Oklahoma Instream Flow Pilot Study (Draft)

PREPARED FOR:

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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 instream flows 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 overview 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.

To more fully understand the issues that have kept the Advisory Group from reaching consensus, the OWRB conducted a questionnaire/survey with open-ended questions in February 2013. 59 % 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. The preliminary input for the analyses was used to guide the facilitated discussion during the ISF Advisory Group workshops to reach a mutual understanding and consensus on instream flow program in Oklahoma.

The prevailing theme of the Advisory Group responses concerned the institutional arrangements surrounding an ISF program: water law and permitting, and protecting 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 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 regulations 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 instance.

The output from the facilitated Instream Flow Advisory Group meetings and workshops was analyzed to further develop recommendations regarding an ISF program. Three workshops were conducted (March 1, May 16, and October 7, 2013). The detailed workshop agendas, summaries and presentations are found on the OWRB 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, as requested/needed, of the different elements of existing ISF programs through technical presentations.

Most of the ISF Advisory Group workshop dialogue and subsequent output from workshops have centered on legal and policy questions, and reflect the earlier preliminary comments received from the questionnaire. After the October 7, 2013 facilitated workshop discussion, J.D. Strong suggested that one way to advance the ISF perspectives and dialogue would be 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 instream flow needs. He suggested developing a process for a pilot study that incorporates a systematic way to address outstanding concerns/issues, including economic impacts associated with the setting of instream flow 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 recommendations. It was agreed that OWRB and consultants would develop a suggested piloting approach/process plan for review by the Advisory Group before the next Instream Flow Advisory Group meeting, tentatively scheduled for January 2014. The process would be geared toward assessing the list of benefits, issues and concerns identified in previous meetings by the Instream Flow Advisory Work Group. This would address Recommendation No. 5, an instream flow pilot study in a state-designated scenic river.

The Advisory Group recommended looking at the upper Illinois River above Tenkiller Reservoir including Baron Fork and Flint creeks. Recognizing that the issues identified in Recommendations 1, 2, and 4 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 instream flow program, (2) identify additional questions and concerns, and (3) identify specific technical components and metrics that can be applied to instream flow 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 instream flow issues consistent with the overall goal of managing water resources in Oklahoma for multiple uses.

Study Purpose and Expected Outcomes

The purpose of a pilot study is to help define a conceptual framework and study process that could be used for development of instream flow recommendations for water resource planning purposes in other watersheds. The Illinois River system upstream of Tenkiller Reservoir is the suggested study area. This stream reach is mostly unregulated. That is, it contains no major storage reservoirs or large diversions. Also,

this reach of the river and two of its tributaries, Baron Fork and Flint creeks, are state-designated scenic rivers. An instream flow study focused on fish has already been conducted on the Baron Fork.[1]

Proposed Study Approach

The proposed approach to the pilot study is modeled after the USGS Instream Flow Incremental Methodology (IFIM). 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. 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 study considering future water use patterns. The methodology includes both an institutional analysis as well as the technical studies needed to identify and assess instream flow alternatives.

The proposed study would be completed by experts with experience in IFIM with a guidance provided by the OWRB and the ISF Advisory Group.

The IFIM process is implemented in five sequential phases:

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

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

Phase 1. Problem Identification and Stakeholder Involvement

Phase 1 has two components: (1) legal-institutional analysis and (2) initial physical analysis. The following tasks are to be completed for the legal-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.

This first component of Phase 1 would address the following legal and policy issues already identified by the Instream Flow Advisory Group in the 2011 OWRB *Instream Flow Issues and Recommendations* report:

- 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

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

The Advisory Group also raised concerns about the economics of implementing an instream flow program in Oklahoma both in terms of study costs and economic benefits/costs on developmental and non-developmental

[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.

resources. These economic issues preliminarily would be addressed in the institutional analysis for the Illinois River and then refined as the study proceeded through the alternatives analysis and recommendation phases.

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

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 to identify the information needed to address the concerns of each interest group. Proper planning will lead to the identification of:

- 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 by the study team 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 (HSC) for specific resident species and life stages of interest and 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 IFIM process involves alternatives analysis and problem 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.

Establishment of instream flow 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?
- 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

After several alternative flow regimes have been thoroughly evaluated by the teams that are party to the instream flow resolution process (defined in Phase 1), the teams negotiate an instream flow regime that meets the overall goals established in Phase 1. The teams must integrate their knowledge and understanding of the technical and social issues to reach a negotiated solution. The negotiation 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. 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. 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.