2011 South Central Texas Regional Water Plan

Study 4 – Environmental Studies

Status Report

South Central Texas Regional Water Planning Group

August 7, 2008

Study 4 – Task 1: Harvest Equations

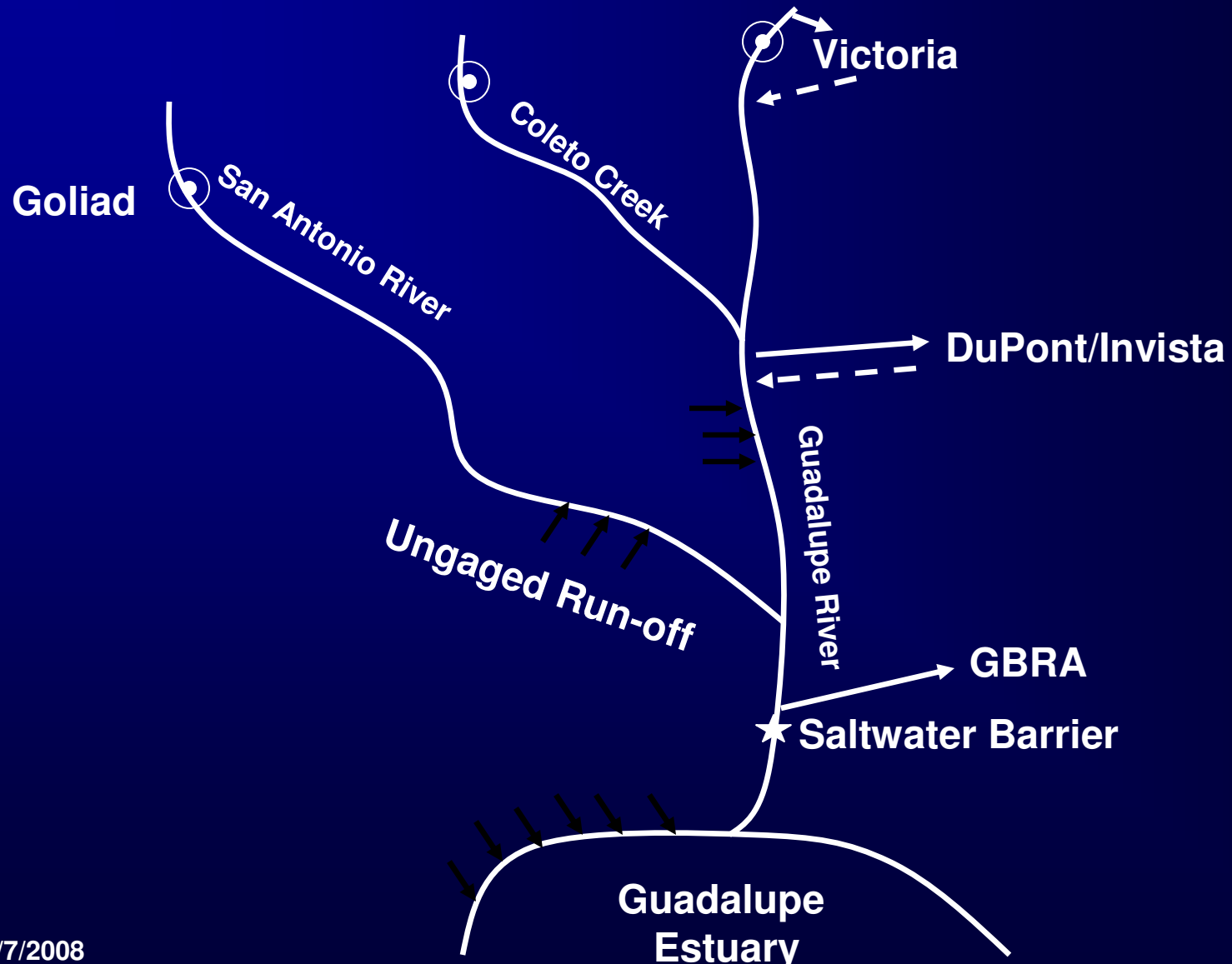
- Research and refine estimates of historical diversions and effluent discharges affecting flows in the lower Guadalupe River and freshwater inflows to the Guadalupe Estuary prior to 1977.

- Evaluate potential effects on fisheries harvest equations for selected species of interest (Blue Crabs, White Shrimp, Brown Shrimp, Eastern Oyster, Black Drum, Red Drum, and Spotted Seatrout).

Topics for Discussion

- Diversion & Return Data Prior to 1977
- Estimate of Historical Inflow to the Guadalupe Estuary
- Harvest Equations with Updated Diversion and Return Data

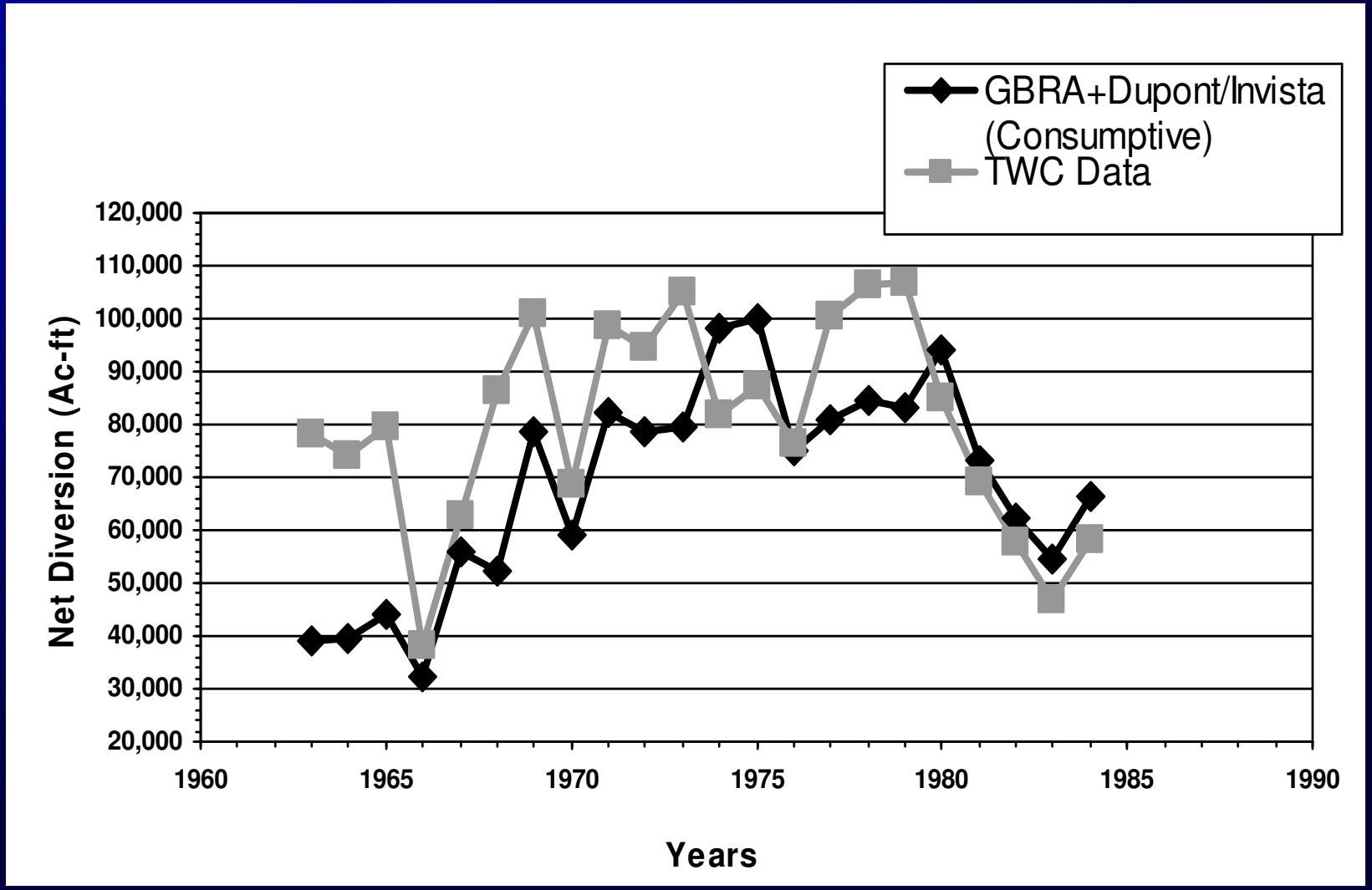
Lower Guadalupe River Basin



Diversion Data

- Cumulative Diversion Data Below Streamgages from Guadalupe-San Antonio River Basin Model Development (1993) –Texas Water Commission
- Historical GBRA Diversions – GBRA & USGS
- DuPont/Invista Diversions – Adjudication & Historical Records
- Victoria WWTP Effluent – Development of Guadalupe-San Antonio River Basin Model

TWC Data vs. GBRA + DuPont/Invista



Monthly Estimate of Historical Inflow to the Guadalupe Estuary

- **Three upstream gages**
  - **Guadalupe River at Victoria**
  - **Coleto Creek near Victoria**
  - **San Antonio River at Goliad**

- **TWC Reported Surface Water Use Diversions**
- **Victoria Returns**
- **Ungaged Run-off Estimates from TWDB Model (TxRR)**

- *Surface Inflow = Gages – Diversions + Returns + Ungaged Run-off*

TPWD/TWDB Original Estimates of Estuarine Inflow

	Bimonthly Periods						
Year	**Jan-Feb**	**Mar-Apr**	**May-Jun**	**Jul-Aug**	**Sep-Oct**	**Nov-Dec**	**Annual Total**
1958	1,376,001	436,678	553,241	166,429	644,020	430,771	3,607,140
1959	413,226	372,483	298,048	239,691	432,961	219,486	1,975,895
1960	265,721	228,188	497,846	498,501	1,292,641	1,080,123	3,863,020
1961	814,994	329,297	690,549	426,986	353,290	296,103	2,911,219
1962	145,954	154,870	230,066	75,638	153,209	175,995	935,732
1963	149,881	109,935	77,732	41,450	52,149	131,151	562,298
1964	164,196	180,003	111,054	111,476	206,412	151,305	924,446
1965	594,119	200,195	857,400	137,214	224,208	460,524	2,473,660
1966	332,988	336,458	526,520	203,866	203,607	139,598	1,743,037
1967	139,584	122,032	133,282	106,992	2,713,063	447,981	3,662,934
1968	1,026,328	431,047	1,137,391	397,050	343,668	298,366	3,633,850
1969	423,894	699,061	522,392	131,071	185,323	275,595	2,237,336
1970	325,758	466,713	696,948	196,559	263,966	117,358	2,067,302
1971	101,951	94,740	102,120	226,135	904,767	528,713	1,958,426
1972	328,749	194,812	1,380,276	283,720	288,345	263,185	2,739,087
1973	232,157	647,963	1,009,090	910,582	1,607,480	625,030	5,032,302
1974	491,408	279,574	447,756	199,216	573,085	773,327	2,764,366
1975	594,479	466,128	1,365,192	501,863	287,211	234,626	3,449,499
1976	182,493	616,996	916,032	445,637	553,300	1,351,322	4,065,780
1977	685,135	1,132,668	943,254	238,327	230,298	322,486	3,552,168
1978	210,829	186,116	231,700	374,319	667,631	293,293	1,963,888
1979	776,170	841,942	1,288,304	462,238	494,651	167,626	4,030,931
1980	223,205	129,267	349,784	147,870	232,483	152,420	1,235,029
1981	164,986	230,841	1,414,993	572,083	1,166,285	588,801	4,137,989
1982	353,499	187,173	575,205	98,773	109,908	242,609	1,567,167
1983	220,345	303,067	211,877	266,075	224,778	159,619	1,385,761
1984	150,823	129,226	60,777	33,109	164,354	174,640	712,929
1985	301,599	570,844	360,028	299,441	244,304	532,234	2,308,450
1986	264,598	159,207	532,965	155,490	389,204	737,625	2,239,089
1987	692,847	555,264	2,718,643	893,407	330,447	262,478	5,453,086

TPWD/TWDB Updated Estimates of Estuarine Inflow

	Bimonthly Periods						
Year	**Jan-Feb**	**Mar-Apr**	**May-Jun**	**Jul-Aug**	**Sep-Oct**	**Nov-Dec**	**Annual Total**
1958	1,376,188	434,608	542,724	152,120	643,083	430,993	3,579,717
1959	413,305	368,125	285,319	225,227	426,252	219,601	1,937,830
1960	265,974	227,739	483,146	478,307	1,288,168	1,080,285	3,823,618
1961	815,196	328,579	682,450	414,765	352,899	296,255	2,890,143
1962	146,114	153,042	217,963	61,901	148,952	176,023	903,996
1963	149,658	106,059	48,628	11,545	42,237	130,741	488,867
1964	164,394	169,954	85,330	86,479	197,659	151,389	855,205
1965	594,015	191,902	835,415	109,247	208,295	460,240	2,399,114
1966	332,820	333,727	521,320	186,736	196,298	138,987	1,709,886
1967	139,301	111,452	110,376	87,621	2,709,068	447,511	3,605,331
1968	1,026,419	424,105	1,113,077	361,675	329,501	298,332	3,553,108
1969	423,615	691,091	490,188	95,354	166,563	275,121	2,141,931
1970	326,127	462,005	673,719	169,923	255,903	116,412	2,004,089
1971	100,831	73,584	74,288	197,205	892,168	527,518	1,865,594
1972	325,838	182,759	1,352,686	260,734	265,723	261,717	2,649,458
1973	229,607	641,733	979,611	869,134	1,591,611	621,135	4,932,831
1974	489,205	270,557	424,308	174,628	557,504	771,560	2,687,761
1975	591,890	452,352	1,339,869	479,646	271,810	232,373	3,367,940
1976	180,593	608,442	894,809	426,421	536,758	1,349,065	3,996,088
1977	685,135	1,132,668	943,254	238,327	230,298	322,486	3,552,168
1978	210,829	186,116	231,700	374,319	667,631	293,293	1,963,888
1979	776,170	841,942	1,288,304	462,238	494,651	167,626	4,030,931
1980	223,205	129,267	349,784	147,870	232,483	152,420	1,235,029
1981	164,986	230,841	1,414,993	572,083	1,166,285	588,801	4,137,989
1982	353,499	187,173	575,205	98,773	109,908	242,609	1,567,167
1983	220,345	303,067	211,877	266,075	224,778	159,619	1,385,761
1984	150,823	129,226	60,777	33,109	164,354	174,640	712,929
1985	301,599	570,844	360,028	299,441	244,304	532,234	2,308,450
1986	264,598	159,207	532,965	155,490	389,204	737,625	2,239,089
1987	692,847	555,264	2,718,643	893,407	330,447	262,478	5,453,086

Existing Harvest Equations with Updated Diversion and Return Data

- **Same Bi-monthly Periods, Annual Harvests, and Equation Formulations**

- **Updated Bi-monthly Inflow Data**
  - *Gages – Diversions + Returns + Ungaged Run-off*

- **Recalculated Coefficients through Multi-Variable Regression using MS Excel**
  - **Coefficients changed, though not significantly**
  - **Example: White Shrimp**

Original: H = 545.59 + 160.9 lnQJF + 279.1 lnQMJ – 155.1 lnQJA – 277.9 lnQND

Updated: H = 532.74 +154.7 lnQJF +257.4 lnQMJ – 121.0 lnQJA – 278.5 lnQND

Harvest Equation Table with Updated Flows

Species	Constant	Jan-Feb	Mar-Apr	May-Jun	Jul-Aug	Sep-Oct	Nov-Dec
White Shrimp							
Original H =	545.59	+ 160.9 $\ln Q_{JF}$		+ 279.1 $\ln Q_{MJ}$	- 155.1 $\ln Q_{JA}$		- 277.9 $\ln Q_{ND}$
Updated H =	532.74	+ 154.7 $\ln Q_{JF}$		+ 257.4 $\ln Q_{MJ}$	- 121 $\ln Q_{JA}$		- 278.3 $\ln Q_{ND}$
Brown Shrimp							
Original lnH =	6.5679				+ 0.6707 $\ln Q_{JA}$	- 0.7486 $\ln Q_{SO}$	
Updated lnH =	7.0587				+ 0.5901 $\ln Q_{JA}$	- 0.7468 $\ln Q_{SO}$	
Blue Crab							
Original H =	110.64	- 145.3 $\ln Q_{JF}$			+ 332.5 $\ln Q_{JA}$	- 141.4 $\ln Q_{SO}$	
Updated H =	342.87	- 139 $\ln Q_{JF}$			+ 280.7 $\ln Q_{JA}$	- 135.1 $\ln Q_{SO}$	
Eastern Oyster							
Original H =	3000.7		+ 180.4 $\ln Q_{MA}$	- 963.3 $\ln Q_{MJ}$	+ 710.0 $\ln Q_{JA}$	- 231.5 $\ln Q_{SO}$	
Update H =	3232.1		+ 153.2 $\ln Q_{MA}$	- 946.8 $\ln Q_{MJ}$	+ 677.6 $\ln Q_{JA}$	- 226.5 $\ln Q_{SO}$	
Black Drum							
Original H =	- 18.087	+ 0.2411 Q_{JF}	- 0.1734 Q_{MA}				+ 0.0850 Q_{ND}
Updated H =	- 18.573	+ 0.2407 Q_{JF}	- 0.174 Q_{MA}				+ 0.0853 Q_{ND}
Red Drum							
Original H =	32.786			+ 0.0797 Q_{MJ}	+ 0.2750 Q_{JA}		- 0.2010 Q_{ND}
Updated H =	43.893			+ 0.0831 Q_{MJ}	+ 0.2832 Q_{JA}		- 0.2199 Q_{ND}
Spotted Seatrout							
Original lnH =	2.6915		- 0.7185 $\ln Q_{MA}$	+ 1.860 $\ln Q_{MJ}$			- 1.086 $\ln Q_{ND}$
Updated lnH =	3.4667		- 0.6779 $\ln Q_{MA}$	+ 1.735 $\ln Q_{MJ}$			- 1.112 $\ln Q_{ND}$

Preliminary Findings

- Changes to harvest equation coefficients are minimal.
- The Lower and Upper Flow Bounds of the data used to derive the equations are broader and improve the application of the equations in scenario simulations.
- Application of the updated bounds decreased excursions by 50% for Brown Shrimp and lesser percentages for other species.

Study 4 – Task 2: Ecologically-Based Streamflow Assessment

- ***Perform ecologically-based streamflow assessments (similar to those for the Guadalupe Estuary in Section 7 of the 2006 Regional Plan) for the Guadalupe River at Victoria and the San Antonio River at Falls City.***

- **In the process of gathering input from TWDB, TPWD, SARA, and NWF regarding measures to be used in the ecologically-based streamflow assessment.**

Study 4 – Task 3: Support and Education Program Presentation Materials

- ***Develop and deliver presentation materials and GIS-based graphics to support SCTRWPG and education programs focused on endangered species habitat ranges, regulatory processes, and other factors potentially affecting implementation of planned strategies.***

Endangered Species and Recommended Water Management Strategies

- **A list of endangered species potentially affected by implementation of the planned strategies has been developed. HDR proposes to develop GIS-based graphics simultaneously illustrating:**
  - **General locations of endangered species habitat**
  - **Locations of planned water management strategies**
  - **Photographs of endangered species and typical habitat.**
- **Such graphics will be presented in "interactive" web-based format, subject to budget constraints.**

Regulatory Processes

- **HDR proposes to prepare a flowchart summarizing regulatory processes associated with development of new water supplies from groundwater and surface water sources.**