

Mouth Closure at the Tijuana Estuary

Jeff Crooks

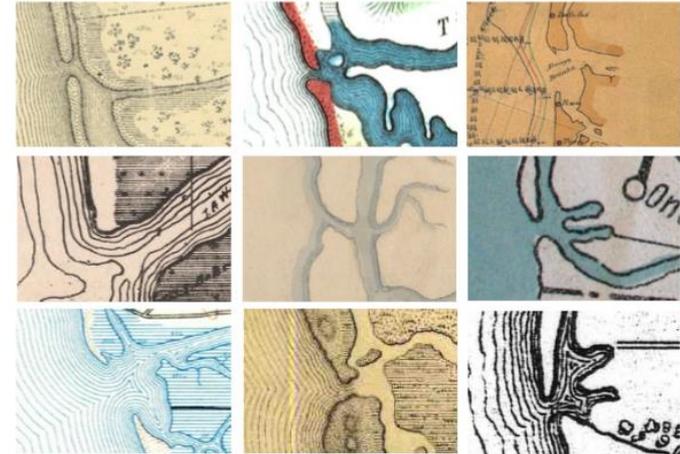
Tijuana River National Estuarine Research Reserve

J McCullough, M Almeida, M Cordrey, J Lorda, B Collins

Tijuana River Mouth Over Time

Year	Source	Inlet Condition
1849	Gray 1849	O
1850	Hardcastle and Gray 1850	O
1850	Ilarregri and Chavero 1850	O
1850	Ilarregri 1850	O
1852	Harrison 1852	O
1854	Poole 1854	O
1875	Denton and Lauteren 1875	O
1881	Unknown 1881	O
1883	Fox & Wiley 1883	O
1886	Clark 1886	A
1887	San Diego Land and Town Company 1887	O
1889	Beasley 1889	O
1889	Mansfield 1889	O
1889	Ryan and Humphreys 1889	O
1900	Denton 1900	O
1901	International Boundary Commission 1901	O
1904	USGS 1904	O
1906	Crowell 1906	O
1910	Rodney Stokes Co. Inc. 1910	O
1912	Alexander 1912	O
1914	Alverson 1914	O
1915	Cromwell 1915	O
1917	Automobile Club of Southern California 1917	O
1917	Guldbaum 1917	O
1918	Savage 1918	O
1920	Rodney Stokes Co. Inc. 1920	O
1921	Ervast 1921	O
1922	San Diego & Arizona Railway 1922	O

Year	Source	Inlet Condition
1928	Mora 1928	O
1929	Adams and Favela 1929	O
1929	Department of Public Works 1929	O
1930	Automobile Club of Southern California 1930	O
1930	USGS 1930	O
1931	Blackburn 1931	O
1931	Harwood 1931	O
1933	USCGS 1933	O
1935	City of San Diego 1935	C
1935	Klare 1935	O
1935	Sipe and McBean 1935	O
1937	Lee 1937	O
1937	Cruse 1937	O
1937	Unknown 1937	O
1943	USGS 1943	O
1944	Guayle 1944	O
1946	City of San Diego 1946	O
1950	Thomas 1950	O
1953	Nichols 1953	O
1953	USGS 1953	O
1935	Rand McNally 1935a	O
1935	Rand McNally 1935b	O
ca. 1880	San Diego Land & Town Company ca. 1880	O
ca. 1900	E. M. Burbeck ca. 1900	O
ca. 1900	Knight ca. 1900	O
ca. 1900	5[????] ca. 1900	O
ca. 1950	Metsker Maps ca. 1950	O
n.d.	Southern California Mountain Water Co. n.d.	O



**Waves
vs.
Tides & River**

Inlet condition	
O	open
C	closed
A	ambiguous

Table XX1883. We analyzed the depiction of the Tijuana estuary inlet in 57 unique historical (1849-1960) cartographic sources. The inlet was classified as "open" if a source suggested that some ocean water could enter the estuary, even if there was closure in the intertidal. All but two of the unique historical (1849-1960) cartographic sources reviewed for this project depict the Tijuana estuary with an open inlet. One 1935 map shows the estuary with a closed inlet, and one shows in the inlet in an ambiguous state. Bold font is used for maps that were likely drawn from direct observations/surveys of the Tijuana estuary.

Tijuana Estuary Mouth Closure 1982 – 1983 El Nino

Effects of frequent storms on vegetation

JB Zedler

544



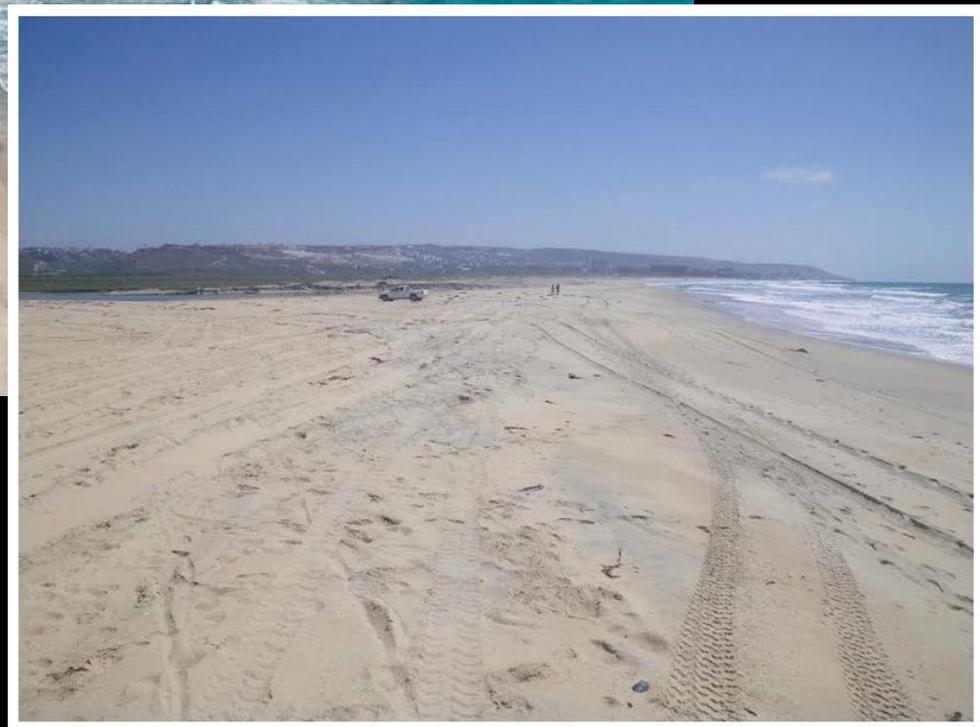
Figure 5. The mouth of the Tijuana Estuary (a) closed in April 1984 and remained closed until sand was dredged from the channels and replaced on the dunes, and bulldozers reopened it (b) in December 1984.



Tijuana River Mouth

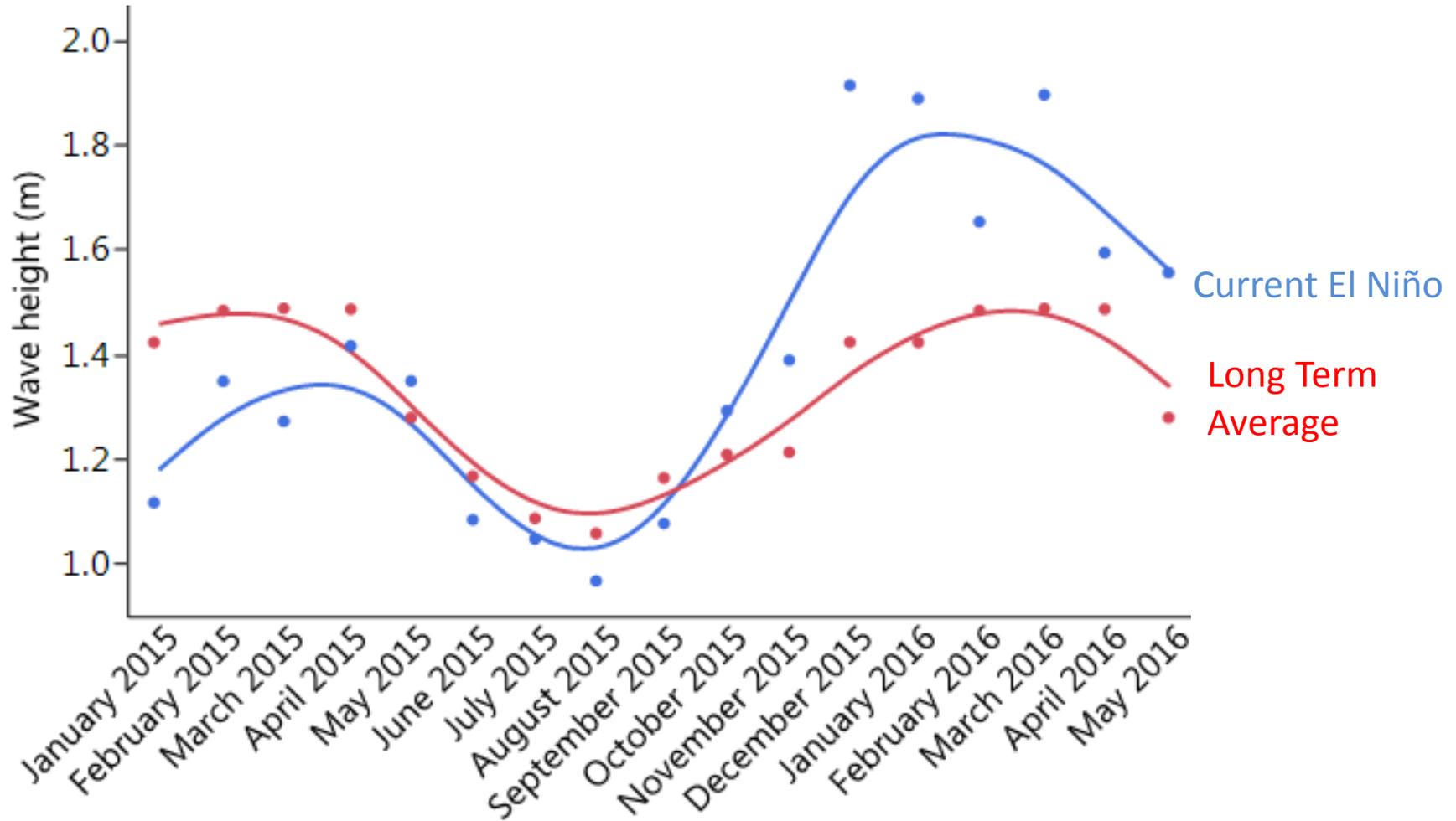


Tijuana River Mouth



David Smith

Wave Heights at Point Loma Buoy



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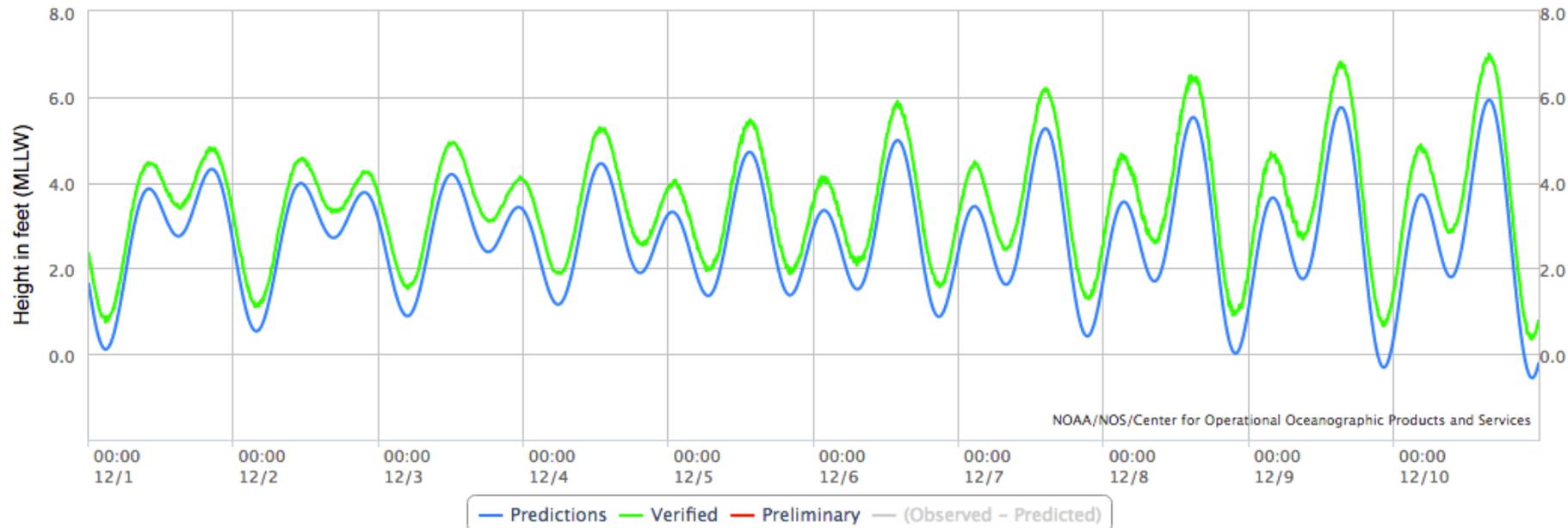
Station Info

Tides/Water Levels

Meteorological Obs.

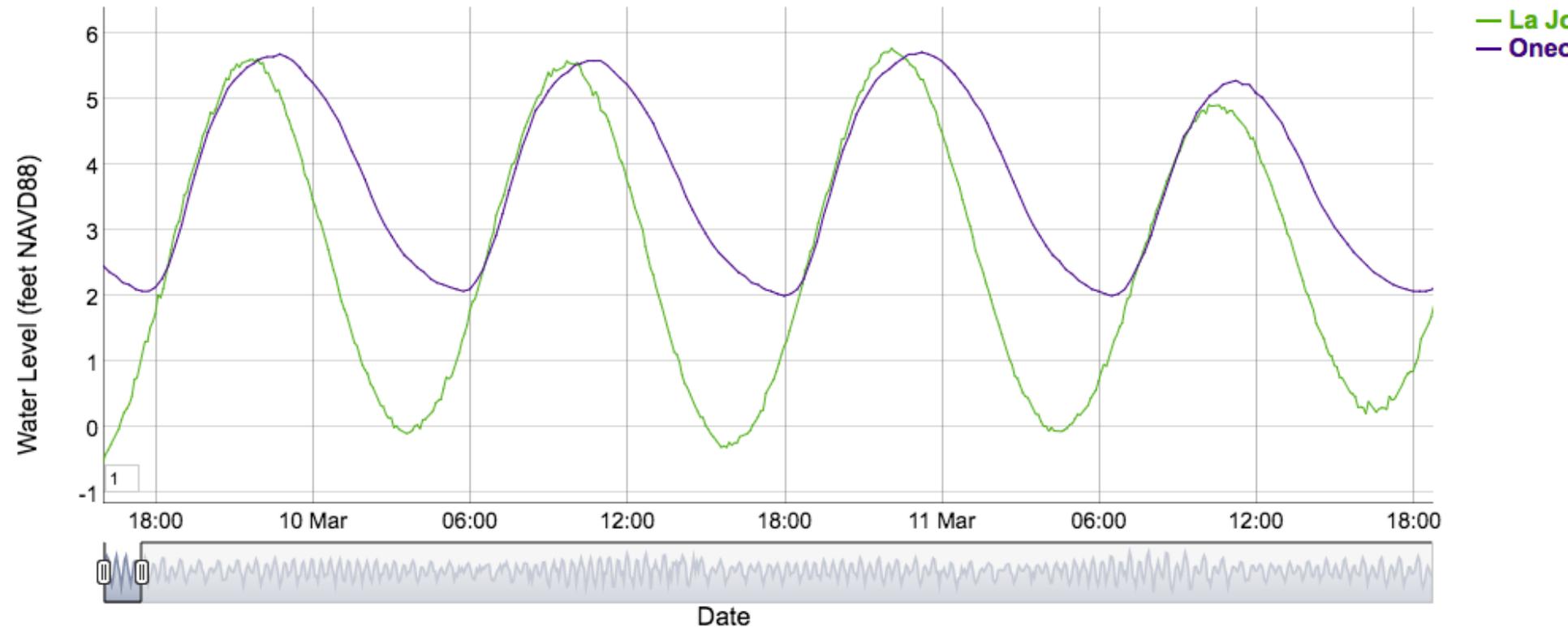
Phys. Oceanography

NOAA/NOS/CO-OPS
 Observed Water Levels at 9410230, La Jolla CA
 From 2015/12/01 00:00 GMT to 2015/12/10 23:59 GMT



TRNERR Oneonta Slough station water levels with NOAA La Jolla

All data is preliminary and has not undergone any QAQC procedures



Show Series:

- NOAA at La Jolla (predicted)
- NOAA at La Jolla (observed)
- TRNERR Oneonta Slough

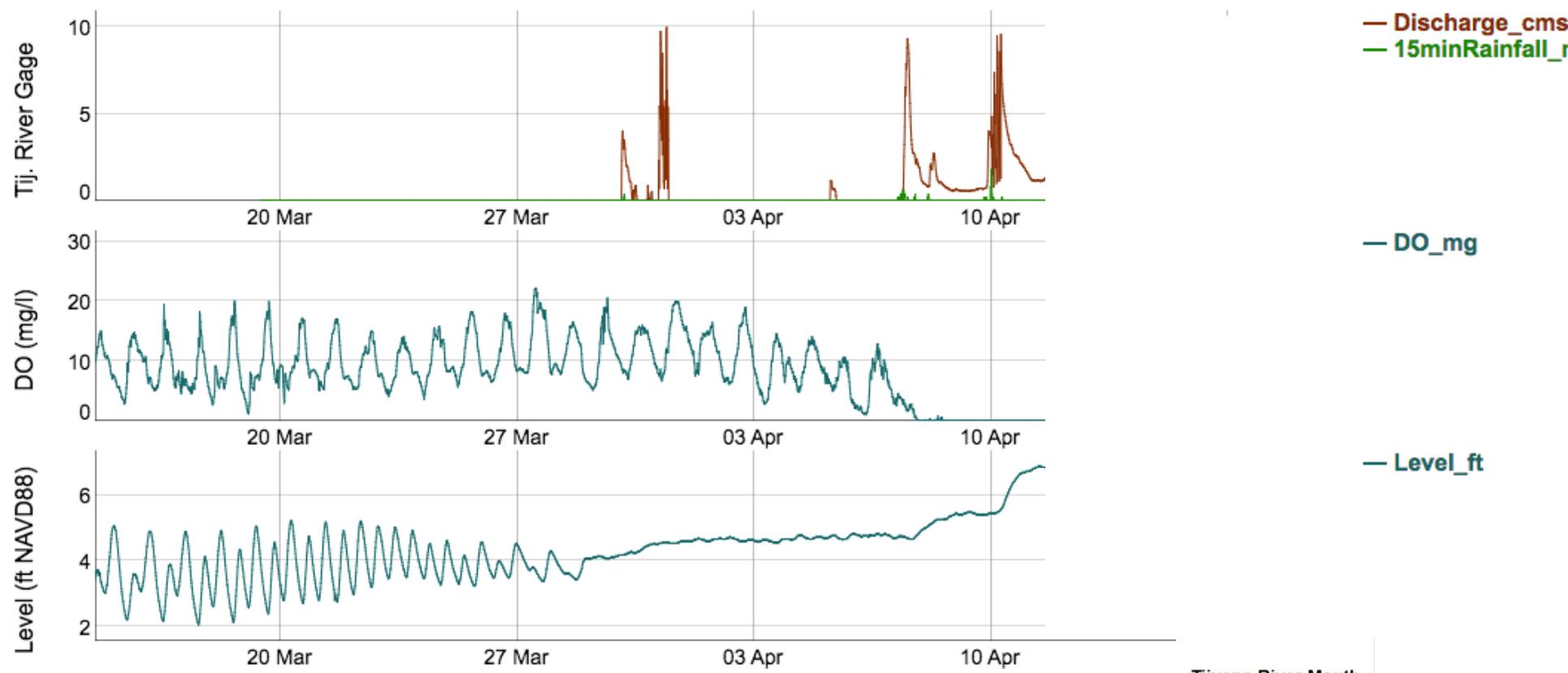
Chart Options:

NOTES:

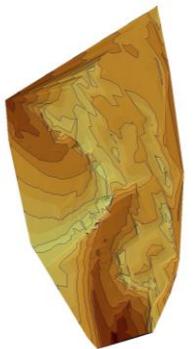
- All times are Pacific Standard Time
- La Jolla is sampled at 6 min intervals
- TRNERR station at 15 min intervals

TRNERR Oneonta Slough station water quality with IBWC river gage data

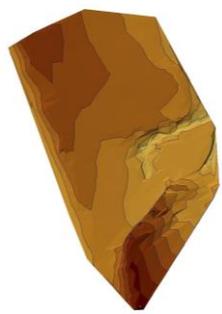
All data is preliminary and has not undergone any QA/QC procedures (please see links below for further information)



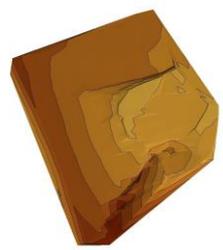
November 23, 2015



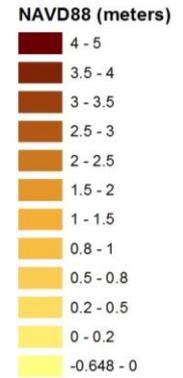
March 31, 2016



April 11, 2016



Tijuana River Mouth Elevation Survey

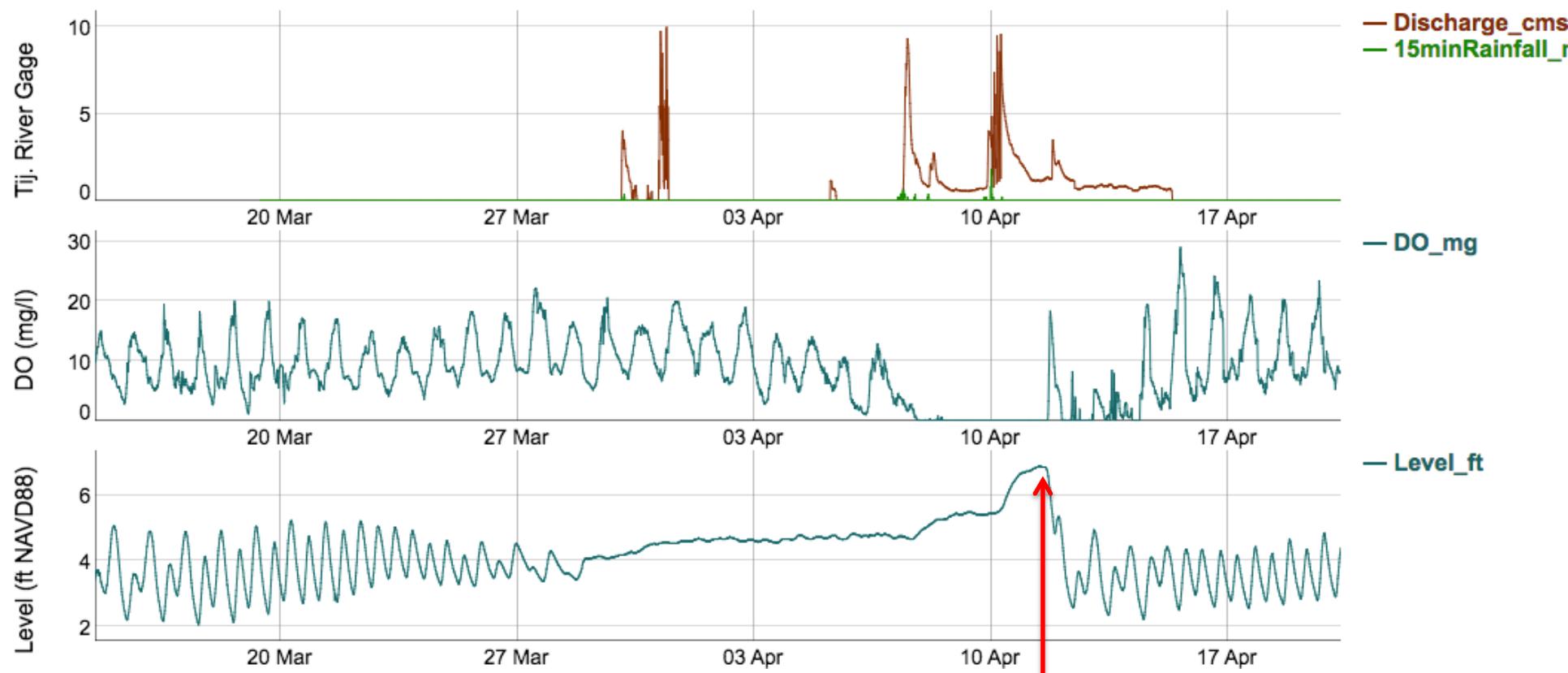






TRNERR Oneonta Slough station water quality with IBWC river gage data

All data is preliminary and has not undergone any QA/QC procedures (please see links below for further information)



TJ river mouth reopened after flooding, shark deaths

El Niño conditions pushed enough sand into the mouth of the Tijuana River south of Imperial Beach to close off the flow of the river to the ocean. With the weekend rains water from the closed off estuary was backing up into Imperial Beach streets, forcing an emergency opening of the river mouth with heavy equipment Monday afternoon. After the water receded it became apparent that the oxygen depleted waters had been fatal to many leopard sharks, mollusks and other species that inhabit the area.



Sea gulls ate the remains of a leopard shark killed when the estuary was closed off from the ocean. — John Gibbins / San Diego Union-Tribune

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Dozens of leopard sharks died near the mouth of the Tijuana River. (Serge Dedina)



Purple
Varnish
Clams



Anoxic Creek Bottom & Wrack

Bubble Snails

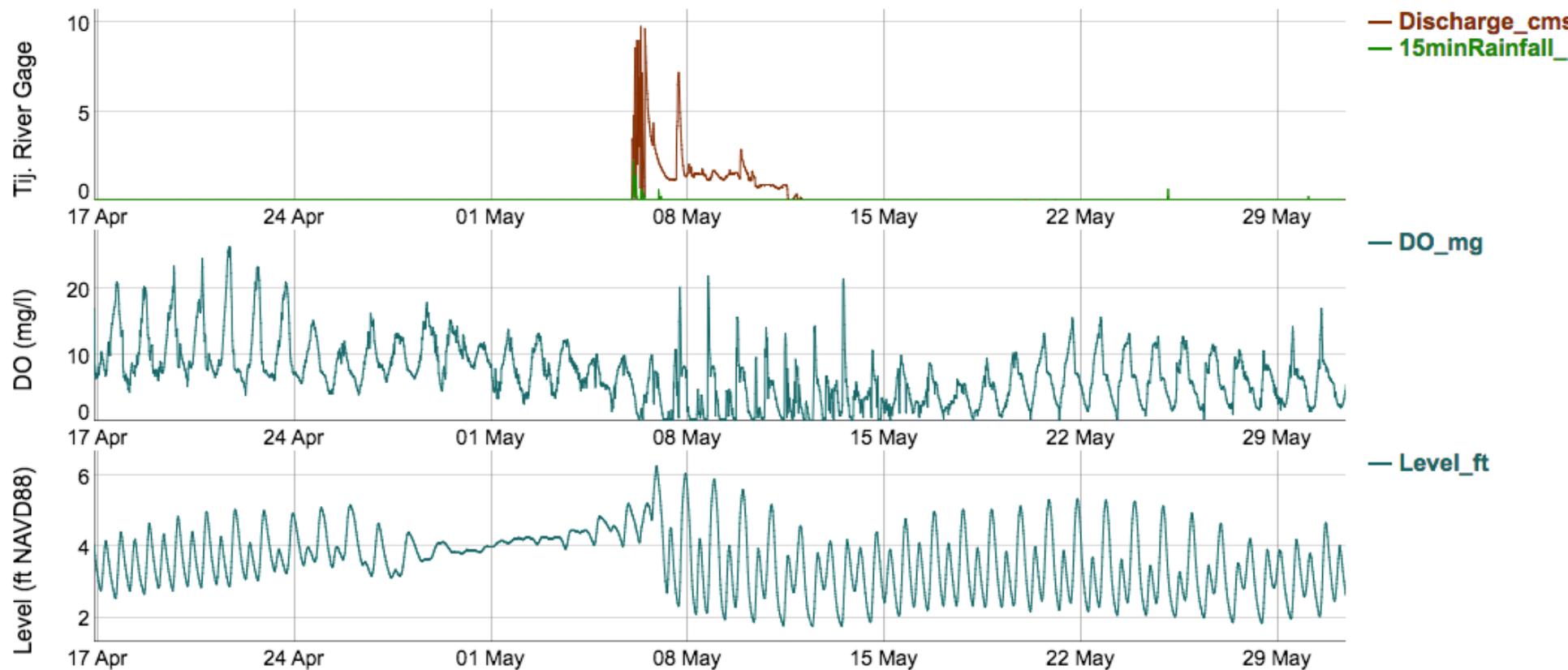


Fish & Sea Hare



TRNERR Oneonta Slough station water quality with IBWC river gage data

All data is preliminary and has not undergone any QA/QC procedures (please see links below for further information)



New sand poses possible threat to Tijuana River

Officials at Tijuana River reserve prepare for worst in wake of replenishment project in Imperial Beach

By Katherine P. Harvey | 11:35 a.m. Feb. 6, 2013



With Tijuana landmarks in the distance a man strolls beside the Tijuana Estuary near where it empties into the ocean. New sand on Imperial Beach is migrating south and threatens to close the mouth of the estuary. — Bill Wechter / UT San Diego

IMPERIAL BEACH — While some residents fight to stay afloat after a recent sand replenishment project in Imperial Beach went awry, the keepers of the Tijuana estuary prepare to keep the waters flowing at the river's mouth.

The sand has not yet closed off the estuary, and it might not ever do so, but reserve manager Brian Collins said he and his team are preparing for the worst at the Tijuana River Estuarine Research Reserve.

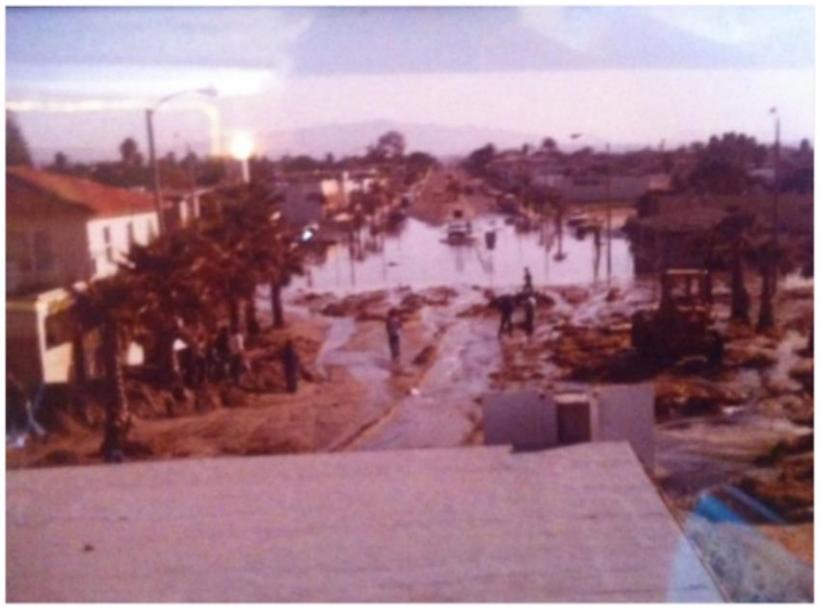


Ecological 'Heart Attack' Feared if IB Sand Closes the Tijuana River

Experts at the Tijuana River National Estuarine Research Reserve are concerned sand from a recent replenishment project could impact flow of the Tijuana River and threaten life supported by Southern California's largest coastal wetland.

Imperial Beach, CA Like Share 0

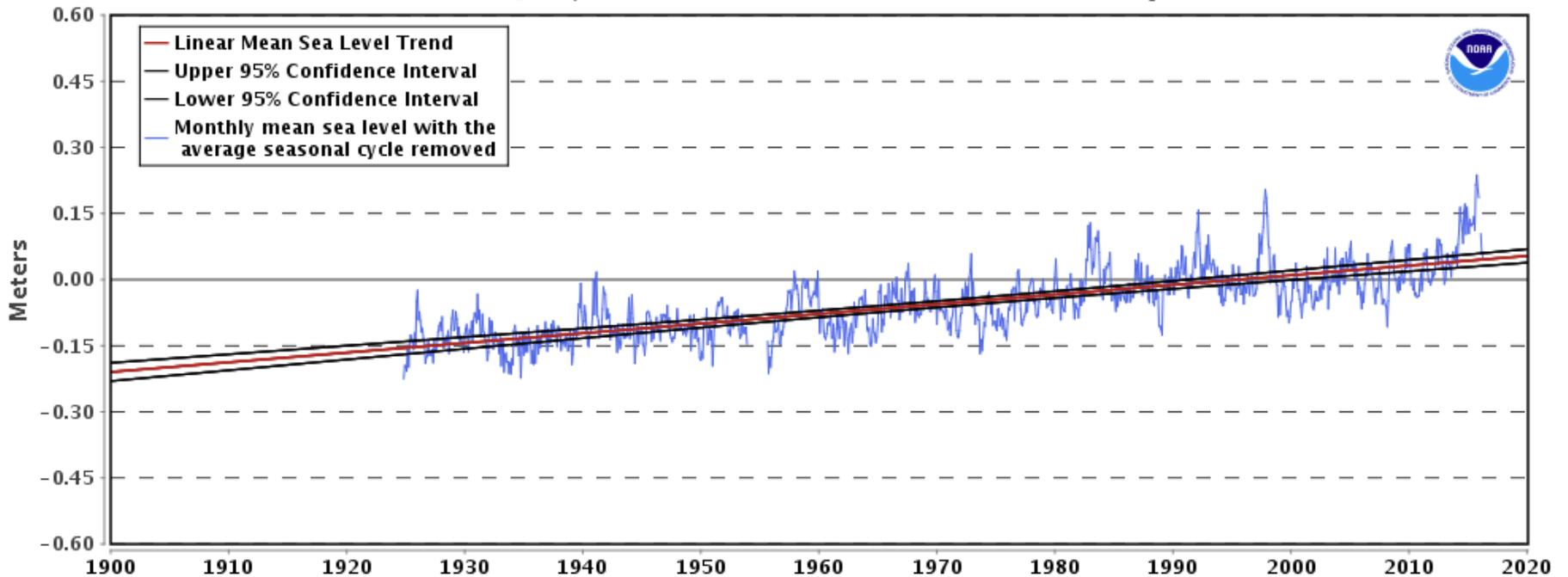
By KHARI JOHNSON (Patch Staff) - February 1, 2013 7:58 am ET



Mean Sea Level Trend 9410230 La Jolla, California

9410230 La Jolla, California

2.19 +/- 0.27 mm/yr



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The mean sea level trend is 2.19 millimeters/year with a 95% confidence interval of +/- 0.27 mm/yr based on monthly mean sea level data from 1924 to 2015 which is equivalent to a change of 0.72 feet in 100 years.

Dealing with Uncertain Futures: Climate Change Vulnerability in the TRV

- There is uncertainty associated with both the marine and riverine drivers, as well as the interaction between the two



Effects of frequent storms on vegetation *Front Ecol Environ* 2010; 8(10): 540–547 JB Zedler

544

Figure 5. The mouth of the Tijuana Estuary (a) closed in April 1984 and remained closed until sand was dredged from the channels and replaced on the dunes, and bulldozers reopened it (b) in December 1984.

Application of SLAMM 5.1 to San Diego County, CA

Dr. Rick Gersberg, Principal Investigator
Professor and Head
Division of Environmental Health
Graduate School of Public Health
San Diego State University

SAN DIEGO, 200, 2 meter Chappa Site 1

and
warren
pinnacle
consulting, inc.
Jonathan S. Clough & Evan C. Larson, Warren Pinnacle Consulting, Inc
PO Box 253, Warren VT, 05674
(802)-496-3476

- However, it is possible to envision plausible futures under different scenarios associated with changing riverine and marine drivers

USGS
science for a changing world

Downscaling climate change models to local site conditions: San Diego National Wildlife Refuge Complex

U.S. Geological Survey, Western Ecological Research Center
Data Summary Report Prepared for the U.S. Fish and Wildlife Service Region 8 Inventory and Monitoring Program and the California Landscape Conservation Cooperative

John Y. Takekawa, Karen M. Thorne, Kevin J. Buffington, Chase M. Freeman and Gwelle Block

Implications

- El Niño conditions provide a snapshot of a potential future
- Still investigating impacts and causes
- TJR mouth rarely closes, but when it does there can be major impacts
- Highlights importance of long-term monitoring, real-time data access, and rapid management response (USFWS and City of IB)



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RESERVE
SYSTEM

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Putting Science to Work in Coastal Communities

