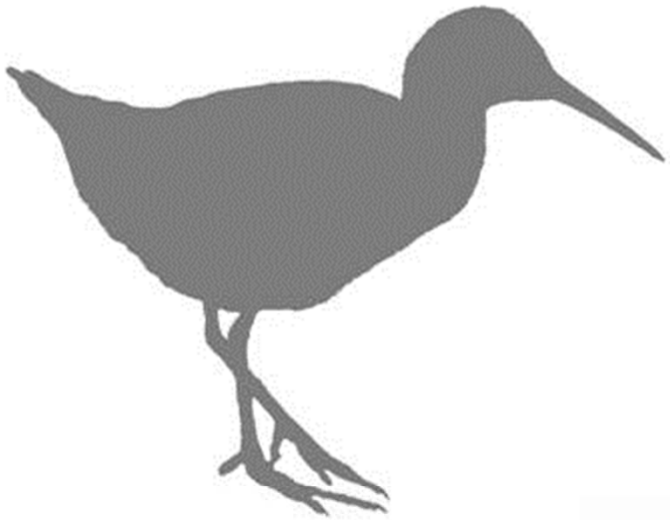
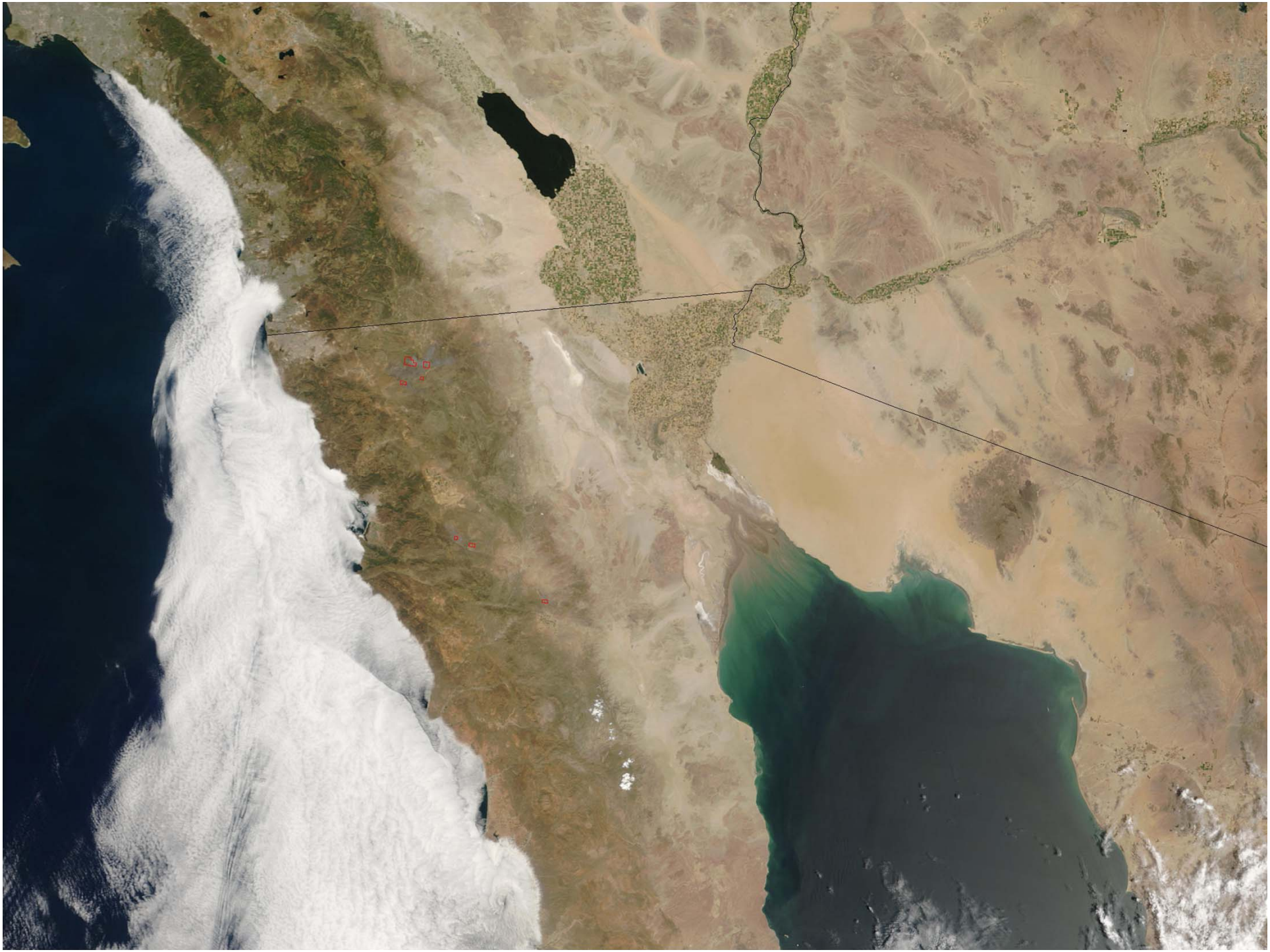
# Status of Marshbirds
# Binational Monitoring Program in the Ciénega de Santa Clara



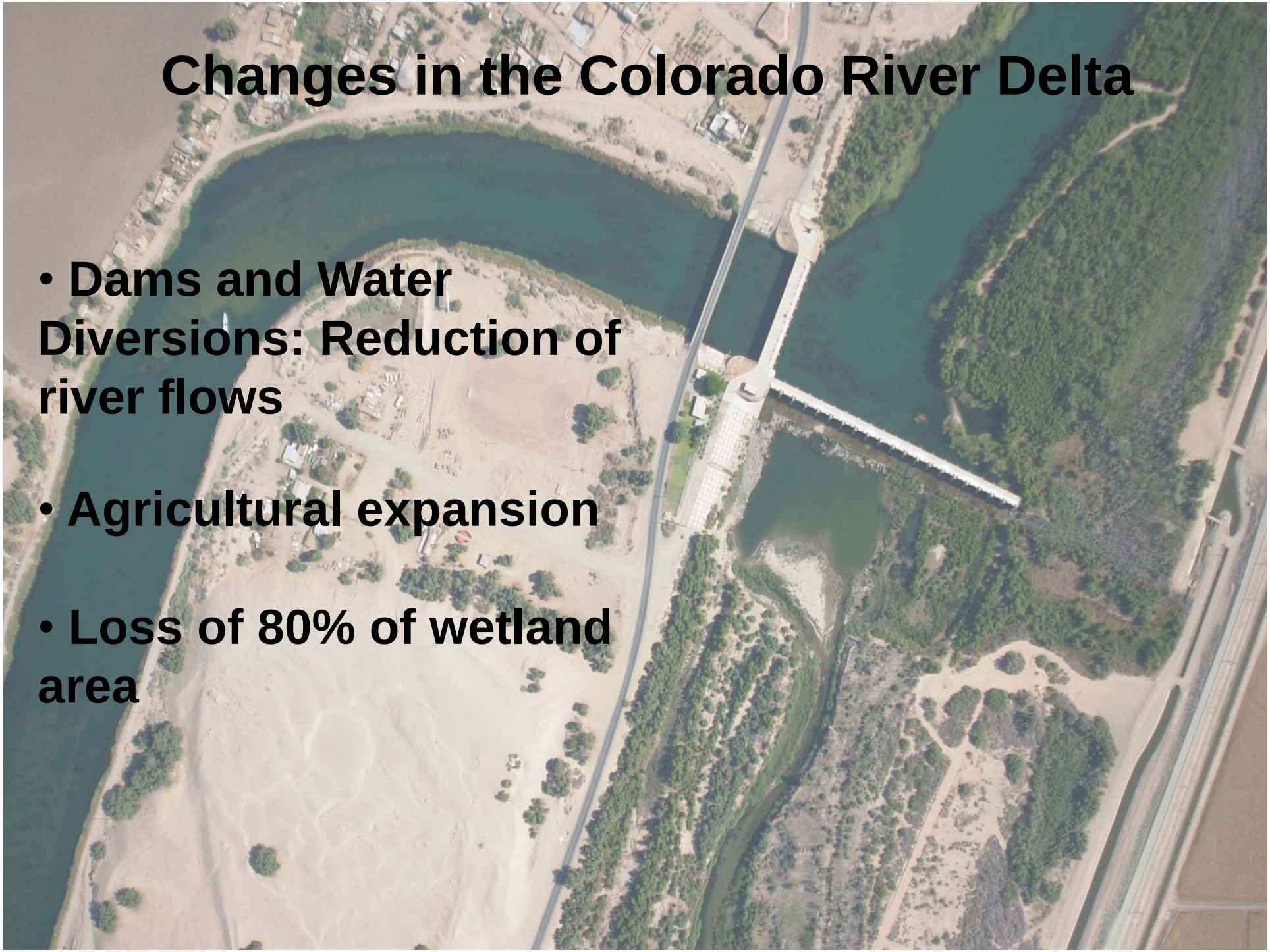
Osvel Hinojosa-Huerta
Ricardo Guzmán Olachea
Juan Butrón Méndez
José Juan Butrón Rodríguez
Alejandra Calvo Fonseca

Pronatura Noroeste
San Luis Río Colorado, Sonora, México

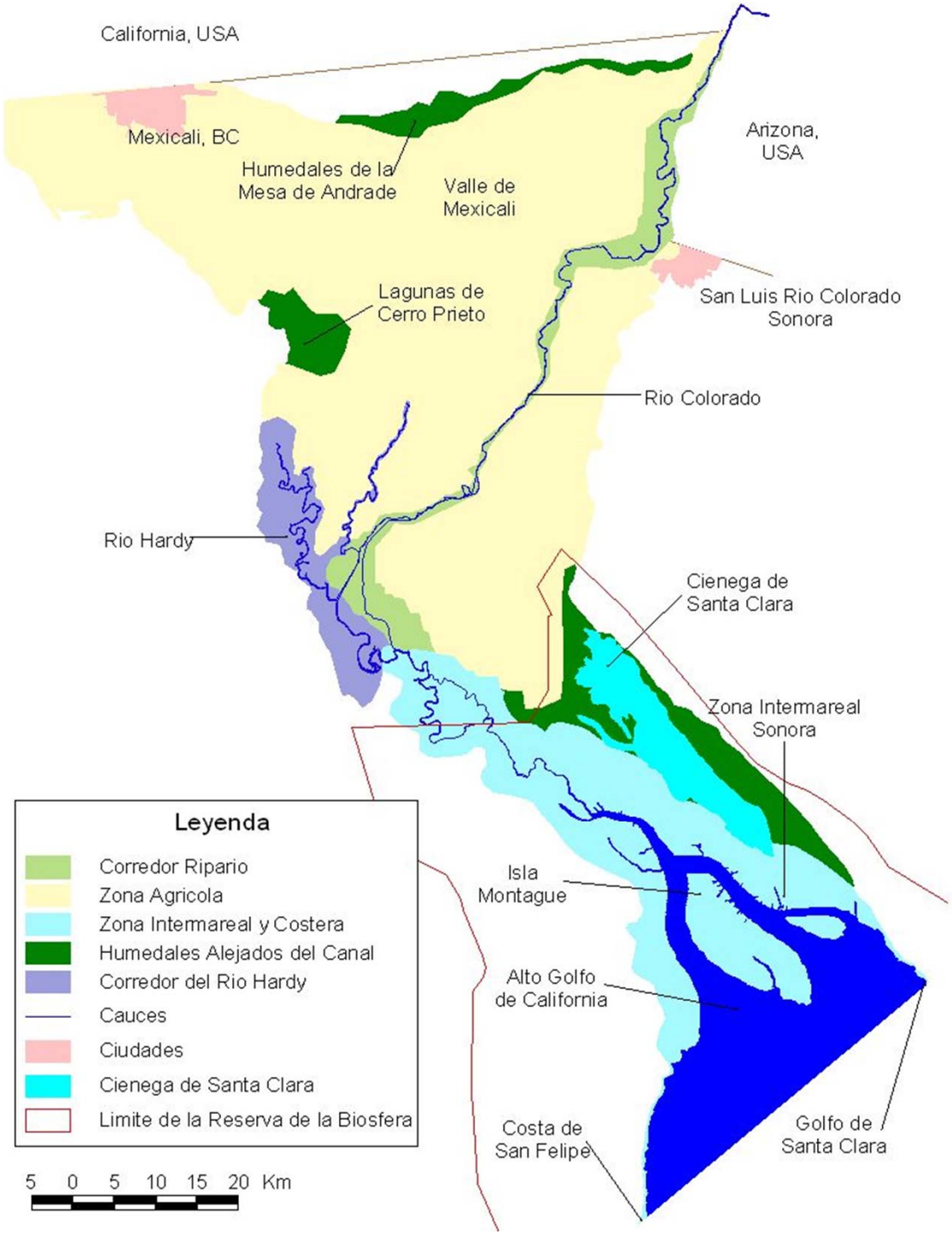
pro natura
noroeste



# Changes in the Colorado River Delta



- **Dams and Water Diversions: Reduction of river flows**
- **Agricultural expansion**
- **Loss of 80% of wetland area**


California, USA
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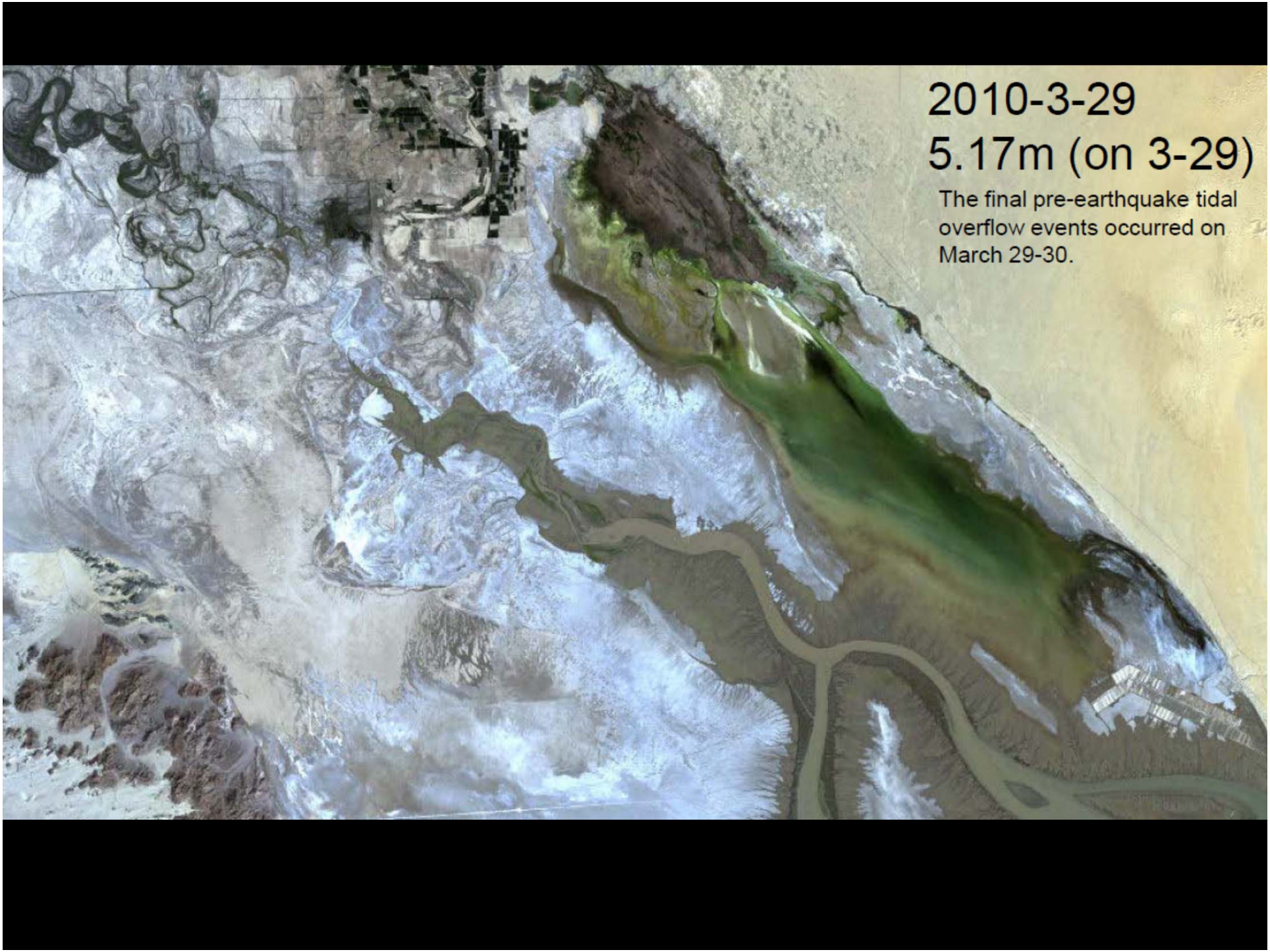
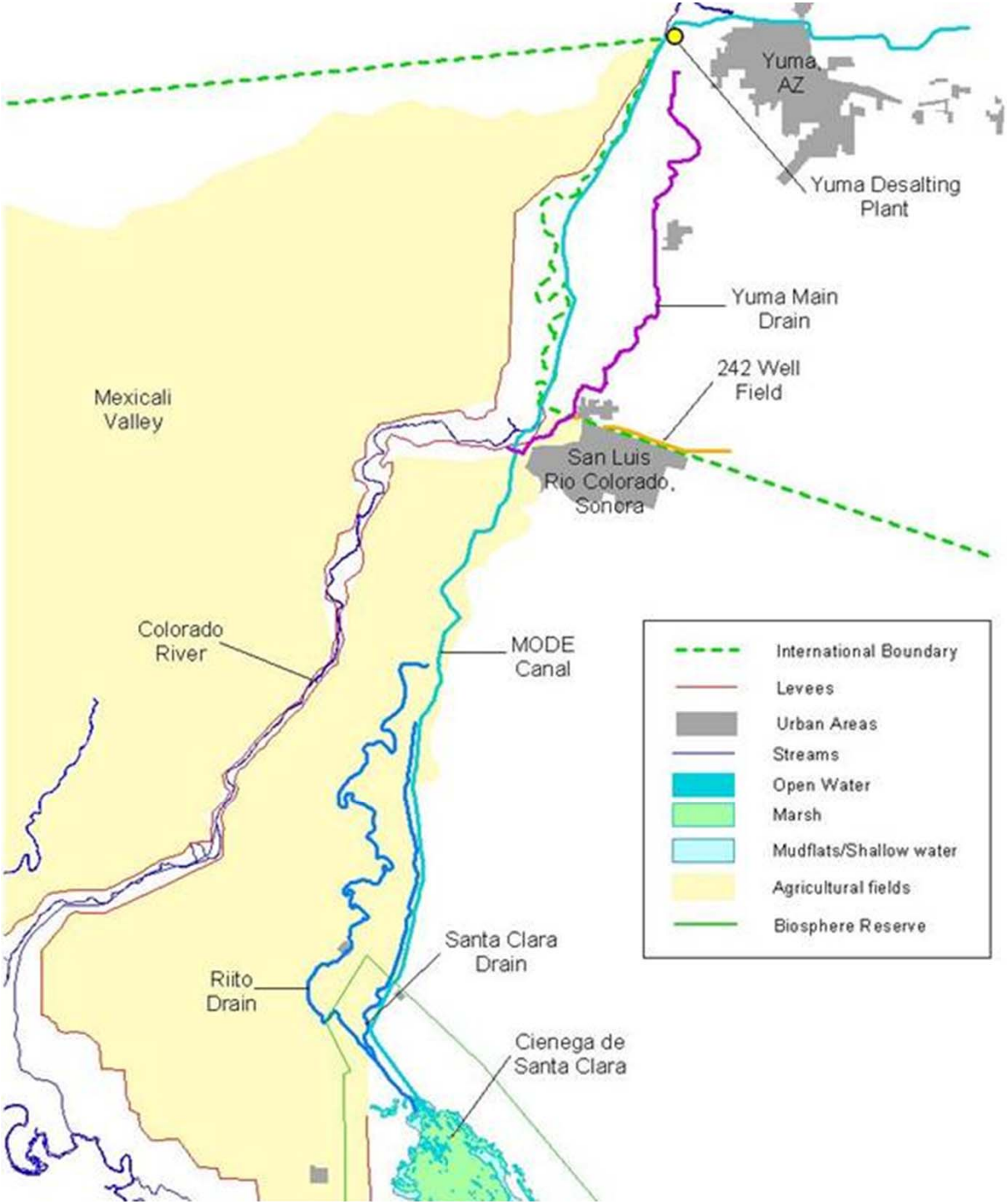
Humedales de la
Mesa de Andrade
Valle de
Mexicali
Arizona,
USA
Lagunas de
Cerro Prieto
San Luis Rio Colorado
Sonora
Rio Colorado
Rio Hardy
Cienega de
Santa Clara
Zona Intermareal
Sonora
Isla
Montague
Alto Golfo
de California
Costa de
San Felipe
Golfo de
Santa Clara
Leyenda
Corredor Ripario
Zona Agricola
Zona Intermareal y Costera
Humedales Alejados del Canal
Corredor del Rio Hardy
Cauces
Ciudades
Cienega de Santa Clara
Limite de la Reserva de la Biosfera
5 0 5 10 15 20 Km


2010-3-29
5.17m (on 3-29)
The final pre-earthquake tidal overflow events occurred on March 29-30.



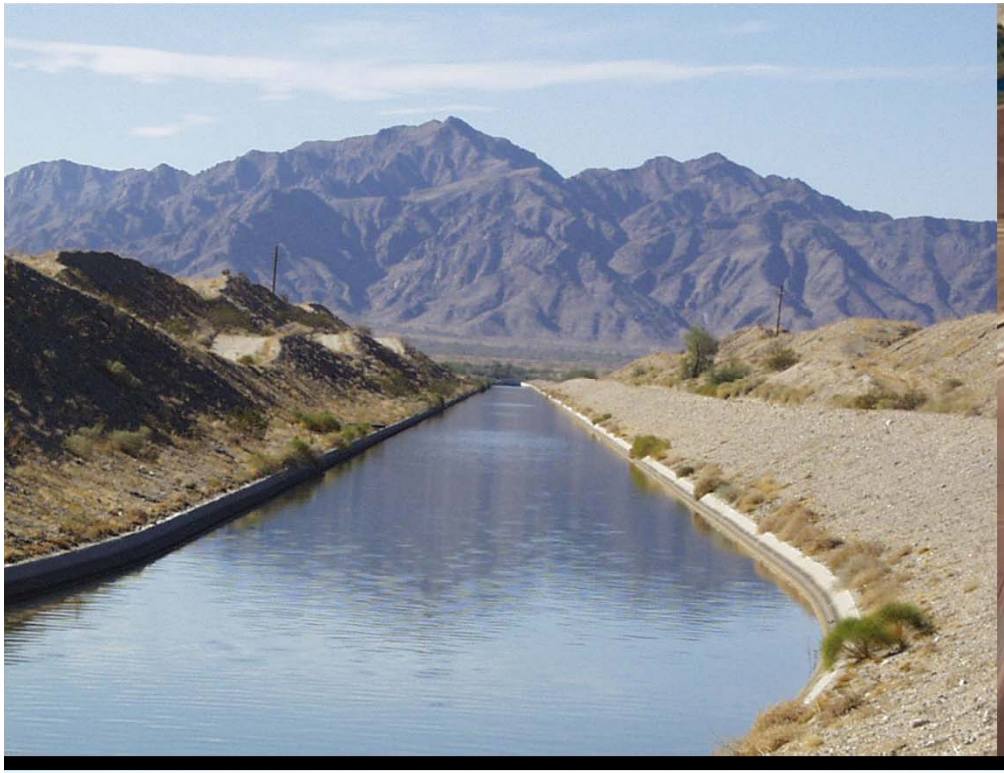

Cienega de Santa Clara: largest wetland in the Delta 40,000 acres

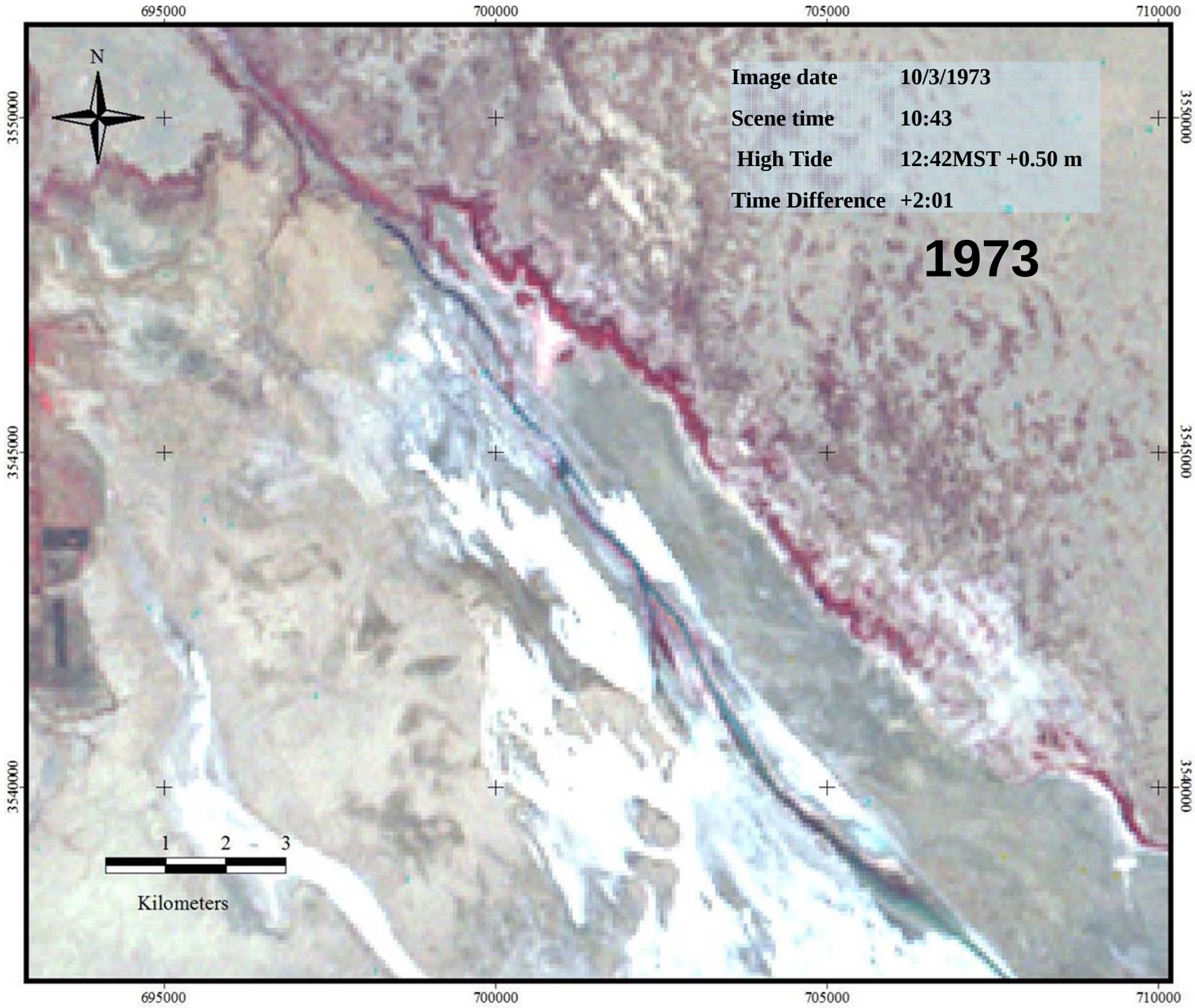
90% of its water is agricultural drainage from the Welton and Mohawk valleys in Arizona

MODE Canal

This same water has being targeted to be used by the Yuma Desalting Plant in Arizona


50

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1973
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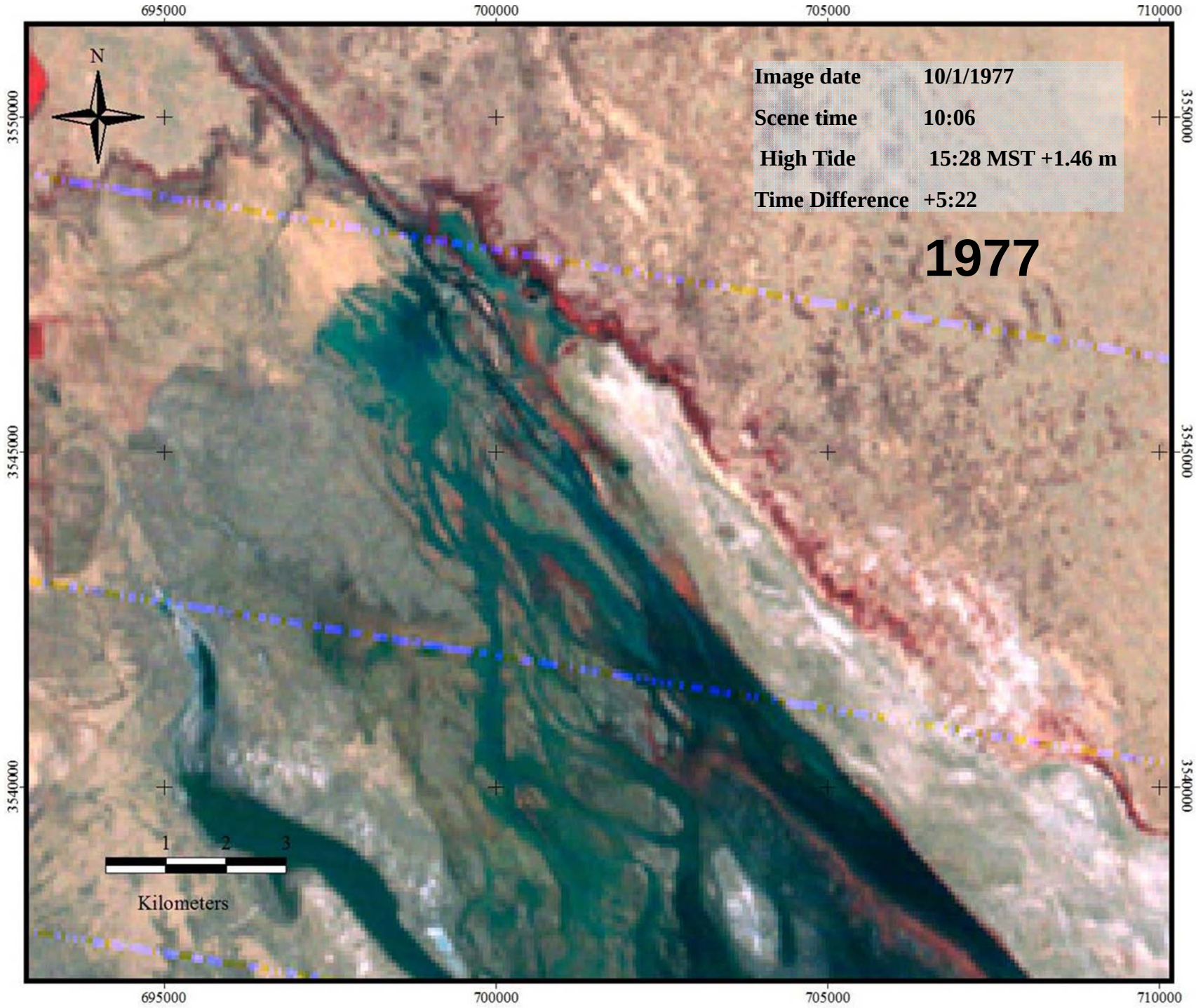
Kilometers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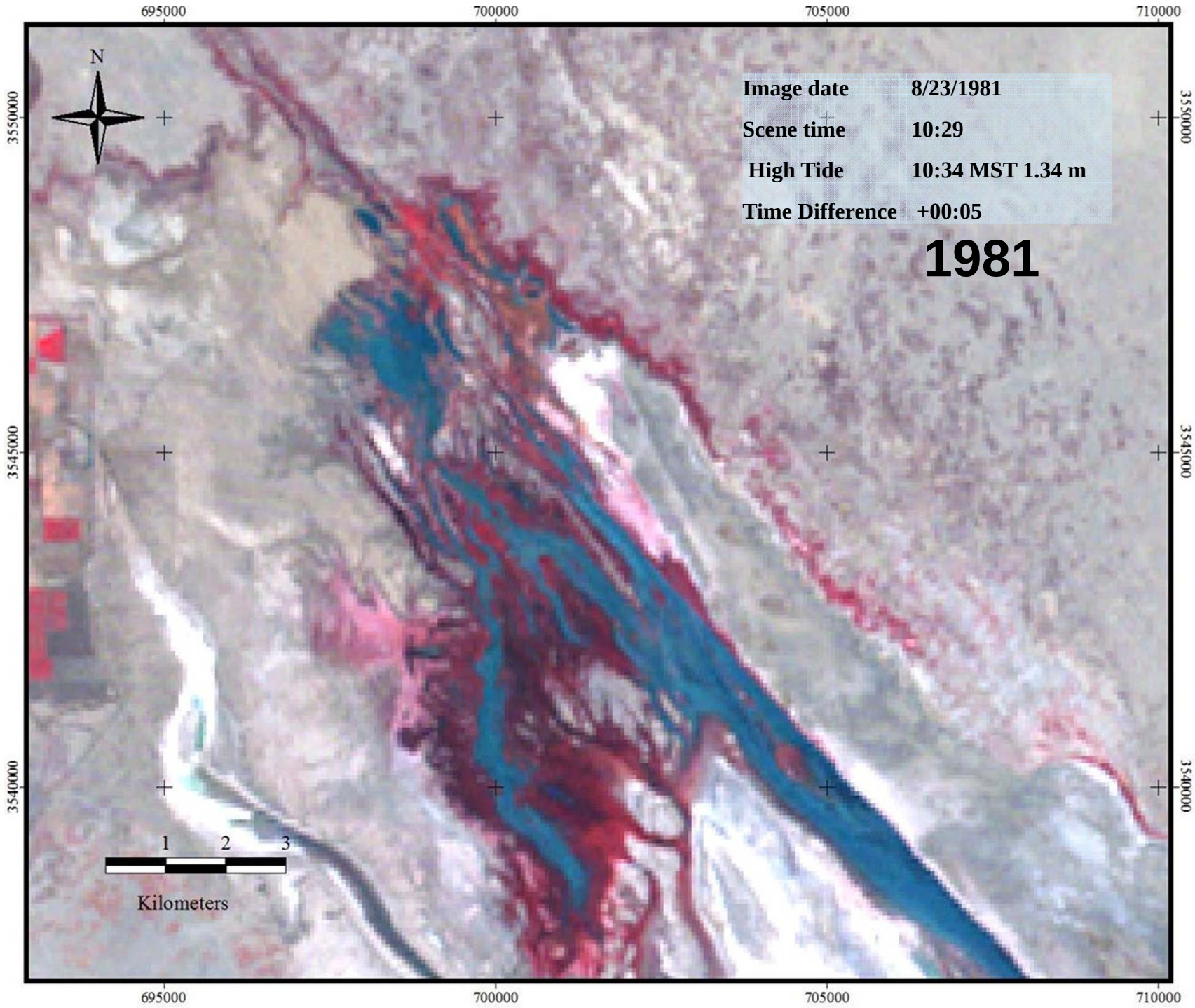
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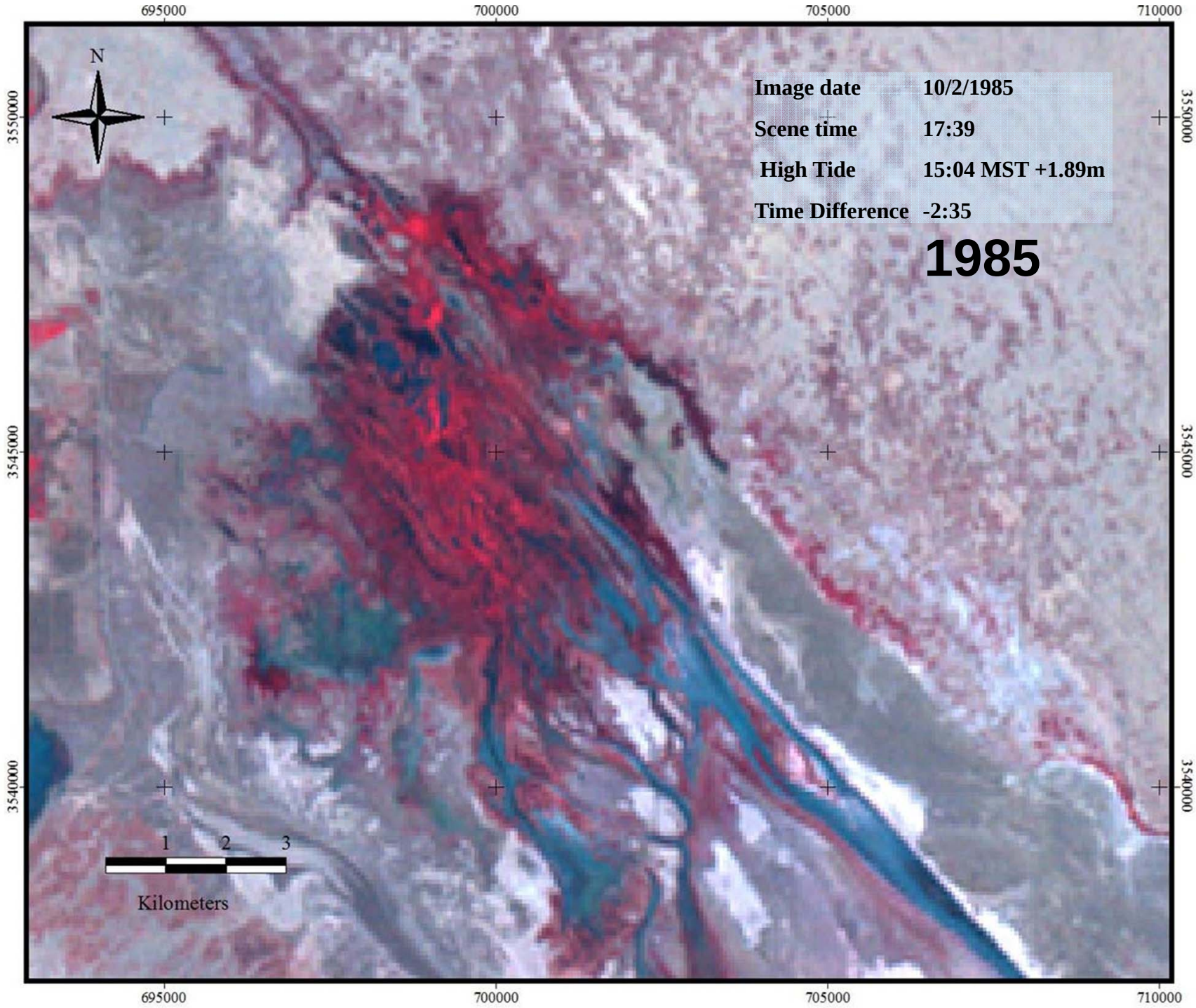
Kilometers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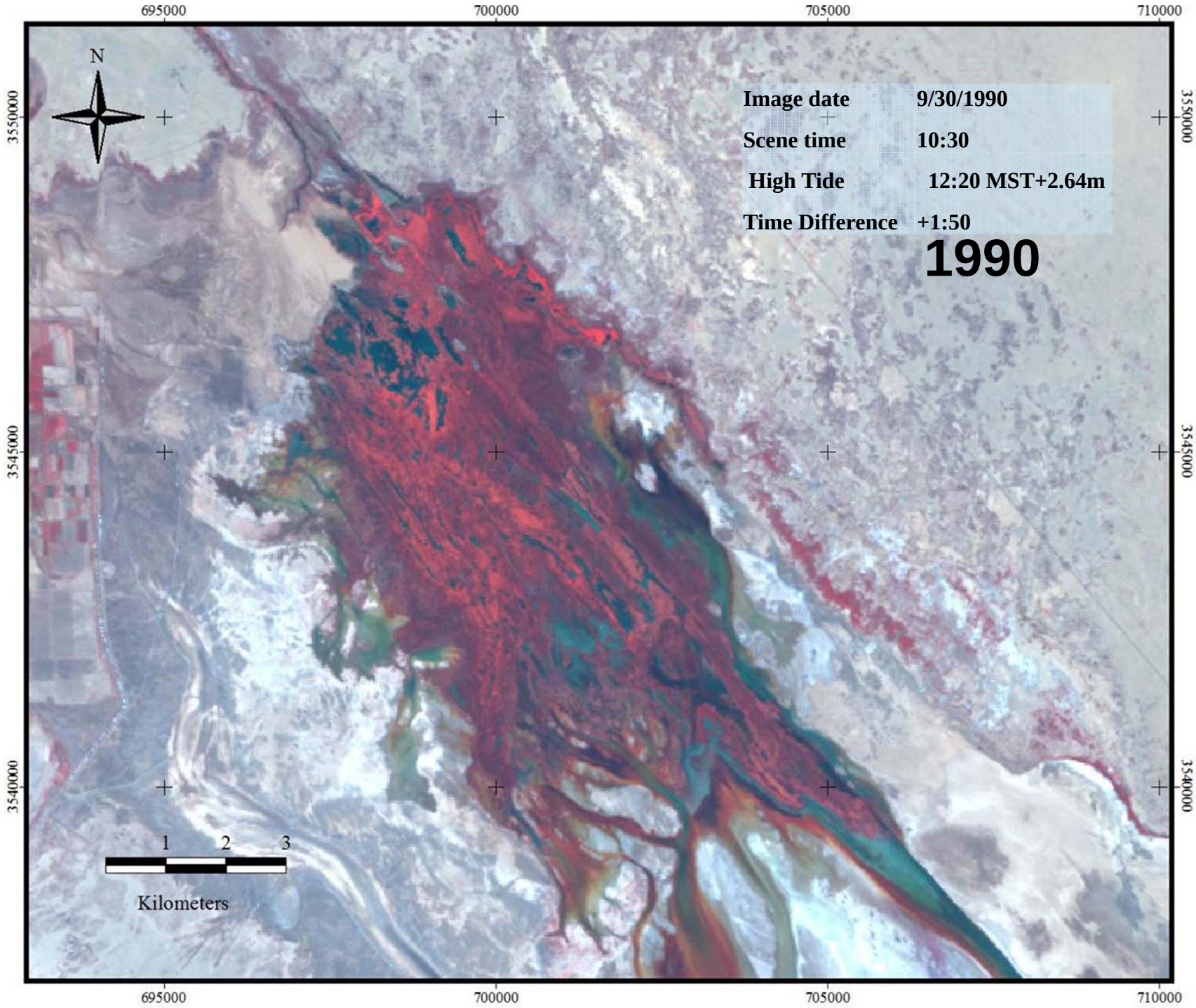
Kilometers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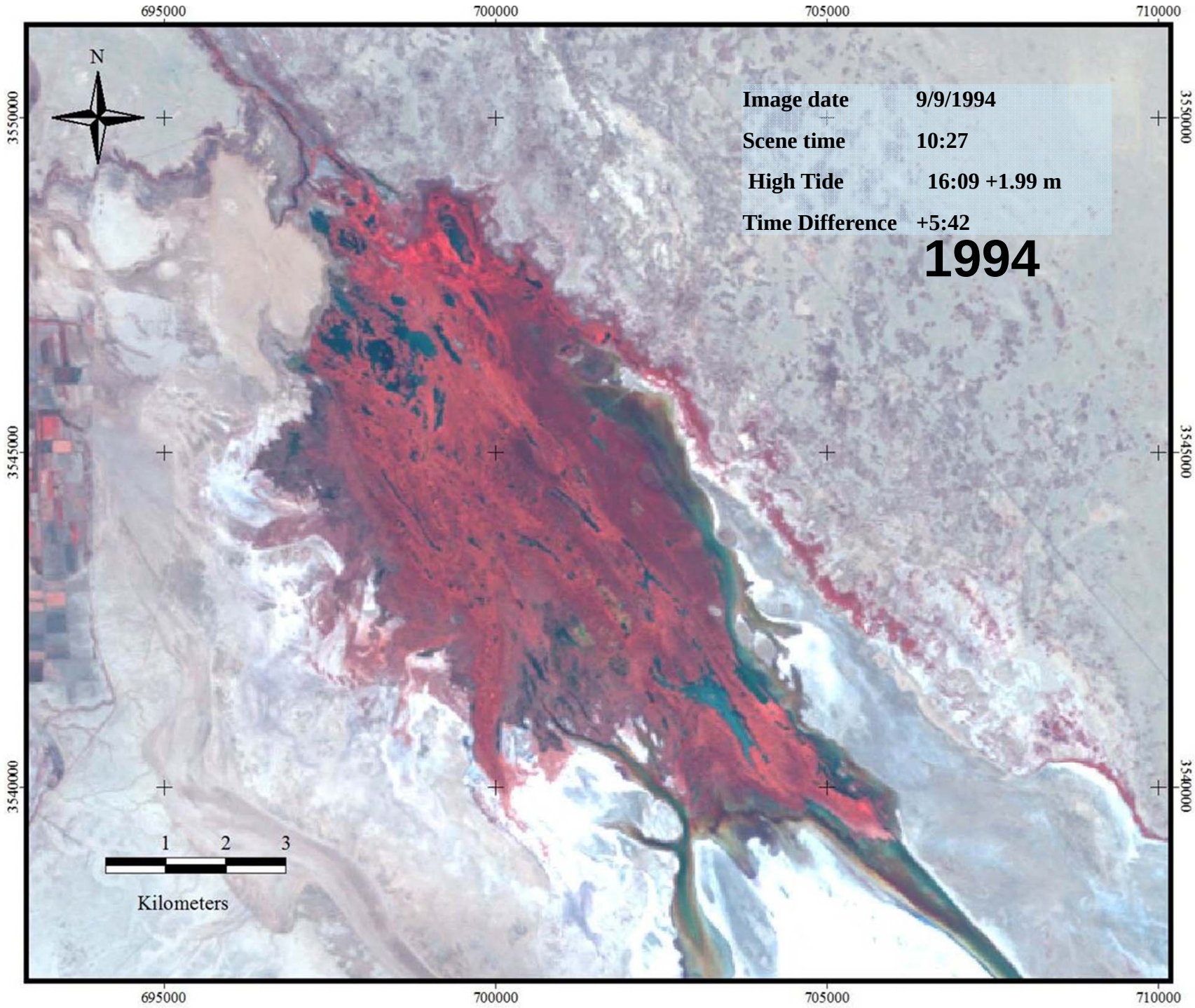
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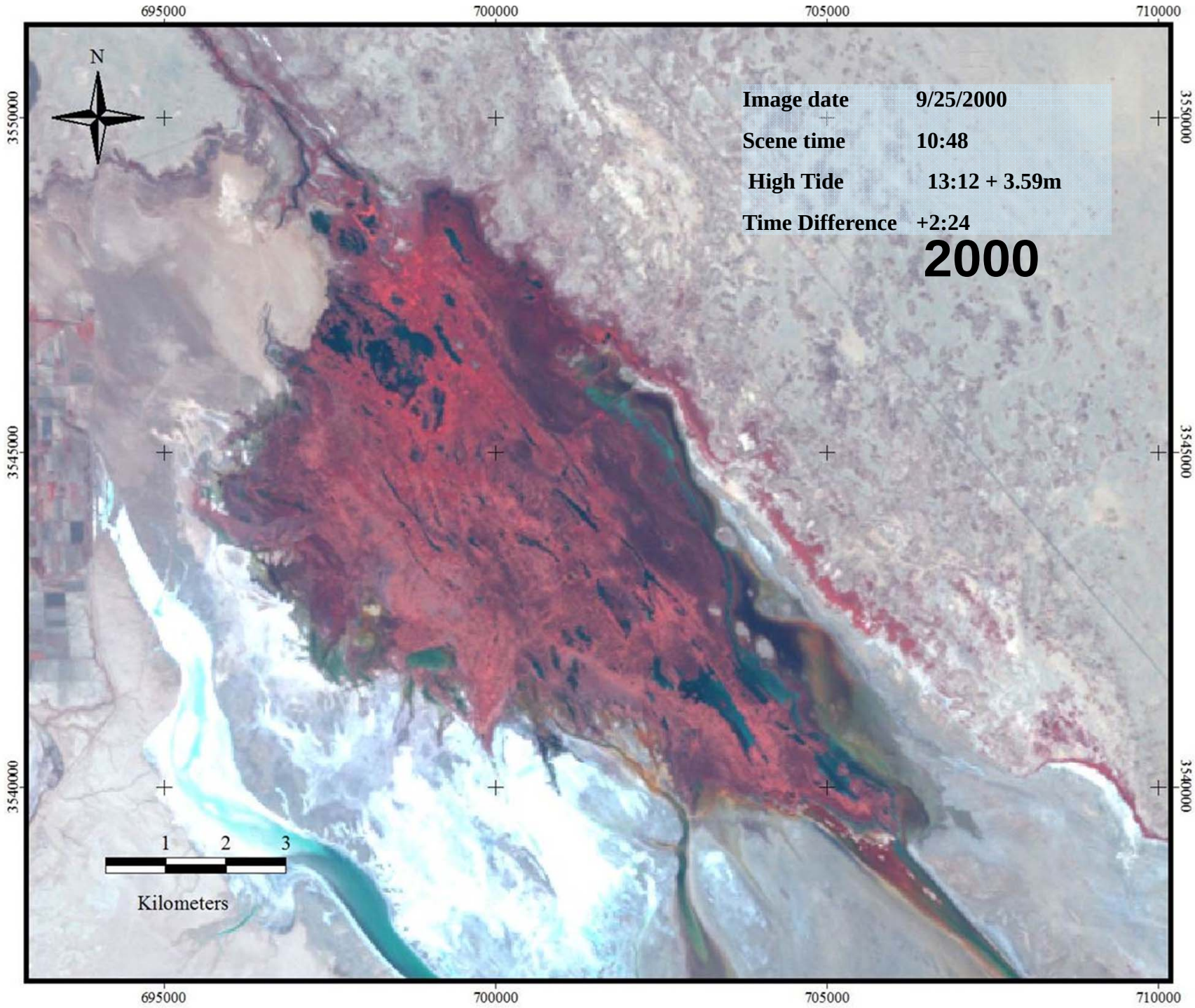
Kilometers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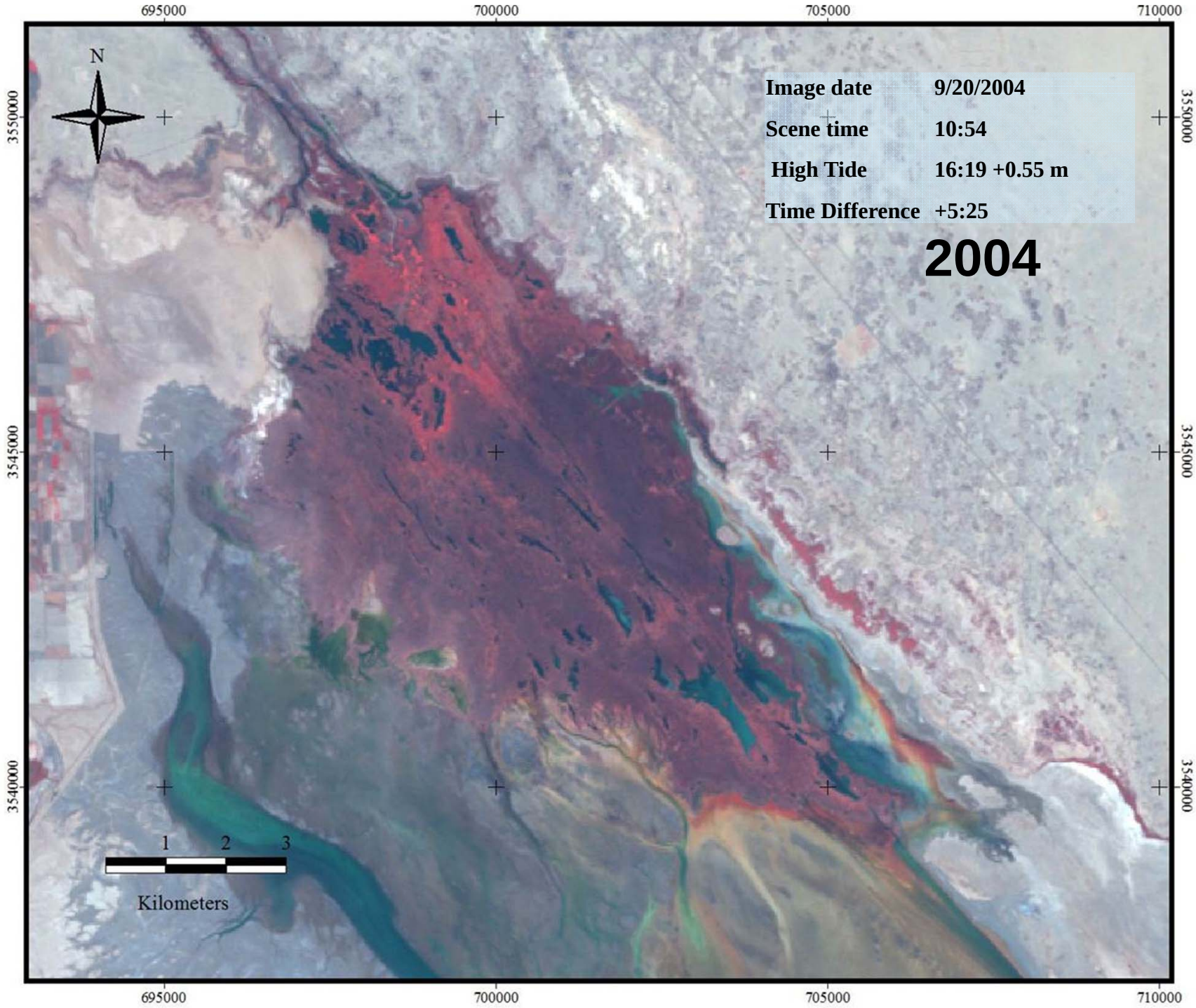
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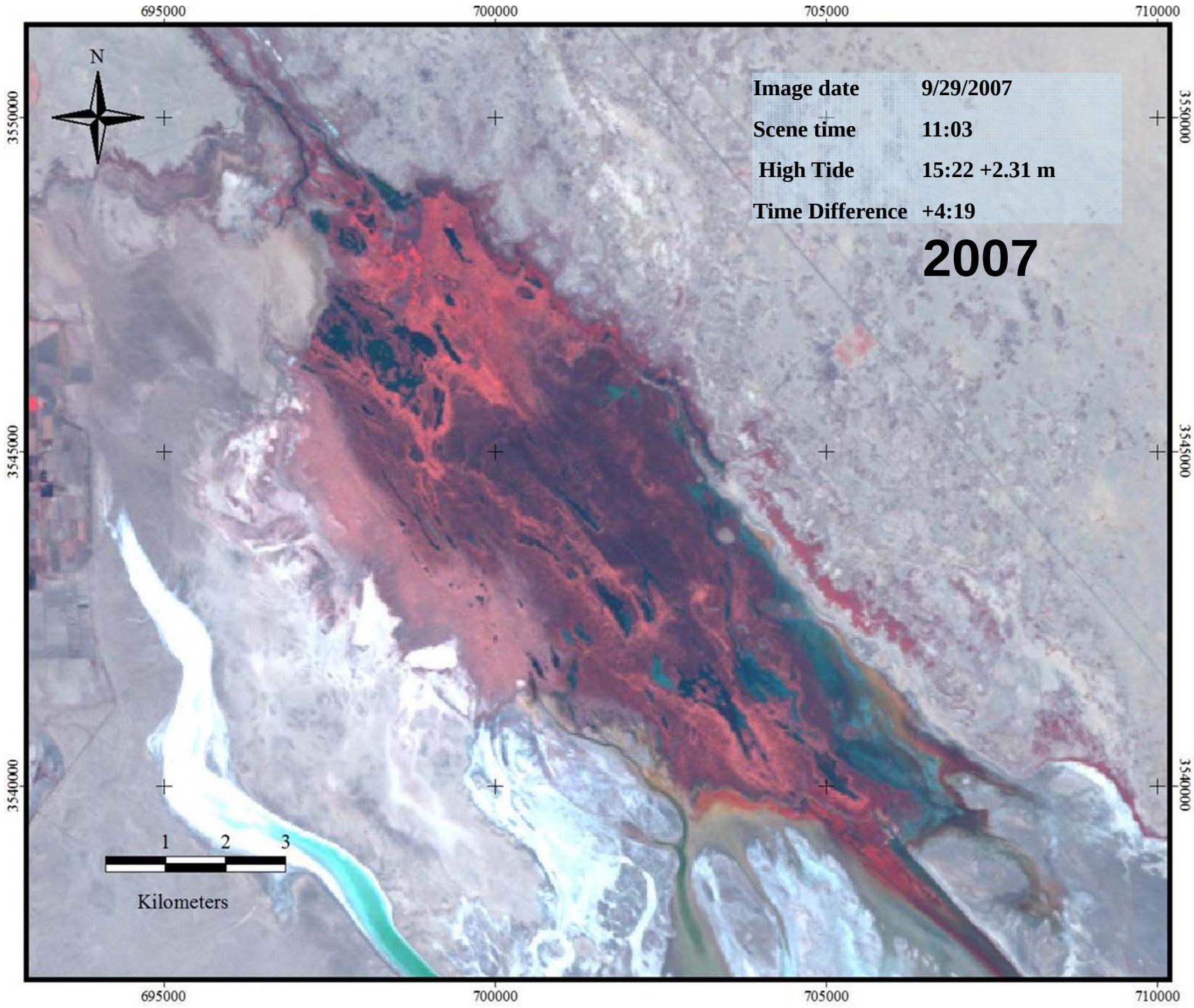
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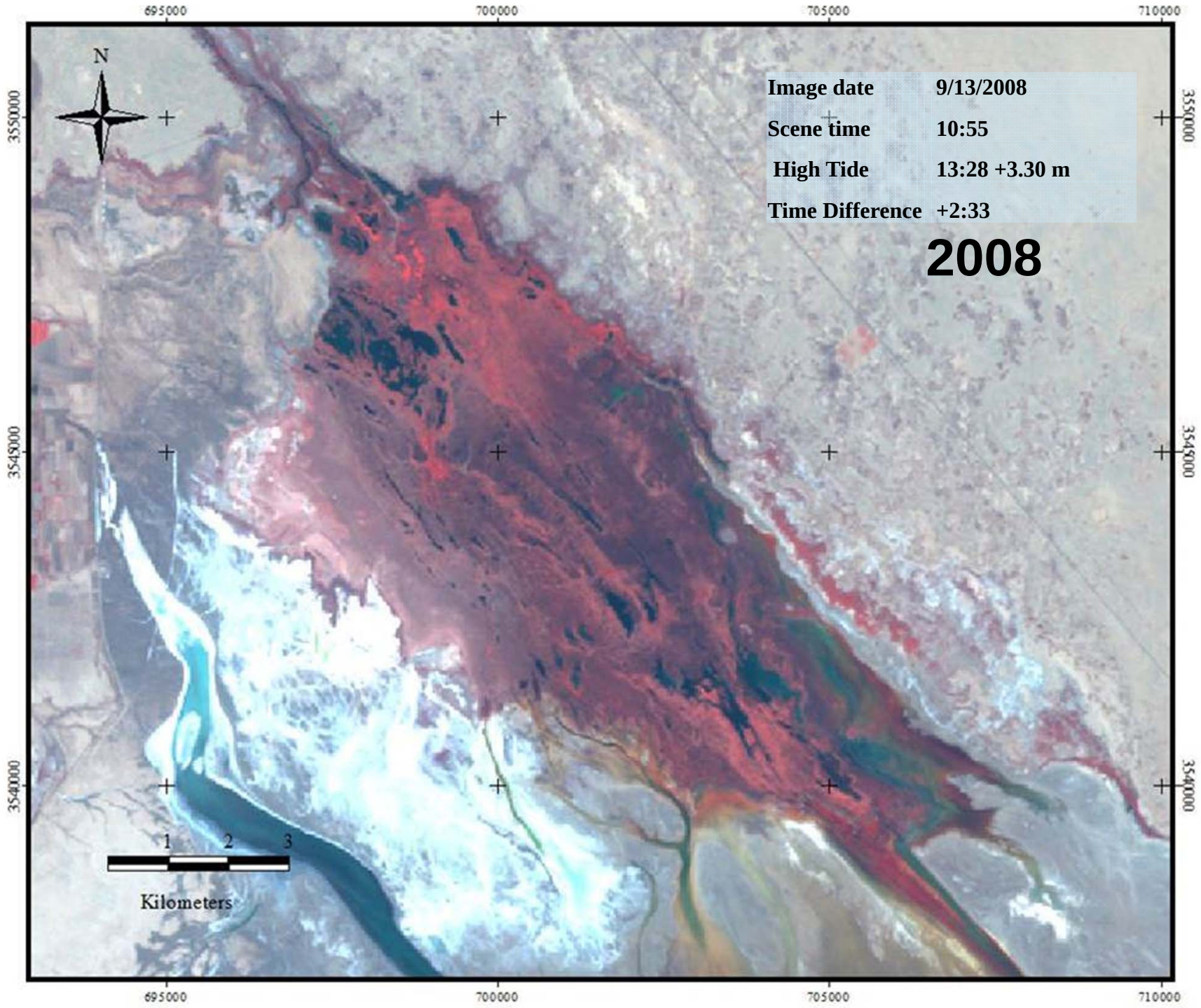
Kilometers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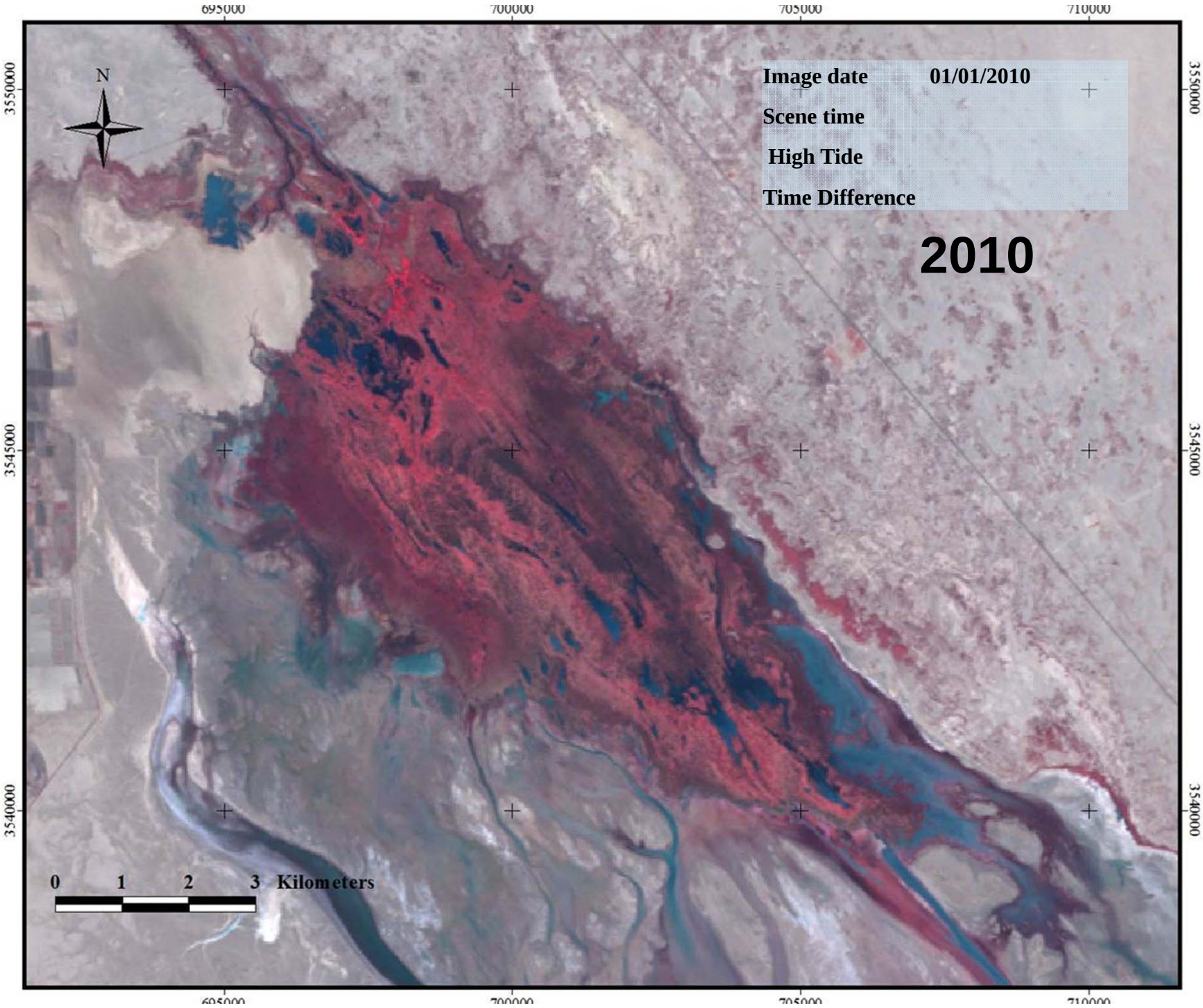
2
3
Kilometers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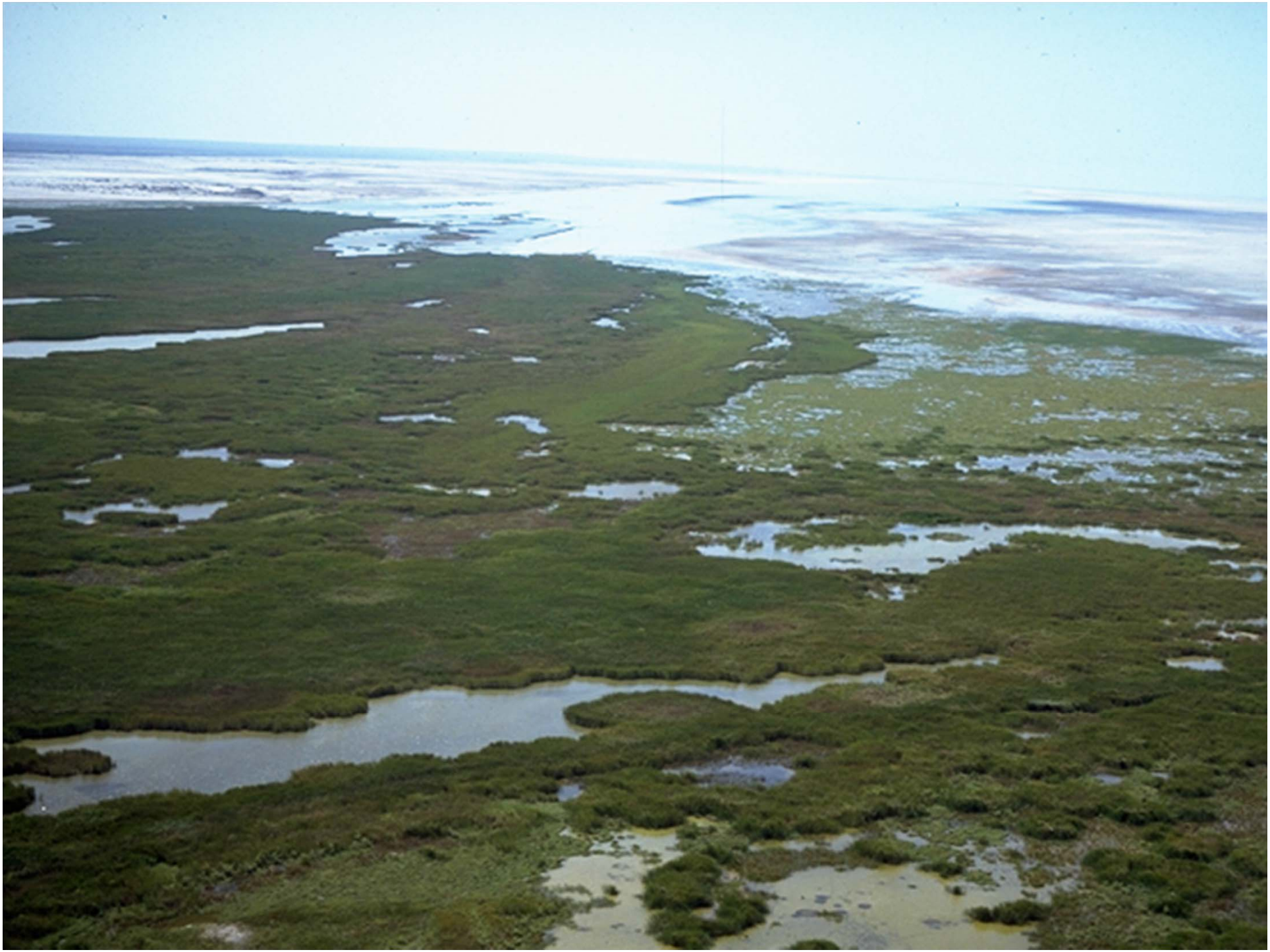
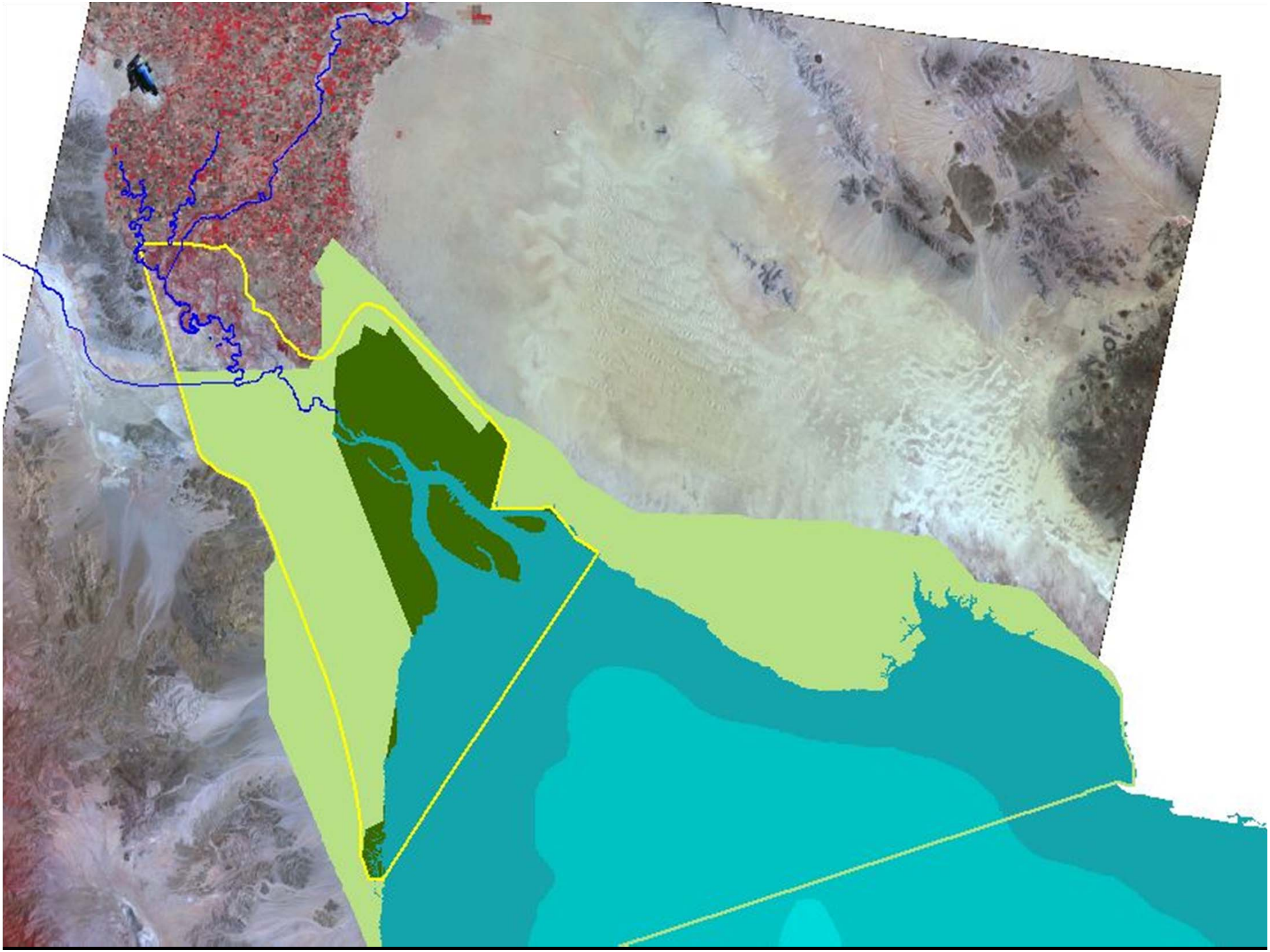
2010
0 1 2 3 Kilometers





# Ciénega de Santa Clara and Yuma Desalting Plant

Trial run of the YDP (May 2010-March 2011), with participation of Arizona, Nevada, California and USBOR, 30% capacity

Historic agreement between Mexico, the U.S. and environmental groups to protect the Cienega

First time in which both countries dedicate water for the environment in the delta, and the first time that environmental groups are part of the Treaty

Comprehensive binational monitoring program

# Binational Monitoring Program for the Ciénega de Santa Clara

THE UNIVERSITY OF ARIZONA

pro natura noroeste

POR LA REALIZACION PLENA DEL HOMBRE

SONORAN INSTITUTE

Reserva de la Biosfera ALTO GOLFO DE CALIFORNIA Y DELTA DEL RÍO COLORADO

CIAD


CAP
CENTRAL ARIZONA PROJECT


Instituto Nacional de Ecología
SEMARNAT
SECRETARÍA DE MEDIO AMBIENTE Y RECURSOS NATURALES


THE METROPOLITAN WATER DISTRICT of SOUTHERN CALIFORNIA


SOUTHERN NEVADA WATER AUTHORITY

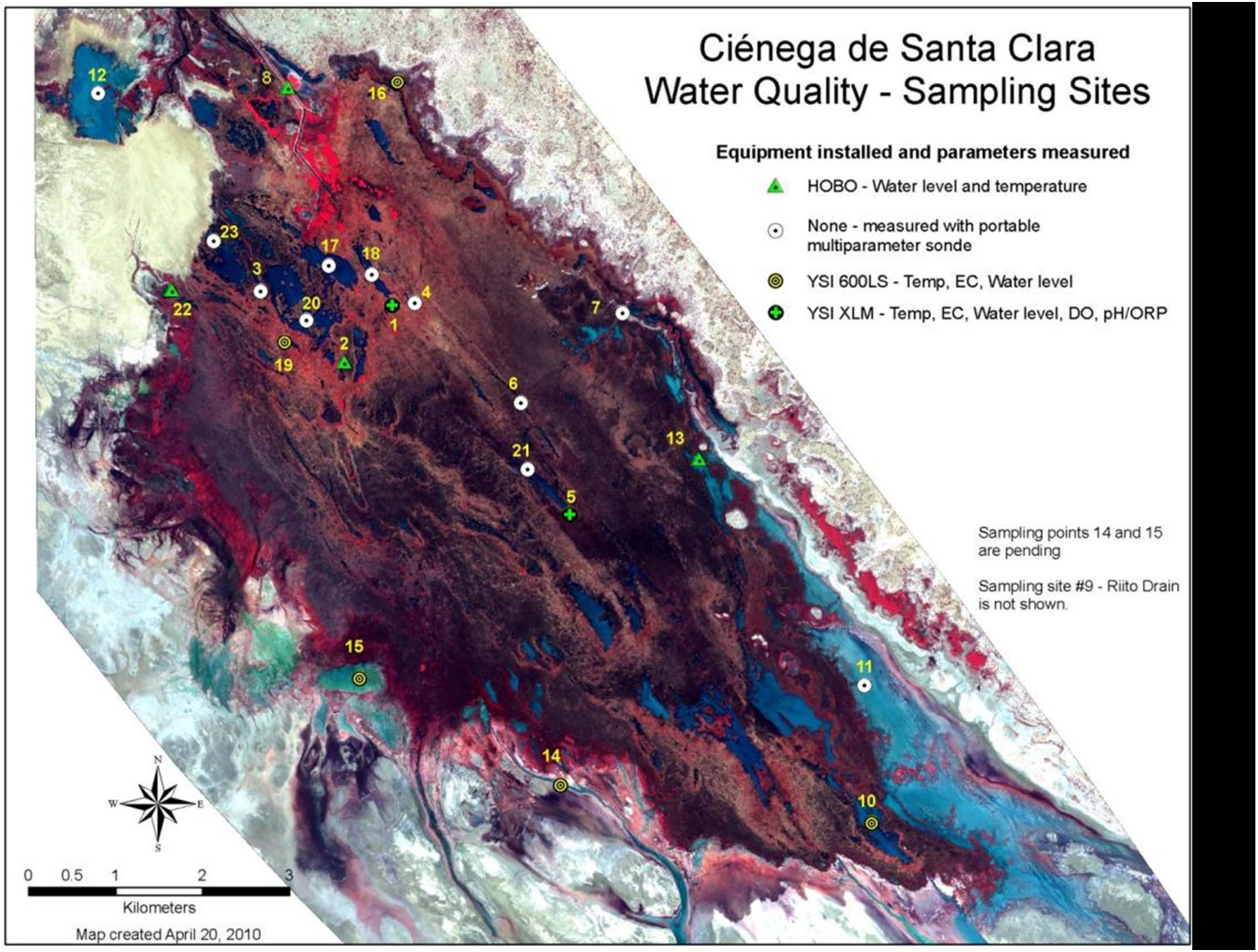

NSF
National Science Foundation
WHERE DISCOVERIES BEGIN

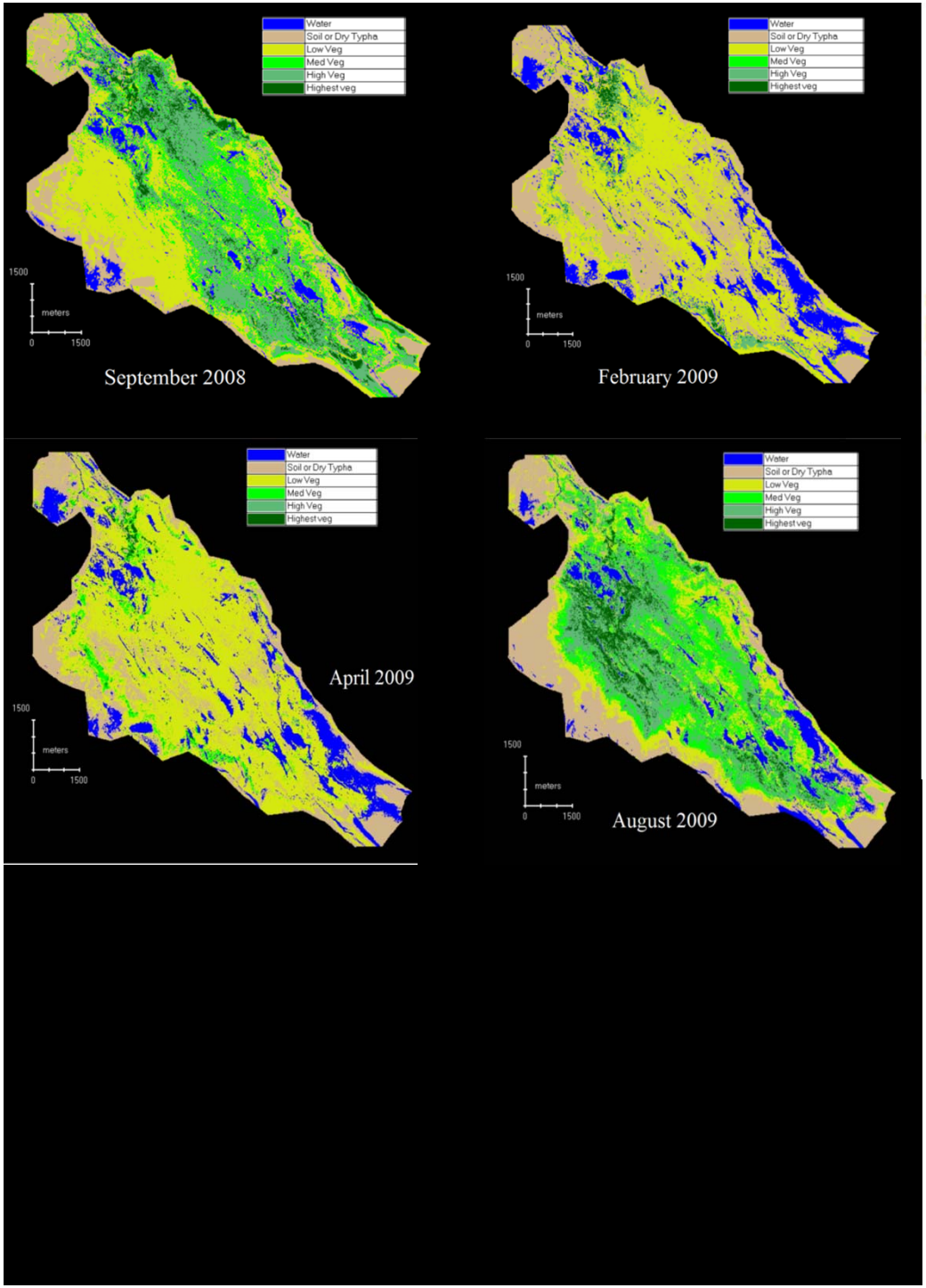

Consejo Nacional de Ciencia y Tecnología
CONACYT
www.conacyt.gob.mx

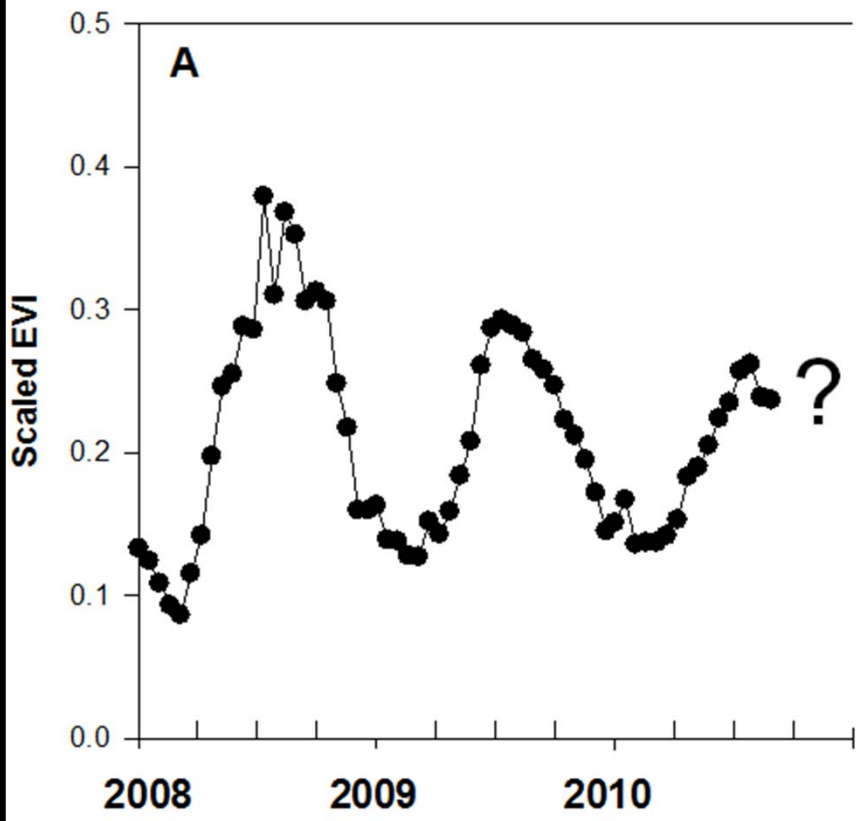

WSP
Water Sustainability Program
Our Water Future
Innovation • Collaboration • Education • Policy


FONDO MEXICANO PARA LA CONSERVACIÓN DE LA NATURALEZA, A.C.
Institución Privada.


Reserva de la Biosfera
ALTO GOLFO DE CALIFORNIA
Y DELTA DEL RÍO COLORADO


Ciénega de Santa Clara
Water Quality - Sampling Sites
Equipment installed and parameters measured
HOBO - Water level and temperature
None - measured with portable multiparameter sonde
YSI 600LS - Temp, EC, Water level
YSI XLM - Temp, EC, Water level, DO, pH/ORP
Sampling points 14 and 15 are pending
Sampling site #9 - Riito Drain is not shown.
12
8
16
23
17
18
3
22
20
4
1
7
19
2
6
21
13
5
15
11
14
10
N
W
E
S
0 0.5 1 2 3
Kilometers
Map created April 20, 2010

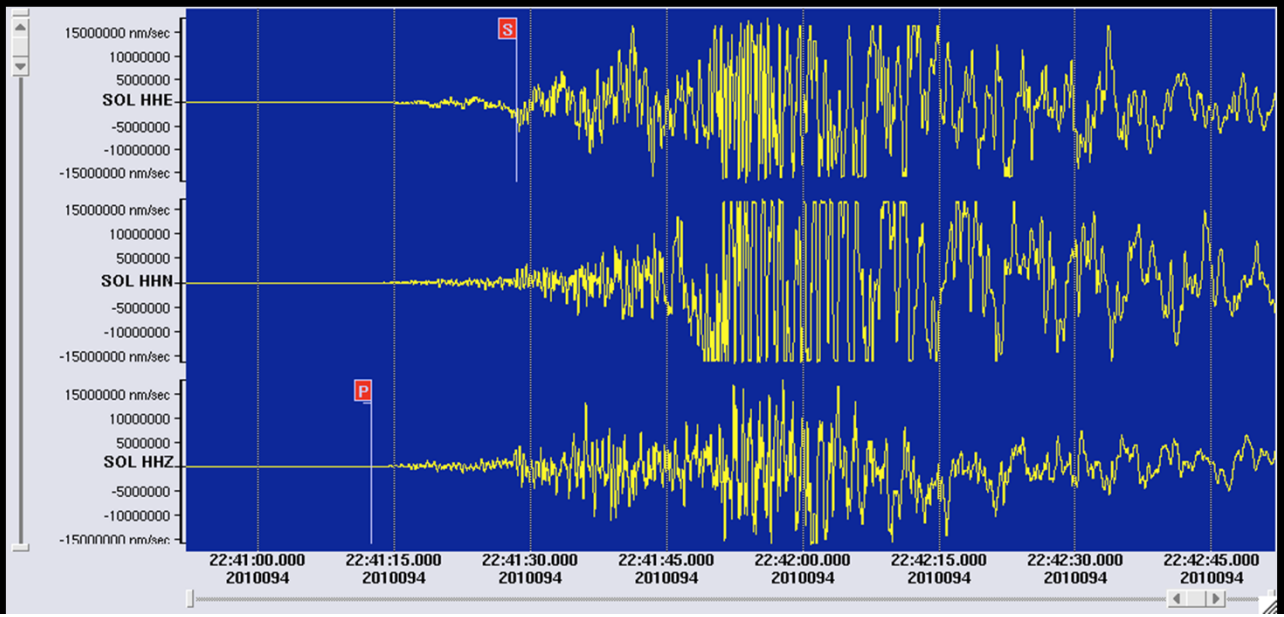


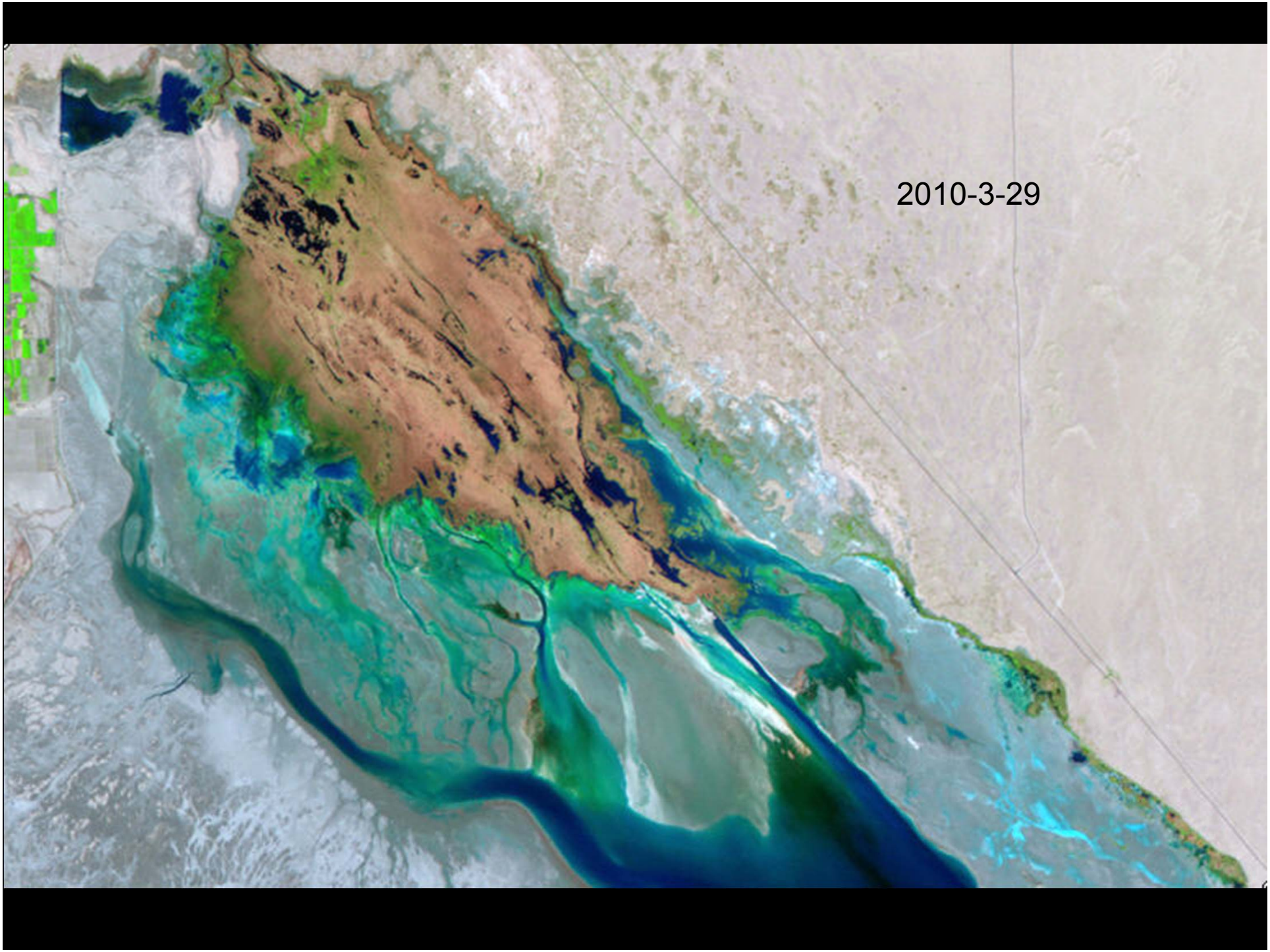

Enhanced Vegetation Index – a measure of photosynthetic activity

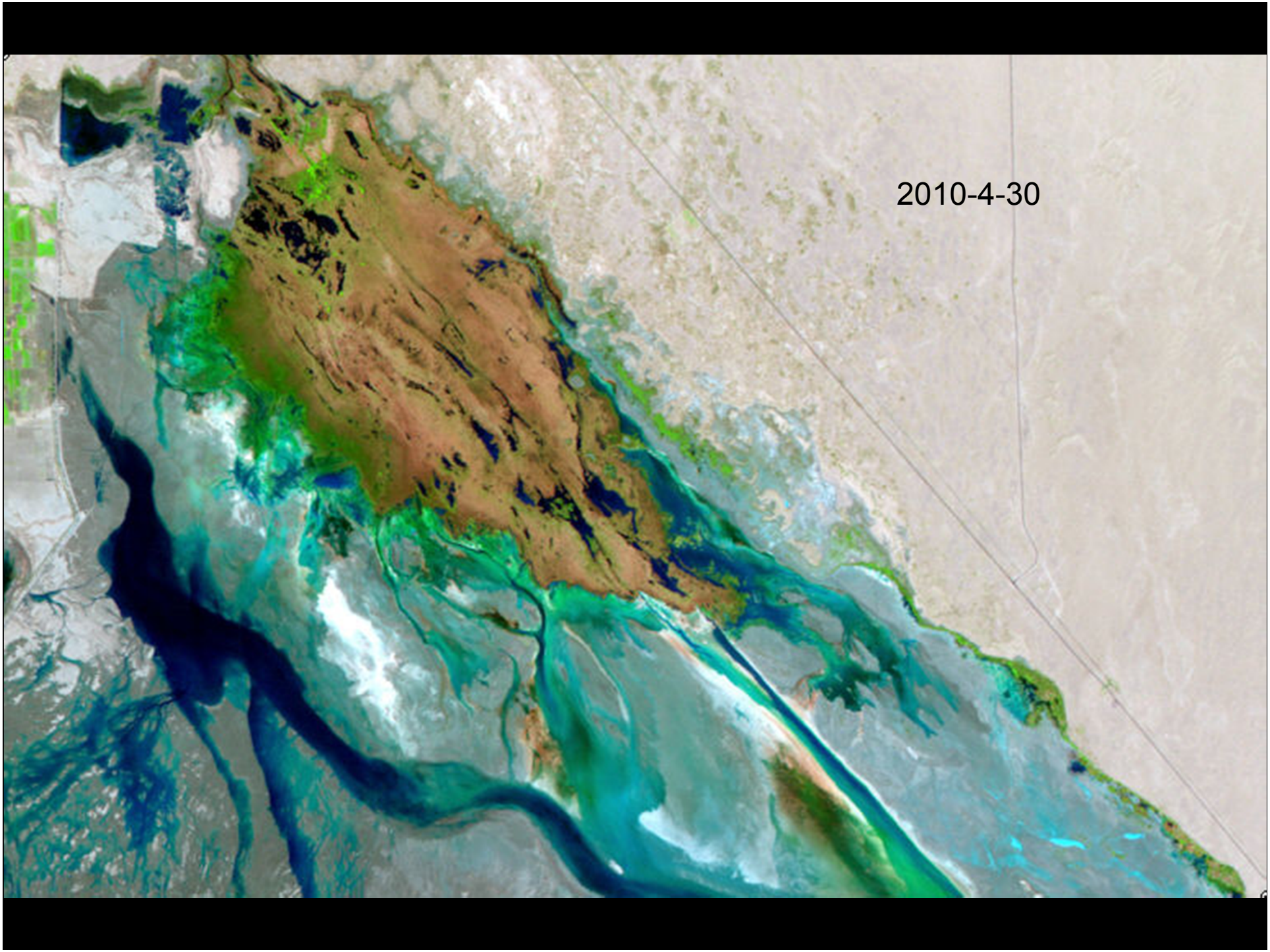
Enhanced Vegetation Index – una medida de la actividad fotosintética

# 7.2 M El Mayor–Cucapah Earthquake, 3:40 PM, April 4, 2010

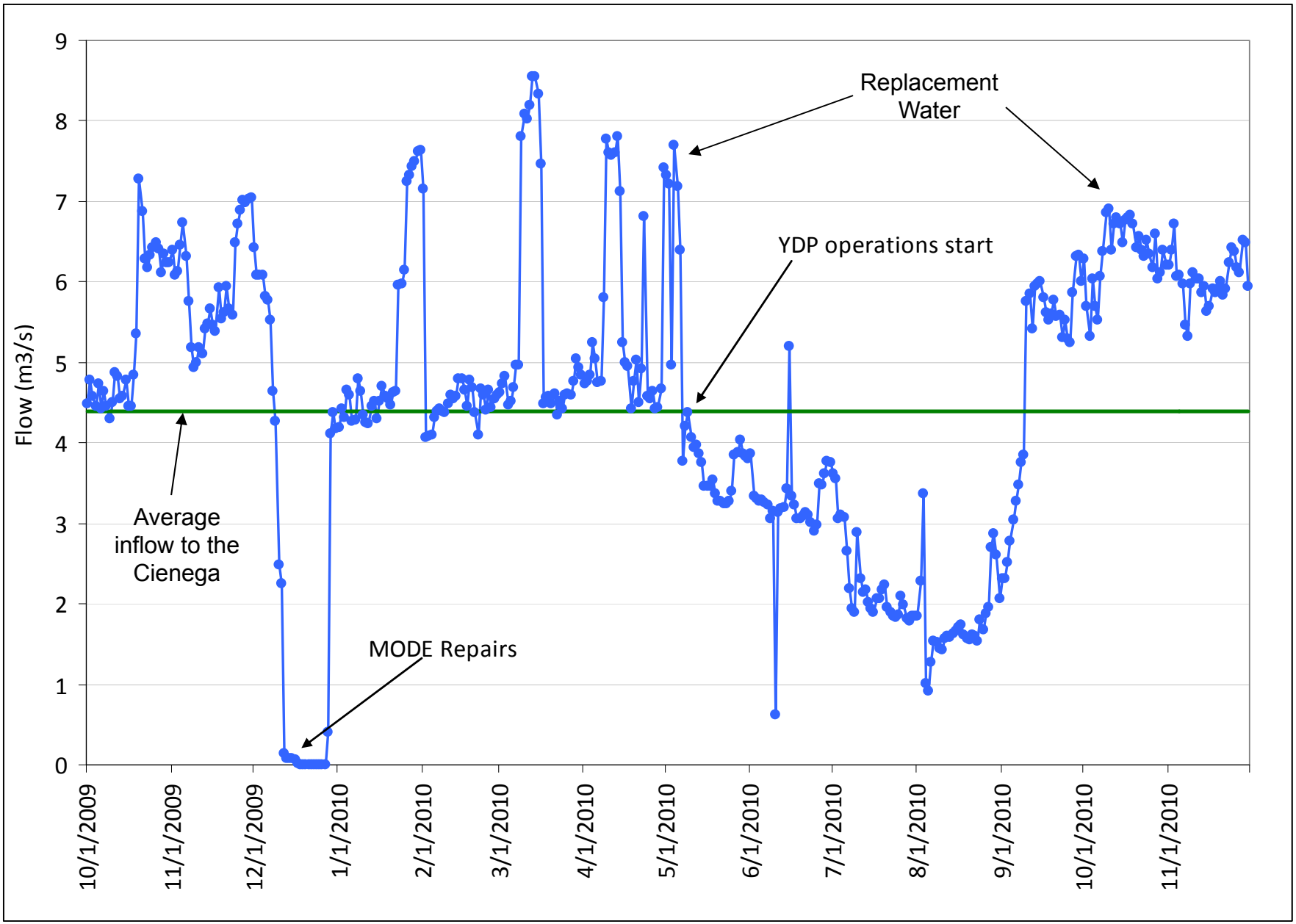




Guadalupe Victoria
Guadalupe Victoria (Km 43)
32 14.841 -115 17.595
32 14.428 -115 16.901
Alberto Oviedo Mota (Reacomodo)
Ejido Doctor Alberto Oviedo Mota
Ingeniero Luis B. Sánchez
Luis B Sánchez
Ciudad Coahuila KM.57
Gonzales offset road
Indiviso - 32° 10' 17.0" , -115° 10' 39.0"
32 01.709 -115 00.172
Nelson offset levee
32 00.414 -114 58.578
Nelson offset levee
Image © 2010 GeoEye
Image © 2010 DigitalGlobe
© 2010 Cnes/Spot Image
© 2010 INEGI
©2009 Google
14.7 km
Imagery Dates: Sep 18, 2004 - Jan 18, 2008
32°06'43.39" N 115°06'03.61" W elev 0 m
Eye alt 50.80 km

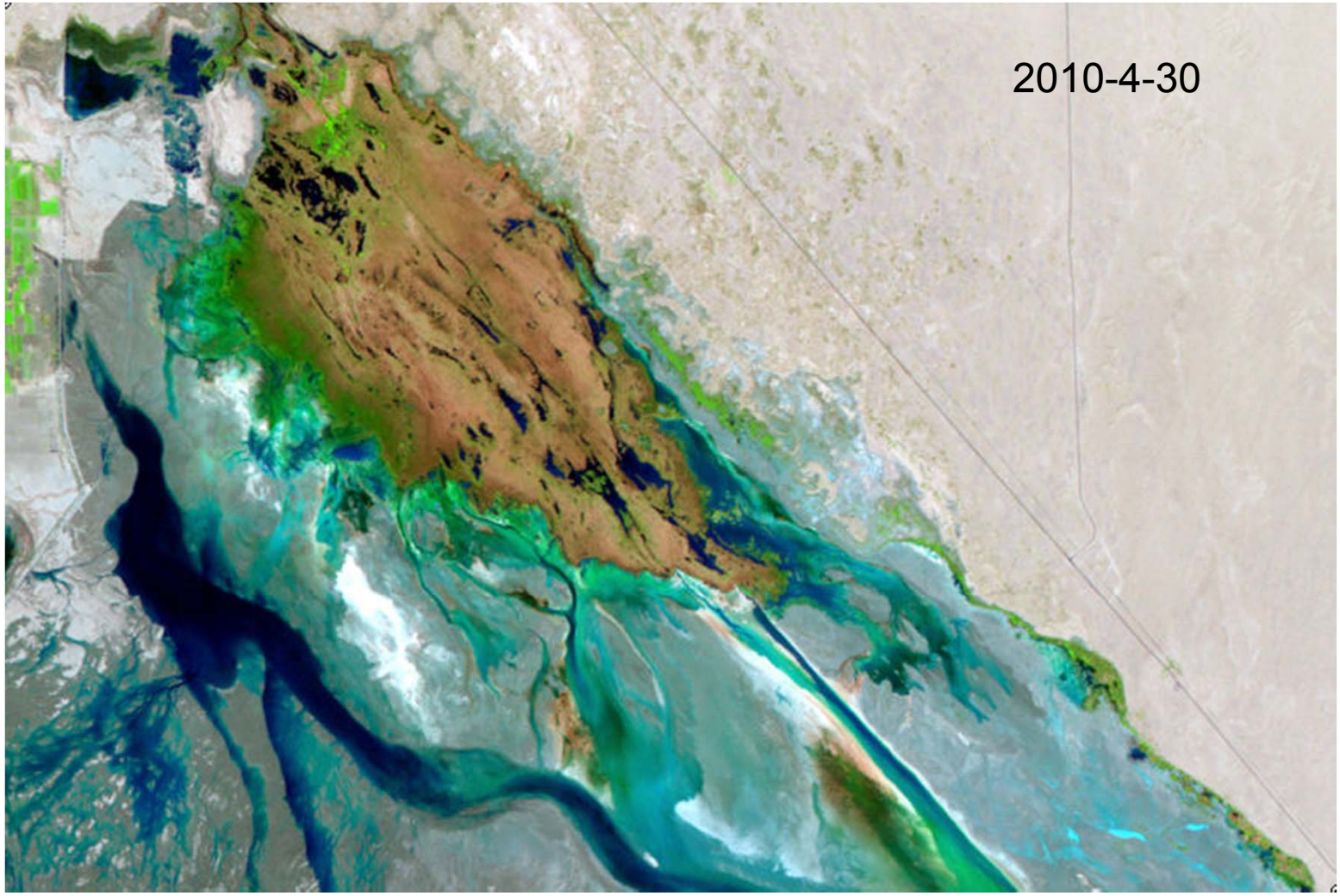

2010-3-29


2010-4-30

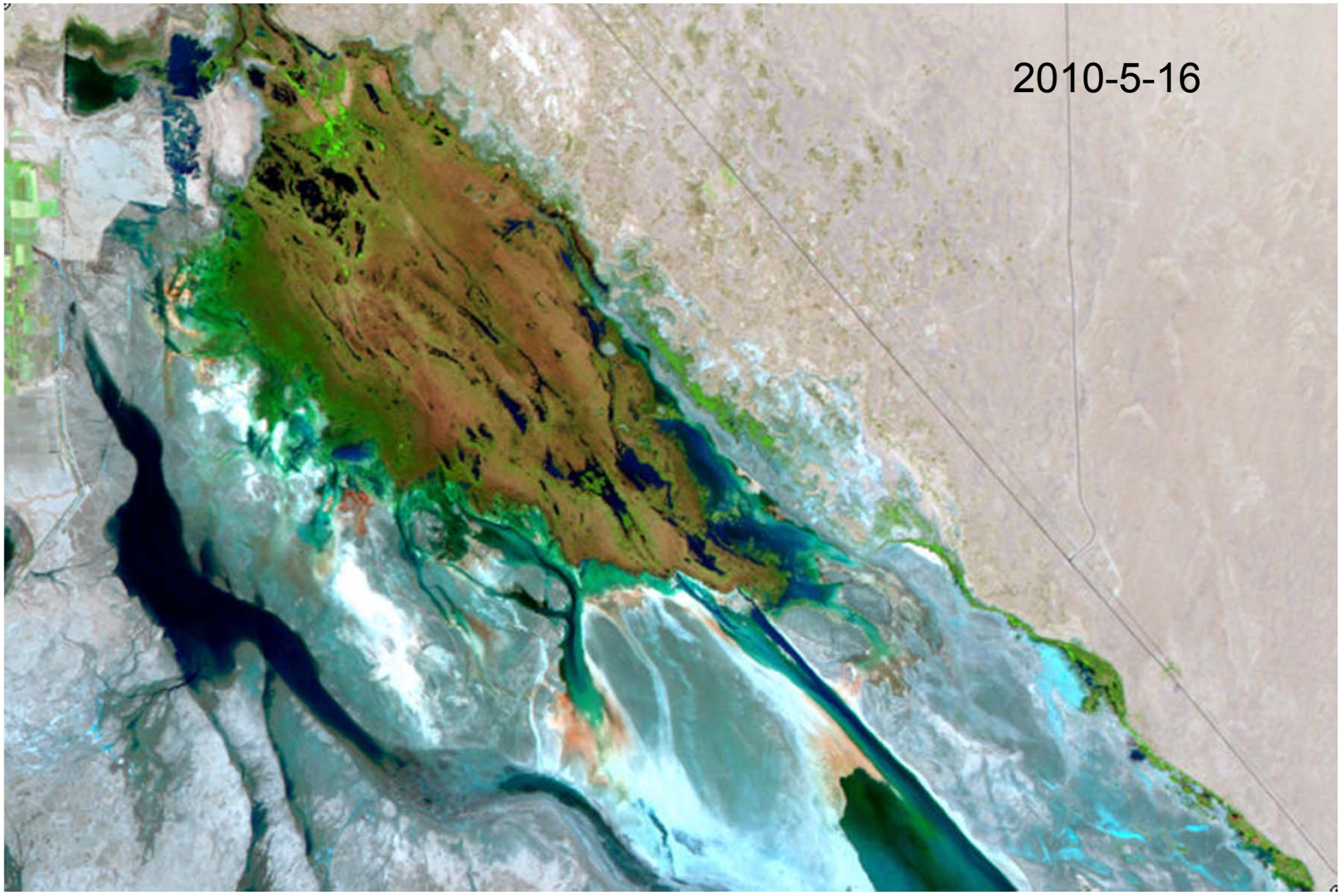
# Inflows to the Ciénega de Santa Clara

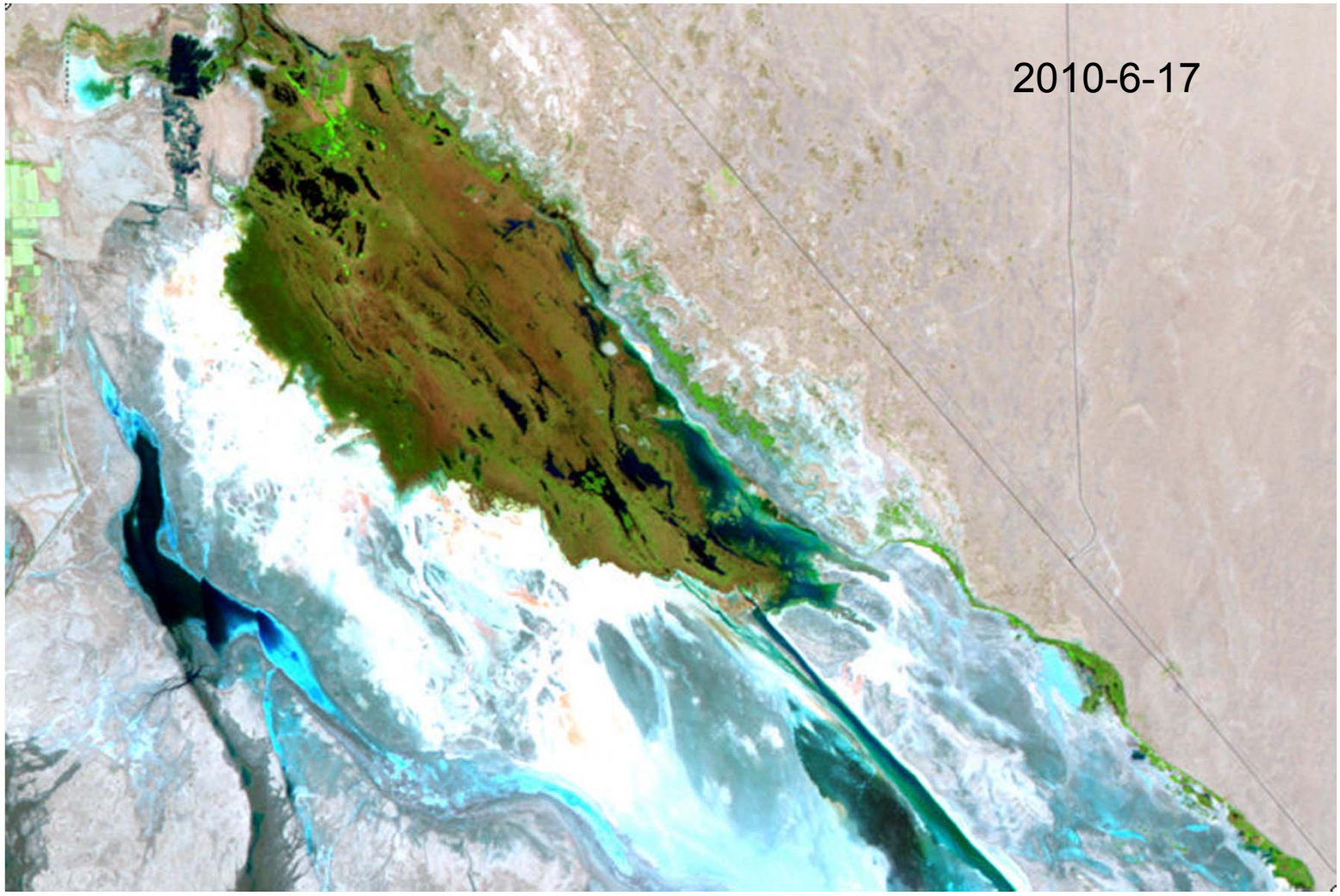


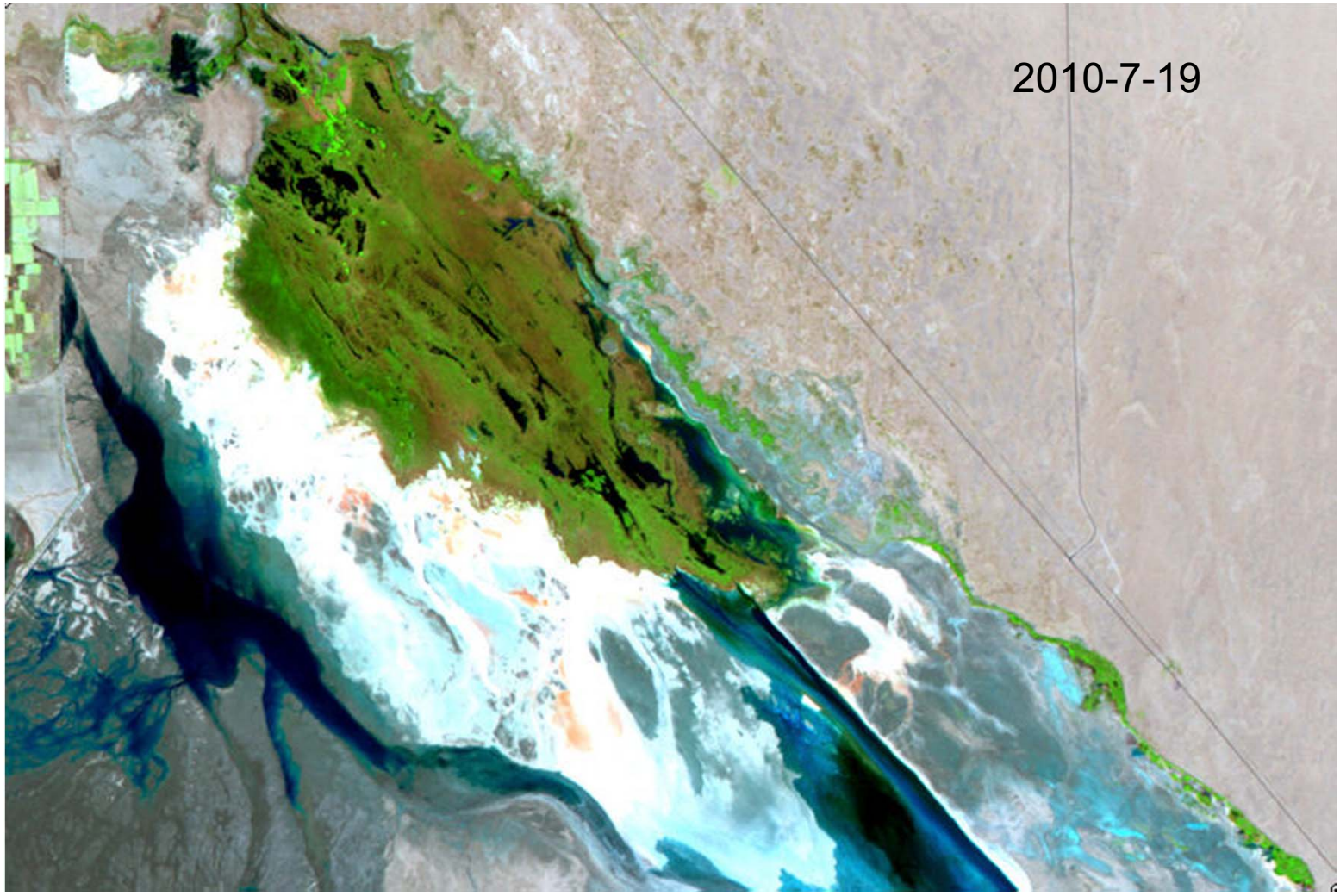
Before the YDP trial run



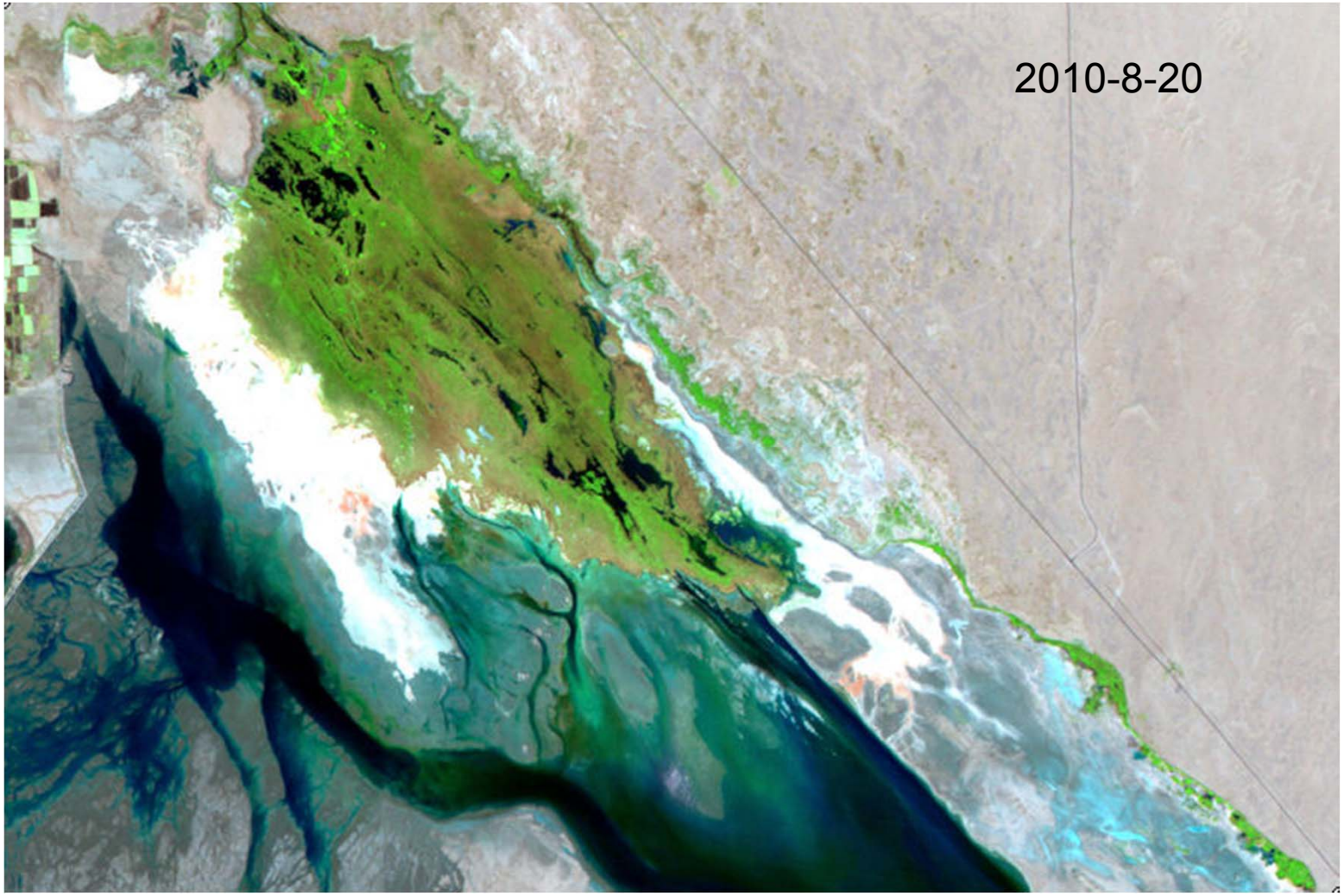
YDP operations begin



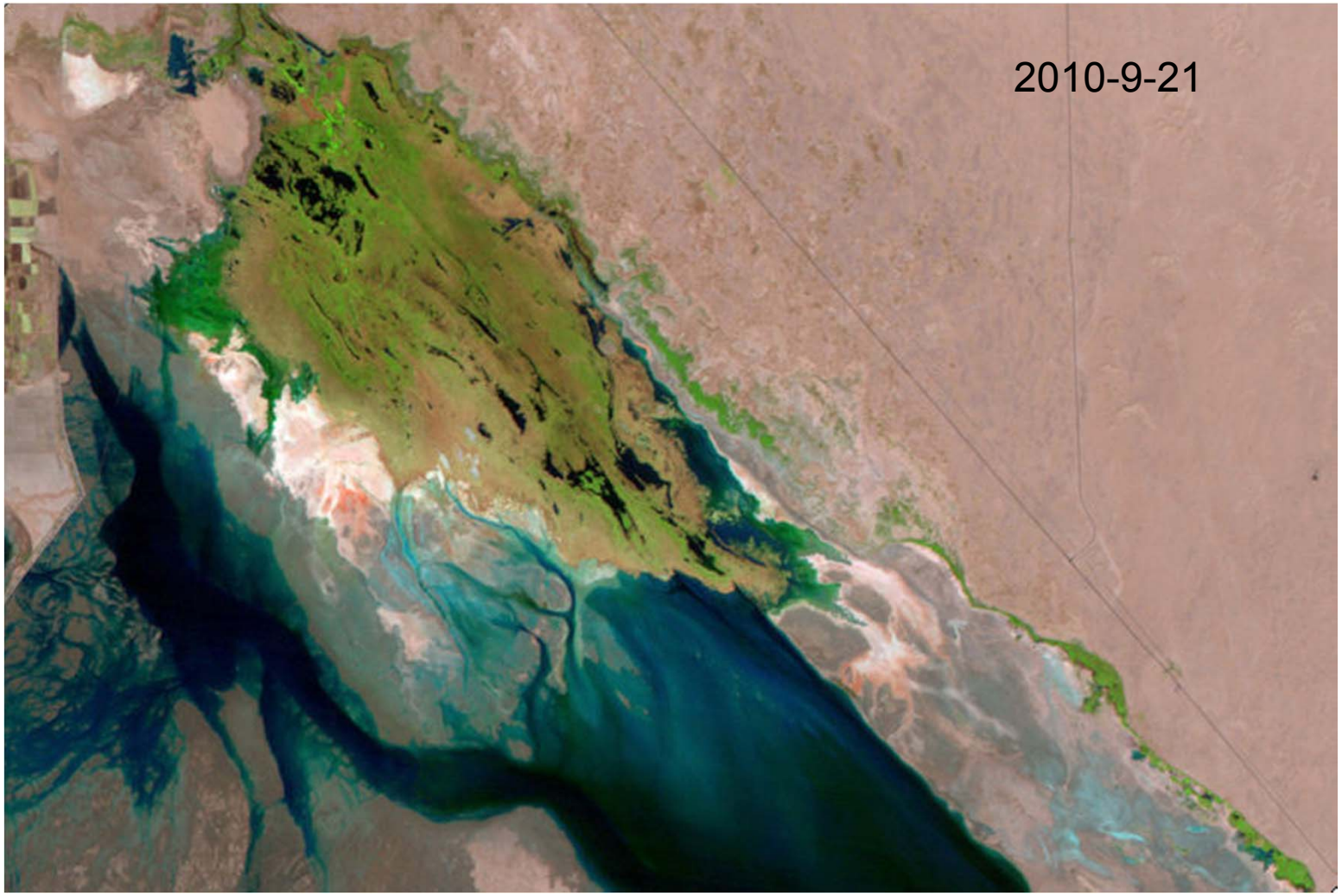

2010-6-17

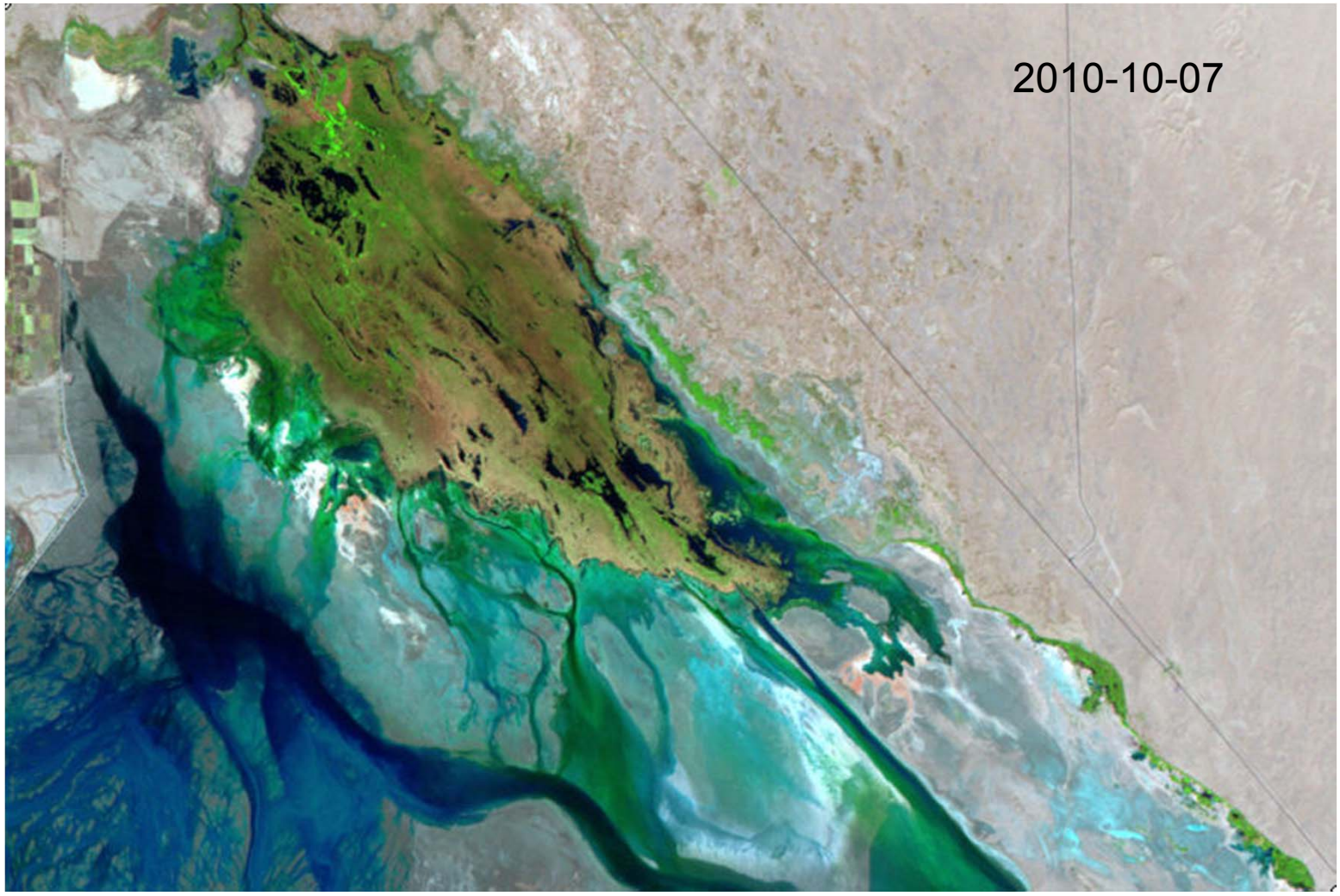

2010-7-19

# Effect of 30% flow reduction

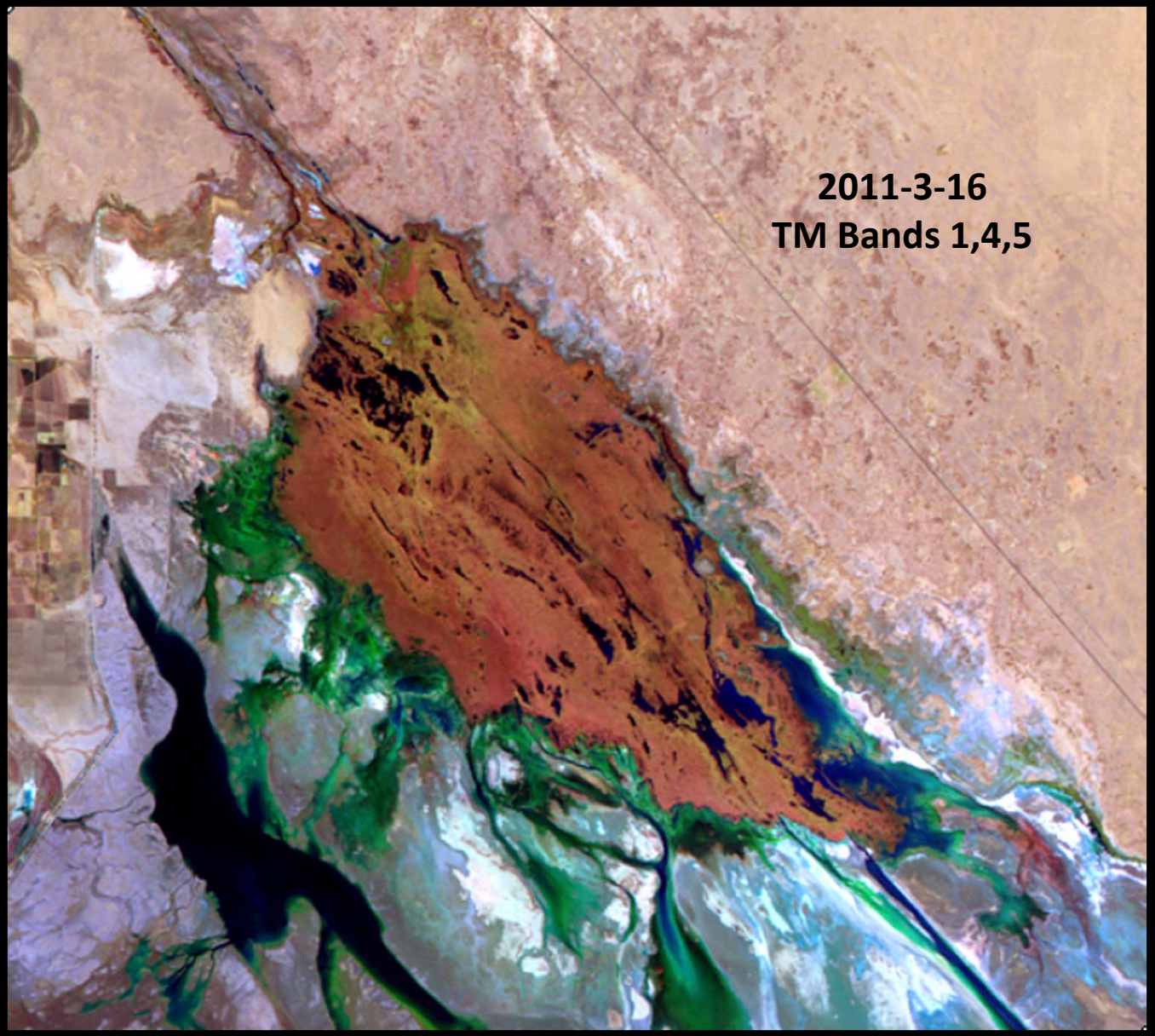


# Replacement water arriving

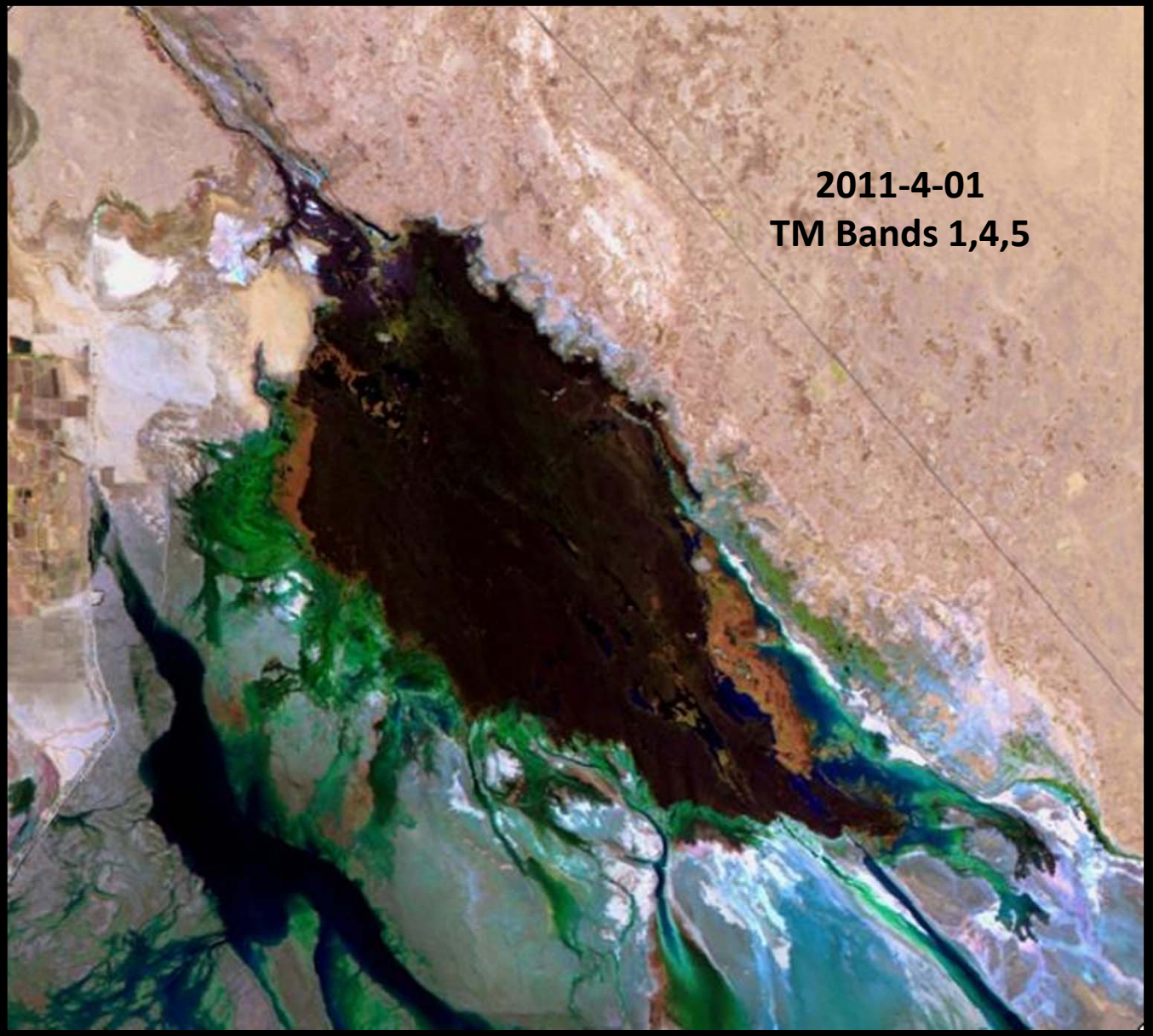



2010-10-07

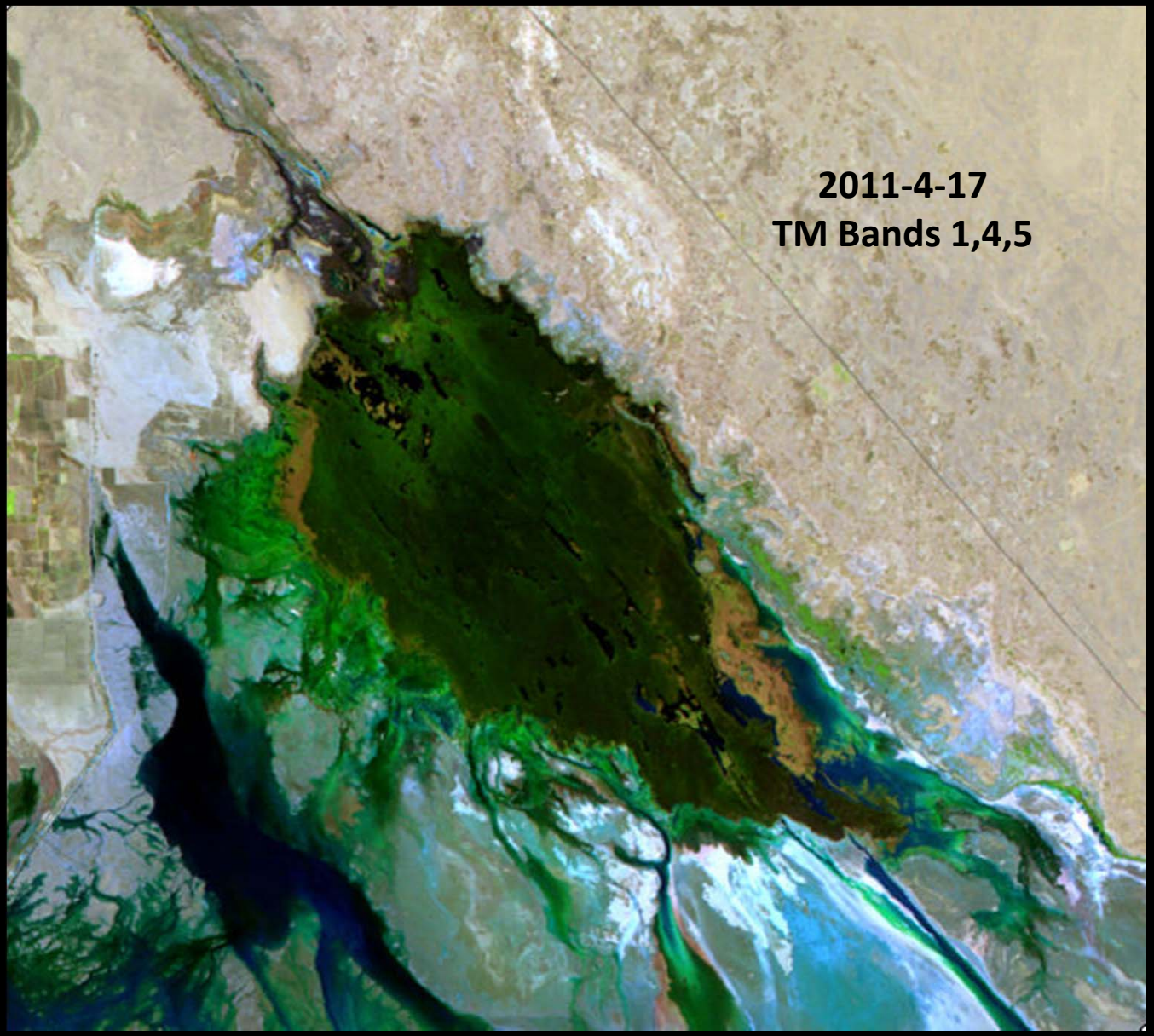
March 24, 2011.  Images by Salvador Chavez, Pronatura




S. Nelson 2011-4-17




S. Nelson 2011-4-17

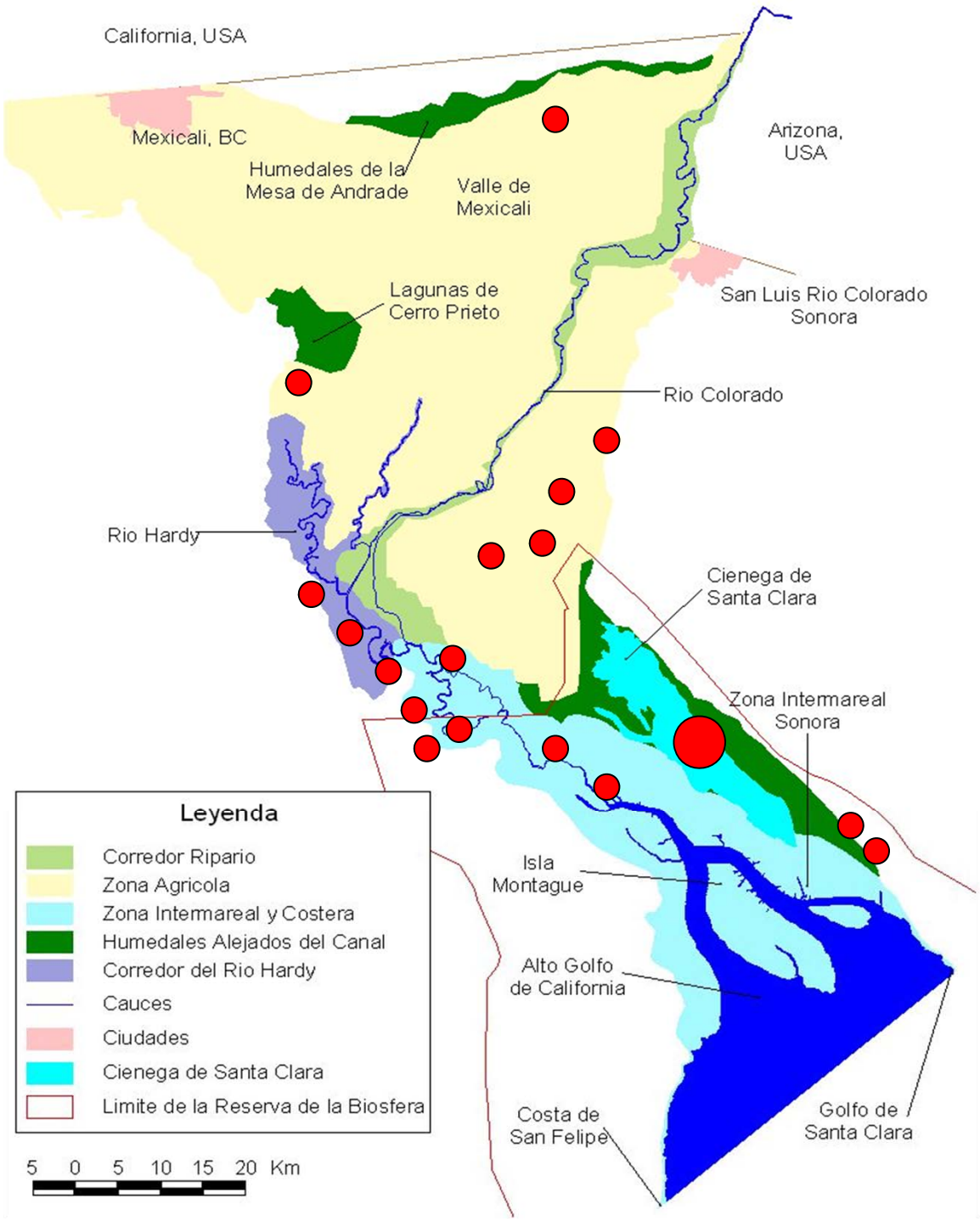



S. Nelson 2011-4-17

**Abril 13, 2011, tres semanas después del incendio**

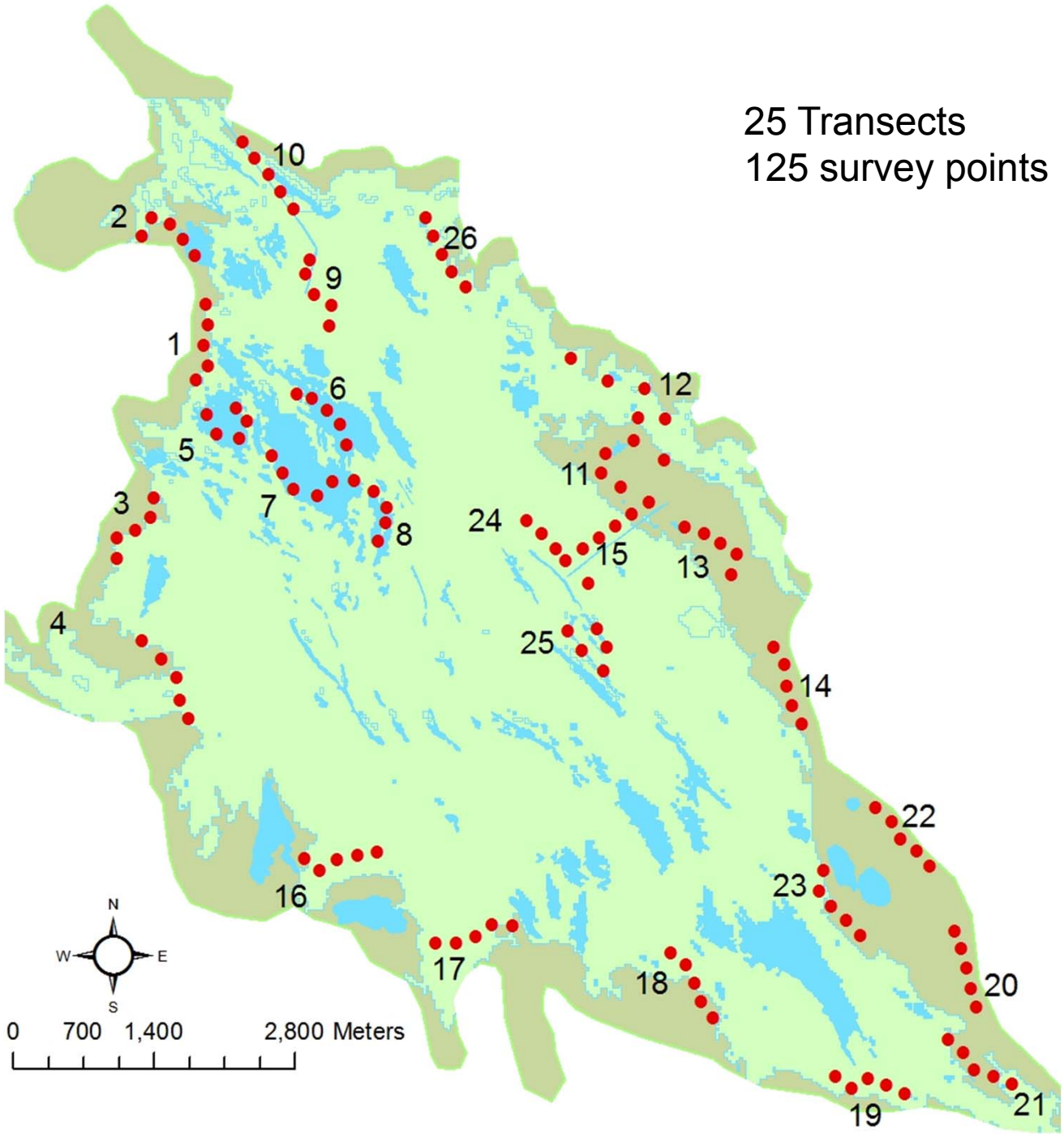
# Protocol

- Standardized Protocol for Monitoring Marshbirds in North America
- Two times per year: March and May
- Based on statistical power analysis to detect trends >3% per year
- 12 years of data: 1999-2010




# Protocol

- 40 transects in 6 wetland areas
- Each transect with 5-10 points
- 25 transects in the Cienega de Santa Clara


25 Transects
125 survey points
10
2
26
9
1
6
12
5
11
7
3
24
8
15
13
4
25
14
22
16
23
17
18
20
19
21
N
W
E
S
0
700
1,400
2,800 Meters

# Analysis

- Access relational database and GIS layers
- Density and abundance estimated using Distance Modeling (GOF, AIC, and CV)
- Population trend: average rails/point at each transect. Linear regression vs time (year)
- Distribution: Spatial Analyst Tools, Inverse Distance Weighted (IDW) Interpolation. Cell size = 100 m, 15 neighbors.

# Results

- We detected 1,478 marshbirds, 96.4% of survey sites
- 631 Yuma Clapper Rails
- CLRA detected at 77.6% of all survey sites
- Detected 16 BLRA, at 5.4% of the sites, located in the edge sites of the Cienega

| | Visit | | | |
|---|---|---|---|---|
| Species | I | II | Total | % |
| American Bittern | 12 | 26 | 38 | 2.57 |
| Black Rail | 4 | 12 | 16 | 1.08 |
| Clapper Rail | 257 | 374 | 631 | 42.69 |
| Least Bittern | 55 | 243 | 298 | 20.16 |
| Sora | 149 | 1 | 150 | 10.15 |
| Virginia Rail | 159 | 186 | 345 | 23.34 |
| Total | 636 | 842 | 1478 | 100.00 |
| Points with no birds | 7 | 5 | 9 | 3.6 |

# Results

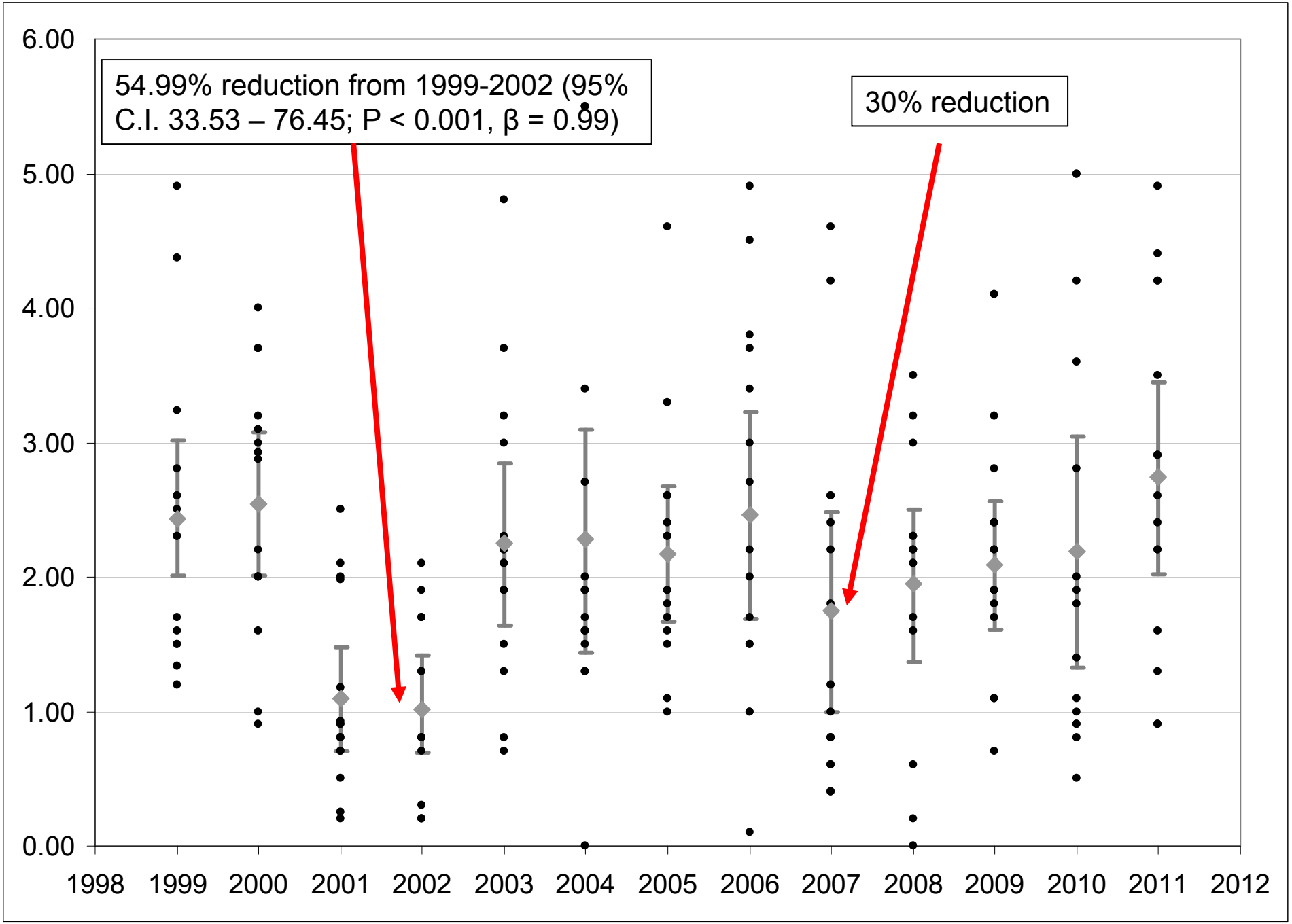
- The overall CLRA avg was 2.74 (± 0.21)/point

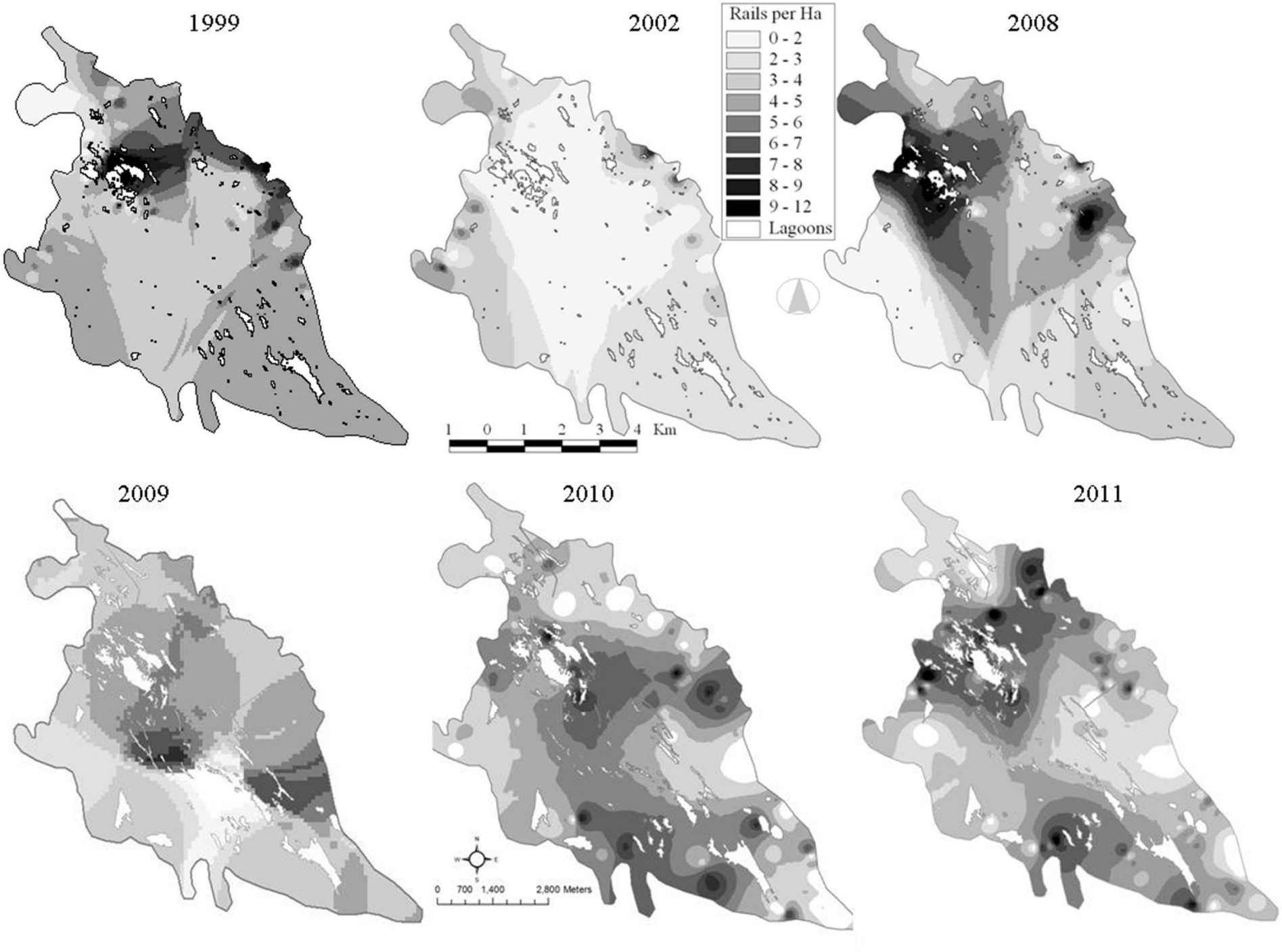
Density estimation with Distance Modeling:

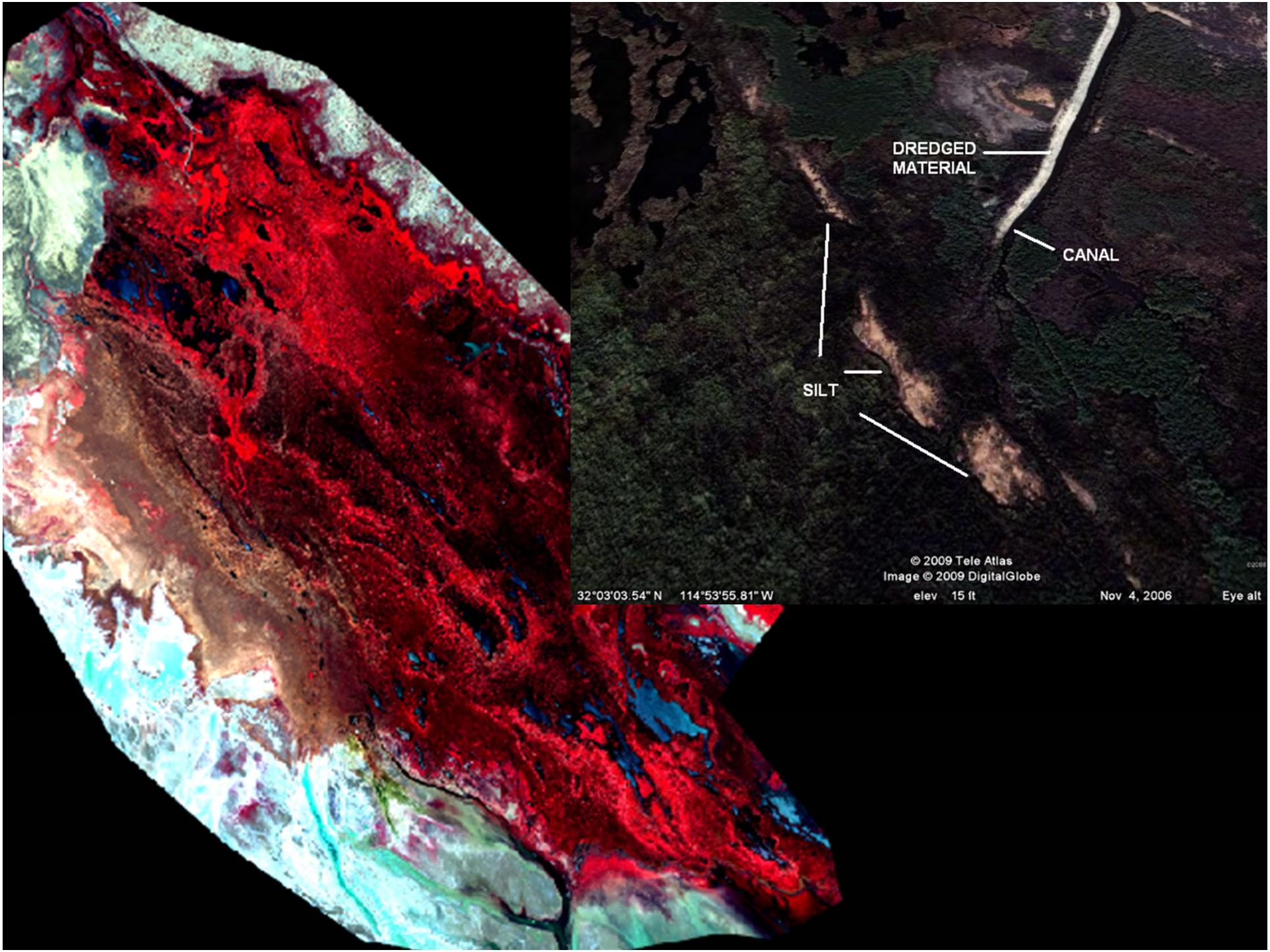
- The density of CLRA was 1.49 rails per ha (95% C.I. 1.33 - 1.67; GOF Chi-p=0.77).

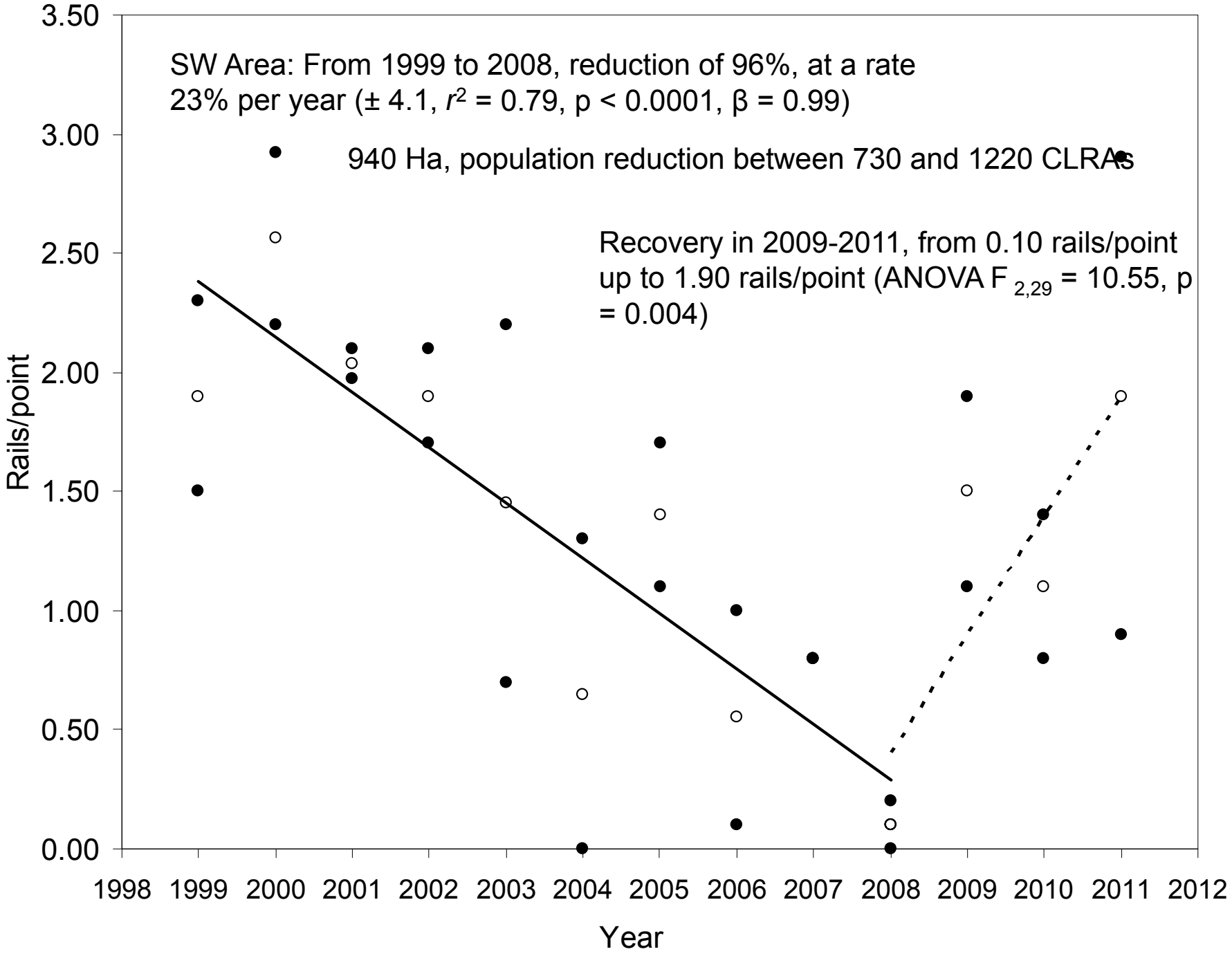
- Study area of 5,800 ha; the estimated abundance 8,642 (95% C.I. 7,714 – 9,686)

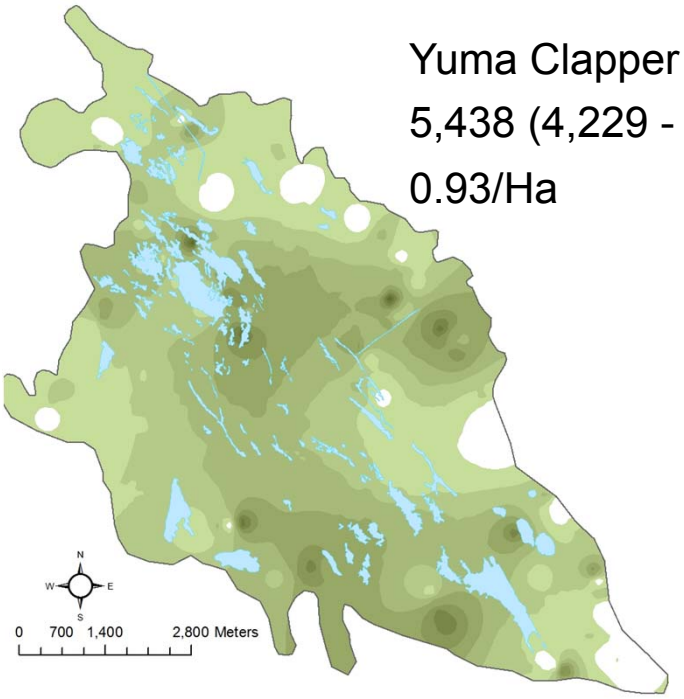
| Year | Density of CLRA (rails/ha) | Pop Estimate |
|---|---|---|
| 2006 | 1.03 (0.81 -1.29) | 5,974 (4,698 – 7,482) |
| 2008 | 0.59 (0.43 – 0.80) | 3,564 (2,623 – 4,842) |
| 2010 | 0.94 (0.73 - 1.21) | 5,438 (4,229 - 6,993) |
| 2011 | 1.49 (1.33 – 1.67) | 8,642 (7,714 – 9,686) |


54.99% reduction from 1999-2002 (95% C.I. 33.53 – 76.45; P < 0.001, β = 0.99)
30% reduction
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

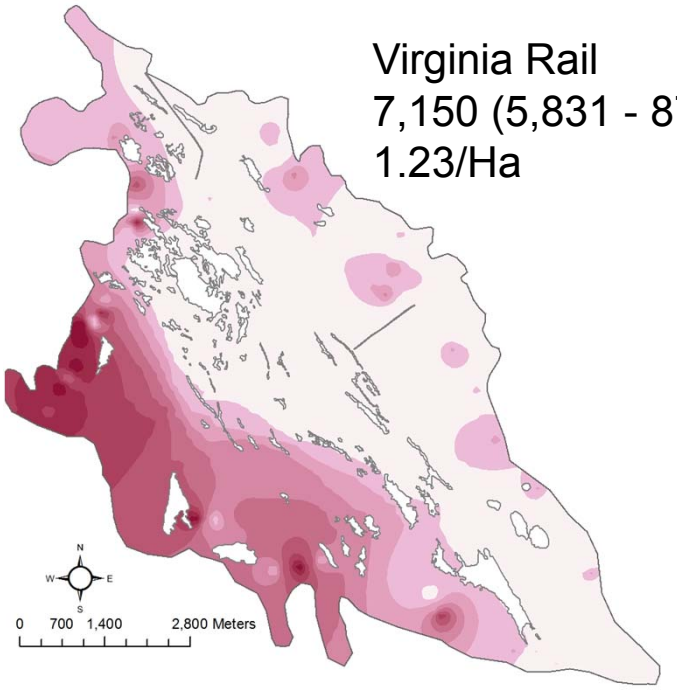

1999
2002
2008
Rails per Ha
0 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
8 - 9
9 - 12
Lagoons
1 0 1 2 3 4 Km
2009
2010
2011
0 700 1,400 2,800 Meters


DREDGED
MATERIAL
CANAL
SILT
© 2009 Tele Atlas
Image © 2009 DigitalGlobe
32°03'03.54" N 114°53'55.81" W
elev 15 ft
Nov 4, 2006
Eye alt

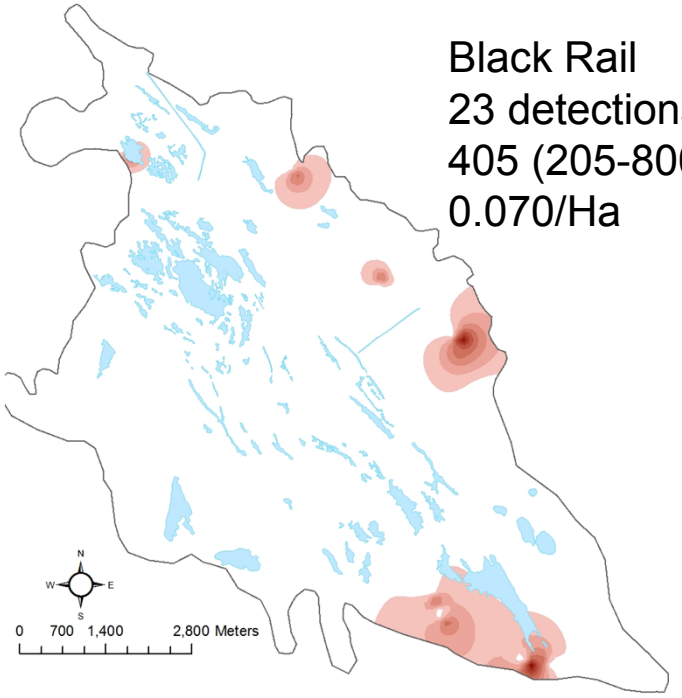

SW Area: From 1999 to 2008, reduction of 96%, at a rate 23% per year (± 4.1, $r^2$ = 0.79, p < 0.0001, β = 0.99)
940 Ha, population reduction between 730 and 1220 CLRAs
Recovery in 2009-2011, from 0.10 rails/point up to 1.90 rails/point (ANOVA $F_{2,29}$ = 10.55, p = 0.004)
Rails/point
Year
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012



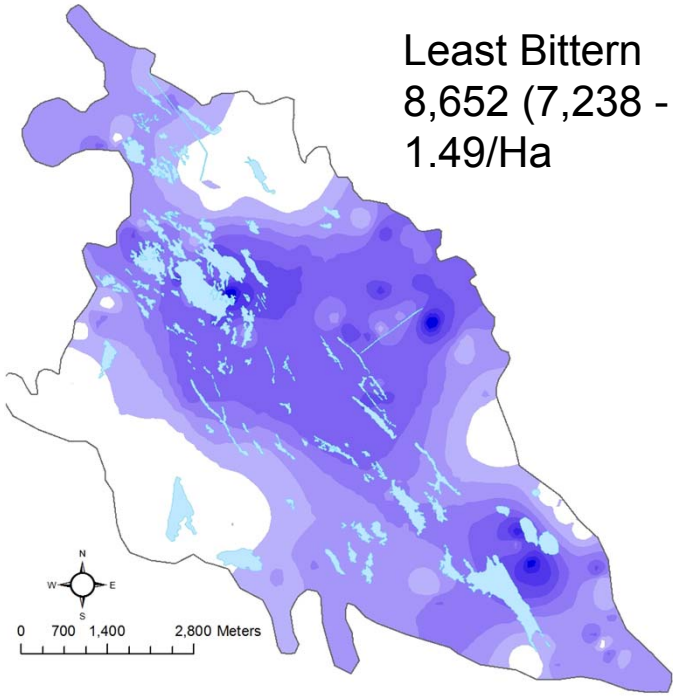

Yuma Clapper Rail
5,438 (4,229 - 6,993)
0.93/Ha



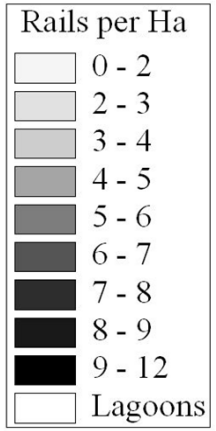

Virginia Rail
7,150 (5,831 - 8768)
1.23/Ha




Black Rail
23 detections
405 (205-800)
0.070/Ha




Least Bittern
8,652 (7,238 - 10,342)
1.49/Ha



Conclusions:

Resilient ecosystem within the level of impacts that have occurred

Lack of dynamism causes senescence of marsh vegetation and declines on bird populations

Reduction of flows to certain areas cause a local reduction in number of Clapper Rails

Disturbance (fire, shift and variation in flows) enhance the dynamism in the marsh and results in increased numbers of marshbirds