

MINIMUM FLOWS AND LEVELS

The State of Florida Minimum Flows and Levels (MFLs) Program is based on Chapter 373.042, *Florida Statutes*, which requires that either a Water Management District (WMD) or the Florida Department of Environmental Protection (FDEP) establish minimum flows for surface watercourses and minimum levels for groundwaters and surface waters. The statutory description of a minimum flow is “the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area” (Ch. 373.042 (1)(a), FS). The statutory description of a minimum level, as applies to Florida’s surface water bodies, is “the level of surface water at which further withdrawals would be significantly harmful to the water resources of the area” (Ch. 373.042 (1)(b), FS). The statute provides guidance to the WMDs and FDEP on how to establish MFLs using the “best information available.”

HSW is involved in all aspects of the MFLs development process and currently provides expertise to three water management districts (Southwest, St. Johns, and Suwannee). Our work ranges from basic statistical data analyses to peer review of proposed MFLs. The following project descriptions demonstrate the range of our on-going work efforts.

Analysis of Hydrologic Data to Support Minimum Flows for Rivers

Southwest Florida Water Management District
West-Central Florida
2002-2006

Short Project Description:

The project objective was to assist the SWFWMD with the analysis of hydrologic data associated with rivers in west-central Florida for the purpose of setting minimum flows for these water bodies. While establishing minimum flows is technically and administratively complex, the scope of this project was focused on using defensible statistical procedures to help interpret the historical data record. Dr. Watson implemented a variety of modeling and statistical procedures under the scope of work to meet a variety of objectives related to establishing MFLs:

- Determine if stream flow is changing over time – Perform hydrograph analysis, single and double mass analysis, regression, and Mann-Kendall tests.

- Determine frequency and duration of inundation – Generate duration of inundation curves.
- Develop synthetic hydrograph for short-term gage using relationship between short-and long-term gage data – Use a systematic sampling procedure to limit serial correlation effects and a piecewise polynomial regression procedure (programmed in SPSS) to identify association between short and long term gage data. Generate duration of inundation curves from synthetic hydrograph data.
- Calculate residence and flushing times for estuarine portions of rivers. Dr. Watson has co-authored two estuarine mixing models (MERT and MMRT).
- Develop statistical models depicting association between river geometry, flow, tidal, influx, and salinity.
- Estimate flow in ungaged portions of rivers using statistical associations.
- Perform a literature review of the effect of dissolved oxygen on benthic organisms.

Minimum Flows and Levels: Water Resource and Human-use Values Assessment

St. Johns River Water Management District
Brevard and Orange Counties
2003-2007

Short Project Description:

The project includes various engineering and environmental sciences tasks to evaluate the potential impacts of minimum flows and levels (MFLs) hydrologic regime to the water resource and human-use values associated with the St. Johns River between SR 46 and SR 520, Brevard and Orange counties.

The project involved assessing if proposed MFLs were protective of ten water resource values in that section of river.

A frequency analysis approach was used by Dr. Watson along with a watershed (HSPF) and river (HEC-RAS) model results. This project requires expertise in surface water hydrology, ecology, and statistics.



**Technical Peer Review for MFLs
Suwannee River Water Management District**
2004-Ongoing

Short Project Description:

HSW was retained by the SRWMD to provide peer review of proposed MFLs for Madison Blue Springs and Lower Suwannee River.

HSW has completed similar peer reviews for the Waccassasa, Upper Santa Fe, and Alapaha Rivers on river sections. Issues related to the modeling of the thermal regime, methods for record extension, and the absence of a warm season MFL were commented on and addressed by the SRWMD.



**SWFWMD Proposed Minimum Flows and Levels
for the Lower Peace River and Shell Creek**
City of Punta Gorda, FL
2007

HSW was retained by Carollo Engineers at the request of the City of Punta Gorda to complete a technical review of the August 24, 2007 Peer Review Draft of the proposed Minimum Flows and Level (MFL) for the Lower Peace River and Shell Creek. The City's water-supply plans currently rely solely on withdrawals from an unregulated in-stream impoundment, Shell Creek Reservoir. Included in the review is an evaluation of the technical methodologies, data and assumptions made in developing the rule, including an evaluation of the appropriateness of the 2 ppt (parts per thousand) isohaline as a critical metric, and other assumptions related to the biology of Shell Creek. An investigation of how the MFL report links its assumptions and recommendations to the definition of "significant harm" in State rules.

The review, performed under the leadership of Dr. Ken Watson and with the assistance of Dr. Scott Emery and Dean Mades, includes brief summaries of the report sections which characterize the hydrology, water quality and biology of the estuarine portions of the subject rivers. The primary focus of the review is the basis by which "significant harm" to the estuaries was evaluated by the District. Regression equations relating fresh-water flows to salinity and other water quality and biological metrics were evaluated. Estuary morphology was characterized in terms of the volume of water, surface area and channel perimeter length that are linked to stage and discharge. Alternative percent-of-flow withdrawal scenarios were evaluated for three seasonal blocks of time representing the wet season, dry season, and late-spring transition from dry to wet season.

**SJRWMD MFL Water Resource and Human-Use
Values Assessment for Lake Poinsett**
St. Johns River Water Management District
2008

HSW was contracted by St. Johns River Water Management District (SJRWMD) to evaluate whether the hydrologic regime defined by the proposed State of Florida Minimum Flows and Levels (MFLs) would protect the ten natural resources and environmental values for the St. Johns River at Lake Poinsett. The District proposed three annual minimum surface water flows and levels (MFLs) at SR-520: minimum frequent high, minimum average, and minimum frequent low. The proposed flows and associated stages are based on detailed conditions observed at multiple transects along this section of river. Potential water supply yields evaluated by others determined that a two-tiered withdrawal scenario would provide the maximum available water and would be in compliance with the proposed MFLs at SR-520.

HSW's approach was to evaluate each WRV (Water Resource Value) for specific indicators of protection and then to use stage-frequency characteristics to determine if the ten WRVs would be protected under the proposed MFLs regime.

Dr. Ken Watson and Dr. Scott Emery lead the efforts at HSW in the development of minimum flows and levels. If you would like additional information, please contact them by phone at 813-968-7722 or by e-mail at kwatson@hsweng.com.