

Slides from Stakeholder Meeting

October 15, 2003

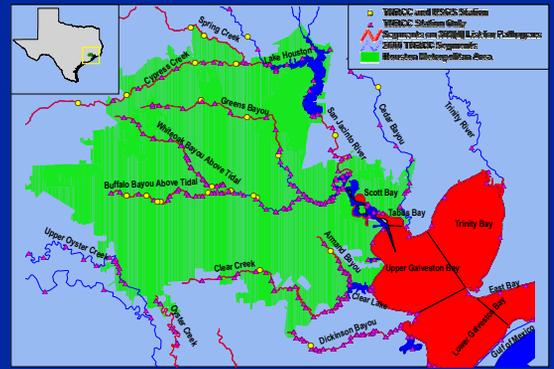
Modeling and Allocation Development for an Urban Indicator Bacteria TMDL

Tina Petersen, Hanadi S. Rifai and
Monica Suarez, University of Houston

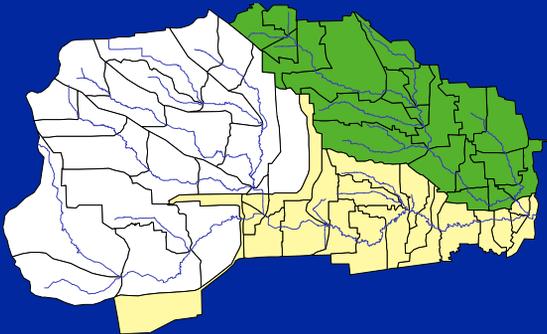
Paul Jensen and Yu-Chun Su, PBS&J

Ronald Stein, TCEQ

Houston Area Pathogen Impairments



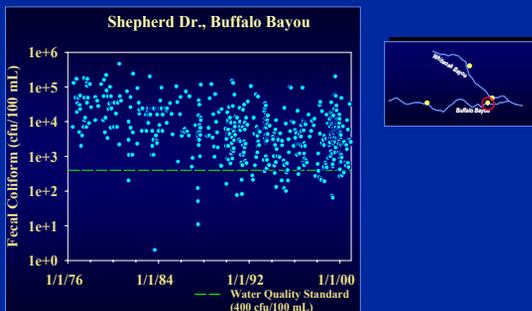
Buffalo and Whiteoak Bayou



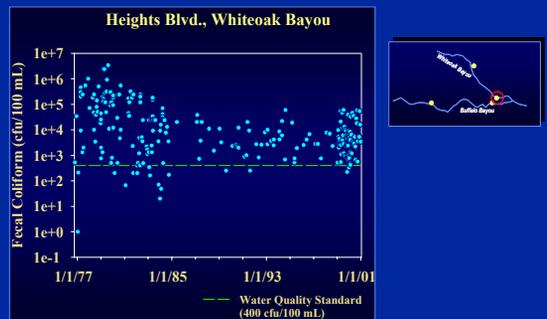
Texas Freshwater Bacteria Standards

<i>E. coli</i>	Geometric Mean	126 MPN/dL
	Not-to-Exceed	394 MPN/dL
Fecal coliform	Geometric Mean	200 cfu/dL
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Historical Water Quality Data



Historical Water Quality Data



Potential Sources of EC in Buffalo and Whiteoak Bayous

Inadequate/Incomplete disinfection from WWTP effluent

Failed septic systems

Unpermitted discharges to storm sewers

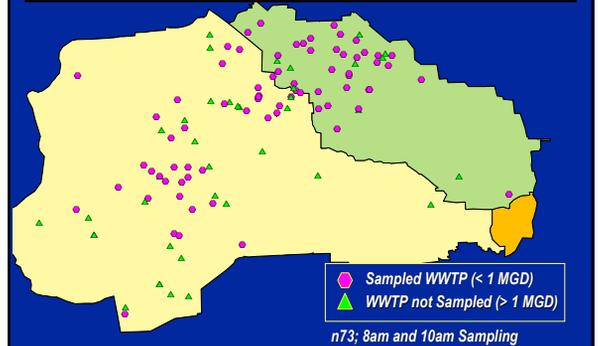
NPS stemming from wildlife in the watershed

Bacteria from upstream sources (Buffalo Bayou Only)

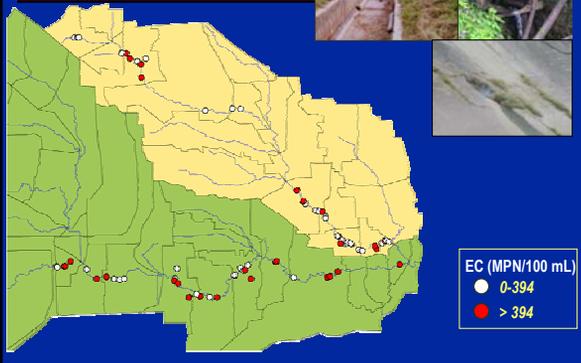
Urban NPS

Stream sediment

WWTP Sampling



DWSS Sampling



E. coli load for WWTP and Storm Sewers

	WWTP Load (MPN/yr)	Storm Sewer Load (MPN/yr)
Buffalo Bayou	1.82E+12	7.89E+13
Whiteoak Bayou	5.83E+14	7.24E+13
Total	5.85E+14	1.51E+14

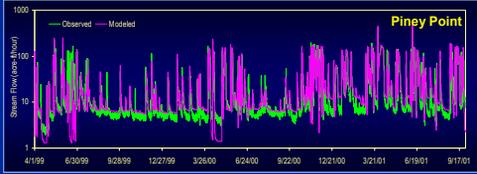
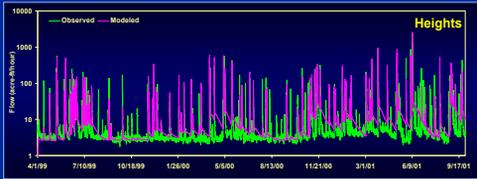
HSPF Conceptual Model



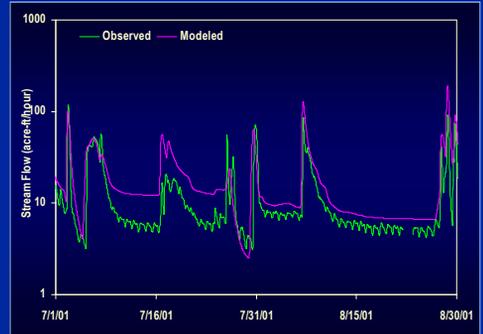
Flow Calibration



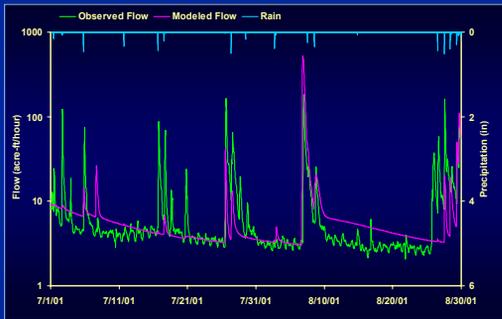
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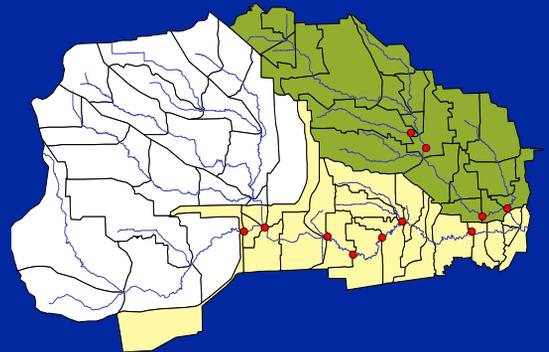
Summer Flow @ Piney Point



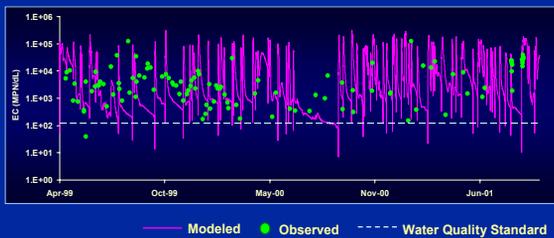
Summer Flow @ Heights



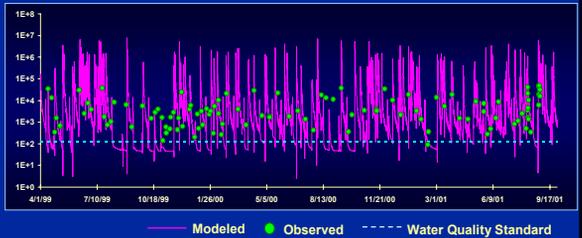
Water Quality Calibration



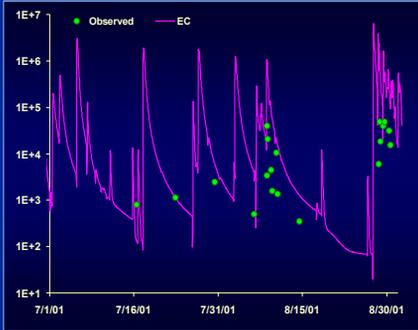
EC Calibration – Shepherd



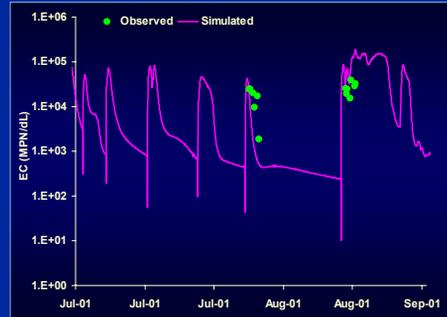
EC Calibration - Heights



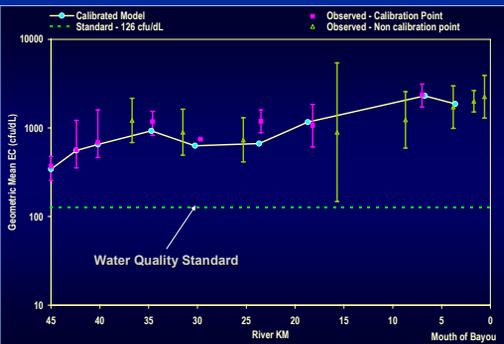
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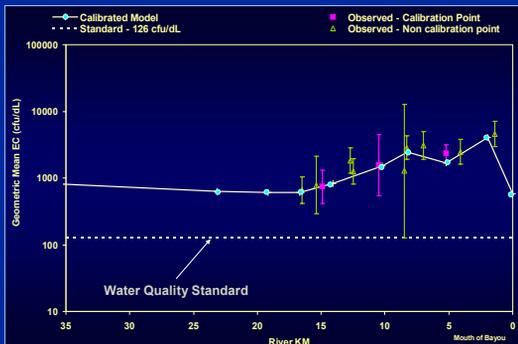
Summer EC @ Buffalo Bayou



Buffalo Bayou – Model Results



Whiteoak Bayou – Model Results



Source Assessment and Allocations

Eliminate Unpermitted Stormwater EC Discharges

Eliminate Wastewater Treatment Plant EC Discharges

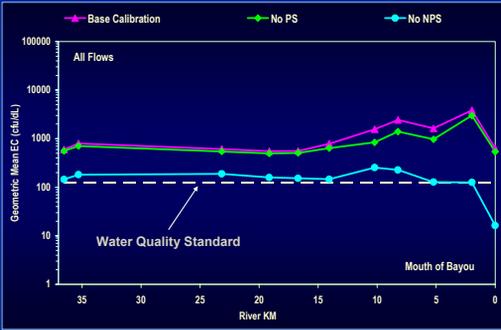
Eliminate Wildlife NPS Accumulation of EC

Eliminate Upstream EC Inflow (Buffalo Bayou)

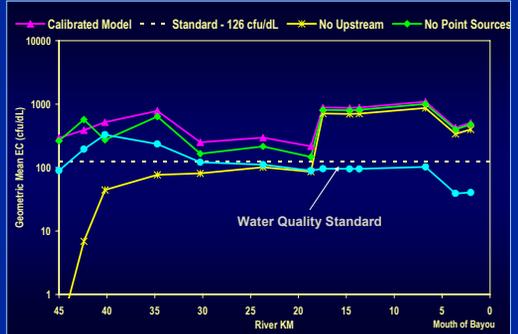
Buffalo Bayou –All Flow Source Assessment



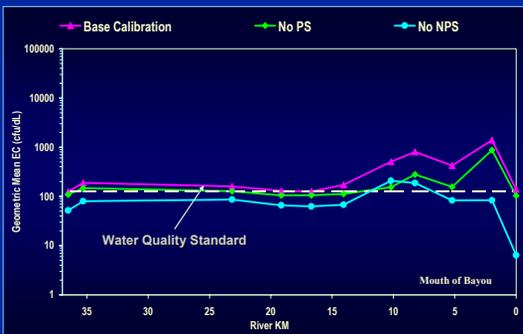
Whiteoak Bayou – All Flow Source Assessment



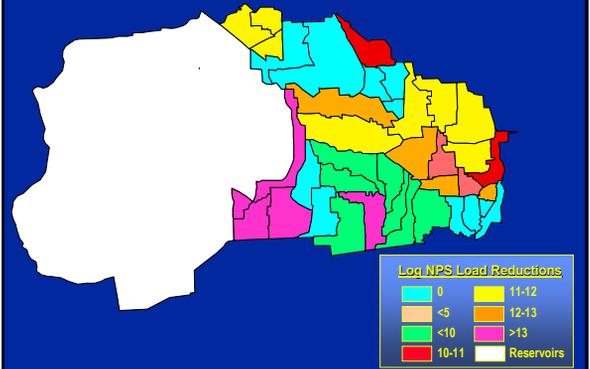
Buffalo Bayou –Low Flow Source Assessment



Whiteoak Bayou – Low Flow Source Assessment



NPS Load Reductions (MPN/acre)



Conclusions

- Historically, EC concentrations in the bayous have been high
- NPS and Upstream Inputs (on Buffalo Bayou) are the most significant sources of bacteria
- NPS required reductions were found to be up to 10^{13} MPN/acre
- BMPs cannot achieve these reductions, so other strategies are being examined

Slides from Stakeholder Meeting

January 28, 2004 and May 18, 2004

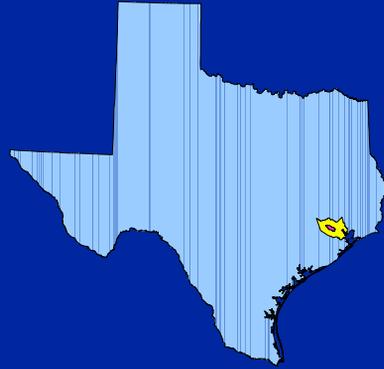
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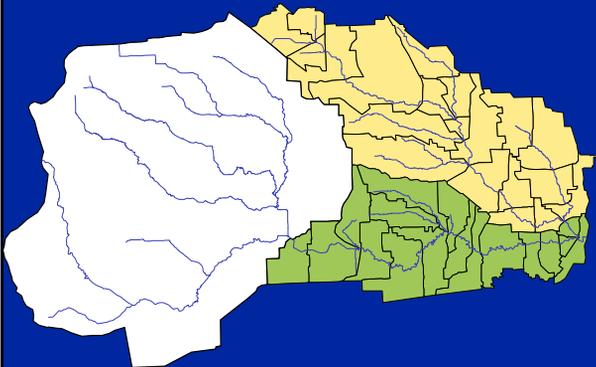
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Buffalo and Whiteoak Bayous



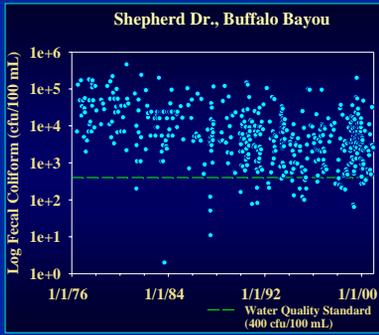
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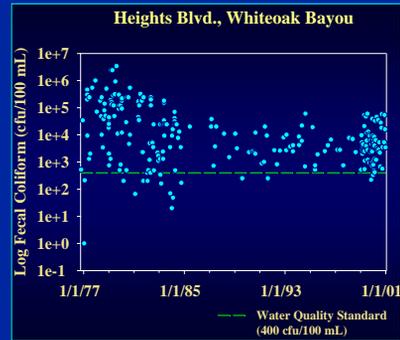
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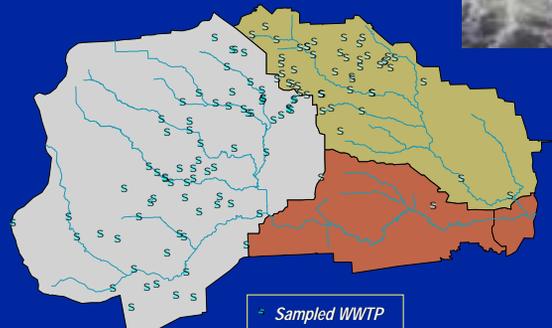
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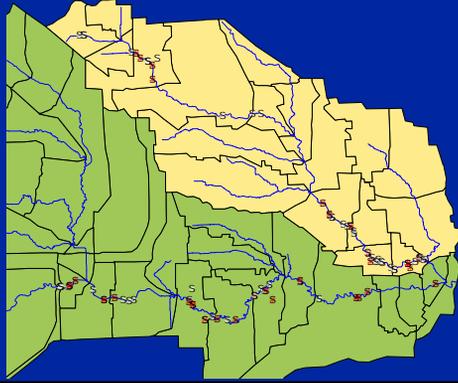
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WWTP Sampling



Storm Sewer Sampling



EC (MPN/100 mL)
 ● 0-394
 ● > 394

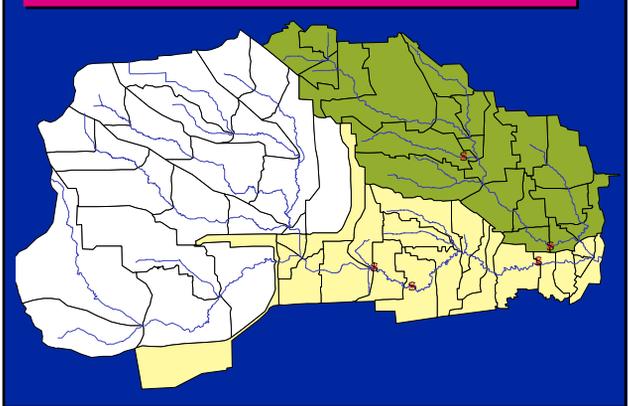
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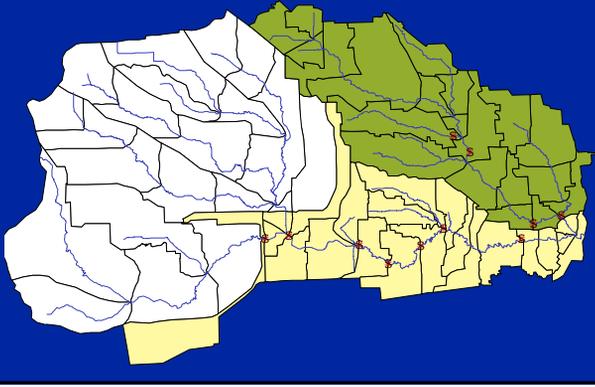
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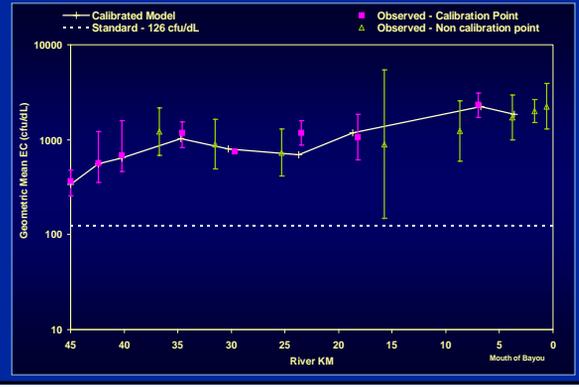
Hydrology Calibration Sites



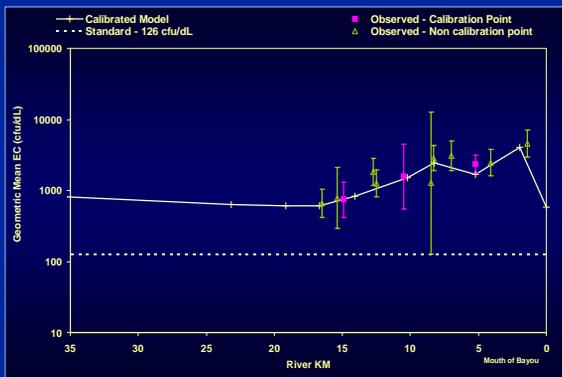
Water Quality Calibration Sites



Buffalo Bayou – Model Results



Whiteoak Bayou – Model Results



Load Allocation Scenarios

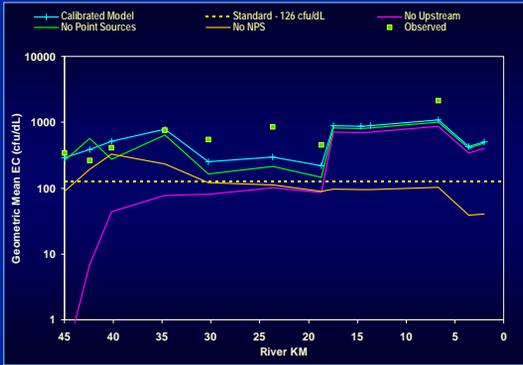
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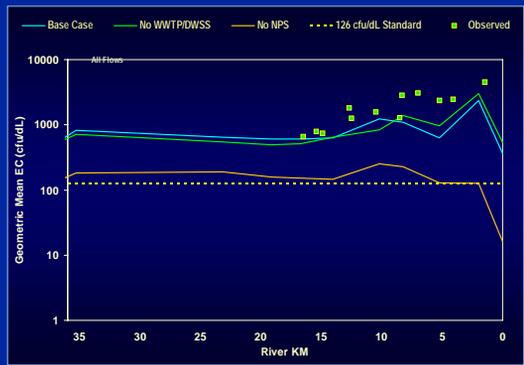
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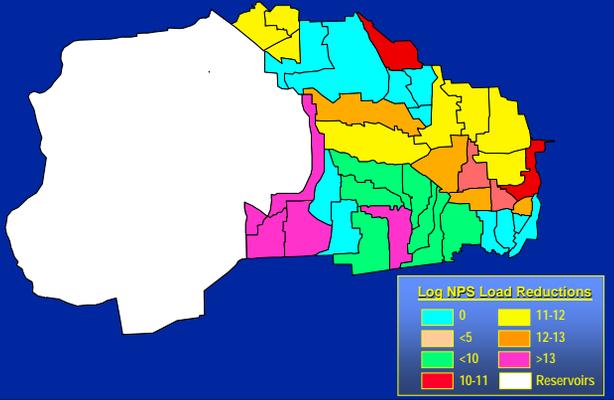
Buffalo Bayou – Source Assessment



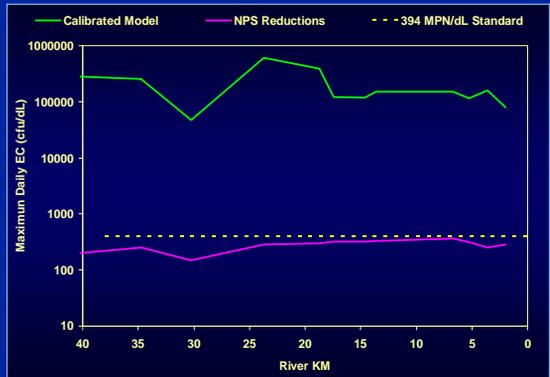
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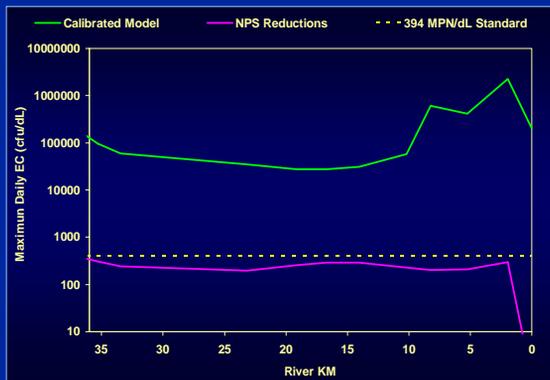
NPS Reductions



Low Flow Allocations – Buffalo Bayou



Low Flow Allocations – Whiteoak Bayou



Acknowledgements

This work has been funded by the TCEQ and the Texas Advanced Technology Program. Their support is acknowledged and greatly appreciated.