

RECOMMENDATIONS OF THE SCIENCE ADVISORY COMMITTEE

Presented To

GOVERNOR'S ENVIRONMENTAL FLOWS ADVISORY COMMITTEE

August 21, 2006

At the request of the Environmental Flows Advisory Committee ("EFAC"), the Science Advisory Committee ("SAC") offers the following recommendations regarding the scientific aspects of establishing appropriate levels of environmental flows for protecting instream uses and the bay and estuary resources of the State of Texas.

- 1. If the EFAC determines that a definition for a "sound ecological environment" should be incorporated into legislation, then it is recommended that the following be considered:***

A sound ecological environment is one that:

- sustains the full complement of native species in perpetuity,***
- sustains key habitat features required by these species,***
- retains key features of the natural flow regime required by these species to complete their life cycles, and***
- sustains key ecosystem processes and services, such as elemental cycling and the productivity of important plant and animal populations.***

Rationale: The State agencies have been charged by the Texas Legislature to establish and maintain data collection and evaluation programs and to conduct studies and analyses for the state's bays and estuaries (Texas Water Code §§16.058) and its rivers and streams (Texas Water Code §§16.059) for the specific purpose of determining appropriate levels of flow necessary to support a *sound ecological environment*. The success of these efforts is entirely dependent upon adoption of an operational definition of *sound ecological environment*. The above definition is suggested as a means for establishing the key factors that must be considered relative to determining what constitutes a *sound ecological environment*. It is likely that interpretation of the meaning of the term "sound" will vary among the aquatic systems of the state, with local stakeholders playing an important role in identifying and assessing the value of what specifically is to be protected with respect to environmental flows.

In practice, ecological status is assessed by determining whether or not indicators of ecological conditions lie within acceptable ranges that reflect a sound ecological environment, or ecosystem. Indicators are metrics of ecological state that are quantitative and based upon (or extracted from) observations of organisms in the aquatic system and the magnitudes of

hydrological, geological, chemical, or hydrographic parameters that influence these organisms. The utility of an indicator requires that sufficient information exists, ranging from fairly natural to severely degraded conditions, such that an acceptable range of responses can be established for the ecosystem. Long-term, historical information is especially important to establish acceptable ranges.

Ecological condition should be assessed using a combination of metrics for ecological functions, integrity, and sustainability. Ecological functions are considered acceptable when the ecosystem provides important ecological processes. Ecological integrity is considered acceptable when the ecosystem has a community of organisms with biological diversity, species composition, structural redundancy, and functional processes comparable to that of natural habitats in the same region. Ecological sustainability is acceptable when an ecosystem maintains a desired state of ecological integrity over time.

2. More extensive review and guidance by stakeholders and the scientific community should be incorporated into the Texas Instream Flow Studies Program.

Rationale: The Texas Instream Flow Studies program is being undertaken jointly by the Texas Water Development Board (“TWDB”), the Texas Commission on Environmental Quality (“TCEQ”) and the Texas Parks and Wildlife Department (“TPWD”), and as currently structured, this program appears to encompass a comprehensive and scientific approach for establishing environmental flow needs for rivers and streams across the state. It is essential, however, that in order for this program to provide acceptable results, it must take into consideration and reflect guidance and direction from stakeholders and be subject to rigorous scientific review, including input on methodologies and the selection of adopted environmental flow regimes.

3. The TCEQ, TWDB and the TPWD should engage as soon as possible the services of qualified professionals to review currently available instream environmental flow assessment tools and to develop one or more desk-top methodologies specifically applicable to Texas river and stream conditions.

Rationale: Statistical desk-top methods and associated technical analyses, i.e., those that can be applied using generally readily-available data and information without conducting site-specific field studies, ultimately may offer the most effective approach for evaluating and establishing appropriate levels of environmental flows for rivers and streams across the state, and the answer to this question should be resolved through the ongoing Texas Instream Flow Studies Program. However, results from this Program are years away, and the desk-top methods currently being employed by the State agencies for permitting and planning purposes have not been validated for Texas streamflow and ecological conditions and may not be providing appropriate environmental flow information. For these reasons, these methods should be thoroughly examined relative to Texas river and stream conditions and should be enhanced or replaced with more appropriate methods to facilitate regulatory permitting actions and planning activities until such time as the Texas Instream Flow Studies program provides more specific guidance. The resulting enhanced methodologies indeed may evolve to become the principal instream environmental flow assessment tools in the long term, if investigations such as those being undertaken through the Texas Instream Flow Studies program prove to be too resource intensive for most situations. These studies will be useful, of course, in providing the site-specific information necessary to ultimately refine the desk-top methodologies to better reflect conditions across the state.

- 4. The significant shortcomings exhibited by the TWDB's State Methodology and the TPWD's "verification" process that are used to develop freshwater inflow recommendations for the state's bays and estuaries must be addressed, and the basic environmental flows process previously set forth in Article 1 of Senate Bill 3 as it was considered by the 79th Texas Legislature in 2005 provides an appropriate means for addressing these shortcomings.*

Rationale: The shortcomings of the TWDB's State Methodology and the TPWD's "verification" process that are used to develop freshwater inflow recommendations for the state's bays and estuaries have been articulated in the SAC report of 2004. The measure of abundance used is commercial harvest (except for the recent Sabine Lake recommendations), which has a poor relation to ecological soundness; the various statistical methods employed are questionable, including regression forms and definition of independent variables; the resulting "optimum" inflow regime is mainly determined by constraints, which are arbitrarily specified; and the optimum solution bears no relation to actual harvests, nor do the optimum patterns of inflow occur in the natural hydrology. The TPWD's verification process is actually a comparative analysis between the *minQ* and *maxH* solutions, and favors the optimal solution with the greater inflow to the bay. One of the most important questions relating to management of inflows to the Texas bays is unanswered by the State Methodology and the TPWD verification analysis, namely under drought conditions what inflows must a bay receive to maintain its ecosystem over the long term. The environmental flows process set forth in Article 1 of Senate Bill 3 as it was considered by the 79th Texas Legislature in 2005 provides the framework and structure for addressing these shortcomings through the proposed Environmental Flows Commission and the Texas Environmental Flows Science Advisory Committee, with case-specific input from the Basin and Bay Area Stakeholders Committees and Basin and Bay Expert Science Teams.

- 5. The TCEQ, TWDB and the TPWD should engage as soon as possible the services of qualified professionals to review existing bay and estuary inflow assessment tools and available data and to develop one or more alternative or supplemental methodologies that could be employed with results from the State's ongoing bay and estuary work as part of the overall process of establishing appropriate interim levels of freshwater inflow requirements for bays and estuaries.*

Rationale: Considering that significant time will be required to modify or improve the State's procedures for establishing appropriate freshwater inflow requirements for bays and estuaries ("B&E") and that even under the previously proposed environmental flows legislation in Article 1 of Senate Bill 3 answers regarding B&E inflow requirements would not be available for several years, there is an immediate need to develop an interim approach to facilitate regulatory permitting actions. For this interim approach, strong consideration should be given to examining the present State Methodology and TPWD's verification process and refining these procedures to the extent possible using available data to more effectively represent estuarine behavior. Special attention should be given to evaluating the validity of existing relationships between estuarine biological resources and inflow and modifying these or other relationships to specifically address B&E inflow needs during drought conditions. Drought conditions are not specifically addressed under the current procedures, and these are the most important with regard to sustaining estuarine resources because of the competing demands for river flows during these periods. In this regard, consideration should be given to evaluating the characteristics and variability of historical inflows, particularly those reflecting stressed estuarine conditions during droughts.

6. *The TCEQ, TWDB and the TPWD should take extensive measures to assure that input from stakeholders and water interests are fully incorporated into the State's environmental flow programs and that methodologies and results from these programs are subject to rigorous scientific review as part of the programs themselves.*

Rationale: Participation by stakeholders and water interests in the State's environmental flow programs and rigorous scientific review are of paramount importance to achieving acceptable environmental flow results. Only through a transparent process can appropriate scientific methods be employed and scientific results be formulated and accepted. The environmental flows process set forth in Article 1 of Senate Bill 3 as it was considered by the 79th Texas Legislature in 2005 provides the framework and structure for assuring such stakeholder participation and scientific review, beginning with the Basin and Bay Area Stakeholders Committees and Basin and Bay Expert Science Teams that are proposed specifically to address individual basin/bay environmental flow issues and needs. Oversight to assure coordination and consistency among basin/bay environmental flow activities and advice and direction to the State agencies are incorporated in Article 1 through the proposed Environmental Flows Commission and the Texas Environmental Flows Science Advisory Committee. As a means to empower greater stakeholder participation in the overall process to determine appropriate environmental flow levels, the State should consider making more data available to the public via the internet.

7. *Adaptive management and precautionary principle methods should be incorporated into all future phases of environmental flow activities, and the proposed instream flow and freshwater inflow adjustment for new permits or permit amendments, as stipulated in Article 1 of Senate Bill 3 as it was considered by the 79th Texas Legislature in 2005, provides an appropriate mechanism for incorporating adaptive management and precautionary principle methods into the TCEQ's water rights permitting process.*

Rationale: History proves that the present science of environmental flows is complex, inexact and subject to varying levels of uncertainty, and is constantly revised in the light of new information. These shortcomings identify a need for an overall environmental flow strategy that facilitates change as future information becomes available. Any future adaptive management approach must consider the need for assuring dependable water supplies for human use and must provide reasonable and scientifically-determined boundaries that limit supply risk while also recognizing scientific uncertainty and erring on the side of caution if the risks of environmental damage are high. Article 1 of Senate Bill 3 as it was considered by the 79th Texas Legislature in 2005 provides for appropriate revisions to Section 11.150 of the Texas Water Code that require the TCEQ to consider adjustments to environmental flow requirements in new water rights permits or permit amendments if such adjustments are deemed appropriate to achieve compliance with applicable environmental flow standards previously adopted by the TCEQ.

8. *Pursuant to provisions of Article 1 of Senate Bill 3 as it was considered by the 79th Texas Legislature in 2005, if considered appropriate by an individual Basin and Bay Area Stakeholders Committee, the function of the proposed Basin and Bay Expert Science Team could be incorporated into the individual Basin and Bay Area Stakeholders Committee, with supplemental technical support and expertise engaged by the individual Stakeholders Committee as deemed appropriate and necessary.*

Rationale: Technical resources available within the state with respect to the specific disciplines required to effectively evaluate all aspects of environmental flows are limited. Consequently, it may not be possible to adequately implement the structure proposed in Article 1 of Senate Bill 3 as it was considered by the 79th Texas Legislature in 2005 for establishing a separate Basin and Bay Expert Science Team for each basin and bay system in the environmental flows assessment process. As an alternative, the function of the proposed Basin and Bay Expert Science Teams could be performed by supplemental technical support and expertise engaged directly by the individual Basin and Bay Area Stakeholders Committees. Under these circumstances, the state-level Texas Environmental Flows Science Advisory Committee would have to play a more active role in the deliberations of the individual Basin and Bay Area Stakeholders Committees to provide an acceptable level of scientific competency and to assure consistency among the environmental flow evaluations and recommendations for all regions of the state.