Final Report

Summary of Instream Flow Advisory Group Activities and Recommendations

Prepared for

Oklahoma Water Resources Board

State of Oklahoma
OWRB
WATER RESOURCES BOARD
the water agency

U.S. Army Corps of Engineers–Tulsa District

Oklahoma Instream Flow Advisory Group

August 2014

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Contents

Appendixes

Background

In 2012, the Oklahoma Water Resources Board (OWRB) published the most extensive and detailed update to the Oklahoma Comprehensive Water Plan (OCWP) in the state's history. The update was guided by two overarching goals:

- Provide safe and dependable water supply for all Oklahomans while improving the economy and protecting the environment.
- Provide information so that water providers, policy makers, and water users can make informed decisions concerning the wise use and management of Oklahoma's water resources.

The 2012 OCWP update was developed under an innovative parallel-path approach, drawing on a combination of detailed technical evaluations and a broad-reaching, bottom-up public input process to guide and then prioritize water policy recommendations.

OCWP and 2009–2011 Instream Flow Advisory Group Recommendations

Previous OCWPs raised the issue of and made recommendations for evaluating nonconsumptive uses of water, including instream flows for environmental and recreational uses. Building on those recommendations and on input from the public participation process, OWRB convened an Instream Flow (ISF) Advisory Group in late 2009 to solicit input from key stakeholders and establish a path forward for further evaluating the need for, and options for, establishing an ISF policy or program in Oklahoma. This Advisory Group had 19 members plus alternates, OWRB staff, and a consultant to help facilitate meetings. The group met in person five times in 2010 and 2011, discussing issues pertinent to ISFs and water resources planning. The group's primary charge was to develop guidance on a process whereby the issue of ISFs could be considered in Oklahoma.

The group developed a report titled *Instream Flow Issues and Recommendations* (OWRB, February 2011). The report acknowledged the lack of consensus among the various water interests and stakeholders in Oklahoma regarding the need for an ISF program and whether or how such a program might be implemented. The report recommended the following steps:

1. Address the legal and policy questions.
2. Study other mechanisms for protecting ISFs.
3. Develop a draft methodology for ISF studies in Oklahoma.
4. Conduct a study on the economics of ISFs in Oklahoma.
5. Perform an ISF pilot study in a scenic river.
6. Preserve the Instream Flow Advisory Group.

2012 OCWP Priority Recommendations

Building on the Advisory Group's 2011 findings and recommendations, and on the public input received through the 2012 OCWP public participation process, one of the eight priority recommendations of the OCWP addressed Instream/Environmental Flows. Specifically, the OCWP recommended that:

> The process developed by the OCWP Instream Flow Workgroup should be implemented and followed to ascertain the suitability and structure of an instream flow program for Oklahoma, with such process commencing in 2012 and concluding by 2015, as outlined by the Workgroup.

ISF Advisory Group 2013–2014

Consistent with these recommendations, the ISF Advisory Group reconvened in 2013 to further define whether and how an ISF program might be implemented in Oklahoma. Just as the OWRB partnered with the U.S. Army Corps of Engineers in developing technical aspects of the OCWP, implementation of the key policy recommendations from the OCWP was supported through this innovative state/federal partnership. And just as the OCWP sought broad input from the public and key stakeholders in water use and management from across the state, implementation of the policy recommendations deliberately draws on a diverse set of water interests and expertise from all parts of Oklahoma.

The Members of the Advisory Group are listed below. Technical and facilitation support was provided to the group by staff from OWRB, CH2M HILL, and Carollo Engineers.

Name	Representing
J. D. Strong (Chair)	OWRB
Jim Barnett	Environmental Federation of Oklahoma
Barry Bolton	Oklahoma Department of Wildlife Conservation
Shannon Brewer	U.S. Geological Survey
Angie Burckhalter	Devon Energy
Tom Creider	Oklahoma State Parks
Mark Derichsweiler	Oklahoma Department of Environmental Quality
Tom Elkins	Cherokee Nation
Mike Fuhr	The Nature Conservancy
James Gammill	Oklahoma Rural Water Association
Bud Ground	Public Service Company of Oklahoma
Charlette Hearne	Oklahomans for Responsible Water Policy
Arnella Karges	Oklahoma State Chamber of Commerce
Michael Kelsey	Oklahoma Cattlemen's Association
David Ocamb	Sierra Club
Diane Pedicord	Oklahoma Municipal League
Marla Peek	Oklahoma Farm Bureau
Tyler Powell	Office of the Secretary of Energy & Environment
Jim Reese	Oklahoma Department of Agriculture, Food and Forestry
Marsha Slaughter	Oklahoma City Water & Wastewater Utilities Department
Kevin Stubbs	U.S. Fish and Wildlife Service
Jeff Tompkins	Bureau of Reclamation
Brooks Tramell	Oklahoma Conservation Commission
Brian Woodard	Oklahoma Independent Petroleum Association

As part of the effort to address the institutional issues regarding whether and how an ISF program might be implemented in Oklahoma (Recommendations 1 and 2 from the 2011 report), a background report—*Instream*

Flow Advisory Group Support (CH2M HILL and Carollo 2013)—was developed to investigate and summarize relevant Oklahoma water laws, existing programs, and state and federal laws that may provide some level of ISF protection and affect development of an ISF program in Oklahoma. The background report provided an overview on the ISF legal and policy framework, other states' ISF programs, and mechanisms for protecting ISFs to support the initial discussions with the ISF Advisory Group. Appendix A contains a copy of the background report. It is also posted on the OWRB website (http://www.owrb.ok.gov/supply/ocwp/instreamflow.php).

Key Issues and Considerations

To explore and gain a common understanding of the issues, OWRB Executive Director and Advisory Group Chair J. D. Strong shared the following with Advisory Group members:

> Our goal is that all members of the Advisory Group have a thorough understanding of the benefits and issues that accompany the potential implementation of an instream flow program and share their thoughts and concerns with the concept. This will require all members of the group to work together to fully explain their viewpoints and the specific basis for those perspectives.

To that end, OWRB asked the Advisory Group members to provide written responses to nine open-ended questions in February 2013:

- What are the most significant potential consequences of an ISF program in Oklahoma? Please be specific. How could any negative consequences be mitigated?
- What are the potential consequences of NOT implementing an ISF program in Oklahoma? Please be specific. What other approaches could be taken to mitigate those consequences?
- How could we measure the social and environmental benefits and consequences of an ISF program? Please explain your method, logic, and reason for your approach.
- How could we measure the financial impacts of an ISF program? Please explain your method, logic, and reason for your approach.
- How could a pilot project be used to evaluate and measure the benefits and concerns you described above?
- Should an ISF program be measured by potential economic impacts alone? Should an ISF program be measured by social and environmental impacts alone?
- If an ISF program is developed, what would be the most important aspects for the program to protect or enhance? Rank the following from high to low (Recreation; Aquatic life—all; Aquatic life—threatened and endangered species; Visual and aesthetic benefits; Receiving water quality; Existing permits for consumptive water use; Future permits for consumptive water use; Other).
- Should legal/regulatory protections be provided for those with existing consumptive water rights? How could those protections be provided?
- Should legal/regulatory protections be provided for future consumptive water rights? How could those protections be provided?

Full responses to the questions were distributed to the group and are included in this report as Appendix B. The types of issues identified included the following, and formed the basis for Advisory Group dialogue:

- Certainty regarding the ability to meet current and future water supply needs
- Clear definition of the goals and need for an ISF program in Oklahoma
- Costs and benefits of an ISF program, considering both consumptive and nonconsumptive water uses
- Providing for human water needs while having acceptable environmental impacts
- Meeting multiple goals for water use, thus providing for both a healthy economy and a healthy environment

- Relative priorities for water use between ISFs and current and future consumptive rights, particularly in times of drought or other shortages

The following is a synopsis of the issues identified by Advisory Group members through OWRB outreach and through discussion at Advisory Group workshops. Details of each workshop are provided in the section that follows. This synopsis is provided for informational purposes and does not replace the detailed input provided by Advisory Group members. This synopsis is not presented in any order and does not in any way approve, advocate for, or advocate against the issues identified by members of the group.

General

- Desire for certainty in future water availability and uses
- Inability to evaluate potential implications without defining specifics of ISF program
- Concern that ISF water may/would be completely unavailable to consumptive users
- Need to better define the purpose, goals, and need for an ISF program
- Need to fully characterize cost/benefit implications for both consumptive and nonconsumptive uses
- Policy decisions needed to address human needs in context of acceptable environmental impacts
- Desire for a healthy economy and a healthy environment
- Intertwined economic, social, and environmental impacts and should be evaluated together
- Ranking relative importance of aspects to protect/enhance is premature or inappropriate; this is not a voting exercise; existing law sets what is and is not protected

Oklahoma Water Law

- Concern that ISF may have priority over existing water rights
- Concern that ISF would have priority over future water rights
- Should evaluate ISF in context of current policies and statutes; ISF program would require statutory changes

Potential Benefits of ISF Programs

- Healthy ecosystems and streams; increased biodiversity
- Fewer Endangered Species Act and threatened and endangered species issues; associated economic impacts
- Maintain/enhance recreational/tourism opportunities and associated economic benefits
- Make permits, streamflows and lake levels more reliable for all users/uses
- Adequate flow to assimilate wastewater discharges and provide other water quality enhancements
- Cost of protection may be lower than cost of rehabilitation

Potential Concerns Regarding ISF Programs

- Existing and future consumptive use permits not met in part or in their entirety
- More groundwater use/conflicts between surface water and groundwater permits
- Creation of “artificial shortages” for consumptive users
- Perception of wasting water by allowing more to flow out of state
- Impacts on current uses of reservoirs
- Economic impacts of reduced water availability (or changes in location of its availability) to consumptive users and related economic development implications

Piloting and Measurements

- Assess existing programs and policies and the degree to which they address ISF goals
- Assess effectiveness, costs, and economic implications of alternate approaches for achieving ISF (cost/benefit analyses)
- Measure streamflow and reservoir levels

- Measure recreation/tourism economic benefits using established guidance/approaches
- Measure loss of income for consumptive users
- Use established metrics/surveys for ecosystem and biota health; consider approach similar to WET testing; consider indicator metrics that may be proportional to broader indices
- Price of water sold
- No single standard approach fits all basins or areas of the state
- Desktop/modeling approaches could simulate multiple years of variable hydrology
- Existing measures and programs may provide a "de facto" pilot study
- Use a pilot study to measure, refine, adjust program before finalizing or implementing any program
- Premature to conduct pilot study without resolution to legal/policy questions
- Use legal foundation to drive metrics

Potential Approaches to Consider

- Compensate consumptive users for losses associated with ISF
- Implement different categories of protection for different types of streams
- Improve flows in a priority stream to mitigate for impacts to lower priority streams
- Use watershed groups or volunteers to collect data
- Linkages between consumptive use conservation and ISF
- Flows upstream of Reclamation reservoirs are protected as a result of Reclamation's withdrawal of all unappropriated water from future permitting, but mandatory ISF releases from reservoirs would impact contract deliveries

Protecting Existing and Future Consumptive Rights

- Most respondents feel existing rights should be protected
- Additional responses:
  - Should be protected when possible
  - Should be protected but may not have priority over ISF
  - ISF should be driven by science and data
  - Are protected under existing statute

A recurring theme of the Advisory Group responses concerned the institutional arrangements surrounding an ISF program: water law and permitting, and protection of existing and future consumptive water rights. The complexity of addressing the ISF program legal and policy issues in the abstract creates an immense challenge for the meaningful analysis of the voiced concerns. To make sound policy recommendations, the Advisory Group acknowledged that the basis, specifics, and consequences of an ISF program must be known and understood.

The measures recommended in the ISF Advisory Group survey included the use of a pilot study to "measure, refine and adjust an ISF program before finalizing or implementing any program" and "scenic rivers are a logical starting point, especially considering that there is already precedence for protection of flows." The recommendations provide a good starting point from which to address the institutional arrangements surrounding an ISF program with a reference to a specific opportunity.

Advisory Group Workshops

Advisory Group members participated in three facilitated workshops in 2013 and a fourth in early 2014 at OWRB's offices in Oklahoma City. The workshop agendas, summaries, and presentations are provided in

Appendix C and are posted to the OWRB website (http://www.owrb.ok.gov/supply/ocwp/instreamflow.php). The workshops were held to solicit the Advisory Group's expertise in order to advance the dialogue on the ISF program in Oklahoma and to deepen their understanding of the different elements of existing ISF programs through technical presentations. The first three workshops included presentation and discussion of the following key content:

- Workshop 1, March 1, 2013—Overview: Advisory Group goals and review of key ISF issues
- Workshop 2, May 16, 2013—Supporting Information: OWRB stream water availability calculations, excess and surplus water, how other states handle ISFs
- Workshop 3, October 7, 2013—Baron Fork ISF History: OWRB permitting for recreation, fish and wildlife, history of the Baron Fork Creek ISF provisions, review of ISF methods and application to Baron Fork

As part of Workshop 3, the Advisory Group recognized that many of the questions posed (e.g., Do domestic use set-asides provide sufficient ISF?) cannot be answered in the abstract or on a broad statewide basis. Rather, the detailed questions and issues must necessarily be examined at a local watershed level. The Advisory Group further reinforced the need to conduct an ISF Pilot Study, as recommended by the previous Advisory Group in its 2011 report.

One way to advance the ISF analysis and dialogue would be to follow an ISF study process similar to the Instream Flow Incremental Methodology (IFIM) process, rather than developing a specific ISF minimal flow. The IFIM is the most widely used method for assessing ISF needs and affords a systematic way to address outstanding concerns/issues, including economic impacts associated with the setting of ISF requirements in Oklahoma. That is, the results of the pilot study would provide actual information that the Advisory Group could use as a basis for their final deliberations.

It was agreed that OWRB and consultants would develop a suggested piloting approach/process plan for review by the Advisory Group. The process would be geared toward assessing the list of benefits, issues and concerns identified in previous meetings by the ISF Advisory Group. This would address Recommendation No. 5 from the 2011 report, which recommended conducting an ISF pilot study in a state-designated scenic river.

The Advisory Group recommended looking at the upper Illinois River watershed above Tenkiller Reservoir, including Baron Fork and Flint creeks. This stream reach is mostly unregulated; that is, it contains no major storage reservoirs or large diversions. Also, this reach of the river and tributary Baron Fork and Flint creeks are state-designated scenic rivers. An ISF study focused on fish has already been conducted on Baron Fork Creek.

Recognizing that the issues identified in Recommendations 1, 2, and 4 from the 2011 report are abstract and statewide, the pilot study would focus on policy as well as technical questions on a single stream/watershed so as to (1) better understand implications of a possible ISF program, (2) identify additional questions and concerns, and (3) identify specific technical components and metrics that can be applied to ISF assessments in other watersheds. The primary goal of the pilot study is to gain a better understanding of the implications of a process to deal with ISF issues consistent with the overall goal of managing water resources in Oklahoma for multiple uses.

The draft Oklahoma *ISF Pilot Study Work Plan* (CH2M HILL, 2013) was distributed to Advisory Group members in December 2013 and discussed at the fourth Advisory Group workshop held at OWRB's offices in Oklahoma City on January 16, 2014. Comments from the Advisory Group were accepted and discussed at the 2014 meeting, and Advisory Group members were offered opportunities to submit written comments on the draft and revised draft work plan through March 2014. Appendix D contains the resulting final work plan.

Recommendations and Path Forward

The ISF Advisory Group process demonstrated the complexity of issues that surround the assessment of whether and how an ISF program could be implemented in Oklahoma. This includes a lack of clear answers or consensus on basic questions, such as the need for and benefits of an ISF program. The OWRB envisions

an ongoing role for the Advisory Group to provide guidance and feedback as the assessment moves into the pilot study phase.

There was no clear consensus of the Advisory Group, but the following themes were supported by some members in the four facilitated workshops and input received throughout the Advisory Group process in 2013 and 2014:

- Existing consumptive water rights should have priority over ISFs.
- A "one size fits all" approach will not work across Oklahoma. An adaptive process that reflects local hydrology and locally unique uses of water in the watershed is required.
- Science supports sound policy decisions.
- There is legal authority for ISF protection in designated Scenic Rivers in Oklahoma, but there is uncertainty regarding authority in other watersheds.
- Questions and concerns regarding ISFs cannot be answered in the abstract. They must be put in the context of an actual watershed, thus the proposed pilot study.

The purpose of the pilot study is to help define a conceptual framework and study process that could be used for development of ISF recommendations for water resource planning purposes in other watersheds. The ISF pilot will be conducted in the Illinois River system upstream of Tenkiller Reservoir, following the work plan established as part of the 2013–2014 ISF Advisory Group efforts. While the specific findings of the Illinois River ISF pilot study (e.g., specific flow goals) would not be transferable to other watersheds, the intent of the pilot is to demonstrate the use of the IFIM process to tailor ISF goals to watershed-specific conditions in light of competing uses for water in the watershed. OWRB will take the lead in securing funding to conduct the phased pilot study in the upper Illinois River watershed and in implementing the pilot study work plan. The timing of the piloting work and several remaining details of the work plan will be established in conjunction with project planning activities once funded.

Appendix A
Background Report:
Instream Flow Advisory Group Support

(CH2M HILL and Carollo, 2013)

Background Report

Instream Flow Advisory Group Support

Prepared for

Oklahoma Water Resources Board

U.S. Army Corps of Engineers, Tulsa District

February 2013

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Contents

1. Introduction

1.1 Project Background

As part of the *2012 Update of the Oklahoma Comprehensive Water Plan (2012 OCWP Update*), the Oklahoma Water Resources Board (OWRB) convened an Instream Flow Advisory Group to discuss benefits and issues regarding a potential future Oklahoma instream flow program. That effort culminated in a report titled *Instream Flow Issues and Recommendations* (2011).[1] The report outlines the issues associated with an instream flow (ISF) program and recommends the following steps:

1. Address the legal and policy questions.
2. Study other mechanisms for protecting instream flows.
3. Develop a draft methodology for instream flow studies in Oklahoma.
4. Conduct a study on the economics of instream flows in Oklahoma.
5. Conduct an instream flow pilot study in a scenic river.
6. Preserve the Instream Flow Advisory Group.

Furthermore, the *2012 OCWP Executive Report* identified eight priority recommendations including the following recommendation regarding Instream/Environmental Flows:

> *The process developed by the OCWP Instream Flow Workgroup should be implemented and followed to ascertain the suitability and structure of an instream flow program for Oklahoma, with such process commencing in 2012 and concluding by 2015, as outlined by the Workgroup*.

Consistent with these recommendations, the Instream Flow Advisory Group is being reconvened to further define whether and how an instream flow program might be implemented in Oklahoma. Determining the suitability and structure of such a program for Oklahoma requires a thorough understanding of the potential benefits and effects of various ISF program structures, including considerations related to existing water rights and future appropriations for consumptive uses.

1.2 About this Report

Consistent with the 2011 OCWP *Instream Flow Issues and Recommendations* report, this background report briefly summarizes relevant Oklahoma water law, as well as existing programs and state and federal laws that may provide some level of ISFs and/or affect development of an ISF program in Oklahoma.

This background report has been prepared as an overview document on the ISF legal and policy framework, other states' ISF programs, and mechanisms for protecting instream flows to support the initial discussions with the Instream Flow Advisory Group. The report is not intended to be a complete or comprehensive review of existing literature on ISF programs, their rationale, or potential benefits and/or detriments. The information provided here has been prepared to support discussion on potential ISF polices for Oklahoma. The output of the pending Instream Flow Advisory Group meetings and workshops will be used to develop any future recommendations on a path forward to the OWRB.

[1] Available at http://www.owrb.ok.gov/supply/ocwp/pdf_ocwp/WaterPlanUpdate/draftreports/OCWP_InstreamFlow_IssuesRecs.pdf.

2. Legal and Policy Framework for Instream Flows

Today Oklahoma water law does not specifically identify "Instream Flows" and thus the topic is often a point of confusion and conflict. The absence of this term is the focus of various opinions and points of contention with multiple parties in Oklahoma. Throughout Oklahoma water law the concept of "flow" or its relation with either natural life or quality of human life is not specifically addressed. Only in those sections of law relating to designated Scenic Rivers does the word "flow" appear in any form. The absence of the written word is perceived by some as being non-existent and un-supported by Oklahoma law while others believe that its existence is implied.

Being absent from written word does not mean that ISF should be without consideration. Some believe that legislative authority afforded to the OWRB allows the discussion, action, and planning for ISF programs. Although without specific authority, the concept of ISF is clouded and contentious. It is realized by many that legislation can change the interpretation of ISF concepts. In addition, the progress of the ISF Advisory Group may have an impact on future ISF programs, if any.

The progress of the ISF Advisory Group allows the consideration of items not specifically called out in Oklahoma law and weighs true the potential impact of items of personal concern. Prior ISF related activities were divisive at times possibly relating to the general nature of the discussion. The reassembly of the ISF Advisory Group will focus on what would define a successful ISF program within a particular stream or watershed. Knowledge gained from discussions will help define the critical aspects of a possible future program. It is not given that a future program is to occur, but instead the results of the ISF Advisory Group effort will frame the critical aspects for inclusion. The balance between nature and humans can be considered, and this balance can be weighted and integrated in the final report.

2.1 Oklahoma Water Ownership, Appropriation, and Permitting

An understanding of Oklahoma water laws, as they relate to ownership, appropriation, and permitting, is critical in assessing existing constraints on the potential development of an ISF program in Oklahoma. This section summarizes applicable state water use laws and policies, as well as other state and federal laws that could have an impact on development of an ISF program in Oklahoma.

2.1.1 Water Types and Ownership

Title 82 of Oklahoma's statutory laws (Waters and Water Rights) recognizes three types of water—(1) diffused surface water (commonly known as "runoff"), (2) water in definite streams, and (3) groundwater—and outlines the system of laws governing the use of each. Runoff and groundwater are owned water types and considered private property rights, whereas stream water is public water subject to appropriation.

2.1.1.1 Runoff

Runoff is water standing on or flowing over the land surface but not forming a definite stream. According to Title 60 of the Oklahoma Statutes (O.S.), the owner of the land owns its runoff. Runoff is the only type of water that is not regulated by the OWRB. Runoff can be captured and used by the landowner in any way.

2.1.1.2 Definite Streams

A stream is defined as a watercourse in a definite, natural channel, with defined beds and banks, originating from a definite source or sources of supply. Streams include rivers, streams, and creeks, and their associated ponds and lakes. They may flow intermittently or at irregular intervals if that is characteristic of the sources of supply in the area (82 O.S. §105.1). Water in definite streams is viewed as a public resource, owned by the people of Oklahoma. According to state law, landowners have the right to use stream water that adjoins or crosses their property for domestic purposes without obtaining a permit. However, water in definite streams can also be used by others, including those who own land away from the stream and those who don't own land at all. The use of surface

water in a definite stream is regulated by the Oklahoma Stream Use Law (82 O.S. §105.1 et seq.). The OWRB issues stream water permits to applicants who intend to place the water to beneficial use.

2.1.1.3 Groundwater

Groundwater is water flowing under the land's surface but not forming a "definite stream." According to 60 O.S. §60, the owner of land owns the underlying groundwater. However, the use of groundwater is subject to reasonable regulations set out in the Oklahoma Groundwater Law, 82 O.S. §1020.1, et seq. Landowners have the right to use groundwater for domestic purposes without obtaining a permit from the state. However, if groundwater is to be used for any other purpose, the landowner or lessee must first obtain a groundwater permit.

2.1.2 Appropriation and Permitting

2.1.2.1 Surface Water Appropriation

Appropriation is the process by which an individual or entity can acquire the right from the state to use public stream water (Oklahoma Administrative Code (OAC) § 785:20-1-2). Surface water appropriation rights in Oklahoma are based on a "first in time, first in right" principle. The first person to apply for the water right establishes a right superior to later appropriators (junior permits). Priority is based upon the date the permit application is filed. There is not priority among beneficial uses in Oklahoma. The issuance of a stream water permit from the state to an applicant creates an "appropriative right to use stream water" in favor of the permittee.

Water appropriations are granted through a permitting process administered by the OWRB. To obtain a water use permit, the applicant must demonstrate the following (82 O.S. §105.12):

- Unappropriated water is available in the amount applied for.
- There is a present or future need for the water.
- The proposed use is beneficial.
- The proposed use will not interfere with domestic or existing appropriative uses.
- If the application is for the transportation of water for use outside the stream system of origin, the proposed use must not interfere with existing or proposed beneficial uses within the stream system of origin.
- If the application is for use of water out of the state, an evaluation must be made whether the water subject of the application could feasibly be transported to alleviate water shortages in Oklahoma.
- After a permit is granted, construction of works to place the water to beneficial use must begin within 2 years, otherwise the permit expires. Stream water permitted for use is forfeited and returned to the public pool if it is not put to a beneficial use within 7 years. If however, evidence described in 82 O.S. §105.16 is presented to the OWRB, the total amount of water authorized by the permit may be placed to beneficial use in accordance with a schedule of use that extends beyond 7 years, based on the life of a proposed project.

2.1.2.2 Protection for Domestic Use

According to 82 O.S. 105.12, the approval of an application to appropriate water requires that there is unappropriated water available in the amount applied for. The OWRB Rule (OAC § 785:20-5-5) describes factors to be considered in determining whether there is unappropriated water in the amount available:

> (a) Determination of water available for appropriation from a stream.
>
> (1) For direct diversions from a stream, the determination of water available for appropriation shall take into consideration the mean annual precipitation run-off in the watershed above the point(s) of diversion, the mean annual flow, stream gauge measurements, domestic uses and all existing appropriations and other designated purposes in the stream system. The Board may consider other evidence or laws relating to stream flow or elevation, including but not limited to apportionment provisions of interstate stream compacts to which the State of Oklahoma is a party and the Oklahoma Scenic Rivers Act.

> (2) Absent the presentation of more accurate evidence to the contrary, the Board shall estimate the amount of water required to satisfy domestic use to be six (6) acre-feet per household per year or three (3) acre-feet per non-household domestic use.

Although not intended to provide ISF protection, the OWRB's practice of reserving water for assumed domestic use when considering water appropriations inadvertently results in some measure of ISF protection, since the amount allocated for domestic use is considered an overestimate of the actual amounts of water required to satisfy domestic uses in Oklahoma (OWRB, 2011). Conveyance of the domestic use set-aside through the stream channel to its actual points of use can provide some level of ISF protection. In addition, flows returned to the stream after human use, treatment, and discharge to receiving streams can provide some level of ISF and could help to satisfy the requirements for protection of (downstream) domestic uses.

The OCWP thirteen regional planning reports, including 82 basin/watershed reports, included projected water uses for each planning region and its associated basins from 2010 to 2060 in ten-year increments for seven distinct consumptive water demand sectors. The OCWP demands were not projected for non-consumptive or instream water uses, such as hydroelectric power generation, fish and wildlife, recreation, and instream flow maintenance.

2.1.2.3 Protection of Scenic Rivers and Outstanding Resource Waters

The Oklahoma Scenic Rivers Act (82 O.S., §§ 1451-1471) was enacted to protect the quality and unique characteristics of certain streams and rivers in Oklahoma, which are viewed as outstanding water resources since they provide numerous exceptional ecological, recreational, and other important benefits to the state.

> "*The Oklahoma Legislature finds that some of the free-flowing streams and rivers of Oklahoma possess such unique natural scenic beauty, water conservation, fish, wildlife and outdoor recreational values of present and future benefit to the people of the state that it is the policy of the Legislature to preserve these areas for the benefit of the people of Oklahoma. For this purpose there are hereby designated certain 'scenic river areas' to be preserved as a part of Oklahoma's diminishing resource of free-flowing rivers and streams*" (82 O.S. 1452).

There are six designated streams identified as "Scenic River Areas" in Oklahoma: Flint Creek, Illinois River, Barren Fork Creek, Upper Mountain Fork River and Lee and Little Lee Creeks. The Oklahoma Scenic Rivers Commission is the state agency that implements the Oklahoma Scenic Rivers Act. The Commission's purpose is to preserve and protect the aesthetic, scenic, historic, archaeological and scientific features of streams and rivers that are covered by the Scenic Rivers Act.

If an application is filed to divert water from a definite stream that has been designated a "scenic river area" under the Scenic Rivers Act (82 O.S. §1451 et seq.), or a stream designated an Outstanding Resource Waters under (785:45-3-2), the OWRB will consider the following factors provided that sufficient information is readily available to assure that appropriate ISFs are protected:

- Quantity of water requested in comparison to the amount of water available for appropriation based on mean annual precipitation runoff produced within the watershed drainage area above the proposed point of diversion.
- Quantity of flow needed in cubic feet per second for recreational purposes, including sustaining existing fish species in the stream, spawning periods for such species, etc., provided that for sustaining existing fish species in the Barren Fork Creek, and unless information to the contrary is shown, a flow restriction of 50 cubic feet per second (cfs) will be considered as needed.
- Existing water quality in the stream and the potential of the diversion to alter the water quality or physical characteristics of the stream.
- Other information as deemed relevant by the Board.

2.2 Other Relevant Laws and Regulations

In addition to Oklahoma water laws, the following state and federal laws and regulations may contribute to or affect ISFs in Oklahoma.

2.2.1 Interstate Stream Compacts

The State of Oklahoma participates in four interstate stream compacts:

- Canadian River Compact (82 O.S. 1991, §526.1): New Mexico, Texas, and Oklahoma
- Arkansas River Basin Compact (82 O.S. 1991, §1401): Kansas and Oklahoma
- Arkansas River Basin Compact (82 O.S. 1991, §1421): Arkansas and Oklahoma
- Red River Compact (82 O.S. 1991, §1431): Arkansas, Louisiana, Oklahoma, and Texas

These written agreements among states, approved by the U.S. Congress, apportion water among the states that participate in the compacts. Part of the compact agreements is to establish commissions to administer the provisions of the Compact. In doing so, commissions can establish, maintain, and operate gaging stations in stream and reservoirs; collect, analyze, and report on data such as streamflow, water quality, and annual yield; and research and develop methods for determining total basin yields, among other functions. The OWRB administers the water rights and the interstate compact agreements throughout the state. To administer these, OWRB maintains a network of U.S. Geological Survey's (USGS) stream gages. Because the interstate stream compacts require flows at specific points of measurement, in rivers that flow both into and out of Oklahoma, there is the potential for compact compliance actions to provide for some level of ISFs in Oklahoma.

Compact agreements might affect the potential development of ISFs, since efforts to develop and implement ISFs and an ISF program in the basins that are part of the Compacts must include measures to ensure the Compact provisions are met and that water management in Oklahoma will not adversely affect water in the other states that are party to each compact. Virtually every watershed in Oklahoma is subject to one of the four Compacts to which Oklahoma is a party.

Items potentially affecting flows between states are legally defined by their respective interstate compacts previously established and ratified by the U.S. Congress. If a point of conflict or a concern develops, the states potentially affected have means and methods in place to address flow conflicts. If a situation develops wherein an action complies with established interstate compacts but results in an unacceptable succession of flow and/or associated water quality reduction, corrective action can be enforced based on the protection of flow requirements specified in the compact and established water quality standards.

2.2.2 Endangered Species Act

The Endangered Species Act (ESA) protects threatened and endangered species and their habitats from extinction as a "consequence of economic growth and development untempered by adequate concern and conservation."It makes it unlawful for anyone to harm listed species. The term "harm" has a broad meaning in the regulations and includes any act that can kill or injure wildlife. Significant habitat modification or degradation that results in the killing or injury of wildlife by means of impairing essential behavioral patterns like feeding, breeding or sheltering may be considered harmful acts.

In Oklahoma, the agency responsible for managing fish and wildlife is the Department of Wildlife Conservation (ODWC). Title 800 of the OAC contains the provisions the ODWC follows. Title 800 prohibits the harvest and selling of all state and federal threatened and endangered species.

U.S. Fish and Wildlife Service (FWS) administers and implements the ESA as it relates to threatened and endangered terrestrial and freshwater organisms. The FWS develops projects and programs to protect fish and wildlife and operates national wildlife refuges. Oklahoma is part of Region 2 of the FWS. The Division of Water Resources of the FWS protects and restores water resources associated with national wildlife refuges. It also uses and diverts water within Region 2 and collects hydrologic information about each refuge's water resources to

provide necessary protection. The FWS may intervene in the management of water resources within a basin as needed in order to protect federally listed species.

2.2.3 Section 10 of the Rivers and Harbor Act

The goal of Section 10 of the Rivers and Harbors Act of 1899 is to protect the navigable capacity of the nation's waterways for the movement of interstate commerce. Section 10 prohibits the unauthorized obstruction or alteration of any navigable water of the U.S. It requires a permit to construct any structure in or over any navigable water and to excavate, dredge, or deposit materials in these waters. Navigable waters in Oklahoma subject to Section 10 of the Rivers and Harbors Act of 1899 include Arkansas River, Bird Creek, Canadian River, Grand (Neosho) River, Illinois River, North Canadian River, Poteau River, Red River, Sans Bois Creek, Verdigris River, and Washita River. Uses that may reduce streams flows or depths enough to impact existing navigation may be susceptible to further review during the Section 10 permitting process.

2.2.4 Section 404 of the Clean Water Act

The intent of Section 404 of the Clean Water Act of 1977 is to protect navigable waters from the indiscriminate discharge of dredged or fill material capable of causing pollution at specified disposal sites through a permitting process. Activities that require a permit under Section 404 include water resources projects such as dams and levees, fill for development, mining projects and infrastructure development such as highways and airports.

The U.S. Army Corp of Engineers (Corps) is the federal agency in charge of permitting construction activities that occur in "waters of the United States," such as rivers, lakes, streams, creeks, natural ponds, and wetlands adjacent to such waters (defined in 33 CFR 328). It issues permits for work in the nation's navigable waters including construction and dredging. The Corps' regulatory program tries to avoid, minimize, or mitigate detrimental environmental impacts on aquatic resources that provide many services for the general public, such as water quality improvement, flood damage reduction, water-related recreation, storm flow conveyance and storage, maintenance of base flow, movement of commerce, spawning and nursery areas for aquatic organisms, and habitat for fish and wildlife.

2.3 Mechanisms for Protection of Instream Flows in Oklahoma

One of the key recommendations (#2) in the Instream Flow Issues and Recommendations Report was for OWRB to study potential mechanisms for protecting instream flows (OWRB, 2011). The state should evaluate the degree of streamflow protection offered by the domestic use set-aside. The purpose of the forthcoming ISF Advisory Group workshops is to further explore the potential mechanisms, and to provide an informed and well thought-out basis for decisions regarding the potential future of an ISF program in Oklahoma. The 2012 OCWP Instream Flow Issues and Recommendations report identified many of the potential opportunities and obstacles. Based on the evaluation of existing permitting requirements and laws in Oklahoma included in this background report, there are a few existing mechanisms that may provide at least some contributions of ISF:

- **Domestic Use Set Asides** – The minimum flow requirements for protection of downstream domestic uses provides the OWRB with the flexibility to consider stream flow or other evidence including provisions of the interstate compacts and the Oklahoma Scenic Rivers Act. The OWRB rule seeks to protect domestic uses through a set-aside of 6 acre-feet of water/year per 160 acres of land. In addition, Title 82 O.S. 2001 §105.2(A) allows a riparian landowner without an OWRB appropriation to store a maximum of a two-year domestic-use supply of water, and Title 60 O.S. §60 requires a riparian landowner collecting the water for domestic use to provide for the continued natural flow of the stream.

- **Projection of Scenic Rivers and Outstanding Resource Waters** –Potentially provides broad protection of stream flows and water quality to protect recreational purposes and sustaining flows for existing fish species. OWRB has established a 50 cubic feet per second (cfs) minimum flow requirement in a portion of Barren Fork Creek, for example.

- **Interstate River Compacts** – These compacts are binding interstate agreements that apportion water in specific rivers and their tributaries in Oklahoma (see above) and require maintenance of stream flows and annual yield. Meeting the flow requirements in these compacts may contribute some amount of flow to ISFs.

In combination these mechanisms likely provide some level of protection for ISF for human use, fish and wildlife needs, and downstream interstate uses. These existing laws provide a basis for initial discussion with the Instream Flow Advisory Group.

3. Instream Flow Programs in Other States

The instream flow program case studies described here include the states assessed in the OCWP (2012). OWRB also conducted an evaluation of ISF programs in western states as part of initial OCWP update activities (2009). Additional information for the selected states was obtained from The Nature Conservancy's report *Practical Guide to Environmental Flows for Policy and Planning with Nine Case Studies in the United States* (Kendy et al., 2012). The intent of describing instream flow programs in other states is to convey some of the main steps and processes undertaken, and to provide references for readers to pursue more detailed accounts of scientific methods and models. Each case study briefly explains the program's hydrologic foundation and the application. Of the featured state programs, Michigan, Colorado and Texas have instream flows fully incorporated into statewide management programs.

Outside the state-specific ISF programs are different river basin ecosystem flow recommendation projects. These are typically performed in collaboration with the U.S. Army Corps of Engineers and other entities within the river basin. Example case studies include the Susquehanna River basin project with the U.S. Army Corps of Engineers (Corps) - Baltimore District, the Susquehanna River Basin Commission (SRBC) and The Nature Conservancy (TNC), the Connecticut River Basin Ecosystem Flow Restoration with the Corps - New England District and the TNC, and Middle Potomac River Basin Environmentally Sustainable Flows with the Corps- Baltimore District, National Park Service, the Interstate Commission on the Potomac River Basin (ICPRB), and other basin jurisdiction agencies. The river basin projects resulted in basin-specific flow recommendations.

Michigan's hydrologic foundation is a database of the median daily flow for the month of lowest summer flow (typically August) for each stream segment. This can be thought of as the typical low flow during the relatively dry summer months. This "Index Flow" was chosen because it represents the most ecologically stressful period of the year. Prospective water users employ the online Water Withdrawal Assessment Tool, "WWAT" (Michigan Department of Environmental Quality 2009), to determine the level of risk associated with their proposed withdrawals. The WWAT uses hydrologic foundation and groundwater models to calculate the flow depletion of the nearest stream segment during summer low flow due to the proposed withdrawal, added to the cumulative withdrawals from upstream segments. The model estimates the risk level (high or low).The assessment tool is available online, as is a tool for permittees to determine the volume of water available based on existing permits and on instream flow needs.

Connecticut has proposed state-wide streamflow regulations to protect instream flows. The regulations contain three primary components: (1) a set of narrative streamflow standards that apply to all streams; (2) a goal classification process through which every stream segment in the state will be associated with one of four environmental flow standards it needs to meet; and (3) a detailed set of flow release requirements for reservoirs and impoundments, with different requirements for small and large reservoirs. The regulations also include the typical requirements related to rights of appeal, public participation, and due process.

Arkansas has required minimum streamflows since 1985. The emphasis of the "Arkansas Method" is in ISF needs for fisheries (Filipek, et.al., 1987). The method of computing the ISF needs combines 1) the use of hydrologic records for Arkansas streams; 2) understanding of fisheries biology and 3) seasonal processes of Arkansas' different physiographic regions. The hydrologic foundation for the "Arkansas Method" ISF flow determination is based on the premise that the average flow of a stream is a composite of size of the drainage basin, geomorphology of the stream channel, climate, vegetation type and abundance, and related land uses. This flow reflects the average, natural hydrograph of the stream, and the component aquatic fauna and flora which have evolved to "fit" the specific characteristics of that stream. Instream flow requirements are based on the physical processes that occur in the streams and the critical life-cycle stages of aquatic biota at three separate times of year. The "Arkansas Method" sets seasonal minimum flows as: 60% mean monthly flow (MMF) November-March; 70% MMF April-July; and 50% MMF or median monthly flow July-October. Some of the state agencies would like to strengthen the instream flow criteria currently used for permitting water withdrawals, particularly for high

conservation priority streams and rivers. Therefore additional studies have been proposed to develop the scientific basis for new criteria (Arkansas SIFN Update, Fall 2011).

Colorado's instream flow program was developed in 1973. In 2005, the Colorado Legislature passed the Colorado Water for the 21st Century Act, launching a statewide water planning effort. The Act mandated that representatives of cities, farms, and other water users join conservation and recreation interests at "basin roundtables" to assess future water supply needs for their watersheds. These assessments are framing discussions about future water allocations and must address both consumptive and non-consumptive (recreation and instream flow) water needs. As of 2005, flow requirements had been established for 486 natural lakes and 8,500 miles of stream. The Colorado Water Conservation Board obtains instream flow rights for individual water bodies, through new appropriations (under the same methods as private appropriations) or through acquiring existing water rights. Instream flow requirements for water bodies are based on water availability, statistical analyses of streamflow records, and biological assessments and typically vary by season.

In 1984, **Kansas** developed Minimum Desired Streamflows for 23 streams. The streamflows were established based on statistical analyses of streamflow records, and flow requirements from interstate water compacts. They were [were? Are they not still?] managed as a water right. In 2006, the Kansas Department of Agriculture developed a GIS-based methodology for assessing streamflow based on statistical analyses of streamflow records and water right data to evaluate water availability.

The ISF program in **Texas** is managed jointly by the Texas Water Development Board, the Texas Parks and Wildlife Department, and the Texas Commission on Environmental Quality. Instream flow studies are conducted to develop water body–specific instream flows and include evaluations of hydrology, hydraulics, physical processes, water quality, and biology. The method requires field data collection and analysis, and computer modeling. It is intended to ensure a sound ecological environment. The process of establishing instream flows is collaborative, among state agencies, river authorities, water management entities, and watershed stakeholders. Instream flow requirements typically are seasonally variable, established to mimic naturally occurring hydrography, before any water use appropriations.

4. Summary

This document was prepared to provide an introduction to ISF programs and to assist the ISF Advisory Group in providing feedback to the OWRB on potential mechanisms for protection of ISFs in Oklahoma. A review of other state programs and existing Oklahoma laws suggest the following:

- Existing ISF programs or requirements in other states vary widely but are generally focused on meeting a combination of downstream flow needs including existing uses and agreements (existing permitted withdrawals, water rights, and/or compacts), recreation, navigation, and maintenance of aquatic resources and wildlife. In most cases, these ISF requirements are implemented through regulatory mechanisms and permitting programs.
- Oklahoma law does not specifically mention ISF requirements, but elements of the water appropriations law (O.S. §82-105.12) provide protection of existing downstream domestic uses. In addition, the Scenic Rivers Act (O.S. §82-1451-1471) requires OWRB to consider flows for the protection of recreation and natural resources when reviewing potential withdrawals from designated streams.
- Potential mechanisms, based on current laws and requirements in Oklahoma that may provide a framework for implementation of ISF include the domestic use set asides, the Scenic Rivers Act, and interstate water compacts.

To facilitate feedback and further discussion, the ISF Advisory Group will be asked to consider these initial findings and potential mechanisms for ISF protection.

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Appendix B
Advisory Group Responses to Background, Policy, and Legal Questions

OWRB Instream Flow Advisory Group
Responses to Questions - February 2013

1. About you...

Name:	Representing:
Jim Reese	Department of Agriculture, Food, Forestry
Tom Creider	Oklahoma State Parks
Arnella Karges	State Chamber of Oklahoma
Charlette Hearne	Oklahomans for Responsible Water Policy
Kevin Stubbs	USFWS
Brian Woodard	OIPA
Angie Burckhalter	Devon
Diane Pedicord	Oklahoma Municipal League
Marla Peek	Oklahoma Farm Bureau
Mike Mathis	Chesapeake Energy
Mike Fuhr	The Nature Conservancy
Shannon Brewer	USGS, OK Coop Unit

2. What are the most significant potential consequences of an instream flow program in Oklahoma? Please be specific. How could any negative consequences be mitigated?

Jim Reese	Conflict between surface and groundwater rights. Which are dominant? Will we take rights away from existing water right holders?
Tom Creider	Potential reduction of water available to existing and to future water right holders. Possible impact to lake and reservoir water levels. During times of drought, instream flow needs become secondary.
Arnella Karges	An instream flow program in Oklahoma could result in the loss of valuable resources and assets by creating artificial shortages for beneficial and consumptive uses, such as industrial, municipal, and agricultural water use. Since Oklahoma is fortunate to have an abundance of water, the state could be seen as wasting water resources due to the outflow of water from the state's boundaries, particularly without adequate water infrastructure in place. If Oklahoma is seen to be wasting resources, the state could face additional challenges regarding management of water. To avoid negative legal and economic impacts, any proposed plan should undergo an extensive impact study focusing on changes to state policies and resulting economic effects.

Charlette Hearne	The most significant positive consequence of establishing an instream flow program in Oklahoma is that, if done correctly, with scientific integrity and a balanced respect for all beneficial water uses, Oklahoma could achieve intergenerational equity in its water planning for 50 or even 100 years Sustainability is the obvious key to water planning, plus no one in Oklahoma should go thirsty! We all want certainty –whether our economic and social well-being depends predominantly on consumptive or non-consumptive water uses. A proper scientific understanding of how much water must stay in a river, stream, or lake to support municipal, economic, environmental and social/recreational needs will lead to sustainability in water policy. And sustainable water policy and practices will give non-consumptive and consumptive water users the certainty they need, especially in periods of low supply and high demand. (Currently, stock analyst are verifying sustainable water resources prior to investing.) Of special note: recognition of the values of stream systems would also allow state water managers to integrate these resources into an overall management scheme for both stream segments and reservoir levels. Reservoirs that are used for water supply would not only have a greater quantity of water within them, but would also have more stable water levels over time. In addition, replenish rates could be accelerated. Likewise for municipalities, maintenance of adequate stream flow levels to assimilate waste water discharges in a safe manner would be a positive. Negative consequences have to be identified, but it is the lack of an instream flow program that will result in negative consequences. Quite simply, the state can't manage what it can't—or won't—monitor. Mitigation may just well lead to litigation if Oklahoma isn't proactive in managing its surface water. We are still in a position to "do it right," to move in a positive direction with regional planning and stakeholder involvement in an instream flow program. Truly listening to stakeholders can avoid many negative consequences. We must be mindful of this: the OWRB is charged with managing and protecting the water resources of the state, now and in the future. We can work together to help the OWRB do it right, or we can allow Federal Agencies to step in and dictate resolution. Currently the choice is ours, and we must choose to be proactive and be lead by science in establishing Oklahoma's Instream Flow Program. Currently, the establishment of Excess and Surplus was more of a "guess", with a 10% margin of error factor pulled out of the sky, and it was based on average flows with no respect to seasonal and monthly variations. Most of the rivers are little to no flow during the summer in SE Oklahoma. Furthermore, non-consumptive uses were ignored. Tribal involvement has been a major oversight, they must be a part of the process. Throughout the water plan it is mentioned, but obviously ignored. Finally, the state has spend millions of dollars with countless opportunities for the citizens to voice their desires----loudly and clearly they have spoken for instream flows to move forward.
Kevin Stubbs	Potential conflicts with existing or future demands for water. At least seasonal uses of water may need to be restricted or modified to support instream flows. Negative consequences could be mitigated by developing additional or new storage, improved efficiency and reduced waste, alternative sources, reuse, or treatment of other sources such as marginal or saline ground water. Positive consequences include better water quality and fewer impaired waters, more reliable inflows for water supply reservoirs, more reliable dilution of discharges and reduced treatment costs. Improved habitat for aquatic life and fewer proposed threatened or endangered species. More stable and reliable water supplies. Improved potential for recreational uses.

Brian Woodard	In order for the OIPA to adequately assess and characterize the "potential consequences" of an instream flow program, we would need to further understand what type of "program" is being proposed (e.g. low-flow target, range of flow target, lake level targets, conjunctive use management, etc.) Without a better understanding of the "program" we are not suited to address the significant consequences that may result from the implementation of an instream flow program. As adoption and implementation of an instream flow program has the potential to fundamentally affect existing water rights and consumptive water users, implementation of any instream flow program should be evaluated under the context of Oklahoma's existing beneficial use policy and statutory authority.
Angie Burckhalter	• ISF Advisory Group members outlined a significant number of issues and concerns with an ISF program. For example: o The beneficial use of water has been the basis of Oklahoma water policy since before statehood, and has served our state well. Oklahomans have made significant investments and operated under these statutory concepts. An ISF program is a significant deviation from current law, and thus will require statutory changes. o ISFs create artificial water shortages by making substantial amounts of water unavailable for beneficial/consumptive use, thereby allowing significant volumes of water to flow out of the State unused. o ISFs create a super priority over all other beneficial uses such as industrial, municipal, and agricultural water use, resulting in uncertainty for existing and future water users. • Also see responses to item 3, 6, 7, and 10.
Diane Pedicord	By reducing the amount of water available for use, such a program will have a detrimental impact on Oklahoma's economy and potential for jobs growth. By superimposing a priority for flow regimes, such a program will destabilize water rights with the consequence that planning for reliable water supplies will be disrupted and uncertain. At a minimum, these issues should be addressed: Legal and Policy Evaluation Questions 1. determine whether there is a need for an Oklahoma ISF policy and describe the basis for making that determination. 2. Define what is meant by ISFs (i.e. natural flow regimes, average annual flows, low flows, historical flows, etc.). 3. Define the purpose or goal of an Oklahoma ISF policy. 4. Determine whether an Oklahoma ISF program could be administered under current stream water law and address specifically how such a program would impact both existing and future water rights. 5. Determine whether alternate means to address ISF related issues could be used or developed under existing programs. This analysis should also provide a cost comparison between the alternate means and an Oklahoma ISF program. This component should include an examination of domestic use flows (set-asides) and existing means to provide for non-consumptive uses under the current administration and management of the appropriative system. 6. Identify what statutory, regulatory, and administrative changes would be needed. 7. Determine the associated costs to implement an Oklahoma ISF program (i.e. more funding for OWRB staff, more stream gauges, computer system upgrades, etc.). 8. Determine how ISFs would affect economic development. 9. Determine whether ISFs would interfere with the current uses of reservoirs.

	Technical and Economic Questions 1. Describe specifically what ISF methodology would be adopted to implement an Oklahoma ISF policy and discuss the impact of such a methodology on availability of water for appropriation and use. 2. Determine whether an Oklahoma ISF program would increase the amount of water that flows out of the state's boundaries to be used in other states. 3. Identify the cost to implement the program at OWRB. 4. Develop a cost/benefit analysis of the economic and environmental impacts of an Oklahoma ISF program. 5. Quantify the immediate and long-term impacts (reduced availability of water in streams and reservoirs, increased costs to users, etc.) of an ISF program on Oklahoma's consumptive water users and on economic development in Oklahoma. 6. How would an Oklahoma ISF program work in relation to other recommendations included in the OCWP?
Marla Peek	Existing permit holders could have their rights usurped. A system based upon instream flow would create uncertainty about the amount of water which could be used by current and future permitholders. An instream flow program could stifle future economic growth if water is taken off the table for farming and ranching and new businesses. An ISF program could create water shortages by making substantial amounts of water unavailable for beneficial/consumptive use. An ISF program could create a super-priority over existing water permit holders. An ISF program would require permanent ongoing new funding and management to implement when there are other pressing issues the OWRB is already required to perform by statute. An ISF program program would be a significant deviation from current law. How could negative consequences be mitigated? The state could reimburse water permit holders annually and in perpetuity for the value of their permit and lost income.
Mike Mathis	I find it difficult to respond to this question without a basic understanding of what is meant by an ISF program. Does this mean a low flow target, a range of flow target, lake level targets, etc.? How would such a program be implemented in context with existing water law?? Without that basis of understanding, it is difficult to discuss positive/negative consequences and mitigation options.
Mike Fuhr	First, this question assumes that there will be negative consequences. I think this is the wrong place from which to start, especially considering the recommendations in the Comprehensive Water Plan (and has been argued by this committee ad nauseum). Many states have developed program WITHOUT significant negative impacts. An Instream Flow Program allows for rivers and streams to be managed in a sustainable manner to conserve their ecosystem functions while working within the bounds of the local human needs for water. The program we will develop will describe the potential alterations to a river or rivers and the consequences to the ecology of the river's ecology (ecology-flow response curve). That is its goal. It is then up to the decision makers to decide, based on input, what the acceptable levels of are and allows for management that takes into account ecological needs – something that is ignored at this time outside of scenic rivers. Negative consequences, if any, can be mitigated by communicating with citizens and policy makers about aquatic biota and instream flow management, and its relationship to the local economy for things like tourism and clean drinking water.
Shannon Brewer	I foresee several positive consequences of an instream flow program. Required minimum flows can maintain ecosystem services (e.g., support fish and freshwater mussel populations necessary to maintain water quality standards) in addition to supporting important fish and wildlife populations. This means lower costs for water treatment plants and an increased likelihood of meeting state/federal water quality standards and protecting the "public trust" expected by people in Oklahoma. Negative consequences- Water use might have to include water conservation measures that are unlikely to limit economic development but might cost money to implement. Water may cost more (I view this as positive but most folks will not). However, in some extreme cases, folks might have to consider water use as sustainable rather than taking the "use it all approach"….this would sadly be difficult for some.

3. What are the potential consequences of NOT implementing an instream flow program in Oklahoma? Please be specific. What other approaches could be taken to mitigate those consequences?

Jim Reese	Ground water rights become dominant. Reservoirs not required to release. Water conservation measures on both sources of water.
Tom Creider	Aquatic species and their habitats may be adversely impacted. Recreational uses may be negatively impacted, with economic consequences to local economies.
Arnella Karges	Failure to properly address water needs across the state could impact business and industry from agricultural needs to recreation and tourism. An impact study assessing the economic costs and benefits of static water levels and allowing excess water to leave the state should be conducted. An economic impact study should include an assessment of the state's ability and cost for recycling and preservation of water resources for future consumption, including identification of infrastructure necessary to meet needs for the state's future growth.
Charlette Hearne	Failure to implement a streamflow program in Oklahoma would first and foremost signal to all that Oklahoma does not recognize the value of its stream resources. Furthermore, we would undermine Oklahoma's chances for both a healthy economy and a healthy environment. If steps are not taken to ensure the quantity, quality and reliability of surface water flow, that flow and the use thereof eventually become non-existent We can look to the Edwards Aquifer in Texas, the region's primary water source. Due to a lack of flow some threatened and endangered species could not propagate, so the federal government said "FIX IT". Area water manager did so initially by stopping ground water permits, thus infringing on private property rights. This case is yet to be totally resolved but the landowners could wind up entitled to just compensation from the state. Look to the Public Trust Doctrine: In the National Audubon Society vs. Los Angeles case regarding Mono Lake, the courts ruled that water rights for the City of Los Angeles from Mono Lake had to be revisited, that the state had an obligation to balance municipal water needs with the public trust value of Mono Lake. In our own state look to the Franco-American Charolaise v. OWRB suit. In the Kiamichi River basin, look to the mussels killed due to low flows. USFW asked for a release to rescue the mussels and endangered species struggling for life–again a federal agency stepped in. Throughout the United States intra- and inter-state battles exist; Tribal Claims, endangered species and the protection of our way of life are all leading to major legal quagmires. The Public Trust Doctrine can be invoked, and take from current waters users so the streams flow, or we can correct the imbalance ourselves.
Kevin Stubbs	Potential impacts to aquatic species and habitats through reduced or altered flows. More proposed threatened and endangered species. Less reliable or stable water supplies and reduced inflows into reservoirs. Potential impacts to non-consumptive and recreational uses. Reduced dilution and higher treatment costs for dischargers, Impacts for domestic use. More impaired waters and reduced water quality. Increased salinity in some streams. More dramatic fluctuations in stream flows and reservoir elevations. Reduced recreational uses and associated economies at communities near reservoirs or streams. Mitigation could include reserved storage in reservoirs for maintaining releases that provide instream flows or seasonal restrictions on withdrawls from the stream or alluvial aquifer. Flows could be improved in a priority stream to mitigate for impacts to lower priority streams.

Brian Woodard	As previously stated in our response to question #2, in order for the OIPA to objectively and adequately assess and characterize the "potential consequences" of NOT implementing an instream flow program, we would need to further understand what type of "program" is being proposed (e.g. low-flow target, range of flow target, lake level targets, conjunctive use management, etc.) Without a better understanding of the "program" we are not suited to address the benefits/consequences that may be realized as a result of the implementation of an instream flow program. With that said, at the proposed point of diversion under any stream water permit application, the OWRB makes a determination including a conservative analysis of the amount of anticipated annualized stream flow, the amount of that average annual flow which is required to be set aside (subtracted from available stream flow) to meet and satisfy the needs of senior permit holders (existing prior appropriators) and how much must be set aside (reserved, subtracted from available stream flow) to meet and satisfy estimated domestic needs and uses. OIPA believes that the need for instream flows has yet to be demonstrated, as the existing process ensures environmental flows and has been validated with time. This process has been affirmed during drought and wet periods, as OWRB's own data states that approximately 36,000,000 acre-feet flows out of the state annually, on average. It's interesting to note that even during the driest years on record, over 8.7 million AF/YR of water flowed uncaptured out of the state (USGS 2005 Annual Water Use Report).
Angie Burckhalter	• The OWRB has stated that there is no specific issue that is being addressed, and it seeks to be proactive on ISF. OWRB also outlines that a significant amount of water leaves the state on an annual basis. This implies that the consequences of not implementing an ISF program would be low. • One of the recommendations in the "ISF Issues & Recommendations" report was to determine whether alternate means to address ISF related issues could be used or developed under existing programs. This analysis should provide a cost comparison between the alternate means and an Oklahoma ISF program. This component should include an examination of domestic use flows (set-asides) and existing means to provide for non-consumptive uses under the current administration and management of the appropriative system. In addition, the OWRB should consider any other viable alternatives (if needed) under existing law.
Diane Pedicord	So far, there has not been a definitive reason given for wanting to impose an instream flow program in Oklahoma. The best we got in the past is the statement that there's no current problem but "we want to be proactive." It was never clear what we would be proactive about. Therefore, there is a need to define the issues and consider alternative solutions to any identified problem. The primary consequence of not implementing is that we need a water plan that aims at statewide solutions to delivering water resources where they're needed. There is no need to deviate from the existing water statutes. There is a need for OWRB to be a better manager of the existing water regime.
Marla Peek	We don't know that there are any. The issue of domestic flow set-aside as a surrogate for instream flow should be fully investigated.
Mike Mathis	See response to #2. With regard to the "other approaches" question, it has been mentioned previously that the current domestic use set-aside might provide a vehicle to address this issue.

Mike Fuhr	If an Instream Flow Program is not implemented, streams in Oklahoma are at risk for future degradation and the potential for the complications that come with additional species falling under the ESA. Developing this program is an effort to be proactive and avoid this from happening. Listings can have significant impacts on the economy which should be avoided (see recent controversy surrounding the lesser prairie chicken right here in OK). We need the ability to maintain or restore ecological processes similar to those streams which are natural or unaltered – this is (or close to it) the key to a successful implementation of an Instream Flow Program and can be accomplished by understanding the temporal variation in a stream and using this information to develop solutions that allow for conservation AND water usage. Our current approach uses a minimum flows approach which results in missed opportunities and bad decisions Other approaches to mitigate consequences are implementing categories of protection for rivers and streams such as full instream flow protection for scenic rivers and streams which implement the five riverine components of water quality, biology, hydrology, geomorphology and connectivity. Other protections such as comprehensive ecologically based instream flow management, which addresses all five riverine components and partial ecologically based instream flow management which addresses one or more of the five riverine components.
Shannon Brewer	No instream flows- water quality will deteriorate and likely cost more to treat. Aquatic biota populations are likely to continue to decline which will have ecological and economic consequences. More listed species. Tourism will likely be negatively impacted. I don't see how you can "mitigate" population declines- stocking is not the solution either as the genetics impacts are also negative in many instances (and aquatic biota require water- stocked or not). Water quality could be "mitigated" using costly structures and techniques. Illness associated with contaminated water contact would likely increase as the climate continues to warm and streamflows decline. Read about the dust bowl- more to it than water use but we should be able to learn from history, right?

4. How could we MEASURE the social and environmental benefits and consequences of an instream flow	
Jim Reese	Level of water in streams and reservoirs is a measurable benefit. loss of income from water sales, crop sales, industrial use is a measurable consequence.
Tom Creider	Two-fold approach to measurement: 1) scientific analysis that details the environmental consequences for having or not having instream flow program; 2) input from individual and organizations who are stakeholders regarding social impacts.
Arnella Karges	Social and environmental benefits and consequences may be measured by analyzing historical drought patterns, population migration, and industrial output in gross domestic product, agricultural production, and other key economic sectors in Oklahoma. Consideration of water needs and historical use for the states' various industries is important before consideration of any policy or proposal that may limit water use to an extent that may harm growth and development in Oklahoma.
Charlette Hearne	That depends largely on the manner in which such a program was structured. Initial program implementation should focus on evaluation of current stream resources and assignment of evaluation criteria to rank the importance of streams and stream segments for various economic and environmental values. From an environmental perspective, there are all types of measurements and surveys that can be done to directly measure the health of an ecosystem. These can range from basic hydrologic evaluations such as velocity of flow to days with flow to more complex chemical and biological evaluations. These methods are well known in the scientific community. With the scientific community and the graduate programs within our state, I am sure we have the resources for their studies and proper evaluation.
Kevin Stubbs	It depends on if you want to measure these things for a specific stream or region as opposed to and entire statewide program. I suggest consulting with qualified economists and biologists to develop a study or process to do this.

Brian Woodard	Again, as previously stated in our response to question #2, in order for the OIPA to objectively and adequately assess and characterize the social environmental benefits and consequentces of implementing an instream flow program, we would need to further understand what type of "program" is being proposed (e.g. low-flow target, range of flow target, lake level targets, conjunctive use management, etc.) Without a better understanding of the "program" we are not suited to address the benefits/consequences that may be realized as a result of the program. Furthermore, when a significant change to water law and the associated regulations is being considered, the OWRB is obligated to complete a comprehensive cost/benefit analysis to inform its decision making process. A comprehensive cost/benefit analysis must be developed that includes, but is not limited to, the associated costs to implement an instream flow program, the financial implications to existing and future consumptive water users, and the economic affect instream flows may have on existing and future economic development.
Angie Burckhalter	• See response to item 7 below.
Diane Pedicord	What would we be measuring? There are various instream flow regimes and goals available. We don't know yet which one might be considered. Therefore, the question of measuring is premature.
Marla Peek	Look at what the cost to existing permit holders will be if they are unable to use their permitted water. Local economies will suffer if farmers and ranchers are unable to use water. Without permitted water, some farmers and ranchers will be unable to buy the inputs they need for crops and livestock. Local economies will suffer as farmers and ranchers will have less money to spend in their communitys.
Mike Mathis	See response to question #2.
Mike Fuhr	- Social: Method: Inform the public through media campaigns, raise public awareness of instream flow values, uses and water rights, solicit input and motivate public support include budgeting for instream flows. -Social: Logic: Society values water flowing in rivers and streams for the multiple instream and out of stream uses it provides. -Social: Reason: We have to engage the public to create a better understanding of instream flows because maintaining water in streams for aquatic life and aesthetics is the hardest use of instream flow to sell to the public. Many people view water in a stream as an opportunity of water going downstream. We have to convince the public that a dry stream is not good for the environment and that we can all do better to conserve water and not waste water on a daily basis. - Environmental: Method: Create a volunteer watershed program or watershed group so that the public can collect data on instream flows such as biology, hydrology, geomorphology, water quality and connectivity of rivers and streams -Environmental: Logic: This will help the public understand that water in rivers and streams benefits aquatic life -Environmental: Reason: In order to provide people with reasoning to accept the importance of instream flow values.

Shannon Brewer	This would be a difficult but not impossible task. I don't think it is reasonable to expect someone to write a simple paragraph related to this question. Lots of work has been done related to quantifying the value provided to society via healthy streams, fisheries, etc. The difficult part would be including future consequences/benefits of sustainability. For example, water use in CA was abused for farming in many regions until 1) groundwater declined reduced surface water supplies, and 2) lawsuits resulted in restoration measures implemented by government agencies. It is unknown what the cost would have been had some water been maintained in these systems. It was projected that benefits would have occurred for fish/wildlife/farmers had minimum flows been maintained. The cost was very high to restore these systems. I would look into some of these programs when including the future costs.

5. How could we MEASURE the financial impacts of an instream flow program? Please explain your method, logic,	
Jim Reese	loss of income from water sales, crop sales, industrial use from ground water. Depending on the source of the groundwater, it may be more drought protected, while the surface water may be more easily treated for consumption.
Tom Creider	Cost-benefit analysis of having, or not having, an instream flow program. Quantitative impacts (current and long-term) from financial social and environmental perspectives.
Arnella Karges	It is important to include all stakeholders throughout the instream flow development process so they may provide input as to what costs may be incurred due to lost industry, loss of ability to support municipal and other drinking water needs, as well as contributing information regarding compliance costs for any new state policies. Revenue resulting from consumptive and nonconsumptive water uses should be considered.
Charlette Hearne	Water is the "BLUE GOLD" of the future. Our population is increasing, but the amount of water is not. This is particularly difficult for me as I view water as being priceless! Aqua Vida!! If we measured the price of water sold, including the rates charged for water used for consumptive purposes (industry, drinking water, large agribusiness), which would not reflect our water's true value. There are very real benefits and values associated with streams that include a healthy aquatic ecosystem (fish, crayfish, plants and their food sources), aesthetics, private property rights of riparian landowners, value to wildlife, timber industry, recreational uses, subsistence values (pretty real in Ok where poverty is high and the cost of food is expected to go even higher); there are economic benefits associated with tourism, value to the community/area of having appropriate green spaces, healthy streams/freshwater/swimming holes and other recreational opportunities. But none of these benefits or values are taken into account under current water policy There are many studies and articles covering how to place a dollar value on such things; it is difficult, but it can be done. If you add up all of these to calculate the true value of a stream and water taken from it, then you know the true cost of water taken from a stream. That amount would give you some idea of the financial impact of an instream flow program. More to the point, it would give you the financial impact of NOT having a solid instream flow program.
Kevin Stubbs	I would consult with qualified economists to evaluate this. Again, the methods and logic depends on the scope or area you want to evaluate.
Brian Woodard	Please refer to the response provided under question #4.
Angie Burckhalter	• See response to item 7 below.
Diane Pedicord	Same as #5
Marla Peek	Since we don't know what an ISF program would look like, we don't know how can measure the financial impacts at this time.
Mike Mathis	See response to question #2.

Mike Fuhr	- Method: Collect data on instream flow in one stream that is unaltered (few withdrawals) and one that is altered (with many withdrawals) and determine flow requirements for those aquatic biota to survive and complete their life history requirements (ecology flow response curve). Then, compare the costs of what stream mitigation would cost to "fix" the stream that is altered and what is takes to bring that stream back to a more natural flow regime even with water withdrawal continuing to occur (to for instance, react to the listing of a mussel or fish under the ESA). -Logic: It is cheaper to protect water resources than to mitigate for the effects caused by altering the natural flow regime and destroying aquatic habitat. Mitigation is much more expensive than doing it right the first time around. - Reason: Economics drives society so if we can show that it is cheaper to protect aquatic resources than to try and undo the damage to streams that have already occurred, then we have saved public taxpayer money and this is what every citizen wants to know. How will this affect my pocketbook?
Shannon Brewer	Several considerations would have to be made- 1) the cost of water conservation practices if imposed, 2) any economic lost, 3) gains through lower investment in water treatment, 4) gains in maintenance of ecosystem services (downstream flood mitigation, water quality, etc), 5) benefits to recreation and human well being (as well as gains to land ownership near streams that flow)…lots of considerations to be had here. The methods, logic, and reasons for the approach would be a volume (if that is really the question) of information….probably not appropriate here.

6. How could a pilot project be used to evaluate and measure the benefits and concerns you described above?	
Jim Reese	Arbuckle Simpson is a pilot program. Reduced water rights from groundwater users can be measured.
Tom Creider	Pilot project would offer a manageable approach to data collection and analysis. It would also provide a way for stakeholders to collectively evaluate the methodogy, data collection, and findings as a precursor to a broader-based study.
Arnella Karges	A pilot project in one part of the state may not translate to a different geography or need for water resources in a different part of the state. Oklahoma's availability of other natural resources vary across the state and thus the population and water needs vary across the state. So, an instream flow program in one part of Oklahoma may not match appropriately to the needs and precipitation patterns of another part of the state.
Charlette Hearne	I believe OSU has implemented such a study. Perhaps not to the extent I have alluded to above but it is a beginning. One might begin with a pilot project on a scenic stream, a targeted stream – specifically the Kiamichi, and one in western Oklahoma. Oversight by the Task Group would be essential. The Kiamichi River should be on the top of the list because it has the most endangered species – flora and fauna – in the state. And is obviously the most targeted either Texas or OCWUT due to its wonderful water that the mussels clean! The Tribes and the USACE have started an instream flow study on the Kiamichi with some outstanding scientists and peer review. Just another reason to the Kiamichi River should be included in the pilot study.
Kevin Stubbs	A similar study was done by Dr. Tracy Boyer for Lake Tenkiller and the lower Illinois River and I have examples of studies conducted on other rivers. I would contact experienced economists like Dr. Boyer and get proposals or input for a pilot project. A pilot project could demonstrate the best use of water to maximize long-term economic benefits for an area.

Brian Woodard	OIPA believes it is premature to initiate an instream flow program until the aforementioned water policy and legal reviews are conducted, followed by a thorough review and analysis of OWRB's current ability to proactively manage the state's water resources under the existing domestic use set-aside including a tabletop exercise commissioned to identify the conservative flows this finding may yield. However, should an Oklahoma instream flow program be adopted, it would be prudent to initiate such an effort as a pilot project. Under a "baseline" pilot project scenario, we may be able to true-up realized information from which we could ascertain the actual economic implications coupled with any perceived benefits of such a program. This would provide the OWRB with an opportunity to refine the process and make necessary adjustments founded on actual information prior to further deployment.
Angie Burckhalter	• It seems premature to consider a pilot project until the various legal and policy questions have been resolved i.e. is an ISF program needed; what is meant by an ISF program (average annual flows, low flows, etc.); what is the purpose and goals of an ISF; what alternatives under current stream water law could address this issue; what are the statutory, regulatory and administrative changes that would be needed; the development of a comprehensive cost/benefit impact analysis; and other related issues.
Diane Pedicord	A pilot project is premature for the same reasons stated above. Meanwhile, it would be helpful for OWRB to identify the various studies and contracts for measuring flows, quantity and quality that are now underway by it or other state and federal agencies. This may help us determine whether we have some kind of de facto pilot project in process already. Also, it would be helpful to have a thorough analysis of the ground truth created by OWRB's current administration of domestic use flows and the amount of water that actually flows out of our borders each year.
Marla Peek	Doesn't OWRB and the OCC already have projects relating to an ISF program that are ongoing? What are those projects? Can the pilot program begin before the economic and legal are researched and examined?
Mike Mathis	Should an ISF program ultimately be formulated, I believe it would be highly prudent to initiate such an effort in a pilot project. That way, we could all understand the on-the-ground implications of such a program with opportunity to fine tune before further deployment.
Mike Fuhr	Pilot Project: This can demonstrate how aquatic resources protection and economics go together to support a healthy ecosystem and a healthy economy. Examples: Illinois River: recreation for floating and fishing, 14 Mile Creek and Spring Creek for smallmouth bass fishing and fly fishing (fishing and recreation is third largest economic driver in Oklahoma), Kiamichi River: floating and fishing, Blue River: floating and fishing.
Shannon Brewer	I have no idea what is being describing as a "pilot project". To actually come up with values that represent something that is truly meaningful, a serious project- not "pilot" project- would be conducted. Pilot usually suggests a small "pre test"...?

7. Should an instream flow program be measured by potential economical impacts alone? Should an instream flow	
Jim Reese	No. No. Human life requires food, water, and air.
Tom Creider	Program needs to include all three measures: economic, social and environmental.
Arnella Karges	No, all impacts are important and ultimately contribute to an economic impact. Without proper management of the state's water resources, resources may be misused or misallocated, harming the environment, humans and thus affecting the state's overall economy and ability to compete nationally.

Charlette Hearne	Any instream flow program must be measured by social, environmental and economic impacts, not only because the three factors are not mutually exclusive, but also because they are intrinsically dependent upon one another. The three must be balanced to create sustainability in any water policy, including and especially the design and implementation of an instream flow program. Every ecosystem on the face of the planet today has a physical or chemical limiting factor. The limiting factor for the state of Oklahoma and the economic engine that it has become is on the verge of being severely impacted by the quantity of water. Continued economic growth will come to an abrupt halt or even regress if there is not adequate supply of water to sustain it. The question that I would propose here is what is the greater long term risk, the formation and implementation of an instream flow program that will ensure quality of life and sustainable economic growth or not implementing an instream flow program, a decision that will most certainly impact quality of life in the future and bring continued economic growth to a screeching halt? Should we sacrifice long-term sustainability for short-term gain? I think not! In college I went home with a classmate from Chicago. In touring we went to the Old Gris Mill. The water that once ran that mill had a huge sign stating "Do Not Touch The Water." We have a moral obligation to protect nature's gifts. This exhibited a social, environmental and economic impact!
Kevin Stubbs	I'm sure all 3 have to be factored in but some streams have more environmental value or potential than others.
Brian Woodard	The legal foundation, for which any instream flow program is based upon, should drive the metrics adopted to evaluate its impacts.
Angie Burckhalter	• Whenever a significant change to water law and the associated regulations is being considered, the OWRB is obligated to complete a comprehensive cost/benefit analysis to inform its decision making process. A comprehensive cost/benefit analysis must be developed that includes, but is not limited to the associated costs to implement an Oklahoma ISF program (i.e. more funding for OWRB staff, more stream gauges, computer system upgrades, etc.), the cost impacts to existing and future consumptive water users, and how ISFs would affect existing and future economic development.
Diane Pedicord	If and when a measurement is appropriate, all factors impacted by an ISF program should be included.
Marla Peek	"...potential economical impacts alone?" Yes.
Mike Mathis	I would think that the legal foundation that any ISF program would be based on would drive the metrics.
Mike Fuhr	No. The program needs to be comprehensive in order to insure that we can conserve our river systems within the framework of our local economy. There needs to be balance as determined by society.
Shannon Brewer	No, I don't think the program should be measured by one aspect, but rather several aspects. In the end, the solution should be about balance- and balance will not be met either by excluding water use…or draining the stream. Society ultimatley has to make this decision but to comply with federal law (clean water act) and prevent additional endangered species listings, it is in the best interest to consider mutual impacts.

8. If an instream flow program is developed, what would be the most important aspects for the program to protect or enhance? Rank the following in order from 1 through 8, with 1 being the most important aspect.

Answer Options	1	2	3	4	5	6	7	8	Count
Recreation	0	0	1	1	2	1	0	1	6
Aquatic life - all	1	2	1	0	1	0	0	2	7
Aquatic life - threatened and endangered species	1	1	0	2	0	1	1	1	7
Visual and aesthetic benefits	0	0	0	1	1	1	1	2	6
Receiving water quality	0	1	3	1	1	0	0	1	7
Existing permits for consumptive water use	4	1	0	0	0	1	0	0	6
Future permits for consumptive water use	1	1	1	0	0	0	2	0	5
Other (describe below)	4	0	0	0	0	1	0	1	6

	Response to "Other" for Question 8
Tom Creider	value to adjacent terrestrial habitats.
Arnella Karges	Overall economic impacts in the state's ability to preserve water resources for beneficial and consumptive uses.
Charlette Hearne	Domestic use - Drinking water is the most important. Beyond that, all these sectors go hand in hand. To prioritize these is to politicize them and leaves us where we are today - fighting over who needs the water most.
Kevin Stubbs	this format is inappropriate, it does not allow aspects to have equal value or take into consideration that different streams have different values or priorities.
Brian Woodard	An instream flow program must work within the realm of our existing appropriative water right system and “beneficial use” policy.
Angie Burckhalter	• The request to rank the items listed above is premature until an ISF program is further defined, what is the purpose and goal of an ISF program, the development of a comprehensive cost/benefit analysis, the impacts to existing and future water rights, and other related issues. Also, see response on item 10.
Diane Pedicord	Under current law, beneficial use is the settled criterion for management of our water resources. Water quality standards also apply to these beneficial uses. There is no basis in our law for protecting other “aspects”.
Mike Mathis	Any ISF program must mesh with the OK Streamwater Law.

9. Should legal/regulatory protections be provided for those with existing consumptive water rights? How could those protections be provided?

Jim Reese	yes. Grandfather clauses.
Tom Creider	Yes. Through statute and provisions of the Okla. Comprehensive Water Plan.
Arnella Karges	Yes, Oklahoma and most western states have developed and managed water resources based upon priority rights for beneficial purposes. If Oklahoma chooses to ‘change the game’ for permit holders or those with surface water allocations, the state is only punishing property owners and those who have worked hard to establish rights or develop agreements over water resources throughout the state’s history. Any new water allocations for an instream flow program must consider those with existing rights and should consider the state’s opportunities and hope for future development. An instream flow program, rather than limiting water use, should aim to establish appropriate preservation, conservation and recycling methods through greater development of water infrastructure.

Charlette Hearne	Existing consumptive water rights should be protected. Otherwise, this program will never happen. Water systems have spent millions on infrastructure and must be maintained. However, provisions for changes in existing and future consumptive uses should be included in the overall program where found appropriate, through the use of incentives. In times of drought and other extreme conditions changes maybe necessary.
Kevin Stubbs	existing rights should be protected when possible but water use must be sustainable and conjunctive uses must be addressed to insure surface and groundwater uses are sustainable and do not impact each other.
Brian Woodard	The current Oklahoma Streamwater and Groundwater Laws provide the details/requirements for protection of water rights and domestic uses. Certainty and reliability for existing and future consumptive water users are key factors that help entities plan and budget their operations and the lack thereof, will negatively impact Oklahoma's future economic development and prosperity.
Angie Burckhalter	• See response to item 10.
Diane Pedicord	Existing water rights are rights protected by the Oklahoma and United States Constitutions.
Marla Peek	Absolutely. Keep the current beneficial use program. Groundwater permits must be protected from those who would like to bring them into an ISF program.
Mike Mathis	The current OK Streamwater and Groundwater Laws provide the details/requirements for protection of water rights and domestic use.
Mike Fuhr	Continue support for first in time, first in right but consider all permitted water withdrawals and see if permit holders can do with less water. Permitted amounts are different than reported yearly actual water use amounts. Use the excess water for instream flow if permitted water user is using less water than what their permit is allocated for (perhaps we finally need to enact some metering to ensure accurate accounting? Otherwise, we are essentially balancing checkbooks without knowing what the amounts on any checks being cashed are). The Public Trust Doctrine can be enacted for the amount of water not used on a permit for instream flow uses for fish and aquatic life.
Shannon Brewer	No- in some areas the entire ecosystem has been compromised (no balance there) so I expect that some changes would be needed if the goal were to protect aquatic life and avoid more endangered species. In areas where this extreme has not occurred the existing water users might benefit from protections (but not to the exclusion of the public trust)

10. Should legal/regulatory protections be provided for future consumptive water rights? How could those protections be provided?

Jim Reese	yes. Human life requires food, water and air. Future consumptive water rights are important.
Tom Creider	Yes, but not only for future consumptive water users, but also for entities who seek to protect and conserve water for environmental values.
Arnella Karges	Yes, future consumptive needs must be considered. Not providing for future consumptive needs is closing the door to new business opportunities, limiting growth of Oklahoma's current industries, additionally burdening already struggling family farms and small businesses, and harming Oklahoma's way of life and traditions. Only through extensive study of the impacts of an instream flow program, with consideration given for potential, future needs of Oklahomans, can a workable plan be developed and met by the state's residents.
Charlette Hearne	As Americans, as Oklahomans, as citizens we must recognize when we have over utilized our resources. The cities of Santa Barbara, many cities in the middle east have had to deal with this issue. With wise use, conservation, updated water law and a true inventory of availability in the worst case scenario perhaps science can help us lead the way, Instream flows can certainly help identify future needs and with accurate measurement of resources. --- a bipartisan movement, with worthy motives would serve our citizens favorably. A bit Idealistic, but definitely realistic.

Kevin Stubbs	If you want to plan for future needs, you need to account for future demands and make sure these uses are sustainable. Storage and flows need long-term protection to avoid overallocation and future conflicts.
Brian Woodard	Please refer to the response provided under question #9.
Angie Burckhalter	• As previously stated, the beneficial use of water has been the basis of Oklahoma water policy since before statehood, and has served our state well. Oklahomans have made significant investments now and for the future and have operated under these statutory concepts. Certainty and reliability for existing and future consumptive water users are key factors that help entities plan and budget their operations and the lack thereof, will negatively impact economic development.
Diane Pedicord	Future water rights, once attained, have the same constitutional protections as existing ones. OWRB is limited in its authority to recognize less than the rights provided by existing statutes.
Marla Peek	Yes. Keep the current system as it is.
Mike Mathis	The current OK Streamwater and Groundwater Laws details the protective framework for prospective water right holders and domestic water users.
Mike Fuhr	Analyze the water needed in different basins and see if water right holders can utilize less water. Water rights and portions of unused water rights can be sold to protect instream flow for fish and aquatic life. Specify that instream flow water rights or reservations are a streamflow or water level below which diversion is prohibited. As part of the 202 update to the Oklahoma Comprehensive Water Plan, look at implementing water conservation, recycling and gray water as part of water plan to help reduce the amount of water consumed in future permit applications.
Shannon Brewer	Not sure in what context this is meant?

Oklahoma Instream Flow Advisory Group
Instream Flow Legal and Policy Questions
May 2013

The following is a compilation of input received as a follow-up to discussions held at the March 2013 Instream Flow (ISF) Advisory Group meeting. Following that meeting, Advisory Group members were asked to further delineate the specific legal and policy questions they have identified regarding a potential ISF program.

The Nature Conservancy (Mike Fuhr/Kimberly Elkins, 4/25/13-4/26/13)

If I remember correctly, the OWRB counsel's opinion is that the Water Board does have the authority to accommodate instream flows as part of its purview. It would be helpful to get a refresher on this subject matter vs. what others on the committee assume is the case. In addition, I think regardless of the answer to this legal authority question, it appears that there is nothing that prevents OWRB from moving forward with data collection and construction of a flow-ecology model (that could ultimately become a part of a decision support tool) for one or more of Oklahoma's streams. Understanding our river systems (i.e. the science; their hydrology/ecology) is separate from the question at hand and necessary to any agency tasked with management of water quantity. And as you might guess, I would very much like to see this process moved forward on any number of streams so we can begin to answer some of the many questions that have arisen over the last few years surrounding ISFs. It still seems that the Scenic Rivers are a logical starting point, especially considering that there is already precedence for regulation of flows.

I don't think there are questions from me as to how instream flow fits into Oklahoma statutes, regulations and laws. It can be done and has been done elsewhere in the United States. I have viewed this effort at understanding legal and policy questions with the Instream Flow Workgroup as a means to stall the effort to protect instream flows in Oklahoma, so that nothing is done about instream flows and to me this is disappointing.

OWRB has water quality standards just as every state does. OWRB can add flow to fish and aquatic life standards just as Tennessee has done. The Tennessee Department of Environment and Conservation (TDEC), is the regulatory authority on water withdrawal permits. See attached water quality standards for Tennessee. *[Note: Standards not attached here; 2007 standards were attached to original email – updated standards are available from State of Tennessee here.]*

The Public Trust Doctrine is used so that natural resource laws can be written, changed or interpreted to benefit riverine resources. Every state including Oklahoma has one.

The doctrine is used to develop legal authorities and for states to control management and use of fishery ,wildlife and water resources held in trust for the public. In some jurisdictions, trust is interpreted as protection of fish and wildlife habitat

Example: California case: Environmental Defense Fund, Inc. v. East Bay Municipal Utility District: Public trust doctrine applied to decisions allocating water in the American River. The judge mandated a plan by which water could be diverted and instream flows protected.

The doctrine can be incorporated directly into regulatory laws that codify and implement the doctrine.

California prohibits development of certain water whose highest and best use is preservation in their wild and natural conditions such as the Scenic Rivers Act. Example: Illinois River.

Organizations such as The Nature Conservancy and private citizens in Oklahoma can apply for instream flow water rights or permits to protect instream flows for fish and wildlife. The Nature Conservancy could apply for water rights on their preserves to protect instream flows via a non-consumptive permit for fish and wildlife.

Oklahoma has stewardship responsibilities to manage fish and wildlife resources using instream flow water rights.

Since 1965, the Oklahoma Department of Wildlife Conservation has had a recreational fish and wildlife permit to provide water to the Durant Fish hatchery in Bryan County. This is a consumptive permit, but no different than applying for a non-consumptive permit for wild fish in the river.

Examples of other states with instream flow water rights or instream flow reservations.
Instream Flow water rights for fish and wildlife: AK, AR, CA, CO, ID, NE, NV, SD, UT, WY
Instream Flow reservations: FL, IO, KS, MN, MT, OR, PA, VA, WA, Alberta, CA

This is from the Southeast Aquatics Resources Partnership (SARP). It mentions Oklahoma and instream flows.

> SIFN Supports Partners' Instream Flow Policy Progress
>
> The Southern Instream Flow Network (SIFN) continues to support the development of instream flow policies in all states throughout the SARP region by providing technical assistance and science-based instream flow resources. The following is an update on five SIFN partner states that are actively working on new or revised state water management plans that will incorporate instream flow standards.
>
> Arkansas:
> Arkansas is updating their 1990 state water plan and projected water needs will be evaluated to the year 2050 for the state's major water demand sectors: Municipal, Residential, Commercial, Industrial, Agricultural, and Energy. Available water supplies will also be evaluated, incorporating needs to protect fish and wildlife. Under a tight timeframe to develop recommendations for state instream flow standards by 2014, the Arkansas Natural Resource Commission has established a Fish & Wildlife Sub-committee. This committee is reviewing their current "Arkansas Method," which is a modified Tenant method, and making recommendations about whether modifications are sufficient or new approaches are needed. SIFN Technical Advisor, Mary Davis, gave a presentation in late March to the Fish & Wildlife Sub-committee on various approaches used by other states for setting standards and available instream flow resources developed for the region.
>
> Alabama:
> The Alabama Water Agencies Working Group (AWAWG) consist of five state agencies, including the Alabama Department of Conservation and Natural Resources, Geological Survey of Alabama, Alabama Department of Environmental Management, Alabama Agriculture and Industries and the Alabama Office of Water Resources. This group under the direction of Governor Bentley has identified water management issues in Alabama and has gathered comments on the issues from stakeholders. AWAWG will incorporate stakeholder comments and recommendations into a document that will be delivered to

Governor Bentley in December 2013. Following review by Governor Bentley and his staff, decisions will be forth coming concerning the course action deemed appropriate. In addition, funds have been proposed in the 2013 Legislative session to fund the completion of ground and surface water assessments. Included in the proposed funding are funds to conduct instream flow assessments. Funds will be administered by the Geological Survey of Alabama.

North Carolina:
North Carolina is coming to the end of a two-year process for developing instream flow recommendations to inform the state's water management plan. An Environmental Flow Science Advisory Board, which is comprised of stakeholders in water resources in the state, has meet monthly through a process guided by the North Carolina Department of Environment and Natural Resources. They have explored various approaches to setting instream flow standards. To inform the process, several agencies, NGOs and research companies have undertaken in-depth studies on river classification and flow-ecology relationships using existing data. Mary Davis has given presentations to the group about approaches to setting instream flows and resources developed under the South Atlantic LCC Project, including a new hydrological classification approach developed by Environmental Flow Specialists, Inc.

Oklahoma:
Oklahoma has begun a process to address instream flow policies in the state. They are engaged in the Gulf Coast Prairie LCC (GCP) instream flow project and have access to the instream flow resources developed by SARP.

Virginia
Although not in the process of developing a new state water management plan, Virginia is actively using the ELOHA framework inform water management decisions. They have developed flow-ecology relationships based on existing fish and macroinvertebrate data and a modeled hydrologic foundation. This effort is helping to inform efforts by SARP and others as to the utility of fine scale hydrologic modeling in quantifying flow alteration in support of the flow-ecology relationships.
For more information about SIFN, contact Mary Davis, Technical Advisor, at mary@southeastaquatics.net.

Oklahoma City Water Utilities (Marsha Slaughter, 5/10/13)

How will stream losses to riparian users and alluvial groundwater be managed or accounted for to make sure the ISF allocation remains for its intended purposes? Require permits?

Moving from the general set-asides provided in the OCWP to stream specifics requires much work. How will the work be prioritized? Largest basin with lowest flow, scenic designated, water quality limited?

How will the total allocation for streams be determined: by segment, at an identified critical point? And if at a critical point, how will that location be determined?

What recurring funding will be required to maintain the program, portions of which may reside in several agencies?

What will be an acceptable level of accuracy for the ISF determination?

OIPA (Brian Woodard, 5/10/13)
See attached letter.

Chesapeake Energy (Mike Mathis, 5/10/13)

- Describe what is meant by "ISF" and what is the purpose/goal/scope of such a policy, in some detail.
- Evaluate whether such an ISF policy can/cannot be achieved within the context of the current Stream Water Law, either by direct or indirect means.
- Critically revisit the legal basis and process whereby the existing Barren Fork ISF was developed/implemented. How has that been administered? What is the process for review/revisit to validate the flow value? What has been the practical historical experience of this ISF implementation? Lessons learned??
- Identify what statutory, regulatory, and administrative changes would be needed to implement an ISF program.

These are some of the threshold questions/ thoughts/issues that come to mind for me to begin understanding the overall context of this effort. From there, I would have a better understanding how to identify/evaluate issues that we might face in such an effort.

Oklahoma Farm Bureau (Marla Peek, 5/10/13)
See attached letter.

Devon Energy (Angie Burckhalter, 5/10/13)

1. Determine whether there is a need for an Oklahoma ISF policy and clearly describe the basis for making that determination.
2. Define the purpose and goal of an Oklahoma ISF policy.
3. Define what is meant by ISFs (i.e. natural flow regimes, average annual flows, low flows, historical flows, etc.).
4. Determine whether alternate means to address ISF related issues could be used or developed under current water law and existing programs. This component should include an examination of all potential options including, but not limited to domestic use flows (set-asides) and existing means to provide for non-consumptive uses under the current administration and management of the appropriative system. In addition, evaluate if there are any existing regulatory requirements that are not fully being implemented that would aid in this effort. Determine how such a program would impact both existing and future water rights.
5. Determine what statutory, regulatory, and administrative changes would be needed to implement an ISF program.
6. Determine whether ISFs would impact current and future uses of reservoirs.
7. Determine if more water flowing out of the state opens up potential issues related to excess water, state water management issues, and potential litigation.
8. Determine if the reduction of available and reliable water sources will deter industrial or economic development in the state.

State Chamber of Oklahoma (Arnella Karges, 5/13/13)
See attached letter.

Oklahoma Municipal League (Diane Pedicord, 5/13/13)

As you know, in 2010 some participants on the Oklahoma Instream Flows Advisory Group for the Oklahoma Comprehensive Water Plan developed a list of issues pertaining to the question whether Oklahoma should adopt an instream flow regime. Because these issues were not adequately addressed at that time, they remain as outstanding matters that must be resolved if a consensus is to be achieved. I have listed them below for your convenience.

Following up on the first meeting of the current ISF Advisory Group, I wish to pose an additional question having both legal and policy overtones. What would be the scope and actual implementation of an ISG regime? By this I mean that we must have a clear understanding about several facets of an ISF program, such as:

A. Where and to whom will it apply:
    a. Will it apply to intermittent streams?
    b. Will it apply to alter or impact existing stream water rights?
    c. If it will not apply in either of the above circumstances, what is the policy gain and is it sufficient to support legally-defensible disparate water rights classifications?
B. Since "use" is the basis of Oklahoma's water rights system, will some users, whether for consumptive or nonconsumptive use, bear a greater burden than others under an ISF regime? If so, what is the rationale for creating disparate impacts among users?

Legal and Policy Evaluation Questions

1. determine whether there is a need for an Oklahoma ISF policy and describe the basis for making that determination.
2. Define what is meant by ISFs (i.e. natural flow regimes, average annual flows, low flows, historical flows, etc.).
3. Define the purpose or goal of an Oklahoma ISF policy.
4. Determine whether an Oklahoma ISF program could be administered under current stream water law and address specifically how such a program would impact both existing and future water rights.
5. Determine whether alternate means to address ISF related issues could be used or developed under existing programs. This analysis should also provide a cost comparison between the alternate means and an Oklahoma ISF program. This component should include an examination of domestic use flows (set-asides) and existing means to provide for non-consumptive uses under the current administration and management of the appropriative system. In addition, evaluate if there are any existing regulatory requirements that are not fully being implemented that would aid in this effort.
6. Identify what statutory, regulatory, and administrative changes would be needed to implement an ISF program.
7. Determine whether ISFs would interfere with the current uses of reservoirs and ascertain the impacts on current permits.
8. Determine if more water flowing out of the state opens up potential questions related to excess water, water management and potential litigation.
9. Determine how the reduction of available and reliable water sources impact business development in the state.

OKLAHOMA INDEPENDENT PETROLEUM ASSOCIATION

May 10th, 2013

Mr. John Rehring
Vice President - Carollo Engineers, Inc.
jrehring@carollo.com

Re: Specific legal and policy questions identified regarding a potential Oklahoma ISF Program

Dear Mr. Rehring:

Please find the following legal and policy questions posed by the Oklahoma Independent Petroleum Association (OIPA) in response to the potential development of an Oklahoma instream flows program.

Legal and Policy Questions

1. Determine the need for an Oklahoma ISF policy and describe the basis of that determination.
2. Clearly define and articulate what is/what is not meant by ISFs (i.e. natural flow regimes, average annual flows, low flows, historical flows, etc.).
3. Articulate the purpose of an Oklahoma ISF policy and the specific goals it aims to accomplish.
4. Determine whether a program could be administered under current state law and address specifically how such a program would impact both existing and future water rights within the state.
5. Identify the statutory, regulatory, and/or administrative revisions which would be needed to administer an ISF program.
6. Determine whether an OK ISF policy would interfere with the current uses of reservoirs throughout the state and ascertain the impacts on current water use permits.
7. Determine if more water flowing out of the state based on an OK ISF policy opens up additional questions related to excess water, water management and potential litigation.
8. Determine whether alternate means to address ISF related issues could be used or developed under existing programs. This analysis should also provide a cost comparison between the alternate means and an Oklahoma ISF program. This component should include an examination of domestic use flows (set-asides) and existing means to provide for non-consumptive uses under the current

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Telephone 405-942-2334 Fax 405-942-4636 Toll Free 800-838-OIPA

administration and management of the appropriative system. In addition, evaluate if there are any existing regulatory requirements that are not fully being implemented that would aid in this effort.

9. Determine how the reduction of available and reliable water sources impact business development in the state.

Should you have any questions concerning these comments, please feel free to contact me at (405) 601-2332 or by email at bwoodard@oipa.com.

Sincerely,

Brian Woodard
Vice President of Regulatory Affairs
500 N.E. 4th Street, Ste. 200
Oklahoma City, OK 73112
Office: (405) 601-2332
E-mail: bwoodard@oipa.com

MARLA PEEK
DIRECTOR OF REGULATORY AFFAIRS

WRITER DIRECT
(405) 523-2437
FAX (405) 530-2634
marla.peek@okfb.org

May 10, 2013

Ms. Terry Sparks
Oklahoma Water Resources Board

Re: Legal and Policy Evaluation Questions for the Instream Flow Advisory Committee

Dear Terry,

Please find Oklahoma Farm Bureau's questions below.

1. Determine whether there is a need for an Oklahoma Instream Flow (ISF) policy and describe the basis for making that determination. What would be the purpose or goal of an Oklahoma ISF policy?
2. Define what is meant by ISFs (i.e. natural flow regimes, average annual flows, low flows, historical flows, etc.).
3. Determine whether an Oklahoma ISF program could be administered under current stream water law. Address specifically how such a program would impact both existing and future water rights.
4. Determine whether alternate means to address ISF related issues could be used or developed under existing programs. This analysis should also provide a cost comparison between the alternate means and an Oklahoma ISF program. This component should include an examination of domestic use flows (set-asides) and existing means to provide for non-consumptive uses under the current administration and management of the appropriative system. In addition, evaluate if there are any existing regulatory requirements that are not fully being implemented that would aid in this effort.
5. Identify what statutory, regulatory, and administrative changes would be needed to implement an ISF program.
6. Determine whether ISFs would interfere with the current uses of reservoirs and ascertain the impacts on current permits.
7. Determine if more water flowing out of the state opens up potential questions related to excess water, water management and potential litigation.
8. Determine if the reduction of available and reliable water sources will impact business development in the state.
9. Determine what impact, if any, an ISF program would have on groundwater permits and use in Alluvium and Terrace Aquifers.

Please let me know if you have any questions. Thanks so much.

Marla R. Peek
Director of Regulatory Affairs

cc: Oklahoma Farm Bureau Board of Directors

STATE CHAMBER
OF OKLAHOMA

MEMO

TO: John Rehring, Vice President of Carollo Engineers
Terri Sparks, Oklahoma Water Resources Board

FROM: Arnella Karges, Vice President of Government Affairs

DATE: May 10, 2013

SUBJECT: Legal and policy questions surrounding a potential Instream Flow Program in OK

As a member of the Instream Flow Advisory group, the State Chamber of Oklahoma seeks answers to the following overarching, major policy issues to ensure due diligence prior to consideration of developing an Instream Flow Program. (Please note that this is not a comprehensive list of questions or concerns that have been raised by various members of the State Chamber of Oklahoma):

- determine whether there is a need for an instream flow policy in Oklahoma and describe the basis for making that determination
- define "instream flow"— for example, does this include natural flow regimes, average annual flows, low flows, historical flows, environmental flows for ecological needs, or other definitions found in other states' laws
- define the purpose or goal of an instream flow policy for our state
- determine whether an instream flow program in Oklahoma could be administered under current stream water law or if changes to existing law will be necessary
- specifically address how an instream flow program would impact existing and future water permits and existing water rights
- determine whether alternate means to address issues related to instream flows could be used or developed under existing state programs or state law; such an analysis should include a cost comparison between the potential, existing alternate means and development of an instream flow program in Oklahoma; this analysis should also include an examination of domestic use flows (also referred to as "set-asides") and existing methods to provide for non-consumptive uses under the state's current administration and management of the appropriative system; additionally, evaluate if there are any existing regulatory requirements that are not fully being implemented that would aid in this effort
- identify what statutory, regulatory, and administrative changes would be necessary to implement an instream flow program

- determine whether requirements of an instream flow program would interfere with the current uses of reservoirs and assess the impacts on current permits
- determine if additional water leaving the state via natural flows exposes Oklahoma to potential issues related to excess water, proper water management and additional litigation
- determine how the reduction of available, reliable water sources impact business development in the state, including all industries across the spectrum – manufacturing, oil and gas exploration and production, agriculture, mining, military and defense contractors, tourism and recreation and many more that contribute to Oklahoma's gross domestic product

Consideration of these major policy implications is imperative before proceeding with outline of development of an instream flow program in Oklahoma. Thoughtful deliberation of these important issues is not only timely, but appreciated by all Oklahomans who operate in a regulatory environment and hope to see the state continue its economic growth.

- Workshop 1, March 1, 2013
- Workshop 2, May 16, 2013
- Workshop 3, October 7, 2013
- Workshop 4, January 16, 2014

Appendix C
Advisory Group Workshop Agendas, Summaries, and Presentations

Meeting Agenda
Instream Flow Workgroup
Kickoff Meeting

Date: March 1, 2013
Time: 1:00 pm
Location: OWRB

Opening Remarks: Goals of the 2013 Instream Flow Advisory Group (Strong) 1:00-1:10 pm

Introduction (All) 1:10-1:20 pm

a. Advisory Group Members: Organization you represent and involvement in previous Advisory Group

b. OWRB, USACE, and consultants: Roles in this process

Review of Recommendations from the 2010-2011 Advisory Group (Strong) 1:20-1:40 pm

Recommendations 1 and 2: Initial Findings (Mitchell) 1:40-2:00 pm

Summary & Discussion of Feedback from 9 Instream Flow Questions (Rehring) 2:00-3:00 pm

Content and Schedule for Next Advisory Group meetings (Rehring) 3:00-3:15 pm

Action Items and Wrap-up 3:15-3:30 pm

Oklahoma Instream Flow Advisory Group Orientation Workshop Notes –
March 1, 2013

Attendees:

ISF Advisory Group – Jim Barnett, Barry Bolton, Shannon Brewer, Angie Burckhalter, Tom Creider, Mark Derichsweiler, Tom Elkins, Mike Fuhr, James Gammill, Bud Ground, Charlette Hearne, Arnella Karges, Mike Mathis, David Ocamb, Diane Pedicord, Marla Peek, Tyler Powell, Marsha Slaughter, Kevin Stubbs, Jeff Tompkins, Brooks Tramell, and Brian Woodard

Consultants – John Rehring, Bryan Mitchell and Anna Childers

OWRB – JD Strong, Terri Sparks, and Derek Smithee

USACE – Bryan Taylor

Others -- Mike Thralls, Kimberly Elkin, Mel Vargas, Christina Akly, Curtis Hoskins, Tom Adams, Jeff Converse, Rupert Nowlin

ISF Advisory Group Meeting Purpose:

As part of the 2012 Update of the Oklahoma Comprehensive Water Plan ("OCWP"), an Instream Flow ("ISF") report provided six recommendations associated with further consideration of an ISF program in Oklahoma. The Instream Flow Advisory Group was reconvened to further define whether and how an instream flow program might be implemented in Oklahoma. The first facilitated workshop was intended to solicit input and advice from the ISF Advisory Group to determine the suitability of a potential ISF program for Oklahoma.

Summary:

- JD provided opening remarks.
    - Some of the ISF Advisory Group members are new and some of them were engaged during the OCWP development process.
    - During the OCWP, ISFs in Oklahoma were discussed with the previous group. That effort resulted in a report on ISF.
    - The first workshop/meeting is intended to further the discussions regarding the 6 recommendations of the OCWP on ISF. One of the 6 recommendations was to continue deliberation and coordination through the Advisory Group.
    - No decision has been made regarding whether there will be an ISF program for Oklahoma.
    - The goal for the first Advisory Group meeting is to collaboratively discuss the ISF Program Q&A responses of the ISF Advisory Group members. Based on the feedback from the Q&A and the meeting discussions, the content/theme for the second workshop should be identified.
    - There will be three additional workshops scheduled in the future. The meeting will be scheduled for 2 to 3 months from now, depending on the types and amount of information that is needed to support that discussion.

- After brief introductions of the workgroup participants, audience, OWRB staff and contractors, John Rehring summarized the different viewpoints of the Q&A feedback that were received from the Advisory Group prior to the meeting. John emphasized that the viewpoints do not represent consensus and are not to be used as votes, but as discussion guides for the workshop.
- The facilitated discussion triggered some main themes as summarized below.
- The next meeting themes/content were identified as outcome from the facilitated discussions. These are included below.

Discussion Themes:

- Why is Oklahoma pursuing an ISF? And, why now?
    - All streams?
    - All water bodies?
    - Site specific?
    - Cost?
    - What's the process?
- Unclear definitions: non-consumptive and environmental flows
    - For example, are fish and wildlife considered part of environmental flows, while recreation is part of non-consumptive water use?
    - Or are the terms basically the same?
- Define surplus and deficit
- Mechanisms:
    - Domestic use set aside: estimate how "much".
    - Scenic Rivers:
        - Laws
        - Scope: all or segment
    - Interstate Compacts
    - Other states' (entities') programs/approaches
    - Prioritization criteria
    - Mandatory conservation measures
- Address the impacts on water rights/allocations:
    - Future
    - Existing:
        - Downstream and upstream
        - Are we over-allocating?
        - More water leaves Oklahoma than comes in (compacts)
    - Stream fluctuations
    - Drought
    - Applied management
    - Storage allocations: over or under-allocated? Per basin-basis.
    - Reservoir dependable yield
    - Mandatory conservation measures
    - Significant, though not unanimous support for existing rights having seniority over any future ISFs
    - Interest in considering effects on existing and future rights as part of the same discussion
- Industry impacts:
    - Benefits:
        - Industry siting and planning: future available water is important
        - Available permits

        - Easier permitting process
        - Secure water storage in reservoirs
    - Detriments:
        - Takes water off the market for consumptive use
        - Going from water surplus to water deficit
        - Future water rights
        - Economic impacts
- Pilot study:
    - Benefits
        - Helps identify what data needs to be collected to understand stream flows:
            - hydrologic foundation of stream flows
            - Flow-ecology relationships
            - River type classification
        - Can help guide the program
        - Can help guide conceptual plan (policy)
    - Detriments:
        - Too soon; process out of sequence; not time to implement
        - Scope drives cost
- Other states' programs
    - Lessons learned
    - Which western states have instream flow programs in place
    - Are all programs supported by law?
- Different types of streams in Oklahoma:
    - Conditions
    - Flowrates:
        - Historic
        - Natural
        - What is baseflow?
        - Frequency
        - Duration
        - Magnitude
        - Rate of change
    - Classifications
    - Climate and ecoregions
    - Ecology
        - Aquatic habitat and communities
        - Water quality
        - Fishless vs. fish-bearing
        - Riparian systems
    - Available water
        - Sediment pool storage
        - Water use allocations
        - Reservoir supply
        - Reservoir dependable yield
    - Impacts of water withdrawals and diversions
    - Uses:
        - Recreation
        - Agricultural irrigation
    - Man-made interference:
        - Impoundments
        - Channel modifications

Recommendations

- At next workshop:
    - Provide summary of existing methods OWRB uses when considering surface water permits
    - Summarize permit availability /definitions from OCWP
    - Summarize excess and surplus water information from OCWP
    - Provide summary of another state's ISF program with respect to water rights seniority and "use it or lose it" applicability to ISFs
- Provide further information regarding existing legal authority for an ISF program and existing mechanisms to address the ISFs in Oklahoma. Address both the legal and policy aspects as well as quantify the availability of water based on the existing data (advisory members will provide further delineation of legal and policy questions):
    - Domestic use set asides
    - Scenic rivers
    - Water allocations under Oklahoma's "use it or lose it" statutory framework; 7-year default and schedule of use
    - Reservoir dependable yield
- Measurement of how existing programs' contributions to ISFs should be measured against identified needs on a specific watershed
- Arrange the meeting date for the early part of the week (Monday or Tuesday), not end of the week; solicit Advisory Group members' availability for several date options
- Provide microphones for better audio

Meeting Agenda
Instream Flow Advisory Group
Meeting #2

Date:	May 16, 2013
Time:	1:00 pm
Location:	OWRB (Board Room) 3800 N. Classen, Oklahoma City

1. Welcome and Goals for Today 1:00-1:05 pm

2. Updates 1:05-1:15 pm
   - Information resources: ISF Website
   - Brief recap of Workshop 1

3. Legal Questions 1:15-1:30 pm
   - Responses to request for specific legal questions
   - Summary of issues identified by Advisory Group to date
   - Process for addressing the questions & comments

4. Supporting Information on Questions and Issues Identified to Date: 1:30-2:45 pm
   Presentation/Discussion Topics
   - Oklahoma Water Law: Stream Water Availability and Permitting Protocol
   - Excess & Surplus Water: Definitions, Procedures, Findings
   - Legal Mechanisms for ISF Protection: How do other states handle instream flow protections, water rights permitting, and administration?

5. Next Steps 2:45-3:15 pm
   - How can we best address the issues and questions raised?
   - What are the key questions posed?
     Other priority questions and issues?

6. Summary and Look-Ahead to Meeting #3 3:15-3:30 pm

Instream Flow Advisory Group Meeting #2 Notes

OWRB, 3800 N. Classen Blvd., Oklahoma City

May 16, 2013, 1:00 p.m.

ATTENDEES:

Tom Elkins, Cherokee Nation
Doug Hawthorne, OTRD/State Parks
Buck Ray, ODWC
Kevin Stubbs, USFWS
David Ocamb, Sierra Club
Jim Reese, OK Dept. of Agriculture
Kim Elkins, TNC
Mike Mathis, Cheasapeake
James Allard, Reclamation
Brooks Tramell, OK Conservation Comm.
Mark Derichsweiler, ODEQ
Bryan Taylor, USACE
Charlette Hearne, OWRP
Mike Fuhr, TNC
Jeff Converse, Canton Lake Assn.
Anna Childers, CH2M Hill
Shannon Brewer, USGS
Jim Barnett, EFO
Angie Burckhalter, Devon
Barry Bolton, ODWC
Brian Woodard, OIPA
Rick Wicker, OWRB
Bryan Mitchell, CH2M Hill
Derek Smithee, OWRB
Tinecia Hearne, ORWR
Brian Vance, OWRB
Owen Mills, OWRB
Jason Childress, OWRB
Tom Adams, Canton Lake Assn.
Rupert Nowlin, Canton Lake Assn.
Phil Moershel, OWRB
Jerry Barnett, OWRB
Terri Sparks, OWRB
Christine Akly, CH2M Hill
Marsha Slaughter, OKC
Marla Peek, OK Farm Bureau
John Rehring, Carollo
J.D. Strong, OWRB

[**bold font** indicates Advisory Group members or their delegates for this meeting]

Welcome, Goals and Updates

OWRB Executive Director J.D. Strong made opening remarks and asked participants to introduce themselves. He stated that the goal for today's Instream Flow (ISF) Advisory Group meeting was to further the dialogue on the issues and goals of a potential ISF program in Oklahoma, report back on some of the questions the group has brought forward, and further discuss the process of assessing potential ISF program options.

John Rehring, Carollo Engineers and ISF meeting facilitator, gave an update of activities since the last meeting. He noted that OWRB's Instream Flow (ISF) website is up and running, providing the group with easy access to meeting notes and other information that might be of interest. The group was urged to provide feedback/suggestions for the web site, and to continue to monitor it for new information.

Legal Questions

Mr. Rehring noted that he had distributed a synopsis of the issues identified by the group, reiterating that the summary was not meant to replace the detailed input provided by members, nor was it meant to prioritize or otherwise indicate consensus of the issues. He had also provided the group with copies of responses to his request for more detailed information on legal and policy concerns. Several of the responses that appeared predominant were chosen to facilitate group discussion:

1) Existing water rights--should they be protected? Should that be a major goal? While the group generally agreed that existing water rights should be protected, there continued to be concern that future water rights would bear the burden of protecting instream flows if a program were implemented. John noted that such issues were important, and that is why we asked that legal questions and concerns be fully identified; so we can assess valid concerns and seek ways to avoid conflict as the potential for an instream flow program is considered.
2) Authority already exists for ISF program -- One member suggested that it is already possible to apply for instream water rights; OWRB has already issued a consumptive water right for a fish hatchery in Durant, setting a precedent that can be applied in other situations.
3) What lessons have been learned from the Baron Fork? Have the impacts of ISF provisions on the Baron Fork River been monitored? Mr. Jim Barnett, EFO, suggested that it would be more agreeable to look at implementation of ISF on a designated scenic river where there is clear legal authority; obviously, the OWRB thought the Scenic Rivers Act provided clear authority at the time a minimum streamflow was set on the Baron Fork.

It was agreed that the consultants and OWRB would provide additional information on the status of the ISF program on the Baron Fork and on permitting protocol for the Durant fishery at the next meeting. Mr. Strong emphasized that the OWRB would like to hear and understand all concerns; some we can hopefully address now, but some we cannot—hopefully today's presentations will help answer some of the pressing questions. Mr. Rehring noted that the problem is that many of the questions and answers are necessarily abstract until we can look at an actual watershed situation.

Presentations/Discussion Topics

Rick Wicker, OWRB Permitting Section, gave a presentation on permitting protocol for stream water permits, including policies on domestic use set aside and permitting guidelines on scenic rivers. Some of the questions and answers pursuant to the presentation are summarized below:

Q: Has the OWRB ever turned down a permit?

A: Yes, but staff tries to work with an applicant so that they get at least a portion of the amount of water they are requesting.

Q: Is available water based on average annual flow?

A: Yes, it is based on mean (or average) annual flow.

Q: Please give more details on the model used to determine water availability.

A: The model is based on USGS's national study on runoff using a digital elevation model with a resolution of 60x60 meters. The runoff data is based on stream gage data from the years 1951 to 1980.

This period includes several exceptional drought periods, including the drought of record of the mid-1950s.

Q: How is groundwater/stream water interaction determined?

A: Under current law, conjunctive use is not considered in permitting actions, except in the Arbuckle Simpson aquifer. Specific legislation was passed designating the Arbuckle Simpson as a sole source aquifer and requiring special permitting considerations, including groundwater/stream water interactions.

Q: Does calculation take storage of farm ponds into account?

A: It does not consider many of the small private ponds for which the OWRB has no information, but it does take into account yields of major reservoirs and estimated storage of NRCS sites.

Q: If a permit is denied, could an applicant get water anyway upon appeal?

A: They could appeal the determination. However, OWRB staff tries to work with an applicant so that they get at least a portion of the amount of water they are requesting. [The applicant often has the opportunity to take a lesser amount of water, apply for a groundwater permit, or change to a seasonal or term permit.]

Q: Is domestic use metered or does OWRB assume that domestic use is within the allowable amount?

A: Domestic use is not metered, so staff assumes full use of the set-aside quantities as described in the presentation.

Q: What if streamflow has changed from the period used to determine permit availability, i.e. 1951-1980s?

A: It is important that staff uses the same criteria in calculating permits in order to be fair to all applicants. However, staff is in the process of updating our models which will hopefully be completed over the next ten years.

Q: How do applicants even know how much water they are using? Do they estimate?

A: Yes, unless they have meters. [A short discussion on some of the issues involving metering of water use followed, including that some entities report more than they use due to "use it or lose it" statutory requirements, and statutes actually prohibit metering unless a majority of landowners request it.]

Mr. John Rehring then made a presentation on the calculations used to determine excess and surplus water for purposes of the *2012 Oklahoma Comprehensive Water Plan Update* (2012 OCWP Update). Some of the questions/discussion following that presentation included:

Q: Why is it important for this group to understand excess and surplus water?

A: Several Advisory Group members requested this information. If instream flows were adopted, it could reduce the amount of surplus water available for use outside a basin. Conversely, understanding the volumes of water protected from allocation to sustain domestic uses, reservoir yields,

downstream uses, and interstate compact obligations suggests that some amount of instream flow protection exists already.

Q: Even though a basin is shown to have excess or surplus water, this does not guarantee water will be available at all times, does it (since it is calculated on average annual flow)? (i.e., the water might not be there when conditions are drier than average.)

A: That is correct. Calculations based on average annual streamflow are in accordance with law and policy; applicants know when they get a permit that there is also priority between users and never a guarantee that water will be available.

Q: In basins where there is no green shown on the graph [no excess/surplus water], does that also indicate that there is no water available for designated instream flow?

A: No, not necessarily.

Q. In basins designated as hot spots, does that indicate water would not be available for instream flows?

A: Not necessarily; also, some basins were hot spots for groundwater and/or water quality reasons, rather than stream water.

Anna Childers, CH2M Hill, then gave a presentation on how other states with instream flow provisions addressed some of the concerns/issues voiced by the ISF Advisory Group members. Some of the issues/questions raised relative to the presentation are as follows:

Q: In Colorado, are provisions for loaning of water rights for instream flow purposes on a voluntary basis?

A: Yes, rights can voluntarily be loaned on a temporary basis.

Q: Did any of the states have a process to review ISFs once a number was set? How do you review the number over time? Should it be higher? Lower?

A: Yes, some states had some type of provisions, but we will have to research the specifics; this is a good action item for us to review and revisit at a future meeting.

Q: Are permit holders subject to losing water rights under Oklahoma law?

A: Yes, definitely. The seven-year "use it or lose it" aspects were explained, along with the role of submitting a schedule of use for OWRB approval for entities that need extended time periods to perfect water rights.

Q: Has Texas begun implementing an instream flow program?

A: Yes.

Q: Do other states have provisions for extreme climatic conditions, such as extended droughts, that allow human consumption to trump over maintaining instream flows when set?

A: California did not remove instream flows, but did decrease base flow protections; Texas puts a call on river flow for municipal and agricultural priority; some states allow municipal use to take priority if a shortage is proven.

Q: Did other states demonstrate adverse economic impacts resulting from ISF programs?

A: Most states show benefits; also, senior water rights were protected. Measuring economic impacts – positive or negative – is difficult.

Q: Do you have a sense for when ISF programs became initiated? Can you provide dates?

A: Colorado in 1973, Kansas in 1984; we will provide dates for other states.

Q: Was the designation for the Baron Fork done through the Scenic Rivers Act?

A: Yes. [It was suggested that the 50 cfs designation be looked at. Is it overprotective? Is it adequate? Has anyone been stopped from using water if the flow went below 50 cfs?]

Next Steps and Summary

Mr. Rehring suggested that that the group reviews the summary of legal issues and other questions and determine some priorities to address. He noted that we have talked about what flow or water may be available via existing programs (e.g., domestic use set-aside), but not about what flows might be needed. He further indicated that thus far we have been asking abstract questions, but cannot answer them in the abstract. For example, flow goals would not be the same for all streams. Thus, the group might give consideration to analyzing the Baron Fork program and other watershed-specific areas.

One group member asked that we look at case law in other states to see what happens when a lawsuit is filed in response to, or in advance of, an instream flow designation, i.e., people go to court when they have a problem; there is interest is seeing what kind of problems have been encountered elsewhere with instream flows. That point was countered with the need to also look at what might happen if you do not consider instream flow needs. Another request was to look at the costs that other states have associated with instream flow programs, such as staff, flow monitoring, etc.

Mr. Strong suggested that maybe it is time to look at some specific watersheds and try to better define what is needed for instream flow, as well as to see if the domestic use set-aside is adequate. We may find that some concerns may be invalid; we may also find new concerns that were not anticipated—we will never know unless we run the numbers.

A suggestion from one member was to lay out what streams could be taken off the table based on 2012 OCWP Update information—i.e., streams that are fully appropriated, basins that have no excess or surplus water, hot spot basins, etc. However, it was pointed out that--absent specific information on the type of intream flow program being considered—even those basins might not necessarily be excluded from consideration. For example, even intermittent streams depend on seasonal flow levels for fish propagation.

To sum up actions to be taken for the next meeting, staff will look at:

1) History of instream flow designation on the Baron Fork (basis of authority, effects observed since implementation, etc.).
2) Dates when western states' instream flow programs were implemented and methods adopted for program review.
3) Permitting protocol for recreation fish and wildlife (including Durant Fish Hatchery)
4) Review of Case Law involving instream flow issues.
5) Consideration of area(s) in which preliminary assessments could be used to compare existing flows and programs to a defined need or goal.

Excess and Surplus Water: Definitions, Procedures, Findings

Instream Flow Advisory Group Meeting 2
May 16, 2013

Statutory Requirements for the OCWP

- Codified at 82 O.S. 1086.2(I)
- Must include…
  - Definition of "excess and surplus water of this state"
  - Recommended procedure for determining "excess and surplus water of this state… to ensure that the area of origin will never be made water deficient."

Excess & Surplus Water

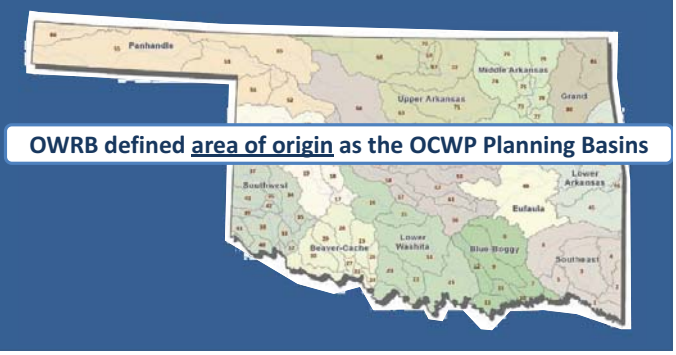
Protecting Local Water Needs While Addressing Statewide Demands

Adopted Definition:

"Excess and surplus water" means the projected surface water available for new permits in 2060, less an in-basin reserve amount, for each of the 80 basins as set forth in the 2012 OCWP Watershed Planning Region Reports whose surface water is under OWRB jurisdiction (excepting the Grand Region); provided that nothing in this definition is intended to affect ownership rights to groundwater and that groundwater is not considered excess and surplus water.

Adopted Procedure:

1) *Each of the 82 OCWP watershed planning basins shall be considered an individual stream system wherein water originates (i.e., area of origin) for purposes of appropriation and permitting.*



OWRB defined area of origin as the OCWP Planning Basins

Adopted Procedure:

2) *The total annual amount of available stream water for new permits in 2060 is equal to the total Surface Water Permit Availability amount as set forth in the OCWP Watershed Planning Region Reports minus the amount of the annual Anticipated Surface Water Permits in 2060 also set forth in those reports. The in-basin reserve amount is equal to 10% of the total Surface Water Permit Availability amount plus 10% of the annual Anticipated Surface Water Permits in 2060.*

DATA FROM OCWP WATERSHED PLANNING REGION REPORTS

Total SW Available for New Permits in 2060 = Total SW Permit Availability for Basin − Anticipated SW Permits in 2060 in Basin*

In-Basin Reserve Amount = 10% of Total SW Permit Availability + 10% of Anticipated SW Permits in 2060

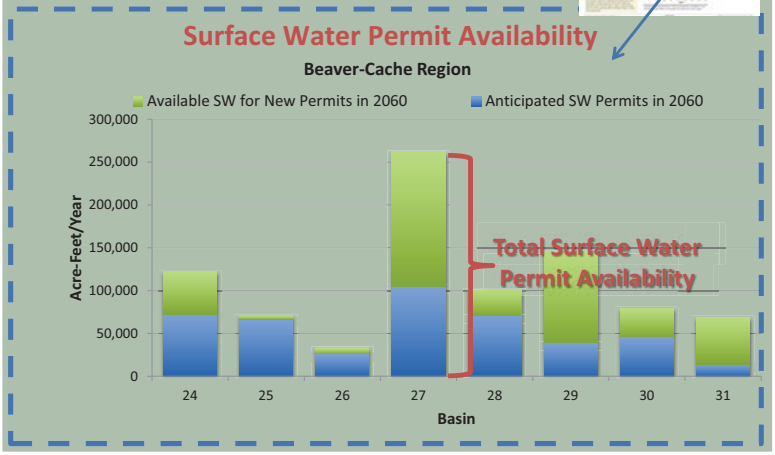
** Includes current and future anticipated permit needs, reservoir yields, existing out-of-basin transfers, downstream future permit needs (one basin downstream), a domestic use set-aside, and compact obligations*

Adopted Procedure:

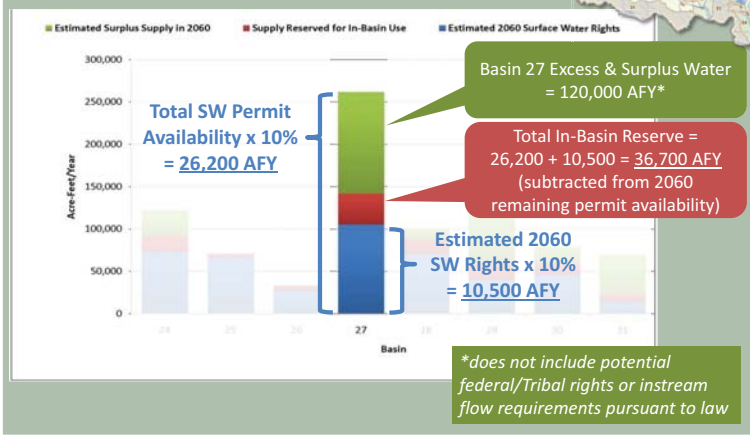
3) *In considering individual applications for permits to transport and use more than 500 acre-feet of stream water per year outside the stream system wherein the water originates, the Board shall determine whether there is "unappropriated water available in the amount applied for" by considering only the remaining amount of excess and surplus water calculated for the stream system where the point of diversion is proposed, and for stream systems located downstream from this proposed point of diversion, provided this procedure shall not be used to reduce the amount authorized under existing permits and water rights.*
4) *The Board will also exclude from consideration for any permit for out-of-basin use:*
   a) *the quantity of water adjudicated or agreed by cooperative agreement or compact to be reserved for Federal or Tribal rights, and*
   b) *the quantity of water reserved for instream or recreational flow needs established pursuant to law.*

- Applies to trans-basin permit applications >500 AFY
- Review of application only considers remaining E&S
- Excludes the quantity of water adjudicated or agreed by cooperative agreement or compact to be reserved for Federal or Tribal rights
- Excludes the quantity of water reserved for instream or recreational flow needs established pursuant to law.

Calculating Surplus Water



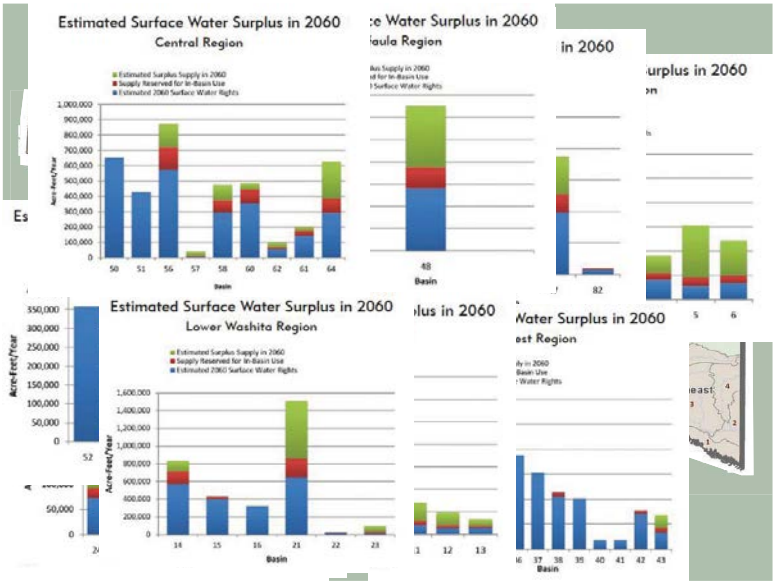
Example
Calculating Surplus Water



**does not include potential federal/Tribal rights or instream flow requirements pursuant to law*

Results

- 52 of 80 basins have surplus water
  - Low: Beaver-Cache Basin 26 – 800 AFY
  - High: Lower Ark. Basin 46 – 7.37M AFY
- 28 of 80 basins have no surplus water
- No excess/surplus water in the Panhandle or West Central Regions
- Not assessed for the two basins in the Grand Region (GRDA authority)



Support for Instream Flow Advisory Group

Legal Mechanisms for ISF Protection
How do other states handle instream flow permitting, water rights, and administration?

ISF Advisory Group Meeting 2: May 16, 2013

Input from ISF Advisory Group orientation workshop

ISF Orientation Workshop Input

- ISF program could impact existing water allocations: future and existing permits
- Different mechanisms are used in states with ISF programs to address water rights

Scope

Overview

- States with prior appropriation doctrine
- De jure ISF laws v. de facto ISF protection
- ISF Protection – how administered:
  - With consumptive rights
  - During drought
  - With unapproriated water
- Provide examples

Terminology

Terminology

- Consumptive
- Nonconsumptive
- Prior appropriation doctrine
- Instream flow
- Environmental flow
- Minimum desirable stream (MDS) flow

Drivers and considerations in other states

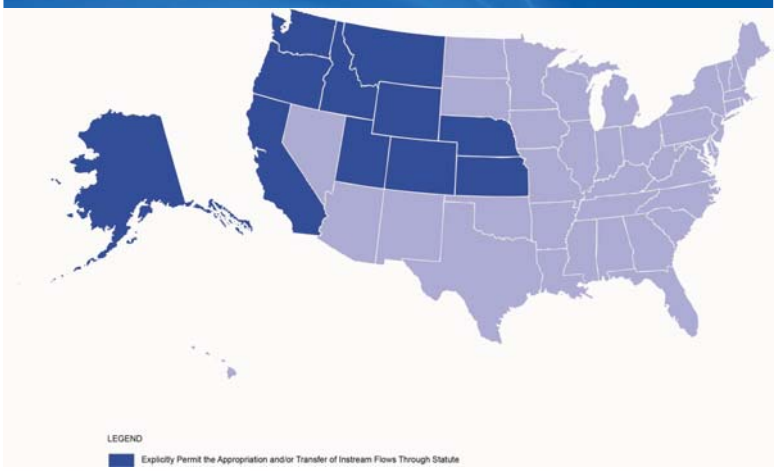
Drivers

- Drivers (internal and external)
  - Recreational uses
  - Interest of general public (social, economic, and environmental values)
  - Aesthetics
  - Water quality
  - Maintenance of riparian areas
  - Maintenance of fish and wildlife
  - Legal compliance (external): ESA, CWA, FERC, USBR, USACE

Drivers and considerations

Considerations

- Considerations:
  - Interstate compacts
  - State laws:
    - No-injury rule
    - Use it or lose it
  - Federal reservoir purpose/authorization and water management decisions
  - Economics
  - Incidental ISF protection and “other” water sources: baseflow, runoff, reservoir releases



Legal mechanisms for ISF protection

Permit Conditions

- Water quality standards: Section 401 certification, water quality criteria
- Minimum flows: Necessary flow regimes, stream segment designations, biologically-based flow standards, and/or target flows

Legal mechanisms for ISF protection

Administration

- Other states manage ISF programs by governor-appointed ISF boards, state agencies for water, wildlife and parks, and special water courts
- ISF recommendations, study plans, requests and prioritization
- Through state legislation:
  - Evaluate and review permits
    - Physical protection (stream gauges)
    - Legal protection (water appropriations)
  - Approve or deny

Legal mechanisms for ISF protection

Priority Status of ISF Rights

- Senior rights:
  - ISF rights have no priority status over other uses (all states)
  - New ISF appropriations do not affect senior surface water appropriations (all states)
  - Priority date for MDS flow will be junior to permits previously issued (KS)

Legal mechanisms for ISF protection

Priority Status of ISF Rights

- Junior rights:
  - Can be called on to lower their diversion if ISFs fall below the MDS flow (KS) or ISF appropriation (CO, MT)
  - Future water reservations for consumptive use and ISF (MT): priority date later will become an appropriation date
  - ISF transfers: consumptive to ISF
    - Specific use: fisheries (MT)
    - Appropriation date and priority remain intact

Legal mechanisms for ISF protection

During Drought

- Water rights and ISF:
  - Water right owners can temporarily loan water to administrative agency without judicial approval (CO)
  - Junior water rights diverting out-of-priority can be restricted (CO, MT)
  - No special regard to appropriations and ISF during drought. MDS program applies only to other appropriations (KS)
- Releases from state-owned reservoirs (KS)

Legal mechanisms for ISF protection

Unappropriated Water

- ISF water is unappropriated water only (NE, AK, ID)
  - Unappropriated water available is to provide ISF rates at least 20 percent of the time requested in NE
- Water conservation and doctrine of forfeiture: (use it, or lose it)
  - Some states protect conserved water from forfeiture or abandonment (CA, CO, UT)

Overview

Ways to Address ISF Protection

- Explicit rules define the implementation of ISF programs in other states
- Target flows or minimum flows are the focus of ISF programs
- Senior water rights are a priority and protected
- ISF rights can be acquired, amended, and transferred, either permanently or temporarily

Stream Water Availability Calculations & Instream Flow Considerations

Instream Flow Advisory Group
ISF Advisory Group Meeting #2
May 16, 2013

State of Oklahoma
OWRB
WATER RESOURCES BOARD
the water agency

Overview Oklahoma Stream Water Law

Domestic Use of Water (no permit required):

- ...for household purposes, including farm and domestic animals up to the normal grazing capacity of the land… and for the irrigation of land not exceeding 3 acres for the growing of gardens, orchards and lawns
- ...for non-household purposes, including agriculture, fire protection, and other non-household entities for drinking water purposes, restroom use, and the watering of lawns **not to exceed 5 acre-feet per year**

Water Use Permitting Requirements

- Applications required (except for domestic use);
- Notice of application (hearing if protested):
  - mail notice (Groundwater)
  - publish notice (Groundwater & Surface Water)
- Administrative Procedures Act process(Protests, hearings)

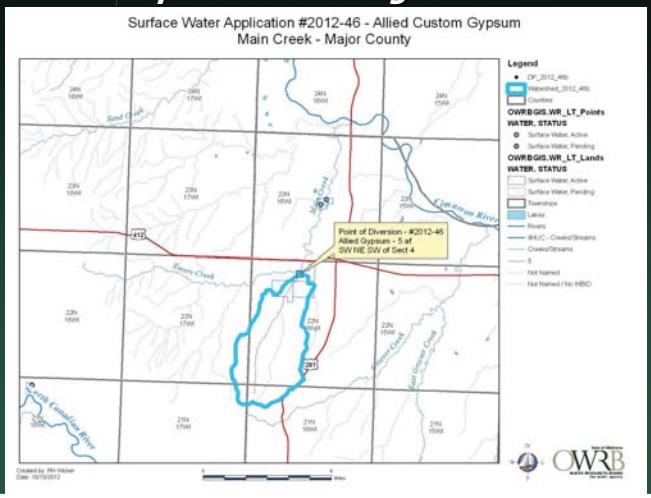
Stream Water Calculations

1.) Is there water available for appropriation at the proposed diversion point in the amount applied for?

Rule provides for the consideration of…

- mean annual precipitation runoff in the watershed above proposed diversion point, the mean annual flow, stream gauge measurements, (runoff from 1951-1980 as calculated by the USGS; ArcInfo Watershed Model used to determine watershed characteristics)
- We subtract from the mean annual runoff: estimated domestic use within full watershed, existing appropriations, reservoir dependable yields and NRCS lakes normal storage
- Board may consider other evidence if presented

Stream Water Availability Upstream Drainage Basin



Stream Water Calculations

2.) Will the proposed diversion interfere with downstream domestic uses and prior appropriations?

- Downstream appropriations and domestic uses on the stream main stem (from the proposed diversion point to the next major tributary) are subtracted from the available water at the diversion point
- Additional drainage below the diversion point may be looked at if needed to determine if interference is likely to occur.

Stream Water Calculations

Domestic Use Set-aside:

- Rule states 6 acre-feet per household per year or 3 acre-feet per year non-household domestic use.
- Calculation Assumptions:
  - Generally use the 6 a.f. household use instead of the 3 a.f. non-household domestic use value.
  - We assume 1 household per 160 acres of land, based on original homestead farms. Less acres per user would be more conservative.
  - Assume this intensity of household use over the entire delineated watershed upstream of proposed diversion point, instead of simply the lands riparian to a stream.
- Rules provide for the presentation of more accurate evidence (i.e. census data, land use studies, GIS layers, aerial photos)

In-stream Flow Protection

- Default criteria to protect existing water right holders also provides a level of in-stream flow protection.
  - Permitted for 2010: Surface Water, 2.6 million AF; Groundwater, 3.5 million AF
  - Actual Reported Use in 2010: Surface, 1.4 million AF; Groundwater, 0.8 million AF
- Default domestic use set-aside (6 AF & 160 acres)
  - current rule does not specify how many acres each household should have
  - But rule allows for consideration of more or less stringent, basin-specific evidence.

Scenic River Considerations

- Additional factors to be determined for Scenic River watersheds:
  - Quantity of water requested in comparison with mean annual runoff at the diversion point
  - Quantity of flow needed for recreational and sustaining of fish species
    - On the Barren Fork Creek a flow restriction of 50 cfs at the Eldon, OK gage will be considered as needed
  - The potential of the existing water quality to be adversely altered by a water diversion

Conclusions

- Domestic Set Aside provides an easy method for preserving stream flow
  - Can be adjusted to different regions of state to be more or less conservative
  - Automatically increases going downstream as the watershed increases
- Scenic Rivers can be a starting place for regulating instream flow
- Questions?

Meeting Agenda
Instream Flow Advisory Group
Meeting #3

Date:	October 7, 2013
Time:	1:30 pm
Location:	OWRB (Board Room) 3800 N. Classen, Oklahoma City

1. Welcome 1:30-1:40 pm
   - Introductions
   - Review Agenda and Goals for Today
   - Brief recap of Workshop 2

2. Baron Fork ISF Case Study
   - Brief History of the Baron Fork Creek Instream Flow Provisions (Smithee/OWRB) 1:40-1:55
   - OWRB Permitting Protocol for Recreation/Fish & Wildlife (Wicker/OWRB) 1:55-2:10
   - Review of Instream Flow Methods and Application to Baron Fork Creek (Olson/CH2M Hill) 2:10-2:55

   – *Brief Break* –

   - Discussion 3:00-3:20

3. Path Forward: Status and Next Steps 3:20-3:45
   - Process overview from OCWP Priority Recommendation for Instream Flows
     - Address the legal and policy questions.
     - Study other mechanisms for protecting instream flows.
     - Develop a draft methodology for instream flow studies in Oklahoma.
     - Conduct a study on the economic impacts of instream flows in Oklahoma.
     - Perform an instream flow pilot study in a scenic river.
     - Preserve the Instream Flow Workgroup.
   - Next Meeting & Next Steps

4. Public Comment 3:45-4:00

Adjourn 4:00

Instream Flow Advisory Group Meeting #3 Notes

OWRB, 3800 N. Classen Blvd., Oklahoma City

October 7, 2013, 1:30 p.m.

ATTENDEES:

Tom Elkins, Cherokee Nation
Tom Creider, OTRD/State Parks
Mike Mathis, At-large
Brooks Tramell, OK Conservation Comm.
Mark Derichsweiler, ODEQ
Charlette Hearne, OWRP
Jeff Converse, Canton Lake Assn.
Anna Childers, CH2M Hill
Forrest Olson, CH2M Hill
Brandon Brown (for Shannon Brewer), USGS
Jim Barnett, EFO
Beth Rooney, Spring Creek Coalition
Jennifer Owen, Spring Creek Coalition
Nathan Madenwald, OKC
Bud Ground, PSO
Tyler Powell, OK Sec. of Environment
LeeAnna Covington, OK Farm Bureau
Julie Cunningham, OWRB
Bill Cauthron, OWRB
Lindy Clay, OWRB
Jason Childress, OWRB
Rebecca Veiga, OWRB
Lynda Williamson, OWRB
Darla Whitley, OWRB
Mary Nell Bruggen, OWRB
Brian Woodard, OIPA
Angie Burckhalter, Devon
Rick Wicker, OWRB
Owen Mills, OWRB
Bryan Mitchell, CH2M Hill
Derek Smithee, OWRB
Jason Childress, OWRB
Terri Sparks, OWRB
Perry Soltani (for Marsha Slaughter), OKC
Marla Peek, OK Farm Bureau
John Rehring, Carollo
J.D. Strong, OWRB

*[**bold font** indicates Advisory Group members or their delegates present for this meeting]*

Welcome

OWRB Executive Director J.D. Strong made opening remarks and asked participants to introduce themselves. John Rehring, Carollo Engineers and meeting facilitator, went over the Agenda and gave a brief summary of the previous meeting.

Baron Fork ISF Case Study *(for PowerPoint presentations, refer to ISF webpage: http://www.owrb.ok.gov/supply/ocwp/instreamflow.php)*

Brief History of the Baron Fork Creek Instream Flow Provisions: Derek Smithee, Chief, OWRB Water Quality Division, discussed Baron Fork's status as a scenic river and went through a chronology of various instream flow provisions applied to the Baron Fork and changes in methodologies since the OWRB Board adopted the first related policy in 1981. While the earliest instream flow provision was apparently set to protect lake levels/prior rights at Lake Tenkiller, the latter provisions were in response to permit applications filed by Adair County RWD #5 for direct diversions from the Baron Fork for public water supply.

In response to a question, Mr. Smithee indicated that the change in 2003 from the technical committee's recommended limit of 35 cfs [i.e., diversions from the Baron Fork were to be restricted when flows went below this number] to 50 cfs was somewhat political [see slide 16]. However, he emphasized that the Board originally favored a 35 cfs limit because they were being conservative, not necessarily because it was a precise technically-derived number. He went on to explain that the numbers were based on figures derived from a study completed by Dr. William L. Fisher in 2000 using an IFIM methodology, with results supporting a range of low-flow limits from 30 to 75 cfs.

General discussion pursued about why some of the numbers were chosen and how they were derived. Mr. Strong followed up by noting that there is really no one correct number; many factors come in to play and the final decision would probably be as much policy-based as science for any instream flow decision anywhere in the United States.

OWRB Permitting Protocol for Recreation, Fish and Wildlife: Rick Wicker, OWRB Permitting Section, discussed the protocol followed by staff in processing permits for recreation, fish and wildlife (RFW) purposes. He noted that there were four kinds of RFW permits issued based on standard industrial classification codes and gave examples of permits issued and amounts under the different classifications.

Several questions followed concerning how the permitted amount of water varied, especially in the case of the Tishomingo National Wildlife Refuge. [This application requested all of the remaining available water in lower Pennington Creek in order to keep the Cumberland Pool filled.] Mr. Wicker stressed that the application was filed in 2005 and has not been approved pending receipt of additional justification.

Another person questioned whether landowners adjacent to a creek could apply for all the water in the creek for fish and wildlife purposes. Mr. Wicker indicated that there is not a precedent for such an application, and an instream flow study would probably need to be completed. Many factors would have to be considered to determine how much water was actually needed for such purposes. He noted that it is up to the applicant to provide justification for the amount of water being requested.

Review of Instream Flow Methods and Application to Baron Fork Creek: The final presentation, given by Forrest Olson, CH2M Hill, summarized the results of his review of instream flow methods and application to Baron Fork Creek. Mr. Olson emphasized that there is not a single answer to questions such as "How much water do fish need?" Rather, "instream flow issues are matters of values more so than science." Mr. Olson provided background on principles critical in considering alternative instream flow regimes and briefly summarized the types of instream flow methods. He also summarized the results of various instream flow methods which were applied to the Baron Fork Creek [see Slide 21].

Mr. Olson was asked to elaborate on how drought conditions can be predicted. He indicated that many western states rely on snowmelt from the mountains to feed streams and rivers. If there is low snowpack in the winter, then you can assume the rivers will have decreased streamflow in the summer. The snowpack relationship may help predict droughts in a large stream like the Arkansas River but not in the other smaller streams in Oklahoma.

Mr. Strong noted that the IFIM flowchart [refer to Slide 15] shows a process, not just looking at fish habitat, thus bringing in all considerations and concerns in an effort to provide more balance on water issues. Derek Smithee said that some states set instream flow requirements using a single number, such as 30% of mean annual flow, to make the process less complicated, but then usually provide an opportunity to do more detailed studies, such as an IFIM.

Discussion/Questions: Mr. Rehring then indicated that the Agenda allowed time for additional discussion and questions, which are summarized below:

- Was there any follow-up to see whether diversions on the Baron Fork (specifically Adair County RWD #5's) ceased when the gage at Eldon dropped below 50 cfs?
    - Julie Cunningham, Chief of the OWRB's Planning and Management Division, said that permit compliance relied on self-monitoring like other water right permits. She noted that if there were any complaints or allegations that the District was using water contrary to their permit conditions, the OWRB would investigate and could enforce the permit. However, there have not been any such complaints to her knowledge.
    - It was noted that all permit holders must, by statute, report their annual water use to the OWRB.
- Was there any economic impact analysis conducted regarding how Adair RWD #5 would meet their water demands when diversions were restricted?
    - An economic analysis of alternatives was conducted when the limits on diversions were first considered, with a conclusion that off-stream storage would be the best approach to providing supplies under such conditions. OWRB staff will check files and put any information found on the instream flow website and/or e-mail.
- We would like to know the economic impacts of a minimum instream flow limit, i.e., tourism impacts.
    - This is one of the parameters we would want to evaluate with a watershed-specific pilot study.
- CH2M Hill's report shows that the domestic use set aside would not provide as much instream flow as might be recommended by various methods. Therefore, we cannot assume that the domestic use set aside meets instream flow needs in every basin. It may or may not provide sufficient instream flow in other basins.
    - However, it was also noted that the degree to which domestic use set aside meets the agreed-upon target would depend on the instream flow requirement you set through a combination of technical analyses and policy decisions.
- Perhaps all the questions and concerns show why a pilot study would make sense.
- A process needs to be developed for a pilot study in the Baron Fork, from start to finish, which includes monitoring.
- Should we expand the pilot study to rivers other than the Baron Fork, such as the Illinois which is facing faster growth, has impoundments, wastewater discharges, etc? Then the pilot could address a bigger array of issues in a basin with greater population and potential impacts on consumptive users, rather than the limited ones encountered on a stream such as the Baron Fork.
- What is the idea of a pilot study? Is it to develop a process? The Baron Fork does not have a lot of issues, so it won't help address various issues that we see elsewhere.
- While the Illinois may be more complicated, it is certainly less complicated than many other basins in other parts of the state.
- We still have not determined that there is even a need to look at instream flow provisions. How do we determine if there is a need?
    - The impacts of having, and not having, an instream flow program can best be evaluated in the context of a specific basin. A pilot study would help assess those.
- Maybe we could look at what might happen if there were no flows in several basins, as shown in the OCWP surface water shortage analyses; we could use the Oklahoma H2O Tool to run some different scenarios.

Path Forward: Status and Next Steps

John Rehring went over the OCWP Priority Recommendation for instream flows, briefly noting the steps in the path developed by the previous instream flow work group that have been fully or partially accomplished and those that have not. After some discussion, J.D. Strong suggested that we should be more concerned about developing a process, such as shown in the IFIM flow chart presented by Mr. Olson [Slide #15], rather than developing a specific number. He suggested developing a process for a pilot study which incorporates a process for addressing any outstanding concerns/issues, including economic impacts associated with the setting of instream flow requirements in Oklahoma. It was agreed that OWRB and consultants would develop a suggested piloting approach/process for review prior to the next instream flow meeting, which is tentatively scheduled for January 2014. The process should be geared toward assessing the list of benefits, issues, and concerns identified in previous meetings by the Instream Flow Advisory Work Group. OWRB staff will also distribute the Corps of Engineers' study on alternative water supply for Adair County RWD #5 if it is available.

Public Comment

Representatives from the Spring Creek Coalition voiced their concerns that diversions from Spring Creek [Grand River Dam Authority jurisdiction] by Peggs Water Company would adversely impact the stream flow.

Brief History of the Baron Fork Creek Instream Flow Provisions

Derek Smithee

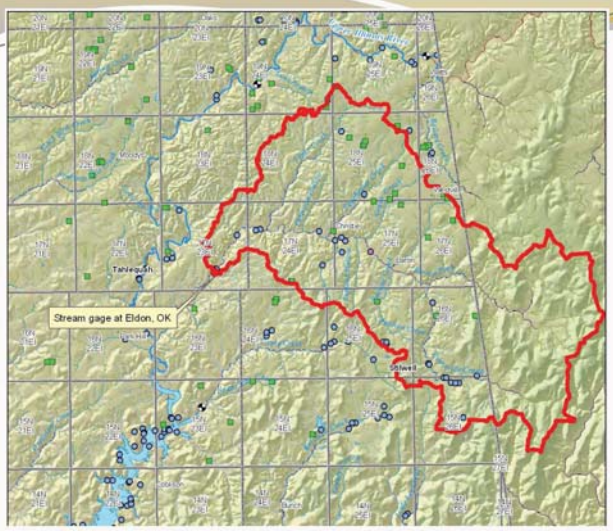
State of Oklahoma
OWRB
WATER RESOURCES BOARD
the water agency

Scenic Rivers Act

- Baron Fork was designated a Scenic River in 1970.
- Statutory language states that:
  - *"The Oklahoma Legislature finds that some of the free-flowing streams and rivers of Oklahoma possess such unique natural scenic beauty, water conservation, fish, wildlife and outdoor recreational values of present and future benefit to the people of the state that it is the policy of the Legislature to preserve these areas for the benefit of the people of Oklahoma. For this purpose there are hereby designated certain "scenic river areas" to be preserved as a part of Oklahoma's diminishing resource of free-flowing rivers and streams."*

Oklahoma's Scenic Rivers

- In June 1981, the Board adopted a policy of prohibiting direct diversions from the Baron Fork when:
  - The flow at the Eldon gage is less than 50 cfs, or
  - Tenkiller Reservoir is below elevation 632.0 feet msl
- The policy addressed concerns regarding the dependable yield of Tenkiller as well as protecting Baron Fork flows



Adair County Rural Water District #5 Permit

- In September 1988, Adair County RWD #5 filed for a permit (App. 88-33) to use 75 acre-feet of water per year from the Baron Fork at a maximum diversion rate not to exceed 150 gpm.
- Applicant's Engineer requested that an unrestricted permit be issued.

- At its April 20, 1989 meeting, the Board adopted a new resolution placing a 13.5 cfs diversion restriction on future permits issued from the Baron Fork.
  - Specific basis for previous 50 cfs restriction unknown
  - 13.5 cfs flow restriction based on an instantaneous flow that would be equaled or exceeded 80% of the time
- Protestants objected to the 13.5 cfs condition:
  - asserted that the April 20, 1989 resolution constituted an ineffective rule because rulemaking had not been followed in its adoption
- At the Board's July 13, 1989 meeting, the permit was issued without any flow condition or restriction.

- OWRB, ODWC, OSRC continued to work together to implement stream flow protection.
- OWRB rules amended in 1994:
  - Set out additional factors to be determined for scenic rivers and outstanding resource waters
  - Provided a flow restriction of 50 cfs for sustaining existing fish species in the Barren Fork Creek unless information to the contrary is shown

- On May 31, 1994, Adair 5 filed for a permit (App. 94-34) to divert an additional amount of water from the Baron Fork.
- The application was protested by the Office of the Attorney General on behalf of the ODWC and Oklahoma Wildlife Federation (OWF).
  - A study entitled "Preliminary Instream flow Assessment for the Barren Fork Creek, Oklahoma," was conducted on behalf of the ODWC by Dr. William G. Layher.

Layher Study

- Used method referred to as the Proportional Analysis Method
- Recommended a minimum flow of 75 cfs, which corresponds to the average median flow without diversions during the low-flow months (July through October)
- An analysis of the methods used showed that site specific information and field-verified data was lacking.
- Pending additional study, Adair 5's permit was issued in June 1998 with a condition that diversions cease when flows drop below 75 cfs at the Eldon gage.

Layher Study

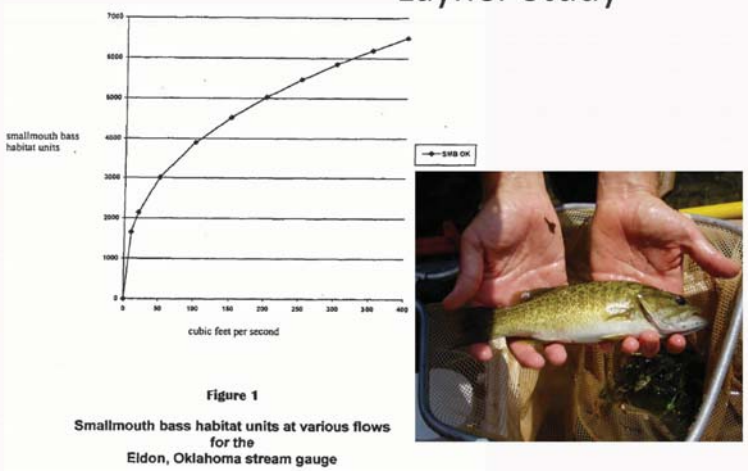
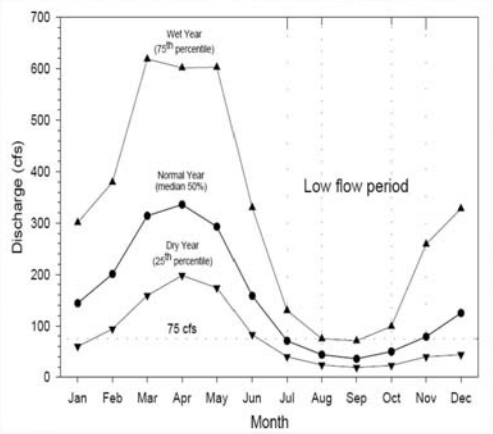


Figure 1

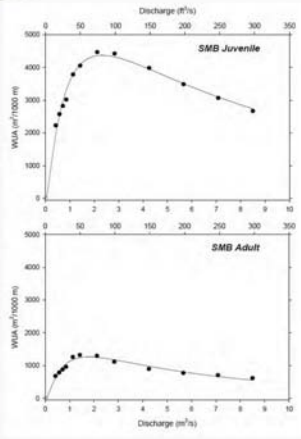
Smallmouth bass habitat units at various flows for the Eldon, Oklahoma stream gauge

Fisher Study

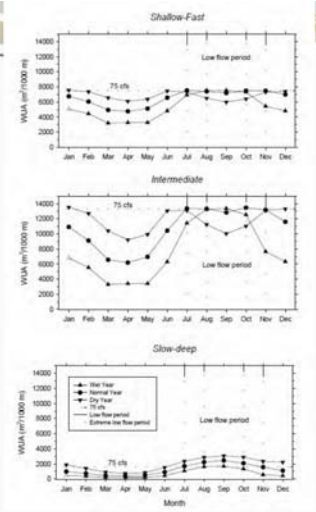
- "Instream Flow Assessment of Baron Fork Creek, Oklahoma"
  - Dr. William L. Fisher and W. Jason Remshardt, OSU, in August of 2000
- Instream Flow Incremental Methodology (IFIM).
  - Analysis of alternative streamflows focused on annual low-flow period
  - Baseline conditions were defined as monthly median streamflows during this period
- Provided organizational framework for evaluating alternative water management options in the Baron Fork.



Monthly median, 25th percentile and 75th percentile discharge in Baron Fork (Fisher Study)



PHABSIM Modeling



WUA and discharge for fish assemblages

The Fisher Study model results indicate that instream flow recommendations could support a minimum instream flow of between 30 and 75 cfs, depending on how the results are interpreted and the level of protection deemed appropriate for the stream.

Current Rule

- A technical committee recommended 35 cfs as the floor.
- Following public review, this was changed to 50 cfs
- In 2003 rulemaking, OAC 785:20-7-3.1 was modified to require suspension of all future permitted withdrawals from Baron Fork Creek when the flow is less than 50 cfs at the Eldon gaging station.

OWRB Permitting Protocol for Recreation/Fish & Wildlife (RFW)

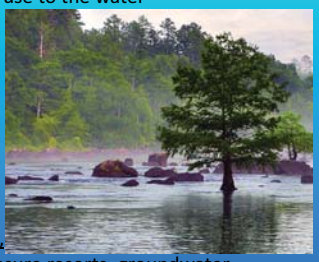
Instream Flow Advisory Group
Meeting #3, October 7, 2013

Rick Wicker, Environmental Program Specialist
Planning & Management Division

State of Oklahoma
OWRB
WATER RESOURCES BOARD
the water agency

Basics of Oklahoma Stream Water Law

- Stream water is publicly owned and subject to appropriation by the OWRB
- "First in time, first in right:
  - Application Date establishes priority use to the water
- "Beneficial use is basis and limit of the appropriation right"
  - Beneficial uses include: "agriculture, irrigation, mining, oil & gas drilling & recovery, milling, manufacturing, power, industrial, public water works for cities & towns, stock raising, public parks, game mgmt. areas, propagation & utilization of of fisheries, recreation, housing developments, pleasure resorts, groundwater recharge, or any other beneficial purpose."



Basics of Oklahoma Stream Water Law

Five Points of Stream Water Law:

- **Unappropriated water has to be available in amount applied for**
- **There is a present or future need for the water—amount has to be justified**
- **The use is beneficial**
- **Use will not interfere with domestic or existing uses**
- **Use will not interfere with uses within stream system of origin (Out of stream system use must protect reasonably foreseeable future use in stream system (50-year))**

Recreation/Fish & Wildlife (RFW) Permits

- 4 kinds of RFW Permits based on Standard Industrial Classification (SIC) codes
- Under each classification, the following subjects will be covered:
  - Number of permits issued
  - How the water is used
  - How allocation amounts are determined
  - Examples of permits issued

Recreation/Fish & Wildlife (RFW) Permits

Classifications/types of RFW Permits:

1) Instream non-consumptive use (SIC 7777)
2) Land, mineral, wildlife, forest conservation (SIC 9512)
3) Fish hatcheries & preserves (SIC 0921)
4) Parks, amusement & recreational areas (SIC 7999)

Recreation/Fish & Wildlife Permits

Instream non-consumptive use (SIC 7777):

- 222 Active permits
- Used primarily for recreation lakes
- Water use amounts are calculated based on local lake evaporation rates
- Examples:

1) Oklahoma City, #98-43, 1450 AF, 3 low water dams on the Oklahoma River (North Canadian)

Recreation/Fish & Wildlife Permits

Instream non-consumptive use (SIC 7777):

- Examples:

2) US F&W Service, #82-75, 272 AF, 96 ac lake, Quanah Parker Lake, Wichita Mtns NWR
3) Dept of Wildlife Cons., #65-272,439 AF, 135 ac lake + duck ponds, Oak Creek (Washita Co)
4) Tishomingo NWR, application #05-17, applied for all the water in lower Pennington Cr, 11,953 AF, to keep the Cumberland Pool filled (5000 + acs)

Recreation/Fish & Wildlife Permits

Land, mineral, wildlife, forest conservation (SIC 9512):

- 56 Active Permits
- Mostly used for wetland development, ponds & marshes, waterfowl and migratory bird habitat
- Water use amounts calculated from acreages, depth of water & number of times inundated annually, usually seasonal

Recreation/Fish & Wildlife Permits

Land, mineral, wildlife forest conservation:

- Examples:
  1) US F&W Service, #51-123, 907 AF for ponds & wetlands in Great Salt Plains NWR
  2) Dept of Wildlife Cons., #90-12, 600 AF for marsh development along Fourche Maline Crk
  3) Sutter Ranch Corp, #10-05, 1307 AF diverted from Wolf Cr to fill 4 recreation lakes, Ellis Co.

Recreation/Fish & Wildlife Permits

Fish hatcheries & preserves (SIC 0921):

- 9 active permits
- Used exclusively for fish propagation
- Water use amounts based on amount of water needed annually to be diverted
- Examples:
  1) Dept of Wildlife Cons., #36-76, 6,445 AF, State Fish Hatchery, Blue River, near Durant
  2) Tishomingo National Fish Hatchery, #31-18, 1,813 AF, on Pennington Cr, Johnston Co.

Recreation/Fish & Wildlife Permits

Parks, amusement & recreation areas (SIC 7999)

- 82 active permits
- Most are multi-use reservoirs
- 35 permits have "0" amounts for RFW, this is based on 785:20-1-5:

> ". . . provided that no amount shall be specified in water rights for non-consumptive uses in reservoirs if a consumptive use is also authorized by the same water right."

Recreation/Fish & Wildlife Permits

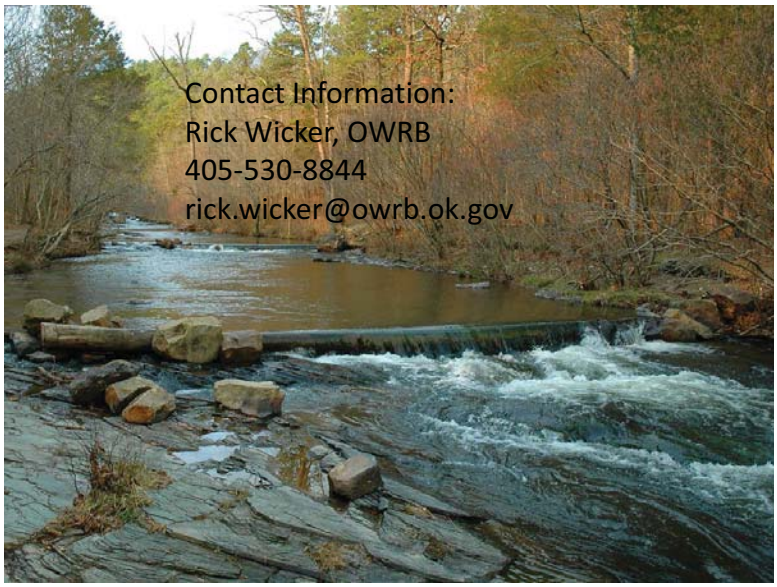
Parks, amusement & recreation areas (SIC 7999)

- Examples:
  1) City of Davis, #77-152, 5600 AF, for public water supply & RFW, 6 low water dams on Honey Cr in Turner Falls Park
  2) Tourism & Recreation Dept, #77-165, 12,620 AF for RFW (11,500 for evaporation loss), Lake Murray SP, Carter Co.

Recreation/Fish & Wildlife Permits

Summary:

- There are currently no RFW permits based on instream flow
- Non-consumptive RFW permits based on local lake evaporation rates, surface areas
- Where use is consumptive the water use amounts are based on justified needs, i.e., hatchery flow rates, wetland inundation volumes, lake fill volumes, etc.



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Review of Instream Flow Methods and Application to Baron Fork Creek

Presented to
Oklahoma Instream Flow Advisory Group

Presented by
Forrest Olson, CH2M HILL

October 7, 2013

US Army Corps of Engineers

CH2MHILL

Oklahoma does not have a formal instream flow protection program, but the topic is considered in other processes:

Federal Processes

- Oklahoma's Interstate Stream Compacts with New Mexico, Texas, Kansas, Arkansas, and Louisiana
- Endangered Species Act
- Section 10 of Rivers and Harbors Act (navigation by the Corps of Engineers)
- Section 404 Clean Water Act: (dredge and fill by the Corps of Engineers)
- Section 401 Clean Water Act, Water Quality Certification
- Federal Power Act (Federal Energy Regulatory Commission)
- National Environmental Policy Act

State Processes

- Oklahoma Outstanding Resource Waters
- Oklahoma Scenic Rivers Act
- Oklahoma Comprehensive Water Plans
- Oklahoma domestic use set aside policy (24 acre feet per sq mi)

Methods of Quantifying Instream Flow *Needs*…. but first:

- How much water do fish *need*?
- How high is up?

Instream flow issues are matters of <u>values</u> more so than science

Principles of Stream Ecosystem Function

- The 3 master parameters:
  - Landscape
  - Flow Regime
  - Sediment Regime
- The three parameters act in dynamic equilibrium, so that if one parameter changes so do the other two
- Understanding these principles is critical in considering alternative instream flow regimes especially in regulated rivers

Environmental (ecological) Flow Regimes

- Flow conditions necessary to support a sound ecological environment
- Four Major Flow Components:
  - **Subsistence Flows** – low flow but enough to meet water quality criteria and prevent direct fish mortality (e.g. 7Q10 flow)
  - **Base Flows** – "normal" conditions between significant precipitation events. Emphasis typically in summer
  - **High-flow Pulses** – brief high flow events but within channel. Supports habitat creation and maintenance, connectivity, and fish migration
  - **Overbank Flows** – maintain riparian, transport sediment and nutrients, recharge aquifers, lateral connection to other water bodies

Major vs. Minor Projects

- In deciding what instream flow method/approach is best, must consider size/nature of the proposed water project
  - **Major** projects include those that regulate flow (storage and release) or involve the setting of basin-wide instream flow standards
  - **Minor** projects are those that don't significantly affect the annual hydrograph or are temporary in nature

Three levels of Instream Flow Consideration

- **Reconnaissance or Planning Level** – Identify instream flow concerns
- **Feasibility Level** – determine if proposed water project is compatible with instream flow resource uses
- **Operational Level** – quantify impacts, develop mitigation, negotiate operational strategies

Types of Instream Flow Methods

- **Hydrologic** – Desk-top methods based on examination of stream flow statistics. Typically based on mean annual flow (MAF) or monthly median flows. Tennant Method is most common
- **Hydraulic** – Requires site-specific data to determine hydraulic responses to flow increments. Wetted Perimeter method is most common
- **Incremental** – produces relationships between stream flow and habitat for selected fish species. The Instream Flow Incremental Methodology (IFIM) is the most used method

Important questions before applying any instream flow method:

- Do we use existing flow conditions or natural (unimpaired) flow conditions? The baseline question.
- Are we protecting existing resource conditions or attempting to restore to natural conditions?

Question of values, not science.

The Tennant Method (and modifications):

- Recommended instream flows by the Tennant Method.

Narrative description of flows	Recommended Flo (percent of mean annual flow)	
	Low Flow Period	High Flow Period
Flushing or maximum	200%	200%
Optimum range	60% – 100%	60% – 100%
Outstanding	40%	60%
Excellent	30%	50%
Good	20%	40%
Fair or degrading	10%	30%
Poor or minimum	10%	10%
Severe degradation	< 10%	< 10%

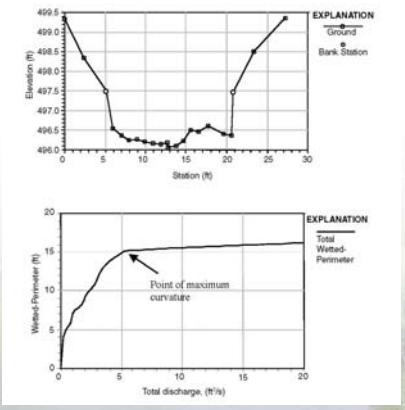
Attributes of Tennant Method

- Simple
- Flexible
- Value driven
- Affected by stream size (but method assumes not)
- Affected by year-to-year variability in MAF
- Affected by stream hydrologic type

Use of Median Monthly Flows for Determining Instream Flow Needs

- The use of monthly or seasonal median flows for recommending minimum instream flows is based on the principle that fish in a particular stream have adapted to the historic streamflow regime, which, at least for baseflows, is best defined by median rather than mean flows.

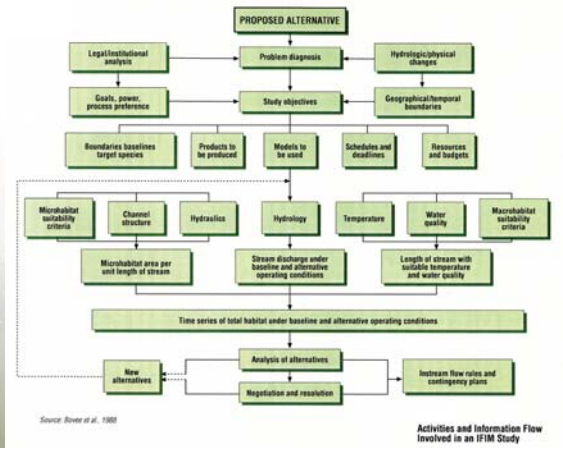
Wetted Perimeter Method



Instream Flow Incremental Methodology

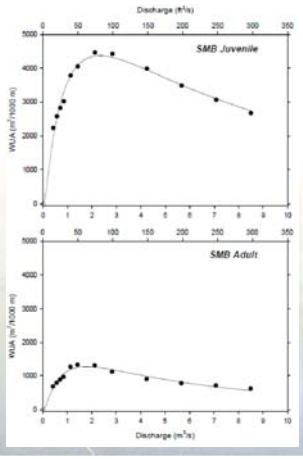
- IFIM is a methodology not a method
- Does not prescribe an instream flow value
- Provides technical information to the decision making process about the affects of alternative flows
- Information subject to different interpretations based on professional opinions and values
- Designed to evaluate alternative instream flows
- Intended for a negotiated resolution

IFIM Activities and Information Flow



Activities and Information Flow Involved in an IFIM Study

Physical Habitat Simulation Model (PHABSIM) is the primary technical tool of IFIM



PHABSIM Results for Baron Fork, Layher 1998 Based on one cross section

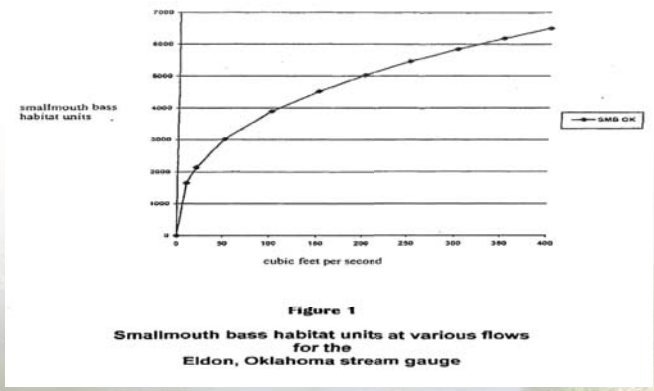


Figure 1

Smallmouth bass habitat units at various flows for the Eldon, Oklahoma stream gauge

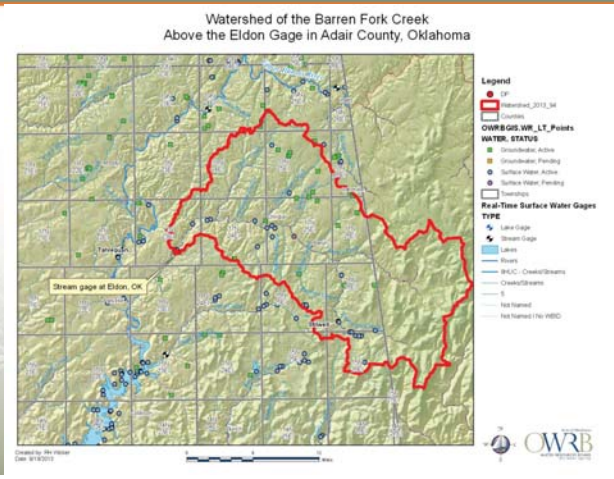
"One-size-fits-all" dilemma with hydrologic-based standard setting methods

- Different stream sizes
- Different hydrologic regimes
- Wet year dry year variability
- Regulated *vs*. unregulated streams
- Watershed or stream goals (values)
- Degree of physical/hydrologic alteration

The "one-size-fits-all" dilemma can be addressed by categorizing streams based on above criteria and establishing different instream flow standards or methods for each category.

Can get complicated though.

Baron Fork Creek



Baron Fork Stream Flow Statistics July –November

Discharge for the Summer and Autumn Low-Flow Months in Baron Fork Creek at Eldon (1948–1999)

Statistic (condition)	Discharge (cfs)				
	July	August	September	October	November
25th percentile (dry)	40	24	19	23	40
Median (normal)	71	44	36	50	79
75th percentile (wet)	130	75	71	99	259
Monthly mean	155	76	129	178	311

Results of Various Instream Flow Methods Applied to Baron Fork Creek

Methods	Resulting Minimum Flow in Baron Fork (cfs)
State Standard Setting:	
Arkansas—100% of median flow (July–October), or 50% of mean monthly flow (July–October)	**50** cfs / **67** cfs
Kansas—Generally 80% of monthly median (some streams are set at 90%)	**40** cfs
Texas (Lyons Method: small diversions)— 60% of monthly median flow (March–September), 40% of monthly median flow (October–February), or 7Q2 flow if higher	**30** cfs (July–September)
Georgia (modified Tennant Method)—30% mean annual flow	**100** cfs
South Carolina (modified Tennant Method)—20% mean annual flow (July–November)	**66** cfs
Orth and Maughan (1981) modified Tennant for OK—10% mean annual flow (July–December)	**33** cfs
Other Methods	
Wetted perimeter	**~50** cfs
PHABSIM shallow-fast habitat guild	**50** cfs (peak of habitat curve), **30** cfs (80% peak of curve)
PHABSIM smallmouth bass	**50–75** cfs (peak of curve), ~ **30** cfs (80% peak of curve)
Oklahoma domestic use set aside	**10** cfs (at Eldon)

Baron Fork PHABSIM Results for Habitat Guilds

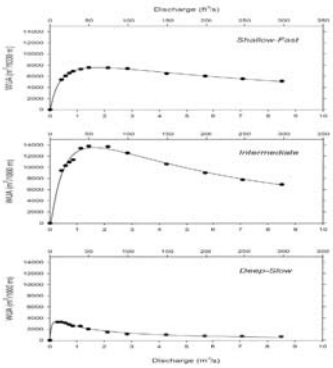
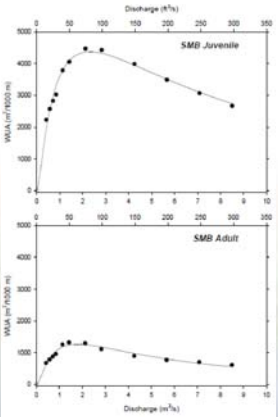


Figure 11.—Relationship between weighted usable area (WUA) and discharge for shallow-fast, intermediate, and deep-slow habitat-use fish assemblages in Baron Fork, Oklahoma.

33

Baron Fork PHABSIM Results for Smallmth Bass



Domestic Use Set Aside

- Domestic Use Set Aside water for Baron Fork at Eldon equates to a flow of 10 cfs
- This flow is considerably less than what other ISF methods recommend and is only 20% of the existing minimum instream flow

Conclusions

- Instream flow issues are as much about values as science.
- Acknowledging that ISF recommendations from desk-top methods are ‘preliminary’ or ‘planning level’ helps make their use more acceptable.
- When deciding on an ISF method/approach, a regulatory agency must balance the need to be uniform and consistent with the reality that each stream, proposal, and circumstance is different.
- Most IFS methods suffer from the one-size-fits-all dilemma.
- Applying different ISF methods or standards to different categories of stream types or project types can help address the one-size-fits-all dilemma.

Conclusions (continued)

- Instream flow recommendations for the Baron Fork using six hydrologic-based methods range from 30 cfs to 100 cfs. The wide range reflects differences in the level of stream protection (a value) implicit in each method.
- The IFIM study of the Baron Fork yielded results that would support a summer minimum flow ranging from 30 cfs to 75 cfs depending on how the results are interpreted (technical) and the level of protection desired (policy).
- The domestic use set aside for the Baron Fork is 10 cfs, which is only 20% of the established minimum flow.

Questions

Review of Instream Flow Methods and Application to Baron Fork Creek, Oklahoma

PREPARED FOR: Oklahoma Water Resources Board (OWRB)

COPY TO: U.S. Army Corps of Engineers Tulsa District

PREPARED BY: CH2M HILL

DATE: September 23, 2013

1. Introduction

This memorandum briefly reviews the instream flow technical issues and potential flow-setting methodologies in Oklahoma with an example application to the Baron Fork Creek in eastern Oklahoma. It is intended to inform and encourage discussion among those interested in protecting or restoring instream values such as fish, recreation, water quality, wildlife, and aesthetics, while facilitating beneficial uses for water removed from streams. Beneficial out-of-stream uses typically include irrigation, domestic, hydropower, and industrial use. This memorandum does not address specific policy and legal issues. Discussions of these issues are available in Oklahoma Water Resources Board (OWRB) (2011) and CH2M HILL (2013). Baron Fork Creek was chosen as an example stream in dealing with the issue of instream flow needs because it is designated a "scenic" river per the Oklahoma Scenic Rivers Act of 1970, it has good long-term flow records and is relatively unregulated, and several studies have been conducted on the river associated with instream flows. Several studies (as well as OWRB hearings) were conducted in response to a water permit application by the Adair Regional Water District No. 5 in 1998. The OWRB has made its final decision on the permit, and it is not the intent of this memorandum to reopen that issue. Furthermore, the use of Baron Fork herein as an example stream to explore instream flow setting methods does not constitute the "pilot study in a scenic river" proposed by the OWRB staff in 2011. It may, however, provide some technical groundwork that would be useful in a pilot study of Baron Fork or other state scenic river.

Oklahoma is one of the few states that do not have a formal instream flow protection program. The need for such a program has been considered by the OWRB for many years and has been most recently discussed in the OWRB's *2012 Update of the Oklahoma Comprehensive Water Plan*. As part of that plan, the OWRB convened an Instream Flow Advisory Group to discuss benefits and issues regarding a potential future Oklahoma instream flow program. That effort culminated in a report titled *Instream Flow Issues and Recommendations* (OWRB 2011). Although Oklahoma does not have an instream flow protection program, the state, primarily through the OWRB, addresses instream flow issues for most streams in the state through policies and administrative procedures that recognize the environmental values associated with the state's waters. In particular, state streams designated as Outstanding Resource Waters under (785:45-3-2) or as a "scenic river area" under the Scenic Rivers Act (82 O.S. §1451–1471) are provided protection for scenic beauty, water conservation, water quality, fish, wildlife and outdoor recreation. Specific flows or methods to determine specific flows to protect these resources are generally not identified. Instream flow requirements, if any, are addressed on a case-by-case basis as the issue comes up, typically through a water use permit application.

In addition to the state administrative processes, other federal or interstate laws and regulations contribute to or require consideration of instream flows. These include:

1. Interstate Stream Compacts with New Mexico, Texas, Kansas, Arkansas, and Louisiana
2. Endangered Species Act
3. Section 10 of Rivers and Harbors Act (navigation by the Corps of Engineers)

4. Section 404 Clean Water Act: dredge and fill (by the Corps of Engineers)
5. Section 401 CWA Water Quality Certification
6. Federal Power Act (Federal Energy Regulatory Act)
7. National Environmental Policy Act

These regulatory processes are discussed briefly in a report (CH2M HILL 2013) prepared for OWRB. In addition to these primarily federal processes, the state of Oklahoma requires that a certain amount of water be maintained in streams as a set aside for future domestic use by landowners in the watershed. The rule requires that 6 acre- feet of water be set aside per household. The state's policy in implementing the rule assumes one household per quarter section; therefore, 24 acre-feet of water is set aside per square mile. This volume of water is converted to flow by assuming that the water would be used at a constant rate 365 days a year. These reserved streamflows for downstream domestic use contribute to maintaining some level of instream flow protection.

2. Methods of Quantifying Instream Flow Needs

Although the term *instream flow needs* is commonly used, the word *needs* is vague, undefined, and value-based. Asking "how much water do fish need?" is like asking "how high is up?" (Thomas R. Payne 2012). Even so, there is a recognized need to establish some quantity of flow to offer some level of protection of values associated with instream flows. Since the early 1970s, more than 200 methods or procedures have been used to quantify instream flows designed to protect instream resource values. By far, the most commonly considered instream resource value is fish. In most cases instream flows considered adequate for fisheries protection are considered protective of water quality, wildlife, and recreation values as well. The Instream Flow Council's book, *Instream Flows for Riverine Resource Stewardship* (Annear et al. 2004), contains a good summary of most of the instream flow assessment methods.

2.1 Principals of Stream Function

To understand and evaluate the usefulness of various methods of recommending instream flows, it is important to understand some basic principles of stream ecology and how the stream's hydrologic behavior dictates its function. The function of a river results from the interaction of three "master parameters" (Leopold 1994): landscape, flow regime, and sediment regime. Typically, when one parameter changes the other two adjust to meet a new dynamic equilibrium. This principle is most pronounced with large storage reservoirs that change all three parameters. For example, a flood control reservoir will reduce peak flows, which in turn will cause the stream channel downstream of the dam to shrink by vegetation encroachment. The reservoir will trap sediment, thereby adding to downstream channel changes. It is important to consider such interactions when assessing alternative instream flow regimes. This is especially important when considering flow prescriptions that approximate or mimic the natural flow regime. Factors that cannot effectively be reversed, such as physical changes that have occurred to the channel or floodplain, and interruption to the sediment supply, must be considered (Annear et al. 2004). In some cases, simply restoring or mimicking the natural hydrograph can be non- or counter-productive to the purpose for which the prescription is intended if the landscape and sediment regime changes are not factored into the interpretation.

When determining how to address an instream flow issue it is important to distinguish between two types of projects or proposals: those that would significantly alter the hydrograph, and those that would merely divert a small amount of water at a constant rate over a prescribed period. For simplicity, these are referred to below as large projects and small projects.

2.2 Large Projects

When assessing the impacts of a large water storage/flow-regulation project that would significantly alter the hydrograph (as well as the landscape and sediment regime), consideration of "environmental flow needs" is more important than it would be for small projects. Environmental (or ecological) flows are those that provide inter- and intra-annual variable flow patterns that mimic the natural hydrograph in terms of magnitude, frequency, duration, timing, and rate of change (Annear et al. 2004). These hydrologic patterns

and variability are key determinants of fish and aquatic organism community structure and stability (Poff and Ward 1989). Applying the environmental flow concept often focuses on four flow components of the flow regime (TIFP 2008):

- **Subsistence flows** are those corresponding to infrequent low flow events that occur naturally during droughts. The objectives of subsistence flows are to maintain water quality criteria and prevent loss of aquatic organisms.
- **Base flows** represent the "normal" flow conditions in the absence of significant precipitation events. Emphasis is typically placed on the summer base flow period because fish populations tend to track existing environmental conditions, which are often worst in streams during the warm low flow period. Most "standard setting" methods used to determine minimum instream flows pertain to base flows.
- **High-flow pulses** are short-duration, high-magnitude flows (but within channels) that follow rainfall events. High-flow pulses serve to maintain important habitat features and connectivity along a stream. Some critical fish behaviors, such as migration or spawning, are often associated with flow pulses.
- **Overbank flows** are infrequent, high-magnitude flow events that produce water levels that exceed those of the channel banks. The high flows maintain riparian areas, transport sediments and nutrients, recharge floodplain aquifers, provide lateral connectivity to channel water bodies, move organic debris to the main channel, and provide life-cycle clues for aquatic and terrestrial species.

Water projects large enough to warrant consideration of environmental flow needs are often projects with a federal nexus. As such, the instream flow issue is usually addressed in some federal permitting or licensing process. Regulatory processes invariably require detailed project-specific studies wherein alternative instream flow regimes are assessed. The use of simple "standard setting" methods for recommending instream flows usually is inappropriate for these types of projects. Various methods and procedures are available to describe environmental flows for the purpose of informing the flow recommendation process, such as Indicators of Hydrologic Alteration, Hydroecological Integrity Assessment Process, Ecological Limits of Hydrologic Alteration, Hydrology-Based Environmental Flow Regime. Researchers at OSU's Water Resources Research Institute recently applied the Hydroecological Integrity Assessment Process approach to characterize and classify 88 streams in Oklahoma based on hydrologic regime (Turton et al. 2009). The four groupings of streams fell roughly within ecoregions defined by climate, geology, soils, and vegetation.

Oklahoma water plans have not recognized environmental flow needs or made provisions for protecting them. However, the most recent revision of the Oklahoma Comprehensive Water Plan identifies instream flows as a subject worthy of additional discussion. As such, the plan formalizes an instream flow workgroup, recommends a pilot study on a state-designated scenic river, and outlines economic, legal, and policy studies associated with a potential instream flow protection program.

2.3 Small Projects

What constitutes a small water project is arbitrary, but for the purpose of discussing methods of determining instream flow recommendations, small projects are those that would not regulate flow by the storage and release of water. For small projects, then, the issue of higher environmental flow, such as pulse or overbank flows, is irrelevant. The potential impacts of smaller projects on instream resource values such as fish are usually focused on the subsistence flows and base flows, particularly during the summer low flow months when water needs for domestic and agricultural use are typically highest.

2.4 Categories and Types of Instream Flow Methods

In general, application of instream flow methods and studies falls into three categories based on the purpose or level of need for the information (Olson 1996):

- **Reconnaissance or Planning Level—**The goal is to identify potential instream flow concerns.

- **Feasibility Level—**The goal is to determine if the proposed project/diversion is likely to be compatible with existing instream resource uses.
- **Operational Level—**The goal is to quantify impacts, develop mitigation measures, and negotiate operational strategies with the permitting agencies.

Methods used for recommending instream flows for planning and reconnaissance application typically are simple desktop types, commonly referred to as standard setting. In many states, the preferred desktop method is one that provides a conservative instream flow recommendation that is then qualified by such terms as "preliminary," "target," "initial," "planning level," "desired," or similar vague language. This provides flexibility for the instream flow recommendation to be modified, typically downward, based on results of additional site- or project-specific studies. The extent of studies needed varies depending on the size of the proposed water diversion and the potential for significant impacts.

There are three main types of methods for determining the baseflow component of an instream flow regime recommendation.

Hydrologic methods use historical (or simulated) streamflow statistics to guide recommendations. The Tennant method (Table 1) and numerous modifications of it is the most commonly used hydrologic method. It defines categories of protection (good, fair, poor) based on percentages of mean annual flow (MAF). It is quite simple but its development relied heavily on professional judgment and thus it is not very scientifically supportable. In addition, its categories of protection level are based on value terms. Application of the method for defining acceptable baseflows in different states has ranged widely from 10 to 40 percent of MAF, but 30 percent of MAF seems to be the most commonly used value for low flow months. Because of its simplicity, the method has received wide acceptance, primarily for planning and reconnaissance level applications.

TABLE 1
Recommended Instream Flows by the Tennant Method

	Recommended Flow (% of mean annual flow)	
Flow Descriptions	**Low Flow Period**	**High Flow Period**
Flushing or maximum	200	200
Optimum range	60–100	60–100
Outstanding	40	60
Excellent	30	50
Good	20	40
Fair or degrading	10	30
Poor or minimum	10	10
Severe degradation	< 10	< 10

One factor typically not considered when using hydrologic methods is stream size. The Tennant method, for example, is based on the assumption that aquatic habitat conditions are similar among streams when they are carrying the same proportion of their mean annual flow. However, a compilation of studies that developed habitat-flow curves for salmon and trout shows that maximum habitat flows (curve peak), when expressed as proportion of MAF, decline as the stream size (based on MAF) increases (Hatfield and Bruce 2000). A similar relationship was observed for smallmouth bass in the Upper James River basin in Virginia, where lower proportions of average streamflow were required to maintain optimum habitat as stream size increased (Leonard et al. 1986).

Other hydrologic methods include the use of monthly median (50 percent exceedance) flows or an exceedance value (e.g., 80 percent) based on the annual hydrograph. The use of monthly median flows is based on the principle that fish and aquatic species in a particular stream have adapted to the historic streamflow regime, which, at least for the baseflows, is best defined by median rather that mean flows.

A common issue when using hydrologic methods is the question of whether to use flow data representing existing flow conditions or historic natural flows, assuming such data are available or can be reasonably simulated. Does the term *protection* of instream flow values infer existing conditions as the baseline, or historic conditions? This is yet another example of a policy-oriented value-based question rather than a

technical issue that must be considered when dealing with instream flow management. Similarly, there may be a need to consider future hydrologic regimes as affected by climate cycles or climate change. A recent study by the U.S. Geological Survey done in cooperation with OWRB found that base flows and total annual flows for many Oklahoma streams have been trending upward since 1980 (Esralew and Lewis 2010).

Hydraulic methods are a step up from hydrologic methods in that they make use of stream/site specific data and thus are not considered desktop methods. By far, the most commonly used hydraulic method is the wetted-perimeter method. The method is based on the assumption that there is a direct relationship between fish habitat (or aquatic organism productivity) and the wetted perimeter of a riffle. It also assumes that protecting riffle habitats will provide protection for pools and other types of stream habitats. In practice, the bottom elevation of a representative riffle is surveyed, and several measurements of water surface elevation and water edge at the riffle are made at multiple flows. A plot is then developed showing the relationship between wetted perimeter and discharge. The point of maximum curvature (inflection point) is used to determine the habitat protection flow. It essentially identifies the most efficient flow for optimizing aquatic productivity. In practice, the identified flow from the wetted perimeter method can vary considerably depending on the cross section selected in the field. A cross section that is abnormally wide, for example, would produce an unrealistically high flow recommendation. Also, the wetted perimeter method may not be appropriate for predominately spring-fed or highly flashy streams. Gippel and Stewardson (1998) present a good review of the limitations associated with the wetted perimeter method.

Colorado uses the R2-Cross method to define instream flow requirements. The method also uses data from representative riffles, but applies depth and velocity criteria as well as percent of bankfull wetted perimeter to identify the flow that provides the desired riffle condition.

Incremental methods produce relationships between increments of streamflow and habitat for selected fish species and their life stages. The Instream Flow Incremental Methodology (IFIM) developed by the U.S. Fish and Wildlife Service is the primary example of this method used globally. The habitat modeling part of the methodology involves the integration of a stream hydraulic model, which predicts depth and velocity changes by flow, with habitat criteria defined as suitable depth, velocity, substrate, and cover for the selected fish species. The models are collectively called Physical Habitat Simulation, or PHABSIM.

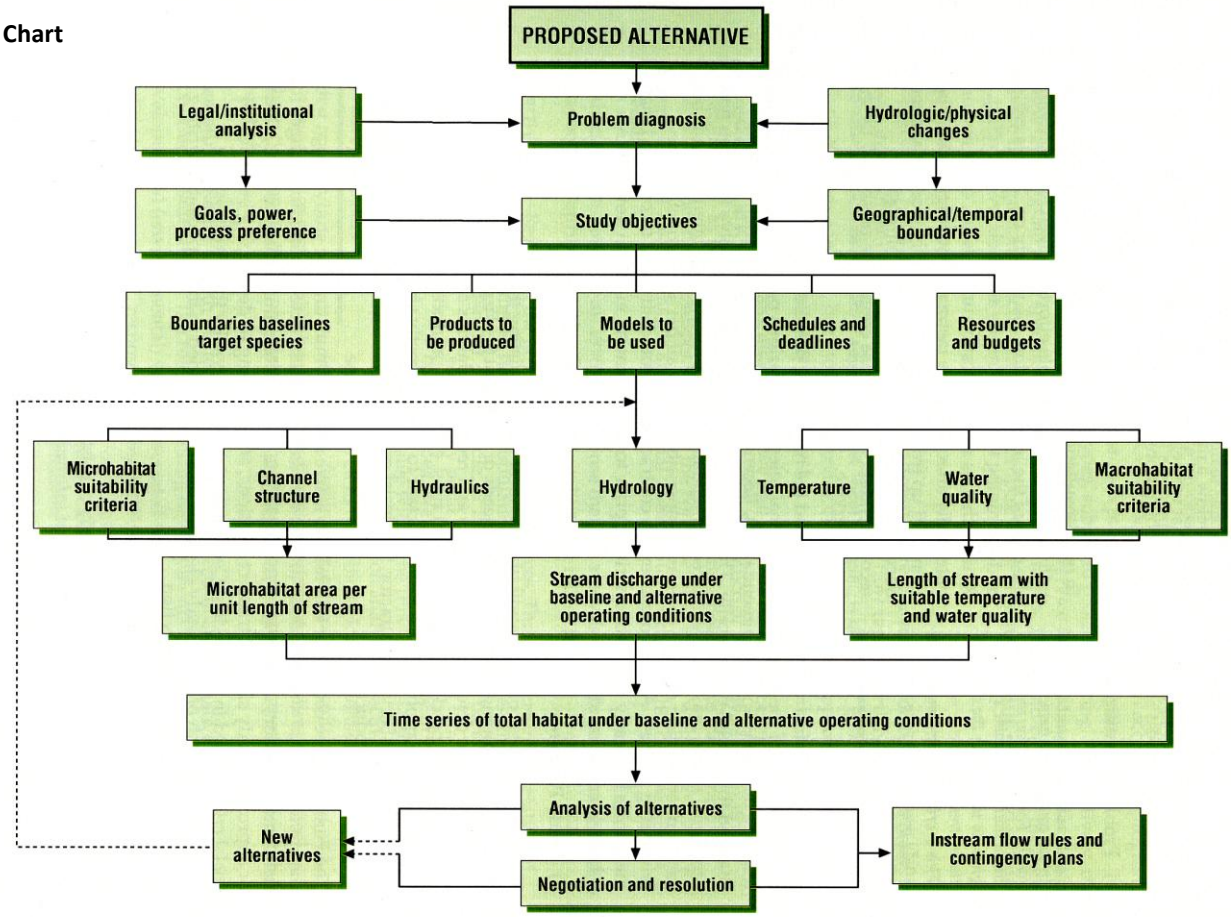
The IFIM is referred to as a *methodology* in contrast to a *method* because it outlines a process for arriving at an acceptable instream flow regime that considers multiple technical and social issues (Trihey and Stalnaker 1985). The typical steps of an IFIM study include the following:

1. Legal and institutional analysis
2. Strategy design
3. Technical studies scoping
4. Development of habitat models (PHABSIM)
5. Formulation of alternatives
6. Negotiations to reach resolution

The IFIM process has been described in a flow chart consisting of 26 activity or information steps (Bovee 1988) (Figure 1). It is important to note that the IFIM and its associated habitat models do not prescribe a single solution regarding an acceptable instream flow value or regime. Rather it provides technical information that is then subject to different interpretations, and to identification of social needs, thus facilitating a negotiated solution that balances among conflicting values.

Because of its high cost, the IFIM methodology is used primarily to assess major water withdrawal projects or proposed dams. However, it is frequently used in conjunction with other studies associated with stream ecosystems (geomorphology, hydrologic alteration, fish biology, riparian vegetation, water quality, sediment regime) to develop guidelines, including instream flow prescriptions, for future water management within a watershed. Good examples of basinwide studies focused on future water allocation and instream flows needs include those being conducted in Alberta, Canada (Clipperton et al. 2003), and Texas (TWDB 2008).

FIGURE 1
IFIM Flow Chart



Source: Bovee et al., 1988

Activities and Information Flow Involved in an IFIM Study

Although the PHABSIM models in IFIM produce multiple habitat-flow curves for different fish species or groupings, these data are often relied upon to recommend a single minimum flow value or a simple minimum flow regime. Invariably, the study results are subject to different interpretations influenced by one's personal values or organizational positions. Fisheries resource agencies often recommend the flow that provides the maximum habitat—the peak of the curve—for a selected species and life stage. In many cases, this may not be an appropriate use of the results. Federal fisheries agencies reviewing PHABSIM studies for ESA-listed salmon on the west coast recently concluded in several cases that flow providing at least 80 percent of the maximum habitat allows conservation and recovery of the fish populations (NMFS 2013). That same 80 percent of maximum habitat value has been used in Canada for prescribing instream flows for trout (Clipperton et al. 2003).

IFIM studies, particularly the PHABSIM models, are not immune from potential biases. Selection of representative study sites and stream cross sections are especially important steps in producing results that truly represent the stream reach in question. Selection of fish species or species guilds to model can also affect the results. One person's "key" species may be another person's "scrap" fish. Finally, the selection of fish habitat criteria or the means of developing site-specific criteria can greatly affect the model results. Various considerations and study techniques have been developed to avoid or minimize these potential biases.

2.5 Previous Instream Flow Method Reviews for Oklahoma

Instream flow needs and methods to quantify flows for protection of instream-related resources in Oklahoma have been the subject of several reports as far back as 1981. All these reports were written by researchers at Oklahoma State University or by the OWRB staff:

- Orth and Maughan 1981—application of Tennant method to Oklahoma
- OWRB (Saja Varghese) 1999—assessment of methods
- OWRB 2009—memorandum supporting comprehensive water plan update)
- OWRB 2011—instream flow issues and recommendations
- Turton et al. 2009 (OSU)—assessment of environmental flows in Oklahoma
- Fisher, Seilheimer, and Taylor 2012 (OSU)—biological assessment of environmental flows

Nearly all the simple standard-setting methods for recommending minimum flows identified in these reports are considered baseflow methods, in that they typically do not address needs for high channel maintenance flows or pulse peak flows. There are, however, simple desktop approaches to address high flow components as well (Reiser et al. 1989).

2.6 The One-size-fits-all Problem with Standard Setting Methods

Standard setting methods, although simple, suffer from the one-size-fits-all approach. Hydrologic methods like Tennant are not appropriate for predominately spring-fed streams because they tend to prescribe a flow that is often much lower than the natural base flow. For flashy and intermittent streams, the Tennant method may prescribe a flow for months in which there may be no natural flow. The Tennant method may prescribe too little flow for small streams and too much for large streams if the purpose is to protect fish habitat. The use of monthly median flows (or seasonal medians) helps avoid some of these problems, but the stream must have sufficient flow records to compute monthly medians.

Standard setting methods also suffer problems associated with using average conditions (e.g., flow) as their basis, yet average conditions are not necessarily common. For example, the year-to-year variability in mean annual flow in Baron Fork Creek measured at Eldon, Oklahoma, has been greater than 11-fold during the period of record from 1949 through 2012. Drought year contingency plans, which can include instream flow prescriptions, are a common approach for dealing with this issue in dry years. This approach is especially useful in the western states where snowpack measurements can forecast summer droughts. Forecasting droughts in Oklahoma may be more difficult.

Applying simple desktop methods to streams that have highly regulated flow or where baseflows have been reduced over time is especially problematic. The desktop methods are principled on the natural flow concept whereby fish and other aquatic resources have adapted to the natural hydrologic regime. But this principle becomes less supportable scientifically as the stream's functional components (landscape/ geomorphology, hydrology, and sediment regime) have been altered over time from natural conditions.

Finally, application of any desktop method should take into account the current goals or future desired condition of the particular stream and its watershed. This is primarily a policy issue, not a technical one. For example, in a highly regulated stream, where much of the water already has been dedicated to out-of-stream use, such as irrigation or municipal supply, the protection or restoration of instream values such as fish may be of low priority. On the other hand, a designated scenic river that is largely unregulated would be expected to receive a higher degree of protection for instream resources, thereby justifying a more conservative approach to setting minimum flow requirements.

To help address the one-size-fits-all syndrome with standard setting methods, some states have categorized streams by various metrics so that different instream flow methods or different protection standards can be applied to different stream categories. Examples of stream categories include these:

- Physical/hydrological types, often associated with ecoregions defined by geology, climate, and vegetation types. An example would be stable vs. flashy streams. Such a categorization has already been done for Oklahoma streams (Turton et al. 2009).
- Degree of hydrologic and physical alterations (past and future). There are several software programs available to quantify hydrologic alterations. Physical alteration requires geomorphic and sediment studies.

- Current water use or watershed goals (irrigation, hydropower, municipal, industrial, recreation, scenic, ecological).
- Size of stream, typically based on average annual flow.

Oregon is a state that uses a stream-type and project-type categorization framework to determine what instream flow methods are appropriate and what intensity of technical study is needed to address instream flow issues (Oregon Water Resources Department 2010).

3. Baron Fork Instream Flow Recommendations Derived from Different Baseflow Methods

To exemplify the application of various instream flows setting methods, we chose Baron Fork Creek in eastern Oklahoma. We selected the stream because it has good flow records, is unregulated, supports a robust fish population of more than 60 species, and is designated a scenic river by the state. The stream has been the subject of instream flow considerations and proceedings associated with water permit applications filed by the Adair County Rural Water District No. 5 in 1988 and 1998. The instream flow history includes the following:

- 50 cfs by OWRB for state Scenic River Act compliance—Board decision June 1981
- 13.5 cfs initial decision by OWRB in 1988 Adair case—Board decision April 1989
- 75 cfs Adair case 1998 permit application–Board decision June 1998
- 50 cfs Board decision in 2003 following review of IFIM study

We caution that Baron Fork is representative of only one type of stream hydrology, and it has a special status designation (scenic). Thus, the use of Baron Fork as an example stream should not be viewed as representative of most other streams in the state.

Streamflows in Baron Fork are lowest in the summer and early autumn months based on gage records from 1948 – 1999 at Eldon. Average monthly flows are about twice the median flows for July through September, but the ratio increases considerably in October and November as more high flow events affect the hydrologic pattern (Table 2). The mean annual flow for the Baron Fork at Eldon is 333 cfs.

TABLE 2
Discharge for the Summer and Autumn Low-Flow Months in Baron Fork Creek at Eldon (1948–1999)

Statistic (condition)	Discharge (cfs)				
	July	August	September	October	November
25th percentile (dry)	40	24	19	23	40
Median (normal)	71	44	36	50	79
75th percentile (wet)	130	75	71	99	259
Monthly mean	155	76	129	178	311

The base flows in Baron Fork are affected by some diversions for domestic and irrigation use. Layher (1998) estimated that streamflow at Eldon could be diminished by up to 19.6 cfs during the summer if all upstream water rights were being used simultaneously. In another analysis, based on reported water use, the OWRB estimated that 1,580 acre-feet per year was being diverted from the stream and its tributaries (OWRB 1998). If that amount of water were used primarily for irrigation over a 5-month period, it would equate to 5 cfs in those months. For the purposes of computing instream flow values for the Baron Fork, we used the flow statistics available at the Eldon gage without accounting for upstream withdrawals.

We applied the instream flow standard setting methods used in Arkansas, Kansas, Texas, South Carolina, and Georgia to Baron Fork. All these examples use hydrologic data as the basis. We also applied the Orth and Maughan modification of the Tennant method for Oklahoma streams. Methods that are modifications of the

Tennant method yielded instream flow values of 33 cfs (Orth and Maughen), 66 cfs (South Carolina), and 100 cfs (Georgia) (Table 3). This rather wide range reflects the flexibility of use with the same method and highlights the differences in the degree of protection for instream flows among the states. Similar differences are evident among those states that use monthly median flows. Monthly median flows used to determine baseflow instream flows are 60 percent (Texas), 80 percent (Kansas), and 100 percent (Arkansas). For the Baron Fork these equate to 30 cfs, 40 cfs, and 50 cfs for the three methods, respectively.

TABLE 3
Results of Various Instream Flow Methods Applied to Baron Fork Creek

Methods	Resulting Minimum Flow in Baron Fork (cfs)
State Standard Setting	
Arkansas—50% of mean monthly flow (July–October), or 100% of median flow (July–October)	67 cfs / 50 cfs
Kansas—Generally 80% of monthly median (some streams are set at 90%)	40 cfs
Texas (Lyons Method: small diversions)— 60% of monthly median flow (March–September), 40% of monthly median flow (October–February), *or* 7Q2 flow if higher	30 cfs (July–September)
South Carolina (modified Tennant Method)—20% mean annual flow (July–November)	66 cfs
Georgia (modified Tennant Method)—30% mean annual flow	100 cfs
Orth and Maughan (1981) modified Tennant for OK—10% mean annual flow (July–December)	33 cfs
Others	
Wetted perimeter	~50 cfs
PHABSIM shallow-fast habitat guild	50 cfs (peak of habitat curve), 30 cfs (80% peak of curve)
PHABSIM smallmouth bass	50–75 cfs (peak of habitat curve), ~ 30 cfs (80% peak of curve)
Oklahoma domestic use set aside	10 cfs (at Eldon)

Figure 2 presents PHABSIM model outputs for Baron Fork (Fisher and Remshardt 2000). Depending on how the results are interpreted, instream flow recommendations could range from 30 to 75 cfs.

We were unable to apply the wetted perimeter method directly to Baron Fork without the needed field data, but the results would likely be similar to the PHABSIM results for the shallow-fast habitat guild. This curve (see Figure 2) peaked at 50 cfs, which would likely correspond to the recommended instream flow using the wetted perimeter method.

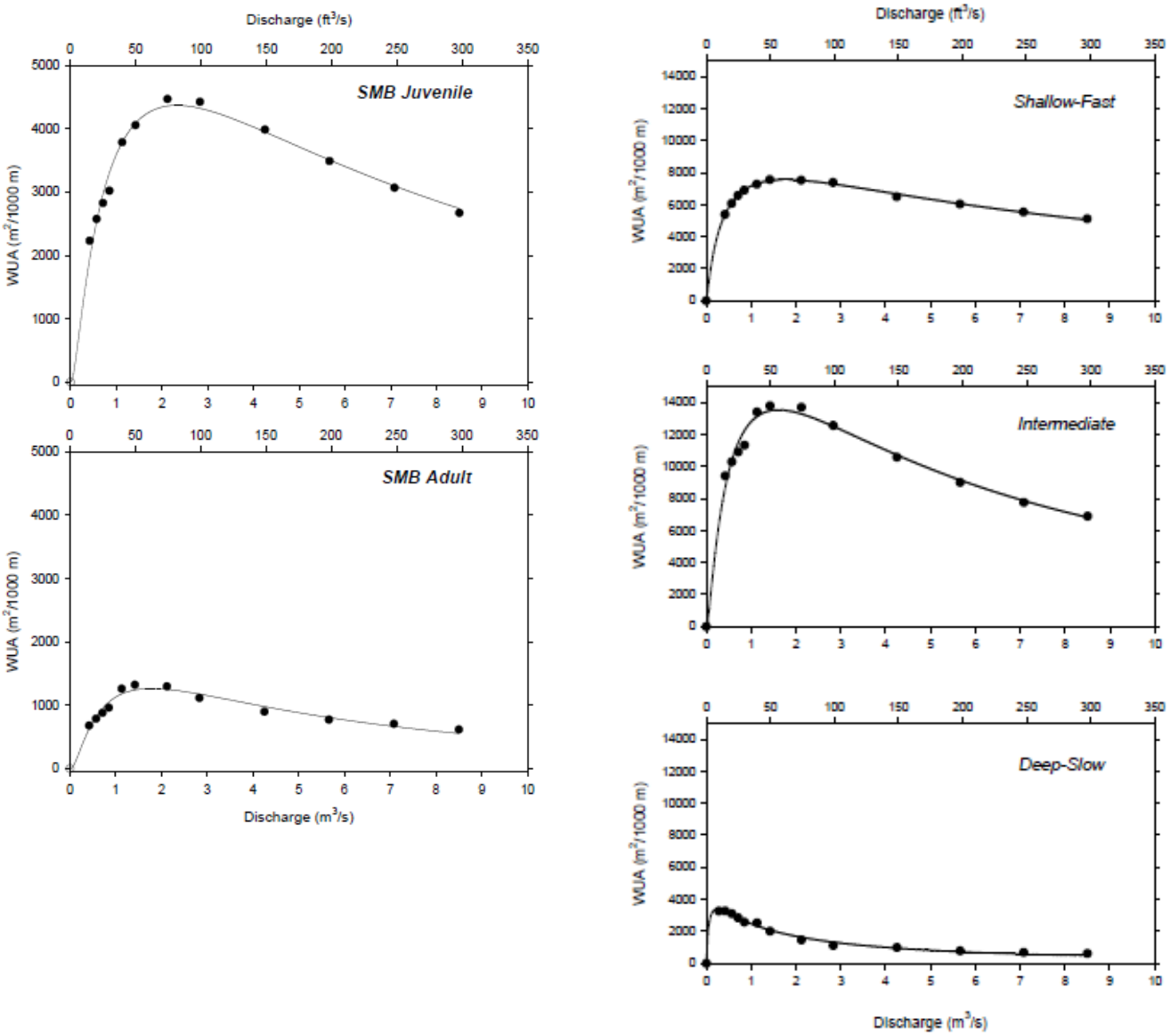
The domestic use set aside for the Baron Fork at Eldon computes to approximately 10 cfs. The computation is based on a watershed area of 312 square miles upstream of the gage site. The unused portion of this set aside water contributes to the maintenance of minimal flows at Eldon, but the computed flow is considerably less than what would be considered adequate for protection of instream resources based on the other methods discussed above. The domestic set-aside flow of 10 cfs for the Baron Fork contributes only 20 percent to the currently established minimum flow of 50 cfs.

4. Summary

This memorandum discusses technical issues associated with the potential application of available instream flow methods to streams in Oklahoma. The primary concern with using simple desktop methods is that they tend to be one-size-fits-all. While appearing easy to use, they can make instream flow setting complicated and contentious. Acknowledging that flows developed from these methods are to be regarded “preliminary” until further studies and negotiations can be completed, if necessary, can make their use more acceptable.

Most desktop instream flow methods have considerable flexibility that can allow their use to be applied with different value-based standards (e.g., good, fair, poor) on a case-by-case basis. Categorizing streams based on several criteria (hydrologic regime, management goals, degree of alteration, size) can assist in tailoring the application of instream flow methods and standards to meet the particular circumstances.

FIGURE 2
PHABSIM Model Outputs for Baron Fork



Multiple instream flow baseflow methods were applied to the Baron Fork Creek in eastern Oklahoma to exemplify the range of results that can be derived. Instream flows for the summer baseflow period derived from these various methods ranged from 30 to 100 cfs. A comprehensive IFIM study of Baron Fork yielded results that would support a minimum instream flow of between 30 and 75 cfs, depending on how the results are interpreted (technical) and the level of protection appropriate to the stream (policy). The Oklahoma domestic use set aside water calculated for Baron Fork at Eldon provides only a nominal contribution to instream flows at that site.

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Meeting Agenda
Instream Flow Advisory Group
Meeting #4

Date:	January 16, 2014
Time:	1:30 pm
Location:	OWRB (Board Room) 3800 N. Classen, Oklahoma City

1. Welcome 1:30-1:40 pm
   - Introductions
   - Review Agenda and Goals for Today
   - Brief recap of Workshop 3

2. ISF Pilot Study 1:40-3:30 pm
   - Brief recap of key issues identified by Advisory Group for further evaluation
   - Overview of draft Pilot Study work plan (Olson/CH2M Hill)
   - Break at approx. 2:45 pm
   - Discussion

3. Path Forward: Status and Next Steps 3:30-3:45 pm

4. Public Comment 3:45-4:00 pm

Adjourn 4:00 pm

Instream Flow Advisory Group Meeting #4 Notes

OWRB, 3800 N. Classen Blvd., Oklahoma City
January 16, 2014, 1:30 p.m.

ATTENDEES:

Barry Bolton, OK Dept. of Wildlife Cons.
Shannon Brewer, USGS
Angie Burckhalter, Devon
Mark Derichsweiler, ODEQ
Tom Elkins, Cherokee Nation
Mike Fuhr, The Nature Conservancy
Bud Ground, PSO
Doug Hawthorne (for Tom Creider), OTRD/State Parks
Charlette Hearne, ORWP
David Martinez, (for Kevin Stubbs), USFWS
Marla Peek, OK Farm Bureau
Jim Reese, ODAFF
Marsha Slaughter, Oklahoma City WUT
Jeff Tompkins, Bureau of Reclamation
Brooks Tramell, OK Conservation Comm.
Brian Woodard, OIPA
J.D. Strong, OWRB
Owen Mills, OWRB
Derek Smithee, OWRB
Terri Sparks, OWRB
Darla Whitley, OWRB
Brian Vance, OWRB
Bryan Taylor, Corps of Engineers
John Rehring, Carollo Engineers
Bryan Mitchell, CH2MHILL
Anna Childers, CH2MHILL
Forrest Olson, CH2MHILL
Dean Couch, Self
LeeAnna Covington, OK Farm Bureau
Buck Ray, OK Dept. of Wildlife Cons.
Cedric Bond, Student
Daniel Fenner, USFWS
Brandon Brous, OK Dept. of Wildlife Cons.
Russell Doughty, ORWP
Kim Elkin, The Nature Conservancy

*[**bold font** indicates Advisory Group members or their delegates present for this meeting]*

Welcome

OWRB Executive Director J.D. Strong made opening remarks and asked participants to introduce themselves. John Rehring, Carollo Engineers and meeting facilitator, went over the Agenda and gave a brief review of the previous meeting.

ISF Pilot Study Work Plan

Recap of Key Issues: Mr. Rehring gave a brief overview of the key issues that were identified by the Advisory Group in previous meetings and discussions. A synopsis of these issues is posted to the ISF webpage at http://www.owrb.ok.gov/supply/ocwp/instreamflow.php; it is recognized that the list does not represent consensus on the issues, but indicates the types of questions and concerns raised by members of the group. He asked the group to revisit the issues and think about whether the proposed process for an instream flow pilot study would address these concerns.

Overview of Draft Pilot Study Work Plan: Mr. Forrest Olson, CH2MHILL, gave a PowerPoint presentation highlighting the process described in the draft Oklahoma Instream Flow Pilot Study document. The draft work plan and presentation are posted to the ISF webpage. Mr. Olson responded to several questions posed throughout the presentation.

Discussion/Questions: Mr. Rehring then indicated that the Agenda allowed time for additional discussion and questions, which are summarized below:

- Why was the Instream Flow Incremental Methodology (IFIM) method chosen?
    - The IFIM method is the most commonly used and it has a strong institutional and stakeholder involvement component. Also, the method was previously used in Oklahoma.
- How does IFIM deal with recreation, as opposed to flows for fish and habitat?
    - Hydraulic recreation parameters can be developed for inclusion of recreation. The process helps inform decision-making to reflect the competing needs of various water users and uses, and culminates in negotiations between various interests in the watershed. OWRB/consultants will make sure that recreation is included in the process.
- There was considerable discussion on the purpose of the pilot study as outlined in the draft, how study results would be used, and concern regarding whether and how the results of the pilot would be applied elsewhere in Oklahoma.
    - The primary purpose of the pilot study is to define, test, and adapt a process that could be applied to any potential study area. A pilot would answer questions and concerns voiced by the advisory group that could not otherwise be answered in the abstract.
    - The pilot study (or study process) suggests the Illinois River system upstream of Tenkiller Reservoir as the pilot study area; the wording could be changed to specify that as the study area.
    - The pilot organizes the steps to a process that allows stakeholders to be involved and provide perspective on what needs to be addressed in a selected study area.
    - The watershed-specific results of the pilot would only apply to the upper Illinois River watershed. However, the same process (or modified process based on lessons learned in the pilot) could be applied to other watersheds in Oklahoma with different watershed-specific conditions and goals, and watershed-specific findings.
- An IFIM study is used to address a “problem”; we do not know that there is a problem, so why should we move ahead with an IFIM?
    - Study will be used to address a process not a problem and will not be used to make a decision on whether an instream flow program should be implemented.
    - Maybe the problem is that we do not know the future impacts of implementing an instream flow program or not implementing a program.
- Will the results from the study be used to extrapolate to other watersheds and/or streams? Is the study approach repeatable?
    - The pilot study will not be used to set flow targets in other watersheds. Rather, it will test the process that could be applied to any watershed to yield stakeholder-supported flow targets specific to the watershed in question.
- Is there anything about the process that seems to bias any particular use?
    - M&I was not mentioned in the draft process, and recreation should also be considered in the evaluations.

    - The intent of the pilot is to consider all water users and uses without bias, but with opportunities for each interest group to engage in the process. The work plan will be reviewed and updated to reflect this basic tenet.
- There are not many withdrawals from the Illinois River system; will this provide useful results regarding potential impacts to consumptive users?
    - The recommendation by the previous ISF Advisory Group was to do a pilot study on a Scenic River, and this recommendation was supported by the current ISF Advisory Group at the previous workshop. The Illinois was chosen because it has some discharges and has a broad existing dataset that should help reduce study costs.
    - The group discussed the merits of conducting the pilot in a watershed that is more heavily used by consumptive users, or conducting pilot studies in more than one watershed. The group ultimately determined that an upper Illinois River study as the first watershed to be analyzed would be the best approach for initial testing of the proposed process.
- If we focus on a Scenic River using the metrics identified in the work plan as Phase 2, will it result in a framework that is biased towards natural flows that will not apply to rivers with higher industrial water uses?
    - Pre-development flows are typically not used as goals, recognizing that consumptive diversions will continue to exist in the stream system. The process can be similar, but will have to reflect supply, demand, and water use attributes and priorities specific to each stream studied.
    - Language of draft pilot needs to be more specific about the goal being to develop a process, not a flow regime that would be extrapolated to stream systems statewide.
- Can the IFIM method be applied to different projects?
    - It can be applied to many different types of projects—irrigation, hydropower, multi-use stream systems, etc.
- The proposed pilot study process should help answer the group's questions and concerns; we should concentrate on how and what we can learn from the process.
- Would process be radically different if a different methodology was used?
    - The IFIM process includes basic steps, generally consecutive, that would essentially be a part of any method employed.
- The draft pilot study work plan does not say anything about consumptive uses of water.
    - The goal is to look at impacts of instream flow alternatives on all users; OWRB/consultants can include language to emphasize that.
- There seem to be different interpretations of the language in the draft document and the intent.
    - Need to create a glossary.
    - Clearly state up-front what the expected outcome of the pilot will be, and how those results will be used to assess impacts of alternatives.
- In identifying representatives of stakeholder groups, need to recognize that many stakeholders for recreation do not live within the watershed; many are tourists and visitors from other areas.
- Did not see anything in Phase 1 about negotiating teams; need to define different teams.
    - The term "negotiating teams" is often used in specific flow-related controversies in watersheds when using the IFIM process.
    - For this pilot study, it is anticipated that a diverse set of water interests would make up the overall stakeholder group.
    - The study team is envisioned as being technical members, while stakeholders may not be.

- The pilot study should include an evaluation of how setting flows could impact downstream reservoir levels, yields, and/or operations.
    - References in the work plan and IFIM documentation are geared more toward upstream reservoir releases into the stream segment in question, but impacts of an ISF program on downstream reservoirs should also be considered where applicable. In the upper Illinois River watershed, there are no major upstream reservoirs, but flows do feed Lake Tenkiller.
    - Study Planning (Phase 2) of the work plan would define metrics that need to be evaluated, including reservoirs; Alternatives Analysis (Phase 4) would look at impacts.
    - Although the timing of flows into a reservoir could affect lake levels and operations, maintaining a set annual flow into downstream reservoirs may help protect yields.
- Change terminology from Problem Identification to Issue Identification; the intent of the pilot is to test the process, not come up with a set flow that would be applied to other watersheds. Essentially, one of the overarching goals is to test the ability of the proposed process to answer the questions voiced by the Work Group by using a real watershed—i.e., What are the costs? To what extent would existing and future uses be impacted?
- As written, the goal of the pilot work plan appears to be the determination of a single flow or flow range for the upper Illinois River watershed, rather than validating the process to see if it answers the key questions posed by the ISF Advisory Group.
- It was suggested that an additional step, "Phase 6" is needed to evaluate the process and address questions such as: Does the process answer the questions we have? Do we need to go back and modify the process so the key questions are answered?
- Need to recognize the uniqueness of the Illinois River watershed during the process development.
- Need to put in an estimated schedule/time frame for each phase of the work plan.
- The timeframe set out in the OCWP recommendations will not be met if we can only get through Phases 1 and 2 within a year.
    - We are already somewhat behind schedule and may need to adjust that when we put some timeframes to each of the Pilot Study phases.

Path Forward: Status and Next Steps

OWRB and its consultants will address comments provided at the meeting on the draft Pilot Study work plan and will distribute the revised draft to the Instream Flow Advisory Group within three weeks. Instructions on when and how to provide comments on the revised draft will be distributed along with the document. In the meantime, any member wanting to provide comments on the initial draft is welcome to send those to John Rehring (JRehring@Carollo.com). Some Advisory Group members expressed interest in meeting periodically to share viewpoints and discuss instream flow issues. At this time, no Instream Flow Advisory Group meetings are scheduled, but members indicated that they would like to meet again prior to getting a pilot underway. OWRB will investigate logistics and timing for the pilot study.

Public Comment

An attendee questioned if/how instream flow and model results would be affected by climate data and projections of climate change. He cautioned that flows based on current data could ultimately not provide sufficient flow under changing climatic conditions.

Oklahoma Instream Flow Pilot Study - Approach for a Scenic River System

Presented to
Oklahoma Instream Flow Advisory Group

Presented by
Forrest Olson, CH2M HILL

January 16, 2014

US Army Corps of Engineers

CH2MHILL.

Primary Goal of Pilot Study:

"Gain a better understanding of the implications of a process to deal with instream flow issues consistent with the overall goal of managing water resources in Oklahoma for multiple uses." The study would help define a conceptual framework and study process that could be used statewide.

The pilot study would focus on policy and technical questions on a single stream/watershed so as to:

1. Better understand implications of a possible instream flow program
2. Identify additional questions and concerns
3. Identify specific technical components and metrics that can be applied to instream flow assessments in other watersheds
4. Help determine costs associated with various ISF study components

Study Area:

Illinois River upstream of Tenkiller Reservoir to Arkansas border including Baron Fork and Flint creeks

Why study a scenic river:

1. Stream flows are less altered
2. Unique state law emphasizing protection of flows
3. Already have a precedent for regulation of flows
4. Significant flow-based recreation and ecological value
5. Extensive data and modeling already exist
6. Recommended by the Instream Flow Advisory Group

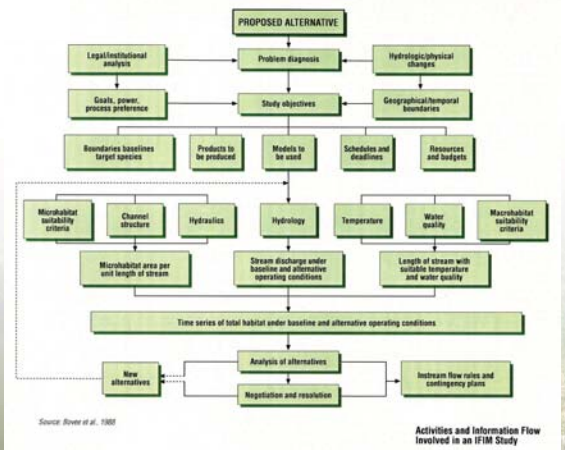
Proposed Study Approach:

Study approach modeled after the USGS Instream Flow Incremental Methodology (IFIM)

Five sequential phases:

1. Problem Identification
2. Study Planning
3. Study Implementation
4. Alternatives Analysis/Impacts
5. Problem Resolution

IFIM Activities and Information Flow



Activities and Information Flow Involved in an IFIM Study

Phase 1. Problem Identification (2 parts):

Phase 1, Part 1 – Institutional Analysis

- Identify stakeholders and affected parties.
- Conduct outreach to affected parties (stakeholder meetings).
- Identify and document concerns and issues of affected parties and provide responses to those issues.
- Outline a preliminary decision process to be used to recommend instream flow criteria.

Previously Identified Institutional Issues

- Legal considerations
- Potential effect on current and future water right holders
- Process for implementing flow recommendations
- Need for statutory changes
- Need for a formal instream flow program

Phase 1, Part 2 – Existing Information Summary

- Summarize existing information on fish and other aquatic resources of concern
- Determine the aquatic resource management goals for the streams or watershed
- Summarize hydrologic information, including existing conditions and simulated natural flows
- Summarize water quality information for the study streams
- Describe landscape features and land use activities that affect hydrology, water quality, and stream sediment dynamics

Phase 2. Study Planning

- The temporal and spatial scale of the evaluations
- Important variables for which information is needed
- How information will be obtained if it is not available
- A schedule of when data must be collected in the field
- Coordination of data collection needed for model input, calibration, and testing
- Estimates of labor, equipment, travel, and other costs required to complete the studies by the agreed study deadline

Phase 3. Study Implementation

1. Data collection/supplementation
2. Model calibration
3. Predictive simulation
4. Synthesis and integration of results

Specific Technical Tasks

- Reanalysis of the hydrological data summarized in Phase 1, to potentially include use of Indicators of Hydrologic Alteration (IHA) or similar software
- Collection of fish and potentially other aquatic organisms if existing data are not sufficient to describe existing conditions
- Characterization of stream channels, including sediment and habitat typing
- Modeling of water temperature and perhaps other chemical constituents
- Development of physical habitat simulation models (PHABSIM) for representative stream reaches
- Development of habitat suitability criteria for key fish species and habitat guilds for inclusion in the physical habitat simulation models

Phase 4. Alternatives Analysis

Each alternative will be evaluated by the following criteria and questions:

- Effectiveness—Are the objectives of each party sustainable? Is no-net-loss of habitat or biological function possible on a sustainable basis? What are the habitat costs and benefits of each alternative?
- Physical Feasibility—Are prior water rights and existing water uses maintained? Are reservoir purposes maintained? Is enough water available?
- Risk—How often does an alternative lead to a failure of the biological system? Is the failure reversible? Can contingency plans be developed?
- Economics—What are the costs and benefits of each alternative?

Phase 5. Problem Resolution

Negotiation Process: Implies that the solution will entail some kind of balance among conflicting social values

Questions

Appendix D
Oklahoma ISF Pilot Study Work Plan

(CH2MHILL, 2014)

Oklahoma Instream Flow Pilot Study Approach

PREPARED FOR: Oklahoma Water Resources Board and US Army Corps Engineers, Tulsa District

PREPARED BY: CH2MHILL

DATE: Revised June 15, 2014

Introduction

As part of the 2012 Oklahoma Comprehensive Water Plan (OCWP), the Oklahoma Water Resources Board (OWRB) convened an Instream Flow Advisory Group to discuss benefits and issues with a potential future Oklahoma instream flow program. This effort culminated in a report titled *Instream Flow Issues and Recommendations* (February 2011). The report outlined the issues associated with an instream flow program and recommended the following steps:

1. Address the legal and policy questions.
2. Study other mechanisms for protecting instream flows.
3. Develop a draft methodology for instream flow studies in Oklahoma.
4. Conduct a study on the economics of instream flows in Oklahoma.
5. Perform an instream flow pilot study in a scenic river.
6. Preserve the Instream Flow Advisory Group.

Furthermore, the *2012 OCWP Executive Report* identified eight priority recommendations including the following recommendation regarding Instream/Environmental Flows:

> The process developed by the OCWP Instream Flow Workgroup should be implemented and followed to ascertain the suitability and structure of an instream flow program for Oklahoma, with such process commencing in 2012 and concluding by 2015, as outlined by the Workgroup.

Consistent with these recommendations, the Instream Flow Advisory Group reconvened in 2013 to further define whether and how an instream flow (ISF) program might be implemented in Oklahoma. The ongoing Advisory Group has continued the dialogue about ISFs in Oklahoma per the recommendations in the 2011 report and the steps listed above. As part of the effort to address the institutional arrangements that govern what can or should be done with an ISF program in Oklahoma (Recommendations 1 and 2), a background report—*Instream Flow Advisory Group Support* (CH2M HILL and Carollo 2013)—investigated and summarized relevant Oklahoma water laws, existing programs and state and federal laws that may provide some level of ISFs and affect development of an ISF program in Oklahoma. The background report provided an initial overview on the ISF legal and policy framework, other states' ISF programs, and mechanisms for protecting ISFs to support the initial discussions with the Instream Flow Advisory Group.

Background

To more fully understand the issues raised by the Advisory Group, the OWRB conducted a questionnaire/survey with open-ended questions in February 2013. Fifty-nine percent of the respondents replied to the questionnaire. In addition, the issues were the subject of significant dialogue by the entire group at each of the Advisory Group meetings.

The issues identified by the Advisory Group were summarized in May 2013. The detailed input was compiled as received and distributed to the Advisory Group. A synopsis of these issues is posted to OWRB's ISF webpage (http://www.owrb.ok.gov/supply/ocwp/instreamflow.php). It is recognized that the list does not represent consensus on the issues, but indicates the types of questions and concerns raised by members of the group. This preliminary input from the Advisory Group was used to guide the facilitated discussions during subsequent ISF Advisory Group workshops.

The prevailing theme of the Advisory Group responses concerned the institutional issues and potential economic impacts surrounding an ISF program, such as water law and permitting, and protecting existing and future consumptive water rights. The complexity of addressing the ISF program legal and policy issues in the abstract creates an immense challenge for the meaningful analysis of the voiced concerns. To make sound policy recommendations, the Group acknowledged that the basis, specifics and consequences of an ISF program must be known and understood.

The measures recommended in the ISF Advisory Group survey included the use of a pilot study to "measure, refine and adjust an ISF program process before finalizing or implementing any program," and one respondent noted that "scenic rivers are a logical starting point, especially considering that there is already precedence for regulations of flows." The recommendations provide a good starting point from which to address the institutional issues surrounding an ISF program with a reference to a specific instance.

Input received at the facilitated Instream Flow Advisory Group meetings and workshops was analyzed to further develop recommendations regarding an ISF program process. Four workshops were conducted (March 1, May 16, and October 7, 2013, and January 16, 2014). The detailed workshop agendas, summaries and presentations are found on OWRB's ISF website (http://www.owrb.ok.gov/supply/ocwp/instreamflow.php). The workshops were held to solicit the Advisory Group's expertise, to advance the dialogue on the ISF program in Oklahoma and to deepen their understanding of the different elements of existing ISF programs through technical presentations.

Most of the ISF Advisory Group workshop dialogue and subsequent output from workshops centered on legal and policy questions as well as effects on water users and economics, reflecting the comments received from the questionnaire. Most of the ISF Advisory Group workshop dialogue and subsequent output from workshops centered on legal and policy questions as well as effects on water users and economics, reflecting the comments received from the questionnaire. At the facilitated workshop on October 7, 2013, it was discussed that one way to advance the ISF perspectives and dialogue was to develop or consider an ISF study process similar to the Instream Flow Incremental Methodology (IFIM) process, rather than developing a specific ISF minimal flow. The IFIM is the most widely used method for assessing ISF needs and affords a systematic way to address outstanding concerns/issues, including potential economic benefits and impacts associated with establishing ISF goals or requirements in Oklahoma. That is, the results of the pilot study would provide tangible information that the Advisory Group could use as a basis for its final deliberations.

It was agreed that OWRB and consultants would develop a suggested piloting approach/process plan for review by the Advisory Group before the January 2014 Instream Flow Advisory Group meeting. The process would be geared toward assessing the list of issues and concerns identified in previous meetings by the Instream Flow Advisory Group. This would address Recommendation No. 5 from the February 2011 report: Perform an ISF pilot study in a state-designated scenic river. The ISF pilot study approach was discussed and refined at ISF Advisory Group meeting on January 16, 2014.

The Advisory Group identified the upper Illinois River above Tenkiller Reservoir, including Baron Fork and Flint creeks, as the best scenic-designated watershed to test the proposed ISF evaluation process. The Illinois River was chosen because it has some discharges and has a broad existing dataset that should help reduce study costs. The group discussed the merits of conducting the pilot in a watershed that is more heavily used by consumptive users, or conducting pilot studies in more than one watershed. The group ultimately determined that an upper Illinois River study as the first watershed to be analyzed would be the best approach for initial testing of the proposed process.

Recognizing that the issues identified in Recommendations 1, 2, and 4 from the February 2011 report are abstract and statewide, the pilot study would focus on both policy and technical questions on a single stream/watershed to accomplish the following:

1. Better understand the benefits, costs, impacts, and other implications of a possible ISF program.
2. Identify additional questions and concerns.

3. Test and refine the process to better address the questions and issues raised by the ISF Advisory Group.
4. Specify technical components of the approach that can be applied to ISF assessments in other watersheds.

The primary goal of the pilot study is to gain a better understanding of the implications of a process to assess ISF benefits and issues consistent with the overall goal of managing water resources in Oklahoma for multiple uses. This includes consideration of ISF needs, recreational uses of water, and consumptive uses of water in the watershed (e.g., public water supply, crop irrigation, power generation and industrial uses), drawing on significant involvement of stakeholders from all water interest groups in the watershed throughout the process.

Study Purpose and Expected Outcomes

The purpose of a pilot study is to help define a study process that could be used for development of ISF recommendations for water resource planning purposes in other watersheds, if the state should move forward with an ISF program. The Illinois River system upstream of Tenkiller Reservoir is the suggested study area for piloting the IFIM process. This stream reach is mostly unregulated; that is, it contains no major storage reservoirs or large diversions. However, the effects that streamflow alternatives might have on the downstream operational purposes of Tenkiller Reservoir would need to be assessed. Primary out-of-stream (consumptive) water uses include those for domestic and agriculture purposes. Instream water flow supports one of the state's most popular destinations for sport fishing, recreational boating, and scenic beauty. Also, this reach of the river and two of its tributaries, Baron Fork and Flint creeks, are state-designated scenic rivers. An ISF study focused on fish has already been conducted on the Baron Fork.[1]

The overall goal is to establish an ISF study process for potential application in other Oklahoma watersheds, but it is important to recognize that each watershed will differ in terms of water supply, water use, future demand, and priorities. Flow recommendations and criteria that may be developed for the scenic –designated Illinois River would not be extrapolated to other stream systems. Again, the emphasis of this study is the process itself, not the specific flow recommendations that may be developed for the Illinois River system. Thus, the watershed-specific results of the pilot would apply only to the upper Illinois River watershed, but the same process (modified based on lessons learned in the pilot) could be applied to other watersheds in Oklahoma with different watershed-specific conditions and goals, and different watershed-specific findings. The pilot study should help identify concerns and needs associated with applying the approach elsewhere in the state.

The study approach outlined below would take roughly 2 years to complete. The initial information reviews, stakeholder outreach, and study planning would require 6 to 12 months. Implementing the field studies, which would include all field work and modeling, would require 6 months or more. Field work would occur primarily in the summer low flow period with additional measurements (flow related) during the spring and/or fall. Once the study results are completed, the analysis of alternatives and resolution of issues could be accomplished in about 6 months, assuming that the parties to the study process are committed to its timely completion.

Proposed Study Approach

The proposed approach to the pilot study is modeled after the USGS IFIM process. Details of the methodology are available at the USGS website (http://www.fort.usgs.gov/products/software/ifim/). The IFIM is a decision-support process that provides a comprehensive technical framework for addressing streamflow needs for fish and other aquatic resources while incorporating consideration of the institutional environment (i.e., recreational interests and consumptive water uses such as public water supply, crop irrigation, power generation and industrial uses). It is the most commonly used methodology that includes institutional and stakeholder components. It employs a phased approach, putting the institutional tasks first, in accordance with the recommendations in the OCWP. The methodology typically is used for specific water project proposals (for example, a water diversion). However, the same steps can be applied to a stream- or basin-wide

[1] W. L. Fisher and W. J. Remshardt. 2000. *Instream Flow Assessment of Baron Fork Creek, Oklahoma.* Final Report, Oklahoma Water Resources Board, Oklahoma City, OK.

study considering future water use patterns. The methodology includes both an institutional analysis as well as the technical studies needed to identify and assess ISF alternatives. It includes deliberate engagement of all uses and users of water in the watershed in the decision-making process.

The proposed study would be completed by experts with experience in IFIM elements, with guidance provided by ISF Advisory Group. State and federal agency expertise would be drawn upon as well.

The IFIM process is implemented in six sequential phases:

1. Issue Identification
2. Study Planning
3. Study Implementation
4. Alternatives Analysis
5. Issue Resolution
6. Process Evaluation

The result is not based strictly on a calculated flow rate or flow regime for the watershed. Rather, it is the product of significant deliberation and input by all parties with water interests in the watershed. The intent of the pilot is to consider all water users and uses without bias, but with opportunities for each interest group to engage in the process. The process helps inform decision-making to reflect the competing needs of various water users and uses, and culminates in negotiations between various interests.

The steps above differ slightly from the published IFIM process in two regards. First, Phase 1 is defined as "Issues Identification" rather than "Problem Identification" because the study is not focused on a specific problem or proposed water development. This is not to say that some of the water issues in the Illinois River system are not viewed as problems by some stakeholders; however, the primary focus of the study is to evaluate the "process" of evaluating issues associated with ISFs. Second, we have added a sixth phase, which will evaluate the overall process itself in line with the overall goal of the study.

At this early stage, OWRB proposes to undertake only the first 2 phases, because the last 3 cannot be clearly scoped until the earlier phases are completed, which could take 6 to 12 months.

Phase 1. Issue Identification and Stakeholder Involvement

Phase 1 has two components: (1) address legal and policy questions; and (2) conduct initial physical analysis. Phase 1 will result in a better understanding of the issues and objectives of the interested parties. Understanding the different objectives will set the stage for multi-objective planning. Collaboration at an early stage of the study will provide the foundation for a successful process.

The following tasks are to be completed for the legal/policy analysis:

- Identify stakeholders and affected parties from both within the watershed and from wherever there is interest in the Illinois River (for example, regional tourism).
- Conduct outreach to affected parties (stakeholder meetings).
- Identify and document concerns and issues of affected parties and provide responses to those issues.
- Outline a preliminary decision process to be used to recommend ISF criteria.

Phase 1 would address the following legal and policy issues in the context of the Illinois River study as those have been identified by the Instream Flow Advisory Group in the 2011 OWRB *Instream Flow Issues and Recommendations* report:

- Consideration of relevant legal, policy, and regulatory factors in the Illinois River study area
- Potential effect on current and future water right holders for municipal, industrial, agricultural, and other out-of-stream uses in the Illinois River study area

- Process for implementing flow recommendations in the Illinois River study area

While these issues were initially identified from an abstract, statewide perspective, the pilot study would address them in context specific to the Illinois River study area.

The Advisory Group also raised concerns about the economics of implementing an ISF program in Oklahoma both in terms of study costs and economic benefits/costs on developmental (out-of-stream water uses) and nondevelopmental (ISF-related) resources. These economic issues would be analyzed in specific context of the Illinois River study area.

The second component of Phase 1 includes the review and summary of information on the physical environment that would be subject to the ISF assessment:

- Summarize existing information on fish and other aquatic resources of concern.
- Determine the aquatic resource management goals for the streams or watershed.
- Summarize hydrologic information, including existing conditions and simulated natural (unimpaired) flows.
- Summarize all existing water rights by quantity and use categories.
- Summarize water quality information for the study streams.
- Describe landscape features and land use activities that affect hydrology, water quality, and stream sediment dynamics.

The final product of the review of existing information will be an identification of data gaps that can be addressed in the study planning and implementation phases discussed below.

Phase 2. Study Planning

The emphasis of Phase 2 is on identifying the information needed to address the concerns of each interest group. Proper planning will lead to the identification of the following:

- The temporal and spatial scale of the evaluations
- Important variables for which information is needed
- How information will be obtained if it is not available
- A schedule of when data must be collected in the field
- Coordination of data collection needed for model input, calibration, and testing
- Estimates of labor, equipment, travel, and other costs required to complete the studies by the agreed study deadline

The study tasks expected for Phase 3 of the overall Illinois River study include those associated with understanding the physical (including hydrologic), biological, and chemical processes that contribute to the stream ecosystem. These may include the following:

- Reanalysis of the hydrological data summarized in Phase 1, to potentially include use of Indicators of Hydrologic Alteration (IHA) or similar software
- Collection of fish and potentially other aquatic organisms if existing data are not sufficient to describe existing conditions
- Characterization of stream channels, including sediment and habitat typing
- Modeling of water temperature and perhaps other chemical constituents
- Development of physical habitat simulation models for representative stream reaches
- Development of habitat suitability criteria for key fish species and habitat guilds for inclusion in the physical habitat simulation models

Phase 2 includes only the study planning effort for the above processes. It should also identify the links among these processes in light of the natural, historical, existing, and anticipated future land use and water allocation practices in the Illinois River basin.

Phase 3. Study Implementation

The technical studies identified during Phase 2 will be implemented in accordance with the schedules and budgets also identified in Phase 2. IFIM study implementation usually can be broken down into four fundamental steps:

1. Data collection/supplementation
2. Model calibration
3. Predictive simulation
4. Synthesis and integration of results

These steps assume that most of the studies, such as fish habitat, hydraulics, hydrology, sediment movement, and water temperature, will involve simulation modeling to some degree.

The general sequence of data collection activities can include the following:

1. Identify aquatic mesohabitats (riffle, runs, pools) within each key physiographic region.
2. Select transects in each mesohabitat and physiographic region.
3. Select IFIM-focus species of fish and macroinvertebrates, and compile habitat suitability criteria for specific resident species and life stages of interest, as well as for recreation (e.g., canoeing/kayaking).
4. Collect field hydraulic and habitat data at selected transects at specific target flows.
5. Implement the Physical Habitat Simulation Model, which integrates stream hydraulic and physical characteristics with microhabitat requirements of key species and life stages. The output “Weighted Usable Area” (WUA) is a surrogate index for what is judged to be suitable habitat for each species under a range of flows.

Phase 4. Alternatives Analysis

The final two phases of the *traditional* IFIM process involve alternatives analysis (Phase 4) and issues resolution (Phase 5). The alternatives analysis is important to the IFIM process because the IFIM process generally does not result in a single “best” flow value. Rather, the IFIM generates WUA estimates over a range of flows (or for alternative flow time-series) for each target species. The WUA estimates form the basis of negotiations among interested parties, including the stakeholders identified in Phase 1.

Establishment of ISF or flow-regime alternatives for a particular stream reach can be formulated by any interested party after reviewing both the institutional analysis and the results of the technical studies from previous study phases. Alternatives are compared to an agreed-upon baseline condition to facilitate understanding of potential impacts and to begin negotiating and creating new alternatives that may be more compatible with the multiple objectives of the parties.

Each alternative will be evaluated by the following criteria and questions:

- Effectiveness—Are the objectives of each party sustainable? Is no net loss of habitat or biological function possible on a sustainable basis? What are the habitat costs and benefits of each alternative?
- Physical Feasibility—Are prior water rights and existing water uses maintained? Are reservoir purposes maintained? Is enough water available for instream resource values and potential future out-of-stream uses?
- Risk—How often does an alternative lead to a failure of the biological system? Is the failure reversible? Can contingency plans be developed?

- Economics—What are the costs and benefits of each alternative? Are existing water rights affected? Are values associated with reasonable future water uses accounted for?

Phase 5. Issue Resolution

After several alternative flow regimes have been thoroughly evaluated by the teams that are party to the ISF resolution process (defined in Phase 1), the teams deliberate ISF criteria or standards that meet the overall watershed goals established in Phase 1. The teams must integrate their knowledge and understanding of the technical and social issues to reach an ultimate resolution. This process implies that the solution will entail some kind of a balance among conflicting social values.

The IFIM process rarely results in a single "best" flow value. Rather, the IFIM generates WUA habitat estimates over a range of flows (or for alternative flow time-series) for each target species or recreational requirement, or both. It is important to understand that the maximum WUA values typically will occur at different flows and differing times of the year for the various target species, life stages, or other uses. In addition, the current and future needs for water for developmental purposes must be considered in the resolution process. Thus, selection of flow regimes suitable for protecting the aquatic community while recognizing the need to accommodate other beneficial uses of the water often requires balancing, tradeoffs, and seasonal variation that are the subject of negotiations and management decisions.

Phase 6. Process Evaluation

Because the primary purpose of this pilot study is to define a conceptual framework and study process to be used for considering ISF needs for water resource planning purposes, it is important that the process itself be evaluated by the participating stakeholders. This will be accomplished with a questionnaire of the stakeholders that will solicit opinions as to strengths and weaknesses of the steps used in the pilot study and suggestions for improvement for future application to other watersheds. This phase may include workshops and other activities as identified in the stakeholder process.

Comment Response Matrix

Oklahoma Instream Pilot Study Approach

#	Location			Comment	Commenter	Response
	Page	Section	Line			
1		General		Overall goal of the study is still unclear	SB	The PS stated goal does not include establishing instream flows for the Illinois River, but instead develops a process to establish instream flows. That said, Phase 4 will include the development of instream flow alternatives.
2		Intro		Indicate that a min. flow in 3 scenic rivers is being developed using the pilot study	SB	See response #1. Alternative instream flow regimes will be identified and assessed (Phase 4), but any decision to adopt an alternative must wait for policy considerations.
3		Phase 1		Consideration should be given to seasonality and state clearly the objective for the seasons: Summer only?	SB	The PS includes consideration of seasonality.
4		Phase 1		Address flow variability: min. flow concerns regarding non-native species of fish	SB	The PS includes consideration of flow variability and native/non-native species.
5		Phase 1		Appropriate consideration of spatial and temporal scaling for the ecology of these (scenic river) systems	SB	The PS includes consideration of temporal and spatial factors in stream ecology.
6		Intro		The study plan should only list Phases 1 and 2 of IFIM since these are the only two phases that are being focused on for this pilot project.	MF	We believe it is important to include all phases of the pilot study. The PS covers all six phases, not just the first two.
7		General		Why this study is designed for a partial IFIM process when IFIM is designed to be completed all the way through with five phases?	KE	The PS approach includes the entire IFIM process.
8		General		Detailed information about where this project is going after phases 1 and 2 should be written into this draft plan. Who will complete the rest of the project? Is there money still available from OWRB to complete all five phases?	KE	OWRB is pursuing federal funding to assist in all phases. However, the results of the first two phases will help drive the remaining phases. Additional work will be predicated on available funding. The composition of the study team ("Technical Committee") should remain intact throughout the six phases of the PS.
9		Intro		This project needs to add a timeline for completing the IFIM beyond 2015.	MF/KE	The PS approach includes all six phases. Timeline depends on funding availability.
10		Intro, Phase 1 and 2		More detail should be provided within phases 1 and 2 of what is actually going to be accomplished in these phases over the next 6–12 months.	MF/KE	At this stage we are attempting to outline a study process/approach. A more detailed study plan will be developed by the study team as part of Phases 1 and 2.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

#	Location			Comment	Commenter	Response
	Page	Section	Line			
11		Intro		The project needs to ensure that a variety of instream flow methods are employed not just IFIM and PHABSIM.	MF/KE	The IFIM is a process, not a technical method (like PHABSIM). PHABSIM typically is done as part of the IFIM, but that does not preclude other methods being used. The decision as to what scientific methods to use (probably several) will be done as part of Phase 2 study planning.
12	1	Intro		Should read: Establish a **process** for an instream flow pilot study in a scenic river	MF/KE	Text modified accordingly.
13	3–4	Intro		Should elaborate more on problem identification and stakeholder involvement and study planning. Eliminate pages 5 and 6 since not completing an IFIM which includes phases 3 to 5.	MF/KE	It is OWRB's intent to ultimately complete all six phases of the study, therefore all should be included in this study approach. Also see response #6.
14	3	Phase 1		Explain who will identify stakeholders	MF/KE	Details on the stakeholder process are to be developed as part of Phase 1.
15	4	Phase 1		For the second component of Phase 1, a review and summary of information on the physical environment needs to be looked at.	MF/KE	Concur with the comment. Phase 1 will include the review of existing information, while Phase 2 will develop specific study plans to address data gaps and additional information needs.
16	4	Phase 1		Paragraph above Phase 3 Study Implementation: phase 2 only includes the study planning effort for the physical, biological and chemical processes of the stream ecosystem. For Phase 1, the second component should be looking at existing information, aquatic resource management goals, and hydrologic information: existing conditions and simulated natural flows, water quality and landscape features in addition to land use.	MF/KE	See response #15.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

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	Page	Section	Line			
17		General		This pilot project should also look at another watershed that is more regulated to see what the effects might be on the current and future water right holders. If there are very few water right holders upstream of the Tenkiller reservoir, then how will the impact on current and future water right holders be assessed as part of the IFIM process.	KE	We agree that a study of a regulated stream would entail many different considerations both in terms of policy and technical issues. However, it is expected that the approach, i.e. process, used for the Illinois River can be used equally well for a regulated stream or for a specific water project proposal. Part of the last phase of this study is to evaluate that very question. Also, the workgroup recommended that a pilot be conducted on a *scenic river*, and the Illinois was included in part because it is more regulated than other scenic rivers.
18		General		If this pilot is designed to address many of the institutional/legal questions that arise at the Instream Flow Workgroup meetings, then how will these be addressed if this river system doesn't have many legal issues since it is un-regulated and has limited water right holders? Plus, if we are looking at the costs associated with a formal instream flow program in Oklahoma, when a regulated and un-regulated system are looked at, comparisons can be made about costs and economics. Economics is a big question for all workgroup attendees.	KE	We agree that a study of a regulated stream would have different and possibly more contentious issues to consider. However, the workgroup recommended that the *pilot* study be done on a stream with fewer issues so that the study *process* can more easily be applied and ultimately assessed for application to other stream systems. Also see response 17.
19		Phase 1		IFIM was developed to learn the basic understanding and description of water supply and habitats within stream reaches of concern. If the Illinois River is a scenic river, then aquatic habitat values should already be protected. Are there stream reaches of concern within the Baron Fork and Flint Creek watersheds found in the Illinois River basin?	MF/KE	The degree to which the Scenic River designation protects habitat values is not known, and of course subject to different opinions based on individual values. It is hoped that the PS will help identify an approach for dealing with other streams in the state where instream resource protection is less defined.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

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	Page	Section	Line			
20		Phase 1		IFIM was originally designed for regulatory responsibility to water development, but the Illinois River upstream of Tenkiller Reservoir is mostly un-regulated (according to Instream Flow workgroup meetings). IFIM is used to study the response of altered flow management schemes, time series of flow and habitat at selected points within the river system. Are there existing flow management schemes in the Illinois River upstream of Tenkiller Reservoir? Isn't this stretch un-regulated? The dam at Lake Tenkiller (and downstream) could act as your regulated stretch and it is an important trout fishery with a huge economic impact for Oklahoma. Wouldn't it make more sense to study the section downstream of the dam? Then alternative flow regimes could be studied.	KE	The reach above Tenkiller Reservoir is unregulated, and we are not aware of any existing flow management regimes in place. The reason for not including a regulated river, such as the reach below Tenkiller, is explained in previous comment responses (#17 and #18). Furthermore, the flow regulation at Tenkiller Dam is guided by the federal (U.S. Army Corps of Engineers) operational plan for the project, meaning that flow regulation in that reach is not subject to state authority.
21		Phase 1		IFIM is used to study the response of altered flow management schemes, time series of flow and habitat at selected points within the river system. Are there existing flow management schemes in the Illinois River upstream of Tenkiller Reservoir? If so, this should be mentioned in the pilot.	MF/KE	We are not aware of any current flow management schemes for the Illinois River above Tenkiller.
22	3	Phase 1		Problem Identification: IFIM is the method designed for resources subject to intensive water development. Is there intensive water development or will there be intensive water development on this stretch of river? Is there a proposed water management change in this section of the river? IFIM is the best method when the stream is subject to significant regulation. This issue should be summarized in the pilot study to address regulatory issues.	MF/KE	Agree that IFIM (and specifically PHABSIM) is most commonly used to assess impacts of proposed water development projects or management changes. However, the methodology is also used to provide technical support for instream flow protection criteria that can be applied to future proposals. Recent examples include Alberta and Texas.
23	4	Phase 2		Biological references (e.g. ODWC) and important times of year throughout a fish life history should be addressed in this pilot.	MF/KE	This important information will be identified and summarized as part of the study.
24	4	Phase 2		This study is designed as a process and not a problem, but IFIM was designed if have a problem. Define the problem upstream of Lake Tenkiller. Context should be given for conducting this pilot project.	MF/KE	See response #15 and #22.
25		Phase 1		Additional details for Phase 1: Understand limiting factors for aquatic organisms and to what extent species are influenced by hydrology and hydraulics	MF/KE	These and other questions will be addressed as part of the PS.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

#	Location			Comment	Commenter	Response
	Page	Section	Line			
26		Phase 1		Additional details for Phase 1: Are there aquatic and flow sensitive resources?	MF/KE	See response #25.
27		Phase 1		Additional details for Phase 1: Need a range of variable flows: visuals are great like photos depicting sites on the Illinois River, Flint Creek and Baron Fork Creek with different flows. Emphasizing aquatic habitat at different flows is important so stakeholders have a visual.	MF/KE	See response #25.
28		Phase 2		Additional details for Phase 2: Is this section of river in good flow and habitat condition?	MF/KE	These and other questions will be identified and addressed as part of the study.
29		Phase 2		Additional details for Phase 2: Use historical flow gage record: Is the Illinois River @ Tahlequah gage located upstream of Lake Tenkiller? Discharge from 10-1-1935 to present.	MF/KE	See response #28.
30		Phase 2		Additional details for Phase 2: Five water year classes: water year types.	MF/KE	See response #28.
31		Phase 2		Additional details for Phase 2: Hydrologic time series: all years per water class (extreme low flow, average flow, high flow) average conditions across all water years in that class.	MF/KE	See response #28.
32		Phase 2		Additional details for Phase 2: Average flow regime within water year class and flow/habitat relations; compute habitat suitability values with focus on inter and intra-annual variability in habitat.	MF/KE	See response #28.
33		Phase 2		Additional details for Phase 2: Establish flow habitat relationships.	MF/KE	See response #28.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

#	Location			Comment	Commenter	Response
	Page	Section	Line			
34		Phase 2		Additional details for Phase 2: Flow habitat relationship for species of greatest concern; what species is the focus on?	MF/KE	See response #28.
35		Phase 2		Additional details for Phase 2: Biological evidence: species year class strength: such as fish scales for aging purposes.	MF/KE	See response #28.
36		Phase 2		Additional details for Phase 2: Emphasize flow regime with intra and inter-annual habitat variability for species of interest at that life stage.	MF/KE	See response #28.
37		Phase 6		Don't need to call Phase 6: just make sure incorporate wording for feedback on IFIM process and on ways to improve process whether it is through a questionnaire or through stakeholder meeting notes.	MF	Phase 6 was added in response to other commenters who wanted to clarify the importance of this step.
38		Phases 1 and 2		Cost of Phases 1 and 2: Provide more details on funding needs to complete an IFIM.	MF	Budget and funding issues will need to be addressed and available funding will drive both timing and fulfillment of these objectives. (Also see response #8.)
39	3	Phase 1		Developmental vs non-developmental; Why not call this consumptive vs. non-consumptive (this is the terminology commonly used).	MF	Developmental can also include non-consumptive water uses that are merely reregulated flow.
40		Phase 1		Aquatic Resources Management Goals: Is this a state driven process or stakeholder driven process of determining these goals?	MF	It is a state-driven process but with stakeholder input.
41		Phase 2		Add a bullet for type of data needed: temporal scale. The state uses monthly averages. This needs to be addressed so that relations can be made to the natural flow regime so that it incorporates all flow options such as extreme low flows, median flows, high flows not just monthly averages. Example from Tennessee: use median flows vs. monthly flows because medians are the middle number for flows and don't average high and low flows in to give an average. The median is found to be more protective of aquatic habitat and life histories	MF	The fact that most all information (e.g. biological, hydrology, recreation) has a temporal component is understood. Concur with the general statements about ways to depict flow data to best reflect ecological aspects. The Technical Committee (study team) will help identify methods to analyze and depict flow data that will inform the instream flow deliberative process.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

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	Page	Section	Line			
42		Phase 2		Add a bullet point: Biological, chemical, hydrological and geomorphological data: Address this. Being able to provide linkages among these variables to create life stage requirements and flow-ecology response curves.	MF	The integration of the ecological information and other data will be considered in recommending instream flow alternatives.
43	2	Para 5		After talking with J. D. on March 13, he said it wasn't he who suggested using IFIM. This sentence makes it sound like he was the ultimate decider of using IFIM for this pilot. You might want to remove this so you don't give workgroup members the wrong impression of whose decision it was to use IFIM.	MF	Thank you for your comment. We will clarify in the work plan.
44		General		OWRB does not have the legal authority to pursue Instream Flows for any streams other than designated Scenic Rivers.	JB	The PS is focused on designated Scenic Rivers.
45		General		The Advisory Group has not yet successfully addressed the legal and policy questions raised in 2012 or adequately performed studies evaluating alternative mechanisms to protecting ISF.	BW	The intent of the PS approach is to analyze any lingering legal and policy questions and concerns in the context of an actual watershed. The PS will help in generating information for more informed evaluation of potential ISF program formulation, planning, implementation, management, impacts and effectiveness.
46		General		In developing an ISF pilot study approach, address the priority recommendations of 2012, as well as review the economic impacts.	BW	See response #45.
47		General		Clarify OWRB's legal authority to pursue Instream Flows for any streams other than designated Scenic Rivers in Oklahoma.	BW	See responses #44 and #45.
48		General		OIPA is concerned that their participation in the Advisory Group may be misinterpreted as condoning or supporting the proposed Pilot Study Approach.	BW	While it is ideal to have the Advisory Group reach a consensus on all actions, participation does not constitute approval. Also, these comments will be made available on the ISF website, so OIPA's concern will be publically noted.
49		General		Address the funding mechanisms for the Pilot Study Approach.	BW	See responses #8 and #38.
50		Phases 1–6		Clarify the costs for the different phases for the study and timelines.	BW	See responses #8 and #38.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

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	Page	Section	Line			
51		General		A due consideration of the below listed concerns should be applied throughout the ISF Pilot Study Approach: • An ISF methodology/process vs. the establishment of ISF regime for the watershed • Inclusion of economic impacts • Analysis of potential effects on future consumptive water users • Statewide perspectives from stakeholders outside of the watershed	BW	We agree that these considerations should be addressed at various stages of the study and especially in the alternatives analysis phase (Phase 4).
52		General		Unclear if the proposed IFIM methodology disproportionally favors "physical or biological habitat models" which will result in a range of flows under a "weighted useable area" and whether or not this process appropriately provides an equal standing to consumptive users. Will the ISF Pilot Study Approach address these concerns?	BW	An instream flow study, by definition, is focused on instream resources such as fish, water quality, recreation, wildlife, and aesthetics. Rest assured, however, that consumptive water uses will be duly considered at various steps of the study. The question of balancing consumptive and non-consumptive water uses is addressed primarily in the alternatives analysis phase (Phase 4).
53		General		We believe we still need an abstract, bird's eye view of related case law. In the May 16, 2013 meeting, there was a reference to "FindLaw", which contained eighty-four lawsuits relating to ISF. Would the OWRB please have someone review these items and provide the Task Force members with a one paragraph summary for each case?	MP	Reviewing related case law is a substantial undertaking and would provide mostly inconsequential information regarding issues that have been experienced in specific situations that likely would not apply to Oklahoma's unique legal and fact situation. What is more important will be the review of Oklahoma-specific legal and policy issues in the context of this study. Also see response #45.
54		Phase 1		We have concerns about how the stakeholder process will work in the Illinois River watershed. Farmers and ranchers are still skeptical about government actions in the watershed based upon the former attorney general's litigation against the poultry companies. The stakeholder process needs to be handled with care and transparency.	MP	We fully intend for this process to be undertaken with great care and transparency. Further details on the stakeholder process are to be developed as part of Phase 1.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

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	Page	Section	Line			
55	5	Phase 1		Define “natural flow”. Is it same as “base flow”?	MP	The PS does not mention base flow, which is the portion of stream flow that is not contributed by runoff and results from seepage of water from the ground into a channel slowly over time. A “natural flow regime” refers to a river's naturally occurring changes in water flow through the course of the year.
56		General		There is still a question about where the money is coming from to pay for this study. We would like to have some idea of what the USGS IFIM process will cost. We are concerned that it will appear as if our organization supports spending millions of dollars on a study. To date there has been no dollar figure on what this study will cost.	MP	See responses #8 and #38 regarding funding, as well as response #48 regarding your organization’s support.
57		General		It appears in the proposal to be taken for granted that fish species and their habitat will be the limiting factor on determining a minimum ISF. If this is the case, what is the point of stakeholder meetings? What decisions will be left to stakeholders if the study shows there may only be so much consumptive water utilized because of its effect on fish species?	MP	Nothing is taken for granted in the proposed PS. Stakeholder input will be crucial to the process of ensuring that ALL water needs are taken into account.
58		General		Would you please clarify the OWRB’s legal authority to conduct ISF studies outside of Oklahoma’s scenic rivers?	MP	See responses #44 and #45.
59		General		The document is quite vague.	BB	We recognize that many components of the study approach appear vague. At this stage we are attempting to outline a study process/approach. A more detailed study plan will be developed as part of Phases 1 and 2.
60		Phases 1–6		Timeline for phases 1 and 2 is estimated a t 6-12 months but no timeline is offered for completion of phases 3-6.	BB	The timeline for completing the Phases 3 to 6 is uncertain at this time. It will largely depend on the outcome of Phases 1 and 2, and, of course, funding. It will certainly require more than one year.
61		Phase 1		It is unclear if ISF recommendations would include monthly or seasonal targets.	BB	We would fully expect that instream flow alternatives could include seasonal and monthly values.
62		Phases 1–6		While the process is important, where does the document say we are implementing instream flows on these Scenic Rivers?	BB	Implementation of instream flows would be a regulatory exercise that is outside the scope of this study.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

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	Page	Section	Line			
63		General		What is the projected cost of the overall project? Who is funding this effort?	AB	See responses #8 and #38.
64	1	Intro, Para 3		This seems to imply the legal analysis is complete. We appreciate what's been done; however, we need a thorough analysis of OK water law and case law and a more detailed analysis/evaluation is needed as well as how this applies to the PS.	AB	Within the PS, we added "initial" to: "The background report provided an *initial* overview on the ISF legal and policy framework, other states' ISF programs, and mechanisms for protecting ISFs to support the initial discussions with the Instream Flow Advisory Group." Also see response #45.
65	2	Background, Para 3		The economic impacts should also be included in this statement.	AB	Added to the report.
66	2	Background, Para 4		Recommend the text say an "ISF program process"	AB	Added to the report.
67	2	Background, Para 5		Institutional "arrangements" should be changed to "issues" to be consistent with the previous paragraph.	AB	Text modified accordingly.
68	2	Background Para 6		This sentence needs to also include impacts to current and future water users and economic impacts from the implementation of an ISF program.	AB	Added to the report.
69	2	Background para 7		Recommend "benefits" be deleted as it falls within "issues and concerns" or it should say "benefits and impacts".	AB	Text modified accordingly.
70	2	Background para 7		Recommend this say ". . . ISF pilot study process approach."	AB	Text modified accordingly.
71	2	Background para 8		Recommend this say ". . . ISF Pilot process evaluation."	AB	Added to the report.
72	3	Background, para 1		This text should clarify that the current law doesn't allow it elsewhere and it's not completely clear it's allowed in the scenic rivers.	AB	*See responses #44 and #45.*
73	3	Background para 2		This PS needs to address all issues and questions raised by the Advisory Group. Otherwise, the process cannot be adequately evaluated to determine if the approach can apply elsewhere.	AB	Text modified accordingly, but as noted, the ISF legal analysis is not complete. See response #45.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

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	Page	Section	Line			
74	3	Background para 2 (numbered list)		Better understanding of benefits and implications using the PS: The bulleted list: This needs to include the impacts to current and future water users as well as the economic cost/benefit analysis.	AB	Added to the report: Recognizing that the issues identified in Recommendations 1, 2, and 4 from the February 2011 report are abstract and statewide, the pilot study would focus on both policy and technical questions on a single stream/watershed so as to "better understand the benefits, costs, impacts, and other implications of a possible ISF program."
75	3	Background para 2 (numbered list)		Better understanding of benefits and implications using the PS: This PS needs to address all issues and questions raised by the Advisory Group. Otherwise, the process cannot be adequately evaluated to determine if the approach can apply elsewhere.	AB	Text modified accordingly (see responses #73 and #74).
76	3	Background, para 3		Revise the sentence: "The primary goal of the pilot study is to gain a better understanding of the implications of a process to deal with ISF benefits and issues consistent with the overall goal of managing water resources in Oklahoma for multiple uses". Recommend this statement be revised to include that the pilot study is to develop a process approach that comprehensively addresses the issues and concerns raised by the ISF Advisory Group.	AB	Text modified accordingly (see response #74).
77	3	Study Purpose and Expected Outcome, para 1		How will the previous ISF study on fish be incorporated into Phase 3 of the PS?	AB	Fish are an indicator of the ecological health of a river, thus appropriate to include along with other indicators. The selection of the key species and other parameters will be left to the Technical Committee.
78	3	Study Purpose and Expected Outcome, Para 2		While the overall goal is to establish a study process… Delete "study". Recommend this say, "While the overall goal is to develop an ISF evaluation process for . . ."	AB	"Study" is consistent with the title of the document. A "study" refers to an investigation and analysis.
79	3	Study Purpose and Expected Outcome, Para 2		"Thus, the watershed-specific results of the pilot would only apply to the upper Illinois River watershed, but the same process (modified based on lessons learned in the pilot) could be applied to other watersheds in Oklahoma with different watershed-specific conditions and goals, and different watershed-specific findings." The PS results should clearly identify the issues and concerns with applying this elsewhere in the state.	AB	Text modified: The pilot study should help identify concerns and needs associated with applying the approach elsewhere in the state.

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Comment Response Matrix

Oklahoma Instream Pilot Study Approach

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	Page	Section	Line			
80	4	Proposed Study Approach		"The process helps inform decision-making to reflect the competing needs of various water users and uses, and culminates in negotiations between various interests in the watershed." What about interests outside the watershed i.e. what's best for the state as a whole? How will this be incorporated into the study? It's mentioned below, but needs to be incorporated into the other phases of the PS.	AB	Phase 1 includes identification of stakeholders and affected parties from both within the watershed and from elsewhere.
81	5	Phase 1, para 2		Bulleted list: "Stakeholder identification (e.g. tourism)." How will a statewide perspective be incorporated into the decision making process?	AB	See response #80. The statewide ramifications will also be addressed in Phase 6.
82	5	Phase 1, para 3		Bulleted list: "Consideration of relevant legal and regulatory factors in the Illinois River study area." Include "policy issues" in this statement.	AB	Text modified accordingly.
83	5	Phase 1, para 4		The concerns or potential ramifications on other watersheds and the state should be discussed in the PS. What about the impacts on future water users? Otherwise how can the "process" be evaluated for use in other areas?	AB	The impacts on future users and statewide implications will be addressed in phase 5 and phase 6, respectively.
84	5	Phase 1, para 6		Bulleted list: Who determines/develops aquatic recourse management goals? How is the Advisory Group included in this process?	AB	Determining who should be included in the study team (Technical Committee) and their specific roles and responsibilities will be addressed in Phase 1 of the PS. An IFIM is an interdisciplinary tool requiring different skills and expertise throughout its implementation. An ISF technical committee should be formed separate from the Advisory Group. The purpose of the IFIM is to help disparate groups solve complex, multi-issue problems in a systematic yet flexible manner. The Technical Committee should consist of competencies in biological sciences, economics, policy and legal disciplines, hydrology, hydraulics, water management, geomorphology, and chemistry.
85	5	Phase 1, para 6		Bulleted list: "Summarize all existing water rights by quantity and use categories." What about the impacts on future water users?	AB	The impacts on future water uses should be addressed in phase 5 and phase 6.

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Oklahoma Instream Pilot Study Approach

#	Location			Comment	Commenter	Response
	Page	Section	Line			
86	6	Phase 3, para 2		How is the "species" issue weighted in the process evaluation? Will it drive the process to a specified end result over other water users? Who selects the species of focus? How will the Advisory Group participate in this process or the selection of other key parameters?	AB	See response # 84 on the composition of the Technical Committee. In response to species concerns, see response #77.
87	7	Phase 4, para 1		The PS needs to fully flesh out the issues associated with the selection of a single flow versus a seasonal flow.	AB	The PS allows for consideration of any type of flow: single, multiple, or variable.
88	7	Phase 4, para 2		It is unclear who will determine if it's an ISF or a flow-regime. How is the state's best interest incorporated? Clarify.	AB	See response #84 on the composition of the Technical Committee. See response #87 on the different flow regimes.
89	7	Phase 4, para 3		Alternatives evaluation: Recommend that the legal and policy issues be included here as well.	AB	Text modified accordingly.
90	7	Phase 4, para 3		Alternatives evaluation: Future water users and rights should be addressed/considered as well.	AB	Text modified accordingly.
91	7	Phase 5, para 1		How are the study/technical "teams" established, roles/responsibilities, etc.?	AB	See response #84 on the composition of the Technical Committee.
92	7	Phase 5, para 2		"Thus, selection of flow regimes suitable for protecting the aquatic community while recognizing the need to accommodate other beneficial uses of the water often requires balancing, tradeoffs, and seasonal variation that are the subject of negotiations and management decisions." This implies a flow regime versus an ISF and that it is based on the aquatic community. It's not clear how the other water users and identified issues will factor into the process if this is the driver. Who makes this decision? How will the Advisory Group have input into this process?	AB	See responses #84 and #87.