

# INSTREAM FLOWS RESEARCH AND VALIDATION METHODOLOGY FRAMEWORK

GSA BBASC UPDATE  
SEPTEMBER 27, 2016



# OVERVIEW

- Original Project goals:
  - To enhance the understanding of flow-ecology relationships in Guadalupe – San Antonio and other basins
  - To initiate the process of developing a methodology for testing established flow standards
- A key focus was how pulse flows affect the ecology in the rivers and estuary

# OVERVIEW

- **Project Development Science Workshops**
  - July and October 2014
  - Hypothesis development and Indicator selection
  - Site selection and methodologies
- **Preliminary field work and observations**
  - July through September 2014
  - Finalized scope of work
- **Environmental Flows Validation Project Study Methodologies Interim Report**
  - Submitted to TWDB in November 2014
- **Instream Flows Research and Validation Methodology Framework Final Study Reports**
  - Submitted to TWDB in August 2015

# ECOLOGICAL COMPONENTS

- Aquatics
- Fish Recruitment
- Floodplain connectivity
- Riparian
- Brazos Estuary



# ENVIRONMENTAL FLOWS VALIDATION METHODOLOGY

- Two main objectives
  - To inform and refine validation methodologies with the goal of having a scientifically defensible approach for testing TCEQ environmental flow standards.
  - To provide each BBASC with information on how application of these methodologies might validate or suggest refinement for existing TCEQ flow standards at select basin sites.

# AQUATICS - DR. TIM BONNER

- 58 abiotic and biotic predictions tested
- 63 riffle habitats, 74 run habitats
- 51,000 macroinvertebrates, 21,000 fishes
- High variability among base flow condition
- Low replication in other tiers

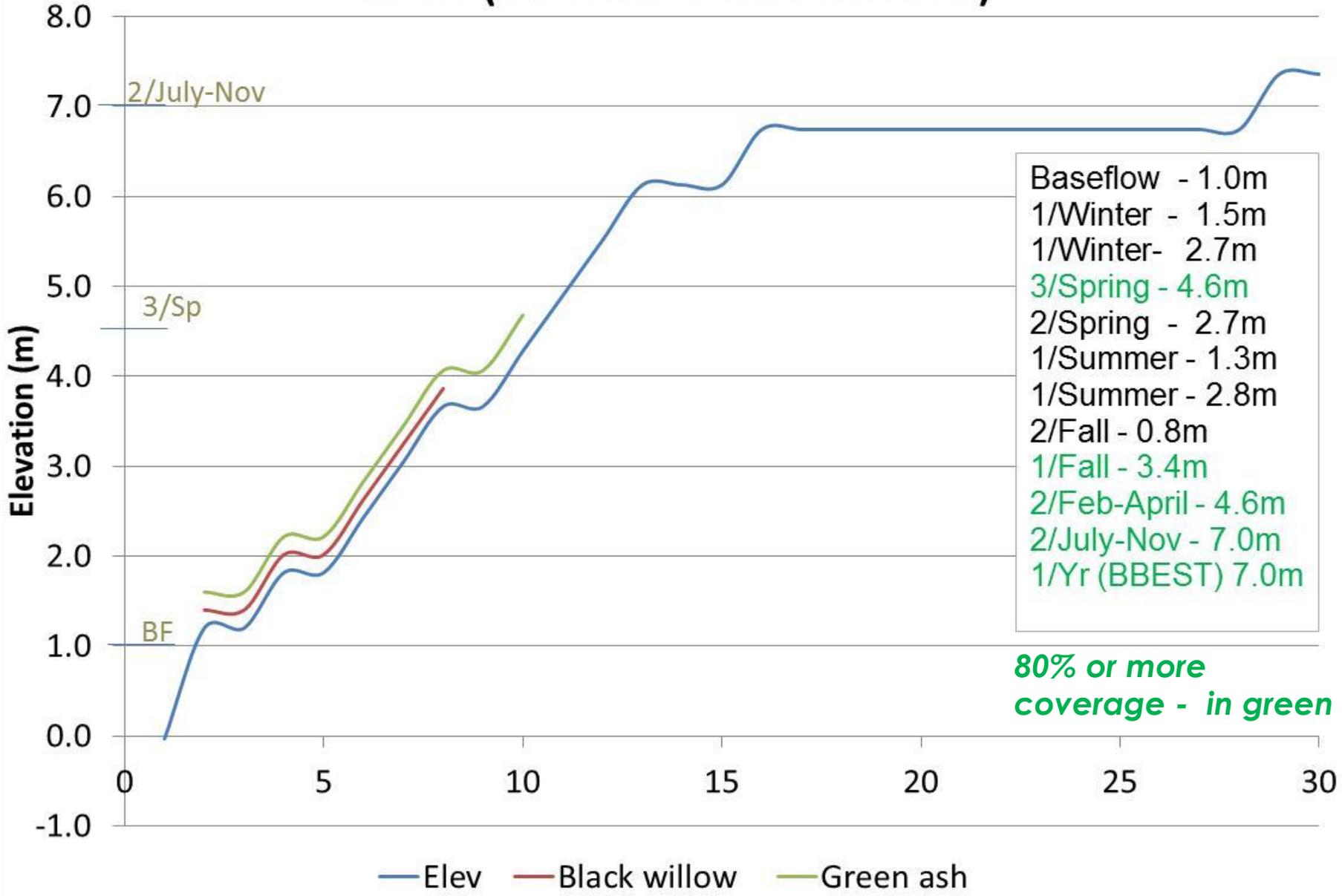
<u>Tier</u>	<u>N</u>
Subsistence	3
Base	30
4 / season	2
3 / season	2
2 / season	9
1 / season	12
1 / year	5

# RIPARIAN – DR. JACQUELYN DUKE

- Compared distribution of seedlings, saplings, and mature trees along established and surveyed transects to inundation from pulse flows
- 3 indicator species
  - Black willow
  - Box elder
  - Green ash



### Goliad (San Antonio river at Goliad)



**80% or more coverage - in green**



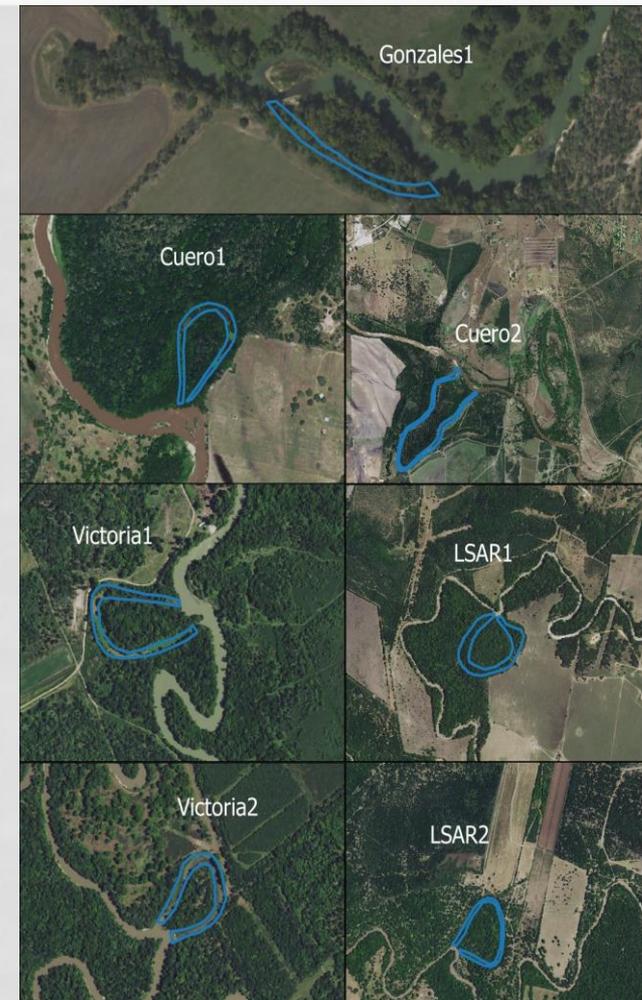
Flow Tiers	Number of All Species Covered* by	Number of Species at the Highest Elev Covered* by	Number That Occurred in 2014
BF	1/14	0/6	6/6
2/W	1/14	0/6	5/6
1/W	1/14	0/6	4/6
3/Sp**	2/2	1/1	1/1
2/Sp	0/14	0/6	2/6
1/Sp	3/12	1/5	3/6
2/Su	1/14	0/6	3/6
1/Su	1/14	0/6	0/6
2/Fa	1/14	0/6	2/6
1/Fa	3/14	0/6	2/6
2/Feb-Apr**	2/2	1/1	0/1
2/Jul-Nov**	2/2	1/1	0/1
1/Yr	12/14	4/6	2/6
* Inundation of 80% or more of the species' distribution			
** Goliad large flow pulses			

## Recommended 1/Spring and 1/Fall:

Site	Highest-Elevation Indicator Species	Distribution (meters)	Elevation 100%	Elevation 80%	CFS 100%	CFS 80%
Blanco	Box Elder	6-40	5.7	5.3	27800	24100
Goliad	Green Ash	3-10	4.2	4.1	3334	3171
Gonzales	Box Elder/Green Ash	18-20	6.2	6.2	6058	6000
Guadalupe	Box Elder	14-24	5.6	5.1	18300	15700
Medina	Box Elder	0-60	3.8	3.0	1227	583
Victoria	Box Elder/Green Ash	4-90	5.3	4.4	6630	4743

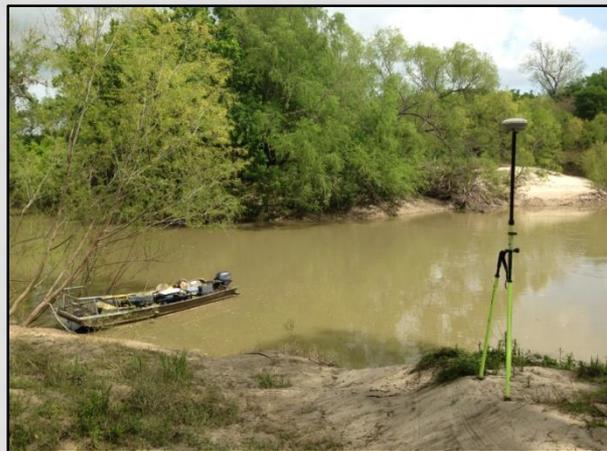
# FLOODPLAIN CONNECTIVITY BIO-WEST

- 7 floodplain lakes evaluated
  - 5 on lower Guadalupe
  - 2 on lower San Antonio
- Fish Community Data
  - Electrofishing, seining
- Connection Data
  - Elevation of control points and water surface
  - Connection discharge interpolated from nearest gauges (Osting et al. 2004)



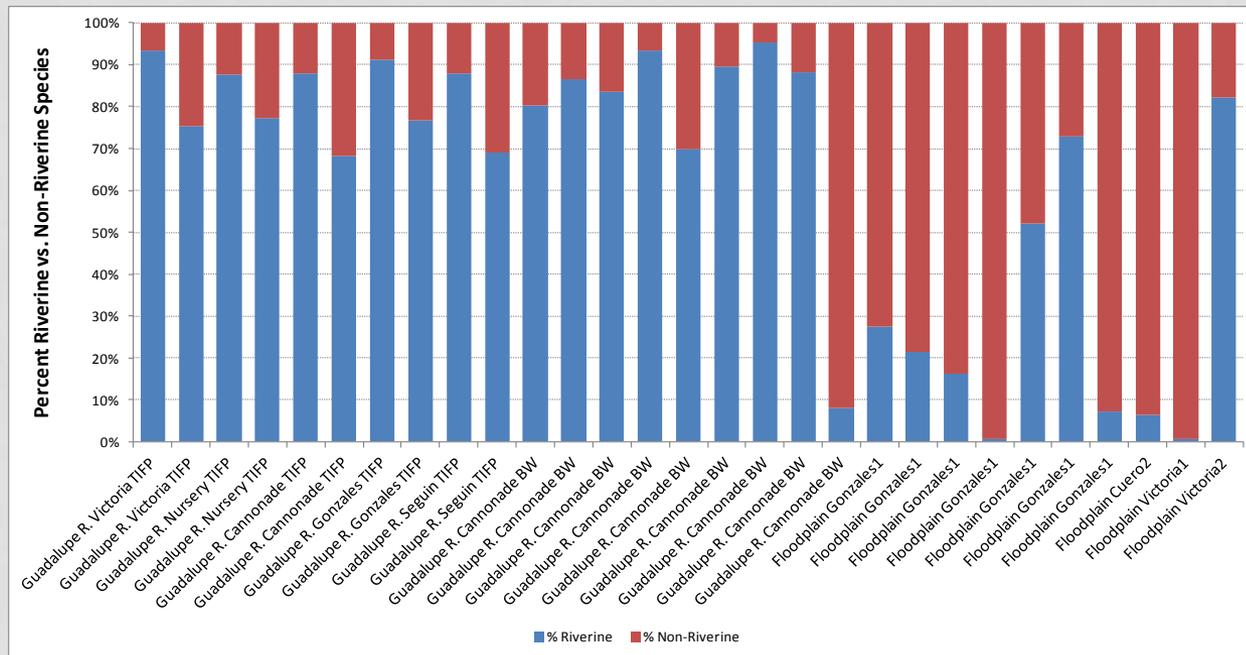
# CONNECTION DATA

Floodplain Site	Corresponding USGS Gauge	Connection Discharge (cfs)	Frequency of Connection
Gonzales1	Guadalupe at Gonzales	2,822	5.2 / year
Cuero1	Guadalupe at Cuero	1,710	6.6 / year
Cuero2	Guadalupe at Cuero	207	Baseflow
Victoria1	Guadalupe at Victoria	290	Baseflow
Victoria2	Guadalupe at Victoria	144	Baseflow
LSAR1	San Antonio at Goliad	2,740	4.0 / year
LSAR2	San Antonio at Goliad	>10,000	0.8 / year



# FISH COMMUNITY DATA

- Species richness ranged from 2 – 23 among floodplain collections
- Fish communities significantly different between floodplain and riverine collections



# INTERPRETATION AND VALIDATION

Floodplain Lake		<b>Gonzales1</b>	<b>Cuero1</b>	<b>LSAR1</b>	<b>LSAR2</b>	
Connection Discharge (cfs)		2,822	1,710	2,740	>10,000	
USGS Gage		Guadalupe River at Gonzales	Guadalupe River at Cuero	San Antonio River at Goliad	San Antonio River at Goliad	
Seasonal Pulses	Winter	2/season	N	N	-	-
		1/season	Y	Y	N	N
	Spring	2/season	Y	Y	N	N
		1/season	Y	Y	-	-
	Summer	2/season	N	N	-	-
		1/season	N	Y	N	N
	Fall	2/season	N	Y	-	-
		1/season	Y	Y	N	N
Large Pulses	Apr. - Jun.	3/period	-	-	Y	N
	Feb. - Apr.	2/period	-	-	Y	N
	Jul. - Nov.	2/period	-	-	Y	N

**TCEQ environmental flow standard pulse recommendations compared to connection discharges at four floodplain lakes in the lower GSA basin. Pulse events with a “Y” had a magnitude greater than the estimated connection discharge, whereas those with an “N” did not. Dashes represent recommendations which were not applicable at a particular gage.**

# SB3 INSTREAM FLOW VALIDATION ROUND 2 – 2016/2017

- Additional expert panel workshops to solicit input from experts and stakeholders
  - Methodologies?
  - Hypostheses?
  - Other Components?
- Continue data collection at established sites
  - Guadalupe and San Antonio Basins
  - Brazos Basin
- Added Colorado and Lavaca Basins
  - Additional replication for Aquatic and Riparian work

# EXPERT PANEL WORKSHOP

- September 8, 2016 at LCRA Service Center in Austin
- Approximately 40 attendees
  - Academics
  - River authorities
  - State agencies
  - Other experts and stakeholders
- Good feedback and interesting discussion
  - Other organisms (birds, herps) as indicators in floodplains
  - Analysis of aquatic data – time lag of response
  - Other data sources?

# FLOODPLAIN - ROUND 2

- Connection magnitude data at additional sites
  - Original data is from 7 of 24 potential sites
  - New sites being evaluated within GSA basin
- Repeat fish community sampling at multiple sites, particularly following pulse events
- Inventory additional organisms



# RIPARIAN ROUND 2 – GSA BASIN

- ~5 previous sites
- Evaluating slight method modifications to allow for additional statistical analysis

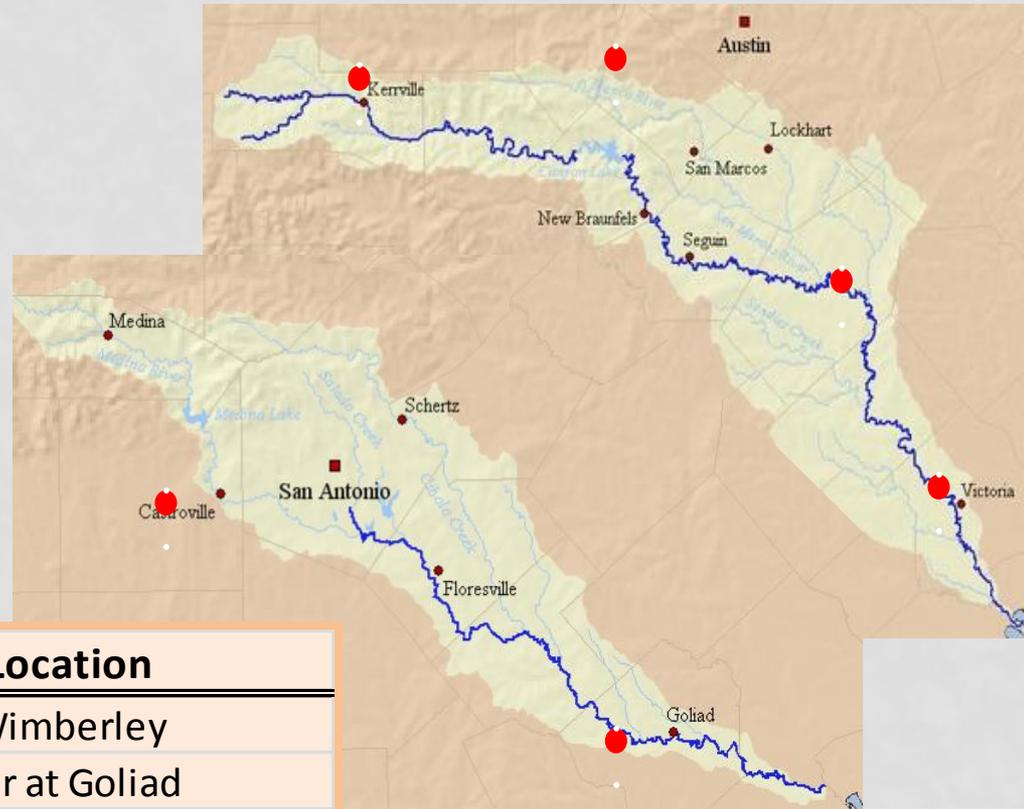


Photo Credit: TX Climate News (modified)

Gauge #	Site Name	Gage Location
<a href="#">8171000</a>	Blanco	Blanco River at Wimberley
<a href="#">8188500</a>	Goliad	San Antonio River at Goliad
<a href="#">8167500</a>	Guadalupe	Guadalupe River near Spring Branch
<a href="#">8173900</a>	Gonzales	Guadalupe River at Gonzales
<del><a href="#">8181500</a></del>	<del>Medina</del>	<del>Medina River at San Antonio</del>
<a href="#">8176500</a>	Victoria	Guadalupe River at Victoria

# AQUATIC - ROUND 2

- Additional replication in GSA, Brazos, and Colorado/Lavaca basins
- Refining analysis to further investigate lag time of response variables
- Examining other available data sources

# ACKNOWLEDGEMENTS

- Landowners
- BBASCs
- TWDB
- TPWD and TCEQ
- BBESTs
- Volunteers



# QUESTIONS?

