

Nueces BBEST Summary Report of Findings

17 January 2012

Senate Bill 3 Environmental Flows Process

Senate Bill 3 (SB3) of the 80th Texas Legislature established a process for the development and implementation of environmental flow standards applicable to major river basins and estuarine systems across the State of Texas. The Nueces River Basin (Nueces Bay, Corpus Christi Bay) and portions of the Nueces – Rio Grande Coastal Basin (Baffin Bay, Upper Laguna Madre, and Oso Bay) are one of seven “basin and bay areas” in Texas required to develop environmental flow standards through this process.

The Environmental Flows Advisory Group (EFAG) appointed nine technical experts to the Science Advisory Committee (SAC) to provide guidance to the Basin and Bay Expert Science Team (BBEST) and Basin and Bay Area Stakeholder Committee (BBASC) for each of the seven basin and bay areas. The 12-member Nueces River and Corpus Christi and Baffin Bays BBEST (Nueces BBEST), appointed by the approximately 40-member Nueces River and Corpus Christi and Baffin Bays BBASC (Nueces BBASC), completed an environmental flows recommendation report in October 2011 using “best available science” and a collaborative process designed to achieve consensus. The Nueces BBASC is currently developing their own recommendations report that evaluates the balance of “human needs” along with environmental needs and this report is due September 1, 2012. Both recommendation reports are submitted to the Texas Commission on Environmental Quality (TCEQ) to consider and balance the relevant information for adoption of rules implementing environmental flow standards.

Key Findings from the Nueces BBEST Recommendations Report

Estuary Environmental Flow Recommendations

- With the exceptions of the Nueces Bay and Delta, all rivers, creeks, and bays are considered to be sound ecological environments.
- Recommended flow regime for the Nueces Bay and Delta is seasonal rather than monthly or bi-monthly: Winter (Nov-Feb), Spring (Mar-Jun), and Summer/Fall (Jul-Oct).
- The Nueces BBEST chose not to provide freshwater inflow recommendations for Baffin Bay, Upper Laguna Madre, Oso Bay, and Corpus Christi Bay, but cautioned that these areas are generally characterized by very limited natural water supply and that reductions in the current flow regimes would raise concern as to maintenance of sound ecological environments.
- Base flow conditions for freshwater inflow into Nueces Bay and Delta is recommended to equal or exceed 166,000 acre feet per year in 80% of years, with seasonal targets and attainments based on historical inflow and indicator species salinity preferences of about 18. The current 2001 Agreed Order includes a 138,000 acre feet per year pass-through regime when storage in the Choke Canyon Reservoir / Lake Corpus Christi System exceeds 70% of capacity.
- Indicator species used for Nueces Bay and Delta: Smooth cordgrass, macro benthic infauna, Atlantic croaker, blue crab, and eastern oyster.
- One overbanking per year is recommended below the Calallen Dam.

Instream Environmental Flow Recommendations

- 20 locations on 12 streams in 3 eco-regions: Nueces River (6), Frio River (3), Sabinal River (2), and 1 each on the West Nueces River, Dry Frio River, Hondo Creek, Seco Creek, San Miguel Creek, Atascosa River, Oso Creek, San Fernando Creek, and Leona Springs in the Edwards Plateau, Southern Texas Plains, and Western Gulf Coastal Plain eco-regions.
- Among the 20 stream locations, 9 are classified as perennial (flow more than 95% of the time) and 11 are classified as intermittent (zero flow up to 50% of the time).

- Instream flow recommendations are based on analysis of USGS streamflow data for the entire periods of record supported, where available, by water quality data, flow-habitat relationships for selected species, simplified geomorphological analyses, and consideration of riparian ecology.
- Seasons for Edwards Plateau sites: Winter (Dec-Mar), Spring (Apr-Jun), Summer (Jul-Sep), and Fall (Oct- Nov).
- Seasons for South Texas Plains and Gulf Coast Plains: Winter (Nov-Mar), Spring (Apr-Jun), Summer (Jul- Aug), and Fall (Sep-Oct).
- Pursuant to the Texas Instream Flow Program, flow regime recommendations include subsistence, base, and pulse (in-channel and overbank) categories.
- Instream subsistence flows, though historically non-existent at intermittent stream locations, are recommended to be no less than 1 cfs for all seasons.
- Water quality is generally good at a range of flows. Some streams exhibit low dissolved oxygen during very low flows and high summer temperatures.
- Base flows provide habitat diversity for fish and are recommended in three seasonal tiers associated with dry, average, and wet hydrologic conditions.
- 80 species of fish and several species of freshwater mussels inhabit basin streams. 17 of these fish species and their habitat preferences were considered in some detail at 3 stream locations.
- Substantial reductions in flow associated with large, on-channel reservoir development (as such projects are potentially capable of impounding high flow pulses and floods) would substantially reduce sediment transport and could modify downstream channel and habitat (aquatic and riparian) characteristics.
- Riparian plants prevent erosion, control sediment movement, and provide important habitat for wildlife. Base flows and a range of pulse flows are necessary to sustain riparian plants.

Sound Ecological Environment

The SAC lists the following characteristics of a sound ecological environment:

- 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.

The Nueces BBEST accepts this list and opines that “an acceptably sound ecological environment is where the flow regime maintains important physical, chemical, and biological characteristics of a water body as well as the native species dependent on these characteristics.”

Nueces Bay and Delta were determined to be unsound ecological environments due to:

- Loss/shift in native species composition;
- Loss/alteration of key habitat features;
- Significant alteration of the natural flow regimes required by indicator species;
- Nutrient elemental cycling and sediment loading are compromised.

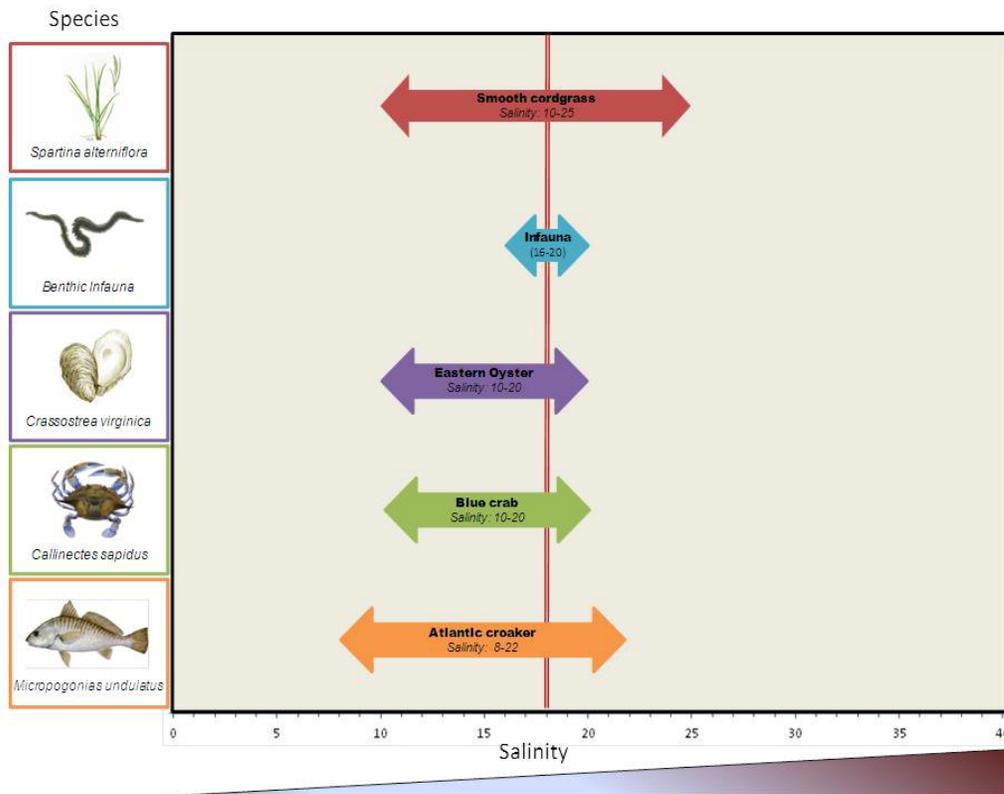
The Nueces BBEST opines that “an unhealthy environment is where human modifications of the flow regime have reduced or eliminated important physical, chemical, or biological features, and significantly altered or reduced native biological community structure.”

Important Tables and Figures from the Nueces BBEST Report

The table below shows the freshwater inflow regime recommendations for Nueces Bay and Delta based on best available science. These volumes and attainment frequencies were developed through robust predictive models relating freshwater inflows, salinity, and the needs of selected indicator species. These recommendations are grounded in the historical patterns of freshwater inflow on a seasonal basis.

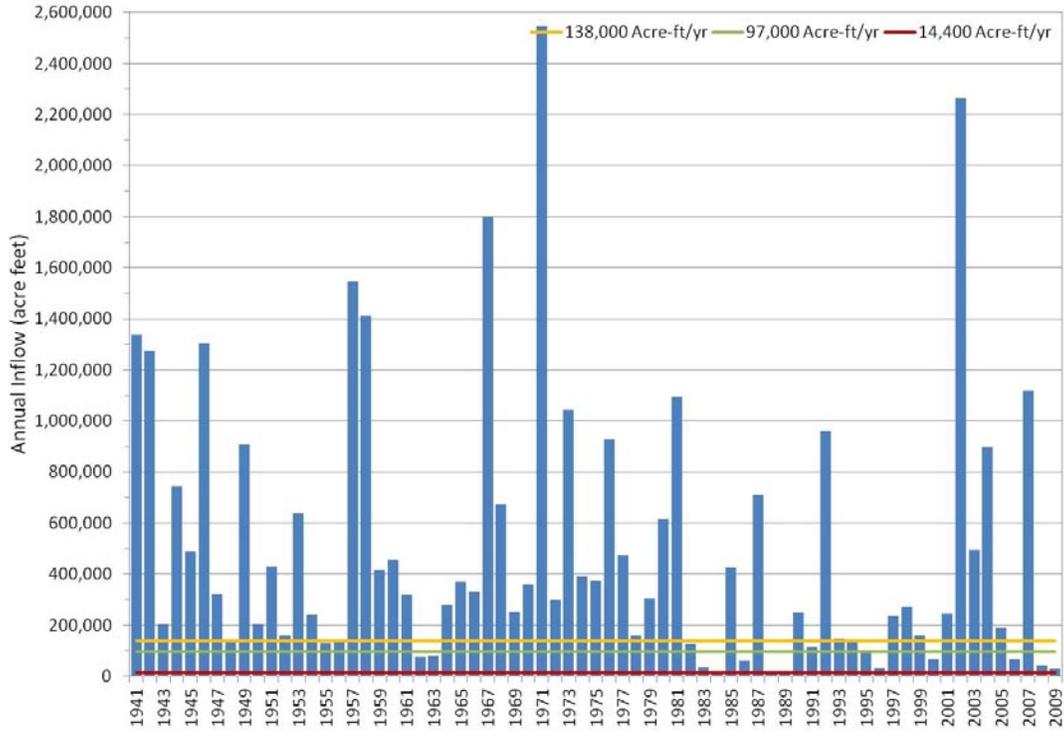
Condition (Target Salinity)	Nueces Bay Freshwater Inflow Regime (Attainment)												Recommendations		Historical Attainment		
	1 overbanking event per year of 39,000 acre-ft; maximum discharge of 3600 cfs												Annual Total	Attainment	1941-2009	1941-1982	1983-2009
High (10)	125,000 Acre-ft (20%)			250,000 Acre-ft (25%)			375,000 Acre-ft (20%)			750,000	25%	22%	26%	15%			
Base (18)	22,000 Acre-ft (60%)			88,000 Acre-ft (60%)			56,000 Acre-ft (75%)			166,000	80%	67%	81%	44%			
Subsistence (34)	5,000 Acre-ft (95%)			10,000 Acre-ft (95%)			15,000 Acre-ft (95%)			30,000	95%	94%	100%	85%			
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct					
	Winter			Spring			Summer			Fall							

Nueces Bay and Delta inflow regime recommendation table.

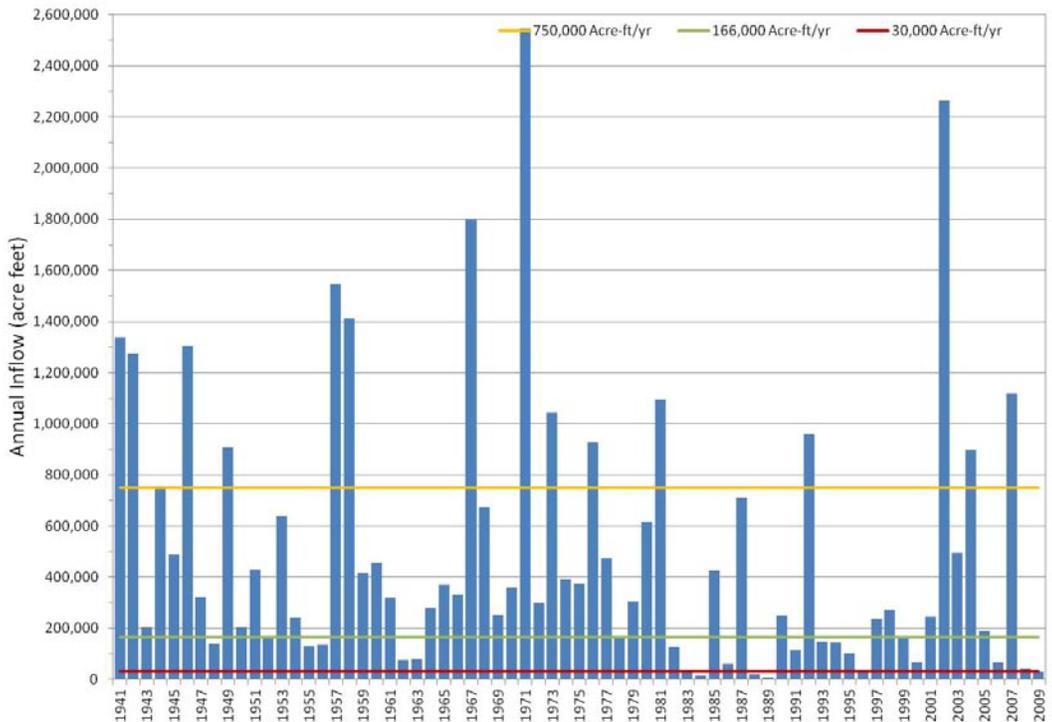


Indicator species profile showing salinity preferences in Nueces Delta and Nueces Bay.

Nueces Bay Inflow – Current Agreed Order



Nueces Bay Inflow - BBEST Recommendation



Annual inflow for Nueces Bay with current Agreed Order inflows (Top) and Nueces BBEST inflow recommendations (Bottom).

Overbank Events	Qp: 15,600 cfs with Average Frequency 1 per 5 years Regressed Volume is 124,000 Duration Bound is 107											
	Qp: 4,750 cfs with Average Frequency 1 per 2 years Regressed Volume is 38,600 Duration Bound is 64											
High Flow Pulses	Qp: 2,220 cfs with Average Frequency 1 per year Regressed Volume is 18,400 Duration Bound is 46											
	Qp: 590 cfs with Average Frequency 2 per year Volume Bound is 11,300 Duration Bound is 26											
	Qp: 48 cfs with Average Frequency 1 per season Volume Bound is 1,000 Duration Bound is 7			Qp: 390 cfs with Average Frequency 1 per season Volume Bound is 6,070 Duration Bound is 17			Qp: 170 cfs with Average Frequency 1 per season Volume Bound is 3,100 Duration Bound is 14			Qp: 50 cfs with Average Frequency 1 per season Volume Bound is 800 Duration Bound is 5		
				Qp: 99 cfs with Average Frequency 2 per season Volume Bound is 1,560 Duration Bound is 9								
Base Flows (cfs)	92			76			92					
	65			48			65					
Subsistence Flows (cfs)	51			44			32			41		
	14			18			16			14		
	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
	Winter				Spring			Summer			Fall	

Flow Levels	High (75th %ile)
	Medium (50th %ile)
	Low (25th %ile)
	Subsistence

Pulse volumes are in units of acre-feet and durations are in days.
Period of Record used : 1/1/1924 to 12/31/2009.

Typical instream flow regime recommendation showing categories and magnitudes of flows recommended during specific seasons throughout the year. This flow recommendation is for the Nueces River at Laguna.