A River Again

Fossil Creek, Desert Fishes, and Dam Removal in the American Southwest

ABSTRACT This article details the successful campaign to decommission two hydroelectric plants and a dam on Fossil Creek in Arizona—a rare perennial stream in the Southwest. Beginning in 1991, American Rivers, the Sierra Club, and community service groups utilized the Federal Energy Regulatory Commission's recommissioning process to force the removal of the dam and plants. They faced opposition from the plants' owner, the historical community, and citizens concerned over the loss of a seemingly "green" source of renewable energy. This study argues that Fossil Creek was a pioneering achievement in the larger movement to remove dams in the United States. After Edwards Dam in Maine, it was only the second dam taken down to restore fish species. In Maine-and in later dam removals in Washington and Oregon-valuable salmon and other anadromous species were the focus of conservation efforts; but in Fossil Creek, the effort was unique in that it centered on helping to save several species of rare desert fishes that had little or no sport or commercial value. The Fossil Creek victory represents an important example of the complex intersection of ecological restoration and environmental politics in the late twentieth century. KEYWORDS American dams, Fossil Creek, Childs-Irving, American Southwest, dam decommissioning, conservation, desert fish

In central Arizona, far removed from the urban expanse of Phoenix, is a rare desert oasis, a free-flowing perennial stream called Fossil Creek. It emerges from a series of springs that flow 43 cubic feet per second at a constant temperature of 72 degrees to create a turquoise blue river. It winds fourteen miles through a 1,500 feet deep canyon before entering the Verde River in central Arizona. The small river, tumbling and spilling over travertine dams and waterfalls, resembles its more famous Arizona cousin, Havasu Creek, in the Grand Canyon. Its life-giving waters support a green ribbon of riparian vegetation dominated by sycamore, walnut, cottonwood, willow, and ash trees. Fossil Creek truly is a rare gem in the desert; it is a relic of a nearly vanished Southwest when hundreds of miles of similar streams flowed

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unimpeded from the region's mountains to the Sonoran Desert thousands of feet below.

But it has not always been this way. For almost a century a dam and flume system diverted almost the entire flow of the creek to power two hydroelectric facilities, the Childs-Irving plants that once provided 70 percent of Phoenix's power needs in the early twentieth century. After fighting for over eight years to recommission the facilities, Arizona Public Service Company (APS)—owner of Childs-Irving plants—decided to give up the battle in 1999. In 2005, the water diversion structures were bypassed. For the first time in almost a hundred years, Fossil Creek flowed freely. The Childs-Irving dam removal was one of the first cases where a hydropower facility was decommissioned through the Federal Energy Regulatory Commission (FERC) review process in the United States.¹

The demolition of the hydroelectric facilities at Fossil Creek was a pioneering achievement in the larger international movement to remove dams and restore free flowing streams in the United States and Europe. During the 1990s and early 2000s, the European Union and U.S. government agencies, such as the Bureau of Reclamation and FERC, established frameworks that enabled dam removal to become a viable water management strategy.² After the Edwards Dam in Maine, the Fossil Creek dam demolition was only the second time in U.S. history where a hydroelectrical facility was taken down to restore a natural river. The decommissioning of the Childs-Irving plants on Fossil Creek was the first case where a desert stream in the Southwest was returned to its natural flow, ending a century of dam building when human needs and economic development took precedence over environmental concerns. While the Edwards Dam and later dams in Washington and Oregon were removed largely to restore important commercial and sports fishes such as salmon, striped bass, herring, and sturgeon, Fossil Creek was unique in centering on helping to save several species of rare and endangered desert fishes. These small, largely unknown fish-primarily minnows and suckers with no food or sporting value, were once commonly called "trash"

I. Lisa Force, interview by author, November 29, 2018; Andrew Fahlund, interview by author, November 30, 2018; E. Linwood Smith and Gordon L. Bender, "Proposed Natural Areas, Fossil Creek Springs, Report no. 11," June 1973, in Fossil Creek Files (FCF), Special Collections and Archives, Cline Library, Northern Arizona University, Flagstaff, Arizona; Barry Burkhart, "Hike Is Demanding, but Full of Beautiful Views," *Arizona Republic*, May 26, 1993.

^{2.} Quirin Schiermeir, "Dam Removal Restores Rivers: Huge European Demolition Projects Offer Hope for Fragmented Ecosystem," *Nature* 557, (May 2018): 290; Roberto Epple, "Dam Removal in Europe Is No Longer Taboo," *Aquaviva* (2016), www.ern.org, accessed 27 May 2019.

or "rough fish." They previously had few champions in an arid region where people placed a much higher value on game species such as trout and bass.³ In the successful campaign to remove the hydroelectric plants, environmental coalition advocates faced opposition from economic interests. They also had to overcome serious concerns over the plants' historical value, Childs-Irving's recognition as an engineering landmark, and questions about whether it made environmental sense to remove a hydropower facility, a seemingly "green" renewable source of energy, and replace it with power produced by fossil fuel-burning sources.⁴

In its details, this article illuminates many of the factors and controversies involved in dam removal decisions. It reveals how an astute environmental advocacy coalition, led by American Rivers and the Center for Biological Diversity, utilized the Federal Energy Regulatory Commission process to have the historically significant and economically viable Childs-Irving hydroelectric power plants removed. In the battle to decommission the plants, the environmental coalition utilized cultural, economic, and ecological arguments to overcome resistance from various stakeholders intent on maintaining the Fossil Creek facilities. As the following pages show, the Fossil Creek case represents an important example of the complex intersection between ecological restoration debates and environmental politics increasingly common in the United States and Western Europe.⁵ A groundbreaking achievement, the Fossil Creek victory helped birth what many scholars now recognize as a "New Era" of dam removal in the United States and Europe.⁶

Because dam decommissioning as a tool for river restoration is a relatively new phenomenon, studies on dam removal decisions and their ecological

3. Paul Marsh, Native Fish Lab, interview by author, June 12, 2013; "Catch a Trash Fish Slam," *Field and Stream*, July 1 2019.

4. Fahlund, interview; Force, interview. Historical and cultural values as they pertain to ecological values and dam removal projects are theorized in: Francis J. Magilligan, Chris S. Sneddon, and Coleen A. Fox, "The Social, Historical, and Institutional Contingencies of Dam Removal," *Environmental Management* 59 (2017): 982–94; Coleen A. Fox, Chris S. Sneddon, and Francis J. Magilligan, "You Kill the Dam, You are Killing a Part of Me:' Dam Removal and the Environmental Politics of River Restoration," *Geoforum* 70 (March 2016): 93–104; Dolly Jørgensen and Birgitta Malm Renöfalt, "Damned If You Do, Damned If You Don't: Debates on Dam Removal in the Swedish Media," *Ecology and Society* 18, no. 1 (2013): 2–9.

5. Magilligan, Sneddon, and Fox, "The Social, Historical, and Institutional Contingencies of Dam Removal," 982–94; Fox, Sneddon, and Magilligan, "You Kill the Dam," 93–104; Epple, "Dam Removal in Europe."

6. William R. Lowry, *Dam Politics: Restoring America's Rivers* (Washington, D.C.: Georgetown University Press, 2003), 2–3.

impacts are still developing and incomplete.⁷ Political Scientist William Lowry wrote one of the first book-length studies on dam removal politics in the United States in 2003. He and other scholars argue that more research needs to be conducted on political, social, cultural, and historical issues involved in dam demolition controversies in both the United States and Western Europe, the leading regions in dam decommissions. They also call for more studies on the rhetorical and symbolic construction and framing of arguments involved in contentious dam removal cases.⁸ This article helps address some of the gaps in scholarly literature identified by Lowry and other scholars.

In his groundbreaking work, Lowry developed a new theoretical framework for analyzing successful and failed dam demolition campaigns utilizing existing Advocacy Coalition Framework analysis, rhetorical framing theories, and other models. He concluded that several factors are central to successful dam removal efforts. These elements include the physical complexity of the task, the economic costs and benefits of removal, and the function of the dam, especially whether it is a multipurpose structure involving numerous stakeholders. Other important considerations include the number of jurisdictions involved, the venue where the decision is made, and the total of advocacy coalition groups engaged. Other factors relevant to successful dam demolitions include whether environmental coalitions can frame their arguments to overcome opposition, whether larger socioeconomic conditions are receptive to change, particularly public opinion, bureaucratic agendas, and support from high-level political leaders, and whether scientific information is available and widely agreed upon.⁹ As the following study shows, the Fossil

7. Martin W. Doyle, Jon M. Harbor, and Emily H. Stanley, "Forum: Toward Policies and Decision-Making for Dam Removal," *Environmental Management* 31, no. 4 (2003): 453–65; Z. J. Grabowski, Ashlie Denton, Mary Ann Rozance, Marissa Matsler, and Sarah Kidd, "Removing Dams, Constructing Science: Coproduction of Undammed Riverscapes by Politics, Finance, Environment, Society and Technology," *Water Alternatives* 10, no. 3 (2017): 769–95; Emily H. Stanley and Martin W. Doyle, "Trading Off: The Ecological Effects of Dam Removal," *Frontiers in Ecology and the Environment* 1, no. 1 (2003): 15–22.

8. Lowry, *Dam Politics*, 2–5; Peter Brewitt, *Same River Twice: The Politics of Dam Removal and River Restoration* (Corvallis: Oregon State University Press, 2019); Grabowski, "Removing Dams, Constructing Science," 769–70; Fox, Sneddon, and Magilligan, "You Kill the Dam," 93–104; Jørgensen and Renöfalt, "Damned If You Do," 2–3; Chris S. Sneddon, Regis Barraud, and Marie-Anne Germaine, "Dam Removals and River Restoration in International Perspective," *Water Alternatives* 10, no. 3 (2017): 648–54:.]

9. Lowry, *Dam Politics*, 2–31; Grabowski, Denton, Rozance, Matsler, and Kidd, "Removing Dams, Constructing Science," 769–71. Peter Brewitt utilizes framing theories and coalition networks theories in his book-length study as well. Brewitt, *Same River Twice*.



FIGURE 1. Map of the Childs-Irving Hydroelectrical Project. *Source*: image 138514, NAU.MAP.1295, courtesy of Cline Library, Northern Arizona University.

Creek case largely confirms Lowry's theories about the importance of these factors to successful dam removal campaigns. Based upon archival research, published media reports, and oral interviews, the Childs-Irving case provides an important study of an early, and ultimately seminal, dam removal victory in the United States and Europe.

DAM REMOVAL: FROM PIPEDREAM TO VIABLE RIVER MANAGEMENT DECISION

Just two decades before the Fossil Creek case, the idea of removing dams, especially large hydroelectric structures, was seen by many, even in the environmental movement, as a pipe dream. Edward Abbey, the iconoclastic writer and social critic, first presented the idea in his classic 1975 novel, *The Monkey Wrench Gang*, a work that focused on a small, loosely aligned group of ecowarriors whose ultimate goal was to blow up Glen Canyon Dam.¹⁰ This desire later helped spawn the environmental group Earth First in 1980. Abbey and other environmentalists saw Glen Canyon Dam as the arch symbol of the failures of a century of unrestricted dam building fever. But to millions of Americans who had come to love Lake Powell, the impoundment created by the dam, and hundreds of other reservoirs like it, the thought

^{10.} Edward Abbey, The Monkey Wrench Gang (Philadelphia: J.B. Lippincott Company, 1975).

But by the 1990s Abbey's radical pie-in-the-sky idea was gaining acceptance in some surprising quarters. Many Americans had soundly rejected the orthodoxy of previous generations. Early in the century, most Americans had cheered as the federal government poured billions of dollars into huge dam and hydroelectric projects through the Bureau of Reclamation, U.S. Army Corps of Engineers, and other agencies. To most citizens, iconic structures such as Hoover Dam stood as monuments to humankind's mastery of nature and America's technological superiority and engineering genius. Dams that flooded sections of national parks, however, were another matter. The bitterly fought but ultimately losing battle of John Muir and the Sierra Club to prevent the flooding of Hetch Hetchy Valley in Yosemite National Park (1908–1913) signaled the limits of what some Americans were willing to sacrifice in the interest of dam building for water storage and hydropower.¹²

Scholars recognize, however, that the true national movement to oppose indiscriminate dam building emerged in the 1950s. It began in 1954 when the Sierra Club, the National Parks Association, the Wilderness Society, and the Izaak Walton League formed an advocacy coalition to successfully defeat the proposed Echo Park Dam that would have flooded sections of Dinosaur National Monument in Utah and Colorado with no thought of the environmental consequences. With the Dinosaur National Monument case and later efforts in the early 1960s to prevent the construction of several dams that would have flooded parts of Grand Canyon National Park in Arizona, environmental coalitions pioneered the use of techniques that would prove successful decades later in cases such as Fossil Creek. These methods included mobilizing public opposition through advertisements in popular magazines and the production of books and other literature, as well as leading efforts to have citizens write Congress to oppose certain dams and hydropower projects.¹³

Thus, as First Lady Claudia "Lady Bird" Johnson dedicated Glen Canyon Dam in 1966 and declared that the giant "plug" in the river was a new kind

^{11.} Jared Farmer, *Glen Canyon Dammed: Inventing Lake Powell and the Canyon Country* (Tucson: University of Arizona Press, 1999), xiii.

^{12.} Daniel McCool, *River Republic: The Fall and Rise of American Rivers* (New York: Columbia University Press, 2012), 8–9, 19, 52–62.

^{13.} Byron E. Pearson, *Still the Wild River Runs: Congress, the Sierra Club, and the Fight to Save Grand Canyon* (Tucson: University of Arizona Press, 2002), xiv, 5–6, 19–23, 36.

of writing on the wall that said beautifully "Man was here!," environmentally conscious Americans were questioning the wisdom of damming almost every last free flowing river. One of these was the damming of the Colorado River and flooding of Glen Canyon, one of the nation's most visually stunning canyon systems (an action the Sierra Club approved as part of its deal with government agencies to prevent the Echo Park Dam at Dinosaur National Monument). Many Americans acknowledged that dams, numbering thirty thousand of significant size in the American West alone, according to one estimate, had contributed to the development of the nation but asked themselves, "at what cost?"¹⁴

Although often overlooked today, one of the first groups to question dam building in the arid American West was a rather small and obscure group of fish scientists employed at institutions such as the University of California, the University of Michigan, and the University of Nevada, Las Vegas. During the early 1960s, a community of ichthyologists, conservation biologists, and other scientists was working feverishly and seemingly against the tide to save threatened and endangered native fishes of the American Southwest.¹⁵ In 1969, they founded the Desert Fishes Council to serve as an advocacy group to promote their causes. One of these scholars, ichthyologist Wendell L. Minckley of Arizona State University, would later help the campaign to restore Fossil Creek. World-renowned desert fish scientists Carl Hubbs, Robert Rush Miller, James Deacon, and several other important scholars established the council almost as an emergency measure when they became alarmed at the rapid loss of endemic fish species in the region. They began to meet at Furnace Creek, Death Valley National Monument, to share studies and to devise strategies for combating threats to native fishes that included water diversion, dam building, groundwater pumping, and-what seems

14. First Lady Claudia "Lady Bird" Johnson quoted in John Else and Linda Harrar, *Cadillac Desert: Water and the Transformation of Nature* (San Jose, Calif.: KTEH and Trans Pacific TV, 1997), 270 min., https://www.youtube.com/watch?v=vKlxKe-Duac; Char Miller, *Not So Golden State: Sustainability vs. the California Dream* (San Antonio: Trinity University Press, 2016), 25, 63; Farmer, *Glen Canyon Dammed*, 137–40; Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York: Oxford University Press, 1985), 5–11; Marc Reisner, *Cadillac Desert: The American West and Its Disappearing Water* (New York: Penguin Books, 1993), 511–12.

15. Robert R. Miller to Harold T. Johnson, 22 October 1969, Alan Bible to R.R. Miller, 15 December 1969, and November 1973 Memorandum of Desert Fishes Council, folder 1, box 1, Desert Fishes Council Collection (DFCC), Special Collections, Lied Library, University of Nevada– Las Vegas.

Through the Desert Fishes Council, Minckley and his colleagues became activist-scholars. Hubbs, in particular, became the leading apostle spreading the message that native aquatic species were on the brink of extinction; he eventually turned into the driving force behind the creation of Sea World in San Diego. Together, these scientists felt compelled to leave the lab and enter the political arena, often volunteering as expert witnesses in litigation regarding threatened native fishes. Their scientific works provided widely accepted data in cases involving threats to native fishes caused by water development in the American West, most importantly with the highly endangered Devils Hole Pupfish near Death Valley in the 1970s. In time many of their graduate students and other devotees came to fill positions at federal and state wildlife agencies, including Arizona Game and Fish, the U.S. Fish and Wildlife Service, the U.S. Forest Service, and the Bureau of Reclamation. Minckley and his colleagues often served as consultants to Arizona Game and Fish and other agencies in their efforts to establish hatcheries and to stock native fishes in waters they once inhabited.¹⁷

By the 1980s, economic and legal realities about aging dams came to aid fish scientists and other dam removal advocates. All dams were built with projected lifespans stemming from the inevitable physical deterioration of the structures, and many were nearing the end of their planned duration. Dam owners, utility companies, and local municipalities were facing a reality check: older dams were costly to repair and to bring up to modern standards; many structures were deemed unsafe and in danger of rupture; the very real prospect of dam failures presented clear cases of legal liability and potential monetary damages. Many dams were filling with silt, destroying their value for water storage and recreation; smaller dams and hydro-electrical plants were producing only a fraction of the local power supply. Increasingly, dam opponents argued the amount of renewable energy was negligible compared

^{16.} Desert Fishes Council, "A Compendium on the Third, Fourth, and Fifth Symposia," November 13–15, 1973, folder 1, box 1, DFCC; Carl Hubbs to Daniel H. Janzen, 21 November 1961, and "American Society of Ichthyologists and Herpetologists' Resolution on Stream Poisoning," July 1960, folder 48/11, box 48, Carl L. Hubbs Papers, Mandeville Special Collections, Scripps Archives, UC-San Diego Library, San Diego.

^{17.} W. L. Minckley to Robert Rush Miller, 8 December 1969, and Howard Bassett to Robert Rush Miller, 15 April 1970, folder 34, box 11, W.L. Minckley Papers, Special Collections, Hayden Library, Arizona State University, Tempe. On scientists' employment in agencies see: Brewitt, *Same River Twice*, 187.

to the environmental costs. In the American West especially, ongoing drought conditions led to predictions that some major reservoirs, including Lake Powell, would go dry in coming decades. Many decried the huge losses of water storage to evaporation. Recreational users often joined organizations such as American Rivers, the Center for Biological Diversity, and the Sierra Club to demand the removal of the structures. They increasingly highlighted the negative consequences of dams that were once ignored or swept aside in the name of progress and development. Environmentalists widely publicized the fact that dams blocked fish runs, destroyed aquatic habitats, and polluted streams; dams blocked free–running rivers and degraded water quality for canoeists, kayakers, and fishing enthusiasts.¹⁸

Because the federal government helped create the problem of aging dams, many looked to governmental agencies for a solution. By the late 1990s, even the once seemingly far-fetched idea of removing Glen Canyon Dam was being advocated by none other than Dan Beard, the former head of the Bureau of Reclamation, traditionally the nation's greatest proponent of dams and development. Appointed by Democratic President Bill Clinton in 1993, Beard (commissioner 1993–1995) and his successor Eluid Martinez (1995– 2001) succeeded in changing the direction of the Bureau from an agency focused on development and dam construction to one with a more holistic water management approach. At the same time, the new generation of university-trained scientists who had filled the ranks of state and federal natural resource agencies was slowly but surely swiveling the focus of their departments away from traditional industry-oriented programs and more toward environmental preservation and restoration.¹⁹

Even with these changes, removing dams, especially large and economically important dams was a highly complicated and often emotional issue. In the early 1990s, American Rivers, the Center for Biological Diversity, and other environmental groups were skeptical that the great dam related agencies like

18. American Rivers, *Rivers at Risk: The Concerned Citizens' Guide to Hydropower* (Washington, D.C.: Island Press, 1989); Stanley and Doyle, "Trading Off," 15–16; Daniel P. Beard, *Deadbeat Dams* (Chicago: Johnson Books, 2015); Steven Hawley, *Recovering a Lost River: Removing Dams, Rewilding Salmon, Revitalizing Communities* (Boston: Beacon Press, 2011), 5–10.

19. On the change in the Bureau of Reclamation's focus and scientists employed at federal agencies see: McCool, *River Republic*, 74–81; "Remarks of James T. McBroom, Department of Interior Pupfish Taskforce," folder 1, box 1, DFCC; Prohibited and Protected Fishes, Amphibians, and Reptile Committee, "Recommendations," and Colorado River Wildlife Council, "Endemic Fishes of the Colorado River System: A Status Report," I May 1977, folder 34, box 11, Minckley Papers.

the Bureau of Reclamation and Army Corps of Engineers would provide support for dam decommissioning efforts. However, a potential, if unlikely, arena emerged for dam opponents to advocate for their cause—the Federal Energy Regulatory Commission's dam relicensing process.²⁰

As San Diego State University geographer Molly M. Pohl and scholars at American Rivers have found, the FERC process has become one of the most important institutional settings for dam removal in the United States. As dam opponents began to intervene in its proceedings, FERC officials gradually showed a willingness to order dam removal.²¹ In the early 1990s, American Rivers, one of the nation's foremost conservation groups, became aware that the time was right for contesting environmentally harmful dams. One study estimated that 85 percent of dams in the United States would have outlived their operational life by 2020, and many of these would be up for relicensing with FERC.²² Andrew Fahlund, a top official at American Rivers, recalls that a test case arose in 1991. The license for the privately owned Edwards Dam on the Kennebec River in Maine was set to expire in 1993, setting in motion a series of events that ultimately led to a federal order for its removal. Also in 1991, FERC's fifty-year license for the Childs-Irving plants at Fossil Creek was set to expire in seven years.²³

With the Federal Power Act of 1920, Congress established the predecessor of FERC. Among its duties, the commission was charged with licensing private, non-federal hydropower dams in the nation. In the early 1990s, FERC was responsible for regulating approximately 56 percent of the 2,300 hydro-electric projects in the United States.²⁴ An independent agency, FERC consists of five presidentially appointed commissioners. Entrusted with ensuring the nation's energy supply, a traditionally industry-friendly mandate, Congress amended FERC's legislation in 1986's Electric Consumers Protection Act to require it give equal consideration to "power and

20. Force, interview; Fahlund, interview.

21. Fahlund, interview; Force, interview; American Rivers, *Rivers at Risk*, 8–11; Brewitt, *Same River Twice*, 20; Molly M. Pohl, "Bringing Down Our Dams: Trends in American Dam Removal Rationales," *Journal of the American Water Resources Association* 38, no. 6 (2002): 1517.

22. Christina Tonnitto and Susan J. Riha, "Planning and Implementing Small Dam Removals: Lessons Learned from Dam Removals across the Eastern United States," *Sustainable Water Resources Management* 2, no. 4 (2016): 490; Fahlund, interview.

23. Andrew Fahlund, "River Rebirth: Removing the Edwards Dam on Maine's Kennebec River," National Geographic, 2000, accessed November 13, 2018, www.nationalgeographic.com; Fahlund, interview.

24. Sara Ashley, "The Influence of Aging Dams and Geography on the Distribution of Dam Removals in the United States," (master's thesis, Oregon State University, 2004).

non-power values" in its deliberations over relicensing a dam. This meant that native fish and other ecological concerns, as well as values such as recreation, had to be taken into account. With the Edwards and Fossil Creek dams, Fahlund realized his organization could utilize the FERC process to affect lasting policy change; environmentalists could challenge the relicensing of aging, obsolete, and environmentally harmful dams on a case-by-case basis and in the process create precedents that could lead to other dam removals. Shortly after targeting the Maine dam, American Rivers and other groups set their sights on the Childs-Irving power plants on Fossil Creek.²⁵

HYDROPOWER DEVELOPMENT AT FOSSIL CREEK

Early Anglo-American settlers immediately saw the hydropower potential of Fossil Creek. The stream and its glorious springs first came to the attention of Arizonans at the dawn of the twentieth century. According to folklore, a cattleman with an eye for business, Lew Turner, chanced upon the springs in the late 1890s while searching for stray cows. Local residents credited Turner for discovering the springs, but dozens of ancient indigenous cultural sites of the Sinagua people, including multi-room cliff houses, storage buildings, rock art panels, and abandoned farm fields, testify that Native peoples had utilized the rich environment for thousands of years prior to its rediscovery by Turner.²⁶

The cattleman found the springs gushing from at least a dozen outlets on the north side of Fossil Creek. Their cool, mineral–laden water flowed at a constant rate of 43 cubic feet per second (cfs) year round. Calcium rich waters emerged from underground sources originating in sedimentary sandstone and limestone formations in the Arizona central highlands, a rugged country of mesas and rocky peaks below the pine-crested Mogollon Rim. The springs are hidden at the bottom of a canyon over 1,500 feet deep; its walls are studded on south facing slopes with desert grasses, cacti, yucca, catclaw acacia, mesquite, and junipers. Now, as then, Fossil Creek nourishes

^{25.} Fahlund, interview; Fahlund, "River Rebirth"; Peter J. Carney, "Dam Removal: Evolving Federal Policy Opens a New Avenue of Fisheries and Ecosystem Management," *Ocean and Coastal Law Journal* 5, no. 2 (2000): 309–40.

^{26.} Jack Grant, "The Fossil Creek Power," May 19, 1968, article/no source, FCF; Ida Smith, "Fossil Canyon Hides Lover's Paradise," *Arizona Days and Ways*, August 14, 1955. Although not widely known in the local area in the 1970s and 1980s, sources note that King S. Woolsey described the springs as early as 1864. *Rim Country History* (Payson, Ariz.: Northern Gila County Historical Society, 1984).



FIGURE 2. Fossil Creek after the dam and flume decommissioning in the early 2000s. *Source*: Coconino National Forest Photography, U.S. Forest Service, CC0 1.0 Universal (CC0 1.0) Public Domain Dedication.

a verdant strip of riparian habitat.²⁷ The carbon dioxide–laden spring water forms travertine deposits on sticks and other debris, creating a series of dams that back up water in pools as the stream cascades down the canyon. Early visitors named the stream after the travertine's fossil-like appearance. After Fossil Creek Springs' rediscovery, newspapers at nearby mining towns like Jerome extolled their sublime beauty. But men like Turner had to eke out a living from the harsh, sunbaked canyon country of central Arizona. He saw a business opportunity in the wondrous springs. He quickly filed for water rights to Fossil Creek and in short order formed the Arizona Power Company (APCO).²⁸

APCO had a ready market in the booming mining towns of Jerome, Prescott, and Crown King in Arizona's ponderosa pine-studded central

27. U.S. Forest Service, "Resource Information Report: Potential Wild and Scenic River Designation, National Forests of Arizona," September 1993, FCF.

28. Ibid.; Sandra J. Owens-Joyce and C.K. Bell, "Appraisal of Water Resources in the Upper Verde River Area," Arizona Department of Water Resources, Bulletin 2, March 1983, and Rebecca C. Sayers, "Potential Impacts of Stream Flow Diversion on Riparian Vegetation: Fossil Creek, Arizona," (master's thesis, NAU, 1998), FCF; "The Natural Bridge and Fossil Creek Springs," *Jerome Mining News*, April 14, 1908; Jean Clark, "Childs-Irving power plants earn spot in National Register of Historic Places," *Verde Independent*, October 30, 1991. mountains and plateaus. Jerome's United Verde Mine was one of the world's top producers of copper, and APCO's plans for a relatively cheap water powered source of electricity created a stir in the area. The former Arizona territorial capital of Prescott had a steam plant to generate electricity for its streetcars, small factories, homes and mines but had to rely on costly supplies of fuel shipped in by rail from sites often as far away as 1,500 miles.²⁹

With customers ready and waiting, APCO set about the herculean task of building a hydroelectric power plant in the rugged depths of Fossil Creek Canyon. In 1907, crews of primarily Apache and Mojave laborers began to build a wagon road to the springs. Over a period of several years, about 600 men using 400 mules and 150 wagons labored on the hydroelectric project. The company built boarding houses for the crew at the bottom of the canyon. In this undeveloped land, supplies had to be shipped to the nearest railroad siding at Mayer, over fifty miles away. The company imported special steel pipe from Germany that was shipped first to San Francisco and then by rail to Mayer. All supplies were taken by mule teams to the canyon rim where drivers had to use skid-breaks to ease the heavy equipment and materials on a perilous descent that plunged over 1,500 vertical feet down a steep rocky road. A large section of one generator alone required a thirteen-mule team to bring it down to the site.³⁰

Company engineers originally planned to build a traditional cement dam and canal system to bring water to its turbines, but the rough terrain necessitated design changes. The company ended up devising a unique dam and flume system. Laborers built a twenty-foot-high dam about a quarter mile downstream from the springs. A diversion channel then transferred almost the entire flow of the creek into an aboveground flume built from redwood planks, cement, and steel; the flume was built on trestles that spanned gullies and passed through thousands of feet of tunnels dug into the hillsides. The flume dropped water almost 3,000 feet for about seven miles before entering Stehr Lake, a small water storage reservoir that served the Childs Plant, the

^{29. &}quot;Cheap Power Assured," *Weekly Arizona Journal-Miner*, February 2, 1910; "Prescott Using Fossil Creek Power," *Weekly Arizona Journal-Miner*, January 26, 1910; "Stringing Wires for Power Plant," *Weekly Arizona Journal-Miner*, November 24, 1909; "Power Obtained from Water to Revolutionize the Industries of Yavapai County," *Jerome Mining News*, January 16, 1909; "Part of River Gets 'Wild and Scenic' Designation," *Verde Independent*, September 3, 1980.

^{30.} Hal Moore, "Fossil Creek Flume—A Pioneer Monument," *Arizona Engineer-Scientist* 10, no. 8 (November 1966); "Four Hundred Voters at Fossil Creek Camp," *Arizona Weekly Journal-Miner*, August 26, 1908.



FIGURE 3. A bridge carrying the flume of the Childs-Irving Hydroelectrical Project near Stehr Lake. *Source*: MS-2 -1.4 -1.022, photo courtesy of the Sharlott Hall Museum.

first power plant completed in 1909. The flow of Fossil Creek then entered the nearby Verde River.³¹

The Fossil Creek project was likely the last large construction job built in Arizona using manual labor and mule teams alone. To transmit power, engineers had to use windmill towers to construct a seventy-five-mile transmission line—the first of its kind in the state—over incredibly rugged terrain. With demand for copper and other metals surging during World War I, a second facility, the Irving Plant, was built near the intake source on Fossil Creek in 1916.³² By the late 1920s the Childs-Irving plants generated 4.2 megawatts of electricity per hour, providing up to 70 percent of the electricity for the growing city of Phoenix and its 30,000 inhabitants. Childs-Irving power proved central to the growth of Arizona cities and industries, particularly mining in the first half of the twentieth century.³³

31. Carolyn Wall, "Public Invited to Share Comments for Fossil Creek Planning," *Verde Independent,* September 18, 1992; Grant, "The Fossil Creek Power"; Moore, "Fossil Creek Flume"; "Fossil Springs—Mystery, Miracle," *Arizona Republic*, October 1, 1961.

^{32.} Clark, "Childs-Irving Power Plants Earn Spot in National Register of Historic Places"; Moore, "Fossil Creek Flume."

^{33.} Clark, "Childs-Irving Power Plants Earn Spot in National Register of Historic Places"; Keith Bagwell, "Clash over Dam Pits History against Nature," Arizona *Daily Star*, June 28, 1998.

POST-DIVERSION ECOLOGY OF FOSSIL CREEK

The Childs-Irving water diversion did not entirely destroy the natural ecosystem of Fossil Creek, although it left a diminished and degraded stream to run in the old channel. The company possessed the right to divert all the water from Fossil Creek. Almost the entire flow of the stream was rerouted into a flume, leaving a trickle of water that flowed at 0.2 cfs in the creek. Because of the consistent flow of the springs, however, this small outflow was constant year-round, proving sufficient to maintain aspects of the original riparian habitat, particularly its native trees and streamside annual and perennial plants. The reduced flows, though, led to the decline and disappearance of many of the travertine dams. Several native fish species that faced habitat loss and other threats elsewhere, including the roundtail chub (Gila robusta), desert sucker (Pantosteus clarki), speckled dace (Rhinichthys osculus), and Sonora sucker (Catostomus insignis), could still survive in the stream, albeit in smaller numbers and in stunted form. With help from Wendell Minckley and other fish scientists, in the 1960s the Arizona Game and Fish Department established a hatchery for rare native fishes near Phoenix. In 1966, state biologists introduced the currently endangered Gila topminnow (Poeciliopsis occidentalis) into the stream, a species that was almost eradicated after public health agencies introduced the similar but more voracious western mosquitofish into state waters in the early twentieth century. Game officials hoped to stock more threatened and endangered fish in Fossil Creek in the decades that followed.34

After the completion of the Childs-Irving facilities, Fossil Creek experienced other changes that devastated perennial streams in Arizona and the greater American Southwest. In particular, water diversion led to the decline of native fishes and opened the door to invasive species such as green sunfish and smallmouth bass that made their way up the stream from the Verde River, itself under siege from development, water diversion, and introduced species. Sometime in the twentieth century non-native crayfish invaded Fossil Creek and competed with native fishes for food. A survey taken on the Verde River at the mouth of Fossil Creek in the late 1990s reported that no

^{34.} W.L. Minckley and Paul C. Marsh, *Inland Fishes of the Greater Southwest: Chronicle of a Vanishing Biota* (Tucson: University of Arizona Press, 2009), 140–41, 169, 193–94, 201–02, 246, 248; Arizona Department of Game and Fish, "List of Threatened Fishes," (1970) and Robert Janzen, to Robert Rush Miller, 15 April 1970, folder "Misc. Correspondence," box 12, Minckley Papers; U.S. Forest Service, "Resource Information Report," and Smith and Bender, "Proposed Natural Areas," FCF. Some scholars place the Desert Sucker in the *Catostomus* genus.

indigenous fishes were present, while numerous non-native species like carp, flathead catfish, largemouth bass, green sunfish, bluegill, channel catfish, and mosquito fish were abundant.³⁵ Statewide and regional threats to native fishes made Fossil Creek all the more important as a present and future refuge. By the late 1970s, native fish were the most threatened group of vertebrates in Arizona; of its indigenous fish species, 25 of 30 were rare and threatened because of limited distribution and habitat destruction.³⁶

Arizona Power's water diversion at Fossil Creek created a complex, if not natural, stream environment. The reach above the power plant dam was populated entirely by native fishes. The dam served as a barrier to nonnative species like carp, green sunfish, smallmouth bass, and red shiners, the latter a small baitfish that has devastated many populations of native fishes in the Southwest. Red shiners, like many other invasive species, either accidentally escaped from bait buckets or were introduced illegally by individuals. But species like the voracious smallmouth bass were stocked in Arizona streams by fish and wildlife agencies to provide gamefish for the state's growing population. These bass were introduced in the Salt River and its major tributaries, including the Verde River in the 1960s, leading to what one ichthyologist called a "population explosion" that greatly reduced the number of once-abundant roundtail chubs, one of the few native species that was valued as a gamefish.³⁷ Well into the 1960s, game and fish agencies had used the toxin rotenone to eradicate native fishes throughout the American West, most notoriously in 1962 when Wyoming and Utah state agencies, with help from the U.S. Fish and Wildlife Service, poisoned approximately 450 miles of the Green River and its tributaries to create a trout fishery prior to the

35. Colorado River Wildlife Council, "Endemic Fishes," Minckley Papers; Anthony T. Robinson, Philip P. Hines, Jeff A. Sorenson, and Scott D. Bryan, "Parasites and Fish Health in a Desert Stream, and Management Implications for Two Endangered Species," *North American Journal of Fish Management* 18, no. 3 (1998): 599–608; National Environmental Policy Act, "Environmental Assessment for the Verde River Headwaters Riparian Restoration Demonstration Project," no date, U.S. Fish and Wildlife Service, "Report: Results of Survey," no date, and J.N. Rinne, "Recent Changes in Fish Statistics: Verde River, Arizona," U.S. Department of Agriculture, November 18, 2000, FCF. For a thorough overview of issues facing desert fishes as of 1990, see, W.L. Minckley and J.E. Deacon, eds., *Battle against Extinction: Native Fish Management in the American* West (Tucson: University of Arizona Press, 1991).

36. Arizona Nature Conservancy Newsletter 2, no. 3 (July 1980).

37. "Fishes of the Gila River System" draft, folder 29, box 8, Nature Conservancy Records (NCR), Special Collections, Main Library, University of Arizona, Tucson; W.L. Minckley, "An Inventory of the Aquatic Ecology of the Colorado River," 1974, box 5, Minckley Papers; Melinda Bennion, Native Aquatics Biologist, Utah Division of Wildlife Resources, interview by author, March 23, 2018.

completion of Flaming Gorge Dam. These government eradication campaigns did their job well. Many of the targeted species such as the Colorado pikeminnow (*Ptychocheilus lucius*) and the razorback sucker (*Xyrauchen texanus*) are now on the endangered species list.³⁸

Because of the widespread introduction of non-native species and the destruction of native fish habitat in the Southwest, the reach upstream from the Fossil Creek dam was one of the few areas in the region with an entirely indigenous fish community. Headwater chubs (*Gila nigra*), speckled dace, desert suckers, and roundtail chubs swam as they had for centuries in this undisturbed stretch of river. The highly endangered razorback sucker had been introduced here in the late 1980s as well.³⁹ The upstream section of Fossil Creek also provided important habitat for sensitive and rare species such as the Chiricahua leopard frog. Fossil springsnail, and Mexican garter snake. While human-caused changes were detrimental to native flora and fish fauna overall, in the early 1970s, biologists who made a major study of the stream and riparian area concluded they showed little sign of human or stock disturbance, the vegetation showed little negative impacts from the hydroelectric facilities, and that overall Fossil Creek was rated as still having "outstanding natural qualities."⁴⁰

Because of its rare and valuable natural features, the Bureau of Land Management (BLM) and U.S. Forest Service worked to secure federal protection for the fourteen-mile stretch of Fossil Creek that ran through public lands, from the springs to the stream's mouth at the Verde River, and to the Verde itself. Congress had passed the landmark National Wild and Scenic Rivers Act in 1968 to preserve certain streams with outstanding recreational, cultural and natural values in their free–flowing state. In the early 1980s, local BLM and Forest Service leaders submitted documentation for reaches of the Verde River near its confluence with Fossil Creek under the 1968 act. In its effort to list sections of the Verde River, the Forest Service encountered

38. R. R. Miller, "Green River Eradication Project", October 15, 1962, R.R. Miller, "Is Our Native Underwater Life Worth Saving?" Carl Hubbs to Daniel Janzen, 21 November 1961, "American Society of Ichthyologists and Herpetologists' Resolution on Stream Poisoning," July 1960, and A.M. Livingston, Chemical Insecticide Corp. to Dear Sir, 4 September 1962, folders 1 and 2, box 49, Hubbs Papers.

39. National Environmental Protection Act, "Environmental Assessment for the Verde River," and U.S. Forest Service, "Resource Information Report," FCF; Jane C. Marks, "Down Go the Dams," *Scientific American*, March 2007, 23.

40. Smith, "Proposed Natural Areas," and U.S. Forest Service, "Resource Information Report," FCF.

opposition from several quarters. As mandated, the government elicited responses to its proposal from the public. The Forest Service reported that 55 percent of respondents opposed the federal designation of the Verde. As was typical in other proposed Wild and Scenic River listings, opposition came from landowners along the stream, cattle raisers, mining companies, water interests, off-road vehicle enthusiasts, and hunters.⁴¹ Nevertheless, over these objections, a remote forty-mile stretch of the Verde River below its confluence with Fossil Creek secured protection as a Wild and Scenic River in 1984.

At the same time, agencies did not face this level of opposition in efforts to protect Fossil Creek. This difference was due largely to the fact there were relatively few stakeholders involved, a rare situation compared to most cases of river and wilderness protection in the United States and Europe. Arizona Public Service Company's control of access to its plants had kept development at bay on Fossil Creek. It maintained a small village of seven company-owned cottages in a pine grove near the Irving Plant and strictly controlled access to a road servicing it to company employees and visitors by written request. There was an extremely steep hiking trail that went to the river, but the arduous climb back up the canyon on often unshaded slopes kept the casual picnicker or swimming party away. The area retained enough of its environmental integrity that the federal government created the 11,500 acre Fossil Creek Wilderness Area around the springs in 1984. Years later in 2009, after the hydropower plants were taken off line, Fossil Creek joined the Verde River, becoming the second designated Wild and Scenic River in the state.⁴²

During the 1970s and 1980s, once-hidden Fossil Creek and its relict hydropower stations were the focus of many articles in local publications. Transplants to Phoenix looked for watery oases to escape the summer heat; pictures of the creek with its deep blue-green pools and tree-lined banks beckoned visitors from the lowlands during Arizona's long summers. For those up for adventure, a trip to the difficult-to-access canyon provided a host of attractions for people from all walks of life. Longtime plant manager Mike

^{41.} Marie E. Sullivan and Mary E. Richardson, "Functions and Values of the Verde River Riparian Ecosystem," U.S. Forest Service, March 1993, U.S. Forest Service, "Verde River: Draft Environmental Statement and Wild and Scenic River Study," 1980, and Owens-Joyce, "Appraisal of Water Resources," FCF; "Part of river gets 'Wild and Scenic' designation."

^{42. &}quot;Valley Land Part of Wilderness Proposal," *Verde Independent,* September 28, 1977; "Fossil Springs Wilderness," *Verde Independent,* February 8, 1984; U.S. Forest Service, "Resource Information Report," FCF; Fahlund, interview.



FIGURE 4. The spillway of the Childs Power Plant with three generators running full load. A small reservoir impounding Fossil Creek known as Stehr Lake fed the plant and was a fishing spot for area anglers pursuing non-native species such as bass and catfish. *Source*: MS-2 -I.4 -I.066, photo courtesy of the Sharlott Hall Museum.

Stewart noted that engineers were particularly fascinated by the aging power facilities and the unique water flume structure at Childs-Irving. They were in awe of the feat it took to build these facilities in frontier conditions. As Stewart told a reporter, "To engineers this place is just phenomenal." In 1976, while the nation was celebrating its bicentennial, the American Society of Mechanical Engineers had the plants designated a National Mechanical Engineering Landmark because of their international and national significance. The declaration noted that the Childs-Irving facility was "a monument to pioneer ingenuity."⁴³ Years later, APS (which now included the former Arizona Power Company) nominated the plants for listing on the National Register of Historic Places. In 1991, the Childs-Irving plants secured historical status. That fall dignitaries from the company, the Tonto National Forest, the Arizona Historical Society, and local towns celebrated a joyous barbeque at the Fossil Creek village; a plaque was placed at the facility to

^{43. &}quot;Power Plant Recognized as Engineering Landmark," *Payson Roundup*, April 22, 1976; "Prescott City Council Eyes Hydroelectric Power Plants," *Prescott Daily Courier*, October 22, 2000.

commemorate its historical status. Arizona Governor Fife Symington declared the date "Childs-Irving Day."44

INTO THE FERC RELICENSING PROCESS

In 1991, the same year as Childs-Irving secured historical status, APS began preparing documentation to submit to the Federal Energy Regulatory Commission to relicense the Childs-Irving plants. A simple notice in a federal publication alerted environmentalists to the proposal. The Center for Biological Diversity had staff members routinely comb the Federal Register where they noticed the pending case. Lisa Force, director of the Phoenix office, was local negotiator for the Center at the time. She recalls that her group saw a "once in a lifetime opportunity" to challenge the plants because they would come up for renewal only once every fifty years. Force and the Center's cofounder, Robin Silver, knew that Fossil Creek was unique; it had one of the few riparian areas that had not been severely overgrazed by cattle in the state. The stream, if restored to its former full flow, could become an even more important refuge for rare and threatened fish species, in particular, because its currently reduced flow and altered habitat favored invasive over native aquatic species. The two also had a unique opportunity in approaching APS; both had worked at the power company in the past, and in a strange twist, Silver was childhood friends with its Chief Executive Officer Bill Post.⁴⁵

To start negotiations, Force and Silver reached out to Post and began meeting with him in 1991 in an office on the top floor of company headquarters in Phoenix. Post was sympathetic. He had seen Fossil Creek's beauty first hand, but Force recalls he had responsibilities to shareholders. This was business, and she remembers that the Childs-Irving plants were something of a "cash cow" for APS; the plants were paid off and were generating over 4 megawatts of power per hour, twenty-four hours a day. This amount of electricity was a small fraction of 1 percent of APS's total output. But much more than the actual power they produced, the Childs-Irving plants were important to the company's image in appearing to produce green, renewable energy.⁴⁶ Additonally, in 1991, Andrew Fahlund of American Rivers,

^{44.} Bob Whitaker, "Fossil Creek: Exploring a Wilderness Shangri-La," *Arizona Highways*, August 1987; Burkhart, "Hike Is Demanding, but Full of Beautiful Views"; "Prescott City Council Eyes Hydroelectrical Power Plants"; Clark, "Childs-Irving Power Plants Earn Spot in National Register of Historic Places."

^{45.} Force, interview.

^{46.} Ibid; Clark, "Childs-Irving Power Plants."

FERC was mandated to serve as an arbiter, a form of neutral tribunal, but environmentalists were skeptical as they intervened in its process. Force recalls that when her group began their campaign at Fossil Creek in 1991, FERC "was not in the business of decommissioning dams." Fahlund remembers that until this time, FERC had generally "rubber stamped" dam relicensing applications. The 1986 FERC reform legislation gave the commission great discretion in applying and deciding cases under its "equal consideration" mandate. But it did not guarantee FERC would change direction and pursue significant policy change. In fact, in 1986, FERC bureaucrats did not believe the commission had the authority to order a dam removed. However in 1994, the commission reversed course and stated unequivocally it did have this authority—and at the owner's expense.⁴⁸ Social scientists William Lowry and Jared Farmer concluded that by the early 1990s there was more support for river restoration and, overall, receptivity to change regarding dam removal at the presidential level and at public agencies such as FERC, the U.S. Fish and Wildlife Service, the Environmental Protection Agency (EPA), and even the Bureau of Reclamation. FERC employee Allan Creamer noticed his agency's change in direction when he joined in 1993. As he recalled years later, "Traditionally, we mostly ignored environmental concerns, but the way we do business around here has changed considerably in the last ten years or so "49

National support for river restoration initiatives also was growing in the 1990s. Many scholars find that, among the public, a broad constituency for river protection emerged this decade. A 2001 Gallup Poll revealed that 58 percent and 87 percent of respondents had a "fair" and a "great deal" of concern for pollution in rivers respectively; another 81 percent had a "great amount" and 48 percent a "fair amount" of concern for the loss of natural habitats and wildlife.⁵⁰ A host of federal environmental laws, including the Wild and Scenic Rivers Act of 1968, the National Environmental Policy Act

^{47.} Force, interview; Fahlund, interview; Christian F. Lenhart, "A Preliminary Review of NOAA's Community-Based Dam Removal and Fish Passage Projects," *Coastal Management* 31, (2003): 79–98.

^{48.} Force, interview; Fahlund, interview; Julia Guarino, "Tribal Advocacy and the Art of Dam Removal: The Lower Elwha Klallam and the Elwha Dams," *American Indian Law Journal* 11, no. 1 (2013): 130.

^{49.} Lowry, Dam Politics, 6, 28, 58; Farmer, Glen Canyon Dammed, xv, ii.

^{50.} Brewitt, Same River Twice, 18-23; Lowry, Dam Politics, 43-51.

Because dams age and deteriorate, FERC typically issues licenses for fifty years. The Childs-Irving fifty-year authorization was set to expire in 1998. Under its general regulations, five years prior to a permit's expiration, a dam owner such as APS must file a document on its intent to relicense with FERC. A notice of intent is then published in the Federal Register. The license holder must notify relevant natural resource agencies, including state game and fish commissions, as well as federal agencies such as the U.S. Fish and Wildlife Service, of its action. A dam owner then must consult with these agencies on its application. It also must file documents with FERC on a plant's operations, its finances, and its environmental impacts. Two years prior to the license's expiration, the holder files a formal relicensing application. The public, usually through environmental and other advocacy groups and coalitions, can review documents and require explanations. Groups can then formally intervene in the proceedings. The commission can mandate additional studies, after which it will accept the application for environmental review. FERC can require a formal Environmental Impact Statement but usually only mandates a lesser level of review called an "environmental assessment." After a comment period, the commission will consider alternatives in contested cases. While much of the work is completed by bureaucrats within FERC, the five commissioners make the final decision. This decision can be appealed to the U.S. Court of Appeals.⁵²

Within the institutional setting of FERC, Force and Fahlund soon realized APS was dead-set against removing its Fossil Creek power plants. Fahlund remembers the power company "fought us at every turn" and repeatedly "threw up roadblocks" at their efforts to stop the relicensing of the Childs-Irving plants. Having the state's largest electrical utilities provider against them did not bode well. The Center thus developed a three-prong strategy to change APS's position and influence FERC. The first step was to file notice to sue. The Center had a strong track record winning environmental litigation, and Force and Silver knew that the company did not want the negative publicity that would flow from a protracted legal battle. American Rivers likewise looked into filing suit using the federal Clean Water Act and

^{51.} Lowry, Dam Politics, 46-47.

^{52.} American Rivers, Rivers at Risk, 29-45; Lowry, Dam Politics, 45-52.

Endangered Species Act. Fahlund and Force also contacted the Yavapai-Apache Nation about joining the battle. Its Chairman Vince Randall was passionate about Fossil Creek and the larger land and water rights involved. The tribe made it clear it was ready to sue the company utilizing legal rights available to the Yavapai-Apache as a sovereign Indian nation. Sam Coppersmith, a former Democratic congressman from Arizona, agreed to provide legal services *pro bono*. Overall, by intervening in the FERC proceedings, American Rivers and the others put APS on notice that relicensing the small, historical plants would be an uphill battle.⁵³

COALITION ADVOCACY AND RHETORICAL FRAMING

The Center for Biological Diversity and American Rivers next built a formidable coalition that included the Sierra Club, the Northern Arizona Audubon Society, the Nature Conservancy, and the Arizona Riparian Council. Both Lisa Force and Andrew Fahlund knew that APS was very concerned about its image in the community. The Center organized "direct action" protests to pressure APS to abandon its relicensing efforts with FERC. These included picketing in front of APS headquarters, letter writing campaigns, and lobbying. As planned, these activities gained much media attention for the cause, a media spotlight that company officials did not want. With these actions, protestors made it clear what they valued: a free flowing river with all its ecological, recreational, spiritual, and cultural values restored.⁵⁴

In the political arena, the environmental coalition worked to frame its arguments by focusing on the positive impacts of removing the Childs-Irving plants and the detrimental impacts of the status quo, namely the degraded stream habitat caused by the dam and flume system. As negotiations dragged on, APS officials publicly announced they had no intention of removing the structures, despite arguments regarding economic costs. Company spokes-persons did indicate they were willing to compromise to improve the stream environment. APS believed it was not legally required to release any water back into the creek, but proposed allowing 10 cfs of the stream's total 43 cfs to flow unimpeded into Fossil Creek to improve animal and plant life.⁵⁵ FERC required APS to produce several environmental impact studies. Local

^{53.} Force, interview; Fahlund, interview.

^{54.} Ibid.

^{55. &}quot;Future of Childs-Irving Power Plants on the Line," *Payson Roundup*, November 17, 1998; Fahlund, interview; Force, interview.



FIGURE 5. Fossil Springs Dam, part of the Childs-Irving Hydroelectrical Project. *Source*: MS-2 -1.4 -1.008, photo courtesy of the Sharlott Hall Museum.

plant supervisor Larry Johnson argued these studies showed there were no negative impacts to threatened or endangered species with current flows. At this stage, the various parties negotiating over Fossil Creek expressed gratitude for the company's willingness to compromise.⁵⁶

SOCIOCULTURAL AND HISTORICAL VALUES ABOUT DAMS

The thought of restoring a free-flowing stream to its natural course inspired joy among environmentalists, but it elicited fear and feelings of impending loss among families that lived in the company village and the limited numbers of tourists who had visited the isolated canyon. Some had come to love Fossil Creek and the Childs-Irving facilities—the dam, flume, and quaint hydroelectric plants as they were. The plants' recognition as a National Historic Landmark and National Mechanical Engineering Landmark complicated dam removal negotiations. These designations offered some federal protections of the structures, and they set up what one local newspaper reporter

56. Wall, "Public Invited to Share Comments"; "Future of Childs-Irving Power Plants."

called a battle of "history against nature," a conflict between well-intentioned people committed to preserving history versus well-intentioned people dedicated to preserving the environment.⁵⁷

In Europe and certain areas of the United States such as New England, historical and sociocultural values are often at the center of debates regarding dam removal. In New England dams targeted for potential demolition were built in the eighteenth and early nineteenth centuries. Their destruction would clearly represent a significant loss of the nation's historical heritage, despite the clear benefits to rivers and other environmental concerns. Although Arizona's Anglo-American history did not date to the colonial era, many stakeholders, including the Arizona Historical Advisory Commission and members of the Arizona State Historical Society, would not take the destruction and removal of the Childs-Irving plants lightly. Sam Steiger, a flamboyant former congressman from Arizona and the mayor of Prescott, fought against removing the plants, arguing that tearing down the facilities would destroy an important Arizona historical site that was central to the state's economic development. Robert Behnke, a councilman from Prescott, agreed, telling a reporter that the thought of demolishing the old hydroelectric plants "was just sad from a historical standpoint."58

For environmental advocates, overcoming opposition stemming from the Childs-Irving plants' listing on the National Register of Historic Places was a potentially devastating blow. Debates over their historical importance reveal the different social and cultural values often at play in dam removal debates, beyond financial and ecological issues. Dartmouth College geographers Charles Sneddon, Coleen Fox, and their colleagues have reviewed dam removal cases in New England. They found that, despite clear ecological benefits and relatively low financial costs of taking down certain dams (many were obsolete, not producing power, and small), the majority of cases were highly contested, and many dam removal efforts failed. This was because the dams and environments in question—historical mills, hydropower facilities, and mill ponds—were inexorably entwined with area towns' history, culture, sense of aesthetics, and community identity. In one case, the Warren Dam in Vermont, the hydroelectric dam was even on the town seal. A study of conflicts in Sweden likewise found residents of historic villages often opposed

^{57.} Carolyn Wall, "Work Is Electric, Setting Idyllic for Childs, Irving Residents," *Payson Roundup*, June 22, 1999; Bagwell, "Clash over Dam."

^{58.} Bagwell, "Clash over Dam"; "Prescott City Council Eyes Hydroelectric Power Plants"; "Prescott Won't Be Part of Any Electricity Business," *Prescott Daily Courier*, November 12, 2000.

dam removal because of a perceived loss of cultural heritage; their rhetoric often revealed deeply held aesthetic and anthropocentric values. In New England, locals tended to see the highly altered environments, the millponds, small lakes, and waterfalls, as "natural" in a sense; the unknown consequences of removing them were frightening and viewed by locals as a great loss to their treasured environment. Residents often viewed proponents of dam removal—whether government agencies, dam owners, or environmental coalitions—as outsiders, trying to impose their values on the largely rural communities, riding roughshod over them in the process.⁵⁹

In Arizona, historical and sociocultural issues involved with the Childs-Irving plants were not as complicated as in New England, or in Europe where dams can date to the Roman era.⁶⁰ The emotional, culturally and symbolically-charged framing of debates witnessed in New England and Western Europe was largely absent from the Fossil Creek campaign. Aiding the removal coalition, a listing on the historic registry does not preclude an order for removal from FERC. The commission often will allow the demolition of historical structures as long as proper documentation of the facilities is made prior to their destruction to preserve "the historic values" of the site. In this light, FERC had an obligation to assess the impact of a potential order on historic properties. Both FERC and APS consulted with the State Historic Preservation Officer of Arizona regarding Childs-Irving. Force and Fahlund recall that state preservation officials took part in their negotiations with FERC and the company.⁶¹

While the Childs-Irving plants were historically important, coalition partners had many facts in their favor as negotiations progressed. Unlike in New England and Western Europe, there were no organized, vocal, and impassioned local communities culturally tied to the Fossil Creek structures. APS employees who lived in the Fossil Creek village were certainly emotionally invested in the site, but they lived there as employees of the company and did not own their homes. They also were small in number, with the enclave generally having less than twenty full-time residents, and villagers' ties to the site did not go back three or more generations like in New England, Europe, and other places. Small cities like Prescott and Jerome—for which the

^{59.} Fox, Sneddon, and Magilligan, "You Kill the Dam," 93–99; Jørgensen and Renöfalt, "Damned If You Do, Damned If You Don't," 2–9.

^{60.} Schiermeir, "Dam Removal Restores Rivers," 290.

^{61.} Margaret B. Bowman, "Legal Perspectives on Dam Removal," *BioScience* 52, no. 8 (2002): 742–47; Force, interview; Fahlund, interview.



FIGURE 6. Exterior view of the Childs Power Plant. The Childs Plant is near the confluence of the Verde River and Fossil Creek. *Source*: MS-2 -1.4 -1.019, photo courtesy of the Sharlott Hall Museum.

Childs-Irving plants' cheap power was central to their industrial and historical development—were relatively far away. As such, the plants did not hold important symbolic importance to residents of these central Arizona towns. In this light, Force and Fahlund hoped they could overcome resistance from the larger Arizona state historical community through compromise.⁶²

According to both Force and Fahlund, having the Yavapai-Apache Nation in their camp proved central to the coalition's framing of sociocultural arguments. In dam removal debates in the same era, including the successful efforts to demolish the Elwha and Glines Canyon Dams on the Elwha River in Washington and several dams on the Penobscot River in Maine, the engagement of the Lower Elwha Klallam and Penobscot Indian Nations was key to these successes. At Fossil Creek, the Yavapai-Apache Nation used its financial resources to produce studies. Because the tribe was a sovereign indigenous nation, FERC was required to consult with it as a governmental

^{62.} Fahlund, interview; Force, interview.

entity. More importantly, Tribal Chairman Randall was able to frame the debate around indigenous spirituality and his people's cultural affiliations with Fossil Creek. This approach helped to counter arguments regarding the Childs-Irving plants' significance to Arizona's Anglo-American history. As Randall noted, the stream was sacred to his people; its importance dated back thousands of years. Tribal leaders noted that Fossil Creek's spiritual value was immeasurable; they argued that its restoration would help revive their community in the present day. It would bring back life and vitality to their often beleaguered reservation.⁶³

RHETORICAL FRAMING: RARE AND ENDANGERED FISHES AND GREATER RIPARIAN ECOLOGICAL RESTORATION

For the environmental coalition, protecting rare and endangered native fishes was a central goal in their campaign. However, in framing and promoting their arguments, Fahlund, Force and their colleagues had a major obstacle before them. Unlike other early dam removal efforts ongoing in the 1990s like the Elwha River dams in Washington and the Edwards Dam in Maine, there were no iconic and charismatic salmon species to center their arguments upon.⁶⁴

As the environmental coalition leaders became aware, pioneering conservation biologists and ichthyologists have long known that raising public consciousness about largely unseen and unknown desert fishes has been a hard sell in the Southwest and greater American West.⁶⁵ Unlike with salmon in the Pacific Northwest, desert suckers and chubs have no built-in support base, although attitudes about preserving native fish had improved markedly since the widespread attempts to eradicate them in the 1950s and early 1960s.⁶⁶ Fishing enthusiasts in a water-thirsty state like Arizona still valued introduced smallmouth bass, rainbow trout, and catfish over native suckers and chubs. As such, environmentalists often focused on more symbolic, charismatic, and high profile species in arguing for the dam removal at Fossil Creek. They

^{63.} Guarino, "Tribal Advocacy and the Art of Dam Removal," 118–20; Force interview; Fahlund interview.

^{64.} J. Anne Shaffer, Eric Higgs, Caroline Walls, and Francis Juanes, "Large-Scale Dam Removals and Nearshore Ecological Restorations: Lessons Learned from the Elwha Dam Removals," *Ecological Restoration* 35, no. 2 (2017): 88; Guarino, "Tribal Advocacy and the Art of Dam Removal," 118–20.

^{65.} Marsh, interview; Carl L. Hubbs and Robert R. Miller, "Philosophy of Transplanting—Its Future and Implications," folder 1, box 1, DFCC; Fahlund, interview.

^{66.} Desert Fishes Council, Memorandum, November 1973, folder 1, box 1, DFCC.

noted that the nation's iconic but endangered bald eagle, as well as the beloved peregrine falcon, black hawk, and river otter stood to gain as well.⁶⁷

Coalition leaders also framed the potential Fossil Creek dam removal as big-picture ecosystem restoration. A 1968 study found that less than 0.1 percent of Arizona's original natural riparian communities still existed, a percentage that continued to decrease in subsequent decades. Restoring the full flow of Fossil Creek promised to benefit riparian vegetation, which in turn would ensure valuable nesting and other habitat for over one hundred species of birds, mammals, reptiles, and amphibians such as the rare Chiricahua leopard frog.⁶⁸

In the early 1990s, Fossil Creek contained one endangered fish species, the razorback sucker, but the rest of the native fish species in the stream were not listed as threatened or endangered under the Endangered Species Act. However, biologists noted that rehabilitating Fossil Creek promised to help forestall such listing elsewhere—a result desired by many local governments and federal conservation-oriented agencies. Scientists with the Arizona Game and Fish Department and other agencies still looked to Fossil Creek as a refugium or protected place to introduce threatened and endangered species such as the spikedace (*Meda fulgida*), Gila topminnow, loach minnow (*Tiaroga cobitis*), and razorback sucker.⁶⁹

In gaining public support, changing demographics in the American Southwest favored environmentalists. Arizona was part of the so-called New West of the post-war period, and on the whole, its people held different values about the environment and the appropriate use of resources than generations past, when Arizona's famous "5 Cs"—copper, cattle, cotton, citrus, and climate—had dominated any discussion about the land and natural resources. By the 1980s, western states like Arizona were highly urban, and this population was central to what environmental historian Marc Reisner called an "almost epochal shift in values," as westerners began to question growth for

^{67. &}quot;Aravaipa Canyon Wilderness," Draft Environmental Statement, Department of Interior, RNC; Lissa Wadewitz, "Forum: Are Fish Wildlife?" *Environmental History* 16, no. 3 (2011): 423–24.

^{68.} U.S. Forest Service, "Report: Results of Survey," and U.S. Forest Service, "Resource Information Report," September 1993, FCF; Bagwell, "Clash over Dam"; Sayers, "Potential Impacts of Stream Flow Diversion," FCF.

^{69.} Sayers, "Potential Impacts of Stream Flow Diversion," and U.S. Forest Service, "Report: Results of Survey," FCF; Bagwell, "Clash over Dam"; Minckley and Marsh, *Inland Fishes*, 207–08; Arizona Game and Fish Commission, "Threatened and Unique Wildlife of Arizona," folder "Misc. Correspondence," box 12, Minckley Papers.

growth's sake. These "new" Arizonans realized that wonderful natural places like Fossil Creek were fast disappearing and becoming scarce. This expanding and increasingly vocal and politicized constituency helped propel the effort to decommission the Childs-Irving plants as the 1990s progressed.⁷⁰

Regionally, the Verde Valley had become a prime retirement destination. Nearby Sedona was a magnate for tourists, health seekers, spiritualists, and retirees. Many of these transplants had moved to the area because of its public lands and spectacular scenery. They had different ideas of how public lands in their area should be managed and maintained. State officials listened to their voices. In the 1990s, Arizona State Parks helped create the Verde Watershed Association, a group composed of agency personnel, business representatives, and citizens interested in the sustainable management of resources in their region. At the same time, Arizona's legislature established the Arizona Water Protection Fund and financed it at the rate of \$5 million annually to provide grants for restoration projects on Fossil Creek, the Verde River, the Gila River, and Sabino Creek near Tucson.⁷¹

Like Edward Abbey's view of Glen Canyon Dam, many Arizonans came to see the Childs-Irving plants not as monuments to pioneer ingenuity and humanity's technological mastery of nature, but as affronts to the natural world and the ecological health of a river. They came to view the dam, flume, and humming generator plants at Fossil Creek as jarringly out of place in an otherwise wild desert canyon, and increasingly called for their removal. A resident of Payson, Andi Brown, expressed the opinion of many when she wrote the local paper: "Arizona Public Service Co. now has a once in a lifetime opportunity to show its concern for the environment. It can choose not to reapply for relicensing the Childs-Irving power plant. It can choose to set a corporate example of respect for a special place in Arizona's arid environment. This would be the right thing to do for generations of Arizonans to come and for the already hard-pressed wildlife of our state."⁷²

The environmental coalition and its team of experts engaged in a wellplanned and astute multiyear campaign to frame their arguments and to build consensus in support of removing the hydroelectric facilities at Fossil Creek. Andrew Fahlund of American Rivers managed a team and consultants; staff

^{70.} Reisner, Cadillac Desert, 513; Fahlund, interview; Force, interview.

^{71.} Barbara Tellman, Richard Yarde, and Mary G. Wallace, "Arizona's Changing Rivers: How People Have Affected Rivers," March 1997, Water Resources Research Center, University of Arizona, FCF.

^{72.} Andi Brown, Letter to the Editor, Payson Roundup, December 18, 1998; Force, interview.



FIGURE 7. Roundtail chub (Gila robusta), the only native fish species in Fossil Creek considered a gamefish. *Source*: "Grand Canyon's Extirpated Fish Species," National Park Service website, https://www.nps.gov/grca/learn/nature/fish-extirpated-species.htm (accessed February 24, 2022).

at the increasingly important Tucson-based Center for Biological Diversity worked diligently alongside representatives of the other environmental organizations. In making dam relicensing decisions, FERC is required to balance competing goals in the "public interest." Environmentalists argued that removing the dam and flume was positive for society. Cooperation in this case would provide a model for the future.⁷³ One effect of APS control of access to the canyon and the lack of private property along the remote stream was that restoration of Fossil Creek faced little of the concerted opposition to river protection that was seen at the nearby Verde River and often elsewhere in the nation such as New England.⁷⁴ There was some resistance from local off-road vehicle groups concerned they would lose access to the canyon. But except for APS, there were no private landowners worried about restrictions of their property rights, no mining interests worried over their access to water, and no water recreation users worried over loss of access to these lands. In fact, the restoration of the stream promised to open the area to a host of new recreational users seeking sources of outdoor recreation fairly close to Phoenix and the booming Verde Valley-swimmers, picnickers, birdwatchers, hikers, kayakers, and others.⁷⁵ Because the stream had never been a destination for fishing enthusiasts, there was no group to fight over the

^{73.} Andrew Fahlund, email message to author, November 28, 2018; Bowman, "Legal Perspectives," 740; Hawley, *Recovering a Lost River*, 5–10; "Prescott City Council Eyes Hydroelectrical Power Plants."

^{74.} Force, interview; Fahlund, interview.

^{75.} Fahlund, interview.

DEBATES OVER HYDROPOWER AS "CLEAN" AND "GREEN" ENERGY

One of the most challenging tasks for American Rivers and its partners was exactly how to frame their arguments in favor of removing a hydropower facility, especially to overcome APS's position and common public perceptions that electricity produced by waterpower was a cheap, clean, renewable, and green energy source like wind and solar. This was both a public relations issue and an economic reality. Countering these perceptions about hydro-electricity was difficult because Childs-Irving's power was renewable energy that did not create air pollution, create highly visible water pollution, or produce waste such as nuclear or coal ash.⁷⁶ As such, the environmental coalition worked to frame their arguments to expose how the Fossil Creek facility disrupted and diminished ecological and sociocultural values associated with the formerly free-flowing desert stream. Fahlund and his associates also publicized the fact that, while relatively cheap to produce, Childs-Irving power was a very small fraction of APS's total portfolio.⁷⁷

Early in the FERC relicensing process, APS spokesperson Marion Gilliam told the press that the company estimated that removing the Childs-Irving plants would cost customers about \$1.3 million to replace the cheap non-polluting power with electricity from plants using fossil fuels like coal. At the time, many Americans were demanding that local power companies utilize renewable and sustainable sources of power, forms of energy that were good for the environment as well as important in helping wean the country from its dependency on foreign oil. Opponents of decommissioning the Childs-Irving plants pointed out these facts. Mayor of Prescott Sam Steiger played upon the seeming contradiction saying: "The conflict here will be with the extreme environmentalists. The environmentalists are on very shaky ground. It is impossible for them to defend tearing down a non-polluting plant that is in first-class condition."⁷⁸ Steiger's claim about the condition of the plants was untrue; newspapers reported that projections estimated it would cost hundreds of thousands of dollars to upgrade the Childs-Irving system.

^{76.} Lowry, Dam Politics, 36; Fahlund, interview; Force, interview.

^{77.} Force, interview; Fahlund, interview.

^{78.} Wall, "Public Invited to Share Comments"; "Prescott City Council Eyes Hydroelectric Power Plants."

Fahlund and his partners tried to change public perceptions about hydropower providing environmentally conscious energy. Reframing the argument he recalls, "We made it clear that it is not 'clean energy' when you destroy an entire stream."⁷⁹

During the late 1990s, American Rivers and other coalition partners publicized data that showed the Childs-Irving facility, with its 4.2 megawatts per hour output, provided less than a fraction of I percent of APS's total electrical generating capabilities. They made a convincing case that taking the Fossil Creek plants out of production was largely inconsequential, especially when compared to the great environmental benefits the proposal promised.⁸⁰ Environmentalists would use similar cost-benefit analyses in future battles to remove aging and obsolete dams elsewhere such as four large hydroelectric dams that blocked salmon runs on the Klamath River in California and Oregon.⁸¹

APS spokespersons countered that even though the plants produced little electricity, the price of removing the Childs-Irving facility itself was estimated at \$10–20 million, costs that likely would have to be passed on to consumers. Company officials repeatedly noted that Childs-Irving's cheap and green energy would have to be replaced by costly fossil fuels that had negative environmental impacts. John Denman, vice president in charge of environmental affairs at APS, told a reporter that even recognizing the plants' small electrical output, the Fossil Creek facilities were still "good for the environment."⁸² County officials also worried about the impact of a plant closure on the local area; the Childs-Irving plants employed between eight and eleven individuals with an annual payroll of \$400,000 in 1998. The facilities provided local governments with about \$77,000 a year in tax revenue.⁸³

THE POLITICS OF DAM REMOVAL

Political Scientist William Lowry notes that presidents and their administrations can use the "bully pulpit" to push for change in dam policy at the

81. Rosenthal, "Opening the Floodgates," 28-32.

82. Wall, "Future of Childs-Irving Power Plants on the Line."

83. "Future Still Uncertain as Childs-Irving Plants Approach 90th Birthday," *Payson Roundup*, January 8, 1999.

^{79.} Fahlund, interview.

^{80.} Steve Yozwiak, "Reviving Fossil Creek," *Arizona Republic*, November 17, 1999; John Rosenthal, "Opening the Floodgates," *National Geographic Traveler* 28, no. 7 (2011): 28–32.

federal level. They also can shift public perceptions about dams.⁸⁴ When serious deliberations over the fate of the Childs-Irving power plants began in the early 1990s, the cards seemed stacked against the environmental coalition. But after Democrat Bill Clinton won the presidency in 1992, the political dynamics changed. Clinton appointed Arizonan Bruce Babbitt to head the Department of the Interior. Much like Dan Beard at the Bureau of Reclamation, Babbitt made it clear he was open to new thinking about federally supported dams and hydroelectric facilities. He set a new tone when he admitted that, "Some [dams] are obsolete, expensive or unsafe. They were built with no consideration of environmental costs." The new direction was confirmed when representatives of several federal agencies came to support decommissioning the Childs-Irving plants, including the Bureau of Reclamation, the U.S. Fish and Wildlife Service, and the U.S. Forest Service. FERC was evolving as well.⁸⁵

In its late 1990s decision on the Edwards Dam, FERC first used a balancing test that it would utilize with the Childs-Irving plants and others. In deciding whether to relicense a facility, it looked at several factors including a dam's age, location, environmental costs, and power generation capabilities. FERC officials indicated that economics and environmental costs were its top two concerns; if the environmental costs outweighed the economic benefits, then a dam was more likely to be ordered removed. FERC ordered APS to conduct environmental impact studies on the Fossil Creek facilities; it ended up completing six such reports. These studies predicted clear improvements to aquatic and riparian habitats with the removal of the dam and flume system.⁸⁶

The Fossil Creek environmental coalition, like other dam removal groups elsewhere, endeavored to frame their ecological arguments utilizing scientific and economic studies. They used data from works produced by university scientists like Wendell L. Minckley. Because it is produced by scholars in an academic, institutional setting, this knowledge is generally valued by the

86. Fahlund, "River Rebirth"; Carney, "Dam Removal," 312–24, 338–39; David D. Hart and N. Leroy Poff, "A Special Section on Dam Removal and River Restoration," *BioScience* 52, no. 8 (August 2002): 653–55; Wall, "Future of Childs-Irving Plants on the Line"; "Future Still Uncertain"; Fahlund, interview; Liba Pejchar and Keith Warner, "A River Might Run through It Again: Criteria for Consideration of Dam Removal and Interim Lessons for California," *Environmental Management* 28, no. 5 (November 2001): 561–75.

^{84.} Lowry, Dam Politics, 58.

^{85.} Fahlund, "River Rebirth"; Wall, "Future of Childs-Irving Power Plants on the Line"; Marks, "Down Go the Dams"; Carney, "Dam Removal," 310; Fahlund, interview.

public and stakeholders above other forms. They also had studies produced by the coalition and the company itself. In relation to many dams removed in the 1990s and early 2000s, the Fossil Creek case promised to be rather low cost and uncomplicated, involving a twenty-five foot high dam and a small flume system.⁸⁷

Scholars note that large, complex dams, especially multipurpose structures, are less likely to be removed than smaller dams with less complicated economic and technical realities. Unknown and uncertain environmental outcomes of a dam demolition also negatively impact chances for removal.⁸⁸ As of 2019, negotiations over taking down four dams on the lower Snake River in Washington have stalled because of the complexities involved. With these large structures, there are multiple jurisdictions involved, numerous stakeholders, including agriculture, transportation, fishing, tribal, and other interests, and contested achievable outcomes. Even the two dams on the Elwha River that various parties agreed to remove presented significant engineering, technical, and environmental challenges. Demolishing these structures proved a large undertaking; one was over 100 feet high while the other was over 200 feet; costs exceeded \$300 million; massive amounts of potentially hazardous silt had to be removed. Projections about the environmental results on the post-removal river ecosystem were far from certain.89

Compared to early dam removals in the Pacific Northwest, the Arizona case was rather uncomplicated. At Fossil Creek, there was only one economic stakeholder, APS, and its customers. Childs-Irving produced a fraction of I percent of the company's power output. The estimated cost of removing the plants, while not insignificant, was \$10–20 million, an amount that APS could afford to absorb. The stream's waters were not used by area towns or local agricultural, mining, or forest industries. There were no private property owners affected by planned restoration efforts. The environmental impact studies produced for FERC clearly showed the benefits to native fishes and

^{87.} Force, interview; Fahlund, interview.

^{88.} Grabowski, "Removing Dams," 273-75; Lowry, Dam Politics, 3-4.

^{89.} National Research Council, *Upstream: Salmon and Society in the Pacific Northwest* (Washington, D.C.: National Academy Press, 1996), 249–50; Guarino, "Tribal Advocacy and the Art of Dam Removal," 36–37; Fahlund, interview; Force, interview; Ed Whitelaw and Ed Macmullan, "A Framework for Estimating the Costs and Benefits of Dam Removal," *BioScience* 52, no. 8 (2002): 724–30.

BREAKTHROUGH: SETTLEMENT AGREEMENT AND DECOMMISSIONING

As the twentieth century came to a close, a breakthrough was reached on the fate of the Childs-Irving power plants. Company officials had been negotiating in the FERC process for over eight years. After the Edwards Dam decision was issued in early 1998, they knew very well that the commission could rule against their license. In 1999, Ed Fox, APS vice president of environmental issues, announced that the company would end its efforts to relicense the Fossil Creek plants. As he said, "It is simply the right business decision to decommission Childs-Irving and to reclaim the unique riparian resource that surrounds Fossil Creek." Company leaders had concluded the costs of keeping the plants outweighed the benefits of removing them. By retiring the Childs-Irving plants, the company would gain a valuable public relations victory by doing right by the environment.⁹¹

At the end of 1999, the parties announced the outlines of a historic, legally binding settlement. APS would shut down and remove most of the Childs-Irving facilities by 2004–2005. The company agreed to pay for the project (ultimately costing \$12 million), but as a cost-saving measure, the agreement allowed it to remove only the top six feet of the twenty-foot diversion dam, allowing the full flow of the stream to tumble over the structure. This would preserve the dam as a barrier to upstream movement of invasive species as well. As a concession to the historical community, the Childs Plant near the Verde River was allowed to remain in place. As of 2015, its fate was unclear as it sat abandoned and decaying. With the historic agreement, for the first time in the history of Arizona and the greater Southwest, a significant stretch of river of approximately fourteen miles would be allowed to flow freely again—an important desert stream restored to its former state.⁹²

^{90.} Fahlund, interview; Wall, "Public Invited to Share"; Bagwell, "Clash over Dam"; "Future of Childs-Irving Plants on the Line"; Force, interview.

^{91. &}quot;Steiger's Power Play," *The Arizona Republic*, October 8, 2000; "Prescott City Council Eyes Hydroelectric Power Plants"; Fahlund, interview; Force, interview.

^{92.} Force, interview; Fahlund, interview; "Fossil Creek to Flow Again," *The Arizona Republic*, November 18, 1999; "Steiger's Power Play"; Jane C. Marks, "Effects of Flow Restoration and Exotic Species Removal on Recovery of Native Fish: Lessons from a Dam Decommissioning," *Restoration Ecology* 18, no. 6 (2010): 934–43; "Prescott City Council Eyes Hydroelectrical Power Plants."

On a Saturday afternoon in June 2005, representatives of the parties involved in negotiations met at a makeshift ceremonial ground on the banks of the stream to retire the dam that had held back the flow of Fossil Creek for almost a hundred years. Speaker after speaker rose to proclaim the significance of the day to their organizations. Andrew Fahlund, who had led the American Rivers team, said, "This represents a watershed event, to do something like this in Arizona is extraordinary." Jack Davis, president and chief operating officer of APS, noted, "This is just another benchmark in the long history of Fossil Creek," when people come to this place centuries from now "they'll remember that short period of time—100 years—when Fossil Creek was used for economic development." Duane Shroufe, director of Arizona Game and Fish, thanked APS saying the company had given "a gem" back to Arizona. While the power company was praised for taking the long view, indigenous people at the event reminded the audience of the deeper, more ancient importance of Fossil Creek to Indigenonus Americans. Jamie Fulmer, tribal chairman of the Yavapai-Apache Nation, saw more than just the rebirth of a river. As he said, "To us, water is sacred, and the water now flowing it will bring back new energy for our community in the Verde Valley and to Arizona." Representatives of various groups flipped a symbolic switch to shut off the water diverted into the flume. What started first as a trickle over bone dry bedrock became a torrent as Fossil Creek roared back to life. Within just two hours of the dam's decommissioning, the steam had filled every nook and cranny, spreading across its former riverbed from bank to bank. The fall before, state and federal fisheries personnel had airlifted thousands of native fish to holding ponds near the creek. Within the year, four endangered fish species, the spikedace, loach minnow, razorback sucker, and Gila topminnow, were once again swimming freely in Fossil Creek. In 2008, the historic flume, Irving Plant, and other structures finally were removed.93

CONCLUSION: THE CHILDS-IRVING HYDROPOWER PLANT DECOMMISSIONING IN HISTORICAL PERSPECTIVE

Coming on the heels of the historic Edwards Dam decommissioning in Maine, the Fossil Creek negotiations and outcomes served as a blueprint for

^{93.} Andrew Fahlund, email correspondence with author, November 2018; "APS Dam Removal Releases Fossil Creek," *The Arizona Republic*, June 19, 2005; Ken Mosher, "Update on the Fossil Creek Native Fish Restoration Project," *In the Current*, January 9, 2017, accessed August 19, 2019, https://inthecurrent.org.

future successful dam removal efforts in the United States. These victories established important early precedents that led to a surge of dam removals and stream restoration work in the decades that followed.⁹⁴ Fossil Creek showed that environmentalists could effectively utilize the FERC licensing process to force power companies to the table and ultimately convince them that the benefits of removing aging, obsolete, and environmentally harmful structures outweighed the costs of keeping them in place. The Center for Biological Diversity, American Rivers, and their partners successfully framed their rhetoric using scientific data to prove the harmful ecological impacts of the Fossil Creek hydropower plants on native fish and other flora and fauna. They did so at a time when popular opinion, presidential leadership, federal and state bureaucracies, and company leaders proved receptive to a change in the status quo. At Fossil Creek, local citizens and power company officials came to see that providing habitat for rare desert fishes and other species was more important than retaining the historic Childs-Irving plants, facilities that by this time had become little more than symbolic forms of "green" energy in a rapidly growing state.

The environmental coalition also was able to frame its arguments in sociocultural terms to overcome the greater Arizona historical community's concern over the loss of a National Historic Landmark. The advocacy of the Yavapai-Apache Nation educated the public, agency leaders, and APS officials, about the deep cultural and spiritual affiliation the people had with Fossil Creek. Through the media, protests, and other mediums, the coalition successfully reframed arguments away from the loss of a historical landmark and toward what would be gained. Seizing upon the public's changed environmental consciousness, the coalition concentrated on potential benefits in sociocultural, spiritual, and ecological terms. As they argued the people of the Southwest and future generations would profit from a restored Fossil Creek.

In light of FERC's decision to order the Edwards Dam in Maine removed, an agency that had once largely rubber stamped relicensing applications now showed a willingness to balance competing interests in the name of river health. APS leaders realized Childs-Irving might share the same fate as the Maine dam. They also concluded the company could gain a public relations victory by restoring Fossil Creek. As such they chose to end their efforts to relicense with FERC. Importantly, compared to many hydroelectric dams in

^{94.} Fahlund, "River Rebirth"; Carney, "Dam Removal"; Fahlund, interview.

the United States, APS costs were relatively low. The demolition was rather simple and inexpensive, the loss of power generation was a small fraction of 1 percent of its total output, and its decision affected relatively few people.

Subsequent studies of the aftereffects of dam removals on the Kennebec River, Fossil Creek, and other streams showed that fish populations rebounded beyond anyone's expectations, facts that provided further momentum for the removal of other dams. Since Edwards Dam and Childs-Irving on Fossil Creek, over 430 dams have been demolished in the United States alone, including the two high dams on the Elwha River in Washington. The U.S. Army Corps of Engineers has committed millions of dollars to restoring river habitats devastated by the very dams it once championed. One statistic tells the tale of the larger historical impact: Just two years after Childs-Irving was taken off line, for the first time in the nation's history there were more federal orders for dam demolitions in 2007 than there were for new hydropower dam construction projects.⁹⁵

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95. Fahlund, interview; Marks, "Effects of Flow Restoration," 934–43; Jeff Crane, "Setting the River Free: The Removal of the Edwards Dam and the Restoration of the Kennebec River," *Water History* I (December 2009): 131; Michael C. Blumm and Andrew B. Erickson, "Dam Removal in the Pacific Northwest: Lessons for the Nation," *Environmental Law* 42, no. 4 (2012): 1043–1100; Marks, "Down Go the Dams."