Raising Arrowrock: A Political Ecology Case Study

Richard Martinez: McNair Scholar

Dr. Todd Shallot: Mentor

Environmental Studies

Abstract

The US Army Corps of Engineers (Corps) currently evaluates construction alternatives for the Arrowrock Dam's future. The process presents a uniquely complex situation as policy, public, and private interests converge. The fear of flooding and availability of irrigation water have deeply influenced the economics through which federal agencies justified building dams in the early 20th century. However, the current political, economic, and environmental stakeholders grapple to fulfill their interests. Furthermore, major policies such as the National Environmental Protection Act, Endangered Species Act, and state protections on the upper tributaries of the Boise River convolute the final decision set for 2017.

Raising Arrowrock

Dedicated in 1915, Arrowrock Dam was the "engineering marvel of its time." Headlines in Boise City proudly stated "Arrowrock, Highest Dam in the World," a record held until 1932 when the height of the Owyhee Dam in Eastern Oregon surpassed it. However, pride for the dam continued, as reflected in the poem "Arrowrock Speaks" published in the *Idaho Statesman* in 1932, "Dependent upon me is….an empire….in the Boise Valley….I was built to store water to irrigate farm lands. Not for Beauty."

Today Arrowrock Dam stands as one of the most significant federally funded dams on the Boise River. Over the last century, the structure has contributed to growth of the Boise Valley's agricultural base and overall population. Specifically, in the municipality of Boise where the population jumped from under 6,000 residents in 1900 to over 17,000 by 1910, and current estimates by the US Census Bureau rank Ada County alone with a population of approximately 416,500. The investment made by the federal government helped realize the mission of reclaiming much of the sparsely settled land along the Boise River.

In 2008, the U.S. Congress identified the Arrowrock Dam, just upstream from Lucky Peak Reservoir, as an "aging federal structure of concern," and in 2015, the Corps of Engineers aims to prepare a draft Environmental Impact Statement surveying a height increase of the impoundment up to 74 vertical feet. The complexities involved with raising the Arrowrock Dam bring together many legal authorities and present some of the hardest questions we face in modern politics: economics, safety, and natural resources.

The construction of large water infrastructure projects were the highlight of the early 20th century and this contributed substantially to the evolution of life in the arid west. Today the process of gaining approval for reconstructing Arrowrock Dam has become a game of political chess. The last major flood occurred in 1985 and challenged the capacity of Arrowrock Dam to control major floods. Both federal and state agencies knew there were limitations with Arrowrock Dam, which is an integral component of the upper Boise Water Project.

A series of policy moves both by the federal and state government later came together attempting to address the issues with the dam. In 1992, Idaho adopted new protections of the Boise River's South, North and Middle Forks into its state water plan. By 2004, federal agencies completed a $20 million upgrade on the century-worn ensign valves with new stainless steel clamshell gates to increase the Arrowrock's ability to release high snow melts during the yearly spring runoff. The evaluations that followed led the state to move forward on investigations of future water needs with state legislation allocating funding to survey potential water storage expansion of twelve dam sites throughout Idaho in collaboration with a federal partner starting in 2006. An agreement made by Idaho Water Resource Board (IWRB) and the US Army Corps of Engineers (Corps) locked in federal funding via the 2007 amended version of the Water Resources Development Act (WRDA) of 1999, which then included surveying for water supply and ecosystem restoration analysis.

The Arrowrock Dam appears as an example in a congressional report in 2008 highlighting the need to address rising maintenance expenditures of aging federal dams. The report specifically referred to the $20 million upgrade, signifying it would not be the last as the dam completes a century of continual service. Furthermore, a succession of evaluations by the federal and state partnership finished in 2010 and placed the Arrowrock Dam at the top of the list for feasibility of water storage and flood control benefits. By 2011, the Corps, focusing specifically on the Arrowrock, completed and presented results of a preliminary evaluation to the public for commentary on alternatives, including raising the height of the dam up to 74 feet, building a new one, upgrading bridge heights down river, replacing smaller push up dams with inflatable weirs, among others options. Comments from community residents, governmental agencies, the private sector, and environmental groups offered a broad range of concerns, including lack of water availability, why build at all, and environmental consequences of the construction options.

The status of the ecosystem restoration component in the amended WRDA of 2007 at this point no longer exists. In an interview, Ellen Berggren, the Snake River Project Manager of the Corps, stated funding is not available on the behalf of the Corps or the IWRB. Further adding that the Corps would welcome an external partner to help fund the ecological restoration effort, but the subject alludes to one of the most difficult valuation processes in environmental economics. Liz Paul, the Spokesperson for Idaho Rivers United (IRU), said that they are willing to collaborate in restoration, but offered little detail as to what such a partnership would accomplish. Ecosystem restoration by definition aims to repair damaged or destroyed ecosystems by facilitating an increase in biodiversity and balance with human systems. That said, coming up with a price to realize that goal is not simple. Unfortunately, the challenge lays in justifying the investment of tax dollars into environmental restoration that does not directly pose negative affects to human health or forecast noteworthy profits. A traditional contingent valuation with valley residents would show a wide range of responses to the value of higher biodiversity, which exemplifies the difficulty of situation. The unpredictable value attributed the environment will make even the most ambitious environmental advocate scratch their head when it comes to deploying an effective strategy to fund and restore the damaged reservoir ecosystems.

Originally built for irrigation, the concerns with Arrowrock convey a provocative shift in construction justification. A clear decline in acres of farmland to subdivision housing in the riverside communities in the Boise Valley advance flood risks. Change in land use makes the assessment of irrigation storage, and flood protection of an ever-growing urban population on the river's floodplain, a formidable opponent of environmental protection. Likewise, the water management mission of US Bureau of Reclamation (USBR) and the Corps mission of flood control align with the most powerful portions of the population in the valley below. Canal companies and farmers with first-in-time water rights are very well established and have plenty of political connections within the area. Naturally, when an opportunity to expand water supply comes about they are all ears. The maximum 74-foot dam raising option expects to amplify the storage capacity of Arrowrock Reservoir by an additional 300,000 acre-feet.

However, Rocky Barker an environmental journalist from the *Idaho Statesman* writes that maximum number of acre-feet proposed by the Corps might seem substantial, but after current irrigators take their shares, only 60,000 acre-feet will remain for distribution. In addition, Compass, the Treasure Valley regional planning agency, projects that the Boise metropolitan area will reach a population of 1.5 million by 2040. These projections are at the core of the IWRB's argument to move forward on a new dam. The projected need of water for future valley residents warrants state action.

Historic Arrowrock

As all rivers, the Boise River experiences cycles of flooding at the surrender of melting snow pack, forming the tributaries that feed into the confluence with the Snake River and beyond. However, the water infrastructure and development have long since domesticated the Boise River. The construction of dams and active river channelization was a response to the flooding, which in turn permitted the transformation of the flood plain into urban developments. The rationale of a living river prior to completion of the Arrowrock quickly evaporated in light of the new irrigation dams and enhanced flood protection. This security provided by the three major Boise Water Project dams, which consist of the Diversion in 1908, the Arrowrock in 1915, and the Lucky Peak in 1955, bolstered growth on the more susceptible tracts of land in the valley.

Prior to the completion of the Arrowrock Dam, irrigation and flood control systems in the Boise Valley limited development on the flood plain to farming. Valley residents understood that building residences or any other physical structures on the flood plain guaranteed damages from the annual snow melt. The high costs and low returns in building a dam on the Boise River detoured private companies from domesticating the river via the federal

land exchange with private companies of the Carey Act of 1894, which proved successful in the Magic Valley just over a hundred miles away. The funding necessary for the project came after passage of the Reclamation Act of 1902, when farmers began to petition the federal government to build a federally funded dam for irrigation benefits.

The Corps conducted the initial reconnaissance surveys around the existing location of the Arrowrock Dam from1903 to 1904 on the behalf of the US Reclamation Service (now US Bureau of Reclamation). Congressional approval for funding the project came on June 10, 1910. Construction on the selected site did not officially begin until the completion of many preliminary projects, including a 17-mile rail line, a sawmill, a camp fit to house 1,500 men, a 1,500-kilowatt power plant for concrete mixers, and 54 miles of telephone line laid for direct contact with the main Boise Reclamation Service office. Furthermore, two cofferdams and a diversion tunnel allowed official construction to commence in 1911. The original price of the dam reached approximately $5,000,000, which originally provided 276,500 acre-feet of water until 1937 when the Corps added the additional five feet to the height of the dam that have remained until today.

Environmental Matters

Unlike the initial construction, the current decision-making process includes the IRU defense of the state river protections, the federal Endangered Species Act (ESA), and National Environmental Protection Act (NEPA) against the Arrowrock project. IRU claims that raising the Arrowrock Dam would be waste of tax dollars. Paul stresses her point that "there is absolutely no good reason to raise the Arrowrock Dam." Adding that, "the Treasure Valley has plenty of water" and that people "need to have better water use practices instead of spending millions of dollars on a project that will inevitably benefit only the people living on the flood plain."

The IRU confidence in the pertinent policies that make up their argument shifted their focus on the potential alternatives to flood control such as off stream detention ponds, raising bridges, building levees, better construction zoning on the rivers flood plain, and water conservation standards. "Investing in such alternatives would save taxpayers thousands if not millions of dollars in comparison to building a dam," says Paul. With tight budgets on both sides of the state and federal partnership, these measures would be encouraging. However, the ideas proposed by the IRU forgo the economic realities of setting aside land for such flood control runoff and the water storage ambitions of the state. Seventy-five percent of the land in the rivers flood plain belongs to private owners. In competition with developers, the market prices and cost to purchase enough land for those measures could turn out to be an expensive endeavor to accomplish. Despite valid points in terms of demanding water conservation and the inherently unequal benefits from raising the dam, the IRU position relies heavily on the provisions set by federal and state protections of the North and South Fork of the Boise River. Together the claims of inefficient use of tax funds and water use, the ESA, the NEPA, and the state river protections, creates the IRU defense against construction at the Arrowrock Dam.

An unfortunate ambiguity in the Arrowrock proposal lays in its location, which is positioned in an area just beyond the zone of the state river protections and federal critical habitat zone of the endangered bull trout in an already ecologically damaged section of Lucky Peak Reservoir. The state protection statues specifically exclude the following: Construction or expansion of dams or impoundments, construction of hydropower projects, construction of water diversion works, dredge or placer mining, alterations of the streambed, mineral, sand, or gravel extraction within the streambed. It may sound like a sure winner for the IRU, but the designated protections explicitly read for the protection from the "backwaters of the Arrowrock Dam to the confluence of the North and South Fork." The proposed raising of Arrowrock positions all construction on the "front waters" of the dam.

The Corps 2011 preliminary evaluation used the successful raising of the San Vicente Dam in California as an example to show the probable methodology for construction. The example shows a cross-section diagram that demonstrates all construction taking place in front of the dam from the base up, using the existing structure as a foundation. Moreover, Lucky Peak Reservoir does not have a dead pool limit, which means there is not a minimum water level required by law nor are there state or federal environmental protections on that body of water. The concreate wall of Arrowrock quite literally separates the protections that make up the bulk of the IRU argument and the proposed dam. The Corps could build a barge below the Arrowrock dam and drain the portion of the reservoir bypassing most state and federal protections.

USBR biologist Dimitri Vidergar indicated that there is a non-migratory population of bull trout that live in the headwaters of Mores Creek, a tributary that feeds into Lucky Peak Reservoir from the north. He also said that the waters in the lower section of Lucky Peak Reservoir near the Mores Creek Bridge are too warm for the bull trout. Vidergar declared that a small migratory population of bull trout may exist in Lucky Peak Reservoir, but only wintering in the lower reservoir and returning to the headwaters of Mores Creek during the summer. A reasonable

statement to make as the completion of the Lucky Peak Dam in 1955 has since produced yearly irrigation drawdowns of the reservoir, which creates an abysmal environment for the temperature sensitive bull trout. In addition, the USBR actively seeks any bull trout via their "trap-and-haul" program that aims to catch any bull trout presumed to have made it through the Arrowrock clamshells and return them to the Arrowrock reservoir.

Despite the environmental uncertainty, it has not resulted in a derailment of the IRU defense. The impending problem remains in the expansion of the Arrowrock Reservoir and the building of new access roads if raised. Corps evaluations estimate a maximum expansion of 6.5 miles to the reservoir if a 74-foot dam raising resulted. Conversely, the US Fish and Game states that any "activities" above normal high water marks "can and often do, impact critical habitat areas." Activities include movements such as maintenance or building of roads. Therefore, one of the primary issues with the project in terms the EIS required by the NEPA will be the expansion of the reservoir that can inundate roads, creeks, and other land below the new proposed 3290-foot watermark. An elevation exploration of the roads along the South Fork and roads leading up to the North Fork are in fact below that elevation.

These activities have the potential to conflict with the ESA as it states that federal agencies must, "insure that any [federal] action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [critical] habitat." However, in section 7-h of ESA, it also states that if an action clearly outweighs the alternatives that may conserve critical habitat, an exemption is possible. The action must be in the public interest, and must have a regional or national significance. If the action meets the criteria outlined in the ESA, then the federal agency pursuing the action and the state governor could apply for an exemption to alter the designated critical habitat area. The need for a biological assessment will determine the adverse effects, and a formed committee will ultimately judge the exemption for final approval. The effects of expanding the reservoir on the tributaries closest to the main body of Arrowrock Reservoir will definitely be the issue of focus for the IRU. Furthermore, the politically conservative IWRB does hold the power to modify the state protections to move forward on their plans for water storage.

Urban Growth and Flood Risk

In terms of the public interest, the socio-economic risks further complicate the situation. Ellen Berggren of the Corps asserts that the valley has never been without flood risk, which is an integral part of the Corps' mission to address the matter. Berggren says it is difficult to get the funding approval from congress for direct flood control measures, which stifles efforts by the Walla Walla District Corps. Valley residents have constantly battled with flooding throughout the Boise River's recorded history. The book *When the River Rises* offers one of the best summaries of that history. The title alone asserts the reality of a living river. In the book, Susan Stacy discusses in detail the most recent major flood events from 1943-1985. The 1943 flood event caused an estimated $1,000,000 in damages and solidified the decision to the build the Lucky Peak Dam. Despite the flooding certainties that continued to occur over the years it was ultimately pressures from irrigators that drove most of the policy made pertaining to dam building, not so much the flooding itself.

The second major flood event in 1985 truly put the Boise Project dams to the test. The winter snowmelt uncovered the limitations of the Arrowrock Dam specifically. The timeworn ensign valves that released excess water during the 1985 spring melt created a noticeable bottleneck. Thus, the upgrade on the Arrowrock made for more than just routine maintenance. In 1915, engineers did not incorporate or even understand the precaution of building dams to withstand the modern standard of a probable maximum flood. Despite the new improvements on the Arrowrock, the Idaho Flood and Seismic Risk Portfolio of 2012-2017 ranks the Lower Boise Sub-basin as the number one area concern in the state due to population growth on the floodplain.

Overall growth in the valley has received national attention, such as in an article in *USA Today*, whose title seems to encompass the going trend: "No end in sight for Idaho's growth." The article boasts of the economic prosperity and urban expansion specifically in the Treasure Valley just prior to the nation's economic downturn. Even in the shadow of the 2008 economic crisis an unrelenting push for riverside development continues. Remarkably, some of the most expensive pieces of property in the valley lay in the most volatile places geographically, including the 952 homes under federal flood protection insurance directly on the floodplain. Well known hazards have yet to detour economic gains by developers using aesthetics as a selling point.

Nowhere will the potential for future floodplain development be greater than in the cities of Star, Eagle, and the western edges of Garden City. These cities hold some of the remaining floodplain farmland in the Boise metro area. According to the United States Department of Agriculture's Census Bureau, the housing boom from

2002 to 2007 reduced Ada County's farmland by 14% and by 4% in the adjacent Canyon County. Records from 2012 show that only 16% of the total area within the two counties qualifies as irrigated farmland. Agricultural land is perfect for developers as the land is typically flat and free of debris, which makes construction that much easier. Aerial images of the valley demonstrate the expanses of land between Eagle and Star as ripe for the picking for subdivision contractors. Growth seems to be an unescapable part of any thriving city, but the laissez faire flood plain zoning that took place over the last 50 years highlights the lucrative profits and apparent risks involved. Stimulating the local economy at the increasing loss of riparian habitat and farmland. In addition, Compass has been working since 2002 to build a commuter transit expansion on State Street that would facilitate the flow of traffic from downtown Boise through Eagle and in to the city of Star. If such a design were to be implemented the farmland and riparian regions on the northern banks of the Boise River between Eagle and Star would eventually sell at premium rates.

The proposal for construction at the Arrowrock Dam influences all valley residents, but in particular the canal companies, farmers, wealthy floodplain homeowners, and the defenders of the river's health. The agencies involved in the matter begins with the USBR who rightfully owns the Arrowrock Dam and whose core mission in the arid west relates to water storage. The USBR has operated the largest water storage facilities in the Boise Valley since the completion of the Diversion Dam. The Corps and the USBR have parallel missions. Historically, their efforts brought ideas into physical reality by constructing all the stages of the Boise Water Project. The Walla Walla District Corps is highly concerned about the flood protection of the largest population in their region. Modifying dams to accommodate for the probable maximum flood risk is a part of water resource management, in part to avoid having to make difficult decisions that would leave principal agencies liable for any possible damages.

The potential economic losses from property damages are a concern to the federal government if payouts under the National Flood Insurance Program (NFIP) are significant. Taking a stroll on the green belt in the cities of Boise, Garden City, and Eagle confirms the volume of properties directly on the floodplain of the Boise River and its tributaries. The three cities are participants of the NFIP. The program is not a requirement, but it allows for variable subsidy rates of insurance for the city's residents that meet or exceed Federal Emergency Management Standards. As of 2012, the coverage liable for payout in the Lower Boise Sub-basin totals $462,378,164, with a collection of $1,105,069 in total premiums by the federal government. Subsidies are available for residents on a scale rated from one to 10, one being the highest and 10 meaning that the city does not participate in the program.

Boise and Eagle rank in at six, while Garden City ranks as an eight. The active performance on flooding awareness and flood risk prevention standards gives these cities these rankings. A set of 19 individual measures split into four categories: public information about risks, mapping and regulations, flood damage reduction, and warning/response. Despite the implementation of some standards in these cities, the risks still exist as they have continued to experience flooding events, such as the 1998 flooding in Eagle affecting multiple subdivisions, which lead to the evacuation of 60 residents, and caused significant damage to sections of the Boise green belt. Also in 2006, the flooding of the unfinished Laguna Pointe subdivision in Eagle did not stop the contractor from selling the homes to the present residents.

A majority of the urban development on the rivers flood plain consist of affluent properties that would certainly benefit from the flood control. These costly properties stretch from below the Diversion Dam to marginally beyond the City of Eagle. Garden City serves as an exception to that where sections of riverside property consist of considerably lower class neighborhoods. However, the city's newly established urban renewal agency hopes to change this with a bulk of their projects focusing on riverside developments. The most recent, River Front East Urban Renewal Plan aims to convert a 199-acre plot along the Boise River into high priced housing, which will expand the newly named Waterfront District. The redevelopment will remove the present trailer homes on river's edge and give the area a modern condominium style face-lift.

The City of Boise on the north side of the river also works toward reclaiming underdeveloped riverfront areas. In particular, an EPA Brownfields project in the west downtown area off 30th Street. Once an oil storage facility known for its soil contamination while in use from 1920 until about 2009, the area is now under consideration for urban renewal. These are just a few examples of cities in the valley planning around a reliably tamed Boise River. As projections for the future linger, many of the alternatives such as retention ponds are odds with the real estate investors that are funding the various projects throughout the valley. Assuming regulations do not change for flood plain construction, the potential economic profits from new developments on the river's flood plain are too lucrative for zero construction zoning.

The economic advantages that may come from raising the Arrowrock Dam can equate to variable gains distributed throughout the valley beyond that of property values. The water expansion to the proposed 300,000 acre-feet could provide at current water bank rates ($17) a maximum value of $5.1 million dollars. With the state's general fund for the fiscal year of 2015 approximating $2.9 billion, the number may sound like a drop in the bucket.

However, when the Arrowrock Dam underwent its $20 million upgrade in 2004, the federal government only anticipated a return of $6.9 million over a 15-year period from the State of Idaho. Berggren stated that the typical cost share between state and federal agencies ranges from a 30/70 to a 40/60 split respectively. The purchase of a new dam at this kind of discount may be worth it. On the other hand, the San Vicente Dam example used by the Corps when finalized produced a price tag of $415.9 million, which if comparable could burden the state with a debt upwards of $120 million plus. Arrowrock differs by 170 feet more in length and 43 feet less in height, which may add or subtract to San Vicente figure. The actual price tag of the proposed dam remains to be determined if granted a green light.

Future Arrowrock

The contention between the irrigators, developers, riverside residents, and environmental advocates involved in the potential raising of Arrowrock make the process an attention-grabbing dilemma for the valley. The push for flood control by the Corps works for the floodplain residents and developers. The IWRB wishes for more water storage, which serves the irrigators and the USBR. The IRU wants the protection and greater consideration of the health of the South and North Fork of the Boise River. All the interests converging at once will make the final decision a difficult one. The Corps hopes to have an environmental impact statement by the end of 2015 and their final recommendation by 2017. That assumes that all goes well. Depending on the outcome of the EIS, the IRU may decide to challenge the strength of the assessment. This may lead to lawsuits that would further delay the process of deciding to begin construction or not.

Without the strong support of the public backing further environmental protection, the odds are against IRU. Of the scoping publications released by the Corps, the alternatives under evaluation fall short of meeting all the expectations of the all the stakeholders involved in one action. For example in terms of addressing water needs, managed aquifer recharge is the one alternative under evaluation in opposition against the dam. USBR and the Corps hydrologists feel hesitant on that action meeting the future water needs of the valley. The IRU asserts water conservation measures can aid in the need for water, but this only receives brief mention in the Corps reports. The unsettled alternatives all refer to alternative methods of flood control that will alleviate risk in isolated areas. The improvement of irrigation head gates will decrease impact of flooding near canals. Raising low bridges will protect areas in their proximity against water backing up against the bridges during high water events. Implementing all of the alternatives would indeed provide protection in strategic areas in the valley that are at risk. However, it still undermines the state's main objective of attaining more water storage, which the Corps asserts they must accommodate to since the IWRB is their client in the project. The Corps, in due course, plan to incorporate several of the alternatives that will best address the flood control risks as well as water storage.

Water conservation if done right could help alleviate future water needs, but the lack of developed methodology makes the endeavor a difficult one to incorporate. Even Paul carrying the torch for water conservation, had only a few ideas how to conserve water, like recommending the low flow faucets, appliances, xeric landscaping, and so forth. She went as far as saying that urbanization off the floodplain will help with water conservation because most new homes come stocked with modern low water use equipment. However, getting to a level of water conservation necessary to ensure the longevity of our current water resources will take more than just a few "green" folks starting to conserve water. It will take citywide initiatives to bring the high levels of water management necessary for success. There may be hope for that vision. During the public commentary meetings held by the Corps in 2010, the principal concern of the residents from the Ada and Canyon Counties were for the environmental impacts of raising the dam and expressed low concerns for water availability, although the representation of residents in those meeting may be a skewed portion of concerned citizens.

The following three years will prove whether the value of ecosystem services can stand against flood plain development plans and future water demands. Whatever the conclusion of the proposal, the topic of water availability, flood control, and ecosystem services will continue to surface in the Boise Valley as these complex issues come center stage overtime. Additionally, the separation of the aquatic ecosystems of the Upper Boise River will remain subject to the ebb and flow of the Boise Water Project dams. The manner of protection will continue to challenge biologist, economists, bureaucracies, and communities. As population growth increases, the amount of people visiting the protected bull trout areas will also intensify, placing added pressure on their ability to survive, while the overarching human ecosystem does the same.

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