Dam Removal Executive Summary

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Synopsis:

Over the course of the past couple centuries many of our nation's rivers have had their natural flow regime impeded by dams. Angela Bednarek points out in her 2001 article Undamming Rivers: A Review of Ecological Impacts of Dam Removal that there are currently 75,000 dams in the United States that are greater than five feet in height (Bednarek 803). Many of these dams are no longer in use and are not used to produce energy (Bednarek 803). Dam removal is an important environmental issue because of the consequences for the ecosystems of the rivers from which they are removed as well as the possible economic consequences for those who may rely on hydroelectric power from the dams. According to Benadrek's research, there is evidence that dam removal does return a river back to its natural state and increases biodiversity (Bednarek 807). The improved habitat could be very beneficial for salmon in the Pacific Northwest where natural runs are currently impeded or made less effective by dams (Bednarek 810). One of the greatest issues surrounding dam removal is the sediment released back into the ecosystem after a dam is removed (Gregory et al.). Dam removal may return rivers to their natural flood regime; prompting landowners to engage in shoring up river banks, undoing some of the ecological good that had been generated by removing the dam in the first place (Gregory et al.) An argument can be made that the transition to renewable energy sources will be hampered by dam removal; however, evidence suggests that this is not the case. In the article Status, trends and significance of American hydropower in the changing energy landscape by Shailesh Sharmaa, JohnWaldman, Shahab Afsharib, and Balazs Feketeb suggests that due to technological advancements in the renewable energy sector and greater understanding of the environmental consequences of hydroelectric energy hydroelectric energy has remained at less than ten percent of the power generated in the United States since 2000 (Sharma et al. 112). Examining the consequences of previous dam removals is crucial in understanding how to move forward as more and more dams are decommissioned. Understanding that each dam is unique and there are a variety of ecological and environmental aspects that should be examined before removing a dam. For example removing a dam in the Pacific Northwest and a dam in the Deep South have different consequences and require different approaches when deciding whether or not removal is appropriate.

Key Findings:

- Dams have a variety of purposes ranging from flood control to power generation (Bednarek 803).
- Although sediment load may have a negative impact on habitat there are examples of ecosystems that have quickly recovered. According to Bednarek's article when Mt. St. Helens erupted and released tons of sediment into the Toutle River; however, after only three months salmon began to reappear (Bednarek 810).
- What time of the year dam removal takes place on rivers with anadromous fish needs to be given careful consideration in order to best mitigate the effects of sediment load on salmon (Bednarek 808)

- Dams prevent precipitation surge from seasonal flooding that many anadromous species rely upon to take them to coastal spawning areas (Bednarek 806).
- In the past 20 years there have been 500 dams removed with a good portion of them having been removed after 1999 (Pess et al. 72).
- The prediction for how long it would take for the Elwah Dam to complete its sediment discharge was originally thought to be a couple years (Lohan). In reality it was a matter of mere weeks (Lohan).
- In the United states, dam removal has accelerated due to many of the dams reaching their life expectancy. (Morley., et. al)
- Though there are negative impacts to dam removals, it was noticed that after a dam was removed, about 95% of the species that were trapped downstream of the dam, began moving back upstream within 1-3 years. (Morley., et al.)
- Studies have shown that dams prevent sediment from reaching the oceans, which worsens coastal erosion. The decomposition of drowned vegetation beneath dam reservoirs also releases methane, a powerful greenhouse gas. Dams have caused massive reductions in the numbers and diversity of fish that migrate up and down rivers, or between rivers and the ocean. Many populations of fish have been driven to extinction by dams, such as the Baiji, or Yangtze River dolphin, and Atlantic salmon once economically important along the east coast of the U.S. (WIREs Water 2017, 4:e1164. doi: 10.1002/wat2.1164)
- Maintenance costs rise as dams age. U.S. dams are on average 56 years old, and seven out of ten will be over 50 by 2025. There are 14% of the nation's 15,500 dams that are classified by the American Society of Civil Engineers as high hazard potential dams, meaning they could cause significant property damage and loss of life if they failed.(WIREs Water 2017, 4:e1164. doi: 10.1002/wat2.1164)

Key Concerns:

- Dam removal will increase sediment loads in streams that may suffocate fish and aquatic plants (Gregory et al.). The magnitude of sediment load behind a dam is highly dependent upon the height of a dam (Gregory et al.). This must be taken into account when determining whether or not the possible good of removing a dam outweighs the bad. The problem with weighing the pros and cons of the decision is predicting how sediment load will behave in the stream is very difficult (Gregory et al.).
- Salmonid species in the United states are suffering due to a host of issues ranging from dams to challenges stemming from hatcheries (Pess et al. 72). Now, many salmon species' populations are suffering greatly in rivers that have been dammed.
- Following dam removal, it is difficult to predict the magnitude and timing of physical, chemical, and biological responses likely to occur. In order to determine whether and how to perform dam removals, dam removal responses must be examined to determine whether and how this should be performed. The following alternative approaches are then described: (1) predictions using studies of actual dam removal, (2) predictions using

studies of existing dams, and (3) predictions based on mechanistic and empirical models.(WIREs Water 2017, 4:e1164. doi: 10.1002/wat2.1164)

- A concern in the dam removal process is that non-native species will be used to repopulate natural salmon streams once returned to their natural state. Also concerning is that there will be a loss in the natural genetic diversity that was once present in the stream even if it is restocked with the same species that were once present (Campbell).

Recommendations:

The best course of action for dam removals would be to first, talk to the river management of the area, and discuss the environmental pros and cons of removing the dam in that area (removing a dam may impact the environment differently depending on where it is.). If it is safe to remove the dam, public opinion should also be taken into account. This can be done with community surveys. Gaining public opinion is important as many of the dams are old and since being built communities have arrision around them. Taking river management and public opinion into consideration, decision makers can then decide the most effective way to remove the dam.

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Status and trends of dam removal research in the United States

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