
Water Supply

Discussion - Demands

Inflows/Pass-Thru Requirements

of Agreed Order



Council Presentation
August 30, 2016



Today's Presentation

- **Alternative Demand Projection**
 - Kristi Shaw (HDR)
- **Fresh Water Inflows**
 - Ray Allen (Coastal Bend Bays and Estuaries Program - CBBEP)
- **Agreed Order Pass-Thru Requirements**
 - Rocky Freund (Nueces River Authority - NRA)



Discover, Discuss, Decide





Presentation Schedule

Date	Topic
May 10, 2016	Discovery – Texas Water Planning
July 19, 2016	Discovery – Demands
August 30, 2016	Discussion – Demands Discovery – Agreed Order
September 27, 2016	Discovery – Current Supplies (and Model Updates) Discovery – Future Supplies* Discovery and Discussion – RFI Approach
October/ November 2016	Discovery - Future Supplies
Nov / Dec 2016	Decide – Adopt Water Management Plan

*** Studied by Region N**

Water Supply

Discussion:

Alternative Demand Projections

Kristi Shaw, P.E., HDR

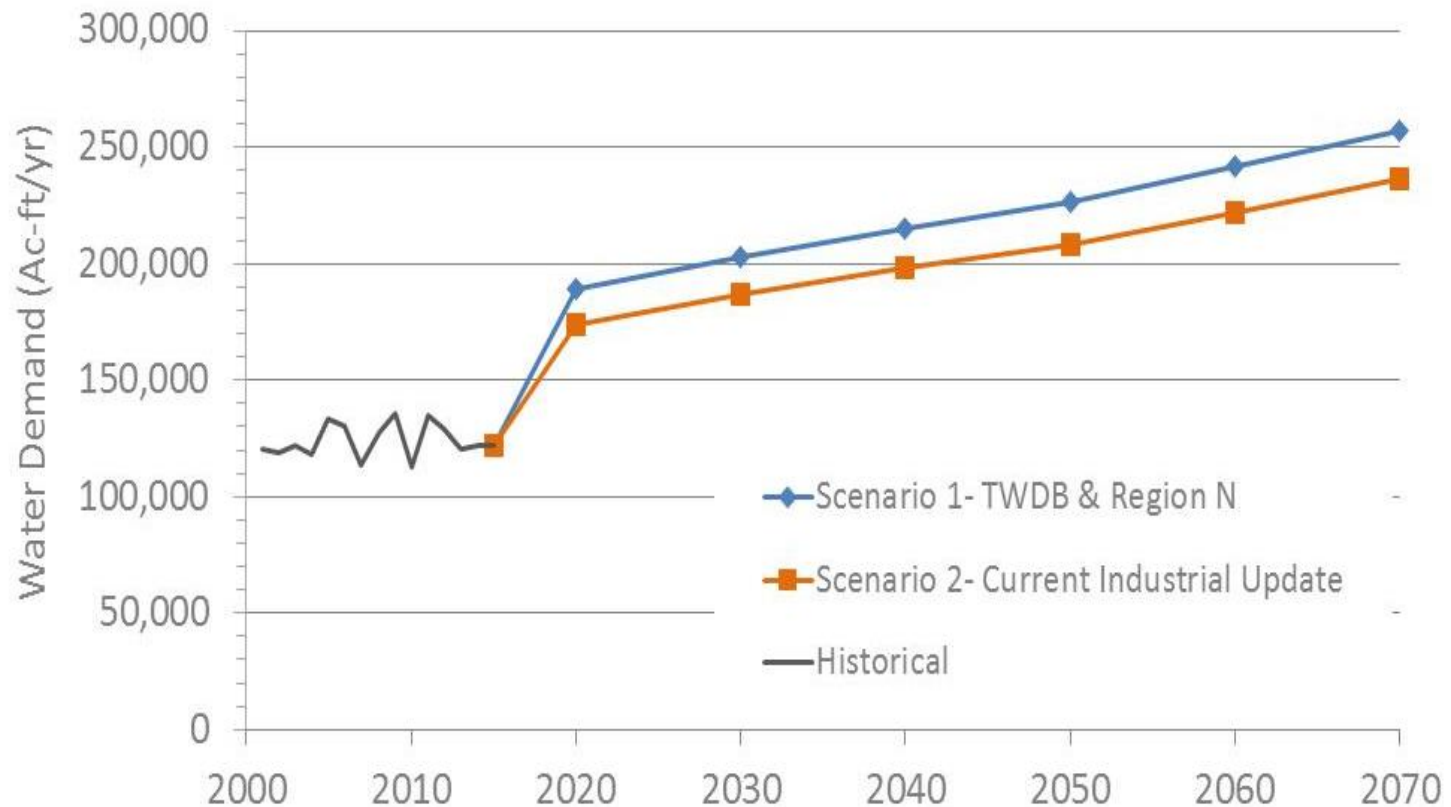


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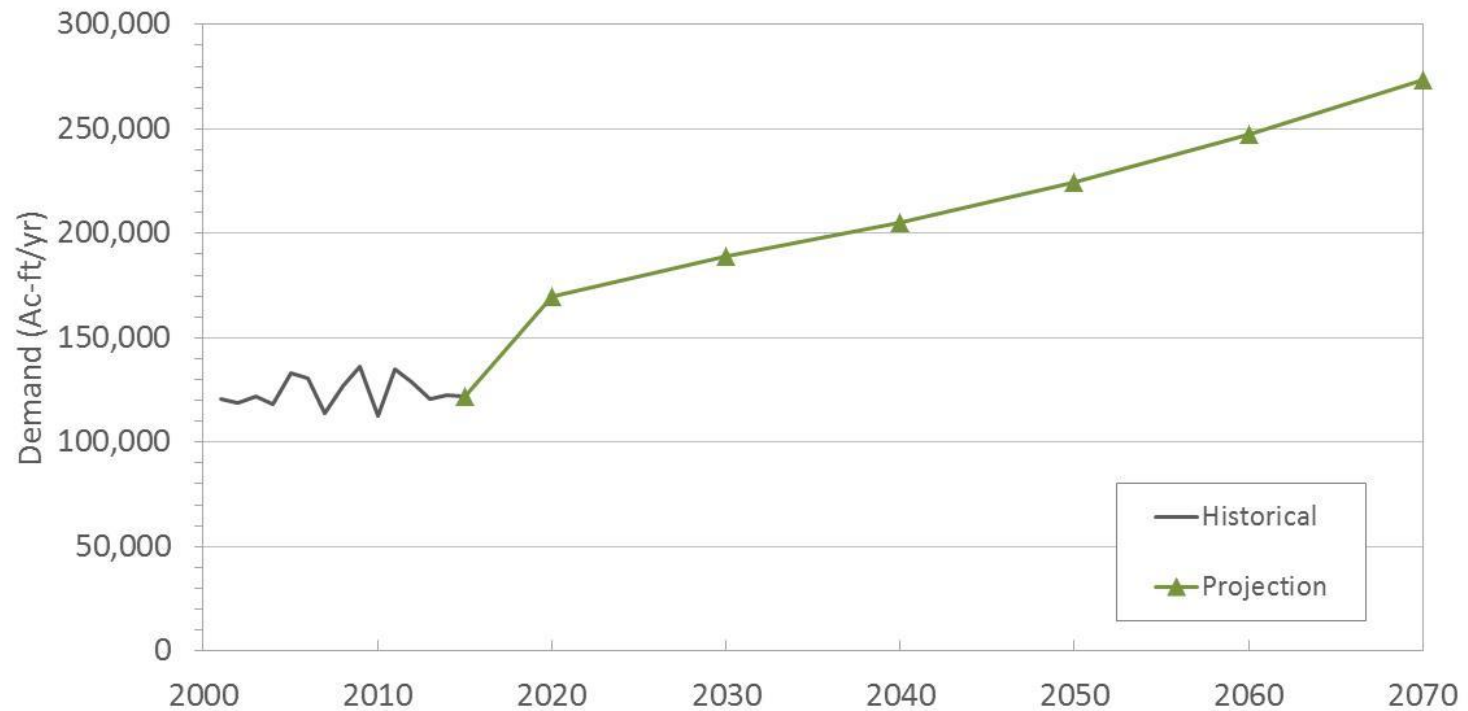


Summary- Range of Water Demands (Previously Presented July 19th)



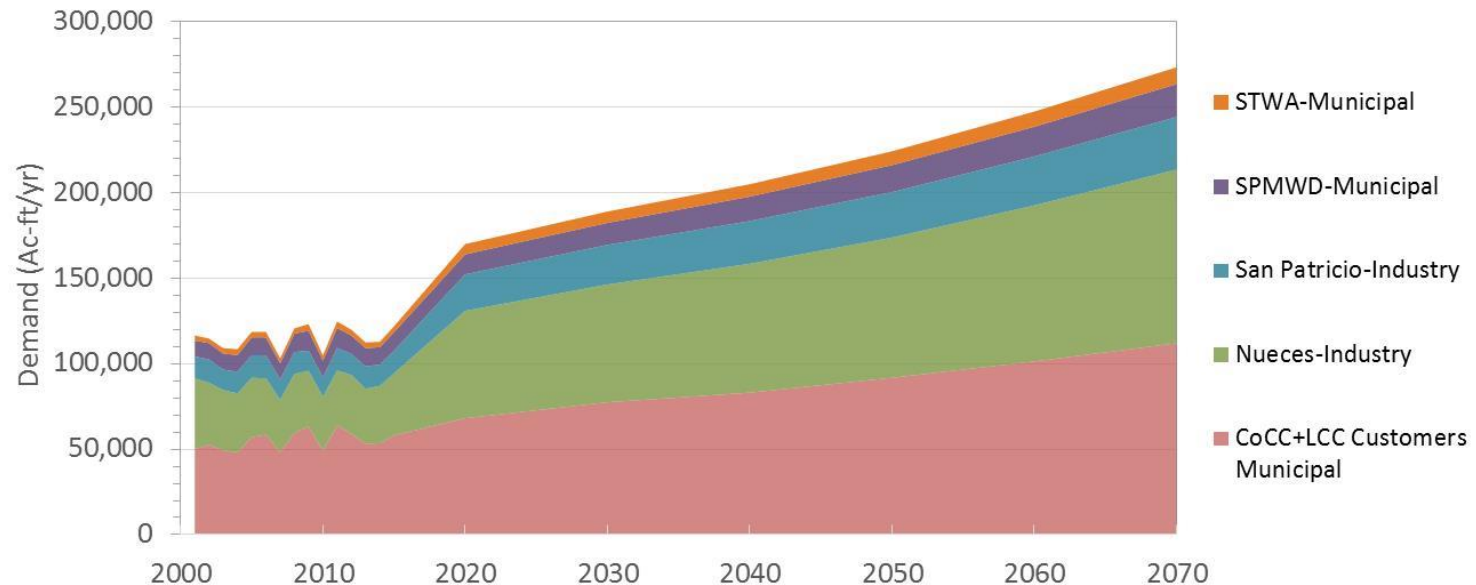


Council-Requested Alternative Based on Dr. Lee Studies Scenario 3- (New)



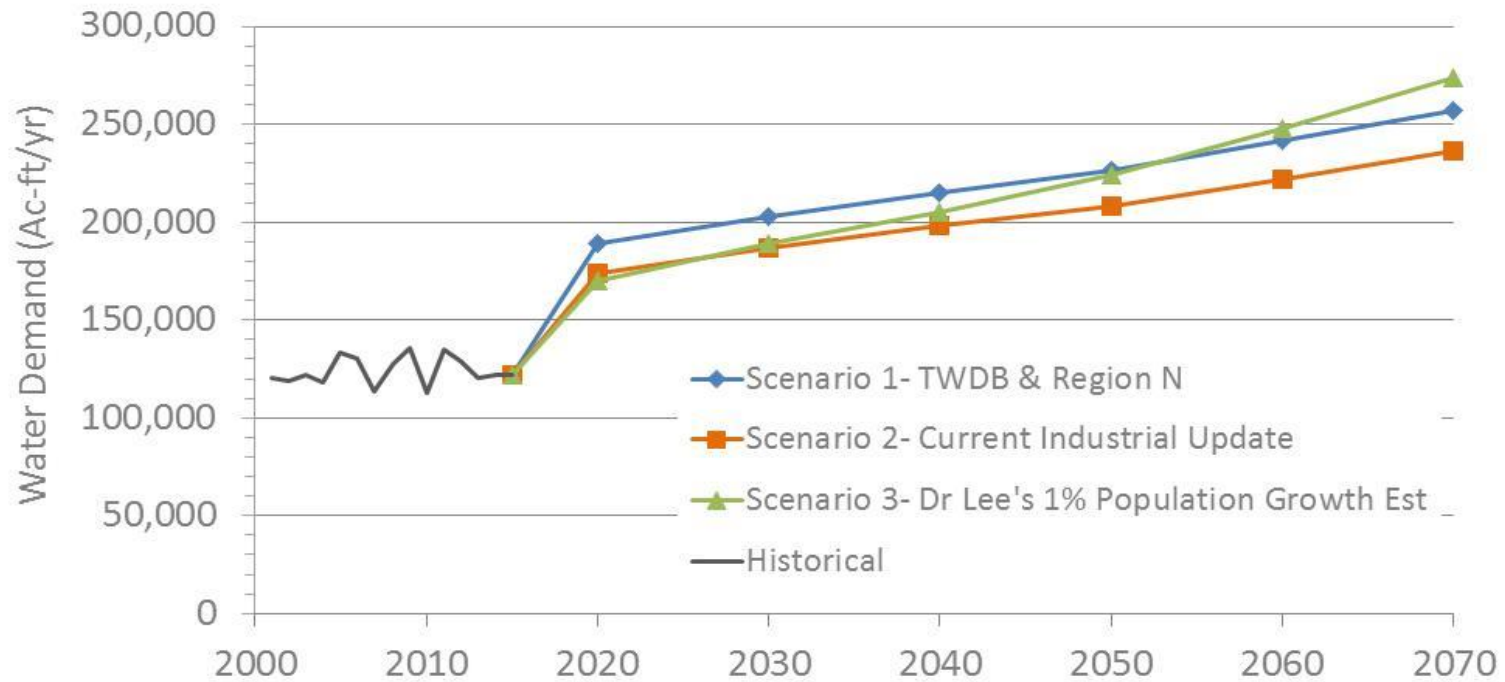


Council-Requested Alternative Based on Dr. Lee Studies Scenario 3- (New)





Summary- Range of Water Demands





Key Entities

- **USBR** (US Bureau of Reclamation) – provided funding for and built Choke Canyon Reservoir (CCR)
 - **TCEQ** (Texas Commission on Environmental Quality) – Party to permit and agreed order
 - **City** (Corpus Christi) – Took operational responsibilities for CCR from USBR
 - **NRA** (Nueces River Authority) – Third party, independent pass-thru compliance assistance
 - **NEAC** (Nueces Estuary Advisory Council) – Monitor pass-thru implementation and make recommendations
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Who is NEAC?

- **Established by 1992 Interim Agreed Order**
 - **Continues through present**
 - **Composed of State agency staff, Port of Corpus Christi, Non Governmental Organizations (NGOs), industry, private citizens, university staff, CBBEP, customers, NRA, and representatives of parties to agreed order, including the City**
 - **Ray Allen, Rocky Freund and Bill Green are members**
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Water Rights Permit - 1976

- Required for authorization of Choke Canyon Reservoir
- To appropriate waters of the state in the Nueces River Basin
- In order to protect the bays and estuaries, the State of Texas preserved inflows to the bay (151,000 AF– Special Condition 5b.)



Since the 1976 Water Rights Permit

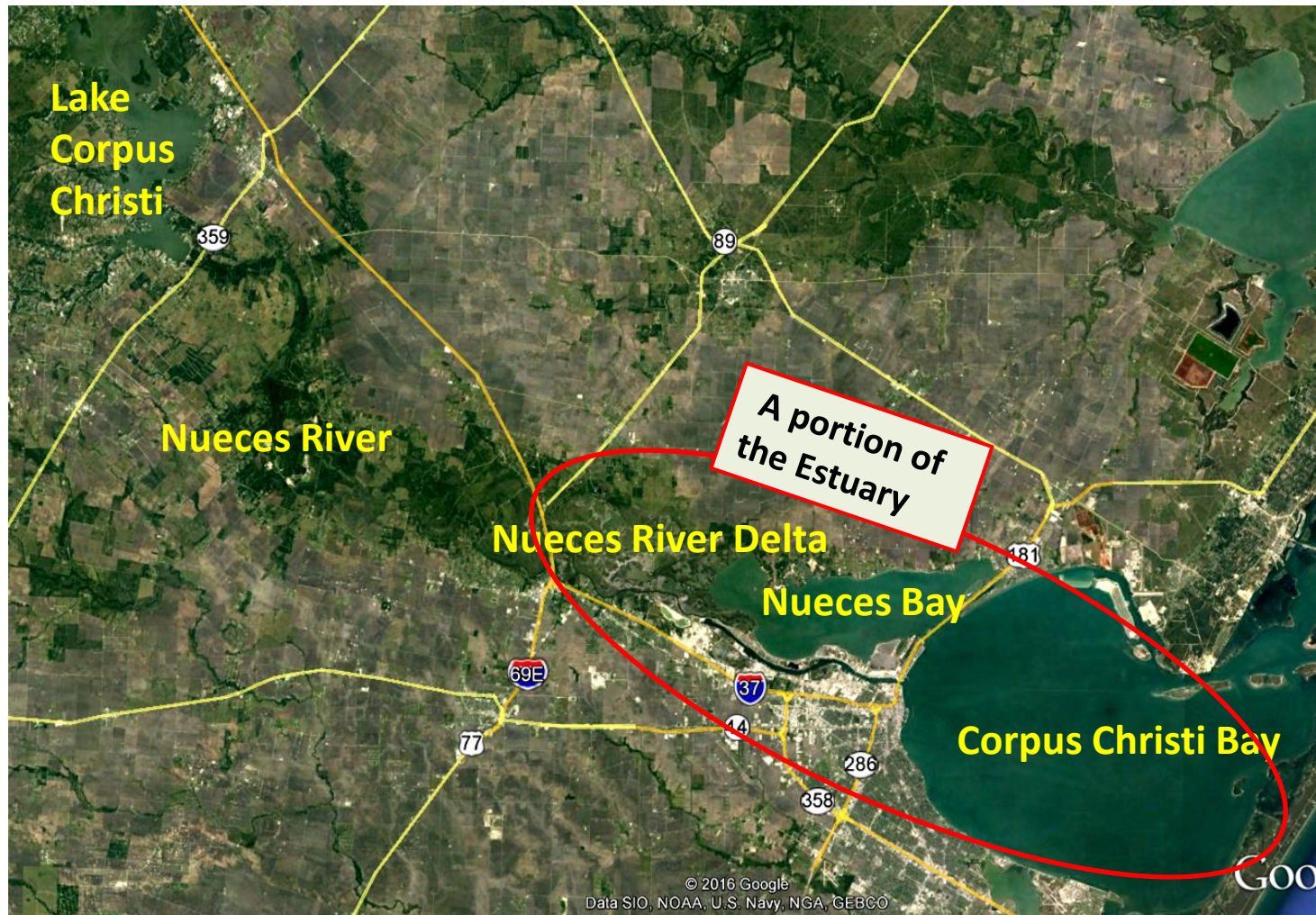
Year	Item	Significance
1990	First Order	Technical Advisory Committee
1992	Agreed Order	Nueces Estuary Advisory Council created, salinity credits
1995	Agreed Order	Changed from 'mandatory releases' to 'passage of inflows', Drought Contingency Plan
2001	Agreed Order	Opened overflow channel, Rincon Bayou pipeline, adaptive management
2007	Senate Bill 3	Required state agencies to address environmental flows of streams and bays

Freshwater Inflows - History, Benefits, and Science

**Ray Allen
Executive Director
Coastal Bend Bays & Estuaries Program**



Nueces River & Estuary



History of the Reservoirs

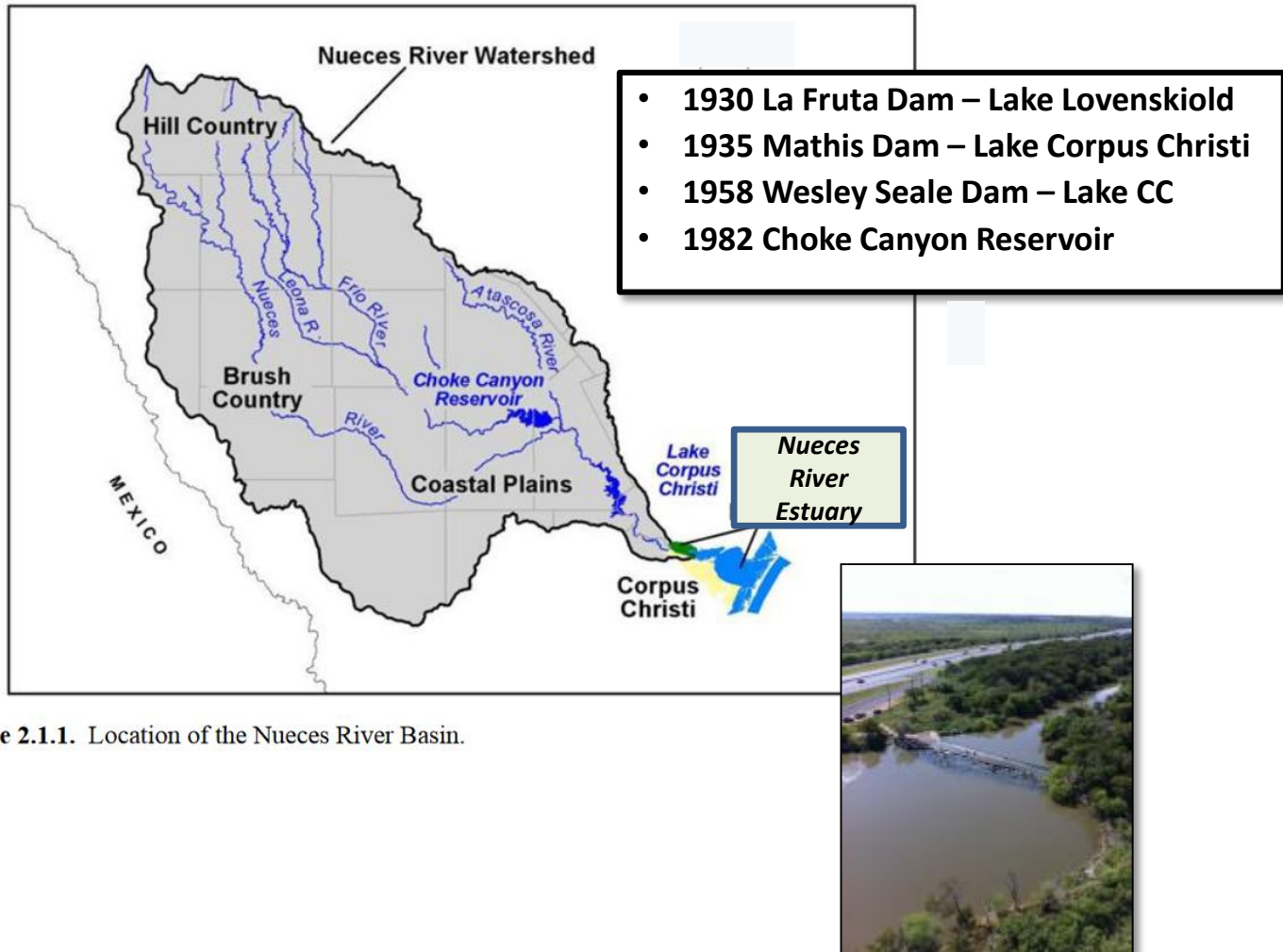
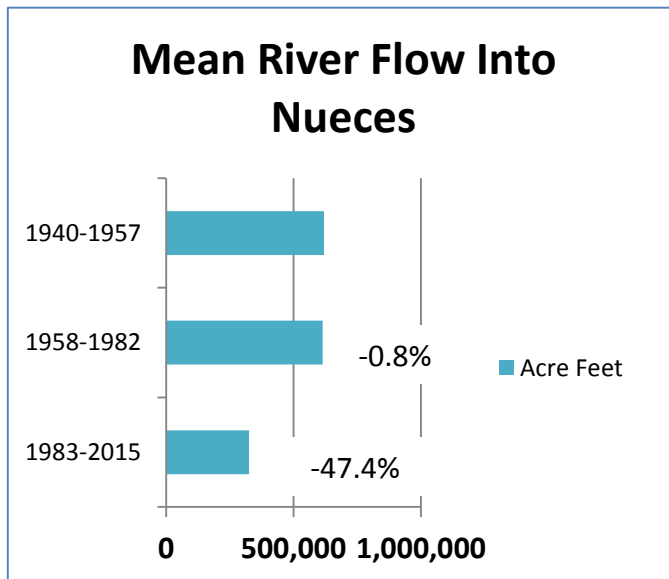


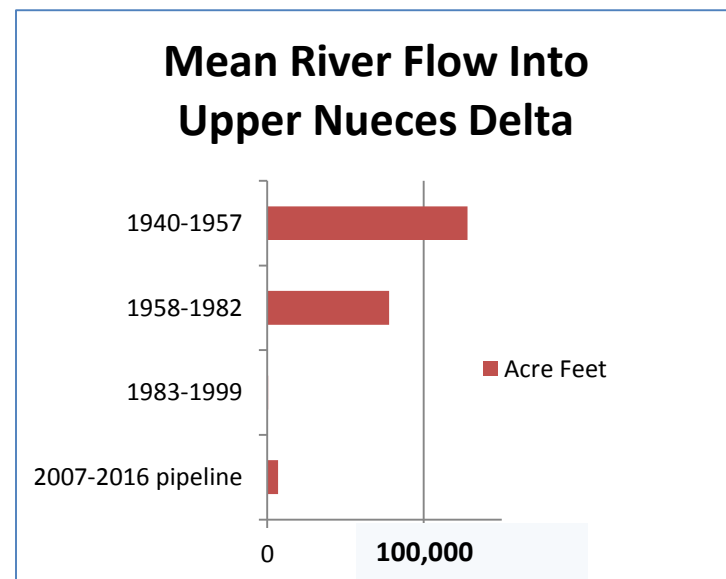
Figure 2.1.1. Location of the Nueces River Basin.

Changes in Freshwater Inflows

- Freshwater inflows have been reduced by **47%** into Nueces Estuary, and by **94%** in the Upper Nueces Delta



*Data not available for 1997 - 2000



*2007-2016 Rincon pipeline flows only, does not include natural overbanking from floods.

Benefits of Freshwater Inflows

Healthy Bays - Healthy Economy - Quality of Life



- **Nature Tourism***
 - 47% of visitors are nature based
 - \$674 million in visitor destination spending
 - \$987 million total economic impact
- **Commercial and Recreational Fisheries**
- **Quality of Life for people who live and play here**

***The Economic Significance of Tourism and Nature Tourism in Corpus Christi, Dr. Jim Lee, TAMUCC, 2014.**

Science: Environmental Flows

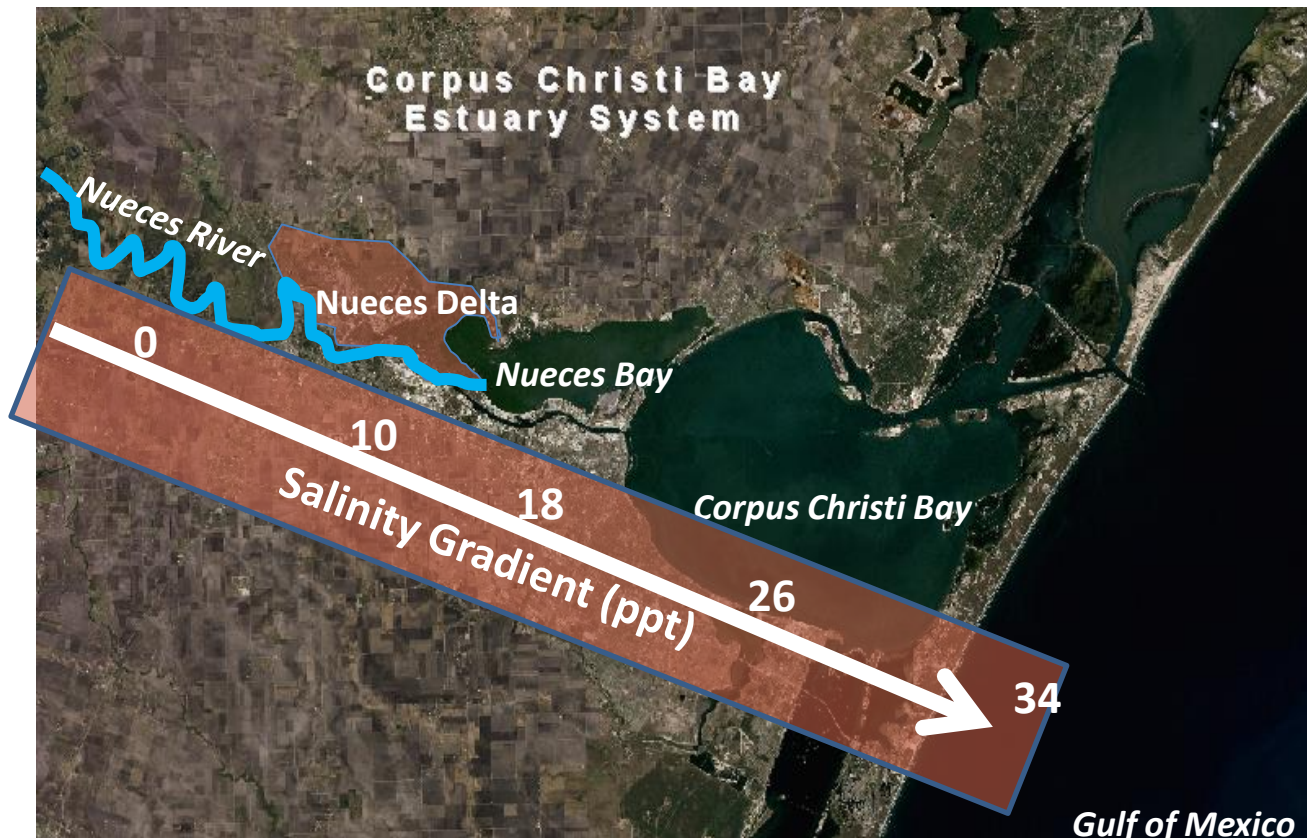
“A schedule of flow quantities that reflects seasonal and yearly fluctuations that typically would vary geographically, by specific location in a watershed, and that are shown to be adequate to support a sound ecological environment and to maintain the productivity, extent, and persistence of key aquatic habitats in and along the affected water bodies.”

Science: Sound Ecological Environment

- **Sustains the full complement of native species in perpetuity;**
- **Sustains key habitat features required by these species;**
- **Retains key features of the natural flow regime required by these species to complete their life cycles; and**
- **Sustains key ecosystem processes and services, such as elemental cycling and the productivity of important plant and animal populations.**

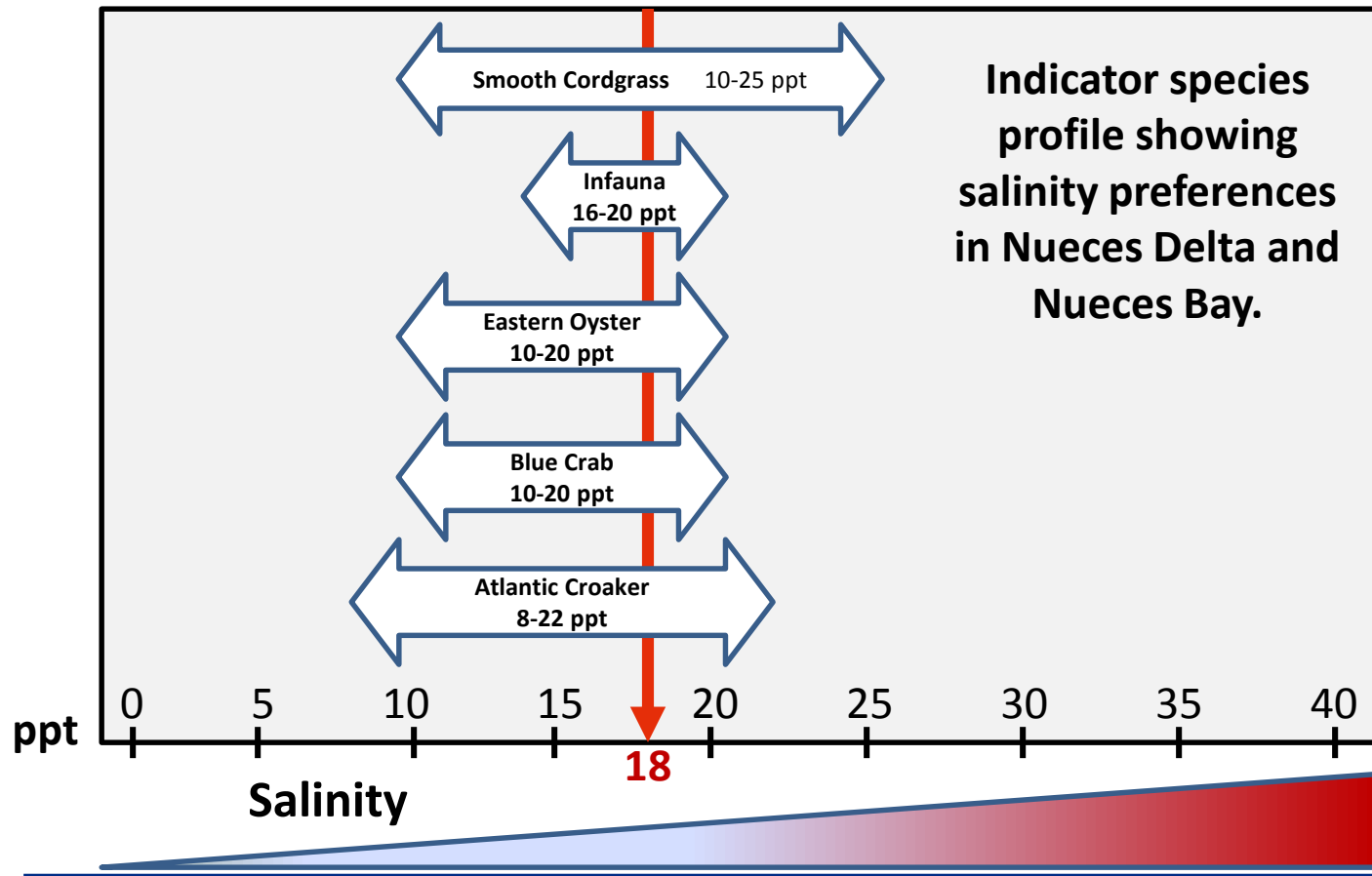
What Exactly do Freshwater Inflows do in the Nueces Estuary?

Create environmental conditions that sustain biological productivity.



Why is Salinity Important?

- Species prefer different salinities
- Benefits are seen throughout the food chain



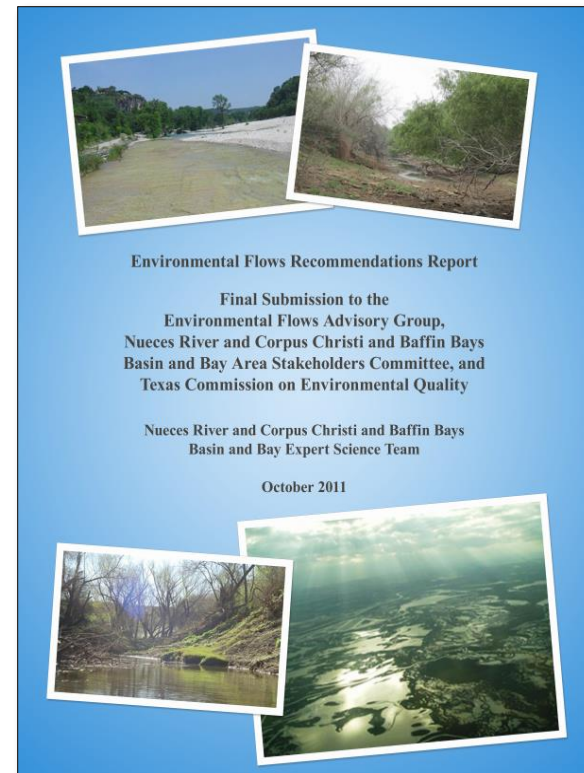
Science: Senate Bill 3 Process

- **Nueces Basin & Bay Expert Science Team (BBEST)**

Historical and scientific review of estuary. Only estuary along Texas coast to not meet the definition of a Sound Ecological Environment.

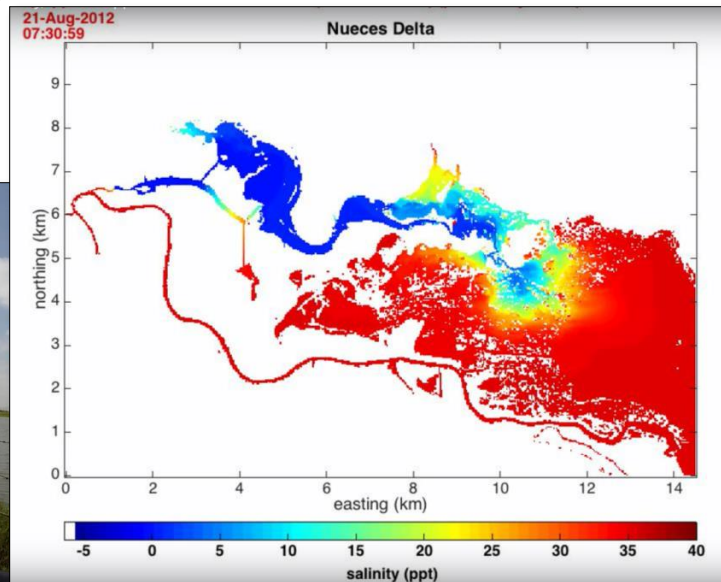
- **Nueces Basin & Bay Area Stakeholder Committee (BBASC)**

Representing agriculture, recreation, municipalities, industrial water users, commercial fishing, public interests, regional water planning, etc.



Studies and Research Since Choke

- Salinity, tide, meteorological data collection
- Studies to evaluate the monthly targets
- Studies on the effectiveness of Rincon Bayou pipeline
 - *Hydrodynamic modeling*
 - *Biological response*



Key Points

- **A healthy Nueces Estuary requires freshwater inflows.**
- **In Texas, other reservoir systems have pass-thru or release requirements (e.g. Lake Texana).**
- **Nueces BBEST Finding: Nueces Bay was not a sound ecological environment.**
- **Required inflow studies have been completed and are ongoing.**



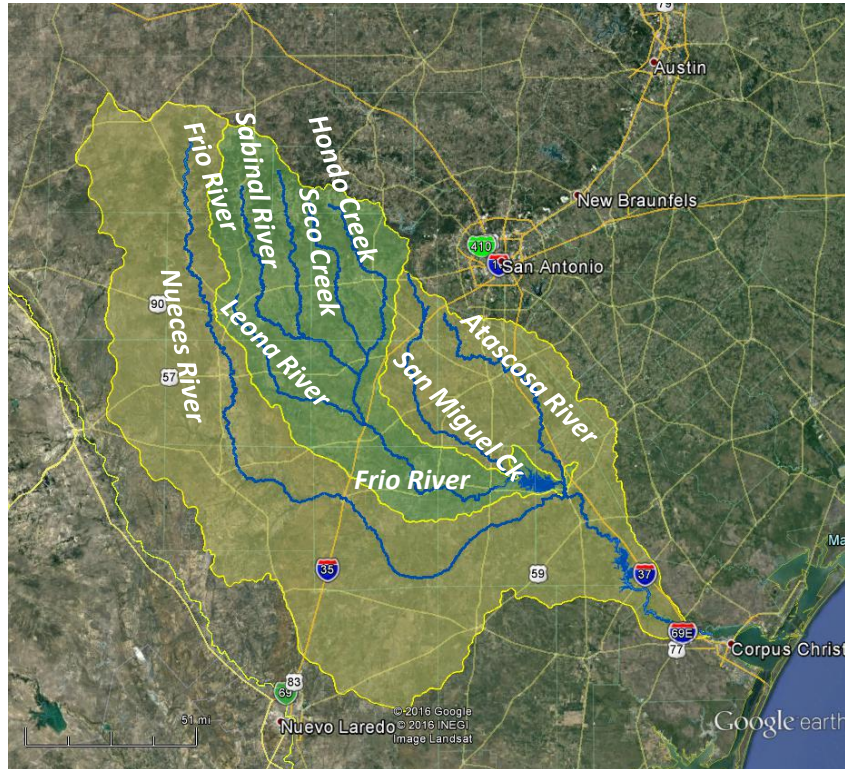
Pass-Thru Requirements of the Agreed Order

Rocky Freund
Deputy Executive Director
Nueces River Authority



Nueces River Authority

Watersheds



- Reservoirs operated as a system to maximize water supply
- Lake Corpus Christi – larger watershed, more likely to fill
- Choke Canyon Reservoir - cooler, deeper reservoir – better storage
- Pass-thru requirements released from Lake Corpus Christi

What is Pass-Thru Requirement?

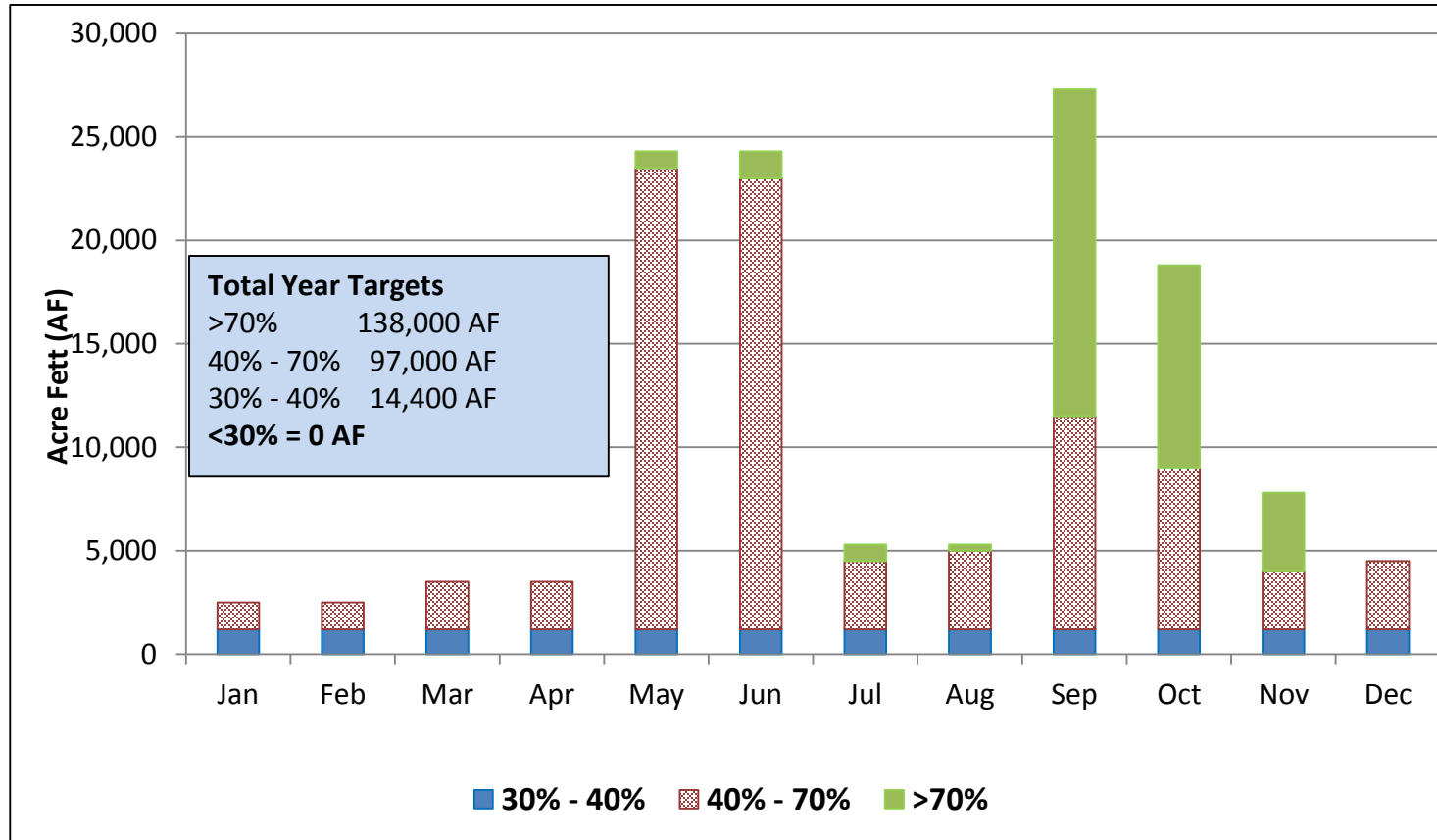
- Measured inflow into the Choke Canyon / Lake Corpus Christi Reservoir System, UP to a *target* amount, is required to be passed through to the bays and estuaries.
- *Target*, in the sense, is the maximum requirement under the agreed order.
- Thus, no release from storage is ever required to meet the *target*.



What Determines Target Amount?

- **Varies by current reservoir system storage
(% of total capacity)**
 - **Varies by month (based on historic flow patterns)**
 - **Salinity relief credit reduces target amount**
-

Annual Total Targets



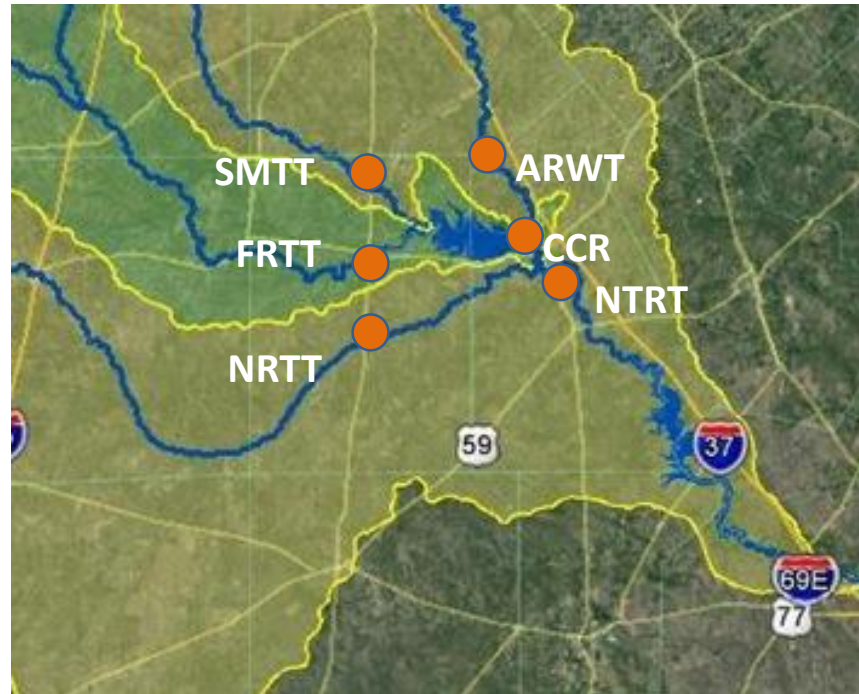
How is the inflow into Reservoir System Measured?

Two computations:

(1) $\text{Inflow} = (\text{NTRT} + \text{FRIT} + \text{SMIT}) - \text{CCR}$

But if sum < 0, then
alternate calculation

(2) $\text{Inflow} = \text{NRTT} + \text{FRIT} + \text{SMIT} + \text{ARWT}$



*(NTRT includes flows from NRTT, ARWT and CCR)

Frequently Asked Questions

How does local rainfall affect pass-thru?

- Any measured inflow into Nueces Bay, whether over the salt water dam at Labonte Park or through Rincon pipeline, counts toward pass-thru.

Does city get credit for surplus inflows?

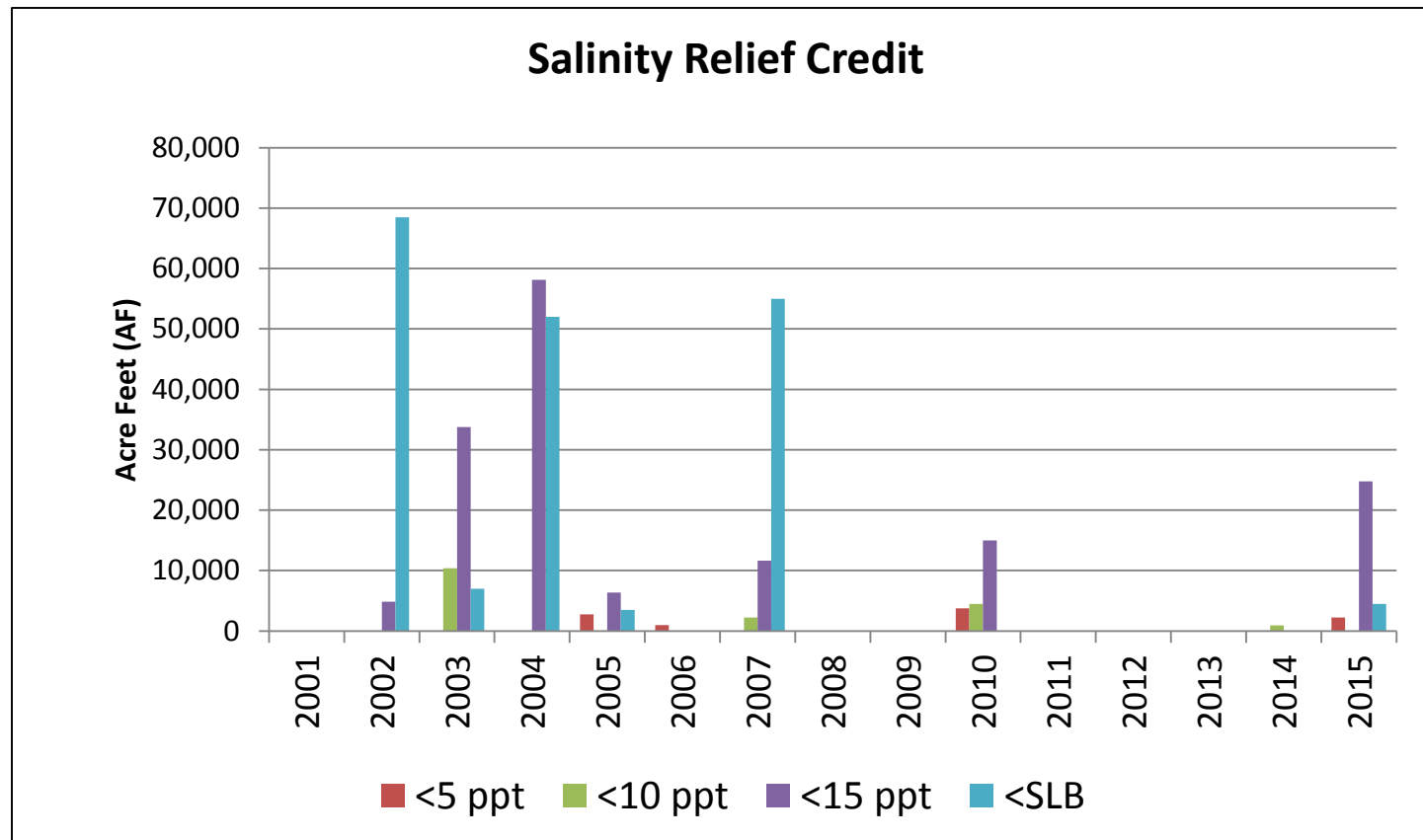
- Yes, surplus inflow, into Nueces Bay & Delta, over required pass-thru can be carried forward to next month but only up to one-half of monthly target.
 - City also receives a 500 AF return flow credit every month that counts toward the pass-thru.
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How do salinity levels in Nueces Bay affect the Target Amount?

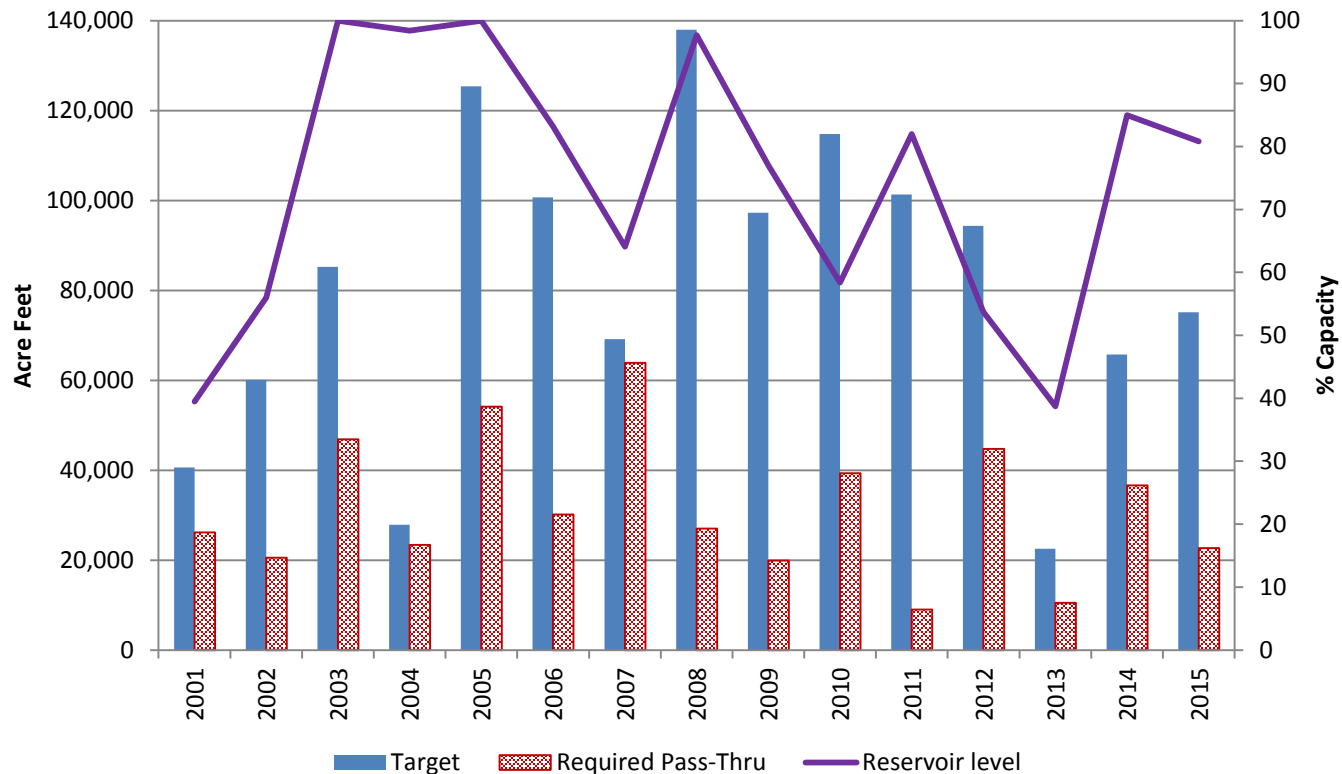
- If the salinity levels at the official monitoring site meets specific criteria, which varies by month, then a salinity relief credit can reduce the target amount.
- Examples:
 - In July 2016, the average salinity for 10 consecutive days was below 15 ppt, so the target was reduced by 50%.
 - In March 2016, the average salinity for 10 consecutive days was below 25 ppt, so the target was reduced by 25%.

Note: City can use the salinity relief credit OR the surplus in any given month, not both.

Has the City Ever Received Salinity Relief Credits? *YES, 9 out of last 15 yrs.*



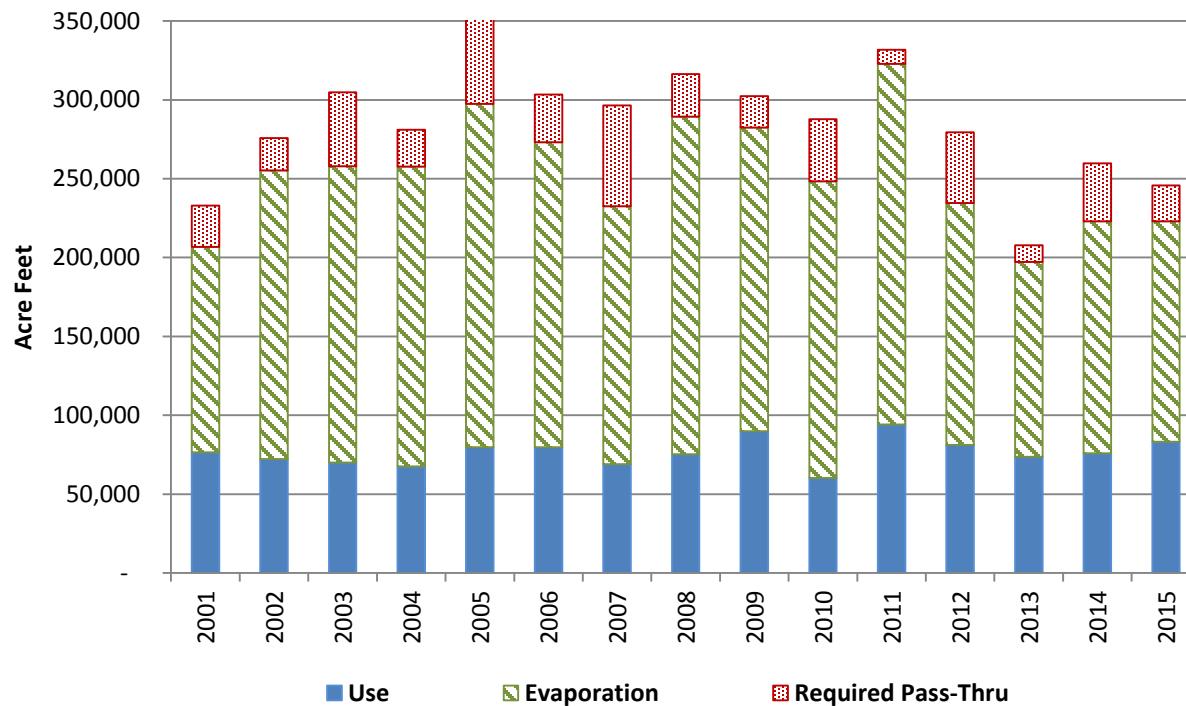
Targets vs Actual Pass-thrus vs Reservoir Levels



Total Water Use*By Year

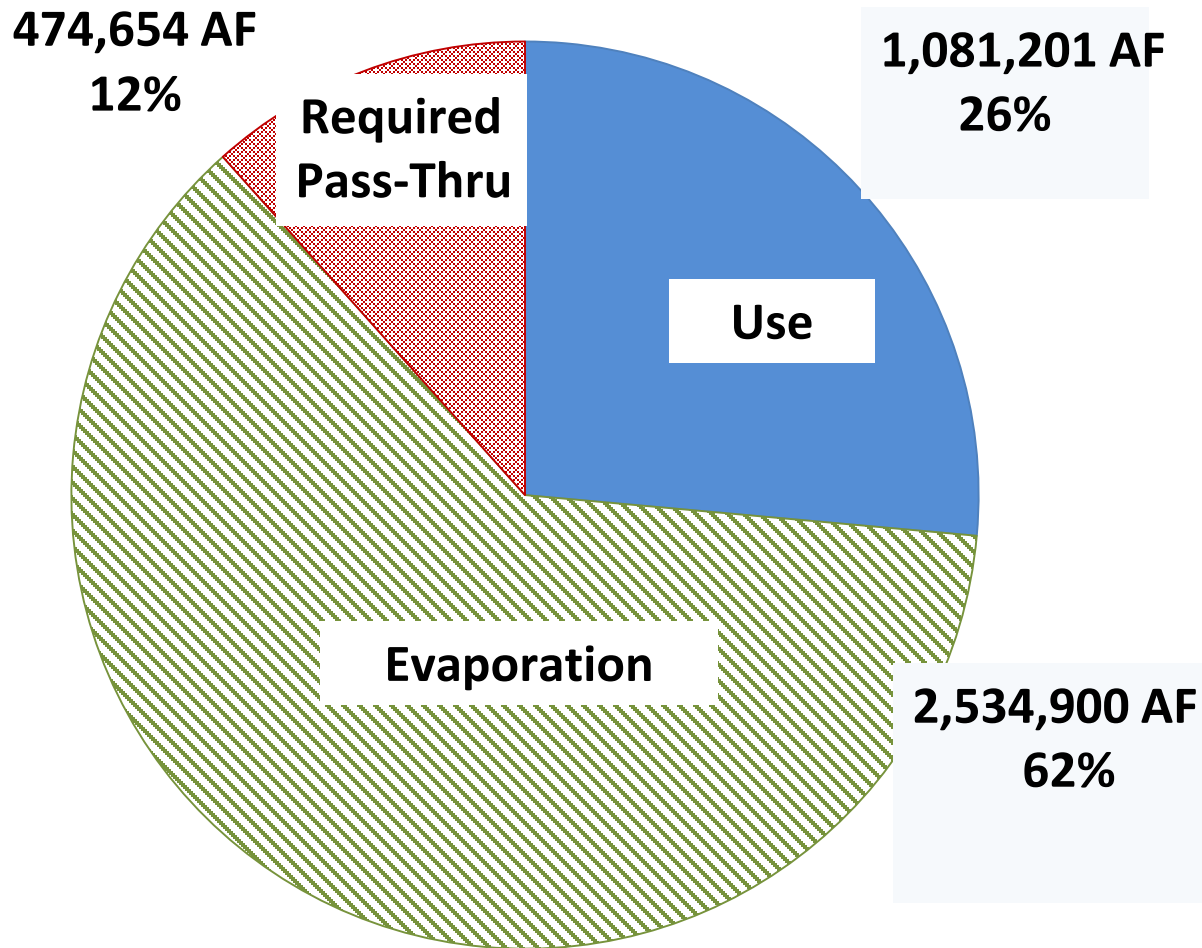
Choke Canyon/Lake CC

Reservoir Systems



****Does not include evaporation from rivers or channel loss between Choke Canyon Reservoir and Lake Corpus Christi.***

Total Water Use*: 2001-2015



** Does not include evaporation from rivers or channel loss*

Example Report

Daily Reservoir System and Pass-Thru Status Report August 22, 2016

Proposed Water Supply Index		
Value	Stage #	Stage Name
Under Review		

Reservoir Supply (AcFt); Stream Flow (AcFt); Evaporation (AcFt); Elevation (Ft); Rainfall (Inches); Temperature (°F)

RESERVOIR STATISTICS											
	Choke Canyon Reservoir			Lake Corpus Christi			CCR/LCC Combined		Lake Texana		
Date	Elevation	Volume	% Capacity	Elevation	Volume	% Capacity	Volume	% Capacity	Elevation	Volume	% Capacity
FULL	220.5	695,271	100%	94.0	257,260	100%	952,531	100%	44.0	161,085	100%
08/22/2016	199.2	263,398	37.9%	88.7	166,517	64.7%	429,915	45.1%	44.2	163,121	101.3%
08/21/2016	198.4	252,149	36.3%	88.6	164,283	63.9%	416,432	43.7%	44.2	163,121	101.3%
07/22/2016	198.4	251,860	36.2%	88.6	164,920	64.1%	416,780	43.8%	43.0	151,919	94.3%
08/22/2015	199.0	261,031	37.5%	92.8	236,337	91.9%	497,368	52.2%	42.6	148,332	92.1%

LAKE TEXANA WATER SUPPLY*									COLORADO WATER SUPPLY		
Date	Daily Intake	MTD	Non-Interruptible			Interruptible			Daily Intake	MTD	YTD
			July	YTD	Remaining	July	YTD	Remaining			
08/21/2016	138	2,881	3,956	27,026	14,814	0	0	12,000	0	0	0

WEATHER RELATED INFORMATION								
	Choke Canyon Reservoir			Lake Corpus Christi			CCR/LCC Combined	
	08/21/2016	MTD	YTD	08/21/2016	MTD	YTD	MTD	YTD
Air Temp	83			89				
Evaporation	147	5,809	49,799	298	5,769	56,264	11,578	106,063
Rainfall	0.63	7.55	24.36	0.88	5.83	15.85		

Example: Stream Flows

Stream Flows			
Gauging Station		08/21/2016	MTD
NTRT	Nueces River at Three Rivers, Texas	1,985	10,312
NRTT	Nueces River at Tilden, Texas	1,788	8,372
FRTT	Frio River at Tilden, Texas	1,792	2,109
SMTT	San Miguel Creek at Tilden, Texas	4,625	6,213
ARWT	Atascosa River at Whitsett, Texas	615	1,541
CCR	Release from Choke Canyon Reservoir	58	1,209
NRMT	Nueces River at Mathis, Texas (La Fruta Bridge)	359	5,653
NCAT	Nueces River at Calallen, Texas	0	35
RBP	Rincon Bayou Pipeline	195	1,791
CRWT	Colorado River at Wharton, Texas	13,319	75,797
Reservoir InFlow			
Computed as:	(NTRT+FRTT+SMTT)-Release from Choke Canyon	8,345	17,425

Example: Inflows & Pass-Thru

ESTUARY INFLOWS AND PASSTHRU REQUIREMENTS					
Target Passthru	Monthly Target	5,000			5,000
	Salinity Relief Credit	0	Effective		
Credit / -Deficit From Previous Month			Date Deficit Satisfied		905
Return Flow Credit			Effective	08/01/2016	500
Required Passthru	Monthly Target	5,000	0		5,000
	Reservoir Inflow	17,425			
Estuary Inflows (NCAT + RBP)					1,826
Passthru Surplus / -Deficit					-1,769

Pass-Thru Requirement equals the lesser of Reservoir Inflow or Monthly Target: 5,000 AF

5,000 – 905 (Surplus from July) = 4,095 AF

4,095 – 500 (Return Flow Credit*) = 3,595 AF

3,595 – 1,826 (Measured Estuary Inflow) = 1,769 AF

remaining to be passed through

*** Note: Deficits from previous months have to be made up before return flow credit can be applied**

TAKEAWAYS

- State of Texas had Water Rights to flow in Nueces River and retained that right with the construction of Choke Canyon.
 - State asserted its Water Rights when agreeing to City's Water Rights for Choke Canyon. The State's water was/is, in essence, used for the pass-thru.
 - Scientific basis for pass-thru and numerous studies
 - Pass-thru requirement has been tweaked, to City's advantage, since original 1976.
 - Robust monitoring system in place
 - Go to <https://www.nueces-ra.org/CP/CITY/passthru/index.php> to see daily, monthly inflows and pass-thru reports.
 - Reservoirs = *our cheapest source of water*
 - Critical in high demand periods when Mary Rhodes not sufficient to meet needs
 - Operate reservoirs paid for by CC water customers to maximize yield for customers with eye to safety of property downstream
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Nueces River Authority

Discussion



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