Training, Research, and Development Center to Support Instream Flow and Water Level Conservation

Draft Feasibility Assessment
Project Number F21AP01124

Prepared by the **Instream Flow and Water Level Conservation Steering Committee**

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INSTREAM FLOW COUNCIL

AFS
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EXECUTIVE SUMMARY

The state-of-the-art for instream flow and water level conservation (IFWLC) has advanced since the mid-1970s. However, since closure of the Cooperative Instream Flow Service Group (CIFSG) in the early 2000s, formalized IFWLC training has been lacking in the interdisciplinary application of eight IFWLC elements comprising important biologic, hydrologic and geomorphic processes and overarching legal, institutional, and public involvement considerations. Although some continuance of these skills has occurred, opportunities for interdisciplinary training and methods development are not broadly available to all water stakeholders. Recognizing this void, the Instream Flow Council (IFC) and American Fisheries Society (AFS) partnered to obtain a multi-state conservation grant (co-administered by the U.S. Fish and Wildlife Service [USFWS] and Association of Fish and Wildlife Agencies [AFWA] and funded from the Wildlife and Sport Fish Restoration [WSFR] program) to evaluate the need and feasibility of re-establishing a national training and development center.

Using a combination of personal contacts among colleagues, peers, and associates, and results from an internet-based survey of water stakeholder interests, the Committee concluded that no appropriate, comprehensive, and consistent training opportunities currently exist, and there was overwhelming broad support for the formation of an IFWLC Center (Center). The Committee then proceeded to evaluate its feasibility by considering what functions such a Center would provide, how it could by organized and managed, and how it could be funded.

The Committee envisions that the Center would provide four primary functions – leadership, interdisciplinary training, research of existing and new methods and the integration of such methods into the training program, and support services. To a large extent, these mirror those originally proffered by the CIFSG but the training and research components would all be contemporized and streamlined to reflect the state-of-the-science.

Four concepts were identified and evaluated for organizing and managing the Center – Centralized, Decentralized – Distributed Network, Hybrid Networking, and Joint Sponsorship.

Centralized – Brick and Mortar	Decentralized – Distributed Network	Hybrid – Networking with Both Virtual and In-person Training	Joint Sponsorship with Other Stakeholder Organizations
Buy, build, or lease a facility to house the Center; location to be determined but favor university setting that would provide flexibility in office space.	Use a distributed network composed of selected personnel from one or more host institutions at one or more locations to cover the required training disciplines.	Most training material to be presented in an online format and include region focused on-demand training. In-person training would be provided for field applications.	Collaborate with other existing programs in water resource management and development of environmental flow/level models and methods.

The Centralized option would be most similar to the original CIFSG but would also carry the highest costs and face the challenges in Center location and filling on-site staffing needs. Decentralized – Distributed Network concept provides more flexibility in staffing and provides greater out-reach potential provided by having a geographically diverse team of instructors. This concept would have lower start-up costs and would rely primarily on virtual training. The Hybrid Networking approach would combine both virtual and in-person training and has the advantage of starting with a small core team of instructors but can expand as needed reducing start-up costs. The Joint Sponsorship builds on the recognition that other stakeholder governmental, non-governmental, academic, and private interests have remained involved in the development of environmental flow and water level conservation methods and that joining forces would increase training curricula.

Three funding options were evaluated including a Governmental Agency Concept, whereby the Center would be supported much like that provided for the CIFSG; Private/Philanthropic Concept, which would seek funding from non-governmental entities and should allow the structuring of the Center independent of outside forces; and the Cooperative Concept which would offer elements from both concepts.

Based on results of the preliminary feasibility assessment, the Committee initially favors a Center that would function as a decentralized distributed network. This approach provides opportunities for hybrid virtual and face-to-face formats for training and would encourage the integration of emerging research and development. However, the Committee seeks further comment and recommendations from stakeholders before finalizing the assessment and proceeding with implementation. While the eventual

format, function, and funding of the Center will evolve over time, the implementation of the project would be guided by the IFC and AFS, with suggestions from potential users of the Center also considered.

One primary outcome of this process will be development of one or more business plans or grant applications that can be used to seek financial support to further advance development of the Center as envisioned above. The Committee is poised to explore a range of options for seeking this support and is open to suggestions and ideas from other interested parties.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION AND OBJECTIVES

Conserving the ecological condition of rivers, lakes, wetlands, and estuaries *to c*urb declines in freshwater biodiversity is a global challenge. Related efforts faced by natural resource managers at virtually every level of government, the private sector, and tribal entities are highly complicated and often contentious. Recognizing that current and future water use demands will increase requires a large-scale strategic development and training framework. Success involves balancing societal needs for the use of water with a keen understanding of the consequences of proposed water management strategies on rivers, lakes, wetlands, and estuary environments. Many aquatic resource managers and stakeholders acknowledge guidance provided by the Instream Flow Council, (IFC) (https://www.instreamflowcouncil.org/), The Nature Conservancy (TNC) (https://www.nature.org/en-us/), the American Fisheries Society (AFS) (https://fisheries.org/) and others that demonstrates the ecological importance of keeping more than just minimum instream flows and water levels in streams, lakes, wetlands, and estuaries. Rather, proper long-term conservation of the ecological vitality of aquatic systems requires consideration and integration of interdisciplinary information from a combination of *eight key elements*[1]*:* hydrology, geomorphology, biology, connectivity, water quality, legal, institutional, and public involvement (adapted from Annear et al. 2004) into flow and water level conservation decision making.

The state-of-the-art for instream flow and water level conservation (IFWLC) has advanced since the mid-1970s. However, formalized training in the interdisciplinary integration of the eight elements, ongoing research into development and application of new approaches, and support services are critically lacking. Beginning in the mid-1970s, the Cooperative Instream Flow Service Group (CIFSG) was charged: to develop and improve methods for assessing and recommending instream flow regimes for habitats of fish, wildlife, and other aquatic organisms, and for recreation; to establish an effective communication network for disseminating instream flow information and training for the purpose of promoting skills needed by water resource managers and stewards in a consistent and credible manner; and to identify research needs and support applied research projects designed to evaluate new approaches. The CIFSG was the major source of this synthesis, development, and training from the mid-1970s to 2000. Many of those trained through the CIFSG program have either retired or moved on to other positions.

[1] Comprised of 5 environmental elements and 3 social elements

Although some continuance of these skills has occurred via personnel mentorship and on-the-job training from experienced practitioners, such opportunities are not broadly available to stakeholders. This has created a void in the continuum of methods development and application in instream flow and water level conservation science.

Recognizing this void, the IFC and AFS partnered to apply and obtain a multi-state conservation grant (co-administered by the U.S. Fish and Wildlife Service [USFWS] and Association of Fish and Wildlife Agencies [AFWA] and funded from the Wildlife and Sport Fish Restoration [WSFR] program) to evaluate the need and feasibility of re-establishing a national IFWLC training and development center (IFWLC Center). The grant application was approved in September 2020 and a ten-member steering committee[2] (Committee) formed to complete the feasibility assessment.

As an initial step, Committee members solicited the opinions of colleagues, peers, and associates regarding the general need for a training center. The feedback received was positive and prompted the Committee to seek opinions and recommendations from a broader range of water stakeholder interest groups via a formalized internet-based survey. This provided further confirmation of need, and the Committee subsequently proceeded with the feasibility assessment (reported in this document), to explore various alternatives more fully for organizing, managing, and funding such a center. The assessment led to the formulation of an implementation strategy and identification of "next steps" directed toward the future establishment of a training center.

The document is organized into the following sections:

- **Introduction and Objectives** (this section);
- **Review of Current and Historical Training Opportunities**, that describes the beginnings of instream flow science in the 1970s and the genesis of formalized training and research programs that culminated in the formation of the CIFSG and then contrasts that with present day training needs and available training opportunities;

[2] The steering committee was comprised of experts representing governmental, non-governmental, academic, and private sectors with extensive experience in the interdisciplinary development, training and application of instream flow and water level conservation methods and who have remained actively involved in water resource issues (see Appendix A for members' names, affiliations, and experience).

- **Current Interest and Need for an IFWLC Center**, that summarizes results from respondents to the August 2021 Instream Flow and Water Level Training Center survey;
- **IFWLC Center Functions**, that highlights its proposed key operating principles;
- **Alternatives Considered for Establishment of an IFWLC Center**, that includes its organization, management, and funding;
- **Implementation Strategy**, that describes the Committee's proposed approach for advancing the development of a IFWLC Training Center.

1.1 Goals and Objectives

The overarching goal of the Committee is to re-establish an IFWLC Center (hereafter – Center) focused on instream flow and water level conservation, that will provide a common platform for instruction of methods and analytical models to fulfill current and future needs of water and environmental resource management. In essence, this goal broadly encompasses that stated by Freeman et al. (2022) that identified the need for an improved understanding of streamflow effects on freshwater fishes, as the Center would contribute to that understanding. Importantly, this goal is premised on the underlying assumption that the Center would provide leadership, training, research, development, and support services using a multidisciplinary approach based on the eight elements above.

The Committee believes this goal is achievable through a stepwise process that is based on the best available information but is also flexible and can be adjusted as new information or opportunities emerge. This feasibility assessment represents the first step in this process and the Committee openly seeks comments and suggestions from all interested parties regarding its findings. The Committee then intends to apply the results of this assessment in developing grant proposals or business plans[3] needed to further advance the re-establishment of an IFWLC Center.

[3] The initial proposal for this project included the development of a business plan. However, development of a feasibility assessment was needed as a precursor to the plan.

2.0 REVIEW OF HISTORICAL AND CURRENT TRAINING OPPORTUNITIES

As part of determining the "need" for an IFWLC Center, the Committee reviewed both historical and current resource issues and needs, and the opportunities for receiving formalized training in the application of instream flow and water level conservation methods, models, and their application.

2.1 Historical Resource Needs and Training Opportunities

In the mid-1970s, the Fish and Wildlife Coordination Act required agencies such as the U.S. Bureau of Reclamation, U.S. Army Corps of Engineers, and U.S. Federal Energy Regulatory Commission to consult with the USFWS on projects pertaining to water management on federal facilities and resources. USFWS field office staff in the Division of River Basin Studies were frustrated with the lack of widely accepted, credible methods to quantify flow needs below large reservoirs. Flow release recommendations were offered but the general lack of standardized approaches often created more controversy than they resolved.

To address this concern, the USFWS obtained funding from the U.S. Environmental Protection Agency (EPA) Office of Water Research and Technology to host workshops to document the state-of-the-art and identify instream flow and related training needs. In 1974 the Cooperative Instream Flow Service Group (CIFSG) in Fort Collins, Colorado was established. It was fully staffed by July 1976. These efforts led to a symposium and specialty conference in Boise, Idaho, in May 1976 that was jointly sponsored by the Western Division of the AFS and the Power Division of the American Society of Civil Engineers (ASCE) (Orsborn and Allman [eds] 1976). The symposium provided a forum for discussing needs and solutions to scientific, technical, legal, and social problems caused by increasing competition for limited stream flow. One of the more seminal and forward-thinking papers presented was by Waters (1976) who described a computer based incremental approach for evaluating fish habitat and flows in California, with many of its underpinnings reflected in the later development of the Physical Habitat Simulation (PHABSIM) model (Milhous et al. 1984) and the overarching Instream Flow Incremental Methodology (IFIM) by the CIFSG.

The CIFSG was an interdisciplinary entity intended to be the center of activity and focal point relating to instream flow method development, training, research oversight, and

support services. The current project's Committee member Dr. Clair Stalnaker was a member of the 1976 symposium organizing committee and Leader of the CIFSG throughout its existence.

The CIFSG initially researched the state-of-the-art among hydrologic, hydraulic, earth resources, sediment transport, water quality, aquatic biology, and the inter-relatedness of these elements to riverine ecology. Through many brain-storming events involving different discipline-trained staff and invited experts on temporary assignment, new methods and analyses were developed and documented. Curricula were prepared and training initially offered for federal, state, and provincial agency employees charged with protecting instream flow regimes through interdisciplinary technical, legal, institutional (policy), and public involvement mechanisms. Training was expanded and provided to a mix of water resource engineers, hydrologists, lawyers, water policy analysts, consultants, tribal entities, and other stakeholders. The grounding in hydrology, hydraulics, water quality, geomorphology, and biology made the concept of instream flow issues more acceptable to resource managers and stakeholders. The CIFSG expanded the scope of traditional instream flow and water level objectives beyond single-flow minimum instream flow prescriptions to the integration of the interdisciplinary sciences that drive ecological processes. This integration of riverine sciences and the need for mitigation planning by the USFWS along with promotion of intra- and inter-annual flow variability for protection of aquatic organisms dictated that research and training requirements grow considerably. A summary of historical courses and training provided by the CIFSG is provided in Appendix B.

This organizational structure led to the widely recognized success of the CIFSG. In 1987 Dr. Robert White, then leader of the Montana Cooperative Fisheries Unit and later President of the AFS, wrote "*... the group has far exceeded the intent of its original objectives and, in my opinion, has made the largest contribution to fisheries of any specialty group within the USFWS or any other federal agency. Through their efforts, the Instream Flow Incremental Methodology that was developed ... provides a framework presenting decision-makers with a series of management options, and their consequences. The positive outcome of these efforts toward the protection of inland stream fisheries is immeasurable.*"

Between 1990 and 1991, the U.S. Department of Interior sought to enhance the science function within Interior agencies by creating a new biological research agency called the United States Biological Survey. The stated intent was to give more credibility to the

science and remove the issue of endangered species from the management agencies by creating an independent science-based organization to assist their information needs. Congress subsequently shifted this new agency to a new Biological Division within the U.S. Geological Survey (USGS). Upon creation of this new program within the USGS, over 70% of the dedicated funding for the CIFSG was absorbed by upper level administrative and regional staff. This loss of funding and change of mission, in combination with the retirement of senior personnel, gradually led to termination of the CIFSG in the early 2000s. A comparable national organization has not existed since that time.

Since its formation, the CIFSG worked to counter the misconceptions about a single minimum flow being adequate to protect stream resources. In its place, they promoted instream flow regimes that mimicked natural intra- and inter-annual flow and habitat variability. Further, the CIFSG promoted the importance of basing flow regime needs on all elements of the aquatic community and life stages. The Instream Flow Incremental Methodology (IFIM) was developed to provide a framework to address and quantify potential impacts of water development projects necessary for mitigation planning as required by the National Environmental Policy Act (NEPA).

During its tenure, the CIFSG provided standardized instream flow training to thousands of stakeholders involved with instream flow and water level conservation on a global basis. Recipients of that training are now retiring, which is creating a void in skilled IFWLC practitioners. This is leading to a situation similar to the mid-1970s, when there was fragmentation in uniform, credible scientific approaches to quantifying instream flow regimes and water level conservation needs.

2.2 Current Resource Needs and Training Opportunities

The basic premise of the proposed Center is that it recognizes the need to effectively conserve instream flow and water levels depends upon integrating all eight elements specified by the IFC (Annear et al. 2004). Most of these elements were first individually identified at the AFS and ASCE specialty conference (Orsborn and Allman [eds] 1976) and later more formally described by the CIFSG as presented in their IFIM approach (Bovee et al. 1998). Many advances and refinements have been applied largely through efforts of instream flow practitioners, who routinely critique existing and new applications (Railsback 2016; Reiser and Hilgert 2018; Webb et al. 2019). What is lacking for stakeholders today is access to an integrated training and development program. The proposed Center is intended to address this deficiency. The Committee acknowledges

that many IFWLC elements exist within various graduate and undergraduate university programs, but no integrated systematic program exists covering all elements, and that these academic programs are ill suited for access by existing practitioners and stakeholders. Likewise, the Committee is not aware these programs exist or are available to stakeholders through private, governmental, and non-governmental entities.

Based on information received to date by Committee members and their networking efforts, there are several sources of governmental, non-governmental, professional, academic, and private organizations offering individualized, continuing training courses in one or more of the eight elements[4]. Some of these include the USFWS National Conservation Training Center (https://www.fws.gov/program/national-conservation-training-center), the U.S. Army Corps of Engineers' Hydraulic Engineering Center/River Assessment System (HEC/RAS) (https://www.hec.usace.army.mil/factsheets/default.aspx), in particular the Hydraulic Engineering Center Ecosystems Functions Model (HEC-EFM) models that define relationships between hydrology and ecology and can display results spatially (https://www.hec.usace.army.mil/software/hec-efm/). The EPA also offers training on various elements related to water quality (e.g., BASINS [https://www.epa.gov/ceam/better-assessment-science-integrating-point-and-non-point-sources-basins]) and has developed tailored training to increase the adaptive capacity to deal with climate change developments (https://www.epa.gov/ceam/basins-tutorials-and-training).

The Nature Conservancy has specifically focused on environmental flows and has developed a set of tools/models that can be applied in addressing water management issues. These include the Indicators of Hydrologic Alteration (IHA) (Richter et al. 1996), the Environmental Flow Components (EFC), and the Ecological Limits of Hydrologic Alteration (ELOHA). The TNC provides access to these methods and models and also references to other sources of useful information via its Conservation Gateway (https://www.conservationgateway.org/ConservationPractices/Freshwater/EnvironmentalFlows/Pages/environmental-flows.aspx). Likewise, Trout Unlimited (TU) (https://www.tu.org/) has championed watershed and riverine ecosystem conservation for over 50 years and has partnered with agencies, landowners and other stakeholders on numerous instream flow related project s (https://www.tu.org/?s=instream+flow+protection). The TNC, TU and other entities have also actively participated with the IFC in disseminating information and describing methods applications in a series of IFC sponsored workshops (https://www.instreamflow

[4] The eight key elements are hydrology, geomorphology, biology, connectivity, water quality, legal, institutional, and public involvement

council.org/workshops/). However, the activities of these organizations are much broader than just environmental flows and their programs are not set up to address the types of services and training envisioned for the proposed Center.

Some of the same governmental and non-governmental organizations, as well as professional organizations, private entities, and the academic sector have also developed applied training specific to legal, institutional, public involvement curricula relating to IFWLC.

The Committee also recognizes that a number of instream flow related analysis systems have been developed by the private sector over the past two decades. Five of the more recent programs include SEFA, meso-HABSIM, inStream/inSalmo, CASiMiR and ELF.

The SEFA (System for Environmental Flow Analysis) suite of programs was tailored around the same overarching guidance of the IFIM and includes an integrated set of tools useful in environmental flow assessments. Many of its components mirror those available in the IFIM, with separate modules for defining habitat-flow relationships, sediment deposition and flushing flow analysis, and water quality modeling (water temperature and dissolved oxygen) (Payne et al. 2011). Developed collaboratively by Thomas Payne, Robert Milhous, Ian Jowett, and Juan Manuel Diez Hernandez, SEFA has gained some recognition for its multidisciplinary focus and is available at http://sefa.co.nz/. However, its administration, training, and support services are not readily available, and the cost of the software hamper its widespread application.

Meso-HABSIM, as its name suggests was likewise patterned after the IFIM software program PHABSIM but is intended to upscale results to the river and watershed level. Developed by Piotr Parasiewicz (Parasiewicz 2001, 2007), this software is available for a fee at https://mesohabsim.org/index.html.

The inSTREAM – Individual-based Stream TROut Environmental Assessment Model, and inSALMO (for Salmon) models take a different approach to environmental flow assessment focusing more on how fish populations may respond to flow modifications, rather than on habitat. Collaboratively developed by Steve Railsback, B.C. Harvey, S.K. Jackson, and R.H. Lamberson (Railsback et al. 2009, 2021) these models are available for free at https://ecomodel.humboldt.edu/instream-and-insalmo-overview. The models represent a promising approach for taking environmental flow analysis a step beyond habitat and into population level effects. However, the models are specific to salmonids

and require substantial biological data that are often lacking in many rivers and streams, and therefore their application may be somewhat limited.

The CASiMiR (Computer Aided Simulation Model for Instream Flow and Riparia) is a free set of models developed in Germany for evaluating conditions of aquatic ecosystems under different flows (http://www.casimir-software.de/ENG/publications_eng.html). In addition to fish habitats, the models consider aquatic benthic organisms as well as floodplain vegetation. The CASiMiR model has had limited application in the United States.

Ecological limit functions (ELF) describe relations between flow and species richness predicted by the River Continuum concept. The ELF framework, employing a fish monitoring database, provides an alternative method for assessing flow depletion impacts without the need for extensive habitat characterization or in-depth flow modeling (Kleiner et al. 2020; Rapp et al. 2020). The ELF framework (https://github.com/HARPgroup/elfgen) can prioritize water withdrawal permits at regional scales from estimates of withdrawal amounts which could be potentially protective of species richness.

Each of these systems incorporate many but not all of the IFWLC elements and are primarily focused on quantifying instream flows in lotic habitats without integrating lake, wetland, and estuary systems, and remain primarily fish centric. Nor, do they integrate legal, institutional public involvement elements. However, there are many lacustrine, palustrine, and estuarine systems that can be jeopardized by water developments and yet few examples exist of methods developed specifically to assess the needs of those types of systems. As noted above, the Center would focus on **I**nstream **F**low and **W**ater **L**evel **C**onservation, and its training and research functions would encompass both riverine (freshwater and estuarine) and lacustrine/palustrine systems and address open water and ice-covered seasonal variations, in addition to integrating legal, institutional, and public involvement curriculums that currently exist.

New methods will continue to be developed to address novel and ongoing concerns such as the effects of groundwater withdrawals (Arthington 2022), hydropeaking (Smokorowski 2022) and ice formation and breakup (Thellman et al. 2021) on aquatic ecosystems. Furthermore, the numerous models and sources of information regarding environmental flows can create confusion among stakeholders and resource managers as to which method/models are “best” for their application, and beyond that, how do you use and then interpret the method/model once it has been selected. Indeed, one of the functions

of the Center would be to provide a platform for the review of new methods, as part of its overall holistic training approach to addressing and solving IFWLC issues.

2.3 Committee Conclusion

After deliberation by Committee members and their network of contacts in federal and state agencies, tribal entities, non-governmental entities, and the academic and private sector, the Committee concluded that no appropriate, comprehensive, and consistent interdisciplinary training opportunities currently exist in North America that is available to all stakeholders to address the needs identified in this document.

By making the proposed Center available to all stakeholders, and emphasizing the interdisciplinary nature of IFWLC studies, the Center would differentiate itself from any other training program and establish itself as an important resource for all instream flow and water level conservation stakeholder interests. As the Center's credibility grows, it should have considerable influence in guiding research and development of new methods to further improve the ability of natural resource managers to assess and manage hydrologic regimes in rivers (freshwater and estuarine), lakes, and wetlands, and improve the ability of all stakeholders to balance societal and IFWLC considerations.

3.0 CURRENT INTEREST AND NEED FOR IFWLC CENTER

A significant step in the assessment, was for the Committee to develop and conduct an independent survey to solicit the interest in and support for a proposed IFWLC Center. This survey was conducted in the summer of 2021 and was distributed widely via the internet to numerous organizations with water management interests (Appendix C). The recipients were also encouraged to forward the survey link to others who might have qualifications and desire to provide input.

Responses were accepted for 30 days after launching the survey and reminders were sent to all recipients twice during the open period. The survey consisted of ten questions with key findings and preliminary conclusions for each question summarized in Appendix D. Some of the key findings from the survey include:

- Four hundred eighty-six (486) people participated in the survey. Nearly 95% of participants indicated support for establishing a training, research, and support Center that would promote integration of multiple disciplines in flow and water level prescriptions (Figure 1).

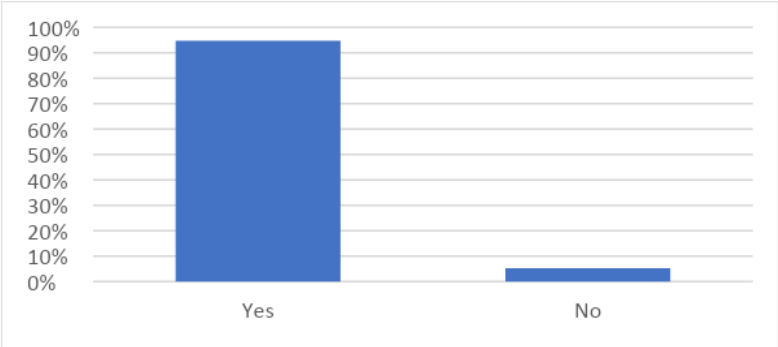

Figure 1 Percentages of survey respondents favoring establishment of an Instream Flow and Water Level Conservation Training Center.

- Most of the responses (75%) indicated affiliation with either a state/provincial or federal (Canadian or U.S.) governmental agency.
- Most respondents were involved in natural resource management either as a biologist, scientist, or the broader category of natural resource manager.
- Three hundred forty-six (346) of the 475 (73%) people who responded to this question have been doing this work for 20 years or less. This indicates that most respondents did not get training directly from the CIFSG.

- Most survey participants said they already possessed some skill in the eight elements noted above. They also expressed strong interest in additional training in all of those elements.
- Four hundred and thirty-nine (439) of the 448 (98%) people who responded to this question indicated a desire to attend a future workshop on this topic if one is held. Of these, one hundred and eighteen (118) (27%) indicated a desire to give a professional presentation at a workshop if one is held.
- Several participants indicated a willingness to work with the Committee to find a setting where training and support services could be provided.

The results of the survey overwhelmingly supported the formation of an IFWLC Center and confirmed the Committee's initial conclusion.

4.0 IFWLC CENTER FUNCTIONS

The Committee envisions that the proposed IFWLC Center would have four primary functions – leadership, interdisciplinary training, research and development of existing and new methods and the integration of such methods into the training program, and support services.

While the Committee recognizes the importance of the research, development, and other client services expected from the proposed Center, it is the interdisciplinary training that is emphasized below. The staff of the proposed Center should be selected for their interdisciplinary expertise and interest in advancing the state of the art and integration of the eight elements.

4.1 Leadership

The Center will act as the central entity for bringing together the IFWLC community and others to not only provide training but to define training needs, identify necessary research, coordinate across training providers, and establish a future direction for IFWLC science to address aquatic conservation challenges.

4.2 Training

Interdisciplinary training would consist of specific modules that address requisite concepts, skills, and techniques for first understanding the ecological conditions potentially impacted by water resource developments, and then developing technically sound instream flow and water conservation level prescriptions. These modules would address introductory through advanced concepts and applications for each of the eight elements emphasizing when, where, and how they are applied, integrated, and interpreted.

Development of an initial core of training curricula, related manuals and materials, and an effective strategy for setting up training elements would be an integral part of the proposed Center. The Center should teach existing technical methods, laws, policies, and public interactions to meet the current need for fundamental skills by practitioners and stakeholders.

Examples of the kinds of information needs associated with each element are provided below. Further information and an example of how to scope an instream flow study can be found in Appendix E of Annear et al. (2004).

- Hydrology – this element broadly embraces aspects of natural flow and water level regimes. Regimes that reflect natural patterns of temporal variability such as intra- and interannual variability (includes open-water and ice-covered seasons) are essential for supporting the ecological condition of surface waters. Such flow and water level patterns are driven by the hydrologic cycle and are critically linked to all other elements listed here and embrace elements such as, but not limited to the following:
    - The historic, present, and projected future hydrologic patterns of a specific water body that are tied to critical geomorphic, water quality, and life history requirements of target organisms, populations, or ecological communities,
    - Flow regimes and water levels affected by groundwater interactions,
    - Proposed water management changes (new flow and water level regimes that may be proposed).
- Geomorphology – this element broadly embraces the linkages between flow/water level, hydraulics, sediment transport, and channel form driven by elements of the flow and water level regimes such as, but not limited to the following:
    - Historic sediment transport load and channel change patterns at relevant temporal and spatial scales,
    - Changes to sediment transport load and deposition are anticipated,
    - Changes in sediment transport load affect channel form and function, and over what spatial and temporal time frames will these changes occur.
- Biology – this element broadly embraces the direct and indirect responses at the individual, population, and community levels of aquatic, riparian, and related ecological components of watersheds in response to the flow and water level regimes such as, but not limited to the following:
    - Predicted changes in available habitats for species, life stages and or guilds assuming proposed changes in flow/water level regimes, and how might these habitat changes influence organisms,
    - The predicted changes in the distribution, relative abundance, and diversity of communities and populations (fish, macroinvertebrates, mussels, vegetation),

  - Natural patterns in species population and community dynamics are expected over annual, decadal, and longer-term temporal scales and how these patterns change given proposed water development.

- Water Quality – this element incorporates several key elements critical to the ecological functions of aquatic systems driven by the complex interaction of flow/water level regimes with physical, chemical, and biological responses that may include, but is not limited to the following:
  - Temperature- any significant changes of flow regimes are likely to result in important changes in water temperature regimes and ice dynamics,
  - Dissolved oxygen-low flows,
  - Turbidity,
  - Salinity,
  - Pollutants/nutrients originating from point and non-point sources.
- Connectivity – refers to the flow/water level exchanges and pathways within localized geomorphology of a watershed that provides for movement of organisms, energy, and matter through lotic and lentic systems. This element relates to:
  - Physical, chemical, and biological properties and patterns,
  - Processes that include longitudinal, lateral, vertical, and temporal scales that maintain and restore connections between rivers and their floodplains and tributaries or lakes for all life stages of species,
  - These considerations may be critical for species' survival in rivers and lakes having extensive hyporheic zones.
- Legal – the basic statutory opportunities (state, provincial, territorial, tribal/First Nation) and how they relate to IFWLC.
  - The basic federal framework and how it relates to the role of states, provinces, tribes/First Nations, and other water stakeholders' ability to protect or restore flow or water level regimes,
  - The role of the Public Trust Doctrine and how it relates to IFWLC regime assessments and water stakeholders' ability to protect or restore flow or water level regimes,
  - The role of interstate compacts related to water management between states and other water stakeholders.
- Institutional capacity – the basic regulations and policies (state, provincial, territorial, tribal/First Nation) and how they relate to IFWLC.

  - Regulations and policies that may differ by jurisdiction from legislation for environmental purposes in rivers, lakes, and wetlands,
  - Specifically include reference to water management in strategic plans instead of speaking more broadly about "habitat,"
  - Staff of agencies and organizations, training, and dedicated budgets.
- Public involvement – identify effective strategies to include, inform, empower, and motivate stakeholders to participate in IFWLC actions.
  - Identify the importance of public involvement,
  - Recognize the difference between public support and public involvement,
  - Identify effective messaging strategies and mechanisms for enhancing public involvement and related effectiveness, and encourage communication between agencies making decisions and the public,
  - Identify the role of non-agency partners and the importance of champions.

4.3 Development of New and Improved Strategies

The IFWLC Center would continue support for existing methodologies and facilitate development, testing, application and interpretation of new methods and strategies for achieving IFWLC outcomes. A primary development activity associated with the proposed Center would be to identify and synthesize emerging science and state-of-the-art methods related to the different elements, and development of procedures and analytical systems that assist in their integration. This aspect of development would necessarily evolve over time as the Center collaborates with the research community to guide its future direction. Advancements would be integrated into future training.

4.4 Support and Networking Services

The proposed Center would also provide a range of fee-based services including but not limited to reviewing scientific and technical reports, evaluating management study and research proposals, as well as providing manuals and information papers. Services would be available to natural resource and water resource management agencies as well as other stakeholders. The proposed Center would not likely conduct independent detailed field studies to quantify flow and water level regime needs as part of specific development activities, and it would not compete with private sector firms, institutions, or entities. However, it may offer advice on such studies and collaborate on research that may advance relevant topics and techniques.

5.0 ALTERNATIVES CONSIDERED FOR ESTABLISHMENT OF AN IFWLC CENTER

Three key considerations factored into the feasibility assessment of the Center: 1) identification of potential Users/Customers of the Center; 2) Organization and Management of the Center including where and how it would generally function; and 3) approaches for securing potential funding to operate and maintain the Center. These are described below.

5.1 Users and Customers of the Center

The proposed Center would be developed to offer instream flow and water level conservation services to a broad range of water management and other stakeholder interests (see Appendix D, Question 2). The Center would benefit a wide range of stakeholders as evidenced by survey responses from throughout North America and seven other countries.

5.2 Organization and Management Approaches

For planning purposes, the feasibility of four administrative concepts were considered with the benefits and risks of each summarized in Table 1. The approaches range from a more centralized and traditional "brick and mortar" concept in which the Center would be housed in a fixed location where in-person training would occur, to a more dynamic de-centralized concept in which virtual training offerings would be provided via a network of personnel from multiple host institutions. A hybrid approach was also considered that encompassed elements of both in-person and virtual training. The fourth approach considered a joint sponsorship with an existing entity such as TNC that has pioneered and provides training in several environmental flow models and methods.

Each of the four concepts was evaluated in terms of Pros (+) and Cons (-) with evaluation factors primarily associated with implementation costs (start-up and operations and maintenance), staffing requirements (both technical and administrative), management structure, and ease of implementation (Table 1). The **Centralized** concept would be most similar to the original CIFSG that was located in Fort Collins, Colorado, but would also carry the highest costs and face the greatest challenges in terms of selecting a location and filling on-site staffing needs. Its resemblance to the CIFSG would provide a pre-existing "Identity" to the Center and promote broad interest and support in its operation. The Center would be developed to provide both in-person and virtual training. The

Decentralized – Distributed Network concept provides greater flexibility in meeting staffing requirements and also provides greater out-reach potential provided by having a geographically diverse team of instructors. This concept would rely primarily on virtual training, although as reflected under the **Hybrid – Networking** concept, some strategically held in-person training sessions could be scheduled either by design or group sponsorship. Both of these concepts have lower start-up costs and have the advantage of allowing for a "phased" implementation process. Thus, training could start small with a core team of instructors that fulfill the primary tenets of instream flow and water level science and can expand as needed to increase instruction and/or diversify training modules. The fourth concept, **Joint Sponsorship**, builds on the recognition that other stakeholder organizations have remained involved in the development of environmental flow and water level models. This would rely on negotiations with them and defining roles and responsibilities mutually beneficial and agreeable to both entities. **Other Concepts** may be identified and explored following review of this feasibility assessment.

Table 1 Options considered[5] and benefits and risks of each for the organization and management of an Instream Flow and Water Level Conservation Center.

Option and Description	Pros (+)	Cons (-)
Centralized – Brick and Mortar: buy, build, or lease a facility to house the Center; location to be determined but favor university setting that would provide flexibility in office space. This option most closely resembles the operation of the former CIFSG in Fort Collins, Colorado.	• Establishes physical presence and Identity/Brand of the Center although would need decision on whether to own or lease facility; • Majority of Center technical staff in close proximity to the facility and would facilitate intra-staff collaboration, curricula development, and planning; • Center includes dedicated in-house training facilities (no competing interests to work around); • Could ultimately serve as a central clearing house for disseminating IFWLC related information, and promoting and implementing new and innovative approaches for addressing IFWLC issues.	• **Mostly cost-related**, as startup and operations costs would be high including: - Large initial capital costs for infrastructure, although university setting would obviate the need for major construction; - Unless already present at selected facility, identifying, hiring, and sustaining full-time requisite technical and administrative staff would be lengthy and costly; - Ongoing Operation and Maintenance costs (utilities, supplies, administration, insurance, etc.); - Disbandment and closure of the Center could be complicated and costly. • Centralized presence in one location may geographically bias the focus of the training; however, this could be avoided/reduced by conducting regional workshops and video-training; • Would likely require lengthy **start-up time** before Center becomes fully operational.

[5] Note – the options listed, and associated pros and cons are those identified by the Committee as most conducive for meeting the overall objectives of an IFWLC Center. Other options may exist, and the Committee is open to evaluating other concepts as they are identified.

Option and Description	Pros (+)	Cons (-)
Decentralized – Distributed Network: use a distributed network composed of selected personnel from one or more host institutions at one or more locations to cover the required training disciplines. These could be federal, state, provincial, private, or university locations and personnel.	• Provides a geographically diverse portfolio of multidisciplinary expertise; • Provides flexibility in staffing to meet evolving water resource issues; • Softens the need (and cost) for full time staffing; • Infrastructure already exists and averts the need for one physical location of the Center; • Reduces singular financial risk as operational costs shared among participating organizations; • Shortens timeframe for implementation of training modules; e.g., some initial courses could be offered in the near-term; • Allows for "phased" implementation – start small and build network as demands increase.	• Center "identity" less defined and may need different brand – e.g., IFWLC as in Consortium instead of Center; • Limited opportunities for in-person brainstorming and collaboration, which may hamper future planning and curricula development. However, establishing a network of personnel with a shared vision of objectives should reduce such limitations; • Management is potentially more difficult (as a function of who is involved); • Imposes structural challenges to sustained or focused collaborations; • Personnel turnover could be problematic, especially if specialty topics are reliant on single instructors; i.e., no backup. This indicates all courses should have at least two instructors available (and substitutes if possible) who could each singly instruct the course; • Everyone potentially has their own day job.

Option and Description	Pros (+)	Cons (-)
Hybrid – Networking with both virtual and some In-person training: this would entail creating the bulk of the training material to be presented in an online format with testing by module, as well as both a set regional training schedule, and on-demand training. In-person training would be provided for field applications.	• Same benefits as Networking option but adds in-person training for both field applications in regional settings, and to groups willing to sponsor more personal training; • This approach may naturally evolve from the Distributed Network.	• Same risks as Networking option; • Some increased costs due to in-person travel and logistical support.
Joint Sponsorship with other stakeholder organizations: others already may have a prominent role in water resource management and development of environmental flow/level models and methods.	• Builds on and enhances existing platforms of environmental flow/level training and strategies; • Consolidates separate training modules so that training opportunities can be more comprehensive.	• Requires strong relationship and shared vision between parties; unless this already exists, this would take time to develop; • Increased complexity in defining roles and responsibilities and curricula development.

5.3 Potential Funding Options

The specifics of funding needs, sources, and financial mechanisms will be developed as part of forthcoming Business Plan(s) based on the actual implementation strategy(s) of the Center (Table 1). Previous sections of this document addressed the history, status, and possible future format and functions of IFWLC training. Though the Committee presently envisions a single approach to initiate the program, there are several strategies and formats that may prove feasible depending on a number of factors. These include, but are not limited to, requirements of a host or partner institution, requirements of potential funding sources, demand for services, and the rate at which full-scale training and related services are developed over the first several years. In consideration of those factors, it is difficult to project the annual cost to initiate the program or approximate the cost over time.

The Committee will explore implementation opportunities after this present document is reviewed by stakeholders and subsequently refined. At that time, Committee members will identify the most likely partners and funding sources and prepare a formal business plan that reflects the needs and conditions of those entities. The Committee is committed to a flexible yet focused approach to the implementation process. As opportunities arise that are not initially recognized, the Committee will shift their focus as needed.

5.3.1 Governmental Agency Concept

Under this concept, the Center would be supported entirely by one or more governmental agencies much like the original support provided by the USFWS (and later the USGS) for the CIFSG. Funding would likely be from a congressionally dedicated agency budget that is protected from defunding or redirection for other purposes. The training site could be located at an existing facility, such as the USFWS National Conservation Training Center, U.S. Forest Service Science Center, the Bureau of Reclamation Science Center, and the U.S. Army Corps of Engineers Learning Center. These facilities offer advantages in that they are already established, likely have adequate support staff (accounting, IT, maintenance, etc. – but not necessarily trainers), are in a location that is recognized by many potential stakeholders and might absorb the proposed facility with relative ease.

Existing facilities may have some staff to offer some of the training and development needed by the proposed Center. However, none are currently engaged in providing consistent training in all eight elements and integrating information from all of them to

shape IFWLC recommendations, assessments, and mitigation strategies. Considering that existing centers already have budgets and staff, it may be difficult to generate additional funding for the interdisciplinary staff functions proposed here, unless an agency sees the need and opportunity in the way that the Fish and Wildlife Service did in the 1970s, 1980s, and early 1990s. It may likewise prove difficult to insulate funding and administration of the proposed Center from redirection to other purposes of those existing centers. Considering changing governmental priorities, it may prove difficult to guarantee that the proposed Center can persist for the term envisioned by the Committee.

5.3.2 Private/Philanthropic Concept

This concept offers the potential to secure the desired long-term revenue stream (depending on the funding source) and the ability to structure a Center independent of outside forces. The flexibility afforded by such an approach is both a challenge and potentially significant benefit. This approach would likely hire few permanent staff but could engage experts (trainers) on long-term retainers and provide compensation based on the effort provided by each one. This approach might appeal to experts who wish to retain their existing jobs but provide services on a part-time basis. Contracting with trainers may relieve the proposed Center of needing to pay benefits, insurance, etc. and be a cost savings compared to the governmental concept.

This approach could be supplemented with government grants or contracts with states, tribes, and federal agencies and fees from participants. The private/philanthropic concept seems most likely to allow the Center to focus on a strictly scientific agenda with less concern about appeasing political pressures.

One of the main challenges of this concept may be the high cost of leasing space for the Center. However, there are several options for securing training space that could be either semi-permanent, transitional, or cloud based. Combining the private/philanthropic concept with governmental agency and/or university support, i.e., a cooperative approach (see below) would be one way to reduce such costs and provide flexibility in securing training space.

5.3.3 Cooperative Concept

The cooperative approach offers favorable elements from each of the above strategies. An interdisciplinary and cooperative facility comprising, for example, a university, private foundations, government agencies and rotating expert staff offers several advantages.

The USGS Cooperative Fish and Wildlife Research Units (of which there are 40 located in 38 states) and the National Conservation Training Center are examples, as was the CIFSG. A cooperative approach involving a university has potentially significant advantages. An effective cooperative agreement would provide for a semi-permanent organization perceived as adding scientific expertise and national recognition to the agreement partners.

University space and staff appointments have the advantage of being able to partner with other university staff to help obtain and process grants in addition to providing other functions of the Center. Under such a cooperative arrangement, if for example a federal agency was to withhold funding, the Center could continue to function if private funding was also a major component of the program. A 2021 survey conducted by the Association of American Colleges and Universities, revealed that 74% of universities were financially challenged (Hess 2021). Therefore, they will be open to creating centers that generate revenues. Since the Center establishes an interdisciplinary program, those institutions having Water Laboratory/Water Resources Research programs, Cooperative Fisheries Research Units or other similar units might offer desirable settings for the proposed Center. The proposed Center that embraces biology, hydrology, earth sciences, water quality and engineering sciences, supplemented by legal, institutional, and public involvement curricula would likely bring strong private support.

6.0 IMPLEMENTATION STRATEGY

Based on the four approaches summarized in Table 1 and input from experts familiar with establishing training programs such as proposed here, the IFWLC Committee initially favors a Center that will function as a decentralized distributed network. This approach provides opportunities for hybrid virtual and face-to-face formats for training, service, and integration of emerging research and development.

While the eventual format, function, and funding of the Center will evolve over time, the implementation of the project will be guided by the IFC and AFS, with suggestions from potential users of the Center also considered. Center personnel and operations could be supported through the establishment of an endowment and supplemented with grants and contracts from federal, state, private, and tribal programs. The endowment could be managed by AFS or IFC as a separate stand-alone fund but could also be combined with a larger fund managed by a project partner (such as a university). Regardless of how information and training are provided, the Committee recognizes that training, research, and support services are likely to occur at different venues as a function of IFWLC stakeholder needs.

Funding is initially needed for the Center to develop updated training curricula for each of the eight elements, as well as their integration that effectively promotes the advancement of the state-of-the-practice. This would be the primary focus during the first several years and would remain an ongoing strategic focus.

The plan for Center leadership and implementation would reflect the same four key functions as noted above, leading to outcomes that support IFWLC goals into the future. These include:

Leadership: Stimulate national, international, and local support for IFWLC goals.

Training: Engage instructors, prepare state-of-the-art curricula, guidance manuals, analytical techniques and interdisciplinary courses covering elements necessary for addressing flow and water level needs for protecting and/or mitigating water management schemes.

Research and Development: Provide focused, objective reviews and technical evaluations of existing and emerging IFWLC methodologies with the goal of updating

training materials, communicating findings to the IFWLC community, and promoting interdisciplinary research.

Support Services: Promote networking, provide a clearing house function, document up-to-date information, and evolving techniques. Track ongoing water project studies, give advice, review project plans of study on request, and circulate periodic reports on the state-of-the-art and practice.

Full time staff envisioned at this time are a Leader and Assistant Leader, providing a balanced background in the eight elements. An Administrative/Training Coordinator assisting in budgeting and arranging travel, siting, and routine details.

Oversight of Center activities will be provided by an Advisory Board of experts appointed by IFC and AFS who are collectively skilled in one or more of the eight disciplines presented in this assessment. The Board members would provide annual reviews and advice on evolving research, development, and training, as well as assistance in recruiting and retaining trainers.

Regardless of what approach is implemented, certain strategic considerations are essential to its implementation and prospects for long-term function. These include the following:

- Secure short-term funding for start-up covering at least the initial 5-years.
- Secure long-term funding or commitments through endowments or other means.
- Be insulated from political forces that might limit or compromise the prospects for the effectiveness and existence of the Center.
- Review research, state-of-the-art techniques, and science within all eight elements and development of procedures and computer-based methods (including documentation) that significantly improve state-of-the-art applications.
- Deliver a high-quality curriculum that provides students with skills to assess the consequences of flow and water level-related change that may affect the eight elements of streams, lakes, wetlands, and estuaries.
- Adapt and incorporate new scientific knowledge and state-of-the-art flow and water level-regime techniques, assessments, and prescriptions.
- Include a recognition of regional differences in the eight elements.

- Provide flexible training to individuals or groups. This might entail an ability to conduct training in various locations upon request as well as at a centralized training location.
- Provide training at a reasonable cost to students that is not a significant burden to them or their employers.

7.0 NEXT STEPS

This draft document is being circulated for stakeholder review. Input received will help the Committee finalize this assessment report and direct future implementation. One primary outcome will be development of one or more types of business plans or grant applications that could be used to seek financial support to further advance development of the Center. The Committee is poised to explore a range of options for seeking this support and remains open to suggestions and ideas from other interested parties.

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APPENDIX A

STEERING COMMITTEE MEMBERS

David Weedman, co-chair, is the retired Aquatic Habitat Program Manager for the Arizona Game and Fish Department and a Past President of the Instream Flow Council. He has over 28 years of experience designing, conducting fish and aquatic habitat inventory, monitoring, and restoration projects in his state. He has participated in and helped plan numerous IFC Flow workshops since 2010 as an IFC Regional Director, President-Elect, President, and now Past President. He holds a bachelor's degree in Interdisciplinary Studies from the University of Arizona and is a Certified Public Manager of ASU's Bob Ramsey Executive Education program.

Doug Austen, co-chair, is Executive Director of the American Fisheries Society and has been working in fisheries science and conservation for over 35 years. Doug has served with the U.S. Fish and Wildlife Service as the first national coordinator for the Landscape Conservation Cooperatives, as Executive Director of the Pennsylvania Fish and Boat Commission and with the Illinois Department of Natural Resources and the Illinois Natural History Survey. Doug received his Ph.D. from Iowa State University, M.S. from Virginia Tech, and B.S. degree from South Dakota State University. Doug is an AFS Certified Fisheries Professional, alumni of the National Conservation Leadership Institute and a Fellow in the American Institute of Fisheries Research Biologists.

Tom Annear is the retired water management supervisor for the Wyoming Game and Fish Department where he worked for over 37 years. He helped develop and implement their instream flow program, formed and chaired the department's water rights management team, and studied potential aquatic benefits and impacts for every major water development project in the state from 1983 to 2017. Mr. Annear is a co-founder of the Instream Flow Council (IFC), served as that organization's first president, and is a member of the Executive Committee. He secured funding for and is senior author of two books published by the IFC, co-authored another IFC book, and was project leader for an IFC project that assessed the status and effectiveness of state and provincial instream flow programs in the U.S. and Canada. He is currently adjunct professor at the University of Wyoming where he teaches a class that explores the theoretical and practical integration of stream ecology, water law, institutional capacity, and public involvement. Mr. Annear has a bachelor's degree in fisheries and wildlife management from Iowa State University and a master's degree in aquatic ecology from Utah State University.

Darren Carlisle was brought up in the arid west and took full advantage of every opportunity to escape to mountain waters. That interest propelled him to earn a B.S. in

Fishery Management (statistics minor) from Utah State University. He continued at Utah State University for an M.S. degree in Aquatic Ecology, where he studied the dynamics of fish populations and their invertebrate prey in remote wilderness lakes. He then worked for about a year with the Idaho Department of Environmental Quality, focused on developing a water-quality management plan for the middle Snake River. His interests evolved once again, and he returned to school at Colorado State University to study how pollution affects mountain stream ecosystems. Upon graduation, he worked for two years with the National Park Service as a regional technical advisor on all things related to aquatic science, including fishery management, pollution assessments, and the design of monitoring programs. Daren has worked at the USGS for 20 years. His research has included developing regional and national tools for ecological assessments of streams and rivers, and most recently on relationships between streamflow modification and biological integrity of aquatic organisms. Daren currently manages the Ecological Flows Program within the USGS Water Mission Area, which aims to improve understanding and predictive capabilities of the water quality and quantity required to sustain aquatic ecosystems.

Christopher Estes is an Aquatic Resources and Habitat Scientist and has been contributing to the field of instream flow and water level conservation (IFWLC) since the late 1960s. After Estes' 2010 retirement from the Alaska Department of Fish and Game as a Fisheries Scientist and Chief of its Statewide Aquatic Resources Coordination Unit, he entered into private IFWLC consultation as principal of Chalk Board Enterprises, LLC. He is a co-founder of the Instream Flow Council and continually served as one its Directors-at-Large since its formation. He has authored and co-authored numerous IFWLC and related publications. He held leadership and support roles both developing and implementing the 2006 *National Fish Habitat Action Plan* (NFHAP). NFHAP was codified as the National Fish Habitat Partnership (NFHP) in 2020 by *Title II of PL 116-188*. Estes serves on several science and technical committees for professional societies and organizations, including AFS. Estes received the 2021 *Stanley A. Moberly Award* co-sponsored by AFS, NFHP, and NOAA for his Outstanding Lifetime Achievements and Contributions to Fish Habitat Conservation. He obtained his bachelor's degree in biology and environmental science from Prescott College, Prescott, Arizona and his master's degree in environmental science from Washington State University, Pullman, Washington.

Dr. Thom Hardy retired as the Meadows Center Water and the Environment Endowed Professor for Environmental Flows at Texas State University Department of Biology. He

holds B.S.s in Education and Biology, and an M.S. in Aquatic Ecology at University of Nevada at Las Vegas. He obtained his Ph.D. in Civil and Environmental Engineering at Utah State University. Thom's interests have focused on the development and testing of integrated instream flow assessment frameworks including development of supporting software systems and training materials. He was the Associate Director of the Utah Water Research Laboratory (10 years) and Director of the institute for Natural Systems Engineering (21 years) at Utah State University College of Engineering. He holds the IFC Life Time Achievement Award, and is a founding member and Honorary Fellow of the Ecohydraulics Committee of the International Association for Hydro-Environment Engineering and Research.

Allan Locke is an aquatic habitat scientist who has been working in the field of aquatic habitat protection, management, and restoration; conservation biology; and environmental flows for more than four decades. From 1975 to 1981, Mr. Locke worked at several Conservation Authorities in Ontario as both a wildlife and fisheries biologist, and as a fisheries biologist for the Ontario Ministry of Natural Resources. In 1981, he joined the Alberta Fish and Wildlife Division where his duties were to develop fisheries habitat protection guidelines and environmental flow science and policy. As the provincial environmental flow specialist, Mr. Locke developed a province-wide program to protect Alberta's flowing waters. From 1998 to 2000, Mr. Locke served on the Instream Flow Council Executive Committee as the first director of Region 5 (Canadian Provinces). From 2004 to 2006, he was honoured to serve as the President of the Instream Flow Council. Along with several colleagues, Mr. Locke co-authored three books published by the Instream Flow Council. In 2013, he formed his own consulting company and provides environmental flow scientific and policy expertise to governments, industry, and NGOs. Mr. Locke received his Hon. B. Sc. degree in Zoology from the University of Guelph. Mr. Locke is a registered professional biologist with the Alberta Society of Professional Biologists and with the British Columbia College of Applied Biology.

Dr. Donald Orth is the Thomas H. Jones Professor in the Department of Fish and Wildlife Conservation at Virginia Polytechnic Institute and State University. Don's expertise focuses on instream flow assessment, population dynamics, habitat use by stream fishes, and restoration ecology. Don attended Eastern Illinois University (B.S.) and Oklahoma State University (M.S. and Ph.D.). He is a Life Member of the American Fisheries Society and a Certified Fisheries Professional. He is also a Fellow of the American Fisheries Society, the American Institute of Fisheries Research Biologists, and the Virginia Natural Resources

Leadership Institute. In 2008, he received the Instream Flow Council's Making a Difference Award for contributions to the science, practice, and practitioners of instream flow. In addition to over 180 popular writings, Don has published over 200 scientific publications on fishes, fisheries, and riverine management and has received numerous awards for his teaching and contributions to conservations and public outreach.

Dr. Dudley Reiser is a fish scientist with more than 42 years of experience designing, implementing, and managing fisheries and aquatic ecology projects, and habitat and instream flow studies. He was the co-founder and President of R2 Resource Consultants in Redmond, Washington which specialized in instream flow analysis and detailed hydraulic and hydrologic modeling. He is now a Senior Science Advisor for Kleinschmidt Associates where he is leading several multidisciplinary instream flow and lake level assessments. Dr. Reiser has prepared numerous peer reviewed publications and provided both written and oral testimony at state and federal proceedings related to water rights. He is a member of the American Fisheries Society and past member of Washington State's Independent Science Panel focused on salmon recovery. Dudley obtained his Ph.D. in Forestry, Wildlife, and Range Sciences from the University of Idaho, an M.S. in Water Resources from the University of Wyoming and a B.A. in Zoology from Miami University, Ohio.

Dr. Clair Stalnaker has been a key player in the instream flow arena for over forty years. He organized and served as Leader of the Cooperative Instream Flow Service Group, U.S. Fish and Wildlife Service. This program solicited interdisciplinary scientists for the purpose of advancing the state-of-the-art and elevating instream flow science and management to national and international prominence. His primary focus was toward a more holistic view of river science and policy, addressing the scientific components and promoting instream flow regimes and mitigation planning rather than "minimum flows." He received his B.S. degree from West Virginia University and Ph.D. from North Carolina State University. He is a life member of the American Fisheries Society and was Assistant Fisheries Unit Leader at Utah State University. He served on national and international task forces and advisory committees and authored numerous publications on instream flow, water allocation, and river management. He served on two committees of the National Research Council (Water transfers in the West and Fishes of the Klamath River). He is an honorary member and recipient of the Lifetime Achievement Award from the Instream Flow Council.

APPENDIX B

TRAINING COURSES OFFERED BY THE ORIGINAL COOPERATIVE INSTREAM FLOW SERVICE GROUP (CIFSG)

This appendix contains a listing and brief descriptions of instream flow related courses that were offered via the U.S. Fish and Wildlife Service's Cooperative Instream Flow Service Group in Fort Collins, Colorado from 1976 to the late 1990s.

Introductory Courses

IF 100 – Offered for one to two days for administrators and others, including the lay public, wanting a basic understanding of IFIM.

IF 200a – Designing and Conducting Studies Using IFIM. Prerequisite to all software and advanced courses. Five days covering concepts of IFIM, project scoping, river segmentation, study reach and site selection, and the uses of IFIM. IFIM philosophy and approach to scoping, developing a plan of study, implementing, documenting, conducting alternative analyses, problem solving, and negotiation.

IF 200b – Instream Flow Incremental Methodology-A Method for Evaluating Conservation Flows. Overview specifically tailored toward those charged with evaluating applications of IFIM to hydropower projects ongoing in the Northeastern U.S. Understanding of different flow decision environments. How basic components of the IFIM are integrated for specific studies. How IFIM products are used in problem solving,

IF 201 – Problem Analysis and Negotiating Solutions Using IFIM. How to formulate, generate, and evaluate alternatives in management of water with special emphasis on hydropeaking applications. Conducting quality assurance reviews of data and simulations used in IFIM applications. Preparing your data and yourself for negotiation or other decision-making processes.

IF 205 – Field Techniques for Stream Habitat Analysis. River segmentation, study reach and site selection, choosing aquatic species/guilds, habitat suitability criteria for habitat description.

IF 251 – Practical Applications in IFIM. An advanced course organizing student teams to conduct and negotiate solutions to using case studies, actual data and hands-on analyses. Integrating hydrology analyses, temperature screening, transferability of suitability criteria, integration of micro and macro habitat, habitat time series, habitat bottlenecks, negotiations, feasibility, risk analysis and contingencies.

Advanced Courses

IF 305 – Field Techniques for Stream Habitat Analysis. Covered everything as in the earlier 205 course. Added emphasis on stream representation, sampling strategies, selection of segments having morphologically differing stream reaches throughout study area, selection and replication of representative (sample) reaches within segments, description of meso-habitats within representative reaches, hydrologic and hydraulic data, calibration to water surface elevation, data for velocity calibration, preparation for entry into PHABSIM and input to hydrology time series and habitat time series software.

IF 310 – Using the computer based Physical Habitat Simulation System. In addition to learning how to operate the software, additional practice in calibration to water surface elevation and measured velocities, combining micro- and macro-habitat creating total habitat values throughout the study area, applying habitat simulations for comparing management alternatives.

IF 312 – The Stream Segment and Stream Network Temperature Models. Describing the macro habitat throughout the entire study area, combining with output microhabitat as input to habitat time series simulations.

IF 402 – Reviewing and Evaluating Instream Flow Studies for Hydropower Relicensing. Designed specifically for those charged with reviewing the study plans and work of others as part of an agency or other entity's input to decision making related to licensing of hydropower units. How to know what constitutes a good hydropower relicensing study plan, with particular attention to a) problem identification, b) addressing study objectives to those problems, and c) determining whether the study has been implemented to meet those objectives. When and how to make enlightened assumptions about missing data, and how and why to ask for additional information. Sharpen skills for making sound, defensible instream flow recommendations to support your resource goals, with emphasis on understanding feasible alternatives and evaluating their effectiveness.

Documentation for These Courses

- Data Collection Procedures for the Physical Habitat Simulation System.
    - Trihey, E. Woody and David L. Wegner. 1981. *Field data collection procedures for use with the physical habitat simulation system of the Instream Flow Group*. Cooperative Instream Flow Service Group, 1981.

- Description and Application of the Stream Simulation and Assessment Model.
    - Grenney, William J. and Andrezej K. Kraszewski. 1981. *Description and application of the Stream Simulation and Assessment Model Version IV (SSAM IV)*. No. 17. Office of Biological Services, Fish and Wildlife Service, US Department of the Interior.
- A Guide to Stream Habitat Analysis using the Instream Flow Incremental Flow Methodology.
    - Bovee, Ken D. 1982. *A guide to stream habitat analysis using the instream flow incremental methodology*. Vol. 1. Western Energy and Land Use Team, Office of Biological Services, Fish and Wildlife Service, US Department of the Interior.
- Introduction to Stream Network Habitat Analysis.
    - Bartholow, J.M. and T. Waddle. 1986. *Introduction to stream network habitat analysis* (Vol. 86). National Ecology Center, Division of Wildlife and Contaminant Research, Fish and Wildlife Service, US Department of the Interior.
- A New Perspective in Institutional Analysis: The Legal-Institutional Analysis Model.
    - Wilds, L.J. 1986. *A new perspective in institutional analysis: the Legal-Institutional Analysis Model (LIAM)* (Vol. 86). National Ecology Center, Division of Wildlife and Contaminant Research, Fish and Wildlife Service, US Department of the Interior.
- Stream Temperature Investigations: Field and Analytic Methods.

  Bartholow, J.M. 1989. *Stream temperature investigations: field and analytical methods* (Vol. 89). U.S. Fish and Wildlife Service.
- Reference Manual for Generation and Analysis of Habitat Time Series.
    - Milhous, R.T. 1990. *Reference manual for generation and analysis of habitat time series: Version II* (Vol. 90). US Department of the Interior, Fish and Wildlife Service.
- Instream Flow Incremental Methodology-A Method for Evaluating Conservation Flows.
    - Bovee, K.D., B.L. Lamb, J.M. Bartholow, C.B. Stalnaker, and J. Taylor. 1998. *Stream habitat analysis using the instream flow incremental methodology*. Geological Survey Reston, VA, Biological Resources Div.

APPENDIX C

IFWLC TRAINING CENTER STAKEHOLDER SURVEY OUTREACH CATEGORIES

DRAFT

The Instream Flow and Water Level Conservation Committee solicited, via a web-based survey, input from a wide range of stakeholders and interest groups (listed below) regarding the support for establishing an IFWLC Training Center.

- American Bar Association (ABA) (https://www.americanbar.org/)
- American Fisheries Society (AFS) and AFS Stakeholder Mailing Lists (https://fisheries.org/)
- Association of Dam Safety (https://damsafety.org/)
- Association of Fish and Wildlife Agencies (https://fishwildlife.org/)
- Bureau of Land Management (https://www.blm.gov/)
- Canadian Water Resources Association (https://cwra.org/en/)
- Dividing the Waters at The National Judicial College (https://www.judges.org/dividing_the_waters/about-dtw/)
- Fisheries and Oceans Canada (https://www.dfo-mpo.gc.ca/index-eng.html)
- Hydro Review (https://www.hydroreview.com/)
- Instream Flow Council (IFC) (https://www.instreamflowcouncil.org/) and IFC Stakeholder Mailing Lists
- Interagency Hydrology Committee for Alaska (https://sites.google.com/site/ihcalaska/home/)
- International Association for Hydro-Environment Engineering and Research (IAHR) (https://www.iahr.org/)
- Interstate Council on Water Policy (https://icwp.org/)
- National Fish Habitat Board and National Fish Habitat Partnerships and Partners (https://www.fishhabitat.org/)
- National Hydropower Association (https://www.hydro.org/)
- National Park Service (https://www.nps.gov/index.htm)
- North American Wetlands Conservation Act Migratory Bird Joint Ventures and Partners (https://mbjv.org/ and https://www.fws.gov/law/north-american-wetlands-conservation-act)
- Northwest Hydropower Association (https://www.nwhydro.org/)
- The Nature Conservancy (https://www.nature.org/en-us/)
- Trout Unlimited (https://www.tu.org/)
- United States Society of Dams (https://www.ussdams.org/)
- U.S. Fish and Wildlife Service Retirees Organization (https://www.fwsretirees.org/)
- U.S. Forest Service Regional Offices (https://www.fs.usda.gov/)

- Western States Federal Agency Support Team (https://westernstateswater.org/westfast/)
- Western States Water Council (https://westernstateswater.org/)
- Several universities in the U.S. and Canada
- Legislators
- Private individual and other stakeholders (unaffiliated with the above)

APPENDIX D

SURVEY RESULTS, FINDINGS, AND KEY CONCLUSIONS

The following summarizes the questions and responses received from the Instream Flow and Water Level Conservation web-based survey regarding the needs and support for a IFWLC Training Center. Note that the Preliminary conclusions are based on the Steering Committee's subjective interpretation and are not necessarily based on data.

Question 1 – I am completing this survey on behalf of ....

Instream flow and water level issues are commonly dealt with by a wide range of professions. To help identify the kinds of training and support that is needed, we asked which sectors may find value in the proposed Center. Figure E-1 summarizes the responses received to this question.

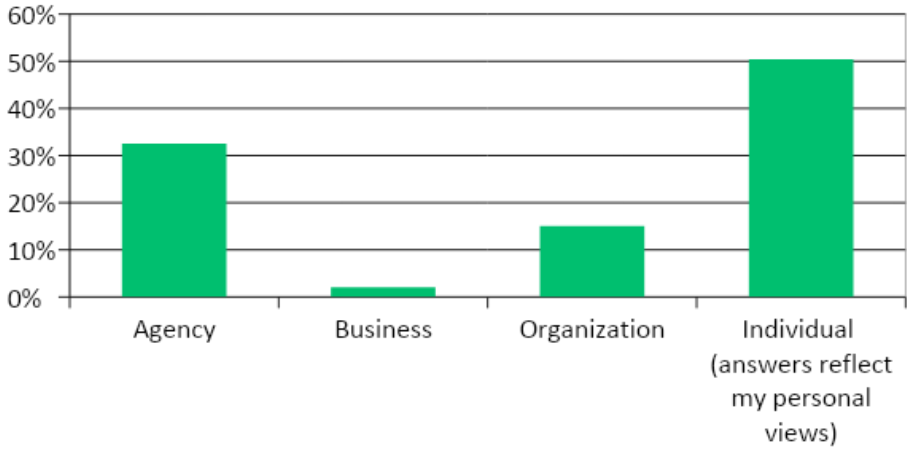

Figure E-1 Percent of total respondents who were responding on behalf of the entity they were representing.

Key Findings

- Half of all respondents were speaking on their own behalf.
- About one-third were speaking on behalf of their agency.
- Less than 20% were speaking on behalf of their company or organization.

Preliminary Conclusions

- Responses were received from forty-nine U.S. states, seven Canadian provinces, and seven other countries demonstrating a wide geographical distribution. The responses reflect a wide range of needs and views.
- The response to the survey may have been limited by the fact that it was only active for 30 days during the traditional field season for many of the people who are likely to need this kind of training. We do not necessarily suspect a bias since the trends observed in the final data set were nearly identical to each download through the survey period.

Question 2 –What best describes your affiliation/water interest? (Select all that apply)

Instream flow and water level conservation principles are commonly dealt with by a wide range of stakeholders. To help us understand the kinds of training and support that is needed, we wanted to identify which stakeholders may find value in the proposed Center. Figure E-2 shows the range of affiliations for which respondents were associated.

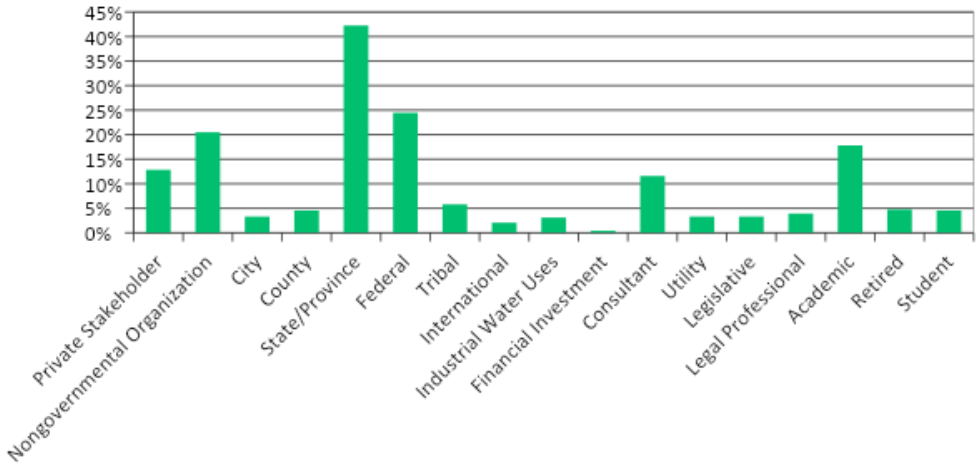

Figure E-2 Percent of total respondents who were affiliated with various professions or entities. Note, respondents were free to select more than one affiliation.

Key Findings

- Most of the responses indicated affiliation with either a state or federal (Canadian or U.S.) agency. Almost twice as many respondents (42%) were associated with state or provincial agencies as for federal agencies (24%).
- The next highest groups of respondents were people associated with nongovernmental organizations (20%), academia (18%), private stakeholders (13%), and consultants (12%).

Preliminary Conclusions

- These groups comprised 75% of all responses, which is not unexpected. These disciplines typically are on the front lines of instream flow and water level quantification efforts.
- It is likely that most people who would seek training at the proposed Center will come from these disciplines.
- Though the proposed Center should market to all of the disciplines who responded, we should anticipate that support and funding (student fees) will come from these four main areas. As such, fee structure must be sensitive to the fiscal limits of these groups.

Question 3 – What 3 categories best describe your instream flow and water level conservation related responsibilities?

Instream flow and water level conservation issues are dealt with by stakeholders with a wide range of professional responsibilities and interests (Figure E-3). Understanding the responsibilities of those responding to the survey was intended to give us a general sense of who might find value in the proposed Center and further refine the range of people who might eventually seek training, research assistance, and general support services.

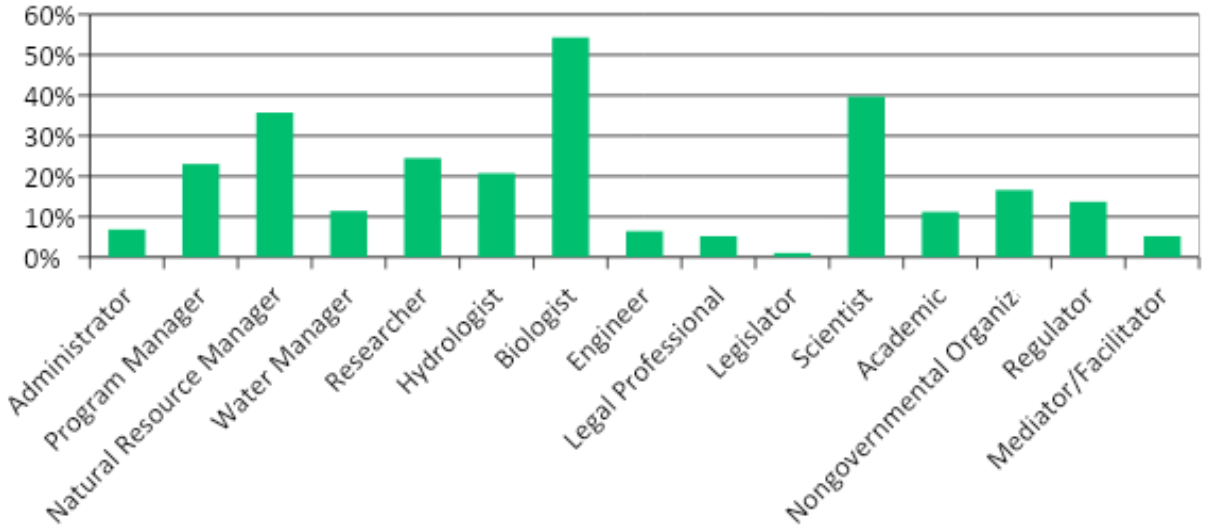

Figure E-3 Percent of people who responded who defined their professional responsibilities in one (or more) of fifteen water management-related professions.

Key Findings

- Most respondents were involved in natural resource management either as a biologist, scientist, or the broader category of natural resource manager.
- Few administrators completed the survey (7%).

Preliminary Conclusions

- Numerically, there are generally fewer administrators related to this discipline compared to the field staff who also took the survey, so we do not read this as a lack of interest by administrators. Administrative support will be critical to getting the Center established and then attracting people for training.
- These results suggest that the need for training in this field is widely recognized among a broad range of people in the scientific community.

Question 4 – How many years have you engaged in instream flow or water level conservation activities?

Considering that the CIFSG ceased providing training in 2001, we wanted to know how many people are conducting instream flow studies today that did not have the benefit of receiving training from that institution. This information can provide a general sense of how people today may be doing studies and making recommendations.

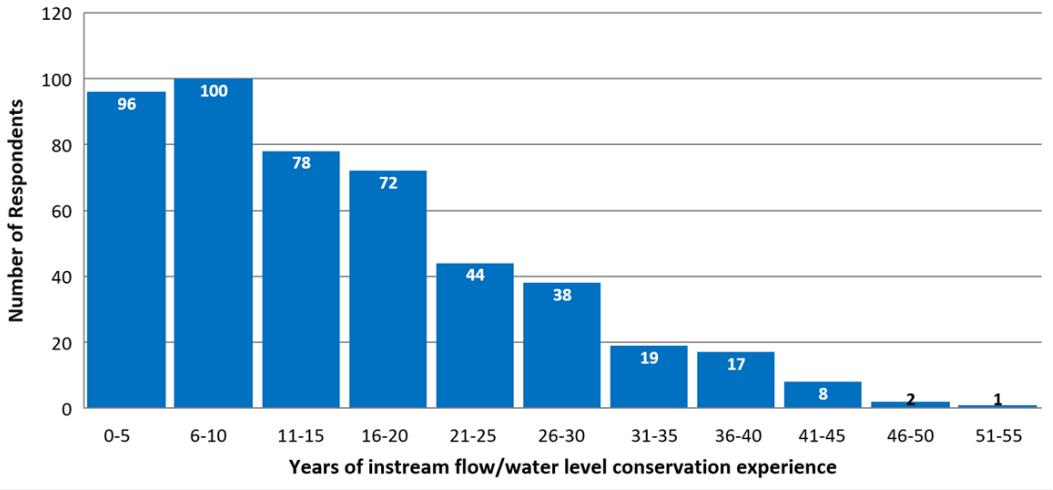

Figure E-4 Number of years people have been doing instream flow and water level conservation studies. Bars represent the sum of responses by five-year increments.

Key Findings

- The mean number of years that people have been involved in this area is 16 years.
- 346 of the 475 respondents who answered this question (73%) have been doing this work for 20 years or less (Figure E-4).

Preliminary Conclusions

- Most respondents have been doing instream flow and water level conservation studies for a relatively long time.
- Since the CIFSG ceased training 20 years ago, results for this question mean that almost three-fourths of all the people doing instream flow and water level studies today did not receive training directly from the former center.
- In the absence of standardized training, most of the people doing instream flow and water level conservation studies today were not trained by the CIFSG.
- The absence of standardized training ultimately leads to variability in the way studies are done today. This trend of high variability among flow and water level studies has been observed by many Committee members.

Question 5 – How often do you analyze or integrate the following disciplines when assessing environmental flows or water levels?

The form and function of rivers and lakes and the ecological systems they support are largely determined by the unique interaction of 5 elements – hydrology, biology, geomorphology, water quality, and connectivity. These elements must also be integrated with legal constraints and public needs and involvement. As a consequence, it is typically necessary that instream flow and water level conservation studies address all of these elements and integrate the output to assess the effect of flow regimes and water levels on ecosystem characteristics. Figure E-5 shows the range of responses to this question.

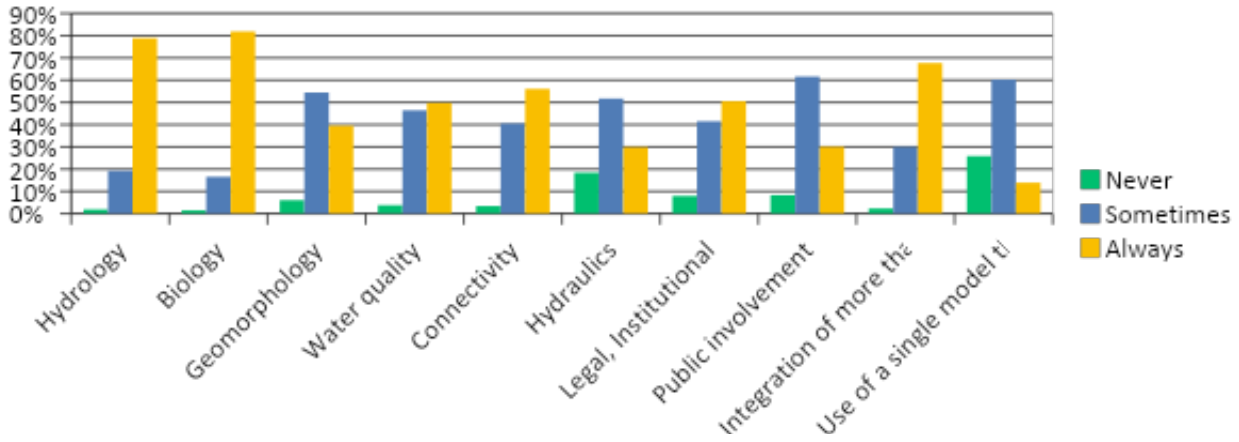

Figure E-5 Frequency that respondents use various disciplines to quantify and recommend instream flow and water level conservation prescriptions.

Key Findings

- The majority (80%) of respondents indicated that they always address hydrology and biology in their assessments. This is expected since this has been the focus of instream flow work since its origins.
- 40% to 55% of respondents said they also address each of the other elements with connectivity getting mentioned slightly more than the other elements.
- A number of respondents said they sometimes or always address legal and institutional issues though it is impossible to know at what level based on this survey.

Preliminary Conclusions

- This question should have been posed a bit differently. By only asking if people used more than one element, we were unable to know how many they actually used in individual studies or if they integrate all five elements in their assessments, which was an important goal of this question. As a consequence, it was easy for

people to answer affirmatively if they integrate hydrology and biology (or any two elements) but nothing else.

- Likewise, we did not ask if people used a model that integrates and analyzes all five elements. None of the members of the Committee is familiar with such a model (i.e., none of us have encountered a study that is based on such a holistic model). For reference, see Locke et al. (2008), Chapter 9.
- Notably, water quality was addressed less than expected. However, most governmental agencies split water quality and water quantity responsibilities between different agencies.

Question 6 – Please indicate what level of training or proficiency best describes your current status in each category below.

As part of our evaluation of the need for a national-level training Center it is important to understand the current level of training or proficiency in the application or evaluation of the disciplines relied on for instream flow and water level conservation efforts. Figure E-6 provides a summary of this information.

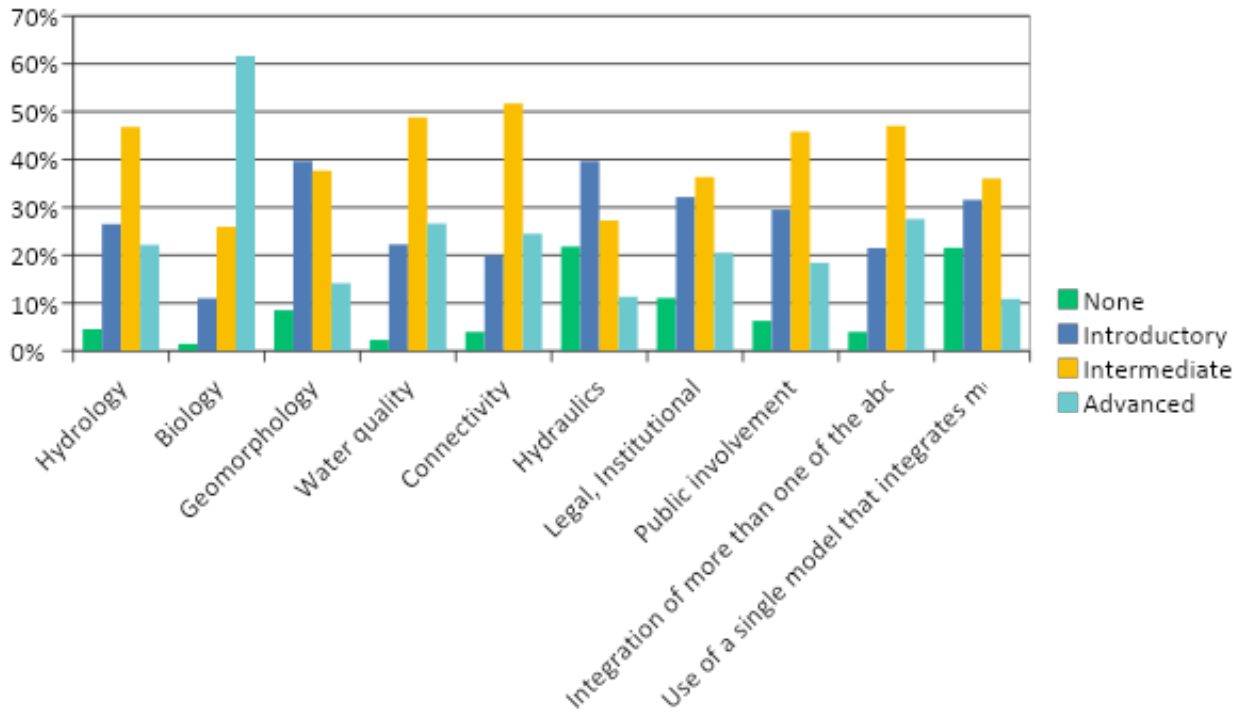

Figure E-6 Summary of responses indicating the level of skill or training respondents thought they possess for doing instream flow and water level conservation studies.

Key Findings

- Most respondents (85%) felt they were competent at intermediate or advanced levels (combined) of biological studies.
- 40%-50% of respondents indicated that they had at least an intermediate level of skill or training in the other 4 scientific disciplines.
- Hydraulics was the scientific discipline that respondents had the least skill with. This response may reflect the lack of appreciation that existing instream flow models such as PHABSIM and 2-D models are based on hydraulics, as reflected by reference to the output of these models as "hydraulic habitat."
- Most respondents felt they had relatively high levels of training and skill with public involvement.

Preliminary Conclusions

- People generally had a relatively high regard for their ability to use the various scientific disciplines.
- The fact that many respondents said they felt they had a good aptitude for dealing with the public likewise does not mean they would not benefit from training to better implement their skills and knowledge.
- Both of these facts came across in the general comments at the end of the survey as well as in Question 8 (i.e., for as much as people know, most people expressed a need for more training).

Question 7 – Select the type(s) of training that best describe(s) how you acquired your current knowledge and proficiency within each of the applicable categories (can choose more than one).

The CIFSG was the primary source of training for instream flow work for over 20 years. Since its termination there has been no central, standardized source of integrated training for instream flow and water level conservation studies. Given that 72% of all people doing such studies today did not have the opportunity to receive training from the CIFSG, we wanted to know where people have received training. To better understand the potential role and function of a national-level training Center, the identification of the existing sources of training given the previously identified levels of proficiency is necessary. Figure E-7 shows where respondents have received training.

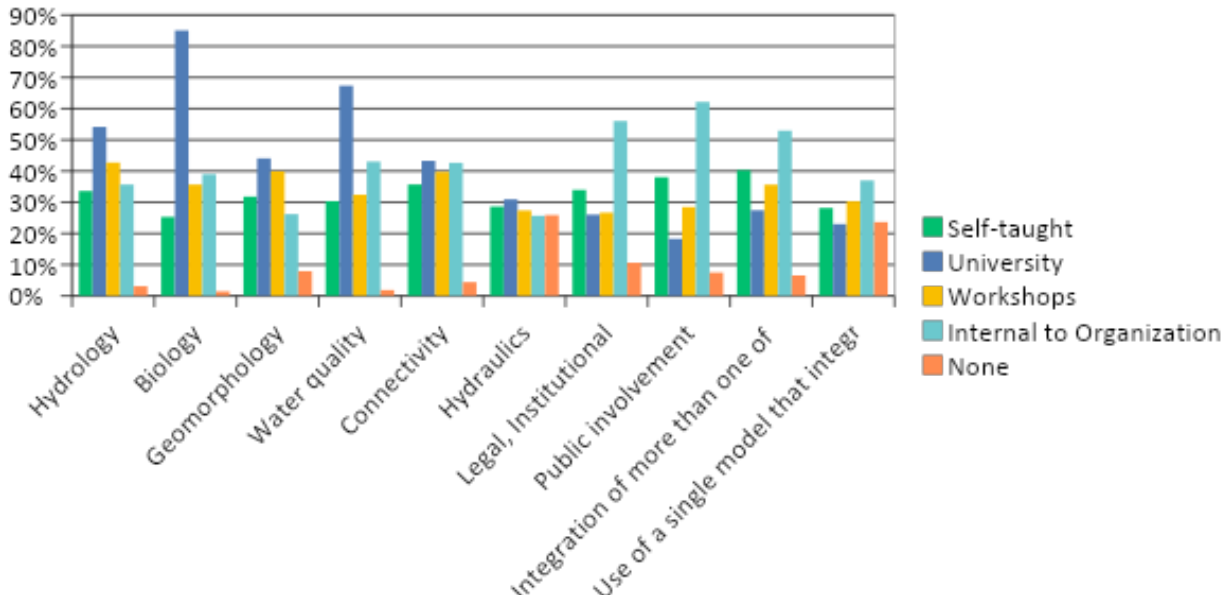

Figure E-7 Sources of training where respondents have obtained skills for doing instream flow and water level conservation studies and recommendations.

Key Findings

- Most respondents indicated that their training in hydrology, biology, and water quality training originated in universities.
- Most training in legal, public involvement, and integration of multiple disciplines originates within agencies and organizations.
- Training in the other scientific disciplines comes from a combination of sources.

Preliminary Conclusions

- The diverse source of training suggests that such training is not standardized across agencies or organizations but is focused on specific needs and projects that may not be applicable to other situations. The fact that training for integration of multiple disciplines comes largely from within a person's agency suggests a relatively high degree of variability in the way this information is collected, interpreted, and applied.
- These findings suggest that such training may be relatively unstructured and variable for each technical discipline.
- The fact that most training in the instream flow and water level conservation field comes from a broad spectrum of sources suggests a trend where each practitioner may do studies differently from the next. This may well lead to conditions of the early years of instream flow work (1970s and 1980s) where each management agency did studies differently than was done in other agencies and organizations.

Such variability exposed practitioners to challenges by flow opponents because their work "was different than another state or province."

- This finding does not minimize the knowledge that people have acquired but does reflect a need to standardize the way data are collected, interpreted, and applied. Consistent, standardized training is known to increase the credibility of studies and recommendations in most other disciplines as evidenced by the need for training to support certifications in other disciplines.

Question 8 – If a National Center were established to provide training, synthesis of emerging scientific research, and technical support for instream flow and water level conservation assessments, which of the following training levels by discipline would you consider important? (Can choose more than one).

If this project goes forward to develop a center that provides training, research oversight, and support services, it is important to know if the people who took the time to complete this survey would find value in the disciplines that the Committee feels are important to recognize in all credible flow and water level studies. Such information will help shape curriculum development and provide insights into how confident most practitioners feel about their current skills and training. Figure E-8 summarizes the input we received for this information.

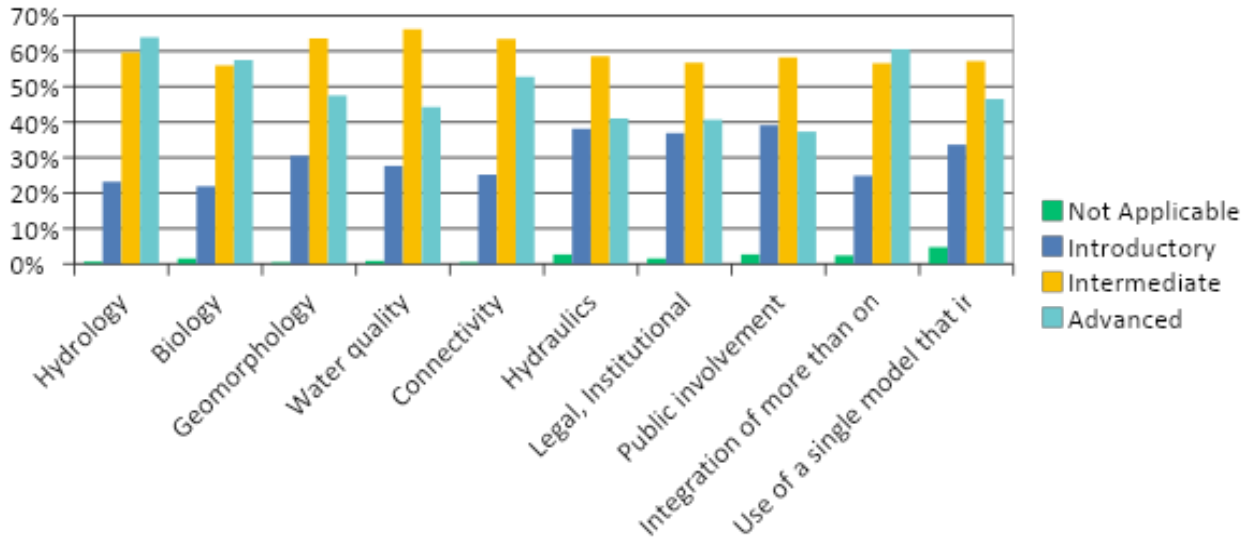

Figure E-8 Summary of how important respondents felt different levels of training were needed for a range of flow and water level disciplines. Percent is based on total responses for each discipline.

Key Findings

- Respondents indicated that intermediate training was needed almost equally in all of the disciplines listed.
- The exceptions to this trend were hydrology and integration of multiple elements, which each received the highest support for advanced training (over 60% of people supported such training).

Preliminary Conclusions

- The fact that so many respondents indicated that they felt skilled in these disciplines (Question 6) but still supported such high levels of training for all listed elements speaks to the importance of developing the proposed Training Center.
- The fact that so many respondents supported the need for training to integrate multiple disciplines in studies further endorses the stated purpose of the proposed Center.
- The fact that so many respondents supported the need to develop a standardized approach to integrating results across multiple disciplines suggests a broad awareness that this is a pressing need that is not currently being met.

Question 9 – Is there a need for a permanent national-level center that provides standardized, consistent training to guide research, and offer basic and customized support services to train stakeholders in the skills necessary to assess instream flow and water level conservation requirements and participate in water use management, research, processes, and decision making to achieve effective state-of-the-art instream flow and water level conservation outcomes?

The most important question for which an answer was needed by the Committee was whether other water management professionals perceived the same need as the committee. This information is not an absolute requirement but was important for affirming the strongly held views of the Committee. Results to this question are shown in Figure E-9.

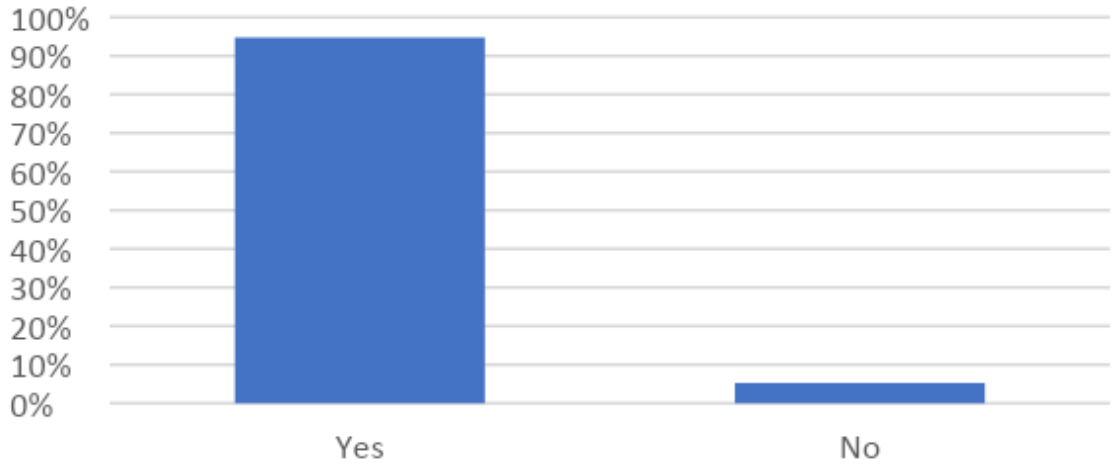

Figure E-9 Responses to whether respondents thought a Center to provide training, research oversight, and support services was needed.

Key Findings

- Nearly 95% (451) of all respondents answered affirmatively that there is a need for a national-level center.
- All of the seven people who responded from countries other than the U.S. supported development of the proposed Center.
- Only 5% (30) of respondents answered that the proposed Center is not needed.
- Our review of those who said a Center is not needed did not reveal any trends in terms of the agency or organization they worked for, their level of responsibility, or geographic location. In fact, in their general comments at the end of the survey, three of those said they were glad to see the IFC taking charge of this effort or were otherwise in agreement that the Center was a good idea.

Preliminary Conclusions

- Given this level of support by people who are already doing instream flow work and feel relatively skilled, we conclude that there is merit to proceed toward implementation of a new training and research Center.
- Reasons given for not supporting the Center reflected a range of opinions about the proposed project, not all of which were in line with the SC vision for the Center. Some of these we suspect were based on preconceived notions, but the survey was not designed to dig very deep into the reasons. This finding encouraged the SC to be more specific about the proposed purpose and function of the Center and we hope we have addressed some of those reservations in this Plan.

Question 10 – If a state-of-the-art workshop were to be scheduled, would you be interested in either of the following (attending or presenting)?

The Committee considers this feasibility assessment to be a work in progress. We have gained a great amount of information and guidance from the survey but know that there are many people who would like to provide additional, more specific assistance. We believe that an international workshop could provide additional insights that would help ensure the success of the proposed Center if this effort ultimately leads to that point. As such, we wanted to know if people who completed the survey would have interest in either attending such a workshop or presenting a professional paper addressing ways to integrate the various disciplines we present.

Key Findings

- 98% (439) of respondents indicated a desire to attend a workshop if one is scheduled.
- 26% (118) respondents expressed an interest in presenting a paper at a workshop if one is scheduled.
- 73% (22 of 30) of people who did not support development of a Center said they would attend a workshop if one were held, and seven said they would consider presenting a paper.

Preliminary Conclusions

- We know that not all these people would ultimately attend or present at a workshop, but there is strong evidence of enthusiasm for networking and willingness to help advance this idea.
- We conclude that we should schedule and host a workshop after completion of this initial phase of the feasibility assessment.
- If feasible, we should look to extend the project contract to facilitate the meeting, then write a final report with specific implementation recommendations.

Other Key Messages from the Survey

- There were several comments that this Center is urgently needed.
- Several people indicated a willingness to help teach some of the classes if a Center is established. When we begin developing the curriculum, we will need to contact these individuals and explore their ideas and suggestions.

- There is a recurring concern that this effort will have a regional focus (Western U.S.) and overlook needs in other parts of the country. We need to make clear that this is not the case.
- There is concern by some that the Center will promote a one-size-fits-all methodology and that studies need to reflect the unique needs of each situation. We need to clarify that the Center will provide tools for people to use as they deem appropriate for each situation.
- There is concern that cost will be too high and classes need to be within the range of what (state and provincial) agencies can afford to pay. We need to do an economic analysis to show as best we can that the Center will be largely subsidized by other funds to keep costs relatively low.
- There were comments that efforts need to be made to prevent the center from falling victim to political maneuvers that could lead to its demise as happened with the CIFSG. A permanent, politically insulated institution is needed.

Several people who participated in the survey offered suggestions for facilities where the Center could possibly be placed and funded. More consideration is needed before decisions of this nature can be made, but it is clear that people want to see the Center become established and be a success.