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## Raising Arrowrock

*Bigger has always been better for the builders of Arrowrock Dam.*

by Richard Martinez

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Dedicated in 1915, Arrowrock Dam was the “engineering marvel of its time.” Headlines in Boise City, Idaho, proudly stated, “Arrowrock, Highest Dam in the World.” That 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.”

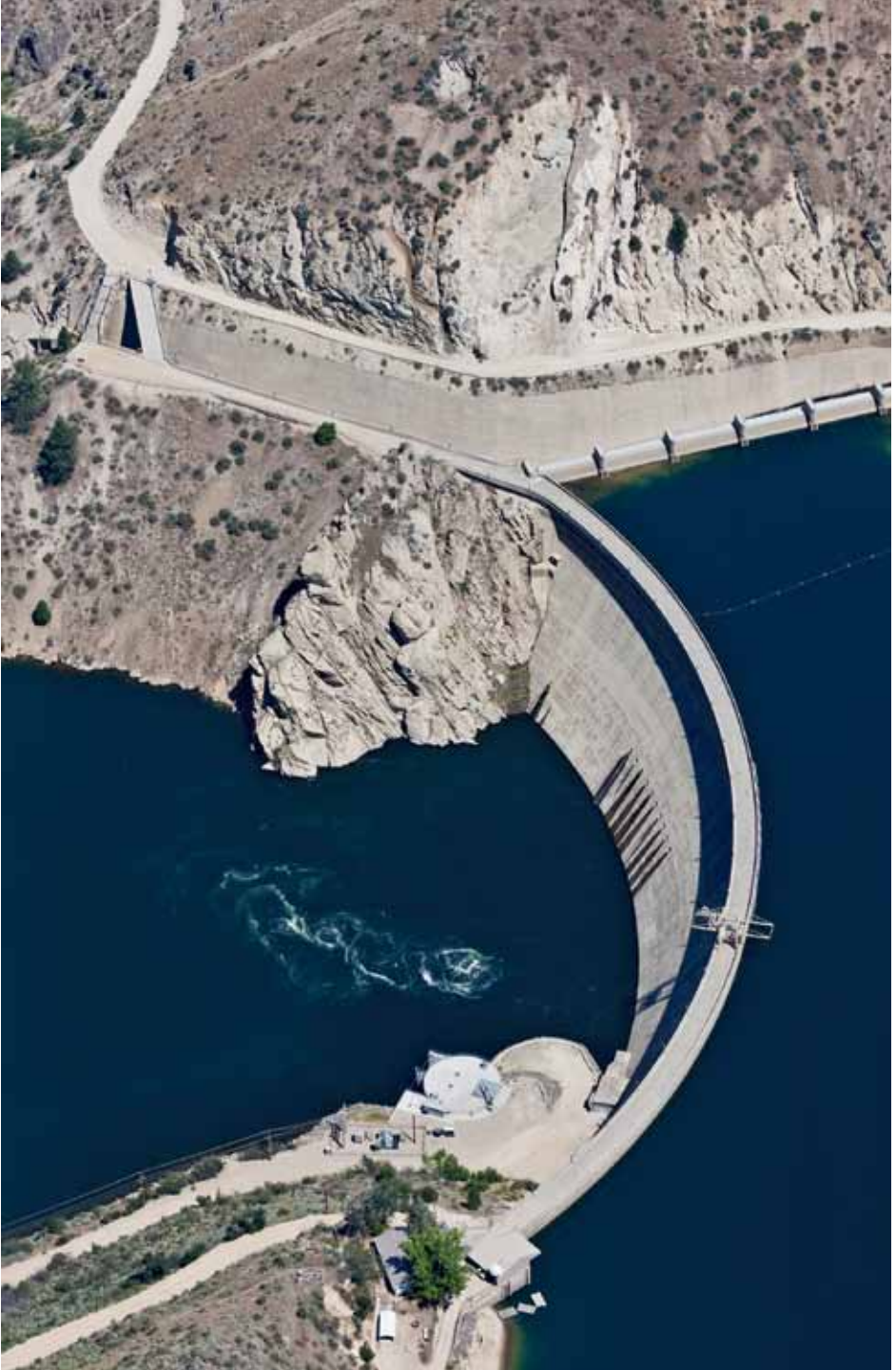
Today, the 350-foot dam above the city of Boise remains the centerpiece of the U.S. Bureau of Reclamation’s Boise-Payette Project. The Boise part of the project serves five irrigation districts with a total storage capacity of 1,793,600 acre-feet. Its three power plants have a total capacity of 50,200 kilowatts. Its 300,000 acres of irrigated crop- and rangeland yield mostly alfalfa, corn seed, fruit, beets, potatoes, and other row crops. The project also provides flood protection for a fast-growing metropolitan statistical area of 616,000.

In 2008, the U.S. Congress identified Arrowrock Dam, just upstream from Lucky Peak Reservoir, as an “aging federal structure of concern” and in 2015, the U.S. Army Corps of Engineers aims to prepare a draft environmental impact statement to study raising the impoundment by 74 vertical feet. The complexities involved in raising Arrowrock Dam bring together many legal authorities and present some of the hardest questions we face in modern politics—those of economics, safety, and natural resources.

### *Aging Arrowrock and Ecosystem Restoration*

The construction of large water infrastructure projects in the early 20th century contributed substantially to the evolution of life in the arid West. The process of gaining approval for reconstructing Arrowrock Dam in the 21st century has become a game of political chess. The last major flood over 9,800 cubic feet per second occurred in 1983 and challenged the capacity of Arrowrock Dam to control major floods. Both federal

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and state agencies knew there were limitations with Arrowrock Dam, which is an integral component of the upper Boise (Water) Project.

Federal and state government agencies later came together 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 had completed a \$20 million upgrade on the century-old ensign valves with new stainless steel clamshell gates to increase Arrowrock's ability to release high snowmelts 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 12 dam sites throughout Idaho in collaboration with a federal partner starting in 2006. An agreement between the Idaho Water Resource Board and the



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South Fork of the Boise River

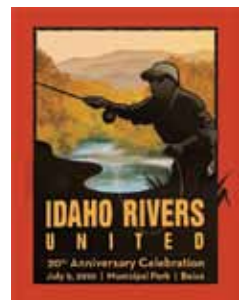
U.S. Army Corps of Engineers locked in federal funding via the 2007 amended version of the Water Resources Development Act of 1999, which then included water supply surveying and ecosystem restoration analysis.

Arrowrock Dam appears as an example in a 2008 congressional report 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 upgrade as the dam completes a century of continual service. Furthermore, the succession of

evaluations by the federal and state partnership ended in 2010 and placed Arrowrock Dam at the top of the list for feasibility of water storage and flood control benefits. By 2011, the Corps of Engineers was focusing specifically on Arrowrock and had presented results of a preliminary evaluation to the public for commentary on alternatives, including (1) raising the height of the dam by up to 74 feet, (2) building a new dam, (3) upgrading bridge heights downriver, and (4) replacing smaller push-up dams with inflatable weirs, among other options. Comments from community residents, governmental entities, the private sector, and environmental groups reflect a broad range of concerns, including lack of water availability, dam reconstruction, and the environmental consequences of the construction and operation.

The ecosystem restoration component in the amended Water Resources Development Act of 2007 no longer exists. Ellen Berggren, Snake River project manager at the U.S. Army Corps of Engineers, stated that funding is not available on behalf of the corps or the Idaho Water Resource Board. She added that the corps would welcome an external partner to help fund the ecological restoration effort, but that would assume familiarity with one of the most difficult valuation processes in environmental economics—that is, determining the value of impaired ecological systems. Liz Paul, the Boise River Campaign coordinator for Idaho Rivers United, said that Idaho Rivers United is willing to collaborate in restoration, but she 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 the goal of restoration is not simple: the challenge lies in justifying the investment of tax dollars in environmental restoration of Arrowrock Dam, a site that does not directly pose negative effects on human health. The relative value would reflect a wide range of responses by Boise Valley residents to the value of higher biodiversity, which illustrates the complexity of the situation. The crux of the problem for conservationists is that



WARD HOOPER FOR IDAHO RIVERS UNITED

Idaho Rivers United questions environmental costs of enlarging big dams.

the safety of certain water levels for people depends on where residential homes are built, that methods for predicting future floods are imperfect, and that residential developers driven by profit will build anywhere, even in the floodplain. Idaho Rivers United must surf these uncertainties to receive money to advocate for wise flood control, protection of the upper rivers, and provision of recreation on the Boise River. The unpredictable value attributed to the environment will make even the most ambitious environmental advocates scratch their heads when it comes to deploying an effective strategy to fund and restore the damaged reservoir ecosystems.



BUD LARSON

The Lucky Peak “rooster tail” is excess water used for power generation that comes through the dam’s outlet slide gates, nicknamed “flip buckets.” The release creates a huge plume of water that can reach a height of 150 feet.

Originally built for irrigation, Arrowrock Dam elicits concerns that 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 trumpet serious flood risks. Changes in land use make 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 the U.S. Bureau of Reclamation and the flood control mission of the U.S. Army Corps of Engineers align with the interests of the most powerful stakeholders in the valley below the dam: canal companies and farmers with

“first-in-time” water rights are 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 would amplify the storage capacity of Arrowrock Reservoir by an additional 300,000 acre-feet.

In a February 4, 2014, *Idaho Statesman* article, environmental journalist Rocky Barker wrote that the maximum number of acre-feet proposed by the Corps of Engineers might seem substantial, but after current irrigators take their share, only 60,000 acre-feet will remain for distribution. In addition, COMPASS (Community Planning Association of Southwest Idaho) projects that the Boise metropolitan area will reach a population of 1.5 million by 2040. These projections are at the core of the Idaho Water Resource Board’s argument to move forward with the expanded dam; an increased need for water for a growing Boise Valley population warrants state action.

### *Historic Arrowrock*

As all rivers do, the Boise River experiences cycles of flooding caused by melting of the snowpack in the high mountains above the city. The water infrastructure and development have long since domesticated the Boise River. Dam construction and active river channelization were responses to the flooding, which, in turn, permitted the transformation of the floodplain into urban developments. The living river soon was vanquished as dam construction and enhanced flood protection became normal practices. This security, provided by four major dams—Diversion in 1908, Arrowrock in 1915, Anderson Ranch in 1941, and 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 floodplain to farming. Valley residents understood that building houses or any other physical structures on the floodplain guaranteed damage from the



U.S. BUREAU OF RECLAMATION

Construction of Arrowrock Dam

annual snowmelt. The high costs and low returns of building a dam on the Boise River detoured private companies from domesticating the river via the federal land exchange with private companies granted by the Carey Act of 1894, which proved successful in the Magic Valley just over 100 miles southeast of the Boise Valley. The funding necessary for the project came after passage of the Reclamation Act of 1902, when farmers petitioned the federal government to build a federally funded dam for the benefit of irrigation.



U.S. BUREAU OF RECLAMATION

Construction camp in Arrowrock Canyon, about 1914

The U.S. Army Corps of Engineers conducted the initial reconnaissance surveys around the existing location of the Arrowrock Dam from 1903 to 1904 on behalf of the U.S. Reclamation Service (now the U.S. Bureau of Reclamation). Congressional approval for funding the project came on June 10, 1910. Construction on the selected site did not officially begin until many preliminary projects were completed, including putting in 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 were built before official construction began in 1911. The dam cost approximately \$5 million and provided 276,500 acre-feet of water until 1937,

when the Corps of Engineers added an additional 5 feet to the height of the dam.

### *Environmental Matters*

Unlike during the initial construction, the current decision-making process pits Idaho Rivers United directly against the Arrowrock project. Idaho Rivers United defends the state river protections, the federal Endangered Species Act, and the National Environmental Protection Act, and it claims that raising Arrowrock Dam would waste tax dollars. Paul stresses her point that “there is absolutely no good reason to raise the Arrowrock Dam.” She adds 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 floodplain.”

Idaho Rivers United focuses on the potential alternatives to flood control, such as forming off-stream detention ponds, raising bridges, building levees, creating better construction zoning on the river’s floodplain, and improving water conservation standards. “Investing in such alternatives would save taxpayers thousands if not millions of dollars in comparison to building a dam,” Paul said. With tight budgets on both sides of the state and federal partnership, these measures should hold some appeal. However, the ideas proposed by Idaho Rivers United forgo the economic realities of setting aside land for such flood control runoff and the water storage ambitions of the state. Private citizens own 75% of the land in the river’s floodplain. In competition with developers, the market prices and cost to purchase enough land for those measures could be an expensive endeavor. Despite making the valid points of demanding water conservation and the inherently unequal benefits that would result from raising the dam, the Idaho Rivers United position relies heavily on the provisions set by federal and state protections of the North and Middle Forks of the Boise River.

Raising and rebuilding Arrowrock Dam would occur on the west side of the dam, below and immediately beside



BOISE RIVER MAINTENANCE

Gravel removal helps control water flow on the Boise River.



the existing reservoir. Idaho's protection statutes specifically exclude construction or expansion of dams or impoundments, construction of hydropower projects, construction of water diversion works, dredge or placer mining, alterations of the streambed, and mineral, sand, or gravel extraction within the streambed in a protected river. Because the rebuilt dam would be below the protected river, it could be permitted. However, federal and state laws protect bull trout as an endangered species, and bull trout live in and above Arrowrock Reservoir. The state also protects the wild, recreational, and scenic river above the reservoir. If the dam were raised 74 feet, the reservoir would inundate a portion of the protected river within the Middle and South Forks of the Boise River. If the state law remains intact, Idaho Rivers United could be the sure winner, but keeping the law intact might be a big challenge in the conservative state of Idaho.

JOEL SARTORE/NATIONAL GEOGRAPHIC STOCK WITH WADE FREDENBERG/USFWS



Bull trout migrate to spawn.

The impending problem remains in the expansion of Arrowrock Reservoir and the construction of new access roads. The Corps of Engineers estimates a maximum expansion of 6.5 miles to the reservoir if a 74-foot dam raising occurs. The U.S. Fish and Wildlife Service states that any “activities” above normal high water marks “can and often do impact critical habitat areas.” Such activities include the maintenance or building of roads. Therefore, one of the primary issues with the project will be in the environmental impact statement required under the National Environmental Protection Act.

This statement will include the expansion of the reservoir that would inundate roads, creeks, and other land below the new proposed 3,290-foot water mark.

These activities have the potential to conflict with the Endangered Species Act, which states that federal agencies must “insure [sic] 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, section 7(h) of the Endangered Species Act also states that if an action clearly outweighs the alternatives that may conserve critical habitat, an exemption to the law is possible. The action must be in the public interest, it must have a regional or national significance, and a biological assessment must be prepared to determine the adverse effects of the proposed action. The governor of Idaho can apply for an exemption to alter the designated critical habitat. The outcome of the biological assessment and other political factors would then be judged by a federal committee, nicknamed “the God Committee,” that would recommend a decision on the governor’s request for the exemption.

The effects of expanding the reservoir on the tributaries closest to the main body of Arrowrock Reservoir will most likely be the key issue for Idaho Rivers United. Furthermore, the politically conservative Idaho Water Resource Board holds the power to modify the state protections to move forward with their plans for water storage. However, turning back the protected rivers law will create an uproar in the state of Idaho and in the changing Congress.

### *Urban Growth and Flood Risk*

Ellen Berggren of the Corps of Engineers asserts that the Boise Valley has never been without flood risk, and addressing flood risk is an integral part of the corps’s mission. 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



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Arrowrock Dam was once the tallest in the world, but it may not be enough to prevent flood risk.

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. Author Susan Stacy describes major flood events from 1943 to 1985. The 1943 flood event caused an estimated \$1 million in damages and solidified the decision to build Lucky Peak Dam. Despite the flooding certainties that continued over the years, it was ultimately pressure from irrigators, and not the flooding itself, that drove most of the policy decisions pertaining to dam building.

The second major flood events, in 1983 and 1985, truly tested the Boise Project dams. 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 to Arrowrock Dam, the Idaho Flood and Seismic Risk Portfolio of 2012-2017 ranks the lower Boise River sub-basin as the number one area of concern in the state because of population growth on the floodplain.

Overall growth in the Boise Valley has received national attention. An article in *USA Today*, titled “No End in Sight for Idaho’s Growth,” describes the ongoing trend. The article boasts of 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 lie 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 who use 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 U.S. Department of Agriculture's census, the housing boom from 2002 to 2007 reduced Ada County's farmland by 14% and by 4% in adjacent Canyon County. Records from 2012 show that only 16% of the total area in the two counties qualifies as irrigated farmland.

Agricultural land is perfect for developers because 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 inescapable part of any thriving city, but the laissez-faire floodplain zoning that has taken place over the past 50 years highlights the lucrative profits and apparent risks involved. 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 to 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 Arrowrock Dam influences all valley residents, but canal companies, farmers, floodplain homeowners, and the defenders of the river's health stand to be the most affected. Agencies involved in the matter begin with the U.S. Bureau of Reclamation, which rightfully owns Arrowrock Dam and whose core mission in the arid West is water storage. The bureau has operated the largest water storage facilities in the Boise Valley since the completion of Diversion Dam in 1909. Historically, the efforts of the corps and the bureau transformed ideas into reality by constructing all stages of the Boise Project. Officials at the Walla Walla District Army Corps of Engineers are concerned about 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 that would avoid difficult decision making, leaving principal agencies liable for

damages. The potential economic losses in property damages are a concern to the federal government if payouts under the National Flood Insurance Program are significant.

Taking a stroll on the greenbelt 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 in the National Flood Insurance Program. The program is not a requirement, but it allows for variable subsidy rates of insurance for city residents who meet or exceed federal emergency management standards. As of 2012, the liability in the lower Boise River sub-basin totaled \$462 million with a collection of \$1.1 million in total premiums by the federal government.



U.S. GEOLOGICAL SOCIETY

The Boise River floods at Glenwood Bridge, 2006.

Subsidies are available for residents on a scale that rates cities from 1 to 10, 1 being the highest in terms of the city's flood protection efforts and 10 meaning that the city does not participate in the program. Boise and Eagle have a rating of 6 and Garden City a rating of 8. The active performance on flooding awareness and flood risk prevention standards gives these cities their ratings. A set of 19 individual measures are 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 risk still exists, as they have continued to experience flooding events. For example, 1998 flooding in Eagle affected multiple subdivisions, led to the evacuation of 60 residents, and caused significant damage to a section of the Boise River Greenbelt. But in 2006, the flooding of unfinished Laguna Pointe subdivision on Eagle Island did not stop the contractor from selling the homes to the present residents.

Most urban development on the river's floodplain is inhabited by affluent property owners who would benefit from flood control measures. These costly properties stretch from below the Diversion Dam to above the city of Eagle. Garden City serves as an exception in that sections of its riverside property consist of lower income 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 of these projects, the 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 Waterfront District subdivision built in 2008. The redevelopment will remove the present lower income trailer homes on the river's edge and give the area a modern condominium-style facelift.

On the north side of the river, Boise also works toward reclaiming underdeveloped riverfront areas. The Environmental Protection Agency's brownfields project in the west downtown area off 30th Street is one example. The site of an oil storage facility from 1920 to 2009, the land is known for its soil contamination but 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 at odds with real estate investors funding projects throughout the valley. Assuming regulations for floodplain construction do not change, the potential economic profits from new developments on the river's floodplain are too lucrative to allow no construction.



BOISE RIVER MAINTENANCE

Riverfront homes dot the Boise River.

## *The Future of Arrowrock Dam*

The economic advantages that may come from raising Arrowrock Dam can equate to variable gains distributed throughout the Boise 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. 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 Arrowrock Dam underwent its \$20 million upgrade in 2004, the federal government anticipated a return of only \$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



U.S. DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION

Spring floods and summer droughts drive the politics of Arrowrock Dam.

from a 30/70 to 40/60 split, respectively. The purchase of a new dam at this discount may be worth it for some, but the actual price tag of the proposed dam remains to be determined if the project is approved.

The contention among the irrigators, developers, riverside residents, and environmental advocates involved in the potential raising of Arrowrock makes the process an attention-grabbing dilemma for the valley. The push for flood control by the U.S. Army Corps of Engineers works for the floodplain residents and developers. The Idaho Water Resource Board

wishes for more water storage, which serves the irrigators and the U.S. Bureau of Reclamation. Idaho Rivers United and many existing residents along the river want protection and greater consideration of the health of the South, Middle, and North Forks of the Boise River. All the interests converging at once will make the final decision a very difficult one. The corps hopes to have an environmental impact statement by the end of 2015 and final recommendation by 2017. That assumes that all goes well. Depending on the outcome of the environmental impact statement, Idaho Rivers United may decide to challenge the findings in the assessment. This may lead to lawsuits that would further delay the process of deciding whether or not to begin construction.

The next few years will prove whether the value of ecosystem services can stand against floodplain development plans and future water demands. Whatever the conclusion of the proposal, the topics of water availability, flood control, and ecosystem values will continue to flow throughout the Boise Valley.



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