



Protecting and Restoring Rivers and Lakes in North America

Trends, challenges, and opportunities for doing a better job

Chris Madson, Tom Annear, and Del Lobb



FEW OF US ever outgrow our fascination with water whether it's in flowing streams and rivers or sparkling lakes and reservoirs. In fact, it's probably bred into us. Our connection with rivers and lakes reaches far beyond the limits of written history, back past the invention of agriculture into the trackless times when people wandered along the river and lake corridors of the world, hunting and fishing for survival. Through prehistory and into the present, rivers and lakes have quenched our thirst, provided food, transported people and freight—in short, cradled us. Even today, watercourses shape the pattern of our agriculture, industry, and urban development.

You'd think we'd treat them with more regard.

Instead, we've gone to great lengths to damage, destroy, and disrespect their ecological benefits and significance for our overall well-being. We've drained them or rerouted them when they don't flow where we want or when they flow "too much" in the "wrong places." And we've dammed streams just about as long as we've polluted them. The consequences for fish, wildlife and other river and lake-dependent living things may have been unintended, at least in the early years of continental settlement, but they have often been disastrous nonetheless.

The process of transforming rivers and lakes in the U.S. and Canada from free-flowing avenues of commerce teeming with fish and wildlife to the point where most of them are altered in some way has been a seemingly gradual



Through prehistory and into the present, rivers and lakes have quenched our thirst, provided food, transported people and freight—in short, cradled us. *Photo of canoe on the Broad River by Ron Ahle, South Carolina Department of Natural Resources.*

Background photo of the Altamaha River, Georgia by Bert Deener, Georgia DNR, Wildlife Resources Division.

one. But today there are over 75,000 dams in the U.S. alone and more than 5,000 of those are significant structures over fifty feet high.

Most people tend to take for granted that the rivers or lakes in their state or province have always looked the way they do now, not realizing the magnitude of change that's occurred and the benefits they've lost. Some of us are even lulled into a complacent belief that the majority of degradation is behind us and things will stay just the way they are well into the future. Such a vision is indeed a false one.

At times the sense of loss and pending threat to the waters we love seems overwhelming and the prospects for change appear hopeless. But there is hope. Though people are a big part of

the problem with the condition of our rivers and lakes today, they are also a part of the solution. You are part of the solution.

To gain perspective on the state of aquatic resources in the continental U.S. and Canada prior to the time of settlement and get a sense of the specter of pending degradation that existed then, one need look no further than the state of Alaska. Alaska's water makes up approximately forty percent of the nation's total surface waters. Three of Alaska's rivers are among the ten largest in the United States. Alaska has more than three million lakes, ranging from pond size to 1,000 square miles.

Christopher Estes is chief of the Statewide Aquatic Resources Coordination Unit for the



From rivers like the Gulkana River in sparsely settled Alaska to more "civilized" rivers like Georgia's Satilla River, a critical need exists to protect what's left of all rivers and restore what we can in those where losses have already occurred. *Gulkana River photo by Bill Romberg, Alaska Department of Fish and Game. Satilla River photo by Bert Deener, Georgia DNR, Wildlife Resources Division.*

Alaska Department of Fish and Game. He notes that “Alaska is at a stage of development where the rest of America was approximately 170 years ago. When water was initially extracted from mighty rivers like the Colorado, dammed on the Columbia, and confined between levees on the Mississippi, our predecessors had little idea what was going to happen to fish and wildlife. But just as development pressures have taken and continue to take their toll on rivers and lakes in the lower 48 states, Alaska is in danger of moving along a similar path if preventative actions aren’t taken.”

Though many people fail to appreciate the threat to Alaska’s rivers and lakes, just like they overlooked threats to natural waters in their own back yards, the losses and looming threats are beginning. Fresh water has been exported from Alaska to Japan, and you can buy “Amazing Alaska Premium Quality Pure Glacier Water” off the shelf in New York City. More than a dozen companies have considered or expressed an interest in exporting Alaskan water around the world by trans-oceanic supertankers or pipelines.

Recently, the state of Alaska dusted off plans from the 1980s for a massive hydroelectric project on the pristine Susitna River in the gorge between the Talkeetna Mountains and the Alaska Range in the southeastern part of the state. The original project would have included two reservoirs, one 48 miles long, the other 26; generated somewhere between 200 and 1600 megawatts of electricity; and choked off spawn-

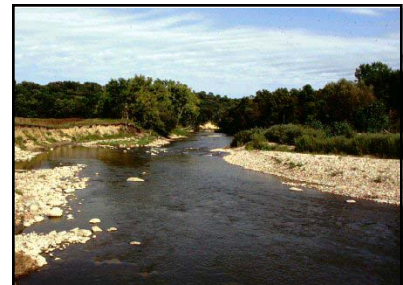
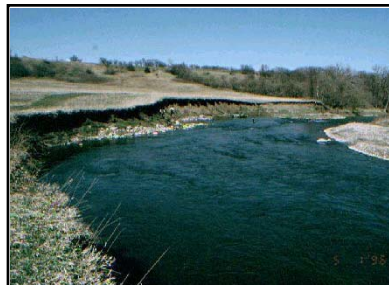
ing runs for countless thousands of salmon for generations to come. Even in remote Alaska the threat of riverine degradation is real.

Alaska may have some of the best water allocation laws and regulations in the nation, but that doesn’t mean they’re adequate for the challenge at hand. Estes worries that the legal framework, infrastructure, data, and monetary resources needed to manage water effectively in Alaska may not be adequate to protect the health of the state’s rivers and lakes and the unparalleled fish and wildlife and other socio-economic benefits they currently support.

As the decades have passed, a handful of state and provincial fish and wildlife agency professionals recognized the need for better legal opportunities and more focused, pro-active strategies to restore and protect the water flowing in streams, as well as the lakes and aquifers that are connected to flowing water. Historically, each state and provincial agency basically worked alone on the water management issues in their state or province, which meant they had to learn the complex science, laws, and public needs essentially on their own. In 1998, they formed an organization called the Instream Flow Council (IFC) to share knowledge and skills so they can better address the daunting challenge of restoring and protecting the water, fish, and wildlife that belong to all of us.

It’s an uphill fight... and a very long hill.

Early in 2009, IFC professionals completed a three-year study of the trends, challenges, and opportunities that state and provincial fish



The Yellow Medicine River in southwestern Minnesota at high, mid, and low flow conditions. Maintaining the health of streams like the Yellow Medicine River requires different flows at different times of year—a flow regime. The laws related to instream flow in most states and provinces fall far short of providing adequate protection for flow regimes. *Photos by Luther Aadland, Minnesota Department of Natural Resources.*

and wildlife agencies face to manage instream flow. Their report *A Status Report of State and Provincial Fish and Wildlife Agency Instream Flow Activities and Strategies for the Future* provides the most comprehensive look ever at the present-day effectiveness of those agencies, the complexity of the issues at hand, and the daunting challenges they face within and outside of their agencies to better manage public trust fish and wildlife resources... and water.

The data and recommendations presented in the report are drawn from two extensive surveys and a weeklong workshop where participants developed potential strategies for dealing with the challenges they described. The picture painted is not a pretty one. The surveys revealed that less than one-quarter of the streams in the U.S. and Canada have ecological conditions that approximate their natural conditions. Forty percent of survey participants reported that the majority of the stream miles in their states and provinces have no legal protection for instream flow at all, and even where there is some kind of protection, it fails to provide meaningful protec-

tion without diligent oversight and enforcement. The restoration of natural flow regimes to impaired streams is even rarer.

The report also shows that the professionals responsible for managing the fish and wildlife in these waters clearly realize the magnitude

of effort and scope of work needed to tackle this challenge. They've identified a large number of strategies for addressing the challenge. Though there is no single strategy for doing a more effective job of managing rivers and lakes, the IFC has identified four major

areas that must improve.

More and better laws, regulations, and policies are needed in virtually every state and province to protect instream flows and water levels in lakes and reservoirs. A single minimum flow level at all times of year does not provide adequate protection for streams—scientific analysis has shown that most streams need seasonally adjusted flow regimes to maintain their full ecological function. In other words, a range of flows is needed that are ecologically appropriate for different seasons. At the time of

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Forty percent of participants in a national survey reported that there is no legal protection for the majority of the stream miles in their state or province. Even where there is some kind of protection, diligent oversight and enforcement is often needed to ensure water remains in the stream or lake to provide intended public benefits. *Photo by Ron Ahle, South Carolina Department of Natural Resources.*

the survey, only one state in the nation had laws that require “full protection” of instream flow regimes. Another 21 states and provinces have laws that may allow full protection of stream flow regimes in some situations, though there are few cases where the laws have been implemented—even in the one state where they are required. Nine states and provinces don’t have a legal framework that allows even “threshold, or minimum, flow protection.” IFC professionals agree that more and better state and provincial laws, regulations, and policies are needed that allow the public to protect appropriate stream flow regimes through the seasons of the year as well as between years. Placing instream flow and lake water management on an equal footing with permits, licenses, and regulations for all other kinds of water uses is a critical need in virtually every state and province.

Laws provide the framework for flow and lake level protection. But as in Alaska, the fact that a state or province has an instream flow law doesn’t mean the law is actually as effective as it may seem to be... or needs to be. What’s more, laws are of little use if the government agencies with authority to manage instream flow don’t act on them, or if laws are not interpreted in a way that supports in-channel public benefits. Translating law into action is a matter of policy, and IFC surveys suggest that only half of

the states and provinces represented by participants in the survey have adopted policies that allow full protection of instream flow.

There may be no better example of this fact than the generations-old struggle over the water in California’s Mono Lake on the east side of the Sierra Nevada Range. Two pristine streams and several smaller watercourses supplied most of the water to the lake, at least until 1941. The city of Los Angeles, more than 300 miles away, diverted the streams in spite of a California law, passed in 1937, that stated “The owner of any dam shall allow sufficient water at all times... to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam.” At that time, water administrators simply chose not to enforce the law in deference to what they may have perceived as a greater need by a great city.

In the 1970s, local communities and concerned conservationists, alarmed at the deepening effects of the water diversion on fish and wildlife in the streams and lake, took on the challenge of seeing that existing laws were enforced and public trust resources were restored. The effort began with small groups of citizens like the Mono Lake Committee but eventually attracted the attention of California Trout and the National Audubon Society. Together these coalitions filed lawsuits and appeals, and



Mono Lake (left), high in the California Sierra Nevada Range was the setting for a classic legal test that affirmed the public’s right to healthy streams and lakes. In 1947 the City of Los Angeles diverted all the water from Rush Creek (right) to the city, drying up the stream and causing lake levels to fall to severely low levels. After more than a decade of legal actions, the court required the city to abide by the pre-existing state law that required diversions such as the one on Rush Creek to pass enough water in the stream to keep fish in good condition. *Photos by Gary Smith, California Department of Fish and Game (retired).*

pressed for new state legislation to support their cause.

After more than a decade of confrontations in and out of court, California District Court Judge Terrence Finney told the Los Angeles Department of Water and Power that it would have to “release sufficient water into the streams from its dams to reestablish and maintain the fisheries which existed in them prior to its diversion of water.”

Gary Smith, now retired, was the leader of the California Department of Fish and Game’s instream flow program through much of the litigation. He appeared as a witness before Judge Finney for more than seventy hours and was primarily responsible for assessing the condition of the affected streams. He lived the Mono Lake battle. He points out that it was imperative to have a sound technical basis for the stream analysis he provided during the deliberations, but in the end, he knows the science would have made little difference if the legal framework for action hadn’t existed and the public hadn’t become involved.

“Our success with Mono Lake turned on several things. Of course, the state law that protected streams and fish was a crucial part of the decision to protect the streams above Mono. The Public Trust Doctrine was also essential—the idea that natural resources are held in trust for everyone and must be managed

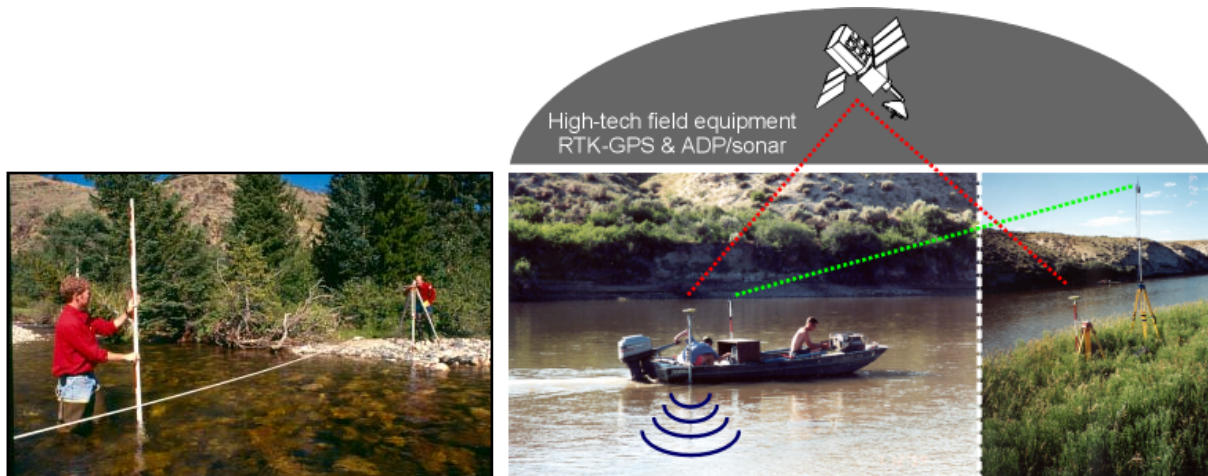
in the best interests of all the people including future generations,” he recalls. “But the laws themselves didn’t make anything happen until motivated, dedicated citizens stood up to challenge Los Angeles, and the challenge

found its way to a judge who was interested, knowledgeable, and wasn’t afraid to uphold the statute. Often, it takes the law, the legal system, and involved citizens to make a difference.”

“As I look back on it now,” he smiles, “it was the apex of my career. The people I met, especially the private citizens who gave so much of themselves—they were the very best.”

The agencies responsible for analyzing instream flow needs should have well-trained staff specifically assigned to the issue. When it comes to debates over water for rivers and

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Determining the flow regime needed to restore or protect rivers and lakes is a fairly complicated, technical business that often requires specialized training and equipment. Most state and provincial fish and wildlife agencies do not have career professionals who are adequately trained in field techniques or who focus the majority of their time on water management duties. *Surveying photo by Beth Edwards, Wyoming Game and Fish Department; GPS / ADP image by Rick Anderson, Colorado Division of Wildlife.*

lakes, there's no substitute for solid information and technical savvy. But according to the IFC report, few of the states and Canadian provinces that participated in the survey have staff with the expertise or funding to collect and analyze information themselves.

Ian Chisholm, supervisor of the Stream Habitat Program for the Minnesota Department of Natural Resources has learned first-hand the value of having enough staff that are well trained and adequately supported. He offers his and his agency's experience with the St. Louis River as a textbook example.

The St. Louis River flows out of northeastern Minnesota and empties into Lake Superior in the town of Duluth. Five dams harness the river, generating eighty percent of all the hydropower in Minnesota. The dams also control the flow of the river. Though the total amount of water flowing down the river in a given year didn't change much from what would have flowed without the dams, the magnitude, duration, and seasonal timing of the river's flow changed a lot and had big changes on fish and wildlife in the river as a consequence. In northern Minnesota, like much of Canada, peak demand for electricity comes in the dead of winter with the need to

heat homes and businesses. The power companies catch and store water in the spring and summer, then release the water over the winter months to generate power. That means the reservoirs behind the dams usually reach their low ebb in early spring. Then, as dam operators close the gates to refill the reservoir, flows in the rivers below the dams dwindle. So instead of a spring flood, the river has a spring drought, a reverse of the natural flow pattern.

After several years of drought in the late 1990s, the reservoirs were drawn down far below normal levels in the spring and early summer, leaving mudflats and boat ramps that didn't reach the water's edge. Cabin owners around the lake and local anglers were incensed. Downstream from the dam, the St. Louis River was reduced to a trickle. Fish and other wildlife on the river were under severe stress.

After a deluge of public comments and a particularly intense meeting where public input was heard loud and clear, the hydro operators, the Federal Energy Regulatory Commission (FERC), and the Minnesota Department of Natural Resources got together to work out an agreement that would help stabilize the reservoirs and bolster flow in the river. Relying heav-



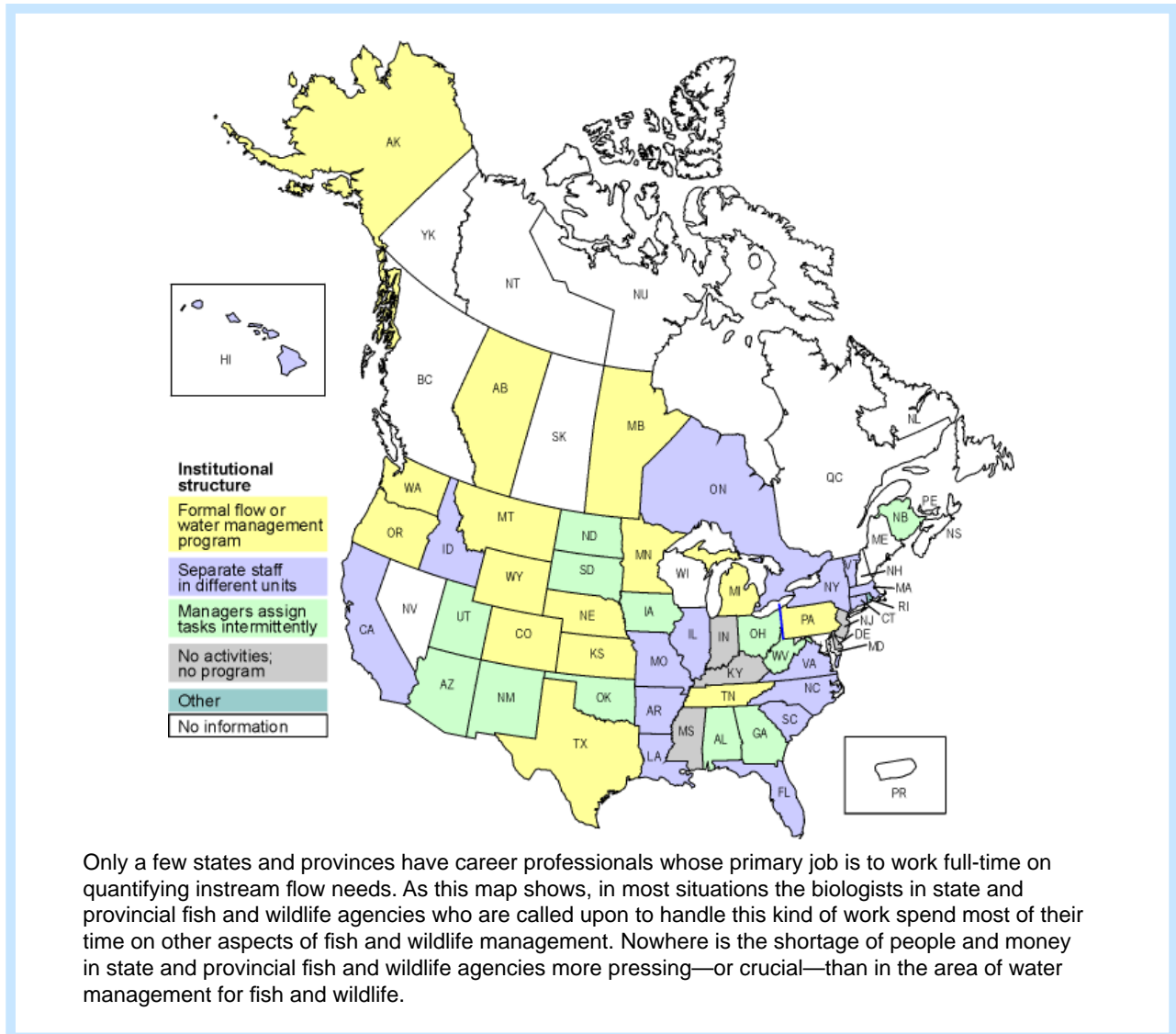
Dams, such as those on Ontario's Frederick House River, may not change the total amount of water that flows in the river over the entire year, but they can change the seasonal timing, duration, and magnitude of flows with potentially significant effects on fish and wildlife in the river below them. *Photo courtesy of the Ontario Ministry of Natural Resources.*

ily on the extensive technical information on the river’s watershed, geologic structure, ecology, and fishery provided by Chisholm’s staff, a plan for managing available water in drought years was developed that split available water between hydropower generation, the reservoirs, and the river in a way that respected the river’s natural flow regime.

As demonstrated by the St. Louis example, having professionals that are familiar with a range of scientific techniques, can apply them in the field, and interpret the results objectively is critically important. Unfortunately the IFC study mentioned above shows that most state and provincial fish and wildlife agency stream specialists do not have a good grasp of more than a handful of methods to quantify stream

flow needs. Even more disturbing, the number of agency biologists who have actually used these methods in the last five years is even less.

Money is part of the problem—state and provincial agencies don’t typically dedicate much funding to train professionals in this area. And only a few states and provinces have created programs and positions that allow career professionals to focus full-time on the task of quantifying instream flow needs. In almost all cases, the fish and wildlife agency people who are called upon to handle this job are chronically burdened with many other demands on their time. Though every conservation agency’s ability to participate in a wide range of fish and wildlife management activities is relatively limited, nowhere is the shortage of people and



Only a few states and provinces have career professionals whose primary job is to work full-time on quantifying instream flow needs. As this map shows, in most situations the biologists in state and provincial fish and wildlife agencies who are called upon to handle this kind of work spend most of their time on other aspects of fish and wildlife management. Nowhere is the shortage of people and money in state and provincial fish and wildlife agencies more pressing—or crucial—than in the area of water management for fish and wildlife.

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Those of us who care about rivers and lakes need to understand at least the basics of what instream flow is and why it is important. Since most peoples' experience with water involves garden hoses and kitchen faucets, we can probably be forgiven for seeing stream flow in simple terms—somewhere, nature turns on a tap and a given amount of water starts downhill, like run-off in a gutter. But in all rivers, science has shown us that the patterns and processes set up by flowing water are infinitely more complex.

The plants and animals that evolve in and around streams and lakes adapt to the special conditions they find there. Change the amount of water flowing in a stream at the wrong time, and you stress some or all of those organisms. From a human point of view, the shift may seem

insignificant—a decline in the abundance of a native darter or a shift in the part of a stream where a species of caddisfly is found. In other cases the loss may be more noticeable especially if it involves the loss of a population of native trout or salmon. Changes in flow or lake level can favor introduced species of fish and wildlife that subsequently thrive and displace the native organisms. Whether we perceive the loss or not, these kinds of effects can be devastating to the entire web of life that depends on healthy, flowing rivers and lakes.

When biologists develop a plan to restore or protect the flow regime in a stream, they're looking for more than the least amount of water needed to keep fish alive. In some cases, they may strive to maintain or restore a flow regime that "mimics the natural hydrograph," which is to say, keep the stream flowing pretty much the way it has in the past—about the same timing,

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Even streams in national parks have suffered from the loss of flow over the past century. The Gros Ventre River in Grand Teton National Park, Wyoming is a prime example of the inability of river managers to ensure adequate flow to support public trust riverine resources even in places where such protections seems logical to some. *Photo by Scott Yates, Executive Director Wyoming Water Project.*

magnitude and duration of floods and low flows. Doing that in turn maintains or restores the fluctuations in current, temperature, and sediment load and countless other intricate elements that are important ecological features for the organisms that live in rivers. In brief, the decisions we make when allocating water to various uses make all the difference when it comes to maintaining or restoring the fishery, aquatic insects, terrestrial wildlife, and recreation associated with rivers and lakes.

Those of us who are not professional stream or lake scientists can easily get lost in the welter of technical detail that an ecological understanding of stream flow entails. For those seeking a better grasp of river processes, the IFC book *Instream Flows for Riverine Resource Stewardship* is one of the few books that provide even armchair ecologists a comprehensive description of the subject under a single cover.

We need to act to protect our streams. There are things a government agency can do well and things it cannot. Properly funded and trained,

government professionals can analyze a complex situation—they can tell us how a river or lake functions, how a change in a stream's flow regime will affect that function, how one living thing in a stream or lake depends on another.

However, while agencies can fulfill their legal charge of managing fish and terrestrial wildlife, it is sometimes difficult for these agencies to protect stream flow entirely on their own. While they can make

recommendations, few fish and wildlife agencies have strong regulatory authority over water.

That's why public involvement is essential. People can change the legal and political framework that surrounds water management for fish and wildlife. A single well-informed, outspoken person can be the catalyst that changes the course of legislation, convinces an agency to strengthen its policies, and protects or restores a stream or lake.

In 1957, Citizens Utility of Vermont decided to build a dam across the Clyde River in the town of Newport. For generations, the Clyde

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After removing the #11 Dam on Vermont's Clyde River, flow was restored to critical spawning areas and with the flow came a return of land-locked Atlantic salmon. Because of this effort and restored habitat, the Vermont Department of Fish and Wildlife now has a restoration program underway to further improve this fishery. *Photo by Rod Wentworth, Vermont Department of Fish and Wildlife.*

had been famous for its run of land-locked salmon, six- to ten-pound fish that came up the river from Lake Memphramagog to spawn. The salmon run dwindled as four other dams were built farther up on the river, but it persisted, along with populations of trout and smallmouth bass, until the #11 Dam in Newport closed its gates, blocking migration to 1,400 feet of critical spawning gravel. Faced with this last obstacle, the salmon run virtually disappeared, along with most of the other game fish in the lower reach of the stream.

Many fishermen were upset, including local schoolteacher Kevin Coffey and his wife Karen. In 1989, the Coffeys got together with other like-minded people to form the Clyde River Committee.

Under pressure from the state of Vermont as well as conservation interests, FERC recommended that the dam be removed. On August 28, 1996, after seven years of work, the Coffeys and dozens of other citizen conservationists watched as the concrete portion of the dam was blown up and removed. In 2007, fish passage

facilities were completed at the downstream Newport Dam and salmon showed up in a collecting tank the first night. By the end of that fall a total of 55 salmon had made their way back to traditional spawning grounds. Because of this effort and restored habitat, the Vermont Department of Fish and Wildlife now has a restoration program underway to further improve this fishery.

Protecting and restoring rivers and lakes is without question a complicated and challenging process that demands the full integration of credible

science, appropriate and effective laws and policies, and an informed and involved public. In the book *Integrated Approaches to Riverine Resource Stewardship; Case Studies, Science, Law, People, and Policy*, the IFC documents several successful outcomes in river management across North America. In every case, the key players achieved favorable outcomes by effectively integrating these three critical components.

For those of us who care about how water is managed for fish and wildlife, some seri-

***There is hope
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The decisions we make when allocating water to various uses make all the difference when it comes to maintaining or restoring the fishery, aquatic insects, terrestrial wildlife, and recreation associated with rivers and lakes. *Saluda River, South Carolina photo by Ron Ahle, South Carolina Department of Natural Resources.*

ous challenges lie ahead. The population of the United States has topped 300 million; it will reach more than 400 million by the year 2050. The populations of Canada and Mexico are growing more rapidly—in 40 years the population of North America will be about 615 million, about twice what it was in 1980.

At the same time, the southern half of the continent will probably be drier and hotter with more of the year's precipitation coming in the winter and spring and more in the form of rain than snow. For much of the continental United States, parts of Canada, and all of Mexico, this will likely mean less runoff through the course of the year and much less runoff in late summer and fall.

The combination of more demand for water and less supply will absolutely put more strain on our streams in the future and make today's controversies look like child's play by comparison. Still, as difficult as water management is today, there are opportunities to find solutions that may not exist in another 20 years—or even in another decade. In the words of famed astronomer Carl Sagan, “Anything else you're interested in is not going to happen if you can't

breathe the air and drink the water. Don't sit this one out. Do something. You are by accident of fate alive at an absolutely critical moment in the history of our planet.”

America's rivers and lakes can no longer survive our indifference. We must care for them and have a visionary plan for each of them or they will dwindle away along with the diverse and unique fish and wildlife that depend on them for their very existence. What would that be like—a land without flowing water? Without the sycamore shade and the mist rising at dawn, the mayflies in the last light of day and the rainbow trout feeding in the eddy, without the kingfisher at noon and the whip-poor-will at midnight. Without the laughter of the current tumbling over water-polished stones on its ancient journey to the sea. A land without healthy rivers is a land diminished.

We need our rivers and lakes and they need us—to understand their ways, to get involved in their management, and to help the fish and wildlife agencies entrusted with their care to fulfill their public trust responsibility to sustain them for all of us and generations yet to come.

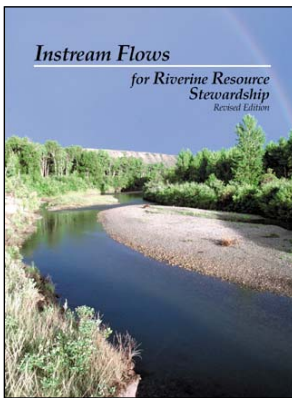


The combination of more demand for water associated with population growth and diminished or altered supplies of water due to global climate change will absolutely put more strain on rivers and lakes in the future. But there is hope that those pressures won't cause the same extent of problems as were experienced in the past. People who choose to get informed and involved in water management issues can make a difference and help achieve a more balanced approach to water management. Their efforts will yield benefits for today's citizens as well as future generations that will inherit their legacy. *Photo of the Athabasca River, Alberta by Kelly Robson.*

More information from the Instream Flow Council

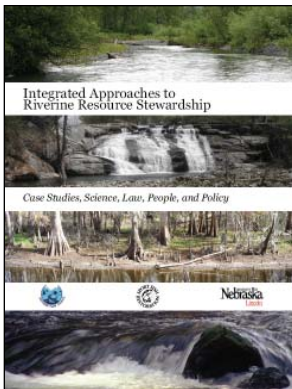
The state and provincial fish and wildlife agency employees who comprise the membership of the Instream Flow Council have extensive experience on the front lines of maintaining and restoring flow and water volumes in streams, rivers, lakes, and reservoirs. In recent years, they've turned much of their attention to sharing their wealth of experience with others to help them understand the complex and challenging business of water management for fish and wildlife—and some of the ways that people can help make a difference.

If you're interested in learning more about protecting streams, rivers, lakes, or reservoirs and the kinds of things you can do to help, the Instream Flow Council has produced several definitive documents on instream flow and water management for fish and wildlife that you might want to take a look at. Each of these publications can be obtained by visiting the IFC web site (www.instreamflowcouncil.org) and following the appropriate links.



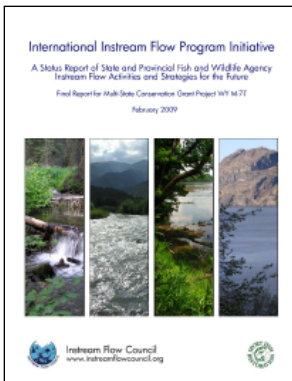
Instream Flows for Riverine Resource Stewardship, revised edition, 2004

This book is widely regarded as “the bible on instream flow” and provides a relatively non-technical understanding of key ecological features of rivers. It reveals the ways that hydrology, biology, geomorphology, water quality, and connectivity interact to shape streams and the many living things that depend on aquatic systems. The book also provides a broad overview of the legal and institutional frameworks by which many of the decisions affecting rivers and lakes are made. The important role of the public in water management is also addressed and will be of particular interest to many readers. \$85.00 (US) plus shipping and handling.



Integrated Approaches to Riverine Resource Stewardship: Case Studies, Science, Law, People, and Policy, 2008

There is no single best way to address every water management challenge so this book provides a close look at eight case studies of efforts to protect river systems throughout the U.S. and Canada. Each study considers the technical, political, regulatory, and legal steps that were taken to manage water in river systems under stress. The authors discuss a range of techniques and approaches that can be used to balance competing demands for water in streams and lakes. This is a highly readable book with lots of detailed information that is grounded in practical experience. \$49.00 (U.S.) plus shipping and handling.



International Instream Flow Program Initiative: A Status Report of State and Provincial Fish and Wildlife Agency Instream Flow Activities and Strategies for the Future, 2009

Members of the Instream Flow Council took a hard look at the challenges, trends, and opportunities that state and provincial fish and wildlife agencies face when fulfilling their legal responsibilities to manage water in streams and lakes for fish and wildlife. This report is packed with data about state and provincial agencies' involvement with water management that is presented in numerous graphs and bulleted interpretations that are relatively easy to read and understand. It also provides a thorough treatment of possible strategies that agencies and the public can draw on for improving water management practices—and agency function—in the future. Downloadable in PDF format for free.