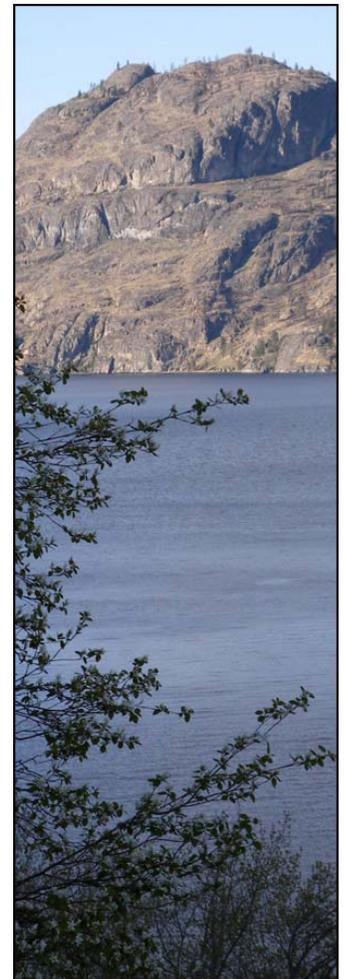


International Instream Flow Program Initiative

A Status Report of State and Provincial Fish and Wildlife Agency
Instream Flow Activities and Strategies for the Future

Final Report for Multi-State Conservation Grant Project WY M-7T

February 2009



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Wood River, Wyoming, photo by Tom Annear

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Okanagan Lake, British Columbia, photo by Kelly Robson

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Preface

In most areas of the United States and Canada the responsibility for allocating public trust water resources rests with the state or province, and each state or province expresses this responsibility according to their prevailing political and social situation. Some governments effectively integrate water quantity, quality and wildlife management. But in many situations, fish and wildlife management agencies sit on the sideline of important water management decisions. As this project progressed, the project team discovered it was not uncommon for some participants to state that their agency just manages fish, and that the majority of water management decisions were handled by a sister agency. This finding was shocking considering the importance of water for fish and wildlife, and the legal responsibility of fish and wildlife agencies for restoring, protecting, and enhancing those resources.

The IIFPI project was conducted to help agencies (and the public they serve) better understand the role agencies play in the complex world of water management. Many agencies perform their role expertly, but too often some of them fail to appreciate the critical importance of being actively involved in water management decisions that affect public trust resources. Many of these decisions are once-in-a-lifetime opportunities with far reaching consequences. Though involvement in water management decisions doesn't guarantee a particular outcome, the active involvement of multiple stakeholders can maximize the chances of a balanced decision.

During a water management decision-making process, stakeholders must take advantage of every tool and strategy that can make their involvement more effective. We designed the IIFPI project to discover details about the tools and processes of water management work in order to share this information with others who can put it to good use. Though many people think that the most effective tool for managing fish and wildlife is simply applying the best available science, the IIFPI findings show that is not necessarily the case. Credible science is absolutely essential, but we found that the key factors affecting most agencies' effectiveness are their institutional structure, the legal framework in which they function, and the level of public support and active public involvement. Integrating these key factors with the application of valid science is not easy, and some fish and wildlife agencies are more successful at this than others. But even the most successful agencies face significant challenges, and no agency can safely rest on its accomplishments.

Fish and wildlife agencies face several critical underlying challenges to effectively manage water for fish and wildlife. The primary challenge is the fact that in the majority of situations (excepting Alaska and parts of Canada) most stream and lake water has already been committed to uses other than fish and wildlife. This situation has come about because most water laws were crafted by (and for) consumptive user groups over a century ago. As competition for limited water supplies increases, many consumptive user groups use the existing legal structure—and general absence of instream flow laws—to minimize the importance of water for instream flow, and claim these laws as proof that consumptive water uses have greater societal value than in-channel water uses. This is a tenuous argument.

In-channel water use was of great importance in settling the U.S. and Canada, and it remains important today. Then as now, rivers provided transportation, commerce,

sustenance, and solace. A century ago, people did not foresee the need for laws to protect adequate instream flow and water volumes because in all likelihood no one could have predicted, or perhaps have even comprehended the magnitude of the change in hydrologic availability that occurred in the absence of such laws. Simply put, instream flow and water volume needs were taken for granted much like passenger pigeons, buffalo, and tall-grass prairies. Only after in-channel uses and values had been compromised did non-consumptive water use interests realize the need to protect or restore degraded systems. Unfortunately, with large quantities of water already committed to consumptive uses, opportunities for restoring flow to streams are limited.

It is not likely that laws will be written or changed to redress this situation on a landscape level. Rather, the way to move forward is on a case-by-case basis, identifying opportunities for water management strategies that can maximize both consumptive and non-consumptive water use. There are two components to this challenge—flow restoration and flow protection. Though many flow-depleted streams and rivers require flow restoration, other areas still retain ecological values that warrant protection but are still at risk. Addressing both restoration and protection is a daunting challenge made even more difficult by a thirsty populace and cumbersome legal system. But agencies and the public must become more effective in addressing this challenge soon, before even more ecological degradation occurs.

Another challenge fish and wildlife agencies face is balancing their activities between reactive and proactive modes. Much of their work requires responding to situations created by activities beyond their sphere of influence. However, agencies also develop long-term plans and proactive strategies on many areas of fish and wildlife management. Balancing their limited resources between reactive and proactive activities is a tremendous challenge. If fish and wildlife agencies are to be truly effective at restoring, protecting, and enhancing fish and wildlife resources, they must deal with water management issues proactively. This is not a passing interest but one that will persist and grow more challenging in the future, so it demands a long-term commitment.

This report does not provide a blueprint for agency organization or function for managing instream flow and water volumes, but we encourage committed agencies to use it as a tool to identify useful elements. We also urge them to draw on the considerable expertise of Instream Flow Council members, sister agencies, the public, and others to rise to the challenge of actively engaging in water management discussions and decisions.

None of us can take instream flow or water volume management for granted any longer. While some agencies are better positioned than others for engaging in this work, the magnitude of the challenge should not be a disincentive for those that are not as fortunate. With water management, as with everything else, fish and wildlife agencies must simply start where they are and go as far and as fast as conditions allow. We trust this report will serve them well on that journey.

Thomas C. Annear

Executive Summary

Project Background

Aquatic habitats and the biotic communities they support are under increasing pressure—less than one-quarter of the streams in the U.S. and Canada have ecological conditions that approximate their natural condition. State and provincial fish and wildlife management agencies typically hold the primary responsibility for managing public trust fish and wildlife resources for the benefit of their citizens, and most agencies have a solid history of effectively managing fish and wildlife populations. However, to fulfill their obligations under the Public Trust Doctrine, agencies must manage long-term habitat processes to protect, restore, or enhance aquatic resources for future generations. It is clear, then, that the traditional perspective held by many agencies—that they manage fish and wildlife, not water—may not serve them well. Because water quality and quantity are important for fish and wildlife, agencies should participate in water management decisions and water allocation processes that have direct bearing on the protection, restoration, or enhancement of aquatic habitats in streams, lakes, and reservoirs. Management of existing, finite water supplies to balance the needs of all species is indeed the ultimate challenge to humans who, for the most part, hold the key to deciding where and how to allocate this precious resource (Postel and Richter 2003).

The International Instream Flow Program Initiative (IIFPI) project was initiated in 2006 to:

- identify trends and opportunities to help state and provincial fish and wildlife management agencies develop, maintain, or improve their ability to participate in water management decisions;
- identify trends in fish and wildlife agencies' flow management activities; and
- develop potential strategies that agencies (and others) could use to better manage water resources for the benefit of fish and wildlife.

This project was primarily funded by the Multistate Conservation Grant Program (number WY M-7-T) of the U.S. Fish and Wildlife Service, awarded and managed by the Wildlife and Sport Fish Restoration Program.

Methodology

Data were collected from two on-line surveys that solicited answers from the primary instream flow or water management coordinator within each participating state and provincial fish and wildlife agency. The two surveys posed more than 300 questions that covered a wide range of instream flow-related aspects of agency work. Representatives from all 50 states and 6 provincial agencies participated in the first survey. Representatives from 45 states and 4 provinces participated in the second survey. See Appendix A (page 77) for a list of participants in various aspects of the project.

The project also included a workshop (see Section 3, page 61) in the fall of 2007, where participants from 43 agencies (38 U.S. state agencies, 4 Canadian provincial agencies, and a Puerto Rican agency) used survey results in combination with input from invited

experts to identify key drivers (defined as trends, obstacles, and opportunities) affecting agencies' flow-related work (Appendix A, page 77). Using this information, participants developed and prioritized an extensive list of strategies to address the various drivers.

Key Findings

The project identified four areas that influence the effectiveness of fish and wildlife agencies to manage aquatic resources and water:

1. institutional capacity of agencies,
2. technical methods agencies use to quantify flow needs,
3. legal opportunities to protect flow, and
4. effectiveness of public involvement.

Institutional Structure and Concepts

Less than one-third of participants indicated that their agency had a formal instream flow or water management program, which was defined as career staff who are adequately trained and funded (see page 10). States in the western U.S. were more inclined to have a formal program than those in other parts of the U.S. and Canada. Most agencies recognized the importance of water in their planning documents or mission statements, though several participants noted that the role of their agency in water management is only implied through the broader term *habitat* (see page 9). Very few states or provinces have a water resource assessment tool or plan to guide their instream flow or water volume-related activities (see page 10). This trend is especially noticeable in Canada and the eastern U.S.

Consistency With IFC Policies

Effective participation in water management issues requires knowledge and integration of a variety of concepts and principles. The Instream Flow Council has identified 46 different aspects of instream flow-related work and has established non-binding guidelines or policies for each (Annear *et al.* 2004). The majority of participants indicated that their agencies' actions were generally consistent with 65–80% of these policies (see page 14). Agencies in the midwestern and southeastern U.S. tended to be less consistent with these policies than agencies in Canada. Most participants indicated their agency's level of consistency had changed little in the ten years prior to the survey. However, a trend of increasing consistency was especially evident in the northeastern U.S. Overall, agencies were most consistent with policies recognizing that flow measurements should meet established protocols and the importance of native aquatic species (see page 15). They were least consistent with policies that call for providing flushing flows, addressing multiple riverine components in flow studies, and monitoring (see page 16).

Coordination and Partnering

Regardless of the scale of policy support for instream flow, the effectiveness of fish and wildlife programs for managing fishery resources (including water) typically benefit from the involvement of other entities. Almost all participants indicated their agency should invest greater effort in the educational and informational aspects of water management (see page 23). Most participants indicated that their agencies' effectiveness might

improve if they interacted more with individual water users, policy makers, civic organizations, local agencies, water user groups, and K-12 school systems (see page 23).

Top Five Program Needs Over the Next Five Years

The list of requirements for more effective participation in water management issues is long, and each agency is unique. When asked what their most important needs were for the next five years, most participants indicated: 1) more supportive laws, regulations, and policies; 2) more staff, funding and training; and 3) a more knowledgeable and involved public sector (see page 26). Although these needs were the most commonly cited ones for all project participants, other needs may be of critical importance for individual agencies.

Legal Protections

The Instream Flow Council has identified four levels of instream flow protection (see Table 5, page 28). Participants in all regions indicated that existing laws and policies generally do not support full instream flow protection for streams and rivers (see page 28). Legal and policy opportunities to obtain comprehensive or partial ecologically based instream flow management or threshold levels of protection are somewhat greater. Laws to protect aquatic habitats in lakes and reservoirs are only slightly more enabling (see page 30). There is considerable opportunity, and a great need for improving laws and policies to protect instream flows and lake and reservoir volumes in virtually all states and provinces.

Instream Flow Quantification Methods

Agencies in most states and provinces can use any scientific method they wish to quantify flow needs. Many may use a combination of methods (see page 33). This flexibility, however, does not indicate use of a wide range of methods, or even actual involvement with instream flow studies. Participants were asked to identify their ability to use and history of using methods for each of five riverine elements (hydrology, geomorphology, biology, connectivity, and water quality). The most commonly used flow methods among responding agencies were the Tennant method and the Physical Habitat Simulation (PHABSIM) method, however fewer than 20 participants indicated that anyone in their agency had used either method in the five years prior to the survey (see page 39). Even fewer participants indicated that their agency had used holistic methods (which incorporate information from more than one riverine element). Participants also indicated that there are virtually no widely used methods for quantifying the volume of water needed to protect or restore aquatic habitat in lakes and reservoirs (see page 44). Because fish and wildlife agencies commonly review the results from instream flow studies by outside entities, this lack of experience with accepted methods is a concern and suggests agencies could do more to provide training and support to their staff.

Stream Miles Protected

The paucity of legal protection opportunities is directly reflected in the number of stream miles in the U.S. and Canada that have been protected or restored to the four different levels of flow protection. Over 90% of stream miles in most states do not have full instream flow protection. In more than half of all states and provinces, over 75% of all streams have no legally recognized instream flow protection (see page 55). There is a

great need, and much opportunity for securing legal protection of flow levels and lake volumes in most states and provinces.

International Instream Flow Program Initiative Workshop

In the project workshop, participants identified legal, institutional, and public involvement factors as the key drivers limiting agency effectiveness. The participants then identified over 120 potential strategies to respond to these drivers (see page 64 for a condensed list of strategies). The variety of potential strategies indicates that there is no single best way to deal with a particular challenge—each situation has its own unique objectives, needs, and opportunities.

Legal Drivers

One of the top drivers under legal issues was that policies, laws, and regulations do not recognize or allow ecologically based flow regimes. Potential strategies for addressing this need were to: 1) update summaries of state, provincial, and federal legal opportunities; and 2) develop a template or model instream flow legislation that states and provinces can refer to when developing or improving legislation to meet the unique needs of their jurisdiction.

Institutional Drivers

One of the top drivers under institutional issues was that many fish and wildlife agencies lack formal instream flow programs. Potential strategies to deal with this challenge include: 1) working with agency directors through the Association of Fish and Wildlife Agencies to increase their awareness of the importance of instream flow for managing fish and wildlife; and 2) the IFC, other organizations or agencies, or the public could work with individual agencies to develop or elevate this priority.

Public Involvement Drivers

There were two primary public involvement drivers. First, the public is not sufficiently knowledgeable about instream flow issues or supportive of instream values. A strategy to address this begins with agencies first defining their intended audience and then refining the message targeted to that group. Private marketing firms may be an effective resource for this strategy. Another strategy is for agencies to make water a more prominent component of their current public information and education programs.

The second primary public involvement driver was that agencies often do not collaborate enough with non-governmental organizations and other stakeholders on water issues. Though agencies work extensively with outside entities on many issues, they often overlook the importance of engaging others to help address the legal and policy issues of water management.

Recommendations

The role, function, and effectiveness of fish and wildlife agencies in water management varies considerably among every state and province in the U.S. and Canada. Without question, the challenges these agencies face in fulfilling their public trust responsibilities are staggering, and given recent demographic and climate trends, the future is uncertain.

Instream flow and water management is not simple now, and trends of the past several decades illustrate all too clearly that water management issues will only become increasingly complex. Therefore, though the cost of participating in water management decisions is high, the cost of failing to participate is even higher.

IIFPI project participants identified a range of strategies to deal with water management needs. These strategies are all related, and the appropriate course depends largely on each agency's needs and priorities. The obvious place for most agencies to begin is with those matters under their direct influence.

Specifically identify instream flow and water volume work as a priority

Some agencies have not yet specifically recognized instream flow as an area under their purview. Therefore, the first step is to specifically include instream flow or water management as a recognized component of habitat management in an agency's strategic plan or other vision documents.

Re-allocate existing resources to instream flow work

Lack of resources and staff to conduct instream flow work is a direct result of instream flow work not being prioritized by agencies. In today's economic climate, it will be difficult to acquire new revenue or personnel to address water management work. However, there may be opportunities to reallocate some existing resources to become more actively involved and competent in water issues. As the economic climate improves, and if stakeholder groups and the public actively support instream flow protection, opportunities for additional funding and personnel to do instream flow work should increase. There are numerous examples in the U.S. where public requests have helped agencies make such changes in their structure and function and obtain the necessary personnel and funding to move in a new direction.

Coordinate all water management work within an agency

An agency may decide that a formal instream flow or water management program may not be warranted but in that case they should have a team of qualified, well-trained, and supported staff to coordinate all water management work. These personnel must be involved in all instream flow studies in their state or province. This will provide a formal means for providing credible input on water management issues and studies.

Train staff in up-to-date quantification methods

Even if agency staff do not themselves conduct instream flow studies, they must still be able to review and comment on both the study design and interpretation of the study results in order to ensure that aquatic resources are given adequate consideration. Therefore each agency must have personnel with current training in conducting and reviewing instream flow studies.

Increase legal and policy support for flow protection and restoration

The lack of legal and policy support for the protection or restoration of flows in streams and water levels in lakes and reservoirs means that there are many opportunities for much progress to improve these protections. Fish and wildlife agencies cannot achieve these changes alone, but can solicit the support or leadership of both the public and other entities.

Engage the public about water management issues for fish and wildlife

A key challenge for agencies is providing public information and educational opportunities about the complex role of water in the ecosystems that people value. Participants repeatedly stressed the need for their agency to do a better job of communicating the link between healthy riverine resources and quality of life issues, as well as countering some of the misperceptions people have about how water is used. Some agencies have public communications staff that are capable of taking on public education campaigns, but hiring outside marketing firms may have as much or more merit.

Pursue partnership opportunities

As agencies take steps to deal with aspects of instream flow under their immediate and direct control, and as they gain expertise with instream flow issues, they can begin to look beyond their immediate sphere of influence to partner with outside entities. Public interest in instream flow issues is growing, and pursuing partnership opportunities can be mutually beneficial. The involvement of stakeholders outside of governmental agencies can be effective—especially when pursuing legal and policy change—and it is certainly appropriate for public entities to be involved in public trust matters.

In Summary

The IIFPI project affirmed the significance and complexity of the challenges facing state and provincial fish and wildlife agencies to effectively manage streams, lakes, and reservoirs and their associated biotic communities. The project also found that there is significant dedication and interest among the fish and wildlife agency instream flow/water management specialists in improving the capacity and effectiveness of water management for the benefit of fish and wildlife. There are no simple solutions, nor is there any one strategy agencies should pursue because each agency works within a unique set of social, legal, biological, and economic factors. All of the potential solutions identified in this report require strategic allocation of limited manpower and budgets, and cooperation and coordination between agencies and stakeholders.

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Introduction

Water is arguably the single most important element on the planet. Water not only determines where plants and animals live, it affects the quality of their lives and is often the determining factor in whether plants and animals can persist at all. Virtually all organisms are adapted or can become adapted to the annual and inter-annual patterns of water availability. Whether in a large southwestern U.S. city, a hardwood forest in the eastern U.S., or a Canadian Pacific coastal salmon stream, the number of organisms and the quality of their existence depends largely on how much water is available in each season of the year.

With the rapid expansion of human populations over the past two centuries, human demand on natural water supplies has also increased. Watering lawns, irrigating fields, supplying industrial production, and flushing toilets all demand reliable water supplies. Meeting this demand is essential to maintain the quality of life people have come to expect, but it comes at a price to plants and animals that have evolved under natural hydrologic cycles. As water availability patterns changed, some organisms have adapted and maintained normal population densities and others have flourished, but many more species have declined or disappeared. Accelerated global climate change has further affected many species and made their future highly uncertain.

Management of existing, finite water supplies to balance the needs of all species is indeed the ultimate challenge to humans who, for the most part, hold the key to deciding where and how to allocate this precious resource (Postel and Richter 2003). Human water use directly affects streams, lakes, and reservoirs which, in turn, affect ecosystems. Over the past half century scientists have developed many tools to help quantify the needs of riverine and lacustrine resources. They have worked to better understand the consequences of flow change and water depletions on the physical form of these water bodies as well as the organisms that reside in them. But scientific tools alone do no more than provide information. Actions in response to this information are derived from the collective values of society in the form of laws, regulations, and policies. Consequently, the management of water supplies, or instream flow, is a highly complex process. It requires not only credible science to define the trade-offs of various water use patterns, but also the ability to communicate with and inform those who influence the development of legal opportunities at local, regional (state or province), or national levels.

State and provincial fish and wildlife agencies have a unique role and responsibility in the water management arena. They are broadly charged with protecting and managing fish and wildlife for the public according to authorities derived from the Public Trust Doctrine (Slade *et al.* 1997). The basic principle of the Public Trust Doctrine is that certain natural resources (especially the waters and underlying lands of coastal areas and navigable rivers, lakes, and reservoirs) are of such importance to the general public that they are held in trust by state governments for present and future generations, and cannot be converted to private ownership. The Public Trust Doctrine is well established in the United States, and though its validity has not yet been formally established in Canada, there is much evidence of its validity as the basis for provincial fish and wildlife management authority (Maguire 1996). National and local governments do not have this vested authority.

State and provincial fish and wildlife agencies must abide by codified laws and policies that occasionally conflict with the Public Trust Doctrine, so their application of the

doctrine's principles can be sometimes be difficult or awkward. Although agencies typically do not play a direct role in the development of laws and policies that affect public trust resources, they can inform the public about the condition and trends of public trust resources. The public can then use this information to make choices that are consistent with their own needs and values. These choices may or may not support Public Trust Doctrine concepts.

Improving fish and wildlife agency effectiveness for managing water resources for fish is a complex, ongoing process. Each agency faces different challenges and works with different processes. However, managing fish, wildlife, and water resources can be more effective and successful if agencies, entities, and individuals work together to draw on each other's valuable knowledge and experiences.

Project Description

The Instream Flow Council (IFC) was formed in 1998 to help state and provincial fish and wildlife management agencies deal more effectively with water management issues associated with their unique responsibilities and challenges for managing public trust fish and wildlife resources. The overarching role of the IFC is to provide U.S. and Canadian fish and wildlife agencies with direct access to the best resources to help fulfill their Public Trust Doctrine responsibilities in managing water resources for fish and wildlife. In spite of the wide differences in fish and wildlife management needs and opportunities across the U.S. and Canada, state and provincial fish and wildlife agencies have many core similarities that facilitate information exchange and learning across political boundaries.

Since forming, the IFC has produced three books (Annear *et al.* 2002, Annear *et al.* 2004, Locke *et al.* 2008) written almost exclusively by active IFC members. The IFC has held biennial meetings, and has networked extensively among members to draw on their collective knowledge and practical experiences. By 2006, IFC leaders perceived a need to combine this information with members' experiences in a project that would provide effective and functional guidance for both members and the instream flow community.

Funding for the International Instream Flow Program Initiative (IIFPI) project was provided under the Multistate Conservation Grant Program (number WY M-7-T) of the U.S. Fish and Wildlife Service, awarded and managed by the Wildlife and Sport Fish Restoration Program. The project's goal was to

protect, restore, and enhance fish and aquatic communities and their habitats by identifying trends and opportunities that will help state and provincial fishery and wildlife management agencies develop, maintain, or improve the effectiveness of their instream flow/water volume programs.

The project involved two on-line surveys, in which all state and provincial fish and wildlife agencies were invited to participate. The first survey, conducted in fall 2006, sought to determine how consistently participating agencies were implementing the various policy statements in Annear *et al.* (2004), and what the agencies' trends had been in the ten years prior to the survey. The second survey, conducted in spring 2007, asked a wide range of questions concerning agencies' effectiveness in protecting riverine resources as a function of their involvement in water management activities or application of instream flow principles.

The IIFPI project consisted of four main parts: i) project planning and management, ii) a two-part survey of state and provincial fish and wildlife agency instream flow programs

in the U.S. and Canada, iii) a facilitated workshop for U.S. and Canadian program representatives, and iv) development of project products and recommendations. This report presents an overall summary of the project and its recommendations. Additional products are tailored specifically for participating agencies and the public. Specific steps in the project included:

- January 1, 2006—Initiated the IIFPI project when funding became available from the U.S. Fish and Wildlife Service, Wildlife and Sport Fish Restoration Program.
- October 2006—Launched a web-based survey to obtain information about agencies' consistency with IFC policies.
- March 2007—Launched a web-based survey to obtain information about agency effectiveness for instream flow activities.
- July 2007—Invited survey participants to participate in an on-line blog to provide the planning team and invited speakers with advance additional information about workshop participants and their agencies.
- October 8–10, 2007—Conducted a workshop for survey participants to identify potential strategies for agencies to more effectively manage water for fisheries.

Desired Outcomes

To ensure that the IIFPI project was as relevant as possible to participating agencies, the project team included survey questions that asked what the participant thought their agency would like to gain from the project, as well as what they personally would like to gain. The results indicated the following:

- There was widespread interest in seeing how agencies' instream flow-related activities compared to other state or provincial agencies, as well as discovering the kinds of activities that other agencies had found to be effective.
- Some participants whose agencies did not have formal instream flow programs indicated interest in using information from the project to help them start a program.
- Some participants with established instream flow programs wanted ideas for improving upon their present practices.
- Other participants cited a desire for help in assessing, developing, and implementing legal and institutional policies and tools related to water resource protection and restoration for aquatic species.
- A few participants commented that they hoped this project would increase public interest in instream flow and the need for its protection.

When participants were asked what they personally hoped to achieve through this project, many indicated that their personal aspirations were the same as what they specified for their agency. Others expressed their personal desire for tools and ideas to help them provide leadership in developing, improving, or supporting the instream flow activities at their agencies. Several said they valued the opportunities provided by the project and involvement with IFC for establishing working relationships that would serve them in the future. Others were hoping to hone their skills to educate and motivate others outside their agency to become more involved in protecting and restoring water resources. Some wanted to see model instream flow or water management legislation and one wanted a

summary of a similar project done ten years prior (the National Instream Flow Program Assessment project).

About This Report

Caveats and Considerations

The information contained in this report is primarily derived from a self-evaluation process; the information was provided by participants in response to questions in two surveys. This report's analyses focus on trends at the national (all participants from all regions combined including Canada) and regional scales. In most cases, this report does not provide specific information about individual agencies. Those who wish to learn more about how individual agencies replied to specific questions should contact the appropriate survey participant as this will ensure an objective understanding of the answers they provided (see Appendix A, page 77 for a list of survey participants).

As with all surveys, this project has definite limitations and considerations. Though the responses to some questions are subjective, the trends and overall conclusions draw strength from the relatively large number of participants providing information for the project. Regardless, the reader should be aware of some factors while reviewing this report:

- Many of the answers provided reflect the subjective opinion of the participant and/or their interpretation of the questions based on their professional experience or expertise.
- Because the responses to some questions are subjective, it is important to appreciate that different individuals within the same agency could have provided somewhat different answers.
- Legal or institutional changes may have occurred since the survey was completed.
- Some of the terms and concepts used in the surveys were not specifically defined for participants. Some concepts (such as *sufficient coordination* and *adequate access*) were left to the broad interpretation of each participant. Additionally, the definition of some terms may differ from agency to agency. (For example, *protection* may have a different connotation in areas that follow the riparian doctrine and areas that follow prior appropriation).
- Not all participants answered all questions. Some individuals skipped some questions so some graphs show different numbers of responses.

General Format

This report follows the basic sequence in which the project was conducted:

Section 1: Agency Organizational Structure and Consistency with IFC Policies provides information gathered in the first survey. It describes agencies in terms of their institutional structure and organization for addressing instream flow-related issues, provides information about each agency's consistency with IFC policies, and illustrates the trends agencies have experienced in the past ten years.

Section 2: Fish and Wildlife Agency Effectiveness provides information on agency effectiveness obtained in the second survey.

Section 3: The International Instream Flow Program Initiative Workshop presents workshop findings about agency and individual strategies.

Section 4: Project and Participation Synopsis provides the project’s overall conclusions. This section also lists recommendations for ways that agencies (and others) can more effectively address the instream flow and water volume issues that affect public trust fishery and wildlife resources.

Overview of Project Participation

The IFC invited the fish and wildlife agencies of each state in the U.S. and each province and territory in Canada to participate in this project. All 50 states and six provinces participated in at least part of the project. Puerto Rico was not involved in either of the two surveys but was invited to participate in the workshop. Figure 1 (page 5) shows the states and provinces that participated in the project and identifies the IFC regions used in the regional analyses. Appendix A (page 77) provides more detailed information about which agency participated in each part of the project and also lists the individual participants in each phase of the project. The colors used to identify regions in Figure 1 are repeated in some of the following tables and figures to codify results.

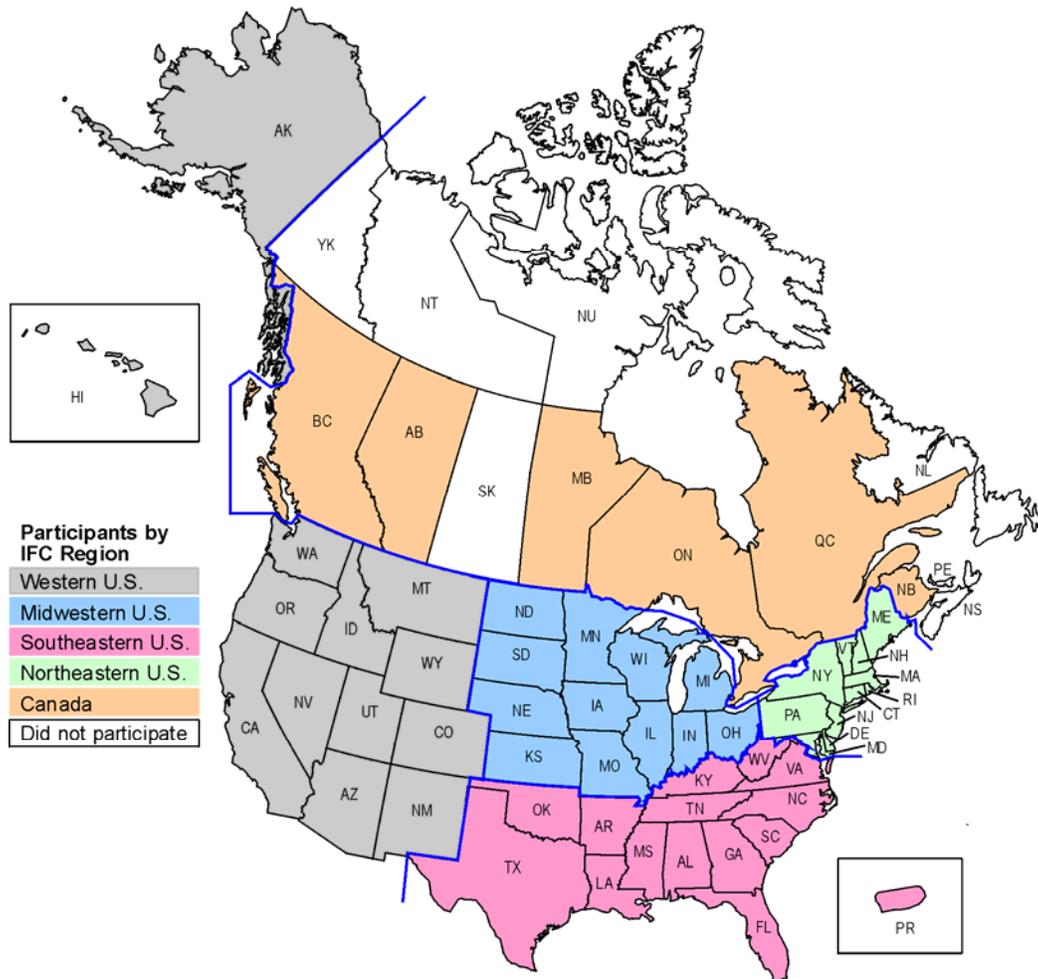


Figure 1. States and provinces whose fish and wildlife agency participated in one or more elements of the project. The blue lines show the division between IFC regions.

Although job titles often do not fully reflect responsibilities within an agency, about one-third of the respondents filling out the surveys had some specific reference to water, instream flow, or hydropower in their title. Almost two-thirds of the respondents' titles included *biologist*, *scientist*, or *specialist*. Other participants described their professional positions as managers, coordinators, or division administrators. In the first survey, about half of the participants conferred with others; some sought input from retirees who had extensive experience with instream flow issues in their agency. In the second survey, about three-quarters of participants responded without conferring with others; the remainder conferred with a combination of supervisors or administrators, supervisees, water management staff (within or outside the fish and wildlife unit or agency), and policy experts. One conferred with a person outside their agency.

1. Agency Organizational Structure and Consistency with IFC Policies

All fish and wildlife agencies share a common responsibility for managing fish and wildlife resources, however each agency's organization and structure reflect its own unique needs and opportunities. To help appreciate the variability in responses to survey questions, it is important to understand the considerable variation in fish and wildlife agencies organizational structure as well as the authorities under which they function.

Institutional Structure and Concepts

Water Management Doctrines

State and provincial fish and wildlife agencies conduct instream flow or water management activities in a variety of ways and according to various institutional constructs (Figure 2, page 8). To appreciate this diversity it is important to know the water management doctrines or principles under which each entity functions.

In the U.S. and Canada, water is allocated according to two primary allocation doctrines. In the eastern portions of both countries, water is administered according to the riparian doctrine. This doctrine is based on the principle that all riparian interests (defined as entities that own land or live adjacent to a river) have an equal right to make use of the water flowing adjacent to their property. These rights to use water exist solely because a stream, river, or lake flows through or next to their property.

In the western portions of the U.S. and Canada, water is administered according to the prior appropriation doctrine. According to this doctrine, individuals can obtain a right to use water by virtue of using it (or filing for a water right or permit) before anyone else. This is often expressed in simple terms as the "first in time is first in right (to use water)" principle (McDonnell *et al.* 1989).

Other principles that have evolved recently are concepts such as the reasonable use doctrine or regulated riparianism. Both of these reflect elements that resemble portions of the riparian and prior appropriation doctrines (Dellapena 1998).

Participants noted that the role of water management was most commonly identified in documents such as a Comprehensive Wildlife Conservation Plan or strategic plan. Others listed water management as a type of departmental policy directive in a unit or division plan, a portion of a state water plan, as a specific element in their federal aid program, or in a document that contains some strategic component related to water management for aquatic species. A few participants noted that inclusion of instream flow or water management elements in their agencies' documents merely amounted to lip service.

To assess the degree to which participating agencies recognized this basic tenet for water management for fish and wildlife, participants were asked to provide information on two points:

1. Participants indicated whether instream flow or water management activities were specifically recognized in their agencies' strategic plans, mission statements, or other guiding documents (Figure 3, page 9).
2. To determine the degree to which agencies actually used these guiding documents in directing their day-to-day activities, participants indicated whether their agencies utilized water resource assessment tools to prioritize water bodies in need of water quantity protection or restoration (Figure 4, page 10).

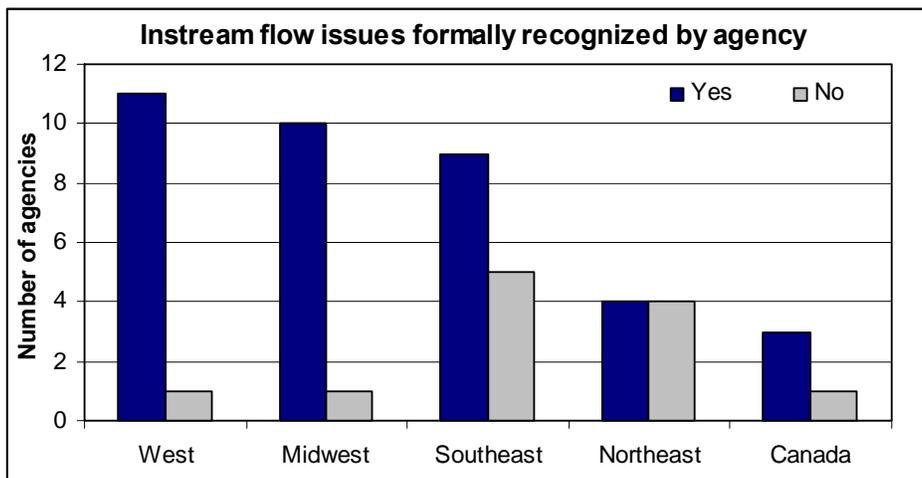


Figure 3. Summary of responses to the question, “Are instream flow/water management issues (and the need for your agency/unit to take substantive action on them) recognized in your agency’s mission statement or any strategic planning documents?”

The intent of the first question was to assess how strategically agencies recognize the importance of water management in performance of their duties. Overall, participants indicated that the majority of agencies do recognize the importance of water management in their strategic planning documents at some level. However, recognition was less likely in the eastern U.S. than in the western U.S. and Canada.

Comments provided by some participants noted several factors that qualify the extent to which water management is really singled out in planning documents as a strategic habitat management element. This question in particular received varied interpretations and types of answers. Some participants checked *yes* but referenced no specific plan, while others cited broad “habitat protection” goals as a basis for providing a *yes* answer. These kinds of implicit links between water management and habitat management needs are technically valid but may not accurately reflect how strategically agencies recognize the importance of water management in performance of their duties. Consequently, the

information presented in Figure 3 (page 9) is probably somewhat less precise than if participants had provided answers according to a strict interpretation of the question.

In response to the second question—whether their agency used some type of water-based prioritization tool to target waters in greatest need of flow management or protection—agencies seemed less likely to actually use water management as a prioritization tool even if they recognized water in their strategic planning documents (Figure 4, page 10). In fact, participants reported that few prioritization tools are actively being used in any programs. Agencies in Canada and the eastern U.S. were less likely to prioritize their activities based on water management needs than agencies in the western U.S. Prioritization tools, where specified, included watershed assessment tools, lists of dewatered or flow-impaired streams, interstate agreements or interdivision committees, and various plans that identified priority watersheds or water bodies.

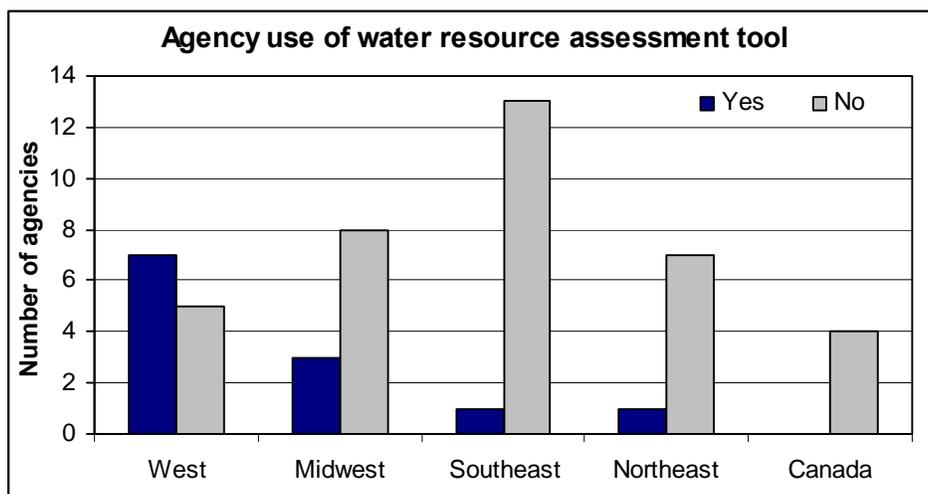


Figure 4. Summary of responses to the question, “Does your agency have some type of water resource assessment tool it uses to prioritize which water bodies require instream flow/water volume protection or restoration?”

Fish and wildlife agencies are typically very strategic about their approach towards fish and wildlife management. This is illustrated by the many ways in which they conduct their planning and prioritization of activities. Water management has a legitimate role in this process, but while strategic planning documents and prioritization tools are important steps in the process of effectively managing public trust water resources for fisheries and wildlife, the critical issue is whether those tools are actually put to use. The first survey could not fully assess this feature of state and provincial agency work, but the second survey was designed to target overall agency effectiveness. The results of the second survey are presented in Section 2 (page 21).

Program Scale

Understanding the institutional structure of state and provincial fish and wildlife agencies sheds considerable light on the way that most of them approach water management issues. The levels of program formality vary across responding jurisdictions (Figure 5, page 11).

Each agency has a different approach to water management issues. Some agencies have no program or flow related activities at all, and some participants noted that their agency is responsible for managing fish, not water. Some agencies distribute the work among

several employees who may be in different locations or divisions. These employees may or may not be experienced in the science of instream flow, and may or may not possess the necessary negotiation skills that would help them effectively manage river flow and water volume in lakes and reservoirs for public trust fish and wildlife resources. Other agencies have well-established programs with staff whose sole responsibility is to deal with complex water management issues. Most of those agencies ensure their staff receives sufficient budgetary resources to do their jobs, and provide regular training in current instream flow methods and negotiation strategies.

There is no clear cut correlation between the scale of an agency’s water management program and the number of streams, lakes, and reservoirs in their jurisdiction that have adequate flow protection. However, it is clear that those agencies with more fully developed flow programs are better able to address instream flow issues on a case-by-case basis when expert guidance from staff personnel is needed. In addition, having a formal program clearly reflects an agency’s long-term commitment to a proactive approach to water issues. Figure 5 (page 11) provides a summary of the status of instream flow related activities among the participants in this project.

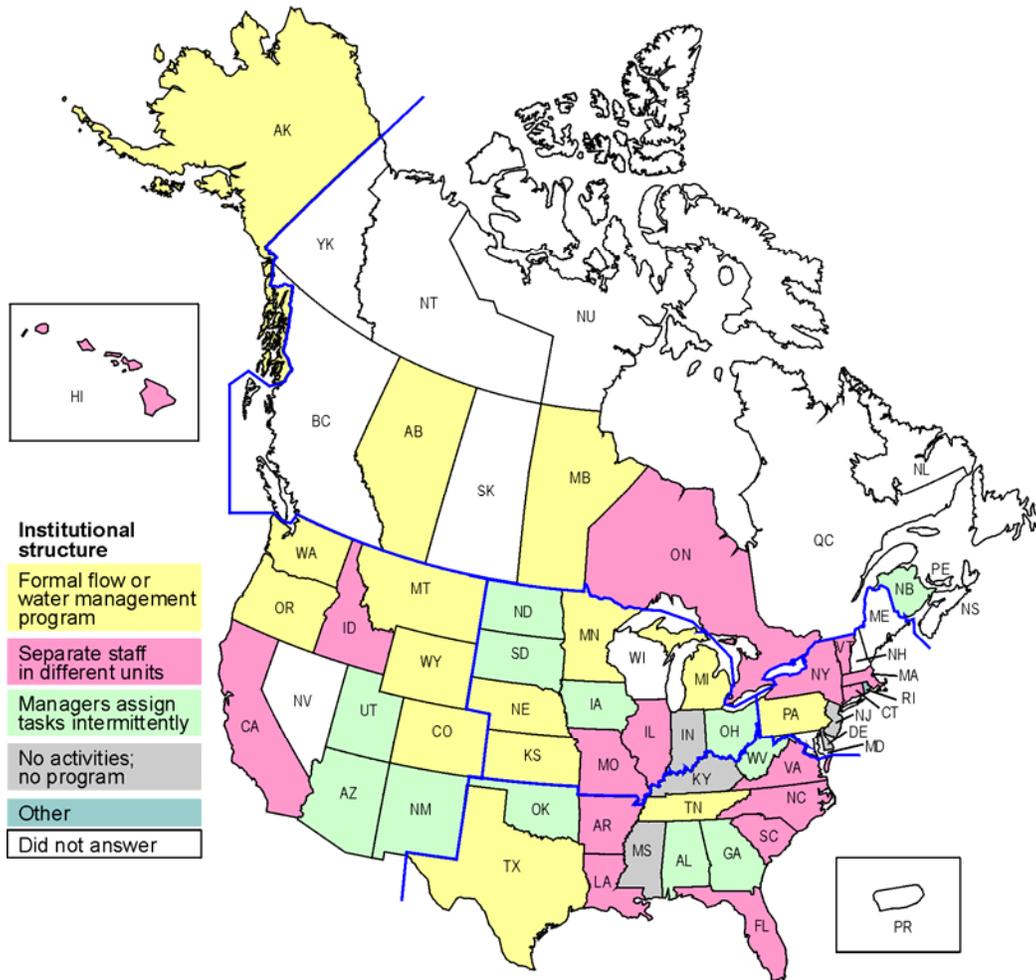


Figure 5. Institutional structure of participating agencies in terms of how they addressed instream flow or water management issues at the time of the survey. The blue lines separate the five IFC regions (see Figure 1, page 5).

Less than one-third of the responding agencies have formal instream flow or water management programs. Two agencies that did not have formal programs were working toward them. Rhode Island has only one person in the agency doing instream flow work and that assignment is just one part of their job.

As with a few other questions in this survey, the participants' comments suggested that the five institutional structures in Figure 5 (page 11) did not always precisely reflect how an agency actually conducts water management. For example, some participants noted that much of their water management work is done in cooperation with one or more sister agencies. Some participants found this question difficult to answer, and this was reflected in their answers to other survey questions that related to how their agency handled various instream flow issues.

Collaboration

In many cases, entities outside of state or provincial fish and wildlife agencies can be key forces for helping protect, restore or enhance flows for public trust fish and wildlife. Participants were asked to list up to four other entities doing work directly related to water management for fish and wildlife, categorized in the areas of science, water management, advocacy, and education. The resulting information is probably not all-inclusive for any or all states and provinces. The information is valuable, however, because it illustrates the fact that water management does not happen in a vacuum. Those working on water management issues within fish and wildlife agencies can draw on outside resources when needed.

Not all participants provided a full list of four other entities but all noted at least one or two other groups concerned with or actively pursuing instream flow work. In general this question illustrates the considerable diversity of potential partners. Other key observations included:

- The most commonly cited category in which entities function was *water management*. The least cited category was *education*.
- Many participants cited sister agencies (such as state or provincial water quality or water allocation agencies) as being proactively involved in instream flow.
- Only four participants identified universities as entities providing assistance in any of the four categories.
- The two non-governmental organizations cited most often across all jurisdictions were The Nature Conservancy (13 U.S. states cited, and it appeared at least once in each category: science, water management, advocacy, and education) and Trout Unlimited (eight U.S. states cited).

Consistency With IFC Policies

The first survey was designed to help participants and the planning team understand the status of state and provincial fish and wildlife agencies' function related to water management for public trust fish and wildlife resources. The survey was structured to determine each agency's consistency with the policies described in the IFC book **Instream Flows for Riverine Resource Stewardship** (Annear *et al.* 2004). A list of these policies is available in Appendix B (page 81).

Each of these policies relate to various aspects of the process for protecting, restoring or enhancing instream flows and water volumes for public trust fish and wildlife resources.

It is important to note that these policies bear no formal regulatory authority or mandate. Rather, they reflect the collective beliefs of the IFC and its membership about important aspects of water management. The IFC vision is that the more consistently an agency implements these policies, the more effective they will be in addressing flow and water volume issues. The second survey (presented in Section 2, page 21) built on this view by focusing on agency effectiveness.

The survey asked participants to provide their opinions about their agency's level of consistency with 43 IFC policies. Though there are 46 policies in Annear *et al.* (2004), the planning team felt that four policies were not appropriate for the survey. Also, none of the policies adequately recognized the inherent linkage between lentic (lakes and reservoirs) and lotic (streams and rivers) systems, so the planning team developed a policy question that addressed this issue.

Again, it is important to note that answers to all of these questions were based on the sole understanding and interpretation of the project participants. The planning team did not follow up on any answers to questions that seemed inconsistent with the understanding of an agency's function unless it was fundamentally clear that the participant had significantly misinterpreted the question. Those situations were few.

Scoring Process

To assess the consistency of agencies with various IFC policies, participants' answers were assigned a numeric value ranging from 1 to 5. Specific categories were *not consistent at all* (1), *somewhat consistent* (2), *fully consistent* (3), *exceeds the standard described in the policy* (4), and *not applicable* (5) (for example some questions pertained only to jurisdictions where water is allocated according to the prior appropriation doctrine). The scores from all participants were then averaged for each question and ranked from high (most consistent) to low (least consistent). Policies which over half the participants indicated were not applicable to their state or province were omitted from the regional analyses. For analysis of the responses of all participants combined, *not applicable* scores were omitted from the ranking analyses, but all policies were included in the ranking process.

For each of the 43 policies that applied to their jurisdiction, each agency's percent of consistency was determined by first calculating a maximum consistency value for each agency and then calculating the percent of that level each agency scored. Maximum consistency for each agency was determined by first removing all policies that were marked not applicable (a score of 5) and then multiplying the remaining number of policies by 3 (fully consistent). In the few situations where a participant noted their agency's actions exceeded the standard for a particular policy (a score of 4) they received a sort of extra credit by factoring the full score into their average. The scores were then summed and contrasted with the maximum potential consistency for that agency. The resulting value was their overall degree of consistency with all applicable policies (e.g., maximum consistency for all policies). This number is different than the percent of all policies an agency is consistent with but more accurately reflects their degree of consistency with IFC policies by eliminating non-applicable policies for some agencies. Results for each agency were provided only to the agency that provided the information and may be obtained by contacting the participant for that agency (see Appendix A, page 77 for contact information). The average percent consistency for each region was determined by averaging the percent of maximum consistency for each agency in each region (Figure 6, page 14).

General Consistency Trends

Most participating agencies exhibited at least 60% consistency with IFC policies, and no region achieved more than 80% consistency. As a general trend, agencies in the northeastern U.S. were somewhat more consistent with IFC policies than agencies in other regions. Though an agency's consistency with IFC policies is an important first step toward maximizing effectiveness in managing fish and wildlife resources, the link is not necessarily direct. Consistency with IFC policies is, however, an important tool to help agencies identify areas where they need to invest more energy and increase focus to benefit overall resource management effectiveness.

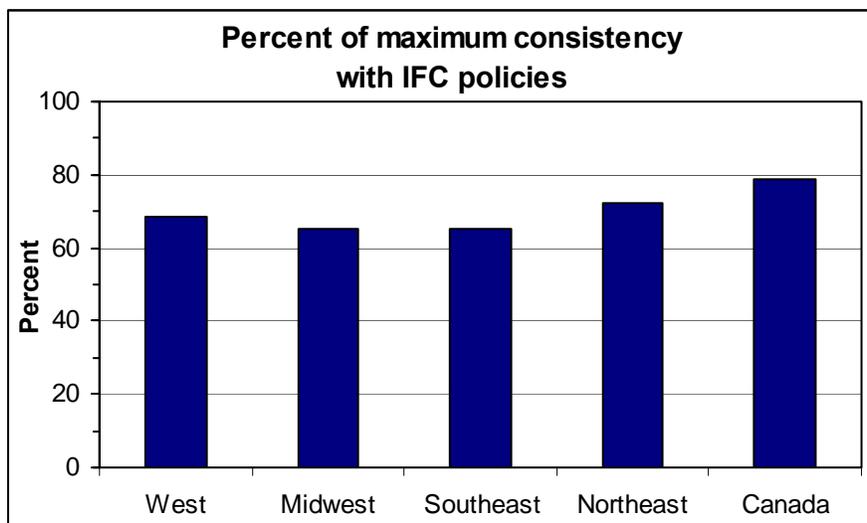


Figure 6. Percent of maximum consistency with IFC policies for all agencies by region at the time of the survey.

Overall Findings for Most and Least Consistency

One of the IIFPI project objectives was to identify trends in agencies' work with instream flow and water volume activities. Though the survey could not provide hard data to defend a particular answer, participants shared their personal opinions about their agency's consistency with a particular policy—whether it had remained the same, become more consistent, or grown less consistent in the past ten years.

Though the IFC believes that agency consistency with all policies is important, the survey analysis ranks the policies that agencies were most consistent with (Table 1, page 15) as well as the policies that agencies were least consistent with (Table 2, page 16). Participants indicated their water management efforts were most consistent with IFC policies regarding discharge measurements, native species management, recognition of legal authority, public trust advocacy, comprehensive water resource planning, and evaluation of riverine resource components in instream flow studies.

Table 1. The IFC policies for all agencies combined that participants indicated their agencies were most commonly consistent with (e.g., either somewhat or fully consistent) at the time of the survey (all responses combined). The maximum number of potential responses for each policy is 56, however some policies were not applicable to some agencies.

IFC policy	Number of agencies that were fully consistent
Discharge Measurements - Discharge meters, stream gaging devices, and flow data collection protocols should meet accepted standards of the U.S. Geological Survey and/or Environment Canada.	34
Native Species - Instream flow activities/programs should acknowledge the importance of and need to manage stream communities and indigenous aquatic biota. Management of nonnative species should not threaten the long-term health or survival of native species and their habitats.	27
Legal Authority - Effective instream flow activities/programs must be based on a clear recognition of legal authorities to protect, enhance, and restore instream flow for public riverine resources.	23
Public Trust Advocacy - Advocacy for and protection of the principles of the Public Trust Doctrine must be among the fundamental guiding principles of effective instream flow activities/programs.	17
Comprehensive Water Resource Planning - Comprehensive water resource planning that includes recognition of instream flows as an essential water use is an important part of effective instream flow activities/programs.	19
Riverine Components - Instream flow studies must evaluate flow needs and opportunities in terms of hydrology, biology, geomorphology, water quality, and connectivity.	18

All five regions (Figure 1, page 5) indicated that flow measurement efforts met the accepted standards of either the U.S. Geological Survey or Environment Canada. This result seems logical because most agencies emphasize collecting credible data. Participants in the majority of regions (three of the five) said that the effect of flow management on native species was likewise consistent with their agency’s overall function. Considering the emphasis in recent years on the importance of maintaining and restoring populations of native species and their habitat, this finding is expected. Though two policies—advocacy for principles of the public trust doctrine and integrating all five riverine components—were each identified among the top five most consistent policies in only one region, the average rank across all regions elevated these two principles to the top five for all regions combined.

It is important to note that this ranking is relative—it compares the various policies to each other. The fact that agencies are most consistent with the policies illustrated in Table 1 (page 15) does not mean that agencies are necessarily fully consistent with these policies. Specifically, less than two-thirds of all participants (34 of 56) indicated that their agency was fully consistent with even the most basic, top scoring policy regarding discharge measurements. Less than one-third of participants (18 of 56) said their agency was consistent with the fifth highest scoring policy (riverine components). The pattern of policy consistency within regions was relatively similar to the overall results (see Appendix C, page 87).

Agencies were least consistent with IFC policies regarding flushing flows, ice processes, riverine resource stewardship, monitoring of instream flow prescriptions, and use of interdisciplinary teams (Table 2, page 16). The number of agencies that are not consistent with these important IFC policies is striking and indicates that almost all agencies have the potential to improve in these areas.

The regional analysis shows considerable differences from the overall results (Appendix C, page 87). Most notably, agencies in the Midwest were least consistent with the IFC policy regarding water rights certainty, and Canadian agencies were least consistent with the policy related to public interest.

Table 2. The five IFC policies for all agencies combined that participants indicated their agencies were least consistent with at the time of the survey (all responses combined).

IFC policy	Number of agencies that were fully consistent
Flushing Flow - For many stream types, a flushing flow for removing fine sediments is a necessary component of instream flow prescriptions.	11
Ice Processes - Water management decisions for streams that are prone to ice formation should document the potential effects that the proposed action might have on the stream channel or associated aquatic organisms and, where appropriate, include measures to minimize or avoid potentially negative effects of project-related ice forming processes.	6
Riverine Resource Stewardship - All streams and rivers should have instream flows that maintain or restore, to the greatest extent possible, ecological functions and processes similar to those exhibited in their natural or unaltered state.	5
Monitoring - Monitoring riverine resource responses to instream flow prescriptions is a fundamental component of effective instream flow activities/programs. Monitoring studies should be based on long-term ecosystem processes as opposed to short-term responses of individual species.	5
Interdisciplinary Teams - Effective instream flow activities/programs require a well-coordinated, interdisciplinary team with adequate staff, training, and funding to address all instream flow and related issues that fall under the agency's responsibilities.	5

Three of the five regions indicated least consistency with the IFC policy on interdisciplinary teams. This finding may reflect on any of several factors, including the lack of formal water management programs and the lack of funding and training for staff dedicated to water management practices. The lack of consistency with monitoring is a concern because both pre- and post-flow management monitoring are critical elements in documenting the value of a flow management strategy.

The lack of consistency with ice processes associated with water management is not unexpected. Most managers tend to focus their attention and efforts on ice-free periods of the year and there has been relatively little study of the relationship between water management, ice processes, and effects on fish habitat and population response.

Likewise, managing flow to maintain sediment transport processes is often overlooked. In portions of the U.S. and Canada there is a sense of having “too much” water at times which may cause some agencies to minimize the importance of addressing water management strategies to maintain the natural channel forming and maintenance processes. Timing and duration of high flow events is as important as flow magnitude. It

can be challenging to manage watersheds to restore the timing, magnitude and duration of high flow events, but is an important part of river management.

Trends in Consistency Since 1996

One of the main objectives of the IIFPI project was to identify major trends in agencies' instream flow and water management activities. When designing this component of the project, the team initially sought to relate information about current conditions to information gathered during the previous work of the National Instream Flow Program Assessment (NIFPA) project that was completed in 1996. However, key differences between these two efforts negated the utility of this strategy. Primary among the differences was that the NIFPA project assessed agency status in more simplistic or general ways. Since that project, agencies' understanding of (and function with) water management concepts have become more sophisticated (as reflected in Annear *et al.* (2004)). The project team also felt that any effort to directly compare the two projects would be inappropriate due to the relatively subjective nature of questions posed. In addition, many of the people involved in the NIFPA project were not involved in the IIFPI project. As a consequence, the IIFPI survey simply asked participants whether, in their opinion, their agency's consistency with each policy had increased, decreased, or remained the same in the previous ten years (Figure 7, page 17). Participants could also indicate whether a policy was not applicable to their agency. *Not applicable* responses were then omitted from the analyses.

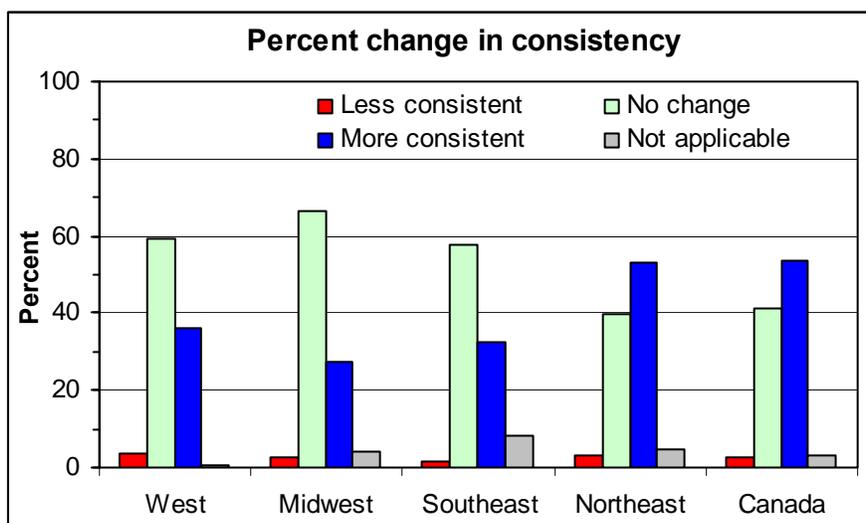


Figure 7. The percent of policies where agency function had changed in the ten years prior to the survey, by region.

This analysis revealed that there was relatively little change in the consistency of most agencies with IFC policies. Most change recorded was positive—many participants indicated that their agencies' activities have become more consistent with IFC policies. The regional analysis shows that the shift to increased consistency was greatest in the northeastern U.S. and Canada. Relatively few participants indicated a decrease in consistency, though there were slightly more responses for *less consistent* in the western U.S. than in other regions.

The survey also sought to identify which policies agencies tended to become more or less consistent with than others (Table 3, page 18 and Table 4, page 18). Results of regional responses are in Appendix D (page 97).

Table 3. Policies that participants indicated their agencies showed the greatest increase in consistency with in the ten years prior to the survey (all responses combined).

IFC policy	Number of agencies reporting increased consistency
Riverine Components - Instream flow studies must evaluate flow needs and opportunities in terms of hydrology, biology, geomorphology, water quality, and connectivity.	35
Native Species - Instream flow activities/programs should acknowledge the importance of and need to manage stream communities and indigenous aquatic biota. Management of nonnative species should not threaten the long-term health or survival of native species and their habitats.	32
Channel Modification - Any proposed stream channel modification should document the hydrologic and geomorphic character and function of the watershed and floodplain and incorporate principles of applied fluvial geomorphology and natural habitat features.	32
Flow Variability - Instream flow prescriptions should provide intra-annual and inter-annual variable flow patterns that mimic the natural hydrograph (magnitude, duration, timing, rate of change) to maintain or restore processes that sustain natural riverine characteristics.	31
Riparian Connectivity - Instream flow prescriptions must recognize the connectivity between instream flows and riparian areas and maintain or establish riparian structure and functions.	30

Policies that participants indicated their agencies has shown a tendency to become more consistent with tended to reflect big picture, philosophical shifts in thinking that have received increasing interest and focus of agencies in recent years. For example, native species management has recently received more agency attention, as has the awareness that the welfare of those species is directly tied to riverine processes like the five key riverine components identified in Annear *et al.* (2004).

Table 4. IFC policies that agencies showed decreased consistency with in the ten years prior to the survey (all responses combined).

IFC policy	Number of agencies reporting decreased consistency
Stream Gaging - Instream flow activities/programs must support individual gaging stations and networks of gaging stations necessary to quantify hydrographs, make and defend instream flow prescriptions, and monitor and enforce instream flow compliance.	11
Legal Counsel - Instream flow practitioners should have ready access to specifically trained legal counsel familiar with water law statutes and instream flow activities/programs in order to obtain consistent representation and maximize instream flow benefits under existing laws and regulations.	7
Interdisciplinary Teams - Effective instream flow activities/programs require a well-coordinated, interdisciplinary team with adequate staff, training, and funding to address all instream flow and related issues that fall under the agency's responsibilities.	6
Fish and Wildlife Agency Role - State and provincial fishery and wildlife agencies should have the primary authority for determining appropriate stream and river flow quantity, quality, and other needs and requirements necessary to restore, manage, and protect fishery and aquatic wildlife resources and processes.	4
Process Development - Instream flow programs should establish a process for quantifying instream flow needs that allows the state, or provincial, fishery and wildlife management agency to identify or approve study needs, study design, data analysis, and flow implementation.	4

The list of policies that agencies had become less consistent with over the preceding ten year period was the same for all regions, though the order varies between regions. The policies that show decreasing consistency suggest an unsettling trend that may further limit agencies' ability to effectively address instream flow issues in the future.

The lack of consistency for agency support of individual gaging stations is a concern for at least two reasons. First, though most state and provincial fish and wildlife agencies historically have not provided primary funding support for stream gages, their tacit support for collecting this information has helped sustain many gaging stations. In the present era of declining budgets and limited agency funding, the ability of agencies to financially support stream gages will continue to be limited. This will lead to a gradual reduction in available gage data, and therefore a lack of data to inform decision-making about flow recommendations. This will limit the effectiveness of some agencies. Second, without adequate baseline data, many other IFC policies stand to be compromised—particularly the monitoring policy.

Decreased consistency with access to legal counsel and interdisciplinary teams both affect the ability of agencies to effectively participate in water management decisions. A declining trend in this policy suggests this aspect of instream flow work by agencies will become more difficult if the trend is not corrected.

Decreased consistency with the role of fish and wildlife agencies in the water allocation process is of concern, as is the apparent lack of adherence to formal processes in water administration or allocation. As the competition for water increases in the future, it is important that fish and wildlife agencies have a formal role in decision-making, and that all parties establish and adhere to formal processes for making those decisions.

2. Fish and Wildlife Agency Effectiveness

The IIFPI project's second survey was launched in spring 2007. This survey was designed to gather quantitative information about the effectiveness of fish and wildlife agency activities related to the management of water in streams, lakes, and reservoirs for public trust fish and wildlife resources. The survey questions were created using a logic model approach similar to the method described by Mattessich (2003). This approach uses *outcomes* (desired future conditions), *outputs* (quantitative deliverables that measure progress toward desired outcomes), *activities* (actions that produce outputs), and *inputs* (the resources, knowledge, and conditions needed to conduct activities).

Logic models are commonly used by planners to map pathways and resources that enable decision makers to achieve desired outcomes. Logic models are crafted in reverse order of elements: first the desired *outcomes* are determined, then the *outputs* that indicate achievement of the outcome, then the *activities* necessary to generate the outputs, and finally the *inputs* needed to conduct the activities. By first defining desired *outcomes*, planners can ensure that each *output*, *activity*, and *input* contributes to the goal. This minimizes the chance of leaving out important factors. There is no single best logic model for fish and wildlife management, so the IIFPI planning team crafted a model they felt reasonably addressed the varied elements that could (or should) be associated with an effective instream flow or water management program (Figure 8, page 22). Survey questions addressed each element in the logic model.

It is important to note that while *inputs*, *activities* and *outputs* are generally within an agency's control, *outcomes* often are not. In addition, there is no direct relationship between specific entries across the columns in Figure 8 (page 22). Although agency program priorities can change with political winds, their legal responsibilities generally do not. As a result, a well-grounded logic model—such as the one used for this survey—should endure temporary, politically induced changes and remain relevant over long periods of time.

The majority of questions in the second survey were multiple choice, but most questions included text boxes to provide participants with the option to comment on how or why they answered questions in a particular way. The project team relied on these comments to help interpret some survey results, but these comments are not included in this report. It is worthwhile to note that the information from these text boxes helped the project team to make valid comparisons between results. In retrospect, it would have been helpful to clearly state the value of these comments and encourage participants to provide them. This would have provided even more valuable information.

Logic Model for an Effective State/Provincial Fish and Wildlife Agency Instream Flow Program			
Inputs	Activities	Outputs (Usually under control of the agency—in contrast to “outcomes”)	Outcomes (Rarely have enough information to fully address, so focus more on outputs)
<p>Budget (equipment, travel, office space)</p> <p>Adequate staff (administrative and field staff; permanent/contract)</p> <p>Staff training</p> <p>Capacity of staff or access to interdisciplinary experts to conduct complex studies that relate to the five riverine components</p> <p>Legal and institutional ability and support to advocate for instream flow protection/restoration</p> <p>Laws, regulations, and policies supportive of restoring or protecting instream flow and water volumes</p> <p>Interagency cooperation (state, federal, local, and tribal)</p> <p>Partnerships with other agencies, organizations, or individuals</p>	<p>Instream flow/water volume studies</p> <p>Permit review and commenting</p> <p>Educational/informational activities</p> <p>Program administration (elements may include activities like supervising, budget preparation, reporting, and contract administration)</p> <p>Professional development (participate in professional organizations) and training</p> <p>Prepare or administer grant applications</p> <p>Help other entities and individuals support or secure conditions of favorable instream flow and water volume</p> <p>Prepare and submit water right filings</p> <p>Purchase or lease water rights, licenses, or permits for instream flow or water volumes in lakes and reservoirs</p> <p>Monitoring/enforcement of instream rights</p> <p>Analysis and development of laws, regulations, and policies</p> <p>Negotiating water quality and quantity protection</p>	<p>Sufficient funding to function effectively</p> <p>Instream flow/water volume recommendations or conditions</p> <p>Flow/volume-related conditions on permits</p> <p>Laws and policies that specifically address instream flow / water volume needs</p> <p>Enforceable flow/volume-related conditions on permits</p> <p>Stream miles with instream flow protection (and % of total miles)</p> <p>Public/community group knowledge and interest in instream flow/water volume issues</p> <p>Partnerships with other agencies, organizations, or individuals</p>	<p><i>Long-term:</i></p> <p>Sufficient stream flows and water volume to support ecologically functioning systems in North America and the species dependent on them in the long term and legal means to protect that water</p> <p><i>Short term:</i></p> <p>Active and objective application of laws, regulations, and policies that support flows that support instream flow and water volume needs</p> <p>A knowledgeable public that advocates for instream/riverine values on equal (or better for degraded systems) footing with other water uses</p>

Figure 8. Logic model developed and used by the planning team to formulate second survey questions to address fish and wildlife agency effectiveness for achieving outcomes.

Inputs

The ability of state and provincial instream flow and water management practitioners to effectively participate in water management decisions and applications is determined in large part by the availability of a variety of resources that are generally referred to as *inputs*. Inputs form the basis of effectiveness for any kind of program because to a large degree they determine the scope and range of activities that agency personnel can perform. In this survey, inputs include such elements as funding, training, human resources, and laws and policies related to water management activities.

Coordination and Partnering

An important input is coordination and partnering with other groups or entities. Regardless of the scale of policy support for instream flow, the effectiveness of fish and wildlife programs for managing fishery resources (including water) typically benefit from the involvement of other entities. The project team identified a list of entities that often coordinate with fish and wildlife agencies. This list is not exhaustive; there may be other kinds of entities that some agencies work with that were not included in the survey.

Figure 9 (page 23) provides a summary of responses from all participants to indicate whether they agreed or disagreed with a series of questions in the following format: “Is there sufficient coordination and/or partnering with [entity] to effectively advance your agency’s instream flow/water management interests?”

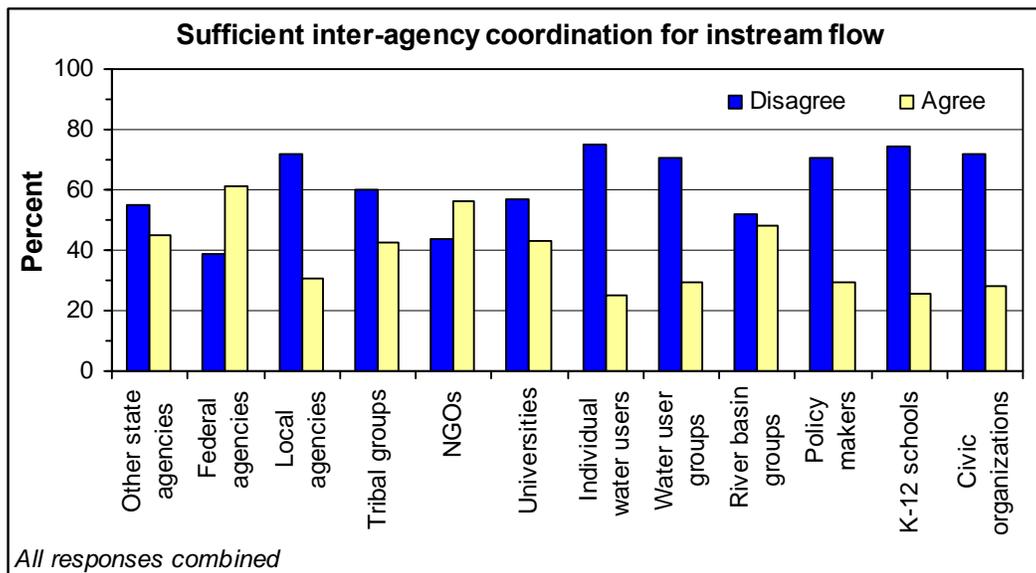


Figure 9. Sufficient inter-agency coordination for instream flow at the time of the survey (all responses combined). Participants were asked, “Is there sufficient coordination and/or partnering with [entity] to effectively advance your agency’s instream flow/water management interests?”

Analysis of the survey responses produced the following conclusions.

- Participants indicated that coordination was not adequate for most of the groups listed.
- Several participants responded that coordination in some areas was sufficient, but then commented that there was not much of it going on. This left the project team to interpret that the respondent did not consider this type of coordination to be important. Other participants consistently responded that there was not enough coordination across the board.
- The group that received the highest numbers of participants indicating a desire for additional coordination was individual water users. The reasons indicated for insufficient coordination with individual water users included: not enough staff, insufficient program initiative, lack of time, as well as lack of (or conflicting) user interest. Only one participant noted they were actively engaged with individual water users “at the table.”
- The broad spectrum of whether respondents felt coordination was valuable was evidenced in the category of coordinating with K–12 teachers and schools. One response was, “Why?” Others commented that there were insufficient educational materials available, and specifically mentioned opportunities to expand instream flow coverage in Project WET and Project WILD educational materials.

Access to and Support from Related Resources

Effective instream flow programs require access to adequate resources and technical support. To help evaluate the extent of access, participants were asked whether they agreed or disagreed that they had adequate access to and support from various key resources. These resources ranged from a well-functioning agency organization, to supportive laws and policies, to an informed and involved public. Additionally, participants were asked if they had adequate levels of various inputs such as funding or staff. Figure 10 (page 25) summarizes the results from twenty different inputs the planning team felt were important, and the regional analysis is provided in Appendix E (page 99).

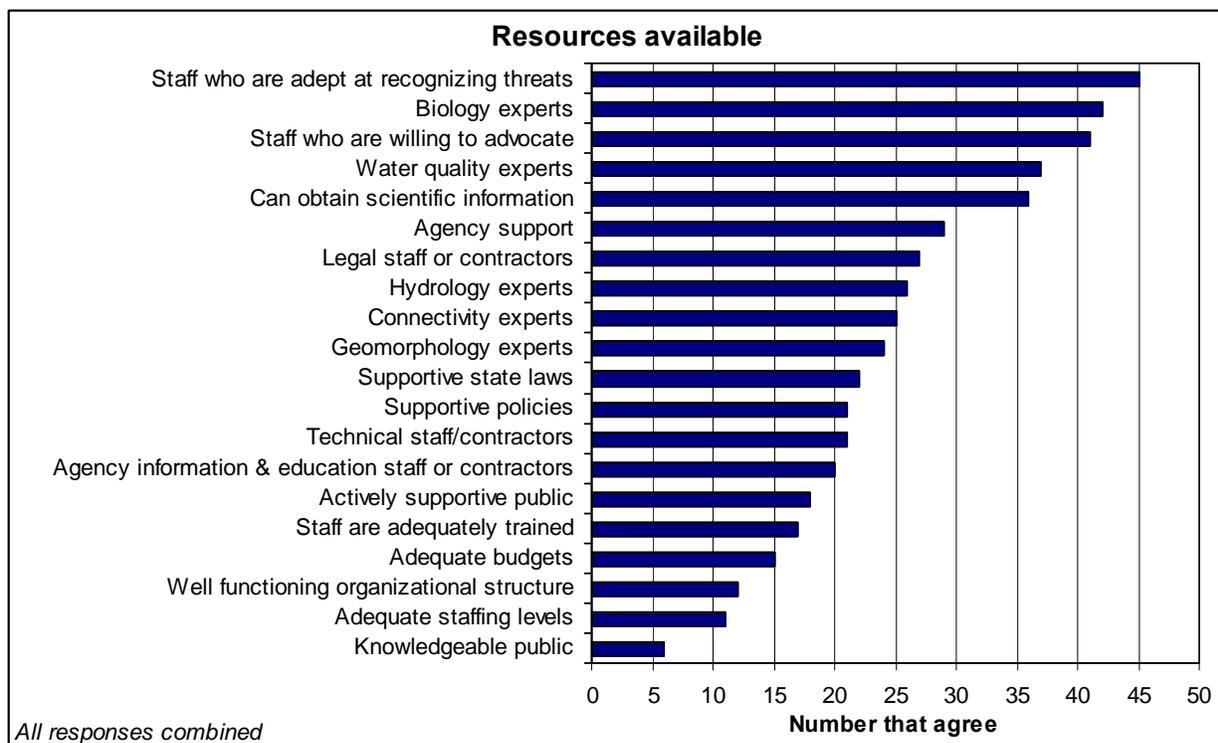


Figure 10. Resources available at the time of the survey (all responses combined). Participants were asked whether they agreed or disagreed with statements in the format of “We have adequate access to or support from [resource].” Other questions simply asked whether participants had adequate levels of various inputs. The graph shows affirmative responses (e.g., they agreed they had adequate access to and support from each resource).

Analysis of the survey responses produced the following conclusions.

- Nearly all participants indicated that their personnel were adept at recognizing threats to aquatic resources.
- The majority of participants indicated that they had adequate access to needed experts in biology and water quality.
- Likewise, most participants indicated that staff in their agency were willing to advocate for fish and wildlife resources and that they had adequate agency support.
- Few participants thought the public in their state or province was knowledgeable about water management issues, or were actively supportive of agency efforts to manage water for fish and wildlife purposes. It is important to note there is a significant difference between a highly supportive but uninvolved or passive public and one that expresses their support by active involvement in instream flow issues.
- As indicated throughout this survey, relatively high numbers of participants in all regions stated that agency staff were not adequately trained, budgets were not adequate, staffing levels were inadequate, and they did not have well-functioning organizational structures to address water management issues.

Top Five Program Needs Over the Next Five Years

Participants were asked to rank the relative importance of the top five program needs as they affect their agency’s effectiveness in protecting or enhancing stream flows and lake or reservoir levels for fish and wildlife over the next five years. Some similar categories of needs were grouped from the preceding questions. Each participant ranked only the top five needs from this entire list (Figure 11, page 26). The data gathered represent the total number of selections for each program input regardless of whether it was ranked first or fifth. This ranking does not necessarily indicate that one input is more important than another as all of these needs were selected by at least some participants. The regional analysis is presented in Appendix F (page 105).

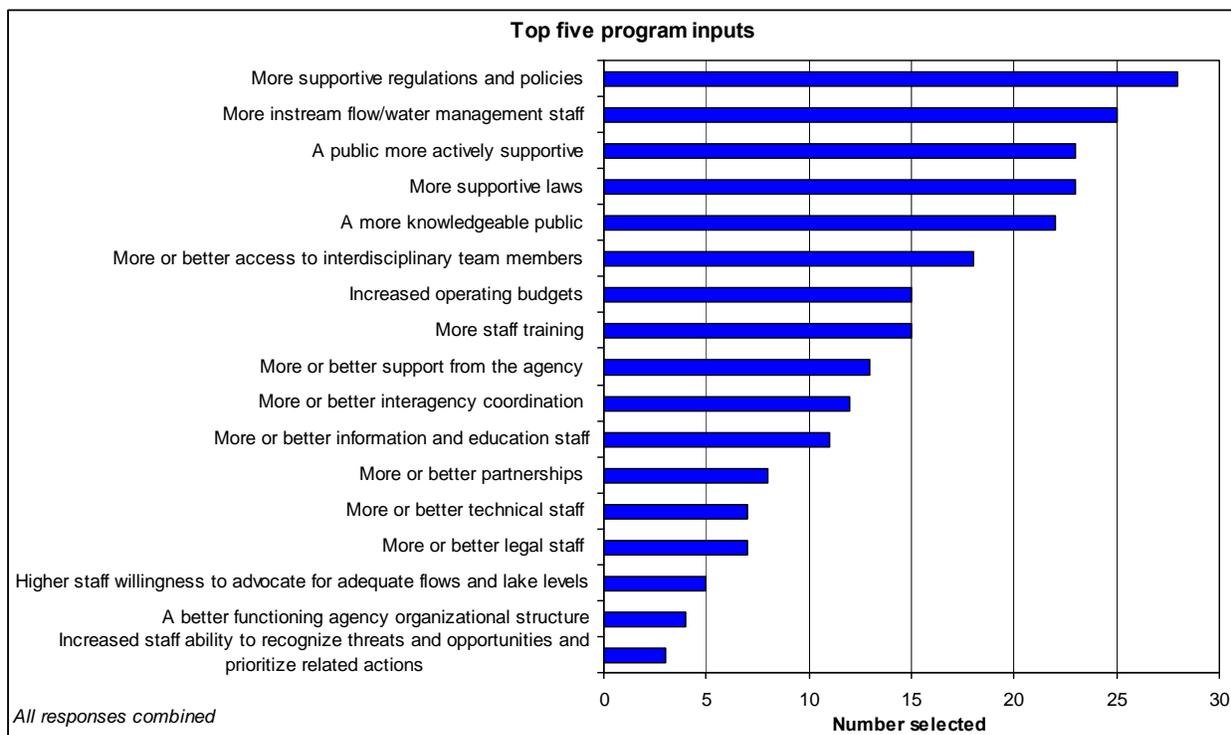


Figure 11. Top five program inputs at the time of the survey (all responses combined). Participants were asked to “Please rank your top five program inputs (grouped from the preceding two questions) as to their relative importance to the success over the next five years of your government unit’s work to protect or enhance stream flows and/or lake levels for fish and wildlife.”

Analysis of the survey responses produced the following conclusions.

- The most commonly identified program needs were: more supportive regulations and policies, more instream flow/water management staff, a public more actively supportive, more supportive laws, and a more knowledgeable public.
- The least commonly identified program needs were: increased staff ability to recognize threats and opportunities and prioritize their related actions, a better functioning agency organizational structure, and higher staff willingness to advocate for adequate flows and lake levels.

- These needs mostly require broad social changes, such as an increased priority on water issues legally, politically, and socially. Though fish and wildlife agencies cannot take a lead role in bringing about these changes, they can support other entities in their efforts.

Several trends were noted for regional responses (Appendix F, page 105):

- There was considerable consistency across all regions in the U.S. except the Northeast.
- *Increased operating budgets* and *more staff training* were top needs in Canada.
- *More or better access to interdisciplinary team members* was important in Canada as well as the Northeast.
- In the Midwest, *more or better support from the agency* to advocate for adequate flows was a top input need.

It would be inappropriate to conclude that improving agency function (for example) is less important than other needs. Rather, Figure 11 (page 26) shows those needs that participants feel have the most potential for improving their effectiveness in the near term.

Each need was identified as a top priority by at least three participants. This suggests that all of these needs are important depending on an agency's particular situation.

Legal and Policy Protections

Though the public may have strong ideas about how water should be managed, and in spite of the fact that scientific methods can quantify instream flow needs with reasonable accuracy, the way water is managed in streams, lakes, and reservoirs is typically determined by the authorities afforded in laws and policies. Laws and policies were addressed separately in the survey.

Instream flow laws

To assess the opportunities provided by laws in states and provinces, participants were asked whether, at the time of the survey, their state or province had laws that allow or require various levels of instream flow protection. For purposes of the survey, *laws* included statutes, administrative rules, and regulations.

Though flow protection is often thought of as a single value, the IFC identifies four different levels of flow protection: full, comprehensive ecological, partial ecological, and threshold (Table 5, page 28). These levels of protection are used consistently throughout this report. Figure 12 provides summary results for all participants combined. The regional analysis is presented in Appendix G (page 111).

Table 5. Levels of flow protection as defined in Annear *et al.* (2004).

Level of protection	Definition
Full instream flow protection	No allowances for additional water withdrawals and/or flow manipulations would be permitted for streams in this category. Management is essentially confined to a hands-off strategy.
Comprehensive ecologically based instream flow management	Flow recommendation based on all five riverine components that varies with the season of year (intra-annual) and with the water supply or watershed condition (inter-annual).
Partial ecologically based instream flow management	Flow requirements are determined on the basis of one or more of the five riverine components.
Threshold level instream flow protection	A minimum, or baseline, instream flow protection that results in considerably less than the average natural flow remaining in the channel.

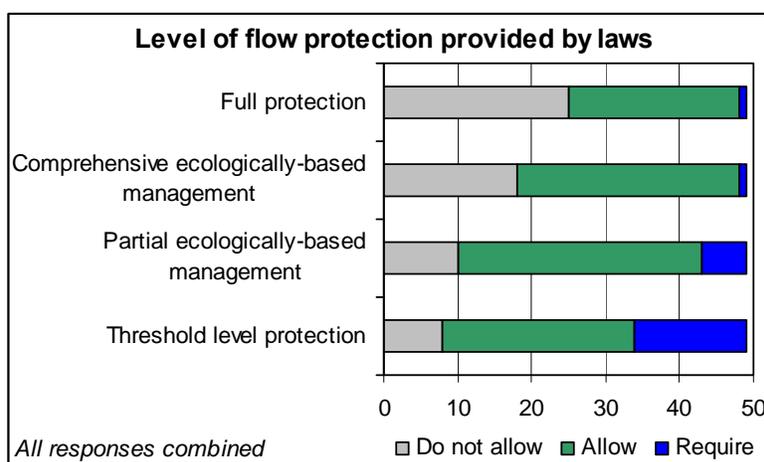


Figure 12. Levels of flow protection provided by laws at the time of the survey (all responses combined). Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively the following types of river corridor management?”

Analysis of the survey responses produced the following conclusions.

- *Full protection*: One state and no provinces required the highest level of protection, 43% of participants indicated that their state or province’s legal framework would allow full protection, while 50% of states and provinces function within a legal framework that does not allow full protection of instream flows.
- *Comprehensive ecological* (59%) and *partial ecological protection* (80%) were allowed or required in most states and provinces. This indicates that these states and provinces have a good legal starting point for protecting instream flow.
- *Threshold protection*: The laws of 18% of states and provinces do not even allow a threshold level of protection. This appears to be of most concern in the northeastern and southeastern U.S. where 38% and 21% (respectively) of the participants indicated that not even a threshold level of legal protection is allowed (see Appendix G, page 111). When almost one-fifth of the states and provinces do not even have a threshold level of legal support, much work is still needed to just achieve a basic legal authority for instream flow protection.

Instream flow policies

While laws are the primary basis for securing legal protections for flow in streams, policies developed in support of those laws (or separate from them) can often be of equal or greater importance. This particular question assesses which states and provinces had, at the time of the survey, policies that allowed or required various levels of instream flow protection. For the purpose of the survey, policies were considered to be derived from agency interpretation of laws or other legal opportunities regardless of which agency possessed the actual authority for that interpretation. This question used the four levels of flow protection described in Table 5 (page 28). Figure 13 (page 29) provides summary results for all participants combined. The regional analysis is presented in Appendix H (page 115).

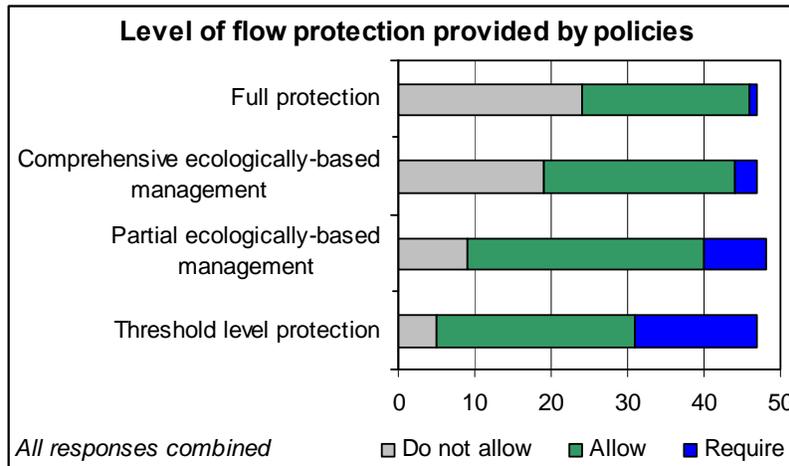


Figure 13. Levels of flow protection provided by policies at the time of the survey (all responses combined). Participants were asked, “Does agency policy or interpretation (your agency or others) of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of river corridor management?”

Analysis of the survey responses produced the following conclusions.

- *Full protection*: One state and no provinces required the highest level of protection. However, 43% indicated their agency or another agency’s interpretation of laws allowed full protection under some circumstances. Almost half of all participants said the state or provincial policies pertaining to instream flow do not support full protection of instream flow.
- *Comprehensive ecological* (51%) and *partial ecological protection* (78%) were allowed or required in most states’ or provinces’ policy interpretation.
- *Threshold protection*: 10% of all states and provinces indicated that current policy did not allow even a threshold level of protection. This situation was most common in the northeastern U.S., where 28% of participants indicated that current policy did not even allow a threshold level of instream flow protection (see Appendix H, page 115).
- In many U.S. states, considerable effort will be needed just to get policies in place to protect basic instream flow levels. In contrast, policies in the four Canadian provinces that participated in this survey appear to be relatively more protective of instream flows.

Lake and reservoir laws

Though instream flow issues are often considered as pertaining solely to water flowing in the channel of streams and rivers, the fact is that many instream flows are dependent on releases or discharges from lakes and reservoirs. Likewise, instream flows in rivers can often be a primary source of maintaining adequate fish and wildlife habitat in the lakes and reservoirs into which they flow. Consequently, it is important to understand the legal opportunities available to state and provincial fish and wildlife management agencies that pertain to water management in standing water bodies.

This report considers natural lakes together with man-made reservoirs, though lakes and reservoirs do have unique considerations in terms of water management. To address the authorities under which states and provinces function regarding standing water bodies, participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir level management for fish and wildlife?” Figure 14 (page 30) provides a summary of responses for all participants combined. The regional analysis is presented in Appendix I (page 119).

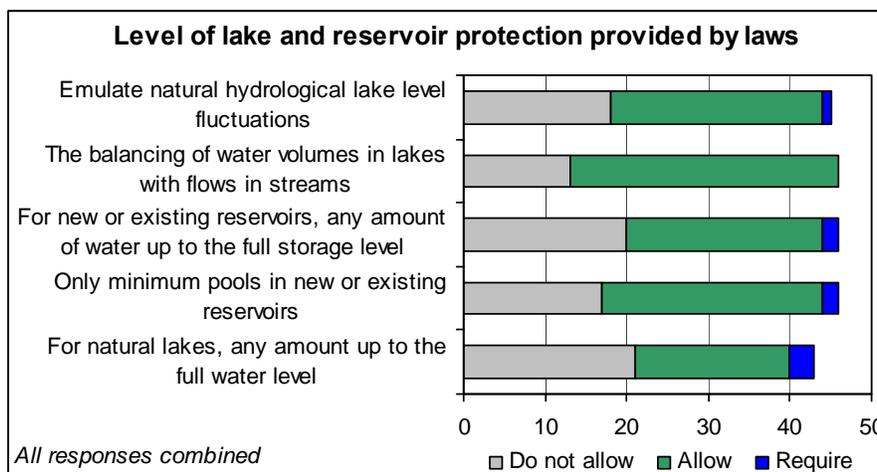


Figure 14. Levels of lake and reservoir protection provided by laws at the time of the survey (all responses combined). Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir level management for fish and wildlife?”

Analysis of the survey responses produced the following conclusions.

- The laws, rules, and regulations in most states and provinces (71%) allow the balancing of water volume in lakes and reservoirs with flows in streams for fish and wildlife management.
- The laws, rules, and regulations in 62% of the states and provinces allow or require only minimum pools in new or existing reservoirs be managed for fish and wildlife.
- The laws, rules, and regulations in most states and provinces (59%) allow or require the emulation of natural lake level fluctuations for fish and wildlife management.
- For new or existing reservoirs, 56% of the states and provinces have laws, rules, and regulations that allow or require any amount of water up to the full storage level for fish and wildlife management.

- For natural lakes, any amount up to the full water level is allowed or required to be managed for fish and wildlife in 52% of the states and provinces.
- Over half of states and provinces have the legal framework of laws, rules, and regulations to manage reservoirs and lakes for the benefit of fish and wildlife. However, more than one-third of the states and provinces have little or no legal support for input into the management of these water bodies. This makes it difficult to manage fish and wildlife resources affected by lake and reservoir water level fluctuations.

Lake and reservoir policies

As with instream flow laws and policies, fish and wildlife agency water management practitioners often find that their ability to implement some laws is often affected by policies. In some cases, policies may represent a relatively liberal interpretation of a law, however in other situations, policy interpretations can limit the effectiveness of some laws. Therefore participants were asked, “Does agency policy or interpretation of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir management?” Figure 15 (page 31) reflects the summarized data of all participants combined. The regional analysis is presented in Appendix J (page 123).

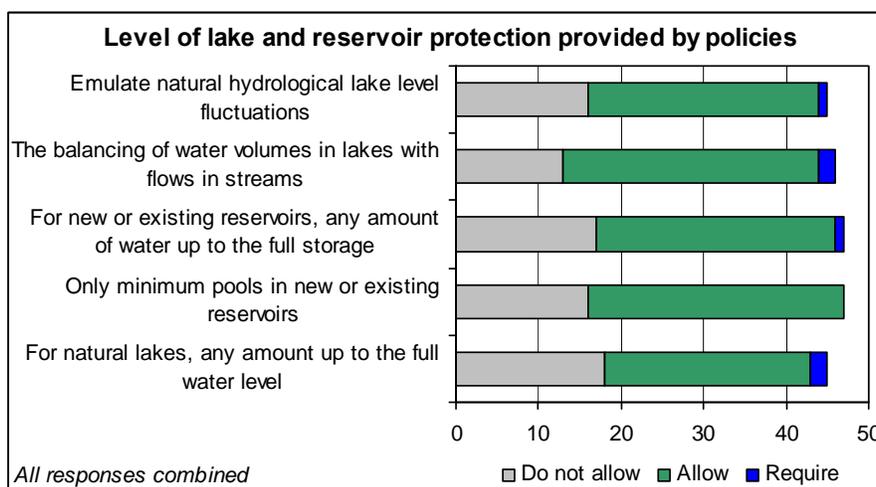


Figure 15. Levels of lakes and reservoir protection provided by policies at the time of the survey (all responses combined). Participants were asked, “Does agency policy or interpretation of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir management?”

Analysis of the survey responses produced the following conclusions.

- The policy or interpretation of laws, rules, and regulations in most states and provinces (71%) allow the balancing of water volume in lakes and reservoirs with flows in streams for fish and wildlife management.
- The policy or interpretation of the laws, rules, and regulations in most states and provinces (66%) allow or require lake and reservoir water level fluctuations be emulated for fish and wildlife management.
- The policy or interpretation of laws, rules, and regulations in 65% of the states and provinces allow or require only minimum pools in new or existing reservoirs to be managed for fish and wildlife.

- In 63% of the states and provinces, the policy or interpretation of the laws, rules, and regulations for new or existing reservoirs allow or require any amount of water up to the full storage level to be managed for fish and wildlife.
- In 59% of the states and provinces, any amount up to the full water level in natural lakes is allowed or required to be managed for fish and wildlife.
- Over half the states and provinces have policies or interpretation of the laws, rules, and regulations to manage reservoirs and lakes for the benefit of fish and wildlife. However, a third or more of the states and provinces have little or no legal support for input into the management of these water bodies. This makes it difficult to manage fish and wildlife resources affected by lake and reservoir water level fluctuations.

Instream Flow Quantification Methods

An important objective of the IIFPI project was to ask participating states and provinces to provide a self-assessment of their capabilities with various instream flow quantification methods. To meet this objective, the project team dedicated a major portion of the survey to issues associated with flow quantification methods. Because some agencies have reported being limited as to the methods they can use to quantify flow needs, the survey gathered information about these limitations. The survey also posed questions about the methods the participants' agencies were experienced in, and which methods the agencies had used in recent years.

Method limitations

In the past, some agency personnel have indicated to the IFC that statutes, policies, or rules limit the methods they can use to quantify instream flow needs. To assess the extent of these limitations participants were asked, "Can you use any, or a combination of, instream flow quantification methods in your state/province, or are you restricted to a specific combination?" Participants were given three choices for answering this question: 1) I am not restricted as to which method I use, 2) I am not restricted in which method I use and can use a combination of methods, and 3) I am restricted to one or more specific method(s). Participants who reported method restrictions were then asked to identify which method (or methods) they were required to use.

Survey responses indicated that participants who were not restricted to a single method could in fact use any one method or a combination of methods (sub-questions 1 and 2). Therefore, responses for those two questions were combined. Of the three states and one province where participants indicated their agencies had method restrictions, none were restricted to a single method. One was required to use the Tessmann method for streams with little allocation, but could use any of a combination of methods for streams with significant development. One agency was limited by rule as to which of several methods could be used in any of a range of situations. Two other participants indicated their agency either had no instream flow program, or instream flow work was done entirely by another state agency. Participants expressed this lack of input as a legal or policy limitation. The results of this question are shown in Figure 16 (page 33). The regional analysis is presented in Appendix K (page 129).

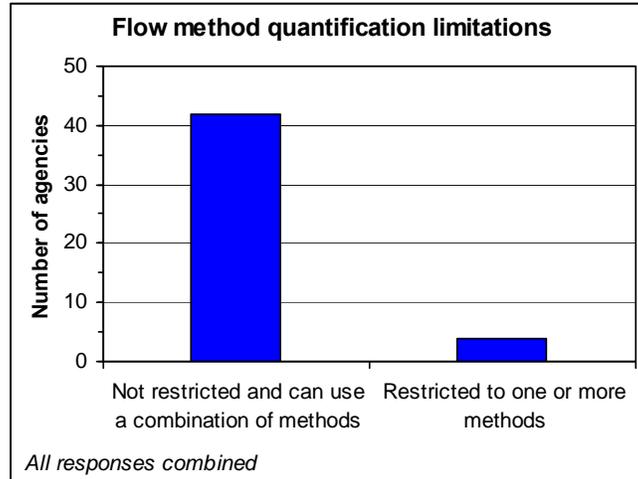


Figure 16. Summary of limitations that state and provincial fish and wildlife agencies functioned under in terms of their ability to use flow quantification methods at the time of the survey. Participants were asked, “Can you use any, or a combination of, instream flow quantification methods in your state/province, or are you restricted to a specific method or combination?” (Total responses = 46)

Analysis of the survey responses produced the following conclusions.

- The majority of participants stated that their agency was not restricted and could use any appropriate flow quantification method.
 - 91% of participants (42 out of 46) could use any single method or combination of instream flow quantification methods they felt was most appropriate.
 - Some participants noted that their agency established their own limits in the choice of methods they felt were most appropriate for use in their jurisdiction. They generally had the ability to modify or replace those methods when the existing tools no longer adequately answered new questions.
 - Others participants pointed out that their capacity to effectively use any particular method was often restricted by time availability or fiscal constraints.
 - Some states and provinces had internal guidelines for applications for instream flow water rights that allow two categories of methods:
 1. standard setting (narrative justification or habitat retention methods), and
 2. incremental (IFIM or other incremental methods).
 - Some agencies had “default” methods such as PHABSIM, single/multiple transect method, wetted perimeter methods, or Tennant method, but staff were able to select from the suite of methods as necessary to make comparisons.
- Only four agencies indicated that they were restricted to using one or more instream flow quantification methods, whether across their entire jurisdiction or only for certain streams.

Method use and capability

A wide variety of instream flow quantification methods have been developed and used in the past three decades. Some of these tools are more widely used than others, though certain methods may be extensively used in some regions and rarely in others. Though most flow quantification tools tend to be oriented to assessing flow needs for biological organisms (fish), practitioners also can rely on methods to assess other riverine resource needs such as hydrology, geomorphology, connectivity, and water quality (Annear *et al.* 2004). Authors such as Wesche and Rechar (1980) have described the use of some methods, but there is little information available in those documents or from other sources about which methods are most commonly used. Fish and wildlife agencies (and others) often wish to know which methods are most commonly used (and accepted) by other agencies in order to ensure that their own efforts are consistent with accepted practices regionally or nationally.

The IIFPI project addressed this need by asking survey participants which methods their agencies were capable of using, and which methods the agencies had actually used in the five years prior to the survey. Participants could also list additional methods for each category of study under an *other* category.

Instream flow or reservoir level quantification methods were grouped into seven categories: 1) hydrology, 2) geomorphology, 3) biology, 4) water quality, 5) connectivity, 6) holistic, and 7) reservoir. The list of methods in each category was drawn primarily from Annear *et al.* (2004). The project team developed the list of methods for *holistic* and *reservoir* assessments based on their understanding of the most commonly used methods in those categories as well as input from other instream flow experts.

In addition to the summary information on the use of each method, survey participants were given the opportunity to provide comments on each method. The summary below attempts to capture the essence of the comments where commonalities exist. Since providing comments was not mandatory, the number of responses for each method differs slightly.

The survey did not define the meaning of the word *capable* when asking which methods staff were capable of using, but assumed the term would be interpreted as technically capable and appropriately trained to use the method. As a consequence, participants could interpret it to mean that staff had some prior level of training or exposure to a method, or that they felt they had appropriate knowledge and ability to research the basic features of a method and could learn to use it in a relatively short time.

Hydrology methods

Only two hydrology-based quantification methods were specifically listed in the questionnaire, although two blanks were left for participants to add additional methods. Figure 17 (page 35) shows the methods that staff in participating fish and wildlife agencies were capable of using at the time of the survey. Figure 18 (page 35) shows the methods that staff in participating fish and wildlife agencies had actually used at least once in the five years prior to the survey.

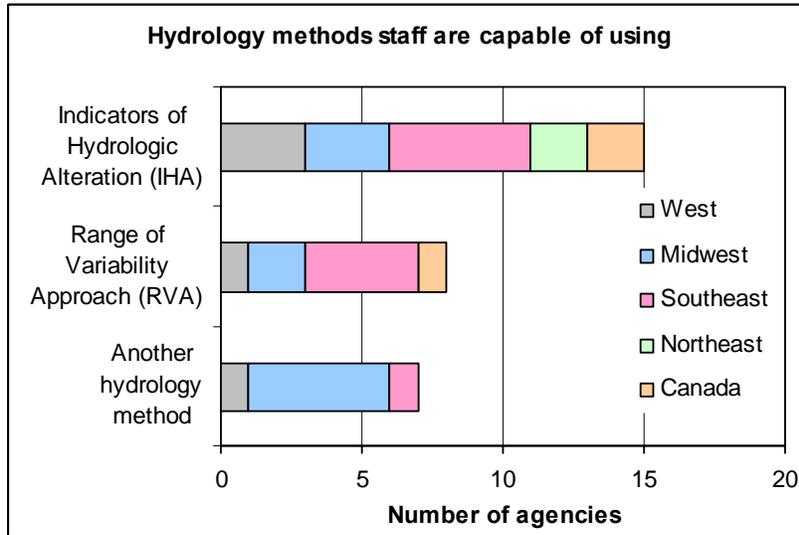


Figure 17. Hydrology methods that staff in participating fish and wildlife agencies were capable of using at the time of the survey, by region. (Total responses = 46)

Analysis of the survey responses produced the following conclusions.

- The IHA method was the hydrology method that participants most commonly reported their agency staff was able to use, however less than one-third (15 of 46 participants) indicated that their agency personnel was capable of using this method.
- Participants in the southeastern U.S. reported more use of hydrology methods than any other region surveyed.

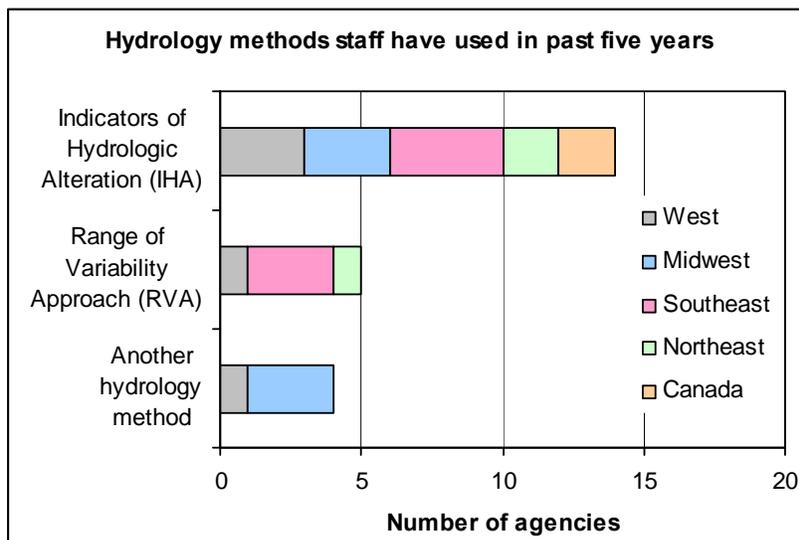


Figure 18. Hydrology methods that staff in participating fish and wildlife agencies had used at least once in the five years prior to the survey, by region.

Analysis of the survey responses produced the following conclusions.

- Though agency staff were capable of using the hydrology methods identified in the questionnaire, fewer of them reported that their agency had used these tools in the five years prior to the survey.
- The IHA method was the most commonly used hydrology method among participating agencies.
- Agencies in the southeastern U.S. tended to use hydrology methods more than those in other regions.
- Some participating agencies had used both RVA and IHA on the same project for comparison purposes.
- Other hydrology methods used by participating agencies were:
 - HSPF (Hydrologic Simulation Program Fortran) model, a U.S. EPA program for simulation of watershed hydrology and water quality for both conventional and toxic organic pollutants;
 - USGS HIP (Hydroecological Integrity Assessment Process) and HAT (Hydrological Assessment Tools), which are somewhat similar to RVA and IHA, but more variables are available and are used to identify hydro-ecological stream types; and
 - StreamStats, a U.S. Geological Survey tool that is often used along with correlation analysis among streams for estimating hydrology in ungaged streams.

Geomorphology methods

Channel form and channel forming processes play a key role in shaping the physical habitat used by fish and other aquatic wildlife. Despite this distinction, many survey participants noted that their agencies were able to review the findings of geomorphology studies, but few had staff with field experience or training in geomorphological flow quantification tools (Figure 19, page 37). Other state and provincial water agencies (or sister divisions within the same agency) tended to have the ability to conduct instream flow determinations using geomorphological flow quantification tools. The only exception to this is the use of Geomorphic Stream Classification System tools such as the Rosgen approach (Rosgen 1996), which is commonly taught to fisheries field staff. Figure 20 (page 37) provides information about the methods that staff with participating agencies had actually used at least once in the five years prior to the survey.

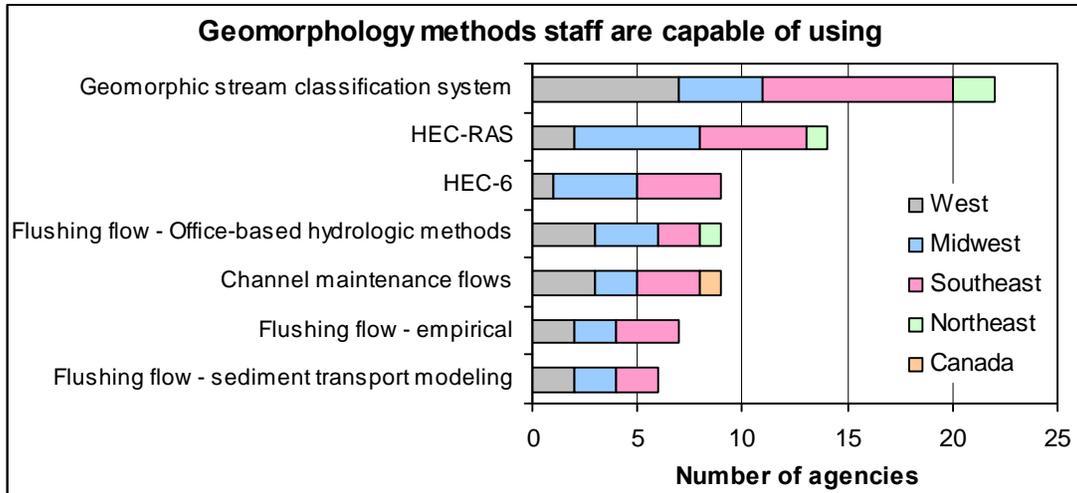


Figure 19. Geomorphology methods that staff in participating fish and wildlife agencies were capable of using at the time of the survey, by region.

Analysis of the survey responses produced the following conclusions.

- Almost half of the state and provincial fish and wildlife agencies were capable of using the Geomorphic Stream Classification System (a Rosgen-type tool).
- About 30% of the states and provinces responding were capable of using the HEC-RAS method (Hydrologic Engineering Center—River Analysis System) to quantify instream flow needs.
- Very few participants reported knowledge of any other geomorphology method, though some understanding of other methods was reported in the southeastern U.S., western U.S., and Canada.

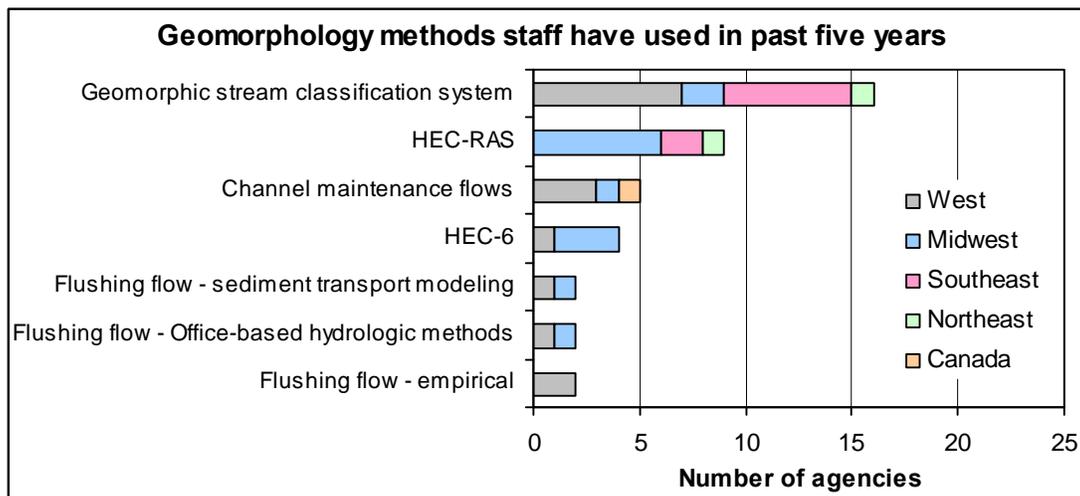


Figure 20. Geomorphology methods that staff in participating fish and wildlife agencies had used at least once in the past five years prior to the survey, by region.

Analysis of the survey responses produced the following conclusions.

- Geomorphic Classification System types of methods such as the Rosgen method were the most commonly used geomorphic method. These methods were mostly used in the western and southeastern U.S., where well over half of the agencies in each region have used the tool.
- Though HEC-RAS had been used by several agencies (mostly in the Midwest), almost half of the survey comments stated that it was used primarily by engineers from sister agencies.
- Very few participants reported using any other geomorphology method, though those that did were located primarily in the western U.S.

Biology methods

The vast majority of early instream flow quantification work was focused specifically on the needs of fish. Therefore, much effort has been focused on biology-based studies—the effects of flow on biological organisms. This has led to the development of more biology-based flow quantification methods than other methods, as reflected in the larger number of methods here than in previous sections. Participants were asked to record their agency’s familiarity with each method (Figure 21, page 38). Then participants recorded which methods their agency has actually used in the five years prior to the survey (Figure 22, page 39).

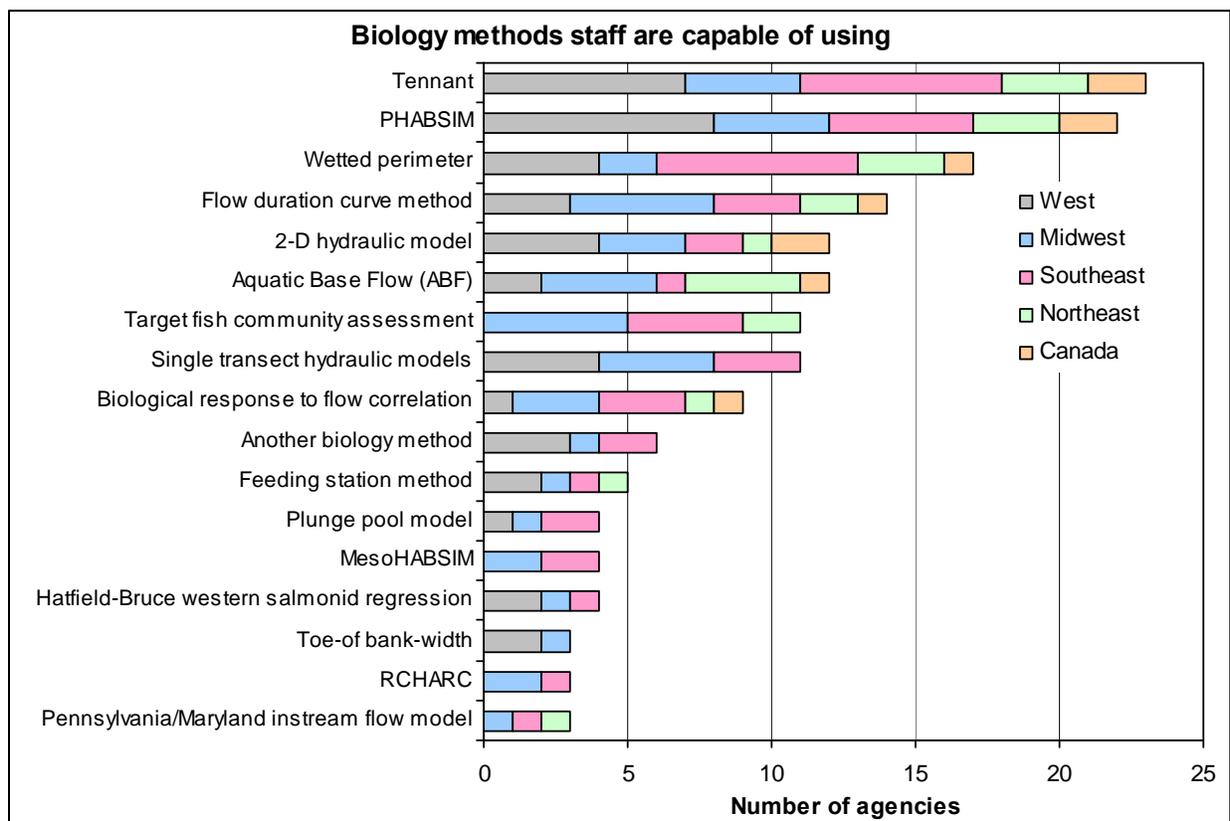


Figure 21. Biology methods that staff in participating fish and wildlife agencies were capable of using at the time of the survey, by region.

Analysis of the survey responses produced the following conclusions:

- Over half of the agencies were capable of using both the Tennant method and Physical Habitat Simulation method (PHABSIM). The majority of that expertise was in the western and southeastern U.S. Two of the four Canadian participants reported that their agency was familiar with these tools.
- Over one-third of participants indicated their agency had familiarity with the group of methods referred to as wetted perimeter methods.
- Several participants reported that they or others in their agency had been trained in the use of two-dimensional hydraulic models, and therefore were able to evaluate the work of others using these models, but relatively few had actual field experience.
- The majority of participants' agencies had little (if any) familiarity with over half of the methods listed.

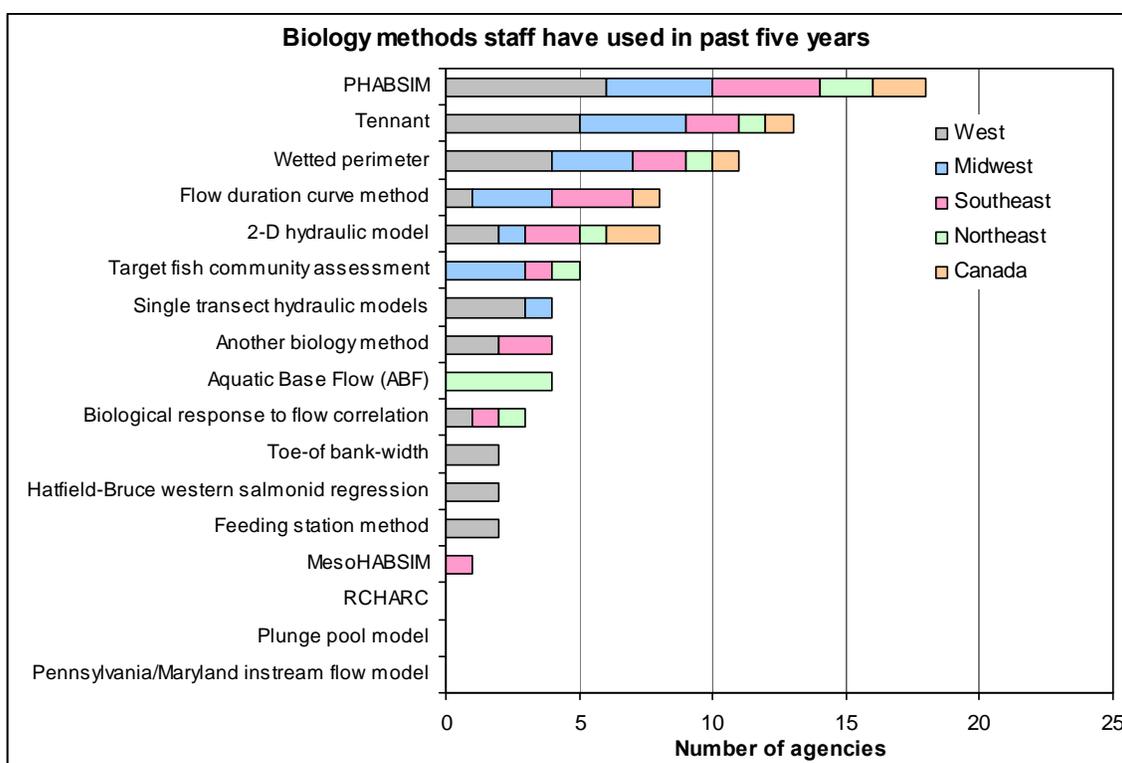


Figure 22. Biology methods that staff in participating fish and wildlife agencies had used at least once in the five years prior to the survey, by region.

Analysis of the survey responses produced the following conclusions.

- The PHABSIM method was the most widely used biological method, as well as the most widely used among all methods in all the survey categories. Primary PHABSIM users were in the western, midwestern, and southeastern U.S. Survey participants consistently commented that though they had been trained and had field experience with the model, their training needed to be updated.
- Of the participants who reported being familiar with most methods (such as the Tennant method), about half of those reported actually using the method. By rule or policy, some agencies were unable to use this method to set instream flows.

- About two-thirds of those who indicated familiarity with wetted perimeter methods had actually used them.
- Other methods participating agencies used were the two-dimensional hydraulic models and flow duration method.
- The majority of methods had not been used by more than one or two participating agencies in the five years prior to the survey. This does not necessarily indicate that the methods are ineffective, because they may be used by others outside of the surveyed fish and wildlife agencies.
- Other biology methods identified in participants' comments included the Oregon method, North Carolina desktop regression formula, and Upper Delaware River Decision Support System.

Water quality methods

Water quality investigations serve a variety of uses, of which instream flow studies is only one. Water quality methods provide information on not only streams, lakes, and reservoirs, but also groundwater and aquifers. Due to this multiplicity of uses, there are many water quality assessment tools in use throughout Canada and the U.S. The survey identified only a handful of the most commonly used methods used to set flow levels or identify trade-offs between flow and river health. Figure 23 (page 40) reflects participants' responses to questions about their agencies' ability to use these methods. Then participants recorded which methods their agency had actually used in the five years prior to the survey (Figure 24, page 41).

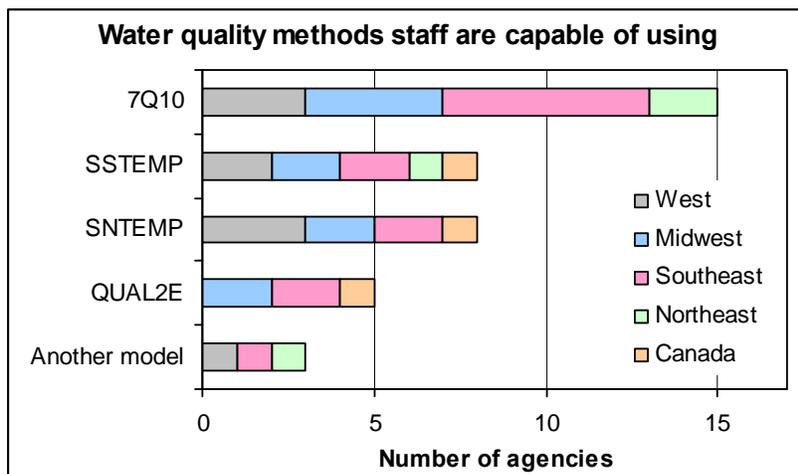


Figure 23. Water quality methods that staff in participating fish and wildlife agencies were capable of using at the time of the survey, by region.

Analysis of the survey responses produced the following conclusions.

- About one-third of participants reported that their agency had some familiarity with the 7Q10 method. It is important to note that this is typically not regarded as a tool for quantifying the instream flow needs of aquatic organisms, but is a statistical tool intended to maintain minimal water quality standards.
- Few participants had much familiarity with water quality models, at least in part because water quality is often regulated or administered by other state agencies.

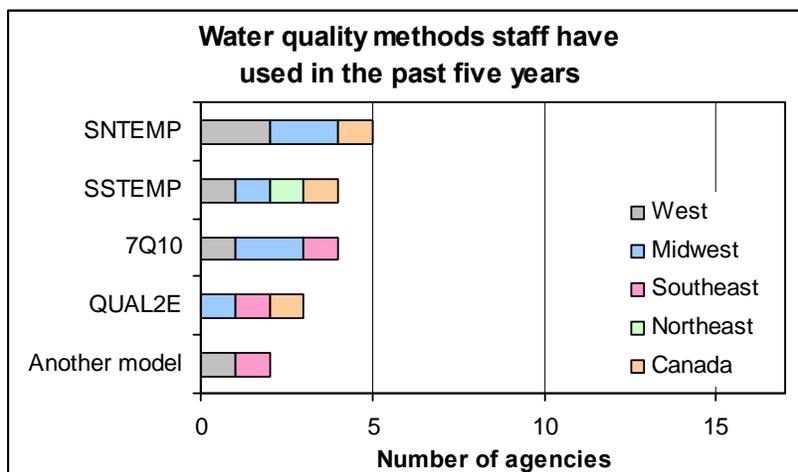


Figure 24. Water quality methods that staff in participating fish and wildlife agencies had used at least once in the five years prior to the survey, by region.

Analysis of the survey responses produced the following conclusions.

- Very few state or provincial agencies had actual field experience using water quality methods to quantify instream flow needs.
- Less than 10% of all participating states and provinces indicated using any of the water quality methods in the survey.
- Other water quality methods identified in participants' comments included MNSTREM, the September Median Flows method, the Connecticut Air/Temperature Model, the CE-QUAL-W2 model, BASINS model, 7Q2 determinations, and the use of statistical correlation analysis of empirical discharge-water temperature data.

Connectivity methods

Connectivity encompasses the spatial and temporal dimensions of water passage through a river basin—lateral, longitudinal, vertical, and temporal. These dimensions include not only the passage of water down a river channel (longitudinal), but also the connections between river channels and its floodplain (lateral), a surface water body and the associated groundwater or aquifer (vertical), and day-to-day or season-to-season flows of water (temporal). Compared to the field of biology, which has a large number of available methods and where the majority of agencies are most experienced, relatively few methods have been developed to quantify the instream flow needs to maintain or restore any of these important types of connectivity. Figure 25 (page 42) reflects participants' responses to questions directed at their agencies' ability to use connectivity methods. Then participants recorded which methods their agency has actually used in the five years prior to the survey (Figure 26, page 42).

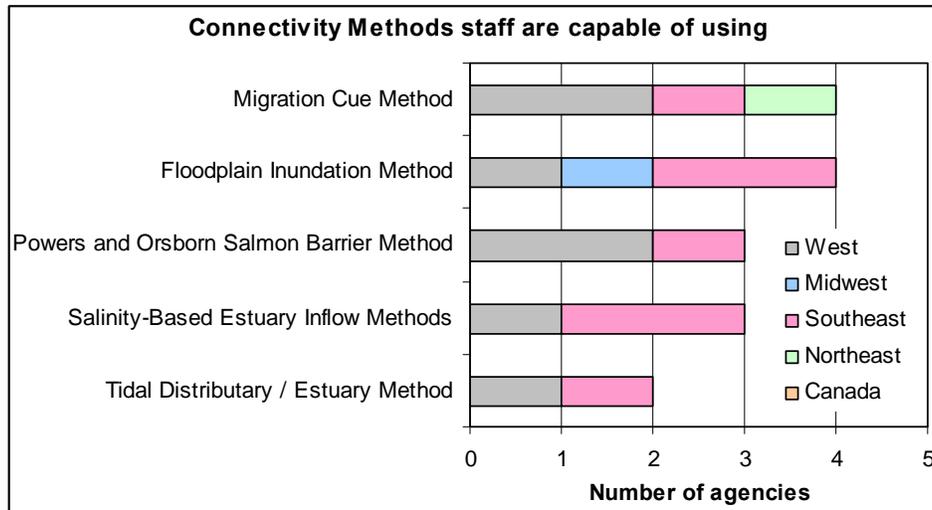


Figure 25. Connectivity methods that staff in participating fish and wildlife agencies were capable of using at the time of the survey, by region.

Analysis of the survey responses produced the following conclusions.

- Only four participants reported that their agencies had staff capable of using any of these connectivity methods.
- The few agencies that had familiarity with connectivity tools were in the western and southeastern U.S. Most of these were U.S. coastal areas where river flow into estuaries is an important issue.

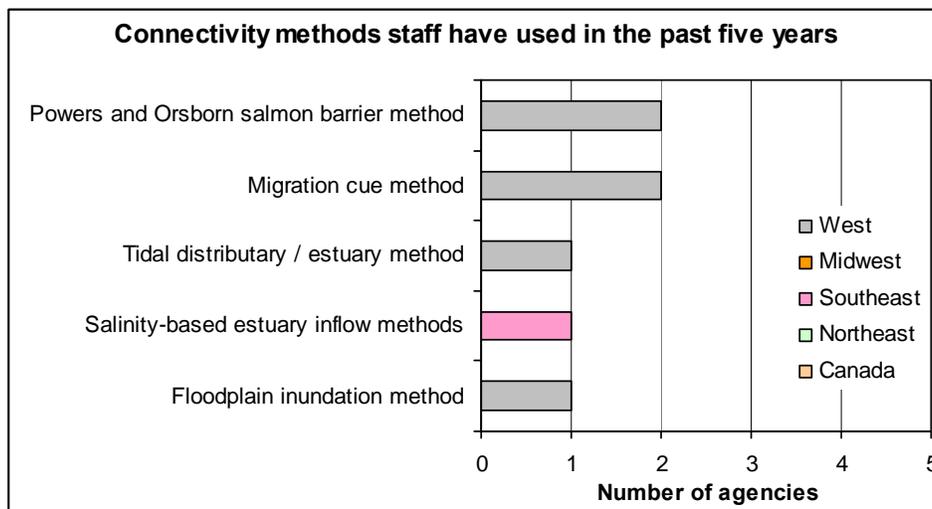


Figure 26. Connectivity methods that staff in participating fish and wildlife agencies had used at least once in the five years prior to the survey, by region.

Analysis of the survey responses produced the following conclusions.

- Only two participants reported that their agency had used any of the connectivity methods listed in this survey.
- Those using connectivity tools were using them to manage anadromous fish populations or estuarine resources.

Holistic methods

Holistic instream flow quantification methods are a relatively new group of tools that use information or data from more than one riverine element to provide information on instream flow needs. Holistic tools may be used to investigate the instream flow needs of a single species, a community of organisms, or a broader index of riverine condition. Figure 27 (page 43) reflects participants’ responses to questions directed at their agencies’ ability to use these methods. Then participants recorded which methods their agencies had actually used in the five years prior to the survey (Figure 28, page 43).

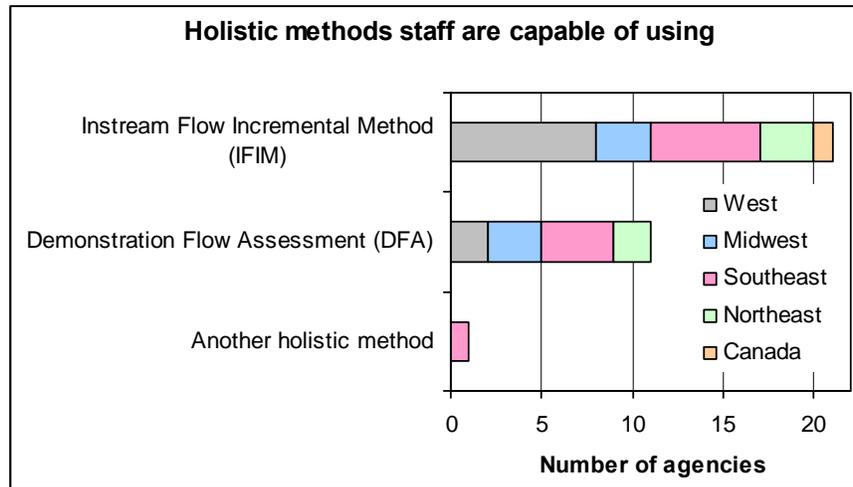


Figure 27. Holistic methods that staff in participating fish and wildlife agencies were capable of using at the time of the survey, by region.

Analysis of the survey responses produced the following conclusions.

- The holistic methods that most participants’ agencies were familiar with were the Instream Flow Incremental Method (IFIM) and Demonstration Flow Assessment.
- Most of the participants reporting agency knowledge of holistic methods were in the western and southeastern U.S.

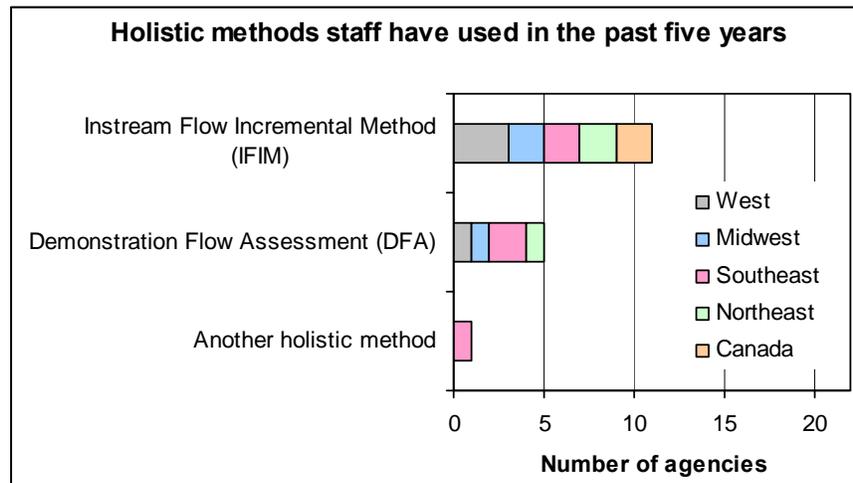


Figure 28. Holistic methods that staff in participating fish and wildlife agencies had used at least once in the five years prior to the survey, by region.

Analysis of the survey responses produced the following conclusions.

- Several participants noted that while their agency had used IFIM in the five years prior to the survey, staff in their agency were no longer capable of using it.
- The Demonstration Flow Assessment method had been used at least once in the five years prior to the survey in all regions of the U.S.
- None of the four Canadian participants indicated that their agencies had ever used a holistic method.

Lake and reservoir methods

In many situations, instream flow levels and reservoir or lake levels are intimately linked. The fact is that fish and wildlife agencies invest as much (or more) effort managing lakes and reservoirs as they do managing flowing water bodies. To reflect this important area of instream flow work, participants were asked to provide information on the various tools that fish and wildlife agencies use to manage water for fisheries in lakes and reservoirs (Figure 29, page 44). Then participants recorded which methods their agencies had actually used in the five years prior to the survey (Figure 30, page 45).

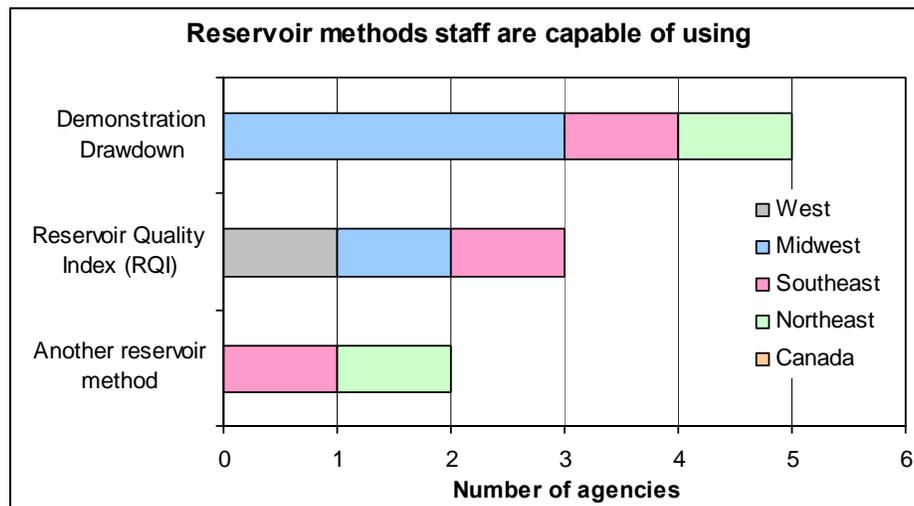


Figure 29. Lake and reservoir methods that staff in participating fish and wildlife agencies were capable of using at the time of the survey, by region.

Analysis of the survey responses produced the following conclusions.

- Very few participants indicated that their agencies were capable of using any of the lake and reservoir methods listed in the survey, or any additional method.
- None of the Canadian participants indicated that their agencies had any familiarity with lake and reservoir methods.

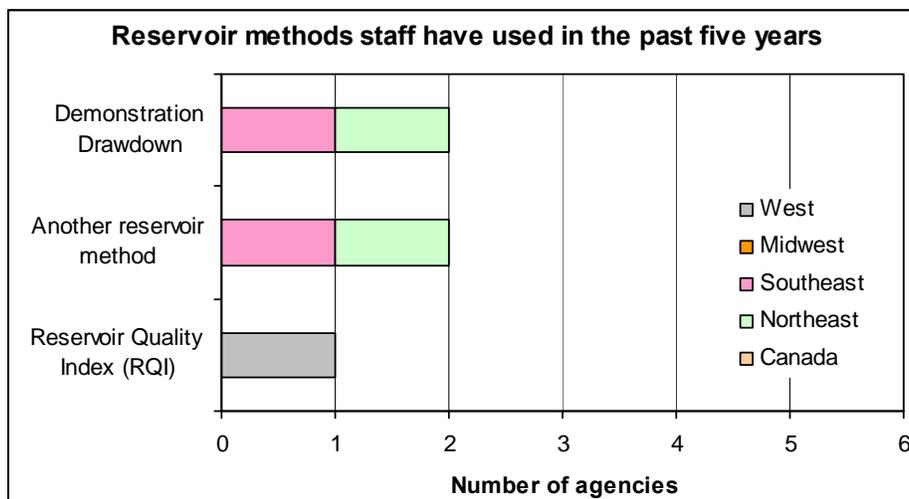


Figure 30. Lake and reservoir methods that staff in participating fish and wildlife agencies had used at least once in the past five years prior to the survey, by region.

Analysis of the survey responses produced the following conclusions.

- Of the 49 survey participants, only two reported that their agencies used any methods to quantify water quantity needs for fisheries in lakes or reservoirs in the five years prior to the survey.
- Other methods used by participants' agencies to quantify the water elevation needs within their impoundments included the Reservoir Simulation Model (developed by the University of Connecticut), WEAPS (Watershed Evaluation and Planning System) that integrates reservoir operation with instream flow releases, and the HEC-5 model.

Activities

Agency Time Spent on Various Activities

Available resources, in combination with an agency's vision or planning documents, largely determine the scope and scale of agency activities. To effectively manage waters in streams, lakes, and reservoirs that sustain populations of public trust fish and wildlife resources, it is important that agencies invest an appropriate amount of effort in activities that support agency effectiveness. The IIFPI project team generated a list of water management activities that seemed generally relevant to achieving the outputs identified in the logic model (Figure 8, page 22). Survey participants were asked whether they felt their agency should spend more or less time on each activity (Figure 31, page 46). The regional analysis is presented in Appendix L (page 131).

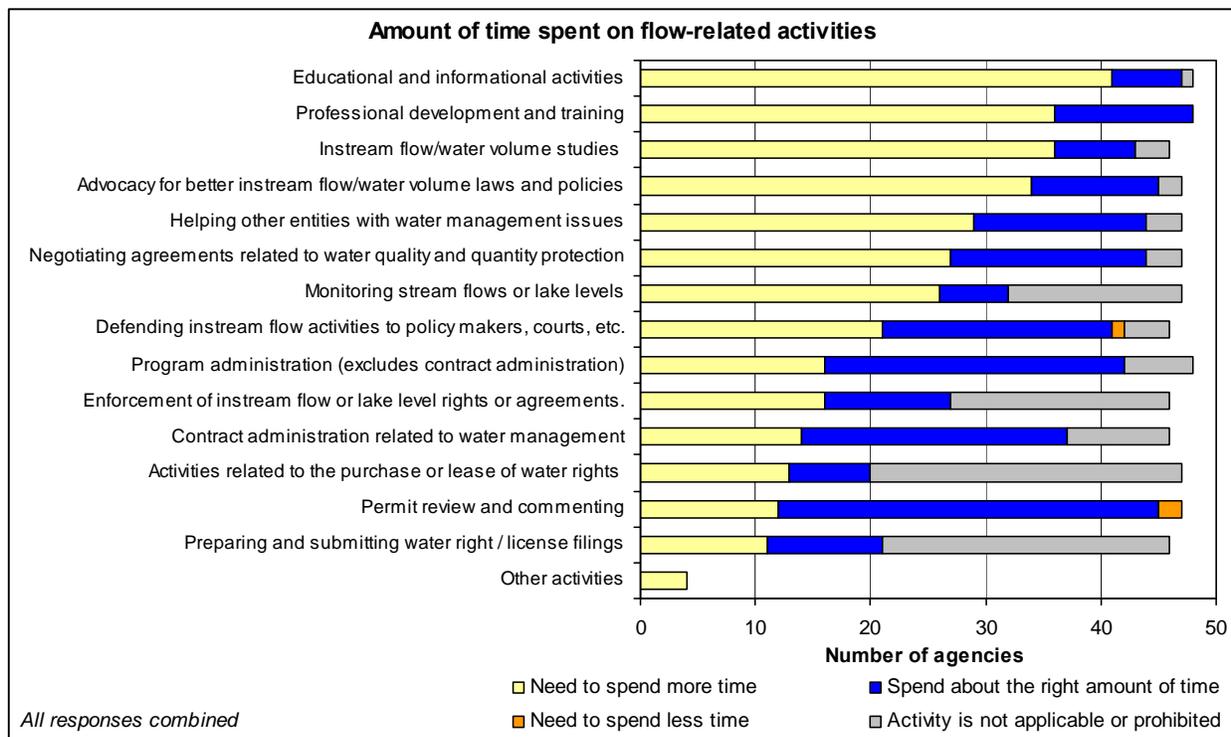


Figure 31. Summary of the amount of time participants indicated they spent or should have spent (at the time of the survey) on a variety of activities associated with instream flow or water management issues (all regions combined).

Analysis of the survey responses produced the following conclusions.

- Though participants indicated they were already overworked and understaffed, they felt they still needed to do much more in many areas. Very few indicated that they needed to spend less time on any task.
- There were very strong indications among participants that their agencies needed to spend more time on *educational and informational activities, instream flow/water volume studies, professional development and training, advocacy for better instream flow/water volume laws and policies, and helping other entities with water management issues.*
- Over half the participants also indicated that their agencies needed to spend more time on *negotiating agreements related to water quality and quantity protection, and monitoring stream flows or lake levels.*
- Agencies in over half the participating states and provinces were prohibited from purchasing or leasing water rights.
- *Preparing and submitting water right/license filings* was either not applicable or prohibited in over half of the responding states and provinces. In the remaining states and provinces, participants indicated support for increasing or maintaining the amount of time spent on these activities.
- Responses on the other activities were varied, but in general unless an activity was listed as not applicable or prohibited, participants indicated that their agency needed to either spend more time or that the right amount of time was being spent.

- The only activities where some participants indicated their agencies needed to spend less time were: *permit review and commenting* (4%) and *defending activities to policy makers, courts, etc.* (2%).

Availability and Effectiveness of Tools and Processes for Streams

Agencies' ability to protect and restore instream flow levels depends on agency staff having a suite of tools to use when opportunities arise. To assess tool availability and effectiveness for streams, the IIFPI project team asked survey participants to indicate what water management tools were available to staff in their agency, and which were most effective in protecting or restoring flows in their state or province. Figure 32 (page 48) and Figure 33 (page 50) address these questions. It is important to note that the list of tools and processes included in the survey was not exhaustive, and some jurisdictions may use tools that were not included. As noted previously, it is important to bear in mind that survey findings were based on the knowledge and understanding of the participants at the time of the survey.

Tool availability for streams

There are a relatively large number of administrative and regulatory mechanisms and processes by which water quantity and quality in rivers, lakes, and reservoirs are managed in the U.S. and Canada. However, not all tools are available in all states and provinces. Figure 32 (page 48) provides information about the availability of tools and processes across participating agencies.

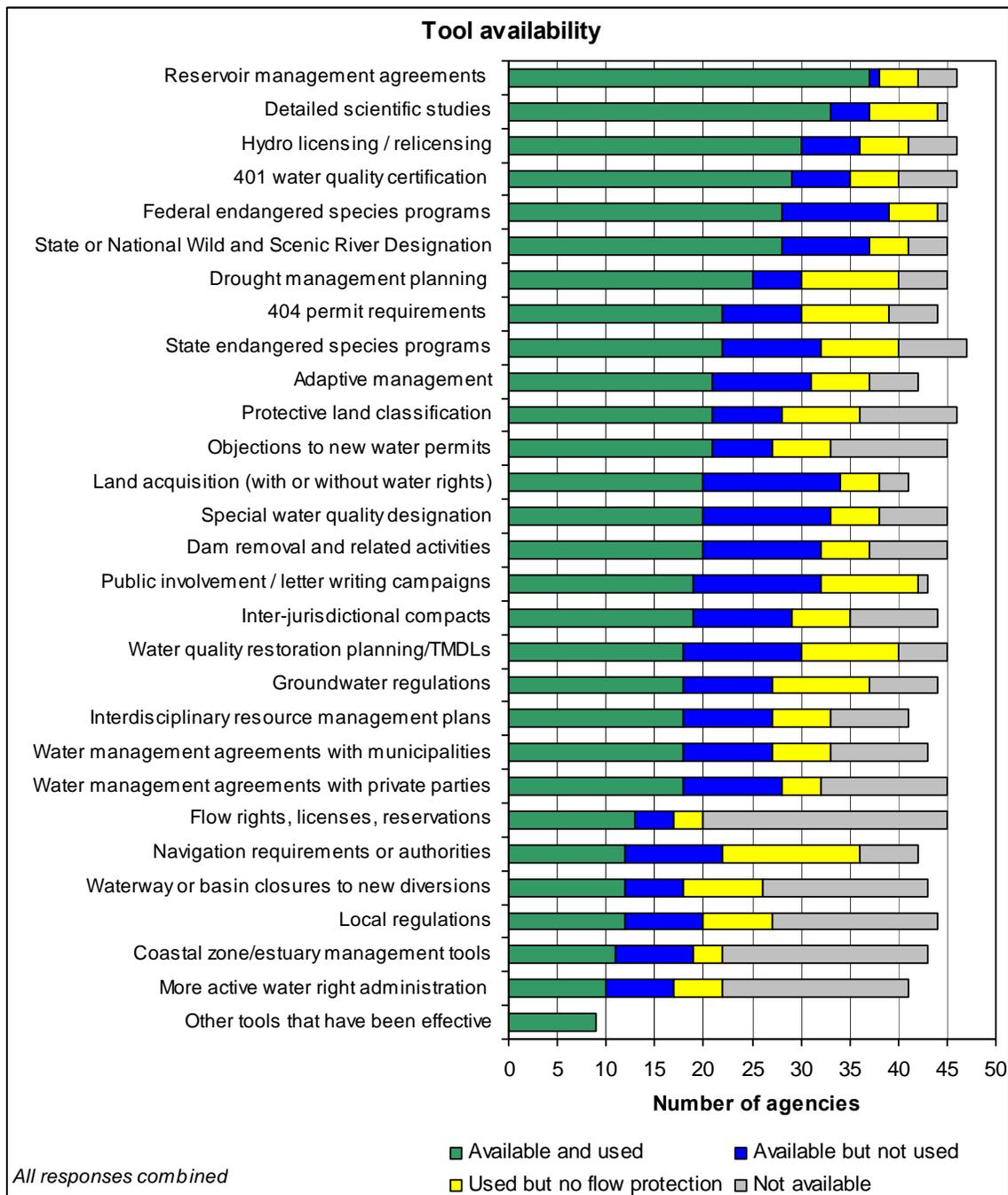


Figure 32. Availability of water management tools and processes for protecting or restoring instream flows at the time of the survey (all responses combined). The *available and used* category is further analyzed in Figure 33 below.

Analysis of the survey responses produced the following conclusions.

- Most of the tools listed were available to the majority of participants’ agencies, although some of the more widely recognized tools like flow rights and licenses were unavailable to about half of participants’ agencies.

- Some tools were available but not used by nearly a quarter of agencies. These tools included: *dam removal and related activities, special water quality designation, water quality restoration planning/TMDLs, and land acquisition (with or without water rights)*.
- For about 20% of agencies, *groundwater regulations, navigation requirements or authorities, water quality restoration planning/TMDLs, drought management planning, and public involvement/letter writing campaigns* were used but participants reported they were not effective tools for restoring or protecting instream flows or water volumes.

Tool effectiveness for streams

Though agencies have access to many tools for managing flow in streams, tool effectiveness is the real test of a tool's value for protecting and restoring flow. As noted previously (Table 5, page 28), there are four levels of instream flow protection. Not all levels of protection fully protect all of the riverine functions necessary to sustain long-term habitat conditions, and consequently not all levels of protection may support long-term persistence of target aquatic species at desired levels. To address the actual utility of various tools for protecting or restoring flow, participants were asked their opinions about the level of instream flow protection or restoration that their agencies had typically been able to achieve with individual tools. The survey gathered data on the specific levels of protection for each of these tools, and responses were also combined for each tool to compare their relative effectiveness at providing any level of flow protection or restoration (Figure 33, page 50).

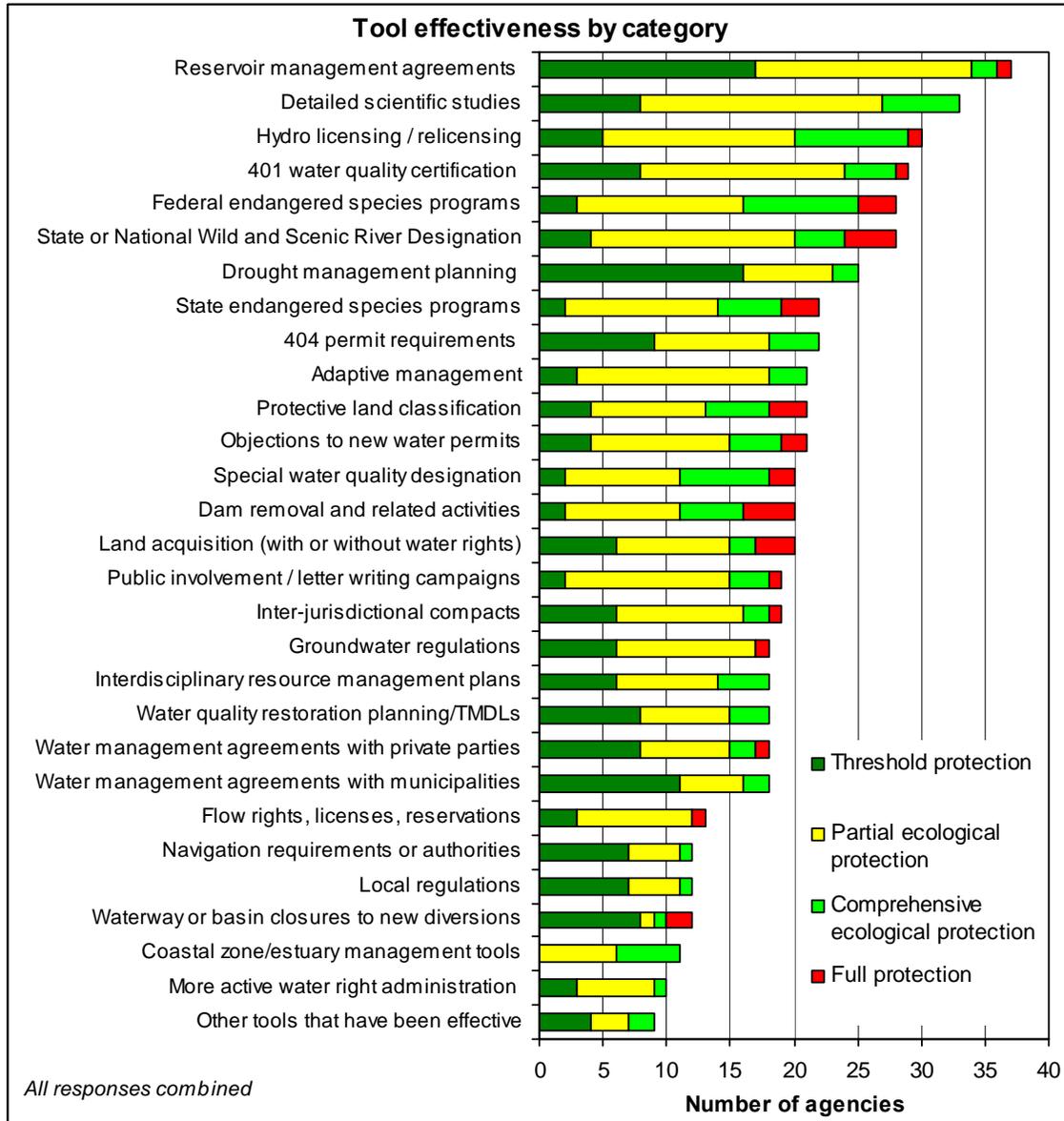


Figure 33. Effectiveness of water management tools and processes for protecting or restoring instream flows at the time of the survey, categorized by the types of flow protection each tool is appropriate for (all responses combined). Participants were asked, “Typically, how effective are the following tools/processes in protecting or restoring instream flow in your state or province?”

Analysis of the survey responses produced the following conclusions.

- Very few of the available tools for managing flow in streams were effective at providing full protection to all ecosystem functions. The most effective tools for providing full protection were: *state or national wild and scenic river designations, dam removal and related activities, federal endangered species programs, protective land classification, and land acquisition (with or without water rights)*.
- When four levels of protection were combined, the tools that were typically most effective at providing any level of protection included: *reservoir management agreements, detailed scientific studies, hydro licensing/re-licensing, 401 water quality certification, federal endangered species programs, and state or national wild and scenic river designation*.
- Some of the least effective tools for protecting or restoring instream flows included: *more active water right administration, coastal zone/estuary management tools, waterway or basin closures to new diversions, and local regulations*.

Availability and effectiveness of tools and processes for lakes and reservoirs

The ability to protect and restore lake and reservoir levels depends on agencies having a suite of tools to use when opportunities arise. To assess what tools were available as well as their effectiveness, participants were asked to indicate what tools were available to their agency and which were tools were most effective in protecting or restoring lake and reservoir levels in their state or province. For lakes and reservoirs, unlike for streams in the previous question, the team did not have a range of defined levels of protection so participants were asked to simply indicate whether each tool was available and if it was, whether it was effective. Figure 34 (page 52) shows the responses to this question.

It is important to note that the list of tools and processes included in the survey was not exhaustive and may not have included all possible methods for managing fisheries in lakes and reservoirs. In addition, the survey responses were based on participants' knowledge and understanding, and may not accurately reflect real opportunities in some states or provinces.

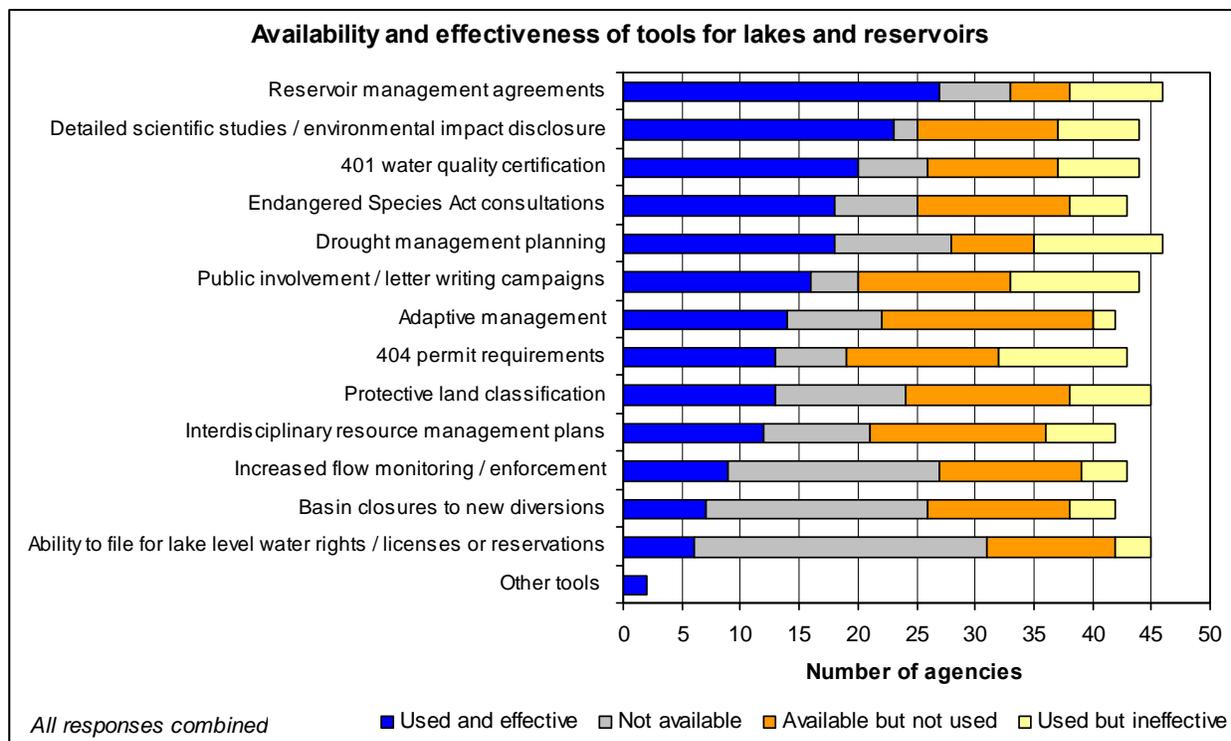


Figure 34. Effectiveness of water management tools and processes for protecting or restoring water volume in lakes and reservoirs at the time of the survey (all responses combined). Participants were asked, “Typically, how effective are the following tools/processes in protecting or restoring lake or reservoir levels in your state or province?”

Analysis of the survey responses produced the following conclusions.

- Almost half of all participants indicated that *reservoir management agreements* were available and effective tools for protecting or restoring fishery resources in lakes and reservoirs.
- About 40% of participants indicated that *detailed scientific studies/environmental impact disclosure*, *401 water quality certifications*, *drought management planning*, and *endangered species act consultations* were potentially effective tools.
- Participants noted that activities such as *securing water rights, licenses or reservations* were among the less available and less effective tools for lake and reservoir management.

Outputs

The ecological condition of streams, lakes, and reservoirs is the result of many complex, interacting factors. An understanding of the current condition of streams, lakes, and reservoirs is important to shape the scale and scope of future activities to maintain, restore, or enhance those resources. Understanding of current conditions helps agencies set priorities, allocate resources, educate the public, revise policies, and develop budgets—in short, to manage the public trust resources.

To gain insight into current conditions, the IIFPI project asked participants several questions about the condition of streams, lakes, and reservoirs in their respective jurisdictions, and the extent of protections these streams, lakes, and reservoirs were afforded. They were also asked to indicate their opinion on how secure those protections were (for example, how much oversight was required to ensure that needed flows actually remained in the stream), and what proportion of stream miles in their state or province had been restored at the time of the survey.

Because estimations may vary in accuracy, participants were asked to provide their estimates in relatively broad ranges. For questions related to stream miles, the survey grouped all streams including perennial, intermittent, and ephemeral in a single group.

Unaltered Stream Mileage

Participants were asked to indicate (in their estimation or others') what portions of the streams in their state or province were in unaltered, free flowing condition (with negligible diversions or developments that have affected stream flow or riverine ecology) at the time of the survey. Responses are summarized in Figure 35 (page 53). The regional analysis is presented in Appendix M (page 137).

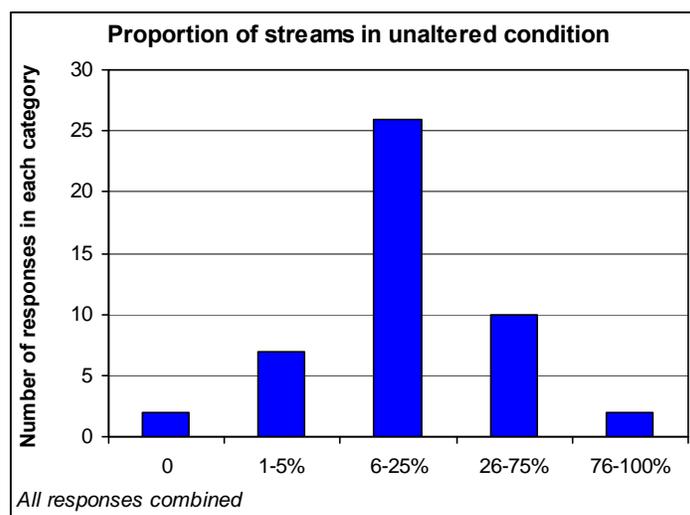


Figure 35. The estimated portion of stream miles reported by participants in each region that were in unaltered condition at the time of the survey (all responses combined). Participants were asked, “In your or others’ estimation, what portion of your state’s/province’s streams are in unaltered, free flowing condition (there have been negligible diversions or developments that have affected streamflow or riparian ecology)?”

Analysis of the survey responses produced the following conclusions.

- Over three-quarters (76%) of the participants reported that 25% or less of their streams were in unaltered, free flowing condition.
- Relatively few streams in the U.S. and Canada are unaltered.
- The southeastern U.S. appeared most impacted; all participants in this region reported 25% or less of streams in an unaltered, free flowing condition and one state reported no unaltered streams.
- Canadian participants reported the most unaltered, free flowing streams. Three of the four participants reported 26–75% unaltered streams, and one reported 76–100% unaltered streams.

Stream Miles Protected

As noted previously, instream flow protection may occur at several different levels—not all of which sustain the kinds of ecological functions needed to maintain habitats and populations of target aquatic resources (see Table 5, page 28). The complexity of instream flow protection means that too often practitioners secure an instream flow agreement, after which they and the public assume that riverine resources in the stream are fully protected when in fact they may be only partially protected, or protected only under certain circumstances. Though an instream flow agreement may be reached for a stream segment or system, the agreement may not necessarily provide the desired level and certainty of flow protection for all uses.

Survey participants were asked to estimate the approximate portion of stream miles (not total streams) in their state or province where flows had different levels of protection. Figure 36 (page 55) shows the summary of responses from all participants combined. The regional analysis is presented in Appendix N (page 139).

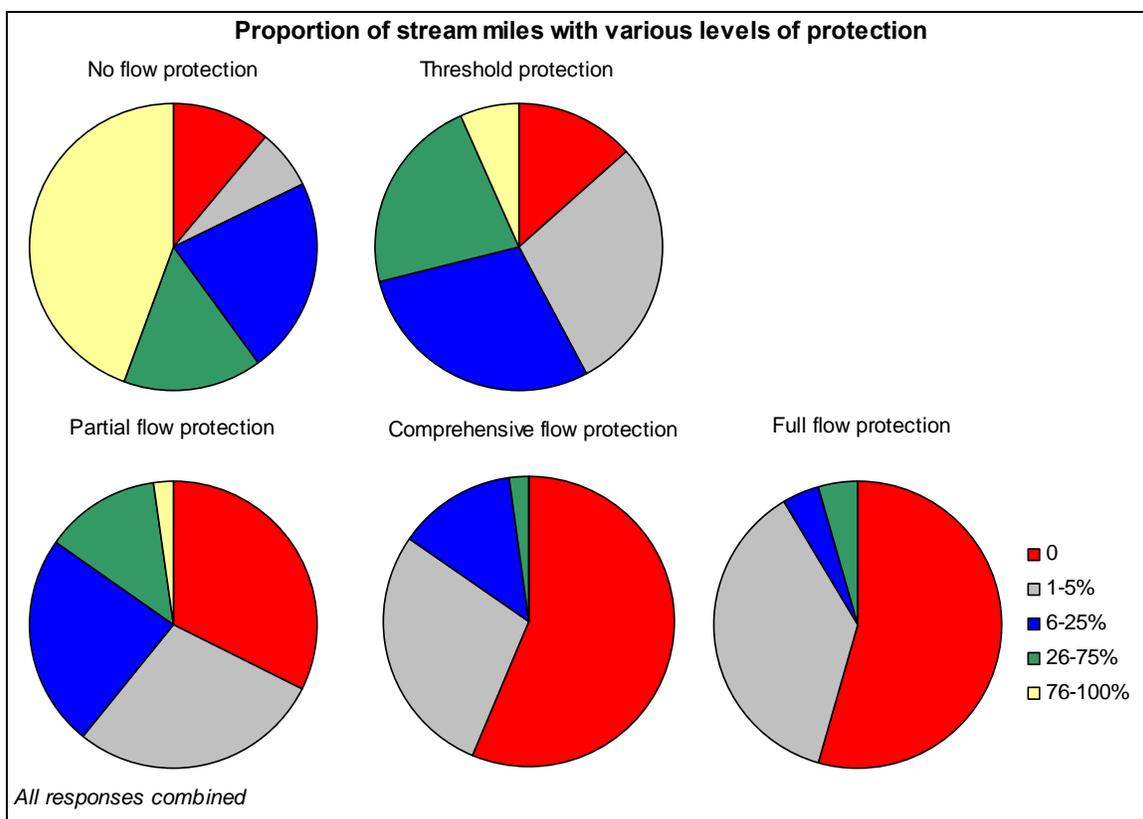


Figure 36. The estimated portion of stream miles with various levels of protection at the time of the survey (all responses combined). Participants were asked, “In your estimation, about what proportion of stream miles in your state or province have the following levels of stream protection?”

Analysis of the survey responses produced the following conclusions.

- In general, instream flows were protected for very few stream miles in the U.S. and Canada, and the level of protection was relatively low.
- *Full protection* was not available on any stream miles in 25 of the states and provinces responding to the survey and 17 participants reported that 1–5% of stream miles in their state or province had this level of protection.
- *Comprehensive ecological protection* was not available on any stream miles in 26 of the states and provinces responding to survey, and 13 participants reported that 1–5% of stream miles in their state or province had this level of protection.
- *Partial ecological protection* was reported by 15 of the participants as not available on any streams in their state or province. 13 participants reported this level of protection available on 1–5% of their stream miles, 11 participants reported this level of protection on 6–25% of their stream miles, and 6 participants reported this level of protection on 26–75% of stream miles.
- *Threshold protection* was reported by 6 participants as not available on any stream mile. 13 participants reported that it was available on 1–5% of their stream miles, 13 participants reported it was available on 6–25% of their stream miles, 10 participants reported it was available on 26–75% of stream miles, and 3 participants reported it was available on 76–100% of stream miles.

- *No flow protection* was reported by 20 of the participants for 76–100% of the stream miles in their state or province at the time of the survey, 9 participants reported no protection on 26–75% of their stream miles, seven reported no protection on 6–25% of their stream miles, and 2 participants reported no protection on 1–5% of their stream miles.
- Five participants reported there was some type of flow protection on all stream miles in their states or provinces.

Reliability of Protection

In many situations where agreements or requirements are established for instream flow protection at some level, uncertainty may remain as to whether the agreed-upon flow amount is actually provided. As noted previously, there are different levels of instream flow protection (Table 5, page 28)—similarly, different levels of effort are required to ensure that the flow remains in the designated stream or stream segment.

To gauge the general reliability of the various levels of protection indicated in the previous question, participants were asked if the protections they indicated in the previous question were generally secure, or if monitoring and enforcement was needed. It is important to note that each flow management situation is unique, but participants’ answers generally relate to stream protections in each group or class of protection.

In the previous question, several participants indicated that no legal or formal protection was provided on streams in their state or province. When analyzing the data for this question, the project team removed these participants, which reduced the overall number of responses. Figure 37 (page 56) summarizes the responses of all participants who were able to respond to this question. The regional analysis is presented in Appendix O (page 145).

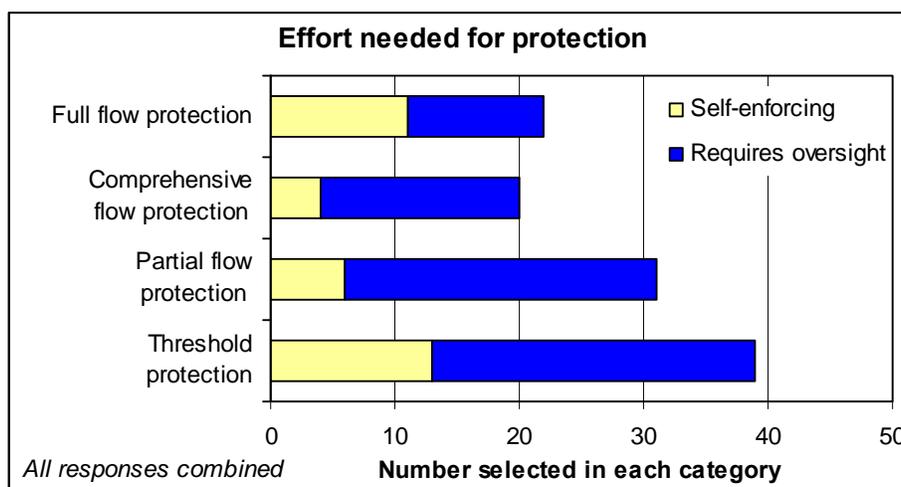


Figure 37. Level of effort needed to ensure implementation of various levels of instream flow protection at the time of the survey (all responses combined). Participants were asked, “Are the protections referenced in the previous question generally secure or do they need continued monitoring/enforcement to be protective?”

Analysis of the survey responses produced the following conclusions.

- In general, most survey participants indicated that if a particular level of protection existed in their state or province, monitoring and enforcement was required for it to be protective. When considered in context with the previous question, responses indicated that even the existing low level of protection was most often not considered generally secure, and that diligent monitoring and enforcement were needed to protect most instream flows.
- *Full protection* was not available in the states or provinces of 25 participants, 11 participants indicated it was available and generally secure, and 10 participants indicated it was available but required monitoring and enforcement.
- *Comprehensive ecological protection* was not available in the states or provinces of 26 participants, 4 participants indicated it was available and generally secure, and 15 participants indicated that it required monitoring and enforcement to be protective.
- *Partial ecological protection* was not available in the states or province of 14 participants, 6 participants indicated that it was available and was generally secure, and 25 participants reported it was available but required monitoring and enforcement to be protective.
- *Threshold protection* was not available in the states or provinces of 5 participants, 12 participants reported it was generally secure, and 27 participants indicated it required monitoring and enforcement to be protective.

Flow Restoration

Two distinct aspects of instream flow management warrant individual consideration. The previous questions have dealt only with the aspect of protecting flows in channel for riverine resources. This perspective is based on the view that there is still adequate flow available for dedication to in-channel use and maintenance of aquatic resources at a desired level. However in many situations, instream flow management is used to restore conditions of favorable flow to streams or stream segments that have been significantly compromised from their natural or desired condition. To address this aspect of instream flow activities, state and provincial fish and wildlife agency participants were asked to estimate the proportion of stream miles in their state or province where instream flows had been restored to each of the four levels of protection (Table 5, page 28). Figure 38 (page 58) summarizes the responses of all participants combined. The regional analysis is presented in Appendix P (page 151).

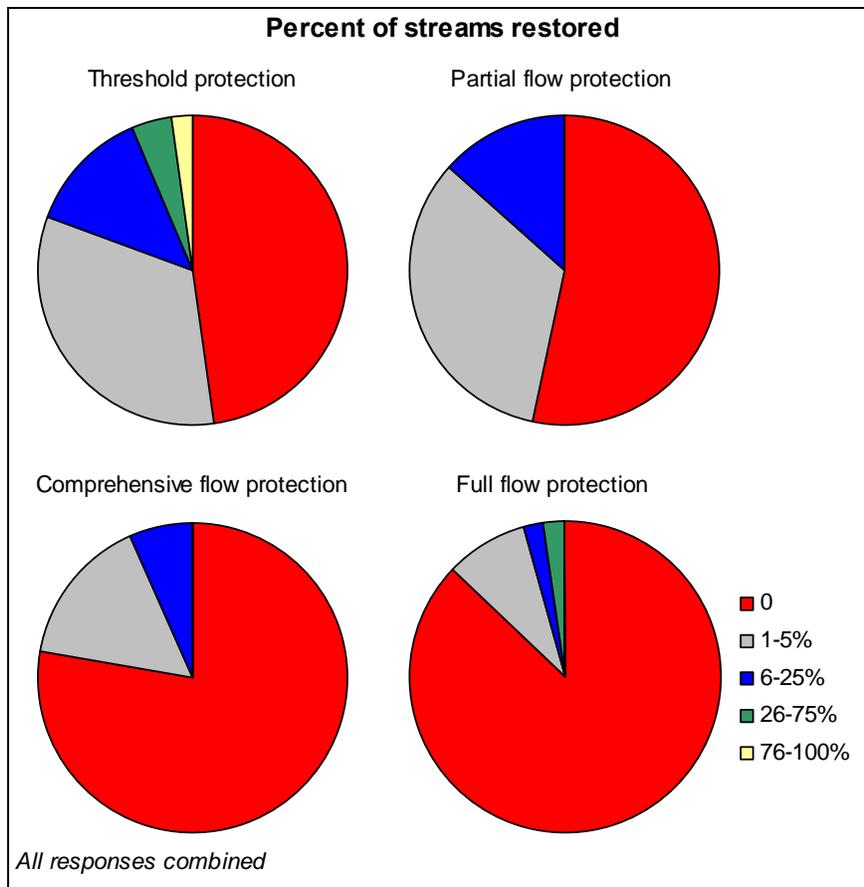


Figure 38. Percent of stream miles restored to any of four different levels of instream flow protection at the time of the survey (all responses combined). Participants were asked, "In your estimation, for what proportion of stream miles in your state or province have flows been restored to the following levels of protection?"

Analysis of the survey responses produced the following conclusions.

- Very few stream miles in either the U.S. or Canada had been restored to the highest levels of flow protection at the time of the survey.
- Relatively more stream miles had been restored to the lowest levels of flow protection at the time of the survey, however the overall extent of restoration appears low.

Outcomes

Outcomes are the desired result of all the inputs, activities and outputs of state and provincial fish and wildlife agency work. Just as it is important to know what the current conditions are in order to set priorities for future work, it is also important to make educated, informed guesses as to what future conditions will be, if current conditions and trends continue. Answers to these questions can help agencies identify areas where they need to place special emphasis to increase prospects for favorable or desirable outcomes.

To determine participants' views on their expectations for future conditions of rivers, lakes, legal opportunities, and public involvement, participants were asked, "In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed below?" Figure 39 (page 59) and Figure 40 (page 60) provide summary information for all participants combined. The regional analysis is presented in Appendix Q (page 157).

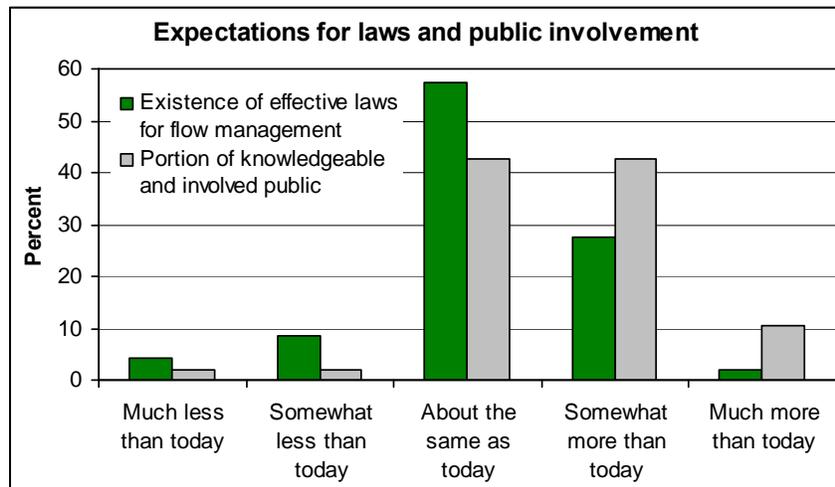


Figure 39. Expectations for future condition of laws and public involvement at the time of the survey (all responses combined). Participants were asked, "In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?"

Analysis of the survey responses produced the following conclusions.

- Most (about 85%) participants felt that the existence of effective laws would be about the same or more than at the time of the survey.
- Nearly all (96%) of participants expressed the belief that the portion of knowledgeable and involved public would be the same or more than at the time of the survey.

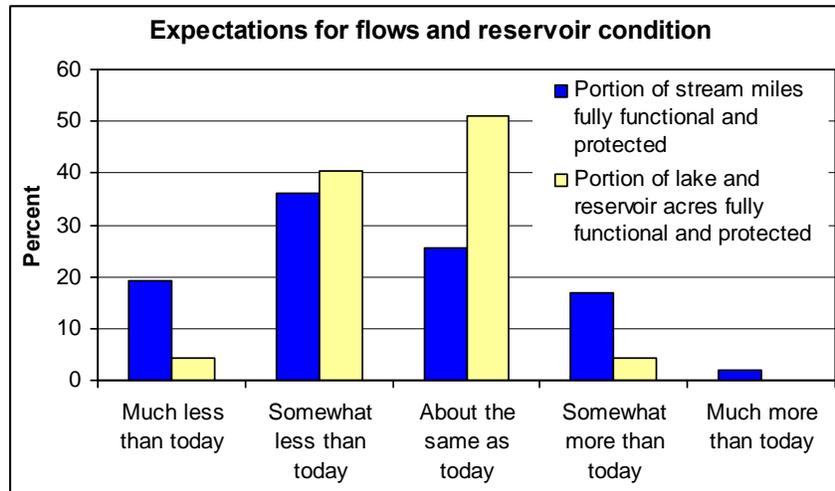


Figure 40. Expectations for future condition of rivers and lakes at the time of the survey (all responses combined). Participants were asked, “In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?”

Analysis of the survey responses produced the following conclusions.

- Participants tended to feel that even with a more supportive and involved public in combination with more effective laws for managing water and instream flow, the condition of rivers, lakes, and reservoirs was more likely to deteriorate than to improve in the future.
- *Fully functional and protected stream miles:* only a quarter of participants felt that the portion would be about the same in ten years as they were at the time of the survey, and the majority (55%) felt that it would be somewhat less or much less.
- *Fully functional and protected lake and reservoir acres:* over 50% of participants felt the portion would be about the same in ten years as at the time of the survey, 44% of participants felt that it would be somewhat less or much less, and none felt it would be much better in the future.

3. The International Instream Flow Program Initiative Workshop

Perhaps the most important step in the IIFPI project was a facilitated workshop held in Denver, Colorado during October 9–11, 2007. The workshop was held to consolidate the participants' considerable expertise in order to identify potential strategies for improving their individual effectiveness as well as their agencies' effectiveness. Workshop participants discussed and ranked drivers (defined as trends, obstacles, and opportunities) relevant to state and provincial agencies for managing water for fish and wildlife resources, and then developed a list of potential strategies for dealing with these drivers.

Prior to the workshop, the IIFPI project team conducted an on-line discussion among some of the participants via a blog (an online [web log](#)). Results from the blog are summarized in Appendix R (page 165). Along with the two surveys, the blog provided the project team, facilitators, and presenters with common themes regarding enhancing the performance of agencies and professionals working on instream flow issues. These themes were used to help plan the workshop.

Workshop Details

Representatives from 38 states, 1 U.S. territory, and 3 provinces attended the workshop, along with 14 invited experts. With very few exceptions, the workshop was attended by the same agency representative who filled out the project surveys. Some agencies sent more than one participant. A complete list of participants is available in Appendix A (page 77).

The workshop consisted of:

- an overview of a similar project (National Instream Flow Program Assessment) conducted in 1995–1998;
- an overview of the IIFPI project's survey development and results;
- a panel presentation of drivers (trends, obstacles, and opportunities) affecting instream flow work;
- periodic reflections regarding workshop progress from Mark Smith of The Nature Conservancy;
- guest addresses from the Association of Fish and Wildlife Agencies, the University of Washington, and the U.S. Fish and Wildlife Service;
- facilitated sessions to rank drivers and associated strategies, including:
 - regional breakout sessions to identify regional drivers;
 - overall rating (via dot-mocracy voting) of the top regional drivers presented to all participants;
 - regional breakout sessions to develop strategies for top regional or overall drivers; and
 - overall rating (via voting) of the top regional strategies presented to all participants;

- participant development of action plans to address drivers and strategies in their personal situations.

The workshop agenda is included in Appendix S (page 167). Detailed results from each stage of the workshop are included in the facilitators' report (available upon request from the authors or the Instream Flow Council president).

Workshop Results

Panel Presentations

The workshop's overview and panel member presentations set the stage for facilitated sessions to identify and rank drivers and associated strategies. Following the presentations, Mark Smith of The Nature Conservancy presented a summary of the presentations' main themes (Box 1). This summary identified specific areas needing improvement: communications, engaging in policy arenas, and the training and use of defensible methods. Mark Smith noted an underlying theme—that agencies and organizations need to discuss what they can do together to bridge the gap between program activities and the desired flow protection outcomes. He then pointed out that a key related question is “how to frame the issue” to the public so the public can provide the leverage with agencies and legislators that is needed to secure those flow protections.

Box 1: IIFPI Workshop Reflections—by Mark Smith of The Nature Conservancy

Main Themes from the Presentations

The first theme I want to discuss is **communications**. As Matt Hogan (Executive Director of the Association of Fish and Wildlife Agencies) pointed out there is a disconnect between the work of the IFC and the public and decision-makers. Melinda Kassen from Trout Unlimited picked up on this theme when she talked about the importance of building a common vision within a community when working at the local level. Brian Richter from The Nature Conservancy talked about the need to be specific about who the audience is, what message will resonate with them, and identifying the appropriate vehicles for communicating that message. As he said, the public is not yet 'feeling the love' about this issue.

The next theme I heard was about the need to engage in the **policy arenas**. Matt mentioned that the IFC is generally below the radar screen and that often it can be dangerous to stick one's head out of the 'foxhole'. He noted that water is 'on the agenda,' but is it on the agenda in the right way? Such work can put people, particularly those trained as scientists and working in agencies, outside of our comfort zone. For me, if we are to be effective, we need to realize that different partners have different roles and we need to recognize those differences. The IFC survey clearly showed that there is a need to change legal frameworks if environmental flows are to be protected.

We also heard from Bob Deibel (U.S. Forest Service) about the continued importance of **training** to make sure that there is a legacy of capable and well trained employees in the agencies. We also need to look beyond our own agencies for expertise, as consultants are often better versed in cutting edge technologies. And we heard about the importance of using sound **methods**—as Brian mentioned, we need to talk about and develop more holistic approaches to flow and flow related issues rather than confusing matters by saying there are 104 (or whatever) different methods.

But the major point I heard is what Kathleen Williams mentioned as a survey result and as an underlying theme to all the talks; over the past decade IFC members have improved their programs, most feel that they generally meet IFC standards, but that **there remains a big gap between the programs and the outcomes we seek**—flow protections implemented on the ground. Also, the goal of achieving protections on the ground is complicated by issues such as climate change, which are shifting priorities at all levels.

Therefore, it seems that a theme that emerged from the talks is to discuss what **we can do separately as different organizations and what we can do together** to secure the protection of environmental flows. And it seems that key question is **how to frame the issue** so we can gain the leverage that will be needed to revamp our laws and secure the protections we seek.

Development of Drivers and Strategies

The workshop included a series of facilitated sessions to develop strategies for improving agencies' instream flow protection or water management effectiveness. In the first regional breakout session, participants identified drivers (trends, obstacles, and opportunities) relevant to instream flow efforts conducted by themselves and their agencies. At the end of the breakout session, participants ranked the top five or six drivers for each region. Those top regional drivers were presented to all participants who then ranked (via voting) the drivers that were most important overall. Participants then returned to their regional breakout groups to develop strategies for the most important regional and/or overall drivers.

The regional drivers and strategies were diverse (see Appendix T, page 171), but showed much commonality across regions. As noted by Mark Smith (Box 2), the breakout groups identified common needs for enabling laws, policy frameworks, communication strategies, and adequate agency resources. Increasing water demand, climate change, and renewable energy development are important trends that will affect instream flow protection. To successfully balance water resource protection and allocation, Mark Smith noted that we need to “provide a vision that people will want to implement.”

Box 2 : IIFPI Workshop Reflections—by Mark Smith of The Nature Conservancy

Themes from the Breakout Groups

A remarkable consistency of issues and needs across the U.S States and Canadian provinces. The groups identified some significant needs:

- Strong **enabling laws** that protect environmental flows.
- Building **policy frameworks** to implement flow protections (these should recognize the link of surface and groundwater).
- Developing effective **communication strategies**—the message about the importance of this issue is not getting through.
- And the need for **adequate resources** for agencies to do their job.

The groups also highlighted some important trends:

- **Increasing demand** for water in many parts of the United States.
- **Climate change** and the push for **renewable energy**.

I also noted that the need for ‘more science’ did not make it to the list of top priorities; though, clearly, good science is the foundation for all this work. What seems to be clear from the groups is that what is missing most is public support for protecting flows for ecological reasons—it is both not a priority and it is not even on people’s minds. We need to find a way to put the issue into people’s consciousness—as Brian and others have pointed out, the message needs to be about water for life and for people, not just for fish and wildlife.

In my mind a key part of our work will need to be providing a vision of ‘success’—what does it mean and how do we achieve the society we want that provides water for our communities, our economy, and our natural environment? Politicians and other policy makers focus on being successful and achieving results valued by others—a key question for us is how we make water flow and water allocation issues a success story—**provide a vision that people will want to implement**. For me, that’s the challenge we face.

Participants ranked important strategies during a final facilitated session. Participants considered the top regional strategies, and then voted to identify the most important overall strategies. After the workshop, the planning team organized these overall strategies into six driver statements. Table 6 shows the planning team’s interpretations and summary of the driver statements and the most important overall strategies. The most important overall strategies generally are the same as the top regional strategies (Appendix T, page 171).

Summary of Drivers and Overall Strategies

Table 6. Top instream flow program improvement strategies, by driver (trend, obstacle, or opportunity). The top five overall strategies are highlighted in bold.

Driver: The public is not sufficiently knowledgeable of instream issues or sufficiently supportive of instream values.

Strategies (34% of total votes):

- Identify the audience and message; hire a marketing firm to design and identify appropriate ways to deliver the message about instream flow issues and values (10.3%).
- Use easily understood language and messages in informational materials about instream flow (7.7%).
- Demonstrate the cumulative impacts that water uses have on aquatic resources (5.9%).
- Develop and implement an international marketing campaign to increase interest in conservation of instream flow values (5.1%).
- Reframe instream flow concepts to help the public understand the connection between water for aquatic resources and “quality of life” for humans (3.5%).
- Get the “quality of life” message out (0.7%).
- The Instream Flow Council and individuals should coordinate or participate with National Fish Habitat Plan implementation to raise awareness of need for/value of environmental flows (especially higher flows) (0.5%).

Driver: The need for methods, policies, laws, and regulations that recognize ecologically-based flow/water level regimes (including all components of flow regimes).

Strategies (22% of total votes):

- Update the extensive documents created by the USFWS in the 1980s to help states identify opportunities under state and federal laws to protect instream flows (7.0%) (For example *Opportunities to Protect Instream Flows in Missouri*.)
- Frame a comprehensive legal and regulatory model that can serve as a guide for developing legal and institutional approaches (4.7%).
- For relatively unallocated systems that have little or no flow or water level information, develop interim water protections that can later be modified when more data is provided. Perhaps develop “model legislation/rule language” (4.4%).
- Develop guidance on how to comment or condition water right applications to provide for peak or elevated flow levels to provide for channel maintenance/elevated ecological flow, and water level needs (3.8%).
- Generate partnership to get state/federal legislation that will give 100% protection of flows needed to support all ecological functions for select locations (2.1%).

Driver: Lack of instream flow program priority in fish and wildlife agencies.

Strategies (16% of total votes):

- Use the Instream Flow Council to illustrate and advocate instream flow issues to agency leaders via the national and regional Association of Fish and Wildlife Agencies organizations (8.4%).
- Make instream flow issues real by illustrating resource impacts and values to agency leaders and staff (8.0%).

Driver: Need to collaborate and partner with non-governmental organizations and other stakeholders.

Strategies (14% of total votes):

- Engage non-governmental organizations and others (including water users) to communicate instream flow problems and solutions to policy makers (12.2%).
- Increase opportunities to partner (1.9%).

Driver: Need to develop agency instream flow plans and improve planning process.

Strategies (10% of total votes):

- Develop Instream Flow Council strategic vision for the future (6.1%).
- Advocate agency use of a structured decision-making process (3.5%).

Driver: Instream flow-related research availability and applicability are not known across jurisdictions.

Strategy (4% of total votes):

- Build a network among all entities (states, provinces, territories, federal government, universities, and non-governmental organizations) doing instream flow research (4.4%).

As shown in Table 6 (page 64), the strategies that address the driver regarding *insufficient public knowledge of and support for instream flow values* received 34% of the participants' votes. The most popular strategies to meet that need were:

- identifying appropriate audiences and messages,
- hiring public relations and marketing firms to help craft and deliver messages, and
- using easily understood messages in informational materials.

Other important strategies for this driver were:

- demonstrating the cumulative effects that water uses have on aquatic resources,
- helping the public understand the connection between water for aquatic resources and human quality of life, and
- developing an international marketing campaign.

Strategies to address the other important drivers generally reflected the following themes (Table 6):

- partnering,
- legal frameworks,
- instream flow priority in agencies, and
- better processes for planning, decision-making processes, and sharing research.

The individual strategy receiving the most votes (12%) was *engage non-governmental organizations and others (including water users) to communicate instream flow problems and solutions to policy makers*. A popular strategy for working towards legal frameworks that recognize ecologically-based flow/water level regimes was *update U.S. Fish and Wildlife Service documents that identify instream flow protection opportunities under state and federal laws*. Working through the *Instream Flow Council and the Association of Fish and Wildlife Agencies*, and *providing examples to illustrate instream flow issues and resource impacts to agency leaders* were important strategies to address the lack of instream flow program priority in fish and wildlife agencies. *Developing an Instream Flow Council Strategic Vision, advocating for structured decision-making processes*, and

building an inter-organizational network also were considered important overall strategies by the workshop participants.

Personal Action Plans

Toward the end of the workshop, each participant was given time to work with a colleague to develop personal action plans that address drivers and strategies important to them and their agency. Action plans were crafted on carbon paper, and each pair of participants exchanged copies. Partners agreed to call and check up on their colleague’s progress at three, six, and twelve-month intervals after the workshop to offer support for addressing the items on their action plans.

The action plans were unique to the individuals creating them, so the IIFPI project team did not summarize them in detail but looked for themes across the plans. Participants’ planned actions were organized into 41 categories which were divided into five focus areas: 1) personal actions, 2) intra-agency coordination and action, 3) coordination or action with other agencies or groups, 4) education-related actions, and 5) legal or policy actions (Appendix U, page 177). The ten most popular planned actions included: *internal and public communication; coordination with non-governmental organizations, stakeholders, and other agencies; involvement in IFC; developing agency plans; training on flow methods; and developing flow management studies and decision-making processes* (Table 7, page 66).

Table 7. Top ten actions included in personal action plans (all responses combined).

	Number of Participants
Inform and coordinate with other staff about flow issues and opportunities (prepare and give PowerPoint presentations, develop intranet communication, etc.)	21
Identify, contact or coordinate with NGOs, federal agencies, and stakeholders to promote environmental water management needs (TNC, TU, League of Women Voters, Conservation Voters, Wildlife Federation, etc.)	18
Inform and coordinate with agency leadership about water and flow issues and opportunities and work to elevate importance of water issues	16
Continue personal involvement with the IFC via meetings, listserv, Flow 2008 conference, being an officer, or working on projects	16
Develop or update an internal agency action plan, strategic plan, white paper or drought management plan to better address or elevate the priority of water management issues and opportunities	15
Work with agency’s outreach and education staff or a private marketing firm to promote environmental flow issues to the public	14
Coordinate with other state or provincial (sister) agencies to elevate awareness and/or priority of flow issues	13
Schedule or receive training on flow methods (PHABSIM, River 2-D, IHA, MesoHABSIM, etc.)	11
Develop flow management guidelines, criteria, standards, or decision-making process for my agency	10
Conduct flow quantification study on a stream or streams, Identify data that can be used to quantify flow needs, or make a recommendation from existing data.	10

Workshop Summary

As Mark Smith notes in Box 3, there is a gap between agencies' instream flow programs and the desired outcomes. In order to bridge this gap, develop shared priorities and work toward improved legal frameworks, it is critical to communicate with and engage the public, stakeholders, agency leadership, non-governmental organizations, and legislatures. Agencies and organizations need strategic visions (including visions shared with other agencies and entities) to achieve flow protection goals, reach new audiences, and find messages that resonate with the public, stakeholders, and decision-makers. The regional strategies, overall strategies, and personal action plans developed at the IIFPI workshop will contribute to state and provincial fish and wildlife agencies more effectively managing water for fish and wildlife resources.

Box 3: IIFPI Workshop Reflections—by Mark Smith of The Nature Conservancy

Overall Summary and Perspectives

To summarize what I see as the major elements of the work to develop IFC strategies by region, I think they can be captured in four primary elements:

- **Reframe the concepts** to get the message out there. Make this issue 'real' for people.
- **Engage others**—non-governmental organizations, users, Association of Fish and Wildlife Agencies—that this work cannot be accomplished alone by the IFC.
- As part of this engagement, **develop shared priorities** with these groups.
- All of this is aimed at working to **improve the legal frameworks** for flow issues.

All of which—the communications, the partnerships, the shared priorities, the improved legal frameworks—are focused on achieving the outcomes we desire—the protection of flows and the natural resources they support. In addition, it's been a constant view that the IFC should work hard to **keep what has been successful** with efforts to date—ensuring good science, building capacity of its members, and ensuring a legacy of good people and good science.

We need a **strategic vision**. As Mamie Parker (U.S. Fish and Wildlife Service) told us, we need to have a clear goal in mind. This workshop has developed a lot of good and very specific ideas about how to achieve this vision. I hope that the ideas from the break-out groups, not just those associated in the highest priority strategies are considered by the IFC. And there should be a **very strategic plan about how to achieve our goals, reach these new audiences, and craft messages that resonate with them**. While we would like to educate everyone to see the world just as we do that is not likely possible. We need to understand who the key decision-makers are, understand what it will take to 'move' them to our position, and then work hard to get them to where they need to be to make progress. We need to work in the real world of policy and politics, where, fortunately or unfortunately, getting a few key people to understand the importance of an issue and getting them to take a position is more effective than educating everyone. Yes, public support is important, but we could spend a lot of effort without much to show for our work if we don't go about our work in a very strategic manner. And the IFC is well positioned to play such a role. Just by looking at the list of speakers who attended: Matt Hogan, Mamie Parker, Brian Richter, Bob Deibel, Melinda Kassen—IFC clearly has some clout (i.e., political capital) to bring to the table and achieve its goals. And we need to continue to look forward. The IFC has people like Christopher Estes, who will not let us rest with what we know today, but remind us that we must always think ahead. "What about lakes" he challenges us—reminding us not to be complacent now that we have some grasp of protecting rivers and streams. And we need to tackle emerging issues that are high on the overall agenda—climate change and renewable energies. We can take advantage of these issues or we risk being behind the times.

So I end where we started. We identified at the beginning that **there is a gap between our programs**, which are generally consistent with the IFC standards, **and the outcomes we seek** that continue to lag seriously behind where they need to be. This workshop has been about building the bridge over this gap. The IFC is off to a great start and I know that I speak for all of The Nature Conservancy when I say we look forward to working with you on this endeavor. Thank you for this opportunity to spend the week with you and discuss this important work.

4. Project and Participation Synopsis

The core goal of the International Instream Flow Program Initiative was to identify trends and opportunities that will help state and provincial fish and wildlife management agencies develop, maintain, or improve the effectiveness of their instream flow/water volume programs. The project received strong participation, with personnel from agencies in all 50 U.S. states, Puerto Rico, and 6 Canadian provinces contributing to the project. Participants showed widespread interest in learning about other agencies' instream flow protection activities, as this understanding would provide a basis for improving their agencies' capacity for formal instream flow or water volume programs.

As expected, there were considerable differences in participants' responsibilities, the scale and organization of their agencies' programs, and the legal frameworks that apply to instream flow work in the states and provinces. IIFPI participants ranged from technical staff (such as biologists and hydrologists) to coordinators and division administrators. Each participating agency was unique in terms of its approach for dealing with instream flow-related issues—one-third of participating agencies had a formal program, over half lacked a formal program but intermittently assigned tasks to managers or had dedicated staff in different units, while some had no activities or program at all. Legal water administration frameworks under which agencies function included the riparian doctrine, prior appropriation doctrine, or some combination of the two.

Challenges and Recommendations

There are no simple solutions to the instream flow and water management challenges faced by state and provincial fish and wildlife agencies. Nor is there any one strategy that all fish and wildlife agencies could or should pursue. Each agency must chart a course appropriate for its own unique institutional, legal, and social framework.

The IIFPI project helped participants identify some of the primary challenges (or drivers) that affect instream flow management opportunities in the U.S. and Canada. Participants developed potential strategies that agencies could use to manage instream flow opportunities in ways that are consistent with their legal mandates, areas of influence, needs, and priorities.

Specifically recognize instream flow work as a priority

Many participants noted that their agencies did not specifically identify instream flow work as a priority. The first step in addressing this concern is for an agency to include instream flow or water management as a recognized component of habitat management in the agency's strategic plan or other vision documents. To achieve this, agency staff can demonstrate to agency leaders the direct relationship between water and fish and wildlife resources and the need for their agency to identify and pursue appropriate, proactive measures within their legal authority. The Instream Flow Council can further support this by advocating the importance of instream flow issues to agency leaders via the Association of Fish and Wildlife Agencies.

Logic models (Figure 8, page 22) can help agencies identify appropriate inputs, activities, and outputs to achieve desired outcomes from instream flow and water management work.

Re-allocate existing resources to instream flow work

Participants identified that obstacles to protecting aquatic resources were created by the lack of resources, staff, and training to conduct instream flow or water management work. These deficiencies appear directly related to the lack of their prioritization by agencies as noted above. One participant observed that “With the current budget cutbacks and shrinking programs there is no way that a water management program can be built if it does not already exist within most agencies.” Another noted that “Our province is perceived as having an abundance of water and we will continue to license it. Our flow program is well behind and will not catch up in ten years.”

The more effective agencies tend to have the following components:

- adequate budgets for water management activities and training;
- staff skilled in water law and policy, with a thorough understanding of water management issues and flow quantification tools;
- staff well versed in methods that address all five riverine resource components (hydrology, geomorphology, biology, water quality, and connectivity), with the ability to use methods from each discipline interactively to quantify instream flow and lake or reservoir management needs; and
- more or better access to interdisciplinary teams including experts in the five riverine resource components and holistic instream flow methods.

It may not be possible for an agency to establish new revenue sources for conducting water management work, but consideration can be given to reallocating existing resources to become more actively involved and competent in water management issues. There are also numerous examples in the U.S. where public requests and input have helped agencies make such changes in their structure, function, and budgets.

Coordinate all water management work within an agency

Agencies that seem to deal most effectively with instream flow issues typically have a formal program with dedicated staff to coordinate all water management work and comment on behalf of the agency. If an agency does not have a formal instream flow or water management program, it is important that the agency have a formalized means for providing credible input on water management issues and studies. A participant commented that “The state lacks as a whole, team members of the required disciplines to dedicate to instream flow program development. This greatly limits the development of such a program in both time and quality.”

It is unlikely that a single individual can perform the large volume of work associated with coordinating an agency’s water management responsibilities but consolidating those skills in a central authority or unit is important. Such a structure could involve a small team with an understanding of water management issues and flow quantification methods, water law, and policy, or a few individuals with dedicated access to experts in those areas.

Train staff in up-to-date methods

Another area where the lack of resources is apparent is the limited experience and lack of training staff have with current instream flow methods.

Survey participants indicated that in the five years prior to the survey:

- only a third of participants indicated that staff in their agency were adequately trained in instream flow methods,
- two-thirds of the agencies had not used the most common method (the Physical Habitat Simulation method (PHABSIM)),
- three quarters of the agencies had not used the simpler Tennant method, and
- few participants were familiar with alternate methods.

Though many instream flow studies are done by other entities, state and provincial fish and wildlife agency staff must still be knowledgeable enough to interpret and comment on both the study design and interpretation of study results in order to ensure that aquatic resources are given adequate consideration in water management decisions. Therefore each agency must have personnel with current training in conducting and reviewing instream flow studies. If agencies are to fulfill their public trust mandates, these personnel must be meaningfully involved in all instream flow studies in their state or province.

Increase legal and policy support for flow protection and restoration

The IIFPI project found that few stream miles are protected in most states and provinces. Even where some protection exists the level of protection provided in most cases is very limited. The main reason for this is a lack of effective laws and policies related to the protection or restoration of flows in streams and water levels in lakes and reservoirs. In order to maintain even the current low level of protection, agencies must actively monitor streams. This situation reflects considerable opportunity to improve the protection and restoration of instream flows in all states and provinces. As one participant stated, “Existence of laws is likely to be the same, the effectiveness is what is critical and is likely to be overwhelmed by the extent of impacts we exert on the landscape and our lack of knowledge, both on specific impacts and their relationships to other aspects and functions of the systems we live within and depend on.” Achieving higher protection will require the support and active involvement of both the public and groups outside the agencies to develop better laws and more effective policies.

Engage the public about water management issues for fish and wildlife

Participants repeatedly stressed that their agencies needed to better communicate with the public and decision-makers in order to illuminate the link between functional riverine resources and quality of life issues. They also identified the need to counter some of the misperceptions the public has about water availability, and how water is allocated and used. One participant stated that “Emphasis on education of the public and also the law and policy makers is something that is desperately needed and can be substantially assisted with by the IFC through the development of educational materials.” Another participant noted, “It is difficult to sell the idea that flows and water volumes are important to the public without the state dedicating staff to the issue. Public outreach is an important component to a successful instream flow program.” And another participant commented, “The importance of water for ecological needs is gaining increased appreciation by the public. This is the one light at the end of the tunnel; let us hope it’s not the train.”

Project participants expressed optimism that the public will become better educated about (and involved in) water management. They also felt this increased knowledge and understanding would result in better laws and policies to protect riverine resources.

Participants' optimism, however, was tempered by their view that the ecological function of streams and lakes of Canada and the U.S. will probably stay the same or decline. This view serves as a challenge to agencies to work within their abilities and authorities to channel gains in public knowledge and legal tools into more effective management of streams, lakes, and reservoirs for fish and wildlife. Effective water management for fish and wildlife is very complex and the public is unlikely to fully appreciate this fact without considerable explanation and education. However, it is rare for agencies to conduct long-term (multi-year) educational efforts like educating the public about flow restoration or protection because they often must focus their limited educational resources on short-term, reactionary issues. Some agencies have public communications staff that are capable of developing educational campaigns, but hiring outside marketing firms to develop and conduct this kind of work may be a viable option for some agencies.

Pursue partnership opportunities

Other entities such as sister agencies, non-governmental organizations, and stakeholder groups are also interested in instream flow issues. Whether their focus is on a single water management case, landscape scale improvement of flow protection or restoration, or more broad advancement of legal opportunities, responses from participants indicated that public interest is high and is increasing. This trend presents increased partnership opportunities that may benefit all parties. Especially in the area of legal or institutional change, stakeholders outside of governmental agencies can be highly effective. Fish and wildlife agencies should consider opportunities to partner with outside groups who can communicate instream flow problems and solutions (including legal frameworks) to law and policy makers and seek improved legal opportunities. These same groups can also work directly with fish and wildlife agencies to convey their values for water management and help agencies prioritize their allocation of limited financial resources and staff.

While establishing and maintaining a working relationship with outside entities, agencies should ensure that these entities understand instream flow issues well enough to effectively participate in decision-making processes. This is yet another reason why long term educational programs are necessary and useful. Agency staff will need to continually educate and inform various entities and groups in water management decisions and issues, and this requires adequate staff and budgetary resources.

Conclusions

Fish and wildlife agencies need to be more effective at communicating the natural resource and societal benefits of protecting water for fish and wildlife. While credible science is the foundation for all water management activities, legal and institutional limitations and expressed public values drive much of fish and wildlife water management in the U.S. and Canada. The IIFPI project results indicate that while maintaining their traditional commitment to conducting the best science possible, fish and wildlife agencies should concentrate on the following areas:

- implementing effective communication strategies for educating and partnering with stakeholders and the public,
- developing strong enabling laws and regulations to protect environmental flows,

- building policy frameworks to implement flow protection and link surface and groundwater, and
- ensuring that sufficient staff and resources are available within efficient organizational structures for agencies to do their jobs effectively.

Improvement in these areas will not be easy, but meeting these challenges will provide long term benefits both to fish and wildlife resources and to our society. Water management is not a simple business, nor is it an area that state and provincial fish and wildlife agencies can ignore if they are to fulfill their public trust obligations. Water management issues and decisions are increasingly complex and contentious as human populations grow and climates change. Though the institutional costs of participating in water management decisions can be high, the natural resource and societal costs of not participating are even higher. Each water allocation decision can have far-reaching ramifications, not only for the survival and prosperity of human communities but also for fish and wildlife communities and the societal benefits they provide.

Decision-makers, the public, and the fish and wildlife agencies themselves must understand that fish and wildlife agencies have a legitimate role in water allocation and management decisions. For fish and wildlife agencies to effectively manage natural resources, they must manage the habitats those organisms depend upon. Because water is the defining element of rivers, lakes, and reservoirs, fish and wildlife agencies need to play a role in water allocation and management decisions.

For fish and wildlife agencies to fulfill their public trust responsibilities of maintaining, restoring, and enhancing fish and wildlife resources, they must transcend the notion that merely keeping a little water in the creek for fish is a valid goal. Over the past few decades, advances in scientific understanding have clearly shown the importance of hydrologic variability in the ecological function of streams, lakes, and reservoirs. Unfortunately, people have a tendency to seek simple solutions to complex problems. As a result, state and provincial fish and wildlife agencies still commonly deal with pressures to manage for a single flow or water volume in an attempt to protect one or a few species. Instead, agencies should strive to manage for a hydrologic regime that varies both within years and from year-to-year and maintains the natural processes that support diverse aquatic communities.

When managing public trust resources, agency biologists and administrators are dealing with the values of their society. They must respect these values, while providing scientific information that informs and therefore shapes change in these values. As values change, public opinion changes, and the public ultimately demands this be expressed in law and policy. Integration of science, public opinion, and law is an active process and almost all change of significance is relatively slow. But the process is most effective when it involves all of the key players.

The International Instream Flow Program Initiative project illustrates that there is much opportunity for other entities to work with fish and wildlife agencies on water issues. The many strategies identified in the workshop show that there are many ways to deal with situations that are invariably unique to each agency. We encourage both agencies and non-agency interests to seek out opportunities for partnership. Organization, persistence, and patience are key factors required by all stakeholders in order to achieve meaningful outcomes that benefit public trust resources and the people who depend upon and enjoy those resources.

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Appendix A. Project Participants

The following individuals participated in the International Instream Flow Program Initiative.

Western U.S.

State	Agency Name	Participant	Survey 1	Survey 2	Workshop
AK	Alaska Department of Fish and Game	Christopher Estes	X	X	X
AK	Alaska Department of Fish and Game	Joe Klein			X
AZ	Arizona Game and Fish Department	Dave Weedman	X	X	X
CA	California Department of Fish and Game	Annie Manji	X	X	X
CO	Colorado Division of Wildlife	Mark Uppendahl	X	X	X
CO	Colorado Division of Wildlife	Jay Skinner			X
HI	Division of Aquatic Resources	Robert Nishimoto	X	X	X
ID	Idaho Department of Fish and Game	Cindy Robertson	X	X	X
MT	Montana Fish, Wildlife & Parks	Andy Brummond	X	X	
MT	Montana Fish, Wildlife & Parks	Mike McLane			X
NM	New Mexico Department of Game and Fish	Lisa Kirkpatrick	X	X	
NM	New Mexico Department of Game and Fish	Rena Held			X
NV	Nevada Department of Wildlife	Rich Haskins	X		X
OR	Oregon Department of Fish and Wildlife	E. George Robison	X	X	X
UT	Utah Division of Wildlife Resources	Eric Larson	X	X	X
WA	Washington Department of Fish and Wildlife	Hal Beecher	X	X	X
WY	Wyoming Game and Fish Department	Paul Dey	X	X	
WY	Wyoming Game and Fish Department	Tom Annear			X
WY	Wyoming Game and Fish Department	Mike Stone			X

Midwestern U.S.

State	Agency Name	Participant	Survey 1	Survey 2	Workshop
IA	Iowa Department of Natural Resources, Fisheries Division	Greg Gelwicks	X	X	
IL	Illinois Department of Natural Resources, Division of Fisheries	Jim Mick	X	X	
IN	Indiana Department of Natural Resources	Jon Eggen	X	X	
IN	Indiana Department of Natural Resources	John Buffington			X
KS	Kansas Department of Wildlife and Parks	Mark Van Scoyoc	X	X	X
KS	Kansas Department of Wildlife and Parks	Ron Kegerries			X
MI	Michigan Department of Natural Resources - Fisheries Division	Gary Whelan	X	X	

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State	Agency Name	Participant	Survey 1	Survey 2	Workshop
MN	Minnesota Department of Natural Resources	Ian Chisholm	X	X	X
MO	Missouri Department of Conservation	Del Lobb	X	X	X
MO	Missouri Department of Conservation	Jason Persinger			X
MO	Missouri Department of Conservation	Paul Blanchard			X
MO	Missouri Department of Conservation	Jane Epperson			X
ND	North Dakota Game and Fish Department	Bruce Kreft	X	X	X
NE	Nebraska Game and Parks Commission	Larry Hutchinson	X	X	X
NE	Nebraska Game and Parks Commission	Gene Zuerlein			X
NE	Nebraska Game and Parks Commission	Rick Holland			X
OH	Ohio Department of Natural Resources, Division of Wildlife	John Navarro	X	X	X
SD	South Dakota Game, Fish and Parks	Ron Koth	X	X	
WI	Wisconsin Department of Natural Resources	Bob Martini	X		
WI	Wisconsin Department of Natural Resources	Martye Griffin			X

Southeastern U.S.

State	Agency Name	Participant	Survey 1	Survey 2	Workshop
AL	Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries	James Cherry	X	X	X
AL	Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries	Stan Cook			X
AR	Arkansas Game and Fish Commission	Jeffrey Quinn	X	X	X
FL	Florida Fish and Wildlife Conservation Commission	Eric Nagjd	X	X	X
GA	Georgia Department of Natural Resources	John Biagi	X	X	
GA	Georgia Department of Natural Resources	Adam Kaeser			X
GA	Georgia Department of Natural Resources	Chuck Coomer			X
KY	Kentucky Department of Fish & Wildlife Resources	Mike Hardin	X	X	
LA	Louisiana Department of Wildlife and Fisheries	Scott Longman	X	X	
MS	Mississippi Department of Wildlife, Fisheries and Parks	Dennis Reicke	X	X	X
NC	North Carolina Wildlife Resources Commission	Chris Goudreau	X	X	X
OK	Oklahoma Department of Wildlife Conservation	Chris Whisenhunt	X	X	
SC	South Carolina Department of Natural Resources	Ron Ahle	X	X	X
TN	Tennessee Wildlife Resources Agency	Kimberly Elkin	X	X	X
TX	Texas Parks & Wildlife Department	Kevin Mayes	X	X	X
VA	Virginia Department of Game and Inland Fisheries	John Kauffman	X	X	X
WV	West Virginia Division of Natural Resources	Kerry Bledsoe	X	X	X

Northeastern U.S.

State	Agency Name	Participant	Survey 1	Survey 2	Workshop
CT	Connecticut Department of Environmental Protection, Inland Fisheries Division	Peter Aarrestad	X	X	X
CT	Connecticut Department of Environmental Protection, Inland Fisheries Division	Rick Jacobson			X
DE	Delaware Division of Fish and Wildlife	Craig Shirey	X	X	
MA	Massachusetts Department of Fish and Wildlife	Todd Richards	X	X	X
MD	Maryland Department of Natural Resources, Inland Fisheries	Charles Goudgeon	X		
ME	Maine Department of Inland Fisheries and Wildlife	Steve Timpano	X		X
NH	New Hampshire Fish and Game Department	John Magee	X		
NJ	New Jersey Division of Fish, Game and Wildlife	Lisa Barno	X		
NJ	New Jersey Division of Fish, Game and Wildlife	Damian Holynskij			X
NY	New York Department of Environmental Conservation	Mark Woythal	X	X	X
PA	Pennsylvania Fish and Boat Commission	Mark Hartle	X	X	X
RI	Rhode Island Department of Environmental Management, Division of Fish and Wildlife	Veronica Masson	X	X	
VT	Vermont Department of Fish and Wildlife	Rod Wentworth	X	X	X

Canada

Province	Agency Name	Participant	Survey 1	Survey 2	Workshop
AB	Alberta Sustainable Resource Development, Fish and Wildlife Division	Andrew Paul	X	X	X
AB	Alberta Sustainable Resource Development, Fish and Wildlife Division	Allan Locke			X
BC	BC Ministry of Environment, Ecosystems Branch,	Ron Ptolemy	X		
MB	Manitoba Water Stewardship, Fisheries Branch	Joel Hunt	X	X	X
NB	New Brunswick Natural Resources, Fish & Wildlife Branch	Kathryn Collet	X	X	X
ON	Ontario Ministry of Natural Resources	Fiona McGuinness	X	X	
ON	Ontario Ministry of Natural Resources	Charles Hendry			X
PQ	Ministère des ressources naturelles et Faune	Marc Mingelbier	X		

Others

Agency Name	Participant	Survey 1	Survey 2	Workshop
Executive Director, Instream Flow Council	Kathleen Williams			Speaker
Executive Director, Association of Fish and Wildlife Agencies	Matt Hogan			Plenary Speaker
Trout Unlimited	Melinda Kassen			Plenary Speaker
Co-leader Global Freshwater Team for The Nature Conservancy	Brian Richter			Plenary Speaker
National Instream Flow Coordinator & Hydropower Program Manager for the U.S. Forest Service	Bob Deibel			Plenary Speaker
University of Alberta	Arlene Kwasniak			Plenary Speaker
Director, Native American Law Center, University of Washington Law School	Robert Anderson			Dinner Speaker
U.S. Fish and Wildlife Service	Mamie Parker			Lunch Speaker
U.S. Geological Survey, retired	Clair Stalnaker			Invitee
The Nature Conservancy	Mary Davis			Invitee
The Nature Conservancy	Eloise Kendy			Invitee
The Nature Conservancy	Robert Wigington			Invitee
National Fish and Wildlife Foundation	Claire Thorp			Invitee
Director, Eastern U.S. Freshwater Program for The Nature Conservancy	Mark Smith			Invitee

Appendix B. IFC Policies

Survey 1 was based on the following list of IFC policies. The top five most consistent policies in each region are coded and the bottom five least consistent in each region are coded . As some policies were tied, there may be greater than five policies coded for each region. Boxes with no color coding indicate that the policy was not among the most or least consistent for any region.

Question Number—Policy	West	Midwest	Southeast	Northeast	Canada
2.1 Public Input. Effective instream flow programs should incorporate public input in the decision-making process.					
2.2 Public Education. State and provincial instream flow programs should include specific actions to inform the public about instream flow concepts, how instream flows are administered, what benefits the programs provide, and what opportunities exist for public involvement.					
2.3 Effective Communication. Information intended for public consideration in instream flow decision-making processes should be straightforward, free of jargon, and provide a basic description of technical and legal concepts, biological processes, and trade-offs.					
2.4 Priority and Legal Standing. For prior appropriation jurisdictions, instream flow rights, reservations, and licenses to restore, manage, and/or protect the aquatic resources of streams, rivers, and lakes should have priority and legal standing to protect aquatic resources.					
2.5 Water Rights Certainty. State and provincial agencies should have the ability to irrevocably protect instream flows through the use of water withdrawal permitting authority, instream water rights, reservations, licenses or some other mechanism that allows the agency to fulfill their custodial trust obligations for riverine resources.					
2.6 Public Interest. States and provinces should designate instream uses of water as in the public interest and/or beneficial uses to ensure that riverine resources and processes are considered on an equal basis with other traditional uses of water.					
2.7 Connectivity of Surface and Ground Water (Legal). The hydrological interconnectivity between ground water and surface flows should be recognized in laws, regulations, and/or policy, and these waters should be conjunctively managed to protect the short- and long-term fundamental public value of fishery and wildlife resources and habitats.					
2.8 Fishery and Wildlife Agency Role. State and provincial fishery and wildlife agencies should have the primary authority for determining appropriate stream and river flow quantity, quality, and other needs and requirements necessary to restore, manage, and protect fishery and aquatic wildlife resources and processes.					
2.9 Water Conservation. For prior appropriation jurisdictions, state and provincial governments should develop and implement legal opportunities to enable consumptive water users to conserve water and dedicate conserved or unused water to instream purposes.					

Question Number—Policy	West	Midwest	Southeast	Northeast	Canada
2.10 Water Quality Standards. Stream and river flow quantity and other needs and requirements necessary to restore, manage, and protect aquatic and riparian fishery and wildlife resources and habitats should be included within water quality standards and permitting processes.					
2.11 Public Funding. Public funding for water management projects should include conditions for the protection of instream flows necessary to meet the needs and requirements of aquatic and riparian fishery and wildlife resources and habitats.					
2.12 Riverine Resource Stewardship. All streams and rivers should have instream flows that maintain or restore, to the greatest extent possible, ecological functions and processes similar to those exhibited in their natural or unaltered state.					
2.13 Public Trust Advocacy. Advocacy for and protection of the principles of the Public Trust Doctrine must be among the fundamental guiding principles of effective instream flow activities/programs.					
2.14 Native Species. Instream flow activities/programs should acknowledge the importance of and need to manage stream communities and indigenous aquatic biota. Management of nonnative species should not threaten the long-term health or survival of native species and their habitats.					
2.15 Reservoir Management. Instream flow activities/programs should acknowledge the effects of new and existing dams on sediment transport and allow managers the ability to recommend strategies for water releases and sediment management that minimize negative effects to existing channel, riparian, and floodplain properties and processes below the dam.					
2.16 Dam Removal. Instream flow activities/programs should support the removal or modification of dams or in-channel barriers and restoration or rehabilitation of affected riverine resources to more natural conditions and functions when those structures' benefits no longer outweigh their societal costs.					
2.17 Process Development. Instream flow programs should establish a process for quantifying instream flow needs that allows the state, or provincial, fishery and wildlife management agency to identify or approve study needs, study design, data analysis, and flow implementation.					
2.18 Legal Authority. Effective instream flow activities/programs must be based on a clear recognition of legal authorities to protect, enhance, and restore instream flow for public riverine resources.					
2.19 Legal Counsel. Instream flow practitioners should have ready access to specifically trained legal counsel familiar with water law statutes and instream flow activities/programs in order to obtain consistent representation and maximize instream flow benefits under existing laws and regulations.					
2.20 Negotiation. Effective instream flow activities/programs should involve personnel who are trained in negotiation skills, supported by their agency administration, and engaged in appropriate negotiation from the start of projects.					

Question Number—Policy	West	Midwest	Southeast	Northeast	Canada
2.21 Interdisciplinary Teams. Effective instream flow activities/programs require a well-coordinated, interdisciplinary team with adequate staff, training, and funding to address all instream flow and related issues that fall under the agency's responsibilities.					
2.22 Comprehensive Water Resource Planning. Comprehensive water resource planning that includes recognition of instream flows as an essential water use is an important part of effective instream flow activities/programs.					
2.23 Drought Planning. State and provincial instream flow activities/programs should support and participate in development of mechanisms or plans to implement water use reductions during drought periods to protect essential instream flows.					
2.24 Flow Variability. Instream flow prescriptions should provide intra-annual and interannual variable flow patterns that mimic the natural hydrograph (magnitude, duration, timing, rate of change) to maintain or restore processes that sustain natural riverine characteristics.					
2.25 Riverine Components. Instream flow studies must evaluate flow needs and opportunities in terms of hydrology, biology, geomorphology, water quality, and connectivity.					
2.26 Stream Gaging. Instream flow activities/programs must support individual gaging stations and networks of gaging stations necessary to quantify hydrographs, make and defend instream flow prescriptions, and monitor and enforce instream flow compliance.					
2.27 Discharge Measurements. Discharge meters, stream gaging devices, and flow data collection protocols should meet accepted standards of the U.S. Geological Survey and/or Environment Canada.					
2.28 Synthetically Developed Hydrologic Data. Instream flow assessments based on synthetically developed hydrologic information should acknowledge the source and quality of data. Final decisions or agreements should be based on collection and use of appropriate field data to refine the precision of the original estimates.					
2.29 Land Use. Instream flow practitioners should recognize the effects of land use practices on instream flows and work with land managers to promote land use practices that maintain or restore the natural hydrograph and avoid or minimize those that negatively affect the natural hydrograph.					
2.30 Habitat. Instream flow prescriptions must maintain flows that protect or restore spatially complex and diverse habitats, which are available through all seasons.					
2.31 Ice Processes. Water management decisions for streams that are prone to ice formation should document the potential effects that the proposed action might have on the stream channel or associated aquatic organisms and, where appropriate, include measures to minimize or avoid potentially negative effects of project-related ice forming processes.					

Question Number—Policy	West	Midwest	Southeast	Northeast	Canada
2.32 Channel Maintenance. Channel maintenance flow is an essential component of instream flow prescriptions for alluvial channels, and the maintenance, rehabilitation, restoration, and preservation of stream channel form and associated biological communities.					
2.33 Flushing Flow. For many stream types, a flushing flow for removing fine sediments is a necessary component of instream flow prescriptions.					
2.34 Channel Modifications. Any proposed stream channel modification should document the hydrologic and geomorphic character and function of the watershed and floodplain and incorporate principles of applied fluvial geomorphology and natural habitat features.					
2.35 Instream Mining. Instream mining as a source of sand, gravel, or other materials should only be considered as a last option, and the mining operation should only be allowed to remove material in excess of the normal sediment transport carrying capacity of the stream.					
2.36 Water Quality. Instream flow prescriptions must recognize the relation between the quantity and quality of water in streams, document the effects of water quality changes on riverine resources, and implement prescriptions that maintain or improve water quality characteristics for natural riverine resources.					
2.37 Riparian Connectivity. Instream flow prescriptions must recognize the connectivity between instream flows and riparian areas and maintain or establish riparian structure and functions.					
2.38 Floodplain Connectivity. Instream flow prescriptions should maintain or re-establish connectivity between instream flows and floodplains.					
2.39 Groundwater Connectivity (Management). Instream flow prescriptions should recognize and describe the extent and nature of connectivity between instream flows and groundwater and manage groundwater withdrawals to avoid potentially negative impacts on instream flows and riverine resources.					
2.40 Longitudinal Connectivity. Instream flow prescriptions should recognize and document the importance of connectivity within defined stream segments and the stream system in general. Management actions should avoid creating longitudinal disconnectivity where appropriate and restore connectivity where needed.					
2.41 Monitoring. Monitoring riverine resource responses to instream flow prescriptions is a fundamental component of effective instream flow activities/programs. Monitoring studies should be based on long-term ecosystem processes as opposed to short-term responses of individual species.					

Question Number—Policy	West	Midwest	Southeast	Northeast	Canada
<p>2.42 Adaptive Management. Adaptive management can be an effective tool but should be used selectively to answer critical uncertainties for instream flow-setting processes.</p>					
<p>2.43 Lake and Reservoir Management. In addition to flow regimes in rivers and streams, effective instream flow/water management programs should integrate and include protection and enhancement efforts/mechanisms for quantifying and retaining sufficient amounts of water volumes within lakes, ponds, and reservoirs to support ecological functions. This applies to water bodies that are both directly/indirectly interconnected with or isolated from flowing water systems.</p>					

Appendix C. Most and Least Consistent Policies for Each Region

Table C-1. IFC policies (including ties) that agencies in the western U.S. were most consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 13.

IFC Policy	Number of agencies that are fully consistent
Public Interest - States and provinces should designate instream uses of water as in the public interest and/or beneficial uses to ensure that riverine resources and processes are considered on an equal basis with other traditional uses of water.	5
Discharge Measurements - Discharge meters, stream gaging devices, and flow data collection protocols should meet accepted standards of the U.S. Geological Survey and/or Environment Canada.	4
Priority and Legal Standing - For prior appropriation jurisdictions, instream flow rights, reservations, and licenses to restore, manage, and/or protect the aquatic resources of streams, rivers, and lakes should have priority and legal standing to protect aquatic resources.	3
Synthetically Derived Hydrologic Data - Instream flow assessments based on synthetically developed hydrologic information should acknowledge the source and quality of data. Final decisions or agreements should be based on collection and use of appropriate field data to refine the precision of the original estimates.	7
Legal Authority - Effective instream flow activities/programs must be based on a clear recognition of legal authorities to protect, enhance, and restore instream flow for public riverine resources.	7
Native Species - Instream flow activities/programs should acknowledge the importance of and need to manage stream communities and indigenous aquatic biota. Management of nonnative species should not threaten the long-term health or survival of native species and their habitats.	6

Table C-2. The five IFC policies (including ties) that agencies in the western U.S. were least consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 13.

IFC Policy	Number of agencies that are fully consistent
Adaptive Management - Adaptive management can be an effective tool but should be used selectively to answer critical uncertainties for instream flow-setting processes.	0
Water Quality - Instream flow prescriptions must recognize the relation between the quantity and quality of water in streams, document the effects of water quality changes on riverine resources, and implement prescriptions that maintain or improve water quality characteristics for natural riverine resources.	0
Riverine Resource Stewardship - All streams and rivers should have instream flows that maintain or restore, to the greatest extent possible, ecological functions and processes similar to those exhibited in their natural or unaltered state.	0
Water Conservation - For prior appropriation jurisdictions, state and provincial governments should develop and implement legal opportunities to enable consumptive water users to conserve water and dedicate conserved or unused water to instream purposes.	3
Monitoring - Monitoring riverine resource responses to instream flow prescriptions is a fundamental component of effective instream flow activities/programs. Monitoring studies should be based on long-term ecosystem processes as opposed to short-term responses of individual species.	0

Table C-3. The five IFC policies (including ties) that agencies in the midwestern U.S. were most consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 12.

IFC Policy	Number of agencies that are fully consistent
Discharge Measurements - Discharge meters, stream gaging devices, and flow data collection protocols should meet accepted standards of the U.S. Geological Survey and/or Environment Canada.	8
Instream Mining - Instream mining as a source of sand, gravel, or other materials should only be considered as a last option, and the mining operation should only be allowed to remove material in excess of the normal sediment transport carrying capacity of the stream.	5
Channel Modification - Any proposed stream channel modification should document the hydrologic and geomorphic character and function of the watershed and floodplain and incorporate principles of applied fluvial geomorphology and natural habitat features.	4
Channel Maintenance - Channel maintenance flow is an essential component of instream flow prescriptions for alluvial channels, and the maintenance, rehabilitation, restoration, and preservation of stream channel form and associated biological communities.	5
Stream Gaging - Instream flow activities/programs must support individual gaging stations and networks of gaging stations necessary to quantify hydrographs, make and defend instream flow prescriptions, and monitor and enforce instream flow compliance.	3
Comprehensive Water Resource Planning - Comprehensive water resource planning that includes recognition of instream flows as an essential water use is an important part of effective instream flow activities/programs.	4
Dam Removal - Instream flow activities/programs should support the removal or modification of dams or in-channel barriers and restoration or rehabilitation of affected riverine resources to more natural conditions and functions when those structures' benefits no longer outweigh their societal costs.	3
Public Trust Advocacy - Advocacy for and protection of the principles of the Public Trust Doctrine must be among the fundamental guiding principles of effective instream flow activities/programs.	3

Table C-4. The five IFC policies (including ties) that agencies in the midwestern U.S. were least consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 12.

IFC Policy	Number of agencies that are fully consistent
Interdisciplinary Teams - Effective instream flow activities/programs require a well-coordinated, interdisciplinary team with adequate staff, training, and funding to address all instream flow and related issues that fall under the agency's responsibilities.	1
Flushing Flow - For many stream types, a flushing flow for removing fine sediments is a necessary component of instream flow prescriptions.	1
Ice Processes - Water management decisions for streams that are prone to ice formation should document the potential effects that the proposed action might have on the stream channel or associated aquatic organisms and, where appropriate, include measures to minimize or avoid potentially negative effects of project-related ice forming processes.	1
Public Interest - States and provinces should designate instream uses of water as in the public interest and/or beneficial uses to ensure that riverine resources and processes are considered on an equal basis with other traditional uses of water.	0
Water Rights Certainty - State and provincial agencies should have the ability to irrevocably protect instream flows through the use of water withdrawal permitting authority, instream water rights, reservations, licenses or some other mechanism that allows the agency to fulfill their custodial trust obligations for riverine resources.	0

Table C-5. The five IFC policies (including ties) that agencies in the southeastern U.S. were most consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 14.

IFC Policy	Number of agencies that are fully consistent
Native Species - Instream flow activities/programs should acknowledge the importance of and need to manage stream communities and indigenous aquatic biota. Management of nonnative species should not threaten the long-term health or survival of native species and their habitats.	8
Discharge Measurements - Discharge meters, stream gaging devices, and flow data collection protocols should meet accepted standards of the U.S. Geological Survey and/or Environment Canada.	7
Flow Variability - Instream flow prescriptions should provide intra-annual and interannual variable flow patterns that mimic the natural hydrograph (magnitude, duration, timing, rate of change) to maintain or restore processes that sustain natural riverine characteristics.	4
Riverine Components - Instream flow studies must evaluate flow needs and opportunities in terms of hydrology, biology, geomorphology, water quality, and connectivity.	3
Lake and Reservoir Management - In addition to flow regimes in rivers and streams, effective instream flow/water management programs should integrate and include protection and enhancement efforts/mechanisms for quantifying and retaining sufficient amounts of water volumes within lakes, ponds, and reservoirs to support ecological functions. This applies to water bodies that are both directly/indirectly interconnected with or isolated from flowing water systems.	3

Table C-6. IFC policies that agencies in the southeastern U.S. were least consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 14.

IFC Policy	Number of agencies that are fully consistent
Public Communication - Information intended for public consideration in instream flow decision-making processes should be straightforward, free of jargon, and provide a basic description of technical and legal concepts, biological processes, and trade-offs.	1
Fish and Wildlife Agency Role - State and provincial fishery and wildlife agencies should have the primary authority for determining appropriate stream and river flow quantity, quality, and other needs and requirements necessary to restore, manage, and protect fishery and aquatic wildlife resources and processes.	1
Legal Counsel - Instream flow practitioners should have ready access to specifically trained legal counsel familiar with water law statutes and instream flow activities/programs in order to obtain consistent representation and maximize instream flow benefits under existing laws and regulations.	2
Groundwater Connectivity (Management) - Instream flow prescriptions should recognize and describe the extent and nature of connectivity between instream flows and groundwater and manage groundwater withdrawals to avoid potentially negative impacts on instream flows and riverine resources.	1
Public Education - State and provincial instream flow programs should include specific actions to inform the public about instream flow concepts, how instream flows are administered, what benefits the programs provide, and what opportunities exist for public involvement.	1
Interdisciplinary Teams - Effective instream flow activities/programs require a well-coordinated, interdisciplinary team with adequate staff, training, and funding to address all instream flow and related issues that fall under the agency's responsibilities.	0

Table C-7. IFC policies that agencies in the northeastern U.S. were most consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 11.

IFC Policy	Number of agencies that are fully consistent
Discharge Measurements - Discharge meters, stream gaging devices, and flow data collection protocols should meet accepted standards of the U.S. Geological Survey and/or Environment Canada.	10
Instream Mining - Instream mining as a source of sand, gravel, or other materials should only be considered as a last option, and the mining operation should only be allowed to remove material in excess of the normal sediment transport carrying capacity of the stream.	3
Legal Authority - Effective instream flow activities/programs must be based on a clear recognition of legal authorities to protect, enhance, and restore instream flow for public riverine resources.	8
Synthetically Derived Hydrologic Data - Instream flow assessments based on synthetically developed hydrologic information should acknowledge the source and quality of data. Final decisions or agreements should be based on collection and use of appropriate field data to refine the precision of the original estimates.	7
Dam Removal - Instream flow activities/programs should support the removal or modification of dams or in-channel barriers and restoration or rehabilitation of affected riverine resources to more natural conditions and functions when those structures' benefits no longer outweigh their societal costs.	6

Table C-8. IFC policies that agencies in the northeastern U.S. were least consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 11.

IFC Policy	Number of agencies that are fully consistent
Fish and Wildlife Agency Role - State and provincial fishery and wildlife agencies should have the primary authority for determining appropriate stream and river flow quantity, quality, and other needs and requirements necessary to restore, manage, and protect fishery and aquatic wildlife resources and processes.	0
Riverine Resource Stewardship - All streams and rivers should have instream flows that maintain or restore, to the greatest extent possible, ecological functions and processes similar to those exhibited in their natural or unaltered state.	1
Interdisciplinary Teams - Effective instream flow activities/programs require a well-coordinated, interdisciplinary team with adequate staff, training, and funding to address all instream flow and related issues that fall under the agency's responsibilities.	1
Floodplain Connectivity - Instream flow prescriptions should maintain or re-establish connectivity between instream flows and floodplains.	2
Ice Processes - Water management decisions for streams that are prone to ice formation should document the potential effects that the proposed action might have on the stream channel or associated aquatic organisms and, where appropriate, include measures to minimize or avoid potentially negative effects of project-related ice forming processes.	1
Reservoir Management - Instream flow activities/programs should acknowledge the effects of new and existing dams on sediment transport and allow managers the ability to recommend strategies for water releases and sediment management that minimize negative effects to existing channel, riparian, and floodplain properties and processes below the dam.	1
Flushing Flow - For many stream types, a flushing flow for removing fine sediments is a necessary component of instream flow prescriptions.	2
Monitoring - Monitoring riverine resource responses to instream flow prescriptions is a fundamental component of effective instream flow activities/programs. Monitoring studies should be based on long-term ecosystem processes as opposed to short-term responses of individual species.	0

Table C-9. IFC policies that agencies in Canada were most consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 6.

IFC Policy	Number of agencies that are fully consistent
Native Species - Instream flow activities/programs should acknowledge the importance of and need to manage stream communities and indigenous aquatic biota. Management of nonnative species should not threaten the long-term health or survival of native species and their habitats.	4
Legal Authority - Effective instream flow activities/programs must be based on a clear recognition of legal authorities to protect, enhance, and restore instream flow for public riverine resources.	4
Discharge Measurements - Discharge meters, stream gaging devices, and flow data collection protocols should meet accepted standards of the U.S. Geological Survey and/or Environment Canada.	3
Comprehensive Water Resource Planning - Comprehensive water resource planning that includes recognition of instream flows as an essential water use is an important part of effective instream flow activities/programs.	2
Stream Gaging - Instream flow activities/programs must support individual gaging stations and networks of gaging stations necessary to quantify hydrographs, make and defend instream flow prescriptions, and monitor and enforce instream flow compliance.	1

Table C-10. IFC policies that agencies in Canada were least consistent with at the time of the survey. The rank for policies was based on a numeric average that was calculated using *not consistent* (1), *somewhat consistent* (2), *fully consistent* (3), and *exceeds standard* (4). Numbers in the column to the right of this table show only the number of agencies that were fully consistent with each policy, or exceeded the standard. Total number of agencies = 6.

IFC Policy	Number of agencies that are fully consistent
Connectivity of Surface and Groundwater (Legal) - The hydrological interconnectivity between ground water and surface flows should be recognized in laws, regulations, and/or policy, and these waters should be conjunctively managed to protect the short- and long-term fundamental public value of fishery and wildlife resources and habitats.	1
Water Quality Standards - Stream and river flow quantity and other needs and requirements necessary to restore, manage, and protect aquatic and riparian fishery and wildlife resources and habitats should be included within water quality standards and permitting processes.	1
Negotiation - Effective instream flow activities/programs should involve personnel who are trained in negotiation skills, supported by their agency administration, and engaged in appropriate negotiation from the start of projects.	0
Groundwater Connectivity (Management) - Instream flow prescriptions should recognize and describe the extent and nature of connectivity between instream flows and groundwater and manage groundwater withdrawals to avoid potentially negative impacts on instream flows and riverine resources.	1
Public Interest - States and provinces should designate instream uses of water as in the public interest and/or beneficial uses to ensure that riverine resources and processes are considered on an equal basis with other traditional uses of water.	1

Appendix D. Trends in Consistency with IFC Policies

The following are lists of policies for each region that participants indicated their agencies were more consistent with at the time of the survey than they were ten years prior. The list of policies that agencies are less consistent with at the time of the survey versus ten years prior is the same as is presented for overall results in Table 4 (page 18) of the text. The numbers preceding the statements refer to the survey question numbers (as shown in Appendix B, page 81).

Western U.S.

2.34 Channel Modifications. Any proposed stream channel modification should document the hydrologic and geomorphic character and function of the watershed and floodplain and incorporate principles of applied fluvial geomorphology and natural habitat features.

2.14 Native Species. Instream flow activities/programs should acknowledge the importance of and need to manage stream communities and indigenous aquatic biota. Management of nonnative species should not threaten the long-term health or survival of native species and their habitats.

2.24 Flow Variability. Instream flow prescriptions should provide intra-annual and inter-annual variable flow patterns that mimic the natural hydrograph (magnitude, duration, timing, rate of change) to maintain or restore processes that sustain natural riverine characteristics.

2.37 Riparian Connectivity. Instream flow prescriptions must recognize the connectivity between instream flows and riparian areas and maintain or establish riparian structure and functions.

Midwestern U.S.

2.34 Channel Modifications. Any proposed stream channel modification should document the hydrologic and geomorphic character and function of the watershed and floodplain and incorporate principles of applied fluvial geomorphology and natural habitat features.

2.29 Land Use. Instream flow practitioners should recognize the effects of land use practices on instream flows and work with land managers to promote land use practices that maintain or restore the natural hydrograph and avoid or minimize those that negatively affect the natural hydrograph.

Southeastern U.S.

2.25 Riverine Components. Instream flow studies must evaluate flow needs and opportunities in terms of hydrology, biology, geomorphology, water quality, and connectivity.

2.14 Native Species. Instream flow activities/programs should acknowledge the importance of and need to manage stream communities and indigenous aquatic biota. Management of nonnative species should not threaten the long-term health or survival of native species and their habitats.

2.15 Reservoir Management. Instream flow activities/programs should acknowledge the effects of new and existing dams on sediment transport and allow managers the ability to recommend strategies for water releases and sediment management that minimize negative effects to existing channel, riparian, and floodplain properties and processes below the dam.

Northeastern U.S.

2.36 Water Quality. Instream flow prescriptions must recognize the relation between the quantity and quality of water in streams, document the effects of water quality changes on riverine resources, and implement prescriptions that maintain or improve water quality characteristics for natural riverine resources.

2.25 Riverine Components. Instream flow studies must evaluate flow needs and opportunities in terms of hydrology, biology, geomorphology, water quality, and connectivity.

2.24 Flow Variability. Instream flow prescriptions should provide intra-annual and interannual variable flow patterns that mimic the natural hydrograph (magnitude, duration, timing, rate of change) to maintain or restore processes that sustain natural riverine characteristics.

Canada

2.25 Riverine Components. Instream flow studies must evaluate flow needs and opportunities in terms of hydrology, biology, geomorphology, water quality, and connectivity.

2.24 Flow Variability. Instream flow prescriptions should provide intra-annual and interannual variable flow patterns that mimic the natural hydrograph (magnitude, duration, timing, rate of change) to maintain or restore processes that sustain natural riverine characteristics.

2.37 Riparian Connectivity. Instream flow prescriptions must recognize the connectivity between instream flows and riparian areas and maintain or establish riparian structure and functions.

2.36 Water Quality. Instream flow prescriptions must recognize the relation between the quantity and quality of water in streams, document the effects of water quality changes on riverine resources, and implement prescriptions that maintain or improve water quality characteristics for natural riverine resources.

2.1 Public Input. Effective instream flow programs should incorporate public input in the decision-making process.

2.30 Habitat. Instream flow prescriptions must maintain flows that protect or restore spatially complex and diverse habitats, which are available through all seasons.

2.32 Channel Maintenance. Channel maintenance flow is an essential component of instream flow prescriptions for alluvial channels, and the maintenance, rehabilitation, restoration, and preservation of stream channel form and associated biological communities.

2.41 Monitoring. Monitoring riverine resource responses to instream flow prescriptions is a fundamental component of effective instream flow activities/programs. Monitoring studies should be based on long-term ecosystem processes as opposed to short-term responses of individual species.

Appendix E. Regional Responses to Question 2.2 (Adequate access to various resources)

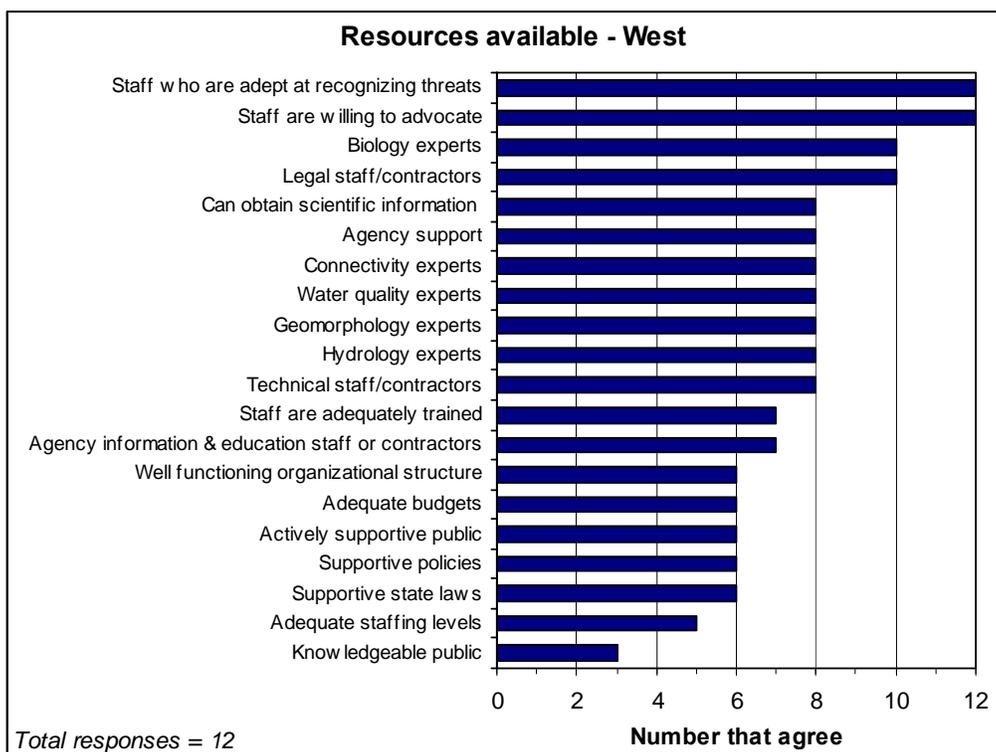


Figure E-1. Resources available in the western U.S. at the time of the survey (all responses combined). Participants were asked to agree or disagree with statements in the format of “We have adequate access to or support from *needed resource*.” Other questions simply asked whether participants had adequate levels of various inputs. The graph shows affirmative responses (e.g., they agreed they had adequate access to and support from each resource).

Key findings

- Responses for agencies in the western U.S. were generally similar to responses for all participants combined. All participants indicated they were adept at recognizing threats to riverine resources and staff are willing to advocate for those resources.
- Most participants indicated their agencies had adequate access to biology experts and legal experts.
- Over half of all participants indicated their agencies had adequate access to experts in most scientific disciplines related to instream flow quantification and could obtain needed scientific information (gage data).
- Few participants indicated the public in their state was knowledgeable about water management issues.

- Less than half of all participants indicated their agencies had adequate budgets, staffing, laws, or policies.
- Most participants did not feel their agencies exhibited a well-functioning organizational structure for dealing with water management issues.

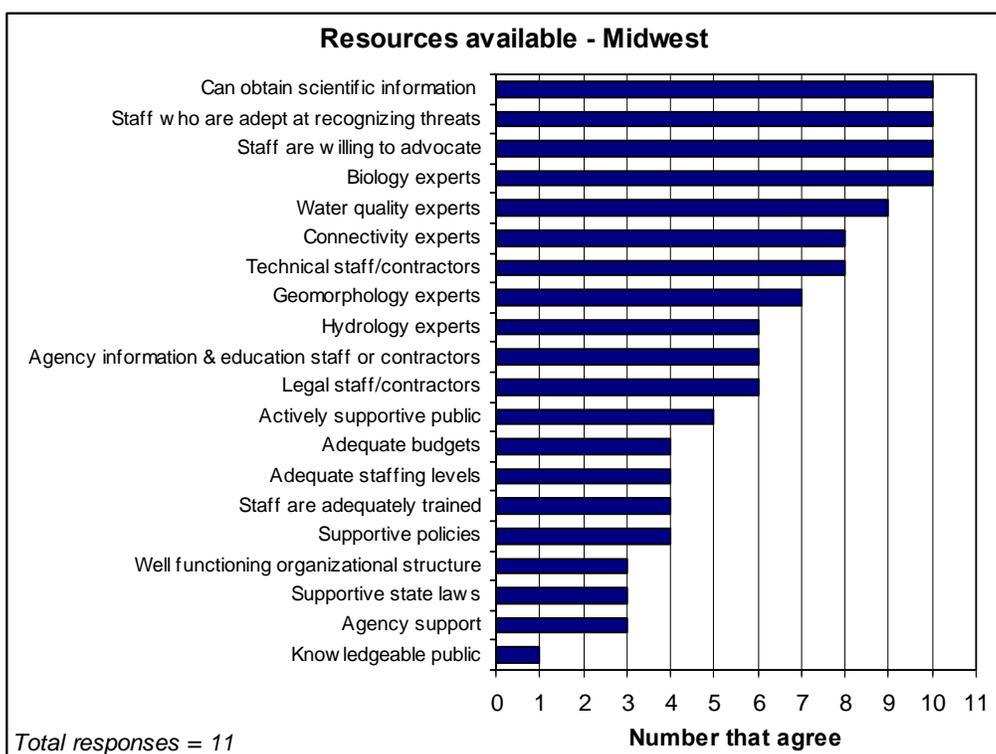


Figure E-2. Resources available in the midwestern U.S. at the time of the survey (all responses combined). Participants were asked to agree or disagree with statements in the format of “We have adequate access to or support from *needed resource*.” Other questions simply asked whether participants had adequate levels of various inputs. The graph shows affirmative responses (e.g., they agreed they had adequate access to and support from each resource).

Key findings

- Most participants indicated their agencies could obtain needed scientific information (gauge data) on streams.
- Likewise, most participants indicated their agencies was adept at recognizing threats to riverine resources and that they were willing to advocate for those resources.
- The majority of participants in this region agreed that their agencies had adequate access to experts in most scientific disciplines related to instream flow, especially biology and water quality.
- As in other regions, most participants said the public in their state was not knowledgeable about water management issues.
- Unlike most other regions, participants in the Midwest felt that they not only did not have supportive laws or a well-functioning organizational structure, but also lacked agency support to work on water management issues.

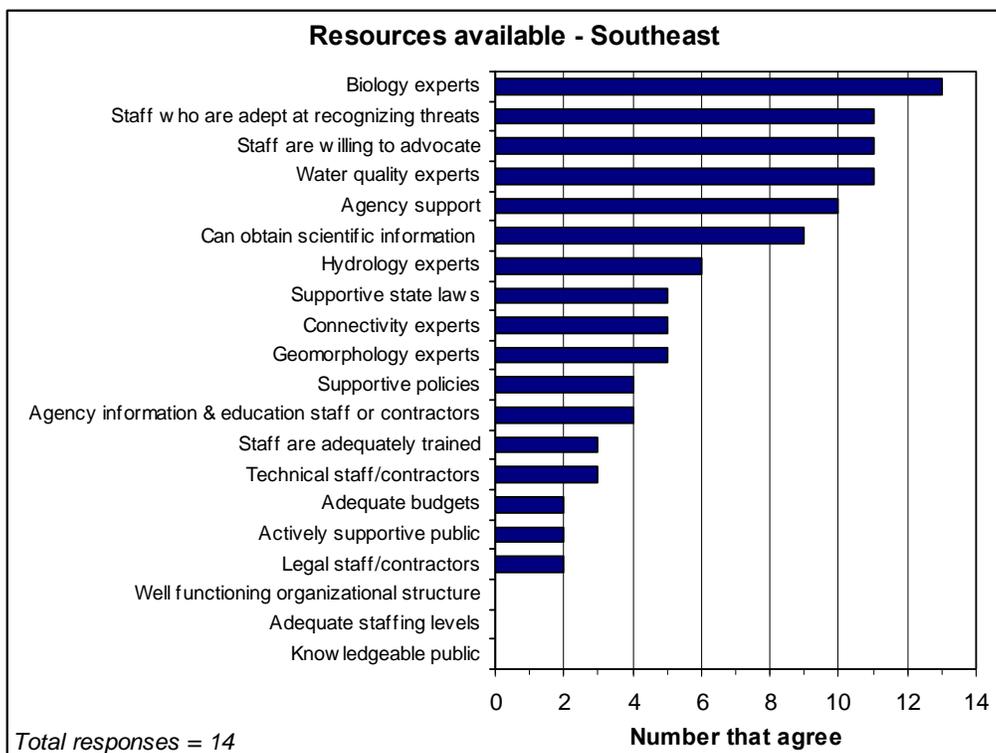


Figure E-3. Resources available in the southeastern U.S. at the time of the survey (all responses combined). Participants were asked to agree or disagree with statements in the format of “We have adequate access to or support from *needed resource*.” Other questions simply asked whether participants had adequate levels of various inputs. The graph shows affirmative responses (e.g., they agreed they had adequate access to and support from each resource).

Key findings

- Most participants indicated their agencies had access to needed experts in biology related to instream flow issues.
- Likewise, the majority of participants said their agencies were adept at recognizing threats to riverine resources and their staff members were willing to advocate for those resources.
- Participants in this region indicated their agencies had access to needed water quality experts and also had adequate agency support for their work related to instream flow issues.
- A significant difference between this region and the others was that not a single participant noted that the public in their state was knowledgeable about instream flow issues, none felt they had adequate staffing levels for instream flow and none said they had a well-functioning organizational structure.
- Other significant issues were lack of access to legal staff or contractors, the absence of an actively supportive public, and inadequate budgets.
- No participants indicated their agencies had adequate access to a well functioning organization structure, adequate staffing levels, or a knowledgeable public.

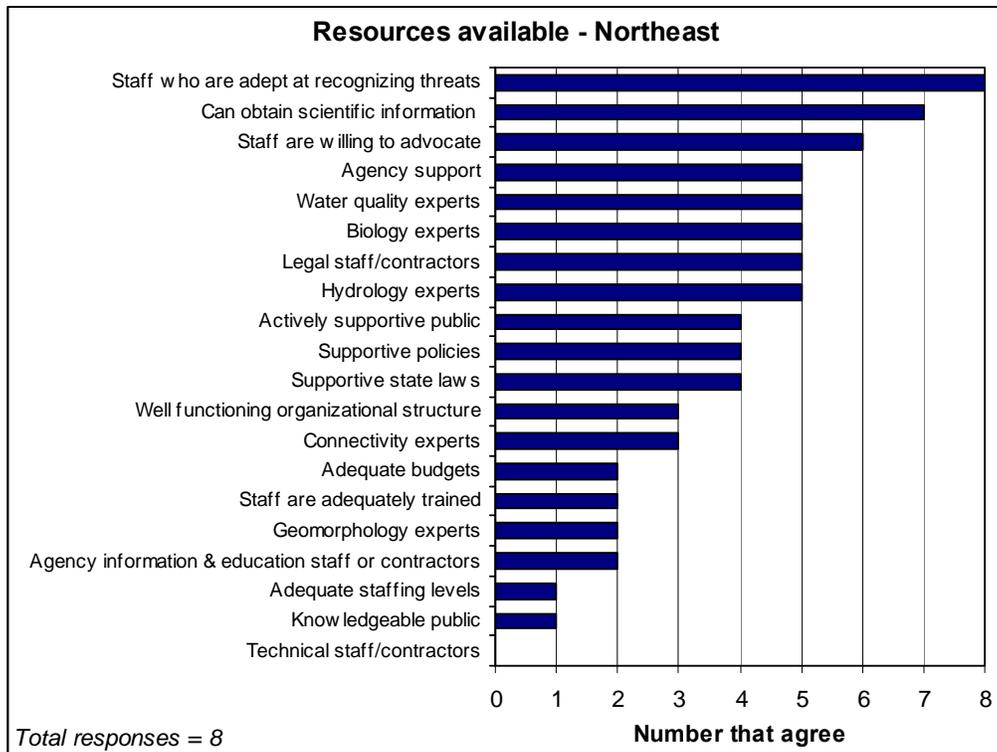


Figure E-4. Resources available in the northeastern U.S. at the time of the survey (all responses combined). Participants were asked to agree or disagree with statements in the format of “We have adequate access to or support from *needed resource*.” Other questions simply asked whether participants had adequate levels of various inputs. The graph shows affirmative responses (e.g., they agreed they had adequate access to and support from each resource).

Key findings

- All participants in the northeastern U.S. indicated their agencies were adept at recognizing threats to riverine resources.
- As in the Midwest, most participants indicated their agencies had adequate access to scientific information (gage data).
- Most participants indicated that staff in their agencies were willing to advocate for riverine resources and importantly, agreed that they had adequate agency support for those actions.
- No participants indicated their agencies had adequate access to technical staff or contractors, which is a concern.
- As in other regions, participants in this region noted that the public was not knowledgeable about water management issues. A factor that could be related to this condition is that the majority of participants said their agencies did not have adequate staffing levels, budgets, training, or access to information and education staff.
- Most participants said their agencies did not have access to experts in geomorphology.
- No participants said their agencies had adequate access to technical staff/contractors.

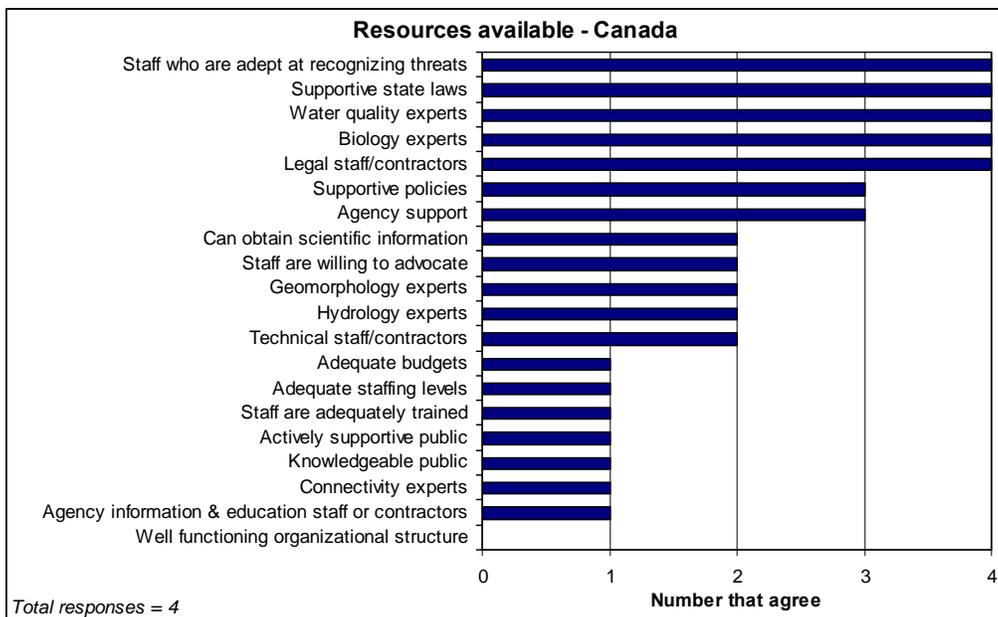


Figure E-5. Resources available in participating Canadian provinces at the time of the survey (all responses combined). Participants were asked to agree or disagree with statements in the format of “We have adequate access to or support from *needed resource*.” Other questions simply asked whether participants had adequate levels of various inputs. The graph shows affirmative responses (e.g., they agreed they had adequate access to and support from each resource).

Key findings

- Each of the four participants in Canada agreed that staff in their agencies were adept at recognizing threats to riverine resources and had water quality and biology experts.
- All four participants also indicated their agencies had supportive provincial laws as well as access to legal staff or contractors, which was a significant difference from information provided by participants in the U.S.
- None of the participants in Canada felt their agencies exhibited a well-functioning organizational structure.
- As in other regions, participants in Canada indicated their agencies lacked adequate budgets, staffing levels, and training.
- Participants also indicated the public in their province was not actively supportive or knowledgeable.
- There also appeared to be a general lack of access to experts in connectivity issues and information and education.

Appendix F. Top Program Inputs by Region

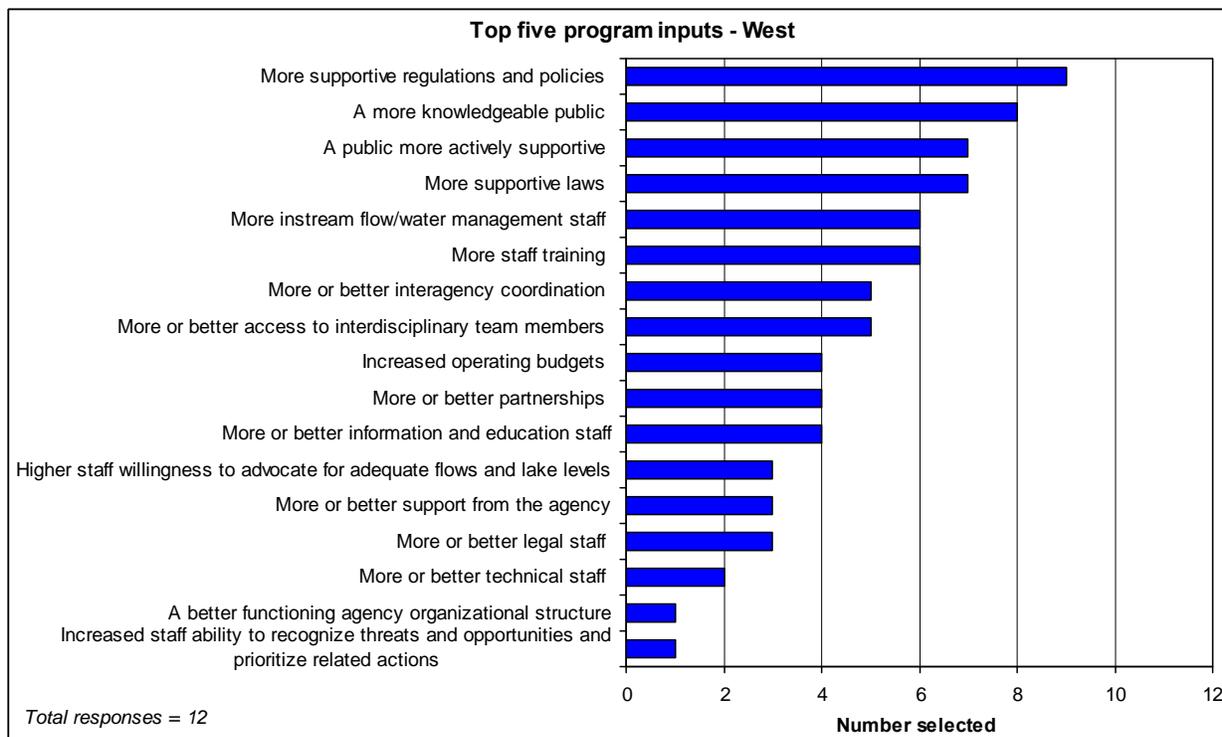


Figure F-1. Top program inputs in the western U.S. at the time of the survey. Participants were asked to “Please rank your top five program inputs (grouped from the preceding two questions) as to their relative importance to the success over the next five years of your government unit’s work to protect or enhance stream flows and/or lake levels for fish and wildlife.”

The most commonly identified program inputs (or needs) for the western U.S. were:

- more supportive regulations and policies,
- a more knowledgeable public,
- a more actively supportive and involved public,
- more supportive laws, and
- more instream flow/water management staff.

The least commonly identified program inputs were:

- increased staff ability to recognize threats and opportunities and prioritize related actions,
- a better functioning organizational structure, and
- more or better technical staff.

Summary

- As in other regions, participants in the western U.S. recognized that the greatest potential for improving instream flow opportunities would come from areas largely outside their control—better laws, policies, and more public involvement and knowledge. Though their agencies could play a role in creating advances in these areas, they are significant areas and are difficult to control.
- Likewise, participants in the western U.S. felt confident they could recognize threats and opportunities, but apparently felt that advancing instream flow opportunities would require more than recognizing threats and opportunities.

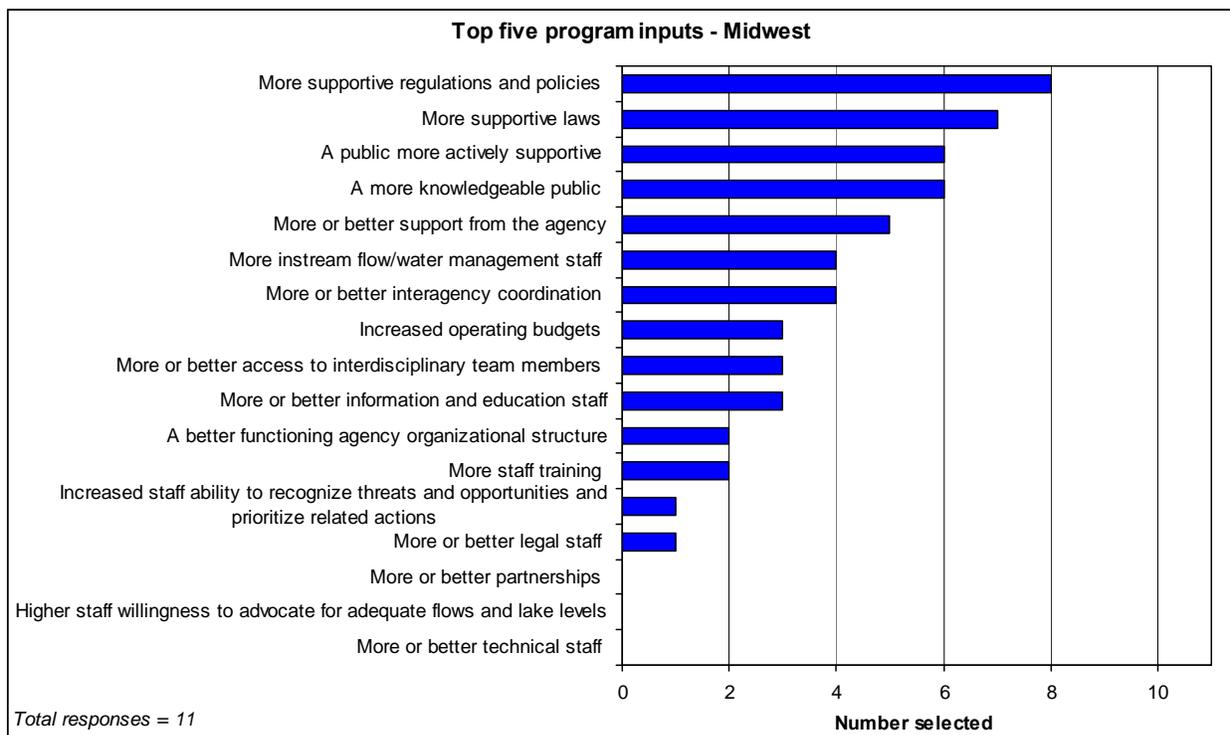


Figure F-2. Top program inputs in the midwestern U.S. at the time of the survey. Participants were asked to “Please rank your top five program inputs (grouped from the preceding two questions) as to their relative importance to the success over the next five years of your government unit’s work to protect or enhance stream flows and/or lake levels for fish and wildlife.”

The most commonly identified program inputs for the midwestern U.S. were:

- more supportive regulations and policies,
- more supportive laws,
- a public that’s more actively supportive of instream flow issues,
- a more knowledgeable public about instream flow and water management issues, and
- more or better support from their agency to advocate for adequate flows and lake levels.

The least commonly identified program inputs were:

- more or better technical staff,
- higher staff willingness to advocate for adequate flows and lake levels, and
- more or better partnerships.

Summary

- Participants in the Midwest, along with participants in other regions, expressed the need for better legal tools and public involvement to advance instream flow issues.
- However in contrast to other regions, they felt that more support from their agency to advocate for instream flow issues would improve their effectiveness. This sentiment suggests either a perception that this strategy has worked in the past or that their efforts have been restrained so they felt the need to make some effort in this area.

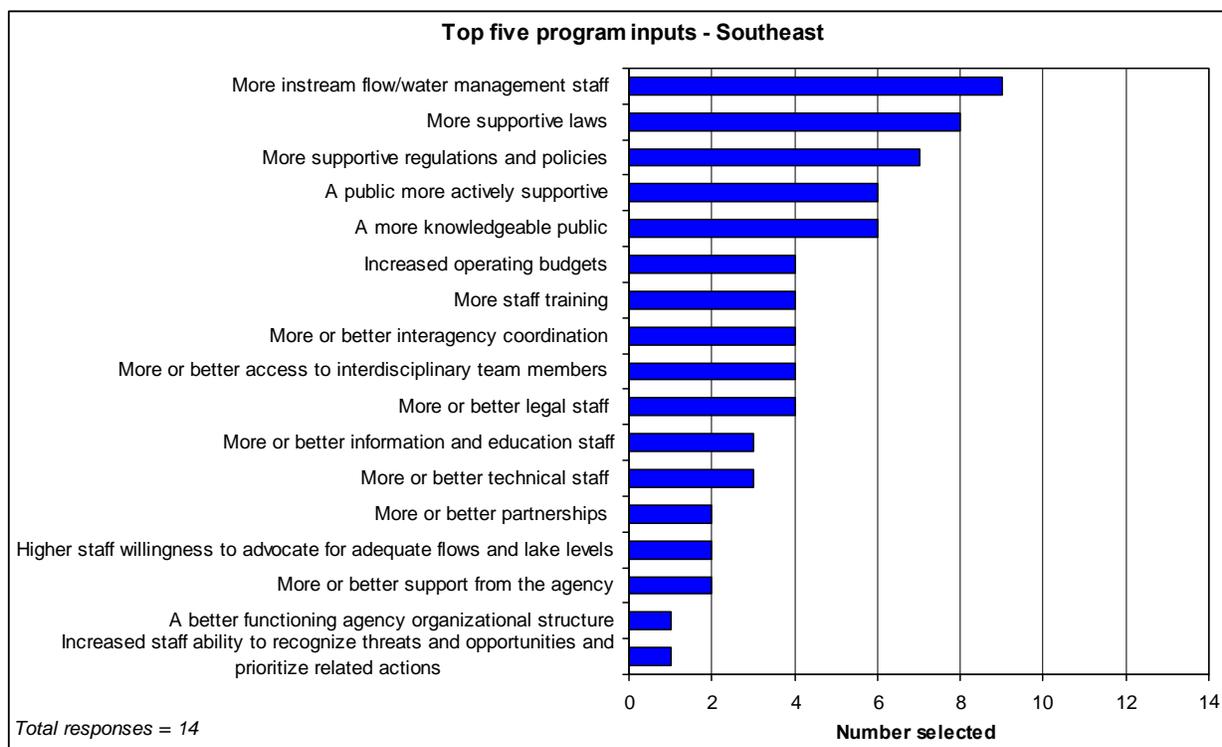


Figure F-3. Top program inputs in the southeastern U.S. at the time of the survey. Participants were asked to “Please rank your top five program inputs (grouped from the preceding two questions) as to their relative importance to the success over the next five years of your government unit’s work to protect or enhance stream flows and/or lake levels for fish and wildlife.”

The most commonly identified program inputs in the southeastern U.S. were:

- more instream flow and water management staff,
- more supportive laws,
- more supportive regulations and policies,
- a more actively supportive public, and
- a more knowledgeable public about instream flow issues.

The least commonly identified program inputs were:

- increased staff ability to recognize threats and opportunities and prioritize related actions, and
- a better functioning organizational structure for their agency.

Summary

- The majority of participants in the southeastern U.S. felt that their agencies could be more effective if they had more staff who were dedicated to working on instream flow and water management issues. This emphasis on internal solutions may be more feasible in the short term (3–5 years) than improving laws or public effectiveness.
- Participants in this region (like participants in other regions) expressed the need for better legal tools and public involvement to advance instream flow.

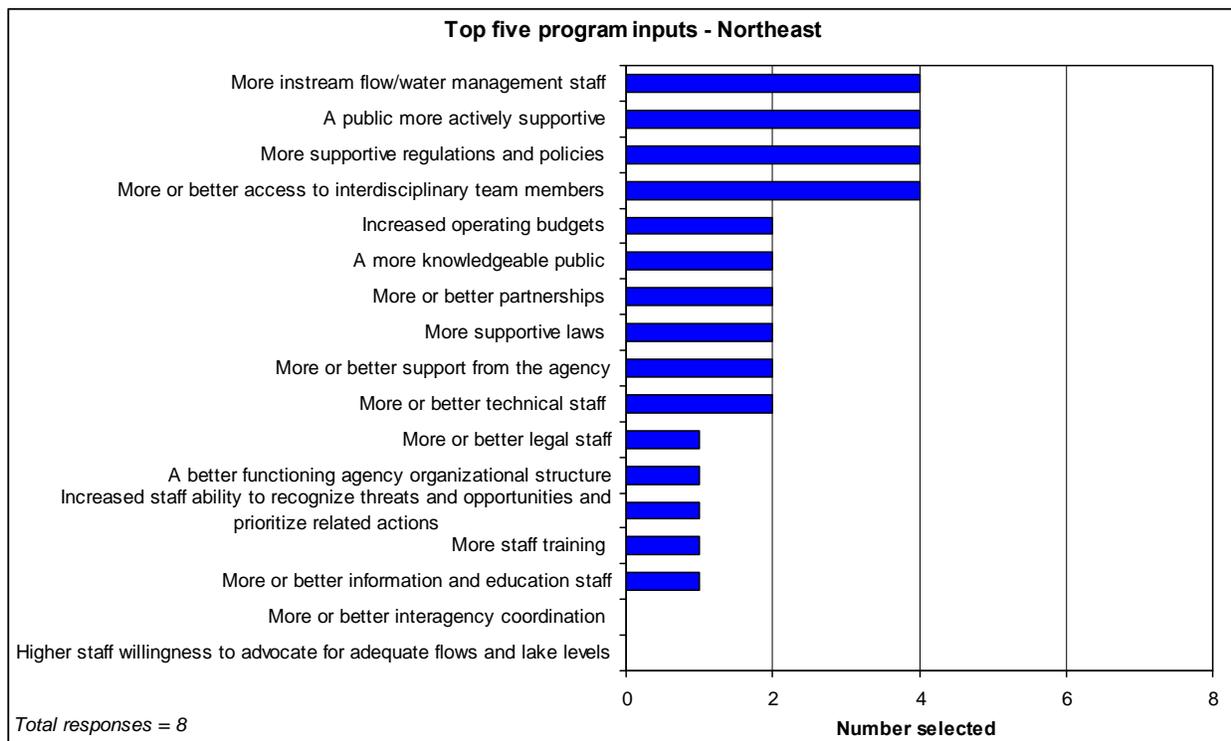


Figure F-4. Top program inputs in the northeastern U.S. at the time of the survey. Participants were asked to “Please rank your top five program inputs (grouped from the preceding two questions) as to their relative importance to the success over the next five years of your government unit’s work to protect or enhance stream flows and/or lake levels for fish and wildlife.”

The most commonly identified program inputs in the northeastern U.S. were:

- more instream flow staff,
- more actively supportive public,
- more supportive regulations and policies, and
- more or better access to interdisciplinary team members.

The least commonly identified program inputs in the northeastern U.S. were:

- more or better interagency coordination, and
- higher willingness of staff to advocate for adequate flows and lake levels.

Summary

- The northeastern U.S. did not show the clear cut indication of important or unimportant program inputs that was shown in other regions. No single input received more than half of the total votes. This widely divergent support for program inputs suggests there was a considerable need for all of these elements, rather than an emphasis on any one or group of elements.

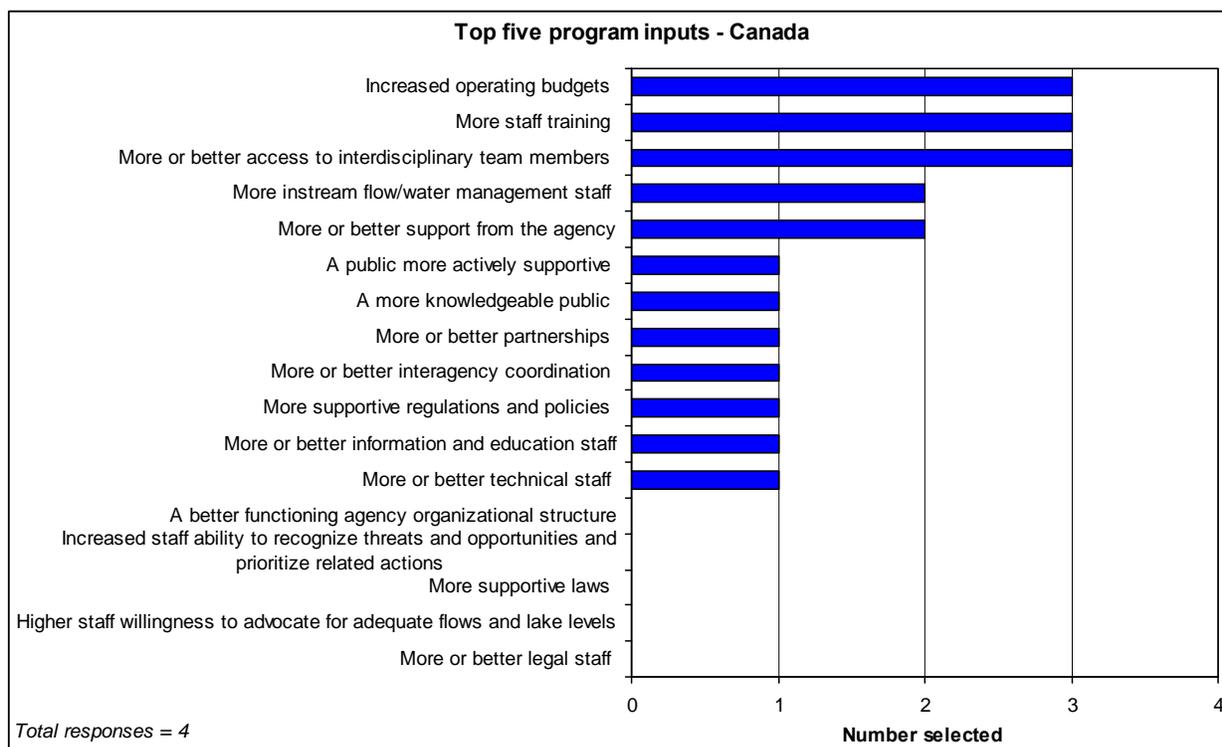


Figure F-5. Top program inputs in participating Canadian provinces at the time of the survey. Participants were asked to “Please rank your top five program inputs (grouped from the preceding two questions) as to their relative importance to the success over the next five years of your government unit’s work to protect or enhance stream flows and/or lake levels for fish and wildlife.”

The most important program inputs for participants in Canada were (tie among five elements):

- increased budgets,
- more staff training,
- more or better access to interdisciplinary team members,
- more instream flow or water management staff, and
- more or better support from their agencies to advocate for adequate flows and lake levels.

Four elements received no votes as important program inputs. These include:

- a better functioning agency organization structure,
- increased staff ability to recognize threats and opportunities and prioritize related actions,
- higher willingness of staff to advocate for adequate flows and lake levels, and
- more legal staff.

Summary

- The emphasis on institutional elements such as budgets, training, staff, and access to interdisciplinary team members suggested a considerable lack of agency capability to conduct effective instream flow activities. This is also reflected in the fact that half of the participants noted a need for better support from their agency to advocate on water issues.
- The relatively low number of participants (four) precludes the project team's ability to draw any significant conclusions from this data set.

Appendix G. Legal Protections by Region

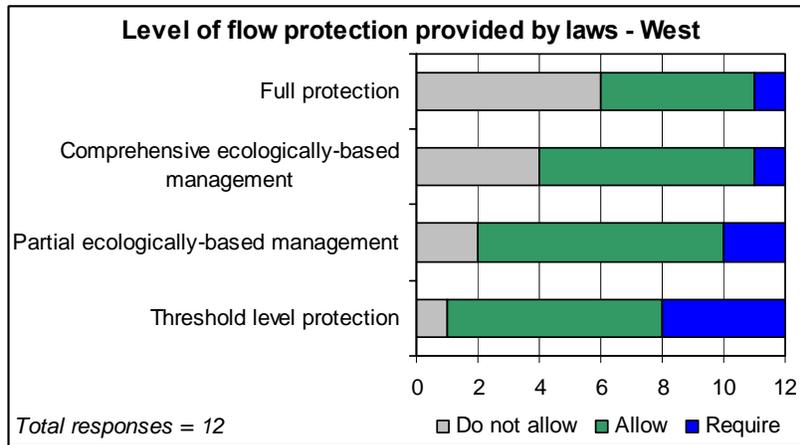


Figure G-1. Levels of flow protection provided by laws in the western U.S. at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively the following types of river corridor management?”

Comments:

- States in the western U.S. did better than the national average with all except one state (90%) having had the legal ability to allow or require at least a threshold level of instream flow protection.
- In addition, 45% of the states in this region allowed (and one state required) full protection, so the region as a whole appeared in a somewhat more affirmative position than other regions.

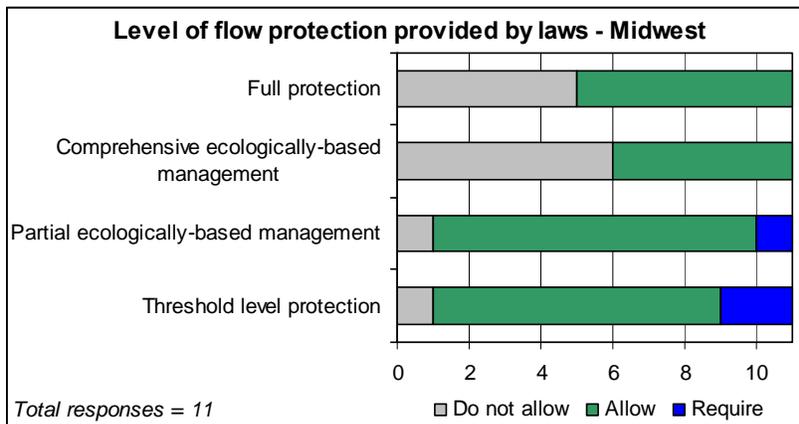


Figure G-2. Levels of flow protection provided by laws in the midwestern U.S. at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively the following types of river corridor management?”

Comments:

- All but one state in the Midwest either allowed or required at least the threshold level of instream flow protection, and 54% allowed full protection. The one state that did not allow for threshold level of instream flow protection required partial ecologically based management.
- All states in the region provided for some level of legal opportunity for instream flows and were in a relatively more affirmative position than most other regions to provide legal protections to instream flows.

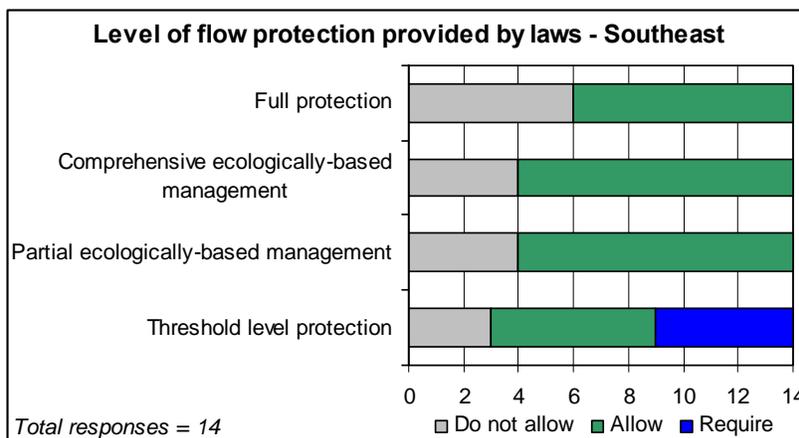


Figure G-3. Levels of flow protection provided by laws in the southeastern U.S. at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively the following types of river corridor management?”

Comments:

- In the southeastern U.S., 21% of the states responding indicated that not even a threshold level of legal support for instream flow protection was allowed. This was the second lowest regional level reported in the survey.
- In an interesting contrast, 57% of the states reported that full protection was allowed and 36% required a threshold level of instream flow protection.

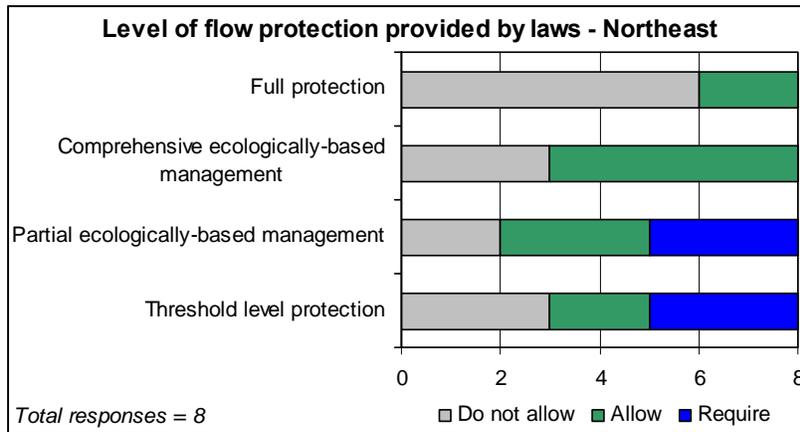


Figure G-4. Levels of flow protection provided by laws in the northeastern U.S. at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively the following types of river corridor management?”

Comments:

- Three of the eight participating states in the northeastern U.S. reported not even a threshold level of legal support for instream flow protection. This was the lowest level reported for any region.
- Only two states allowed or required full protection.
- In contrast, 38% (3) of the states in the region required a threshold level of protection.

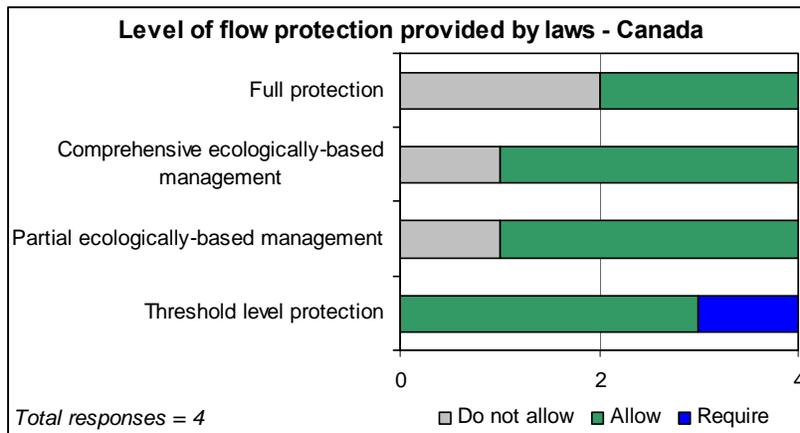


Figure G-5. Levels of flow protection provided by laws in participating Canadian provinces at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively the following types of river corridor management?”

Comments:

- All of the participating Canadian provinces reported that their legal structure either allowed or required threshold level instream flow protection.
- Full protection was allowed in 50% of the provinces.
- Responses by the four participating agencies were generally among the most affirmative in support of instream flow.

Appendix H. Instream Flow Policies by Region

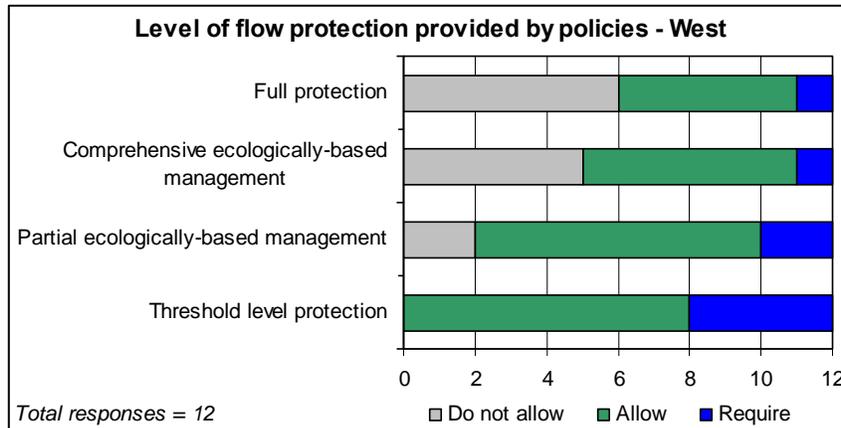


Figure H-1. Levels of flow protection provided by policies in the western U.S. at the time of the survey. Participants were asked, “Does agency policy or interpretation (your agency or others) of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of river corridor management?”

Comments:

- Policies in all of the western U.S. states required or allowed at least the threshold level of instream flow protection.
- The participant who indicated that no threshold level of protection was allowed or required under their state’s legal system (previous question) indicated that threshold protection was allowed by policy interpretation. The participant commented, “Most instream flow protection that occurs is the result of the federal Endangered Species Act.”
- In addition, 45% of the states in this region allowed (and one state required) full protection; the region as a whole is in a more affirmative position in support of instream flows than most other regions in the U.S.

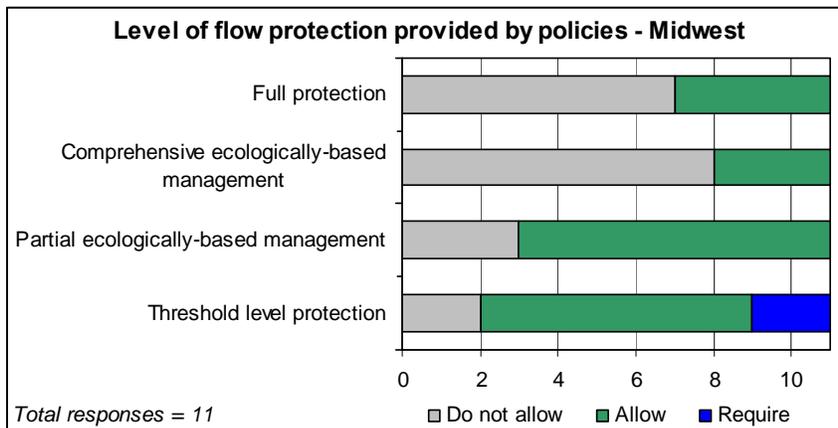


Figure H-2. Levels of flow protection provided by policies in the midwestern U.S. at the time of the survey. Participants were asked, “Does agency policy or interpretation (your agency or others) of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of river corridor management?”

Comments:

- Of the midwestern states, 81% (10) either allowed or required at least the threshold level of instream flow protection under policies that were current at the time of the survey.
- Partial ecologically based management was allowed by 73% (8) of the states in this region, however only 27 % (3) allowed comprehensive based management, and only 36% (4) allowed full protection of instream flow.

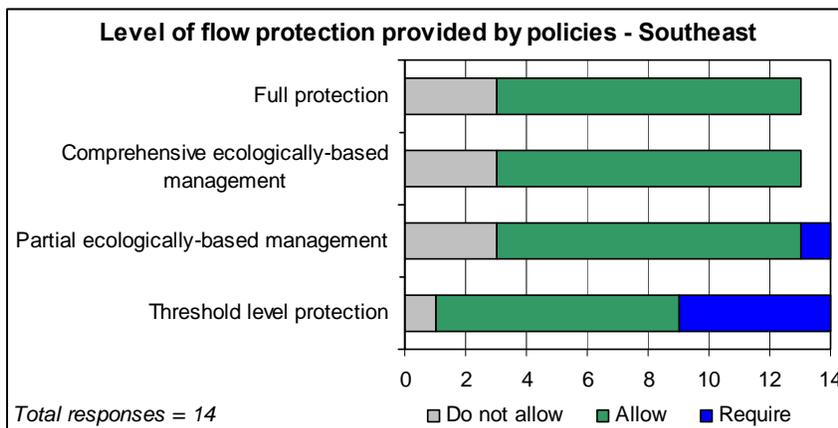


Figure H-3. Levels of flow protection provided by policies in the southeastern U.S. at the time of the survey. Participants were asked, “Does agency policy or interpretation (your agency or others) of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of river corridor management?”

Comments:

- In the southeastern U.S. 7% (1) of the participants indicated their state did not allow even a threshold level of instream flow protection under the policy interpretation current at the time of the survey.
- In contrast, 71% of participants (10) indicated full, comprehensive or partial ecologically based management was allowed and 36% (5) required threshold protection.

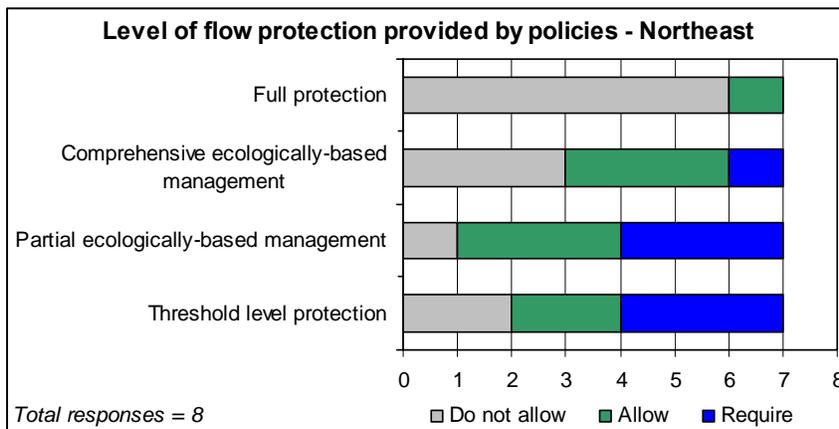


Figure H-4. Levels of flow protection provided by policies in the northeastern U.S. at the time of the survey. Participants were asked, “Does agency policy or interpretation (your agency or others) of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of river corridor management?”

Comments:

- In the northeastern U.S. 28% (2) of the states reported not even a threshold level of policy support for instream flow protection. This was the lowest level reported by any region.
- In contrast, 43% (3) reported that the threshold level was required.
- Only 16% (1) even allowed full instream flow protection.

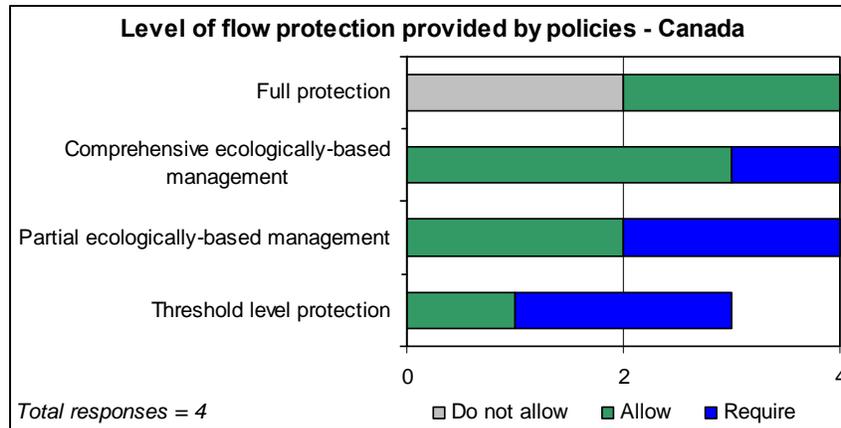


Figure H-5. Levels of flow protection provided by policies in participating Canadian provinces at the time of the survey. Participants were asked, “Does agency policy or interpretation (your agency or others) of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of river corridor management?”

Comments:

- All the participants from Canadian provinces reported their policy allowed or required either comprehensive ecological, partial ecological, or threshold level of instream flow protection.
- Full instream flow protection was allowed under the policies of 50% (2) of the provinces.
- This region had the most affirmative policy support for instream flow protection in terms of percent of participants responding. It is important to note, however, that only one-third of Canadian provinces participated in the survey.

Appendix I. Legal Protections for Lakes and Reservoirs by Region

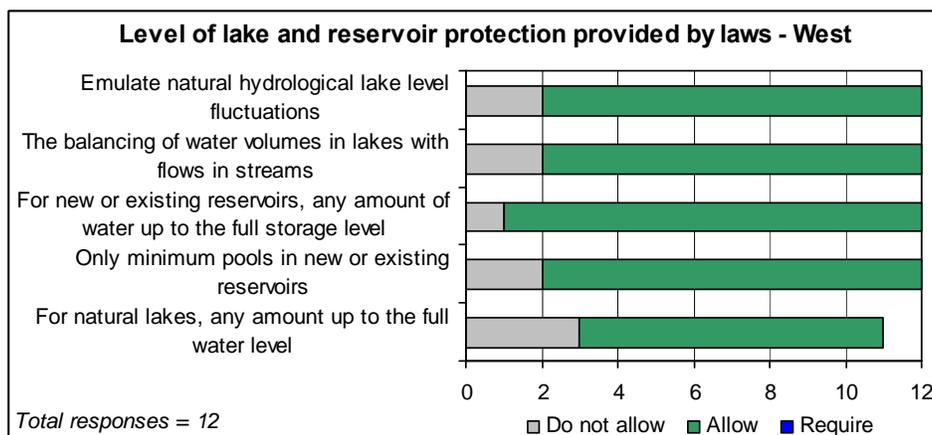


Figure I-1. Levels of lake and reservoir protection provided by western U.S. laws at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir level management for fish and wildlife?” Some participants did not provide a response for all levels of protection.

Comments:

- States in the western U.S. indicated somewhat more affirmative laws for lakes and reservoirs than the response for all other regions combined. 83% (10 of 12) states indicated the availability of laws, rules, and regulations allowing for the emulation of the natural hydrological lake fluctuations as well as for the balancing of water volumes in lakes and reservoirs.
- Laws in 92% of states in this region (11) allowed protection of any amount of water up to full storage, and 73% (8) allowed for protection of water in natural lakes with any amount up to full water level to be managed.
- Laws in 83% of states (10) allowed only minimum pools for fisheries in new or existing reservoirs.
- Comments by various participants indicated that they had several legal tools, such as state laws allowing for natural lake level water right filings, minimum lake levels being treated the same as instream flow opportunities, and the ability to buy storage rights for conservation pools.

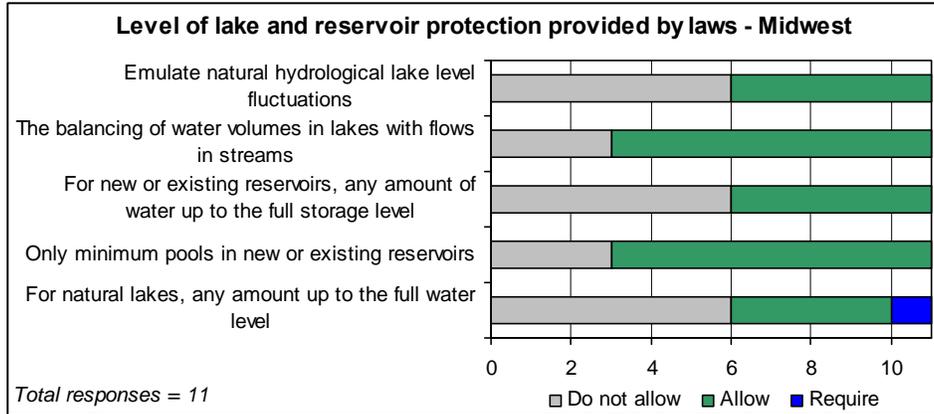


Figure I-2. Levels of lake and reservoir protection provided by midwestern U.S. laws at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir level management for fish and wildlife?” Some participants did not provide a response for all levels of protection.

Comments:

- Participants in the Midwest overall had relatively limited support in their laws, rules, and regulations for managing lakes and reservoir levels for fish and wildlife.
- Only 45% allowed the emulation of the natural hydrologic lake level fluctuations, 73% allowed the balancing of water volumes in lakes with flows in streams, 45% allowed, for new or existing reservoirs, any amount of water up to full storage level, 73% allowed only management of minimum pools in new or existing reservoirs, and 50% allowed or required, for natural lakes, any amount up to the full water level.

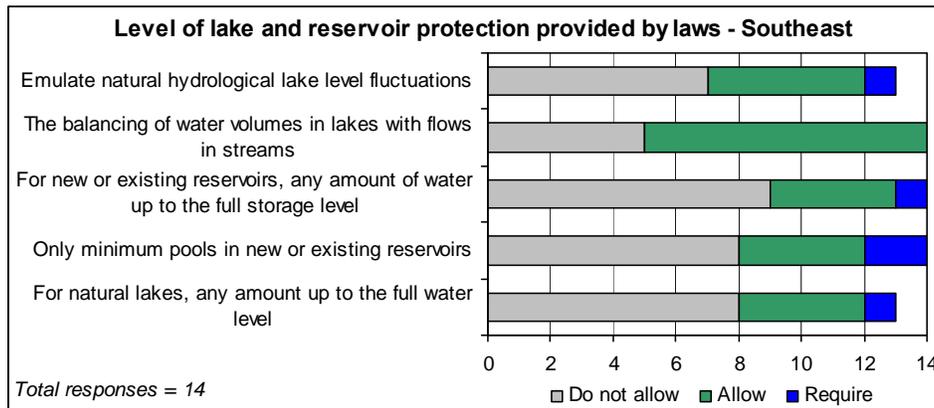


Figure I-3. Levels of lake and reservoir protection provided by southeastern U.S. laws at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir level management for fish and wildlife?” Some participants did not provide a response for all levels of protection.

Comments:

- In southeastern U.S. states, overall support for lake and reservoir management in laws, rules, and regulations was very limited.
- Only 46% required or allowed the emulation of natural hydrological lake level fluctuations, 64% allowed the balancing of water volume in lakes with the flow in streams, 36% allowed or required, for new or existing reservoirs, any amount of water up to the full storage level, 43% allowed or required only minimum pools in new or existing reservoirs be managed, and 38% allowed or required, for natural lakes, any amount up to full water level be managed for fish and wildlife.
- Several participants mentioned that control of many reservoir levels in the region was through federal agencies such as the U.S. Army Corps of Engineers and the Tennessee Valley Authority.

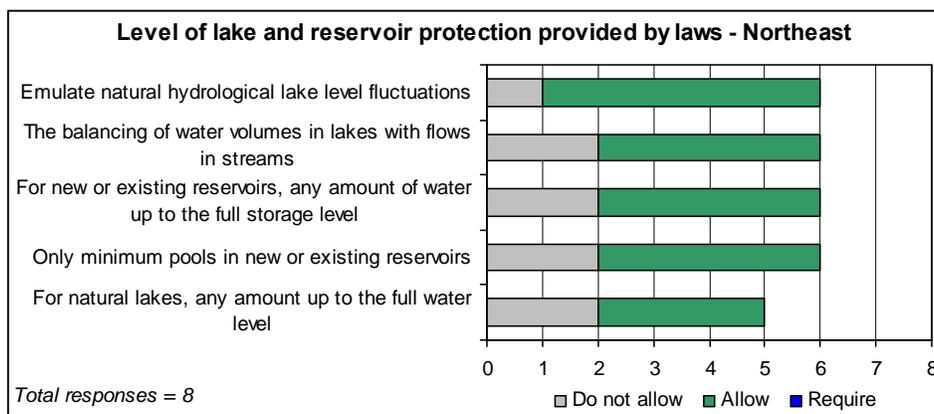


Figure I-4. Levels of lake and reservoir protection provided by northeastern U.S. laws at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir level management for fish and wildlife?” Some participants did not provide a response for all levels of protection.

Comments:

- Participants in the northeastern U.S. indicated the support for lake and reservoir management in state laws, rules, and regulations was relatively high compared to all regions.
- Laws, rules, or regulations in 83% of the states allowed fish and wildlife management of lakes and reservoirs that emulate the natural hydrological lake level fluctuations. 67% allowed the balancing of water volumes in lakes with flow in streams. 67% allowed, for new and existing reservoirs, any amount of water up to the full storage level. 67% allowed management of only minimum pools in new or existing reservoirs. And 60% allowed, for natural lakes, any amount up to the full water level.

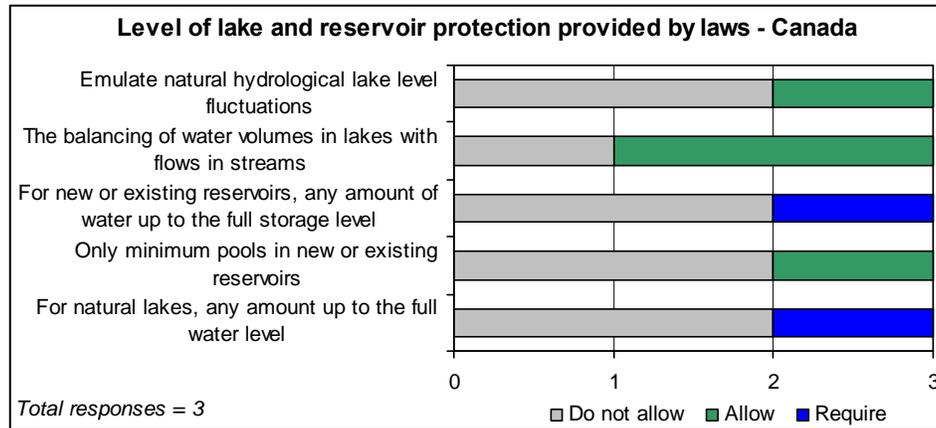


Figure I-5. Levels of lake and reservoir protection provided by laws in participating Canadian provinces at the time of the survey. Participants were asked, “Do your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir level management for fish and wildlife?” Some participants did not provide a response for all levels of protection. One participant did not answer this question.

Comments:

- Canadian participants indicated their provinces’ laws, rules, and regulations for the management of lakes and reservoirs for fish and wildlife were relatively limited.
- Only 33% (1) allowed the emulation of the natural hydrological lake level fluctuation. 66% (2) allowed for the balancing of the water volume in lakes with the flow in streams. 33% (1) required, for new or existing reservoirs, any amount of water up to the full storage level. 33% (1) allowed only minimum pools in new or existing reservoirs be managed. And 33% (1) required, for natural lakes, any amount up to the full water level be managed.
- One participant was not aware of any provincial laws, rules, or regulations that addressed lake and reservoir management, so they did not answer the question because of uncertainty as to how accurate their assessment was.

Appendix J. Policies for Lakes and Reservoirs by Region

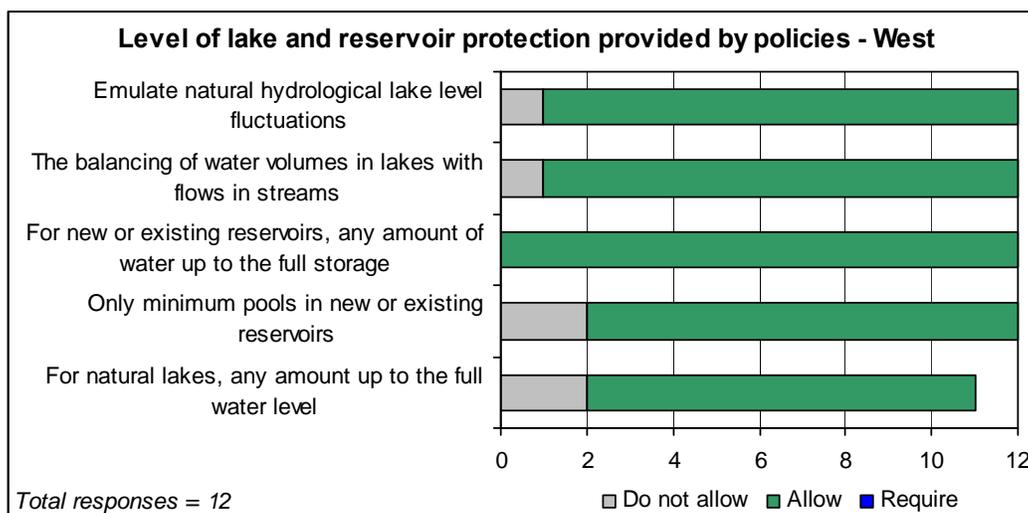


Figure J-1. Levels of lakes and reservoir protection provided by policies in the western U.S. at the time of the survey. Participants were asked, “Does agency policy or interpretation of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir management?” Some participants did not provide a response for some questions.

Comments:

- States in the western U.S. appeared to have more affirmative policies than was observed in other regions. Over 90% of states had policies that allowed for the emulation of the natural hydrological lake fluctuations. A similar number reported their policies allowed for the balancing of water volumes in lakes and reservoirs,
- All participants indicated their states’ policies allowed any amount of water up to full storage to be protected for fish and wildlife.
- Policies in 81% of reporting states allowed protection of only minimum pools for fisheries in new or existing reservoirs.
- For natural lakes, any amount up to full water level could be protected under policies in 80% of participating states.
- Comments by participants indicated they had several legal tools such as state laws allowing for natural lake level water right filings, minimum lake levels being treated the same as instream flow opportunities, and the ability to buy storage rights for conservation pools.

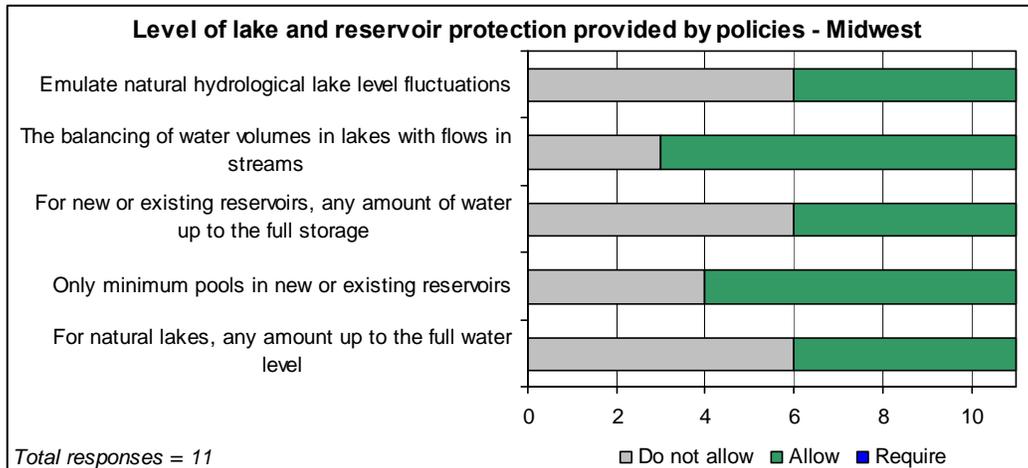


Figure J-2. Levels of lakes and reservoir protection provided by policies in the midwestern U.S. at the time of the survey. Participants were asked, “Does agency policy or interpretation of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir management?” Some participants did not provide a response for some questions.

Comments:

- Participants in the midwestern U.S. overall reported limited support in their policy or interpretation of the laws, rules, and regulations for managing lakes and reservoir levels for fish and wildlife.
- Only 45% of participants reported their states’ policies allowed the emulation of the natural hydrologic lake level fluctuations. 73% reported policies that allowed the balancing of water volumes in lakes with flows in streams. 45% reported policies that allowed, for new or existing reservoirs, any amount of water up to full storage level. 63% reported policies that allowed only management of minimum pools in new or existing reservoirs. 45% reported policies that allowed or required, for natural lakes, any amount up to the full water level.

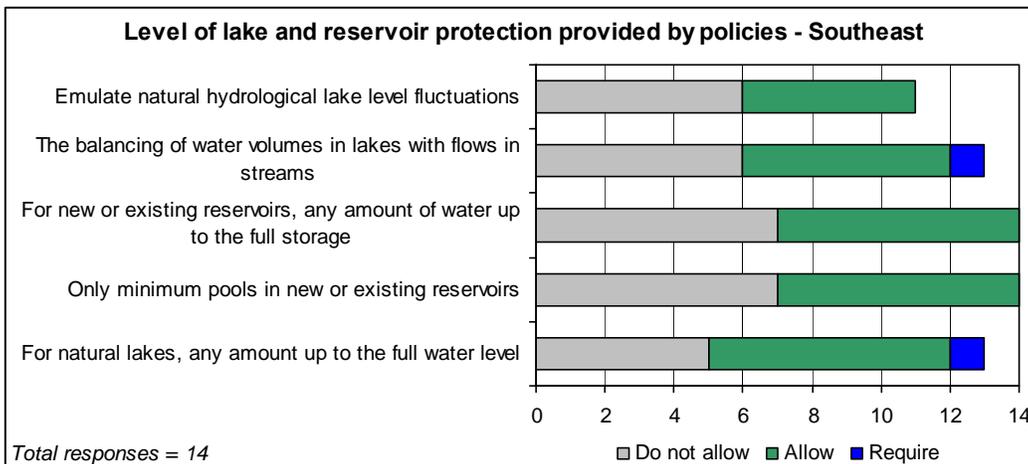


Figure J-3. Levels of lakes and reservoir protection provided by policies in the southeastern U.S. at the time of the survey. Participants were asked, “Does agency policy or interpretation of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir management?” Some participants did not provide a response for some questions.

Comments:

- Participants in the southeastern U.S. reported that support for lake and reservoir management in their state’s policy or interpretation of laws, rules, and regulations was very limited.
- Only 45% of states required or allowed the emulation of natural hydrological lake level fluctuations. 54% allowed or required the balancing of water volume in lakes with the flow in streams, 50% allowed or required, for new or existing reservoirs, any amount of water up to the full storage level, 50% allowed or required only minimum pools in new or existing reservoirs be managed. 61% allowed or required, for natural lakes, any amount up to full water level be managed for fish and wildlife.
- Several of the participants mentioned that control of many reservoir levels in the region was through federal agencies such as the U.S. Army Corps of Engineers and the Tennessee Valley Authority.

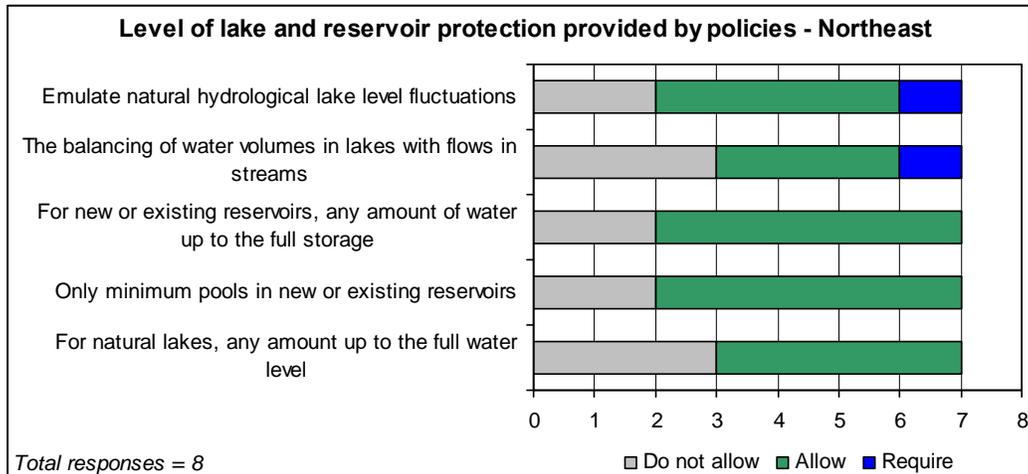


Figure J-4. Levels of lakes and reservoir protection provided by policies in the northeastern U.S. at the time of the survey. Participants were asked, “Does agency policy or interpretation of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir management?” Some participants did not provide a response for some questions.

Comments:

- Participants in the northeastern U.S. reported that support for lake and reservoir management in the state’s policy or interpretation of the laws, rules, and regulations was somewhat more affirmative compared to other regions.
- Policy or interpretation of the laws, rules or regulations in 71% of the states allowed fish and wildlife management of lakes and reservoirs that emulated the natural hydrological lake level fluctuations. 57% allowed or required the balancing of water volumes in lakes with flow in streams. 71% allowed, for new and existing reservoirs, any amount of water up to the full storage level. 71% allowed management of only minimum pools in new or existing reservoirs. 57% allowed, for natural lakes, any amount up to the full water level.

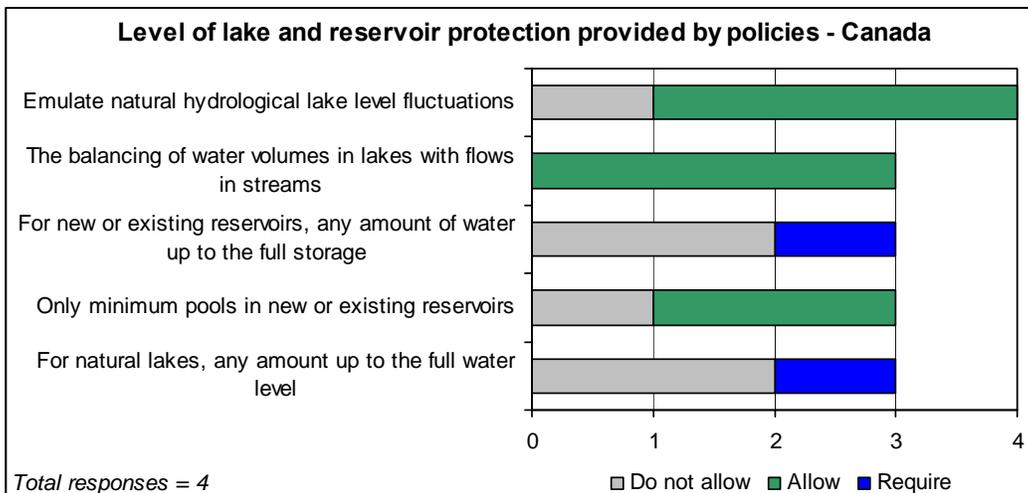


Figure J-5. Levels of lakes and reservoir protection provided by policies in participating Canadian provinces at the time of the survey. Participants were asked, “Does agency policy or interpretation of your state or provincial laws, rules, and regulations allow or require, respectively, the following types of lake and reservoir management?” Some participants did not provide a response for some questions.

Comments:

- Participants from Canadian provinces indicated they had limited support from policy or interpretation of the laws, rules, and regulations for the management of lakes and reservoirs for fish and wildlife.
- Only 66% (2) allowed the emulation of the natural hydrological lake level fluctuation. 100% allowed for the balancing of the water volume in lakes with the flow in streams. 33% (1) required, for new or existing reservoirs, any amount of water up to the full storage level. 66% (2) allowed only minimum pools in new or existing reservoirs be managed. 33% (1) required, for natural lakes, any amount up to the full water level be managed.
- One participant was not aware of any policies that addressed lake and reservoir management, but did not answer the question because of uncertainty as to how accurate their assessment was.

Appendix K. Flow Method Quantification Limitations

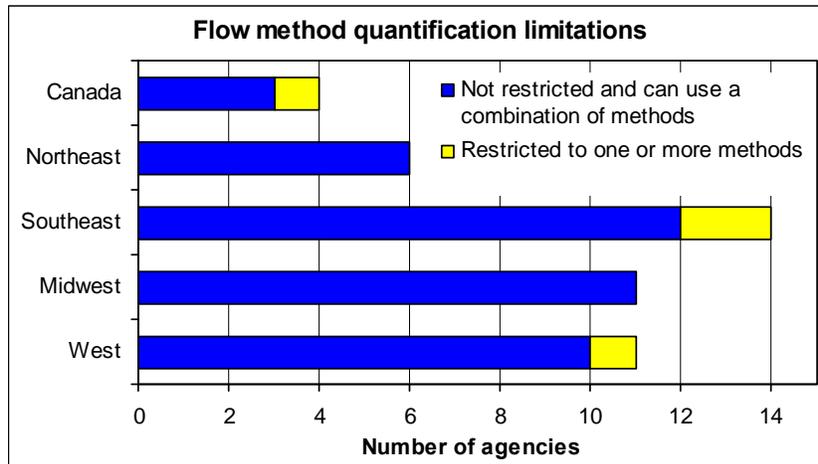


Figure K-1. Summary of limitations that state and provincial fish and wildlife agencies functioned under at the time of the survey in terms of their ability to use flow quantification methods, by region. Participants were asked, “Can you use any, or a combination of, instream flow quantification methods in your state/province, or are you restricted to a specific method or combination?”

Appendix L. Time Spent on Activities by Region

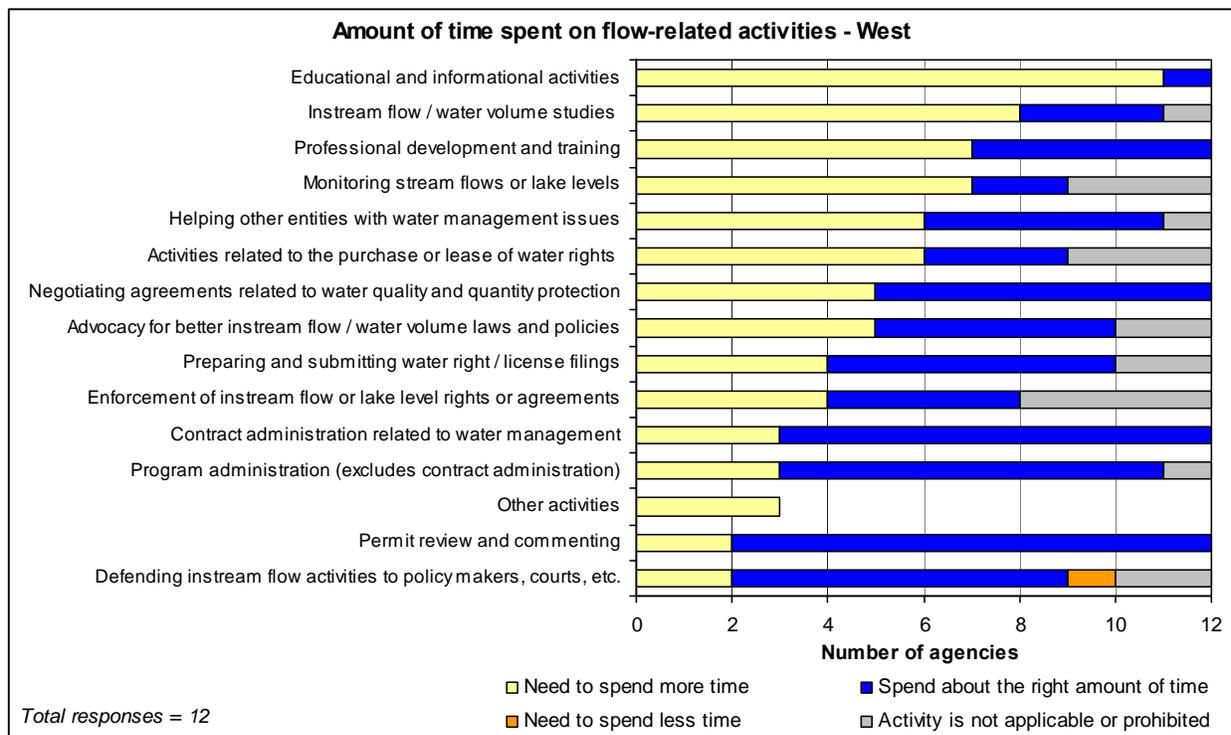


Figure L-1. Summary of the amount of time participants in the western U.S. indicated they spend or should spend (at the time of the survey) on a variety of activities associated with instream flow or water management issues.

Comments:

- Participants in the western U.S. indicated strong support for spending more time on *educational and informational activities* (100%), *instream flow/water volume studies* (73%), *monitoring flows or lake levels* (64%), and *professional development and training* (64%). Over half of the participants also expressed support for spending more time on *helping other entities with water management issues* (55%), and *activities related to the purchase or lease of water rights* (54%). The remaining activities overall either were considered to have the right amount of time spent or were split between the need to spend more time or the right amount of time by states not marking them as not applicable or prohibited.
- One participant indicated they needed to spend less time on *defending instream flow activities to policy makers, courts, etc.*; no other activity was identified as needing less time. This participant provided the following qualification to the way they answered this question, “If this question means should we spend more time engaging with the legislature to allocate adequate funds and support then, yes we need to increase the amount of time—if it means should we spend more time defending our existing program to the legislature (i.e., why what we did has value and was worth the funds), I think resources would be better spent actually doing data collection and analysis and developing flow recommendations so environmental watchdog groups would be less likely to threaten lawsuits.

- Several activities were not applicable or prohibited: *enforcement of instream flow or lake level rights or agreements* in four states (36%); *activities related to the purchase or lease of water rights and monitoring stream flows or lake levels* in three states each (27%); *preparing and submitting water right/license filings, defending instream flow activities to policy makers, courts, etc., and advocacy for better instream flow/water volume laws and policies* in two states each; and *instream flow/water volume studies, program administration, and helping other entities with water management issues* in one state each.

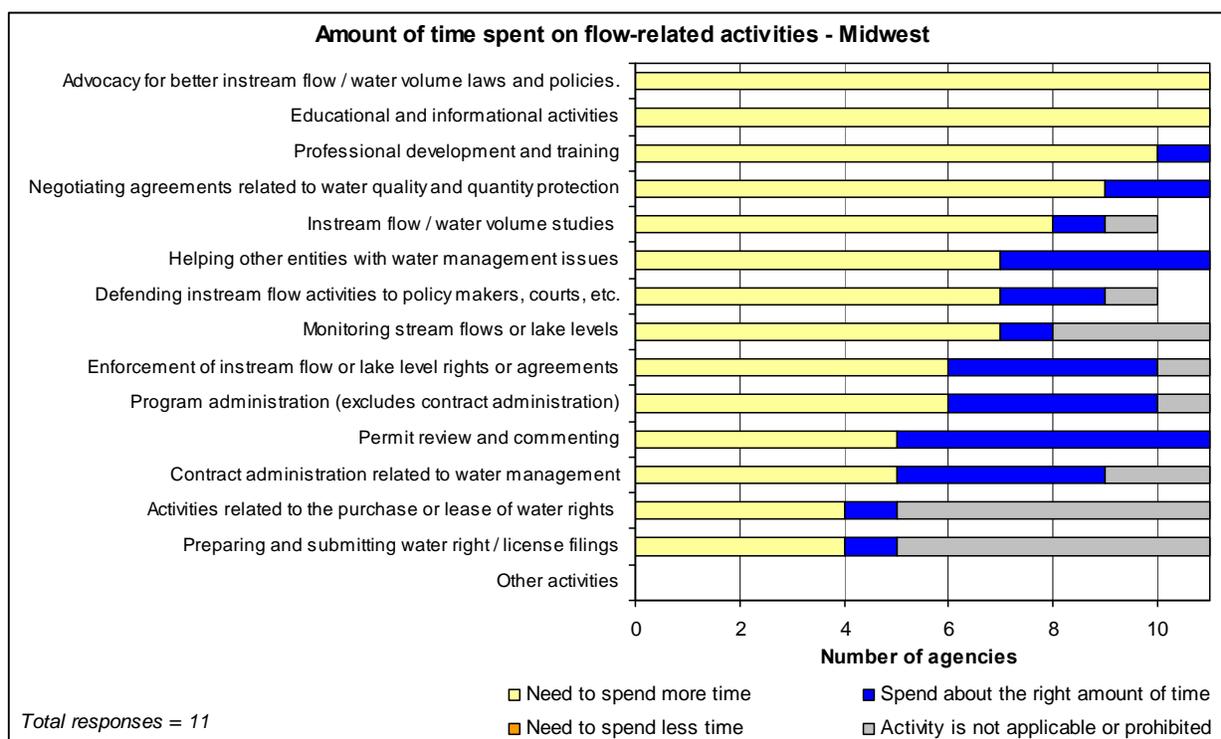


Figure L-2. Summary of the amount of time participants in the midwestern U.S. indicated they spend or should spend (at the time of the survey) on a variety of activities associated with instream flow or water management issues. Some participants did not provide a response for some questions.

Comments:

- Participants in the midwestern U.S. all indicated a need to spend more time on *educational and informational activities* (100%), and spend more time pursuing *advocacy for better instream flow/water volume laws and policies* (100%). Other activities that participants in this region thought warranted the investment of more time included *professional development and training* (91%), *negotiating agreements related to water quality and quantity protection* (82%), *instream flow/water volume studies* (80%), and *defending instream flow activities to policy makers, courts, etc.* (70%). In addition, over half the participants indicated a need to spend more time *helping other entities with water management issues* (64%), *monitoring stream flows or lake levels* (60%), *program administration* (55%), and *enforcement of instream flow or lake level rights or agreements* (55%)
- *Preparing and submitting water right/license filings* and *activities related to the purchase or lease of water rights* were not applicable or prohibited in 55% of the states (6). Most of the remaining participants indicated they needed to spend more time on these activities.

- Other activities listed as not applicable or prohibited were *monitoring stream flows or lake levels* (27%); *contract administration related to water management* (18%); *instream flow/water volume studies* (9%); *program administration* (9%); *enforcement of instream flow or lake level rights or agreements* (9%); and *defending instream flow activities to policy makers, courts, etc.* (9%).

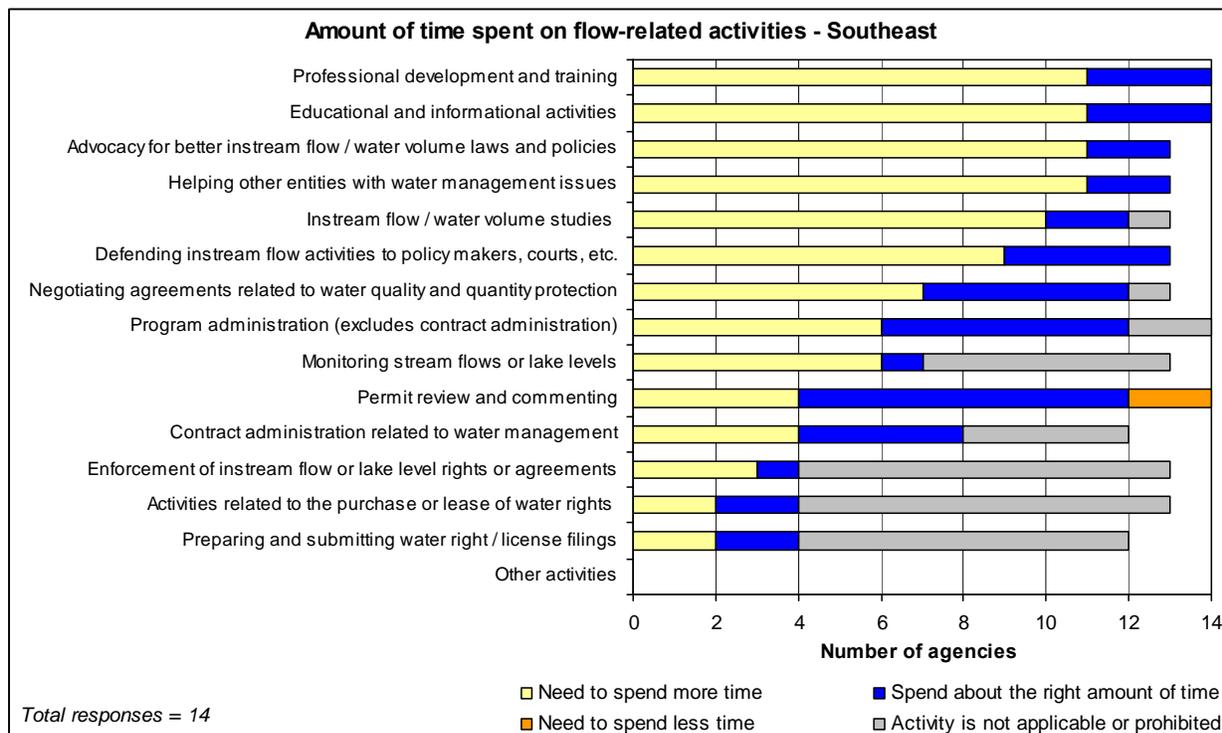


Figure L-3. Summary of the amount of time participants in the southeastern U.S. indicated they spend or should spend (at the time of the survey) on a variety of activities associated with instream flow or water management issues. Some participants did not provide a response for some questions.

Comments:

- Most participants indicated that more time needed to be spent on *helping other entities with water management issues* (85%), *advocacy for better instream flow /water volume laws and policies* (85%), *educational and informational activities* (79%), *professional development and training* (79%), and *instream flow/water volume studies* (77%). In addition, at least half the participants expressed the opinion that more time be spent on *defending instream flow activities to policy makers, courts, etc.* (64%), *negotiating agreements related to water quality and quantity protection* (54%), and *program administration* (50%).
- Several activities were not available to most participants: *activities related to the purchase or lease of water rights* (69%), *preparing and submitting water right/license filings* (67%), and *enforcement of instream flow or lake level rights or agreements* (64%). Other activities not available in some states were *monitoring stream flow or lake levels* (46%); *contract administration related to water management* (33%), *program administration* (17%), *instream flow/water volume studies* (8%), and *negotiating agreements related to water quality and quantity protection* (8%).

- Two participants indicated they needed to spend less time spent on *permit review and commenting* (14%); one participant expressed the opinion that less time spent on *defending instream flow activities to policy makers, courts, etc.* (7%). However, the majority of participants indicated that they needed to either spend the same or more time on these activities.

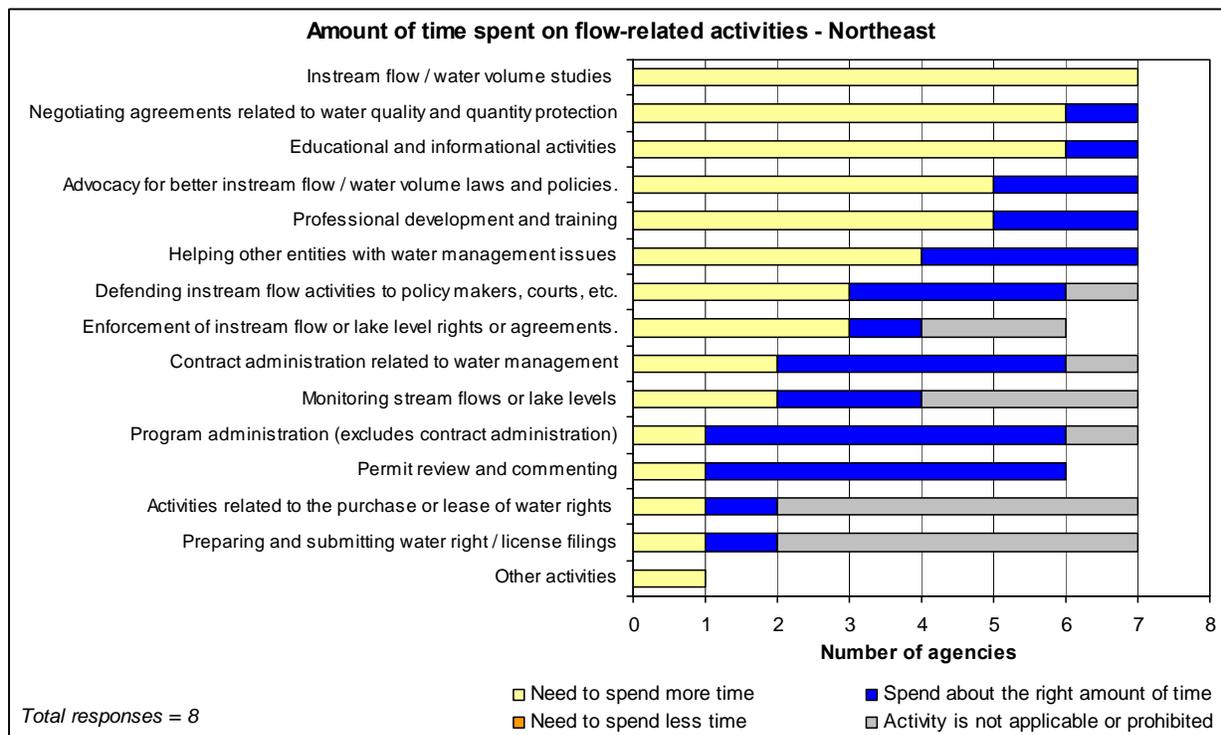


Figure L-4. Summary of the amount of time participants in the northeastern U.S. indicated they spend or should spend (at the time of the survey) on a variety of activities associated with instream flow or water management issues. Some participants did not provide a response for some questions.

Comments:

- All participants indicated they needed to spend more time on *instream flow/water volume studies* (100%) and most expressed a similar sentiment regarding effort expended on *educational and informational activities* (86%), *negotiating agreements related to water quality and quantity protection* (86%), *professional development and training* (71%), and *advocacy for better instream flow/water volume laws and policies* (71%). In addition, over half indicated they needed to spend more time on *helping other entities with water management issues* (57%) and *enforcement of instream flow or lake level rights or agreements* (50%).
- No participant indicated they needed to spend less time on any activity listed.
- Several activities were either not applicable or prohibited in this region: *preparing and submitting water right/license filings* (71%); *activities related to the purchase or lease of water rights* (71%); *monitoring stream flows or lake levels* (44%); *enforcement of instream flow or lake level rights or agreements* (33%); *contract administration related to water management* (17%); *program administration* (7%); and *defending program administration to policy makers, courts, etc.* (14%).

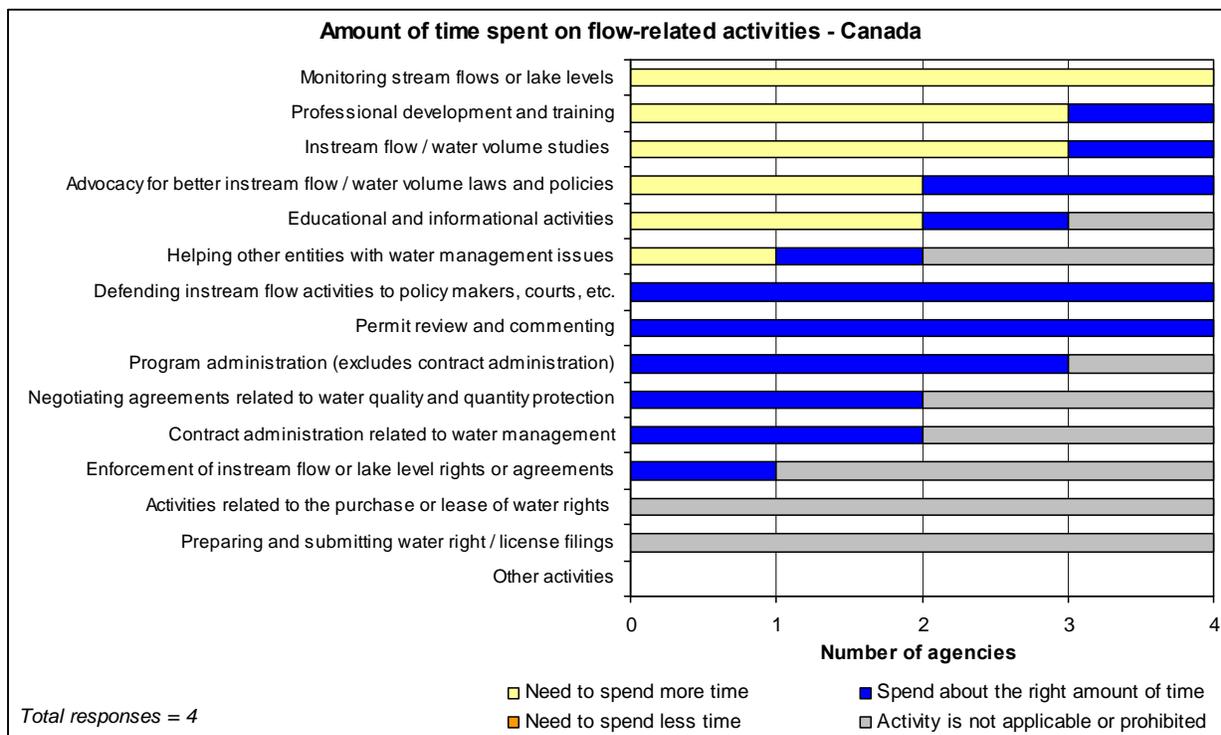


Figure L-5. Summary of the amount of time participants in participating Canadian provinces indicated they spend or should spend (at the time of the survey) on a variety of activities associated with instream flow or water management issues.

Comments:

- Most participants indicated they needed to spend more time on *monitoring stream flows or lake levels* (100%), *professional development and training* (75%), and *instream flow/water volume studies* (60%). In addition, half of the participants indicated they needed to spend more time on *educational and informational activities* (50%) and *advocacy for better instream flow/water volume laws and policies* (50%).
- No participants indicated they needed to spend less time on the activities listed.
- Several activities were not available in some or all of the provinces: preparing and submitting water right/license filings (100%); activities related to the purchase or lease of water rights (100%); enforcement of instream flow or lake levels rights or agreements (75%); negotiating agreements related to water quality and quantity protection (50%); helping other entities with water management issues (50%); contract administration related to water management (33%); program administration (25%); and educational and informational activities (25%).

Appendix M. Portion of Streams in Unaltered Condition

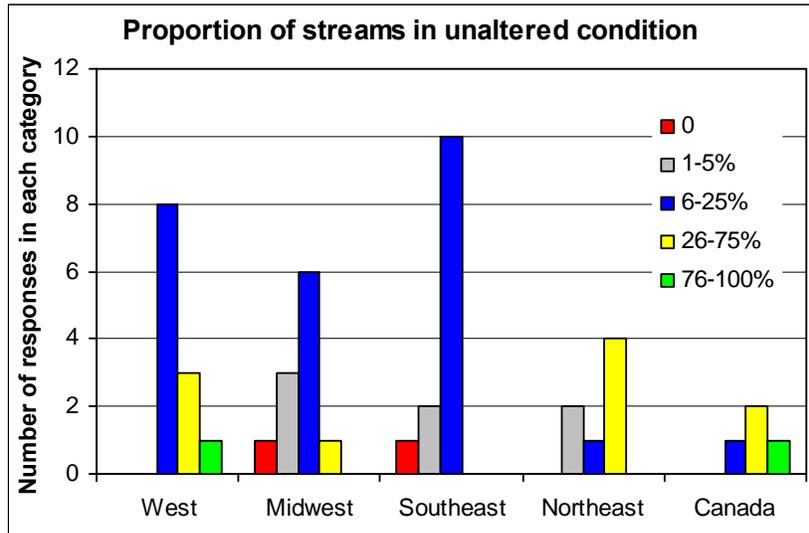


Figure M-1. Estimated portion of stream miles that were in unaltered condition at the time of the survey, by region. Participants were asked, “In your or others’ estimation, what proportion of your state’s/province’s streams are in unaltered, free flowing condition (there have been negligible diversions or developments that have affected streamflow or riparian ecology)?”

Appendix N. Stream Miles Protected by Region

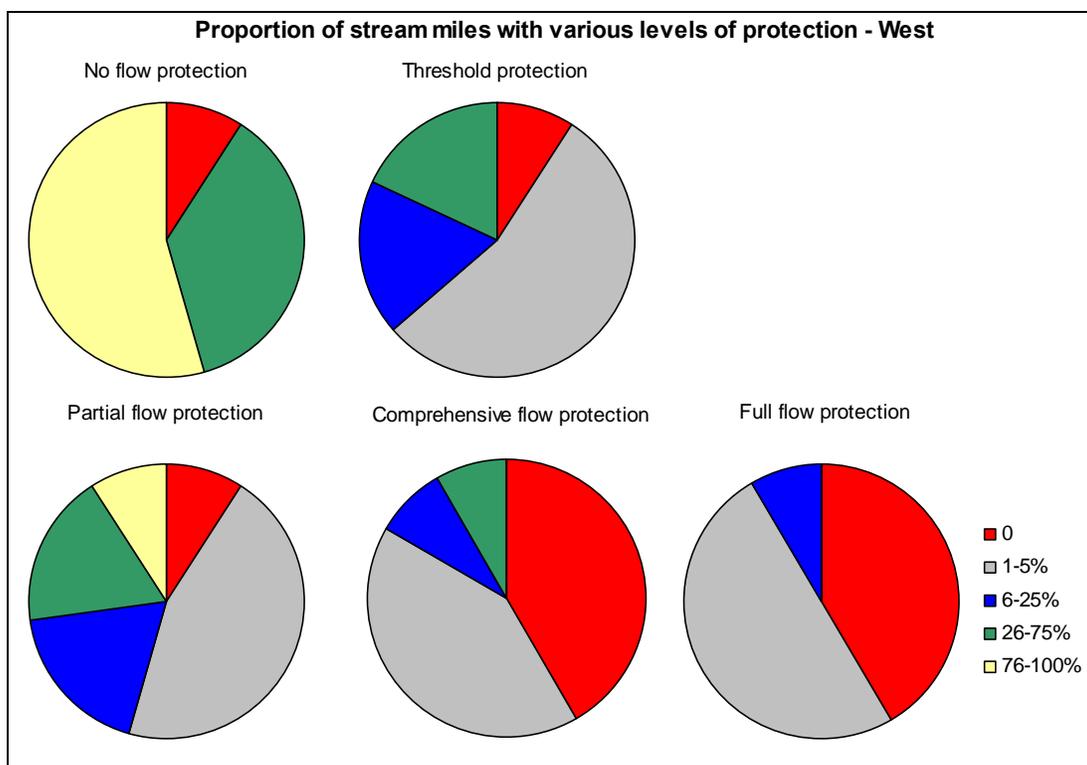


Figure N-1. The estimated portion of stream miles in the western U.S. with various levels of protection at the time of the survey. Participants were asked, “In your estimation, about what proportion of stream miles in your state or province have the following levels of stream protection?” Total responses = 12.

Comments:

- *Full protection:* 5 participants reported full protection was not available, 6 reported it was available on 1–5% of streams, and 1 reported full protection on 6–25% of stream miles.
- *Comprehensive ecological protection* was not available for 5 of the states in this region, 5 reported 1–5 % of their stream miles had this level of protection, 1 reported this level of protection on 6–25% of their stream miles, and 1 reported this level of protection on 26–76% of their stream miles.
- *Partial ecological protection* was not available on streams in 1 state, 5 participants reported this level of protection on 1–5% of stream miles, 2 reported this level of protection on 6–25% of stream miles, and 1 reported this level of protection on 26–76% of their stream miles..
- *Threshold protection:* 6 participants reported threshold protection on 1–5% of their stream miles, 2 reported this level of protection on 6–25% of stream miles, 2 reported this level of protection on 26–75% of stream miles, and one reported this level of protection wasn’t available on any stream miles in their state.

- *No flow protection*: 6 participants reported no flow protection on 76–100% of stream miles, 4 reported no protection on 26–75% of stream miles, and 1 participant reported no streams in their state had no protection (i.e., all streams had some level of protection).

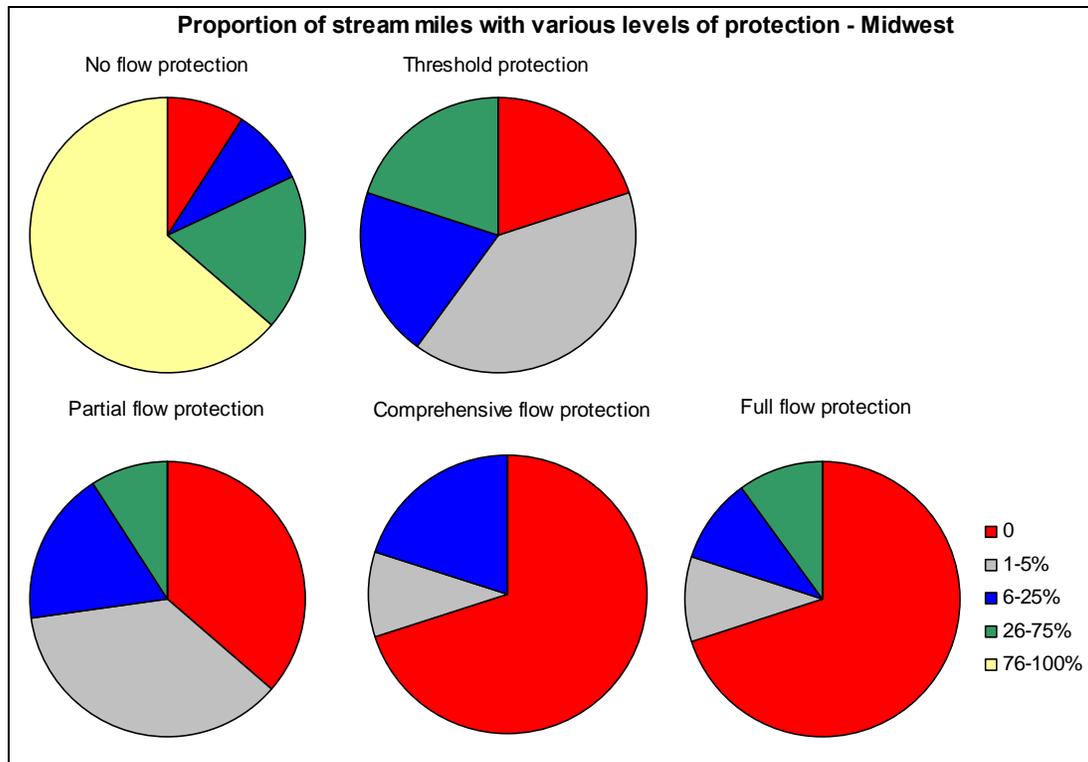


Figure N-2. The estimated portion of stream miles in the midwestern U.S. with various levels of protection at the time of the survey. Participants were asked, “In your estimation, about what proportion of stream miles in your state or province have the following levels of stream protection?” Total responses = 11.

Comments:

- *Full protection*: 7 participants reported full protection was not available on any stream miles, 1 reported this level of protection on 1–5% of stream miles, 1 reported this level of protection on 6–25% of stream miles, and 1 reported this level of protection on 26–75% of stream miles.
- *Comprehensive ecological protection* was not available in 7 states, 1 participant indicated this level of protection on 1–5% of stream miles, 2 participants indicated this level of protection on 6–25% of stream miles.
- *Partial ecological protection* was not available on streams in 4 of the states, 4 reported this level of protection on 1–5% of stream miles, 2 reported this level of protection on 6–25% of stream miles, and 1 reported this level of protection on 26–75% of stream miles.
- *Threshold protection* was not available in 2 of the states, in 4 states this level of protection was available on 1–5% of stream miles, 2 reported this level of protection on 6–25% of stream miles, and 2 reported this level of protection on 26–75% of stream miles.

- *No flow protection* was available on 76–100% of the stream miles in 7 of the states; 2 participants reported no protection was available on 26–75% of stream miles; 1 participant reported no protection on 6–25% of stream miles, and 1 participant indicated that some type of flow protection existed on all stream miles in the state.

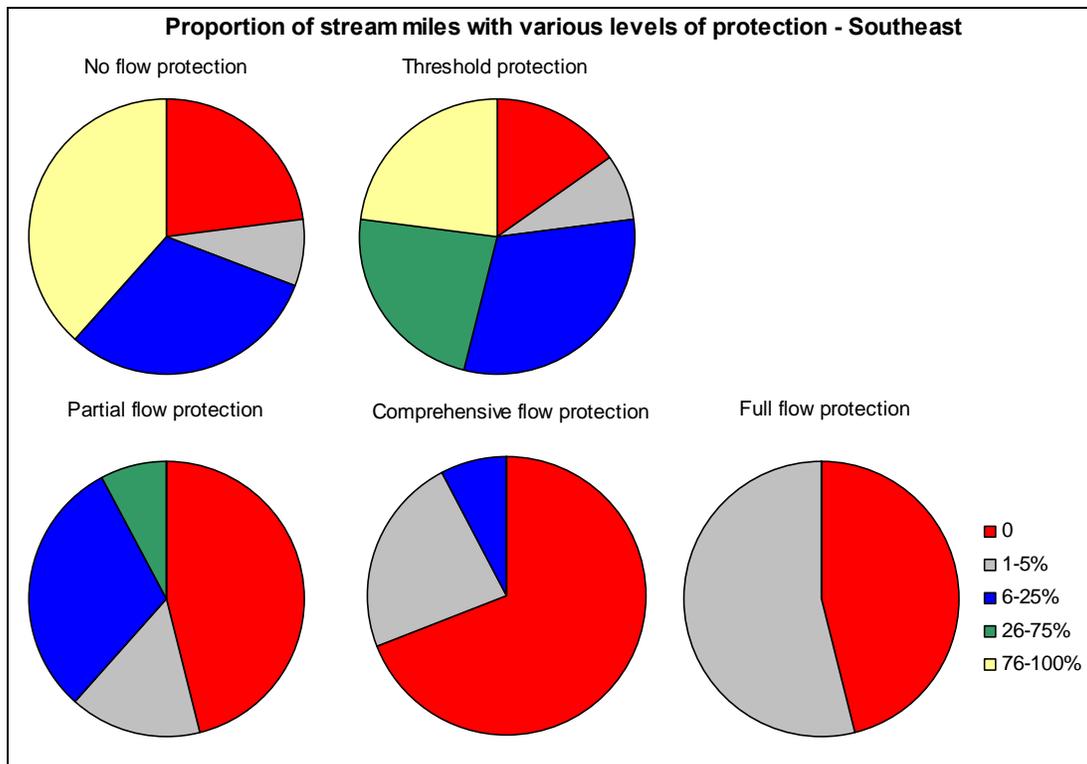


Figure N-3. The estimated portion of stream miles in the southeastern U.S. with various levels of protection at the time of the survey. Participants were asked, “In your estimation, about what proportion of stream miles in your state or province have the following levels of stream protection?” Total responses = 14.

Comments:

- *Full protection:* 6 participants reported no full flow protection while 7 reported this level of protection on 1–5% of the stream miles in their state.
- *Comprehensive ecological protection:* 9 participants reported no comprehensive flow protection, 3 reported this level of protection on 1–5% of their states’ stream miles, and 1 reported this level of protection on 6–25% of their stream miles.
- *Partial ecological protection:* 6 participants reported no partial flow protection on any stream miles, 2 reported this level of protection on 1–5% of their stream miles, 4 participants reported this level of protection on 6–25% of stream miles, and 1 reported this level of protection on 26–75% of their stream miles
- *Threshold protection:* no threshold protection was reported in 2 states, 1 reported this level of protection on 1–5% of stream miles, 4 reported this level of protection on 6–25% of stream miles, 3 participants reported this level of protection on 26–75% of stream miles, and 3 reported this level of protection on 76–100% of stream miles.

- *No flow protection*: 5 participants reported no flow protection on 76–100% of their stream miles, 4 reported no protection on 6–25% of their stream miles, 1 reported no protection on 1–5% of their stream miles, and 3 reported some type of flow protection on all streams miles.

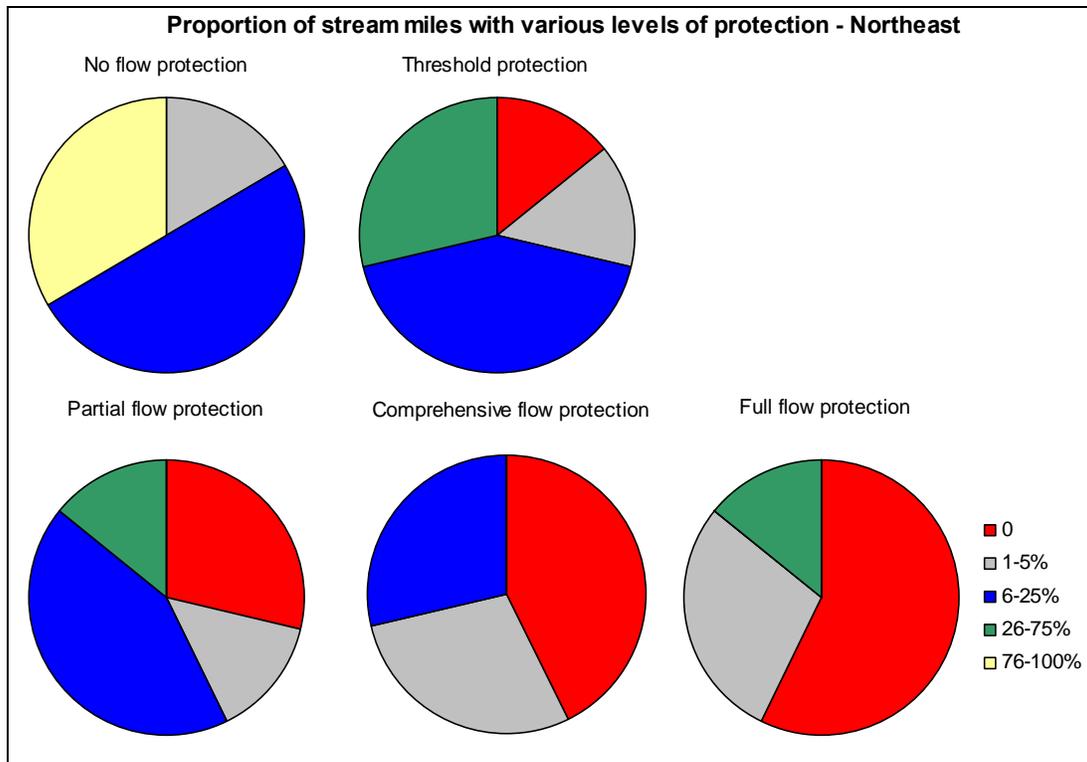


Figure N-4. The estimated portion of stream miles in the northeastern U.S. with various levels of protection at the time of the survey. Participants were asked, “In your estimation, about what proportion of stream miles in your state or province have the following levels of stream protection?” Total responses = 8.

Comments:

- *Full protection*: 4 participants indicated no stream miles had full flow protection, 2 had full flow protection on 1–5% of their streams, and 1 had this level of protection on 6–25% of stream miles.
- *Comprehensive ecological protection*: 3 states had no stream miles with comprehensive flow protection, 2 had this level of protection on 1–5% of stream miles, and 2 had this level of protection on 6–25% of stream miles
- *Partial ecological protection* was not available in 2 of the states, 1 had this level of protection on 1–5% of their stream miles, 3 had this level of protection on 6–25% of their stream miles, and 1 had this level of protection on 26–75% of their stream miles.
- *Threshold protection* was not available in 1 state, 1 state had this level of protection on 1–5% of their stream miles, 3 had this level of protection on 6–25% of their stream miles, 2 had this level of protection on 26–75% of their stream miles.
- *No flow protection*: 3 states had no flow protection on 26–75% of their stream miles, 2 had no protection on 6–25% of stream miles, and 1 had no protection on 1–5% of their stream miles.

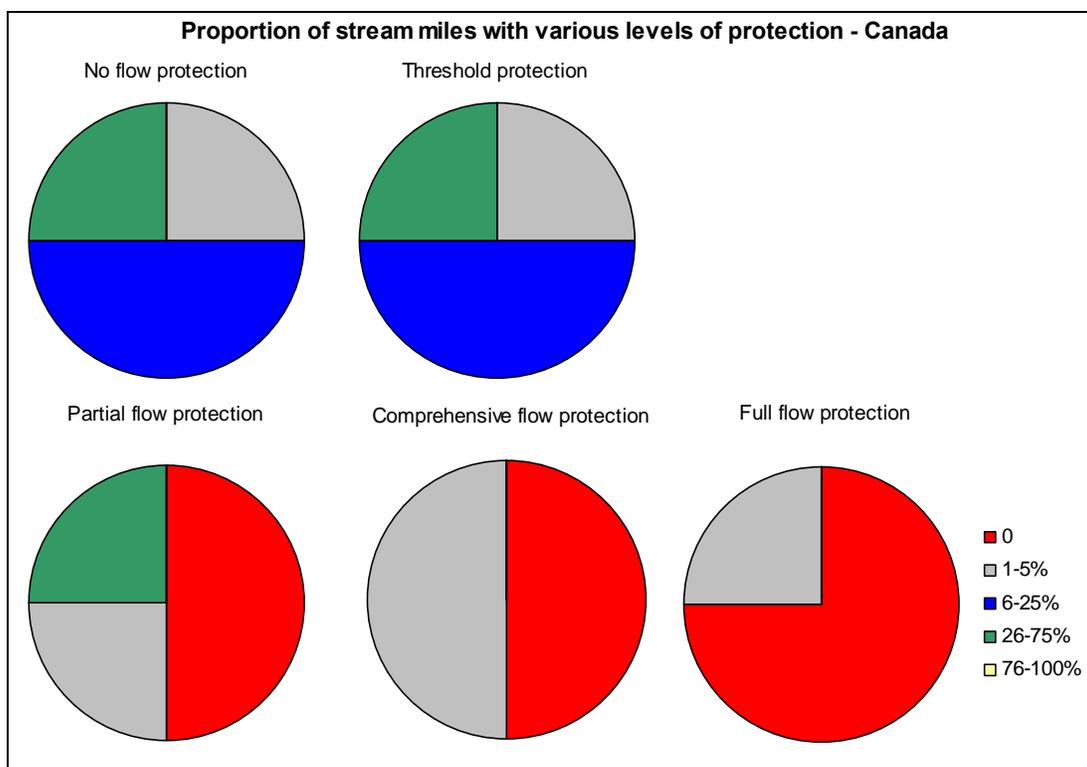


Figure N-5. The estimated portion of stream miles in participating Canadian provinces with various levels of protection at the time of the survey. Participants were asked, “In your estimation, about what proportion of stream miles in your state or province have the following levels of stream protection?” Total responses = 4.

Comments:

- *Full protection:* 3 participants reported no full flow protection on any stream miles and 1 had full protection on 1–5% of stream miles.
- *Comprehensive ecological protection:* Half of the provinces had no comprehensive ecological protection on any stream and the other half had this level of protection on 1–5% of stream miles.
- *Partial ecological protection:* Half the provinces had no partial *ecological* protection on any streams, 1 had this level of protection on 1–5% of their streams, and 1 had this level of protection on 26–75% of their streams.
- *Threshold protection:* 1 province had threshold flow protection on 1–5% of their stream miles, half had this level of protection on 6–25% of their stream miles, and 1 province had this level of protection on 26–75% of stream miles.
- *No flow protection:* 3 of the provinces had no flow protection for 26–75% of their stream miles, and 1 participant indicated some protection for all stream miles.

Appendix O. Reliability of Protection for Streams by Region

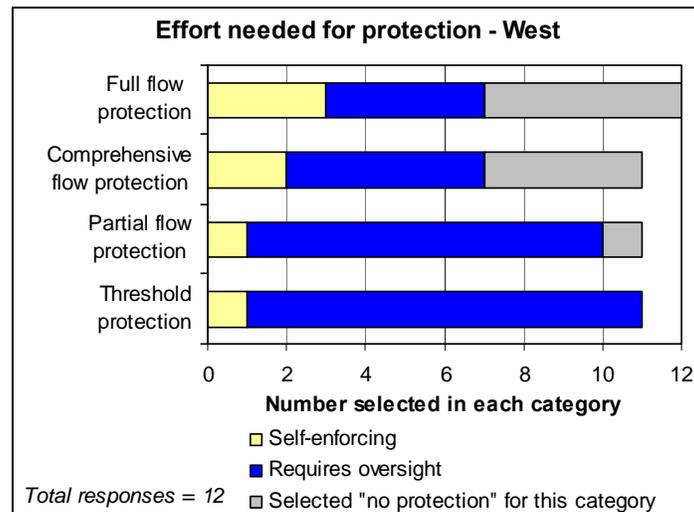


Figure O-1. Level of effort needed to ensure implementation of various levels of instream flow protection in the western U.S. at the time of the survey. Participants were asked, “Are the protections referenced in the previous question generally secure or do they need continued monitoring/enforcement to be protective?” Some participants did not answer some questions.

Comments:

- *Full protection*: Five participants indicated full protection was not available in their state. Four participants indicated it was available and required monitoring and enforcement to be protective while three participants indicated it was available and generally secure. One of the participants who indicated it was generally secure noted that no development was allowed in the areas with full protection.
- *Comprehensive ecological protection* was not available in four states. Two participants indicated that in their states it was available and generally secure and one indicated limited or no development was allowed in these areas. Five participants indicated that monitoring and enforcement were needed to ensure protection.
- *Partial ecological protection* was not available in one state, and it was available in the remaining ten. Of these ten, one participant indicated it was generally secure, while the other nine participants indicated that monitoring and enforcement were required for the protection to be effective. One participant commented the reason it required monitoring and enforcement was because development was allowed and occurred in these areas.
- *Threshold protection* was available in all western U.S. states. One participant indicated it was generally secure, while the others indicated it required monitoring and enforcement to be protective.

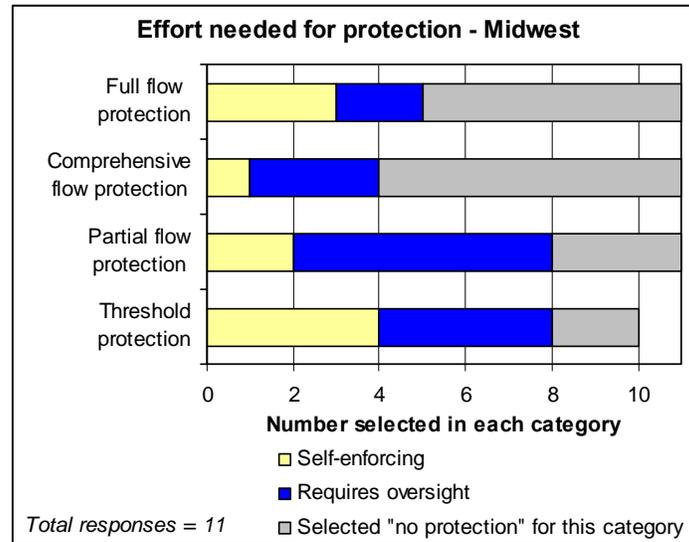


Figure O-2. Level of effort needed to ensure implementation of various levels of instream flow protection in the midwestern U.S. at the time of the survey. Participants were asked, “Are the protections referenced in the previous question generally secure or do they need continued monitoring/enforcement to be protective?” Some participants did not answer some questions.

Comments:

- *Full protection:* Full flow protection was not available in six states. In the remaining five states, three participants indicated it was available and generally secure and two indicated it was available but required monitoring and enforcement in order to be protective.
- *Comprehensive ecological protection* was not available in seven states. In the remaining four, one participant considered it generally secure and the other three indicated monitoring and enforcement necessary for flow protection.
- *Partial ecological protection* was not available in three states. In two states this protection was available and generally secure, while in six states it was available but monitoring and enforcement were considered necessary.
- *Threshold protection* was not available in two states. In four states it was considered generally secure while in four other states monitoring and enforcement was considered necessary for effective protection.

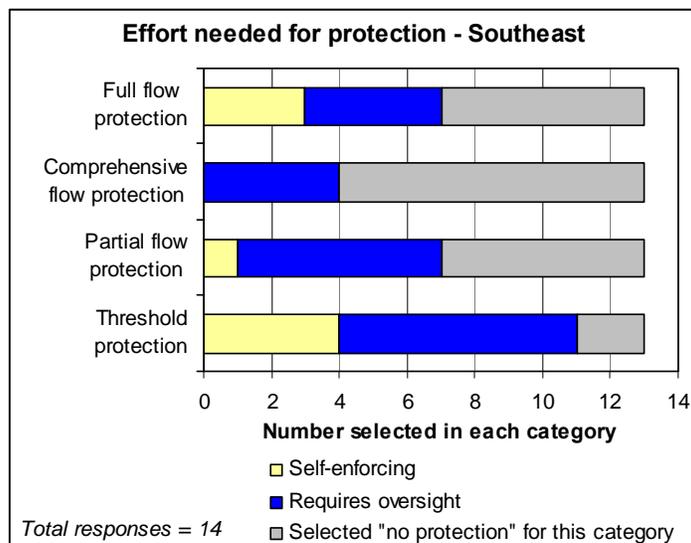


Figure O-3. Level of effort needed to ensure implementation of various levels of instream flow protection in the southeastern U.S. at the time of the survey. Participants were asked, “Are the protections referenced in the previous question generally secure or do they need continued monitoring/enforcement to be protective?” Some participants did not answer some questions.

Comments:

- *Full protection* was not available in six states. Three participants indicated that full protection available and generally secure, while four indicated it was available but protective only with monitoring and enforcement.
- *Comprehensive ecological protection* was not available in nine states. In four states it was available but considered protective only with monitoring and enforcement.
- *Partial ecological protection* was not available in six states. In one state it was available and considered secure while in six other states it was available but considered protective only with monitoring and enforcement.
- *Threshold protection* was not available in two states. In four states it was available and considered to be providing generally secure protection. In seven states it was also available but considered protective only with monitoring and enforcement.

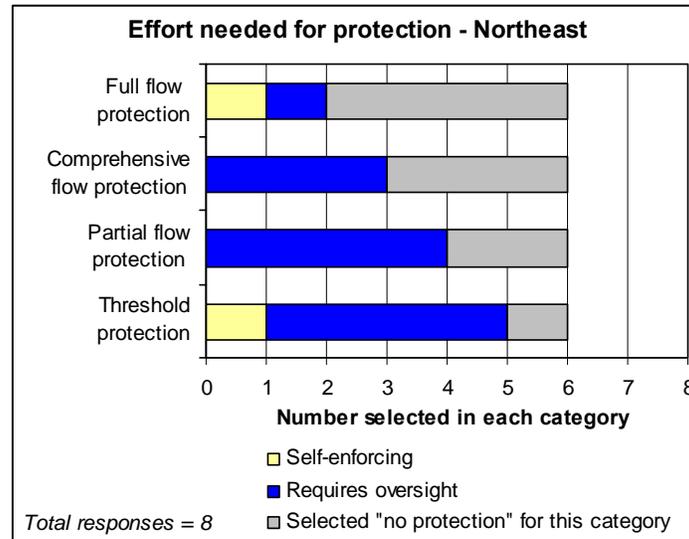


Figure O-4. Level of effort needed to ensure implementation of various levels of instream flow protection in the northeastern U.S. at the time of the survey. Participants were asked, “Are the protections referenced in the previous question generally secure or do they need continued monitoring/enforcement to be protective?” Some participants did not answer some questions.

Comments:

- *Full protection* was not available to four states. One participant indicated it was available and generally secure on land in state ownership, and one participant indicated it was available but protective only with monitoring and enforcement.
- *Comprehensive ecological protection* was not available in three states. In three other states it was available but considered effective only with monitoring and enforcement.
- *Partial ecological protection* was not available in two states. In four states it was available but considered protective only with monitoring and enforcement.
- *Threshold protection* was not available in one state. In one state it was available and considered generally secure. In the remaining four states it was available, but monitoring and enforcement was considered necessary for effective protection.

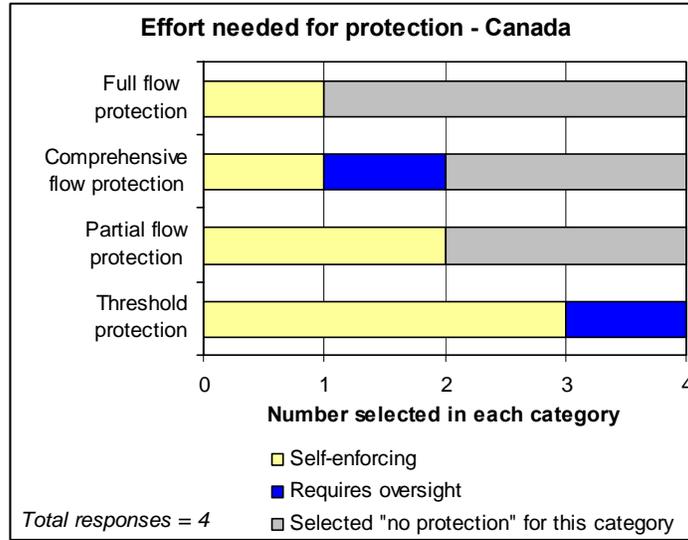


Figure O-5. Level of effort needed to ensure implementation of various levels of instream flow protection in participating Canadian provinces at the time of the survey. Participants were asked, “Are the protections referenced in the previous question generally secure or do they need continued monitoring/enforcement to be protective?” Some participants did not answer some questions.

Comments:

- *Full protection* was not available in three provinces. In one province it was available and considered generally secure.
- *Comprehensive ecological protection* was not available in two provinces. In two others it was available, with one provincial participant considering it generally secure and the other indicating monitoring and enforcement were needed for it to be protective.
- *Partial ecological protection* was not available in two provinces. In two others it was available and considered generally secure.
- *Threshold protection* was available in all four provinces. It was considered generally secure in three provinces and in one province it was considered protective only with monitoring and enforcement.

Appendix P. Percent of Streams Restored by Region

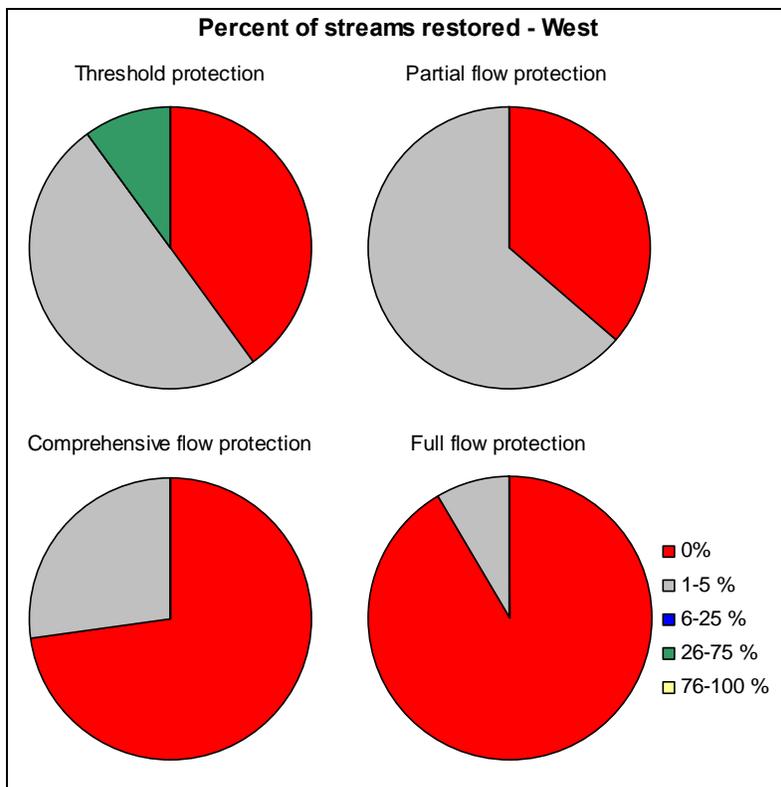


Figure Q-1. Percent of western U.S. stream miles restored to any of four different levels of instream flow protection at the time of the survey. Participants were asked, “In your estimation, for what proportion of stream miles in your state or province have flows been restored to the following levels of protection?” Some participants did not answer some questions. Number of responses = 12.

Comments:

- Some participants did not answer some questions. There were 12 responses for full protection, 11 responses each for comprehensive ecological protection and partial ecological protection, and 10 responses for threshold protection.
- *Full protection:* participants in 11 states reported no streams were restored to full protection in their states. One participant reported 1–5% of stream miles were restored to full protection.
- *Comprehensive ecological protection:* participants in 8 states reported that no stream miles were restored to comprehensive ecological protection, 3 participants indicated 1–5% of stream miles were restored to this level of protection, and 1 participant commented that most restorations had occurred through the FERC process.
- *Partial ecological protection:* participants in 4 states reported no stream miles were restored to partial ecological protection, 7 participants reported 1–5% of stream miles were restored. One of those participants indicated their state was just beginning to be able to purchase water rights to make this happen. Another participant commented that even though some restoration has been

accomplished, tailwater salmonid fisheries had not been restored to even a semblance of natural conditions.

- *Threshold protection:* participants in 4 states reported no stream miles were restored to even threshold protection, 5 participants reported 1–5% of stream miles were restored to this level of protection, and 1 participant reported 26–75% of stream miles were restored to this level. One participant who reported no stream miles protected commented that while there were a few instances where water was put back in dewatered reaches, this affected few stream miles.

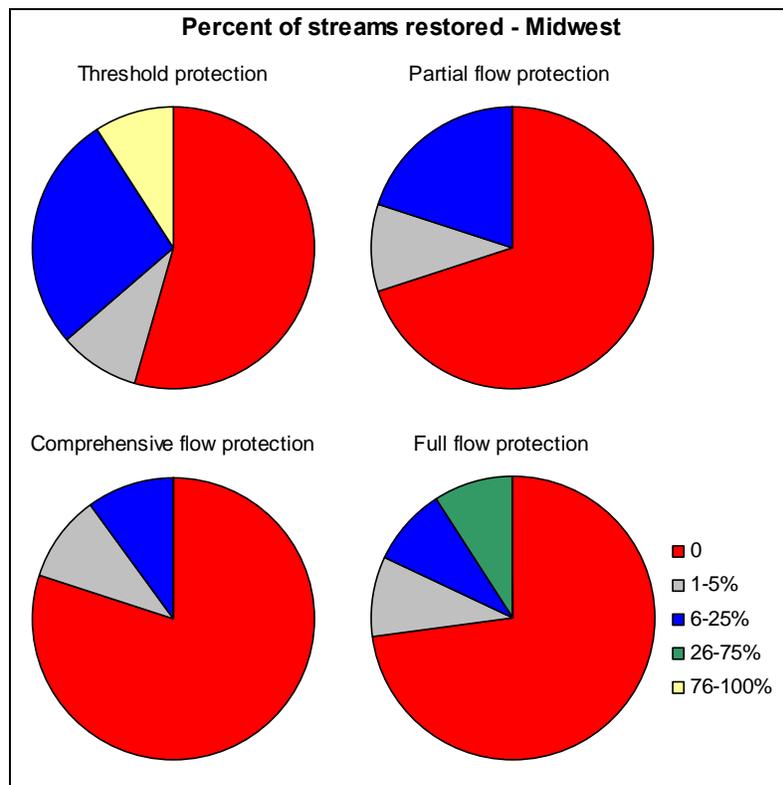


Figure Q-2. Percent of midwestern U.S. stream miles restored to any of four different levels of instream flow protection at the time of the survey. Participants were asked, “In your estimation, for what proportion of stream miles in your state or province have flows been restored to the following levels of protection?” Some participants did not answer some questions. Number of responses = 11.

Comments:

- Some participants did not answer some questions. There were 11 responses for full protection, 10 responses each for comprehensive ecological protection and partial ecological protection, and 11 responses for threshold protection.
- *Full protection:* participants in 8 states reported no stream miles were restored to full flow protection. In the remaining 3 states, 1 participant indicated 1–5% was restored, 1 reported 6–25% was restored, and 1 reported 26–75% was restored. 1 participant indicated this protection may improve with a combined three-state and federal program for Platte River threatened and endangered species (this same comment was made for full, comprehensive ecological and partial ecological stream flow protections). One participant did not answer this question.

- *Comprehensive ecological protection:* participants in 8 states reported no stream miles were restored to comprehensive ecological protection, 1 reported 1–5% of stream miles were restored to this level, and 1 reported 6–25% of stream miles were restored to this level. One participant did not answer this question.
- *Partial ecological protection:* participants in 7 states reported no stream miles were restored to partial ecological protection. 1 participant reported 1–5% were restored to this level and commented that through the FERC process they were able to restore flows to a portion of the St. Louis River system using PHABSIM. The remaining 2 participants reported 6–25% of stream miles were restored to this level. One participant did not answer this question.
- *Threshold protection:* participants in 6 states reported no stream miles were restored to even threshold protection, 1 state reported 1–5% were restored, 3 reported 6–25% were restored, and 1 reported 75–100% were restored (this state participant commented that some of these streams may have been restored to partial or comprehensive protection, but could not put a number on it).

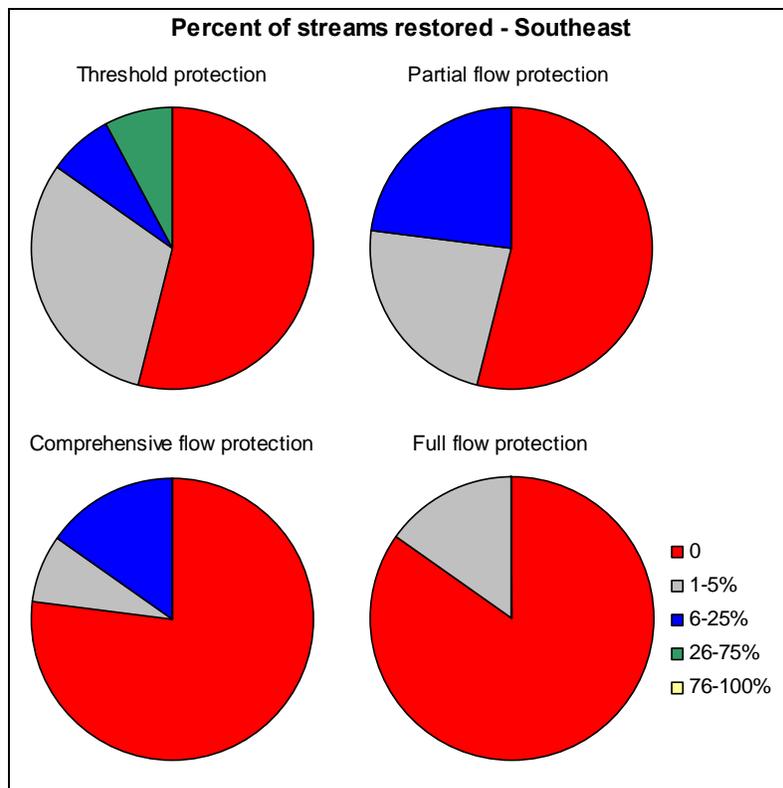


Figure Q-3. Percent of southeastern U.S. stream miles restored to any of four different levels of instream flow protection at the time of the survey. Participants were asked, “In your estimation, for what proportion of stream miles in your state or province have flows been restored to the following levels of protection?” Some participants did not answer some questions. Number of responses = 13.

Comments:

- Some participants did not answer some questions. There were 13 responses for each of the levels of protection.
- Some participants did not answer some questions. There were 7 responses for full protection, comprehensive ecological protection, and partial ecological protection, and 8 responses for threshold protection.
- *Full protection*: participants in 11 states reported no streams were restored to full instream flow protection and 2 reported 1–5% were restored. One participant commented (on all the levels of flow restoration) that their state did not plan for restoration but instead worked to recognize allowable withdrawals.
- *Comprehensive ecological protection*: participants in 10 states reported no stream miles were restored to the comprehensive ecological protection, 1 reported 1–5% of stream miles were restored, and 2 reported 6–25% of stream miles were restored to this level of protection.
- *Partial ecological protection*: participants in 7 states reported no stream miles were restored to partial ecological protection, 3 states reported 1–5% of stream miles restored, and 3 reported 6–25% of stream miles restored to this level.
- *Threshold protection*: participants in 7 states reported no stream miles restored to the threshold level of protection, 4 states reported 1–5% of stream miles restored, 1 participant reported 6–25% of stream miles restored, and 1 reported 26–75% of stream miles restored to threshold level protection.

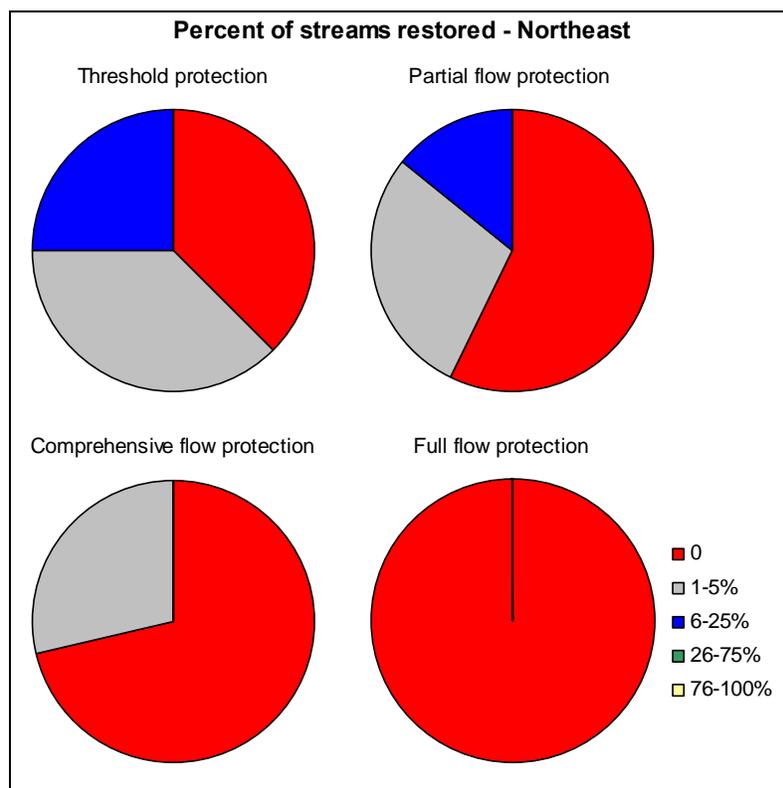


Figure Q-4. Percent of northeastern U.S. stream miles restored to any of four different levels of instream flow protection at the time of the survey. Participants were asked, “In your estimation, for what proportion of stream miles in your state or province have flows been restored to the following levels of protection?” Some participants did not answer some questions. Number of responses = 8.

Comments:

- Some participants did not answer some questions. There were 7 responses for full protection, comprehensive ecological protection, and partial ecological protection, and 8 responses for threshold protection.
- *Full protection*: All 7 participants reported that no stream miles were restored to full protection.
- *Comprehensive ecological protection*: participants in 5 states reported no stream miles were restored to comprehensive ecological protection, and 2 participants reported 1–5% of stream miles were restored to this level.
- *Partial ecological protection*: participants in 4 states reported no stream miles were restored to partial ecological protection, 2 participants reported 1–5% of stream miles restored to this level, and 1 reported 6–25% of stream miles were restored to this level.
- *Threshold protection*: participants in 3 states reported no stream miles were restored to the threshold protection level, 3 reported 1–5% of streams were restored to this level, and 2 participants reported 6–25% of stream miles were restored to this level.

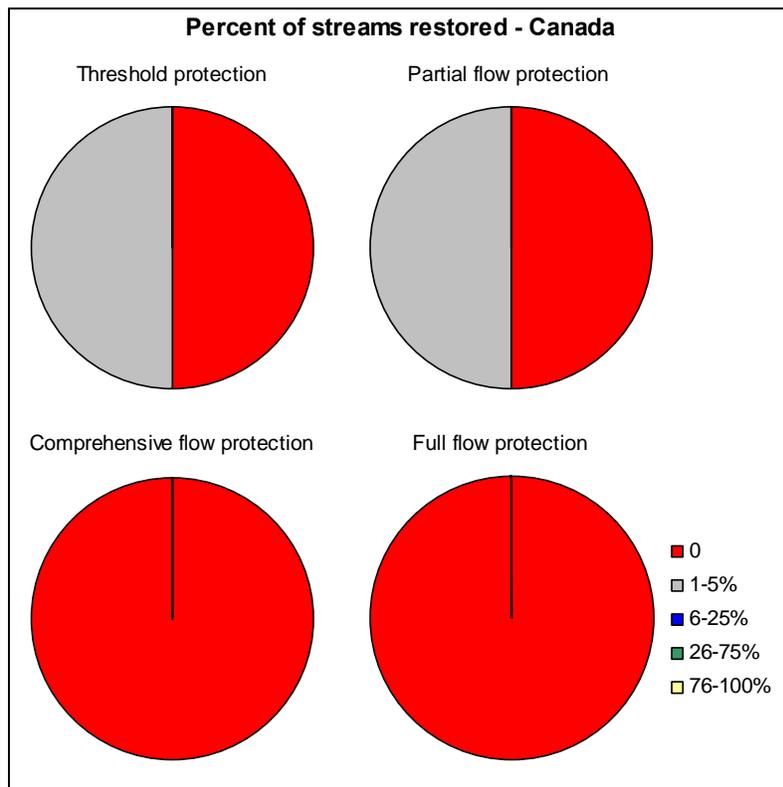


Figure Q-5. Percent of stream miles in participating Canadian provinces restored to any of four different levels of instream flow protection at the time of the survey. Participants were asked, “In your estimation, for what proportion of stream miles in your state or province have flows been restored to the following levels of protection?” Number of responses = 4.

Comments:

- *Full protection:* participants in all 4 provinces reported no stream miles were restored to full protection.
- *Comprehensive ecological protection:* participants in all 4 provinces reported no stream miles were restored to the comprehensive ecological protection.
- *Partial ecological protection:* participants in 2 provinces reported no stream miles were restored to partial ecological protection, and participants in the remaining 2 provinces reported that 1–5% of the stream miles were restored to this level of protection.
- *Threshold protection:* participants in 2 provinces reported no stream miles were restored to even the threshold level of protection, and the other 2 participants reported 1–5% of stream miles were restored to this level of protection.

Appendix Q. Outcomes by region

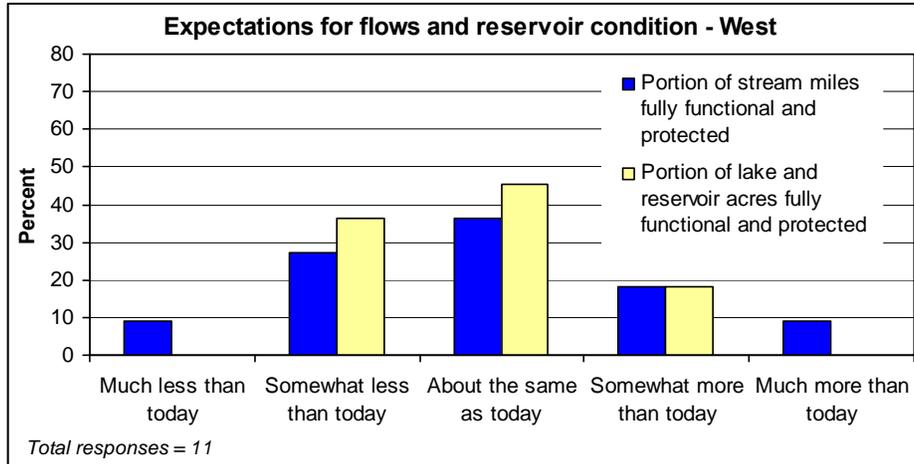


Figure R-1. Western U.S. participants’ expectations at the time of the survey for future condition of rivers and lakes. Participants were asked, “In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?”

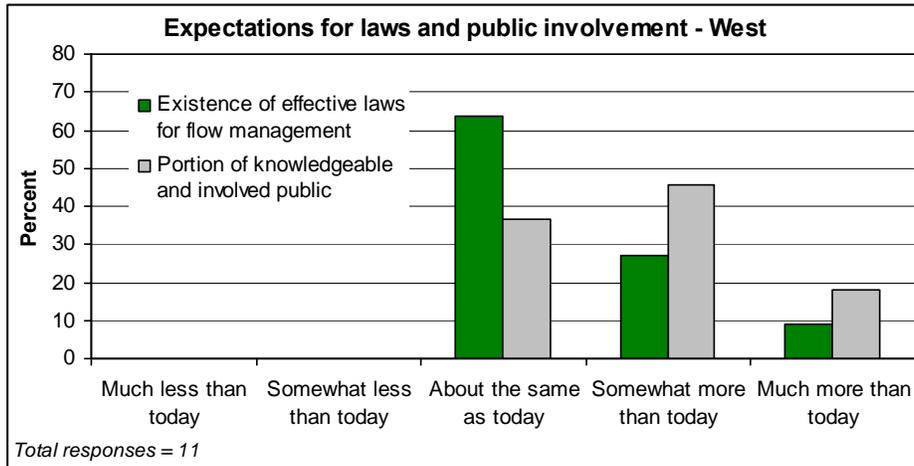


Figure R-2. Western U.S. participants’ expectations at the time of the survey for future condition of laws and public involvement. Participants were asked, “In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?”

Key findings:

- As noted in other regions, most participants in the western U.S. felt that the portion of stream miles fully functional and protected from degradation would be the same or less than at the time of the survey. However, over 25% of participants felt the portion would be somewhat greater or much greater.

- A similar pattern was noted for lakes and reservoirs where the majority of participants thought protections would be the same or less than today but about 20% felt conditions would be somewhat better.
- All participants indicated that they thought the existence of laws would at least the same or better than at the time of the survey.
- Likewise, all participants indicated they thought the public would be more knowledgeable and involved in the future than they were than at the time of the survey.

Summary:

- Some participants in the western U.S. saw opportunity for improvement via increased federal regulation (FERC) and acquisition of instream flow water rights.
- Participants also noted a gradual shift in agricultural practices and values that could lead to improved flow conditions in some situations.
- Some comments in text boxes indicated a belief that drought associated with climate change may be an uncontrollable factor that could combine with increased demand for human uses to the detriment of riverine resources.

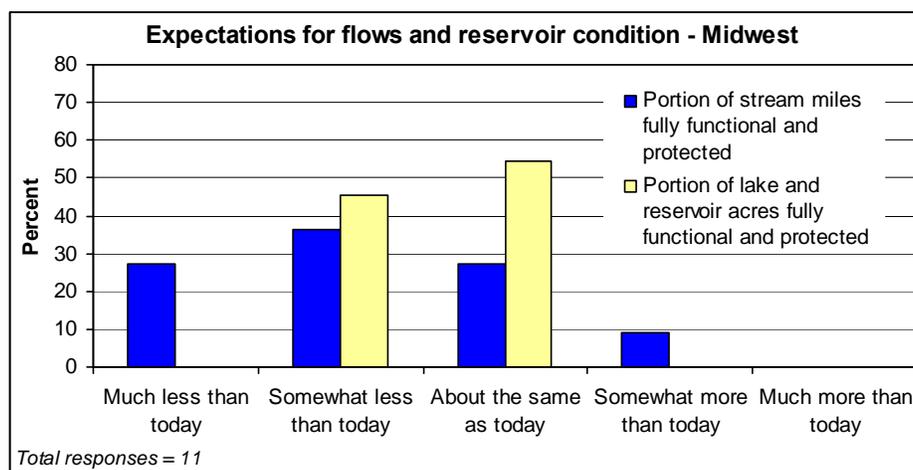


Figure R-3. Midwestern U.S. participants’ expectations at the time of the survey for future condition of rivers and lakes. Participants were asked, “In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?”

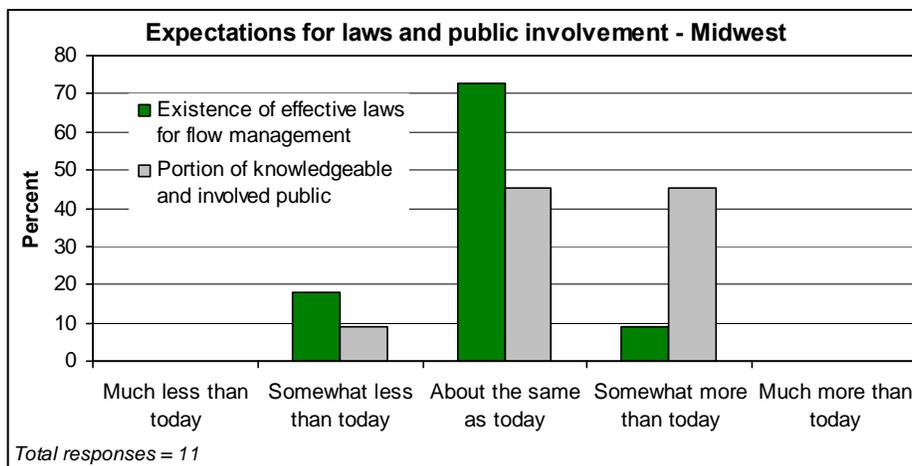


Figure R-4. Midwestern U.S. participants' expectations at the time of the survey for future condition of laws and public involvement. Participants were asked, "In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?"

Key findings:

- Most participants in the midwestern U.S. (91%) felt the portion of stream miles that were fully functional and protected from degradation would be the same or less than at the time of the survey. However over a quarter of those felt conditions would be much worse.
- All participants felt the portion of lake acres that were fully functional and protected would be about the same or slightly less than at the time of the survey.
- The majority of participants (73%) indicated they thought the existence of effective laws would be the same as at the time of the survey. Few participants foresaw any decline in laws and even fewer participants expected any improvement.
- About half of all participants felt that public knowledge and involvement would be the same as at the time of the survey. An equal number thought this output would be slightly better.

Summary:

- Urbanization of rural areas, developments along lake shorelines and watersheds and development pressures in general were expected to be major factors associated with declining conditions for lakes and streams.
- The existence of laws may be the same or better but their effectiveness or interpretation would be key.

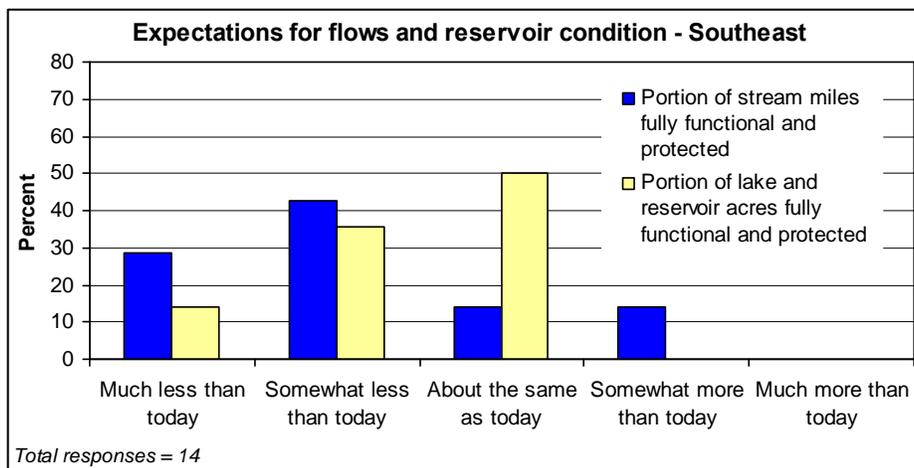


Figure R-5. Southeastern U.S. participants’ expectations at the time of the survey for future condition of rivers and lakes. Participants were asked, “In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?”

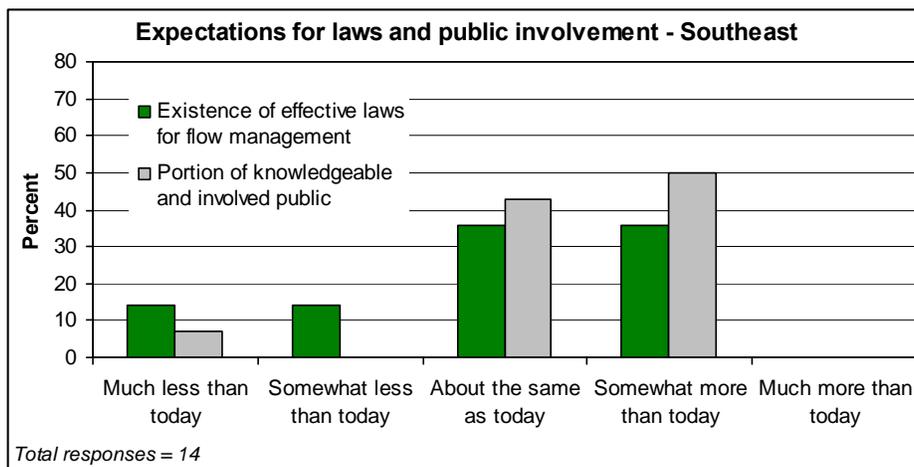


Figure R-6. Southeastern U.S. participants’ expectations at the time of the survey for future condition of laws and public involvement. Participants were asked, “In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?”

Key findings:

- Most participants in the southeastern U.S. (72%) expressed the belief that protections for streams would be less or much less in the next ten years than they were at the time of the survey.
- Participants were somewhat more optimistic about the condition of lakes and reservoirs with most (88%) of participants indicating they thought those resources would be the same as they were at the time of the survey, or only somewhat less.
- Not a single participant expected standing water resources to be in better condition in the next ten years than they were at the time of the survey.

- Many participants (71%) thought the effectiveness of laws related to streams and lakes would remain the same or improve in the future.
- Nearly all (93%) of participants expected the public to either become more knowledgeable and involved in water management issues, or to remain the same in the future.

Summary:

- Given existing development conditions, some participants expressed the belief that creating new laws and engaging the public may be too late to maintain or restore aquatic resources.
- Setting flow standards may address quantitative needs in some situations but a bigger concern was that watershed development and eutrophication will degrade aquatic resources.

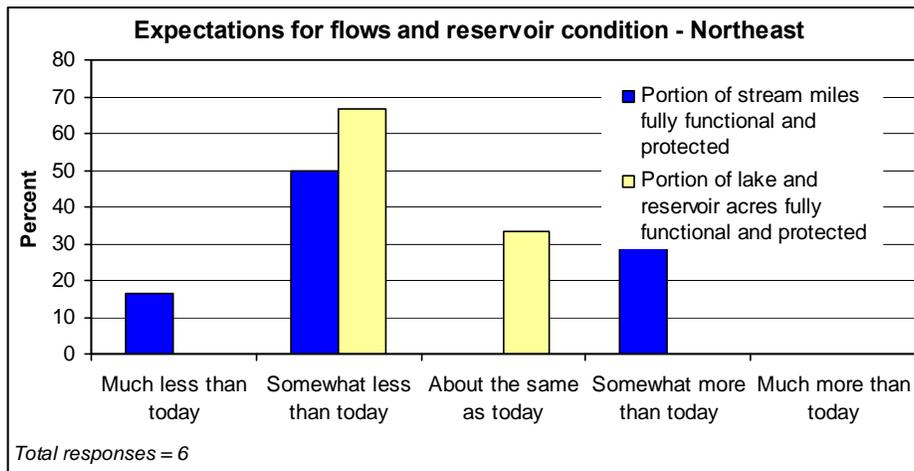


Figure R-7. Northeastern U.S. participants’ expectations at the time of the survey for future condition of rivers and lakes. Participants were asked, “In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?”

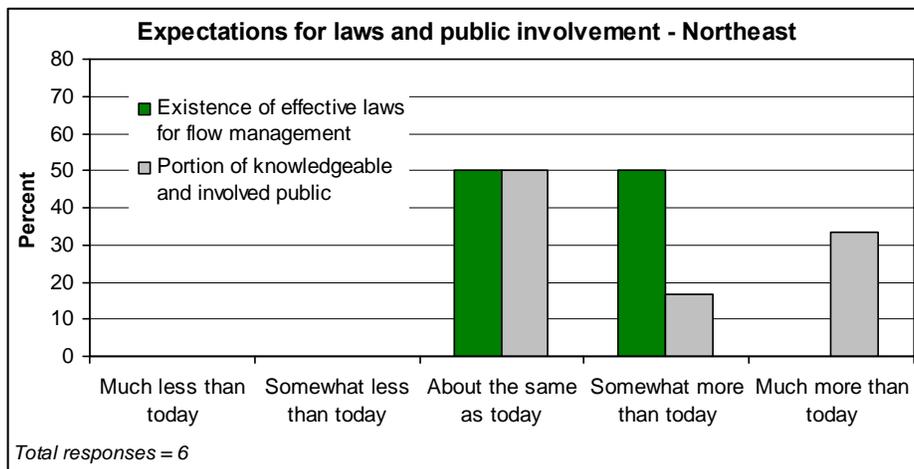


Figure R-8. Northeastern U.S. participants’ expectations at the time of the survey for future condition of laws and public involvement. Participants were asked, “In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?”

Key findings:

- None of the participants in the northeastern U.S. felt stream protections would be the same in the future than at the time of the survey. Most (66%) felt conditions would be somewhat or much less, however one-third of participants thought the rivers in their state would be better protected and functional.
- All participants indicated they expected lakes and reservoir protection and function to be the same or somewhat worse in the next ten years than at the time of the survey.
- Half of all participants expected to see more effective laws for streams and lakes in the future.
- One-third of participants expected public knowledge and involvement to be much better in ten years than they were at the time of the survey.

Summary:

- There was an increasing interest and activity associated with dam removal, which should result in some enhancements of some streams.

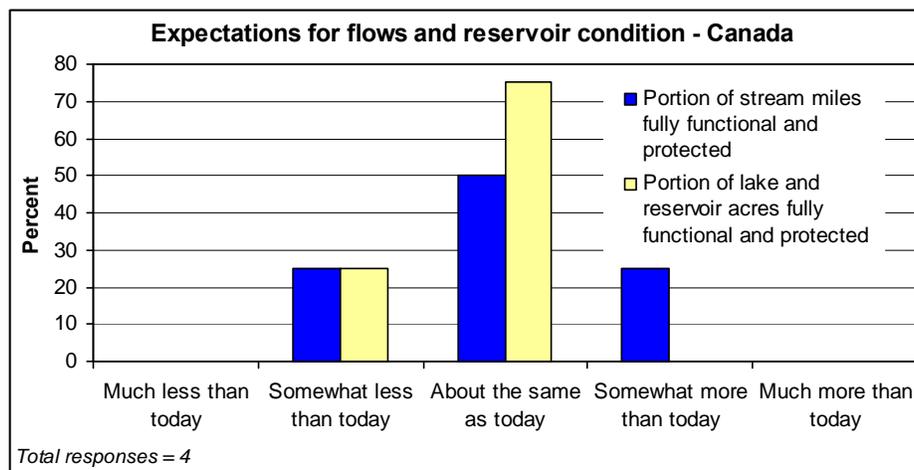


Figure R-9. Canadian participants' expectations at the time of the survey for future condition of rivers and lakes. Participants were asked, "In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?"

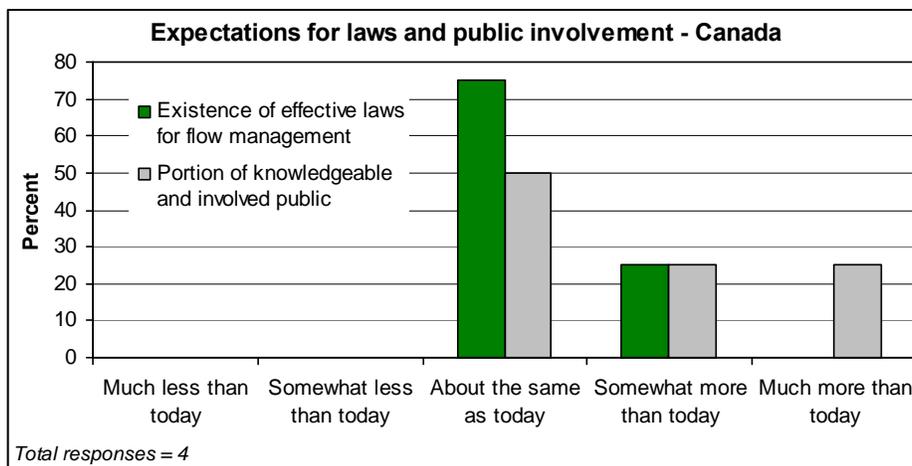


Figure R-10. Canadian participants' expectations for future condition of laws and public involvement at the time of the survey. Participants were asked, "In your estimation, if current conditions and trends continue, what will be the condition ten years from now of the elements listed?"

Key findings:

- The Canadian participants generally felt the function and protections of streams in Canada would be about the same as at the time of the survey, though there were indications that some felt conditions would be somewhat less and others felt they would be somewhat better.
- Most participants felt the function and protections afforded lakes and reservoirs would be the same in ten years than at the time of the survey, though one indicated those conditions would be somewhat less. No participants expected conditions to be even somewhat better in the future.
- As in other regions, most participants expected the existence of laws to be the same or somewhat better in the next ten years than at the time of the survey. None expected a decline in the existence of effective laws for water management.
- Participants generally felt public knowledge and involvement would be the same or much better in the next ten years than at the time of the survey.

Summary:

- Though many responses indicated that participants expect protections and function to remain unchanged, the unfortunate fact is that many waters have no protections today so the threat of degradation in the future is very real.

Appendix R. Summary of Contractor Blog

The blog consisted of two rounds of opportunities for online group discussion. The first round asked participants to name and discuss the three biggest challenges and the three biggest opportunities that instream flow professionals would face in next five years affecting the performance of their agency, and their personal performance, respectively. The second round asked participants to offer three solid ideas that might serve as beginning solutions to one or several of the issues identified in the first round of discussion.

Representatives of 12 states and provinces participated in the first discussion and 4 in the second. Despite the small number of participants there were common themes (as described below). A detailed summary was provided by the facilitation contractors and this information was condensed by the project team to the material provided here.

Challenges:

- There is an absence of enabling legislation for instream flow work, or if legislation exists it isn't implemented or used.
- There is a lack of instream flow personnel (and, by inference, lack of funding) and lack of training and/or expertise about instream flow management for existing personnel.
- Agencies lack resolve to implement instream flow interventions.
- Instream use is often a 'junior' water right.
- Alternative energy programs (e.g., ethanol production based on agriculture) can intensify pressure to extract water (i.e., pitting one 'public good' against another 'public good').
- There is a lack of a universal acceptance of the science behind instream flow management.
- There is a lack of recognition of the role and value of managing instream flows as a 'beneficial use' by key regulators or decision-making bodies (e.g., sometimes there is a perception that water left in stream represents a 'wasted' economic opportunity).

Opportunities:

- There is a robust array of existing instream flow methods.
- Other organizations (e.g., agencies, universities) have programs and expertise that can be accessed for learning, coaching, etc. and there are generally positive, collaborative relationships between these entities.
- There is high technical excellence and dedication of staff who work on instream flow issues.
- There are some water access programs available for instream flow reservations (e.g., a Water Supply Bank, best management practices, Water Transaction Program).
- Some entities have passed legislation on instream flow management (e.g., West Virginia's Water Resources Protection Act, Maine adopting a new rule on flow standards).
- There is some level of awareness by stakeholder groups of the importance of instream flows and some are building coalitions (e.g., Watershed Restoration and Protection Strategies in Kansas).
- Some fish and wildlife commissions are asking staff to generate instream flow policy recommendations (e.g., Nebraska).

Suggestions:

- *Close regulatory and policy gaps.* There are a variety of gaps including: simple omissions of enabling legislation, agency lead responsibility for water management being assigned outside of the fish and wildlife agency, and the benefits of existing legislative direction not being fully realized because implementing policy is incomplete.
- *Improve method selection.* The best instream flow assessment methods are not being used for a number of administrative jurisdictions thereby leaving a vacuum or a debate about the best available science.
- *Hire or add instream flow personnel.* A lack of instream flow staff hinders simple implementation of programs not to mention affirmative initiatives like policy reform.
- *Invest in training.* Staff in various jurisdictions feel the need for greater support by the instream flow management community to help them gain knowledge, skills, and abilities for program implementation.
- *Enhance stakeholder awareness.* Instream flow professionals can, in some jurisdictions, feel alone in their work to improve management. They sense a need for greater awareness of the importance of instream flow management, and they sense an opportunity as some non-governmental organizations are starting to take an interest and increase their work on instream flow issues.

Appendix S. Workshop Agenda

Workshop on Strategy Development For State and Provincial Fish and Wildlife Agency Instream Flow Professionals

October 9–11, 2007

DoubleTree Hotel • 3203 Quebec Street • Denver, Colorado

Sponsored and Conducted by The Instream Flow Council

What we will do: This workshop is designed to support state and provincial fish and wildlife agency managers in the United States and Canada in their work influencing water flows, storage, release, or diversions for human use that is in synch with riverine sustainability principles.

Expectations: You should come to the workshop with,

1. A personal commitment to analyze what is happening in your ‘real-world’ working environment that is hindering and helping with your personal and your organization’s effectiveness;
2. A commitment to participate in information sharing at a national, regional, and personal level about program strengths and weaknesses that will help you and your colleagues improve their effectiveness, and
3. A personal willingness to continuous improvement that will be expressed at the end of the workshop as a short-list of realistic activities you will implement in the coming year and beyond.

Background to the workshop: The Instream Flow Council’s Instream Flow Program Initiative is a three-year assessment of all state and provincial fish and wildlife agency instream flow or water management programs. The main feature of the project involves bringing agency representatives together with outside water management experts to develop strategies for personal and program improvement. This workshop is one element of the project and is intended to:

- allow participants to discuss with each other the results of the IFC surveys on program effectiveness and relative differences and commonalities,
- bring representatives of stakeholder groups together to discuss with program representatives their perspectives on trends, obstacles, and opportunities related to improving instream flow protection and restoration in the US and Canada, and
- develop creative and realistic strategies for participants and their agencies to address these issues and improve their overall effectiveness at managing public trust riverine resources.

Agenda

October 9		
12:00	LUNCH—Colorado Rooms I, II, III	
Module 1—Opening—Grand Ballroom I		
1:00	Call to order Welcome, workshop theme, and purpose Hal Beecher (IFC President) Matt Hogan (Association of Fish and Wildlife Agencies)	Why we are here
Module 2 - Where are we now?—Part 1—Grand Ballroom I		
2:00	National Instream Flow Program Assessment, Part 1 - Christopher Estes (IFC Director At-Large) General overview of the surveys and explanation of the IFC Logic Model—Kathleen Williams (IFC Executive Director and Project Coordinator) Survey results - Tom Annear (IIFPI Project Manager)	How we got here
3:00	BREAK	
3:30	Panel and discussion Bob Deibel (USFS, National Instream Flow Coordinator) Brian Richter (The Nature Conservancy, Sustainable Waters Program Director) Melinda Kassen (Director of Trout Unlimited's Western Water Project) Arlene Kwasniak Associate Professor, Faculties of Environmental Design and Law, University of Calgary	Seed questions to panelists: 1) What trends, obstacles, and opportunities affect the effectiveness of state and provincial instream flow or water management efforts? What are the 'drivers' for an agency? What are the 'drivers' for the individual instream flow professional's job? 2) What techniques and strategies could agencies employ to improve their effectiveness with instream flow and water management activities? 3) What resources they, their organization, or others could offer to facilitate these strategies? 4) How IFC could function more effectively to help our members or the speakers' own efforts to deal with public trust aquatic resources?
5:00 end 5:25	Wrap up What I think I learned, so far - Mark P. Smith (Director, Eastern U.S. Freshwater Program, The Nature Conservancy) Closing activities	
6:00—9:00	DINNER AND CASH BAR—Colorado Rooms I, II, III Presentation—Robert Anderson—Associate Professor of Law, Director, Native American Law Center, University of Washington	

October 10		
Module 3 - Where are we now?—Part 2—Grand Ballroom I		
8:00	Call to order Preparation for breakout groups	
8:40	Breakouts by five regions List top 5: <i>Trends</i> <i>Obstacles</i> <i>Opportunities</i> Create two lists: Agency Drivers and Personal Effectiveness Drivers and stratify by Science Issues, Public Involvement Issues, Institutional Issues, Legal Issues, and Other Issues.	Isolate the key drivers at the regional level that should guide management from IFC, agencies, and individuals
10:00	BREAK	
10:30	Plenary Roll-up of top 5 <i>Trends, Obstacles, Opportunities</i> at the national level	Roll up regional challenges into a national picture for the IFC
11:50	Wrap up—What I think I learned, so far—Mark P. Smith (Director, Eastern U.S. Freshwater Program, The Nature Conservancy) Closing activities	
12:00	LUNCH—Oakroom/Rossos Presentation - Mamie Parker—US Fish and Wildlife Service, Assistant Director, Fisheries and Habitat Conservation	
Module 4 - Where do we want to go?—Part 1		
1:30	Plenary Breakout group assignment and logistics (room allocations, etc.)	
2:00	Breakouts by Five regions Strategy identification to deal with the top 5 Agency Drivers for your region	Identify viable strategies that should be considered as a response to trends, Obstacles, or opportunities that exist in your agency work environment.
3:10	BREAK	
3:30	Breakouts by Five regions Strategy identification to deal with the top 5 Personal Effectiveness Drivers (personal or regional, if they affect personal performance)	Identify viable strategies that should be considered as a response to trends, Obstacles, or opportunities that exist in your personal work environment.
5:00 to 5:30	While in the last breakout, design your breakout reporter's presentation for tomorrow morning (8-minute reports). Wrap up and closing comments for each breakout group.	
6:00	SOCIAL—Grand Ballroom II Cash bar and “heavy” hors d'oeuvres. Wear your finest fish theme apparel (optional).	
8:00 p.m.	Regional team meetings for regions 2, 3, 4, and 5. To be held in breakout rooms used earlier in the day	

October 11		
7:00 a.m.	BREAKFAST—Crystal III	
Module 5 - Where do we want to go?—Part 2—Grand Ballroom I		
8:00 a.m.	<p>Plenary</p> <p>Picking the most promising strategies for the IFC to implement or champion (considering staff, IFC, and partner roles) and potential resources to support the suggestions. Eight-minute reports from the breakout groups. Working with this material.</p>	Create a manageable short-list of potential IFC action items
10:00	BREAK	
10:20	<p>Plenary</p> <p>Personal work plan</p>	Plotting a personal strategy that captures the synergy of individuals and IFC working in their organization for each other's benefit
11:05	<p>Plenary</p> <p>Wrap up—What I think I learned, for the whole darned thing!—Mark P. Smith (Director, Eastern U.S. Freshwater Program, The Nature Conservancy)</p> <p>Prior presenters' sound bites about what they learned.</p> <p>Closing comments—Tom Annear (IIFPI Project Manager)</p>	Regain the big picture perspective of our collective work together
Module 6—Closing LUNCH—Reflecting upon and celebrating the workshop accomplishments		
12:00	LUNCH—Crystal III	
1:30 - End of the workshop		
2:00	Region 1 regional meeting. To be held in Executive Room A until 5:00 p.m. and reconvened over dinner at a nearby establishment.	

Appendix T. Top Strategies, by Driver, from Regional Breakout Groups

Strategies in bold were presented to all workshop participants for voting.

Western U.S.

Priority drivers	Corresponding strategies
Messaging on the relationship between instream flow (lentic and lotic) and "quality of life" is not getting out	<p>Work through existing state water conservation programs.</p> <p>Hire public relations expert.</p> <p>Put informational inserts in water bills.</p> <p>Conduct demonstration projects showing successes and failures.</p> <p>Engage the watershed communities in flow-related partnerships.</p> <p>Conduct a survey to learn the level of public knowledge about instream flow issues and what aspects are most important.</p> <p>Actively identify "common ground" with those who disagree.</p>
Increased interest and willingness of non-agency groups to take on flow projects/issues creates increased partnership opportunities with non-traditional partners.	<p>Interpersonal communication with stakeholders (personal and agency).</p> <p>Partnership with non-governmental organizations for funds.</p> <p>Develop shared/common priorities.</p> <p>Partner with stakeholders to get our message out.</p> <p>Help non-agency groups build their capacity to work on instream flow issues.</p>
The need for methods, laws, and regulations that recognize ecologically-based flow regimes (including all flow components).	<p>Develop partnership to get legislation that will give full protection of all ecological functions.</p> <p>Develop guidance on how to best evaluate and comment on water development projects.</p> <p>Instream Flow Council and individuals support National Fish Habitat Plan and its implementation.</p> <p>Generate draft legislation.</p>

Midwestern U.S.

Priority drivers	Corresponding strategies
Perception of water richness; lack of public support for needed instream flows	<p>Demonstrate cumulative effects that water uses have on aquatic resources.</p> <p>Create a pool of instream flow articles for use by others to communicate through a wide variety of media and develop positive perceptions about aquatic resources.</p> <p>Reframe instream flow concepts to help public understand connection between water for aquatic resources and “quality of life” for humans.</p> <p>Bring in marketing specialists.</p> <p>Identify audiences then craft and deliver messages.</p> <p>Select targeted messages aimed at specific audiences (e.g., agency directors, farm organizations, NGOs, etc.).</p> <p>Develop and analyze data to support article development in above strategies.</p> <p>Regulate “nominal” withdrawals.</p>
Lack of instream flow programs and/or priority within agencies.	<p>Use Instream Flow Council to illustrate and advocate instream flow issues to Agency leaders via the Association of Fish and Wildlife Agencies.</p> <p>Demonstrate social/economic importance of instream flows.</p> <p>Demonstrate <u>tangible</u> harms without and <u>tangible</u> benefits with adequate instream flows.</p> <p>Create a bulleted list of why instream flow is important.</p> <p>Tie instream flow issues to what’s in the news (e.g., floods, fish kills, etc.).</p> <p>Use constituent groups to contact and influence legislators (and other influencers) to ‘do the right thing’ relative to instream flow issues.</p>
Lack of policy/laws/regulations	<p>Work with NGOs/stakeholders/etc to encourage regulating agencies to enforce appropriate instream flow policies.</p> <p>Foster relationships with legislators to increase willingness to champion needed instream flow laws and regulations.</p> <p>Look at existing laws and regulations that can be used to address instream flow issues.</p> <p>Develop policy for your agency (maybe via a ‘white paper’ to start off).</p> <p>Foster relationships with regulatory agencies to enhance instream flow regulations.</p>
Insufficient expertise in fields such as hydrology, ecosystem modeling, risk assessment	<p>Work with the International NGO coalition to develop on-line training packages relative to instream flow.</p> <p>Identify specific (regional and state) training needs and prioritize.</p> <p>Develop and share listings of available training/expertise sources (e.g., Fort Collins USGS, International Environmental Flows Network, etc.) and provide to members via Instream Flow Council network.</p> <p>Utilize the expertise of other agencies, the Instream Flow Council, and individuals.</p>

Southeastern U.S.

Priority drivers	Corresponding strategies
<p>There needs to be a strategic vision and plan for the future instream flow program in each state.</p>	<p>Decide on an agency vision for the future related to instream flow. Present a preliminary idea to agency leaders including the scope of the instream flow program. Sell the need to people by identifying what we do, legal requirements, and why we need to change. (i.e., “where are we, where do we need to be?”). Build support within agency staff and constituency; find a legislator or board member to recommend program creation or improvement. Compare costs of having no plan with the benefits of an instream flow program; conduct a needs assessment. Find a state that has a flow-related strategic plan to use as a model. Do an in-house strategic plan including funding; issue a Request For Proposals for contract help.</p>
<p>There needs to be policy, law and rules for the instream flow program (e.g., the linkage of surface water and ground water in some states). There are inconsistent laws that disagree. Instream flow is not, legally, a beneficial use in some states.</p>	<p>Update the publications “Opportunities to protect instream flow in...” by the USFWS. Find a model law. Commission a comprehensive water law study. Policy change to use existing laws. Demonstrate the need for legislation for storm water and drought management.</p>
<p>The public needs to be more supportive of instream flow values.</p>	<p>Hire a marketing firm to design the message, identify the audience, and identify and use appropriate vehicles to deliver the message. Develop a marketing plan. Encourage changes in behavior. Target specific decision makers. Work with NGOs to help deliver the message.</p>

Northeastern U.S.

Priority drivers	Corresponding strategies
Lack of flow-friendly statutes, regulations, and policy.	<p>Frame a comprehensive regulatory model; conduct gap analysis.</p> <p>Use climate change as an entrée to start discussions of instream flow.</p> <p>Work with outside groups (NGOs) to enable them to work with legislators to introduce an instream flow bill.</p> <p>Be ready with scientifically defensible instream flow assessment tools to be ready when a bill passes.</p> <p>Articulate problem and vision. Defining existing water use may be an important first step. Identify roles of stakeholders in the regulatory situation—what experience is lacking? Users are looking for certainty/fixed water use target/rules.</p>
Instream flow work is not a high enough agency priority.	<p>Document successes and failures (e.g., miles of habitat lost or gained, fishing opportunities gained or lost). Highlight demonstration projects that show win-win solutions to generate more funding.</p> <p>Create a paradigm shift toward agency prioritization of public values (quality of life issues such as those identified in The Nature Conservancy research shared by Brian Richter) versus serving only special interests.</p> <p>Link flow issues to discussions about climate change and renewable energy—they are connected.</p> <p>Take legislators, decision makers and/or agency leadership to on-site visits to help them understand the Instream Flow program. The first-hand experience of fishing, holding on to a hatchery fish or standing next to a free-flowing river can lead to better understanding and increased program dollars. Photo opportunities are a good reminder to them of Instream Flow program benefits.</p> <p>Obtain additional financial resources through State Wildlife Grants, National Fish Habitat Project, etc to support projects and positions.</p>
Lack of public support of instream flow needs.	<p>Make the issue real by illustrating the impacts to inform instream flow discussions. Create better information for use in communication, education, and working with the media. Use GIS to show concepts visually.</p> <p>Brand ISF as the Wildlife Action Plans were based on research. Hire a marketing firm, use common words, and develop key messages.</p> <p>IFC conference for I & E people to develop educational programs and materials based on IFC books.</p> <p>Work with economists on value of water and species associated with it.</p> <p>Develop a curriculum for elementary and middle level school children to develop appreciation of flowing water.</p>
Collaborate with non-governmental organizations and others.	<p>Coordinate with TNC, TU and other NGOs and water users to talk with legislators and help them recognize the large constituency and benefits—numbers count.</p> <p>Define mutually beneficial, fundable, collaborative research projects that would bring in non-federal dollars to match grant dollars for a series of projects.</p> <p>Get together with partners to talk about implementing strategies from this meeting.</p> <p>Develop healthy rivers public information program in cooperation with NGOs.</p>

Canada

Priority drivers	Corresponding strategies
Pro-development culture	Develop and implement an international marketing campaign to increase the public's resource conservation values.
Inadequate planning process.	Advocate the use of a structured decision-making process.
Research availability, applicability, awareness not known across jurisdictions. Staffing	Build a network among all entities doing instream flow research (provinces, territories, federal government, universities, and non-governmental organizations).
Information and education	<p>Develop a communication strategy (marketing campaign) or plan on how to get the message out.</p> <p>Identify the message(s).</p> <p>Identify audiences (tailor to specific audiences?).</p> <p>Connect the messages to particular benefits, both specific (farming, fish, recreation, etc.) and 'global' (big-picture message such as human need for water).</p> <p>Be strategic about where peer pressure can be helpful—everyone benefits from water (degraded water hurts all)</p>

Appendix U. Summary of Common Elements from the Personal Action Plans Developed at the Workshop

During the workshop each participant developed personal action plans to the address drivers and strategies important to them and their agency. Participants' planned actions were organized into 41 categories which were divided into five focus areas: 1) intra-agency coordination and actions, 2) personal actions, 3) coordination or action with other agencies or groups, 4) education-related actions, and 5) legal or policy actions. The following is a summary of common themes across the plans. The ten most popular actions are highlighted in **bold**.

Intra-agency coordination and actions:	Number of participants
Inform and coordinate with other staff about flow issues and opportunities (prepare and give PowerPoint presentations, develop intranet communication, etc.)	21
Inform and coordinate with agency leadership about water and flow issues and opportunities and work to elevate importance of water issues	16
Develop or update an internal agency action plan, strategic plan, white paper or drought management plan to better address or elevate the priority of water management issues and opportunities	15
Develop flow management guidelines, criteria, standards or decision-making process for my agency (e.g., George Robison's high flow guidelines)	10
Train field staff to use basic flow assessment tools	2
Get my agency to become a member of IFC or maintain existing membership	2
Get other personnel and leaders in my agency involved in IFC via meetings, Flow 2008, etc.	1
Get or solicit money for another position to deal with instream flow issues	1
Personal actions:	
Continue personal involvement with IFC via meetings, listserv, Flow 08, being an officer, or working on projects	16
Schedule or receive training on flow methods (PHABSIM, River 2-D, IHA, MesoHABSIM, etc.)	11
Conduct flow quantification study on a stream or streams, identify data that can be used to quantify flow needs, or make a recommendation from existing data.	10
Mentor new employees	8
More effectively manage my time for flow work to specifically focus on things like planning, research, tool development and policy development. Begin with the end in mind.	6
Network with other state or provincial fish and wildlife agencies	6
Never leave out water when talking about habitat; promote instream flow concepts more diligently in comments and reviews	4
Develop priority list of streams where my agency can direct or focus flow activities.	3
Develop new assessment tools	3
Work with national efforts and programs (AFWA, NFHI) to advance instream flow issues nationally	3
Keep better records to share with staff (so they can find out what's going on or has been done with flow issues)	2
Read the IFC book	2
Continue involvement in or get involved in water management issues in my agency	2

Start and keep a water management and strategy journal or other record. Use this to provide personal accountability, track changes and identify need for changing your focus.	1
Identify opportunities for converting existing agency (consumptive) water rights or permits to instream flow	1
Coordination or actions with other agencies or groups:	
Identify, contact or coordinate with NGOs, federal agencies, and stakeholders to promote environmental water management needs (TNC, TU, League of Women Voters, Conservation Voters, Wildlife Federation, etc.)	18
Coordinate with other state or provincial (sister) agencies to elevate awareness and/or priority of flow issues	13
Form an interdisciplinary committee or team to address or coordinate state or provincial environmental flow issues	5
Get myself or agency flow managers assigned to or members of national habitat efforts like AFWA, NFHI, etc.	2
Convene or participate in an intra/inter-agency forum to specifically address flow needs and elevate this priority	2
Coordinate with other entities to implement a flow study or agreement	2
Consolidate data, study results, and recommendations from all other agencies and entities doing flow work throughout the state or province	1
Join an environmental organization or committee and work to promote water issues and activities with that group	1
Education-related actions:	
Work with agency's outreach and education staff or a private marketing firm to promote environmental flow issues to the public	14
Write an article or series of articles about water management/environmental flows for my agency's publication or other (non-agency) medium	6
Use department internet web site to inform the public about environmental flow and water management issues	3
Develop GIS overlays to show the connection between land use and water quality or quantity of streams and lakes	2
Coordinate with local utilities to include environmental awareness and stewardship messages in utility bills (theme should be something like "you can make a difference with instream flow, global climate change, etc.)	1
Develop an educational brochure on the importance of water management for fish and wildlife	1
Legal or policy actions	
Become more familiar with my state or provincial laws and policies and the role of other agencies regarding water management opportunities for fish and wildlife	5
Get more informed on instream flow issues	5
Investigate or pursue opportunities to create or improve environmental flow legislation	5
Get agency legal staff more involved in environmental flow issues or participate on water management-related task forces	3

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