

Sponsored by:

**Trinity River
Authority**

City of Dallas

City of Houston

**Tarrant Regional
Water District**

North Texas

**Municipal Water
District**

Status Galveston Bay Inflow Study

Consultants:

**George Ward, Ph.D.
Espey Consultants, Inc.
Brown and Root, Inc.
Freese & Nichols, Inc.**

CONCERNS

Bay Requirements Very Large

Bay Requirements - Long Term

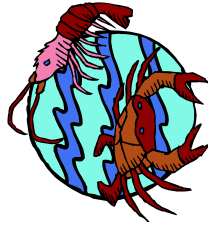
vs. Water Supply – Drought



Focus of Effort

TWDB's representation of the health of the estuary and its response to freshwater inflow

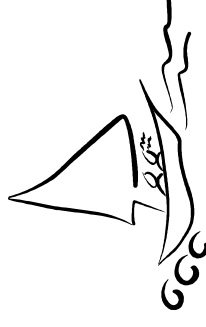
Health of Estuary



Abundance of Species



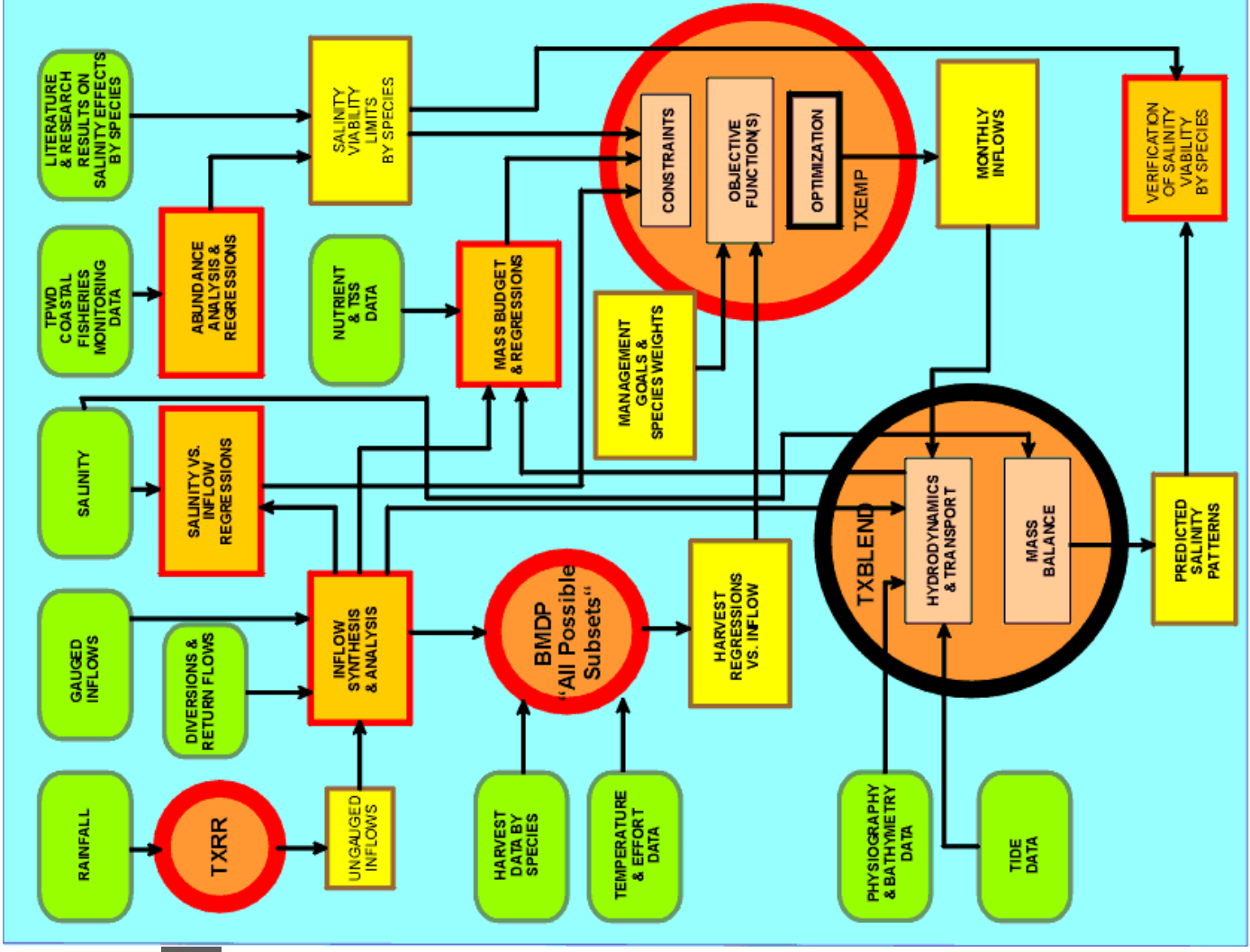
Commercial Harvest



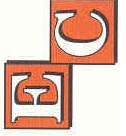
1. Evaluation of the regressions' predictive ability
2. Testing of the TWDB assumption that harvest represents abundance
3. Review of the statistical methodology employed by TWDB to develop the regressions

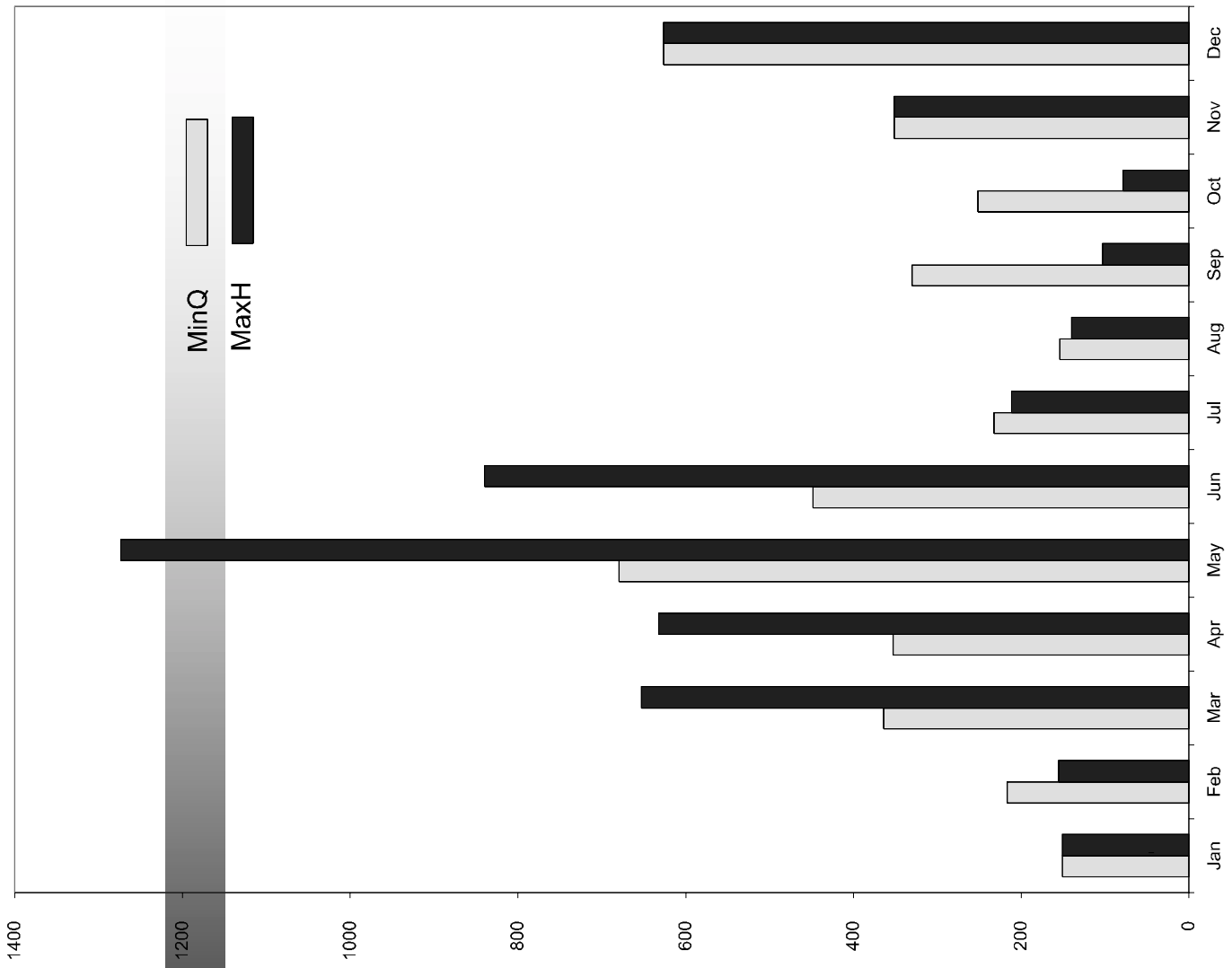
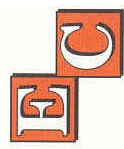


State Methodology Schematic



Schematic of State Methodology as presented by TWDB



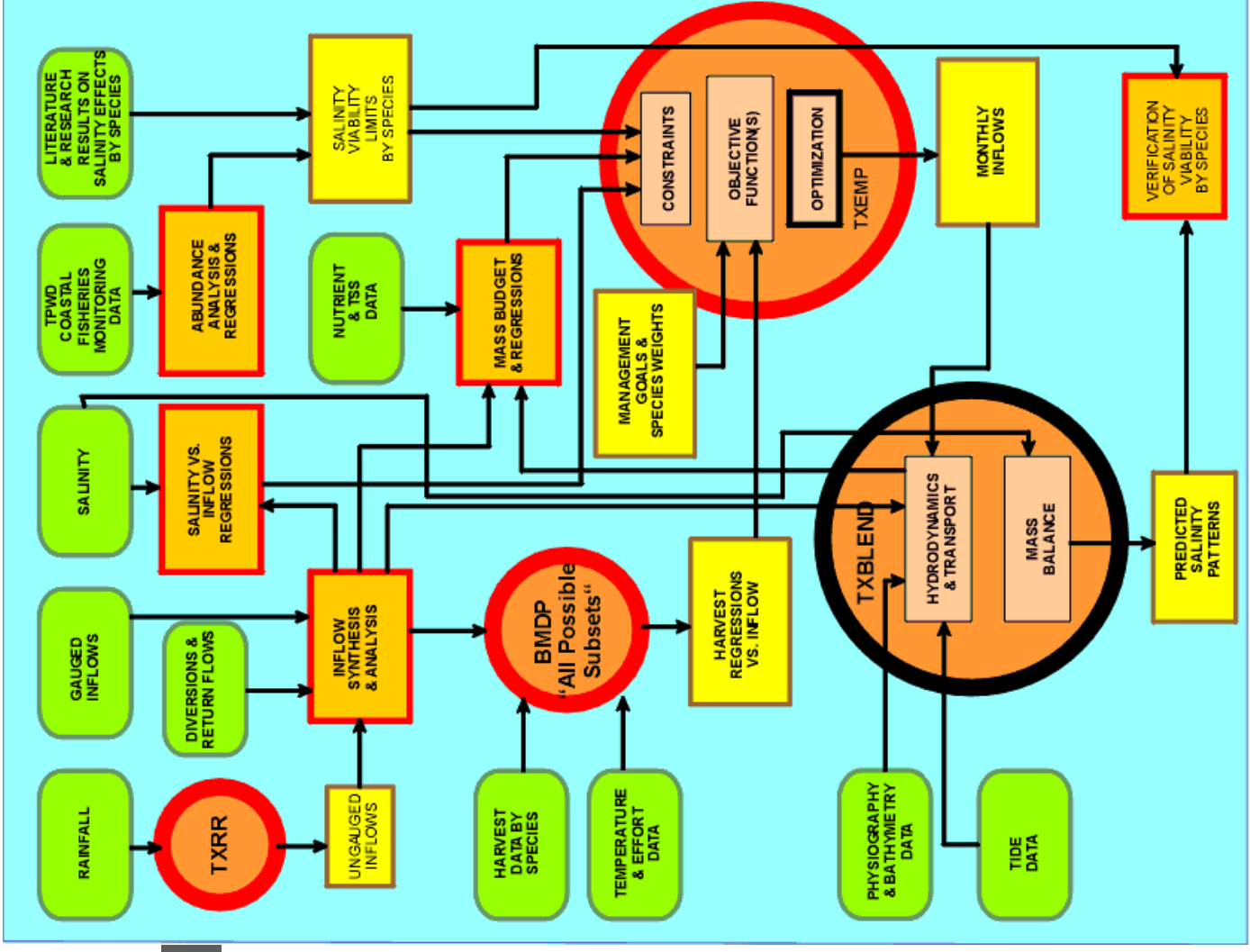


Monthly Flows of MinQ and MaxH Solutions

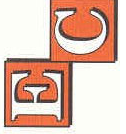
Monthly flows of MinQ and MaxH solutions

1400
1200
1000
800
600
400
200
0

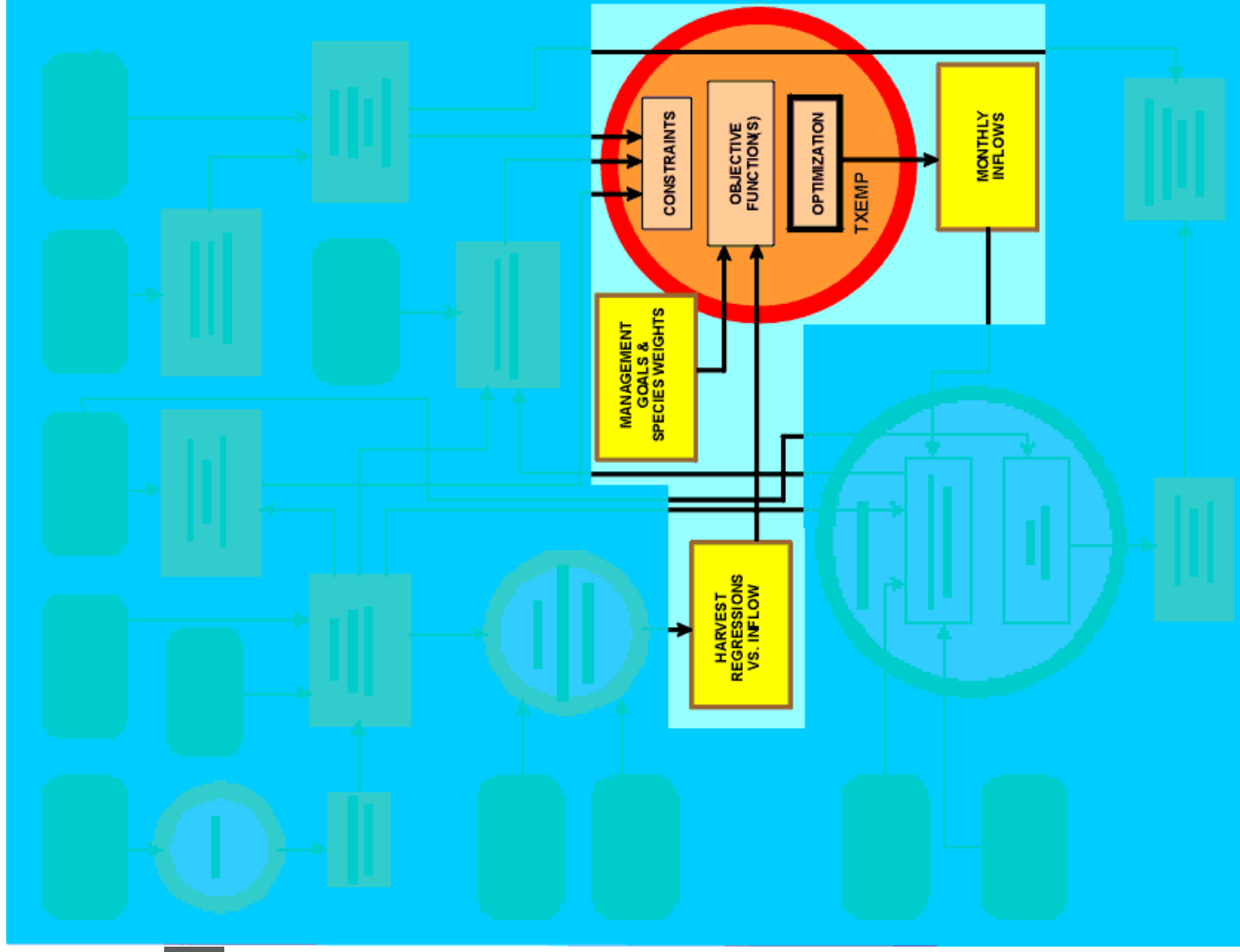
State Methodology Schematic



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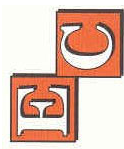
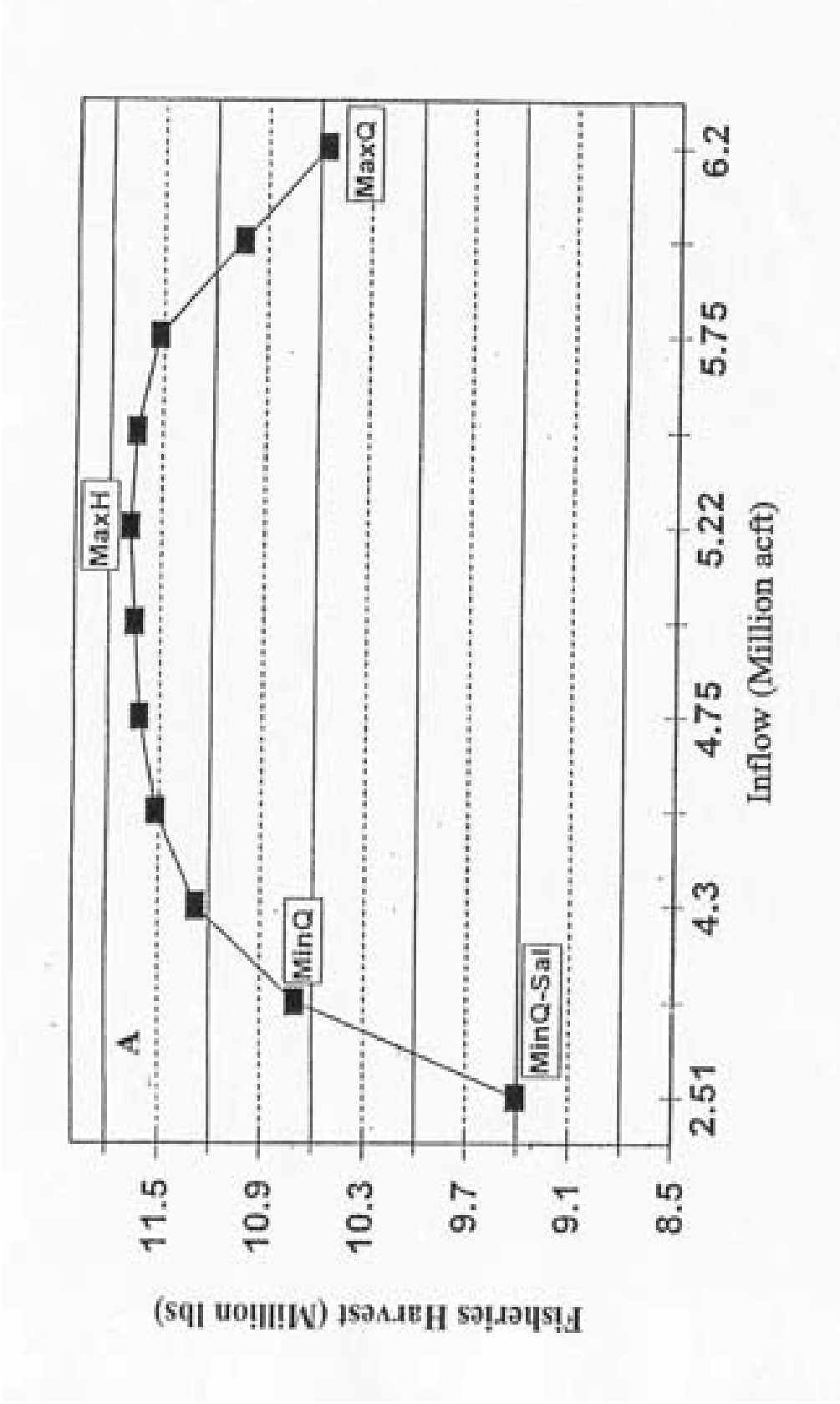
State Methodology Schematic



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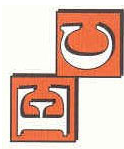
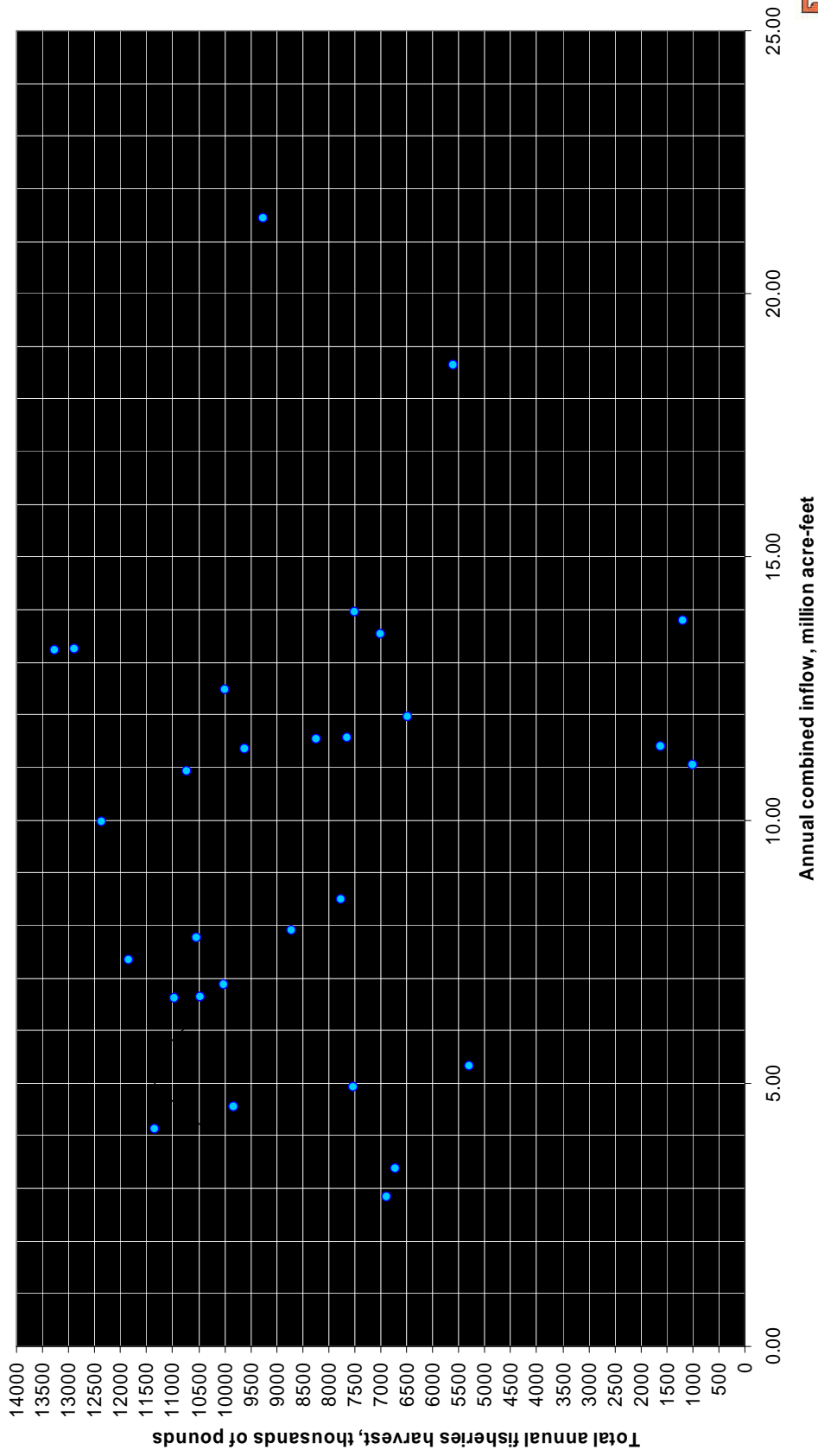


TWDB Harvest vs. Inflow Curve



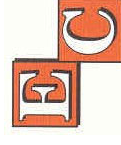
Harvest Curve Comparison (with actual annual harvest data)

Harvest Curve Comparison



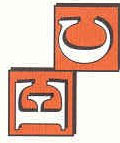
Disaggregated relative contributions of species and bimonthly flow to total computed harvest, for MaxH flows

	const	Q_{JF}	Q_{MA}	Q_{MJ}	Q_{JA}	Q_{SO}	Q_{ND}	ratio to total harvest
Flow (MaxH)		0.0586	0.2464	0.4052	0.0674	0.0348	0.1876	
Blue crab	0.0643	-0.0072	0.0932	-0.0333		-0.0074	0.0503	0.160
Oyster	0.3571	-0.0246		0.0514	-0.0284			0.355
Red drum	0.0020			0.0018	-0.0016	0.0003		0.003
Black drum	0.0043	-0.0008			0.0031	-0.0010	0.0028	0.008
Spotted seatrout								0.029
Brown shrimp	0.0873	-0.0151			0.0126	0.0063	0.0296	0.121
White shrimp	0.2751	-0.0181	0.0301		-0.0098		0.0423	0.320
Flounder	-0.0010	-0.0008			0.0016		0.0041	0.004
TOTAL	0.7891	-0.0666	0.1233	0.0199	-0.0224	-0.0018	0.1290	1.000





Crucial Questions

- 1) Is the commercial harvest of a species in fact a measure of its real abundance in the bay, given the other potential irrelevant factors that can corrupt the data?**
- 2) If so, have the important relationships been captured in the statistical model?**



Commercial Harvest vs. TPWD Independent Fishery Data

-  State Methodology is based on the hypothesis that the Commercial Harvest is an indicator of abundance.
-  TPWD Coastal Fishery Data provides potential ecological indicators, including abundance.

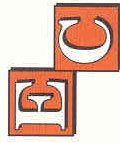
TPWD COASTAL FISHERIES DATA

- Randomized sampling in space
- Time-intensive sampling, generally year-round
- Multiple collection gear types
- Invariant collection procedures and protocols
- All species in collection identified and counted, rigorous sub- sampling for size measurement
- Environmental parameters measured and recorded, using established protocols
- Digitized database extends 1975-present



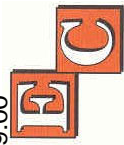
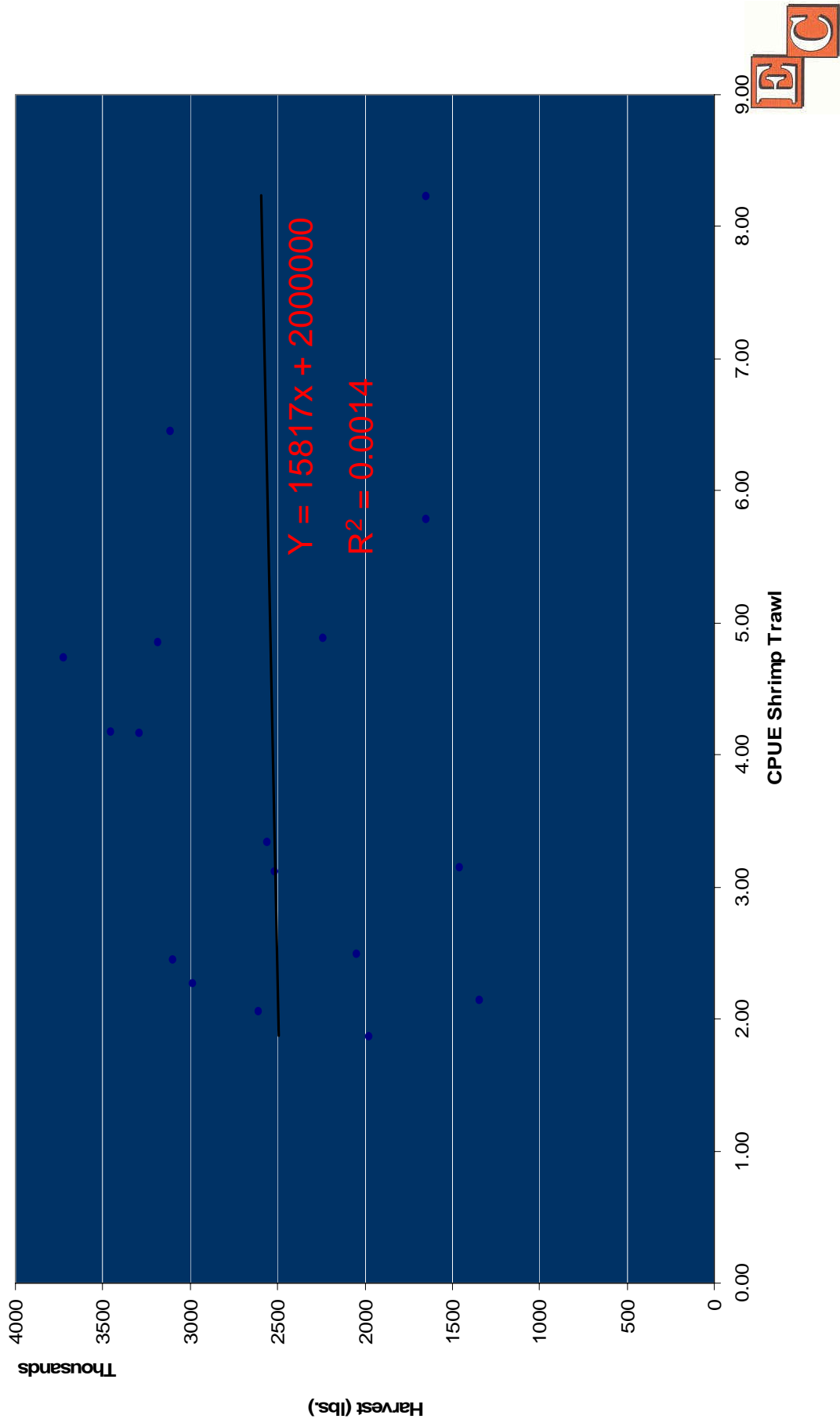
Analyses

- Analysis of correlation between commercial harvest data and TPWD coastal fisheries data.
- Catch per unit effort (CPUE), a direct measure of abundance, determined by various schemes:
 - Bay total
 - Sub-bay regions
 - Alternative weighting (area, calendar time)
 - Immigration/emigration & life stages



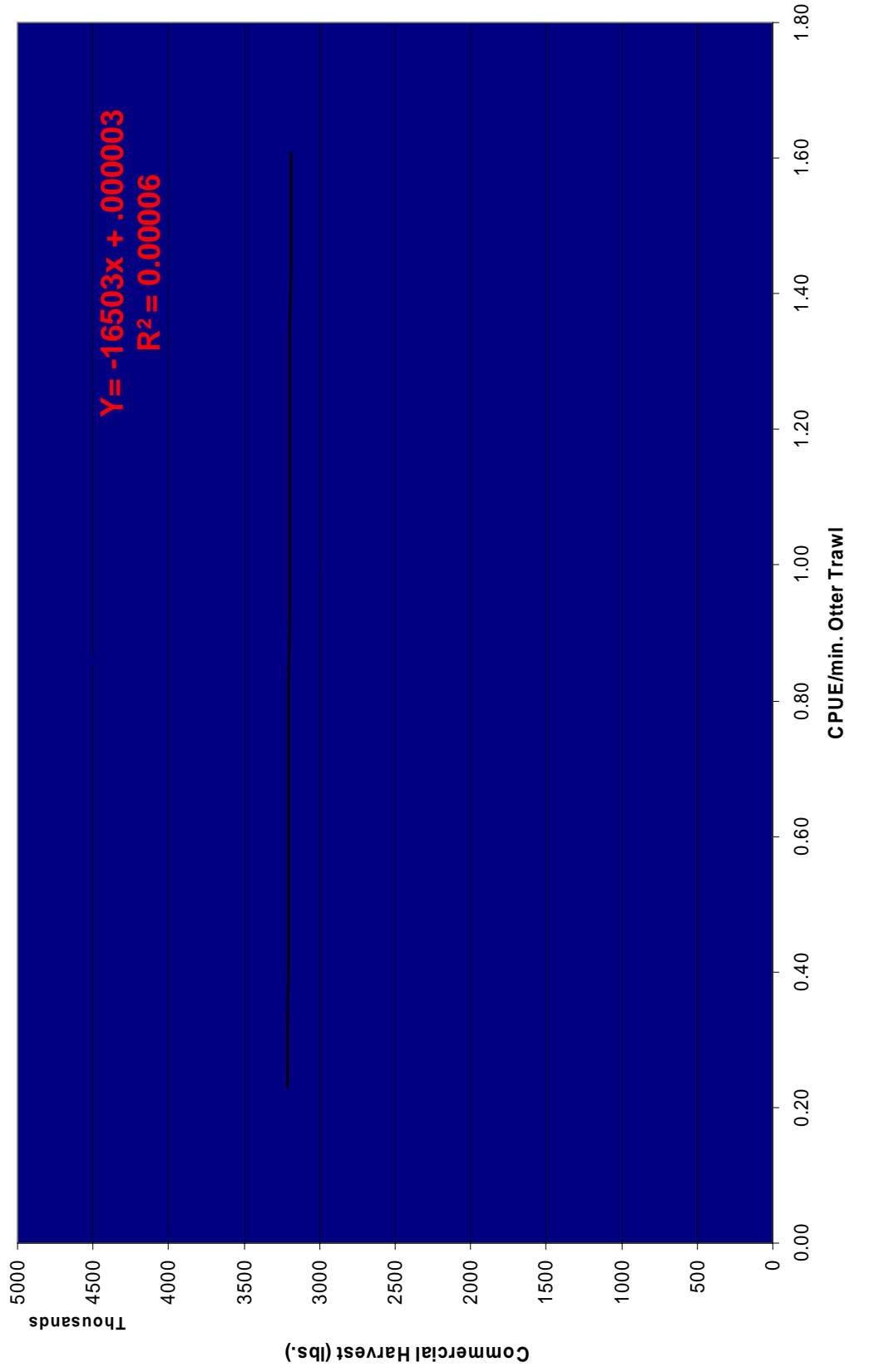
Brown and Pink Shrimp Correlation

Correlation of Brown and Pink Shrimp NMFS Bay Table vs TPW Fishery Shrimp Trawl Data (1982-98)



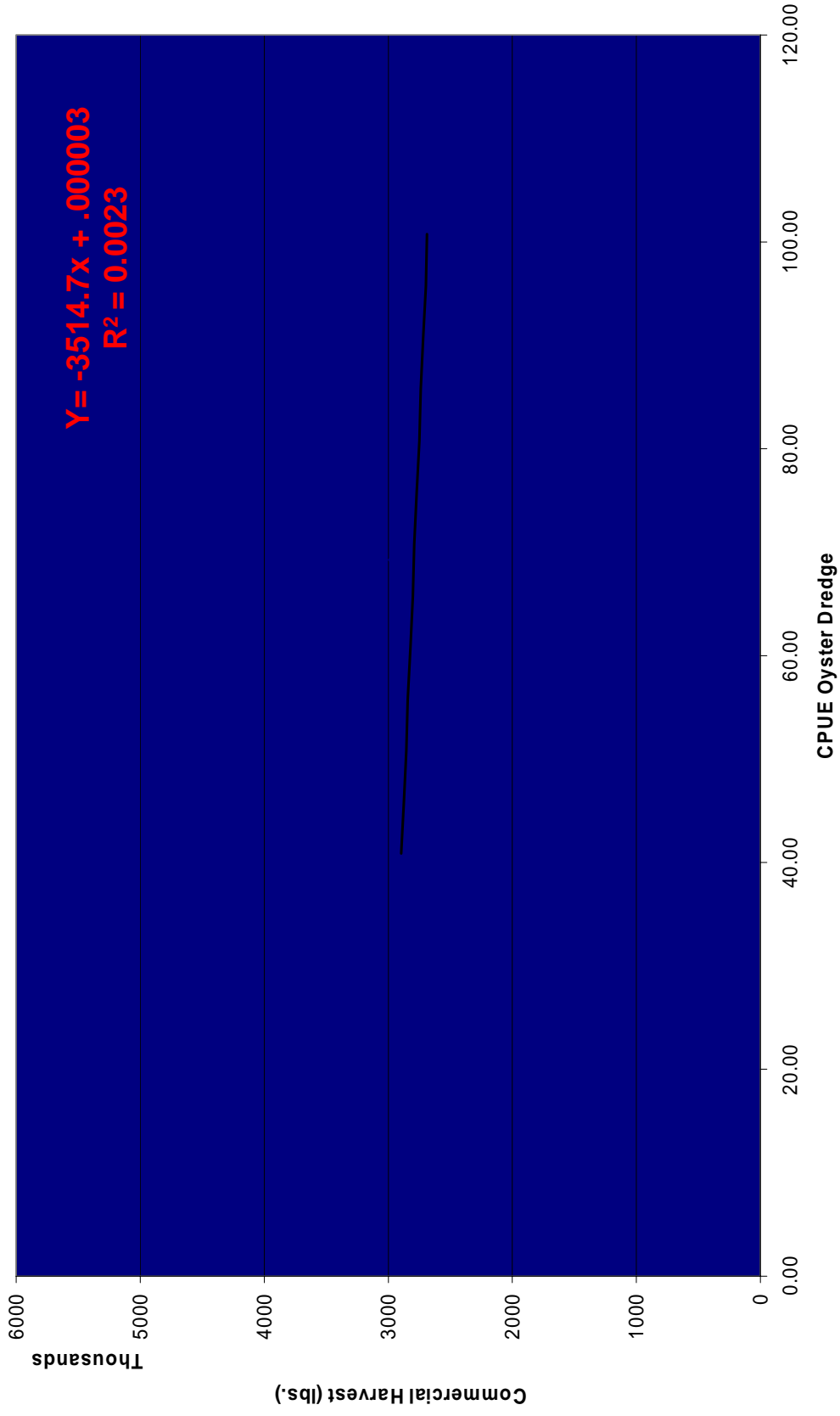
White Shrimp Correlation

Correlation of White Shrimp NMFS Bay Table vs. TPWD Fishery Otter Trawl Data (1982-98)



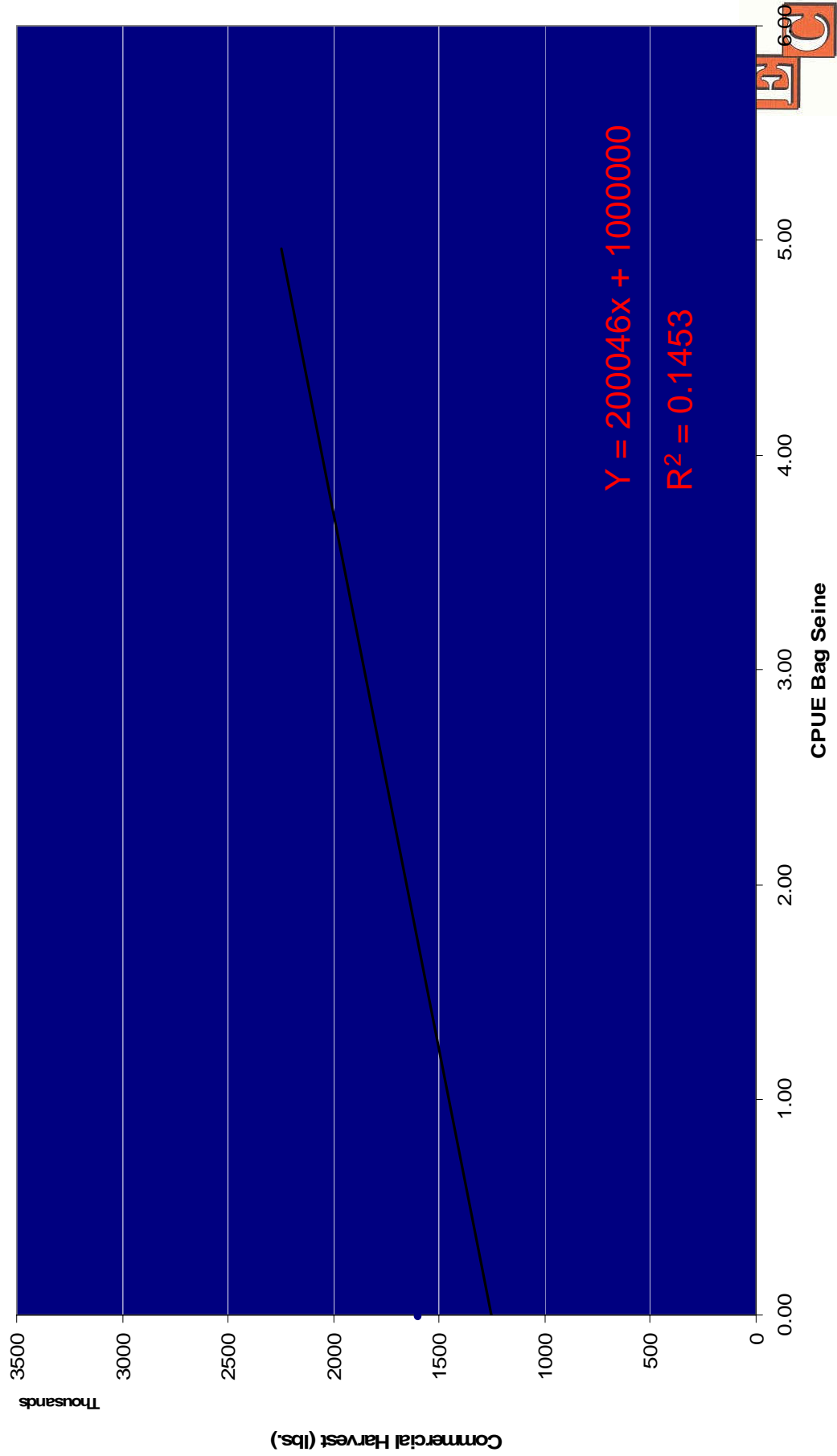
Oyster Correlation

Correlation of Eastern Oyster TPWD Commercial Harvest vs. TPWD Fishery Oyster Dredge Data (1986-98)



Blue Crab Correlation

Correlation of Blue Crab TPW Commercial Harvest vs. TPW Fishery Bag Seine Data (1976-98)



Summary

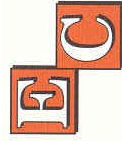
Analysis of the commercial harvest data's correlation with TPWD Coastal Fisheries data indicates that commercial harvest does not represent a meaningful proxy measure of abundance in the bay. Commercial harvest apparently does not correlate with abundance.

The response of the ecosystem to freshwater inflows has not been adequately captured by the statistical methods employed.

It is not apparent how the beneficial inflows, as presently set out, can be readily applied in practical water management.

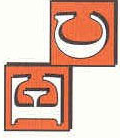
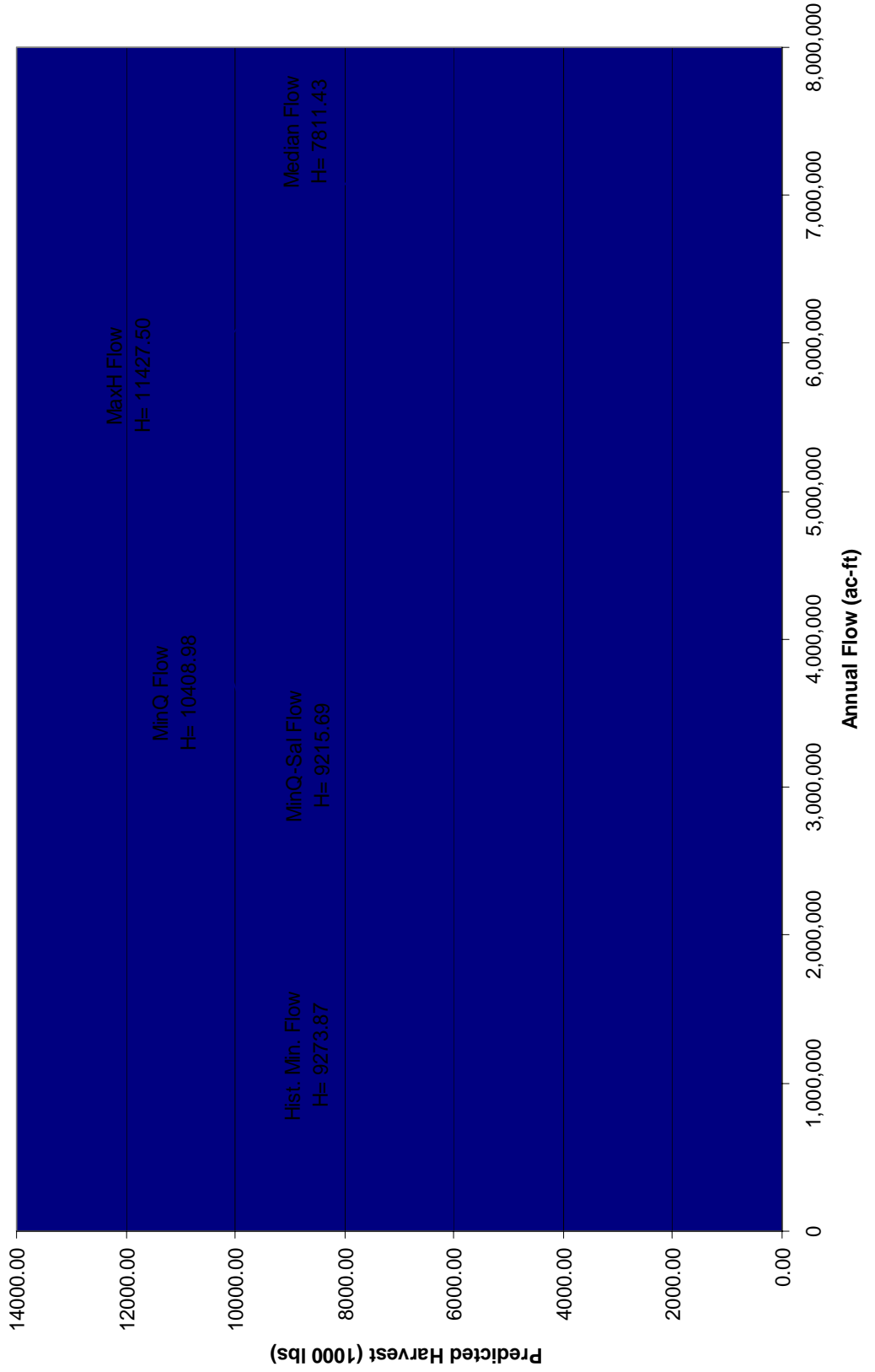
The State Methodology should be further developed to improve its application under drought conditions

The State Methodology is the first major attempt to model estuarine health in Texas. The Sponsors' study is an attempt to improve the scientific basis of the process.



Focus

Predicted Annual Harvest Under Various Flow Regimes using State Methodology Regression Equations



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