

A TIMELINE OF

CEDAR BAYOU



Lavaca Bay

Matagorda Bay

MSC Entrance Channel

Pass Cavallo

San Antonio Bay

Copano Bay

Aransas Bay

Cedar Bayou

Nueces Bay

Corpus Christi Bay

Aransas Pass



**HYNES
BAY**

**San Antonio
Bay**

**ESPIRITU
SANTO**

Matagorda Island

Blackjack Peninsula

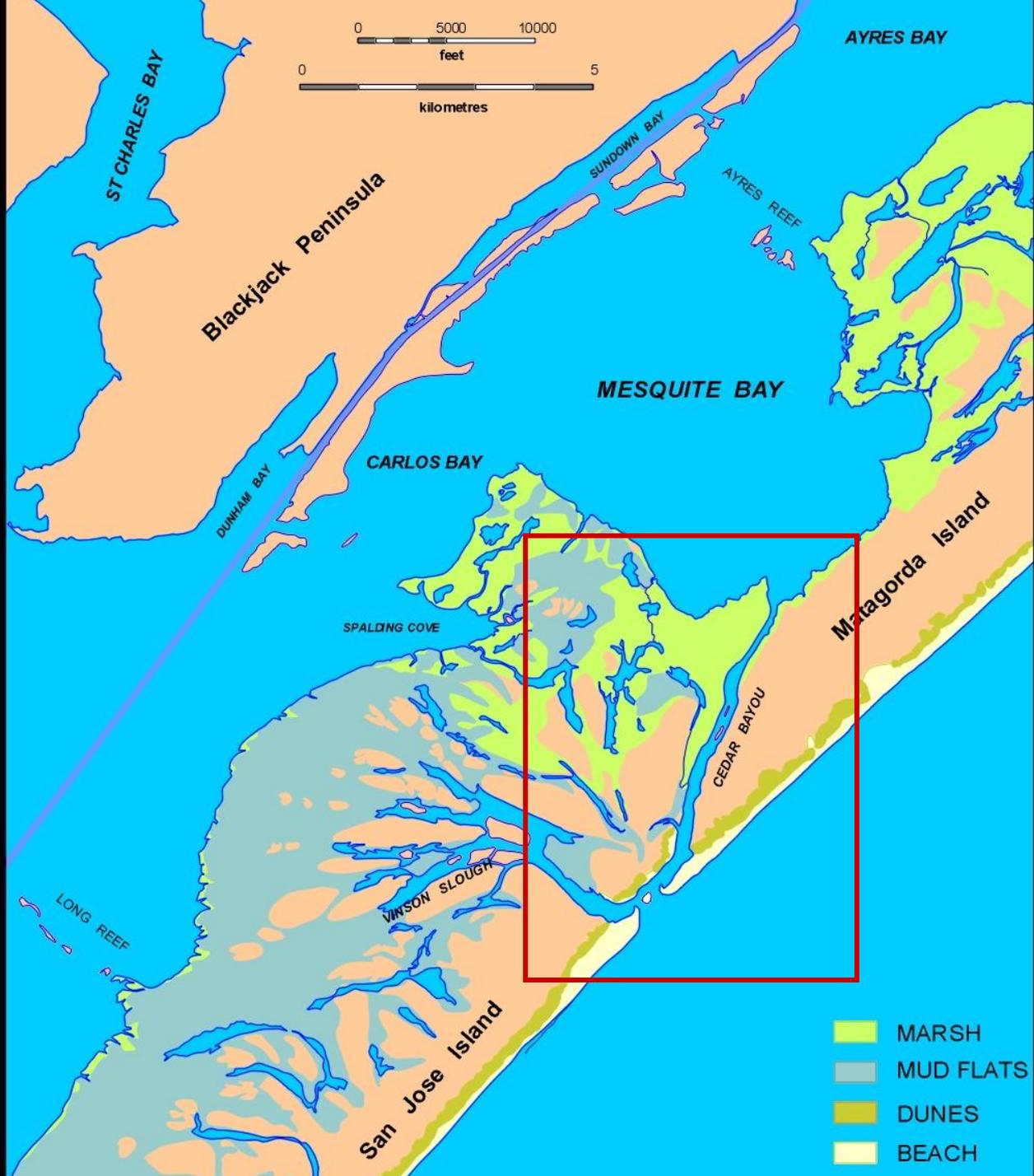
**AYRES
BAY**

**MESQUITE
BAY**

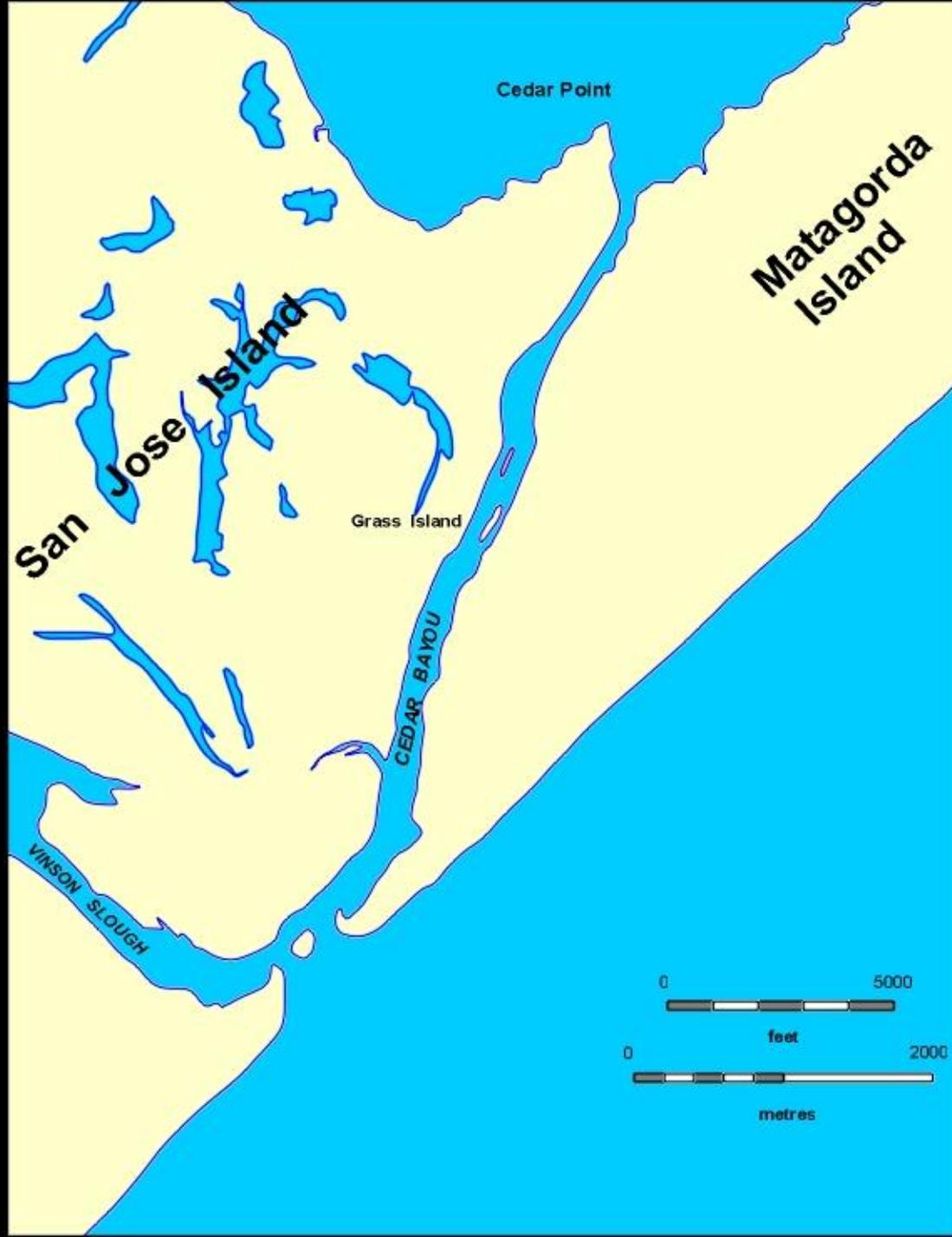
**ARANSAS
BAY**

**CEDAR
BAYOU**

San Jose Island



- MARSH
- MUD FLATS
- DUNES
- BEACH



OBJECTIVES



COMPILE DATA ON THE HISTORICAL STATUS (OPEN OR CLOSED) OF CEDAR BAYOU SINCE CA. 1950 ~ 1900

SOURCES OF INFORMATION



mapped measurements



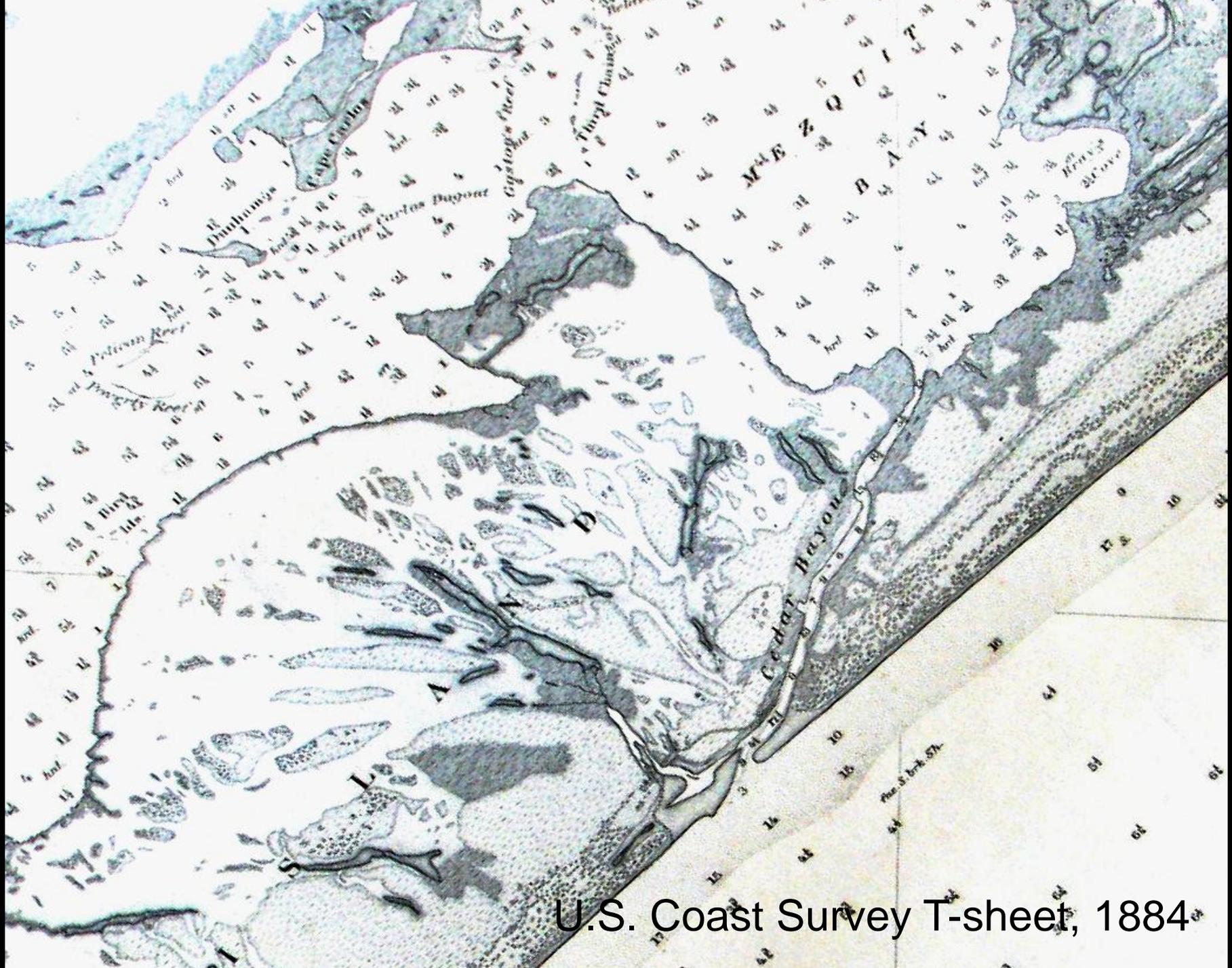
cross-section surveys



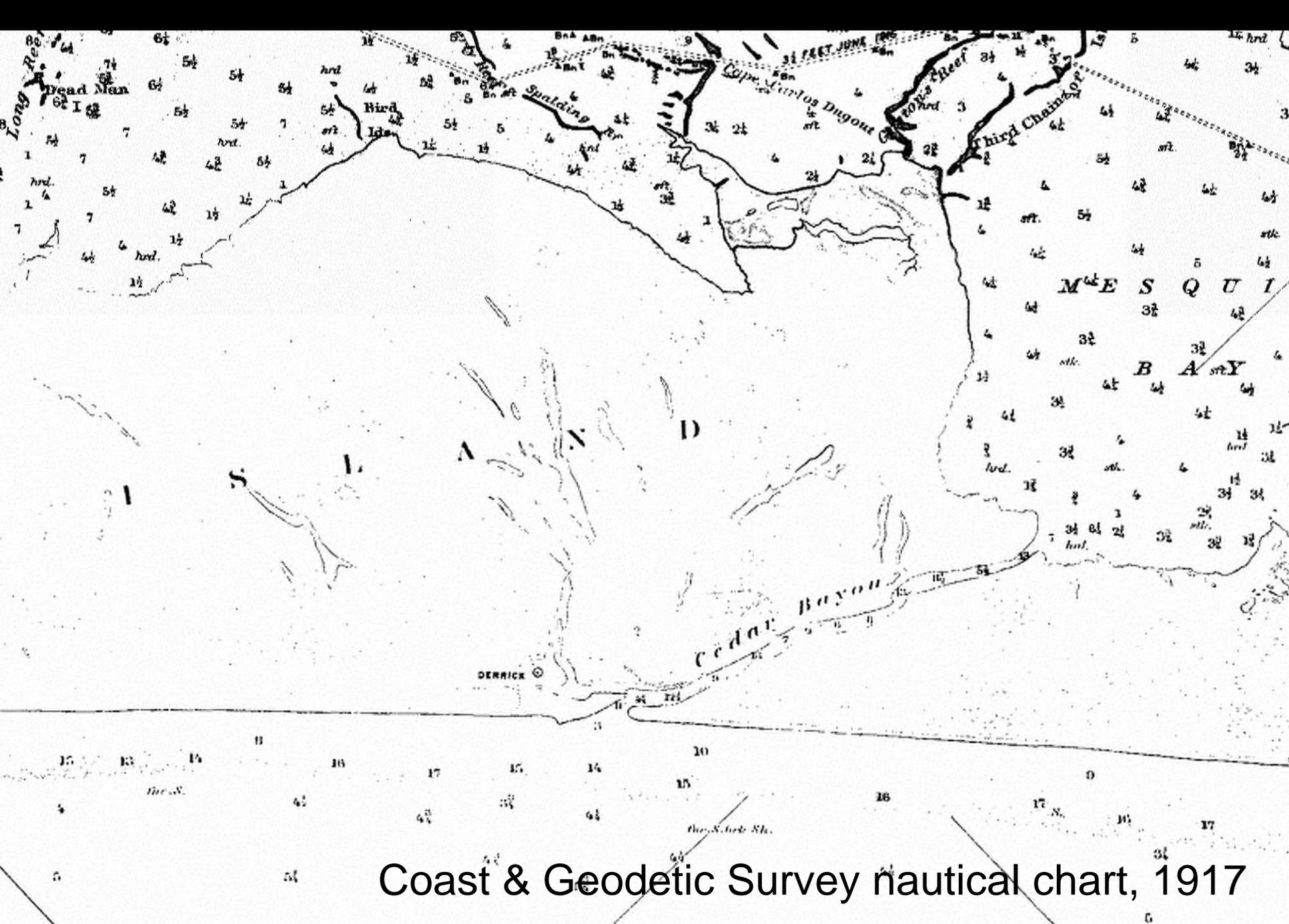
hydrographic or topographic maps



soundings

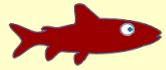


U.S. Coast Survey T-sheet, 1884

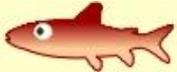


Coast & Geodetic Survey nautical chart, 1917

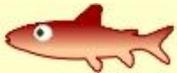
SOURCES OF INFORMATION



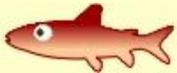
mapped measurements



cross-section surveys



hydrographic or topographic maps



soundings



aerial photography



vertical (surface normal)

NASA Sep 1972



NASAIMSC 210 SEP 72

02-0119

DATA TYPES



WIDTH (no depth)



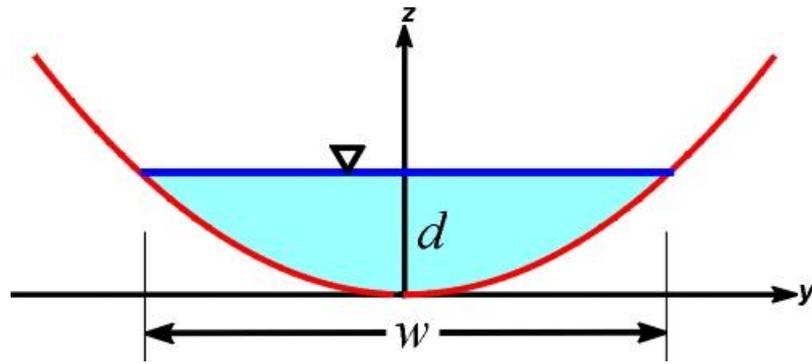
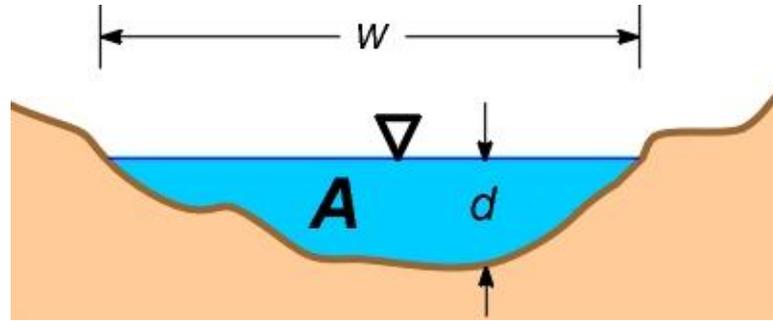
DEPTH (no width)



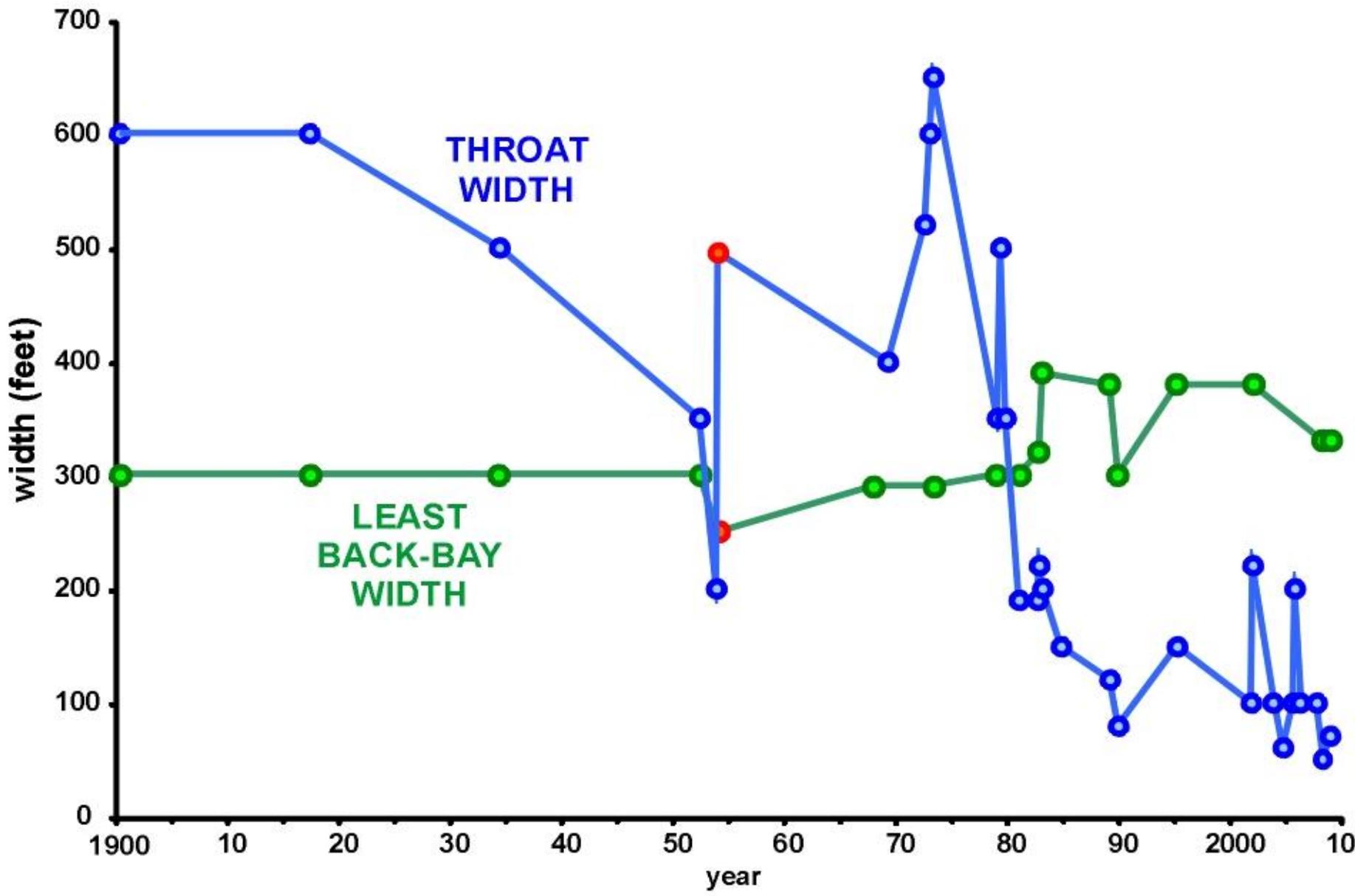
WIDTH & TALWEG DEPTH



SURVEY OF KEY CROSS SECTIONS

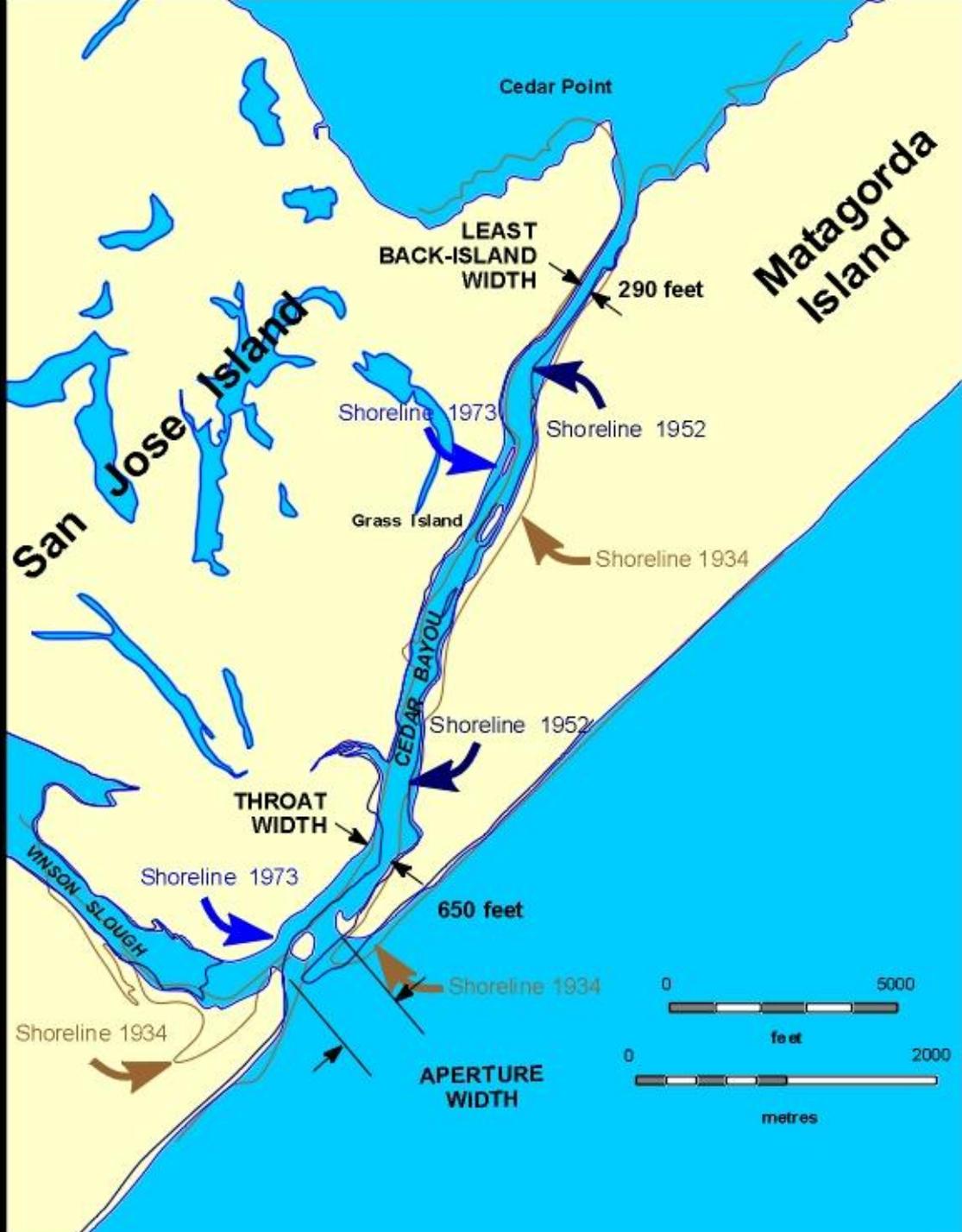






OBSERVATIONS

1. Back-bay reach of Cedar Bayou has been stable for past century.
2. Throat has been trending downward, except for 1960-80.



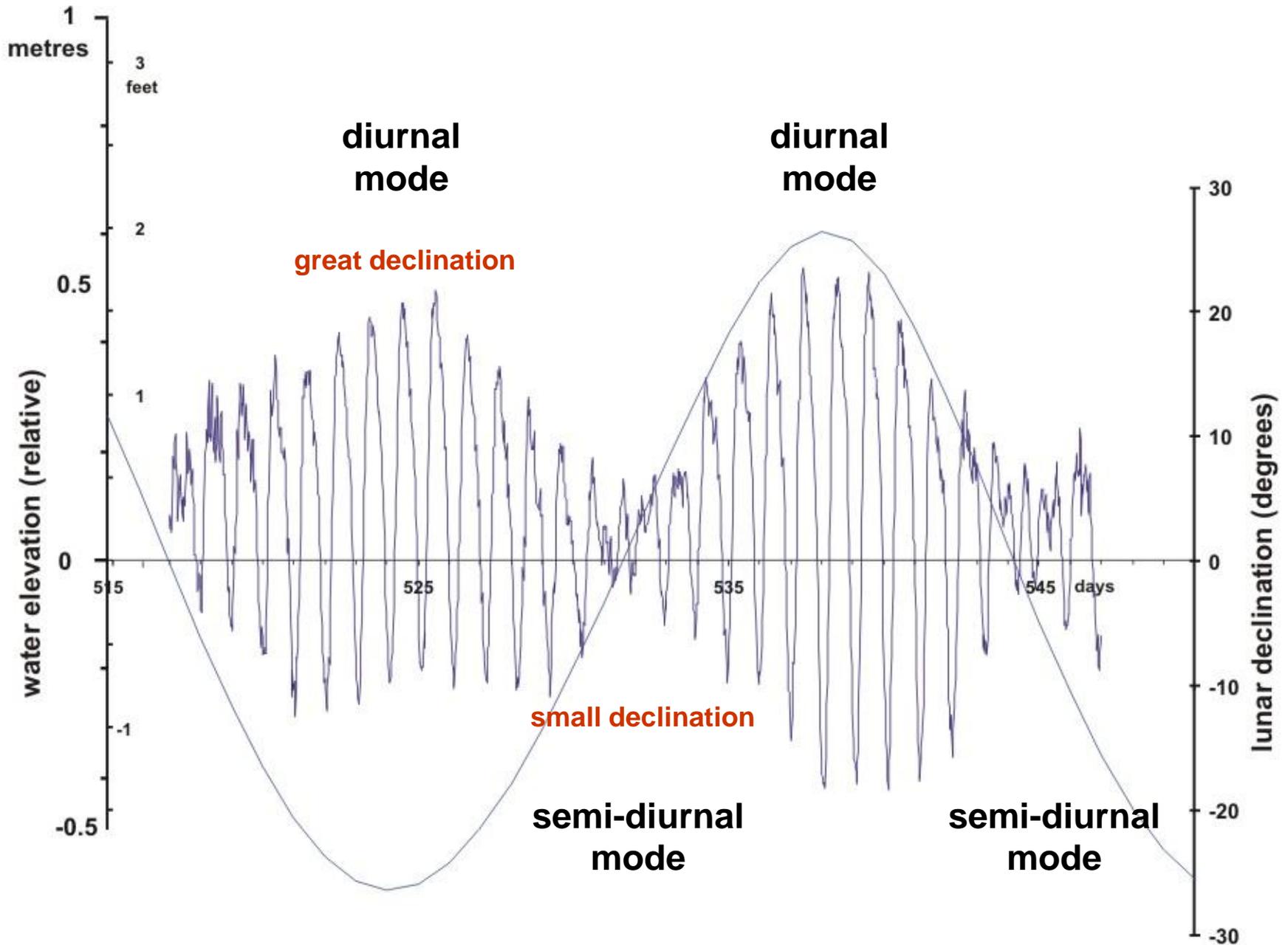
SOURCES OF ERROR

WATER-LEVEL VARIATION DUE TO:

Astronomical tide

Bob Hall Pier

June 2009

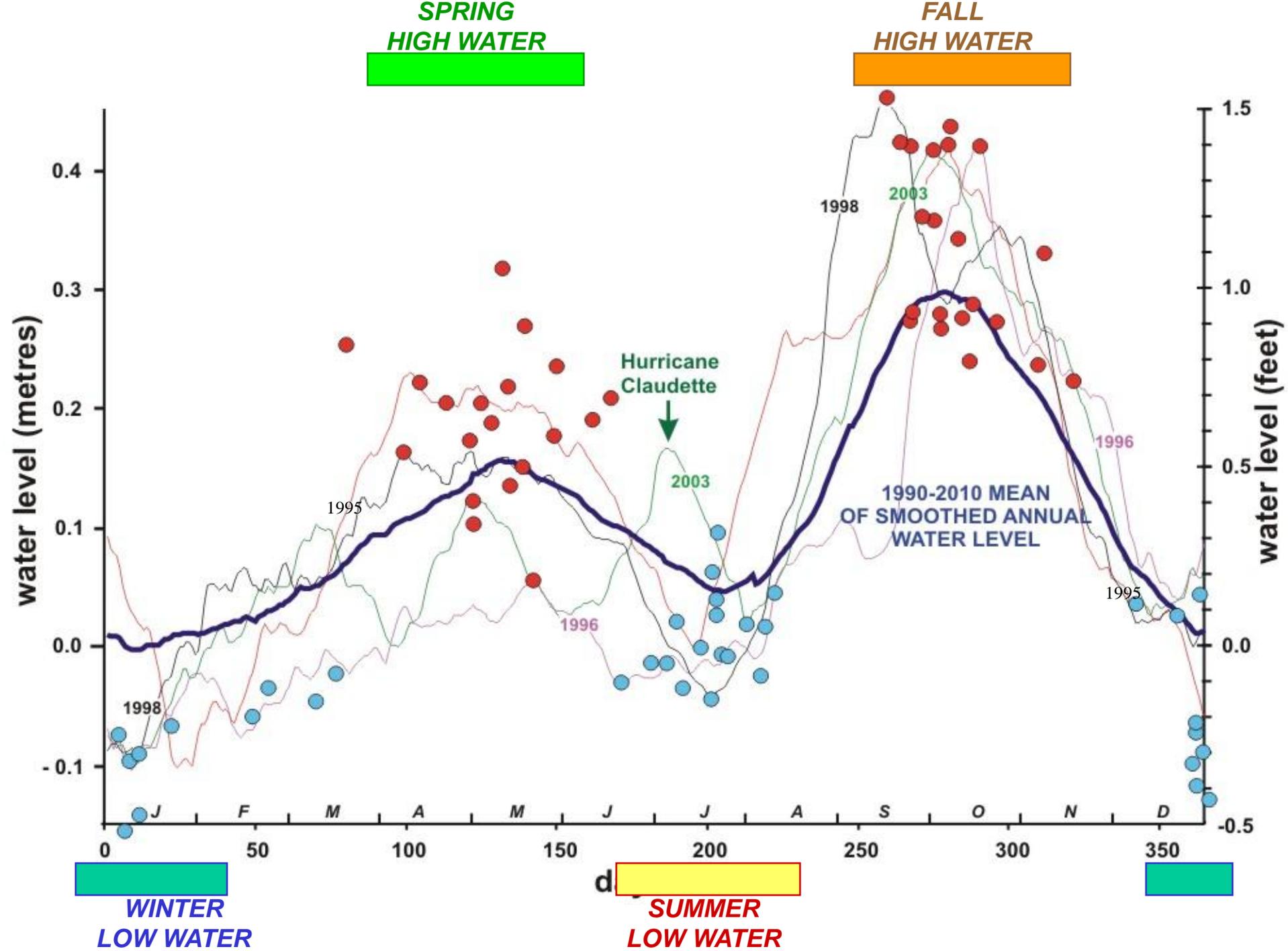


SOURCES OF ERROR

WATER-LEVEL VARIATION DUE TO:

Astronomical tide

Seasonal water-level variation



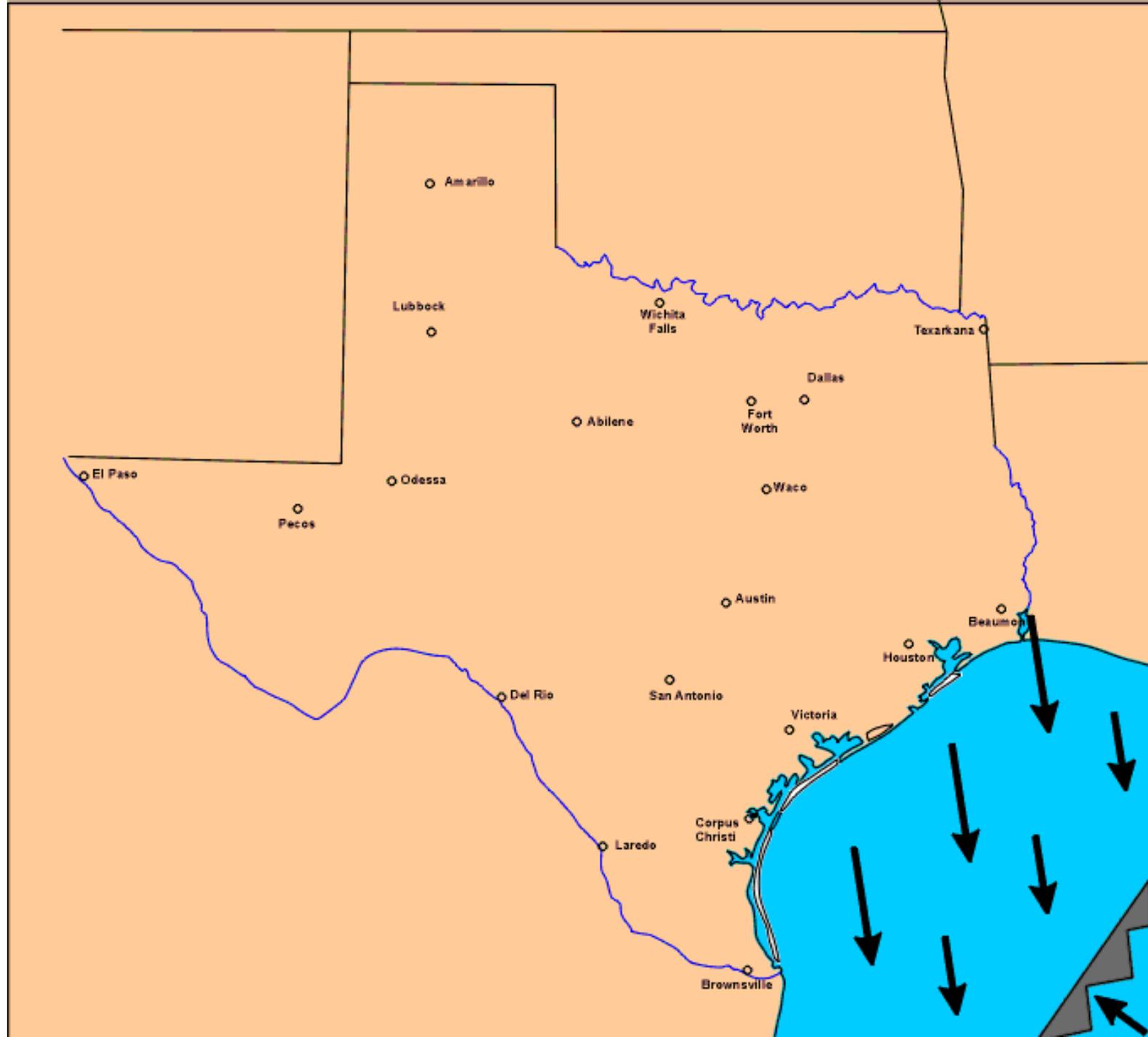
SOURCES OF ERROR

WATER-LEVEL VARIATION DUE TO:

Astronomical tide

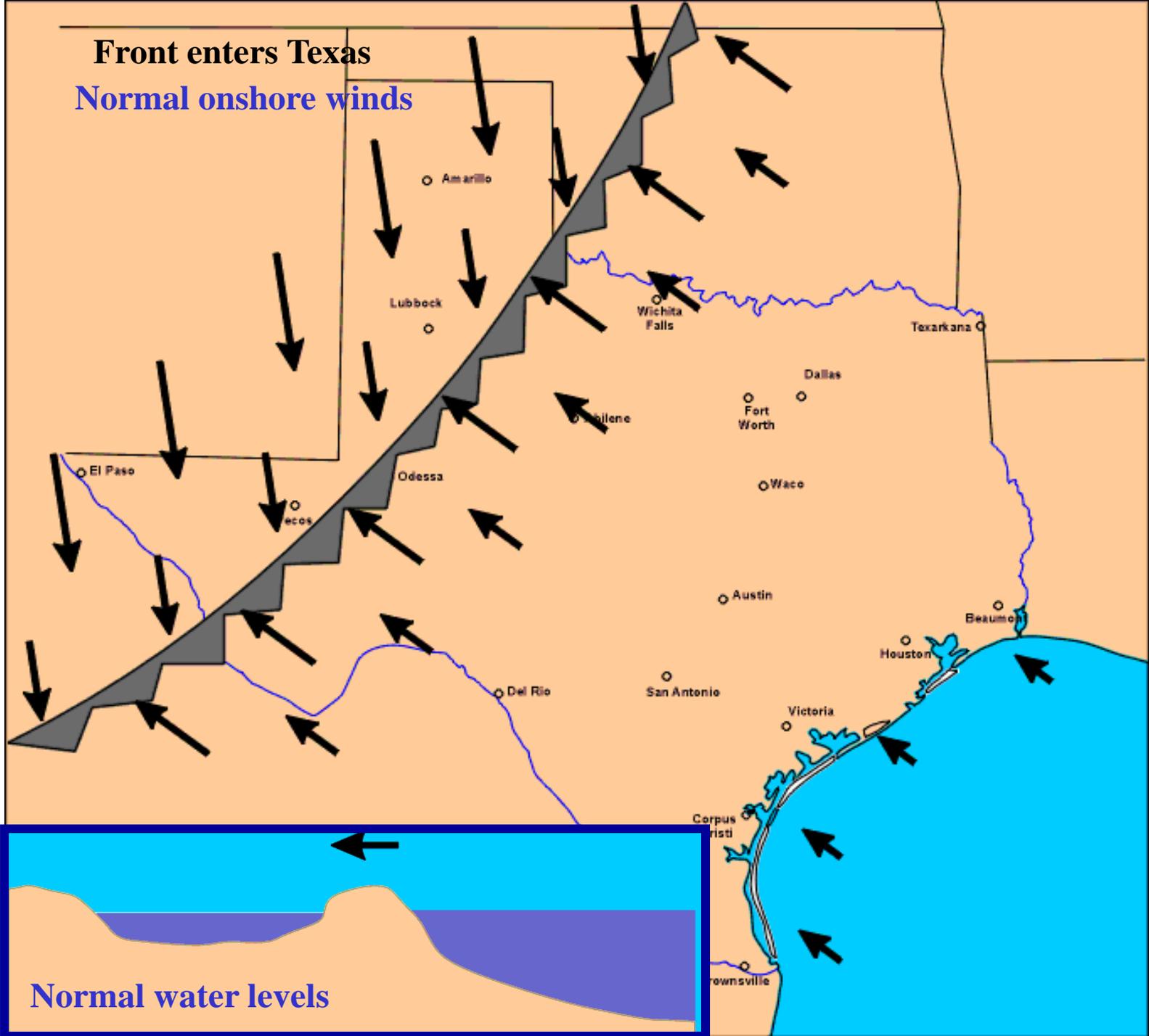
Seasonal water-level variation

Meteorological water-level changes

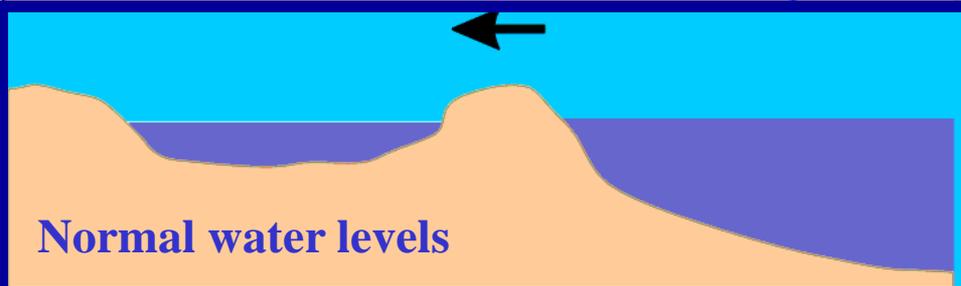


Front enters Texas

Normal onshore winds

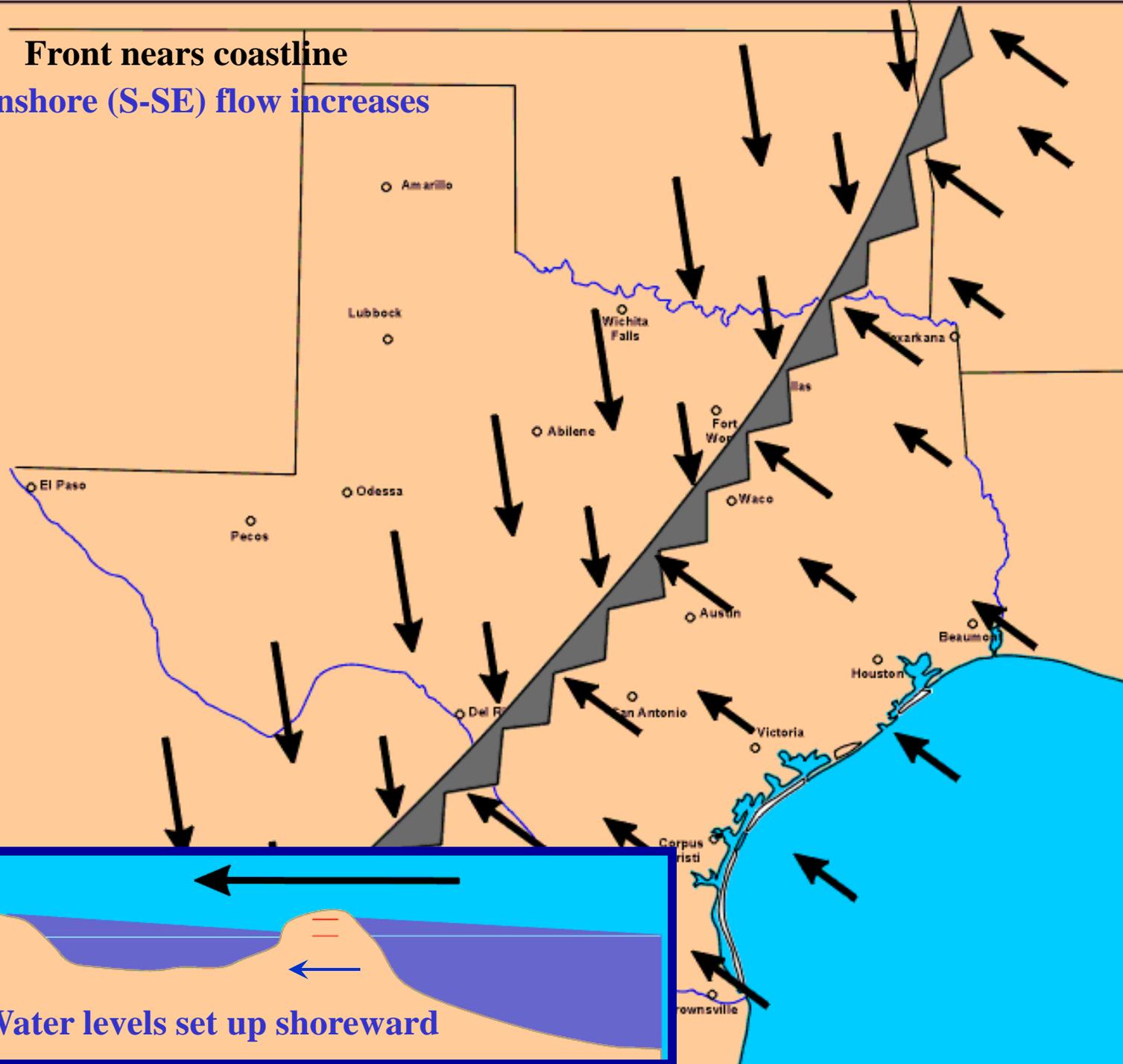


Normal water levels



Front nears coastline

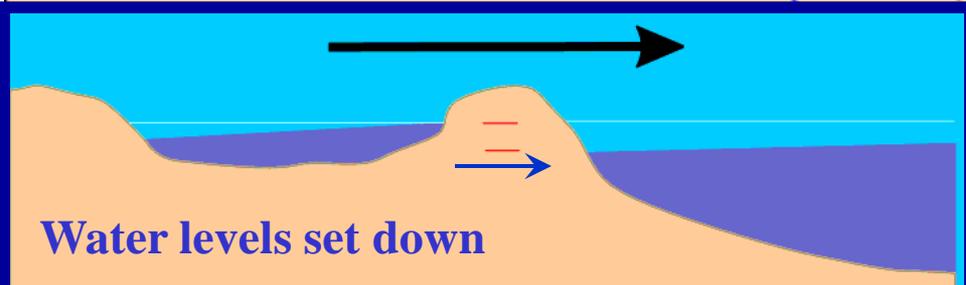
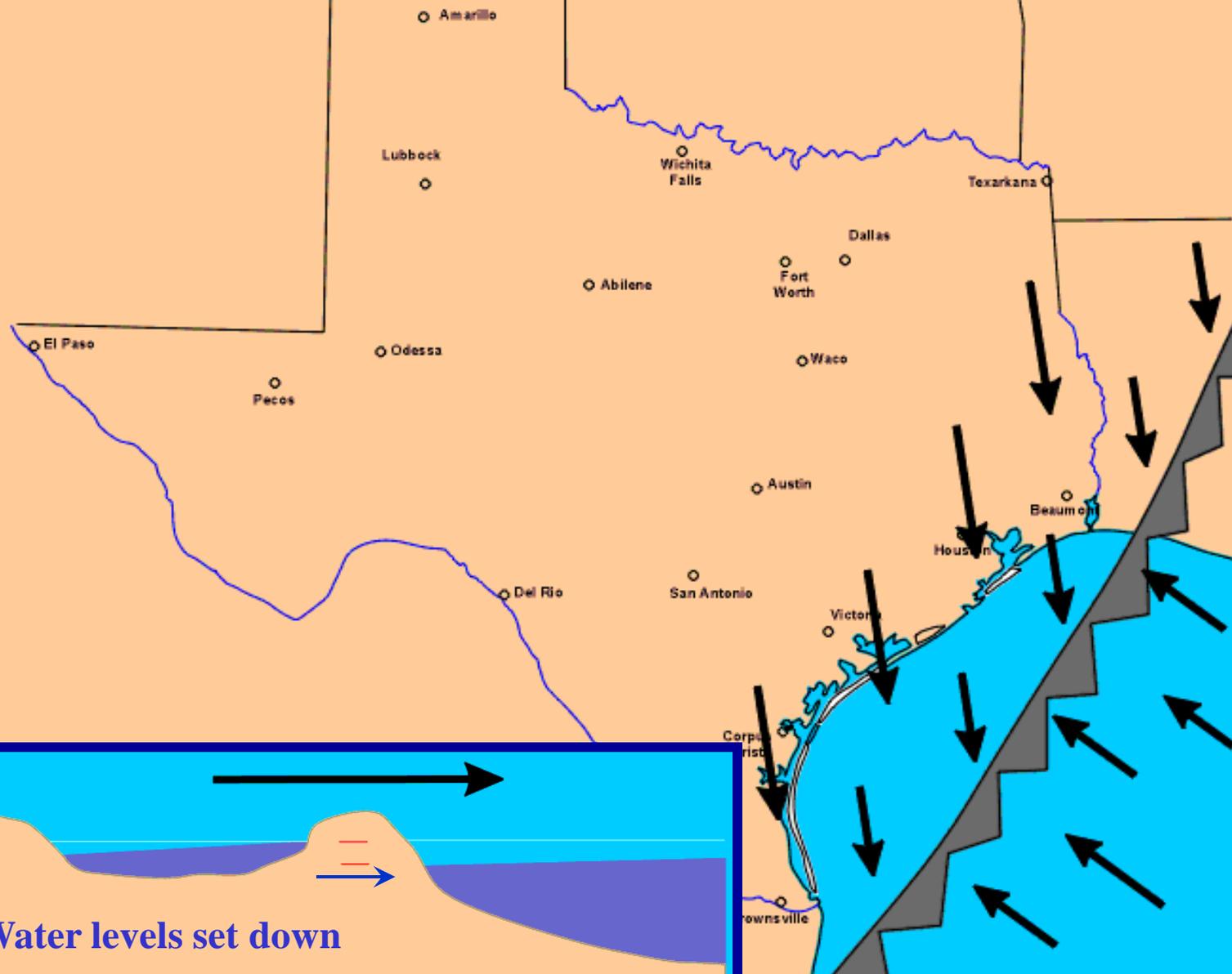
Onshore (S-SE) flow increases



Water levels set up shoreward

Front moves offshore

N winds freshen



Water levels set down

SOURCES OF ERROR

WATER-LEVEL VARIATION DUE TO:

Astronomical tide

Seasonal water-level variation

Meteorological water-level changes

Heavy rainfall and/or flood events

**GUADALUPE +
SAN ANTONIO
RIVERS**



**SAN ANTONIO
BAY**

Mission Lake

Guadalupe Bay

Hynes Bay

Matagorda Island

**Gulf of
Mexico**





Lavaca/Navidad

Colorado

Guadalupe

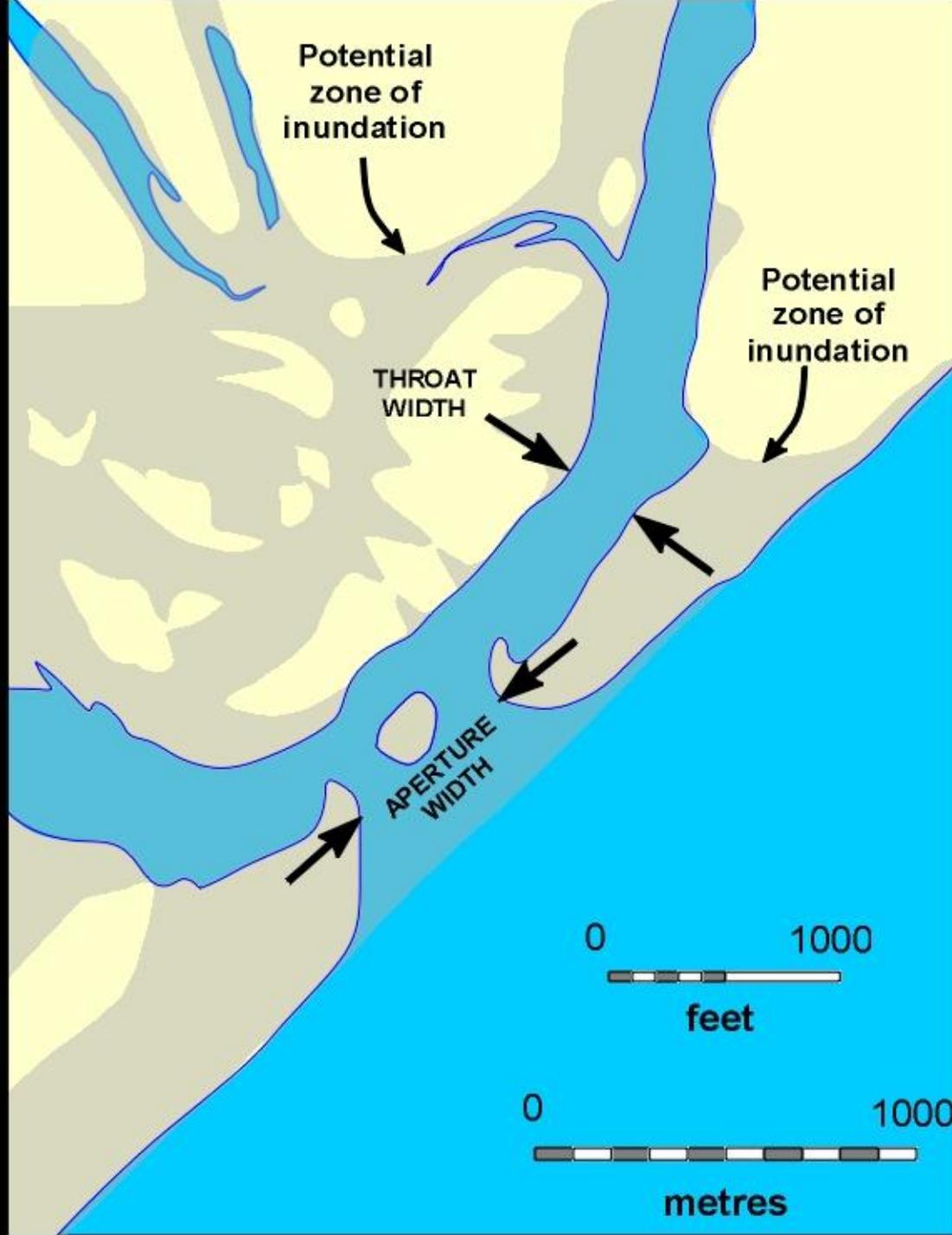
Aransas/Mission/Copano

Nueces

SOURCES OF ERROR

WATER-LEVEL VARIATION DUE TO:

Astronomical tide	<i>Range</i> 3.5 ft
Seasonal water-level variation	2.0 ft
Meteorological water-level changes	4.0 ft (fronts)
Heavy rainfall and/or flood events	?



SOURCES OF ERROR

WATER-LEVEL VARIATION DUE TO:

Astronomical tide

Seasonal water-level variation

Meteorological water-level changes

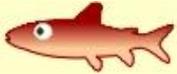
Heavy rainfall and/or flood events

ERRONEOUS OR UNKNOWN TIME OF DATA

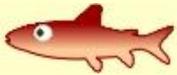
SOURCES OF INFORMATION



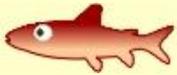
mapped measurements



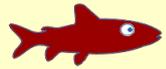
cross-section surveys



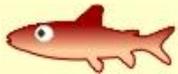
hydrographic or topographic maps



soundings



aerial photography



vertical (surface normal)



oblique

TPWD 4 Sep 1968



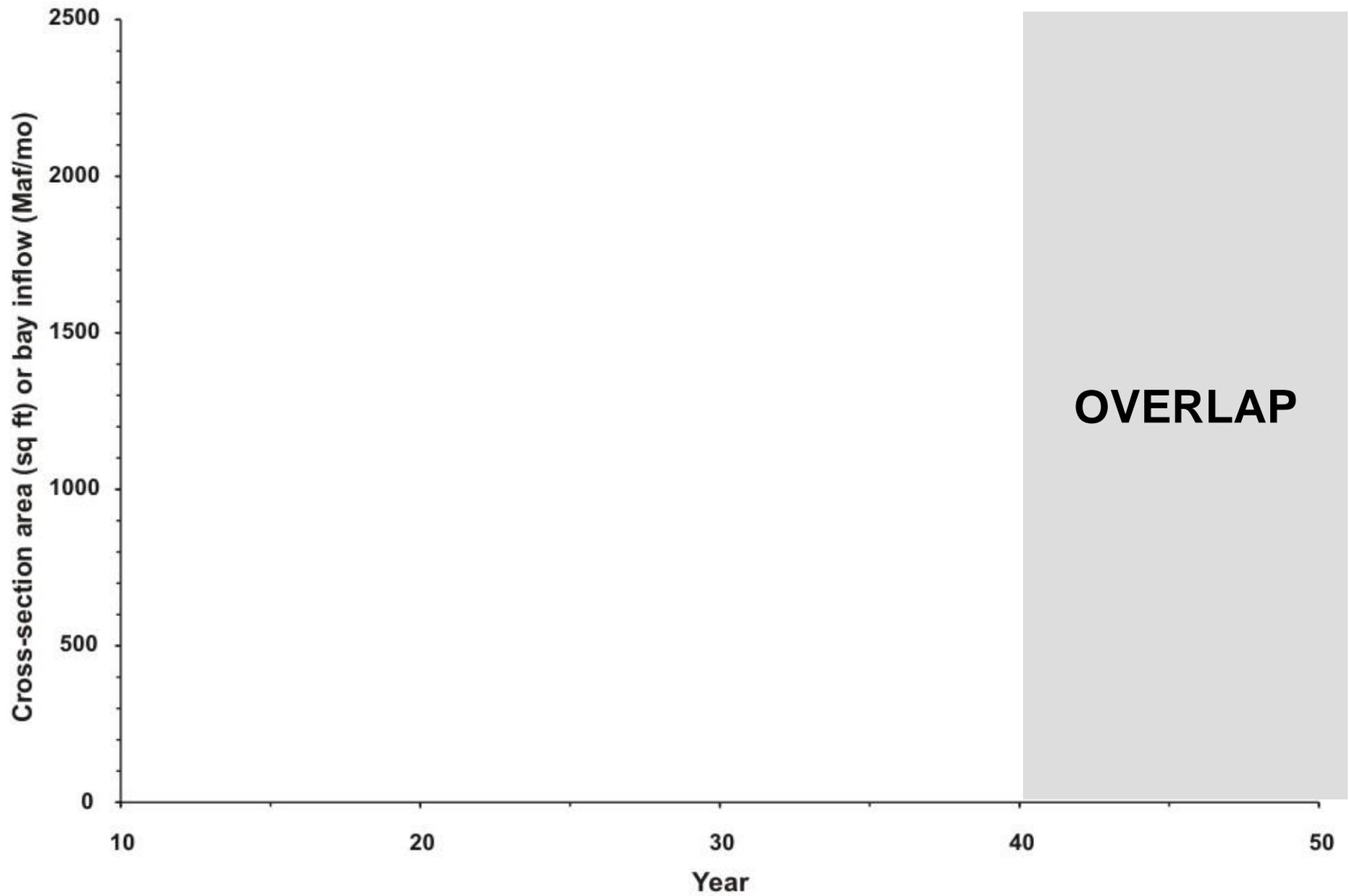
10 Jan 2010

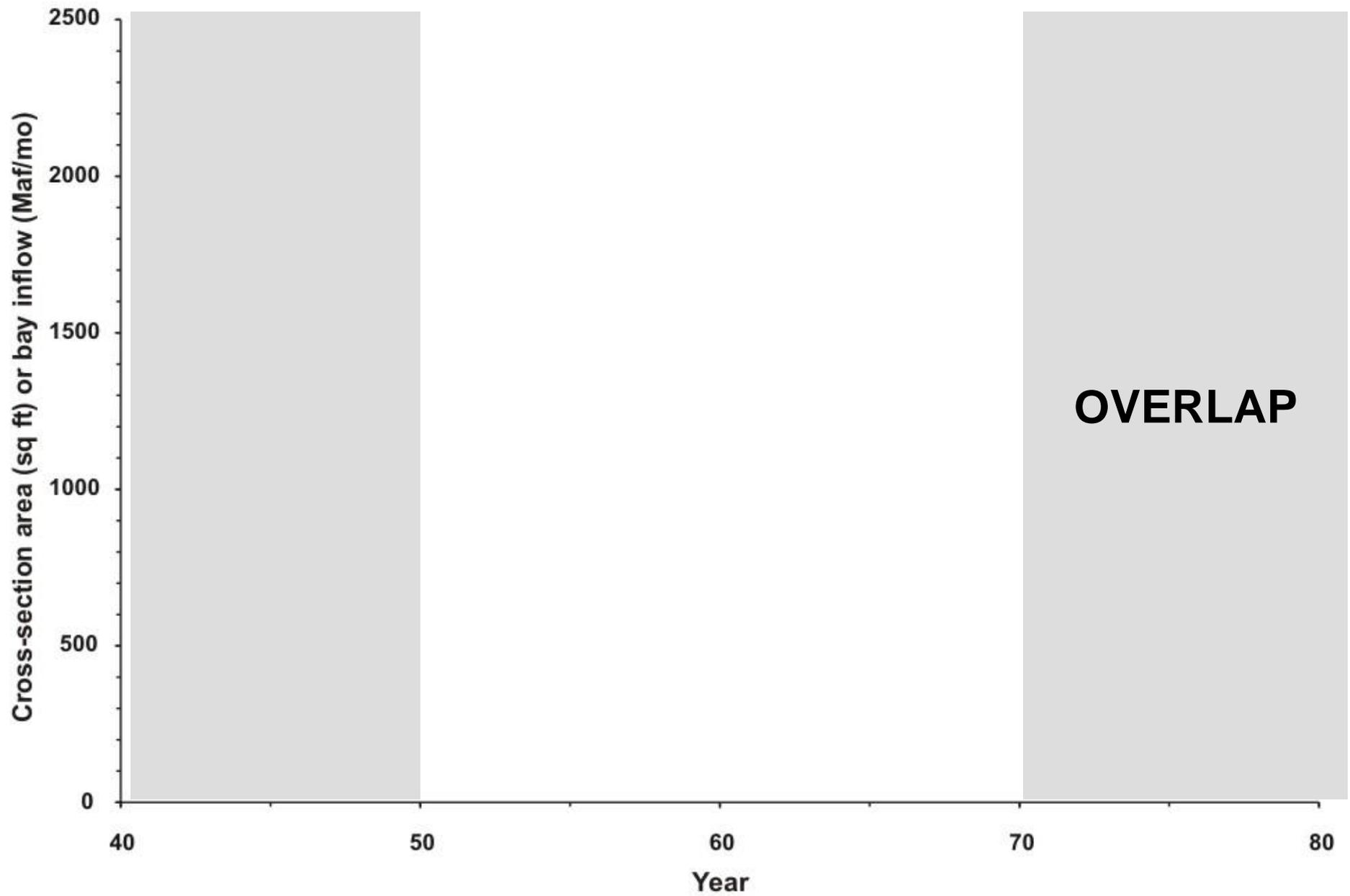
Photograph by Dr Richard Watson

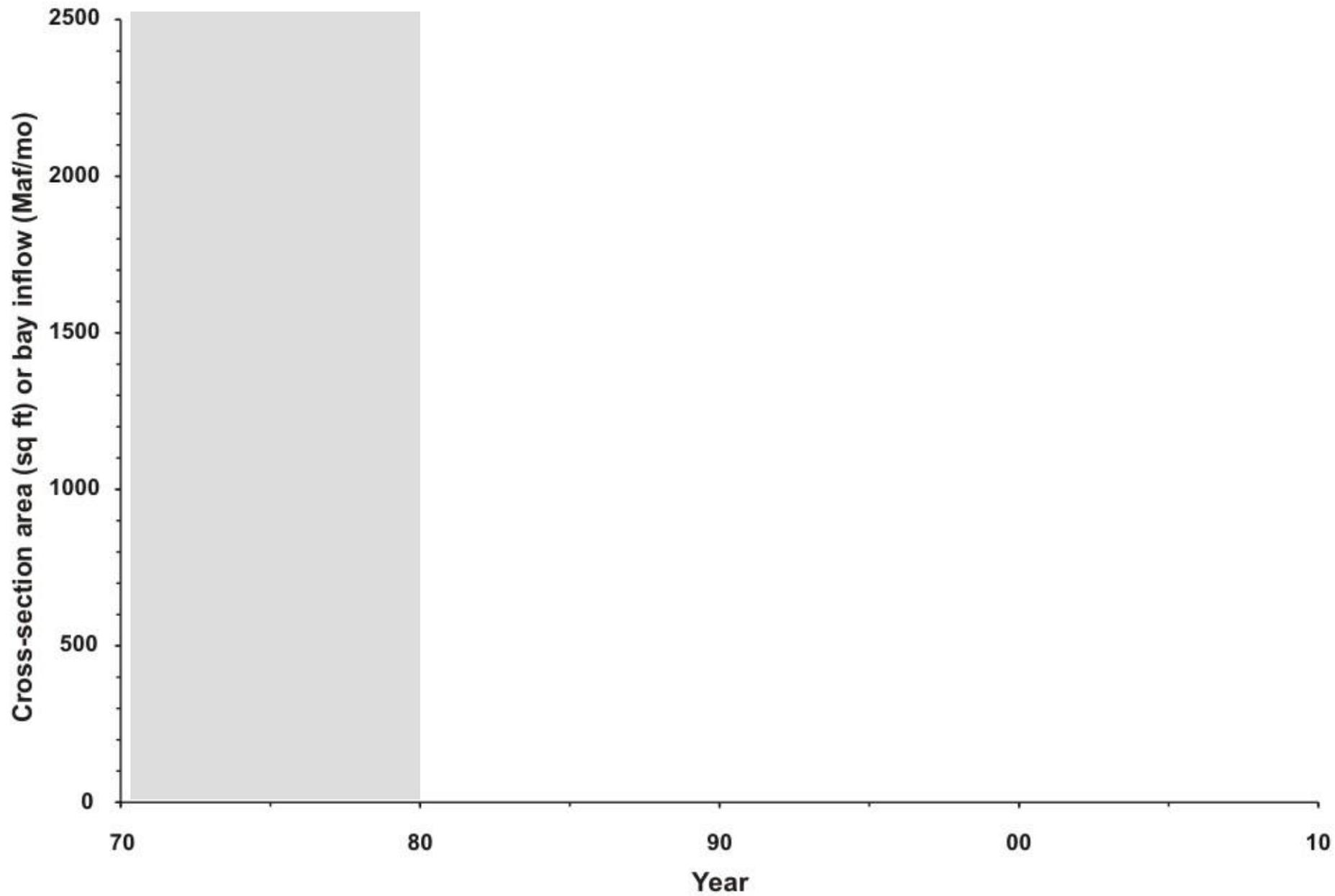


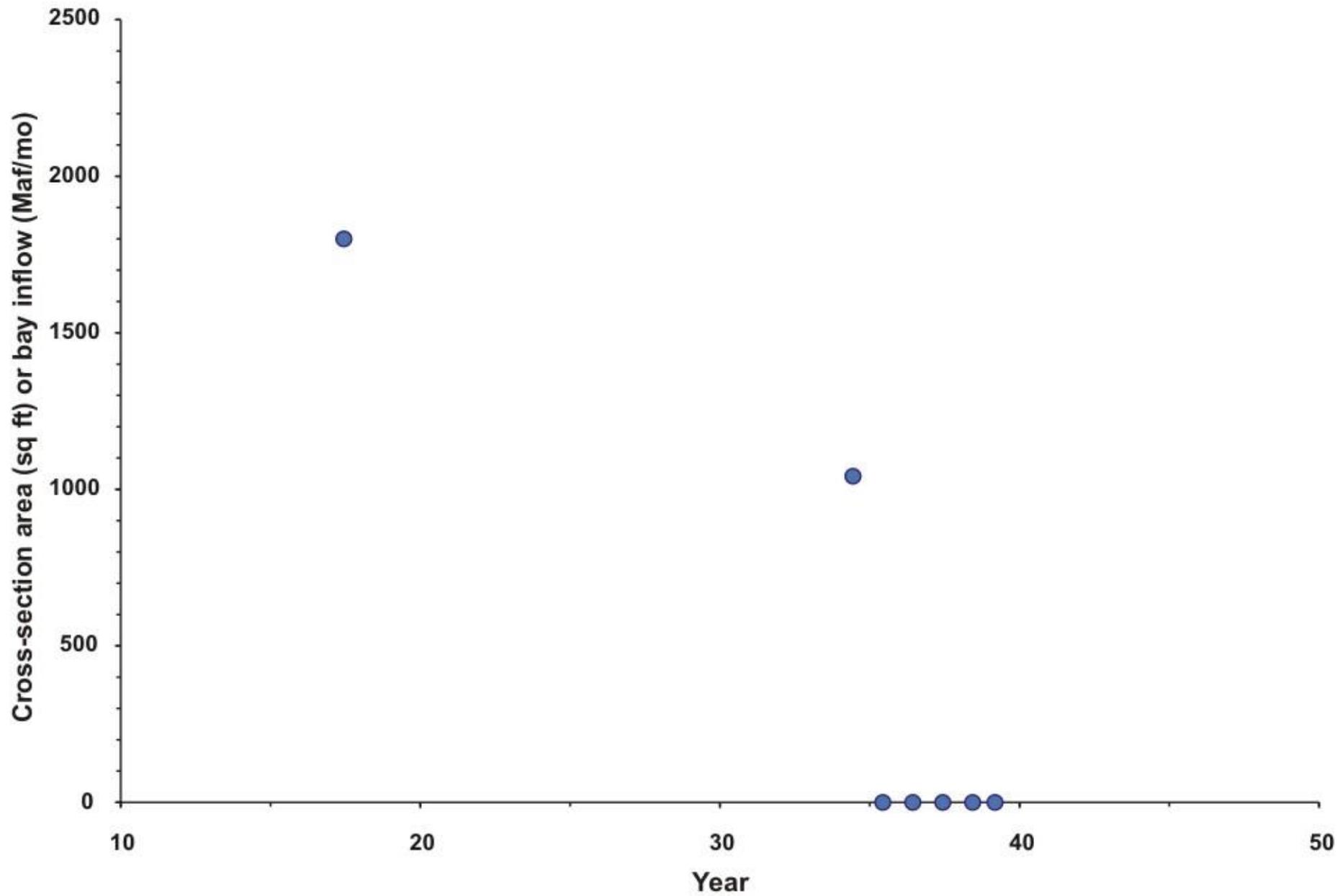
OBSERVATIONS

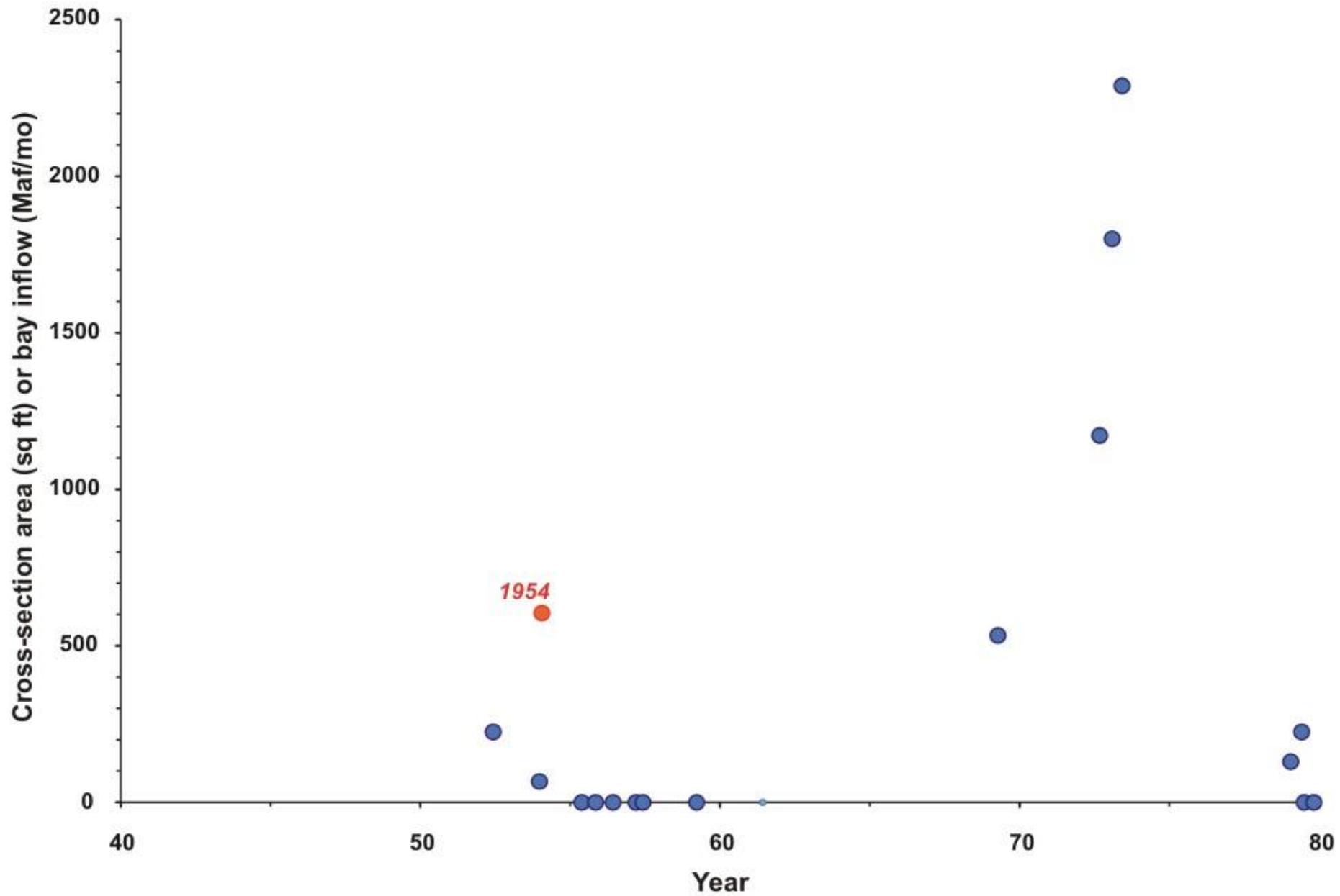
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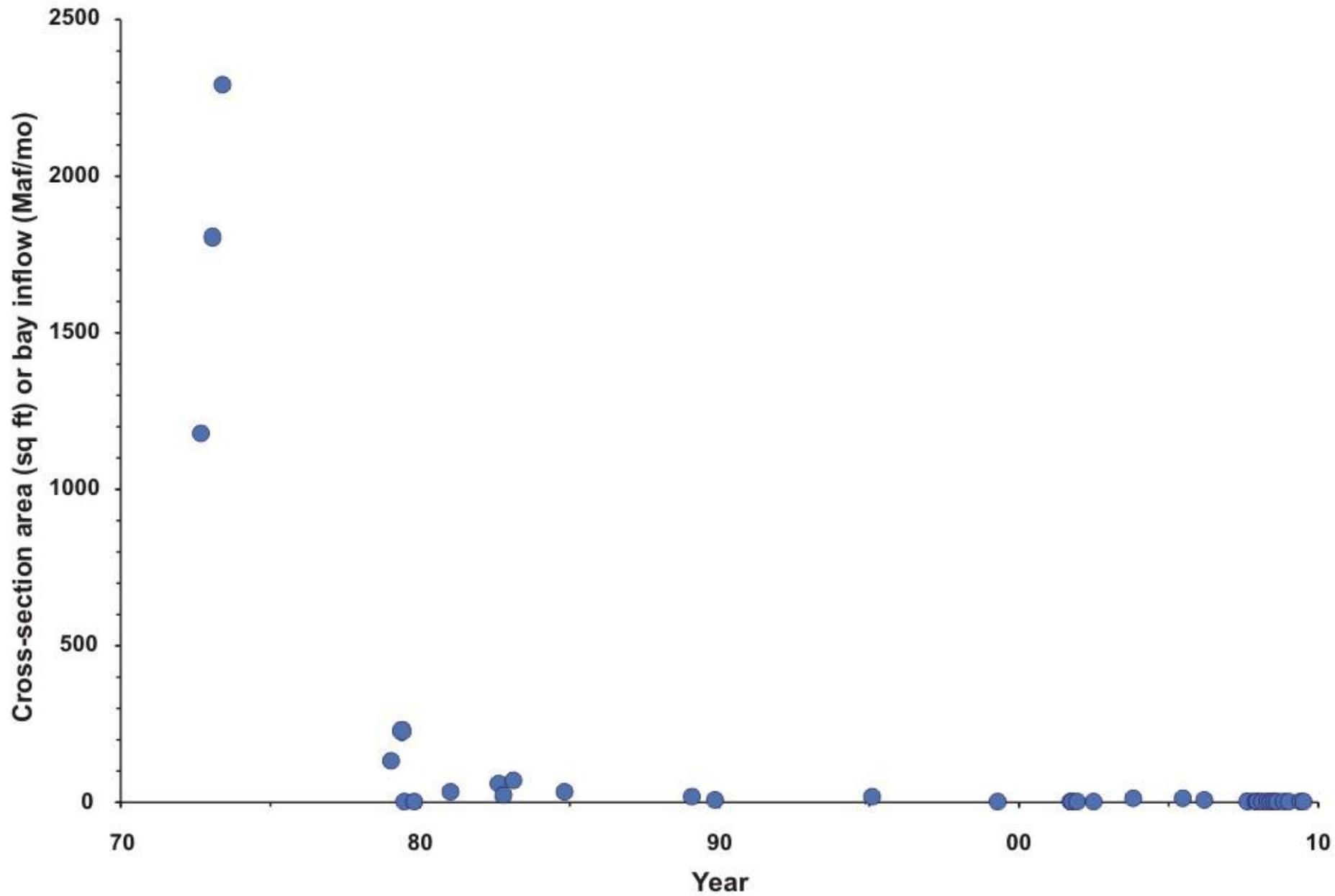












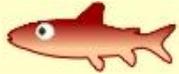
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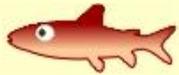
SOURCES OF INFORMATION



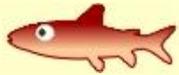
mapped measurements



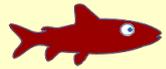
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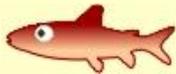
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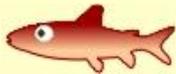
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vertical (surface normal)



oblique



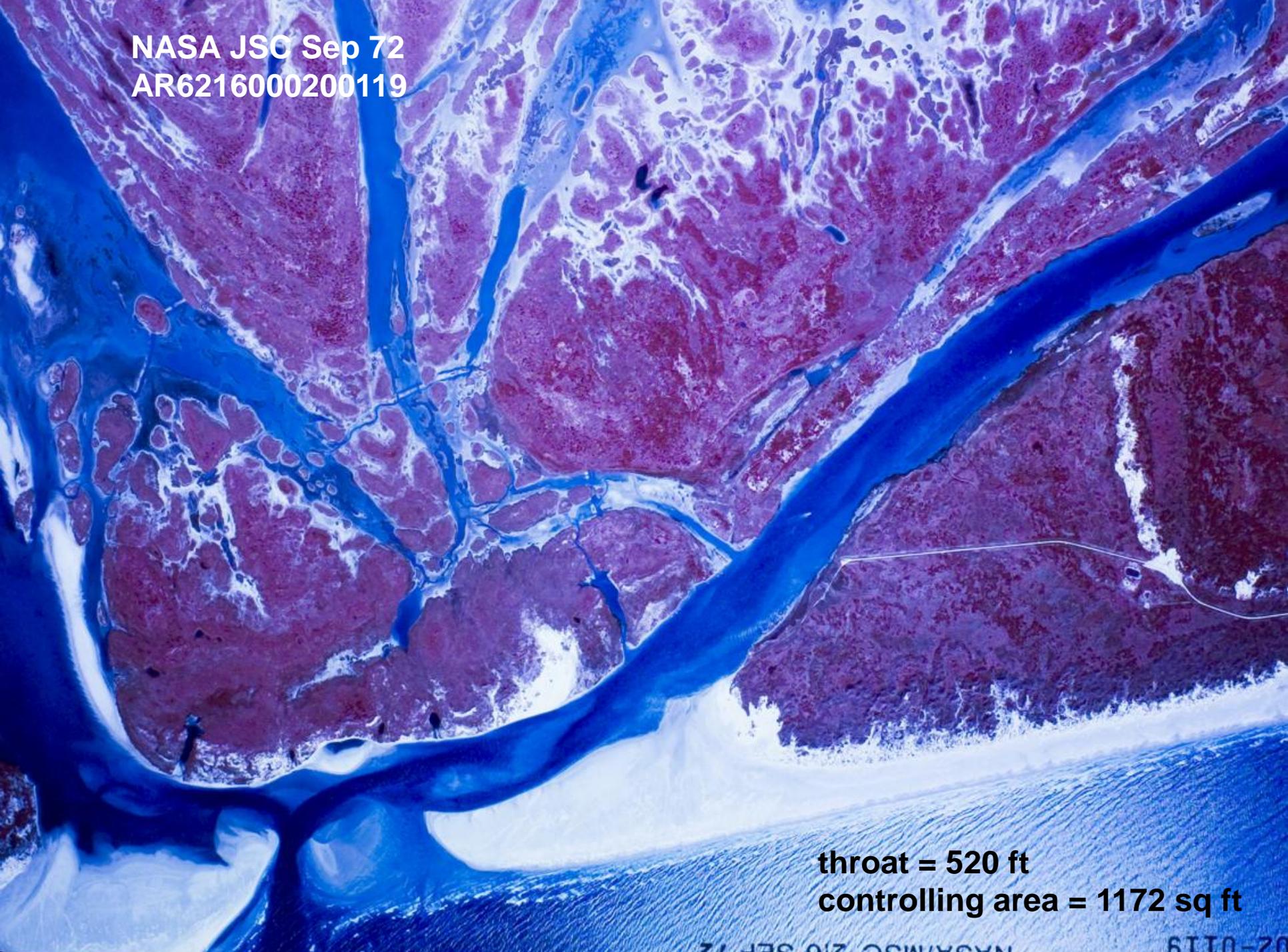
observations & reports

USGS NHAP 12 Feb 81
NC1NHAP810273026

“MARGINAL”: AREA < 100 sq ft

aperture = 150 ft
controlling area = 28 sq ft

NASA JSC Sep 72
AR6216000200119



throat = 520 ft
controlling area = 1172 sq ft

NASA JSC SEP 72

AR6216000200119

NPS 21 Sep 82
ARL820510131978

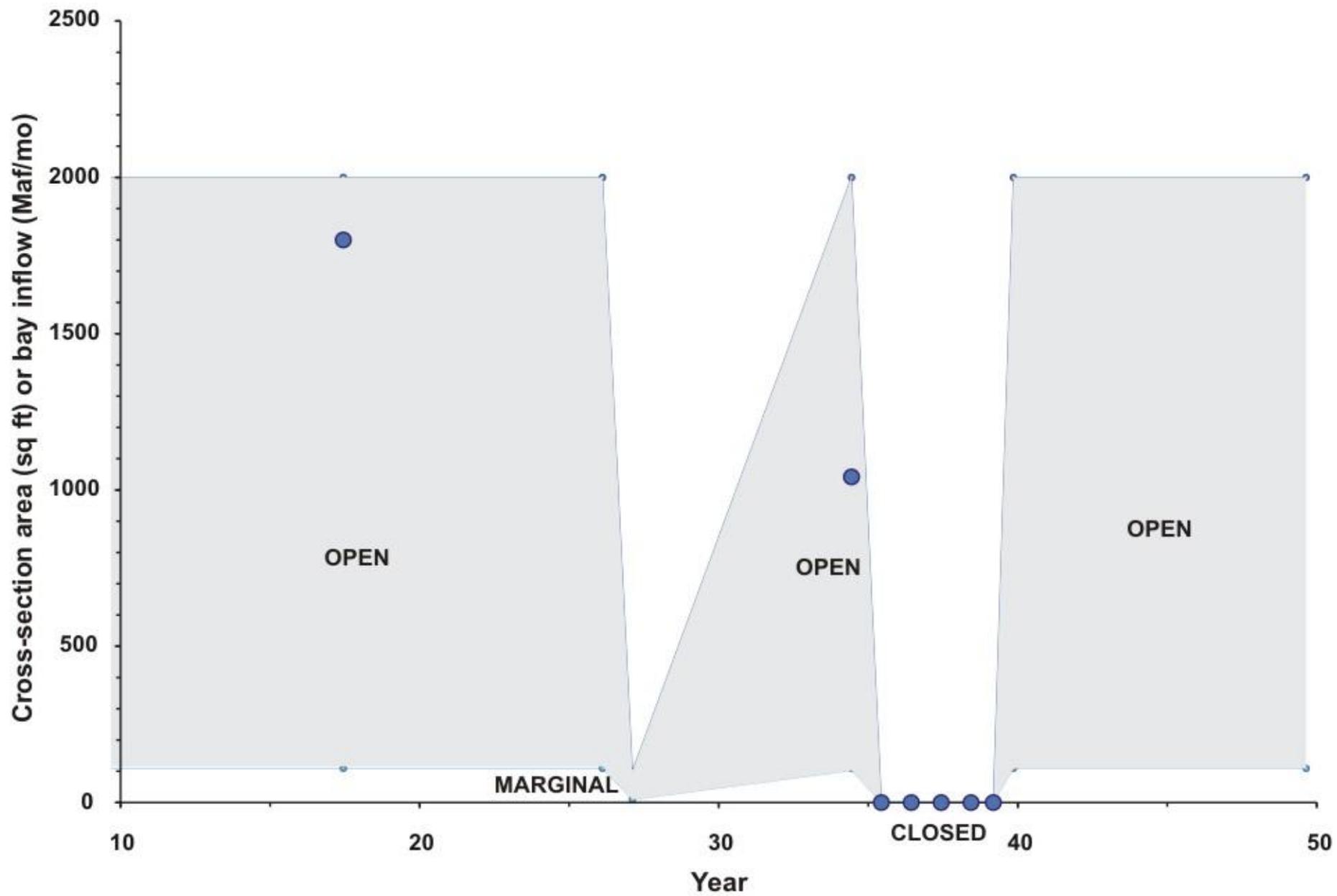


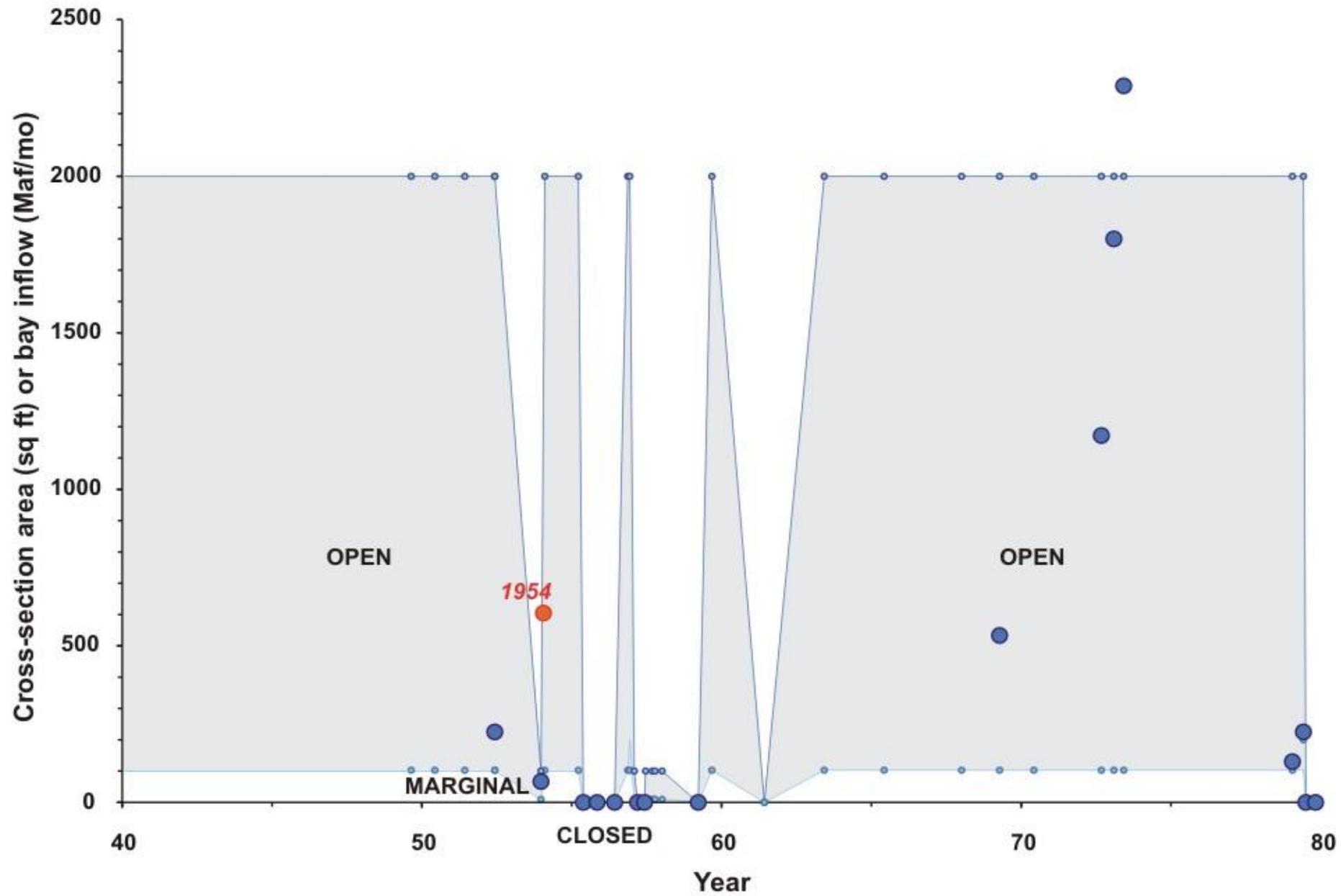
aperture = 200 ft
controlling area = 57 sq ft

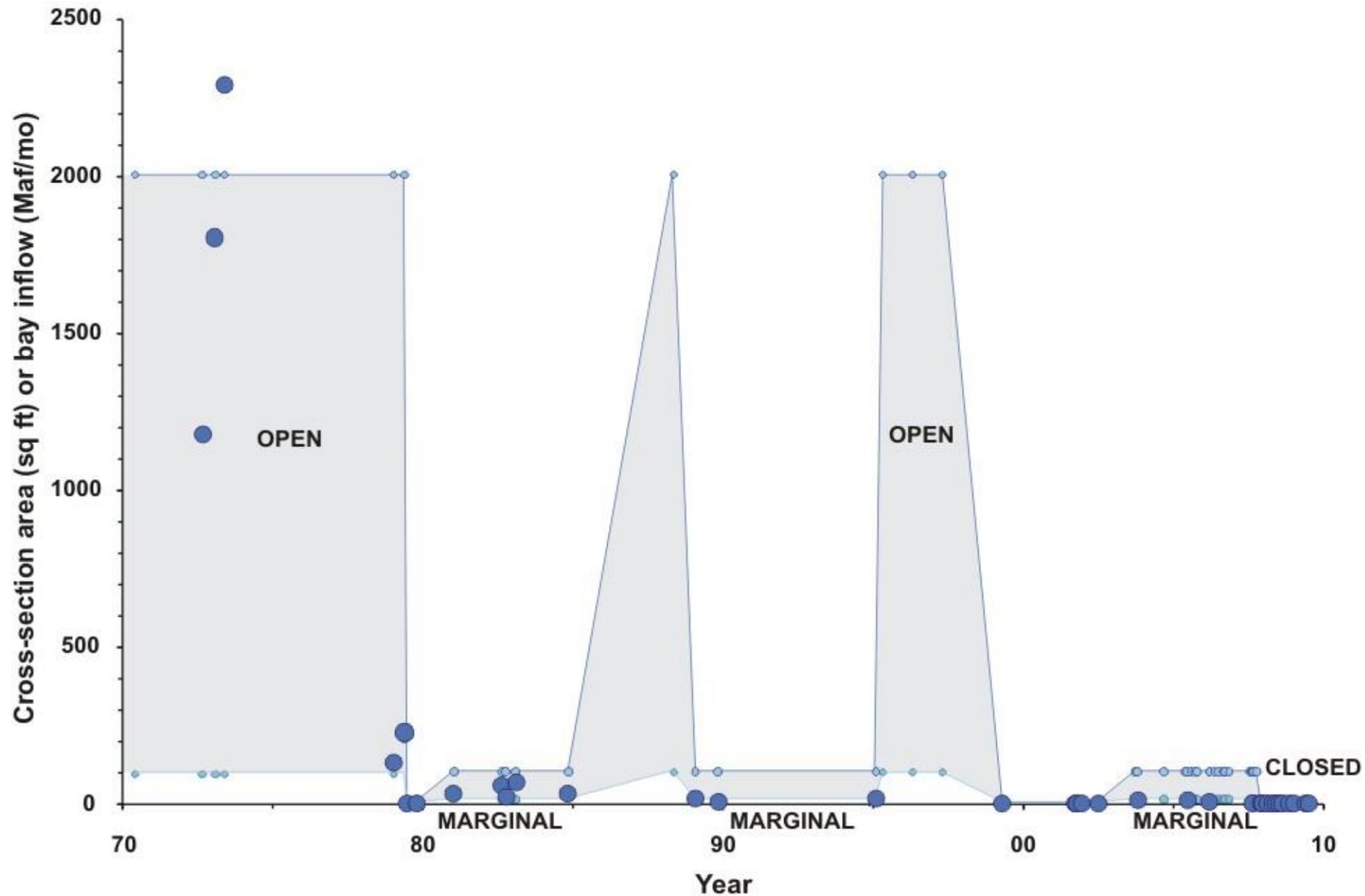
**USGS NHAP 5 Nov 82
NC1NHAP810377096**



**aperture = 130 ft
controlling area = 18 sq ft**

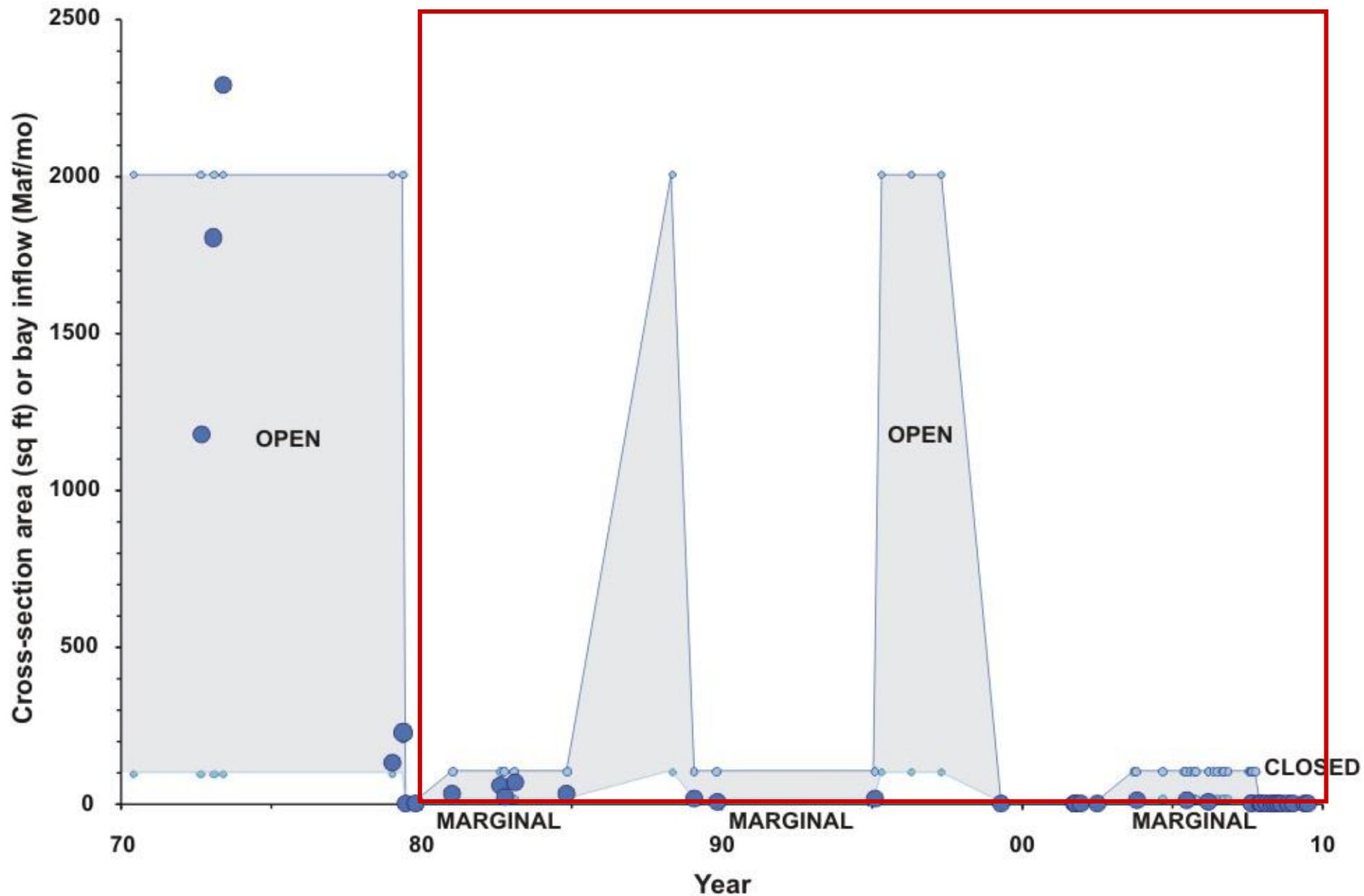


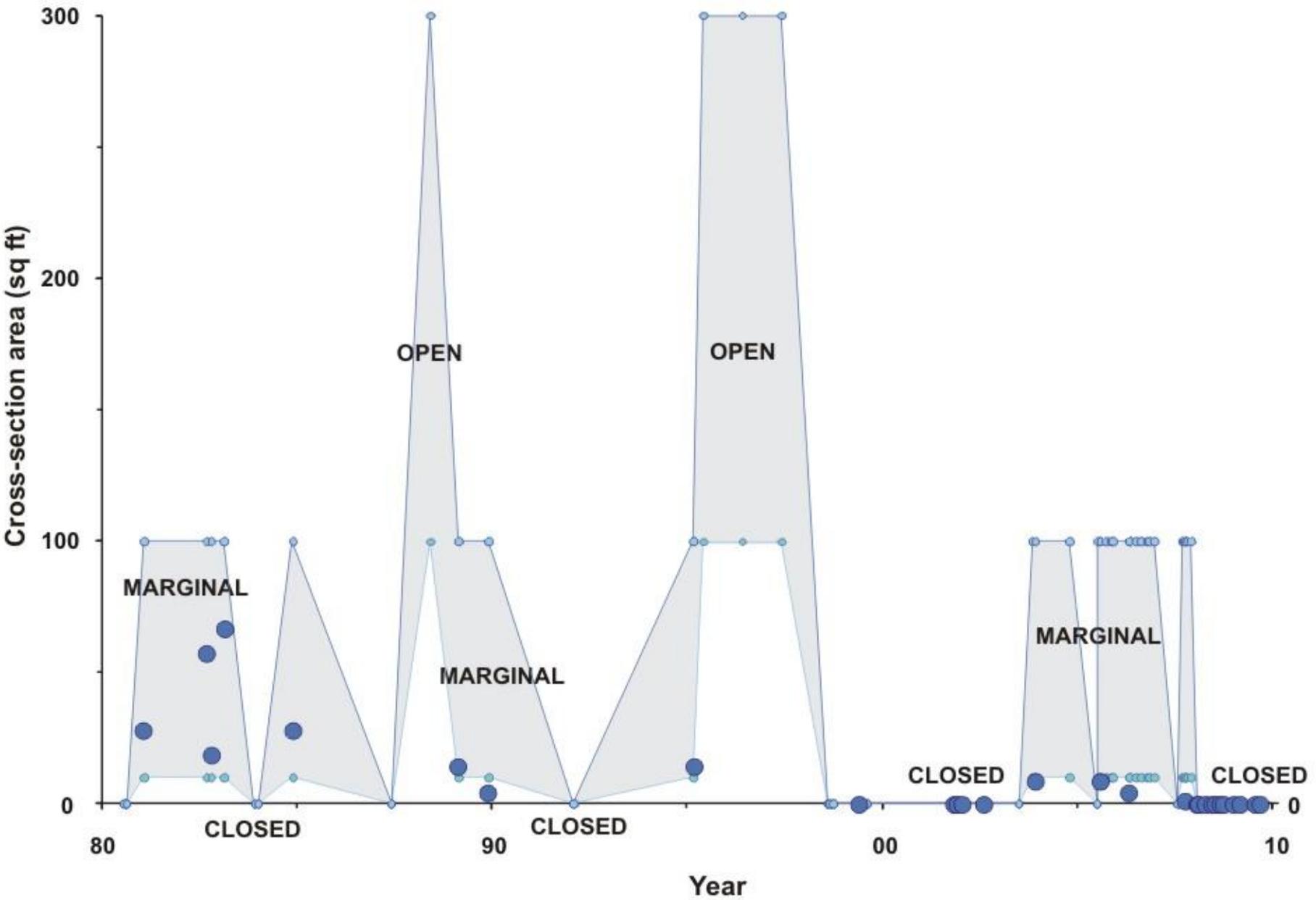


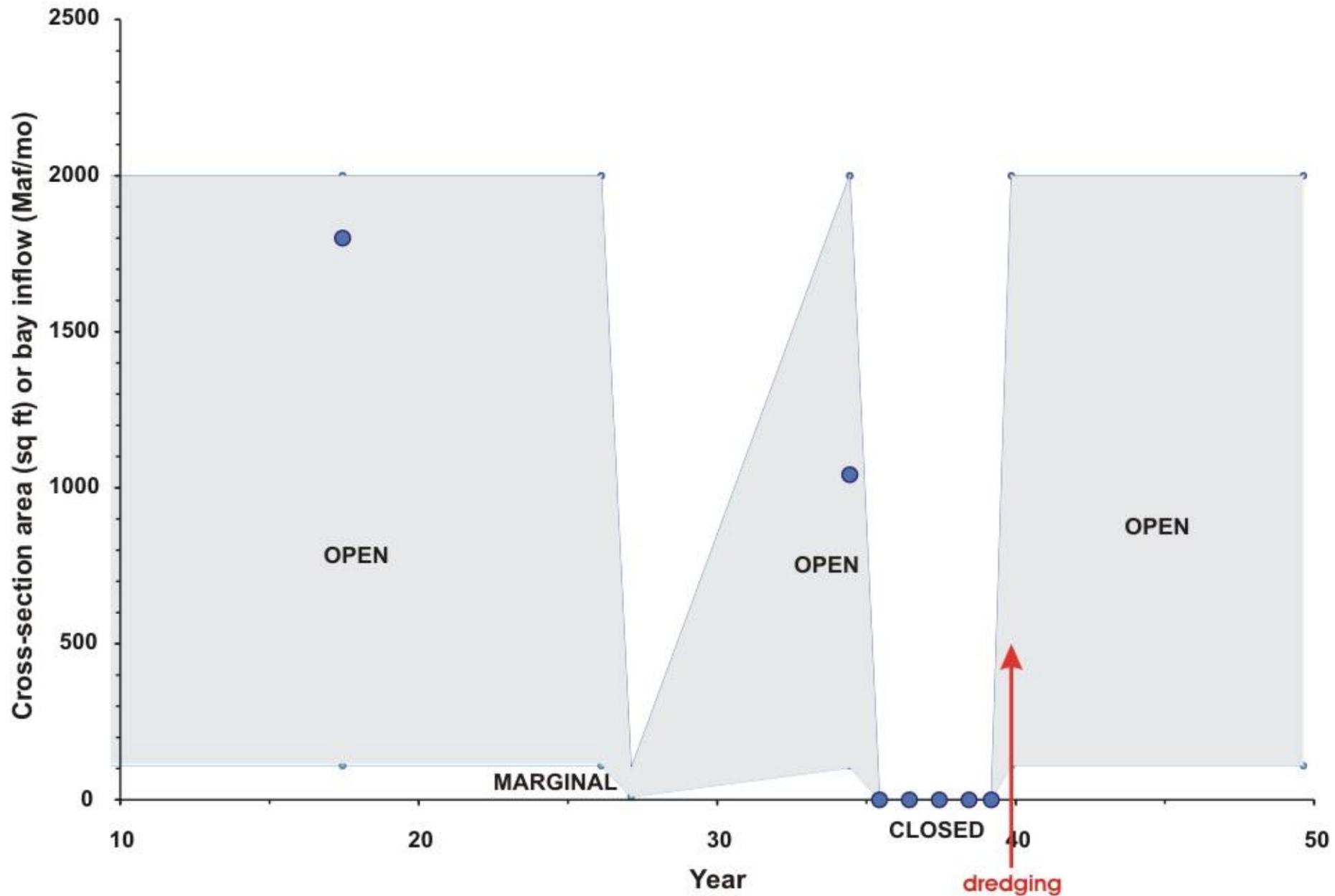


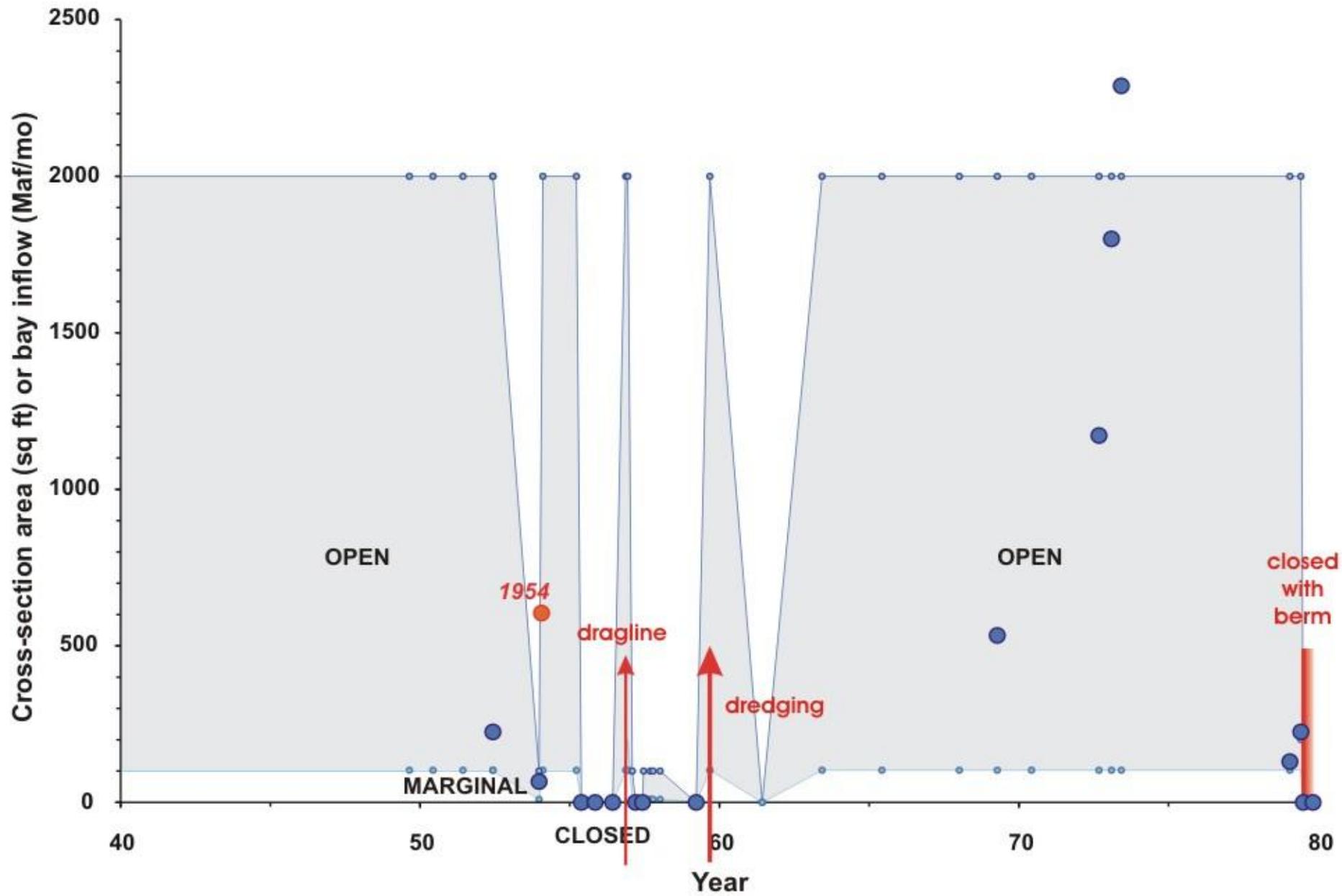
OBSERVATIONS

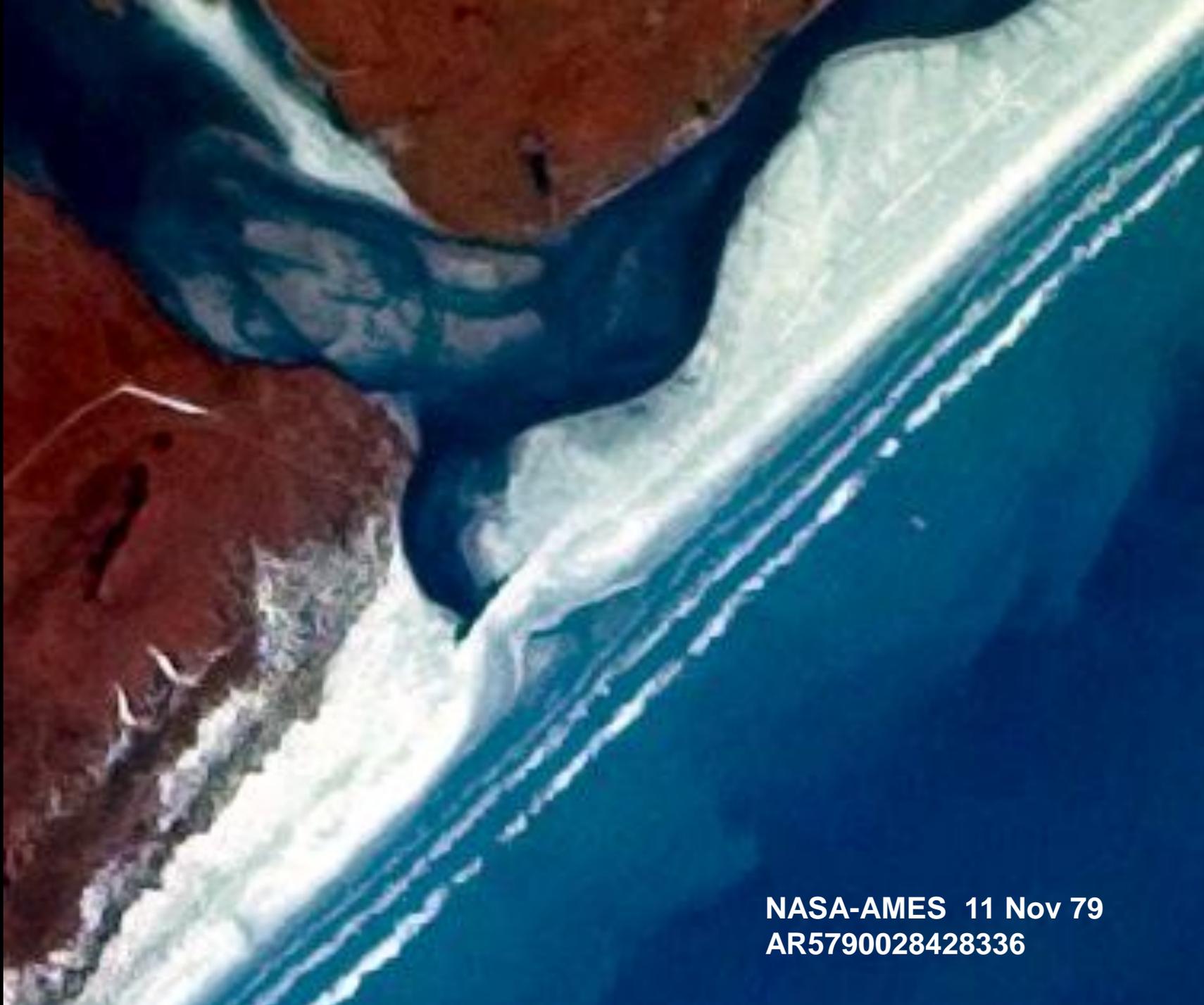
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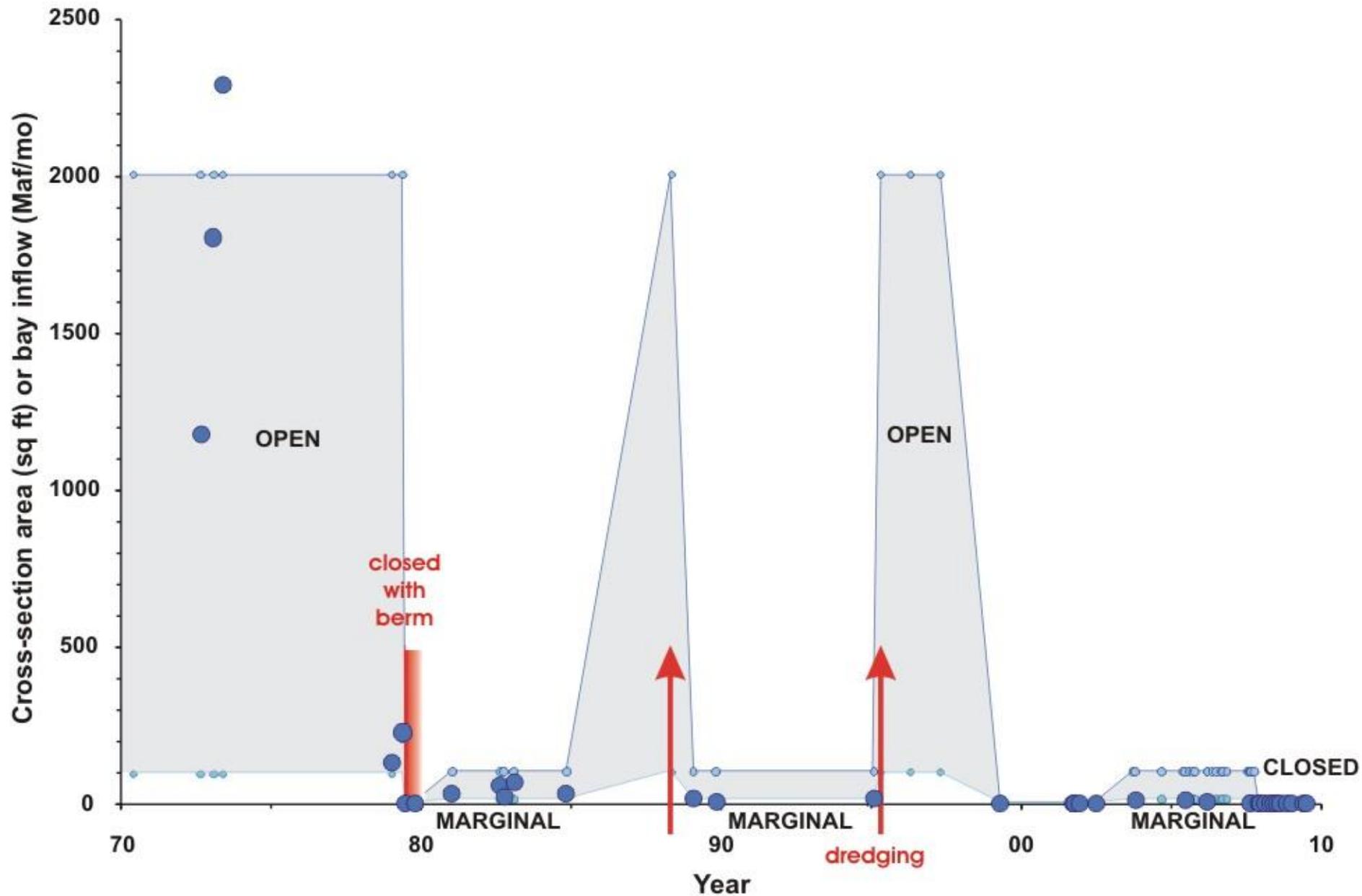






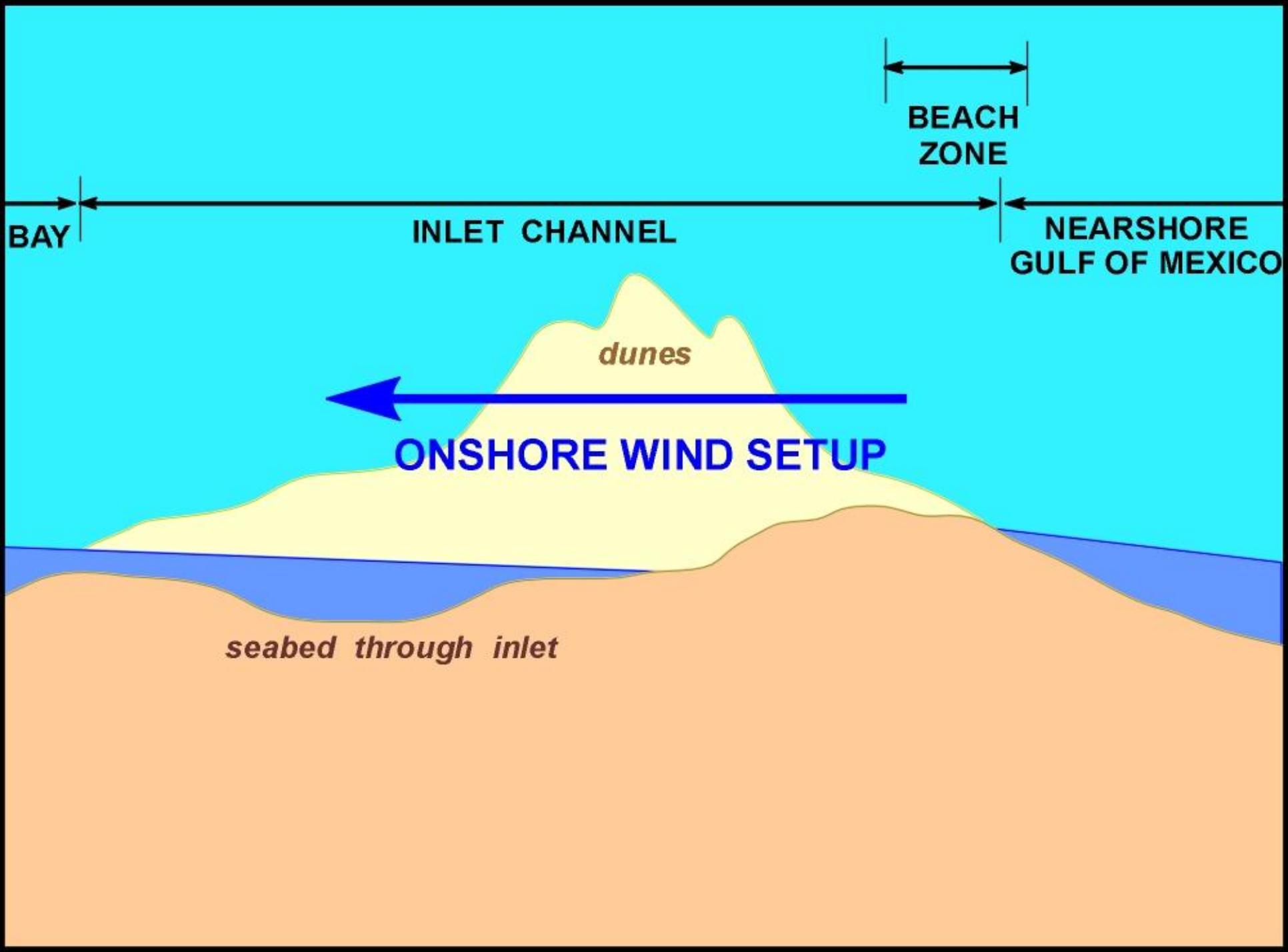


NASA-AMES 11 Nov 79
AR5790028428336



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7. Dredging has been ineffective.



BAY

INLET CHANNEL

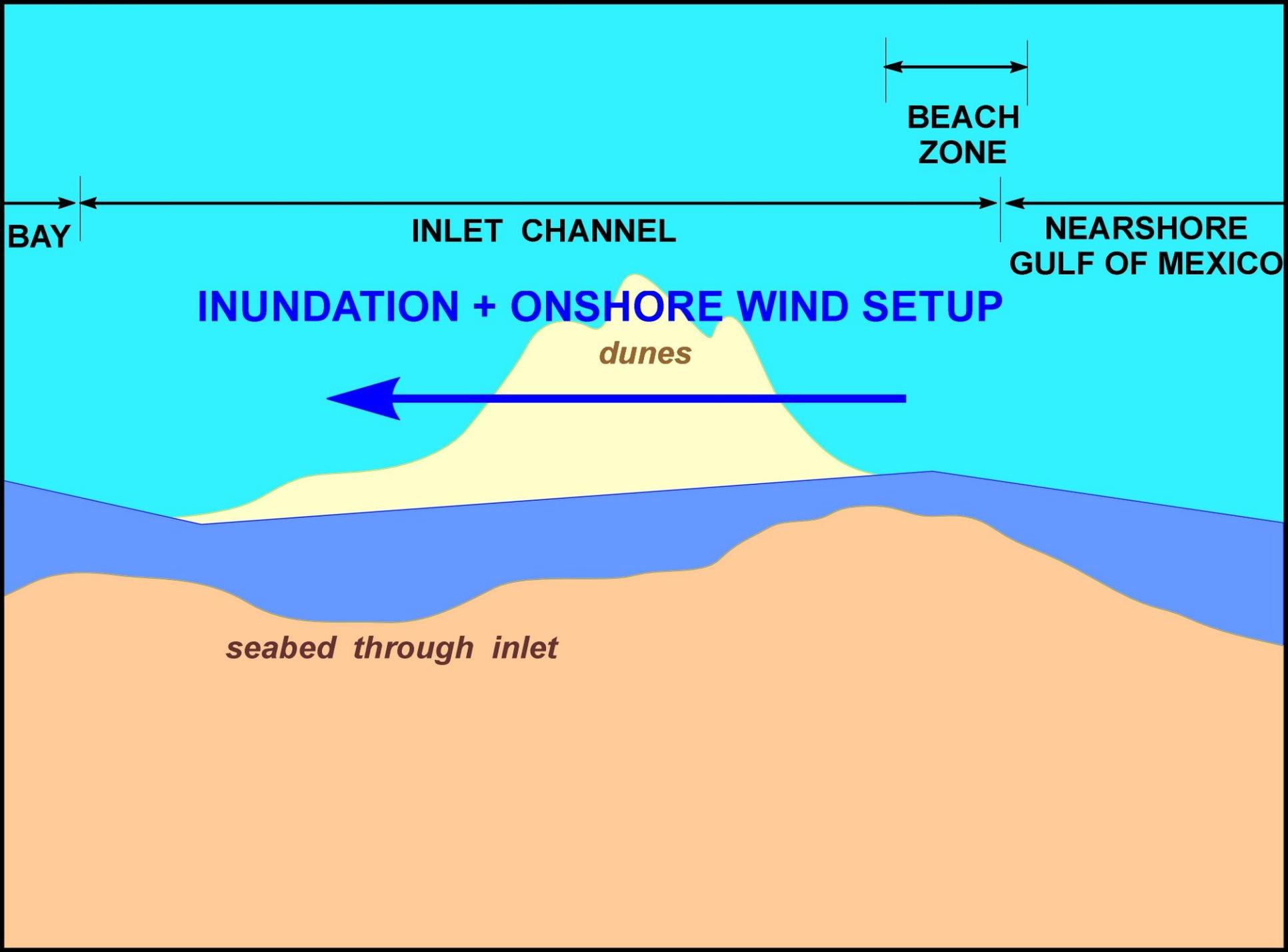
BEACH ZONE

NEARSHORE GULF OF MEXICO

dunes

ONSHORE WIND SETUP

seabed through inlet



BEACH ZONE

BAY

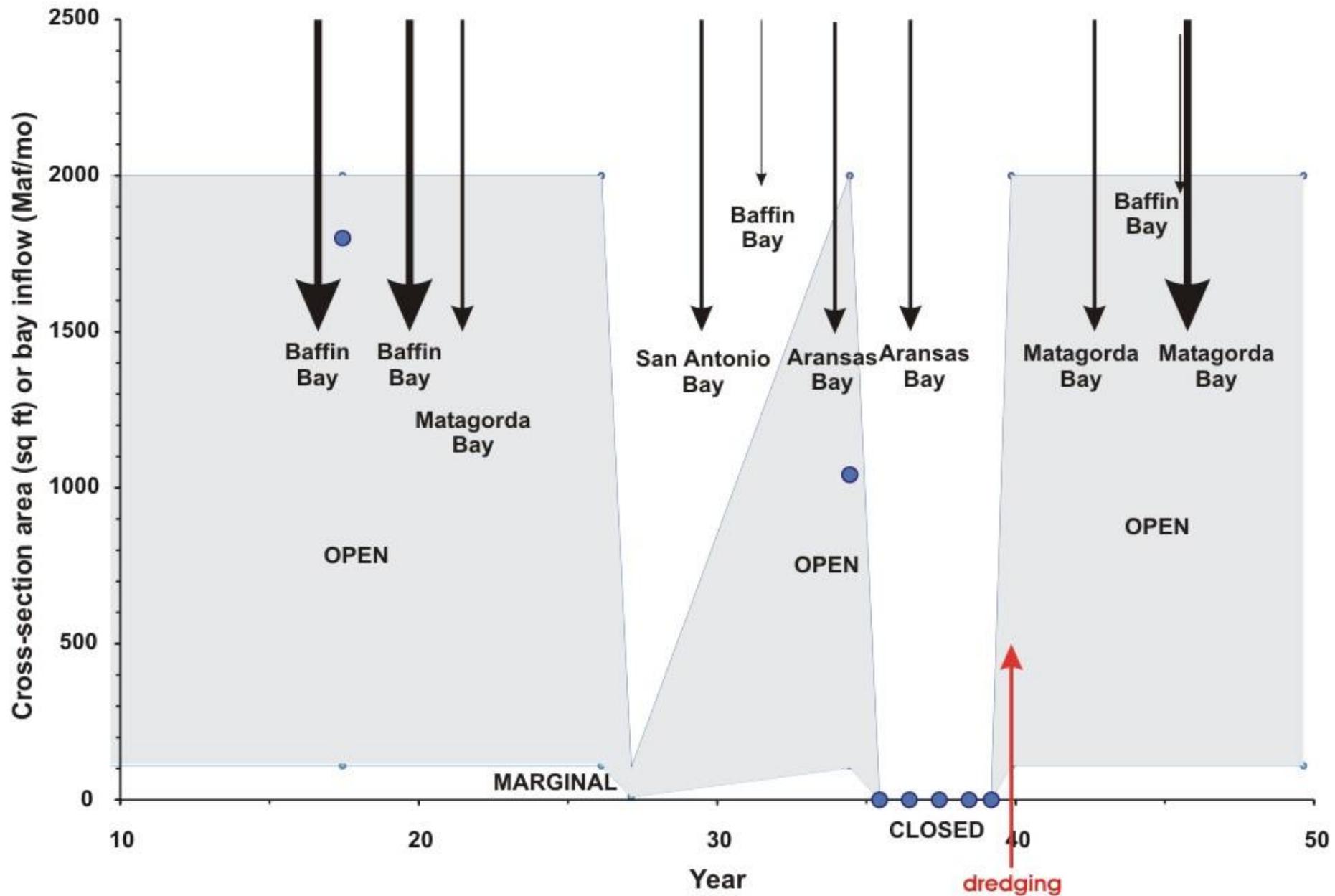
INLET CHANNEL

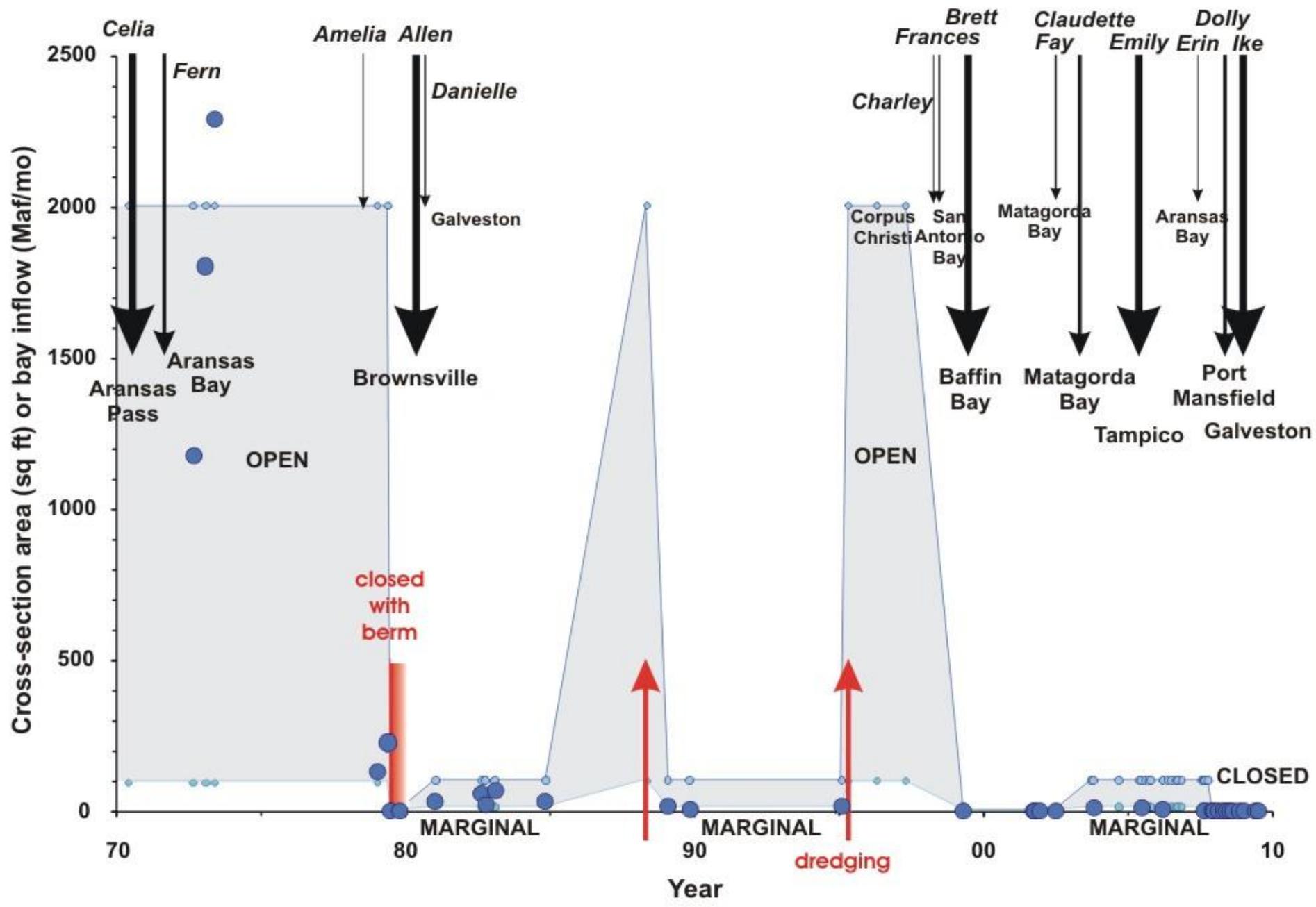
NEARSHORE GULF OF MEXICO

INUNDATION + ONSHORE WIND SETUP

dunes

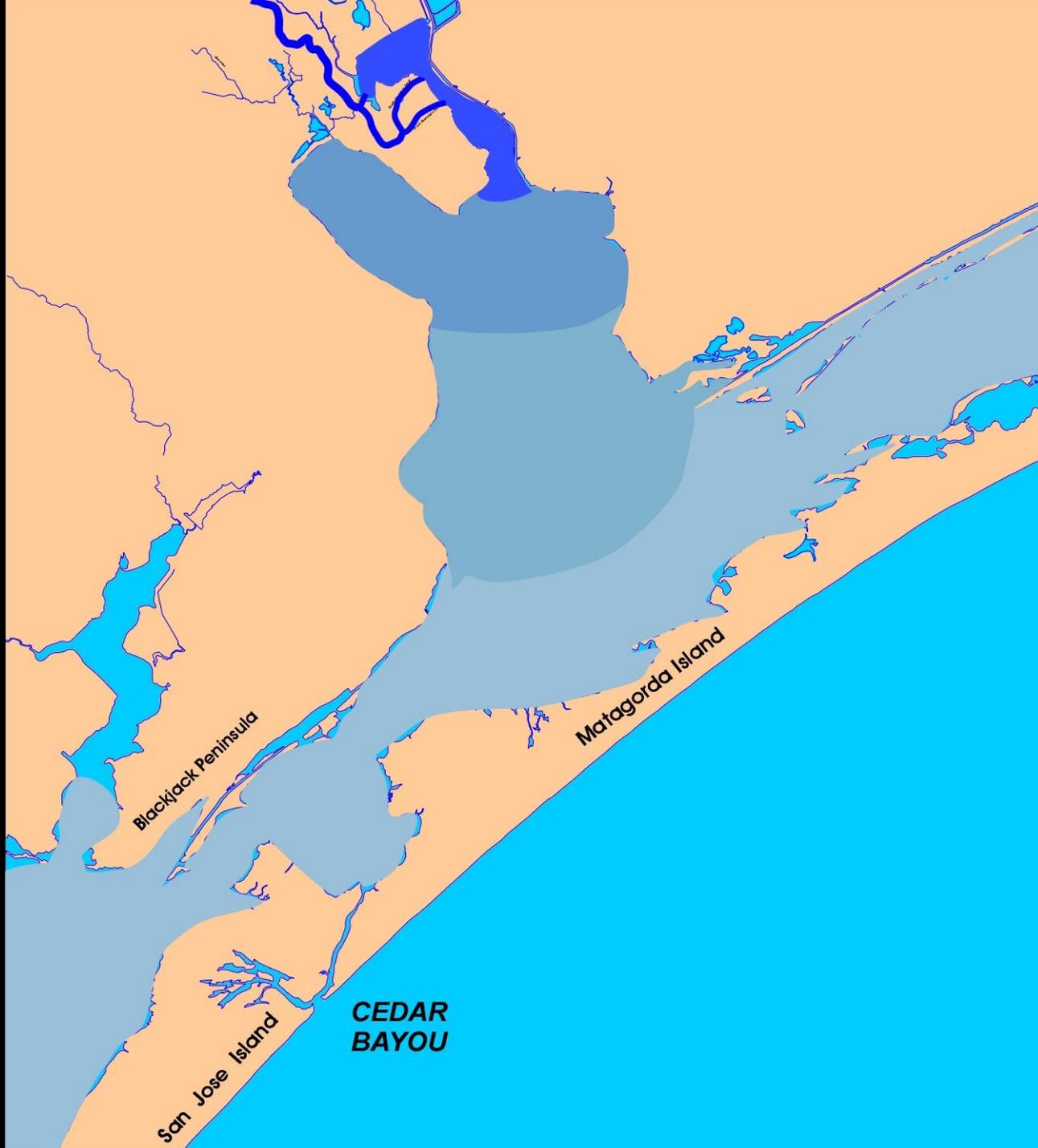
seabed through inlet





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7. Dredging has been ineffective.
8. During the 70's hurricanes may have been a factor in the large inlet dimensions. If so, apparently a direct landfall on Aransas Bay is necessary.



Blackjack Peninsula

Matagorda Island

San Jose Island

**CEDAR
BAYOU**

USGS 1 Feb 79
AR1VEOC00040056

Monthly inflow to San Antonio Bay (Taf)

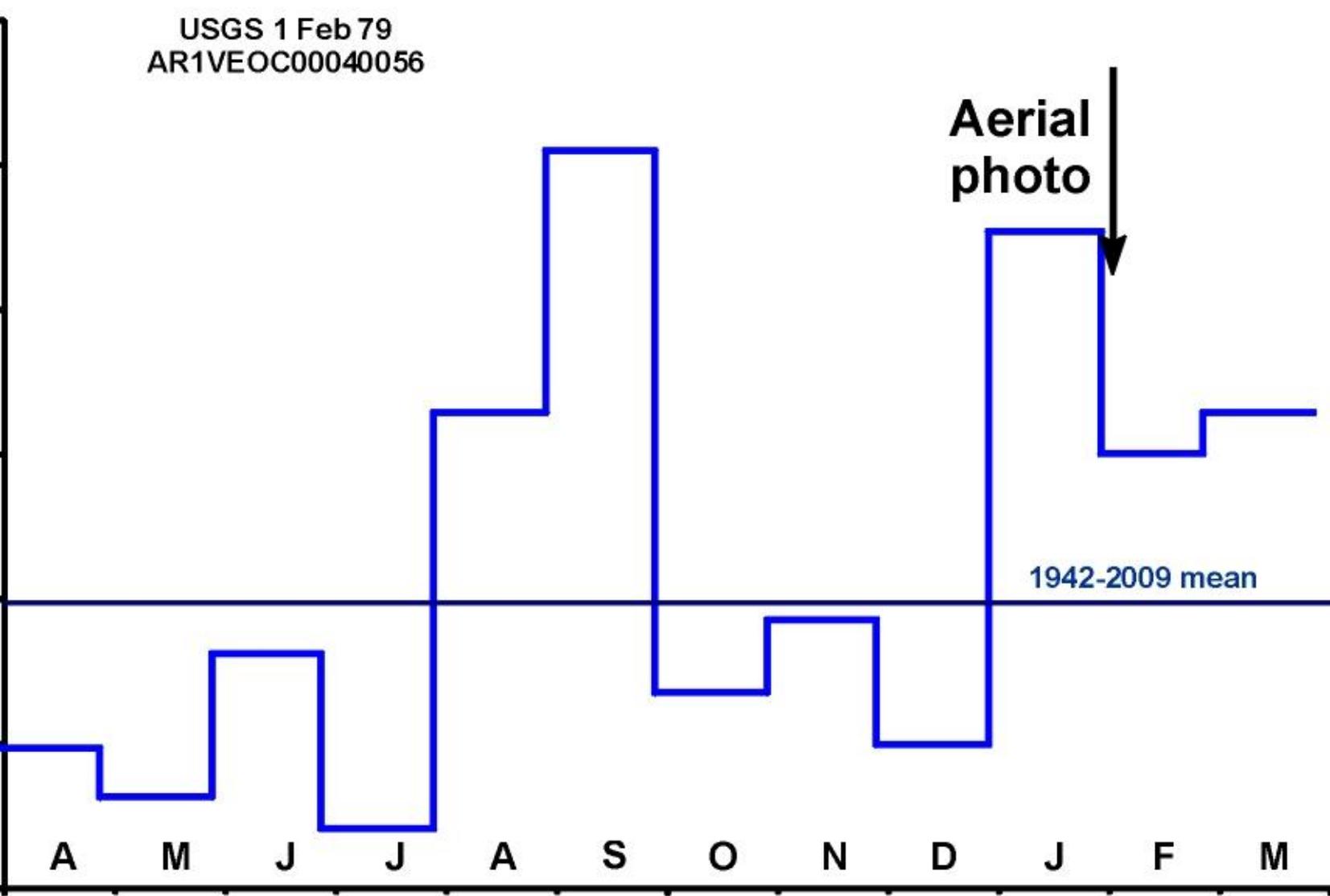
Aerial
photo

1942-2009 mean

78.25 78.50 79.00 79.25

A M J J A S O N D J F M

600
400
200
0



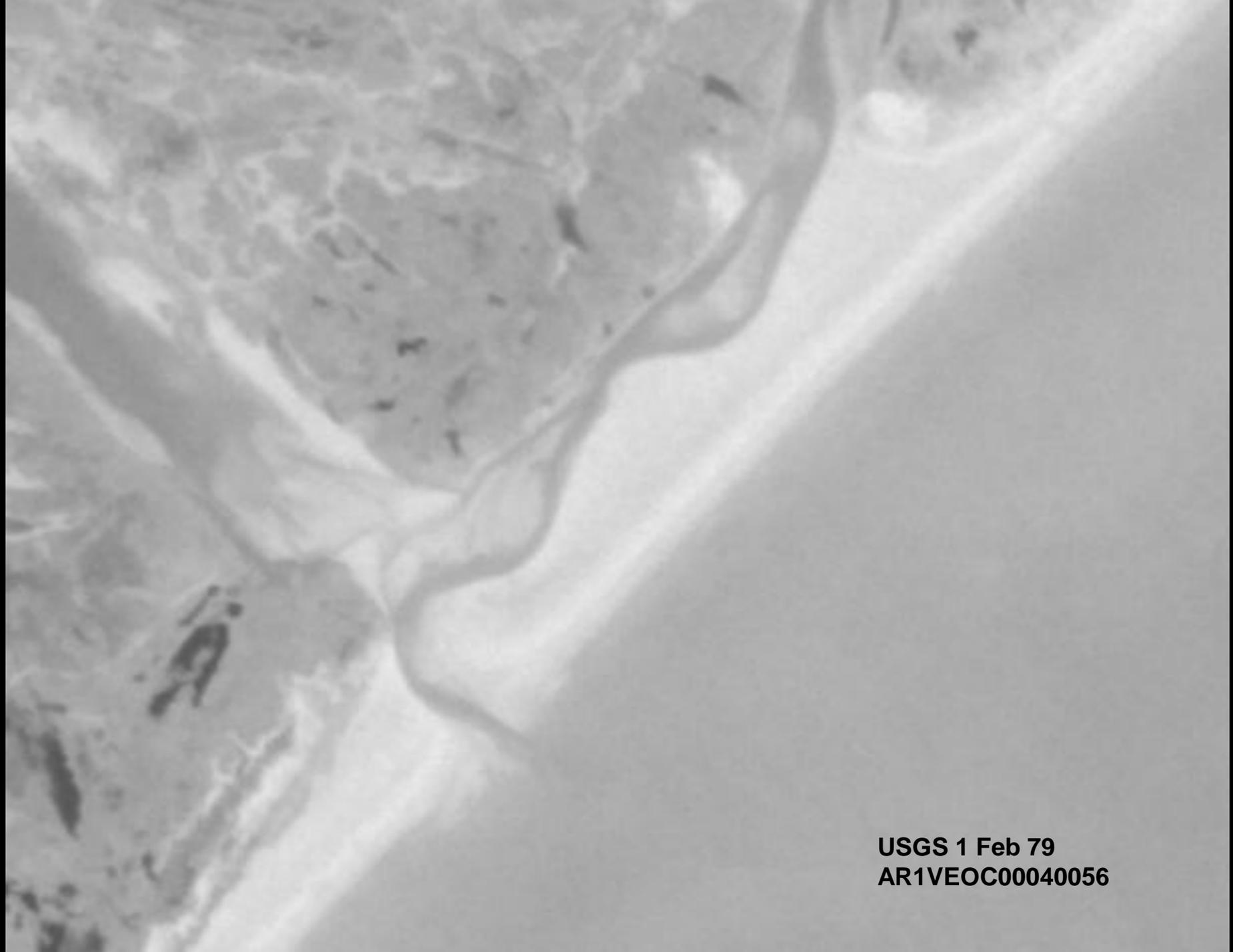
USGS 1 Feb 79
AR1VEOC00040056

GS-VEOC

4-56

1-21-79





USGS 1 Feb 79
AR1VEOC00040056

USGS 22 Apr 69
AR1VCFI00010053

Monthly inflow to San Antonio Bay (Taf)

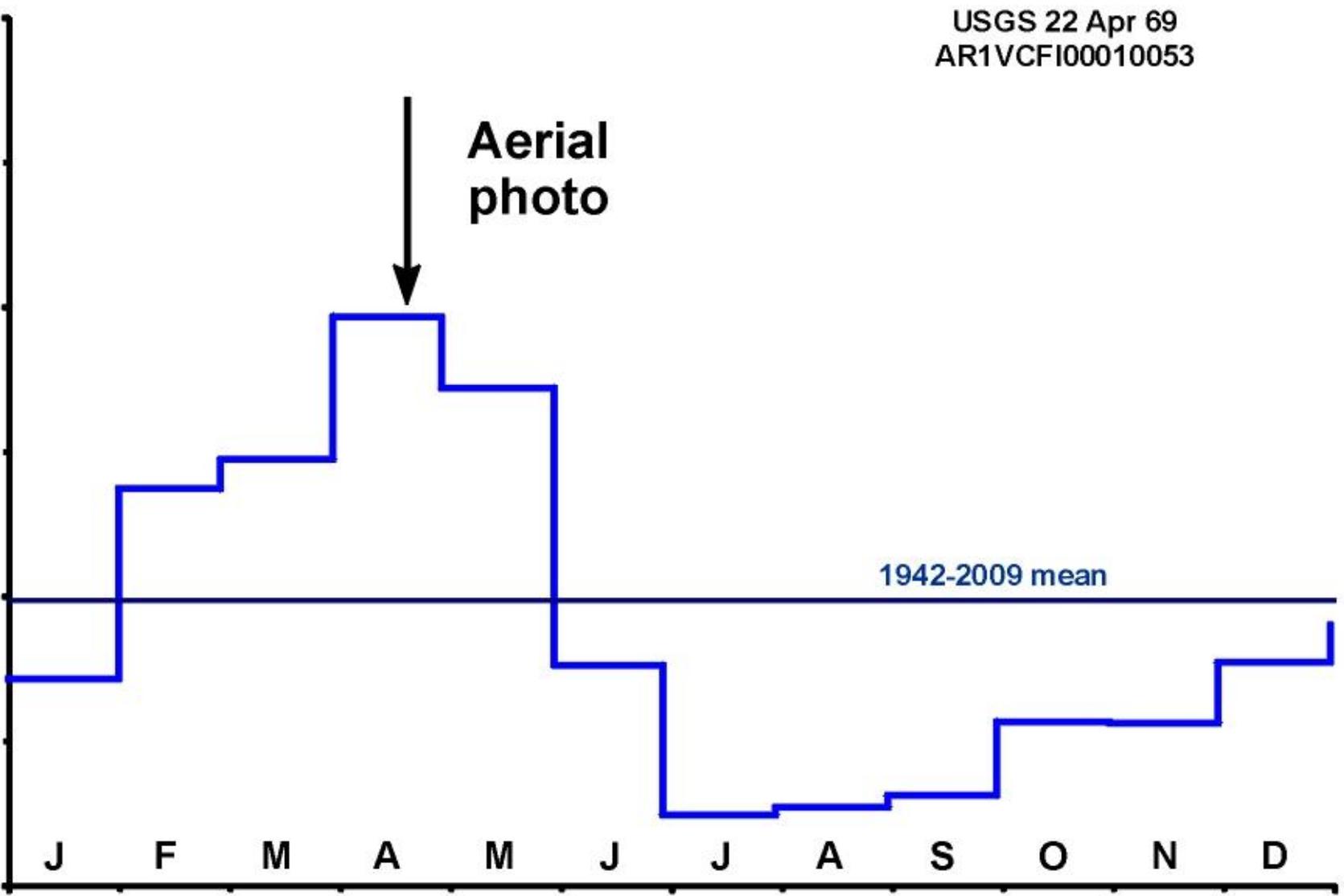
Aerial
photo

1942-2009 mean

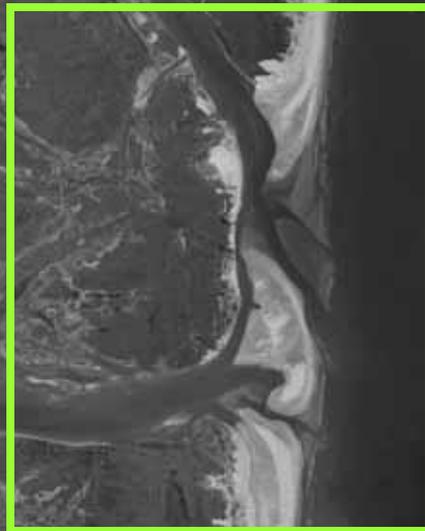
69.00 69.50 70.00

J F M A M J J A S O N D

0 200 400 600



USGS 22 Apr 69
AR1VCFI00010053



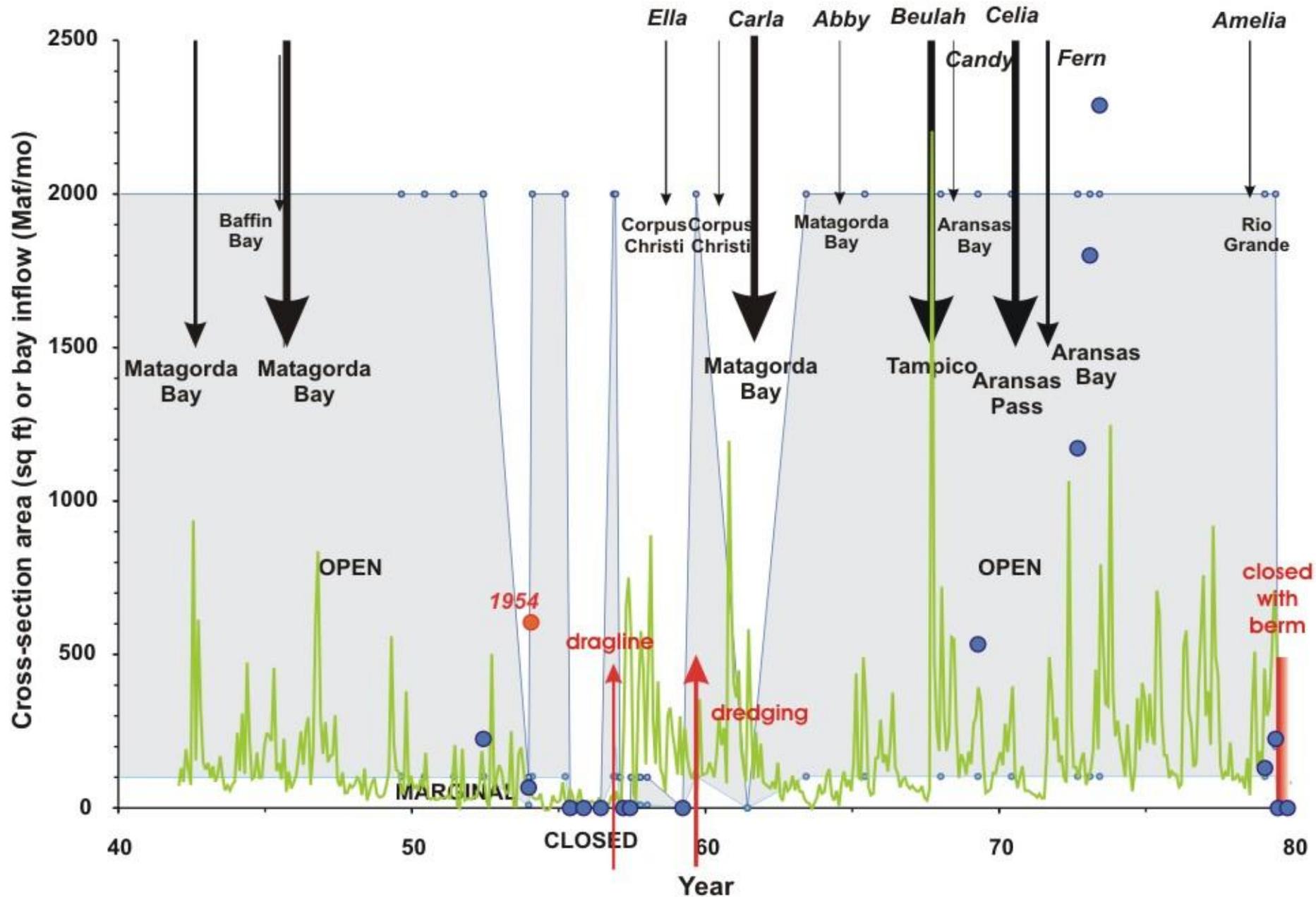
GS-VCFI

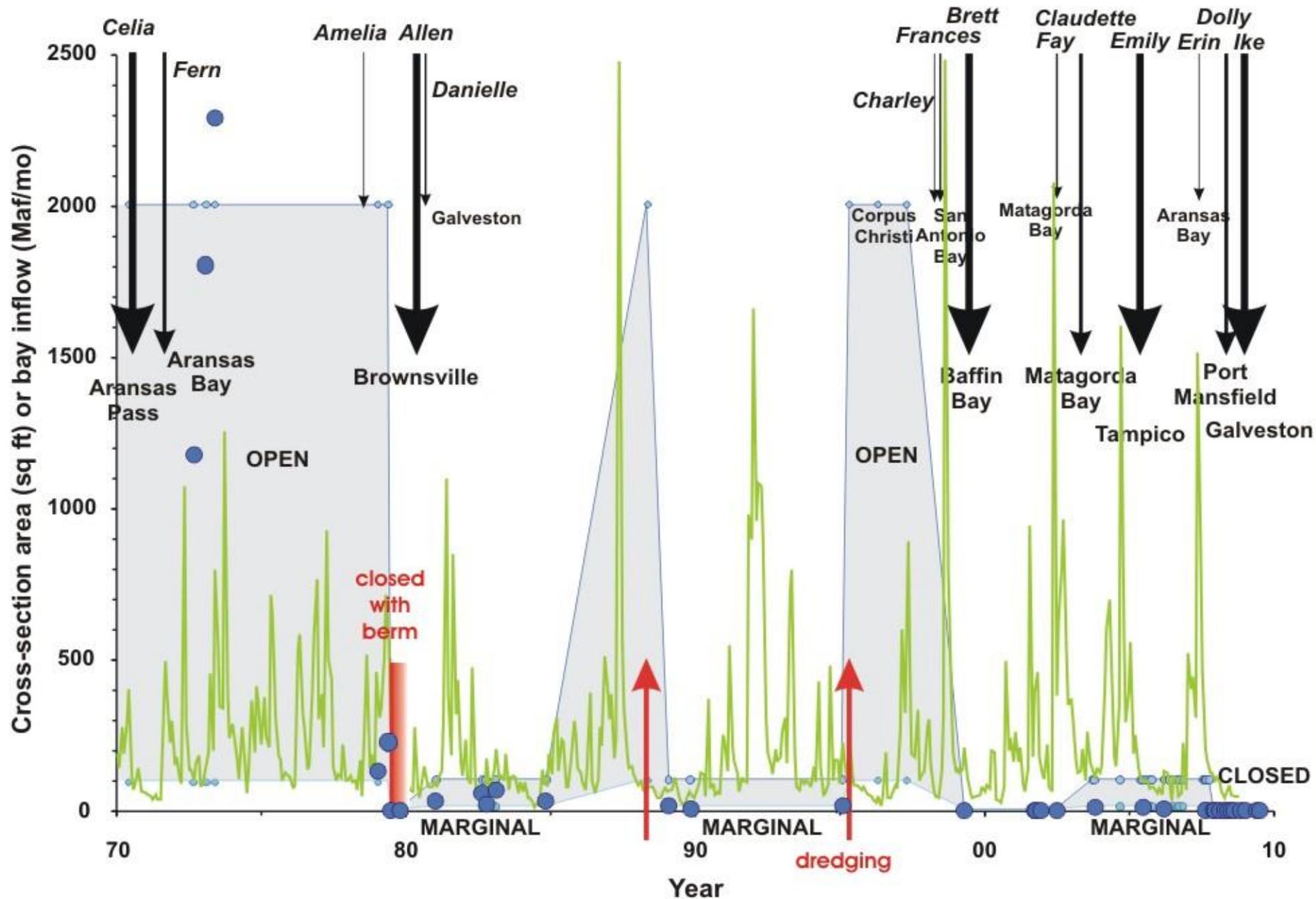
1-53

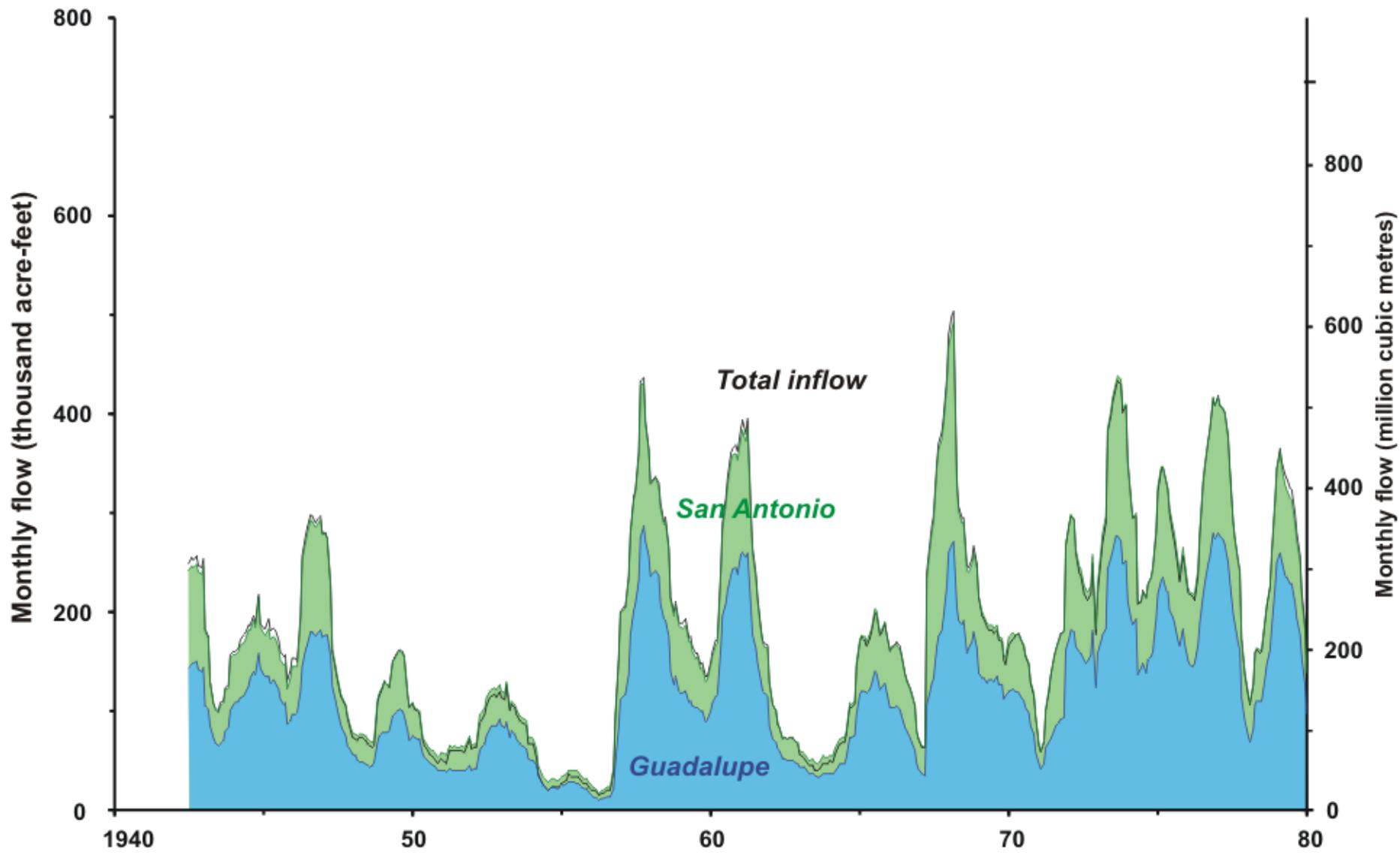
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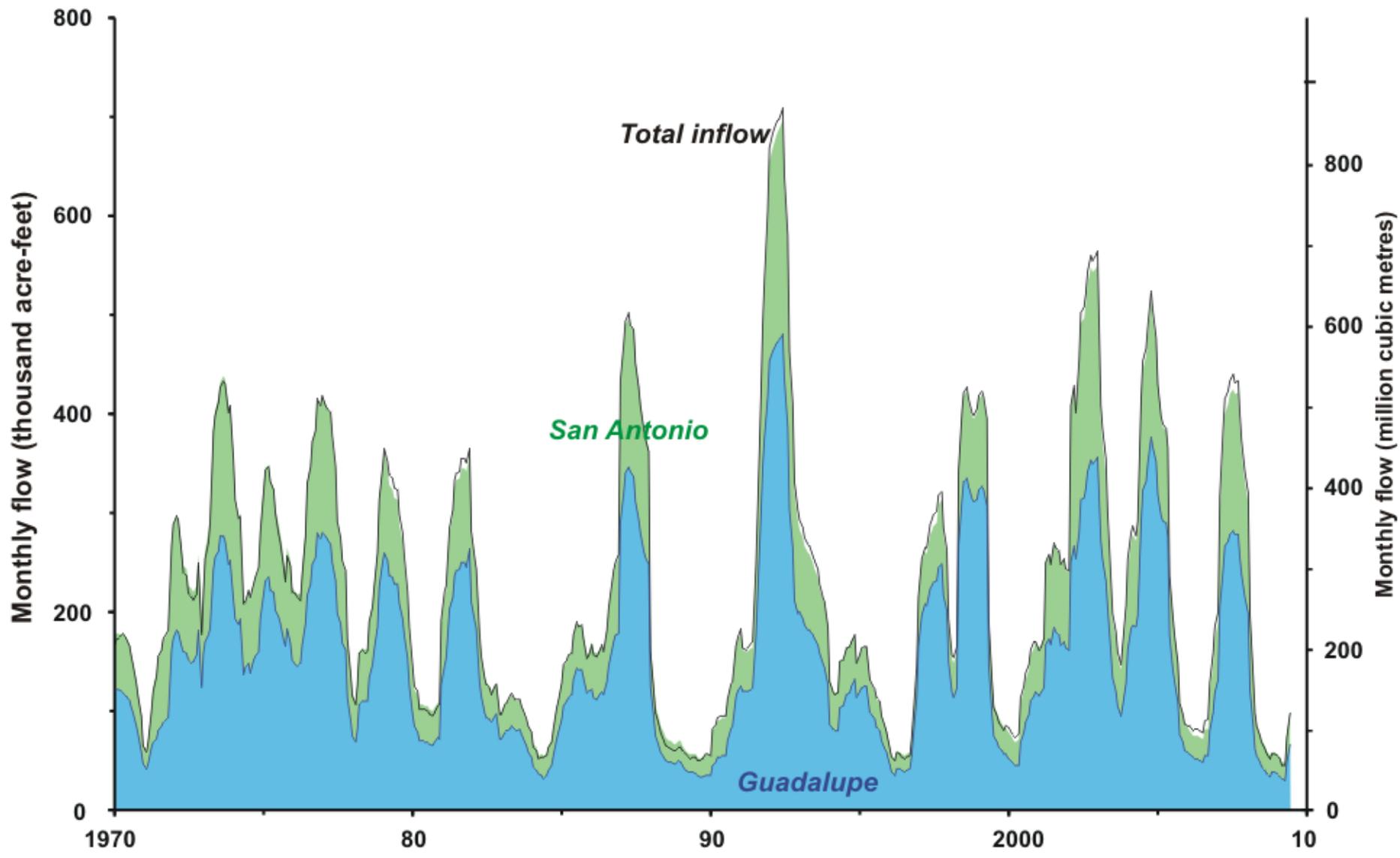
USGS 22 Apr 69
AR1VCFI00010053

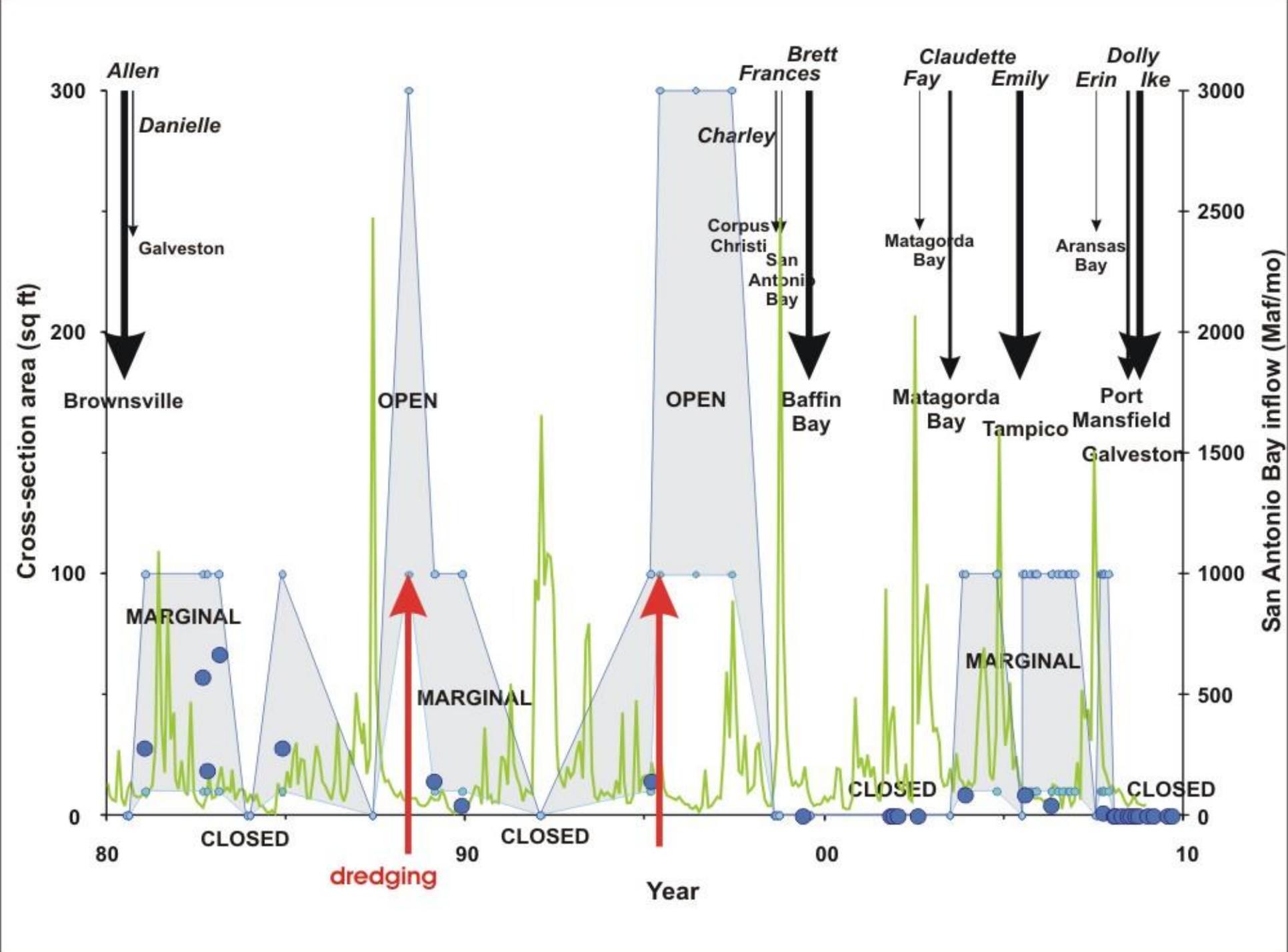








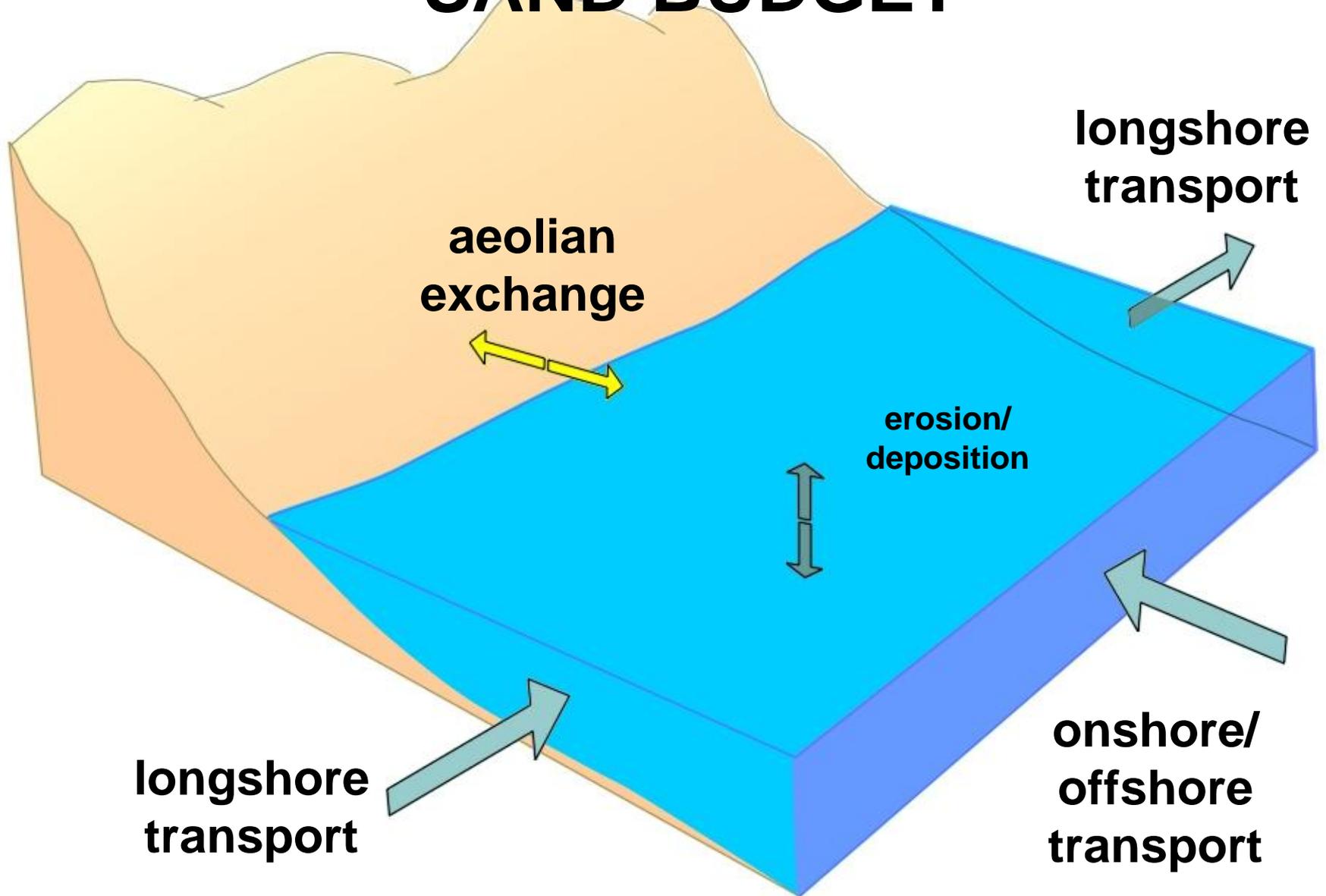




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6. Since 1980, Cedar Bayou has been chronically closed or only marginally open.
7. Dredging has been ineffective.
8. During the 70's hurricanes may have been a factor in the large inlet dimensions. If so, apparently a direct landfall on Aransas Bay is necessary.
9. Freshwater inflow does not appear to play a role in inlet maintenance.

SAND BUDGET



LITTORAL DRIFT



COAST

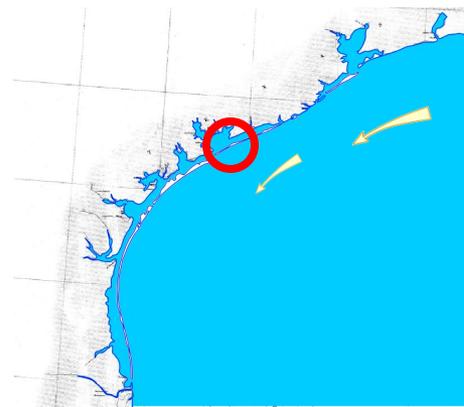


**TRAPPED LITTORAL
SEDIMENTS**



**PREDOMINANT
LITTORAL
DRIFT**

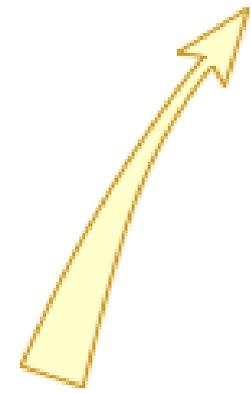
MATAGORDA ENTRANCE CHANNEL



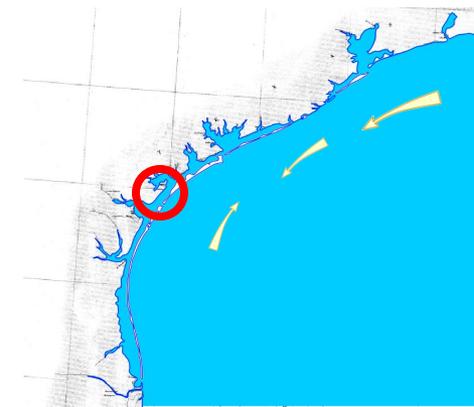


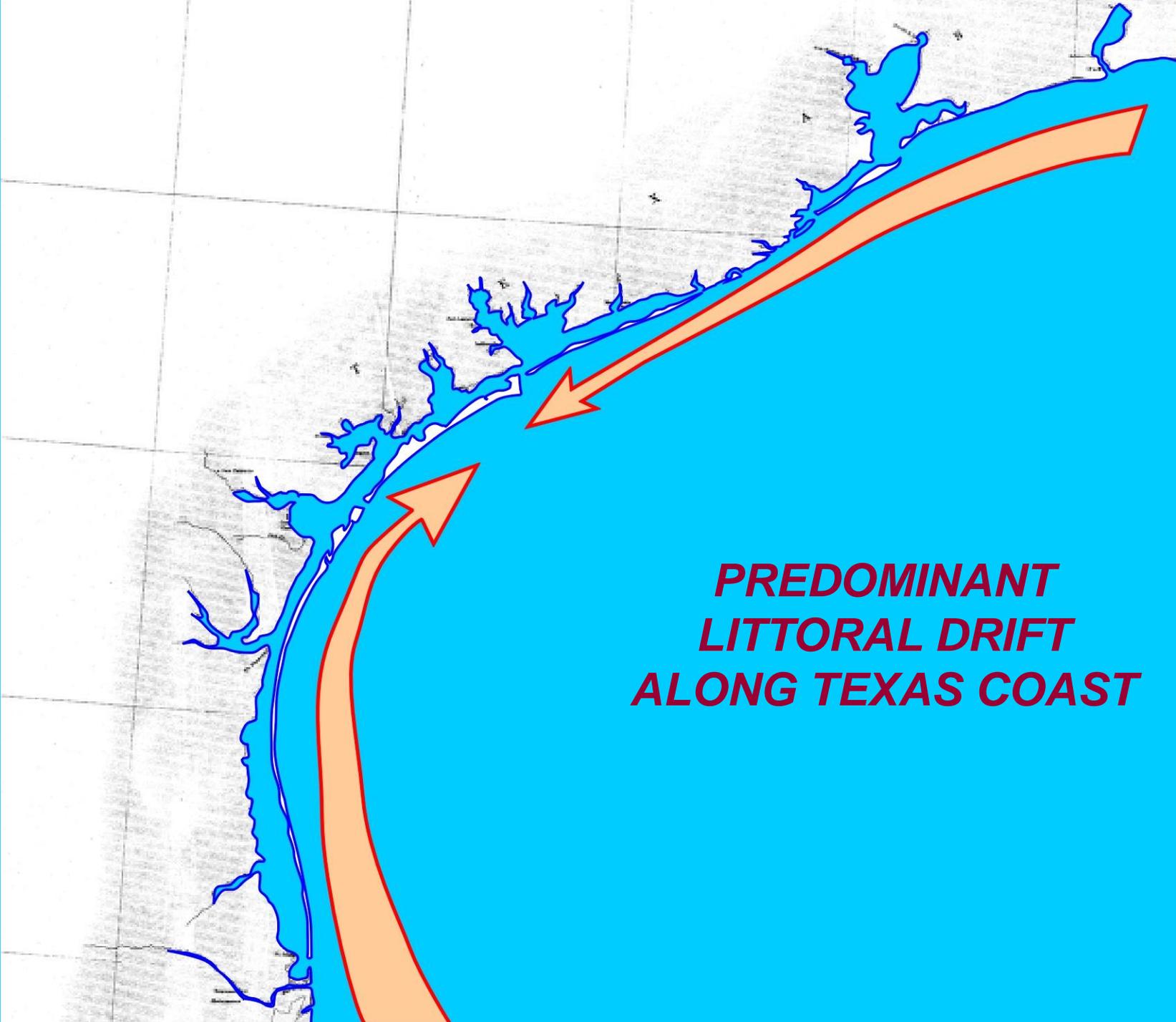
**TRAPPED LITTORAL
SEDIMENTS**

ARANSAS PASS

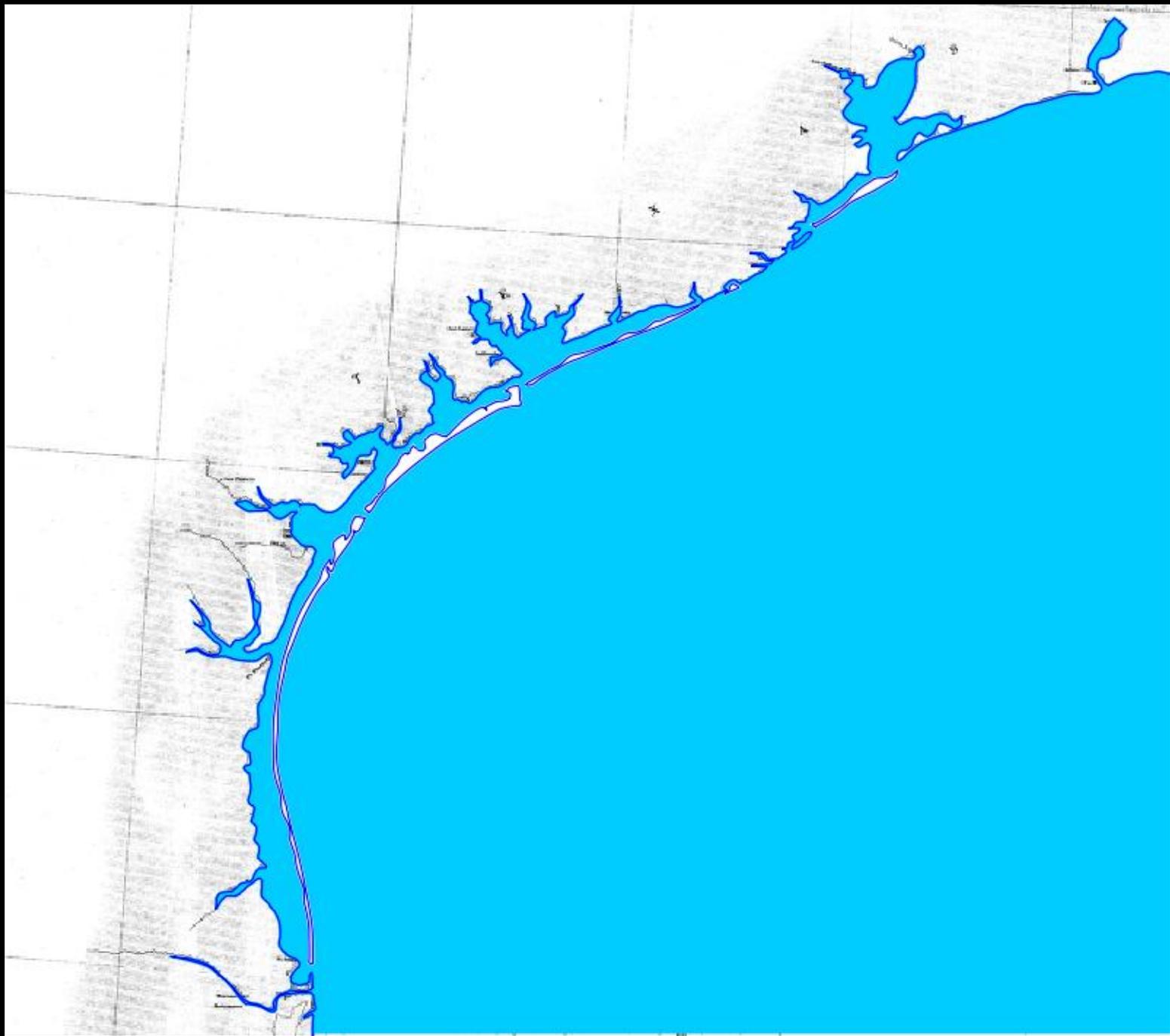


**PREDOMINANT
LITTORAL
DRIFT**





***PREDOMINANT
LITTORAL DRIFT
ALONG TEXAS COAST***



THREE FACTOIDS ABOUT TIDES ON THE TEXAS COAST



“Microtidal” - Offshore tidal range around a meter



Tide range larger on the Gulf shore, smaller inside the bays



Dominated by 4 – 5 principal frequencies

Predominant tidal harmonics on Texas coast

SEMIDIURNAL

12.4 hr

LUNAR

DIURNAL

24.8 hr

LUNAR

FORTNIGHTLY

13.6 da

LUNAR DECLINATION

Predominant “tidal” harmonics on Texas coast

SEMIDIURNAL	12.4 hr	LUNAR-SOLAR
DIURNAL	24.8 hr	LUNAR-SOLAR
FORTNIGHTLY	13.6 da	LUNAR DECLINATION
SEMIANNUAL	6 mos	SECULAR
DECLINATION	18.6 yr	TIDAL EPOCH

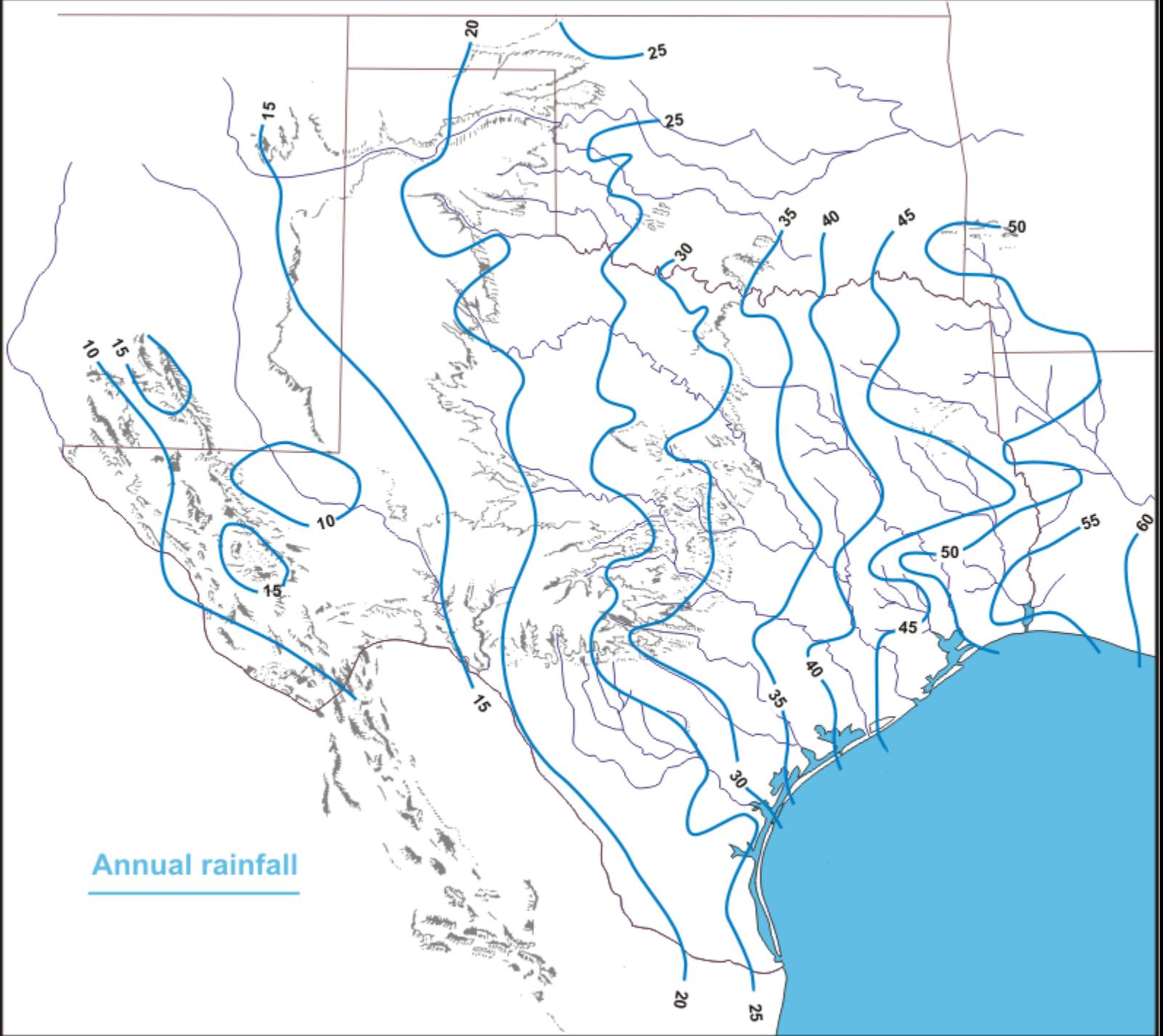
SIX (6) FACTOIDS ABOUT TEXAS SURFACE WATER



**RAINFALL IS PRODUCED ALMOST ENTIRELY FROM
DEEP CONVECTION**



**RAINFALL DECLINES PRECIPITOUSLY FROM EAST TO
WEST**



Annual rainfall

SIX (6) FACTOIDS ABOUT TEXAS SURFACE WATER

RAINFALL IS PRODUCED ALMOST ENTIRELY FROM DEEP CONVECTION

RAINFALL DECLINES PRECIPITOUSLY FROM EAST TO WEST



RUNOFF IS SMALL AS A PROPORTION OF RAINFALL



RUNOFF DECLINES EVEN MORE PRECIPITOUSLY FROM EAST TO WEST

SIX (6) FACTOIDS ABOUT TEXAS SURFACE WATER

RAINFALL IS PRODUCED ALMOST ENTIRELY FROM DEEP CONVECTION

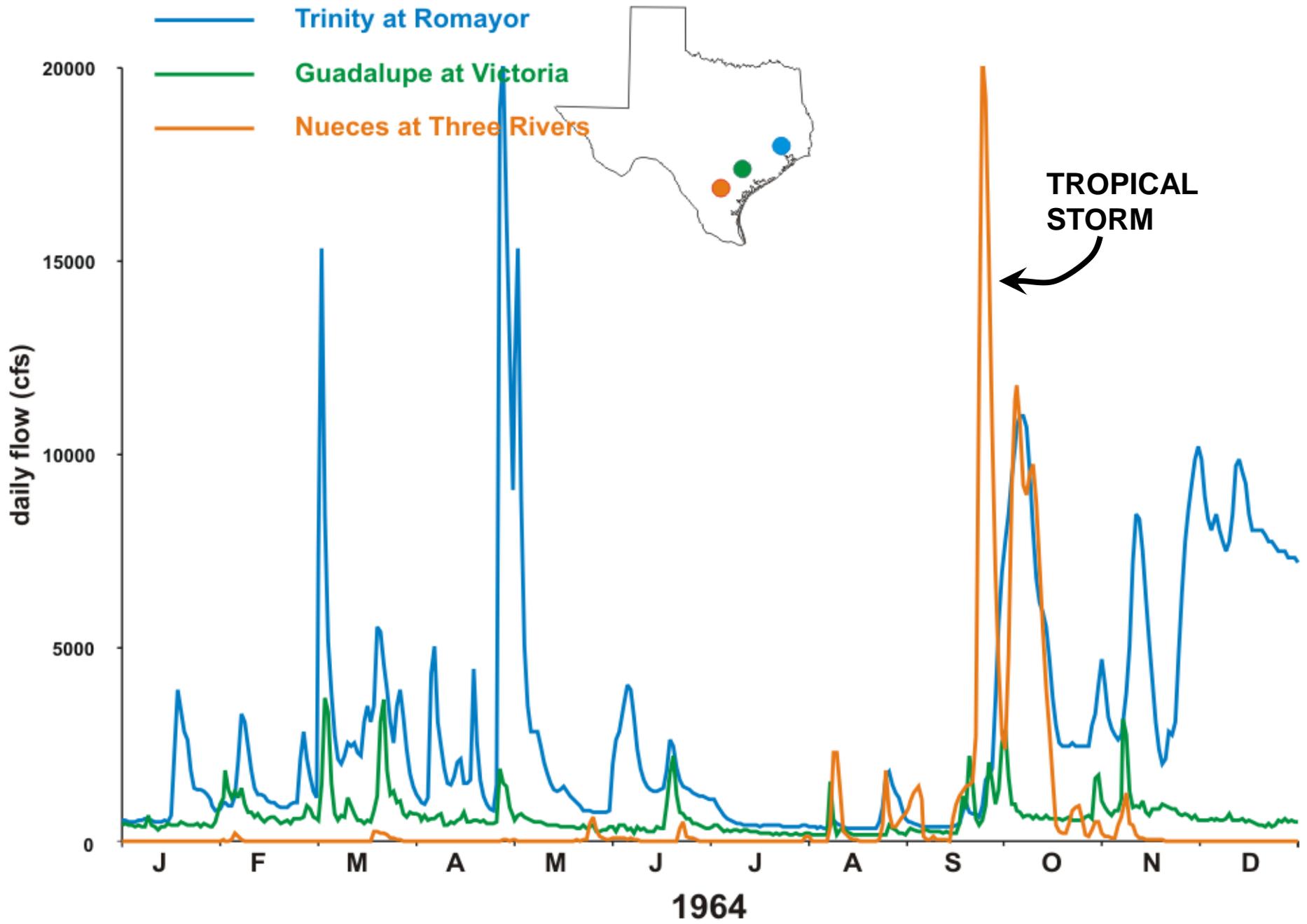
RAINFALL DECLINES PRECIPITOUSLY FROM EAST TO WEST

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STREAMFLOW IS FLASHY



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STREAMFLOW IS FLASHY



STREAMFLOW EXHIBITS LARGE VACILLATIONS ON TIME SCALES OF MONTHS TO YEARS

ESTUARY HYDROGRAPHY (a.k.a. circulation)

PRIMARY FORCING FACTORS



MORPHOLOGY & BATHYMETRY



TIDES



HYDROLOGY (FRESHWATER INFLOW)



METEOROLOGY



SALINITY INTRUSION
(DENSITY CURRENTS)

A large alligator is shown in a body of water, with its mouth wide open. The alligator's dark, scaly skin is visible, and the water around it is turbulent and white with foam. The text 'QUESTIONS ?' is overlaid on the left side of the image in a blue, outlined font.

QUESTIONS ?