, deforestation from that can cause an increase in salt in the water. The impact of the salt will then be amplified because it can accumulate behind the dam. When the water is then released, it deposits salt onto farmlands which can ruin the land (Gohain, 2008). This illustrates that dams aren’t necessary for handling floods because they cause far more harm than good. Dams interrupt floodplain plant growth, the passage of nutrients during floods, and what nutrients are spread.

In order to keep ecosystems healthy, there needs to be a healthy salmon population. Salmon can't complete their migration with dams presenting an obstacle. Even with the presence of fish ladders, the salmon can’t travel through at proper rates (Hilborn, 2013). In addition, dams alter the habitats of salmon, creating challenges for salmon spawning (McGlothlin, 2021). The removal of dams is needed to maintain these populations. Most dams should be removed because they are contributing to this problem and aren’t providing the services they were originally constructed for (Service, 2011). However, even if a dam does fulfill a service, there are other means to accomplish the same services, so it is possible to remove those dams as well. Being able to generate renewable energy and clean water in other means would allow the dams to be removed and restore the ecosystem (McGlothlin, 2021). Furthermore, while attempting to minimize the impact of floods through dams, the natural flood cycles and nutrient cycles are ruined (Gohain, 2008; Lyon, 1913). This harms floodplain plants and the distribution of nutrients. Dams also make floods more intense and dangerous when they do happen (Smith, 2005). Natural flooding is safer and better for the environment than having dams (Lyon, 1913). There is no need to keep dams in place when they are harming the survival of salmon.

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