



SAN ANTONIO
RIVER AUTHORITY

Field Monitoring Efforts

Friday, March 29, 2019

COMMITTED TO SAFE, CLEAN, ENJOYABLE CREEKS AND RIVERS

Overview

- 1) Upper San Antonio River Boundary Redefinition
- 2) Mission Reach Intensive Nekton Survey
- 3) Long-term Texas Instream Flow Program Monitoring
- 4) Holistic Mussel Project
- 5) Mission Reach Mussel Survivability Study
- 6) Mussel Propagation and Production Project



Upper San Antonio River (USAR) Boundary Re-definition

- Assessment Units:
 - *Intended to have relatively homogeneous **chemical, physical, and hydrological** characteristics, an AU provides a basic unit for assigning site-specific standards and for applying water quality management programs of the agency – TCEQ 2016*

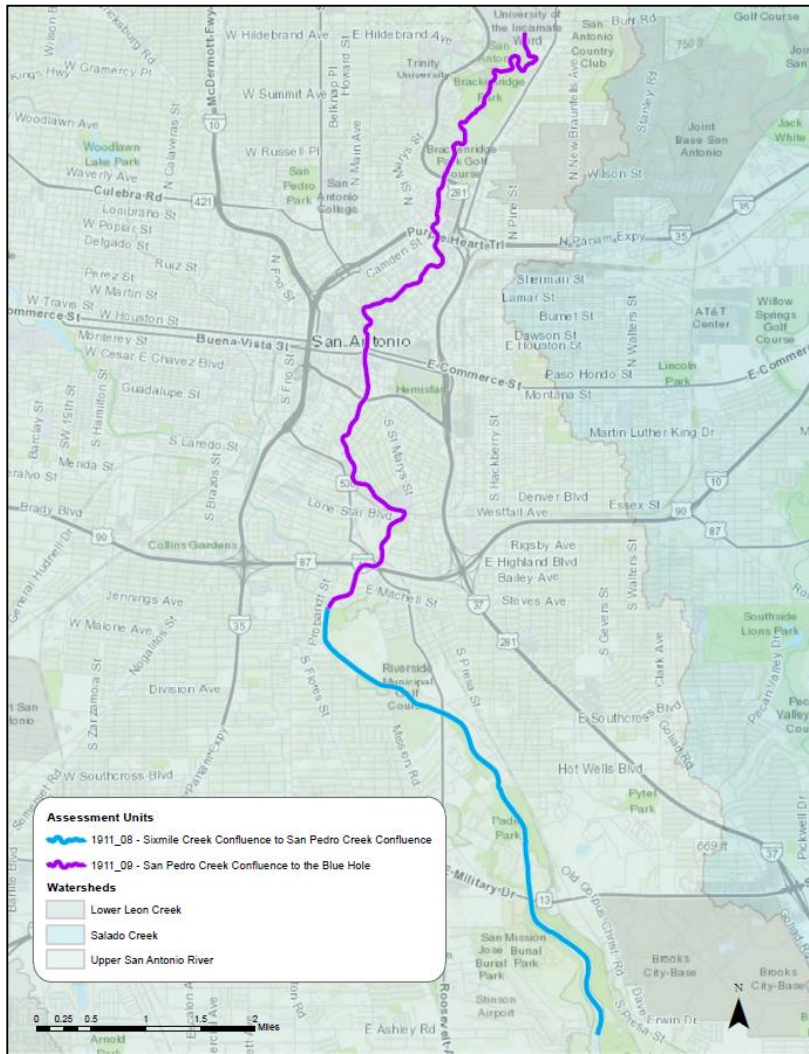


AU Status

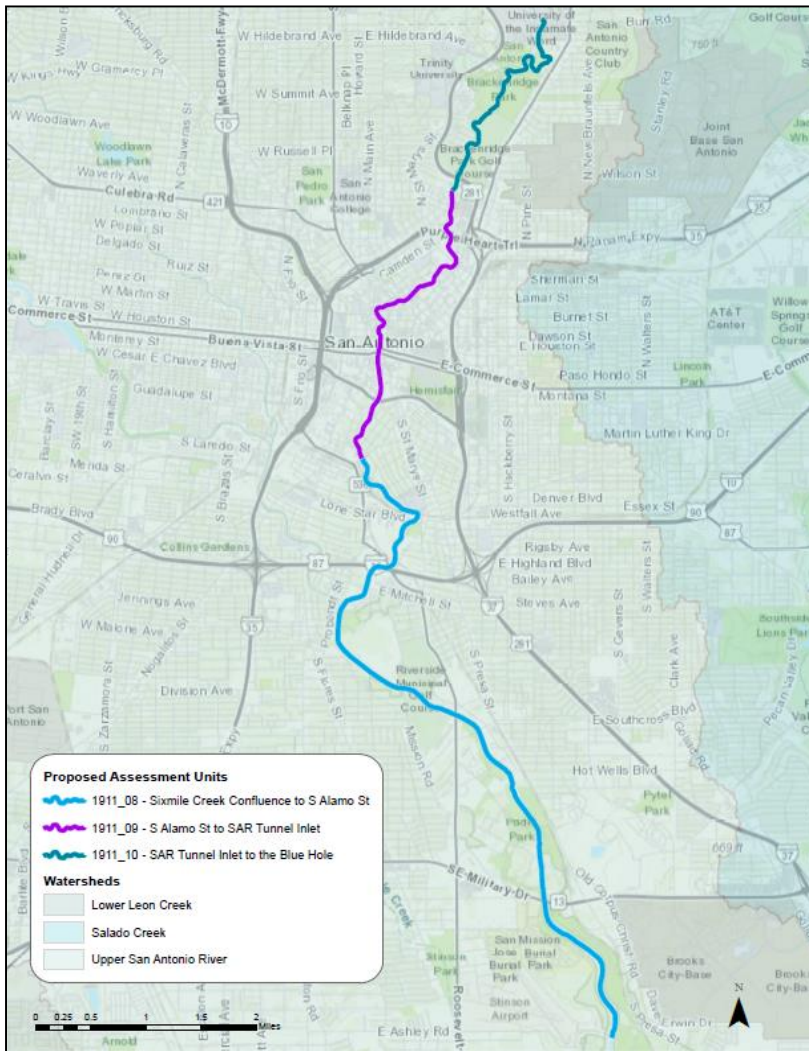
AU	Level of Support (LOS) ¹	Method
1911_08 – Sixmile Confluence to San Pedro Creek Confluence	Concern	Impaired Habitat, Impaired Fish Community, Nitrate
	Non-Support	Bacteria ²
1911_09 – San Pedro Creek Confluence to Blue Hole	Concern	Impaired Habitat, Nitrate, Phosphorus
	Non-Support	Impaired Fish Community, Bacteria ²

1 – As Assessed in 2014 Texas Integrated Report

2 – Not “Listed”, TMDL’s completed and approved by EPA



Proposed AU



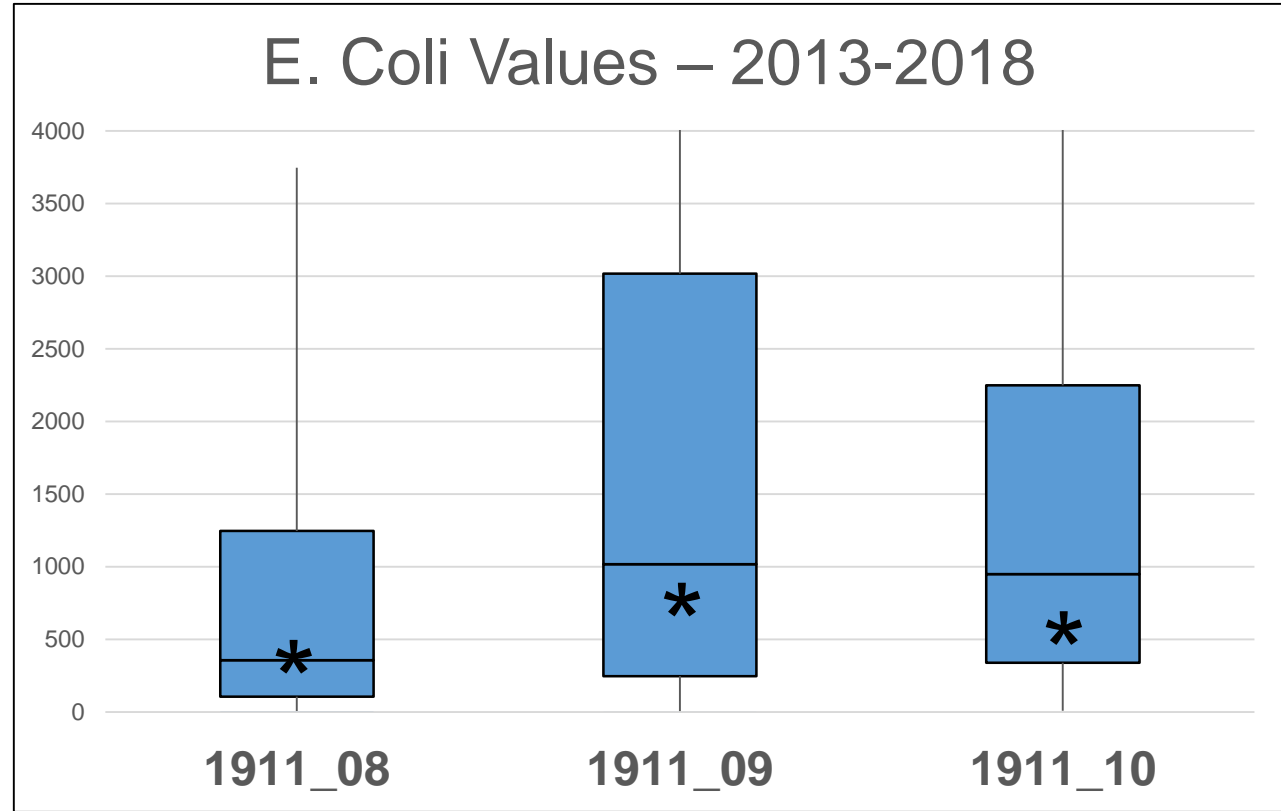
AU	Level of Support (LOS) ¹	Method
1911_08 – Sixmile Confluence S Alamo St	Concern	Impaired Habitat, Impaired Fish Community, Nitrate
	Non-Support	Bacteria ²
1911_09 – S Alamo St to Tunnel Inlet	Concern	Nitrate, Phosphorus
	Non-Support	Bacteria ²
1911_10 – Tunnel Inlet to Blue Hole	Concern	Impaired Habitat, Nitrate, Phosphorus
	Non-Support	Impaired Fish Community, Bacteria ²

1 – As Assessed in 2014 Texas Integrated Report

2 – Not “Listed”, TMDL’s completed and approved by EPA

Chemical

- Geomeans*:
 - 1911_08 = 350
 - 1911_09 = 775
 - 1911_10 = 591
- 1° Rec Standard – 126 cfu/100 mL
- 2° Rec Standard – 399 cfu/100 mL



Biological

- While bacteria is addressed using I-Plan and TMDL, biology is only delisted w/improved metrics
- Proactive ecological restoration opportunities in 1911_08 and 1911_10

AU	IBI	ALU ¹	HQI	ALU ²
1911_08	35.9	Intermediate	20.1	High
1911_09	No Data	NA	No Data	NA
1911_10	37.6	Intermediate	20.2	High

1 – High IBI ALU designation ≥ 41

2 – High HQI ALU designation > 19



Physical



**TCEQ_14256 – SAR at Mitchell
1911_08**



**TCEQ_20118 – SAR at Houston
1911_09**



**TCEQ_12909 – SAR at Mulberry
1911_10**

- Obvious physical difference, even in restored Mission Reach



Hydrological

- All three proposed AU's heavily influenced by anthropogenic effects, 1911_09 more regulated and not subjected to large pulse flows due to presence of tunnel



Next Steps

- ESD Staff will notify TCEQ
- TCEQ/SARA staff will formulate sampling plan
- Sampling plan finalized after April 3rd, Coordinated Monitoring Meeting
- Sampling likely conducted over two years (contingent upon sampling plan)
- Updated boundaries in 2021 Texas Surface Water Quality Standards



Mission Reach Intensive Nekton Survey (MRINS)

- Mission Reach Avian Study
- How to best capture diversity?
- Observed habitat associations?
- Stratification of fish communities?



MRINS



- Mesohabitat specific sampling
- Measure fish to analyze age/size structure
- Establish species diversity and individual abundance



MRINS

Reach		Downstream San Pedro			
Collectors					
Data Recorder					
Data Reviewer					

File Name:	DSP_03192019_H39.xlsm
Folder:	L:\Field-ops\mission reach Intensive Nekton Survey\Data File\2019\Nekton\DSP_03192019
Station:	39

	Date	Time	Depth
Start	3/19/2019		
End	3/19/2019		

Reach Information	
Segment	1911
Basin Size	269.3070
Ecoregion	32

Location Designation	
Dominant Substrate	
Secondary Substrate	
Mesohabitat	
Edge Designation	

Collection Effort Information					
Collection Method					
Electrofishing (seconds)					
# of Seine Hauls					
Total Length of Hauls (m)					
Seine Length (m)					

Water Quality Parameters					
Dissolved Oxygen					
Temperature					
pH					
Conductivity					
Turbidity					

	Upstream Left	Downstream Left	Middle	Downstream Right	Upstream Right
Depth					
Velocity					
Dominant Substrate					
Latitude					
Longitude					
GPS Instrument					

52 MISSING VALUES

Comments (optional)

Fish Community Data		7 8 9		+1 +5		Count Fish	Recent Changes (newest to oldest)	
Now Measuring Fish	Help	4 5 6	1 2 3	0	-1 -5			
		← 0 Clear			Clear/Reset			

Common Carp	Mimic Shiner	Spotted Bass	Channel Catfish	Suckermouth Catfish
Golden Shiner	Ghost Shiner	Largemouth Bass	Blue Catfish	<i>Pterygoplichthys</i> sp.
Burrhead Chub	Sand Shiner	Guadalupe Bass	Black Bullhead	Rio Grande Cichlid
Texas Shiner	Bullhead Minnow	Smallmouth Bass	Yellow Bullhead	Mozambique Tilapia
Ribbon Shiner	Fathead Minnow	Warmouth	Flathead Catfish	Blue Tilapia
Blacktail Shiner	Central Stoneroller	Green Sunfish	Tadpole Madtom	Red Belly Tilapia
Red Shiner	Goldfish	Redspotted Sunfish	Freckled Madtom	American Eel
Weed Shiner	Western Mosquitofish	Redear Sunfish	Texas Logperch	Blackstripe Topminnow
River Carpsucker	Sailfin Molly	Bluegill	Bigscale Logperch	Inland Silverside
Grey Redhorse	Amazon Molly	Orangespotted Sunfish	River Darter	Mexican Tetra
Smallmouth Buffalo	Green Swordtail	Redbreast Sunfish	Orangethroat Darter	Alligator Gar
Mountain Mullet	Gizzard Shad	Longear Sunfish	Greenthroat Darter	Spotted Gar
White Mullet	Threadfin Shad	White Crappie	Slough Darter	Longnose Gar
Striped Mullet	White Bass	Freshwater Drum		
New Hybrid	Green Sunfish x Bluegill	Bluegill x Longear Sunfish	New Disease	New Disease

Comments:	
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Bluegill x Longear Sunfish



MRINS



Sailfin Molly



MRINS

- March 18-21
- 67 Unique Mesohabitats
- # of Species
- # of Individuals Caught



Largemouth Bass



MRINS Charismatic Species



Texas Logperch



Guadalupe Bass



MRINS Future



- Davis Lake sampling on April 2nd
- Significant data analysis
- Recommendations* moving forward
- Year II sampling in Summer 2020



Long-term Texas Instream Flow Program (TIFP) Monitoring

- TIFP created by the TX Legislature in 2001 (Senate Bill 2) to assess how much water rivers need to maintain a “sound ecological environment”
- Senate Bill 3 initiated the Environmental Flow Process in 2007 to establish recommendations and standards for all basins, even unstudied basins



TIFP Monitoring

- Recommendations in 2011:
 - Bay and Basin Expert Science Team (BBEST)
- Standards in 2012:
 - Texas Commission on Environmental Quality

INSTREAM FLOWS RESEARCH AND VALIDATION METHODOLOGY FRAMEWORK

Guadalupe, San Antonio, Mission, and
Aransas Rivers and Mission, Copano,
Aransas, and San Antonio Bays Basin

FINAL REPORT

Prepared for
Texas Water Development Board

Prepared by
San Antonio River Authority
Dr. Timothy Bomer (Texas State University)
Dr. Jacquelyn Duke (Baylor University)
BIO-WEST, Inc.

September 24, 2015

PURSUANT TO SENATE BILL 1 AS APPROVED BY THE 80TH TEXAS LEGISLATURE, THIS STUDY REPORT WAS FUNDED FOR THE PURPOSE OF STUDYING ENVIRONMENTAL FLOW NEEDS FOR TEXAS RIVERS AND ESTUARIES AS PART OF THE ADAPTIVE MANAGEMENT PHASE OF THE SENATE BILL 1 PROCESS FOR ENVIRONMENTAL FLOWS ESTABLISHED BY THE 80TH TEXAS LEGISLATURE. THE VIEWS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE AUTHOR(S) AND DO NOT NECESSARILY REFLECT THE VIEWS OF THE TEXAS WATER DEVELOPMENT BOARD.



TIFP Monitoring



Orangespotted Sunfish

- Study goal to further evaluate instream flow hypotheses in relation to recommendations and standards



TIFP Monitoring

Sampling Years	Location	USGS Gauge	Station	Baseline Sampling	Flow Tier/Connection Pulse Responses	Nekton	Benthics	Water Quality	Total Yearly Events
Odd Years (2019, 2021, 2023, 2025 and 2027)	SAR near Falls City	08183500	16580	2	3	X	X	X	13
	Cibolo Creek near Falls City	08186000	12798	2	3	X	X	X	
	Floodplain Lake LSAR1	08188500	S0080	2	1	X		X	
Even Years (2020, 2022, 2024, 2026 and 2028)	SAR near Goliad	08188500	12792	2	3	X	X	X	13
	Medina River at San Antonio	08181500	12813	2	3	X	X	X	
	Floodplain Lake LSAR1	08188500	S0080	2	1	X		X	

First sampling events scheduled April 8-10



Holistic Mussel Project (HMP)

- Adopted by SARA board in June 2014, sampling began Fall 2014
- Establish species diversity and abundance:
 - Qualitative wadeable and deep pool
 - Quantitative wadeable and deep pool



HMP Summary

- 232 samples to date
- Leon and Lower Cibolo Creek sampling complete
- San Antonio River (SAR) qualitative complete*
- Started Lower Medina River and Salado Creek sampling
- 12 species, 911 individuals



HMP Summary

Species	Common Name	Cibolo Creek	Leon Creek	San Antonio River	Total
<i>Lampsilis teres</i>	Yellow Sandshell	38	0	247	285
<i>Amblema plicata</i>	Threeridge	0	0	185	185
<i>Cyclonaias aurea</i>	Golden Orb	32	0	129	161
<i>Tritogonia verrucosa</i>	Pistolgrip	7	0	132	139
<i>Utterbackia imbecillis</i>	Paper Pondshell	3	4	50	57
<i>Arcidens confragosus</i>	Rock Pocketbook	0	0	46	46
<i>Cyrtonaias tampicoensis</i>	Tampico Pearlymussel	0	0	13	13
<i>Quadrula apiculata</i>	Southern Mapleleaf	0	11	0	11
<i>Megalonaias nervosa</i>	Washboard	0	0	8	8
<i>Pyganodon grandis</i>	Giant Floater	0	0	4	4
<i>Toxolasma texasense</i>	Texas Lilliput	0	0	1	1
<i>Lampsilis hydiana</i>	Louisiana Fatmucket	1	0	0	1
				TOTAL	911



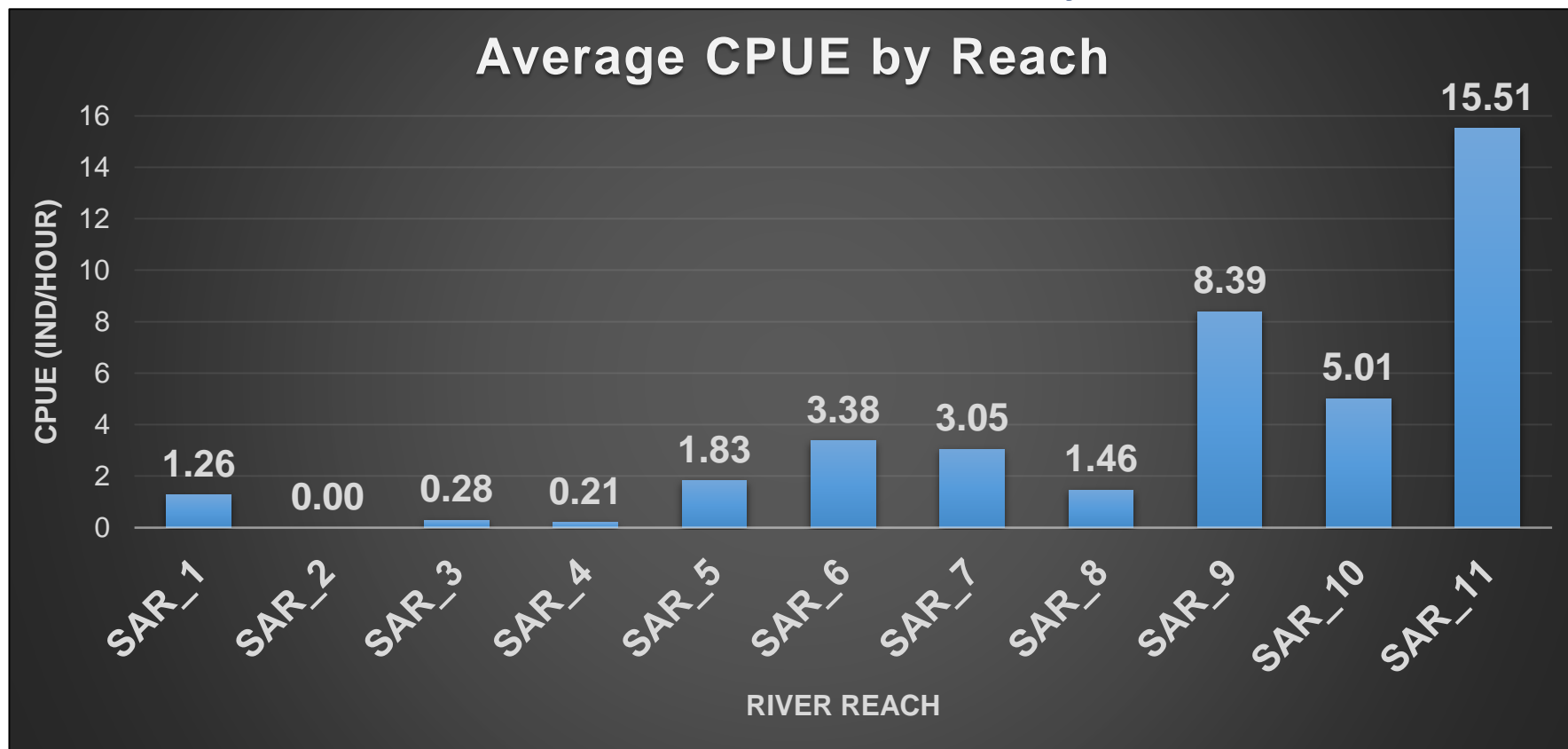
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SAR Summary

Average CPUE by Reach



Upstream

Downstream



SAR Improvement Project



June 2009



September 2018

SAR Upstream Mitchell Rd, Mission Reach



SAR Improvement Project



August 2013



September 2018

SAR Downstream Mission Parkway/Padre Rd, Mission Reach



Mission Reach Mussel Survivability (MRMS) Study

- HMP surveys yielded one mussel in the Mission Reach (MR)
- 21 sites surveyed from 11/3/2015 – 3/14/2017
- Wadeable and deep pool



Paper Pondshell – *Utterbackia imbecillis*



MRMS Study



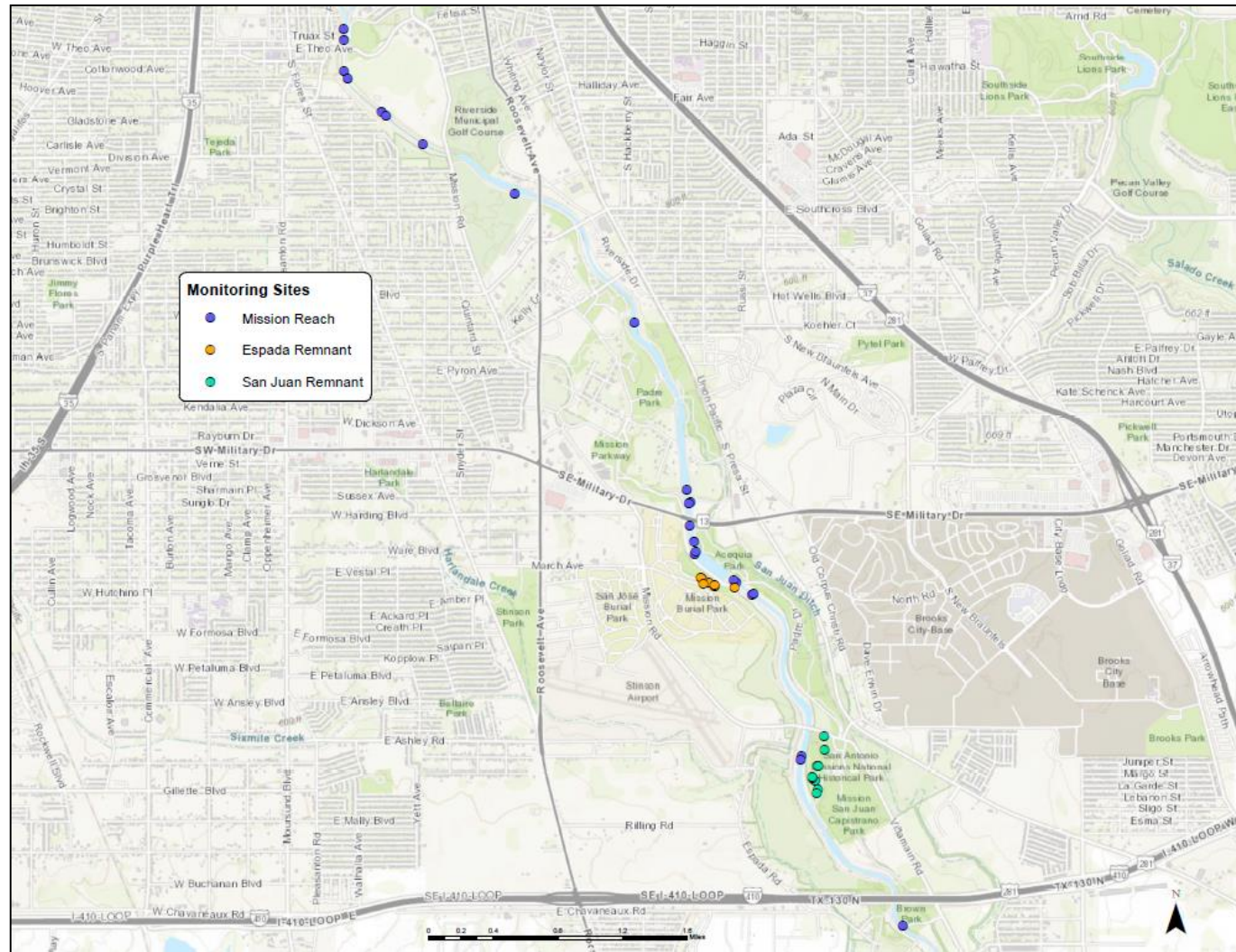
San Juan Remnant Mussels

- Remnant channel (Espada & San Juan) HMP surveys yielded 68 mussels representing 4 species
- 14 sites surveyed from 8/4/2016 – 5/7/2018
- Wadeable only



Summary

- Catch Per Unit Effort (CPUE)
 - Mission Reach = 0.05
 - Espada Remnant = 5.51
 - San Juan Remnant = 0.81



MRMS Study

- Suitable habitat?
 - Water quality
 - Water quantity
 - Host fish
 - Substrate availability
- Natural recolonization?



Otilla Dam, Bexar County



MRMS Study

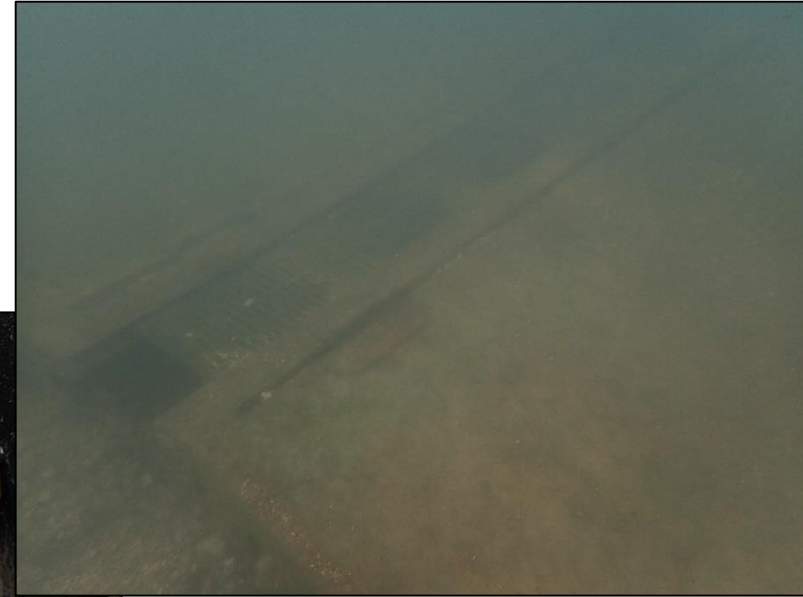


- Implemented 8/14/2017
- Three MR sites, one downstream (Goliad) control site
- Three gear types
- Survival and growth rates



Golden Orb – *Cyclonaias aurea*

MRMS Study



**Mussel Bunker – Exposure
to water quality
Issues due to siltation**



MRMS Study



SAR Downstream Padre Rd, Mission Reach

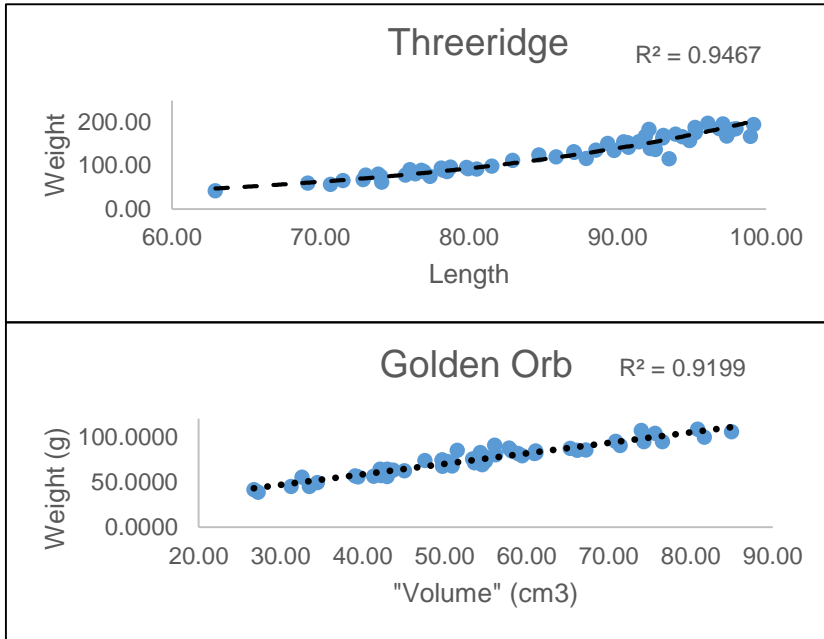


SAR at SH 239, north of Goliad (Control)

Mussel Cage – Exposure to water and sediment quality, no immigration or predation



Preliminary MRMS Data



Length-weight relationship at time of capture

	Mitchell	Davis Lake*	Padre Rd	SH 239 (Control)**
Length	0.29	NA	3.90	NA
Weight	4.42	NA	18.64	NA
Volume	3.24	NA	30.68	NA
BCI	0.044	NA	0.177	NA
IGR	0.002	NA	0.0361	NA

Growth metrics as of November 2018

*Site abandoned in August 2018 due to sedimentation

**No data collected after May 2018 due to flows



FW Mussel Propagation & Production (MP3) Objectives

USFWS will:

- Develop propagation methodology for four species
- Assist w/development of basin wide genetic management plan
- Produce individuals for re-introduction in Mission Reach*

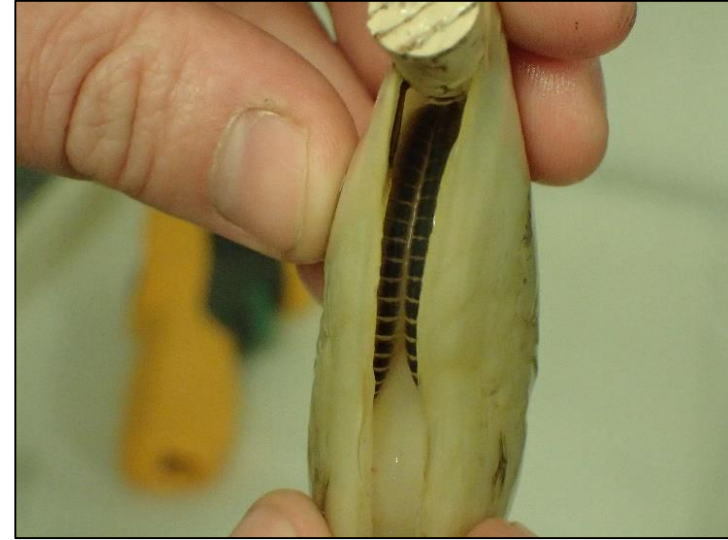


Species in MRMS and MP3 Projects



Task Order I Deliverables

- USFWS will produce/deliver:
 - 1) Juveniles to be used as part of the River Authority's MRMS study
 - 2) Size at stocking guidelines
 - 3) Quarterly written reports
 - 4) Current Biosecurity Plan and any future amendments for all USFWS hatcheries/facilities to be involved in project



Gravid Yellow Sandshell
Lampsilis teres



Future Work

- HMP:
 - One day of qualitative sampling on SAR, qualitative on Medina River and Salado Creek; basin-wide quantitative work
- MRMS:
 - Quarterly monitoring for two additional years
- MP3:
 - Explore methodology for first two years; production of individuals for reintroduction contingent upon data from MRMS study



Questions?

